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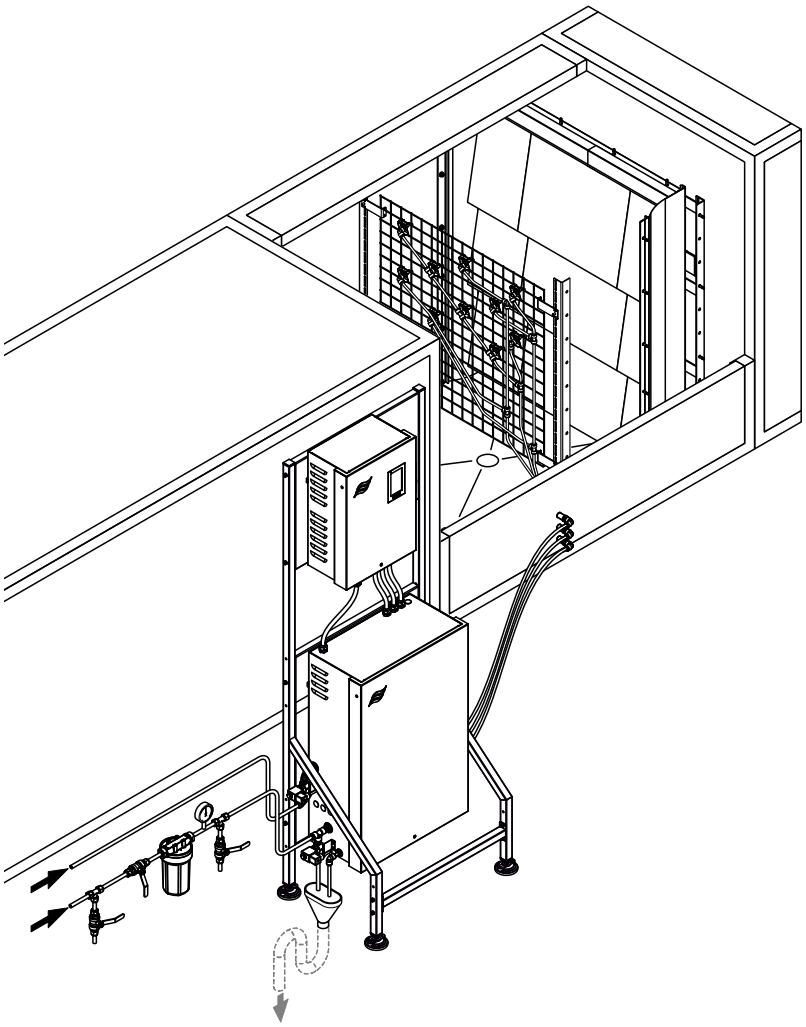
DL SERIES



PLANNING MANUAL

Adiabatic air humidification system
Condair **DL II**

Humidification, Dehumidification
and Evaporative Cooling

condair

Thank you for choosing Condair

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 DL Series Introduction

The DL Series hybrid humidifier is based exclusively on the advantages of the two humidification principles of atomization and evaporation. The humidifying water is atomized by stainless steel atomizing nozzles at low pressure. The atomizing nozzles have an adjustable spray output and 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 thus allow the most effective utilization of the high-grade humidifying water. At the same time, they prevent water accumulation in downstream components. Behind the Condair DL humidifier, there is aerosol-free and hygienically humidified breathable 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

– **Type B**: without booster pump (this is used when the reverse osmosis system can provide adequate 43-101 psi (3-7 bar) pressure to the Condair DL depending on the nozzles, this is configured when ordering a Type B DL. For questions, please contact na.applications@condair.com)

NOTE: Type A should be used unless ordered with the Condair RODL. The booster pump ensures efficient performance of the low-pressure nozzles, helps to overcome static pressure in the duct, and helps with modulation in larger DL units.

	Condair DL	
	Type A (with booster pump)	**Type B (without booster pump)**
AHU/duct inside width	18" ... 330" (450 ... 8400 mm)	
AHU/duct inside height	18" ... 157" (450 ... 4000 mm)	
Humidification capacity	11 - 2,204 lb/hr (5-1000 l/hr)	11 - 2,204 lb/hr (5-1000 l/hr)

Both base models can be extended with different options in their functionality. Furthermore, there are different accessories available. See table in *Section 3.6*.

2.3 DL System Components

The Condair DL System is made up of **3 main components** shown in *Fig. 1*:

– Control unit (1) and Central unit (2)

– Nozzle System (3)

– Post Evaporative Unit with Ceramic Media (4)

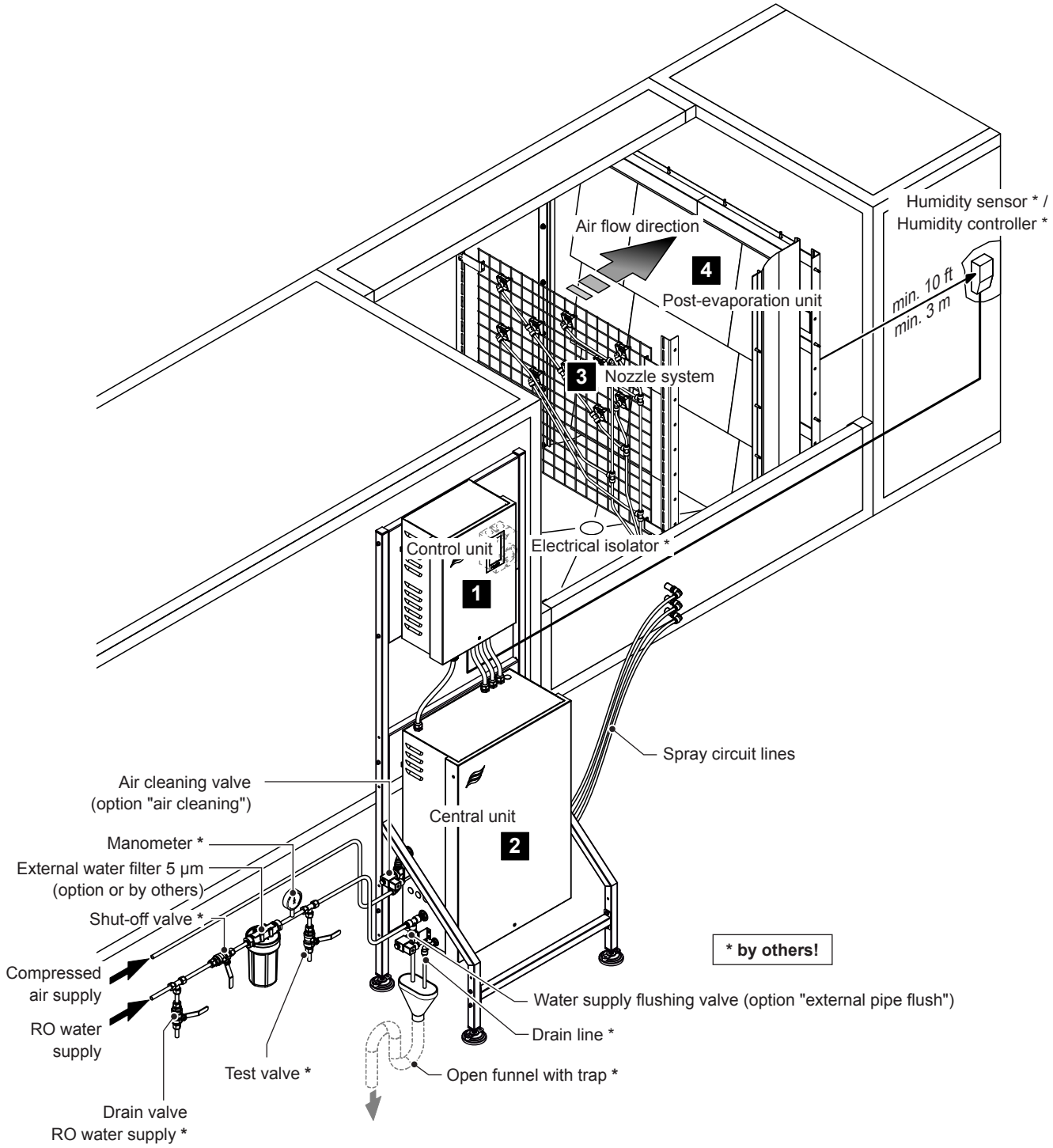
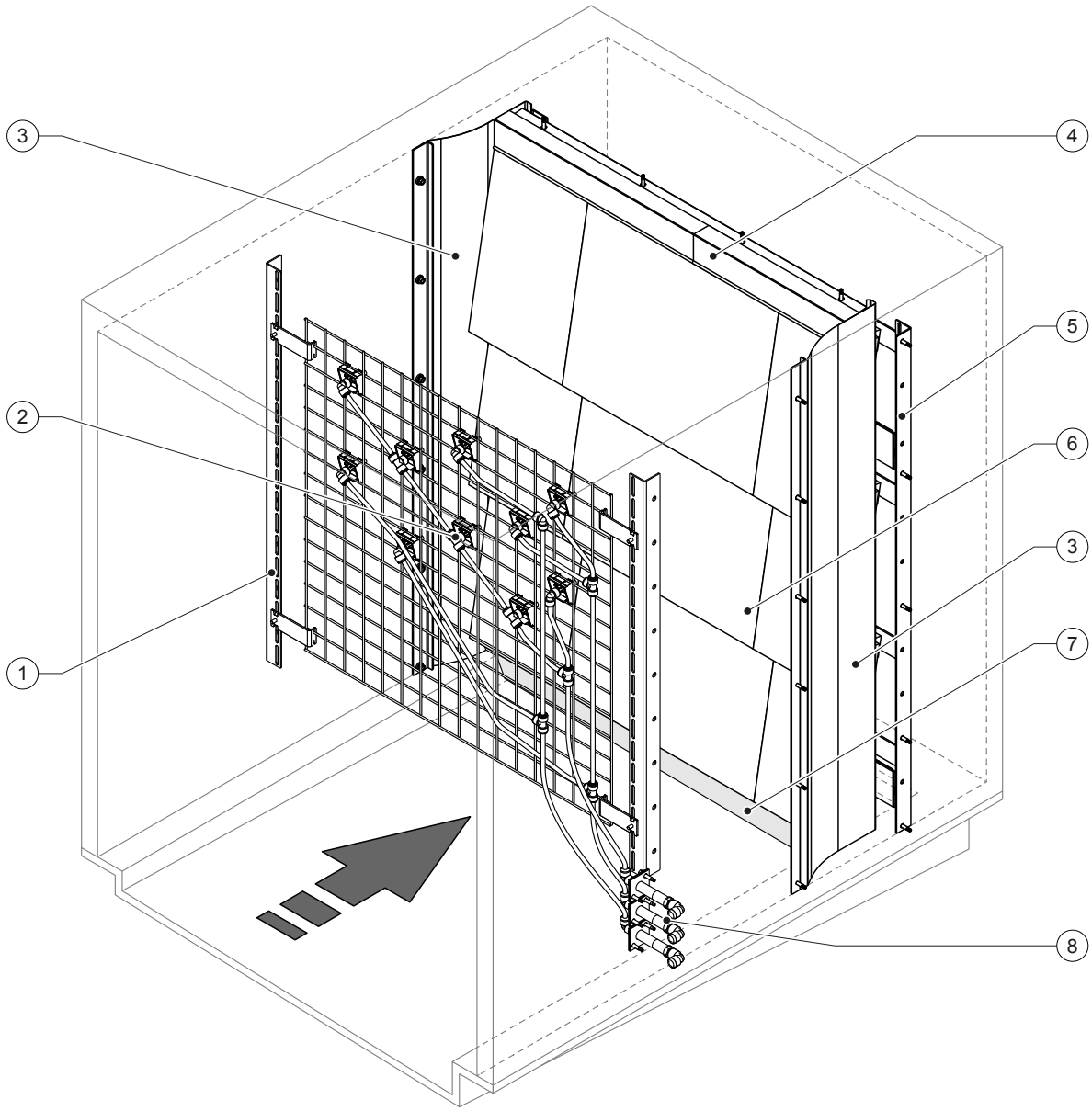


Fig. 1: DL System Components

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 operation manual 2603655:
https://www.condair.com/humidifier-humidifiers/dl-series-adiabatic-evaporative-humidifier

3 DL Unit Properties and Clearances

3.1 Dimensions

Dimensions AHU/duct (Min-Max)	
Installation length "L"	23" - 36" (600 - 900 mm) [1)]
Width "W"	18" - 330" (450 - 8400 mm)
Height "H"	18" - 157" (450 - 4000 mm)

[1)] Larger installation length available as special

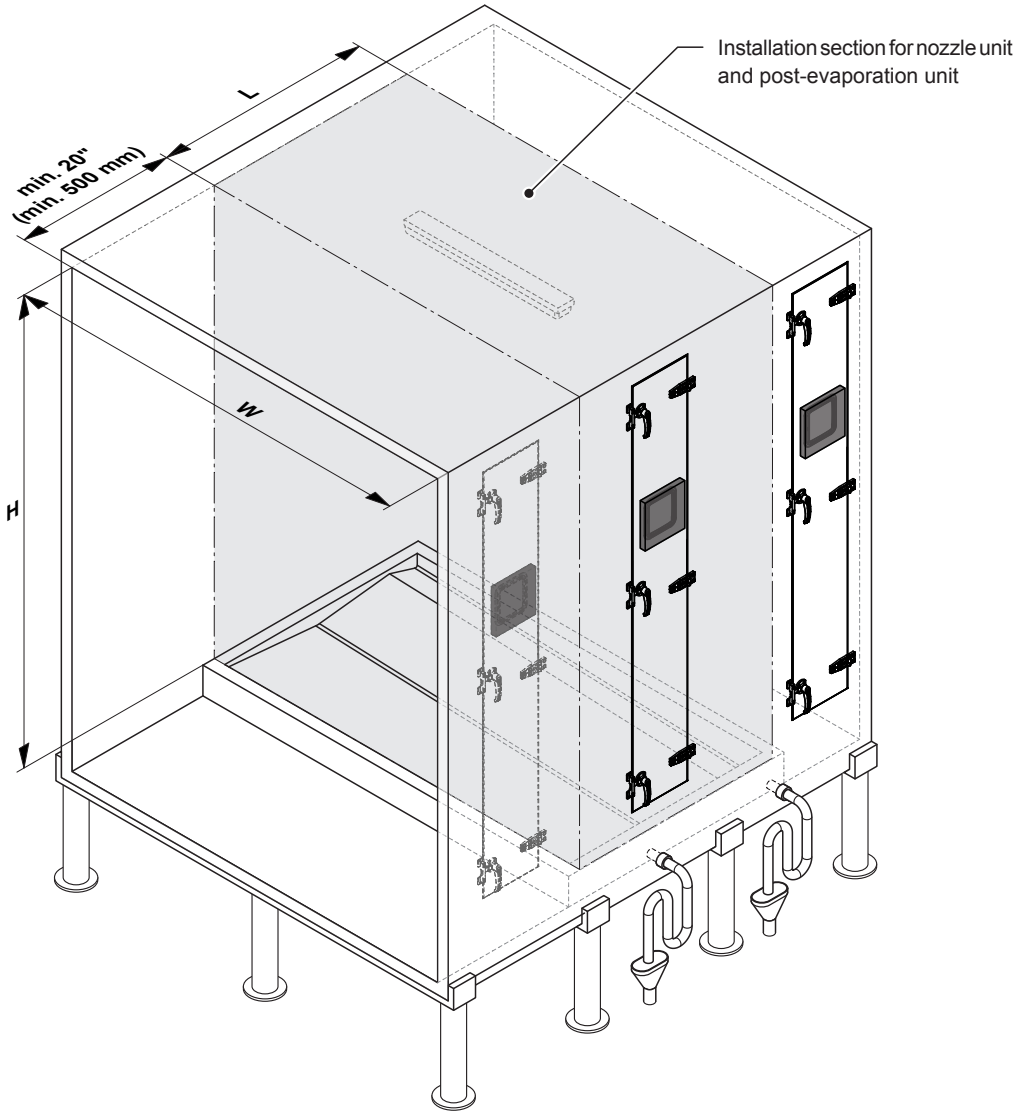
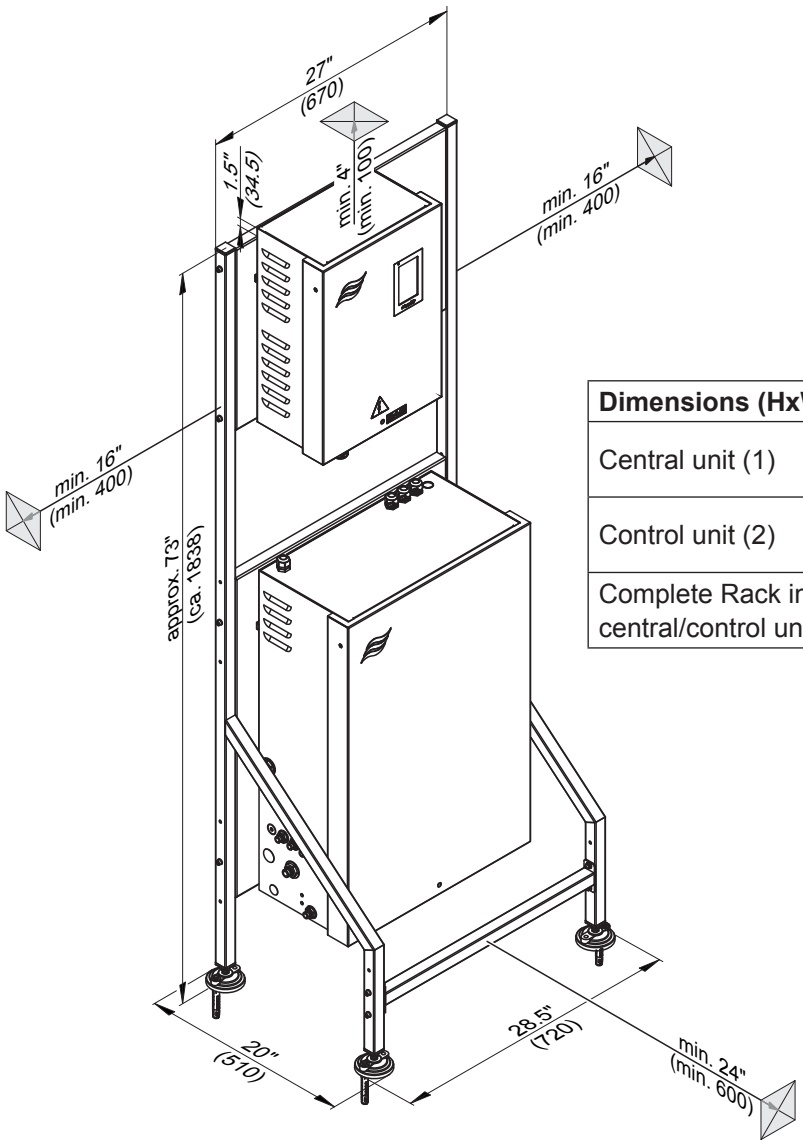


Fig. 3: AHU/duct dimensions



Dimensions (HxWxD)	
Central unit (1)	31.50" x 20.87" x 11.22" (800 x 530 x 285 mm)
Control unit (2)	19.09" x 13.58" x 8.54" (485 x 345 x 217 mm)
Complete Rack incl. central/control unit (3)	73" x 28.5" x 20" (1838 x 720 x 510 mm)

Fig. 4: Clearances and rack dimensions

3.2 System Weights

	DL Type A	DL Type B
Central Unit	approx. 119 lbs (54 kg)	approx. 77 lbs (35 kg)
Control Unit	approx. 33 lbs (15 kg)	
Post-evaporation Unit (wet)	approx. 12 lbs/ft^2 (55 kg/m^2) humidifier area	
Post-evaporation Unit (dry)	approx. 9 lbs/ft^2 (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" or the two hot conductors "L1" and "L2", respectively 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 at least 10 mm^2.
Fuse, Electrical Isolator, Residual Current Circuit Breaker	The installation of the fuse(s) F3 (15 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 22.05 lb/hr (10 kg/hr) spray capacity

See installation manual 2603656 for more details:
https://www.condair.com/humidifier-humidifiers/dl-series-adiabatic-evaporative-humidifier

3.4 Water Requirements

Requirement	Range
Fully demineralized	RO or DI
Conductivity	0.5 – 15.0 µS/cm
Inlet pressure at max capacity	Min. 44 psi (3 bar)
Inlet temperature	Max 68 °F (20 °C)
Additives	None (unless approved by Condair)
Germ count	Max. 100 cfu/ml at inlet

For full requirements reference: https://www.condair.com/m/0/21-656-water-treatment-guide-3.pdf

3.5 Required Clearances

Location	Clearance Requirement (minimum)
Before nozzle grid	20" (500 mm)
After post-evaporation unit	4" (100 mm)
Between nozzle grid and inspection door	2" (40 mm)
From the right side of the inspection door to the end post evaporation unit	16" (400 mm)

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

Inspection door between nozzle grid and post-evaporation unit

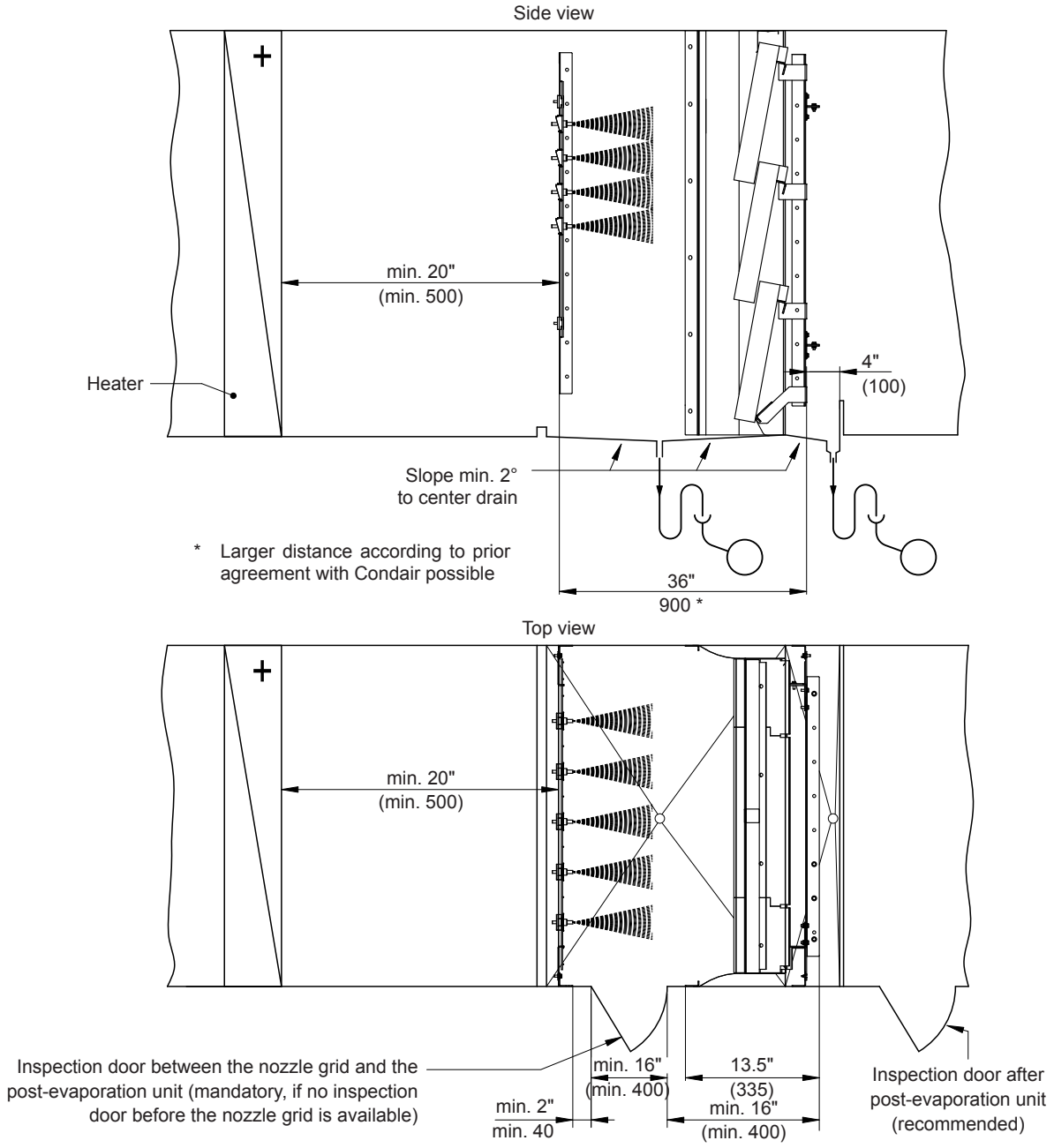


Fig. 5: Positioning of the humidification unit with inspection door between nozzle grid and post-evaporation unit and after post-evaporation unit - dimensions in inches (mm)

Inspection door before nozzle grid

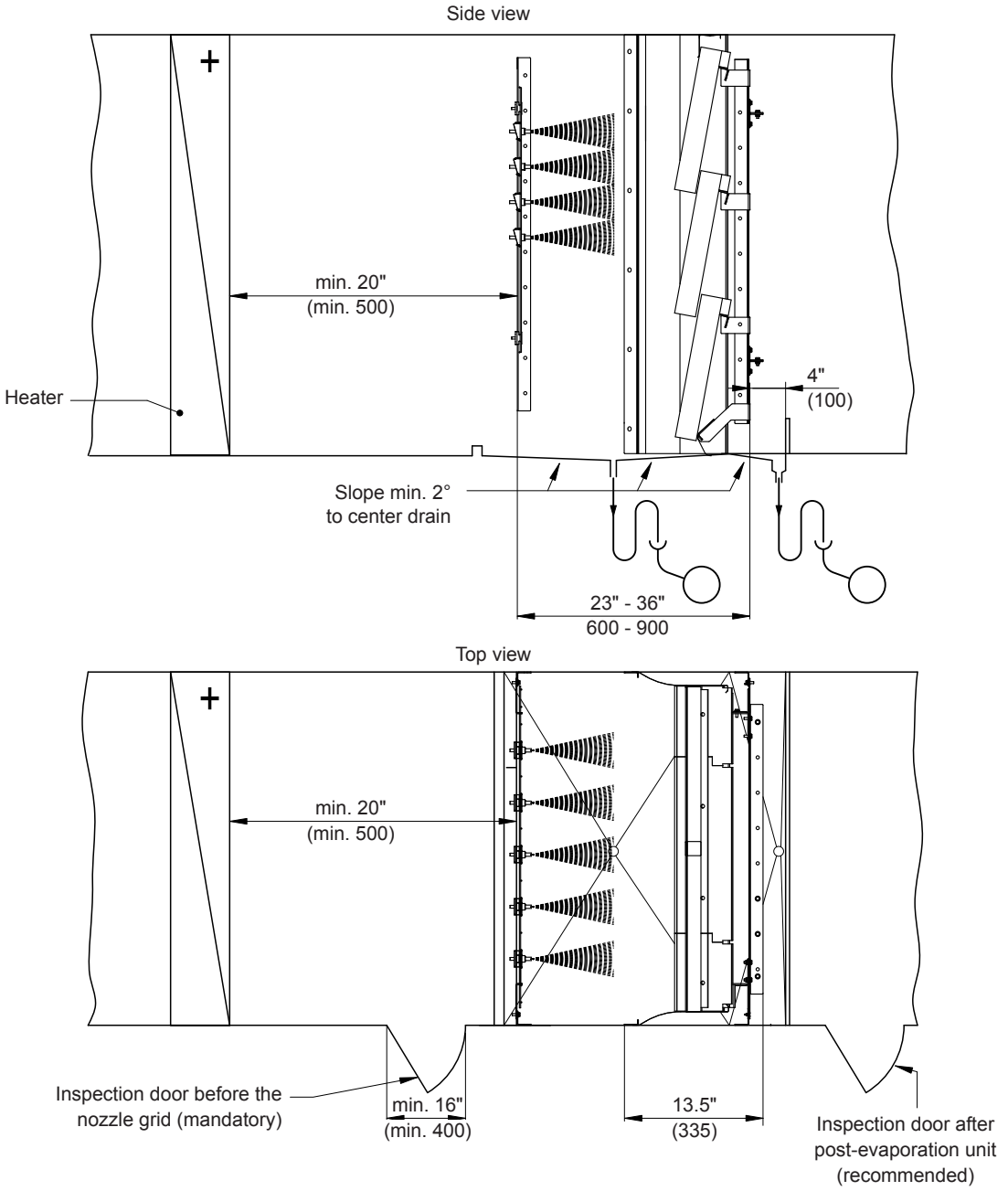


Fig. 6: Positioning of the humidification unit with inspection door before and after the humidification unit - dimensions in inches (mm)

3.6 Available options

		Condair DL	
		Type A	**Type B**
Silicone Free	Produced with silicone free components.	x	x
Sterile filter (0.45 µm)	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
Leak monitoring	Provides an additional safety sensor that can be placed where needed (typically in the central unit and on the floor). If the sensor detects the presence of water accumulation, it will trigger a fault alarm and can be configured to shut down the unit.	x	x
Water temperature monitoring	Monitoring of the inlet water temperature for triggering of a flushing if the limit values for the inlet temperature are exceeded, or if temperature is too low (to prevent freezing) or too high (to prevent a water temperature that would promote a bacterial growth).	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, periodic inspections, or cases where additional flushing is required.	x	x [1)]
External pipe flush	Used to flush the supply pipe from the reverse osmosis to the DL. When flushing, the water in the supply pipe will thereby not flow through the DL but will be guided into the drain. 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
External valve block with drain 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	
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 >400 lb/hr (>182 kg/h) due to pressure loss.	x	
Gateway board for LonWorks	Allows LonWorks communication	x	x

[1)] Available only for type B systems with 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	Required for humidification capacity calculation. Used to calculate duct velocity and determine if droplet separator is required: No droplet separator required up to 492 ft/min (2.5 m/s) Droplet separator required up to 787 ft/min (4 m/s)
2	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. Air conditioning equipment mounted upstream or downstream of the Condair DL humidification unit (e.g. silencers, air cooler with a lamella droplet separator, heating coils, air filters, cross arms, changes of the direction of the airstream due to branches or curves, etc.) or cross-sectional variations may cause air turbulences or air backflow which prevent proper functioning of the Condair DL. If necessary, rectifiers or perforated plates must be installed on the building side before the humidifier
3	Outside air (%)	Required for load calculation.
4	Air Temperature	Either entering humidification system, or desired temperature of air leaving humidification system Required for load calculation and system efficiency calculation
5	Pre-heating	Coil must have enough capacity for peak design conditions
6	Right/left side nozzle grid connections	Determines location for wall feed throughs
7	Duct internal dimensions (tolerance: ± 1" (25.4 mm)	Required for sizing of the humidification unit (nozzle grid and post-evaporation unit)
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 and control panel	Required for electrical and water connection sizing. Should be less than 32 ft (9.75 m) and on the same level as best practice.
10	Stainless steel section length	23" - 36" (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	Minimum required for system feasibility
12	Location of inspection doors	Required for maintenance access.

5 Installation Requirements

5.1 AHU/Duct Requirements

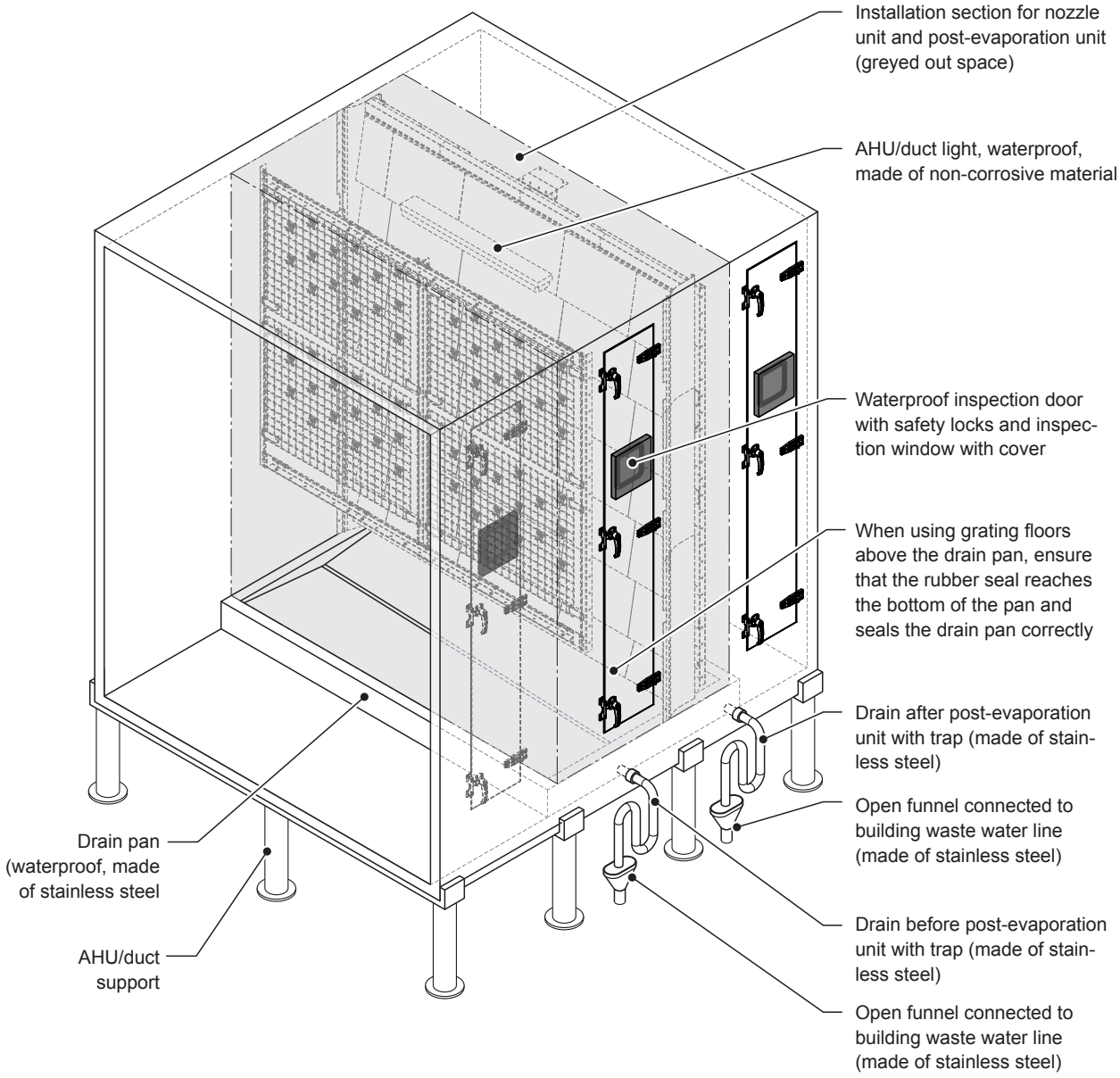
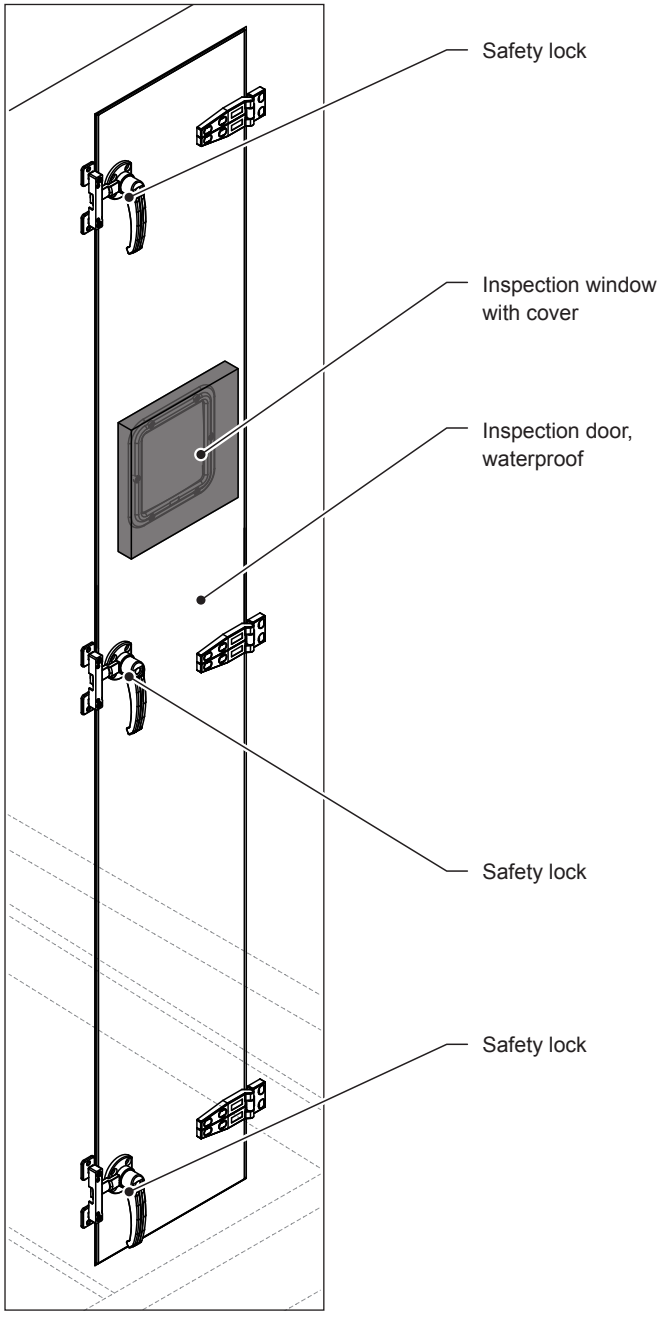


Fig. 7: Example AHU/Duct Section for DL Humidification Unit

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. Drain pan must slope a min 2° to center 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). For hygienic reasons connect the drainpipes with an open outlet to the wastewater system of the building. Larger units require a leg in the midsection that must be mounted to the ceiling and on solid ground with no slope. Ceiling must be reinforced. This may end up within the middle of the drain pan
2	AHU Section/ Waterproofing	AHU section must be waterproof. All components close to the humidification units or contacting any RO 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 help or from submittal data. Larger units using mounting legs must be mounted with reinforcement traverses where supports are mounted. Note: The post evaporator unit weighs approx. 55 kg/m^2 when wet.
4	Air Flow/ Filter	Air filter of MERV 13-14 or better required at the air inlet of the humidification unit. Laminar airflow is required. A perforated plate can be used to achieve this if needed.
5	Insulation	Duct insulation when ambient temperature may become low. If the system is equipped with a heater, make sure it is at least 20" (500 mm) away from the humidification unit.
6	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 RO/DI water.
7	AHU/Duct Support	AHU/duct should be mounted on supports in order that the spray circuit lines can be mounted with constant downslope to the connections of the central unit.

8	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 16" (400 mm) and a minimum height of 30" (750 mm). Exception: For AHU/duct with a height less than 30", the inspection door height must be +1" 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 or the mounting rack, respectively 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 mounting rack with the control/ central unit is mounted should meet the following ambient conditions: Ambient temperature: 41 ... 104 °F (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. 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 housing feed throughs of the duct are as short as possible (max. 32 ft (10 m)). The central unit and the control unit which are mounted to the mounting rack are freely accessible with sufficient space available 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 the mounting rack is installed in a drip-proof location Hydraulic and control unit should be installed next to the duct/ AHU where the wall feed throughs are located. See *Section 8.6* for common positioning mistake examples.

6 Special Installations

Type	Overview	Requirements
Lower Building Level	It is possible to install the central and control unit of the Condair DL on a lower level of the building than the humidification unit	Using the external valve block option, so long as the pressure to the nozzles will be sufficient. Confirm your design with the factory prior to ordering. Wall feed throughs must be at higher level than the spray circuit connectors on the central unit spray circuit lines must have constant downslope of min 2% from the wall feed throughs to spray circuit connectors.

7 System Selection Chart

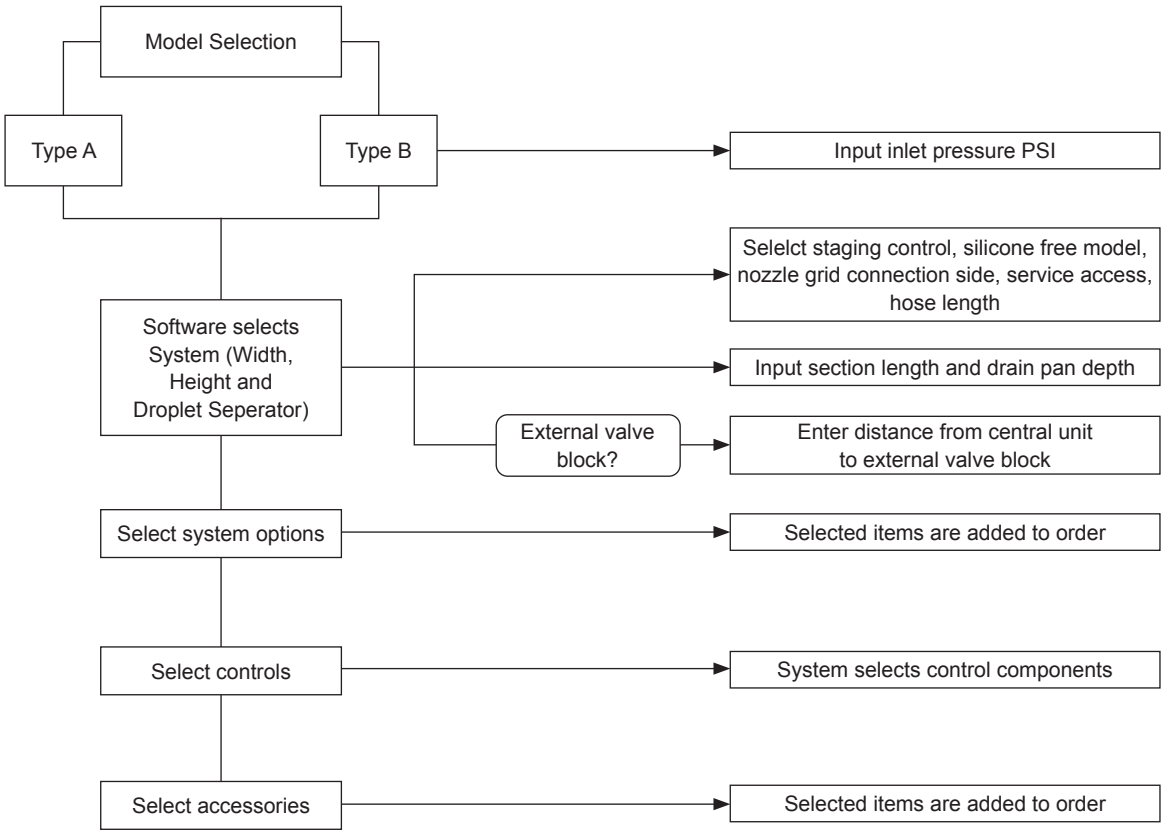


Fig. 9: System Selection Chart

8 Appendix

8.1 Appendix A – Correct AHU/Duct Layout

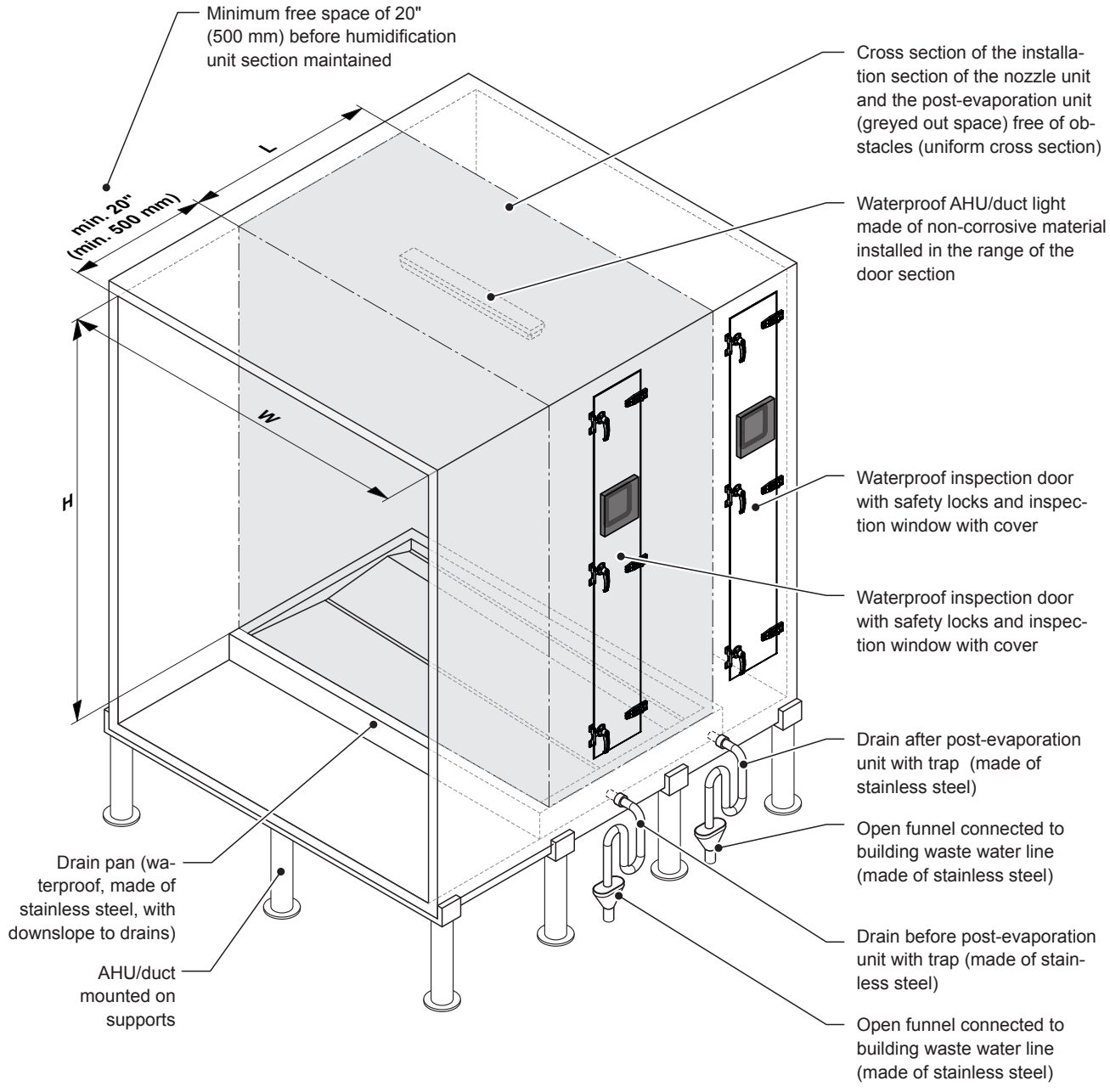


Fig. 10: Example Layout AHU/Duct Section for DL Humidification Unit

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

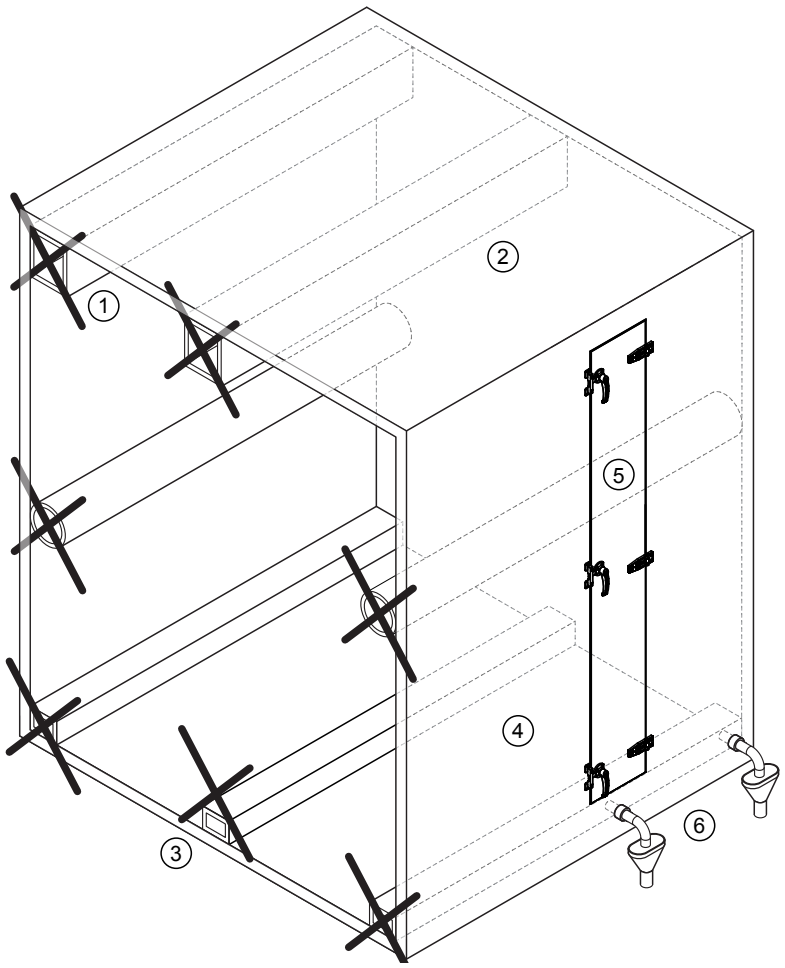


Fig. 11: Layout Faults of AHU/Duct Section for DL Humidification Units

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. Air blowing out through the drain lines during operation.

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

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

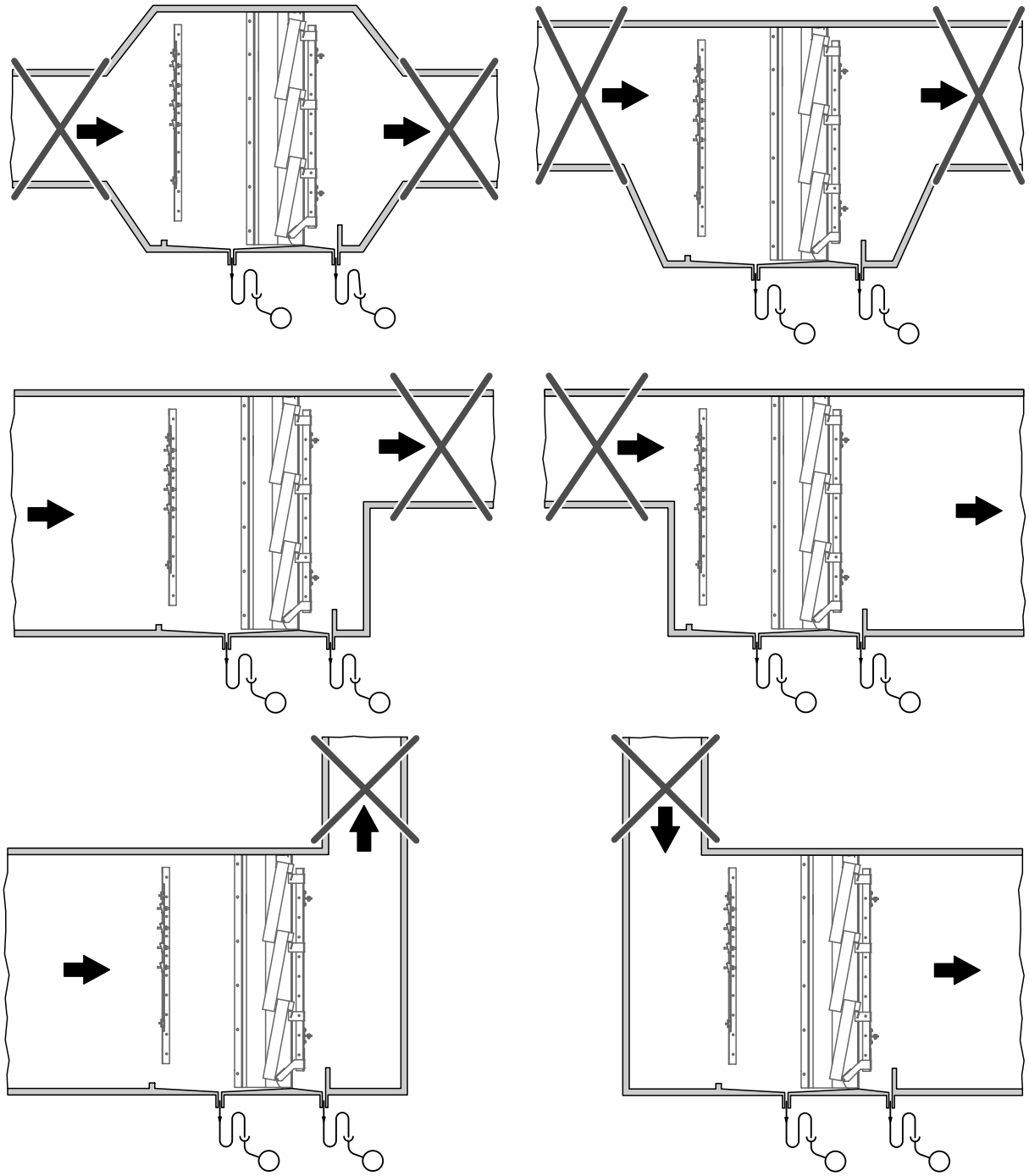


Fig. 12: Non-permissible constrictions of the AHU/duct before and after the Condair DL humidification units (side views)

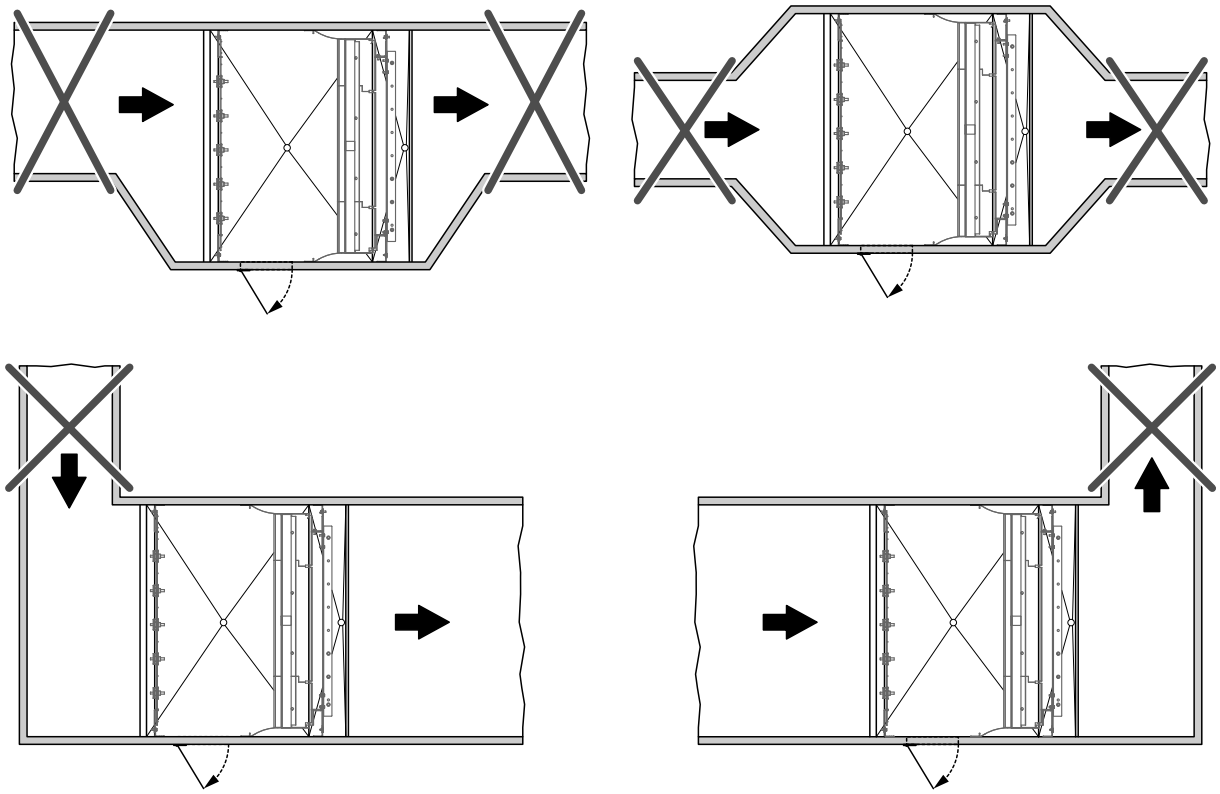


Fig. 13: Non-permissible constrictions of the AHU/duct before and after the Condair DL humidification units (top views)

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

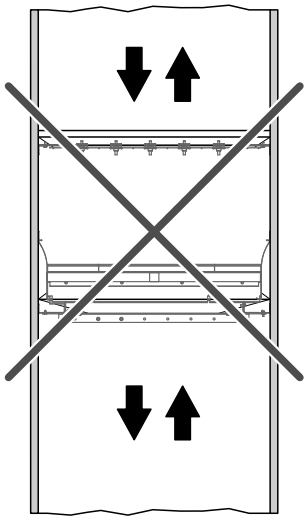


Fig. 14: Non-permissible installation of the Condair DL humidification unit in vertical AHU/ducts

8.4 Appendix D – Wrong nozzle grid connection side

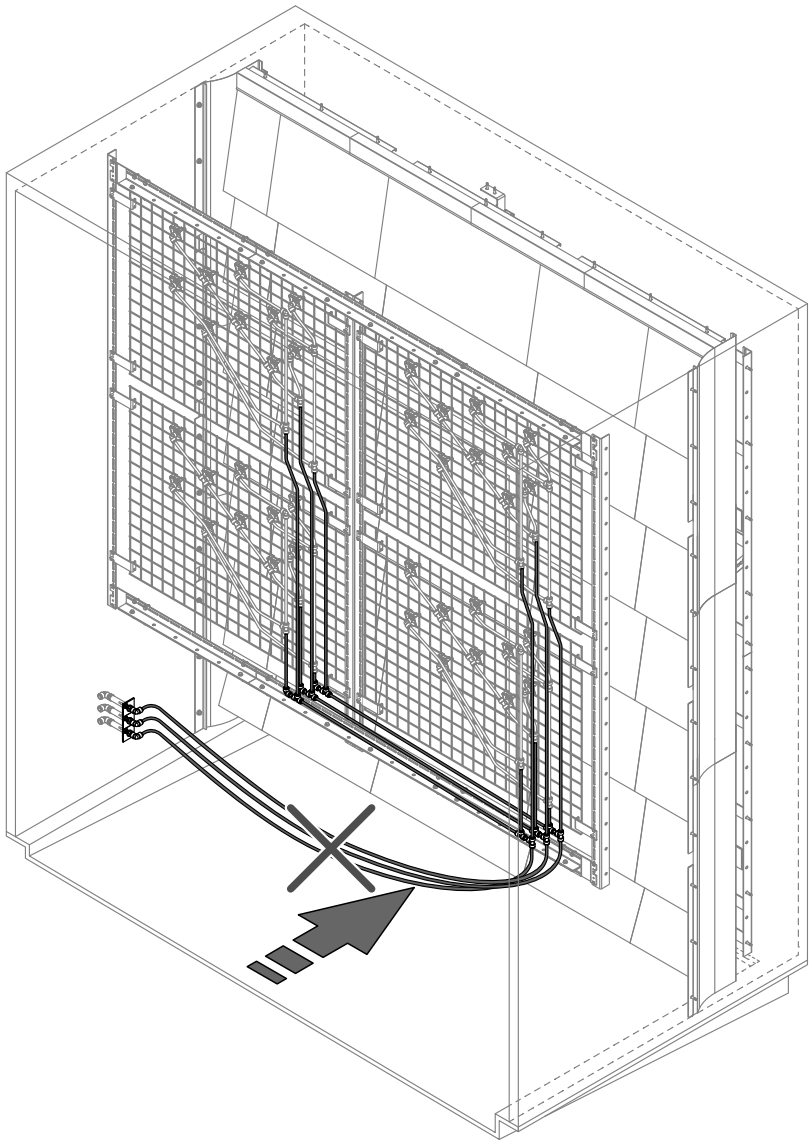


Fig. 15: Wrong nozzle grid connection side

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 be drained by gravity. Standing water remains in the spray lines.

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

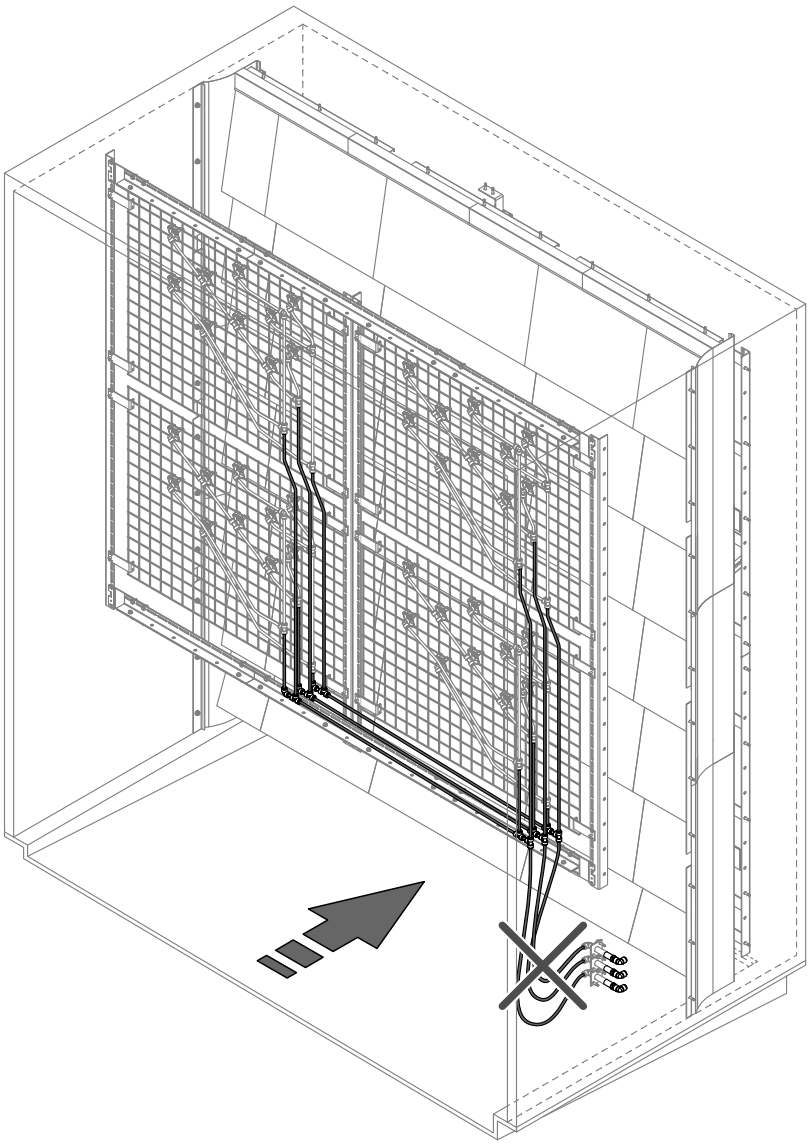


Fig. 16: Spray circuit lines from nozzle grid connections to wall feed troughs are sagging

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.

8.5 Appendix E – Images of proper installations

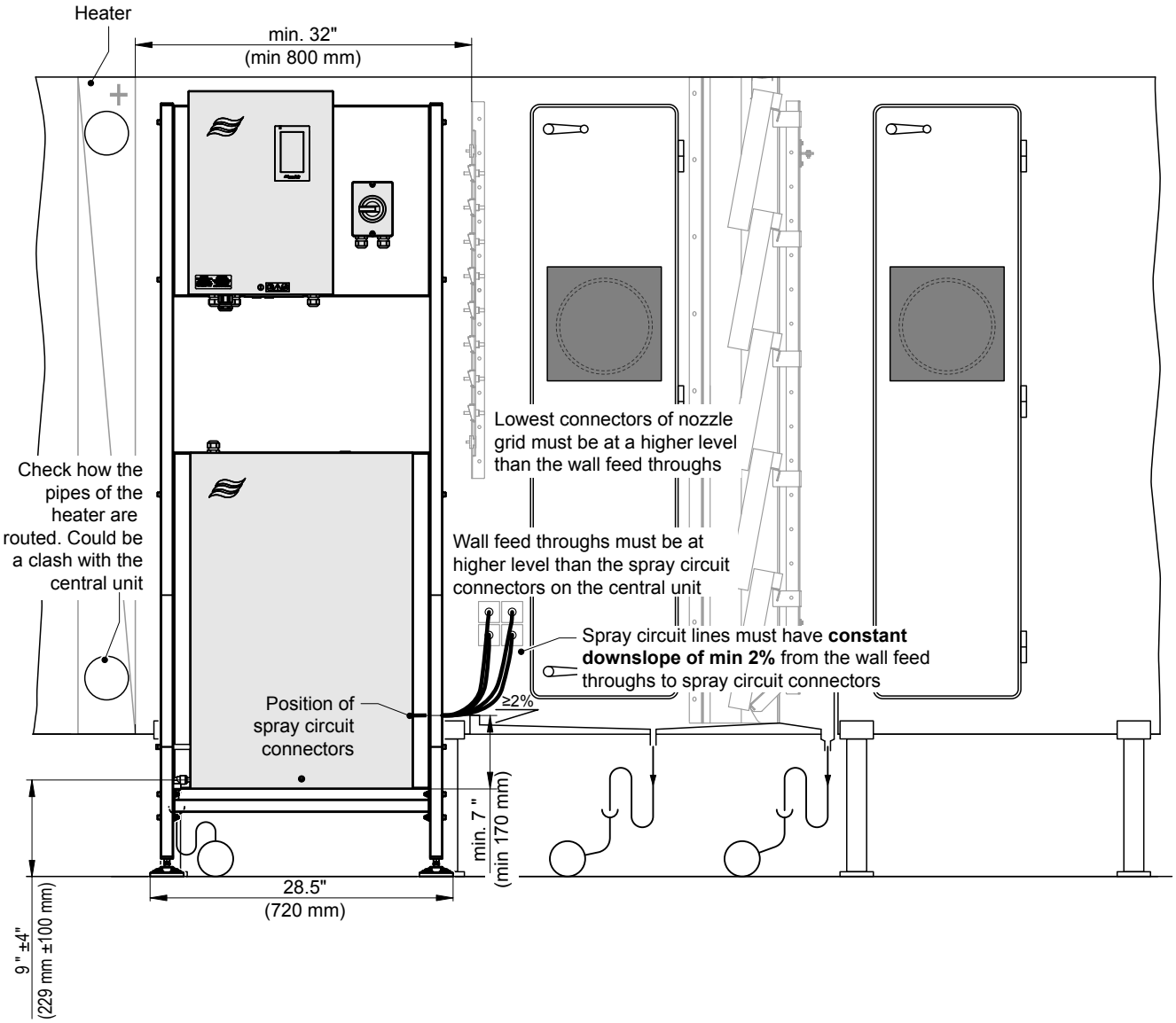


Fig. 17: Example 1: Positioning the rack before the nozzle grid

WARNING!
Risk of injury

The rack must mandatory be fixed to the floor!

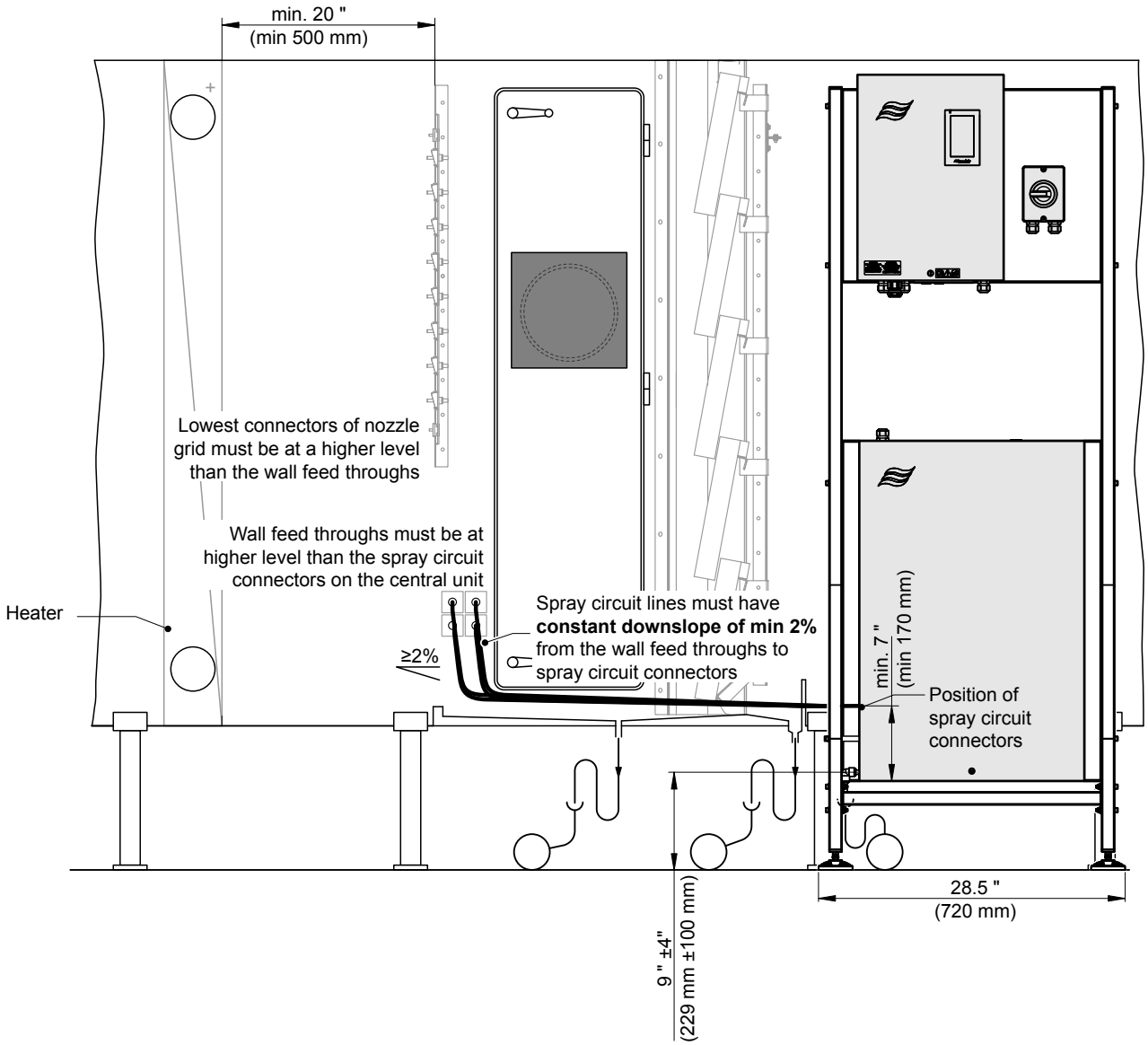
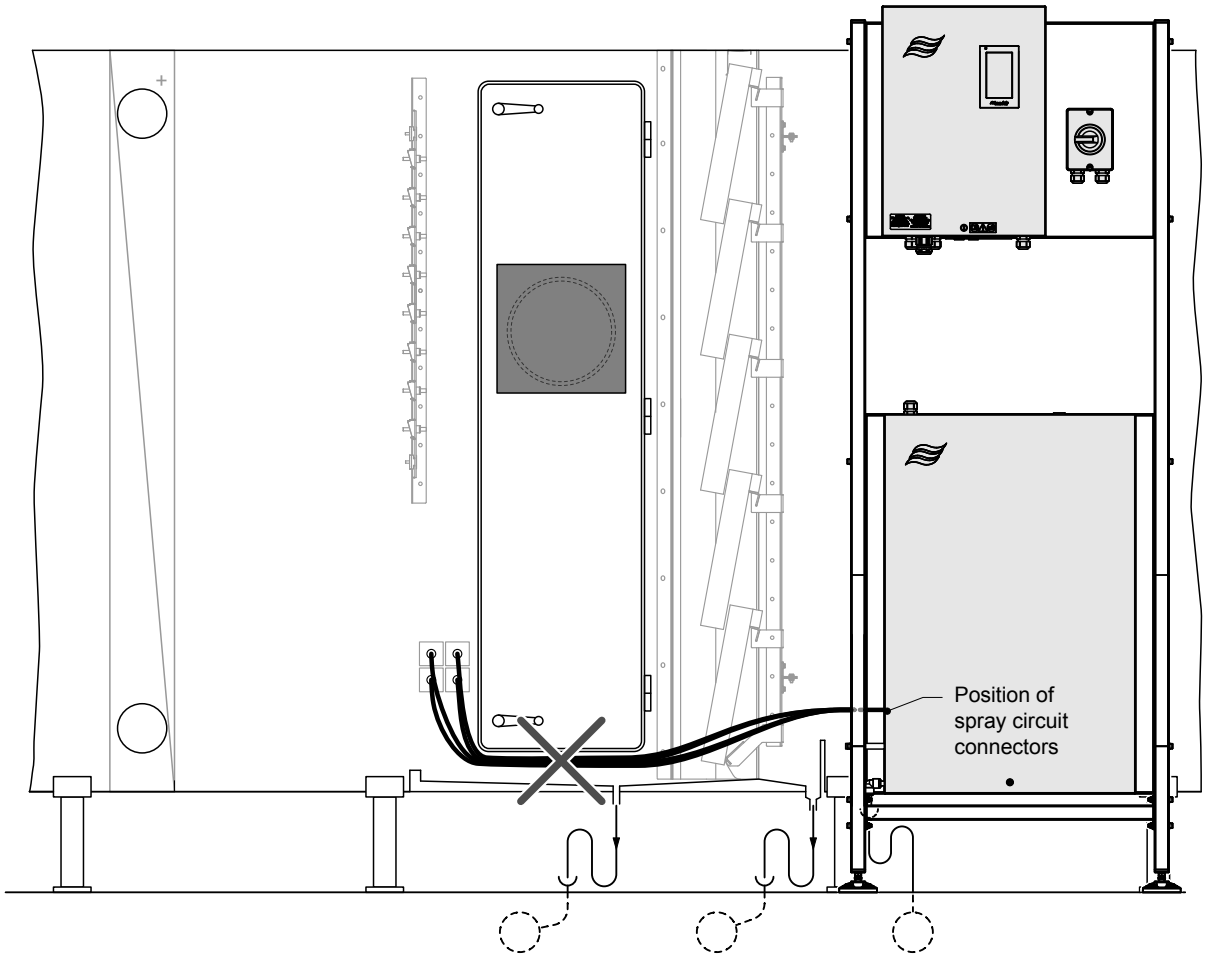


Fig. 18: Example 2: Positioning the rack after the post evaporation unit

WARNING!
Risk of injury

The rack must mandatory be fixed to the floor.

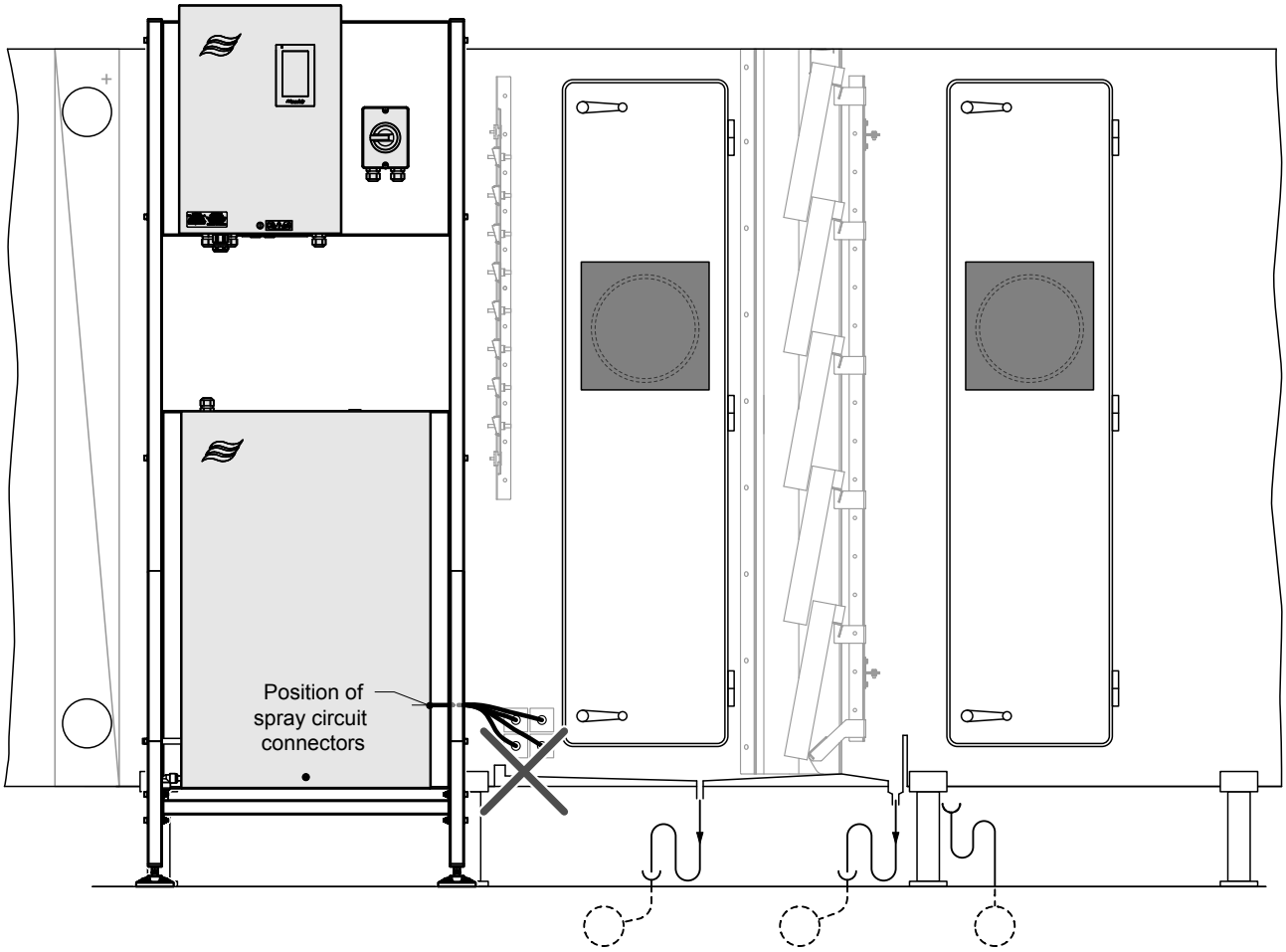
8.6 Appendix F – Common Positioning Mistakes



Problem: 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: Lower central unit in rack one position (-4" (-100 mm)) down that the spray circuit connections are below the lowest point of the spray line routing to create a constant downslope.
Important: The drain pipe of the central unit must still have a constant downslope to the drain funnel after the modification.

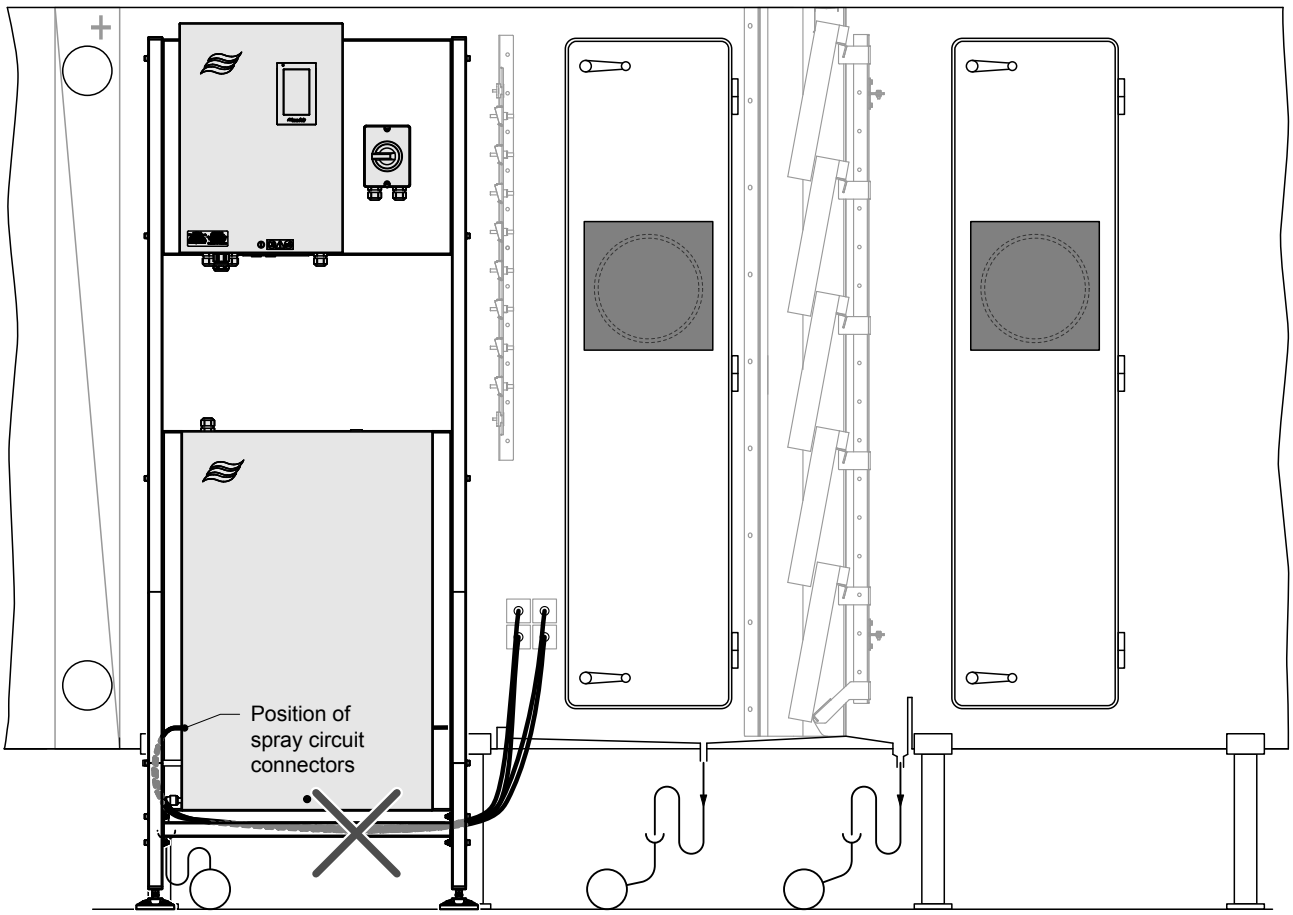
Fig. 19: Position Fault Example 1



Problem: 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. 17*) or lower central unit in rack one position (-4" (-100 mm)) down.
Important: The drain pipe of the central unit must still have a constant downslope to the drain funnel after the modification.

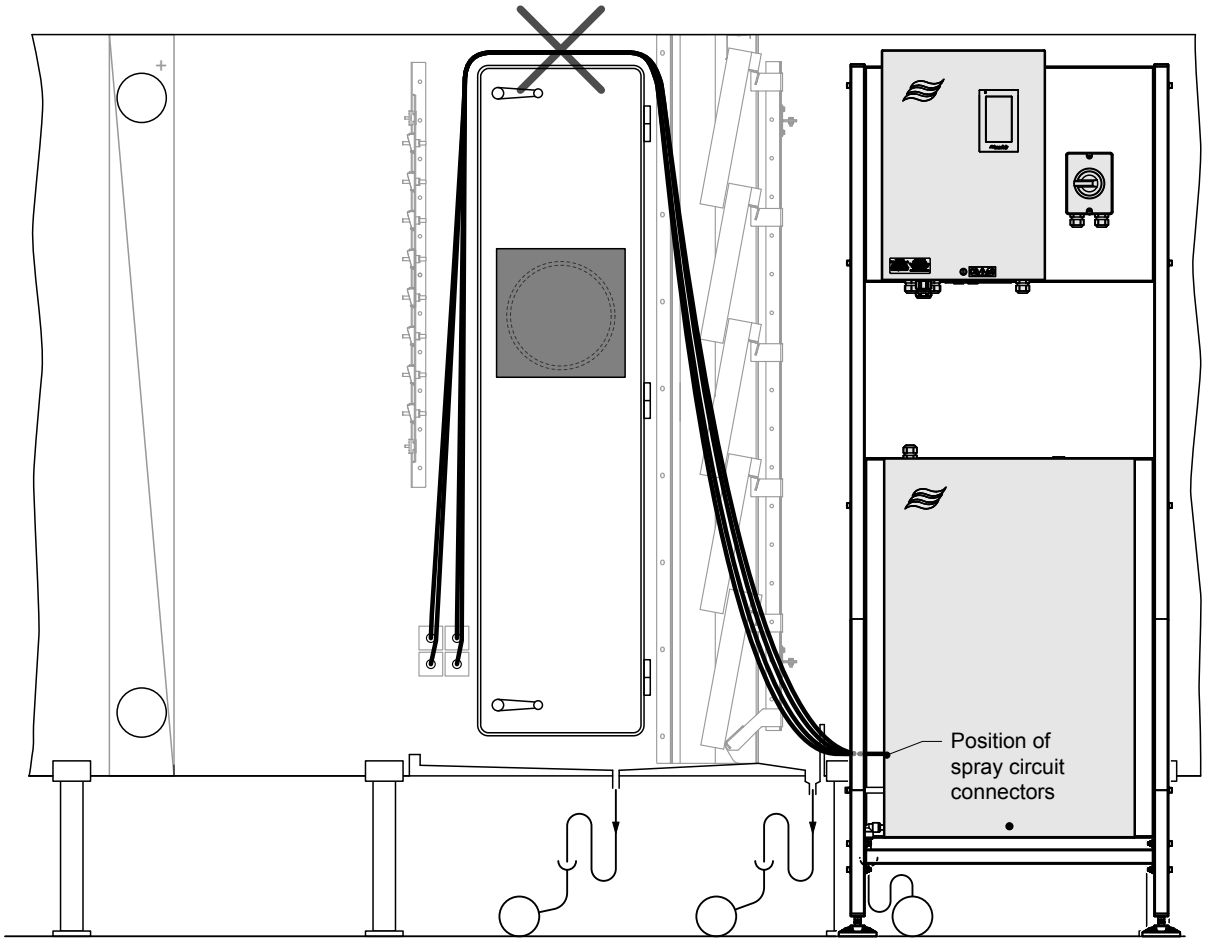
Fig. 20: Rack Position Fault Example 2



Problem: 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. 17* to *Fig. 18*). Modification is described in the Condair DL installation manual.

Fig. 21: Rack Position Fault Example 3



Problem: The spray circuit lines are routed upwards above the central unit. This routing causes a water column and pressure loss in the spray circuit lines as well as standing water in the spray circuit hoses.

Remedy: Route the spray circuit lines according *Fig. 18*.

Fig. 22: Rack Position Fault Example 4

Note: If correct routing of the spray circuit lines according *Fig. 17* to *Fig. 18* is not possible the optional "External valve block" may be the solution. Please contact your Condair partner in this behalf.

8.7 Appendix G – Checklist Commissioning

Checklist Commissioning

Adiabatic humidifier Condair DL _____

Customer		*Humidification capacity [lb/hr]*	
Location		*Air volume [m³/hr]*	
Project		*AHU manufacturer AHU*	
Serial number		*Material AHU*	
DL Code	DL	*Length of humidifier section [inches]*	
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?		

	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?		

Electric installation / Test electric components		
Wiring correct		
Service switch present?		
Connections retighten		
2x PE connected?		
Pump existing		
Rotation of the pump proofed?		
Snap ferrite mounted?		
Test FU		
Test steps controlling		
Test flushing and spray valves		
Test pressure sensor PS4 and PS5		
Flushing function		

Control functions		
External controller		
Number of steps		
Adaption "On"?		
Capacity limitation activated?		
Flushing water from central unit visible?		
Safety loop connected on X1?		
Error relay connected on RFI board?		
BACnet?		
LonWorks?		
Modbus?		

Options		
Test leakage monitoring		
Test external pipe flush		
Test air cleaning		

Data / Values

Inlet pressure PS4 [psi]	
Nozzle pressure PS5 [psi]	
Conductivity [µS/cm]	
Water Temperature [°F]	
Remaining capacity Ag+ [Ah]	
Type Ag+	
Ag+ current at 100 % demand	
Capacities of spray circuits [lb/hr]	1 (Y5): ____ 2 (Y6): ____ 3 (Y7): ____ 4 (Y8): ____ 5 (Y9): ____
Demand signal range [VDC] [mA]	

Remarks

Signature customer

_____

Signature engineer

_____

8.8 Appendix H – Operating Ranges

	Operating Range	
	DL Type A (with booster pump)	**DL Type B (without booster pump)**
Hydraulic		
Humidification capacity	11 ... 2,204 (5 ... 1000 l/hr) [1)]	
Nozzle pressure	43.5 ... 101.5 psi (3 ... 7 bar)	
Nozzle sizes	8 (0.40, 0.53, 0.66, 0.79, 0.92, 1.06, 1.19 and 1.32 gal/hr at 58.0 psi / 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 <463 lb/hr (<210 kg/hr): 0.58 - 0.66 gal/min at 58.0 psi (2.2 - 2.5 l/min at 4 bar) Nozzle capacity >463 lb/hr (>210 kg/hr): 0.98 - 1.06 gal/min at 58.0 psi (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 22.05 lb/hr (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	100 ft/min - 492 ft/min (0.5 - 2.5 m/s) (without droplet separator), >492 ft/min - 787 ft/min (2.5 - 4.0 m/s) (with droplet separator) Uniform air flow over the full cross section is required	
Max. admissible air temperature	140 °F (60°C) (before humidification unit)	
Water		
Connector water supply	ø0.47" (ø12 mm) plug-in coupling or 1/2" male thread adapter (supplied)	
Connector water drain	ø0.39" (ø10 mm) plug-in coupling or 1/2" male thread adapter (supplied)	
Admissible water supply pressure	working pressure 44 ... 101.5 psi (3 ... 7 bar)	working pressure 44 ... 101.5 psi (3 ... 7 bar)
Admissible water temperature	41 ... 68 °F (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	41 ... 104 °F (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 11 lb/hr (5 kg/hr) can only be regulated at a flow pressure <58.0 psi (<4.0 bar). With a flow pressure of ≥58.0 psi (≥4.0 bar), we recommend a minimum output of 22 lb/hr (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

Notes

Notes

Warranty

Condair Inc. or Condair Ltd. (depending on the entity that supplied the product, and hereinafter collectively referred to as CONDAIR) warrant for a period of two years after installation or 30 months from the manufacturer's ship date, whichever date is earlier, that CONDAIR's manufactured and assembled products, not otherwise expressly warranted, are free from defects in materials and workmanship. Notwithstanding the foregoing, the products listed below have an alternate warranty period:

- GS/GSTC Series heat exchanger(s) are warranted to be free from defects in materials and workmanship for a period of 3 years from installation or 40 months from the manufacturer's ship date, whichever is earlier.
- SAM-e Short Absorption Manifolds, except for the coupling seals, are warranted to be free from defects in materials and workmanship for a total period of 10 years from the manufacturer's ship date.
- Humilife RH humidifiers are warranted to be free from defects in materials and workmanship for a period of 5 years from the manufacturer's ship date. CONDAIR may, at its discretion, replace individual components or Humilife RH units as a whole.
- Spare 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.
- No warranty is made against corrosion, deterioration, or suitability of substituted materials used as a result of compliance with government regulations.

CONDAIR's obligations and liabilities under this warranty are limited to furnishing replacement parts to the customer, F.O.B. CONDAIR's factory. The replacement parts are warranted for the balance of the term of the warranty on the original humidifier or 90 days, whichever is longer. Procedure:

1. Customer Requests Warranty as per instructions on the CONDAIR Warranty Form.
2. CONDAIR reviews the warranty claim and will respond in one of two ways:
    a. Warranty Accepted – Replacement Part or credit granted.
    b. Warranty Declined – Response with justification will be provided to the customer.
3. In some cases, CONDAIR may request the part to be returned, freight prepaid by the customer, as part of the warranty acceptance or warranty determination process. Some reasons include:
    a. Part must be analyzed to determine the root cause of failure.
    b. Part must be returned to the supplier for claim/investigation.

    When parts are requested to be returned, replacement parts will be sent by CONDAIR to the customer against an invoice from CONDAIR paid by the customer. The cost of the replacement parts will be reimbursed to the customer with a credit note after the parts are received and analyzed by CONDAIR, if the warranty is accepted.

The warranties set forth herein are in lieu of all other warranties expressed or implied by law. No liability whatsoever shall be attached to CONDAIR 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, with the exception of a purchased extended warranty described below, must be in writing, and signed by an officer of CONDAIR.

CONDAIR makes no warranty and assumes no liability unless the equipment is installed in strict accordance with the installation manual in effect at the date of purchase, and by properly qualified and licensed professionals capable of installing such equipment.

CONDAIR 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.

CONDAIR makes no warranty and assumes no liability whatsoever for damage to the products, humidifier, supply lines, drain lines, steam distribution systems, or the building as a whole caused by freezing.

CONDAIR reserves the right to change the design, specifications, and performance criteria of its products without notice or obligation.

Extended Warranty

Extended warranties are available to purchase under the conditions listed above. Extended warranties must be purchased at the time of the original equipment order.

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