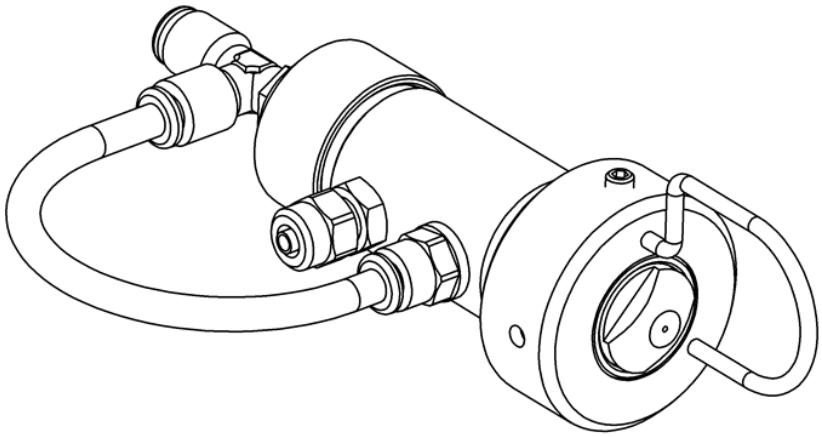
# TECHNICAL MANUAL



## FOG SYSTEM BUS nozzles

Spray nozzles

# Contents

# FOG SYSTEM - BUS nozzles

## 1. SAFETY INSTRUCTIONS

### 1.1 INTRODUCTION

You have recently purchased the FOG SYSTEM - BUS Nozzles humidifier and we hope that you will be completely satisfied with this product. Thank you for your confidence in us.

The safety instructions contained in this manual are intended for use by specialized, qualified personnel who are authorized to install, commission, and maintain the unit.

To get the best results from your humidifier, we recommend :

- Read the instructions in this manual carefully.
- Keep this manual in a safe place for future reference.
- Pass on this manual in the event of sale or transfer of the unit, to ensure that all information about the unit is passed on.

| WARNINGS AND SAFETY SYMBOLS USED IN THIS MANUAL | |
|---|---|
|  | **Danger! Caution.** General safety instructions, violation of which may result in malfunction and/or personal injury and/or damage to property. |
|  | **Danger! High voltage.** If high voltages are present inside the device or any of its components, disregarding this warning may result in death or serious injury to persons and/or significant material damage. |
|  | **Electrostatic hazard.** Device components may be subject to damage as they are highly sensitive to electrostatic discharges. |
|  | **Möbius strip.** Some parts of the device can be recycled; the user is responsible for their disposal. |

If the package is damaged, please make a claim to the carrier by registered letter with acknowledgement of receipt within 24 hours and make a declaration to the Devatec representative.

Images, graphics, and values are subject to change without notice.

Keep these instructions in a safe place, and if you have any questions which are not answered in this manual, please do not hesitate to contact us or your Devatec representative.

**Our team is ready to listen!**

## 1.2 IMPORTANT NOTES

| | |
|---|---|
| **GENERAL** | This manual contains full details of installation, commissioning, and maintenance of the FOG SYSTEM humidifier - BUS nozzles.<br>Maintenance, service, and repairs, as well as the study of the risks and dangers associated with these operations, must be carried out by qualified, competent and authorized personnel.<br>Make sure that any risks or hazards, especially when working at height, are defined in advance by an authorized person.<br>We also recommend installing a safety perimeter. Make sure the power supply is disconnected before carrying out maintenance.<br>Please tighten all power cable terminals periodically. |
| **INTENDED USE** | The FOG SYSTEM humidifier - BUS nozzles manufactured by Devatec is designed exclusively for humidifying air in air handling units and rooms.<br>The user undertakes to use the equipment in accordance with the safety rules set out in this documentation.<br>Improper use may result in danger and serious damage to the user, third parties and equipment. |
| **CONSERVATION** | The unit should be stored in a dry, frost-proof place, protected from shocks and vibrations. |
| **WATER** | BUS nozzles can be used with drinking, demineralized, or softened water. It is absolutely forbidden to inject chemicals into the hydraulic system. Ensure that the water supply pressure does not exceed 6 bar. Always make sure the installation complies with local standards. |
| **ELECTRICITY** | The user guarantees that the electrical installation work will be carried out by a qualified technician. It is the installer's responsibility to provide the correct cable cross-section and circuit breaker protection. Make sure the humidifier is earthed with a suitable conductor. |
| **GUARANTEE** | Devatec guarantees its products for one (1) year.<br>Devatec's liability shall be limited exclusively to the repair or replacement by Devatec of the part or product, excluding labor or other disassembly or installation costs. At its discretion, Devatec may also decide to refund the purchase price of the part or product. Failure to comply with the above recommendations, additional assembly and/or conversion using components other than those supplied with the device, or any other use other than that intended, will be considered as non-compliance with the prescriptions and will invalidate the warranty. |
| **RESPONSIBILITY** | Devatec accepts no liability for faulty installation or improper use of the equipment and its components.<br>We strive to provide you with a manual that is as comprehensive as possible. However, conditions in the air handling industry are such that the information contained in this documentation may be subject to change without notice. |

## 1.3 DECLARATION OF CONFORMITY

The devices meet the requirements of the European directives.

| | |
|---|---|
| **DEVICE TYPE** | Humidifier |
| **MODEL NAME** | FOG SYSTEM - BUS nozzles |
| **MANUFACTURER** | Devatec<br>185 boulevard des Frères Rousseau 76550 Offranville - FRANCE |

We hereby declare that the equipment specified above conforms to the directives mentioned at the beginning of this declaration.

FRAMBOT Jean-François

Director

05.06.2022

## 1.4 RoHS DECLARATION

Devatec,

Confirms that the FOG SYSTEM - BUS nozzles are manufactured in compliance with the following European regulations:

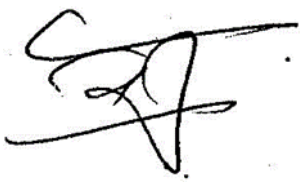
2011/65/EU (RoHS)

These regulations govern the use of mercury, cadmium, lead (in welding processes), chromium VI as well as PBB and PBDE after July 1, 2006.

MINFRAY Jean-Marie

R&D Engineer

05.06.2008



# FOG SYSTEM - BUS nozzles

## 2. PRESENTATION

The nozzle system solves a wide range of humidity problems in industry and the service sector, with minimum installation and maintenance costs. The FogSystem is used for adiabatic air-cooling using water and compressed air.

### 2.1 FEATURES

Standard delivery includes :

1. BUS nozzles (alone or in bar form for AHUs).
2. Manifold.
3. Control box for proportional control operation 0-10V

(Alternative: MCR3 or MCR30 for ON-OFF operation).

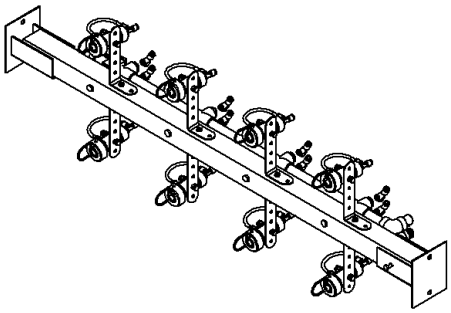


Figure 1 : Nozzles bar

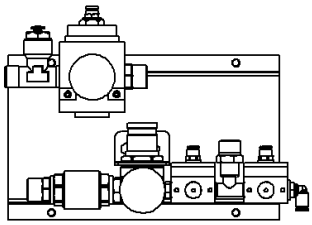


Figure 2 : Manifold

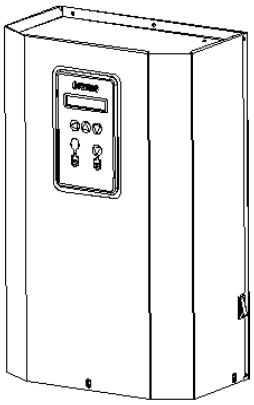
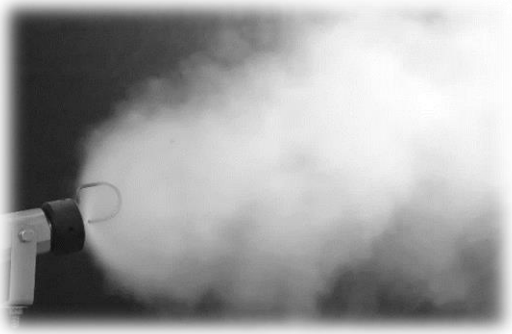


Figure 3 : Control box

**ACCESSORIES & OPTIONS**

- Hose connection 1m long (stainless steel braided)
- Water filtration : 20 µm, 1 µm filters, UV sterilizer
- Air filtration : 5 µm filters.
- Hygrostat
- Proportional humidity transmitter 0-10V

### 2.2 OPERATING PRINCIPLE



The Ultrasonic BUS nozzle uses pressurized air and water which, as it leaves the nozzle, comes up against an ultrasonic resonator that helps perfect the atomization of the water.

The water is broken down into very fine particles (1 to 1.5 µm), forming a mist that is rapidly absorbed by the air.

This nozzle is used in air streams (air handling units, air ducts, cold rooms, etc.).

In air handling units, the nozzle (BUS) is attached to a bar by means of a bracket. This is oriented so that the mist is in the air stream.

Made of stainless steel, with no mixing chamber, maintenance is reduced to a minimum.

## 2.3 WATER SUPPLY

**Tap Water:** nozzle maintenance required.
**Osmosis water:** thanks to the quality of osmosis water, maintenance on nozzles is reduced.
**Softened water:** use strongly discouraged.

The use of **osmosis water is recommended** to limit the appearance of white dust in the duct or in the room where the nozzle is located. What's more, osmosis water reduces the amount of maintenance required on the equipment.

When using tap or softened water, we recommend the optional water filtration system to reduce dust particles.

## 2.4 LEGIONELLOSE

Legionella is a bacterium [...], naturally present in freshwater environments. It is a bacillus 0.2 to 0.9 µm wide and 2 to 20 µm long. It is found only in aquatic environments such as lakes, rivers and even in drinking water, where it is accepted up to : < 100 CFU/100 ml (3). Ingested, the bacterium is harmless, but inhaled from aerosols, it can cause Legionnaires' disease. Aerosols need to be between 1 and 10 µm in size, so they can be transported deep into the lungs, in the pulmonary alveoli. Legionnaires' disease occurs only in pipes filled with stagnant cold water.

During operation, the water pipes are always replenished with clean water, thus avoiding stagnant water. During the humidification period, the units operate with virtually no downtime, so there's no risk of bacteria in the pipes.

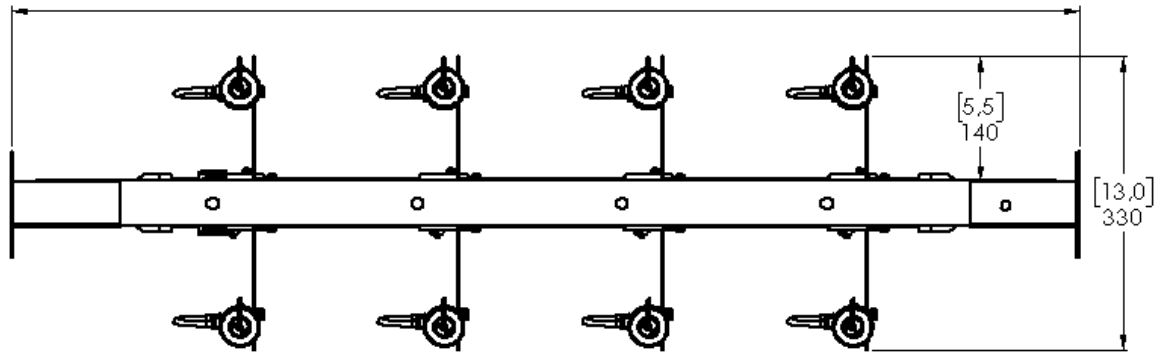
On the other hand, there are risks during prolonged shutdowns (mid-season or summer). That's why FOG SYSTEM control units feature an automatic drain that takes place after each control or system shutdown. The pipes are emptied, preventing water stagnation.

For even greater hygienic safety, you can use the Water Filtration System option, which includes a UV sterilizer to destroy all viruses and bacteria.

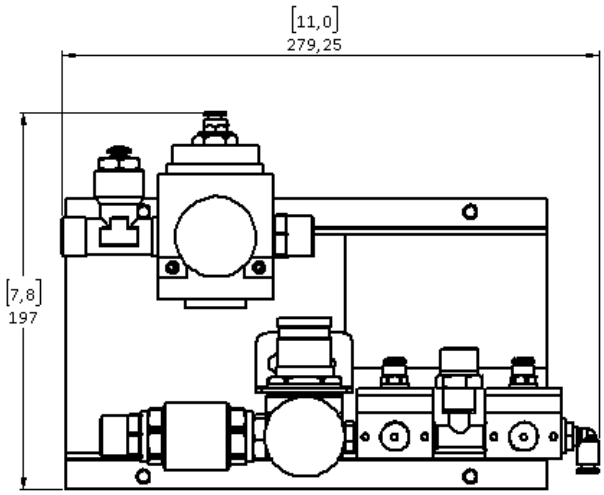
## 2.5 SIZING

BUS nozzle bar (mm/[in])

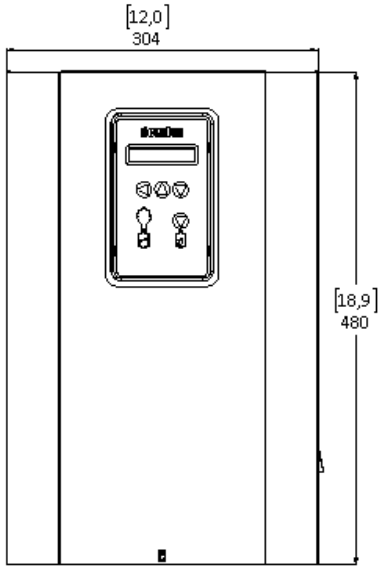
X: Custom dimensions



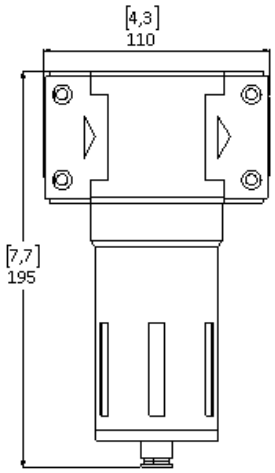

Manifold (mm/[in])




Control cabinet (mm/[in])




Air filter(mm/[in])




## 2.6 CONSUMPTION

Below a table summarizing air consumption and water flow rates according to the pressures used. To ensure proper nozzle operation and a good spray plume, make sure there is a 1 bar pressure difference between water and air.

| Air pressure [bar] | 3 | 4 | 5 |
|---|---|---|---|
| **Water pressure [bar]** | 2 | 3 | 4 |
| **Air flow [l/min]** | 23 | 24 | 24 |
| **Water flow [l/h]** | 4 | 6 | 8 |

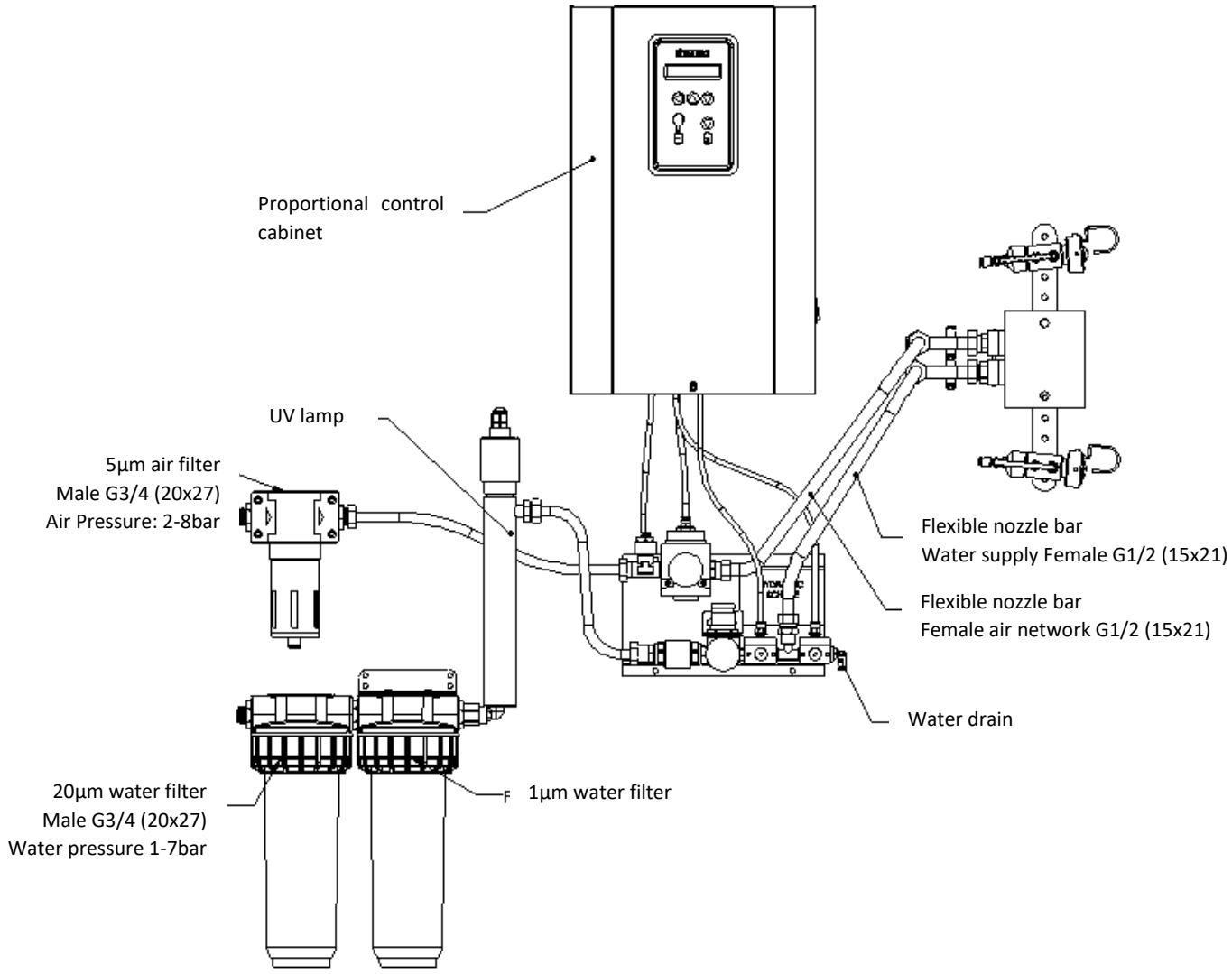
**Before the manifold :**

**Air pressure must be between 2 bar minimum and 8 bar maximum.**
**Water pressure must be between 1 bar minimum and 7 bar maximum.**
**An air pressure 1 bar higher than the water pressure is recommended.**

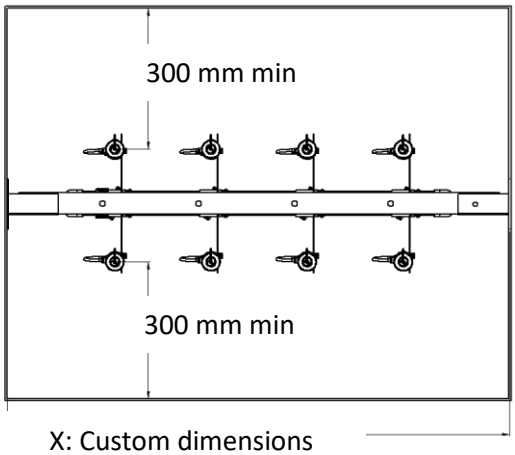
# 3. INSTALLATION

## 3.1 EXAMPLE OF AN AIR HANDLING UNIT INSTALLATION

**Installation Control and Filtration**




**Nozzle bar installation**

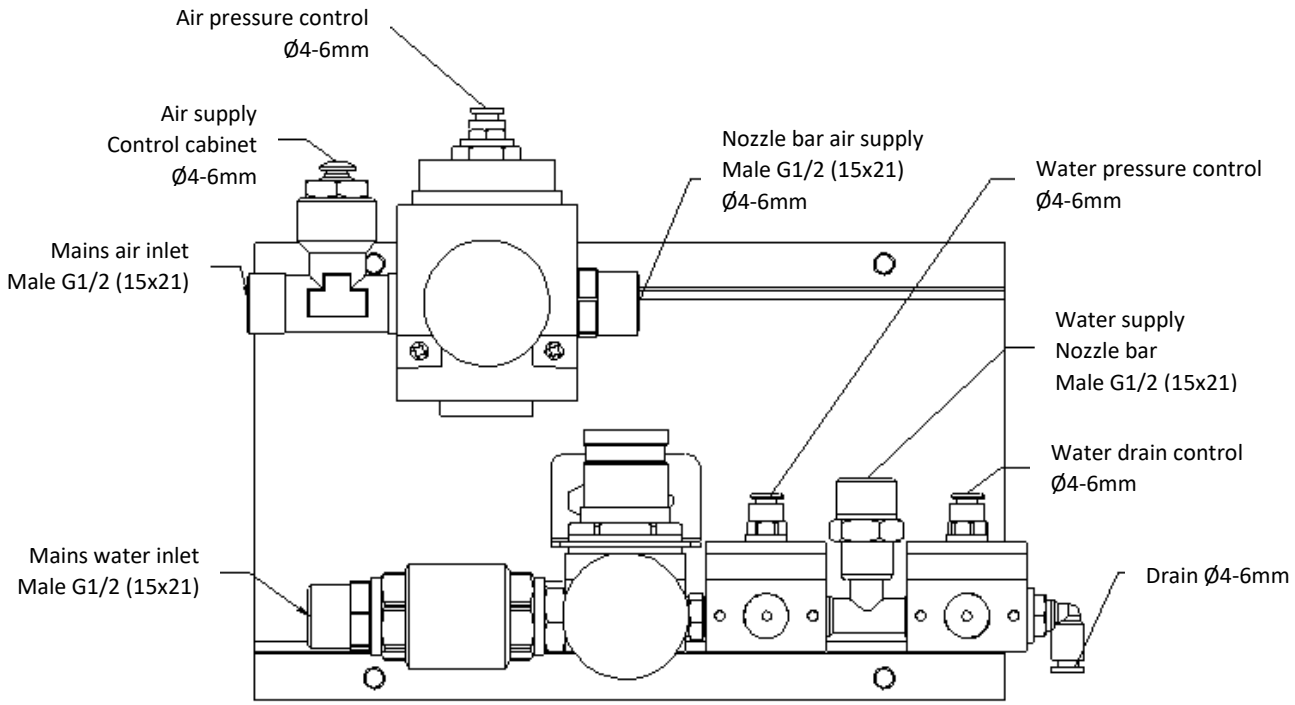



X: Custom dimensions

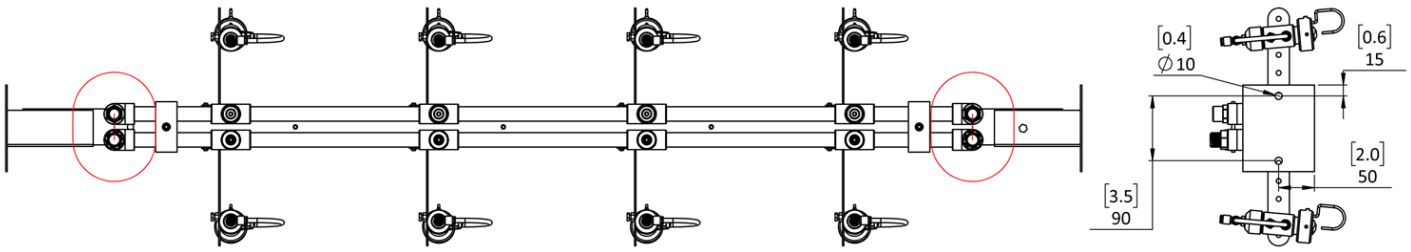
# FOG SYSTEM - BUS nozzles

### 3.1.1 EQUIPMENT AND CONNECTION DETAILS

**Manifold (Controls up to 30 nozzles) :**

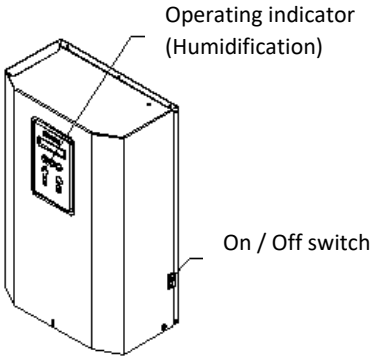


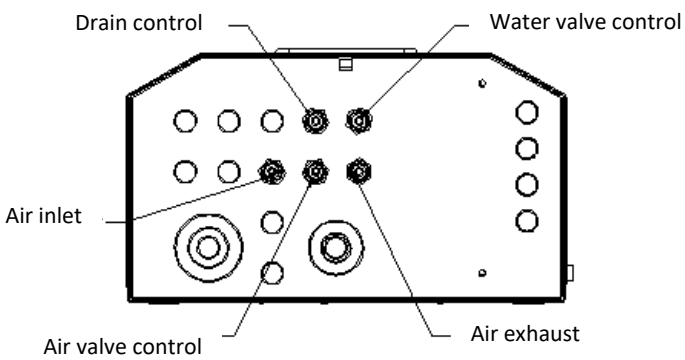

**BUS nozzles bar :**




Nozzles bar water and air connection
2 possibilities depending on installation

**Control cabinet (controls up to 6 manifolds) :**



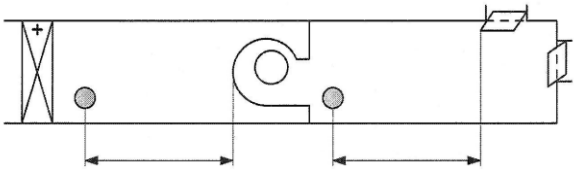
### 3.1.2 ABSORPTION DISTANCE

A certain distance is required for the mist leaving the BUS nozzles to be absorbed by the air (please consult us for details). Within this absorption distance, the injected water is still visible in the air stream.
If parts are placed in this area, condensation may form on them. It is therefore essential to take this absorption distance into account when positioning the BUS nozzles.

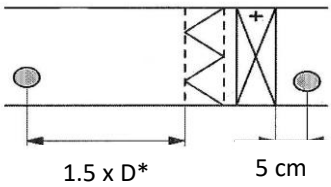
**Minimum absorption distance**

Nozzles must be located at the minimum absorption distance defined below. Depending on the configuration of the air handling unit, here are some important guidelines to follow.

***Before/after a fan***

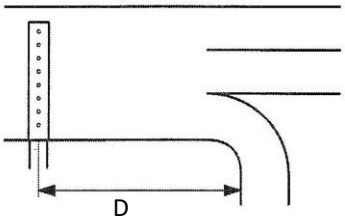


***Before/after heating battery or filter***

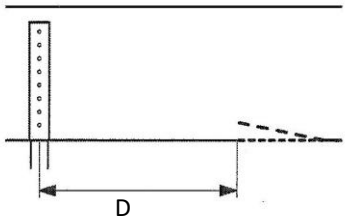



*2.5 x D before a particulate filter or an absolute filter

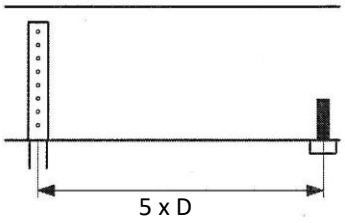
**Before a junction**



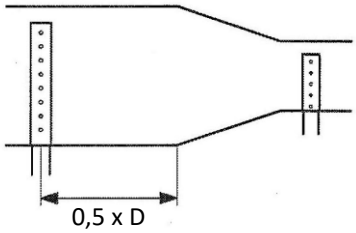

**Before an air grid**



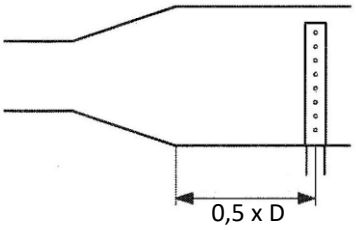

**Before a humidity sensor**



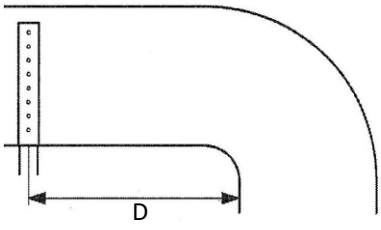

**Before/after strangulation**




**Before enlargement**




**Before a bend**




**Minimum installation distances**

- It is essential to install a high-limit hygrostat that will stop humidification if the set humidity is exceeded, thus avoiding the risk of air saturation.
- Choose a suitable place to install the nozzles in the duct.
- If this is not possible, consult Devatec or its local distributor to find the most appropriate solution.

# FOG SYSTEM - BUS nozzles

**Estimating absorption distance**

As a rough guide, you can obtain an approximation of this absorption distance by following the method below:

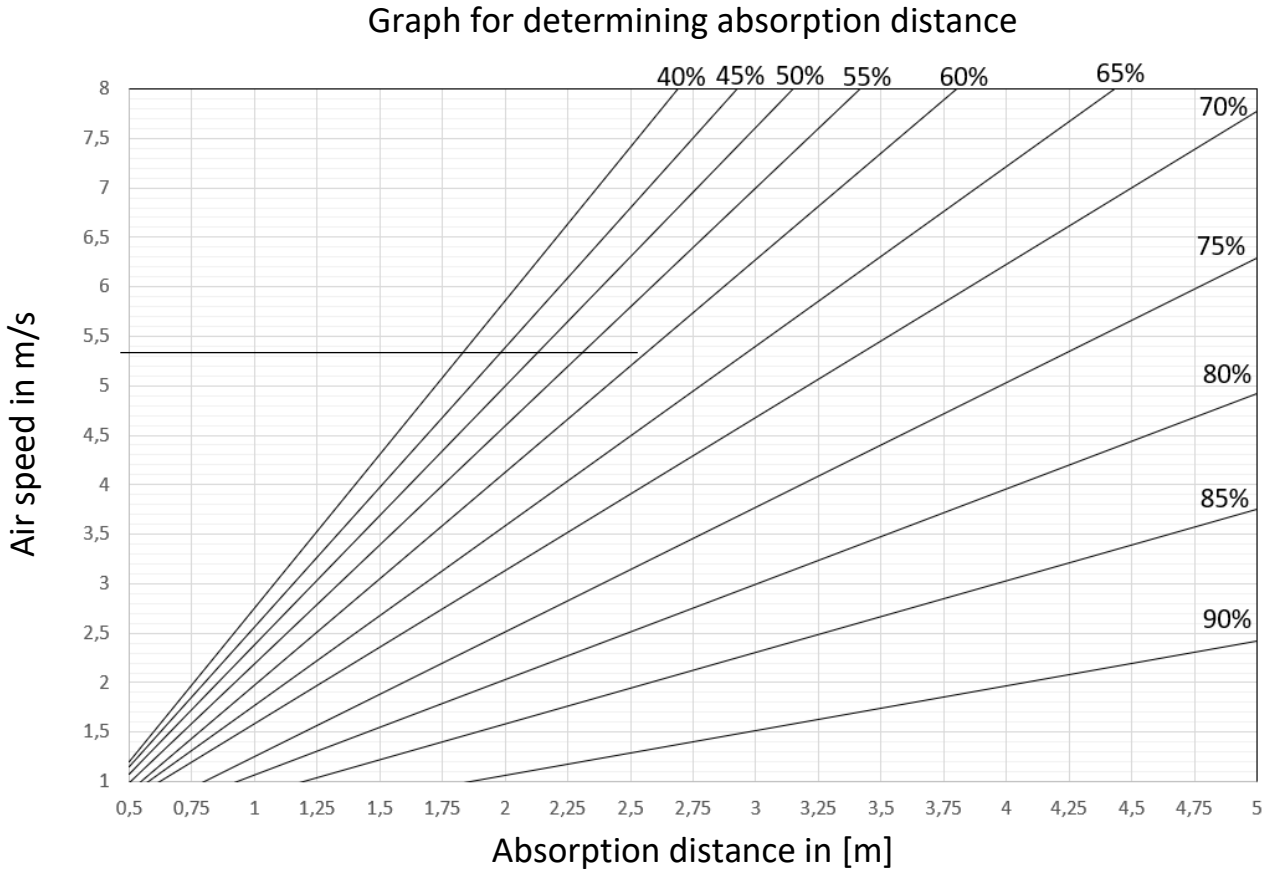
- Know your air flow in $m^3$ /h (noted D) and your cross-sectional area in $m^2$ (noted s)
- Then calculate the air speed in m/s using the following formula: $V_{air} = \frac{Air\ Flow\ Rate}{Section*3600}$
- Once the speed has been obtained, plot the corresponding horizontal line on the graph.
- Then draw the vertical line at the intersection of the chosen relative humidity

This gives the absorption distance in meters.

Example:

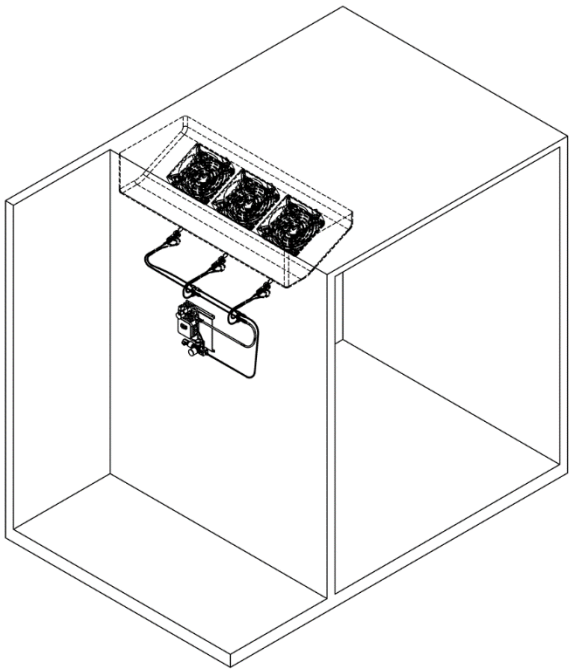
- Air flow rate 30 000 $m^3$/h
- Air Handling Unit size 1250*1250mm
- $V_{air} = \frac{Air\ Flow\ Rate}{Section*3600} = \frac{30000}{1.56*3600} = 5.34\ m.s^{-1} \approx 5.3\ m.s^{-1}$

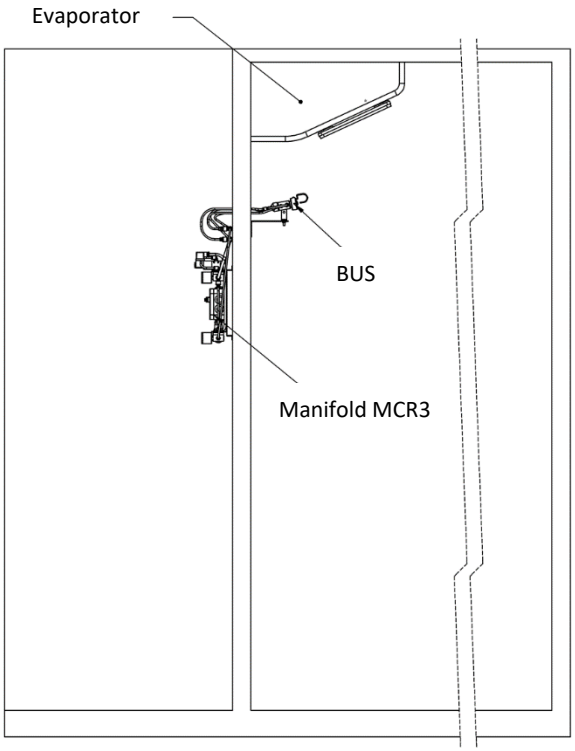
- Relative Humidity 60%
- Absorption distance approx. 2.55 m



## 3.2 COLD ROOM INSTALLATION

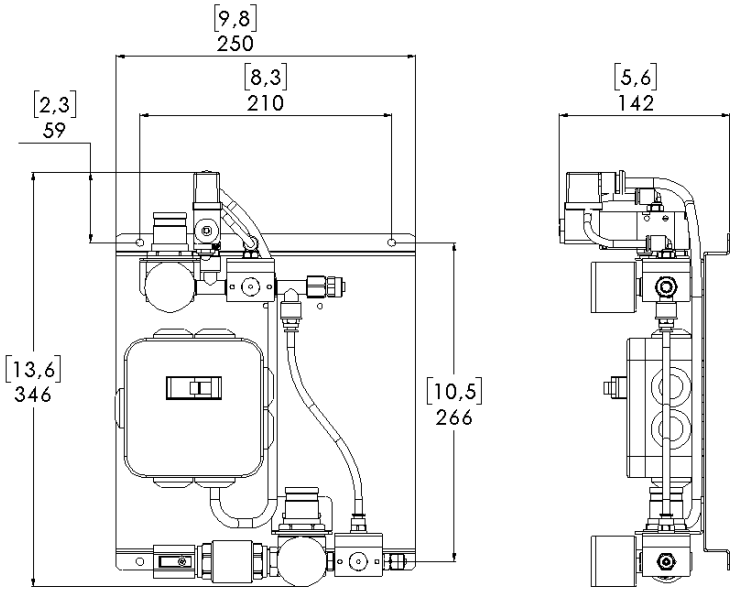
### 3.2.1 INSTALLATION EXAMPLE



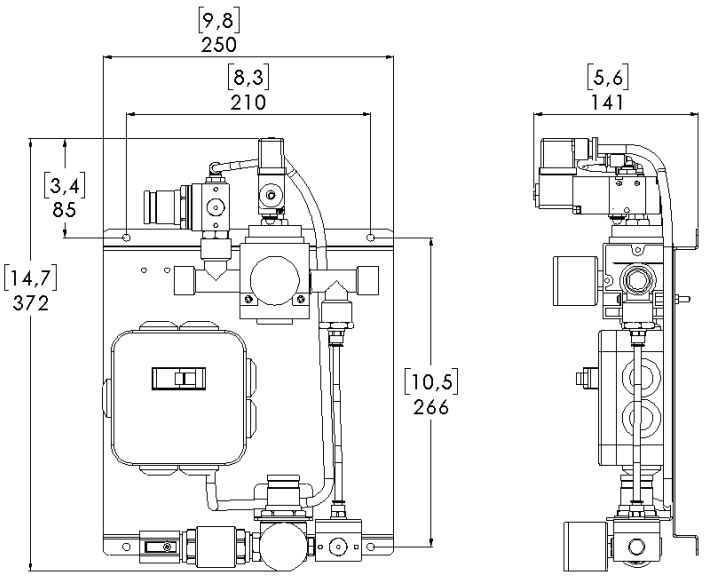



### 3.2.2 EQUIPMENT DETAILS

**Manifold and connection (dimensions in mm / [in]) :**



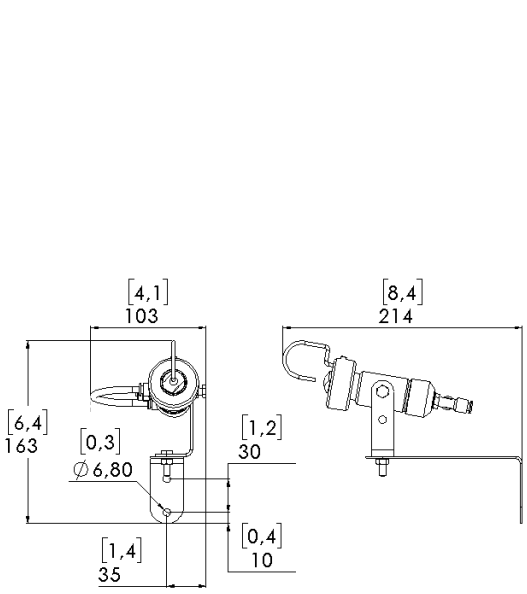

Manifold type MCR-3 for up to 3 nozzles



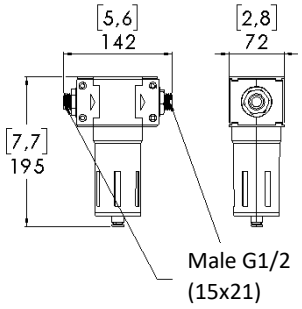

Manifold type MCR-30 for up to 30 nozzles

# FOG SYSTEM - BUS nozzles

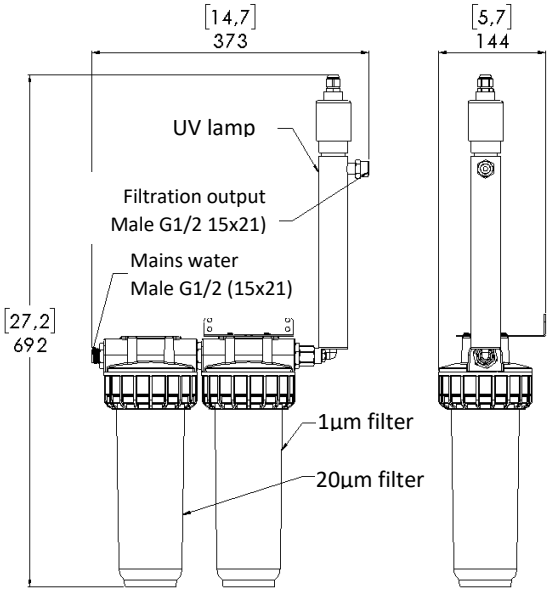
**Options: BUS nozzle support, air filter and water filter (dimensions in mm / [in]) :**




Wall bracket




Air filter system




Water filter system

**Use of equipment :**

Possibility of connecting 1, 2, 3 "BUS" nozzles on the MCR3 manifold and up to 30 on the MCR30 manifold.
Minimum **air pressure at mark 14** = 2 bar = 72.5 psi.
Air consumption for 1 "BUS" nozzle at 4 bar = 22 l/min.
Minimum **water pressure at mark 15** = 1 bar = 58 psi.
BUS nozzle water flow: 2l/h to 7l/h depending on air and water pressures.

## 4. COMMISSIONING

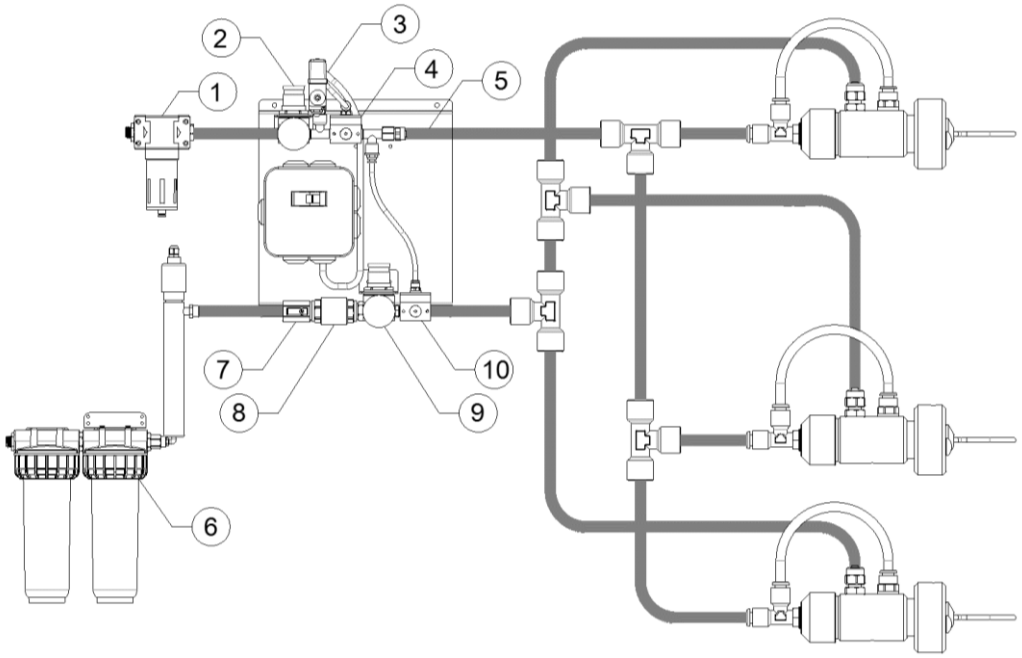
1. Check installation: Pneumatic and electrical diagrams, see next page.
2. Check that the valve is closed at mark 7.
3. Pull and turn air regulator 2, to set air valve pressure gauge.
4. Open valve 7, pull out and turn water regulator 9 to set pressure gauge to 3 bar.
5. Connect hygrostat or available dry contact.

For proper atomization, the air pressure must be at least 1 bar higher than the water pressure.

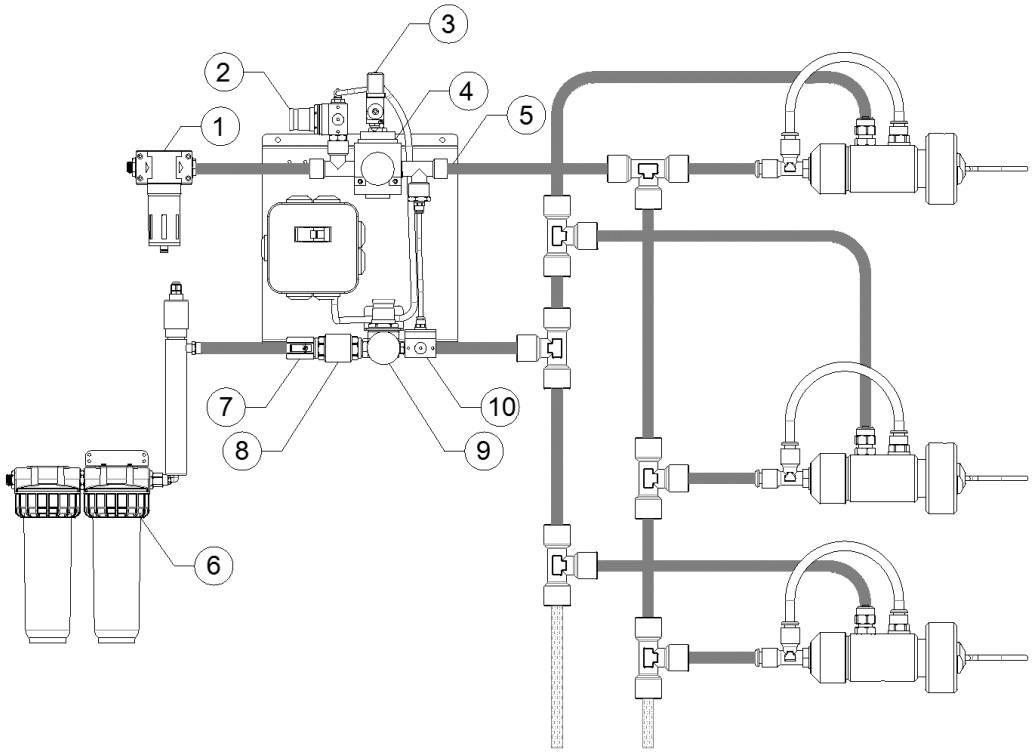
# FOG SYSTEM - BUS nozzles

### 4.1.1 PNEUMATIC DIAGRAM

**1 to 3 nozzles (MCR 3) :**




**1 to 30 nozzles (MCR 30) :**

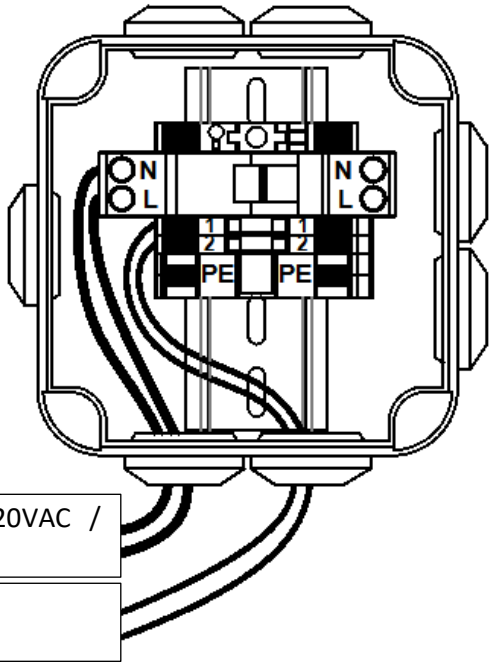



Up to 30 nozzles

1 : Air filtration option
2: Air pressure regulator
3: On/off solenoid valve
4: Air flow regulator
5: Air piping
6 : Water filtration option
7: Water supply valve
8: Check valve
9: Water pressure regulator
10: Pneumatic on/off valve

### 4.1.2 WIRING DIAGRAM

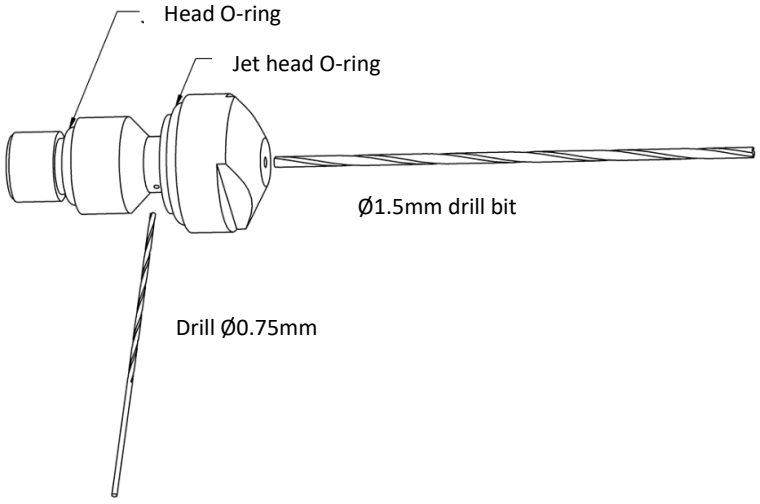
**Connection to be made by you :**




| |
|---|
| Supply voltage: 24VAC/110-120VAC / 208-240VAC |
| Control contact :<br>Example: hygrostat connection |

## 5. MAINTENANCE

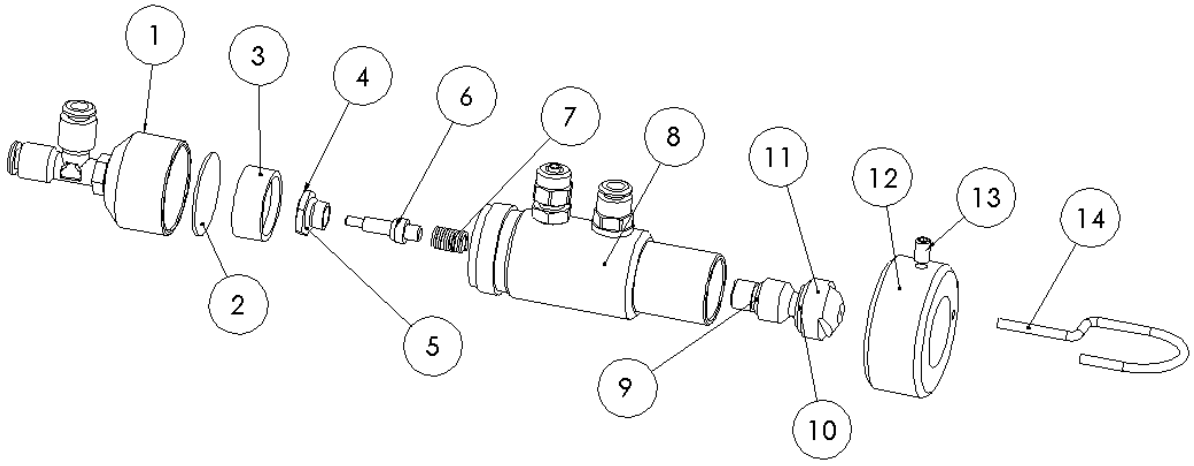
### 5.1 JET MAINTENANCE



# FOG SYSTEM - BUS nozzles

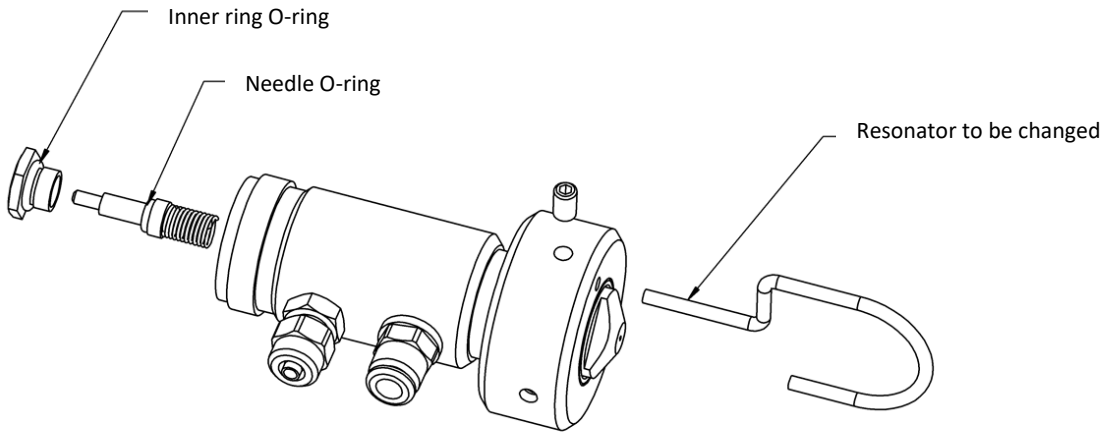
## 5.2 NOZZLE MAINTENANCE

Cleaning should ONLY be carried out when using TAP WATER. It is advisable to change the gaskets and membrane each time the nozzle is serviced.



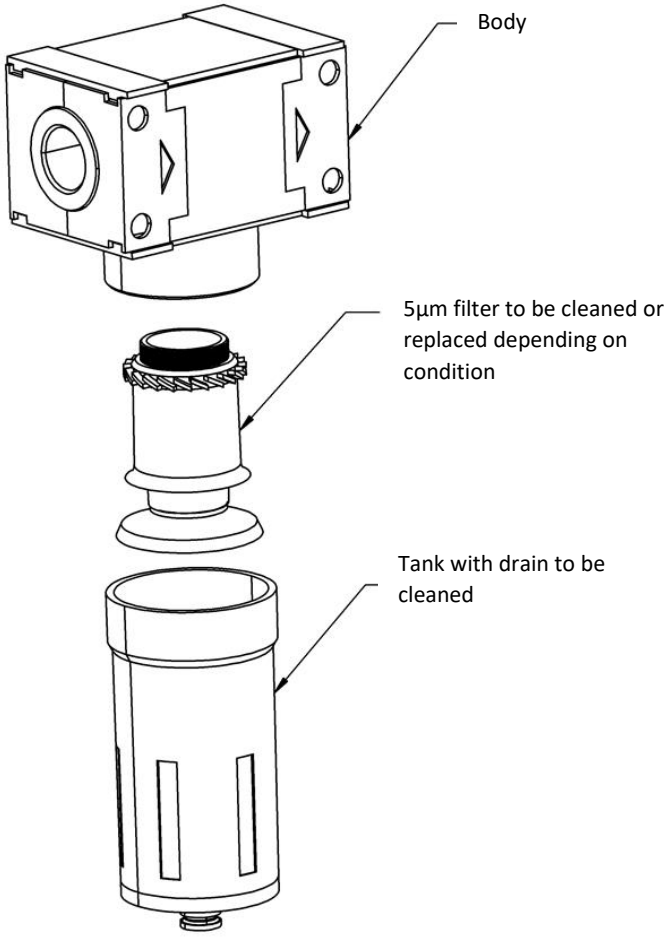

| N° | Code | Description |
|---|---|---|
| 1 | D116347-8-SP | BUS nozzle rear body |
| 2 | D116348-SP | Membrane |
| 3 | D116347-7-SP | Needle + seat + inner ring + BUS nozzle spring |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | D116347-4-SP | Main body BUS nozzle |
| 9 | D116349-SP | Nozzle O-ring |
| 10 | D116350-SP | Nozzle head O-ring |
| 11 | D116347-2-SP | Nozzle for BUS nozzle |
| 12 | D116347-3-SP | Resonator ring + screw for BUS nozzle |
| 13 | | |
| 14 | D116347-1-SP | Resonator for BUS nozzles |
| 2, 5, 9,10 | D116347-SP | Gasket kit + membrane for BUS nozzle |

## 5.3 MAIN BODY MAINTENANCE

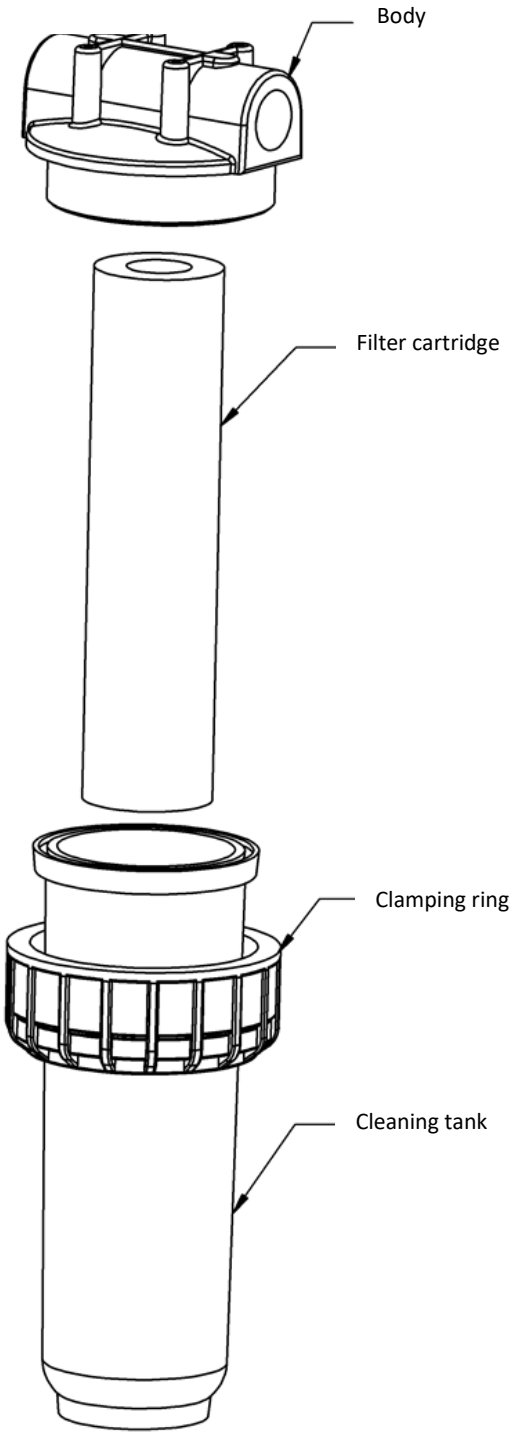


## 5.4 FILTER MAINTENANCE

Option: Air filtration



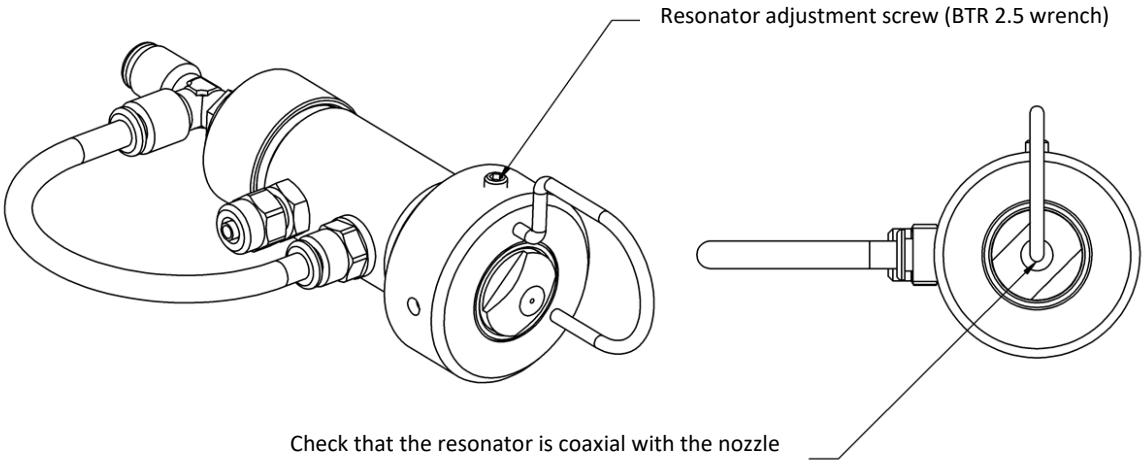

Option: Water filtration



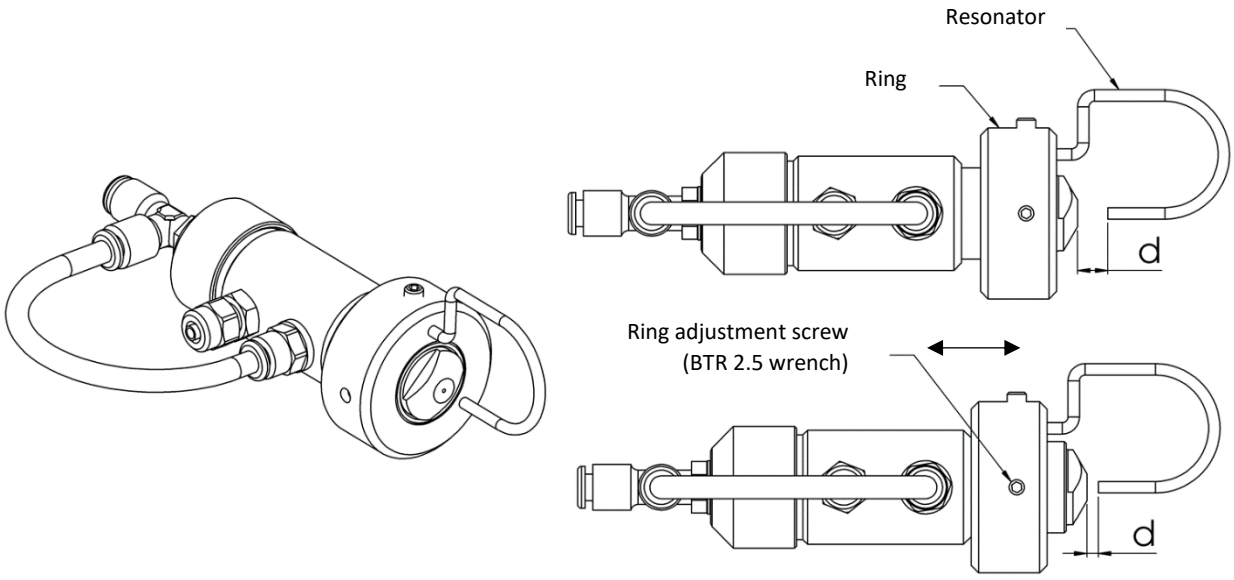
## 6. BREAKDOWN ASSISTANCE

**1. Droplets form on the ground or in the sheathing.**

- Check the direction of the resonator, which should be towards the top of the nozzle (see picture below).
- Check resonator setting.




- The ring and resonator reduce the absorption distance. The smaller the "d" value, the shorter the absorption distance: adjust the position of the ring to obtain the desired fog for your air flow.




**2. BUS nozzles no longer spray water.**

- Check that the water supply is in place and that the valve upstream of the system is open.
- Also check the compressor for correct air flow.
- If necessary, clean the nozzle (see section 5).

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