

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 2211

The full-vacuum chlorinator used as pressure reducing valve is of central importance for the safety in vacuum installations. For this reason the C 2211 version has been designed in accordance with the latest findings. The device combines several functions in one housing:

(all numbers in brackets refers to the schematic diagram on the following page)

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) Simultaneous delivery

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 Cl₂/h.

In most application, chlorine delivery from one cylinder is not sufficient because much more chlorine is required than 650 g Cl₂/h. In these cases, chlorine is supplied simultaneously from several cylinders in so-called battery operation.

In order to make sure that the cylinders are emptied uniformly, all full-vacuum chlorinators must start working at the same vacuum. For this purpose JESCO C 2211 chlorinators are fitted with an opening pressure adjusting device. The adjusting screw (4)



is used to set the effect of forces between springs (9) and (3). As a result, it is ensured that the opening pressure is the same for all chlorinators and that the chlorine gas is delivered almost simultaneously from all connected cylinders.

Simultaneously delivery works with rate of approximately 200 g/h and more. In order not to remain under this rate, make sure that the number of connected cylinders is not larger than necessary.

c) Flow limiter

If some cylinders of a battery are already emptied and the full metering capacity is required, the delivery rate of the partly filled cylinders becomes inadmissibly high, thus causing icing of the cylinders. To avoid this, a flow limiter (11) is integrated in the vacuum connection, which allows a maximum delivery rate of approx. 1000 g/h.

If the full-vacuum chlorinator is mounted on chlorine barrels or in the case of sufficient chlorine supply from other sources, the device enables rates of up to 10 kg/h. For this purpose, the flow limiter can easily be removed.

(As a standard the flow limiter is an integrated part of the delivery).

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.

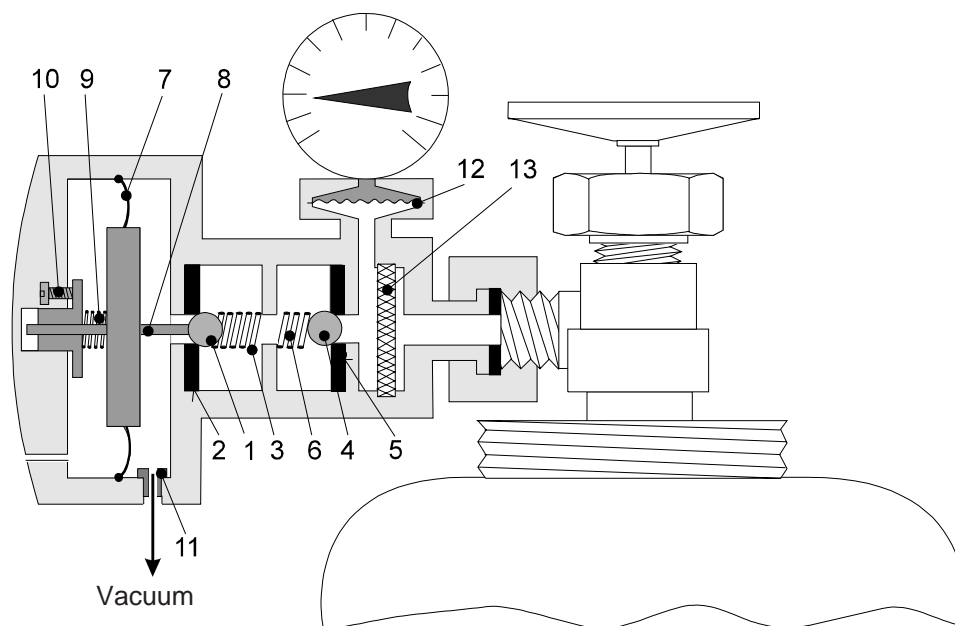
Thus humidity cannot enter the cylinder during replacement. The humidity of the entering air would cause the chlorine cylinder to corrode internally so that the chlorine gas could be contaminated. Consequently, the residual pressure preservation helps to extend the operational life of the chlorine cylinder.

e) Pressure gauge

The C 2211 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 (12) 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.

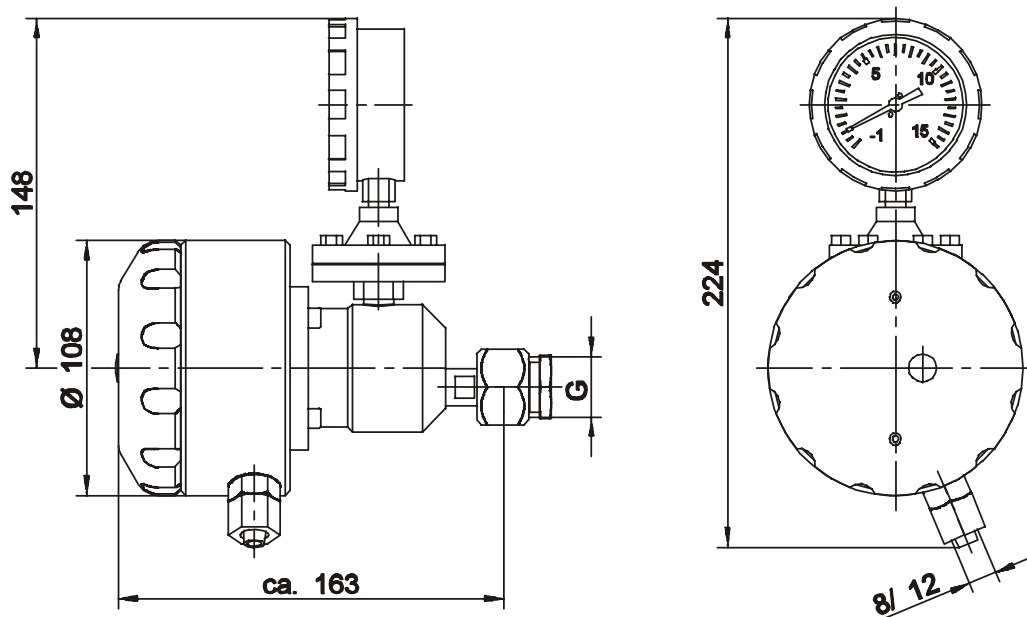
Schematic diagram of the full-vacuum chlorinator C2211



Technical data of the full-vacuum chlorinator

Materials	chlorine-resistant such as nickel-plated brass, Hastelloy, PVC, Viton
Max. capacity with flow limiter	approx. 1 kg/h
without flow limiter	10 kg/h
Operating vacuum	80 mbar (for 200 g/h)
Weight	2200 g
Pressure stage	PN16
Pressure connection	union nut W1", G5/8, G3/4
Metering connection	PE tubing d 8/12

Dimensions C 2211



Full-vacuum chlorinator C 2211

Union nut W 1"	Part No. 20401100
Union nut G 5/8	Part No. 20401101
Union nut G 3/4	Part No. 20401102

Tubing / Accessories

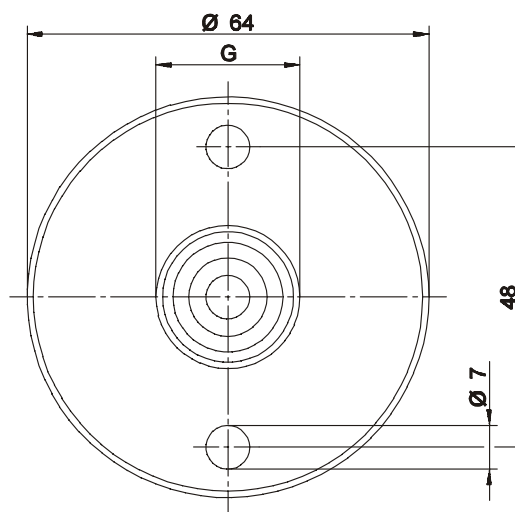
PE d 8/12	Part No. 97124
PVC d 8/12	Part No. 97561
PE d 12/16	Part No. 97176
Ammonia bottle (30ml)	Part No. 13513
Accessories kit (5m PE tubing, mounting brackets, ammonia)	Part No. 22412
Fork wrench SW32	Part No. 15901

Wall holder

Two different wall holders are available:
 A PVC wall holder is used to receive the chlorinator while 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 supplied simultaneously from several chlorine cylinders via a manifold. Thus it is possible to meter large quantities with just one chlorinator.

Dimensions and Part Nos.



PVC wall holders for C 2211

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)	

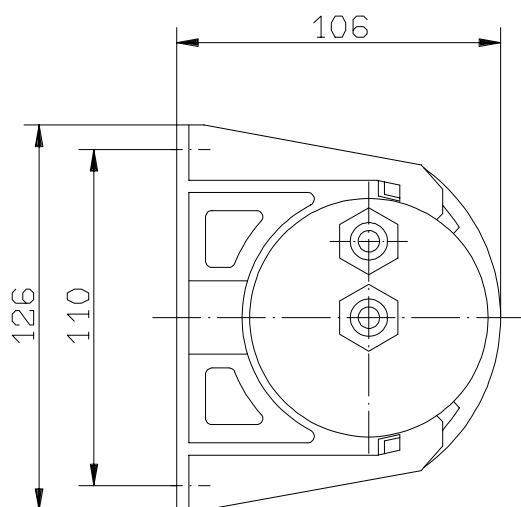
Safety valve

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. It opens at the lowest excessive pressure and discharges the piping system. The end of the blowdown pipe is run near the gas sensor. Thus an immediate alarm signaling is ensured.

Technical data

Materials: PVC, Viton, Hastelloy
 Opening pressure: 20 mbar
 Connection: PE tubing d 8/12
 Weight: 350 g

Dimensions and Part No.



Safety valve Part No. 32843
 (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 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.

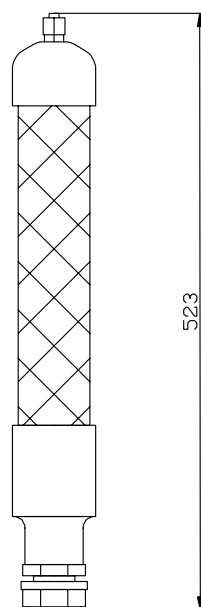
Technical data

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

Note:

It is sensible to use a transparent PVC tubing 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)

Measuring glass holder

The measuring glass holder combines two functions: It monitors and adjusts the chlorine gas flow. Flow meters with maximum rates of 25...4,000 g Cl₂/h are available. The chlorine gas flow is adjusted using the needle valve of the measuring glass holder.

The measuring glass holder is fixed anywhere in line between the full-vacuum chlorinator and the ejector non-return valve. Twofold or threefold measuring glass holders, which allow to distribute the chlorine gas flow to several metering points, are also available.

Note:

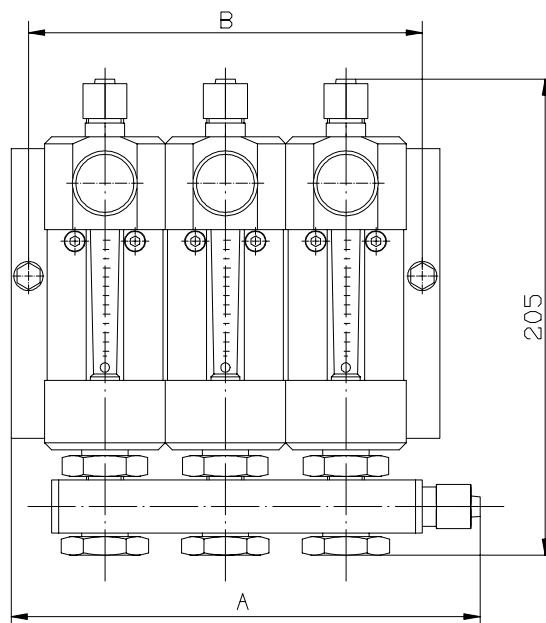
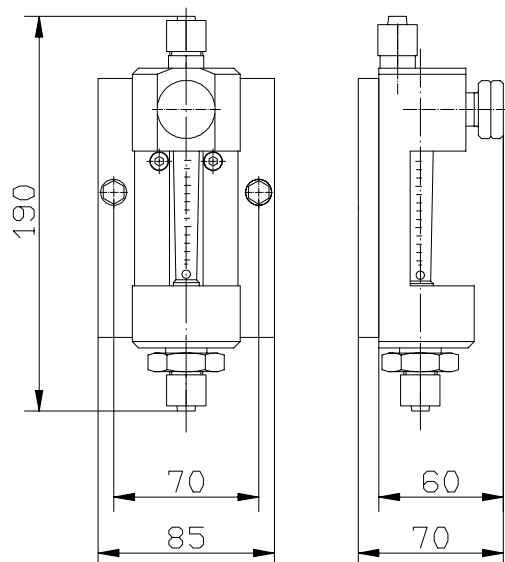
If the chlorination installation is to correspond to the German standard DIN 19606, a back-pressure regulator must be used, which avoids pressure fluctuations in the system. The back-pressure is integrated in the non-return valve (see MB 2 32 01).

Technical data

Materials: PVC, Viton, Ceramic, PMMA
 Measuring ranges: 1...25 g Cl₂/h
 up to 200...4000 g Cl₂/h
 Setting ration: 1:20
 Accuracy: +/- 6% of final scale reading
 Connections: PE tubing d 8/12
 Weight: 400 g

Note:

If the chlorine gas flow is to be adjusted remotely in an automatic control system, a chlorine control valve (see MB 2 07 10) is integrated in the vacuum line between measuring glass and back-pressure regulator.

Dimensions and Part Nos.


Due to the large number of combination possibilities twofold and threefold measuring glass holder are combined from individual measuring glasses and an assembly kit. Please specify the required measuring ranges when ordering.

Measuring range g Cl ₂ /h	Single measuring glass	Measuring glass in distribution block
1 ... 25	33367	33359
4 ... 80	33368	33360
10 ... 200	33369	33361
25 ... 500	33370	33362
50 ... 1000	33371	33363
100 ... 2000	33372	33364
125 ... 2500	33373	33365
200 ... 4000	33374	33366

Assembly kit	Dim. A	Dim. B	Part No.
2-fold	152	120	33375
3-fold	202	170	33376

(Delivery incl. mounting material)
 Measuring glasses for larger metering capacities are also available.

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

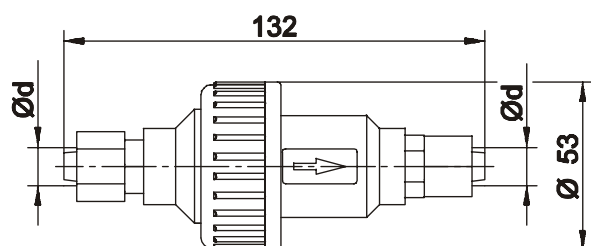
Flow rate: up to 10 kg Cl₂/h

Connections: PE tubing d 8/12 or
PE tubing d 12/16

Weight: 150 g

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).

Dimensions and Part Nos.

Back stop with connections for:

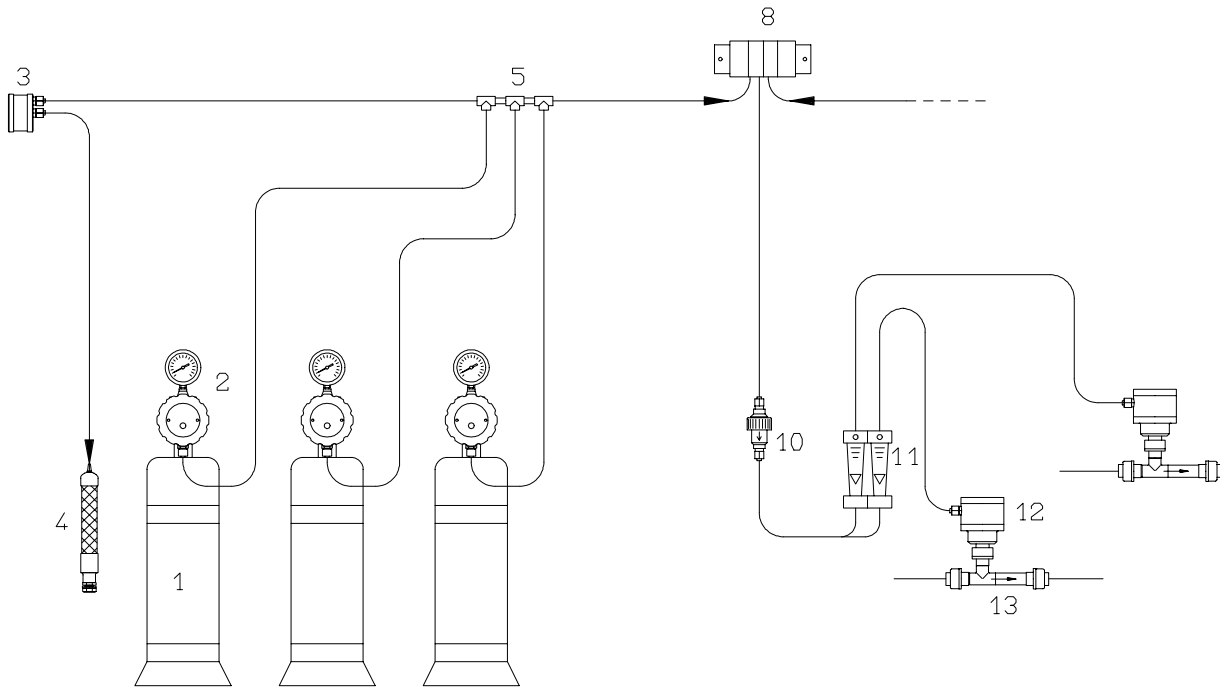
Tubing d 8/12 Part No. 20435060

Tubing d 12/16 Part No. 20435061

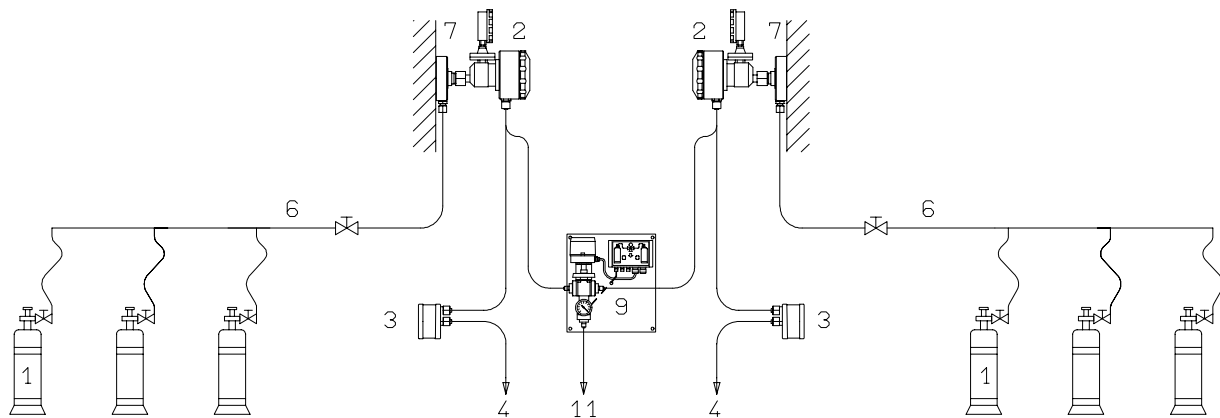
PVC d 16i Part No. 20435118

Installation examples

Several full-vacuum chlorinators mounted directly on the chlorine cylinders



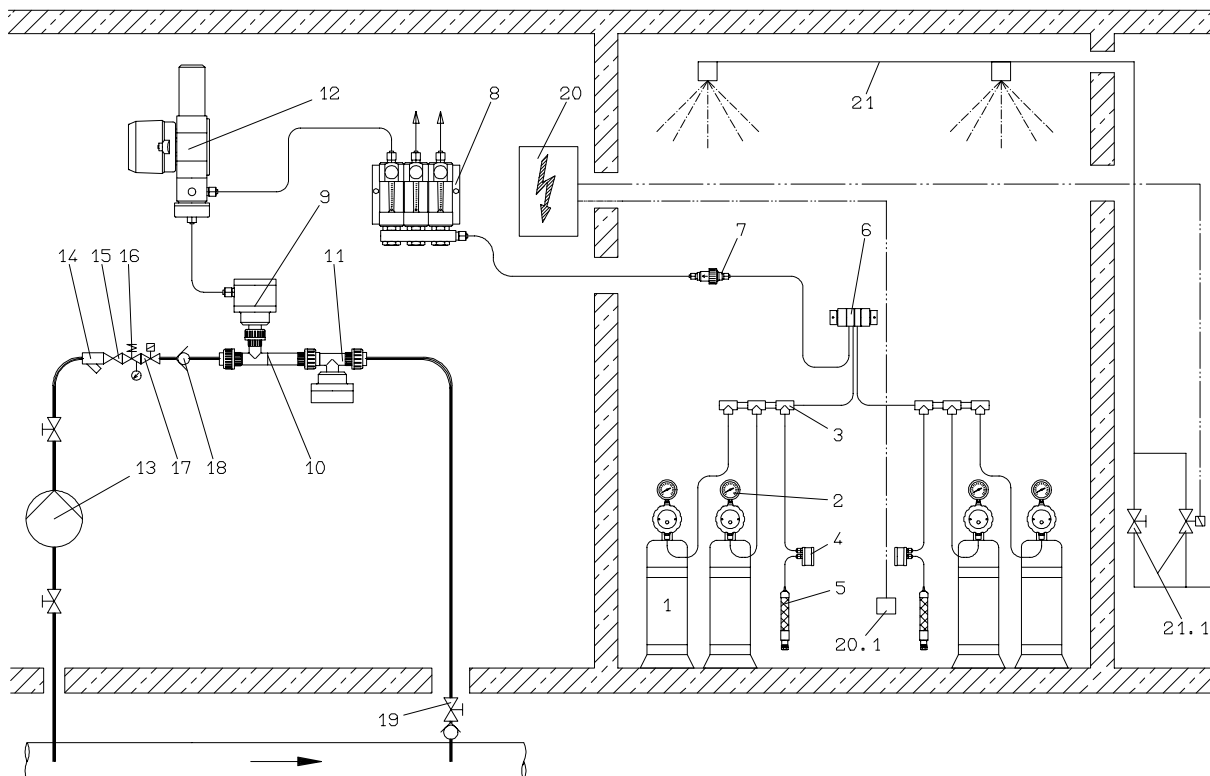
Several chlorine cylinders combined on the discharge side with one full-vacuum chlorinator per cylinder



Legend

- | | |
|----------------------------------|-------------------------------|
| 1 Chlorine cylinder | 8 Changeover equipment C 2005 |
| 2 Full-vacuum chlorinator C 2211 | 9 Changeover equipment C 7512 |
| 3 Safety valve | 10 Back stop |
| 4 Activated-carbon cartridge | 11 Measuring glass |
| 5 Vacuum manifold | 12 Ejector non-return valve |
| 6 Overpressure manifold | 13 Ejector |
| 7 Wall connection block | |

Schematic diagram of a complete chlorination installation



Legend

1 Chlorine cylinder		13 Booster pump	MB 2 29 01
2 Full-vacuum chlorinator C 2211	MB 2 04 11	14 Dirt trap	MB 2 29 04
3 Vacuum manifold	MB 2 23 02	15 Shutoff valve	MB 2 29 04
4 Safety valve	MB 2 04 11	16 Pressure reducing valve with pressure gauge	MB 2 29 04
5 Activated-carbon cartridge	MB 2 04 11	17 Solenoid valve	MB 2 29 04
6 Chlorine changeover equipment C 2005	MB 2 04 05	18 Ball non-return valve	
7 Back stop or Safety Shutoff Valve	MB 2 04 11 MB 2 04 06	19 Chlorine solution injector	MB 2 34 01
8 Measuring glasses / distribution block	MB 2 04 11	20 Chlorine gas warning device	MB 2 36 04
9 Ejector non-return valve	MB 2 32 01	20.1 Sensor for gas warning device	MB 2 36 04
10 Ejector	MB 2 31 01	21 Sprinkler installation	MB 2 41 00
11 Vacuum breaker	MB 2 33 02	21.1 Accessories for sprinkler installation	
12 Control valve C 7700	MB 2 07 10		