

### Purpose of full-vacuum chlorinators

Chlorine gas is important for the disinfection of potable and swimming pool water but also represents a source of danger as far as handling, transportation and storage are concerned. Therefore the vacuum principle has been used in chlorination installations already for decades. According to this principle, the pressure of the chlorine gas is reduced to vacuum, and only then, if the vacuum is sufficient, will chlorine gas flow to the metering point.

The main safety aspect is that the escape of chlorine gas is actually avoided. Even in the case of a line rupture chlorine gas cannot escape but only ambient air can be primed.

### Full-vacuum chlorinator C 2212

The full-vacuum chlorinator used as pressure reducing valve is of central importance for the safety in vacuum installations. For this reason the C 2212 version has been designed in accordance with the highest safety standards. Its compact design is most suitable for installations of simple structure. The C 2212 combines several functions in one housing:

(all numbers in brackets refer to the schematic diagram on the page MB 2 04 12 / 3).

#### a) Vacuum regulation

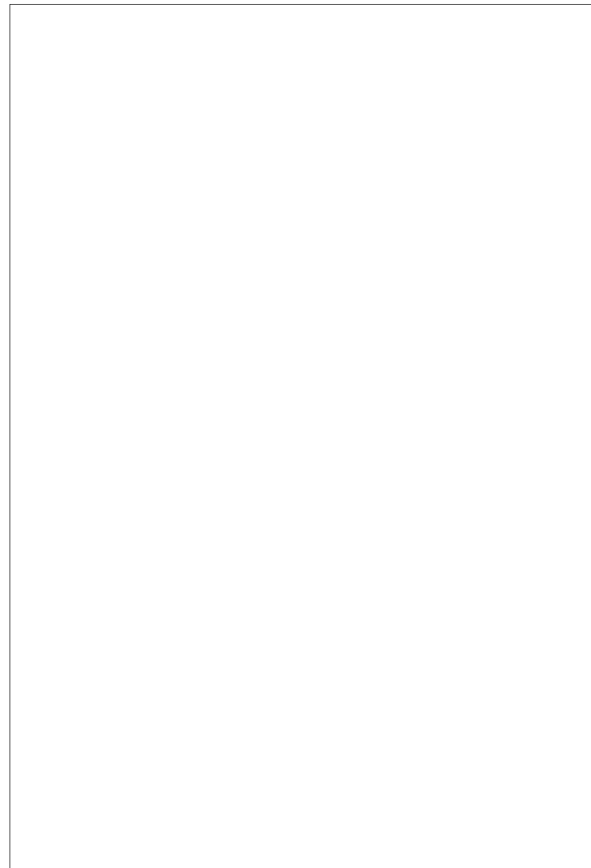
In the initial position the ball (1) rests on the valve seat (2). It is pressed onto the seat by the locking spring (3) and the chlorine cylinder pressure and closes the system. After switching on the ejector (water-jet pump), a vacuum is generated. The vacuum applies a force to the working diaphragm (7) of the full-vacuum chlorinator, which is directed to the right. This force is transferred to the valve ball (1) by the valve rod (8) so that chlorine gas enters the vacuum system. If the vacuum breaks down, the valve ball falls back immediately onto the valve seat and stops the chlorine gas supply.

#### b) Flow indication and adjustment

A flow meter is mounted on the front side of the C 2212 full-vacuum chlorinator. The position of the float element (11) indicates the flow directly at the scale on the gauge tube. Gauge tubes with maximum rates between 25...4000 g Cl<sub>2</sub>/h are available.

#### Attention:

The constant volume of chlorine gas delivered per hour from one chlorine cylinder must not exceed 1 % of the original contents. Consequently the



maximum rate for e.g. a 65 kg cylinder is 650 g Cl<sub>2</sub>/h. Otherwise there is the risk of cylinder icing. If larger amounts are required, the chlorine is supplied simultaneously from several cylinders (see installation examples).

The chlorine gas flow can be easily adjusted using the needle valve (12) located directly at the measuring glass holder.

#### Note:

For automatic control of chlorination an electrically operated chlorine control valve (see MB 2 07 10) is used. If required, it is installed anywhere in the tubing line to the ejector non-return valve.

#### Note:

If the chlorination installation is to correspond to the German standard DIN 19606, a back-pressure regulator must be used, which avoids pressure fluctuations in the system. The back-pressure regulator is integrated in the non-return valve (see MB 2 32 01).

**c) Safety valve**

If the inlet valve of the vacuum chlorinator does not close completely due to impurities, it is possible that an excessive pressure develops in the vacuum piping system which causes undesired chlorination. To avoid this, the safety valve is used. Even the lowest pressure causes the large working diaphragm (7) to move to the left. Thus the spring (8) is compressed and the diaphragm disk (9) lifts off from the valve seat (10). As a result a flow tunnel opens at the diaphragm disk, and the excessive pressure escapes into the left chamber of the vacuum chlorinator.

The end of the blowdown pipe is run near the gas sensor. Thus an immediate alarm signaling is ensured.

**d) Residual pressure preservation**

While emptying the chlorine cylinder, the cylinder pressure decreases until it is too low to remove the ball (4) against the spring (6) from the valve seat (5). A residual pressure of approx. 0.1 bar remains in the cylinder.

Thus humidity cannot enter the cylinder during replacement. The humidity of the entering air would cause the chlorine cylinder to corrode internally so that the chlorine gas could be contaminated. Consequently, the residual pressure preservation helps to extend the operational life of the chlorine cylinder.

**e) Pressure gauge**

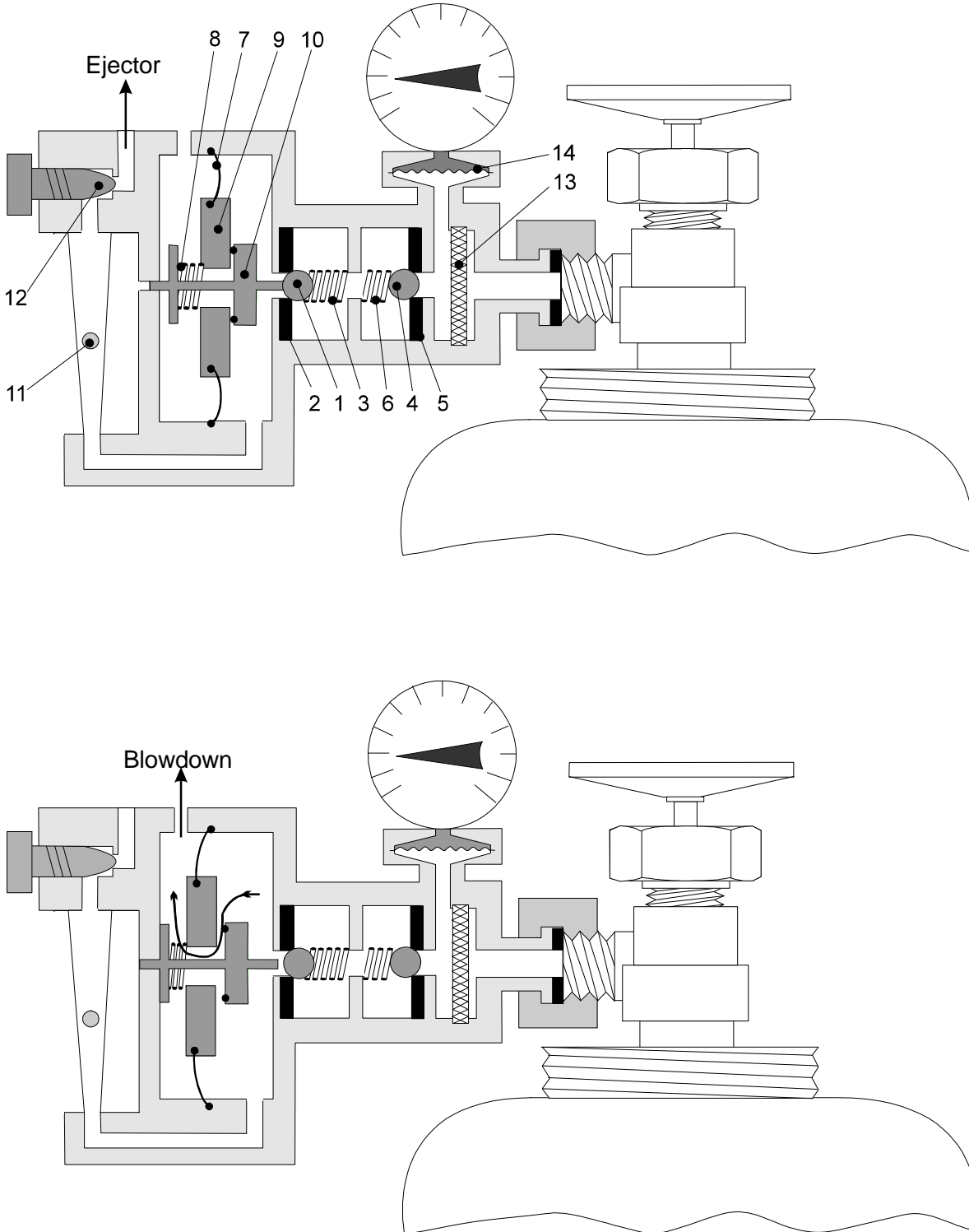
The C 2212 chlorinator is equipped with a pressure gauge for the indication of the cylinder pressure. The gauge is protected by a silicone-diaphragm separator transmitting the pressure harmlessly, and has a hydraulically coupled, splash-proof measuring element in a plastic housing. The separating diaphragm (14) is coated with a silver film as a protection against the chlorine gas. In order not to damage it by dirt particles the chlorine gas is directed through an integrated filter (13) before reaching the pressure gauge.

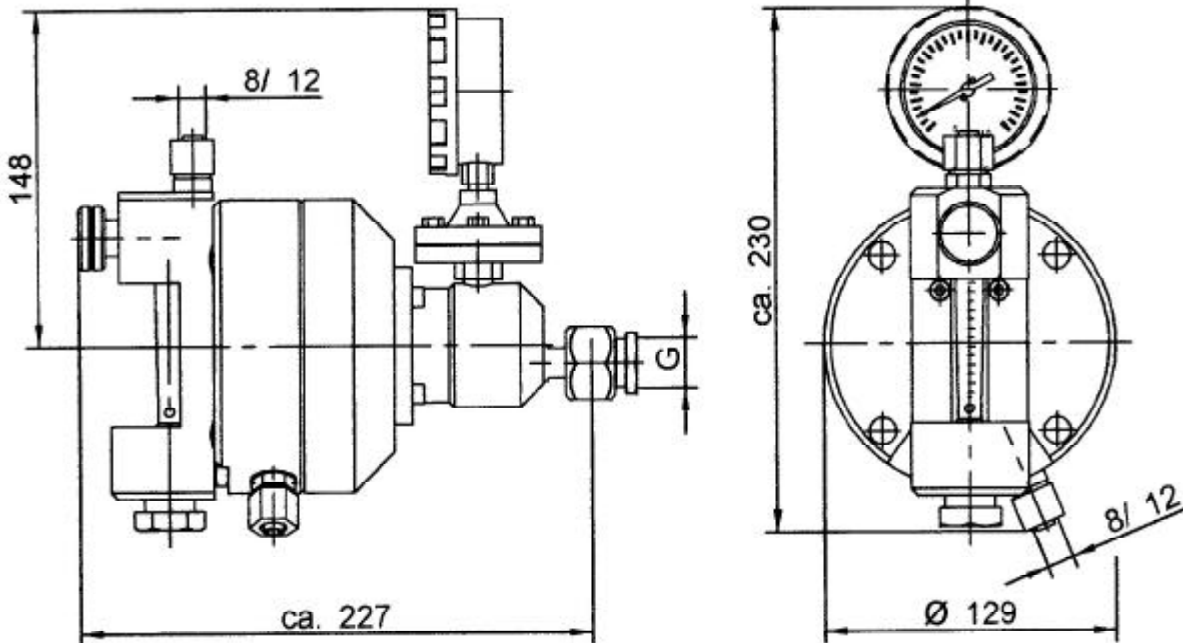
The measuring range of the pressure gauge is -1...0...15 bar so that also the residual pressure preservation function can be controlled.

**Technical data of the full-vacuum chlorinator**

Materials	chlorine-resistant such as nickel-plate brass, Hastelloy, PVC, Viton
Operating vacuum	80 mbar (for 200g/h)
Response pressure of safety valve	30 mbar
Maximum flow	depending on the measuring glass, up to 4000 g/h
Setting ratio	1:20
Accuracy	+/- 6% final scale reading
Weight	3000 g
Pressure stage	PN16
Pressure connection	union nut W1", G5/8, G3/4
Metering connection	PE tubing d 8/12
Blowdown connection	PE tubing d 8/12

Schematic diagram of the full-vacuum chlorinator C 2212



**Dimensions C 2212**

**Full-vacuum chlorinator C 2212**

Measuring range	Cylinder connection		
	W 1"	G 5/8	G 3/4
1... 25	20401200	20401208	20401216
4... 80	20401201	20401209	20401217
10... 200	20401202	20401210	20401218
25... 500	20401203	20401211	20401219
50... 1000	20401204	20401212	20401220
100... 2000	20401205	20401213	20401221
125... 2500	20401206	20401214	20401222
200... 4000	20401207	20401215	20401223

**Tubing / Accessories**

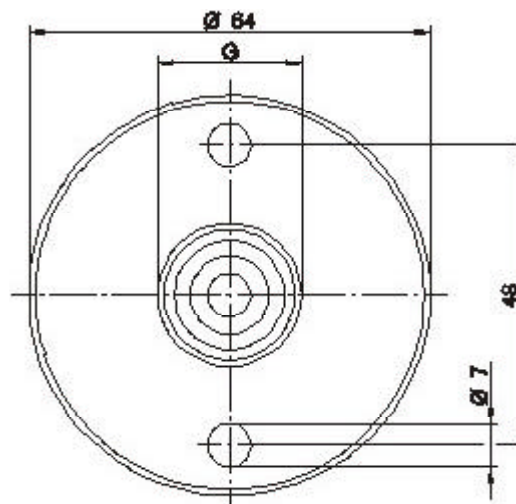
PE d 8/12	Part No. 97124
PVC d 8/12	Part No. 97561
PE d 12/16	Part No. 97176
Ammonia bottle (30ml)	Part No. 13513
Accessories kit (5m PE tubing, mounting brackets, ammonia)	Part No. 22412
Fork wrench SW32	Part No. 15901

**Wall holder**

Two different wall holders are available:  
 A PVC wall holder is used to receive the chlorinator while the cylinder is exchanged and closes the pressure connection at the same time. Thus the entry of humid air is avoided effectively also during replacement of the cylinder.

A steel wall holder (see MB 2 23 03) is used as a permanent connection unit. The chlorinator is mounted onto the wall holder and is supplied

simultaneously from several chlorine cylinders via a manifold. Thus it is possible to meter large quantities with just one chlorinator (see installation example 2).

**Dimensions and Part Nos.**

**PVC wall holders for C 2212**

Threaded pin W 1"	Part No. 28380
Threaded pin G 5/8	Part No. 29752
Threaded pin G 3/4	Part No. 28360
(Delivery incl. mounting material)	

### Activated-carbon cartridge

In almost any installation incl. vacuum systems, temporary shock pressures may occur, which cause the extremely sensitive safety valve to respond briefly so that the gas warning device is activated.

In order to make sure that only a "real" dangerous situation is indicated by the gas warning device, an activated-carbon cartridge is integrated in the blowdown pipe, thus avoiding faulty alarms. Only if larger amounts of chlorine escape will an alarm be reported.

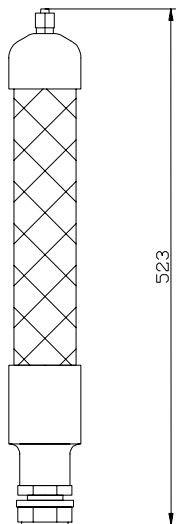
#### Technical data

Material: PVC  
 Contents: 1.2 l  
 Connection: PE or PVC tubing d 8/12  
 Weight: 1200g

#### Note:

It is sensible to use a transparent PVC tubing (d 8/12 = JESCO part no. 97561) as the connecting line to the activated-carbon cartridge instead of the standard PE tubing. As soon as the PVC tubing gets in contact with chlorine it changes from transparent to milky green. In the case of a chlorine outbreak, the point of leakage can thus be noticed at a glance.

#### Dimensions and Part No.



Activated-carbon cartridge Part No. 12032301  
 (Delivery incl. mounting material)

### Back stop / back-pressure valve

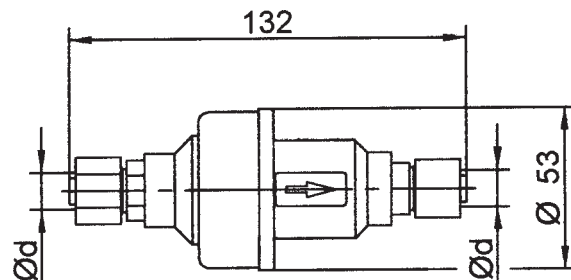
It is an experience that even the best ejector non-return valve may become untight sometime because of impurities. Therefore the installation of an additional back stop is prescribed by law in some countries. Its function is to prevent water from entering the chlorinators even in the case of a failure so that these devices are not damaged.

The backstop has a second safety function. It requires a small differential pressure to open. The value of this differential pressure has been chosen so that it slightly exceeds the minimum response pressure of the safety valve. Even in the case of creeping chlorine leakage at the full-vacuum chlorinator, the safety valve responds exactly thus avoiding the development of excessive pressure in the vacuum system.

#### Technical data

Materials: PVC, Viton, glass, Hastelloy  
 Response pressure: 40 mbar  
 Flow rate: up to 10 kg Cl<sub>2</sub>/h  
 Connections: PE tubing d 8/12 or PE tubing d 12/16  
 Weight: 150 g

#### Dimensions and Part Nos.



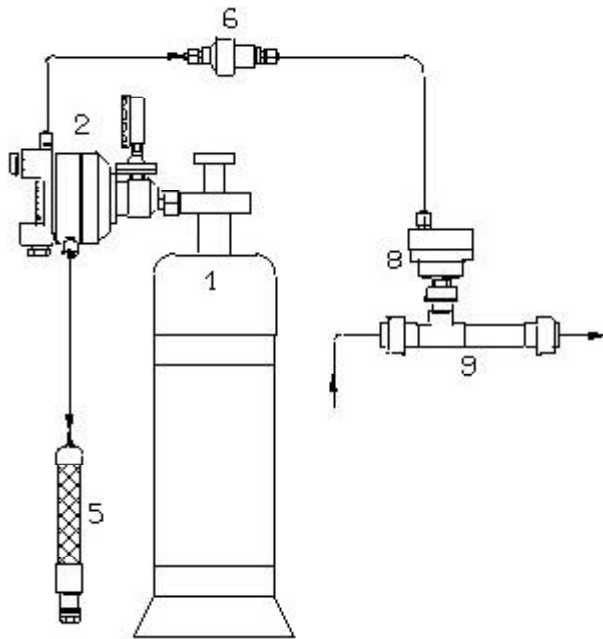
Back stop with connections for  
 tubing d 8/12 Part No. 20400060  
 tubing d 12/16 Part No. 20400061  
 PVC d 16i Part No. 20435118

### Safety Shutoff Valve

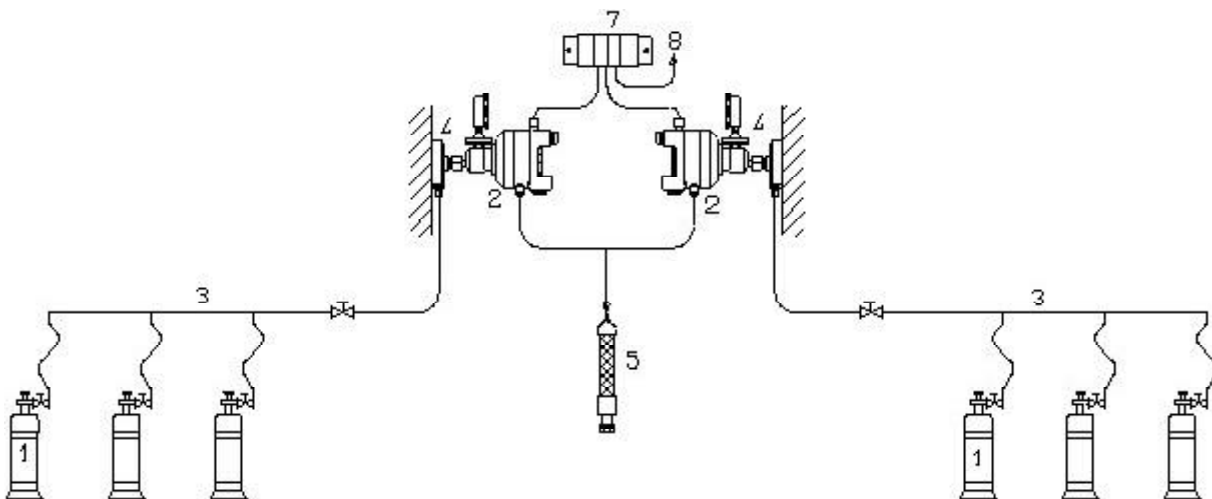
Often the use of a valve is required which opens only if the ejector is under vacuum and which is completely closed during system standstill. The safety shutoff valve ensures this function. It is installed instead of the back stop. (Description see MB 2 04 06).

Installation examples

Simplest installation structure



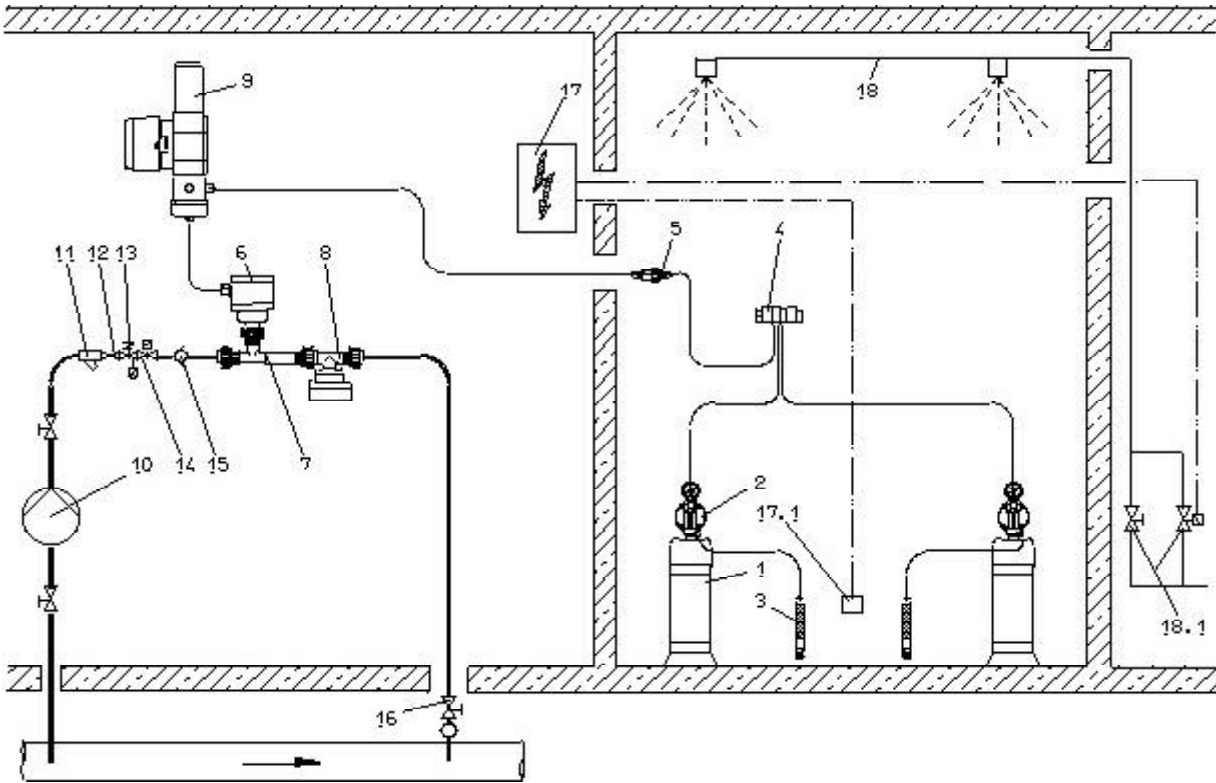
Several chlorine cylinders combined on the discharge side with one full-vacuum chlorinator per battery



Legend

- |                                  |                               |
|----------------------------------|-------------------------------|
| 1 Chlorine cylinder              | 6 Back stop                   |
| 2 Full-vacuum chlorinator C 2212 | 7 Changeover equipment C 2005 |
| 3 Overpressure manifold          | 8 Ejector non-return valve    |
| 4 Wall connection block          | 9 Ejector                     |
| 5 Activated-carbon cartridge     |                               |

Schematic diagram of a complete chlorination installation



Legende

1	Chlorine cylinder		12	Shutoff valve	MB 2 29 04
2	Full-vacuum chlorinator C 2212	MB 2 04 12	13	Pressure reducing valve with pressure gauge	MB 2 29 04
3	Activated-carbon cartridge	MB 2 04 12	14	Solenoid valve	MB 2 29 04
4	Chlorine changeover equipment C 2005	MB 2 04 05	15	Ball non-return valve	
5	Back stop or Safety Shutoff Valve	MB 2 04 12 MB 2 04 06	16	Chlorine solution injector	MB 2 34 01
6	Ejector non-return valve	MB 2 32 01	17	Chlorine gas warning device	MB 2 36 04
7	Ejector	MB 2 31 01	17.1	Sensor for gas warning device	MB 2 36 04
8	Vacuum breaker	MB 2 33 02	18	Sprinkler installation	MB 2 41 00
9	Control valve C 7700	MB 2 07 10	18.1	Accessories for sprinkler installation	
10	Booster pump	MB 2 29 01			
11	Dirt trap	MB 2 29 04			