REZNOR®

ErP 2021

ErP Lot 21
Seasonal Efficiency
and NOx compliant

RHC21 4000

GAS FIRED AIR HEATER MODULE

INSTALLATION / COMMISSIONING / SERVICING

CE UKCA

(EU) 2016/426(GAR), 2009/125/EC(ErP), 2014/35/EU (LVD) and 2014/30/EU(EMC) Regulations and Directives.
The following harmonised standards have been applied:
EN 17082, EN 60335-1, EN 60335-2-102, EN 55014-1, and EN 55014-2

Please read this document carefully before commencing installation, commissioning and/or servicing.
Leave it with the end user/site agent to be placed in their premises technical file after installation.

WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death.
All work must be carried out by appropriately qualified persons.
The manufacturer does not take any responsibility in the event of non-observance of the regulations concerning the connection of the apparatus causing a dangerous operation possibly resulting in damage to the apparatus and/or environment in which the unit is installed.

MANUAL PART NO. D301334 ISS 3

NORTEK™ GLOBAL HVAC

Contents

Nortek Global HVAC (UK) Ltd
Fens Pool Avenue, Brierley Hill, West Midlands, DY5 1QA, England
Tel: +44(0)1384 489 700 Fax: +44(0)1384 489 707

EC Declaration of Conformity

Product: Power-vented gas-fired air heaters

Model Type(s): RHC21 4000 Series Models (4024-05 / 4036-08 / 4050-06 / 4060-07 / 4075-09 / 4100-12 / 4125M15 / 4150M18)

This declaration is issued under the sole responsibility of the manufacturer. The object of the declaration is to detail that the product listed above is in conformity with the following applicable standards and legislation:

Number	**Description**
2006/42/EC	Machinery Directive
2016/426 (EU)	Gas Appliance Regulations (GAR)
2009/125/EC	Eco-Design Directive (ErP)
2014/35/EU	Low Voltage Directive (LVD)
2014/30/EU	Electromagnetic Compatibility Directive (EMC)

Applicable Standards Applied

EN 17082:2019	Domestic and non-domestic gas-fired forced convection air heaters for space heating not exceeding a net input of 300kW
IEC 60335-1:2020	Household and similar electrical appliances - Safety - Part 1: General requirements.
EN 60335-2-102:2006	Household and similar electrical appliances - safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections
EN IEC 55014-1:2021	Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus. Part 1: Emission
EN IEC 55014-2:2021	Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Immunity.

Controls Applied

BS EN ISO 9001:2015 (LRQA Registered Company (N° LRQ 0870105/A)

Technical documentation for the product is available from this address.

Signed on behalf of Nortek Global HVAC (UK) Ltd

Gavin Horton
Quality Lead for Nortek Global HVAC (UK) Ltd 10/06/2021

Important notice to installers

Before installation, carefully read these instructions and follow the processes explained by the manufacturer. These instructions are only valid for appliances designed to operate in Europe. If the country code and gas category on the appliance data label does not match the country of installation or the country codes and gas categories as shown in this instruction manual, it will be necessary to contact the distributor or manufacturer to provide the necessary information for the modification of the appliance to the conditions of use for the country of installation.

Installing, commissioning, testing, programming and maintenance of these products must only be carried out by suitably qualified and trained technicians and in full compliance with all applicable regulations and current best practices.

Check if the appliance as described on the packaging label is in accordance with the correct type and model as specified on the data plate and complies with your customer order.

Check that the temperature ranges given and those of the location match. The appliance must be powered with a voltage corresponding to the value shown on the rating plate.

These units must be installed in accordance with the rules in force and local regulations / legislation as appropriate plus all local building codes. Installers should satisfy themselves that the gas pipework installation is carried out in accordance with all current legislation, Codes of Practice and recommendations.

Additionally it may be necessary to protect the gas valves which form part of the heater or burner assembly from potential pipe contamination particularly, but not exclusively, where copper gas pipework is used.

In instances where copper pipework is to be used for all or part of a gas pipework installation, including short length final connections then we advise that installers consult with the gas supplier or provider and satisfy themselves what additional precautions may be necessary.

Improper installation, adjustment, alteration, service, or maintenance can cause property damage, injury, or death. Read the installation, operation, and maintenance instructions thoroughly before installing or servicing this equipment.

Gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapours or combustible dust, in atmospheres containing chlorinated or halogenated hydrocarbons or in applications with airborne silicone substances.

Any reference made to Laws, Standards, Directives, Codes of Practice or other recommendations governing the application and installation of heating appliances and which may be referred to in Brochures, Specifications, Quotations, and Installation, Operation and Maintenance manuals is done so for information and guidance purposes only and should only be considered valid at the time of the publication.

The manufacturer cannot be held responsible from any matters arising from the revision to or introduction of new Laws, Standards, Directives, Codes of Practice or other recommendations.

The temperature in the controls section of the unit must never be less than -10°C otherwise damage could occur to the sealing elements of the gas valve and to the electrical components.

The electrical isolator should only be used in an emergency and should not be used for closing down the main burner, as it switches off the fan prematurely and may damage the heat exchanger, invalidating the warranty.

Health and safety

Due consideration should be taken for workplace safety, risk assessments and waste disposal.

Any modification of the product may be hazardous and the manufacturer is not liable for any damage or injury caused by improper use.

Do not use this appliance if any part has been immersed in water. Immediately call a qualified service technician to inspect the appliance and replace any gas control that has been immersed in water.

This appliance is not intended for use by persons (including children) with reduced sensory or mental capabilities or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

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

Gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapours or combustible dust, in atmospheres containing chlorinated or halogenated hydrocarbons or in appliances with airborne silicone substances.

The manual should be kept in a safe place for future reference.

For your safety, if you smell gas:

- **Do not try to light any appliance**
- **Do not touch any electrical switch, do not use any phone in your building**
- **Evacuate all personnel**
- **Contact your gas supplier immediately**

Do not store or use petrol or other flammable vapours and liquids in the vicinity of the appliance.

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death.

Read the installation, operation and maintenance instructions thoroughly before installing or servicing this equipment.

Installation, assembly, commissioning, service and maintenance procedures must be carried out only by suitably competent qualified persons.

Unauthorised modifications to the appliance, or departure from the manufacturer's guidance on intended use, or installation contrary to the manufacturer's recommendations may constitute a hazard.

Use only factory authorised parts and spares when replacement is required.

In case of persistent problems, contact your distributor.

1. Introduction

Isolate any electrical supply to the heater and controller before proceeding.

1.1 Basic information

The instructions in this manual apply to the RHC21 4000 gas-fired air heating modules installed at an operational ambient temperature between -15°C and +45°C.

The appliances must be installed in accordance with the rules in force. Before installation, check that the local distribution conditions,nature of gas and pressure and adjustment of the appliance are compatible.

A permanent electricity supply of 230 volts, 50 hertz, single phase is required.

RHC21 4000 air heater modules are suitable for use in internal and external air handling units (when installed internally where the height above floor level is greater than 1.8 meters measured to the underside of the appliance they may be used as a garage air heater).

Model RHC21 4000 air heater modules may be installed as a Type C room sealed heater requiring both a combustion air inlet pipe and a flue pipe (Type C_{13}, C_{33} or C_{53} only) or as a Type B forced draught heater where the combustion air is taken from the room space the heater is installed in and which requires only a flue pipe exhausting to outdoors (Type B_{23} or B_{53} only). All products of combustion must be flued to outdoor atmosphere.

All models and sizes are available for use with natural gas with operating temperatures between 15°C and 40°C.

These instructions are only valid for appliances designed to operate in Europe. If the country code and gas category on the appliance data label does not match the country of installation or the country codes and gas categories as shown in this instruction manual, it will be necessary to contact the distributor or manufacturer to provide the necessary information for the modification of the appliance to the conditions of use for the country of installation.

Check that the local distribution conditions of electricity supply, type of gas and pressure of the appliance are compatible.

The total installation should be installed in accordance with the rules in force, relevant National Standards, local regulations,and Codes of Practice.

When the external control calls for heat, an electronic control begins the ignition sequence to provide for a safe start.

Under normal conditions the fan motor runs constantly and after a call for heat it switches the heater on through a room or duct stat. However,in some applications, about 30 seconds after the call for heat, the fan control relay will activate the fan motor of the air handler.

The electronic control will supervise the flame during the entire heating cycle to ensure safe operation. When the required room temperature is reached, the main burner will shut down leaving the fan running to cool down the heat exchanger. After approximately 45 seconds, the fan delay relay will turn off the fan (if wired).

All models may only be used when installed within a closed compartment, e.g. an air handling unit or using the optional vestibule.

For dimensions refer to figures 1,2 & 3 following. All dimensions are in mm (25.4mm= 1inch)

Only recognised air handling unit manufacturers are authorised to build in the heater module. Please contact your distributor.

Any other application is forbidden and dangerous. Failure to comply can result in severe personal injury, death and/or property damage. Note: manufacturer warranties do not apply in such circumstances.

1.2 Warranty

This equipment comes as standard with a manufacturers two year warranty (2 years parts, 1 year labour) unless agreed otherwise at the time of order. The warranty is void if:-

- Model RHC21 4000 heaters are installed in atmospheres containing flammable vapours or atmospheres containing chlorinated or halogenated hydrocarbons or atmospheres containing any silicone, aluminium oxide,etc. that adheres to spark ignition flame sensing probes.
- The installation is not in accordance with these instructions.
- The maximum air flow through the heat exchanger tubes is not respected (see section 3.5).
- The required minimum air delivery is not respected (see table 7).
- The duct dimensions do not comply with the prescribed dimensions (see table 8)
- The inlet temperature (measured at the heat exchanger inlet) is lower than the value stated on the chart (see fig.5: dew point occurrence chart).

1.3 Definitions

Module:

The gas-fired heating module.

Constructor:

The undertaking, which builds a module into another casing. e.g. an air handling unit.

Appliance:

The end product of the constructor

Compartment:

The section of an appliance into which the module is installed

B23 / B53 Appliance:

An appliance where the air for combustion is taken from within the area where the gas burner is operated. A flue pipe is required exhausting to outdoors.

C13 / C33 / C53 Appliance:

An appliance where the air for combustion is taken from outside the area where the gas burner is operated (room sealed). Both a combustion air inlet pipe and a flue pipe are required.

Dew point:

The condition, when the temperature is such that the water vapour in the combustion products condenses out.

Dimensions:

All dimensions are in mm (25.4mm= 1 inch)

2 Technical Data

Model	RHC21	4024-05	4036-08	4050-06	4060-07	4075-09	4100-12	4125M15	4150M18
Combustion air & flue type Indoor		B_{23} / B_{53} / C_{13} / C_{33} / C_{53}							
Combustion air & flue type External		Rooftop							
Heat Input High Fire (Hs) [1]	kW	29.30	44.00	61.50	77.60	91.50	120.00	153.00	183.00
Heat Input Low Fire (Hs) [1]	kW	8.79	13.20	18.60	22.38	27.45	37.00	45.20	49.08
Heat Input High Fire (Hi) [2]	kW	26.40	39.64	55.41	69.91	82.43	108.11	137.84	164.86
Heat Input Low Fire (Hi) [2]	kW	7.92	11.89	16.76	20.16	24.73	33.33	40.72	44.22
Heat Output H2 High Fire [4]	kW	24.17	36.19	51.20	64.74	76.04	99.61	125.43	151.25
Heat Output H2 Low Fire [4]	kW	7.77	11.69	16.49	19.75	24.33	32.81	40.04	43.55
Gas Consumption High Fire (Hs) G20 [3]	m³/h	2.79	4.19	5.86	7.39	8.71	11.43	14.57	17.42
Gas Consumption Low Fire (Hs) G20 [3]	m³/h	0.84	1.26	1.77	2.13	2.61	3.52	4.30	4.67
Gas Consumption High Fire (Hs) G25 [3]	m³/h	3.24	4.87	6.81	8.59	10.13	13.29	16.94	20.26
Gas Consumption Low Fire (Hs) G25 [3]	m³/h	0.97	1.46	2.06	2.48	3.04	4.10	5.00	5.43
Gas Consumption High Fire (Hs) G25.3 [3]	m³/h	3.17	4.77	6.66	8.41	9.91	13.00	16.58	19.83
Gas Consumption Low Fire (Hs) G25.3 [3]	m³/h	0.95	1.43	2.02	2.43	2.97	4.01	4.90	5.32
Gas Service Connection	Inches BSP	½"	¾"	¾"	¾"	¾"	¾"	1¼"	1¼"
Flue & Combustion Air Connection Collars (Indoor)	Ø mm	100	130	130	130	130	130	130	130
Condensation Connection / Outlet	Ø mm	22 OD							
Minimum V1 Airflow at 15°C with Heat Output H1 [6]	m³/h	N/A	N/A	3900	4700	5700	7500	N/A	N/A
	kW	N/A	N/A	50.0	60.0	73.8	96.6	N/A	N/A
Temperature Rise at V1 Airflow	K	N/A	N/A					N/A	N/A
Minimum V2 Airflow at 15°C with Heat Output H2 [7]	m³/h	2880	5281	5950	7150	8800	11700	9600	12300
Temperature Rise at V2 Airflow	K	25	20	26	27	26	25	39	37
Electrical Connection	1 Phase	230V 1N ~ 50Hz							
Total Electric Rating	kW	0.08	0.30	0.30	0.30	0.30	0.28	0.60	0.60
Approx Appliance Weight (net)	kg	31	52	90	100	120	149	220	250
Protection Grade	IP	20 (Indoor) / X4D (External)							

1 Refers to gross calorific value of fuel
2 Refers to net calorific value of fuel
3 Natural gas: G20 Hs 37.78 MJ/m³, G25 Hs 32.49 MJ/m³, G25.3 Hs 33.2 MJ/m³
4 Heat output depends on airflow - heat output H2 only for airflows above V2
5 H2 = heat output at airflow V2 (V2 = minimum airflow required for high heat output H2)
6 H1 = heat output at airflow V1 (V1 = minimum airflow required through enclosure)

Table 1 : Specifications

Model	RHC21	4024-05	4036-08	4050-06	4060-07	4075-09	4100-12	4125M15	4150M18
CO_2 at High Fire (Throttle) G20	%	8.80	8.70	8.80	8.80	8.80	8.50	8.50	8.50
CO_2 at High Fire (Throttle) G20 Both Burners *	%	N/A	N/A	N/A	N/A	N/A	N/A	8.50	8.50
CO	ppm	< 50 ppm							
CO_2 at Low Fire (Offset) G20	%	7.90	7.90	7.90	7.90	7.90	7.60	7.90	7.90
CO_2 at Low Fire (Offset) G20 Both Burners *	%	N/A	N/A	N/A	N/A	N/A	N/A	7.90	7.90
CO	ppm	< 50 ppm							
CO_2 at High Fire (Throttle) G25	%	8.80	8.70	8.80	8.80	8.80	8.50	8.50	8.50
CO_2 at High Fire (Throttle) G25 Both Burners *	%	N/A	N/A	N/A	N/A	N/A	N/A	8.50	8.50
CO	ppm	< 50 ppm							
CO_2 at Low Fire (Offset) G25	%	7.90	7.90	7.90	7.90	7.90	7.60	7.90	7.90
CO_2 at Low Fire (Offset) G25 Both Burners *	%	N/A	N/A	N/A	N/A	N/A	N/A	7.90	7.90
CO	ppm	< 50 ppm							
CO_2 at High Fire (Throttle) G25.3	%	8.80	8.70	8.80	8.80	8.80	8.50	8.50	8.50
CO_2 at High Fire (Throttle) G25.3 Both Burners *	%	N/A	N/A	N/A	N/A	N/A	N/A	8.50	8.50
CO	ppm	< 50 ppm							
CO_2 at Low Fire (Offset) G25.3	%	7.90	7.90	7.90	7.90	7.90	7.60	7.90	7.90
CO_2 at Low Fire (Offset) G25.3 Both Burners *	%	N/A	N/A	N/A	N/A	N/A	N/A	7.90	7.90
CO	ppm	< 50 ppm							
Flue Gas Temperature High Fire ΔT	°C	169	166	150	147	151	150	173	160
Flue Gas Temperature Low Fire ΔT	°C	35	30	29	39	29	28	31	28
Mass Flow Rate Flue Gases High Fire G20	kg/h	19.79	36.61	43.57	53.10	69.04	98.65	124.27	143.30
Mass Flow Rate Flue Gases High Fire G25	kg/h	19.60	35.30	41.86	56.58	70.45	94.32	130.35	147.39
Mass Flow Rate Flue Gases High Fire G25.3	kg/h	21.28	35.15	44.47	62.00	71.62	89.75	131.90	147.99
Flue Pressure at Maximum Flue Resistance	Pa	1	2	10	30	12	48	3	55
Thermal Efficiency High Fire NCV	%	91.57	91.31	92.41	92.61	92.24	92.14	91.00	91.74
Thermal Efficiency Low Fire NCV	%	98.17	98.32	98.43	97.94	98.40	98.42	98.32	98.49

Service door closed. CO_2 tolerance is **±** 0.1
* For M series appliances with both burners ruuning, %CO_2 tolerance is **±** 0.25

Table 2 : Nominal combustion values and flue gas properties

Country	Gas Category	Gas Type	Nominal Supply Pressure (mbar)	Maximum Supply Pressure (mbar)	Minimum Supply Pressure (mbar)
AT, BG, CH, CY, CZ, DK, EE, ES, FI, GB, GR, HR, IE, IT, LT, LV, NO, PT, RO, SE, SI, SK, TR	I2H	Natural Gas (G20)	20	25	17
LU, PL, RO	I2E	Natural Gas (G20)	20	25	17
BE	I2E(R)B	Natural Gas (G20/G25)	20 / 25	25 / 30	17 / 20
FR	I2Esi	Natural Gas (G20/G25)	20 / 25	25 / 30	17 / 20
DE	I2ELL	Natural Gas (G20/G25)	20 / 20	25 / 30	17 / 18
NL	I2EK	Natural Gas (G20/G25.3)	20 / 25	25 / 30	17 / 20

Table 3 : Gas supply details

3 Dimensions

Figure 1 Side View

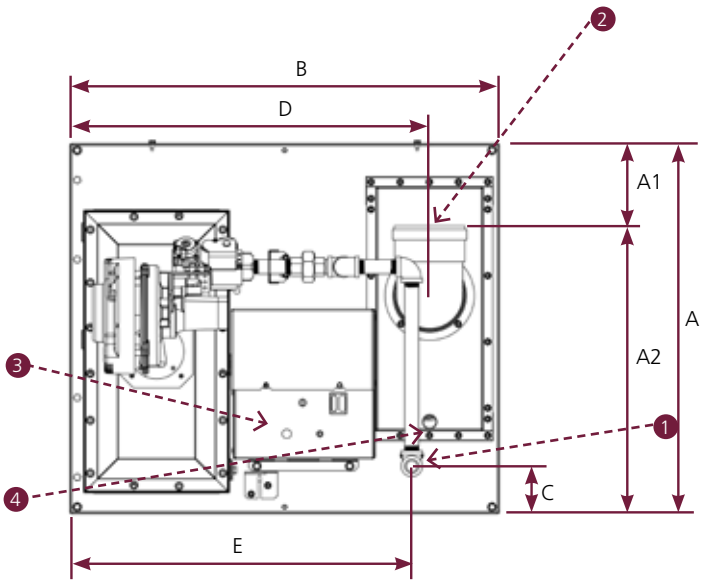


Figure 1.1 RHC21 4024-05

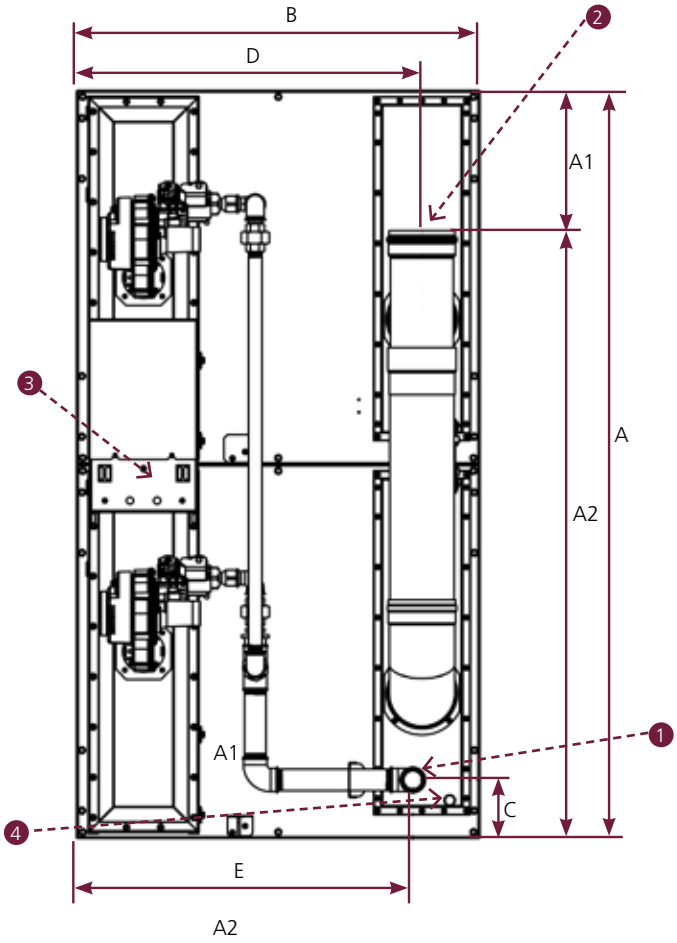


Figure 1.3 RHC21 4125M15, 4150M18

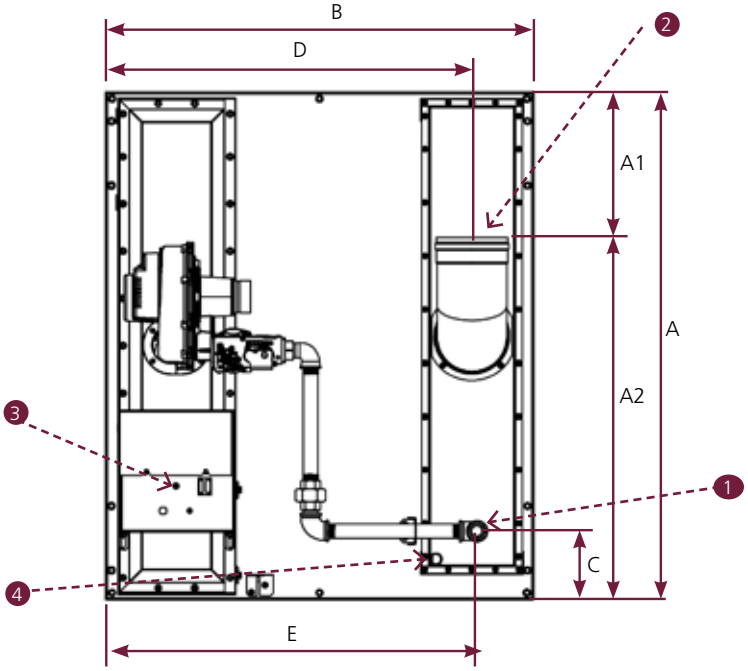


Figure 1.2 RHC21 4036-08, 4050-06, 4060-07, 4075-09, 4100-12

1. Gas connection
2. Flue outlet
3. Electrical connection
4. Condensate connection

3 Dimensions

Figure 2 Top View

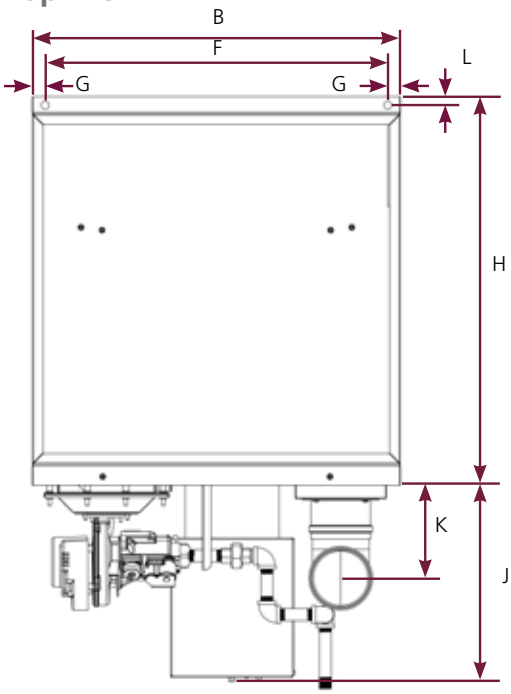


Figure 2.1 RHC21 4024-05

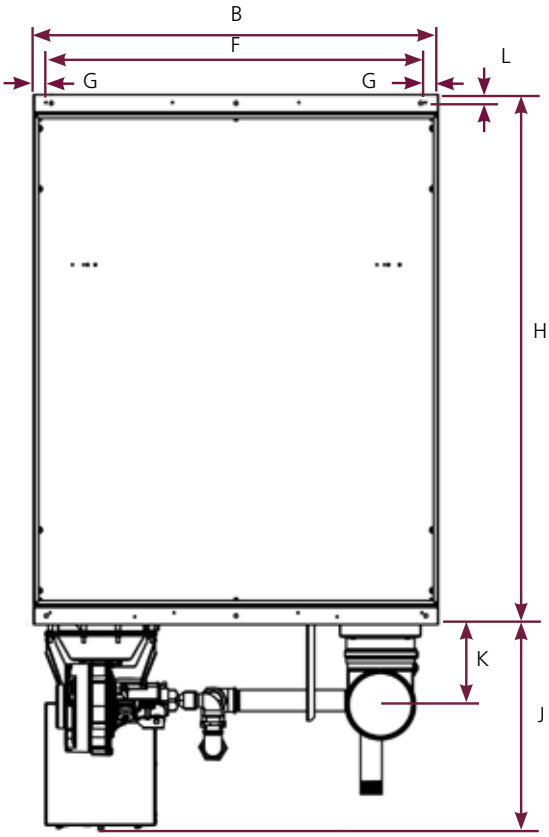


Figure 2.3 RHC21 4125M15, 4150M18

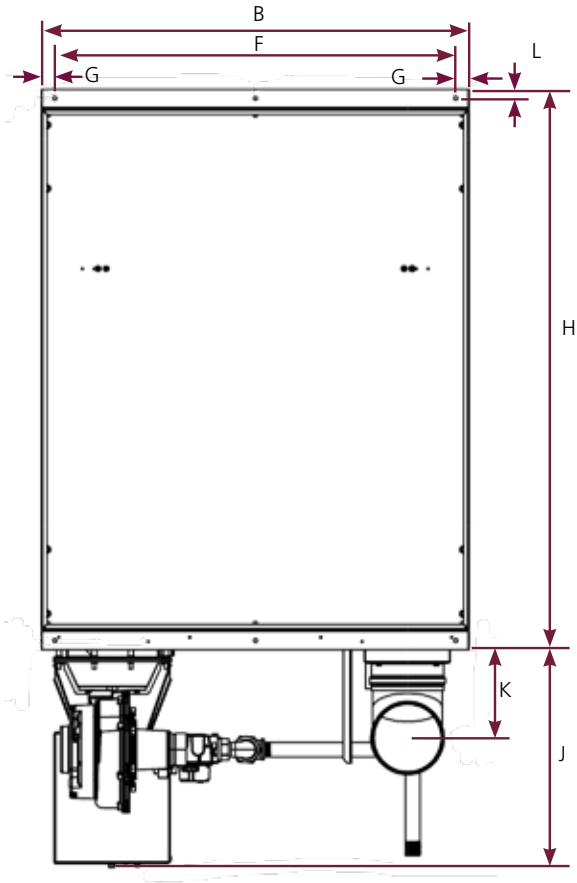


Figure 2.2 RHC21 4036-08, 4050-06, 4060-07, 4075-09, 4100-12

3 Dimensions

Figure 3 Front View

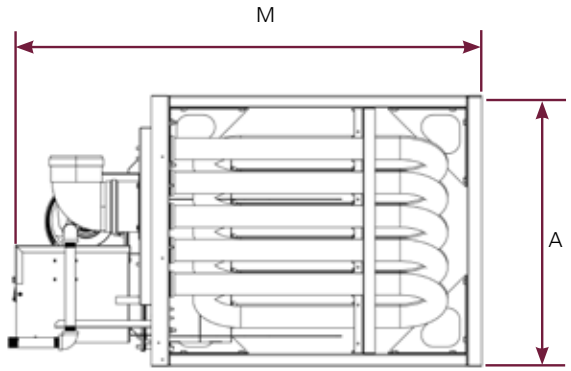


Figure 3.1 RHC21 4024-05

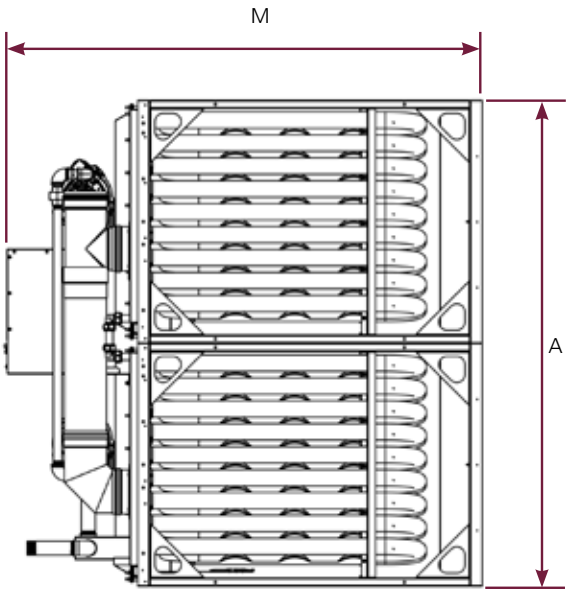


Figure 3.3 RHC21 4125M15, 4150M18

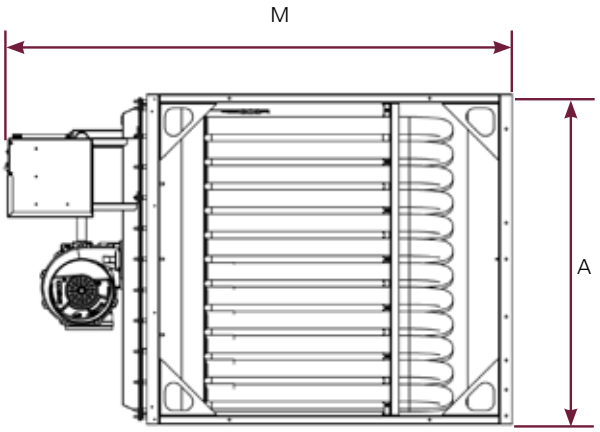


Figure 3.2 RHC21 4036-08, 4050-06, 4060-07, 4075-09, 4100-12

RHC21	4024-05	4036-08	4050-06	4060-07	4075-09	4100-12	4125M15	4150M18
A	560	837	531	601	741	950	1272	1482
A1	125	234	111	197	268	272	199	278
A2	435	603	420	404	473	678	1073	1204
B	648	648	800	800	800	800	800	800
C	72	105	116	71	113	129	115	116
D	543	543	685	685	685	685	685	685
E	516	492	666	666	667	694	667	667
F	602	602	730	TBA	730	750	730	730
G	23	23	35	TBA	35	25	35	35
H	684	684	1049	1049	1049	1049	1049	1049
J	346	406	346	346	407	408	407	408
K	164	159	159	159	159	165	159	159
L	23	23	17	TBA	17	17	17	17
M	1030	1090	1395	1395	1456	1457	1456	1457

Table 4 : Dimensions

RHC21	4024-05	4036-08	4050-06	4060-07	4075-09	4100-12	4125M15	4150M18
Unit kg	31	52	90	100	120	149	220	250
Package kg	18	23	29	29	29	29	58	58
Total kg	49	75	119	129	149	178	278	308

Table 5 : Approximate weights

4 Installation

4.1 General requirements

It is important that all gas appliances are installed in accordance with the rules in force and by appropriately qualified persons. Failure to install appliances correctly could lead to prosecution. It is in your own interest and that of safety to ensure compliance with the law.

Air heaters should not be installed in corrosive atmospheres i.e. near plating, spray or de-greasing plants or in areas where there is a fire risk.

Care should be exercised when designing ducting systems especially with regard to the application of restriction and direction turning fittings, i.e. elbows directly on to the air heater, doing so can cause an uneven and turbulent air flow across the heat exchanger resulting in heat exchanger hot spots and nuisance shut down of the gas burner due to localized overheating, thus activating thermal over-heat controls.

The location must also provide sufficient space to allow the heater to be serviced. Ensure that the air heater is installed in a level plain and that the surface onto which it is installed is vibration free.

4.2 Unpacking and preparation

Prior to dispatch, the air heater was operated and tested at the factory.

Check the shipping label and data plate to ensure the specification of gas and electrical supplies are compatible.

Read this document and become familiar with the installation requirements and the appliance before commencing installation.

4.3 Heater location

Do not locate the air heater where it may be exposed to water spray, rain, etc. The location chosen for the air heater must permit the provision of a satisfactory flue system venting to outdoor atmosphere and adequately ventilated to provide for combustion air.

Position	mm
Top	150
Flue connector	150
Access panel	600
Non access side	150
Bottom	50

Table 6 : Installation clearances

4.4 Minimum airflow requirement

The minimum airflow duty through the heating section must be observed as indicated in table 7.

Model	m^3/hr	m^3/s
RHC21 4024-05	2880	0.800
RHC21 4036-08	5281	1.467
RHC21 4050-08	5850	1.625
RHC21 4060-07	7150	1.986
RHC21 4075-09	8800	2.44
RHC21 4100-12	11700	3.250
RHC21 4125M15	9600	2.667
RHC21 4150M18	12300	3.417

Table 7 : Minimum airflow requirements

4.5 Maximum airflow condition

Special attention must be made to ensure that the temperature rise of the air passing through the module around the heat exchanger tubes is high enough to avoid condensation forming within the tubes.

This condensation forming could occur by super cooling of the products of combustion. Such condensation can be the source of severe corrosion and damage to tubes or part of the tubes.

The chart below indicates the probability of condensation forming within the tubes with reference to:

- the temperature rise of the air through the module (around the tubes)
- the inlet air temperature passing over the heat exchanger.

As a function of the expected minimum inlet air temperature, the minimum required temperature rise (to avoid condensation) must be derived from the chart.

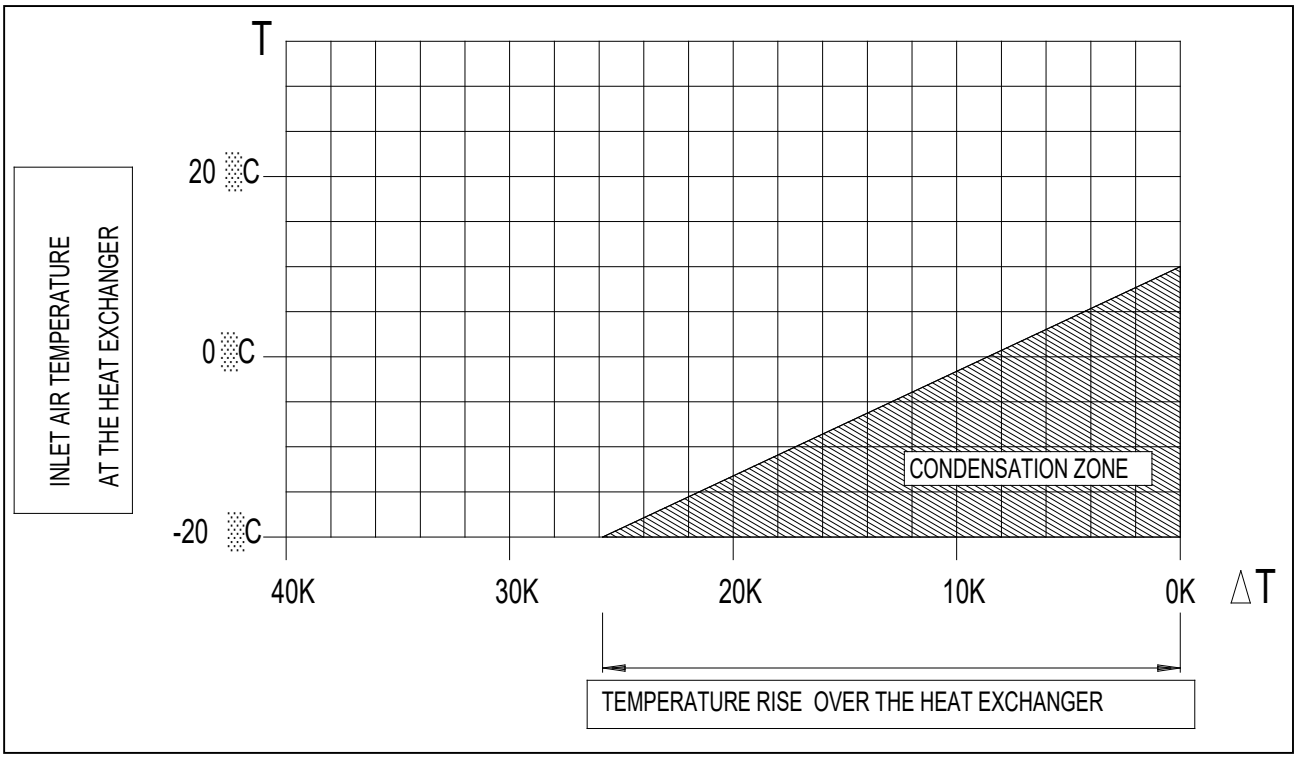


Figure 5 Dewpoint occurrence chart (condensation zone)

Example :

- expected minimum inlet temperature = -5°C
- minimum required temperature rise shown on the chart = +13°K

Table 1 indicates the heat output (kW) of the different models.

The maximum allowable airflow through the module (duct channel) around the tubes can be calculated as follows

$$\text{Vmax (m}^3\text{/h)} = \frac{\text{heat output kW x 1000}}{\Delta\text{T minimum x 0.3423}} = \text{m}^3\text{/h}$$

Example 1: Tmin = 13K (with minimum inlet temperature = -5°C)
model 4075-09 at 100% heat output : 76.04kW results into Vmax = 17088m³/h

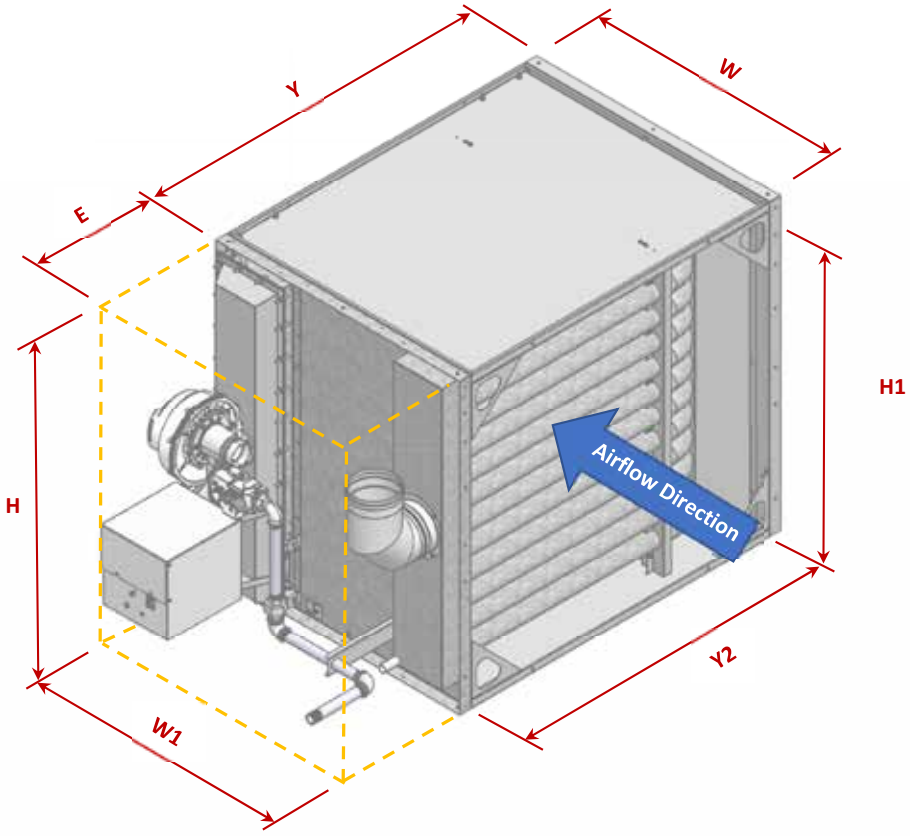
$$\text{Vmax (m}^3\text{/h)} = \frac{76.04\text{kW} \quad \text{x } 1000}{13 \text{ x } 0.3423} = 17088 \text{ m}^3\text{/h}$$

Example 2: Tmin = 13K (with minimum inlet temperature = -5°C)
model 4075-09 minimum airflow (see table 7 air flow duty) : 24.33kW results into :

$$Vmax\ (m^3/h) = \frac{24.33kW \times 1000}{13 \times 0.3423} = 5468\ m^3/h$$

Note: attention must be given to determine the maximum allowable airflow as a function of the appropriate heat input.

4.6 Compartment dimensions



RHC21	H	H1	Y	Y2	W	W1	E
RHC4024-05	560	509	684	610	648	648	400
RHC4036-08	837	787	684	610	648	648	400
RHC4050-06	531	481	1049	975	800	800	400
RHC4060-07	601	551	1049	975	800	800	400
RHC4075-09	741	691	1049	975	800	800	450
RHC4100-12	950	900	1049	975	800	800	450
RHC4125M15	1272	1222	1049	975	800	800	450
RHC4150M18	1482	1432	1049	975	800	800	450

Table 8 : Duct channel & controls compartment

4.7 Combustion air supply & flue system

RHC21 4000 heaters may be installed internally as a Type C room sealed heater requiring both a combustion air inlet pipe and a flue pipe (Type C13, C33 or C53 only) or as a Type B forced draught heater where the combustion air is taken from the room space the air handling unit / heater module is installed in and which requires only a flue pipe exhausting to outdoors (Type B23 or B53 only). All products of combustion must be flued to outdoor atmosphere.

The heaters are designed to operate safely and efficiently with either a horizontal or vertical flue system when installed according to the specific requirements and instructions.

If the module is replacing an existing heater, ensure that the flue is of the correct size and that the existing flue is in good condition.

A correctly sized flue system is required for safe operation of the heater.

For testing, the flue pipe should include a sealable test point. Ideally the test point should be at least 450mm away from the air heater flue connection socket. However if a concentric flue is attached directly to the connection sockets then the combustion should be tested through the flue outlet collar via a drilled test point which must be securely plugged on completion.

Follow the flue pipe manufacturer's installation instructions for making joints, including connections to the air heater, for passing through a building element and for support requirements.

Gasket sealed single wall seamless aluminium or stainless steel flue pipes are required. All joints must be sealed to prevent the products of combustion from leaking into the building.

The products of combustion from the heater must be flued to the outside of the building.

A properly sized flue system is required for safe operation of the heater.

The flue MUST be installed in accordance with national and local regulations.

An improperly sized flue system can cause unsafe conditions and/or create condensation.

Failure to provide proper flueing arrangements could result in death, serious injury and/or damage to property.

It is important to ensure that there is an adequate clean air supply at all times for both combustion and heating requirements. Modern buildings involve greater use of insulation, improved vapour barriers and weather proofing. These practices mean that buildings are sealed much tighter than in the past.

Proper combustion air supply for a power vented Type B installation requires ventilation of the heated space. Natural infiltration of air may not be adequate. Use of exhaust fans aggravates this situation.

It is important to ensure that there is adequate combustion air supply at all times. Reliance on doors and windows is not permitted.

Ensure that an adequate clean air supply for combustion and ventilation is provided within the building in accordance with the relevant rules and regulations in force.

Where multiple or modular heaters are served by a common flue system, a flue draught stabiliser must be installed at the flue connection off each heater to prevent cross contamination of flue products from one heater to the other.

Single wall flue pipe exposed to cold air or run through unheated areas must be insulated. Where condensation is unavoidable, provision must be made for the condensation to flow freely to a point to which it can be released, i.e. a drain or gully.

The condensation drain from the flue must be constructed from non-corrodible material not less than 20 mm diameter. Copper or copper-based alloys must not be used for condensation drains.

Flue gas properties are given in table 2 : Nominal combustion values and flue gas properties on page 9 of this manual.

Table 10 below shows flue pipe sizes and maximum vent lengths. The minimum flue length is 0.5 metres.

4.8 Type B appliances

If the heater is to be installed internally as a Type B appliance, air for combustion will be taken from within the space where the heater is installed.

Single wall seamless aluminium or stainless steel flue pipes are required. All joints must be sealed to prevent the products of combustion from leaking into the building. If the flue passes through a combustible element of the building it must be enclosed in a sleeve of non-combustible material and separated from the sleeve by a minimum of 25 mm air break. The temperature of any combustible material near to the flue must not exceed 65°C when the heater is in operation. The flue must be at least 150 mm away from any combustible material.

Single wall flue pipe exposed to cold air or run through unheated areas should be insulated. Where condensation is unavoidable, provision must be made for the condensation to flow freely to a point to which it can be released, i.e. a drain or gully. The condensation drain from the flue must be constructed from non-corrodible material not less than 20 mm diameter. Copper or copper based alloys must not be used for condensation drains.

Vertical flue runs greater than 3m long will require a condensate drain fitting between the flue outlet of the heater and the vertical flue pipe. Alternatively, insulated flue pipe should be considered.

Horizontal flue runs should be installed with a slight gradient of approximately 5° towards the terminal. Due consideration should be given to the possibility of condensation from the flue freezing on any footpaths that pass below the terminal.

It is important to ensure that there is an adequate air supply at all times for both combustion and heating requirements.

Ensure that the air combustion inlet opening at the heater cannot be obstructed.

4.9 Type C appliances

If the heater is to be used internally in a Type C balanced flue application, it must be fitted with a combustion air inlet duct that obtains outdoor air and a flue pipe that exhausts flue products to outdoors.

RHC21 Model		4024-05	4036-08	4050-06	4060-07	4075-09	4100-12	4125M15	4150M18
Heater socket and flue diameter	mm	100	130						
Maximum straight length two pipes (combustion air inlet and flue outlet pipe) with wall or roof terminal (Type C appliance	m	9.0							
Maximum straight length single pipe (flue outlet pipe) with wall or roof terminal	m	9.0							
Equivalent length of 45° elbow	m	0.75							
Equivalent length of 90° elbow	m	1.5							
Minimum flue length	m	1.0							

Table 9 : Flue Diameter and Flue Pipe Lengths

Single wall seamless aluminium or stainless steel flue pipes are required. All joints must be sealed to prevent the products of combustion from leaking into the building. If the flue passes through a combustible element of the building it must be enclosed by a sleeve of non-combustible material and separated from the sleeve by a minimum of 25 mm air break. The temperature of any combustible material near to the flue must not exceed 65°C when the heater is in operation. The flue must be at least 150 mm away from any combustible material.

Single wall flue pipe exposed to cold air or run through unheated areas should be insulated.

Where condensation is unavoidable, provision must be made for the condensation to flow freely to a point to which it can be released, i.e. a drain or gully. The condensation drain from the flue must be constructed from non-corrodible material not less than 20 mm diameter. Copper or copper based alloys must not be used for condensation drains.

Vertical flue runs greater than 3m long will require a condensate drain fitting between the flue outlet of the heater and the vertical flue pipe. Alternatively, insulated flue pipe should be considered.

Horizontal flue runs should be installed with a slight gradient of approximately 5° towards the terminal.

Due consideration should be given to the possibility of condensation from the flue freezing on any footpaths that pass below the terminal.

4.10 Gas supply

Note : gas service connection Rc ½ for model RHC21 4024-05, Rc ¾ for models RHC21 4036-08 to 4100-12 inclusive and Rc 1¼ for models RHC21 4125M15 and 4150M18.

RHC21 4000 air heaters are designed to operate on natural gas (G20 / G25 / G25.3). Refer to the specifications in section 2 of this document and to the data plate for details of supply pressures.

A competent and/or qualified engineer is required to either install a new gas meter to the service pipe or to check that the existing meter is adequate to deal with the rate of gas supply required. Installation pipes should be fitted in accordance with national standards so that the supply pressure, as stated in the technical data section will be achieved.

It is the responsibility of the competent engineer to ensure that other relevant standards and codes of practice are complied with in the country of installation. Pipes of smaller size than the heater inlet gas connection must not be used. The complete installation must be tested for soundness as described in the country of installation. Support gas piping with pipe hangers, metal strapping, or other suitable material.

Do not rely on the heater to support the gas pipework installation.

Before installation, check that the local distribution conditions, nature of gas and pressure, and adjustment of the appliance are compatible.

This appliance is designed for a maximum gas supply pressure of 50mbar. When pressure testing the supply piping with test pressures above 50mbar, disconnect the heater and manual valve from the gas supply line that is to be tested. Cap or plug the supply line.

To facilitate servicing, the air heater must be fitted with an approved gas service tap and union fitting or union tap adjacent to the appliance.

The inlet gas supply line must be installed so as to permit the access door to be opened and to allow removal of slide out burner assembly.

Check that the gas category is in accordance with the data described on the air heater.

An adequate gas supply sized to provide the dynamic pressure for the volume required for the air heater(s) is essential to maintain the nominal heat input.

Other gas fired plant using the same gas service must also be taken into account.

A 90° action, positive stopped gas service tap must be fitted adjacent to the appliance, fitted in a manner to facilitate appliance burner removal for service purposes, see figure 6.

Ensure that the gas service includes a filter and has been tested and purged in accordance with prescribed practice prior to commissioning and taking the appliance into service.

As a rule, gas service pipes should not be routed through air ducts. Should it be necessary to do so then pipe work joints must not be made within the air duct.

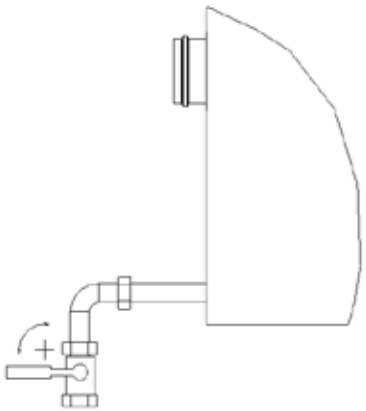


Figure 6 Gas connection detail
Rc ½ for model RHC21 4024-05, Rc ¾ for models RHC21 4036-08 to 4100-12 inclusive and Rc 1¼ for models RHC21 4125M15 and 4150M18

4.11 Electrical supply

The electrical installation may only be carried out by an appropriately qualified person in accordance with the current Rules and Regulations in force.

This appliance must be earthed.

Check the electrical specification is in accordance with the specification on the appliance data plate. A unique appliance wiring diagram is supplied as a separate document.

A constant 230 volt 50 Hertz single phase with neutral link fused electricity supply is required. All heaters and controls must be earthed.

A lockable isolator with contact separation of at least 3.0 mm on all poles should be installed adjacent to the appliance and within reach of any person working on the heater.

When a number of heaters are to be connected as part of a single installation each heater must be provided with a separate isolator.

The final connection must be made in the terminals provided in the control compartment. Follow the wiring diagram provided with the air heater and the air handler.

Electrical supply cable conductor size should be 1.5 mm. The length of conductors between the cord grip and the terminals must be such that in the event that the cable becomes taut the line conductors do so before the earth conductor.

Check that the air heater is well earthed and that an earth leakage test is carried out.

An external green indicator light is fitted on the heater section to signify when the burner is ON.

An external burner reset switch with red indicator light is fitted on the unit. To add a remote reset button, make connections to the terminals in the heater as indicated on the wiring diagram.

If the reset button requires activating for any reason, the cause must be determined. After determining and correcting the problem, restart the heater and monitor for a period long enough to ensure proper operation (approximately 5 minutes).

Ensure that all cables and installers wiring are appropriately fixed and that they do not touch the flue or combustion collector box.

To ensure that the unit is airtight, all unused cable couplings must be hermetically sealed.

Permanent damage can occur to the ignition controller when faulty/incorrect connections to the thermostat, reset switch or burner failure lamp are made!

Switching of wires for reset switch and flame failure will destroy the ignition controller.

4.12 Electrical isolator

Ensure that an electrical Isolator with two pole separation with a minimum air break between poles of 3.0 mm has been fitted adjacent to the air heater.

4.13 Installation of multiple heaters

Multiples of RHC21 4000 series heaters may be installed in series or parallel. In this instance, each heater MUST BE provided with flue, gas, electrical, control and condensate connections in the manner described in this section.

Where multiple heaters are installed, they MUST BE commissioned and set up as Master and Slave units in the same manner described for modular heaters in sections 5.6 and 5.9 following. Where multiple heaters are installed in series, the Master heater should be installed on the outlet side of the air handling unit or plenum.

4.14 Room space / duct sensor siting

Each module requires a 0-10V DC control signal in order to operate. A room space / duct thermostat / sensor should be used to ensure the correct room space / duct temperature is achieved.

The siting of the room thermostat (if used) is important. Do not fit on an outside wall. Avoid location in draughty areas or where it may be influenced by heat sources e.g. the sun, etc.

Do not attempt to control more than one heater module from a room thermostat or control panel unless the control system is designed to do so. Follow instructions supplied with such panels.

Thermostat(s) and/or temperature sensor(s) should be mounted on a vibration free surface. Room thermostat(s) / sensor(s) should be mounted about 1.5m above floor level. Follow the thermostat manufacturers fitting instructions.

It is essential the main input line and neutral to terminals L and N remains live at all times even when the appliance is switched off; this is to ensure correct operation of the unit.

4.15 Wiring Diagrams

A unique wiring diagram has been separately provided for the heater.

4.16 Condensate Collection and Disposal

The RHC21 4000 has an integral 22mm condensate discharge pipe, which the installer should connect to the nearest foul drainage point as part of a suitably designed condensate disposal system. A trap must be fitted inline before connecting to a drain point. Where modular or multiple heaters are installed, a condensate trap MUST be fitted to each heater.

A condensate disposal system that relies on gravity should be satisfactory for most installations. If a gravity system is not possible, a condensate pump must be installed. There are a number of commercially available pumps made for this purpose. If using a condensate pump,

follow the pump manufacturer's installation recommendations.

The condensate water coming from the heater has a pH-level of approx 4.6 and can affect materials made from zinc and/or copper, hence it is strongly advised against letting the condensation water flow off through the gutter without a condense neutralizing kit (by others) being fitted.

A condensate discharge extension kit is available for those instances when the discharge pipe needs to be located outside the air handling unit.

Ensure correct disposal of condensate is carried out in accordance with local and national legislation/regulatory requirements.

Traps must be fitted to each heater and filled with water prior to use.

5 Commissioning and testing

RHC21 4000 heaters must be commissioned before putting into service.

Commissioning and testing must only be carried out by suitably trained and qualified personnel.

This section should be read and fully understood before commencing commissioning and testing.

5.1 Electrical Check

After completion of the installation and before switching on the electrical supply to the appliance, a qualified electrician must carry out a preliminary check. The following must be checked:

- Check that electrical cables/wiring do not touch the 'hot' combustion collector box or flue and fix them on the gas pipe;
- Check that all wiring is connected in accordance with the appliance circuit diagram;
- Ascertain that the correct fuse value and cable size has been provided;
- Check to ensure that the appliance is earthed by conducting an earth continuity test. Connect a test meter, one lead to the appliance earth terminal and the other to the mains incoming earth point at the electrical isolator. A resistance reading of 1.0 ohm or less must be indicated. If a higher reading is obtained, check all cable connections to ensure adequate security and cleanliness. If problem still exists, it may be necessary to consult the electricity supply undertaking;
- Carry out a polarity test. Connect one lead of a suitable AC voltmeter to earth and connect the other lead to the live supply terminal (L) at the air heater;
- Switch ON the power to the air heater and check for correct voltage. The same result should be obtained by connecting the test leads between live and neutral. Connect the voltmeter test leads to N and E. A reading of + 0V should be obtained. If these tests do not conform with the above, there is a fault which must be rectified before proceeding further with the commissioning;
- Check that a suitable thermostat or control panel has been fitted;
- Ensure that an electrical isolator with two pole separation with a minimum air break between poles of 3.0 mm has been fitted adjacent to the air heater.

5.2 Gas connection

Gas service connection Rc ½ for model RHC21 4024-05, Rc ¾ for models RHC21 4036-08, 4050-06, 4060-07, 4075-09 and 4100-12 and Rc 1¼ for models RHC21 4125M15 and 4150M18.

Only persons formally qualified to work on gas fired apparatus may carry out commissioning and testing. The whole of the gas service installation including the meter must be inspected, tested for soundness and purged in accordance with appropriate requirements by a qualified person.

Never use a flame for checking gas soundness

5.3 Pre-start checks

Prior to starting up the unit, carry out the following checks:-

- Do not use this appliance if any part has been subjected to water ingress. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control.
- Check gas pipework for leaks and correct gas line pressure.
- Purge gas lines of trapped air.
- Check electrical wiring and ensure that wiring conforms to the wiring diagram. Be sure that all cables are correctly sized to meet the requirements of the units.
- Verify that the appliance is earthed by conducting an earth continuity test.
- Ensure that fuses are of the correct rating and fuse value.

- Check polarity. Verify that line voltage exists between the live terminal L1 and earth ground.
- Check ignition controller program key matches the resistance value as shown in Combustion data table for the heater model.
- Ensure that the air discharge louvres are open.
- Check that no combustibles are near to the unit. Requirements are in the location and installation section of this manual.
- Check vent system to be sure that it is installed according to the combustion air supply instructions given in the installation section of this manual.
- Press LC3 thermostat reset button to ensure it is not in lockout.

5.4 Start-up

For your safety, follow the instructions exactly otherwise damage or injury could occur!

During start up all gas services (up to the gas meter) must be checked again for gas soundness to ensure no leaks are present.

1. Turn on the gas supply and check for gas leaks. Ensure that all pressure test points are closed and gas tight.
2. Switch on the electrical supply.
3. Set the room thermostat to call for heat at high fire (10V).
4. If the red light next to the lockout reset switch is illuminated, press and hold it for 3 seconds, then release. If the light does not go off see Fault Finding section.
5. From initial power up there can be a delay of up to 2 minutes before the heater will respond to a heat demand. During this time, the ignition controller performs a self diagnostic routine.
6. The combustion fan will now run and the burner will automatically light after about 35 seconds. The air circulation fan will run within 30 seconds.
7. If the installation is new, three start-up cycles may be necessary due to air still being present in the gas pipe. Should the air heater still not light, refer to Fault Finding section.
8. The gas pressure must correspond to the data in table 3 on page 9. If the gas pressure is higher than 50mbar, a pressure regulator must be installed. If the gas pressure is lower than the minimum as shown on the data plate, check the supply pipework to ensure it is correctly sized. Gas pressure should be checked with the appliance running at maximum heat load.

When overheating occurs, shut the manual gas tap before turning off the electric power.

5.5 Air / gas ratio controls

RHC21 4000 appliances are fitted with air-gas ratio control devices with two adjustments - throttle and offset.

Throttle is adjusted at high fire.

Offset is adjusted at low fire.

5.6 Modular Heaters

For modular models (RHC21 4125M15 and 4150M18) and where multiple heaters are installed in series or parallel, the gas valves should be individually adjusted / commissioned. M series products have a Master and Slave burner arrangement. Each burner has its own individual air-gas ratio control. Multiple heaters need to be set up in a Master / Slave arrangement.

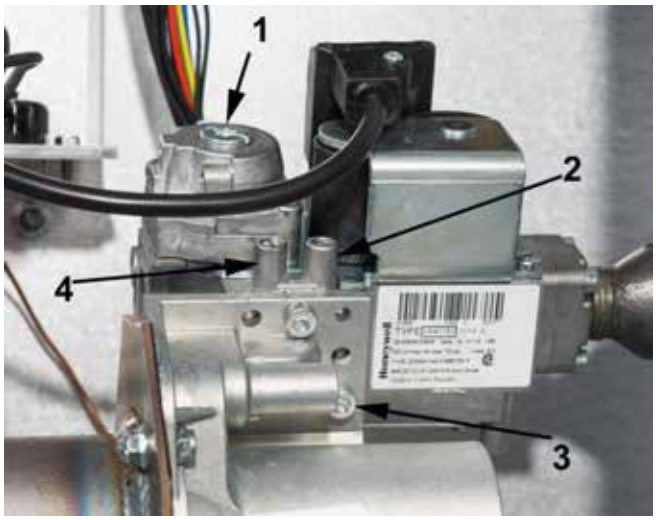
5.7 Gas valve adjustment

All units are set before leaving the factory. Any modification must be carried out by a suitably qualified technician.

All models with the exception of RHC21 4100-12

To adjust the throttle use a 4mm hex key on the screw located on the venturi. Rotate counter clockwise to increase %CO_2. Rotate clockwise to decrease %CO_2.

To adjust the offset, use a T40 Torx key to remove the protection cap on the gas valve. Rotate counter clockwise to decrease pressure / %CO_2 and rotate clockwise to increase pressure / %CO_2. Refit cap after adjustment.



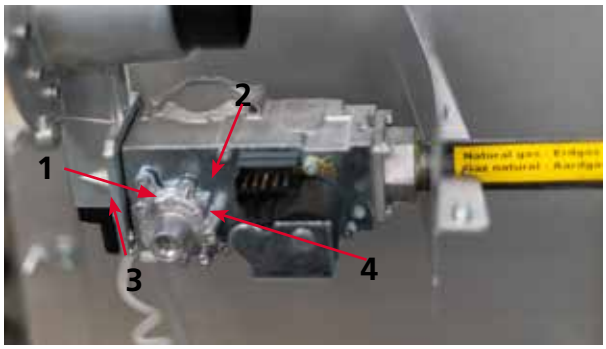
1 - Offset adjustment
2 - Inlet pressure measuring point
3 - CO_2 adjustment point (throttle)
4 - Offset pressure measuring point

Figure 7: Gas valve adjustment. Note that there are two valves on the modular heaters (RHC21 4125M15 and 4150M18)

Model RHC21 4100-12

To adjust the throttle use a 4mm hex key on the screw located on the venturi. Rotate clockwise to increase %CO_2. Rotate counter clockwise to decrease %CO_2.

To adjust the offset, use a T40 torx key to remove the protection cap on the gas valve. Rotate counter clockwise to decrease pressure / %CO_2 and rotate clockwise to increase pressure / %CO_2. Refit cap after adjustment.



1 - Offset adjustment
2 - Inlet pressure measuring point
3 - CO_2 adjustment point (throttle)
4 - Offset pressure measuring point

Figure 8: Gas valve adjustment model RHC21 4100-12

5.8 Gas conversion

RHC21 4000 heaters are designed to operate on natural gas types G20, G25 and G25.3.To modify for use on an alternative listed gas type, follow the commissioning guide and refer to the Combustion Data table adjacent for approximate throttle turns from G20 setup.

The data label needs to be updated after conversion. Using permanent ink place an 'X' in the box above the relevant gas type column to indicate the new gas setting. Obscure any previous indication.

Upon completion of conversion recommission the heater. Refer to the commissioning section for more details.

Model		4024-05	4036-08	4050-06	4060-07	4075-09	4100-12	4125M15	4150M18
CO2 at High Fire (Throttle) G20	%	8.80	8.70	8.80	8.80	8.80	8.50	8.50	8.50
CO2 at High Fire (Throttle) G20 Both Burners *	%	N/A	N/A	N/A	N/A	N/A	N/A	8.50	8.50
CO	ppm	< 50 ppm							
Throttle turns from closed Top Burner		N/A	N/A	N/A	N/A	N/A	N/A	5.5 out	6.5 out
Throttle turns from closed Bottom / Single Burner		4.25 out	5.75 out	6.0 out	7.5 out	7.5 out	28.0 in	6.25 out	6.5 out
CO2 at Low Fire (Offset) G20	%	7.90	7.90	7.90	7.90	7.0	7.60	7.90	7.90
CO2 at Low Fire (Offset) G20 Both Burners *	%	N/A	N/A	N/A	N/A	N/A	N/A	7.90	7.90
CO	ppm	< 50 ppm							
Low Fire Offset Pressure (G20) Top Burner	Pa	N/A	N/A	N/A	N/A	N/A	N/A	-5	-19
Low Fire Offset Pressure (G20) Bottom / Single Burner	Pa	-7	-7	-18	-36	-38	-21	-13	-16
CO2 at High Fire (Throttle) G25	%	8.80	8.70	8.80	8.80	8.80	8.50	8.50	8.50
CO2 at High Fire (Throttle) G25 Both Burners *	%	N/A	N/A	N/A	N/A	N/A	N/A	8.50	8.50
CO	ppm	< 50 ppm							
Throttle turns from G20 Top Burner		N/A	N/A	N/A	N/A	N/A	N/A	1.75 out	2.5 out
Throttle turns from G20 Bottom / Single Burner		1.5 out	2.25 out	1.75 out	3.5 out	2.5 out	6.5 in	3.0 out	2.5 out
CO2 at Low Fire (Offset) G25	%	7.90	7.90	7.90	7.90	7.90	7.60	7.90	7.90
CO2 at Low Fire (Offset) G25 Both Burners *	%	N/A	N/A	N/A	N/A	N/A	N/A	7.90	7.90
CO	ppm	< 50 ppm							
Low Fire Offset Pressure (G25) Top Burner	Pa	N/A	N/A	N/A	N/A	N/A	N/A	-5	-19
Low Fire Offset Pressure (G25) Bottom / Single Burner	Pa	-7	-7	-18	-36	-38	-21	-13	-16
CO2 at High Fire (Throttle) G25.3	%	8.80	8.70	8.80	8.80	8.80	8.50	8.50	8.50
CO2 at High Fire (Throttle) G25.3 Both Burners *	%	N/A	N/A	N/A	N/A	N/A	N/A	8.50	8.50
CO	ppm	< 50 ppm							
Throttle turns from G20 Top Burner		N/A	N/A	N/A	N/A	N/A	N/A	1.5 out	2.25 out
Throttle turns from G20 Bottom / Single Burner		1.0 out	2.0 out	1.5 out	3.0 out	2.25 out	6.0 in	2.25 out	2.25 out
CO2 at Low Fire (Offset) G25.3	%	7.90	7.90	7.90	7.90	7.90	7.60	7.90	7.90
CO2 at Low Fire (Offset) G25.3 Both Burners *	%	N/A	N/A	N/A	N/A	N/A	N/A	7.90	7.90
CO	ppm	< 50 ppm							
Low Fire Offset Pressure (G25.3) Top Burner	Pa	N/A	N/A	N/A	N/A	N/A	N/A	-5	-19
Low Fire Offset Pressure (G25.3) Bottom / Single Burner	Pa	-7	-7	-18	-36	-38	-21	-13	-16
Flue Gas Temperature High Fire ΔT	°C	169	166	150	147	151	150	173	160
Flue Gas Temperature Low Fire ΔT	°C	35	30	29	39	29	28	31	28

Model		4024-05	4036-08	4050-06	4060-07	4075-09	4100-12	4125M15	4150M18
Thermal Efficiency High Fire NCV	%	91.57	91.31	92.41	92.61	92.24	92.14	91.00	91.74
Thermal Efficiency Low Fire NCV	%	98.17	98.32	98.43	97.94	98.40	98.42	98.32	98.49
Ignition Controller Program Key Top Burner	Ω	N/A	N/A	N/A	N/A	N/A	N/A	15,000	33,000
Ignition Controller Program Key Bottom Burner	Ω	1,000	2,200	3,300	4,700	6,800	10,000	22,000	33,000

Service door closed
%CO2 tolerance ± 0.1
* For M Series appliances running with both burners %CO2 tolerance is ± 0.25

Table 10 : Nominal Combustion Values with service door closed

5.9 Commissioning

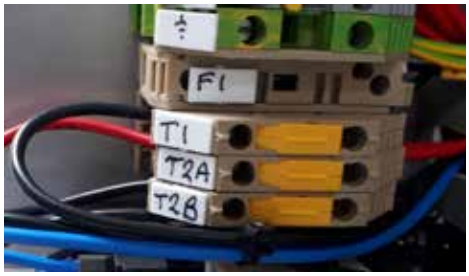
General

Commissioning requires the use of a CO/CO_2 flue gas analyser with an inaccuracy < 0.1% and two pressure gauges. For measuring gas pressure a resolution of 0.1 mbar or better is recommended. For measuring offset pressure a low range gauge with a resolution of 1 Pa or better is required.

M series heaters / multiple heaters

Modular M Series heaters have two burners which must be commissioned sequentially, a Master (Burner 1) controlled by contact T1 in the control section and a Slave (Burner 2) controlled by contacts T2A and T2B. Where multiple heaters are installed, they MUST BE set up as a Master / Slave in a similar manner.

Model	Master (Burner 1)	Slave (Burner 2)
4125M	Bottom	Top
4150M	Bottom	Top



T1, T2A and T2B contacts all closed

The Master burner MUST be commissioned first. To commission the master burner, isolate the Slave burner by opening contact T1.

Unplug the 3-pole plug supplying power to the combustion fan of burner 2. Once the Master burner is running, the venturi of the Slave burner needs to be covered ; e.g. use adhesive tape.

T1 contact open, T2A and T2B closed

Unplug 3 pole plug

Large venturi covered with tape

Small venturi covered with tape

With the Slave burner isolated, commission the Master burner following the commissioning procedure given overleaf.

Once the Master burner has been commissioned, the Slave burner must be commissioned. To commission the Slave burner, the Master burner must be isolated. To isolate the Master burner and commission the Slave, close contact T1 and open T2A and T2B. Remove the adhesive tape covering venturi 2 and reconnect the 3-pole plug to the combustion fan. Unplug the 3-pole plug supplying power to the combustion fan of burner 1. Once the Slave burner is running, the venturi of the Master burner needs to be covered, e.g. use adhesive tape.

T2A and T2B contacts open, T1 closed

With the Master burner isolated, commission the Slave burner following the commissioning procedure given overleaf. When the Master and Slave have individually been commissioned, the correct operation of the complete appliance must be verified in the following manner:-

1. Ensure T1, T2A and T2B are all closed, and a heat demand is present.
2. The Master burner will fire first followed by the Slave after a short delay.
3. Check the CO/CO_2 values to ensure safe operation of the appliance. See Table 10 previously.
4. At high fire, if CO_2 reading with both burners running is greater than 0.25 of target value, but less than 9.00% (e.g. target value 8.50% CO_2, measured value 8.80% CO_2), then a small reduction of throttle to both burners can be performed.

The throttle reducing turns should be applied equally to both the top and bottom burners as follows: -

Model	Max Top Burner Throttle Reduction	Max Bottom Burner Throttle Reduction	Turn Ration Between Top and Bottom
4125M	0.5 turns	0.5 turns	1:1
4150M	0.5 turns	0.5 turns	1:1

Note the correct direction of throttle rotation for the model being commissioned (see section 5.7).

5. If high fire CO_2 reading with both burners running is greater than 9.00% CO_2, repeat individual burner commissioning.
6. At low fire, if CO_2 reading with both burners running is within 0.25 of the target value, then no further adjustments are required. If outside of +/-0.25 the offset can be adjusted on both burners equally to fine tune the low fire CO_2.
7. Recheck CO_2 at high fire and fine tune if necessary.
8. Shutdown both burners and perform a restart. Check that both burners have a smooth ignition.

Isolate power supply before opening and closing contacts T1, T2A and T2B.

The Master and Slave burners are interlocked. If one burner does not fire or proceeds to lockout, the other burner will cease to function.

Commissioning procedure

Read section on air-gas ratio control adjustment before proceeding.

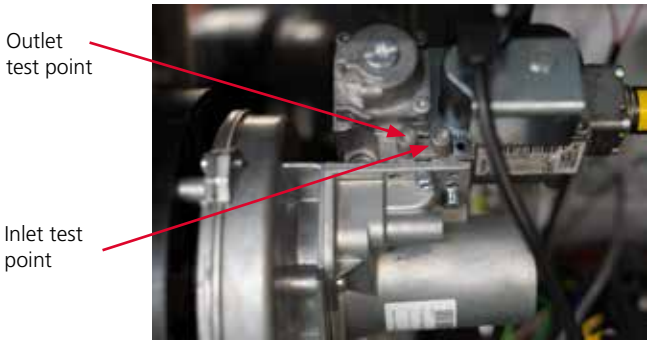
During commissioning the appliance $\%CO_2$, CO ppm and flue gas temperature values should be compared to those shown in the Combustion Data

Slacken screw in gas valve inlet pressure test point and attach gas pressure gauge.

1. Start the appliance following the start up procedure.
2. Ensure the thermostat is set to call for maximum heat (10V). For optimal appliance control during commissioning the 0-10VDC thermostat inputs can be substituted with a manually adjustable 0-10VDC generator wired into the burner terminals 66 & 64 (see wiring diagram).
3. Check gas supply pressure against the values on the data plate. If gas supply pressure is too low, shut-down the unit and correct.
4. Put CO/CO_2 analyser probe into flue. Observe the CO/CO_2 readings and adjust throttle screw until nominal high fire $\%CO_2$ value is achieved +/- 0.1$\%CO_2$ (see Combustion Data for details). If the venturi has been replaced it can be approximately set by fully closing and then adjusting the throttle a set number of turns as indicated in the combustion data table.

If the chamber insulation has been replaced the organic binders will burn off during the first few minutes of operation. This will result in a temporary increase in CO and CO_2 readings.

5. Keep appliance running at full rate until completely stabilised and recheck $\%CO_2$. If necessary make further adjustments to throttle before proceeding.
6. Slacken screw in gas valve outlet pressure test point and attach low range pressure gauge. Note, offset is a vacuum reading.



Gas pressure test points for all RHC21 4000 models except RHC21 4100-12

Gas pressure test points for model RHC21 4100-12

To set low fire adjust thermostat to call for minimum heat (1V):-

- Adjust offset screw to obtain nominal offset pressure +/- 5 Pa (See Combustion Data for details).
- Observe the CO/CO_2 readings and adjust offset screw if needed to obtain nominal low fire $\%CO_2$ (+/-0.1$\%CO_2$).
- Return heater to high fire (10V) and recheck high fire $\%CO_2$ value. If necessary make any final adjustments to the throttle.
- Disconnect pressure gauges and tighten screws in gas valve test points.
- Remove heat demand and allow heater to shut-down.
- Reconnect thermostat connections if bypassed for commissioning.

5.10 Commissioning - hand over

Upon full and satisfactory completion of commissioning, a record of commissioning information should be left with the person responsible for the heater. The commissioning engineer must ensure that the user is familiar with the safe and efficient use of the heater, detailing the function of all controls and main components.

The user should be made aware of the following in particular: -

(i) Lighting, shutdown, and operational information.

(ii) Safety features, data plate, and labelling.

(iii) The requirement for regular inspection - especially if the heater is within a more demanding environment - and the need for regular servicing carried out by a suitably qualified person.

A commissioning record sheet is provided at the end of this manual.

5.11 Operation

The appliance requires a 0-10VDC signal to control the burner. A value > 1.0VDC will indicate a heat demand and the combustion fan will start the pre-purge.

Before an ignition attempt the combustion fan slows to ignition speed. When the ignition speed has been reached the burner will attempt ignition.

If ignition is unsuccessful there will be another purge followed by ignition. The total number of ignition attempts before lockout is 3.

The spark electrode stays energised throughout the ignition attempt, even if the flame has been established.

Once the flame has been sensed the burner will run at the ignition speed for a few seconds to allow the flame to stabilise. Following flame stabilisation the fan speed will increase to high fire to allow the heat exchanger to warm up quickly.

After a short delay the air movement fan will start. Once warm up has completed the burner is released to the control of the 0-10VDC thermostat and will modulate to the requested heat demand.

The burner will begin to modulate before the set temperature has been reached. At this point the burner rate will adjust according to the heat demand from the thermostat.

When set point temperature is reached the burner will turn off and the appliance will post-purge to dissipate any residual heat.

If, for any reason, the burner flame is extinguished during a run cycle, an automatic attempt at re-ignition will take place. If after three ignition attempts the burner does not relight, safety shut down and lockout will occur. Manual intervention to reset will be necessary to put the unit back into service.

In the event of overheating for any reason, overheat controls operate to switch off the burner.

The limit control LC3, which operates at a higher temperature setting, switches off the burner to a lockout condition requiring a thorough check of the heater and a manual reset via the LC3 limit control body followed by the lockout reset switch. A cooling time of about 3 minutes is necessary before resetting.

The appliance is fitted with an LED status light. This can be used to determine the current status of the appliance and help to diagnose fault conditions. See Figure 9 : LED Status table overleaf for more information.

The burner should be run for a minimum of 3 minutes after start up by the control system to prevent condensate forming.

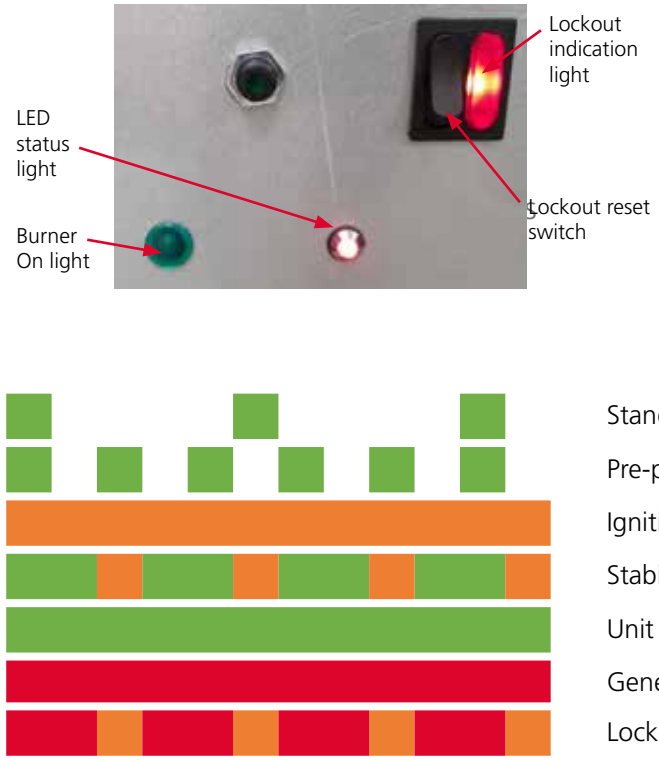


Figure 9 LED Status

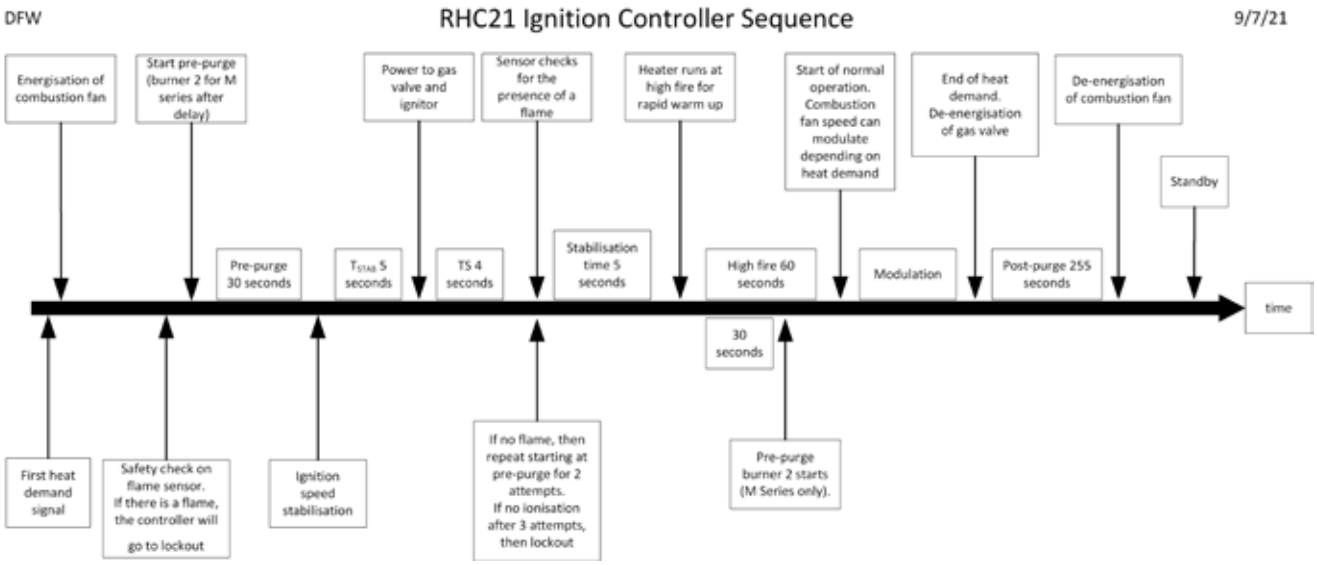
5.12 To turn the air heater OFF for short periods

Adjust the room thermostat to its lowest setting or 'OFF'. The fan will continue to run to cool the heater and then switch OFF automatically (or follow the instructions of the air handling unit). To relight, reset the thermostat.

5.13 To turn the air heater OFF for long periods

Adjust the room thermostat to OFF or its lowest setting. When the fan has stopped, turn OFF the gas supply and then switch OFF the electricity supply to the air heater (or follow the instructions of the air handling unit).

Gas and electricity must only be turned off in case of emergency or for prolonged periods of shutdown.

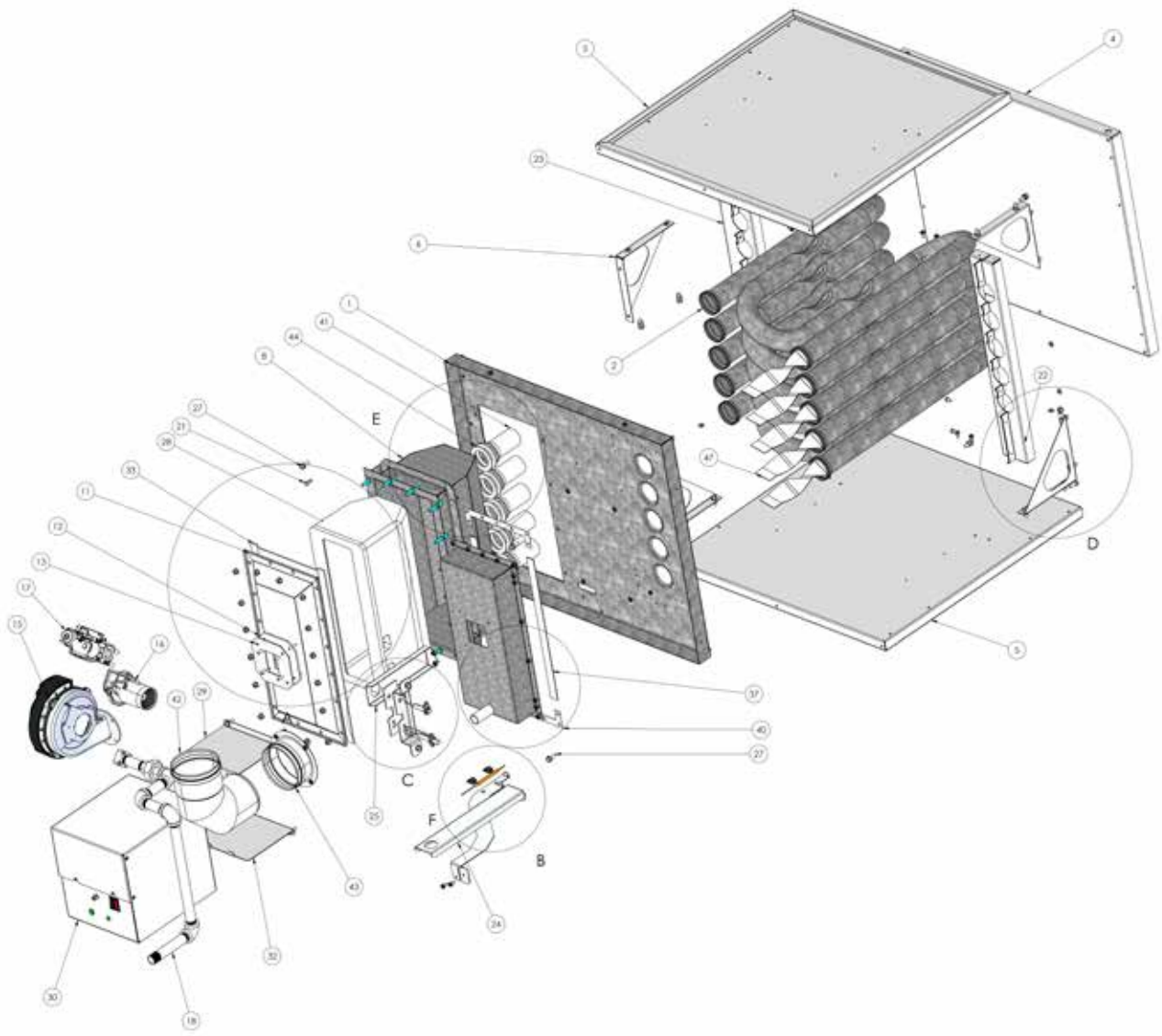


Start position	The system is not in lock-out and can proceed with the start up sequence upon a demand for heat
Pre-purge time	This is a period of 35 seconds during which the combustion fan operates prior to activation of the ignition device.
Safety time	The safety time is the delay between the gas valve being energised and the flame sensor checking for the presence of a flame. This is a period of 4 seconds. Note : if no flame is sensed, the burner controller will attempt ignition 3 times before going into lock-out mode.
Post-purge time	This is the time of 255 seconds between burner shut-down and the moment the combustion fan is de-energised.

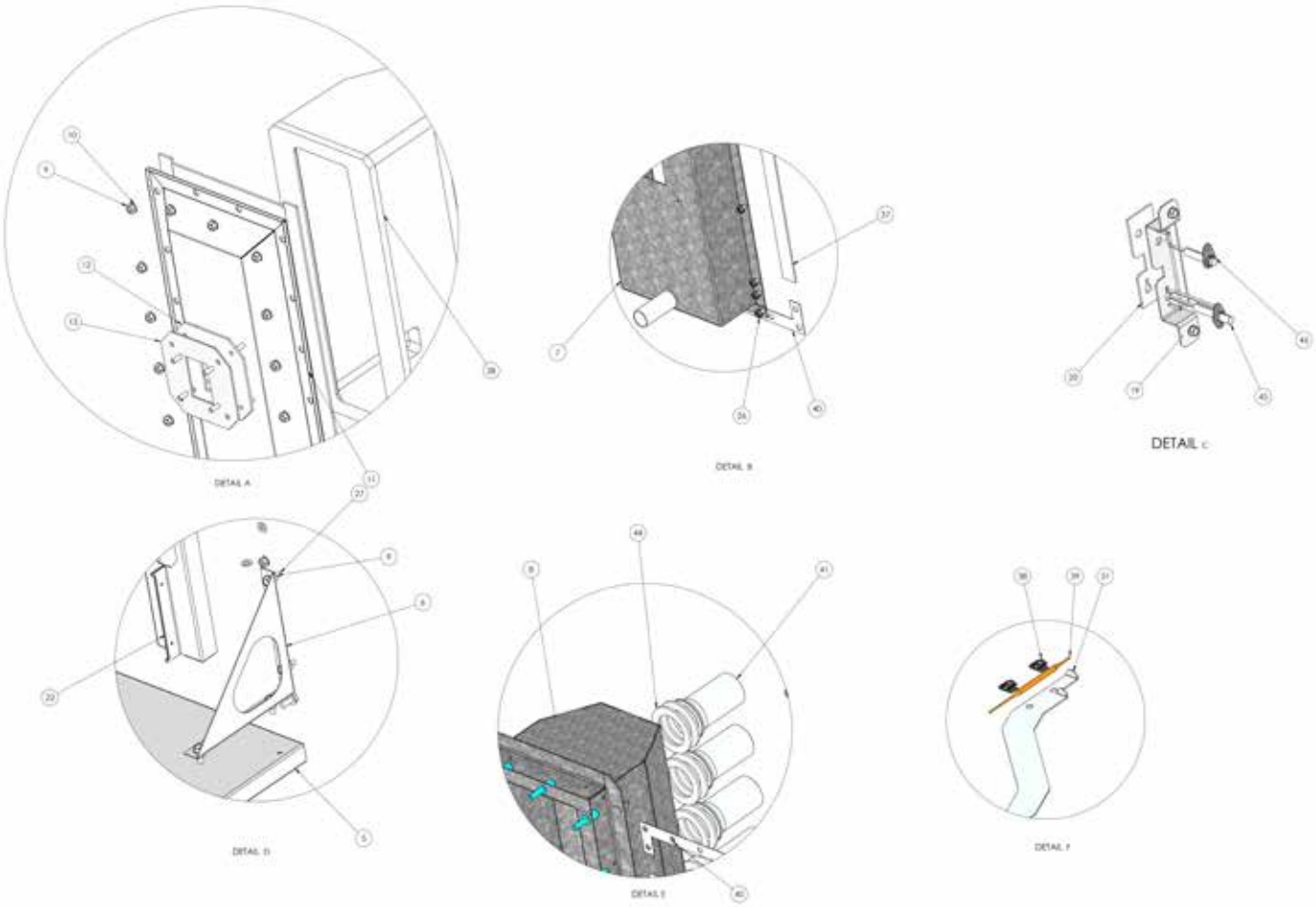
Figure 8 Ignition system timetable

6 Servicing and maintenance

RHC21 4024-05 component layout

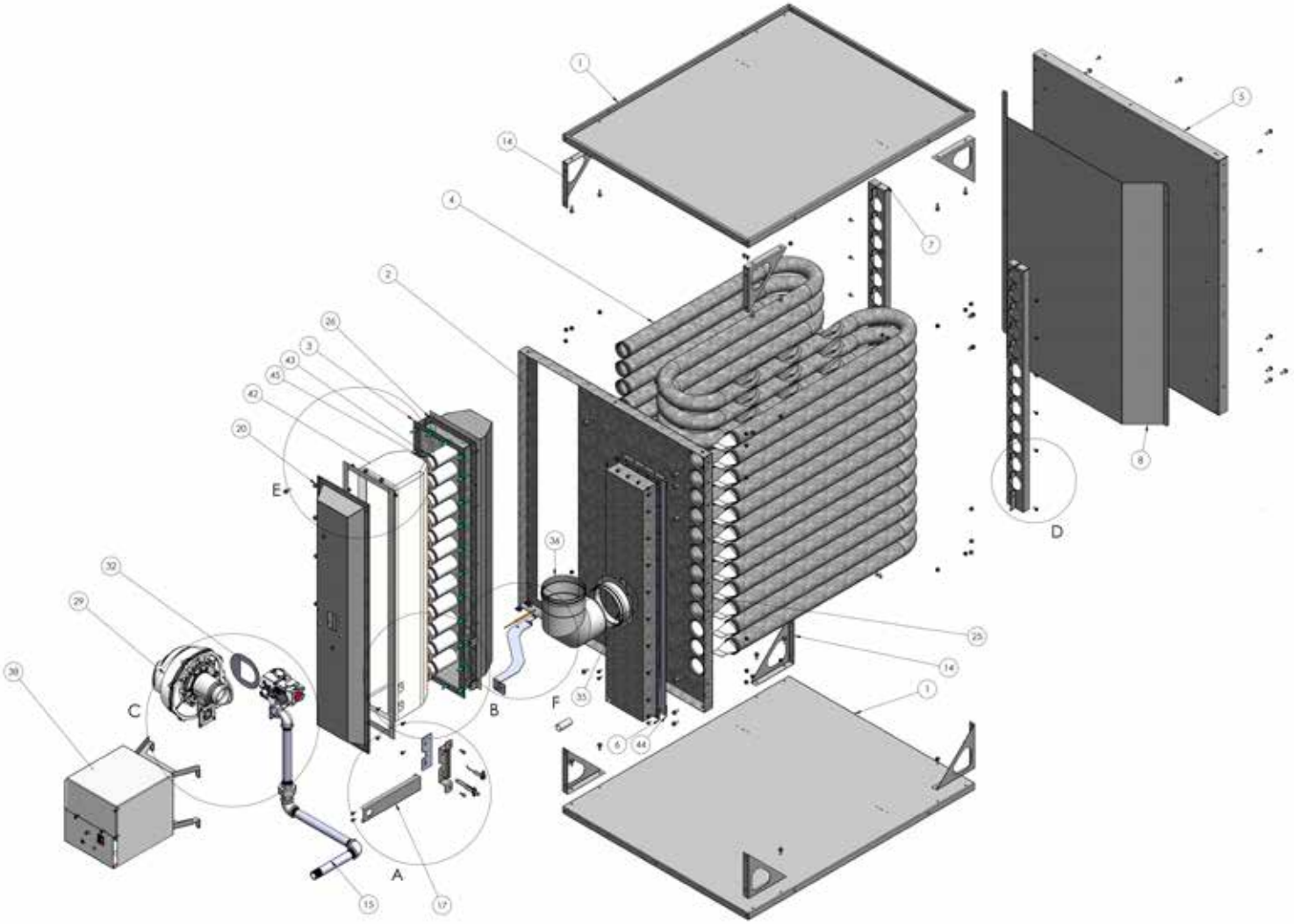


Ref	Description	Ref	Description
1	Header panel assembly	13	Fan transition plate assembly
2	Tube	14	Fan - transition plate gasket
3	Blind rivet but	15	Combustion fan
4	Rear panel	16	Venturi fix kit
5	Top / bottom panel	17	Gas valve
6	Corner bracket	18	Gas train assembly
7	Collector box assembly	19	Probe bracket assembly
8	Burner chamber assembly	20	Ignition probe & flame sensor ceramic paper
9	Hex fullnut	21	Hex screw
10	Washer	22	Tube support
11	Burner	23	Tube left support
12	Transition plate - burner gasket	24	Gas pipe bracket bottom

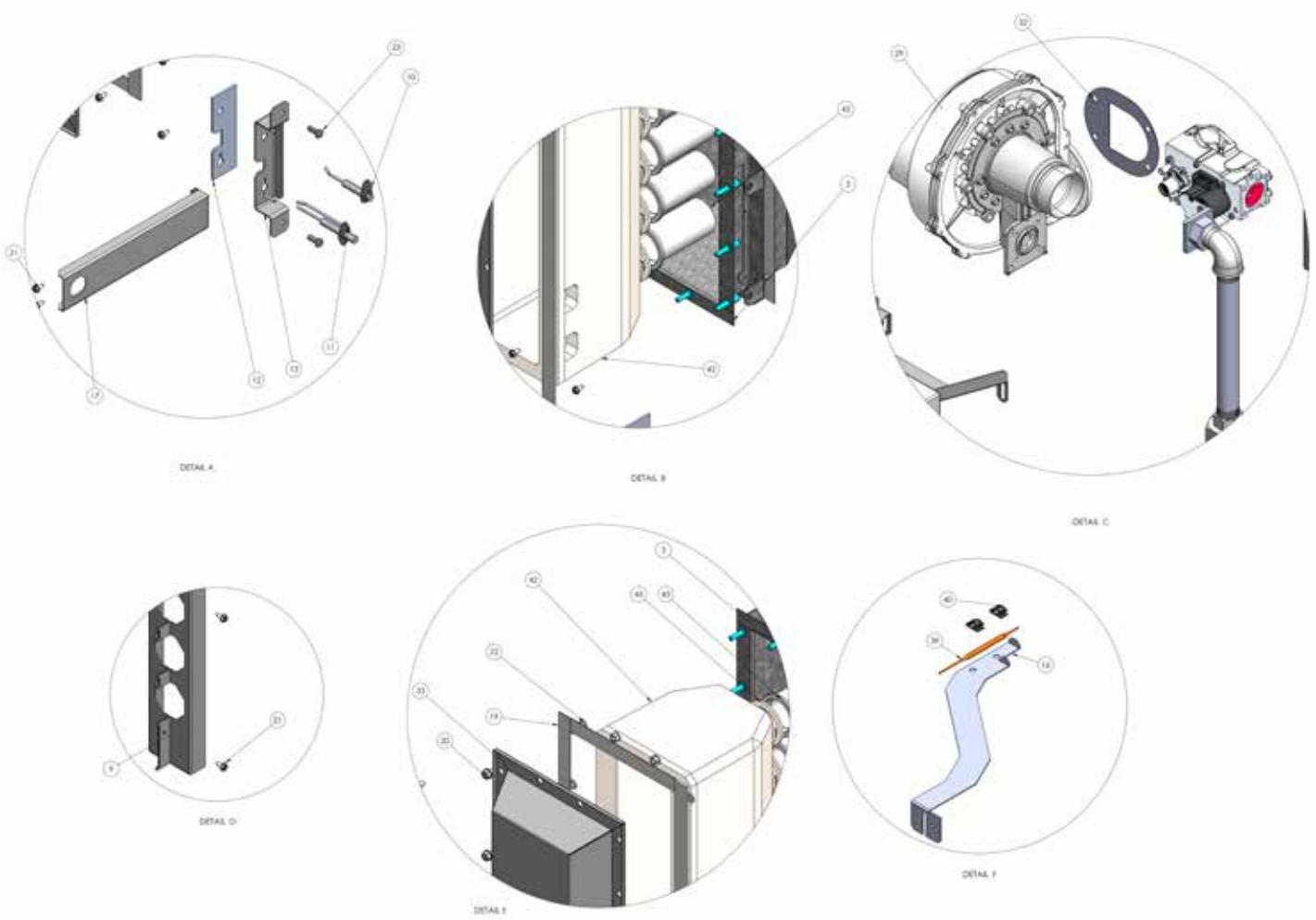


Ref	Description	Ref	Description
25	Gas pipe bracket top	37	Gasket
26	Tapitscrew	38	Clips
27	Taptite	39	LC3 limit controller
28	Tube burner insulation	40	U shape silicon gasket
29	Control box bracket	41	Burner tube insert
30	Control box assembly with controller	42	Stainless steel elbow 90°
31	Thermostat bracket	43	Stainless steel spigot
32	Control box bracket bottom	44	Insulation ring
33	Ceramic paper gasket with adhesive	45	Spark igniter
34	Ceramic paper gasket with adhesive	46	Flame sensor
35	Ceramic paper gasket with adhesive	47	Turbulator / baffle
36	Ceramic paper gasket with adhesive		

RHC21 4036-08, 4050-06, 4060-07, 4075-09 and 4100-12 component layout

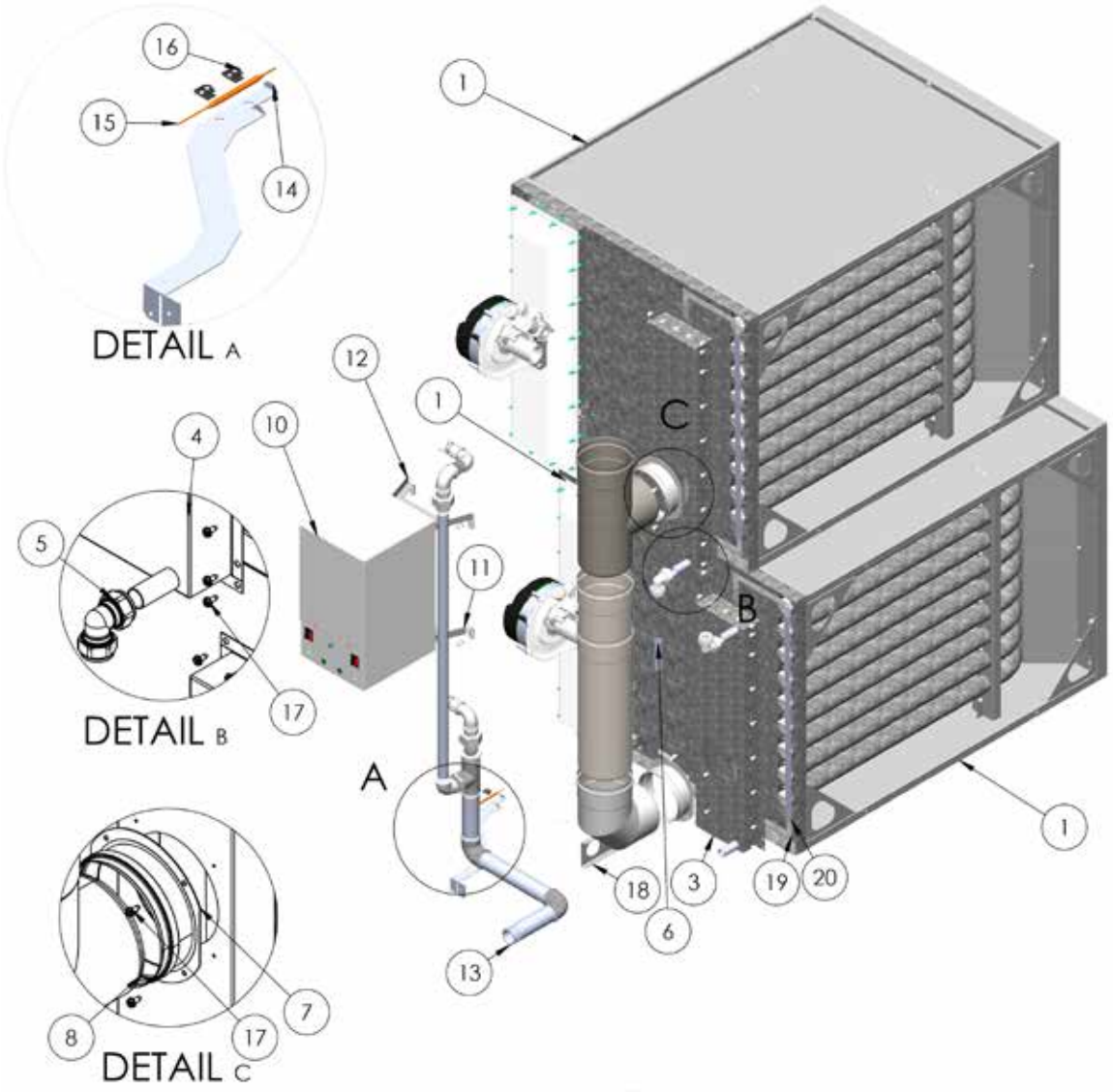


Ref	Description	Ref	Description
1	Top / bottom panel	13	Probe bracket assembly
2	Header panel	14	Corner bracket
3	Burner chamber assembly	15	Gas train assembly
4	50mm tube	16	Thermostat bracket
5	Rear panel	17	Gas train bracket
6	Collector box assembly	18	Nyloc nut
7	Tube support	19	Ceramic paper gasket with adhesive
8	Rear shield	20	Taptite screw
9	Tube support 2	21	Tapitscrew
10	Flame sensor	22	Washer
11	Spark igniter	23	Hex screw
12	Ignition probe and flame sensor ceramic paper	24	Hex fullnut



Ref	Description	Ref	Description
25	Turbulator / baffle	37	Control box bracket
26	Ceramic paper gasket with adhesive	38	Control box assembly with controller
27	Ceramic paper gasket with adhesive	39	LC3 limit control
28	Silicon foam gasket	40	Clips
29	Combustion fan	41	Ceramic paper gasket with adhesive
30	Gas valve	42	Burner insulation
31	Venturi	43	2" tube insert
32	Fan trans plate gasket	44	U shaped silicon gasket
33	Burner	45	2" Tube insert gasket
34	Control box bracket		
35	Stainless steel 304 spigot		
36	Stainless steel 304 elbow		

RHC21 4125M15 and 4150M18 component layout



Ref	Description	Ref	Description
1	Unit assembly	13	Gas train assembly
2	Limit stat bracket	14	Thermostat bracket
3	Bottom collector box assembly	15	LC3 limit controller
4	Top collector box assembly	16	Clips
5	Brass elbow	17	Tapitscrew
6	Stainless steel 304 tube	18	Gas train bracket
7	Stainless steel 304 spigot	19	U shape silicon gasket
8	Stainless steel 304 tee	20	Silicon foam gasket
9	Stainless steel 304 90° elbow	21	Hex fullnut
10	Double control box assembly with controller	22	Not used
11	Control box bracket	23	Stainless steel 304 adjustable flue
12	Control box bracket	24	Washer

6 Servicing and maintenance

Only appropriately qualified persons may carry out servicing and fault finding on this gas fired equipment.

Before commencing service ensure that both the gas and the electricity are turned and switched "OFF" and that the air heater has cooled down.

Inadvertent substitution or replacement of components similar to those specified or replacement in a manner contrary to the method herein described could constitute a hazard and lead to prosecution.

Always consult your distributor at the slightest doubt.

RHC21 4000 air heaters will operate with a minimum of maintenance. To ensure long life and satisfactory and safe performance, an air heater that is operated under normal conditions should be inspected and cleaned at the start of each heating season. If the air heater is operated in an area where unusual amounts of dust, etc. are present in the air, more frequent servicing is recommended.

When any service is completed, be sure that components are reassembled correctly to ensure that no unsafe condition exists.

Upon completion of the service carry out the commissioning instructions outlined in section 5 of this document.

Excessive dirt build up on the inside of the burner ports could cause unburned gas to spill out of the back of the burner tube causing a fire or explosion. To prevent this occurring, clean all of the burner ports at least annually.

When cleaning air heaters, wearing of eye protection and a dust face mask is recommended.

6.1 Service procedure

The following procedures should be carried out at least annually:

- Check the heat exchanger internally and externally for evidence of physical damage.
- Check the burner for scale, dust, or lint accumulation. Clean if required.
- Check the vent or vent/combustion air system for soundness. Replace any parts that do not appear sound.
- Check the wiring for any damage. Replace damaged wiring.

6.2 Heat exchanger maintenance

Remove any external dirt or dust accumulation. Visually check the heat exchanger for cracks and holes. If a crack or hole is observed, replace the heat exchanger.

7 Removal and replacement of parts

RHC21 4000 air heaters must only be fitted with authorised replacement parts. These heaters must use certificated spare parts to comply with legislation.

7.1 Replacement of gas valve

1. Unplug the gas valve and combustion fan power cables.

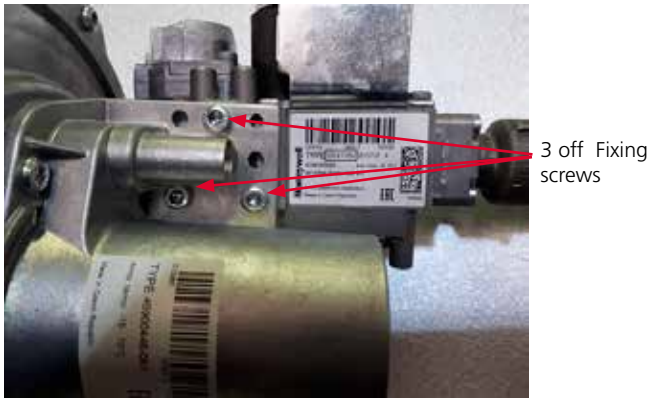
2. Disconnect the gas supply union inside the cabinet and unscrew the gas pipe.

3. Unscrew the outer 8mm nuts securing the combustion fan to the burner.

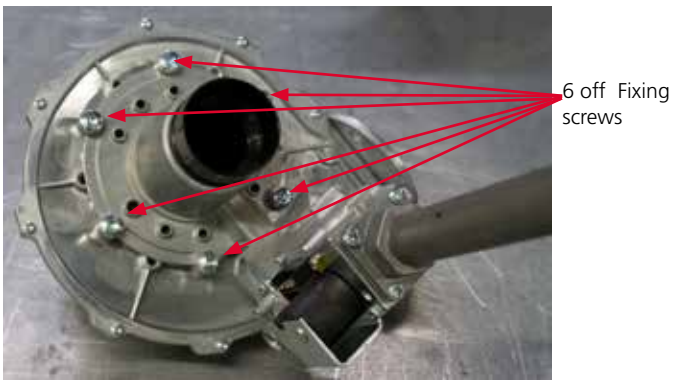
4. Remove the gas valve / combustion fan assembly from the unit.

RHC21 4000 all models except 4100-12 gas valve flange assembly

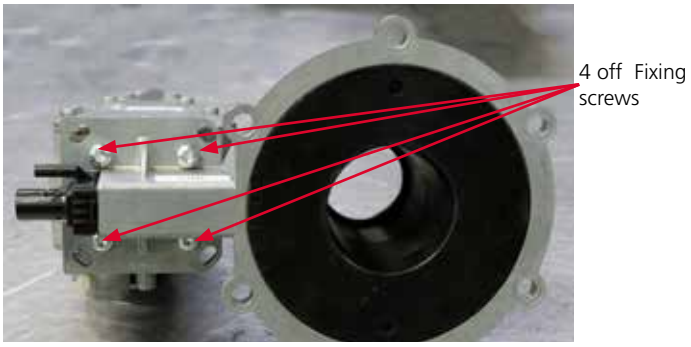
5. The gas valve can now be disconnected from the venturi by removing the fixing screws. There are 3 screws on the gas valves for all RHC21 models with the exception of the 4100-12. There are 4 screws on the RHC21 model 4100-12 gas valve. To gain access to the venturi fixing screws on the gas valve for the RHC21 model 4100-12, the combustion fan must be first removed.



RHC21 all models except 4100-12 gas valve fixing screws

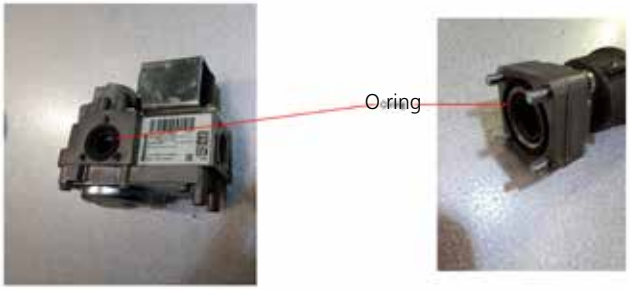


RHC21 model 4100-12 remove combustion fan to reveal gas valve fixing screws

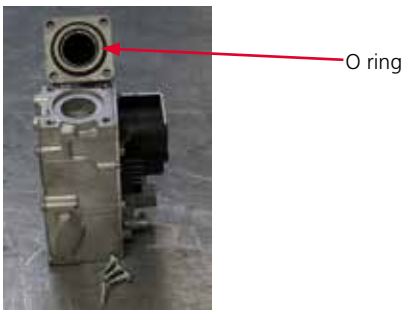


RHC21 models 4100-12 gas valve fixing screws

6. The gas supply pipe with flange can be removed by unscrewing the 4 fixings. Do not lose the o-ring seal.



RHC21 4000 all models except 4100-12 gas valve inlet flange assembly. Note that there are two gas valves on RHC21 4125M15 and 4150M18

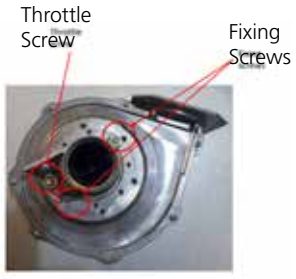


RHC21 model 4100-12 gas valve inlet flange assembly

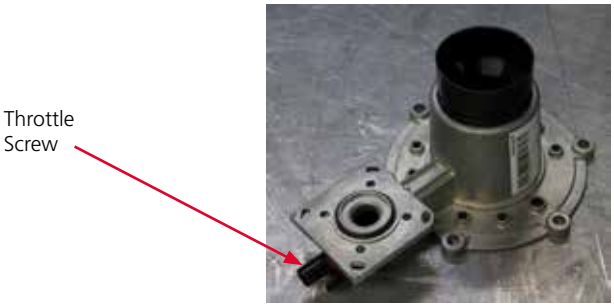
7. Refit gas valve in reverse order ensuring the o-ring is fitted between the gas valve and venturi.
8. Follow start up and commissioning procedures.

7.2 Venturi cleaning and replacement

1. Clean the venturi inlet with a lint free cloth.
2. For replacement follow steps 1 to 5 from gas valve replacement.
3. Separate the venturi from the combustion fan by removing the fixings (3 screws RHC21 4000 all models except 4100-12 and 6 screws RHC21 models 4100-12 as per the photographs shown under gas valve replacement).



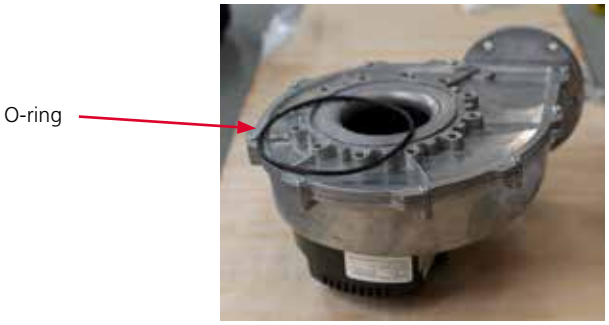
RHC21 4000 all models except 4100-12 venturi



RHC21 model 4100-12 venturi

4. Before fitting new venturi, ensure throttle screw is fully closed (turn throttle clockwise for all RHC21 4000 models except 4100-12 and anticlockwise for RHC21 model 4100-12. Do not overtighten.
5. Replace cork gasket all RHC21 4000 models except 4100-12 or o-ring on RHC21 model 4100-12, 8175M21 (1 off valve) and 8200M24 (2 off valves)) between combustion fan and venturi.

RHC21 4000 all models except 4100-12 combustion fan

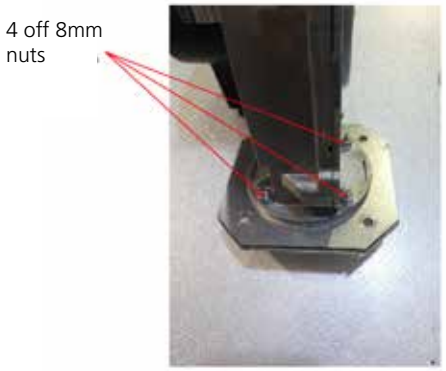


RHC21 model 4100-12 combustion fan

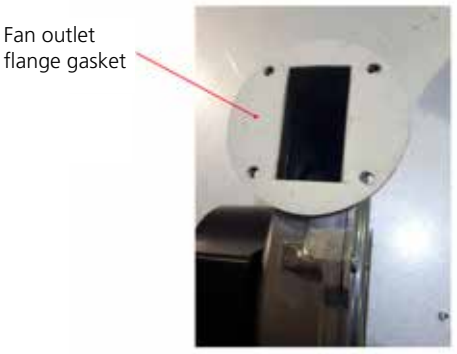
6. Refit remaining items in reverse order.
7. Follow start up and commissioning procedure.

7.3 Combustion fan cleaning and replacement

1. Follow steps 1 to 4 from gas valve replacement and step 3 from venturi replacement.
2. Clean fan body with a lint free cloth and blow any dirt out of the wheel using compressed air (air should not exceed 1.5 bar).
3. Check condition of fan wheel. If damaged replace fan.
4. On RHC21 4000 all models except 4100-12 there is a mounting plate that will need to be transferred across to the new fan. There is no mounting plate fitted to the 4100-12.
5. To remove unscrew the 8mm nuts.



6. Attach new gasket to fan outlet flange (all models). Fit mounting plate to all RHC21 4000 models except RHC21 4100-12, where there is no mounting plate.



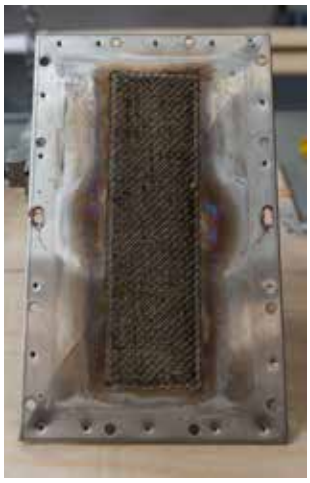
7. Refit remaining items in reverse order.
8. Follow start up and commissioning procedure.

7.4 Burner cleaning and replacement

1. Follow steps 1 to 4 from gas valve replacement.
2. Unscrew the burner fixings with a deep 10mm socket.

3. The burner can now be removed.
4. Rinse the burner body with clean water and dry.
5. Inspect the burner for cracks, holes or splits in the mesh. If damaged the burner should be replaced.

Burner with face insulation in place



Burner with face insulation removed

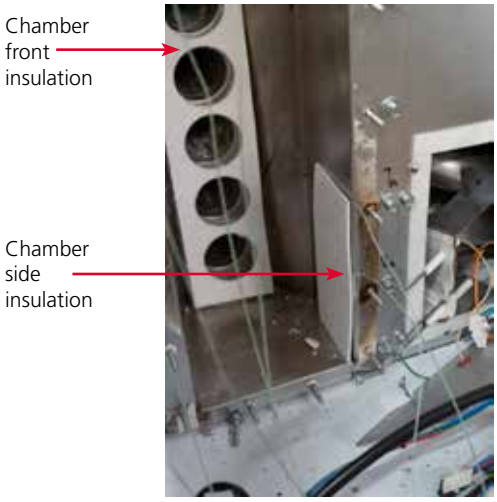
7. The burner mesh can be cleaned by either placing it under clean running water or by immersing it in a container full of clean water. The burner should be allowed to dry naturally or be blown dry using compressed air (drying air should not exceed 1.5 bar).
8. Replace the burner gasket if necessary.
9. Refit in reverse order.
10. Follow start up and commissioning procedure.

7.5 Burner chamber / tube insulation check and replacement

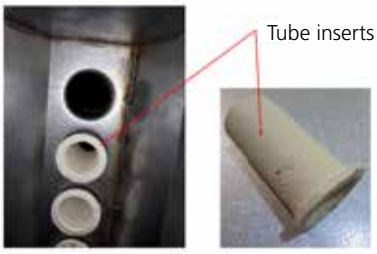
1. The insulation material is a mixture containing Refractory Ceramic Fibres (RCF) / Alumino-Silicate Wools (ASW). Do not handle until all safety instructions have been read.
2. Wear appropriate PPE such as gloves, protective clothing, eye protection, and respiratory protection. Follow all local regulations and industrial hygiene standards.
3. Handle insulation with care to minimise airborne dust.
4. Dispose of waste in accordance with local regulations, such as a landfill licensed for this purpose.
5. Unless wetted, such waste may be dusty and should be properly sealed in containers for disposal.
6. The Material Safety Data Sheet is available from the appliance manufacturer.

7. With the burner removed the integrity of the combustion chamber and tube insulation can be verified. It is normal for small superficial cracks to be present in the surface of the insulation.

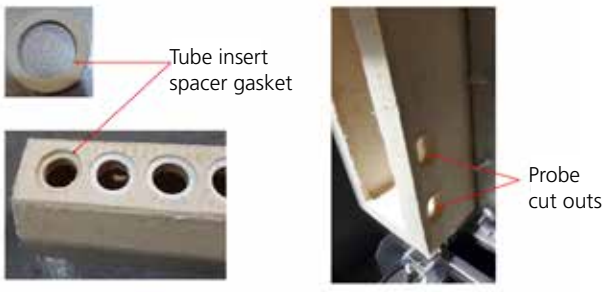
8. Remove any debris from inside the burner chamber. A vacuum with a minimum of M Class dust extraction rating can be used. Do not use compressed air.
9. Check the integrity of the insulation. Use a torch to inspect the insulation sleeves fitted into each tube. Broken tube inserts or the presence of deep cracks or warping indicate that the insulation needs to be replaced.
10. To remove the chamber insulation the burner probes must first be removed. See cleaning and replacement of burner probes for procedure.
11. With the burner probes removed the insulation block can be pulled out from the chamber. This will reveal two additional thin strips of insulation material. The first is located at the front of the chamber where the tubes are secured. The second is located on the lower right side of the chamber where the probes are normally located. It is recommended that both of these thin insulation strips are replaced whenever the cast insulation block is removed. Ensure the lower right insulation strip has the preformed holes lined up with the probe holes in the side of the chamber.



12. The tube inserts can now be accessed and withdrawn from the tubes.



13. Refit replacement tube inserts, tube insert spacer gaskets and chamber insulation ensuring the chamber insulation is correctly orientated, so the cut outs line up with the burner probe position.

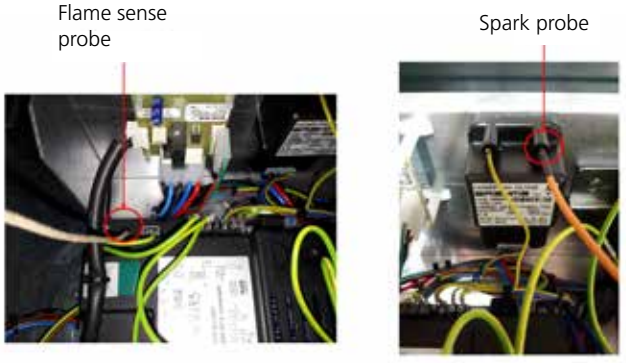


14. Confirm the tube inserts slot into the corresponding recess in the front face of the chamber insulation block and gently pull them towards the chamber insulation. Ensure there are no gaps between the chamber insulation and tube inserts. Up to three tube insert spacer gaskets may be needed per tube insert.

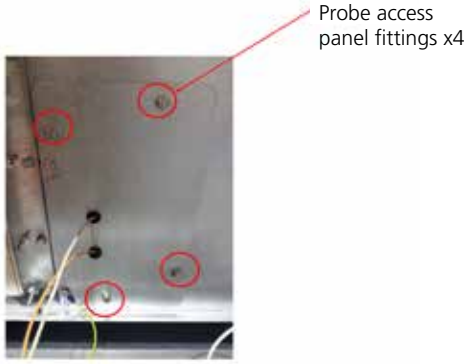
15. Refit burner probes. Check condition of probe bracket gasket and replace if necessary.
16. Replace the burner gasket if necessary.
17. Refit in reverse order.
18. Follow start up and commissioning procedure.

7.6 Cleaning and replacement of burner probes

1. Disconnect the spark and flame sense cables from the ignition transformer and ignition controller.



2. Unscrew 4 fixings with 10mm socket to remove the probe access panel.



3. Once removed unscrew the 2 fixings with a 10mm socket to release the probe mounting bracket.

4. Pull probe mounting bracket away from the burner chamber to extract the burner probes.

5. The burner probe assembly can now be removed from the heater.
6. Review the condition of the probes. Light oxidation can be removed with a fine abrasive paper.
7. Measure the length of each probe and check against the dimensions given below. If probes are corroded or damaged in any way, they will need to be replaced.

Flame probe

Length of probe =

46.55mm overall

32.95mm to angle

13.79 mm angle to tip

Tip deflection away from 0° = 27°

8. Check spark gap against dimensions below, if necessary, adjust using long nose pilers. Be careful not to crack the ceramic sleeve.

Spark probe

Length of probe =

78.5mm long probe

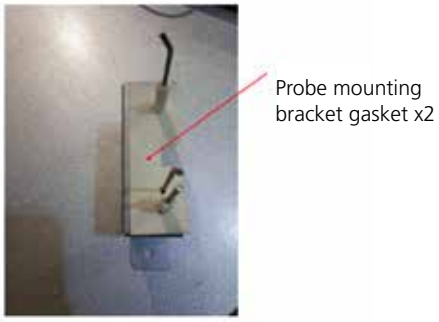
42.3mm short probe

3.5±0.5 mm gap between probes

Angle of probe = 20°

9. To replace the probe, unscrew the 7mm nut to release the probe from the bracket and change.

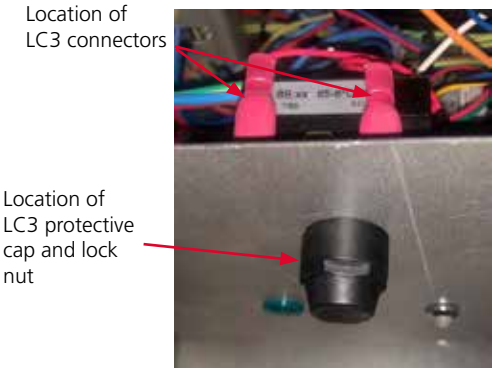
10. Check condition of probe bracket gasket and replace if necessary.



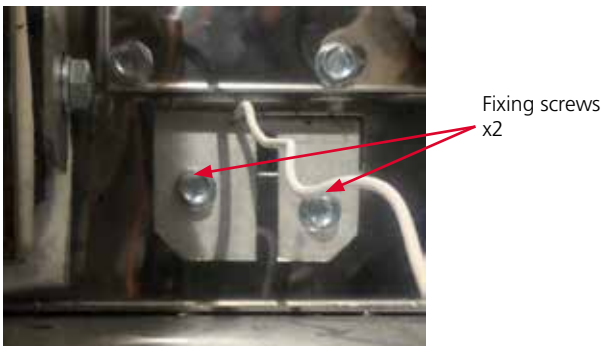
11. Refit all parts in reverse order.
12. Follow start up and commissioning procedure.

7.7 Replacement of LC3 safety thermostats

1. Disconnect LC3 electrical connectors.
2. Remove LC3 protective cap and lock nut.



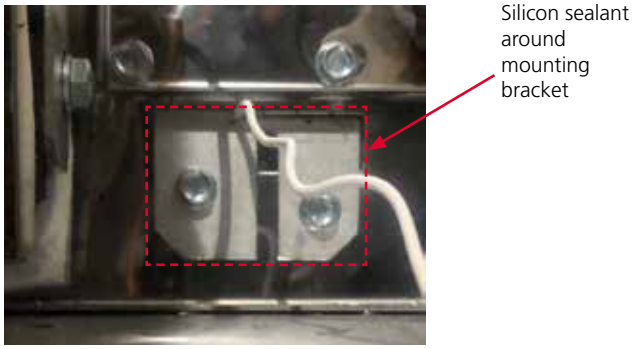
3. Unscrew the 2 fixings from the mounting bracket.



4. Withdraw mounting bracket from heater.

Thermostat mounting bracket

5. The thermostats can now be removed from the mounting bracket.
6. Replace one or both thermostats as needed. Ensure sensor is pushed up to the return at the end of the bracket and secured in place with the retaining clips. Replace clips if necessary. Ensure thermostat is held tightly by the retention clips. It may be necessary to close the clips with pliers before fitting the thermostat.
7. Refit all parts in reverse order. Press LC3 button to reset thermostat.
8. Seal gaps around thermostat mounting bracket with silicone sealant to maintain the integrity of the burner compartment.



9. Follow start up and commissioning procedure.

7.8 Replacement of ignition controller

1. Disconnect all electrical connections.
2. Unscrew fixings located in the corners of the controller.
3. Remove program key and refit into new controller.
4. Fix new controller to electrical panel and reattach all wiring.
5. Follow start up and commissioning procedure.

7.9 Replacement of ignition transformer

1. Disconnect all electrical connections.
2. Unscrew fixings and remove transformer.
3. Refit in reverse order.
4. Follow start up and commissioning procedure.

7.10 Replacement of lockout circuit board

1. Disconnect all electrical connections.
2. Pinch circuit board retention clips to release.
3. Refit in reverse order.
4. Follow start up and commissioning procedure.

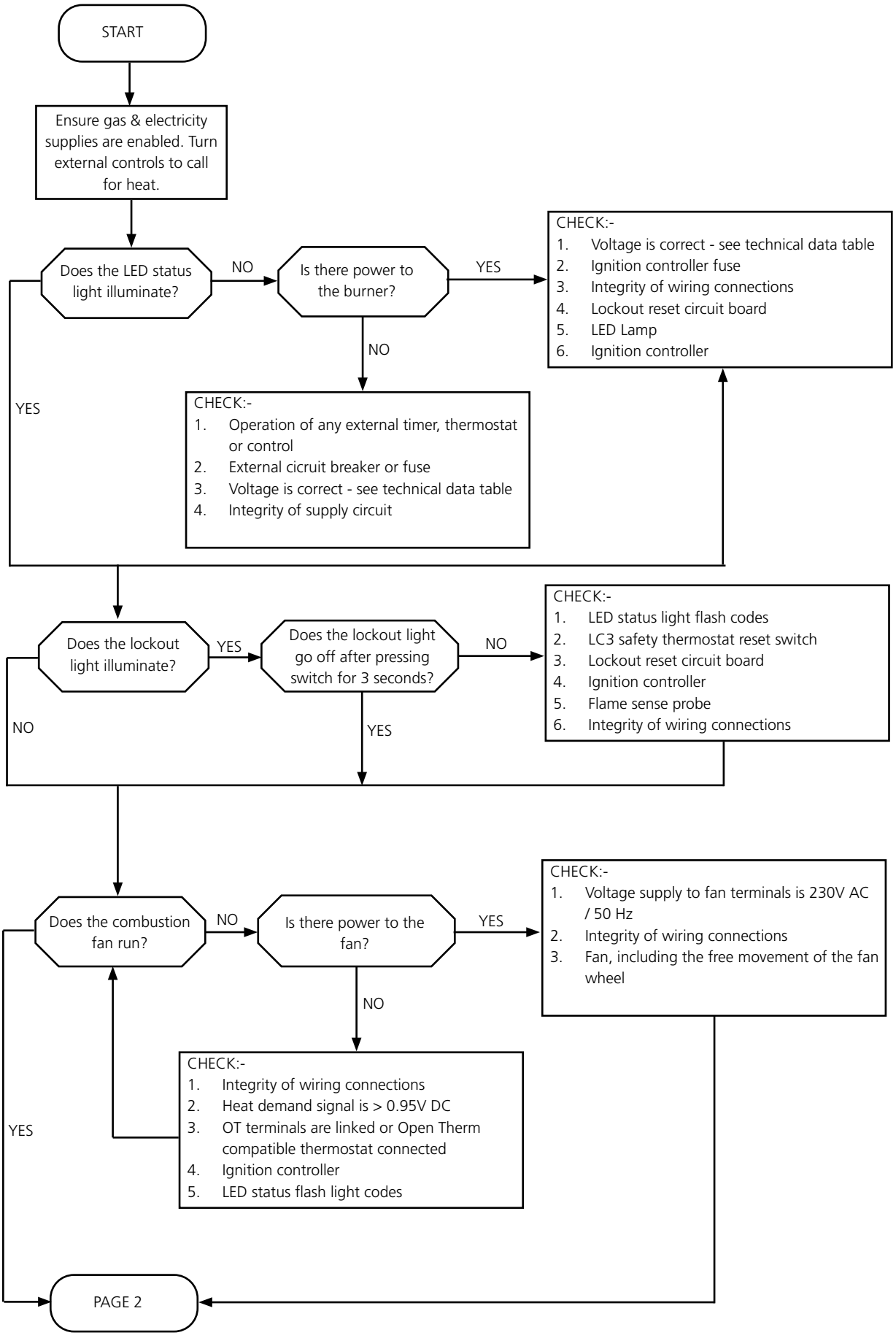
7.11 Flue and combustion air

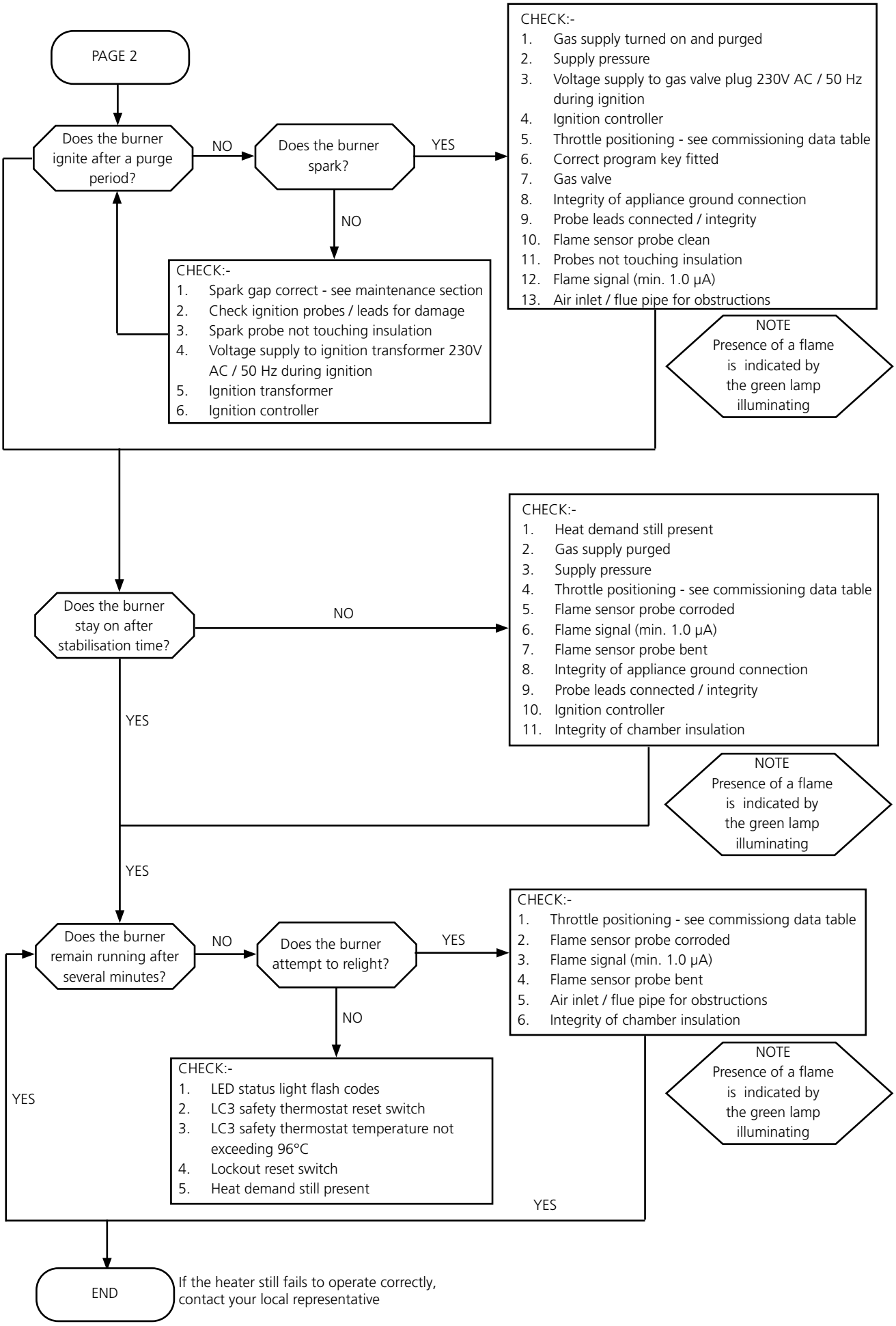
Check the complete system at least once a year. The inspection should include all joints, seams, concentric adapters and the flue terminal cap. Replace any defective or heavily corroded parts.

7.12 Unit operation

The combustion and correct operation of the appliance should be verified as a part of the normal service routine. Follow the steps in the start up and commissioning procedures to verify.

8. Fault finding




PAGE 2
Does the burner ignite after a purge period?
NO
Does the burner spark?
YES
NO
CHECK:-
1. Gas supply turned on and purged
2. Supply pressure
3. Voltage supply to gas valve plug 230V AC / 50 Hz during ignition
4. Ignition controller
5. Throttle positioning - see commissioning data table
6. Correct program key fitted
7. Gas valve
8. Integrity of appliance ground connection
9. Probe leads connected / integrity
10. Flame sensor probe clean
11. Probes not touching insulation
12. Flame signal (min. 1.0 µA)
13. Air inlet / flue pipe for obstructions
CHECK:-
1. Spark gap correct - see maintenance section
2. Check ignition probes / leads for damage
3. Spark probe not touching insulation
4. Voltage supply to ignition transformer 230V AC / 50 Hz during ignition
5. Ignition transformer
6. Ignition controller
NOTE
Presence of a flame is indicated by the green lamp illuminating
Does the burner stay on after stabilisation time?
NO
YES
CHECK:-
1. Heat demand still present
2. Gas supply purged
3. Supply pressure
4. Throttle positioning - see commissioning data table
5. Flame sensor probe corroded
6. Flame signal (min. 1.0 µA)
7. Flame sensor probe bent
8. Integrity of appliance ground connection
9. Probe leads connected / integrity
10. Ignition controller
11. Integrity of chamber insulation
NOTE
Presence of a flame is indicated by the green lamp illuminating
YES
Does the burner remain running after several minutes?
NO
Does the burner attempt to relight?
YES
NO
CHECK:-
1. Throttle positioning - see commissiong data table
2. Flame sensor probe corroded
3. Flame signal (min. 1.0 µA)
4. Flame sensor probe bent
5. Air inlet / flue pipe for obstructions
6. Integrity of chamber insulation
CHECK:-
1. LED status light flash codes
2. LC3 safety thermostat reset switch
3. LC3 safety thermostat temperature not exceeding 96°C
4. Lockout reset switch
5. Heat demand still present
NOTE
Presence of a flame is indicated by the green lamp illuminating
YES
YES
END
If the heater still fails to operate correctly, contact your local representative

9. Parts listing

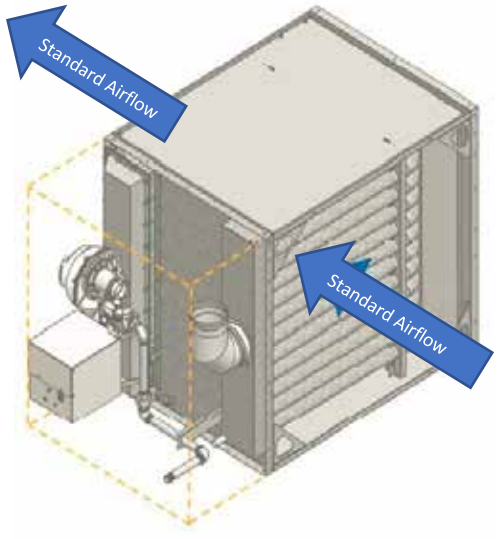
9.1 Spares

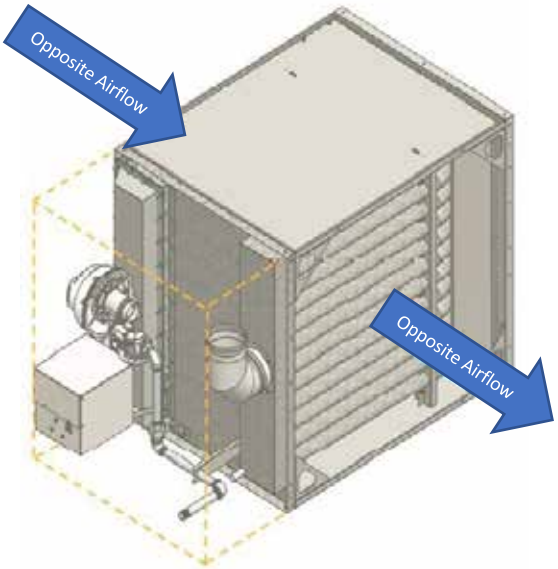
Description	Part Number	Application
Ignition controller Kit for RHC21-4024-05	1038147	4024-05
Ignition controller Kit for RHC21-4036-08	1038148	4036-08
Ignition controller Kit for RHC21-4050-06	1038149	4050-06
Ignition controller Kit for RHC21-4060-07	1038150	4060-07
Ignition controller Kit for RHC21-4075-09	1038151	4075-09
Ignition controller Kit for RHC21-4100-12	1038152	4100-12
Ignition controller Kit for RHC21-4125M15 (TOP BURNER)	1038153	4125M15
Ignition controller Kit for RHC21-4124M15 (BOTTOM BURNER)	1038154	4125M15
Ignition controller Kit for RHC21-4150M18 (TOP OR BOTTOM BURNER)	1038155	4150M18
Spark Probe c/w Lead & Blind Grommet	1031978	All
Flame Sense Probe c/w Lead & Blind Grommet	1031979	All
Ignition transformer	1030638	All
Probe mounting gasket set	1037440	All
Burner face insulation / burner gasket	1037196	4075-09, 4150M18, 4125M15(9)
Burner face insulation / burner gasket	1037194	4050-06, 4125M15(6)
Burner face insulation / burner gasket	1037360	4100-12
Burner face insulation / burner gasket	1037361	4024-05
Burner face insulation / burner gasket	1037362	4036-08
Burner face insulation / burner gasket	1037363	4060-07
Chamber Insulation Kit, A (5)	1037448	4024-05
Chamber Insulation Kit, B(6)	1037449	4050-06, 4125M15(6)
Chamber Insulation Kit, C(7)	1037450	4060-07
Chamber Insulation Kit, D(8)	1037451	4036-08
Chamber Insulation Kit, E(9)	1037452	4075-09, 4125M15(9), 4150M18
Chamber Insulation Kit, F(12)	1037453	4100-12
Lockout reset circuit board	03-25327-01	All
Lockout Reset Switch	60-61998	All
Gas valve lead	1030864	All
Gas Valve	03-25800	4024-05, 4036-08, 4050-06, 4125M15(6), 4060-07
Gas Valve	03-25801	4075-09, 4125M15(9), 4150M18
Gas Valve	1030499	4100-12
Gas Valve Flange & O-Ring Assy.	03-25137	4024-05, 4036-08, 4050-06, 4060-07, 4075-09, 4125M15
Gas Valve Flange & O-Ring Assy.	03-24976-02	4100-12, 4150M18
Venturi Kit	1037455	4024-05
Venturi Kit	1037762	4036-08
Venturi Kit	1037457	4050-06 & 4125M15
Venturi Kit	1037458	4075-09, 4125M15, 4150M18, 4060-07
Venturi Kit	1030764	4100-12
Premix Burner	1031347	4024-05
Premix Burner	1037264	4036-08
Premix Burner	1030327	4050-06, 4125M15(6)
Premix Burner	1031664	4060-07
Premix Burner	1030136	4075-09,4125M15(9), 4150M18
Premix Burner	1031224	4100-12

Description	Part Number	Application
Combustion Fan Kit	1037459	4024-05
Combustion Fan Kit	1037460	4036-08, 4075-09, 4125M15, 4150M18, 4050-06, 4060-07
Combustion Fan Kit	1037461	4100-12
LED Lamp	60-61997	All
Green Neon Lamp	28-50-038	All
Burner wiring harness single	1031639	4024-05, 4036-08, 4050-06, 4060-07, 4075-09, 4100-12
Burner wiring harness double	1031640	40125M15, 4150M18
Collector Box U - Gasket	1031727	All

9.2 LC3 limit stat options

RHC21 4000 Series LC3 Limit Stat Options				
Model	LC3 Standard Hand		LC3 Opposite Hand (-O)	
	Part Number	Setting Temp °C	Part Number	Setting Temp °C
RHC21-4024-05	1031960	65	1031960	65
RHC21-4036-08	1031960	65	1031960	65
RHC21-4050-06	1031960	65	1031960	65
RHC21-4060-07	1031960	65	1031960	65
RHC21-4075-09	1031960	65	1031960	65
RHC21-4100-12	1031960	65	1031959	55
RHC21-4125M15	1031959	55	1031959	55
RHC21-4150M18	1031960	65	1031959	55





10. User operating instructions

10.1 Checks before lighting the air heater

Before lighting the heater, ensure:-

1. The electrical supply to the heater is OFF.
2. All air outlets associated with the ductwork system served by the heater are open.
3. The control thermostat is set to MAXIMUM.
4. Any time control associated with the system is set to an ON period.
5. Any other controls associated with the system are calling for heat.

10.2 Lighting the air heater

1. Switch on the electrical supply at the heater.
2. Provided the associated external controls are calling for heat (and in an ON time period if time control is provided), the heater start up sequence will automatically commence.
3. After a short delay, the heater will light and the green BURNER ON indicator will light.
4. If ignition is unsuccessful there will be a purge period followed by ignition. Three ignition attempts will be made before the heater goes into lockout mode.
5. Once in lockout mode, the LOCKOUT indicator will light. A lockout is reset via the switch next to the lockout indication light.

Contact the installer or supplier if the heater will not light after several attempts.

10.3 To shut down the air heater

1. For short periods, turn the associated thermostat to OFF or its lowest setting.
2. For long periods, again turn the associated thermostat to OFF or its lowest setting. Wait 5 minutes then turn OFF the electrical supply at the associated local isolator.

10.4 Overview of operation

The heater MUST NOT be controlled by switching the main electrical supply to it ON and OFF

The ignition sequence will commence each time the external controls (e.g. Time clock, room thermostat etc.) call for heat / operation. The internal combustion fan will run to purge the heat exchanger and flue, then an ignition attempt will be made. The ignition spark will be generated, the main gas valve opens and the burner will light. The green 'ON' indicator will illuminate.

When the external controls are satisfied the burner will be turned off and approximately 2 - 3 minutes later the combustion fan will be automatically stopped. If the burners fail to light the control box will make a total of 3 attempts at ignition.

In the event of overheating for any reason, overheat controls operate to switch off the burner. The limit control LC3 (which operates at a higher temperature setting) switches off the burner to a lockout condition. This will require a thorough check of the heater and a manual reset via the LC3 limit control body followed by the lockout reset switch. A cooling time of about 3 minutes is necessary before resetting.

The appliance is fitted with an LED status light. This can be used to determine the current status of the appliance and help to diagnose fault conditions. See LED Status table in section 5.11 (page 28) for more information.

10.5 Maintenance

Maintenance and service must only be carried out by appropriately qualified persons. It is in your interest to ensure proper service and maintenance is carried out at a regular basis. Periods between service are dependent upon the local environment where the heater is installed. All gas appliances should be serviced at least annually, preferably at the end of the heating season.

In case of any damage to the appliance, it must be shut down completely and checked by an appropriately qualified person.

In the event of difficulties in resolving any of these matters, please do not hesitate to contact the official distributor.

10.6 Important notes

- Free and clear access must be maintained to and around the heater for servicing purposes and the air supply to the heater must not be restricted in any way.
- Combustible materials must not be stored adjacent to the heater. If at any time a gas leak is suspected, turn OFF the gas supply at the meter and contact the local gas undertaking immediately.
- The heater uses gas and electricity to provide power. It is hazardous to tamper with or attempt to service the heater unless you are a competent and qualified person in the field of Gas and Electrical work.
- If you have any safety questions reference the servicing and installation of any of our heaters please do not hesitate to contact us for expert advice.

Model			RHC21							
Item	Symbol	Units	4024-05	4036-08	4050-06	4060-07	4075-09	4100-12	4125M15	4150M18
Type of Fuel	-	-	4050-064036-08Natural Gas G20							
Capacity										
Rated Heating Capacity	Pnom	kW	24.2	36.2	51.2	64.7	76.0	99.6	125.4	151.2
Minimum Capacity	Pmin	kW	7.8	11.7	16.5	19.7	24.3	32.8	40.0	43.5
Electrical Power Consumption										
At Rated Heating Capacity	elmax	kW	0.040	0.093	0.123	0.115	0.151	0.174	0.331	0.408
At Minimal Capacity	elmin	kW	0.008	0.018	0.012	0.018	0.021	0.029	0.042	0.051
In Standby Mode	elsb	kW	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Useful Efficiency										
Useful Efficiency at Rated Heating Capacity	ηth, nom	%	82.5	82.3	83.3	83.4	83.1	83.0	82.0	82.6
Useful Efficiency at Minimum Capacity	ηth,min	%	88.4	88.6	88.7	88.2	88.6	88.7	88.6	88.7
Other Items										
Envelope Loss Factor	Fenv	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Flame Consumption	Pign	kW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emissions of Nitrogen Oxides (Input Energy (GCV)	NOx	mg/kWh	54	40	66	67	69	59	67	57
Emission Efficiency	ηs, flow	%	96.5	97.2	96.4	96.4	96.4	96.4	94.5	95.2
ErP Seasonal Space Heating Energy Efficiency	ηs	%	84.2	84.8	84.4	84.2	84.4	84.3	82.5	83.4
Thermal Efficiency at Rated Heating Capacity (NCV)	η	%	91.6	TBC	91.6	92.6	92.2	92.1	91.0	91.7

Model			RHC21							
Item	Symbol	Units	4024-05	4036-08	4050-06	4060-07	4075-09	4100-12	4125M15	4150M18
Type of Fuel	-	-	Natural Gas G25							
Capacity										
Rated Heating Capacity	Pnom	kW	24.2	36.3	51.2	64.3	75.8	99.4	125.9	150.6
Minimum Capacity	Pmin	kW	7.8	11.7	16.5	19.8	24.2	32.9	40.0	43.5
Electrical Power Consumption										
At Rated Heating Capacity	elmax	kW	0.040	0.093	0.123	0.115	0.151	0.174	0.331	0.408
At Minimal Capacity	elmin	kW	0.008	0.018	0.012	0.018	0.021	0.029	0.042	0.051
In Standby Mode	elsb	kW	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Useful Efficiency										
Useful Efficiency at Rated Heating Capacity	ηth, nom	%	82.6	82.4	83.2	82.8	82.9	82.9	82.3	82.3
Useful Efficiency at Minimum Capacity	ηth,min	%	88.3	88.3	88.6	88.5	88.3	88.8	88.5	88.5
Other Items										
Envelope Loss Factor	Fenv	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Flame Consumption	Pign	kW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emissions of Nitrogen Oxides (Input Energy (GCV)	NOx	mg/kWh	56	51	48	55	57	60	45	68
Emission Efficiency	ηs, flow	%	96.5	97.2	96.4	96.4	96.5	96.4	94.5	95.2
ErP Seasonal Space Heating Energy Efficiency	ηs	%	84.1	84.6	84.4	84.3	84.1	84.4	82.5	83.2
Thermal Efficiency at Rated Heating Capacity (NCV)	η	%	91.7	91.5	92.4	91.9	92.0	92.0	91.3	91.4

Model			RHC21							
Item	Symbol	Units	4024-05	4036-08	4050-06	4060-07	4075-09	4100-12	4125M15	4150M18
Type of Fuel	-	-	Natural Gas G25.3							
Capacity										
Rated Heating Capacity	Pnom	kW	24.1	36.4	51.0	64.1	75.7	99.4	126.0	151.3
Minimum Capacity	Pmin	kW	7.8	11.7	16.4	19.8	24.2	32.7	40.0	43.6
Electrical Power Consumption										
At Rated Heating Capacity	elmax	kW	0.040	0.093	0.123	0.115	0.151	0.174	0.331	0.408
At Minimal Capacity	elmin	kW	0.008	0.018	0.012	0.018	0.021	0.029	0.042	0.051
In Standby Mode	elsb	kW	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Useful Efficiency										
Useful Efficiency at Rated Heating Capacity	ηth, nom	%	82.3	82.6	82.9	82.7	82.7	82.8	82.3	82.7
Useful Efficiency at Minimum Capacity	ηth,min	%	88.2	88.4	88.4	88.3	88.2	88.5	88.5	88.8
Other Items										
Envelope Loss Factor	Fenv	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Flame Consumption	Pign	kW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emissions of Nitrogen Oxides (Input Energy (GCV)	NOx	mg/kWh	65	48	54	48	63	69	47	67
Emission Efficiency	ηs, flow	%	96.5	97.2	96.5	96.4	96.5	96.4	94.5	95.2
ErP Seasonal Space Heating Energy Efficiency	ηs	%	84.0	84.7	84.1	84.1	84.0	84.2	82.4	83.4
Thermal Efficiency at Rated Heating Capacity (NCV)	η	%	91.3	91.7	92.0	91.8	91.8	91.9	91.4	91.8

Handover Document
Commissioning Details

Appliance Serial No: .....

Model Type: .....

Customer Name: .....

Address: .....

.....

Site name: .....

Commissioning Engineer

Name ..... Gas Safe Reg No.....

Company Name .....

Commissioning Date: .....

Burner

Fuel type .....

Inlet Pressure .....mbar Working Pressure .....mbar

Burner Pressure: Low Fire .....mbar High Fire .....mbar

Low Fire CO .....ppm High Fire CO .....ppm

Low Fire CO_2 .....ppm High Fire CO_2 .....ppm

Flue Gas Efficiency (net) .....%

Flue Gas Temperature .....^{O}C

Supply voltage .....

Supply Amps .....

Signature ..... Date .....

Notes

Notes

This document replaces the previous, Manual Part No. Reznor, RHC21 4000 Installation EN Dec 2021 D301334 Issue 2

Current full Part No. **Reznor,** RHC21 4000 Installation EN Feb 2022 D301334 Issue 3

NORTEK GLOBAL HVAC (UK) LTD
Fens Pool Avenue
Brierley Hill
West Midlands DY5 1QA
United Kingdom
Tel +44 (0)1384 489700
Fax +44 (0)1384 489707
reznorsales@nortek.com
www.reznor.eu

NORTEK™
GLOBAL HVAC