

Chlorine Evaporator  
**C 6100**  
Operating Instructions



Read the operating instructions!

The user is responsible for installation and operation related mistakes!



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# 1 Notes for the Reader

These operating instructions contain information and behaviour rules for the safe and designated operation of the device.

Observe the following principles:

- read the entire operating instructions prior to inaugurating the device.
- ensure that everyone who works with or on the device has read the operating instructions and follows it.
- maintain the operating instructions throughout the service life of the device.
- pass the operating instructions on to any subsequent owner of the device.

## 1.1 General non-discrimination

In these operating instructions, only the male gender is used where grammar allows gender allocation. The purpose of this is to make the text easy to read. Men and women are always referred to equally. We would like to ask female readers for understanding of this text simplification.

## 1.2 Explanation of the signal words

Different signal words in combination with warning signs are used in these operating instructions. Signal words illustrate the gravity of possible injuries if the risk is ignored:

Signal word	Meaning
DANGER	Refers to imminent danger. Ignoring this sign may lead to death or the most serious injuries.
WARNING	Refers to a potentially hazardous situation. Failure to follow this instruction may lead to death or severe injuries.
CAUTION	Refers to a potentially hazardous situation. Failure to follow this instruction may lead to minor injury or damage to property.
NOTICE	Refers to a danger which, if ignored, may lead to risk to the machine and its function.

Table 1: Explanation of the signal words

## 1.3 Explanation of the warning signs

Warning signs represent the type and source of a danger:

Warning sign	Type of danger
	Danger to life from chlorine poisoning
	Danger to life due to electric shock
	General danger zone
	Danger of damage to machine or functional influences

Table 2: Explanation of the warning signs

## 1.4 Identification of warnings

Warnings are intended to help you recognise risks and avoid negative consequences.

This is how warnings are identified:

Warning sign	SIGNAL WORD
<p><b>Description of danger.</b></p> <p>Consequences if ignored.</p> <p>⇒ The arrow signals a safety precaution to be taken to eliminate the danger.</p>	

## 1.5 Instruction for action identification

This is how pre-conditions for action are identified:

- ✓ Pre-condition for action which must be met before taking action.
- ✘ A resource such as a tool or auxiliary materials required to perform the operating instructions.

This is how instructions for action are identified:

- ➔ Separate step with no follow-up action.
- 1. First step in a series of steps.
- 2. Second step in a series of steps.
  - ▶ Result of the above action.
- ✓ **Action completed, aim achieved.**

## 2 Safety

### 2.1 General warnings

The following warnings are intended to help you to eliminate the dangers that can arise while handling the device. Risk prevention measures always apply regardless of any specific action.

Safety instructions warning against risks arising from specific activities or situations can be found in the respective sub-sections.

	<b>DANGER</b>
<b>Danger to life from chlorine poisoning!</b>	
Chlorine is poisonous. In severe cases, breathing in chlorine may lead to death. It irritates the eyes, the respiratory system and the skin.	
⇒ Use sufficient personal protective equipment.	
⇒ When carrying out any work on the system, use a respirator mask with a Type B gas filter that complies with EN 14387.	
⇒ Always comply with the accident prevention regulations that apply at the place of use.	
⇒ Get rid of leaks without delay. You must get rid of even very minor leaks without delay. Together with the humidity, chlorine forms hydrochloric acid and corrosion results in rapidly increasing leakage.	
⇒ Use only chlorine-resistant seals.	
⇒ Only use seals once. Reusing them leads to leaks.	

	<b>DANGER</b>
<b>Danger to life from chlorine poisoning!</b>	
Chlorinators without gas warning devices are an increased safety risk, since it is not possible to detect escaping chlorine gas in good time or at all.	
⇒ Install a gas warning device.	

	<b>DANGER</b>
<b>Danger to life from chlorine poisoning!</b>	
Changing the factory settings and permissible values with regard to the water level, the temperature and pressure can endanger the proper and safe operation of the device.	
⇒ Do not change the factory settings at all controls. If in doubt, please contact the manufacturer.	

	<b>WARNING</b>
<b>Increased risk of accidents due to insufficient qualification of personnel!</b>	
Chlorinators and their accessories must only be installed, operated and maintained by personnel with sufficient qualifications. Insufficient qualification will increase the risk of accidents.	
⇒ Ensure that all action is taken only by personnel with sufficient and corresponding qualifications.	
⇒ Prevent access to the system for unauthorised persons.	

	<b>NOTICE</b>
<b>Damage to the system due to the formation of hydrochloric acid</b>	
Chlorine gas is highly hygroscopic. This means that humidity enters the system at any open connection on devices or pipes, which results in the formation of hydrochloric acid and contamination. This inevitably causes damage to the units.	
⇒ Keep all connections (including in the vacuum system and on all devices not currently in use) closed at all times.	

### 2.2 Information about chlorine

Chlorine is a hazardous substance. The chemical element chlorine is a greenish-yellow, toxic gas with a pungent odour, which can be detected in the air at concentrations below 1 ppm (= 1 ml/m<sup>3</sup>).

Chlorine is 2.5 times heavier than air and accumulates at ground level.

Chlorine is extremely toxic for water organisms. The reason for the toxicity of chlorine is its extraordinary reactivity. It reacts with animal and vegetable tissue and thus destroys it.

Air with a chlorine gas content of 0.51% leads to a quick death in mammals and humans, as it attacks the respiratory tract and the pulmonary alveolus (formation of hydrogen chloride or hydrochloric acid).

	<b>NOTICE</b>
<b>Faults due to insufficient chlorine quality</b>	
Impurities in the chlorine gas form deposits in devices and valves and can attack the components chemically. This can lead to malfunctions.	
⇒ Only use technically pure chlorine that meets the following requirements:	
- Mass content of chlorine at least 99.5%	
- Water content max. 20 mg/kg	
Chlorine that complies with EN 937 meets these requirements	

### 2.3 Hazards due to non-compliance with the safety instructions

Failure to follow the safety instructions may endanger not only persons, but also the environment and the device.

The specific consequences can be:

- failure of important functions of the device and of the corresponding system,
- failure of required maintenance and repair methods,
- danger to persons,
- danger to the environment caused by substances leaking from the system.

### 2.4 Working in a safety-conscious manner

Besides the safety instructions specified in these operating instructions, further safety rules apply and must be followed:

- accident prevention regulations
- safety and operating provisions,
- safety regulations on handling hazardous substances,
- environmental protection provisions,
- applicable standards and legislation.

### 2.5 Personal protective equipment

Based on the degree of risk posed by the dosing medium and the type of work you are carrying out, you must use corresponding protective equipment. Read the Accident Prevention Regulations and the Safety Data Sheets to the dosing media find out what protective equipment you need.

As a minimum, the following protective equipment is recommended:



Protective mask



protective clothing



Protective gloves



safety shoes

Corresponding protective equipment must be used during these tasks:

- commissioning,
- all work on gas-conveying system parts
- changing the chlorine gas containers,
- shutdown,
- maintenance work,
- disposal.

	<b>DANGER</b>
<p><b>Danger to life from chlorine poisoning!</b></p> <p>If chlorine gas escapes, a filter mask is ineffective, since it is not a self-contained breathing apparatus.</p> <p>⇒ If chlorine gas escapes, wear a Type 2 self-contained breathing apparatus that complies with EN 137.</p>	

### 2.6 Personnel qualification

Any personnel who work on the device must have appropriate special knowledge and skills.

Anybody who works on the product must meet the conditions below:

- attendance at all the training courses offered by the owner,
- personal suitability for the respective activity,
- sufficient qualification for the respective activity,
- training in how to handle the device,
- knowledge of safety equipment and the way this equipment functions,
- knowledge of these operating instructions, particularly of safety instructions and sections relevant for the activity,
- knowledge of fundamental regulations regarding health and safety and accident prevention.

All persons must generally have the following minimum qualification:

- training as specialists to carry out work on the device unsupervised,
- sufficient training that they can work on the device under the supervision and guidance of a trained specialist.

These operating instructions differentiate between these user groups:

#### 2.6.1 Specialist staff

Specialist staff are able, thanks to their professional training, knowledge and experience as well as knowledge of the respective provisions, to do the job allocated to them and recognise and/or eliminate any possible dangers by themselves.

#### 2.6.2 Trained electricians

Due to their professional training, knowledge and experience as well as knowledge of specific standards and provisions, trained electricians are able to do the electrical work assigned to them and to recognise and avoid any any potential dangers by themselves.

They are specially trained for their specific working environment and are familiar with relevant standards and provisions.

They must comply with the legally binding regulations on accident prevention.

#### 2.6.3 Trained persons

Trained persons have been trained by the user into the tasks they are supposed to perform and into the dangers stemming from improper behaviour.

Trained persons have attended all trainings offered by the operator.

### 2.6.4 Personnel tasks

In the table below you can check what qualifications are the pre-condition for the respective tasks. Only people with appropriate qualifications are allowed to perform these tasks!

Qualification	Activities
Specialist staff	<ul style="list-style-type: none"> <li>■ Transportation</li> <li>■ Assembly</li> <li>■ Hydraulic installations</li> <li>■ Commissioning</li> <li>■ Control</li> <li>■ Taking out of operation</li> <li>■ Fault rectification</li> <li>■ Maintenance</li> <li>■ Repairs</li> <li>■ Disposal</li> </ul>
Trained electricians	<ul style="list-style-type: none"> <li>■ Electrical installation</li> <li>■ Rectifying electrical faults</li> <li>■ Electrical repairs</li> </ul>
Trained persons	<ul style="list-style-type: none"> <li>■ Storage</li> </ul>

Table 3: Personnel qualification

### 3 Intended Use

#### 3.1 Notes on product warranty

Any non-designated use of the device can impair its function and the protection provided. This leads to invalidation of any warranty claims!

Please note that liability is on the side of the user in the following cases:

- The device is operated in a manner which is not consistent with these operating instructions, particularly safety instructions, handling instructions and the section "Intended Use".
- Information on usage and environment (see section 5 "Technical data" on page 12) is not adhered to.
- If people operate the device who are not adequately qualified to carry out their respective activities.
- No original spare parts or accessories of Lutz-Jesco GmbH are used.
- Unauthorised changes are made to the device.
- The user uses different dosing media than those indicated in the order.
- Maintenance and inspection intervals are not adhered to as required or not adhered to at all.
- The device is commissioned before it or the corresponding system has been correctly and completely installed.
- Safety equipment has been bridged, removed or made inoperative in any other way.

#### 3.2 Intended purpose

The chlorine evaporator C 6100 is intended for the following purpose: Converting liquid chlorine into gaseous chlorine through the addition of heat. Feeding the gaseous chlorine into a chlorination system.

#### 3.3 Device revision

These operating instructions apply to the following devices:

Device	Month / year of manufacture
C 6100	07/2012 onwards

Table 4: Device revision

#### 3.4 Prohibited dosing media

The device must not be used for the following media and substances:

In the evaporation coil:

- all media apart from liquid and gaseous chlorine
- not technically pure chlorine with a mass content of less than 99.5%

In the water tank:

- all fluids apart from water
- contaminated water

## 4 Product description

### 4.1 Scope of delivery

Please compare the delivery note with the scope of delivery. The following items are part of the scope of delivery:

- Chlorine evaporator C 6100,
- Counterflange for assembly on the site pipe line,
- Assembly accessories for flange DN25/PN40,
- Square hollow key SW7,
- Operating instructions.

### 4.2 Design and function

#### 4.2.1 Structure of the device

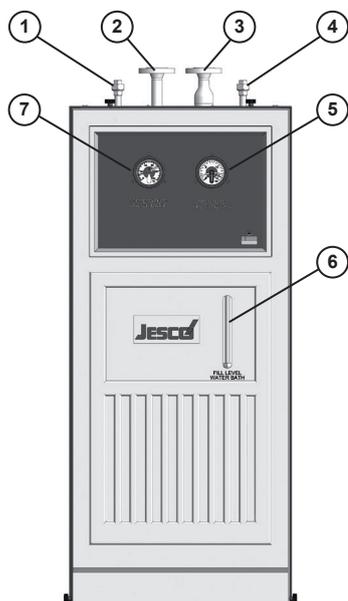


Fig. 1: Structure of the device

Position	Description
1	Water inlet
2	Liquid chlorine inlet
3	Chlorine gas output
4	Vent connection for the water tank
5	Contact pressure gauge
6	Fill level display for water container
7	Contact thermometer

Table 5: Description of components

The chlorine evaporator C 6100 consists of an evaporator part with an electric heating unit and all sensors for controlling and monitoring the device.

The evaporator is controlled by a separate control cabinet. This is not part of the scope of delivery and must be ordered separately.

All assemblies apart from the control cabinet are housed within a steel frame coated with epoxy resin powder. The front is fitted with cladding consisting of a plastic cover with a front panel cut-out and removable side sections made of steel sheets.

#### 4.2.2 Function description

##### 4.2.2.1 Fluid delivery of chlorine

For economical reasons, the gas take-off from chlorine tanks is only recommended up to a requirement of 25 – 40 kg/h. If higher chlorine gas volumes are required, we recommend the take-off of liquid chlorine from chlorine tanks with subsequent gas generation in a chlorine evaporator. At ambient temperatures of more than 15 °C, up to 18 % of the original content of the chlorine tank can be removed, that is, 180 kg Cl<sub>2</sub>/h from a 1 ton chlorine tank.

##### 4.2.2.2 Control equipment

The control equipment for the chlorine evaporator consists of level sensors, contact thermometers, a temperature monitor and a contact pressure gauge. This equipment is fed into an internal terminal box, which must be connected to an external control cabinet.

The factory setting of the sensor technology is entered in the wiring diagram in section 7.4.2 “Wiring diagram for internal terminal box” on page 20.



Fig. 2: Internal terminal box

The following operation parameters are monitored and controlled:

**Water level**

The level of the water in the water tank can be read off from the fill level display (6) (see Fig. 1). During trouble-free operation of the system, the fill level display is filled to two thirds. The water level is monitored by a 3-bar level probe. The level probe causes a solenoid valve in the water supply to open or close depending on the water requirement as a consequence of water evaporation.

**Pressure**

The contact pressure gauge (5) built in on the front displays the current pressure of the chlorine gas supply. The pressure corresponds to the vapour pressure and is exclusively dependent on the temperature of the chlorine tanks (e.g. 6 bar at 20 °C).

If the maximum pressure is exceeded, the contact pressure gauge causes the heating elements to switch off immediately.

**Water temperature**

The water temperature is controlled and monitored by a contact thermometer (7) and a temperature monitor.

The contact thermometer keeps the temperature constant between 68 °C and 72 °C. The current temperature can be read off. At temperatures below 68 °C, two heating elements (for the C 6100 with 65 kg Cl<sub>2</sub>/h output) or four heating elements (for the C 6100 with 220 kg Cl<sub>2</sub>/h output) are switched on and heat the water in the water tank to the operating temperature. The heating elements are mounted on the water tank and connected directly to the external control cabinet. The heating is switched off in stages as the temperature increases.

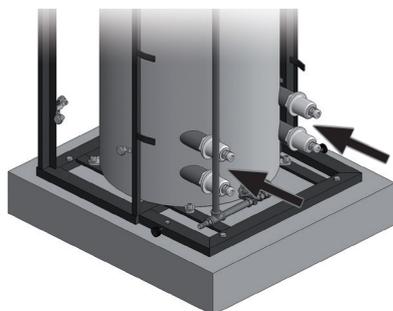


Fig. 3: Heating elements

The temperature monitor monitors the minimum and maximum water temperature. If the temperature of 80 °C is exceeded, an alarm is triggered. If the temperature falls below 60 °C, a valve that must be installed in the piping behind the output of the chlorine evaporator automatically closes the pipe line to the vacuum controller. This prevents liquid chlorine entering the dosing system after the system has cooled and damaging components made of PVC.

The temperature monitor is installed inside the housing. The switch points are separately adjustable. However, the factory settings must not be changed!

**Chlorine gas thermometer**

The chlorine evaporator C 6100 can be supplied with an optional thermometer, which displays the chlorine temperature at the output of the device. This temperature must be higher than the temperature at the input. Only then is the liquid chlorine completely evaporated.

**Control cabinet**

A control cabinet, which must be ordered separately, is available for connecting/controlling the equipment mentioned above. In this control cabinet, the heating elements are also connected by means of contactors.

The requirements regarding the design of the control cabinet are specified in section 7.4.3 "Requirements regarding the control cabinet" on page 21.

**4.3 Rating plate**

The rating plate contains information on the safety and functional method of the product. The rating plate must be kept legible for the duration of the service life of the product.

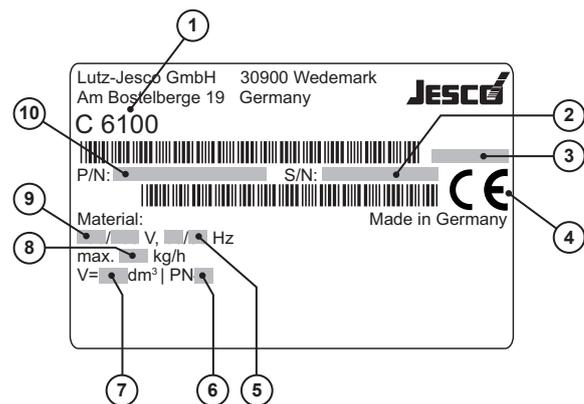


Fig. 4: Rating plate C 6100

No.	Description
1	Product name
2	Serial number
3	Month/year of manufacture
4	Label showing conformity with applicable European directives
5	Frequency
6	Pressure stage
7	Volume of evaporation coil
8	Maximum consumption capacity
9	Voltage supply
10	Part number

Table 6: Rating plate

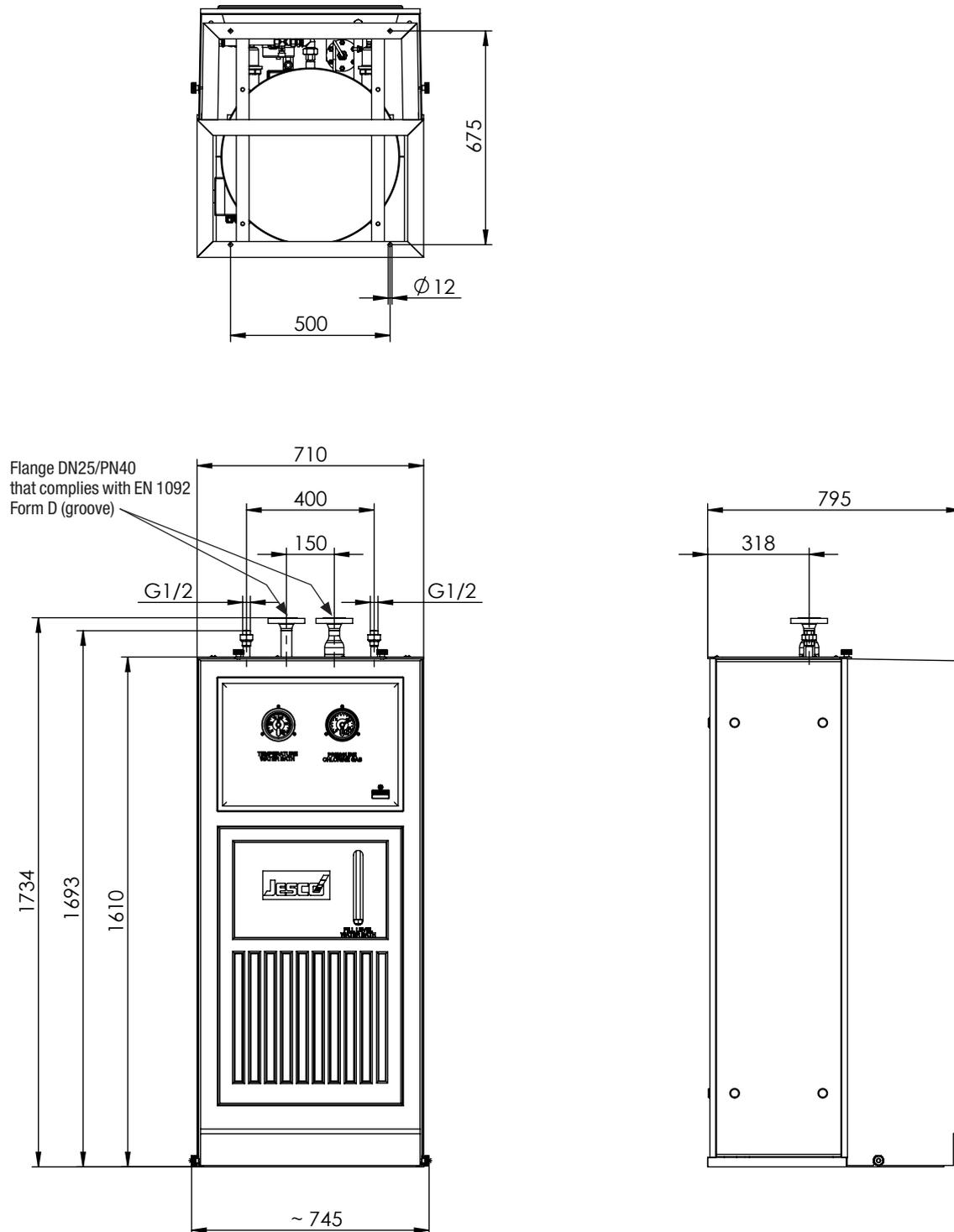
## 5 Technical data

Description		Value
Heat transmission		Evaporation coil in the hot water tank
Evaporator capacity	1.8 dm <sup>3</sup> evaporation coil	8.3 dm <sup>3</sup> evaporation coil
	65 kg Cl <sub>2</sub> /h	220 kg Cl <sub>2</sub> /h
Volume of warm water tank		approx. 175 l
Heating		Heating elements 230/400 V, 50/60 Hz, 5 kW each Heating output at 65 kg Cl <sub>2</sub> /h: 10 kW (2 heating elements) Heating output at 220 kg Cl <sub>2</sub> /h: 20 kW (4 heating elements)
Protection class		IP54
Permissible ambient temperature		0 – 50 °C (no direct sunlight)
Max. operating pressure		40 bar (at 100°C)
Max. operating temperature		80 °C
Weight (without water)		approx. 275 kg
Materials	Housing	Frame of steel with side cladding made of steel sheet, Front cover made of plastic reinforced with fibreglass
	Evaporation coil, water tank, water supply	Steel
Connections	Chlorine (Input and output)	Flange DN25/PN40 that complies with EN 1092 Form D (groove)
	Water inlet	G 1/2
	Water drain	Hose nozzle for hose d 16 i
	Vent connection for the water tank	G 1/2 Female
Solenoid valve	Application area	0.3 – 16 bar
Contact load rating	Contact pressure gauge (0 – 16 bar)	max. 250 V, max. 1 A, 30 W
	Contact thermometer (0 – 100 °C)	
	Temperature monitor 0 – 100 °C	max. 24 V, max. 0.1 A

Table 7: Specifications

## 6 Dimensions

All dimensions in mm



## 7 Installation

	<b>DANGER</b>
<b>Danger to life from chlorine poisoning!</b>	
<p>Under the influence of heat, liquid chlorine expands considerably. An impermissible high pressure can occur if a pipe line or a system component is filled with liquid chlorine and all inputs and outputs are closed. This can cause system parts to burst, causing chlorine to escape.</p>	
<p>⇒ In each section of the system where liquid chlorine can be trapped, install a rupture disk, preferably with a contact pressure gauge (expansion system).</p>	
<p>⇒ In this case, relief may only be performed into a safe environment, e.g. in an expansion tank made of steel. The container should be brand-new and must be capable of accommodating at least 20 % of the line volume.</p>	
<p>⇒ In the piping at the output of the chlorine evaporator, install an expansion system with an additional relief valve if the pressure relief is not equipped with an expansion tank, but simply opens into the intake port of the scrubber. If the pressure falls, the relief valve closes again thus preventing an unnecessarily high chlorine leak.</p>	

	<b>NOTICE</b>
<b>Damage to the system due to incorrect installation</b>	
<p>The failure to observe installation instructions (e.g. use of unsuitable tools, incorrect torque) can damage the system parts.</p>	
<p>⇒ Use suitable tools.</p>	
<p>⇒ Note the specified torque.</p>	

	<b>NOTICE</b>
<b>Damage to the system by liquid chlorine</b>	
<p>Failure of the automatic fill level control for the water tank presents a risk of the system running dry. To prevent this, the electrical heating for the water tank is switched off when a minimum fill level is reached. Since the chlorine is now no longer evaporated, downstream dosing units may be damaged by liquid chlorine.</p>	
<p>⇒ Install a valve that automatically closes the piping at the output of the chlorine evaporator when the minimum fill level is reached and if the temperature in the water tank falls below 60 °C.</p>	

	<b>DANGER</b>
<b>Danger to life from chlorine poisoning!</b>	
<p>Chlorinators without gas warning devices are an increased safety risk, since it is not possible to detect escaping chlorine gas in good time or at all.</p>	
<p>⇒ Install a gas warning device.</p>	

	<b>WARNING</b>
<b>Increased risk of accidents due to insufficient qualification of personnel!</b>	
<p>Chlorinators and their accessories must only be installed, operated and maintained by personnel with sufficient qualifications. Insufficient qualification will increase the risk of accidents.</p>	
<p>⇒ Ensure that all action is taken only by personnel with sufficient and corresponding qualifications.</p>	
<p>⇒ Prevent access to the system for unauthorised persons.</p>	

### 7.1 Installation location

The chlorine evaporator C 6100 is installed in the room used for the chlorine supply.

The room must fulfil the following requirements:

- easily ventilated,
- secured against access by unauthorised persons,
- protected against weather conditions,
- frost-free,
- permissible ambient temperature adhered to (see section 5 "Technical data" on page 12),
- equipped with direct output into the open air,
- doors open outwards and can be opened at any time from inside without a key,
- not connected to other rooms,
- flame-retardant and gas-tight separation from other rooms,
- monitored by a gas warning device,
- equipped with a scrubber system,
- room of sufficient size to allow trouble-free assembly as well as inspection and maintenance of the device at all times,
- the room is at least 3 m in height,
- a water connection with a hose is available for maintenance purposes.

## 7.2 Installing the device

	<b>WARNING</b>
<b>Danger of personal injury and material damage!</b>	
<p>The device is extremely heavy. The failure to take adequate safety precautions during transportation and to act with caution can lead to accidents involving personal injuries and damage to property. Limbs can be crushed when the device is set up.</p> <p>⇒ Transport the device using a floor conveyor that is suitable for the load such as a pallet truck, forklift truck or crane.</p> <p>⇒ Wear safety shoes while transporting the device.</p>	

	<b>NOTICE</b>
<b>Damage to the system due to incorrect installation</b>	
<p>The device must be anchored to the floor in such a way that guarantees sufficient stability. If this is not the case, it may become displaced during installation and during operation. This can lead to tension in the piping system with negative consequences for the system and for operating safety.</p> <p>⇒ Anchor the device to the floor on a level concrete foundation provided for the purpose. The foundation must have adequate dimensions and must be designed for the load. It should ideally be raised approx. 150 mm. In this way, the device is better protected in the event of flooding.</p>	

Precondition for action:

- ✓ The device is in the transportation packaging on the concrete foundation provided for the assembly.

Perform the following working steps:

1. Remove the transport packaging.
2. Remove the top inlays (1) and (2).
3. Loosen the screws (3), (4), (8) as well as the screw on the front cover (6) opposite the screw (8).
4. Make sure that the clamping piece (5) does not fall into the device.
5. Remove the front cover (6) and the clamping piece (5).
6. Remove the side part (7), the opposite side part and the rear wall. To do this, use the square hollow key SW7, which is contained in the scope of delivery.

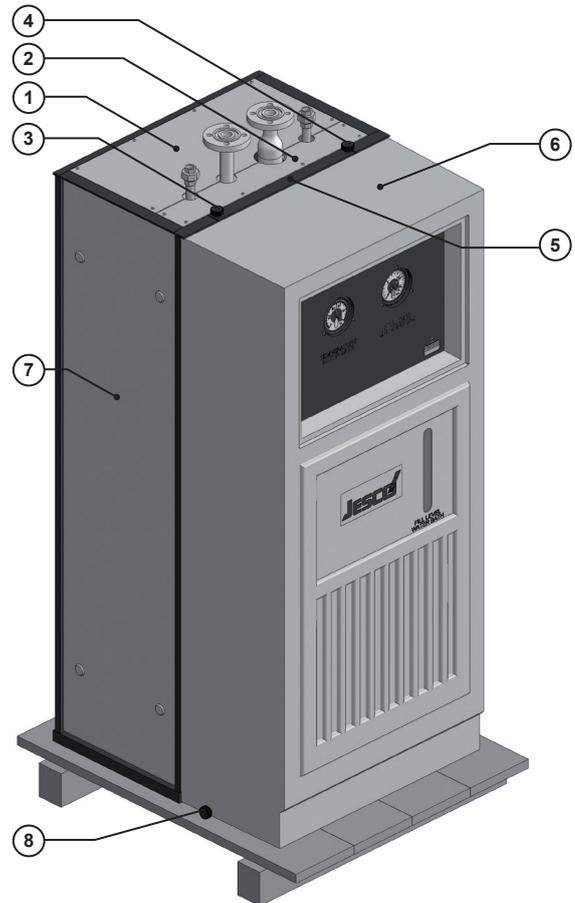


Fig. 5: Remove the front cover and rear wall

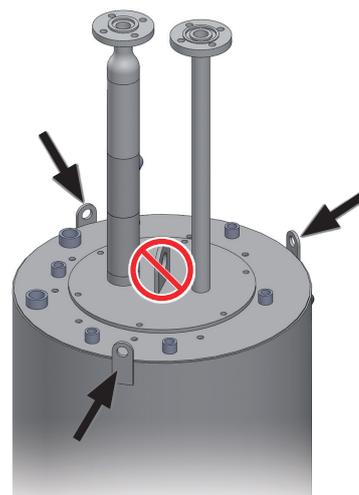


Fig. 6: 3 lifting lugs on the water tank (shown without housing frame)

7. Use a crane to lift the device by means of the 3 lifting lugs provided for the purpose on the water tank. Do not use the centrally arranged lifting lug for the evaporation coil!
8. Align the device correctly and set it down on the concrete foundation provided.

9. Drill holes into the concrete foundation through the four recesses provided for the purpose in the housing frame.

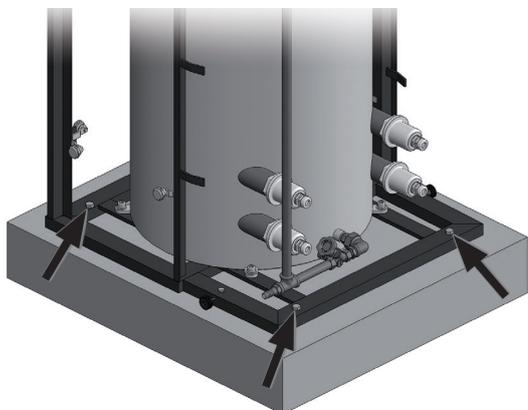


Fig. 7: Anchoring on the concrete foundation

10. Insert four rawplugs and bolt the device securely to the floor.
11. Fit the rear wall, the side part (7) and the opposite side part. To do this, use the square hollow key SW7, which is contained in the scope of delivery.
12. Fit the top inlays (1) and (2).
13. Fit the clamping piece (5).
14. Fasten the screws (3), (4), (8) as well as the screw on the front cover (6) opposite the screw (8).
15. Fit the front cover (6).

✓ **Device is installed.**

### 7.3 Hydraulic installations

- The pipe connection between the evaporator and the vacuum controller should be as short as possible.
- Seamless pipes of the dimension DN25 (1") made from unalloyed carbon steel are used as pressure lines. Only in very long systems or when multiple vacuum controllers are connected to a common supply line must a larger pipe be used.

The following nominal widths are recommended for the pressure line (pressure loss max. 0.5 bar, max. speed 20 m/s, calculated at 1.5 bar with 4x90° angles):

Mass flow of chlorine	Length of pressure line					
	10 m	20 m	30 m	50 m	100 m	150 m
80 kg/hr	DN25	DN25	DN25	DN25	DN25	DN25
120 kg/hr	DN25	DN25	DN25	DN25	DN25	DN32
200 kg/hr	DN25	DN25	DN25	DN32	DN32	DN32
400 kg/hr	DN32	DN32	DN32	DN40	DN40	DN50
600 kg/hr	DN40	DN40	DN40	DN40	DN50	DN50

Table 8: Recommended nominal widths for the pressure line at the output of the chlorine evaporator

- All lines must be laid free of stress.
- The expansion system must be installed directly after the chlorine evaporator. No valve can be mounted between the chlorine evaporator and the expansion system.
- An automatic shutoff valve must be installed downstream of the expansion system.
- The chlorine gas filter is fitted between the automatic shutoff valve and the pressure reducing valve.
- A pressure reducing valve must be installed in the pressure line. It prevents the chlorine gas from condensing in the installation downstream of the chlorine evaporator. The valve reduces the pressure to a level whereby reverse liquefaction of chlorine in the downstream line would only occur far below 0 °C.
- The line from the chlorine evaporator to the pressure reducing valve must be installed at a constant uphill gradient.

#### 7.3.1 Chlorine connection

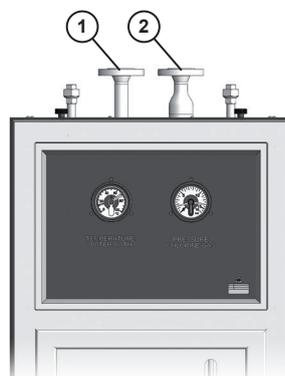


Fig. 8: Chlorine connection

Position	Description
1	Liquid chlorine input
2	Chlorine gas output

##### 7.3.1.1 Creating the flange connection

Precondition for action:

- ✓ The inside of the supply line is clean and dry.
- ✓ The transport protection is removed.
- ✓ The sealing surfaces are free of contamination and damage.
- ✓ Seals must be clean, undamaged and dry.
- ✓ Bolts, nuts and washers are clean and undamaged.



Any bolts, nuts and washers that are removed during assembly work must be replaced with new ones if they are damaged. Used bolts, nuts and washers may only be installed if they are in new condition.

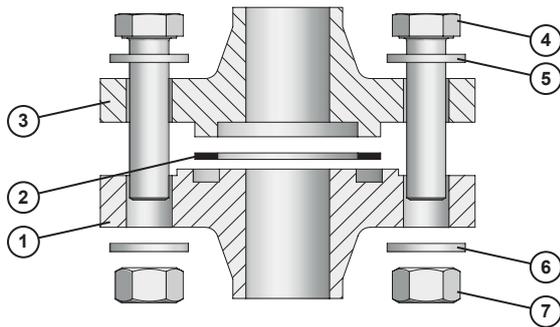


Fig. 9: Creating the flange connection

Perform the following working steps:

1. Lubricate the sliding faces and thread of bolts, nuts and washers e.g. using fitting grease or PTFE grease.
2. Place the flat gasket (2) into the groove of the connection flange (1). Assemble the seal in dry condition.
3. Mount the tongue flange (3). Make sure that the flat gasket (2) does not slip.
4. Fit the bolts (4), washers (5, 6) and nuts (7) by hand.
5. Tighten the bolts evenly alternately crosswise in three stages: 20 Nm, 35 Nm, 50 Nm. After this, retighten all the bolts to the full target tightening torque (50 Nm).
6. Setting the seal (adapting to the flange seal surface) can make it necessary to retighten the bolts. For this reason, retighten the bolts to 50 Nm after a few hours.

✓ **Flange connection created.**

### 7.3.1.2 Creating the threaded connection

	<b>DANGER</b>
<b>Danger to life from chlorine poisoning!</b>	
Pipe connections and fittings in pressurized lines must be sealed with chlorine-resistant substances. Unsuitable sealants react with the chlorine and lead to leakages.	
⇒ Use only sealants that are resistant in contact with chlorine (e.g. anaerobic sealants).	

Precondition for action:

- ✓ The inside of the supply line is clean and dry.
- ✓ The transport protection is removed.
- ✓ The threads are metallic bright.

Perform the following working steps:

1. Clean the thread with a fat-dissolving cleaning agent, e.g. alcohol.
2. Allow the thread to dry completely.

3. Apply the thread sealant to the external thread in a circular motion to the start of the thread. Leave the first thread clear. Apply the thread sealant all the way down to the root of the thread to thoroughly grease the thread flank.

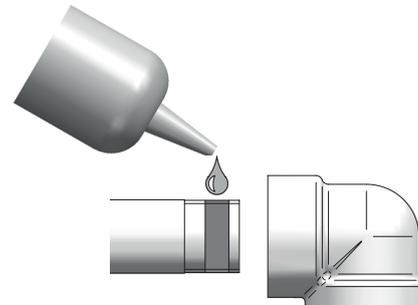


Fig. 10: Seal in the thread

	<b>NOTICE</b>
<b>Leakage due to incorrect installation</b>	
To ensure that the connection is correctly aligned, it is necessary under certain circumstances to turn the thread anticlockwise. When the connection is loosened, bubbles form in the adhesive, which can lead to leakages.	
⇒ Only turn the thread anti-clockwise.	
⇒ If the orientation is not correct after the connection has been tightened, repeat steps 1 – 5.	

4. Insert the threaded pin into the internal thread and apply a little thread sealant to the internal thread. Screw the parts by hand.
5. Use a tool to tighten the connection. The thread size 1" NPT requires approx. 150 Nm.
6. Remove excess thread sealant with a cloth.
7. Allow the bond to harden for at least 12 hours prior to the leak test.

✓ **Threaded connection created.**

### 7.3.2 Water connection



Fig. 11: Water connection

Position	Description
1	Water inlet
2	Vent connection for the water tank



#### NOTICE

#### Damage to the system due to incorrect water quality

Using the wrong water quality can lead to corrosion, poor heat transmission or the formation of sludge.

- ⇒ Fill the water tank with drinking water quality only.
- ⇒ Do not use completely desalinated water.

### 7.3.3 Vent connection for the water tank

During operation, water vapour forms in the water tank and this must be vented.

Lay the vent line as follows:

- leading out of the building,
- on an uphill gradient,
- ending in a conduit elbow that opens downwards,
- if necessary, fit vermin protection.

### 7.3.4 Drainage connection

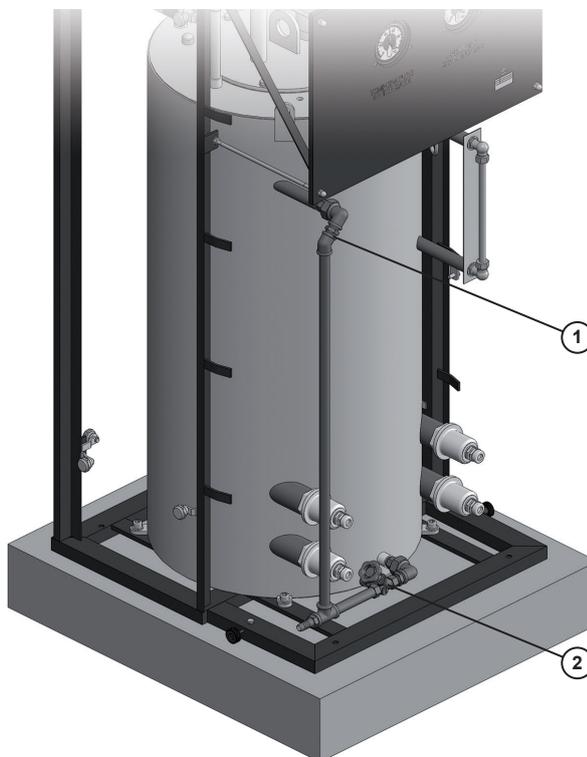


Fig. 12: Drainage connection

Position	Description
1	Overflow
2	Drainage valve

The drainage connection fulfils two tasks:

- Draining the water tank during maintenance work.
- Overflow of water tank if the water level is too high e.g. due to a contaminated solenoid valve.

The water must be able to flow visibly and freely downward. A hose that ends in a floor drain is ideally suited.

## 7.4 Electrical installation

### 7.4.1 Earthing the device

	DANGER
<p><b>Mortal danger from electric shock!</b></p> <p>Non-existent or insufficient earthing of the device will lead to electric shocks with fatal injuries.</p> <ul style="list-style-type: none"> <li>⇒ Earth the device properly at the locations provided before making additional electrical connections and operating the device.</li> <li>⇒ Check the earth on the device on a regular basis.</li> </ul>	

The earth connections are located at the following points:

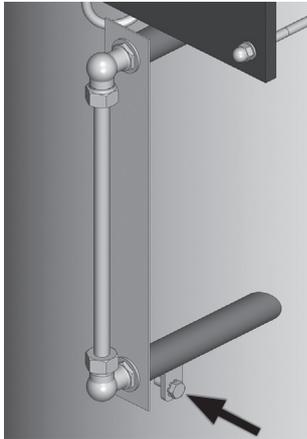


Fig. 13: Earth connection for the water tank (below the fill level display)

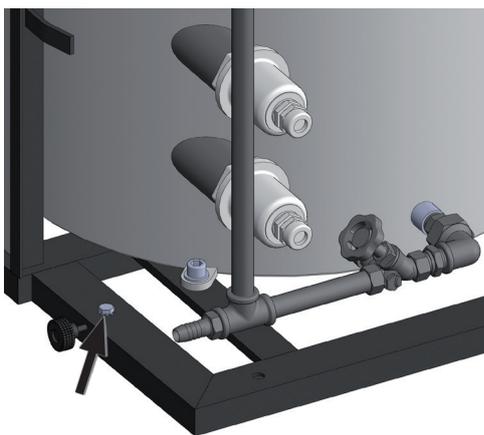


Fig. 14: Earth connection for the housing frame (at the left-hand bolt on the front cover)

### 7.4.2 Wiring diagram for internal terminal box

The internal components, such as temperature monitor, contact pressure gauge etc. are delivered fully wired to the internal terminal box. The contact lines must be connected to an external control cabinet in accordance with the terminal connection diagram below.

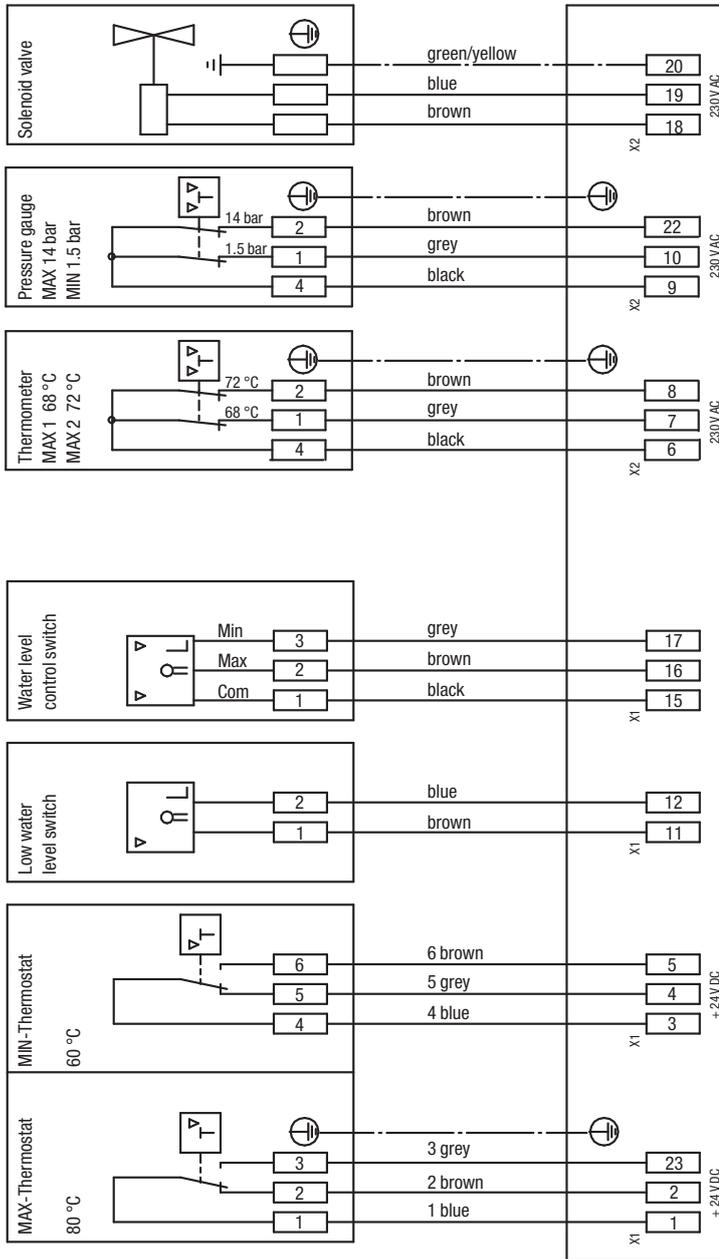


Fig. 15: Wiring diagram for internal terminal boxes

### 7.4.3 Requirements regarding the control cabinet

The chlorine evaporator C 6100 is controlled from an external control cabinet. Control cabinets from Lutz-Jesco GmbH are designed and configured for operation with the device.

If you did not order a control cabinet from the manufacturer, you must use your own control cabinet. This must meet specific requirements that are explained in the table below.

Sensor/Actuator	Description	Switching logic	Connection port
Heating elements (C 6100 with 65 kg Cl <sub>2</sub> /h output)	Two heating elements of 5 kW each, 230 V/400 V, 50 Hz	-	Heating elements
heating elements (C 6100 with 220 kg Cl <sub>2</sub> /h output)	Two groups of heating elements consisting of 2 x 5 kW each, 230 V/400 V, 50 Hz	-	Heating elements
MAX temperature monitor	Changeover contact	MAX/MAX at 80 °C: <ul style="list-style-type: none"> <li>■ Alarm relay "Overtemperature"</li> <li>■ Horn</li> <li>■ Strobe</li> </ul>	Terminal box in the C 6100 housing
MIN temperature monitor	Changeover contact	MIN/MIN at 60 °C: <ul style="list-style-type: none"> <li>■ Automatic shutoff valve closes</li> <li>■ Alarm signalling (deactivated during the warming phase)</li> </ul>	Terminal box in the C 6100 housing
Contact thermometer	Two potential-free N.C., max. 250 V, 1 A, 30 W	Contact 1 switches at 68 °C and contact 2 switches at 72 °C: <ul style="list-style-type: none"> <li>■ Below 68 °C, both heating levels are switched on.</li> <li>■ Between 68 °C and 72 °C, only one level is connected.</li> <li>■ Above 72 °C, the heating is switched off.</li> </ul>	Terminal box in the C 6100 housing
Contact pressure gauge	Two potential-free N.C., max. 250 V, 1 A, 30 W	MIN 1.5 bar: <ul style="list-style-type: none"> <li>■ alarm relay "lack of chlorine"</li> </ul> MAX 14 bar: <ul style="list-style-type: none"> <li>■ alarm relay "overpressure"</li> <li>■ Horn</li> <li>■ Strobe</li> </ul>	Terminal box in the C 6100 housing
2-bar level probe Protection against dry running	A level relay is required in the control cabinet.	MIN/MIN: <ul style="list-style-type: none"> <li>■ Heating off</li> <li>■ Automatic shutoff valve closes</li> <li>■ Alarm signalling</li> </ul>	Terminal box in the C 6100 housing
3-bar level probe Fill level	A level relay is required in the control cabinet.	MIN: <ul style="list-style-type: none"> <li>■ Solenoid valve opens</li> </ul> MAX: <ul style="list-style-type: none"> <li>■ Solenoid valve closes</li> </ul>	Terminal box in the C 6100 housing
Solenoid valve	230 V, 50/60 Hz, 8 W	<ul style="list-style-type: none"> <li>■ Closes, if disconnected</li> <li>■ Opens to top up the water level</li> </ul>	Terminal box in the C 6100 housing

Table 9: Requirements concerning the control cabinet

Sensor/Actuator	Description	Switching logic	Connection port
Rupture disk with contact pressure gauge	Potential-free N.C. See product information for expansion system.	<ul style="list-style-type: none"> <li>■ Heating off</li> <li>■ Automatic shutoff valve closes</li> <li>■ Alarm relay "overpressure"</li> <li>■ Horn</li> <li>■ Strobe</li> </ul>	Rupture disk with contact pressure gauge
Automatic shutoff valve	Motor ball valve with battery system 230 V, 50 Hz, max. 50 W	<ul style="list-style-type: none"> <li>■ Closes, if disconnected</li> </ul>	Automatic shutoff valve

Table 9: Requirements concerning the control cabinet

## 7.5 Completing the installation

After completing installation, you must check that all the connections are leak-proof (see 8.2 "Inspecting the pressure system" on page 24).

Furthermore, all cable screw connections must be securely tightened to guarantee the IP protection class.

 All exposed bright metal surfaces must be painted as the atmosphere in chlorine gas rooms is highly corrosive. RAL1003 yellow 2-component epoxy resin paint, for example, is suitable. Paint must only be applied after a successful leak test has been completed.

## 7.6 Installation example

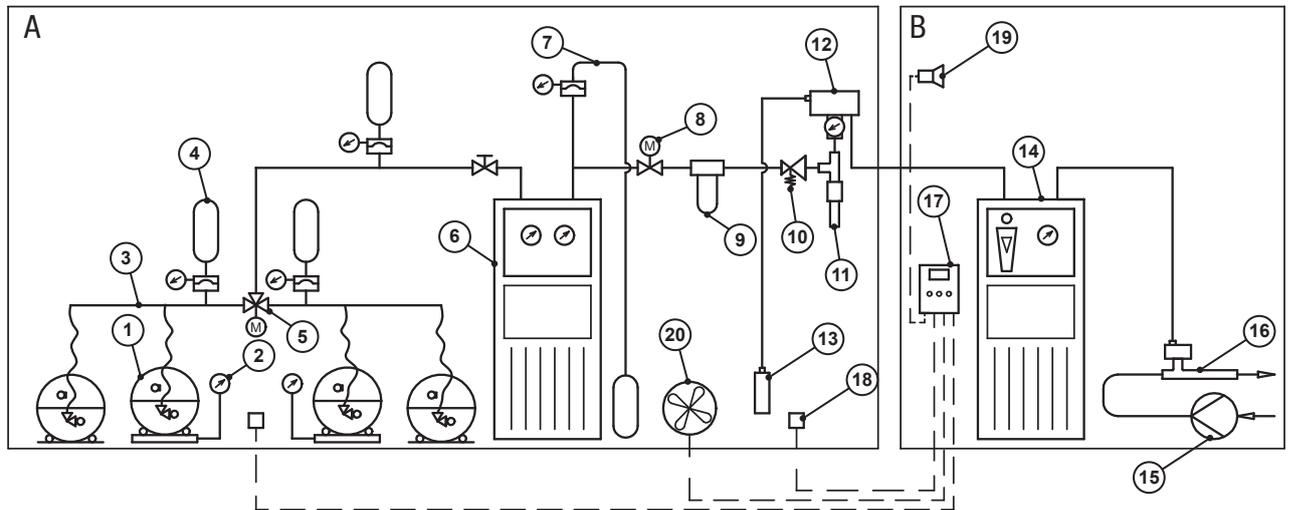


Fig. 16: Installation with a chlorine evaporator

Position	Description	Position	Description
A	Room for the chlorine supply	10	Pressure reducing valve
B	Dosing device room	11	Moisture eliminator with heating collar
1	Chlorine barrel	12	Vacuum controller
2	Chlorine barrel scale	13	Activated carbon cartridge
3	Manifold	14	Dosing device
4	Expansion system for piping	15	Motive water pump
5	Changeover switch	16	Injector with non-return valve
6	Chlorine evaporator	17	Gas warning device
7	Expansion system for chlorine evaporator	18	Gas sensor
8	Automatic shutoff valve	19	Horn
9	Chlorine gas filter	20	Entrance port of the chlorine eliminator

Table 10: Designation of components

## 8 Start-up

**DANGER**

**Danger to life from chlorine poisoning!**

Changing the factory settings with regard to the water level, the temperature and the pressure can endanger the proper and safe operation of the device.

⇒ Do not change the factory settings for any controls. If in doubt, please contact the manufacturer.

**DANGER**

**Chlorine gas can escape due to systems that are leaky or not installed correctly!**

Chlorinators constitute an increased safety risk if they have not been properly installed, if an adequate leak test has not been performed or if the devices are not in good condition.

⇒ Before placing the system into operation, have it checked by technical personnel to ensure that it is in the proper condition and leaktight.

⇒ The condition of the installation must be checked for adequate tightness on a regular basis.

⇒ Get rid of leaks without delay. You must get rid of even very minor leaks without delay. Together with the humidity, chlorine forms hydrochloric acid and corrosion results in rapidly increasing leakage.

### 8.1 Turning on the device

Precondition for action:

- ✓ The device is configured according to the factory setup.
- ✓ The chlorine container valves are closed.
- ✓ The device has been installed in accordance with section 7 "Installation" on page 14.
- ✓ The device is earthed.
- ✓ The water supply is switched on.

Perform the following working steps:

1. Set the main switch on the control cabinet to *On*.
2. Start automatic operation on the control cabinet.
  - ▶ The chlorine evaporator C 6100 now starts fully automatic operation.
  - ▶ The solenoid valve opens and water is filled into the water tank until fill level provided is reached. The fill level display should be approximately two thirds full.

The device requires a particular time to reach the operating temperature of 68 °C – 72 °C:

Power output	Time required to heat up
65 kg Cl <sub>2</sub> /h	approx. 2 hours
220 kg Cl <sub>2</sub> /h	approx. 1 hour

✓ **Device switched on.**

Once the operating temperature is reached, the device is ready to use. However, fully automatic operation using liquid chlorine may only be started after the entire system has been inspected for leaks.

### 8.2 Inspecting the pressure system

Check the pressure system of the chlorine container to the vacuum regulator in two stages:

1. Leak test with nitrogen,
2. Leak test with chlorine.

#### 8.2.1 Carrying out the leak test with nitrogen

You are strongly recommended to carry out this inspection before carrying out the leak test with chlorine, since it shows leaks in the pressure system without the risk of chlorine escaping.

As an alternative, you can carry out the inspection using dry compressed air.

The leak test can also be carried out with the chlorine evaporator switched off.

Precondition for action:

- ✓ All the shut-off valves in the pipe system were opened.
- ✓ A nitrogen cylinder with a pressure reducer (0 – 25 bar) has been connected.

Perform the following working steps:

1. Slowly raise the system pressure at the nitrogen cylinder's pressure reducer to 10 bar.
2. Close the nitrogen cylinder's valve.
3. Apply soap solution to all the potential leaks.
  - ▶ Bubbles form at leak locations (with a possible time delay).
4. Close the outlet on the nitrogen cylinder's pressure reducer and observe the pressure gauge in the installation.
  - ▶ The pressure must not drop within one hour.
5. If bubbles form at the potential leak locations and /or the pressure at the contact pressure gauge falls, this means that the piping is untight. Depressurise the system using the injector to evacuate the piping.

6. Repair the leak. If joints are made, make sure that they harden sufficiently.
  7. Repeat the leak test using nitrogen.
- ✓ **Leak test with nitrogen carried out.**

### 8.2.2 Carrying out the leak test with chlorine gas

	<b>DANGER</b>
<b>Danger to life from chlorine poisoning!</b>	
If you start the leak test with chlorine gas before the entire system has been installed and the injectors are ready for operation, chlorine gas may not be extracted immediately in the event of a leak.	
⇒ Make sure that all the components in the plant are installed correctly and the injectors are ready for operation before starting the leak test with chlorine gas.	
⇒ Put on protective clothing before carrying out the leak test with chlorine gas.	

Precondition for action:

- ✓ The leak test with nitrogen has been carried out successfully.
- ✓ All shutoff valves in the piping system have been closed.
- ✓ A chlorine tank has been closed (at the gas take-off of the chlorine tank).
- ✓ The injector is ready for operation.
- ✓ The chlorine evaporator C 6100 is switched on (see section 8.1 "Turning on the device" on page 24).
- ✓ The device has reached operating temperature.

Perform the following working steps:

1. Briefly open the chlorine container valve and close it again.
2. Open the first valve in the pipe line, starting from the chlorine tank.
3. Carry out the ammonia test at the pipeline section up to the first closed valve: Hold an open bottle containing the ammonia solution close to the pipe and make slight pumping motions with the plastic bottle. Ammonia steam with chlorine forms a white vapour and makes even very small leaks visible.

	<b>NOTICE</b>
<b>Damage to the system due to the ammonia solution</b>	
If the ammonia solution comes into contact with the system, this leads to corrosion on the devices.	
⇒ Make sure that you do not spill any ammonia.	

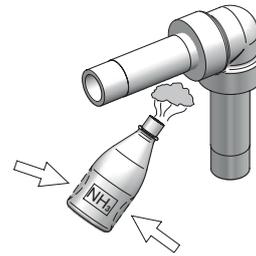


Fig. 17: Leak test with ammonia

4. Open additional downstream valves in the pipe line in sections. In each case, let a little chlorine gas into the system and close the valves again. Then carry out the ammonia test at this pipe line section and the associated fittings. Proceed in this manner until all piping and fittings have been tested for leaks.

If you find leaks:

1. Close the chlorine tank valve.
2. Depressurise the system using the injector to evacuate the piping.
  - ▶ The pressure gauge displays 0 bar.
3. Set the main switch on the control cabinet to *Off*.
4. Switch off the injector at the booster pump.
5. Repair the leak. If joints are made, make sure that they harden sufficiently.
6. Repeat the leak test.

If you do not find any leaks:

1. Close the chlorine tank valve.
  2. Depressurise the system using the injector to evacuate the piping.
    - ▶ The pressure gauge displays 0 bar.
  3. Switch off the injector at the booster pump.
- ✓ **Leak test with chlorine gas completed.**

### 8.3 Commissioning the device

Precondition for action:

- ✓ The leak test with chlorine gas has been carried out successfully.
- ✓ The valve at the input of the chlorine evaporator is closed.
- ✓ The valve on the chlorinator is closed.
- ✓ The chlorine evaporator C 6100 is switched on (see section 8.1 "Turning on the device" on page 24).
- ✓ The device has reached operating temperature.
- ✓ At least one chlorine tank has been connected to the valve for withdrawing liquid chlorine (lower valve).



#### NOTICE

##### Damage to the system by liquid chlorine

If the valves are opened too quickly, the liquid chlorine may not be or may not be sufficiently evaporated under certain circumstances. If an injector is switched on, liquid chlorine can enter the vacuum line and damage PVC components. Furthermore, rapid opening of the valves causes downstream piping to ice up due to the energy loss during evaporation.

⇒ Take care to open each valve slowly.

Perform the following working steps:

1. Open the valves from the chlorine tank in sequence, starting in the direction of the chlorine evaporator.
  2. Switch the injector on
  3. Open the valve on the chlorinator.
- ✓ **The device is commissioned.**

## 9 Operation

	<b>DANGER</b>
<p><b>Chlorine gas can escape due to systems that are leaky or not installed correctly!</b></p> <p>Chlorinators constitute an increased safety risk if they have not been properly installed, if an adequate leak test has not been performed or if the devices are not in good condition.</p> <ul style="list-style-type: none"> <li>⇒ Before placing the system into operation, have it checked by technical personnel to ensure that it is in the proper condition and leaktight.</li> <li>⇒ The condition of the installation must be checked for adequate tightness on a regular basis.</li> <li>⇒ Get rid of leaks without delay. You must get rid of even very minor leaks without delay. Together with the humidity, chlorine forms hydrochloric acid and corrosion results in rapidly increasing leakage.</li> </ul>	

The chlorine evaporator C 6100 is an automatic self-regulating system (correct configuration of the device and of the control cabinet as well as installation of all required accessories are prerequisites). During ongoing operation, it requires no operation.

### 9.1 Shutting down in an emergency

	<b>DANGER</b>
<p><b>Danger to life from chlorine poisoning!</b></p> <p>Chlorine is poisonous. In severe cases, breathing in chlorine may lead to death. It irritates the eyes, the respiratory system and the skin.</p> <ul style="list-style-type: none"> <li>⇒ If chlorine escapes, leave the room immediately.</li> <li>⇒ Use sufficient personal protective equipment.</li> <li>⇒ If chlorine gas escapes, wear a Type 2 self-contained breathing apparatus that complies with EN 137.</li> <li>⇒ Only initiate counter measures after putting on the protective equipment.</li> </ul>	

In an emergency, you must immediately disconnect the device from the mains supply or activate the Emergency Stop switch installed in the system.

The chlorine tank valves must be closed.

The further procedure depends on the type of accident and should be planned and executed by professional personnel.

### 9.2 Inspection intervals

You must check the components of the chlorinator for leaks on a daily basis and after maintenance or commissioning work.

## 10 Shutdown

### 10.1 Short-term shutdown

Perform the following working steps:

1. Close the chlorine tank valves.
2. Use the injector to suck off the remaining chlorine until the pressure gauge displays 0 bar.
3. Switch off the injector.
4. Stop automatic operation on the control cabinet.
5. Set the main switch on the control cabinet to *Off*.

✓ **Chlorinator shut down for the short term.**

### 10.2 Long-term shutdown

Perform the following working steps:

1. Close the chlorine tank valves.
2. Use the injector to suck off the remaining chlorine until the pressure gauge displays 0 bar.
3. Operate the chlorination installation for approx. 5 minutes with nitrogen or dry compressed air at approximately 5 bar.
4. Switch off the injector.
5. Stop automatic operation on the control cabinet.
6. Set the main switch on the control cabinet to *Off*.
7. Close the water supply.
8. Wait until the temperature of the water in the water tank is in equilibrium with the ambient temperature.
9. Open the drainage valve and let the water flow out of the water tank.
10. Close all the connections to protect the lines and devices from humidity and dirt.

✓ **Chlorinator shut down for the long term.**

### 10.3 Storage

	NOTICE
<p><b>Damage to the system due to the formation of hydrochloric acid</b></p> <p>Chlorine gas is highly hygroscopic. This means that humidity enters the system at any open connection on devices or pipes, which results in the formation of hydrochloric acid and contamination thus inevitably causing damage to the units.</p> <p>⇒ Keep all connections (including in the vacuum system and on all devices not currently in use) closed at all times.</p>	

Required actions:

- ✓ The device has been shut down in accordance with the section 10.2 "Long-term shutdown".

Storing the device correctly will extend its service life. You should avoid negative influences such as extreme temperatures, high humidity, dust, chemicals, etc.

Ensure ideal storage conditions where possible:

- the storage place must be cold, dry, dust-free and generously ventilated,
- temperatures between + 2 °C and + 40 °C,
- relative air humidity must not exceed 90 %.

### 10.4 Transportation

#### 10.4.1 Packing the device

Required actions:

- ✓ The device has been shut down in accordance with the section 10.2 "Long-term shutdown".

Perform the following working steps:

1. Dismantle all piping.
2. Seal all open connections airtight.
3. Loosen the floor anchorage.
4. Use a crane to lift the device.
5. Set it down on a pallet.
6. Bolt the device onto the pallet.
7. Fit the side parts and a cover to the pallet.

✓ **The device is packed**

If the device is sent back to the manufacturer, please follow sections 15 "Declaration of no objection" on page 43 and section 16 "Warranty Application" on page 44.

### 10.5 Disposal of old equipment

- Before disposing of the old equipment, you must clean off the remaining chlorine by rinsing it with nitrogen or air.
- The device must be disposed of in accordance with applicable local laws and regulations. It should not be disposed of as domestic waste!
- As the disposal regulations may differ from country to country, please consult your supplier if necessary.

## 11 Maintenance

Products by Lutz-Jesco are manufactured to the highest quality standards and have a long service life. However, some parts are subject to operational wear. This means that regular visual inspections are necessary to ensure a long operating life. Regular maintenance will protect the device from operation interruptions.

**DANGER**

**Mortal danger from electric shock!**

Live parts can inflict fatal injuries.

- ⇒ Before carrying out any maintenance work, always disconnect the device from the power supply.
- ⇒ Secure the system to prevent it from being switched on by accident.

**DANGER**

**Danger to life from chlorine poisoning!**

Do not carry out maintenance or any other work on the chlorinator until the system has been decommissioned and there is no more chlorine gas in the pipes. The failure to follow this instruction presents a significant risk of injury.

- ⇒ Prior to any maintenance work, prepare the system in accordance with section 11.3 "Preparing the system for maintenance" on page 30.

**WARNING**

**Increased risk of accidents due to insufficient qualification of personnel!**

Chlorinators and their accessories must only be installed, operated and maintained by personnel with sufficient qualifications. Insufficient qualification will increase the risk of accidents.

- ⇒ Ensure that all action is taken only by personnel with sufficient and corresponding qualifications.

**NOTICE**

**Damage to the system due to corrosion**

Water in chlorine carrying system components combines with chlorine to form hydrochloric acid and leads to corrosion

- ⇒ After maintenance work is complete, remove all water residues from the system before placing it into operation.

### 11.1 Maintenance intervals

To avoid hazardous incidents, chlorinators must be regularly maintained. This table gives you an overview of maintenance work and the intervals at which you must carry it out. The next few sections contain instructions for carrying out this work.

Interval	Maintenance
Daily or after maintenance or repair work	<ul style="list-style-type: none"> <li>■ Check water level in the viewing glass</li> <li>■ Check that the system is leaktight</li> <li>■ Check the values displayed on the instruments</li> </ul>
After 1 year	<p>Minor maintenance:</p> <ul style="list-style-type: none"> <li>■ Clean and test evaporation coil</li> <li>■ Check water tank</li> <li>■ Maintaining the anti-corrosion protection device</li> <li>■ Test function of electrical equipment</li> <li>■ Test connecting line between pressure gauge and ball valve</li> <li>■ Replace seals</li> </ul>
After 3 years	<p>Major maintenance:</p> <ul style="list-style-type: none"> <li>■ Carry out all steps in minor maintenance</li> <li>■ Replace all reactive anodes</li> <li>■ Maintain ball valve</li> <li>■ Replace connecting line between pressure gauge and ball valve</li> </ul>
After 5 years	<ul style="list-style-type: none"> <li>■ Replace contact pressure gauge</li> </ul>

Table 11: Maintenance intervals

In some cases, regional regulations may require shorter maintenance intervals. Maintenance intervals depend only on how frequently the equipment is used. Chemical wear of rubber parts, for example, begins with the initial medium contact and continues irrespective of the usage.

## 11.2 Maintenance accessories

Description	Part number
Silicone grease, medium viscosity 35 g for application to seals	35537
Liquid sealant 50 ml for bonding threads up to 3/4" NPT	1641
Liquid sealant 50 ml for bonding threads above 1" NPT	97715
Ammonia solution 50 ml for the leak test	13514

Table 12: Maintenance sets

## 11.3 Preparing the system for maintenance

Perform the following working steps:

1. Close the chlorine tank valves.
2. Use the injector to suck off the remaining chlorine until the pressure gauge displays 0 bar.
3. Operate the chlorination installation for approx. 5 minutes with nitrogen or dry compressed air at approximately 5 bar.
4. Switch off the injector.
5. Stop automatic operation on the control cabinet.
6. Set the main switch on the control cabinet to *Off*.
7. Close the water supply.
8. Wait until the temperature of the water in the water tank is in equilibrium with the ambient temperature.
9. Remove the cladding from the device as described in section 7.2 "Installing the device" on page 15.

✓ **The system is prepared for maintenance.**

## 11.4 Cleaning the evaporation coil

The evaporation coil can be cleaned using either water or steam. The evaporation coil is usually cleaned and rinsed with water in its installed condition. This procedure is described below.

Required actions:

- ✓ The system has been prepared for maintenance in accordance with section 11.3 "Preparing the system for maintenance" on page 30.
- ✓ A water connection with a hose is available.
- ✓ The evaporation coil is mounted in the chlorine evaporator.

Perform the following working steps:

1. Set the main switch on the control cabinet to *On*.
2. Start automatic operation on the control cabinet.
  - ▶ Wait until the device has reached operating temperature.
3. Remove the chlorine lines at the input and at the output of the device.

4. Close the ball valve between the evaporation coil and pressure gauge.
5. Connect a pressure hose for water to the input and the output flange of the device respectively.
6. Connect the hose to the output flange (thick pipe) with a water tap.
7. Lay the hose at the input flange (thin pipe) to a floor drain.
8. Rinse the evaporation coil with water until the water comes out of the hose again at the output of the evaporation coil.
9. Close the water supply and leave the water to stand in the evaporation coil for approximately half an hour.
  - ▶ The water bath heats the water in the evaporation coil, thereby helping to dissolve deposits.
10. Keep rinsing the evaporation coil with water until it runs clear and clean from the end of the hose.
  - ▶ The evaporation coil is clean on the inside.
11. Connect a supply of compressed air or nitrogen to the chlorine output (thick pipe).
12. Blow the water out of the evaporation coil at approx. 6 bar.
  - ▶ The evaporation coil only contains residual amounts of water.
13. Remove the hoses from the input and output flanges and allow the evaporation coil to stand open for around half an hour.
14. The heat of the water tank causes the remaining moisture in the evaporation coil to evaporate.
15. Open the ball valve between the evaporation coil and the pressure gauge.
16. Stop automatic operation on the control cabinet.
17. Set the main switch on the control cabinet to *Off*.
18. Seal all the connections airtight to protect the piping and devices from air humidity and dirt.

✓ **Evaporation coil cleaned**



Alternatively, the evaporation coil can also be removed and cleaned using steam. This procedure is not described. In the case of steam cleaning, note the operating limits of the device (see 5 "Technical data" on page 12). Steam cleaning may only be carried out by personnel that are trained in and familiar with the use of steam. The evaporation coil must also be thoroughly dried after steam cleaning.

## 11.5 Removing the evaporation coil

Precondition for action:

- ✓ The system has been prepared for maintenance in accordance with section 11.3 “Preparing the system for maintenance” on page 30.
- ✓ The chlorine connections have been removed.
- ✓ The water has been drained from the water tank.

Perform the following working steps:

1. Remove the connecting line between the pressure gauge and ball valve.

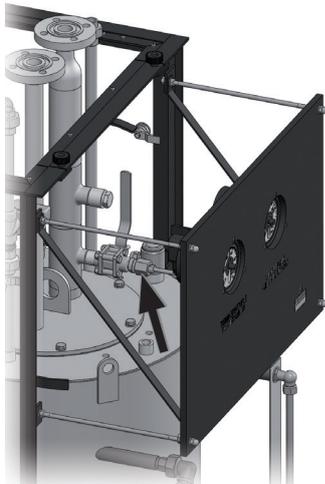


Fig. 18: Removing the connecting line

2. Remove the sensor on the thermometer for the chlorine gas temperature from the evaporation coil, if fitted.
3. Loosen the six bolts on the mounting plate on the evaporation coil.

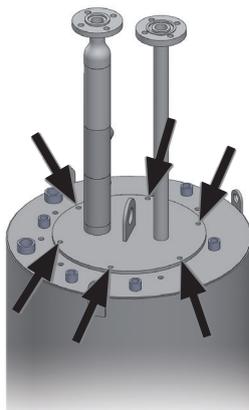


Fig. 19: Six bolts on the mounting plate (housing frame not shown)

4. Attach a suitable lifting device to the lifting lug on the mounting plate of the evaporation coil.

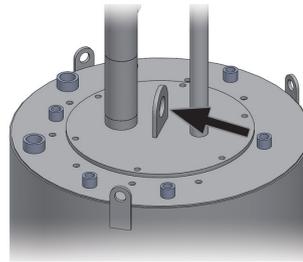


Fig. 20: Lifting lug

5. Carefully lift out the evaporation coil from the water tank of the chlorine evaporator.
  6. Carefully place the evaporation coil on the floor and secure it to prevent it from rolling away.
  7. Rinse the evaporation coil from the outside with water.
- ✓ **The evaporation coil is disassembled.**

## 11.6 Checking the evaporation coil

### 11.6.1 Visual inspection

There must be no visible signs of significantly increased corrosion or even pitting on the evaporation coil.



The evaporation coil is not painted under water. Painting would interfere with the transfer of heat

Pay particular attention to the following:

- The area at which the water level flows if the evaporation coil is in the water bath
- Weld seams

### 11.6.2 Weight inspection

Precondition for action:

- ✓ The evaporation coil has been cleaned in accordance with section 11.4 “Cleaning the evaporation coil” on page 30.
- ✓ The evaporation coil has been disassembled in accordance with section 11.5 “Removing the evaporation coil” on page 31.

Perform the following working steps:

1. Weigh the evaporation coil.



The evaporation coil can be weighed together with the bonded connecting parts. The weight of these components must be deducted from the overall weight:

- Ball valve with 2 double nipples: approx. 960 g
- Threaded plug 3/4" NPT: approx. 120 g

2. Compare the weight with the manufacturer's specified weight that is stamped into the mounting plate (on the surface beside the lifting lug).
    - ▶ If the measured weight is more than 2% below the stamped value, the evaporation coil may only be used after positive findings in additional tests (see section 11.6.2.1 "Additional tests").
- ✓ **Weight inspection executed.**

### 11.6.2.1 Additional tests

	DANGER
<p><b>Danger to life from chlorine poisoning!</b></p> <p>In evaporation coils that exhibit higher weight losses, the walls may have fallen below the technically required thickness and progressive corrosion may lead to an escape of chlorine.</p> <p>⇒ If the measured weight is more than 2% lower than the stamped weight, carry out the following tests.</p> <p>⇒ Replace the evaporation coil if the tests are not passed.</p>	

### Measuring the wall thickness

The wall thickness of the evaporation coil may be determined e.g. using ultrasound and must not fall below the following values at any point:

Pipe outer diameter	Wall thickness
Ø 60.3 mm	4.5 mm
Ø 33.7 mm	3.5 mm

If these values are not reached, the evaporation coil must be replaced.

### Pressure test

The hydrostatic pressure test is conducted at room temperature with water at 60 bar. No leaks are permitted.

The inside of the evaporation coil must then be completely dried.

## 11.7 Checking the water tank

Precondition for action:

- ✓ The evaporation coil has been removed.
- ✓ The water has been drained from the water tank.

### 11.7.1 Carrying out a visual inspection

Perform the following working steps:

1. Open the drainage valve at the water tank.
2. Rinse the water tank thoroughly with a water hose.
3. Possible encrusted deposits must be mechanically removed.
4. Check the water tank for signs of excessive corrosion. Pay particular attention to the weld seams.

✓ **Visual inspection completed**

## 11.8 Maintaining the anti-corrosion protection device

The steel parts in the water tank are protected against corrosion by a cathodic corrosion protection. Cathodic corrosion protection is an electrochemical protection system in which an electrical direct current flows through the electrolyte (water) to the metal structures to be protected (cathode). The protective current is generated using galvanically active anodes (reactive anodes) made of magnesium. The reactive anodes wear out in the process and must be regularly replaced.

	<p>The wear on the anodes depends on the water quality. For this reason, the recommended replacement interval of 3 years is only a guide value. The decisive factor is the weight check on the anodes.</p>
--	--

Required actions:

- ✓ The system has been prepared for maintenance in accordance with section 11.3 "Preparing the system for maintenance" on page 30.
- ✓ The water has been drained from the water tank.
- ✓ The evaporation coil has been disassembled in accordance with section 11.5 "Removing the evaporation coil" on page 31.

Perform the following working steps:

1. Unscrew all eight anodes, including the anode extensions, from the water tank.

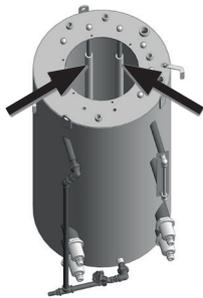


Fig. 21: Anodes in the water tank

2. Unscrew the anodes from the extensions.
3. Weigh the anodes.
  - ▶ When an anode weighs less than 0.5 kg, it must be replaced.
4. In the water tank, use sandpaper to clean the surface that the anode rests against to ensure metallic contact.
5. Re-fit the anodes with the extensions in the water tank and tighten the nuts with approx. 20 Nm.

- ✓ **Maintenance of the anti-corrosion protection device is complete.**

## 11.9 Assembling the evaporation coil

Precondition for action:

- ✓ A new seal is available.
- ✓ The surfaces of the water tank and of the mounting plate on the evaporation coil are clean and even.

Perform the following working steps:

1. Place a new seal on the water tank and align it according to the hole pattern.
2. Insert the evaporation coil into the water tank.
3. Fit the six bolts by hand and gently tighten them with a tool.
4. Before assembling the connecting line between the ball valve and pressure gauge, the line must be bent in such a way that it fits, free of stress, with the connections. To do this, use a bending tool so that the pipe does not kink.
5. Insert the new flat gaskets and attach the connecting line.
6. Tighten the union nuts with approx. 20 Nm. Secure the threaded sleeve with a second open-end spanner to prevent distortion.
7. Fit the sensor on the thermometer for the chlorine gas temperature, if fitted.

- ✓ **The evaporation coil is mounted.**

## 11.10 Performing maintenance on the pressure gauge

Precondition for action:

- ✓ The system has been prepared for maintenance in accordance with section 11.3 "Preparing the system for maintenance" on page 30.

### 11.10.1 Maintaining the connecting line

The connecting line between the ball valve and pressure gauge compensates for movements between the water tank and the basic frame. Due to the movement, it is subjected to mechanical wear and must be replaced no later than the recommended usage duration (see section 11.1 "Maintenance intervals" on page 29).

Perform the following working steps:

1. Using an open-end spanner WAF 27, loosen the union nuts of the connecting line. Secure the threaded sleeve with a second open-end spanner to prevent distortion.
2. Carry out a visual inspection of the condition of the line. If signs of corrosion are visible, the line must be replaced.
3. Clean the sealing surfaces on the connecting line and at the threaded sleeve e.g. using isopropyl alcohol.
4. Blow out the line using compressed air or nitrogen.
5. If the line is not mounted again immediately, seal the ends of the line airtight.
6. Before assembling the connecting line between the ball valve and pressure gauge, the line must be bent in such a way that it fits, free of stress, with the connections. To do this, use a bending tool so that the pipe does not kink.
7. Insert the new flat gaskets and attach the connecting line.
8. Tighten the union nuts with approx. 20 Nm. Secure the threaded sleeve with a second open-end spanner to prevent distortion.

- ✓ **Maintenance of the connecting line is complete.**

### 11.10.2 Checking the pressure gauge

There is not need to carry out maintenance on the pressure gauge. It is sufficient to inspect the pressure gauge visually. After the recommended usage duration, it must be replaced (see section 11.1 "Maintenance intervals" on page 29).



Pressure gauges that have been disassembled must be tested and readjusted by the manufacturer.

Perform the following working steps:

1. Check the input of the pressure gauge for contamination. Remove the contamination with isopropyl alcohol. Under no circumstances should a sharp tool be used to clean the input.
2. Check the device for signs of corrosion. If there are signs heavy corrosion, the pressure gauge must be replaced.
3. If the pressure gauge is not immediately reconnected, seal the connection airtight.

- ✓ **The check on the pressure gauge is complete**

### 11.10.3 Checking the ball valve

The condition of the ball valve must be checked. During major maintenance, the seals must be replaced. (See section 11.1 "Maintenance intervals" on page 29)

Perform the following working steps:

1. Examine the ball valve for signs of external corrosion. Pay particular attention to the area around the control rod.
  - ▶ If there is heavy corrosion, the ball valve must be replaced.
2. Open and close the ball valve fully several times.
3. Check whether the ball valve can be moved with uniform resistance throughout the entire operating angle (90°).
  - ▶ If this is not the case, or if the ball valve appears to be impaired in terms of its functionality in another way, it must be maintained in accordance with the manufacturer's instructions or replaced.

✓ **The ball valve has been checked.**

### 11.11 Testing the electrical equipment

The electrical equipment must be checked annually by a qualified electrician. In particular, the function of the safety equipment must be checked (the processing of sensor signals and the actuation of actuators, see section 7.4.3 "Requirements regarding the control cabinet" on page 21).

### 11.12 Finishing maintenance

Perform the following working steps:

1. Make a note of the date and scope of the maintenance performed.
2. Attach a sticker displaying the maintenance date to the device.
3. Fit the connections to the device.
4. Repair the paint damage on the device.
5. Re-fit the cladding for the device in accordance with the instructions in the section 7.2 "Installing the device" on page 15.
6. To restart the system, proceed in accordance with the instructions in section 8 "Start-up" on page 24.

✓ **Maintenance completed.**



All exposed bright metal surfaces must be painted as the atmosphere in chlorine gas rooms is highly corrosive. RAL1003 yellow 2-component epoxy resin paint, for example, is suitable. Paint must only be applied after a successful leak test has been completed.

## 12 Troubleshooting

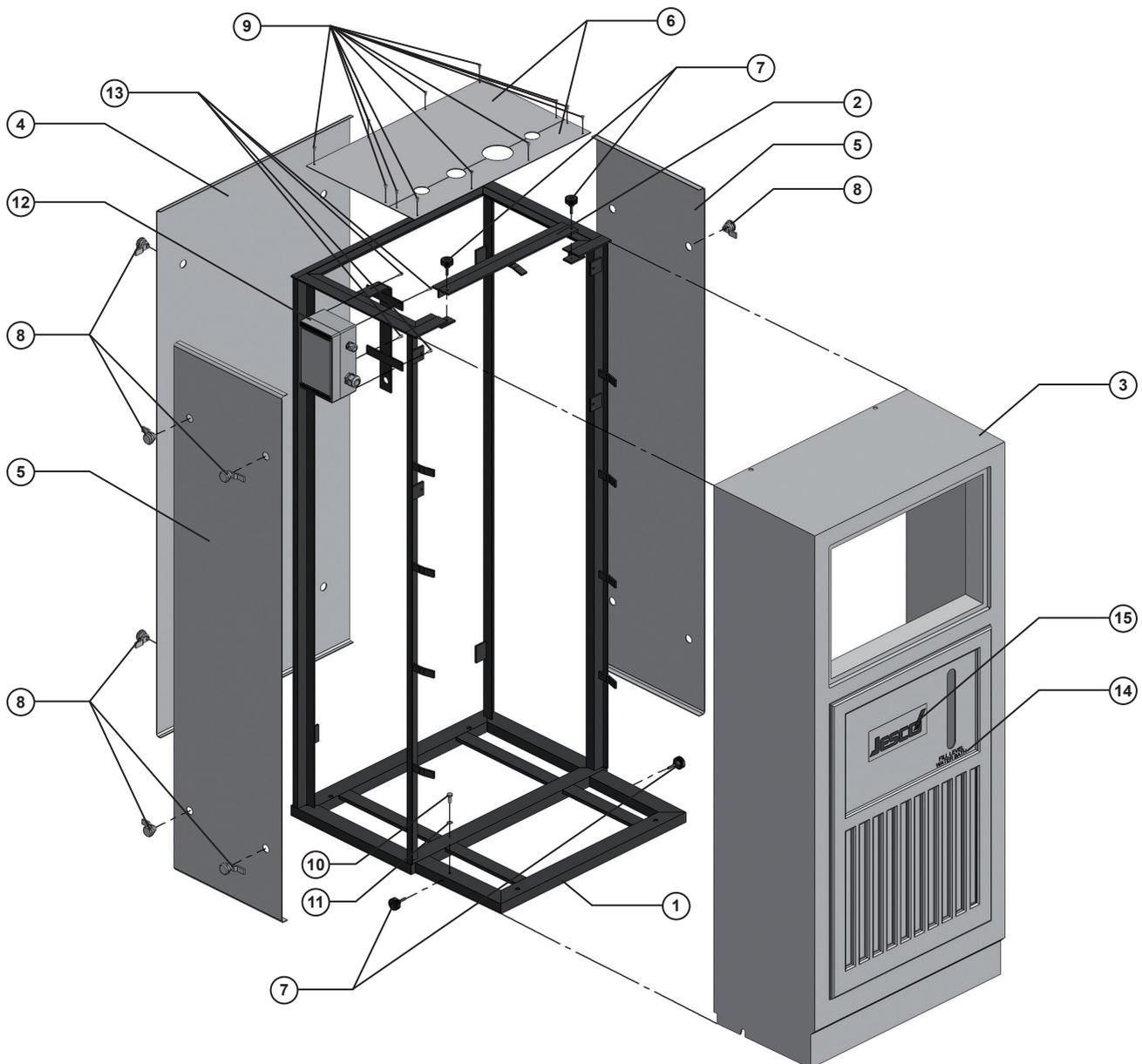
See below for information about how to rectify faults on the device or the system. If you cannot eliminate the fault, please consult with the manufacturer on further measures or return the device for repair.

Problem	Possible cause	Remedy
Minimum water temperature of 60 °C is not reached or undershot	The heating elements are defective	Switch off chlorine evaporator. Check power supply to heating elements.
	Surface of the bars is contaminated, e.g. with lime scale	Drain water. Switch voltage off. Disassemble and clean heating elements.
	The water in the water tank has fallen below the minimum fill level and the level probe for protection against dry running has switched off the heating	Check water supply and solenoid valve. Replace solenoid valve if necessary.
Maximum water temperature of 80°C exceeded	Contact thermometer is defective	Check contacts. If necessary, replace contact thermometer.
Water in water tank has fallen below the minimum fill height	Water supply too low due to contaminated or closed supply lines and/or defective solenoid valve	Check water supply and solenoid valve. Replace solenoid valve if necessary. In case of contamination: Install dirt trap upstream of solenoid valve.
Maximum operating pressure exceeded	The device has been isolated between two valves.	Switch off the device. Check valves upstream and downstream of the device.
Burst rupture disk	The device has been isolated between two valves.	Switch off the device. Replace the rupture disk.
Evaporator output is not reached.	Insufficient heating energy to evaporate the liquid chlorine due to deposits on and/or in the evaporation coil	Switch off the device. Clean the device.
Chlorine smell in the room	Leakage at piping or fittings	Carry out leakage test.
Ice or too much condensation at the pressure line	Chlorine delivery too high	Connect additional chlorine drums.
	Pressure loss at valves not fully opened causes strong cooling due to expansion	Open valves fully.

Table 13: Troubleshooting

## 13 Spare parts

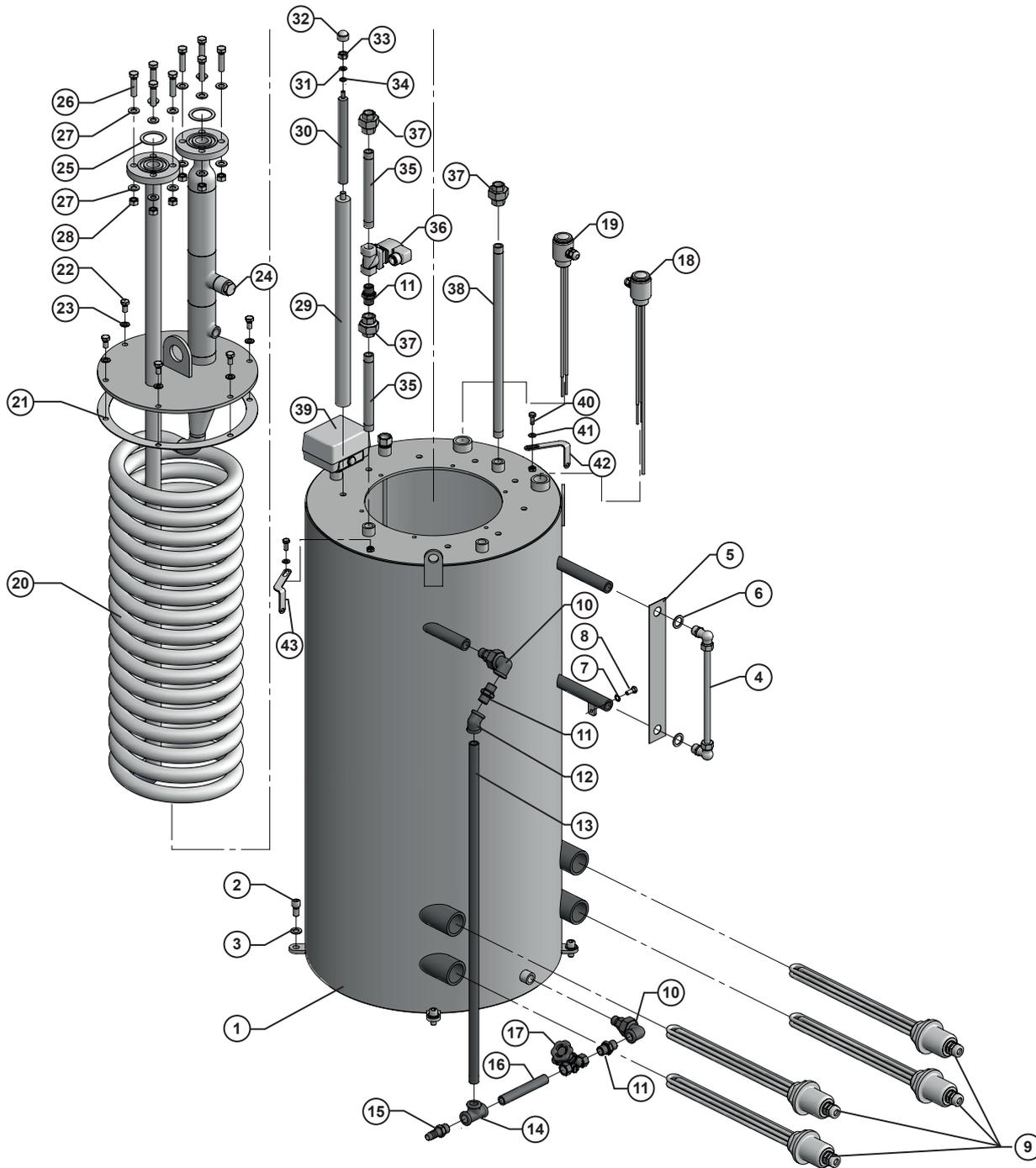
### 13.1 Housing cladding and housing frame



Position	Quantity	Description
1	1	Complete basic frame
2		Clamping piece
3	1	Hood cabinet
4	1	Back panel
5	2	Side panel
6	1	Cover panel
7	4	Knurled knob Ø32-M6x25
8	12	Rotary bar, screw-in
-	2	Square hollow key WAF 7 for rotary bar
9	12	Oval-head screw M4x8
-	1	Sticker for protective conductor symbol
10	1	Hexagon-headed bolt M8x20
11	1	Toothed washer A 8.4
12	1	Terminal box
13	4	Cylinder head screw M4x12
14	1	Sticker "LEVEL WATERBATH"
15	1	Sticker "JESCO"

Table 14: Housing cladding and housing frame

**13.2 Evaporation coil and water tank**



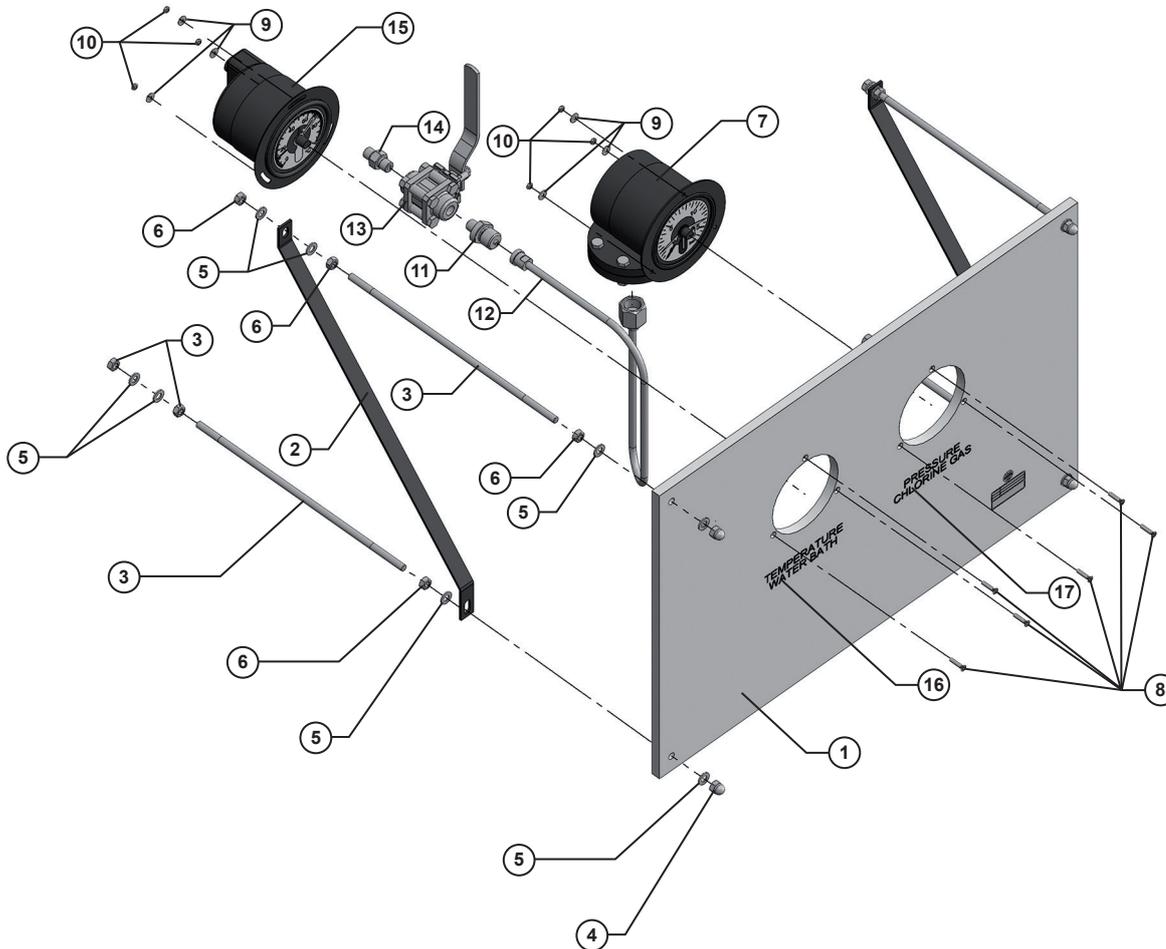
Position	Quantity	Description
1	1	Water tank
2	4	Cylinder head screw M12 x 25
3	4	Washer Ø13
-	1	Insulating foam board
-	5	Adhesive tape for insulation
4	1	Fill level display G 1/2
5	1	Guard plate
6	2	Flat gasket Ø30 / Ø21x2
-	1	Sticker for protective conductor symbol
7	1	Toothed washer A8.4
8	1	Hexagon-headed bolt M8 x 20
9	4	Immersion heater 5 KW 230V/400V
10	2	Elbow union G1/2 a / i
11	2	Double nipple R1/2
12	1	Angle 45° G1/2 i
13	1	Pipe R1/2 x 860
-	5	Arrow sign black/white
14	1	T-piece G1/2
15	1	Hose nozzle Ø16 with tap G1/2
16	1	Pipe R1/2 x 140
17	1	Shutoff valve G1/2
18	1	3-bar electrode
19	1	2-bar electrode
20	1	Evaporation coil
21	1	Flat gasket Ø350/300
22	6	Hexagon-headed bolt M10 x 25
23	6	Washer Ø10.5
24	1	Plug 3/4" NPT
25	2	Flat gasket Ø57/42 x 1.5
26	8	Hexagon-headed bolt M12 x 50
27	16	Washer Ø13
28	8	Hexagon nut M12
29	8	Anode
30	8	Anode extension
31	8	Washer Ø 8,4
32	8	Protective cap M8

Table 15: Evaporation coil and water tank

Position	Quantity	Description
33	8	Protective cap M8
34	8	Toothed washer
35	2	Pipe R1/2 x190
36	1	Electro-solenoid valve G1/2
37	3	Threaded connection G1/2 i/i
38	1	Pipe R1/2 x 483
39	1	Temperature monitoring
40	1	Hexagon-headed bolt M8 x 20
41	1	Washer Ø8,4
42	1	Mounting angle right
43	1	Mounting angle left

Table 15: Evaporation coil and water tank

### 13.3 Front panel



Position	Quantity	Description
1	1	Front plate
2	2	Brace for chlorine evaporator
3	4	Spacer bolt M8 x 325
4	4	Cap nut M8 DIN 1587
5	16	Washer Ø8.4
6	12	Hexagon nut M8
7	1	Contact pressure gauge
8	6	Countersunk screw M4 x 20
9	6	Washer Ø 4.3
10	6	Hexagon nut M4
11	1	Reduction 1/4" NPT a-G1/2 a
12	1	Connecting line

Table 16: Front panel

Position	Quantity	Description
13	1	Ball valve
14	1	Reduction 1/2" NPT a-1/4" NPT a
15	1	Contact thermometer with long-distance line and protective covering
16	1	Sticker "TEMPERATURE WATER BATH"
17	1	Sticker "PRESSURE CHLORINE GAS"

Table 16: Front panel

### 13.4 Maintenance sets

Part	Content	Part number
Small maintenance set	<ul style="list-style-type: none"> <li>■ Flat gaskets</li> </ul>	20500013
Large maintenance set (after 3 years)	<ul style="list-style-type: none"> <li>■ Small maintenance set</li> <li>■ Reactive anodes</li> <li>■ Set of seals for ball valve</li> <li>■ Connecting line with union nuts</li> </ul>	20500014

Table 17: Maintenance sets

## 14 EC declaration of conformity - chlorine evaporator



**(DE) EG-Konformitätserklärung**

Hiermit erklären wir, dass das nachfolgend bezeichnete Gerät aufgrund seiner Konzipierung und Bauart sowie in der von uns in Verkehr gebrachten Ausführung den einschlägigen grundlegenden Sicherheits- und Gesundheitsanforderungen der aufgeführten EG-Richtlinien entspricht. Bei einer nicht mit uns abgestimmten Änderung am Gerät verliert diese Erklärung ihre Gültigkeit.

**(EN) EC Declaration of Conformity**

We hereby certify that the device described in the following complies with the relevant fundamental safety and sanitary requirements and the listed EC regulations due to the concept and design of the version sold by us.

If the device is modified without our consent, this declaration loses its validity.

**(FR) Déclaration de conformité CE**

Nous déclarons sous notre propre responsabilité que le produit ci-dessous mentionné répond aux exigences essentielles de sécurité et de santé des directives CE énumérées aussi bien sur le plan de sa conception et de son type de construction que du modèle que nous avons mis en circulation.

Cette déclaration perdra sa validité en cas d'une modification effectuée sur le produit sans notre accord explicite.

**(ES) Declaración de conformidad CE**

Por la presente declaramos que, dados la concepción y los aspectos constructivos del modelo puesto por nosotros en circulación, el aparato mencionado a continuación cumple con los requisitos sanitarios y de seguridad vigentes de las directivas de la U.E. citadas a continuación.

Esta declaración será invalidada por cambios en el aparato realizados sin nuestro consentimiento.

**(NL) EU-overeenstemmingsverklaring**

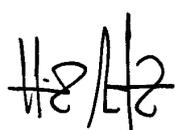
Ondergetekende Lutz-Jesco GmbH, bevestigt, dat het volgende genoemde apparaat in de door ons in de handel gebrachte uitvoering voldoet aan de eis van, en in overeenstemming is met de EU-richtlijnen, de EU-veiligheidsstandaard en de voor het product specifieke standaard. Bij een niet met ons afgestemde verandering aan het apparaat verliest deze verklaring haar geldigheid.

**(PT) Declaração de conformidade CE**

Declaramos pelo presente documento que o equipamento a seguir descrito, devido à sua concepção e ao tipo de construção daí resultante, bem como a versão por nós lançada no mercado, cumpre as exigências básicas aplicáveis de segurança e de saúde das directivas CE indicadas.

A presente declaração perde a sua validade em caso de alteração ao equipamento não autorizada por nós.

<b>Bezeichnung des Gerätes:</b>	Chlorverdampfer
<b>Description of the unit:</b>	Chlorine evaporator
<b>Désignation du matériel:</b>	Évaporateur de chlore
<b>Descripción de la mercancía:</b>	Evaporador de cloro
<b>Omschrijving van het apparaat:</b>	
<b>Designação do aparelho:</b>	Evaporador de cloro
<b>Typ:</b>	C 6100
<b>Type:</b>	
<b>EG-Richtlinien:</b>	Maschinenrichtlinie, Druckgeräterichtlinie
<b>EC directives:</b>	Die Schutzziele der Niederspannungsrichtlinie wurden gemäß Anhang I, Nr. 1.5.1 der Maschinenrichtlinie eingehalten. The protective aims of the Low Voltage Directive were adhered to in accordance with Annex I, No. 1.5.1 of the Machinery Directive. Rohrwendel nach Druckgeräterichtlinie Kategorie III mit EG-Einzelprüfung (Modul G) Tubular coil according to Pressure Equipment Directive category III with EC unit varification (module g)
<b>Dokumentationsbevollmächtigter:</b>	
<b>Authorized person for documentation:</b>	Lutz-Jesco GmbH



Heinz Lutz  
Geschäftsführer / Chief Executive Officer  
Lutz-Jesco GmbH  
Wedemark, 05.11.2019

Lutz-Jesco GmbH  
Am Bostelberge 19  
30900 Wedemark  
Germany

## 15 Declaration of no objection

Please copy the declaration, stick it to the outside of the packaging and return it with the device.

### Declaration of no objection

Please fill out a separate form for each appliance!

We forward the following device for repairs:

Device and device type: ..... Part-no.: .....

Order No.: ..... Date of delivery: .....

Reason for repair: .....

.....

.....

#### Dosing medium

Description: ..... Irritating:  Yes  No

Properties: ..... Corrosive:  Yes  No

We hereby certify, that the product has been cleaned thoroughly inside and outside before returning, that it is free from hazardous material (i.e. chemical, biological, toxic, flammable, and radioactive material) and that the lubricant has been drained.

If the manufacturer finds it necessary to carry out further cleaning work, we accept the charge will be made to us.

We assure that the aforementioned information is correct and complete and that the unit is dispatched according to the legal requirements.

Company / address: ..... Phone: .....

..... Fax: .....

..... Email: .....

Customer No.: ..... Contact person: .....

Date, Signature: .....

## 16 Warranty Application

### Warranty claim

Please copy and send it back with the unit!

If the device breaks down within the period of warranty, please return it in a cleaned condition with the complete warranty claim.

#### Sender

Company: ..... Phone: ..... Date: .....

Address: .....

Contact person: .....

Manufacturer order no.: ..... Date of delivery: .....

Device type: ..... Serial number: .....

Nominal capacity / nominal pressure: .....

Description of fault:.....

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

#### Service conditions of the device

Point of use / system designation:.....

.....  
.....

Accessories used (suction line etc.):.....

.....  
.....  
.....  
.....

Commissioning (date): .....

Duty period (approx. operating hours): .....

Please describe the specific installation and enclose a simple drawing or picture of the chemical feed system, showing materials of construction, diameters, lengths and heights of suction and discharge lines.

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