

REZNOR®

FLOOR STANDING WARM AIR HEATER

FSE Model Range (Gas & Oil)



INSTALLATION/ COMMISSIONING/SERVICING



Machinery Directive (2006/42/EC)
Low Voltage Directive (2014/35/EU)
Electromagnetic Compatibility Directive: (2014/30/EU)
Regulation (EU) 2016/2281
Gas Appliance Regulations (EU) 2016/426

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.

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PRODUCT INTRODUCTION

The FSE range of cabinet heaters combine innovative design with proven heat exchanger technology to provide a high efficiency cost effective and durable range.

The units may be specified for either free blowing applications or for use with ductwork.

Model Range+

Gas fired cabinet heaters are suitable for use with Natural Gas (G20), most units can also be specified for Propane (G31)

Oil fired cabinet heaters are suitable for use with Class D gas oil (35 sec), most units can also be specified for Kerosene (28 sec oil). Oil fired cabinets are supplied complete with factory fitted fire valve and oil filter

Vertical free standing models are available from 40kW to 300kW. Two stage burners are fitted as standard along with a Smartcom Multi-zone control panel.

Options Inlet air filter

HEALTH AND SAFETY

General Health and Safety



WARNING

Warning is used when failure to heed or implement the instruction(s) can lead to not only component damage, but also to a hazardous situation being created where there is a risk of personal injury.



CAUTION

Caution is used when failure to follow or implement the instruction(s) can lead to premature failure or damage to the heater or its component parts

- Do not store or use petrol or other flammable vapours and liquids in the vicinity of the appliance.
- In case of persisting problems, contact your distributor

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.

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.

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.

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

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.

Carry out a risk assessment for the task to be carried out and ensure the correct use of any Personal Protective Equipment.

GAS LEAK EMERGENCY

If you can smell gas from or near the heater:

- Do not try to light any appliance
- Do not smoke or light matches
- Do not turn electrical switches on or off
- Open doors and windows, to air the room
- Close the fuel control to the device
- if you still smell gas turn off the the supply at the meter unless the meter is in the cellar
- Raise the alarm and evacuate all personnel to a safe place
- Promptly Call your Gas Emergency number

Enter your gas emergency number below

Before using this appliance:

- Check that the voltage indicated on the type plate corresponds to the mains supply voltage.
- Ensure that the heater has been securely fastened in its final mounting position

Location/Positioning



The oil variant of the heaters must be installed in accordance with the current OFTEC regulations for oil fired products.

Under no circumstances should any item be placed on or above any part of the heater, whether it is being used or not.

All basic criteria must be satisfied prior to commencing the installation and commissioning process.

The heater must be positioned and installed to comply with all relevant standards and guidelines. And should also meet the local and national fire regulations and insurance criteria, this is critical if the heater is to be installed within a special risk area (e.g. being; within close proximity to where petrol engined vehicles are stored or parked, where cellulose spraying takes place, where woodworking machinery is being operated, etc.).



The heater must not be installed within an area with unsuitable conditions, e.g. where the atmosphere is highly corrosive, has a high degree of salinity, or where high wind velocities may affect burner operation.

Suitable protection should be provided for the appliance when it is located in a position where it may be susceptible to external mechanical damage; for example, fork lift trucks, overhead cranes etc.

Indirect heaters must not be located in hazardous areas, however, it is permissible for the heater to supply air to such areas

The heater must not be installed within an environment where there is a high concentration of chlorides, fluorides, salts, or other aggressive or volatile chemicals/compounds. Nor should the heater be positioned where the burner could be adversely affected by high winds or draughts.

The location chosen for the heater must allow for the fitting of an effective flue system.

The location must also allow for adequate clearance for the air supply, return air circulation, gas supply and electrical supply, whilst also providing good and safe working access. The heater must be installed on a flat and level surface made from non-combustible material, which is sufficiently robust to withstand the weight of the heater and any ancillary equipment.

General requirements



Unauthorised modifications to the appliance, or departure from the manufacturers guidance on intended use, on recommended practices may constitute a hazard. To ignore the warning and caution notices, and advice from the manufacturer on installation, commissioning, servicing, or use, will jeopardise any applicable warranty.

Moreover, such a situation could also compromise the safe and efficient running of the appliance itself, and thereby constitute a hazard

All heaters must be earthed.

The installation of the appliance must meet all the relevant European, national, and local criteria

Prior to installation the following points should be considered;

- The position of the heater for the optimum efficient distribution and circulation of warm air.
- The position of the heater relative to the route of the flue
- The position of the heater relative to the supply of fuel
- The position of the heater relative to the electrical services, and if appropriate, any additional controls.
- The position of the heater relative to the supply of fresh air
- The height if applicable at which the heater is to be mounted and potential stratification /circulation problems.
- The position of the heater relative to service and maintenance requirements

Electrical supply



Ensure the supply is in accordance with the manufacturer's recommendations and is as stated on the appliance data plate.

The main electrical supply must not be switched off or disconnected as a method for stopping the heater, the exception to this is in an emergency, or during servicing, where the heat exchanger has been given sufficient cooling time to prevent damage from occurring. Claims for damage will not be considered if they resulted from incorrect wiring or incorrect use of the heater

Wiring external to the heater must be installed in accordance with any local, national, and European regulations.

The means of connection to the main electrical supply must allow for complete electrical isolation of the heater, furthermore, in the case of a unit wired for a three phase supply, the supply should only be used to serve the heater itself and no other plant or equipment.

The position of the isolation switch must be such that it is adjacent to the heater and easily accessible at all times. In addition, the isolator itself must have a contact separation of not less than 3mm.

The Control fuse ratings are detailed on the appliance data plate.



Ensure that the electric and gas supplies are turned off before any electrical work is carried out on the heater.

Ensure that wiring cannot make contact with any surfaces liable to be subject to high temperatures or where the insulation of the wiring could be impaired as a result of such contact

General

This manual is an integral part of the heater, therefore it should always be carefully kept and it should always be provided together with the heater, if it is transferred to another owner or user. If this manual is damaged or lost, a new one should be requested from the installer or from the manufacturer. After unpacking the product, please check the contents to ensure all components are present. If not, please contact your supplier.

The installation must be carried out by suitably qualified personnel who, at the end of the work, will commission the appliance and issue to the owner a copy of the commissioning report, which also confirms that the installation has been carried out in accordance with regulations & standards applicable to the country of use and in accordance with the manufacturers instructions.

This appliance has been manufactured specifically for room heating and must be used for this purpose. Contractual liability of the manufacturer in respect of damages caused to people, animal or premises by incorrect installation, settings, maintenance or by improper use of the heater is excluded.

During the initial start-up, there may be the formation of odours and fumes due to the evaporation of the oil added to protect the heat exchanger during storage; this is normal and will disappear after a short period. It is recommended to ensure suitably ventilation for room.



If the appliance is to remain unused for long periods, it is recommended that the following operations are carried out:

- Turn the appliances' electrical supply off via the local isolator.
- Close the main fuel supply valve

If there is a long period of time between operation, it is recommended that you contact your installer to carry out the new start-up.

The heater shall be fitted with approved accessories only. The manufacturer is not liable for damages arising from the improper use of the heater or from the use of non-original materials or accessories. References to Laws, Regulations, Directives and Technical Rules mentioned in this manual are provided only for information purposes and are in force when the manual is printed.

The introduction of new provisions or amendments to current laws does not represent an obligation of the manufacturer towards third parties. Repairs or maintenance are to be performed by trained personnel only.

Do not modify or tamper with the appliance, the manufacturer will not be held responsible for any third party modifications to the heater.

The services that are to be connected (fuel pipes, power supply, etc.) must be suitably secured and must not be hazardous with the risk of tripping.

The manufacturer is responsible for the product compliance with Laws, Directives or Construction Rules in force when the product is marketed. The knowledge and observance of the laws and standards regarding plant design, installation, operation and maintenance are the sole responsibility of the designer, installer and user. The manufacturer shall not be held responsible for failure to comply with the instructions of this manual, for the

consequences of any operations carried out and not specifically provided for or for translations open to misinterpretation.

The electrical system must feature suitable individual and independent electrical protection for each appliance which, in case of accidental failure, will be activated on the single appliance without prejudice to the proper operation of the other units present on the installation.

Note:

The appliance is designed to be operated with the heating capacity and the air flow rate specified in the Data Sheet. If the heating capacity is too low and/or the air flow rate is too high, combustion products may condensate, resulting in the irreparable corrosion of the heat exchanger. If the heating capacity is too high and/or the air flow rate is too low, overheating of the heat exchanger may occur, resulting in the activation of the high temperature safety devices and could cause damage to the exchanger

Disposal instructions

Disposing of the appliance must be done by an authorised company and in compliance with the applicable laws. Before taking waste to Authorised Collection Centres, dismantle and separate the various materials that compose it which in summary are:

- Ferrous materials
- Aluminium and copper
- Electrical wiring
- Seals and insulating materials
- Plastic materials
- Electronic cards

Compliance notices

- The heater range detailed herewith are manufactured within a strictly controlled quality environment within the parameters of ISO 9001.

These instructions are only valid if the following country code is on the appliance GB. IE. If this code is not present on the appliance, it is necessary to refer to the technical instructions which will provide the necessary information concerning the modification of the appliance to the conditions of use for the country.

The manufacturer has taken reasonable and practical steps to ensure that all heaters are safe and without risk when properly used. These heaters should therefore only be used in the manner and purpose for which they were intended, and in accordance with the recommendations detailed herewith. The manufacturer supports all new products being supplied to their customers with a comprehensive information pack; this clearly defines mandatory instructions for the safe installation, use, and maintenance, of the appliance(s).

Where proprietary items are incorporated into any of the heaters, detailed information and instructions are also provided as part of the information pack. It is the responsibility of the installer, owner, user, or hirer of the heater to ensure that they are familiar with the appropriate information/manuals supplied by the manufacturer and the safety instructions. In addition, operators must be suitably trained in the use of the appliance so as to ensure its continued safe and efficient use.

The manufacturer has a commitment to continuous improvement and therefore reserve the right to amend or change the specification of Warm Air Heater subject to compliance with the appropriate European, national and local regulations

The Warm Air Heater range conforms to the following standards:

EN 292-1

Safety of Machinery - Basic Concepts, General Principles for Design Basic Terminology Methodology

EN 292-2

Safety of Machinery - Basic Concepts, General Principles for Design Technical Principles and Specifications

EN 60204-1

Safety of Machinery - Electrical Equipment for Machines Specification for General Requirements

EN 60335-1

Safety of Household and Similar Electrical Appliances General Requirements

EN 50165

Electrical Equipment of non-electric heating appliances for household and similar purposes, safety requirements

EN 55014

Limits and methods of measurement of radio disturbance characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electrical tools and similar electric apparatus

EN 1020

Non-domestic forced convection gas-fired air heaters. Machinery Directive (2006/42/EC) Low Voltage Directive (2014/35/EU) Electromagnetic Compatibility Directive: (2014/30/EU) Regulation (EU) 2016/2281 Gas Appliance Regulations (EU) 2016/426

Warranty

The heater is supplied with a 1 year parts and labour warranty and a further year on all parts excluding consumables.

The warranty commences from the date of dispatch from the manufacturer, and is subject to the terms detailed within the Manufactures 'conditions of business'.

Note: The warranty may be invalidated if:

- The installation is not in accordance with the general requirements of this manual.
- The flue arrangement and air supply for the heater are not in accordance with the manufacturers recommendations, codes of practice, or similar standards.
- Air flow through the heater is not in accordance with the manufacturers technical specifications.
- Internal wiring on the heater has been tampered with or unauthorised service or repairs undertaken.
- The main electrical supply input to the heater has been interrupted during the heating mode.
- The heater has been subject to and affected by the ingress of water in any form.
- The heater is not operated at the rating(s) laid down in the manufacturers technical specifications.
- The heater has not been operated or used within the normal scope of its intended application.
- The manufacturer's recommended minimum service requirements have not been complied with.

Note: All warranty claims must contain the following info to enable processing to take place.

- Heater model
- Heater serial number
- Order reference/date of order, together with
- Full installation details (name and address Details or symptoms of fault
- Installers name and address
- Commissioning and service records

Faulty parts must be returned to the supplier, the address of which is provided at the rear of this manual. Any such parts will undergo inspection to verify the claim. Replacement parts supplied prior to this may be charged, and a credit supplied upon subsequent validation of the warranty claim. Consumable items are specifically not included within the scope of the warranty.

Note: Notification is required the immediate moment a fault is suspected.

The manufacturer will not accept responsibility for any additional damage that has been caused, expense incurred, or consequential loss resulting from any failure of the heater(s).



Nortek Global HVAC equipment must be installed and maintained in accordance with the requirements of the Codes of Practice or rules in force.

All external wiring must comply with the codes of practice or rules in force in the country of installation.

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

TECHNICAL DATA

Technical Data

Heat Exchanger

Manufactured from welded stainless steel, it can be easily inspected for cleaning and maintenance operations and comprises the following elements:

- Cylindrical shaped combustion chamber in stainless steel with low thermal load.
- Heat exchanger elements in steel with large surface area containing staggered and opposing indentations.

External casing

The external casing consists of panels in a pre-painted and/or powder-coated sheet metal, also includes:

- Frame structure in press-folded profile with aluminium die-cast corner joints.
- Sandwich panels with internal glass wool insulation.

Fan assembly

Consists of one or more centrifugal fans with a low level of sound emission and high performance.

- Three-phase models are driven by electric motors with a pulley and belt transmission system.
- Single-phase models use a direct drive fan.

Safety and control thermostat

The appliances are equipped with thermostats with the sensor located on the air supply (pre-calibrated and electrically connected in the factory), with the following functions:

- "FAN" function (FAN thermostat – calibration: +25/+35°C). Activates the

fans max. 60 seconds after the burner has started and stops them approx. 4 minutes after the burner has switched off.

- "SAFETY" function (TR safety thermostat - factory calibration + 80°C), has the function of interrupting the burner operation in case of abnormal overheating of the air. It is automatically reset. It shall be correctly calibrated when it is used for the first time.
- "LIMIT" function (LM Thermostat - sealed calibration: +100°C): will stop the burner if the air becomes overheated abnormally. Reset is manual.

Flue pipe

The heater is fitted with a circular flue collar to enable a condense TEE to be inserted safely and fixed at the start of the flue system.

Identification

The warm air heaters can be identified through:

- The data plate, applied on the heater, that specifies the main technical performance data.
- In the event of damage or loss, request a duplicate from the manufacturer.

Receiving the product

The appliance is supplied with:

- Document envelope including:
- User guide
- Wiring diagram
- Labels with bar code
- Riello burner for installer fitting
- Burner Owner's Manual

Fixed protection

In order to avoid accidental contact with the movable parts of the machine, check if the following fixed protections have been properly installed:

- Grille on air intake.
- Appliance infill panels.
- Burner casing.

Structure

Legend

1. Secondary heat exchangers
2. Combustion chamber
3. Rear flue manifold
4. Front flue manifold
5. Heat exchanger inspection door
6. Flue connection
7. Burner mounting
8. Flame spy hole
9. Fan
10. Fan motor
11. Electrical panel
12. Fan-limit tri-thermostat
13. Smartcom controller

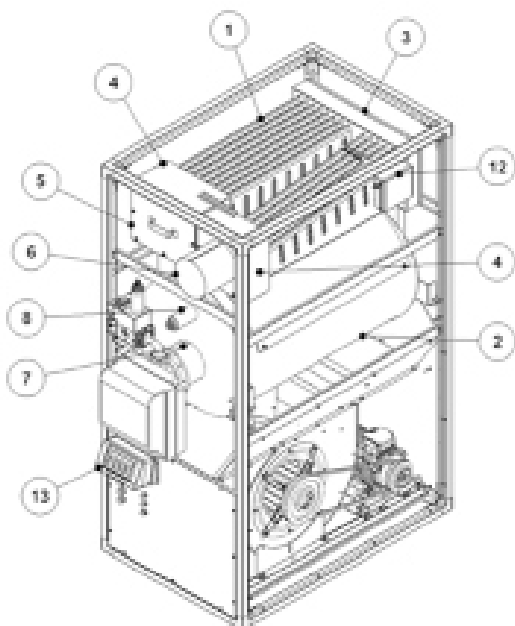


Figure 1. Component layout

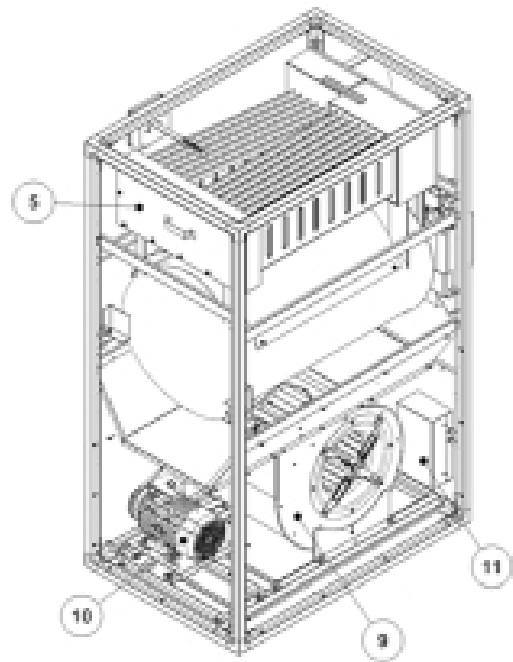


Figure 1 cont. Component layout



Figure 2. Heat exchangers models 60–300

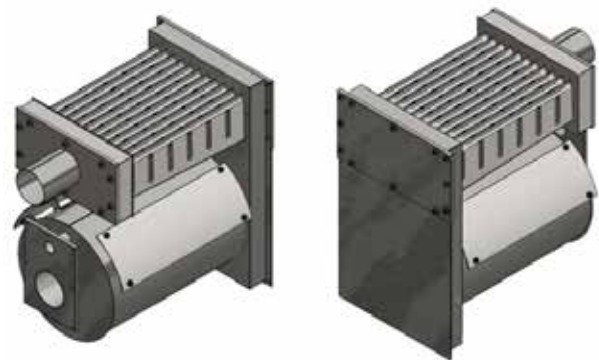


Figure 3. Heat exchanger model 40

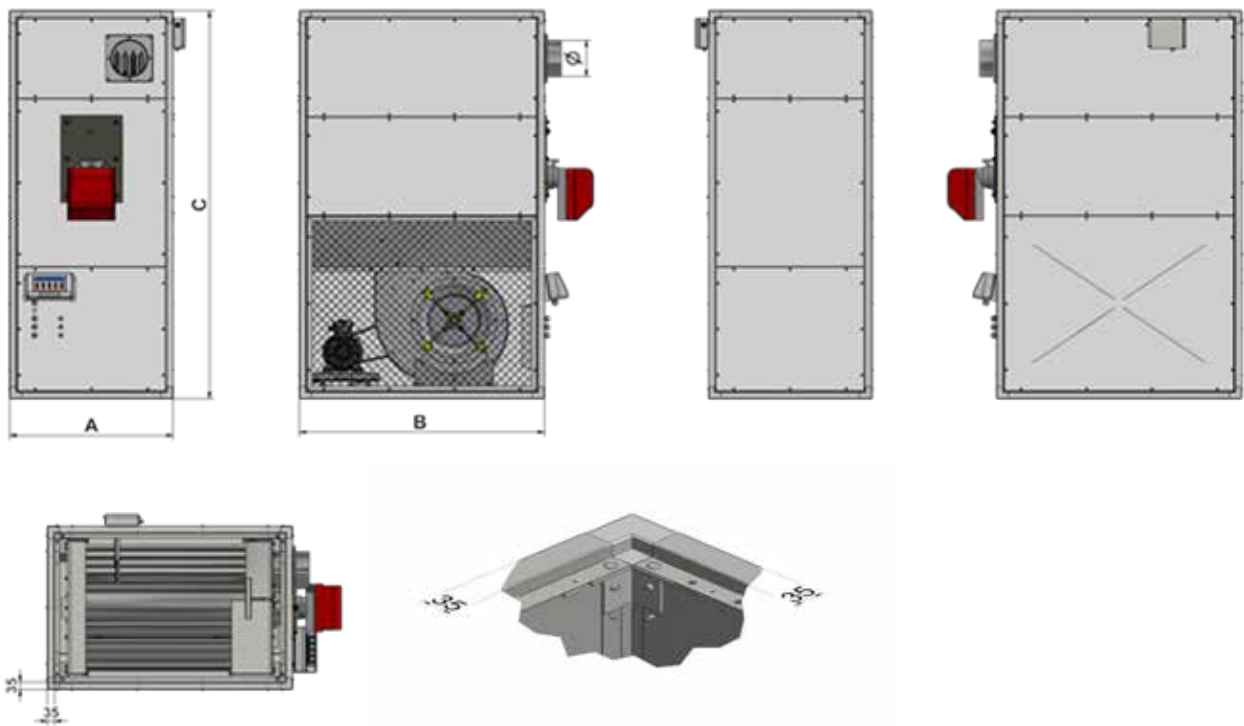


Figure 4. Dimensions and weight

MODEL	A	B	C	Net weight	Flue Ø mm	Flue Ø nom
FSE 40	600	770	1500	145	130	5"
FSE 60	650	950	1650	225	150	6"
FSE 75	650	950	1650	245	150	6"
FSE 100	800	1200	1900	310	180	7"
FSE 145	800	1200	1900	345	180	7"
FSE 175	1000	1500	2150	485	205	8"
FSE 225	1000	1500	2150	525	205	8"
FSE 300	1250	1800	2360	660	305	12"

Table 1 – Without burner

Gas	Model	FSE 40	FSE 60	FSE 75	FSE 100	FSE 145	FSE 175	FSE 225	FSE 300
Flue type	Class	B23 / B53							
Heat output (G20)	kW	39.0	56.8	68.5	99.2	143.5	175.9	223.4	300.0
Heat input nett (G20)	kW	43.0	63.0	75.2	110.0	158.0	195.0	248.0	328.0
Efficiency nett	%	91	91	91	91	91	91	91	92
Gross flue gas temperature (1)	°C	210	220	205	215	210	215	220	200
Heat output low fire	kW	28.0	38.2	52.9	67.1	99.9	124.0	153.6	230.6
Heat input nett low fire	kW	30.0	41.0	56.7	72.0	106.0	131.2	165.0	244.0
Efficiency low nett	%	94	93	94	93	95	95	93	94
Gross flue gas temperature (1)	°C	155	155	155	155	140	140	155	140
Nominal inlet pressure G20 natural gas	mbar	20							
Natural gas G20 consumption	m³/h	4.6	6.7	8.0	11.6	16.7	20.6	26.2	34.7
Nominal inlet pressure G31 LPG gas	mbar	37							
Nominal inlet pressure G31 (NL) LPG gas	mbar	30							
LPG gas G31 consumption	litres	6.8	9.8	11.3	17.2	24.4	30.9	39.2	50.2

Heating Oil	Model	FSE 40	FSE 60	FSE 75	FSE 100	FSE 145	FSE 175	FSE 225	FSE 300
Flue type	Class	B23 / B53							
Heat output (35 sec)	kW	40.0	55.5	69.9	96.4	144.9	175.1	218.9	304.3
Heat input nett (35 sec)	kW	43.0	60.0	75.2	106.0	158.0	189.3	235.0	328.0
Efficiency nett	%	93	92	93	91	92	92	93	93
Gross flue gas temperature (1)	°C	195	200	195	240	230	205	190	200
Heat output low fire	kW	33.2	44.4	53.5	84.3	113.8	133.3	158.6	222.5
Heat input nett low fire	kW	35.0	48.0	56.7	90.6	120.9	141.1	165.0	235.0
Efficiency low nett	%	95	93	94	93	94	94	96	94
Gross flue gas temperature (1)	°C	150	170	165	200	170	165	120	150
Heating oil (35 sec) consumption	kg/h	3.6	5.0	6.3	8.9	13.3	16.0	19.8	27.6

Kerosene	Model	FSE 40	FSE 60	FSE 75	FSE 100	FSE 145	FSE 175	FSE 225	FSE 300
Flue type	Class	B23 / B53							
Heat output (28 sec)	kW	40.0	57.3	69.8	102.1	138.4	182.0	210.4	305.4
Heat input nett (28 sec)	kW	43.0	61.0	75.2	110.0	150.0	195.0	225.0	328.0
Efficiency nett	%	93	94	93	93	92	93	93	93
Gross flue gas temperature (1)	°C	180	170	190	205	210	185	200	195
Heat output low fire	kW	35.8	45.3	62.8	88.5	124.4	153.0	129.2	251.2
Heat input nett low fire	kW	38.0	48.0	67.0	95.0	134.0	161.0	135.0	265.0
Efficiency low nett	%	95	95	94	94	93	96	96	95
Gross flue gas temperature (1)	°C	155	155	170	185	195	145	145	155
Kerosene (28 sec) consumption	kg/h	3.6	4.8	6.2	8.9	12.4	16.0	18.7	26.1

	Model	FSE 40	FSE 60	FSE 75	FSE 100	FSE 145	FSE 175	FSE 225	FSE 300
Fan thermostat calibration	°C	+35							
Limit thermostat calibration	°C	+100							
Range of use	°C	-15/+40							
External static pressure	Pa	80	150	150	150	150	150	150	150
Supply air fan quantity	No.	1							
Fan size	Type	10-10	280	280	355	355	355	355	400
Sound level (2)	dB(A)	74.0	76.9	81.6	79.8	85.5	76.6	82.7	82.9
Nominal temperature rise	°C	33	35	33	35	39	37	35	36
Nominal airflow rate	m³/h	3500	4800	6300	8300	10900	14000	19000	25000
Nozzle quantity (nozzle version only)	No.	2	2	3	3	3	4	4	4
Combustion chamber pressure	mbar	0.2	1.1	1.2	1.4	2.0	1.4	1.5	2.9

(1) Referred to combustion air temperature +15°C

(2) Sound power at inlet of fan

Table 2 – Technical specifications

Gas categories and emissions class

Always ensure that the gas burner is certified for the correct category. The unit is certified in EU countries and countries to soon enter the EU, according to the gas categories shown

Model	FSE 40	FSE 60	FSE 75	FSE 100	FSE 145	FSE 175	FSE 225	FSE 300
CLASS	4							

Table 3 – NOx emissions class table (UNI EN 1020 reference):

Class 4, for values that are not greater than 100 mg/kWh

Country	Category	Country	Category
AL	I12H3B/P, I12H3P	IE	I12H3P
AT	I12H3B/P	ET	I12H3+
BE	I2E(R)B, I3P	LT	I12H3B/P, I12H3P
BG	I12H3B/P, I12H3P	LU	I12E3B/P
CH	I12H3B/P	LV	I2H
CY	I3B/P, I3P	MC	I12H3B/P, I12H3P
CZ	I12H3B/P, I12H3+, I12H3P	MT	I3B/P, I3P
DE	I12ELL3B/P	NL	I12L3P
DK	I12H3B/P	NO	I3P
EE	I12H3B/P	PL	I12E3PB/P
ES	I12H3+ PT	PT	I12H3+
FI	I12H3B/P RO	RO	I12H3B/P, I12H3P
FR	I12ER3P	SE	I12H3B/P
GB	I12H3P	YES	I12H3B/P, I12H3P
GR	I12H3B/P	SK	I12H3B/P, I12H3+, I12H3P
HR	I12H3B/P, I12H3P	TR	I12H3B/P
HU	I12H3B/P		

Table 4 – Gas categories table – Destination country

INSTALLATION

Pre installation

Packaging

The heater will usually be supplied wrapped in heavy gauge polythene, non assembled parts will be supplied separately.

Prior to installation, the assembly of the heater should be completed, it is advisable that this is undertaken in the area where the heater is scheduled to be sited.



It is strongly advised that when positioning the heater the lifting eyes are used, thereby reducing the risk of inadvertent damage being occasioned to the heater.

Flooring

The heater must be installed on a level non-combustible surface capable of supporting the weight of the heater and any ancillary equipment.

Electrical Installation/connection

Cabinet heaters are available either for 415V 50Hz 3PH or 230V 50Hz 1PH supplies depending upon the model specified.

The electrical supply must be as specified and suitable for the heater, and must be run within conduit to a point adjacent to the heater, and be terminated to provide an isolation point that will prevent remote or inadvertent activation.

Cables, conduit, and fittings that are used to make the connection between the isolator and the heater must conform to the appropriate local and national regulations.

All heaters are supplied fused and pre-wired, all must be earthed.

Final connections for any additional external controls must be completed on site, and must be carried out according to local and national regulations. Separate user information is provided for the time control unit and the burner, and forms part of the product information pack which accompanies every heater when despatched.



Always isolate from the mains electrical supply before commencing work on the heater.

Always ensure that the appropriate personal protective equipment is used.

Air Distribution Installation

The materials selected must be of low heat capacity, and it is preferable that all warm air ductwork is thermally insulated

Where ducting may be subject to deterioration from exposure to moisture or high humidity material selection and insulation are prime considerations. Joints and seams must be airtight and fastened securely and designed to remain so, even when operating at high temperatures.

Adequate support must be designed into the layout of the ductwork to ensure that the integrity of the seams and joints is maintained.

The support must be independent and separate from the heater and the ducting, to allow for free movement during expansion and contraction.

Where ducting passes through walls or partitions sufficient clearance must be left, irrespective of any fire stop requirement, to allow for expansion and contraction.

Failure to adhere to these latter two points can result in the generation and transmission of excess noise.

Where ducting is installed in concrete flooring a permanent membrane must be used to isolate the ducting from the corrosive effect of the alkaline salts within the concrete.

Care should be taken to ensure that soft insulation material does not become compressed and thereby lose its insulation effectiveness.

The following sub-assembly parts should be assembled to allow installation to continue.

Vertical Nozzle Models

For free blowing applications it will be necessary to complete the final assembly before continuing with the installation. The nozzles should be pushed home on the spigots and positioned to provide the desired airflow. When in the correct position fix in place with drill screws.

- Ensure louvres are adjusted outwards and ensure blades are not resonating.
- The nozzles should be securely fixed in their desired position on completion of commissioning.



Care should be taken when adjusting the louvre blades on the outlet nozzles, closing too many blades could lead to the heater tripping on high limit. Should this occur please reset the limit device and gradually open nozzles until the heater no longer trips.

Please note that fully closing the louvres on the nozzle above the limit device should be avoided at all times.

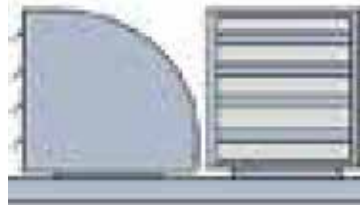


Figure 5 Nozzle system

Handling

Handling must only be done by a qualified engineer. If a fork-lift is used, pitchfork the machine in the lower part using the appropriate ways in the wood pallet. Shipping and handling must be carried out with extreme care to avoid damage to the unit and danger to the persons involved.

During transportation and handling, it is forbidden to stand near the unit. Use the forklift forks with a minimum length equal to the width of the machine.

If belts or ropes are used, a rocker arm must be used (not included) to prevent the pressure exerted by the same from damaging the structure of the unit. Should it be necessary to place more than one unit on top of each other, observe the index indicated on the packaging itself and be very careful when aligning the packages so as not to create unstable stacks. If the device needs to be moved by hand, make sure that there is enough workforce available in proportion with the weight indicated in Figure 6 "dimensions and weight" and depending on the distance to cover.

We recommend the use of personal protective equipment (PPEs).



Figure 6 Handling

Installation considerations

The installation location must be determined by the system designer and/or by a competent person able to take into account technical requirements, the standards and regulations in force.

Generally, special permissions need to be obtained. (E.g.: regulations concerning zoning, architecture, fires, environmental pollution, noise emission, etc.).

It is important all users have full permission before the installation can begin.

To properly install the heater, bear in mind that the heaters should:

- Be placed on a flat surface, capable of bearing its weight;
- Be supported over the entire perimeter of the lower base;
- Be placed on a surface whose deflection and strength is such that it can prevent vibrations from reaching underneath;
- Respect the clearance distances in order to allow for a correct flow of air and normal cleaning and maintenance operations;
- Maintain the safety distances from flammable material;
- Be placed close to a flue chimney;
- Be able to be connected to the fuel source
- Be close to an electrical socket;
- Allow for easy maintenance and inspections;
- Be fitted with the ventilation openings required by the relevant regulations.

It is forbidden to install it:

- In places where there are aggressive atmospheres;
- In tight spaces where the sound level of the heater can be increased by reflections or echoes;
- In corners where leaves could accumulate or where other objects could clog the air passage and reduce the heater efficiency;
- In pressurised places;
- In de-pressurised places;
- Outdoors, if not provided with protection against bad weather conditions.

Blocks for transportation

To prevent damage during transport, some mechanical blocks may be installed (red in colour) that constrain the movement of certain internal components. The identification and instructions for removal of these blocks are reported on a self-adhesive label positioned on the unit.

Remove blocks before start-up.

Safety area

The unit must be easily and safely accessible without the need for special equipment (ladders, mobile platforms, etc.). It is important to keep at least the minimum distance required to allow normal operation of the unit and perform maintenance operations whilst not creating any obstacles to the flow of air.

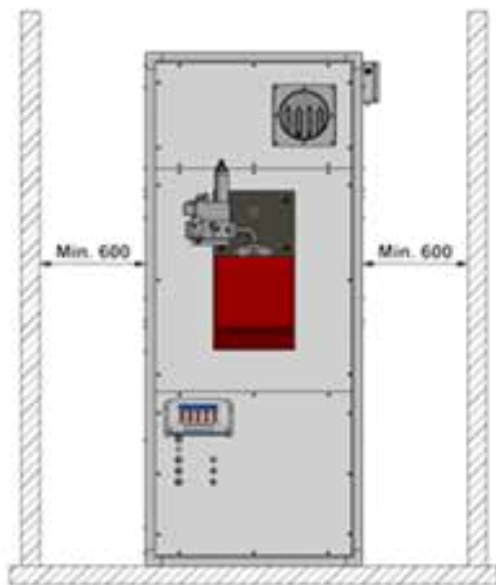


Figure 7a Safety area

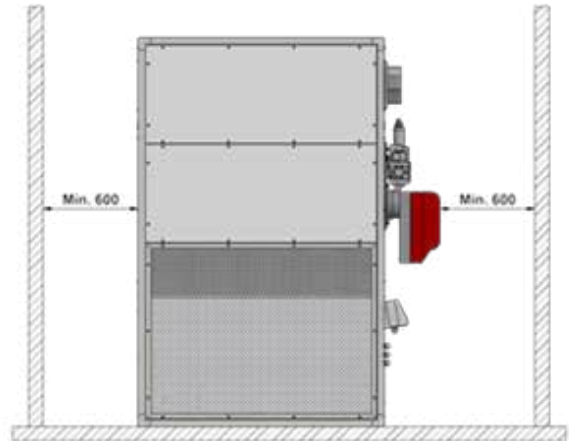


Figure 7b cont. Safety area

Air supply and return

Intake direction and treated air outlet:

- OUT Air supply direction
- IN Air intake direction

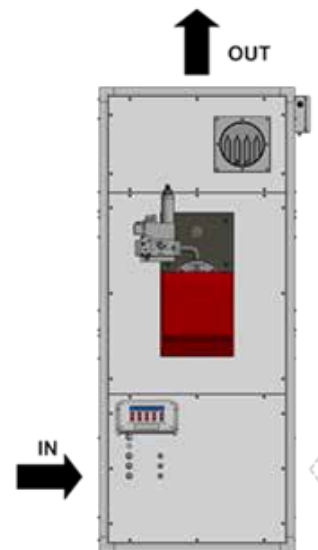


Figure 8a Air supply and return

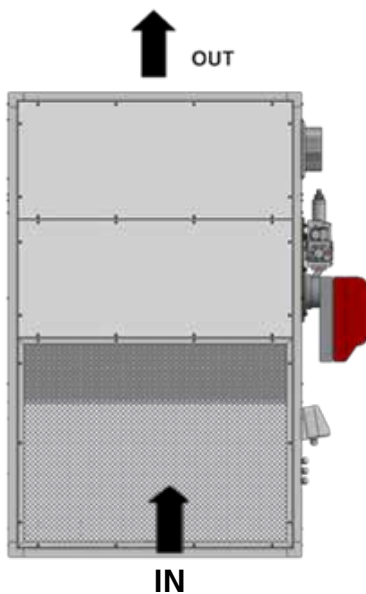


Figure 8b Air supply and return

Accessories

Any accessories must be suitable for installation, follow the respective instructions provided.

Principle of operation

The operating principle is described below:

- When the two-stage thermostat detects a temperature much lower than the set value, it commands the burner to turn on at the maximum heat input previously set.
- Approx. 1 minute after the flame has been ignited, and the ventilation unit starts, it will release warm air into the room.
- When the thermostat detects that the set temperature has almost been reached, it switches to low fire
- When the thermostat detects that the second pre-set temperature level has also been reached, it signals the to turn-off the burner.

- After 3–4 minutes, (when the heat exchanger has completely cooled) the ventilation unit will also switch off.
- The entire cycle is repeated automatically according to the required temperature setting for the room.

Fuel connection

The heater should be connected to the fuel supply by a qualified engineer only, complying with the relevant regulations.

As far as gas burners are concerned, we suggest placing a leak detector near them, which will operate an electro valve that will stop the gas supply in case of any accidental leakage. The gas supply line should be installed by a qualified person, in compliance with all the relevant Laws, Regulations and Rules. Refer to the designer of the system

Flue gas discharge

Flue gas exhaust connection position and example of connection to the flue:

- Condensate discharge fitting is necessary to prevent any condensate that has formed in the flue to flow inside the heat exchanger.
- The vent pipe and the flue connector must be in compliance with the Regulations and Laws in force. They must consist of metal and rigid pipes, capable of resisting the mechanical, thermal and chemical stress caused by the combustion.
- It is mandatory that all components of the flue are certified.
- To avoid reflux of condensation from the flue to the air heater, there must be a condensation discharge at the lowest point of the flue. See Figure 9

- The flue duct cannot rest on the appliance.
- The flue must reach the minimum pressure required by the current technical standards, considering “zero” pressure` to the connection with the flue duct.
- Unsuitable or wrongly sized flues or flue gas pipes might amplify the burning noise and negatively effect the combustion parameters.
- Joint seals should be made of materials resistant to the thermal and chemical stress caused by the combustion products.
- If walls and/or covers have to be crossed, this operation should be carefully carried out, preventing seepage or risk of fire
- Do not use plastics pipes

Recommend to:

- Avoiding long runs of horizontal flue.
- Using metal pipes with a smooth surface that are capable of resisting the thermal and chemical stress caused by combustion products, with the same diameter as the connector of the heater or larger
- Avoid narrow bends and section reductions;
- Having a trap to take and analyse the combustion products;
- Anchoring the flue gas discharge pipe
- Having a proper end cover to prevent rainwater seepage into the heater and causing significant friction losses.

Condensate Drain

A condensate drain with trap should be fitted to the flue tee piece supplied with the heater as shown in figure 9 fixing 1 this is

not supplied by the manufacturer
Condensate disposal should be in line with any local requirements or codes of practice

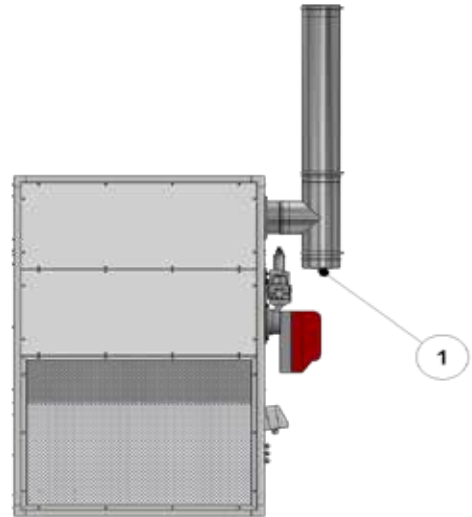


Figure 9 Flue gas discharge



The flue pipe connecting the heater to the flue should be easily dismantled; to allow users to easily control and clean inside the heat exchanger

Combustion air

- The appliance must be installed in accordance with the regulations in force and be used only in a well ventilated area.
- The combustion air inlet is always far away from any obstacles (leaves, sheets of paper, nylon, etc.)
- Proper air openings should be made in the building, to comply with relevant standards for ventilation.

Burner assembly

The installer is in charge of mounting, electrically connecting and setting the burner.

- These operations should be carried out only by a qualified engineer, carefully complying with the burner and technical manuals (provided together with the device).
- If the burner does not have a certificate please contact the manufacturer immediately, before progressing forward.
- The data for the RIELLO brand burners are subject to change without notice. We always recommend consulting the latest version of the burner instructions.
- The new burner models are in a continuous stage of improving. For specific needs, consult the manufacturer.

Air intake and supply (ducted units only)

Connect the ducts of the air inlet circuit to the side opening, the appliance is set up for both right and left connections. To change the air inlet side, simply swap the grille and blanking panels around.

To attach an air inlet duct, remove the grille and attach the duct to the heater flanges.

The warm air distribution duct is attached to the flanges at the outlet of the heater.

Connection with ducting and/or accessories should be carried out by fitting sealing gaskets.

This precaution is necessary to ensure the joint is correctly tightened. In order to

prevent vibrations from transmitting to the air pipes, we recommend installing suitable anti-vibration joints. Check with the plant designer about installing a fire resistant shutter.

Note: The dimensions of the air inlet and outlet ducts should be defined by a qualified engineer, on the basis of the performance specified in Table 2

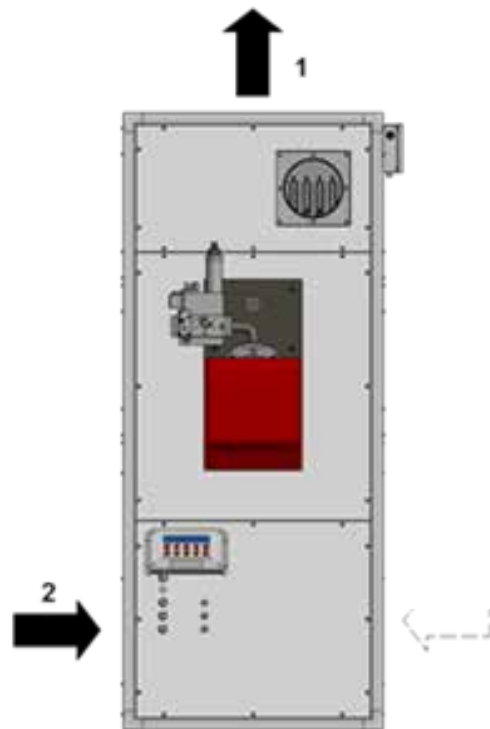


Figure 10 Air intake and supply (ducted units only)

1. Air outlet direction
2. Air intake direction

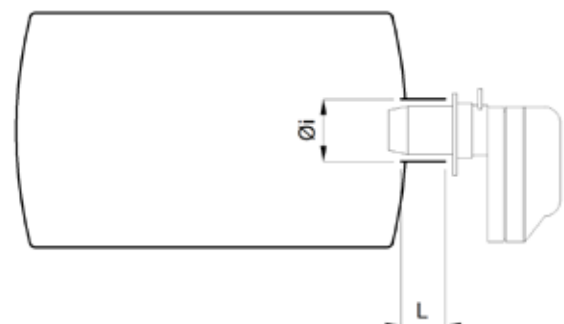


Figure 11. Burner opening dimensions

Model	FSE 40	FSE 60	FSE 75	FSE 100	FSE 145	FSE 175	FSE 225	FSE 300
Øi mm	115	145	145	165	165	165	165	200
L mm	90	90	90	120	120	120	120	125

Table 6 – Burner opening dimensions

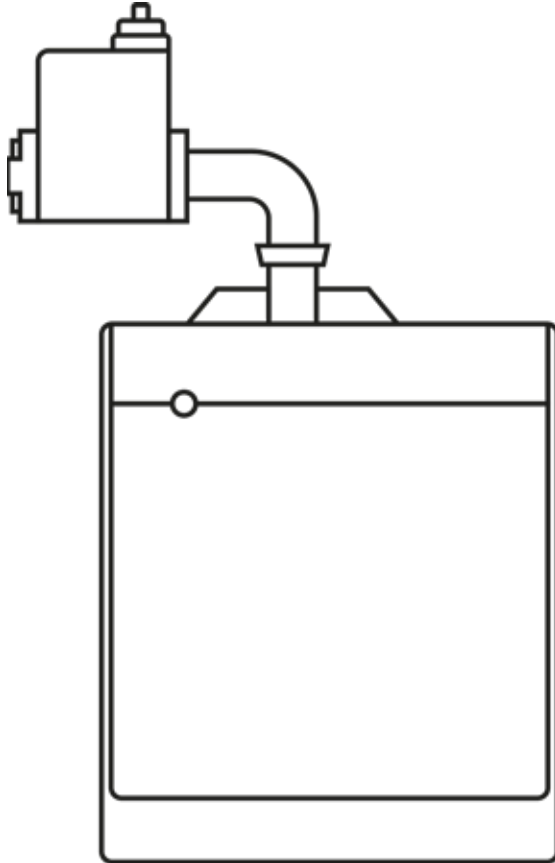


Figure 12 Correct burner position

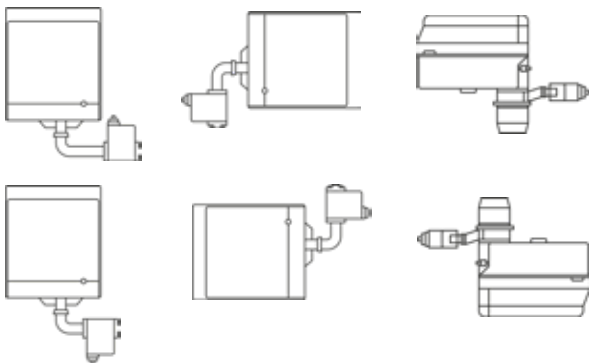


Figure 13 Incorrect burner position

Burner position

The burner must conform to the local standards and legislations in place. The RIELLO-burner has been designed to operate in the position shown in Figure 11,

The positions shown in Figure 12, will not allow the air damper to close when the burner is on standby.

Gas Installation/ connection



**The installation must be purged and tested for soundness prior to commissioning.
Always ensure that appropriate personal protective equipment is used**

Service pipework must terminate at an approved isolating valve, and be adjacent to the position of the heater. The connection to the heater can be made by way of either an approved flexible coupling, or rigid connection. Threaded connections must comply with ISO288/1 of ISO 7/1, further information concerning the accepted practice in European countries is detailed in EN 1020. The diameter of the pipework from the isolating valve to the burner connection must not be less than the diameter of the burner connection inlet.

Flue Discharge Pressure Switch

To stop the operation of the appliance in case of accidental obstruction of the flue



It is mandatory to have a pressure switch in the flue discharge pipe connection

For reasons of transport, this device can be supplied together with the appliance in a separate package. If it is not already mounted, proceed with the installation, following the guidelines given:

- Using the existing self-tapping screw (2), attach the bracket complete with differential pressure switch (3) to the appliance.
- Using the silicon tube supplied with the device, connect the (+) outlet of the pressure switch to the flue pipe connection (4).
- Using the appropriate cable clamps, fasten the electrical cable (1) to the appliance.
- Perform electrical connection of the differential pressure switch to the contacts of the burner T1-T2

The set-point of flue pressure switch is pre-adjusted and sealed at the factory. Before installation, check carefully that it matches to the appliance on which it will be mounted.

The position of the silicon tube must be such as to ensure an inclination between the pressure switch and the pressure probe on the flue pipe connection. void "air pockets" and/or "siphons" within the tube as these can prevent the unit from operating.

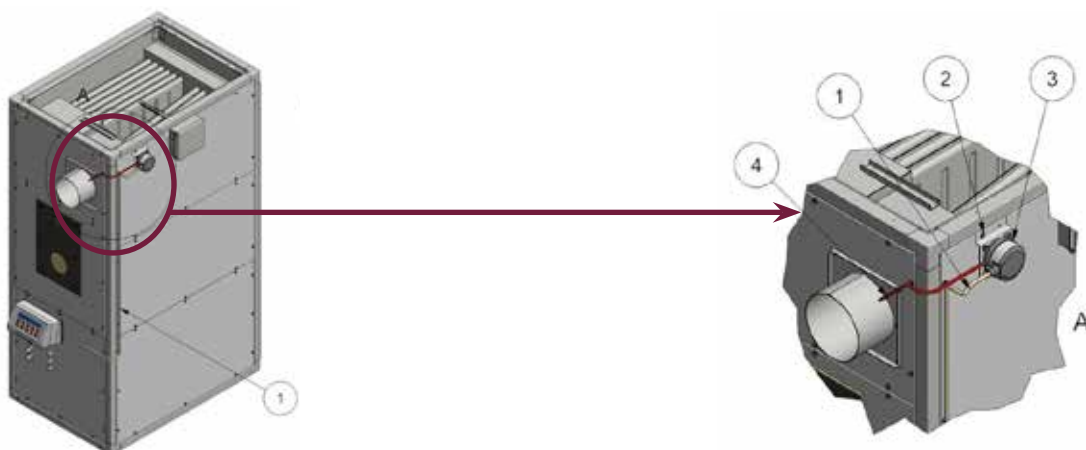
When completely assembled, perform a test of correct operation. Simulate a blocked flue to activate the differential pressure switch and verify that the burner shut down occurs immediately; when the normal working conditions are restored, the burner should turn on again.

MAXIMUM CHIMNEY LENGTH



The flue exhaust chimney must be designed and sized by a competent and qualified technician.

In any case the loss of load must be lower than the values shown in the table below.



Model	Unit	FSE 40	FSE 60	FSE 75	FSE100	FSE 145	FSE 175	FSE 225	FSE 300
Set point	mbar	1,1	1.5	1.6	2.0	2.3	4.0	5.0	2.1

Table of the maximum pressure in the chimney:

Model	Unit	FSE 40	FSE 60	FSE 75	FSE100	FSE 145	FSE 175	FSE 225	FSE 300
Max Pressure	mbar	0.10	0.11	0.18	0.15	0.25	0.30	0.50	0.18

Table of the maximum pressure in the chimney:

Oil Installation/connection



Prolonged exposure and contact with gas oil can result in the natural oils being removed from the skin, sensitisation can result in dermatitis.

Always ensure that the appropriate personal protective equipment is used.

Fuel supply



Galvanised or plastic pipe work and fittings must not be used. (See BS 5410 Part 1)

The constraints of the application will, to a large extent, determine whether it is preferable to use a single pipe gravity feed system, or whether the two pipe pumped system is more appropriate. Where more than one appliance is to share a common supply it will be necessary to use a pressurised ring main system.

All pipe work must be constructed and installed so that it does not permit the ingress of air. The construction, size, and position of the oil storage tank must take account of the current regulations, as well as suiting the requirements of the installation.



On pumped systems always check that the pump is correctly set up prior to operation.

Ensure that valves are open allowing a free flow of oil through the system.

In order to promote trouble free operating it is necessary that the oil within the storage

tank and oil line does not fall below the cold filter plugging point (cfpp), in the UK and with class D fuel (also referred to as gas oil). The critical temperature is -4°C for this summer grade.

The cfpp critical temperature for the winter grade is -12°C. If summer grade fuel is stored for winter use in areas prone to severe frosts and low temperatures it will be necessary to insulate or even heat the supply tank and pipe work.

Note: The fuel supplier should be contacted prior to installation so that any requirements concerning delivery, transport, storage and use can be addressed before work commences.

The inlet pump pressure must not exceed a maximum of 0.4 bar, this is because beyond this point gas is liberated from the oil.

Storage tank

An externally painted steel storage tank to BS 799 part 5 or a medium density polyethylene oil tank OFTEC certified to OFS T-100 may be used. Local, national, European and fire regulations must also be complied with and must include:

- A fuel level gauge (not made from glass) a vent pipe with a diameter greater than that of the filler and featuring a weatherproof termination.
- A sludge valve.
- An outlet valve situated at the opposite end of the tank to the sludge valve.
- A filler pipe connection situated at the opposite end to the outlet valve.

The size of the storage tank must take account of the estimated consumption and any quantity price breaks offered by the oil supplier. It is preferable to install the tank outside, however, if this is not practicable and the tank has to be installed indoors advice must be sought about its positioning, especially so far as fire regulations are concerned.

If a separate fire resistant chamber cannot be provided for indoor installations, a catchment pit with a capacity 10% greater than that of the storage tank must be provided storage tanks can if necessary be sited on a roof, but this is subject to special regulations as well as local authority approval and compliance with fire regulations, reference to BS 5410 part 2 & part 1 is strongly suggested.

It is advisable to leave the tank unpainted on the inside, but to paint the outside with a proprietary grade of anti-corrosive paint.



A galvanised or open topped tank is strictly not allowed. All oil storage tanks require a bond.

The Control of Pollution Regulation (Oil Storage) 2001 should be consulted prior to installation.

Single pipe system (gravity feed)

For installations where the oil tank is 200mm or more above the level of the fuel pump the principle of gravity feed may be used. The draw off point for the supply to the burner must not be positioned any lower than 100mm above the bottom of the tank.

Where a return valve is fitted this must be tamper proof to prevent inadvertent operation.



If the valve is closed when the pump is running the oil pressure can be increased sufficiently so as to cause damage to the seals within the pump.

The return oil should be discharged (preferably) through an elbow onto a tank plate situated within the tank, this should be positioned so as not to introduce air or air bubbles into the draw off pipe.

Two pipe system

This is used where the oil storage tank is lower than the pump.

Access for the fuel feed to the burner should be via a suitable tapping made in the top of the tank, and the fuel feed pipe should extend to not less than 100mm above the bottom of the tank. A non return valve with a metal to metal seat should be fitted, especially if the return pipe work is terminated at a level above the draw off tube. The non- return valve must be removable for service and maintenance purposes, and the return pipe from the pump must therefore be extended down into the tank to the same level as the suction pipe.

The presence of a tamper proof isolating valve fitted within the return pipe is only required if there is a risk that oil will siphon out of the tank if the return pipe is disconnected at the pump during maintenance or servicing and if the non return valve has been omitted.

Pressurised ring main system

This system is used to supply a number of units from a common storage tank. A booster pump is used to provide the pressure to push the oil around the ring main and back to the tank.

Pressure reducing valves should be fitted on the delivery pipe to each heater to ensure that the pressure at the burner pump is less than 6 psi.



The internal by-pass plug must be removed from the burner pump when used in a pressurised ring main application.

Pipe work and fittings



Galvanised or plastic pipe work and fittings must not be used. (See BS 5410 Part 1)



All joints must be sealed properly, if necessary using PTFE tape or other approved sealing media. The pipe work must be effectively sealed so as to prevent the ingress of air. The fire check valve must be operated by way of a fusible link positioned so that it is above the burner.

Note: It is advisable to check all pipe work prior to installation to ensure that there is no loose debris or scale present. The oil feed to each heater must be fitted with a fire check valve and isolating valve.

Black iron pipes can be hammered to assist in the removal of these contaminants

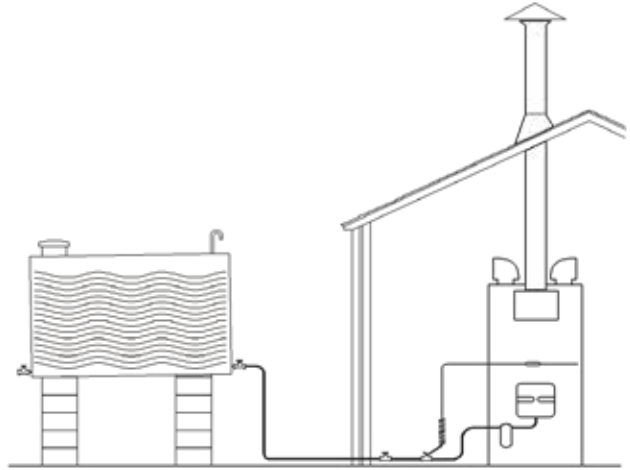


Figure 14. Typical arrangement of oil storage tank and single pipe system

1. Gate valve
2. In-line filter
3. Pump
4. Relief valve
5. Pressure gauge
6. Pressure reducing valve
7. Return to tank

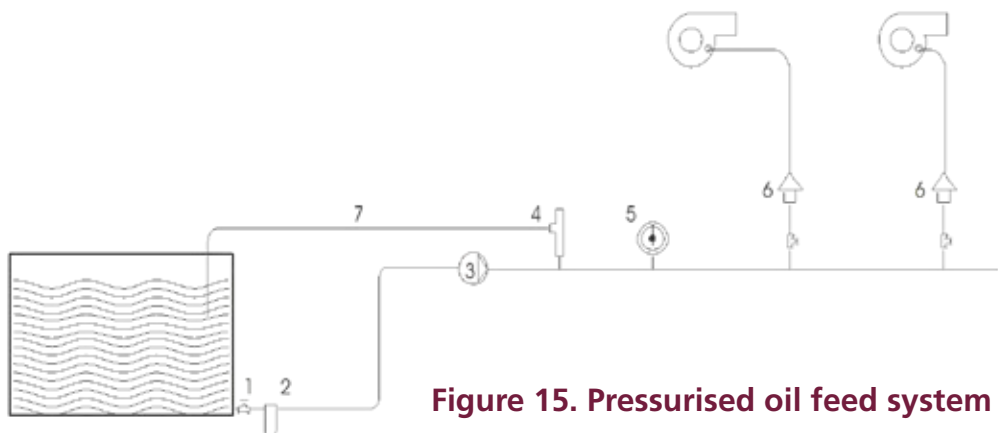


Figure 15. Pressurised oil feed system

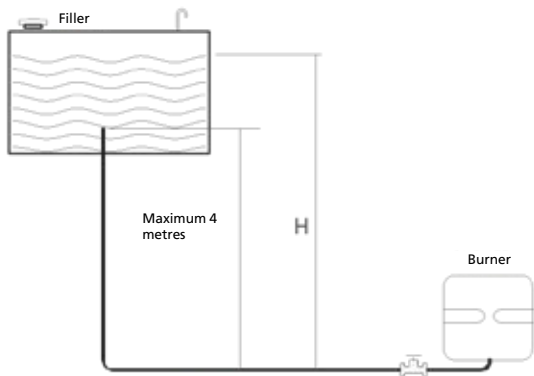


Figure 16. Burner oil pump details 40 - 175 gravity feed from the bottom of the tank



Before starting the burner make sure that the return pipeline is not clogged. Any obstruction would cause the pump seals to break

Note: All burners are despatched suitable for gravity feed installations

H(m)	L metres	
	8mm I.D	10mm I.D
0.5	10.0	20.0
1.0	20.0	40.0
1.5	40.0	80.0
2.0	60.0	100.0

Table 7 – Dimensions burner 40-175 gravity feed

The pump suction should not exceed a maximum of 4 metres. Beyond this limit gas is released from the oil. Oil lines must be completely airtight.

The return line should terminate within the oil tank at the same level as the suction line; in this case a non return valve is not required.

The return line should terminate within the oil tank at the same level as the suction line; in this case a non return valve is not required. Should, however, the return line terminate over the fuel level, a non return valve is essential. This solution, however, is less safe than the previous one, due to the possibility of leakage in the valve.

Priming the pump: start the burner and await priming. Should lock-out prior to arrival of the fuel, wait at least 20 seconds before repeating the operation

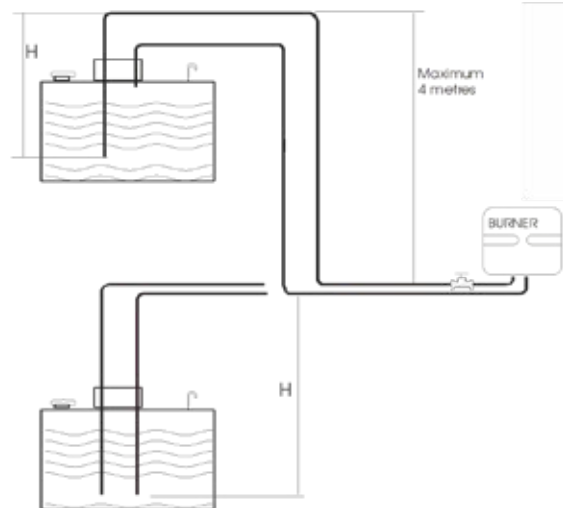


Figure 17. Burner oil pump details 40 - 175 suction feed

H(m)	L metres	
	8mm I.D	10mm I.D
0.0	35.0	100.0
1.0	30.0	100.0
1.0	25.0	100.0
1.5	20.0	90.0
2.0	15.0	70.0
3.0	8.0	30.0
3.5	6.0	20.0

Table 8 – Dimensions burner 40-175 suction feed

The dimension P should not exceed 4 metres to avoid damage to the pump seals

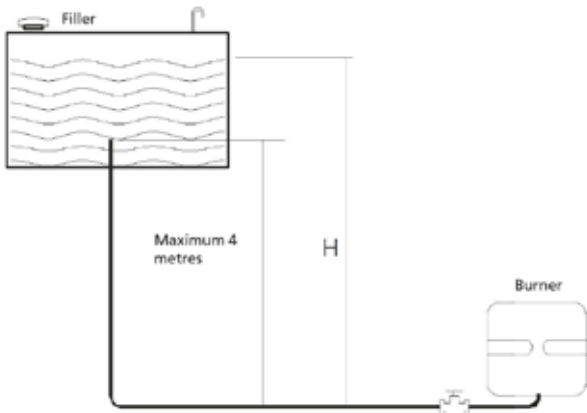


Figure 18. Burner oil pump details 225-300 gravity feed from bottom of tank

H(m)	L metres	
	8mm I.D	10mm I.D
0.5	5.0	10.0
1.0	10.0	20.0
1.5	15.0	30.0
2.0	20.0	40.0

Table 9 – Dimensions burner 225-300

Burner technical details

The data and any pre-calibration at the factory are non-binding. It is always mandatory to check and adjust the burner at start-up and in the actual conditions of use.

Natural Gas	Model	FSE 40		FSE 60		FSE 75		FSE100	
		MIN	MAX	MIN	MAX	MIN	MA	MIN	MAX
Riello burner		BS1D		BS2D		BS2D		BS3D	
Head pressure	mbar	2.9	5.5	2.7	6.1	4.6	7.6	2.6	6.0
Burner head position	No	4.0		1.0		5.0		2.0	
Air damper position	No	1.5	4.0	1.3	2.9	2.2	6.0	0.6	2.0
Measured CO ₂	%	9.4		8.9	9.1	9.3	9.5	9.0	9.4
Measured CO	ppm	1		14	3	3	2	32	30
Gas connections	inch	Rp 1/2		Rp 3/4		Rp 3/4		Rp 3/4	

NOTE: Head pressure is the differential pressure between the burner outlet gas pressure and the combustion chamber pressure.

Table 10a Burner technical details NATURAL GAS FSE 40-100

Natural Gas	Model	FSE 145		FSE 175		FSE 225		FSE 300			
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Riello burner		BS3D		BS4D		RS34 MZ		RS44 MZ		RS35/MBLU	
Head pressure	mbar	4.2	8.6	4.1	9.3	3.7	8.5	5.5	10.0	1.5	5.7
Burner head position	No	5.0		6.5		3.0		2.0		3.0	
Air damper position	No	1.5	5.0	1.5	5.0	40.0	80.0	45.0	70.0	20.0	43.0
Measured CO ₂	%	9.2	9.4	9.1	9.3	9.1		9.3	9.2	9.58	9.52
Measured CO	ppm	23	5	7		18	1	1		1	113
Gas connections	inch	Rp 3/4		Rp 1 ¼		Rp 1 ½		Rp 2		Rp 1 ½	

NOTE: Head pressure is the differential pressure between the burner outlet gas pressure and the combustion chamber pressure.

Table 10b Burner technical details NATURAL GAS FSE 145-300

Propane	Model	FSE 40		FSE 60		FSE 75		FSE100	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Riello burner		BS1D		BS2D		BS2D		BS3D	
Head pressure	mbar	4.50	9.20	3.80	7.80	6.70	10.00	2.90	6.50
Burner head position	No	4.0		0.5		6.0		0.0	
Air damper position	No	2.9	6.0	0.9	2.0	2.1	3.5	0.9	3.0
Measured CO2	%	9.36	9.91	10.75	10.77	9.24	9.33	9.30	9.40
Measured CO	ppm	1	1	1	1	0	1	1	0
Gas connection	inch	Rp 1/2		Rp 3/4		Rp 3/4		Rp 3/4	
Smoke number	No	0	0	0	0	0	0	0	0

NOTE: Head pressure is the differential pressure between the burner outlet gas pressure and the combustion chamber pressure.

Table 11a Burner technical details PROPANE FSE 40-100

Propane	Model	FSE 145		FSE 175		FSE 225		FSE 300	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Riello burner		BS3D		BS4D		RS34 MZ		RS35/M BLU	
Head pressure	mbar	4.70	9.70	3.20	7.70	3.70	9.10	7.50	12.50
Burner head position	No	5.0		3.0		3.0		4.0	
Air damper position	No	1.0	3.0	1.5	3.8	40.0	80.0	40.0	85.0
Measured CO2	%	9.52	9.38	9.58	9.60	9.75	9.60	9.40	9.60
Measured CO	ppm	1	5	1	0	3	3	0	0
Gas connection	inch	Rp 3/4		Rp 1 ¼		Rp 1 ½		Rp 1 ½	
Smoke number	No	0	0	0	0	0	0	0	0

NOTE: Head pressure is the differential pressure between the burner outlet gas pressure and the combustion chamber pressure.

Table 11b Burner technical details PROPANE FSE 145-300

Heating Oil	Model	FSE 40		FSE 60		FSE 60		FSE 75		FSE100	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Riello Burner		RG1RKD		RG2KD		RG2D		RG2D		RG3D	
Nozzle Danfos 60° S	GPH	0.85		1.10		1.10		1.35		2.00	
Pump Pressure	bar	8.1	12.6	8.0	14.0	9.5	14.5	8.7	15.0	10.1	13.8
Burner Head Position	No	3.0		9.0		1.0		3.0		5.0	
Air Damper Position	No	0.5	3.5	0.5	3.0	0.5	1.5	0.7	2.3	0.5	1.1
Measured CO2	%	12.40	12.54	12.56	12.55	10.15	12.12	12.64	12.50	12.68	12.24
Measured CO	ppm	1	1	4	1	8	1	1	1	1	1
Pump connection	inch	3/8		3/8		3/8		3/8		3/8	
Smoke Number	No	0	0	0	1	1	1	1	1	0	0

Table 12a Burner technical details OIL FSE 45-100

Heating Oil	Model	FSE 145		FSE 175		FSE 225		FSE 300	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Riello burner		RG3D		RG4D		RG5D		RL32 BLU	
Nozzle danfos 60° S	GPH	3.00		3.50		3.50	1.50	5.50	
Pump pressure	bar	8.0	13.7	8.0	14.4	10.9	10.9	9.0	17.5
Burner head position	No	5.0		2.5		6.0		1.0	
Air damper position	No	0.6	3.9	0.7	2.3	0.5	3	41.0	129
Measured CO ₂	%	12.47	12.63	12.69	12.44	12.69	12.52	12.48	12.50
Measured CO	ppm	2	4	1	1	2	2	1	1
Pump connection	inch	3/8		3/8		3/8		3/8	
Smoke number	No	0	0	0	0	0	0	0	0

Table 12b Burner technical details OIL FSE 145-300

Kerosene	Model	FSE 40		FSE 60		FSE 75		FSE100	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Riello burner		RG1RKD		RG2D		RG2D		RG3D	
Nozzle danfos 60°S	GPH	1.00		1.35		1.75		2.5	
Pump pressure	bar	8.0	10.0	7.0	11.0	8.0	10.0	8.0	10.0
Burner head position	No	4.0		0.0		0.0		5.0	
Air damper position	No	0.5	2.0	0.5	2.0	0.6	1.9	1.1	2.0
Measured CO ₂	%	11.76	11.69	11.88	12.23	12.00	12.01	11.65	12.44
Measured CO	ppm	1	2	4	2	1	1	1	1
Pump connection	inch	3/8		3/8		3/8		3/8	
Smoke number	No	1	1	0	0	1	1	1	1

Table 13a Burner technical details KEROSENE FSE 40-145

Kerosene	Model	FSE 145		FSE 175		FSE 225		FSE 300	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Riello burner		RG3D		RG4D		RG5D		RL32 BLU	
Nozzle danfos 60°S	GPH	3.5		4.5		3.0	2.0	7.0	
Pump pressure	bar	8.0	10.0	7.0	10.0	11.0	11.0	7.0	11.0
Burner head position	No	5.0		5		4.0		1.0	
Air damper position	No	0.7	2.0	0.8	3.0	0.5	6.0	40.0	70.0
Measured CO ₂	%	12.04	12.08	12.55	12.54	12.49	12.63	12.70	12.70
Measured CO	ppm	1	1	1	1	0	1	1	1
Pump connection	inch	3/8		3/8		3/8		3/8	
Smoke number	No	1	1	0	0	0	0	0	0

Table 13b Burner technical details KEROSENE FSE 175-300

Electrical connections

The electric panel is pre-installed with burner, control and safety thermostat of the FAN-LIMIT device connected. Please follow the directions below to get started:

- General power supply;
- Connections to the blown burner;
- Connections to the various external safety systems (fire dampers, humidifier, fire protection, etc.).
- Electrical connections must only be carried out by qualified engineers
- If confused, please contact manufacturer for further clarification.
- Install upstream of the unit a differential magneto thermal circuit breaker suitably sized according to the regulations in force.
- Always connect the earthing system, taking care to leave the earth wire slightly longer than the other wires, in the event that the wires are accidentally pulled, the latter is the last one to be removed.
- Get a qualified engineer to check that the section of the cables and the electrical system are suitable for the maximum power absorbed by the unit indicated on the information plate.
- Respect polarity in the connection of the power supply (phase - neutral). In any case, make sure that the direction of rotation of the fans is correct.
- The unit must be connected to an efficient earthing system. The manufacturer shall not be held responsible for any damage caused by failure to earth the appliance.
- The electrical cables must be positioned away from hot and/or cold surfaces, or areas with sharp edges.
- In accordance with the Standards regarding the installation of electrical components, a device disconnected from the mains with an opening distance between contacts that guarantees complete disconnection in over-voltage conditions III (Standard EN 60335-1) must be included.
- Do not use water pipes or gas pipes to earth the unit.
- For input and output of the electrical wires, use the dedicated cable clamps on the unit

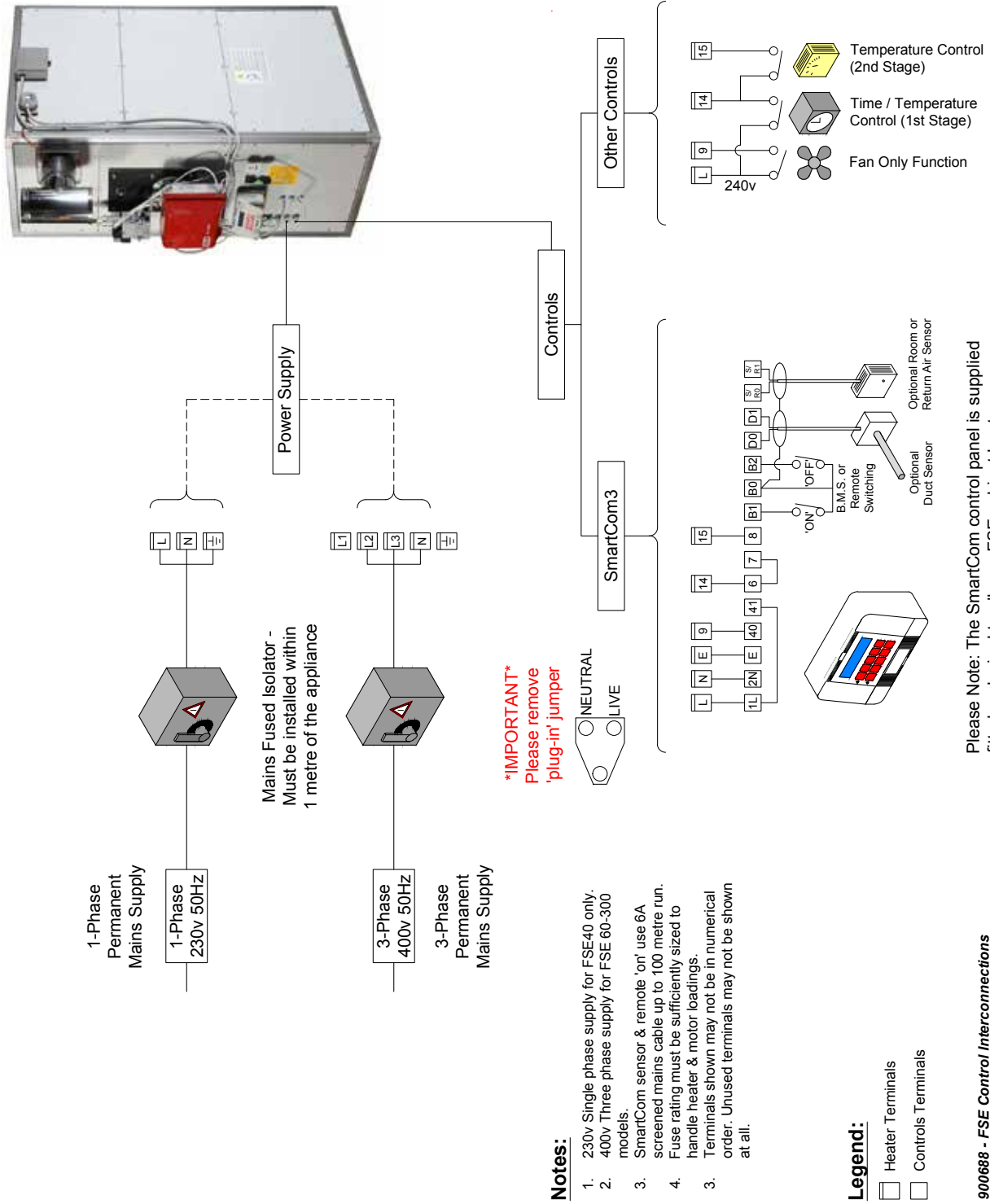
The appliance must always be powered. Operation must only be obtained by the settings of the controls.

Wiring diagram reference codes
 FSE 40 8000003938
 FSE 60 to 300 8000003939

Model		FSE 40	FSE 60	FSE 75	FSE 100	FSE 145	FSE 175	FSE 225	FSE 300
Single-phase power supply	V / 50Hz	230 1N	N/A						
Three-phase power supply	V / 50Hz	N/A	400 3N						
Electrical protection	IP	20							
Fan motor quantity	No.	1	1	1	1	1	2	2	2
Unit power	kW	0.4	1.1	1.5	2.2	3.0	1.1	2.2	3.0
Unit current	A	4.6	2.5	3.3	4.6	6.2	2.5	4.6	6.2
Motor start up	Type	Direct							
Burner		See burner instruction manual for details							

Table 14 – Electrical data

CONTROL INTERCONNECTIONS



COMMISSIONING

Control panel

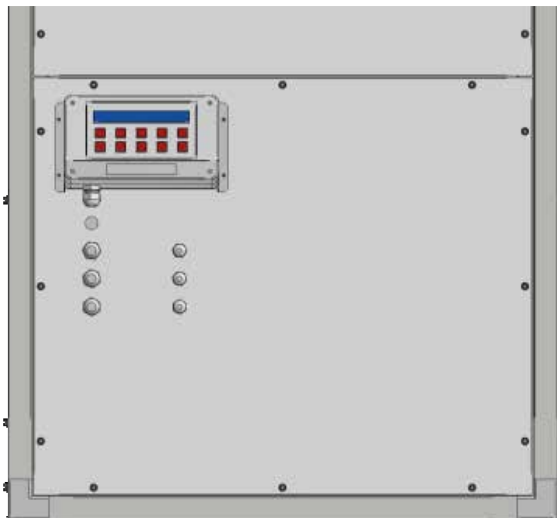


Figure 19. Control panel

The control panel is located in the lower left of the front panel, refer to instructions provided with the control panel.

Limit safety thermostat

The appliance is equipped with a MANUAL RESET LIMIT safety thermostat with the element positioned on the air supply. It functions to stop the burner if the air becomes too hot. It can be restored by pushing the restore button, after removing the causes that have triggered it.

Fan thermostat

The appliance is equipped with a fan thermostat with the element positioned on the air supply.

Activating the fan max. 60 seconds after the burner has started and it stops it approx. 4 minutes after it has stopped. Thus, preventing cold air from being released when the heater is activated.

The thermal energy accumulated by the heat exchanger will be disposed of before the fan stops.

TR safety thermostat

The appliance is equipped with an automatic reset TR safety thermostat with the element positioned on the air supply. It has the function of stopping the burner if the air becomes overheated. Restoring is automatic.

Controls

For its operation and programming, refer to the dedicated instructions, which are supplied together with the appliance.

LIMIT thermostat reset button:

Located on the LIMIT thermostat's interface, the button will reset the operation of the burner after it has stopped due to overheating. Before resetting the device please verify that the issues have been resolved before continuing operation. If confused, please contact manufacturer for further clarification.

Ventilation/Heating

Operating cycle in fan only mode:

- Power the appliance
- Turn on the unit in fan only mode

At this point, the fan unit will operate and air at ambient temperature will be released.

Operating cycle in heating mode:

- Power the appliance
- Set the room thermostat to desired temperature
- Turn on the unit on "heating" mode.

At this point the burner is powered electrically, after the pre-purge function of the combustion chamber, the flame will begin to ignite. About one minute after the flame is ignited, the fan unit starts and warm air will be released.

Once the temperature set on the room thermostat has been reached, the burner stops and after approx. 4 minutes the fan unit will also stop.

The entire cycle is repeated automatically each time the temperature drops below the value set on the room thermostat.

Fan speed control

Models 60–300

For all the installations requiring changes of static pressure, the air flow should be adjusted to the nominal value accordingly.

The pulley installed on the fan motor(s) is of the adjustable diameter type.

The heaters ordinarily come with a median transmission ratio, so a nominal value can be obtained in installations, as standard.

Begin by checking (when the burner is operating on the nominal thermal output) the temperature rise between the air outlet and inlet temperature and compare with the specifications of Table 2.

In any case, check that the fan rotation direction matches the direction indicated by the arrow on the worm-conveyor.

If there is a three-phase electric motor, to change the direction of rotation simply swap any two phases of the supply line without tampering with the wiring of the electrical panel.

It is also necessary to make sure that the current absorbed by the motor does not exceed what is indicated on the plate, adjust—if necessary—the rpm of the fan to obtain this result.

To adjust the fan speed, proceed as follows:

By increasing the diameter of the drive pulley, the number of rotations of the fan and the electric absorption of the motor increase. The reverse effect will happen if you decrease the diameter.

Note: In the case of models equipped with more than one motor, each motor must be adjusted and its electrical absorption must be checked

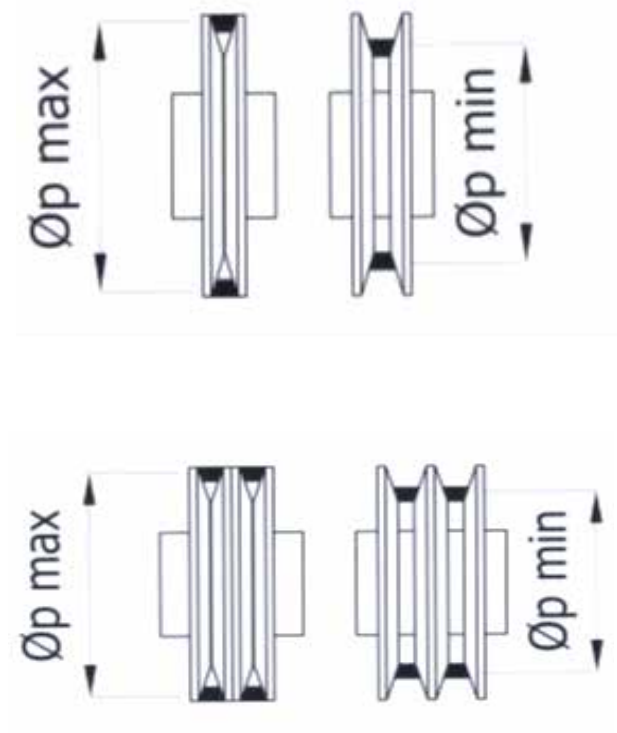


Figure 20. Fan speed control

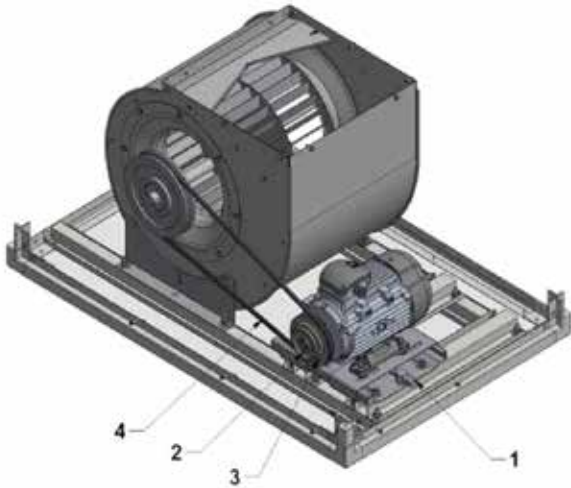


Figure 21. Fan

To change rpm of the fan, perform the following operations:

- Relax the belts tension by unloosing the screw 1
- Remove the belt 4
- Using an allen key, loosen the screws 2 of the sheave 3 movable part.
- Rotate the sheave of the movable part until the desired original diameter is reached.
- Firmly tighten the screws 2
- Install the belt 4 and set to correct tension.

Do not excessively stretch the belts as the fan shaft could break. When you press the two sides of the belt with your hands it must be able to bend about 20-30 mm

FSE 40 Fan motor

The fan motor of the FSE 40 appliance is keyed directly onto the impeller. The motor is also available in a three-speed rotation version. It is shipped from the factory connected at the minimum speed, which corresponds to the nominal air flow

without residual useful static pressure; if it is necessary to increase its performance, simply connect it to the average or maximum rotation, respecting the wiring diagram positioned on the fan itself.

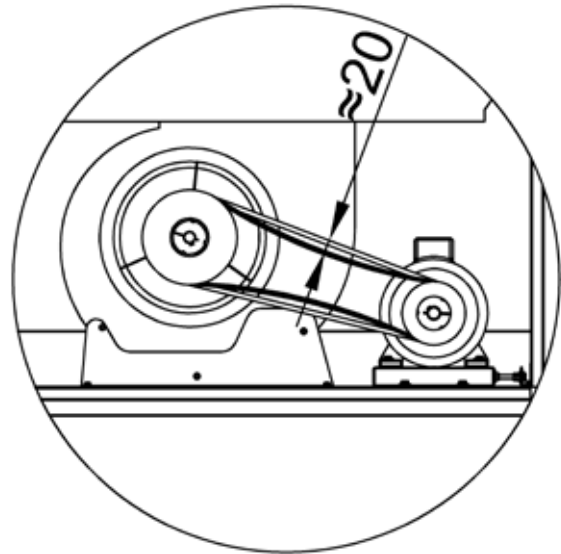


Figure 22. Fan belt

Starting and stopping

To Start

The start-up operation must be performed by qualified engineer, after making sure that the components of the plant have been installed properly and that all the safety devices have been adjusted correctly.

The first start-up consists of the following:

- Close the room thermostat contact: the burner will start the operating cycle and, after the pre-purge cycle, the flame will be ignited
- Check that the fan starts about 1 minute after the flame is ignited
- Check the combustion parameters
- Wait for the heater to reach full temperature (20 min.) And make sure that the limit thermostat does not intervene

- Open the room thermostat contact and make sure that the burner stops
- Close the room thermostat contact again and perform a new burner ignition cycle
- Close the fuel shut-off valve and make sure the burner stops

During the first start-up cycle, the burner may stop due to the lack of fuel supply. In this case, wait at least 30 seconds and, after resetting the burner by pressing the dedicated button, repeat the operation.

During the first few hours of operation, it is common for fumes and odours to form due to the heating of paints and seals. The smell will fade by itself within a few hours, but if it continues for a prolonged period of time, please contact the manufacturer. It is recommended to ventilate the room during this time.

To Stop

To stop the air heater, use the room thermostat only, by setting it to the minimum temperature or by opening the contact of the switch itself —if present— or on stop.

Wait for the fan to stop (4 min.) and then, if necessary, turn the power off from the main switch.

Never stop the appliance by cutting off the electrical power, the thermal energy stored in the heat exchanger may cause dangerous overheating situations, with possible damage to the air heater.

Moreover the 'LIMIT' thermostat could be triggered and it might be necessary to release it manually.

Inspections

In order to ensure that the heater works properly, some basic parameters should be checked.

Turn the unit on and:

- Make sure that the fan unit starts within 60 seconds after the burner is turned on.

With the unit steady

(After an approximate 20 minutes of continuous use) perform the following operations:

- Make sure there are no fuel leaks.
- Check the correct fuel flow rate by weighing the diesel fuel or reading the gas meter
- Check that the unit's flue gas temperature and the technical data are similar with a tolerance of $\pm 10^{\circ}\text{C}$.
- Make sure that the manual resetting safety thermostat calibration is correct.
- Check that the temperature near the safety thermostat is correct (ambient temperature + air temperature).
- Check that no faults have been reported on the safety thermostat.
- Check that no faults have been reported on the safety devices present on the machine.
- Make sure that the temperature gradient is compliant to the value specified in Table 2 on page 9 with a $\pm 2^{\circ}\text{k}$ tolerance.
- Re-activate the appliance. Simulate the intervention of the safety thermostat and check that the burner turns off. Do not adjust the factory settings

- Check that the fan electric absorption value does not exceed the value specified in the plate.
- Check that the air pressure switch on the burner is properly calibrated so that it will turn the burner off in case of an insufficient flow of combustion air.
- Make sure that the fan operates for another 3/4 minutes after the burner has been turned off, before it stops.

All of the aforementioned checks must be carried out. If you want to control the flame through the flame viewer, you must remove the threaded plug and make sure that you wear protective eye-wear.

Condensation check

The appliance is designed to be operated with the heating capacity and the air flow rate specified in the Data Sheet section.

If the heating capacity is too low and/or the air flow rate is too high, combustion

Products may condensate, resulting corrosion of the heat exchanger.

Check inside of the heat exchanger for condensation.

This check should be performed by turning off the burner after half an hour of continuous use, checking simultaneously through the flue connection if there is any trace of humidity in the flue gas collector and in the flue gas pipe elements.

There should not be leakage coming from the safety condensate discharge.

Indicators

Voltage presence indicator

Placed on the electric panel, it is a green light indicator, which turns on when there is a voltage.

Safety devices signaller

Positioned on the electrical panel, consisting of a red indicator which lights up when one of the appliance's safety devices has intervened.

Burner lock indicator

Located on the burner, is a red light indicator, which will turn on when the burner is in lockout.

Fan electric absorption

To measure the electrical absorption of the appliance motor, proceed as follows:

- Insert the current meter on a phase of the main supply line;
- Set the heater for operation in summer mode, so as to exclude all other devices (burner and auxiliaries);
- Read the electric absorption value on the current meter and compare it with the data written on the fan plate.

MAINTENANCE

Maintenance



Maintenance checks should be made more frequently to appliances close to/or under particularly hot areas

- Repairs or maintenance must be performed by a competent and qualified engineer.
- Disconnect the unit from the main power and fuel supply before any maintenance and/or inspection work.
- In order for the heater to properly work and be maintained, we suggest regularly cleaning and maintenance checks listed in the following bullet points.
- Cleaning and maintenance intervals must be carried out in relation to the appliance use conditions, to the installation site and to the environment.
- Any action to this effect must be carried out safely by a qualified engineer.
- It is recommended that you use personal protective equipment.
- All maintenance/cleaning operations requiring the use of ladder or other means, must be secured safely before use.
- It is advisable to report the changes on/ or to the appliance (date, description, type of intervention, cause, etc.).
- If you are not going to use the appliance for long periods of time, turn the main switch "off". If long periods of unusual operation occur, it is advisable to contact the manufacturer on how to restart operation
- Regularly check that all the screws used to assemble the heater are properly fixed

Cleaning of gas or oil burner

The burner should be cleaned by authorized personnel, only.

Electro-ventilator cleaning



The belts must have enough tension to prevent sliding on the pulley. Too much tension on the belts may cause the bearings and/or shaft to break.

After removing the necessary panels, clean the component using a wet cloth. Be sure to periodically check the tension of the transmission belts and the alignment between the motor pulley and the fan pulley. The belts should not be stretched; if the belt is pressed on both sides with the hands, it should bend between 20-30 mm. To manage the tension, operate the two belt-stretching bolts.

Thermostat safety check

Check functionality of the safety thermostat at least quarterly. Simulate its intervention and it should be verified that the burner goes out.

Security control

Checking electrical connections
Periodically check the correct tightening of all electrical connections

Periodically check the operation of all the safety devices of the unit, by simulating their intervention and making sure that the unit stops safely.

Jacket cleaning

With a wet cloth, clean all the inner and outer surfaces of the jacket. Do not use solvents and / or abrasives products on the unit.

Flue gas analysis

Combustion control-analysis checks must be done periodically.

Heat exchanger integrity

Periodically check for cracks and/or leakages of the heat exchanger

The heat exchanger should be cleaned, internally and externally, by authorized personnel and in compliance with specific rules. In general, we suggest cleaning the exchanger at least once a year, at the beginning of every winter.

For such operation, perform the following operations:

- Disconnect the flue
- Open the inspection door (3)
- Remove inspection door with flue connection (4)
- Remove the burner (1)
- Remove the panel (2)
- Remove the panel (5)
- Remove the inspection door (6)
- Remove turbulators if present
- With a brush, clean the inside of the fume pipes (7)
- With a vacuum remove any soot that

has been deposited in the front (8) and rear (9) manifolds

- If necessary, use a vacuum, remove any soot that has been deposited inside the combustion chamber
- If necessary, also remove the side panels and carry out external cleaning of the heat exchanger
- Reassemble all the pieces, especially considering the tightness and replacing the gaskets, if needed
- If necessary, also clean the flue pipe



Cleaning of the FSE 40 appliance must be carried out similarly, considering that the tube bundle(7) consists of only one row.

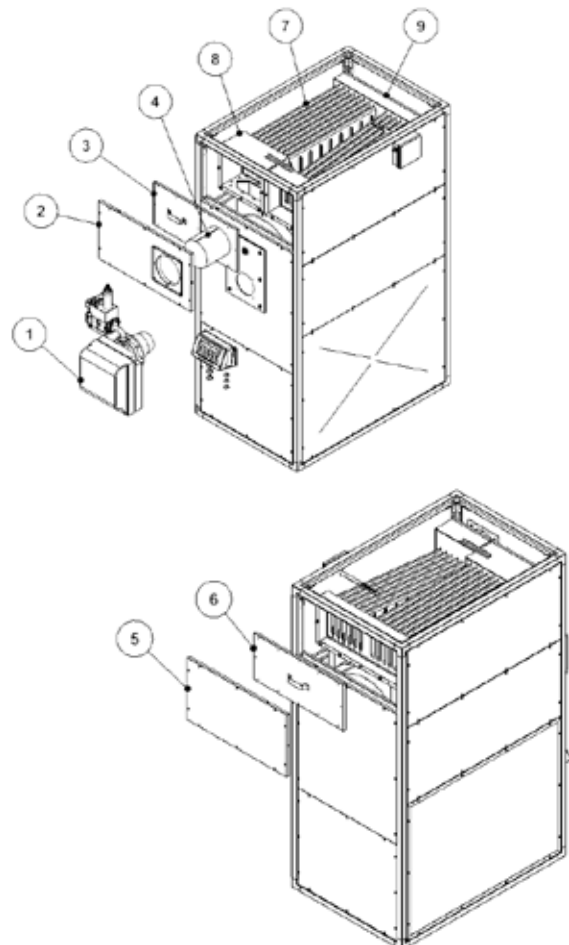


Figure 23 Cleaning and inspection

Servicing



Servicing must be carried out on a regular basis, the maximum interval between services being one year

It is a requirement that only suitably qualified and competent persons are allowed to undertake the servicing.

Further details are available from either the commissioning engineer or from the manufacturer.

Start-up procedure

- Enable burner via controller by selecting 'Heat' (Relay 2); 'Heat On'; 'Heat/Auto'. (This is dependent on control type supplied. Refer to individual controller operating manual).
- Burner will fire and establish within 60 seconds.
- As temperature of heater increases, fan will operate

Stop procedure

- Disable burner by selecting 'Heat OFF'; 'Standby'.*
- (*Dependent on control type supplied. Refer to individual controller operating manual.)
- The burner will turn off.
- The fan will continue to run until heat dissipation allows the fan and limit thermostat to shut down the fan.



Do not use the main electrical isolator to turn off the heater, to do so can cause damage to the heat exchanger and combustion chamber and thereby invalidate the warranty.

Shut down procedure

Perform the steps in the stop procedure, then when main fan stops, turn main electrical isolator off, isolate fuel supply.

Ventilation only

- Enable fan on via controller by selecting
- Fan will operate without the burner for the set period of the controller

Lockout situations

If either the burner or the fan and limit thermostat go to lockout, the lockout must be cleared manually before the ignition sequence can be re-initiated

Repeated or frequent lockouts must be investigated and their cause determined by a qualified and competent engineer

BURNER PARTS LIST

Item / Model	FSE 40	FSE 60	FSE 75	FSE 100
Gas - Two stage burner + gas train	BS1D	BS2D	BS2D	BS3D
	29-99-579	29-99-571	29-99-571	29-99-572
Burner gasket	30-02-698	30-05-795	30-05-795	30-05-813
Control box	30-02-967	30-02-967	30-02-967	30-02-967
Spark electrode	30-08-930	30-08-931	30-08-931	30-08-931
Probe / Photocell	30-07-987	30-07-988	30-07-988	30-07-988
Propane conversion kit	30-01-003	30-01-004	30-01-004	30-01-005

Table 15a Parts list FSE 40-100

Item / Model	FSE 40	FSE 60	FSE 75	FSE 100
Oil - Two stage burner	RG1RKD	RG2KD	RG2D	RG3D
	29-99-602	29-99-607	29-99-603	29-99-604
Burner gasket	30-05-787	30-05-795	30-05-795	30-05-813
Nozzle - 35s gas oil	0.85 x 60°S	1.10 x 60°S	N/A	1.35 x 60°S
	27-00-415	27-00-438		27-00-427
Nozzle - 28s kerosene	1.00 x 60°S	N/A	1.35 X 60°S	1.75 x 60°S
	27-00-418		27-00-427	27-00-436
Control box	30-01-175	30-01-174	30-01-174	30-01-174
Spark electrode	30-07-513	30-02-981	30-07-495	30-07-495
Probe / Photocell	30-07-839	30-07-839	30-07-839	30-07-839
Oil pump	30-07-854	30-07-854	30-078-54	30-07-854
Fire valve	28-30-102	28-30-102	28-30-102	28-30-102
Oil filter	29-15-017	29-15-017	29-15-017	29-15-012

Table 15b Parts list FSE 40-100

Item / Model	FSE 145	FSE 175	FSE 225	FSE 300	
Gas - Two stage burner + gas train	BS3D	BS4D	RS34 MZ	RS44 MZ	RS35/M BLU
	29-99-572	29-99-580	29-99-548	29-99-561	29-99-587
Burner gasket	30-05-813	30-08-500	30-03-817	30-03-817	30-03-817
Control box	30-02-967	30-02-967	30-13-073	30-13-073	30-13-362
Spark electrode	30-08-931	30-08-932	30-14-037	30-14-037	30-14-037
Probe / Photocell	30-07-988	30-07-988	30-13-725	30-13-725	30-13-725
Propane conversion kit	30-01-005	30-01-011	30-10-423	30-10-424	30-10-424

Table 15c Parts list FSE 145-300

Item / Model	FSE 145	FSE 175	FSE 225	FSE 300
Oil - Two stage burner	RG3D	RG4D	RG5D	RL32 BLU
	29-99-604	29-99-605	29-99-606	29-99-581
Burner gasket	30-05-813	30-05-813	30-05-813	30-03-817
Nozzle - 35s gas oil	3.00 x 60°S	3.50 x 60°S	3.50 x 60°S + 1.50 x 60°S	5.50 x 60°S
	27-00-048	27-00-078	27-00-078 + 27-00-430	27-01-064
Nozzle - 28s kerosene	3.50 x 60°S	4.50 x 60°S	3.50 x 60°S + 2.00 x 60°S	7.00 x 60°S
	27-00-078	27-00-079	27-00-078 + 27-00-032	27-00-081
Control box	30-01-174	30-01-174	30-01-174	30-13-071
Spark electrode	30-07-495	30-07-495	30-07-495	30-07-617

Table 15d Parts list FSE 145-300 cont'd on next page

Item / Model	FSE 145	FSE 175	FSE 225	FSE 300
Probe / Photocell	30-07-839	30-07-839	30-07-839	30-12-135
Oil pump	30-07-854	30-07-854	30-08-570	30-12-732
Fire valve	28-30-102	28-30-102	28-30-102	28-30-102
Oil filter	29-15-012	29-15-012	29-15-020	29-15-020


Table 15d Parts list FSE 145-300

GENERAL PARTS LIST


Part Number	Description	Qty Used per Model							
		40	60	75	100	145	175	225	300
1210179	Flue pressure switch	1	1	1	1	1	1	1	1
1215220	Fan/limit 3 switch assembly	1	1	1	1	1	1	1	1
1215001	Fan & limit switch (auto reset)	1	1	1	1	1	1	1	1
1215020	High limit switch (manual reset)	1	1	1	1	1	1	1	1
1810341	Fan motor 1.1kW 3ph FSE		1				2		
1810342	Fan motor 1.5kW 3ph FSE			1					
1810343	Fan motor 2.2kW 3ph FSE				1			2	
1810344	Fan motor 3.0kW 3ph FSE					1			2
1800804	Blower direct drive 10/10 1ph FSE40	1							
1800488	Blower ADH280L FSE		1	1					
1800335	Blower ADH355L FSE				1	1	2	2	
1800357	Blower ADH400L FSE								2
1801545	Pulley variable 136 FSE		1	1	1	1		2	2
1801156	Pulley taper bush 1210-24 FSE		1	1					
1801104	Pulley B250 FSE		1		1				
1801128	Pulley taper bush 2012-25 FSE		1	1					
1801021	Pulley B200 FSE			1					
1801157	Pulley taper bush 1210-28 FSE				1	1		2	2
1801162	Pulley taper bush 2012-30 FSE				1	1	2	2	2
1801095	Pulley B212 FSE					1		2	
1801546	Pulley variable 121 FSE						2		
1801147	Pulley taper bush 1108-24 FSE						2		
1801543	Pulley B236 FSE						2		2
1030162	Relay Finder 40.52.8.230.0000 (RS)	1	1	1	1	1	1	1	1
1030163	Relay Finder 40.61.8.230.0000 (RB)	1	1	1	1	1	1	1	1
1030164	Overload TESYS E CL10A 4...6A LRE10 (RT)	1			1			2	
1030165	Fuse 5x20T std 6.30A 250V 0-114306 (F1)	1	1	1	1	1	1	1	1
1030167	Contactore TESYS E 1NC5,5KW220VAC LC1E1210M7 (KM1-2)	1	1	1	1	2	2	2	2
1030168	Overload TESYS E CL10A 2.5...4A LRE08 (RT1-2)		1	1			2		
1030169	Overload TESYS E CL10A 5.5...8A LRE12 (RT1-2)					1			2
B55	Belt B55		1						
B52	Belt B52			1					
SPB1700	Belt SPB1700				1				
SPB1650	Belt SPB1650					1			
SPB1550	Belt SPB1550						2	2	
SPB1800	Belt SPB1800								2

Table 15e General parts list FSE 40-300


ErP Data chart natural gas

Information requirements for warm air heaters Commission Regulation (EU) 2018										
B1 warm air heater:	[NO]									
C2 warm air heater:	[NO]									
C4 warm air heater:	[NO]									
Type of fuel:	Natural Gas									
Model:	FSE		FSE40 G	FSE60 G	FSE75 G	FSE100 G	FSE145 G	FSE175 G	FSE225 G	FSE300 G
Item:	Symbol	Units								
Capacity:										
Rated heating capacity:	P rated,h	[kW]	39.0	56.8	68.5	99.2	143.5	175.9	223.4	300.1
Minimum capacity:	Pmin	[kW]	28.1	38.2	53.2	67.3	100.4	124.0	153.6	230.6
Electric power consumption:										
At rated heating capacity:	elmax	[kW]	0.183	0.195	0.197	0.403	0.408	0.43	0.53	0.598
At minimal capacity:	elmin	[kW]	0.156	0.164	0.17	0.371	0.38	0.375	0.53	0.565
In standby mode:	elsb	[kW]	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Useful efficiency:										
Useful efficiency at rated heating capacity:	η_{nom}	[%]	82%	81%	82%	81%	82%	81%	81%	82%
Useful efficiency at minimum capacity:	η_{pl}	[%]	84%	84%	84%	84%	85%	85%	84%	85%
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]	59	66	70	54	64	59	81	97
Emission efficiency:	$\eta_{s,flow}$	[%]	91%	91%	91%	91%	90%	91%	90%	90%
ErP seasonal space heating energy efficiency:	η_s	[%]	72%	72%	72%	72%	72%	72%	72%	72%
Thermal efficiency at rated heating capacity [NCV]:	η	[%]	91%	90%	91%	90%	91%	90%	90%	91%


ErP Data chart propane gas

Information requirements for warm air heaters Commission Regulation (EU) 2018										
B1 warm air heater:	[NO]									
C2 warm air heater:	[NO]									
C4 warm air heater:	[NO]									
Type of fuel:	Propane Gas									
Model:	FSE		FSE40 P	FSE60 P	FSE75 P	FSE100 P	FSE145 P	FSE175 P	FSE225 P	FSE300 P
Item:	Symbol	Units								
Capacity:										
Rated heating capacity:	Prated,h	[kW]	38.4	57.4	67.5	98.2	139.6	176.51	222.95	294.61
Minimum capacity:	Pmin	[kW]	27.9	38.9	52.3	67.3	98.7	124.25	156.04	227.02
Electric power consumption:										
At rated heating capacity:	elmax	[kW]	0.183	0.195	0.197	0.403	0.408	0.43	0.53	0.598
At minimal capacity:	elmin	[kW]	0.156	0.164	0.17	0.371	0.38	0.375	0.53	0.565
In standby mode:	elsb	[kW]	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Useful efficiency:										
Useful efficiency at rated heating capacity:	η_{nom}	[%]	82%	84%	82%	82%	81%	83%	82%	82%
Useful efficiency at minimum capacity:	η_{pl}	[%]	85%	87%	85%	86%	85%	87%	87%	85%
Other items:										
Envelope loss factor:	Fenv	[%]	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	0.00	0.00	0.00
Emissions of nitrogen oxides [input energy (GCV)]:	NOx	[mg/kWh]	84	96	99	89	98	90	97	96
Emission efficiency:	$\eta_{s,flow}$	[%]	91%	91%	91%	91%	90%	90%	91%	90%
ErP seasonal space heating energy efficiency:	η_s	[%]	73%	75%	72%	73%	72%	74%	74%	72%
Thermal efficiency at rated heating capacity [NCV]:	η	[%]	89%	91%	90%	89%	88%	91%	90%	90%

ErP Data chart oil

Information requirements for warm air heaters Commission Regulation (EU) 2018										
B1 warm air heater:	[NO]									
C2 warm air heater:	[NO]									
C4 warm air heater:	[NO]									
Type of fuel:	Heating Oil									
Model:	FSE		FSE40 O	FSE60 O	FSE75 O	FSE100 O	FSE145 O	FSE175 O	FSE225 O	FSE300 O
Item:	Symbol	Units								
Capacity:										
Rated heating capacity:	Prated,h	[kW]	40.0	55.5	69.9	96.4	144.9	175.1	218.9	304.3
Minimum capacity:	Pmin	[kW]	33.2	45.5	53.5	84.3	113.8	133.3	158.6	222.5
Electric power consumption:										
At rated heating capacity:	elmax	[kW]	0.278	0.184	0.192	0.405	0.405	0.43	0.53	0.53
At minimal capacity:	elmin	[kW]	0.247	0.175	0.176	0.396	0.396	0.375	0.53	0.53
In standby mode:	elsb	[kW]	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Useful efficiency:										
Useful efficiency at rated heating capacity:	η_{nom}	[%]	87%	87%	87%	85%	86%	87%	87%	87%
Useful efficiency at minimum capacity:	η_{pl}	[%]	89%	89%	88%	87%	88%	89%	90%	89%
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]	130	133	151	145	129	127	127	113
Emission efficiency:	$\eta_{s,flow}$	[%]	90%	90%	91%	89%	89%	90%	91%	90%
ErP seasonal space heating energy efficiency:	η_s	[%]	74%	75%	76%	72%	74%	75%	77%	76%
Thermal efficiency at rated heating capacity [NCV]:	η	[%]	93%	92%	93%	91%	92%	92%	93%	93%

ErP Data chart kerosene

Information requirements for warm air heaters Commission Regulation (EU) 2018										
B1 warm air heater:	[NO]									
C2 warm air heater:	[NO]									
C4 warm air heater:	[NO]									
Type of fuel:	Kerosene									
Model:	FSE		FSE40 K	FSE60 K	FSE75 K	FSE100 K	FSE145 K	FSE175 K	FSE225 K	FSE300 K
Item:	Symbol	Units								
Capacity:										
Rated heating capacity:	Prated,h	[kW]	40.0	54.5	69.8	102.1	138.4	182.0	231.8	305.3
Minimum capacity:	Pmin	[kW]	35.8	49.1	62.7	88.5	124.4	153.0	167.4	251.1
Electric power consumption:										
At rated heating capacity:	elmax	[kW]	0.278	0.184	0.192	0.405	0.405	0.45	0.439	0.53
At minimal capacity:	elmin	[kW]	0.247	0.175	0.176	0.396	0.396	0.409	0.4	0.53
In standby mode:	elsb	[kW]	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Useful efficiency:										
Useful efficiency at rated heating capacity:	η_{nom}	[%]	88%	89%	88%	88%	88%	89%	89%	89%
Useful efficiency at minimum capacity:	η_{pl}	[%]	90%	90%	89%	89%	88%	90%	91%	90%
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]	145	130	167	141	150	129	142	111
Emission efficiency:	$\eta_{s,flow}$	[%]	89%	89%	90%	89%	88%	88%	90%	89%
ErP seasonal space heating energy efficiency:	η_s	[%]	74%	75%	75%	73%	72%	75%	78%	76%
Thermal efficiency at rated heating capacity [NCV]:	η	[%]	93%	94%	93%	93%	92%	93%	93%	93%



NORTEK GLOBAL HVAC (UK) LTD

Fens Pool Avenue
Brierley Hill
West Midlands DY5 1QA
United Kingdom
Tel 01384 489250
Fax 01384 489707
reznorsales@nortek.com
www.reznor.eu

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