



HygroMATIK®

FlexLine Plus

Electric Heater Steam Humidifiers



Manual

IMPORTANT: READ AND SAVE THESE INSTRUCTIONS



FLP.CSA
E-8881770

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FlexLine FLP 05/08/15/25/30/40/50 CSA

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WARNING
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Risk of electrical shock!

Hazardous electrical high voltage!

All electrical work to be performed by certified expert staff (electricians or expert personnel with equivalent training) only.

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1. Introduction

Dear Customer,

Thank you for choosing a HygroMatik steam humidifier.

HygroMatik steam humidifiers represent the latest in humidification technology.

In order to operate your HygroMatik steam humidifier safely, properly and efficiently, please read these operating instructions.

Employ your steam humidifier only in sound condition and as directed. Consider potential hazards and safety issues and follow all the recommendations in these instructions.

If you have additional questions, please contact your expert dealer.

For all technical questions or spare parts orders, please be prepared to provide unit type and serial number (see name plate on the unit).

1.1 Typographic Distinctions

- preceded by a bullet: general specifications
- » preceded by an arrow: Procedures for servicing or maintenance which should or must be performed in the indicated order
- ☑ Installation step which must be checked off.

italics Terms used with graphics or drawings

1.2 Documentation

Please note

In addition to this manual, the appropriate FlexLine Control documentation is mandatory for the operation of the unit. This is not applicable to StandardLine devices, here the documentation of the controller is included in the operation manual.

Retention

Please retain these operating instructions in a secure, always accessible location. If the product is resold, turn the documentation over to the new operator. If the documentation is lost, please contact HygroMatik.

Versions in Other Languages

These operating instructions are available in several languages. If interested, please contact HygroMatik or your HygroMatik dealer.

1.3 Symbols in Use

1.3.1 Specific Symbols related to Safety Instructions

According to EN 82079-1 (and ANSI Z535.6), the following signal words are used within this document:

▲ DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

▲ WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

▲ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

1.3.2 General Symbols

Please note

This symbol is used whenever a situation requires special attention beyond the scope of safety instructions.

1.4 Intended Use

HygroMatik electric heater steam humidifiers serve for steam production based on tap water, partially softened water or fully desalinated water/cleaned condensate.

Proper usage also comprises the adherence to the conditions specified by HygroMatik for:

- installation
- dismantling
- reassembly
- commissioning
- operation
- maintenance
- disposal.

Only qualified personnel may operate the unit. Persons transporting or working on the unit must have read and understood the corresponding parts of the Operation and Maintenance Instructions and especially the chapter 2. „Safety Notes“.

Additionally, operating personnel must be informed of any possible dangers by the provider. A copy of this manual is to be placed at the unit's operational location.

By construction, HygroMatik steam humidifiers are not qualified for exterior application.

⚠ WARNING

Risk of scalding!

Steam with a temperature of up to 100 °C (212 °F) is produced.

Do not inhale steam directly!

2. Safety Instructions

These safety instructions are required by law. They promote workplace safety and accident prevention.

2.1 Guidelines for Safe Operation

2.1.1 Scope

Comply with the accident prevention regulation „DGUV Regulation 3“ to prevent injury to yourself and others. Beyond that, national regulations apply without restrictions. This way you can protect yourself and others from harm.

2.1.2 Unit control

Do not perform any work which compromises the safety of the unit. Obey all safety instructions and warnings present on the unit.

In case of a malfunction or electrical power disruption, switch off the unit immediately and prevent a restart. Repair malfunctions promptly.

⚠ WARNING

Restricted use.

IEC 60335-1 stipulates as follows:

This device may be used by children of eight years of age and above as well as by persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge so long as they are supervised or have been instructed regarding the safe use of the device and understand the hazards that may result from it. Cleaning and user maintenance of the unit must not be undertaken by children without supervision.

The following applies to the HygroMatik installation kits:

Please note

Ensure that the system/machine in which the HygroMatik installation kit will be installed fully complies with the provisions of the directives (2006/42/EC) and the EMC directive 2014/30/EU and that all safety-relevant functions have been implemented in the control system.

2.1.3 Unit Operation

⚠ WARNING

Risk of scalding!

Uncontrolled hot steam escape in case of leaking or defective components possible.

Switch off unit immediately.

⚠ WARNING

For Ministeam devices applies:

Risk of scalding!

No persons may be under the cloud of steam blowing out (at a distance of approx. 1 m/40 inch in the direction of blowing out and 0.5 m/20 inch on both sides of the device).

NOTICE

Risk of material damage!

- The unit may be damaged if switched on repeatedly following a malfunction without prior repair. Rectify defects immediately!
- The unit must not be operated on a DC power supply.
- The unit may only be used connected to a steam pipe that safely transports the steam (not valid for MiniSteam units).
- Regularly check that all safety and monitoring devices are functioning normally. Do not remove or disable safety devices.
- Steam operation is only allowed when the unit cover is closed.

NOTICE

Water leaks caused by defective connections or malfunctions are possible.

Water is constantly and automatically filled and drained in the humidifier. Connections and water-carrying components must be checked regularly for correct operation.

2.1.4 Mounting, dismantling, maintenance and repair of the unit

NOTICE

The HygroMatik steam humidifier is IP20 protected. Make sure that the unit is not object to dripping water in the mounting location.

Installing a humidifier in a room without water discharge requires safety devices to protect against water leakages.

-
- Use genuine spare parts only
 - After any repair work, have qualified personnel check the safe operation of the unit
 - Attaching or installing of **additional components** is permitted only with the **written consent** of the manufacturer

NOTICE

Do not install HygroMatik steam generators above electrical equipment such as fuse boxes, electrical appliances, etc. In the case of a leakage, leaking water can damage the underlying electrical equipment

2.1.5 Electrical

⚠ WARNING

Risk of electrical shock!

Hazardous electrical voltage!

Any work on the electrical system to be performed by certified expert staff (electricians or expert personnel with comparable training) only.

Steam operation may only be started when the unit cover is closed.

During maintenance or installation work, the device must be disconnected from the power supply and secured against being switched on again. The absence of voltage must be ensured by a measurement.

Leaks can cause leakage currents. Observe safety regulations on working with voltage parts (applies to electrode steam humidifiers).

After electrical installation or repair work, test all safety mechanisms (such as grounding resistance).

NOTICE

Use only original fuses with the appropriate amperage rating.

Regularly check the unit's electrical equipment. Promptly repair any damage such as loose connections or burned wiring.

Responsibility for intrinsically safe installation of the HygroMatik steam humidifiers is incumbent on the installing specialist company.

3. Transport

Please note

Proceed carefully when transporting the steam humidifier in order to prevent damage due to stress or careless loading and unloading.

Time limits for filing freight claims with shipping companies are*:

Shipping company	After receipt of goods
Carriers	no later than 4 days
Parcel service	immediately

* Time limits for some services subject to change.

3.1 Packing

Please note

Pay attention to the icons affixed to the packing box.

3.2 Interim Storage

Store the unit in a dry place and protect from frost and strong sunlight.

3.3 Check for Complete and Correct Delivery of Goods

Upon receipt of the unit, confirm that:

- model and serial number on the name plate match those specified in the order and delivery documents
- the equipment is complete and all parts are in perfect condition

Please note

In case of damage from shipment and/or missing parts, immediately notify the carrier or supplier in writing.

4. Functional Description and Device Composition

4.1 Mode of Action

The immersion heater principle

Depending on the output rating, one, three or six heater elements are arranged within a closed cylinder. Exemplary given, the figure below shows the heater elements and other main components of a heater element steam generator of the FLP series with 6 heater elements.

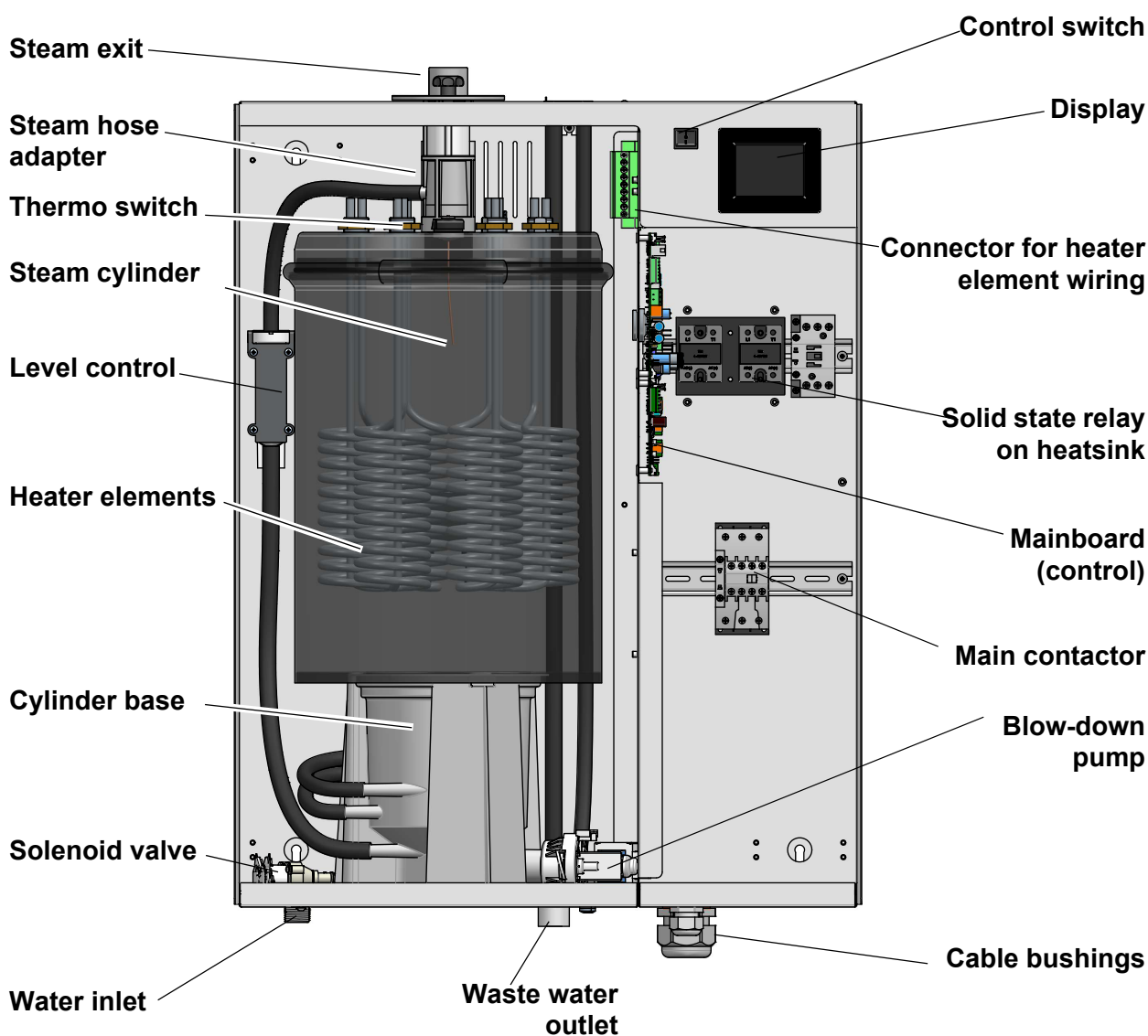
The cylinder(s) are filled with either tap water of varying quality, fully desalinated water or partially softened water.

The heat introduced by the heater elements heats up the cylinderwater to approx. 100 °C (212 °F), transforming the water into steam

with a temperature of approx. 100 °C (212 °F). This steam is virtually mineral-free and germ-free.

When fully desalinated water is used, the cylinder water is almost totally clear of minerals. This situation guarantees a long lifetime of the cylinder(s) and the heater element(s), since virtually no hardeners will fall-out and no mineral deposits will occur. Such, the number of inspections and/or maintenance operations required will be reduced to a minimum.

When tap water is used for operation, some of the minerals dissolved in the water are likely to settle in the cylinder in form of solids of various compositions. However, most of the solids are flushed out by cyclic blow-down with the help of a heavy-duty blow-down pump.



4.2 Operational sequence

The steam humidifier is switched on by pressing the control switch on the front panel to the „I“ position. If the safety chain is closed, the inlet multiple solenoid valve (twin solenoid valve (25)^{*)} in case of FLPxx-T and FLPxx-TSPA units, 4-fold solenoid valve (71)^{*)} with FLPxx-TPRO units^{*)} opens and water is fed into the steam cylinder.

Filling level in the cylinder is controlled by a level control device (27)^{*)}. In a plastic cylinder, connected to the steam cylinder via hoses in the way communicating tubes are connected, a sensor for continuous proportional water level survey is located.

The cylinder water is periodically blown down. For usage of the unit with fully desalinated water, the blow-down function may be blocked.

Water blow-down is achieved by means of the blow-down pump (32)^{*)} that is continuously monitored during unit operation. In case of pump disruption, the HygroMatik steam humidifier is shut off.

With normal water quality, blow-down loss is in the range of 7 to 15% of the steam amount produced. Depending on water quality, a full steam cylinder blow-down is run every 3 to 8 days.

Mineral deposits settle in the open area below the heater element(s) and are removed through periodic maintenance. The blow-down pump itself has wide openings and can flush out smaller pieces of mineral deposit. This extends the service life of the unit and reduces the required maintenance interval.

On blow-down, water flows from the pump into the drain hose system.

For maintenance purposes, the cylinder water may be pumped out by pressing and holding the control switch in the „II“ position.

^{*)} numbers indicated correspond with those in the exploded view in the „Exploded view“ chapter.

4.3 Internal Output Setting

Continuous control is achieved by proportional driving (pulse width modulation) of the heater elements via one or both solid state relays. In this way the humidifier can be proportionally operated across the entire output range of 5% - 100% of the nominal capacity. A power setting of 0% to 5% of the nominal output is possible, but not technically feasible due to condensate losses in the steam line.

If the unit is equipped with more than 3 heater elements, the output power provision is accomplished in 2 stages. As long as a certain threshold was not reached, the heating power necessary is solely controlled via the solid state relays and the 3 heater elements in a proportional manner (stage 1). If the output power requested lies beyond what is available in stage 1, three additional heater elements are activated via a main contactor in a one-step operation mode (stage 2). Any power requirement in excess of the stage 2 rating is then proportionally supplied via the solid state relays by the stage 1 operational mode.

4.4 Mechanical Construction

The type of housing is designed for wall mounting. The steam cylinder is made from stainless steel. Depending on the power output range, one, three or six heater elements are incorporated.

4.4.1 FlexLine Plus

Freshwater supply is accomplished by means of a twin solenoid valve that is also used for the SuperFlush functionality.

4.4.2 FlexLine Process

The units featuring the TPRO-control allow the exceedingly precise steam control via a fourfold solenoid valve. For this to work, the use of fully demineralized water is mandatory. A six-way solenoid valve is optionally available, enabling the HyCool and HyFlush options.

4.5 Thermal fuses

The devices of the FLP series have several thermal fuses which are electrically connected in series. After one of the fuses has tripped, the device switches to the fault status. A device restart is required but is possible only if the relevant thermal switches have cooled down or the thermal sensors have been unlocked.

The following fuses are available:

on the cylinder cover

- 1 thermal switch (Klixon) to protect against overheating of the steam cylinder; the switch has a pin for manual reset after cooling down
- 1 or 2 (for devices with six radiators) thermal sensors with capillary tube for direct thermal monitoring of the radiators. One capillary tube each is connected to 1 to 3 radiators (depending on the device type). After a thermal sensor has been triggered, it must be reset manually (see maintenance description)

on solid state relays

The solid state relay (or two solid state relays on devices with higher power) is (are) thermally protected by a bimetal switch. The bimetal switch returns to its initial position during the cooling process.

5. Mechanical installation

⚠ WARNING

Risk of foot injuries!

Prevent unit from dropping during installation!
Helping hand of a second person is advisable.

⚠ WARNING

Risk of electrical shock!

Hazardous electrical voltage.
During installation, the unit must be disconnected from power supply and secured against being switched on again. The absence of voltage must be ensured by a measurement.

5.1 Environment Parameters to be met and Mounting Recommendations

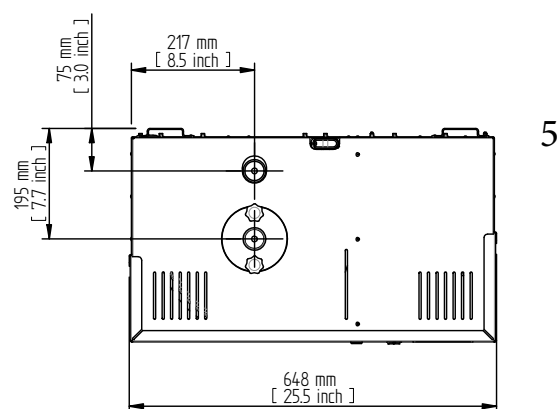
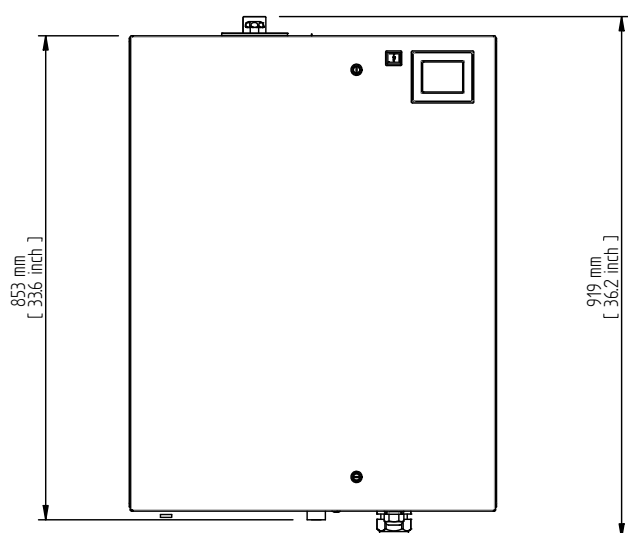
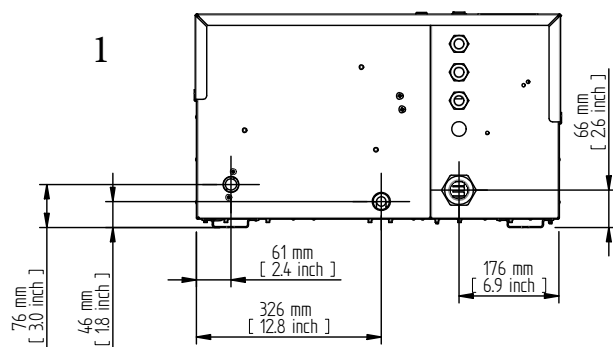
When selecting the installation site for the steam humidifier, take the following into account:

- The minimum clearances indicated in the fitting measures section must be observed in order to ensure adequate unit ventilation and allow for unobstructed access in case of maintenance
- Protection class IP20
- By design, HygroMatik steam humidifiers are not qualified for outdoor installation (electronical components and water-bearing parts may be damaged)
- Ambient temperature must lie between +5 and +40 °C (+41 and +104 °F) in order to protect the unit electronics against damage; frost may damage the steam cylinder, the solenoid valve and pump, as well as make hoses burst
- Relative humidity must not exceed 80 % r.h., since values beyond may lead to electronic malfunction or damage
- Installation in a closed room requires aeration and, eventually, temperature conditioning in order to meet the a.m. environmental conditions
- The steam humidifier should be installed as close as possible to the steam manifold. Optimum performance is only guaranteed when steam and condensate hoses are kept short
- Make use of existing water connections for supply and draining
- Hoses must be laid at a consistent 5 to 10 % incline/decline; sagging and kinking prevention is a must
- Mount the unit on a stable, preferably solid wall offering the bearing capacity required (s. unit technical specifications). If such a wall is not at hand, the unit may be attached to a stand bracket firmly bolted to the floor
- For proper functioning of the level control, plumb and level installation of the unit is required
- The steam humidifier rear panel heats up during operation to a maximum of 70 °C (158 °F). Take care that the construction on which the unit is to be mounted is not made of temperature-sensitive material

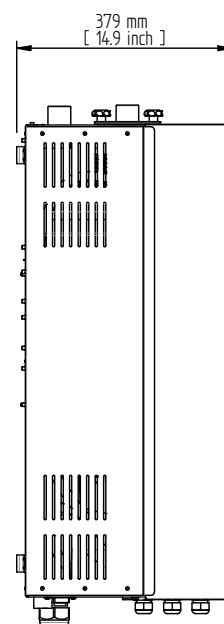
5.1.1 Dimensions and Mounting Directions

3D model under

<https://www.hygromatik.com/en/downloads>

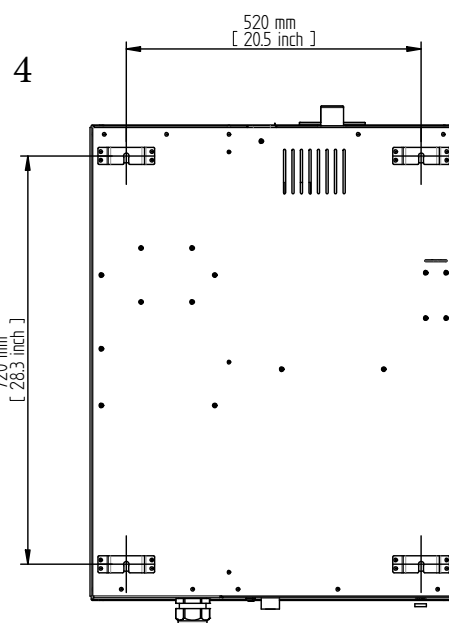


3



2

1:10



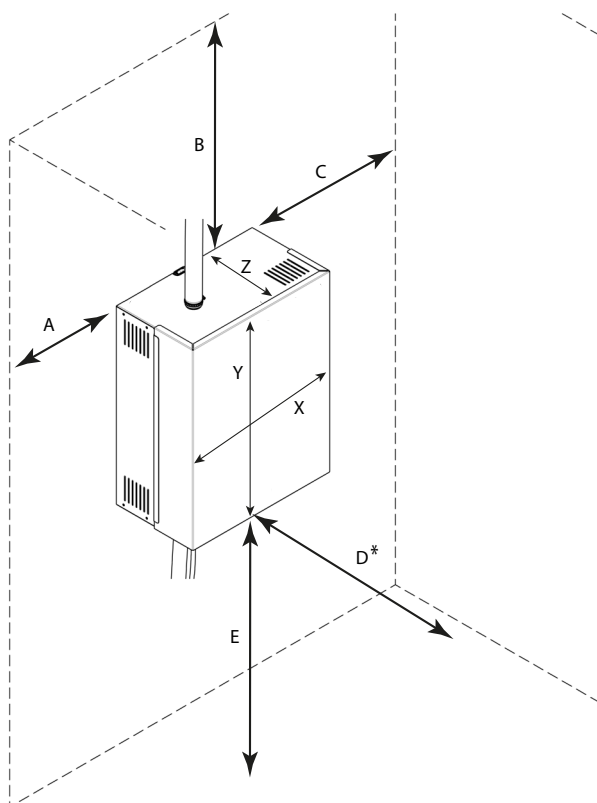
1 bottom view

2 side view

3 front view

4 back view

5 top view



Mounting principle

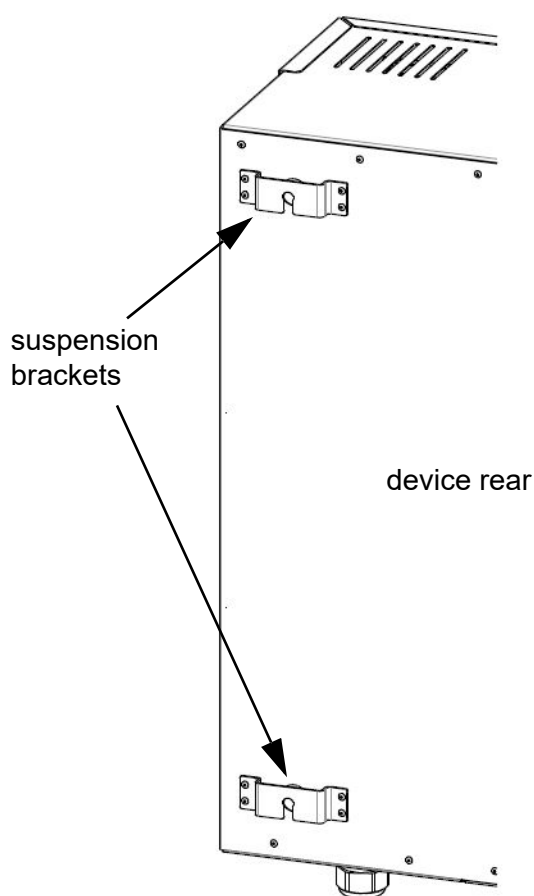
Wall clearances

When mounting the steam humidifier, the wall clearances shown in the fig. below must be obeyed::

A	5 cm / 2,0 inch
B	50 cm / 19,7 inch
C	20 cm / 7,8 inch
D	60 cm / 23,6 inch
E	30 cm / 11,8 inch

* distance to designated paths

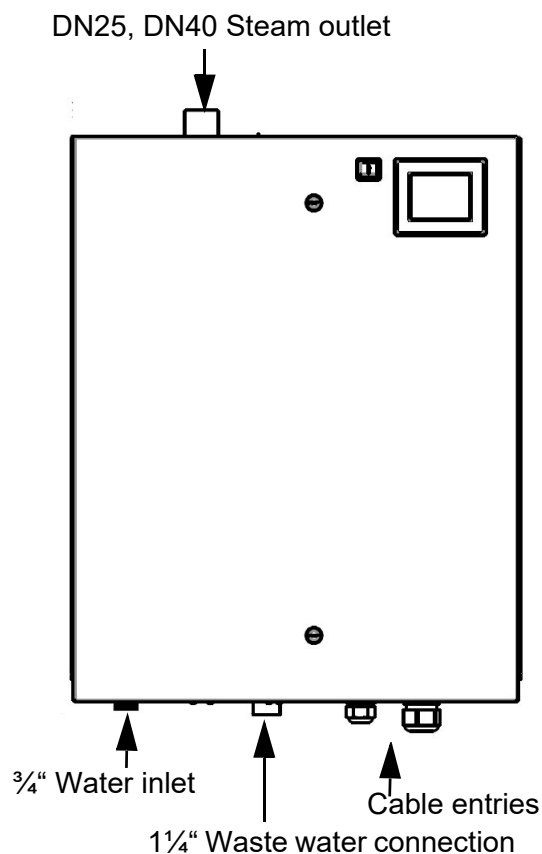
For wall mounting drill measures, please consult the table above (measure A and B). In case of no suitable wall available for mounting the unit, it is recommended that installation is made on brackets firmly anchored in the floor.



- » mark the holes for the upper suspension brackets screws
- » drill holes and dowel
- » screw in the supplied mounting screws; let the screws protrude approx. 12 mm/.5 inch from wall
- » ensure firm fixation and load-carrying capacity of the mounted screws!
- » hook in the unit and ensure safe suspension
- » mark the holes for the lower suspension brackets screws
- » remove the unit
- » drill holes and dowel
- » hook in the unit and mount the lower screws firmly

Please note

- To function properly, the steam humidifier must hang level and plumb.
- When choosing the installation location, consider the necessary distance between the unit and existing designated paths. This should be at least 60 cm.
- The mounting wall must be made of a temperature-resistant material, as the enclosure can heat up to 70°C / 158 °F.

Device connections:

5.1.2 Unit Installation Check

Before start-up, pls. check proper unit installation following the list below:

- ☒ Unit perpendicularly aligned in both the vertical and horizontal axis ?
- ☒ All clearances obeyed?
- ☒ Steam hose installed with a 5 - 10 % minimum incline/decline (see chapter "Steam line") ?
- ☒ Condensate hose features a loop functioning as a steam barrier (see chapter „Condensate hose“) ?
- ☒ Steam manifold(s) properly positioned?
- ☒ All bolts and clamps properly tightened?
- ☒ Steam manifold(s) horizontally mounted and suspended on the free end, if required ?
- ☒ All seals (o-rings) in place?
- ☒ All ventilation slots on housing top unobscured?

5.2 Steam line and condensate hose layout

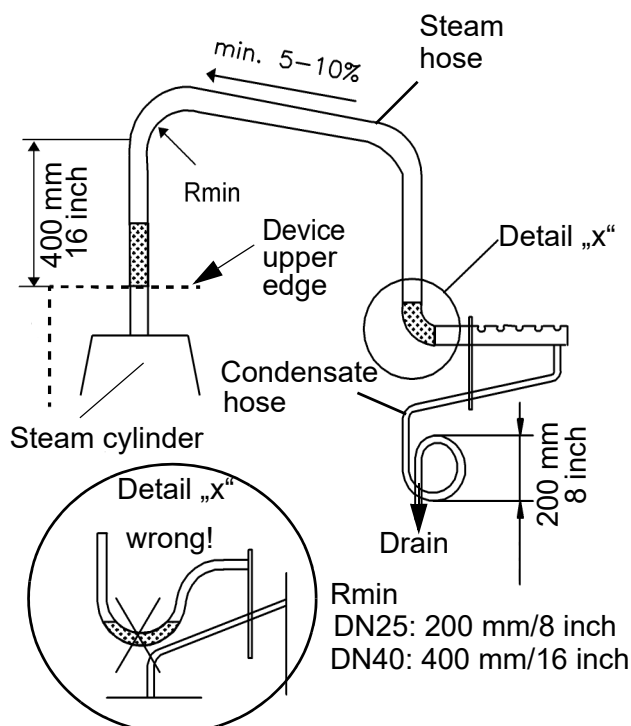
Please note

Because of the high requirements on hose material under the operating conditions given, it is recommended to use genuine HygroMatik hoses only.

5.2.1 Guide lines for steam line design

- Steam hose nominal diameter must not be smaller than the steam outlet of the HygroMatik steam humidifier (do not restrict the cross-section, otherwise back pressure will increase). Select the steam hose that fits the unit.
- Steam hoses must be laid without sags and kinks and with a continuous slope of 5-10% (otherwise sags may result).
- Steam hoses must be supported every 500 mm (20 inches) by clamp brackets.
- Steam hoses should be kept as short as possible. Implement lengths beyond 5 m (16 ft.) as insulated fixed piping to keep energy loss and condensate generation to a minimum. Beyond 10 m (32 ft.) insulated installation is a must. Fixed piping is generally recommended for straight steam line segments.
- If the steam output is divided between two steam distributors (different from the standard design), install the Y-piece for the steam hose as close as possible to the steam distributors. This way, only one steam hose is used for the majority of the distance and condensate losses are reduced. Certain unit types in the HygroMatik steam humidifier portfolio (e.g. FLE40 and FLE80), on the other hand, require the Y-piece to be installed as close as possible to the steam outlet and the steam line to be routed via 2 ways.
- Allow easy access to the steam pipe/ steam hose installation

- Respect minimum bending radii:
DN 25 Steam hose: $R_{min} = 200 \text{ mm}/8''$
DN 40 Steam hose: $R_{min} = 400 \text{ mm}/16''$



schematic representation

- » Run steam hose to a height of 400 mm/16 inch minimum above the steam humidifier and then to the steam manifold with a continuous decline of 5 to 10 %.
- » Feed condensate hose to a waste-water pipe/drain with a 200 mm/8 inch diameter loop as a steam barrier. Minimum distance from steam manifold to loop must be 500 mm/20 inch. Fill loop with water.

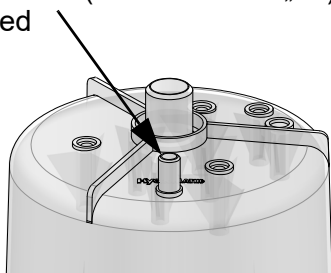
5.2.2 Condensate recirculation

The condensate hose may be run from the steam manifold back to the steam cylinder, as depicted in the schematic drawing below. Alternatively, the condensate hose may be fed directly in a wastewater pipe or a drain.

Please note

Should condensate return into the steam cylinder be intended, the connection stub on the cylinder upper part must be drilled out first with a ANSI drill size „O“ drill. To do so, the steam cylinder must be removed from the housing (s. maintenance chapter). In case of a console instead of a housing, the cylinder is to be lifted off the cylinder base for drilling the stub or may even remain in place.

Drill out condensate hose connection stub with an 8 mm (ANSI drill size „O“) drill, if required



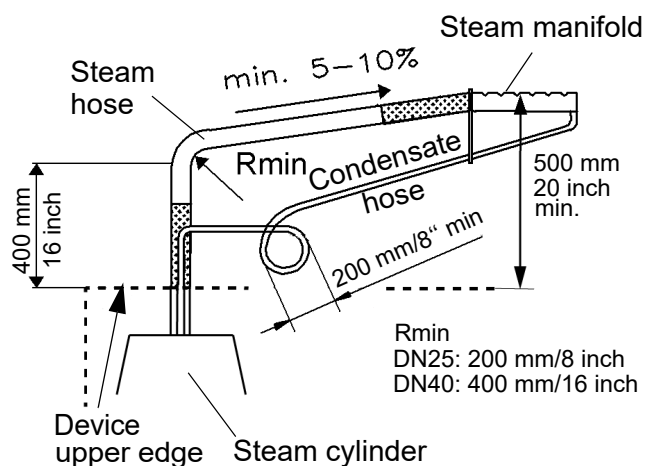
Steam cylinder top view

For heater element humidifiers:

Condensate return is only possible for the FLH 30-50 and all FLP unit sizes. Please contact the HygroMatik hotline.

Condensate hose guide

- » Lay the condensate hose from the steam distributor with a gradient through the housing bore to the steam cylinder and fasten it there to the connection pipe.
- » Lay the condensate hose with a loop of 200mm/ 8 inch diameter as a steam barrier.



**Installation type 1,
schematic representation**

Please note

If the steam distributor is positioned lower than 500 mm above the top edge of the unit, the condensate hose cannot be fed back into the steam humidifier..

5.3 Steam Manifold

5.3.1 General installation guidelines

When installing steam manifolds, pls. follow these guidelines:

Positioning within duct

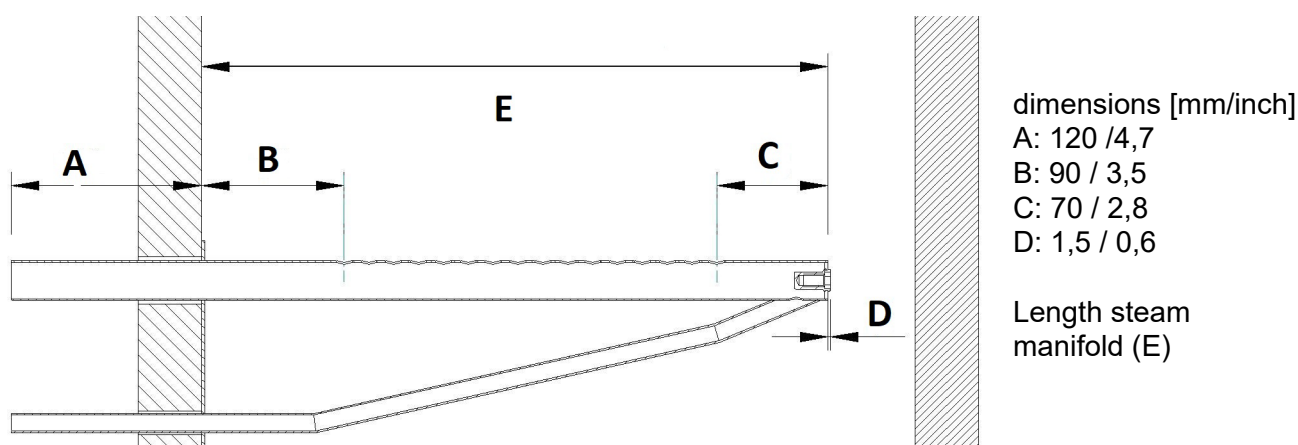
- Install the steam manifold as close as possible to the steam humidifier in order to minimize steam loss through condensation.
- Steam manifold placement on the supply side of the air duct is preferable.
- Install steam manifold strictly horizontal in order to ensure proper condensate drain.
- A minimum distance of 0,3 m (11,81 inch) in the direction of the air flow in front of the steam manifold(s) must be maintained to other installations.

Allowable pressures

- Max. allowable pressure in air duct is 1500 Pa/.218 PSI (exemption: SLE02, SLH02, KIT E02 and KIT H02 only allow for 1200 Pa/.174 PSI)
- On suction side, max. -500 Pa (.07 PSI) is tolerable
- With high-pressure air conditioning systems, modifications of the unit's drain hose system may possibly be required depending on the overall pressure situation. These modifications must be **coordinated with your expert dealer.**

Water drain

- We point out that according to the German Association of engineers (VDI) guideline VDI 6022, a water drain must be provided within the absorption distance inside the air duct



Please note

The length of the steam manifold connection piece is constant and always increases the total length of the steam manifold by exactly 120 mm.

Example: The total length of a 600 steam distributor is 720 mm.

Standard manifold dimensions [mm]/[inch]*:**

220/ 8.7	400/ 15.7	600/ 23.6	900/ 35.4	1200/ 47.2	1450/ 57.1
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*** Special lengths on demand.

Number and size of the steam manifolds available as well as the nominal diameter of the respective steam and condensate hoses may be taken from the tables shown in chapter „Technical Data“.

5.3.2 Recommendations for dimensioning

The recommendations given below are based on homogenous air flow in the duct.

Please note

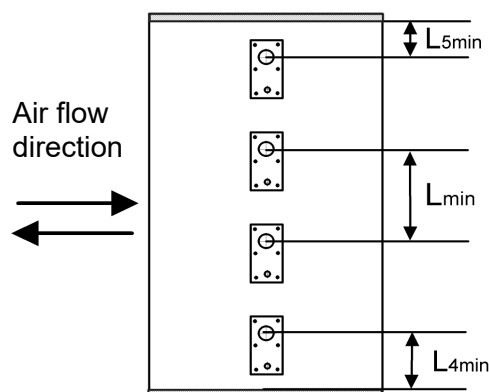
Start by arranging the steam distributors in the lower third of the air-conditioning duct (as low as possible, observing the minimum distances).

Minimum distance for condensation avoidance:

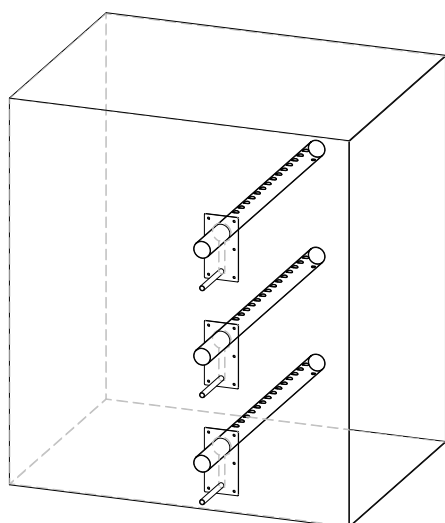
$L_{min} = 200 \text{ mm} / 7.9 \text{ inch}$: „Steam manifold - Next steam manifold“ distance

$L_{4min} = 150 \text{ mm} / 5.9 \text{ inch}$: „Lowest steam manifold - Duct bottom plane“ distance

$L_{5min} = 250 \text{ mm} / 9.8 \text{ inch}$: „Highest steam manifold - Duct ceiling plane“ distance



Standard steam manifold arrangement:



Steam manifold arrangement for special air duct shapings:

Height of the air-conditioning duct is too flat for the number of steam distributors:

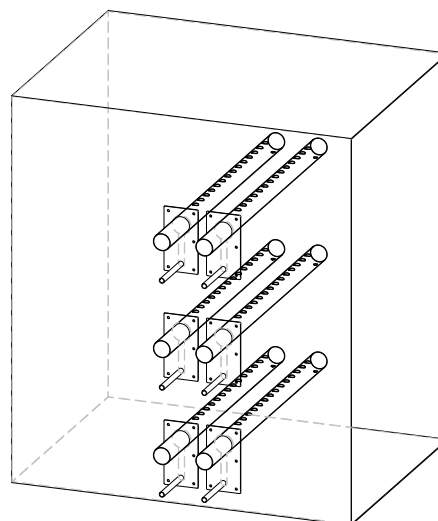


Fig: parallel arrangement of the steam distributors

Narrow, high air duct:

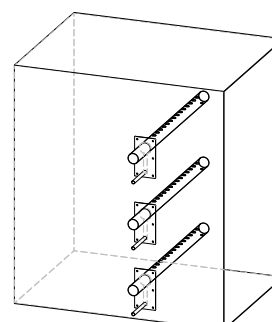


Fig: vertical arrangement of the steam distributors

Flat air duct

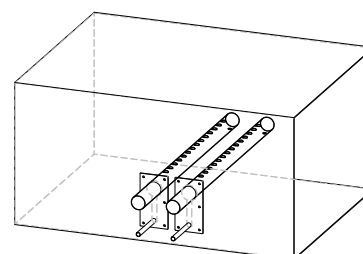


Fig: parallel arrangement of the steam distributors

NOTICE

If several steam distributors are fed from one manifold, make sure that the flow velocity of max. 12 m/s is not exceeded.

Example: 4xDN 40 pipes (120 kg/hour) require at least 1x DN 76 manifold.

NOTICE

When using several steam humidifiers on one manifold, ensure (constructively, e.g. by means of a shut-off valve) that no steam is forced into switched-off steam humidifiers during steam production.

Connection of the steam distributors / steam accesses

The distance of the steam distributors to subsequent obstacles (if their placement behind the steam distributor is unavoidable) such as filters depends on the humidification distance and is described in more detail on the following pages.

5.4 Absorption Distance B_N

The "absorption distance" (B_N) is defined as the distance from the steam feed to where the steam is completely absorbed in the treated air. Within the absorption distance, steam is visible as mist in the air stream.

Condensation may occur on anything installed within the absorption distance.

Although steam outside the absorption distance (B_N) is completely absorbed, it is not yet evenly diffused in the duct. If you plan to install any parts or devices inside the absorption distance, such as sensors or elbows, we recommend increasing the absorption distance using the formulae below. The absorption distances required for certain installed fittings are distinguished by separate symbols and calculated as a multiplier of the absorption distance B_N .

Absorption Distance	
B_N	for normal obstructions such as sensors, ventilators, outlets
$B_C = (1.5...2) \times B_N$	for fine filters, heat registers
$B_S = (2.5...3) \times B_N$	for particle filters
$B_d = (3...5) \times B_N$	for humidity sensors, duct humidistats

The absorption distance has no fixed value, but depends on many factors. These are depicted in the absorption distance nomogram below.

5.4.1 Determining the Absorption Distance

To determine the absorption distance, the following parameters are required:

- Air humidity before humidification x_1 in g/kg
- Air temperature after humidification t_2 in °C (with steam humidifiers the change in air temperature due to humidification may be disregarded t_1 or t_2)
- Specific increase in humidity Δx in g/kg (can be determined in the h,x diagram)
- quantity of steam introduced $\overset{o}{m}_D$ in kg/h.
- air speed w_L in m/s in air duct
- Total length l_D of the steam manifold installed in the air duct

Length l_D of the usable steam manifold depends on the dimensions of the air duct. The length of the absorption distance can be reduced by using multiple steam manifolds (also see section on the steam manifold).

Method:

Graphically determine absorption distance B_N using the absorption distance nomogram (also see Section „Absorption Distance Nomogramm“). Enter the value of the parameters enumerated above into the respective quadrants. The resulting point of intersection indicates the value of the desired absorption distance B_N .

Notes:

Air humidity before humidification x_1 :.....[g/kg]

Air temperature after humidification t_2 :.....[°C]

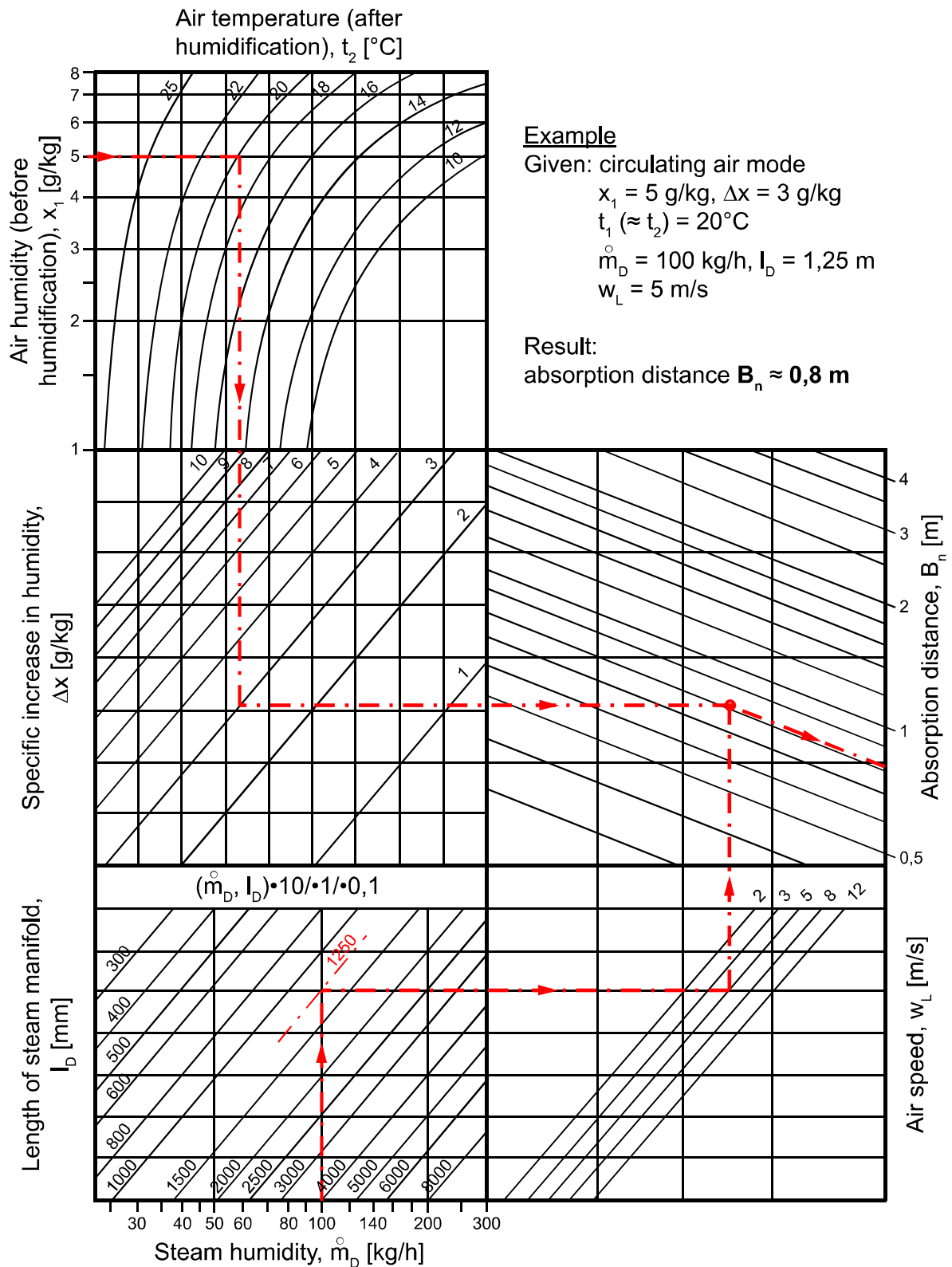
Specific increase in humidity Δx :.....[g/kg]

Quantity of steam introduced $\overset{o}{m}_D$:.....[kg/h]

Air speed w_L :.....[m/s]

Total length of steam manifold l_D :.....[mm]

5.4.2 Absorption Distance Nomogram



Source: Henne, Erich: Luftbefeuchtung (Air Humidification), 3rd Edition 1984 (Page 101), Oldenbourg Industrieverlag, Munich

6. Water connection

⚠ WARNING

Risk of scalding!

Very hot water to be found in and around the steam humidifier during and after operation. Have all installation work done by expert staff in order to avoid scalding hazards due to improper water guidance.

⚠ WARNING

Risk of electrical shock!

Hazardous electrical voltage!

Before starting installation work ensure that the unit is not yet connected to the power supply.

General Rules

- Obey local water utility regulations
- When using fully demineralised water, we recommend the use of stainless steel or plastic pipes.
- Verify that necessary safety measures have been taken – in compliance with either German Technical and Scientific Association for Gas and Water (DVGW) guidelines (DIN EN1717) or local regulations – that eliminate backflow of polluted water into drinking water treatment facilities. This may require the installation of a system separator of the CA type (minimum measure, allowable only when free discharge into the drainage system is given). Within the humidifier, a double check valve (58) is located in the water supply line. It prevents - in accordance with DIN EN 61770 - the backflow of water.
- Supply water must not exceed 40°C (104°F)
- Allowable range of water pressure: 1 to 10 bar /14.5 to 145 psi (100×10^3 to 100×10^4 Pa)
- For connection to the water supply pipe, make use of a water hose

- Blow-down water must drain freely
- As installation or retrofit option, the DVGW-conform **HyFlow** system separator is available for the HygroMatik electrode steam humidifiers (except SLE 02).
- You can also use a standard BA/CA system separator for the corresponding fluid category.

6.1 Feed water quality

HygroMatik heater steam humidifiers are designed for operation

- with drinking water* or
or treated drinking water like
- partially or fully softened water
- cleaned condensate
- mixed or normal demineralised water
without chemical additives.
- When using deionised water, there must be a minimum conductivity of 3µS/cm.
- Do not use copper or brass for the humidifier inlet and outlet pipes. These materials can be destroyed by the deionised water/ condensate. Suitable materials are, for example, stainless steel or plastic pipes.
- From a water hardness of 15°dH, we recommend upstream water treatment.
- The feed water that is used (independent of the type of treatment) must have a minimum pH value of 6.5.
- FLP-TPRO units may only be operated with softened water
- Operation with fully softened water (0°dH) is possible

* according to the drinking water regulation

6.2 Operation with softened water

NOTICE

Do not use softened water unless special measures are taken!

- Operation with partially or fully softened water makes it necessary to adjust the blowdown parameters to a higher blow-down frequency.
- Even if the HygroMatik steam humidifier is supplied with partially softened water, the remaining hardness builders can cause fine crystalline deposits. These can be set down in the sieve area of the steam cylinder bottom part and cause blocking of the sieve.
- Operation with fully softened water (0°dH) is possible

6.3 Water supply

NOTICE

Foreign material in water supply pipe may cause premature wear of the solenoid valve.

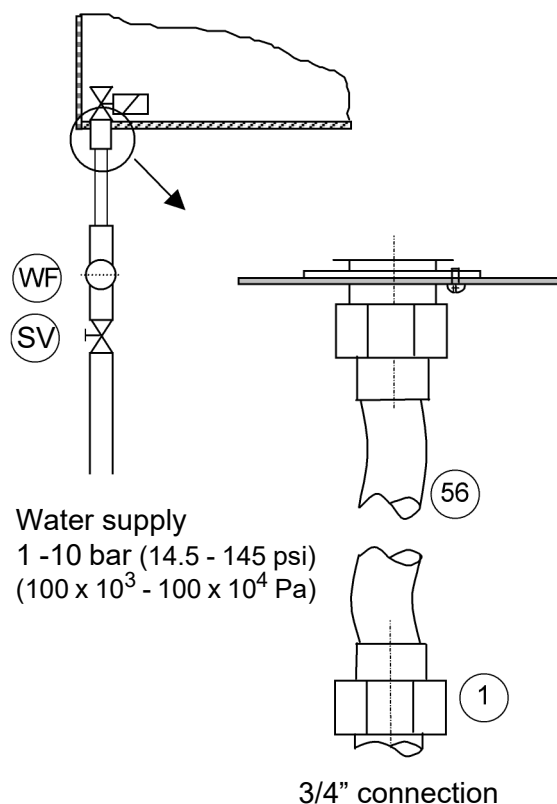
Flush the water supply pipe before making connection to the solenoid valve. This is of particular importance in case of a newly installed pipe.

- » Install a shut-off valve (SV) in the supply line.
- » Install a water filter (WF) if required due to bad water quality.

Please note

- Shut-off valve (SV) and water filter (WF) are not included in the delivery
- For connection to the water supply line, the water hose (56) with cap nuts (1) on both ends supplied with the unit may be used.

- In case of no safety device for drinking water protection according to DIN EN 1717 present in the house installation system, a system separator at least of the CA type is mandatory.



*) the numbers refer to the exploded view in the chapter with the same name.

Make connection as follows:

- » Attach cap nut with inner seal ring to inlet screw joint on the humidifier housing and tighten.

NOTICE

Do not overtighten the cap nut!
Excessive tightening will destroy the fitting.

Please note

- » Screw the other hose end cap nut with its inner seal on a customer-provided water tap (cap nut internal thread is 3/4").
- » Strainer must be placed inside the solenoid valve

6.4 Water discharge

⚠ WARNING

Risk of scalding!

During blow down, up to 0.3 l/sec (0.8 gal./sec) are being drained with a temperature of about 95 °C (203°F).

Ensure that the drain hose is reliably fastened and wastewater can drain freely and pressureless.

Please note

Humidifier installation location and wastewater discharge must be on the same pressure level. In case of a drain connection on positive pressure, pls. consult your expert dealer.

Guidelines for water discharge composition

- Use original HygroMatik water drain hose
- Do not buckle drain hose
- Use a drain pipe and outlet pipe made of suitable material (temperature resistant up to 95°C (203°F); with waste water cooling HyCool up to 60°C)
- In case of a free outlet according to DIN EN 1717, a system separator for liquid category 3 is required for the water connection.
- In all other cases, use a system separator for liquid category 5.

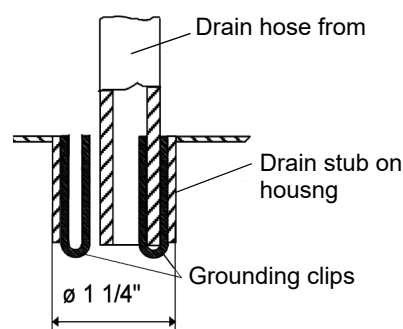
How to proceed

- » Run a 1 1/4 " drain hose of 250 to 1000 mm (10 to 40 inch) length into a pressure-free outlet according to DIN EN 1717.

Valid for all steam humidifiers (KITS are not included):

- » Position the hose to the side of the humidifier to prevent rising steam from hitting the housing.
- » Slide pump drain hose onto one of the grounding clips.
- » Slide overflow hose of the HyFlow system separator (if present) onto the other grounding clip.

Grounding clip functioning



The two grounding clips attached to the inner surface of the housing drain stub are in direct contact with water and shunt potential residual electric currents away from the housing during blow-down and in case of a cylinder water overflow.

Between the pump drain hose jacket and the inner surface of the cabinet drain connection, a gap exists due to the diverging diameters. If water collects on the base plate, it will flow through this gap into the drain hose and then into the drainage system.

Please note

With the optional wastewater cooling system **HyCool** (not available for FLP-XX-TPRO units), HygroMatik offers an option for limiting the steam humidifier wastewater temperature in order to protect thermosensitive wastewater pipe lines. By blending with tap water during blow-down, wastewater temperature is below 60°C (140°F) as long as inlet water temperature does not exceed 30°C (86° F).

6.5 Water connections final check

Go down the following water installation checklist:

- ☒ All screws and clamps properly tightened?
- ☒ Water supply line flushed before making connections?
- ☒ Water connection properly installed?
- ☒ Water discharge properly installed?
- ☒ Does blow-down water drain freely?
- ☒ Water supply line and water discharge leakage-free?

7. Electrical connection

⚠ WARNING

Risk of electrical shock!

Hazardous electrical voltage.

All work related to electrical installation to be performed by expert staff (electricians or expert personnel with equivalent training) only. Do not connect the reverse osmosis unit to the live power supply before all installation work has been completed.

Please note

The customer is responsible for checking expert staff qualification.

General installation rules

- All local rules concerning the implementation of electrical installations must be obeyed
- Electric connector cables to be laid professionally
- Install the electrical connections according to the wiring diagram
- With units of a nominal power output > 33 kW electrical connection to a permanent line is mandatory (according to VDE 0700 Part 98)

NOTICE

Possible electronical components destruction through electrostatical discharge!

Prior to commencing electrical installation work, steps must be taken to guard the sensitive electronical components of the unit control against damage from electrostatical discharge.

7.1 Electrical installation approach

Do not connect the steam humidifier to the live power supply before all installation work has been completed.

- » Provide fuses with a contact gap of at least 3mm per pole.
- » Install a separate main connection for each steam cylinder including main circuit breaker, main switch etc.
- » Make main connection according to the table below.

Main connection and Fusing

For the FlexLine steam humidifiers in the standard version, main connection can be found in the Technical Data (in the chapter of the same name).

Other operating voltages on request.

Please note

HygroMatik recommends the use of slow blowing up to middle time-lag main fuses.

Steam humidifier installations should incorporate an individual residual current circuit breaker (Type A-RCD).

The maximum current consumption and the resulting required fuse protection of the individual standard unit types can be found in the technical data table (chapter Technical data at the end of this manual).

7.2 Cable connections

The table below shows the number and dimensioning of the cable connections provided by the various FlexLine housing types.

Model	M25	M25 with MSI*)	M32	M40	Blind plug*)
FLE05/10 FLH03/06 FLH09	1	1	0	0	3
FLE15/20 FLE25 FLH15/25	1	1	0	0	3
FLE30/40	0	1	1	0	3
FLE50/65 FLH30/40 FLH50	0	1	0	1	3
FLE80	0	1	2	0	3
FLE100 FLE130 FLH80 FLH100	0	1	0	2	3

Model	M25 PG	M25 with MSI*)	M40 PG	Ø 25 filler plug
FLP 05/08	1	1	0	3
FLP15/25	1	1	0	3
FLP30/40/50	0	1	1	3

*) Multiple seal insert

**) Ø 25 mm/~ 1.0 inch

Characteristics of metric cable connections

Thread	Wrench size [mm/in.]	Cable diameter supported [mm/in.]
M25x1,5	30/~ 1.2	9 - 17/ ~0,35 - 0,67
M25x1.5 with MSI*)	30/~ 1.2	6 (3x)/ ~0,24 (3x)
M32x1,5	36/~ 1.4	13 - 21/ ~0,51 - 0,83
M40x1,5	46/~ 1.6	16 - 28/ ~0,63 - 1.1

7.3 Safety interlock

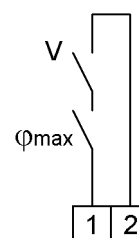
⚠ WARNING

Risk of electrical shock!

Hazardous electrical voltage.

When standard wiring was made, terminal 1 shows 230 VAC after commissioning.

Across terminal 1 and 2 the so-called safety interlock is wired. This wiring allows for integration of safety devices. In case of an open safety interlock the steam humidifier does not operate.



Safety interlock terminals 1/2 on

Please note

Factory setting leaves the safety interlock open!

Install contact interlocks, e.g. a max. hygrostat, vane relays, pressure controllers, air interlock devices etc. in series across terminal 1 and 2.

NOTICE

Contacts across terminals 1 and 2 must be potential free and properly rated!

Rating must comply with the control voltage in use.

Best practice implies the integration of a max. hygrostat in the safety interlock wiring to protect against over-humidification due to a r.h. sensor malfunction.

7.4 Connection diagram

The device-specific wiring diagrams are included in the scope of delivery. Please use them for the installation and keep them in a safe place.

7.5 Electrical installation check list

Check electrical installation with respect to customer-site requirements and local power supply regulations.

- ☒ Safety interlock properly wired across terminals 1 and 2?
- ☒ Supply voltage in accordance with name plate voltage rating?
- ☒ All electrical connections made according to the wiring diagram?
- ☒ Is the sensor (temperature sensor or r.h. sensor, depending on the application scenario) properly connected to the main p.c.b. ? (make sure that the input selected is adequate for the type of sensor installed with respect to the signal type and range specified).
- ☒ All screw terminal connections properly tightened?
- ☒ Have all electrical cable and plug connections been properly tightened?
- ☒ Proper unit grounding made?

8. Commissioning

⚠ WARNING

Risk of operating error!

Start-up of the unit is restricted to expert staff only (electricians or expert personnel with equivalent training).

Step 1: Check of mechanical integrity and wiring

- » Open housing cover.
- » Check cylinder seating.
- » Check steam, condensate and drainhose clamps.
- » Check that all electrical wire connections (including steam cylinder wiring) are tight and secure.

Step 2: Switching on the steam humidifier

- » Switch on main breaker.
- » Open water supply stopcock (operating pressure should be 1bar min., 10bar max./14.5 psi min., 145 psi max.).
- » Switch on unit by setting control switch to "I".

Step 3: The unit performs a self-test and, then, commences normal operation

- During self-test, the On/Off button icon  flashes for a couple of seconds
- On completion of the test, the software version is displayed for a short moment. Consequently, normal operation is commenced. However, steam is not produced without a demand pending

Step 4: Trigger steam demand

- » Set control for commissioning check for permanent steam demand and close safety interlock.

The water inlet solenoid valve opens and feeds water into the steam cylinder

Step 5: Monitor unit function and check for leakage

- » Let unit operate for 15 to 30 minutes.
- » If leaks appear, switch off the unit.

⚠ WARNING

Risk of electrical shock!

Hazardous electrical voltage!

Follow safety instructions for work on live components.

Step 6: Repair leaks

- » Find leaks and eliminate.
- » Check again for leaks.
- » When everything is o.k., reattach housing cover.

9. Maintenance

9.1 General

For the achievement of a long unit life span, regular maintenance is a must. Maintenance works to be performed refer to unit assemblies that underlie either mechanical or electrical wear and tear, or may be impeded by residues in their proper functioning.

A steam humidifier's optimal performance and the maintenance intervals required primarily depend on the water quality encountered and the amount of steam produced. A particular water quality may shorten or lengthen maintenance intervals. The amount of residues found in the steam cylinder allows for a hint on future maintenance intervals.

Another scenario influencing the unrestricted unit availability is the main contactor lifetime in terms of a maximum number of switch cycles allowed, as indicated by its manufacturer. Unit control monitors the number of switch cycles and produces a service message when the max. number is reached.

- „Cycles_main_contactor x“ is indicated when the number of cycles pre-set for main contactor „x“ (x = 1...5) is reached. The main contactor should then be replaced and the counter reset (s. „Service“ submenu in the „FlexLine controls“ manuals).

After a „Steam_amount_counter“ message, maintenance work mainly encompasses checking and cleaning all of the unit parts including the steam cylinder inside, and a unit test run.

As part of the maintenance work, screw terminals and plug connections must be checked every time. If required, retightening the terminal screws is a must as well as ensuring tight fit of all of the plug connections.

Since steam and condensate hoses are subject to wear as well, hoses must also be checked regularly for tightness, flexibility and firm seating.

Seals are wear parts. As such, seal integrity checks and replacement is also a part of the regular maintenance work.

9.1.1 Service messages

In case of a service message produced, the HygroMatik logo in the main section of the touch display (for explanation s. „FlexLine controls“ manuals) is blanked. Instead, a frame is shown with the service icon  in it and a „Service message (xx)“ („xx“ indexes the message code). When the message frame is touched, the service message is displayed in clear language.

The service messages are listed in detail in the „FlexLine controls“ manuals. Following hereafter, pls. find 2 service messages denoted as examples:

- „Steam_amount_counter“ is output when the pre-set produced steam amount is reached. Maintenance of the device is necessary.

9.1.2 Service messages for preventive maintenance

HygroMatik steam humidifiers continuously monitor the performance of the following functional areas:

- Blow-down operations
- Cylinder filling

When reaching pre-set trigger levels, unit control outputs preventive service messages that relate to the corresponding functional area.

The functional area addressed should then be checked at short term and maintained, if required (s. „FlexLine controls“ manuals, „Service messages and warnings“ chapter).

9.1.3 Safety instructions for maintenance

⚠ WARNING

Risk of electrical shock!

Hazardous electrical voltage. Unit must be switched off and protected against restart by expert staff (electricians or expert personnel with equivalent training) before any maintenance work is commenced.

⚠ WARNING

Risk of skin burning!

Hot steam cylinder during operation and for some time afterwards.

Drain steam cylinder before any maintenance work is commenced. After that, wait approx. 10 mins before starting maintenance work.

Check steam cylinder temperature by cautious approximation with hand (do not touch!).

⚠ WARNING

Risk of scalding!

Water pumped or drained from the steam cylinder may have a temperature of up to 95 °C.

Wear proper PPE (Personal Protection Equipment)!

NOTICE

Take care of ESD protection!

The electronic components of the humidifier control are very sensitive to electrostatic discharges. In order to protect these components during maintenance, steps must be taken to guard against damage from electrostatic discharge.

9.2 Maintenance frame work when unit is operated with fully demineralised water and condensate

Instructions on maintenance and cleaning intervals are entirely based on empirical data.

Cycle time	Maintenance work
4 weeks after initial commis-sioning	• Visual inspection of electrical and mechanical connections. • Visual inspection of level control. • Visual inspection of the steam cylinder interior.
anually	• Visual inspection of electrical and mechanical connections. • Visual inspection of level control. • Visual inspection of heater element and thermo switch • Visual inspection of steam cylinder interior. • If required, cleaning of steam cylinder, heater element, thermo switch and level control followed by the replacement of all sealing. • Cleaning the vent hole in the pipe bend • Cleaning the fine filter of the solenoid valve • Checking the hoses

9.3 Maintenance when unit is operated with tap water or partially softened water

No precise maintenance intervals can be specified because these always depend on water quality and the amount of steam generated. It is advisable to adjust the frequency of maintenance to the specific operational experience. HygroMatik recommends to check the opened steam cylinder 1 or 2 weeks after initial commissioning in order to quantify the amount of residue produced so far, allowing for determining future maintenance intervals and/or the adjustment of blow-down cycles possibly required.

Blow-down cycles

The vaporisation process causes hardness builders (calcium) in form of solids of various compositions to fall out within the steam cylinder. Cyclic blow-down by means of a powerful blow-down pump followed by fresh water refills remove parts of this solid built-up.

Water quality

When tap water is used, it must be taken into account that cleaning intervals shorten as the carbonate hardness level increases. As a general rule, it is preferable to operate the unit with fully demineralized water since operation will not be affected by mineral deposits and flushing loss will be minimized.

Please note

Possibly, maintenance intervals may be extended by moderately increasing the blow-down cycle rate. Please consult your expert dealer.

9.4 Maintenance steps

⚠ WARNING

Risk of skin burning!

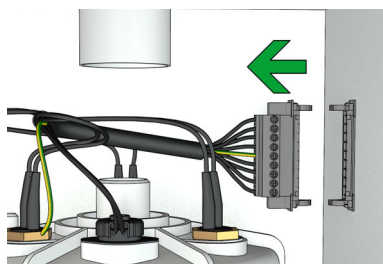
During operation and for some time afterwards the cylinder is hot. Check temperature before touching.

9.4.1 Steam cylinder removal

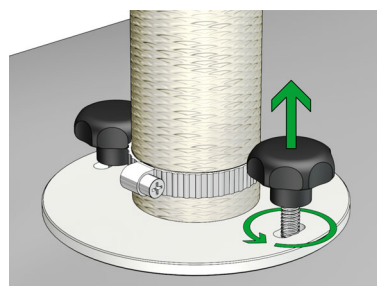
- » Hold the control switch in position II to pump the rest of the water out of the cylinder.



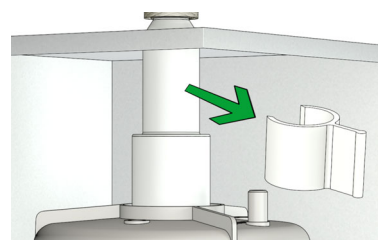
- » Set the control switch to position 0 to switch off the unit.
- » Disconnect unit from power supply and secure against reconnection.
- » Remove unit housing cover.
- » Check the unit again to ensure no voltage is present.
- » Shut off the water supply.
- » Wait 10 minutes so that the possibly hot cylinder can cool down.
- » Check the temperature by carefully approaching it with your hand, do not touch the cylinder if the rest heat should be too strong.
- » Separate transfer connector halves.



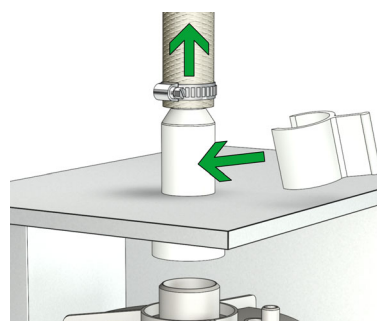
- » Twist and remove star screw on the steam hose adapter.



- » Remove clip on the steam hose adapter.



- » Push the steam hose adapter up out of the cabinet and secure it with the clip.



- » Undo clamping belt.
- » Lift steam cylinder out of the base.

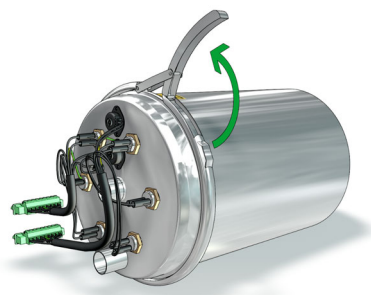
NOTICE

Risk of material damage!

When lifting the cylinder out of the housing or reassembling be aware not to damage the heating element cable.

9.4.2 Cleaning / O-ring replacement

- » Open cylinder clamping ring and lift off cover with heater elements.



- » Remove the used O-rings between the cylinder halves, in the base and in the steam hose adapter.
- » Remove all deposits inside the cylinder .
- » Clean the heating element(s) by scraping or scrubbing. A small amount of scale hardener is harmless.
- » Lift strainer insert (12) out of the base using the two access holes on the side.
- » Remove all deposits from the coarse strainer.
- » Keep coarse strainer clean with mechanical utilities.
- » Check base for deposits and remove if necessary. Especially the passes of the hose connections should be checked.
- » Insert coarse strainer and position correctly by clicking the cut-out into place in the clip.
- » Insert new O-rings in the base and in the steam hose adapter.

NOTICE

Risk of functional disruption!

Use descaler or cleaning detergents only for cylinder and heater element cleaning. Do not introduce in cylinder base or apply to hoses!

Prior to restarting the unit, make sure that the device assemblies in question are thoroughly flushed or rinsed.

Possible damage to the unit!

Excessive use of force during mechanical cleaning of the cylinder or heating element can damage these parts of the unit.

9.4.3 Cleaning the connecting hoses, base connections, fine filter and drain pump

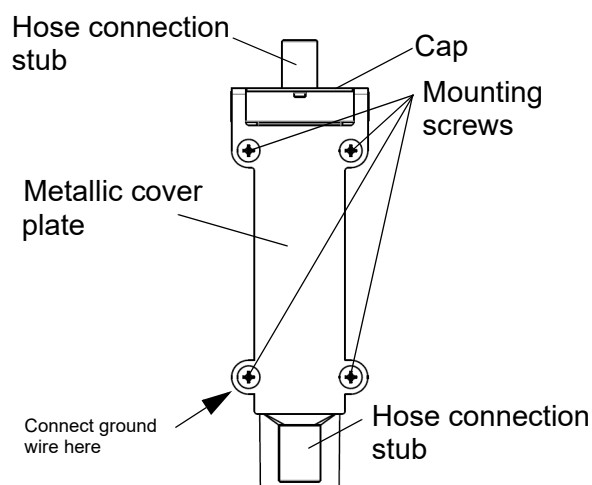
- » Check the connection hoses for condition and free passage.
- » Check all connections of the cylinder base for free passage.
- » Clean the hoses and connections if necessary.
- » Remove the fine filter on the water connection side from the solenoid valve and clean it under running water.
- » Clean the drain pump as described in the section of the same name.

NOTICE

When operating with partially softened water or tap water, scale may be discharged with the steam flow and may settle in the nozzle positioned in steam hose adapter. Therefore, this nozzle should be inspected regularly as part of the general maintenance review and cleaned if necessary.

*) the numbers refer to the exploded view in the same named chapter

9.4.4 Level control device cleaning



Water sensor

The level control device is accessible only after removal of the steam cylinder.

- » Disconnect hoses from level control device connection stubs on upper and lower side
- » Remove the 4 screws securing the metallic cover plate of the level control device and the device as such against the unit rear wall. Memorize ground wire attachment position (under lower left hand side screw).
- » Unclip level control device enclosure cap with a flick of the thumb and remove.
- » Take out o-ring and dispose of.
- » Make visual inspection of level control device enclosure interior and clean, if required. Scratch out any deposits, if present.
- » Inspect both level control connection hoses and clean, if required.
- » Insert new o-ring.
- » Re-attach enclosure cap.
- » Align metallic plate with level control device enclosure mounting holes and insert screws in upper left and lower right position. Reintroduce level control device into humidifier housing and loosely affix to unit rear wall with the 2 screws.

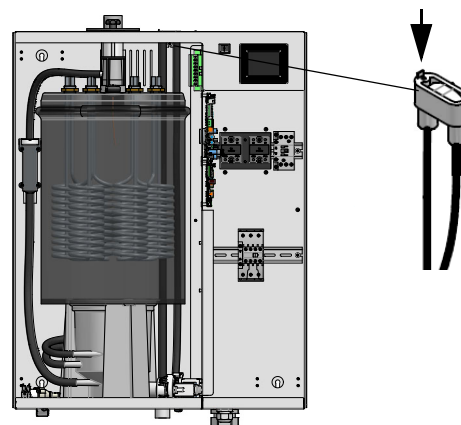
- » Insert the 2 screws remaining into the open level control device enclosure mounting holes while positioning the ground wire connection eyelet under the lower left screw.
- » Handtighten all of the screws.

Please note

A functional check of the level control device may only be accomplished while the device is installed into the unit!

9.4.5 Cleaning the vent hole on the pipe elbow

The pipe elbow is only accessible when the steam cylinder is removed.



- » Remove the pipe elbow from the back wall of the housing by unscrewing the fixing screw of the pipe elbow.
- » Check the small opening on the top of the pipe elbow for dirt.
- » Remove any dirt, e.g. with a small screwdriver.
- » Reattach the pipe elbow to the back wall of the housing with the screw.

Please note

The vent hole should be checked for free circulation during every maintenance. A blocked vent hole has a negative effect on the drainage process (see also chapter "Trouble shooting" in the manual of the control).

9.4.6 Reinstallation of the cylinder

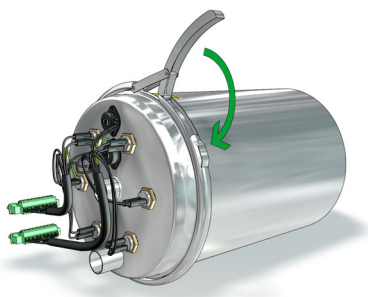
- » Moisten new o-ring (15) or the o-ring that was removed in a previous step and place on the upper part of the cylinder collar on the cylinder cover.

⚠ WARNING

Risk of pinching fingers!

To avoid harming fingers during closing of the clamping ring, make sure that your fingers are not in the closing range.

- » Replace cylinder cover.
- » Replace clamping ring and close.



- » Insert the steam cylinder into the base with a slight twisting motion and pressure.

Please note

The "Hot surface" sticker must point to the front side of the unit.

NOTICE

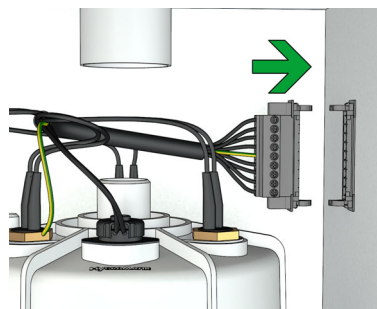
Risk of functional disruption!

Risk of material damage!

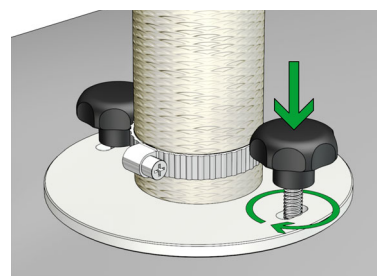
Loose cable connections may result in increased transition resistance and contact area overheating.

- » Check all cabling terminals and plugs for tight seating. Plugs must sit on their respective contacts as far as they will go.
- » Check heater element wiring for damaged insulation.

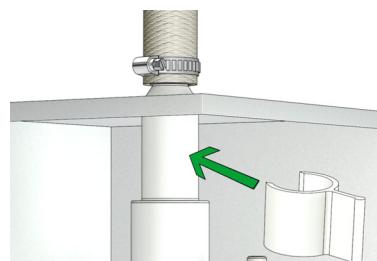
- » Reconnect connector halves.



- » With a gentle turning motion, put adapter (2) over the o-ring on the steam outlet and fix it with the star screws.



- » Slide clip between adapter and cabinet.



- » Close clamping belt.
- » Follow the handling instructions in the section **Leakage test**.

*) the numbers refer to the exploded view in the same named chapter

9.5 Removal and installation of unit components

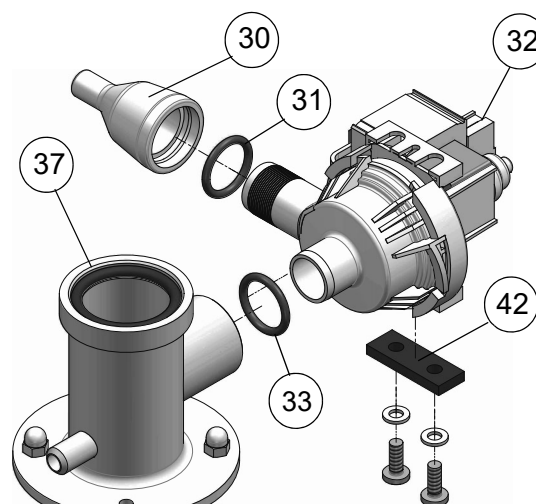
9.5.1 Cleaning of blow-down pump

Removal and cleaning

- » Remove steam cylinder as described in the **Removal of the steam** cylinder section.
- » Detach adapter (30)* from pump (32).
- » Detach electrical cable from pump.
- » Unscrew mounting screws from housing bottom plate (safe vibration buffer, bolts and washers for reinstallation) and pull pump out of cylinder base (37).
- » Open pump bayonet lock.
- » Remove residues from pump and drain hoses (replace O-ring if required).

Reinstallation

- » Moisten O-ring (33) and insert into cylinder base (37) horizontal stub.
- » Push pump back into cylinder base and bolt to bottom plate incorporating the vibration buffer and washers saved during removal.
- » Moisten O-ring (31) and insert into adapter (30).
- » Slide adapter onto pump stub.
- » Refit electrical cable to pump connector (no polarisation).
- » Reassemble steam cylinder and reinstall in humidifier housing as described in the **Reinstallation of the steam cylinder** section.
- » Follow the handling instructions in the section **Leakage test**.



Blow-down pump

9.5.2 Heater element replacement

Removal

- » Remove and open steam cylinder as described in the **Removal of the steam** cylinder section.
- » Open cylinder clamping belt and lift-off cover with heater elements.
- » Separate thermo switch capillary tube from heater element(s) by detaching the retainer clips.
- » Remove wiring of the heater element(s) in question from connector terminals (mark positions for rec-lamping).
- » Unscrew heater element fixing nut(s) from cylinder cover.
- » Pull heater element/s downward out of steam cylinder cover.
- » Remove grounding ring cable lug.
- » Clean the sealing surface on the underside of the cover around the area where the new heater element will be installed.

Reinstallation

- » Install replacement heater element(s) (with new sealing) while considering the correct sequence of all of the mounting parts. Ensure proper grounding and tighten nut(s).
- » Insert heater element wires into the terminals of the wiring connector following the markings made when disassembling. Polarity is not an issue.
- » Refit thermo switch capillary tube to heater element(s) using retainer clips.
- » Reassemble steam cylinder and reinstall in humidifier housing as described in the **Reinstallation of the steam cylinder** section.
- » Follow the handling instructions in the section **Leakage test**.

From an electrical point of view, the thermo switch/es on the cylinder cover, the bimetal switch/es on the solid state relay/s as well as the Klixon thermo switch mounted on the cylinder cover are all wired in series. If one of the devices mentioned triggers due to an overheat situation, the main contactor K1 switches off and controls enters the „120“ error state (i.e. „Thermo switch“). Steam production is then interrupted. A unit restart is required which is, however, only possible after the bimetal switch/es has/have cooled down and/or the thermo switch/es and/or the Klixon thermo switch were unlocked.

Please note

In case that a thermal protection device triggers repeatedly, check for possible cause prior to any further use of the unit.

9.5.3 Releasing the thermal safety devices

Variety of thermal protection devices in use

For overheat protection, the steam humidifier is equipped with one or two thermo switches, depending on the power output rating. They are mounted on the steam cylinder cover. The thermo switch/es is/are coupled to the heater element/s by means of a capillary tube. Each of thermo switch controls 1 to 3 heater elements. Thus, with 6 heater element units, each one of the thermo switches is assigned to a group of 3 heater elements.

For additional safety in case of one of the thermo switches being defective, a Klixon thermo switch is screwed to the cylinder cover.

The mounting positions of a single thermo switch and the Klixon are shown in the next section in an exemplary representation.

Supplementary to the thermal protection devices in conjunction with the steam cylinder, the solid state relay/s is/are protected by bimetal switches to avoid damage introduced by inadequate ventilation due to e.g. vent holes that are obstructed.

9.5.4 Unlocking of a thermo switch on the cylinder cover

Whether a thermo switch and, if so, which of the devices, has triggered, may be detected by a passage measurement (let the unit cool down before starting the measurement!).

Unlocking is then accomplished as such:

Slightly push down the red button protruding a few millimeters from its holder. This will make the button return to its original position and unlock the mechanism.

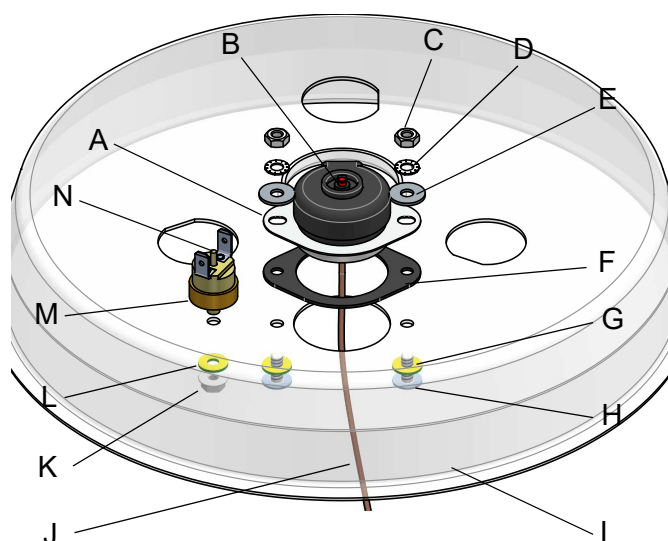
Relasing a thermo switch does not erase the fault message in the control fault memory.

9.5.5 Unlocking of the Klixon thermo switch

Whether the Klixon thermo switch has triggered, may be detected by a passage measurement (usually, when overheat is encountered, the thermo switch/es trigger).

Unlocking is accomplished by pressing the unlocking pin located between the electrical connection contacts of the Klixon switch.

9.5.6 Thermo switch replacement (for heater element)



- A: Thermo switch
- B: Unlocking button for thermo switch
- C: M4 Mounting nut (2x)
- D: Lock washer (2x) E: Washer (2x)
- F: Seal G: Flat seal (2x)
- H: M4x10 Flange screw (2x)
- I: Cylinder cover (7)
- J: Capillary tube (attached to up to 3 heater elements)
- K: M4 Mounting nut L: Flat seal
- M: Klixon thermo switch
- N: Unlocking pin

NOTICE

Risk of material damage!

Do not buckle the thermo switch capillary tube!

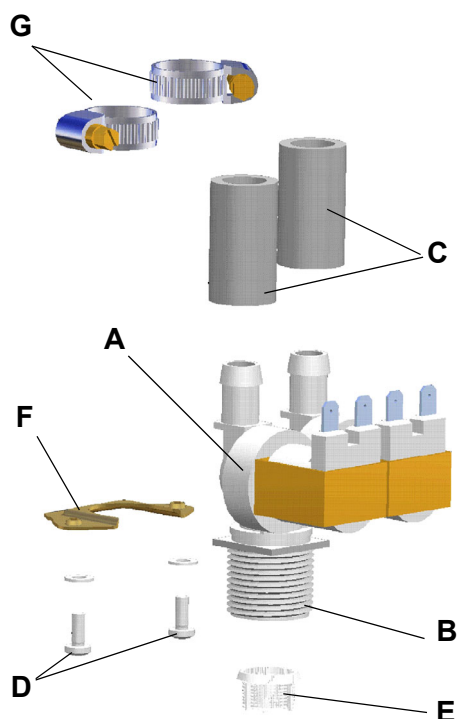
Removal

- » Remove cylinder as described in the **Removal of the steam** cylinder section.
- » Remove wiring of the thermo switch from connector terminals (mark positions for reclamping).
- » Detach capillary tube (J) retainer clips from heater element(s).
- » Separate capillary tube from heater element(s) (4).
- » Unscrew the two screws (H) holding thermo switch in place.
- » Pull out thermo switch-upwards off steam cylinder cover.

Reinstallation

- » Install replacement thermo switch with a new sealing while feeding the capillary tube cautiously through the cylinder cover hole.
- » Insert M4x10 flange screws (2 pcs.) with new flat seal into cover holes from below.
- » Attach washers (E) and lock washers (D), screw on M4 nuts (C) and fasten lightly.
- » Connect the capillary tube to the heater element. Ensure proper contact so that no limestone layer may built up. In case of humidifiers with several heating elements, the capillary tube is attached to all of the heating elements (max. 3).
- » Insert thermo switch wires into the terminals of the wiring connector following the markings made when disassembling.
- » Reinstall steam cylinder in humidifier housing as described in the **Reinstallation of the steam cylinder** section.
- » Follow the handling instructions in the section **Leakage test..**

9.5.7 Removal and reinstallation of the twin solenoid valve including fine filter cleaning



Twin solenoid valve (FLPxx-T)

Removal

- » Remove steam cylinder as described in the **Removal of the steam** cylinder section.
- » Unscrew supply water hose coupling nut from supply water connection (B).
- » Remove connecting hoses (C) originating from cylinder base after marking connection position.
- » Detach electrical cable connectors from twin solenoid valve (A).
- » Unscrew solenoid valve mounting screws (D) (save washers).
- » Remove twin solenoid valve from housing bore.

Fine filter cleaning

- » Remove fine filter from solenoid valve tap water connection side and clean under running water.
- » Reinsert fine filter into twin solenoid valve.

Reinstallation

- » Reinsert twin solenoid valve with seal (F) in unit housing bore.
- » Bolt-down twin solenoid valve using screws (D) and washers.
- » Reconnect electrical cables to twin solenoid valve regarding the connection positions marked.
- » Reattach connecting hoses (C) originating from cylinder base using clamps (G) (regard the connection position recorded).
- » Reinstall steam cylinder in humidifier housing as described in the **Reinstallation of the steam cylinder** section.
- » Reattach supply water hose to supply water connection (B).
- » Follow the handling instructions in the section **Leakage test**.

9.5.8 Removal and reinstallation of the quadruple solenoid valve including fine filter cleaning (FlexLine Process)

Removal

- » Remove steam cylinder as described in the **Removal of the steam** cylinder section.
- » Unscrew supply water hose coupling nut from supply water connection (B).
- » Remove hex nut (C) of supply water connection (B).
- » Disconnect John-Guest-connections of the connecting hoses (d) after marking connection position.
- » Detach electrical cable connectors from quadruple solenoid valve (A) after marking connection position.
- » Remove quadruple solenoid valve from housing bore.

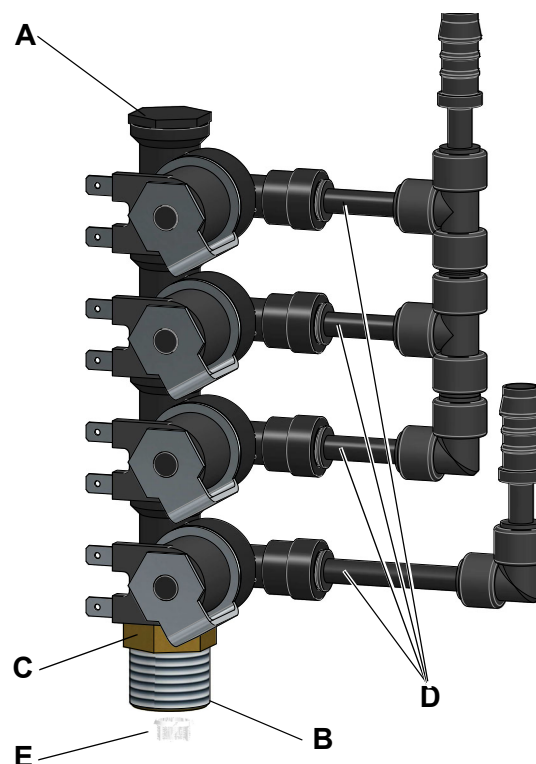
Fine filter cleaning

- » Remove fine filter from solenoid valve tap water connection side and clean under running water.
- » Reinsert fine filter into twin solenoid valve.

Reinstallation

- » Reinsert solenoid valve in unit housing bore.
- » Reattach connecting hoses (D) (regard the connection position recorded).
- » Reconnect electrical cables to quadruple solenoid valve regarding the connection positions marked.
- » Using the hex nut (C), fasten the supply water connection (B) in housing bore.
- » Reassemble steam cylinder and reinstall in humidifier housing as described in the **Reinstallation of the steam cylinder** section.

- » Reattach supply water hose to supply water connection (B).
- » Follow the handling instructions in the section **Leakage test**.



**Quadruple solenoid valve
(FLPxx-TPRO)**

9.6 Leak test

⚠ WARNING

Risk of electrical shock!

Hazardous electrical voltage!

Follow safety instruction for work on live components.

Leakages may invoke leak currents.

The leak test described below must be done after all maintenance work that affects the water circuit inside the unit. If work has been done at several points, the final leak test is enough, although this work step is listed for all parts of the work.

The leak test must be done with the unit open, paying particular attention to the warning above.

- » Open the water supply.
- » Switch on the unit and check the inside for leaks (hose connections, O-rings, seals) after 15-30 minutes of operation.
- » In case of leakage turn off power supply and secure against being switched on again.
- » Find leakage and eliminate.
- » Check again.
- » Follow the instructions in the section **funktional check**.

9.7 Functional check

- » Run the system with maximum output for a couple of minutes
- » Check hose connections and seals for leakage.

9.8 Finishing maintenance

- » Reattach unit housing cover
- » Reset service interval

Reset service interval:

After finishing substantial maintenance work, the service interval must be reset by means of the „Service-reset_cyl. 1“ or „Service-reset_cyl. 2“ parameters (only with double cylinder units), s. „FlexLine controls“ manual, „Service“ submenu.

The steam amount counter now again holds the value preset that determines the next maintenance requirement when reached.

9.9 Dismantling

Once the steam humidifier will no longer be used, dismantle (demolish or scrap) it by following the installation procedures in reverse order.

⚠ WARNING

Dismantling of the unit may only be performed by qualified personnel. Electrical dismantling may only be performed by trained electricians.

Disposal after dismantling

The humidifier is made up of metal parts and plastic parts. In reference to European Union directive 2012/19/EU issued on 4 July 2012 and the related national legislation, please note that:

The components of the electrical and electronic devices must not be disposed of as municipal waste, and therefore the method of waste separation must be applied. The public or private waste collection systems defined by local legislation must be used.

NOTICE

The operator is responsible for the disposal of unit components as required by law.

10. CSA Certificate of Compliance



Certificate of Compliance

Certificate: 2125886

Master Contract: 238708

Project: 70198540

Date Issued: 2018-09-28

Issued to: Hygromatik GmbH
Lise-Meitner Strasse 3
Henstedt-Ulzburg, D-24558
GERMANY
Attention: Michael Lutkemann

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.



Issued by: Anand Venketaraman
Anand Venketaraman

PRODUCTS

CLASS - C121106 - COMFORT CONDITIONING EQUIPMENT-Humidifiers and Evaporative Coolers

CLASS - C121186 - COMFORT CONDITIONING EQUIPMENT-Humidifiers and-Evaporative Coolers -
Certified to U.S. Standards

Humidifiers, heater type, stationary, industrial or commercial, rated 600V or less, 60Hz, 3 ph, as follows:

Models HL06, HL09, HL12, HL18, HL24, HL27, HL30, HL36, HL45 with heater 48A max.

Models FLP05, FLP08, FLP15, FLP25, FLP30, FLP40, FLP50, FLH03, FLH06, FLH09, FLH15, FLH25, FLH30, FLH40, FLH50, FLH60, FLH80, FLH100, rated 208/240/460/480/600, 60Hz, 48A max.

Models SLH03, SLH06, SLH09, SLH15, SLH25, SLH30, SLH40, SLH50, rated 208/240/480/600, 60Hz, 48A max.

Notes:

1. Model designation may be followed by suffix letters and numbers denoting type of control, supply voltage, number of phases.
2. Installation of the equipment in the field is subject to acceptance by the local inspection authority.

**Certificate:** 2125886**Master Contract:** 238708**Project:** 70198540**Date Issued:** 2018-09-28**APPLICABLE REQUIREMENTS**

- | | |
|--|---------------|
| CSA Std C22.2 No. 104-11(4 th Ed) | - Humidifiers |
| UL Std No. 998 (5 th Ed) | - Humidifiers |

Supplement to Certificate of Compliance**Certificate:** 2125886**Master Contract:** 238708 (238708)



Certificate: 2125886
Project: 70198540

Master Contract: 238708
Date Issued: 2018-09-28

*The products listed, including the latest revision described below,
are eligible to be marked in accordance with the referenced Certificate.*

Product Certification History

Project	Date	Description
70198540	2018-09-28	Update to report 2125886 to add missing models during project # 70182230- No charge job
70182230	2018-06-28	Add new series FLH series and SLH series to report 2125886(Continuation of partially closed project 70153375)
70027120	2015-03-23	Update report 2125886 to add 230 VAC Control options.
70005960	2014-05-21	Update report 2125886 to add new model HL-27 and revise minor specifications of non critical components
2387011	2011-01-19	Update Report 2125886 to revise component model numbers and corrections as per FIR Dt. Aug 19 2010.
2125886	2009-05-21	Steam humidifiers, 3 phase, 60Hz, Models HL06, HL09, HL12, HL18, HL24, HL30, HL36, HL45 with heater 48A max..

11. Spare Parts

*)	FLP05	FLP08	FLP15	FLP25	FLP30	FLP40	FLP50	Article No.	Description
									Steam generation 208-240 V
	1							SP-08-01000	Steam cylinder FLP05 complete incl. O-ring set
	1							SP-08-01010	Steam cylinder top FLP05 complete incl. O-ring set
			1					SP-08-01040	Steam cylinder FLP15 complete incl. O-ring set
			1					SP-08-01050	Steam cylinder top FLP15 complete incl. O-ring set
					1			SP-08-01080	Steam cylinder FLP30 complete incl. O-ring set
					1			SP-08-01090	Steam cylinder top FLP30 complete incl. O-ring set
8	1		3		6			SP-07-01100	Radiator 5kg 208-240 V, incl. gaskets
									Steam generation 380-415 V
	1							SP-08-01001	Steam cylinder FLP05 complete incl. O-ring set
	1							SP-08-01011	Steam cylinder top FLP05 complete incl. O-ring set
		1						SP-08-01021	Steam cylinder FLP08 complete incl. O-ring set
		1						SP-08-01031	Steam cylinder top FLP08 complete incl. O-ring set
			1					SP-08-01041	Steam cylinder FLP15 complete incl. O-ring set
			1					SP-08-01051	Steam cylinder top FLP15 complete incl. O-ring set
					1			SP-08-01061	Steam cylinder FLP25 complete incl. O-ring set
					1			SP-08-01071	Steam cylinder top FLP25 complete incl. O-ring set
						1		SP-08-01081	Steam cylinder FLP30 complete incl. O-ring set
						1		SP-08-01091	Steam cylinder top FLP30 complete incl. O-ring set
							1	SP-08-01101	Steam cylinder FLP40 complete incl. O-ring set
							1	SP-08-01111	Steam cylinder top FLP40 complete incl. O-ring set
							1	SP-08-01121	Steam cylinder FLP50 complete incl. O-ring set
							1	SP-08-01131	Steam cylinder top FLP50 complete incl. O-ring set
8	1		3		6	3		SP-07-01101	Heating element CY17/45 5kg 380-415 V, incl. gasket
8		1		3		3	6	SP-07-01104	Heating element CY17/45 8,4kg 380-415 V, incl. gasket
									Steam generation 440-480 V
	1							SP-08-01002	Steam cylinder FLP05 complete incl. O-ring set
	1							SP-08-01012	Steam cylinder top FLP05 complete incl. O-ring set
		1						SP-08-01022	Steam cylinder FLP08 complete incl. O-ring set
		1						SP-08-01032	Steam cylinder top FLP08 complete incl. O-ring set
			1					SP-08-01042	Steam cylinder FLP15 complete incl. O-ring set
			1					SP-08-01052	Steam cylinder top FLP15 complete incl. O-ring set
					1			SP-08-01062	Steam cylinder FLP25 complete incl. O-ring set
					1			SP-08-01072	Steam cylinder top FLP25 complete incl. O-ring set
						1		SP-08-01082	Steam cylinder FLP30 complete incl. O-ring set
						1		SP-08-01092	Steam cylinder top FLP30 complete incl. O-ring set
							1	SP-08-01102	Steam cylinder FLP40 complete incl. O-ring set
							1	SP-08-01112	Steam cylinder top FLP40 complete incl. O-ring set
							1	SP-08-01122	Steam cylinder FLP50 complete incl. O-ring set
							1	SP-08-01132	Steam cylinder top FLP50 complete incl. O-ring set
8	1		3		6	3		SP-07-01102	Heating element CY17/45 5kg 440-480 V, incl. gasket
8		1		3		3	6	SP-07-01105	Heating element CY17/45 8,4kg 440-480 V, incl. gasket
									Steam generation 575-690 V
	1							SP-08-01003	Steam cylinder FLP05 complete incl. O-ring set
	1							SP-08-01013	Steam cylinder top FLP05 complete incl. O-ring set
		1						SP-08-01023	Steam cylinder FLP08 complete incl. O-ring set
		1						SP-08-01033	Steam cylinder top FLP08 complete incl. O-ring set
			1					SP-08-01043	Steam cylinder FLP15 complete incl. O-ring set
			1					SP-08-01053	Steam cylinder top FLP15 complete incl. O-ring set
					1			SP-08-01063	Steam cylinder FLP25 complete incl. O-ring set
					1			SP-08-01073	Steam cylinder top FLP25 complete incl. O-ring set
						1		SP-08-01083	Steam cylinder FLP30 complete incl. O-ring set
						1		SP-08-01093	Steam cylinder top FLP30 complete incl. O-ring set
							1	SP-08-01103	Steam cylinder FLP40 complete incl. O-ring set
							1	SP-08-01113	Steam cylinder top FLP40 complete incl. O-ring set
							1	SP-08-01123	Steam cylinder FLP50 complete incl. O-ring set
							1	SP-08-01133	Steam cylinder top FLP50 complete incl. O-ring set
8	1		3		6	3		SP-07-01103	Heating element CY17/45 5kg 575-690 V, incl. gasket
8		1		3		3	6	SP-07-01106	Heating element CY17/45 8,4kg 575-690 V, incl. gasket

Spare parts (2)

*)	FLP05	FLP08	FLP15	FLP25	FLP30	FLP40	FLP50	Article No.	Description
Steam generation general									
	1	1	1	1				AC-08-00000	O-ring set (consisting of: items 3, 6, 11, 16, 31, 33, 34)
					1	1	1	AC-08-00001	O-ring set (consisting of: items 3, 6, 11, 16, 31, 33, 34)
10	1	1	1	1	1	1	1	E-2205126	thermal switch
9					1	1	1	B-2205043	Thermal sensor with 2 connection cables of equal length
9`	1	1	1	1	1	1	1	B-2205033	Thermal sensor with 1 long and 1 short connection cable (for connection of thermal switches)
27	1	1	1	1	1	1	1	CN-07-01010	Water level sensor complete with short cable
12	1	1	1	1	1	1	1	B-2205025	Adapter for steam hose DN40 with nozzle
14					1	1	1	E-2209008	Adapter for steam hose, rear, for steam outlet DN40
15	1	1	1	1	2	2	2	E-2209002	Clip for adapter
1	1	1	1	1	1	1	1	E-2205050	cylinder base for HL without strainer basket
2	1	1	1	1	1	1	1	E-2205052	strainer basket
Water feed									
25	1	1	1	1				WF-04-00012	Double solenoid valve FLP05-25 208-240 V 0,2-10bar with mounting set
25					1	1	1	WF-06-00012	Double solenoid valve FLP30-50 208-240 V 0,2-10bar with mounting set
71	1	1	1	1	1	1	1	WF-08-01000	4-way solenoid valve FLP-TPRO 208-240 V 0,2-10bar
72	1	1	1	1	1	1	1	B-2304011	Screw connection with double check valve for FLP-TPRO
	1	1	1	1	1	1	1	WF-08-00000	Water inlet group (consisting of items: 21, 22, 23, 24, 28, 29)
	1	1	1	1	1	1	1	WF-08-01001	Water inlet group TPRO (consisting of items: 21, 22, 23, 24, 28, 29)
Water drain									
	1	1	1	1	1	1	1	B-2425009	Drain hose system incl. O-ring (consisting of items 30, 31, 36, 37, 38)
32	1	1	1	1	1	1	1	B-2404027	Drain pump without mounting set (consisting of items: 31, 32, 33)
35	1	1	1	1	1	1	1	B-2424014	Mounting kit for blowdown pump
Electrics									
Main contactor 208-240 V									
	1							E-2507040	Main contactor 20A, K1 - FLP05
			1**					E-2507060	Main contactor 35A, K1 - FLP15 **when connected to 200-240 V 3ph
			1***					E-2507080	Main contactor 65A, K1 - FLP15 ***when connected to 200-240 V 1ph
					1			E-2507080	Main contactor 65A, K1 - FLP30
					1			E-2507060	Main contactor 35A, K1.2 - FLP30
Main contactor 380-480 V									
	1	1						E-2507040	Main contactor 20A, K1 - FLP05, FLP08
			1	1				E-2507060	Main contactor 35A, K1 - FLP15, FLP25
					1			E-2507060	Main contactor 35A, K1 - FLP30
					1			E-2507040	Main contactor 20A, K1.2 - FLP30
						1		E-2507070	Main contactor 50A K1 - FLP40
						1		E-2507060	Main contactor 35A K1.2 - FLP40
							1	E-2507080	Main contactor 65A, K1 - FLP50
							1	E-2507060	Main contactor 35A K1.2 - FLP50
Main contactor 575-690 V									
	1	1						E-2507040	Main contactor 20A, K1 - FLP05, FLP08
			1	1				E-2507060	Main contactor 35A, K1 - FLP15, FLP25
					1			E-2507060	Main contactor 35A, K1 - FLP30
					1			E-2507040	Main contactor 20A, K1.2 - FLP30
						1	1	E-2507070	Main contactor 50A K1 - FLP40, FLP50
						1	1	E-2507060	Main contactor 35A K1.2 - FLP40, FLP50

Spare parts (3)

*)	FLP05	FLP08	FLP15	FLP25	FLP30	FLP40	FLP50	Article No.	Description
									Electrics
	1	1						CN-03-01000	Solid state relay for FLP05-08 208-480 V incl. heat sink & STB
			1	1	1	1	1	CN-07-01000	Solid state relays for FLP15-50 208-480 V incl. heat sink & STB
	1	1	1	1	1	2	2	WR-07-01010	Plug connector electric compartment - water compartment radiator, plug + coupling
	1	1	1	1	1	1	1	CN-07-00020	Mainboard incl. plug fine-wire fuse 2,5A
	1	1	1	1	1	1	1	CN-07-00025	Mainboard incl. plug fine-wire fuse 0.5A (for devices with control voltage transformer)
	1	1	1	1	1	1	1	CN-07-00030	Expansion board for FlexLine-TPRO
	1	1	1	1	1	1	1	CN-07-00040	Relay board
	1	1	1	1	1	1	1	CN-07-00021	FlexLine touch display
	1	1	1	1	1	1	1	E-2502412	Control switch, 2-pole, latching / non-detenting on one side, center "0"
									Accessories
70								SP-07-26000	Steam hose DN25, per m
70								SP-07-26001	Steam hose DN40, per m
57								E-2420423	Drain hose 1 1/4", per m
56								B-2304031	Hose water connection 3/4", 0,6m, flexible
								E-2604002	Condensate hose DN12, per m
								E-2404004	Steam hose clamp DN25
								E-2604016	Steam hose clamp DN40
								E-2404010	Clamp for drain hose 1 1/4"
								E-8501064	Condensate hose clamp
								E-2604042	Connectors for steam distribution T-piece DN25, stainless steel
								E-2604023	Connectors for steam distribution T-piece DN40, stainless steel
								E-2604021	Connectors for condensate T-piece DN12

*) numbers refer to exploded view

For ordering spare parts, a template can be found on the www.hygromatik.com website under the „Contact“ tab. Your spare parts order may as well be directed per e-mail to the HygroMatik main office using the address hy@hygromatik.de.

Please make sure to specify your unit model and serial number.

12. Technical specifications

208 V

Technical specifications FlexLinePlus heater (FLPxx-T)		
Technical specifications FlexLinePlus Professional heater (FLPxx-TPRO)		
Unit type	FLP05	FLP15
Steam output [lb/h]	9,0 - 9,0 - 12,1	26,9 - 26,9 - 36,6
Electrical connection ⁽¹⁾	208 - 208 - 240V /3Ph /50-60Hz	
Rated power [kW]	3,1 - 3,1 - 4,1	9,3 - 9,3 - 12,4
Nominal current [A]	14,9 - 14,9 - 17,2	25,9 - 25,9 - 29,9
Fuse [A]	3 x 20	3 x 35
Connection terminals max. [in ²]	0,2	0,4
Number of steam cylinder	1	
Control	FlexLine mainboard with capacitive 3.5" touch colour display	
Control voltage ⁽³⁾	208 - 240V 2,5A	
Steam hose connection [in]	1 x 1,0 ⁽⁵⁾	
Water consumption ⁽⁷⁾ [usgal/h]	6,6	19,92
Water flow rate ⁽⁸⁾ [usgal/min]	0,74 / 5,81	
Max. filling capacity [usgal]	4,0	
Empty weight [lb]	70,5	75,0
Operation weight [lb]	104,7	109,1
Width ⁽⁹⁾ [in]	25,6	
Height ⁽⁹⁾ [in]	33,7	
Depth ⁽⁹⁾ [in]	15,0	
Water connection ⁽¹⁰⁾	FLP: fully demineralised water / cleaned condensate / partially softened / tap water of varying qualities FLP-TPRO: RO-water / cleaned condensate 1 to 10 bar, for 3/4" external thread	
Drain water connection	Connection Ø 1 1/4"	

⁽¹⁾ Other voltages on request

⁽³⁾ Separate control voltage on request

⁽⁵⁾ Including adapter DN40/DN25

⁽⁷⁾ Maximum water consumption at 100% demand plus blow down losses.
Water consumption depends on the water quality and options installed.

⁽⁸⁾ Flow rate of the feed water during refilling or pumping out. Unit without options / maximum rate with options.

⁽⁹⁾ Outer dimensions of width and depth. Height including drain connection

SPA units (FLE05-FLE15) will be delivered with a steam hose connection of 1x1,6 inch.

Technical specifications 460 V

	Technical specifications FlexLinePlus heater (FLPxx-T)						
	Technical specifications FlexLinePlus Professional heater (FLPxx-TPRO)						
Unit type	FLP05	FLP08	FLP15	FLP25	FLP30	FLP40	FLP50
Steam output [lb/h]	10,1 - 11,0 - 12,1	17,0 - 17,6 - 20,1	30,6 - 33,1 - 36,6	50,9 - 55,1 - 60,4	61,3 - 66,1 - 73,0	81,6 - 88,2 - 97,0	96,3 - 105,4 - 114,6
Electrical connection ⁽¹⁾	440 - 460 - 480V /3Ph /50-60Hz						
Rated power [kW]	3,5 - 3,8 - 4,1	5,8 - 6,3 - 6,9	10,4 - 11,4 - 12,4	17,3 - 18,9 - 20,6	20,9 - 22,8 - 24,8	27,7 - 30,3 - 33	32,8 - 35,8 - 39
Nominal current [A]	7,9 - 8,3 - 8,6	13,1 - 13,7 - 14,3	13,7 - 14,3 - 14,9	22,7 - 23,7 - 24,8	27,4 - 28,6 - 29,9	36,4 - 38 - 39,7	43 - 45 - 46,9
Fuse [A]	3 x 16			3 x 30	3 x 35	3 x 50	
Connection terminals max. [in²]	0,2		0,4		1,4		
Number of steam cylinder	1						
Control	FlexLine mainboard with capacitive 3.5" touch colour display						
Control voltage ⁽³⁾	208 - 240V 0,5A						
Steam hose connection [in]	1 x 1,0 ⁽⁵⁾			1 x 1,6	1 x 1,6 ⁽⁶⁾	2 x 1,6	
Water consumption ⁽⁷⁾ [usgal/h]	6,6	10,92	19,92	32,88	39,72	52,8	62,4
Water flow rate ⁽⁸⁾ [usgal/min]	0,74 / 5,81				1,08 / 6,16		
Max. filling capacity [usgal]	4,0				7,9		
Empty weight [lb]	70,5		77,2		90,4		
Operation weight [lb]	104,7		111,3		157,6		
Width ⁽⁹⁾ [in]	25,6						
Height ⁽⁹⁾ [in]	33,7						
Depth ⁽⁹⁾ [in]	15,0						
Water connection ⁽¹⁰⁾	FLP: fully demineralised water / cleaned condensate / partially softened / tap water of varying qualities FLP-TPRO: RO-water / cleaned condensate 1 to 10 bar, for 3/4" external thread						
Drain water connection	Connection Ø 1 1/4"						

⁽¹⁾ Other voltages on request ⁽³⁾ Separate computer DN40/DN25 ⁽⁵⁾ Including adapter DN40/DN25 ⁽⁶⁾ Including Y-piece DN40

⁽⁷⁾ Maximum water consumption at 100% demand plus blow down losses. Water consumption depends on the water quality and options installed.

⁽⁸⁾ Flow rate of the feed water during refilling or pumping out. Unit without options / maximum rate with options.

⁽⁹⁾ Outer dimensions of width and depth. Height including drain connection

SPA units (FLE05-FLE15) will be delivered with a steam hose connection of 1x1,6 inch.

Technical specifications 600 V

	Technical specifications FlexLinePlus heater (FLPxx-T)						
	Technical specifications FlexLinePlus Professional heater (FLPxx-TPRO)						
Unit type	FLP05	FLP08	FLP15	FLP25	FLP30	FLP40	FLP50
Steam output [lb/h]	8,4 - 9,3 - 9,3	14,1 - 15,2 - 15,2	25,4 - 27,8 - 27,8	42,1 - 45,9 - 45,9	50,8 - 55,2 - 55,2	67,7 - 73,6 - 73,6	84,4 - 91,9 - 91,9
Electrical connection ⁽¹⁾	575 - 600 - 600V /3Ph /50-60Hz						
Rated power [kW]	2,9 - 3,1 - 3,1	4,8 - 5,2 - 5,2	8,7 - 9,4 - 9,4	14,3 - 15,6 - 15,6	17,3 - 18,8 - 18,8	23 - 25 - 25	28,7 - 31,2 - 31,2
Nominal current [A]	5 - 5,2 - 5,2	8,3 - 8,7 - 8,7	8,7 - 9,1 - 9,1	14,4 - 15 - 15	17,4 - 18,1 - 18,1	23,1 - 24,1 - 24,1	29,7 - 30,1 - 31
Fuse [A]	3 x 16				3 x 20	3 x 30	3 x 35
Connection terminals max. [in²]	0,2		0,4		1,4		
Number of steam cylinder	1						
Control	FlexLine mainboard with capacitive 3.5" touch colour display						
Control voltage ⁽³⁾	208 - 240V 0,5A						
Steam hose connection [in]	1 x 1,0 ⁽⁵⁾			1 x 1,6	1 x 1,6 ⁽⁶⁾	2 x 1,6	
Water consumption ⁽⁷⁾ [usgal/h]	5,04	8,28	15,12	24,96	32,88	40,08	50,04
Water flow rate ⁽⁸⁾ [usgal/min]	0,74 / 5,81				1,08 / 6,16		
Max. filling capacity [usgal]	4,0				7,9		
Empty weight [lb]	70,5		77,2		90,4		
Operation weight [lb]	104,7		111,3		157,6		
Width ⁽⁹⁾ [in]	25,6						
Height ⁽⁹⁾ [in]	33,7						
Depth ⁽⁹⁾ [in]	15,0						
Water connection ⁽¹⁰⁾	FLP: fully demineralised water / cleaned condensate / partially softened / tap water of varying qualities FLP-TPRO: RO-water / cleaned condensate 1 to 10 bar, for 3/4" external thread						
Drain water connection	Connection Ø 1 1/4"						

⁽¹⁾ Other voltages on request

⁽³⁾ Separate control voltage on request

⁽⁵⁾ Including adapter DN40/DN25

⁽⁶⁾ Incl. Y-piece DN40

⁽⁷⁾ Maximum water consumption at 100% demand plus blow down losses. Water consumption depends on the water quality and options installed.

⁽⁸⁾ Flow rate of the feed water during refilling or pumping out. Unit without options / maximum rate with options.

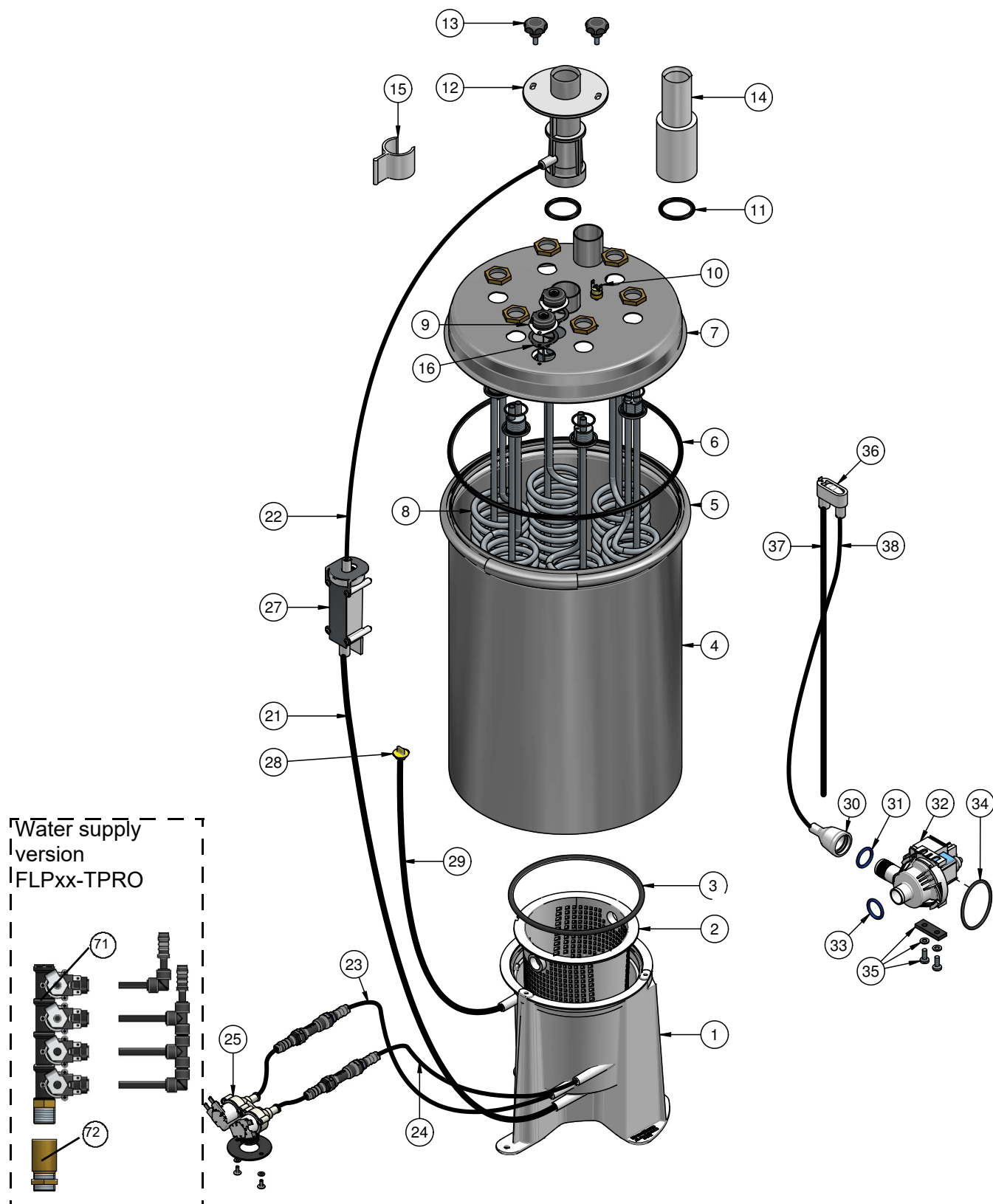
⁽⁹⁾ Outer dimensions of width and depth. Height including drain connection

SPA units (FLE05-FLE15) will be delivered with a steam hose connection of 1x1,6 inch.

13. Exploded view

The figure following shows the FLP model composition. The number of heater elements vary with respect to the complete FLP series.

The index numbers in the figure correspond to the spare parts list.



14. View of housing





HygroMATIK®

Lise-Meitner-Str.3 • D-24558 Henstedt-Ulzburg
Phone +49(0)4193/ 895-0 • Fax -33
eMail hy@hygromatik.de • www.hygromatik.com
member of **CAREL Group**