



# INSTALLATION AND OPERATIONAL MANUAL

Adiabatic humidification system  
Condair ML Princess 2/Princess 2 Max

Humidification and Evaporative Cooling

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## 1.0 General information

### 1.1 Foreword

This manual has been written to ensure the safe use, performance, and longevity of the equipment, and is intended for use by engineers and properly trained technical personnel. Please read this manual thoroughly before specifying, designing, or installing a ML Princess 2 or ML Princes 2 Max from Condair A/S. Keep the manual for future reference.

As our policy is one of continuous research and development, we reserve the right to amend, without notice, the specifications provided in this document. Condair A/S does not guarantee nor accept liability for the accuracy of information in this document.

This installation and operation manual is supplemented by various separate items of documentation (installation drawings, technical specifications etc.). Where necessary, appropriate cross-references are made to these publications in this installation and operation manual.

### 1.2 Guide to symbols used in this manual.



**WARNING!**

Instructions relating to safety.



**CAUTION!**

Instructions relating to the correct operation of the unit.

### 1.3 Health and safety

Installation, maintenance, repair work or decommissioning should only be carried out by appropriately qualified and properly trained technical personnel. The users are responsible for ensuring their suitability. The customer is responsible for ensuring that the installation of the equipment complies with all local regulations.

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.

All ideograms, signs and markings applied to the unit must be observed and kept in a readable state.



#### **WARNING!**

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



#### **WARNING!**

**High pressure!** The ML Princess 2/ML Princess 2 Max operate with high pressurized water at 70bar. Inappropriately fastened hoses may be forced out of the screw connections when pressurized. Never loosen hoses or screw connections in a pressurized system.

## **1.4 Hygiene**

Please observe the local health and safety executive's technical guidance on the control of Legionellosis in water systems.

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

The ML Princess 2 and ML Princess 2 Max system components are produced according to the HACCP principles 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.



#### **WARNING!**

**The ML Princess 2 and ML Princess 2 Max Systems 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.**

### **1.4.1 Guidelines to ensure your system stays clean and prevent the growth of Legionella.**

- Carry out a risk assessment of the water system in collaboration with a competent person and implement an appropriate monitoring and control program.
- Initiate procedures for changing filters, disinfection etc.
- Choose a service contract that suits your company.
- Shut down the system if polluted drinking water is found in your area.
- Avoid water temperatures between 25°C and 45°C, which favors the growth of Legionella.
- Do not shut down 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 ML Princess 2/ML Princess 2 Max 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.

### **1.4.2 The Condair service team experts**

Condair has expert service technicians who can provide:

- Bacteriological troubleshooting on site \*
- Cleaning and disinfection services
- Preventive maintenance
- Repair and fault-finding services.
- Training and guidance

\*Condair uses a fast method for measuring bacterial activity in the water. It is an approved and patented method called BactiQuant. Once a water sample has been taken, we can read the bacteriological quality of the water within 30 minutes and disinfect the system if necessary.

## 1.5 Intended use.

The ML Princess 2 and ML Princes 2 Max is intended for adiabatic humidification and cooling. Any other, or further, application is not considered use for the intended purpose. Condair A/S cannot be made liable for any damage or injury attributable to inattentive, inappropriate, negligent, or incorrect operation of the equipment, whether caused deliberately.

Operation of the equipment in the intended manner requires that all the information in this installation and operation manual be observed (safety instructions in particular).



### WARNING!

**Risk of electric shock!** A person may come in contact with live parts when the 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.



### WARNING!

Poorly maintained humidification systems may be hazardous.

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

### 1.5.1 Ensure safe operation.

Safe operation of the humidification system after commissioning is the customers responsibility. If you suspect that safe operation of the ML Princess 2/ML Princess 2 Max system has been compromised, the system should be shut down immediately and secured against accidental power-up. Below are the conditions that enforce a system shut down.

### 1.5.2 System shut down conditions.

The ML Princess 2/ML-Princes 2 Max system should be shut down if:

- Components are damaged, worn or very soiled.
- Fans are stopped or noisy.
- Joints, pipes, or hoses are leaking.

No modifications must be made to the ML Princess 2/ ML-Princess 2 Max system without the manufacturer's consent. All people working with the ML Princess 2/ ML-Princess 2 Max system must report any alterations made to the system to Condair or a Condair representative immediately.

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

## **1.6 Warranty**

The ML Princess 2 and ML-Princess 2 Max system parts are covered by a two-year warranty from the invoice date except for the replacement parts listed in the routine maintenance section. Failure to observe the manufacturer's installation and maintenance recommendations and instructions will invalidate the warranty. Condair A/S cannot be made liable for damage or injury attributable to failure to observe the manufacturer's installation and maintenance recommendations and instructions.

## **1.7 Product Storage**

If storing the system becomes necessary prior to use, the components must be covered and protected from physical damage, dust, frost, and rain.

It is recommended that the ML Princess 2/ML-Princess 2 Max system and components be kept in their transit packaging for as long as possible prior to installation.

## **1.8 Inspection**

It should be noted that all our systems are tested before leaving the factory to ensure that they meet the design specifications and other non-functional requirements that are customer specific.

However, upon receipt, remove the transit packaging and inspect the system and components to ensure that no damage has occurred during transit. Any visible damage must be reported to your Condair distributor immediately. If the components are put into storage, use of the original packaging is recommended for the purpose.

## **1.9 Correct method of lifting**

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.

## **1.10 Disposal**

You must observe local laws and regulations when disposing of your ML Princess 2/ ML Princess 2 Max System at the end of its working life.

## **1.11 Water quality guide**

The quality of water being used in the ML Princess 2/ ML Princess 2 Max systems should be checked prior to system commissioning and comply with the guidelines in the high-pressure pump manual.

### **1.11.1 Water monitoring**

The ML Princess 2/ ML Princess 2 Max systems must be monitored for hygiene as part of the maintenance program. Please refer to the maintenance section for further guidance.

### **1.11.2 Disinfection**

To maintain the system hygiene, it is advised that preventative disinfection be carried out at appropriate frequencies, but at least once a year.

Condair A/S recommends using the disinfection fluid SANOSIL S010 AG 5% (our code: 155404000) to the System via the high-pressure pump, and a desired concentration of 0.1%.

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 Condair distributor who will be happy to support you.



## 2.0 Product Overview

The ML Princess 2 and ML Princess 2 Max are part of a complete high pressure humidification systems with one or more humidification units. Every unit consists of a nozzle ring with 4-8 nozzles and a built-in fan.

Humidity is added to the room air as water under high- pressure, is atomized into micro-sized particles, and are immediately absorbed into the surrounding air. The fan distributes the mist particles, thus securing a uniform humidity throughout the entire room.



*Figure 1: The ML Princess 2/ML Princess 2 Max*

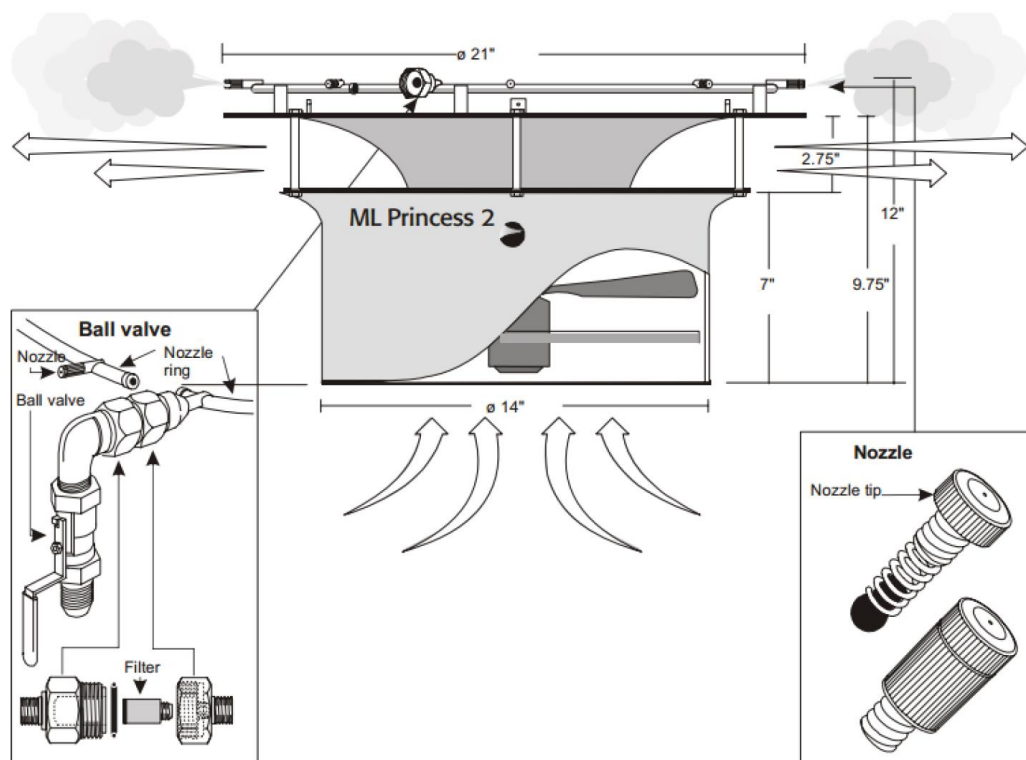


Figure 2: The ML Princess 2 detailed illustration

The ML Princess 2 is manufactured with a fan which allows more installation and control options. The fan has its own power circuit, and hence more speed regulation options that are achieved by a speed regulating board.

The regulating board is installed inside the connection box and assists the system in lifting the sprayed water further out, but at the same time reducing the power consumption to a third of the max power input. This also helps reduce the noise level of the fan.

The fan is by default configured to position 4, for the ML Princess 2 which is standard for normal use.

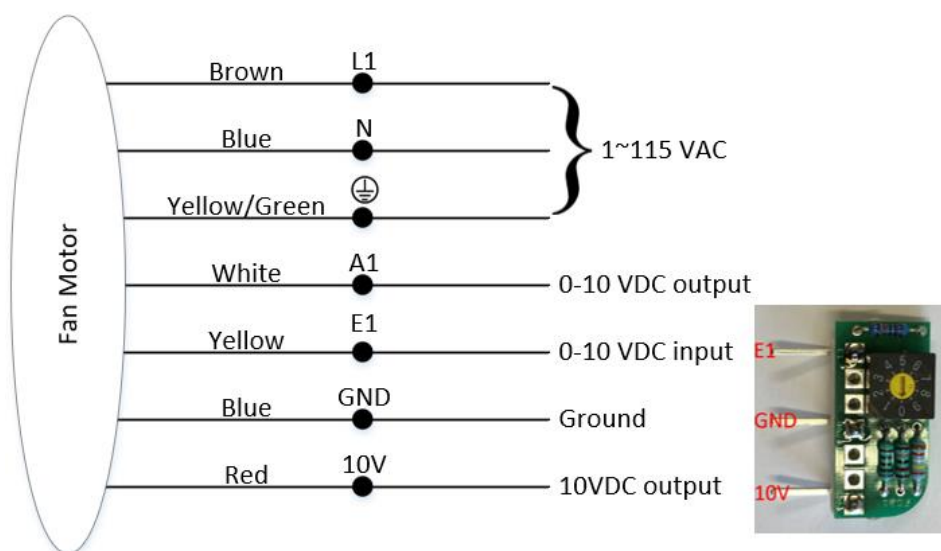


Figure 3: Fan connection with the special controller circuit board & its cable routing

The fan for the ML Princess 2 Max is by default configured to position 7. The main difference between the ML Princess 2 and the ML Princess 2 Max is the fan speed setting and bigger nozzles.

## 2.1 ML Princess 2 Specification

The ML Princess 2 and ML Princess 2 Max have the following characteristics:

- Powder painted steel 37 Housing or anodized aluminum.
- Low noise fan system
- Regulated fan speed.
- Ball valve for water inlet
- Possibility to connect a potentiometer for the humidification/fan performance.

## 2.2 Technical data

### 2.2.1 Technical data for the ML Princess 2/ML Princess 2 Max

Below the technical specifications of the ML Princess 2/ML Princess 2 Max

Technical Data		
	ML Princess 2	ML Princess 2 Max
<b>Weight</b>	5.5 kg	5.5 kg
<b>Number of nozzles</b>	8 pcs.	8 pcs.
<b>Recommended nozzle size</b>	1.5 - 4.5 L/h	6,5 L/h
<b>Nozzle capacity</b>	10 - 36 L/h	52 L/h
<b>Nozzle working pressure</b>	35 – 70 bars	35 – 70 bars
<b>Nozzle material</b>	Stainless steel	Stainless steel
<b>Anti-drip valve</b>	Standard	Standard
<b>Housing Material</b>	Anodized aluminum	Anodized aluminum
<b>Power Supply</b>	200-240 VAC, 50/60 Hz. IP44 100-130 VAC, 50/60 Hz. IP44	200-240 VAC, 50/60 Hz. IP44 100-130 VAC, 50/60 Hz. IP44
<b>Power consumption</b>	At nominal speed 26W	At nominal speed 49W
<b>Protective grille</b>	Epoxy treated steel	Epoxy treated steel
<b>Color</b>	ALUMINUM	ALUMINUM
<b>RH working range</b>	20-80% RH	20-80% RH

### 2.2.2 Noise level

The noise level for both ML Princess 2 and ML Princess 2 Max is approximately as indicated below:

Noise Level		
Distance to unit (Vertical)	1.5m	3m
dB(A)	59.5*	53*

*Note: \* are approximated values.*

### 2.3 Conditions of use

The power supply cable must be connected to the fixed connection box<sup>1</sup> (UL Versions only) mounted on the Baffle plate of the ML Princess 2 or ML Princess 2 Max.

### 2.4 Scope of delivery

#### Standard package.

- ML Princess 2 & ML Princess 2 Max humidifier
- Installation instructions and operation manual
- Accessory kit 102910005
- Nozzle gasket
- Nozzle set.

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<sup>1</sup> See section 5.0 for details.

## 3.0 Assembling of the ML Princess 2

### 3.1 Installation of the nozzle ring on the baffle plate (A)

The nozzle ring is fastened on top of the baffle plate using the nozzle ring brackets. Standard nozzle rings are provided with ball valve, filter unit and nozzles.

### 3.2 Final installation of nozzle ring (B)

Do not install the bleeding nozzle on each individual humidity unit until the system has been flushed through.

### 3.3 Installation of ball valve and filter union on nozzle ring (C)

Assemble ball valve and filter union as shown on the drawing. 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.

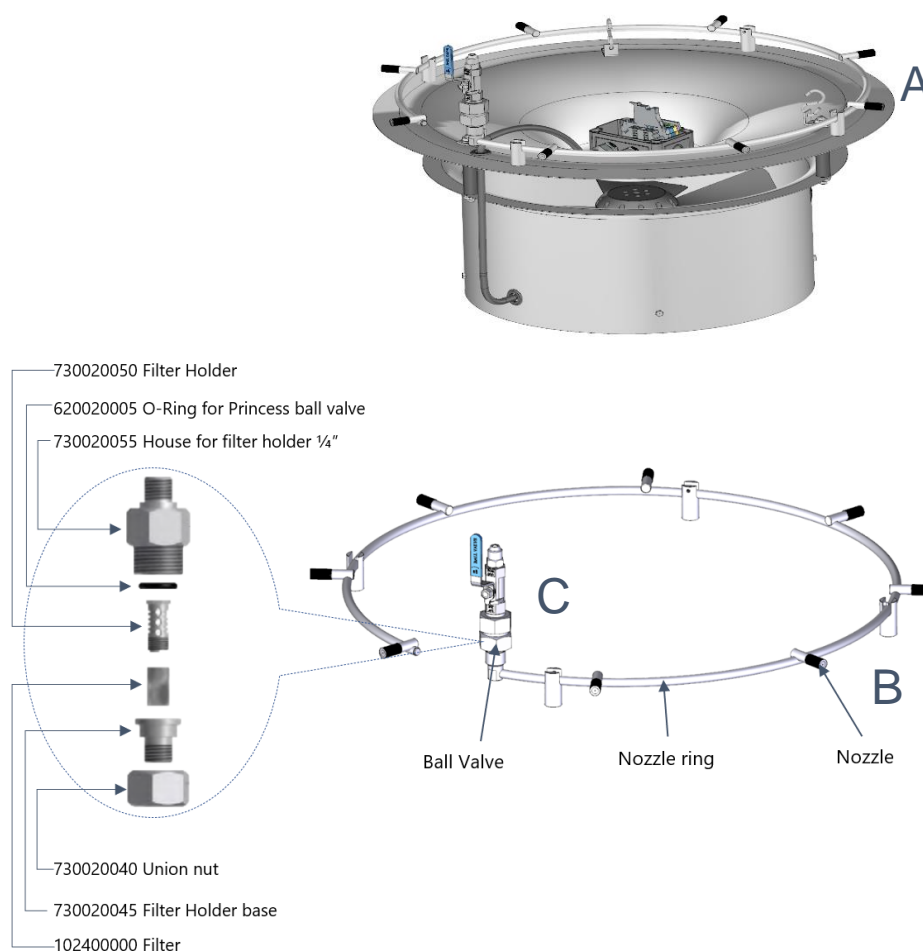




Figure 4: Assembly overview of the Princess 2

### 3.4 Model type name plate

The US and CA versions of the system is configured to operate at 115 VAC-60 Hz. The operating pressure is 70 Bar/1000 PSI and indicated on the name plate.



  
Condair A/S, Parallelvej 2, DK-8680 Ry

  
LISTED  
Humidifier  
E475863

Model: ML Princess 2

Serial-No: 9999999

Year: 02/2023

Power rating: 1~115V 60Hz 1,2A 140W

Max Unit Fuse: 10 A

70bar/1000psi

Made in Denmark

ML Princess 2, or ML Princess 2 Max

Running number from Condair ERP-system

Month (02) + Year (2023)

Figure 5: Model type name plate

**WARNING!**

Never unscrew a nozzle on a pressurized unit. Disconnect power to the pump station when working on high-pressure systems or close the ball valve on the unit.

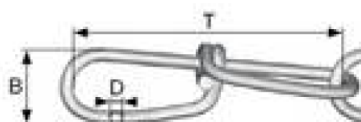
- Before inserting the nozzle, check that its threads and O-ring are intact.
- Screw the nozzle in by hand, tighten.
- Use a set of polygrip pliers to tighten the nozzle (approx. 1/8 turn) (torque: 2.1 Nm +/- 0.1 Nm)
- Always tighten on the tip of the nozzle too, to make sure it is also tight.

**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.

## 4.0 Ceiling mounted ML Princess 2

The ML Princess 2 can be hanged from the ceiling. For this purpose, it is recommended that an electro galvanized knotted chain as shown below be used.



D (mm)	T (mm)	B (mm)	Breaking load (kg)	Unit weight (kg/100m)
Ø1,6	23	7	22	6

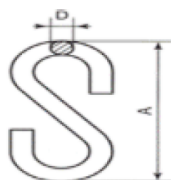
This chain type is not in the delivery package and hence should be bought separately. Condair can supply the below listed items if required.

Item no.	Description
101101000	Chain fixture 6 m
101100000	Chain fixture 10 m
101104000	Chain for Princess units, 100 m

When mounting the system from the ceiling, adjust the chains so that the unit is in level. After flushing and bleeding of the ML Princess 2 system, remove the excess chain and close S-hooks.

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

Further, S hooks are used to attach the ML Princess 2/ML Princess 2 Max to the chains. The recommended size and strength are as shown below.



D (mm)	A (mm)	Breaking load (kg)	Unit weight (kg/Pc)
Ø3,0	30	7	0,003

Condair can supply this item, if need be, and the item order number is stated below.



Item no.	Description
760020040	S-hook Ø3x30mm - galv.

Min. order 10 PCS =1 bag

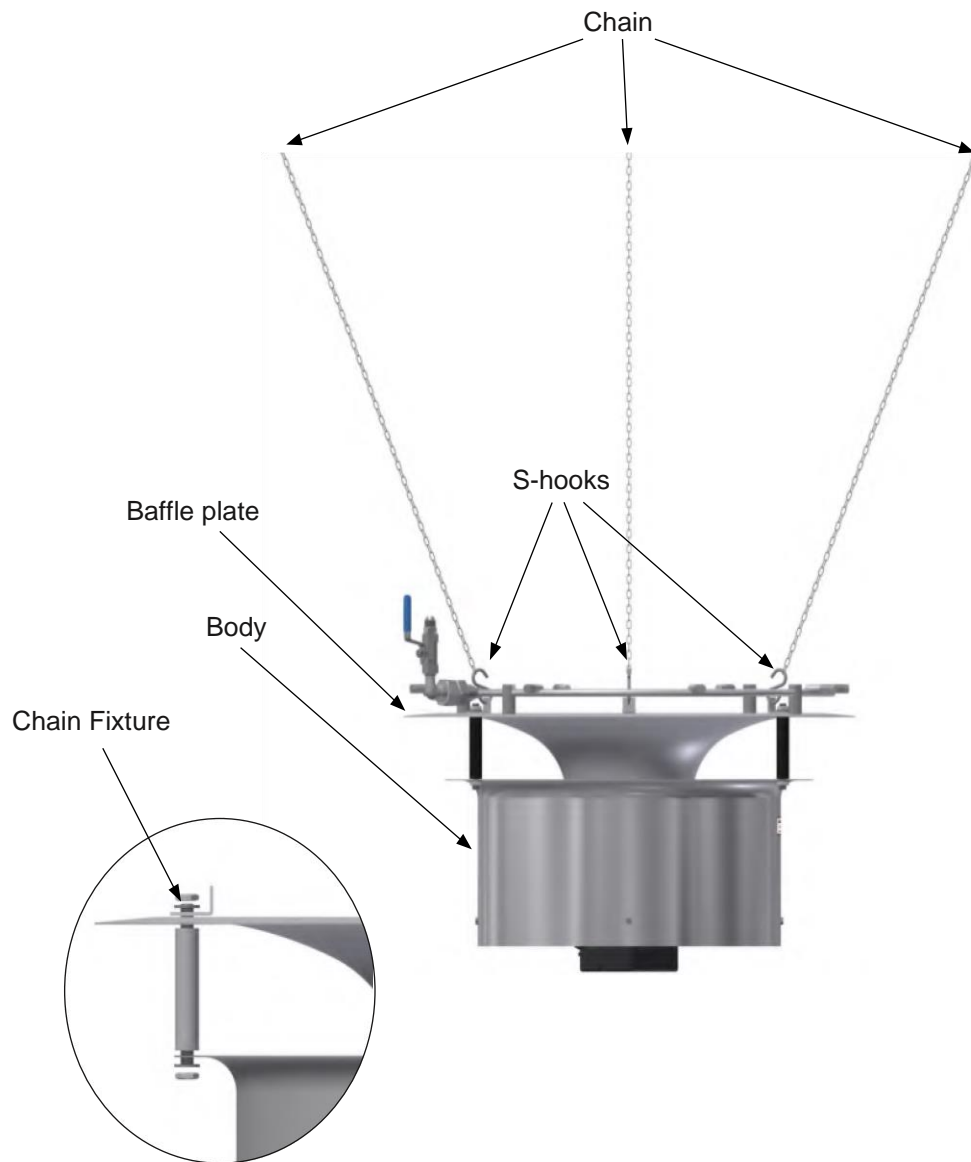


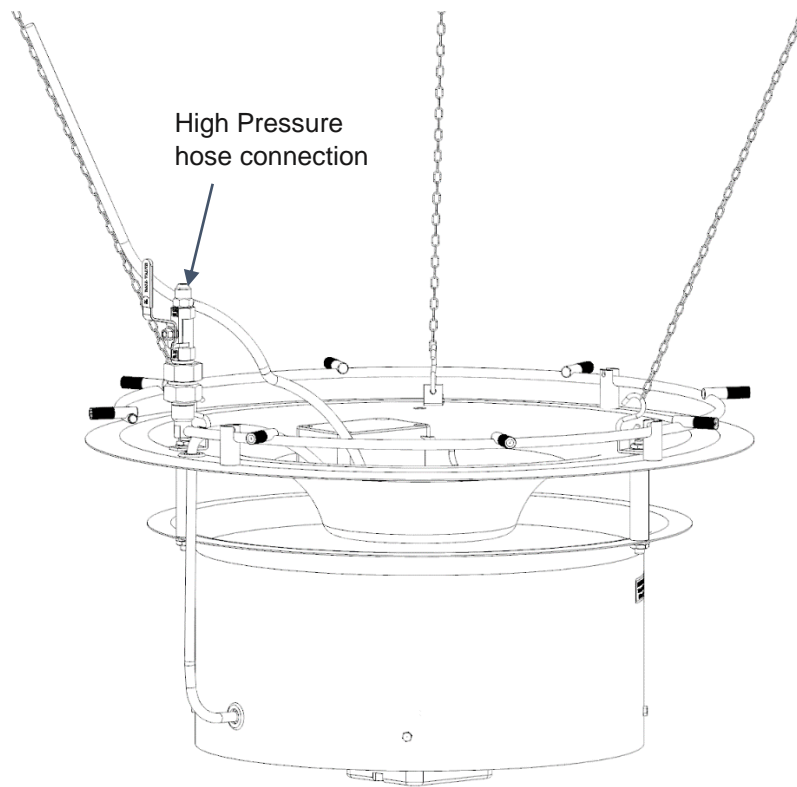
Figure 6: The ceiling fixed version of the ML - Princess 2

**N.B:**

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

When installing, fit the baffle plate to the body of the unit as indicated and attach the chains to the housing.

## 5.0 Water and power connection



*Figure 7: The High-Pressure water pipe connection*

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.

### 5.1 Electrical connection

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.

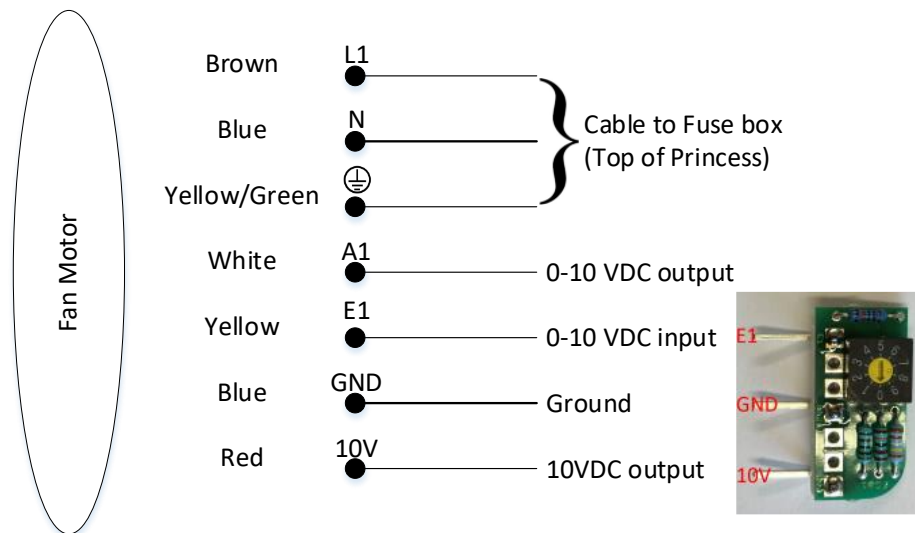


Figure 8: Electrical connection of the fan motor.

For the US & Canada markets, the connection should be done via a fuse/circuit breaker connection box with a 6m AWG 14 cable which is supplied together with the ML Princess 2/ML Princess 2 Max package.

The connection box is located on the baffle plate of the system as shown below. The fuse holder can be opened, and a replacement ceramic fuse of type 179200.10 (5x20mm) can be inserted.

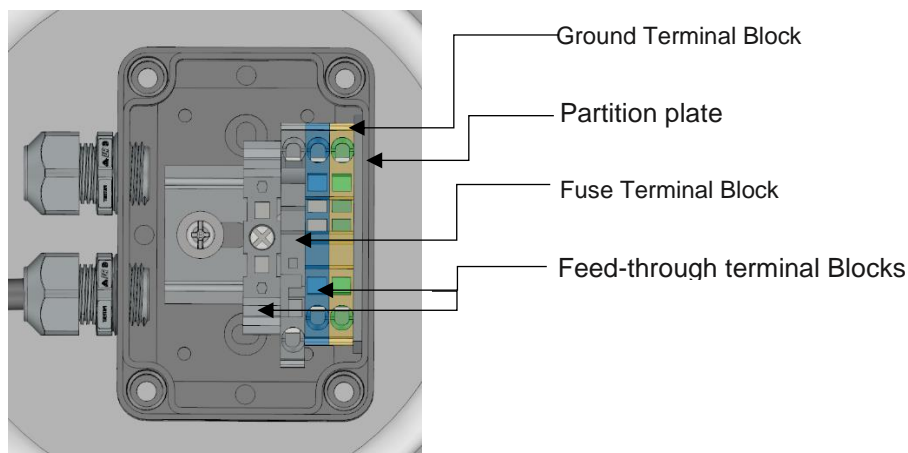


Figure 9: Connection in the Fuse Box

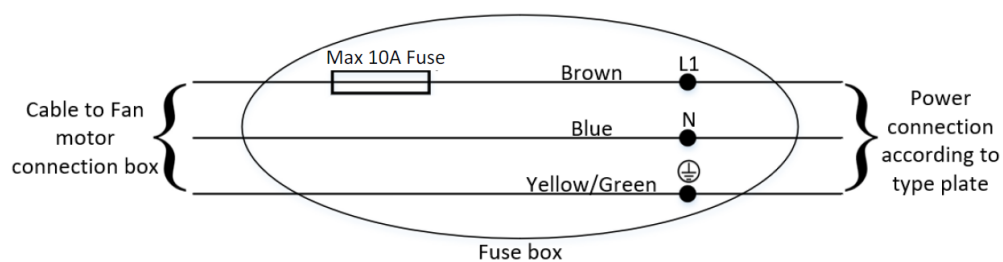
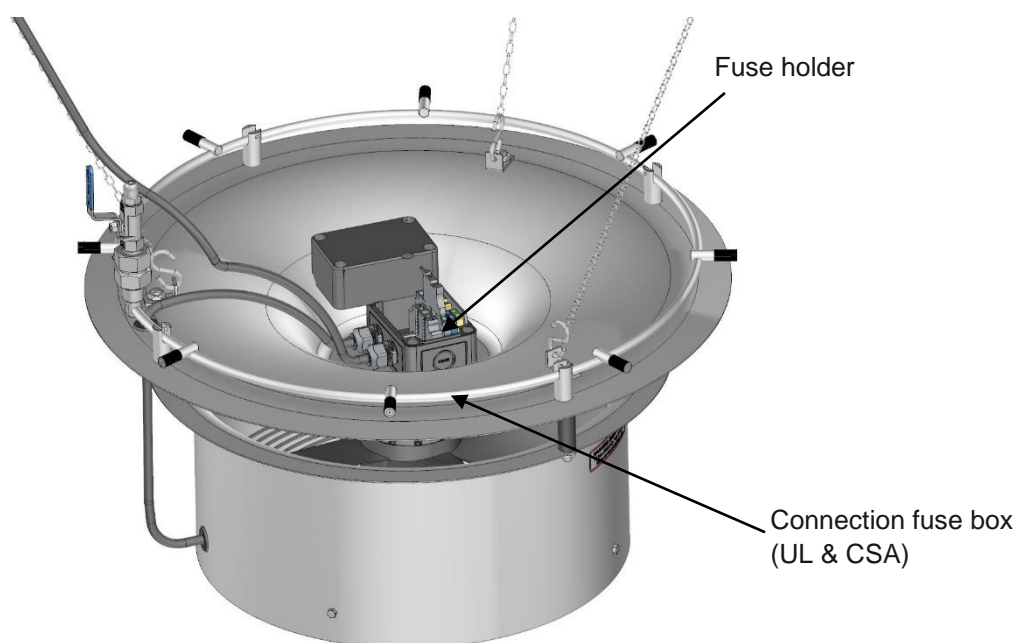


Figure 10: Connection diagram



*Figure 11: ML Princess 2/ML Princess 2 Max for the US & Canada market*

## 6.0 Installation of the air filter under fan (option)

The air filter serves as protection for the fan motor. In operating environments with much dust/dirt in the air (e.g., carpentry workshops) it may be necessary to clean the filters often due to the high dust loads that are carried with the conveying air.



Figure 12: Air filter fixation steps

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

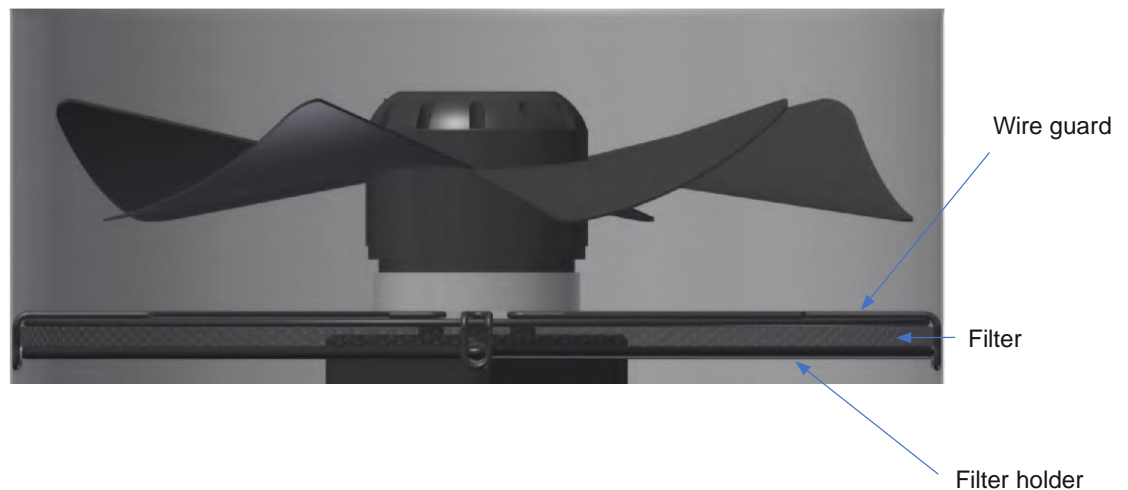


Figure 13: Placement of the air filter

## 7.0 Hose layout examples

Below an illustration of how hoses should be laid out. It is important that sizing of the hoses is done according to TI013GB.

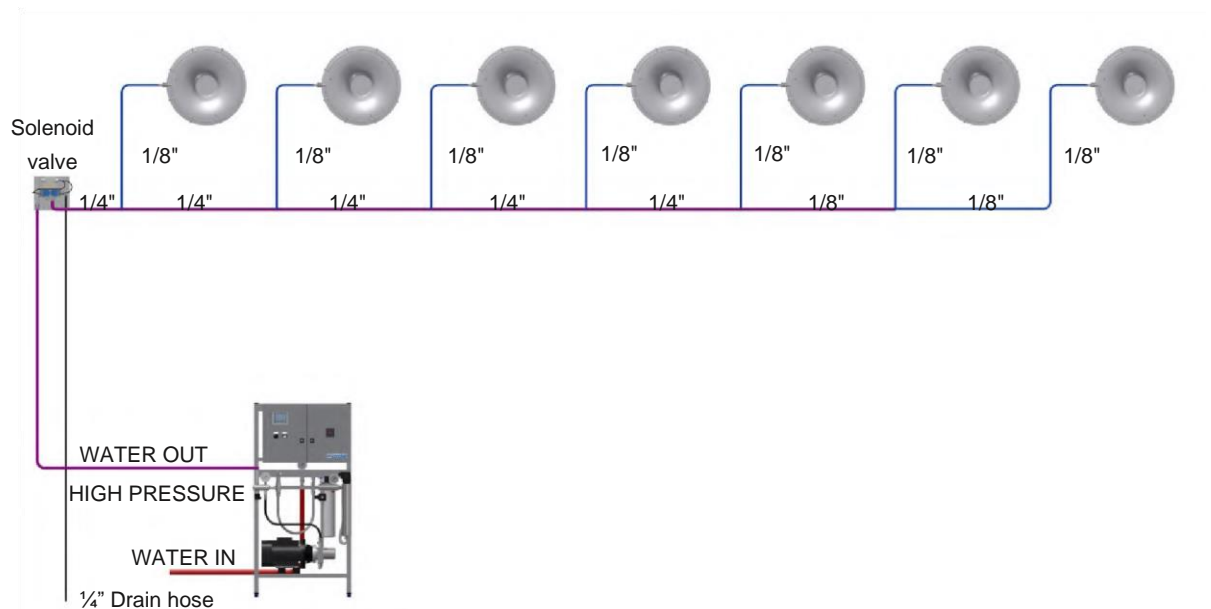


Figure 14: Example of hose layout in series

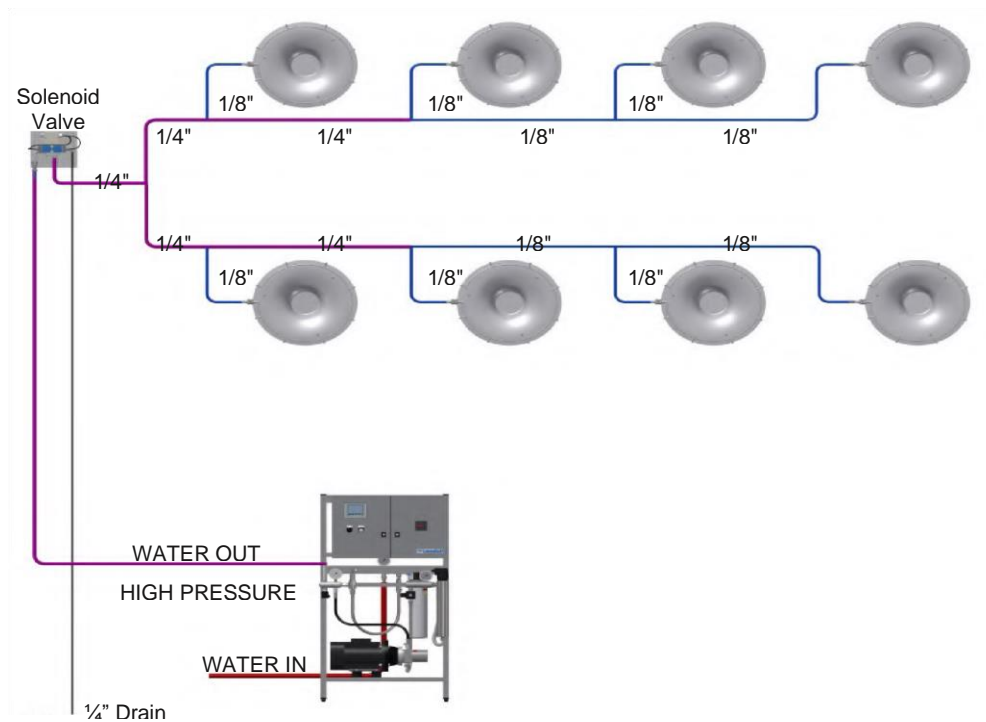


Figure 15: Example of hose layout parallel connected

## 8.0 Spare parts

ITEM	PART NO.
Nozzle ring without ball valve, filter and nozzles	102 200 001
Ball valve, complete <i>Angled - Old version</i>	102 910 000
<i>Straight – New version</i>	102 910 005
Bracket set for nozzle ring ML Princess 2	102 901 000
Fan for the ML Princess 2, 230 VAC	2599234
Fan for the ML Princess 2, 115 VAC	2599235
Bag with 8 nozzles, 1.5 L/H	671 300 011
Bag with 8 nozzles, 2.5 L/H	671 300 012
Bag with 8 nozzles, 4.5 L/H	671 300 013
Bag with 8 nozzles, 6.5 L/H (ML Princess 2 max only)	671 300 014
Fan filter for Princess 2	100 400 000
Fan filter holder Princess 2	100 402 000
Filter 20 µ, short	102 400 000

## 9.0 Distances between modules

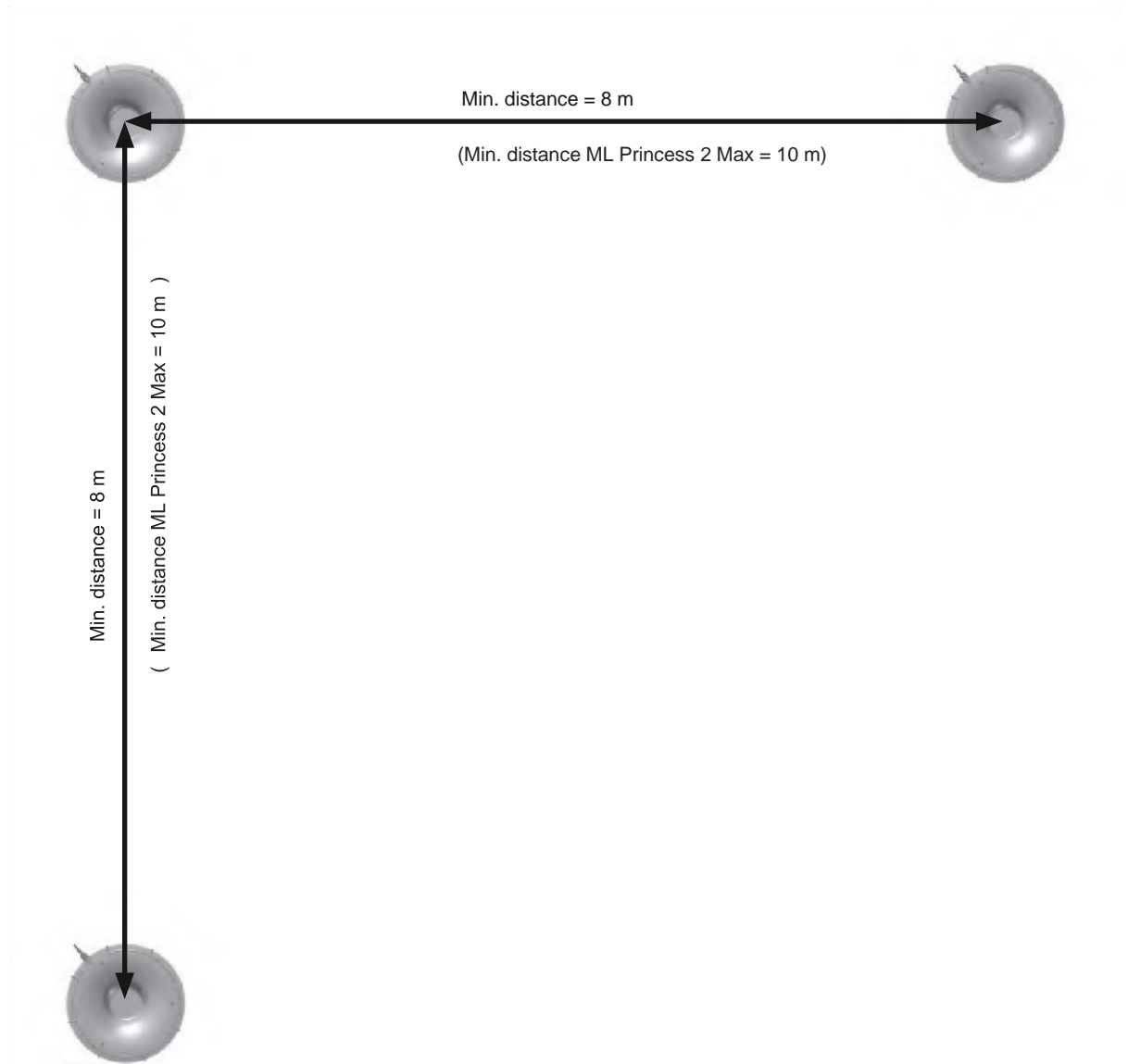
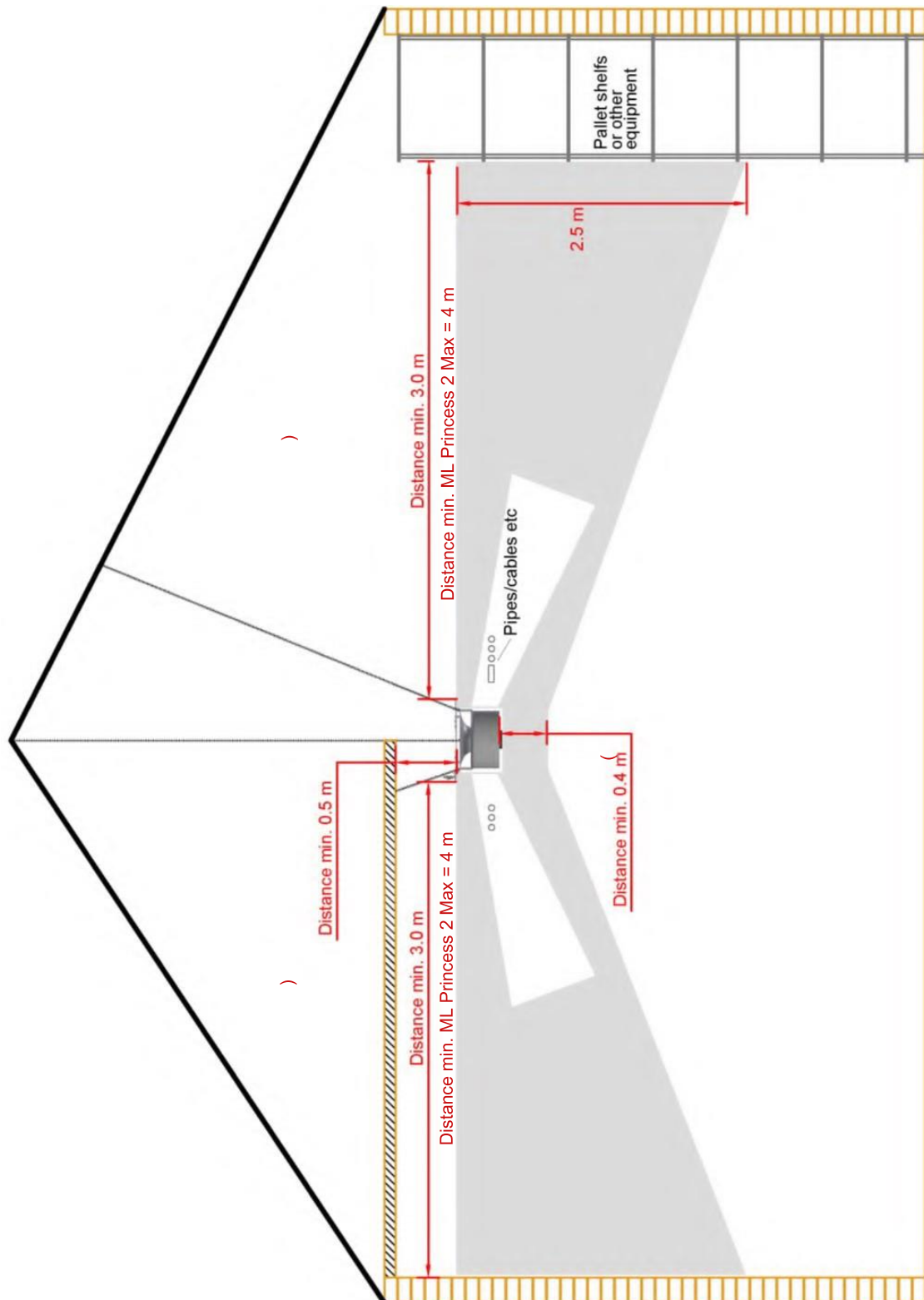


Figure 16: Distances between modules



## 10 Miscellaneous mounting distances



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## 11. Appendixes



### 1. UL Compliance certificate.

The ML Princess 2 and ML Princess 2 Max are UL recognized products including all the accessories that are required for their operation.

The UL compliance certificate number is: **E475863 vol.2**