Project Information

Project Number:	SK190030015
Project Name:	Radient Technologies
Project Date:	03/01/2019
Customer Name:	
Customer Address:	
Customer Purchase Order Number:	
Location:	
Engineer:	
Agent (Salesperson):	Exel Systems Inc. / Vic Carriere
Notes:	

Product and Option Schedule:

		Tag		
Air Conditions		H-1(for AHU-7)	H-2(for AHU-8)	H-3(for AHU-9)
External	Temperature	-29.20°F	-29.20°F	-29.20°F
Indoor	Temperature	70.0°F	70.0°F	70.0°F
Outdoor Air		Mechanical	Mechanical	Mechanical
Mechanical	Total Air Flow	12700CFM	11000CFM	12000CFM
	Outside Air	50%	50%	50%
Humidifier Selection				
Humidifier Capacity		210.0lb/hr	155.0lb/hr	180.0lb/hr
Humidifier Model		SKG4N2101NAW	SKG4N1551NAW	SKG4N1801NAW
Signal		Modulating	Modulating	Modulating
Power				
Voltage/Phase/Cycle		120/1/60hz	120/1/60hz	120/1/60hz
Amperage		6A	6A	6A
Dispersion Selection				
Dispersion Model (# of tubes)		Multi Steam (15) H	Multi Steam (11) H	Multi Steam (12) H
Absorption distance		13"	13"	13"
Controls and Accessories		LO Hose 3-1/8, MF Multi-Steam-SD, NF SHS80, SW APS, SW SKGHEATER-A6	LO Hose 3-1/8, MF Multi-Steam-SD, NF SHS80, SW APS, SW SKGHEATER-A6	LO Hose 3-1/8, MF Multi-Steam-SD, NF SHS80, SW APS, SW SKGHEATER-A6

Air Conditions		H-4(for AHU-1)
External	Temperature	-29.20°F
Indoor	Temperature	70.0°F
	R.H.	50%
Outdoor Air		Mechanical
Mechanical	Total Air Flow	24000CFM
	Outside Air	95%
Humidifier Selection		
Humidifier Capacity		810.0lb/hr
Humidifier Model		SKG4N8104NA
Signal		Modulating
Power		
Voltage/Phase/Cycle		120/1/60hz
Amperage		15A
Dispersion Selection		
Dispersion Model (# of tubes)		Multi Steam (12) H
Absorption distance		38"
Controls and Accessories		LO Hose 3-1/8, MF Multi-Steam-SD, NF SHS80, SW APS

Product Description

Standard Features:

CABINET: Powder coated steel cabinet. Key locked access door.

HUMIDIFIER CONTROL: Microprocessor-based controller with 128x64 pixel LCD, menu-driven configuration, and 8 configuration buttons including auto/off and drain buttons.
- User rights management to display only menu functions available to the type of user logged in
- Quick Config Menu displays only the most commonly used functions for faster and easier installation
- Independent schedules for unit operation and drain cycle
- In-field firmware upgradeable via SD card, USB or BACnet
- Simple viewing and exporting of trending log and alarm log
- BMS integration via BACnet MS/TP or Modbus
- Optional Ethernet module for BACnet IP/Modbus IP and web services for remote configuration and diagnostics

PIPING: Tubing is molded silicone eliminating junctions that could leak and allows for the use of any water type (tap, DI or RO). The plumbing assembly is equipped with a fixed 1" (25mm) air gap which incorporates supply and overflow fittings with an integral check valve to rout overflow in the event of static pressure increase.

VALVES: Inlet: Quiet solenoid. Drain: Drain pump with manual bypass.

EVAPORATION CHAMBER: Permanent cleanable 316 stainless steel chamber. For servicing, the bottom of the evaporation chamber will be easily removable with no use of tools from the evaporation chamber top by means of a clamp. The evaporation chamber bottom section is an easily cleanable vessel.

HEAT EXCHANGER AND COMBUSTION CHAMBER: Made of 316 stainless steel.

AFEC (Anti-foaming Energy Conservation): The patented AFEC system ensures proper water level control under varying water conditions (Hard, soft, RO or DI) by initiating a drain only when foam is detected eliminating the need for surface skimming.

WATER LEVEL DETECTION SYSTEM: The patent-pending water level detection system with redundancy uses three sensors consisting of a high-resolution capacitive sensor and two resistive sensors. The capacitive sensor and dual resistive sensors cross-verify their respective functions, which results in automatic self-zeroing throughout the lifetime of the humidifier. The two types of water level sensors provide redundancy; if one fails, the other sensor takes over and ensures safe and uninterrupted operation while providing a local/remote warning. A fill valve at the top of the sensors' tube flushes and cleans the sensors at every drain cycle to ensure they are free of deposits.

THERMAL PROTECTION: Three level temperature protection. The first sensor is located inside the evaporation chamber. The second is on the outside of the evaporation chamber cover and the third is located on the flue gases outlet. Either sensor will stop the humidifier if a high temperature condition is detected.

MODULATION CONTROL: Modulation is achieved though speed variation of the air/gas premix blower. Modulation is ranging from 10% to the maximum rated capacity of the humidifier.

CAPACITY REDUCTION: The maximum output can be programmed from 10 to 100% by using the MaxOutput setting.

WATER COOLER: Internal drain water to ensure drain water tempering to 140˚F (60˚C) or less.

ETL-C-US listed.

Product Description

Standard Features:

CABINET: Powder coated steel cabinet against outdoor climate with fiberglass insulation. Key locked access door.

HUMIDIFIER CONTROL: Microprocessor-based controller with 128x64 pixel LCD, menu-driven configuration, and 8 configuration buttons including auto/off and drain buttons.

- User rights management to display only menu functions available to the type of user logged in
- Quick Config Menu displays only the most commonly used functions for faster and easier installation
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- BMS integration via BACnet MS/TP or Modbus
- Optional Ethernet module for BACnet IP/Modbus IP and web services for remote configuration and diagnostics

PIPING: Tubing is molded silicone eliminating junctions that could leak and allows for the use of any water type (tap, DI or RO). The plumbing assembly is equipped with a fixed 1" (25mm) air gap which incorporates supply and overflow fittings with an integral check valve to rout overflow in the event of static pressure increase. Water supply pipe is equipped with electric heating cable to prevent the water from freezing. In conjunction with the Anti-Freeze Temperature feature, the entire unit can be maintained above the freezing temperature.

VALVES: Inlet: Quiet solenoid. Drain: Motorized pump. A normally open motorized drain valve permits draining of the evaporation chamber even during a power failure.

EVAPORATION CHAMBER: Permanent cleanable 316 stainless steel chamber. For servicing, the bottom of the evaporation chamber will be easily removable with no use of tools from the evaporation chamber top by means of a clamp. The evaporation chamber bottom section is an easily cleanable vessel.

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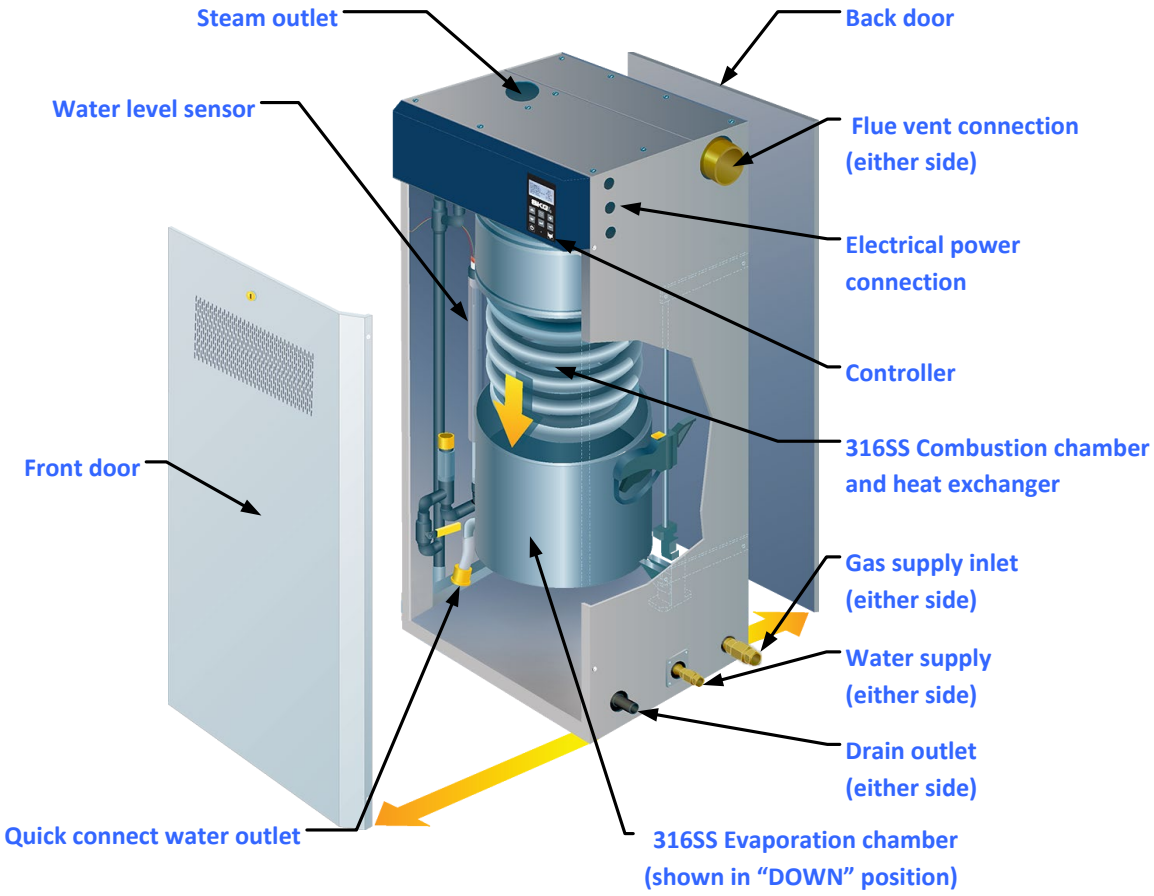
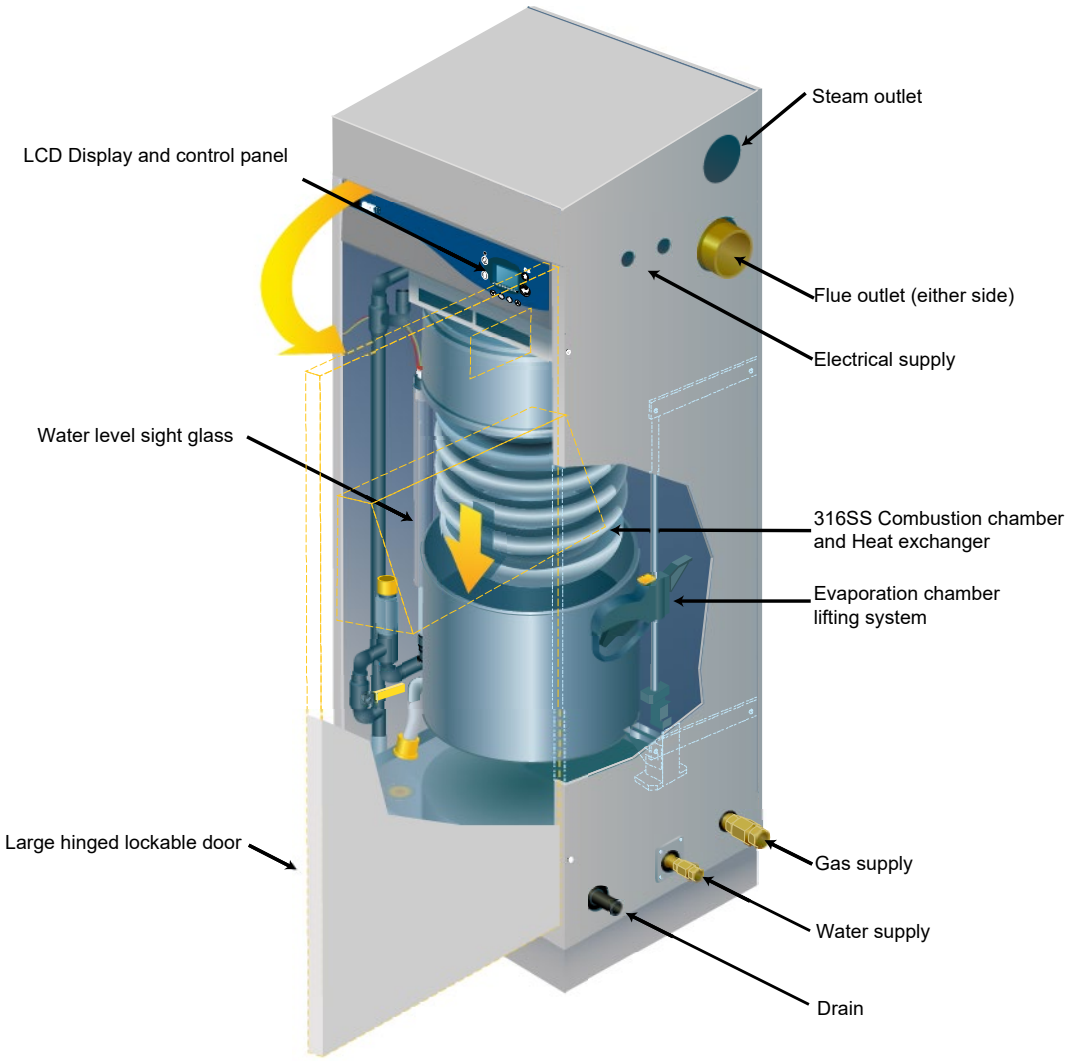
Technical Specifications



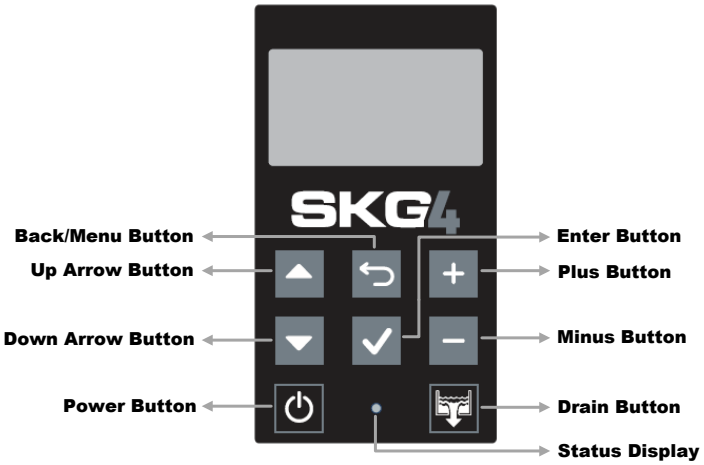
Tag	Model	No. of Modules	Steam Capacity (lb/hr)	Input Capacity / Gas (Btu/hr)	Voltage / Current	No. of Outlets	Multi-Steam Header Dia.
H-4	SKG4N8104	4	810	989692 Natural	120/15A	4	3 1/8"

Technical Specifications



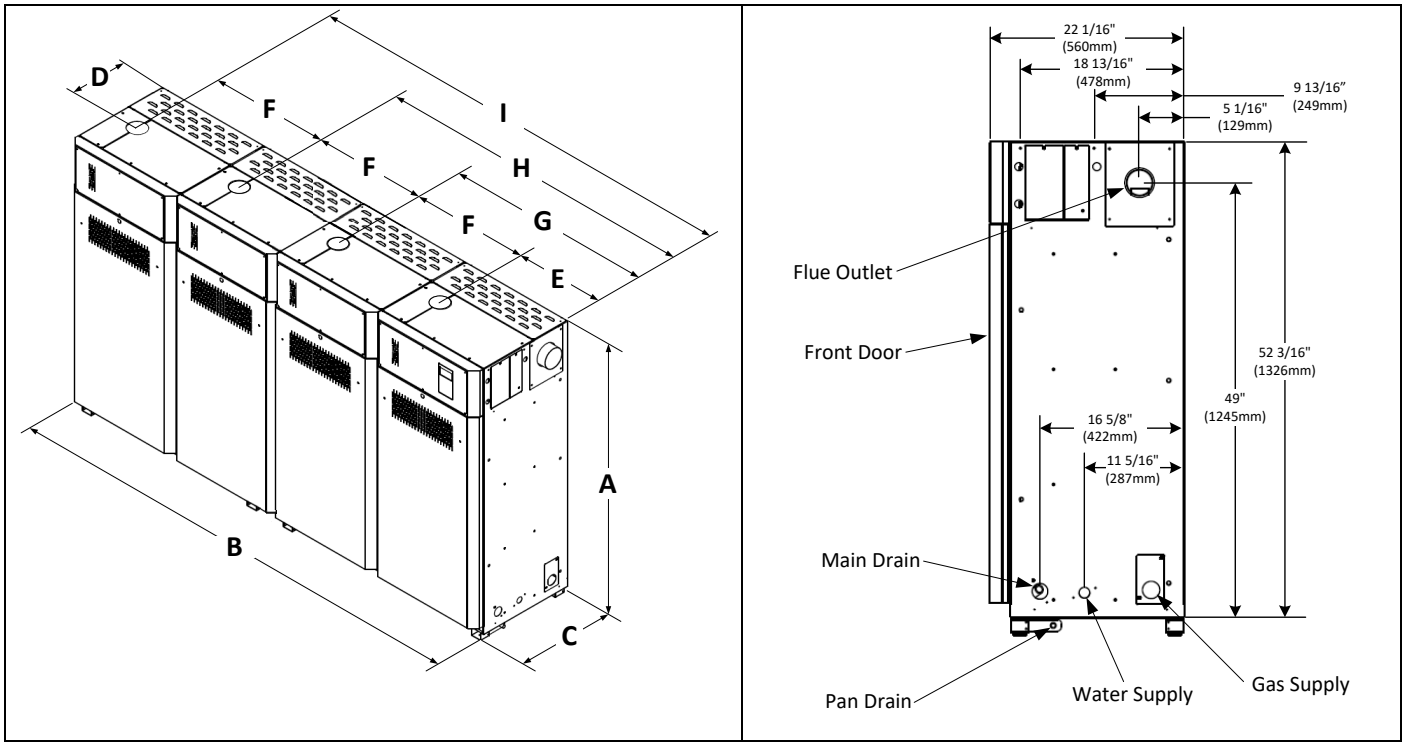
Tag	Model	No. of Modules	Steam Capacity (lb/hr)	Input Capacity / Gas (kW Natural)	Voltage / Current	No. of Outlets	Multi-Steam Header Dia.
H-1	**SKG4N2101**	1	210	247423	120/6A	1	3 1/8"
H-2	**SKG4N1551**	1	155	210052	120/6A	1	3 1/8"
H-3	**SKG4N1801**	1	180	235844	120/6A	1	3 1/8"

SKG4 Monitoring and Control Panel



Feature		Description
Status Display	☼ (Blue)	Indicates that the humidifier is turned on. The LED will begin blinking as the system is initializing.
	☼ (Red)	Indicates that the alarm is issuing a warning and that the system must be verified.
	O (Off)	Indicates that the humidifier is turned off.
Power Button	⏻	The power button is used to turn the humidifier on or off. Must be pressed and held for 3 seconds to perform the related action, in order to prevent accidental activation. Even when the humidifier is powered off, the controller remains operational.
Drain Button		The drain button is used to manually activate the drain cycle. Must be pressed and held for 3 seconds to perform the related action, in order to prevent accidental activation. Even when the humidifier is powered off, a drain cycle may be initiated. *Once the manual drain cycle is completed, the system will automatically be powered off. To turn the humidifier back on, press and hold the power button.*
Up and Down Arrow Buttons	▲ ▼	The up arrow button is used to scroll to the next menu item or parameter. The down arrow button is used to scroll to the previous menu item or parameter.
Plus and Minus Buttons	+ –	The plus button is used to increase the value of the displayed parameter. The minus button is used to decrease the value of the displayed parameter.
Back/Menu Button	⮌	The back/menu button is used to go to previous menu or to access the Main Menu page from the Idle Screen.
Enter Button	✓	The enter button is used to advance to the next sub-menu, to access the selected option or to confirm set parameter value.

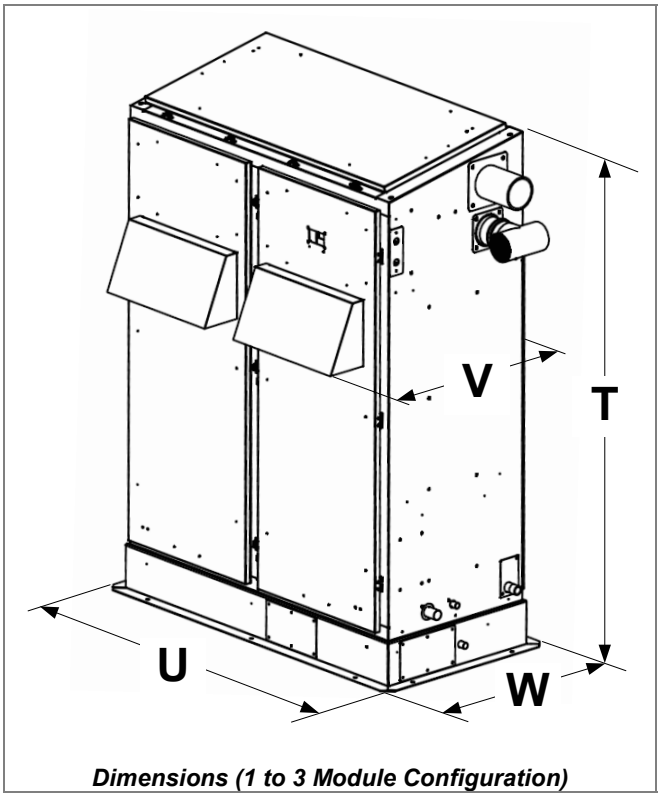
Dimensions:



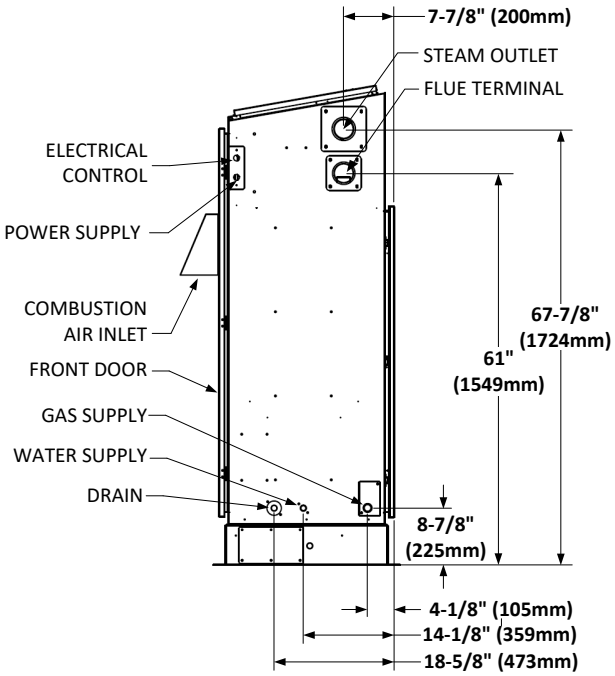
Dimensions and Weight

Tag	Model	Dimensions (in)									Weight (lb)	
		A	B	C	D	E	F	G	H	I	Empty	Full of Water
H-4	SKG4N8104	54	96	22	11	19	24	43	67	91	1270	1764

Dimensions:



Dimensions (1 to 3 Module Configuration)



Connections (1 to 3 Module Configuration)

Dimensions and Weight

Refer to Drawing No: DCDWG1 for detailed connection dimensions

Tag	Model	Dimensions				Weight	
		T	U	V	W	Empty	Full of Water
H-1	SKG4N2101	74.7	30.6	33.25	29	627	748
H-2	SKG4N1551	74.7	30.6	33.25	29	627	748
H-3	SKG4N1801	74.7	30.6	33.25	29	627	748

Positioning and Installation

General Recommendations

The SKG4 humidifier must be installed in an easily accessible location to allow proper access for inspection and servicing of the humidifier. The unit must never be installed in a location where unusual malfunction of the unit can cause damage to the building structure or to costly equipment. Typically, the total steam line length between the humidifier and the steam distributor depends on the steam line material type:

- For flexible steam hose: the total steam line length must not exceed 16 feet (5 meters). For longer distances use insulated hard piping.
- For insulated hard piping: the total steam line length is determined by the humidifier capacity: one equivalent foot for each lb/h capacity of the humidifier (0.67 m for each kg/h), with a maximum of 50 feet (15 m). For longer steam line runs, consult factory.

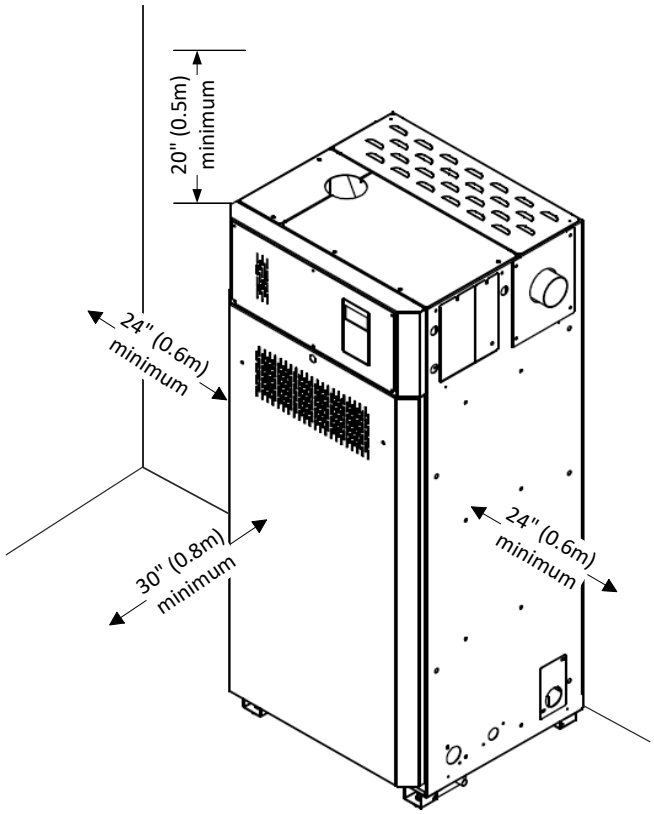
Minimum Clearances

Minimum clearances are:

- Top, 20” (0.5 m) minimum
- Both sides, 24” (0.6 m) minimum
- Front, 32” (0.8 m) minimum

Note: The above minimum clearances are indicated for inspection and servicing access. The SKG4 humidifier is designed for zero clearance to combustible materials.

The humidifier is designed to be installed directly on the floor. Adjustable legs are provided in order to ensure proper level. Provide a level, solid foundation and ensure that the floor beneath the humidifier is water proof to withstand any water spillage during servicing or in the event of a problem.



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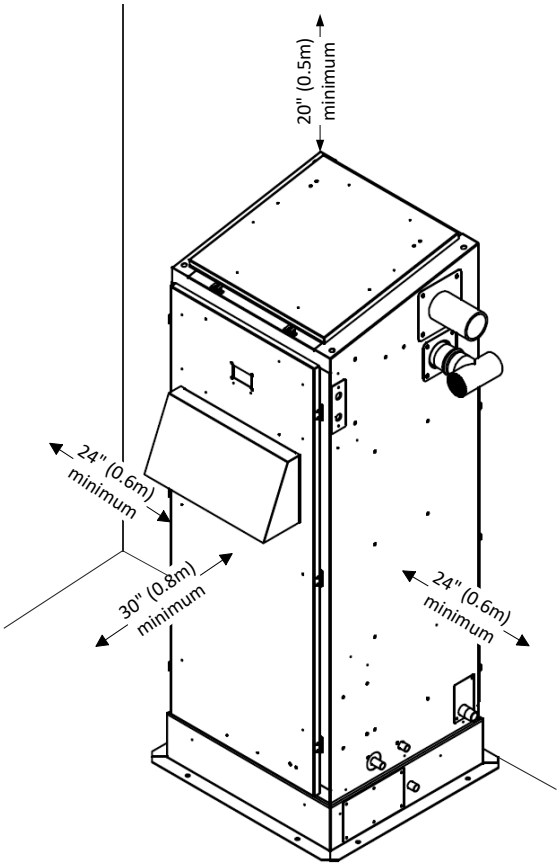
Minimum Clearances

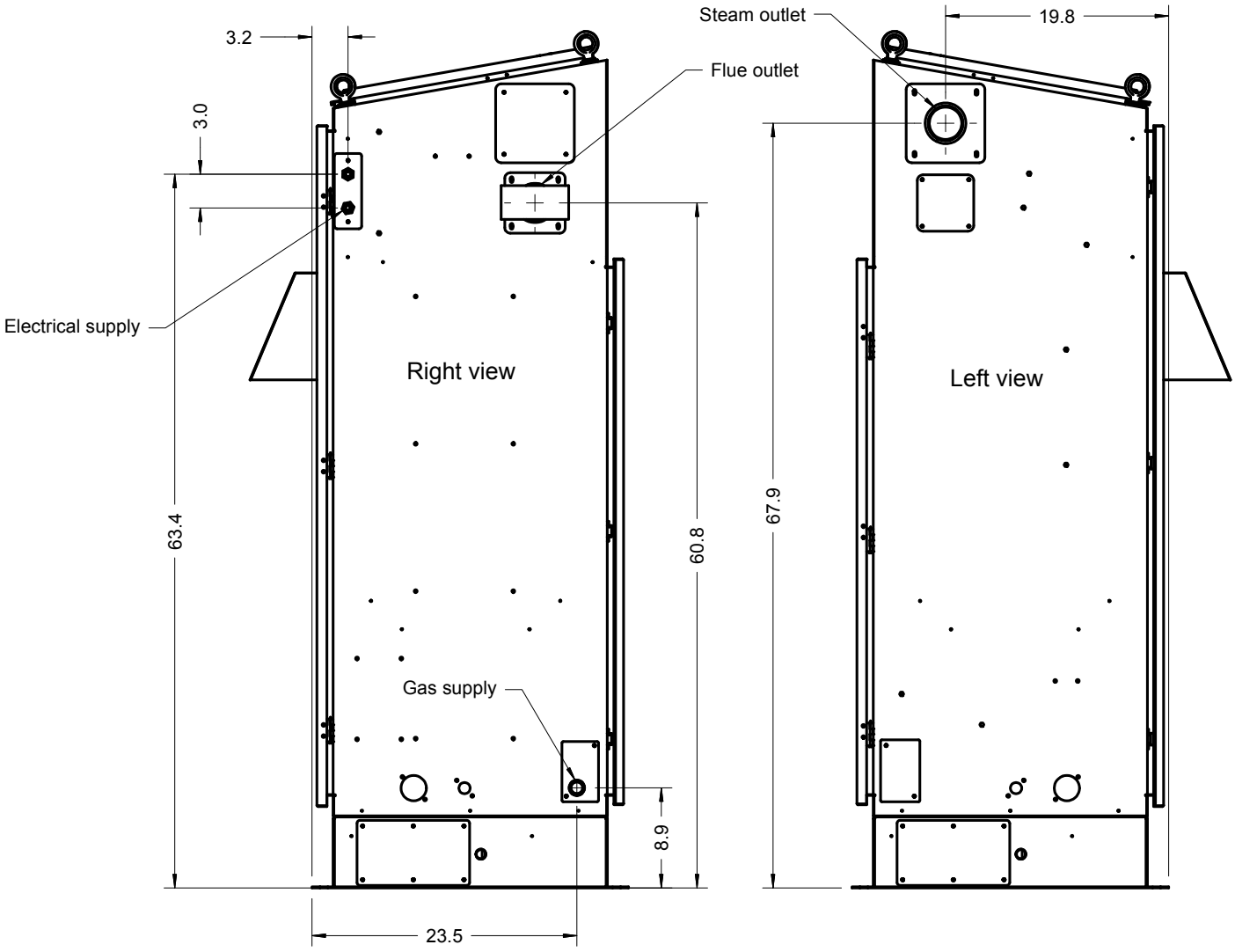
Minimum clearances are:

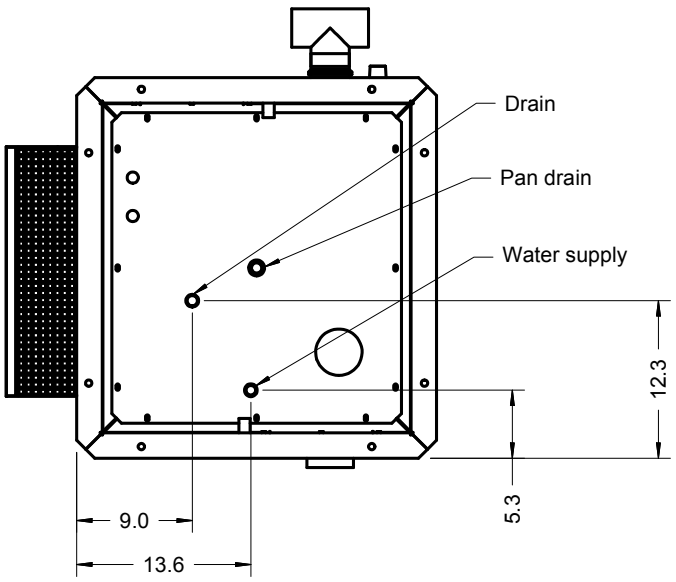
- Top, 20” (0.5 m) minimum
- Both sides, 24” (0.6 m) minimum
- Front, 30” (0.8 m) minimum

Note: The above minimum clearances are indicated for inspection and servicing access. The SKG4 humidifier is designed for zero clearance to combustible materials.

The humidifier is designed to be installed directly on the floor/roof or a curb. Provide a level, solid foundation and ensure that the floor/roof beneath the humidifier is water proof to withstand any water spillage during servicing or in the event of a problem. The base of the SKG4 humidifier must be secured to the floor/roof using ½” (12mm) diameter bolts and washers.







DRAWING NO. :	DCDWG1
DESCRIPTION :	GAS HUMIDIFIER XXXLB/HR XXXV ENC
DWG DATE :	5/3/2019
MATERIAL :	
FINISH :	
SHEET :	1 OF 1
FILE PATH :	M:\NEW_DRAWING\10-SKG4 OUTSIDE\CAPTURE IOM\SKG4W-1 - SteamL - DrainB - WaterB - ElecR - GasR - FlueR.idw

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A Revision

SCALE =

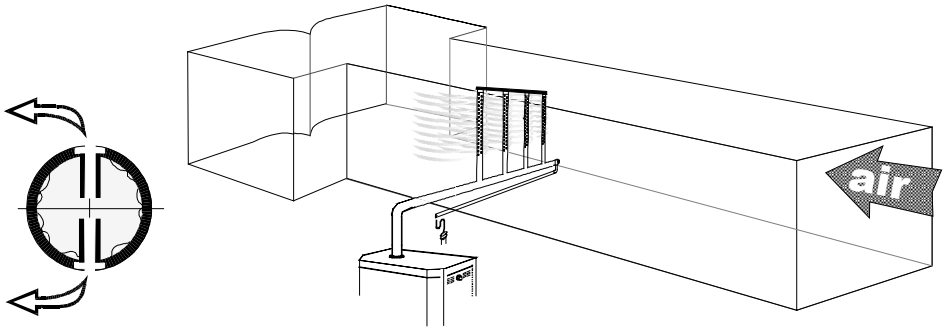
X.XX N Verification point

X.X = ± 0.03
X.XX = ± 0.01
X.XXX = ± 0.005
HOLE = + 0.002 - 0.000
DEGREES = ± 0.5°

	DATE	SYM	DESCRIPTION	DRAFT	APPR.
1	5/3/2019	A	NEW DRAWING	B.C.	
2					
3					
4					
5					
6					
7					
8					

Steam Dispersion System Selection and Positioning

Multi-Steam System



The Multi-Steam system is to be installed in critical locations in air handling systems, particularly where absorption distances are very short, less than 3 feet (900mm), or low air duct temperatures are in effect.

The Multi-Steam is custom made to the dimensions of duct or AHU. Multiple stainless steel dispersion tubes are connected to a stainless steel header. The dispersion tubes include brass insertion nozzles to prevent condensate from escaping.

Tag	Model
H-1	MF Multi-Steam 86in. x 44in. (15 Tubes) H *(to be installed on site by mechanical contractor)*
H-2	MF Multi-Steam 62in. x 44in. (11 Tubes) H *(to be installed on site by mechanical contractor)*
H-3	MF Multi-Steam 68in. x 44in. (12 Tubes) H *(to be installed on site by mechanical contractor)*
H-4	MF Multi-Steam 2X 70in. x 56in. (12 Tubes) H *(to be factory installed in Haakon AHU-1)*

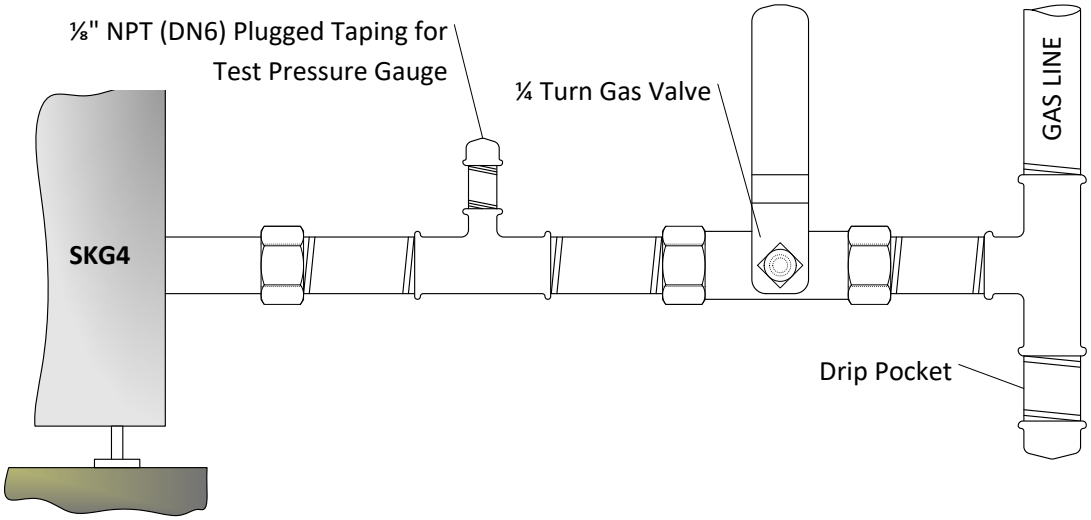
Gas Supply Connection

Gas Pipe Diameter

Model	Gas Connection Size
SKG4-N1101 to 4502	1” NPT (25mm) Male
SKG4-N5053 to 8104	1-1/2” NPT (40 mm) Male

Refer to local codes and regulations regarding the type and volume of gas handled, in order to obtain the pressure drop allowed in the gas line and to determine gas pipe diameter.

When multiple SKG4 humidifier modules are installed, consideration must be taken to total capacity, gas flow and length of main.



The gas supply pressure at the inlet pressure tap, when all burners are running, must be:

- 7” w.c. (1.75kPa) for natural gas.
- 14” w.c. (3.5 kPa) for propane and butane.

Water Supply Installation

Water Inlet Specifications

The SKG4 humidifier is designed to be used with tap, reverse osmosis and deionised water.

Maximum water supply pressure: 10 to 70 psig (70 to 480kPa)

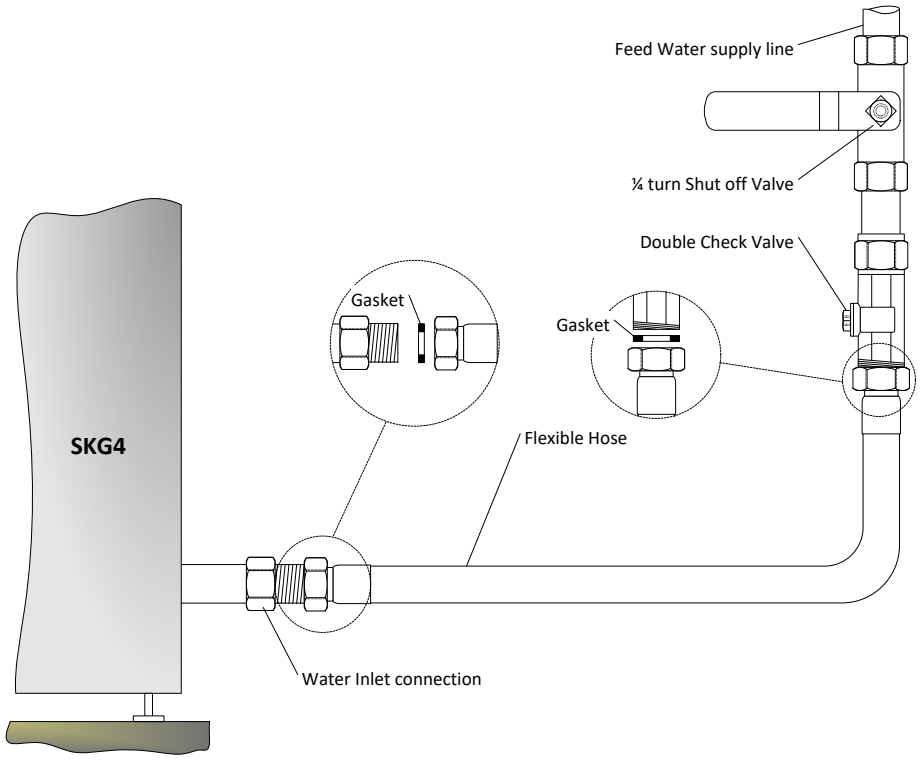
Minimum water temperature: 39˚F (4˚C)

Maximum water temperature: 104˚F (40˚C)

Water Supply Line Installation

To facilitate servicing, a shut off valve must be installed in the water line, within 40” (1 m) of the humidifier.

Model	*Water Inlet Connection Size*
SKG4-NXXXX	½” (15mm) Male



Water Drain Connection

Water Drain Specifications

Water drain temperature: 140˚F (+60˚C)

Model	*Water Drain Outlet Connection Size*	*Pan Drain Outlet Connection Size*	*Open Drain Minimum Size*
SKG4-N1101 to 2101	Ø⅞" (22mm)	Ø½" (15mm)	Ø3" (80mm)
SKG4-N2652 to 4052	Ø1 ⅜" (36mm)		
SKG4-N5053 to 8104	Ø2" (50mm)		Ø4" (100mm)

Water Drain Installation

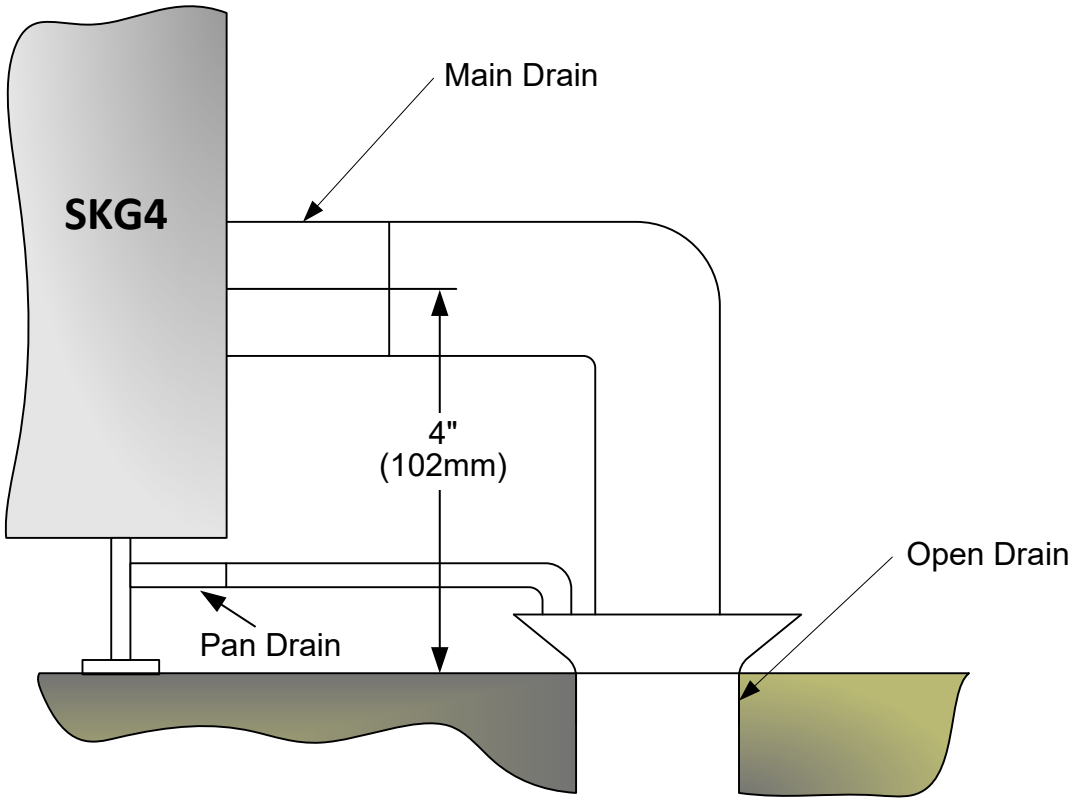
Water drain outlet connection must be connected to drain pipe of sufficient size.

It is recommended to use standard copper hydraulic pipes of sufficient size.

Minimum water drain pipe gradient must be of ¼" (6.5mm) per foot (300mm) horizontal run.

No drain trap is required.

Pan drain connection must be connected to drain pipe through separated line.



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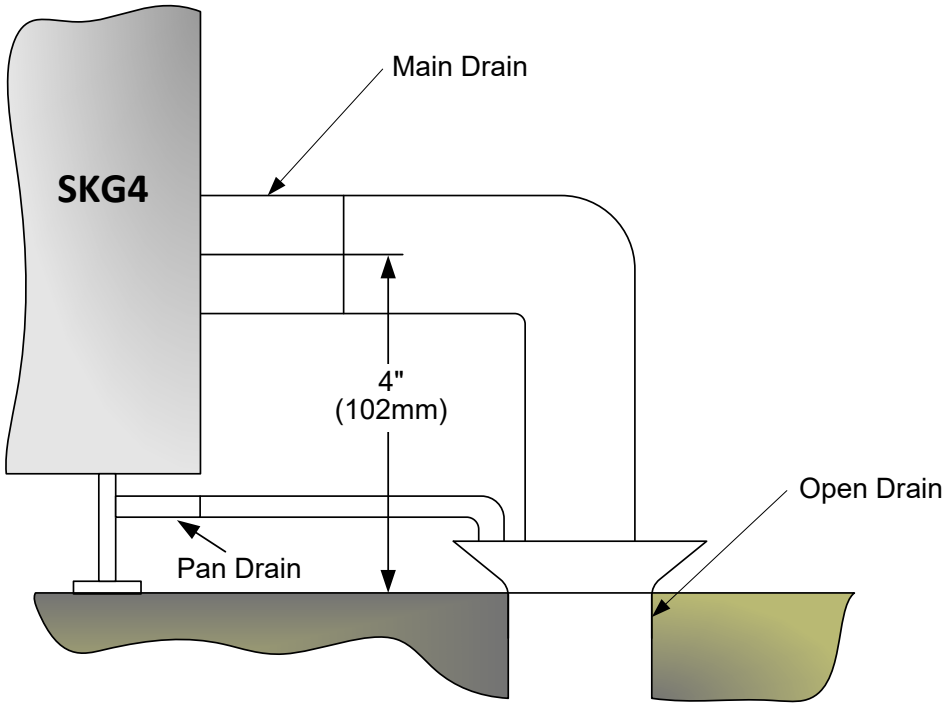
It is recommended to use standard copper hydraulic pipes of sufficient size.

Minimum water drain pipe gradient must be of ¼" (6.5mm) per foot (300mm) horizontal run.

No drain trap is required.

The weather proof enclosure is provided with a pan drain at the base of the humidifier.

Pan drain connection must be connected to drain pipe through separated line.



Water Drain Valve

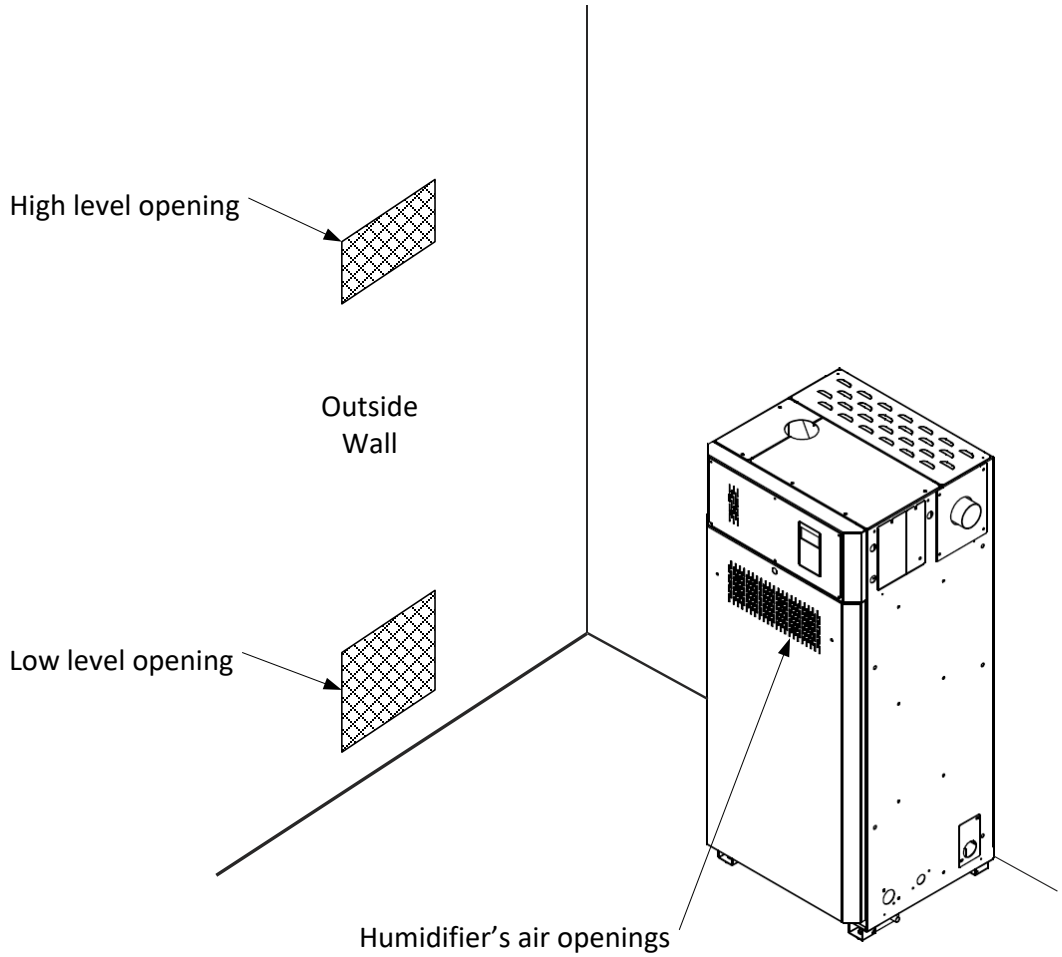
The weather proof enclosure is equipped with a normally open valve, enabling the humidifier to drain all water during a power failure, in order to prevent water from freezing within the unit.

Combustion Air

Tag	Model	Nb of Modules	Natural Ventilation Installation	
			Minimum Low Level Opening – Inlet	Minimum High Level Opening – Outlet
H-1	SKG4N2101	1	80 in²	80 in²
H-2	SKG4N1551	1	60 in²	60 in²
H-3	SKG4N1801	1	70 in²	70 in²
H-4	SKG4N8104	4	320 in²	320 in²

Note: These minimum openings section are specified for the combustion air requirement of the SKG4 Humidifier. If other gas fired appliances are installed in the same room, the openings will have to be increased to be able to supply adequate combustion air for all of the appliances.

Natural Ventilation Installation



Flue Gas Venting Connection

The SKG4 humidifier must be installed with a listed BH vent with a single or double wall system for positive pressure and condensation. The vent must be made of AL29-4C stainless steel and be air and water tight.

Approved ''BH vent'' systems

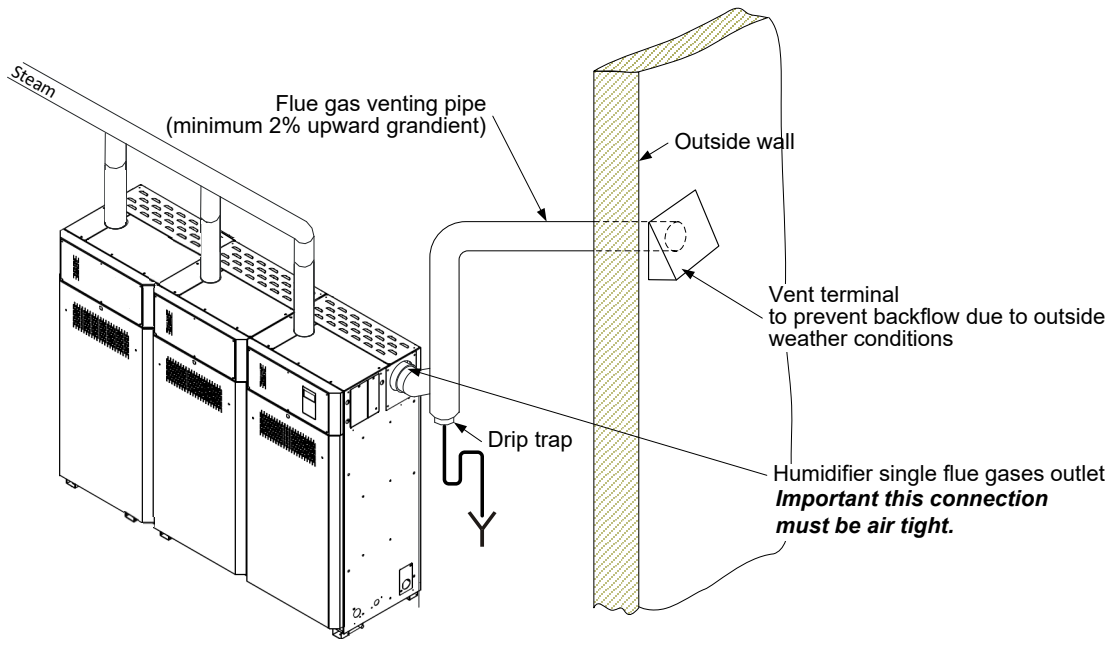
Cheminee Lining HEP, HEPL or HEPL2 rigid venting system,
Flexmaster Z-Vent Model SVE Series III rigid venting system,
DuraVent FasNSeal (single-wall) or FasNSeal W2 (double-wall) venting system,
MagnaFlex PV Model insulated flexible venting system,
Selkirk/HeatFab Saf-T Vent Model single-wall or double-wall venting system.

Flue Gas Venting Specification

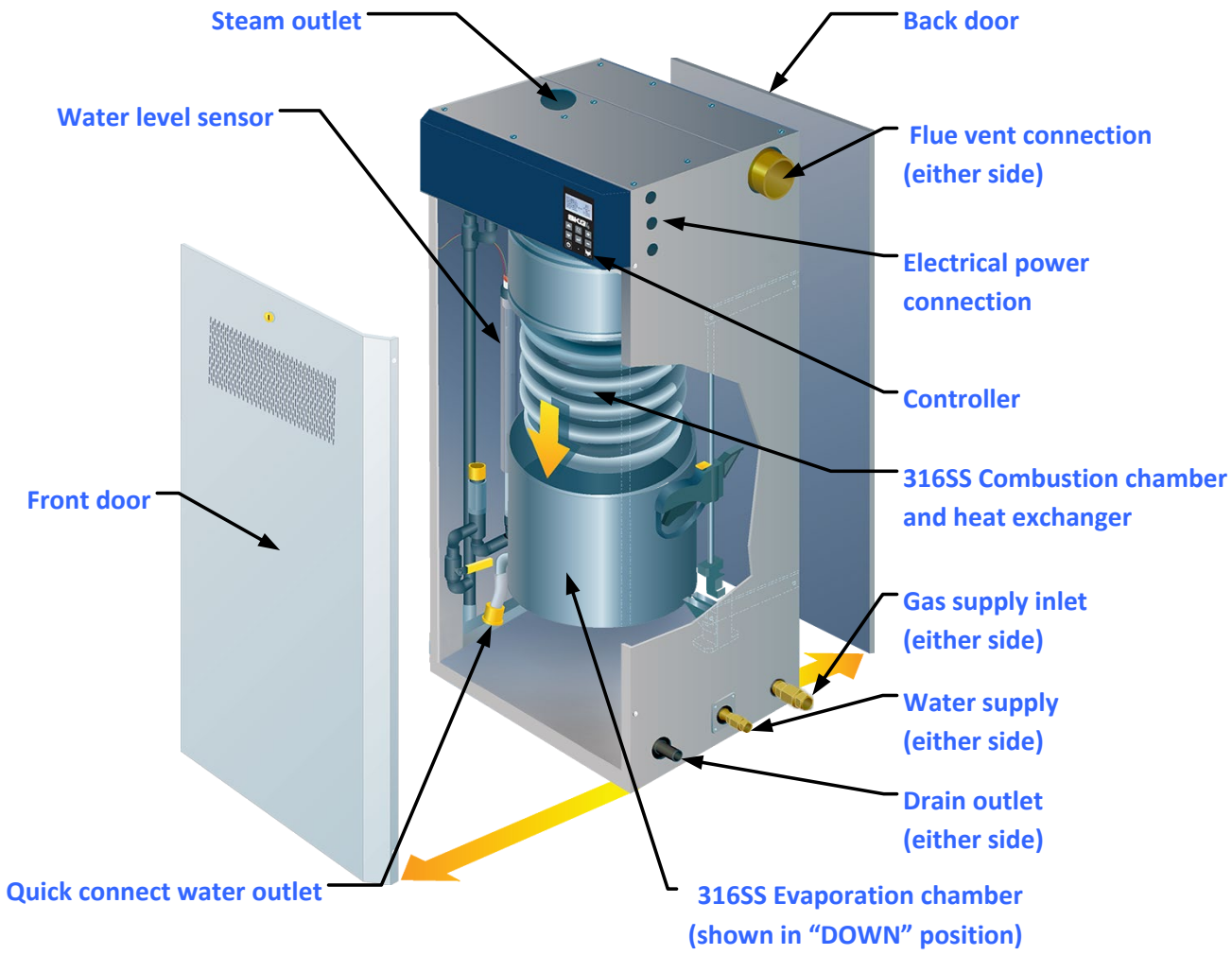
The SKG4 humidifier is a fan assisted condensing positive pressure flue gas appliance.
Maximum flue gases temperature: 392˚F (200˚C).
Maximum flue gases venting pipe length:
100ft (30m) – 10ft (3m) x (total number of 90˚elbow) – 5ft (1.5m) x (total number of 45˚elbow).

Model	Single Flue Gases Outlet Diameter
SKG4-N1101 to 2101	Ø3” (76mm) O.D.
SKG4-N2652 to 4052	Ø4” (100mm) O.D.
SKG4-N5053 to 8104	Ø5” (125mm) O.D.

Flue gas venting pipe diameter must be the same as the SKG4 flue gas connector.
Minimum flue gas venting pipe upward gradient must be ¾” (20mm) in 40” (1000mm) horizontal run or as per flue gas venting manufacturer’s instructions.
The SKG4 humidifier is a condensing appliance. As such, its high efficiency may cause condensation in the flue gas venting.
Condensate drip tee must be installed, as per flue gas venting manufacturer’s instructions.



Inlet and Outlet Locations



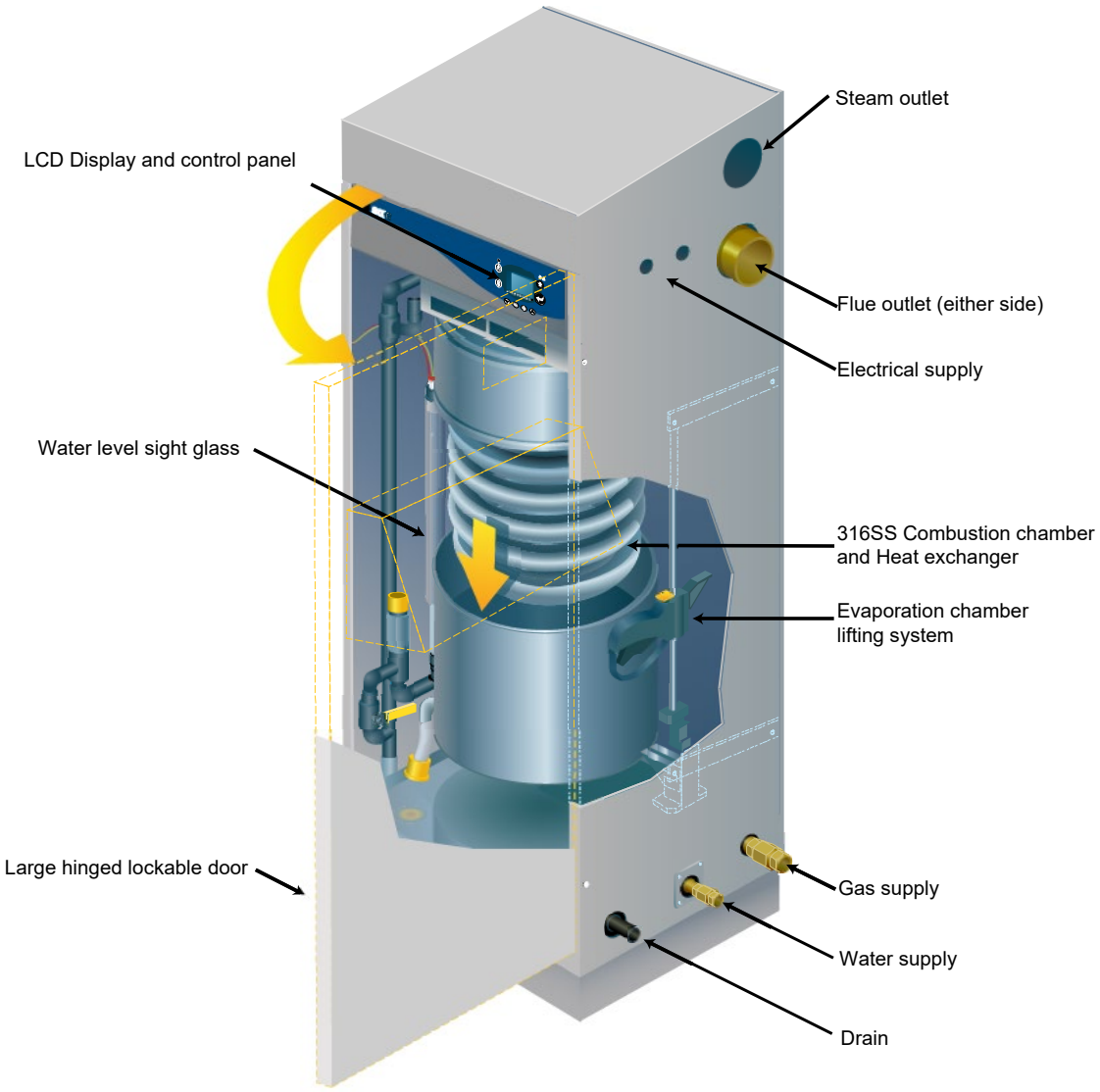
(View with right side connections)

Note: Drain outlet, water supply inlet, gas supply inlet and flue outlet are located on the right hand side of the humidifier. Left hand side location of any of these outlets or inlets is available upon request.

Connection	Right side* (standard)	Left side* (optional)
Drain outlet	☐	☐
Water supply inlet	☐	☐
Gas supply inlet	☐	☐
Flue outlet	☐	☐

* When in front of the humidifier

Inlet and Outlet Locations



(View with right side connections)

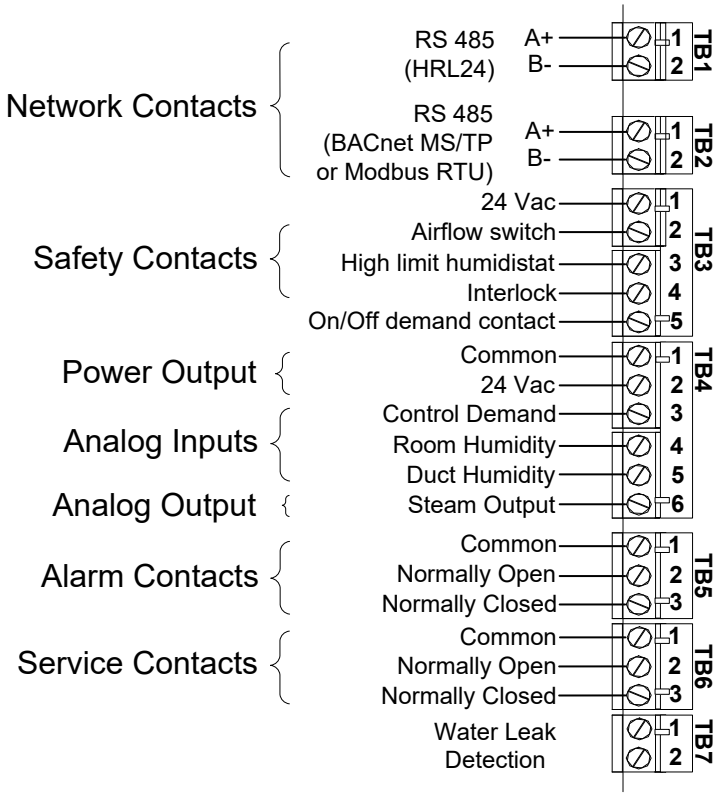
Note: Steam outlet, drain outlet, water supply inlet, gas supply inlet and flue outlet are located on the right hand side of the humidifier. Other locations of any of these outlets or inlets are available upon request.

Connection	Right side* (standard)	Left side* (optional)	Bottom (optional)
Steam outlet	☐	☒	☐ (**)
Drain outlet	☐	☐	☒
Water supply inlet	☐	☐	☒
Electrical supply inlet	☒	Not available	☐
Gas supply inlet	☒	☐	Not applicable
Flue outlet	☒	☐ (**)	Not applicable

* When in front of the humidifier
** The steam outlet at the bottom interferes with the flue outlet of the left side. This combination is not available.

Control Terminals

Electrical Control Connections



Safety Contacts

The **Airflow switch** contact must be wired between terminals TB3 1&2. If this contact opens, operation of the SKG4 unit will stop. The unit will display the airflow switch as open, but will not generate an alarm. If an airflow switch is not used, install a jumper between terminals TB3 1&2.

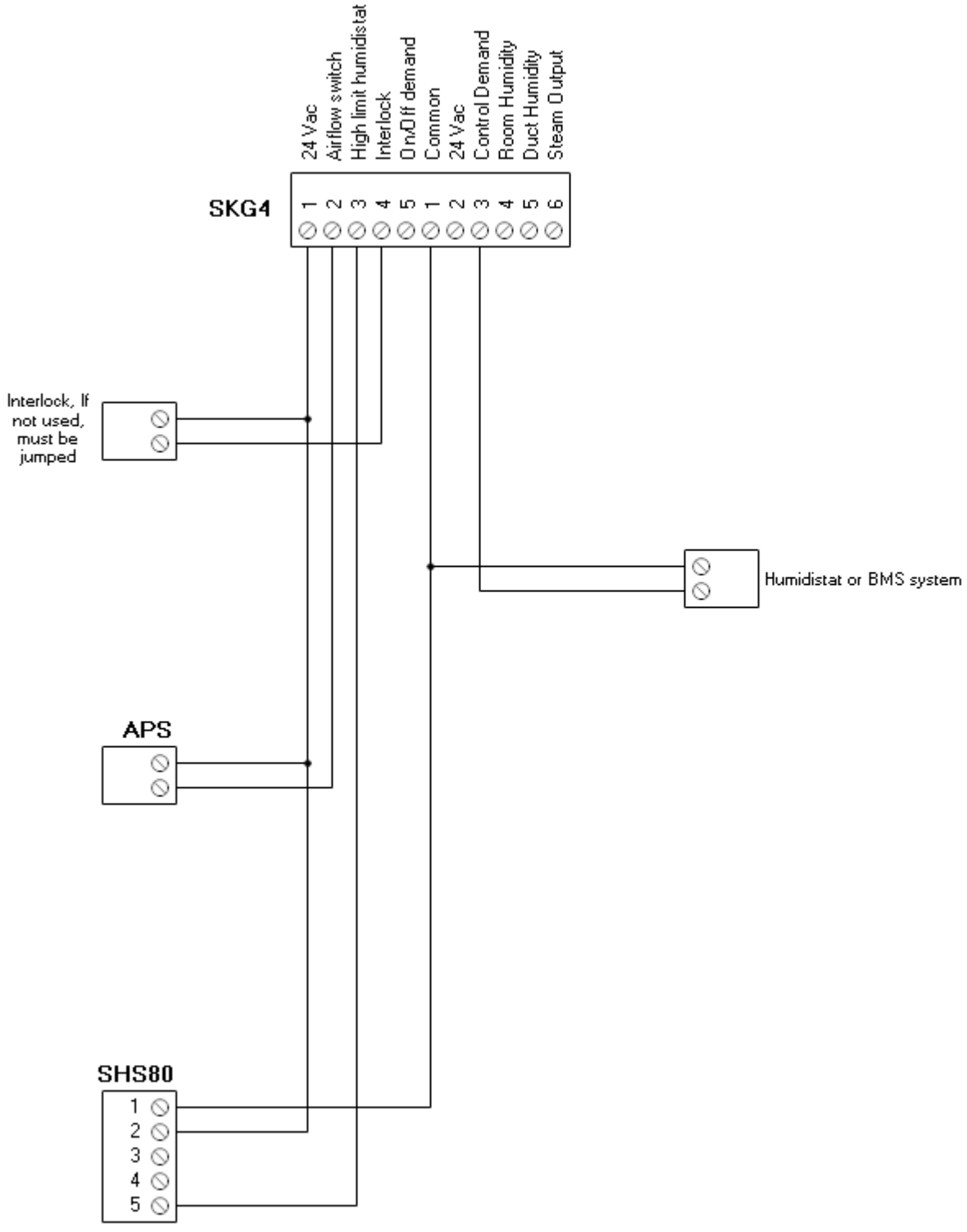
The **High limit humidistat** contact must be wired between terminals TB3 1&3. If this contact opens, operation of the SKG4 unit will stop and an **alarm** message will be displayed. If a high limit humidistat is not used, install a jumper between terminals TB3 1&3.

The **Interlock** must be wired between terminals TB3 1&4. If this contact opens, operation of the SKG4 unit will stop. The unit will display the Interlock as open, but will not generate an alarm. If Interlock is not used, install a jumper between terminals TB3 1&4.

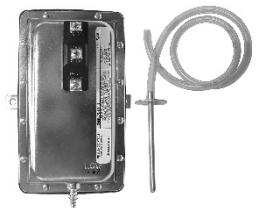
Dry Contacts

Two series of volt free contacts are provided: **Alarm Contacts** and **Service Contacts**.
Each series has one Normally Closed contact and one Normally Open contact.
These contacts are used to switch a low voltage, ideally **24V**, with a switching current of no more than **3 Amps**.
It is recommended to use the Normally Closed contact, as this contact will open in the event of a humidifier fault.

Control Wiring Diagram (H-1, H-2, H-3, H-4)



Controls & Accessories

Item	Model	Description
	SHS80	Duct mounted humidity sensor with On/Off high limit humidistat, 0-10VDC output, with an accuracy of +/-3%. Adjustable range: 20-90% RH. Built-in humidity and temperature sensor.
	APS	Air pressure switch, SPDT, 0.05"WC (1.3mmWC) set point.

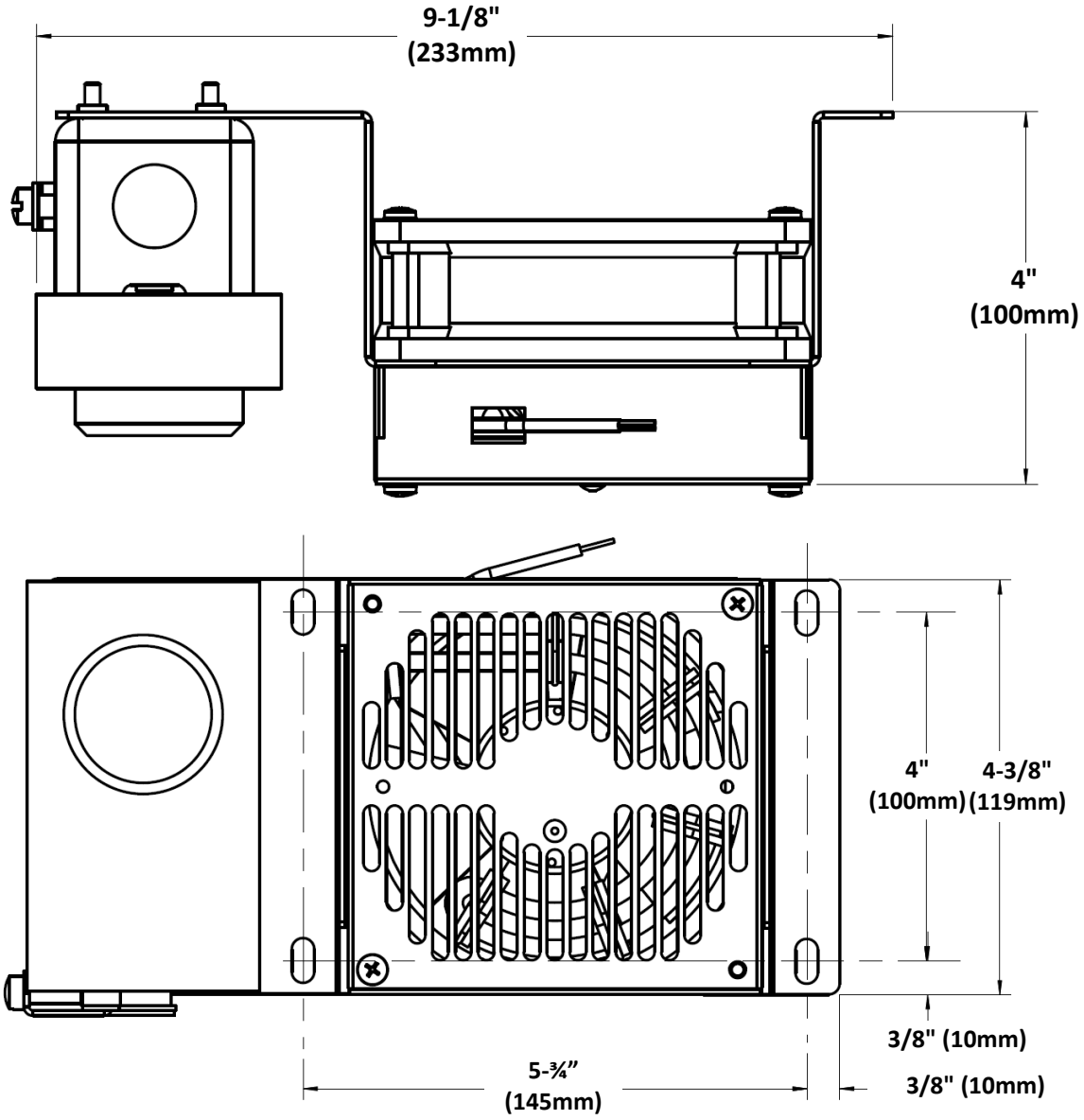
Models

SW SKGHEATER-A6
SW SKGHEATER-C6

Technical Specifications

Specifications	SW SKGHEATER-A6	SW SKGHEATER-C6
Power	600W	
Voltage	120V	240V
Current	5A	2.5A
Frequency	50/60Hz	
Air Flow	71CFM (120m^3/h)	*50Hz:* 89CFM (152m^3/h) *60Hz:* 106CFM (180m^3/h)
Fan Frame Material	Aluminum	
Fan Blade Material	Steel	

Dimensions



Wiring Diagram