2583702_C_EN_1803

GS SERIES

INSTALLATION MANUAL

Gas-fired Steam Humidifier
Condair **GS**

Humidification and Evaporative Cooling

condair

Thank you for choosing Condair

Installation date (DD/MM/YYYY):
Commissioning date (DD/MM/YYYY):
Site:
Model:
Serial number:

Contents

1 Introduction

1.1 Before You Start!

Thank you for purchasing the Condair GS humidifier.

The Condair GS humidifier incorporates the latest technical advances and meets all recognized safety standards. Never-the-less, improper use of the Condair GS humidifier may result in danger to the user or third parties, and/or damage to property.

To ensure safe, proper and economical operation of the Condair GS humidifier, observe and comply with all information and safety instructions contained in this manual, as well as all relevant documentation of components of the installed humidification system. Comply with all local and regional regulations dealing with gas, combustion air, flue gases, water, steam and electrical installations.

If you have additional questions, contact your Condair representative. They will be glad to assist you.

1.2 General

Limitations

The subject of this manual is the Condair GS humidifier. The various options and accessories may only be described in-so-far as is necessary for proper installation and operation of the equipment. Additional information on available options and accessories can be obtained in the instructions that are supplied with them.

This manual is restricted to the installation of the Condair GS humidifier, and is intended for well trained personnel who are suitably qualified for their respective tasks.

Symbols Used in This Manual

CAUTION!

The catchword "CAUTION" in conjunction with the general caution symbol is used to provide safety instructions that, if neglected, may cause damage and/or malfunction of the unit or damage to property.

WARNING!

The catchword "WARNING" in conjunction with the general warning symbol is used to provide safety instructions that, if neglected, may cause injury to personnel. Other specific warning symbols may also be used in place of the general symbol.

DANGER!

The catchword "DANGER" in conjunction with the general danger symbol is used to provide safety instructions that, if neglected, may cause severe injury to personnel or even death. Other specific danger symbols may also be used in place of the general symbol.

Other Related Publications

This manual is supplemented by other publications such as the Operation and Maintenance Manual, Spare Parts List, etc., which are included in the delivery of the equipment. Where necessary, appropriate cross-references to these publications have been added in this manual.

Storage of Manual

Keep this manual in a place where it is safe and readily accessible. If the equipment is moved to another location, make sure that the manual is passed on to the new user.

If the manual is lost or misplaced, contact your Condair representative for a replacement copy.

Language Versions

This manual is also available in other languages – contact your Condair representative.

2 For Your Safety

General

Every person who is tasked with the installation of the Condair GS humidifier must read and understand this manual before performing any work on the unit. Knowing and understanding the contents of the Installation Manual, and the Operation and Maintenance Manual is a basic requirement for protecting personnel against any kind of danger, preventing faulty operation, and operating the unit safely and correctly.

All labels, signs and marking applied to the Condair GS humidifier must be observed and kept in a readable state.

Personnel Qualifications

All procedures described in this manual must only be performed by personnel who are adequately qualified, well trained and are authorized by the customer.

For safety and warranty reasons, any activity beyond the scope of this manual must only be performed by qualified personnel authorized by Condair.

All personnel working with the Condair GS humidifier must be familiar with, and comply with the appropriate regulations on workplace safety and prevention of accidents.

Intended Use

The Condair GS humidifier is intended exclusively for air humidification using a Condair-approved steam distributor within specified operating conditions (refer to the Operation and Maintenance Manual for details). Any other type of application, without the express written consent of Condair, is considered to be not conforming to its intended purpose, and may lead to dangerous operation and will void the warranty.

In order to operate the equipment in the intended manner all information contained in this manual, in particular the safety instructions, must be observed closely.

Safety Precautions that Must be Observed

DANGER!
Risk of electric shock!

The Condair GS humidifer is mains powered. Live parts may be exposed when the access panels are removed. Touching live parts may cause severe injury or even death.

Prevention: The Condair GS humidifier must be connected to the mains only after all installation work has been completed, checked for correct workmanship, and the access panels are installed properly and fastened securely.

DANGER!
Risk of fire or explosion!

The Condair GS is a gas-fired humidifier. Improper installation, adjustment, alteration, service, maintenance or use can cause carbon monoxide poisoning, explosion, fire or other hazards that can cause serious injury, death or property damage.

If over-heating occurs or if the gas fails to shut off: Shut off the gas supply at the manual gas shutoff valve before shutting off the electrical power supply.

DO NOT use this appliance if any part has been under water. Call a qualified service technician immediately to inspect and replace any part of the control system or gas control that has been under water.

Any work on the gas system must only be performed by a qualified installer, service agency or your local gas supplier. Use only factory-authorized and listed kits or accessories when installing or modifying this appliance.

DO NOT store or use gasoline or other flammable vapours and liquids in the vicinity of the humidifier or any other appliance.

What to do if You Smell Gas:

DO NOT try to light any appliance.

DO NOT touch any electrical switch.

DO NOT use any phone in the building.

Leave the building immediately.

Call your gas supplier immediately from a location far away from the building with the gas leak. Follow the gas supplier's instructions.

If you cannot reach your gas supplier, call the fire department.

WARNING!
Risk of severe burns from contact with hot steam vapours!

The Condair GS humidifier produces hot steam vapours for humidification. Bare skin in contact with hot steam vapours can result in severe burns.

Prevention: Avoid contact with steam vapours, or wear appropriate personal protective equipment when working near steam vapours.

WARNING!
Risk of severe burns from contact with hot surfaces!

The water tank, steam line and exhaust system in the Condair GS humidifier get very hot during operation. Bare skin in contact with hot surfaces can result in severe burns.

Prevention: Shut down the humidifier and wait for it to cool down to room temperatures before touching these surfaces, or wear appropriate personal protective equipment.

Preventing Unsafe Operation

All personnel working with the Condair GS humidifier must immediately report to the customer any alterations to the unit that may affect safety, and **secure the humidifier against accidental power-up**.

Modifications to the Unit Prohibited

Modifications are NOT permitted on the Condair GS humidifier without the express written consent of Condair.

The location of the various safety labels on the Condair GS humidifier is shown in *Figure 1*.

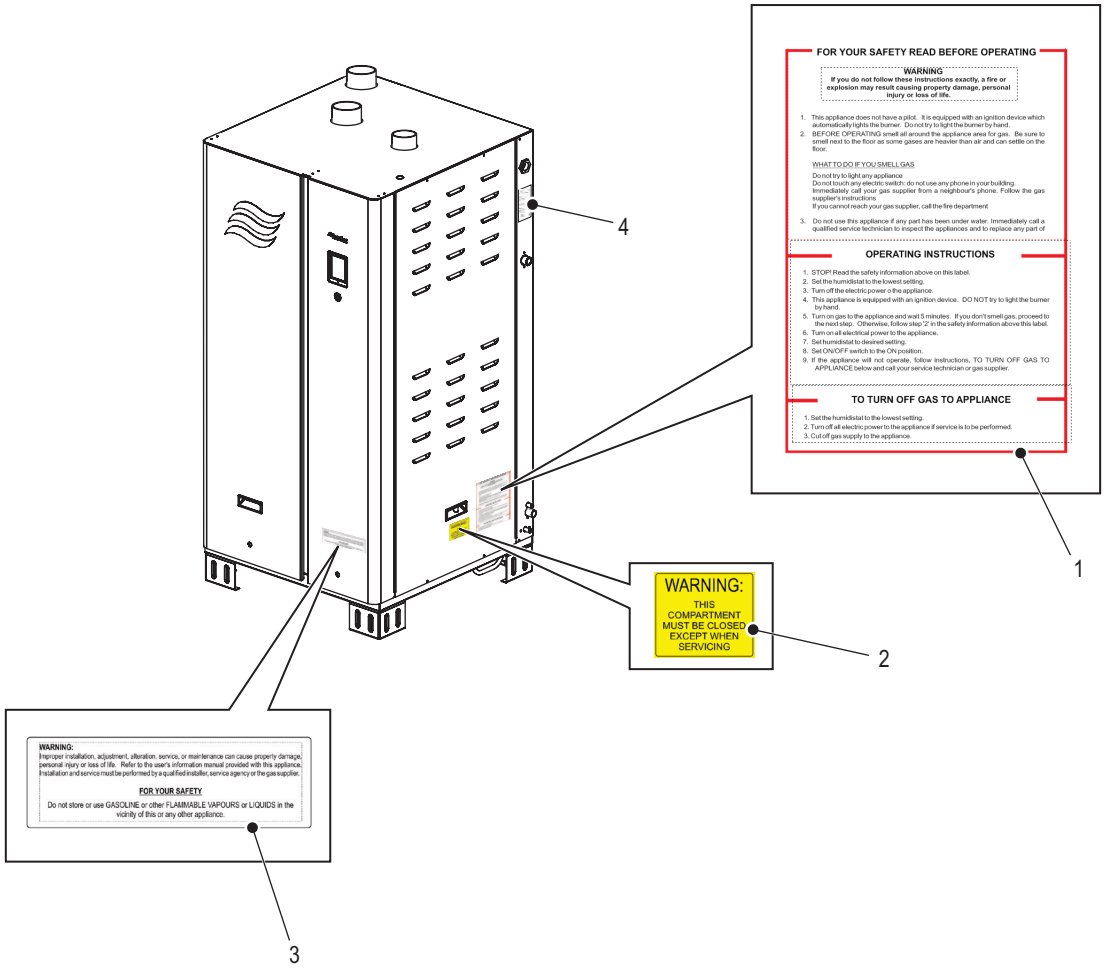


Figure 1: Safety Labels

1 Label, gas safety warning
2 Label, keep cabinet closed warning
3 Label, general safety warning
4 Label, specification

3 Receiving and Storage

3.1 Inspection

All Condair products are shipped F.O.B at the factory. All damage, breakage or loss claims are the responsibility of the shipping company.

After receiving the shipment, inspect the goods as follows:

– Inspect the shipping boxes for damage. Report any shipping box damages to the shipping company without delay.

– Check the goods against the packing slip to ensure that all items have been delivered. Report any shortages to your Condair representative within 48 hours of receipt of the goods. Condair does not assume responsibilities for any shortages beyond this period.

– Unpack the parts/components and check for any damage.

  If parts/components are damaged, notify the shipping company immediately.

– Verify the model type on the specification label to ensure that it is suitable for your installation. Refer to *Figure 3 on page 8*.

3.2 Storage and Transportation

Storage

Store the Condair GS humidifier in its original packaging inside a protected area that meets the following requirements until it is installed. These requirements also apply if the unit needs to be stored for an extended period of time.

– Room temperature: 5 to 40°C

– Room humidity: 10 to 75% RH

Transportation

For optimum protection always transport the unit and components in their original packaging, and use appropriate lifting/transporting devices.

Packaging

Keep the original packaging of the unit/components for later use.

If the packaging needs to be disposed off, observe local regulations on waste disposal. Recycle packaging where possible.

4 Product Overview

4.1 General Description

The Condair GS series is a completely new design of gas-fired steam humidifiers. It is designed to provide clean steam humidification at an economical price. The Condair GS humidifier is available in condensing high-efficiency (CS) and standard-efficiency models in capacities ranging from 23 kg/h to 260 kg/h.

The Condair GS humidifier comes in two housing styles – compact (23-45 kg/h), and full-size (65-260 kg/h). Refer to *Figure 2*.

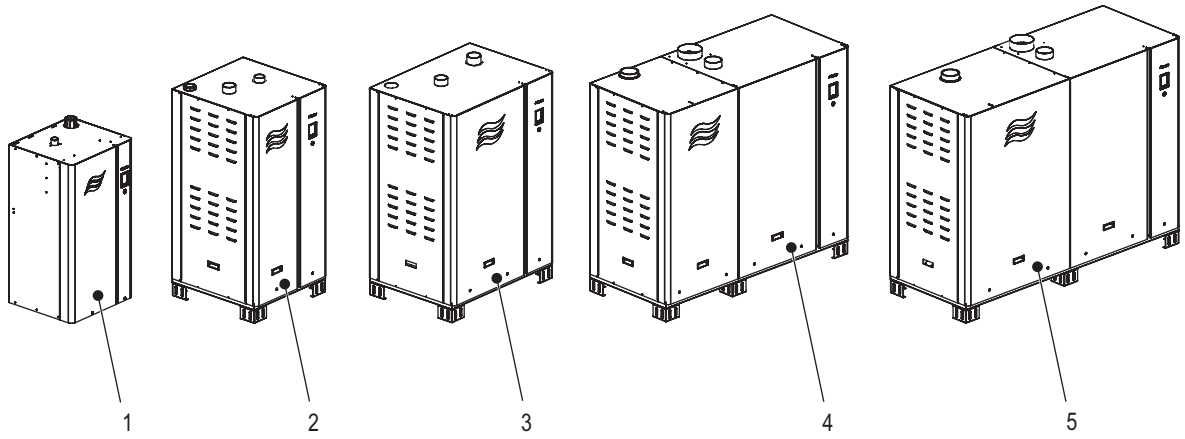


Figure 2: Condair GS Series Humidifiers

1 GS 23/45 (compact housing)
2 GS 65 (full-size housing)
3 GS 90/130 (full-size housing)
4 GS 195 (full-size housing)
5 GS 260 (full-size housing)

4.2 Model Designation

The specification label on the right side of the Condair GS humidifier shows its model number, serial number and ratings – refer to *Figure 3*. The breakdown of the model number is shown in *Figure 4*.

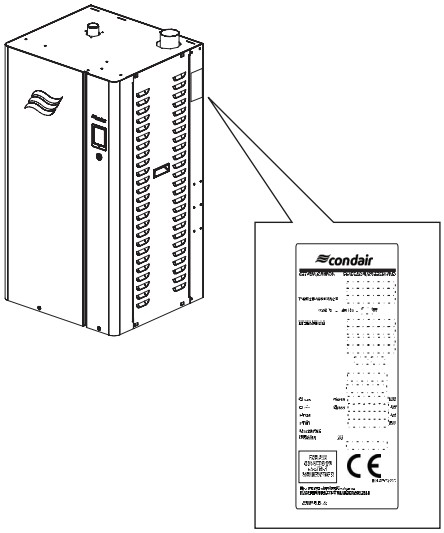


Figure 3: Condair GS Series Humidifier Specification Label

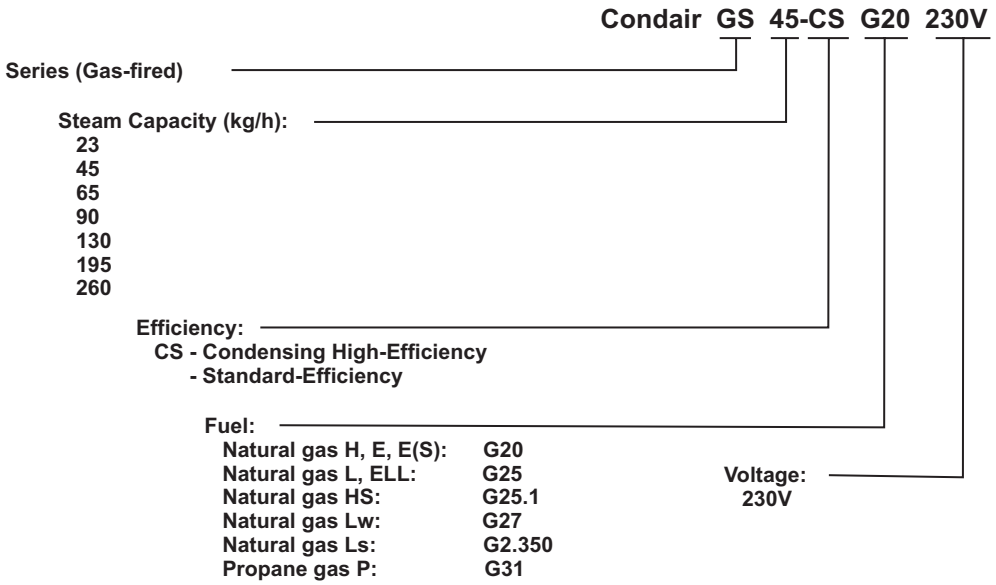


Figure 4: Model Number Breakdown (Example)

4.3 Model Specifications

Table 1 and *Table 2 on page 13* list the specifications for the Condair GS humidifier.

Condensing High-Efficiency (CS) Model Specifications

Table 1: Condensing High-Efficiency (CS) Model Specifications

Fuel	Blower Speed	Input (kW)	Steam Capacity (kg/h)	Manifold Pressure (Pa)
Model GS 23-CS				
Natural gas G20	Maximum	18.2	23	-2.5
	Minimum	3.6	4.6	-2.5
Propane G31	Maximum	18.2	23	-2.5
	Minimum	3.8	4.6	-2.5
Model GS 45-CS				
Natural gas G20	Maximum	36.3	45	-2.5
	Minimum	7.3	9	-2.5
Propane G31	Maximum	36.3	45	-2.5
	Minimum	7.3	9	-2.5
Model GS 65-CS				
Natural gas G20	Maximum	54.5	65	-2.5
	Minimum	10.9	13	-2.5
Propane G31	Maximum	54.5	65	-2.5
	Minimum	10.9	13	-2.5
Model GS 90-CS				
Natural gas G20	Maximum	72.7	90	-2.5
	Minimum	7.3	9	-2.5
Propane G31	Maximum	72.7	90	-2.5
	Minimum	7.3	9	-2.5

Fuel	Blower Speed	Input (kW)	Steam Capacity (kg/h)	Manifold Pressure (Pa)
Model GS 130-CS				
Natural gas G20	Maximum	109.0	130	-2.5
	Minimum	10.9	13	-2.5
Propane G31	Maximum	109.0	130	-2.5
	Minimum	10.9	13	-2.5
Model GS 195-CS				
Natural gas G20	Maximum	163.5	195	-2.5
	Minimum	10.9	13	-2.5
Propane G31	Maximum	163.5	195	-2.5
	Minimum	10.9	13	-2.5
Model GS 260-CS				
Natural gas G20	Maximum	218.0	260	-2.5
	Minimum	10.9	13	-2.5
Propane G31	Maximum	218.0	260	-2.5
	Minimum	10.9	13	-2.5

Standard-Efficiency Model Specifications

Table 2: Standard-Efficiency Model Specifications

Fuel	Blower Speed	Input (kW)	Steam Capacity (kg/h)	Manifold Pressure (Pa)
Model GS 23				
Natural gas G20	Maximum	20.5	23	-2.5
	Minimum	4.1	4.6	-2.5
Propane G31	Maximum	20.5	23	-2.5
	Minimum	4.1	4.6	-2.5
Model GS 45				
Natural gas G20	Maximum	41.0	45	-2.5
	Minimum	8.2	9	-2.5
Propane G31	Maximum	41.0	45	-2.5
	Minimum	8.2	9	-2.5
Model GS 65				
Natural gas G20	Maximum	61.5	65	-2.5
	Minimum	12.3	13	-2.5
Propane G31	Maximum	61.5	65	-2.5
	Minimum	12.3	13	-2.5
Model GS 90				
Natural gas G20	Maximum	82.0	90	-2.5
	Minimum	8.2	9	-2.5
Propane G31	Maximum	82.0	90	-2.5
	Minimum	8.2	9	-2.5
Model GS 130				
Natural gas G20	Maximum	123.0	130	-2.5
	Minimum	12.3	13	-2.5
Propane G31	Maximum	123.0	130	-2.5
	Minimum	12.3	13	-2.5

Fuel	Blower Speed	Input (kW)	Steam Capacity (kg/h)	Manifold Pressure (Pa)
Model GS 195				
Natural gas G20	Maximum	184.5	195	-2.5
	Minimum	12.3	13	-2.5
Propane G31	Maximum	184.5	195	-2.5
	Minimum	12.3	13	-2.5
Model GS 260				
Natural gas G20	Maximum	246.0	260	-2.5
	Minimum	12.3	13	-2.5
Propane G31	Maximum	246.0	260	-2.5
	Minimum	12.3	13	-2.5

4.4 Options

There are no options for the Condair GS humidifier.

4.5 Accessories

4.5.1 Accessories Overview

Table 3: Accessories

Model Condair GS		**23 ...**	**45 ...**	**65 ...**	**90 ...**	**130 ...**	**195 ...**	**260 ...**
Steam distributor (refer to *Table 4 on page 15*)		81-...						
	quantity	1	1	2	2	3	4	6
OptiSorp steam distribution system (refer to *Table 5 on page 15*)		System 1	System 1	System 2	System 2	System 3	System 2 System 3	–
	quantity	1	1	1	1	1	1 of each	–
Steam hose adapter		–	–	**SA80** (3" / 2x 1 3/4")	**SA80** (3" / 2x 1 3/4")	**SA120** (3" / 3x 1 3/4")	**SA200** (4" / 5x 1 3/4")	**SA240** (4" / 6x 1 3/4")
	quantity	–	–	1	1	1	1	1
Steam hose / meter		**DS80**						
	quantity	1	1	2	2	3	4	6
Condensate hose / meter		**KS10**						
	quantity	1	1	2	2	3	4	6
Filter valve		**Z261** (1 pc. per system)						
Flue gas adapter with condensate drain		–	**FA40**	**FA40**	**FA80**	**FA80**	**FA160**	**FA240**
	quantity	–	1	1	1	1	1	1

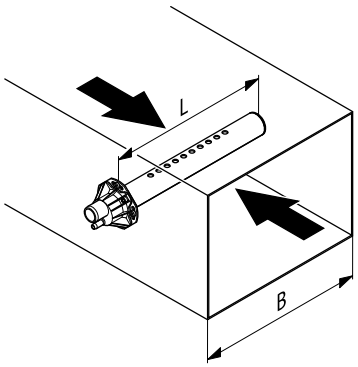
4.5.2 Accessory Details

Steam Distributor

The steam distributors are selected on the basis of the duct width (for horizontal installation) or the duct height (for vertical installation), and the capacity of the steam humidifier.

IMPORTANT! Always select the longest possible steam distributor for optimum humidification distance.

Table 4: Steam Distributor Details



Steam distributor [1] for Condair GS 23/45/65/90/130/195/260		Duct Width (B) (mm)	Maximum Steam Capacity (kg/h) [3]
Type	Length (L) (mm) [2]		
81-350	350	400…600	30
81-500	500	600…750	30
81-650	650	750…900	50
81-800	800	900…1100	50
81-1000	1000	1100…1300	50
81-1200	1200	1300…1600	50
81-1500	1500	1600…2000	50
81-1800	1800	2000…2400	50
81-2000	2000	2200…2600	50
81-2300	2300	2500…2900	50
81-2500	2500	2700…3100	50

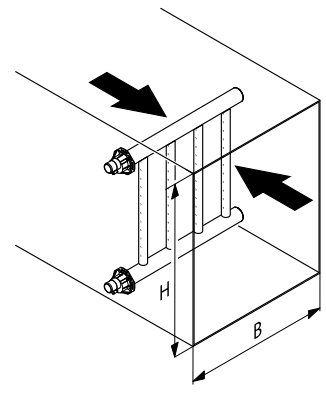
1) Material: CrNi steel
2) Special length on request
3) To fully exploit the overall capacity of your Condair GS humidifier, the output of each steam outlet may be fed to more than one distribution pipe. If more than one steam distribution pipe is fed per steam outlet the steam line must be divided into multiple branches. Appropriate fittings are available on request.

Note: If the humidification distance has to be reduced for technical reasons, the steam output of the humidifier must be divided between two steam distributors, or the OptiSorp steam distribution system must be used. Contact your Condair representative.

OptiSorp Steam Distribution System

The OptiSorp steam distribution system is used in ventilation ducts with a short humidification distance. When ordering an OptiSorp system the duct dimension must be specified. Refer to *Table 5*.

Table 5: OptiSorp Details



OptiSorp	Number of Steam Connections	Max. Steam Capacity (kg/h) [1]	Duct Dimensions	
			Width (mm)	Height (mm)
System 1	1	45 (30)	450...4000	450...1650
System 2	2	90 (60)	450...4000	450...2200
System 3	3	135 (90)	450...4000	800...3200
System 4	4	180 (120)	450...4000	800...3200

1) The values in brackets apply to duct widths less than 600 mm.

5 Installation

5.1 General

Strictly observe and perform all installation tasks including the mounting of the unit and connection of the gas, flue gas, water, steam and power supplies as described in this manual.

Adhere to all local and national regulations dealing with gas, combustion air, flue gas, water, steam and electrical installations.

Condair does not accept any liability for installation of humidification equipment by unqualified personnel, or the use of equipment/parts that are not authorized by Condair.

Personnel Qualifications

All installation work must be performed only by licensed personnel authorized by the customer. It is the customer's responsibility to verify qualifications of the personnel.

Safety

Observe the following safety precautions:

DANGER!
Risk of explosion and fire!

The Condair GS is a gas-fired humidifier. Improper installation, adjustment, alteration, service, maintenance or use can cause carbon monoxide poisoning, explosion, fire or other hazards that can cause serious injury, death or property damage. If assistance is required, contact a qualified installer, service agency or your local gas supplier.

Use only factory-authorized and listed kits or accessories when installing or modifying this appliance.

DANGER!
Risk of electric shock!

The Condair GS humidifier is mains powered. Live parts may be exposed when the door panels are removed. Touching live parts may cause severe injury or even death.

Prevention: The Condair GS humidifier must be connected to the mains only after all installation work has been completed, checked for correct workmanship, and the door panels are installed properly and fastened securely.

CAUTION!
Risk of damage to internal components from electrostatic discharge (ESD)!

The electronic components inside the humidifier are sensitive to electrostatic discharge (ESD).

Prevention: Take appropriate measures to protect the electronic components inside the unit against damage caused by electrostatic discharge (ESD). Refer to IEC 61340.

5.2 Installation Overview

5.2.1 Typical Installation – Compact Units

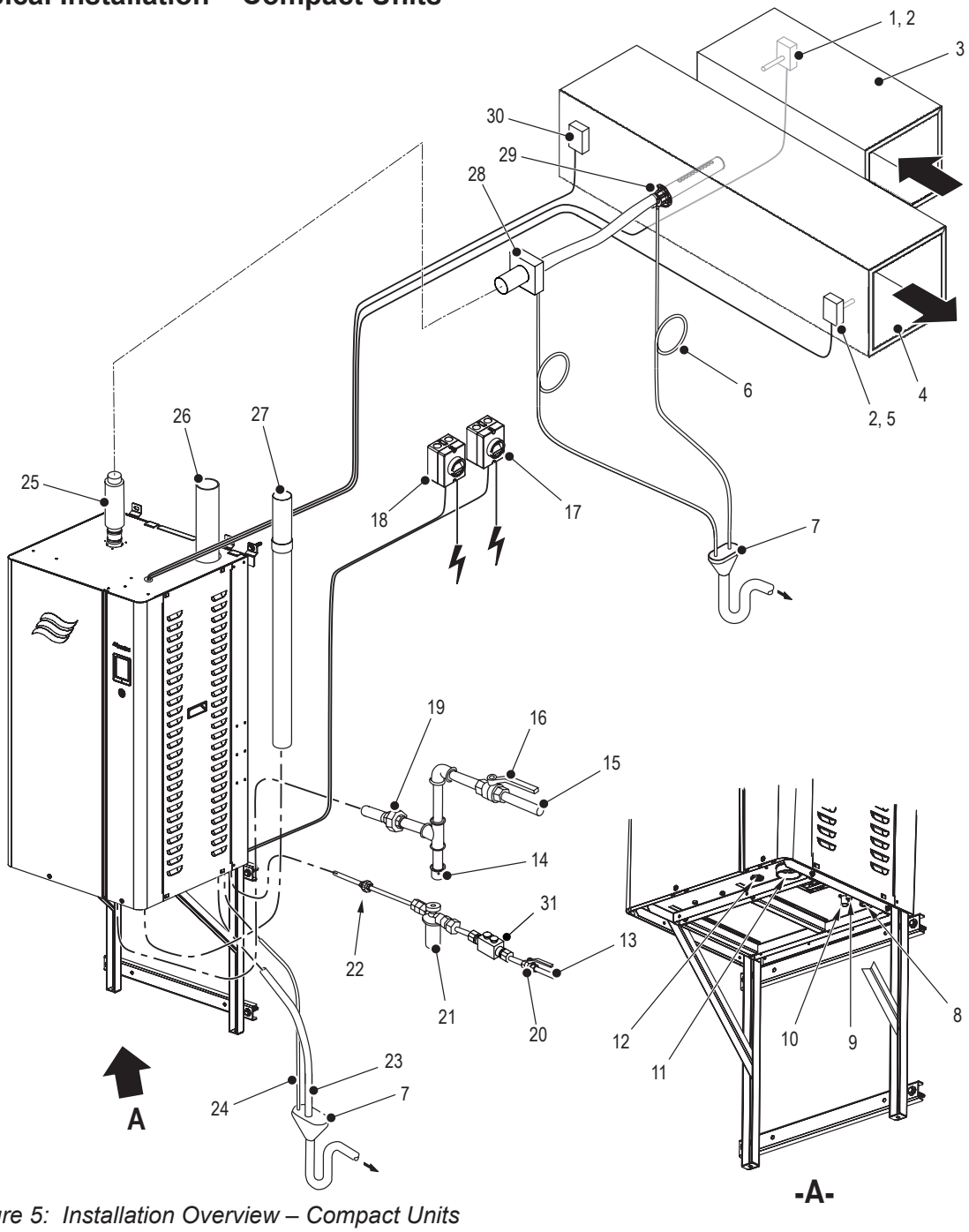


Figure 5: Installation Overview – Compact Units

1 Humidistat, On/Off (used for humidity control)
2 Humidity sensor or modulating humidistat (used for control of the space in the return duct, high limit in the supply duct)
3 Duct, return air
4 Duct, supply air
5 Humidistat, On/Off, high limit (external security loop)
6 Drain line, condensate (with trap)
7 Funnel, air gap (with optional trap)
8 Inlet, water
9 Outlet, condensate drain
10 Outlet, Drain
11 Inlet, intake air
12 Inlet, Gas
13 Supply line, water
14 Trap, sediment
15 Supply line, gas
16 Valve, manual gas shutoff
17 Switch, disconnect, electrical fused (dedicated)
18 Switch, disconnect, control signals (dedicated)
19 Fitting, union
20 Valve, water shutoff
21 Filter, water
22 Fitting, union
23 Drain line
24 Drain line, exhaust condensate (CS model only)
25 Steam line
26 Vent, exhaust (connected to exterior)
27 Vent, air intake (connected to exterior – optional)
28 Adapter, steam hose
29 Distributor, steam
30 Switch, air proving (external security loop)
31 Double check valve backflow preventer (supplied by others)

5.2.2 Typical Installation – Full-Size Units

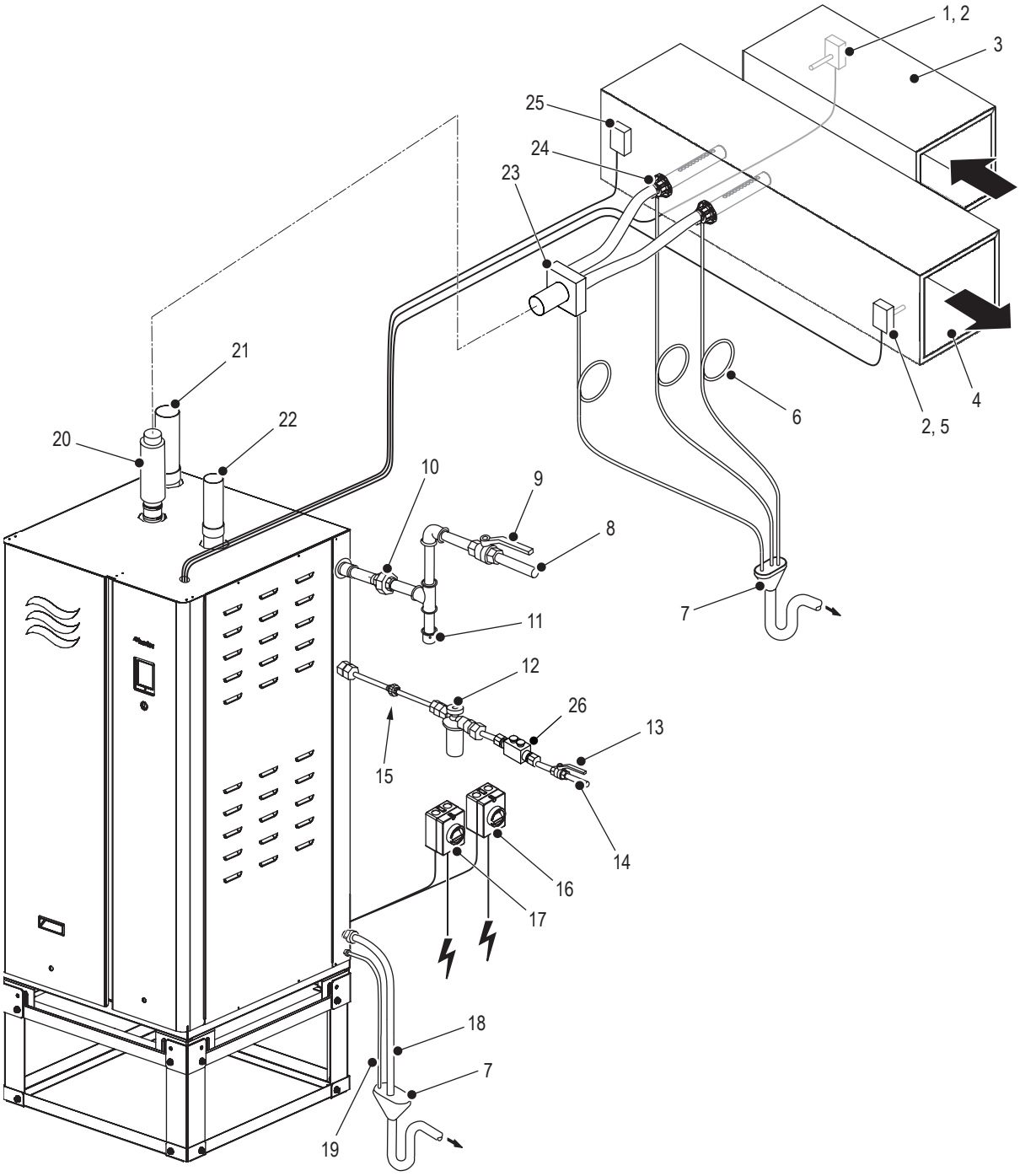


Figure 6: Installation Overview – Full-Size Units (GS 65-CS Shown)

1 Humidistat, On/Off (used for humidity control)
2 Humidity sensor or modulating humidistat (used for control of the space in the return duct, high limit in the supply duct)
3 Duct, return air
4 Duct, supply air
5 Humidistat, On/Off, high limit (external security loop)
6 Drain line, condensate (with trap)
7 Funnel, ar gap (with optional trap)
8 Supply line, gas
9 Nalve, manual gas shutoff
10 Fitting, union
11 Trap, sediment
12 Filter, water
13 Valve, water shutoff
14 Supply line, water
15 Fitting, union
16 Switch, disconnect, electrical fused (dedicated)
17 Switch, disconnect, control signals (dedicated)
18 Drain line
19 Drain line, exhaust condensate (CS model only)
20 Steam line
21 Vent, air intake (connected to exterior – optional)
22 Vent, exhaust vent (connected to exterior)
23 Adapter, steam hose
24 Distributor, steam
25 Switch, air proving (external security loop)
26 Double check valve backflow preventer (supplied by others)

5.3 Site Requirements

In preparation for installation of the Condair GS humidifier ensure that the following site requirements are satisfied. Report any discrepancies to the site engineer.

Steam and Condensate Lines

- ☐ The location of the Condair GS humidifier is largely dependent on the location of the steam distributor, the exhaust vent pipe and the air intake pipe. To minimize heat loss through the steam line, choose the location of the humidifier so that it is as close as possible to the steam distributor.
- ☐ Keep the length of the steam line as short as possible. When possible, install the humidifier below the steam distributor. Make sure that the selected location permits proper routing of steam and condensate lines. Refer to *"Best Practices for Installing Steam and Condensate Lines" on page 30* for details.

Mounting

- ☐ The space in which the humidifier is to be installed must allow adequate clearances for ease of maintenance, and must be easily accessible for servicing. Refer to *"Clearances" on page 21* for the required and suggested clearances. Adhere to all local and national installation regulations. Condair is not responsible for any installation code violations.
- ☐ The Condair GS humidifier is designed to be floor-mounted, with the exception of the GS 23/45 unit which comes with a floor stand that also converts to mounting bracket for wall-mounting. The GS 65-195 units can also be mounted on an optional floor stand. The floor must be level if mounting the unit on the floor. If wall-mounting the compact unit, choose a wall or other suitable surface that offers a sufficiently high load-bearing capacity – refer to maximum operating weight in *Table 11 on page 22*. In addition, the mounting surface must be able to withstand temperatures of 60-70 °C that can be generated during operation of the humidifier. Care must also be taken to ensure that the unit is not mounted above sensitive equipment or walkways.
- ☐ Do not mount the humidifier on wooden floors, carpeting or near combustable materials. Adhere to all local and national installation regulations.
- ☐ Do not mount the humidifier on vibrating surfaces, or near hot surfaces or surfaces that can freeze.
- ☐ The Condair GS humidifier must be installed in a drip-proof location within buildings, where the ambient temperature is 5-40 °C and the relative humidity is 5-80% (non-condensing). The selected location must also protect all electrical components in the humidifier from water damage.

Water Supply

- ☐ The water supply to the humidifier must be cold potable drinking water, reverse osmosis (RO) water or de-ionized water (DI), with a flow rate of 10 L/min for Condair GS 23-130 unit or 20 L/min for Condair GS 195/260 unit. The water quality requirements are listed in *Table 6*.

  Table 6: Water Quality Requirements

Water Type	Hardness (PPM)	Alkalinity (pH)	Chloride (PPM)
Potable	0-256	5-8	0-50
Treated	0-17	5-8	0-50

- ☐ The water supply line to the humidifier should be minimum 12 mm in diameter with a 3/4 in BSPP female end. The line must also have a shutoff valve and a union fitting for ease of maintenance.
- ☐ The water supply should be filtered to 5 µm and pressure regulated to 3.0-8.0 bar. If necessary, a surge arrestor should be installed if pressure surges occur.
- ☐ For best performance, water temperature should be 1-15 °C; maximum temperature must not exceed 25 °C.
- ☐ The water from the tank may flow back to the water source. To prevent backflow from the unit to the water supply, install a double check valve backflow preventer. Adhere to all local and national installation regulations.
- ☐ The water supply pipe can be made of plastic that is pressure-proof and certified for use with drinking water systems, copper (not permitted for DI water) or stainless steel (minimum DIN 1.4301).
- ☐ The water supply should be free of additives such as corrosion inhibitors, disinfectants, etc., which may affect the performance of the humidifier.

Drainage

- ☐ The humidifier should be connected to a dedicated building drain (recommended) with a minimum drainage rate of 20 L/min. The drain line must allow free and easy drainage.
- ☐ The building drain pipe should be made of a material rated to handle high temperature discharge water at 100 °C.
- ☐ The space in which the humidifier is to be installed should have a floor drain connected to the building drain. However, if a floor drain is not available, a leakage monitoring device must be supplied to permit interruption of the water supply in case of a leakage. A drain pan is also recommended to prevent property damage.

Combustion Air

- ☐ The space in which the humidifier is to be installed must have access to a good supply of clean combustion air at atmospheric pressure. Adhere to all appropriate local and national installation regulations.
- ☐ The maximum temperature of the combustion air supply must be 30 °C.
- ☐ For additional requirements refer to *"Combustion Air Connection" on page 39*.

Exhaust Venting

- ☐ The space in which the humidifier is to be installed should permit routing of exhaust air to the outside. Adhere to all appropriate local and national installation regulations.
- ☐ For additional requirements for the different types of exhaust vent installations refer to *"Exhaust Vent Connection" on page 42*.

Gas Supply

- ☐ Gas supply to the unit must be equipped with a certified manual gas shutoff valve located in the immediate vicinity of the humidifier.
- ☐ If black gas pipes are used, a sediment trap (located between the manual shutoff valve and the unit) must also be supplied.
- ☐ A capped 3 mm test port must be installed in the gas line immediately upsteam from the humidifier gas connection.
- ☐ A union fitting must be installed in the gas line immediately upsteam from the humidifier gas connection.
- ☐ The operating pressure of the gas supply to the humidifier must be as listed in *Table 7*.

Table 7: Gas Operating Pressure

Gas Type		Operating Pressure		
		Nominal	Minimum	Maximum
Natural gas H, E, E(S)	G20	1.99 kPa	1.69 kPa	2.49 kPa
Natural gas L, ELL	G25	2.49 kPa	1.99 kPa	2.99 kPa
Natural gas HS	G25.1	2.49 kPa	1.99 kPa	2.99 kPa
Natural gas Lw	G27	1.99 kPa	1.74 kPa	2.29 kPa
Natural gas Ls	G2.350	1.30 kPa	1.05 kPa	1.59 kPa
Propane gas P	G31	3.71 kPa or 4.98 kPa	2.49 kPa	5.73 kPa

- ☐ The gas supply line must be sized as listed in *Table 8*. The pipe connection should have male BSPP threads.

Table 8: Gas Line Size

Model	Minimum Gas Line Size	Gas Connection Adapter*
GS 23	15 mm	1/2 in NPT to 15 mm BSPP
GS 45	15 mm	1/2 in NPT to 15 mm BSPP
GS 65	20 mm	3/4 in NPT to 20 mm BSPP

Model	Minimum Gas Line Size	Gas Connection Adapter*
GS 90	25 mm	1 in NPT to 25 mm BSPP
GS 130	25 mm	1 in NPT to 25 mm BSPP
GS 195	32 mm	1 in NPT to 32 mm BSPP
GS 260	32 mm	1 in NPT to 32 mm BSPP

* Supplied

Power Supply

- ☐ The power supply to the humidifier must not exceed the rated current draw indicated on the specification label. Refer to *Figure 3 on page 11*.
- ☐ The power supply must have an external dedicated slow acting fused disconnect switch located in the immediate vicinity of the humidifier. The fusing requirements are found in *"Power:" on page 78*.
- ☐ A separate disconnect switch is required for the control voltage.

5.4 Mounting the Humidifier

Before mounting the Condair GS humidifier, refer to *"Site Requirements" on page 19* for the location and mounting requirements.

5.4.1 Clearances

The required clearances are listed in *Table 9 on page 22*, and the suggested clearances are listed in *Table 10 on page 22*. Refer to *Figure 7*. Consult local and national installation regulations. Condair does not accept responsibility for violations of the installation codes.

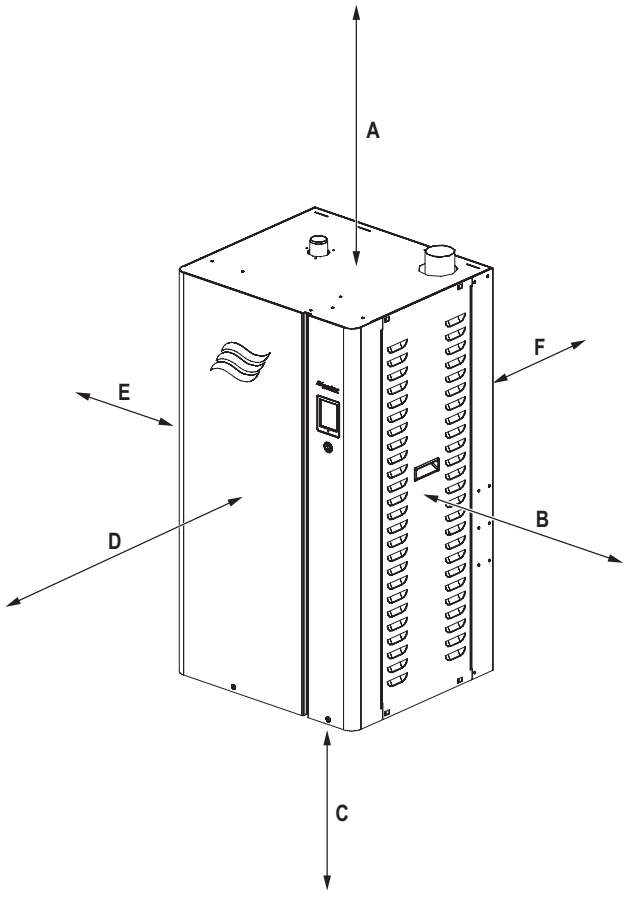


Figure 7: Condair GS Humidifier Suggested Clearances

*Table 9: Required Clearances**

Model	Overhead Clearance "A"	Right Side Clearance "B"	Ground Clearance "C"	Front Clearance "D"	Left Side Clearance "E"	Rear Clearance "F"
GS 23	406 mm	610 mm	610 mm	914 mm	0 mm	0 mm
GS 45	406 mm	610 mm	610 mm	914 mm	0 mm	0 mm
GS 65	406 mm	610 mm	0 mm	914 mm	0 mm	0 mm
GS 90	406 mm	610 mm	0 mm	914 mm	0 mm	0 mm
GS 130	406 mm	610 mm	0 mm	914 mm	0 mm	0 mm
GS 195	406 mm	610 mm	0 mm	914 mm	610 mm	0 mm
GS 260	406 mm	610 mm	0 mm	914 mm	610 mm	0 mm

* Consult local and national regulations.

Table 10: Suggested Clearances

Model	Overhead Clearance "A"	Right Side Clearance "B"	Ground Clearance "C"	Front Clearance "D"	Left Side Clearance "E"	Rear Clearance "F"
GS 23	914 mm	762 mm	610 mm	914 mm	0 mm	0 mm
GS 45	914 mm	762 mm	610 mm	914 mm	0 mm	0 mm
GS 65	914 mm	762 mm	0 mm	914 mm	0 mm	0 mm
GS 90	914 mm	762 mm	0 mm	914 mm	0 mm	0 mm
GS 130	914 mm	762 mm	0 mm	914 mm	0 mm	0 mm
GS 195	914 mm	762 mm	0 mm	914 mm	762 mm	0 mm
GS 260	914 mm	762 mm	0 mm	914 mm	762 mm	0 mm

5.4.1.1 Overall Dimensions and Weight

The overall dimensions and weight of the Condair GS humidifier are listed in *Table 11*. **Note:** The dimensions and weights do not include the floor stand or wall mount bracket.

Table 11: Condair GS Humidifier Overall Dimensions and Weights

Model	Dimensions			Weight	
	Height	Width	Depth	Net	Operating
GS 23	1102 mm	598 mm	539 mm	79.6 kg	147.4 kg
GS 23-CS				86.2 kg	154.2 kg
GS 45	1102 mm	598 mm	539 mm	88.5 kg	158.8 kg
GS 45-CS				95.3 kg	165.6 kg
GS 65	1410 mm	684 mm	705 mm	131.5 kg	167.8 kg
GS 65-CS				145.1 kg	226.8 kg
GS 90	1410 mm	960 mm	705 mm	199.6 kg	333.4 kg
GS 90-CS				217.7 kg	351.5 kg
GS 130	1410 mm	960 mm	705 mm	199.6 kg	344.7 kg
GS 130-CS				217.7 kg	362.8 kg
GS 195	1410 mm	1580 mm	705 mm	340.2 kg	521.6 kg
GS 195-CS				362.9 kg	544.3 kg
GS 260	1410 mm	1859 mm	705 mm	383.3 kg	673.6 kg
GS 260-CS				412.8 kg	703.1 kg

5.4.2 Standard Wall Mounting – Compact Unit Only

Install the compact Condair GS humidifier on the wall or other suitable mounting surface as follows. Refer to *Figure 8 on page 24*.

1. Check that the selected mounting location provides adequate clearances for maintenance, and is at an easily servicable height. Refer to *"Clearances" on page 21*.
2. Make sure that the mounting surface has adequate structural strength to support the operating weight of the unit – refer to *Table 11 on page 22* for weights. Condair recommends mounting to 20 mm thick plywood or equivalent.
3. Remove all the packaging material around the Condair GS humidifier that was used for shipping the unit. Remove the accessory box and open its contents.
4. Assemble the mounting bracket using the instructions in the accessory box.
5. Locate the mounting bracket at the desired position on the wall or other suitable vertical mounting surface.
6. Attach the mounting bracket with one M10 bolt and washer (not supplied). Use longer bolt if going through drywall or other structural material into the mounting surface.
7. Level the mounting bracket, and mark the locations of the remaining three attachment points.
8. Install three more M10 bolts and washers (not supplied), and secure the mounting bracket to the mounting surface.
9. Remove the door panels from the humidifier.
10. Remove and discard the two shipping screws that secure the unit to the shipping pallet.

WARNING!
Heavy object – risk of personal injury, or damage to equipment!

Prevention: Use an appropriate lifting device to lift the humidifier. Lift the unit from the bottom, and not the side or top panels.

11. Carefully lift the humidifier by its base frame and raise it off the shipping pallet.
12. Carefully lower the humidifier onto the mounting bracket that is secured to the mounting surface.
13. Install four M6×12 bolts and washers (supplied) and secure the humidifier to the mounting bracket. Torque the bolts to 9 N·m.
14. Install the two L-brackets on the top of the unit with the sheetmetal screws (supplied).
15. Secure the L-brackets to the vertical mounting surface with two M6 bolts and washers (not supplied).
16. Install the door panels.

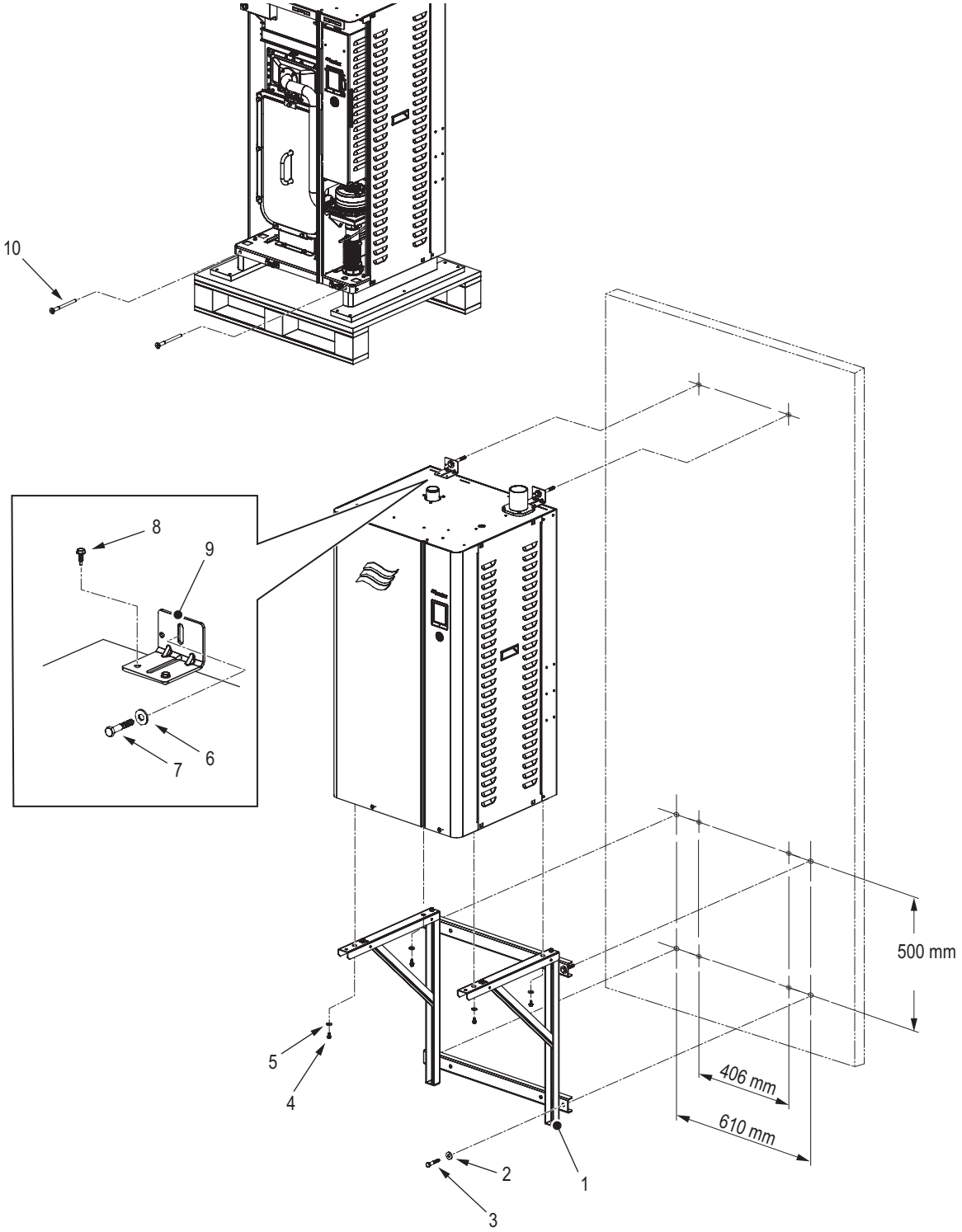


Figure 8: Standard Wall Mounting, Compact Unit Only

1 Bracket, mounting (supplied)
2 Washer, flat, M10 (×4, not supplied)
3 Bolt, M10×50 (×4, not supplied)
4 Bolt, M6×12 (×4, supplied)
5 Washer, flat, M6 (×4, supplied)
6 Washer, flat, M6 (×2, not supplied)
7 Bolt, M6×25 (×2, not supplied)
8 Screw, sheetmetal (×4, supplied)
9 Bracket, L (×2, supplied)
10 Screw, shipping (×2, discard)

5.4.3 Standard Floor Stand Mounting – Compact Unit Only

Install the compact Condair GS humidifier on the floor stand, if desired, as follows. Refer to *Figure 9 on page 26*.

1. Check that the selected mounting location provides adequate clearances for maintenance. Refer to *"Clearances" on page 21*.
2. Remove all the packaging material around the Condair GS humidifier that was used for shipping the unit. Remove the accessory box and open its contents.
3. Assemble the floor stand using the instructions in the accessory box.
4. Make sure that the floor is hard and level, then set the floor stand on the floor (and optionally against a wall or other suitable vertical mounting surface). Level the stand using the levelling screws on its feet.

   Note: If desired, remove the levelling screws and secure the floor stand to the floor with suitable bolts and washers (not supplied).
5. Remove the door panels from the humidifier.
6. Remove and discard the two shipping screws that secure the unit to the shipping pallet.

   WARNING!
   Heavy object – risk of personal injury, or damage to equipment!

   Prevention: Use an appropriate lifting device to lift the humidifier. Lift the unit from the bottom, and not the side or top panels.
7. Carefully lift the humidifier by its base frame and raise it off the shipping pallet.
8. Carefully lower the humidifier onto the floor stand.
9. Install four M6×12 bolts and washers (supplied) and secure the humidifier to the floor stand. Torque the bolts to 9 N·m.
10. Install the two L-brackets on the top of the unit (optional) with the sheetmetal screws (supplied).
11. Secure the L-brackets to the vertical mounting surface with two M6 bolts and washers (not supplied).
12. Install the door panels.

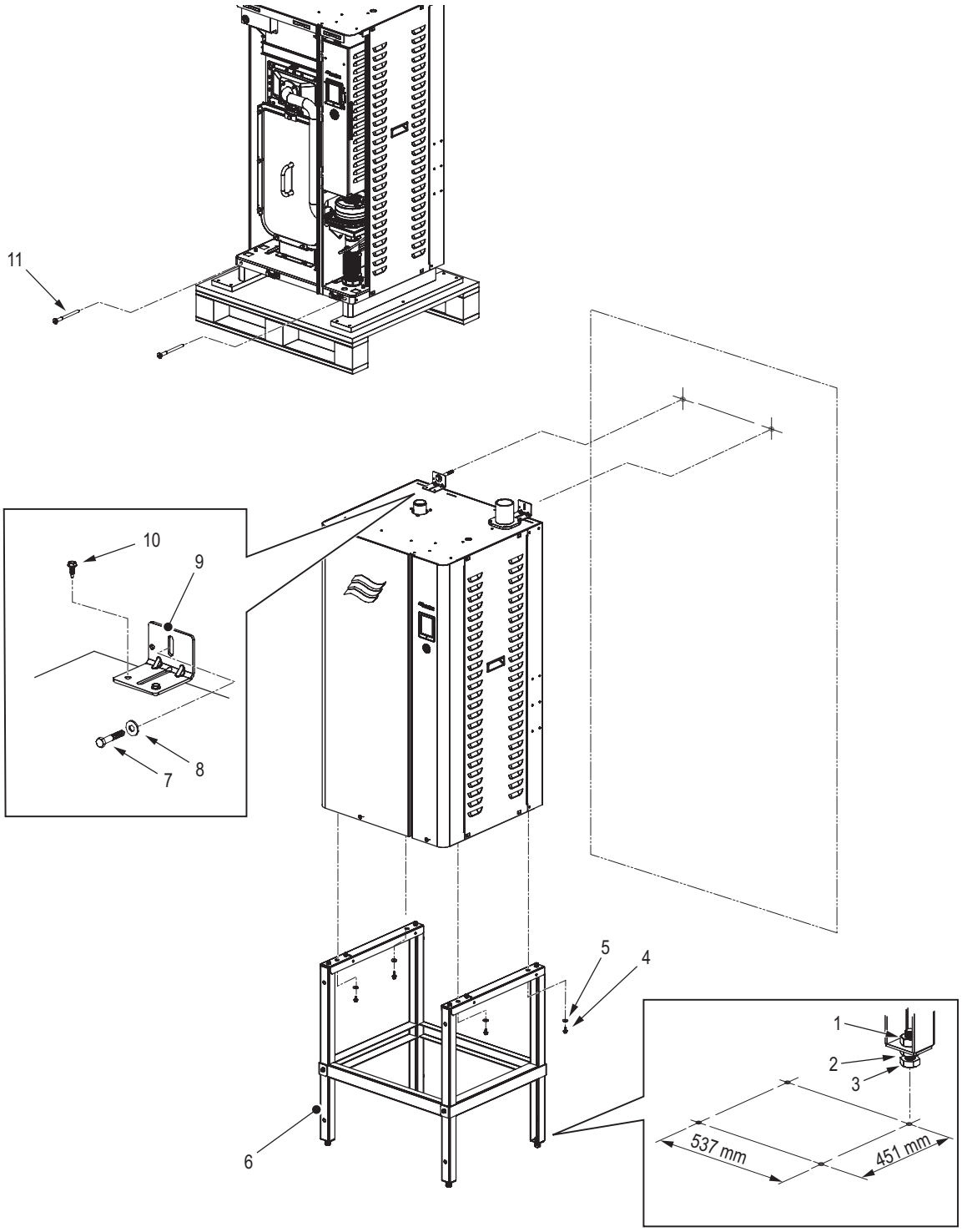


Figure 9: Standard Floor Stand Mounting, Compact Unit Only

1 Nut
2 Nut, jam
3 Screw, leveling
4 Bolt, M6×12 (×4, supplied)
5 Washer, flat, M6 (×4, supplied)
6 Stand, floor
7 Bolt, M6×25 (×2, not supplied)
8 Washer, flat, M6 (×2, not supplied)
9 Bracket, L (×2, supplied – used if unit is installed against a vertical mounting surface)
10 Screw, sheetmetal (×4, supplied)
11 Screw, shipping (×2, discard)

5.4.4 Standard Mounting – Full-Size Unit

Install the full-size Condair GS humidifier on a mounting stand as follows. Refer to *Figure 10*.

1. Check that the selected mounting location provides adequate clearances for maintenance. Refer to *"Clearances" on page 21*.
2. Remove all the packaging material around the Condair GS humidifier that was used for shipping the unit. Remove the accessory box and open its contents.
3. Assemble the mounting stand using the instructions in the accessory box.
4. Set the mounting stand on a hard level floor, and level it using shims, if necessary.

   Note: If desired, secure the mounting stand to the floor with suitable M10 bolts and washers (not supplied).

   WARNING!
   Heavy object – risk of personal injury, or damage to equipment!

   Prevention: Use an appropriate lifting device to lift the humidifier. Lift the unit from the bottom, and not the side or top panels.

5. Carefully lift the humidifier by its base frame and raise it off the shipping pallet. Lower it onto the mounting stand. Check that it is seated properly.

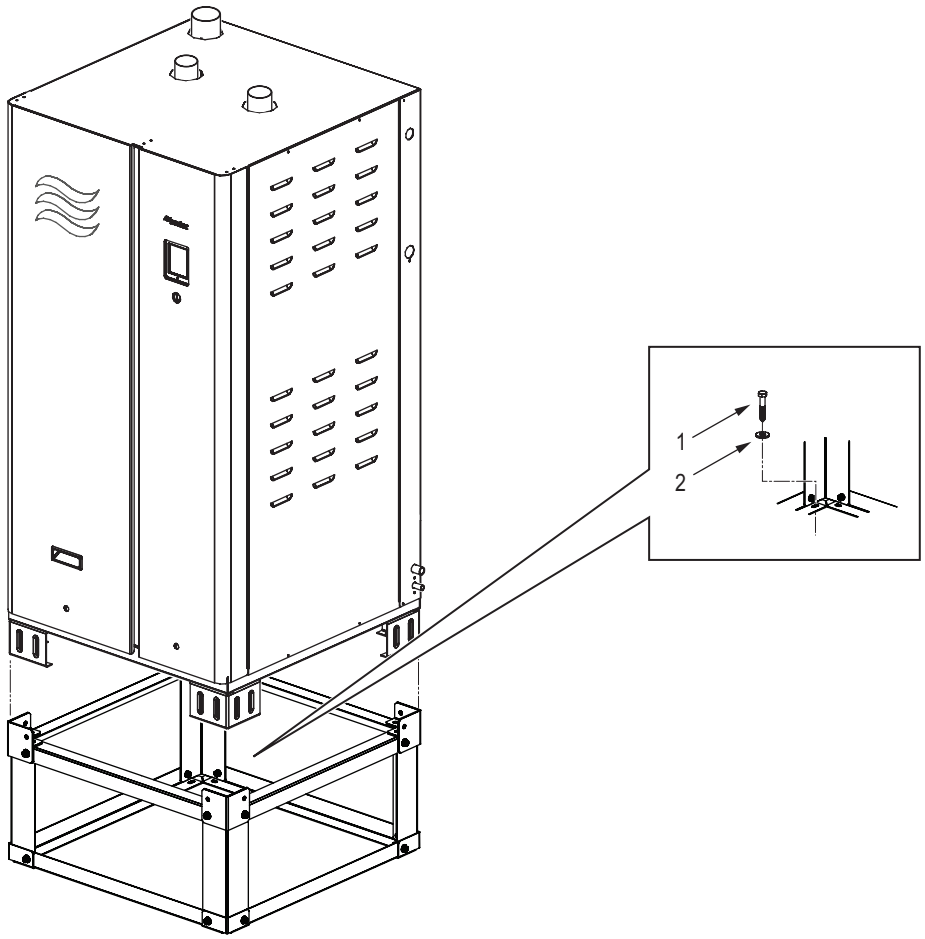


Figure 10: Optional Mounting, Full-Size Unit (GS 65 Shown)

1 Bolt, M10×50 (×4, not supplied)
2 Washer, flat, M10 (×4, not supplied)

5.4.5 Mounting Checklist

Check the following to ensure that the humidifier has been mounted correctly:

- ☐ Unit installed in the correct location (according to *"Clearances" on page 21*)?
- ☐ Adequate clearance for servicing unit?
- ☐ Mounting surface stable, and suitable for mounting the humidifier?
- ☐ Unit level?
- ☐ Unit secured properly?

5.5 Steam Connection

Steam generated by the Condair GS humidifier can be distributed into a conditioned space using Condair blower packs and steam distributors – refer to their respective manuals for installation details.

Refer to *"Site Requirements" on page 19* for the steam and condensate line installation requirements. Read *"Best Practices for Installing Steam and Condensate Lines" on page 30* before installing the main steam line and condensate lines.

5.5.1 Installing the Main Steam Pipe

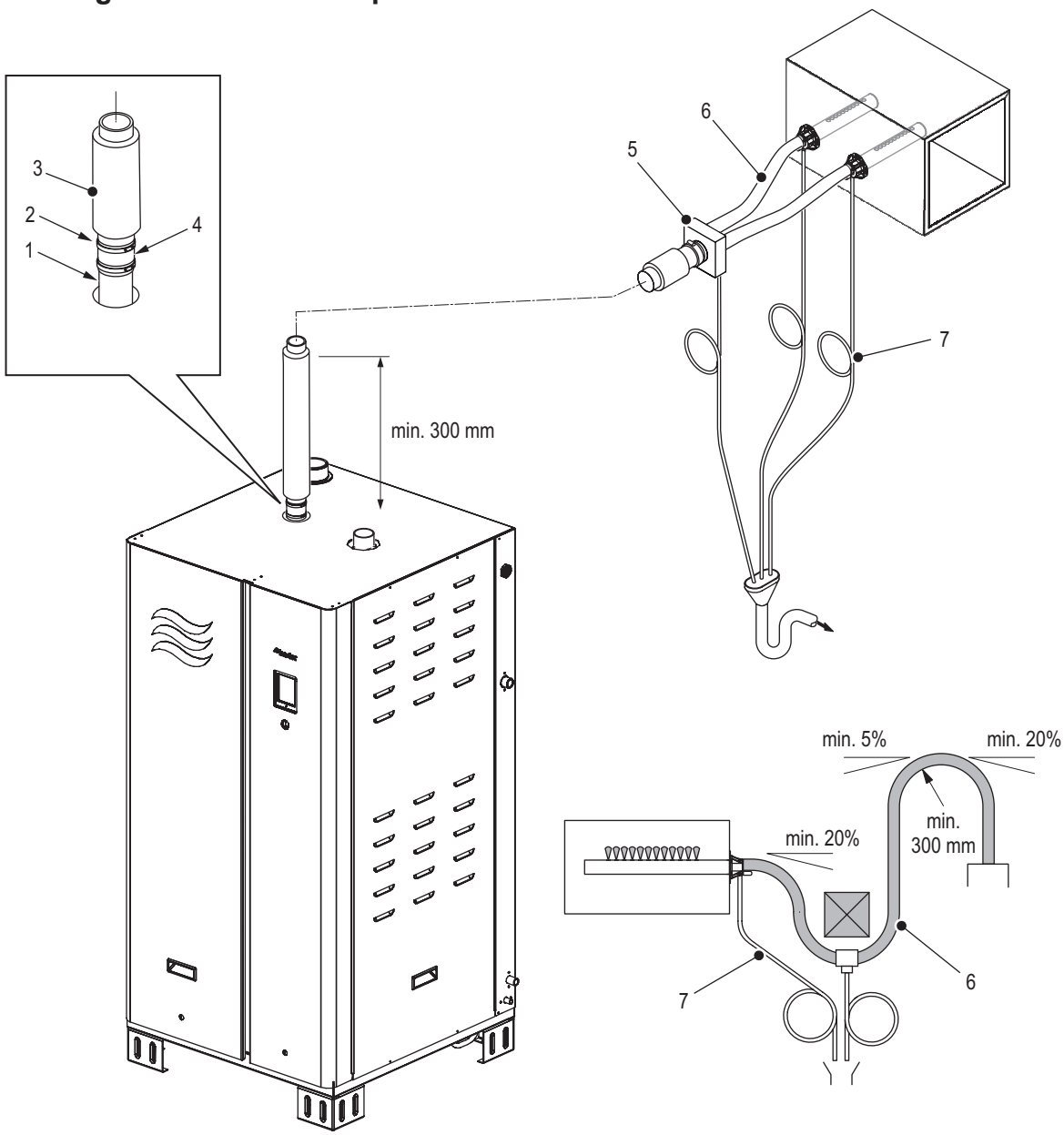


Figure 11: Main Steam Line Installation

1 Steam outlet, humidifier
2 Clamp, gear (supplied)
3 Steam pipe, rigid (main) – must rise straight up minimum 300 mm above steam outlet before continuing to steam distributor. Maximum 6 m long.
4 Cuff, hose (supplied)
5 Adapter, steam hose (accessory)
6 Steam hose – must have minimum bend radius of 300 mm, and minimum upslope of 20% or minimum downslope of 5% to steam distributor. Maximum 4 m long. Steam hose must not sag – add condensate drain line, as shown, if necessary.
7 Drain line, condensate – must have minimum downslope of 20%. The trap should be minimum 300 mm in diameter, and located minimum 300 mm below the steam distributor or dip in the steam line.

Table 12: Humidifier Steam Outlet Diameter

Model	Outside Diameter
GS 23	45 mm
GS 45	45 mm
GS 65	75 mm
GS 90	75 mm
GS 130	75 mm
GS 195	100 mm
GS 260	100 mm

5.5.2 Best Practices for Installing Steam and Condensate Lines

Condair recommends that you observe the following best practices for installing atmospheric steam lines and condensate lines.

Refer to *Figure 11 on page 29*.

Steam Line

– Use rigid steam pipes made of copper or stainless steel (minimum DIN 1.4301) exclusively. Steam pipes made of any other materials may adversely affect the operation of the unit, and will void the warranty.

– Refer to *Table 12* for the required minimum internal diameter of the steam pipe. The internal diameter of the steam pipe can be expanded, but once expanded a reduction in diameter is not permitted, except at the steam distributor.

– The maximum length of the rigid main steam pipe is 6 m. Exceeding the maximum length can affect performance of the unit, and may void the warranty. Backpressure in the line combined with duct static pressure must not exceed 1.49 kPa for compact units, and 2.49 kPa for full-size units.

IMPORTANT! When calculating the backpressure on the unit, include allowances of approximately 100 Pa for every meter of rigid steam pipe, and every 90° elbow.

– The minimum bend radius for rigid steam pipes is 5× the internal diameter. Avoid 90° bends, or use long radius elbows for steam pipes. This minimizes backpressure and formation of condensation.

IMPORTANT! When determining the length and routing of steam lines, allowances must also be made for thermal expansion.

– The steam line from the humidifier must lead straight upwards for a minimum of 300 mm before continuing on to the steam distributor – refer to *Figure 11 on page 29*. The steam line must have a minimum upslope of 20% or minimum downslope of 5% to the steam distributor – refer to *Figure 12 on page 31*.

– Use only Condair steam hose between the steam outlet on the humidifier and the steam distributor. Other types of steam hoses can affect performance of the unit, and may void the warranty. The length of the steam hose should be kept to a minimum (ideally 2 m, maximum 4 m). The minimum bend radius of the steam hose is 300 mm. The steam hose must not sag, and must have a minimum upslope of 20% or minimum downslope of 5% to the steam distributor.

IMPORTANT! When calculating the backpressure on the unit, include allowance of approximately 100 Pa for every meter of steam hose.

Allowances must also be made for shrinkage in the length of the steam hose due to aging.

– Use short lengths of steam hose to connect the steam line to the humidifier or steam distributor. Secure the steam hoses with gear clamps.

CAUTION!
Risk of damage to the gear clamp.

Do not over-tighten the gear clamp. The maximum torque value for gear clamps is 180 N·cm.

– Do not combine multiple steam lines, except at the steam distributor. Use a Condair steam hose adapter (accessory) specifically designed for that purpose, and only if the humidifiers connected to the adapter operate in parallel.
– To minimize formation of condensation, the steam pipe must be insulated with a minimum of 25 mm of pipe insulation over its entire length.
– The weight of the steam pipe/hose must be supported so there is no load on the humidifier.

WARNING!
Risk of severe burns from contact with hot steam vapours!

Restrictions in the cross-section of the steam line will cause excessive backpressure in the steam tank when the unit is operating, which may cause unexpected release of hot steam vapors. Bare skin in contact with the hot steam vapours can result in severe burns. In addition, excess backpressure also affects performance of the unit.

Prevention: Observe the following:

- Upon completion of the installation, purge the steam line to remove any contaminants and installation materials.
- The steam hose must not have any kinks or other restrictions.
- To prevent condensate pockets, the steam line must not sag. If necessary, support the steam line with pipe clamps, trough, or wall brackets, and install a condensate drain at the lowest point in the steam line.
- DO NOT install a shutoff valve (e.g. a manually operated shutoff valve, solenoid valve, etc.) in the steam line.

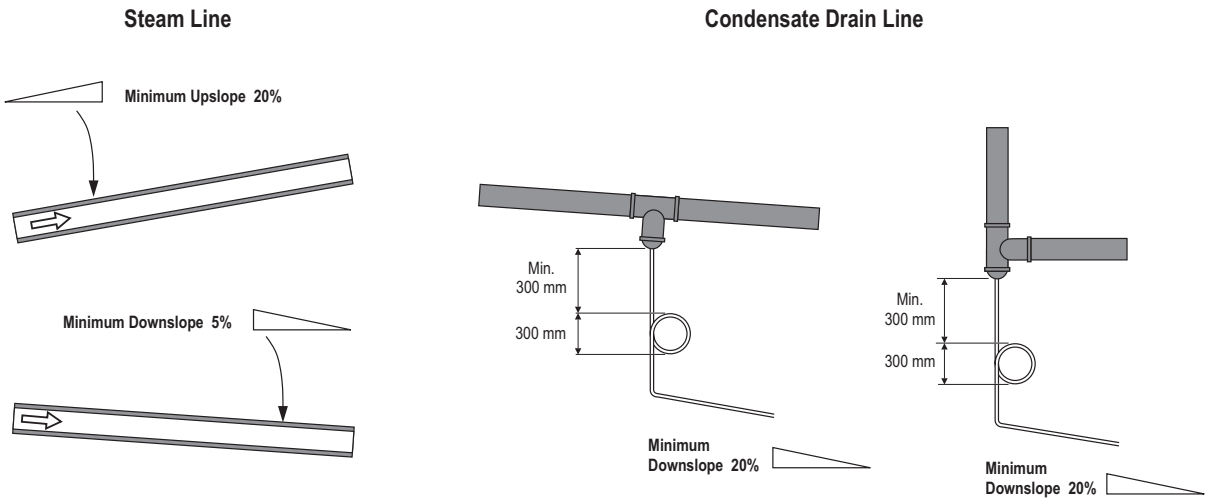


Figure 12: Steam and Condensate Line Slopes

Condensate Lines

– Use Condair condensate hose exclusively. Other types of condensate hoses can affect performance of the unit, and may void the warranty.

WARNING!
Risk of severe burns from contact with hot fluids or steam!

The condensate lines may be filled with hot fluids or steam. Bare skin in contact with hot fluids or steam can result in severe burns.

Prevention: Never plumb the condensate lines to empty into a sink used by personnel. Always connect the lines to a floor drain according to applicable national and local plumbing regulations.

– Condensate traps must be installed at all low points, and at horizontal-to-vertical transitions in the steam line. The condensate drain lines should always connect to full-size "Tee" connectors in the steam line. Refer to *Figure 12 on page 31*.

– The condensate lines must have a minimum downslope of 20%, with a minimum 300 mm diameter condensate trap, and connect to the building floor drain with condensate cooler (if required). The condensate trap must be at least 300 mm below the condensate “Tee” and the steam distributor.

– Condensate lines must have individual traps before emptying to a common condensate drain. The common condensate drain must be sized appropriately to handle all the condensate.

– Make sure that the condensate lines allow proper flow.

– Do not over-tighten the hose clamps on the condensate lines.

IMPORTANT! Before starting up the unit, prime the condensate traps with water.

5.5.2.1 Common Steam and Condensate Line Installation Mistakes

Some common steam and condensate line installation mistakes are shown in *Figure 13*.

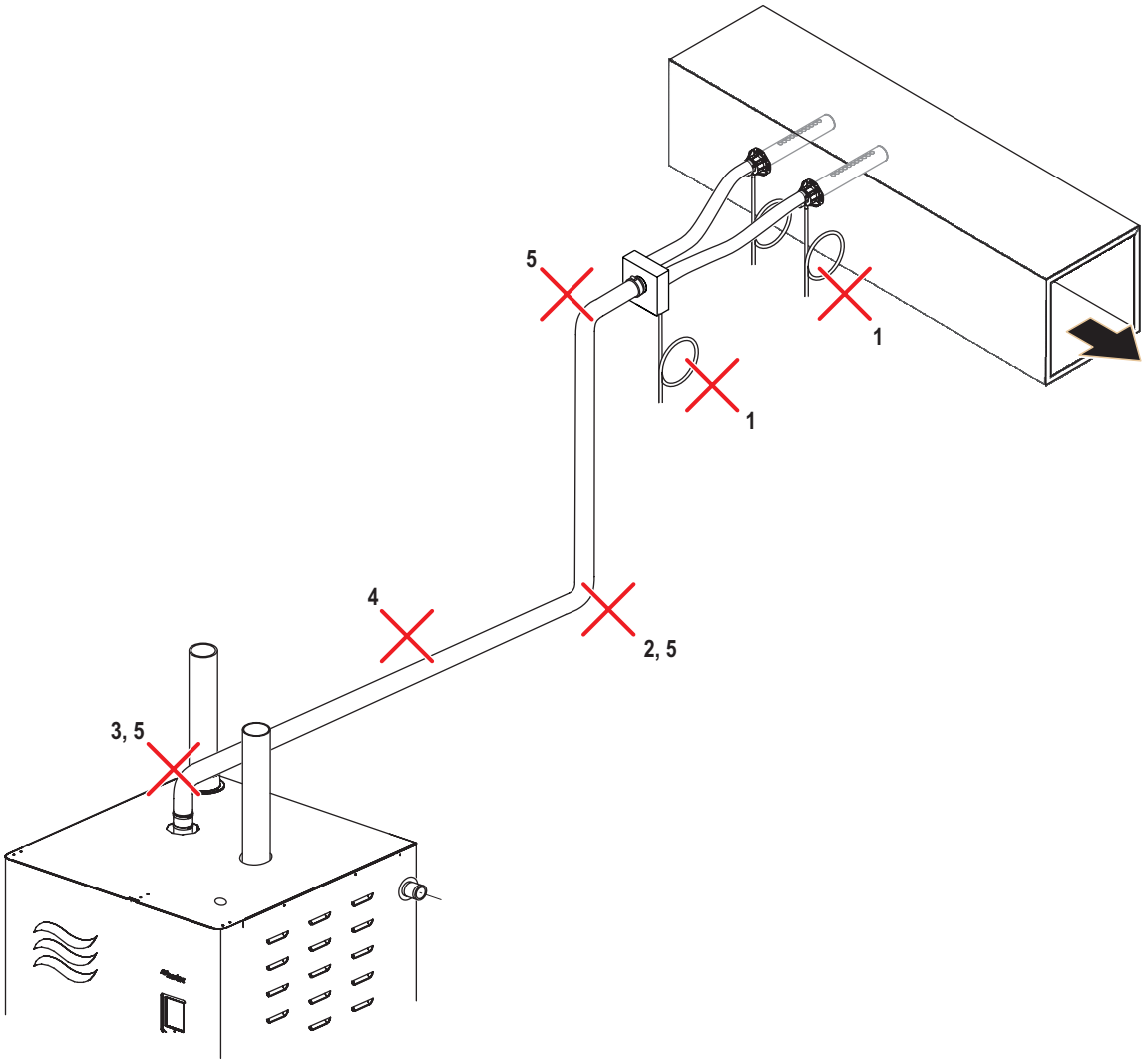


Figure 13: Common Steam and Condensate Line Installation Mistakes

1 The condensate trap is located less than the required minimum 300 mm below the steam distributor.
2 No condensate trap is installed at the horizontal-to-vertical transition.
3 The steam line does not run straight up for the required minimum 300 mm before continuing on to the steam distributor.
4 Steam line is not sloped – minimum upslope of 20% or minimum downslope of 5% to the steam distributor is not maintained.
5 The required long radius elbow (for rigid pipe) is not used.

5.5.3 Steam Connection Checklist

Check the following to ensure that the steam connections for the humidifier have been installed correctly:

Steam Line

- ☐ Observed all best practices?
- ☐ Steam pipe sized correctly?
- ☐ The main steam pipe does not exceed maximum length of 6 m?
- ☐ The steam hose between the steam hose adapter and steam distributor does not exceed maximum length of 4 m?
- ☐ Long radius elbows (for rigid pipes) used?
- ☐ Backpressure in the line combined with duct static pressure does not exceed 1.49 kPa for compact units, or 2.49 kPa for full-size units?
- ☐ Steam line runs straight up from the humidifier steam outlet for at least 300 mm before bend?
- ☐ Steam line has minimum upslope of 20% or minimum downslope of 5% to the steam distributor?
- ☐ Steam line does not reduce in diameter except at the steam distributor; and condensate line installed just before the restriction?
- ☐ Steam lines do not merge except at the steam distributor through a Condair steam hose adapter?
- ☐ Steam line does not sag?
- ☐ Steam connections securely with clamps? Clamps torqued adequately?
- ☐ Allowances made for thermal expansion of rigid pipes, and shrinkage of steam hose?
- ☐ Steam line insulated over its entire length?

Condensate Line

- ☐ Local regulations on drain water temperature requirements have been satisfied?
- ☐ Condensate traps installed at all low points, and at horizontal-to-vertical transitions in the steam line?
- ☐ Condensate lines in the steam line always connect to full-size "Tee" connectors?
- ☐ Condensate traps have a minimum loop diameter of 300 mm and installed at least 300 mm below the condensate “Tee” and the steam distributor?
- ☐ All condensate lines have a minimum downslope of 20%?
- ☐ Condensate lines have individual traps before emptying to a common condensate drain? Condensate drain sized appropriately to handle all the condensate?
- ☐ Condensate traps primed with water?

5.6 Water Connections

Refer to *"Site Requirements" on page 19* for the water supply and drain requirements.

Read *"Water Connection Requirements" on page 38*, and perform the water connections as shown in *Figure 14 on page 35* or *Figure 15 on page 36*, as applicable.

5.6.1 Water Connections – Compact Unit

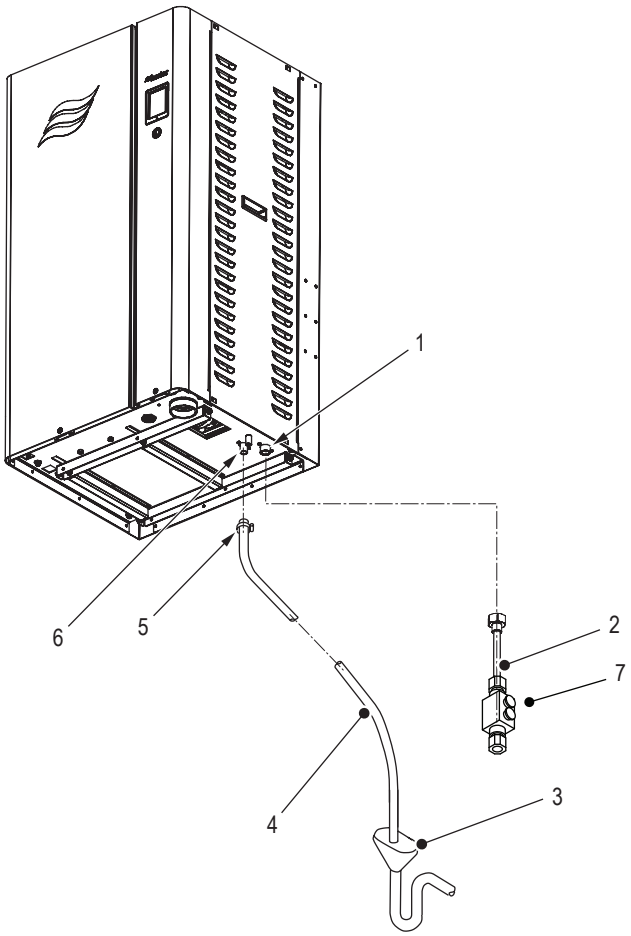


Figure 14: Water Supply and Drain Connections, Compact Unit

1 Inlet, fill valve – 3/4 in BSPP (male plastic thread)
2 Supply line, water – minimum 12 mm diameter
3 Funnel, air gap – drain pipe connected to the funnel must have minimum inner diameter of 45 mm and be within 1 m of the unit
4 Hose, drain, 22 mm I.D. (not supplied) – minimum constant downslope of 10%, and must not touch sides or bottom of funnel
5 Clamp, hose (not supplied)
6 Outlet, drain, 22 mm O.D. (unthreaded)
7 Double check valve backflow preventer (supplied by others)

5.6.2 Water Connections – Full-Size Unit

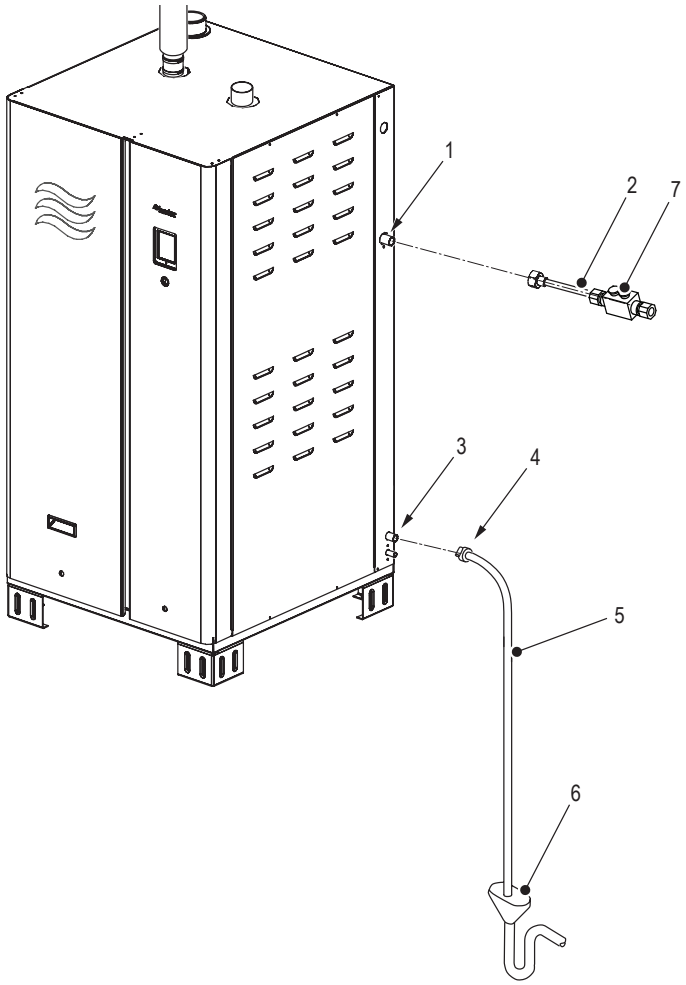


Figure 15: Water Supply and Drain Connections, Full-Size Unit

1 Inlet, fill valve – 3/4 in BSPP (male plastic thread)
2 Supply line, water – minimum 12 mm diameter
3 Outlet, drain, 22 mm O.D. (unthreaded)
4 Clamp, hose (not supplied)
5 Hose, drain, 22 mm I.D. (not supplied) – minimum constant downslope of 10%, and must not touch sides or bottom of funnel
6 Funnel, air gap – drain pipe connected to the funnel must have minimum inner diameter of 45 mm and be within 1 m of the unit
7 Double check valve backflow preventer (supplied by others)

5.6.3 Exhaust Condensate Drain Line (CS Model Only)

Install the condensate drain line (CS model only) as shown in *Figure 16*.

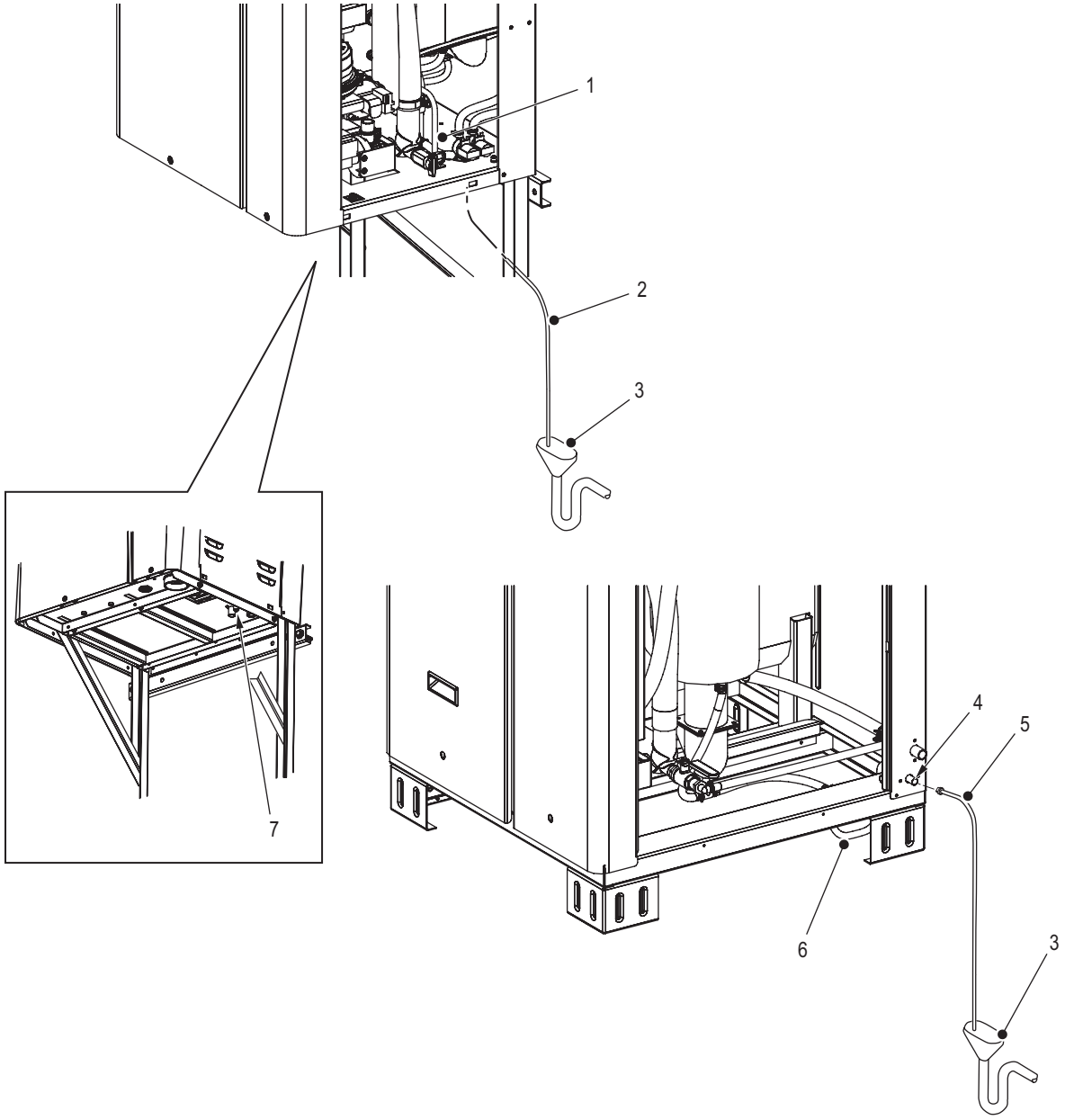


Figure 16: Exhaust Condensate Drain Line (CS Model Only)

1 Trap, internal condensate (compact unit) – primed with water
2 Hose, drain, exhaust condensate (compact unit) – (not supplied) must have constant minimum downslope of 20%, and must not touch sides or bottom of funnel.
3 Funnel, air gap – funnel must be located below the condensate outlet and be within 1 m of the unit
4 Outlet, condensate drain (full-size unit), 13 mm O.D. (unthreaded)
5 Hose, drain, exhaust condensate (full-size unit) – (not supplied) must have constant minimum downslope of 20%, and must not touch sides or bottom of funnel.
6 Trap, internal condensate (full-size unit) – primed with water
7 Outlet, condensate drain (compact unit), 9.5 mm O.D. (unthreaded)

5.6.4 Water Connection Requirements

Water and drain connections must meet the following requirements:

- All water supply and drain connections are to be installed to local plumbing regulations.
- For ease of maintenance, a water shutoff valve and union fitting must be installed in the supply line just before the humidifier.
- The water filter must be installed as close as possible to the humidifier.
- Prevent water from the tank from re-entering the water supply. Install a double check valve backflow preventer and secure it along the water supply line to the unit. Adhere to all local and national installation regulations.
- The water supply pipe should be minimum 12 mm in diameter with a 3/4 in BSPP female end. The water supply pipe can be made of plastic (pressure-proof to 690 kPa and certified for use with drinking water systems), copper (not permitted for DI water) or stainless steel (minimum DIN 1.4301).

CAUTION!
Risk of damage to the plastic threads in the fill valve!

Prevention: Hand-tighten the water supply connection to the fill valve.

- The air gap funnel should be located away (max 1 m) from the control cabinet to keep any rising steam from damaging the electrical components in the control cabinet.
- The drain pipe connecting the air gap funnel to the building drain must have a minimum internal diameter of 45 mm. Use stainless steel (minimum DIN 1.4301) or copper pipe (not permitted for DI water).
- The drain hose from the humidifier should be as short as possible, and empty into the air gap funnel without touching its sides or bottom. Drain hose must have a minimum constant downslope of 10% and must be secured with a hose clamp. The drain hose must be rated for 100 °C.
- Install the exhaust condensate hose (CS model only), and secure it with a hose clamp – refer to *Figure 16 on page 37*. The hose must be rated for 100 °C. Connect the hose to a condensate neutralization device, if required by local code, before connecting the hose to a drain.
- Upon completion of installation, disconnect and flush the water supply and drain lines to clear out any debris in the lines. Check the strainer in the fill valve is free of all debris. Reconnect the lines.
- Prime the condensate trap inside the unit (CS model only) with water.

5.6.5 Water Connections Checklist

Check the following to ensure that the water connections for the humidifier have been installed correctly:

- ☐ Water quality meet the requirements listed in *Table 6 on page 19*
- ☐ Shutoff valve and union fitting installed in supply line?
- ☐ Double check valve backflow preventer is installed along the water supply line to the unit? Is the double check valve backflow preventer installed, adhering to all applicable local and national installation regulations?
- ☐ Water supply pipe minimum 12 mm in diameter? Plastic pipe (pressure-proof and certified for use with drinking water systems), copper or stainless steel if using potable drinking water or RO water? Plastic or stainless steel pipe if using DI water?
- ☐ 5 µm water filter installed in the supply line close to the humidifier?
- ☐ Water supply temperature 1-25 °C?
- ☐ Water supply surge-protected and pressure regulated to 3-8 bar?
- ☐ Check for leaks in the water supply line?
- ☐ Air gap funnel in the floor located away (max 1 m) from the control cabinet in the humidifier?

- ☐ Drain pipe between air gap funnel and building drain have a minimum internal diameter of 45 mm? Copper or stainless steel pipe if using potable drinking water or RO water? Stainless steel pipe if using DI water?
- ☐ Drain hose from humidifier empty into the air gap funnel without touching its sides or bottom? Drain hose have a minimum constant downslope of 10%, and secured with hose clamp? Drain hose rated for 100 °C?
- ☐ Exhaust condensate hose installed (CS model only)? Hose rated for 100 °C? Trap inside unit primed with water?
- ☐ Water supply and drain lines flushed? Strainer in the fill valve free of debris?

5.7 Combustion Air Connection

The combustion air regulations for gas-fired appliances vary from country to country. Adhere to all relevant national and local regulations. If assistance is required, consult your Condair representative.

The installation must only be performed by a qualified technician, who is well versed with the national and local regulations of the jurisdiction.

Excess exposure to contaminated combustion air will result in safety and performance-related problems with the humidifier. Known contaminates include: halogens, ammonia, and chlorides, excessive dust, lime or dirt. Excess exposure to these contaminants will also affect the on-board electronics. Contact Condair if you have any questions. If necessary, isolate the unit from the contaminated space.

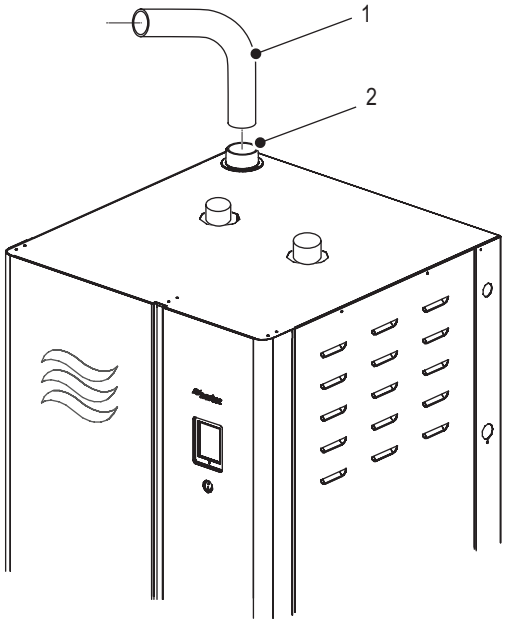
Refer to *"Site Requirements" on page 19* for combustion air requirements.

Select the type of installation required for combustion air – refer to *"In-Room Air Installation"* or *"Room Seal Installation" on page 40*.

5.7.1 In-Room Air Installation

This type of installation draws combustion air from inside the room/space where the humidifier is installed. An appropriate opening to the outside of the building must be provided to allow fresh combustion air into the space. Adhere to all national and local installation regulations for fresh combustion air in the room/space.

Note: Condair recommends installing an elbow (fitted with a screen) at the intake air inlet on all Condair GS 65-260 units to prevent dirt and debris from being drawn into the combustion chamber. Seal the connection with silicone sealant. Keep the area around the air intake clear of all obstructions. Refer to *Figure 17*.



Refer to *Table 13 on page 40* for outside diameter of elbow.*In-Room Air Installation – Condair GS 65-260*

1 Elbow (not supplied)
2 Inlet, intake air (full-size unit)

5.7.2 Room Seal Installation

A room seal installation draws fresh combustion air from the outside. The room seal requirements for combustion air vary from country to country, as stated at the beginning of this section. The vent diameter listed in *Table 13* must be maintained over the entire length of the vent. Adhere to all national and local installation regulations.

In addition, refer to *"Room Seal Installation Requirements" on page 41*.

Table 13: Air Intake Vent Diameter

	GS 23	GS 23-CS	GS 45 GS 45-CS	GS 65 GS 65-CS	GS 90 GS 90-CS	GS 130 GS 130-CS	GS 195 GS 195-CS	GS 260 GS 260-CS
Intake Vent Outside Diameter	80 mm	60 mm	80 mm	80 mm	100 mm	100 mm	150 mm	150 mm

Figure 18 shows the room seal intake vent connection for the compact and full-size Condair GS humidifiers.

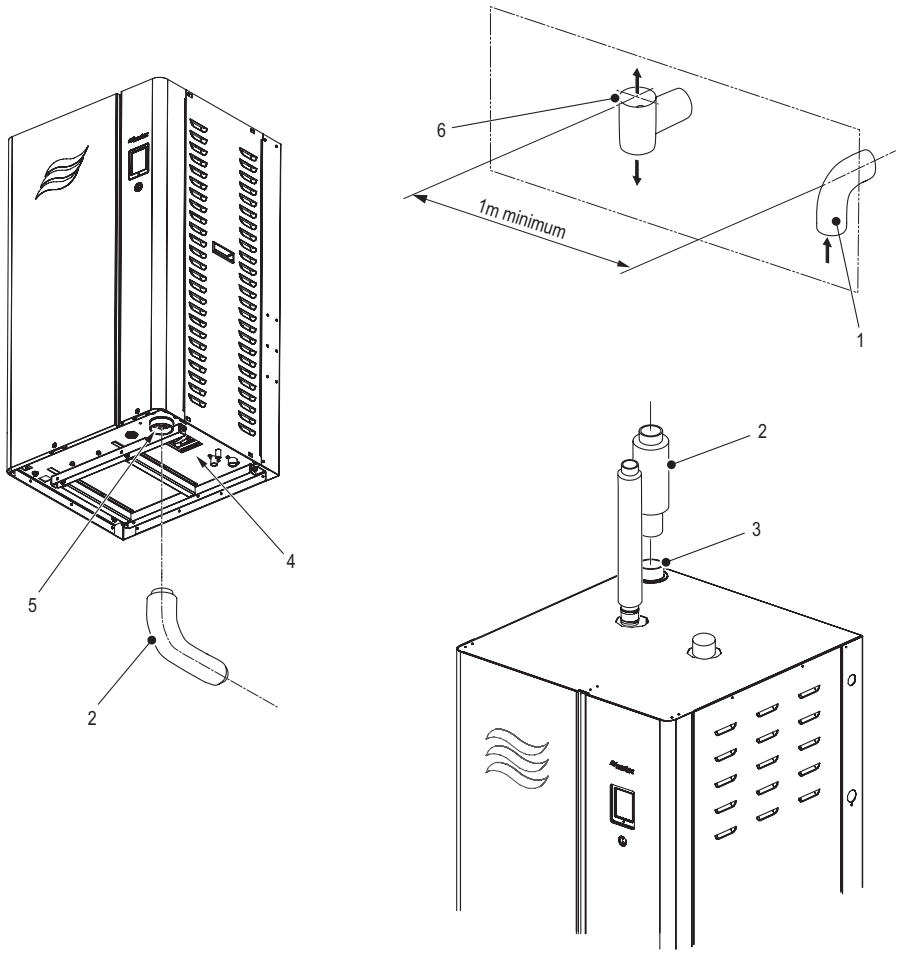


Figure 17: Condair GS Room Seal Installation

1 Terminal, air intake (elbow) – terminal located outside building and facing down (not supplied)
2 Vent, intake – wrapped with insulation (not supplied)
3 Inlet, intake air (full-size unit)
4 Access, maintenance (compact unit) – do not block
5 Inlet, intake air (compact unit)
6 Terminal, exhaust ("Tee") – terminal located outside building and opening vertical (not supplied)

5.7.2.1 Room Seal Installation Requirements

In addition to the requirements of the applicable national and local regulations for room seal installations, the following requirements must also be satisfied:

– The intake vent must not exceed an equivalent length of 21 m for natural gas and 15 m for propane.

  Note: Each 90° bend is equivalent to 3 m of straight pipe, and each 45° bend is equivalent to 1.5 m of straight pipe. The intake vent should not have more than six bends.

– The intake vent diameter is listed in *Table 13 on page 40*. The vent diameter must remain uniform over the entire run.

– Poly-propylene intake vent pipes may be used. All intake vent piping must be approved for room seal applications, and all joints and seams must be sealed with appropriate sealant.

IMPORTANT! Route the intake vent so that it does not obstruct access to any of the services to the humidifier. On the compact unit, make sure that the maintenance access for the drain pump is not obstructed.

– The intake vent must be supported every 1.5 m, and at every pipe bend.

– An intake (elbow) terminal must be installed on the outside termination of the air intake vent, with the elbow facing down – refer to *Figure 18 on page 38*. The air intake terminal and exhaust vent terminal must be located on an exterior surface. The location and spacing between the terminals must comply with all local and national regulations, with at least a minimum spacing of 1 m between them.

– The air intake terminal and exhaust vent terminal can be installed in different pressure zones. The air intake terminal and exhaust vent terminal must not be installed on opposite walls of the building.

– At low temperatures, water condensation can occur on the outside of the air intake vent. To prevent this, Condair suggests adding in-line heating and insulation on the intake vent.

5.7.3 Combustion Air Checklist

Check the following to ensure that the combustion air requirements for the humidifier have been satisfied:

In-Room Air Installation

☐ All relevant national and local regulations for fresh combustion air satisfied?

☐ Elbow installed at the intake air inlet?

Room Seal Installation

☐ All relevant national and local regulations for room seal installation satisfied?

☐ Intake vent length does not exceed an equivalent length of 21 m for natural gas or 10 m for propane? Maximum six bends?

☐ Vent diameter as listed in *Table 13 on page 40*, and uniform over the entire run?

☐ All joints and seams in the vent sealed with appropriate sealant?

☐ Intake vent supported?

☐ Spacing between air intake terminal and exhaust vent terminal minimum 1 m?

☐ Intake vent heated and insulated in cold climates?

5.8 Exhaust Vent Connection

The exhaust venting regulations for gas-fired appliances also vary from country to country. Adhere to all relevant national and local regulations. If assistance is required, consult your Condair representative.

The general requirements and the exhaust venting types are discussed below in *"General Requirements"*. Other specific requirements are listed in *"Exhaust Venting Requirements, Standard-Efficiency Models" on page 50* and *"Exhaust Venting Requirements, Condensing High-Efficiency Models" on page 50*.

5.8.1 General Requirements

The exhaust vent system used with the Condair GS humidifier must satisfy the following requirements:

- The exhaust vent systems shall be certified to meet all applicable provisions of the national building regulations. Any local regulations related to exhaust venting systems must also be adhered to.
- All installation material must be in accordance with local regulations.
- In applying the regulations, refer to the vent system manufacturer's instructions, the local gas supplier regulations, and the specific instructions in this manual.
- This appliance must be installed in compliance with all national regulations. The installation must only be performed by a qualified technician, who is well versed with the national and local regulations of the jurisdiction.
- Proper removal of combustion gases must be assured, and building materials must be protected from degradation by flue gases.
- Never mix venting types. Never use two different manufacturer's equipment for the same exhaust vent.
- All horizontal exhaust vent runs must maintain a constant minimum upslope of 2.1% (21 mm/m) to prevent accumulation of condensate.
- All horizontal runs must be adequately supported every 1.5 m to prevent sagging. In addition, every pipe bend must also be supported.
- When an exhaust vent run exceeds 7 m, insulate the exhaust vent pipe to reduce the amount of condensate that could form inside the vent.
- When an exhaust vent passes through a cold area or a location that has large amounts of air flow over the vent, insulate the exhaust vent pipe with type-F90 insulation to prevent condensation inside the vent.
- When an exhaust vent passes through walls, floors, and ceilings, proper clearances must be maintained around combustible materials and venting manufactures fire stop equipment. Adhere to local regulations.

WARNING!
Risk of severe burns from contact with hot exhaust vent!

Prevention: Install a fire-proof screen or barrier minimum 50 mm from the exhaust vent to prevent contact with it.

- All exhaust vents must be made of corrosion-resistant materials, and all sealing materials must be tested and approved for exhaust venting systems.
- The exhaust vent should extend at least 1 m above the roof, and at least 1 m above any ridge within 2.5 m of the chimney. Local regulations apply.
- The exhaust vent must terminate at a sufficient height above the roof to prevent blockage due to accumulation of snow.
- All exhaust vent pipes must be sealed with high temperature RTV silicone rated for at least 250 °C.
- *Table 14 on page 43* lists the diameter of the exhaust vent. The vent diameter must remain uniform over the entire run. Adhere to all local and national installation regulations.

Table 14: Exhaust Vent Diameter

	GS 23	GS 23-CS	GS 45 GS 45-CS	GS 65 GS 65-CS	GS 90 GS 90-CS	GS 130 GS 130-CS	GS 195 GS 195-CS	GS 260 GS 260-CS
Exhaust Vent Diameter	80 mm	60 mm	80 mm	80 mm	100 mm	100 mm	150 mm	150 mm

Sidewall Venting

The following additional requirements must be satisfied if the exhaust vent terminates at a sidewall:

IMPORTANT! Some countries prohibit routing the vent pipe through sidewalls. Adhere to all national and local regulations.

- Locate the humidifier as close as possible to the wall that is used for termination of the vent.
- Locate the exhaust terminal at least 1 m above any forced air inlet located within 3 m, or at least 1 m below and 1 m horizontally from, or 0.5 m above any door, window, or gravity air inlet into any building.
- A minimum horizontal clearance of 1 m from electric meters, gas meters, regulator and relief equipment must be maintained.
- Install certified vent terminals at the vent terminations.
- Locate the vent terminal at least 2.5 m above grade when it is adjacent to public walkways.
- Locate the bottom of the vent terminal at least 45 cm above grade or ground, or normally expected snow accumulation level. The snow level may be higher on walls exposed to prevailing winds.
- Avoid areas where experience shows that condensate drip may cause problems – such as above planters, patios, or over public walkways, or over an area where condensate or vapour could create a nuisance or hazard, or could be detrimental to the operation of regulators, relief valves, or other equipment. Refer to the vent manufacturer's installation instructions.

Room Seal Exhaust Venting

The Condair GS humidifier is certified as a C13, C33 and a C53 appliance. Where local regulations permit, the humidifier can be installed as a C6 appliance (refer to *"Installation as a C6 Appliance" on page 46* for the requirements). Contact your Condair representative for installation assistance.

The following additional requirements must be satisfied for room seal exhaust venting:

- The equivalent length of the exhaust vent should be minimum 2.1 m and maximum 21 m.
- An air intake (elbow) terminal must be installed in the intake vent, with the elbow facing down. The air intake terminal and exhaust vent terminal must be located on an exterior surface. The location and spacing between the terminals must comply with all local and national regulations, with at least a minimum spacing of 1 m between them.

For Type C13 and C33 installations, refer to *Table 15* for diameters of the concentric terminations.

Table 15: Concentric Termination Diameters for C13 and C33 installations

	GS 23	GS 23-CS	GS 45 GS 45-CS	GS 65 GS 65-CS	GS 90 GS 90-CS	GS 130 GS 130-CS	GS 195 GS 195-CS	GS 260 GS 260-CS
Concentric Termination Diameters	Φ 80/125 mm	Φ 60/100 mm	Φ 80/125 mm	Φ 80/125 mm	Φ 100/150 mm	Φ 100/150 mm	Φ 150/200 mm	Φ 150/200 mm

Figure 18, *Figure 19 on page 44*, *Figure 20 on page 45*, and *Figure 21 on page 48* show the general types of venting arrangements that can be used with the Condair GS humidifier. These are guidelines only. Adhere to all national and local regulations.

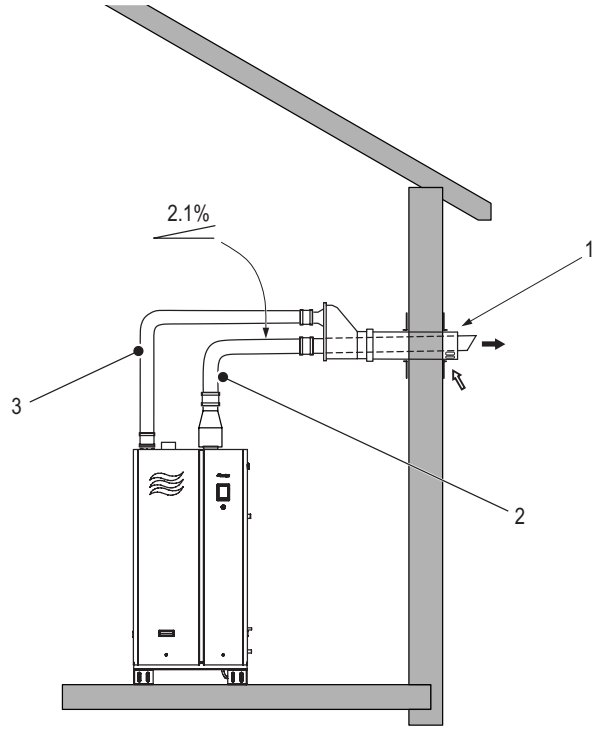


Figure 18: Type C13 Exhaust Venting for Room Seal Installations

1 Terminal, concentric (not supplied)
2 Vent, exhaust (not supplied) – minimum 2.1 m, maximum 21 m long
3 Vent, intake (not supplied) – minimum 2.1 m, maximum 21 m long

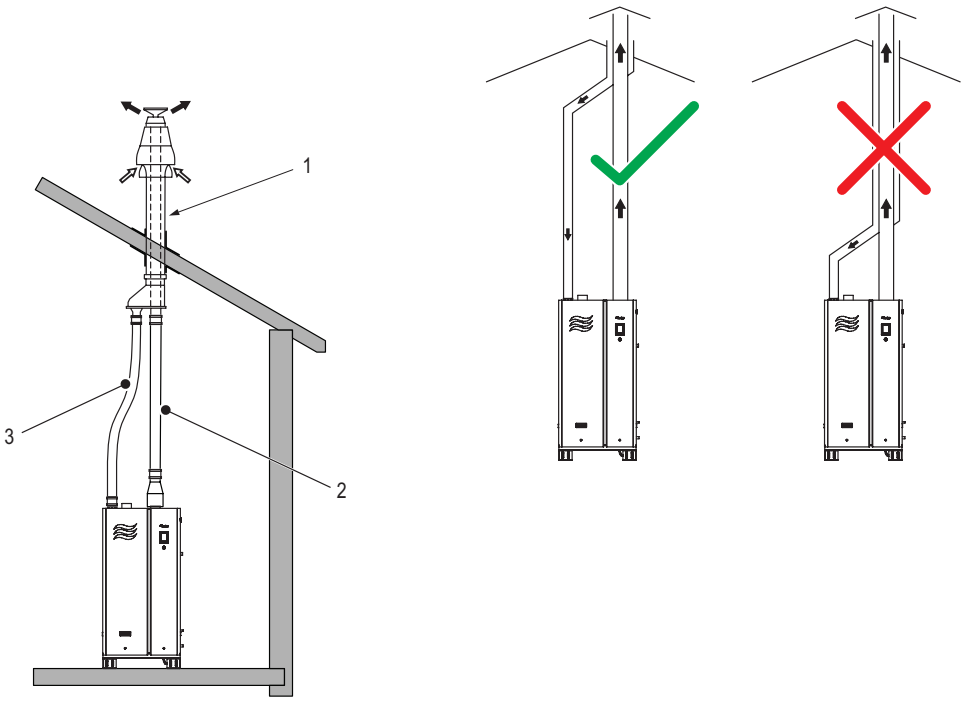


Figure 19: Type C33 Exhaust Venting for Room Seal Installations

1 Terminal, concentric (not supplied)
2 Vent, exhaust (not supplied) – minimum 2.1 m, maximum 21 m long
3 Vent, intake (not supplied) – minimum 2.1 m, maximum 21 m long

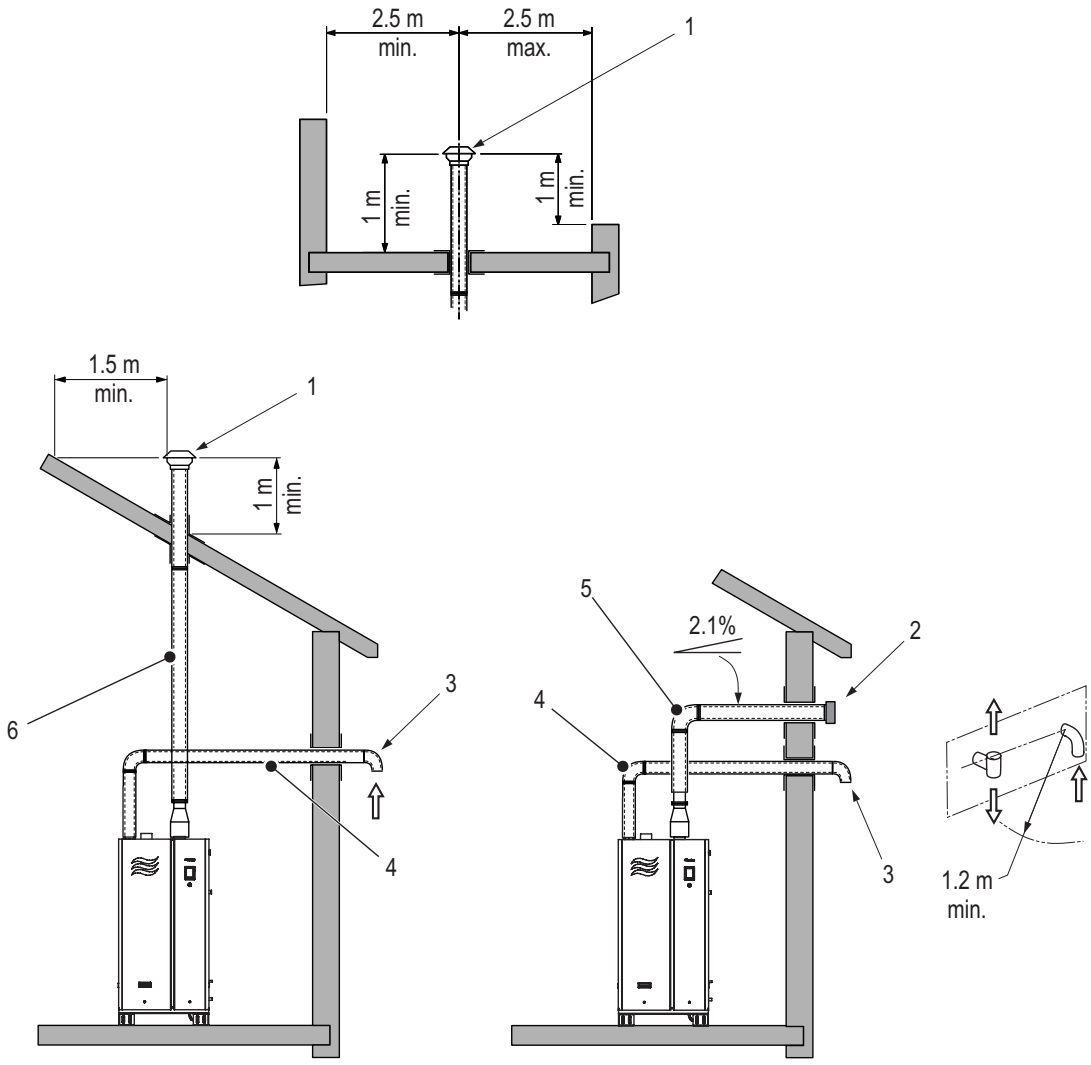


Figure 20: Type C53 Exhaust Venting for Room Seal Installations

1 Cap, rain (not supplied)
2 Terminal, exhaust (not supplied) – refer to local regulations
3 Terminal, air intake (not supplied) – refer to local regulations
4 Vent, intake, horizontal (not supplied) – minimum 2.1 m, maximum 21 m long
5 Vent, exhaust, horizontal (not supplied) – minimum 2.1 m, maximum 21 m long with a constant minimum upslope of 2.1%
6 Vent, exhaust, vertical (not supplied) – minimum 2.1 m, maximum 21 m long

5.8.1.1 Installation as a C6 Appliance

Where local regulations permit, the Condair GS humidifier may be installed as a C6 appliance. When installed as a C6 appliance, the humidifier must be connected to a separately approved and marketed system for the supply of combustion air and discharge of flue gases. The exhaust vent, intake vent and terminals used in such an installation must meet the following requirements:

Exhaust Vent Requirements

- The exhaust vent must be installed according to the supplier's certified instructions.
- Unless specified by the vent manufacturer, the length of the exhaust vent must meet the requirements shown in *Table 16*. Refer to vent manufacturer's literature for recommended pressure loss for elbows, fittings and terminations.
- When installed, the equivalent length of the intake and exhaust vents must be the same.
- The exhaust vent material must be suitable for the operating temperature of the humidifier.
- Connect the exhaust vent to the exhaust outlet in the humidifier as described in *"Exhaust Vent Installation" on page 49*. Refer also to *Figure 21 on page 48*.

Table 16: Allowable Pressure Loss

Model	Exhaust Vent			Intake Vent			Allowable Total Pressure Losses (Exhaust Vent, Intake Vent and Terminals)	
	Vent Diameter	Allowable Equivalent Length		Vent Diameter	Allowable Equivalent Length			
		Minimum	Maximum		Minimum	Maximum	Minimum	Maximum
GS 23	80 mm	1.5 m	33 m	80 mm	1.5 m	33 m	0 mbar	0.74 mbar
GS 23-CS	60 mm			60 mm				
GS 45	80 mm	1.5 m	33 m	80 mm	1.5 m	33 m	0 mbar	0.74 mbar
GS 45-CS								
GS 65	80 mm	1.5 m	33 m	80 mm	1.5 m	33 m	0 mbar	1.2 mbar
GS 65-CS								
GS 90	100 mm	1.5 m	33 m	100 mm	1.5 m	33 m	0 mbar	0.74 mbar
GS 90-CS								
GS 130	100 mm	1.5 m	33 m	100 mm	1.5 m	33 m	0 mbar	1.2 mbar
GS 130-CS								
GS 195	150 mm	1.5 m	33 m	150 mm	1.5 m	33 m	0 mbar	1.2 mbar
GS 195-CS								
GS 260	150 mm	1.5 m	33 m	150 mm	1.5 m	33 m	0 mbar	1.2 mbar
GS 260-CS								

Intake Vent Requirements

- All room seal installations must use a sealed intake vent to supply fresh combustion air from the outside.
- Unless specified by the vent manufacturer, the length of the intake vent must meet the requirements shown in *Table 16*. Refer to vent manufacturer's literature for recommended pressure loss for elbows, fittings and terminations.
- When installed, the equivalent length of the intake and exhaust vents must be the same.

- The intake vent material may be made of plastic or smooth-walled metal.
- In colder climates, insulate the intake vent to prevent condensation inside the vent.
- Connect the intake vent to the air intake inlet in the humidifier as described in *"Room Seal Installation" on page 40*. Refer also to *Figure 21 on page 48*.

Total Pressure Loss Requirements

The total pressure losses in the exhaust vent, intake vent and terminals must meet the requirements shown in *Table 16 on page 46*.

Use the following formulas to calculate the total pressure losses. Refer to *Table 17 on page 48* for the mass flow rates used in the calculations.

$$P_T = P_r + P_t$$

where,

$$P_r = \frac{0.246 \times L \times V_a \times V_f}{d}$$

$$V_a = \frac{354 \times Q}{d^2} \times \left[\frac{100 \times A}{x} + B \right]$$

$$V_f = V_a \times \frac{\left(t_f + 273\right)}{\left(t_a + 273\right)}$$

Where,
P_T = total pressure (mbar)
P_r = pressure loss due to resistance (mbar)
P_t = pressure loss caused by exhaust terminal (mbar) – refer to literature supplied with terminal
L = equivalent length of all pipes (m)
d = internal diameter of pipe (mm)
V_a = velocity of flue products (m/s) at ambient temperature
V_f = actual velocity of flue products (m/s)
Q = appliance input (kW)
t_f = temperature of flue products (°C)
t_a = ambient temperature (°C)
A = CO_2 produced by combustion gas (0.095 for natural gas)
B = water vapour produced by combustion of gas (0.190 for natural gas)
x = 9.5 (actual % of CO_2 in flue products)

Table 17: Flue Products

Model	Minimum Heat Input		Maximum Heat Input	
	Flue Temperature (°C)	Mass Flow Rate (kg/min)	Flue Temperature (°C)	Mass Flow Rate (kg/min)
GS 23	80	0.10	135	0.50
GS 23-CS	57	0.09	57	0.44
GS 45	80	0.20	135	1.00
GS 45-CS	57	0.18	57	0.88
GS 65	80	0.30	135	1.49
GS 65-CS	57	0.27	57	1.32
GS 90	50	0.39	135	2.00
GS 90-CS	39	0.35	57	1.76
GS 130	50	0.59	135	2.98
GS 130-CS	39	0.52	57	2.64
GS 195	40	0.87	135	4.47
GS 195-CS	32	0.77	57	3.96
GS 260	35	1.16	135	5.96
GS 260-CS	29	1.03	57	5.28

Intake Terminal and Exhaust Terminal Requirements

- The intake and exhaust terminals must comply with the requirements of EN 1856-1.
- The intake and exhaust terminals must be located and installed according to the supplier's certified instructions.
- A protective guard must be installed over the exhaust terminal if the terminal is located less than 2.4 m above the ground.

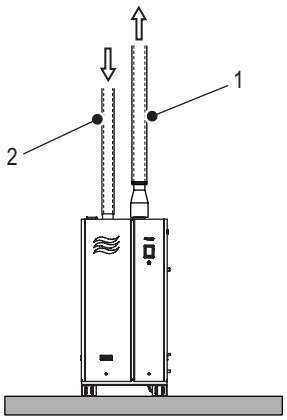


Figure 21: Type C6 Exhaust Venting for Room Seal Installations

1 Vent, intake – refer to local regulations
2 Vent, exhaust – refer to local regulations

5.8.2 Exhaust Vent Installation

All vent installations must be in accordance with national and the local regulations.

Each CS model is supplied with an adapter (with internal gaskets). To connect the plastic exhaust vent to the unit, first insert the adapter into the exhaust outlet and secure it to the top panel with four sheetmetal screws (supplied) – refer to *Figure 22*. Then slide the exhaust vent into the adapter until it bottoms out, and secure it with the clamp built into the adapter. A sealant is not required.

For the standard-efficiency model, connect the stainless steel exhaust vent directly to the exhaust outlet. The exhaust outlet has internal gaskets, hence a sealant is not required. Slide the vent into the adapter until it bottoms out.

In both cases, make sure that the exhaust vent is supported by hangers or pipe straps so that there is no load on the humidifier.

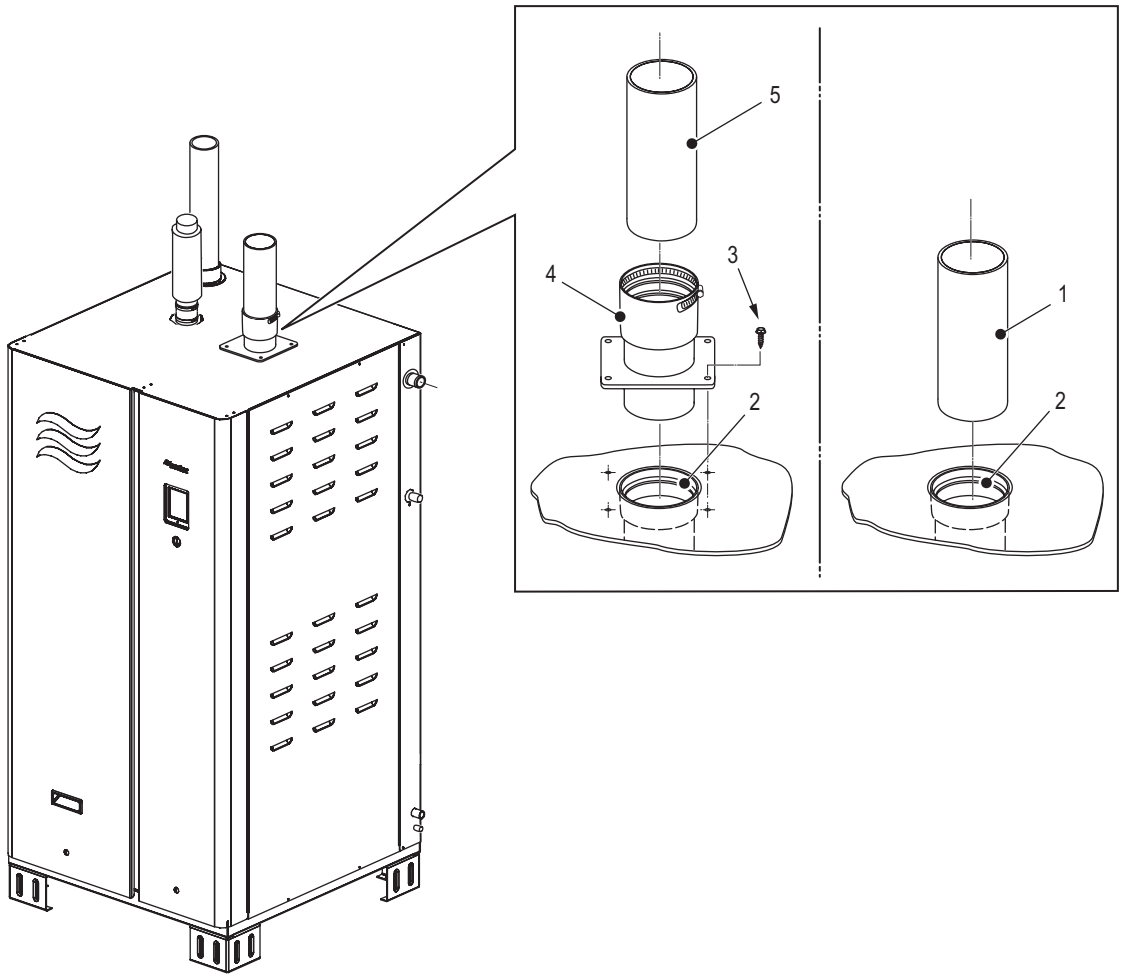


Figure 22: Condair GS Exhaust Vent Connection

1 Vent, exhaust – stainless steel (for standard-efficiency model)
2 Outlet, exhaust, humidifier
3 Screw, sheetmetal (×4, supplied, for CS model only)
4 Adapter, exhaust – plastic (supplied, for CS model only)
5 Vent, exhaust – plastic (for CS model only)

5.8.2.1 Exhaust Venting Requirements, Standard-Efficiency Models

The exhaust venting for the Condair GS standard-efficiency model humidifier must be designed for under-pressure utilizing suitable high temperature venting material with condensate drainage.

In addition to the *"General Requirements" on page 42*, the following requirements must also be satisfied for the exhaust vent installation in a Condair GS standard-efficiency models:

- All vent installation must be in accordance with the national and local regulations.
- Adhere to all local regulations for routing of the vent pipe and under-pressure requirements.
- Stainless steel venting material used in the installation must comply with all national and local regulations.
- Adhere to the vent manufacturer's installation instructions.
- The permissible under-pressure range is -20 to -62 Pa.
- Normal operating temperature range is 180-193 °C. The maximum permissible flue temperature is 200 °C. If the maximum temperature is exceeded, the humidifier will shut down for safety reasons.
- The exhaust vent must not exceed an equivalent length of 21 m, and the pipe diameter must be maintained over the entire run.
- The vent run should be as direct as possible with no more than six elbows in the system. Each 90° elbow is equivalent to 3 m of straight pipe, and each 45° elbow is equivalent to 1.5 m of straight pipe.

5.8.2.2 Exhaust Venting Requirements, Condensing High-Efficiency Models

The exhaust venting for the Condair GS condensing high-efficiency (CS) model humidifier must be designed for over-pressure utilizing either low or high temperature venting material.

In addition to the general requirements stated in *"General Requirements" on page 42*, the following requirements must also be satisfied for the exhaust vent installation in a Condair GS CS model:

- Plastic venting material used in the installation must comply with all national and local regulations.
- The plastic vent pipe must be connected to the exhaust outlet on the humidifier – refer to *Figure 22 on page 49*.
- The exhaust vent pipe must not exceed an equivalent length of 21 m, and the pipe diameter must remain uniform over the entire run.
- The vent run should be as direct as possible with no more than six elbows in the system. Each 90° elbow is equivalent to 3 m of straight pipe, and each 45° elbow is equivalent to 1.5 m of straight pipe.
- The maximum permissible flue temperature is 70 °C. Normal operating range is 49-60 °C.

5.8.3 Exhaust Vent Checklist

Check the following to ensure that the exhaust vent for the humidifier has been installed correctly:

- ☐ Exhaust vent installed in accordance with all national and local regulations, vent manufacturer and Condair requirements?
- ☐ Proper clearances maintained between exhaust vent and combustible materials?
- ☐ Exhaust vent diameter as listed in *Table 14 on page 43*, and uniform over the entire run?
- ☐ The equivalent length of the exhaust vent minimum 2.1 m and maximum 21 m? Maximum six elbows in the exhaust vent?
- ☐ Exhaust vent secured properly with hangers or pipe straps?

5.9 Gas Connection

Gas piping must meet all applicable national and local gas supply pressure requirements.

Refer to *"Site Requirements" on page 19* for the gas supply requirements. In addition, refer to *"Gas Connection Requirements" on page 52*.

IMPORTANT! Tampering with the gas valve, without the express consent of Condair, will void the warranty.

5.9.1 Gas Connection, Compact and Full-Size Unit

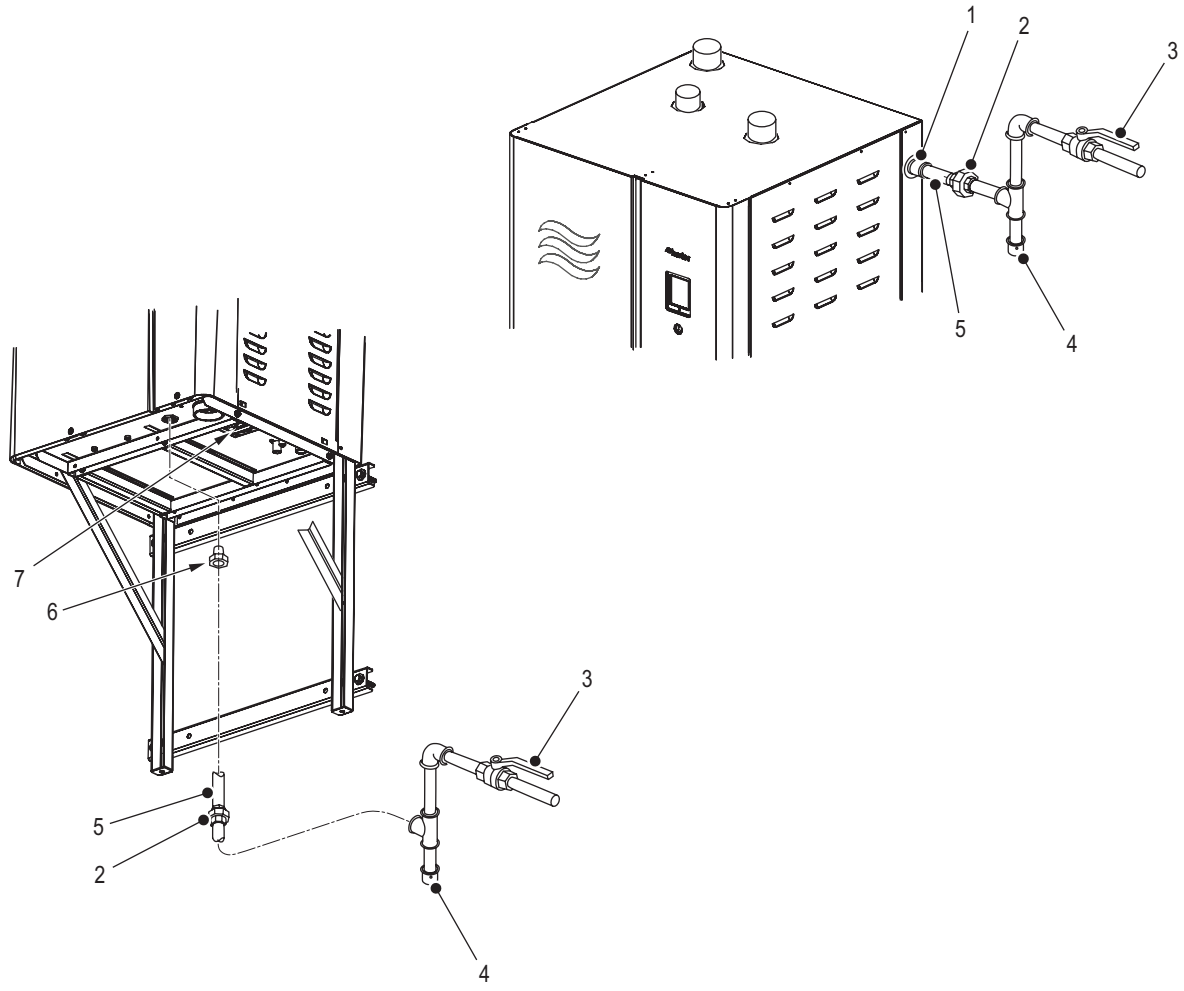


Figure 23: Gas Connection

1 Adapter, gas inlet, (full-size unit) – (supplied)
2 Fitting, union (not supplied)
3 Valve, manual gas shutoff (not supplied)
4 Trap, sediment (not supplied)
5 Stainless steel section of gas pipe (at final connection)
6 Adapter, gas inlet, (compact unit) – (supplied)
7 Maintenance access for drain pump – do not obstruct

5.9.2 Gas Connection Requirements

In addition to the requirements of the applicable national and local codes for gas connections, the following requirements must also be satisfied:

– A certified manual gas shutoff valve must be installed immediately upstream from the humidifier. Refer to *Figure 23*.

– For gas line size and gas connection adapter details refer to *Table 8 on page 20*.

– If black pipe is used, a sediment trap must also be installed immediately upstream from the humidifier.

IMPORTANT! To prevent rapid formation of rust in the stainless steel gas manifold inside the unit, Condair recommends the use of a stainless steel section of pipe at the gas connection to the humidifier.

IMPORTANT! Route the gas line so that it does not obstruct access to any of the services to the humidifier. On the compact unit, make sure that the maintenance access for the drain pump is not obstructed.

– DO NOT use teflon tape on gas line pipe threads. A flexible sealant suitable for use with natural gas and propane gas is recommended.

– All gas piping must be adequately supported to prevent any strain on the humidifier gas connection.

– Upon completion of the gas installation, perform the *"Gas Leakage Test"* described below.

5.9.3 Gas Leakage Test

DANGER!
Risk of explosion and fire!

Prevention: NEVER use an open flame to check for gas leaks. Risk of injury, death or property damage. Use a commercial soap solution or a gas sniffer to check for leaks.

CAUTION!
Risk of damage to the gas valve!

Prevention: Before performing the leakage test described below, close the manual gas shutoff valve at the humidifier to isolate the gas valve from system pressure. Failure to do so may damage the gas valve, and will void warranty.

1. Close the manual gas shutoff valve at the humidifier.
2. Pressurize the gas supply line to a maximum of 3.5 kPa, and test all gas connections external to the humidifier for leaks using a commercial soap solution or a gas sniffer. Seal all leaks before operating the humidifier.
3. After completing the leakage test, de-pressurize the gas supply line BEFORE opening the manual gas shutoff valve.

5.9.4 Gas Connection Checklist

Check the following to ensure that the gas connection for the humidifier has been installed correctly:

- ☐ Is a certified manual gas shutoff valve installed immediately upstream from the humidifier?
- ☐ Is a sediment trap installed (if using black pipe)?
- ☐ Is a stainless steel section of pipe used at the gas connection to the humidifier?
- ☐ Gas pipe routing allow clear access to other service connections at humidifier?
- ☐ Gas piping adequately supported?
- ☐ Leak test completed, and all leaks fixed?
- ☐ De-pressurize gas supply line after leak test?

5.10 Humidity Control Systems

5.10.1 Humidity Control Configurations

Three different humidity control configurations are discussed below – refer to *"Configuration 1 – Room Humidity Control" on page 53*, *"Configuration 2 – Room Humidity Control with Continuous Supply Air Humidity Limitation" on page 54* and *"Configuration 3 – Supply Air Humidity Control with Continuous Output Limitation" on page 55*.

Table 18 shows the suggested applications for each configuration.

Table 18: Humidity Control Applications

Application	Location of humidity sensor	
	Room or exhaust air duct	Supply air duct
Air conditioning systems with:		
fresh supply air portion up to 33%	Configuration 1	Configuration 1
fresh supply air portion up to 66%	Configuration 1 or 2	Configuration 2 or 3
fresh supply air portion up to 100%	Configuration 2	Configuration 3
supply air humidity control	–	Configuration 3
Direct room humidification	Configuration 1	–

Contact your Condair representative for assistance if you have other requirements such as:

- humidification of rooms up to 200 m^3.
- air conditioning systems with a high number of air exchanges.
- systems with variable air volume flow.
- test facilities with extreme control accuracy requirements.
- rooms with a high variation in maximum steam capacity.
- systems with temperature fluctuations.
- cold rooms and systems with dehumidification.

5.10.1.1 Configuration 1 – Room Humidity Control

Configuration 1 is suitable for direct room humidification and air conditioning systems with mainly re-circulated air. The humidity sensor or humidistat is preferably located in the room or in the exhaust air duct. Refer to *Figure 24*,

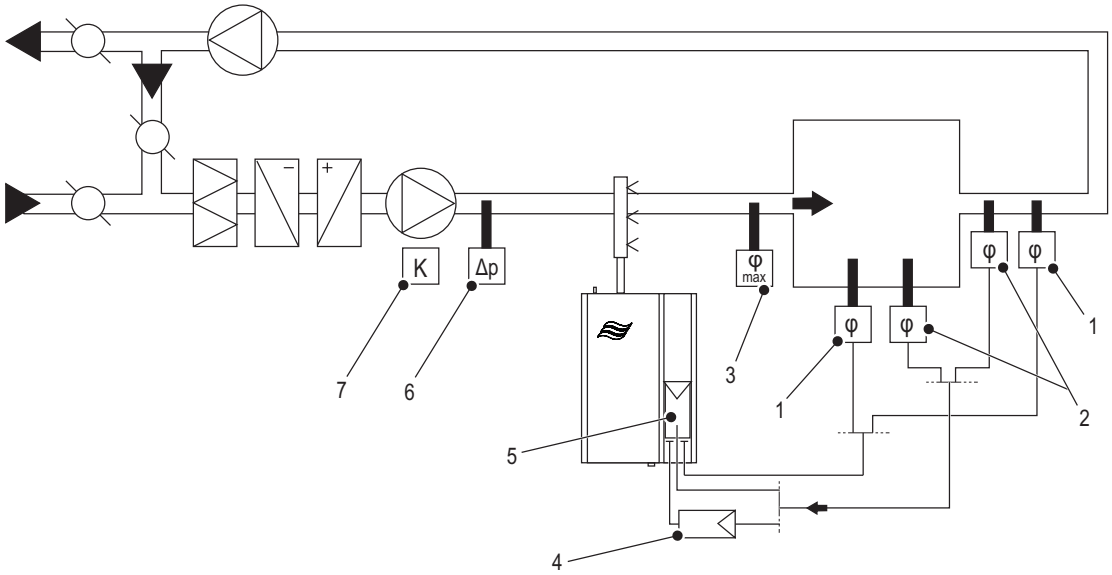


Figure 24: Configuration 1 – Room Humidity Control

1 Humidistat
2 Sensor, humidity
3 Humidistat, safety
4 Controller, external PI
5 Controller, internal PI
6 Monitor, airflow
7 Interlock, ventilation

5.10.1.2 Configuration 2 – Room Humidity Control with Continuous Supply Air Humidity Limitation

Configuration 2 is suitable for air conditioning systems with a large portion of fresh supply air, low air temperature, post-humidification, or variable airflow volume. If the supply air humidity exceeds the preset value, continuous limitation is effected prior to the room humidity control. Refer to *Figure 25*.

The humidity sensor (1) is preferably located in the exhaust air duct or in the room itself. The humidity sensor (2) for limitation of the supply air humidity is located in the supply air duct after the steam distribution pipe. This configuration requires a continuous controller with the option to connect a second humidity sensor.

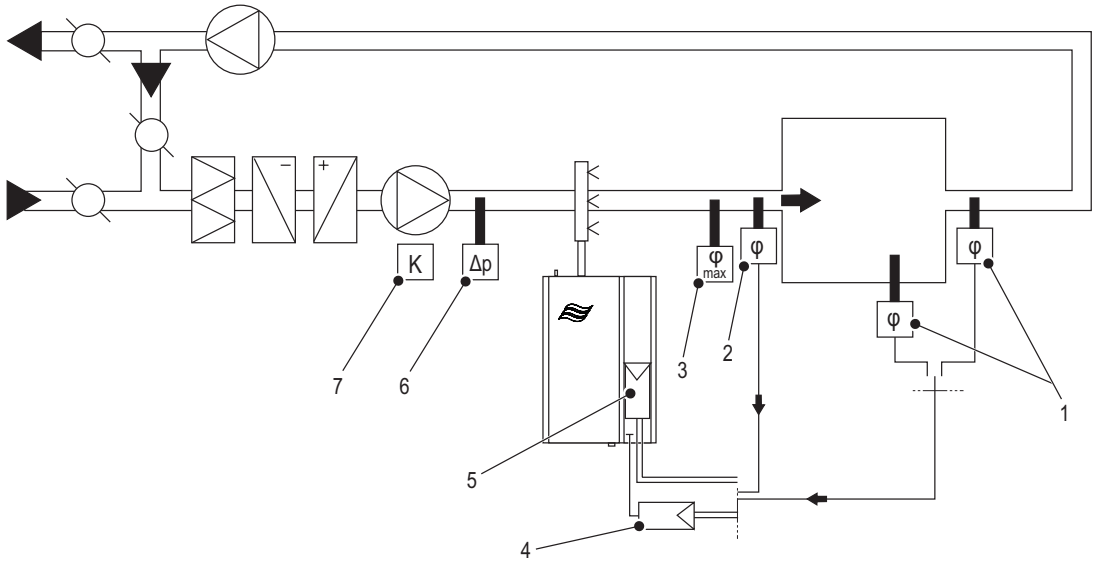


Figure 25: Configuration 2 – Room Humidity Control with Continuous Supply Air Humidity Limitation

1 Sensor, humidity
2 Sensor, humidity
3 Humidistat, safety
4 Controller, external continuous (e.g. PI controller)
5 Controller, internal P/PI
6 Monitor, airflow
7 Interlock, ventilation

5.10.1.3 Configuration 3 – Supply Air Humidity Control with Continuous Output Limitation

Configuration 3, supply air humidity control (humidity sensor installed in supply air duct), should be used only where room humidity control is impracticable for technical reasons. Refer to *Figure 26*.

The humidity sensor (1) is located in the supply air duct after the steam distribution pipe. The humidity sensor (5) for continuous output limitation is located in the supply air duct before the steam distribution pipe. Such a configuration always requires a PI-controller, with the option to connect a second humidity sensor.

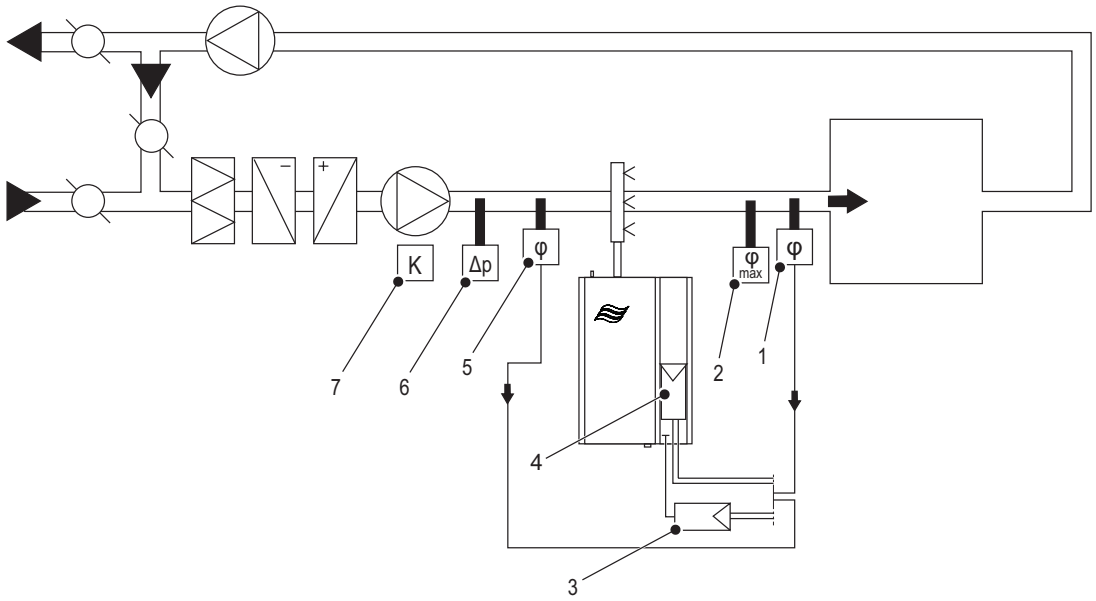


Figure 26: Configuration 3 – Supply Air Humidity Control with Continuous Output Limitation

1 Sensor, humidity
2 Humidistat, safety
3 Controller, external PI
4 Controller, internal PI
5 Sensor, humidity
6 Monitor, airflow
7 Interlock, ventilation

5.10.2 Permissible Control Signal Inputs

Table 19 shows the different permissible control signal inputs to the Condair GS humidifier.

Table 19: Permissible Control Signal Inputs

Humidity Control with External Controller Control Signals	Humidity Control with Internal PI Controller Humidity Sensor Signals	Digital Inputs (via Modbus, BACnet IP/MSTP slave)
0-5 VDC (potentiometer 135-10kΩ) 1-5 VDC 0-10 VDC 2-10 VDC 0-20 VDC 0-16 VDC 3.2-16 VDC 0-20 mA 4-20 mA	0-5 VDC (potentiometer 135-10kΩ) 1-5 VDC 0-10 VDC 2-10 VDC 0-20 VDC 0-16 VDC 3.2-16 VDC 0-20 mA 4-20 mA	BACnet IP BACnet MSTP Slave Modbus Lonworks (Option) BACnet MSTP BTL Certified (Option) BACnet IP BTL Certified (Option)
Humidistat (24 V On/Off)		

5.11 Electrical Connections

Refer to *"Site Requirements" on page 19* for the electrical requirements.

Install the electrical connections according to the applicable wiring diagrams (refer to *"Wiring Diagrams" on page 57*), and the instructions for *"External Connections" on page 60*.

For connecting multiple Condair GS humidifiers, refer to *"Connecting Multiple Units Using Linkup" on page 66*.

5.11.1 General

Safety

The electrical installation work requires removal of the door panels in the humidifier. Observe the following safety precautions:

DANGER!
Risk of electric shock!

The Condair GS humidifier is mains powered. Live parts may be exposed when the door panels are open. Touching live parts may cause severe injury or even death.

Prevention: The Condair GS humidifier must be connected to the mains only after all installation work has been completed, checked for correct workmanship, and the door panels are closed and fastened securely.

CAUTION!
Electrostatic discharge (ESD)!

The electronic components inside the humidifier are sensitive to electrostatic discharge (ESD).

Prevention: Take appropriate measures to protect the electronic components inside the unit against damage caused by electrostatic discharge (ESD). Refer to IEC 61340.

- All electrical installation work must be performed only by a licensed electrician authorized by the customer. It is the customer's responsibility to verify qualifications of the personnel.
- The electrical installation must be performed according to the wiring diagrams in this manual, the instructions in this section, as well as applicable national and local codes.
- Make sure that the main power cable is proper grounded through the ground lug inside the control cabinet.
- All cables must lead into the unit via appropriate strain relief connectors, and be secured with clamp straps.
- Make sure the cables are secured, and do not rub on any components or become a tripping hazard.
- Adhere to national and local codes for maximum cable length and required wire sizes for cables.

5.11.2 Wiring Diagrams

5.11.2.1 Condair GS 23/45/90

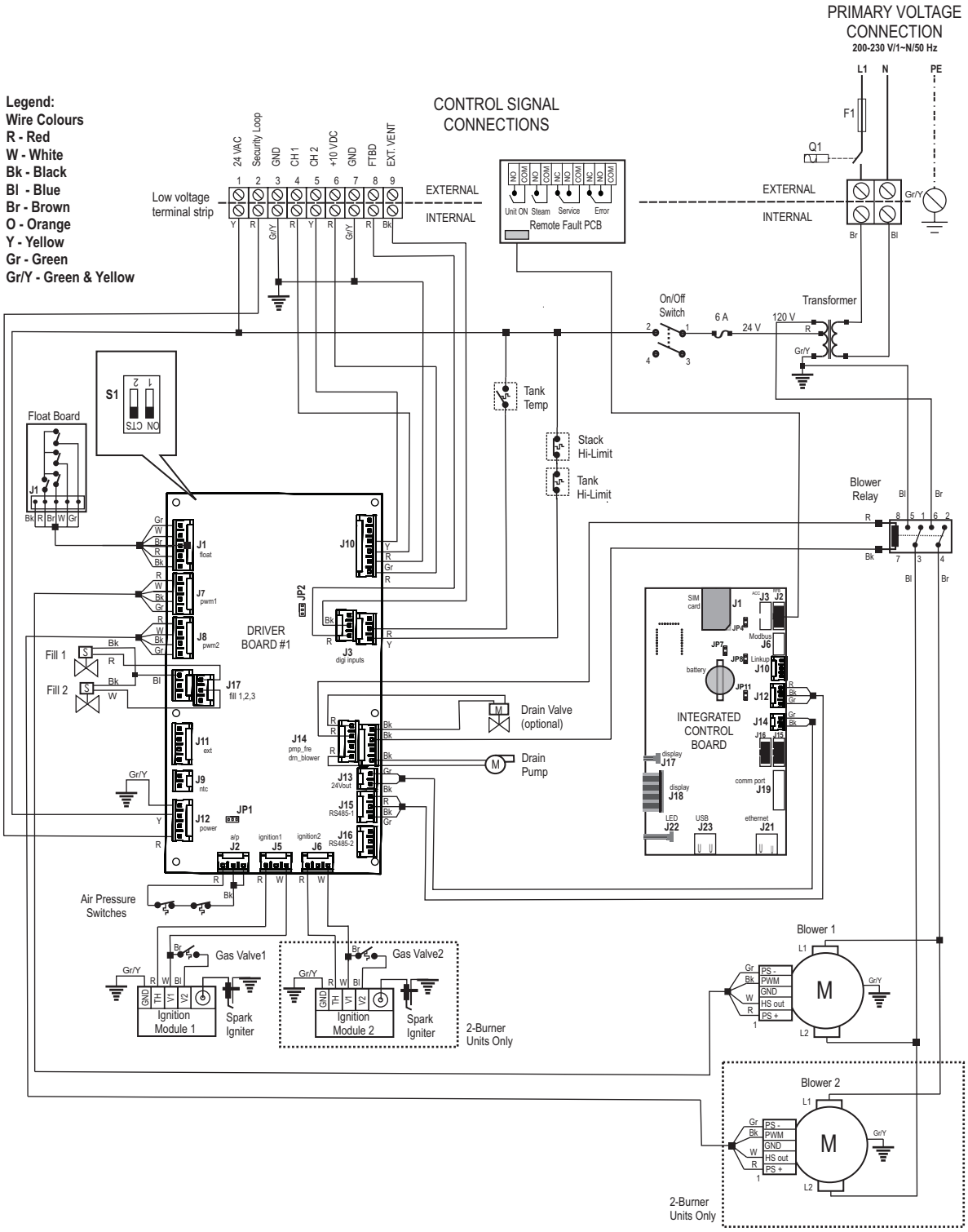


Figure 27: Wiring Diagram - Condair GS 23/45/90

JP4 Jumper – for activating the termination resistor for Modbus or BACnet MSTP network.
J6 Connector, Modbus (RS485 interface)
JP7 Jumper – for activating Modbus or BACnet MSTP communication via connector J6.
JP8 Termination, Linkup system
J10 Connector, Linkup
F1 External fuse voltage supply

5.11.2.2 Condair GS 65/130/195/260

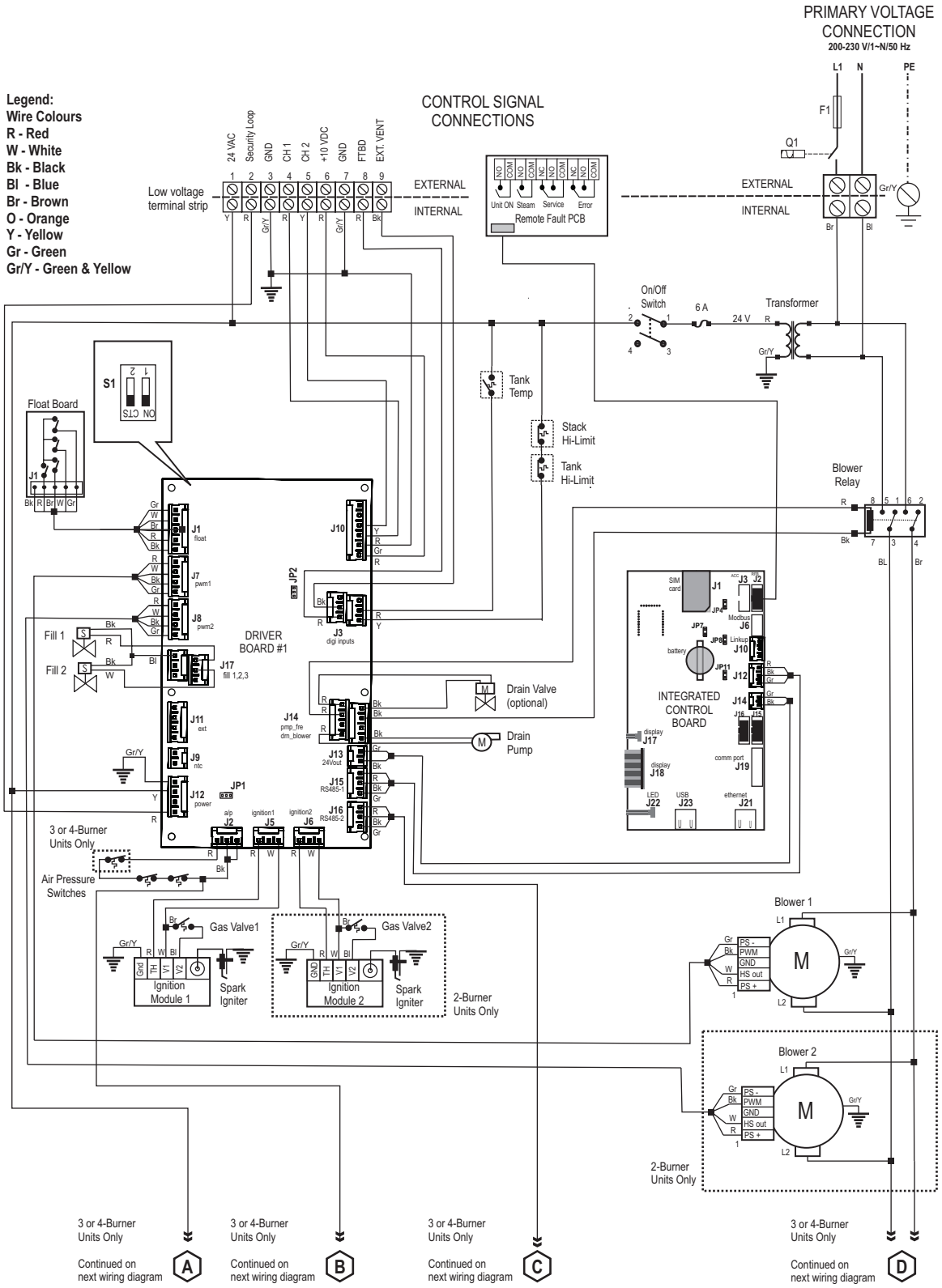


Figure 28: Wiring Diagram - Condair GS 65/130/195/260

JP4 Jumper – for activating the termination resistor for Modbus or BACnet MSTP network.
J6 Connector, Modbus (RS485 interface)
JP7 Jumper – for activating Modbus or BACnet MSTP communication via connector J6.
JP8 Termination, Linkup system
J10 Connector, Linkup
F1 External fuse voltage supply

5.11.2.3 Condair GS 195/260

Figure 29 shows the supplementary wiring diagram for the Condair GS 195/260 units. The connections are carried over from *Figure 28 on page 58*.

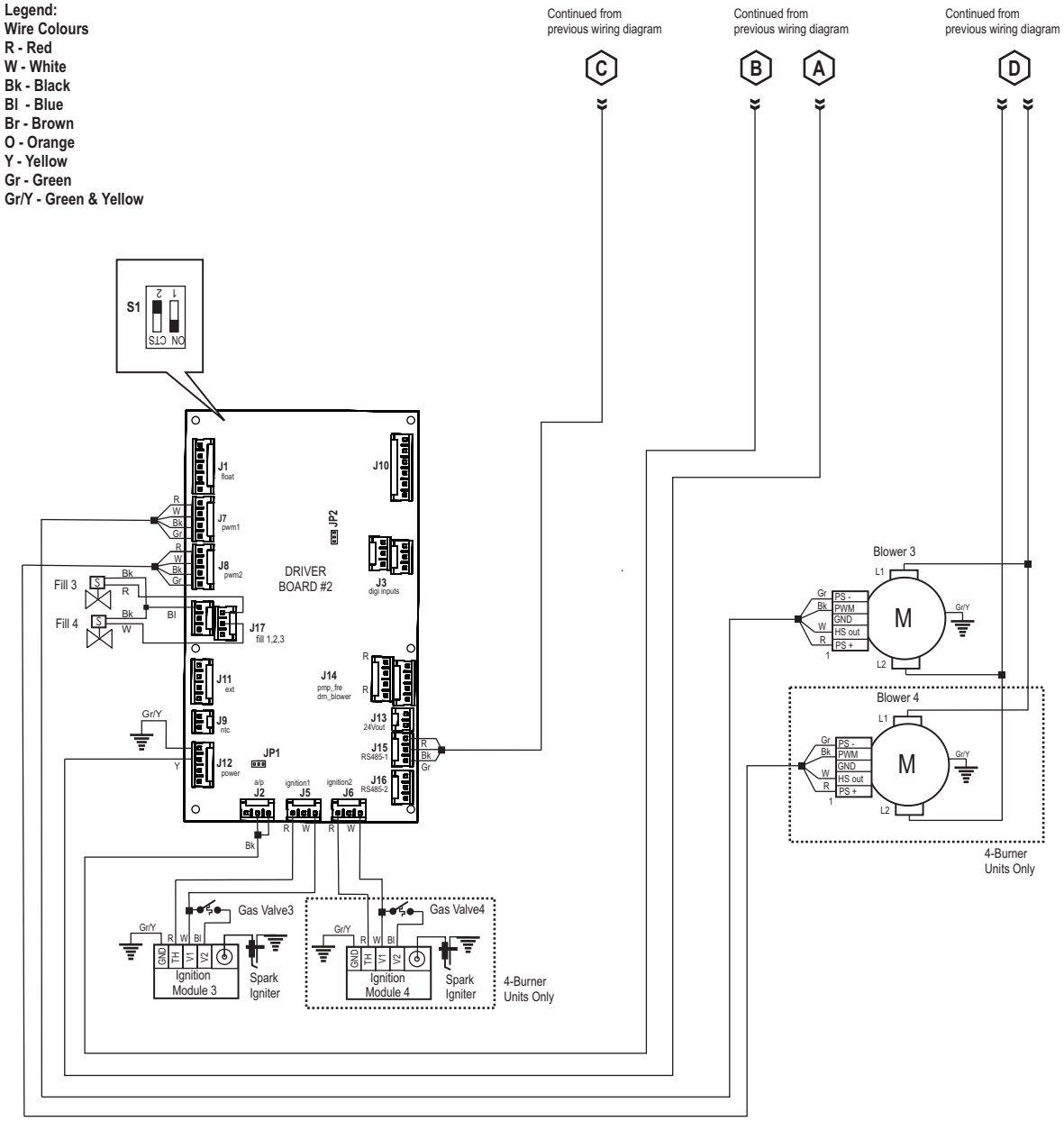


Figure 29: Wiring Diagram - Condair GS 195/260

5.11.3 External Connections

This section describes the different external control signal and power connections to the Condair GS humidifier.

CAUTION!
Risk of improper operation, or damage to equipment and property!

Prevention: Before disconnecting the control signal cables, tag all wires. Reconnect all wires properly after servicing.

5.11.3.1 External Security Loop

The external security loop consists of dry contacts of the external monitoring devices (for example, ventilation interlock, high limit humidistat, air proving switch, etc.). Connect the external safety devices in series to pins "1" and "2" in the low voltage terminal strip. Refer to *Figure 27 on page 57* and *Figure 30*.

IMPORTANT! A high limit humidistat is highly recommended to prevent over-humidification and potential damage to property.

IMPORTANT! Install a jumper between pins "1" and "2" in the low voltage terminal strip if no external On/Off devices are connected to the security loop.

The connecting cables must lead into the control cabinet through strain relief connectors.

CAUTION!
Risk of damage to internal components!

Prevention: DO NOT apply voltage to low voltage terminal strip pins "1" and "2" through the contacts of the external On/Off devices.

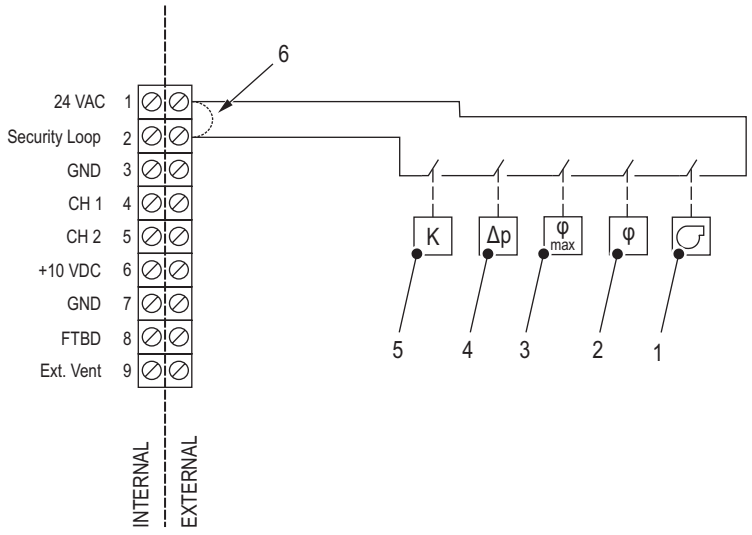


Figure 30: External Security Loop Connections

1 Blower pack
2 Humidistat, On/Off
3 Humidistat, high limit
4 Switch, air proving
5 Interlock, ventilation
6 Jumper (installed if no devices connected to security loop)

5.11.3.2 Modulating Demand or Humidity Signal

Connect an external humidity sensor input or direct demand modulating input to pins "3" and "4" in the low voltage terminal strip. Refer to *Figure 27 on page 57* and *Figure 31*. The permissible control signal input values are shown in *Table 19 on page 55*.

Do not connect multiple modulating signals to the same modulating input on the humidifier. If necessary, connect the second modulating signal to pin "5" and "3", using pin "3" as common. Make sure that Control Channels is set to "Dual" in the control software to utilize the second modulating signal – refer to the Operation and Maintenance Manual.

Alternately, transducer signals or demand signals can be written to the humidifier via a valid digital communication protocol.

The signal cable must lead into the control cabinet through a strain relief connector. If a shielded signal cable is used, connect the shielding to pin "3".

CAUTION!

If the shielding of the signal is already connected to a potential or a grounded conductor, do not connect it to pin "3".

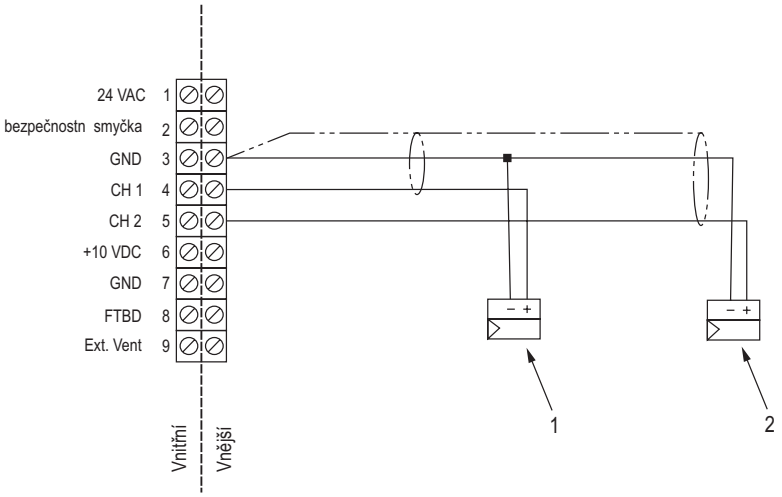


Figure 31: Modulating Demand or Humidity Signal Connections

1 Modulating demand or humidity sensor signal
2 Modulating high limit demand or humidity sensor signal (additional)

5.11.3.3 24 VDC On/Off Humidistat

If a 24 VDC On/Off humidistat is used, connect the signal cable to terminal pins "4" and "6" in the low voltage terminal strip. Refer to *Figure 32*. Set Control Mode to "On/Off" in the control software – refer to the Operation and Maintenance Manual.

IMPORTANT! When connecting a 24 VDC On/Off humidistat, jumper JP2 on the driver board must be set to 24 V (so that pin "6" will output 24 VDC).

Note: By default the jumper JP2 is set to 10 VDC, so that the output can be used for test purposes.

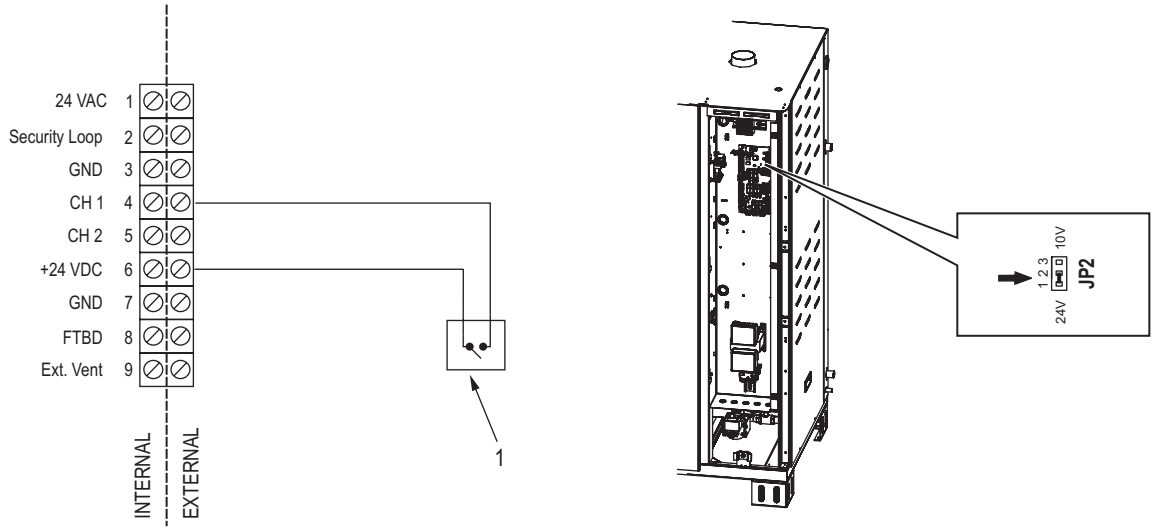


Figure 32: 24 V On/Off Humidistat Connection

1 Humidistat, 24 VDC On/Off

5.11.3.4 Full Tank Blowdown Signal Connection

If an external full tank blowdown signal is used, connect the 24 VAC full tank blowdown input signal to pins "1" and "8" in the low voltage terminal strip. Refer to *Figure 33*.

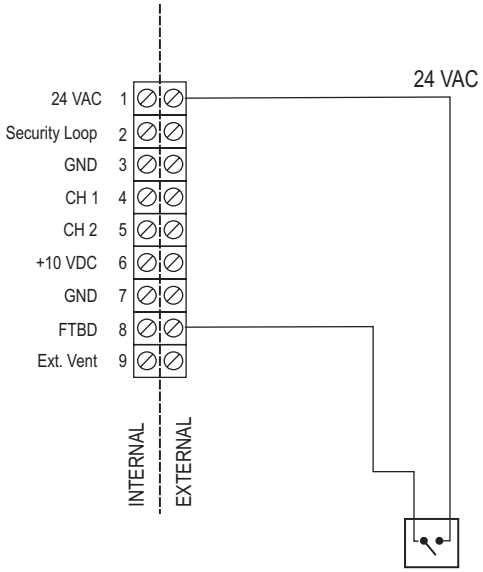


Figure 33: Full Tank Blowdown Signal Connection

5.11.3.5 External Vent Connection

Connect the 24 VAC external vent input signal to pins "1" and "9" in the low voltage terminal strip. Refer to *Figure 27 on page 57* and *Figure 34*.

IMPORTANT! The jumper JP1 on the driver board must be set to pins "2" and "3" to accept the external vent input signal. **Note:** On a Condair GS 130/195/260 unit with two driver boards, it is only necessary to set the jumper setting on Driver Board #1.

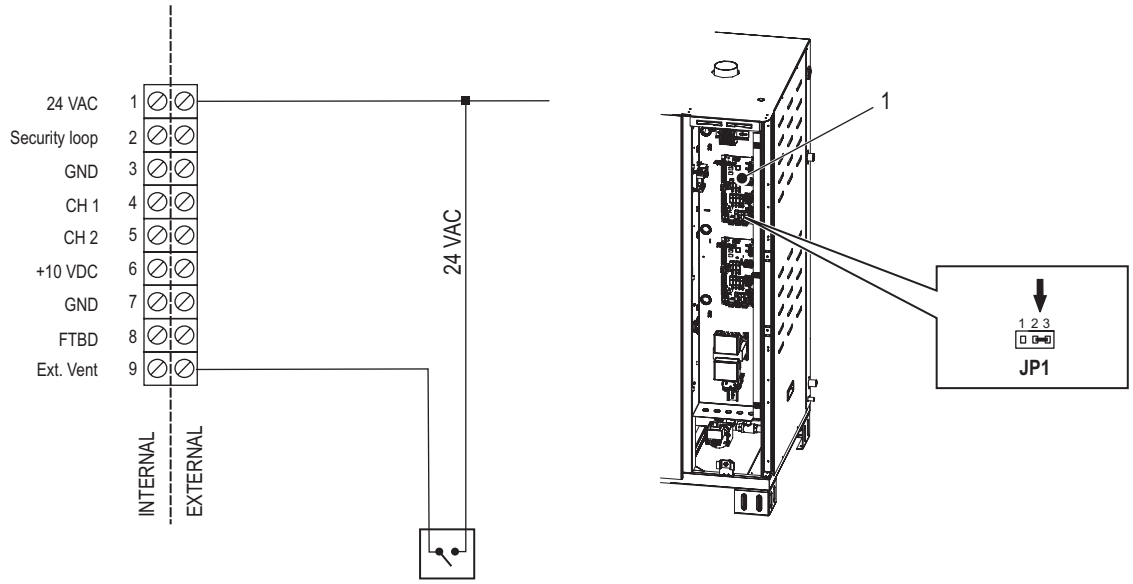


Figure 34: External Vent Connection

1 Board, driver (#1)

5.11.3.6 Remote Fault PCB Connections

The remote fault PCB (printed circuit board) in the Condair GS humidifier has the following four dry relay contacts for remote display of humidifier status and fault conditions. Refer to *Figure 35 on page 64* for the relevant terminal contacts.

- Error – this relay can be wired to open (NC) or close (NO) when a fault is detected by the humidifier controls.
- Service – this relay is activated when the set maintenance interval elapses. It can be wired to open (NC) or close (NO) when a warning appears on the touchscreen panel of the humidifier and the status LED turns yellow in colour.

  Note: This relay can be configured in the control software to indicate status updates or system warnings – refer to the Remote Fault Board tab in the Operation and Maintenance Manual.
- Steam – this normally open (NO) relay closes when the unit is producing steam.
- Unit on – this normally open (NO) relay closes when the humidifier has power, and the On/Off switch is in the On position.

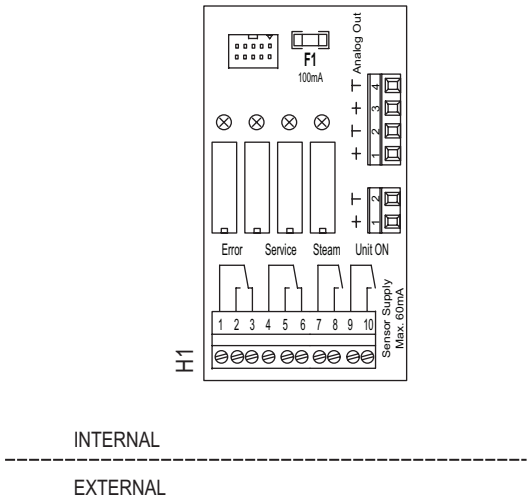


Figure 35: Remote Fault PCB Connections

The remote fault PCB connects to the connector J2 on the Condair GS control board.

5.11.3.7 Single-Phase Power Supply Connection

Connect the single-phase power supply to the Condair GS humidifier as shown in *Figure 36*. Refer to the specification label (*Figure 3 on page 11*) for power requirement and sizing of fused disconnect switch.

IMPORTANT! Make sure that the main power cable is proper grounded through the ground lug inside the control cabinet.

All wiring must be in accordance with national and local electrical codes.

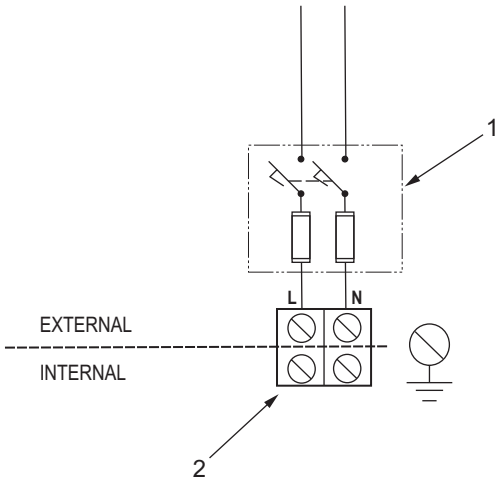


Figure 36: Single-Phase Power Supply Connections

1 Switch, disconnect, external fused
2 Terminal block, power supply

5.11.3.8 Modbus Connection

The Condair GS humidifier comes standard with a Modbus communications interface, which can be used to remotely control its output or monitor its operation.

Refer to *Figure 37* and connect the Modbus communication cable to the Condair GS humidifier as follows:

1. Connect a Modbus cable to the connector J6 on the Condair GS control board. Refer to *Table 20* for Modbus cable requirements, and *Table 21* for communication parameters. Contact your Condair representative if assistance is needed to change the default communication parameters.

   Note: The jumper JP7 on the control board must be installed to activate Modbus or BACnet MSTP communication via RS485 interface (J6). If the jumper is not installed, no communication will take place through J6.

2. Install the jumper JP4 on the control board if the Condair GS humidifier is the first or last unit in the network.

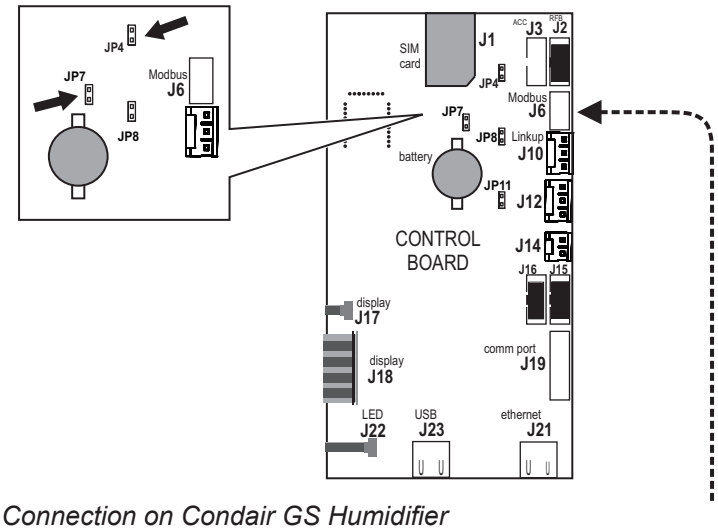


Figure 37: Modbus Connection on Condair GS Humidifier

JP4 Jumper – for activating the termination resistor for Modbus or BACnet MSTP network
J6 Connector, Modbus (RS485 interface)
JP7 Jumper – for activating Modbus or BACnet MSTP communication via RS485 interface (J6)

Table 20: ModBus Cable Requirements

BMS Protocol	Signal Type	Recommended Cable	Maximum Distance from Condair humidifier to BMS
Modbus	EIA-485, 2-wire	18-24 AWG shielded, twisted pair, 120Ω *	670 m

* Connect humidifiers in a daisy chain to the Modbus RTU. Ground shield at on end only – either at the BMS or the humidifier.

Table 21: Modbus Communication Parameters

Parameter	Default	Adjustable Range
Signal type	EIA-485	–
Transmission mode	RTU	–
Baud rate	9600	110, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800 or 115200
Data bits	8	–
Stop bits	1	–
Parity	Even	Odd, Even, None
Address	10	1-247
Time out	300 s	1-300 s

5.11.4 Connecting Multiple Units Using Linkup

The integrated control board in the Condair GS humidifier allows up to four integrated controllers to connect in a "main-extension" configuration using Condair's Linkup system. All the humidifiers within this setup must share the same environment, and be controlled by one set of control signals connected to the main unit.

Refer to *Figure 38* and connect multiple unit using Linkup as follows:

1. Connect all control signals for the entire Linkup configuration to the low voltage terminal strip in the main unit.
2. Install a jumper wire between the pins "1" and "2" in the low voltage terminal strip on all extension units.
3. Connect a multi-strand twisted pair shielded cable (18-24 AWG, 120 Ω) between the J10 connectors on the control board of each Condair GS humidifier in the Linkup system. **Note:** Maximum recommended distance between units is 30 m.

IMPORTANT! Do not reverse polarity.

4. Install the termination jumper JP8 in the control board of the last extension unit in the Linkup system.
5. Finally, refer to the Operation and Maintenance Manual to set up the multi-unit configuration in the control software.

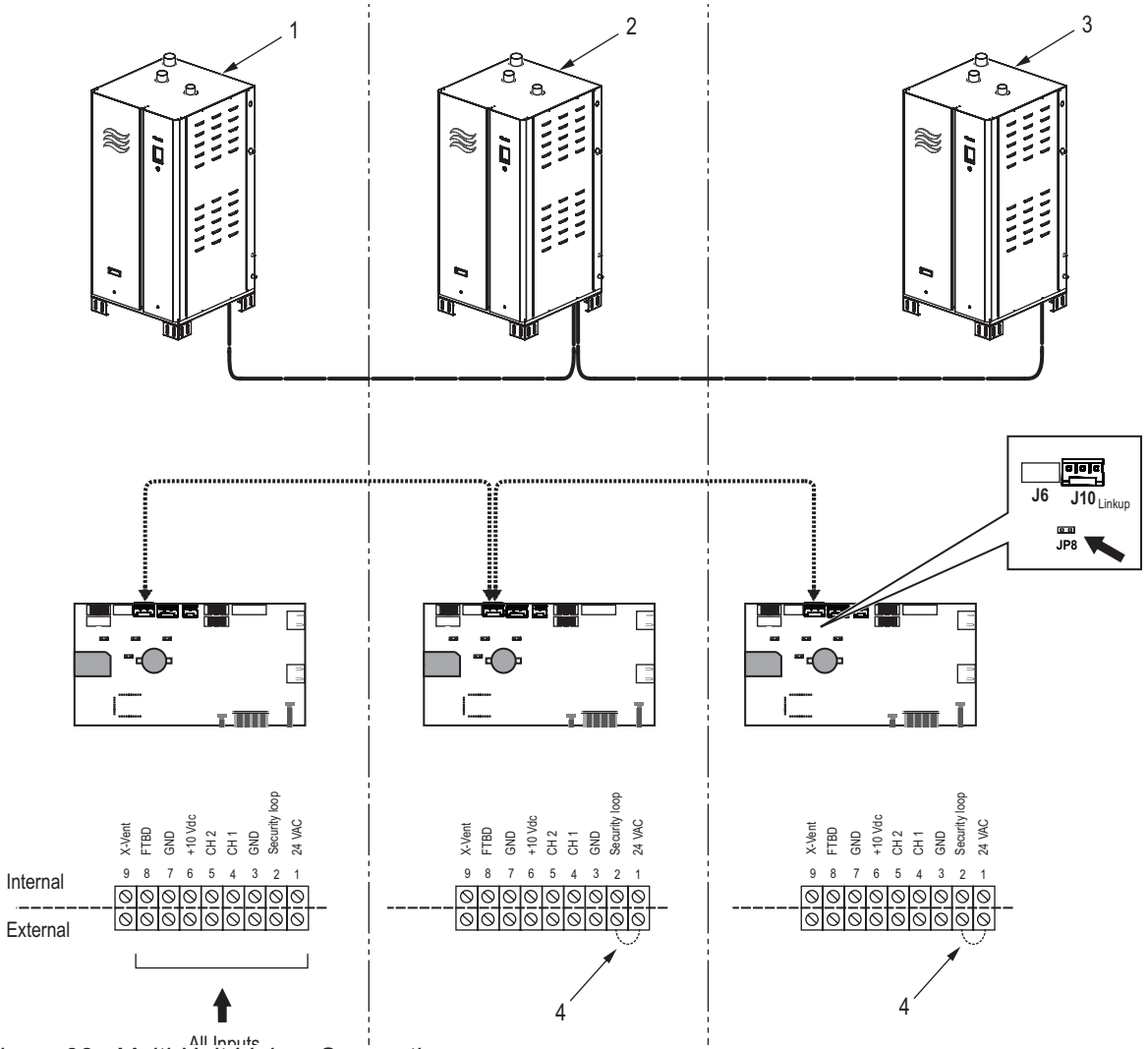


Figure 38: Multi-Unit Linkup Connections

1 Main unit (all control signals to unit)
2 Extension unit #1 (no control signals to unit)
3 Extension unit #X (no control signals to unit)
4 Jumper (on all extension units)

5.11.5 Electrical Connections Checklist

Check the following to ensure that the electrical connections for the humidifier have been installed correctly:

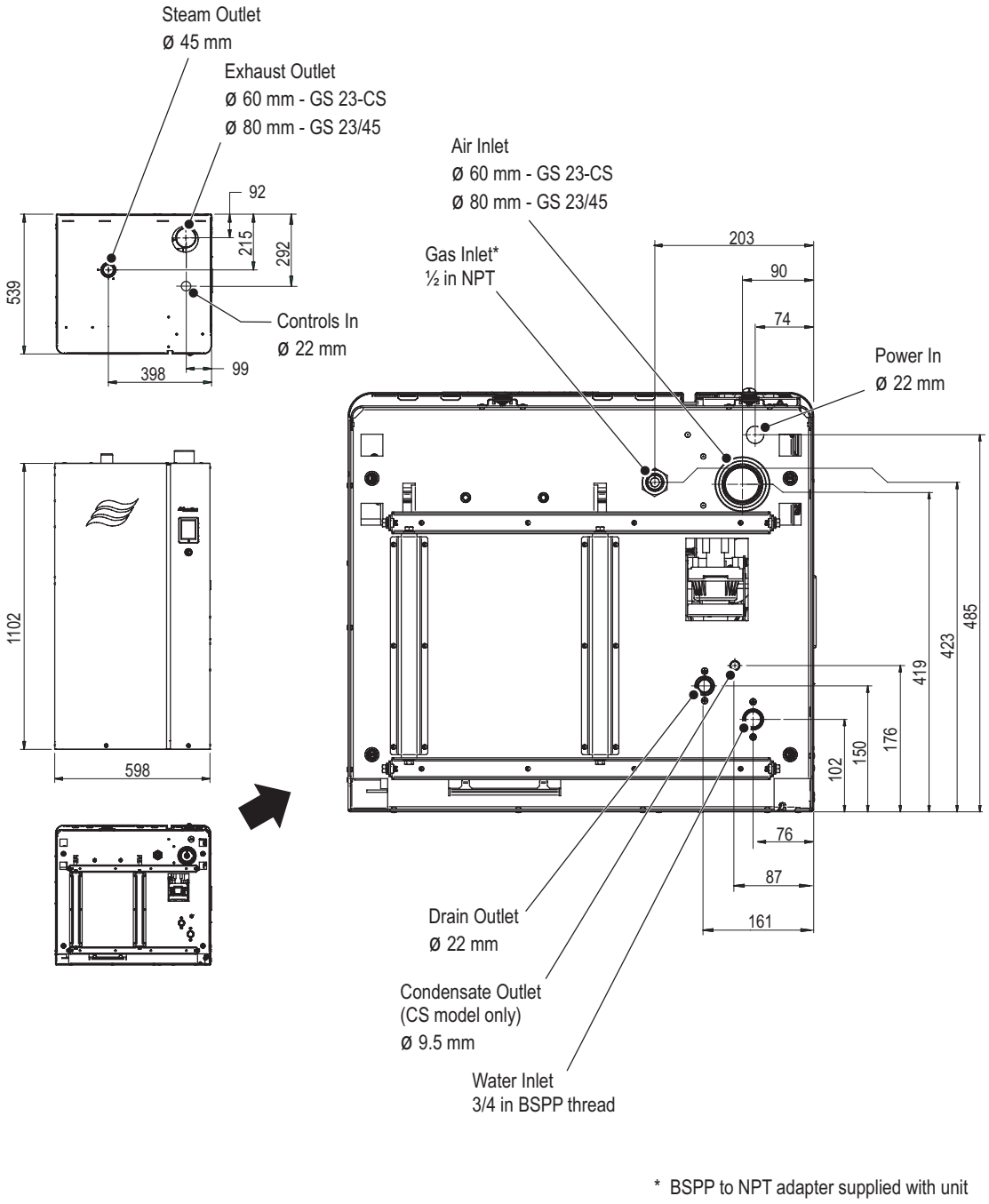
- ☐ Power supply meet the rated current draw limits shown on the specification label (*Figure 3 on page 11*)?
- ☐ Power supply have an external dedicated fused disconnect switch?
- ☐ All wiring done according to the wiring diagram and instructions in this manual?
- ☐ Main power cable properly grounded through the ground lug inside the control cabinet?
- ☐ All cables fastened securely?
- ☐ All cables free of tension and pass through strain relief connectors?
- ☐ Electrical installation meet the applicable national and local codes?
- ☐ All door panels closed and fastened securely?

6 Product Specifications

6.1 Weights

For the weights of the Condair GS humidifier models refer to *Table 11 on page 22*.

6.2 Dimensions



* BSPP to NPT adapter supplied with unit

Figure 39: Condair GS 23/45

All dimensions are in millimeters.

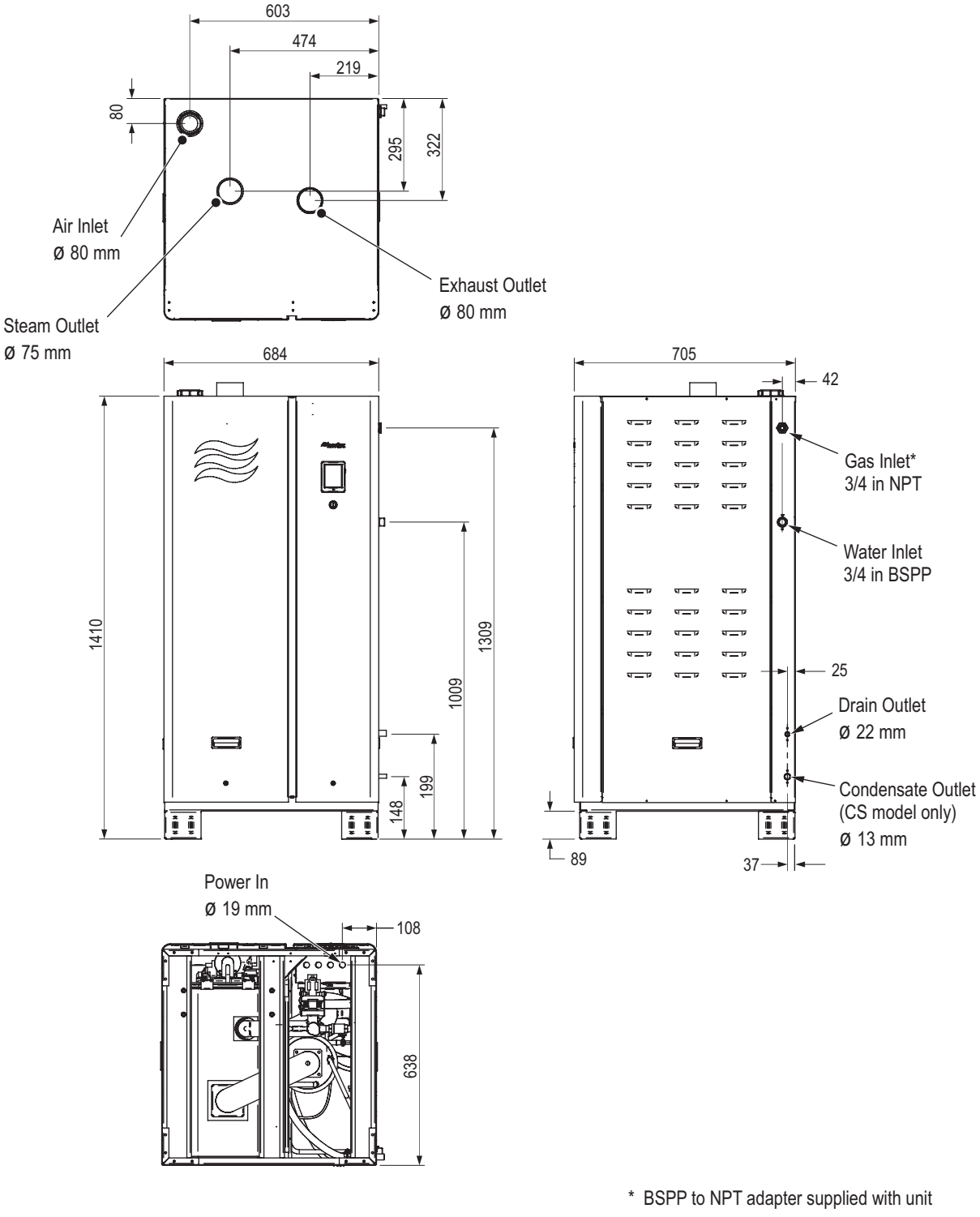


Figure 40: Condair GS 65

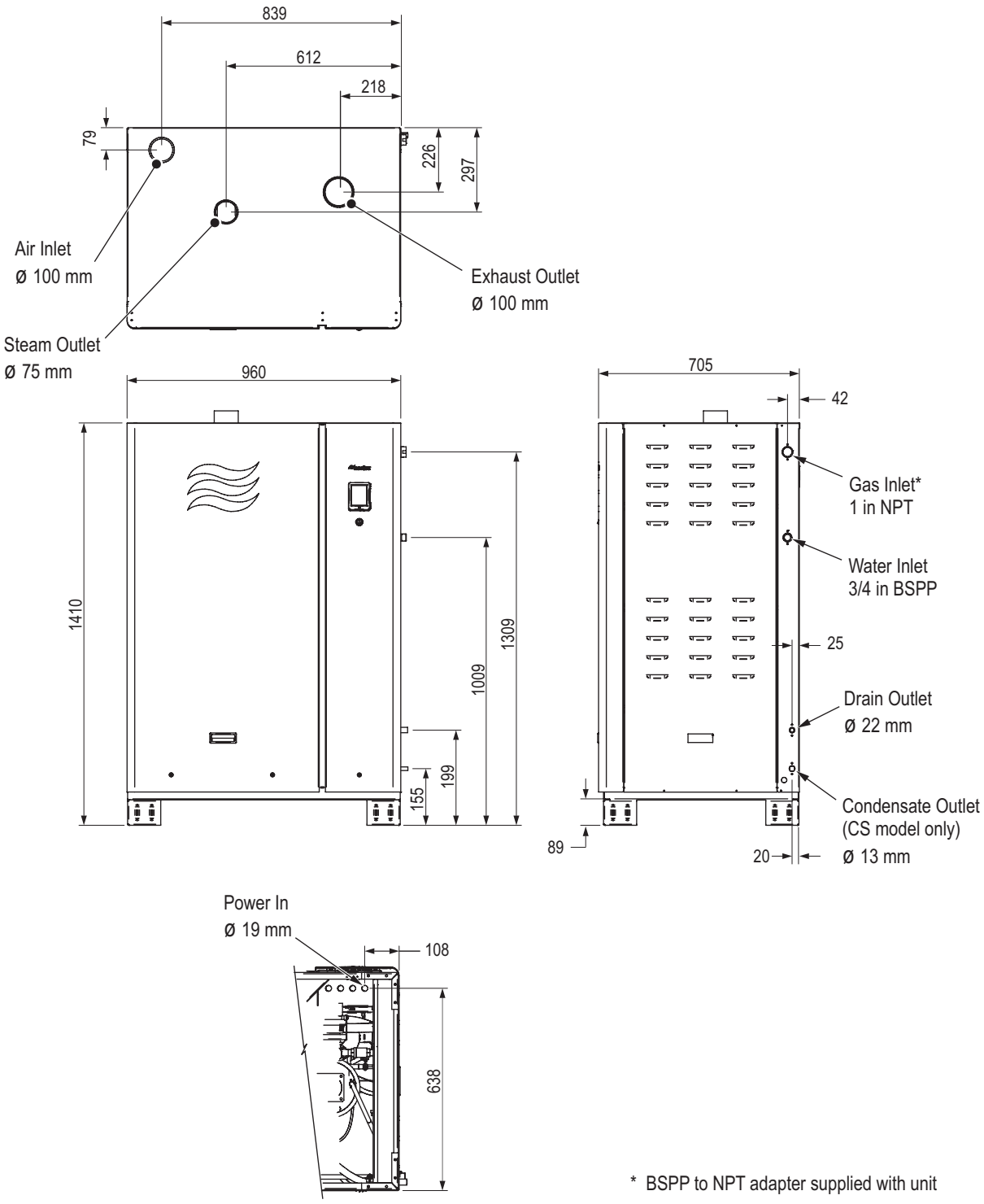


Figure 41: Condair GS 90/130

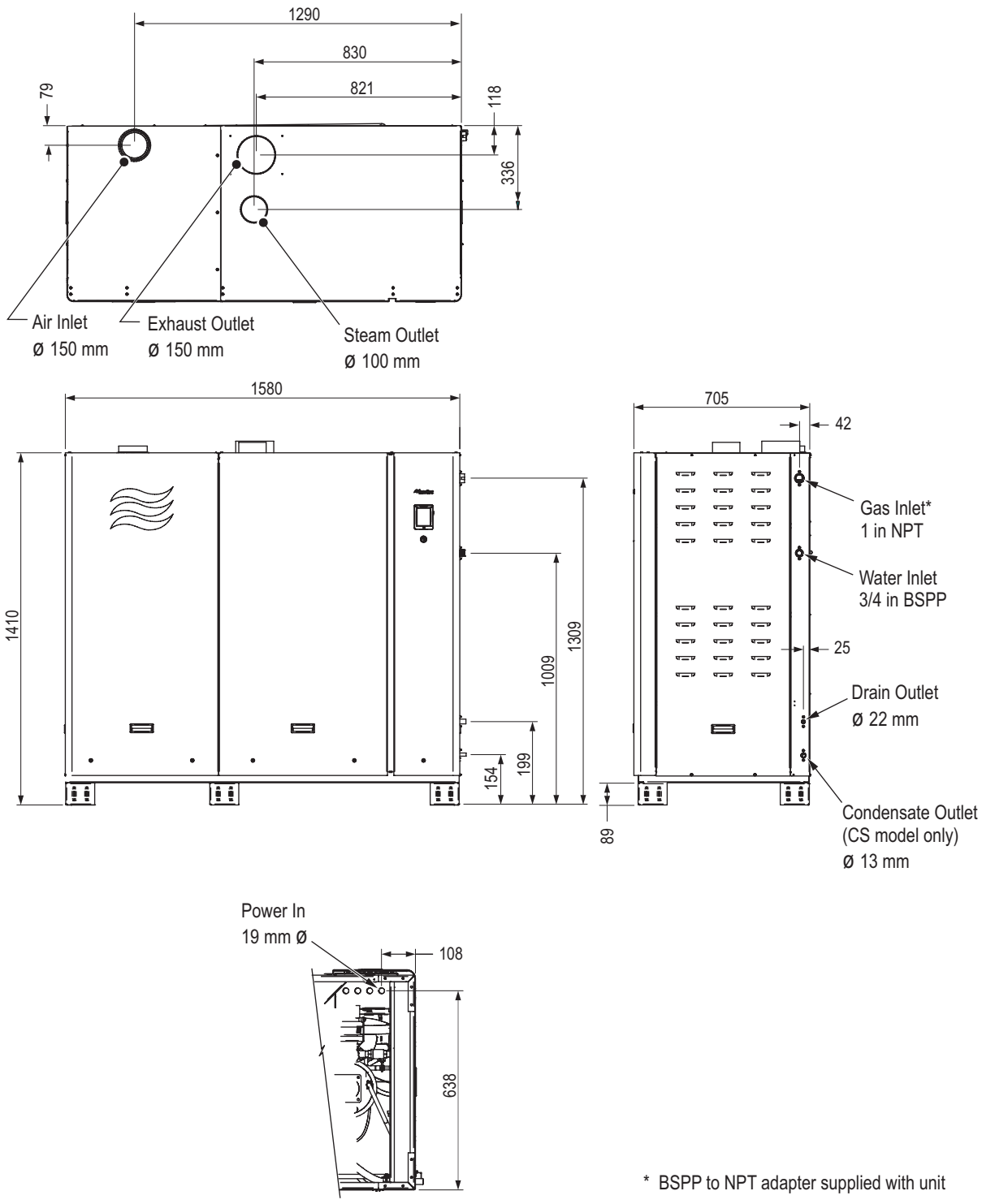


Figure 42: Condair GS 195

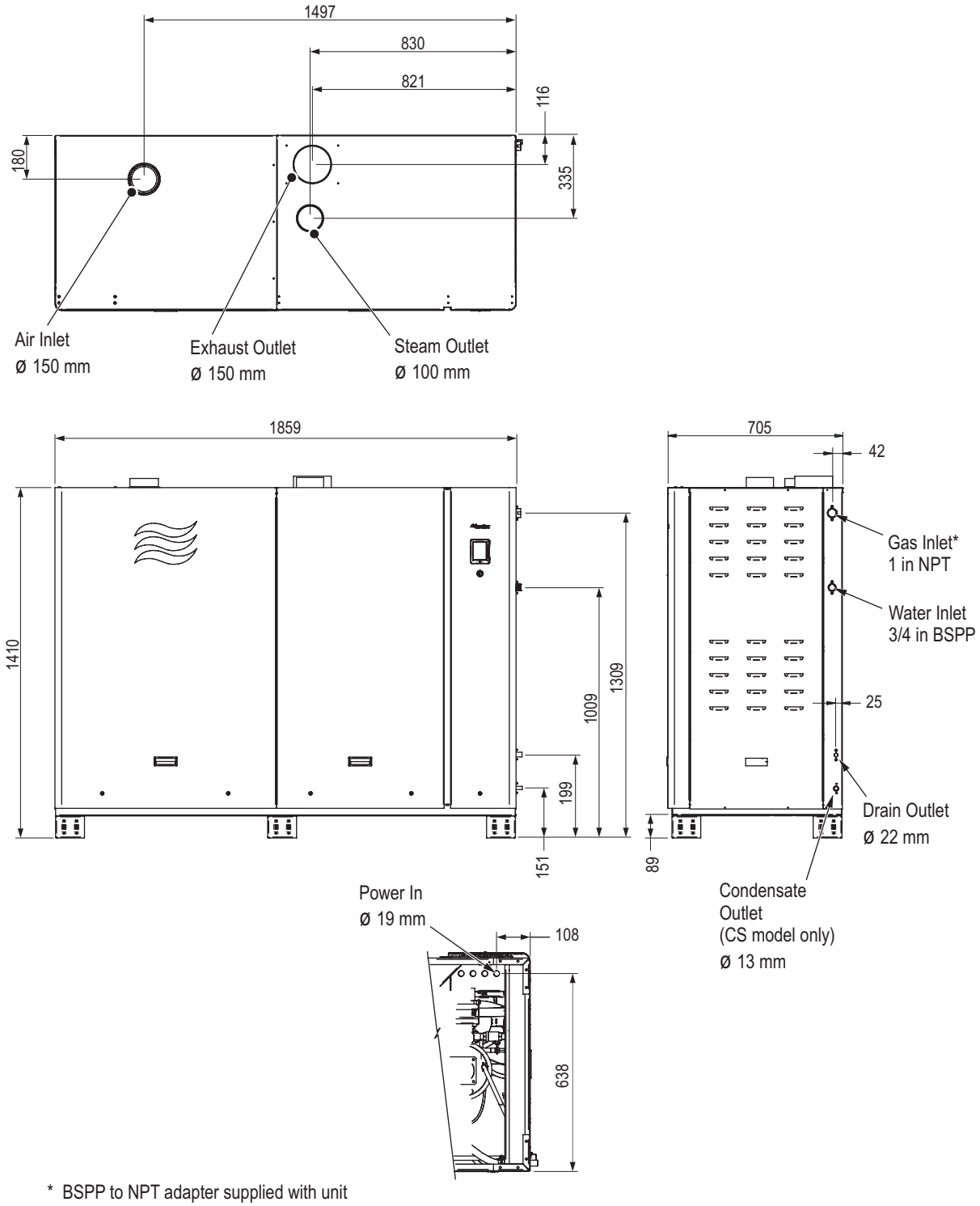


Figure 43: Condair GS 260

4 Commissioning

4.1 General

The Condair GS humidifier must be commissioned and operated only by personnel who are well qualified and properly trained to commission the Condair humidifier. It is the customer's responsibility to verify the qualifications of personnel.

4.2 Commissioning

The unit must always be commissioned for the first time by a service technican from your Condair representative, or by personnel who are well trained and authorized by the customer.

The steps are in the following order:

1. Verify the site requirements have been satisfied.
2. Inspect the humidifier mounting.
3. Inspect the gas supply connection.
4. Inspect the electrical connections, and check for correct voltage.
5. Inspect the water and drain connections.
6. Inspect the steam and condensate line installations.
7. Inspect the combustion air installation.
8. Inspect the exhaust vent installation.
9. Flush the water supply and drain lines.
10. Configure the controls and the Condair GS humidifier.
11. Conduct performance tests, including control and monitoring devices.
12. Fill out the commissioning protocol documents.

A Appendix

A.1 Installation Checklist

The following is a consolidated installation checklist that can be used in the commissioning of the unit:

Mounting

- ☐ Unit installed in the correct location (according to *"Clearances" on page 21*)?
- ☐ Adequate clearance for servicing unit?
- ☐ Mounting surface stable, and suitable for mounting the humidifier?
- ☐ Unit level?
- ☐ Unit secured properly?

Steam Line

- ☐ Observed all best practices?
- ☐ Steam pipe sized correctly?
- ☐ The main steam pipe does not exceed maximum length of 6 m?
- ☐ The steam hose between the steam hose adapter and steam distributor does not exceed maximum length of 4 m?
- ☐ Long radius elbows (for rigid pipes) used?
- ☐ Backpressure in the line combined with duct static pressure does not exceed 1.49 kPa for compact units, or 2.49 kPa for full-size units?
- ☐ Steam line runs straight up from the humidifier steam outlet for at least 300 mm before bend?
- ☐ Steam line has minimum upslope of 20% or minimum downslope of 5% to the steam distributor?
- ☐ Steam line does not reduce in diameter except at the steam distributor; and condensate line installed just before the restriction?
- ☐ Steam lines do not merge except at the steam distributor through a Condair steam hose adapter?
- ☐ Steam line does not sag?
- ☐ Steam connections securely with clamps? Clamps torqued adequately?
- ☐ Allowances made for thermal expansion of rigid pipes, and shrinkage of steam hose?
- ☐ Steam line insulated over its entire length?

Condensate Line

- ☐ Local regulations on drain water temperature requirements have been satisfied?
- ☐ Condensate lines installed at all low points, and at horizontal-to-vertical transitions in the steam line?
- ☐ Condensate lines in the steam line always connect to full-size "Tee" connectors?
- ☐ Condensate traps have a minimum loop diameter of 300 mm and installed at least 300 mm below the condensate “Tee” and the steam distributor?
- ☐ All condensate lines have a minimum downslope of 20%?
- ☐ Condensate lines have individual traps before emptying to a common condensate drain? Condensate drain sized appropriately to handle all the condensate?
- ☐ Condensate traps primed with water?

Water Connections

- ☐ Water quality meet the requirements listed in *Table 6 on page 19*?
- ☐ Shutoff valve and union fitting installed in supply line?
- ☐ Water supply pipe minimum 12 mm in diameter? Plastic pipe (pressure-proof and certified for use with drinking water systems), copper or stainless steel if using potable drinking water or RO water? Plastic or stainless steel pipe if using DI water?
- ☐ 5 µm water filter installed in the supply line close to the humidifier?
- ☐ Double check valve backflow preventer is installed along the water supply line to the unit? Is the double check valve backflow preventer installed, adhering to all applicable local and national installation regulations?
- ☐ Water supply temperature 1-25 °C?
- ☐ Water supply surge-protected and pressure regulated to 3-8 bar?
- ☐ Check for leaks in the water supply line?
- ☐ Air gap funnel in the floor located away (max 1 m) from the control cabinet in the humidifier?
- ☐ Drain pipe between air gap funnel and building drain have a minimum internal diameter of 45 mm? Copper or stainless steel pipe if using potable drinking water or RO water? Stainless steel pipe if using DI water?
- ☐ Drain hose from humidifier empty into the air gap funnel without touching its sides or bottom? Drain hose have a minimum constant downslope of 10%, and secured with hose clamp? Drain hose rated for 100 °C?
- ☐ Exhaust condensate hose installed (CS model only)? Hose rated for 100 °C? Condensate trap inside unit primed with water?
- ☐ Water supply and drain lines flushed? Strainer in the fill valve free of debris?

Combustion Air Connection – In-Room Air Installation

- ☐ All relevant national and local regulations for fresh combustion air satisfied?
- ☐ Elbow installed at the intake air inlet?

Combustion Air Connection – Room Seal Installation

- ☐ All relevant national and local regulations for room seal installation satisfied?
- ☐ Intake vent length does not exceed an equivalent length of 21 m for natural gas or 10 m for propane? Maximum six bends?
- ☐ Vent diameter as listed in *Table 13 on page 40*, and uniform over the entire run?
- ☐ All joints and seams in the vent sealed with appropriate sealant?
- ☐ Intake vent supported?
- ☐ Spacing between air intake terminal and exhaust vent terminal minimum 1 m?
- ☐ Intake vent heated and insulated in cold climates?

Exhaust Vent Connection

- ☐ Exhaust vent installed in accordance with all national and local regulations, vent manufacturer and Condair requirements?
- ☐ Proper clearances maintained between exhaust vent and combustible materials?
- ☐ Exhaust vent diameter as listed in *Table 14 on page 43*, and uniform over the entire run?
- ☐ The equivalent length of the exhaust vent minimum 2.1 m and maximum 21 m? Maximum six elbows in the exhaust vent?
- ☐ Exhaust vent secured properly with hangers or pipe straps?

Gas Connection

- ☐ Is a certified manual gas shutoff valve installed immediately upstream from the humidifier?
- ☐ Is a sediment trap installed (if using black pipe)?
- ☐ Is a stainless steel section of pipe used at the gas connection to the humidifier?
- ☐ Gas pipe routing allow clear access to other service connections at humidifier?
- ☐ Gas piping adequately supported?
- ☐ Leak test completed, and all leaks fixed?
- ☐ De-pressurize gas supply line after leak test?

Electrical Connections

- ☐ Power supply meet the rated current draw limits shown on the specification label (*Figure 3 on page 11*)?
- ☐ Power supply have an external dedicated fused disconnect switch?
- ☐ All wiring done according to the wiring diagram and instructions in this manual?
- ☐ Main power cable properly grounded through the ground lug inside the control cabinet?
- ☐ All cables fastened securely?
- ☐ All cables free of tension and pass through strain relief connectors?
- ☐ Electrical installation meet the applicable national and local codes?
- ☐ All access panels closed and fastened securely?

B Appendix

B.1 Performance Data

Model	Minimum Input		Maximum Input		Min./Max. Steam Capacity (kg/h)
	Natural Gas (G20) (kW)	Propane (G31) (kW)	Natural Gas (G20) (kW)	Propane (G31) (kW)	
GS 23-CS	3.6	3.6	18.2	18.2	4.6-23
GS 23	4.1	4.1	20.5	20.5	4.6-23
GS 45-CS	7.3	7.3	36.4	36.4	9-45
GS 45	8.2	8.2	41.0	41.0	9-45
GS 65-CS	10.9	10.9	54.5	54.5	13-65
GS 65	12.3	12.3	61.5	61.5	13-65
GS 90-CS	7.3	7.3	72.7	72.7	9-90
GS 90	8.2	8.2	82.0	82.0	9-90
GS 130-CS	10.9	10.9	109.0	109.0	13-136
GS 130	12.3	12.3	123.0	123.0	13-136
GS 195-CS	10.9	10.9	163.5	163.5	13-195
GS 195	12.3	12.3	184.5	184.5	13-195
GS 260-CS	10.9	10.9	218.0	218.0	13-260
GS 260	12.3	12.3	246.0	246.0	13-260

B.2 Operating Data

Control Signal Input Type:	
Active	0-5 VDC, 1-5 VDC, 0-10 VDC, 2-10 VDC, 0-20 VDC, 0-16 VDC, 3.2-16 VDC, 0-20 mADC, 4-20 mADC
Passive	135-10 kΩ ohmic humidity sensor
On/Off control	<2.5 VDC Off 2.5-20 VDC On
Digital inputs (via Modbus, BACnet IP/ MSTP slave)	BACnet IP, BACnet MSTP Slave, Modbus, LonWorks (Option), BACnet MSTP BTL-Certified (Option), BACnet IP BTL-Certified (Option)

Ambient Conditions:	
Ambient temperature	5-40 °C
Relative humidity	5-80% (non-condensing)

Combustion Air:	
Combustion air maximum temperature	30 °C

Backpressure:	
Maximum permissible backpressure (duct static pressure and line backpressure)	1.49 kPa compact unit 2.49 kPa full-size unit

Gas Operating Pressure:		
Natural gas:		
H, E, E(S)	G20	1.69-2.49 kPa
L, ELL	G25	1.99-2.99 kPa
HS	G25.1	1.99-2.99 kPa
Lw	G27	1.74-2.29 kPa
Ls	G2.350	1.05-1.59 kPa
Propane:	G31	2.49-5.73 kPa

CO_2 Levels in Flue Products:		
Gas Type:	**CO_2 at Maximum Rate**	**CO_2 at Minimum Rate**
G20	9.5 ± 0.2%	8.5 ± 0.2%
G25		
G25.1		
G27		
G2.350		
G31	10.4 ± 0.2%	9.5 ± 0.2%

Water Supply:	
Water pressure (regulated)	3.0-8.0 bar
Flow rate	10 L/min for Condair GS 23-130, 20 L/min for Condair GS 195/260
Water temperature	1-15 °C recommended; maximum 25 °C
Water quality	Cold potable water filtered to 5 µm, hardness of 0-256 ppm, pH level between 5-8 and chloride 0-50 ppm.

Drain Water:	
Drain water temperature	60 °C maximum
Drainage capacity	20 L/min

Power:	**230 V/1~50 Hz**			
	Pn max. in kW	In max. in A	Cable cross section (mm^2)	Fuse "F1" in A Slow acting (aM)
GS 23-CS	0.23	1.0	1.5	10
GS 45-CS	0.23	1.0	1.5	10
GS 65-CS	0.35	1.5	1.5	10
GS 90-CS	0.32	1.4	1.5	10
GS130-CS	0.53	2.3	1.5	10
GS 195-CS	0.72	3.1	1.5	10
GS 260-CS	0.92	4.0	1.5	10

Notes

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