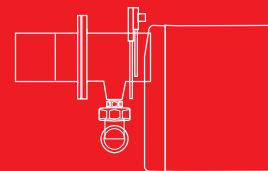
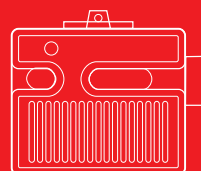




## Riello 40 FSD Series

Two Stage Gas Burners

FS5D	12/23	÷	58	kW
FS20D	58/81	÷	220	kW



The Riello 40 FSD series of one stage gas burners, is a complete range of products developed to respond to any request for light industrial application. The Riello 40 FSD series is available in five different models, with an output ranging from 11 to 220 kW, divided in four different structures.

All the models use the same components designed by Riello for the Riello 40 FSD series. The high quality level guarantees safe working.

The Riello 40 FSD burners are fitted with a microprocessor – based control box, with diagnostic functions.

In developing these burners, special attention was paid to reducing noise, to the ease of installation and adjustment, to obtaining the smallest size possible to fit into any sort of boiler available on the market. All the models are approved by the EN 676 European Standard and conform to European Directives for EMC, Low Voltage, Machinery and Boiler Efficiency.

All the Riello 40 FSD burners are tested before leaving the factory.

# Technical Data

MODEL			FS5D	FS20D
Burner operation mode			Two stage	
Heat output (Hi) (1)	min. - max.	kW kcal/h	12/23 ÷ 58 10.000/20.000 ÷ 50.000	58/81 ÷ 220 50.000/70.000 ÷ 189.000
FUEL/AIR DATA				
Fuel		Family 2 Pressure	NCV 8 ÷ 12 kWh/m³ – 7.000 ÷ 10.340 kcal/m³	
			min. 8 mbar max. 200 mbar	
			min. 24 mbar max. 360 mbar	
Operation			Intermittent (FS1)	
Use			Boilers: water and diathermic oil	
Ambient temperature		°C	0 – 50	
Combustion air temperature		°C max.	60	
ELECTRICAL DATA				
Electrical supply			1/230V/50Hz	
Fan motor		rpm – rad/s	2800 – 294	2750 – 288
		V – Hz	230 – 50	230 – 50
		W	90	150
		A	0.75	1.3
Ignition transformer			Primary 230 V Secondary 18 kV / 11 mA	Primary 230 V Secondary 8 kV / 30 mA
Capacitor		µF	2	5
Absorbed electrical power		kW	0.15	0.25
Protection level			IP40	
EMISSIONS				
Noise levels (2)	Soundpressure	dB (A)	59.4	66.8
	Sound power		70.8	78.5
APPROVAL				
Directive			2006/42/EC – 2016/426/UE – 2014/30/UE – 2014/30/UE	
Conforming to			EN 676 – EN 12100	
Certification			CE-0476CT2714	

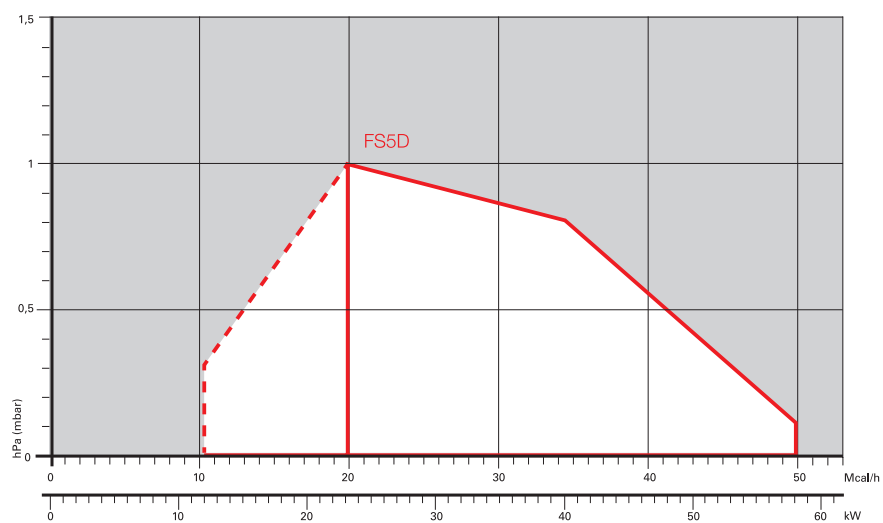
Reference conditions:

(1) Temperature: 20°C - Pressure: 1013.5 mbar - Altitude: 0 m a.s.l. - Noise measured at a distance of 1 meter.

(2) Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum rated output. The sound power is measured with the "Free Field" method, as per EN 15036, and according to an "Accuracy: Category 3" measuring accuracy, as set out in EN ISO 3746.

Since the Company is constantly engaged in the production improvement, the aesthetic and dimensional features, the technical data, the equipment and the accessories can be changed. This document contains confidential and proprietary information of RIELLO S.p.A. Unless authorised, this information shall not be divulged, nor duplicated in whole or in part.

## Firing Rates



Useful working field for choosing the burner



1<sup>st</sup> stage operation range

Test conditions  
conforming to EN676  
Temperature: 20°C  
Pressure: 1013.5  
mbar  
Altitude: 0 m  
a.s.l.

# Gas train

## GAS TRAIN DESIGNATION

Series:		MB						
		MBC						
		VGD						
		CB						
		DMV						
		CG						

Size:	405	407	410	412	415	420	-
	65	1200	1900	3100	5000		
	50	65	80	100	-	-	-
	512	520	525	5065	5080	50100	50125
	120	220	-	-	-	-	-

Operation:	/S	only ON-OFF function
	/1	stage mode opening
	/2	2nd stage mode opening
	/P	1st stage mode opening with air/gas proportional regulator

Leak detection control:	-	0
	CT	leak detection control device installed on the gas train
	CQ	equipped with pressure switch for leak detection control

Joint type:	R	threaded joint
	F	standard flange ISO
	F1	square flange BS1
	F2	square flange BS2
	F3	square flange BS3 - BS4

Electrical connection:	T	Terminals - Terminal strip
	SD	Domestic plug
	SM	Medium voltage plug

Standard output pressure range:	-	without pressure governor
	0	with governor and air/gas proportional pressure
	2	with governor and output pressure up to 20 mbar
	3	with governor and output pressure up to 30 mbar
	4	with governor and output pressure up to 40 mbar
	5	with governor and output pressure up to 50 mbar
	6	with governor and output pressure up to 60 mbar
	8	with governor and output pressure up to 80 mbar
	15	with governor and output pressure up to 150 mbar

Valve control:	0	shared
	2	separate

CB	5065	/1	CT	F	SM	3	0
----	------	----	----	---	----	---	---

BASIC DESIGNATION

EXTENDED DESIGNATION

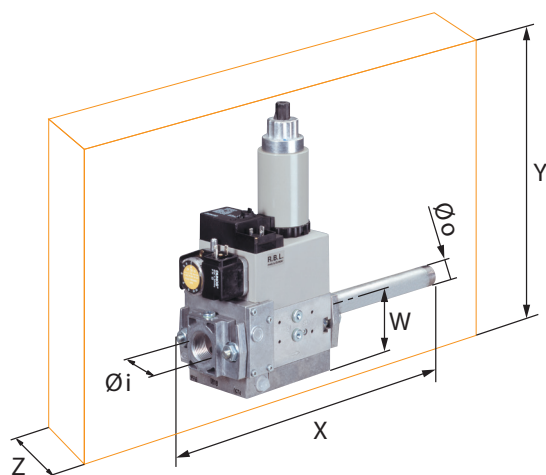
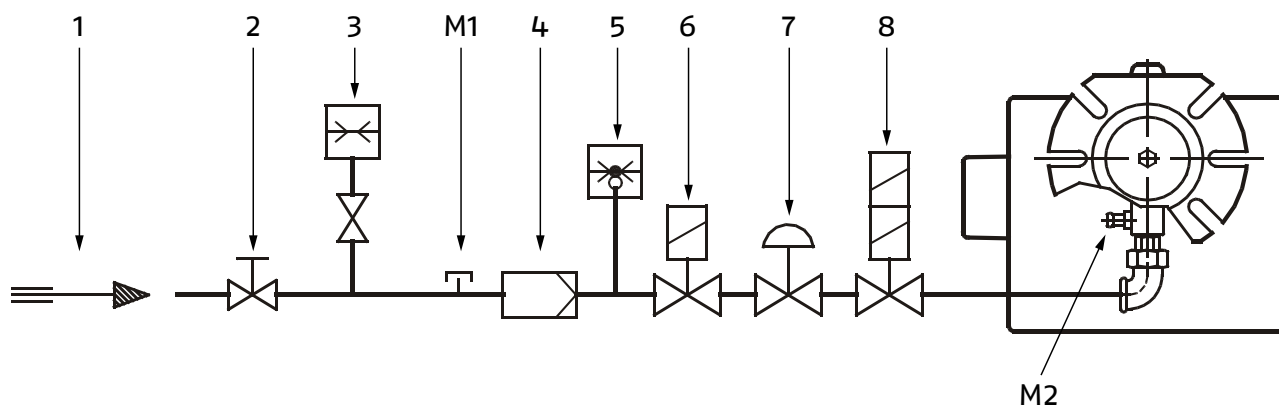
## GAS TRAINS

The burners are set for gas supply from either the right or left hand sides.

Depending on the fuel output and the available pressure in the supply line, you should check the correct gas train to be adapted to the system requirements.

The gas train is Multibloc type, containing the main components in a single unit and it can be fitted with the valves seal control (as accessory).

### MB 405-407-410/2



1	Gas input pipe
2	Manual gate (the responsibility of the installer)
3	Gas pressure gauge (the responsibility of the installer)
4	Filter
5	Gas pressure switch
6	Safety valve
7	Pressure stabiliser
8	1st and 2nd stage adjustment valve
M1	Gas-supply pressure test point on the pressure switch
M2	Pressure coupling test point

The dimensions of the gas trains vary depending on their construction features.

The following table shows the dimensions of the gas trains that can be fitted to Riello 40 FSD burners, intake and outlet diameters.

GAS TRAIN								BURNER		NOTE
MODEL	CODE *	Ø in	Ø out	X mm	Y mm	W mm	Z mm	NATURAL GAS	LPG	
MB 405/2	3970084	Rp 1/2"	Rp 1/2"	321	257	46	120	FS5D	FS5D	(1) (3)
MB 407/2	3970537	Rp 3/4"	Rp 3/4"	371	257	46	120	FS20D	FS20D	(1) (2)
MB 410/2	3970534	Rp 1"	Rp 3/4"	405	315	55	145	FS20D	FS20D	(1)

Please see Designation of Gas Train Series in the page before the Catalogue index.

\* Gas train are 230V/50Hz - 220V/60Hz electrical supply

(1) With installed plug (if the plug is not necessary, remove it in accordance with gas train instruction manual indication)

(2) FS20D ≤ 180 kW with natural gas

(3) With 1/2" - 3/4" reduction nipple supplied

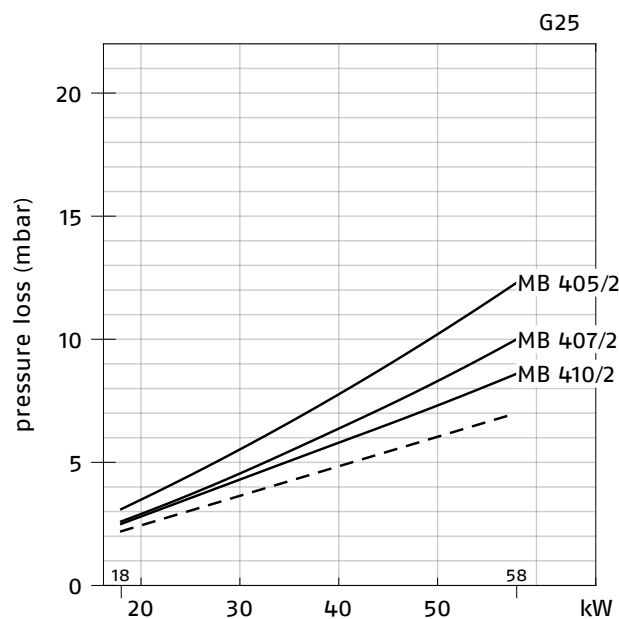
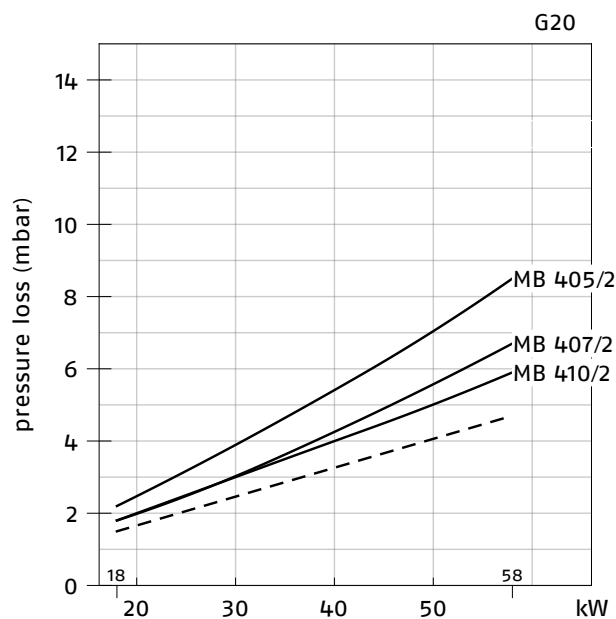
The valve seal control device is compulsory (conforming to EN 676) on gas trains to burners with a maximum output over 1200 kW.

To select the gas train please refer to the technical data leaflet and/or instruction manual.

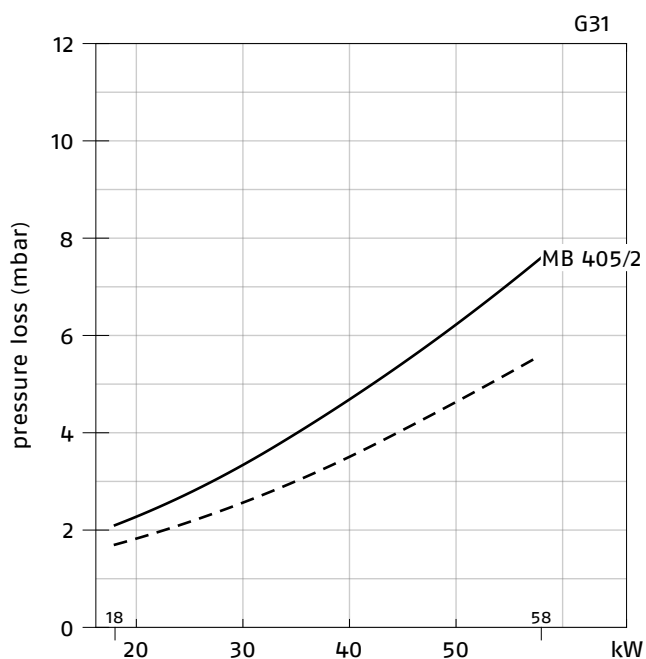
## Pressure Drop Diagram

The diagrams indicate the minimum pressure drop of the burners with the various gas trains that can be matched with them; at the value of these pressure drop add the combustion chamber pressure. The value thus calculated represents the minimum required input pressure to the gas train.

### FS5D (NATURAL GAS)



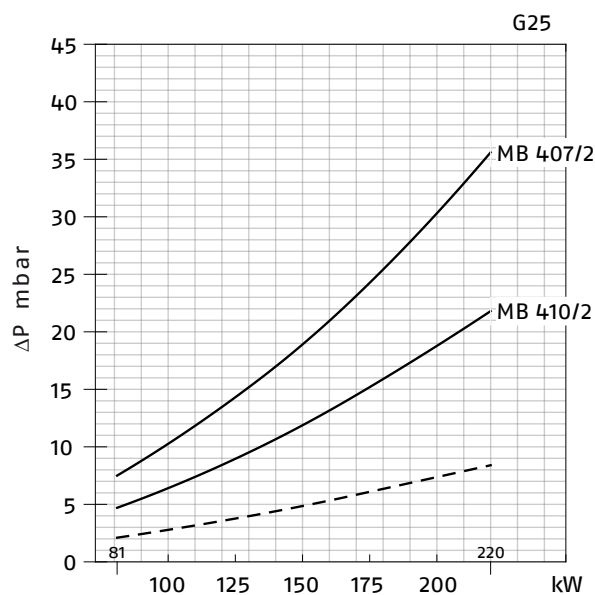
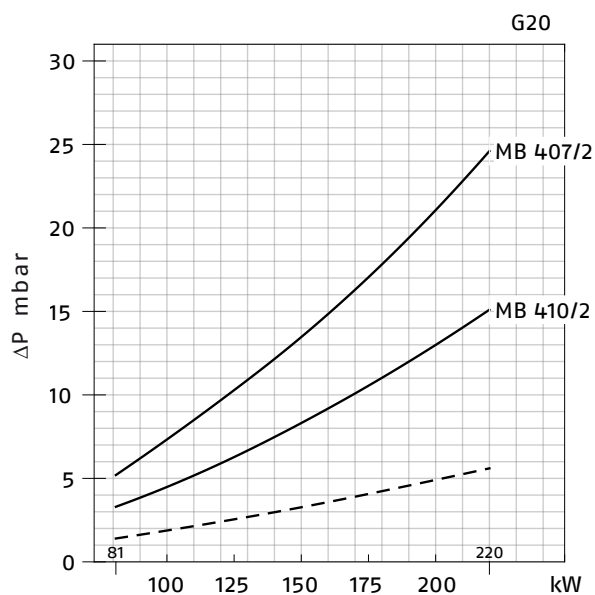
### FS5D (LPG)



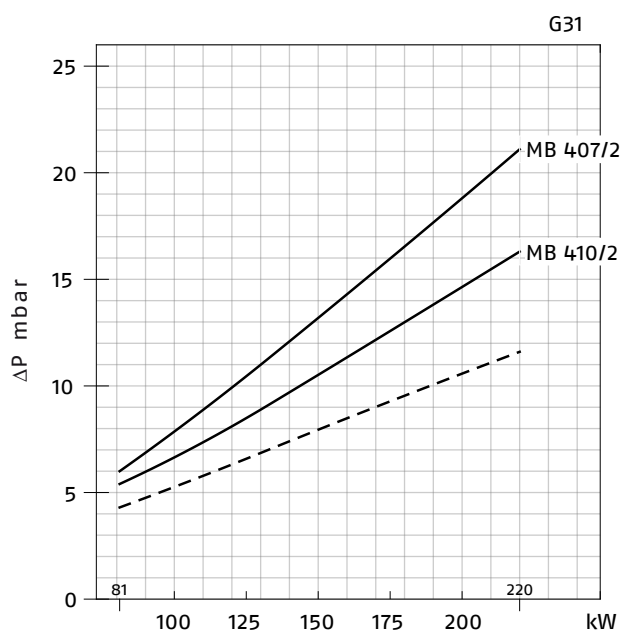
For pressure levels different from those indicated above, please contact Riello Burners Technical Office.  
In LPG plants, Multibloc gas trains do not operate below 0°C.  
They are only suitable for gaseous LPG (liquid hydrocarbons destroy the seal materials).

— Combustion head + gas train  
- - - Combustion head

## FS20D (NATURAL GAS)



## FS20D (LPG)



For pressure levels different from those indicated above, please contact Riello Burners Technical Office.

In LPG plants, Multibloc gas trains do not operate below 0°C.

They are only suitable for gaseous LPG (liquid hydrocarbons destroy the seal materials).

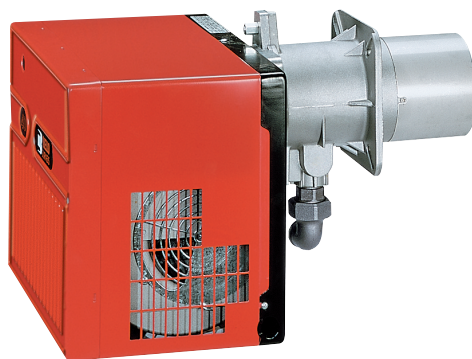
— Combustion head + gas train  
 - - - Combustion head



## Ventilation

The different ventilation circuits always ensure low noise levels with high performance of pressure and air delivery, inspite of their compact size.

The burners are fitted with an adjustable air pressure switch, conforming to EN 676 standards.



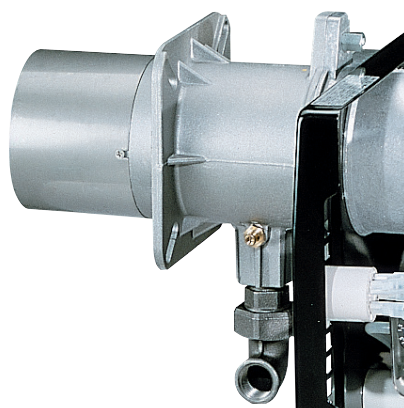
Air suction

## Combustion Head

The combustion head in Riello 40 FSD burners is the result of an innovative design, which allows combustion with low polluting emissions, while being easy to adapt to all the various types of boilers and combustion chambers.



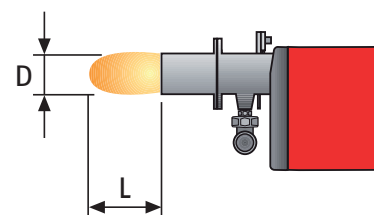
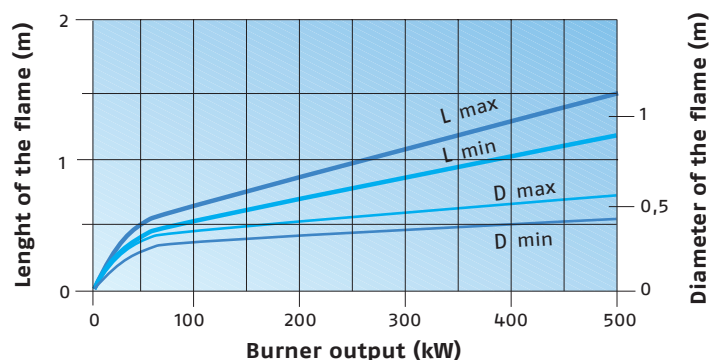
Combustion head



Mobile flange

Simple adjustment allows the internal geometry of the combustion head to be adapted to the burner output.

## DIMENSIONS OF THE FLAME



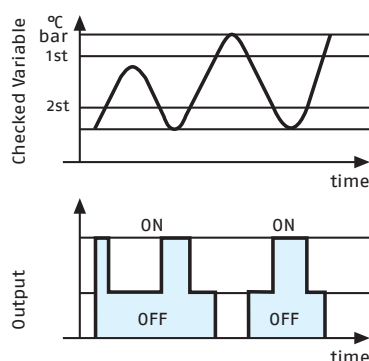
Example:  
 Burner thermal output = 350 kW;  
 L flame (m) = 1.2 m (medium value);  
 D flame (m) = 0.6 m (medium value)

## Operation

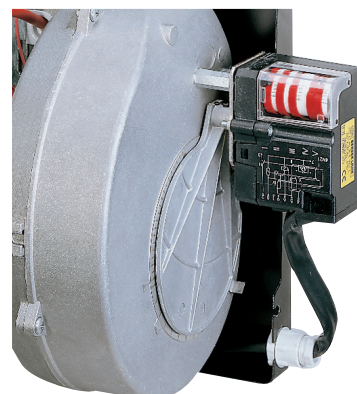
All these models are two stage operation.

The Riello 40 FSD series of two stage burners allows operating at both full and reduced output, with consequent reduction in turning the burner on and off, their giving better performance to the boiler.

During stand-by, the air damper is completely closed (controlled by an electric servomotor) and prevents heat loss due to the flue draught.



Two stage operation



Air damper adjustment

The FS5D model is fitted with the new microprocessor control panel. For helping the commissioning and maintenance work, there are two main elements:

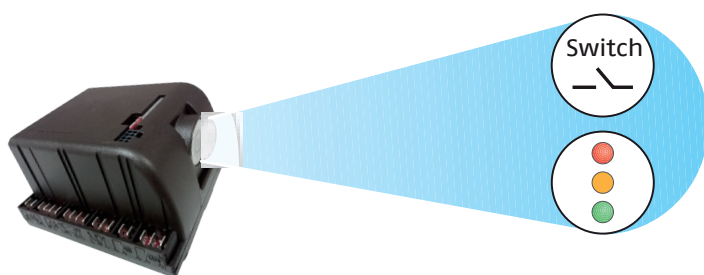


The lock-out reset button is the central **operating element** for resetting the burner control and for activating / deactivating the diagnostic functions.



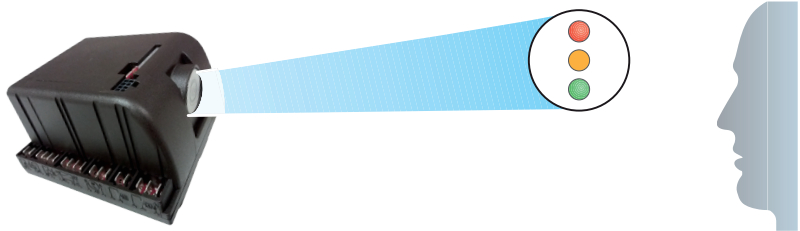
The multi-color LED is the central **indication element** for visual diagnosis and interface diagnosis.

Both elements are located under the transparent cover of lock-out reset button, as showed below.



There are two diagnostic choices, for indication of operation and diagnosis of fault cause:

**- visual diagnosis:**



**- interface diagnosis:**



By the interface adapter and a PC with dedicated software.

**Indication of operation:**


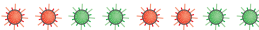




In normal operation, the various statues are indicated in the form of colour codes according to the table below.

Color code table		
Operation status	Color code	Color
Stand-by	○ ○ ○ ○ ○ ○ ○ ○	Off
Pre-purging	☀ ○ ☀ ○ ☀ ○ ☀ ○	Flashing orange
Ignition phase	☀ ○ ☀ ○ ☀ ○ ☀ ○	Flashing green
Flame OK	☀ ☀ ☀ ☀ ☀ ☀ ☀ ☀	Green
Undervoltage/overvoltage	☀ ☀ ○ ○ ☀ ☀ ○ ○	Low flashing orange
Fault, alarm	☀ ☀ ☀ ☀ ☀ ☀ ☀ ☀	Red
Extraneous light	☀ ☀ ☀ ☀ ☀ ☀ ☀ ☀	Green - Red

**Diagnosis of fault causes:**

After lock-out has occurred, the red signal lamp is steady on. In this status, the visual fault diagnosis is in according to the error code table below:

**Error code table**

Signal	Possible cause
<b>Red</b> 	The flame does not stabilise at the end of the safety time: - faulty ionisation probe - faulty or soiled gas valves - neutral/phase exchange - faulty ignition transformer - poor burner regulation (insufficient gas)
<b>Red - green</b> 	Min. air pressure switch does not close after the limit thermostat closed: - air pressure switch faulty - air pressure switch incorrectly regulated
<b>Flashing red</b> 	Presence of flame: - in stand-by position after heat demand - during pre-purging
<b>Slow flashing red</b> 	Loss air pressure: - during pre-purging - during safety time or operations
<b>Fast flashing red</b> 	Loss of flame 4 times during operations after 3 attempts of re-cycle: - poor burner regulation (insufficient gas) - faulty or soiled gas valves - short circuit between ionisation probe and earth - faulty ionisation probe
<b>Red - orange</b> 	Min. air pressure switch is already closed before the limit thermostat closed: - air pressure switch faulty - air pressure switch incorrectly regulated

The FS20D model is fitted with the new microprocessor control panel for the supervision during intermittent operation.

For helping the commissioning and maintenance work, there are two main elements:

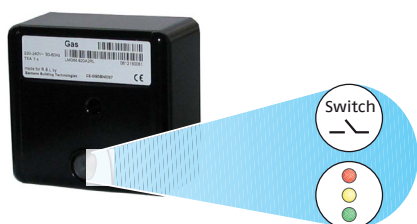


The lock-out reset button is the central operating element for resetting the burner control and for activating / deactivating the diagnostic functions.



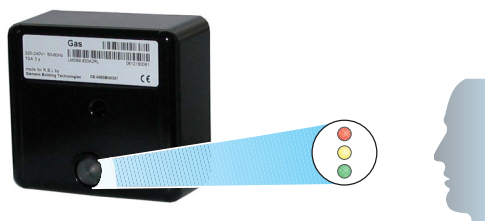
The multi-color LED is the central indication element for visual diagnosis and interface diagnosis.

Both elements are located under the transparent cover of lock-out reset button, as showed below.

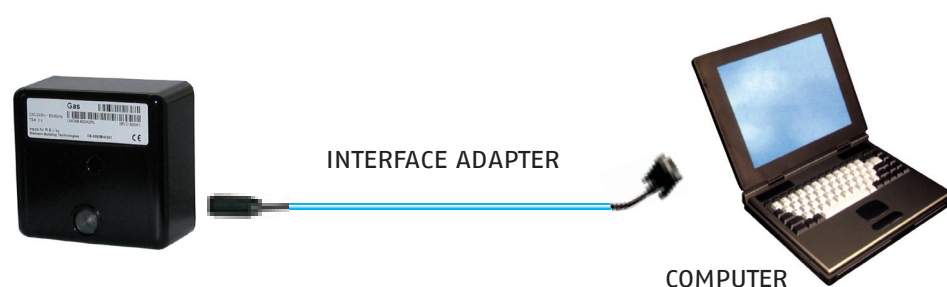


There are two diagnostic choices, for indication of operation and diagnosis of fault cause:

**- visual diagnosis:**



**- interface diagnosis:**



By the interface adapter and a PC with dedicated software.

**Indication of operation:**

In normal operation, the various status are indicated in the form of colour codes according to the table below. The interface diagnosis (with adapter) can be activated by pressing the lock-out button for > 3 seconds.

Color code table		
Operation status	Color code	Color
Stand-by	○ ○ ○ ○ ○ ○ ○ ○	Off
Pre-purging	☀ ☀ ☀ ☀ ☀ ☀ ☀ ☀	Yellow
Ignition phase	☀ ○ ☀ ○ ☀ ○ ☀ ○	Flashing yellow
Flame OK	☘ ☘ ☘ ☘ ☘ ☘ ☘ ☘	Green
Poor flame	☘ ○ ☘ ○ ☘ ○ ☘ ○	Flashing green
Undervoltage/overvoltage	☀ ☘ ☀ ☘ ☀ ☘ ☀ ☘	Yellow red
Fault, alarm	☘ ☘ ☘ ☘ ☘ ☘ ☘ ☘	Red
Extraneous light	☘ ☘ ☘ ☘ ☘ ☘ ☘ ☘	Green - Red

**Diagnosis of fault causes:**

After lock-out has occurred, the red signal lamp is steady on. In this status, the visual fault diagnosis according to the error code table can be activated by pressing the lock-out reset button for > 3 seconds.

The interface diagnosis (with adapter) can be activated by pressing again the lock-out button for > 3 seconds. The flashes of red LED are a signal with this sequence :

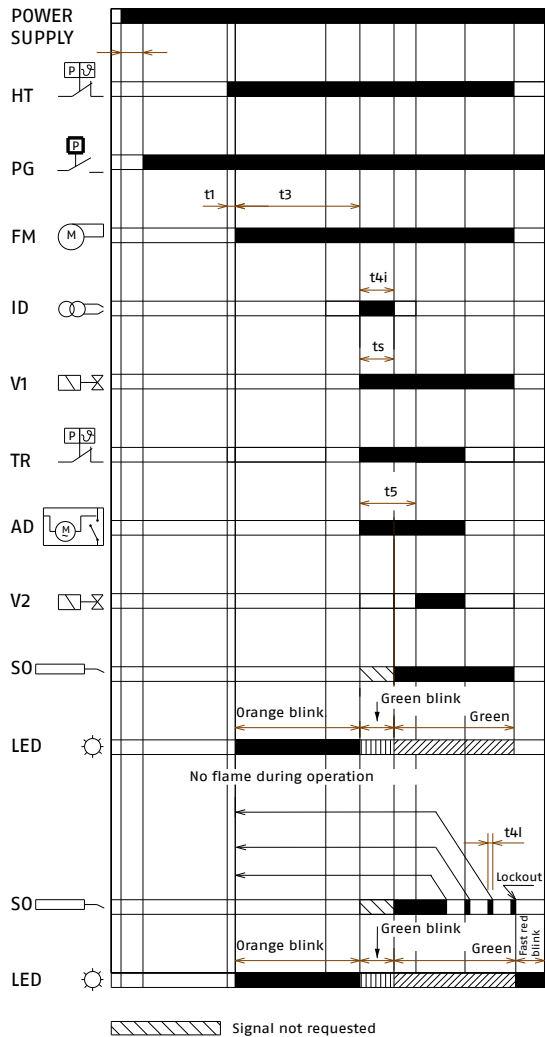
(e.g. signal with n° 3 flashes – faulty air pressure monitor)



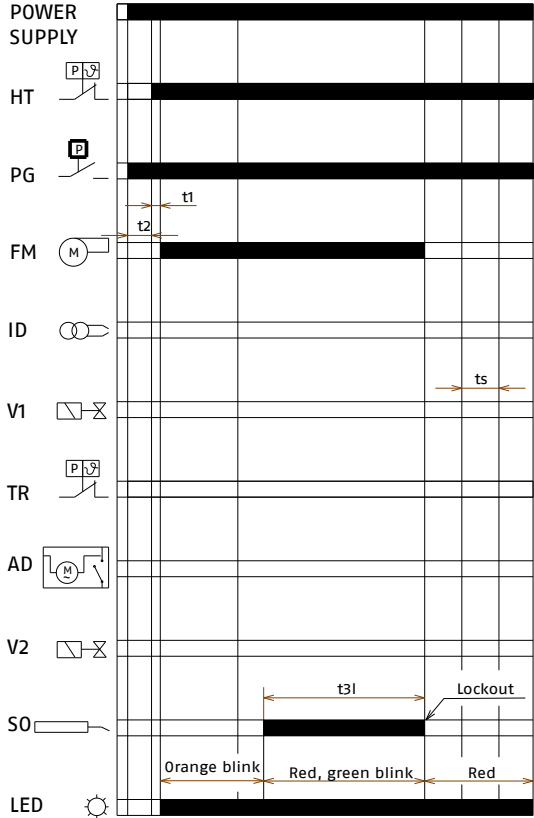
Error code table	
Flash code	Possible cause of fault
2 flashes ☘ ☘	No establishment of flame at the end of safety time : - faulty or soiled fuel valves - faulty or soiled flame detector - poor adjustment of burner, no fuel - faulty ignition equipment
3 flashes ☘ ☘ ☘	Faulty air pressure switch
4 flashes ☘ ☘ ☘ ☘	Simulation of flame on burner start up
7 flashes ☘ ☘ ☘ ☘ ☘ ☘ ☘	Loss of flame during operation : - faulty or soiled fuel valves - faulty or soiled flame detector - poor adjustment of burner
10 flashes ☘ ☘ ☘ ☘ ☘ ☘ ☘ ☘ ☘ ☘	Wiring error or internal fault

# START UP CYCLE FS5D

## Normal operation



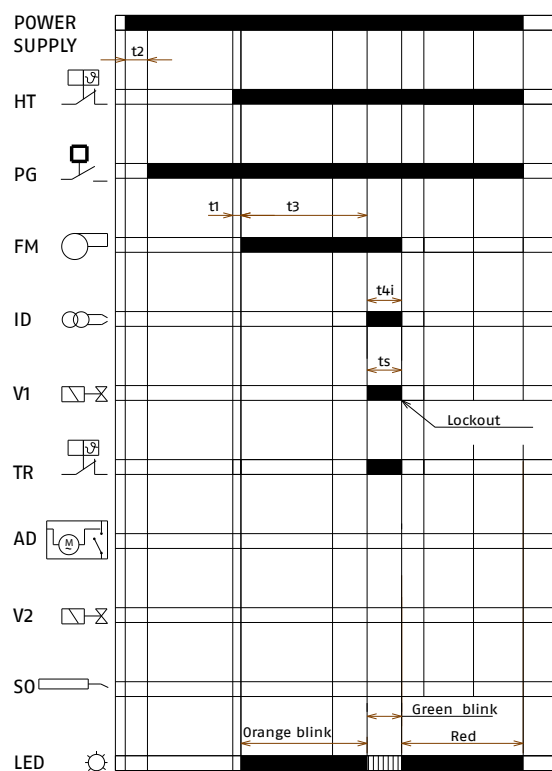
## Lockout due to extraneous light during pre-purging



### KEY

AD	Electric air damper opener
FM	Fan motor
HT	Heat request
ID	Ignition device
LED	LED colour inside the button
PG	Low gas pressure switch
S0	Ionisation probe
TR	Adjustment thermostat
t1	Standby time
t2	Initialisation time for checking
t3	Pre-purging time
t3l	Checks for presence of extraneous light during pre-purging phase
t4i	Total ignition time
t4l	Reaction time to achieve safety lockout due to lack of failure
t5	Delay time between the 1st and 2nd stage
ts	Safety time
V1	1st stage gas valve
V2	2nd stage gas valve

## Lockout due to ignition failure FS5D



## KEY

AD	Electric air damper opener
FM	Fan motor
HT	Heat request
ID	Ignition device
LED	LED colour inside the button
PG	Low gas pressure switch
S0	Ionisation probe
TR	Adjustment thermostat
t1	Standby time
t2	Initialisation time for checking
t3	Pre-purging time
t3l	Checks for presence of extraneous light during pre-purging phase
t4i	Total ignition time
t4l	Reaction time to achieve safety lockout due to lack of failure
t5	Delay time between the 1st and 2nd stage
ts	Safety time
V1	1st stage gas valve
V2	2nd stage gas valve

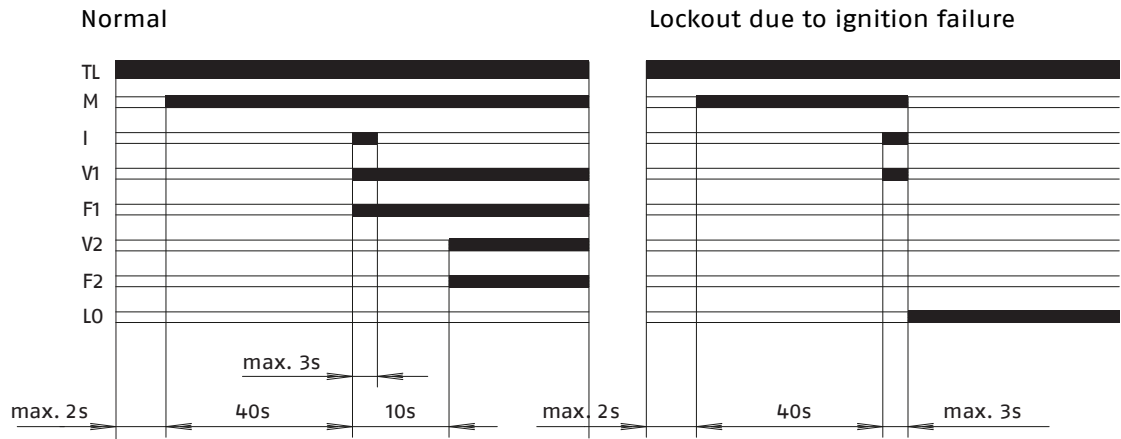
## Operating times (seconds)

t1	t2	t3	t3l, t4l	t4i	ts	t5
max	max	-	max	-	-	min/max
2	4.5	40	1	3	3	5/25



**START UP CYCLE FS20D**

Operation sequence of the burner

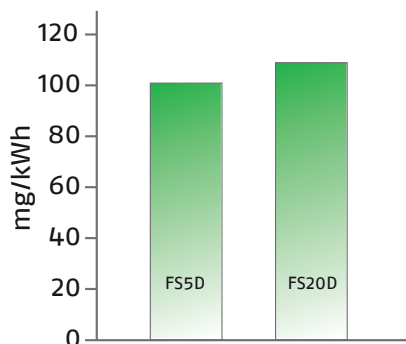


KEY	
I	Ignition transformer
F1	1st stage flame
F2	2nd stage flame
L0	Lockout
M	Fan motor
TL	Limit thermostat
V1	1st stage gas valve
V2	2nd stage gas valve

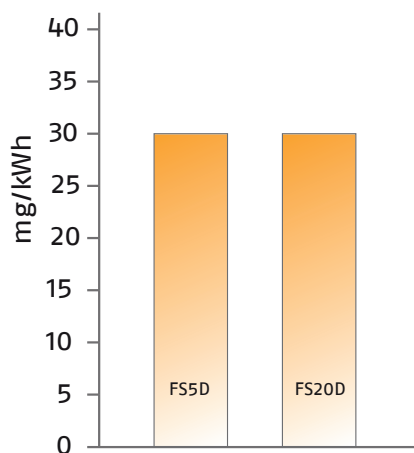
## Emissions

The emission data have been measured in the various model at maximum output, in conformity with EN 676 standard.

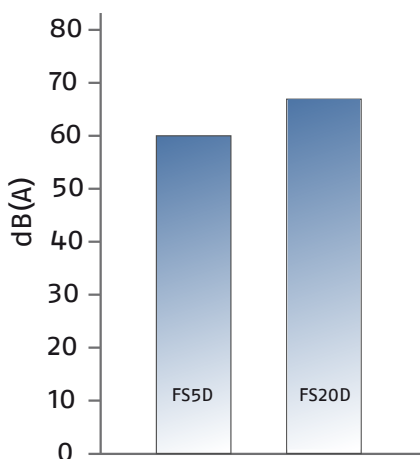
### NOx EMISSIONS



### CO EMISSIONS



### NOISE EMISSIONS



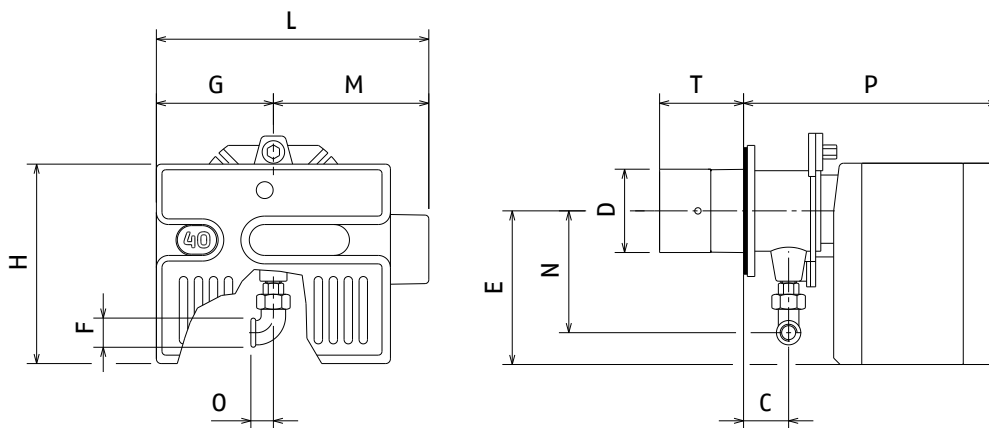
Special attention has been paid to noise reduction.  
All models are fitted with sound-proofing material inside the cover.



## Overall Dimensions (mm)

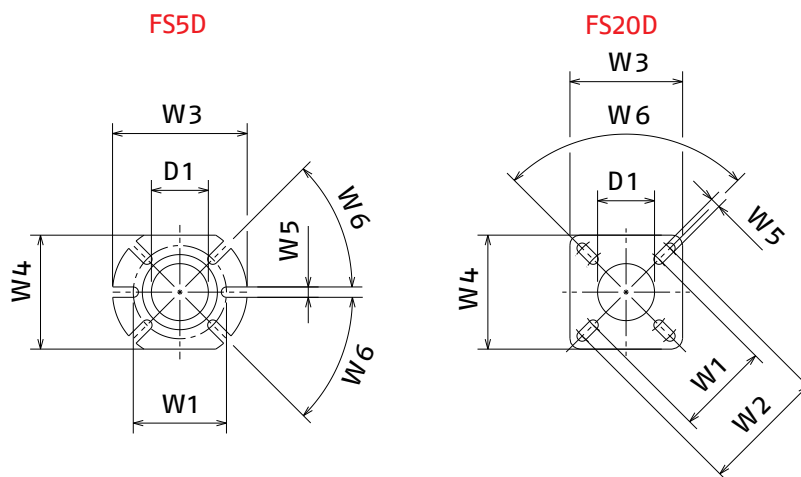
These models are distinguished by their reduced size, in relation to the outputs achieved, which means they can be fitted to any boiler on the market.

### BURNER



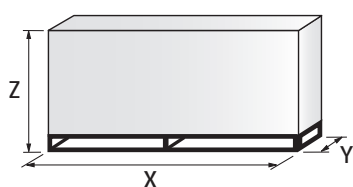
MODEL	C	D	E	G	H	L	M	N	O	P	T
FS5D	48	91	180	136	233	306	170	138	28	295	100
FS20D	67	125	230	136	298	413	238	152	33	389	120

### BURNER - BOILER MOUNTING FLANGE



MODEL	D1	W1	W2	W3	W4	W5	W6
FS5D	104	130	-	170	140	10	45°
FS20D	125	170	200	170	170	11	90°

### PACKAGING



MODEL	X	Y	Z	kg
FS5D	445	355	325	10
FS20D	535	535	375	20

## Installation Description

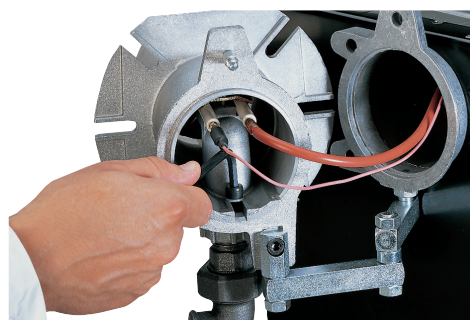
Installation, start up and maintenance must be carried out by qualified and skilled personnel.  
The burner is set in factory on standard calibration (minimum output), if necessary adjustments can be made on the basis of the maximum output of the boiler.  
All operations must be performed as described in the technical handbook supplied with the burner.

### BURNER SETTING

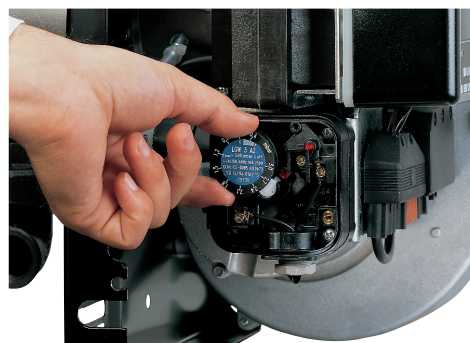
The air damper position is easy to set, and in the FS20D can be adjusted without removing the burner cover.



Head setting is easy and aided by a graduated scale, a test point allows reading the air pressure in the combustion head.

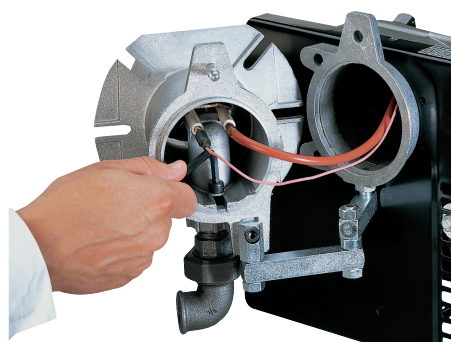


Riello 40 FSD burners are fitted with an air pressure switch which, in accordance with EN 676 standards, can be adjusted by the installer using a graduated selector, on the basis of the effective working conditions.



### MAINTENANCE

The maintenance position is easily carried out by hinge that joins the body of burner to the flange.



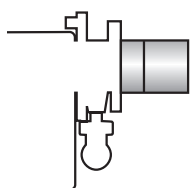
## Burner accessories

### REMOTE RESET CONTROL KIT FOR THE MG 557 CONTROL BOX

The MG 557 control box can be remotely released using an electric command kit. This kit must be installed in conformity with the local authority.

BURNER	CODE
FS5D	3002750

### EXTENDED HEAD KIT



“Standard head” burners can be transformed into “extended head” versions by using the special kit. Below the KITS available for the various burners are listed, showing the original and the extended lengths.

BURNER	STANDARD HEAD LENGTH (mm)	EXTENDED HEAD LENGTH (mm)	CODE
FS5D	100	125	3000820
FS20D	120	280	3000873

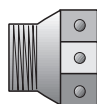
### LPG KIT



For burning LPG gas, a special kit is available to be fitted to the combustion head on the burner, as shown in the following table.

BURNER	STANDARD HEAD CODE	EXTENDED HEAD CODE
FS5D	3000882	3000882
FS20D	3000886	3000886

### TOWN GAS KIT

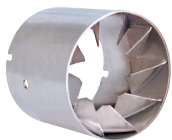


BURNER	KIT CODE
FS5D	3000889
FS20D	3000894

### 7-PIN PLUG KIT

If necessary a 7-pin plug kit is available (in packaging of n. 5 pieces).

BURNER	CODE
FS5D – FS20D	3000945

**END CONE WITH TURBULATOR DISK**

The end cone turbulator disk reduces the flame length. It is suitable for hoven application (CO emissions) and short boiler chamber.

BURNER	PROJECTION (mm)	CODE
FS5D	+15	3000916
FS20D	+23	3000919

**CONTINUOUS VENTILATION KIT FOR RMG CONTROL BOX**

If the burner requires continuous ventilation in the stages without flame, a special kit is available as given in the following table.

BURNER	CODE
FS20D	3010094

**PC INTERFACE KIT**

To connect the control box to a personal computer for the transmission of operation, fault signals and detailed service information, an interface adapter with PC software are available.

BURNER	KIT CODE
FS20D	3002719

**Gas train accessories****SEAL CONTROL KIT**

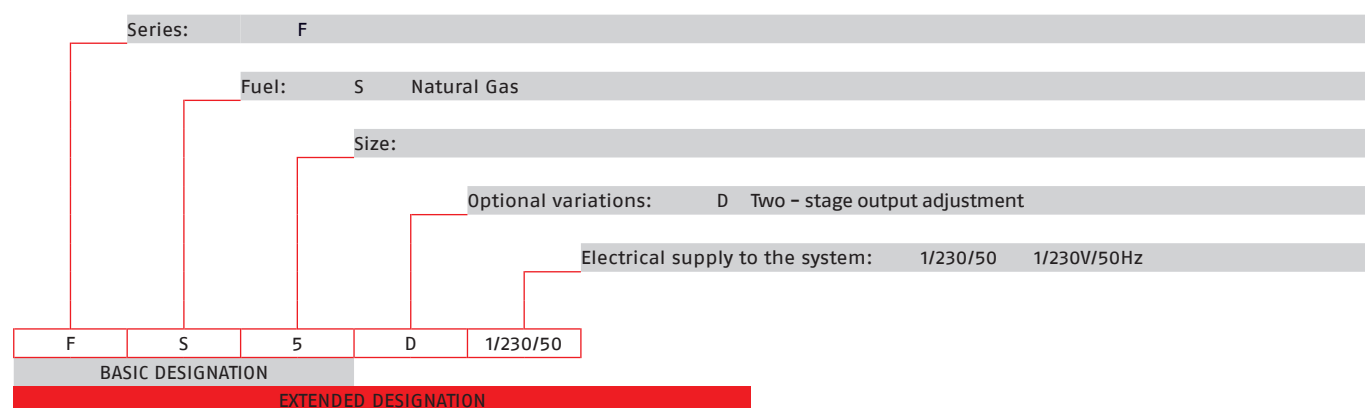
To test the valve seals on the gas train a special "seal control kit" is available.

GAS TRAIN	CODE for 50Hz operation	CODE for 60Hz operation
MB/1 type	3010123	20050030

# Specification

## DESIGNATION OF SERIES

A specific index guides your choice of burner from the various models available in the FS series. Below is a clear and detailed specification description of the product.



## AVAILABLE BURNER MODELS

BURNER MODELS	ELECTRICAL SUPPLY	HEAT OUTPUT		ABSORBED ELECTRICAL POWER (kW)	CERTIFICATION
		(kW)	NATURAL GAS (Nm <sup>3</sup> /h)		
FS5D	1/230/50	12/23 - 58	1.2/2.3 - 5.8	0.15	CE-0476CT2714
FS20D	1/230/50	58/81 - 220	5.8/8.1 - 22	0.25	CE-0476CT2714

## SPECIFICATION

### STATE OF SUPPLY

#### **Burner**

Monoblock, gas burners, completely automatic, with two stage settings fitted with:

- Fan with forward curve blades
- Metallic cover
- Air damper, open in stand by, driven by an electric servomotor
- Air damper with 1st and 2nd stage adjustment
- Single phase electric motor 230 V, 50 Hz
- Combustion head fitted with:
  - stainless steel head cone, resistant to high temperatures
  - ignition electrodes
  - ionisation probe
  - gas distributor
  - flame stability disk
- Adjustable air pressure switch, with graduated selector, to guarantee burner lock out in the case of insufficient combustible air
- Microprocessor-based burner safety control box (with diagnostic, remote reset, continuous purge integrated, recycle, post-purge)
- IP X0D (IP 40) electric protection level.

#### **Standard equipment:**

- Insulating gasket
- Screws and nuts for fixing the flange to the boiler
- Hinge
- Cable grommet
- Instruction handbook for installation, use and maintenance
- Spare parts catalogue.

#### **Conforming to:**

- 2014/30 EU Directive (electromagnetic compatibility)
- 2014/35 EU Directive (low voltage)
- 2016/426 EU Gas Appliances Regulation
- 2006/42 CE Directive (machine)
- EN 676 (gas burners)

#### **Available accessories to be ordered separately:**

- Remote reset control kit for control box
- Extended head kit
- LPG kit
- Town gas kit
- 7-pin plug kit
- End cone with turbulator disk
- Continuous ventilation kit for control box
- PC interface kit
- Seal control kit









# Riello Burners a world of experience in every burner we sell.

10/2018

T50028UK05



[ 1 ]



[ 2 ]

[ 1 ] BURNERS PRODUCTION PLANT  
S. PIETRO, LEGNAGO (VERONA) - ITALIA

[ 2 ] HEADQUARTER BURNERS DIVISION  
S. PIETRO, LEGNAGO (VERONA) - ITALIA

Across the world, Riello sets the standard in reliable and high efficiency burner technology.

With burner capacity from 5 kW to 48 MW, Riello gas, oil, dual fuel and Low Nox burners deliver unbeatable performance across the full range of residential and commercial heating applications, as well as in industrial processes.

With headquarter in Legnago, Italy, Riello has been manufacturing premium quality burners for over 90 year. The manufacturing plant is equipped with the most innovative systems of assembling lines and modern manufacturing cells for a quick and flexible response to the market.

Besides, the Riello Combustion Research Centre, located in Angiari, Italy, represents one of the most modern facility in Europe and one of the most advanced in the world for the development of the combustion technology.

Today, the company's presence on worldwide markets is distinguished by a well-constructed and efficient sales network, alongside many important Training Centres located in various countries to meet its customers' needs. Riello has 13 operational branches abroad (in Europe, America and Asia), with customers in over 60 countries.

RIELLO S.p.A. - 37045 Legnago (VR) - Italy  
tel. +39 0442 630111 - fax: +39 0442 21980  
[www.riello.com](http://www.riello.com)

Since the Company is constantly engaged in the production improvement, the aesthetic and dimensional features, the technical data, the equipment and the accessories can be changed. This document contains confidential and proprietary information of RIELLO S.p.A. Unless authorised, this information shall not be divulged, nor duplicated in whole or in part.

# RIELLO