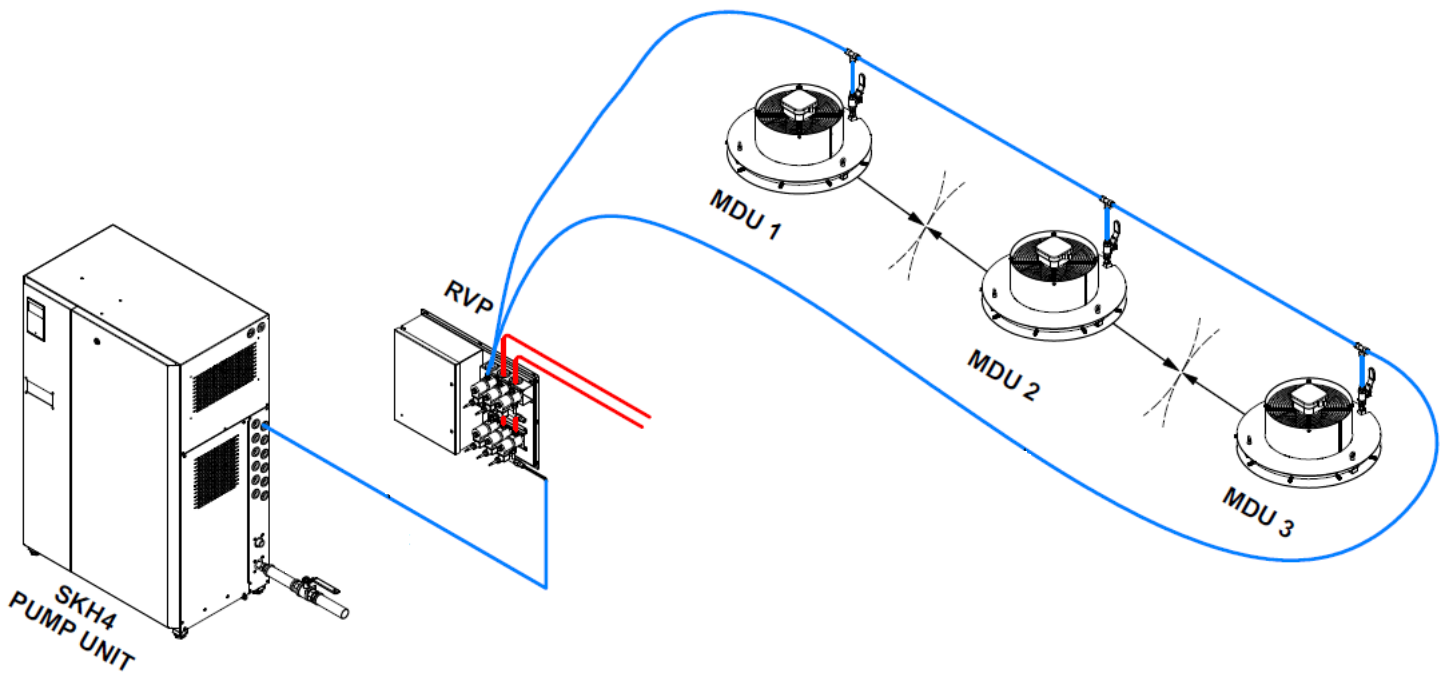




neptronic®

SKH4 High-Pressure Atomizer

In Space Mist Distribution Installation Guide



Mist Humidification Guide

The following document describes the procedure to follow in order to properly install an in-space mist distribution system for the SKH4. The steps and guidelines outlined in this document must be followed in order to avoid any anomaly resulting from inaccurate installation.



All installation work must be carried out by suitably qualified personnel and must conform to local codes and regulations.

Site considerations

There are multiple factors specific to the site that can have a massive impact on the in space high pressure mist absorption. Examples of these include the following:

- Temperature:
 - Average: Higher average air temperature will improve mist absorption.
 - Variations and local: Temperature fluctuations or localized **cold air** drafts can have a significant negative impact on mist absorption.
- Humidity:
 - Average: Lower average air humidity will improve mist absorption.
 - Variations and local: Humidity fluctuations or localized humid air drafts can have a significant negative impact on mist absorption.
- Site airflow pattern: Windows, doors, ventilation, etc. can create localized air drafts that affect mist absorption.
- Control:
 - Instruments: Proper sensor(s) and sensor location(s) are critical in order to ensure proper humidifier operation and may be critical to ensure proper mist absorption.
 - Control: Proper control loops and parameter settings are required for optimal mist absorption. In space high pressure mist generally requires large areas and as a result are generally not suited for precision control. The Duty Cycle parameter utilizing 50-70% running factors with interruption periods between sprays can improve mist absorption.
- Air quality: Dust in the air can have negative effects on mist absorption.
- Water quality: Water quality can influence water absorption efficiency. The minerals that are typically found in water, once evaporated, will result in air containing dust particles.
- Smoke detector: Can be triggered by humidity.

It is the designer's responsibility to consider the site factors that could have an impact on mist absorption and assess the risks accordingly.

The in space high pressure mist humidification is not an option that should be designed for optimal temperatures or every inch of available space; it should be designed with an adequate safety factor and the possibility for commissioning and/or adjustment.

Mist Distribution Absorption

Absorption distances are highly dependant on air condition.

Minimum recommended values below are considering:

- 5L/h nozzle
- Air temperature: 20±2 °C
- Air humidity: 40-50% RH



Always be mindful of the potential risk of water falling during operation or maintenance.

The combination of site considerations and system design may result in variations to the guidelines below, allowing smaller or wider clearances as required.

Spraying in Space (Standard)

An in-space hydraulic network is made up of piping that starts at the stage valve and ends at the drain valve. Along this pipe run, single nozzles can be placed in order to spray directly into the area.

- Plan a location that is easy to access and permits easy inspection and servicing of the nozzles.



Always be mindful of the potential risk of water falling, during operation or maintenance. Do not install humidification equipment where water could cause damage to the building or to the equipment.

- The type of hose used must be stainless steel tubing or flexible nylon hose. It must be appropriately sized for the water flow and the in-line pressure (1000psi / 70Bar).
- The hoses must be maintained and attached securely and must not move when pressure is applied.
- Do not install the ramp and nozzle in a location where failure of the system could result in damage to the building structure or to other expensive equipment.
- Ensure that the mist is not directed towards and/or at risk of causing condensation on any equipment.

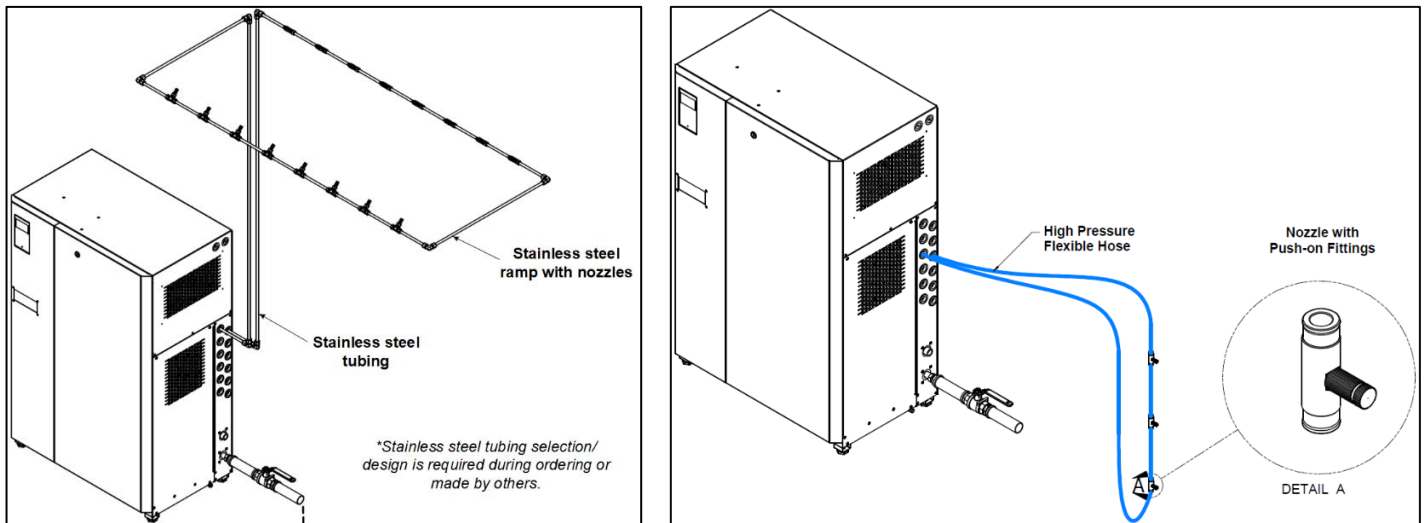




Illustration 1 - Typical Installation with Rigid Nozzle Ramp or Flexible Nylon Tubing

Neptronic offers the following adaptor fittings in order to mount nozzles inline for these types of lines:

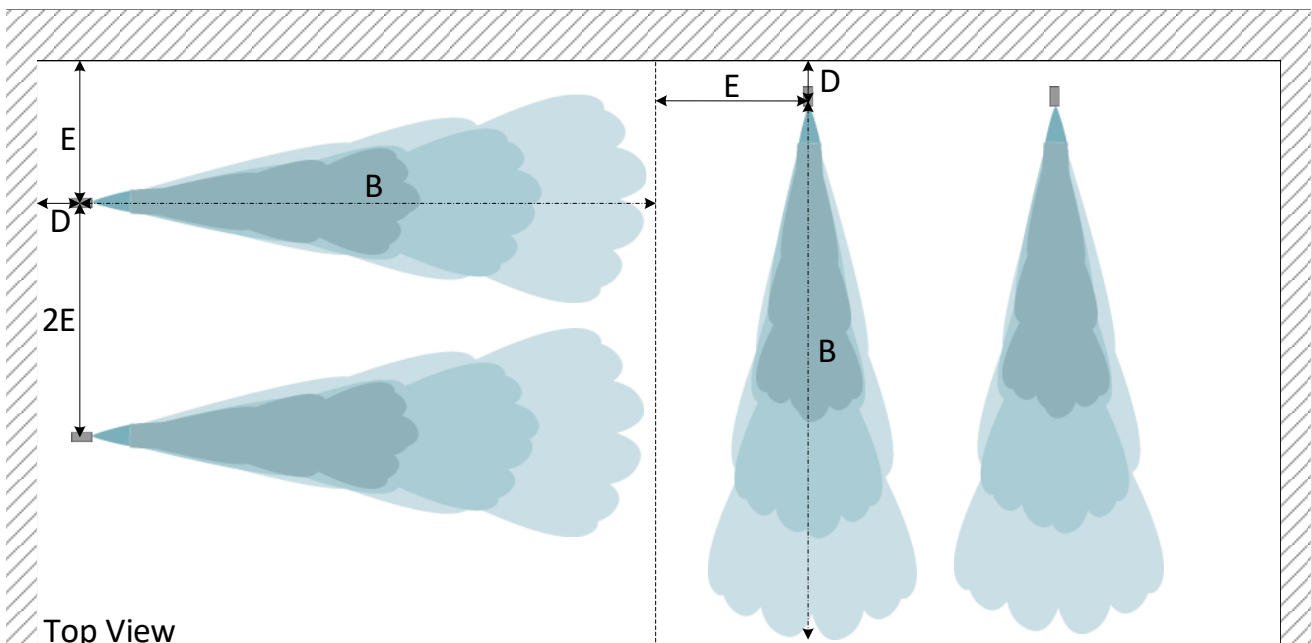
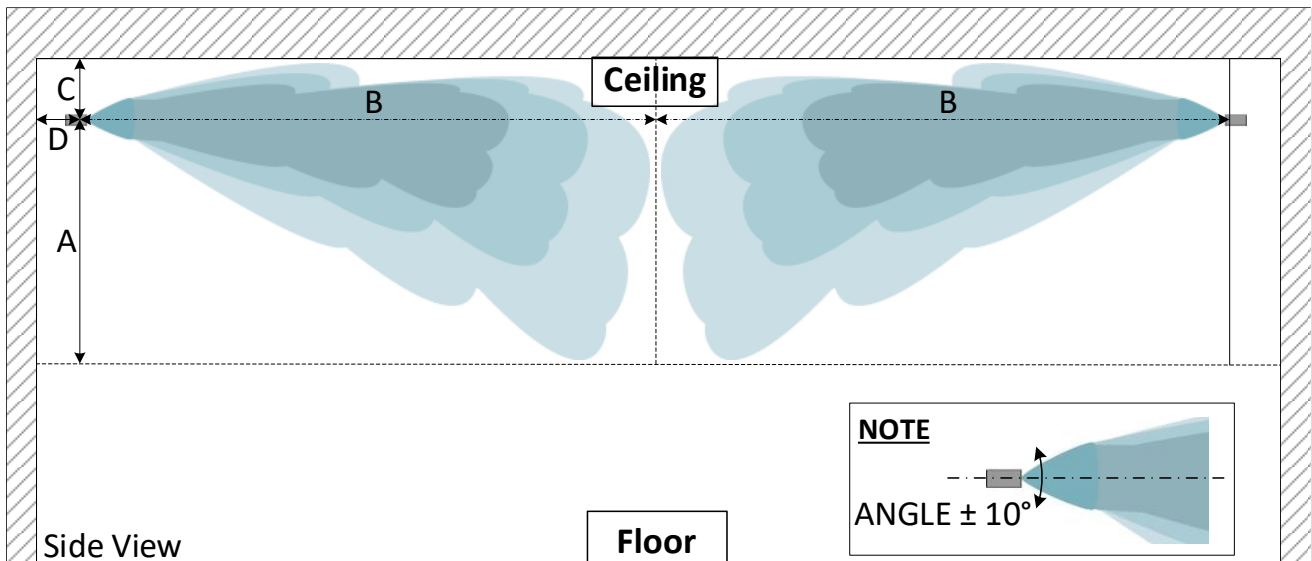
Tube	Type	Dimension	Part Number	
Flexible Nylon Tube	Push to Connect	O.D.3/8 (DN10)	SPH2552	
		O.D.1/2 (DN12)	SPH4008-36	
Stainless Steel Tube	Compression	O.D.3/8 (DN10)	SPH2538	
		O.D.1/2 (DN12)	SPH4008-45	

In-space Direct Spray – Clearances



		Feet	Meter	
A	Minimum clearance area under the nozzle:	5L/h	20	6.1
		4L/h	17	5.2
		3L/h	14	4.3
B	Minimum clearance area in front of the nozzle:	12	3.6	
C	Minimum clearance area above the nozzle:	3	0.9	
D	Minimum clearance from the nozzle to the back of a wall:	3	0.9	
E	Minimum clearance area from the sides of the nozzles:	3	0.9	

*Increasing the spacing between nozzles will improve mist absorption.



Example of Clearances

Spraying in Space with Fan-Assisted Distributors

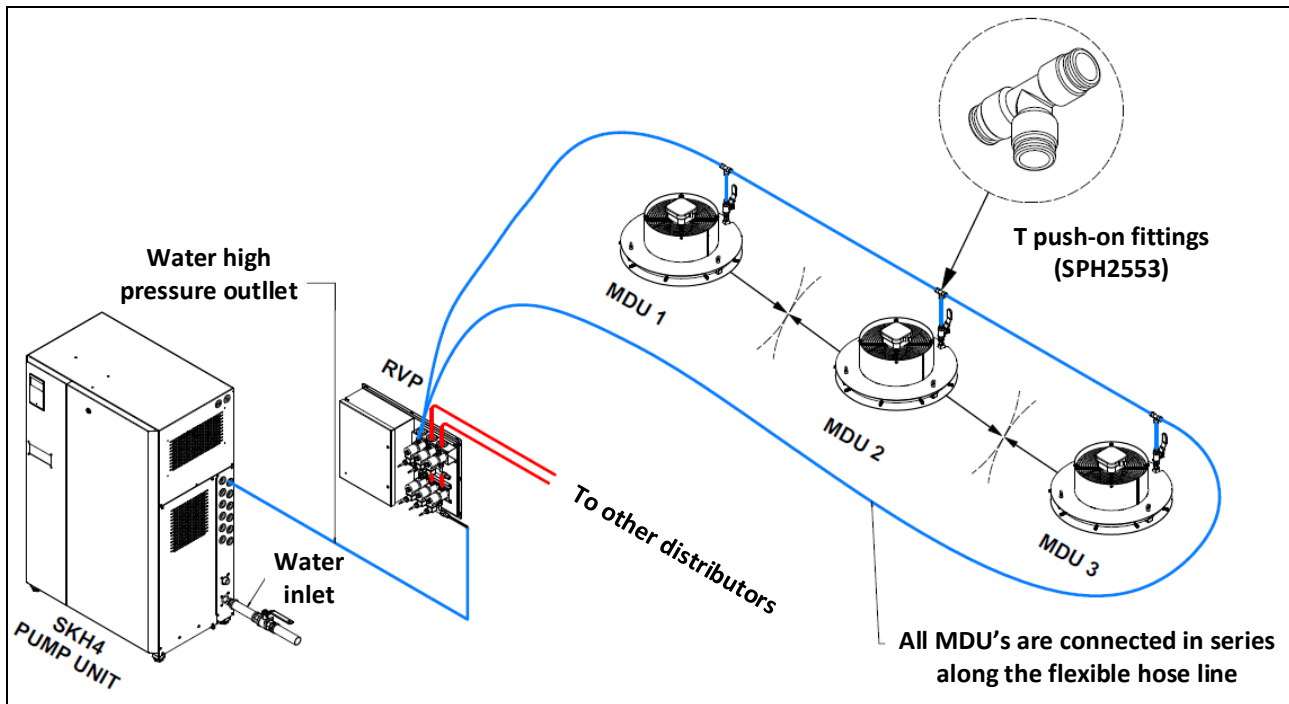
An in-space hydraulic network is made up of piping that starts at the stage valve and ends at the drain valve. Along this pipe run, fan assisted distributors can be placed in order to spray directly into the area by placing tees along the main line.

- Plan a location that is easy to access and permits easy inspection and servicing of the nozzles.



Always be mindful of the potential risk of water falling, during operation or maintenance. Do not install humidification equipment where water could cause damage to the building or to equipment.

- The type of hose used must be stainless steel tubing or flexible nylon hose. It must be appropriately sized for the flow and the in-line pressure (1000psi).
- The hoses must be maintained and attached securely and must not move when pressure is applied.
- Do not install the ramp and nozzle in a location where failure of the system could result in damage to the building structure or to other expensive equipment.
- Ensure that the mist is not directed towards and/or at risk of causing condensation on any equipment.



Fan-Assisted Distributors Typical Installation

Fan-Assisted Distributors Installation

Ceiling Installation

To install the MDU to the ceiling, connect two metallic suspension cables (not supplied) to the three rings. Verify the strength of the cables and ensure that they can support the weight of the distributor (see table) before commencing installation.

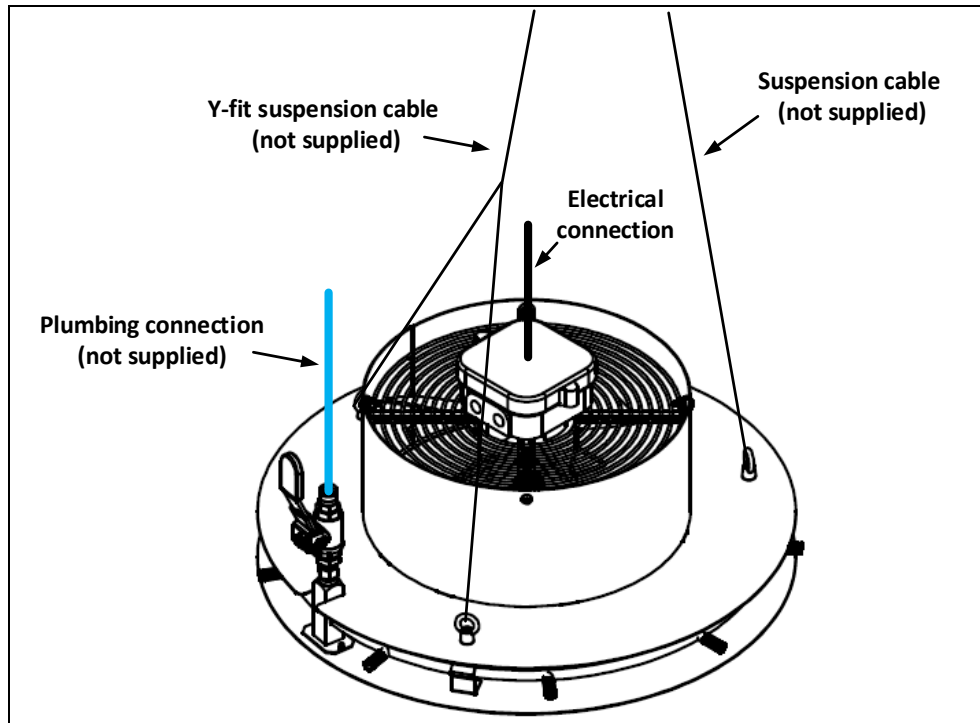


Illustration 2 - MDU Ceiling Installation

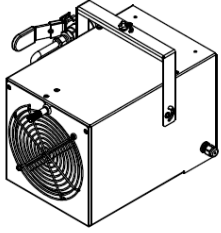
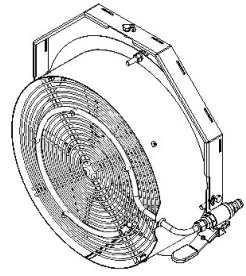
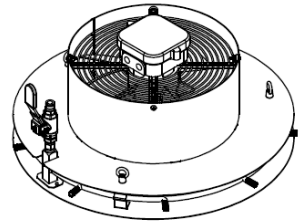
Wall Installation

To install the distributor to the wall, fasten with screws (not supplied) to a suitable location:

- Check the solidity of the chosen support or wall (brick, concrete, or stud partition wall) on which the distributor remote panel will be mounted.
- Drill holes matching the hole of the support into the support or wall (anchors not supplied):
- Ensure that the hole dimensions (diameter and depth) adhere to the recommendations of the chosen anchors.
- Affix screws (not supplied) with a minimum diameter of 0.23" (6mm) to all fixation points.
- Adjust the positioning of the distributors and lock in place using the locking hardware on the distributors.

Dimensions and Weight

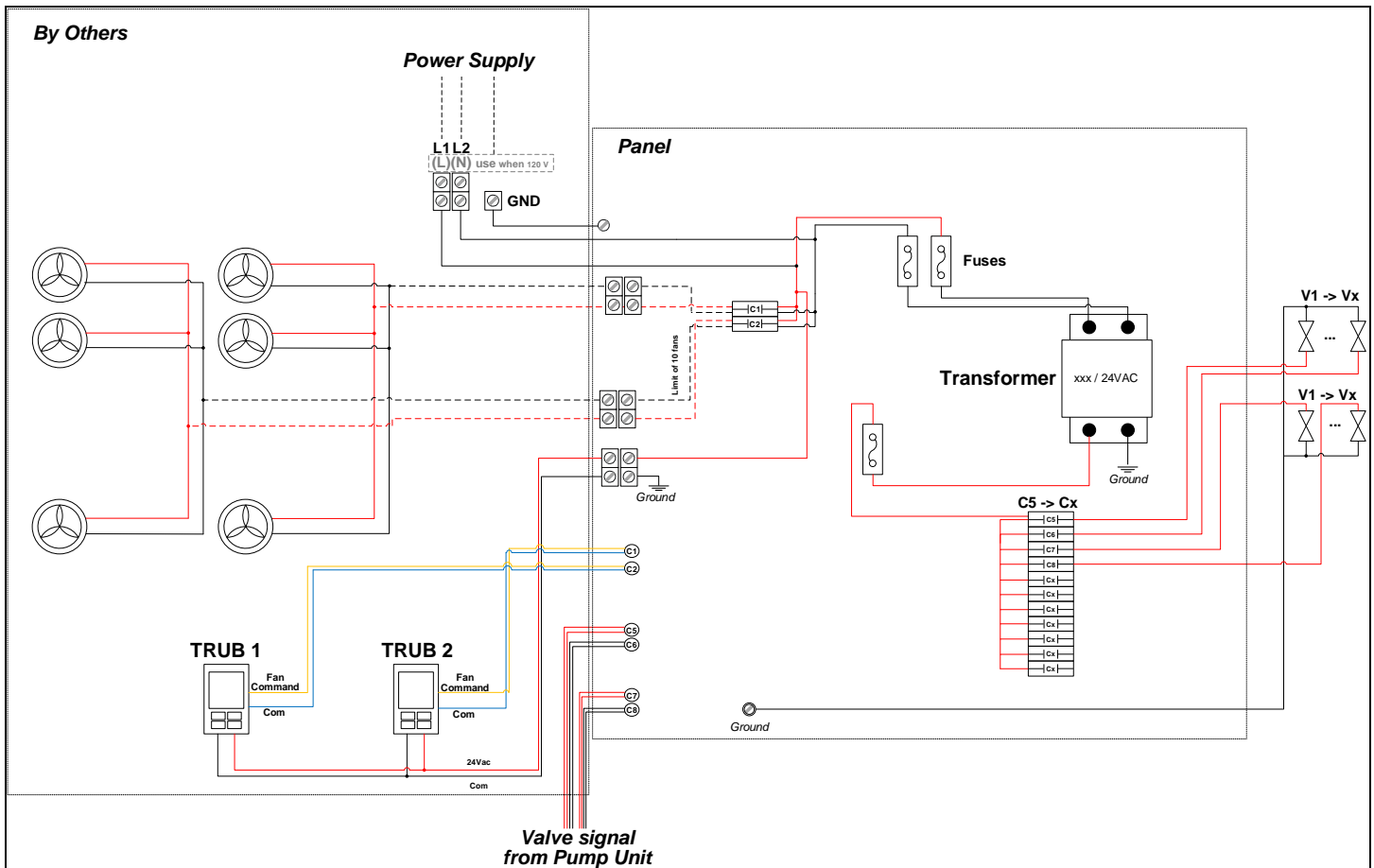
Fan-Assisted Distributors Dimensions and Weight

Model	Nozzle Capacity	Dimensions (in) [mm]	Weight (lb) [kg]	Mounting	Illustration
ADU (Axial)	1 (6.6lb/h to 10lb/h) [3l/h to 5l/h]	12.14 x 9.4 x 10.5 [308 x 239 x 267]	8 [3.6]	Wall mounted	
	5 (33lb/h to 50lb/h) [15l/h to 25l/h]	Diameter 18.3 x 8.4 [465 x 213]	17 [7.7]	Wall mounted	
MDU (Radial)	9 (60lb/h to 90lb/h) [27l/h to 45l/h]	Diameter 20.3 x 9 [516 x 229]	22 [10]	Suspended	

Fan assisted Power Supply Connections

To connect the power to the fan assisted distributors, the power line must be routed through the RVP to be controlled by the controller.

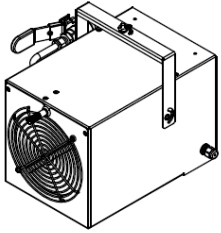
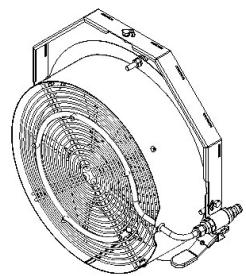
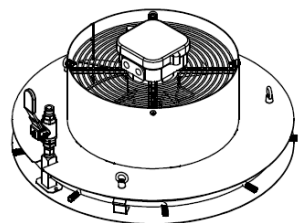
The TRUB or BMS, needs to send a 24VAC signal in order to start the fans before humidification (Refer to the TRUB instructions to see the configuration for the SKH4 in-space distribution). That signal activates the fan relay (highlighted in yellow). Wire this according to the number of fans used in the system.



Connections Wiring Diagram

Capacities and Power of the Fan-Assisted Distributors

Table 1 - Fan-Assisted Distributors Capacity and Power

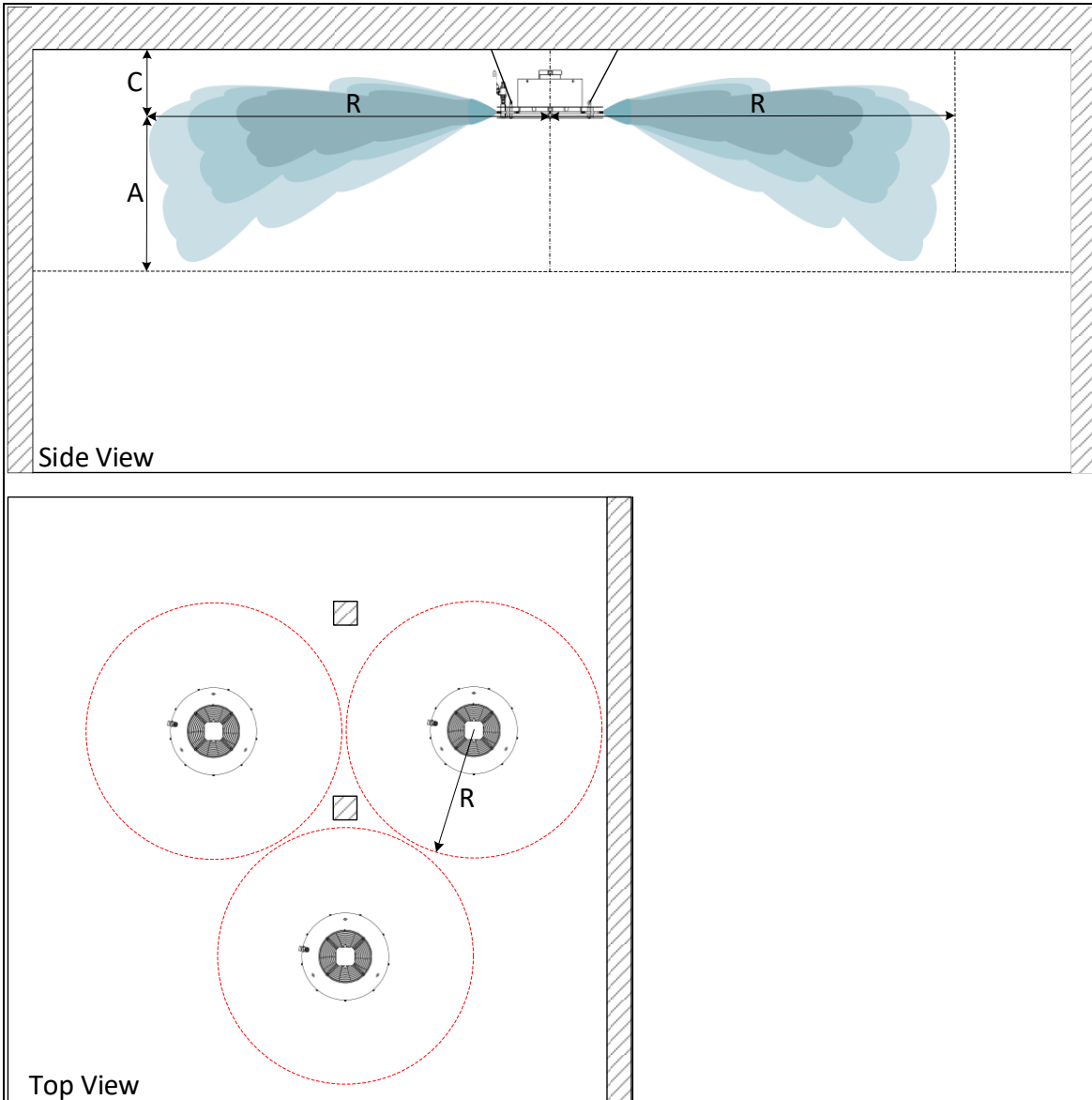
Model	Nozzle Capacity	CFM	Voltage	MCA (A)	Mounting	Illustration
ADU (Axial)	1 (6.6lb/h to 10lb/h)	200	120V (60Hz)	1.1	Wall mounted	
			240V (60Hz)	0.6		
ADU (Axial)	5 (33lb/h to 50lb/h)	1000	120V (60Hz)	1.8	Wall mounted	
			240V (60Hz)	0.6		
MDU (Radial)	9 (60lb/h to 120lb/h)	1000	120V (60Hz)	1.8	Suspended	
			240V (60Hz)	0.6		

The relays used in the RVP have a maximum rating, the standard being 8A per relay. Ensure to validate the size of the relay at the installation. Use this table in order to size and determine the maximum number of fans per relay. The jump activation signal comes from the controller and is directed to all the relays associated within the same zone.

Radial Mist Dispersion Unit (MDU-1000) – Clearances



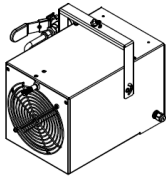
	Feet	Meter
A - Minimum clearance under the MDU:	13	4.0
C - Minimum clearance above the MDU:	3	0.9
R - Minimum radial clearance around the MDU:	16	5.0



Examples of Clearances

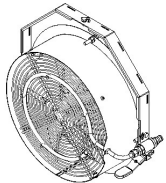


Axial Dispersion Unit – Clearances



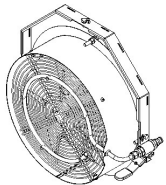
ADU-200

	Feet	Meter
A - Minimum clearance under:	8	2.4
B - Minimum clearance in front:	13	4.0
C - Minimum clearance above:	2	0.6
D - Minimum clearance behind:	1	0.3
E - Minimum clearance on either side:	5	1.5



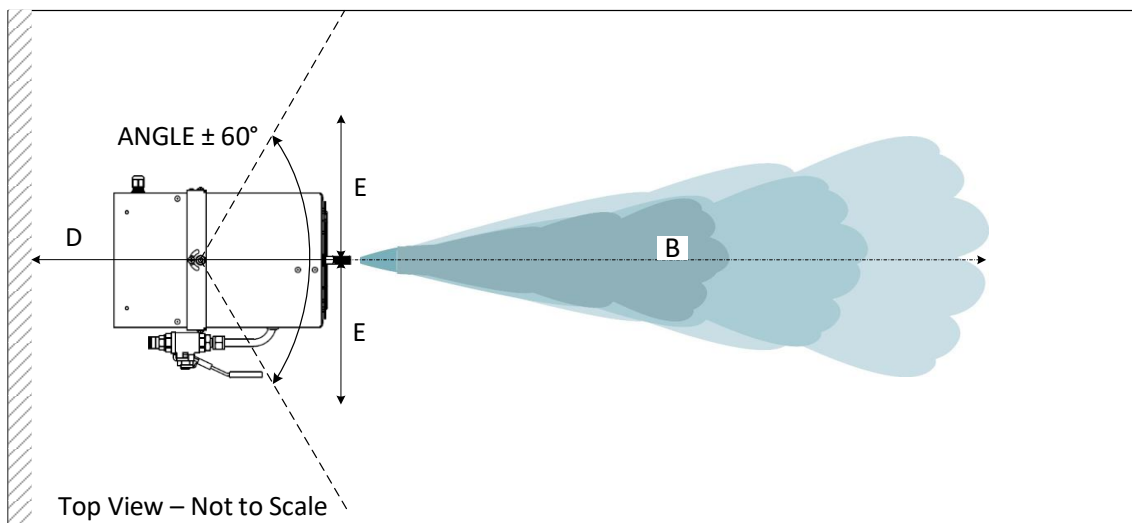
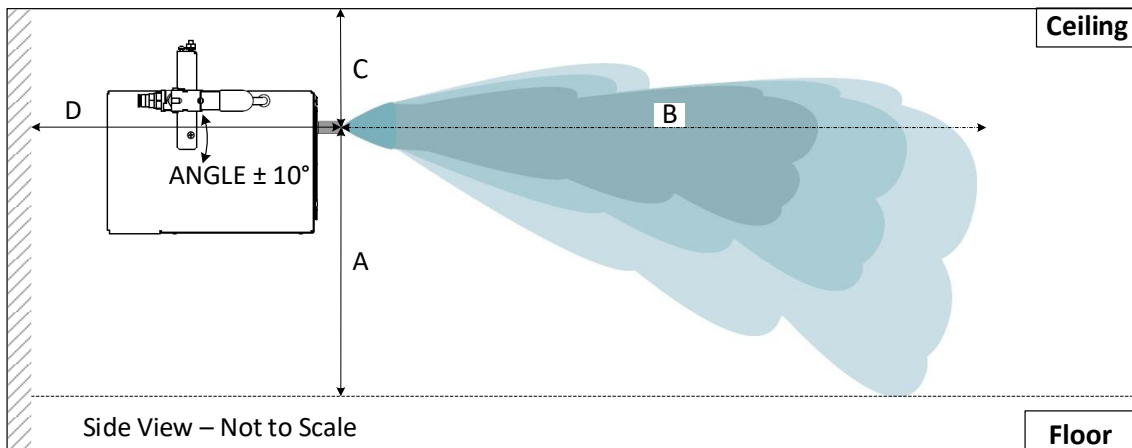
ADU-1000

	Feet	Meter
A - Minimum clearance under:	10	3.0
B - Minimum clearance in front:	26	8.0
C - Minimum clearance above:	3	0.9
D - Minimum clearance behind:	1	0.3
E - Minimum clearance on either side:	8	2.4



ADU-2000

	Feet	Meter
A - Minimum clearance under:	10	3.0
B - Minimum clearance in front:	20	6.0
C - Minimum clearance above:	3	0.9
D - Minimum clearance behind:	1	0.3
E - Minimum clearance on either side:	6.5	2



Examples of Clearances

Start-Up Procedure

Once the installation is complete, follow this start-up procedure in order to ensure that the SKH4 High-Pressure Atomizer is ready for normal operation. We strictly recommend following this procedure in order to avoid any anomaly resulting from inaccurate installation of the components.



Initial verification and start-up must be carried out by suitably qualified personnel.

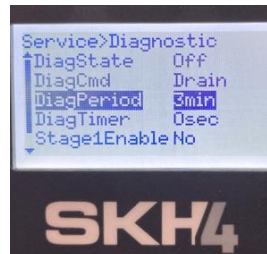
Initial Verification

- | | |
|-------------------|---|
| Clearance | 1. Ensure that the humidifier cabinet is installed in a location where it can be serviced correctly. <input type="checkbox"/> |
| | 2. Ensure that the pump station is installed in a temperature-controlled environment of less than 86°F (30°C). Verify that the pump station is fixed securely to the ground and that it remains stable. <input type="checkbox"/> |
| Mechanical | 3. If an in-duct spray system is used, ensure that the nozzle rack assembly is correctly installed within the AHU. <input type="checkbox"/> |
| | 4. If an MDU or ADU is used for in-space spray distribution, ensure that it is correctly installed and secured onto the ceiling. <input type="checkbox"/> |
| | 5. Verify that the pump station water connections are installed properly: |
| | a) Ensure that water is supplied to the humidifier and that an isolation valve is installed on the water line. With the water isolation valve turned on, verify that there are no apparent leaks. <input type="checkbox"/> |
| | b) Ensure that the pan drain outlet is properly connected to a flexible hose and that it is directed towards an open drain. Verify that the water drainage is not obstructed. <input type="checkbox"/> |
| Hydraulic | 6. Verify that the zone hydraulic connections are installed properly: |
| | a) If an in-duct spray system is used, ensure that all nozzle ramps are properly connected and assembled onto the rack assembly. <input type="checkbox"/> |
| | b) If a standard in-space spray distribution system is used, ensure that all nozzles within the ramp have been connected in series and that they are properly secured. <input type="checkbox"/> |
| | c) If an in-space fan-assisted spray distribution system is used, ensure that all units are connected in series and that they are properly secured. <input type="checkbox"/> |
| | d) Ensure that isolation valves are opened on all the fan-assisted distributors <input type="checkbox"/> |
| Electrical | 7. Verify that the power supply (voltage) conforms to the appliance name plate on the side of the humidifier. <input type="checkbox"/> |
| | 8. Ensure that the Interlock is properly connected to the controller. If Interlock is not used, verify that a jumper is connected between terminals TB3 1&4. <input type="checkbox"/> |
| | 9. If a room or duct humidistat is used, verify that it is fixed securely to the wall or duct and to the pump unit, respectively, and ensure that it is properly connected to the controller. Verify that the setpoints and the address are properly adjusted. <input type="checkbox"/> |
| | 10. If a TRUB is used, verify that it is fixed securely to a support or wall located within the desired zone and ensure that it is properly connected to the pump unit. Verify that the setpoints are properly adjusted. Refer to the TRUB documentation for more information. <input type="checkbox"/> |

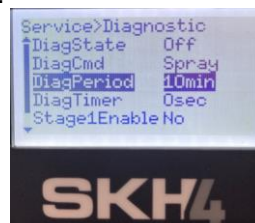
Start-Up

1. Proceed to start-up the humidifier, as follows:
 - a) Remove the Front door and Right door (located on the right side of the front of the humidifier cabinet), in order to gain access to the high-pressure pump.
 - b) Ensure the zones and the number of stages are configured, and the stage valves are connected to the hoses properly.
 - c) **Important!** If the pump unit is stainless steel, loosen the top hex socket screw of the pump in order to bleed the air (see yellow label). This needs to be performed during the drain until the output is clear of any air bubbles, while the pump is running at a low speed. This will spill a bit of water as the air is pumped out in the output and through the valve.
 - d) Press the Menu button ✓ to access the Main Menu screen and enter the password 4433 (Installation level). Navigate to the **Service** menu. Then, select the **Diagnostic** mode and set **DiagPeriod** to 3 minutes and set **DiagCmd** to **Drain** and set **DiagState** to **On**, to start the drain sequence.
 The system will then start draining.
Warning! This mode disables alarms to give the user full control. To turn off diagnostic mode, exit the menu, or off button, to change **DiagState** to **off**.
 - e) Press the Menu button ✓ to access the Main Menu screen and enter the password 4433 (Installation level). Navigate to the **Service** menu. Then, select the **Diagnostic** mode and set **DiagPeriod** to 3 minutes and set **DiagCmd** to **Drain** and set **DiagState** to **On**, to start the drain sequence.
 The system will then start draining.
Warning! This mode disables alarms to give the user full control. To turn off diagnostic mode, exit the menu, or off button, to change **DiagState** to **off**.

Start-up



- f) Important! If the pump unit is Stainless Steel, once it's free of air, retighten the top hex socket screw of the pump while it's running to seal off the bleeding port. The drain sequence automatically stops after 3 minutes, it can be restarted again if the pump has not been bled.
- g) If the drain is successful and no leaks are detected, the system can be tested at a high pressure.
- h) Change the DiagCmd to Spray and enable each stage, individually at first since the connections and distributions nozzles need to be inspected for leaking and spraying
- i) Set DiagPeriod to 10 minutes and set DiagState to On to start the high pressure spray sequence.

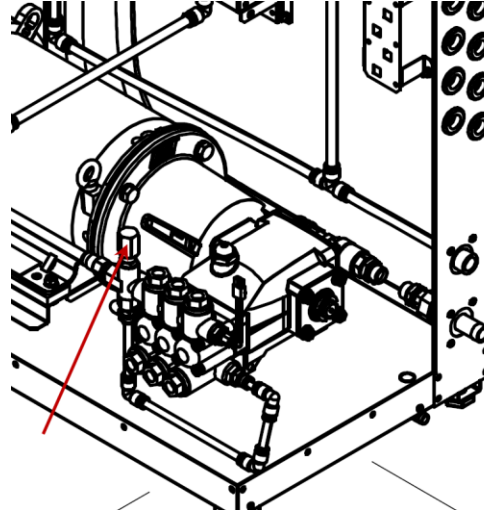




- j) Check the pressure reading on the controls. Pressure should be stable after the air was evacuated from the line.

Warning! This could result in nozzle spitting big water droplets at first.

- k) If the pressure reads <1000psi, slowly turn the high pressure unloader on the pump clockwise until a value of 1000psi is displayed in the Pressure on the Home screen and also on the high pressure manometer located on the front of the unit. The spray sequence of the diagnostic mode will stop automatically after 10 minutes.




Start-up



- Verify that all nozzles within the activated stage are spraying correctly and that the pressure is stable at 1000psi.

Warning! With the low and high pressure flush, depending on the installation piping, there can be a lot of particles that will be cleaned of the system and can clog nozzles and valves. Verify that all the nozzles close properly.

- Do steps d) through j) with all the remaining stages (except bleeding, that steps only needs to be done once).
- Exit diagnostic mode. Turn on the humidifier by pressing and holding the Power button  for 3 seconds. Verify that the power display LED light is turned on. If there's a demand for a zone, the unit will start.
- Check the Home screen that the **Pressure** is at **1000 psi**, **ControlState** is **Normal**, **State** is **Spraying** If there is any **Alarm** appears, verify the list of Alarms and possible causes provided in the manual.

Safety test

- 2. Check the location of the Airflow switch in the system and its operation by stopping the fan. With no air movement in the AHU, the humidifier should automatically stop.

- 3. Reset the Airflow switch if needed.

- End** 4. The humidifier is now ready for normal operation.

Diagnostic mode

If required, a diagnostic mode is accessible through the Service menu, the diagnostic mode allows manual activation and override of the SKH4. It's possible to activate each stage without any demand to the pump. This allows for inspection, purging the air out of the line and validation of operation of a particular stage.



Alarms and interlocks coming from zone(s) are bypassed while manual override is active.

Enter the mode from the Service, Diagnostic mode. The function allows to select the action to drain or to pressurize the stage(s) selected below, and then to turn the action on or off.

First, select the command type (Spray or Drain), set desired time for test, and enable or disable the desired stage(s) manually. To turn on the action, change the DiagState to ON.

Going out of the menu, changing Command type or the end of Period will turn the State back to Off. The exiting of the diagnostic state sends the SKH4 to its regular Off state.



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