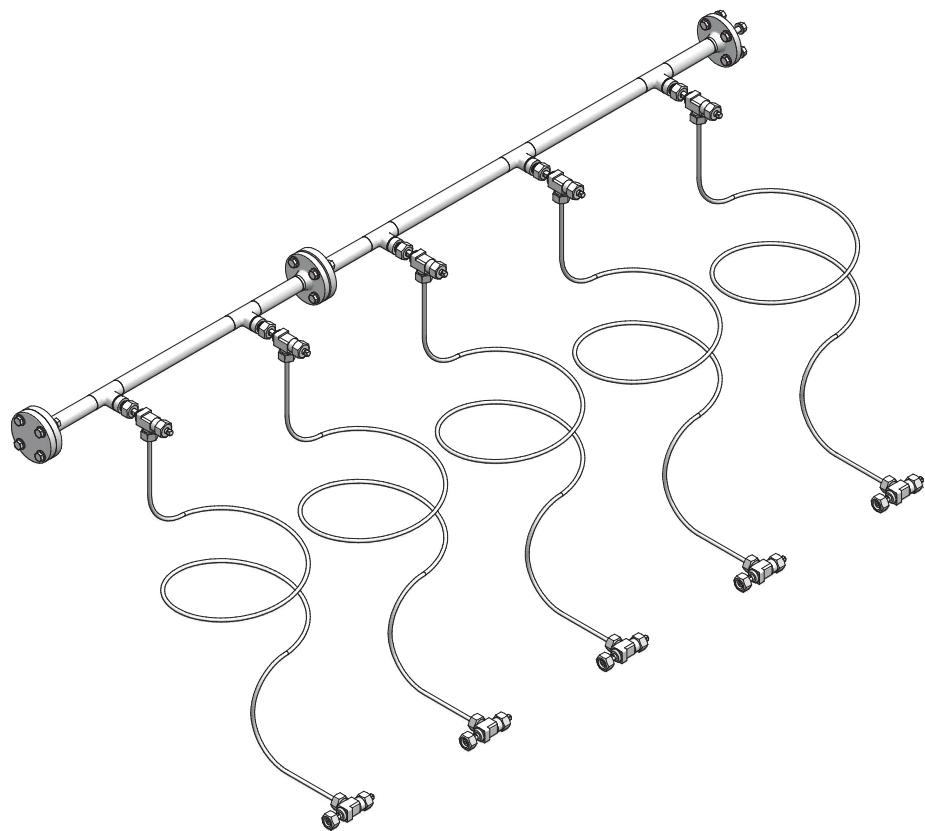


## Pressurized manifold

### 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 chlorine gas filter 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
	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
<b>Description of danger.</b> Consequences if ignored. ⇒ The arrow signals a safety precaution to be taken to eliminate the danger.	

### 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-chapters.



#### DANGER

##### Danger to life from chlorine poisoning!

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.



#### NOTICE

##### Damage to the plant due to the formation of hydrochloric acid

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.

- ⇒ Keep all connections (including in the vacuum system and on all devices not currently in use) closed at all times.



#### DANGER

##### Danger to life from chlorine poisoning!

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.



#### NOTICE

##### Faults due to insufficient chlorine quality

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



#### 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.
- ⇒ Prevent access to the system for unauthorised persons.

### 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>
<b>Danger to life from chlorine poisoning!</b>	
<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 persons

Trained persons have received training from the operator about the tasks they are to perform and about the dangers stemming from improper behaviour.

Trained persons have attended all trainings offered by the operator.

### 2.6.3 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>■ Commissioning</li> <li>■ Control</li> <li>■ Replace the chlorine tank</li> <li>■ Taking out of operation</li> <li>■ Fault rectification</li> <li>■ Maintenance</li> <li>■ Repairs</li> <li>■ Disposal</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 9) 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 device is intended for the following purpose only: Uniting fluid or gaseous chlorine from a number of pressure tanks into a single line.

### 3.3 Device revision

This operating instructions apply to the following devices:

Device	Month / year of manufacture
Pressurized manifold	01/2009 onwards

Table 4: Device revision

The production date is indicated on the rating plate.

### 3.4 Prohibited dosing media

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

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

## 4 Product description

### 4.1 Scope of delivery

Carefully check the delivery prior to installation and refer to the delivery note to ensure the delivery is complete and to check for any transport damage. Contact the supplier and/or carrier regarding any questions concerning the delivery and/or transport damage. Do not operate defective devices.

The scope of delivery includes:

- Pressurized manifold (depending on the number of connections in sections) consisting of a manifold and flexible connection lines
- Flange connections (screws, nuts, U-washers and seals)
- Blind flange
- Pipe clamps with mounting hardware
- WAF 32 open-end spanner for operating the corner valves
- optional: Auxiliary valve, corner valves
- Operating instructions

### 4.2 Design and function

#### 4.2.1 Structure of the device

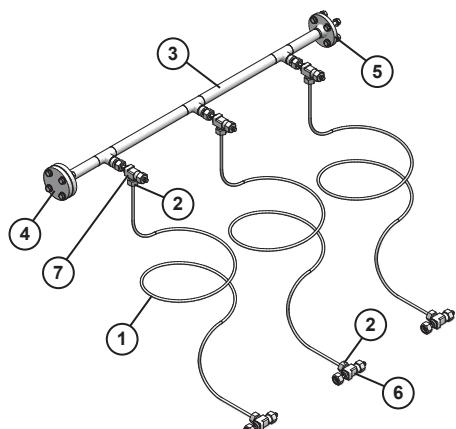


Fig. 1: Structure of the device

Position	Description
1	Flexible connection line
2	Union nut on both sides of the flexible line
3	Manifold (sections each with 2 or 3 connections)
4	Connection flange for further manifolds or nitrogen flushing device (blind flange included in the scope of delivery)
5	Connection flange at the output
6	Auxiliary valve (optional)
7	Corner valve (optional)

Table 5: Description of components

#### 4.2.2 Function description

Only a restricted amount of chlorine can be withdrawn from chlorine cylinders and chlorine drums at any one time. The max. possible flow rate using chlorine cylinders or chlorine drums is insufficient for many installations.

Manifolds represent one solution. These combine multiple chlorine flows and feed the system via a line. Supply is performed using either gaseous or fluid chlorine.

A pressurized manifold connects all tanks forming a single pressure system so that chlorine is withdrawn simultaneously from all tanks. The chlorine is fed to an individual vacuum regulator via the manifold.

#### 4.2.3 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.

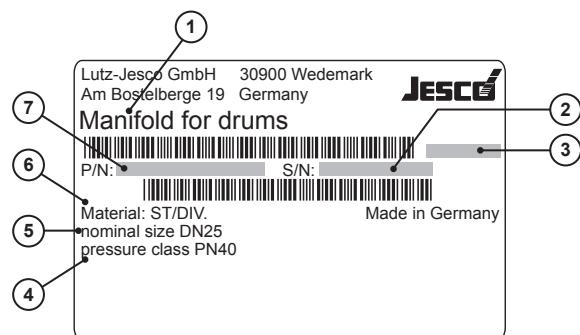


Fig. 2: Rating plate Pressurized manifold

No.	Description
1	Product name
2	Serial number
3	Month/year of manufacture
4	Pressure stage
5	Nominal width
6	Material
7	Part number

Table 6: Rating plate

## 5 Technical data

<b>Description</b>		<b>Value</b>
Max. flow rate (fluid)	Manifold	2600 kg/h Cl <sub>2</sub> (at 20°C and 1 m/s)
	Flexible connection line	140 kg/h Cl <sub>2</sub> (at 20°C and 1 m/s)
Max. flow rate (gaseous)	Manifold	400 kg/h Cl <sub>2</sub> (at 20°C and 10 m/s)
	Flexible connection line	20 kg/h Cl <sub>2</sub> (at 20°C and 10 m/s)
Pressure stage		PN40
Nominal width	Manifold	DN25
	Flexible connection line	DN6
Materials	Manifold	Unalloyed steel Coated
	Flexible connection line	Copper Galvanic coated
	Auxiliary valves and corner valves	Bronze / Monel / PTFE
Weight	for cylinders	approx. 4.5 kg (per connection)
	for drums	approx. 6 kg (per connection)
	Corner valve	approx. 0.6 kg
	Drum valve	approx. 0.6 kg

Table 7: Specifications

## 6 Dimensions

All dimensions in mm

### 6.1 Manifold

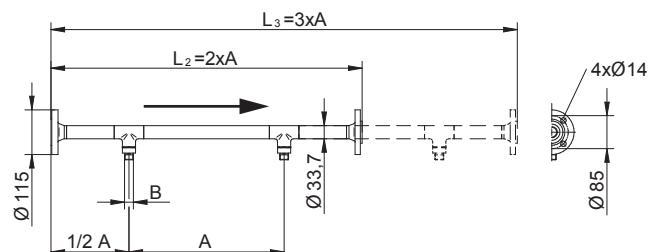


Fig. 3: Manifold

Scale		Value
A	With chlorine cylinders	400 mm
	With chlorine drums	1000 mm
B		BSP 5/8 (BS341)
Input side flange		DN25 / PN40 with groove (according to EN 1092-1, Form D)
Output side flange		DN25 / PN40 with spring (according to EN 1092-1, Form C)

Table 8: Manifold

The length of the manifold is calculated from the number of connections for the flexible connection lines multiplied by the respective dimension A

### 6.2 Flexible connection line

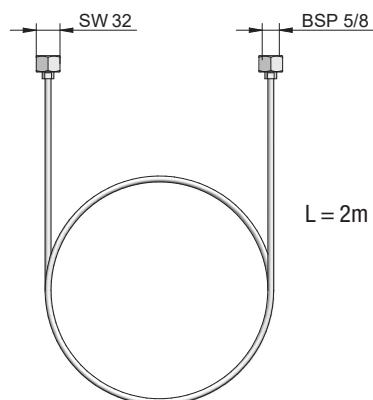


Fig. 4: Flexible connection line

### 6.3 Corner valve

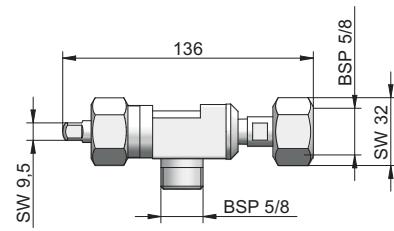


Fig. 5: Corner valve

### 6.4 Auxiliary valve with union nut

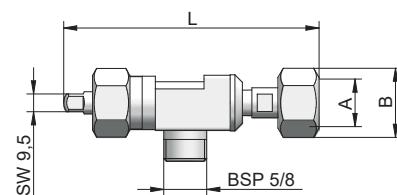


Fig. 6: Auxiliary valve with union nut

A thread	Standard	B Width across flats	L
BSW 1"	DIN 477	WAF32	139 mm
BSP 5/8	BS 341	WAF32	136 mm
BSP 3/4	AS 2473	WAF32	145 mm
1.30" - 14 NGO	CGA V-1 (660)	WAF32	134 mm
BSW 1 1/4"	DIN 4676	WAF41	155 mm
M26 x 3	-	WAF32	146 mm

Table 9: Auxiliary valve with union nut

### 6.5 Auxiliary valve with YOKE connection [CGA V-1 (820)]

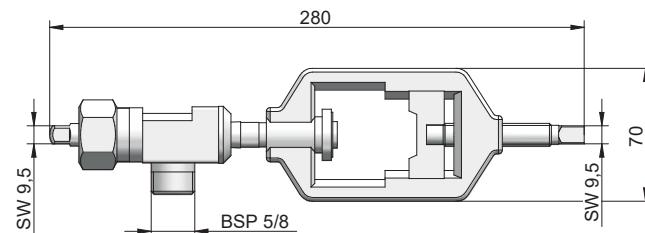


Fig. 7: Auxiliary valve with YOKE connection [CGA V-1 (820)]

## 7 Installation



### 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.
- ⇒ Prevent access to the system for unauthorised persons.



### NOTICE

#### Damage to the system by liquid chlorine

Specific components from chlorinators may not be permitted to come into contact with fluid chlorine, as fluid chlorine attacks PVC components. If the connection lines are installed e.g. in vertical loops, fluid chlorine will collect in the lowest point in the loop. The fluid chlorine can penetrate the running operation and thus enter and damage components such as the vacuum regulator. The manifold and the flexible connection lines must be installed in such a way that the reliquified chlorine is able to flow back fully into the chlorine tank.

- ⇒ Install the manifold with at least a 1 % incline.
- ⇒ Install the flexible connection lines with at least a 1 % incline. If you wish to install the connection lines in loops, these must also be installed with a constant incline.



### NOTICE

#### Damage to the system due to incorrect installation

The failure to observe installation instructions (e.g. use of unsuitable tools, incorrect torque) can damage the system parts.

- ⇒ Use the tool intended for this purpose.
- ⇒ Note the specified torque.

### 7.1 Notes for installation

- The manifold is installed in the room used for the chlorine supply.
- It can be fastened with pipe clamps (preferably made of rubber).
- The device may not be exposed to direct sunlight.
- The chlorine cylinders/chlorine drum and the manifold are connected with flexible copper pipes. Every connection line must be fitted with an auxiliary valve on its input.
- Corner valves facilitate operation and maintenance. They may only be used to withdraw gaseous chlorine.

### 7.2 Installing the device

#### 7.2.1 Installing the manifold

Precondition for action:

- ✓ A flat wall
- ✓ The mounting material is suitable for the wall.

Perform the following working steps:

1. Mark the mounting point on the wall. Ensure a continually increasing installation.
2. Drill the holes for the pipe clamps.
3. Install the pipe clamps.
4. Place the manifold on the pipe clamps.
5. Clasp the pipe clamps around the manifold.
- ✓ **Manifold has been installed.**

#### 7.2.2 Installing 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.

Resources required:

- ✖ Torque wrench WAF19 20 – 50 Nm



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.

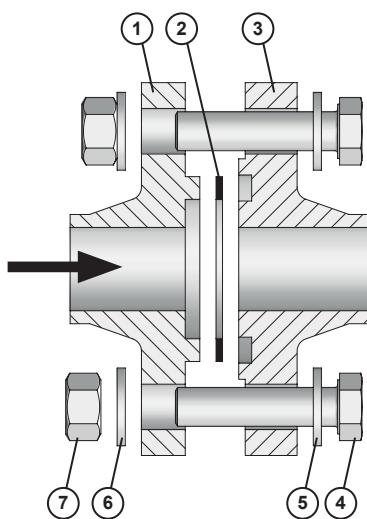


Fig. 8: Assembling the flange connection

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 seal (2) into the groove of the connection flange (3). Assemble the seal in dry condition.
3. Mount the tongue flange (1). 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 assembled**

### 7.2.3 Installing the flexible connection lines

Precondition for action:

- ✓ The sealing surfaces are free of contamination and damage.
- ✓ Seals must be clean, undamaged and dry.
- ✓ The inside of the lines are clean and dry.

Resources required:

- ☒ Wrench for the operation of auxiliary and corner valves
- ☒ New seals for flexible connection lines
- ☒ New seal for the chlorine tank valve



#### NOTICE

##### Breaking the flexible connection lines

The flexible connection lines are made of copper. Copper is flexible but repeated bending of the line can lead its becoming brittle. This can result in breakage of the line.

- ⇒ Renew any damaged (e.g. buckled) lines.
- ⇒ Renew the flexible connection lines after two years at the latest.

#### 7.2.3.1 Connect to the manifold



#### DANGER

##### Danger to life from chlorine poisoning!

Installations with the withdrawal of fluid chlorine may not allow connection of the flexible connection lines to the manifold via corner valves. The danger exists that the fluid chlorine becomes trapped between the auxiliary valve on the chlorine tank and the corner valve in the flexible connection line. The fluid chlorine expands with increasing temperature and can cause the flexible connection line to burst.

- ⇒ Screw the connection of the flexible connection line directly onto the connection of the manifold using the union nut.

Perform the following working steps:

**With the withdrawal of fluid chlorine:**

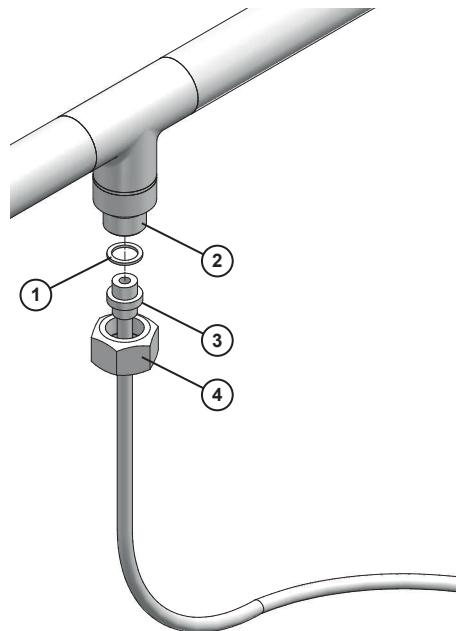


Fig. 9: Connection to the manifold with withdrawal of fluid chlorine

1. Insert a new seal (1) on the sealing surface on the connection (3) of the flexible connection line.
2. Screw the flexible connection line to the connection of the manifold with the union nut (4). The tightening torque is approx. 40 Nm.

**With the withdrawal of gaseous chlorine:**

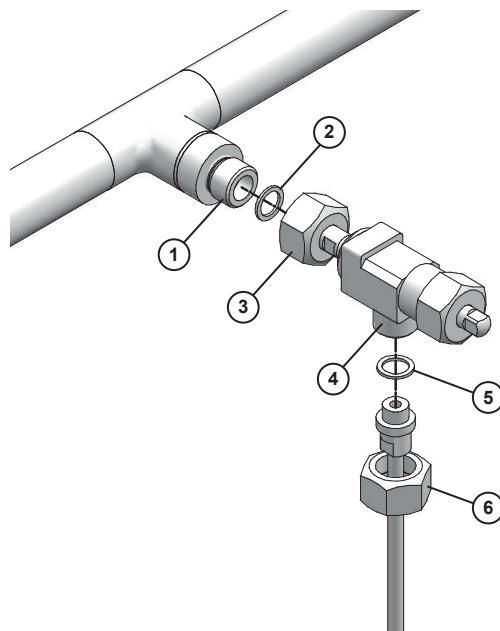


Fig. 10: Connection to the manifold with withdrawal of gaseous chlorine

1. Insert a new seal (2) on the sealing surface on the connection of the corner valve.
2. Screw the corner valve union nut (3) to the connection of the manifold. The tightening torque is approx. 40 Nm.
3. Insert a new seal (5) on the sealing surface on the connection of the flexible connection line.
4. Screw the flexible connection line union nut (6) to the connection of the corner valve (4). The tightening torque is approx. 40 Nm.

### 7.2.3.2 Connect to the chlorine tank

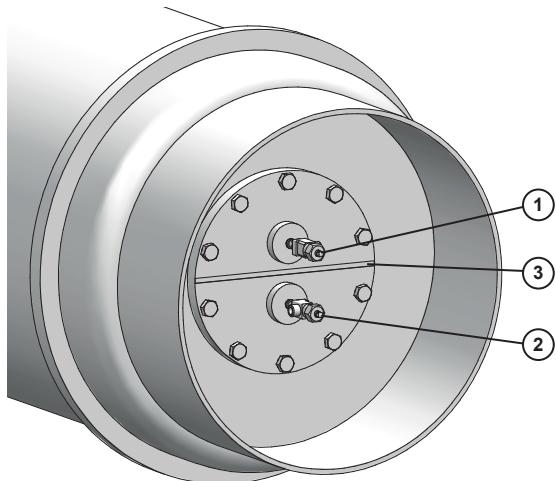


Fig. 11: Chlorine barrel

The chlorine drums are fitted with two tank valves. The upper valve (1) provides gaseous chlorine, the lower valve (2) provides fluid chlorine. The marking (3) on the drum must be located horizontally.

Precondition for action:

- ✓ The protective housing of the chlorine tank has been removed.
- ✓ The chlorine tank valve is closed.
- ✓ The screw cap on the connection of the tank valve has been removed.

Perform the following working steps:

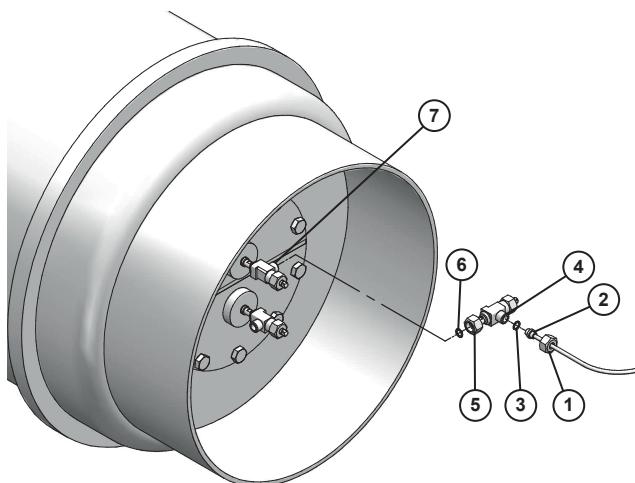


Fig. 12: Connect to the chlorine tank

1. Insert a new seal (3) on the sealing surface on the connection (2) of the flexible connection line.
2. Screw the flexible connection line to the auxiliary valve connection (4) with the union nut (1). The tightening torque is approx. 40 Nm.
3. Insert a new seal (6) on the sealing surface of the auxiliary valve.

4. Screw the auxiliary valve to the connection of the chlorine tank valve with the union nut (5). The tightening torque is approx. 40 Nm.

✓ **Flexible connection line installed.**



We recommend marking the flexible connection line with the date of the initial installation. This facilitates adherence to the prescribed maintenance intervals.

## 7.3 Completing the installation

After completing installation, you must check that all the connections are leak-proof (see 8.1 "Inspecting the pressure system" on page 18).



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.

## 7.4 Installation examples

### 7.4.1 Pressurized manifold with accessories

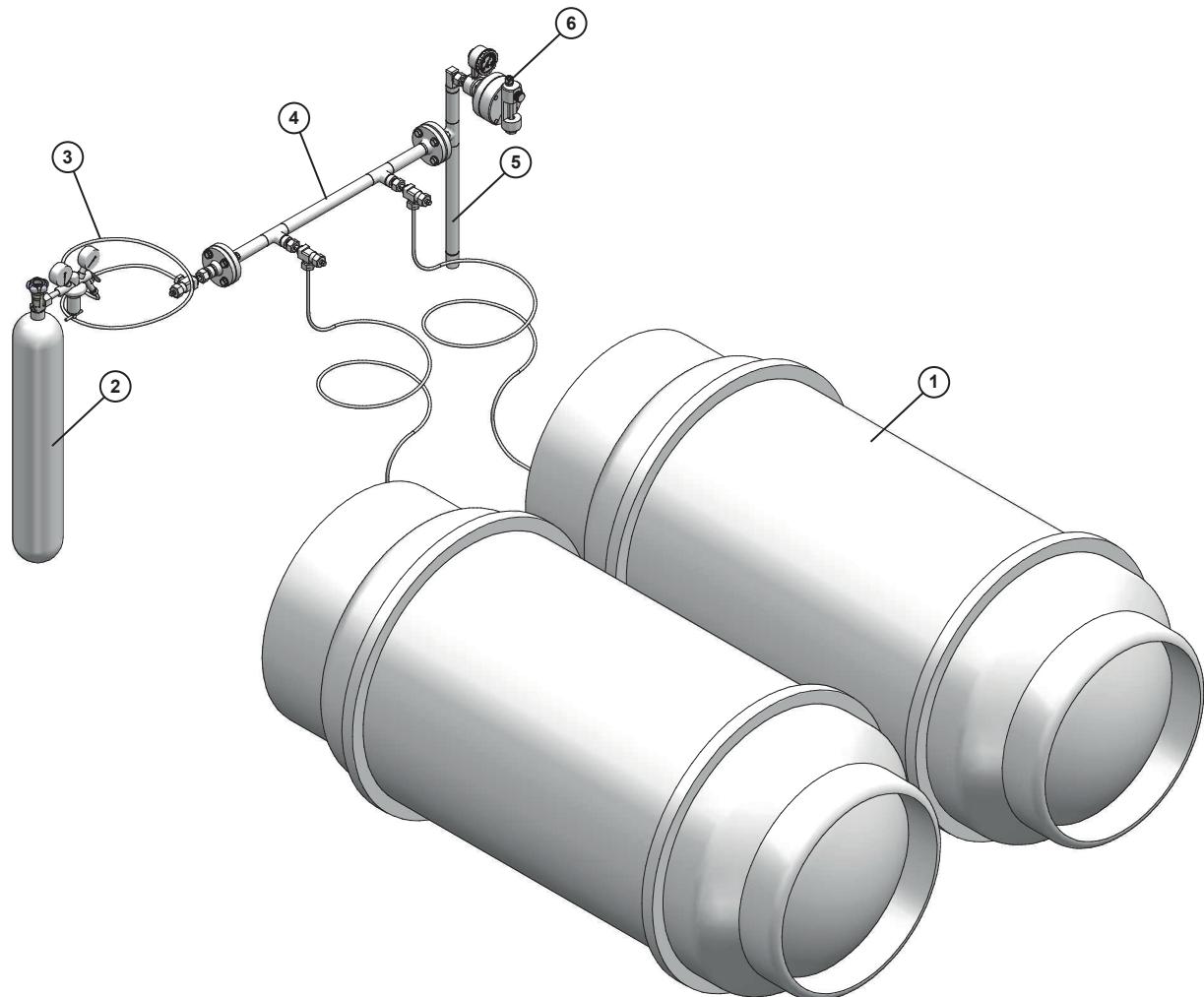


Fig. 13: Pressurized manifold with accessories

No.	Description
1	Chlorine drums
2	Nitrogen cylinder
3	Nitrogen flushing device
4	Pressurized manifold
5	Moisture eliminator
6	Vacuum regulator

Table 10: Designation of components

#### 7.4.2 Chlorination system without chlorine evaporator

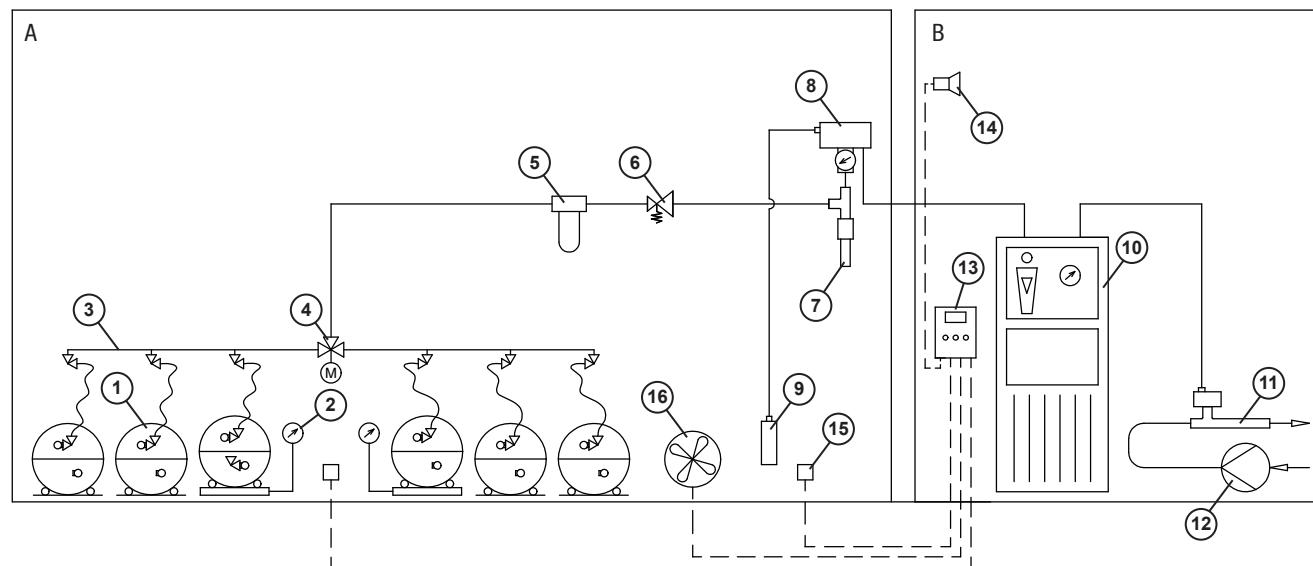


Fig. 14: Installation without a chlorine evaporator

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

Table 11: Designation of components

#### 7.4.3 Chlorination system with chlorine evaporator

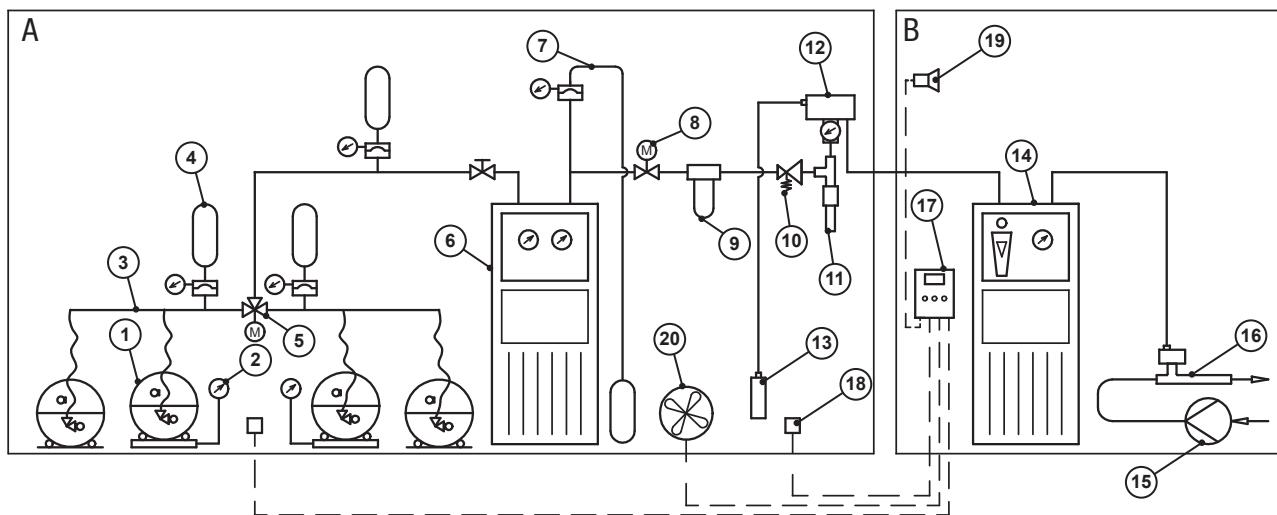


Fig. 15: Installation with a chlorine evaporator

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

Table 12: Designation of components

## 8 Start-up

 <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>
 <b>DANGER</b>	<p><b>Danger to life from chlorine poisoning!</b></p> <p>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.</p> <ul style="list-style-type: none"> <li>⇒ 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.</li> <li>⇒ Put on protective clothing before carrying out the leak test with chlorine gas.</li> </ul>

### 8.1 Inspecting the pressure system

Check the pressure system of the chlorine tank for leaks up to the vacuum regulator in two stages:

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

#### 8.1.1 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.

Precondition for action:

- ✓ All the open connections of the pressure system were closed correctly.
- ✓ 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. Repair the leak. Allow any adhesive surfaces to harden sufficiently and repeat the leak test with nitrogen.

- ✓ **Leak test with nitrogen carried out.**

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

 <b>DANGER</b>	<p><b>Danger to life from chlorine poisoning!</b></p> <p>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.</p> <ul style="list-style-type: none"> <li>⇒ 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.</li> <li>⇒ Put on protective clothing before carrying out the leak test with chlorine gas.</li> </ul>
-------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Precondition for action:

- ✓ The leak test with nitrogen has been carried out successfully.
- ✓ All the open connections of the pressure system were closed correctly.
- ✓ 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.

Resources required:

- ✖ Cylinder with ammonia solution

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>	<p><b>Damage to the plant by the ammonia solution</b></p> <p>If the ammonia solution comes into contact with the plant, this leads to corrosion on the equipment.</p> <ul style="list-style-type: none"> <li>⇒ Make sure that you do not spill any ammonia.</li> </ul>
---------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

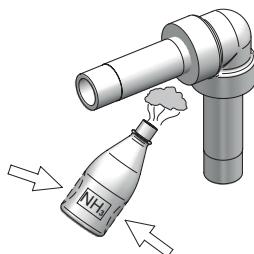


Fig. 16: Leak test with ammonia

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. Use the injector to suck off the remaining chlorine.
3. Operate the chlorination installation for approx. 5 minutes with nitrogen or dry compressed air at approximately 5 bar.
4. Switch off the injector at the booster pump.
5. Repair the leak. Allow any adhesive surfaces to harden sufficiently and 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.
3. Switch off the injector at the booster pump.

 **Leak test with chlorine gas completed.**

## 9 Operation



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

Perform the following working steps:

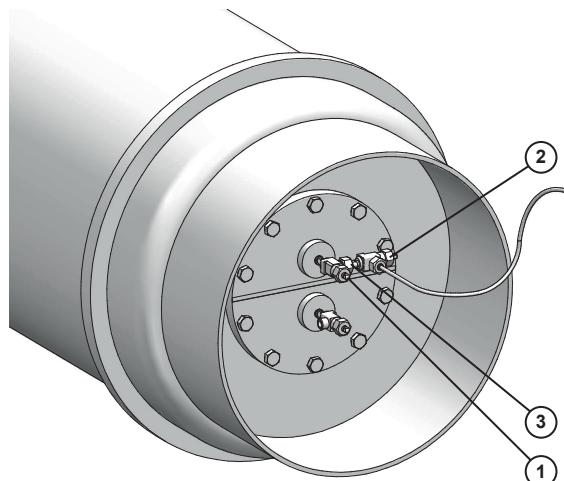


Fig. 17: Chlorine drum with installed auxiliary valve

1. Close the chlorine tank valve (1).
2. Use the injector to suck off the remaining chlorine.  
► The system is depressurized.
3. Close the auxiliary valve (2). Use the wrench intended by the manufacturer for the operation of auxiliary valves/corner valves.
4. Screw the auxiliary valve (2) with the union nut (3) from the chlorine tank valve (1).



### DANGER

**Danger to life from chlorine poisoning!**

Chlorine is poisonous. In severe cases, breathing in chlorine may lead to death. It irritates the eyes, the respiratory system and the skin.

- ⇒ When carrying out any work on the system, use a respirator mask with a Type B gas filter that complies with EN 14387.
- ⇒ 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.

Precondition for action:

- ✓ One or more chlorine tanks are empty.

Resources required:

- ✗ Cylinder with ammonia solution
- ✗ Wrench for the operation of auxiliary and corner valves
- ✗ Threaded plugs for the auxiliary valves
- ✗ Protective caps for the chlorine tank valves
- ✗ Protective housing (transport protection for the chlorine tank)
- ✗ New seals for the chlorine tank valves



### NOTICE

**Damage to the plant due to the formation of hydrochloric acid**

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.

- ⇒ Close the open connections on the auxiliary valve and the chlorine tank valve immediately using the threaded plug and protective cap intended for the purpose.

5. Fit the protective housing to the chlorine tank.
6. Replace the empty chlorine tank with a full tank and fasten it securely.
7. Remove the protective housing of the new chlorine tank.
8. Remove the protective cap on the thread of the chlorine tank valve.
9. Check the sealing surface of the chlorine tank valve for soiling and damage. Clean the surface if necessary using isopropyl alcohol and allow it to dry completely before proceeding.
10. Remove the threaded plug on the auxiliary valve.
11. Check the sealing surface of the auxiliary valve for soiling and damage. Clean the surface if necessary using isopropyl alcohol and allow it to dry completely before proceeding.

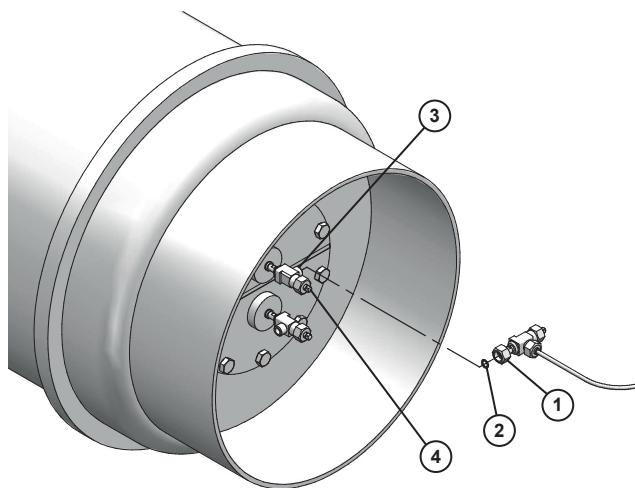


Fig. 18: Installing the auxiliary valve with new seal

12. Insert a new seal (2) on the sealing surface on the connection of the corner valve.
13. Screw the auxiliary valve to the connection of the chlorine tank valve with the union nut (1). The tightening torque is approx. 40 Nm.
14. Open the chlorine tank valve (4) slowly for a short time.
15. Perform the ammonia test on the chlorine tank valve and the auxiliary valve on the flexible connection line.
16. Open the chlorine tank valve slowly until it is fully open. Then close it by c. a quarter revolution .
17. Open the auxiliary valve slowly until it is fully open. Then close it by c. a quarter revolution .
18. Perform the ammonia test on the chlorine tank valve and the auxiliary valve on the flexible connection line.

 **Chlorine tank replaced**

## 9.2 Shutting down in an emergency

	<b>DANGER</b>
<b>Danger to life from chlorine poisoning!</b>	
<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>	

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.

## 9.3 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.
  3. Switch off the injector.
- ✓ **Chlorinator shut down for the short term.**

- temperatures between + 2 °C and + 40 °C,
- Relative air humidity must not exceed 90 %.

### 10.4 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.

### 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.
  3. Operate the chlorination installation for approx. 5 minutes with nitrogen or dry compressed air at approximately 5 bar.
  4. Close all the connections to protect the lines and devices from humidity and dirt.
  5. Switch off the injector.
- ✓ **Chlorinator shut down for the long term.**



We recommend maintenance after a longer standstill period (see chapter 11 "Maintenance" on page 23).

### 10.3 Storage

	<b>NOTICE</b>
<b>Damage to the plant 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 lines, which results in the formation of hydrochloric acid and contamination, thus inevitably causing damage to the units. ⇒ Keep all connections (including in the vacuum system and on all devices not currently in use) closed at all times.	

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,

## 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.

	<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>	

### 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.

Interval	Maintenance
Upon every chlorine tank replacement	<ul style="list-style-type: none"> <li>■ Replace the connection seals</li> </ul>
After 2 years	<ul style="list-style-type: none"> <li>■ Replace the flexible connection lines, auxiliary valves, corner valves and seals</li> </ul>

Table 13: 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

The following maintenance accessories are available:

- Silicone grease, medium viscosity 35 g for application to seals
- Ammonia solution 50 ml for the leak test
- Wrench for the operation of auxiliary and corner valves

### 11.3 Preparing the system for maintenance



#### 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 lines. The failure to follow this instruction presents a significant risk of injury.

⇒ Proceed in accordance with the following instructions.

Perform the following working steps:

1. Close the chlorine tank valves.
2. Use the injector to suck off the remaining chlorine.
3. Run the chlorinator for approximately five minutes with nitrogen or dry compressed air.
4. Switch off the injector.
5. Close all the connections to protect the lines and devices from humidity and dirt.

✓ The system is prepared for maintenance.

### 11.4 Device maintenance

Precondition for action:

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

Perform the following working steps:

- ⇒ Perform a visual inspection of the manifold. If there are signs heavy corrosion, it is to be replaced.
- ✓ Device is maintained.

### 11.5 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. Repair the paint damage on the device.
- ✓ 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.

To restart the system, proceed in accordance with the instructions in section 8 "Start-up" on page 18.

## 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
No or insufficient dosing	The chlorine tank is empty.	Connect a new chlorine tank.
	The tank valve or a valve in the chlorine supply is closed or not fully open (can often be recognized via the freezing on the valve)	Open valves fully.
	The connection line on the chlorine tank is buckled or blocked.	Clean or replace the line.
	The filter in the chlorine gas is blocked (recognisable via the low pressure on the vacuum regulator input).	Clean or replace the filter. Use a better quality of chlorine gas.
	The supply pressure for the vacuum regulator is too low.	Increase the outlet pressure of the pressure reducing valve.
Chlorine smell in the room	A leakage on the overpressure line	Locate and seal leaks using the ammonia test.
Ice or too much condensation at the inlet valve or pressure line	Chlorine withdrawal is too high.	Connect additional chlorine drums.
	Pressure loss at valves not fully opened causes strong cooling due to expansion	Open valves fully.
The auxiliary valve does not fit the chlorine tank valve	There are valves with various connection geometries. The connections are subject to different standards.	Acquire the container valve specifications from the supplier and procure the fitting auxiliary valves

Table 14: Troubleshooting

## 13 Spare parts

### 13.1 Flexible connection line

Description	Info
Flexible connection line (including 2 seals)	2 m, on both sides with union nut G5/8
	4 m, on both sides with union nut G5/8
	6 m, on both sides with union nut G5/8

Table 15: Flexible connection line

### 13.2 Seals

#### 13.2.1 Connection seals for cylinders and drums

Connection	National standard
BSW 1"	DIN 477
G5/8	BS 341
G3/4	AS 2473
1.030"-14 NGO	CGA V-1 (660)
Yoke	CGA V-1 (820)
BSW 1 1/4"	DIN 4676
M 26 x 3	-

Table 16: Connection seals for cylinders and drums of special PTFE

#### 13.2.2 Seal for corner valves

Connection	National standard
G5/8	BS 341

Table 17: Seal for corner valves

#### 13.2.3 Seal for flanges

Description	Info
Seal for flanges	DN25 / PN40 with key and slot
Assembly accessories for flanges	Screws, nuts, washers, gaskets

Table 18: Seal for flanges

### 13.3 Valves

#### 13.3.1 Auxilliary valves with with connection output G5/8

Connection input	National standard
BSW 1"	DIN 477
G5/8	BS 341
G3/4	AS 2473
1.030"-14 NGO	CGA V-1 (660)
Yoke	CGA V-1 (820)
BSW 1 1/4"	DIN 4676
M 26 x 3	-

Table 19: Auxilliary valves

#### 13.3.2 Corner valve with connection output G5/8

Connection input	National standard
G5/8	BS 341

Table 20: Corner valve

## 14 Note to EU conformity

The device falls under the purview of the pressure equipment directive 2014/68/EU.

The values stated below do not exceed the limit values in accordance to article 4, paragraph 1. Therefore, it is designed and manufactured in accordance with valid good engineering practice. This pressure device may not carry a CE marking and an EU declaration of conformity will not be issued.

Device designation: Pressurized manifold

type: -

Pressure stage: PN40

Nominal diameter: DN25

max. temperature: 50 °C

Medium: Chlorine, fluid group 1

The device fulfils all the demands made by the directive(s)

2014/68/EU Pressure equipment directive

The following harmonized standards were applied:

EN 1092-1 Flange and its connections

EN 10216-2 Seamless steel pipe for compression load

EN 10253-2 Adapter for welding

## 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: .....

.....

.....

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

Date, Signature: .....

## **16 Warranty claim**

## **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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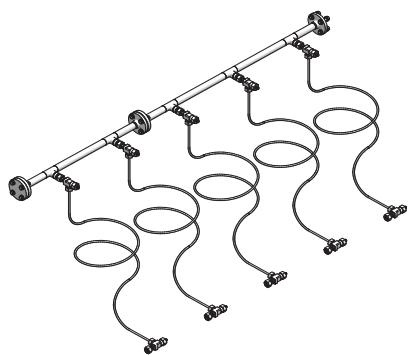
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Operating instructions  
Pressurized manifold