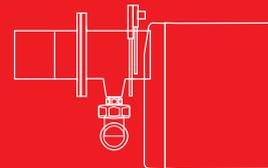
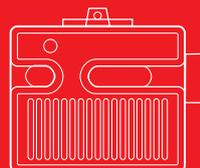




## Riello 40 FSD Series

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

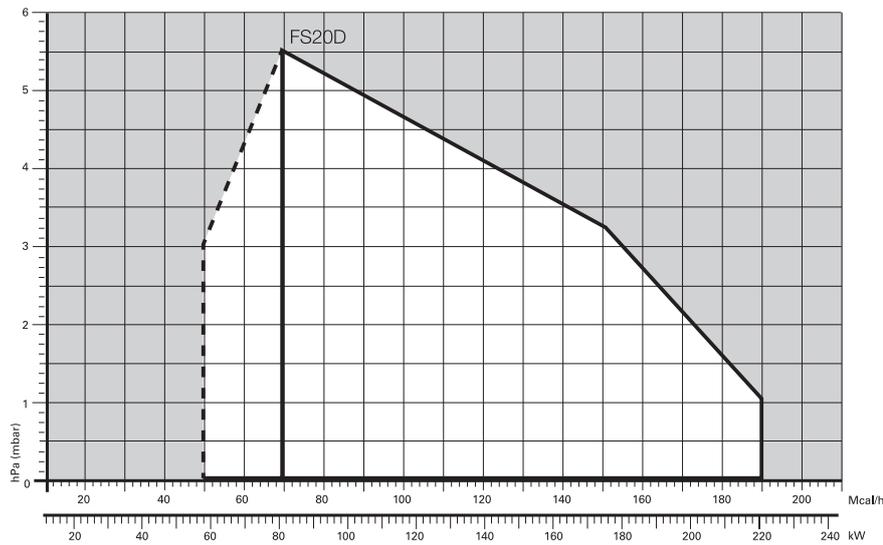
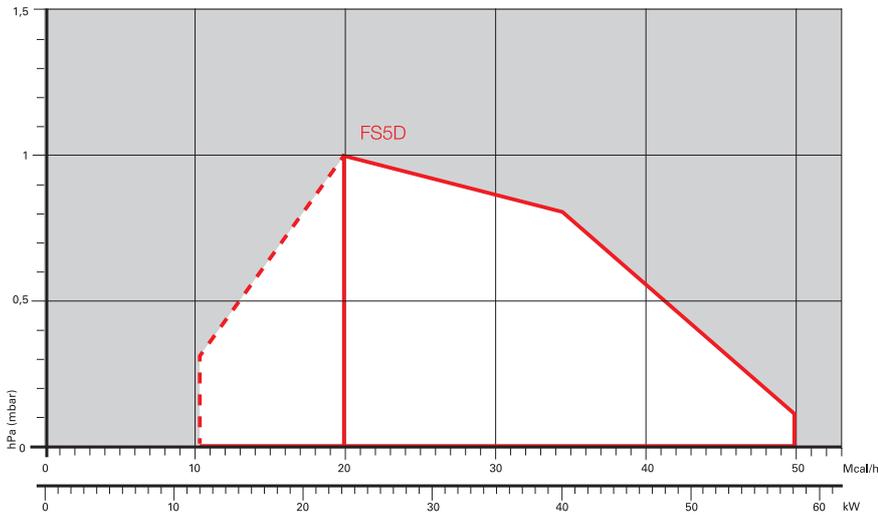
MODEL			FS5D	FS20D
Burner operation mode			Two stage	
Modulation ratio at max. output			===	
Servomotor		type	R.B.L	BERGER
		run time s	12/23 ÷ 58	58/81 ÷ 220
Heat output		kW	10/20 ÷ 50	50/70 ÷ 189
		Mcal/h	9.5 ÷ 30	20 ÷ 50
Working temperature		°C min./max.	0/40	
<b>FUEL/AIR DATA</b>				
G20 gas	net calorific value	kWh/Nm <sup>3</sup>	10	
	gas density	kg/Nm <sup>3</sup>	0.71	
	gas delivery	Nm <sup>3</sup> /h	1.2/2.3 ÷ 5.8	5.8/8.1 ÷ 22
G25 gas	net calorific value	kWh/Nm <sup>3</sup>	8.6	
	gas density	kg/Nm <sup>3</sup>	0.78	
	gas delivery	Nm <sup>3</sup> /h	1.4/2.7 ÷ 6.7	6.7/9.4 ÷ 25.6
LPG gas	net calorific value	kWh/Nm <sup>3</sup>	25.8	
	gas density	kg/Nm <sup>3</sup>	2.02	
	gas delivery	Nm <sup>3</sup> /h	0.4/0.8 ÷ 2.2	2.2/3.1 ÷ 8.5
Fan		type	Centrifugal with forward curve blades	
Air temperature		max °C	40	
<b>ELECTRICAL DATA</b>				
Electrical supply		Ph/Hz/V	1/50/230 (±10%)	
Auxiliary electrical supply		Ph/Hz/V	===	
Control box		type	MG 557/3	RMG 88.62C2
Total electrical power		kW	0.110	0.250
Auxiliary electrical power		kW	===	
Protection level		IP	X0D	
Fan motor	electrical power	kW	0.09	0.15
	rated current	A	0.65	1.4
	start up current	A	2.6	5.6
	protection level	IP	20	
Ignition transformer		type	Incorporated in the control box	Separated from the control box
		V1 - V2	(-) - 8 kV	230 V - 8kV
		I1 - I2	(-) - 12 mA	1.8 A - 30 mA
Operation			Intermittent (at least one stop every 24 h)	
<b>EMISSIONS</b>				
Noise levels	sound pressure	dB (A)	60	73
	sound power	W	===	
Gas G20	CO emission	mg/kWh	< 40	
	NOx emission	mg/kWh	≤ 120	
<b>APPROVAL</b>				
Directive			2006/42/EC - 2009/142/EC - 2014/30/UE - 2014/35/UE	
Conforming to			EN 676 - EN 12100	
Certification			CE-0694CN7805	

Reference conditions:

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

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	
Size:	405    407    410
	65
Operation:	/1 stage mode opening /2 two stage mode opening
Leak detection control:	- 0
Joint type:	R threaded joint F1 square flange BS1 F2 square flange BS2 F3 square flange BS3 - BS4
Electrical connection:	SD Domestic plug T Terminals - Terminal strip
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
Valve control:	0 shared

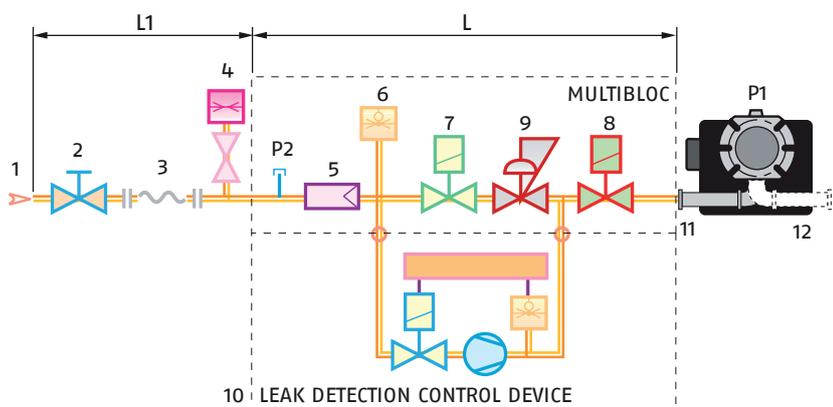
  

MB	407	/2	-	R	SD	2	0
BASIC DESIGNATION				EXTENDED DESIGNATION			

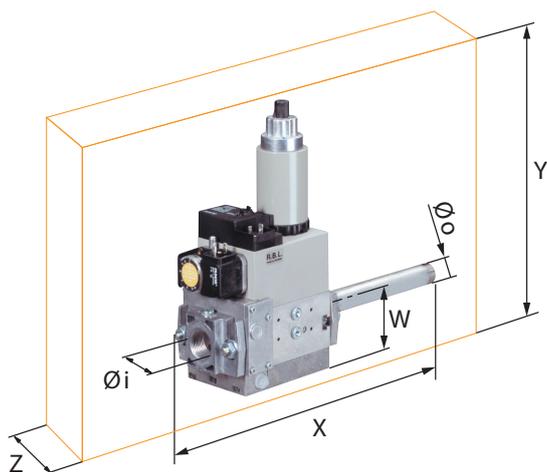
**GAS TRAINS**

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**



1	Gas input pipework
2	Manual valve (charged to the installer)
3	Antivibrating joint
4	Gas pressure gauge
5	Gas filter
6	Min. gas pressure switch
7	Safety gas valve
8	Adjustment solenoid: 1st and 2nd stage: firing delivery adjustment (rapid opening) maximum delivery adjustment (slow opening)
9	Pressure regulator
10	Leak detection control device for valves 7 and 8 (accessory)
11	Gas train-burner adapter
12	Burner
13	Shutter with adjustment screws
14	Pressure regulator setting device
15	Regulation solenoid
P1	Combustion head pressure
P2	Upstream pressure from the filter
P3	Upstream pressure from the control valve
L	Gas train supplied separately
L1	Installer's responsibility



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.

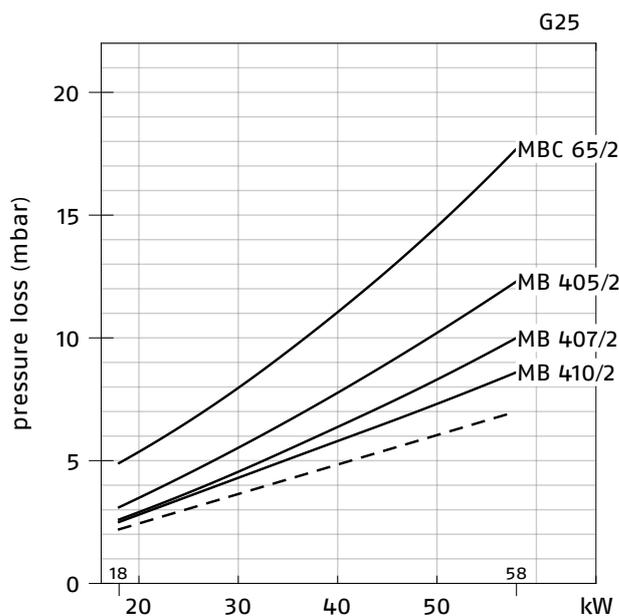
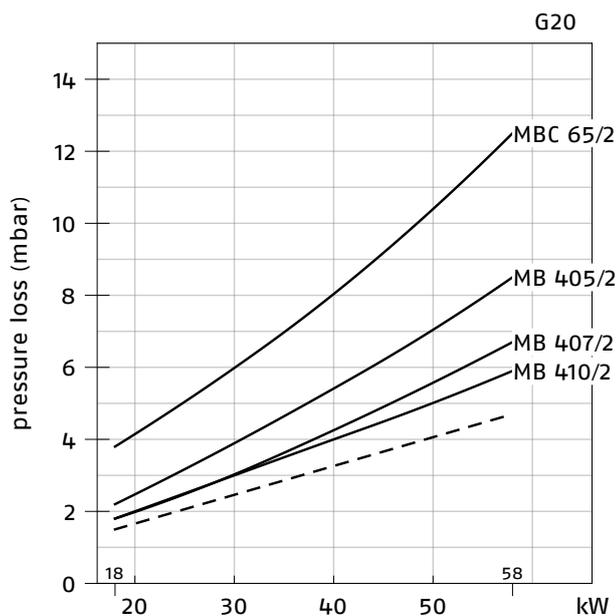
GAS TRAIN							
MODEL	CODE	Ø in	Ø out	X mm	Y mm	W mm	Z mm
MB 405/2	3970084	Rp 1/2"	Rp 1/2"(*)	321	257	46	120
MB 407/2	3970537	Rp 3/4"	Rp 3/4"	371	257	46	120
MB 410/2	3970534	1"	Rp 3/4"	405	315	55	145

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

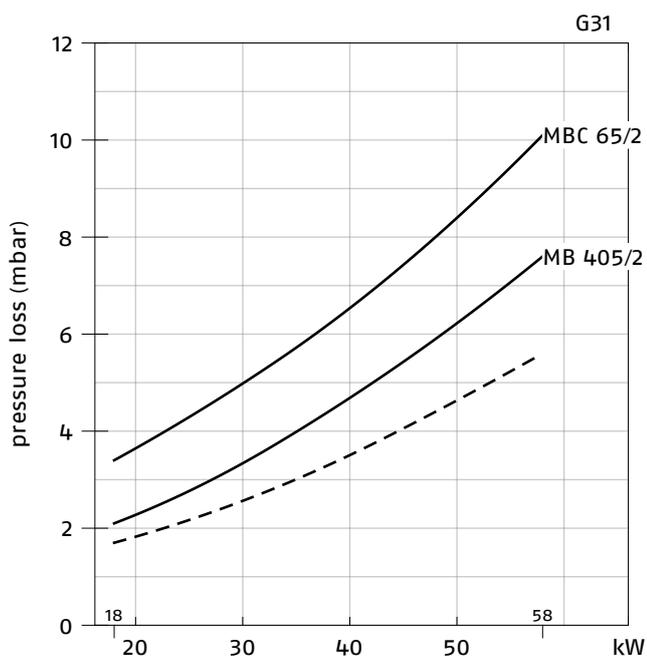
## Pressure Drop Diagram

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)



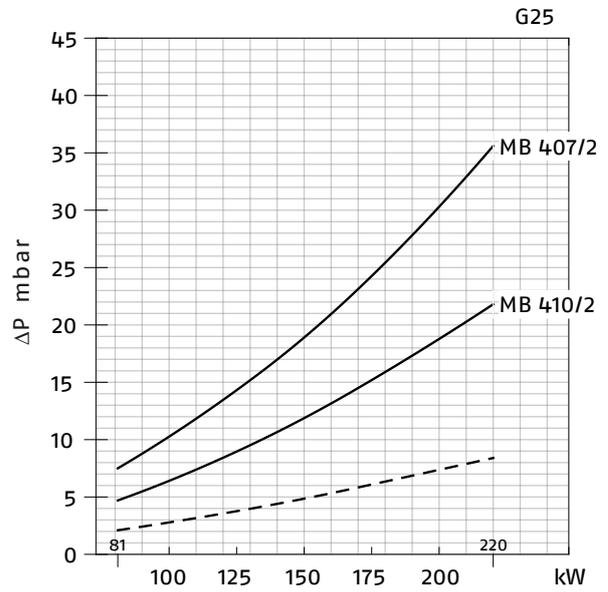
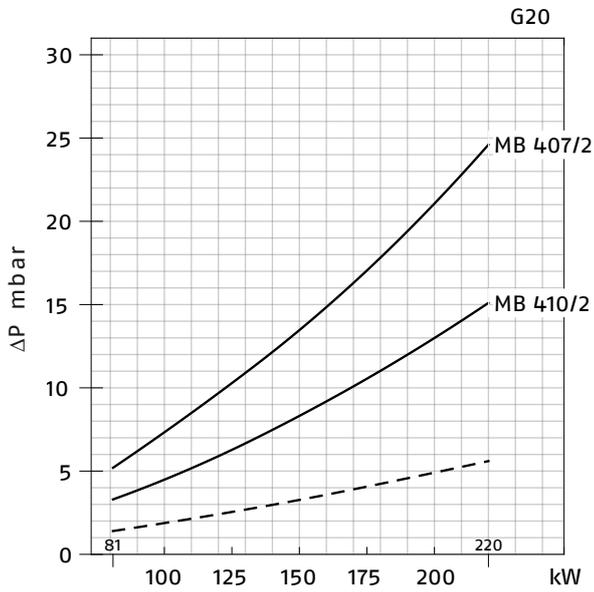
### FS5D (LPG)



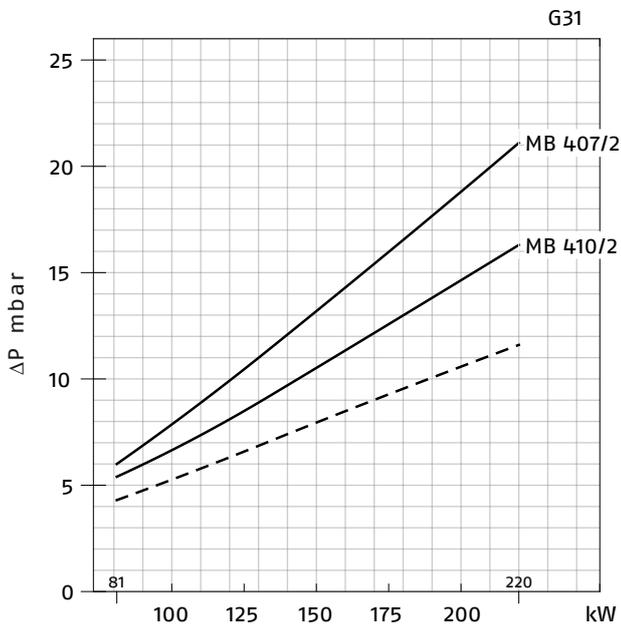
For pressure levels different from those indicated above, please contact Riello Burners Technical Office.  
 In LPG plants, Multibloc gas trains do not operate below 0°C.  
 They are only suitable for gaseous LPG (liquid hydrocarbons destroy the seal materials).

- Combustion head + gas train
- - - Combustion head

**FS20D (NATURAL GAS)**



**FS20D (LPG)**



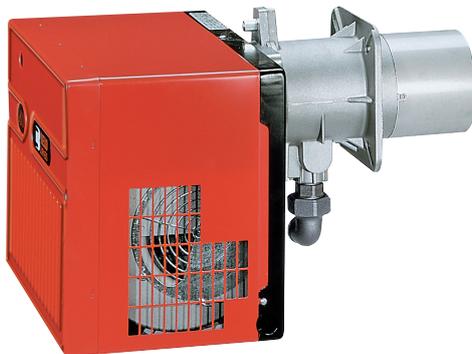
For pressure levels different from those indicated above, please contact Riello Burners Technical Office.  
 In LPG plants, Multibloc gas trains do not operate below 0°C.  
 They are only suitable for gaseous LPG (liquid hydrocarbons destroy the seal materials).

- 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.



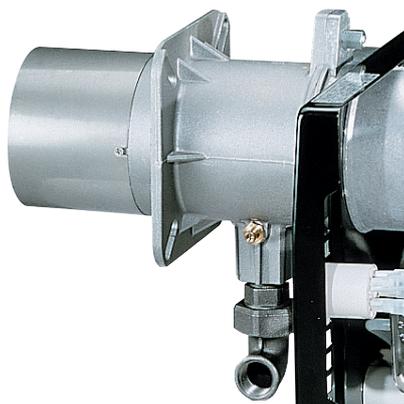
Air suction

## 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.



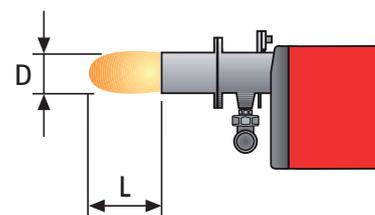
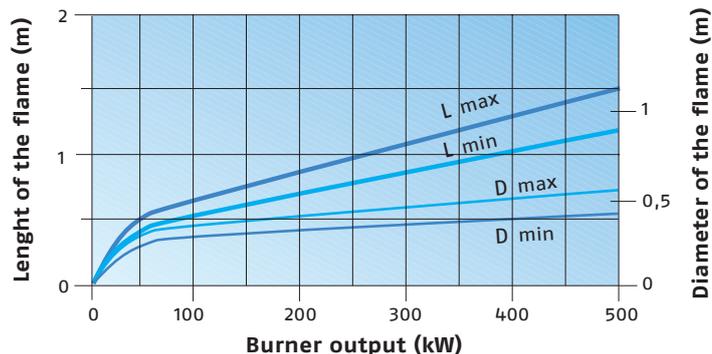
Combustion head



Mobile flange

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

## DIMENSIONS OF THE FLAME



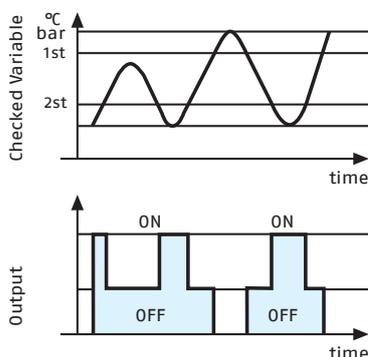
Example:  
 Burner thermal output = 350 kW;  
 L flame (m) = 1.2 m (medium value);  
 D flame (m) = 0.6 m (medium value)

## 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 MG 557 microprocessor control panel. For helping the commissioning and maintenance work, there are two main elements:

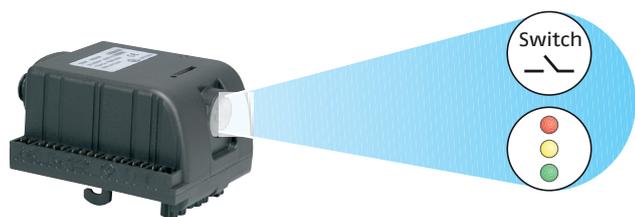


The lock-out reset button is the central **operating element** for resetting the burner control and for activating / deactivating the diagnostic functions.



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**

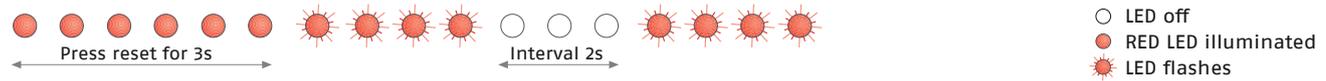
<b>Operation status</b>	<b>Color code</b>
Stand-by	○ Led off
Pre-purging	● Green
Ignition phase	● Green
Flame OK	● Green
Post purge	● Green
Undervoltage, built-in fuse	○ Led off
Fault, alarm	● Red
Flame simulation	○ Led off

**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.

Example of blinks sequence:



**Error code table**

Signal	Possible cause
2 flashes 	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)
3 flashes 	Min. air pressure switch does not close or is already closed before the limit thermostat closed: - air pressure switch faulty - air pressure switch incorrectly regulated
4 flashes 	Presence of flame: - in stand-by position after heat demand - during pre-purging
6 flashes 	Loss air pressure: - during pre-purging - during safety time or operations
7 flashes 	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

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.



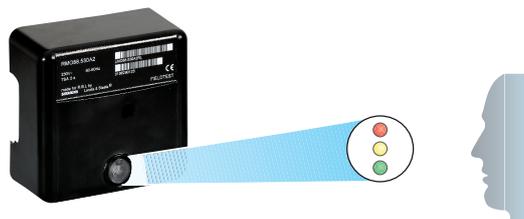
The multi-color LED is the central indication element for visual diagnosis and interface diagnosis.

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

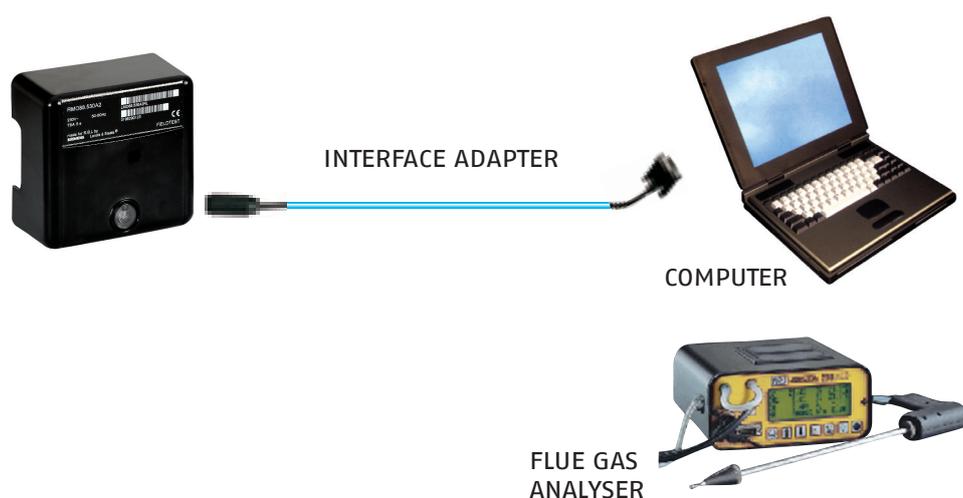


There are two diagnostic choices, for indication of operation and diagnosis of fault cause:

**- visual diagnosis:**



**- interface diagnosis:**



By the interface adapter and a PC with dedicated software or by a predisposed flue gas analyzer (see paragraph accessories).

**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**

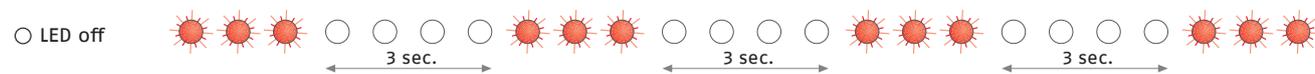
Operation status	Color code
Stand-by	○ ○ ○ ○ ○ ○ ○ ○
Pre-purging	☀ ☀ ☀ ☀ ☀ ☀ ☀ ☀
Ignition phase	☀ ○ ☀ ○ ☀ ○ ☀ ○
Flame OK	● ● ● ● ● ● ● ●
Poor flame	● ○ ● ○ ● ○ ● ○
Undervoltage, built-in fuse	☀ ● ☀ ● ☀ ● ☀ ●
Fault, alarm	● ● ● ● ● ● ● ●
Extraneous light	● ● ● ● ● ● ● ●

○ LED off

**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)*

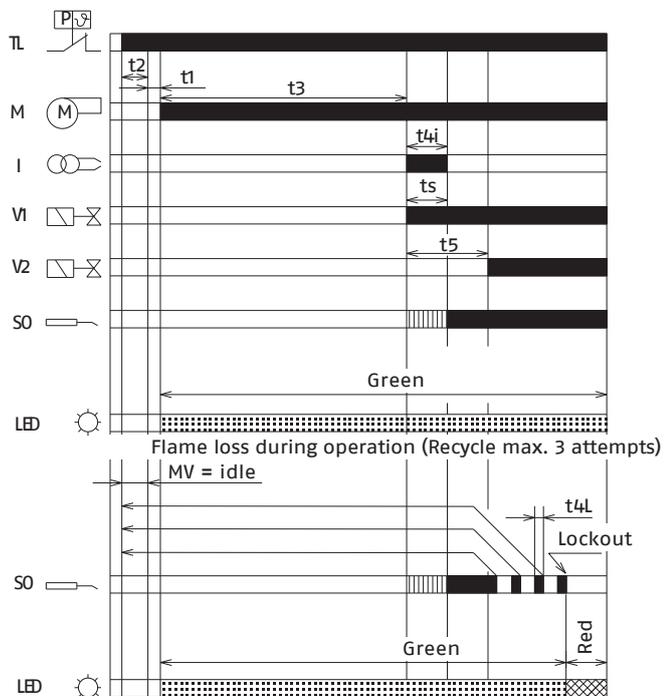


**Error code table**

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 monitor
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**

**Regular operation FS5D**

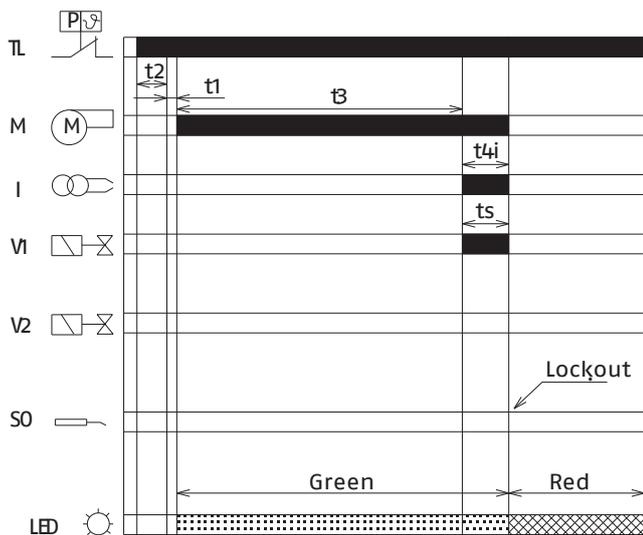


**KEY**

I	Ignition transformer
LED	Reset button LED indicating operating status
M	Fan motor
S0	Ionisation probe
TL	Limit thermostat
V1	1st stage gas valve
V2	2nd stage gas valve

- Red (LED signalling)
- Green (LED signalling)
- No signal needs to be received

**Lockout due to ignition failure FS5D**



- Red (LED signalling)
- Green (LED signalling)

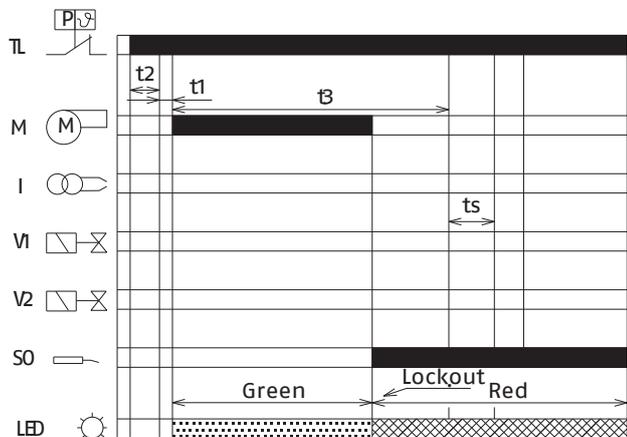
**KEY**

I	Ignition transformer
LED	Reset button LED indicating operating status
M	Fan motor
S0	Ionisation probe
TL	Limit thermostat
V1	1st stage gas valve
V2	2nd stage gas valve

**Operating times (in seconds)**

t1, t3l, t4l, t4a	t2l	t2, t4i	t2a	t3	t3a	t3r	ts	t5	t6
max	max	-	-	-	max	max	-	min/max	max
1	30	3	120	40	15	70	3	5/25	360

Lockout due to a flame or flame simulation FS5D detected during pre-purging



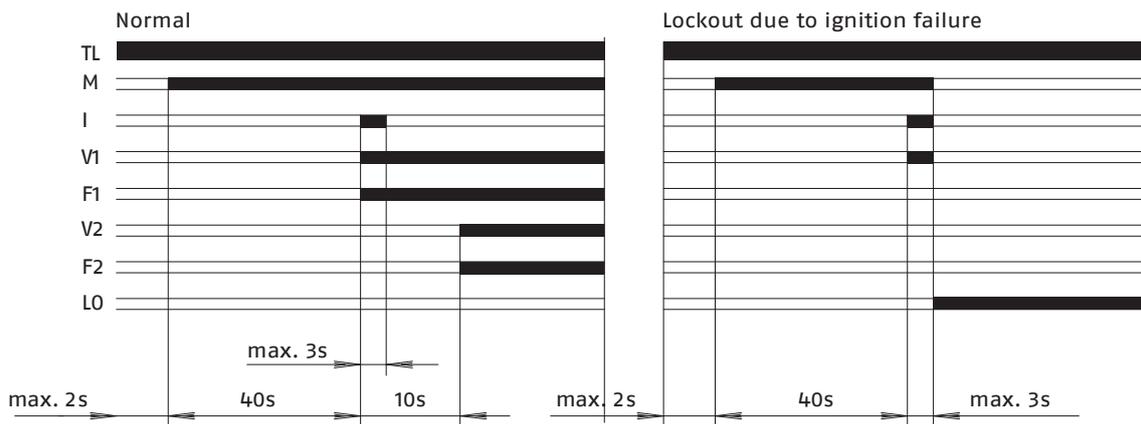
Red (LED signalling)  
Green (LED signalling)

KEY

I	Ignition transformer
LED	Reset button LED indicating operating status
M	Fan motor
S0	Ionisation probe
TL	Limit thermostat
V1	1st stage gas valve
V2	2nd stage gas valve

t1, t3l, t4l, t4a	t2l	t2, t4i	t2a	t3	t3a	t3r	ts	t5	t6
max	max	-	-	-	max	max	-	min/max	max
1	30	3	120	40	15	70	3	5/25	360

Lockout due to ignition failure FS20D



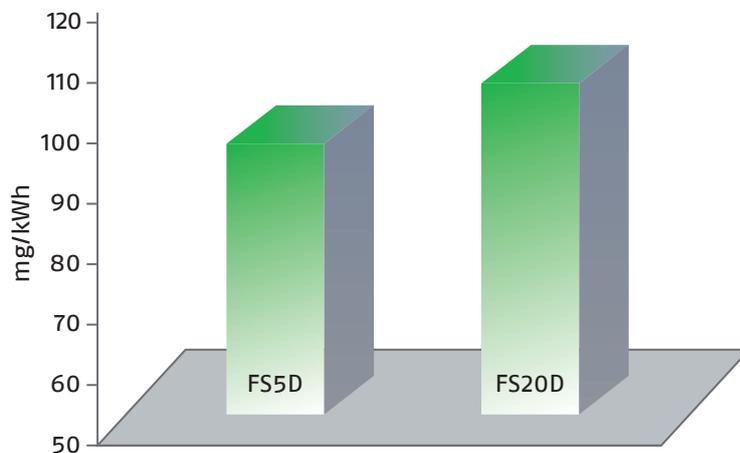
KEY

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

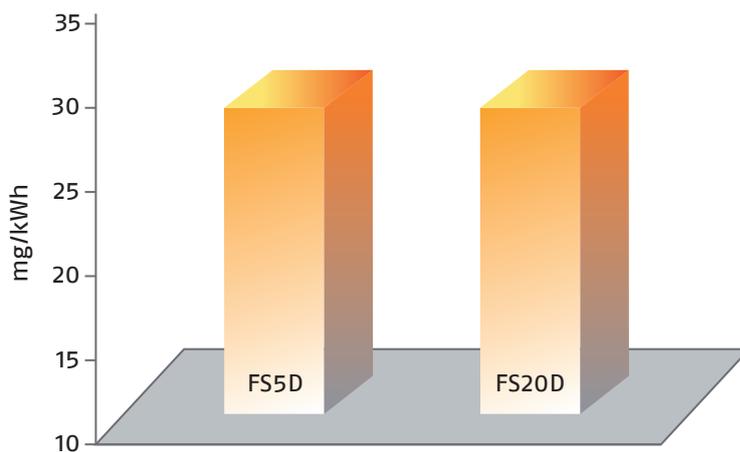
## Emissions

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

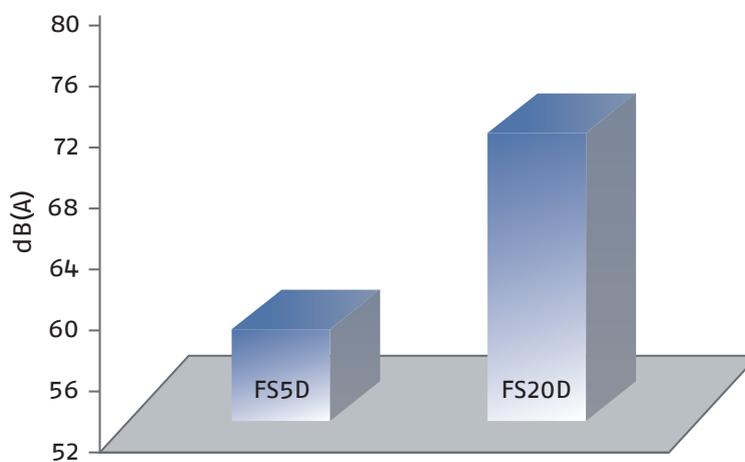
**NOx EMISSIONS**



**CO EMISSIONS**



**NOISE EMISSIONS**



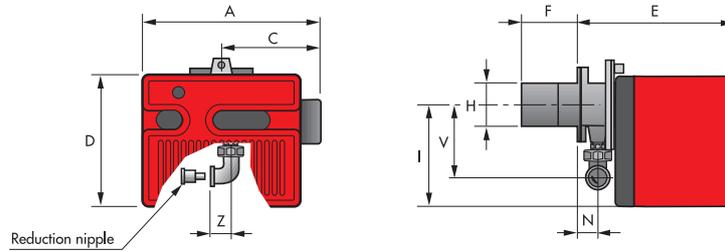
Special attention has been paid to noise reduction.  
All models are fitted with sound-proofing material inside the cover.



# Overall Dimensions (mm)

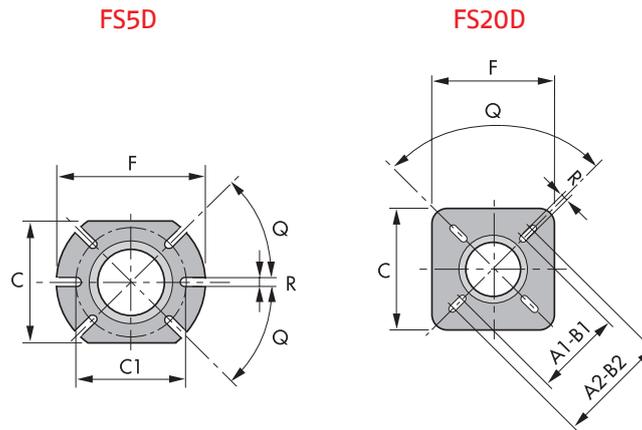
These models are distinguished by their reduced size, in relation to the outputs achieved, which means they can be fitted to any boiler on the market.

## BURNER



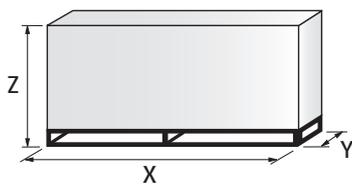
MODEL	A	C	D	E	F	H	I	N	V	Z
FS5D	306	170	233	295	100	91	180	48	138	28
FS20D	413	238	298	389	120	125	230	67	152	33

## BURNER - BOILER MOUNTING FLANGE



MODEL	A1	A2	B1	B2	C	C1	F	Q	R
FS5D	-	-	-	-	140	130	170	45°	10
FS20D	155	200	155	200	170	-	170	90°	11

## PACKAGING



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

## Installation Description

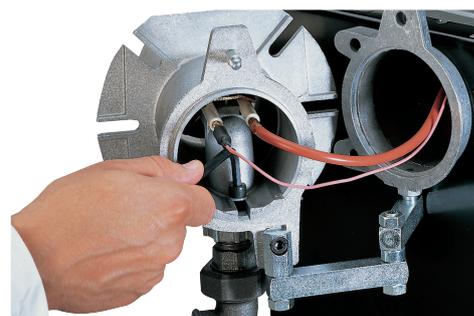
Installation, start up and maintenance must be carried out by qualified and skilled personnel. The burner is set in factory on standard calibration (minimum output), if necessary adjustments can be made on the basis of the maximum output of the boiler. All operations must be performed as described in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

### BURNER SETTING

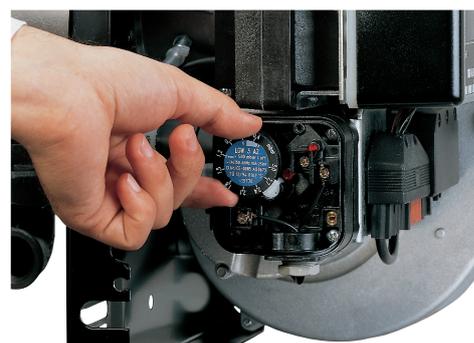
The air damper position is easy to set, and in the FS20D can be adjusted without removing the burner cover.



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

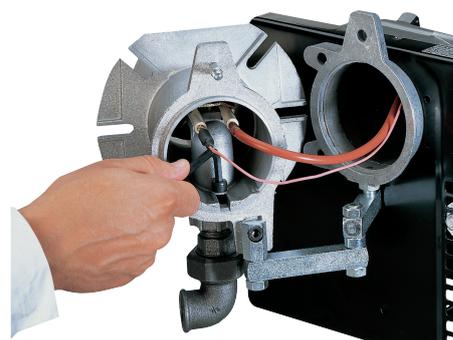


Riello 40 FSD burners are fitted with an air pressure switch which, in accordance with EN 676 standards, can be adjusted by the installer using a graduated selector, on the basis of the effective working conditions.



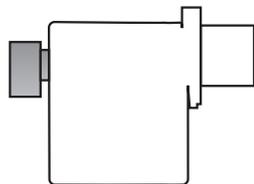
### MAINTENANCE

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



## Burner accessories

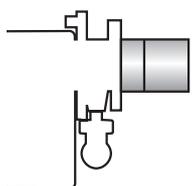
### REMOTE RESET CONTROL KIT FOR THE MG 557/3 CONTROL BOX



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

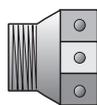
### LPG KIT



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
FS5D	3002731
FS20D	3002719

**Gas train accessories**

**SEAL CONTROL KIT**



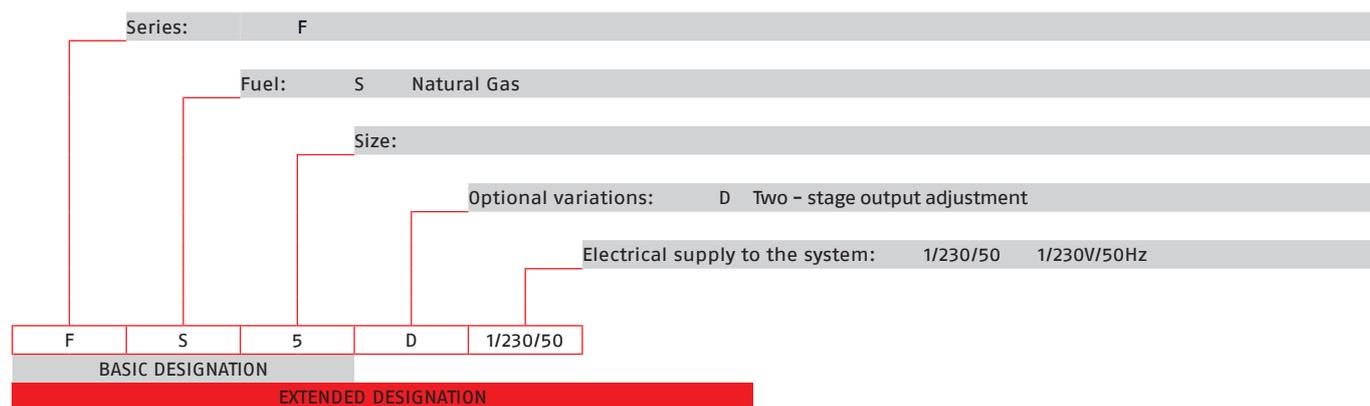
To test the valve seals on the gas train a special "seal control kit" is available.

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 BS series. Below is a clear and detailed specification description of the product.



## AVAILABLE BURNER MODELS

BURNER MODELS	ELECTRICAL SUPPLY	HEAT OUTPUT		TOTAL ELECTRICAL POWER (kW)	CERTIFICATION	NOTE
		(kW)	NATURAL GAS (Nm <sup>3</sup> /h)			
FS5D	1/230/50	12/23 - 58	1.2/2.3 - 5.8	0.110	CE-0694 CN7805	(1)
FS20D	1/230/50	58/81 - 220	5.8/8.1 - 22	0.250	CE-0694 CN7805	(1)

Net calorific value G20: 10 kWh/Nm<sup>3</sup> - Density: 0.71 kg/Nm<sup>3</sup>

The burners of FSD series are in according to EN 676

(1) With terminal block.

## 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 MG 557 (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 UE Directive (electromagnetic compatibility)
- 2014/35 UE Directive (low voltage)
- 2009/142 EC Directive (gas)
- 2006/42 EC Directive (machine)
- EN 676 (gas burners)

#### Available accessories to be ordered separately:

- Remote reset control kit for MG 557/3 control box
- Extended head kit
- LPG kit
- Town gas kit
- 7-pin plug kit
- End cone with turbulator disk
- Continuous ventilation kit for RMG control box
- PC interface kit
- Seal control kit

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

06/2016  
T50028UK04



[ 1 ]

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.



[ 2 ]

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

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

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