

**IMPORTANT!** Read and save these instructions. This manual to be left with the equipment.



# ML HEADS INSTALLATION GUIDE

Adiabatic humidification system

# Thank you for choosing Nortec

Installation date (DD/MM/YYYY):

Commissioning date (DD/MM/YYYY):

Site:

Model:

Serial number:

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# 1 Introduction

## 1.1 Before You Start!

Thank you for purchasing the Nortec ML direct room high pressure adiabatic humidification system. The Nortec ML adiabatic humidifier incorporates the latest technical advances and meets all recognized safety standards. Never-the-less, improper use of the Nortec ML adiabatic humidifier may result in danger to the user or third parties, and/or damage to property.

To ensure safe, proper and economical operation of the Nortec ML adiabatic humidifier, observe and comply with all information and safety instructions contained in this manual, as well as all relevant documentation of components of the installed humidification system.

If you have additional questions, contact your local Nortec representative. They will be glad to assist you.

## 1.2 General

### Limitations

The subject of this manual is the Nortec ML systems direct room humidification heads. The various options and accessories may only be described in-so-far as is necessary for proper installation and operation of the equipment. Additional information on available options and accessories can be obtained in the instructions that are supplied with them.

This manual is restricted to the installation, operation, technical data and parts of the Nortec ML direct room humidification heads, and is intended for well trained personnel who are suitably qualified for their respective tasks.

### Symbols used in this manual



#### CAUTION!

The catchword "CAUTION" in conjunction with the general caution symbol is used to provide safety instructions that, if neglected, may cause damage and/or malfunction of the unit or damage to property.



#### WARNING!

The catchword "WARNING" in conjunction with the general warning symbol is used to provide safety instructions that, if neglected, may cause injury to personnel. Other specific warning symbols may also be used in place of the general symbol.



#### DANGER!

The catchword "DANGER" in conjunction with the general danger symbol is used to provide safety instructions that, if neglected, may cause severe injury to personnel or even death. Other specific danger symbols may also be used in place of the general symbol.

**Other related publications**

This manual is supplemented by other publications such as the MLPRO Installation and Operation Manual, which are included in the delivery of the equipment. Where necessary, appropriate cross-references to these publications have been added in this manual.

**Storage of manual**

Keep this manual in a place where it is safe and readily accessible. If the equipment is moved to another location, make sure that the manual is passed on to the new user. If the manual is lost or misplaced, contact your Nortec representative for a replacement copy.

**Language versions**

This manual is also available in other languages – contact your Nortec representative.

## 2 For your safety

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### 2.1 Safety



**DANGER!**

Always isolate all supplies to the system before commencing any maintenance or repair.

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#### **General**

Every person who is tasked with the installation, operation or maintenance of the Nortec ML adiabatic humidifier must read and understand this manual before performing any work. Knowing and understanding the contents of the installation manual and the operation and maintenance manual is a basic requirement for protecting personnel against any kind of danger, preventing faulty operation, and operating the unit safely and correctly.

All labels, signs and marking applied to the Nortec ML adiabatic humidifier must be observed and kept in a readable state.

#### **Personnel qualifications**

All procedures described in this manual must only be performed by personnel who are adequately qualified, well trained and are authorized by the customer.

For safety and warranty reasons, any activity beyond the scope of this manual must only be performed by qualified personnel authorized by Nortec.

All personnel working with the Nortec ML adiabatic humidifier must be familiar with, and comply with the appropriate regulations on workplace safety and prevention of accidents.

#### **Intended use**

The Nortec ML humidification heads is intended exclusively for adiabatic humidification and/or evaporative cooling using a Nortec MLP or MLP-RO high pressure pump station within specified operating conditions (refer to the Nortec MLPRO IOM for details). Any other type of application, without the express written consent of Nortec, is considered to be not conforming to its intended purpose, and may lead to dangerous operation and will void the warranty.

In order to operate the equipment in the intended manner all information contained in this manual, in particular the safety instructions, must be observed closely.

## Safe Operation

If it is suspected that safe operation has been compromised, the ML-System should immediately be shut down and secured against accidental power-up.

Shut down the Nortec ML Humidification System if:

- Components are damaged, worn or very soiled
- Fans have stopped or are noisy
- Joints, pipes or hoses are leaking
- Unusual or very loud noise

No modifications must be made on the ML-System without the manufacturer's consent. All persons working with the system must report to the owner if any alterations are detected.

Use only original accessories and spare parts available from your Nortec representative.



### **DANGER!**

**Risk of electric shock!**

**A person may come in contact with live parts when the pump station/control unit is open. Touching live parts may cause severe injury or death.**

**Prevention:** Before carrying out any work on the system, disconnect power and water supply.



### **DANGER!**

**Poorly maintained humidification systems may be hazardous.**

**Prevention:** read, understand and follow maintenance guidelines to ensure your system stays safe.



### **WARNING!**

**High pressure!** When running the system is pressurized at 1015 psi. Inappropriately fastened hoses may be forced out of the screw connections when pressurized. Never loosen hoses or screw connections in a pressurized system.



## 2.2 Health and hygiene



### DANGER!

The Nortec ML System must be installed, operated and maintained in accordance with this manual. Failure to do so could result in contamination that might cause Legionnaires' disease, which can be fatal.



### DANGER!

To prevent water stagnation and microbial contamination, the systems power supply should be left switched on. If the system is switched off for more than 48 hours, the pipework and system must be disinfected as per the instructions, and a full risk assessment must be undertaken to ensure safe operation.

### Health risks

Please observe the local health and safety codes, standards and technical guidance on the control of Legionella in water systems.

The user is responsible for ensuring that the water system complies with local regulations, bye-laws and guidelines (such as the HSE ACoP L8, VDI 6022, ISO 22000, HACCP or equivalent). If inadequately maintained, water systems, of which any humidifier is a part, can support the growth of microorganisms, including the bacterium that causes Legionnaires' disease.

Nortec ML systems, products and components are produced according to the ISO 22000 standards, which means that we have considered all aspects of this equipment to reduce the risk of Legionnaires' disease and other similar conditions. However, the user is responsible for ensuring that the installation, operation and maintenance work on the equipment is performed in a manner ensuring that the system stays clean.

Any risks or hazards relating to the system, including during installation and maintenance, should be identified by a competent health and safety representative who is responsible for introducing effective control measures.

### Water monitoring

The quality of water being used in the Nortec ML Humidification System should be checked prior to system commissioning and comply with the guidelines in the high pressure pump manual.

The Nortec ML Humidification System must be monitored for hygiene as part of the maintenance program. Please refer to the maintenance section for further guidance.

### **Guidelines for a hygienic system**

- Carry out a risk assessment of the water system using a competent person, and implement an appropriate monitoring and control program.
- Initiate procedures for changing filters, disinfection etc.
- Enter into a service contract that suits your company.
- Stop the system if polluted drinking water is found in your area.
- Avoid water temperatures between 77°F and 113°F, which favour the growth of Legionella.
- Do not stop the system unless it is faulty or leaking (avoid water stagnation).
- Refrain from closing nozzles or sections, unless there is leakage or a fault (avoid water stagnation).
- Disinfect the high-pressure system at least once a year and after every maintenance or repair. Always carry out a complete system disinfection if it has been turned off for more than 48 hours.
- Have water samples taken and tested for harmful bacteria at least once a year.
- Conduct follow-up measurements until the system is clean if bacteria have been detected in the system.

### **Disinfection**

Depending on the system hygiene, it is advised that preventative disinfection fluid be added to the MLP RO water tank at an appropriate frequency, but at least once a year.

Nortec Humidity Ltd. recommends using the disinfection fluid SANOSIL S010 AG 5% (our code: 155404000) to the System via the high pressure pump, desired concentration 0.1%. DISIFIN is safe, non-toxic and eco-friendly which provides a prophylactic, disinfection dose and is effective against all types of microorganisms, including Legionella and E.coli.

Please read the pump manual for more information on disinfection.

If you are in any doubt about the suitability of water quality, please contact your Nortec Humidity distributor who will be happy to support you.

## 3 Receiving and storage

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### 3.1 Inspection

All Nortec products are shipped F.O.B at the factory. All damage, breakage or loss claims are the responsibility of the shipping company.

Upon receipt, remove the transit packaging and inspect the components to ensure that no damage has occurred during transit. Inspect the goods as follows:

- Inspect the shipping boxes for damage. Report any shipping box damages to the shipping company without delay.
- Check the goods against the packing slip to ensure that all items have been delivered. Report any shortages to your Nortec representative within 48 hours of receipt of the goods. Nortec does not assume responsibilities for any shortages beyond this period.
- Unpack the parts/components and check for any damage. If parts/components are damaged, notify the shipping company immediately.
- Verify the model type on the specification label to ensure that it is suitable for your installation.

### 3.2 Storage and transportation

#### Storage

Store the Nortec ML adiabatic humidifier in its original packaging inside a protected area that meets the following requirements until it is installed. These requirements also apply if the unit needs to be stored for an extended period of time. If put into storage prior to use, the components must be covered and protected from physical damage, dust, frost and rain. Avoid below freezing temperatures as this can degrade certain wet parts and components, such as RO membranes.

For storage Nortec recommends:

- Room temperature: 41 to 104°F (5 to 40°C)
- Room humidity: 10 to 75% RH

#### Transportation

For optimum protection always transport the unit and components in their original packaging, and use appropriate lifting/transporting devices.

Lifting or handling must only be carried out by trained and qualified personnel. Ensure that the lifting operation has been properly planned and risk-assessed, and that all equipment has been checked by a skilled and competent health and safety representative.

The customer is responsible for ensuring that operators are trained in handling heavy goods, and to enforce the relevant lifting regulations. Refer to the weights and measures section for system weight.

**Packaging**

It is recommended that the components be kept in its transit packaging for as long as possible prior to installation.

Keep the original packaging of the unit/components for later use. If the packaging needs to be disposed of, observe local regulations on waste disposal. Recycle packaging where possible.

**Disposal**

You must observe local laws and regulations when disposing of your Nortec ML system at the end of its working life.

## 4 Site planning

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### 4.1 Prior to starting (4.1)

The basic principles for planning described below are theoretical ones. In practice, the necessary humidification capacity is influenced by parameters that cannot be covered by this documentation. For this reason, the values that were determined in theory have to be complemented by practical values or corrected in many cases. Nortec's technical service team will be pleased to assist you.

#### **Notes on the planning of direct room air humidification systems in one or more zones.**

Proceed as follows when selecting and/or dimensioning the air humidification system:

- Determine the volume of the room and the air changes
- Determine the set points (temperature and humidity/relative humidity)
- Determine the humidification areas
- Calculate the maximum humidification capacity
- Define the device requirements
- Determine the placement of zone valves and hygrometers

### 4.2 Experts on site

Nortec Humidity has expert technicians employed by Nortec who can provide:

- Pre-site analysis
- Positioning and site assistance or recommendations
- Installation support
- Start-up and commissioning
- Bacteriological troubleshooting on site \*
- Cleaning and disinfecting
- Preventive maintenance
- Repair and fault finding
- Training and guidance

\* Nortec Humidity uses an industry leading method for measuring bacterial activity in the water; the approved and patented BactiQuant test. This, unique to Nortec, field test takes water samples from critical project locations. Thereafter, the bacteriological quality of the water can be read within 30 minutes, and the system can be disinfected if necessary.

Nortec Humidity follows the guidelines in VDI 6022 for colony forming units (CFU) counts in humidifiers. The CFU count in the humidification water must not exceed 150 CFU/ml, corresponding to a maximum BQ value of 40. Please contact your local Nortec Humidity representative for further information about our services.

## 5 ML Princess - Direct room humidification



Figure 1: ML Princess direct room humidification system

### 5.1 General description

The Nortec ML Princess direct room humidification head is a state-of-the-art high pressure adiabatic dispersion unit. It is part of a complete high pressure humidification system with one or more humidification units and one or more high pressure pump stations.

Every Princess unit consists of a nozzle ring with either 8, or 12 nozzles, and a built-in fan. The nozzles are placed in a ring like fashion to allow the built-in fan to disperse the high pressure atomized mist in a 360° formation.

Humidity is produced as water under high pressure is atomized into micro-sized particles. The fan distributes the fog particles, therefore ensuring a uniform humidity coverage throughout the entire area.

The Princess units are typically hung from a ceiling via chains, and water is fed via the high pressure tubing and electricity is fed via cables.

## 5.2 Assembly overview

### 5.2.1 Electrical connection



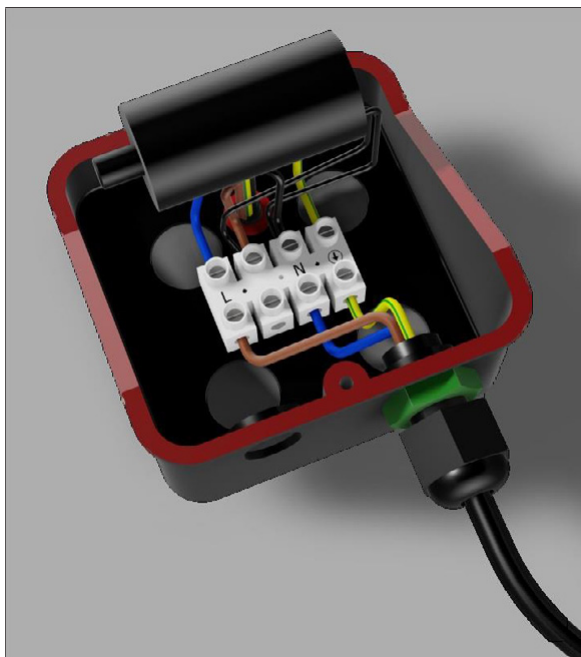
**DANGER!**

**Risk of electric shock!**

**A person may come in contact with live parts when the pump station/control unit is open. Touching live parts may cause severe injury or death.**

**Prevention:** Before carrying out any work on the system, disconnect power and water supply.

The fan must be connected to power supply by an authorized electrician. The fan is normally connected through a prescribed switch for continuous operation so that the air in the room is constantly recirculated.



Electrical connection box placed under the fan and shown above.

Recommended cables:

230 V Cable 3 x 0.75 PKAJ, Black

115 V ÖLFLEX Control TM 3G1 UL

*Figure 2: Electrical connection box*

## 5.2.2 Nozzle ring installation

- A. The nozzle ring is installed on top of the fan by means of the delivered fittings. Standard nozzle rings are provided with ball valve, filter unit and automatic bleeding.
- B. For the final installation of the nozzle ring, do not install the bleeding nozzle on each individual humidity unit until the system has been flushed through.
- C. In the event the ball valve does not come fully assembled. Assemble ball valve and filter union as shown in *Figure 3*. Make sure that the filter fixture is attached securely and the O-ring is in place before assembling the filter union. Close the ball valve when the unit is finally mounted.

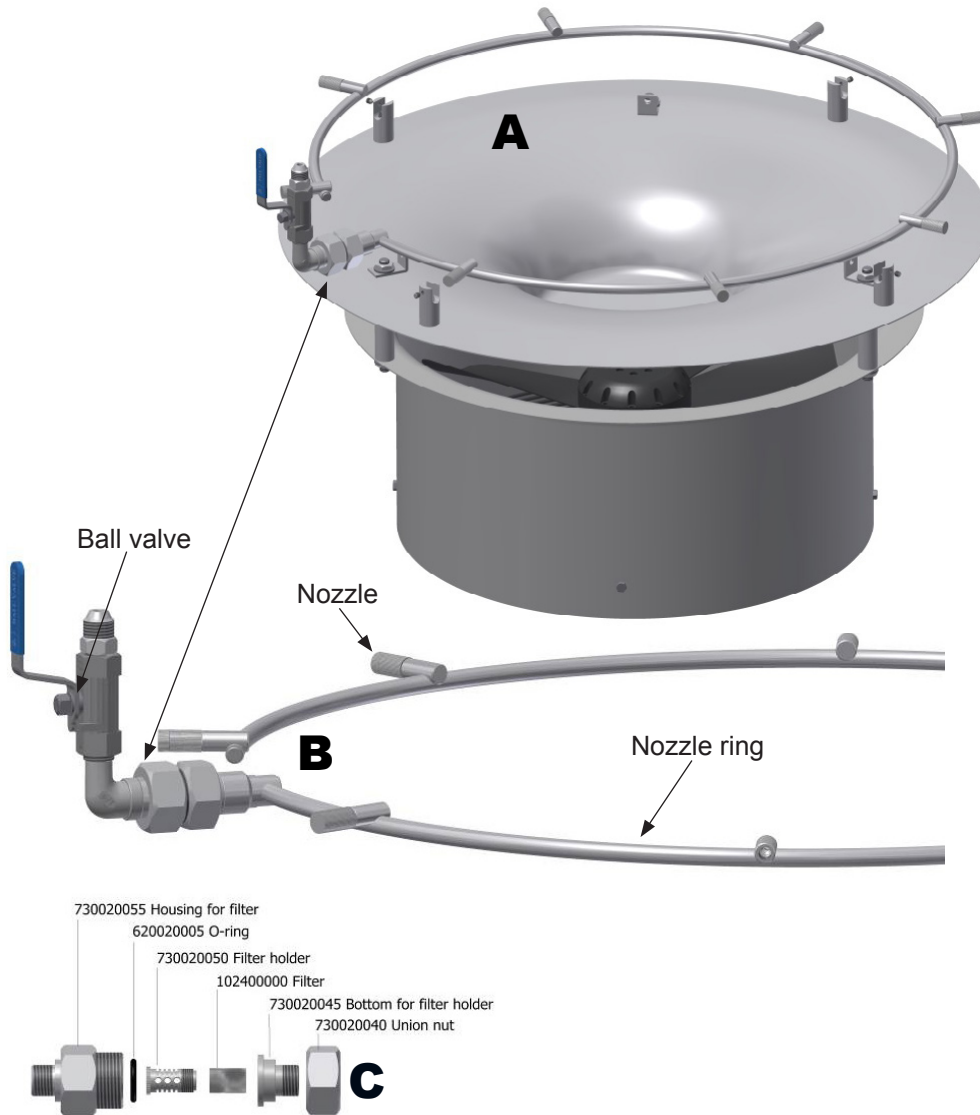


Figure 3: Assembling Princess 2



### 5.2.3 Warning label

Prior to assembling, installing, or mounting the Princess heads, ensure that the warning label is appropriately affixed on the side of the Princess head, as shown in [Figure 4](#). Ensure that it is mounted in a visible place.



Figure 4: Warning label



#### **WARNING!**

Never unscrew a nozzle on a pressurised unit. Disconnect power to the pump station when working on high-pressure system.

- Before inserting the nozzle, check that its threads and O-ring are intact.
- Screw the nozzle in by hand, tighten.
- Use a set of polygrip pliers to tighten the nozzle (approximately 1/8 turn) (torque: 1.5 ft.lb)
- Ensure that the nozzle itself is tightened by tightening on the tip of the nozzle.



#### **CAUTION!**

Be careful! The threads on the nozzles break easily, the nozzle seals with an O-ring and hence does not need to be tightened very hard, just a little more than you can do by hand.

## 5.2.4 Installation of optional air filter

The air filter serves as protection for the fan motor. In operating environments with higher than normal dust/dirt in the air (woodworking, composite sanding, etc.) it may be necessary often to clean filters due to the high dust loads that are carried with the conveying air.



1. ML Princess seen from below without filter
2. Install the filter while the fan is in operation
3. Place the filter holder

Figure 5: Installation of air filter under fan

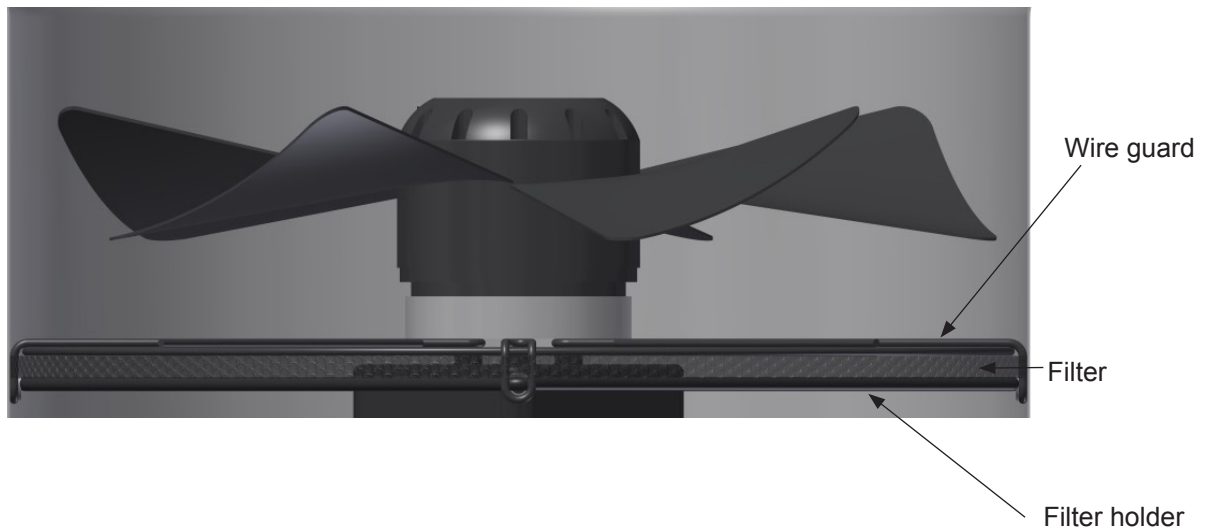


Figure 6: Filter assembly

## 5.3 Placement overview

Strictly observe and perform all installation tasks including the mounting of the unit and connection of the water and power supplies as described in this manual.

Observe and comply with all local and national codes dealing with water and electrical installations.

Nortec does not accept any liability for installation of humidification equipment by unqualified personnel, or the use of equipment/parts that are not authorized by Nortec.

### Personnel Qualifications

All installation work must be performed only by licensed personnel authorized by the customer. It is the customer's responsibility to verify qualifications of the personnel.

### Safety

Observe the following safety precautions:



#### **WARNING!**

**Large mechanical equipment - risk of personal injury!**

**Installing Princess units in large open spaces requires use of ladders, scissor-lifts, one-man lifts, hotel lifts, aerial work platforms, or mobile elevating work platforms, etc.**

**Prevention:** Before carrying out any work on the system, ensure that lifts are safe for use by operator or customer's building maintenance team.



#### **DANGER!**

**Heights - risk of personal injury or death!**

Prior to mounting any mechanical lifts to reach heights, whether: hotel lifts, scissor lifts, one-man lifts, aerial lifts, work platforms, etc., ensure that personnel are adequately trained and licensed to operate such lifts. **Failure to do so may result in severe injury or death.**

**Prevention:** Ensure that you abide by health and safety codes, local building codes and proper safety training regulations to ensure safe use of any lifts.



#### **WARNING!**

**High pressure!** When running the system is pressurized at 1015 psi. Inappropriately fastened hoses may be forced out of the screw connections when pressurized. Never loosen hoses or screw connections in a pressurised system.

## General Notes on Positioning

The positioning of a system is always determined during planning and noted in the system documents. Prior to mounting the ML Princess unit, ensure that all hose layouts, distances between heads and atomization clearances have been considered and adhered to, as per [Figure 7](#), [Figure 8](#), [Figure 9](#) and [Figure 10](#).

The recommended hose layouts, distances between humidification heads and atomization clearances, are shown below. Consult local and national installation regulations. Nortec does not accept responsibility for violations of the installation codes.

The following general positioning notes, however, have to be read and complied with in any case:

- Make sure that the construction (rafter, beam, wall, pillar, ceiling construction, etc.) on which the devices and/or system components will be mounted disposes of a sufficient load-carrying capacity and is suitable for fixing.
- Position the Nortec ML Princess units in such a way to enable the atomized mist to spread freely. When the mist is prevented from spreading by obstacles (e.g. ceilings, beams, ventilation ducts, airflow, machinery, etc.), turbulences can build up and condensation may occur as a result.
- [Figure 10](#) shows the recommended clearances, of the expansion of the atomization stream, and the clearances that have to be maintained. These are ideal and recommended maximum capacities using ML nozzles. Different weather, climate and indoor conditions can alter the spread and distance of the mist. As shown in [Figure 9](#), when the nozzles and humidification heads are placed one opposite the other, make sure that a minimum distance of 26 ft. is adhered to. This will avoid the streams to condensate each other.
- Pay close attention to the airflow of the room. Do not install humidification heads or nozzles in the immediate vicinity of a supply, return or exhaust system or of a cold-air inlet.
- Do not direct humidification heads or their nozzles at cold parts of a building, e.g. outside walls, windows, etc. (risk of condensation).
- Insulate cold-water pipes in the area of the atomizing stream (risk of condensation).
- The evaporation process absorbs heat from the ambient air. For this reason, make sure that the atomized stream is not directed on persons or on places directly above workplaces.
- In order to guarantee optimum humidification, ensure that the atomizers are sensibly distributed in the room.
- The system components have to be mounted in such a way to provide enough space for operation and maintenance.

Please contact Nortec's Technical Service Team in case you have questions on positioning and clearances.

### 5.3.1 Hose layout for ML Princess

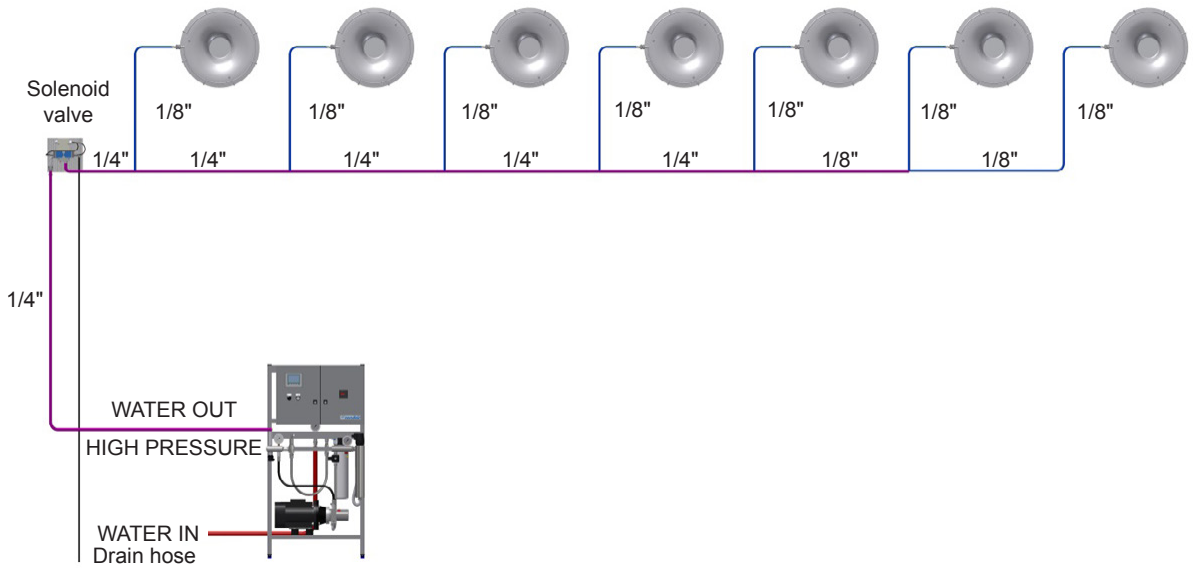


Figure 7: Hose layout inline

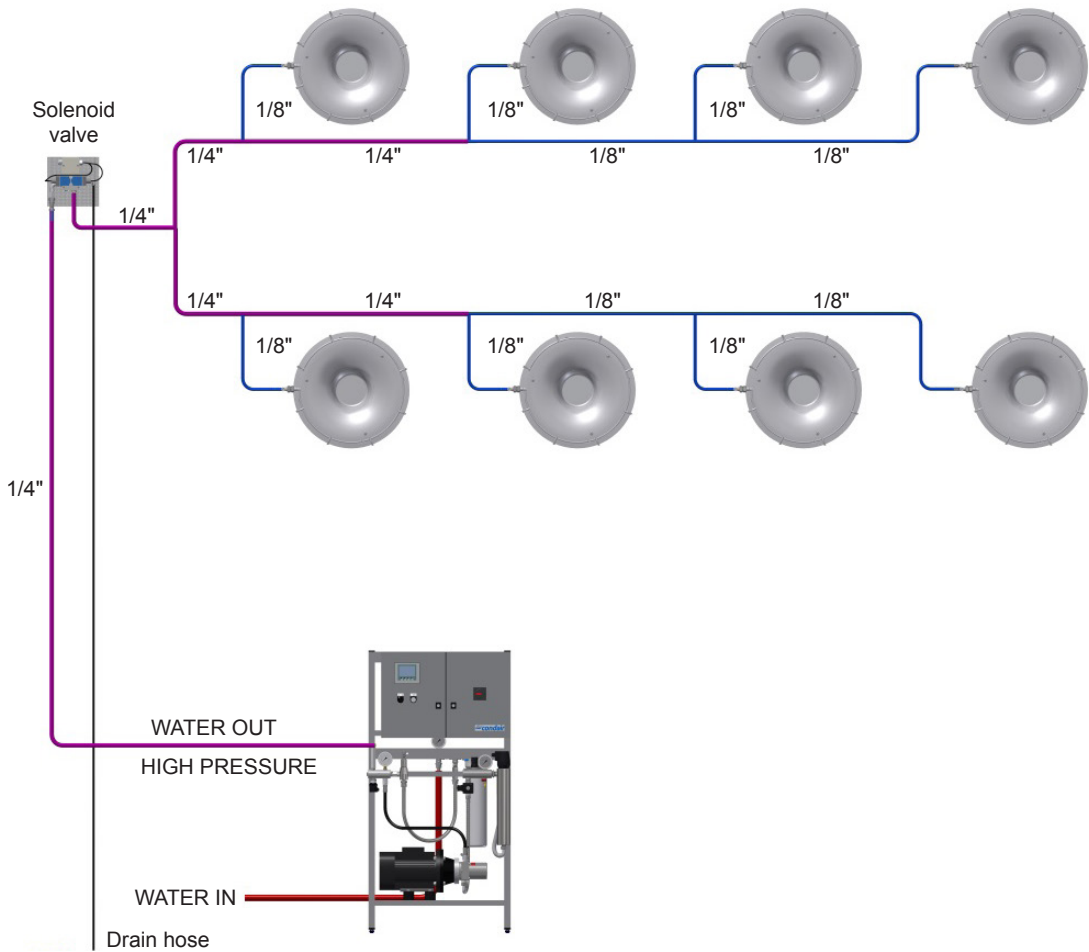


Figure 8: Hose layout parallel

### 5.3.2 Placement of heads

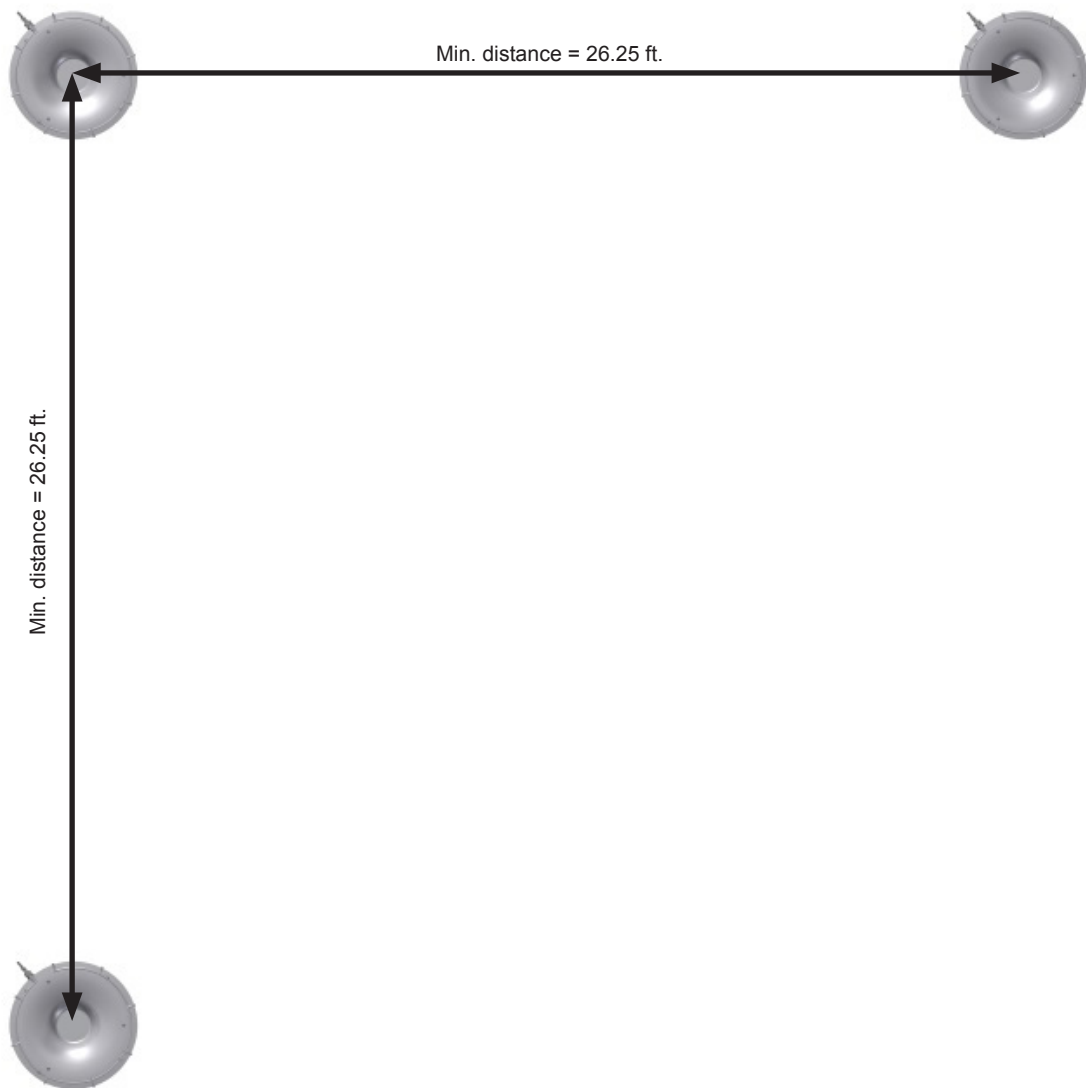


Figure 9: Distances between modules

### 5.3.3 Atomization clearances

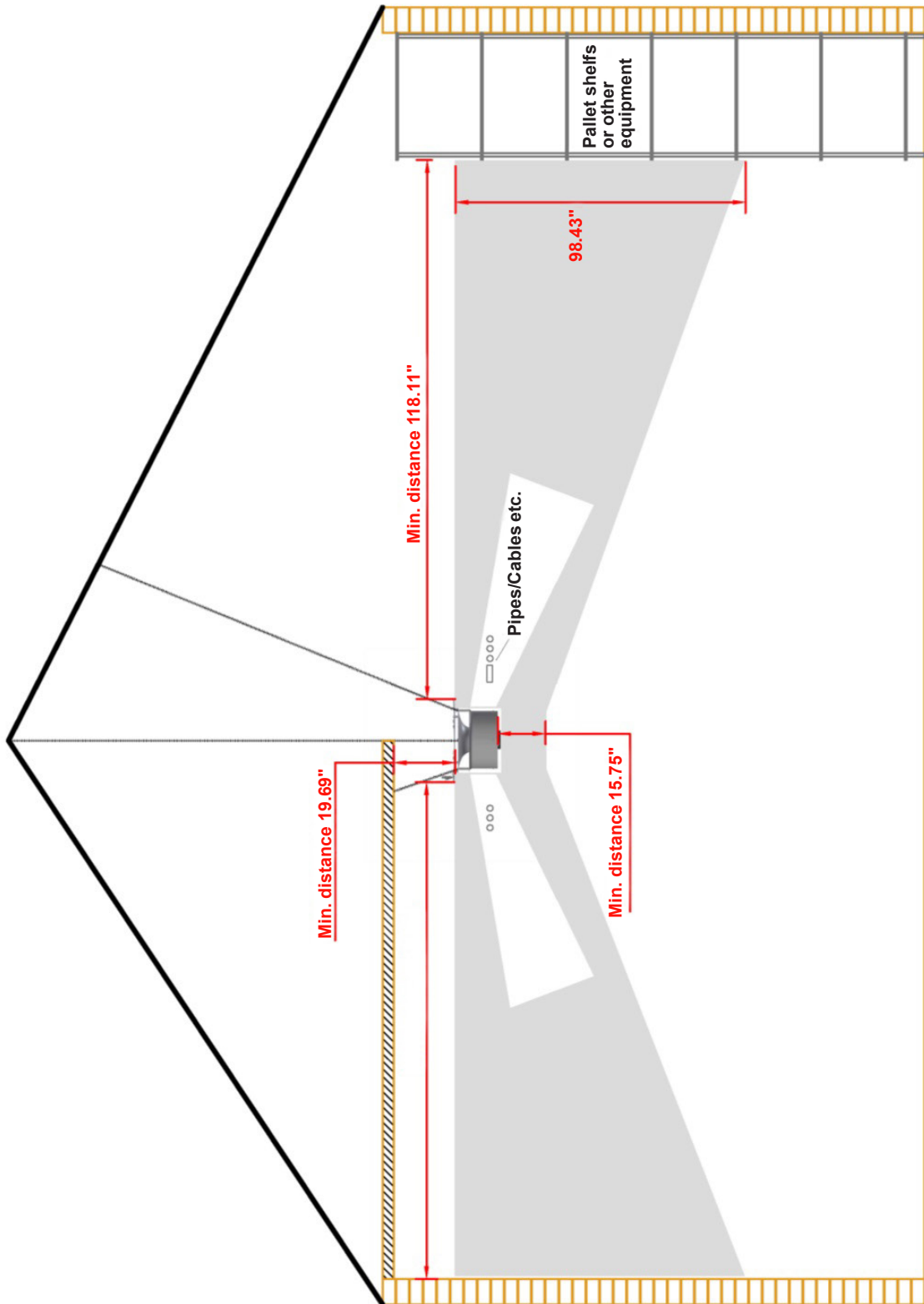


Figure 10: Miscellaneous mounting distances

## 5.4 Mounting the humidifier

As mentioned earlier, the Princess units are typically hung from a ceiling via chains, and water is fed via the high pressure tubing and electricity is fed via cables. There are additional wall brackets that may be purchased for wall mounting.

### 5.4.1 Ceiling installation

Adjust the chains so that the unit is level. After flushing and bleeding of ML Princess remove the excess chain and close S-hooks.

The chains have to be fastened to the ceiling with appropriate material (screws, raw plugs, concrete screw anchors etc.).

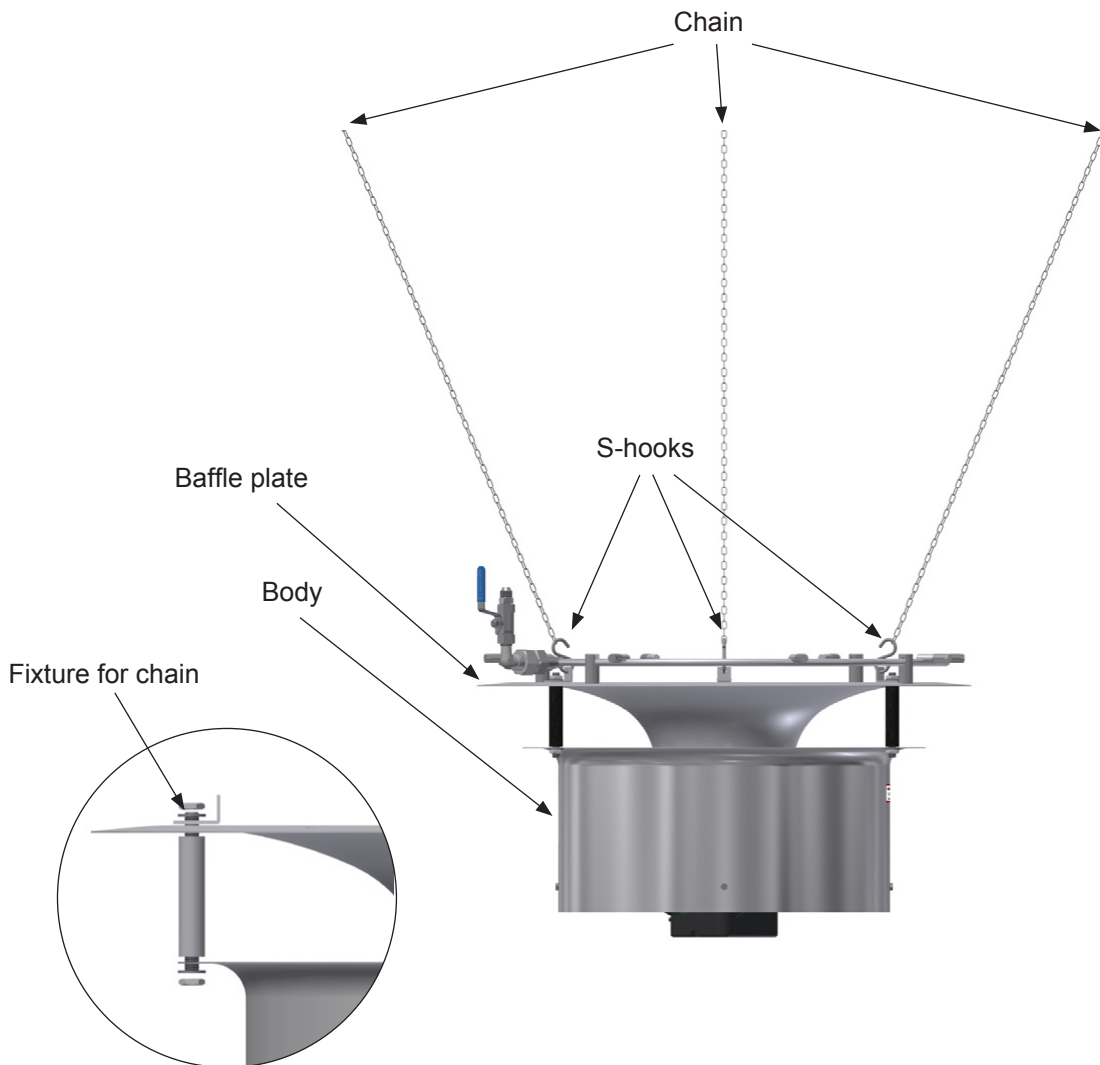


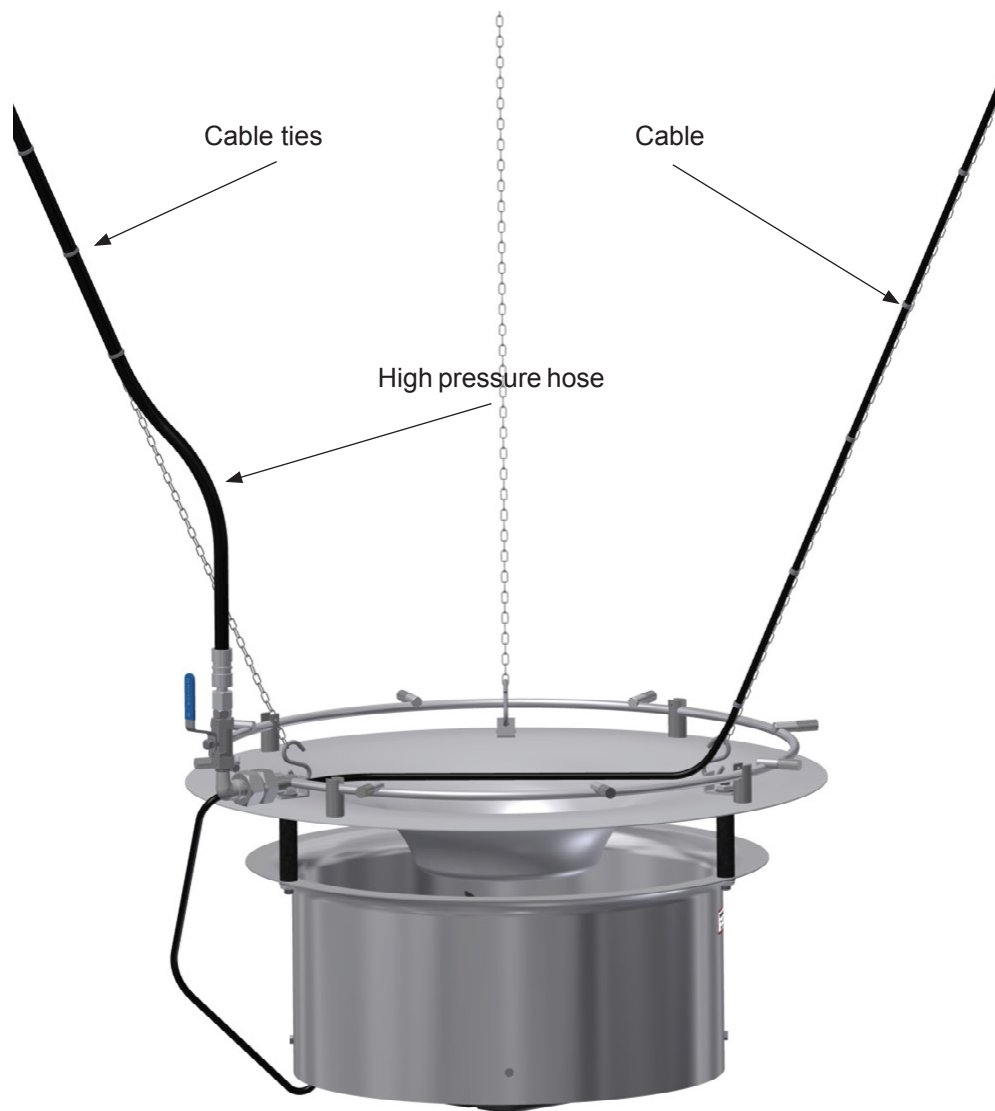
Figure 11: Ceiling mounted ML Princess 2

The baffle plate must be positioned as indicated on the drawing and always with the pointed end turning towards the fan blades in order to secure correct operation.

Fit the baffle plate to the body of the unit as indicated and attach the chains to the housing.



## 5.4.2 Connecting water and power



*Figure 12: Connecting water and power to the ML Princess 2*

The high pressure hose is connected to the ball valve. The hose can be strapped to the chain using cable ties. Avoid vertical U-turns on the hose. This might cause pockets of air in the hose.

The cable is connected to the power supply by an authorized person.

### 5.4.3 Optional - Wall mount

The bracket is used for wall mounting of ML Princess 2, where only humidification out into the room is wanted.

Together with the wall bracket, a shielding for the fan is supplied, so that the air does not blow against the wall.

The distance between wall and module is adjustable from 0.98 ft. to approximately 1.6 ft.

Wall bracket and shielding are attached together with fitting for nozzle ring and dispenser plate spacer.

Using a wall mounted Princess 2 the three nozzles pointing towards the wall will be blind nozzles.

For fastening the bracket to the wall one always must use the correct screws and raw plugs if necessary in regard to which material the wall may consist of.

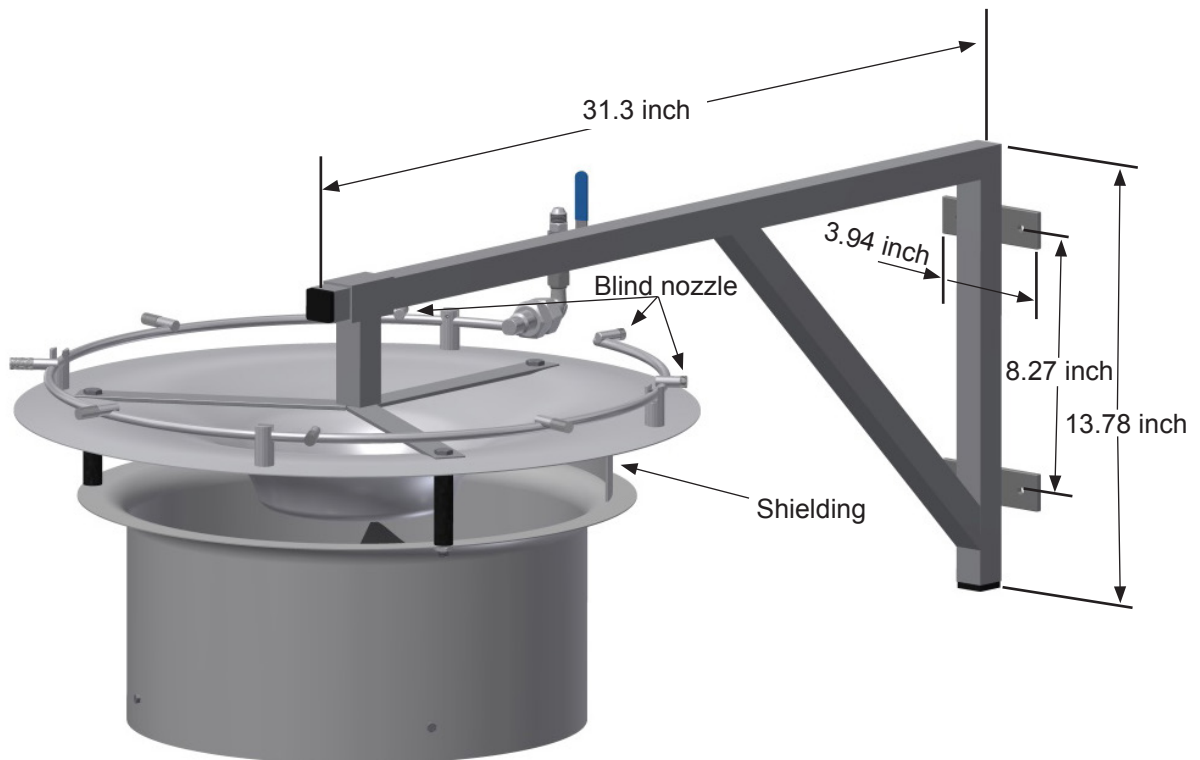


Figure 13: Wall mounted ML Princess 2

#### Technical specifications

Part no.	101102000
Material	Powder painted steel
Colour	Grey
Dimensions	2.6 ft. x 1.2 ft. x 0.3 ft.
Weight:	7.7 pound

## 5.5 Spare parts

Item	Part No.
Nozzle ring without ball valve, filter and nozzles	102 200 001
Ball valve, complete	102 910 000
Bracket set for nozzle ring ML Princess 2	102 901 000
Fan for ML Princess 2, 230 VAC	310 010 000
Fan for ML Princess 2, 115 VAC	310 010 002
Bag with 8 nozzles, 3.3 lb/h	671 300 011
Bag with 8 nozzles, 5.5 lb/h	671 300 012
Bag with 8 nozzles, 9.9 lb/h	671 300 013
Bag with 8 nozzles, 14.3 lb/h	671 300 014
Fan filter for Princess 2	100 400 000
Fan filter holder Princess 2	100 402 000

## 5.6 Product specifications

### 5.6.1 Technical data for ML Princess 2

Weight	20 lb
Number of nozzles	8 nozzles
Recommended nozzle size	5.5 lb/h or 10 lb/h
Material	Powder painted steel 37
Motor	75W, 900 RPM 220-240 VAC, 50/60 Hz, 16A, IP44 or 100 W, 1050 RPM 115 VAC, 60 Hz , 16A, IP44
Capacity	985 - 1150 CFM of air
Noise level	55 dB
Wire guard	Epoxy treated
Colour	RAL 9006
RH working range	20-80% RH

### 5.6.2 Technical data for ML Princess 3

Weight	25 lb
Number of nozzles	12 nozzles
Recommended nozzle size	5.5 lb/h or 10 lb/h
Material	Powder painted steel 37
Motor	160 W, 900 RPM 115 VAC, 60 Hz , 16A, IP44
Capacity	Up to 1980 CFM of air
Noise level	59 dB
Wire guard	Epoxy treated
Colour	RAL 9006
RH working range	20-80% RH

### 5.6.3 Technical data for nozzles

Working pressure	507-1015 psi
Material	Stainless steel
Anti-drip valve	Standard

### 5.6.4 Technical data for nozzle ring

Material	316 stainless steel
Pre-filter	20 micron

### 5.6.5 Sound power

Converted to noise level in free field:

Distance to unit	3.3 ft.	6.6 ft.	9.8 ft.	16.4 ft.
dB	54	48	45	41

As an option the fan speed is reduced. Sound power (LWA) at 50% voltage is 56.0 dB(A)

## 5.7 Declaration of compliance

### CE - Declaration of Compliance

**Manufacturer:**

Condair A/S  
Technical Manager.: Jesper Lund – Jensen  
Parallelvej 2  
8680 Ry

We hereby declare, that the following spray modules for humidification purposes with ML pump systems:  
ML Princess 2; ML Princess 3

**are manufactured in accordance with the following EC directives:**

- 2006/42/EC, Directive on machinery
- 2004/108/EC, EMC directive (ElectroMagnetic Compatibility)
- 2006/95/EC, The low voltage directive
- 2009/125/EC, ErP-directive – ecodesign requirements of energy-related products

**The following harmonized standards have been applied:**

- EN ISO 12100:2011, Safety of machinery – General principles for design – Risk assessment and risk reduction
- ISO TR 14121-2:2012, Safety of machinery – Risk ass. – Part 2: Practical guidance and examples of methods
- EN 60335-1:2012, Household and similar electrical appliances - Safety - Part 1: General requirements
- EN 60204-1:2006 + amendments, Safety of machinery – Electrical equipment of machines – Part 1: General requirements
- EN 61000-6-2:2005 + amendments, Electromagnetic compatibility (EMC). Generic standards. Immunity for industrial environments
- EN 61000-6-3:2007 + amendments, Electromagnetic compatibility (EMC). Generic standards. Emission standard for residential, commercial and light-industrial environments

**Installation and operation:**

**Description of the unit:** See Technical data

**Mounting and safety instructions**

Should be placed at a height of minimum 2,0 m above floor-level to the lower edge of the unit, to eliminate danger caused by possible touching of the impeller/ fan when operating. The fan is not equipped with guard grill at the outlet side of the fan, therefore the power to the fan should be switched off if work is done within a 0,5 m safety area from the outlet of the fan.

**Vibration-noise**

Transmitted noise from vibrations is minimised during mounting, by equalizing the force in all hanging points. (See separate mounting instruction for ML Princess)

**Electrical connection**

Electrical connection should be made according to local rules by authorized people.  
The fan should be connected to an external voltage switch.

**Service and maintenance**

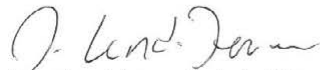
The impeller and the internal side of the cabinet/body should be cleaned for dust and dirt at least once every year, or when necessary. Should be cleaned in water and soap, or special cleaning solution for aluminium. Do not use organic dissolutions or other strong chemicals for the cleaning.

Before the cleaning procedure is started, the power supply must be safely switched off, and it must be secured that the power cannot be switched on again during the cleaning.

**Sound level**

Sound level measured 1 metre from motor: 55 dB(A) at 50 Hz supply.

DK-Ry, 29. oktober, 2014



Jesper Lund-Jensen, Technical Manager

Condair A/S  
Parallelvej 2, DK-8680 Ry  
Tel. +45 8788 2100  
www.condairsystems.dk

## 6 ML Solo - Direct room humidification

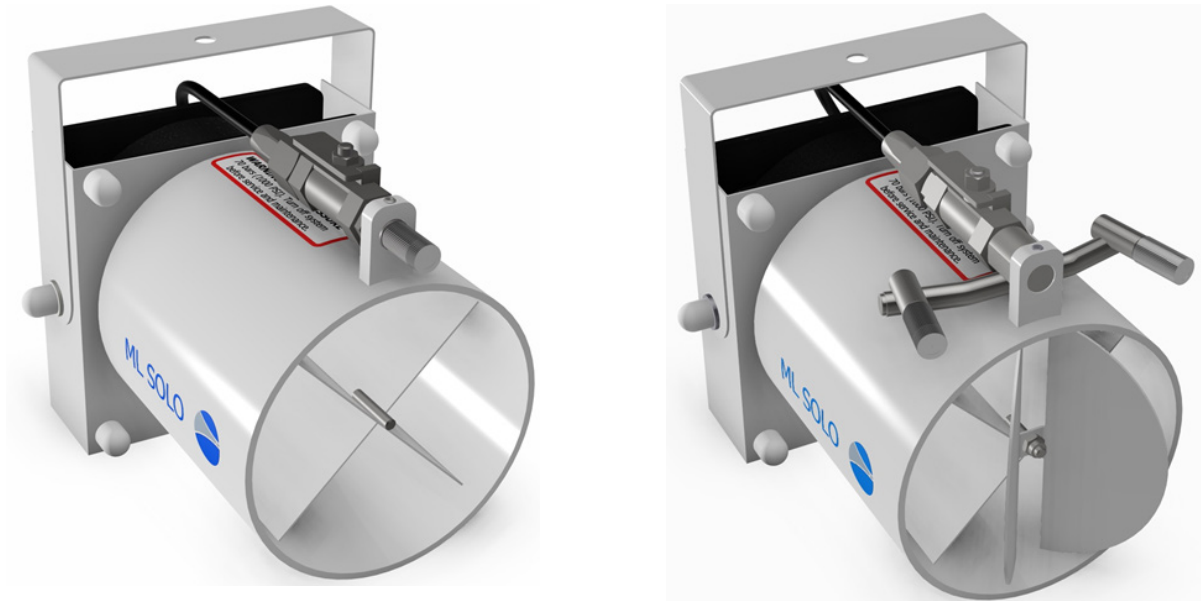


Figure 14: ML Solo direct room humidification system

### 6.1 General description

The Nortec ML Solo direct room humidification head is a subject-oriented high pressure adiabatic dispersion unit. It is part of a complete high pressure humidification system with one or more Solo units and one or more high pressure pump stations.

Every ML Solo unit consists of 1 or 2 nozzles and a built-in fan. The nozzles are pointed in the direction where humidity or evaporative cooling is desired, and the built-in fan allow for the mist to be dispersed in a straight unidirectional trajectory.

The ML Solo is perfect for focused humidification needs; fruit and vegetable sections, printing works, print shops, electronics fabrication or ESD suppression, labs, etc. The humidification unit is particularly suitable for applications with low ceiling height. The unit has been developed with flexible and adjustable joints that make it possible to adapt the humidification direction.

ML Solo features a low noise level and an output that corresponds to traditional compressed air nozzles. In most places, ML Solo will be able to replace compressed air nozzles straight away.

Humidity is produced as water under high pressure (1015 psi) is atomized into micro-sized particles which are instantly absorbed into the surrounding air.

The Solo units are typically attached to walls or columns via specific Nortec Solo brackets, and water is fed via the high pressure tubing and electricity is fed via cables.

## 6.2 Assembly overview

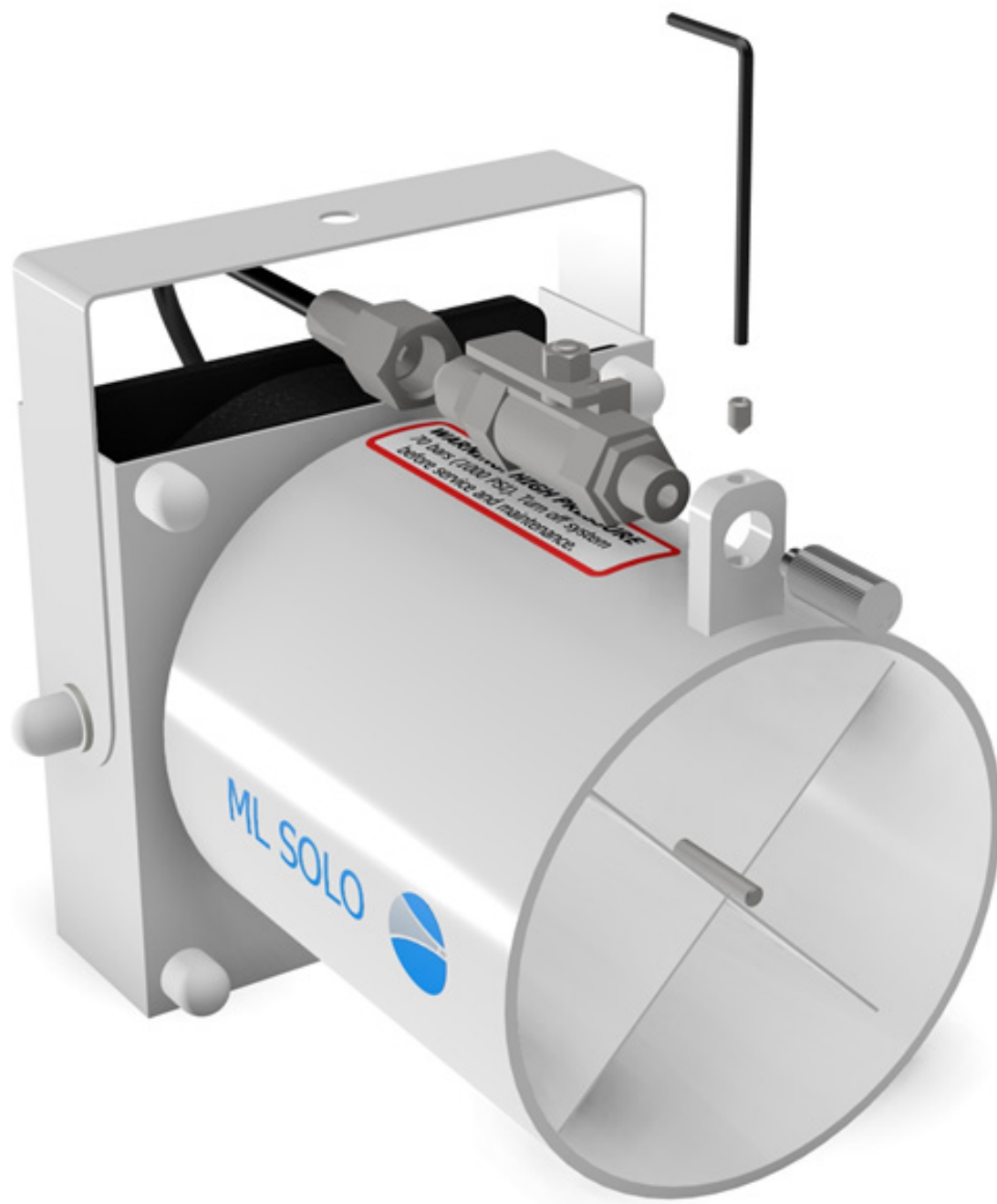


Figure 15: Assembling the ML Solo



## 6.2.1 Solo assembly



### WARNING!

Never unscrew a nozzle on a pressurised unit. Disconnect power to the pump station when working on high-pressure system.



### CAUTION!

Be careful! The threads on the nozzles break easily, the nozzle seals with an O-ring and hence does not need to be tightened very hard, just a little more than you can do by hand.

Before inserting the nozzle, check that its threads and O-ring are intact.

- As shown In [Figure 16](#), insert the nozzle into the ball valve:
- Screw the nozzle in by hand and tighten.
- Use a set of polygrip pliers to tighten the nozzle (approximately 1/8 turn) (torque: 1.5 ft.lb)
- Ensure that the nozzle itself is tightened by tightening on the tip of the nozzle.

Next step, see [Figure 17](#), is to connect the high pressure hose to the ball valve. Avoid vertical U-turns on the hose. This might cause pockets of air in the hose.

Insert the nozzle and ball valve assembly through the designated slot on the top of the ML Solo head and fasten it using a 2mm Allen Key.



Figure 16: Inserting the nozzle

## 6.2.2 Electrical connection

The ML Solo runs on 24V power. It must be connected to the power supply by an authorized electrician.

## 6.3 Mounting the humidifier

Strictly observe and perform all installation tasks including the mounting of the unit and connection of the water and power supplies as described in this manual.

Observe and comply with all local and national codes dealing with water and electrical installations.

Nortec does not accept any liability for installation of humidification equipment by unqualified personnel, or the use of equipment/parts that are not authorized by Nortec.

### Personnel Qualifications

All installation work must be performed only by licensed personnel authorized by the customer. It is the customer's responsibility to verify qualifications of the personnel.

### General Notes on Positioning

The positioning of a system is always determined during planning and noted in the system documents.

Prior to mounting the ML Princess unit, ensure that all hose layouts, distances between heads and atomization clearances have been considered and adhered to, as per [Figure 19](#), [Figure 20](#) and [Figure 21](#).

The recommended hose layouts, distances between humidification heads and atomization clearances, are detailed in Section 6.4. Consult local and national installation regulations. Nortec does not accept responsibility for violations of the installation codes.

### 6.3.1 Standard mounting

The Nortec ML Humidification Heads can be fastened to a wall or ceiling using the appropriate

The fixtures have to be fastened to the wall or ceiling using appropriate material (screws, raw plugs, concrete screw anchors etc.)

We recommend to locate the appropriate mounting location - either a 2x4 wooden stud or equivalent.

Using the appropriate fixtures, see [Figure 18](#), append the unit plus fixture as shown in [Figure 17](#) to an appropriate location.



#### **WARNING!** **Damage to property or equipment**

Make sure that the construction on which the devices and/or system components will be mounted (rafter, beam, wall, pillar, ceiling, construction, etc.) disposes of a sufficient load-carrying capacity and is suitable for fixing

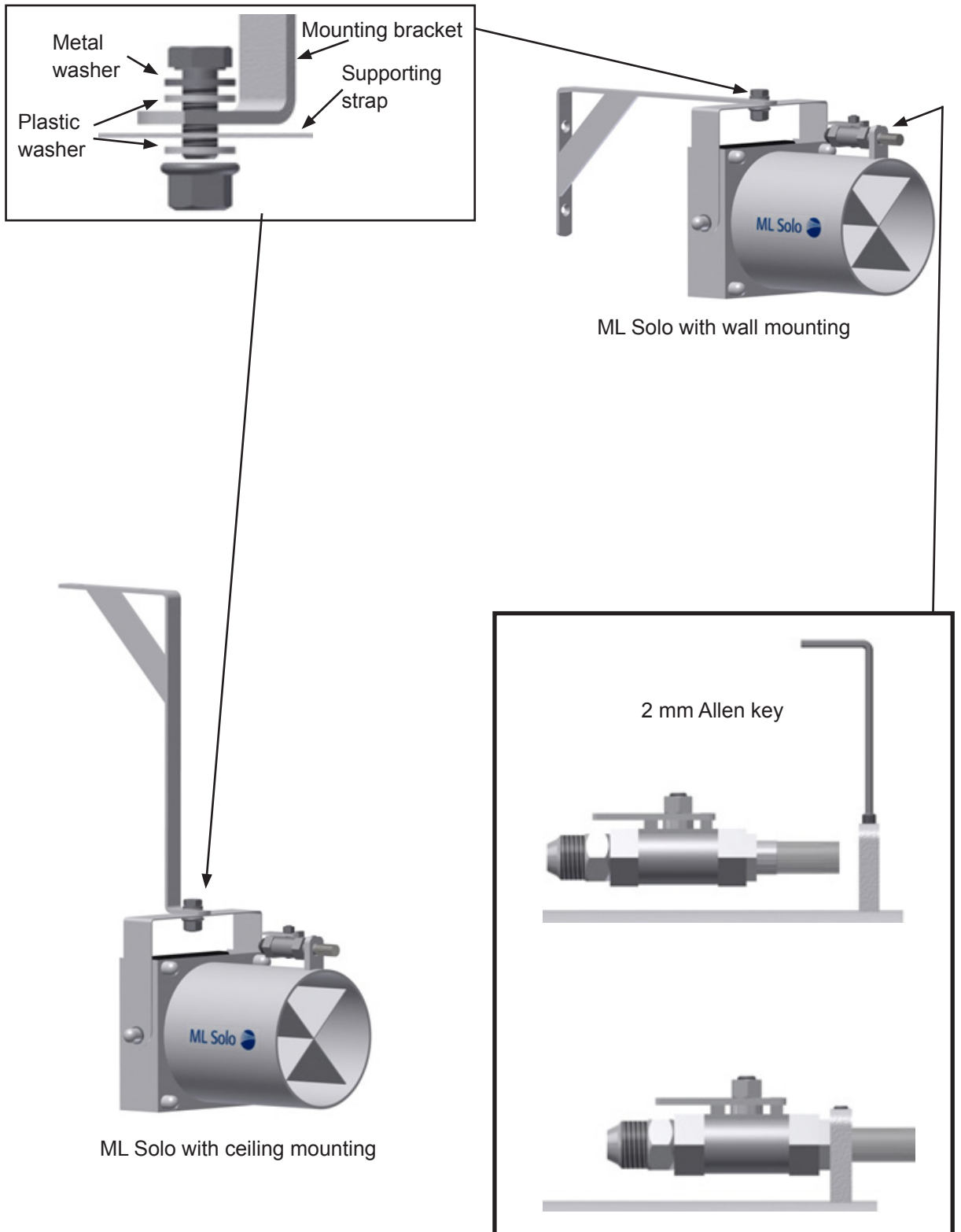
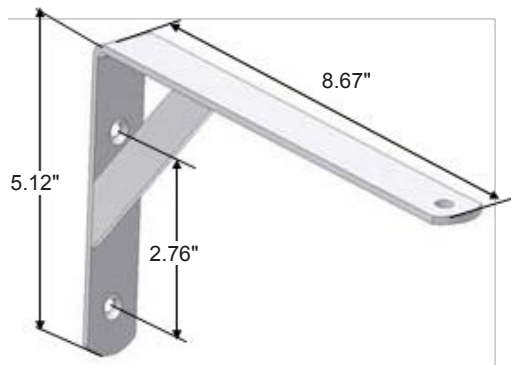
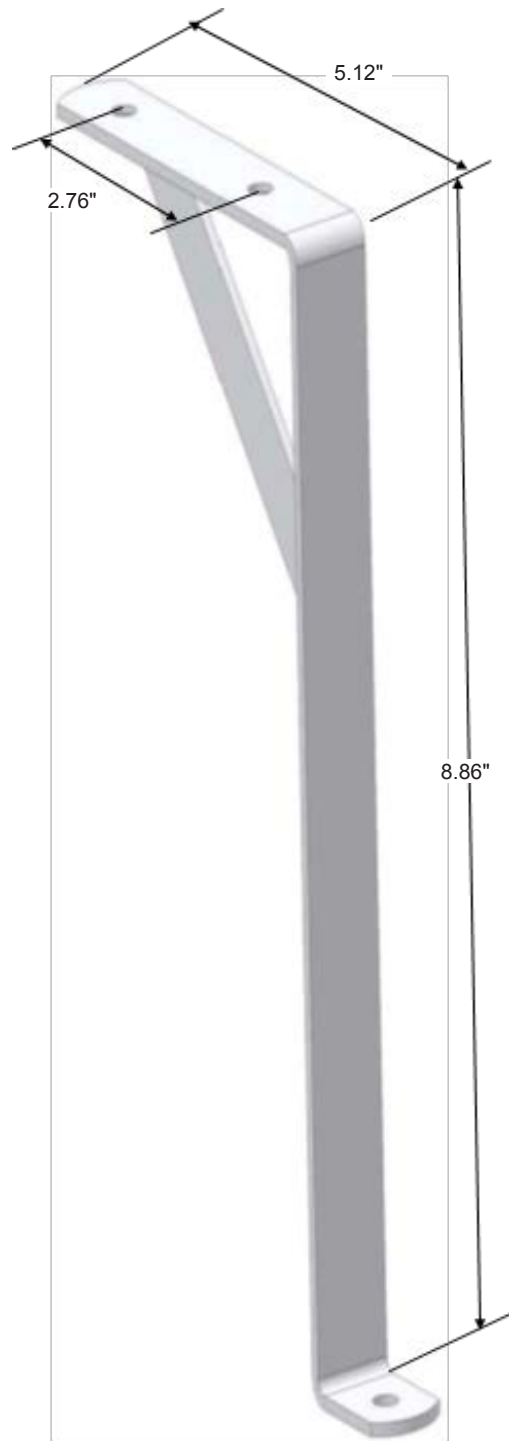


Figure 17: Mounting the ML Solo, wall or ceiling

**Wall fixture**



**Ceiling fixture**



*Figure 18: Wall and ceiling fixtures*

## 6.4 Placement overview

### 6.4.1 Hose layout for ML Solo

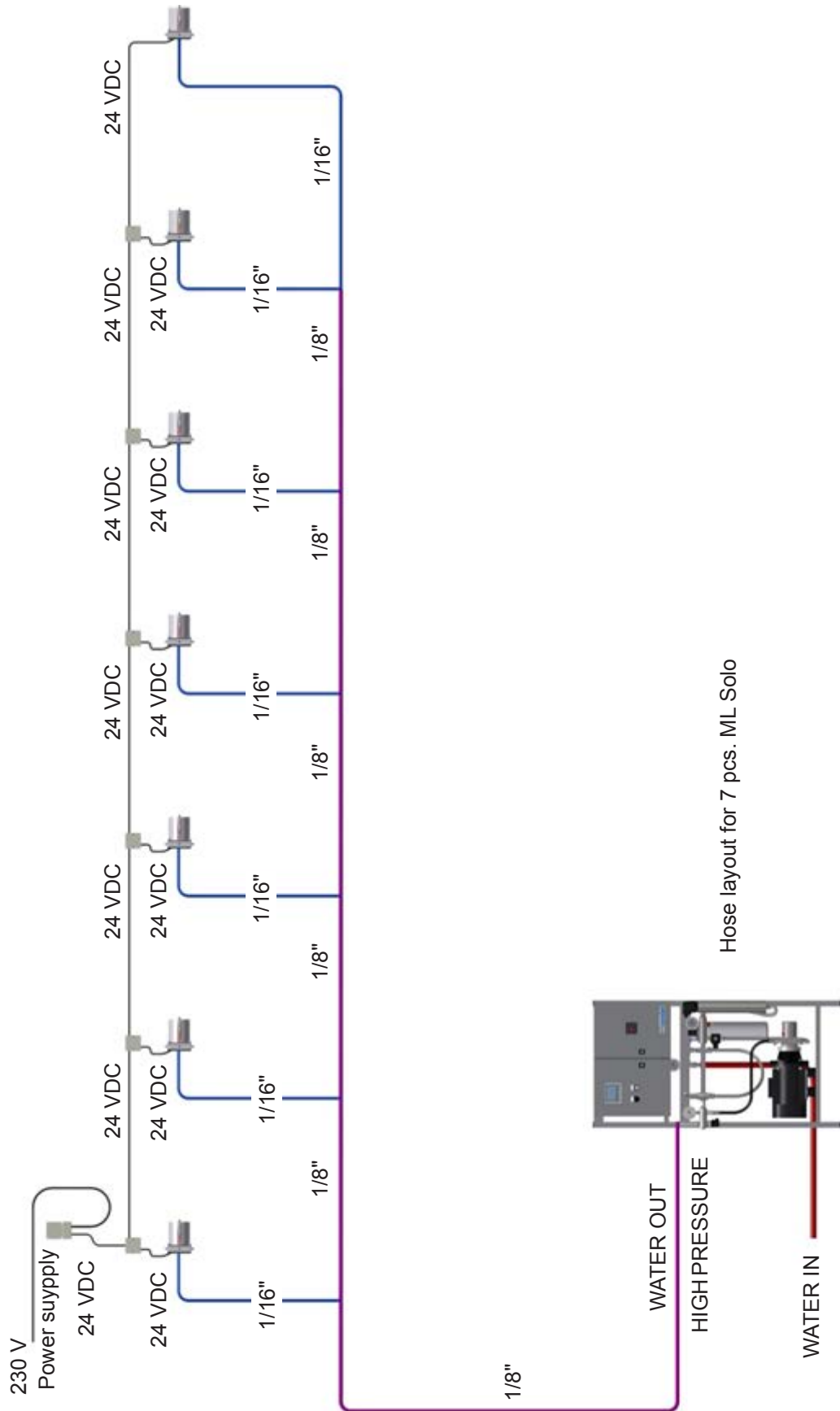


Figure 19: Hose layout for ML Solo

## 6.4.2 Atomization clearances

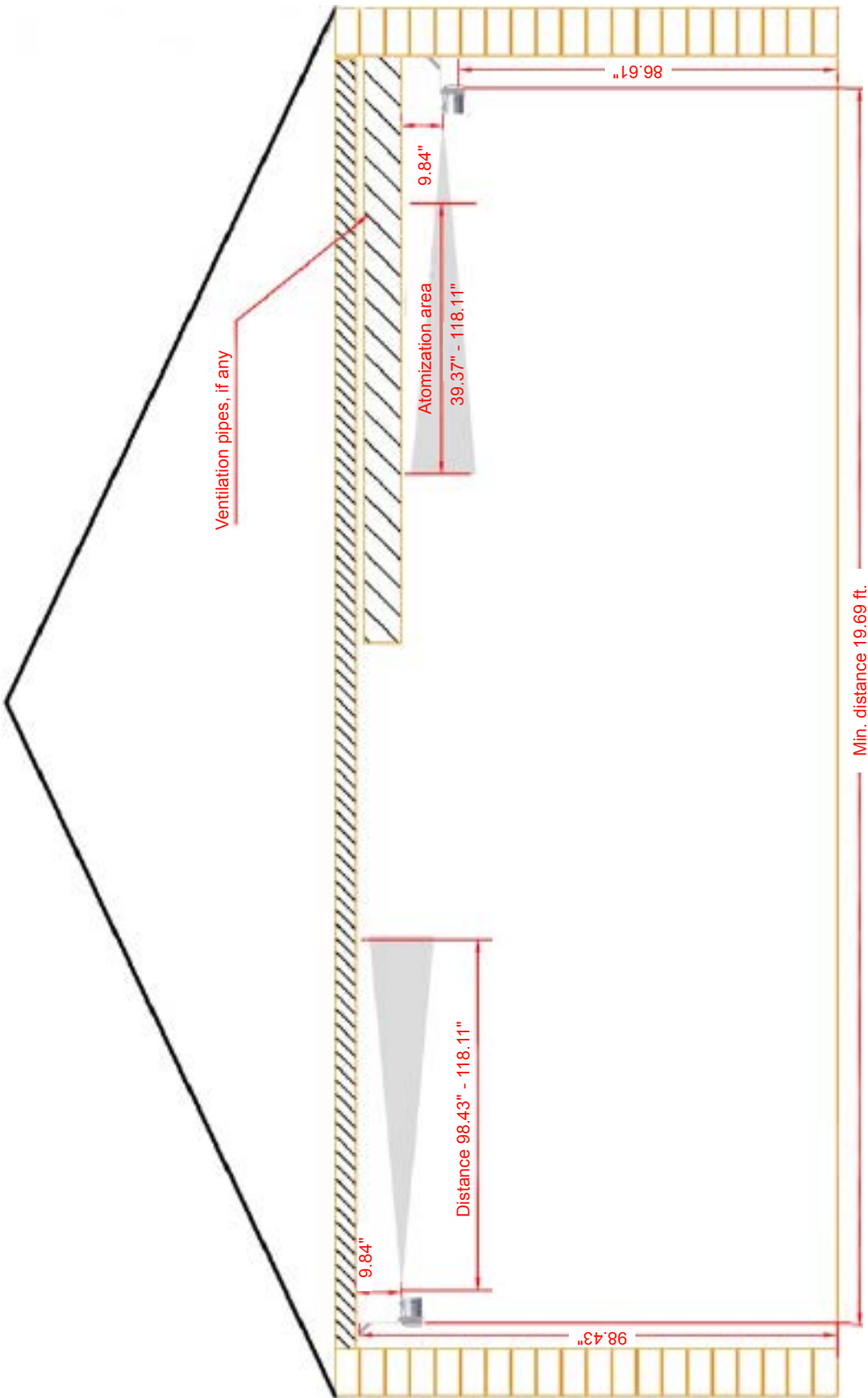
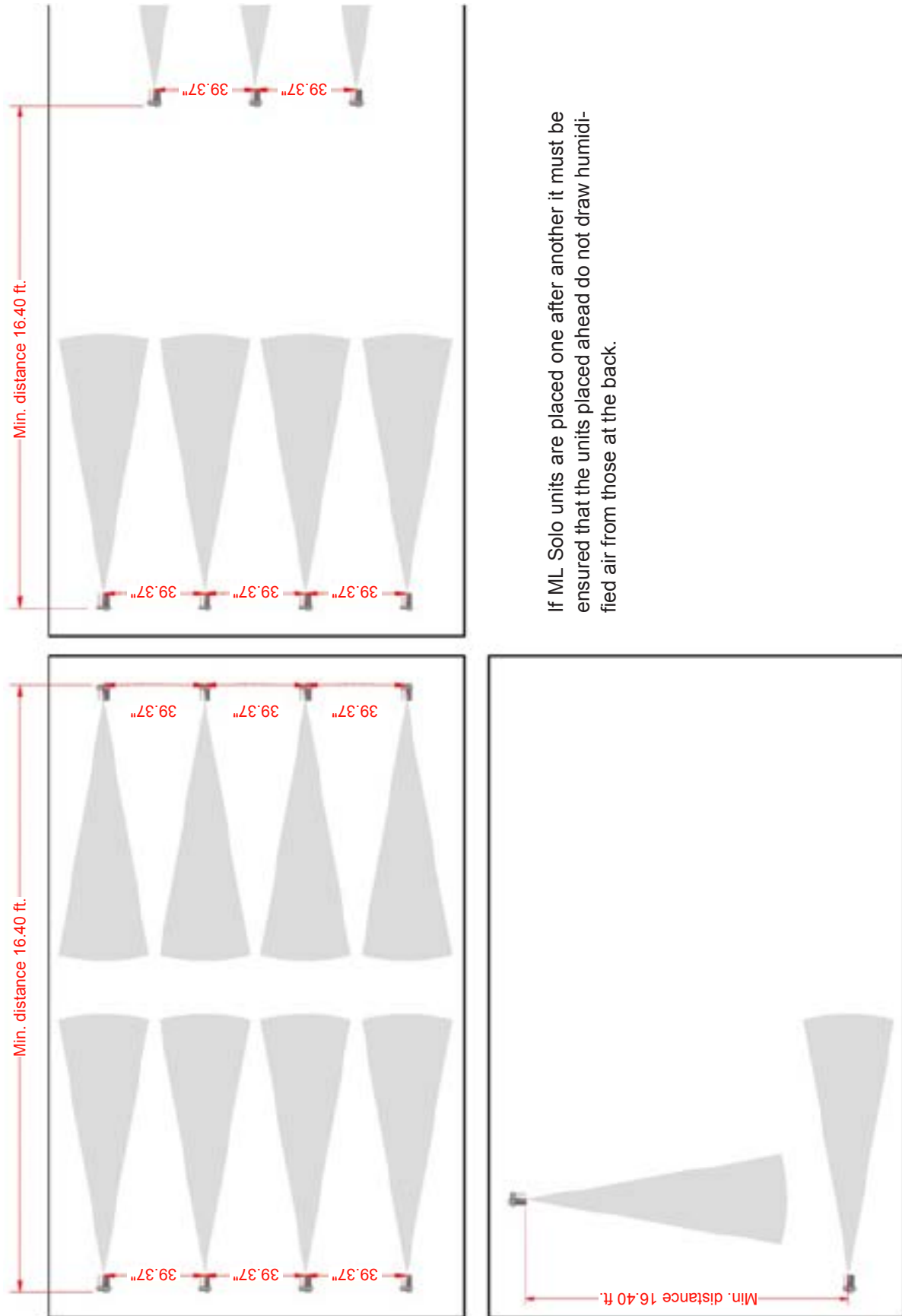


Figure 20: Miscellaneous mounting distances

ML Solo is often placed at very low floor-to-ceiling heights. In rooms with a low floor-to-ceiling height, the following must be considered: Atomization close to a person will often cause the feeling of draft conditions. This means that no stationary working places should be within the atomization area of 3 ft. to 10 ft. from the nozzle head. By way of example, the optimum placement for ML Solo is in passages in production rooms where the range of the nozzle is respected.

### 6.4.3 Placement of heads



If ML Solo units are placed one after another it must be ensured that the units placed ahead do not draw humidified air from those at the back.

Figure 21: Distances between modules

## 6.5 Product specifications

### 6.5.1 Technical data for ML Solo

	<b>ML Solo 1</b>	<b>ML Solo 2</b>
Weight	4.4 lb	4.4 lb
Size (h x w x d)	7.1 x 5.9 x 6.7 inch	7.1 x 5.9 x 6.7 inch
Noise level	41/44.5 dB	41/44.5 dB
Material	Powder painted steel	Powder painted steel
Air capacity	75 CFM	75 CFM
Humidification capacity	3.3 - 5.5 lb/h	6.6 – 11 lb/h
Operating pressure	507 - 1015 psi	507 - 1015 psi
Fan	Axial fan	Axial fan
Approvals (fan)	CE	CE
Connection, water	1/16" ML High pressure hose	1/16" ML High pressure hose
Connection, electricity	Connect to switch according to regulations; supplied with approx. 1 m cable 2 x 0.75 mm <sup>2</sup>	Connect to switch according to regulations; supplied with approx. 1 m cable 2 x 0.75 mm <sup>2</sup>
Power consumption	24 VAC, 50/60 Hz, 15/16 W, IP55	24 VAC, 50/60 Hz, 15/16 W, IP55
Min. room height	8 feet	8 feet
Min. distance to ceiling	10 inches	10 inches
Min. clearance in front of nozzle	9.8 feet	9.8 feet
Colour	White / Grey / Black	White / Grey / Black
Nozzles	3.3 or 5.5 lb/h	3.3 or 5.5 lb/h
Suspension from wall or ceiling	Wall or ceiling	Wall or ceiling

### 6.5.2 Sound power

Sound power (LWA) 56.0 dB(A).

Converted to the noise level in free field:

<b>Distance to unit</b>	<b>3.3 ft.</b>	<b>6.6 ft.</b>	<b>9.8 ft.</b>	<b>16.4 ft.</b>
dB	45	40	35	31

As an option the fan speed is reduced.

Sound power (LWA) at 75% voltage is 48.0 dB(A).



### 6.5.3 Nozzle part and size

Nozzle size	Item number
3.3 lb/h	103 200 001
5.5 lb/h	103 160 000

### 6.5.4 Nozzle specifications

Working pressure	35-70 bar
Material	Stainless steel
Anti-drip valve	Standard

### 6.5.5 Accessories

		Colour	Item number
Wall fixture	Solo 1 + 2	White	132 400 001
		Grey	132 400 002
		Black	132 400 003

		Colour	Item number
Ceiling fixture	Solo 1 + 2	White	132 401 000
		Grey	132 420 000
		Black	132 422 000

### 6.5.6 Power supply

Power supply	Item number
24V AC Transformer for 3 pcs. ML Solo, 230-240 VAC 50 Hz, 60 W	132 419 000
24V AC Transformer for 7 pcs. ML Solo, 230-240 VAC 50 Hz, 150W	132 420 000
24V AC Transformer for 10 pcs. ML Solo, 230-240 VAC, 50 Hz, 210W	132 421 000
24V AC Transformer for 15 pcs. ML Solo, 230-240 VAC, 50 Hz, 300W	132 422 000

## 6.6 Declaration of compliance

### CE – Declaration of Compliance

**Manufacturer:**

Condair A/S  
Technical Manager.: Jesper Lund – Jensen  
Parallelvej 2  
8680 Ry

**We hereby declare, that the following spray modules for humidification purposes with ML pump systems:**

ML Solo 1; ML Solo 2  
Voltage: 24 VAC 50/60 Hz

**are manufactured in accordance with the following EC directives:**

- 2006/42/EC, Directive on machinery
- 2004/108/EC, EMC directive (ElectroMagnetic Compatibility)
- 2009/125/EC, ErP-directive – ecodesign requirements of energy-related products
- 2011/65/EU RoHS Directive

**The following harmonized standards have been applied:**

- EN ISO 12100:2011, Safety of machinery – General principles for design – Risk assessment and risk reduction
- ISO TR 14121-2:2012, Safety of machinery – Risk ass. – Part 2: Practical guidance and examples of methods
- EN 60335-1:2012, Household and similar electrical appliances - Safety - Part 1: General requirements
- EN 60204-1:2006 + amendments, Safety of machinery – Electrical equipment of machines – Part 1: General requirements
- EN 61000-6-2:2005 + amendments, Electromagnetic compatibility (EMC). Generic standards. Immunity for industrial environments
- EN 61000-6-3:2007 + amendments, Electromagnetic compatibility (EMC). Generic standards. Emission standard for residential, commercial and light-industrial environments

**Installation and operation:**

**Description of the unit:** See Technical data

**Mounting and safety instructions**

Should be placed at a height of minimum 2,0 m above floor-level to the lower edge of the unit, to eliminate danger caused by possible touching of the impeller/ fan when operating. The fan is not equipped with guard grill at the outlet side of the fan, therefore the power to the fan should be switched off if work is done within a 0,5 m safety area from the outlet of the fan.

**Vibration-noise**

Transmitted noise from vibrations is minimized during mounting with the enclosed clamp. (See separate mounting instruction for ML Solo)

**Electrical connection**

Electrical connection should be made according to local rules by authorized people.  
The fan should be connected to an external voltage switch.

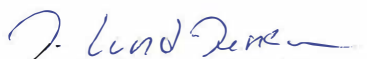
**Service and maintenance**

The impeller and the internal side of the cabinet/body should be cleaned for dust and dirt at least once every year, or when necessary. Should be cleaned in water and soap. Do not use organic dissolutions or other strong chemicals for the cleaning.  
Before the cleaning procedure is started, the power supply must be safely switched off, and it must be secured that the power cannot be switched on again during the cleaning.

**Sound level**

Sound level measured 1 metre from motor: 43 dB(A) at 50 Hz supply.

DK-Ry, 30. oktober, 2014

  
Jesper Lund-Jensen, Technical Manager

Condair A/S  
Parallelvej 2, DK-8680 Ry  
Tel. +45 8788 2100  
www.condairsystems.dk

## 7 ML Flex - Direct room humidification

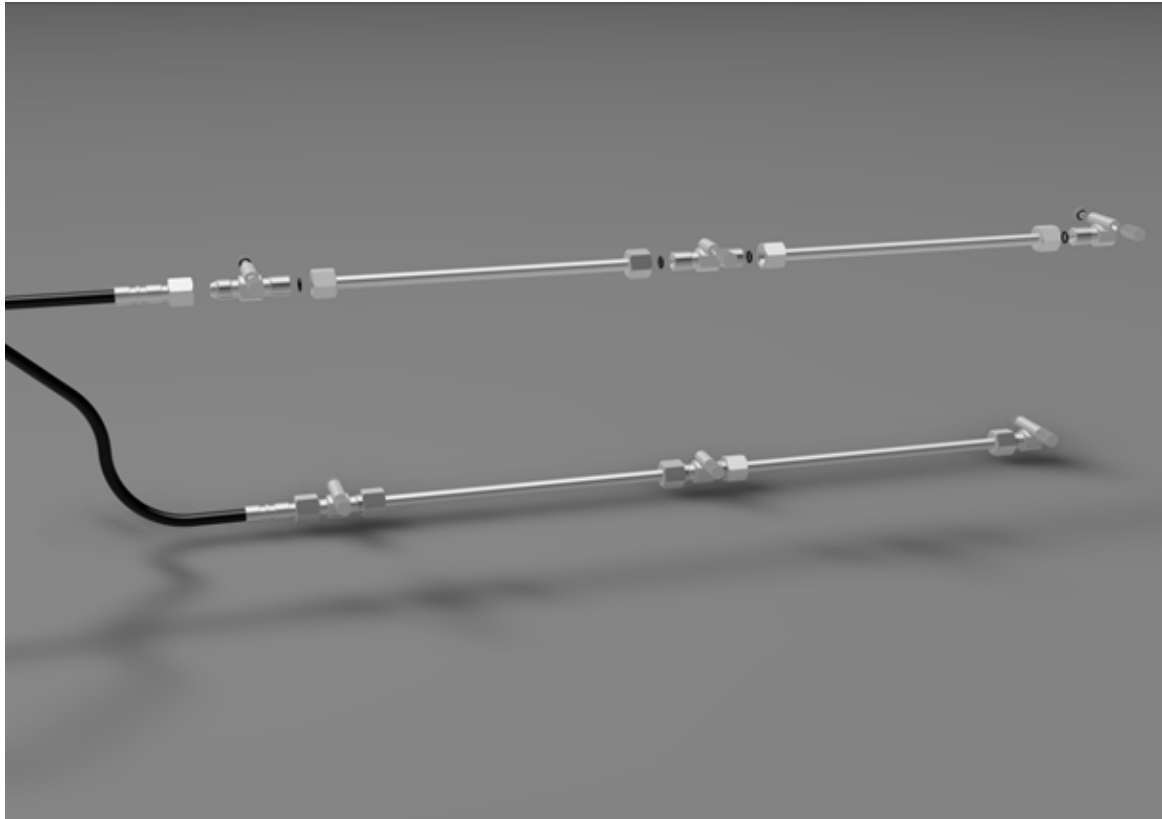


Figure 22: ML Solo direct room humidification system

### 7.1 General description

The Nortec ML Flex direct room humidification head is a high pressure and high efficiency atomizing adiabatic dispersion system. It is part of a complete high pressure humidification system, with ideally more Flex heads and nozzles, and one or more high pressure pump stations.

Every ML Flex is composed of 316 stainless steel tubing and nozzles. There are no fans or any need for electricity, making it ideal for explosion proof projects or highly sensitive applications. Since there are no fans or dispersion means the Flex relies on gravity to draw the mist downward to be evaporated. Therefore ML Flex nozzles and tubing are placed in high ceiling areas.

Nortec ML Flex is suitable for humidification in industrial and horticultural industry, as well as for dust control in rooms with high dust load, such as the textile industry.

The system is built with flexibility in mind, it can be easily designed or dimensioned to suit practically any project.

ML Flex System allows you to choose between wall and ceiling mounting. The nozzles are mounted in the T-sections which can be rotated individually.

Humidity is produced as water under high pressure (1015 psi) is atomized into micro-sized particles which are instantly absorbed into the surrounding air.



Can be used in hazardous areas such as, EX rooms (i.e. explosion proof).

## 7.2 Assembly overview

Strictly observe and perform all installation tasks including the mounting of the unit and connection of the water and power supplies as described in this manual.

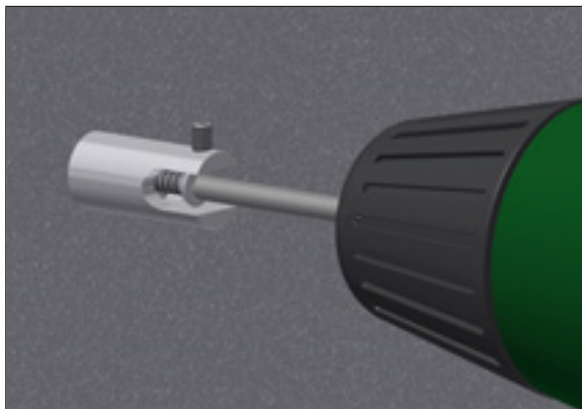
Observe and comply with all local and national codes dealing with water and electrical installations.

Nortec does not accept any liability for installation of humidification equipment by unqualified personnel, or the use of equipment/parts that are not authorized by Nortec.

### Personnel Qualifications

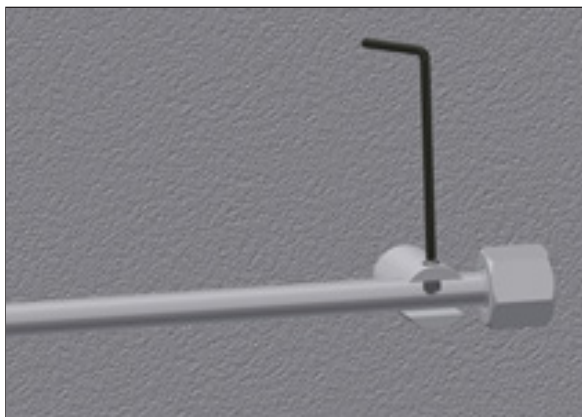
All installation work must be performed only by licensed personnel authorized by the customer. It is the customer's responsibility to verify qualifications of the personnel.

### 7.2.1 ML Flex Assembly

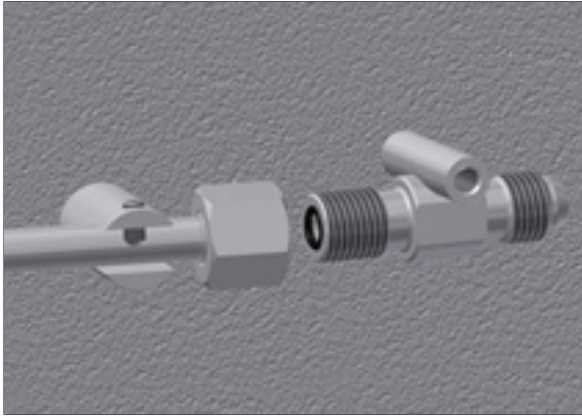


The wall suspension is fastened to the wall with an appropriate screw.

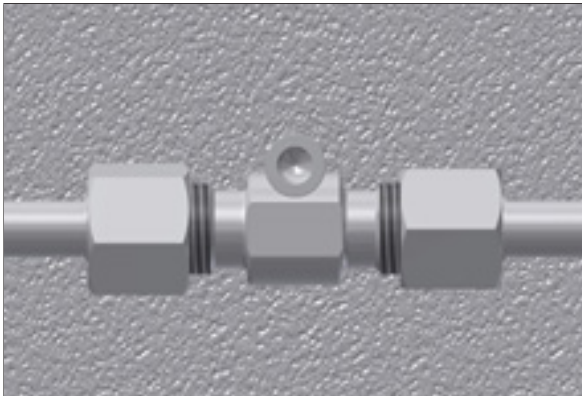
Maximum distance between wall suspensions is 3.0 ft. and the tube has to be fastened with at least 2 wall suspensions even if it is shorter than 3.0 ft.



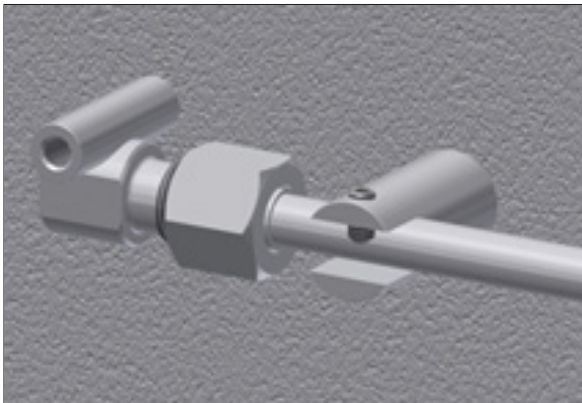
The tube is placed in the suspensions and secured by fastening the set screws by use of a 2 mm Allen key.



Mount the hose connection T-piece. Remember to place the O-ring.



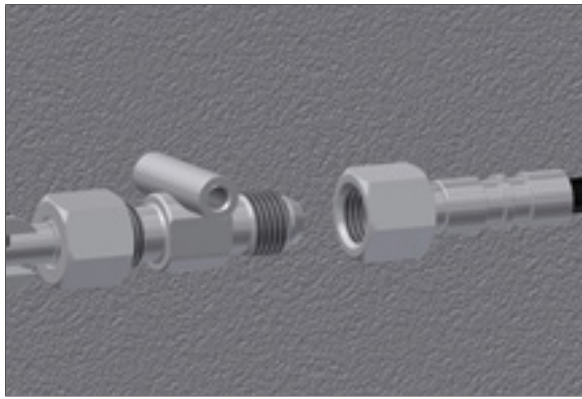
Join to flex tubes with T-pieces. Remember the O-rings. The nozzle fixture has to be on top of the assembly to avoid air pockets and to ensure the correct spray direction.



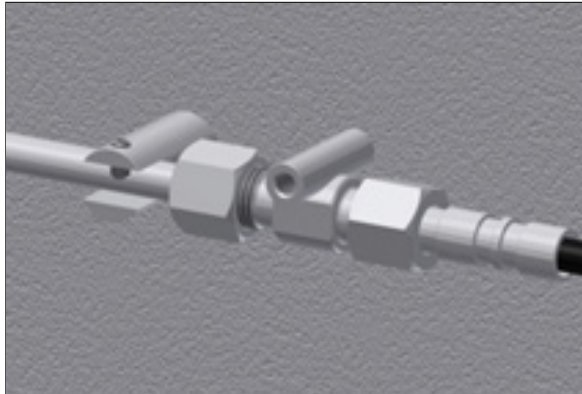
The end piece is mounted on the last tube in line. Remember the O-ring. The nozzle fixture has to be on top of the assembly to avoid air pockets and to ensure the correct spray direction.



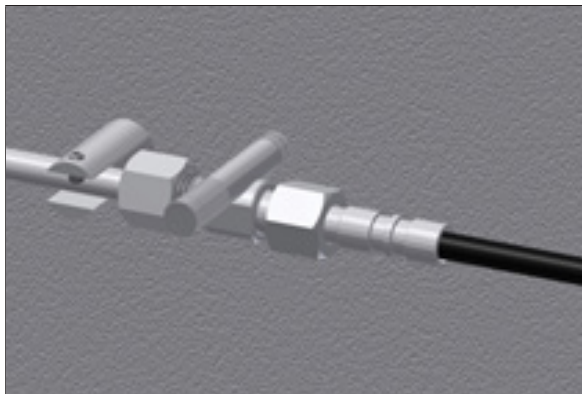
All joints are retightened by use of two fork wrenches NV17 (span of jaws).



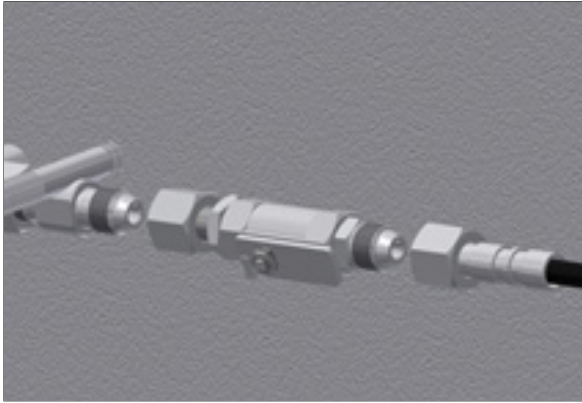
Connect the 1/8" high pressure hose to the hose nipple.



Flush the system thoroughly before fitting the nozzles.

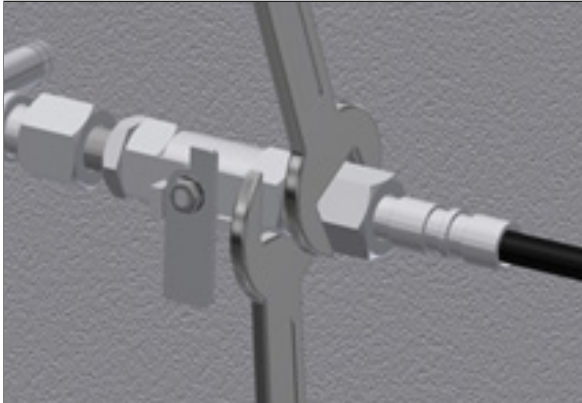


Please observe that the nozzle pointing towards the wall is fitted with a blind nozzle.



### **OPTIONAL BALL VALVE**

If a ball valve is needed this is fitted between high pressure hose coupling and the hose coupling on the flex system.



Retighten by use of two fork wrenches NV17 (span of jaws).



### **Ceiling suspension**

The system is hung up using the same fitting as for wall suspension and by means of either chains or wires.

Note: When the nozzles spray they create oppositely directed force of up to 1.1 lb-f. if suspended without horizontally support the pipe will swing back and forth when spraying.



## 7.2.2 Inserting the nozzle



### WARNING!

Never unscrew a nozzle on a pressurised unit. Disconnect power to the pump station when working on high-pressure system.



### CAUTION!

Be careful! The threads on the nozzles break easily, the nozzle seals with an O-ring and hence does not need to be tightened very hard, just a little more than you can do by hand.

Before inserting the nozzle, check that its threads and O-ring are intact.

- As shown In [Figure 23](#), insert the nozzle into the Flex assembly
- Screw the nozzle in by hand, tighten.
- Use a set of polygrip pliers to tighten the nozzle (approx. 1/8 turn) (torque: 2.1 Nm +/- 0.1 Nm)
- Ensure that the nozzle itself is tightened by tightening on the tip of the nozzle.

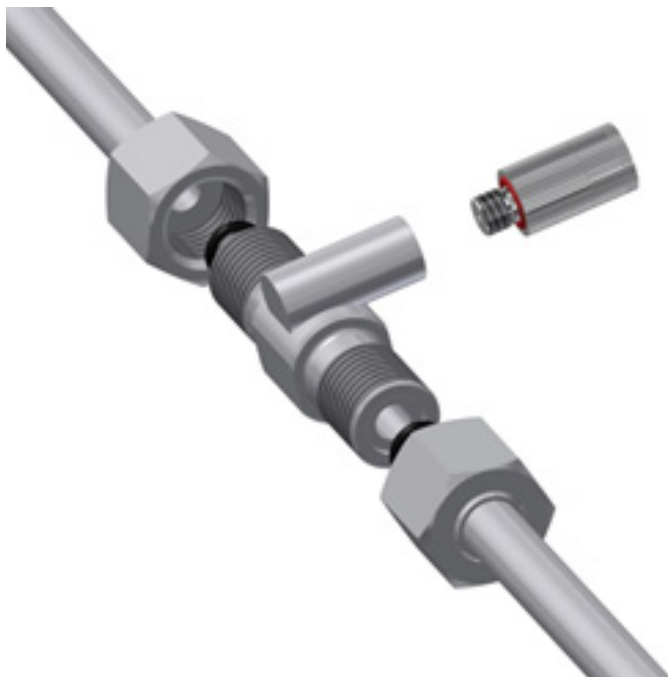


Figure 23: Inserting the nozzle

### 7.2.3 Water connection

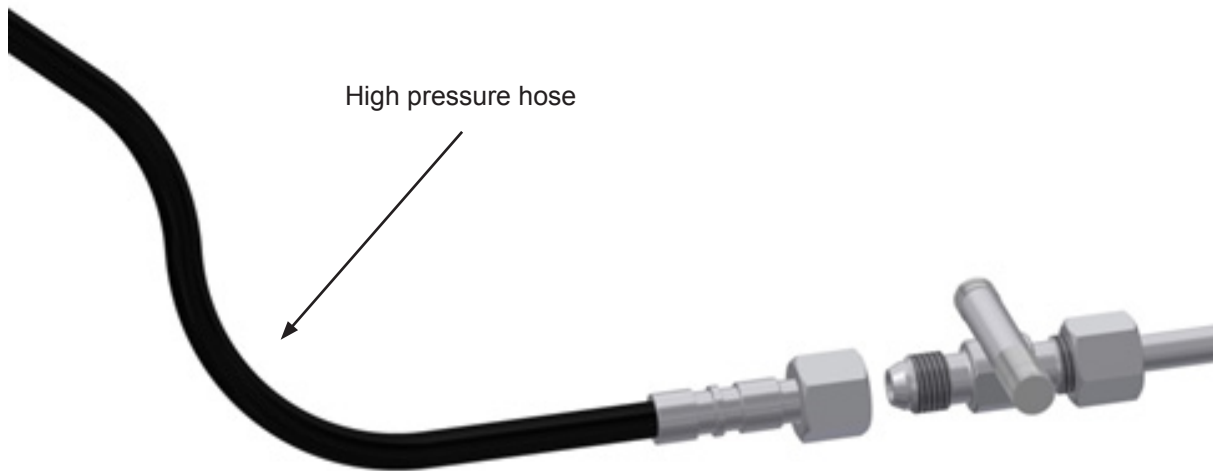


Figure 24: Connecting water to ML FLEX

The high pressure hose is connected to the ball valve. The hose can be strapped to the chain using cable ties. Avoid vertical U-turns on the hose. This might cause pockets of air in the hose.

### 7.2.4 Completed assembly

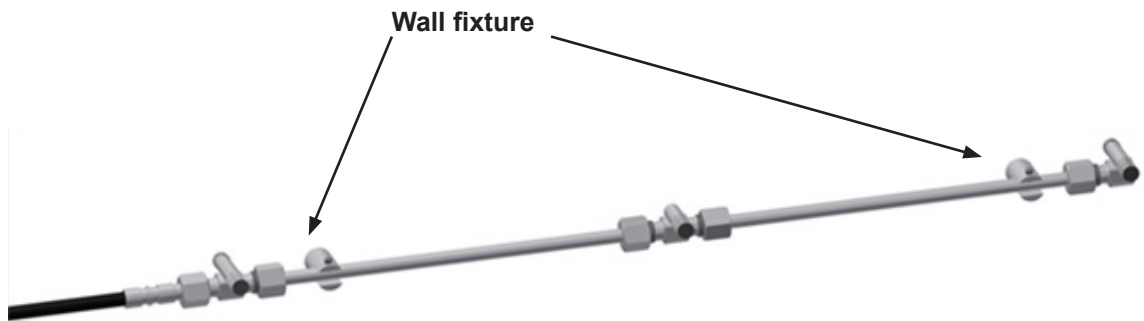


Figure 25: Wall mounted ML FLEX

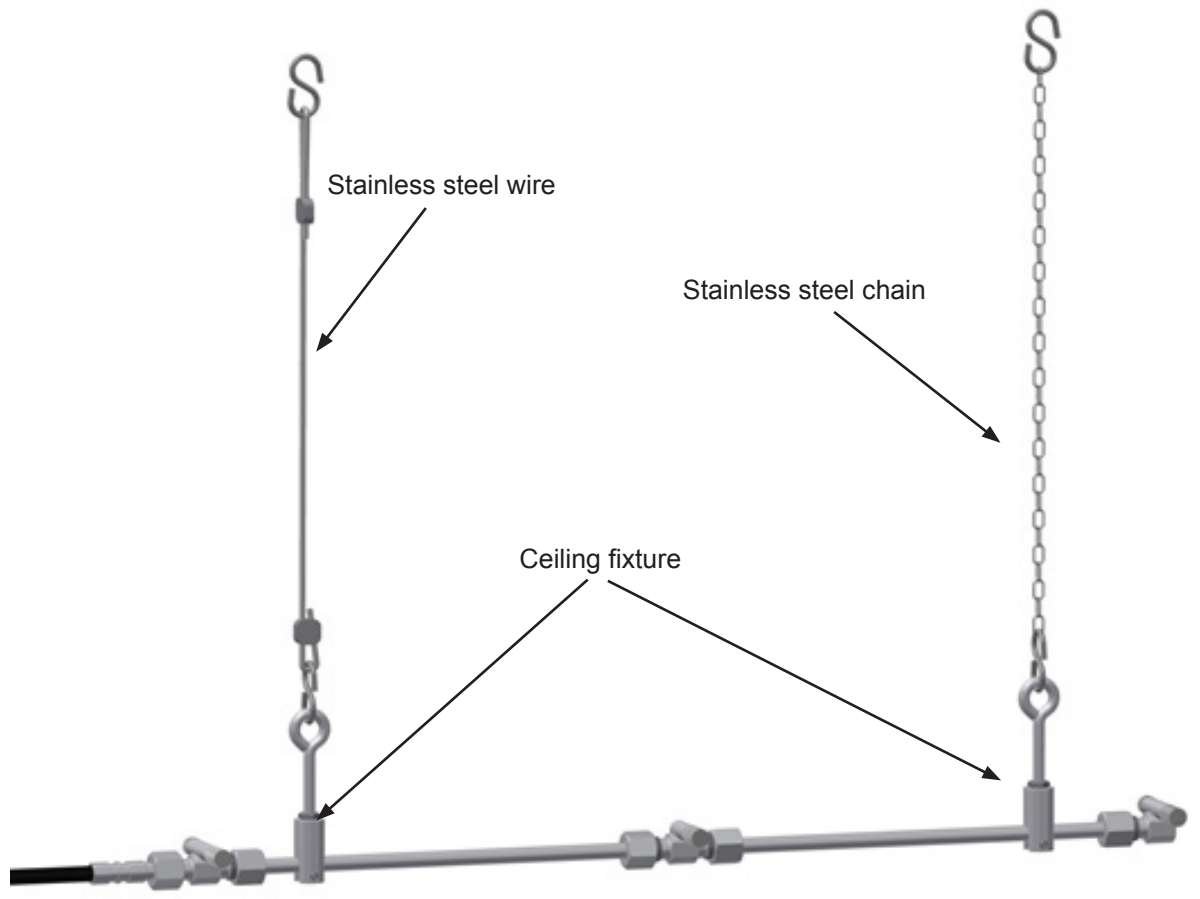


Figure 26: Ceiling mounted ML FLEX

## 7.3 Placement overview

### General Notes on Positioning

The positioning of a system is always determined during planning and noted in the system documents. Prior to mounting the Nortec ML Flex humidification units, ensure that all hose layouts, distances between heads and atomization clearances have been considered and adhered to, as per [Figure 27](#).

The recommended hose layouts, distances between humidification heads and atomization clearances, are shown below. Consult local and national installation regulations. Nortec does not accept responsibility for violations of the installation codes.

The following general positioning notes, however, have to be read and complied with in any case:

- Make sure that the construction (rafter, beam, wall, pillar, ceiling construction, etc.) on which the devices and/or system components will be mounted disposes of a sufficient load-carrying capacity and is suitable for fixing
- Position the Nortec ML Flex atomizers in such a way to enable the atomized mist to spread freely. When the mist is prevented from spreading by obstacles (e.g. ceilings, beams, ventilation ducts, airflow, machinery, etc.), turbulences can build up and condensation may occur as a result.
- [Figure 27](#) shows the recommended clearances, of the expansion of the atomization stream, and the clearances that have to be maintained. These are ideal and recommended capacities using ML nozzles under standard conditions. Different weather, climate and indoor conditions can alter the spread and distance of the mist
- As shown in [Figure 27](#), when the nozzles and humidification heads are placed one opposite the other, make sure that a minimum distance of 20 feet is adhered to. This will avoid the streams to condensate each other.
- Pay attention to the airflow of the room. Do not install humidification heads or nozzles in the immediate vicinity of a supply, return or exhaust system or of a cold-air inlet.
- Do not direct humidification heads or their nozzles at cold parts of a building, e.g. outside walls, windows, etc. (risk of condensation).
- Insulate cold-water pipes in the area of the atomizing stream (risk of condensation).
- The evaporation process absorbs heat from the ambient air. For this reason, make sure that the atomized stream is not directed on persons or on places directly above workplaces.
- In order to guarantee optimum humidification, ensure that the atomizers are sensibly distributed in the room.
- The system components have to be mounted in such a way to provide enough space for operation and maintenance.

Please contact Nortec's Technical Service Team in case you have questions on positioning and clearances.

### 7.3.1 Positioning clearances

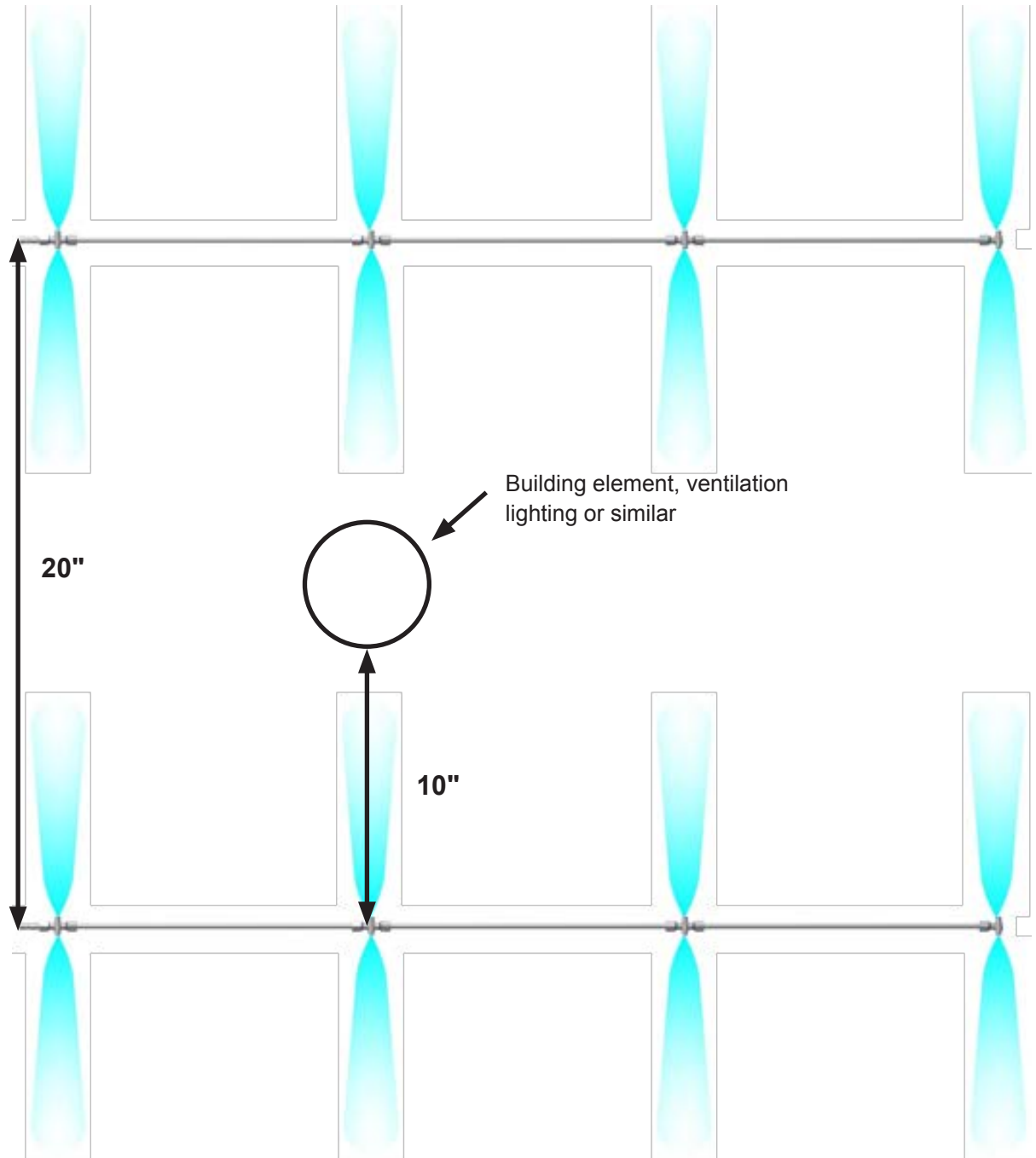


















Figure 27: Distances between modules

## 7.4 Parts and spare parts

Some of the following parts and spare parts may only be available in select markets. Contact your local sales representative for more information on pricing and lead times.

Item	Part No.	
Standard tubes 9.8 inches 1.6 ft. 2.5 ft. 3.3 ft. 6.6 ft.	120 304 007 120 306 007 120 308 007 120 310 007 120 312 007	
Hose connection without nozzles	120 341 007	
Hose connection with double nozzles	120 342 007	
T-section single nozzle	120 320 007	
T-section double nozzles	120 321 007	
Connection piece without nozzles	120 340 007	

Item	Part No.	
End piece with double nozzles	120 330 007	
Wall fixture	120 318 000	
Ceiling fixture	120 319 000	
Fixture for 3/8" tubes Used when mounting on a support pipe	730 020 280	
Stainless nozzles 5.5 lb/h 10 lb/h	201 020 003 201 020 001	
Stainless nozzle 3.3 lb/h	103 200 001	
Blind nozzle	103 140 000	
Nozzle swivel adapter	25 81 276	
O-rings 50 pcs. 100 pcs.	120 351 007 120 350 007	

Item	Part No.	
Small ball valve	25 78 176	
Chain		
20 ft.	101 101 000	
33 ft.	101 100 000	
328 ft.	101 104 000	

## 7.5 Product specifications

### 7.5.1 Technical data for ML Flex

Wall / ceiling fixture	≈ 1 per 3 feet
Weight:	≈ 2.7 ounce/foot
Material	316 Stainless steel
Sound pressure level	Approximately 32 dB
Working pressure	507-1015 psi
Min. distance to ceiling	8 inches
Min. free clearance for atomization	5 feet
Max length	460 feet
Max flow	396 lb/h
Max no. of nozzles 5.5 lb/h	70
Max no. of nozzles 10 lb/h	40

### 7.5.2 Dimensioning

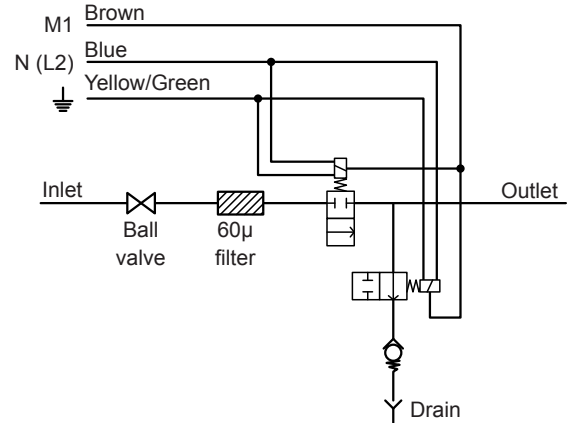
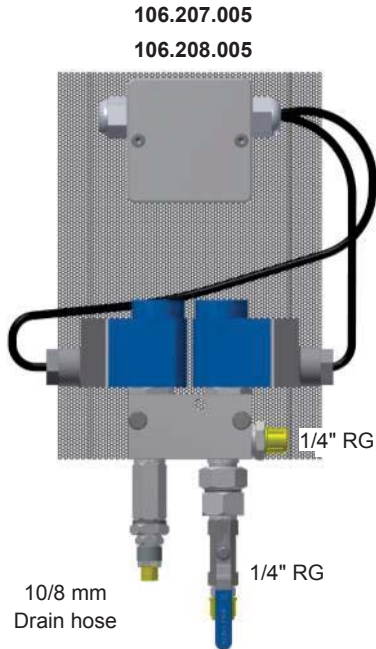
Floor to ceiling height	Recommended nozzle sizes	Recommended operation setting
> 19 ft.	10 lb/h	≈ 70 %
13 ft. - 19 ft.	5.5 lb/h	50-60 %
6.5 ft. - 13 ft.	3.3 lb/h	50-60 %



# 8 Appendix

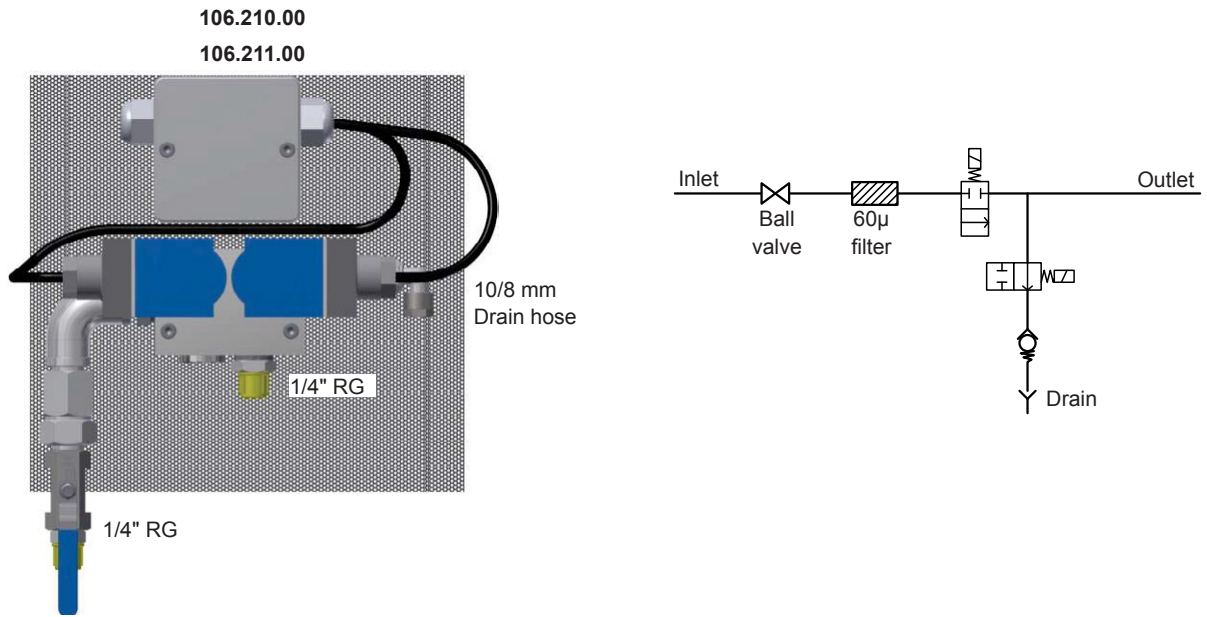
## 8.1 Solenoid valve (zone valve)

Data source: TD025GB



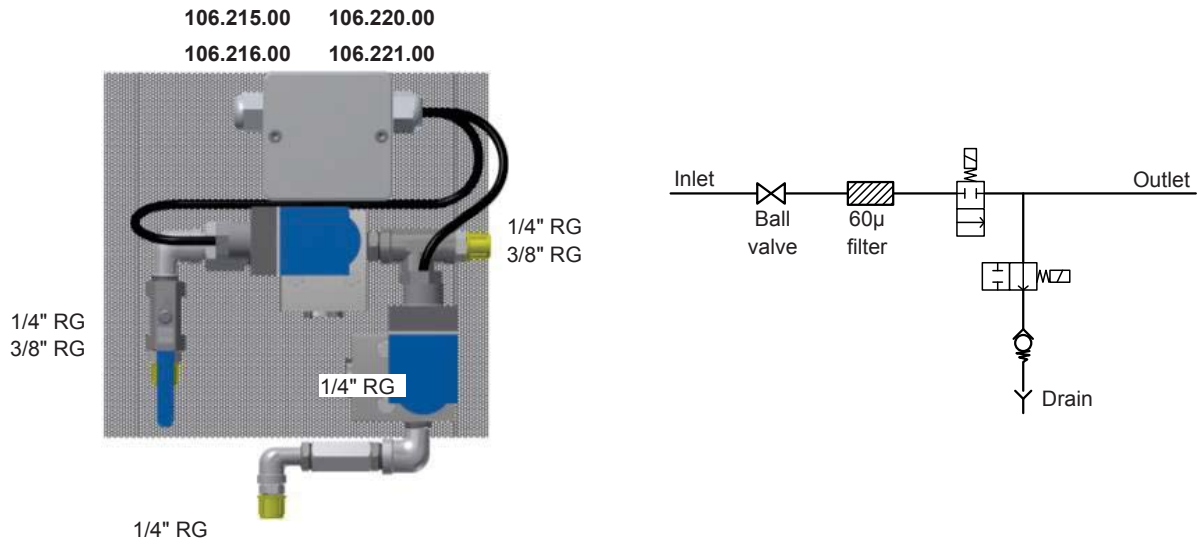
Spare parts	
102.400.000	Filter for pre-filter at nozzle ring, length 0.59 inch, 20 µ nominal
106.531.000	Coil, 240 VAC, 50 Hz
106.532.000	Coil, 200 VAC, 50/60 Hz / 240 VAC, 60Hz
106.533.000	Armature NC
106.534.000	Armature NO
106.535.000	Piston kit (1 piston)
240.010.004	Pilot nozzle, 0.047 inch
240.010.003	Pilot nozzle, 0.0625 inch

Technical data	106.207.005	106.208.005
Flow range	0-16,72 Gal/h	
Water type	All types	
Inlet and outlet fittings	1/4"	
Connection for outlet hose	10/8 mm PA hose	
Filtration	20 µ	
Valve type	3/2-ways valve with built-in counter block, stainless steel	
Coil power	240 VAC/50 Hz	200 VAC 50/60 Hz 240 VAC/ 60 Hz
Power consumption	42 VA, 20 W	
Power consumption, cut-in	88 VA	



Spare parts	
106.500.000	Filter for pre-filter at solenoid valve set, length: 0.98 inch, 60 µ nominal
106.531.000	Coil, 240 VAC, 50 Hz
106.532.000	Coil, 200 VAC, 50/60 Hz / 240 VAC, 60Hz
106.533.000	Armature NC
106.534.000	Armature NO
106.535.000	Piston kit (1 piston)
240.010.004	Pilot nozzle, 0.047 inch
240.010.003	Pilot nozzle, 0.0625 inch

Technical data	106.210.000	106.211.000
Flow range	13.2-79.2 Gal/h	
Water type	All types	
Inlet and outlet fittings	1/4"	
Connection for outlet hose	10/8 mm PA hose	
Filtration	60 µ	
Valve type	Combination of NC and NO in a common block with stainless steel check valve	
Coil power	240 VAC/50 Hz	200 VAC 50/60 Hz 240 VAC/ 60 Hz
Power consumption	42 VA, 20 W	
Power consumption, cut-in	88 VA	



Spare parts	
106.500.000	Filter for pre-filter at solenoid valve, length: 0.98 inch, 60 $\mu$ nominal
106.531.000	Coil, 240 VAC, 50 Hz
106.532.000	Coil, 200 VAC, 50/60 Hz / 240 VAC, 60Hz
106.533.000	Armature NC
106.534.000	Armature NO
106.535.000	Piston kit (1 piston)
240.010.004	Pilot nozzle, 0.047 inch
240.010.003	Pilot nozzle, 0.0625 inch

Technical data	106.215.000	106.216.000	106.220.000	106.221.000
Flow range	13.2-79.2 Gal/h			
Water type	All types			
Inlet and outlet fittings	1/4"		3/8"	
Connection for pressure release outlet hose	1/4"			
Filtration	60 $\mu$			
Valve type	Directional valve NC and NO with stainless steel check valve			
Coil power	240 VAC/50 Hz	200 VAC 50/60 Hz 240 VAC/ 60 Hz	240 VAC/50 Hz	200 VAC 50/60 Hz 240 VAC/ 60 Hz
Power consumption	42 VA, 20 W			
Power consumption, cut-in	88 VA			

### 8.1.1 Solenoid valve set

If the system consists of several different zones, load permitting, one pump is sufficient to supply all the zones. Each zone must be equipped with a solenoid valve set, which opens when the zone needs humidification and relieves the pressure in the high-pressure hose when the zone stops.

All solenoid valve sets are mounted on a mounting plate and equipped with a filter and a ball valve on the inlet side. However, a few special models do not feature the filter and ball valve.

The filter protects the solenoid valves against contaminants and the valve enables the disconnection of one department when servicing the system. If the ball valve is closed, it is very important at the same time to disconnect the power to the department control cabinet. If this is not done, the pump may become overheated due to lack of flow and thus cooling of the pump.

A traditional solenoid valve set features two individually controlled solenoid valves; one solenoid valve for the on/off function and one solenoid valve for pressure relief. Another solution is a construction with 3/2 valves and a single control signal.

The advantages of 3/2 valves are that the electrical connection is more simple and that due to the valve, the system is constantly pressure relieved. Any leakage from the valve is directed to an outlet, thus no dripping from the nozzles.

Please note that the ML system facility featuring the PLC control can only be used with 3/2 valves.

A check valve is mounted on the pressure relief side to prevent the system from drainage in case of defect nozzles or in connection with replacement of nozzles.

**Due to the check valve's 7.25 psi opening pressure, the maximum allowed vertical distance between the solenoid valve set and the upper nozzle of the installation is 16 feet.**

### 8.1.2 Choosing size and type

The maximum flow of the department determines type and combination.

Softened water allows for the use of brass valves, while water from reverse osmosis (RO) requires the use of corrosion-proof valves.

Surface water with a conductivity less than 50  $\mu\text{S}/\text{cm}$  requires the use of corrosion-proof valves.

### 8.1.3 Pressure release hoses

Important: Discharge hoses from pressure release valves must be conducted to a free outlet. Do not connect discharge hoses, make sure they run separately. Secure the hoses properly, as they are exposed to strong pressure impacts.

Please note that some of the largest solenoid valve sets require a 1/4" high-pressure hose for pressure release, while smaller valve sets require a 10/8 mm PA hose.

Surface water with a conductivity less than 50  $\mu\text{S}/\text{cm}$  requires the use of corrosion-proof valves.

## 8.2 Humidity sensors

Data source: TD150GB-03

### HST2-010, item no. 105 501 000

The HST2-010 is an electric sensor for measurement of the relative humidity and temperature in atmospheric air. The relative humidity is transformed to a 0-10.0 VDC signal corresponding to 0-100 % RH. Furthermore the HST2-010 has a built in PT1000 temperature sensor element.

The HST2-010 is well suited for humidity controlling equipment and is easy to interface to electronic controllers and PLC's due to the standardized output signal and very low power consumption.

Suitable in greenhouses, printing houses, textile industry etc.



Figure 28: HST2-010, item no. 105 501 000

### HST2-420, item no. 2583 695

The HST2-420 is an electronic sensor for measurement of the relative humidity and temperature in atmospheric air. The relative humidity is transformed to a 4 - 20 mA signal corresponding to 0 - 90 % RH. Furthermore the HST2-420 has a built-in PT1000 temperature sensor element with 4 - 20 mA signal converter.

The HST2-420 is well suited for humidity controlling equipment and is easy to interface to electronic controllers and PLC's due to the standardized output signal.



Figure 29: HST2-420, item no. 2583 695

	HST2-10 HST2-420	HST2-10 HST2-420
<b>General specifications</b>		
Measuring range	0 – 90 % RH	
Tolerance at 77 °F	±4.5 % RH @ 30 – 80 % RH +/-7 % RH @ 0 to 30 % RH & 80 to 100 % RH	
Tolerance, full temperature range	+/-5 % RH @ 30 to 80 % RH +/-8 % RH @ 0 to 30 % RH & 80 to 100 % RH	
PT1000 element	Class B tolerance standard; class A on	
<b>Supply specifications</b>		
Supply voltage	13 – 27 VDC	12 – 30 VDC
Current limitation	Max. 26 mA	
Current consumption	<2.5 mA @ 27 VDC <1.5 mA @ 13 VDC	
<b>Environment</b>		
Operating temperature	32 - +122 °F	
Storage temperature	-4 - +158 °F	
<b>Connections</b>		
Max. cable length	50 m: 3x0.5 mm <sup>2</sup> 165 feet: 3x18 AWG  For cables above 164 ft. 1/2 use 4-20 mA converters (see accessories)	
Connector	Standard sensor connector M12x1, 5 pins PIN1: +Supply voltage 13-27 VDC PIN2: 0 – 10.0 VDC output PIN3: - (reference) PIN4: PT1000 temp. sensor PIN5: PT1000 temp. sensor	Standard sensor connector M12x1, 4 pins PIN1: +Supply voltage 12-30 VDC, for temp. sensor PIN2: +Supply voltage 12-30 VDC, for humidity sensor PIN3: 4-20 mA output signal corresponding to 0-100 °C PIN4: 4-20 mA output signal corresponding to 0-100 % RH
<b>Housing</b>		
Dimensions	Ø33/64 x 4 21/84 inch	
Material, housing	POM, black POM, black & aluminium	
Material filter	PE, black/blue	
Weight	0.704 oz.	2.464 oz.
<b>Accessories</b>		
	105 502 000, 4-20 mA converter type U/I (to be used if cable length is above 164 ft.)  105 511 000, 6.5 ft. PVC cable with plug	Incl. in standard package: Binder M12, connector type 99 0436 10 05

NOTE: If RH is between 90 and 100% a DOL sensor is used, DOL114, item no. 105 525 000

**DOL114, item no. 105 525 000**

### **Product description**

DOL 114 is a high-precision sensor for measuring relative humidity and temperature. It is intended for application in livestock houses but is also well suited for a number of industrial applications.



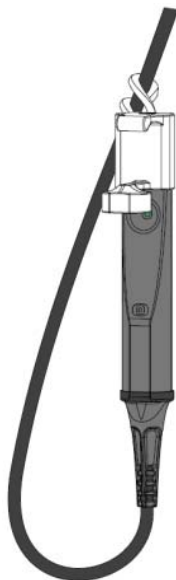
*Figure 30: DOL 114*

### **Important maintenance**

Clean DOL114 using water and a brush. Do not use:

- High-pressure cleaner
- Highly compressed air
- Solvents
- Corrosive/caustic agents
- Alcohol-based disinfectants

During cleaning and disinfection, the sensor must be protected using a protection cap and be placed in vertical position.



*Figure 31: Positioning and protection during cleaning*

After the sensor has been exposed to water and condensation, the sensor requires time during which the relative humidity is less than 80% in order to measure correctly.

Do not bend the sensor as this would inflict permanent damage on the electronics of the sensor.

Dol-sensors reserve the right to change this document and the product herein described without further notice.

LED/Light Protocol		
LED		Status
Green	Red	
ON		Operation OK
Flash		Outside normal range (below 10% RH or exceeding 95% RH)
	ON	Connection error Load < 500 $\Omega$
	Flash	Sensor defect Over/under voltage alarm (below 11 V or exceeding 32 V) Overload



Figure 32: Mounting

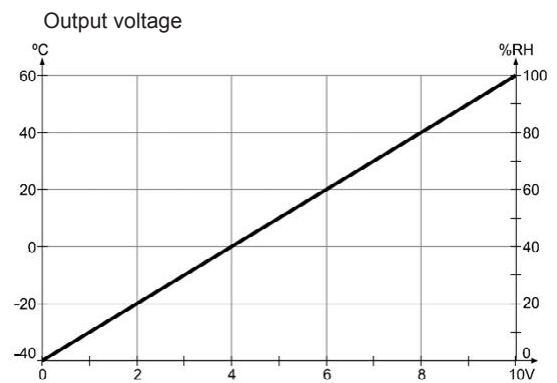


Figure 33: Functional graph

## Installation

For optimum mounting of the sensor, use mounting clips or mount it free-hanging in the cable.

The sensor element requires free air passage. See Fig. 1. Mount the sensor so it is not exposed to direct sunlight, as this would affect the measurement.



**REMEMBER TO PUT ON A PROTECTION CAP BEFORE MOUNTING THE CABLE.**

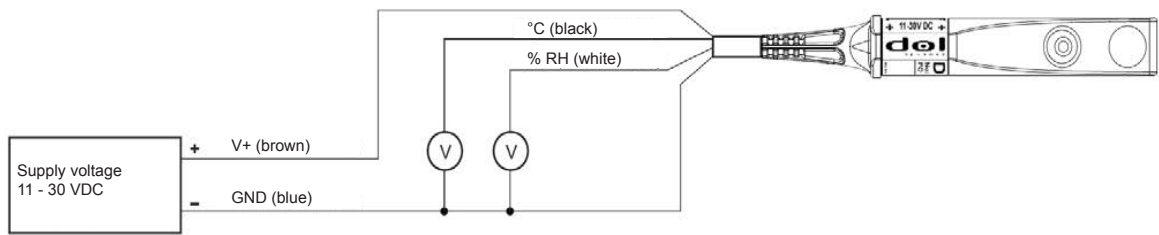


Figure 34: Connection

Table 1: Signals and wire colors in other products

<b>DOL 14</b>		<b>DOL 14 HQ</b>		<b>DOL 114</b>
Black = +13-24 VDC	→	White = +13-28 VDC	→	Brown = +11-30 VDC
Brown = 0...10 V / %RH	→	Green = 0...10 V / %RH	→	White = 0...10 V / %RH
No temperature output	→	No temperature output	→	Black = 0...10 V / °C
Blue = GND (0 V)	→	Brown = GND (0 V)	→	Blue = GND (0 V)

	Humidity	Temperature
<b>Measuring range</b>	0-100 %RH	-40 °C – 120 °F
<b>Accuracy 1</b>	±2 % RH (40-85 %) ±3 % RH (10-95 %) at 21 – 104 °F *	+50 – 104 °F ±0.9 °F at -22 – 140 °F ±2.7 °F
<b>Output signal</b>	0.1 V / % RH 0.1	0.1 V / °C; 0 °C at 4 V
<b>Common</b>		
<b>Time constant</b>	2 min.	
<b>Supply voltage</b>	11 -30 VDC	
<b>Current</b>	20 mA @ no load 70 mA @ max. load	
<b>Load</b>	< 500 Ω -> 10 MΩ	
<b>Recommended load</b>	≥ 100 kΩ	
<b>Output current</b>	20 mA per output (current limited)	
<b>Output impedance</b>	< 1 Ω	
<b>Temperature, operation</b>	-40 °F – 140 °F	
<b>IP classification</b>	IP 67	
<b>Cable</b>	6.6 ft., 4 x 22 AWG / 0.34 mm <sup>2</sup>	
<b>Max. cable length</b>	326.1 ft. @ 0.75 mm <sup>2</sup> , 656.2 ft. @ 1.5 mm <sup>2</sup>	
<b>Shipment weight ex. connector</b>	5.30 oz.	
<b>Measure, shipment</b>	10.8 x 7.8 x 0.80 inch	
*: After direct water exposure and condensation a period with less than 80 % RH is needed for correct measurement		

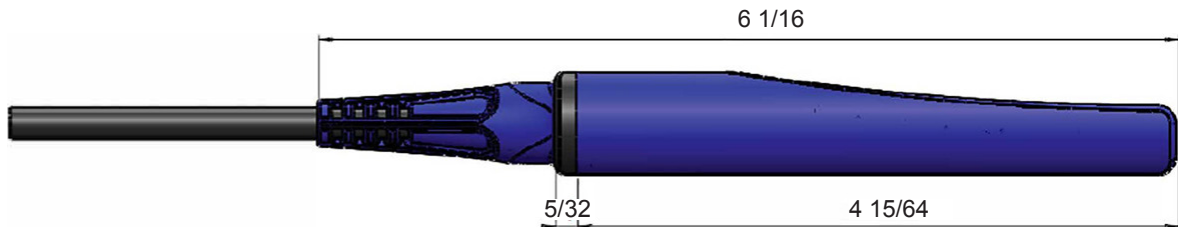


Figure 35: Dimensions (in inch)

### 8.3 Installation examples

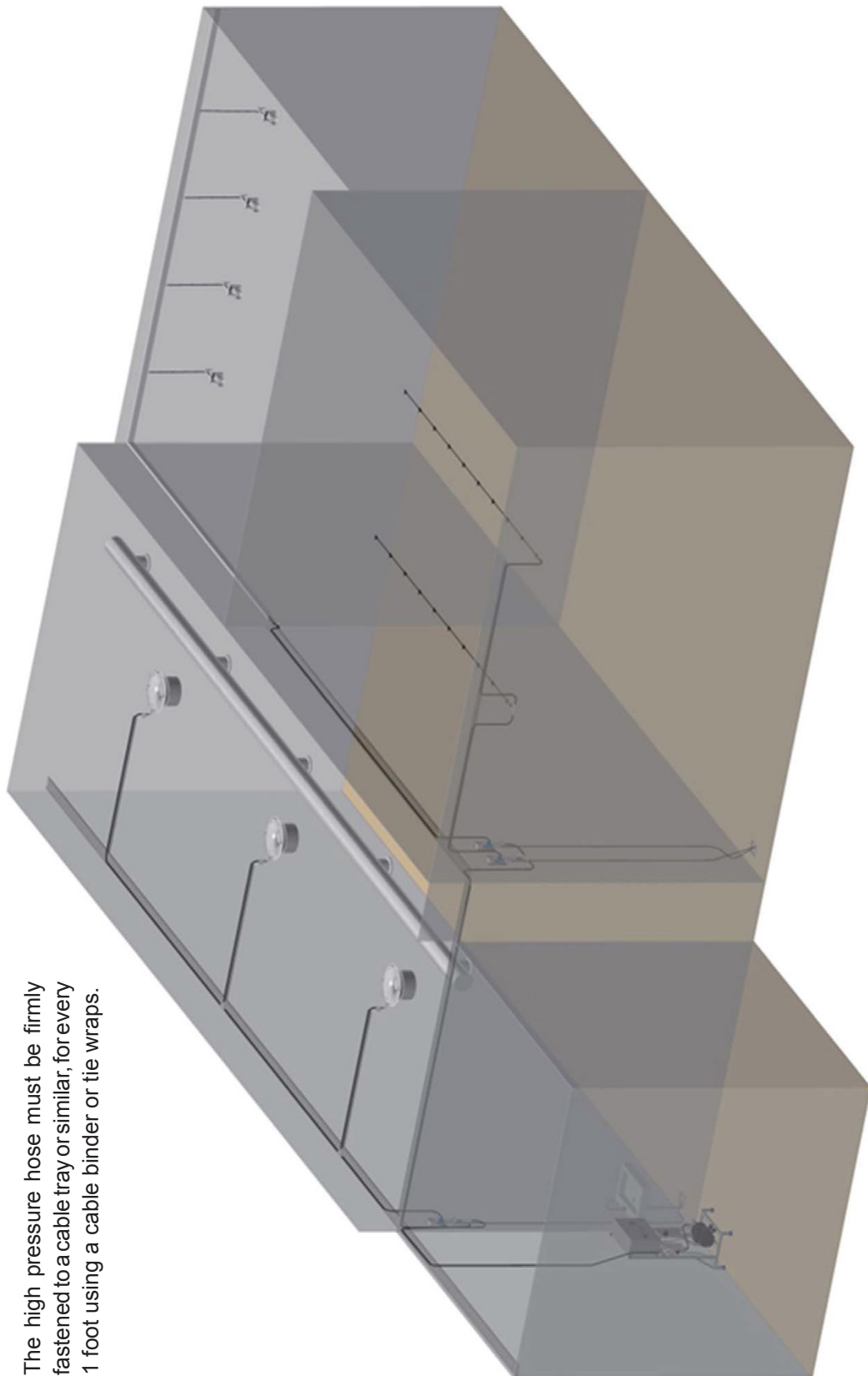


Figure 36: Installation Example 1

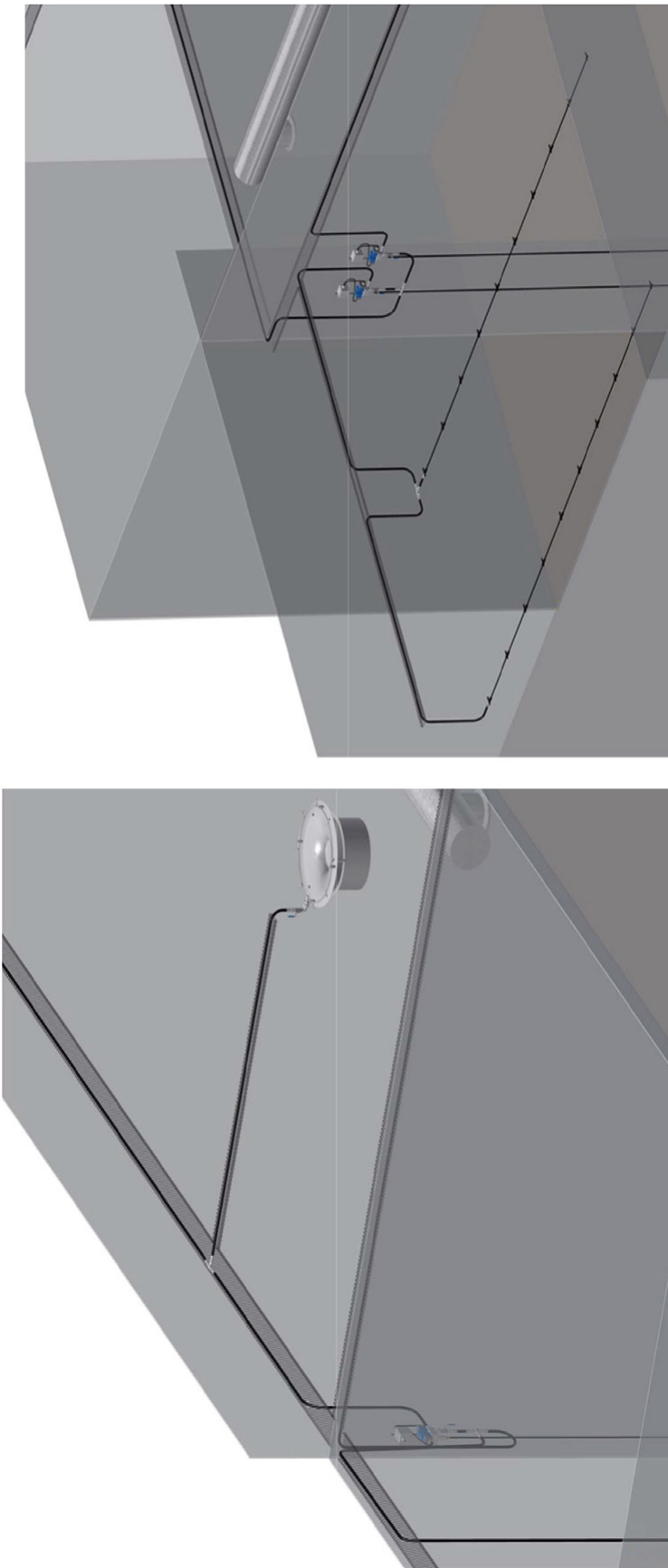


Figure 37: Installation Example 2

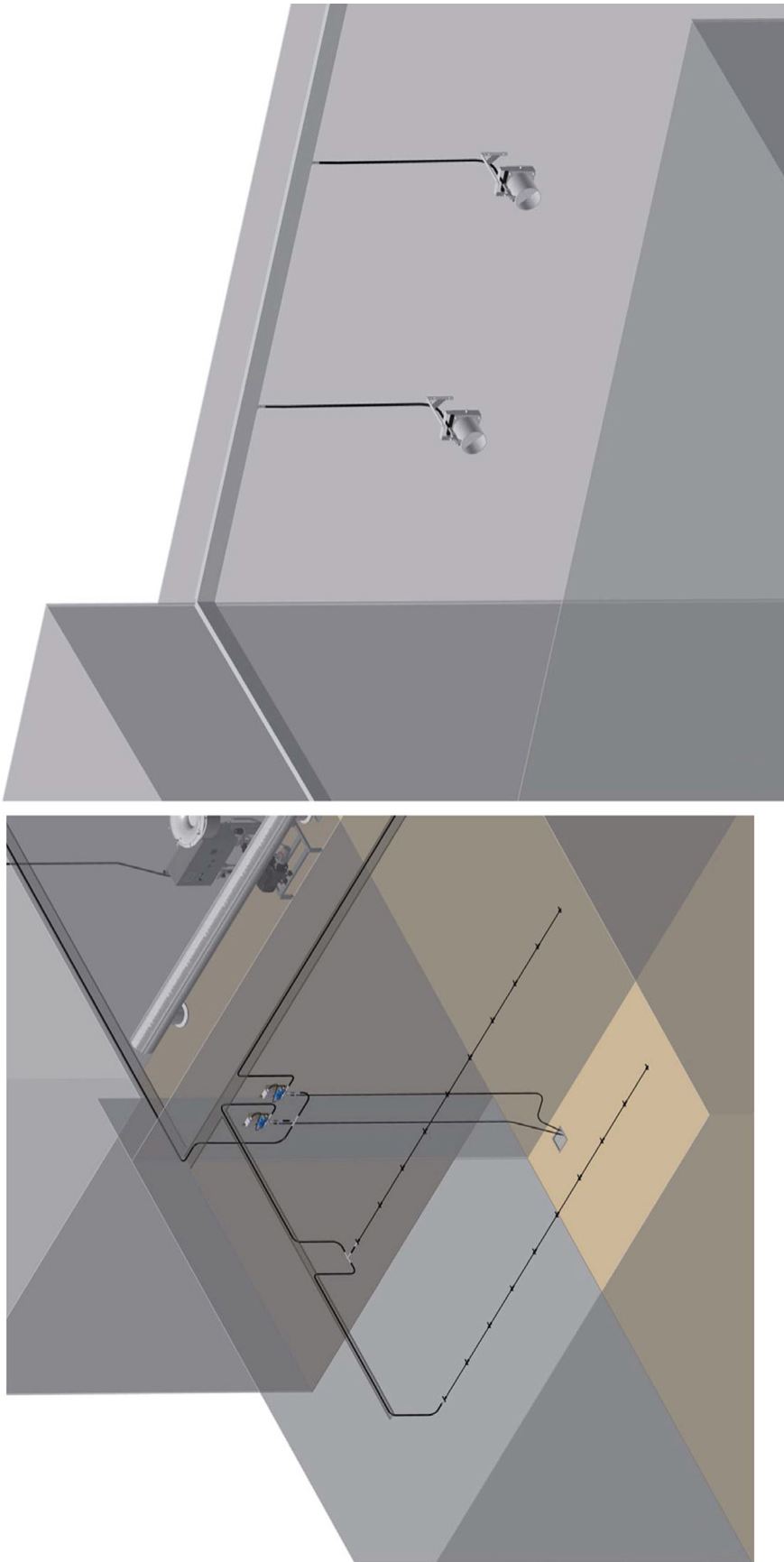


Figure 38: Installation Example 3

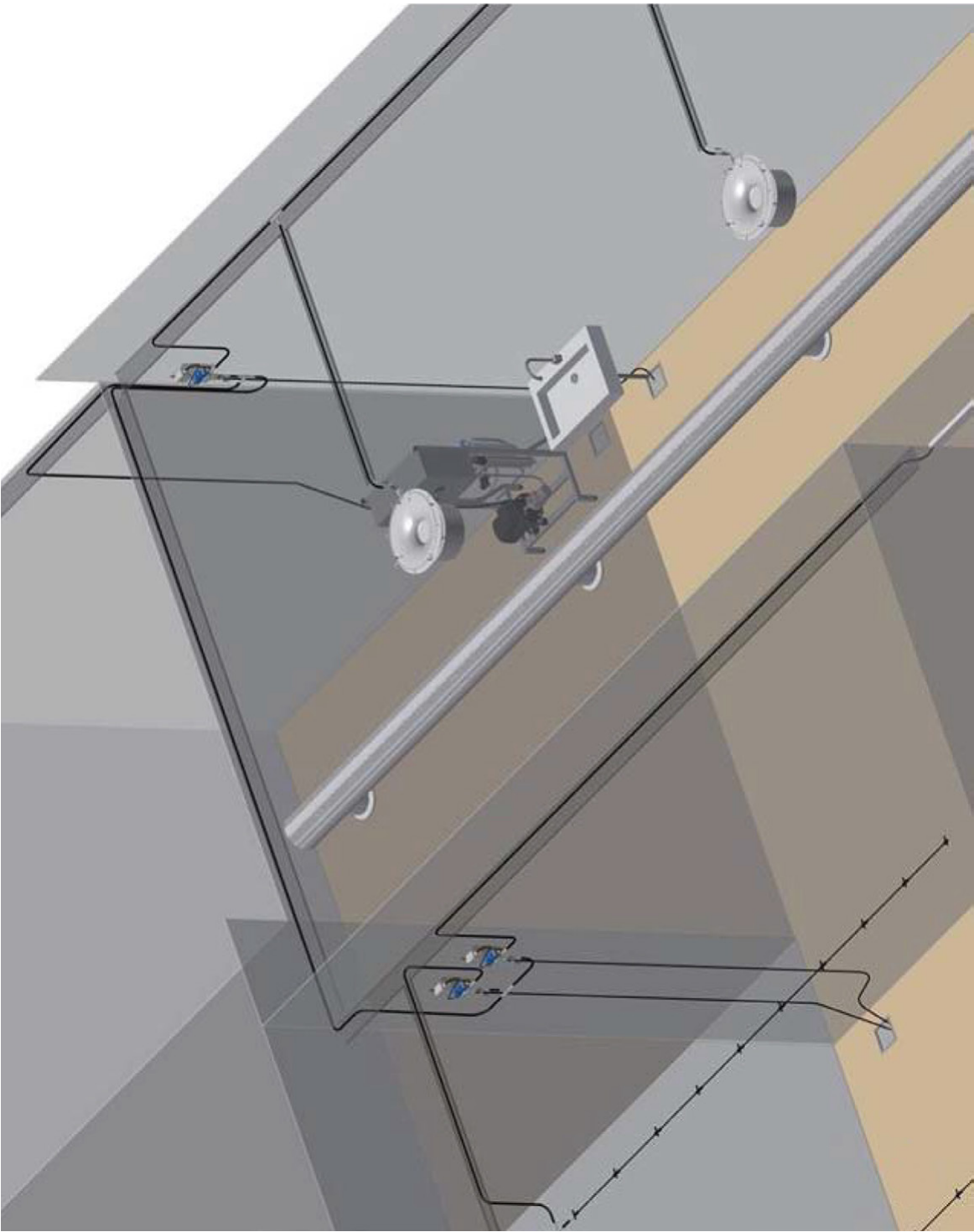


Figure 39: Installation Example 4

## 8.4 Mounting instruction

Data source: MA048GB - 01

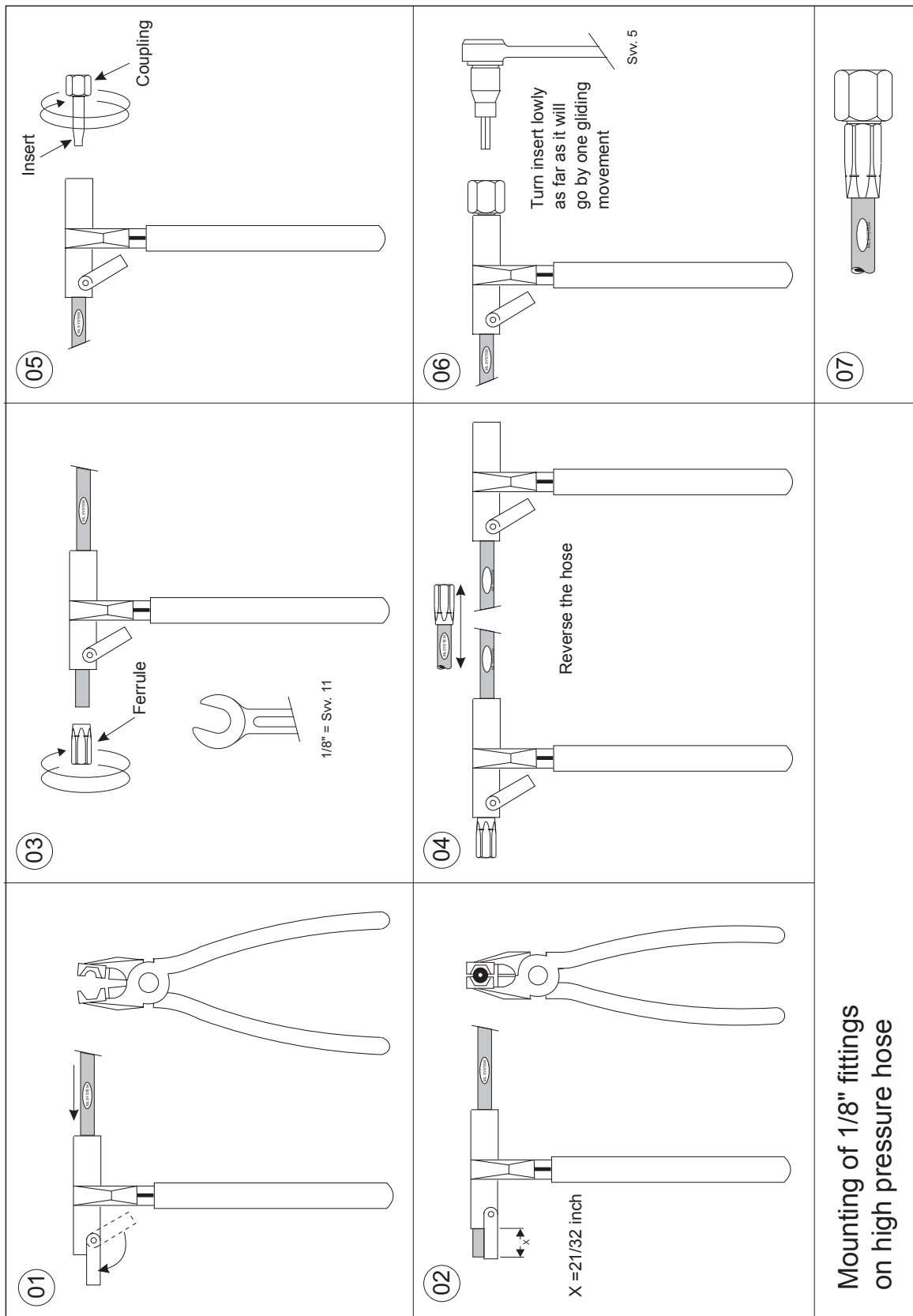
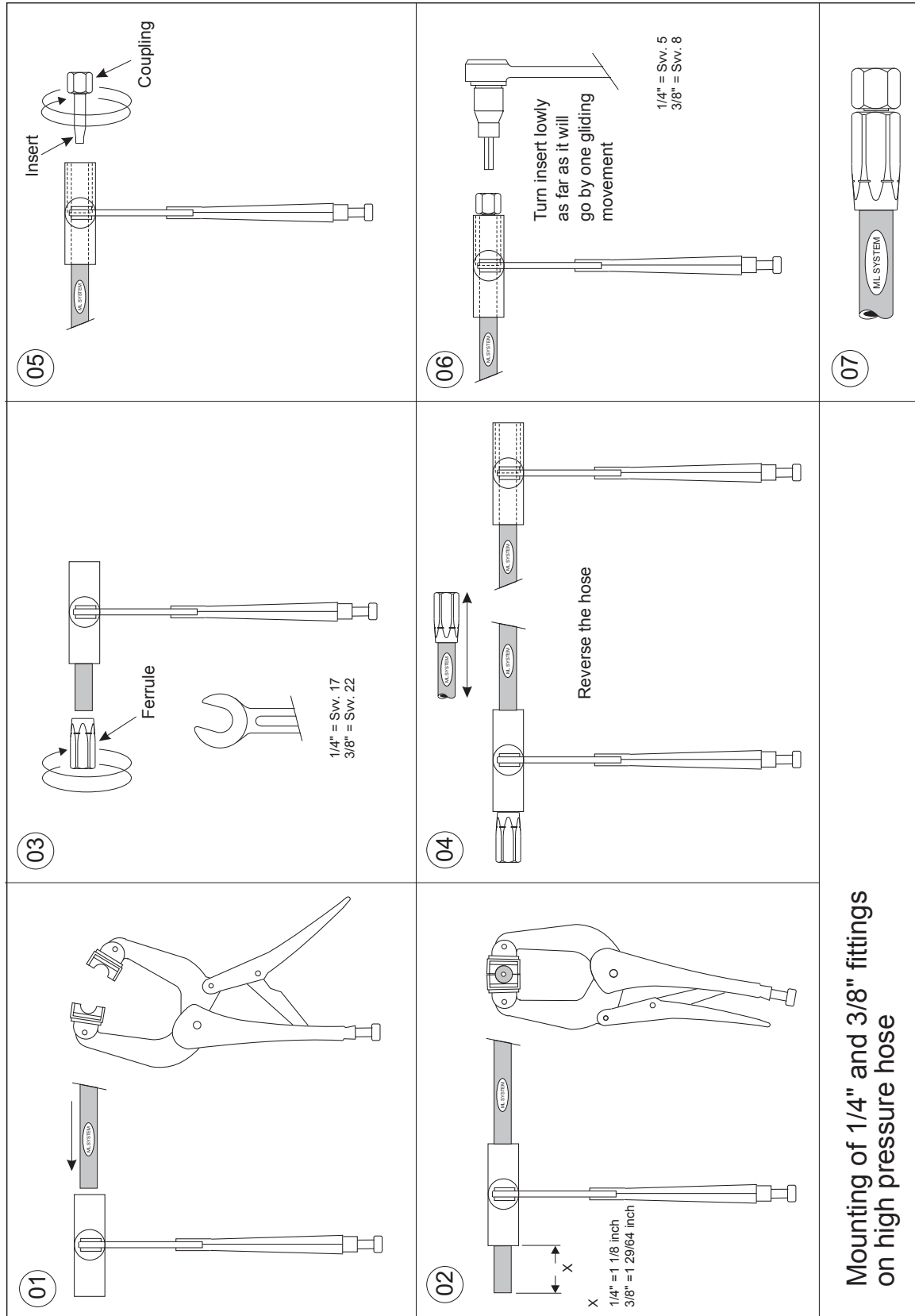


Figure 40: Mounting instruction



Mounting of 1/4" and 3/8" fittings on high pressure hose

Figure 41: Mountin instruction



## 8.5 Stainless steel screw couplings

Data source: MA074GB - 03

- 1) Saw or cut the hose in the right length.
  - a) Check the hose diameter.
    - Tolerance outside: A
    - Tolerance inside: B
- 2) Clean the ends for metal filings.
- 3) Screw on the covering to the hose
  - note that the covering has left-hand thread.
- 4) Screw the covering as far as it will go and then back, so the hose is allowed to expand when the insert is screwed in (see drawing).
- 5) Lubricate the end of the insert with a detergent, and install the insert by means of an Allen key.
- 6) Do not allow the hose to turn around while the insert is being screwed in - use special tool from Nortec and screw in the insert in one long movement.
- 7) Insert has to be screwed completely home, so it is locked.
- 8) Check with a C Allen key that there is a free passage through the insert. The key must be led completely through to the bottom without any resistance.

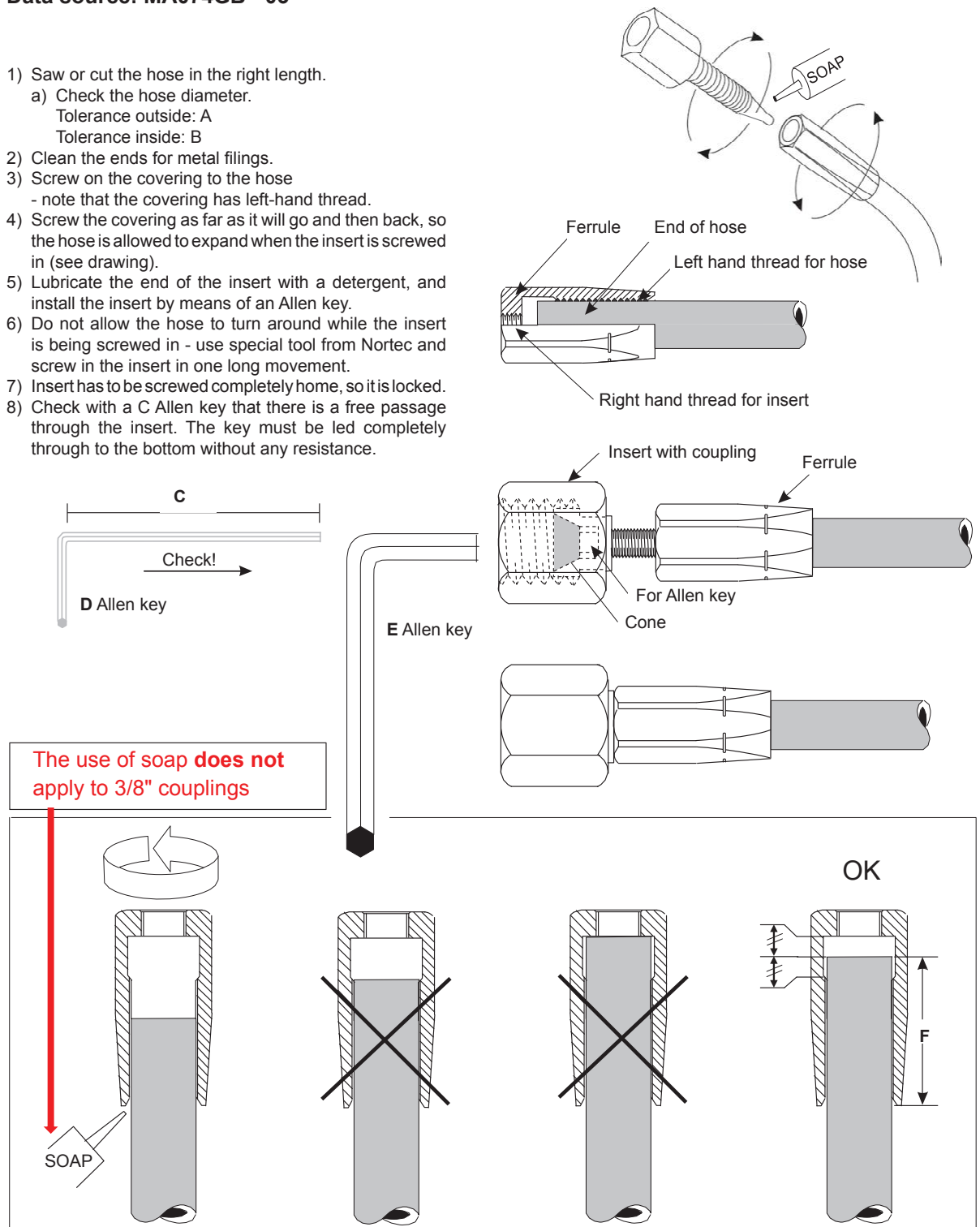


Figure 42: Mounting stainless steel screw couplings

Coupling size	A	B	C	D	E	F
1/16"	13/64 ± 1/64 inch	1/16 ± 1/64 inch	Min. 1 3/8 inch	1/32 inch	13/64 inch	31/64 inch
1/8"	9/32 ± 1/64 inch	9/64 ± 1/64 inch	Min. 1 49/64 inch	1/16 inch	13/64 inch	21/32 inch
1/4"	15/32 ± 1/64 inch	17/64 ± 1/64 inch	-	-	13/64 inch	1 1/8 inch
3/8"	39/64 ± 1/64 inch	25/64 ± 1/64 inch	-	-	5/16 inch	1 29/64 inch

### Torque values

The following torque values have to be respected when assembling the hose to the nipple.

Observe different values for 3/8" and 1/16", 1/8" and 1/4" hoses.

Use two wrenches when tightening the union nut to the nipple.

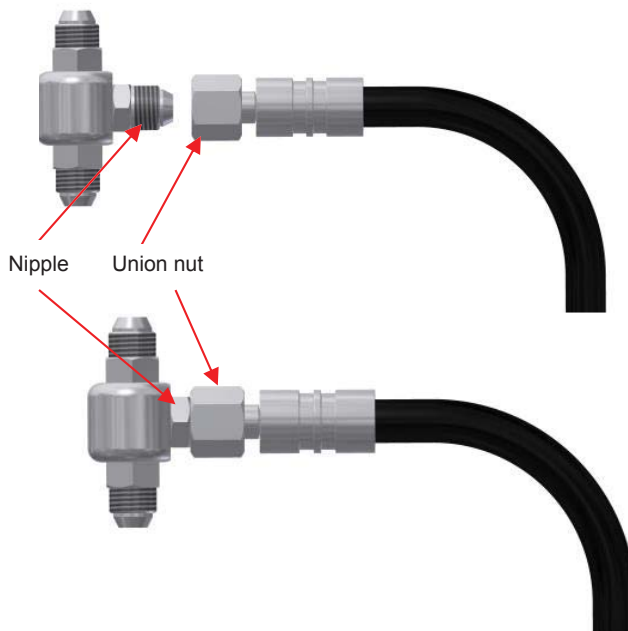


Figure 43: Tightening the union nut to the nipple

Coupling size	Torque value*	Torque value*
3/8"		52 ft.lb ±1.5 ft.lb
1/16", 1/8", 1/4"		31 ft.lb ±1.5 ft.lb

\*Torque values are valid for both screw and press fittings

### IMPORTANT

The high pressure hoses must be stored at max. 104 °F and may not be exposed to direct sunlight.

During cutting of hoses and mounting of couplings the max temperature is 104 °F.

## 8.6 High pressure hose dimensioning

Data source: TI013GB - 01

Hose dimension	Minimum flow lb/h	Maximum flow lb/h	Maximum length feet	Minimum bending radius, inch @ 90°
1/16"	0.26	5.28	82 ft.	3.15
1/8"	2.64	23.8	196 ft.	3.9
1/4"	18.5	92.5	492 ft.	5.1
3/8"	52.8	211	656 ft.	7.1
PA 10/8 mm (pressure release hose)			65 ft.	5.9

Example:

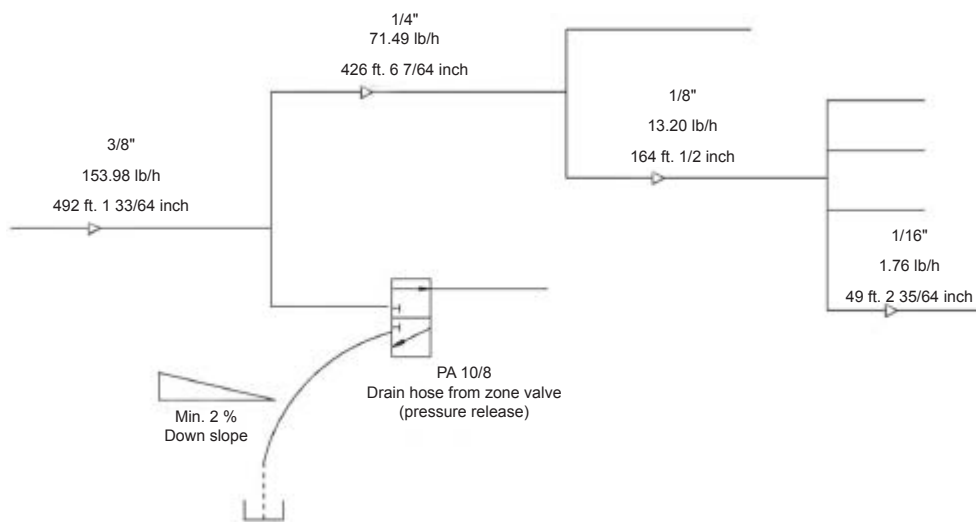


Figure 44: Example high pressure hose dimensioning

## 8.7 ML nozzles (5.5 - 10 lb/h)

Data source: TD122GB - 03

### Description:

The ML standard nozzles are specifically designed nozzles of highest quality, which atomizes water under high pressure to millions of microscopic particles sized 5-10 microns, which immediately evaporate in to the surrounding air. The nozzle has a built in non-drip valve and can be used alone or mounted on the various ML System humidification modules.

The different nozzle sizes allows for all humidifying purposes to be solved as well as it is possible to reach an adiabatic cooling effect even in climates with a high relative humidity.

### Typical use:

The ML System nozzles are typically used with the ML System humidification units for humidifying rooms where an invariable humidity throughout the year is demanded. The size of the nozzle is adjusted to the room height and ventilation conditions.

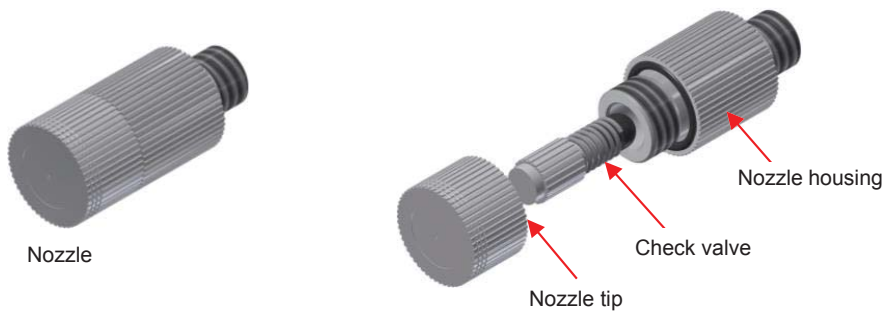


Figure 45: ML nozzle (5.5 - 10 lb/h)

### Specifications:

Nozzle	5.5 lb/h	10 lb/h
Capacity	3.7 – 5.5 lb/h	7.7 - 11.0 lb/h
Working pressure	507 - 1015 psi	507 - 1015 psi
Material	Stainless steel	Stainless steel
Thread	12/24 UNC/2A	12/24 UNC/2A
Non-drip valve	Standard	Standard
Filter	Option	Option
Requirements for conductivity $\mu\text{S}/\text{cm}^*$	$5 < \text{EC} < 1000$	$5 < \text{EC} < 1000$
Part number	103.160.000	03.150.000

### Spare parts:

O-ring	103.115.000	103.115.000
--------	-------------	-------------

\* The lower conductivity the longer service life and a lower risk for blockage.

## 8.8 ML nozzle (3.3 lb/h)

Data source: TD116GB - 01

Unique high-technology nozzle from Nortec

- Extremely fine atomization
- Minimum humidification power
- Optimum cooling and humidification effect



### Description:

The nozzle atomizes water under high pressure into millions of microscopic particles in sizes from 5-15 micron, which immediately evaporates into the ambient air. The nozzle has incorporated filter and anti-drip valve, and it can be used alone or in all the ML System humidification units.

The quick absorption in the air means that the nozzle can meet all humidification tasks and with the nozzle a cooling and humidification effect can be obtained, even in climates with high relative humidity.

### Typical use:

The ML 3.3 lb/h nozzle is used in rooms with the highest demands within humidification, such as in repro departments, in offices, or within the electronics industry. At the same time the nozzle is used for fog cooling of units or in zones where a significant cooling effect is required.

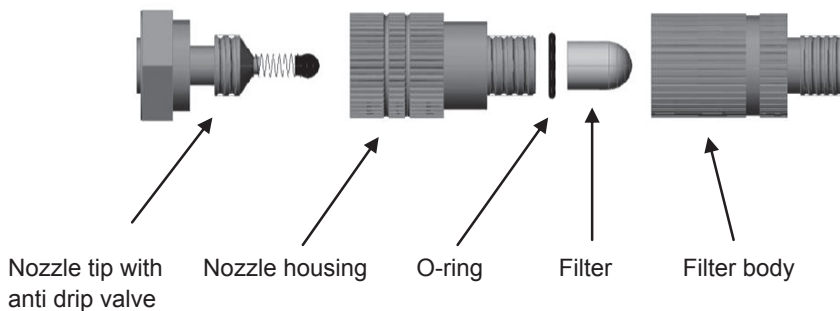


Figure 46: ML nozzle (3.3 lb/h)

### Specifications:

Nozzle	3.3 lb/h
Capacity	2.6 - 3.3 lb/h
Working pressure	507-1015 psi
Material	Stainless steel
Thread	1/2" UNC/2A
Anti-drip valve	Standard
Filter	Standard
Requirements for conductivity $\mu\text{S}/\text{cm}$	$5 < \text{EC} < 80$
Part number	Part number 103.200.001

### Spare parts:

Filter	103.106.000
Filter	103.137.012

## 8.9 Optional - Nozzle swivel adapter

Using this adapter it is possible to rotate the nozzle in a direction to avoid spraying on other items.

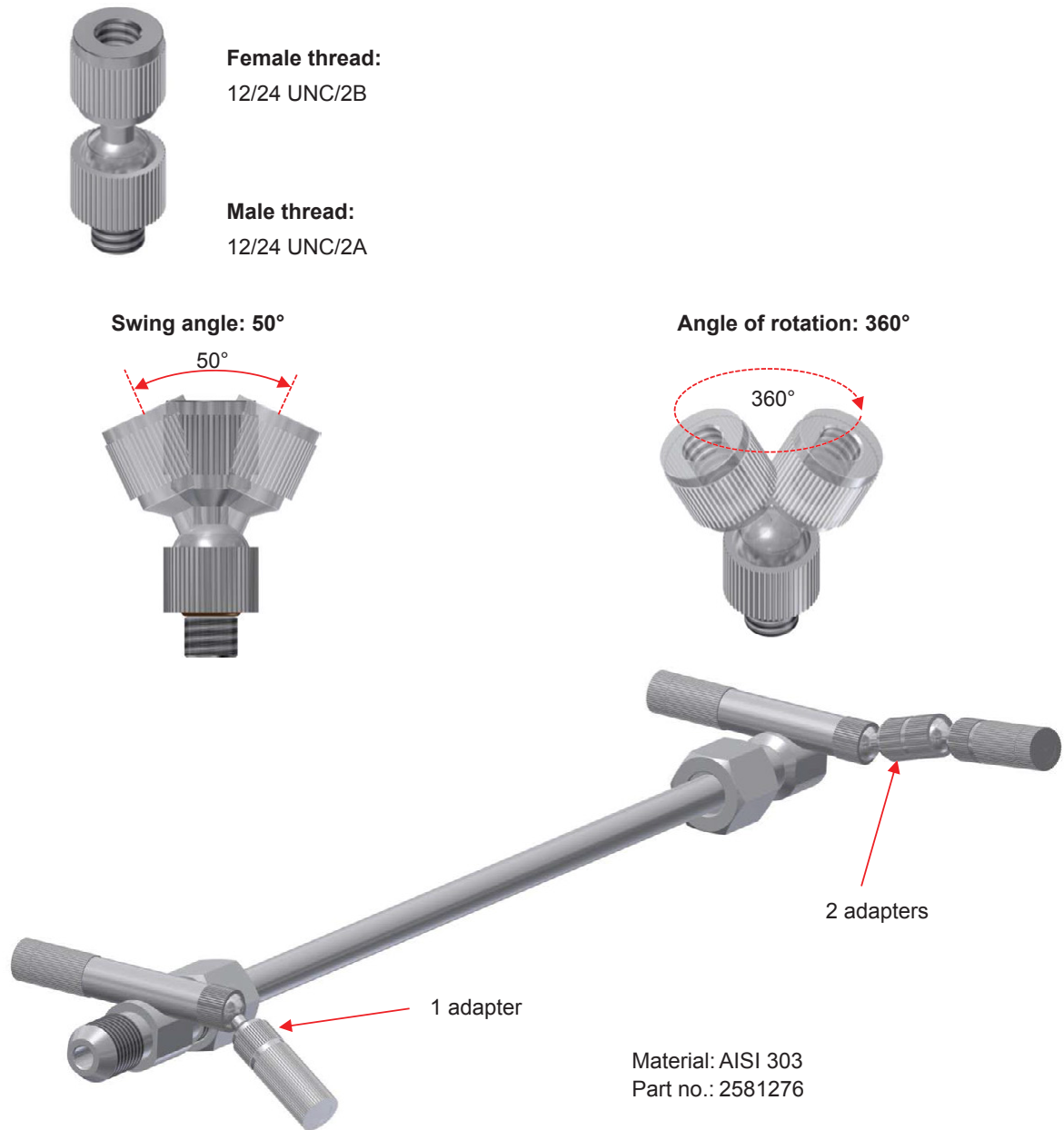


Figure 47: Nozzle swivel adapter

# Warranty

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Nortec Humidity Inc. and/or Nortec Humidity Ltd. (hereinafter collectively referred to as THE COMPANY), warrant for a period of two years after installation or 30 months from manufacturer's ship date, whichever date is earlier, that THE COMPANY's manufactured and assembled products, not otherwise expressly warranted, are free from defects in material and workmanship. No warranty is made against corrosion, deterioration, or suitability of substituted materials used as a result of compliance with government regulations.

THE COMPANY's obligations and liabilities under this warranty are limited to furnishing replacement parts to the customer, F.O.B. THE COMPANY's factory, providing the defective part(s) is returned freight prepaid by the customer. Parts used for repairs are warranted for the balance of the term of the warranty on the original humidifier or 90 days, whichever is longer.

The warranties set forth herein are in lieu of all other warranties expressed or implied by law. No liability whatsoever shall be attached to THE COMPANY until said products have been paid for in full and then said liability shall be limited to the original purchase price for the product. Any further warranty must be in writing, signed by an officer of THE COMPANY.

THE COMPANY's parts or materials that are considered consumables are NOT covered by the warranty.

THE COMPANY makes no warranty and assumes no liability unless the equipment is installed in strict accordance with a copy of the catalog and installation manual in effect at the date of purchase and by a contractor approved by THE COMPANY to install such equipment.

THE COMPANY makes no warranty and assumes no liability whatsoever for consequential damage or damage resulting directly from misapplication, incorrect sizing or lack of proper maintenance of the equipment.

THE COMPANY makes no warranty and assumes no liability whatsoever for damage resulting from freezing of the humidifier, supply lines, drain lines, or quality of the water used.

THE COMPANY retains the right to change the design, specification and performance criteria of its products without notice or obligation.

THE COMPANY's limited warranty on accessories, not of the companies manufacture, such as controls, humidistats, pumps, etc. is limited to the warranty of the original equipment manufacturer from date of original shipment of humidifier.

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