Reaction Tower for Hypochloric Acid

General

When preparing the chlorine solution in the chlorine gas ejector, in addition to hypochloric acid (HClO), hydrochloric acid is produced as well in the motive water.

Reaction process:

$Cl_2 + H_2O \longrightarrow HClO + HCl$

The pool water is gradually acidified by the hydrochloric acid, if it is not neutralized by the natural hardness of the water Ca (HCO_3) or other appropriate measures.

If the pool water constantly circulating and also used for the ejector operation is very soft, artificial hardness must be produced in order to avoid an inadmissible reduction of the pH value.
This problem can be solved easily by using a hypochloric acid reaction tower, in which the hydrochloric acid is neutralized completely by means of granulated marble ($CaCO_3$).

Reaction process:

$CaCO_3 + 2\ HCl \longrightarrow CaCl_2 + H_2O + CO_2$

Not only the hydrochloric acid is destroyed in the reaction tower but also more higly effective hypochloric acid is produced due to a reaction between chlorine and marble.

Reaction process:

$CaCO_3 + 2\ Cl_2 + H_2O \longrightarrow 2\ HClO + CaCl_2 + CO_2$

Installation and operation

The reaction tower is to be installed directly after the ejector outlet in an upright position. A pressure loss of about 0.2 bar in the reaction tower has to be taken into consideration for the ejector configuration. Besides, it must be ensured that the reaction tower is always filled sufficiently with granulated marble (at least 30%), which is decreasing because of the aforementioned reaction.

Marble consumption

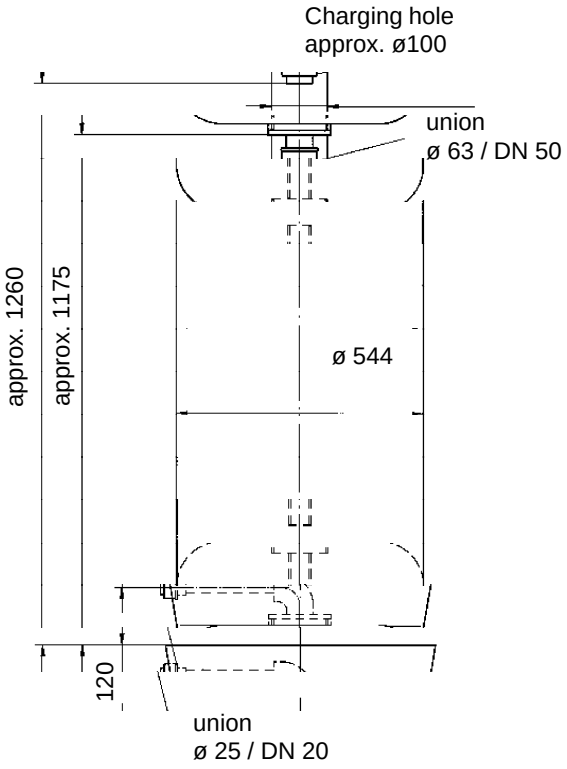
The marble consumption can be determined as a function of water hardness, flow and chlorine gas volume using the following formula.

$$\mathbf{M = 0.704 \bullet Cl_2 \ — \ 17.83 \bullet T \bullet °dH}$$

Marble	M	[g/h]
Chlorination	Cl_2	[g/h]
Motive water	T	[m^3/h]
German hardness	°dH	[—]

Note:
If the result is negative, no marble is required.

Dimensional drawing



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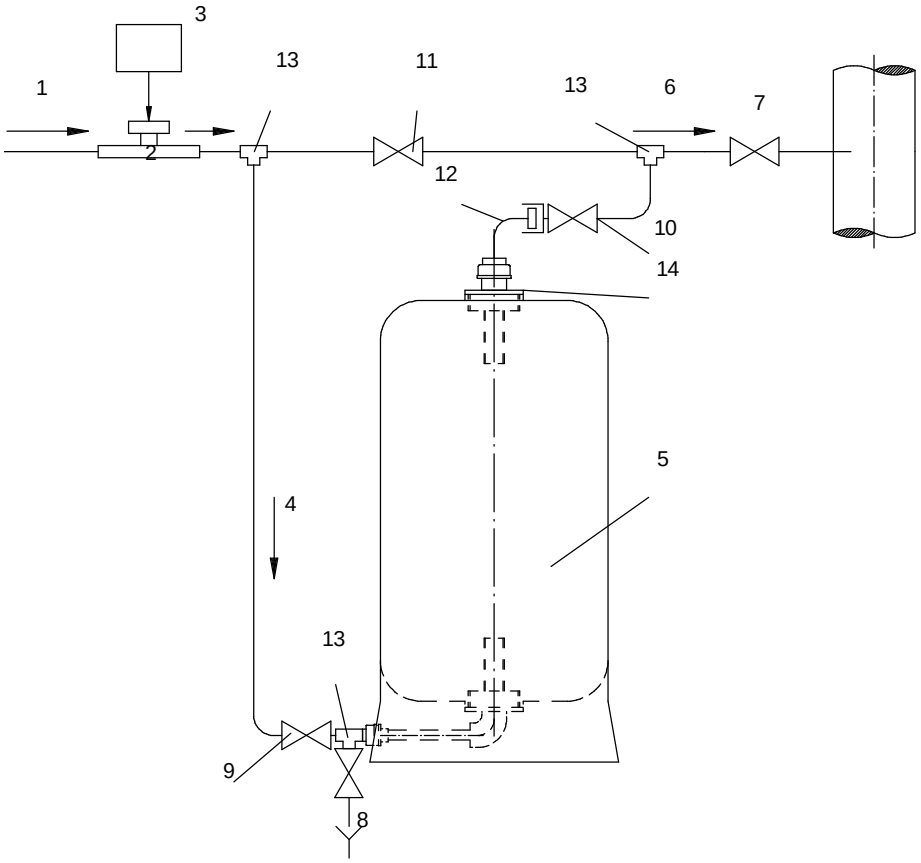
Flow diagram



1 Motive water
2 Ejector
3 Chlorinator
4 Acid chlorine solution
5 Reaction tower
6 Hypochloric acid
7 Solution injection
8 Drain valve
9 Ball valve
10 Ball valve
11 Ball valve
12 Outlet bend
13 T piece
14 Charging hole

Part Numbers

Reaction tower incl. wrench for charging hole:	23533714
Granulated marble, 50 kg: (4 x 50 kg are required for initial filling)	97544
Installation accessories (items 8 - 13):	32594

Maintenance of the reaction tower

The reaction tower is connected to the bypass lines using the installation accessories. During operation, ball valve (11) is shut and ball valves (9 and 10) are open so that the chlorine solution flows through the reaction tower. To charge the reaction tower with granulated marble, ball valve (11) is opened and ball valves (9 and 10) are closed.
The water contained in the reaction tower can be drawn off by opening the drain valve (8).
Granulated marble is filled into the tower after removing the outlet bend (12) and opening the union (14). A suitable special wrench is contained in the scope of delivery. After restarting the reaction tower, check the connected lines for leaks.

Technical data

Material:	wound glass fiber-reinforced epoxy resin tank with weld-less internal ABS casing.
Capacity:	164 litre
Operating pressure:	max. 10 bar
Operating temperature:	max. 50° C
Pressure loss:	depends on the water flow, filling level and grain size of the marble (normally less than 0.2 bar)
Filling:	200kg of granulated marble, grain size: 10 mm
Max. water flow:	3 m^3/h
Connections:	inlet DN 20 outlet DN 50