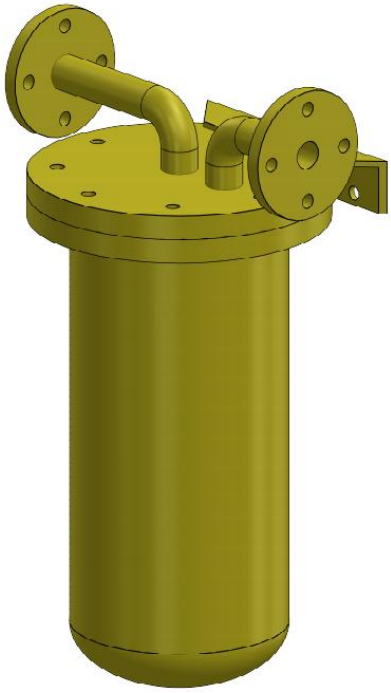
# L.T 05

ChloroMaster

ECS Co. Ltd

# liquid chlorine trap and chlorine gas filter

# (For Cl2 and So2)



## INSTRUCTION MANUAL

ChloroMaster@outlook.sa
(+013) 2765056
58 Mahaliya 1 - Second District
Obour - Qalyubia
(+202) 01228402593

## 1. Intended Use

The Chlorine Liquid Trap is designed to protect chlorine gas dosing systems by capturing and retaining any liquid chlorine droplets or condensate that may form inside the chlorine gas pipeline. It ensures that only dry and impurity-free chlorine gas passes downstream to critical equipment such as ejectors, regulators, valves, and measuring devices.

The trap serves two primary functions:

1. **Liquid Chlorine Separation:**
   It retains condensed liquid chlorine generated due to temperature variations, evaporator malfunction, or pressure instability, preventing liquid carryover into sensitive downstream components.
2. **Gas Impurity Filtration:**
   The integrated PTFE strainer and mineral filtering media remove solid particles and impurities that may obstruct nozzles, valve seats, or gas dosing elements.

To evaporate any collected liquid chlorine safely, the unit incorporates a self-regulating electric strip heater that maintains the vessel at a constant temperature, preventing re-condensation and ensuring continuous, stable gas flow.

This equipment is intended exclusively for gaseous chlorine applications and must be installed directly in the chlorine gas line using the provided flange connections.
Using the unit outside its intended purpose or with incompatible chemicals may result in equipment failure, safety hazards, or system malfunction.

## 2. General Safety Instructions

The Chlorine Liquid Trap is part of a high-risk chlorine gas system.
To ensure safe installation, operation, and maintenance, the following safety instructions must be strictly observed at all times:

### 2.1 Personnel Qualification

- Only trained and authorized technician's familiar with chlorine handling are permitted to work on this equipment.
- Electrical connections must be carried out by certified electricians.
- Maintenance involving chlorine exposure must be performed by personnel trained in emergency response procedures.

### 2.2 Personal Protective Equipment (PPE)

- Always wear full chlorine-compatible PPE including:

- Chemical-resistant gloves
- Full-face mask with chlorine cartridge or SCBA
- Protective goggles
- Chemical-resistant suit

- Never approach the unit without a functioning gas detector in the work area.

**2.3 System Safety Precautions**

- Ensure the area is properly ventilated before working on the trap.
- Never attempt to open or dismantle the trap while the pipeline is pressurized.
- Confirm that all upstream and downstream shut-off valves are closed before maintenance.
- The unit must only be used for dry gaseous chlorine—no other gases or chemicals are permitted.

**2.4 Heater Safety**

- Verify that the strip heater is connected to the correct voltage (220 V) and protected by proper circuit protection.
- The heater surface may become hot; avoid direct contact.
- Never operate the trap without insulation installed around the heater.

**2.5 Installation Safety**

- Use proper lifting tools when handling the vessel (22 kg).
- Ensure flange faces, gaskets, and bolts are clean and chlorine-compatible before tightening.
- After installation, perform a hydrostatic or pneumatic leak test according to the specified pressure.

**2.6 Operation Alarms & Monitoring**

- Continuously monitor chlorine gas detectors in the room.
- If any chlorine leakage is detected, evacuate immediately and follow plant emergency procedures.

**2.7 Prohibited Actions**

- Do not weld, grind, or apply heat near the trap when it contains chlorine gas.

- Do not bypass the heater or insulation.
- Do not use the trap as structural support for piping or equipment.

**2.8 Read the Manual**

- All personnel must read and understand this instruction manual before commissioning the unit.
- Failure to follow these safety instructions may result in serious injury, equipment damage, or chlorine release.

## 3. Description

The Chlorine Liquid Trap is a high-capacity safety component designed to protect chlorine gas dosing systems from the harmful effects of liquid chlorine carryover and solid impurities within the gas pipeline. The unit ensures that only dry, clean chlorine gas passes downstream to the dosing and control equipment, thereby preventing operational disruptions and extending the service life of the entire chlorination system.

The trap consists of a heavy-duty **ANSI Schedule 80 seamless carbon-steel**, internally equipped with a **PTFE strainer grid** and **chlorine-resistant rockwool filtering media**. This combination effectively separates solid contaminants and captures any condensed liquid chlorine droplets formed as a result of temperature variations, pressure fluctuations, or evaporator irregularities.

To prevent re-condensation and ensure continuous gas flow, the vessel is wrapped with a **self-regulating electric strip heater** (110–150 W depending on unit capacity). The heater maintains a stable surface temperature sufficient to evaporate any accumulated liquid chlorine inside the trap. The vessel is internally insulated using **Rockwool tubes** (Ø150 mm, 40 kg/m$^3$, ASTM C76-02) to preserve heat and enhance system efficiency.

The trap is installed directly in the chlorine gas line using **DN 25 flanges** manufactured according to **DIN 2527 / 2512 standards**, allowing quick connection to the pipeline. Its design enables filter replacement without removing the unit from the line. For systems requiring uninterrupted chlorine supply during maintenance, a bypass line with three shut-off valves is recommended.

The Chlorine Liquid Trap is available in two sizes:

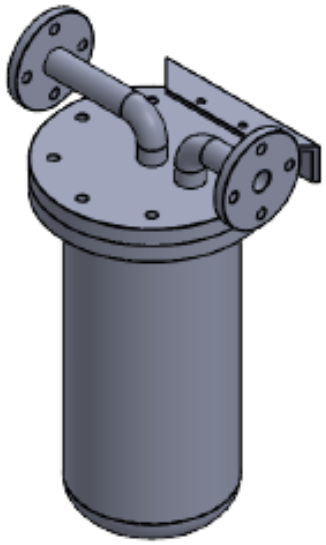
- **DN 150 (High Capacity)**
- **DN 100 (Low Capacity)**

Both versions are hydrostatically tested at **1.5 times the working pressure (10 bar test)** to ensure safe operation under all expected working conditions.

### 3.1 Scope of Supply

The Chlorine Liquid Trap package includes the following components:

**1. Chlorine Liquid Trap Vessel**



- High-grade seamless carbon-steel body (ANSI Sch 80)
- Available capacities:
  - **DN 150 – High Capacity**
  - **DN 100 – Low Capacity**
- Internal PTFE filtration grid (5 mm thickness, 1 mm mesh)

**2. Strip Heater Assembly**

- Electric heater
- **3 m / 150 W** for high-capacity model
- **2.2 m / 110 W** for low-capacity model
- Rated voltage: **220 V AC**

**3. Insulation System**

- Rockwool tube insulation
- Ø150 mm, density 40 kg/$m^3$
- ASTM C76-02 compliant
- External aluminum or protective cladding (if included)

**4. Flange Connections**

- Inlet: Groove flange DN 25 (G1), DIN 2527/2512
- Outlet: Tongue flange DN 25 (G1), DIN 2527/2512
- Lead gasket 1 inch

**5. Mounting & Support Components**

- Steel base or mounting brackets
- Fasteners, chlorine-resistant bolts & nuts

**6. Documentation**

- Instruction manual

- Technical data sheet
- Hydrostatic test certificate (pressure tested at 1.5 × working pressure)

### 3.2 Technical Data

**1. Chlorine Liquid Trap Vessel**

| Item | Specification |
|---|---|
| **Type** | Liquid Chlorine Trap – High / Low Capacity |
| **Nominal Sizes** | DN 150 (High Capacity) / DN 100 (Low Capacity) |
| **Material** | Carbon Steel – ANSI Sch 80, Seamless |
| **Welding Process** | Low-hydrogen electrode (E7018) |
| **Internal Filter Grid** | PTFE, 5 mm thickness, 1 mm mesh |
| **Insulation** | Rockwool Tube Ø150 mm, 40 kg/m$^3$ (ASTM C76-02) |
| **Working Pressure** | 7 bar (typical) |
| **Hydrostatic Test Pressure** | 1.5 × working pressure = 10 bar |
| **Nominal Pressure Rating** | PN16 |
| **Installation Connection** | Flanged, Inlet Groove Flange DN25 (G1) / Outlet Tongue Flange DN25 (G1) – DIN 2527/2512 |
| **Weight** | 22 kg (manufacturer reference) |

**2. Heater Strip**

| Item | Specification |
|---|---|
| **Type** | Self-regulating electric heating strip |
| **Voltage** | 220 V AC |
| **High-Capacity Model** | Length 3 m – Power 150 W |
| **Low-Capacity Model** | Length 2.2 m – Power 110 W |
| **Function** | Maintains vessel wall temperature high enough to evaporate trapped liquid chlorine |

### 3. Operating Conditions

| Item | Specification |
|---|---|
| **Maximum Gas Flow** | Up to 200 kg/h chlorine gas |
| **Chlorine State** | Dry gaseous chlorine with potential liquid droplets |
| **Installation Orientation** | Vertical installation in chlorine gas line |
| **Service Fluid** | Chlorine gas ($Cl_2$), liquid droplets possible |

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### 4. Accessories

- Rockwool insulation layer with protective jacket
- Lead gasket for chlorine service
- Fasteners & support brackets
- Optional bypass line with 3 shut-off valves (recommended during maintenance)

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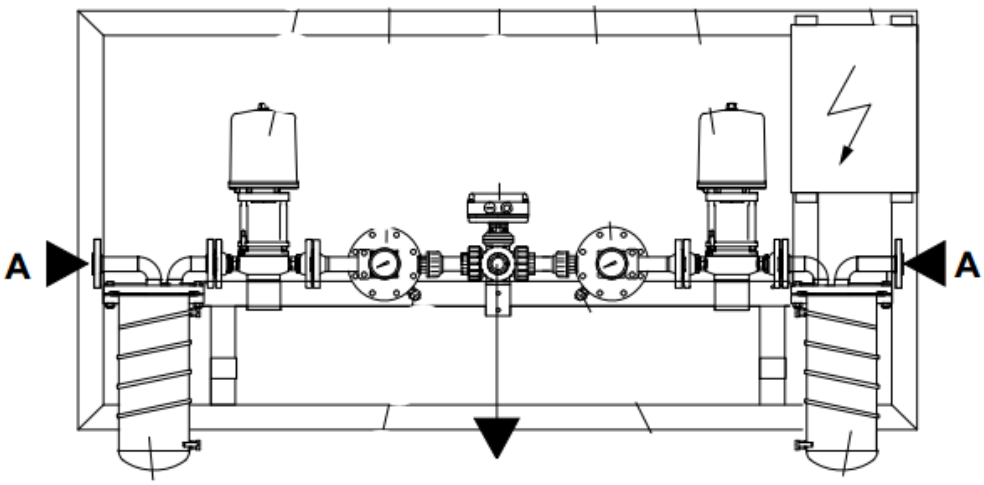
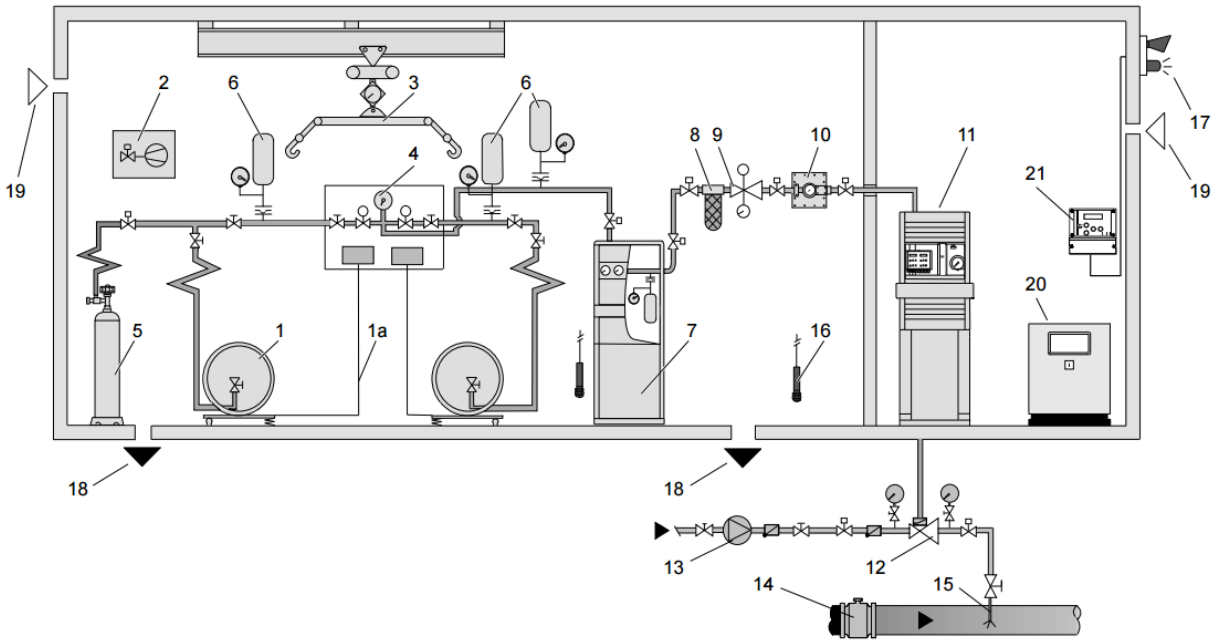
### 5. Spare Parts

- PTFE internal filter grid
- Heater strip
- Lead gasket
- Rockwool insulation sections

## 4. Installation

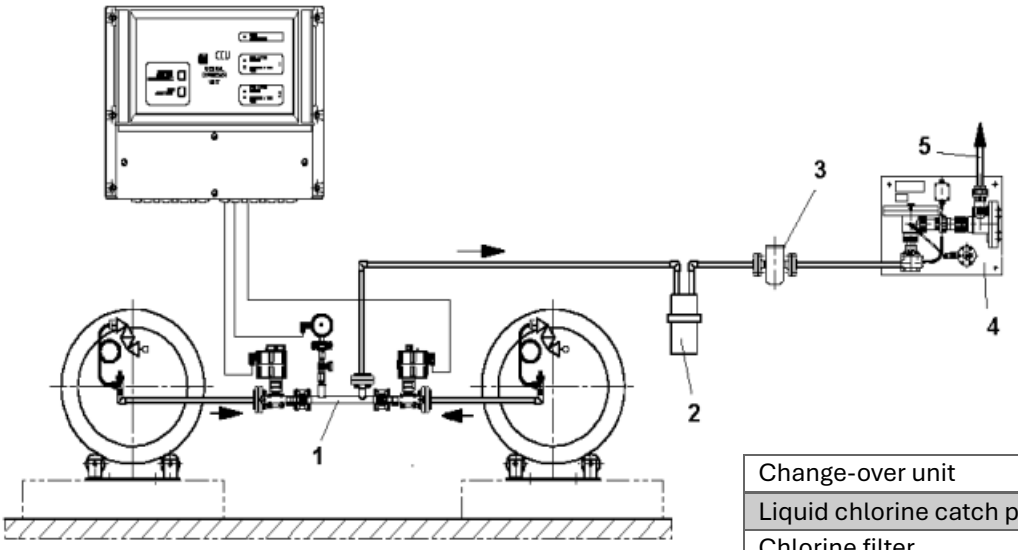


### 4.1 Liquid discharge




| Pos. | Component | Pos. | Component |
|---|---|---|---|
| **1** | Chlorine drum | **11** | chlorine gas dosing system |
| **1a** | Chlorine drum scale | **12** | VGS injector |
| **2** | Controller for the pneumatic shut-off valve | **13** | booster pump |
| **3** | Chlorine drum lifting device | **14** | Flowmeter with 4-20 mA signal |
| **4** | change-over device | **15** | Injection unit |
| **5** | Nitrogen rinsing device | **16** | Gas sensor |
| **6** | Expansion tank with bursting disc | **17** | Horn and flashlight |
| **7** | evaporator | **18** | Vent to a Grundfos chlorine gas neutralisation system |
| **8** | Liquid Trap heated liquid chlorine trap with filter | **19** | Ventilation of the building |
| **9** | pressure reducing valve | **20** | Central control cabinet (SCADA) |
| **10** | vacuum regulator | **21** | Conex DIA-G gas warning system |

### 4.2 gas discharge




| | |
|---|---|
| Change-over unit | 1 |
| Liquid chlorine catch pot | 2 |
| Chlorine filter | 3 |
| Vacuum regulating unit | 4 |
| To gas control units | 5 |

### 4.3 Installation & Leak Test

The following procedure ensures proper installation and leak-free commissioning of the chlorine liquid trap and gas filter prior to operation.

| Step | Description | Notes / Warnings |
|---|---|---|
| **1** | Ensure all chlorine gas line valves are fully closed before starting installation. | ⚠ Always wear a chlorine–rated gas mask and protective goggles. |
| **2** | Mount the Liquid Trap onto the gas line using the designated groove/tongue flanges (DN25). | Use lead gaskets only, as they are suitable for dry chlorine service. |
| **3** | Tighten all flange bolts gradually using a cross-pattern sequence. | Use new bolts and washers to ensure proper sealing. |
| **4** | Briefly open the chlorine gas inlet valve for one second to perform an initial “sniff test” for leakage. | If any chlorine odor is detected, close immediately and re-seal. |
| **5** | If no leak is detected, reopen the valve for a longer period to confirm complete tightness. | Repeat the test if necessary. |
| **6** | If a leak is detected: close all valves immediately, increase ventilation, repair the leak, and repeat the test. | ⚠ Keep personnel away from the area for at least one minute. |
| **7** | Once the system is fully tight, connect the electrical supply to the heater strip but do not switch it ON yet. | The heater is only energized after the system goes into operation. |

## 5. Regular Maintenance

### 5.1 Regular maintenance

To keep the Chlorine Liquid Trap and Gas Filter operating safely and correctly, the following maintenance tasks must be carried out by trained personnel according to the indicated intervals.

**Daily**

- Check for leaks around all flanges, gaskets, and welded joints using approved leak-detection methods.
- Confirm heater strip operation by ensuring the outer surface of the trap is warm and stable.
- Verify pressure readings to ensure normal gas flow and no blockage.

**Monthly**

- Check chlorine gas flow to ensure the filter is not clogged.
- Inspect the internal PTFE strainer for early wear or damage.
- Verify grounding and electrical protection for the heater strip.

**Every 6 Months**

- Replace or clean the filter media depending on system conditions.
- Inspect the heater strip and replace it if there are signs of damage.
- Check flange bolts for corrosion and tighten them according to specifications.

**Yearly**

- Perform a full inspection by opening the filter assembly.
- Replace the lead gasket during reassembly to ensure proper sealing.
- Conduct a hydrostatic test at 1.5 times the working pressure (10 bar).
- Repaint or protect the vessel surface if any corrosion is found.

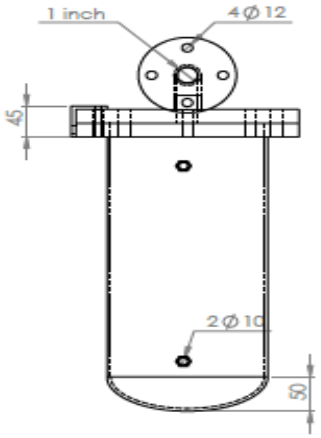
**After Any Liquid Chlorine Carryover**

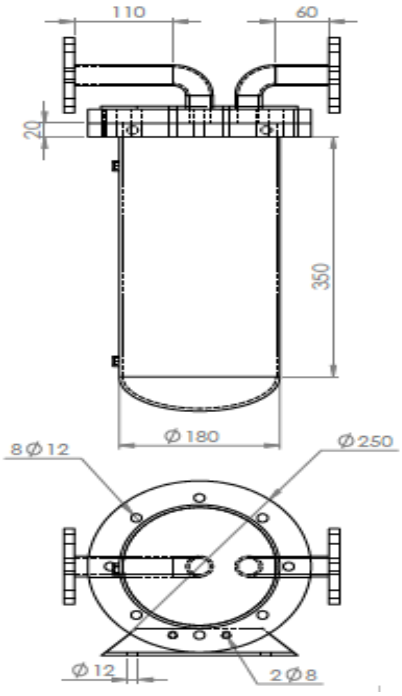
- Inspect the PTFE strainer and internal parts for chemical damage.
- Confirm heater strip operation to ensure evaporation of any remaining chlorine.
- Check all connections for leaks before restarting the system.

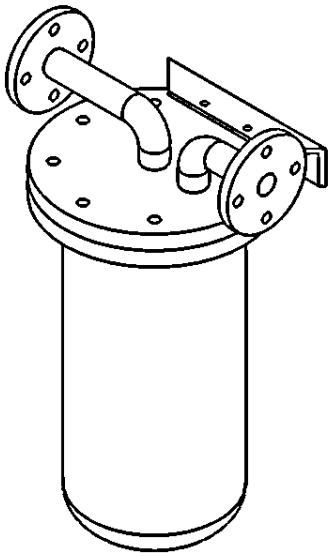
## 6. Drawings and parts lists

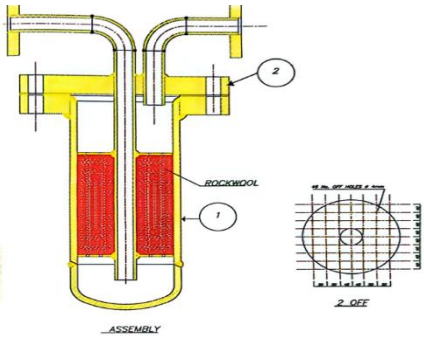
### 6.1 Chlorine Liquid Trap

❖ **DN 150 High Capacity**

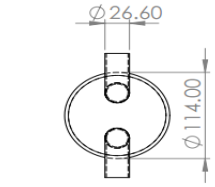


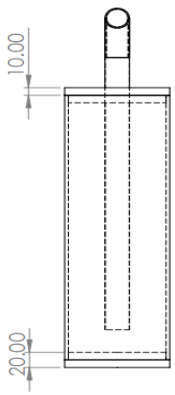



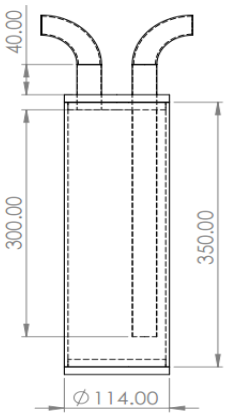



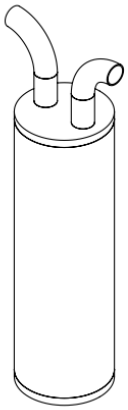



❖ **DN 100 Lowe Capacity**



### 6.2 Spare Parts & Replacement

The following spare parts are recommended to ensure continuous and safe operation of the Chlorine Liquid Trap and Gas Filter. All replacement work must be carried out by trained and authorized personnel using original or approved components only.

**Recommended Spare Parts**

- **PTFE Strainer (Internal Grid)**
  – Used to separate solid impurities and must be replaced if clogged or damaged.
- **Lead Gasket (Flange Seal)**
  – Ensures tight sealing between flanges; must be replaced whenever the trap is opened.
- **Heater Strip (Self-Regulating Type)**
  – Provides surface heating to evaporate any liquid chlorine. Replace if defective or not heating uniformly.
- **Rockwool Insulation Tube**
  – Thermal insulation around the vessel; replace if wet, damaged, or worn.
- **Bolts & Nuts Set (Flange Fasteners)**
  – Replace if corroded or when performing major overhauls.

**Replacement Notes**

- Always depressurize the chlorine line before removing or replacing any component.
- After reassembly, perform a full leak test using an approved method.
- Ensure the grounding and electrical connections of the heater strip are properly restored.
- Dispose of all chlorine-contaminated materials according to local hazardous-material regulations.

## Final Notes

This manual provides the necessary information for the safe installation, operation, and maintenance of the unit. The operator must ensure that all safety instructions are followed and that only authorized personnel carry out work on the system. For spare parts, service, or further technical assistance, please contact [ChloroMaster].