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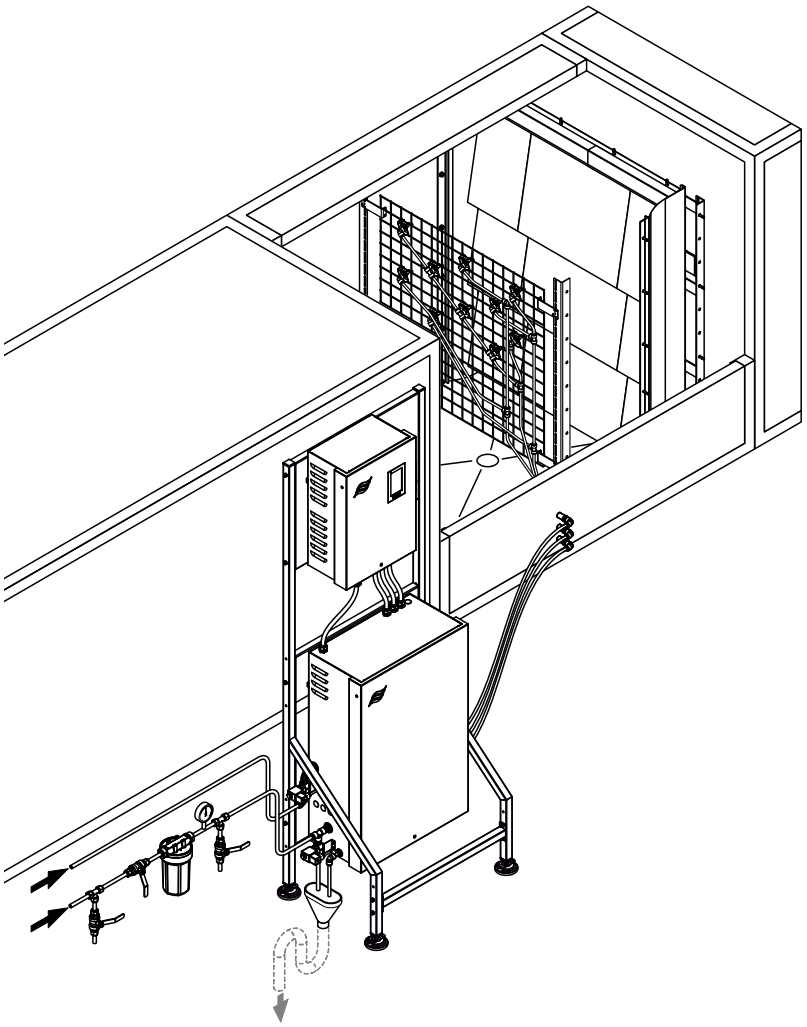
DL SERIES



PLANNING MANUAL

Adiabatic air humidification system
Condair **DL II**

Humidification, Dehumidification
and Evaporative Cooling

condair

Thank you for choosing Condair

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Contents

1 Introduction

1.1 Notes on the Planning Manual

The subject of this planning manual is the DL Adiabatic Hybrid Humidifier and its different versions.

This planning manual contains:

– Overview of the Condair DL and available options
– Notes on design requirements
– Notes on installation requirements (duct, positioning, water quality, etc.)

If you have questions after reading this documentation, please contact your Condair representative. They will be glad to assist you.

2 System Overview

2.1 Introduction to Condair DL Adiabatic Air Humidification System

The Condair DL adiabatic air humidification system is based on the advantages of the two humidification principles of atomization and evaporation. The humidifying water is atomized by stainless steel nozzles at low pressure. The stainless steel nozzles are optimally distributed over the entire cross-section of the device. A high evaporation efficiency and a uniform humidity distribution are achieved by this layout. The post-evaporation unit made of premium ceramic is placed at the end of the humidification distance. It captures the humidifying water and ensures the best possible evaporation. The ceramic plates ensure the most effective utilization of the high-grade humidifying water. At the same time, they prevent water accumulation in downstream components. The Condair DL humidifier unit guarantees breathable, aerosol-free, and hygienically humidified air.

2.2 System Versions

The Condair DL humidification system is available in two base models for different AHU/duct sizes:

– **Type A**: with booster pump (guarantees the required water pressure of 7 bar at 100% demand)

– **Type B**: without booster pump (Type B is used when the reverse osmosis system can provide sufficient and stable pressure of 3-7 bar to the Condair DL. The water pressure must be specified when ordering so that the system can be configured accordingly. For questions, please contact your Condair representative)

	Condair DL	
	Type A (with booster pump)	**Type B (without booster pump)**
AHU/duct inside width	450 ... 8400 mm	
AHU/duct inside height	450 ... 4000 mm	
Humidification capacity	5 ... 1000 l/hr	5 ... 1000 l/hr

Both base models can be extended with different options in their functionality. See table in *Section 3.6*.

2.3 Condair DL System Components

The Condair DL System is made up of **4 main components** shown in *Fig. 1*:

- Control unit (1)
- Central unit (2)
- Nozzle System (3)
- Post Evaporative Unit with Ceramic Media (4)

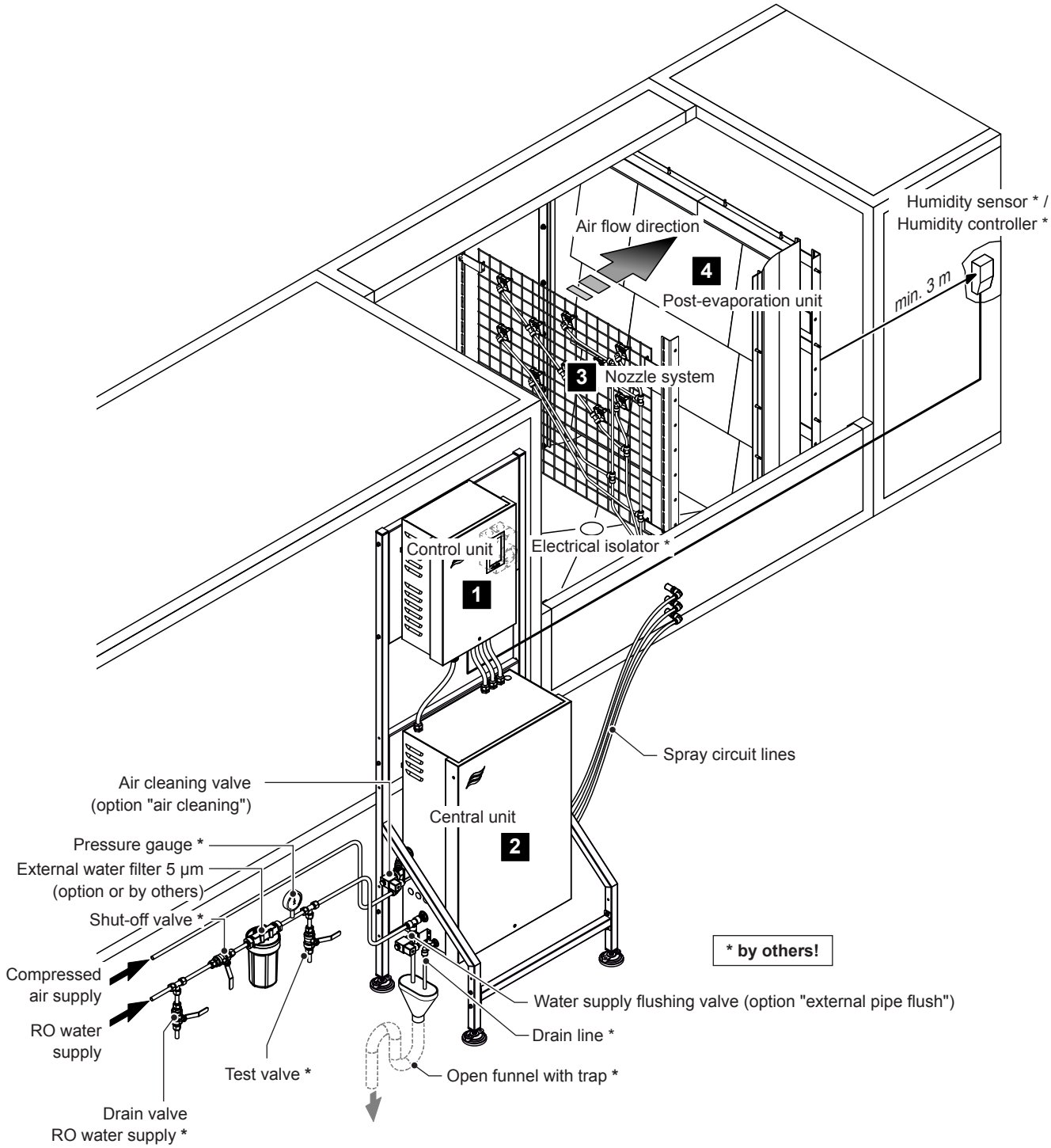
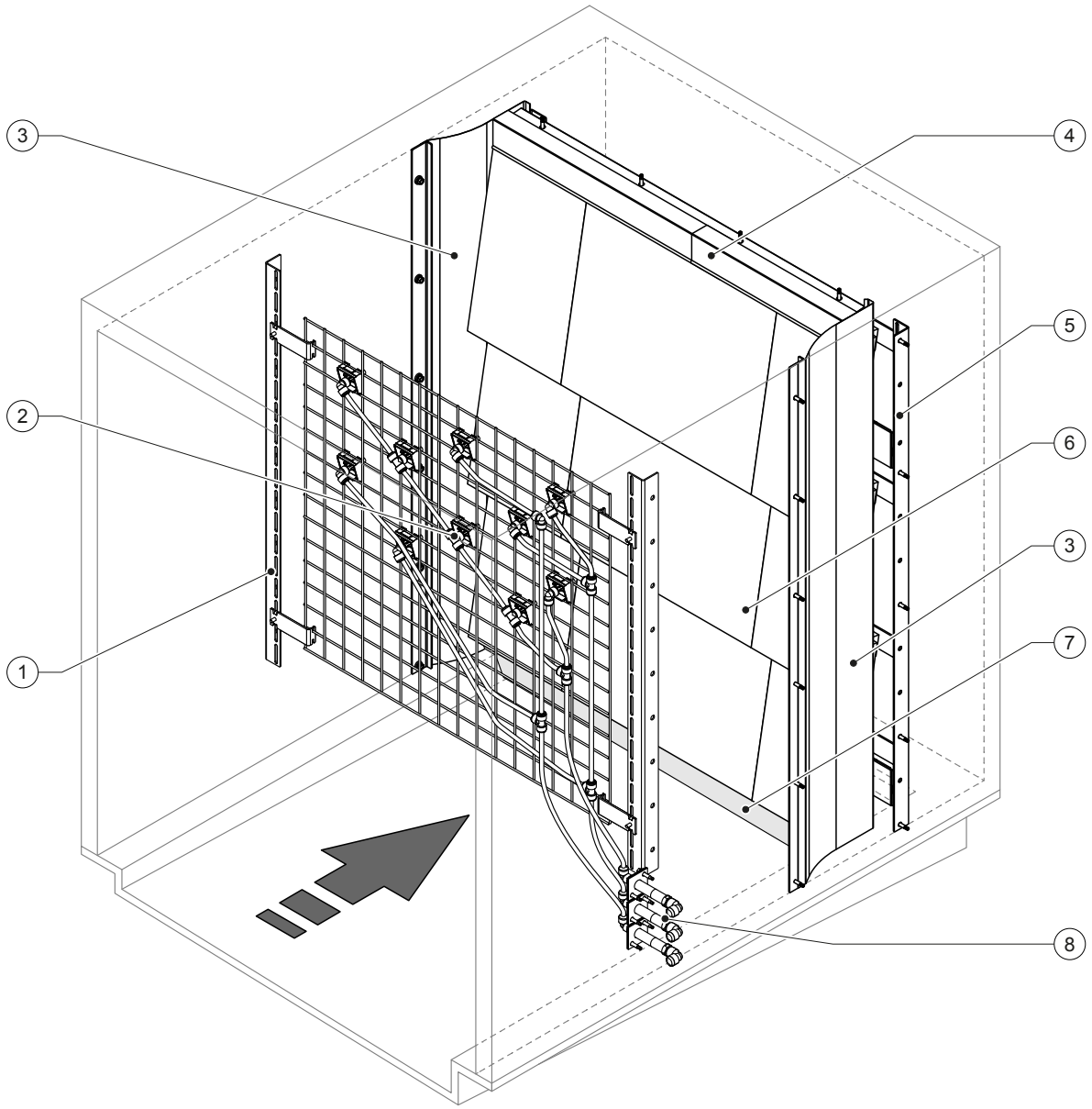


Fig. 1: Condair DL System Components

2.4 Overview Humidification Unit



1 Support frame Nozzle unit
2 Spray nozzles
3 Lateral sealing plates
4 Upper sealing plates
5 Support frame post-evaporation unit
6 Ceramic plates
7 Rubber sealing duct floor
8 Wall feed throughs spray circuits

Fig. 2: Overview humidification unit

2.5 Functional Description

See Condair DL operation manual.

3 Condair DL Unit humidification Unit Properties and Clearances

3.1 Dimensions

Dimensions AHU/duct (Min-Max)	
Installation length "L"	600 ... 900 mm [1)]
Width "W"	450 ... 8400 mm
Height "H"	450 ... 4000 mm

[1)] Larger installation length available as special

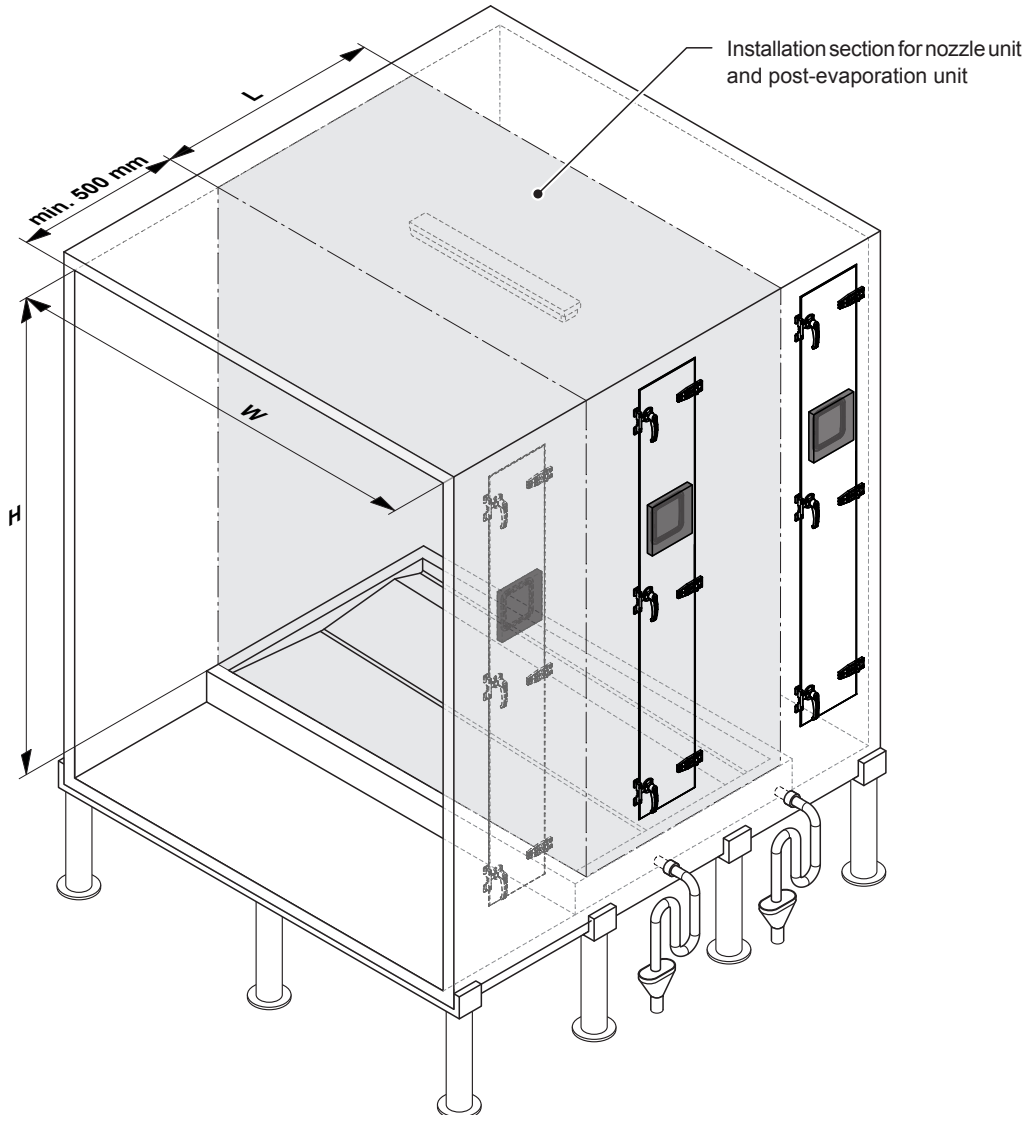
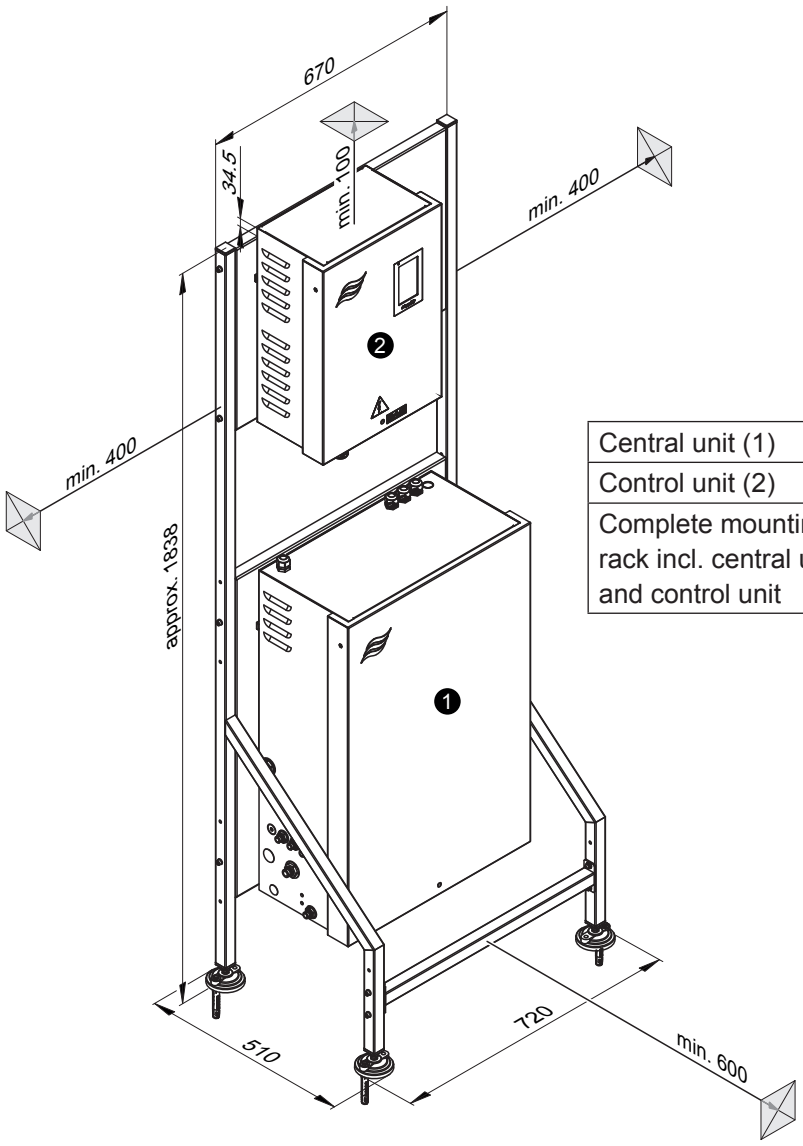


Fig. 3: AHU/duct dimensions



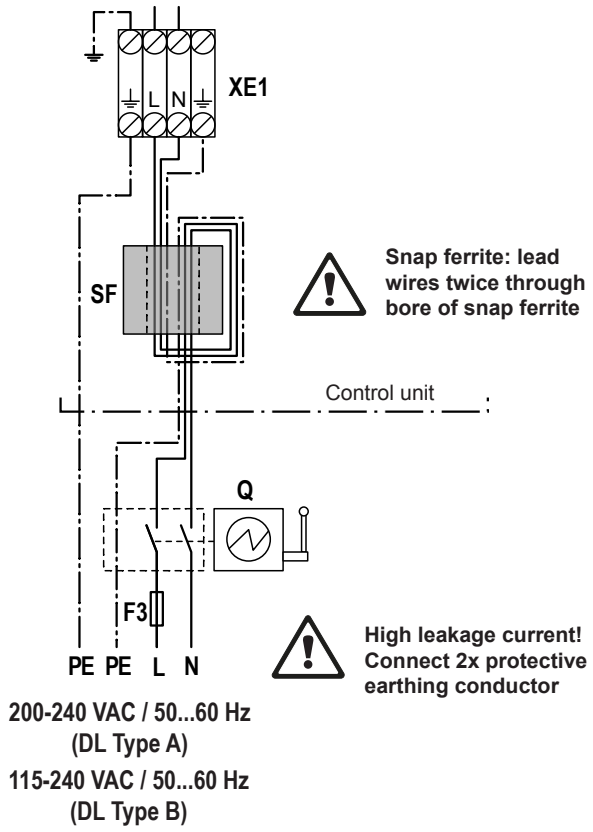
	Dimensions (HxWxD)
Central unit (1)	800 x 530 x 285 mm
Control unit (2)	485 x 345 x 217 mm
Complete mounting rack incl. central unit and control unit	1873 x 720 x 510 mm

Fig. 4: Clearances and mounting rack dimensions (dimensions in mm)

3.2 System Weights

	DL Type A	DL Type B
Central Unit	approx. 54 kg	approx. 35 kg
Control Unit	approx. 15 kg	
Post-evaporation Unit (wet)	approx. 55 kg/m^2 humidifier area	
Post-evaporation Unit (dry)	approx. 40 kg/m^2 humidifier area	

3.3 Electrical Requirements

Item	Requirements
Mains Voltage	The mains voltage supply is to be connected to terminals "XE1" via the snap ferrite "SF" (supplied) in accordance with the wiring diagram. The phase "L1" and the neutral conductor "N" and one of the protective earth wires "PE" are to be led twice through the bore of the snap ferrite "SF" supplied. 
Second Protective Earth (PE)	**DANGER!** When using a frequency converter there must be **TWO protective earth conductors for optimum safety**. **The second protective earth wire must be connected directly to the nearest potential equalization**. The wire cross section of both earth conductors must comply with the local regulations. If the present installation does not allow for two protective earth conductors, the wire cross section of the single earth conductor must be 10 mm^2.
Fuse, Electrical Isolator, Residual Current Circuit Breaker	The installation of the fuse F3 (10 A slow acting), the electrical isolator "Q" (all pole disconnecting device with a minimum contact clearance of 3 mm) and a residual current circuit breaker with 30 mA trigger current (by others) in the mains supply line are mandatory.
Supply voltage/current control unit	DL Type A: 200...240 VAC / 50...60 Hz, max. 6.5 Amps DL Type B: 100...240 VAC / 50...60 Hz, max. 0.5 Amps
Power consumption control unit (including solenoid valves)	55 ... 65 VA (dependent on the number of switched valves and whether the display is in sleep mode or not)
Power consumption booster pump	approx. 12 VA per 10 kg/hr spray capacity

See Condair DL II installation manual for more details.

3.4 Water Supply Requirements

Requirement	Range
Fully demineralized	RO or DI
Conductivity	0.5 ... 15.0 µS/cm
Inlet pressure	3 ... 7 bar
Inlet temperature	Max. 20 °C
Additives	None (unless approved by Condair)
Germ count	Max. 100 cfu/ml at inlet

3.5 Required Clearances

Location	Clearance Requirement (minimum)
Before nozzle grid	500 mm
After post-evaporation unit	100 mm
Between nozzle grid and inspection door	40 mm
From the right side of the inspection door to the end post evaporation unit	400 mm

See *Fig. 5* and *Fig. 6*

Inspection door between nozzle grid and post-evaporation unit

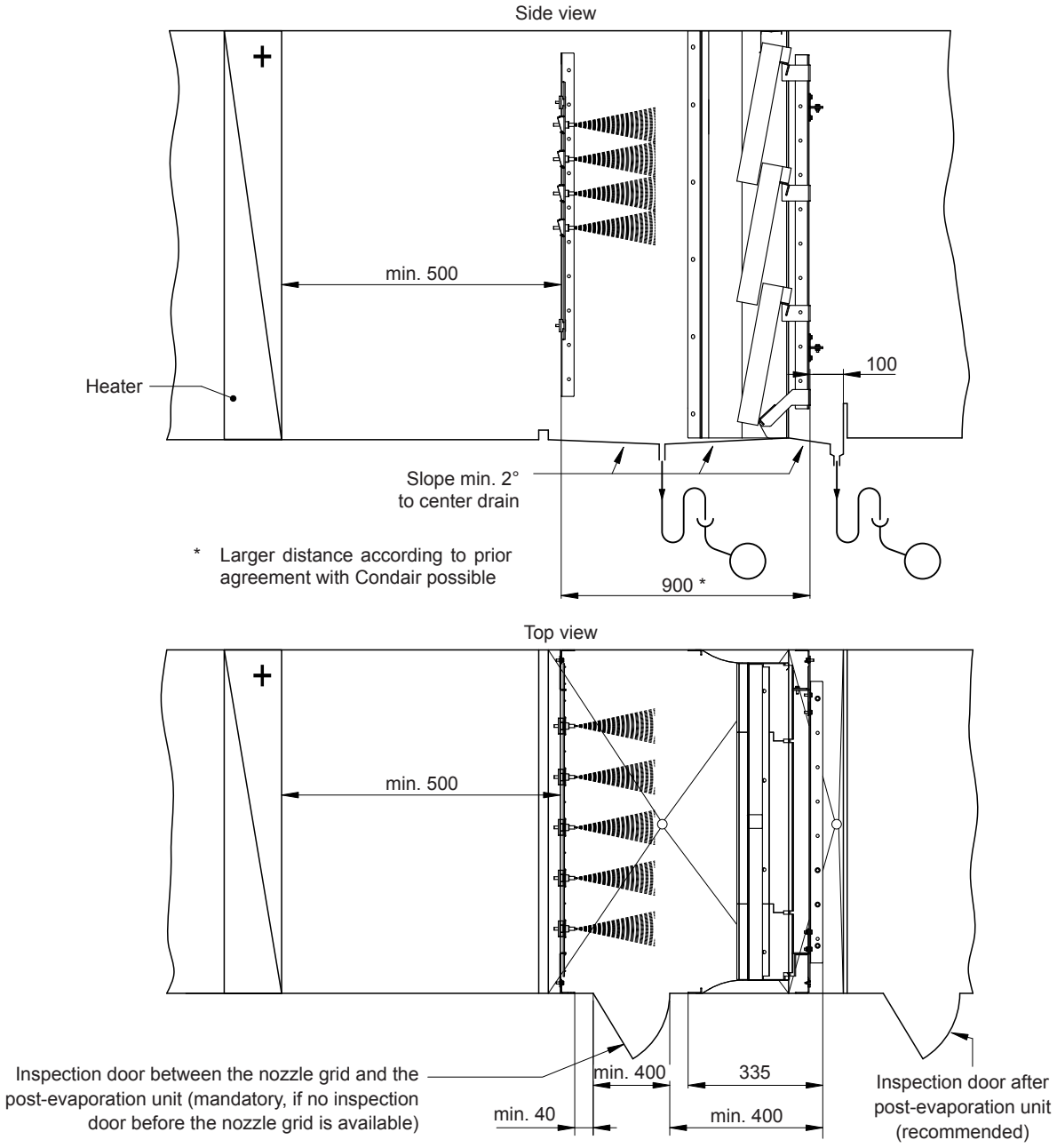


Fig. 5: Positioning of the humidification unit with inspection door between nozzle grid and post-evaporation unit and after post-evaporation unit - dimensions in mm

Inspection door before nozzle grid

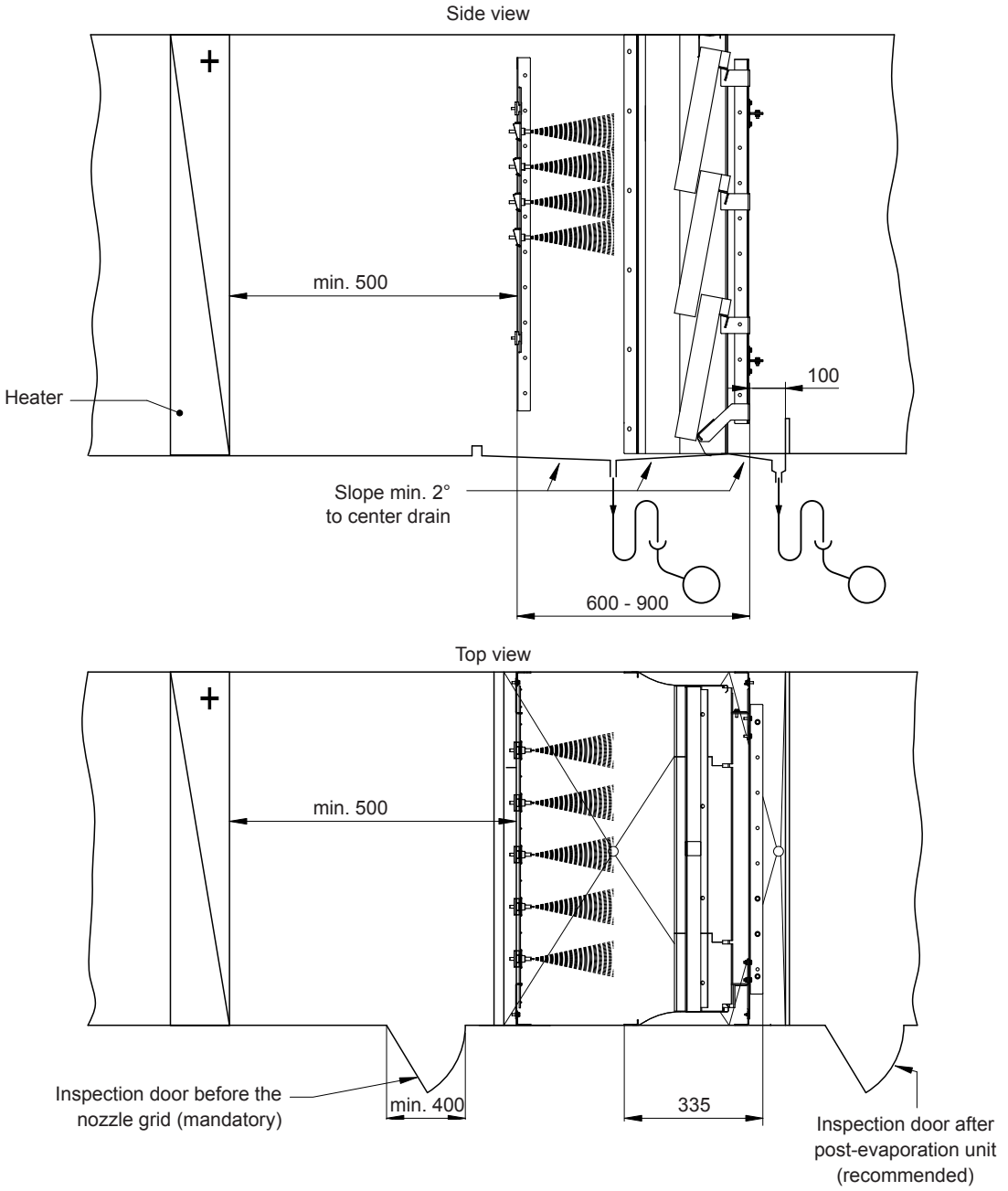


Fig. 6: Positioning of the humidification unit with inspection door before and after the humidification unit - dimensions in mm

3.6 Available options

		Condair DL	
		Type A	Type B
Silicone Free	Produced with silicone free components.	X	X
Leak monitoring	Provides two leak sensors. One is placed inside the central unit and the other below the central unit. If the sensors detect water accumulation, they report an error and the inlet valve will be closed.	X	X
Sterile filter	The sterile filter with automatic self monitoring is installed upstream of the booster pump. Provides additional hygiene safety. Please notice filter replacement interval according to the instructions.	X	X
Air cleaning	Additional fittings and connection points to allow the system to be dried and flushed with compressed air. This can be used for summer shutdowns or cases where additional flushing is required.	X	X [1)]
External pipe flush	Additionally allows a separate flushing of the water supply line from the reverse osmosis unit to the DL. During flushing, the water in the supply line does not flow through the Condair DL, but is directed directly into the drain just before the inlet valve. Please consider space conditions.	X	X
External water filter 5 µm	The external water filter serves as a prefilter and is installed at the water inlet prior to the central unit. Please notice filter replacement interval according to the instructions.	X	X
Gateway board	Allows LonWorks or BACnet IP/BACnet MS/TP communication. Note: BACnet is also supported directly by the controller by default. However, the gateway boards allow for more flexibility. For example, object names can be changed or other text (the "Description" property) can be adapted in the BACnet objects.	X	X
Mounting rack	Mounting rack for central unit and control unit.	X	X
Disinfection for service	A T-connector and check valves are added to the hydraulic system, allowing a disinfectant to be introduced. Not recommended for systems with load >180 kg/hr due to pressure loss.	X	X [2)]

		Condair DL	
		Type A	**Type B**
Water temperature monitoring	Monitoring of the inlet water temperature to trigger a flush when the corresponding limit value of the inlet water temperature is exceeded or undershot. – If the temperature is too low, the flushing process attempts to prevent the water from freezing. – If the temperature is too high, the flushing process will attempt to lower the water temperature, as otherwise the likelihood of bacteria formation increases.	X	X
External valve block with auxiliary outlet valve	The valve block is integrated in an external housing separately from the central unit. Used when the central unit is far away from the wall feed throughs or a constant downslope of the spray circuit lines cannot be provided.	X	
Clamping sheet bottom rubber sealing post evaporator	Clamping sheets (spring steel) for better stabilization of the rubber seal at the bottom of the post-evaporator.	X	X

[1] Available only for type B systems **with** sterile filter

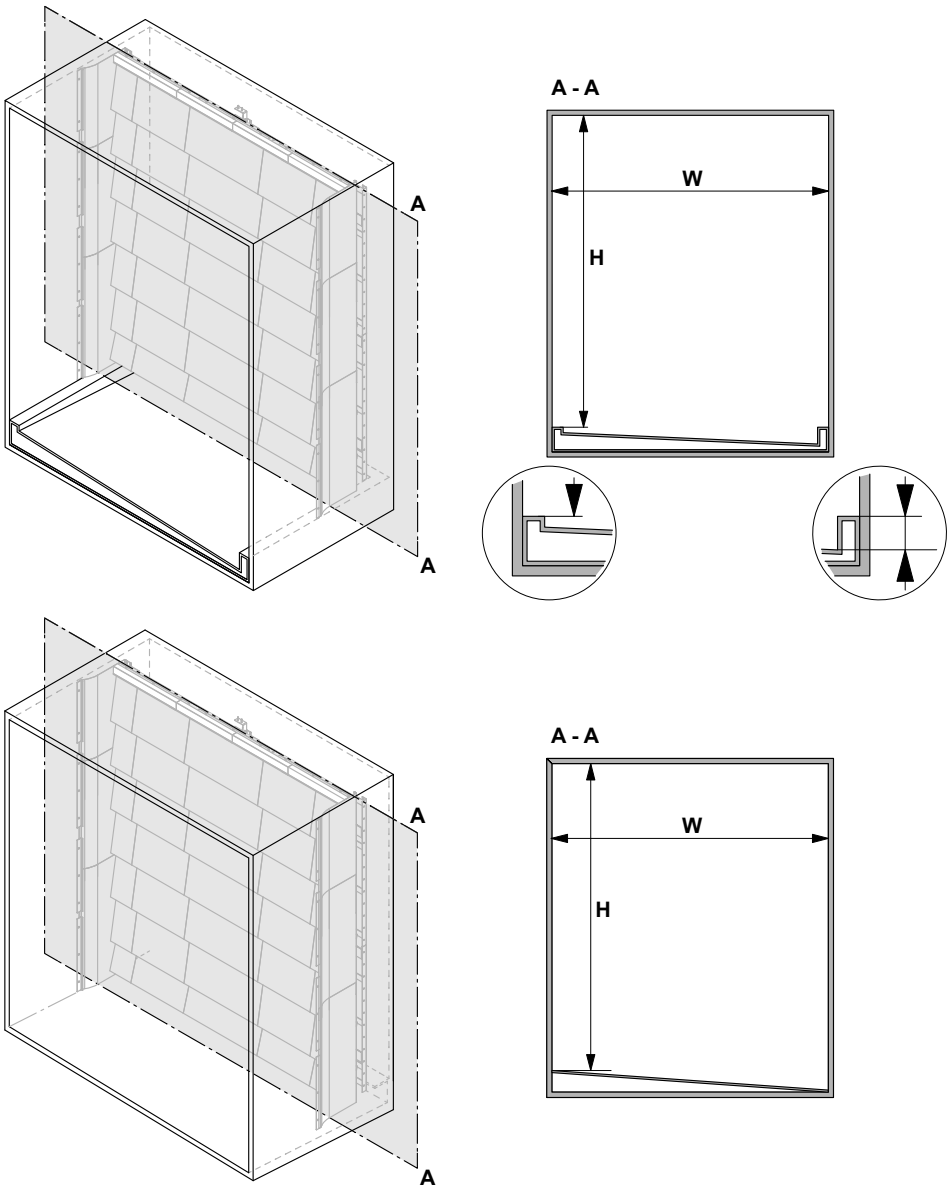
[2] Available only for type B systems **without** sterile filter

4 Design Requirements

The following parameters will be needed when sizing and selecting your Condair DL humidification system:

Item #	Required Parameter	Why is this needed?
1	Air volume	Used to calculate air velocity and determine if droplet separator is required. Note: For air velocities up to 2.5 m/s, a droplet separator is not required. For air velocities >2.5 m/s to 4.0 m/s, the additional droplet separator is required. Also required for calculating humidification capacity.
2	Outside air portion in %	Required for calculating the humidification capacity and for determining the temperature or humidity of the mixed air.
3	Air temperature before humidifier	Required for calculating the humidification capacity.
4	Air humidity before humidifier	Required for calculating the humidification capacity.
5	Humidity setpoint after humidifier	Required for calculating the humidification capacity.
6	Right/left side nozzle grid connections	Determines location for wall feed throughs and is responsible for ensuring that the nozzle grids can be produced correctly.
7	Duct internal dimensions (tolerance: ±25 mm	Required for sizing of the humidification unit (nozzle grid and post-evaporation unit). Note: The specified height must already include the pan height. Example: – Ventilation unit interior height 1000 mm – Pan height: 50 mm --> Required height for design: 950 mm
8	Thickness of AHU wall	Required to determine the length of the wall feed throughs (Two choices 75 mm or 125 mm long).
9	Distance between humidification system and desired location of central unit	Required to determine the length of the water hoses between the central unit and the wall feed throughs. Should be less than 10 m and on the same floor.
10	Humidifier section length	600 ... 900 mm of AHU section is required for system feasibility (this is from nozzle grid to post-evaporation unit of the DL)
11	Drain pan depth	Determines the height of the rubber seal between the post-evaporator unit and the bottom of the drain pan.

Item #	Required Parameter	Why is this needed?
12	Internal dimensions "H" and "W" of the AHU/duct	For the precise determination of the humidifier unit dimensions. Note: Dimension "H" is measured from the ceiling to the top edge of the drain pan (drain pan frame), see illustrations below.



5 Installation Requirements

5.1 AHU/Duct Requirements

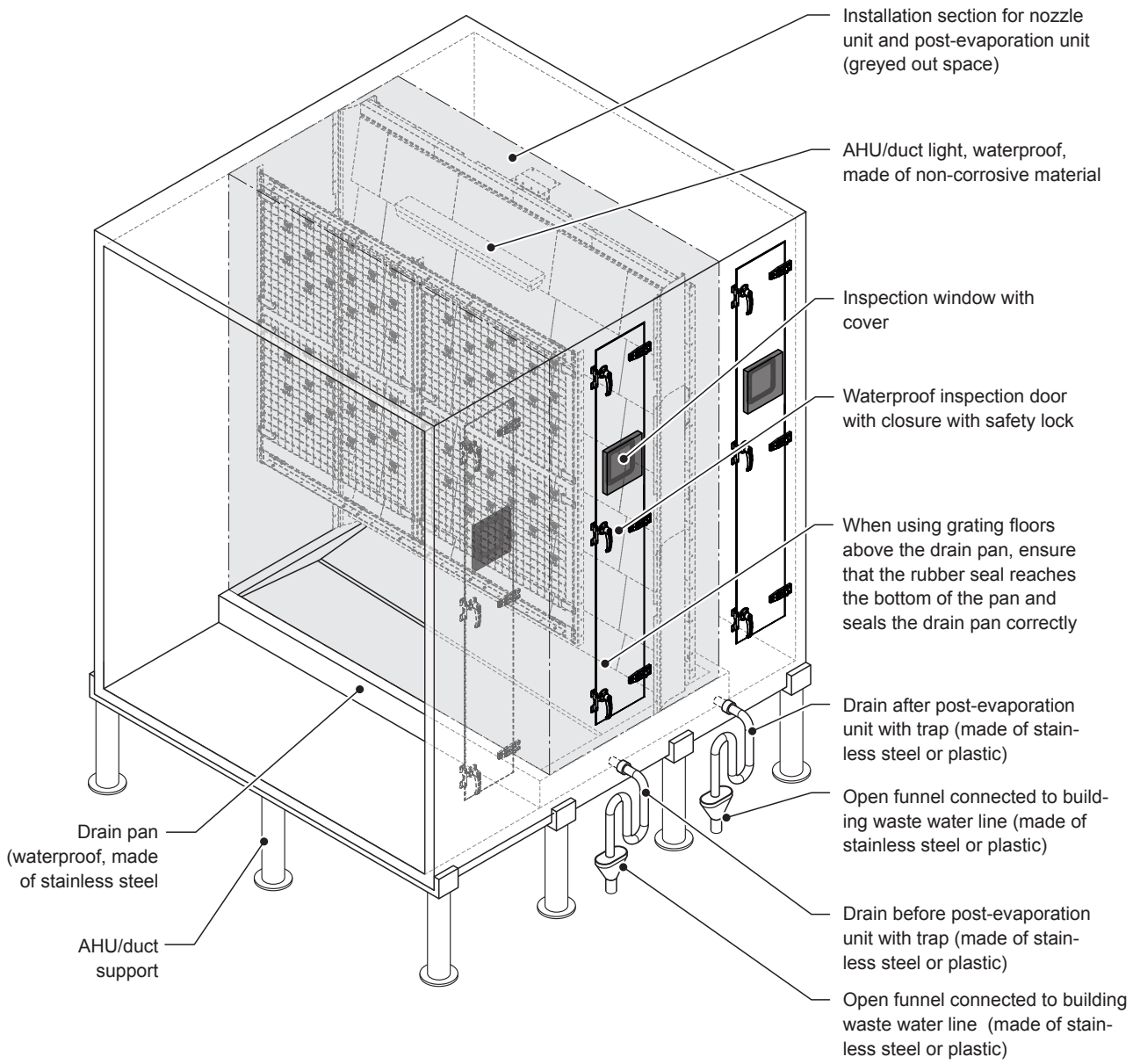
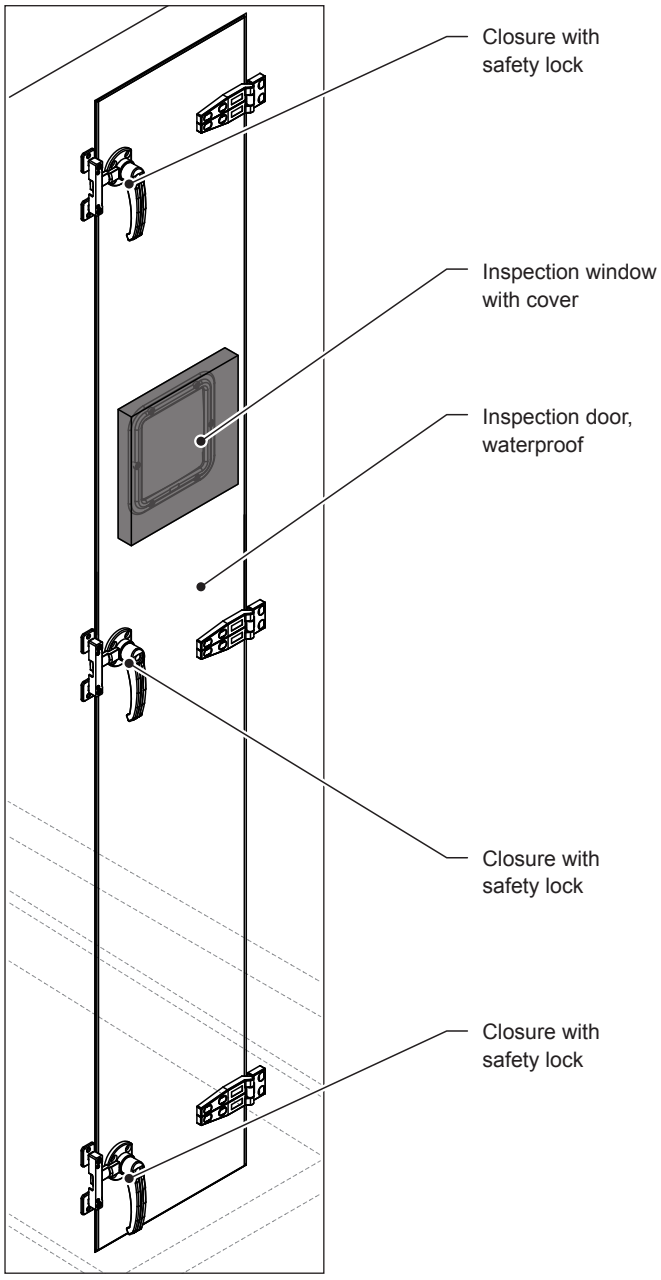


Fig. 7: Example AHU/Duct Section for the Installation of the Condair DL Humidification Unit

Item #	Item Name	Description
1	Drain Pan	The Condair DL must be installed in a section of AHU/duct containing a waterproof stainless steel drain pan. The drain pan must slope a min 2° to the drain. Drains before and after the post-evaporation unit are required. Each drain must be individually piped to the wastewater system via a siphon (made of stainless steel or plastic). For hygienic reasons connect the drainpipes with an open outlet to the wastewater system of the building. Larger units require a leg support in the midsection that must be mounted to the ceiling and on solid ground with no slope. A stable, flat surface is therefore required to support the leg support. The drain pan must be designed to ensure the support surface (e.g., with a reinforced cross member).
2	AHU Section/ Waterproofing	AHU section must be waterproof. All components close to the humidification units or contacting any reverse osmosis water must be corrosion resistant stainless steel or plastic. Duct walls and ceiling must be free of any debris or mounted material. Space between nozzle grid and post-evaporation unit must be clear of obstructions.
3	Load Bearing	Load bearing capacity of the AHU must be ensured. Exact weight will vary per system and can be found in the data sheet. Larger units using mounting legs must be mounted with reinforcement traverses where leg supports are mounted. Note: The post evaporator unit weighs approx. 55 kg/m^2 when wet.
4	Air Flow	In order to avoid drops seeping over the ceramic plates, an uniform air flow over the full cross section of the post-evaporation unit must be guaranteed. AHU equipment mounted upstream or downstream can impair the humidifier's function, causing backflow, or causing air turbulence. These include: – Silencers – Cross beams – Directional changes and branches – Bends – Cross-sectional changes – Air coolers – Heating coils – Air filters If necessary, rectifiers or perforated plates must be installed on the building side before the humidifier. A typical guideline for perforated plates is 60% open and 40% closed

Item #	Item Name	Description
5	Air Filter	Air filter of "ISO ePM1 60%" or better required at the air inlet of the humidification unit.
6	Heating	Unlike steam humidifiers, adiabatic humidifiers cool the air. Therefore, a preheating coil with sufficient heating capacity must be installed in the AHU to achieve the humidity and temperature setpoints. If the system is equipped with a heater, make sure it is at least 500 mm away from the humidification unit.
7	Insulation	Duct insulation when ambient temperature may become low.
8	AHU/Duct Light	Waterproof AHU/duct light mounted between nozzle unit and post-evaporation unit. The AHU/duct light mount should be of non-corrosive material since it will get exposed to reverse osmosis water.
9	AHU/Duct Support	AHU/duct should be mounted elevated on supports in order that the spray circuit lines can be mounted with constant downslope to the connections of the central unit.

Item #	Item Name	Description
10	Inspection door	Sufficiently large waterproof inspection door with coverable inspection window must be available in the AHU/duct for installation, control and maintenance purposes. An inspection door directly before the nozzle grid or an inspection door between the nozzle grid and the post-evaporation unit must be provided in the AHU/duct. For easier installation and maintenance purposes, we recommend an additional inspection door in the AHU/duct after the post-evaporation unit. Inspection doors should have a minimum width of 400 mm and a minimum height of 750 mm. Exception: For AHU/duct with a height less than 762 mm, the inspection door height must be +25 mm higher than the nozzle grid height.  *Fig. 8: Construction of the inspection door*

5.2 Requirements for Positioning of the Central and Control Units

Item #	Item Name	Description
1	Floor Drain	The central unit may only be installed in rooms with a floor drain. Ensure that sensitive materials are kept clear of the central unit to prevent damage in case of a water leak. If the central unit must be installed in a location without floor drain, it is mandatory to provide a leak monitoring device to safely interrupt the water supply in case of a leak.
2	Ambient Conditions	The room in which the control unit and the central unit are mounted must meet the following ambient conditions: Ambient temperature: 5 ... 40 °C Ambient humidity: max. 80 %rh, not condensing
3	Location	All DL equipment (central unit, control unit, nozzle system and post-evaporation unit) should only be installed in a properly conditioned indoor space. The DL humidification system, including all pipes and water hoses, must not be used outdoors. The summer heat would warm any residual water in the pipes, significantly increasing the risk of bacterial growth. Avoid installation where there is chance of unit freezing, this can cause damage to the system. Heat treating of water lines going to the Condair DL is not permitted for hygiene reasons. The length of the spray circuit lines between central unit and wall feed throughs of the duct are as short as possible (max. 10 m). The central unit and the control unit must be placed in a location freely accessible for maintenance purposes (minimum clearances showed in *Fig. 4* must be adhered to). The central unit and the control unit are protected according to IP21. Make sure that these components are only installed in a location protected from dripping water and dust. The central unit and the control unit should be installed directly next to the duct/ AHU where the wall feed throughs are located. See *Section 6.6* for common positioning mistake examples.

6 Appendix

6.1 Appendix A – Correct AHU/Duct Layout

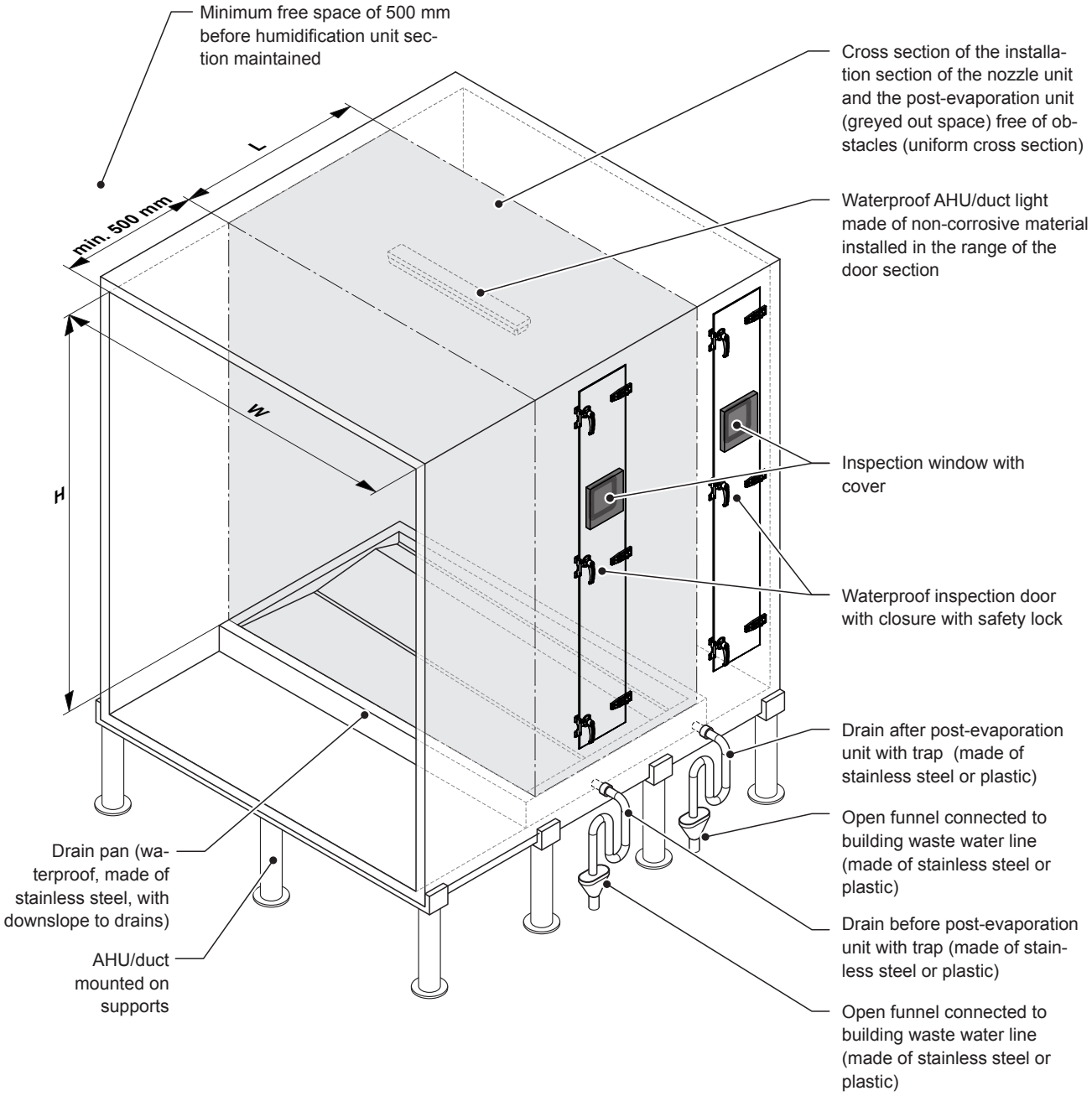


Fig. 9: Example Layout AHU/Duct Section for DL Humidification Unit

6.2 Appendix B – Layout Faults of AHU/Duct Section for Condair DL Humidification Units

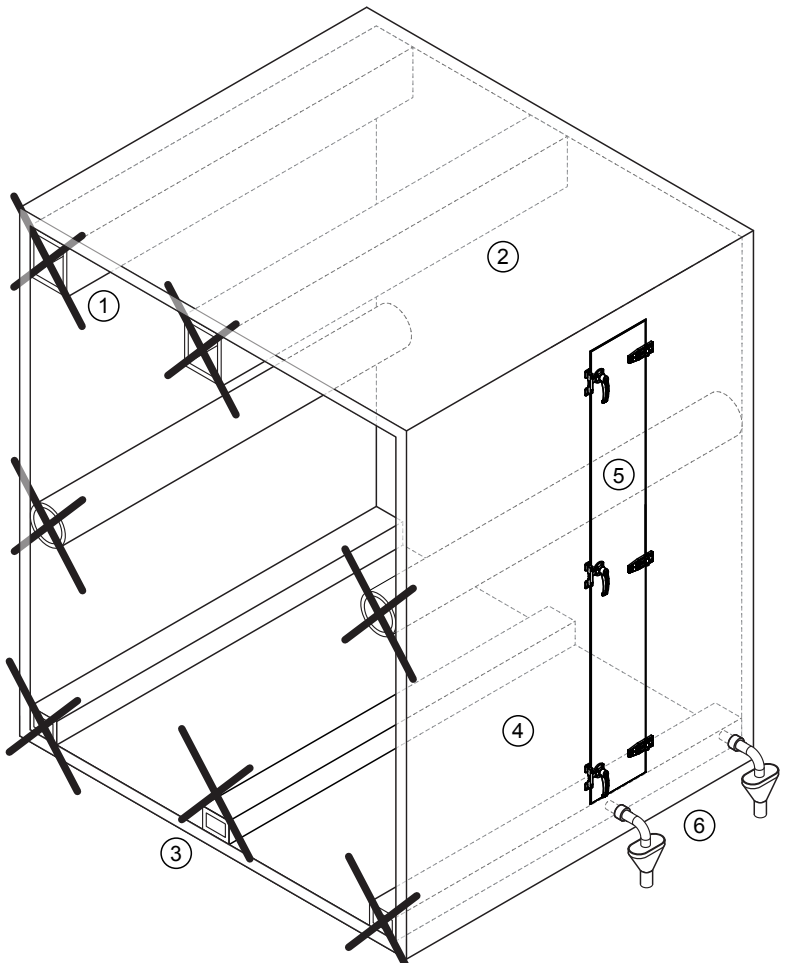


Fig. 10: Layout Faults of AHU/Duct Section for Condair DL Humidification Units

1	Obstacles in the cross section of the installation sections of the humidification unit. Nozzle unit and the post-evaporation unit cannot be mounted.
2	Missing AHU/duct light.
3	AHU/duct not mounted on supports. Layout of the spray circuit lines with constant downslope to central unit not possible.
4	Missing drain pan.
5	Inspection window with cover missing in inspection door.
6	Drains of drain pan are not equipped with a traps. During operation, air flows into or out of the AHU via the drain lines, depending on whether the fan is arranged on the pressure or suction side.

6.3 Appendix C – Images of Layout Faults of AHU/Duct

Non-permissible constrictions of the AHU/duct before and after the Condair DL humidification units

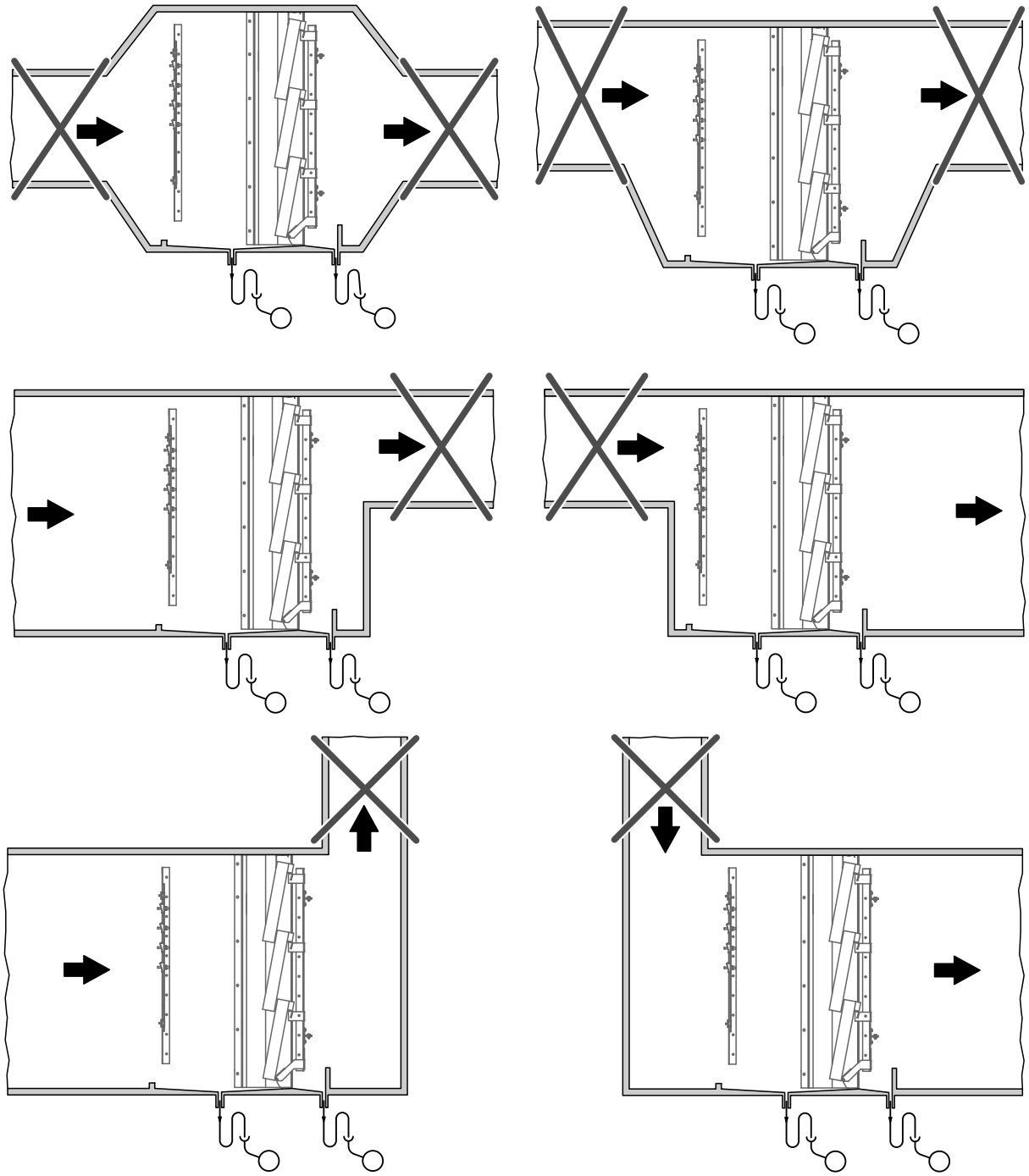


Fig. 11: Non-permissible constrictions of the AHU/duct before and after the Condair DL humidification units (side views)

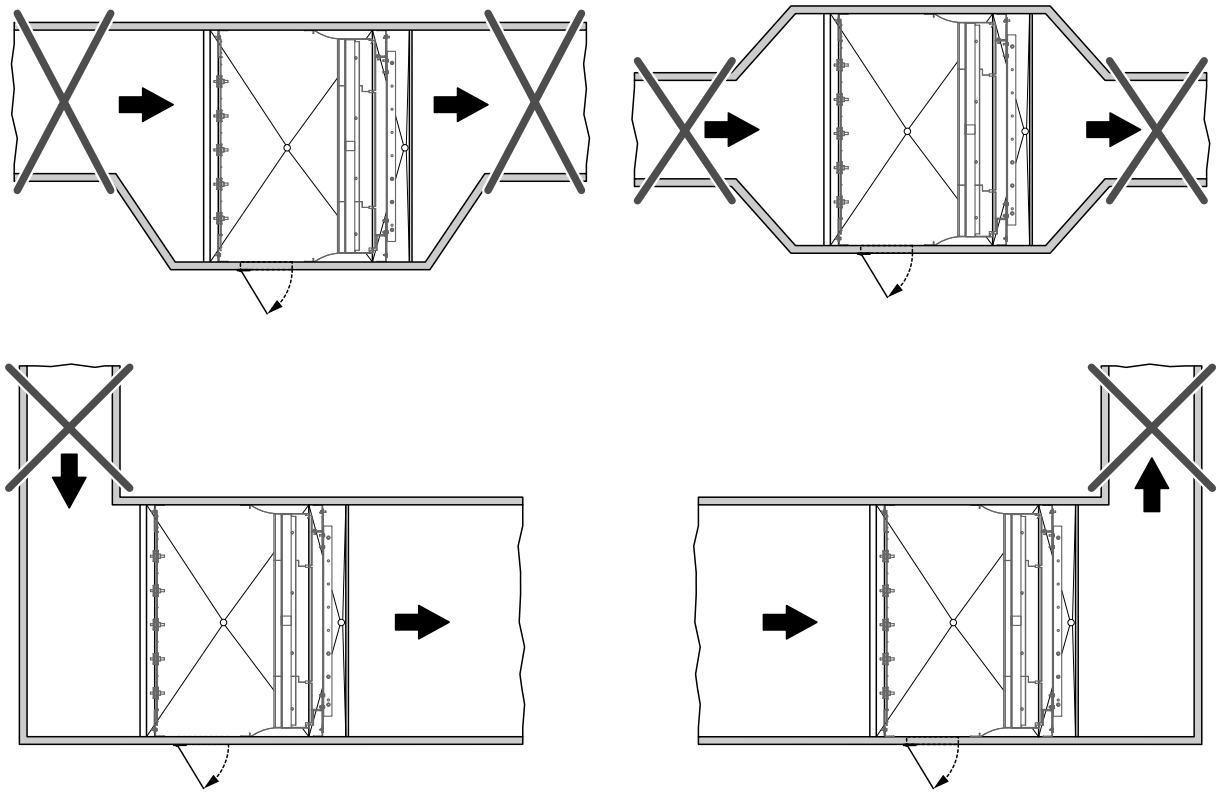


Fig. 12: Non-permissible constrictions of the AHU/duct before and after the Condair DL humidification units (top views)

Non-permissible installation of the Condair DL humidification unit in vertical AHU/ducts

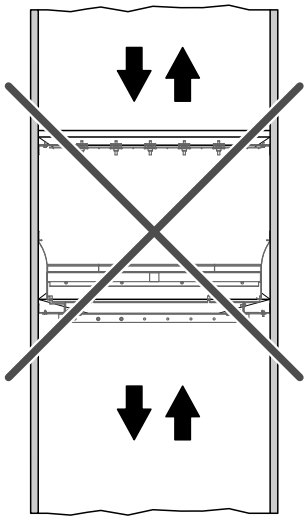


Fig. 13: Non-permissible installation of the Condair DL humidification unit in vertical AHU/ducts

6.4 Appendix D – Wrong Nozzle Grid Connection Side

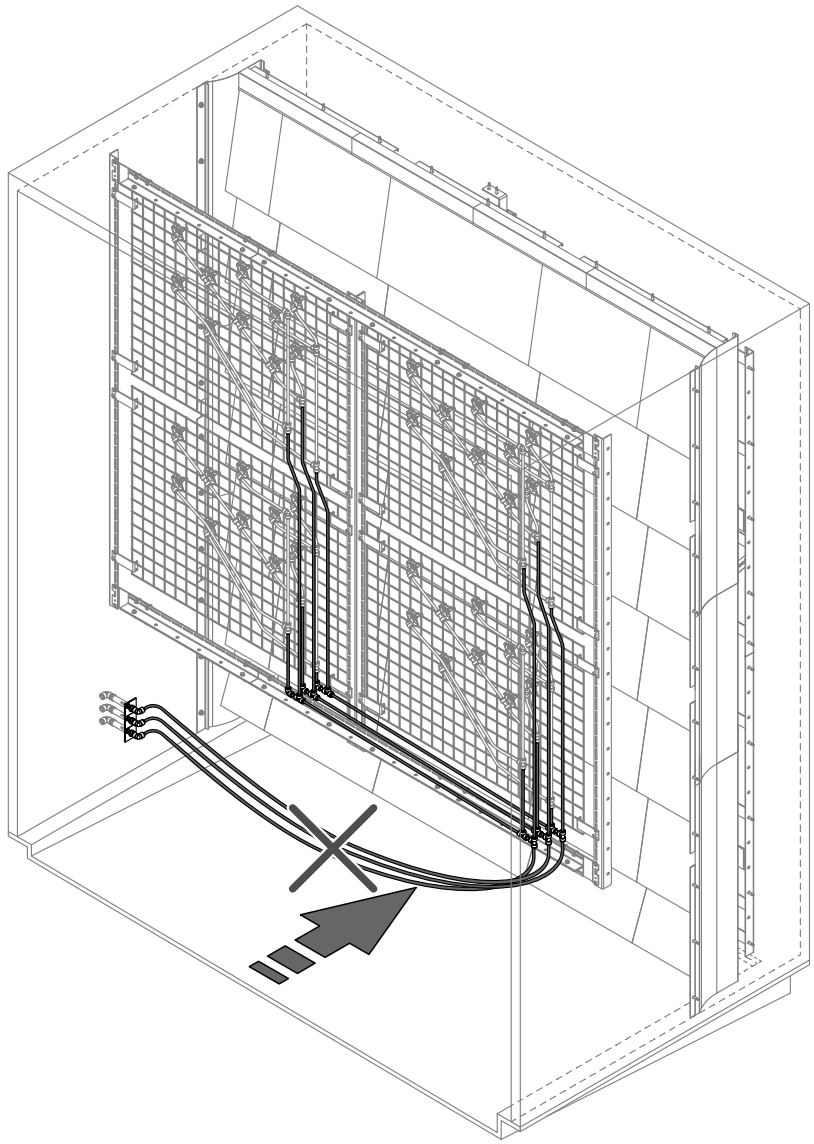


Fig. 14: Wrong nozzle grid connection side

Note: If wrong nozzle grid connection side is selected the spray lines may not be guided to the wall feed throughs with constant downslope. The spray lines may sag and may not be drained by gravity. Standing water remains in the spray lines.

Remedy: Order pre-assembled new nozzle grids with the correct connection side.

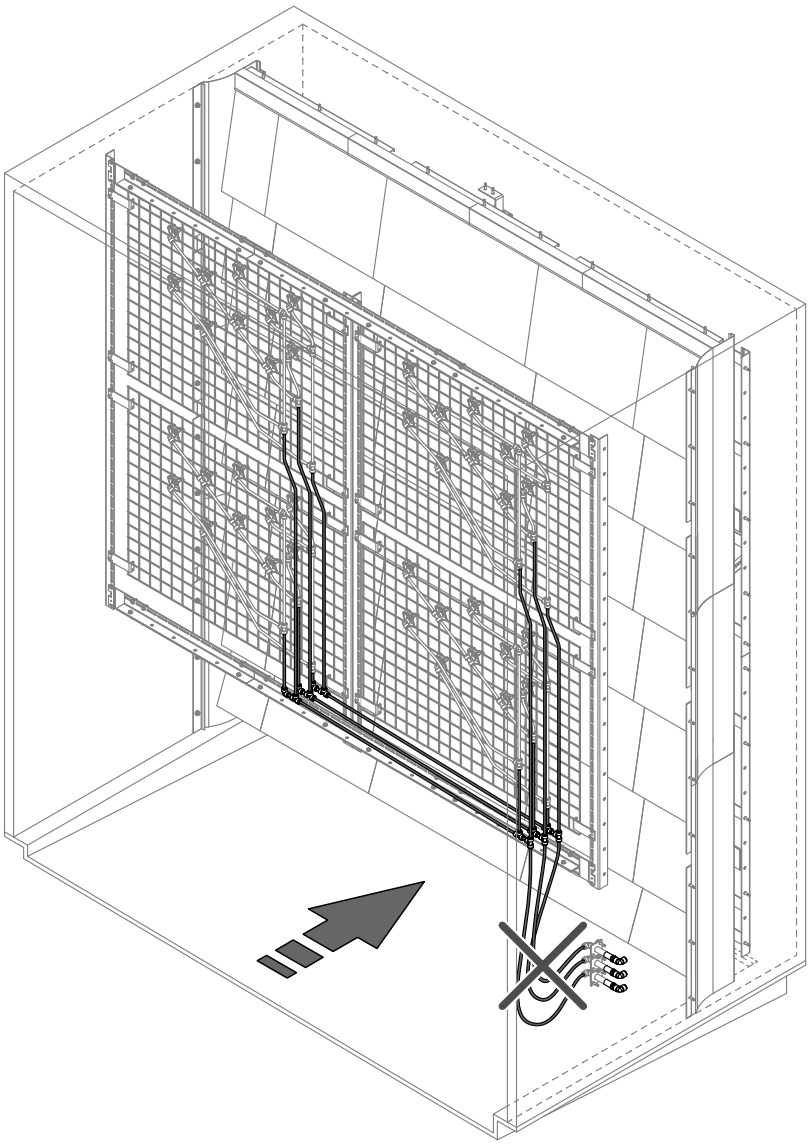


Fig. 15: Spray circuit lines from nozzle grid connections to wall feed troughs are sagging

Problem: Spray circuit lines between nozzle grid connections and wall feed throughs are sagging. Spray circuit lines cannot completely drained by gravity. Standing water remains in the spray circuit lines.

Remedy: Install spray circuit lines between nozzle grid connections and wall feed throughs constant downslope.

6.5 Appendix E – Images of Proper Installations

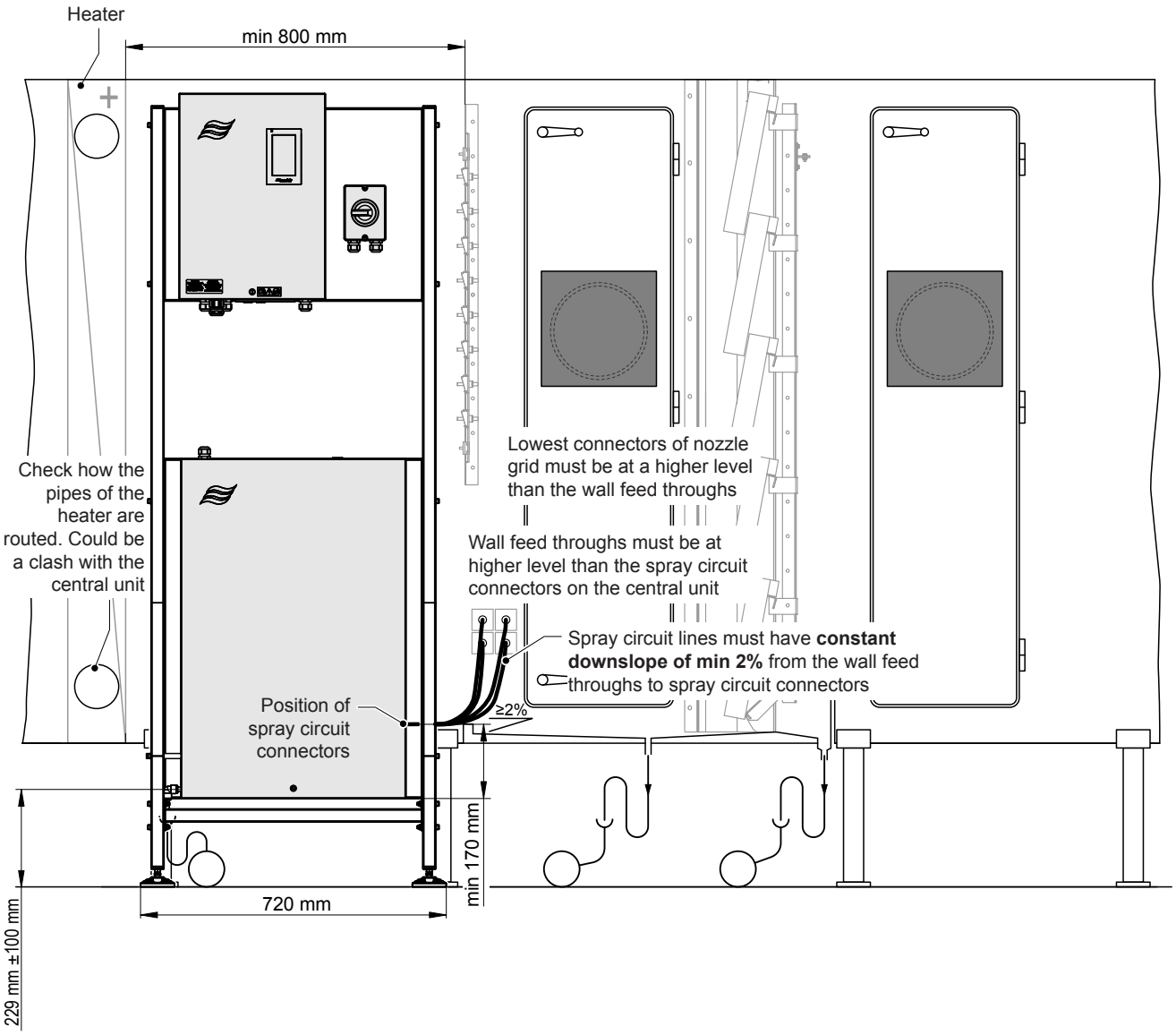


Fig. 16: Example 1: Positioning the mounting rack before the nozzle grid

WARNNG!
Risk of injury

The optional mounting rack must mandatory be fixed to the floor!

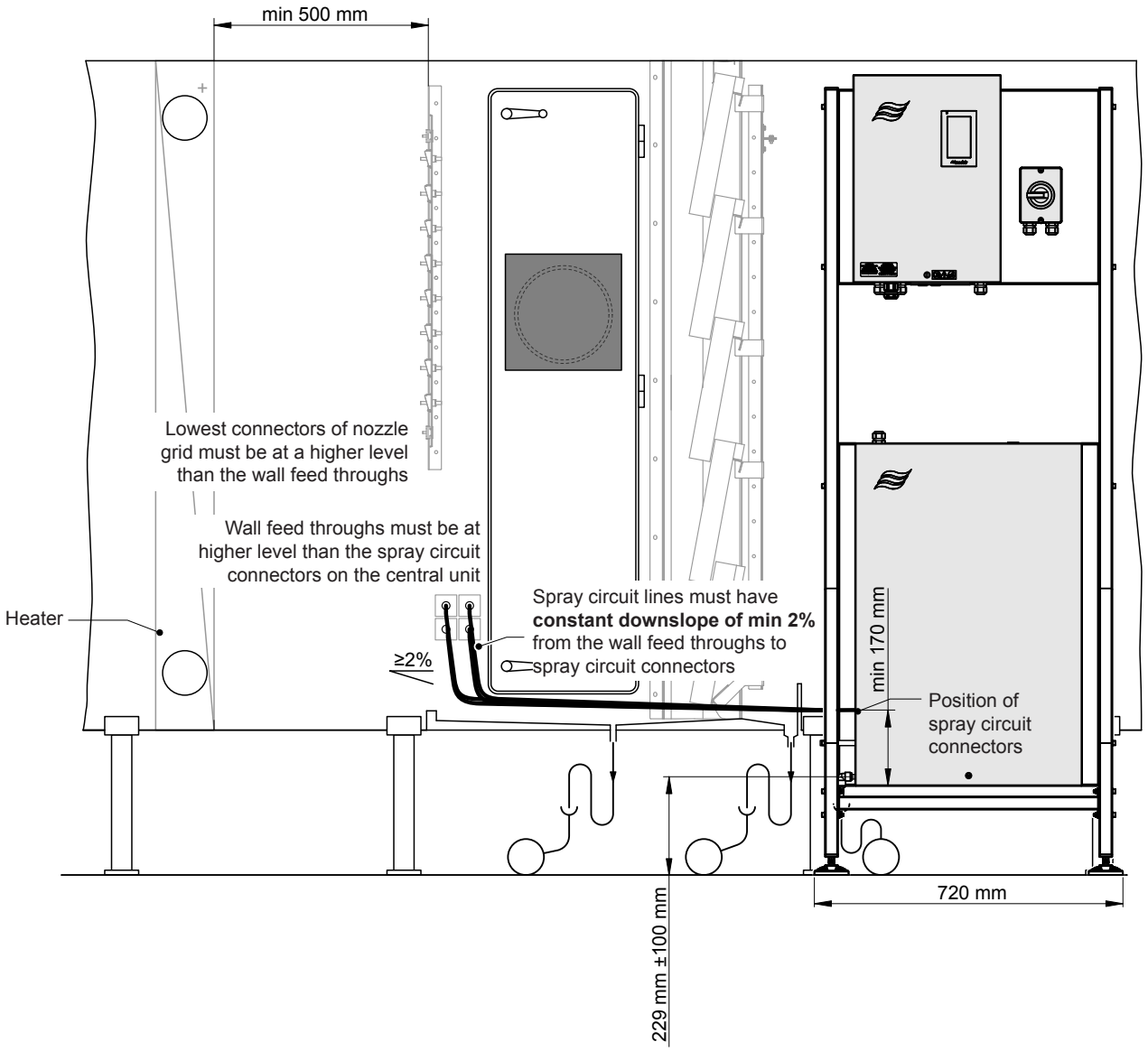
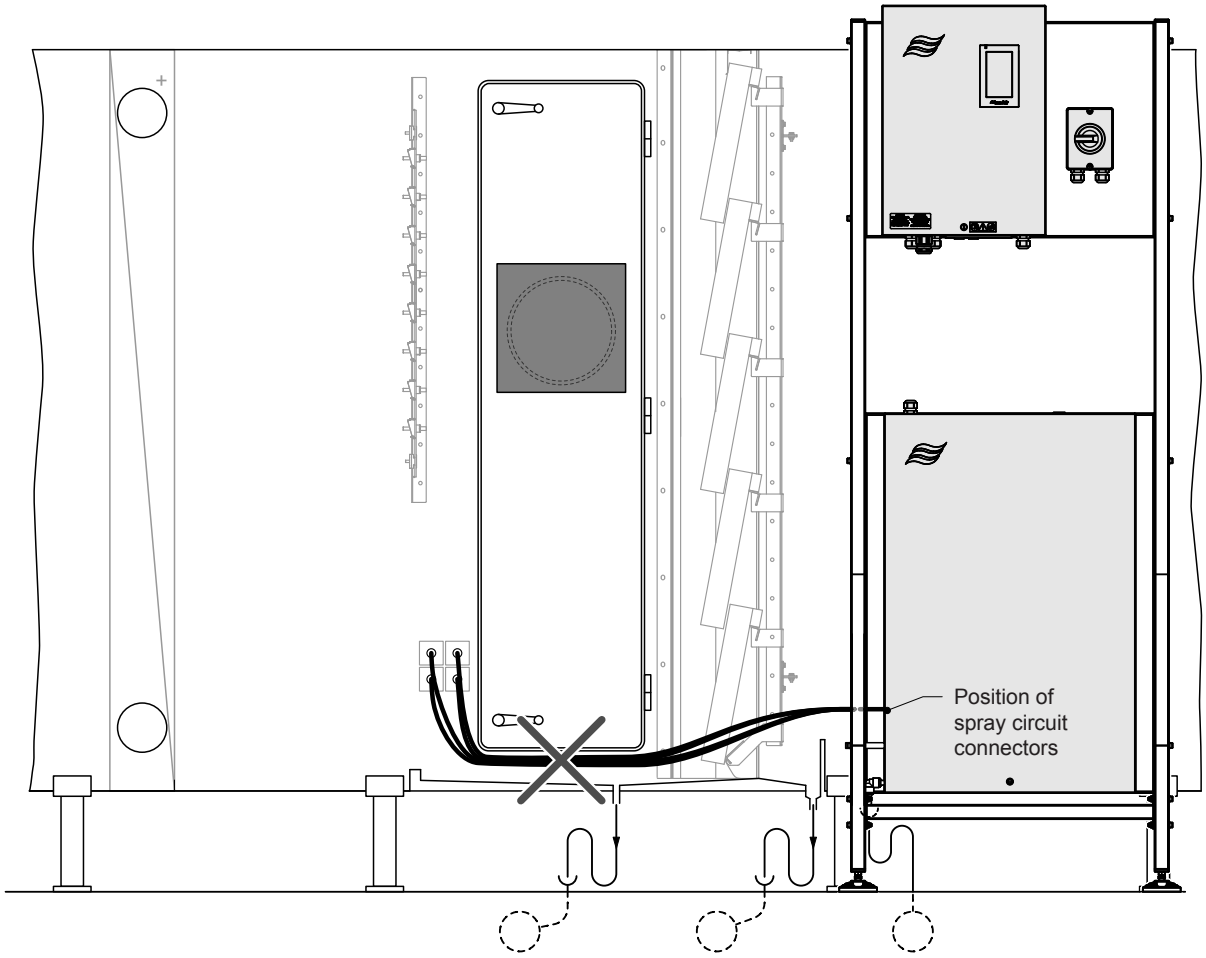


Fig. 17: Example 2: Positioning the mounting rack after the post evaporation unit

WARNING!
Risk of injury

The optional mounting rack must mandatory be fixed to the floor.

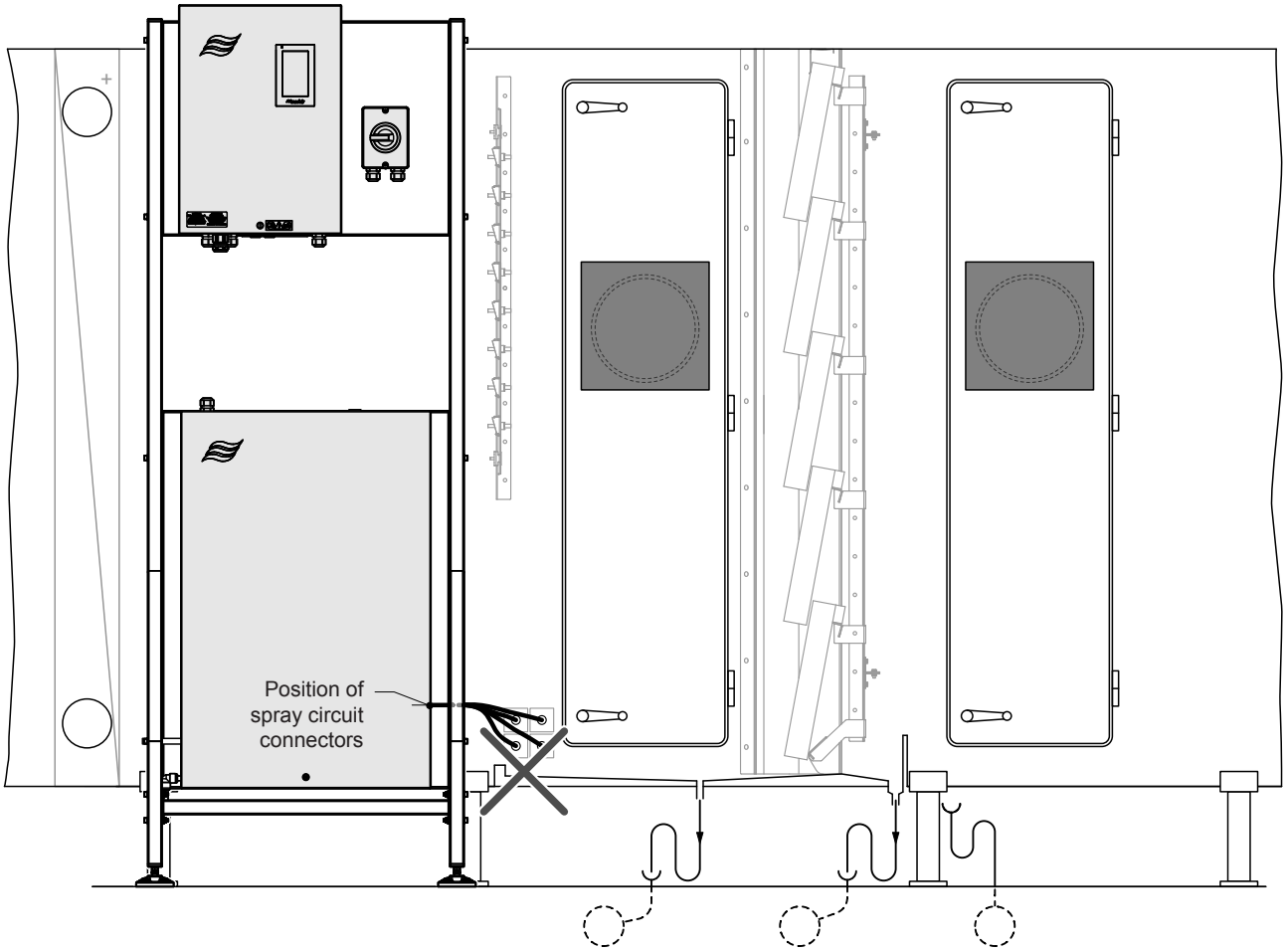
6.6 Appendix F – Common Positioning Mistakes



Problem: The spray circuit lines sag under the door. Spray circuit lines are not completely drained by gravity. Standing water remains in the spray circuit lines.

Remedy: Mount the central unit lower so that the spray circuit connections are below the lowest point of the spray line routing to create a constant downslope. Or, mount an inspection door that extends less downwards so that the hoses could be routed under the door.
Important: The drain pipe of the central unit must still have a constant downslope to the drain funnel after the modification.

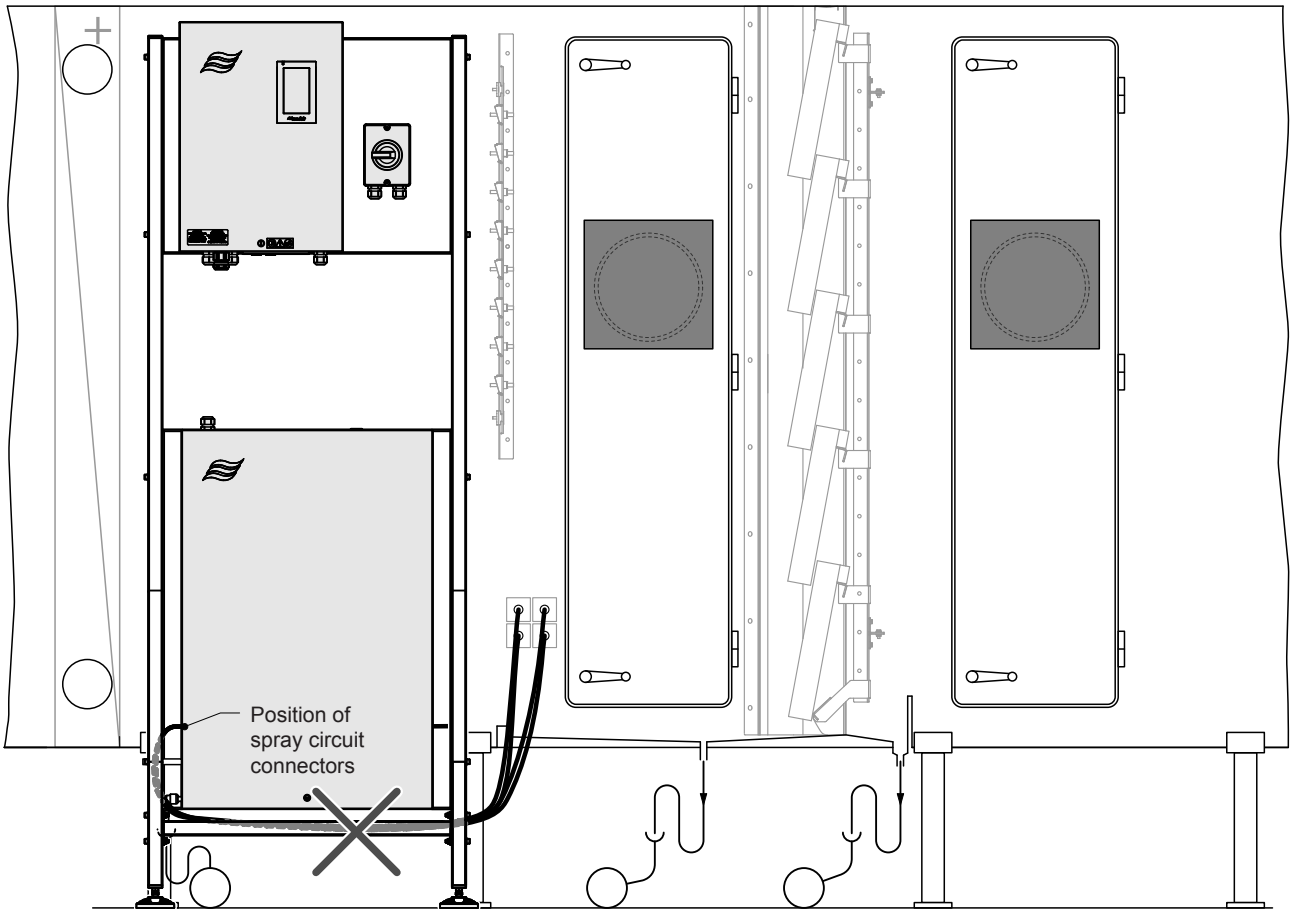
Fig. 18: Position Fault - Example 1



Problem: The spray circuit connections of central unit are above wall feed throughs. Spray lines are not completely drained by gravity. Standing water remains in the spray lines.

Remedy: Position wall feed throughs further up (but still below lowest connector of nozzle grid) or position the central unit further down to create a gradient (according *Fig. 16*).
Important: The drain pipe of the central unit must still have a constant downslope to the drain funnel after the modification.

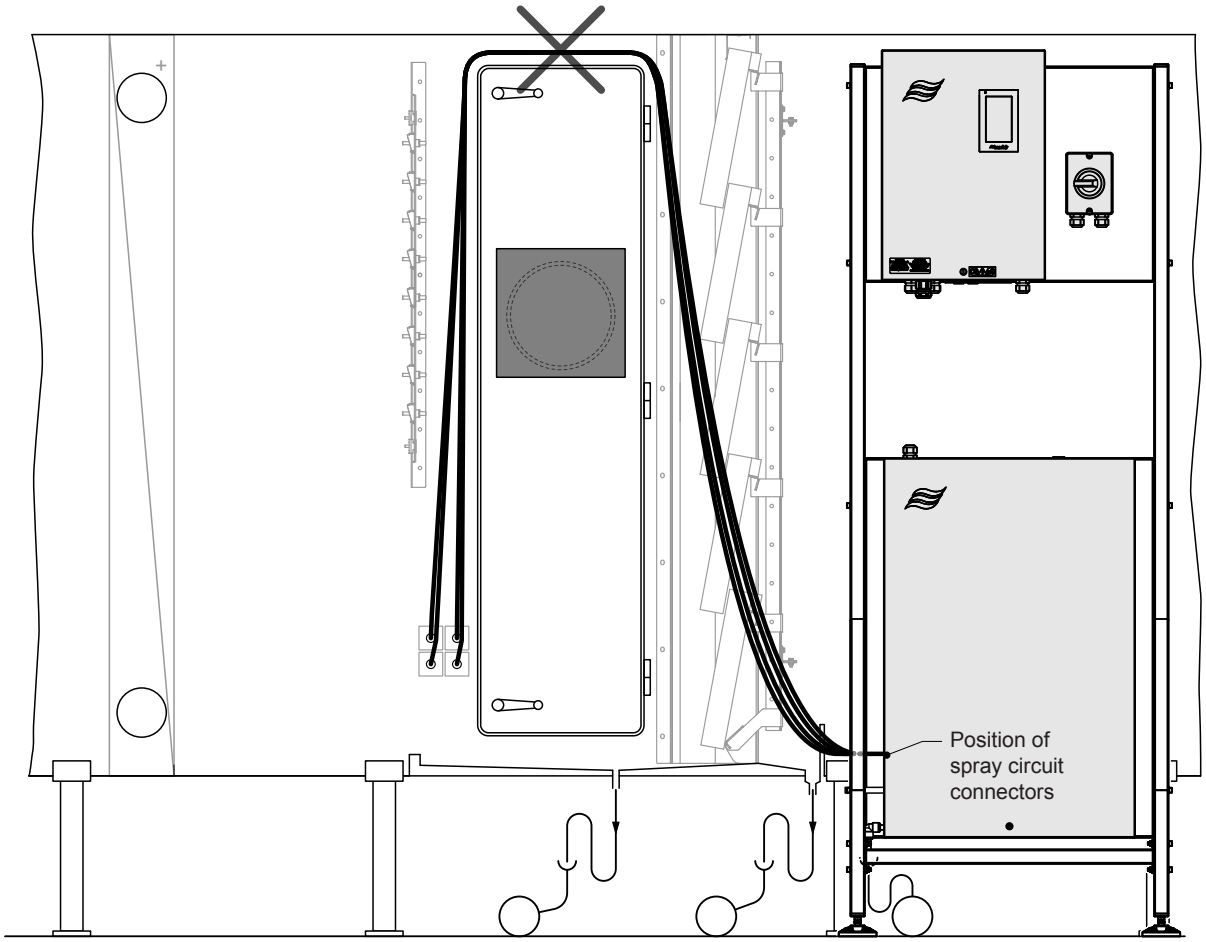
Fig. 19: Mounting Rack Position Fault - Example 2



Problem: The spray circuit lines are connected on the "wrong" side of the central unit. Spray lines are not completely drained by gravity due to the hose layout (curvature). Standing water remains in the spray lines.

Remedy: Modify central unit from spray circuit connection side left to the spray circuit connection side right (according *Fig. 16* to *Fig. 17*). Modification is described in the Condair DL installation manual.

Fig. 20: Mounting Rack Position Fault - Example 3



Problem: The spray circuit lines are routed upwards. This leads to a water column and pressure loss, as well as standing water in the spray circuit lines.

Remedy: Route the spray circuit lines according *Fig. 17*.

Fig. 21: Mounting Rack Position Fault - Example 4

Note: If correct routing of the spray circuit lines according *Fig. 16* to *Fig. 17* is not possible the optional "External valve block" may be the solution. Please contact your Condair representative in this behalf.

6.7 Appendix G – Checklist Commissioning

Checklist Commissioning

Adiabatic humidifier Condair DL _____

Customer		*Humidification capacity [kg/hr]*	
Location		*Air volume [m³/hr]*	
Project		*AHU manufacturer*	
Serial number		*Material AHU*	
DL Code	DL	*Length of humidifier section [mm]*	
Software version		*Date*	

General	**yes / ok**	**no / failure**
Slope to center drain		
Inspection window with cover present		
Lighting inside the AHU section		
Prefilter installed Quality ___		
Inspection door present		
Inspection door before the DL		
Inspection door after the DL		
Humidifier section isolated		
AHU waterproof, no leakage		
Floor drain or leak sensor present		

	yes / ok	**no / failure**
Spray circuit hoses correct mounted		
Drain hose correct installed		
Flushing water from central unit visible		
Drain inside the AHU section		
All hoses tight		
Nozzle connections tight		
Ceramic plates undamaged		
Humidifier section disinfected		
Spray angle of nozzles		
Flush water from central unit visible		

Electric installation / Test electric components		
Wiring correct		
Electrical isolator present		
Cable connections retighten		
2x PE (protective conductor) connected		
Pump existing		
Rotation direction of the pump checked		
Snap ferrite mounted		
Frequency converter tested		
Steps switching tested		
Flushing and spray valves tested		
Pressure sensor PS4 and PS5 tested		
Flushing function tested		

Control functions		
Control signal connected		
Safety loop connected on X1		
Remote error relay connected		

Options		
Leakage monitoring tested		
External pipe flush tested		
Air cleaning tested		

Data / Values

External controller	
Number of steps	
Humidifier connected to the network	
Capacity limitation activated	
Inlet pressure PS4 [bar]	
Nozzle pressure PS5 [bar]	
Conductivity [µS/cm]	
Water Temperature [°C]	
Remaining capacity Ag+ [Ah]	
Type silver cartridge (Hygiene Plus)	
Ag+ current at 100 % demand	

Capacities of spray circuits [kg/hr] 1 (Y5): ____ 2 (Y6): ____
3 (Y7): ____ 4 (Y8): ____
5 (Y9): ____

Demand signal range [VDC] [mA] _____

Remarks

Signature customer

_____

Signature of commissioning technician

_____

6.8 Appendix H – Operating Ranges

	Operating Range	
	DL Type A (with booster pump)	**DL Type B (without booster pump)**
Hydraulic		
Humidification capacity	5 ... 1000 l/hr [1)]	
Nozzle pressure	3 ... 7 bar	
Nozzle sizes	8 (1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5 and 5.0 l/hr at 4 bar	
Flushing water consumption	Nozzle capacity <210 kg/hr: 2.2 - 2.5 l/min at 4 bar Nozzle capacity >210 kg/hr: 3.7 - 4.0 l/min at 4 bar	
Electric		
Supply voltage/current control unit	200...240 VAC / 50...60 Hz, max. 6.5 Amps	100...240 VAC / 50...60 Hz, max. 0.5 Amps
Power consumption control unit (including solenoid valves)	55 ... 65 VA (dependent on the number of switched valves and whether the display is in sleep mode or not)	
Power consumption booster pump	approx. 12 VA per 10 kg/hr spray capacity	——
Voltage solenoid valves (Y1-Y10)	24 V DC	
Frequency converter	Yes	No
Control signals	0-5 VDC, 1-5VDC, 0-10 VDC, 2-10 VDC, 0-16 VDC, 3.2-16 VDC, 0-20 VDC, 4-20 VDC, 0-20 mA, 4-20 mA	
Control accuracy [2)]	7-steps: ±3 %rh and 15-steps: ±2 %rh	7-steps: ±4 %rh and 15-steps: ±3 %rh
Sound		
Sound level	approx. 51 dB(A)	approx. 41 dB(A)
Air		
Air velocity	0.5 - 2.5 m/s (without droplet separator), >2.5 - 4.0 m/s (with droplet separator) Uniform air flow over the full cross section is required	
Max. admissible air temperature	60°C (before humidification unit)	
Water		
Connector water supply	ø12 mm plug-in coupling or 1/2" male thread adapter (supplied)	
Connector water drain	ø10 mm) plug-in coupling or 1/2" male thread adapter (supplied)	
Admissible water supply pressure	working pressure 3 ... 7 bar	working pressure 3 ... 7 bar
Admissible water temperature	5 ... 20 °C	
Water quality requirements	fully demineralized water from reverse osmosis system with 0.5...15 µS/cm (without any additives), max. 100 cfu/ml	
Operating monitoring RO water	min. pressure, max. pressure, pressure after sterile filter, conductivity	

	Operating Range	
	DL Type A (with booster pump)	**DL Type B (without booster pump)**
Ambient conditions operation		
Admissible ambient temperature	5 ... 40 °C	
Admissible ambient humidity	10 ... 80 %rh, non-condensing	

[1)] Larger capacities on demand (consider possible number of steps for capacity range!) Note: For systems "Type A" (with booster pump), the minimum output of 5 kg/hr can only be regulated at a flow pressure <4.0 bar. With a flow pressure of ≥4.0 bar, we recommend a minimum output of 10 kg/hr for "Type A" systems.

[2)] The nominal control accuracy may not always be available, because various factors (temperature control, water recycling, flap valve systems, etc.) may affect the accuracy

Notes

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