



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**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.

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.

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.

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.

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.

Regularly check that all safety and monitoring devices are functioning normally. Do not remove or disable safety devices.

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

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.

Disconnect unit components from electrical power supply prior to work.

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.

2.2 Disposal after dismantling

NOTICE

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

3. Transport

3.1 Overview

Please note

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

3.2 Packing

Please note

Pay attention to the icons affixed to the packing box.

3.3 Interim Storage

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

3.4 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.

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.

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.

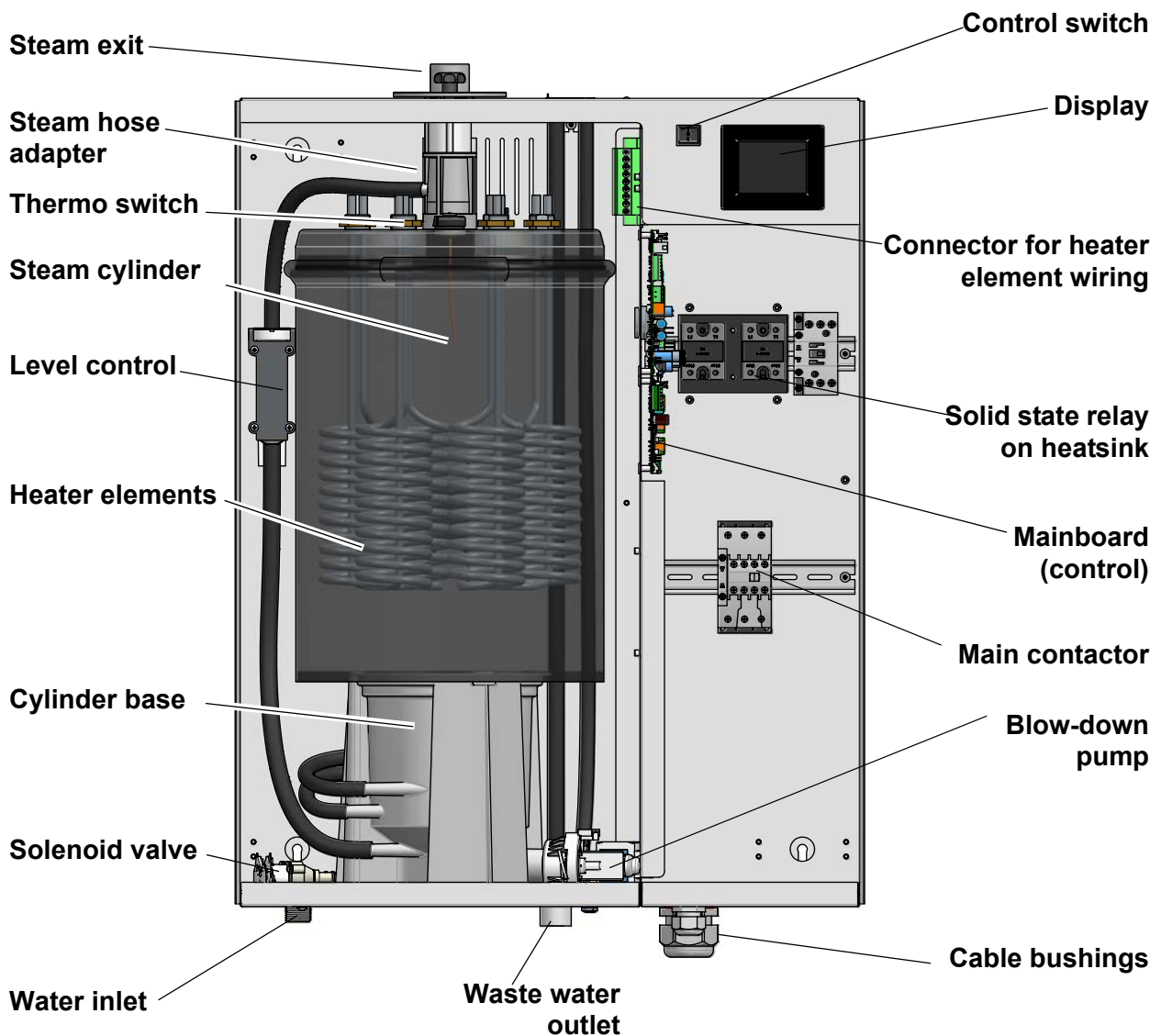
The cylinder(s) are filled with either tap water of varying quality, fully desalinated water or partially softened water.

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.

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.

5.1 Environment Parameters to be met and Mounting Recommendations

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

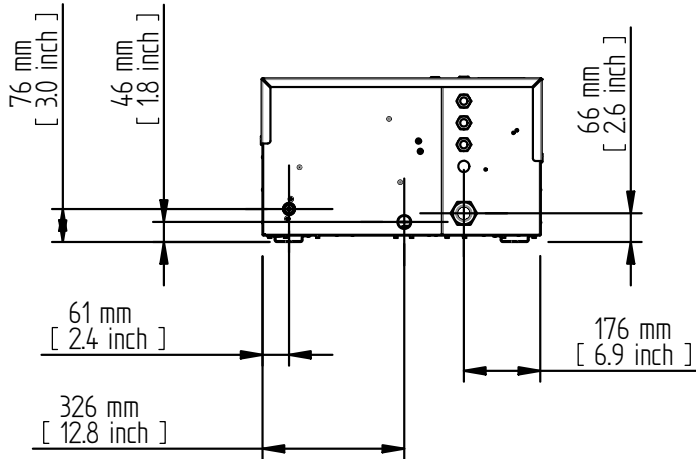
- The minimum clearances indicated in the fitting measures section must be observed in order to ensure adequate unit ventilation and allow for unobstructed access in case of maintenance
 - Protection class IP20
 - By design, HygroMatik steam humidifiers are not qualified for outdoor installation (electronical 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

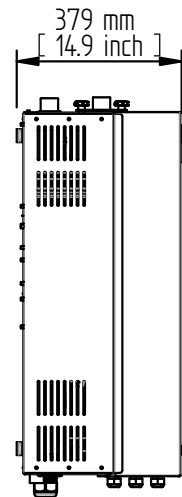
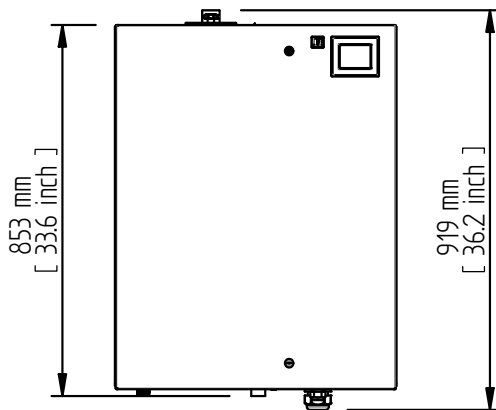
3D model under

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

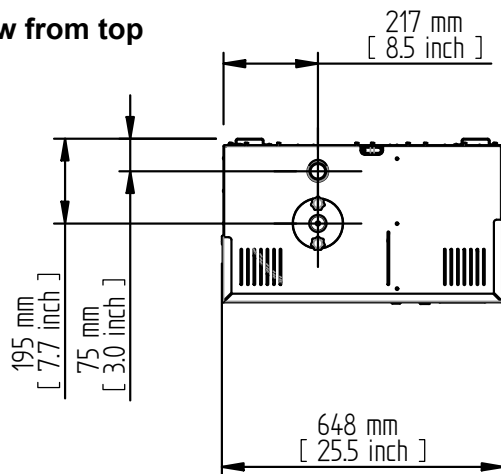
View from below



Front view

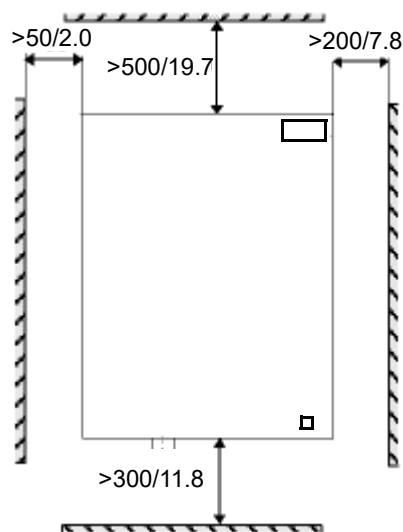


View from top



Wall clearances

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



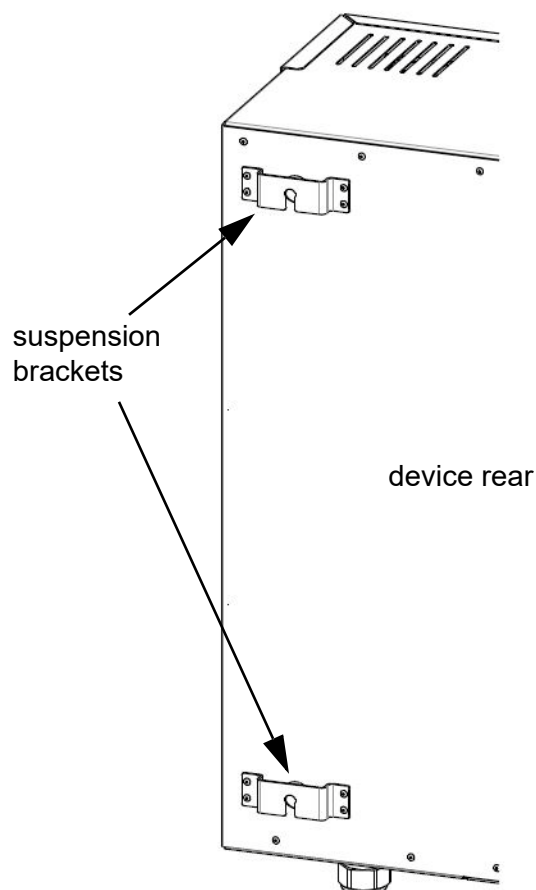
all measures in mm/inch

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.

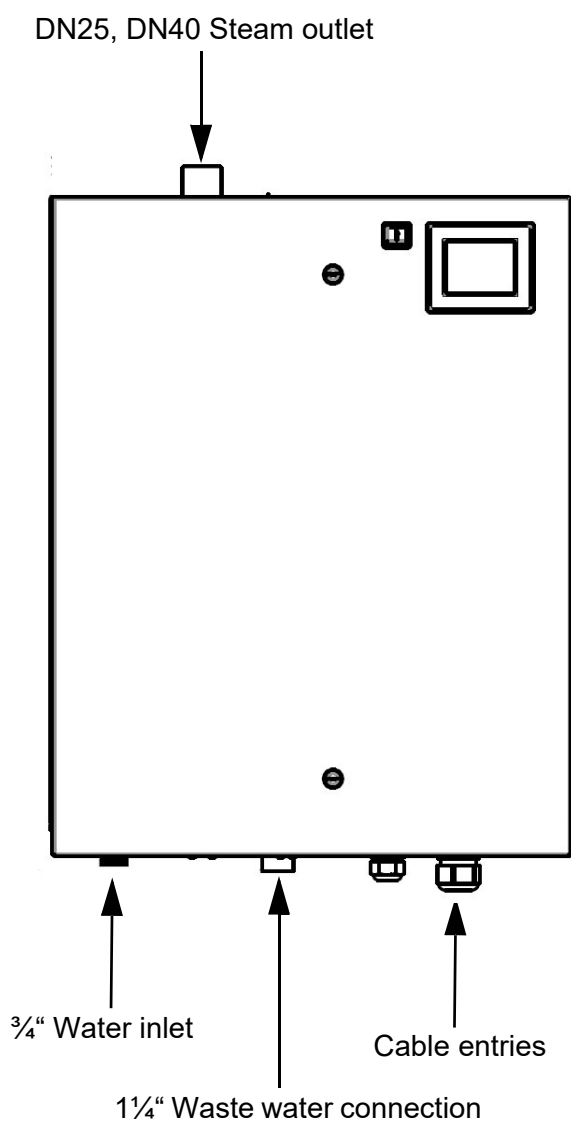
- » mark the holes for the upper suspension brackets screws
- » drill holes and dowel
- » screw in the supplied mounting screws; let the screws protrude approx. 12 mm/.5 inch from wall
- » ensure firm fixation and load-carrying capacity of the mounted screws!
- » hook in the unit and ensure safe suspension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

To function properly, the steam humidifier must hang level and plumb.

Mounting principle



Device connections:



5.2 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?

5.3 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.

5.3.1 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 m_D^o 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]

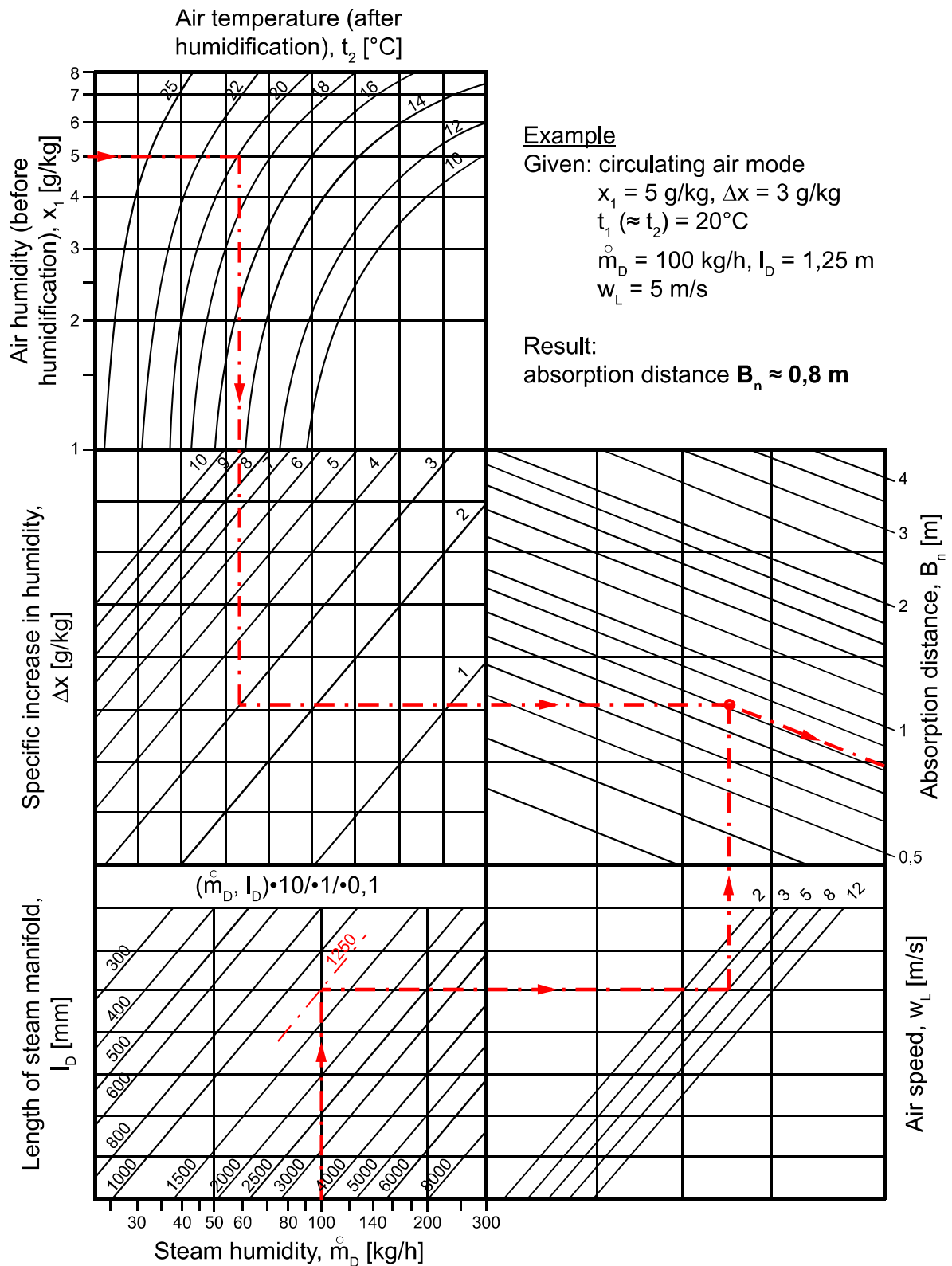
Specific increase in humidity Δx :.....[g/kg]

Quantity of steam introduced m_D^o :.....[kg/h]

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

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

5.3.2 Absorption Distance Nomogram



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

5.4 Steam Manifold

5.4.1 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
- Shown installation and positioning dimensions are based on empiric values. Special environmental conditions may require adjustments. Pay special attention to avoid condensate generation in air duct

Allowable pressures

- Max. allowable pressure in air duct is 1500 Pa/.218 PSI (exemption: SLE02 only allows 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

When increased airflow speed is encountered

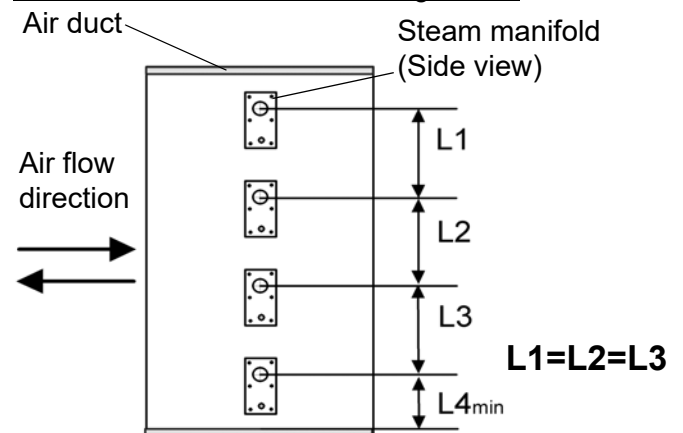
- Air flow rates beyond 3m/s (9.84 ft/s) may lead to condensate drainage problems at the steam manifolds due to vacuum built-up. A possible remedy is twisting the steam manifold in its horizontal axis by few angular degrees. In case of problems, pls. consult your expert dealer.

5.4.2 Recommendations for dimensioning

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

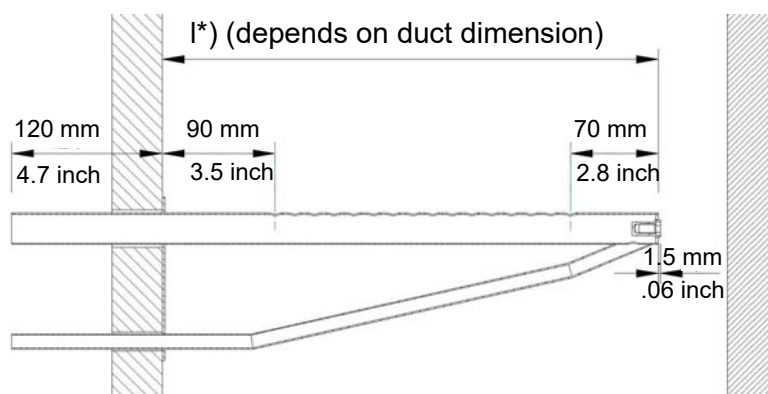
Horizontal installation of steam manifold

Standard steam manifold arrangement:

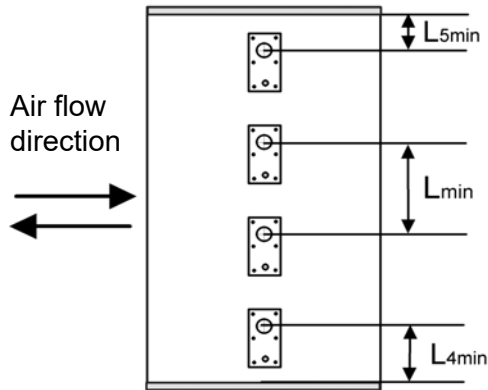


An even distribution of steam manifolds ensures a uniform steam distribution.

Please use the total height of the duct!



*) s. table of manifold lengths **Horizontal assembly position in duct**



Minimum distance for condensation avoidance:

$L_{min} = 210mm/8.3\text{ inch}$: „Steam manifold - Next steam manifold“ distance

$L_{4min} = 120mm/4.7\text{ inch}$: „Lowest steam manifold - Duct bottom plane“ distance

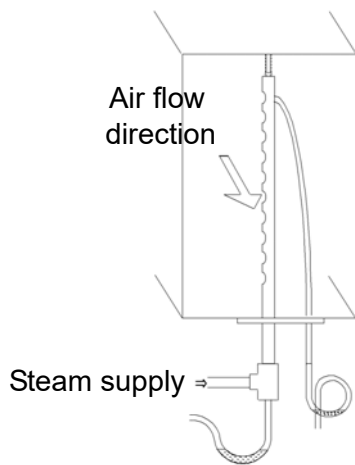
$L_{5min} = 120mm/4.7\text{ inch}$: „Highest steam manifold - Duct ceiling plane“ distance

Steam manifold arrangement for special air duct shapings

flat	steam manifold laterally staggered (with respect to air flow direction) in case of L_{min} (s. above) not to be met	<p>Air flow direction</p>																
very flat	<p>by tilting the steam manifold 30 - 45° towards the air flow direction, the minimum upper clearance can be reduced to 70 mm/2.8 inch.</p> <table border="1" data-bbox="384 1429 906 1617"> <thead> <tr> <th>Min[mm/inch]</th> <th colspan="2">H1</th> <th>H2</th> </tr> <tr> <td></td> <th>30°</th> <th>45°</th> <td></td> </tr> </thead> <tbody> <tr> <td>DN25/1"</td> <td>182/7.2</td> <td>168/6.6</td> <td>225/8.6</td> </tr> <tr> <td>DN40/1 1/2"</td> <td>193/7.6</td> <td>179/7.2</td> <td>230/9.1</td> </tr> </tbody> </table>	Min[mm/inch]	H1		H2		30°	45°		DN25/1"	182/7.2	168/6.6	225/8.6	DN40/1 1/2"	193/7.6	179/7.2	230/9.1	<p>narrow channel</p> <p>Air flow direction</p>
Min[mm/inch]	H1		H2															
	30°	45°																
DN25/1"	182/7.2	168/6.6	225/8.6															
DN40/1 1/2"	193/7.6	179/7.2	230/9.1															
narrow, high	identical lengths one on top of the other, staggered laterally if possible																	
square	identical lengths, staggered vertically and laterally																	
low, very wide	facing each other																	

Vertical steam manifold installation

Steam manifold arrangement



Horizontal installation of the steam manifolds is preferable. However, vertical installation into the air duct from below is also possible.

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

220/	400/	600/	900/	1200/	1450****/
8.7	15.7	23.6	35.4	47.2	57.1

*** Special lengths on demand.

**** will be replaced in 2019 by 1500 mm / 59,1 inch long steam distributors

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“.

5.5 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.

5.5.1 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)
- 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
- When 2 steam manifolds are in use (other than with a standard implementation), place steam Y piece as close as possible to the steam manifolds. Such, for the main part of the piping just one steam hose is required and condensate loss is minimized
- Allow easy access to the steam pipe/ steam hose installation
- Pressure conditions within the duct are influenced by device steam output, steam line layout and the duct composition itself. In some rare situations it may become necessary to optimize steam line layout for achieving the results intended
- Respect minimum bending radii:

DN 25 Steam hose: Rmin = 200 mm/8"
 DN 40 Steam hose: Rmin = 400 mm/16"

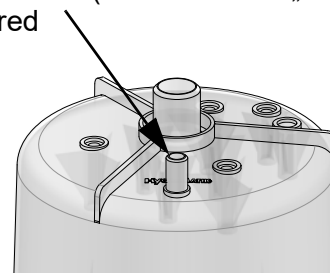
5.5.2 Condensate hose layout

The condensate hose may be run from the steam manifold back to the steam cylinder, as depicted in the schematic drawing below with concern to installation type 1. Alternatively, the condensate hose may be fed directly in a wastewater pipe or a drain (s. installation type 2).

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, section „Steam cylinder removal and reinstallation“).

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



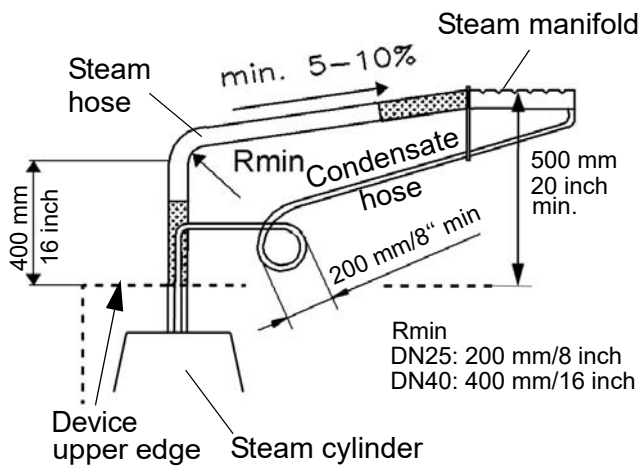
Steam cylinder top view

5.5.3 Steam line and condensate hose installation types

Installation type 1

Steam manifold is positioned more than 500 mm above device upper edge:

- » 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 incline of 5 to 10 %.
- » Feed condensate hose from steam manifold with a decline into waste-water pipe or drain.
- » As a steam barrier, lay out a 200 mm/8 inch min. loop (s. schematic representation below). Minimum distance from steam manifold to loop must be 500 mm/20 inch. Fill loop with water prior to steam humidifier commissioning.



**Installation type 1,
schematic representation**

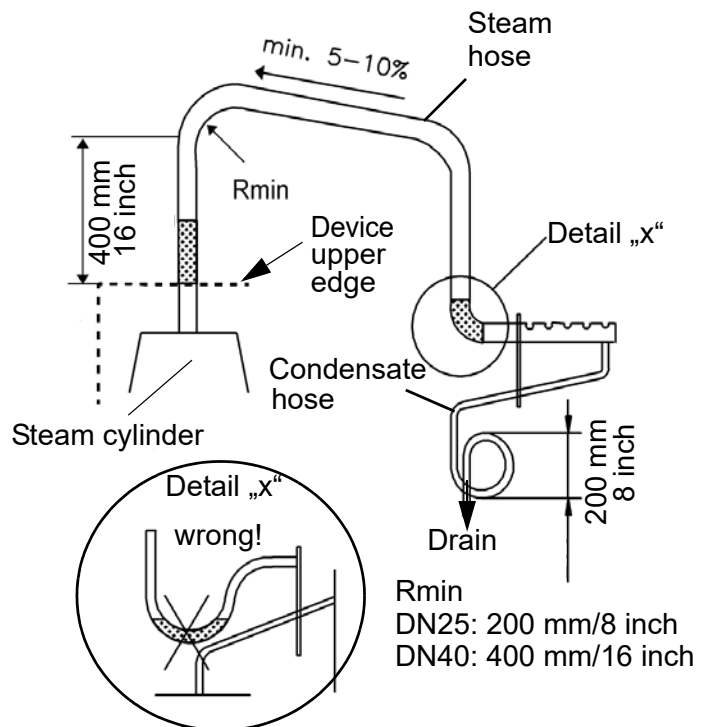
Installation type 2

Steam manifold is positioned less than 500 mm above or below device upper edge:

Please note

In this arrangement the condensate hose cannot be fed back to the steam humidifier.

- » Run steam hose to a height of 400 mm/16 mm 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.



**Installation type 2,
schematic representation**

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
- 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 104°F
- Allowable range of water pressure: 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
- min. conductivity of feedwater: $3\mu\text{S/cm}$

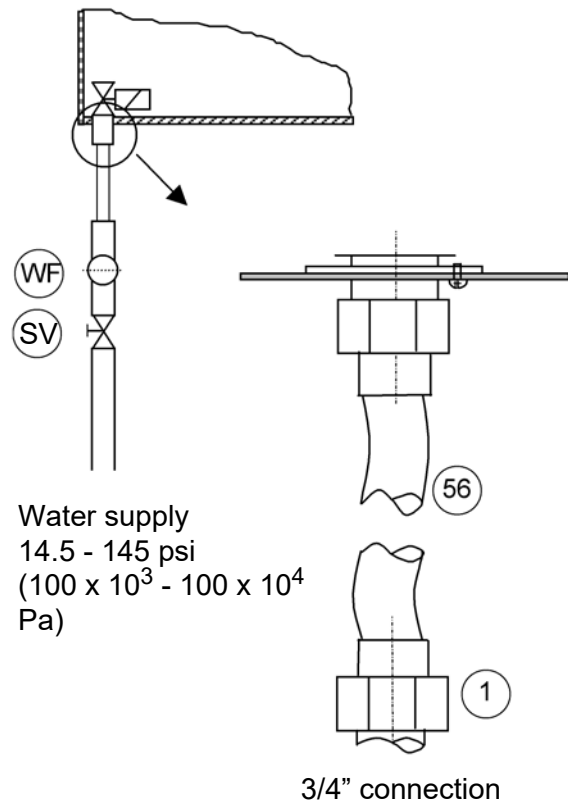
6.1 Water supply

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.

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

Strainer must be placed inside the solenoid valve.

- » Screw the other hose end cap nut with its inner seal on a customer-provided water tap (cap nut internal thread is $\frac{3}{4}$ ").

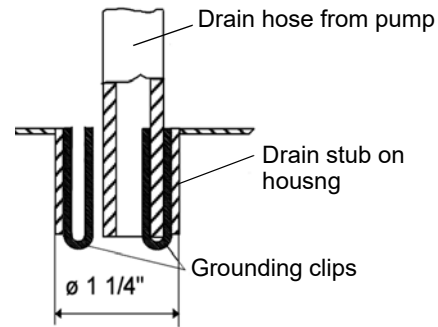
6.2 Water discharge

▲WARNING

Risk of scalding!

During blow down, up to .08 gal./sec are being drained with a temperature of about 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 flexible water hose
- Do not buckle drain hose
- Discharge line and drain pipe material must be temperature resistant up to 203 °F

How to proceed

- » Run a 1 1/4 " drain hose of 10 to 40 inch length into a pressure-free outlet (DIN EN 1717 is a good design reference). The hose must be guided sideways of the humidifier to prevent ascending vapor from condensing on the humidifier's housing.
- » Fit drain hose to connection stub on humidifier housing bottom side.
- » Slide pump drain hose onto one of the grounding clips (s. fig. below).
- » 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 and rinse processes, wastewater temperature is below 140 °F as long as inlet water temperature does not exceed 86 °F.

6.3 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

Danger of electric shock!

Dangerous electric voltage!

All work relating to the electrical installation may only be carried out by designated specialist personnel (electrician or qualified person with equivalent training).

Please note

The customer is responsible for monitoring the qualifications of the specialist personnel.

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

NOTICE

Potential component damage due to electrostatic discharge!

To protect the sensitive electronic components, measures to prevent damage due to electrostatic discharge must be taken before the start of the installation work.

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 .12 inch (3 mm) 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 connections, current draw and fusing

The table on the next page shows the respective values relevant for the various models of the FLP steam humidifier series.

Please note

HygroMatik recommends the use of slow blowing up to middle time-lag main fuses (only applies to the a.m. mains supply voltage).

Steam humidifier installations should incorporate an individual resilient current circuit breaker.

Model	Voltage [VAC]		Phases	Output [lbs/h]		Output [kg/h]		No. of cylinders	No. of heating elements	per cylinder					
	50...60Hz			from to		from to				Power [kW]		Nominal Current [A]		On-site fusing	
	from	to		from	to	from	to			from	to	from	to	Qty.	Rating [A]
FLP05	208	240	1	9.0	12.1	4.1	5.5	1	1	3.1	4.1	14.9	17.2	1	20
	208	240		9.0	12.1	4.1	5.5			3.1	4.1	14.9	17.2	3	20
	440	480	3	10.1	12.1	4.6	5.5			3.5	4.1	7.9	8.6	3	15
	575	600		8.4	9.2	3.8	4.2			2.9	3.1	5.0	5.2	3	15
FLP08	440	480	3	16.9	20.0	7.7	9.1	1	1	5.8	6.9	13.1	14.3	3	15
	575	600		14.1	15.2	6.4	6.9			4.8	5.2	8.3	8.7	3	15
FLP15	208	220	1	27.3	30.7	12.4	13.9	1	3	9.3	10.4	44.8	47.4	3	50
	208	240		27.3	36.5	12.4	16.6			9.3	12.4	25.9	29.9	3	35
	440	480	3	30.6	36.5	13.9	16.6			10.4	12.4	13.7	14.9	3	20
	575	600		25.3	27.7	11.5	12.6			8.7	9.4	8.7	9.1	3	15
FLP25	440	480	3	50.8	60.3	23.1	27.4	1	3	17.3	20.6	22.7	24.8	3	30
	575	600		42.0	45.8	19.1	20.8			14.3	15.6	14.4	15.0	3	20
FLP30	440	480	3	61.2	72.8	27.8	33.1	1	6	20.9	24.8	27.4	29.9	3	35
	575	600		50.8	55.2	23.1	25.1			17.3	18.8	17.4	18.1	3	20
FLP40	440	480	3	81.4	96.8	37.0	44.0	1	6	27.7	33.0	36.4	39.7	3	50
	575	600		67.5	73.5	30.7	33.4			23.0	25.0	23.1	24.1	3	35
FLP50	440	480	3	96.1	114.4	43.7	52.0	1	6	32.8	39.0	43.0	46.9	3	50
	575	600		86.9	94.6	39.5	43.0			29.6	32.2	29.7	31.0	3	40

Table of FLP series main connection, current draw and fusing data

7.2 Cable Connections

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

Model	M25	M25 MSI ^{*)}	M40	Blind plug ^{**)}
FLP05/08	1	1	0	3
FLP15/25	1	1	0	3
FLP30/40/ FLP50	0	1	1	3

^{*)} MSI = 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/~ .35 - .67
M25 MSI ^{*)}	30/~ 1.2	6 (3x)/~ .24 (3x)
M32x1.5	36/~ 1.4	13 - 21/~ .51 - .83
M40x1.5	46/~ 1.6	16 - 28/~ .63 - 1.1

7.3 Connection of interlock (safety) system

⚠ WARNING

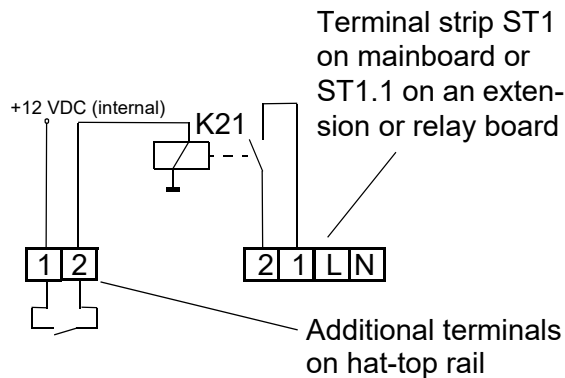
Danger of electric shock!

Dangerous electric voltage!

After the commissioning of the unit, a 230 VAC voltage is present at terminal 1 when standard wiring is used.

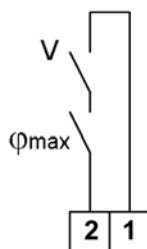
The so-called interlock (safety) system is located between terminals 1 and 2 with terminal 1 holding 230 VAC. For closing the interlock, a make contact is required across terminals 1 and 2. This contact is supplied by relay K21. For energising the relay, a make contact or a bridge is required across the additional terminals on the hat-top rail.

If the interlock (safety) system is open, the humidifier does not start or the operation is interrupted.



Terminals 1/2 for connection of the interlock (safety) system made accessible via relay K21

Safety equipment can be wired (also in series) into the interlock (safety) system, as shown in the fig. below:



Please note

The interlock (safety) system is not closed when delivered ex-factory!

In air conditioning, it is standard to incorporate a max. hygostat in the interlock (safety) system. The max. hygostat is used as a safety feature in case of a malfunction of the humidity sensor.

7.4 Full wiring diagrams

Pls. find the full wiring diagrams in the respective FlexLine Control Manual:

For climate applications:

FlexLine Control Climate, chapter 7, „Wiring diagrams“

For SPA applications:

FlexLine SPA Control , chapter 8, „Wiring diagrams“

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 of relay K21?
- Supply voltage in accordance with name plate voltage rating?
- All electrical connections made according to the wiring diagram?
- R.h. sensor properly connected with respect to signal type and range (Climate applications only making use of a r.h. sensor)?
- Temperature sensor properly connected (SPA applications only)?
- 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.

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.
- „*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.

9.1.2 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 commissioning	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.

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 Removing and cleaning the steam cylinder

*) the numbers in parenthesis relate to the exploded view drawing in the exploded view section (this is also true for the following sections).

Steam cylinder removal

- » Close off water supply.
- » Drain steam cylinder (9) by setting main switch to Pos II.
- » Disconnect power supply and secure against restart (switch off control switch, remove main fuse and control fuse F1).
- » Verify absence of electric current.
- » Remove unit cover
- » Separate transfer connector halves
- » Twist and remove star screw on the steam hose adapter.
- » Remove clip on the steam hose adapter (2).
- » Push the steam hose adapter up out of the cabinet and secure with the clip.
- » Undo clamping belt.

▲ WARNING

Risk of skin burning!

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

-
- » Lift steam cylinder (9) out of the base (11).

NOTICE

Risk of material damage!

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

Reinstallation

- » Remove cylinder base o-ring (13) and check o-ring seating in cylinder base for deposits.
- » In case of deposits present, clean seating as described in the „Cleaning of cylinder base and strainer“ section.
- » Check o-ring for damage and replace, if required (replacement is generally recommended).
- » Moisten o-ring in insert into cylinder base.
- » Remove o-ring (4) from steam hose adaptor.
- » Moisten new o-ring and insert into steam hose adaptor.
- » Push steam cylinder back into base with a gentle twisting motion.

Please note

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

- » 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.
- » Reconnect transfer connector halves for heater element wiring
- » Switch circuit breakers back on
- » Perform leakage check procedure according to section 9.4.1.

9.4.1 Perform leakage check

▲ WARNING

Risk of electrical shock!

Hazardous electrical voltage!
Follow safety instructions for work on live components.
Leakages may invoke leak currents.

The leakage check procedure outlined hereafter must be carried out following all maintenance work relating to the water circuit within the unit. When work has been done in several areas, a final leakage check is sufficient though this step is part of all of the relevant particular partial work.

The leakage check procedure must be run with the housing cover detached and with special regard to the warning given above.

- » Open water supply.
- » Let unit run for 15 to 30 mins, then check inner housing for leakages (hose connections, o-rings, seals and gaskets).
- » In case of leakage turn off power supply and secure against being switched on again.
- » Find leakage and eliminate.
- » Repeat leakage check until no further water exit is detected.

9.5 Cylinder base and strainer cleaning

- » Remove steam cylinder as described in section 9.4.
- » Remove cylinder base o-ring (13)
- » 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.
- » Thoroughly clean o-ring seating in cylinder base. No calcium residue must remain on the seating.
- » Reinstall steam cylinder as described in section 9.4.

9.6 Steam cylinder and heater element cleaning

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.

- » Open cylinder clamping ring (7) and lift off cover (5) with heater elements (8).
- » Remove o-ring (15) and check. HygroMatik recommends the replacement of the o-ring (15) between cylinder (9) and cylinder cover (5) when reassembling the cylinder
- » Remove all deposits. Small amounts of scale deposits on the heater element(s) (8), however, are harmless.

NOTICE**Risk of material damage!**

Excessive force when cleaning the cylinder or the heater element(s) may harm these device parts.

- » 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 (5).
- » Replace cylinder cover (5).
- » Replace clamping ring (7) and close

▲ WARNING**Risk of pinching fingers!**

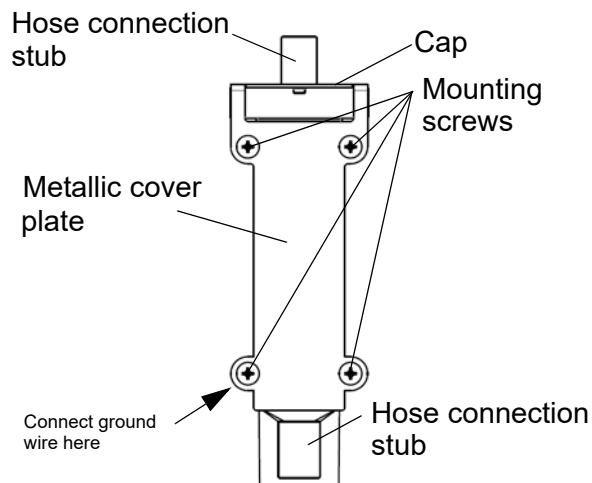
To avoid harming fingers during closing of the clamping ring, make sure that your fingers are not in the closing range.

9.7 Cleaning Connection Hoses, Cylinder Base Connections, Steam Hose Adapter Nozzle

Within the regular maintenance frame, all connection hoses should be checked for freedom of deposits and good overall condition. Also, all of the cylinder base (11) connections should be checked for free passage and cleaned, if necessary.

When operating with partially softened water or tap water, scale may be discharged with the steam flow and may settle in the nozzle (3) positioned in steam hose adapter. Therefore, this nozzle should be inspected regularly as part of the general maintenance review and cleaned if necessary.

9.8 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!

9.9 Heater element replacement

Removal

- » Remove and open steam cylinder as described in the „Removing and cleaning the steam cylinder“ section (section 9.4).
- » Open cylinder clamping belt (6) and lift-off cover (7) with heater elements (8).
- » 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 reclamping).
- » 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 „Removing and cleaning the steam cylinder“ section.

9.10 Releasing the thermal safety devices

9.10.1 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.

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 (see sections 9.10.2 and 9.10.3) 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.

9.10.2 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 (see fig. in section 9.11) protruding a few millimeters from its holder. This will make the button return to its original position and unlock the mechanism.

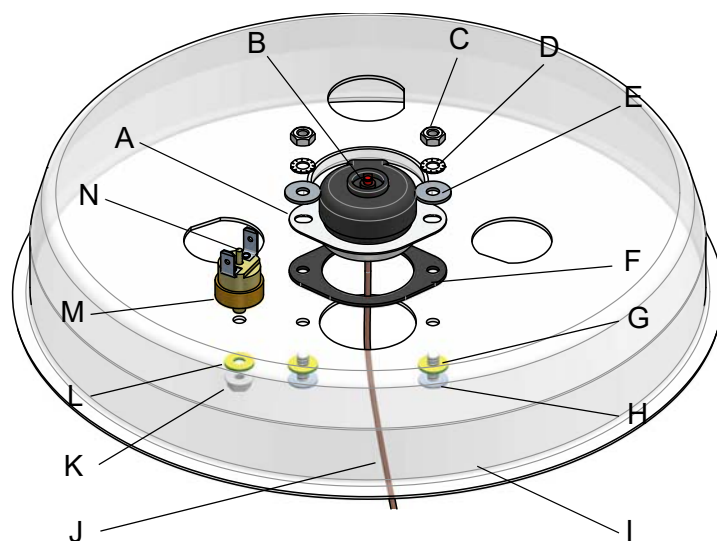
Relasing a thermo switch does not erase the fault message in the control fault memory.

9.10.3 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 (see fig. in section 9.11).

9.11 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

Removal

- » Remove and open the steam cylinder as described in "Removing and cleaning 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.

NOTICE**Risk of material damage!**

Do not buckle the thermo switch capillary tube!

Reinstallation

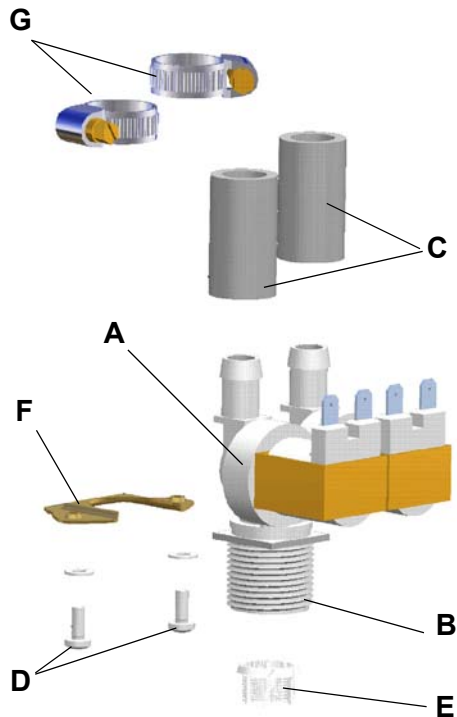
- » Install replacement thermo switch with a new sealing while feeding the capillary tube cautiously through the cylinder cover hole.
- » Insert M4x10 flange screws (2 pcs.) with new flat seal into cover holes from below.
- » Attach washers (E) and lock washers (D), screw on M4 nuts (C) and fasten lightly.
- » 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.
- » Reassemble steam cylinder and reinstall in humidifier housing as described in the „Removing and cleaning the steam cylinder“ section.

9.12 Inspection of wiring connections and heater element wiring**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

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



Twin solenoid valve (FLPxx-T)

Removal

- » Close off water supply.
- » Drain steam cylinder (9) by setting main switch to Pos II.
- » Disconnect power supply and secure against restart.
- » Verify absence of electric current.
- » Remove steam cylinder as described in section 9.4.
- » 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.

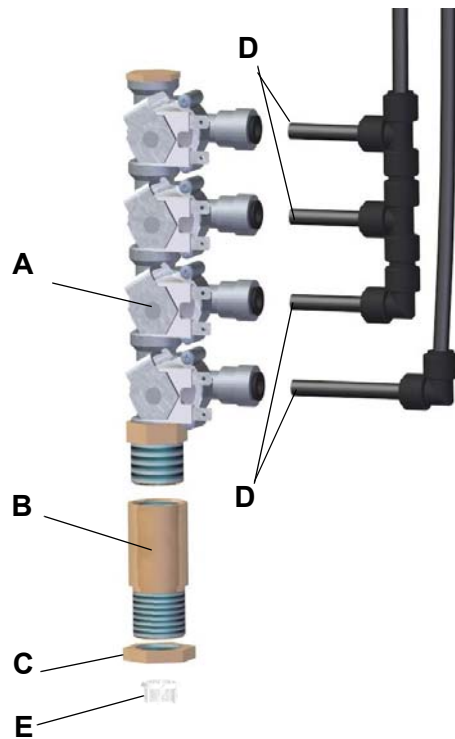
Fine filter cleaning

- » Remove fine filter from twin 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 as described in section 9.4.1.
- » Reattach supply water hose to supply water connection (B).
- » Perform leakage check procedure according to section 9.4.1.

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



Quadruple solenoid valve (FLPxx-TPRO)

Removal

- » Close off water supply.
- » Drain steam cylinder (9) by setting main switch to Pos II.
- » Disconnect power supply and secure against restart.
- » Verify absence of electric current.
- » Unscrew supply water hose coupling nut from supply water connection (B).
- » Remove steam cylinder as described in section 9.4.
- » 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 quadruple solenoid valve tap water connection side and clean under running water.
- » Reinsert fine filter into quadruple solenoid valve.

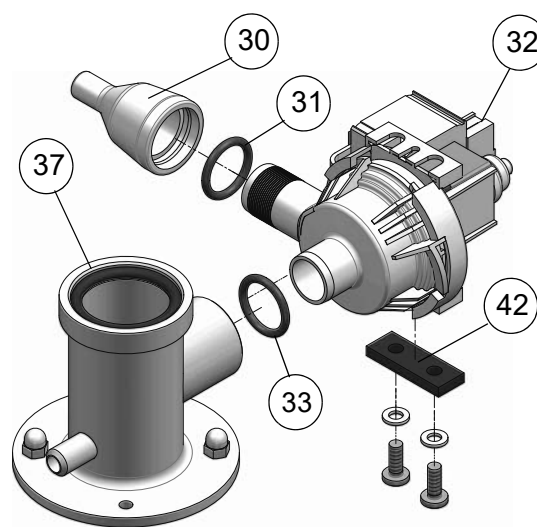
Reinstallation

- » 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.
- » Reinstall steam cylinder as described in section 9.4.1.
- » Reattach supply water hose to supply water connection (B).
- » Perform leakage check procedure according to section 9.4.1.

9.15 Cleaning of blow-down pump

Removal and cleaning

- » Remove steam cylinder as described in „Removal and reinstallation of 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).



Blow-down pump

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).
- » Open water supply
- » Perform leakage check according to section 9.4.1

^{*)} numbers refer to the exploded view in the section of the same name

9.16 Inspection of hoses

Since steam and condensate hoses are prone to wear as well, those hoses should undergo regular checks as well.

9.17 Functional check

- » Run the system with maximum output for a couple of minutes
- » Check all safety devices.
- » Perform leakage check procedure

9.18 Completion of maintenance

- » Remount unit cover.
- » Reset the service interval by using the parameter "Reset_cyl. 1" (see operating instructions FlexLine Controls ", submenu "Service").

In doing so the steam counter contains again the preset value after which next maintenance is required

10. Dismantling

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

▲ WARNING

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

Please note

Obey the safety guidelines in section “Safety Instructions,” especially the guidelines for disposal.

11. 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, SLH 30, 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
Project: 70198540

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

APPLICABLE REQUIREMENTS

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

12. Spare Parts

FLP05	FLP08	FLP15	FLP25	FLP30	FLP40	FLP50	Article No.	Description
Steam generation 220-240V								
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
1		3		6			SP-07-01100	Radiator 5kg 220-240V, incl. gaskets
Steam generation 380-415V								
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
1		3		6	3		SP-07-01101	Heating element CY17/45 5kg 380-415V, incl. gasket
	1		3		3	6	SP-07-01104	Heating element CY17/45 8,4kg 380-415V, incl. gasket
Steam generation 440-480V								
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
1		3		6	3		SP-07-01102	Heating element CY17/45 5kg 440-480V, incl. gasket
	1		3		3	6	SP-07-01105	Heating element CY17/45 8,4kg 440-480V, incl. gasket
Steam generation 600-690V								
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
1		3		6	3		SP-07-01103	Heating element CY17/45 5kg 600-690V, incl. gasket
	1		3		3	6	SP-07-01106	Heating element CY17/45 8,4kg 600-690V, incl. gasket
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)
1	1	1	1	1	1	1	E-2205126	thermal switch
				1	1	1	B-2205043	Thermal sensor with 2 connection cables of equal length
1	1	1	1	1	1	1	B-2205033	Thermal sensor with 1 long and 1 short connection cable (for
1	1	1	1	1	1	1	CN-07-01010	Water level sensor complete with short cable
1	1	1	1	1	1	1	B-2205025	Adapter for steam hose DN40 with nozzle
				1	1	1	E-2209008	Adapter for steam hose, rear, for steam outlet DN40
1	1	1	1	1	2	2	E-2209002	Clip for adapter
1	1	1	1	1	1	1	E-2205050	cylinder base for HL without strainer basket
1	1	1	1	1	1	1	E-2205052	strainer basket

FLP05	FLP08	FLP15	FLP25	FLP30	FLP40	FLP50	Article No.	Description
Water feed								
1	1	1	1				WF-04-00012	Double solenoid valve FLP05-25 220-240V 0,2-10bar w ith
				1	1	1	WF-06-00012	Double solenoid valve FLP30-50 220-240V 0,2-10bar w ith
1	1	1	1	1	1	1	B-2304131	4-w ay solenoid valve FLP-TPRO 220-240V 0,2-10bar
1	1	1	1	1	1	1	B-2304011	Screw connection w ith double check valve for FLP-TPRO
1	1	1	1	1	1	1	WF-08-01001	Water inlet group (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,
1	1	1	1	1	1	1	B-2404027	Drain pump w ithout mounting set (consisting of items: 31, 32, 33)
1	1	1	1	1	1	1	B-2424014	Mounting kit for blow down pump
Electrics								
Main contactor 200-240 V								
1							E-2507040	Main contactor 20A, K1.1 - FLP05
		1**)					E-2507060	Main contactor 35A, K1.1 - **) w hen connected to 200-240 V
		1***)					E-2507080	Main contactor 65A, K1.1 - ***) w hen connected to 200-240 V
				1			E-2507080	Main contactor 65A, K1.1 - FLP30
				1			E-2507060	Main contactor 35A, K1.2 - FLP30
Main contactor 380-415 V								
1	1						E-2507040	Main contactor 20A, K1.1 - FLP05, FLP08
		1	1				E-2507060	Main contactor 35A, K1.1 - FLP15, FLP25
				1			E-2507060	Main contactor 35A, K1.1 - FLP30
				1			E-2507040	Main contactor 20A, K1.2 - FLP30
					1		E-2507070	Main contactor 50A K1.1 - FLP40
					1		E-2507060	Main contactor 35A K1.2 - FLP40
						1	E-2507080	Main contactor 65A, K1.1 - FLP50
						1	E-2507060	Main contactor 35A K1.2 - FLP50
Main contactor 440-690 V								
1	1						E-2507040	Main contactor 20A, K1.1 - FLP05, FLP08
		1	1				E-2507060	Main contactor 35A, K1.1 - FLP15, FLP25
				1			E-2507060	Main contactor 35A, K1.1 - FLP30
				1			E-2507040	Main contactor 20A, K1.2 - FLP30
					1	1	E-2507070	Main contactor 50A K1.1 - FLP40, FLP50
					1	1	E-2507060	Main contactor 35A K1.2 - FLP40, FLP50
Electrics								
1	1						CN-03-01000	Solid state relays for FLP05-08 incl. heat sink and STB
		1	1	1	1	1	CN-07-01000	Solid state relays for FLP15-50 incl. heat sink and STB
1	1						WR-03-01010	Plug connector electric compartment - w ater compartment
		1	1	1	2	2	WR-07-01010	Plug connector electric compartment - w ater compartment
1	1	1	1	1	1	1	CN-07-00020	Mainboard incl. plug fine-w ire fuse 2,5A
1	1	1	1	1	1	1	CN-07-00025	Mainboard incl. plug fine-w ire fuse 0.5A (for devices w ith
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 sw itch, 2-pole, latching / non-detenting on one side,
Accessories								
							E-2604012	Steam hose DN25, per m
							E-2604013	Steam hose DN40, per m
							E-2420423	Drain hose 1 1/4", per m
							B-2304031	Hose w ater 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.hygroamatik.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@hygroamatik.de.

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

13. Technical specifications

Technical specifications FlexLinePlus Heater (FLPxx-T)																						
Technical specification FlexLine Process Heater (FLPxx-TPRO)																						
Model	Voltage [VAC] 50...60Hz ⁽¹⁾		Phases		Output [lbs/h]		Output [kg/h]		No. of cylinders	No. of heating elements	Power [kW]		Nominal Current [A]		On-site fusing Qty. Rating [A]	Steam hose connection [mm/inch]	Empty weight [kg/lbs]	Operational weight [kg/lbs]	Unit size ⁽⁴⁾		Water installation	
	from	to	from	to	from	to	from	to			from	to	from	to					Height [mm/inch]	Width [mm/inch]		Depth [mm/inch]
FLP05	208	240	1	9.0	12.1	4.1	5.5	3.1	4.1	14.9	17.2	1	20	1	1	1 x 40/1 1/2 ⁽²⁾	32 / 70.6	47 / 103.6	855 / 33.7	650 / 25.6	380 / 14.7	FlexLinePlus: Fully demineralized water / cleaned condensate / partially softened Water / tap water (different qualities) 14.5 to 145 psi, with 3/4" connection for external thread FlexLinePlus Professional: Fully demineralized water / cleaned condensate 14.5 to 145 psi 3/4" external thread
	208	240	3	9.0	12.1	4.1	5.5	3.1	4.1	14.9	17.2	3	20									
	440	480	3	10.1	12.1	4.6	5.5	3.5	4.1	7.9	8.6	3	15									
FLP08	575	600	3	8.4	9.2	3.8	4.2	2.9	3.1	5.0	5.2	3	15	1	1	1 x 40/1 1/2 ⁽²⁾	35 / 77.2	50 / 110.2	855 / 33.7	650 / 25.6	380 / 14.7	FlexLinePlus: Fully demineralized water / cleaned condensate / partially softened Water / tap water (different qualities) 14.5 to 145 psi, with 3/4" connection for external thread FlexLinePlus Professional: Fully demineralized water / cleaned condensate 14.5 to 145 psi 3/4" external thread
	440	480	3	16.9	20.0	7.7	9.1	5.8	6.9	13.1	14.3	3	15									
	575	600	3	14.1	15.2	6.4	6.9	4.8	5.2	8.3	8.7	3	15									
FLP15	208	240	1	27.3	30.7	12.4	13.9	9.3	10.4	44.8	47.4	3	50	1	1	1 x 40/1 1/2	35 / 77.2	50 / 110.2	855 / 33.7	650 / 25.6	380 / 14.7	FlexLinePlus: Fully demineralized water / cleaned condensate / partially softened Water / tap water (different qualities) 14.5 to 145 psi, with 3/4" connection for external thread FlexLinePlus Professional: Fully demineralized water / cleaned condensate 14.5 to 145 psi 3/4" external thread
	208	240	3	27.3	36.5	12.4	16.6	9.3	12.4	25.9	29.9	3	35									
	440	480	3	30.6	36.5	13.9	16.6	10.4	12.4	13.7	14.9	3	20									
FLP25	575	600	3	25.3	27.7	11.5	12.6	8.7	9.4	8.7	9.1	3	15	1	1	1 x 40/1 1/2	35 / 77.2	50 / 110.2	855 / 33.7	650 / 25.6	380 / 14.7	FlexLinePlus: Fully demineralized water / cleaned condensate / partially softened Water / tap water (different qualities) 14.5 to 145 psi, with 3/4" connection for external thread FlexLinePlus Professional: Fully demineralized water / cleaned condensate 14.5 to 145 psi 3/4" external thread
	440	480	3	50.8	60.3	23.1	27.4	17.3	20.6	22.7	24.8	3	30									
	575	600	3	42.0	45.8	19.1	20.8	14.3	15.6	14.4	15.0	3	20									
FLP30	440	480	3	61.2	72.8	27.8	33.1	20.9	24.8	27.4	29.9	3	35	1	1	2 x 40/1 1/2 ⁽³⁾	41 / 90.4	71 / 156.5	855 / 33.7	650 / 25.6	380 / 14.7	FlexLinePlus: Fully demineralized water / cleaned condensate / partially softened Water / tap water (different qualities) 14.5 to 145 psi, with 3/4" connection for external thread FlexLinePlus Professional: Fully demineralized water / cleaned condensate 14.5 to 145 psi 3/4" external thread
	575	600	3	50.8	55.2	23.1	25.1	17.3	18.8	17.4	18.1	3	20									
	440	480	3	81.4	96.8	37.0	44.0	27.7	33.0	36.4	39.7	3	50									
FLP40	575	600	3	67.5	73.5	30.7	33.4	23.0	25.0	23.1	24.1	3	35	1	1	2 x 40/1 1/2	41 / 90.4	71 / 156.5	855 / 33.7	650 / 25.6	380 / 14.7	FlexLinePlus: Fully demineralized water / cleaned condensate / partially softened Water / tap water (different qualities) 14.5 to 145 psi, with 3/4" connection for external thread FlexLinePlus Professional: Fully demineralized water / cleaned condensate 14.5 to 145 psi 3/4" external thread
	440	480	3	96.1	114.4	43.7	52.0	32.8	39.0	43.0	46.9	3	50									
	575	600	3	86.9	94.6	39.5	43.0	29.6	32.2	29.7	31.0	3	40									

(1) Other voltages upon request.

(2) Reducer DN40/DN25 included.

(3) Incl. Y-piece DN40.

(4) External width and depth dimensions. Height including drainage nozzles.

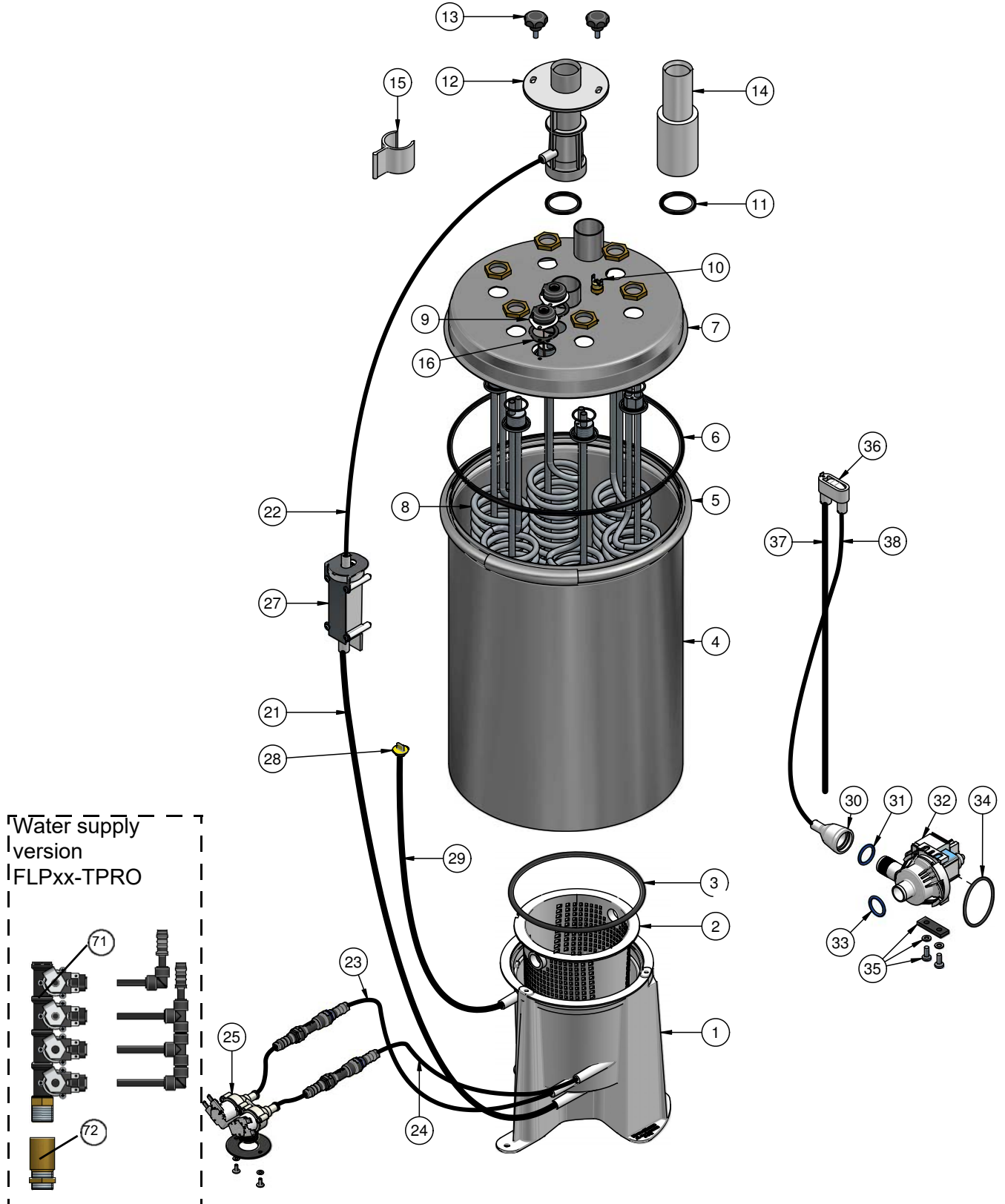
Technical specifications FlexLinePlus Heater (FLPx-x-TSPA)																						
Model	Voltage [VAC] 50...60Hz ⁽¹⁾		Phases		Output [lbs/h]		Output [kg/h]		No. of cylinders	No. of heating elements	Power [kW]		Nominal Current [A]		On-site fusing Qty. Rating [A]	Steam hose connection [mm/inch]	Empty weight [kg/lbs]	Operational weight [kg/lbs]	Unit size ⁽⁴⁾		Water installation	
	from	to	from	to	from	to	from	to			from	to	Height [mm/inch]	Width [mm/inch]					Depth [mm/inch]			
FLP05	208	240	1	9.0	12.1	4.1	5.5	3.1	4.1	14.9	17.2	1	20	1	1	1 x 40/1 1/2 ⁽²⁾	32 / 70.6	47 / 103.6	855 / 33.7	650 / 25.6	380 / 14.7	FlexLinePlus: Fully demineralized water / cleaned condensate / partially softened Water / tap water (different qualities) 14.5 to 145 psi, with 3/4" connection for external thread FlexLinePlus Professional: Fully demineralized water / cleaned condensate 14.5 to 145 psi 3/4" external thread
	208	240	3	9.0	12.1	4.1	5.5	3.1	4.1	14.9	17.2	3	20									
	440	480	3	10.1	12.1	4.6	5.5	3.5	4.1	7.9	8.6	3	15									
FLP08	575	600	3	8.4	9.2	3.8	4.2	2.9	3.1	5.0	5.2	3	15	1	1	1 x 40/1 1/2 ⁽²⁾	35 / 77.2	50 / 110.2	855 / 33.7	650 / 25.6	380 / 14.7	FlexLinePlus: Fully demineralized water / cleaned condensate / partially softened Water / tap water (different qualities) 14.5 to 145 psi, with 3/4" connection for external thread FlexLinePlus Professional: Fully demineralized water / cleaned condensate 14.5 to 145 psi 3/4" external thread
	440	480	3	16.9	20.0	7.7	9.1	5.8	6.9	13.1	14.3	3	15									
	575	600	3	14.1	15.2	6.4	6.9	4.8	5.2	8.3	8.7	3	15									
FLP15	208	240	1	27.3	30.7	12.4	13.9	9.3	10.4	44.8	47.4	3	50	1	3	1 x 40/1 1/2	41 / 90.4	71 / 156.5	855 / 33.7	650 / 25.6	380 / 14.7	FlexLinePlus: Fully demineralized water / cleaned condensate / partially softened Water / tap water (different qualities) 14.5 to 145 psi, with 3/4" connection for external thread FlexLinePlus Professional: Fully demineralized water / cleaned condensate 14.5 to 145 psi 3/4" external thread
	208	240	3	27.3	36.5	12.4	16.6	9.3	12.4	25.9	29.9	3	35									
	440	480	3	30.6	36.5	13.9	16.6	10.4	12.4	13.7	14.9	3	20									
FLP25	575	600	3	25.3	27.7	11.5	12.6	8.7	9.4	8.7	9.1	3	15	1	3	1 x 40/1 1/2	35 / 77.2	50 / 110.2	855 / 33.7	650 / 25.6	380 / 14.7	FlexLinePlus: Fully demineralized water / cleaned condensate / partially softened Water / tap water (different qualities) 14.5 to 145 psi, with 3/4" connection for external thread FlexLinePlus Professional: Fully demineralized water / cleaned condensate 14.5 to 145 psi 3/4" external thread
	440	480	3	50.8	60.3	23.1	27.4	17.3	20.6	22.7	24.8	3	30									
	575	600	3	42.0	45.8	19.1	20.8	14.3	15.6	14.4	15.0	3	20									
FLP30	440	480	3	61.2	72.8	27.8	33.1	20.9	24.8	27.4	29.9	3	35	1	6	2 x 40/1 1/2 ⁽³⁾	41 / 90.4	71 / 156.5	855 / 33.7	650 / 25.6	380 / 14.7	FlexLinePlus: Fully demineralized water / cleaned condensate / partially softened Water / tap water (different qualities) 14.5 to 145 psi, with 3/4" connection for external thread FlexLinePlus Professional: Fully demineralized water / cleaned condensate 14.5 to 145 psi 3/4" external thread
	575	600	3	50.8	55.2	23.1	25.1	17.3	18.8	17.4	18.1	3	20									
	440	480	3	81.4	96.8	37.0	44.0	27.7	33.0	36.4	39.7	3	50									
FLP40	575	600	3	67.5	73.5	30.7	33.4	23.0	25.0	23.1	24.1	3	35	1	6	2 x 40/1 1/2	41 / 90.4	71 / 156.5	855 / 33.7	650 / 25.6	380 / 14.7	FlexLinePlus: Fully demineralized water / cleaned condensate / partially softened Water / tap water (different qualities) 14.5 to 145 psi, with 3/4" connection for external thread FlexLinePlus Professional: Fully demineralized water / cleaned condensate 14.5 to 145 psi 3/4" external thread
	440	480	3	96.1	114.4	43.7	52.0	32.8	39.0	43.0	46.9	3	50									
	575	600	3	86.9	94.6	39.5	43.0	29.6	32.2	29.7	31.0	3	40									

(1) Other voltages upon request.
 (2) Reducer DN40/DN25 included.
 (3) Incl. Y-piece DN40.
 (4) External width and depth dimensions. Height including drainage nozzles.

14. 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.



15. View of housing



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