

## Packaged burner systems HeatPak

### OPERATING INSTRUCTIONS

· Edition 12.23 · EN · 32-00065-03



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### 1 SAFETY

#### 1.1 Please read and keep in a safe place



Please read through these instructions carefully before installing or operating. Following the installation, pass the instructions on to the operator. This unit must be installed and commissioned in accordance with the regulations and standards in force. These instructions can also be found at [www.docuthek.com](http://www.docuthek.com).

#### 1.2 Explanation of symbols

**1, 2, 3, a, b, c** = Action

**→** = Instruction

#### 1.3 Liability

We will not be held liable for damage resulting from non-observance of the instructions and non-compliant use.

#### 1.4 Safety instructions

Information that is relevant for safety is indicated in the instructions as follows:

#### **DANGER**

Indicates potentially fatal situations.

#### **WARNING**

Indicates possible danger to life and limb.

#### **CAUTION**

Indicates possible material damage.

All interventions may only be carried out by qualified gas technicians. Electrical interventions may only be carried out by qualified electricians.

#### 1.5 Conversion, spare parts

All technical changes are prohibited. Only use OEM spare parts.

## 2 CHECKING THE USAGE

The HeatPak burner systems RatioAir RAHP and RatioMatic RMHP are designed for industrial applications for heating air and comprise an integrated combustion air fan, a gas safety and control system and a burner control unit. Typical applications include drying systems, hot air generation or process gas heating.

This function is only guaranteed when used within the specified limits – see page 10 (10 Technical data). Any other use is considered as non-compliant. Please refer to the information about the mounted components in the attached documentation or online at [www.docuthek.com](http://www.docuthek.com):

Operating instructions [Pressure regulators with solenoid valve VAD, VAG, VAH, VAV](#).

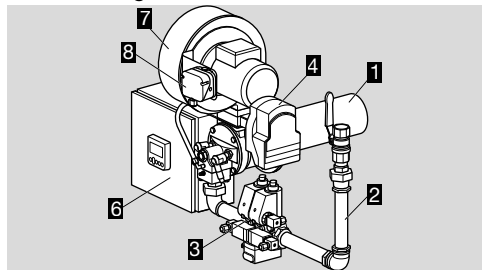
Operating instructions [Solenoid valves for gas VAS, VCS](#).

Operating instructions [Burner control unit BCU 370](#).

Operating instructions [Burner control unit BCU 570](#).

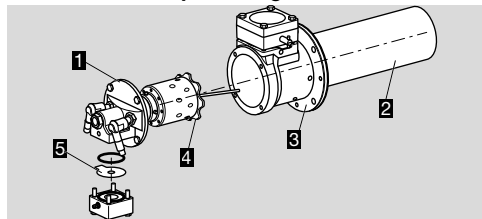
Operating instructions [Actuators IC 20](#).

### 2.1 Part designations



- 1 Burner RatioAir RAHP or RatioMatic RMHP
- 2 Gas inlet section
- 3 Double solenoid valve VCG
- 4 Linear flow control with actuator (IFC) or Air butterfly valve with actuator IC 20
- 5 Burner control unit BCU 370 or BCU 570
- 6 Air fan
- 7 Min. pressure switch

### 2.2 RAHP/RMHP part designations



- 1 Gas insert
- 2 Burner tube
- 3 Burner flange
- 4 Burner head
- 5 Measuring orifice

### 2.3 Type code

<b>RAHP 20.</b>	RatioAir HeatPak burner V2.0
<b>RMHP 30.</b>	RatioMatic HeatPak burner V3.0
<b>040–400</b>	Burner size
<b>L</b>	Natural gas type L
<b>N</b>	Natural gas type H
<b>P</b>	Propane
<b>B</b>	Butane
<b>S</b>	Combustor type: straight (only RAHP)
<b>M</b>	Medium velocity (only RAHP)
<b>Supply voltage</b>	
<b>1</b>	120 V, 1 Ph / 400 V, 3 Ph – 50/60 Hz
<b>2</b>	230 V, 1 Ph / 400 V, 3 Ph – 50/60 Hz
<b>T</b>	Three-point step control
<b>E</b>	Continuous control
<b>2</b>	Wired to terminal box IP 54
<b>7</b>	Panel with BCU 570
<b>8</b>	Panel with BCU 570 and Profinet
<b>9</b>	BCU 370
<b>0</b>	BCU 370 with PROFIBUS-DP
<b>X</b>	No 3-way solenoid valve
<b>C</b>	3-way solenoid valve (continuous fan)
<b>F</b>	Flame rod
<b>U</b>	UV scanner UVC 10
<b>D</b>	UV scanner UVC 1 for continuous operation

### Gas supply pressure

<b>X</b>	50–100 mbar
<b>H</b>	100–400 mbar
<b>X</b>	No gas filter
<b>G</b>	Gas filter
<b>X</b>	No inlet pressure gauge
<b>P</b>	Inlet pressure gauge

## 3 INSTALLATION

### ⚠ WARNING

Risk of injury!

Please note the following to ensure that no damage occurs during installation:

- Use suitable support and handling equipment to lift and install the burner.

### ⚠ CAUTION

Incorrect installation!

Please observe the following to ensure that the HeatPak is not damaged during installation and operation:

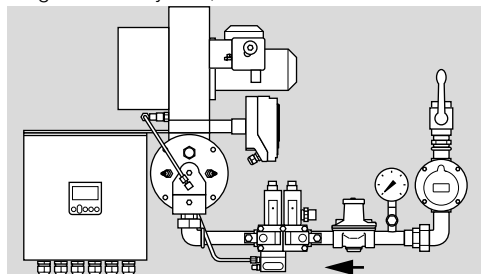
- Check that all the components are clean and undamaged.
- Ensure that the chamber wall is strong enough to bear the weight of the burner system.
- Dropping the system or a component can cause permanent damage. In this event, replace the entire device and associated modules before use.

- Protect the burner system from the effects of weather, damage, dirt, excessive temperatures and moisture.
- Ensure that the ambient conditions of the burner comply with the specifications, see Technical data. Refer to the documentation for the installed components.
- Route the flue gas out of the building into a safe zone. No flue gas may be allowed to collect in the working area.

- The HeatPak must be secured using the burner housing. The burner can be installed on the actual furnace wall without any components having to be removed.
- Use the supplied burner flange seal for installing the burner.

### 3.1 Installation position

- Only install the HeatPak in the alignment described. The gas flows from right to left in the gas control system, see direction of arrow.



### 3.2 Combustion chamber conditions

The burner type depends on the application.

Burner RAHP can be used in closed combustion chambers or furnaces.

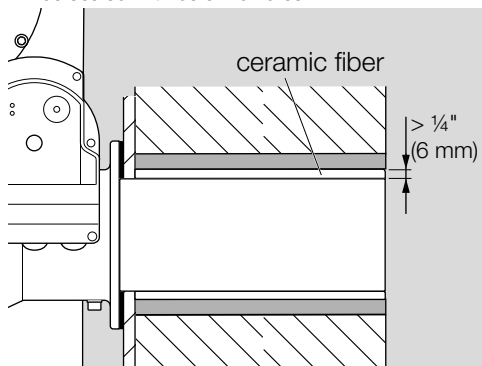
The RMHP is exclusively designed for hot air applications.

- The flames must not be influenced by the process air in the application. This would result in increased emissions. A vertical air flow on the flame must be avoided at all costs. The flame can be protected by a flame tube.

### 3.3 Chamber wall

- The furnace wall must have adequate dimensions to bear the weight of the HeatPak. For information on the weight, see page 10 (10 Technical data).
- Use suitable support and lifting devices for lifting and installing the HeatPak.
- Ensure there is an easily accessible measuring connection on the furnace wall near the burner to measure the pressure inside the combustion chamber.
- Use the supplied retaining screws to install the burner on the furnace wall. The number of screws will vary between 4 and 8, depending on the burner type.

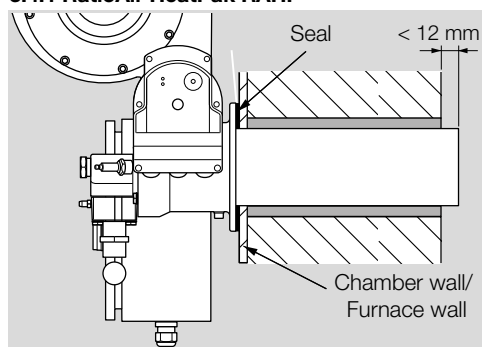
- The customer must provide the corresponding number of nuts and washers.
- Use the supplied burner flange seal for the area between the burner flange and chamber wall.
- The opening in the chamber wall should be at least 12 mm (1/2") larger in diameter than the external diameter of the burner tube. The gap must be sealed with ceramic fibres.



### 3.4 Burner installation

- 1 Ensure that the burner flange seal is installed between the burner flange and chamber wall.
- 2 Position the retaining screws using the boreholes in the burner mounting flange.
- 3 Install the burner on the chamber wall using nuts and washers.

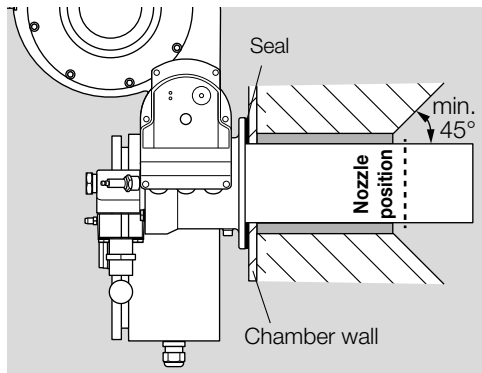
#### 3.4.1 RatioAir HeatPak RAHP



The recommendations of the supplier relating to the thermal expansion of refractory materials must be noted for the furnace wall. The wall must not transfer any tension to the burner tube or the surrounding refractory coating. The refractory wall and the furnace casing may expand unevenly. Expansion gaps in the furnace wall allow the uniform movement of the furnace casing, burner quartz bracket, burner tube and the surrounding refractory material. The burner tube may expand by a maximum of 25.4 mm (1") over the inside of the furnace wall. If it expands further, install a spacer (12 mm (1/2")) on the outside of the furnace. This will hold the end of the burner tube within 12 mm (1/2") of the wall end.

If the burner tube is shorter than the furnace wall thickness, the burner tube should be recessed into the wall. The angle for this should be at least 45° to prevent overheating the refractory material. Detailed information can be found in the RatioAir operating instructions at [www.docuthek.com](http://www.docuthek.com).

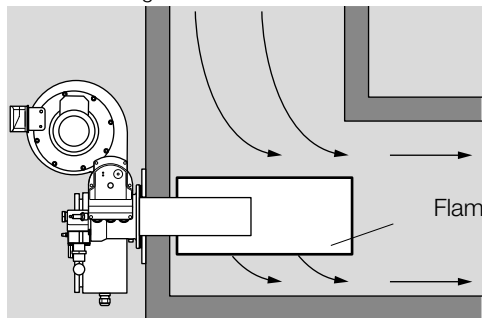
### 3.4.2 RatioMatic HeatPak RMHP



If the burner is used in heat exchangers at low temperatures, it can be installed directly on the combustion chamber. There is no need for a refractory lining. If the chamber insulation extends beyond the nozzle position of the burner, cut the insulation at the end of the burner tube at an angle of at least 45°. Detailed information can be found in the RatioMatic operating instructions at [www.docuthek.com](http://www.docuthek.com).

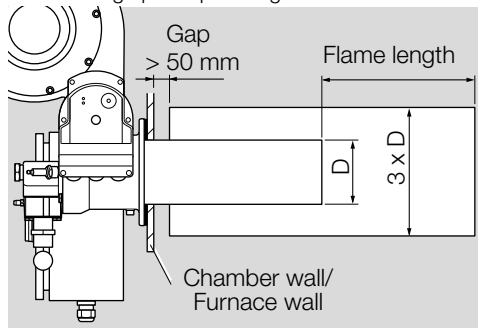
### 3.4.3 Flame tube

For air heating applications, the process air is generally heated by the hot flue gases from the burner. A flame tube is recommended for flow velocities > 15 m/s to protect the burner flame from being cooled or extinguished.



The flame tube is positioned around the burner tube and the flame. The diameter of the flame tube should be around 3 x the burner tube diameter. The length of the flame tube must cover the full length of the flame, see Technical data, page 11 (10.2 Flame length).

A gap (> 50 mm) is required on the burner side. This allows a small volume of process air in the tube to cool the combustion chamber and to prevent pressure building up and pulsating flow in the flame tube.



## 4 GAS SUPPLY

### ⚠ WARNING

Incorrect installation!

Please observe the following to ensure that the HeatPak is not damaged during installation and operation:

- The HeatPak must not be used to carry incoming gas supply lines. Use suitable support and suspension devices for the gas supply lines and the burner system.
- The gas inlet pressure must always be inside the specified limits, see page 10 (10 Technical data). Pressure values above the specified range may damage the variable air/gas ratio control. Pressure values below the specified range may adversely affect the control of the gas flow through the variable air/gas ratio control.

- The gas pressure for the HeatPak must be at least 50 mbar (19.7 "WC). A pressure regulator is recommended for a pressure of over 100 mbar (39.4 "WC). A GDJ is available as an option to reduce the inlet pressure from 400 mbar (160 "WC) to 100 mbar (39.4 "WC).
- Flexible tubes or bellows units should be installed to prevent mechanical stress or transmission of vibrations.

## 5 WIRING

### WARNING

Please observe the following to ensure that no damage occurs:

- The gas lines must not be used for grounding.
- Check and ensure that there is a good connection for grounding.
- The wiring for the burner must comply with current wiring standards.
- An incorrect connection of the live wires and PEN wire could constitute a hazard.
- If the signals from the burner control unit are supplied through a flame monitor control panel from an external supplier, responsibility for the wiring is exclusively in the hands of the operator.

A 3-phase power supply with an insulator must be provided near the burner. In addition, an external single-phase power supply must be available. The HeatPak is operated with a control voltage of 230 V, 50 Hz or 110 V, 50 Hz. The fan must be always be supplied with 400 V, 50 Hz.

### DANGER

Electric shocks can be fatal!

- Before working on possible live components, ensure the unit is disconnected from the power supply.
- HeatPak burners feature a spark electrode and a transformer. The ignition is already wired to the transformer at the factory.
- The supplied control unit depends on the selected option.
- HeatPak with BCU 370: 1-phase 230 V, 50 Hz or 110 V, 50 Hz. The supply voltage depends on the selected option, see [Burner control unit BCU 370](#) operating instructions. The fan must be connected separately with 3 phases 400 V, 50 Hz.
- HeatPak with switch box for BCU 570 and OCU: the switch box must be supplied with 400 V, 50 Hz.
- For more detailed information about the BCU 570, see [Burner control unit BCU 570 and Operator control unit OCU](#) operating instructions.
- Refer to the operating instructions for the device components in the HeatPak to ensure that the site supply voltage and control unit are wired correctly.

## 6 PREPARING COMMISSIONING

### 6.1 Safety instructions

- Agree on settings and commissioning of the burner with the system operator or manufacturer.
- Check the entire system, upstream devices and electrical connections.
- Note the operating instructions for individual controls.

### DANGER

Risk of explosion!

- Gas pressure upstream of the burner gas valves (pressure in the gas pressure control system) must be **10 mbar** higher than the fan air pressure. This ensures that the slow ingress of air flow into the combustion gas is prevented in the event of a fault due to a blocked flameless gas lance.
- Please observe the appropriate precautions when igniting the burner.
- Pre-purge the furnace chamber with air (5 x volume) before every ignition attempt.
- Fill the gas line to the burner carefully and correctly with gas and vent it safely into the open air – do not discharge the test volume into the furnace chamber.

### DANGER

Risk of poisoning!

- Open the gas and air supply so that the burner is always operated with excess air – otherwise CO will form in the furnace chamber. CO is odourless and poisonous! Conduct a flue gas analysis.
  - The burner must only be commissioned by authorized trained personnel.
- If the burner does not ignite even though the automatic burner control unit has been switched on and off several times: check the entire system.

### 6.2 Determining the gas and combustion air flow rates

$$Q_{\text{Gas}} = P_{\text{B}}/H_{\text{i}}$$

$$Q_{\text{Air}} = Q_{\text{Gas}} \cdot \lambda \cdot L_{\text{min}}$$

- $Q_{\text{gas}}$ : Gas flow rate in m<sup>3</sup>/h (ft<sup>3</sup>/h)
- $P_{\text{B}}$ : Burner capacity in kW (BTU/h)
- $H_{\text{i}}$ : Gas heating value in kWh/m<sup>3</sup> (BTU/ft<sup>3</sup>)
- $Q_{\text{air}}$ : Air flow rate in m<sup>3</sup>(n)/h (SCFH)
- $\lambda$ : Lambda, air index
- $L_{\text{min}}$ : Minimum air requirement in m<sup>3</sup>(n)/m<sup>3</sup>(n) (SCF/SCF)
- Information on the gas quality supplied can be obtained from the gas supply company.

## Common gas qualities

Gas type	Heating value		L <sub>min</sub> m <sup>3</sup> (n)/ m <sup>3</sup> (n) (SCF/ SCF)
	H <sub>u</sub>	H <sub>o</sub>	
Natural gas H	11.0	1114	10.6
Natural gas L	8.9	901	8.6
Propane	25.9	2568	24.4
Butane	34.4	3406	32.3

→ Data in kWh/m<sup>3</sup>(n) refer to the lower heating value H<sub>u</sub> and data in BTU/SCF refer to the higher heating value H<sub>o</sub> (gross calorific value).

## 7 COMMISSIONING

### 7.1 Purge air/Cooling air

While the burner is switched off and depending on the furnace temperature, a certain air flow must be maintained to ensure safe ignition and monitoring of the burner and for cooling the burner components. The air fan must remain active for this purpose until the furnace has cooled down completely (< 100°C (212°F)). The air volume for purging/cooling is defined by the calibrated minimum position of the IC 20.

### 7.2 Igniting and adjusting the burner

#### **⚠ WARNING**

Risk of burning!

Incorrect operation!

- Burner components and outflowing flue gases are hot.
- Refer to the safety information. Attach warning signs and a contact guard.
- Ensure adequate ventilation of the combustion chamber before each burner start!
- Only ignite the burner if it shows no signs of damage or malfunctions.
- Wear ear protection.

### Settings at the factory

- The burner is not set at the factory.
- The pressure switches are preset to suit the application.
- The gas measuring orifice has been selected for the specified gas type.

### 7.3 Preparation

- 1** Ensure that all the work for the commissioning, checking the installation and pre-purging the gas lines has been carried out in compliance with current statutory regulations.
- 2** Check whether all the required technical supply systems are available.
- 3** Place the following measuring instruments at the ready:

- Pressure setting: digital or U-bend pressure gauge,
  - Flames signal intensity: µA measuring instrument.
- 4** Check the setting for the max. gas pressure switch and the min. air pressure switch.
- The max. gas pressure switch must be set 20% higher than the maximum gas pressure. The min. air pressure switch must be set to around 50% of the maximum air pressure, see page 13 (10.6 RAHP settings) and page 14 (10.7 RMHP settings).

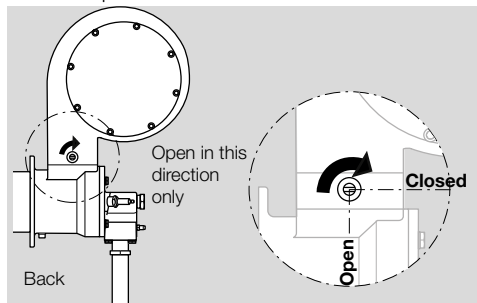
### 7.4 Flameless test mode

- 1** Ensure that the burner heat does not exceed the specified technical limits of the combustion chamber temperature, see page 10 (10 Technical data).
  - 2** Close the manual valve.
  - 3** Switch on the power supply to start the burner.
  - 4** Ensure that the fan is operating if the combustion air fan is controlled remotely.
  - 5** Switch on the burner control unit.
- If the burner starts correctly, the BCU will start the ignition process. The valves will open. A safety shut-down takes place as no flame is reported. The valves close and the gas supply is shut off safely.

#### **⚠ DANGER**

If simulated limit value excesses or flame faults do not result in the gas supply being shut down within the required response time: shut down the system immediately, switch off the gas supply and rectify the fault before the process is continued.

- 6** Check actuator IC 20. The air butterfly valve must open towards the burner insert.



- The ignition capacity (opening angle 0–90°) can be set using switching cam S1. The minimum capacity is set using switching cam S4. A fault may occur during ignition if this is set too low. The low-fire rate setting must be adjusted.
- The following section describes how to adjust the low-fire rate and check the high-fire rate.

### 7.5 Checking the combustion air

- Only make settings in Manual mode.
- 1** For more detailed information on commissioning and setting the switching cams, see Actuators IC 20 operating instructions.

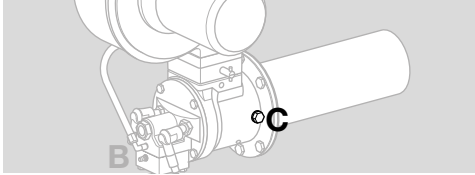
2 Switch IC 20 to Manual mode.

### Setting the low-fire rate

3 Start the combustion air fan.

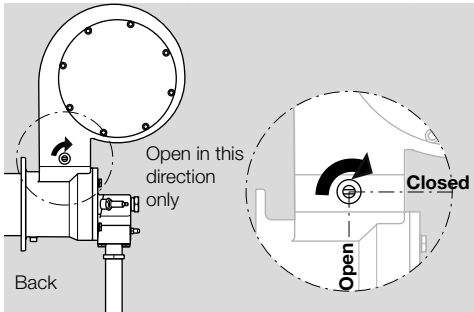
4 Set actuator IC 20 to low-fire rate.

5 Measure the air pressure differential between test point **C** and the combustion chamber test point.



6 Set low-fire rate on the IC 20 using switching cam S4.

→ The slot at the end of the shaft of the air butterfly valve shows the position of the air butterfly valve.



The minimum opening angle (S4) of the butterfly valve is set as follows at the factory:

- RMHP = 0°.
- RAHP = 15°.

→ Applications with a high positive chamber pressure: if necessary, set the opening angle for low-fire rate to slightly open (0 to 30°) to achieve an adequate air pressure differential.

→ For the air pressure setting data, see page 10 (10 Technical data).

The factory setting for high-fire rate is for applications with a neutral or positive pressure.

→ If the burner is used with a high negative chamber pressure and if you wish to avoid excessive firing of the burner, limit the movement of actuator IC 20.

### Air test at high-fire rate

7 Set the actuator to high-fire rate.

8 Measure the air pressure differential between test point **C** and the combustion chamber test point.

→ Compare the measurement to the setting data for air pressure, see page 10 (10 Technical data).

9 If the air pressure for high-fire rate is not available at an adequate level, see page 9 (9 Assistance in the event of malfunction).

10 After making all the settings correctly, close all test points and switch the IC 20 to Automatic mode.

### 7.6 Starting the burner

1 Switch on the mains voltage.

2 Open manual valve AKT.

3 Start the burner.

4 Ensure that the fan is operating.

→ The burner control unit BCU will start the ignition process.

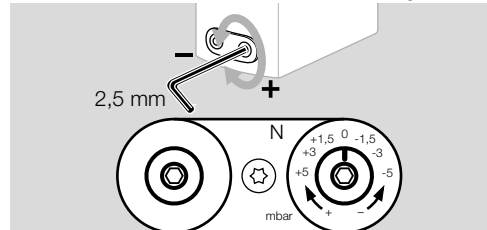
5 If the burner does not ignite at the first attempt, rectify the fault and press Reset.

6 If an automatic restart is not parameterized, restart the burner manually.

### If the burner does not ignite

a Ignite the burner again to purge the air from the gas line.

b If the burner still does not ignite, turn the adjusting screw on the air/gas ratio control VAG half a turn anticlockwise to increase the gas flow.



→ For more detailed information on commissioning and setting, see [Pressure regulators with solenoid valve VAD, VAG, VAH, VAV](#) operating instructions.

c Reignite the burner.

d Repeat the setting on the VAG until the burner ignites.

→ See page 9 (9 Assistance in the event of malfunction).

### The burner has ignited

→ The flame should just project out of the burner tube.

→ Otherwise, increase the gas flow until the flame is visible.

7 Switch actuator IC 20 to Manual mode.

8 In the event of a flame fault, increase the gas flow by turning the adjusting screw on the VAG half a turn.

9 Repeat the setting process as described above.

10 Set the low-fire rate using the adjusting screw on the VAG to the lowest flow rate which still enables a stable flame to be maintained.

→ Monitor the flame through the inspection window on the burner insert. In low-fire rate, it should be blue with yellow flashes.

→ If you are using propane or butane, a correct flame in low-fire rate may have permanent yellow flashes.



## Checking the flame in low-fire rate

### **⚠ CAUTION**

Please note the following to ensure that the burner is not damaged during operation:

- Do not switch off the fan until the temperature in the combustion chamber has fallen below 120°C. This prevents hot gas flowing back through the burner and the fan and damaging the burner.

- a Shut off the gas supply.
- b Switch off the fan if the temperature in the combustion chamber falls below 120°C.
- c Restart the burner.
- d Check whether the ignition can be repeated.
- e Ensure that there is a flame signal in low-fire rate.

- The integrated gas measuring orifice is selected for a specific gas type. This is why there is no need for setting at high-fire rate.

### 7.7 Checking burner operation

#### Simulate a flame failure.

- 1 Shut off the gas supply.
- Close the valves and the burner will switch off.
- 2 Open the gas supply.
  - 3 Reignite the burner.
- After the ignition has been successful, the burner will switch to high-fire rate.

#### Check the max. gas pressure switch.

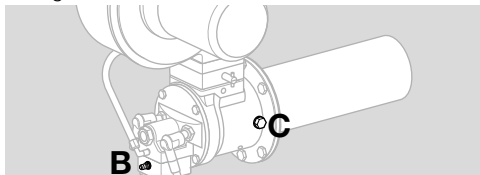
- 4 Reduce the setpoint value for the switching point using the hand wheel on the DG..C until the pressure switch trips.
- Close the valves and the burner will switch off.
- 5 Restore the original setting on the DG..C.
  - 6 Reignite the burner.

#### Check the min. gas pressure switch.

- 7 Increase the setpoint value for the switching point using the hand wheel on the DG..C until the pressure switch trips.
- Close the valves and the burner will switch off.
- 8 Restore the original setting on the DG..C.
  - 9 Reignite the burner.

#### Acceptance report

- 10 Measure the differential gas pressure (test point B) and differential air pressure (test point C) at the test point in the combustion chamber.
- 11 Measure the flame signal at low-fire rate and high-fire rate.



- 12 Record the measurements in an acceptance report for future use.

## 8 MAINTENANCE

### **⚠ DANGER**

Risk of explosion!

- Please observe the appropriate precautions when igniting the burner.
- Maintenance work on the burner must be carried out by authorized trained personnel only.

### **⚠ DANGER**

Risk of poisoning!

- Open the gas and air supply so that the burner is always operated with excess air – otherwise CO will form in the combustion chamber. CO is odourless and poisonous! A flue gas analysis should be conducted.

### **⚠ DANGER**

Risk of burning!

- Outflowing flue gases and burner components are hot.

### **⚠ CAUTION**

Please note the following to ensure that the burner is not damaged during the maintenance work:

- Do not switch off the fan until the temperature in the combustion chamber has fallen below 120°C. This prevents hot gas flowing back through the burner and the fan and damaging the burner.

#### 8.1 Monthly

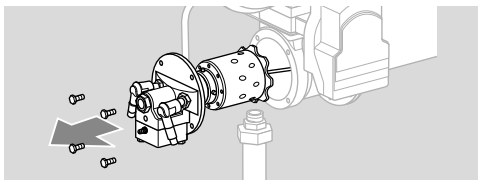
- 1 Check the flame sensors and clean them if necessary.
- 2 Check the air and gas pressures, see page 10 (10 Technical data).
- 3 Check the system alarms to ensure they react correctly.
- 4 Check and clean the spark electrode.
- 5 Check that the air butterfly valve operates smoothly and has the correct settings.
- 6 Check the function of the fan.
- 7 Check the safety functions: force each different shut-down manually. As you do so, monitor whether the relevant function operates as specified by the manufacturer.
- 8 Check the manual valve to ensure it functions correctly.
- 9 Clean the optional fan filter and replace it if necessary.
- 10 Check and clean the fan rotor.

#### 8.2 Annually

- 1 Check the tightness of the gas solenoid valves.
- 2 Check the settings for the pressure switches: check the pressure settings and switching processes of the pressure switches and compare them to the actual pulse pressure.
- 3 Conduct a visual inspection of the ignition cable and all other connections.



- 4 Check the impulse lines for leaks.
- 5 Remove the burner, clean it and inspect it.
- 6 Ensure that the following components are not damaged or warped:
  - Burner head
  - Spark electrode
  - Flame sensors
  - Burner tube
- 7 The burner does not have to be removed and you do not have to enter the chamber to check the burner head and burner tube:
  - a Switch off the burner.
  - b Close the manual valves.
  - c Allow the chamber temperature to fall to 121°C.
  - d Separate the gas pipe at a connection point or at the burner insert.
  - e Undo the four retaining screws at the burning insert.



- f Remove the burner insert and carefully place it to one side.
- g Check the components and clean them if necessary.
- h Use the reverse procedure to install the components.

## 9 ASSISTANCE IN THE EVENT OF MALFUNCTION

### **⚠ DANGER**

Electric shocks can be fatal!

- Before working on possible live components, ensure the unit is disconnected from the power supply.

### **⚠ DANGER**

Risk of injury!

Burner heads have sharp edges.

- Burner inspection must only be performed by authorized trained personnel.

→ If no issues are found when checking the burner, proceed to the automatic burner control unit and check for faults in accordance with the relevant operating instructions.

### **? Fault**

- ! Cause
  - Remedy

### **? Burner start commences but stops before ignition.**

- ! Fault on the fan.
  - Check the fan and rectify the fault.
- ! Fault with the combustion air: blocked fan inlet or filter.
  - Clean the air inlet.
  - Clean or replace the filter.
- ! Fault with the combustion air: failure of the pressure switch.
  - Check the pressure switch.
  - Replace a defective pressure switch.

### **? Burner start commences but no ignition takes place.**

- ! No ignition: the ignition transformer has no power supply.
  - Restore the power supply to the ignition transformer.
- ! No ignition: open circuit between the ignition transformer and spark electrode.
  - Correct the wiring to the spark electrode.
- ! No ignition: the spark electrode is soiled.
  - Clean the spark electrode.
- ! No ignition: the spark plug and burner are not grounded correctly.
  - Clean the thread on the spark electrode and burner.
- ! No ignition: the insulation on the spark electrode is damaged.
  - Check the spark electrode. Replace a damaged spark electrode.
- ! Low gas pressure: the gas pressure to the air/gas ratio control is inadequate.
  - Ensure there is an adequate gas inlet pressure.
- ! Low gas pressure: the double block valve with air/gas ratio control VCG does not open.
  - Check the electrical connection to the air/gas ratio control.
  - Check the output signals from the BCU.
  - Open the manual valves.
- ! Low gas pressure: the pilot rate setting is too low.
  - Increase the pilot rate setting.
- ! Low gas pressure: the setting on the VCG is too low or too high.
  - Set the low-fire rate and high-fire rate on the air/gas ratio control, see section entitled “Commissioning”, Pressure regulators with solenoid valve VAX operating instructions.
- ! Excess gas: defective or missing measuring orifice.
  - Check the attached burner data to find the correct measuring orifice.

**? Burner ignites and then switches off.**

- ! No flame signal: damaged flame rod.
- ! No flame signal: soiled UV sensor lens.
  - Check the flame signal.
  - Check the flame sensor and clean or replace it if necessary.
- ! No flame signal: the connections of the spark electrode and flame rod have been reversed.
  - Swap the connections for the spark electrode and flame rod.

**? Burner flame is large and yellow in high-fire rate. Burner flame is unstable, burner produces soot, smoke or emits excessive carbon monoxide.**

- ! The gas/air ratio is not set correctly. The gas measuring orifice is blocked.
- ! Blocked gas line.
- ! Defective or missing measuring orifice.
  - Clean the gas measuring orifice.
  - Check and clean the gas line.
  - Check the attached burner data to ensure you have the correct measuring orifice.
- ! Gas pressure too high: the pressure setting on the air/gas ratio control is too high.
  - Correct the settings for low-fire rate on the air/gas ratio control, see section entitled "Commissioning", [Pressure regulators with solenoid valve VAX operating instructions](#).

**? Burner flame is weak and unstable at low-fire rate.**

- ! Low gas pressure on the burner.
  - Correct the settings for low-fire rate on the air/gas ratio control, see section entitled "Commissioning", [Pressure regulators with solenoid valve VAX operating instructions](#).
- ! Low air pressure.
  - Clean or replace the filter.
  - Check the direction of rotation of the fan.
  - Compensate for the chamber pressure by setting the air valve to low-fire rate.

**? Burner start is unable to commence.**

- ! The min. air pressure switch on the fan has not closed the contact.
  - Check the setting of the air pressure switch, see page 6 (7.5 Checking the combustion air).
  - Check the optional air filter
  - Check the direction of rotation of the fan.
  - Check the outlet pressure of the fan.

**? Burner does not reach the specified capacity.**

- ! Low air pressure: the air valve does not open.
- ! The fan is rotating in the wrong direction.
- ! The air inlet or filter is blocked.
  - Check the limit value settings of the actuator.
  - Check and correct the wiring for the fan.
  - Clean the air inlet and optional filter.
  - Replace the filter if necessary.
- ! Low gas pressure (with adequate air supply): the gas inlet pressure to the air/gas ratio control is too low.
  - Check the gas inlet pressure.

## 10 TECHNICAL DATA

Min. gas supply pressure: 50 mbar (19.7 "WC).  
Max. gas supply pressure:  
100 mbar (39.4 "WC) (standard),  
400 mbar (157 "WC) (optional with GDJ).  
Control voltage: 230 V, 50/60 Hz or 120 V, 50/60 Hz.  
Fan voltage: 400 V, 3 phases, 50/60 Hz.  
Burner capacities, see page 11 (10.4 Burner capacities at combustion chamber pressure (0 mbar)).  
Control type: modulating.  
Control input: three-point-point step or analogue (4–20 mA, 0–20 mA or 0–10 V).  
Actuator running time: 30 s/90°.  
Ignition: direct ignition.  
Flame control: flame rod (standard), standard UV sensor or UV sensor for continuous operation.  
Combustion chamber temperature: max. 1050°C (~1900°F).  
Combustion chamber pressure: -2.5 to +2.5 mbar (-0.98 to +0.98 "WC).

### 10.1 Gas types

	Code letter	Heating value range		Density	
		kWh/m(n)	BTU/scf	kg/m	lb/scf
Natural gas L and H	B	8–12	810–1215	0.7–0.9	0.041–0.053
Propane, propane/butane, butane	M	25–35	2480–3472	2.0–2.7	0.118–0.159

## 10.2 Flame length

Burner	Flame length	
	m	ft
RAHP 20.040..S	0.6	2
RAHP 20.075..S	1	3.3
RAHP 20.100..S	1.1	3.6
RAHP 20.200..S	1.4	4.6
RAHP 20.300..S	1.7	5.6
RAHP 20.040..M	0.5	1.6
RAHP 20.075..M	0.7	2.3
RAHP 20.100..M	1.0	3.3
RAHP 20.200..M	0.9	3.0
RAHP 20.300..M	1.6	5.3
RMHP 30.075	0.8	2.6
RMHP 30.100	1.0	3.3
RMHP 30.200	1.5	4.9
RMHP 30.300	1.7	5.6
RMHP 30.400	1.8	5.9

## 10.3 Fan capacity

Burner	Fan
	kW
RAHP 20.040..S	0.18
RAHP 20.075..S	0.25
RAHP 20.100..S	0.37
RAHP 20.200..S	1.1
RAHP 20.300..S	1.5
RAHP 20.040..M	0.25
RAHP 20.075..M	0.37
RAHP 20.100..M	0.55
RAHP 20.200..M	0.75
RAHP 20.300..M	1.5
RMHP 30.075	0.25
RMHP 30.100	0.37
RMHP 30.200	0.55
RMHP 30.300	0.75
RMHP 30.400	1.5

## 10.4 Burner capacities at combustion chamber pressure (0 mbar)

Burner type	Burner capacity <sup>1)2)</sup>	
	kW	kBTU/h
RAHP 20.040..S	110	413
RAHP 20.075..S	250	939
RAHP 20.100..S	300	1126
RAHP 20.200..S	650	2440
RAHP 20.300..S	900	3379
RAHP 20.040..M	100	375
RAHP 20.075..M	200	751
RAHP 20.100..M	240	901
RAHP 20.200..M	600	2253
RAHP 20.300..M	845	3172
RMHP 30.075	200	751
RMHP 30.100	350	1314
RMHP 30.200	500	1877
RMHP 30.300	750	2816
RMHP 30.400	1100	4130

1) kW for LHV ( $H_i$ ,  $H_D$ )

2) BTU/h for HHV ( $H_s$ ,  $H_D$ )

### 10.5 Burner size – capacities at various reverse flow pressures

Burner	Burner capacity <sup>1)2)</sup>						Low-fire rate	
	-2.5 mbar (-0.98 "WC)		0 mbar (0 "WC)		2.5 mbar (0.98 "WC)		kW	kBTU/h
	kW	kBTU/h	kW	kBTU/h	kW	kBTU/h		
RAHP 20.040..S	123	462	110	413	100	375	9	34
RAHP 20.075..S	303	1138	250	939	239	897	9	34
RAHP 20.100..S	320	1201	300	1126	264	991	10	38
RAHP 20.200..S	675	2534	650	2440	603	2264	15	56
RAHP 20.300..S	949	3563	900	3379	854	3206	20	75
RAHP 20.040..M	113	424	100	375	98	368	9	34
RAHP 20.075..M	212	796	200	751	182	683	9	34
RAHP 20.100..M	260	976	240	901	218	818	10	38
RAHP 20.200..M	640	2403	600	2253	560	2102	15	56
RAHP 20.300..M	886	3326	845	3172	805	3022	20	75
RMHP 30.075	220	826	200	751	180	676	9	34
RMHP 30.100	367	1378	350	1314	333	1250	15	56
RMHP 30.200	522	1960	500	1877	478	1795	20	75
RMHP 30.300	776	2913	750	2816	724	2718	35	131
RMHP 30.400	1141	4284	1100	4130	1059	3976	50	188

1) kW for LHV ( $H_f$ ,  $H_{f,0}$ )

2) BTU/h for HHV ( $H_s$ ,  $H_o$ )

## 10.6 RAHP settings

Depending on the application, the RAHP is available with a straight or tapered (MV = medium velocity) burner tube.

		RAHP20.040		RAHP20.075		RAHP20.100		RAHP20.200		RAHP20.300	
		Burner tube									
		Straight	MV	Straight	MV	Straight	MV	Straight	MV	Straight	MV
<b>High-fire rate</b>											
Capacity (net)	kW	110	100	250	200	300	250	650	600	900	800
$p_{\text{air}} - \text{test point C}^2)$	mbar	16	16	6.5	6.5	10.5	16.5	20	22	24	24
<b>Natural gas H</b>											
$p_{\text{gas}} - \text{test point B}^2)$	mbar	13.1	14.1	5	5	8.5	8.5	19	21	18	18
Measuring orifice dia.	mm	10	10.6	18	19	18.5	18.5	23	23	25	25
<b>Propane</b>											
$p_{\text{gas}} - \text{test point B}^2)$	mbar	14	14	5	5	8.5	8.5	16	16	18	18
Measuring orifice dia.	mm	8.3	8.2	14	14	14.5	14.5	18.5	18.5	20.5	21
<b>Butane</b>											
$p_{\text{gas}} - \text{test point B}^2)$	mbar	13.7	13.7	5	5	8.5	8.5	16	16	18	18
Measuring orifice dia.	mm	7.6	7.9	13	13.5	13.0	13.0	17.0	17.5	19	20
<b>Gas inlet pressure<sup>3)</sup></b>											
$p_{\text{gas min.}}$	mbar	50	50	50	50	50	50	50	50	50	50
<b>Pressure switch settings</b>											
$p_{\text{gas max.}}$	mbar	20	20	10	10	15	15	25	25	25	25
$p_{\text{gas min.}}$	mbar	35	35	35	35	40	40	40	40	40	40
$p_{\text{air min.}}$	mbar	10	10	3	3	7.5	7.5	12	12	17.5	17.5

1) Max. deviation  $-0.05/+0.1$  mbar

2) Max. deviation  $\pm 1$  mbar

3) Based on natural gas

## 10.7 RMHP settings

		RMHP30.075	RMHP30.100	RMHP30.200	RMHP30.300	RMHP30.400
<b>High-fire rate</b>						
Capacity (net)	kW	200	350	500	750	1100
$p_{air}$ – test point $C_2$	mbar	9.0	11.0	16.0	22.0	21.0
<b>Natural gas H</b>						
$p_{gas}$ – test point $B_2$	mbar	8.5	10.0	15.5	21.0	20.0
Measuring orifice dia.	mm	19	29	29	30	36
<b>Propane</b>						
$p_{gas}$ – test point $B_2$	mbar	7.0	9.5	15.5	17.5	20.0
Measuring orifice dia.	mm	14.0	22.5	22.5	24.5	30.0
<b>Butane</b>						
$p_{gas}$ – test point $B_2$	mbar	7	8.5	14.5	17.5	20.0
Measuring orifice dia.	mm	12.7	19.0	19.0	21.0	25.0
<b>Gas inlet pressure<sup>3)</sup></b>						
$p_{gas}$ min.	mbar	25	50	55	65	75
<b>Pressure switch settings</b>						
$p_{gas}$ max.	mbar	12	15	22	22	26
$p_{gas}$ min.	mbar	40	40	40	40	40
$p_{air}$ min.	mbar	3	6	8	11	15

1) Max. deviation  $-0.05/+0.1$  mbar

2) Max. deviation  $\pm 1$  mbar

3) Based on natural gas

## 11 LOGISTICS

### Transport

Protect the unit from external forces (blows, shocks, vibration).

Transport temperature: see page 10 (10 Technical data).

Transport is subject to the ambient conditions described.

Report any transport damage on the unit or packaging without delay.

Check that the delivery is complete.

### Storage

Storage temperature: see page 10 (10 Technical data).

Storage is subject to the ambient conditions described.

Storage time: 6 months in the original packaging before using for the first time. If stored for longer than this, the overall service life will be reduced by the corresponding amount of extra storage time.

## 12 CERTIFICATION

### 12.1 Eurasian Customs Union



The products HeatPak meet the technical specifications of the Eurasian Customs Union.

### 12.2 Declaration of Incorporation pursuant to the Machinery Directive

The HeatPak complies with the requirements of EN 746-2, the Machinery Directive 2006/42/EC and all the provisions of the Low Voltage Directive 2014/35/EU. This is confirmed by the manufacturer's Declaration of Incorporation.

## 13 DISPOSAL

Devices with electronic components:

### **WEEE Directive 2012/19/EU – Waste Electrical and Electronic Equipment Directive**



At the end of the product life (number of operating cycles reached), dispose of the packaging and product in a corresponding recycling centre. Do not dispose of the unit with the usual domestic refuse. Do not burn the product.

On request, old units may be returned carriage paid to the manufacturer in accordance with the relevant waste legislation requirements.



## FOR MORE INFORMATION

The Honeywell Thermal Solutions family of products includes Honeywell Combustion Safety, Eclipse, Exothermics, Hauck, Kromschroder and Maxon. To learn more about our products, visit [ThermalSolutions.honeywell.com](http://ThermalSolutions.honeywell.com) or contact your Honeywell Sales Engineer.

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