



W O R L D W I D E



Installation and user manual  
**HHB SERIES**  
Direct gas fired air heater

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HOLLAND HEATER HEATS THE WORLD



Organisme Notifié N° 1312

Notified Body 1312

**CERTIFICAT**  
*Certificate*
**MODULE B**
**EXAMEN UE DE TYPE – TYPE DE PRODUCTION | EU TYPE EXAMINATION – PRODUCTION**

 Règlement (UE) 2016/426 « Appareils à gaz » Paragraphe 1 – Annexe III  
 Regulation (EU) 2016/426 « Gas appliances » Paragraph 1 – Annex III

**Certificat / Certificate n° : 1312DN6686 (rév. 2)**

Révise le certificat / Revises the certificate n° 1312DN6686 du 2022/10/20

 CERTIGAZ, après examen et vérifications, certifie que l'appareil :  
 CERTIGAZ, after examination and verifications, certifies that the appliance:

- Fabricant / Manufacturer : HOLLAND HEATER De Lier B.V.  
Keersopstraat 55, 3044EX, ROTTERDAM – The Netherlands
- Marque commerciale et modèle(s) / Trade mark and model(s) : HHB-40, HHB-70, HHB-100, HHB-120
- Genre de l'appareil / Kind of the appliance : Générateurs d'air chaud à convection forcée utilisant les combustibles gazeux pour le chauffage de locaux à usage non domestique, de débit calorifique inférieur ou égal à 300 kW.  
Non-domestic direct gas-fired forced convection air heaters for space heating not exceeding 300 kW  
Type: A3  
Utilisé uniquement pour l'aviculture et l'horticulture.  
Only used for poultry farming and horticulture.
- Désignation du type / Type designation : HHB

Pays de destination Destination countries	Pression (mbar) Pressure (mbar)	Catégories Categories
AT, BG, CH, CY, CZ, DK, EE, ES, FI, GB, GR, HR, IE, IT, LT, LV, NO, PT, RO, SE, SI, SK, TR	20	I2H
LU, PL, RO	20	I2E
BE	20/25	I2E(R)
BE	20/25	I2E(S)
CZ, DK, HU, MT, NL, RO	30	I3P
BE, CH, CZ, ES, FR, GR, HR, IE, IT, LU, PL, PT, SI, SK, TR	37	I3P
FR	20/25	I2Esi
DE	20	I2ELL
NL	20/25	I2EK
FR	20/25	I2Er
AT, BE, CH, CZ, DE, ES, FR, GR, HU, NL, SK	50	I3P
BE, CY, DK, EE, FR, GB, HU, IT, LT, NL, RO, SE, SI, SK	30	I3B/P
AT, CH, CY, CZ, DE, FR, SK	50	I3B/P

Est conforme aux exigences essentielles du Règlement (UE) 2016/426 « Appareils à gaz ». | Is in conformity with essential requirements of « Gas appliances » (EU) 2016/426 Regulation.


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Puteaux, le 8 novembre 2023

Le Directeur Général

Claudie CANON

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1/1

Dear user,

Thank you for buying our HHB direct gas fired air heater. This installation and user manual contain information that will help you familiarize yourself with this product. To make sure that our new products always function as good and efficiently as possible, and for your own safety, we recommend that you read the entire manual. Pay special attention to the warnings and safety instructions before using this appliance for the first time.

This HHB direct gas fired air heater has been designed for heating poultry and livestock houses. Especially in the early life stages, young animals need plenty of heat. By creating an optimum living environment from the very beginning, the animals will be very comfortable. This keeps them healthy, and it benefits production.

The HHB direct gas fired air heater is also highly suitable for horticultural applications. It can be used for heating rooms where vegetables and flowers grow and for keeping these frost-free. It can also be used for heating storage facilities for potatoes and other crops.

The HHB creates the optimum temperature for your space. This air heater is installed in such a way that it functions at optimal performance.

The HHB has control ports for potential free contacts. This way, the appliance can be controlled by using a thermostat. For controlling the device using a climate computer, the appliance is provided with additional relays. The device is secured via a burner relay, which uses the air speed to control the functioning of the flue-gas outlet and ionization as flame guard. It is also equipped with a maximum thermostat, to prevent overheating.

This manual should be used both by the installer and by the user of the HHB. The necessary information is provided in the various tables.

This is the original manual of the HHB. If you cannot find the information you need, or if you need other information, please contact your supplier.

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GENERAL MANUAL

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# 1 GENERAL SECTION

## General information

### 1.1 Foreword

This document is intended to be a reference guide, which may be used only by authorised persons for the purpose of safely installing, using, and maintaining the product indicated on the cover of this document. Holland Heater B.V. shall not be held liable for any damages or injuries arising because of failure to comply with the instructions provided within this manual.

The air heater has been designed and manufactured with the utmost care and attention to ensure that it will provide you with many years of service. The air heater complies with the NEN-EN 12669 European standard and bears the CE quality mark.

*Because of this, modifications to the air heater are not permitted.*

Prior to being supplied to you, this air heater has been subjected to a close inspection. To ensure that your air heater continues to serve you for many years, and without any problems, we advise you to contact an authorised specialist to service your appliance once every year. If you follow the instructions in this manual, you can rest assured that you will enjoy your air heater for many years to come.

### 1.2 Liability waiver

All rights reserved. No part of this publication may be reproduced and/or published by means of print, photocopy, microfilm, or any other means, without the prior written permission of Holland Heater. This similarly applies to the accompanying drawings and diagrams.

Holland Heater reserves the right to change parts at any time, without informing the consumer either directly or prior to doing so. The content of this manual is also subject to change, without prior notification. This manual applies to the standard design air heater. Holland Heater therefore cannot be held liable for any damages arising from changes made to the specifications of the standard design appliance.

Please contact your supplier for information not included within this manual relating to adjustments, maintenance work or repairs.

This manual has been compiled with the utmost care and attention; however, Holland Heater cannot accept responsibility for any errors within this book or the consequences of such errors.

PLEASE READ THIS DOCUMENT CAREFULLY BEFORE USING YOUR AIR HEATER.



Handle this manual with care and always keep it within reach of the air heater.



Check data on the type plate when choosing the gas type you are going to use.

### 1.3 Product description

#### Intended use

This heater may only be used for the purposes for which it has been designed, namely:

- Heating poultry or other livestock houses
- Heating greenhouses and keeping them frost-free
- Heating storage spaces for potatoes or other crops and keeping them frost-free.

Proper use also includes respecting use, installation, and maintenance conditions.

The appliance follows the relevant standards and guidelines. Only use the appliance when it is in perfect technical condition.

#### Improper use

Any other, additional usage is not considered to be in accordance with the intended purpose. The manufacturer accepts no liability for damages or injury arising from such use.

## 1.4 Basic information

This installation and operation manual belongs to the model HHB direct gas fired air heater. These models have an axial ventilator for circulating and distributing heated air. These devices are only suitable for indoor installation, at a working temperature between -15°C and 45°C and are only suitable for suspension. When installing the device, all relevant regulations must be respected. Make sure the power supply, the gas type and the on-site gas pressure correspond with the appliance specifications. These data only apply to the countries indicated on the type plate of the appliance. In auto mode- and when more heat is required, after a safety check of the burner relay, the ventilator will start. After about 10 seconds, the main burner will ignite. About 15 seconds after the heat is required, the appliance starts working. Throughout the entire heating cycle, the flame is controlled by the flame relay, which guarantees safe functioning. After reaching the desired room temperature, the main relay switches off. To cool off the appliance, the ventilator keeps running for another 120 seconds. After that, the ventilator switches off and the appliance enters sleep mode, waiting for the next heat demand.

## 1.5 Pictograms and safety symbols

The following symbols are used for the appliance in this manual.



### Risk warning: general

Failure to comply with the guidelines will cause material damage, (permanent) bodily injury or even death.



### Warning risk of electrocution

Failure to comply with the guidelines will cause (permanent) bodily injury or even death.



### Warning risk of burns

Failure to comply with the guidelines will cause burns or even death.



### Warning high-pressure wash

Failure to comply with the guidelines will cause material damage of the LTU 80-100, bodily injuries or even death.



### Recycling



### Tips

Suggestions and recommendations to perform the relevant procedures more easily.

## 1.6 Service and technical support

For information regarding specific adjustments, maintenance or repair work that fall outside the scope of this document, please contact your supplier. Your supplier is always ready to assist you. Please ensure that you have the information on the identification plate at hand.

## 1.7 Warranty provisions

The sales and warranty provisions applicable to the air heater, as per the Metal union conditions, form part of the terms and conditions of delivery.

Holland Heater is registered with the Chamber of Commerce under number 27226471.

## 1.8 Identification of the device

The identification plate of your air heater is fixed to the appliance. This lists the correct information for the air heater supplied. The figure below shows an **example** of a possible identification plate.

<b>Holland Heater De Lier BV</b> <b>Keersopstraat 55, 3044 EX</b> <b>Rotterdam, Netherlands</b>		 1312-23
Model (trade name)	HHB 100	
Power Supply	230VAC 1N 50Hz	
Appliance category	I3P	
Appliance type	A3	
Serial Number	2321375	
Date of manufacture	09/11/2023	
Product identification number	1312DN6686	
Commercial identification symbol		
Appliance set for (Type of Gas)	Propane	
Calorific output	98 kW	
Thermal efficiency		
Country of destination	GB	
Gas supply pressure	37 - 50 mbar	
Gas burner pressure	22 mbar	
External static pressure	0 Pa	
Degree of protection	IP-x6	
Gas injector	8 holes - HHB 100 Propane	
Engine power	620 Watt	
Air movement	6500 m <sup>3</sup> /h	
Weight	48 kg	
AIR HEATER FOR AGRO- HORTICULTURAL USE		
 READ THE USER'S INSTRUCTION BEFORE INSTALLING OR USING THIS APPLIANCE		
THIS APPLIANCE SHALL BE INSTALLED IN ACCORDANCE WITH THE RULES IN FORCE AND IN A PLACE THATS MEETS THE APPROPRIATE VENTILATION REQUIREMENTS.		

Fig. 2.8-1 Example of identification plate

## 1.9 Ordering spare parts

It is essential that you state the following information when ordering parts:

- The item number for the part you wish to order.
- The name of the part you wish to order.
- The model and serial number of the air heater for which the part is intended.
- The voltage to which your air heater is connected.

## 2 Safety regulations and hazard warnings

### 2.1 General

- The manufacturer accepts no liability for damage or injury arising because of failure to comply (strictly) with the safety regulations and instructions in this document, or because of carelessness during installation, use or maintenance of the appliance indicated on the cover of this document or any accompanying accessories.
- Depending on the specific working conditions or accessories used, additional safety instructions may need to be taken into consideration. Please contact your supplier immediately if you observe a potential hazard when using the air heater.
- The user of the air heater is always fully responsible for following the site safety regulations and guidelines.

## 2.2 User manual

- Any person working on or with the air heater must be aware of the content of this user manual and must follow the instructions herein precisely. The management must use this manual to train personnel and must observe all instructions and directions.
- Never change the order of the actions to be performed.
- Always retain this document in a fixed location, near the air heater.

## 2.3 Pictograms and instructions on the air heater (if present)

- Pictograms, warnings, and instructions on the appliance are for safety precautions. Under no circumstances must they be covered or removed, and they must remain in place and legible throughout the entire service life of the air heater. Pictograms, warnings, and instructions that have become illegible must be replaced or repaired immediately.

## 2.4 Users

- Operation of the unit is reserved for persons who have been trained with this document.

## 2.5 Intended use \*

- ❖ The unit was designed for heating poultry and livestock houses. Without ventilation, the dimensions of the room should total at least 200m<sup>3</sup> per m<sup>3</sup>/h gas consumption.
- ❖ To heat rooms occupied by humans, approval of the Directorate-General for Labour in Netherlands, is required for this application. The room must be well ventilated at all times.
- ❖ Any additional usage is not considered to be in accordance with the intended purpose. The manufacturer accepts no liability for damages or injury arising from such use. The heater complies with the applicable standards and guidelines. Only use the unit in a technically perfect condition and in accordance with its intended purpose, as described.
- ❖ *"Intended use", as laid down in EN 2006-42, is the use for which the technical product is suited, as specified by the manufacturer and inclusive of the instructions in the sales brochure. If in doubt, the "intended use" is what appears to be the ordinary use when the construction, design and function of the product are taken into consideration. Using the product as intended also comprises following the instructions in the directions for use.*

## 2.6 Safety regulations and hazard warnings

### 2.6.1 General



- Regular maintenance of the appliance prevents malfunctioning.
- Read this manual before first use. The gas supply, electrical supply and thermostat must be connected as described.
- Any illegal change to the appliance rules out manufacturer's liability for any resulting damage.
- Always comply with the local and national regulations.
- Installation and maintenance may only be carried out by authorized personnel, with the required training, knowledge, or practical experience to assure correct installation and maintenance.
- The appliance is a heater for use in the above-specified rooms. Other use for other purposes is considered improper use. Liability for damage resulting from improper use will be on the user.
- General fire hazard isn't discussed in this manual. For more information about this, refer to the fire insurance company and/or to the local fire brigade.
- Allow a distance from the appliance to the nutrition and drinking facilities and to plants in the greenhouse, to make sure they don't dehydrate.
- We recommend use of a temperature controller (thermostat, climate computer) with a switching difference of  $\pm 2$  °C. It will start the appliance if the room temperature drops 1 °C below the set temperature and stop it when the temperature rises 1°C above the room temperature. Such a thermostat reduces the risk of malfunctions and improves the performance of the appliance.
- All the maintenance activities may only be carried out by a qualified technician.
- Never remove or open inspection hatches while appliance is functioning or may be turned on.
- When the appliance keeps malfunctioning, the mains voltage of the appliance must be disconnected, and the gas valve must be turned off. Contact the supplier.

### 2.6.2 Safety



- Before turning on the appliance, all the electrical wiring must be checked for visible defects and the broken wires must be repaired.
- Never switch off the power supply while the appliance is functioning. Wait for the appliance to stop and allow it to cool down before switching it off. The ventilator keeps running for about one more minute after the moment the appliance closes the gas valve, and the combustion is switched off.
- Never use the appliance if there are removed or missing components.
- Covering electric motors and fans causes high temperatures and damage to appliance and can cause fire.
- The appliance may not be installed in environment with corrosive atmospheres or with fire hazard.
- Only use the fuel that is indicated on the type plate.
- To avoid oxygen depletion, make sure the space where the appliances are installed are properly ventilated:
  - Ensure a mechanical suction or ventilation system with a capacity of at least 10 m<sup>3</sup> of air per hour for each installed capacity of 1 kW. Make sure that the quantity of air that is evacuated is replaced by clean air.
  - The space must have sufficient natural ventilation. If the space has two openings, a ventilation factor of 1,0 (meaning: air refreshment in the room, per hour) must be obtained in a natural way. The openings must have a free surface area of at least 60 x B cm<sup>2</sup>, where B = installed capacity in kW. The total capacity of the installed appliances may not be higher than 1 kW per 20 m<sup>3</sup> space volume when natural ventilation is used.

### 2.6.3 Electrical



- Any electrical damage must be repaired by a qualified electrician.
- The power supply must be equipped with an adequate power protection.
- There must be a wall socket near the appliance. The power supply cable with plug may not be changed.
- The appliance must always be equipped with grounding.
- Disconnect the appliance from the power supply (unplug it) before you start working on the appliance.
- Never connect the appliance to a three-phase network.

## 3 Technical specifications

### 3.1 Overview

		HHB-040	HHB-070	HHB-100	HHB-120
Nominal load on upper value	kW	40	70	98	110
Nominal load on upper value	Btu	136136	238910	371923	406044
Gas consumption natural gas (H-Gas @ 15°C)	m³/h	3.77	6.5	9.45	11.4
Gas consumption natural gas (L-Gas @ 15°C)	m³/h	4.47	7.76	11.08	13
Gas consumption propane	kg/h	2,9	5,4	6,5	8,1
Natural gas injector	mm	8x Ø 2,1	10x Ø 2,6	10x Ø 3,4	10x Ø 3,8
Natural gas injector	Inch	8x Ø 0.08	10x Ø 0.10	10x Ø 0.13	10x Ø 0.15
Propane injector	mm	8x Ø 1,38	8x Ø 1,9	8x Ø 2,2	8x Ø 2,4
Propane injector	Inch	8x Ø 0.05	8x Ø 0.07	8x Ø 0.08	8x Ø 0.09
Connection pressure natural gas (H-Gas G20)	Mbar	20	20	20	20
Connection pressure natural gas (L-Gas G20)	Pa	2000	2000	2000	2000
Connection pressure natural gas (H-Gas G25)	Mbar	25	25	25	25
Connection pressure natural gas (L-Gas G25)	Pa	2500	2500	2500	2500
Connection pressure propane	mbar	37 / 50	37 / 50	37 / 50	37 / 50
Connection pressure propane	Pa	3700 / 5000	3700 / 5000	3700 / 5000	3700 / 5000
Natural gas burner pressure - G20*	mbar	10,2	9,2	8,6	8,1
Natural gas burner pressure - G20*	Pa	1020	920	920	810
Natural gas burner pressure - G25*	mbar	15	13,5	13	11,3
Natural gas burner pressure - G25*	Pa	1500	1350	1300	1130
Propane burner pressure - G31*	mbar	22	20	22	22
Propane burner pressure - G31*	Pa	2200	2000	2200	2200
Butane burner pressure - G30*	mbar	17	15,6	18,4	18,4
Butane burner pressure - G30*	Pa	1700	1560	1840	1840
Power voltage	Vac	230	230	230	230
Remote control	Vac	Standard 24VAC – Optional 24VDC – 230VAC			
Power consumption (50Hz)	Watt	265	480	620	620
Power consumption (60Hz)	Watt	312	657	850	850
Power consumption (50Hz)	A	1,3	2,3	2,9	2,9
Power consumption (60Hz)	A	1,88	3,71	4	4
Air movement	m³/h	3800	5000	6500	6500
Worp ±	M	35	35	40	40
Worp ±	ft	114	114	131	131
Nominal speed ventilator (50Hz)	rpm	1400	1290	1350	1350
Nominal speed ventilator (60Hz)	rpm	1638	1509	1650	1650
Start recurrence 3x	Sec	3	3	3	3
Ionization flow (normal)	µA	10 - 15	10 - 15	10 - 15	10 - 15
Appliance weight	Kg	32	42	48	48
Appliance weight	lbs	70,5	92.6	105.6	105.6
Length (A)	mm	1000	1105	1152	1152
Length (A)	Inch	39.4	43.55	45.38	45.38
Width (B)	mm	550	637	689	689
Width (B)	Inch	21.6	25.03	27.15	27.15
Height (C)	mm	500	580	624	624
Height (C)	Inch	19.7	22.85	24.59	24.59

Table Tabel4.1-1 Technical data

## 3.2 Dimensions

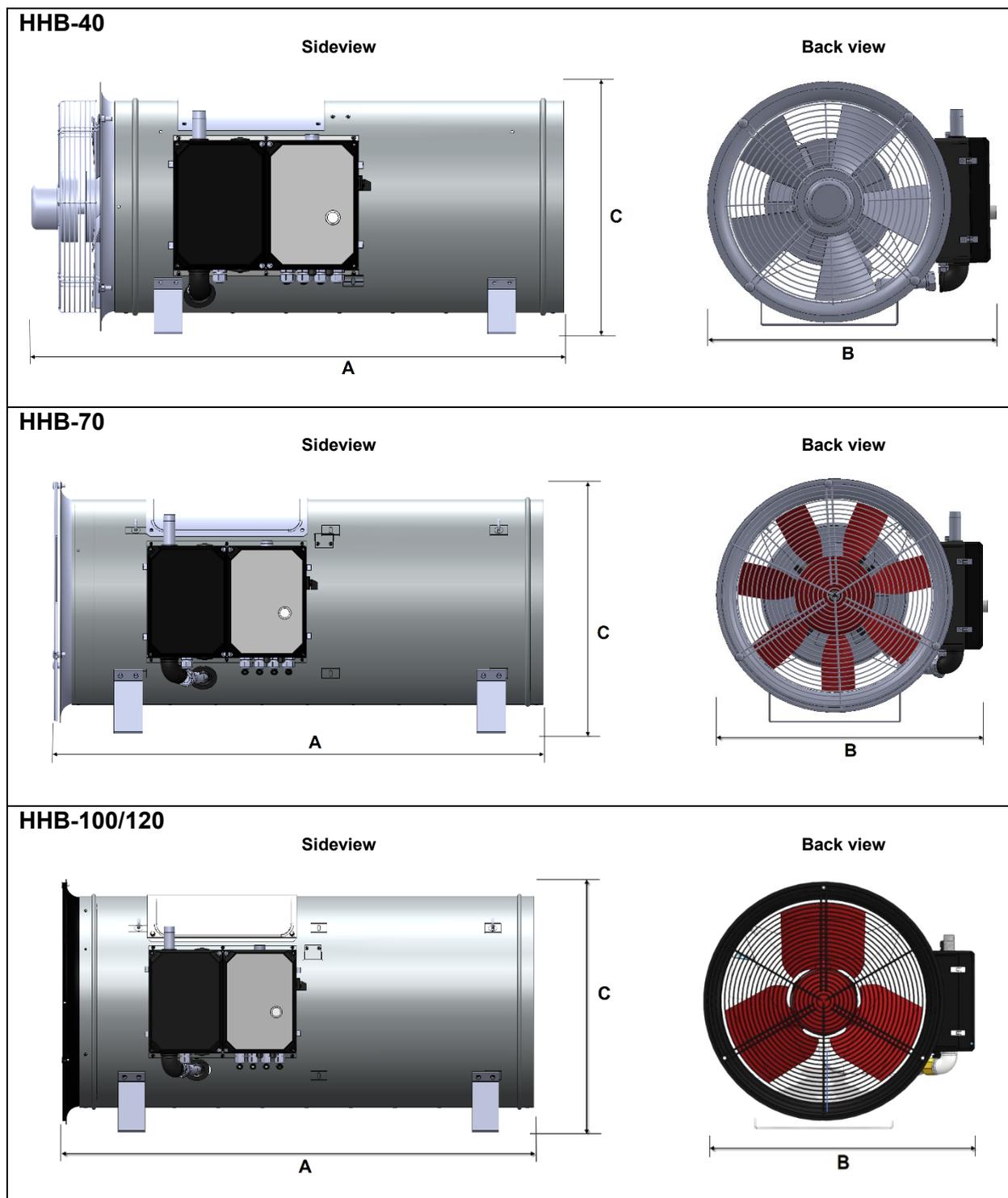


Figure 4.1 -Dimensions

## 4 Safety devices

### 4.1 General

- All safety devices must be fitted correctly and may only be removed by trained and authorised service technicians for the purpose of maintenance and repair works.
- The air heater must never be used when the safety devices are not complete or are not fitted or if the devices have been turned off or rendered inoperative.
- The safety devices must be checked regularly to ensure they are operating correctly and, if necessary, be repaired immediately by service technicians.

## 4.2 Modifications

- It is prohibited to modify the air heater in any way.
- The specifications outlined in this document must not be changed.

## 4.3 Installation

- The installation, maintenance and repair of the air heater and any adjustments must only be carried out by authorised service personnel.
- The air heater must always be connected to a reliable earthed and watertight wall socket. For service and maintenance work, the plug may only be removed from the wall socket once the air heater has completed the cooling procedure. This will take at least 1.5 minutes.
- Bear in mind that the air heater is phase sensitive. See section 6.2.
- The air heater must never be connected to a duct system.
- You must leave enough free space around the appliance, as safety zone. The free space around the appliance is 1 meter. On the front of the appliance, you must leave 3 meters free space, because some objects may be flammable. See figure 5.3-1

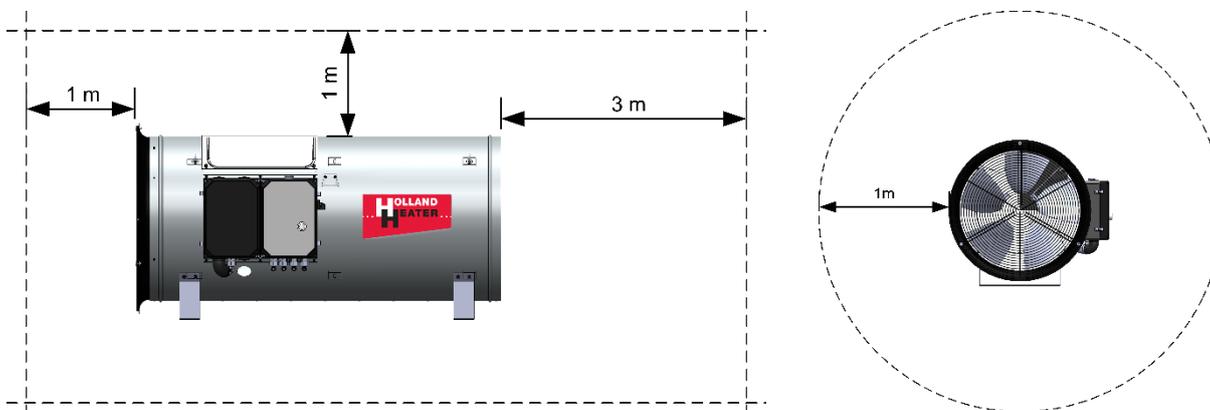


Fig. 5.3-1 Free space around the heater

## 4.4 Instructions prior to first use

- Inspect the air heater prior to use and check for damages.
- Avoid exposing the air heater to water and moisture for long periods of time.
- Keep the control instruments free from dirt and grease.
- Never use sharp objects to operate the appliance.
- Bear in mind that some parts of the air heater become hot during use.
- When the air heater is not used for long periods of time, remove the plug from the wall socket and shut off the gas supply.

 The plug must not be removed from the wall socket at any time whilst the air heater is in use. The same applies to removing the supply in any way whatsoever. You are only permitted to do so once the air heater has completed the cooling procedure, which takes at least 1.5 minutes. If this instruction is not followed, the temperature safety mechanism will be activated.

 **Note!** The air heater is phase sensitive. For the air heater to function, it is essential that the plug is inserted into the wall socket in the correct manner. See section 6.2.

## 5 FOR AUTHORIZED PERSONS

The following chapters refer to authorized persons who have sufficient training and knowledge to be able to carry out operations on the appliance.

## 6 Installation

### 6.1 Gas connection



Pursuant to NEN 1078, and NEN 8078, the connection of the gas supply must be carried out by qualified personnel. It is also essential that the site regulations are observed.

Connection to a gas network may only be carried out by qualified personnel. The gas installation must comply with the applicable regulations, and it must be made of suitable materials that comply with the installation requirements. According to the provisions, a gas tap (gas gate valve) must be within reach of the appliance, so the gas supply can be shut off at any moment.

The supply pressure to the appliance is laid out in gas categories and can differ from one country to another. Before the appliance is connected, check whether the gas type on the type-plate corresponds with the gas type that will be supplied.

If the HHB is hung with flexible suspension material or rods, it must be connected to the gas supply with approved flexible connections. There must be enough free space in the connector to move the device. Use a flexible connection of a sufficiently large diameter to prevent pressure drop and reduce gas flow noise. Use a gas filter if necessary.

The maximum supply pressure of the appliance is 60mBar. Make sure this pressure is never exceeded. When the gas pipe is pressurized, close the tap of the appliance.



**The maximum gas pressure applied on the device is 60mbar. Pay attention to this when pressurizing the main gas pipe.**



Don't use the gas supply pipe of the appliance to hang or fasten the appliance from it.

### 6.2 Electrical connection

The electrical installation may only be carried out by qualified personnel, in accordance with current regulations. All electrical connections must be made in the electrical panel of the appliance.



Pursuant to NEN 1010, the connection of the electrical supply must be carried out by qualified personnel. It is also essential that the site regulations are observed.

Connect the electric mains through a reliably earthed and watertight wall socket, which is provided with power via a load-protection circuit-breaker with a guaranteed value of 16 Amp. A 3-core cable must be used for the single-phase connection, which must be connected to the terminals marked L, N and PE (earth) in the air heater control box. In connection with the phase sensitivity of the air heater, a waterproof wall socket must be used to connect the appliance to the mains voltage. For an illustration of the correct way to insert the plug into the wall socket, please see figure 7.2-1. The circuit and wiring diagram can be found in annex B.



The appliance must be provided with earth connection.



**Note!** The air heater is phase sensitive. For the air heater to function, it is essential that the plug is inserted into the wall socket in the correct manner.

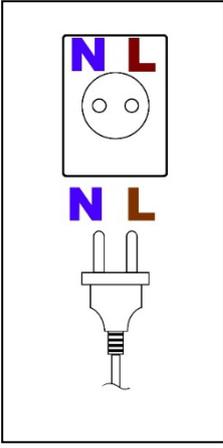


Fig. 7.2-1 Correct method for inserting plug into wall socket

**6.2.1 Connecting thermostat**

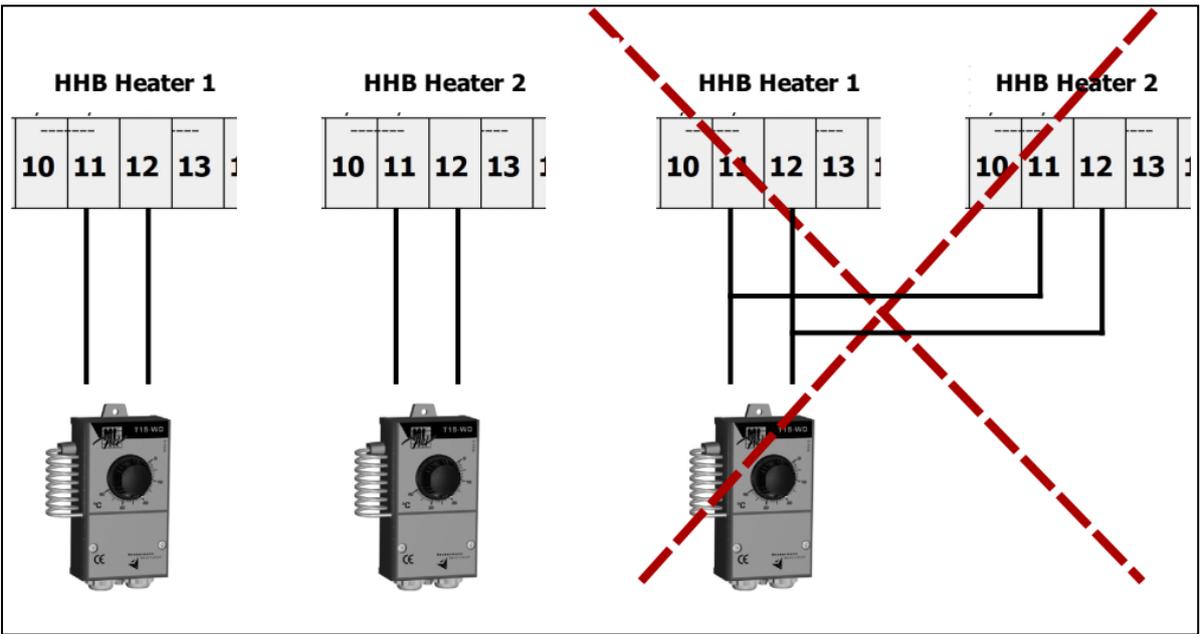
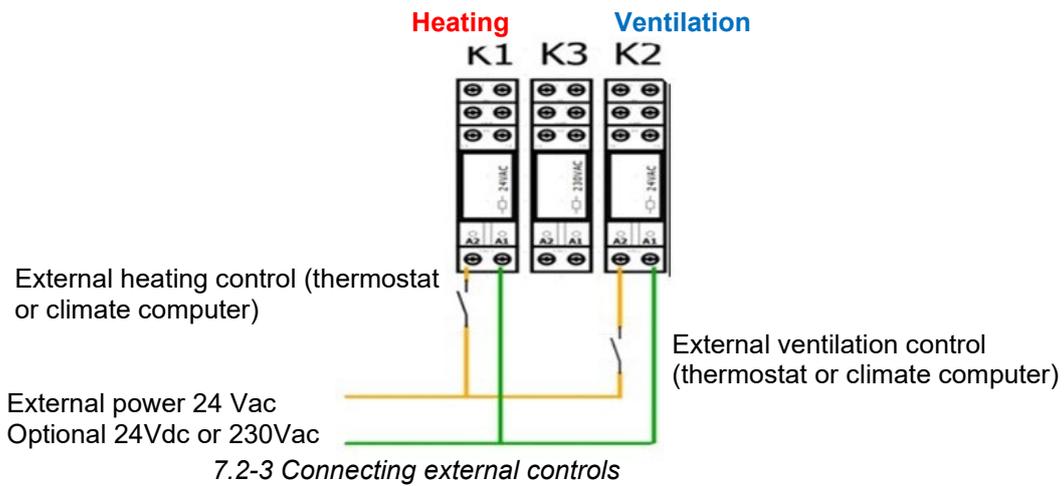


Fig. 7.2-2 Connecting Ambient Thermostat

## 6.2.2 Connecting external controls



## 6.2.3 External control. Supplying several heaters

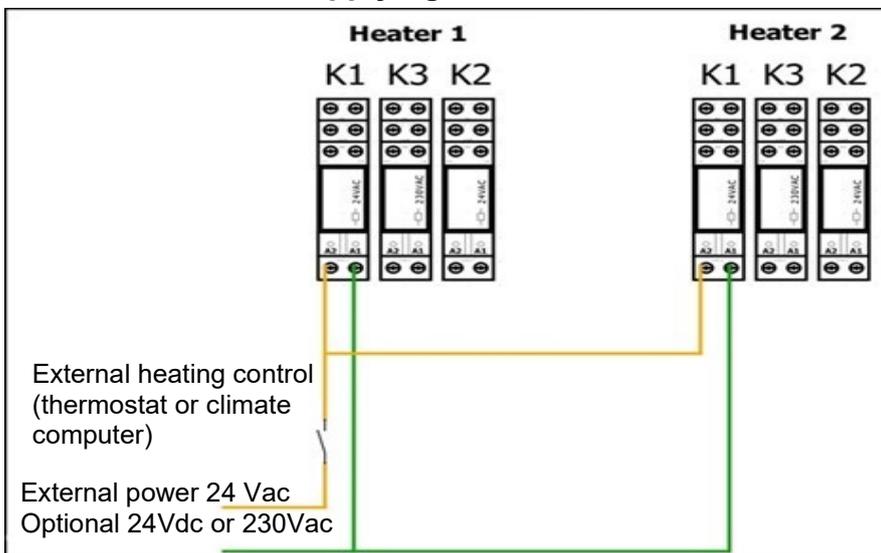


Fig. 7.2-3 Connecting external heating supply to several HHB heaters.

## 6.2.4 External control Ventilating several heaters.

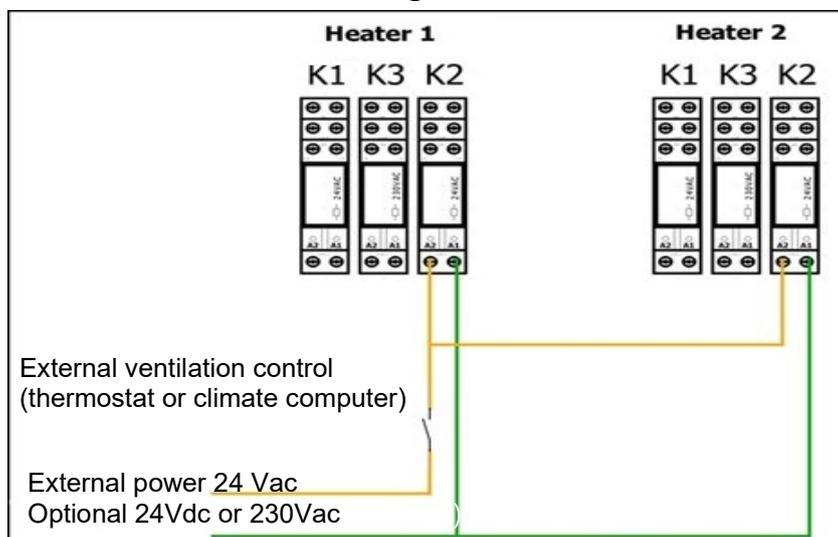


Fig. 7.2-4 Connecting external heating to several HHB heaters.

### 6.3 General points

The air heater must be installed horizontally. Ensure the air heater is protected from rain, leaks, etc. Figure 7.3-1 shows how the air heater should be installed and positioned.



**Under no circumstances must hoses and/or ducts be mounted on the sides where the inlet and outlet are located.**



The air heater outlet must not directly face flammable elements. A minimum distance of 3 metres should be allowed. A minimum distance of 1 metre from the wall should be allowed on the suction side.



When used to heat rooms occupied by persons, thorough ventilation should be provided. Oxygen deficiencies or CO<sub>2</sub> surpluses can occur more rapidly in extremely cold weather. The statutory regulations should be observed. If in doubt, please contact your supplier

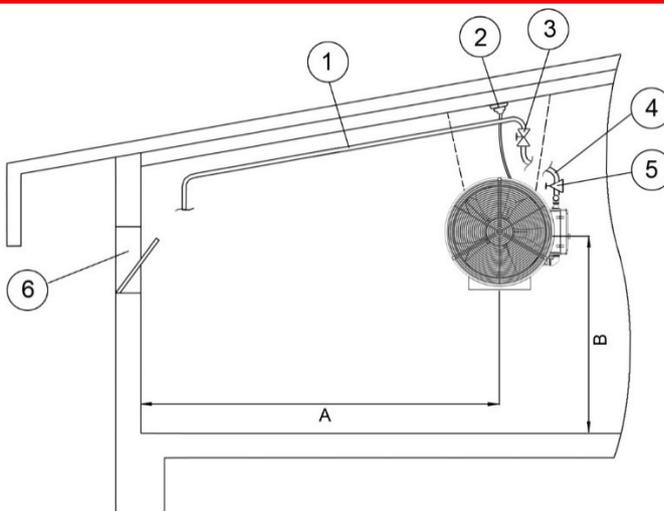


Fig. 7.3-1 Installation and positioning of the HHB air heater

Recommended width (A) is 2 to 2.5 metres, depending on the feeding and watering system. Recommended height (B) is 1.8 metres or tailored to the height of the air inlet valves.

Pos.	Description:	Item no.
1	Gas Supply	
2	Wall electricity socket and plug	
3	Gas valve 3/4" Natural Gas	520058
	Gas Valve 1/2" LP Propane	520250
4	Gas Hose 3/4" Natural Gas	520148
	Gas Hose 1/2" LP Propane	520089
5	Gas Pressure regulator 3/4" Natural Gas	520029
	Gas Pressure regulator 1/2" LP Propane	520251
	Gas Filter 3/4" Natural Gas	520032
6	Air inlet valves (Sample of poultry house situation)	

## 6.4 Instructions prior to first use



The air heater may only be used by authorised persons, as specified previously in sections 6.1 and 6.2.

Once the air heater is connected according to the directions specified in sections 4 and 5, it is essential that the following points are checked prior to first using the appliance:

- The gas connections and ventilation of the gas pipe, see section 6.1.
- The connection to the mains voltage, see section 6.2.
- That the plug has been correctly inserted into the wall socket, see fig. 6.2-1.
- Correct connection of thermostat or climate computer

When you have completed this checklist, the air heater can be started. This can be done manually, via thermostat control or via a computer-controlled 24VAC voltage.



At the factory, the gas block has been set according to the standard in your country. Nevertheless, you should always have this value and the settings on the gas block verified by the person authorised to set up the air heater for use.

The Gas blocks described below is illustrated in figure 7.2-1 and figure 7.2-2.

A manometer can be used to check the supply pressure and the burner pressure and to compare these with the values shown in annexe A. You can do this by turning the screw in the measuring nipple (31.1 and 31.3) one quarter, using an appropriate, short screwdriver. The pressure can be adjusted where necessary using the pressure adjustment screw (31.2). Following the measurement, check that the screw is screwed into the measurement nipple. If the gas specification is unknown, it can be requested from the energy supplier.

## 6.5 Gas block

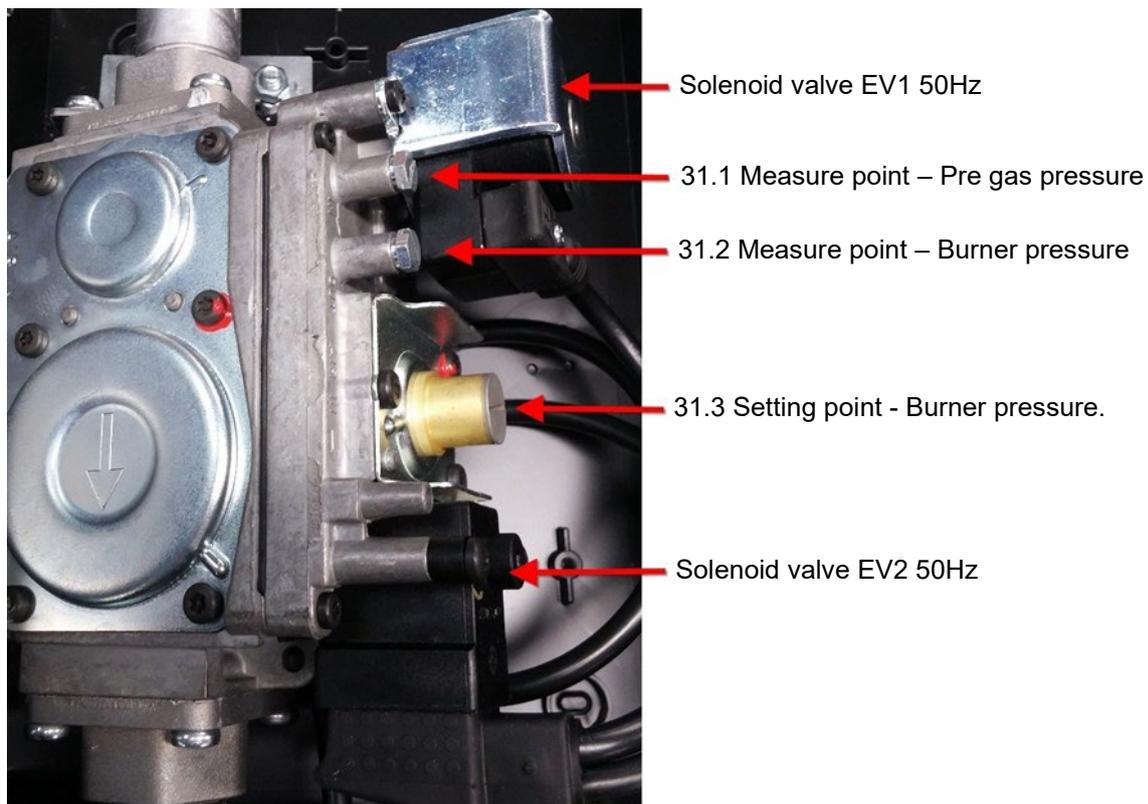


Figure 7.2-1: Gas block 50Hz

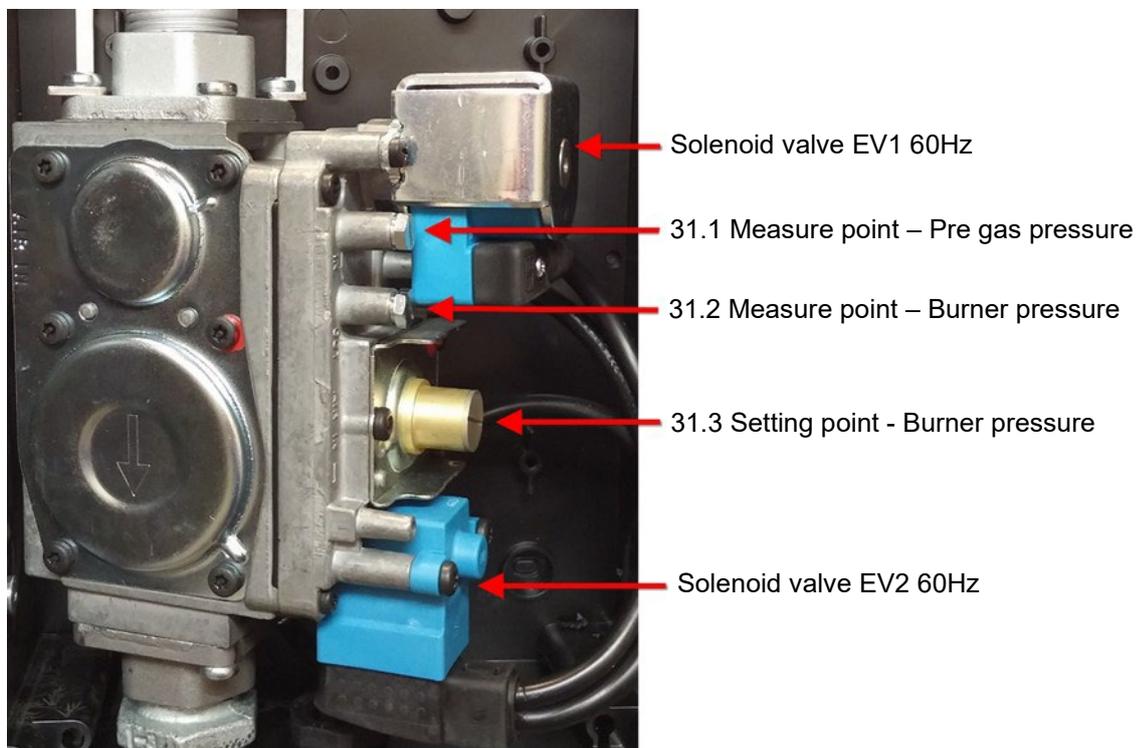


Figure 7.2-2: Gas block 60Hz

## 7 Maintenance



Always remove the plug from the wall socket and shut off the gas supply when carrying out work on the appliance. **Note!** The air heater is phase sensitive. For the air heater to function, it is essential that the plug is reinserted into the wall socket in the correct manner. See also section 6.2.



When components are still warm, please wear gloves to prevent burns.

If the HHB Air Heater is used for other purposes than in broiler houses, the appliance must be cleaned of dust every 2 months. The following parts should be cleaned when cleaning the appliance of dust.

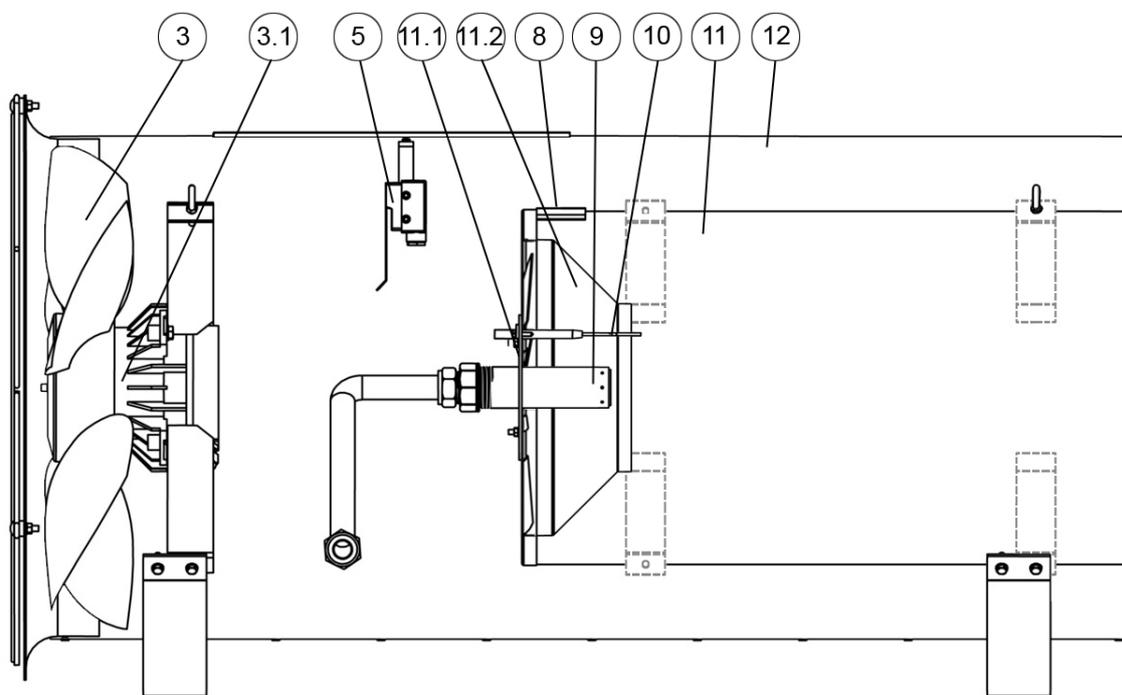


Fig. 8.1-1 Parts which should be cleaned of dust.

Pos.	Name:	Item no.	Pos.	Name:	Item no.
3	Fan blades	See Table 8.1-1	10	Ignition Electrode	020031
3.1	Fan motor		11	Combustion chamber	
5	Vane switch	525401	11.1	Vents	
8	Capillary sensor (fixed to thermostat)	510173	11.2	Cone	
9	Gas injector (Nozzle)	See Fig.9.1-2	12	Outer casing	



When using a high-pressure hose, ensure that parts 3.1 and 5 do not come into direct contact with the jet from the high-pressure hose. These parts are highly sensitive and must be handled with care.

After hosing off the appliance with water, the air heater must be set to ventilate for at least 15 minutes (see fig. 12-2.3) to dry any remaining moisture in the air heater. After reconnecting the air heater, check the gas connections for leaks. This inspection should be performed by an authorised person.

## 7.1 Ventilators

Ventilator for:	Item no:
HHB-040, 50/60 Hz	510269
HHB-070, 50/60Hz	510270
HHB-100/120, 50Hz	See Spare parts list
HHB-100/120, 60Hz	See Spare parts list

Table 8.1-1

## 8 Conversion to another gas type

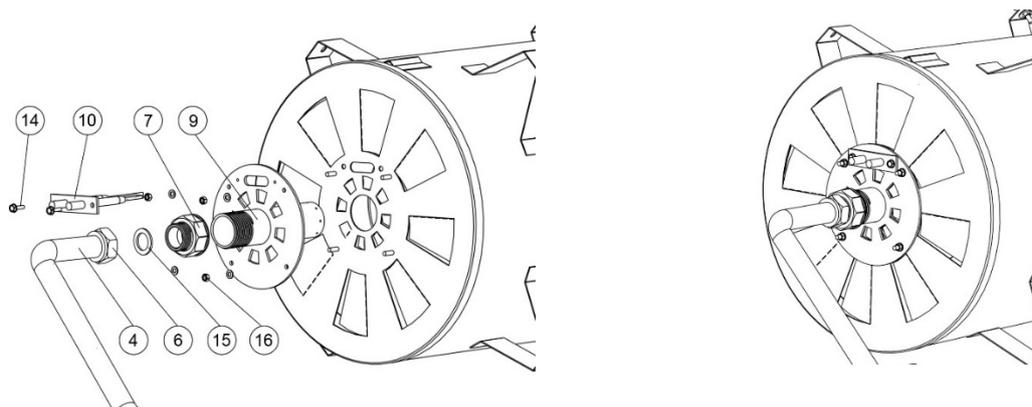
If necessary, the HHB air heater can be easily converted from natural gas to propane, butane or LPG or vice versa.



The air heater may only be converted to a different type of gas by a person authorised to do so. This will ensure that all the parts that transport the gas are assembled correctly.

The assembly sequence is as follows (see fig. 9.1-1):

- Open the inspection panel (21).
- Remove the ignition set (10). Take care not to damage the pins.
- Unscrew the coupling nut (6) from the flexible gas pipe (4). Do this carefully to ensure that the rotating plate does not move.
- Remove the nozzle (9) by unscrewing the 4 x M5 nuts (16).
- Remove the union nut joint (7) from the old nozzle.
- Now fit the nozzle for the other type of gas.
- Fit the union nut joint, using Teflon tape.
- Reconnect the flexible gas pipe. Always use a new gasket ring to do this (15).
- Fit the ignition set.
- Check that all the cables are set up properly and are not damaged.
- Check all gas connections for leaks.
- Close the inspection panel.
- Start up the burner and set the correct gas pressure on the gas block, as per the specifications in annexe A, see also section 6.3.
- Fit a new identification plate with the corresponding gas category.



Disassembled

Assembled

Fig. 9.1-1 (Dis)assembling of the injector.

Pos.	Name:	Item no.	Pos.	Name:	Item no.
4	Flexible gas pipe	020044	10	Ignition electrode	020031
6	Swivel nut	520109	14	Parker	
7	Reducer	020021	15	Gasket ring	520070
9	Nozzle	See fig. 9.1-2	16	M5 nut + ring	

The differences between the natural gas and propane/butane nozzle are shown in the figure 9.1-2 below. The mounting plate for the natural gas nozzle is equipped with holes, whilst the nozzle for the propane/butane nozzle is equipped with rectangular slots. Furthermore, the diameter of the injection holes depends on the HHB type.

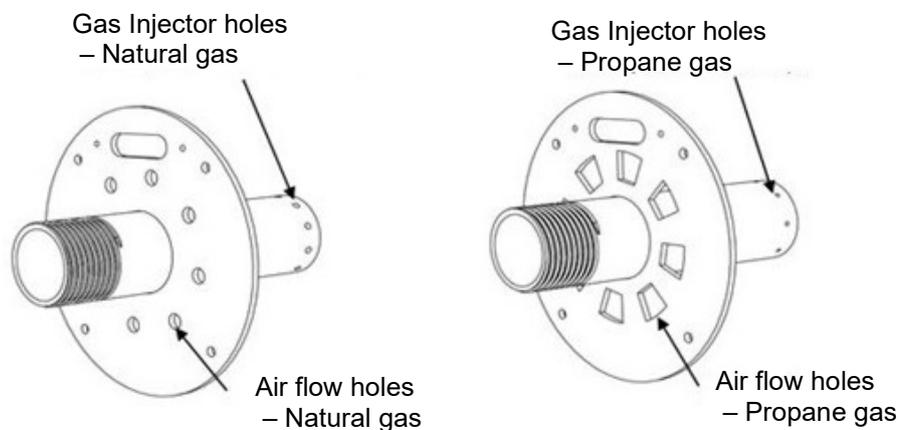


Fig. 9.1-2 Difference between the different injectors

Version	Suitable for:	Item no.
8 x Ø 2,1	HHB-40	020025
10 x Ø 2,6	HHB-70	020026
10 x Ø 3,4	HHB-100	020023
10 x Ø 3,8	HHB-120	020024

Version	Suitable for:	Item no.
8 x Ø 1,4	HHB-40	020029
8 x Ø 1,8	HHB-70	020030
8 x Ø 2,2	HHB-100	020027
8 x Ø 2,4	HHB-120	020028

## 9 Environment



Make sure that defective parts or parts that are at the end of their life are taken to an official collection point for recycling. This way, you help reduce the negative effects on the environment.

## 10 Troubleshooting

### 10.1 General

When resolving malfunctions, it is recommended to check the following first:

- The appliance is connected to the correct voltage 240 V +/- 10%. Problems can occur if there is no connection to the mains voltage supply or if the supply voltage is too low.
- The appliance is supplied with the correct quantity of gas. Problems can occur if there is no gas pressure, or if the pressure is too high- or too low.



**Attention!** The air heater is phase sensitive. It is essential that the plug is inserted into the wall socket in the correct manner. See also section 5.2.

### 10.2 Burner relay response to malfunctions

The table below illustrates the response of the burner relay to various types of malfunctions. After the appliance stopped, the red signal lamp will light up. When the power is restored following a power failure, the appliance will still be paused. The cause of the malfunction must be investigated and, after resolving the malfunction, the appliance can be restarted by pressing the reset button.

Cause:	Response:
Power failure	Restart
Voltage below undervoltage threshold	Safety cut-out
Voltage above undervoltage threshold	Restart
No flame at the end of «TSA»	<u>Factory setting:</u> Freeze at the end of «TSA» Max. 3 repetitions, followed by freeze at the end of «TSA»
Flame extinguished during operation	<u>Factory setting:</u> Appliance pauses • Flame formed at end of «TSA» → Max. 3 repetitions • No flame formed at end of «TSA» → Freeze
«LP» stuck in operating position	Start-up hindered, freezing no later than after a maximum of 65 seconds
«LP» stuck in resting position	Freeze after «t10» elapses
No air pressure signal after «t10» elapses	Freeze
«CPI»-contact is open during «tw»	Start-up hindered, freezing after a max. of 60 seconds

<b>Legend:</b>	tw	Wait time	TSA	Safety time for ignition
	LP	Vane switch	CPI	Closed position inspection
	t10	Specified time for LP		

### 10.3 Burner relay status indicator

During normal operation, the various operating statuses are indicated in the form of colour codes, as shown in the colour coding table below. During start-up, the status is indicated as shown in the following table 10.3-1

Tabel 10.3-1 Burner relay status indicator

**Colour coding table for the multicolour signalling lamp (LED)**

Status:	Colour code:	Colour:
Delay time <<tw>>, other waiting statuses	0.....	Off
Ignition phase, controlled ignition	○●○●○●○●	Flashing yellow
In operation, flame present	■.....	Green
In operation, poor flame signal	■○■○■○■○	Flashing green
Wrong signal form Ionisation	■▲■▲■▲■▲	Green - Red
Undervoltage	▲●▲●▲●▲●	Yellow - red
Failure alarm	▲.....	Red
Error code export (see <<error code table>>)	▲○▲○▲○▲○	Flashing red
Interface diagnosis	▲▲▲▲▲▲	Red flickering light

**EXPLANATION:**

- ▲ Red ..... Continuous On
- Yellow
- Green

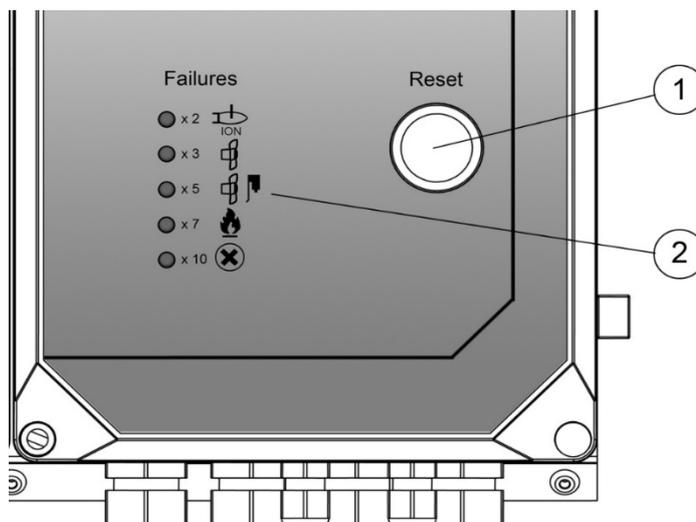


Fig. 10.3-1 Clarification of table 10.3-1

Pos.	Name:
1	Multicolour signalling lamp (LED), see table 10.3-1
2	Error code pictograms, see table 10.4-1

## 10.4 Burner relay malfunction indicator

After the appliance has frozen, the red error signalling lamp on the top of the box will remain lit continuously. In this situation, the visual diagnosis of the cause of the malfunction according to the error code table can be activated by holding down the reset button for 3 seconds. If the reset button is pressed once more for at least 3 seconds, the interface diagnosis is activated. Should the interface diagnosis be activated accidentally, in which case the faint red light of the signal lamp will flicker, this can be deactivated by pressing the reset button once more for at least 3 seconds. The changeover is indicated by a yellow pulsing light.

Error code table		
Red flashing code of signal lamp:	<<AL>> on terminal 10:	Possible cause:
2 flashes	On	No problems with flame at end of <<TSA>> * Faulty or soiled gas valve * Faulty or soiled ionisation pin * Burner not set properly, no fuel * Faulty ignition system
3 flashes	On	<<LP>> faulty * Loss of pressure signal after <<t10>> * <<LP>> stuck in resting position
5 flashes	On	Time exceeded * <<LP>> stuck in operating position
7 flashes	On	Flame goes out regularly during operation (limitation of repetitions) * Faulty or soiled gas valve * Faulty or soiled ionisation pin * burner not set properly
10 flashes	Off	Connection error, output contacts, other faults
14 flashes	On	CPI-contact not closed

<b>Legend:</b>	AL	Error report (alarm)	TSA	Safety time for ignition
	LP	Vane switch	CPI	Closed position inspection
	t10	Specified time for LP		

Table 10.4-1 Error code table

## 10.5 Malfunctions and potential solutions

<b>Malfunction :</b>	<b>The air heater does not start, even when started manually.</b>
<b>Possible cause:</b>	<ul style="list-style-type: none"> <li>• The plug is not in the wall socket.</li> <li>• No mains voltage.</li> <li>• Faulty burner relay.</li> <li>• Master switch is switched off.</li> <li>• Maximum safety has been engaged.</li> </ul>
<b>Solutions:</b>  	<ul style="list-style-type: none"> <li>• Check the mains lead for damage and/or insert the plug into the wall socket.</li> <li>• Check that there is a supply current using a voltmeter. If not, check the voltage circuit.</li> <li>• Replace the burner relay.</li> <li>• Reset the master switch.</li> <li>• Reset the maximum safety system.</li> </ul>

<b>Malfunction:</b>	<b>The air heater does not respond to the heat demand of the thermostat and 24 VDC drive. Manual ventilation and heating do work however.</b>
<b>Possible cause:</b>	<ul style="list-style-type: none"> <li>• No 24VDC drive.</li> <li>• Loose wiring.</li> <li>• Break in the system wiring.</li> <li>• 24VDC relay is loose or faulty.</li> <li>• Faulty thermostat.</li> <li>• Faulty burner relay.</li> </ul>
<b>Solutions:</b>  	<ul style="list-style-type: none"> <li>• Check the 24VDC drive.</li> <li>• Repair loose wiring.</li> <li>• Check the system and repair the break in the wiring.</li> <li>• Replace the 24VDC relay.</li> <li>• Replace the thermostat.</li> <li>• Replace the burner relay.</li> </ul>

<b>Malfunction :</b>	<b>The air heater does nothing. It is however connected to the mains voltage and gas.</b>
<b>Possible cause:</b>	<ul style="list-style-type: none"> <li>• Maximum protection has been activated.</li> <li>• It is possible that the capacitor is faulty.</li> <li>• It is possible that one or more electrical components are faulty.</li> </ul>
<b>Solutions:</b>  	<ul style="list-style-type: none"> <li>• When restarting the appliance, check that the fan continues to ventilate for 60 seconds afterwards.</li> <li>• Check that the fan is working.</li> <li>• If necessary, replace the fan or capacitor.</li> </ul>

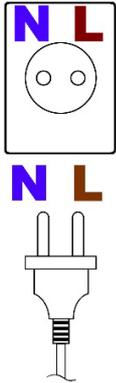
	<ul style="list-style-type: none"> <li>• Remove any dirt from the grille in front of the fan.</li> <li>• Check that all electrical components are working correctly.</li> </ul>
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<b>Malfunction:</b>	<b>The air heater starts correctly but does not ignite. Gas is however being released. The red error lamp lights up (Error code 2).</b>
<b>Possible cause:</b>	<ul style="list-style-type: none"> <li>• The ignition set is faulty.</li> <li>• The ignition cable has poor connection, is loose or is not connected properly.</li> <li>• The earth cable is loose or is not connected properly.</li> <li>• The burner relay is faulty and does not allow the ignition.</li> </ul>
<b>Solutions:</b> 	<ul style="list-style-type: none"> <li>• Replace the ignition set.</li> <li>• Insert connection or repair loose contacts.</li> <li>• Repair or replace the loose earth wire.</li> <li>• Replace the burner relay.</li> </ul>

<b>Malfunction :</b>	<b>After starting up, the fan starts, but stops within a minute. The red error lamp lights up (Error code 3).</b>
<b>Possible cause:</b>	<ul style="list-style-type: none"> <li>• The vane does not shift or does not stay in position.</li> <li>• The fan is not providing sufficient air.</li> </ul>
<b>Solutions:</b> 	<ul style="list-style-type: none"> <li>• Check the air heater for dirt or blockages.</li> <li>• Replace the vane.</li> <li>• When the fault has been resolved, reset the appliance by pressing the reset button.</li> </ul>

<b>Malfunction:</b>	<b>The appliance lights up shortly and then shuts off. The red warning lamp lights up (Error code 7 or 10).</b>
<b>Possible cause:</b>	<ul style="list-style-type: none"> <li>• Loose earth wires or loose wires to the ionisation pin.</li> <li>• Ionisation pin is not receiving sufficient power.</li> <li>• Ionisation pin is broken or loose.</li> <li>• Burner relay is not functioning correctly.</li> <li>• The fan is not producing enough rotations.</li> <li>• The mains voltage is too low.</li> <li>• Gas pressure is set too low.</li> </ul>
<b>Solutions:</b> 	<ul style="list-style-type: none"> <li>• Repair the earth wires or the wires to the ionisation pin.</li> <li>• Check the ionisation pin for damage, loose contacts, moisture, and dirt.</li> <li>• Clean or replace the ionisation pin if necessary.</li> <li>• Replace the capacitor for the fan.</li> <li>• Check whether the supply voltage is correct by measuring. Resolve the problem. Reset the appliance by pressing the reset button.</li> </ul>

<b>Malfunction :</b>	<b>The appliance starts up but does not ignite and there is no gas. The fan rotates however (Error code 5 or 10).</b>
<b>Possible cause:</b>	<ul style="list-style-type: none"> <li>• Fan rotates too slowly and does not turn on the vane.</li> <li>• Vane is not functioning correctly.</li> <li>• Loose wiring.</li> </ul>
<b>Solutions:</b>  	<ul style="list-style-type: none"> <li>• Check that the fan is not losing power or generating too few revolutions per minute because of a faulty capacitor.</li> <li>• Measure and check whether the vane operate correctly. Replace if necessary.</li> </ul>

<b>Malfunction :</b>	<b>The appliance starts up three times, burns for a short while and then stops. Red lamp lights up.</b>
<b>Possible cause:</b>	<ul style="list-style-type: none"> <li>• The appliance is phase sensitive. It is possible that the plug has been inserted into the wall socket incorrectly.</li> </ul>
<b>Solutions:</b>  	<ul style="list-style-type: none"> <li>• Rotate the plug in the wall socket, see figure below.</li> </ul> 

## 10.6 Technical support

Should you have any questions or encounter any problems with your HHB air heater, please contact your supplier in all instances. They offer full assistance and support.

## 11 FOR END USERS

The next part in this manual is for the end user of the appliance.

## 12 Operation

### 12.1 General functioning

The Holland Heater HHB air heater is a direct gas fired air heater which means that the exhaust flues resulted from burning gas are supplied directly to the air being heated. This has the important advantage that the efficiency of the heating is maximum (all the heat is used, so the efficiency is 100%). Another advantage is that no evacuation system is necessary for the exhaust flues, so the installation costs can be kept low. Because the exhaust flues are mixed with the ambient air, the CO<sub>2</sub> percentage in the air will increase. This requires that the space is properly ventilated with outside air, to prevent that the CO<sub>2</sub> percentage increases too much. You can find more information about this in chapter 6.3 of the manual.

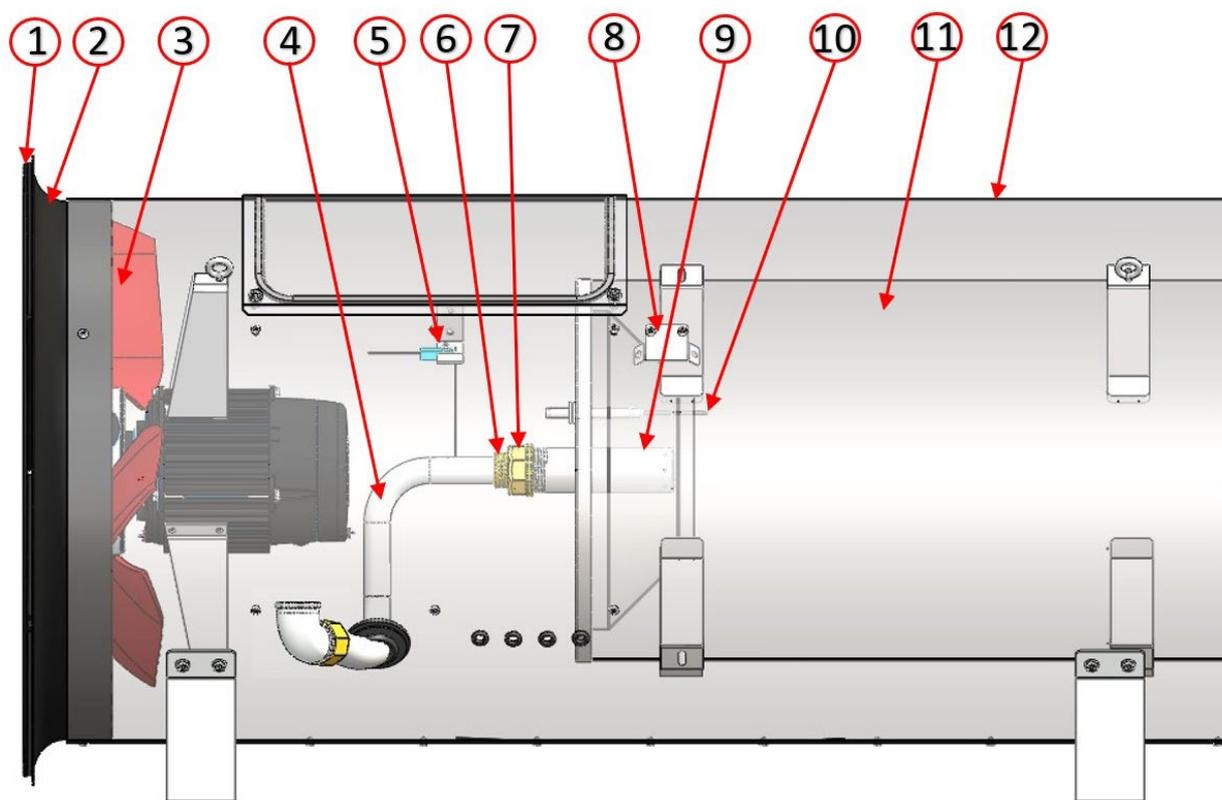


Fig. 11.1-1 Section of the HHB Air heater

Pos.	Name	Article No.	Pos.	Name	Article No.
1	Grill with Inlet ring 70kW	020120	9	Nozzle	See Fig.8.-2
2	Grill with Inlet ring 100/120kW	020121			
3	Ventilator + motor	See Spare parts list	10	Ignition electrode	020031
4	Flexible gas pipe	020044	11	Burner chamber 040	020037
5	Vane switch	510401		Burner chamber 070	020036
6	Swivel nut	520109		Burner chamber 100/120	020035
7	Reducer	020021	12	Outer casing	
8	Capillary sensor (fixed to thermostat)	510173	13	Pedestal	530102

The integrated ventilator ensures that air flows through the vanes of the twisted disk on the inlet side of the burner chamber and the cone into the burner chamber. Most of the air flows between the burner chamber and the outer casing and provides maximum air-throw at an average low air temperature. This secondary air also ensures the cooling of the outer casing.

The gas is injected through a radial nozzle (9), in the cone. A rotating gas / air mix is created and is ignited by a high-voltage ignition spark. The rotating mixture ensures a stable blue flame and compact combustion with low NO<sub>x</sub>, CO emissions. The C<sub>2</sub>H<sub>4</sub> (ethylene) formed is null. As safety device, a flame protection ionization pin (10) is installed. This device automatically switches the burner off via the burner relay (40) once the flame dies or becomes unstable. This ensures that no unburned gas is released into the room. For extra protection, a wind vane has been mounted that switches off the burner if the fan does not supply enough air or should break down. If the temperature in the air heater becomes too high, the maximum thermostat switches off the burner. This results in a block-mode from the maximum thermostat and must then be reset by pressing the reset button (35).

## 12.2 Control

After turning on the appliance (see fig. 12.2-3), the program of the burner relay is activated. The burner control (40) then checks the rest position of the wind vane (5) and checks that there is no flame (rest position flame control), after which the fan (3) is started. After a pre-programmed pre-purge period, the ignition will be activated, after which the gas valves in the gas block (31) are opened.

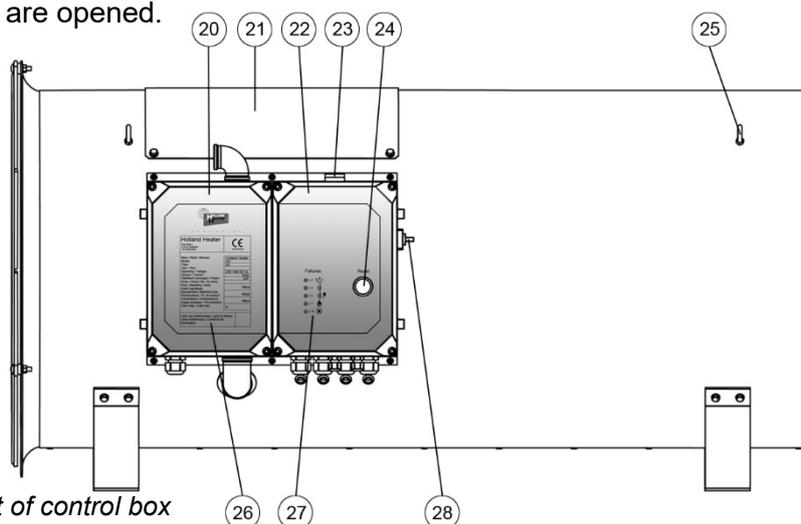


Fig. 12.2-1 Front of control box

Pos.	Name:	Item no.
20	Gas block protective casing	20033
21	Inspection panel	530060
22	Control box	20032
23	Fault lamp	510146

Pos.	Name:	Item no.
24	Reset button	Part of Burner controller
25	Hanging eye	
26	Identification plate	
27	Failure indicator	510146
28	Selector switch	510140

The gas is now injected into the combustion chamber via the nozzle and is ignited. The burner relay (40) then checks whether a stable flame is formed within three seconds of the gas valve opening. If a stable flame does not form, the burner relay allows the system to restart twice more before generating a fault (freezing).

When the air heater is switched off, the gas valves are shut off and ventilation continues for a further 1.5 minutes to ensure that the combustion chamber is sufficiently cooled.

If the wind vane intervenes due to a lack of air, the burner is switched off, followed by a blocking and fault message. When the maximum thermostat intervenes, it is switched off and blocked, after which both the burner control and the maximum thermostat (35) must be reset (24).

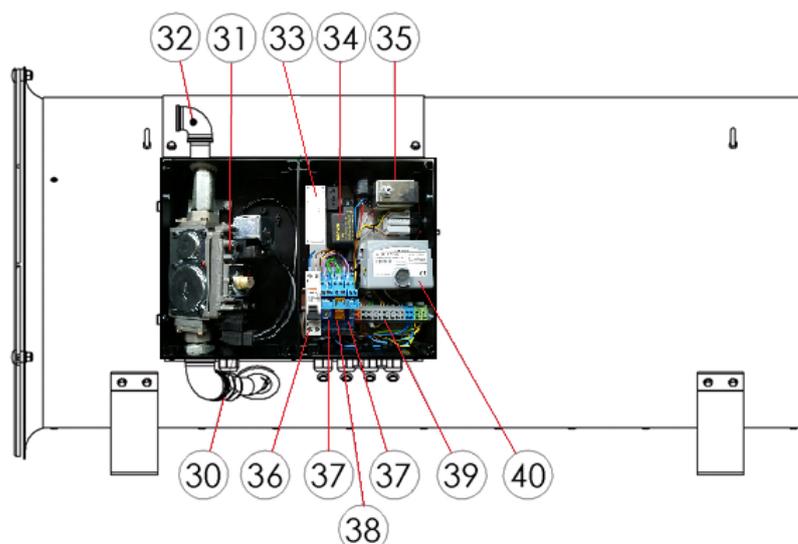


Fig. 12.2-2 Overview of Gas valve and Control panel

Nr.	Description:	Item no.
30	Flexible Gas Pipe	20044
31	Gas valve SIT	520154
32	Terminal 3/4"	
33	Condensator - 8 µF	510058
34a	Ignition transformer ZT870	510109
34b	Ignition transformer TSM	510230
35	Thermostat max 110°C	510173

Nr.	Description:	Item no.
36	Circuit breaker	510069
37	Relay K1&K2 24VAC	530131
	Relay K1&K2 24VDC	510291
	Relay K1&K2 230VAC	510118
38	Relay K3 230 VAC	530155
39	Terminal strip	510094
40	Burner control – Siemens LME39	510047

❖ For further details on Gas valve, please refer to Fig. 7.2-1 & 7.2-2

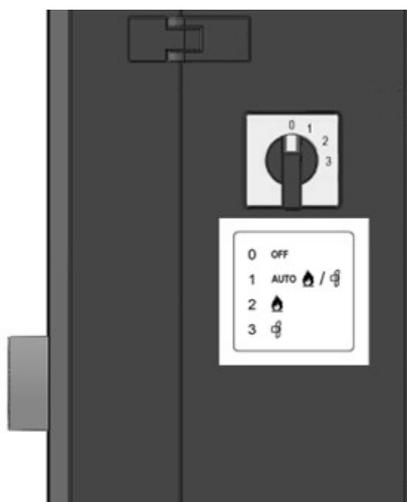


Fig. 12.2-3 Operation of selector switch

The selector switch has the following positions:

- 0 = Off
- 1 = Automatic heating / automatic ventilation
- 2 = Continuous heating
- 3 = Continuous ventilation

## 13 Annexes

### Annex A – Gas pressures for different types of gas

The burner pressure is dependent on the calorific value and the density of the gas. To establish a direct connection to the required burner pressure, the so-called Wobbe index has been introduced. This is the relationship between the calorific value and the square root of the relative density of the gas.

$$\text{Wobbe Index} = \frac{H_s}{\sqrt{d}}$$

All values have been adjusted for standard environmental conditions (15°C and 1013 mbar).

The appliance should always be monitored to ensure that the required gas inlet pressure is available.

#### Natural gas:

The required pressure is 20 mbar for natural gas. The burner pressure for different types of gas can be found in the table below.

HHB with nozzle 10 x ø 3,8				
Wobbe Index:		Burner pressure:		Comment:
kWh/m <sup>3</sup>	MJ/m <sup>3</sup>	mbar	Pa	
11,4	41,0	11,6	1.160	G25 L- gas
11,6	41,8	11,3	1.130	
11,8	42,5	11,0	1.100	
12,0	43,2	10,7	1.070	
12,2	43,9	10,4	1.040	
12,4	44,6	10,2	1.020	
12,6	45,4	9,9	990	
12,8	46,1	9,7	970	
13,0	46,8	9,4	940	
13,2	47,5	9,2	920	
13,4	48,2	8,9	890	
13,6	49,0	8,7	870	
13,8	49,7	8,5	850	
14,0	50,4	8,3	830	
14,2	51,1	8,1	810	G20 H-gas
14,4	51,8	7,9	790	
14,6	52,6	7,7	770	
14,8	53,3	7,5	750	
15,0	54,0	7,3	730	
15,2	54,7	7,2	720	

#### Propane / butane:

The required pressure is 37 - 50 mbar after the gas pressure regulator for propane or butane, depending on the gas category. There should be 0.5 – 2.5 bar supply pressure available to the propane pressure regulator.

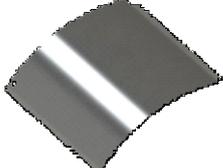
### 13.1 Annex B: - Spare Parts & Accessories

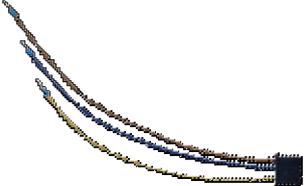
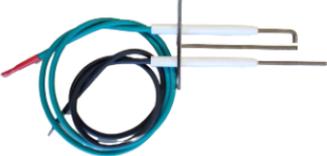
<b>HHB</b>		
<b>Item Number</b>	<b>Description</b>	<b>Image</b>
520058	Gas Valve - 3/4"	
520250	Gas Valve - 1/2"	
520089	Gas Hose - Gas 1/2"	
520029	Regulator - 3/4"	
520251	Regulator - LP/Propane Gas 1/2"	
520032	Filter - Natural Gas 3/4"	
510173	Max. Thermostat	
010039	Fresh Air Intake Kit 40 & 70	

<b>HHB</b>		
<b>Item Number</b>	<b>Description</b>	<b>Image</b>
490022	Reducer G-½" Rs-⅜"	
525401	Wind Vane Switch	
510047	Siemens Burner Control - LME39	
020031	Ignition Electrode	
510109	Ignition Transformer	
510291	DC Relay-24V 2W 8 Amp	
530155	AC Relays-230V 1W 16 Amp	

<b>HHB</b>		
<b>Item Number</b>	<b>Description</b>	<b>Image</b>
510069	Circuit Breaker 10 Amp	
020099	Capacitor 10µF	
520154	Gas Valve SIT	
520171	Cable - Gas Valve Nova 822	
510106	Cable - Transformer ZT870	
510140	Selector Switch	
520129	Nozzle HHB-70 NG	
520130	Nozzle HHB-70 LP/LPG	
510270	Fan 70kW	

<b>HHB</b>		
<b>Item Number</b>	<b>Description</b>	<b>Image</b>
520070	Grommet Ring 30x20x2 mm	
020120	Grill & Inlet Ring 70kW	
020121	Grill & Inlet Ring 100/120kW	
500018	Ventilator + Motor 100&120kW	
020044	Flexible Gas Pipe	
520109	Swivel Nut	
020021	Reducer	
020025	Nozzle 8 x Ø2.1 mm - 40kW NG	
020026	Nozzle 10 x Ø2.6 mm - 70kW NG	

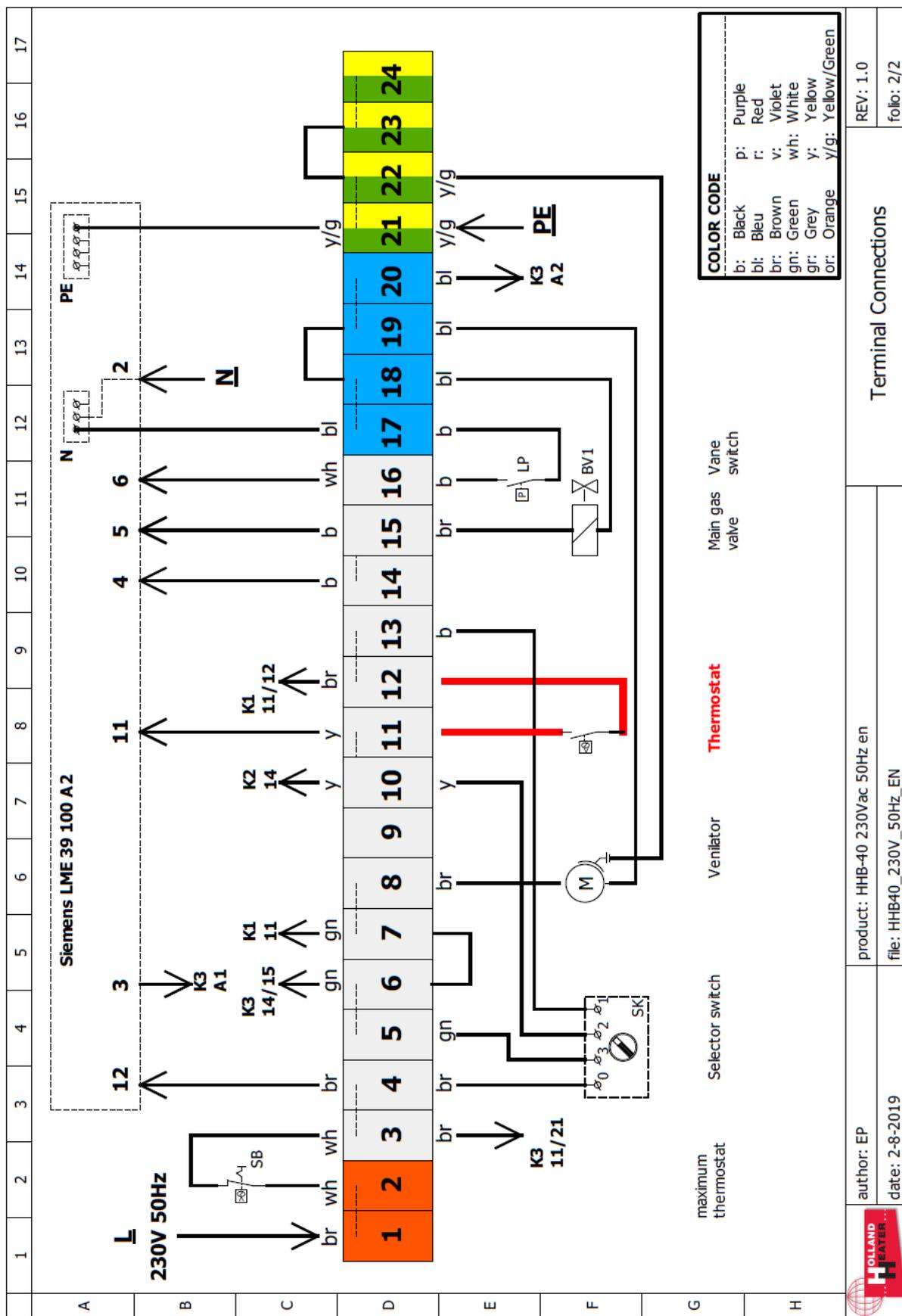
<b>HHB</b>		
<b>Item Number</b>	<b>Description</b>	<b>Image</b>
020023	Nozzle 10 x Ø3.4 mm - 100kW NG	
020024	Nozzle 10 x Ø3.8 mm - 120kW NG	
020029	Nozzle 8 x Ø1.4 mm - 40kW LPG	
020030	Nozzle 8 x Ø1.9 mm - 70kW LPG	
020027	Nozzle 8 x Ø2.2 mm - 100kW LPG	
020028	Nozzle 8 x Ø2.4 mm - 120kW LPG	
530102	Pedestal	
020033	Gas Block Protective Casing	
530060	Inspection Panel	

<b>HHB</b>		
<b>Item Number</b>	<b>Description</b>	<b>Image</b>
020032	Control Box	
510227	Signal light RED Led 230V LPMLM4	
530131 24VAC 510291 24VDC 510118 230VAC (all 2W,8A)	Relay K1 & K2 - AC and DC options (DC=Blue & AC=Orange)	
020169 020170	Vostermans Fan - HHB 100&120 50Hz Vostermans Fan - HHB 100&120 60Hz	
510058	Condensator - 8μF	
40116	Wired connector 3 pin - TSM transformer	
510230	Ignition transformer - Brahma TSM15898000	
020173	Ignition Electrode & spark cable - Brahma TSM15898000	

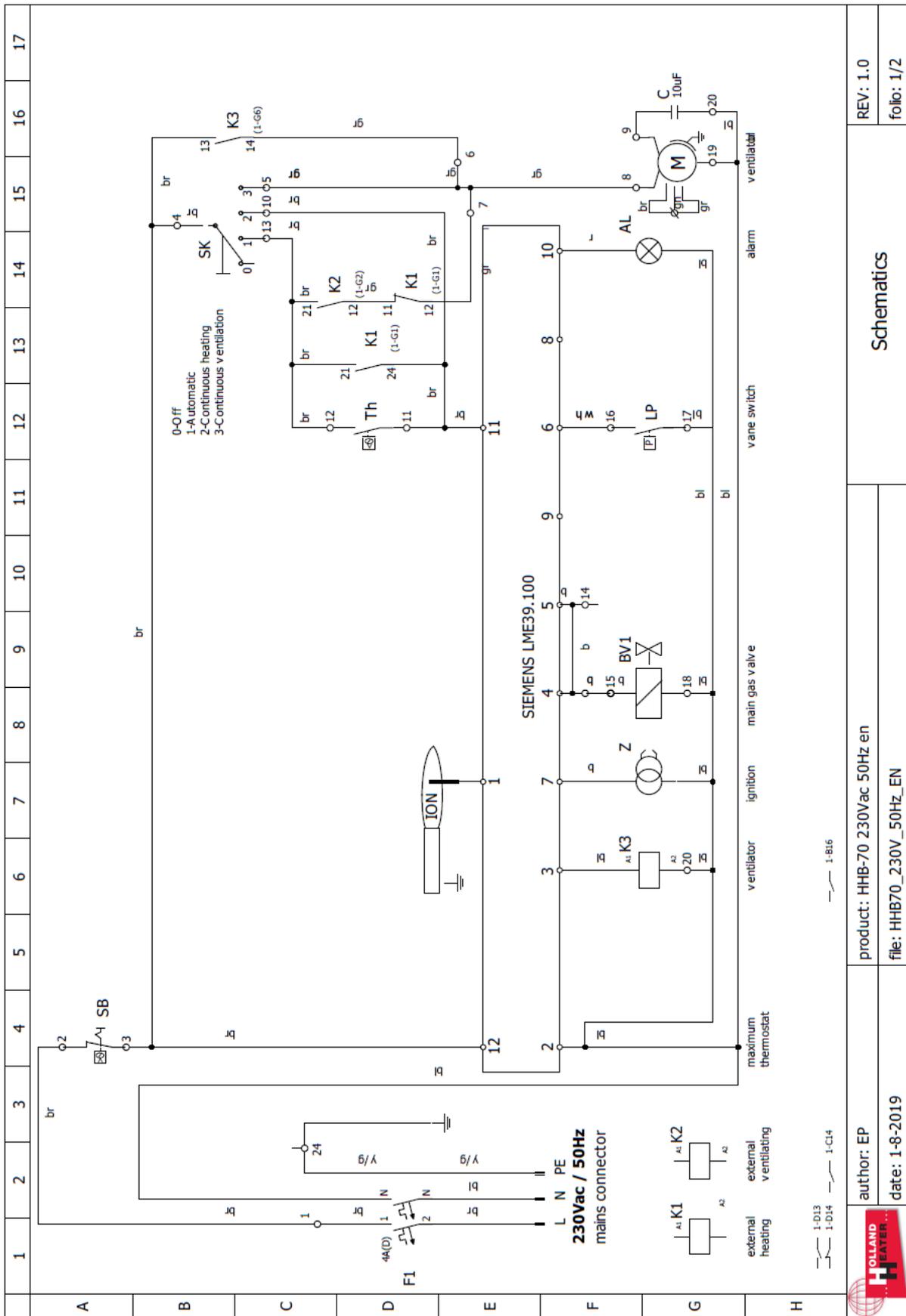




# Terminal strip HHB-40, 50Hz

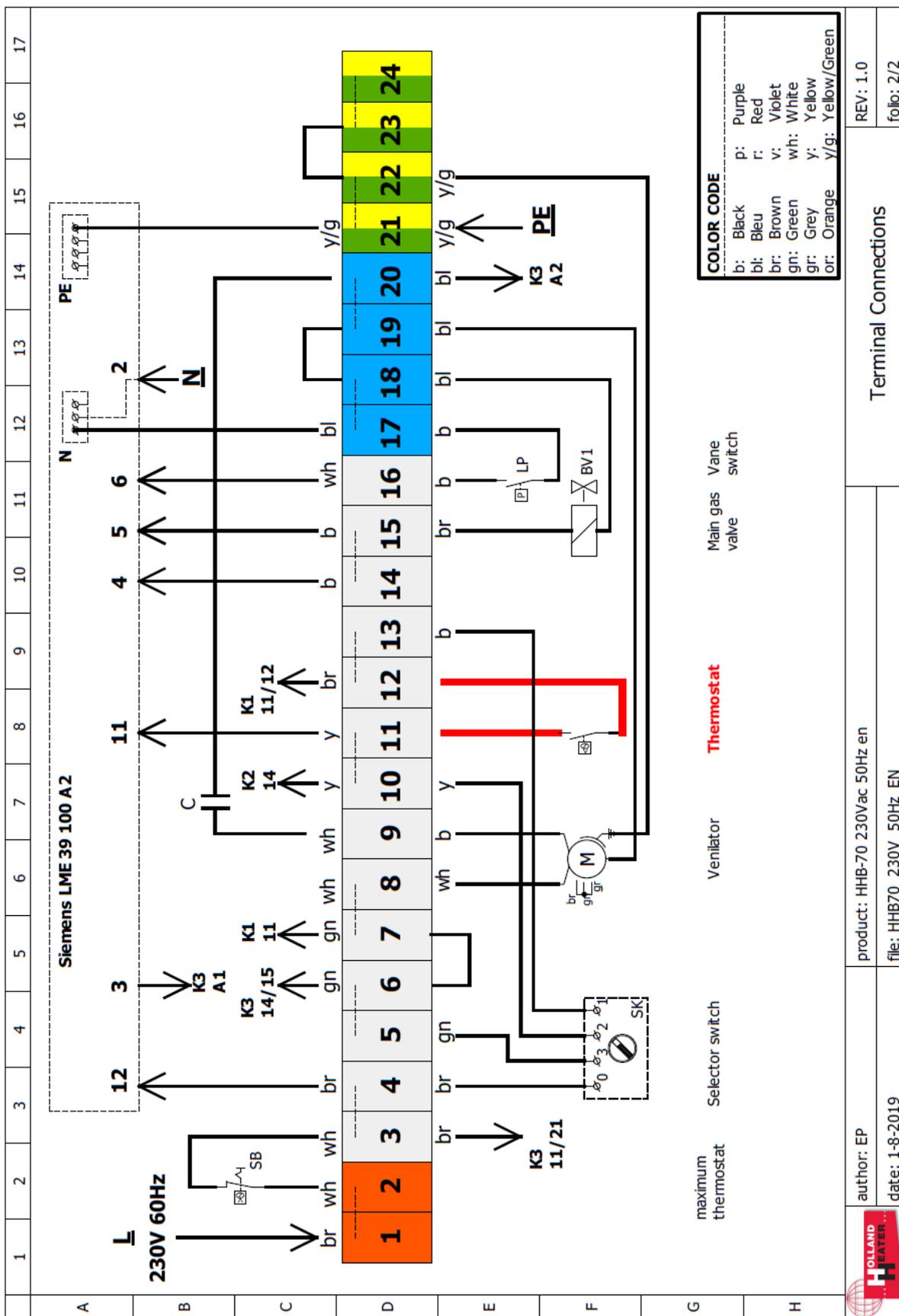


# Diagram HHB-70, 50Hz



		author: EP	product: HHB-70 230Vac 50Hz en file: HHB70_230V_50Hz_EN	Schematics		REV: 1.0
		date: 1-8-2019				folio: 1/2

# Terminal strip HHB-70, 50Hz



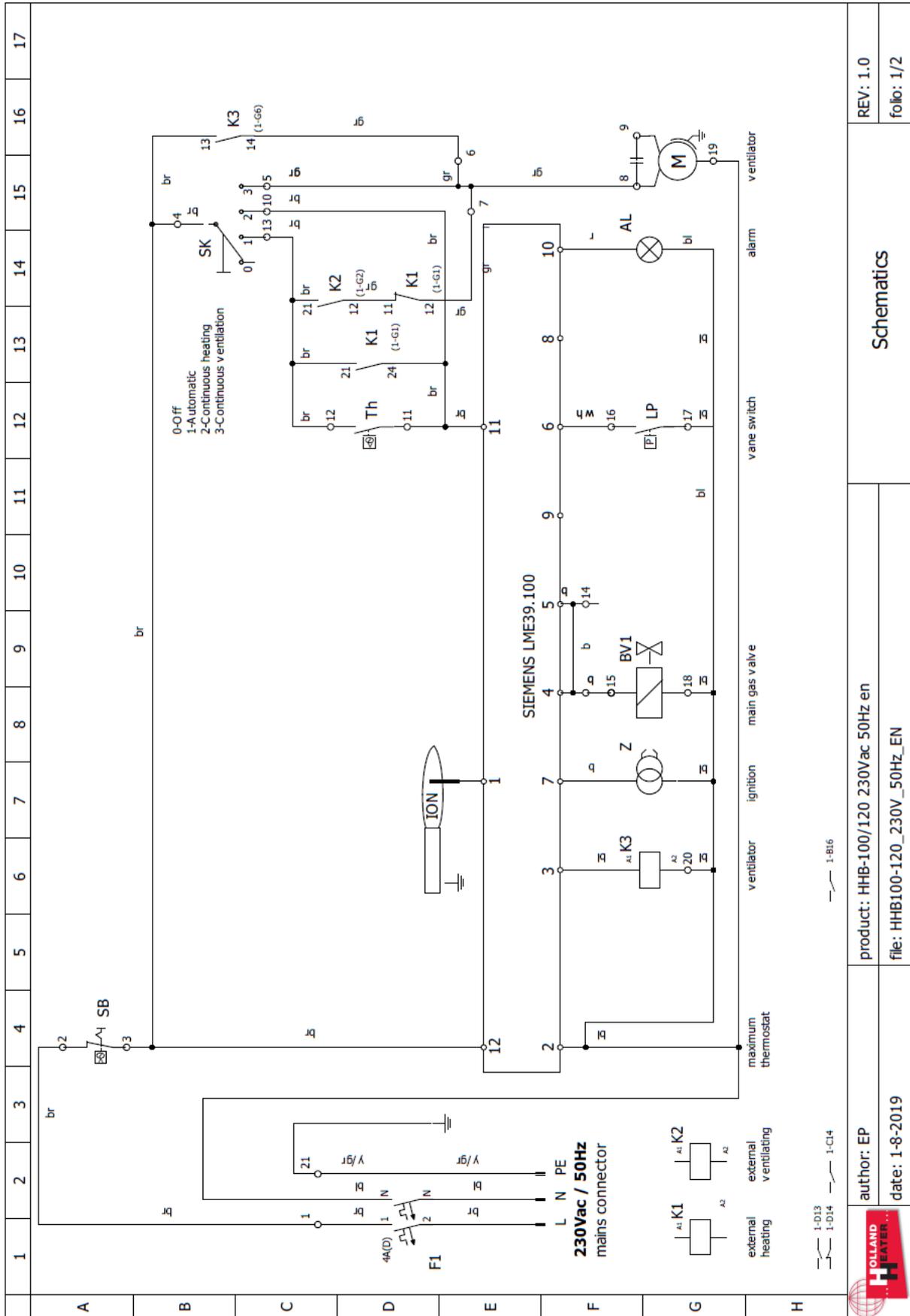
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date: 1-8-2019

product: HHB-70 230Vac 50Hz en  
file: HHB70\_230V\_50Hz\_EN

Terminal Connections

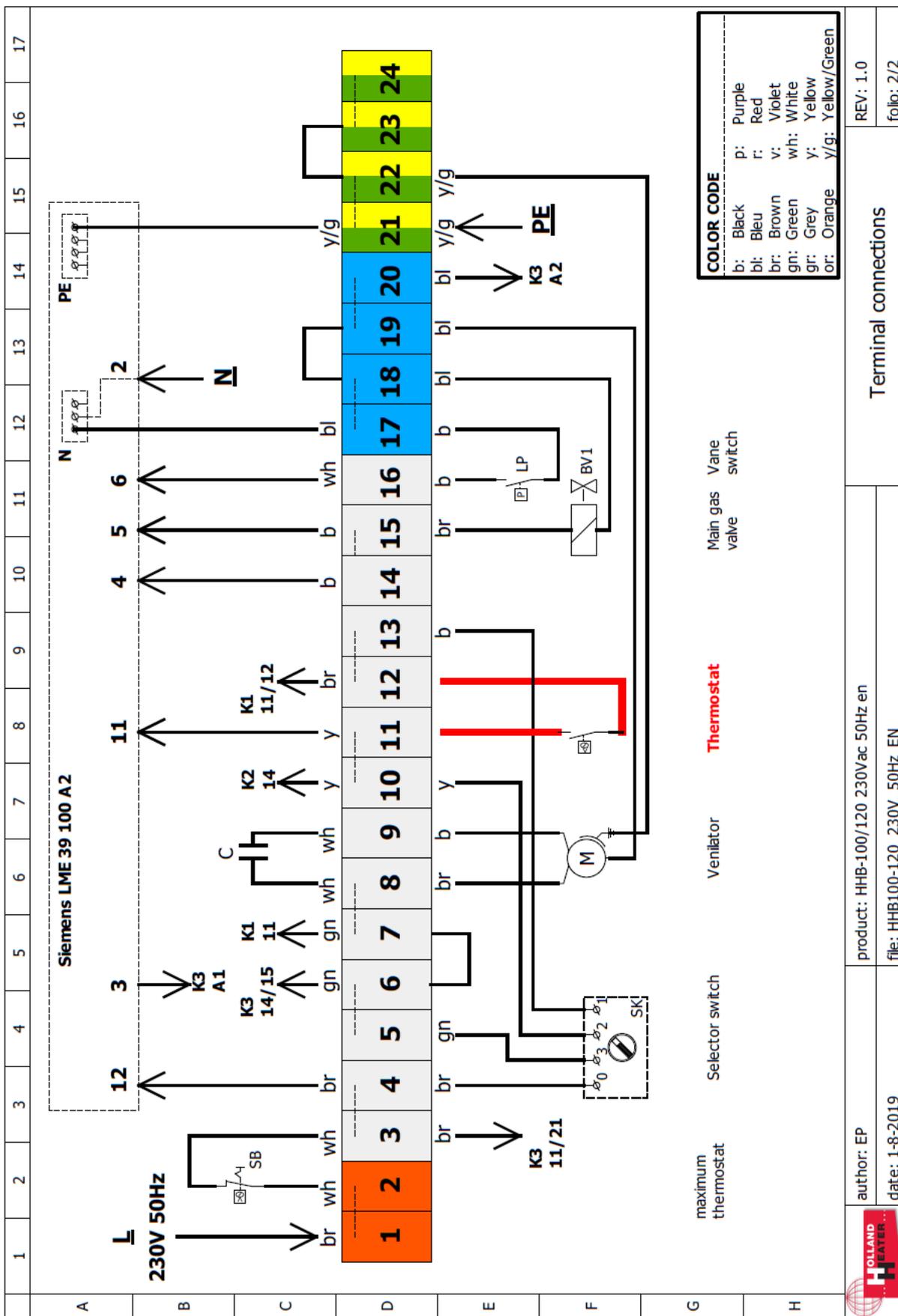
REV: 1.0  
folo: 2/2

# Diagram HHB-100/120, 50Hz

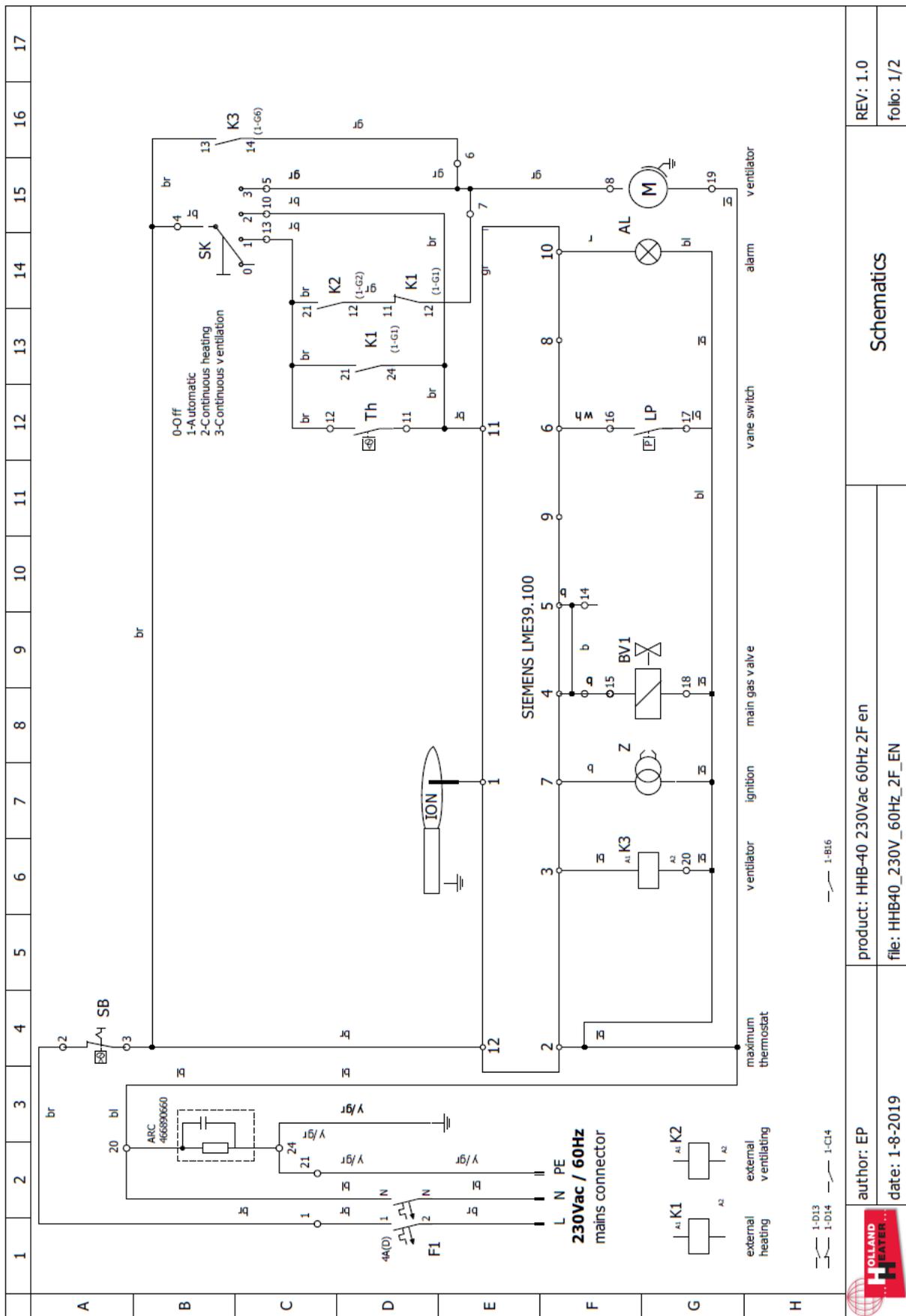


Schematics	REV: 1.0 folio: 1/2
author: EP date: 1-8-2019	product: HHB-100/120 230Vac 50Hz en file: HHB100-120_230V_50Hz_EN

### Terminal strip HHB-100/120, 50Hz



### Diagram HHB-40, 60Hz 2f

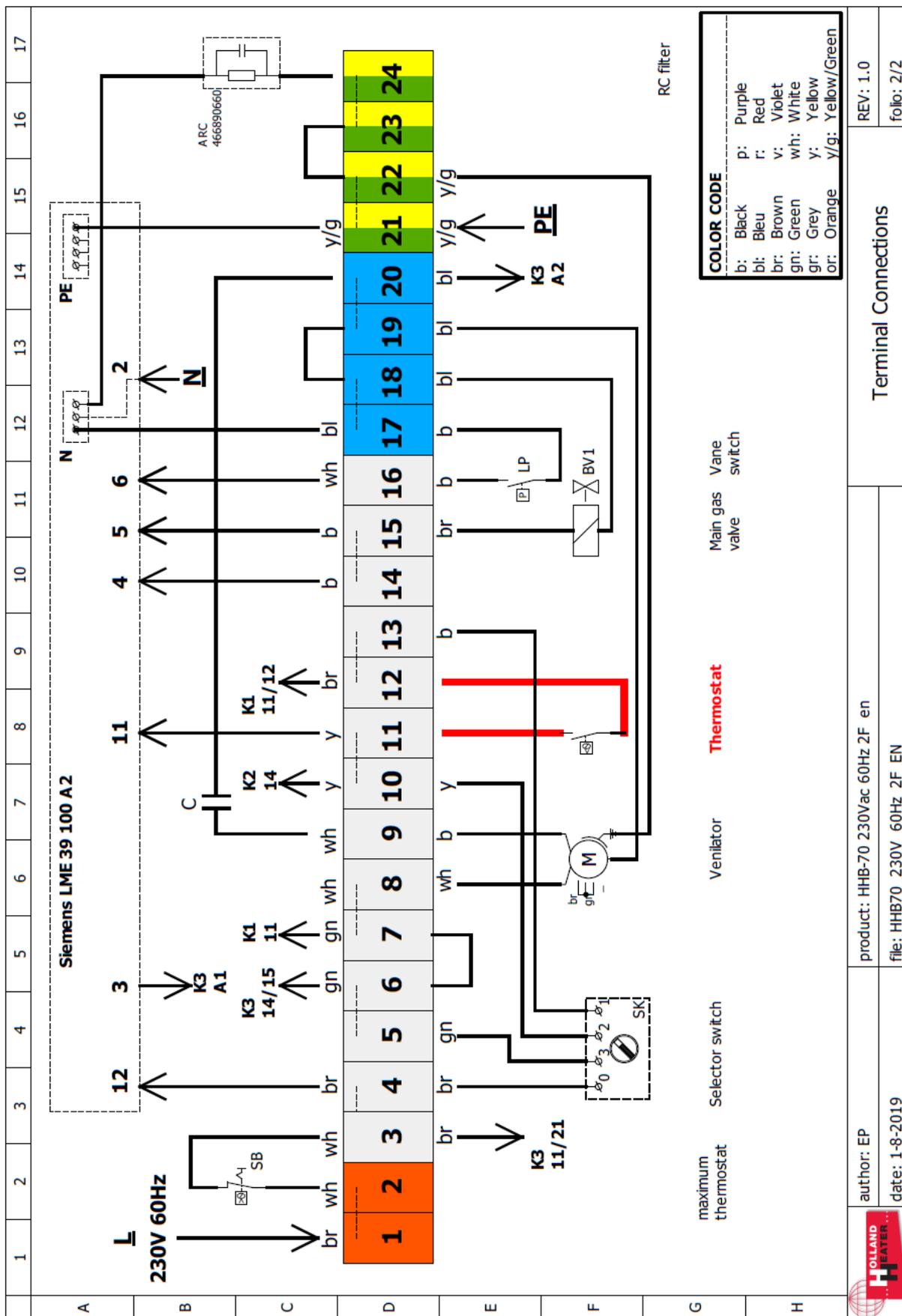


	author: EP	<b>Schematics</b>	REV: 1.0
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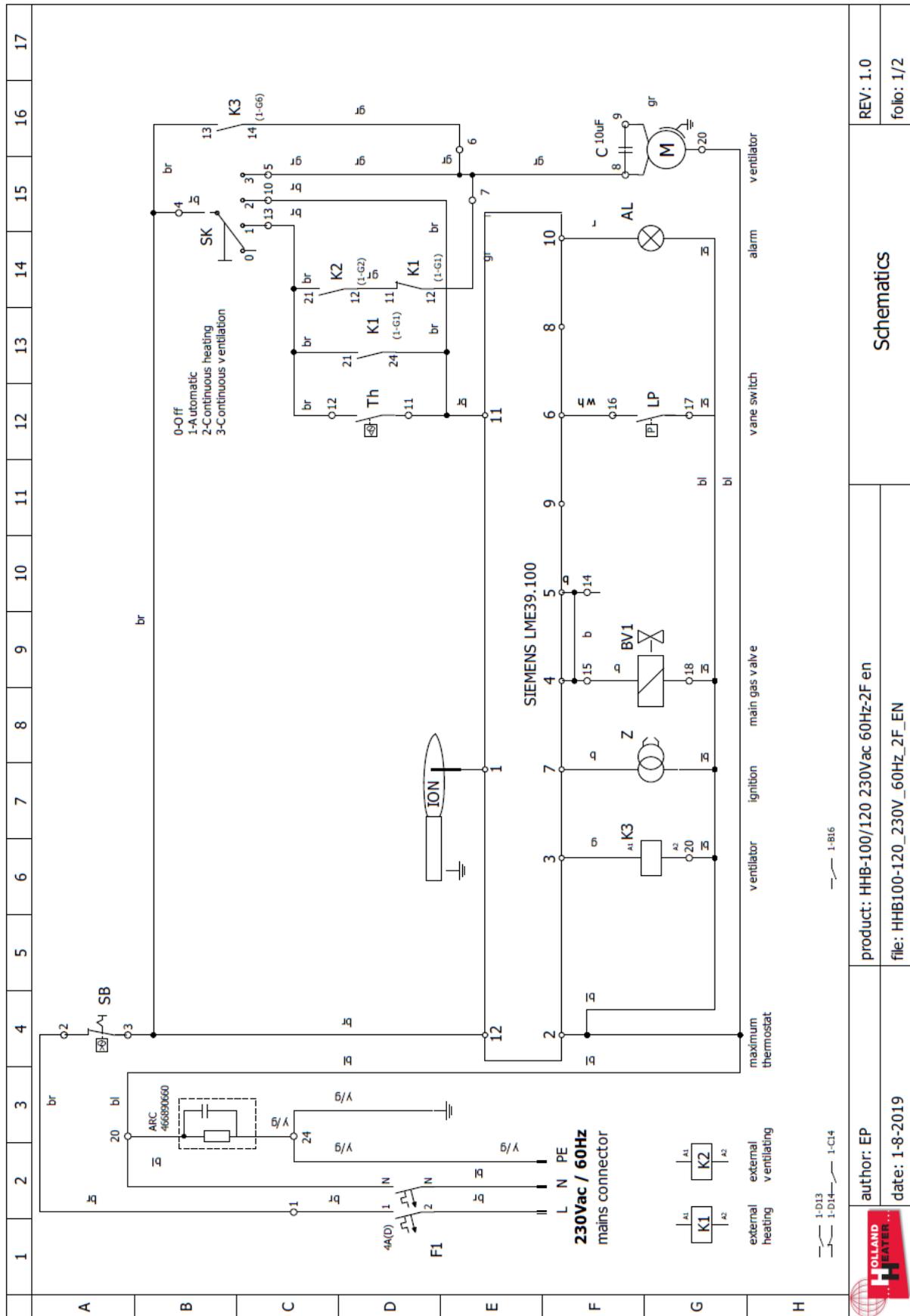




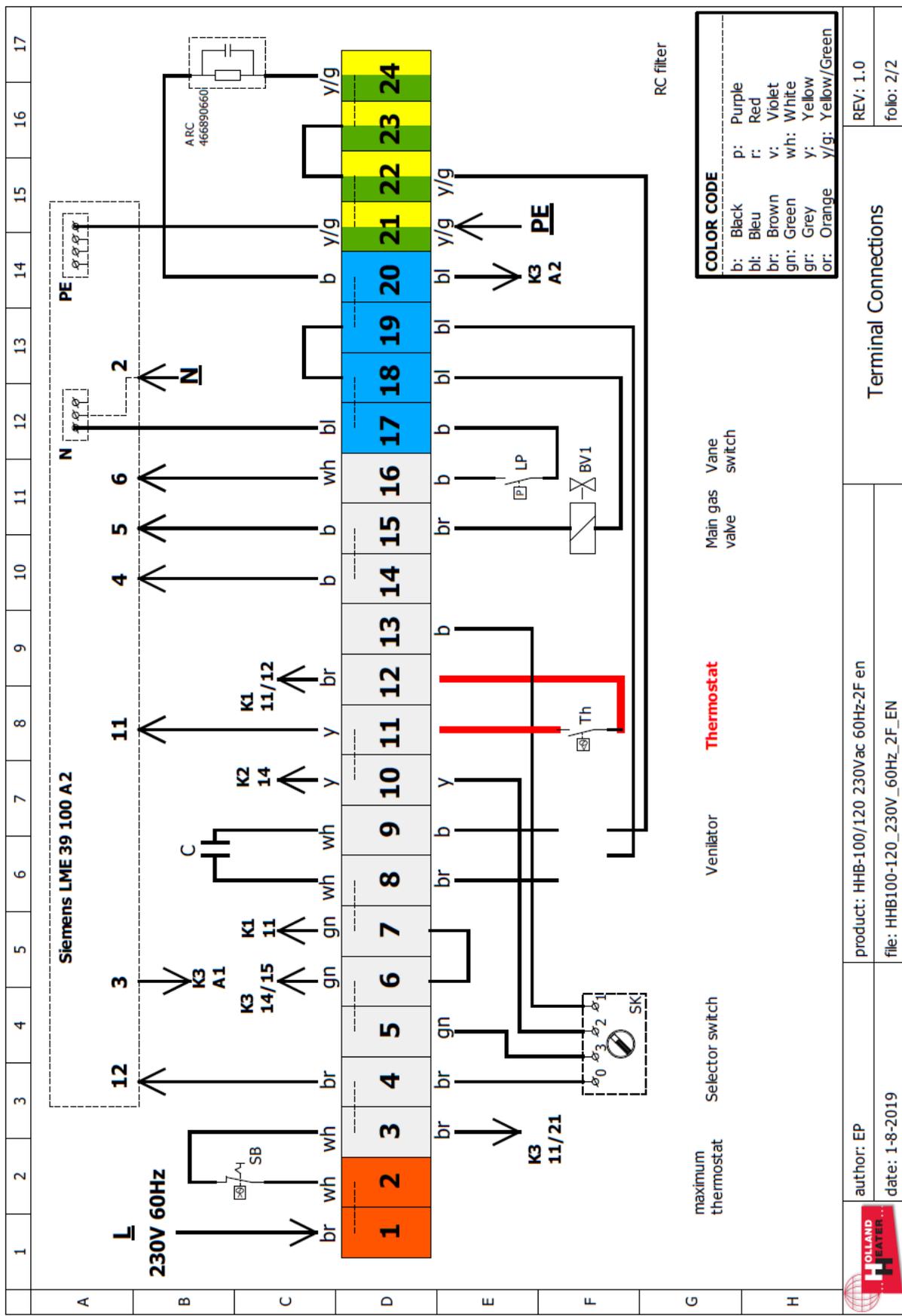
# Terminal strip HHB-70, 60Hz 2f



# Diagram HHB-100/120, 60Hz 2f



### Terminal strip HHB-100/120, 60Hz 2f



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