

Condair GS... C series

Gasfired steam humidifier



INSTALLATION, COMMISSIONING AND
SERVICE INSTRUCTIONS

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1 Introduction

1.1 At the very beginning

Thank you for deciding on the **Condair GS C series Gasfired Steam Humidifier** (abbreviated as “Condair GS”).

The Condair GS incorporates the latest technical advances and **satisfies the requirements of the European Gas Equipment Directive (90/396/EEC)** and all known safety standards. Nevertheless, improper use may result in danger to the user or third parties and/or impairment of the installation or other material assets.

To ensure a safe, proper, and economical operation of the Condair GS, please observe and comply with all information and safety instructions contained in the present installation, commissioning and service instructions as well as the instructions given in the manuals for the components used in the humidification system.

If you have questions, which are not or insufficiently answered in this documentation, please contact your Condair supplier. They will be glad to assist you.

1.2 Notes on the installation, commissioning and service instructions

Limitation

The subject of these installation, commissioning and service instructions is the **Condair GS C series Gasfired Steam Humidifier** in its different versions. The various accessories are only described insofar as this is necessary for proper operation of the equipment. Further information on accessories can be obtained in the respective instructions.

These installation, commissioning and service instructions is restricted to the planning, **installation, commissioning, operation, servicing and trouble shooting** of the gasfired steam humidifier Condair GS and is meant for **well trained personnel being sufficiently qualified for their respective work**.

These installation, commissioning and service instructions are supplemented by various separate items of documentation (operating instructions for Condair GS/GS...OC - C series control, spare parts list, etc.). Where necessary, appropriate cross-references are made to these publications in the installation, commissioning and service instructions.

Symbols used in this documentation

CAUTION!

The catchword "CAUTION" designates notes in this documentation that, if neglected, may cause **damage and/or malfunction of the unit or other material assets**.

WARNING!

The catchword "WARNING" used in conjunction with the general caution symbol designates safety and danger notes in this this documentation that, if neglected, may cause to **injury to persons**.

DANGER!

The catchword "DANGER" used in conjunction with the general caution symbol designates safety and danger notes in this this documentation that, if neglected, may lead to **severe injury or even death of persons**.

Safekeeping

Please safeguard these installation, commissioning and service instructions in a safe place, where they can be immediately accessed. If the equipment changes hands, the installation, commissioning and service instructions should be passed on to the new operator.

If the installation, commissioning and service instructions get mislaid, please contact your Condair supplier.

Language versions

These installation, commissioning and service instructions are available in various languages. Please contact your Condair supplier for information.

Copyright protection

The present installation, commissioning and service instructions are protected under the Copyright Act. Passing-on and reproduction of the installation, commissioning and service instructions (or part thereof) as well as exploitation and communication of the contents are prohibited without written permission by the manufacturer. Violation of copyright terms is subject to legal prosecution and arises liability for indemnification.

The manufacturer reserves the right to fully exploit commercial patent rights.

2 For your safety

General

Every person working with the Condair GS must have read and understood the installation, commissioning and service instructions before carrying out any work.

Knowing and understanding the contents of the installation, commissioning and service instructions is a basic requirement for protecting the personnel against any kind of danger, to prevent faulty operation, and to operate the unit safely and correctly.

If the information in these installation, commissioning and service instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

All ideograms, signs and markings applied to the unit must be observed and kept in readable state.

Qualification of personnel

All actions described in the present Installation, commissioning and service instructions (commissioning, operation, maintenance, etc.) must be carried out only by **well trained and sufficiently qualified personnel authorised by the owner**.

For safety and warranty reasons any action beyond the scope of this manuals must be carried out only by qualified personnel authorised by the Conair representative.

It is assumed that all persons working with the Condair GS are familiar and comply with the appropriate regulations on work safety and the prevention of accidents.

Intended use

The gas fired steam humidifier Condair GS is intended exclusively for **humidification in ventilation systems within the specified operating conditions**. Any other type of application without the express written consent of the manufacturer is considered as not conforming with the intended purpose and may lead to the Condair GS becoming dangerous.

Operation of the equipment in the intended manner requires **that all the information in these installation, commissioning and service instructions is observed (in particular the safety instructions)**.

Danger that may arise from the unit



DANGER!

Danger of electric shock

The Condair GS is mains powered. One may get in touch with live parts when the unit is open. Touching live parts may cause severe injury or danger to life.

Prevention: before carrying out any work set the Condair GS out of operation as described in chapter 6.3 (switch off the unit, disconnect it from the mains and stop the water and gas supply) and secure the unit against inadvertent power-up.

⚠ DANGER!**Danger of explosion**

The Condair GS is working with gas. Improper installation, adjustment, alteration, service, maintenance, or use can cause carbon monoxide poisoning, an explosion, fire, or other conditions which may cause personal injury or property damage.

Prevention: any work on the gas system must be carried out only by well trained and sufficiently qualified personnel authorised by the owner. Before carrying out any work on the gas system set the Condair GS out of operation as described in chapter 6.3. (switch off the unit, disconnect it from the mains and stop the water and gas supply) and secure the unit against inadvertent power-up.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this 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 telephone in your building. Immediately call your gas supplier from a neighbor's telephone. Follow the gas supplier's instructions. If you can not reach your gas supplier, call the fire department.

⚠ DANGER!**Danger of burning**

The water tank, the steam line and the exhaust system get very hot during operation. There is danger of burning when touching these components during or shortly after operation.

Prevention: Do not touch the water tank, the steam line and the exhaust system during operation. Before carrying out any work set the Condair GS out of operation as described in chapter 6.3, then wait until the components has cooled down sufficiently thus preventing danger of burnin.

Behaviour in case of danger

If it is suspected that **safe operation is no longer possible**, then the Condair GS should immediately **be shut down and secured against accidental power-up according to chapter 6.3**. This can be the case under the following circumstances:

- if you smell gas
- if the Condair GS or its mains cable is damaged
- if the Condair GS is no longer operating correctly
- if connections and/or piping are not sealed
- if components of the Condair GS humidifier are worn or badly soiled.
- if the Condair GS or any components has been exposed to excess humidity.
- after longtime storage under unfavorable conditions.
- after transportation under unfavorable conditions.

All persons working with the Condair GS must report any alterations to the unit that may affect safety to the owner without delay.

Prohibited modifications to the unit

No modifications must be undertaken on the Condair GS without the express written consent of the manufacturer.

For the replacement of defective components use exclusively **original accessories and spare parts** available from your Condair supplier.

3 Product Overview

3.1 Product versions/Model designations

The Condair GS gasfired steam humidifier is available in **6 different models with different maximum steam output performance (40, 80, 120, 160, 200 and 240 kg/h)**.

All models can be supplied in a version suitable for operation independent of the room air conditions (With a separate air inlet) and can be operated with natural gas or propane (the unit is supplied Ex-works for a specific type of gas operation).

Model designation

| | GS | 40 | C | G20 | RS |
|--|--|----|---|-----|----|
| Product line (gasfired steam humidifier with operation and display unit) | _____ | | | | |
| Steam output (kg/h) 40 80 120 160 200 240 | _____ | | | | |
| Equipment series | _____ | | | | |
| Fuel Natural gas H, E, E(S): Natural gas L, ELL: Natural gas HS: Natural gas Lw: Natural gas Ls: Propane gas P: | G20 G25 G25.1 G27 GZ350 G31 | | | | |
| Room air-independent unit (with separate air intake) | _____ | | | | |

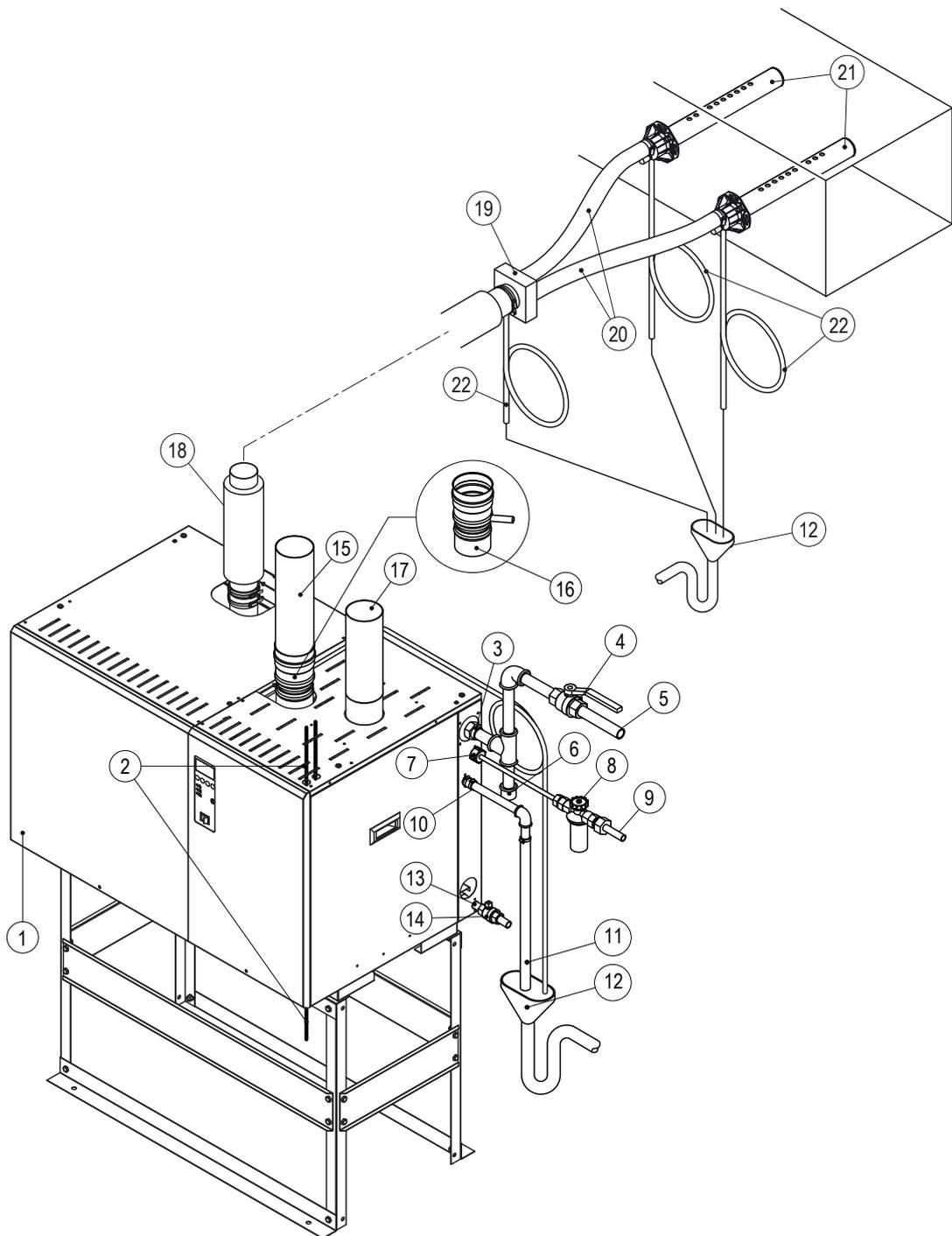
The humidifiers are equipped with an **operating and display unit**, as standard, by means of which the current operating parameters can be interrogated and the equipment can be configured for operation. The humidifiers are controlled via the **internal PID controller** or an external **continuous controller**.

3.2 Delivery

The standard delivery includes:

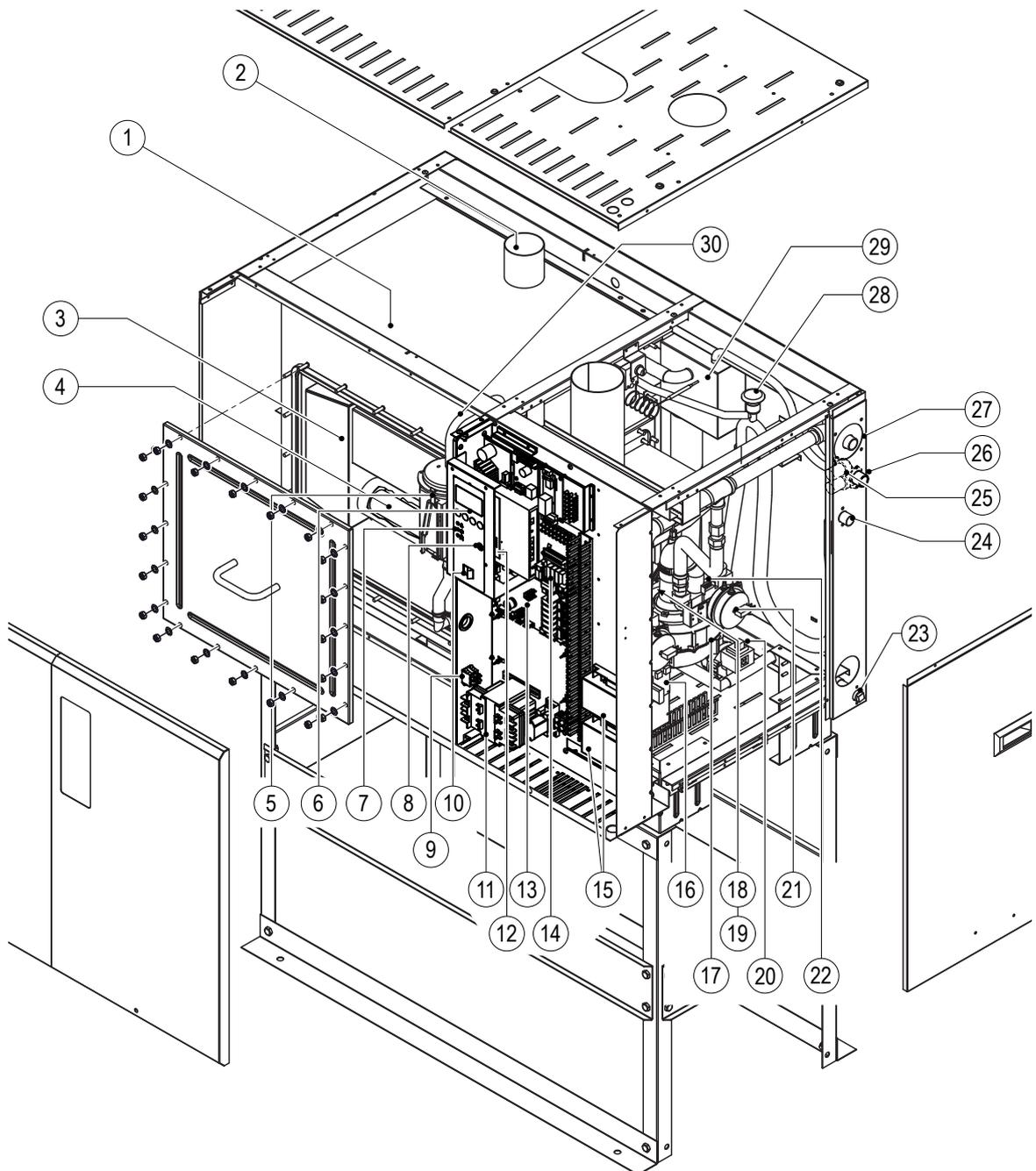
- Gasfired steam humidifier Condair GS compl. with unit stand (according to the model designation)
- Installation, commissioning and service instructions Condair GS C series
- Operating instructions Condair GS control
- Spare parts list
- Accessories ordered according to chapter 4.4 (steam distribution pipes, steam hoses, etc.).

3.3 Humidification system overview



- | | | | |
|----|--|----|--|
| 1 | Gasfired steam humidifier | 13 | Auxiliary drain connection |
| 2 | Electrical connections | 14 | Shut-off valve auxiliary drain (building side) |
| 3 | Gas supply connection | 15 | Flue gas pipe |
| 4 | Shut-off valve gas supply line (building side) | 16 | Flue gas adapter with condensate drain (accessory "FA...") |
| 5 | Gas supply line (building side) | 17 | Air intake pipe (RS-units only) |
| 6 | Sediment trap (building side) | 18 | Main steam pipe (building side) |
| 7 | Fill water connection | 19 | Steam hose adapter (accessory "SA...") |
| 8 | Filter valve (accessory "Z261") | 20 | Steam hose (accessory "DS80") |
| 9 | Water supply line (building side) | 21 | Steam distribution pipe (accessory "81-...") |
| 10 | Drain water connection | 22 | Condensate hose (accessory "KS10") |
| 11 | Drain water line | | |
| 12 | Funnel with trap | | |

3.4 Construction of the gasfired steam humidifier



- | | | | |
|----|--|----|--------------------------------------|
| 1 | Water tank | 15 | Ignition modules |
| 2 | Steam outlet(s) (1 to 6) | 16 | Burner electronic |
| 3 | Heat exchanger (1 to 3) | 17 | Combustion air blower (1 to 6) |
| 4 | Burner (1 to 6) | 18 | Flame sensor |
| 5 | Level unit | 19 | Igniter |
| 6 | Key pad and display unit | 20 | Drain pump |
| 7 | Indication LED's green: "Steam production" yellow: "Maintenance" red: "Error" | 21 | Air pressure switch |
| 8 | Drain key (manual draining) | 22 | Gas pressure control valve (1 to 6) |
| 9 | Drain override switch (manual draining) | 23 | Auxiliary drain line |
| 10 | Unit switch | 24 | Drain connection |
| 11 | Transformer | 25 | Double inlet valve filling water |
| 12 | Control board | 26 | Connection filling water |
| 13 | Driver board | 27 | Connection gas supply line |
| 14 | Remote operating and fault indication board | 28 | Vacuum break |
| | | 29 | Filling chamber |
| | | 30 | Pressure equalizer line (level unit) |

3.5 Principle of operation

Combustion System

The combustion system is based on a fully modulating forced draft combustion air blower, a negative pressure regulator gas valve and a 100% premix burner. On a call for humidity, the combustion air blower starts and creates a negative pressure across an orifice located at the air inlet. The blower starts for a moment to purge the system, then the hot surface ignitor is activated. During this time the electronic ignition module does a diagnostic check of safety systems including the air proving switch which senses the negative pressure at the air inlet.

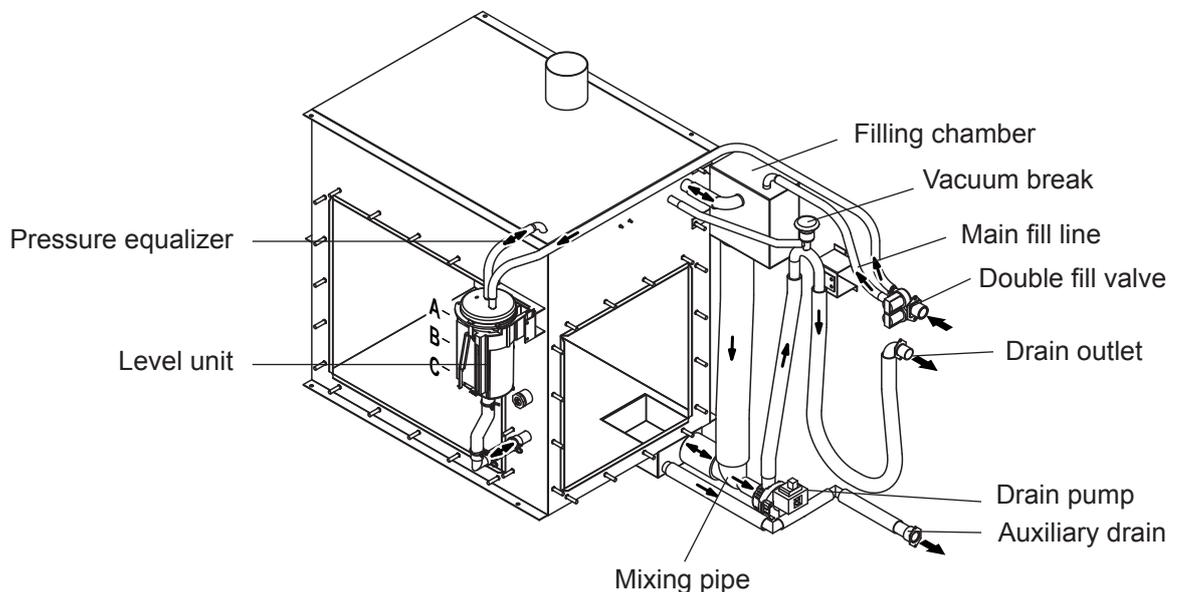
After the function of the safety systems has been verified, the gas valve will open and the gas/air mixture is ignited by the hot surface ignitor. If flame is sensed by the flame sensor within 7 seconds the gas valve remains open and combustion continues. If flame is not sensed, the above sequence is repeated a maximum of three times after which the ignition module will lock out and a respective error message will appear in the display.

The gas valve maintains a constant ratio of air to Natural Gas or Propane independent of blower speed or external conditions. This air and fuel is thoroughly mixed in the blower and then forced through the burner ports where ignition occurs.

Hot products of combustion are forced through a baffle inside the heat exchanger and then vented outside. The heat exchanger has large vertical surfaces to minimize scale build-up and promote scale shedding to the bottom of the tank. This self-cleaning action helps to maintain the efficiency of the heat exchanger while the smooth surfaces allow for easy cleaning when necessary.

The GS 40 has a single combustion chamber/heat exchanger. The combustion system is duplicated on larger units with multiple chambers inside a common tank.

Regulation of the water level in the tank



The level in the water tank is continuously monitored by the level unit. On initial start-up, the control unit checks the function of the level unit. During this test the tank is filled up first to level "A", then drained to level "C" and filled up again to level "A". As soon as level "B" is reached and the test of the level unit was successful the humidifier is ready for operation, if a humidification demand is present the combustion process starts.

When the water level due to the evaporation process reaches level "B", the level unit sends a signal to the control system, which opens the double inlet valve and the water tank is filled up. On reaching level "A", the level unit again sends a signal to the control system and the double inlet valve is closed. If the water level goes below level "C", the combustion will be interrupted until the water level reaches "C" again.

To ensure safe operation, the control system constantly monitors the proper function of the level unit in regular intervals.

Steam generation/control

The steam is generated in the water tank via the heat exchanger/s. The steam production is regulated continuously by the internal PID controller or an external continuous controller.

Flushing

The concentration of minerals in the water in the tank increases due to the evaporation process. In order that this concentration does not exceed a specified value, an appropriate quantity of water is pumped off from the tank at a fixed time interval and replaced by fresh water. These flushing cycles are based on steam production to increase the efficiency of the humidifier.

When a flushing cycle is initiated the drain pump is activated and the inlet valve opens. In the mixing pipe below the filling chamber the hot drain water is mixed with the cold cooling water and leaves the unit with a temperature approx. around 60 - 70 °C.

If the lowest operating level is reached in the tank during the flushing process, the inlet valve remains open until the water level in the tank has again reached the normal operating level.

4 Basic planning

4.1 Selecting the unit

The selection of the unit is reflected in the type description:

Condair GS 80 C G20 RS

1. Required maximum steam capacity _____
2. Required combustion gas _____
3. Combustion air supply _____

4.1.1 Calculating the maximum required steam capacity

The maximum required steam capacity is calculated from the following formulas:

$$m_D = \frac{V \cdot \rho}{1000} \cdot (x_2 - x_1) \quad \text{or} \quad m_D = \frac{V}{1000 \cdot \varepsilon} \cdot (x_2 - x_1)$$

m_D : maximum steam demand in **kg/h**

V : volume of supply air portion per hour in **m³/h** (for indirect room humidification) or room volume to be humidified per hour in **m³/h** (for direct room humidification)

ρ : specific gravity of air in **kg/m³**

ε : specific volume of air in **m³/kg**

x_2 : desired absolute room air humidity in **g/kg**

x_1 : minimum absolute supply air humidity in **g/kg**

The values for ρ , ε , x_2 and x_1 can be gathered from the h,x-diagram or the Carrier-Diagram for moist air respectively.

For a rough estimate of the calculated steam capacity, the following table can be used. The values listed in the table are based on a desired room air temperature of 20 °C and a desired relative room air humidity of 45 %rh.

Note: To roughly estimate the calculated maximum steam capacity for larger supply air portions or room volumes, the values listed in the table can be projected accordingly.

| Max. portion of supply air in m ³ /hr or room volume to be humidified per hour in m ³ /hr | | | max. steam capacity in kg/h |
|---|--------------|-------------|-----------------------------|
| Temperature / rel. humidity of supply air | | | |
| -15°C / 90%rh | -5°C / 80%rh | 5°C / 60%rh | |
| 5000 | 6600 | 8000 | 40 |
| 10000 | 13200 | 16000 | 80 |
| 15000 | 19800 | 24000 | 120 |
| 20000 | 26400 | 32000 | 160 |
| 25000 | 33000 | 40000 | 200 |
| 30000 | 39600 | 48000 | 240 |

Condair GS 80 C G20 RS

Example:

Max. portion of supply air 10000 m³/h,
temperature/rel. humidity of supply air
-15°C/90%rh

Important notes:

- The required maximum steam capacity depends on the specific application and the installation. The calculated steam capacity based on the above formulas, the h,x diagram and the condition of the air to be humidified does not consider any steam loss (e.g. due to condensation in the steam hoses and the steam distributors), any heat loss of the unit as well as any absorption or release of humidity of materials located in the room being humidified. In addition, the calculated steam capacity does not consider any losses caused by the draining rate depending on the water quality. The total amount of losses depends on the entire system and must be taken into consideration when calculating the required steam capacity. If you have any questions regarding the calculation of the steam capacity please contact your Condair supplier.
- For systems where the max. required steam capacity varies extensively (e.g. for test facilities or for systems with variable air volume flow, etc.), please contact your Condair supplier.

4.1.2 Combustion gas

The Condair GS can be operated with **natural gas** or **propane**. The equipment is configured ex-works for the respective combustion gas that is to be employed. If required, the equipment can be converted at a later date to work with one of the other combustion gas.

| Combustion gas | Designation |
|----------------------------|-------------|
| Natural gas H, E, E(S) | G20 |
| Natural gas L, ELL | G25 |
| Natural gas HS | G25.1 |
| Natural gas Lw | G27 |
| Natural gas Ls | GZ350 |
| Propane gas P (Liquid gas) | G31 |

Condair GS 80 C G20 RS**4.1.3 Combustion air supply**

To ensure correct combustion, care must be taken to provide either a **ventilation opening in the room where the equipment is installed (room air-dependent device)** or a **separate air inlet pipe (room air-independent device)** so that an adequate supply of clean, fresh air, is available.

| Equipment version | Designation |
|---|-------------|
| Room air-dependent device For rooms with a sufficiently large ventilation opening and a source of clean intake air. Caution! Local building regulations must be observed. | — |
| Room air-independent device (RS equipment) Air supply through a separate pipe from outside the building. For closed rooms, rooms with low air pressure and rooms with dirty intake air. | RS |

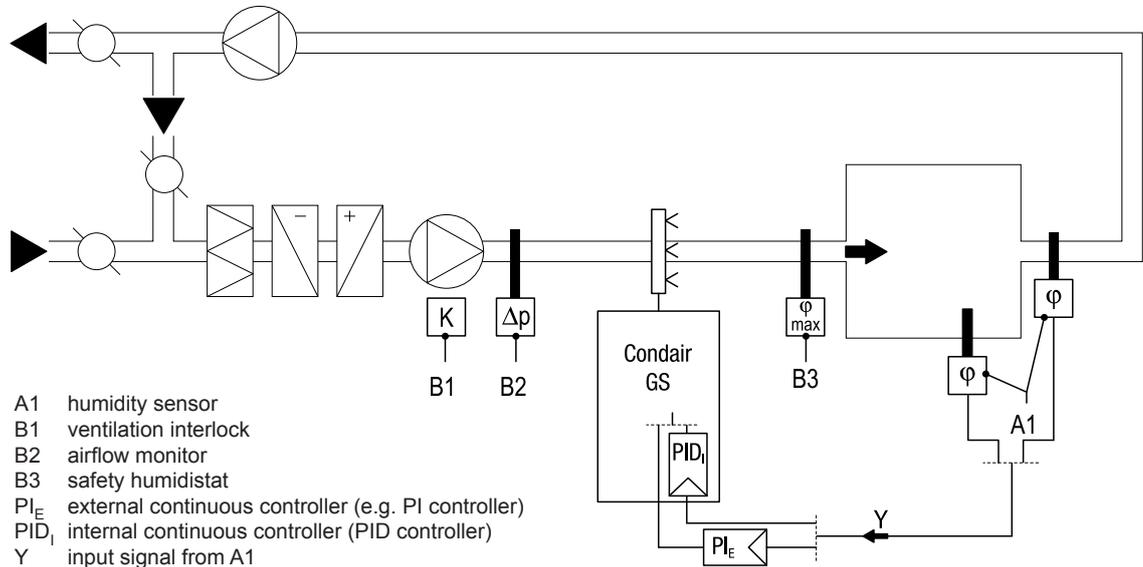
Condair GS 80 C G20 RS

4.2 Selecting the control system

The various control systems

– System 1: Room humidity control

System 1 is suited for air conditioning systems with mainly recirculated air. The humidity sensor is preferably located in the room itself or in the exhaust air duct.

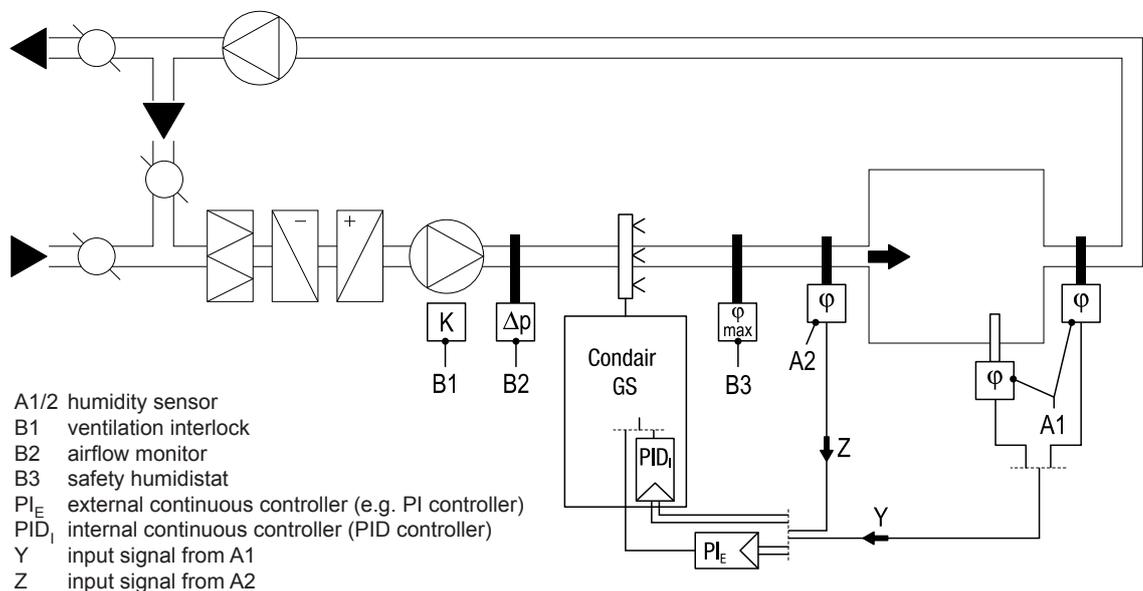


– System 2: Room humidity control with continuous limitation of the supply air humidity

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

The humidity sensor (A1) is preferably located in the exhaust air duct or in the room itself. The humidity sensor (A2) for the limitation of the supply air humidity is located in the supply air duct after the steam distribution pipe. This control system requires the internal PID controller or an external continuous controller with the option to connect a second humidity sensor.

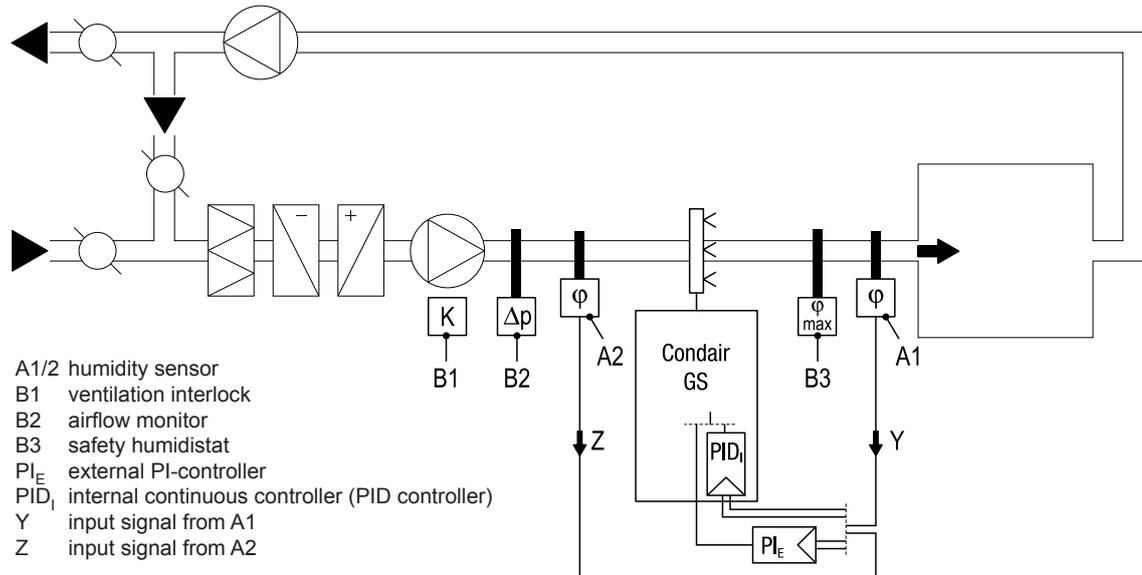
Attention! The continuous limitation of the supply air humidity is no substitute for the safety humidistat.



– System 3: Supply air humidity control with continuous output limitation

Supply air humidity control (humidity sensor installed in supply air duct) should be used only where room humidity control is impracticable for technical reasons. Such systems always require a PI-controller.

The humidity sensor (A1) is located in the supply air duct after the steam distribution pipe. The humidity sensor (A2) for the continuous output limitation is located in the supply air duct before the steam distribution pipe. Such a system requires the internal PID controller or an external PI-controller with the option to connect a second humidity sensor.



Which humidity control system for which application?

| Application | Location of the humidity sensor | |
|--------------------------------|---------------------------------|-----------------|
| | Room or exhaust air duct | supply air duct |
| Air conditioning systems with: | | |
| Supply air portion up to 33% | System 1 | System 1 |
| Supply air portion up to 66% | System 1 or 2 | System 2 or 3 |
| Supply air portion up to 100% | System 2 | System 3 |
| Supply air humidity control | — | System 3 |

Please contact your Condair supplier, if your application meets the following conditions:

- Humidification of small rooms up to 200 m³
- 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 max. steam capacity
- Systems with temperature fluctuations
- Cold rooms and systems with dehumidification

Control/input signals

The Condair GS is regulated via the internal PID controller or an external continuous controller (e.g. PI controller).

Important! For the control systems 2 and 3 the external controller must be equipped with two control signal inputs.

The Condair GS processes the following control signals:

- 0 ... 10 VDC
- 2 ... 10 VDC
- 0 ... 10 mADC
- 2 ... 10 mADC
- 0 ... 20 mADC
- 4 ... 20 mADC
- 0 ... 5 VDC
- 1 ... 5 VDC

Further information is provided in Chapter 5.9.

Output signals

The Condair GS provides the following output signals:

- 10 VDC (max. 20 mA)
- Remote operating and fault signals (4 potential-free contacts)

Further information is provided in Chapter 5.9.

4.3 Options

At the moment no options are needed for the Condair GS.

4.4 Accessories

4.4.1 Accessories overview

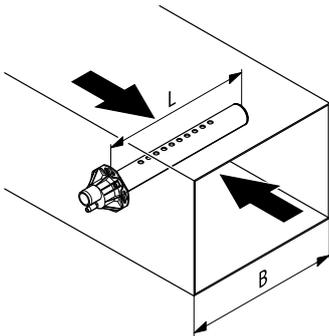
| Model Condair GS | 40 ... | 80 ... | 120 ... | 160 ... | 200 ... | 240 ... |
|---|--------------------------------|--|---|---|---|---|
| Steam distribution pipe (see accessory details in chapter 4.4.2) | 81-... | | | | | |
| number | 1 | 2 | 3 | 4 | 5 | 6 |
| OptiSorp steam distribution system (see accessory details in chapter 4.4.2) | System 1 | System 2 | System 3 | System 4 | System 2 System 3 | System 3 |
| number | 1 | 1 | 1 | 1 | 1 of each | 2 |
| Steam hose adapter | — | SA80 <small>(3" / 2x 1 3/4")</small> | SA120 <small>(3" / 3x 1 3/4")</small> | SA160 <small>(4" / 4x 1 3/4")</small> | SA200 <small>(4" / 6x 1 3/4")</small> | SA240 <small>(4" / 6x 1 3/4")</small> |
| number | — | 1 | 1 | 1 | 1 | 1 |
| Steam hose / meter | DS80 | | | | | |
| number | 1 | 2 | 3 | 4 | 5 | 6 |
| Condensate hose / meter | KS10 | | | | | |
| number | 1 | 2 | 3 | 4 | 5 | 6 |
| Filter valve | Z261 (1 pc. per system) | | | | | |
| Flue gas adapter with condensate drain | FA40 | FA80 | FA120/160 | | FA200/240 | |
| number | 1 | 1 | 1 | | 1 | |

4.4.2 Accessory details

Steam distribution pipes

The steam distribution pipes 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 distribution pipe (optimum humidification distance).



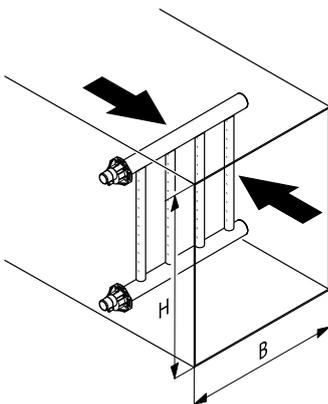
| Steam distribution pipes ¹⁾ for GS 40, 80, 120, 160, 200 and 240 | | Duct width (B) | Steam capacity |
|--|--------------------------------|----------------|----------------------------|
| Type | Length in mm (L) ²⁾ | in mm | max. in kg/h ³⁾ |
| 81-350 | 350 | 400...600 | 30 |
| 81-500 | 500 | 600...750 | 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 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 (see chapter 5.3.1) has to be reduced for technical reasons, the steam output of your unit must be divided between **two steam distribution pipes** or the **OptiSorp steam distribution system** must be used. If this is the case, contact your Condair supplier.

OptiSorp steam distribution system

The OptiSorp steam distribution system is used in ventilation ducts with a short humidification distance (for the calculation of the humidification distance refer to chapter 5.3.1). When ordering an OptiSorp system the duct dimension must be specified. Please consult the data in the following table.



| OptiSorp | Number of steam connections | Max. steam capacity in kg/h ¹⁾ | Duct dimensions | |
|-----------------|-----------------------------|---|-----------------|--------------|
| | | | Width in mm | Height in 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) For duct widths <600 mm the values in brackets apply

5 Mounting and installation works

5.1 Important notes on mounting and installation works

Qualification of personnel

All mounting and installation work must be performed only by adequately qualified personnel familiar with the Condair GS. Ascertaining the qualifications is the customer's responsibility.

General notes

All the information contained in these installation, commissioning and service instructions relating to equipment assembly and to gas, flue gas, water, steam and electrical installation must be unconditionally observed and complied with.

The local directives and regulations for the installation of gasfired equipment (Steam humidifiers) must be unconditionally observed and complied with.

All local regulations relating to the execution of gas, flue gas, water, steam and electrical installations must be observed and complied with.

Safety

The connection of the Condair GS to the mains electrical supply must not be made until all installation work has been completed.

Incorrectly executed installations can result in personal injury and/or damage to property through explosions, fires, carbon monoxide poisoning, electric shock, etc. If you require assistance, please contact a qualified installer, your local gas supplier or your Condair representative. In the installation itself, use only materials available from your Condair representative and accessories approved by him.

5.2 Unit fitting

5.2.1 Humidifier location

The positioning of the Condair GS is largely dependent on the location of installation of the steam distribution pipe (see Chapter 5.3.1) and on the details of the flue gas pipe (see Chapter 5.6) and the air supply line (RS units only, see Chapter 5.7). To ensure proper functioning of the steam humidifier and to obtain optimum efficiency, the following points must be considered and observed when choosing the location for the steam humidifier:

- the local and national regulations for installation of gasfired equipment must be observed and followed. The manufacturer accepts no liability for non-compliance with these regulations.
- Install the steam humidifier so that :
 - the length of the steam hose is as short as possible (ideally 2 m, max. 4 m), the minimum bend radius ($R= 300$ mm) and the minimum upslope (20 %) and the minimum downslope (5 %) of the steam hose can be maintained (see Chapter 5.3.2).
Note: Long steam lines reduce the maximum steam output of the humidifier, due to the heat loss involved. The static pressure also increases.
 - the flue gas pipe can be installed in accordance with the applicable local building and installation regulations.
 - in the case of room air-independent units (RS units) the installation location can be reached with an air supply line and good accessibility is assured.
- In the case of room air-dependent units care must be taken to provide an adequate intake of air (in accordance with local building regulations).

For UK only: Please refer to BS 5440: Part II or BS 6644 when installing units. We draw your attention especially to combustion and ventilation air supply requirements for plant rooms. Permanent low and high level openings communicating directly with the outside air shall be fitted with grilles having a total minimum free area as follows.

| | Free area grille sizes | |
|--------|-------------------------|------------------------|
| | Low level | High level |
| GS 40 | 14,400 mm ² | 14,400 mm ² |
| GS 80 | 55,800 mm ² | 27,900 mm ² |
| GS 120 | 70,200 mm ² | 35,100 mm ² |
| GS 160 | 84,600 mm ² | 43,300 mm ² |
| GS 200 | 89,000 mm ² | 50,500 mm ² |
| GS 240 | 113,400 mm ² | 57,700 mm ² |

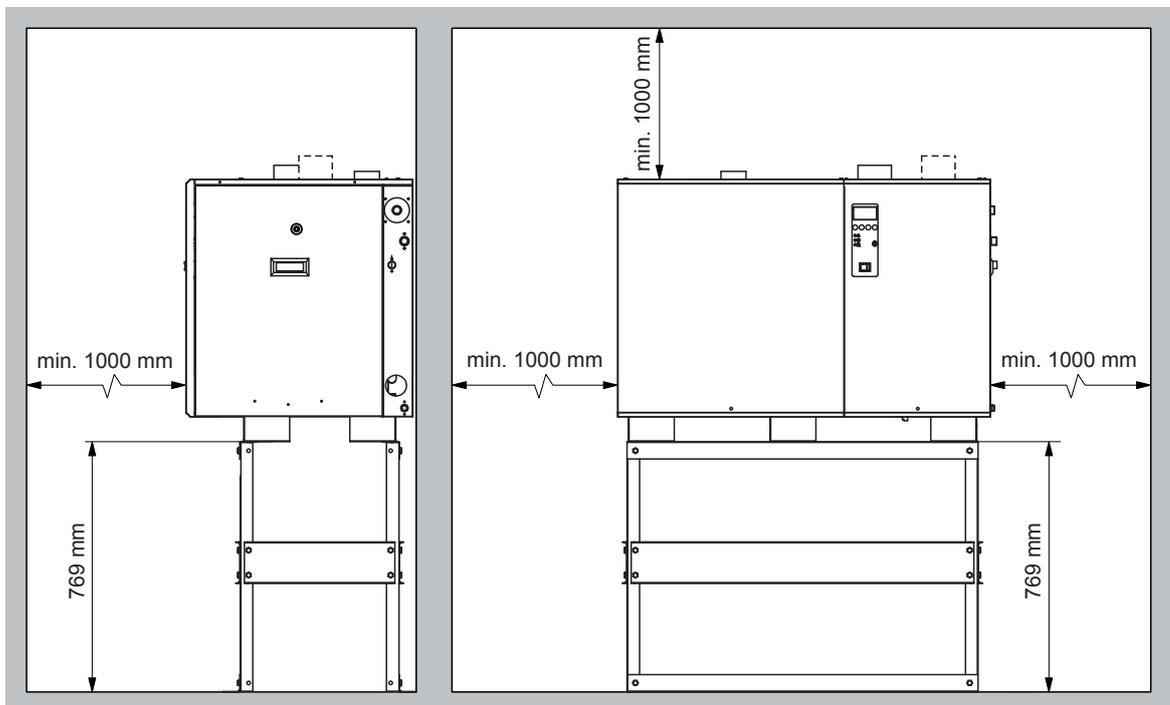
The room air-independent humidifiers (RS units) do not require a separate ventilation opening, since the combustion air required is provided by an air intake pipe from outside the building.

CAUTION!

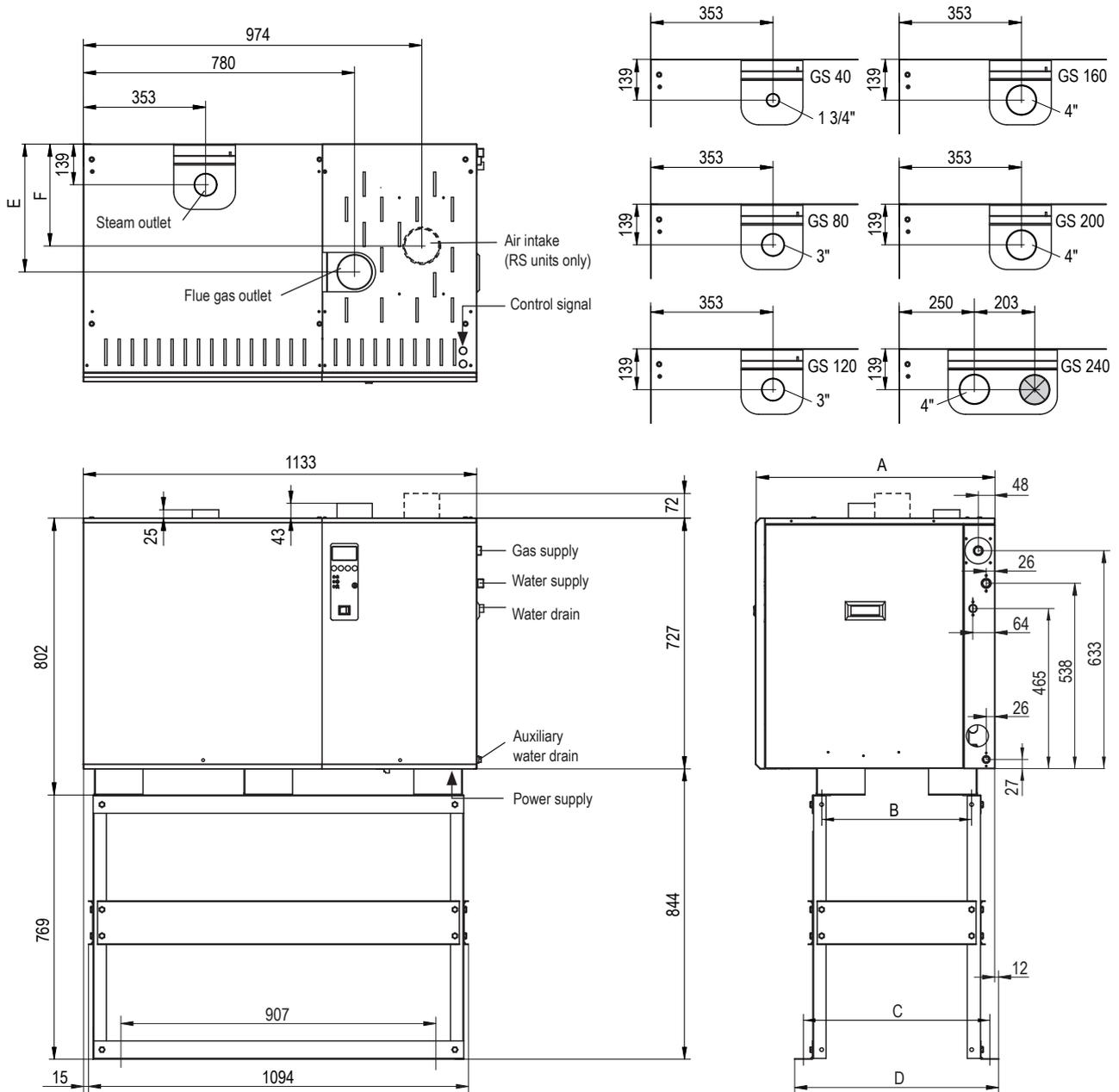
Operation of the humidifier with unclean air can lead to safety problems and reduce the output of the unit. Impurities in the air are, for example: Halogens, ammonia, chloride, excessive dust, lime and dirt. For questions about air quality, please refer to the technical service department of your Condair distributor

- The Condair GS gasfired steam humidifiers are designed for floor mounting on the unit stand (included in the delivery) fixed to the floor.
- The sheet covering of the Condair GS heats up during operation (max. surface temperature approx. 60 - 70 °C). Therefore make sure that no heat-sensitive materials are placed in the immediate vicinity of the humidifier.

- No combustible materials must be placed in the immediate vicinity of the Condair GS humidifier (Insulation materials, wooden floor coverings, etc.). Observe local regulations!
- Do not mount the humidifier in a location that is endangered by heat or frost! If the humidifier must be mounted outside, it must be housed in a weatherproof and thermostatically ventilated cabinet. If necessary, please contact your Condair representative.
- Do not mount the humidifier on a base that is subject to vibration. If necessary, please contact your Condair representative.
- The Condair GS must be installed only in locations equipped with a water drain or with sensors that safely interrupt water supply in case of leakage.
- Do not cover the air openings in the top and bottom covers of the humidifier housing otherwise the air flow may be insufficient. Furthermore, do not place the unit in a narrow niche or a closed compartment (observe minimum distances).
- Position the humidifier so that the unit is easily accessible and there is sufficient space for maintenance work. The minimum distances shown in the following illustration must be maintained.



Dimensions (in mm)



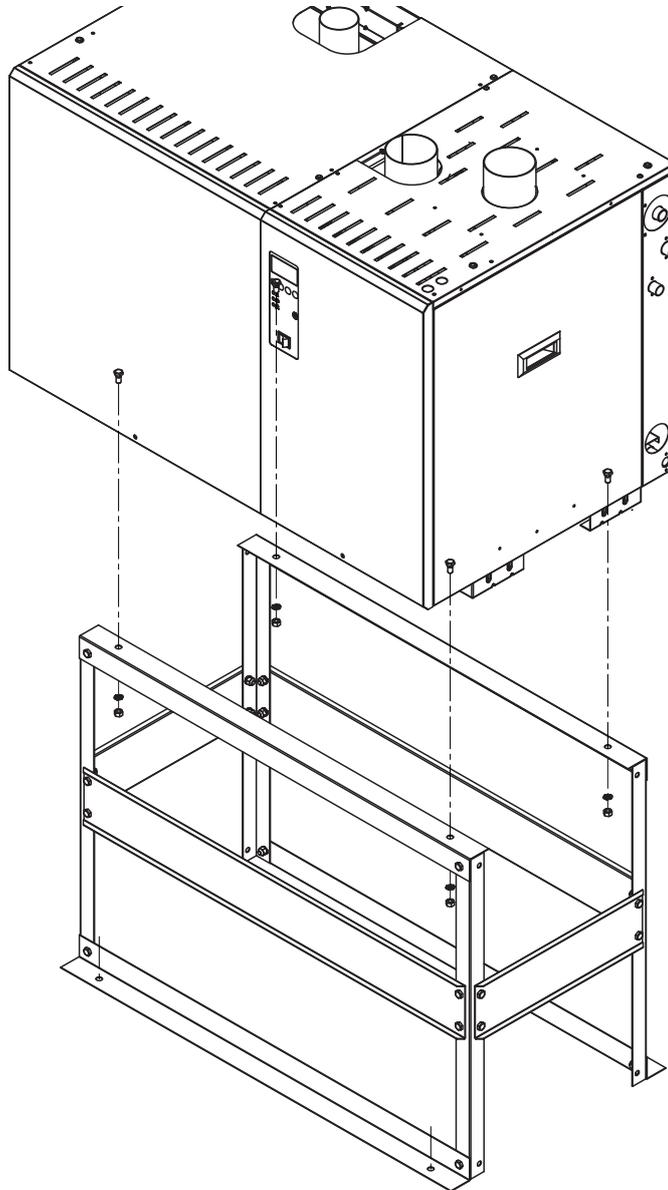
| | A | B | C | D | E | F |
|--------|------|------|------|------|-----|-----|
| GS 40 | 528 | 271 | 377 | 421 | 236 | 160 |
| GS 80 | 689 | 431 | 537 | 588 | 372 | 295 |
| GS 120 | 1086 | 827 | 933 | 984 | 371 | 278 |
| GS 160 | 1086 | 827 | 933 | 984 | 371 | 278 |
| GS 200 | 1482 | 1224 | 1330 | 1381 | 366 | 187 |
| GS 240 | 1482 | 1224 | 1330 | 1381 | 366 | 187 |

Connections and weights

| Model | Connections | | | | | | Net weight kg | Operating weight kg |
|--------|-------------|--------------------|---------------|------------|--------------|-----------------------|---------------|---------------------|
| | Flue gas | Steam No. x ø | Filling Water | Gas | Water Drain | Auxiliary Water Drain | | |
| GS 40 | 3" (76 mm) | 1 x 1 3/4" (45 mm) | BSP 3/4" | BSP 1/2" | 3/4" (19 mm) | NPT 1/2" | 140 | 211 |
| GS 80 | 4" (101 mm) | 1 x 3" (76 mm) | BSP 3/4" | BSP 3/4" | 3/4" (19 mm) | NPT 1/2" | 162 | 273 |
| GS 120 | 5" (127 mm) | 1 x 3" (76 mm) | BSP 3/4" | BSP 1" | 3/4" (19 mm) | NPT 1/2" | 238 | 459 |
| GS 160 | 5" (127 mm) | 1 x 4" (101 mm) | BSP 3/4" | BSP 1" | 3/4" (19 mm) | NPT 1/2" | 261 | 471 |
| GS 200 | 6" (152 mm) | 1 x 4" (101 mm) | BSP 3/4" | BSP 1 1/4" | 3/4" (19 mm) | NPT 1/2" | 290 | 610 |
| GS 240 | 6" (152 mm) | 1 x 4" (101 mm) | BSP 3/4" | BSP 1 1/4" | 3/4" (19 mm) | NPT 1/2" | 314 | 623 |

5.2.2 Mounting the humidifier

The Condair GS humidifiers must be mounted on the unit stand **supplied with the unit**. If mounting on the unit stand supplied is not possible in your particular case, select a method of mounting that is of similar stability. In case of doubt, please contact your Condair supplier.



Mounting instructions

1. Assemble the unit stand as shown in the separate installation instructions. Hand tighten all bolts only.
2. Lift up humidifier with a lifting device approx. 900 mm above the floor.
3. Position unit stand below the humidifier.
4. Lower the humidifier and align with the holes of the unit stand.
5. Fasten the humidifier to the unit stand using the bolts, cup washers and nuts provided.
6. Tighten all nut and bolt pairs to 22.6 Nm (200 lb-in) or until secure.
7. Position the entire assembly to the desired location. Make sure the humidifier is stable, shimming of the floor below the support legs of the unit stand may be necessary.
8. Fix the unit stand to the floor (mandatory) via the four holes in the support plates of the unit stand.

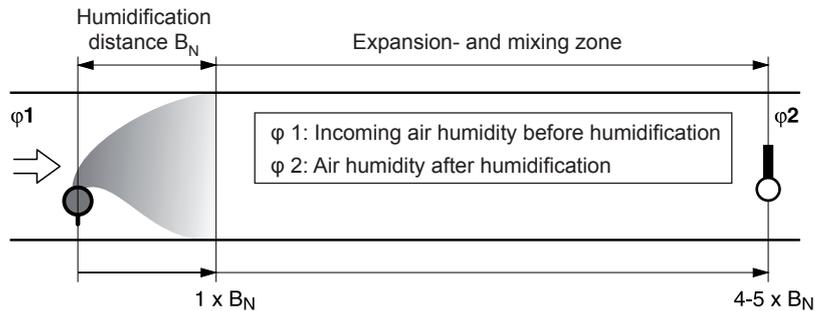
5.3 Steam installation

5.3.1 Positioning and mounting of the steam distribution pipes

The location for the steam distribution pipes should be determined at the time of dimensioning the air conditioning system. Please note the following instructions to ensure proper humidification of the duct air.

Calculating the humidification distance

The water vapor, emitting from the steam distribution pipes, requires a certain distance to be absorbed by the ambient air so that it is no longer visible as steam. This distance is referred to as humidification distance “ B_N ” and serves as a basis for the determination of the minimum distances from the upstream components in the system.



The calculation of the humidification distance “ B_N ” is dependent on several factors. For a rough estimation of the humidification distance “ B_N ”, the following table is useful. Recommended **standard values** listed in this table are based on a supply-air temperature range of 15°C to 30°C. The values given in **bold print only apply to steam distribution pipes 81-..**, the values in brackets apply to the **OptiSorp steam distribution system**.

| Input humidity ϕ_1 in %rh | Length of humidification distance B_N in m | | | | | |
|--------------------------------|--|------------|------------|------------|------------|------------|
| | Output humidity ϕ_2 in %rh | | | | | |
| | 40 | 50 | 60 | 70 | 80 | 90 |
| 5 | 0.9 (0.22) | 1.1 (0.28) | 1.4 (0.36) | 1.8 (0.48) | 2.3 (0.66) | 3.5 (1.08) |
| 10 | 0.8 (0.20) | 1.0 (0.26) | 1.3 (0.34) | 1.7 (0.45) | 2.2 (0.64) | 3.4 (1.04) |
| 20 | 0.7 (0.16) | 0.9 (0.22) | 1.2 (0.30) | 1.5 (0.41) | 2.1 (0.58) | 3.2 (0.96) |
| 30 | 0.5 (0.10) | 0.8 (0.17) | 1.0 (0.25) | 1.4 (0.36) | 1.9 (0.52) | 2.9 (0.88) |
| 40 | – | 0.5 (0.11) | 0.8 (0.20) | 1.2 (0.30) | 1.7 (0.45) | 2.7 (0.79) |
| 50 | – | – | 0.5 (0.13) | 1.0 (0.24) | 1.5 (0.38) | 2.4 (0.69) |
| 60 | – | – | – | 0.7 (0.16) | 1.2 (0.30) | 2.1 (0.58) |
| 70 | – | – | – | – | 0.8 (0.20) | 1.7 (0.45) |

For duct widths <600 mm the humidification distance for the OptiSorp system increases by approx. 50%

ϕ_1 in %rh: Relative supply air humidity prior to humidification at the lowest supply air temperature

ϕ_2 in %rh: Relative supply air humidity after the steam distribution pipe at maximum capacity

Example

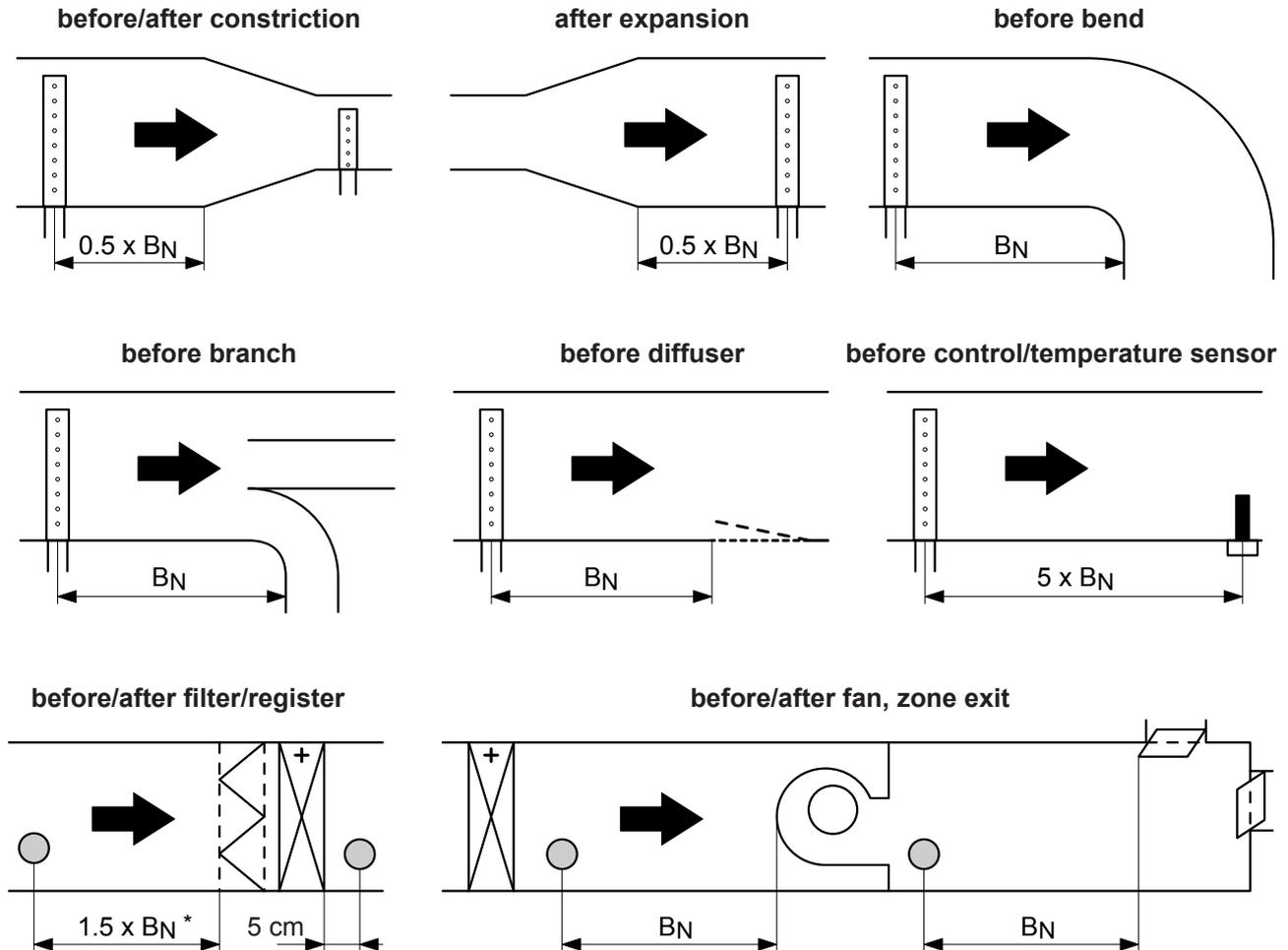
given: $\phi_1 = 30$ %rh, $\phi_2 = 70$ %rh

humidification distance B_N : **1.4 m** (0.36 m for steam distribution system OptiSorp)

Note: If the humidification distance has to be reduced for technical reasons, the amount of steam per steam outlet must be divided between two steam distribution pipes or the steam distribution system OptiSorp must be used. If this is the case, contact your Condair supplier.

Minimum distances to be observed

To prevent the water vapor, that is emitting from the steam distribution pipe, from condensing on downstream system components, a minimum distance to the steam distribution pipe must be observed (depends on the humidification distance “ B_N ”).



* $2.5 \times B_N$ before submicron particle filter

Installation notes and dimensions

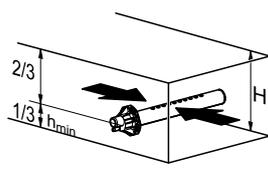
The steam distribution pipes are designed for either horizontal installation (on the duct wall) or, with accessories, for vertical installation (in the duct floor). The outlet orifices should always point upwards and at right angles to the airflow.

If possible, the steam distribution pipes should be installed on the pressure side of the duct (max. duct pressure 1700 Pa). If the steam distribution pipes are installed on the suction side of the duct, the maximum vacuum must not exceed 800 Pa.

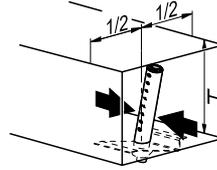
Select a location for the installation, tailored to suit your duct (see the following illustrations) and position the steam distribution pipes in the duct so that a uniform distribution of steam is achieved.

In positioning the steam distribution pipes, the following dimensions should be observed:

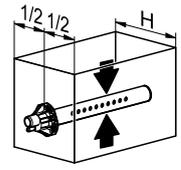
g min. = 100 mm
h min. = 85 mm



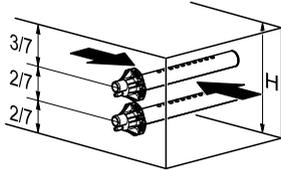
H min. = 250 mm



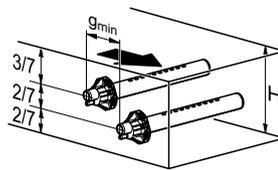
H ≥ 400 mm



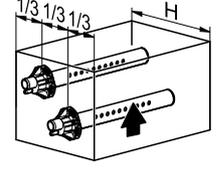
H min. = 200 mm



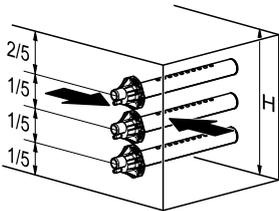
H min. = 400 mm



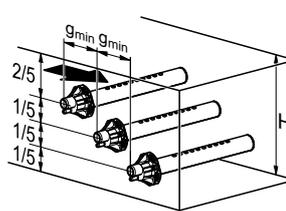
H min. = 350 mm



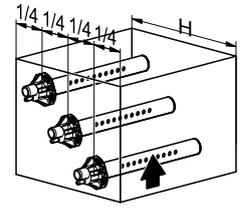
H min. = 300 mm



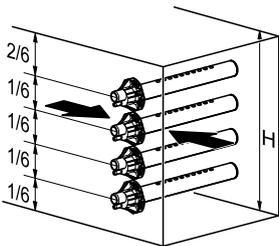
H min. = 600 mm



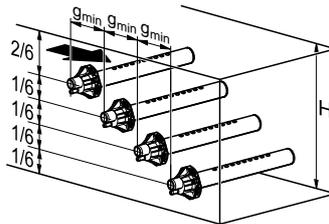
H min. = 500 mm



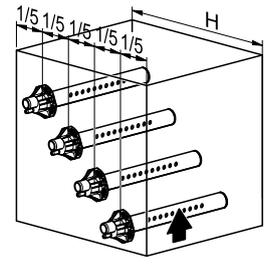
H min. = 400 mm



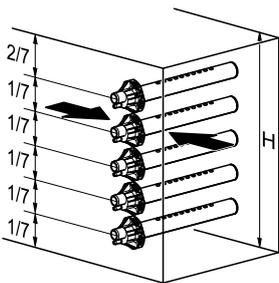
H min. = 720 mm



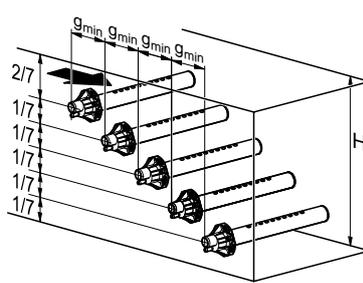
H min. = 600 mm



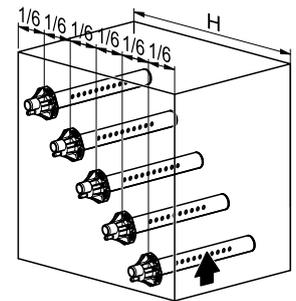
H min. = 500 mm



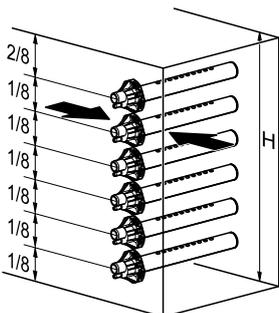
H min. = 840 mm



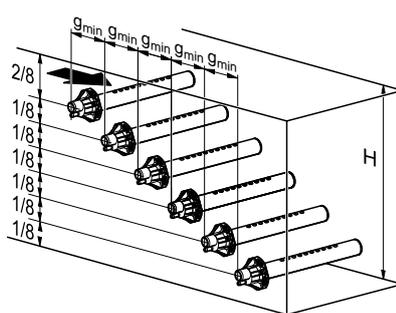
H min. = 700 mm



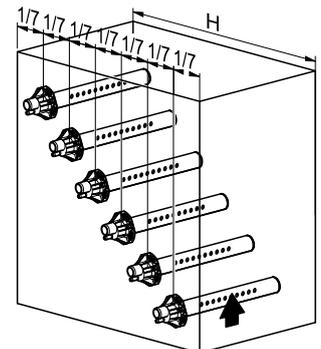
H min. = 600 mm



H min. = 960 mm



H min. = 800 mm

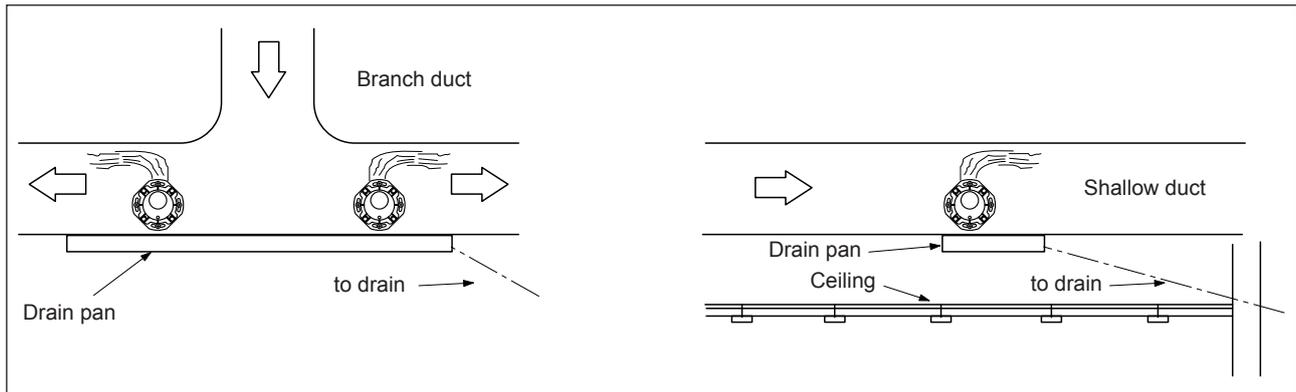


H min. = 700 mm

Note: When locating the OptiSorp steam distribution system please note the instructions in the separate documentation for this product.

Guidelines for dimensioning the ventilation ducts

- To facilitate the installation of the steam distribution pipes and for control purposes, a sufficiently sized control opening should be planned.
- Within the range of the humidification distance, the ventilation duct should be waterproofed.
- Low temperature ducts below 15°C, shallow ducts, or branch ducts might require the use of a field supplied condensate drain pan below the steam distributor (see figure below).



- Air ducts passing through cold rooms should be insulated to prevent the humidified air from condensing along the duct wall.
- Poor airflow conditions within the air duct (e.g. caused by obstacles, tight bends, etc.) can lead to condensation of the humidified air.
- Steam distribution pipes must not be mounted to round ducts.
- Exercise extreme caution when installing in fiberglass or internally lined ducts. If necessary, remove 10-15 cm of the lining where the steam is being introduced.

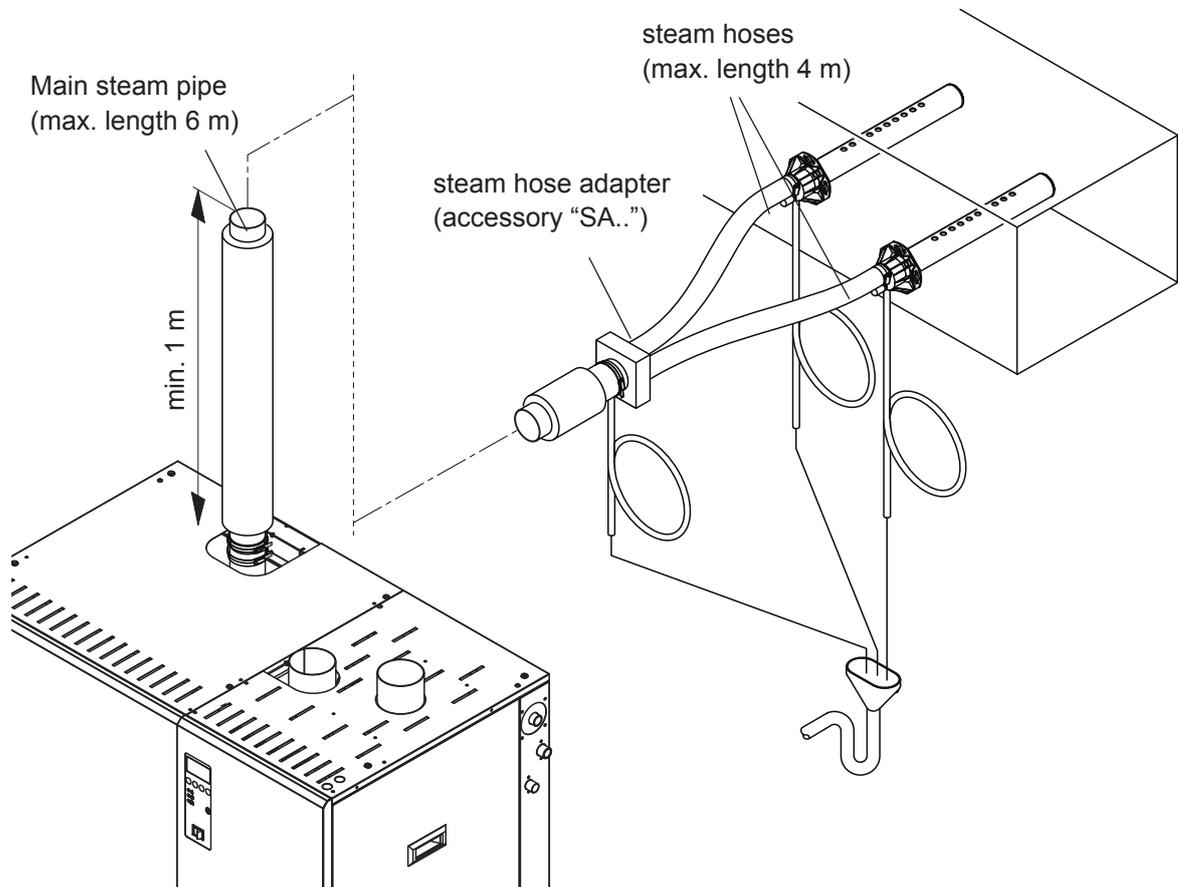
If you have questions relating to the dimensioning of ventilation ducts in combination with Condair steam humidifiers, contact your Condair supplier.

Installing the steam distribution pipes/OptiSorp steam distribution system

Detailed information on the installation of steam distribution pipes and OptiSorp steam distribution system can be found in the separate “Mounting Instructions” for this products.

5.3.2 Installing the main steam pipe

The steam pipe between the steam outlet of the unit and the steam hose adapter (main steam pipe) must be made with solid piping.



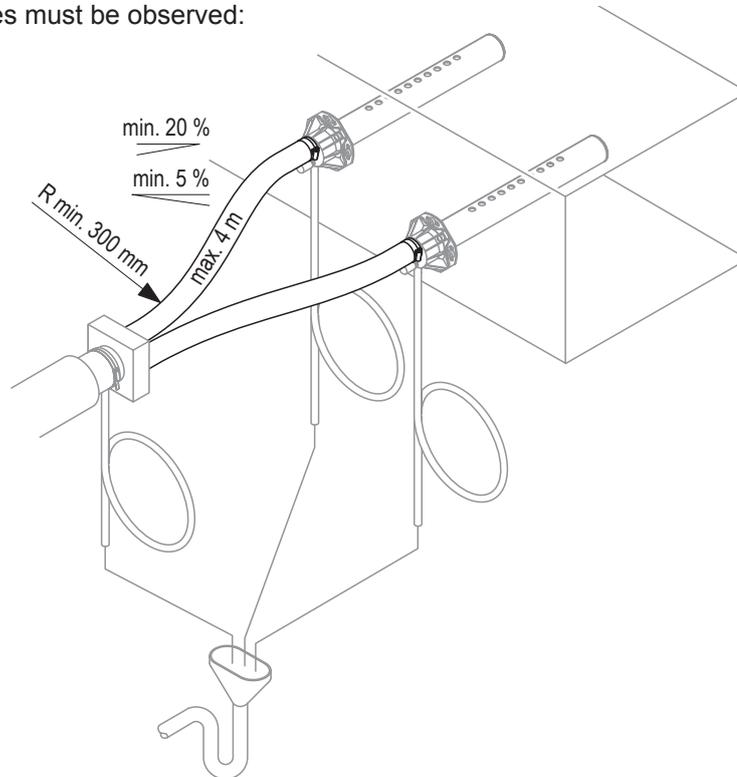
The following notes must be observed:

- The internal diameter of the steam outlet on the unit must be maintained over the entire length of the main steam piping.
- The maximum length of the main steam pipe is 6 m.
Important! Allowance must be made for a **pressure loss of 10 mm water column (approx. 100 Pa)** per meter length or per 90° bend.
- The **minimum bend radius** for solid pipes is **4-5 x internal diameter**. 90° bends should be avoided. Wherever possible, pipe bends with large radius should be used (e.g. produced using a pipe bending machine, or constructed from a pair of 45° bends). This reduces the performance loss due to the formation of condensate, and in addition, the static pressure in the steam line.
- Use Cu pipe (for operation with untreated drinking water only) or stainless steel pipe (min. DIN 1.4301) exclusively.
- To minimize the condensate formation (= loss), the steam pipes must be insulated over the entire length of the piping.
- Connection of the steam pipe to the steam outlet on the unit and the connection on the steam hose adapter is effected by means of short lengths of steam hose secured with hose clamps.
- At spots where condensate could accumulate inside the pipe a condensate drain with siphon (min. hose bend Ø200 mm) must be mounted.

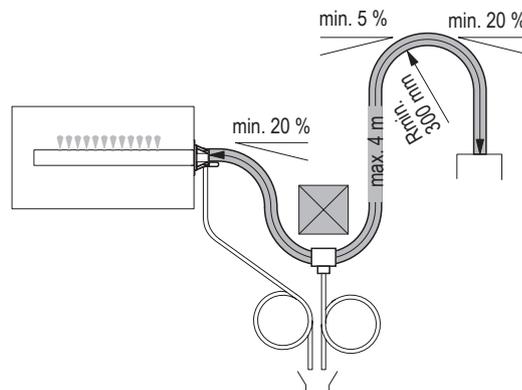
5.3.3 Installing the steam hoses between steam hose adapter and steam distributors

Important! Use original Condair steam hose exclusively. Other types of steam hoses can cause undesired operational malfunctions.

The following notes must be observed:



- Lead the steam hose with an **upslope of at least 20%** or with a **minimum downslope of 5%** to the steam distribution pipe.
- The steam hose should be kept as short as possible (**ideally 2 m, max. 4 m**) while observing the **minimum bend radius of 300 mm**. **Important!** Allowance must be made for a **pressure loss of 10 mm water column (approx. 100 Pa)** per meter steam hose.
- Reductions in the cross section such as kinks should be avoided throughout the entire length of the hose. The installation of a stop cock in the steam hose is not permissible.
- Steam hoses must be prevented from sagging (condensate pockets); if necessary, support with pipe clamps, rails or wall brackets. If sagging can not be prevented (e.g. when passing by obstacles) a condensate drain with siphon (min. hose bend $\varnothing 200$ mm) must be mounted at the lowest point of the steam hose (see following illustration).



- **Important!** When deciding on the length and layout of the hose, it should be noted that the steam hose may become somewhat shorter with progressive ageing.

Securing the hose

The steam hose must be secured to the steam distribution pipe and humidifier steam outlet by means of **hose clamps**.

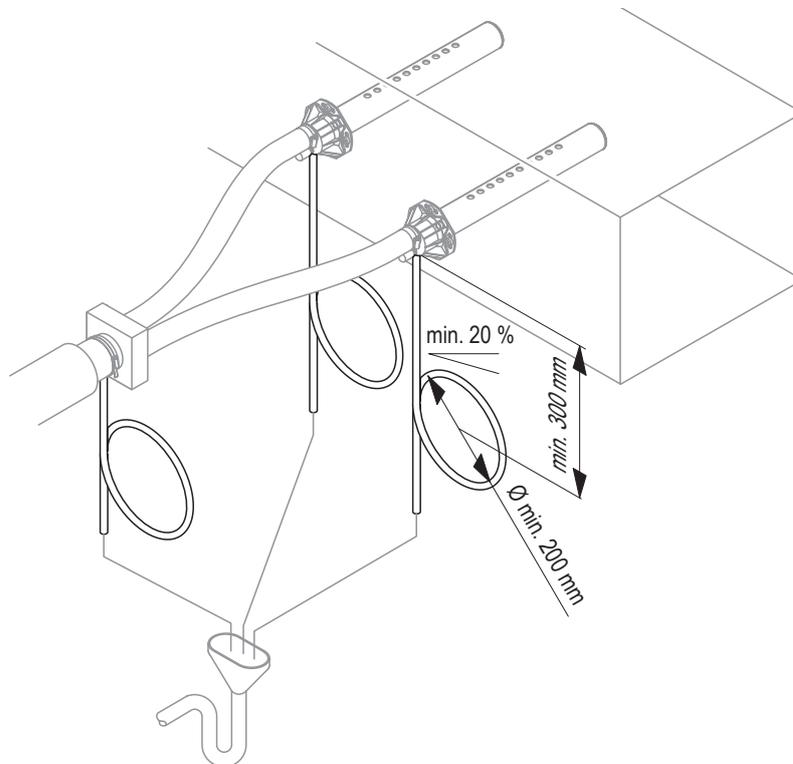
Steam line with fixed piping

For steam lines with fixed piping, the same instructions apply to the laying of the piping as already described. The following additional notes should be observed:

- The **minimum internal diameter of 45 mm** should be applied over the whole length of the piping.
- Use exclusively Cu pipe (for operation with untreated drinking water only) or stainless steel (min. DIN 1.4301).
- To minimize the condensate formation (=loss), the steam pipes must be insulated.
- The **minimum bend radius** for solid pipes is **4-5 x internal diameter**.
90° bends should be avoided. Wherever possible, tube bends with large radii should be used (e.g. produced using a tube bending machine, or constructed from a pair of 45° bends). This reduces the performance loss due to the formation of condensate, and in addition, the static pressure in the steam line.
- **Important!** Allowance must be made for a **pressure loss of 10 mm water column (approx. 100 Pa)** per meter length or per 90° bend.
- Connection of the steam pipes to the steam distribution pipe and steam humidifier is effected by means of short lengths of steam hose secured with hose clamps.

5.3.4 Installing the condensate hoses

Important! Use original Condair condensate hose exclusively. Other types of hoses can cause operational malfunctions.



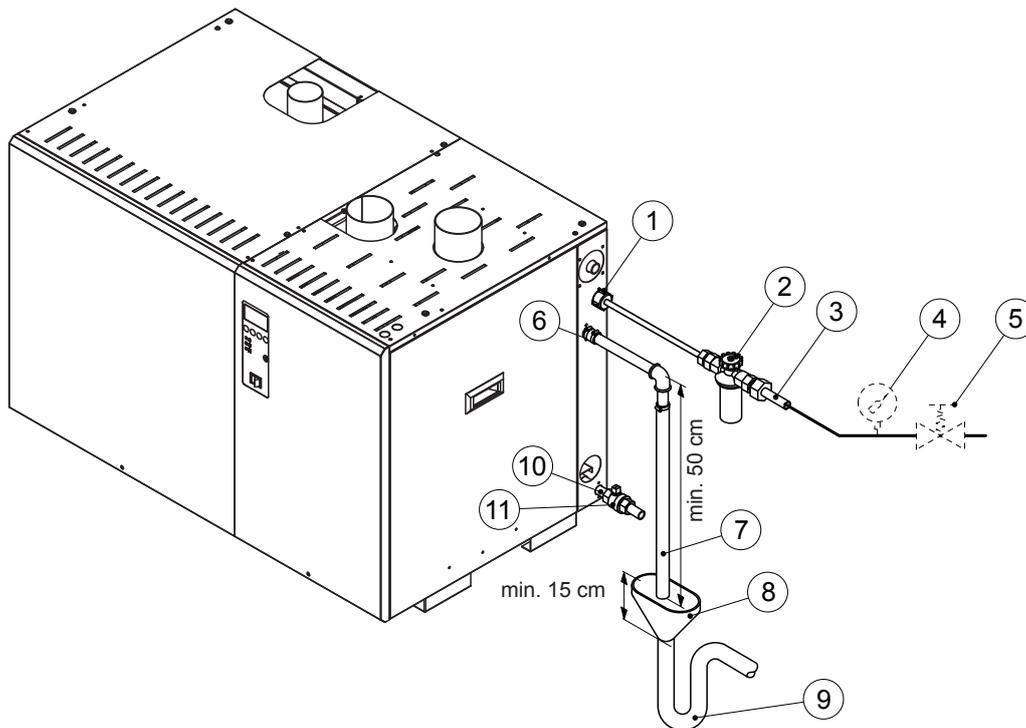
The individual condensate hoses of the main steam pipe (if present), the steam hose adapter (if present) and the steam distribution pipes must be led down with a **minimum downslope of 20 %** via a siphon (min. hose bend $\varnothing 200$ mm) into a discharge funnel.

Important! Before putting the unit into operation, the siphon of the condensate hose must be filled with water.

5.4 Water installation

5.4.1 Performing the water installation

Overview water installation



- 1 Filling water connection BSP 3/4" (outside thread)
- 2 Filter valve (accessory "Z261")
- 3 Filling water supply line (min. inner Ø: 12 mm)
- 4 Manometer (installation recommended, building side)
- 5 Pressure reducing valve (compulsory for water pressures >8 bar, building side)
- 6 Water drain connection 3/4" (Ø19 mm)
- 7 Drain line, building side (min. inner Ø: 45 mm, min. 50 cm directed vertically downwards)
- 8 Funnel (building side, min. height 15 cm)
- 9 Siphon (min. inner Ø: >45 mm, building side)
- 10 Auxiliary water drain connection NPT 1/2" (inside thread)
- 11 Shut-off valve (installation recommended, building side)

Water supply

The water supply pipe is to be connected via the filter valve (accessory "Z261"), to the connection on the unit (see foregoing illustration). The filter valve should be installed as close to the humidifier as possible.

Note: Instead of the filter valve, a **shut-off valve** and a **water filter 5 µm** ((both essential) can be used.

The following specifications must be observed:

- Connections on unit: **BSP 3/4"** (outside thread)
- Min. inner diameter of supply line: **12 mm**
- Admissible mains pressure **3.0 to 8.0 bar** (hammer-free system)
For mains pressures >8 bar, connection must be made via pressure reducing valve (adjusted to 3.0 bar). For mains pressures <3.0 bar please contact your Condair supplier.
- Supply rate: **10 l/min**
- Admissible supply temperature: **1...30 °C**
- **Notes on water quality:**
 - For the water supply of the Condair GS, use exclusively **untreated drinking water** or **fully demineralized water**.
Note: The use of fully demineralized water reduces the maintenance and the cleaning of the water tank to a minimum.
 - The use of **additives** such as corrosion inhibitors, disinfectants, etc. is **not allowed**, since these additives may endanger health and affect proper operation.
 - If the Condair GS shall be operated with softened or partly softened water, please contact your Condair supplier.
- The connection material must be pressure-proof and certified for use in drinking water supply systems.

CAUTION!

Fully demineralized water is aggressive. When making connections to a fully demineralized water system, use exclusively plastic or stainless steel installation materials (min. DIN 1.4301).

- **Important!** Before connecting the water line to the unit, the line must be flushed thoroughly.

Water drain

The drain line should be connected to the unit drain connection using a hose coupling. The drain line should drop vertically down for a minimum of 50 cm and into an open drain funnel (min. height 15 cm). The drain line is then connected via a siphon to the building drain line. The minimum internal diameter of 45 mm must be maintained over the full length of the building drain line. Make sure that the drain line is correctly attached and easily accessible for the purpose of inspection and cleaning. The following connection data should be observed:

- Connection on unit (hose connection): **3/4" (Ø19 mm)**

CAUTION!

Use only **temperature-resistant** installation materials!

When using fully demineralized water, only stainless steel (min. DIN 1.4301) or chemically-resistant plastic (e.g. Polypropylene) connection components must be used.

- Drainage capacity: **approx. 20 l/min**
- Min. inner diameter of the building drain line: **45 mm**
- Min. downslope after siphon: **10 %**

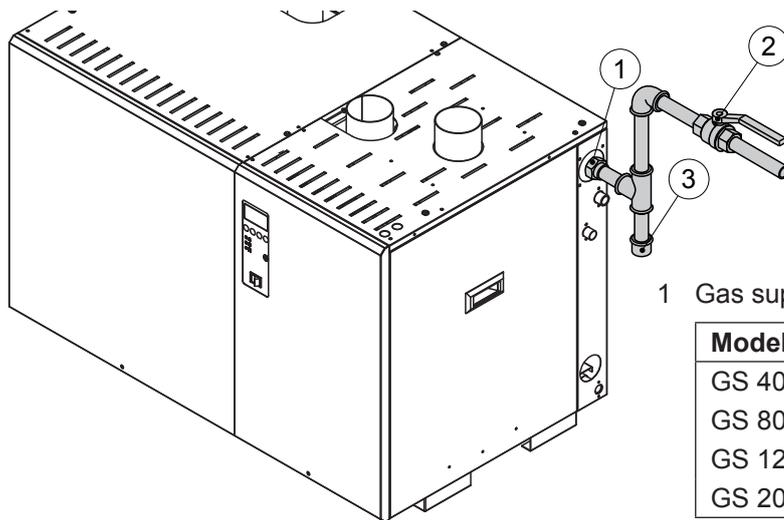
Note: It is not permissible to curve the drain pipe upwards, because this can lead to the collection of deposits at the lowest point in the pipe and to the blockage of the pipe.

5.5 Gas installation

All installation work must be carried out in accordance with the applicable local building and installation regulations.

5.5.1 Performing the gas installation

Overview Gas installation



1 Gas supply connection

| Model | Connection |
|-------------------|------------|
| GS 40 | BSP 1/2" |
| GS 80 | BSP 3/4" |
| GS 120 and GS 160 | BSP 1" |
| GS 200 and GS 240 | BSP 1 1/4" |

2 Gas shut-off valve (building side)

3 Sediment trap (Installation - building side - essential in the case of the use of steel gas pipes)

Installation notes

The gas supply pipe must be connected to the connection on the unit via a shut-off valve (essential requirement), which is installed in the immediate vicinity of the unit. When steel gas pipes are in use, it is essential that a sediment separator be fitted between the shut-off valve and the unit connection. The following connection data must be adhered to:

- Permissible gas operating pressure:

| Gas | | Operating pressure (mbar) | | |
|------------------------|-------|---------------------------|------|------|
| | | Nominal | Min | Max |
| Natural gas H, E, E(S) | G20 | 20 | 17 | 25 |
| Natural gas L, ELL | G25 | 25 | 20 | 30 |
| Natural gas HS | G25.1 | 25 | 20 | 30 |
| Natural gas Lw | G27 | 20 | 17.5 | 23 |
| Natural gas Ls | GZ350 | 13 | 10.5 | 16 |
| Propane gas P | G31 | 37 or 50 | 25 | 57.5 |

- The connection material used must be pressure tested and approved for gas installations.
- Do not use teflon tape on gas line pipe threads. A flexible sealant suitable for use with Natural Gas and Propane Gas is recommended.
- Plan gas supply piping so it will not interfere with removal of gas valves or blower assemblies and front or side service doors.

5.5.2 Leak testing

After completion of the installation work, the whole gas line must be tested to a **maximum pressure of 40 mbar (4.0 kPa) for natural gas or 150 mbar (15 kPa) for propane** and checked for leaks using a commercially available soap solution. The bubbles indicate leaks. All leaks must be eliminated before the humidifier is put into operation.



DANGER!

Never use an open flame to check for leaks. The presence of any leakage is a source of danger to persons and to property, due to the possibility of fire and explosion.

If the gas circuit must be tested to a pressure of over 150 mbar (15 kPa), the gas supply pipe must be removed from the unit connection. After the test, the gas line must be depressurized before it is reconnected to the unit.

CAUTION!

Non-observance of the above instruction can lead to damage to the gas pressure regulating valve. Gas pressure valves overloaded due to high pressure are not covered by the manufacturer's guarantee.

5.5.3 Conversion instructions for operating the humidifier with another type of gas

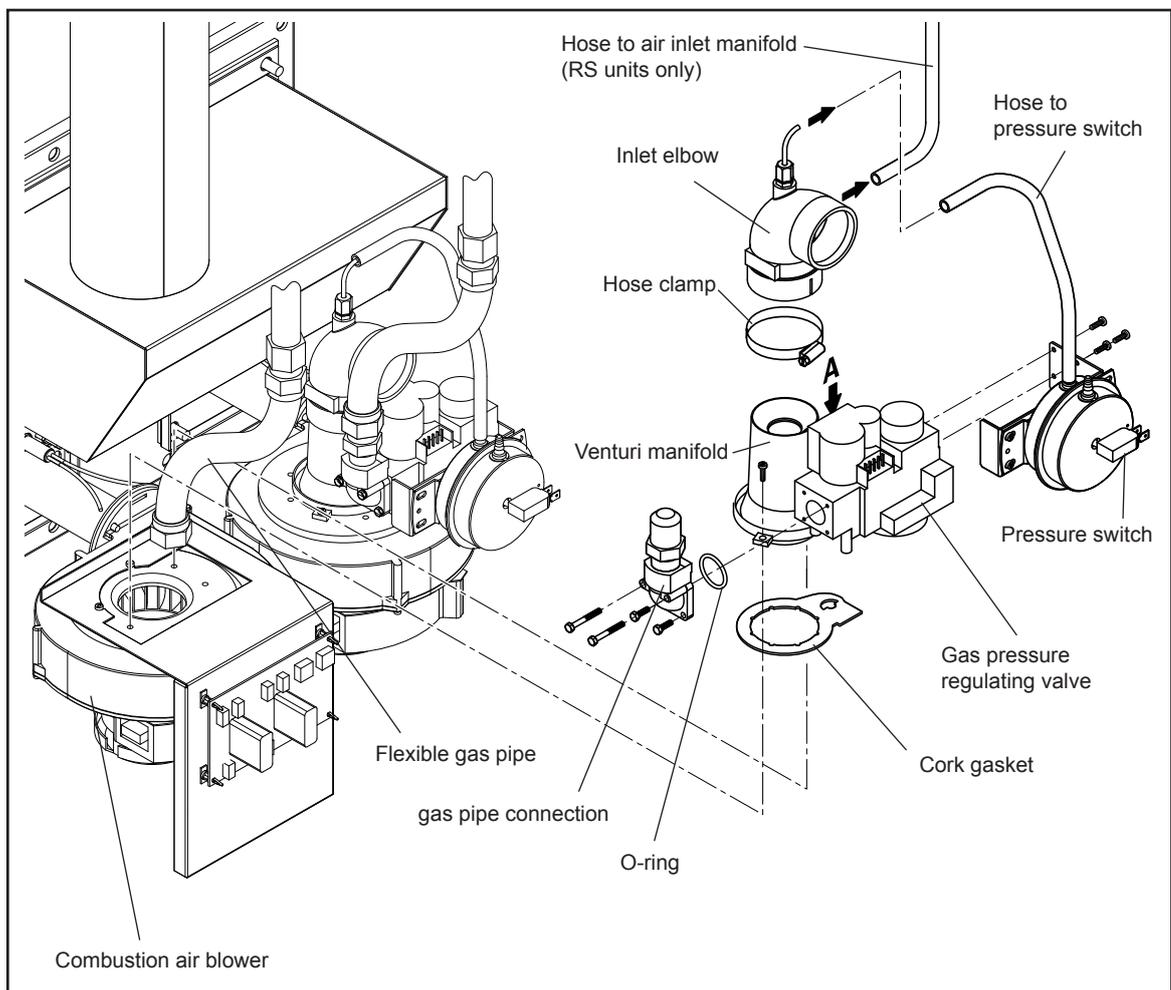
Ex works the appliance is equipped to operate on one type of gas. To convert an appliance for operation on another type of gas, follow the directions below (see also illustration on the following page).

Important: The conversion shall be carried out by a manufacturer's authorized representative or person trained and licenced for such activities, in accordance with the requirements of the manufacturer or local authorities having jurisdiction in the area of installation.

1. Disconnect the humidifier from the electrical power supply and take precautions against inadvertent switching on.
2. Turn off gas supply to appliance and secure it against inadvertent opening.
3. Undo the screw(s) (Phillips screwdriver) and remove the right side panel(s).
4. Disconnect the hose(s) from the inlet elbow (note the layout). Then, loosen the hose clamp and remove the inlet elbow.
5. Undo the coupling of the corresponding flexible gas pipe and disconnect gas pipe from the gas pressure regulating valve.
6. Disconnect electrical cables to the gas pressure regulating valve and the air pressure switch (note assignment before removal).
7. Undo the two screws that mount the venturi manifold to the combustion air blower, then lift up the manifold together with the gas pressure regulating valve.
8. Undo the four screws and remove the gas pipe connection of the gas pressure regulating valve.
9. Undo the three screws of the air pressure switch support and remove the pressure switch assembly from the gas pressure regulating valve.
10. Check the cork gasket and the O-ring in the gas pipe connection for damage and replace if necessary.

11. Attach the gas pipe connection (with mounted O-ring) and the pressure switch assembly to the gas pressure regulating valve supplied (comes with venturi manifold attached).

Warning! Make sure the gas type indicated on the label of the venturi manifold corresponds to the gas you are using. **Do not change the setting of sealed adjustment screw "A"**.
12. Fix the new venturi manifold (don't forget the cork gasket) together with the gas pressure regulating valve with the two screws to the combustion air blower.
13. Reconnect the flexible gas pipe to the gas pressure regulating valve and tighten the coupling.
14. Fix the inlet elbow with the hose clamp to the venturi manifold.
15. Reconnect the hose from the air pressure switch and if present from the air inlet manifold (on RS units only) to the inlet elbow.
16. Reconnect the electrical cables to the gas pressure regulating valve and the air pressure switch.
17. On multiple burner units repeat steps 4 to 16 for each gas valve assembly.



18. Carry out a leakage test (Refer to instructions in 5.5.2).
19. Turn power to unit back on and initiate a test fire sequence to check for proper ignition characteristics.
20. If tests are acceptable, affix appropriate conversion label to data plate. Replace door panel and fix it with screw. Then, return unit to normal operation.
21. Conversion is now complete.

5.6 Flue gas installation

Important: Since the regulations for the installation of flueing systems differ from country to country, the relevant local regulations must be adhered to without reservation.

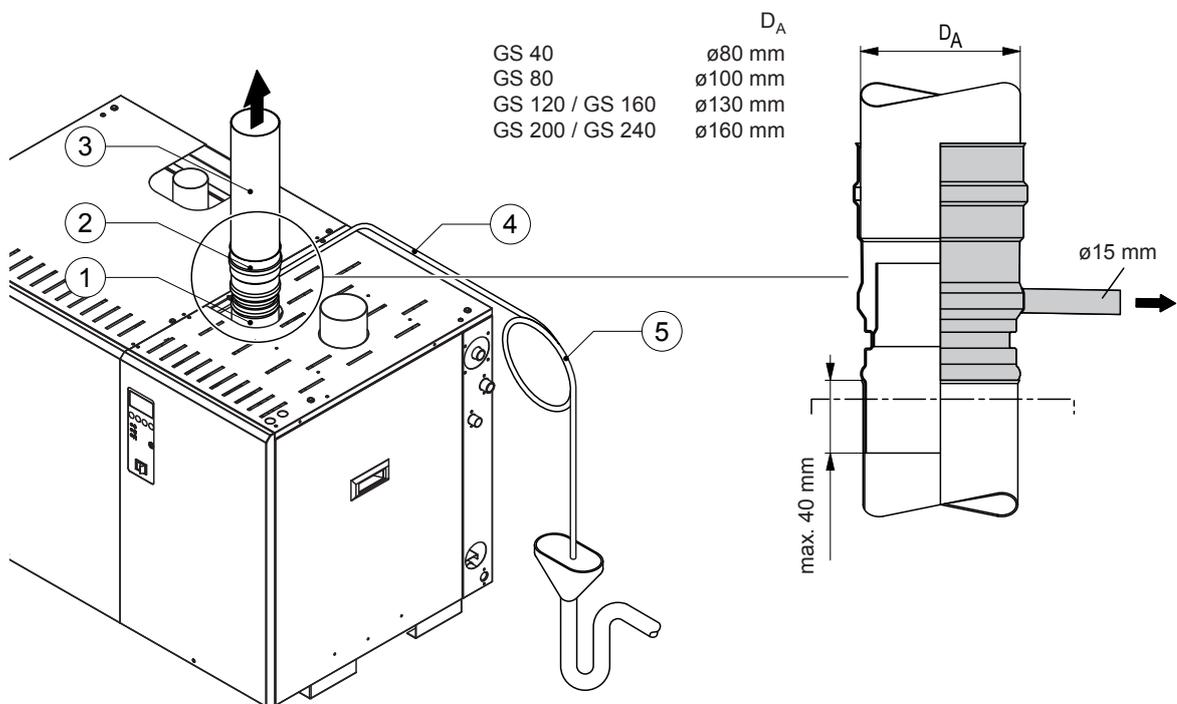
In any case, please consult your Condair representative. This applies in particular to the room air-independent steam air humidifiers (RS units).

Please note that flueing must be designed for overpressure or underpressure, depending on local regulations.

All work concerning the flue pipe installation must be performed only by adequately qualified personnel. Ascertaining the qualifications is the customers responsibility.

5.6.1 Performing flue gas installation

Overview

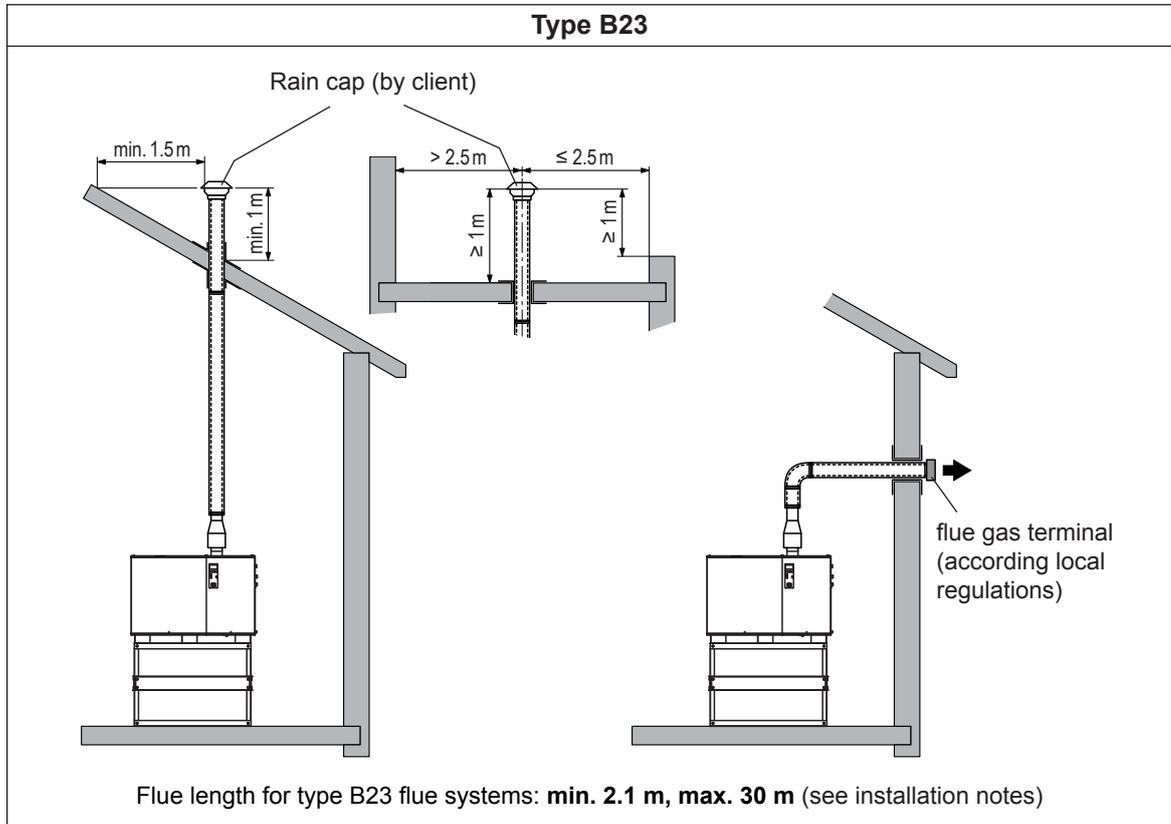


- 1 Flue gas connection on the unit
 - GS 40: ø76 mm (3")
 - GS 80: ø101 mm (4")
 - GS 120/GS 160: ø127 mm (5")
 - GS 200/GS 240: ø152 mm (6")
- 2 Flue gas adapter with condensate drain (accessory "FA...")
 - GS 40: FA40 (D_A = 80 mm)
 - GS 80: FA80 (D_A = 100 mm)
 - GS 120/GS 160: FA120/160 (D_A = 130 mm)
 - GS 200/GS 240: FA200/240 (D_A = 160 mm)
- 3 Flue gas pipe (building side)
- 4 Condensate drain (building side)
- 5 Siphon (min. diameter 300 mm, building side)

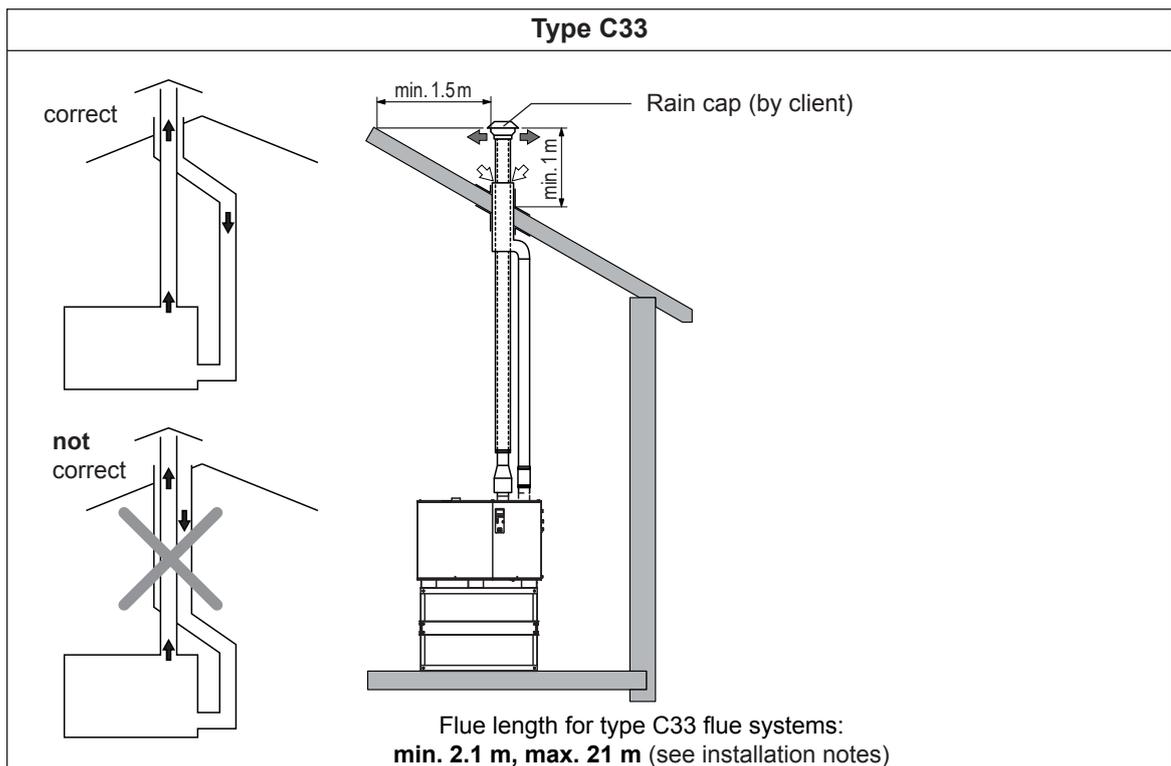
Flue arrangement

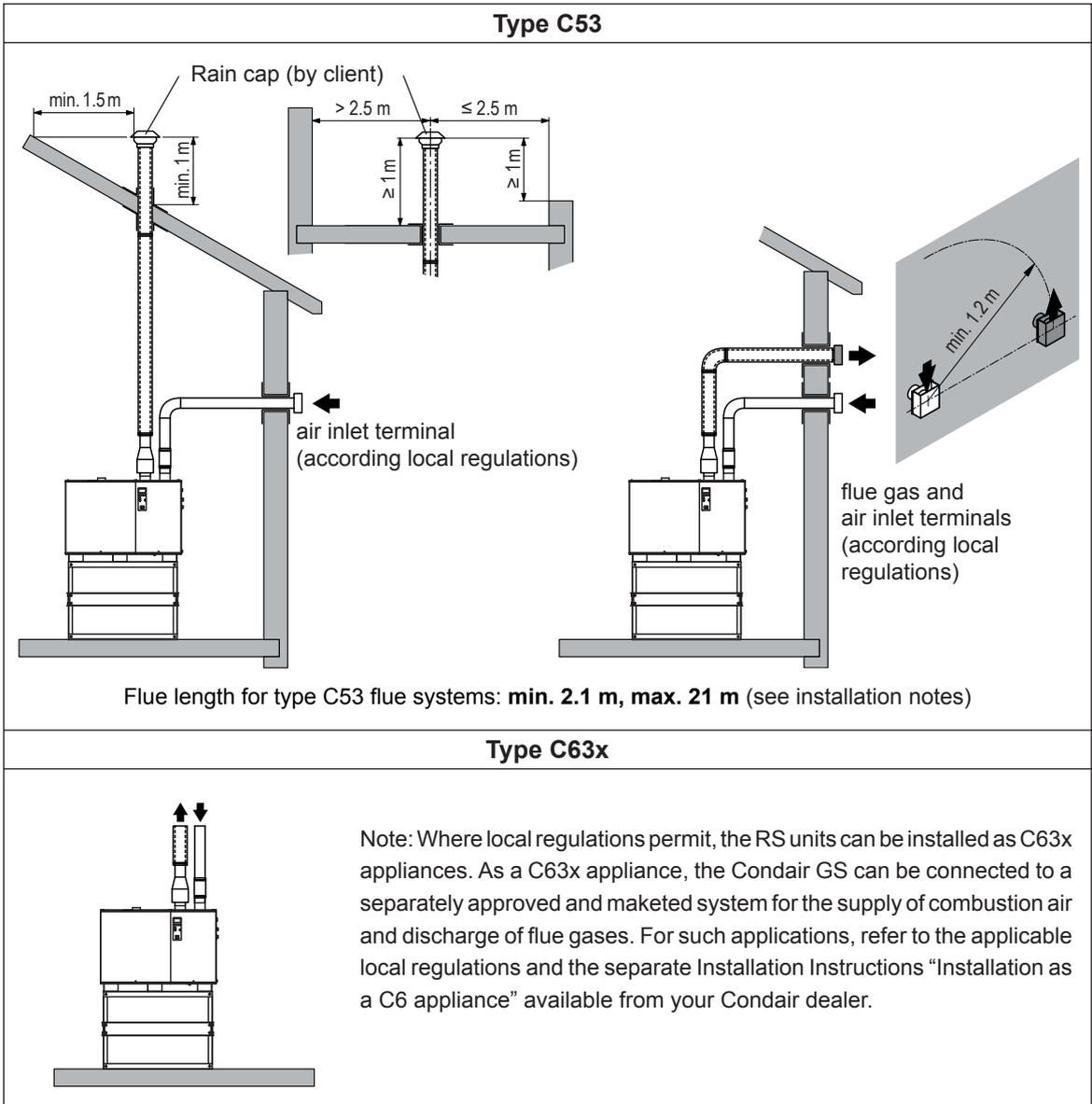
There are different types of applicable flue systems for the Condair GS depending on the unit type (room air-dependent or room air independent units). The following flue gas diagrams are for guidance only, and must be read in accordance with the local country codes for flue gas systems.

Applicable flue systems for room air-dependent units



Applicable flue systems for room air-independent units – RS units





General installation notes

The following instruction notes must be observed:

- Flue gas specifications: ---> see table in chapter 10.2
- The flue gas temperature during normal application and when the maintenance schedule is fulfilled is between 160 - 180 °C. If the unit is not maintained properly the flue gas temperature could increase. In this case the temperature switch would shut down the unit if the temperature exceeds 200 °C for safety reasons.
- Use exclusively corrosion free installation and sealing materials tested and approved for flue gas systems.
- All connections of the flue gas pipe must be sealed with high temperature RTV silicone rated for at least 250 °C.
- Select a suitable piping arrangement for the discharge of flue gases from the building.
- The minimum internal diameter must be observed over the entire length of the flue gas pipe.
 - GS 40: ø76 mm (3")
 - GS 80: ø101 mm (4")
 - GS 120/GS 160: ø127 mm (5")
 - GS 200/GS 240: ø152 mm (6")
- Horizontal pipe sections should have a minimum upward slope of 21 mm/m and should be supported every 1.5 m and additionally supported at every pipe bend.
- For any flue lengths over 7 m long, use insulated pipes.
- When the flue pipe is lead through nearby rooms the pipe must be equipped with an F90-type insulation.
- Provide a fire-proof screen or barrier (at a minimum distance of 50 mm to flue gas pipe) to prevent personal injury in areas where inadvertent personnel contact with flue pipe can occur or where heat-sensitive products are stored.
- Secure the flue pipe (e.g. by means of beading the pipe, see overview) to prevent it from slipping into the flue connector of the unit.
- A condensate discharge point should be installed at an appropriate position in the GS humidifier flue gas system (see overview). A siphon with a minimum 300 mm head of water must be installed in the condensate discharge line, so that no flue gases can escape via the discharge pipe.

Before operating the humidifier, make sure that the siphon in the condensate discharge is filled with water and the condensate outlet is in accordance with the applicable local regulations for sanitary installations.

Flueing with overpressure

When flueing with overpressure the maximum admissible length of the flue pipe equals 30 meters for room air-dependent units and 21 meters for room air-independent RS unit (assuming same diameter as connector on Condair GS) where each 90° elbow is equal to 3 m and each 45° elbow is equal to 1.5 m of straight pipe. Three elbows outside the humidifier casing is a recommended maximum for flueing systems.

We recommend 30 m or 21 m respectively flue length maximum to ensure that output is maintained. For lengths over 30 m or 21 m respectively, please consult your Condair supplier.

Flueing with underpressure

If local regulations require flueing with underpressure, the underpressure must be within -0.2 and -0.62 mbar. The applicable local regulations for the layout of flue gas pipes for underpressure must be observed and complied with.

Additional requirements when flueing through a sidewall

Attention! Some countries prohibit leading the flue pipe through a side wall. Observe local regulations and contact the local authorities and/or the chimney-sweep.

Position the humidifier as near as possible to the wall through which the flue pipe is to be taken.

Locate the flue terminal at least 1 m above any forced air inlet located within 3 m; or at least 1 m below, 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 is required.

Locate the flue terminal at least 2.5 m above grade when it is adjacent to public walkways.

Locate the bottom of the flue 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 local experience indicates that condensate drippage may cause problems such as above planters, patios, or over public walkways, or over an area where condensate or vapor could create a nuisance or hazard, or could be detrimental to the operation of regulators, relief valves, or other equipment.

Refer to the flue manufacturer's installation instructions.

Additional requirements for flue gas systems of RS units

The RS units are certified as C33 and C53 appliances. Where local regulations permit, the RS units can be installed as C6 appliances. For such applications, refer to the separate Installation Instructions "Installation as a C6 appliance" available from your Condair dealer.

Please observe the following additional requirements for the flue gas installation of RS units:

- Only use installation material in accordance with the local regulations.
- The flue gas pipe and the air inlet pipe must have the same length (min. 2.1 m, max. 21 m).
- Observe the requirements regarding terminal locations in section 5.7.

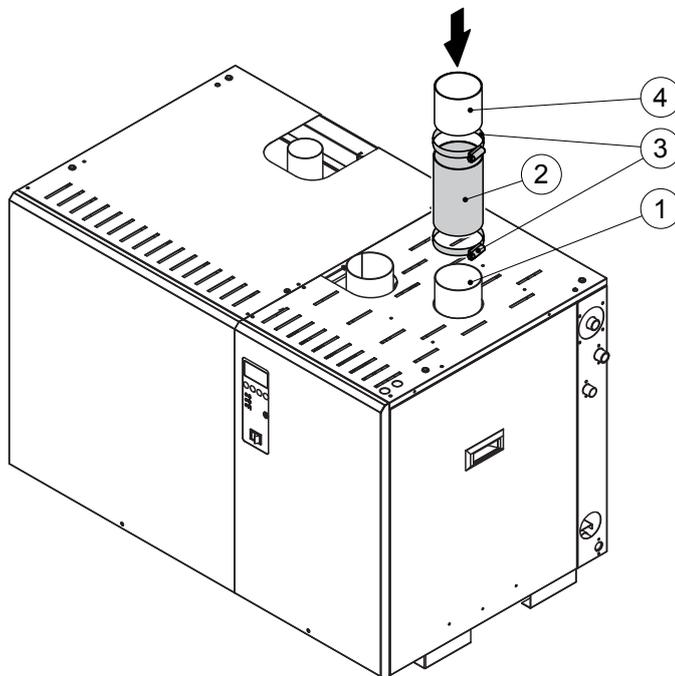
5.7 Installation of the air inlet line for room air-independent units (RS units)

Important: Since the regulations for the installation of air supply systems for gasfired appliances differ from country to country, **the relevant local regulations must be adhered to without reservation. In any case, please consult your Condair representative.**

Installation of the air supply line must only be carried out by adequately qualified personnel.

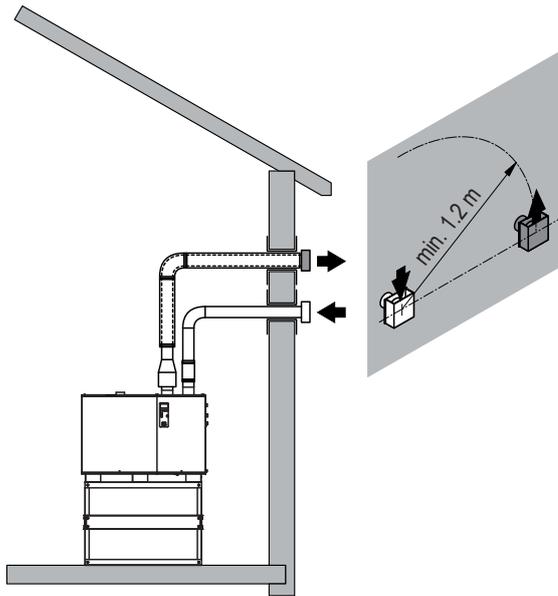
5.7.1 Performing air supply installation

Overview



- 1 Air supply connection on RS units
 - GS 40: \varnothing 76 mm (3")
 - GS 80: \varnothing 101 mm (4")
 - GS 120/GS 160: \varnothing 127 mm (5")
 - GS 200/GS 240: \varnothing 152 mm (6")
- 2 Connection hose (building side)
- 3 Hose clamps (building side)
- 4 Air supply line, hose or rigid pipe (building side)

Air supply arrangement



Installation notes

- Max. admissible supply air temperature is 30 °C. Make sure the air supply line is not heated up by the flue gas line.
- The maximum pipe length for the air supply line is equivalent to 21 meters. The minimum diameter (see above) must be maintained over the entire length of the line. In this estimate, each 90° bend is equal to 3 m of straight pipe length and each 45° bend is equal to 1.5 m of straight pipe length. Not more than 3 pipe bends must be built into the air supply line.
The air supply line should be approximately as long as the flue gas line and must be supported at least every 1.5 m of its length and additionally supported at every pipe bend.
- The air supply line can be provided either as a fixed tube or as a hose. The minimum internal diameter must be observed over the entire length.
 - GS 40: ø76 mm (3")
 - GS 80: ø101 mm (4")
 - GS 120/GS 160: ø127 mm (5")
 - GS 200/GS 240: ø152 mm (6")
- All connections on the air supply line must be positively sealed with a silicone sealant to ensure proper sealing of the air supply line.
- The air supply line must be installed with the supplied air intake wall terminal (see illustration above and refer to section "Terminal locations").
- At low temperatures (under 18 °C), water of condensation can form on the outside of the air supply line. To prevent this, we recommend that air supply lines that are situated in cold rooms are insulated.

Terminal locations

When locating the air intake and the flue gas terminals the following requirements must be observed:

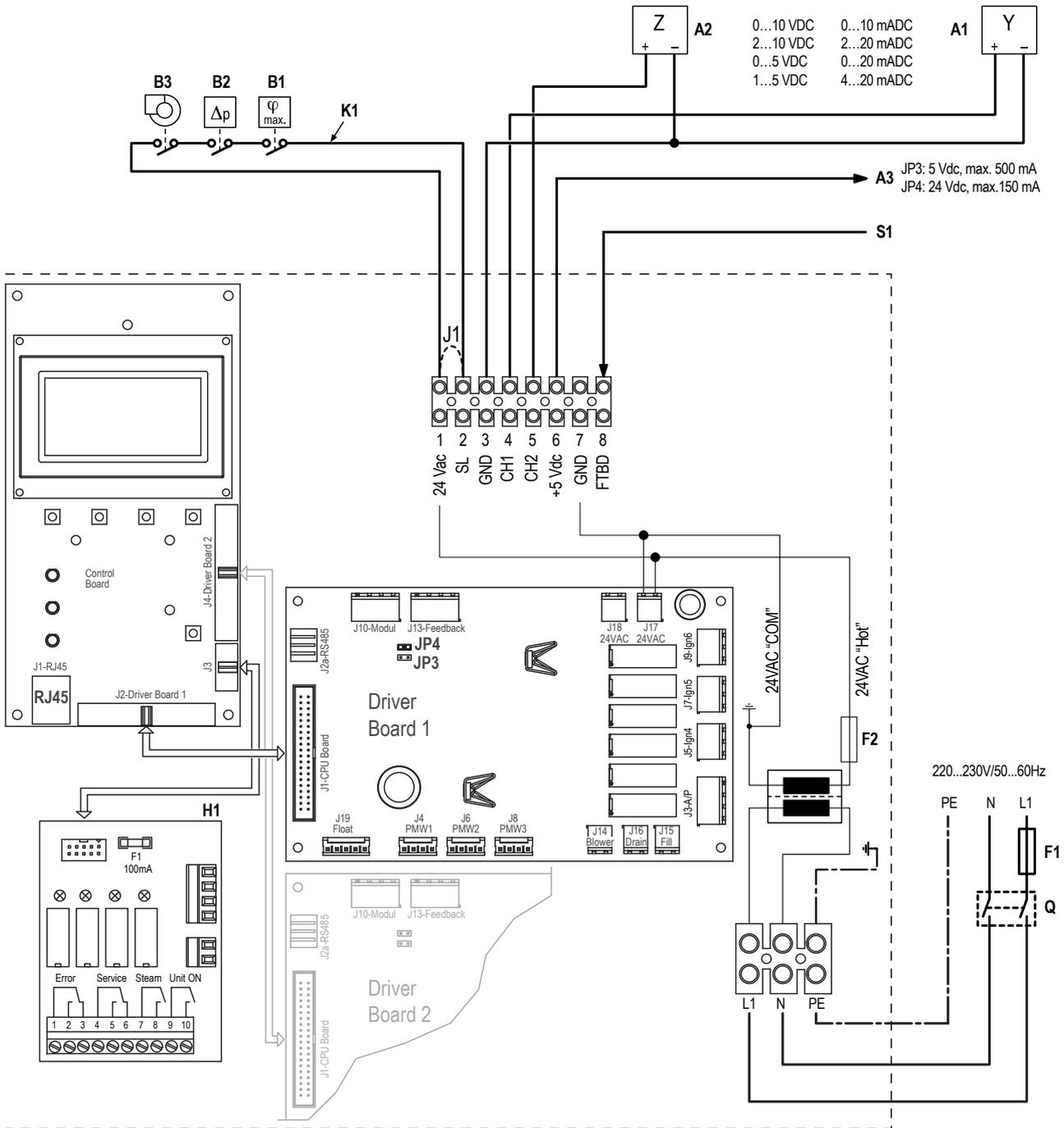
- All terminal must terminate at an outside location.
- Location of air intake and flue gas terminal must comply with all local and national regulations.
- Air intake and flue gas terminal can be installed in different pressure zones.
- Air intake and flue gas terminal cannot be installed on opposite walls of the building.
- A minimum distance of 1.2 m must be maintained between the air intake and the flue gas terminal to prevent recirculation of flue gases (see figure above).
- When the flue gas or air intake terminal is located less than 2.75 m from the ground or can be accessed by personnel a guard must be installed at a minimum distance of 50 mm to the terminal to prevent personal injury.

5.8 Installation of control and monitoring devices

- Install the **room humidity sensor** and the **safety humidistat** at the same height as thermostats and in a location where the measured humidity corresponds to that of the room. Under no circumstances should the humidity sensors be positioned in the vicinity of the air flow from ventilator units or air intake grids. Do not mount humidity sensors on an outer wall, where temperature fluctuations can affect the control behavior.
- Install the duct humidity sensor in a position where the measured humidity corresponds to that of the room that is being humidified (usually in the duct return circuit). Do not position humidity sensors in the immediate vicinity of steam distribution pipes, nor in sections of a duct subject to air turbulence, nor within the path of the humidification process itself.
- Install the safety humidistat in the duct, after the steam distribution pipes and far enough away from these, that all the steam has been absorbed into the air (minimum distance 3 m). The safety humidistat must be positioned such that it only detects that the humidity is too high when the room humidity is in reality too high or has reached the saturation limit.
- Install the flow monitor such that reliably detects the existence of an airflow and the absence of an airflow. Connect it in such a way, that the circuit is closed when airflow is present and opens when there is no airflow.
- Before starting the humidifier, check all control and monitoring devices for correct function.
- Calibration of the control and monitoring devices (On/Off and continuous) following the installation is recommended. The accuracy of the humidity sensor and the safety humidistat must always be checked before commissioning the humidifier system.

5.9 Electrical Installation

Wiring diagram



- A1** control or sensor signal Y (signal type set via control software)
- A2** control or sensor signal Z (air supply limit signal) (signal type set via control software)
- A3** Output 24 Vdc (JP4) or 5 Vdc (JP3)
- B1** Safety high limit humidistat (building side)
- B2** Flow control (building side)
- B3** Ventilation interlock (building side)
- F1** External Fuse (10 A, slow-acting, building side) 220...240 VAC power supply
- F2** Fuse (6 A, fast-acting) 24 VAC power supply
- H1** Remote operating and fault indication
- J1** Cable bridge (if no monitoring devices are connected)
- JP3** Jumper (to set output A3 to 5 Vdc max. 500 mA)
- JP4** Jumper (to set output A3 to 24 Vdc max. 150 mA)
- K1** External safety loop (24 Vac)
- Q** External service switch or plug-type connector
- RJ45** Communication interface (for detailed informations refer to the separate documentation)
- S1** Full tank blow down (24 Vac)

Installation notes

All work concerning the electric installation must be performed only by adequately qualified personnel (electrician or workman with equivalent training). Ascertaining the qualifications is the customer's responsibility.

Observe all local regulations concerning the electric installation.



DANGER!

Danger of electric shock!

The steam humidifier may be connected to electric mains only after all installation work has been completed.

CAUTION!

The electronic parts inside the humidifier are very sensitive to electrostatic discharge. To prevent damage, appropriate measures against electrostatic discharge (ESD protection) must be taken when carrying out installation work

Primary wiring

Humidifiers require field wiring to primary voltage terminal blocks. Power requirement is 220...240V/50...60Hz, 10 A slow-acting fused ("F1") circuit, single phase. The mains cable (**not included in the delivery**) must be fed through a 22 mm hole in the bottom of the control compartment equipped with a feed through with strain relief (**not included in the delivery**). Installation of external service switch "Q" (all pole disconnecting device with a minimum contact opening of 3 mm) is mandatory.

When installed, the appliance must be electrically grounded in accordance with local codes, if an external electrical source is utilized.

Connect ground wire to cabinet ground clamp.

External wiring sizes must be in accordance with existing local electrical codes and by-laws.

Remote operation and fault indication (H1)

The Remote operation and fault indication board is equipped with 4 relays for remote operation and fault indication.

- "On": this relay closes after the humidifier has been powered up
- "Steam": this relay closes as soon as steam is produced
- "Service": this relay closes when the set maintenance interval has expired
- "Error": this relay closes when an error occurs

External safety circuit (K1)

To guarantee the safety of the humidification system, monitoring the operation by means of a safety circuit is an absolute requirement. To accomplish this, the potential-free contacts (250V/2A) of external monitoring devices (B1: safety high limit humidistat, B2: airflow monitor, B3: ventilation interlock, etc.) are connected in series to terminals 1 and 2.

Control or sensor signal

The control signal (signal Y) is connected to terminals 3 and 4. The air supply limit signal (signal Z) is connected to terminals 3 and 5. By default the Condair GS is configured for a 0...10 VDC control signals. The control signal type can be modified via the software (see menu "user settings", in the operating instructions for the Condair GS control). The configuration whether the Condair GS is controlled via the internal or via an external controller is also done via the software.

Output A3

This output is available for custom purposes. The lines are connected to terminals 6 and 7. The output signal type is configured by setting the jumper on JP3 (5 Vdc max. 500 mA) or on JP4 (24Vdc max. 150 mA).

Full tank blow down 24 VAC (S1)

This input signal can be used for remote triggering a full tank blowdown. If a 24 VAC signal is present for more than 60 seconds the tank blows down. The signal line is connected to terminals 8 and 7.

6 Inspecting the installations (Check list)

Before the Condair GS is operated for the first time, the responsible personnel must **inspect all installations for correct execution (observing of local regulations)** and check that the **unit is correctly configured**. All deficiencies must be corrected by specialist action before commissioning takes place.

Use the following check list to ascertain that the installations were performed correctly:

- Unit installation
 - Is the unit in the correct place (see chapter 5.2.1)?
 - Is the unit correctly aligned vertically and horizontally?
 - Is steam humidifier properly secured (unit stand fixed to the floor)?
- **Steam installation**
 - Steam distribution pipe
 - Steam distribution pipe correctly positioned and secured (screws tightened)?
 - Are the outlet orifices at right angles to the air flow direction?
 - Steam pipe between steam outlet on unit and steam hose adapter (main steam pipe)
 - Maximum length of 6 m?
 - Minimum bend radius of 4-5 x internal diameter of solid steam pipe?
 - Is the pipe properly insulated?
 - Is the correct installation material used?
 - Is the minimum internal diameter maintained over the entire pipe length?
 - Steam hose between steam hose adapter and steam distributor
 - Maximum length of 4 m?
 - Minimum bend radius of 300 mm (4-5 x internal diameter with fixed piping)?
 - Have the instructions for hose positioning been followed?
 - Steam hose: no sagging (condensate pocket)?
 - Rigid steam lines: properly insulated? Correct installation material used? Minimum internal diameter maintained?
 - Steam hose securely attached with clamps?
 - Heat expansion during operation and shortening of the hose with ageing taken into consideration?
 - Condensate hoses
 - Downslope of at least 20 %?
 - Siphons existing and filled with water?
 - Condensate hoses correctly fixed?
- Water installation
 - Filling water supply
 - Has filter valve (accessory “Z261”) or shut-off valve and filter 5 µm respectively been installed in supply line?
 - Have admissible water pressure (3.0 – 8 bar) and temperature (1 – 30 °C) been observed?
 - Does supply capacity match the humidifier(s)?
 - Is the piping properly secured and sealed?

- Water drain
 - Has minimum inside diameter of drain pipe (at least 45 mm) been maintained throughout the entire length?
 - Has drain pipe been installed with a downslope of at least 10 %?
 - Have temperature-resistant materials been used (up to 100°C)?
 - Are the hoses and pipes correctly attached and sealed (hose clamps and screwed connections tightened)?
 - Is the minimum funnel height of 150 mm observed?
- Gas installation
 - Is the shut-off valve fitted?
 - Is a sediment separator installed, if steel pipes are used?
 - Is the gas circuit correctly sealed (leakage check carried out)?
 - Is the permissible gas pressure being maintained (see the table in 5.5.1)?
 - Have the correct sealing materials been used?
- Flue gas system
 - Does the flue gas system comply with the local regulations?
 - Does flue gas pipe length comply with the maximum recommended (see 5.6.1)?
 - Is the minimum pipe cross-section (corresponding to the internal diameter at the unit connection) maintained over the entire length of the pipe?
 - Have condensate discharge outlets been incorporated where necessary and provided with a siphon and is the siphon filled with water?
 - Is the flue gas pipe sealed and has the permitted sealing material been used?
 - Have all heat-sensitive and easily flammable materials been removed from the vicinity of the flue gas pipe?
 - Is the flue gas pipe insulated at all the necessary positions?
 - Is the flue gas outlet terminal outside the building correctly located?
 - Have the permitted sealing materials been used?
- Air supply system for room air-independent units (RS units)
 - Does the air supply system comply with the local regulations?
 - Does air supply line length comply with the maximum recommended (see 5.7)?
 - Is the minimum pipe cross-section (corresponding to the internal diameter at the unit connection) maintained over the entire length of the air supply line?
 - Is the air supply line correctly sealed and has the permitted sealing material been used?
 - Is the inlet terminal outside the building correctly located?
- Electrical installation
 - Does the electrical installation comply with the local regulations?
 - Do the mains voltages applied correspond to the supply voltage stated on the rating plate of the unit?
 - Is the voltage supply correctly fused?
 - Is the service switch “Q” installed in the supply cable?
 - Are all components correctly connected in accordance with the wiring diagram?
 - Are all connection cables fixed?
 - Are the connecting cables free of tension (fitted through cable glands/secured with cable clamps)?
 - Is the Condair GS correctly configured?

7 Operation

7.1 Important notes on operation

Qualification of personnel

The Condair GS must only be commissioned and operated by persons who are familiar with equipment and adequately qualified to undertake this work. Monitoring such qualification is a matter for the customer.

Initial commissioning must only be undertaken by the Condair service technician or by the customer's own specially trained personnel.

Safety

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

Should overheating occur, or the gas fail to shut off, shut off the manual gas valve to the appliance before shutting off the electrical supply.

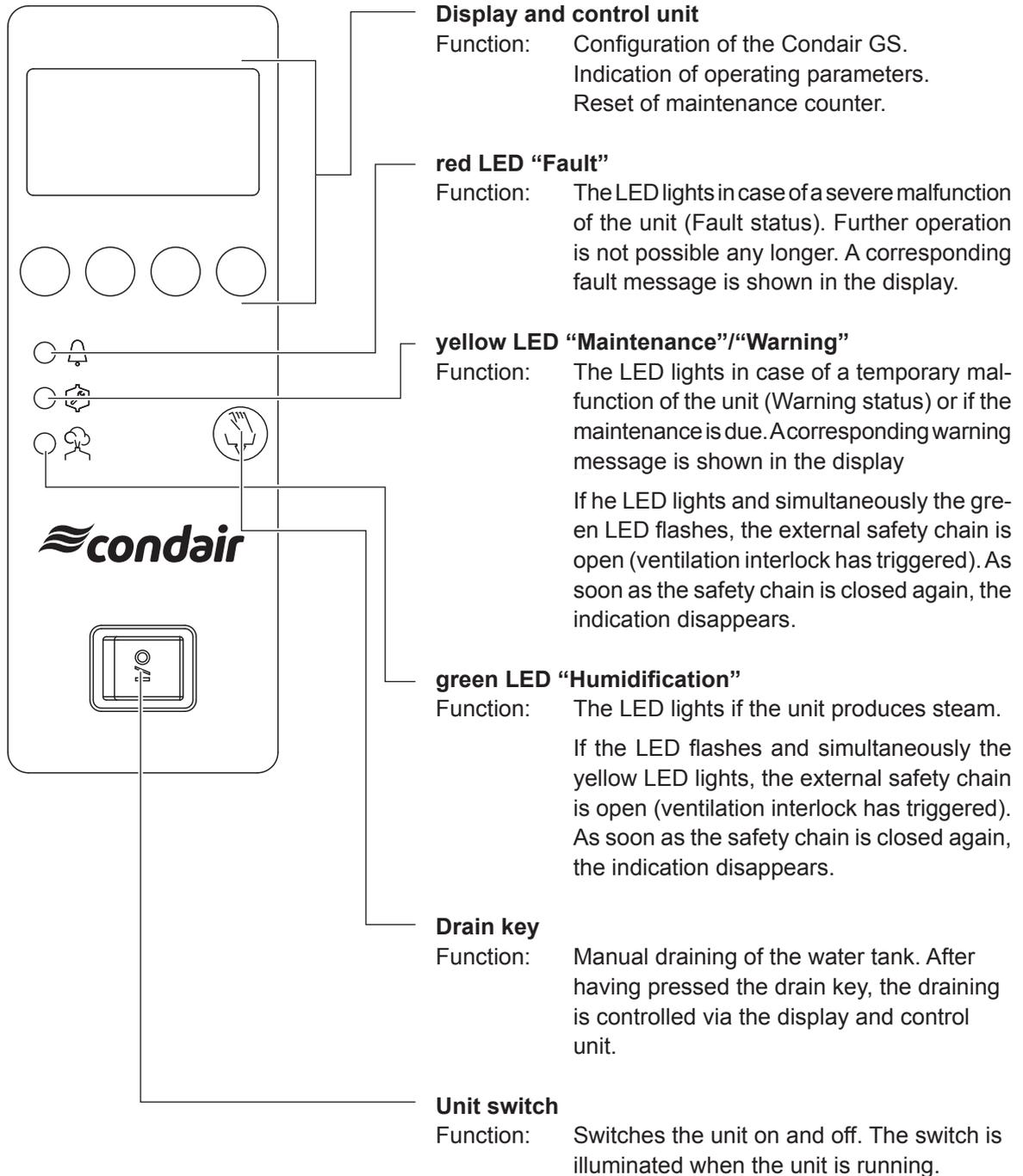
Do not operate this appliance if any part has been exposed to excess humidity. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

An open unit must not be operated. Before putting the Condair GS humidifier into operation make sure all doors are closed and locked with the screw.

For safe operation of the Condair GS humidifier, make sure the ambient conditions meet the respective specifications defined in this documentation.

To prevent excess humidification the operation of the Condair GS must be monitored by a high limit on/off humidistat (see chapter 5).

7.2 Function of the display and operating elements



7.3 Commissioning

Before the Condair GS is operated for the first time, the responsible personnel must **inspect all installations for correct execution** and check that the **unit is correctly configured (see check list in chapter 6)**. All deficiencies must be corrected by specialist action before commissioning takes place.

The humidifier is operated as follows:

1. Examine the humidifier and all installations for possible damage.

CAUTION!

Damaged units and units with damaged installations must not be operated!

2. Check the cleanliness of the outer cabinet:
The panels may be cleaned with a damp cloth and warm soapy water.

CAUTION!

Make sure no water is dripping into the cabinet through the ventilation openings in the unit housing.

3. Fill the water tank:
 - Close the shut-off valve in the gas supply line.
 - Open the shut-off valve in the water supply pipe.
 - Set humidity controller to maximum humidity demand.
 - Switch-on the service switch in the electrical supply circuit.
 - Switch-on the humidifier at the unit switch.
 - The filling valve opens and the water tank fills (filling time: approx. 30 minutes for the largest model, for smaller units the filling time is shorter). At the end of the filling cycle the control unit checks the function of the water level unit. If the control unit has verified the proper function of the water level unit the ignition sequence starts. After three attempts at ignition the auto ignition switches off. The red LED lights and a corresponding error message is shown in the display. Now switch the humidifier Off.

4. Check ignition:

The regulator is still set to maximum humidity demand and the shut-off valve in the gas line is closed.

- Switch-On the humidifier at the unit switch.

The combustion air blower(s) start(s). Note: On multi-blower units, wait until all blowers have started.

Then, 15 seconds later (pre-purging time) the igniter is activated and the gas pressure regulating valve opens. After 7 seconds the gas pressure regulating valve closes and the igniter is de-energized (due to missing ignition).

Note: On multi-burner units, this process is successively completed for all burners.

After three ignition attempts per burner (complete with pre-purging), the humidifier goes into safety lockout.

- Open the shut-off valve in the gas supply pipe.
No gas should flow to the main burner. End of the test.
- Switch-off the humidifier at the unit switch. Note: To reset the safety switch-off, switch-off the humidifier for at least five seconds and then switch it on again.
- Adjust the humidity controller again to the set humidity value.

5. Pre-purge of the gas pressure regulating valve(s):

- Disconnect all ignitors from the ignition modules.
- Switch-On the humidifier at the unit switch.

The combustion air blower(s) start(s). Note: On multi-blower units, wait until all blowers have started.

Then, 15 seconds later (pre-purging time) the gas pressure regulating valve opens for 7 seconds, then it closes again (due to missing ignition).

Note: On multi-burner units, this process is successively completed for all burners.

After three ignition attempts per burner (complete with pre-purging), the humidifier goes into safety lockout.

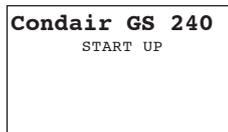
Note: To reset the safety switch-off, switch-off the humidifier for at least five seconds and then switch it on again.

Repeat this sequence minimum 2 times in order to make sure no air is left in the gas system.

- Switch-off the humidifier at the unit switch.
- Reconnect all ignitors to the ignition modules.

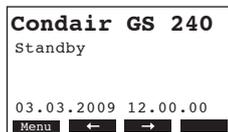
6. Start the humidifier:

- Open the shut-off valve in the water supply pipe.
- Open the shut-off valve in the gas supply pipe.
- Switch on the external service switch.
- Switch the humidifier On at the unit switch.



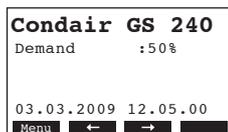
The Condair GS carries out a **system and level test**, during which all the LEDs light up.

If a failure occurs on the system test, a corresponding error message is shown in the display.



After the system test the unit is in **normal operation mode**. The display shows the **standard operating display** (first page of the indication level).

Note: The contents of the standard operating display depends on the actual operating status and on the configuration of the Condair GS and can differ from the opposite display.



As soon as the humidity controller demands humidity, the combustion air blower(s) start(s). Then, 15 seconds later (pre-purging time) the ignition process for the burner(s) is started. The burner(s) ignite(s) and steam is generated in the tank via the heat exchanger(s). The green LED lights and the adjacent display is shown.

If no flame is detected by the flame sensor within 7 seconds after the ignition of a burner, the gas pressure regulation valve closes again. The ignition sequence is repeated a maximum of three times per burner. If no burner could be ignited, the humidifier goes into system lockout. The red LED lights and an appropriate fault message appears in the display. At the same time, the operating and remote fault alarm potential-free contact ("Error") closes.

Note: The system lockout is reset by switching the humidifier off briefly (5 seconds) and then on again.

If only individual burners of a multi-burner unit could not be ignited the humidifier remains operational. In the display a corresponding warning message appears in the display indicating which burner(s) has/have failed to ignite.

Note: for detailed information regarding the operation of the control unit and the configuration settings please observe the information given in the **separate operating instructions to the Condair GS control**.

7.4 Notes on operation

7.4.1 Remote operating and fault indication

Via the operating and fault indication the following operating status are shown remotely:

| Activated remote indication relay | When? | Display on unit |
|-----------------------------------|---|--|
| “Error” | A malfunction (fault status) is present, further operation is not possible. | Red LED lights A corresponding fault message is shown in the display |
| “Service” | Maintenance is due. The unit remains operational for a certain time. | Yellow LED lights The service warning message is shown in the display |
| “Steam demand” | Steam demand/ Steam production | Green LED lights. The standard operating display is shown. |
| “Unit on” | Unit switched on | Unit switch lights. The standard operating display is shown. |

7.4.2 Inspections during operation

During operation the Condair GS and the humidification system have to be inspected weekly. On this occasion check the following:

- the water, gas and steam installation for any leakage.
- the humidifier and the other system components for correct fixing and any damage.
- the electric installation for any damage.

If the inspection reveals any irregularities (e.g. leakage, error indication) or any damaged components take the Condair GS out of operation as described in chapter 7.5. Then, contact your Condair representative.

7.5 Taking the unit out of operation

If the humidifier must be taken out of operation, e.g. for maintenance work, proceed as follows:

1. Close the shut-off valve in the gas supply pipe.
2. Close the shut-off valve in the water supply pipe.
3. Press the drain switch. The gas pressure regulation valve/s close/s and the tank empties.
Important! If drain pump is defective, drain tank manually via the auxiliary drain.
4. Wait until the water tank empties. Now switch off the humidifier at the unit switch.
5. Isolate the humidifier from the electrical power supply: Switch off the external service switch in the power supply circuit and secure the switch in the Off position to safeguard against unintentional switch-on.

8 Maintenance

8.1 Important notes on maintenance

Qualification of personnel

All maintenance work must be carried out only by **well qualified and trained personnel authorised by the owner**.

Maintenance and repair of the electrical installation of the Condair GS must be carried out only by qualified personnel (e.g. electrician) being aware of possible danger and implications.

It is the owner's responsibility to verify proper qualification of the personnel.

General notes

The instructions and details for maintenance work must be followed and upheld.

Only the maintenance work described in this documentation may be carried out.

Only use original Condair spare parts to replace faulty parts.

Safety

Before maintenance is initiated, the Condair GS must be taken out of operation in accordance with instructions in chapter 7.5 and protected against unintentional switching on.

8.2 Maintenance instructions

To maintain operating reliability, the Condair GS **must be serviced at regular intervals**. Here, a distinction is made between the **first service after 500 hours of operation (I)**, the **minor service every time the maintenance alarm appears (II)** and the **annual maintenance (III)**.

Important! Depending on the hardness of the water and the average steam output, under certain circumstances it may be necessary to reduce the service interval for the minor maintenance work. If the **lime residues deposited** on the floor of the tank **exceed a height of 5 cm** the interval must be reduced. If the height is less than 5 cm the interval can be extended.

Important: Every service action must be documented in the "Maintenance" report sheet (a copy of this document is provided in these installation, commissioning and service instructions). Warranty is void if the specified maintenance intervals are not observed and the maintenance work are not carried out according the instructions.

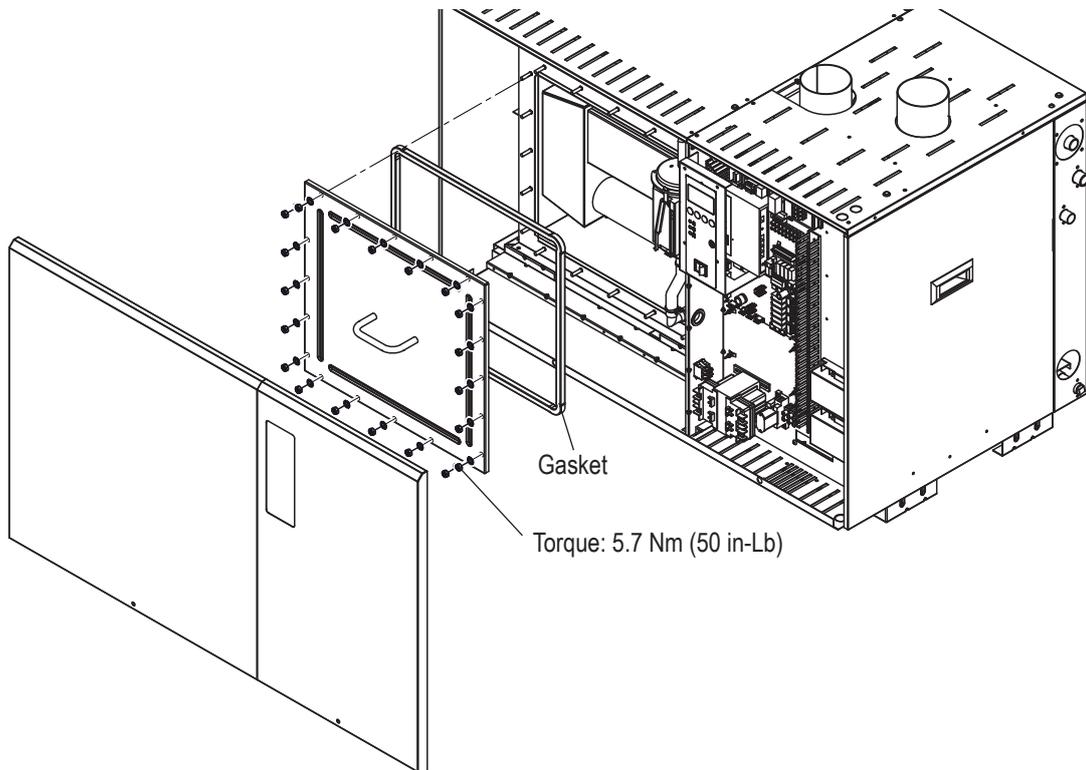
The following is an overview of the work to be carried out at each of the service stages.

| Components | Interval | | | Work required |
|--------------------------------------|----------|----|-----|---|
| | I | II | III | |
| Water tank | X | X | X | Drain the tank, then open it and measure the height of the lime residues on the tank floor (max. 5 cm). Remove the lime from the tank. Check all pipe connections to the tank (specially the level unit passages). Clean if necessary. |
| Water outlet pipes, including siphon | X | X | X | Press the drain switch and check for free drainage. Inspect all pipes for lime deposits and for correct sealing. Clean or replace pipes with lime deposits. Reseal/replace leaking pipes. |

| Components | Interval | | | Work required |
|--------------------------------|----------|----|-----|---|
| | I | II | III | |
| Water installation | X | X | X | Check all water hoses in the unit for cracks and correct fixing, replace defective hoses. Check supply pipes for sealing, seal if necessary. Clean the filter valve (or water filter). Check correct function of level unit. Clean or replace if necessary. |
| Unit inner chamber | X | X | X | Check the inner chamber for dirt and deposits and clean if necessary. |
| Steam installation | X | | X | Inspect the steam and condensate hoses for cracks and correct fixing, replace defective hoses. |
| Electrical installation | X | | X | Check all cables in the unit for secure fixing and condition and check the insulation. |
| Air supply pipe (RS units) | X | | X | Check for sealing, seal if necessary. Check screen in air intake terminal, clean if necessary. |
| Flue gas temperature sensor | X | | X | Visual check that sensor is intact, wired and attached to the exhaust. |
| Flue gas system | X | | X | Check flue gas system for sealing and remove all traces of condensate. Check screen in flue gas terminal, clean if necessary. If specified, have the flue gas system inspected by an appropriate specialist. |
| Igniter and flame sensor | | | X | Every year or every 2000 hours (which is reached first). Remove and replace igniter and flame sensor (special spares set "Burner parts subject to wear"). |
| Burner / combustion air blower | | | X | Remove burner and inspect the condition of burner mat. Blow out burner mat with compressed air or replace burner if necessary. Replace all burner seals with new ones (special spares set "Burner parts subject to wear"). Clean combustion air blower if necessary. The electric motors of the blowers are provided with permanent lubrication and do not require maintenance. |

8.3 Dismantling work for maintenance and the replacement of components

Prepare water tank for cleaning



1. Take the humidifier out of operation, as described in chapter 7.5.
2. Unlock and remove the left front panel. Then, unscrew the nuts of the side tank cover and remove the cover.
3. **On GS 120 ... 240 only:** unlock and remove the left top panel. Then, unscrew the nuts of the top tank cover and remove the cover.

The re-assembly of the water tank takes place in the reverse sequence. Make sure that the seals of the tank covers are not damaged (replace if necessary).

Important! Tighten the nuts of the tank cover(s) with a torque wrench (torque: 5.7 Nm). Do not overtighten the nuts.

Cleaning the water tank



WARNING!

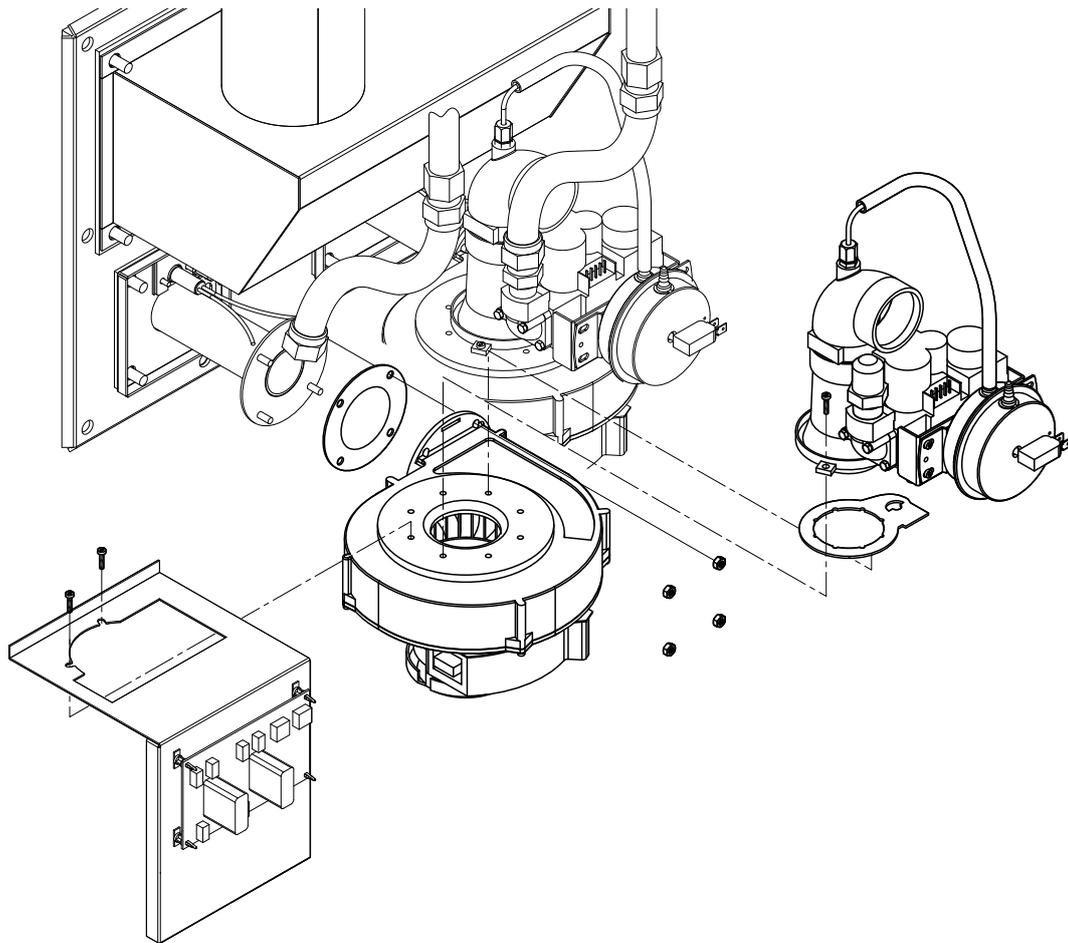
Danger of combustion!

The water and all lime deposits in the tank can be extremely hot and may lead to burning on contact. Therefore, allow the humidifier to cool before commencing cleaning work.

The combustion chamber walls are usually self-cleaning. Due to the expansion and contraction during the humidification process, lime deposits peel from the walls and sink to the floor of the tank. An accumulation of lime on the floor of the tank up to a maximum height of 50 mm is permissible and does not affect the operation of the humidifier.

- Remove the lime deposits in the tank and combustion chamber walls with a plastic scraper. Do not use metal spatulas or scrapers, because these are likely to scratch the internal walls of the tank.
- Remove lime deposits from the floor of the tank with a spatula and/or with an industrial water suction apparatus. Rinse out residual accumulations of lime with fresh tap water via the open auxiliary water drain connection (Using a bucket). Never rinse away lime accumulations directly into the connected water drain outlet, because there is a danger of the drain pump, the drain pipe and the siphon becoming blocked.
- Remove the hose connections to the tank and clean them internally.

Removal and installation of the combustion air blower



1. Take the humidifier out of operation, as described in chapter 7.5.
2. Undo the screw(s) (Phillips screwdriver) and remove the right side panel(s).
3. Disconnect cables to combustion air blower, gas pressure regulating valve and pressure switch (note assignment of the connections).
4. **On RS units only:** Undo the hose clamp and remove the air supply hose from the inlet elbow. Also disconnect the small air hose from the inlet elbow.
5. Undo the coupling of the corresponding flexible gas pipe and disconnect the gas pipe.
6. Undo the two screws of the venturi manifold and lift up the manifold together with the gas pressure regulating valve.
7. Undo the two screws of the electronic board (if present) and remove electronic board.
8. Undo the nuts on the outlet side of the blower and remove the blower unit.

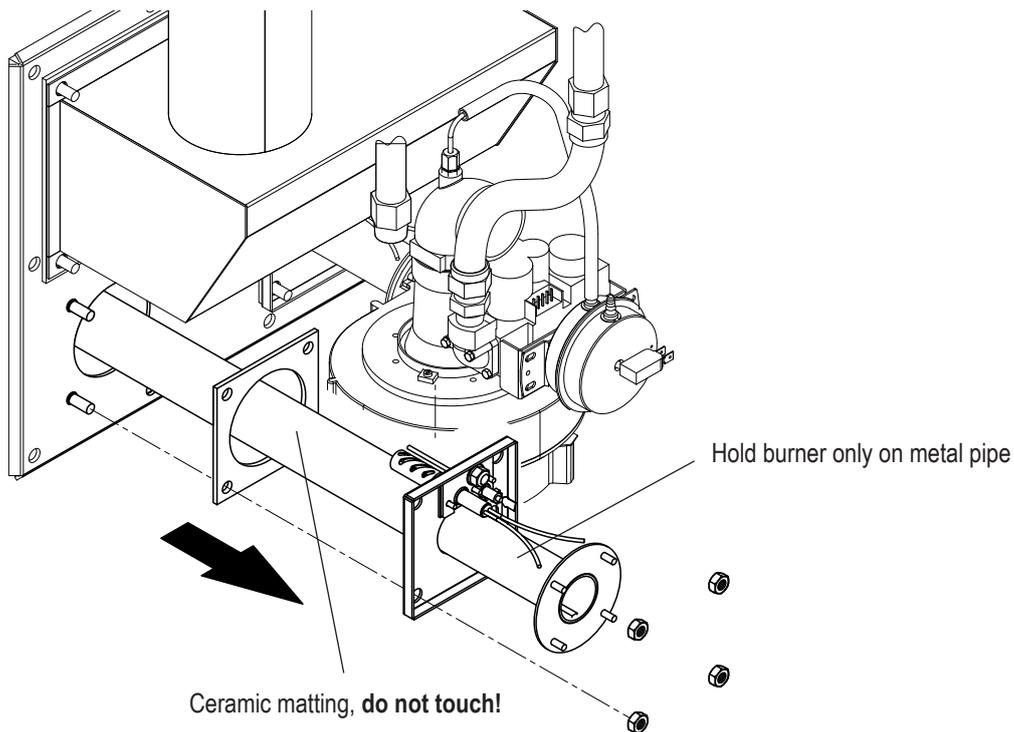
Reinstallation is achieved by following the reverse sequence. Replace defective seals with new ones. Make sure that all seals are inserted correctly and all cables are connected correctly.

⚠ DANGER!

Danger of explosion!

Following maintenance work on the gas system, a leakage test must always be undertaken in accordance with chapter 5.5.2.

Removal and installation of the burner



1. Take the humidifier out of operation, as described in chapter 7.5.
2. Undo the screw(s) (Phillips screwdriver) and remove the right side panel(s).
3. Remove the combustion air blower (see the section “Removal and installation of the combustion air blower” above).
4. Disconnect the cables to the igniter and to the flame monitoring unit and remove the components (see the section on “Removal and installation of the igniter and the flame sensor”).
5. Unscrew the four nuts in the burner flange and **carefully** remove the burner unit. Make sure that the burner is not damaged.

Note: Grease, dirt and dust at the ceramic matting can affect the performance of the burner.

Re-installation is achieved by following the reverse sequence. Renew the flange seal and replace igniter and flame sensor if necessary. Tight the nuts of the burner flange with a torque wrench (torque: 10 Nm). Make sure all cables are connected correctly.



DANGER!

Danger of explosion!

Following maintenance work on the gas system, a leakage test must always be undertaken in accordance with chapter 5.5.2.

Cleaning the burner elements

Carefully blow out the burner element mats (ceramic fibre material) from outside with compressed air. Severely soiled burner elements should be replaced.

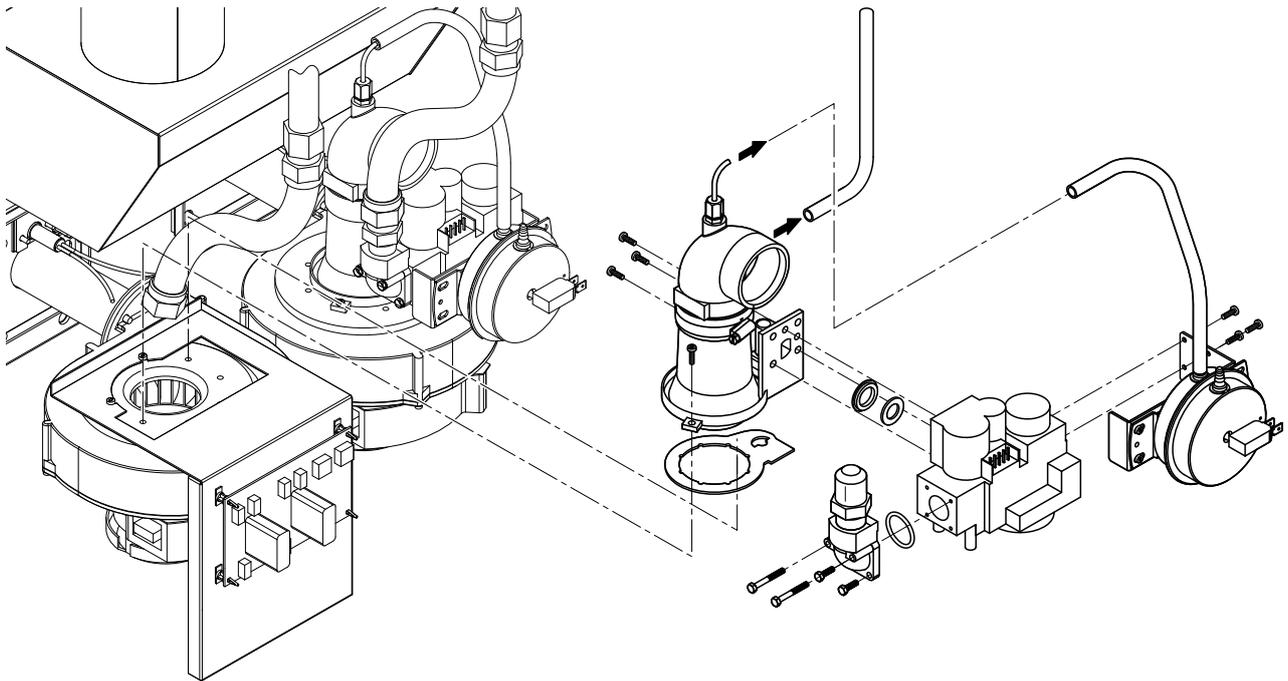
Cleaning the blower/burner chamber of the unit

Carefully clean the blower and the burner chamber by freeing any kind of soiling and accumulations.

CAUTION!

Wet cleaning of the blower and the burner chamber is not permitted!

Removal and installation of the gas pressure regulating valve



1. Take the humidifier out of operation, as described in chapter 7.5.
2. Undo the screw(s) (phillips screwdriver) and remove the right side panel(s).
3. **On RS units only:** Undo the hose clamp and remove the air supply hose from the inlet elbow. Also disconnect the small air hose from the inlet elbow.
4. Disconnect electrical wiring to the gas pressure regulating valve and the pressure switch (note the connection layout).
5. Undo the coupling of the corresponding flexible gas pipe and disconnect the gas pipe.
6. Undo the two screws of the venturi manifold and lift up the manifold together with the gas pressure regulating valve.
7. Undo the four screws and remove the gas pipe connection of the gas pressure regulating valve.
8. Pull off the hose connected to the pressure switch (note the connection layout). Then, undo the three screws of the pressure switch support and remove pressure switch assembly from the gas regulating valve.
9. Undo the three screws fixing the gas pressure regulating valve to the venturi manifold then, remove the gas pressure regulating valve from the venturi manifold.

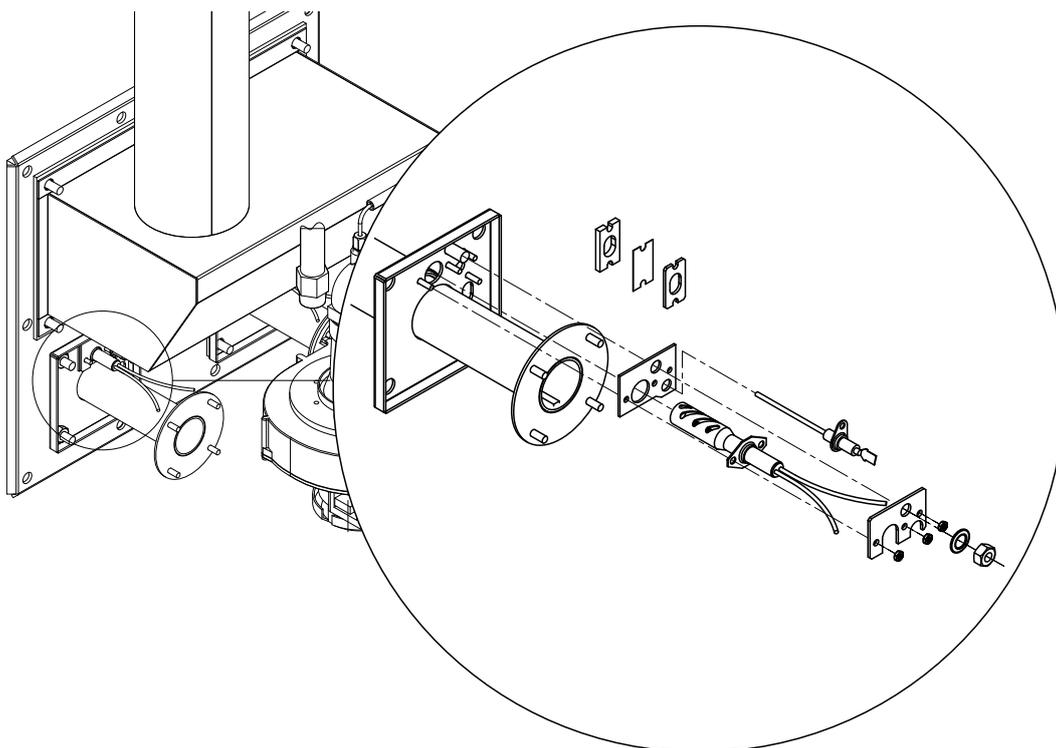
Reinstallation is achieved by following the reverse sequence. Replace defective seals with new ones. Make sure that all seals are inserted correctly and all cables are connected correctly.

⚠ DANGER!

Danger of explosion!

Following maintenance work on the gas system, a leakage test must always be undertaken in accordance with chapter 5.5.2.

Removal and installation of the igniter and the flame sensor



CAUTION!

When replacing the igniter and the flame sensor, use only the set of spares “burner spare parts subject to wear” available from your Condair supplier, since otherwise the humidifier could be damaged.

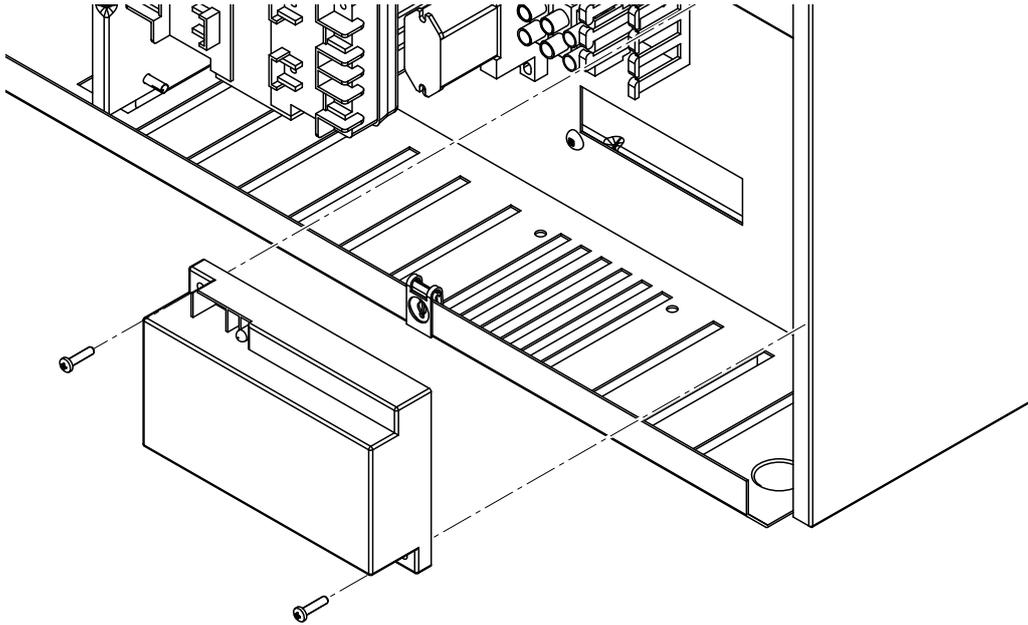
1. Take the humidifier out of operation, as described in chapter 7.5.
2. Undo the screw(s) (Phillips screwdriver) and remove the right side panel(s).
3. Disconnect the wiring connection to the igniter and to the flame sensor.
4. Unscrew the fixing nuts for the igniter and the flame sensor. Now carefully remove the igniter and flame sensor.

CAUTION!

The silicon carbide igniter is breakable. Therefore handle it with great care to avoid damage.

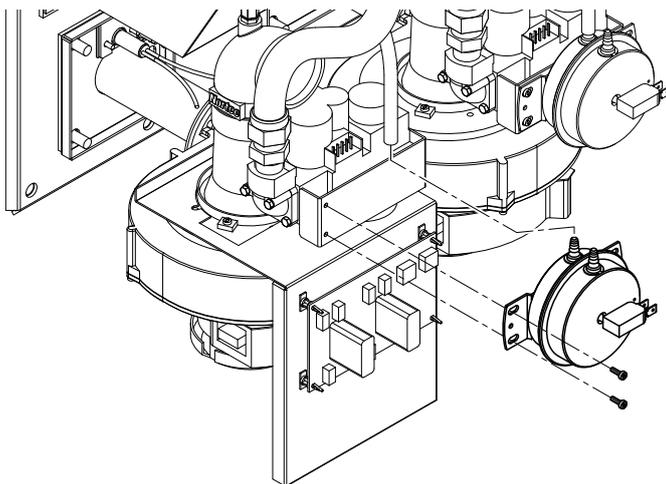
Reinstallation is achieved by following the reverse sequence. Inspect gaskets and replace if defective. Make sure that all gaskets are inserted correctly and all cables are connected correctly.

Replacement of the ignition module



1. Take the humidifier out of operation, as described in chapter 7.5.
 2. Undo the screw (phillips screwdriver) and remove the right front panel.
 3. Note the cable assignment, then remove all connection cables to the ignition module.
 4. Unscrew the two fixing screws securing the ignition module and then remove ignition module.
- Re-installation follows in the reverse sequence. Make sure the connecting cables are connected correctly.

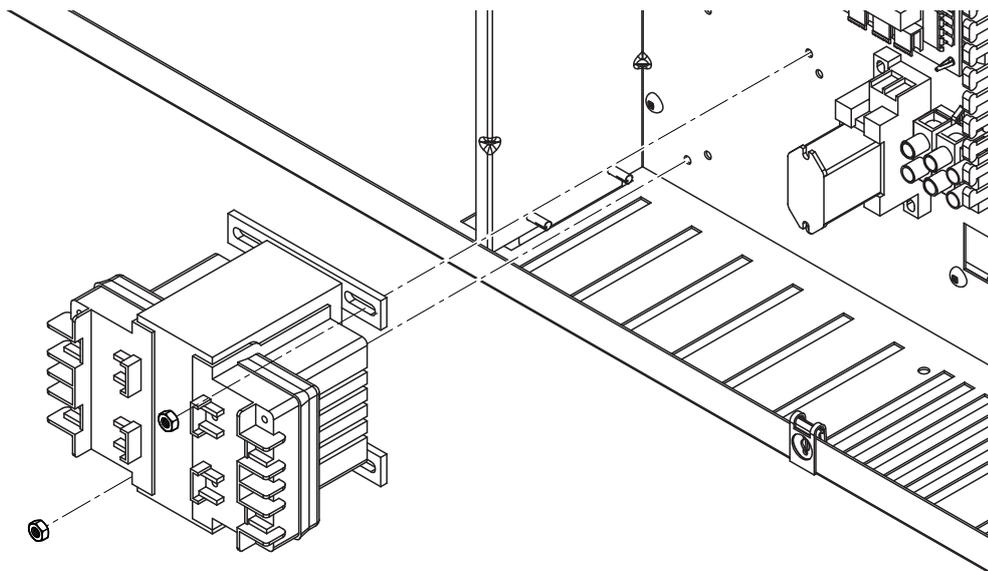
Replacement of the air pressure switch



1. Take the humidifier out of operation, as described in chapter 7.5.
2. Undo the screw(s) (phillips screwdriver) and remove the right side panel(s).
3. Pull off the hose connected to the pressure switch (note the connection layout).
4. Remove the connection cable to the pressure switch (note assignment before removal).
5. Unscrew the two fixing screws and remove the air pressure switch.

Re-installation follows in the reverse sequence. Make sure the cables and the hose are connected correctly.

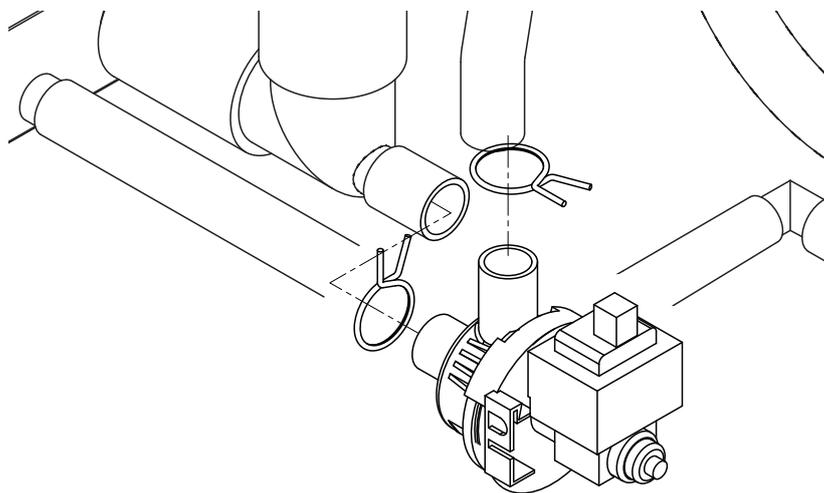
Replacing the transformer



1. Take the humidifier out of operation, as described in chapter 7.5.
2. Undo the screw (Phillips screwdriver) and remove the right front panel.
3. Remove the connection cables to the transformer, if necessary labeling the cables before removal.
4. Unscrew the two nuts and remove the transformer.

Re-installation is carried out in the reverse sequence. Make sure the cables are connected correctly.

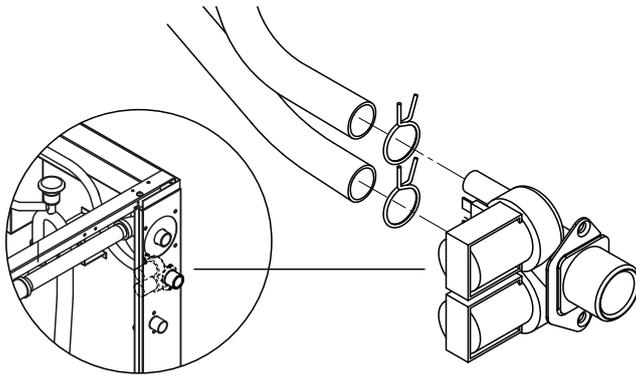
Replacing the drain pump



1. Take the humidifier out of operation, as described in chapter 7.5.
Important! If drain pump is defective, drain tank manually via the auxiliary drain.
2. Undo the screw (Phillips screwdriver) and remove the right side panel.
3. Remove the connection cables to the drain pump (note assignment before removal).
4. Remove hose clamps on the drain pump connections and pull off the hoses, then remove the drain pump.

Re-installation is carried out in the reverse sequence. Make sure the hoses are correctly secured with the hose clamps and the cables are connected correctly.

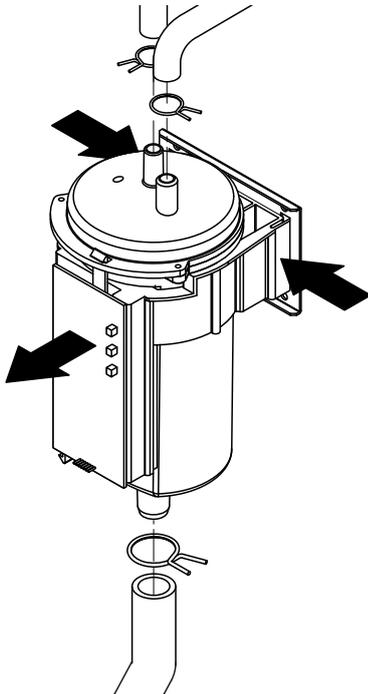
Replacing the fill valve



1. Take the humidifier out of operation, as described in chapter 7.5.
2. Undo the screw (Phillips screwdriver) and remove the right side panel.
3. Remove the connection cables to the fill valve (note assignment before removal).
4. Remove hose clamps on the fill valve connections and pull off the hoses.
5. Undo the two screws fixing the fill valve to the housing, then remove the fill valve.

Re-installation is carried out in the reverse sequence. Make sure the hoses are correctly secured with the hose clamps and the cables are connected correctly.

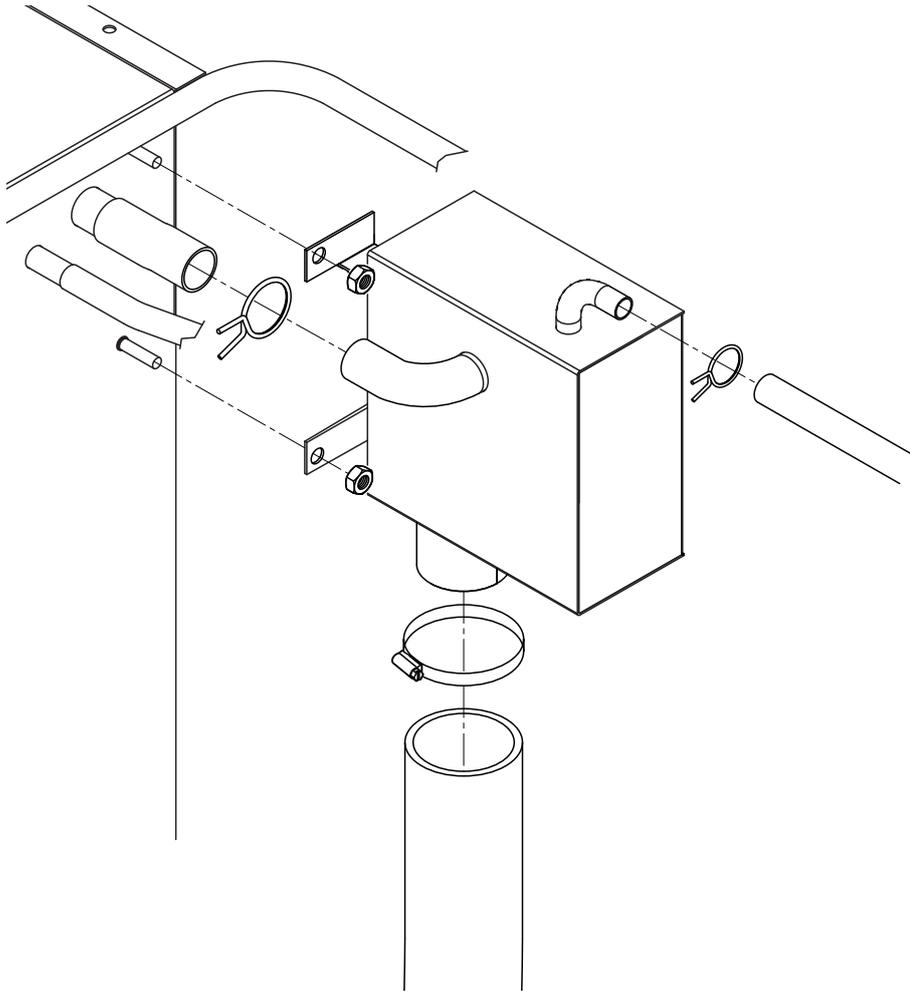
Replacing the water level unit



1. Take the humidifier out of operation, as described in chapter 7.5.
2. Undo the screw (Phillips screwdriver) and remove the left front panel.
3. Remove the connection cable to the level unit.
4. Remove hose clamps on the level unit connections and pull off the hoses.
5. Squeeze both sides of the mounting bracket to release it from the slots in the support bracket behind the water level unit, then remove the level unit.

Re-installation is carried out in the reverse sequence. Make sure the hoses are correctly secured with the hose clamps and the cable is connected correctly.

Replacing the filling chamber



1. Take the humidifier out of operation, as described in chapter 7.5.
2. Undo the screw (Phillips screwdriver) and remove the right side panel.
3. Remove hose clamps on the filling chamber connections and pull off the hoses.
4. Undo the two nuts securing the filling chamber to the face of the tank, then remove the filling chamber.

Re-installation is carried out in the reverse sequence. Make sure the hoses are correctly secured with the hose clamps.

Removal of the heat exchanger (see following illustration)

1. Take the humidifier out of operation, as described in chapter 7.5.
 2. Disconnect the gas supply pipe from the connection on the humidifier and close off the pipe.
 3. Undo the screw(s) (Phillips screwdriver) and remove the right side panel(s).
 4. **On RS units only:** Remove the hoses from air intake manifold and air inlet elbows. Then, dismount air supply pipe at the air supply connection.
 5. Dismount flue gas pipe at the flue gas outlet connection.
 6. Undo the screw(s) (Phillips screwdriver) and remove the left and the right top panels.
 7. Free all cable connections to the components (combustion blower, ignition module, air pressure switch, etc.) of the respective heat exchanger.
- Important! Note the connector assignment.**
8. Undo the coupling of the respective flexible gas pipe and remove the flexible gas pipe.
 9. Dismount the burner with the air blower and the gas pressure regulating valve of the respective heat exchanger.
 10. Unscrew the nuts and remove the flue gas manifold from the heat exchanger.
 11. Unscrew the nuts on the heat exchanger and pull out the heat exchanger from the tank.

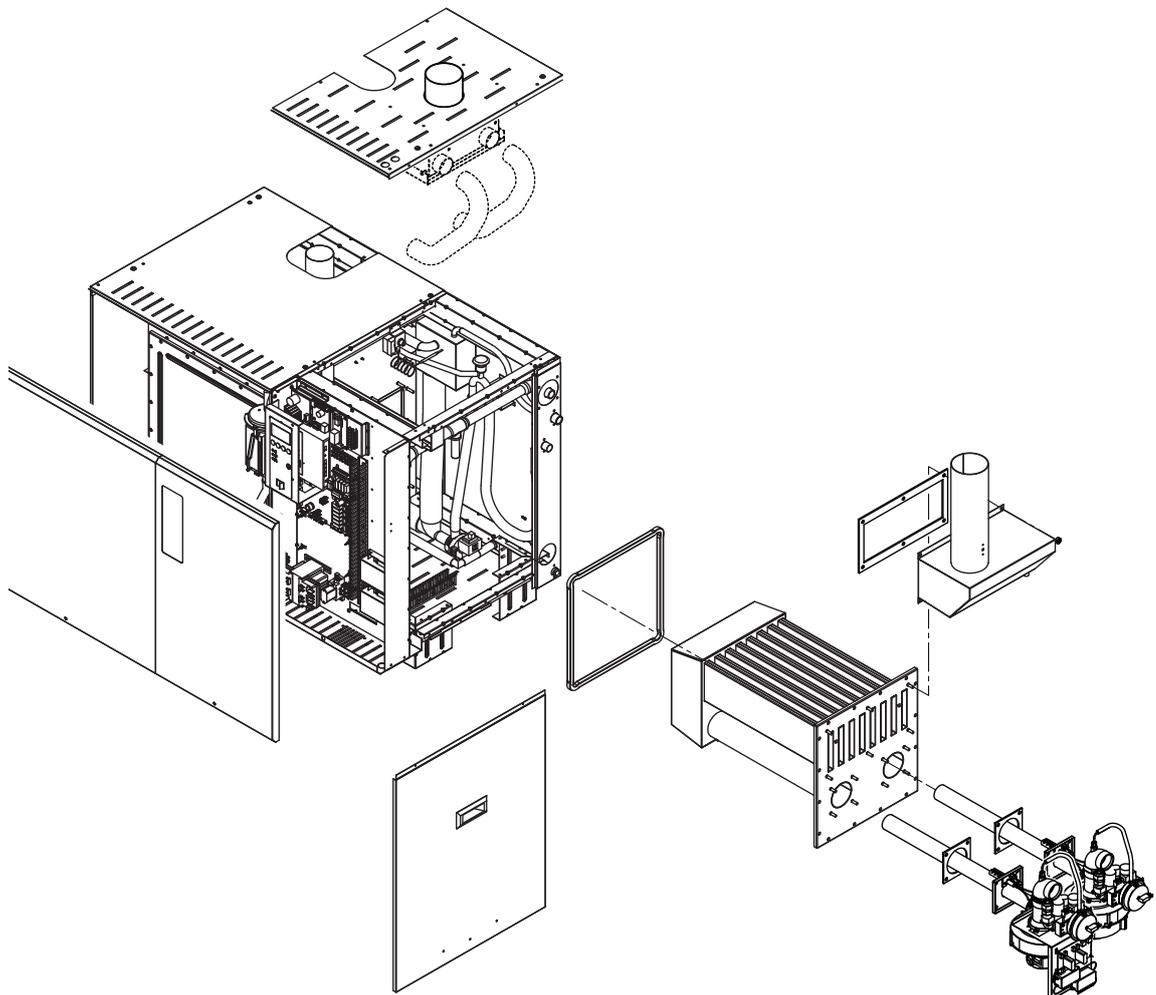
Re-installation is carried out in the reverse sequence. Replace all seals with new ones. Make sure all cables are connected correctly.



DANGER!

Danger of explosion!

Following maintenance work on the gas system, a leakage test must always be undertaken in accordance with chapter 5.5.2.



8.4 Notes on cleaning agents

The information and specifications relating to the cleaning agents to be used must be strictly observed. In particular: Information on personal protection, environmental protection and all restrictions in the use of cleaning agents.

The use of disinfectants is only permitted if they deposit no poisonous residues. In all cases, the components that have been cleaned in this way are to be rinsed with water.

CAUTION!

Do not use solvents for cleaning purposes, nor aromatized or halogenized hydrocarbons or other aggressive substances.

Follow local environmental protection regulations without reservation.

8.5 Resetting the maintenance reminder

After completing maintenance work, the maintenance reminder message must be reset via the reset function in menu mode of the control (see chapter 5.6 in the separate operating instructions for Condair GS control).

9 Troubleshooting

9.1 Important notes on troubleshooting

Qualification of personnel

Have faults eliminated by **adequately qualified and trained personnel** only. **Malfunctions caused by the electrical installation must be repaired by authorized personnel (e.g. electrician) only.**

Safety

When eliminating faults, the Condair GS **must be taken out of operation**, as described in chapter 7.5, and prevented from further inadvertent operation.

Make sure the power supply to the unit is cut off (test with voltage tester) and that the stop valves in the water and gas supply line are closed.

General note

Most operational malfunctions are not caused by faulty equipment but rather by improper installation or disregarding of planning guidelines. Therefore, a complete fault diagnosis always involves a thorough examination of the entire system. Often, the steam hose connection has not been properly executed, or the fault lies with the humidity control system.

9.2 Error indication

Malfunctions during operation are indicated by a corresponding warning message (operation still possible, yellow LED lights) or a fault message (operation not possible any longer, red LED lights) in the display of the operating and control unit. Detailed information thereto can be found in the separate operating instructions for Condair GS control.

9.3 Resetting the error indication

To reset the error indication:

Disconnect the Condair GS from the mains for approx. 5 seconds, then reconnect again.

Note: If the fault has not been eliminated, the error indication reappears after a short while.

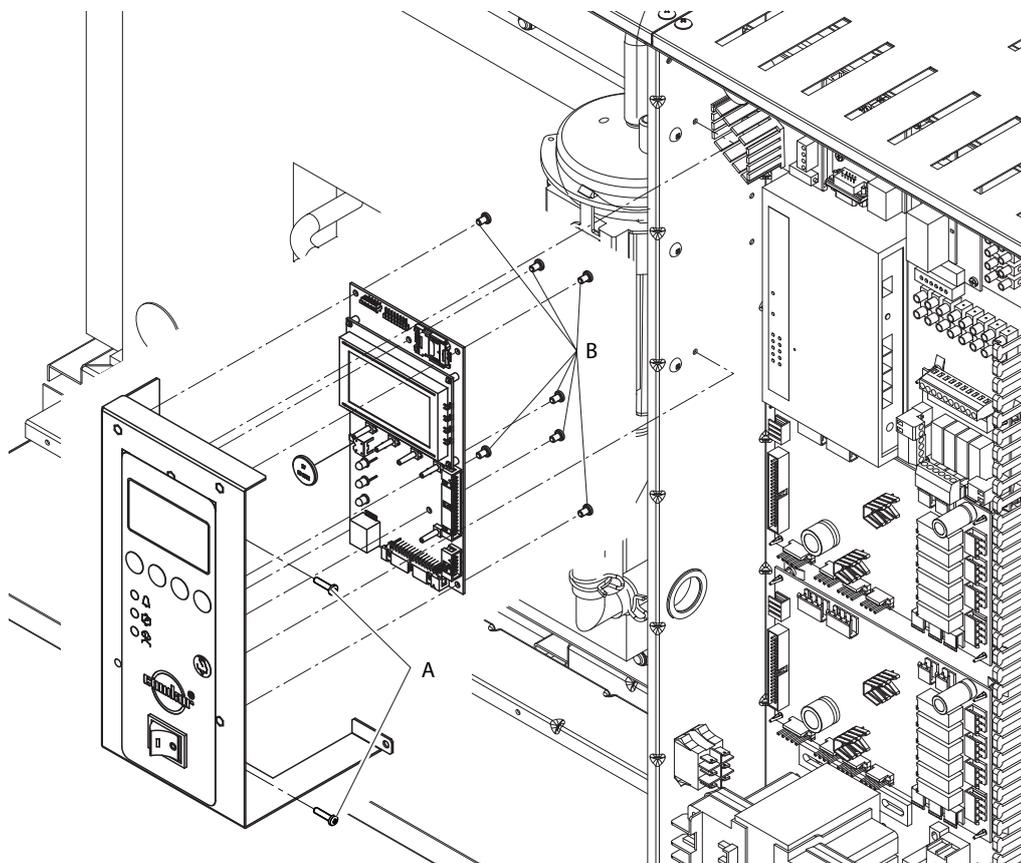
9.4 Replacing the backup battery on the control board of the Condair GS

1. Set the Condair GS out of operation as described in chapter 7.5.
2. Undo the screw (phillips screwdriver) and remove the right front panel.

CAUTION!

The **electronic components** inside the humidifier are **very sensitive to electrostatic discharge**. Before carrying out the next step, appropriate **measures must be taken to protect the electronic components against damage caused by electrostatic discharge (ESD protection)**.

3. Undo the 2 screws "A" of the display and control unit, then carefully remove the display and control unit to the front.
4. Undo the 7 fastening screws "B" of the control board, then carefully pull-off the control board from the display and control unit assembly.



5. Replace the backup battery (CR2032, Lithium 3V).
6. Reassemble the unit in reverse order.
7. If necessary set date and time (see operating instructions of the control).



WARNING!

Environmental hazard!



The old battery must be returned to an authorised collecting point for correct disposal/ recycling in accordance with local regulations. In no case the old battery must be disposed of in the domestic waste or into the environment.

10 Taking out of service/Disposal

10.1 Taking out of service

If the Condair GS must be replaced or if the humidification system is not needed any more, proceed as follows:

1. Take the unit out of operation as described in chapter 7.5.
2. Have the unit (and all other system components, if necessary) unmounted by a qualified service technician.

10.2 Disposal/Recycling



Components not used any more must not be disposed of in the domestic waste. Please dispose of the unit or the individual components in accordance with local regulations at the authorised collecting point.

If you have any questions, please contact the responsible authority or your local Condair representative.

Thank you for your contribution to environmental protection.

11 Specifications

11.1 Technical Data

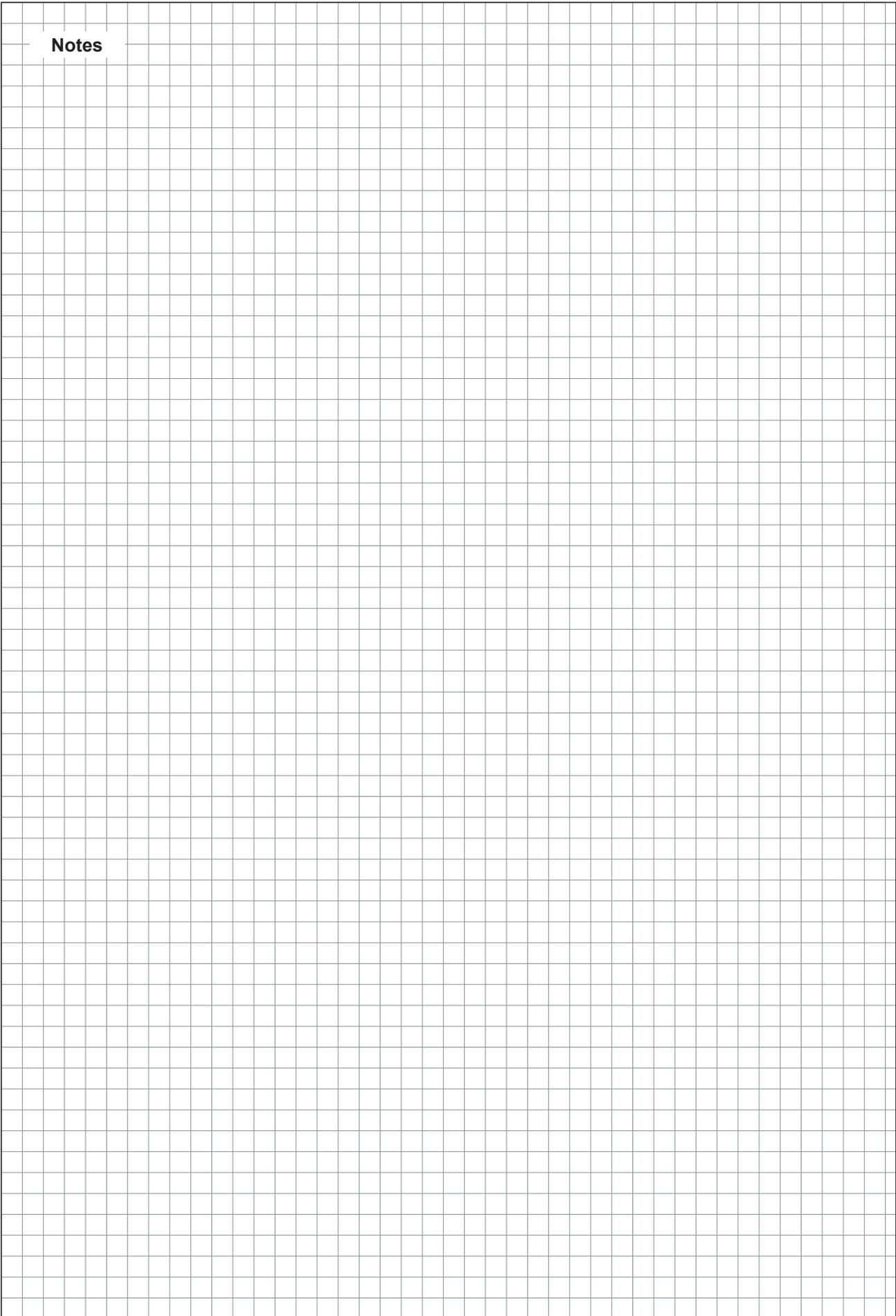
| Condair GS | | 40 | 80 | 120 | 160 | 200 | 240 |
|---|--|--|-------------|-------------|-------------|-------------|-------------|
| Steam output | | | | | | | |
| room air-dependent | kg/h | 10...40 | 10...80 | 10...120 | 10...160 | 10...200 | 10...240 |
| room air-independent (RS units) | kg/h | 10...40 | 10...80 | 10...120 | 10...160 | 10...200 | 10...240 |
| Energy consumption | kw | 36.5 | 73.0 | 109.5 | 146.0 | 182.5 | 219.0 |
| Gasous fuel | Natural gas (G20, G25, G25.1, G27, GZ350) or Propane gas (G31) | | | | | | |
| Electric connections | | | | | | | |
| power supply | | 230V/50...60Hz/1Phase | | | | | |
| power consumption | W | 460 | 690 | 920 | 1150 | 1380 | 1610 |
| power supply fuse | | 10 A, slow acting | | | | | |
| Mechanical Connections | | | | | | | |
| Fill water inlet | Inch | BSP 3/4" | | | | | |
| Drain | Inch | 3/4" (19 mm) | | | | | |
| Auxiliary drain | Inch | NPT 1/2" | | | | | |
| Gas line | Inch | BSP 1/2" | BSP 3/4" | BSP 1" | BSP 1" | BSP 1 1/4" | BSP 1 1/4" |
| Steam hose connection | Inches | 1 3/4" (45 mm) | 3" (76 mm) | 3" (76 mm) | 4" (101 mm) | 4" (101 mm) | 4" (101 mm) |
| Flue pipe connection | Inches | 3" (76 mm) | 4" (101 mm) | 5" (127 mm) | 5" (127 mm) | 6" (152 mm) | 6" (152 mm) |
| Humidity control | | | | | | | |
| Possible control signals | | 0...5VDC / 1...5VDC / 0...10VDC / 0...20mA / 4...20mA | | | | | |
| Dimensions | | | | | | | |
| Height | cm | 81 (158 unit on stand) | | | | | |
| Width | cm | 114 | | | | | |
| Depth | cm | 53 | 69 | 109 | 109 | 149 | 149 |
| Shipping weight | kg | 174 | 210 | 295 | 319 | 358 | 382 |
| Operating weight | | | | | | | |
| filled | kg | 211 | 273 | 459 | 471 | 610 | 623 |
| empty | kg | 140 | 162 | 238 | 261 | 290 | 314 |
| Operating conditions | | | | | | | |
| Admissible water pressure | bar | 3...8 | | | | | |
| Water quality | | untreated drinking water or fully demineralized water | | | | | |
| Admissible gas supply pressure | mbar | G20: 17...25 / G25: 20...30 / G25.1: 20...30 G27: 17.5...23 / GZ350: 10.5...16 / G31: 25...57.5 | | | | | |
| Admissible ambient temperature | °C | 5...30 | | | | | |
| Overpressure at the flue outlet at full load | Pa | 80 | | | | | |
| at minimum load | Pa | 5 | | | | | |
| Type of protection | | IP20 | | | | | |
| Admissible duct air pressure | Pa | -800 ... +1700 | | | | | |
| Further informations | | | | | | | |
| Conformity | | CE | | | | | |
| Patents | | Condair® international trademark/international patents | | | | | |

11.2 Flue gas specifications

| | | Natural gas G20 | | Natural gas G25 | |
|--------------------------|-------------------|-----------------|-----------|-----------------|-----------|
| | | full load | part load | full load | part load |
| Condair GS 40 | | | | | |
| energy consumption | kW | 36.5 | 10.5 | 36.5 | 10.5 |
| gas consumption | kg/h | 2.4 | 0.68 | 3.04 | 0.87 |
| | m ³ /h | 3.478 | 0.8695 | 4.0443 | 1.0111 |
| exhaust temperature | °C | 180 | 120 | 180 | 120 |
| exhaust mass flow | kg/s | 0.015 | 0.0034 | 0.017 | 0.0058 |
| CO ₂ -content | % | 8.9 | 8 | 8.7 | 8 |
| flue gas pressure | Pa | 80 | 5 | 80 | 5 |
| exhaust diameter | mm | 76 | | 76 | |
| Condair GS 80 | | | | | |
| energy consumption | kW | 73 | 10.5 | 73 | 10.5 |
| gas consumption | kg/h | 4.72 | 0.68 | 6.08 | 0.87 |
| | m ³ /h | 6.956 | 0.8695 | 8.0886 | 1.0111 |
| exhaust temperature | °C | 180 | 72 | 180 | 72 |
| exhaust mass flow | kg/s | 0.03 | 0.0067 | 0.034 | 0.0113 |
| CO ₂ -content | % | 8.9 | 4.4 | 8.7 | 4.3 |
| flue gas pressure | Pa | 80 | 5 | 80 | 5 |
| exhaust diameter | mm | 101 | | 101 | |
| Condair GS 120 | | | | | |
| energy consumption | kW | 109.5 | 10.5 | 109.5 | 10.5 |
| gas consumption | kg/h | 7.08 | 0.68 | 9.12 | 0.87 |
| | m ³ /h | 10.434 | 0.8695 | 12.133 | 1.0111 |
| exhaust temperature | °C | 180 | 57 | 180 | 57 |
| exhaust mass flow | kg/s | 0.045 | 0.0099 | 0.051 | 0.0169 |
| CO ₂ -content | % | 8.9 | 2.9 | 8.7 | 2.9 |
| flue gas pressure | Pa | 80 | 5 | 80 | 5 |
| exhaust diameter | mm | 127 | | 127 | |
| Condair GS 160 | | | | | |
| energy consumption | kW | 146 | 10.5 | 146 | 10.5 |
| gas consumption | kg/h | 9.44 | 0.68 | 12.16 | 0.87 |
| | m ³ /h | 13.9121 | 0.8695 | 16.1773 | 1.0111 |
| exhaust temperature | °C | 180 | 49 | 180 | 49 |
| exhaust mass flow | kg/s | 0.06 | 0.0131 | 0.068 | 0.0224 |
| CO ₂ -content | % | 8.9 | 2.2 | 8.7 | 2.2 |
| flue gas pressure | Pa | 80 | 5 | 80 | 5 |
| exhaust diameter | mm | 127 | | 127 | |
| Condair GS 200 | | | | | |
| energy consumption | kW | 182.5 | 10.5 | 182.5 | 10.5 |
| gas consumption | kg/h | 11.8 | 0.68 | 15.2 | 0.87 |
| | m ³ /h | 17.3902 | 0.8695 | 20.2216 | 1.0111 |
| exhaust temperature | °C | 180 | 44 | 180 | 44 |
| exhaust mass flow | kg/s | 0.075 | 0.0164 | 0.085 | 0.0279 |
| CO ₂ -content | % | 8.9 | 1.8 | 8.7 | 1.7 |
| flue gas pressure | Pa | 80 | 5 | 80 | 5 |
| exhaust diameter | mm | 152 | | 152 | |
| Condair GS 240 | | | | | |
| energy consumption | kW | 219 | 10.5 | 219 | 10.5 |
| gas consumption | kg/h | 14.16 | 0.68 | 18.24 | 0.87 |
| | m ³ /h | 20.8682 | 0.8695 | 24.2659 | 1.0111 |
| exhaust temperature | °C | 180 | 41 | 180 | 41 |
| exhaust mass flow | kg/s | 0.09 | 0.0196 | 0.102 | 0.0335 |
| CO ₂ -content | % | 8.9 | 1.5 | 8.7 | 1.5 |
| flue gas pressure | Pa | 80 | 5 | 80 | 5 |
| exhaust diameter | mm | 152 | | 152 | |

When operating with natural gas G25.1, G27, GZ350 or propane gas (G31), please contact your Condair supplier for the corresponding flue gas specifications

Notes





CONSULTING, SALES AND SERVICE:



Reg.No. 40002-2

Manufacturer:
Condair Ltd.
Talstrasse 35-37, 8808 Pfäffikon, Switzerland
Ph. +41 55 416 61 11, Fax +41 55 416 62 62
info@condair.com, www.condair.com