RIELLO BURNERS

CE

ONE STAGE LIGHT OIL AND KEROSENE BURNERS

RDB SERIES

RDB1-1R	16,8 ÷ 40,6 kW
RDB2-2R	24 ÷ 46,2 kW
RDB2.1-2.1R	21 ÷ 54 kW
RDB2.2-2.2R	21 ÷ 54 kW
RDB3	35,6 ÷ 69 kW
RDB3.2	41,5 ÷ 119 kW
RDB4	53,5 ÷ 113 kW

The Riello RDB series of one stage light oil and kerosene burners is available in 8 basic models, with an output ranging from 16,8 to 120 kW, in three different structures. The models are available in light oil and kerosene versions, conventional flue and balanced flue, with or without the fuel pre-heater fitted.
A new model has been specifically designed to meet the increasing trends towards high pressure working field demand.
These models are distinguished by their compact size.
All the models use the same components designed by Riello for the RDB series. The high quality level guarantees safe working.
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 267 European Standard and conform to European Directives for EMC, Low Voltage, Machinery and Boiler Efficiency.
All the RDB burners are fired before leaving the factory.

TECHNICAL DATA

	Model			RDB1	RDB1R	RDB2	RDB2R	RDB2.1	RDB2.1R	RDB2.2	RDB2.2R	RDB3	RDB3.2	RDB4
	Burner operation mode			One stage										
	Modulation ratio at max. output			--										
	Servomotor		type	--										
		run time	s	--										
	Heat output		kW	16,8 - 26,3	21,6 - 40,6	24 - 38,3	33 - 46,2	21 - 41,5	33 - 54	21 - 41,5	33 - 54	35,6 - 69	41,5 - 119	53,5 - 113
			Mcal/h	14,4 - 22,6	18,6 - 34,9	20,6 - 32,9	28,5 - 39,7	18 - 36,1	28,4 - 45,9	18,1 - 35,7	28,9 - 44	30,6 - 59	35,26 - 103,2	48 - 97,2
			kg/h	1,4 - 2,2	1,8 - 3,4	2 - 3,2	2,8 - 3,9	1,8 - 3,5	2,8 - 4,5	1,8 - 3,5	2,8 - 4,3	3 - 5,8	3,5 - 10	4,5 - 9,5
	Working temperature		°C min./max.	0/40										
Fuel / air data	Net calorific value		kWh/kg	11,9										
			kcal/kg	10.200										
	Viscosity		mm^2/s (cSt)	4 ÷ 6 (at 20°C) for light oil models / 1,5 ÷ 6 (at 20°C) for kerosene models										
	Pump		type	R.B.L.										
		delivery	kg/h	30 (at 12 bar)										
	Atomised pressure		bar	8 ÷ 15										
	Fuel temperature		max. °C	50										
	Fuel pre-heater			NO	YES	NO	YES	NO	YES	NO	YES	NO	NO	NO
	Fan		type	centrifugal with forward curve blades										
	Air temperature		max. °C	40										
	Electrical supply		Ph/Hz/V	1/50/230 ±10%										
	Auxiliary electrical supply		Ph/Hz/V	--										
	Control box		type	R.B.L.535 SE/LD (*)	R.B.L.535R SE/LD (*)	R.B.L.535 SE/LD (*)	R.B.L.535R SE/LD (*)	R.B.L.535 SE/LD (*)	R.B.L.535R SE/LD (*)	R.B.L.535 SE/LD (*)	R.B.L.535R SE/LD (*)	R.B.L.535 SE/LD (*)	R.B.L.535 SE/LD (*)	R.B.L.535R SE/LD (*)
	Total electrical power		kW	0,115	0,175	0,125	0,175	0,124	0,174	0,124	0,174	0,16	0,16	0,16
	Auxiliary electrical power		kW	--										
	Heaters electrical power		kW	--	0,055/0,025	--	0,055	--	0,055	--	0,055	--	--	--
	Protection level		IP	40										
	Pump motor electrical power		kW	--										
	Rated pump motor current		A	--										
	Pump motor start up current		A	--										
	Pump motor protection level		IP	--										
Electrical data	Fan motor electrical power		kW	0,09								0,15		
	Rated fan motor current		A	0,75								1,3		
	Fan motor start up current		A	3								4,3		
	Fan motor protection level		IP	20										
	Ignition transformer		type	Incorporated in the control box										
			V1 - V2	(--) - 8 kV										
			I1 - I2	(--) - 16 mA										
	Operation			Intermittent (at least one stop every 24 h)										
	Sound pressure		dB (A)	60	60	61,5	61,5	62	62	62	62	63	63	66
Emissions	Sound power		W	--										
	CO emission		mg/kWh	< 30										
	Grade of smoke indicator		N° Bacharach	< 1										
	C_xH_y emission		mg/kWh	< 10 (after the first 20s)										
	NOx emission		mg/kWh	< 200									< 185	< 200
Approval	Directive			89/336/EEC, 73/23/EEC, 98/37/EEC, 92/42/EEC										
	Conforming to			EN 267										
	Certification			CE-0036 0316/01	CE-0036 0326/01	CE-0036 0316/01	CE-0036 0316/01	CE-0036 0316/01	CE-0036 0316/01	CE-0036 0316/01	CE-0036 0316/01	CE-0036 0275/99	CE-0036 0332/02	CE-0036 0274/99

(*) - available also with MO 535

Reference conditions:
Temperature: 20 °C
Pressure: 1013 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.
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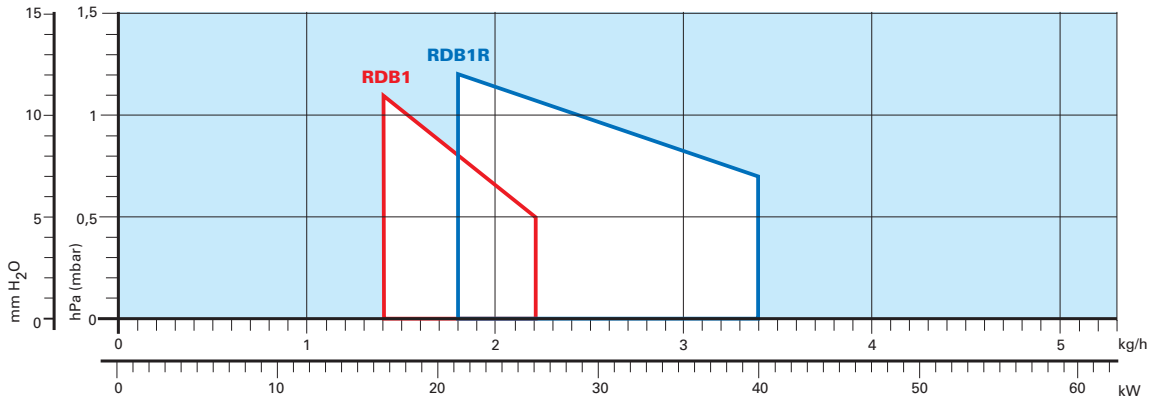
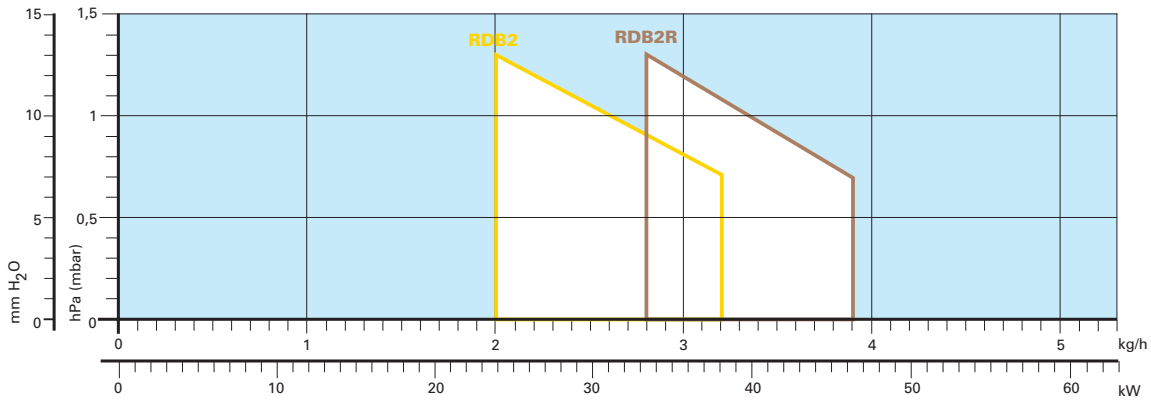
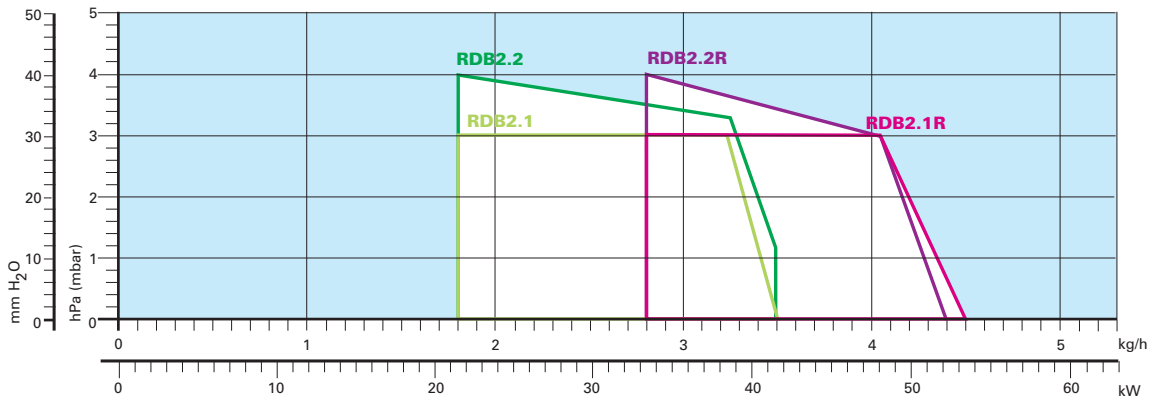
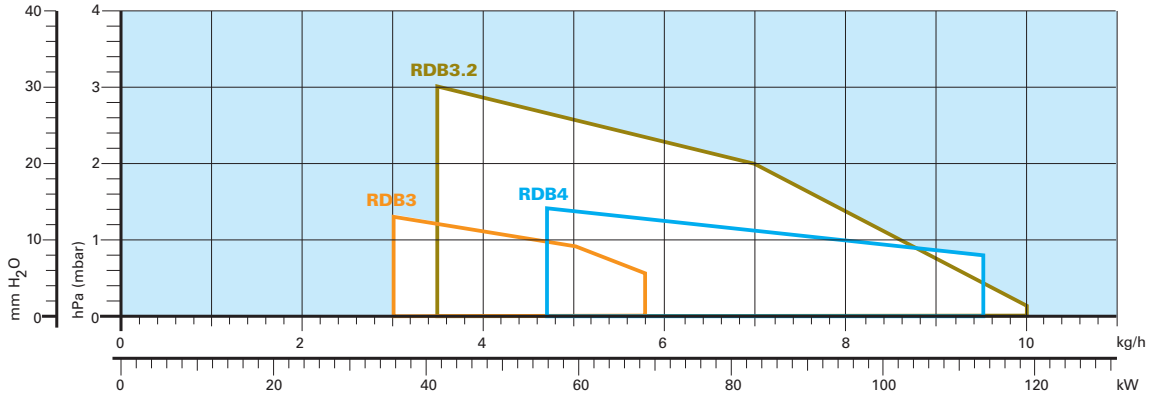
FIRING RATES

For every model (e.g. RDB1) are available many combustion heads which allow to optimize the working field.









Useful working field for choosing the burner

Firing rate in progress

Test conditions conforming to EN 267:
Temperature: 20°C
Pressure: 1013 mbar
Altitude: 0 m a.s.l.

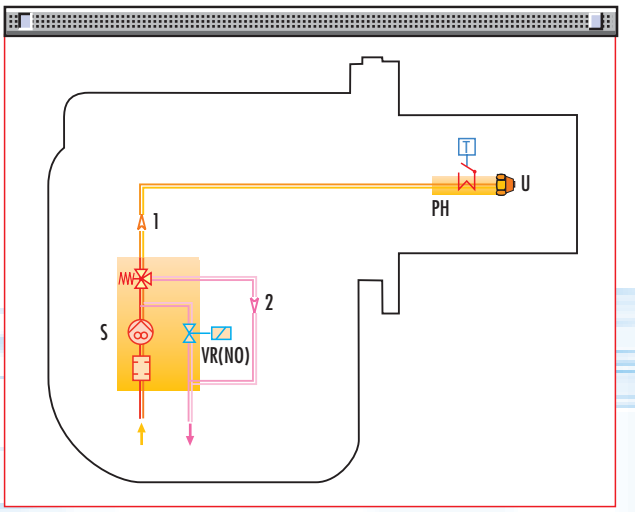
FUEL SUPPLY

HYDRAULIC CIRCUIT

All the models have a Riello geared pump with safety valve on the return circuit, and some are fitted with a fuel pre-heater.
The kerosene models have a special kerosene pump, which guarantees reliable operations with this type of fuel.

Fuel pump

RDB - RDB R



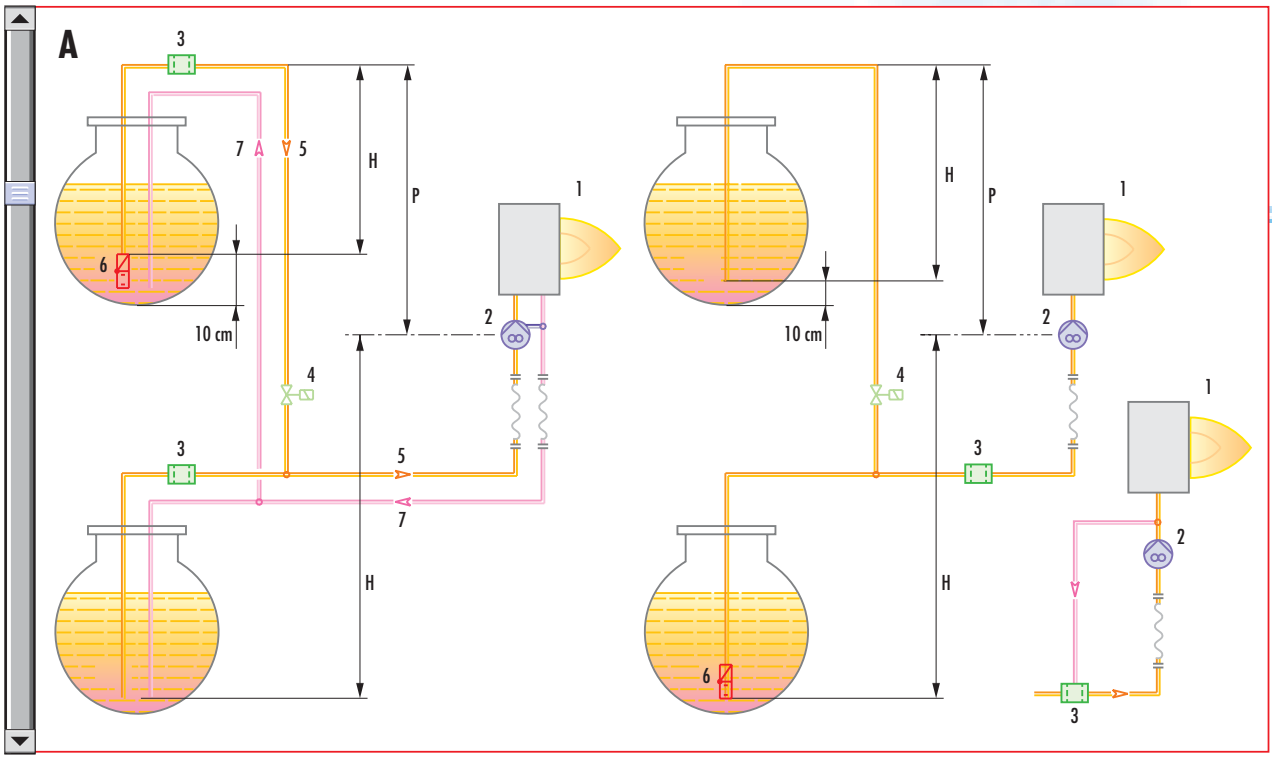
S	Pump with filter and pressure regulator on the delivery pipe
VR(NO)	Oil return valve normally open
1	Oil input pipe to the nozzle
2	Oil return pipe from the regulator
PH	Oil pre-heater with thermostat (where provided)
U	Nozzle

SELECTING THE FUEL SUPPLY LINES

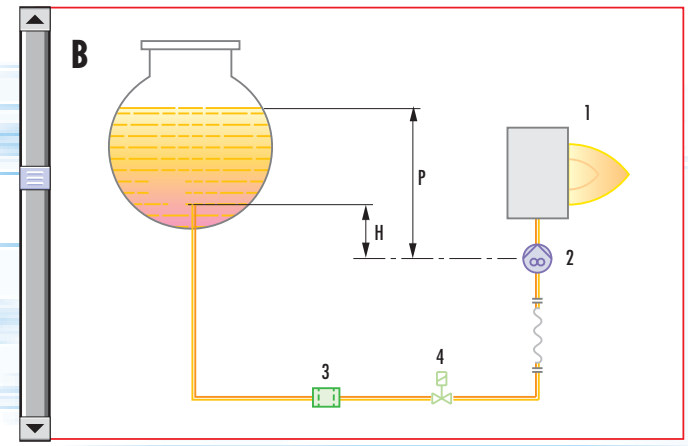
The fuel feed must be completed with the safety devices required by the local regulations in force.

The table shows the choice of piping diameter for the various burners, depending on the difference in the height between the burner and the tank and the distance between them.

MAXIMUM EQUIVALENT LENGTH OF THE PIPEWORK L[m]				
	Type A system		Type B system	
Pipe size	Ø8mm	Ø10mm	Ø8mm	Ø10mm
H (m)	Lmax (m)	Lmax (m)	Lmax (m)	Lmax (m)
0	35	100	-	-
0,5	30	100	10	20
1,0	25	100	20	40
1,5	20	90	40	80
2,0	15	70	60	100
3,0	8	30	-	-
3,5	6	20	-	-



Type of system that can be installed



H	Difference in height
Ø	Internal pipe diameter
P	Difference in height ≤ 4 m
1	Burner
2	Pump
3	Filter
4	Shut-off solenoid valve
5	Suction pipework
6	Bottom valve
7	Return pipework

VENTILATION

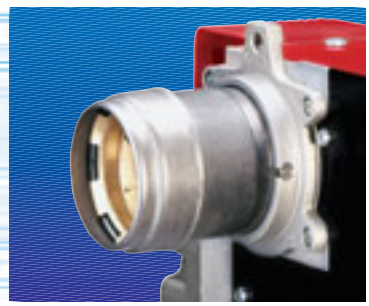
The RDB series has been designed and developed paying special attention to reducing noise levels, while guaranteeing high performance of pressure and air delivery, inspite of their compact size.

Special attention has also been paid to the air-tightness of the air circuit (this is also checked during the functional tests to the burners on the production line); the air-tightness is guaranteed by special technical solutions and seals, and is always conserved after any servicing operations. All the conventional flue models can be easily converted to balanced flue, and vice versa, by using a special kit.

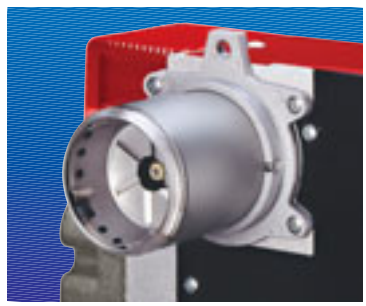
Air suction

COMBUSTION HEAD

Several types of combustion heads are available, to optimise all the various burner-boiler matchings.
A simple adjustment to the combustion head (where fitted) allows adapting secondary air to the burner output.

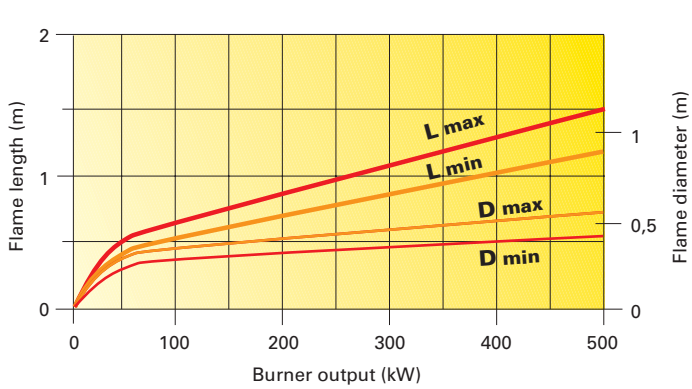


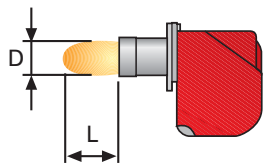
Adjustable combustion head



Fixed combustion head

Dimensions of the flame





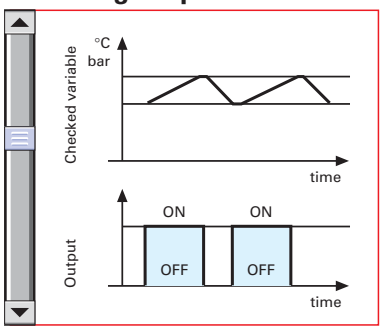
Example:
Burner thermal output = 350 kW;
L_{flame} (m) = 1,2 m (medium value);
D_{flame} (m) = 0,6 m (medium value)

ADJUSTMENT

BURNER OPERATION MODE

All these models are one stage operation; the special profile on the air-damper and its micrometric adjustment, ensure precise working even at the lowest output levels of the burner.

"One stage" operation



Air damper

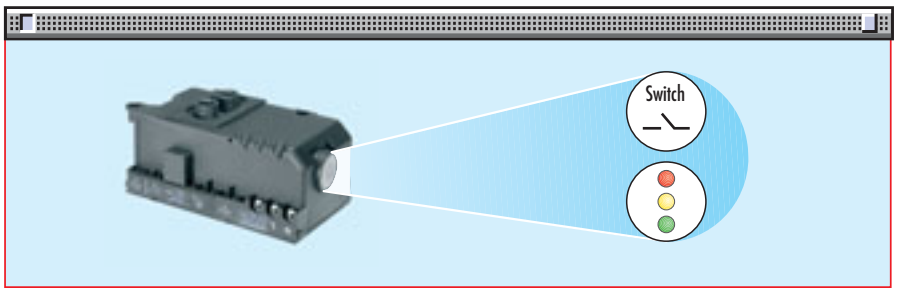
Air damper adjustment

The RDB burners can be fitted either with **analogic control box RBL 535 SE/LD** or with the new **microprocessor control panel, MO535**, which allows the the supervision during intermittent operation.
With reference to the MO 535 digital control panel, there are two main elements for helping the commissioning and maintenance work:

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

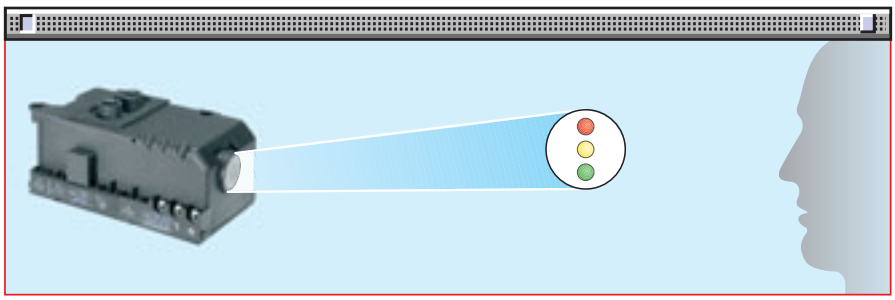
The multi-color LED is the central indication element for visual diagnosis and interface diagnosis.

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

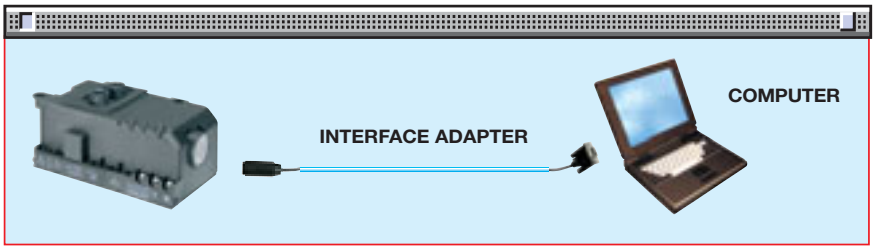


There are two diagnostic choices, for indication of operation and diagnosis of fault cause:

- **visual diagnosis**:



- **interface diagnosis**:



by the interface adapter and a PC with dedicated software.

Indication of operation:

Color code table			
Operation status	**Color code**		**Flashing type**
Off	○	Off	
Pre-heating	● ○ ● ○ ● ○	..... Green flashing	slow
Pre-purging	● ○ ● ○ ● ○	.....Orange flashing	medium
Safety time	● ○ ● ○ ● ○	..... Green flashing	medium
Running	● ● ● ● ● ●	Green-Steady on	
Shutdown test	● ○ ● ○ ● ○	.....Orange flashing	fast flashing
Pump priming cycle	● ● ● ● ● ●	Green-Red-Orange	
Extraneous light	● ● ● ● ● ●	Green-Red	
Undervoltage or overvoltage	● ● ● ● ● ●	Red-Orange	

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

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 more than 0,2 seconds and <5 seconds.
In the case of lockout the burner can also be reset by an external button wich connects terminal “L” (supply line) with terminal 6 of the pin plug (XP6).

Fault description table		
Flashing code	**Frequency of the flash of reset button**	**Fault Description**
● ● ● ● ● ●		Extraneous light
● ● ● ● ● ●		Undervoltage or overvoltage
●	steady ON	Lock-out for no flame during ts
● ○ ● ○ ● ○	medium	Lock-out for false flame signal or burner control error
● ○ ● ○ ● ○	fast	Lock-out for maximum number of repetition

Fault diagnostics

Error code table		
LED colour	**Lock-out time**	**Probable cause**
● Steady ON	Immediate	No flame at the end of safety time: - flame detector defective or dirty - oil valve defective or dirty - faulty ignition transformer - badly regulated burner - oil fuel not present
● Flashing	After max.2,5 sec.	Extraneous light: - after the limit thermostat switching on - during the prepurging
● Fast flashing	After 3 recycles	Flame failure during operation: - badly adjutement burner - oil valve defective or dirty - flame detector defective or dirty

The **MO535 digital control box** gives some other advantages:

RECYCLE FUNCTION

The control box allows a recycle, i.e. complete repetition of the start-up programme, making up to 3 attempts, in the event the flame failure during operation.
If the flame failure again, this will cause the burner to lock out. If there is a new demand for heat during the recycle, the 3 attempts are reset when the limit thermostat (**TL**) switches.
NOTE: After 510 seconds of continuous operation a new reignition possibility is added.
By disconnecting power supply, when new heat demand occur (power supply is applied to the burner) all reignition possibilities are allowed (3 maximum).

LIMIT OF CONTINUOUS IGNITION

In case of continuous ignition transformer recycling, the maximum permissible number of repetitions is one attempt every minute.

IGNITION PREVENTED IN CASE OF EXTRANEOUS LIGHT

If extraneous light condition continues for more than 25 s, lock-out condition is reached.
A new ignition attempt may occur by resetting the control box, when new heat demand occur (power supply is applied to the burner).

SHUT-DOWN TEST

If the remote reset button is pressed during normal operation or during the start sequence for more than 5s the unit will perform a shut-down. If the remote reset button is released, start up sequence begins.

AUTOMATIC PUMP PRIMING

In lock-out condition, the burner can be placed in a purge routine in order to purging air from oil lines and filters for 30 seconds. Repeat this function any 5 times to protect the pump.

Automatic pump priming	
Pump priming activation sequence	**Color code**
The remote reset button must be pressed and held for more than 6s and afterwards released	green / orange / red fast flashing
If then the remote reset button is pressed and afterwards released before 3s pump priming cycle starts	green / orange / red flashing

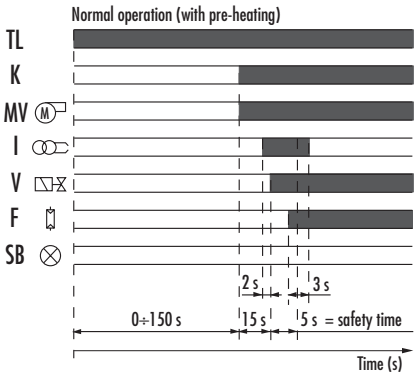
Pump priming cycle can be deactivated before the end of “pump priming time” by repeating the activation sequence.

LOCK-OUT AND RESET

The burner can be reset by pushing the built-in reset button for more than 0.2s (< 5s).
In the case of lockout the burner can also be reset by an external button which connects terminal “**L**” (supply line) with terminal 6 of the pin plug (**XP6**).
Attention: **The burner can be reset only 5 times consecutively, then power supply has to be disconnected for a new 5 reset possibilities.**
The burner can only be reset if power supply is applied to the control box.

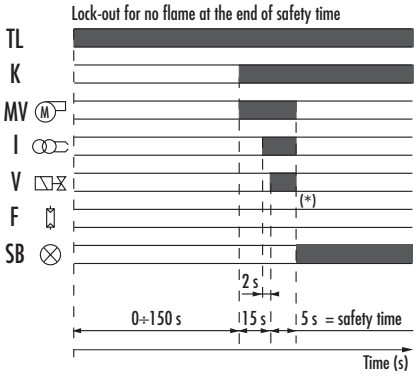
START UP CYCLE

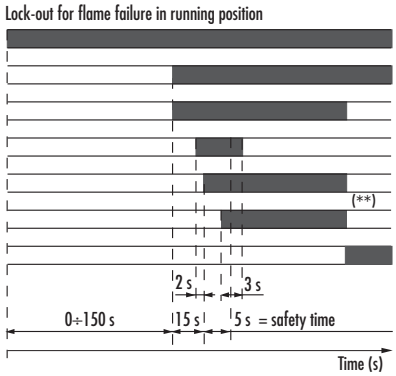
Digital control box MO535



Correct operation

0s	The burner begins the ignition cycle at the start of the heat demand
0s-150s	Pre-heater time
150s-165s	Pre- purging time (163s-165s Pre ignition time)
165s-170s	Ignition trasformer is “on” during all safety time
170s-173s	Post-ignition time after signal flame detection.

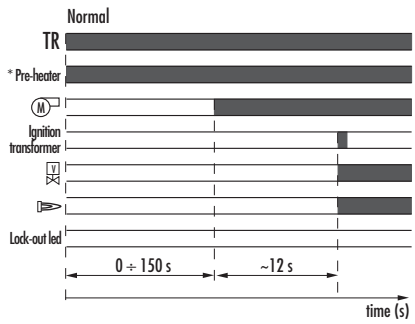




(*) If the flame doesn’t light within the safety time the burner locks-out.

(**) Only 3 consecutive reignitions are allowed.

Analogic control box RBL 535 SE/LD



Correct operation

0s	The burner begins the ignition cycle.
0s-12s	Pre-purge with the air damper open.
12s	Ignition.

* only model with pre-heater

If the pre-heater is fitted there is a further delay before pre-purge; this delay can reach 150s depending on room and fuel temperatures.

Lock-out due to ignition failure
If the flame does not light within the safety limit (~5s) the burner locks-out.
The lock-out is shown by a led on the appliance.

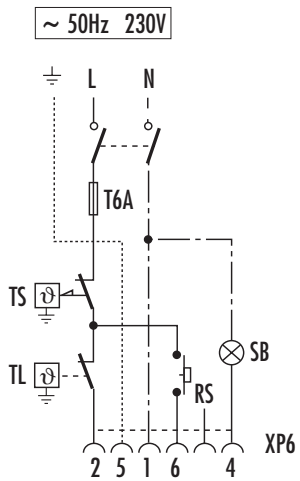
WIRING DIAGRAMS

Appliance fitted with an ignition transformer

Electrical connections must be made by qualified and skilled personnel in conformity with the local regulations in force.
The terminal board is incorporated in the burner control box and connection is easy following the clear instructions that are given.

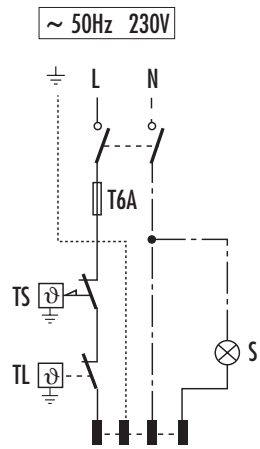
"ONE STAGE" OPERATION

Digital application - MO535



RS - Remote reset
SB - Lock-out signal
T6A - Fuse
TL - Limit thermostat
TS - Safety thermostat
XP6 - 7 pole socket

Analogic application - RBL 535 SE/LD



S - Lock out led
TL - Regulation thermostat
TS - Safety thermostat (manual reset)
T6A - Fuse

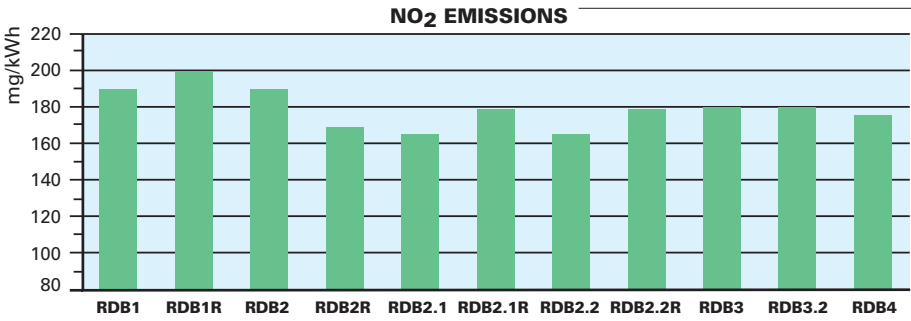
The following table shows the supply lead sections and types of fuse to be used.

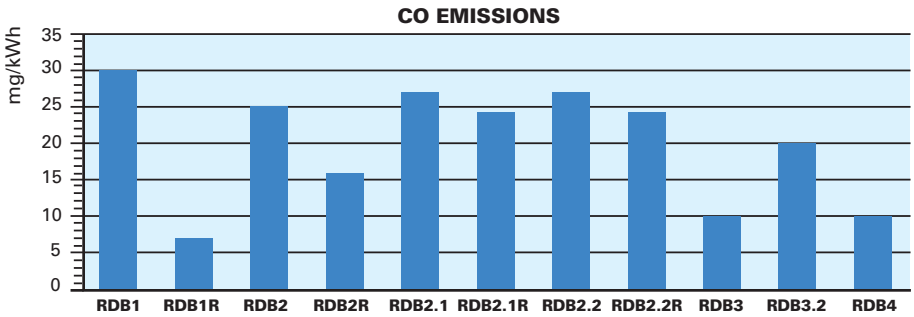
Model	RDB1-1R	RDB2-2R	RDB2.1-2.1R	RDB2.2-2.2R	RDB3	RDB3.2	RDB4
	230V	230V	230V	230V	230V	230V	230V
F A	T6	T6	T6	T6	T6	T6	T6
L mm²	1	1	1	1	1	1	1

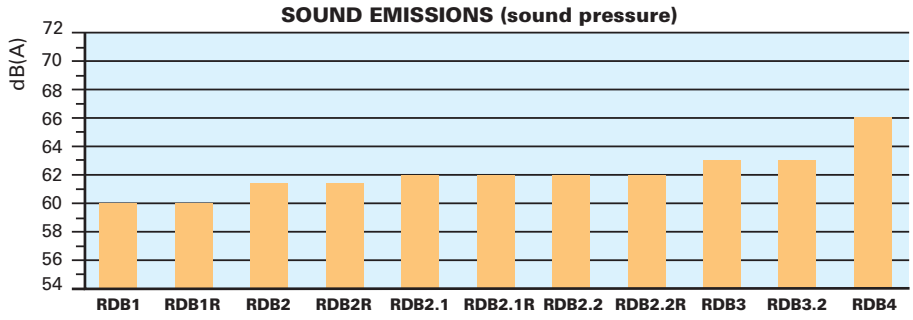
F = Fuse L = Lead section

EMISSIONS

The emission data have been measured in the various models at maximum output, in conformity with EN 267 standard.





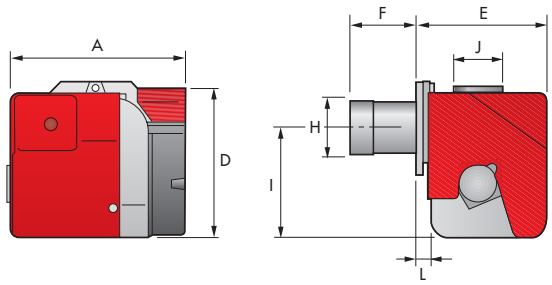


OVERALL DIMENSIONS (mm)

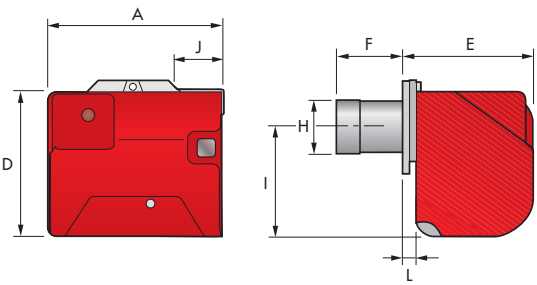
These models are distinguished by their reduced size, in relation to their output, which means they can be fitted to any boiler on the market.

BURNER

RDB1-1R - RDB2-2R - RDB2.1-2.1R - RDB2.2-2.2R



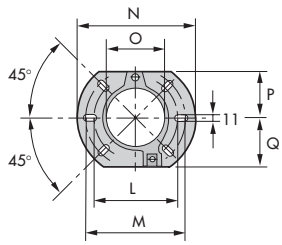
RDB3 - RDB3.2 - RDB4



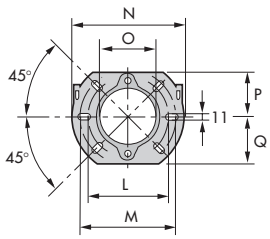
Model	A	D	H	F	E	L	I	J
RDB1-1R	276	230	89-90	76-86	202	20	168	75
RDB2-2R	276	230	89-90	76-86	202	20	168	75
RDB2.1-2.1R	286	230	85	77	202	20	168	75
RDB2.2-2.2R	286	230	85	77	202	20	168	75
RDB3	325	268	88	78	253	30	204	75
RDB3.2	325	268	95	69,5	253	30	204	75
RDB4	325	268	105	111	253	30	204	75

BURNER-BOILER MOUNTING FLANGE

RDB1-1R - RDB2-2R
RDB2.1-2.1R - RDB2.2-2.2R

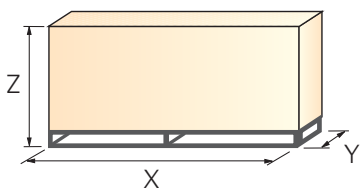


RDB3 - RDB3.2
RDB4



Model	L	M	N	O	P	Q
RDB1-1R	130	150	180	91	72	72
RDB2-2R	130	150	180	91	72	72
RDB2.1-2.1R	130	150	180	91	72	72
RDB2.2-2.2R	130	150	180	91	72	72
RDB3	140	168	189	106	83	83
RDB3.2	140	168	189	106	83	83
RDB4	140	168	189	106	83	83

PACKAGING



Model	X	Y	Z	kg
RDB1-1R	395	305	295	11
RDB2-2R	395	305	295	11
RDB2.1-2.1R	395	305	295	11
RDB2.2-2.2R	395	305	295	11
RDB3	435	360	355	15
RDB3.2	435	360	355	15
RDB4	435	360	355	15

INSTALLATION DESCRIPTION

Skilled and qualified personnel must perform installation, start up and maintenance.
A nozzle is fitted to the burner and used for fire tests in the factory. If necessary, change the nozzle on the basis of the maximum output of the boiler.
All operations must be carried out as described in the technical handbook supplied with the burner.

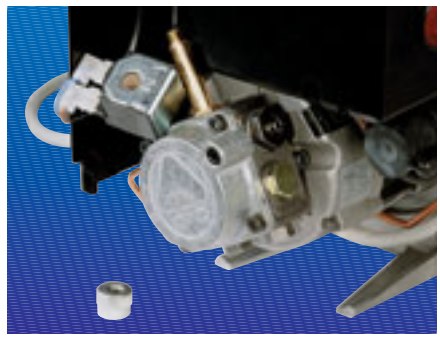
BURNER SETTING

- RDB series burners can be adjusted from the back of the burner just using a single tool; the air damper is easily adjustable (thanks to a micrometric screw and a position indicator) without removing the burner cover.

- Head setting area is easily accessible and the operation is simple thanks to a graduated scale.

MAINTENANCE

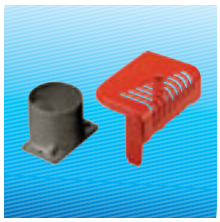
- In models RDB3 and RDB4, the maintenance position is easily carried out by hooking the burner to the flange, after removing it from the fixing screws.
- Maintenance is easy because all the components, including the combustion head, are easily accessed by just unscrewing a single nut.
- The main components - the control box, motor and pump - are outside the air circuit, thus avoiding any risk of oil build up inside the circuit.
- All the electrical components are connected by socket-plugs and they are easy to reach for controls.



BURNER ACCESSORIES

Balanced-conventional flue conversion kit

All the RDB series models are easily converted from conventional flue to balanced flue, by replacing the plastic screen on the air intake with the connector for the air supply pipe.
The reverse operation can be carried out on all the models from balanced flue to conventional flue burner, by replacing the connector on the air supply pipe with the plastic screen on the air intake.



Balanced-conventional flue conversion kit		
Burner	**Balanced flue kit code**	**Conventional flue kit code**
RDB1-1R - RDB2-2R RDB2.1-2.1R - RDB2.2-2.2R	**3062774**	**3062775**
RDB3 - RDB4	**3062774**	**3062876**

Tester

The tester controls the correct working of the burner components in the RDB series. It can be fitted to all the models, with or without pre-heater.
It is made up of two parts: a control instrument and a "control box" which replaces and simulates the one on the burner.
This tester is very simple to use: just replace the burner control box with the tester to check correct working of the motor, valve, pre-heater and flame probe (only photo-resistance).
This device has a display showing the levels that have been measured, a selection switch for selecting the component to be tested and four switches to be used in the various working stages of the burner.

Tester	
Burner	**Kit code**
RDB - RDB R	**3087216**

Direct testing	Measurements
(M) MOTOR The switch feeds the motor.	(V) L1-N Main voltage (230 V)
VALVE The switch feeds electromagnetic winding of the coil. A red led signals excitation stage, and a green led signals retainer stage.	(A) Pre-heater current consumption
PRE-HEATER The switch feeds the light oil pre-heater; a green led signals the thermostat cut-in.	(V) (M) Secondary voltage (low voltage)
TRANSFORMER The switch feeds the firing transformer inside the control box and excites the oil valve.	(A) Photo-resistance current consumption

Light oil filter

For cleaning light oil from dirty particles and impurities filters with the following features are available:

Light oil filter		
Burner	**Filtering degree (μm)**	**Kit code**
All models	60	**3006561**

Filter made up of aluminium body and stainless steel filtering cartridge; available singularly.

Light oil filter		
Burner	**Filtering degree (μm)**	**Kit code**
All models	60	**3075011**

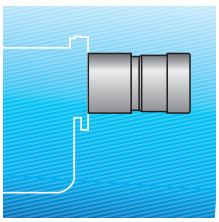
Filter made up of aluminium cover, plastic tank and nylon filtering cartridge; available in packaging of 50 pieces.

Light oil filter/degassing unit

To solve problems of air or water in the oil circuit a special filter/degassing unit is available, made up of aluminium cover, plastic tank, stainless steel filtering cartridge, air release cap and water purge valve. It is available singularly.

Light oil filter/degassing unit		
Burner	**Filtering degree (μm)**	**Kit code**
All models	100	**3000926**

Extended head kit



Extended head kit			
Burner	**Standard head length (mm)**	**Extended head length (mm)**	**Kit code**
RDB4	111	170	**3004590**

SPECIFICATION

A special index will help you choose the right burner from the available RDB models.
There is also a clear and detailed product specification and description.

DESIGNATION OF SERIES

Series: RDB

Size

Possible variations: R Light-oil pre-heater

Electrical supply to the system: 1/230/50 1/230V/50Hz

RDB	1	R	1/230/50

AVAILABLE BURNER MODEL

RDB1-1R	1/230/50
RDB2-2R	1/230/50
RDB2.1-2.1R	1/230/50
RDB2.2-2.2R	1/230/50
RDB3	1/230/50
RDB3.2	1/230/50
RDB4	1/230/50

PRODUCT SPECIFICATION

Burner

Completely automatic monobloc light oil and kerosene burners, with single-stage operation fitted with:
- Fan with forward inclined blades
- Air damper with external adjustment, with no need to remove the cover
- Air-tight air circuit, also available in the balanced flue version
- Single phase electric motor 230 V, 50 Hz
- Combustion head fitted with:
    - stainless steel head cone, resistant to high temperatures
    - ignition electrodes
    - flame stability disk
- Geared pump (specific version for kerosene) for fuel supply, fitted with filter
    - pressure regulator
    - attachments for fitting a pressure gauge and vacuum meter
    - internal by-pass for preparing for single-pipe installations
- Fuel feed solenoid valve incorporated in the pump
- Photocell for flame detection
- Electronic flame control equipment available with MO 535 (on demand)
- Protective filter against radio interference
- Light oil nozzle
- IP X0D protection level
- Fuel pre-heater (optional).

Approval:
- EN 267 standard.

Conforming to:
- Directive 89/336/EEC (electromagnetic compatibility)
- Directive 73/23/EEC (low voltage)
- Directive 98/37/EEC (machinery)
- Directive 92/42/EEC (efficiency).

Standard equipment:
- Two flexible pipes for connection to the light oil supply line
- Two nipples for connection to the pump
- Flange, screws and nuts for fixing
- Thermal screen
- Air intake
- Protection grill
- Exagonal key
- Instruction handbook for installation, use and maintenance
- Spare parts list.

Available accessories to be ordered separately:
- Balanced-conventional flue conversion kit
- Tester
- Light oil filter
- Light oil filter/ degassing unit
- Extended head kit (only for RDB4).

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