Gas Boosters

Fixed Speed Booster with integrated Pressure Switches and Terminal Panel

CODE	MODEL
3000200	RB200
3000300	RB300
3000400	RB400

CONTENTS

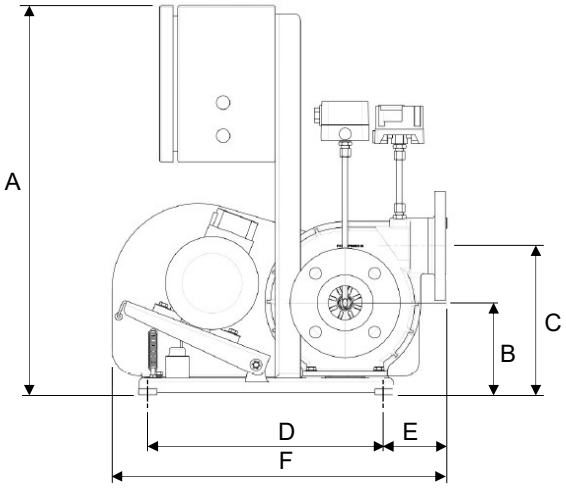
TECHNICAL DATA Table 1

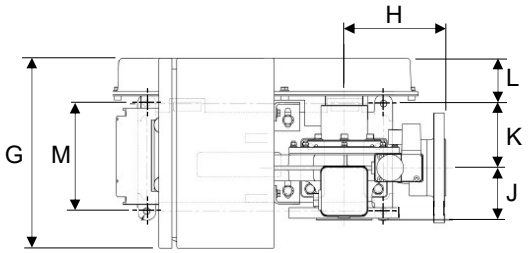
MODEL		RB200	RB300	RB400
MAX.FLOW RATE	(Nm^3/h)	300	508	1025
NATURAL GAS (S.G. = 0.6, Net CV = 9.67 kWh/Nm^3)	(kW)	2901	4913	9912
MAX. PRESSURE LIFT	(mbar)	32	45	73
OTHER GASES		Towns Gas/ Biogas**		
ELECTRICAL SUPPLY		400 V/ 3 Ph./ 50 Hz (1 Ph. Available RB200)		
CONTROL VOLTAGE		230 V/ 50 Hz		
ELECTRIC MOTOR	(W)	550	1500	4000
RUN CURRENT	(A)	1.5	3.1	8.2
START CURRENT	(A)	7	17	58
MAX. ELECTRICAL POWER CONSUMPTION	(W)	990	2150	5500
ELECTRICAL PROTECTION		IP54		
WEIGHT	(kg)	15	29	60
NOISE LEVEL*	(dBA)	76	80	84
ORDER CODE		3000200	3000300	3000400
APPLICABLE DIRECTIVES & STANDARDS		Machinery Directive 2006/42/EEC EMC Directive 2004/108/EEC Low Voltage Directive 2006/95/EEC Gas Booster British Standard BS 8487		

*Measured at 1 m from booster, with ducted inlet and outlet. **Subject to biogas specification.

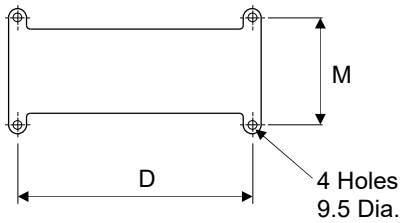
RIELLO policy is one of continuous product improvement. The right is reserved to vary any design, dimension or performance without previous notice.

DIMENSIONS (mm) Fig 2





Booster Base



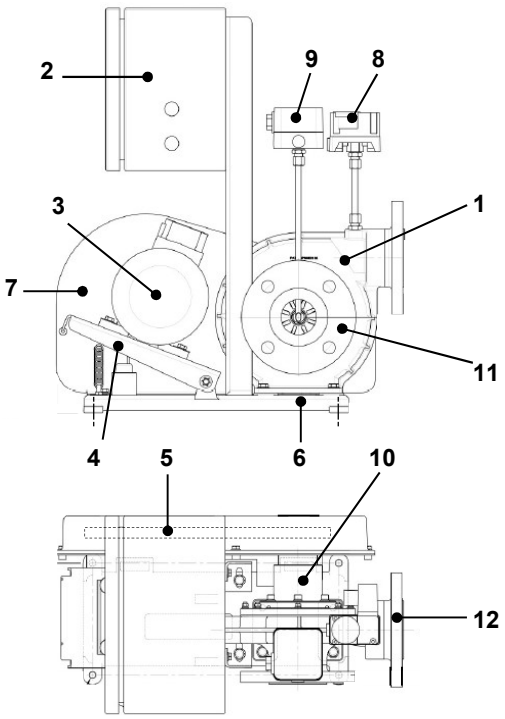
MODEL	INLET	OUTLET
RB200	DN50	DN50
RB300	DN80	DN50
RB400	DN100	DN80

Flange sizes (BS4504, PN16)

MODEL	A	B	C	D	E	F	G	H	J	K	L	M
RB200	587	140	225	355	80	502	286	152	78	97	89	162
RB300	640	178	305	378	82	585	311	180	101	71	97	143
RB400	641	202	353	419	138	706	433	237	115	79	129	184

BOOSTER COMPONENTS Fig 3

1. Booster Impellor Body
2. Terminal Panel
3. Drive Motor
4. Drive Tensioning
5. Drive Belt
6. Base
7. Drive Guard
8. Low Outlet Gas Pressure Switch
9. Low Inlet Gas Pressure Switch
10. Booster Bearing Assembly
11. Inlet Flange
12. Outlet Flange



BOOSTER CAPACITY Fig 4

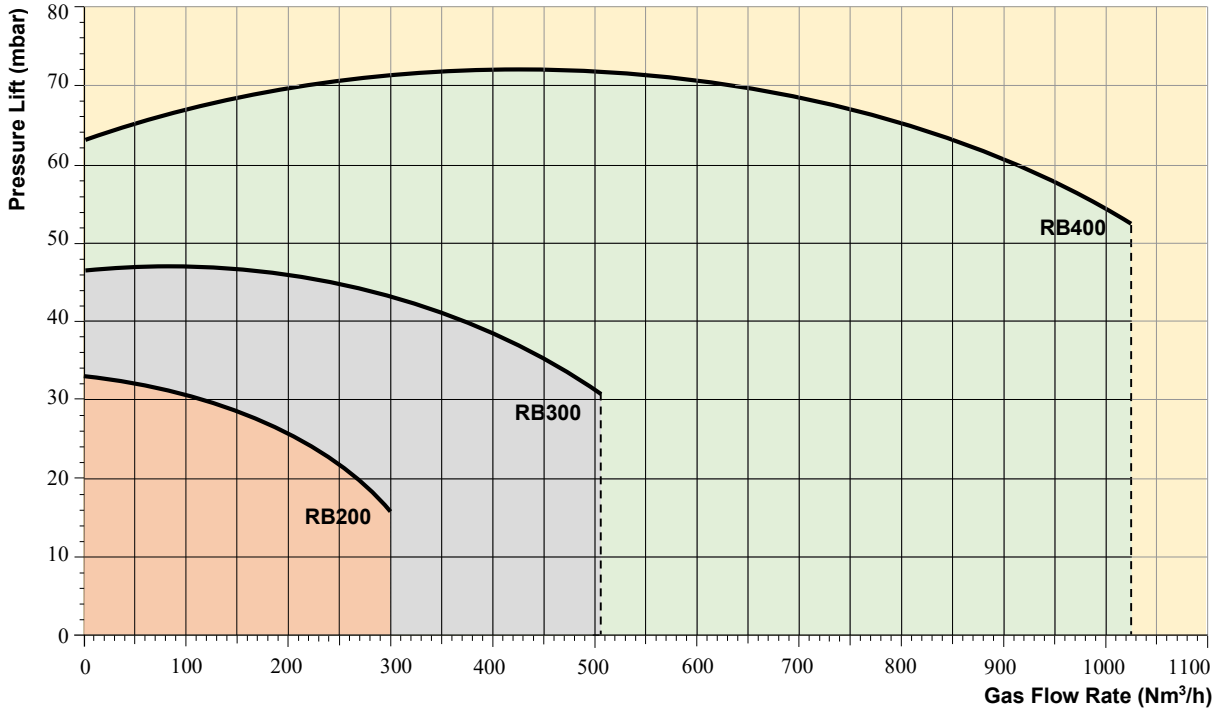


Fig. 4 indicates the booster pressure lift for natural gas (SG = 0.6). For other gases please contact Riello Ltd.

The pressure lift generated by the booster changes as the gas flow rate increases or decreases, as indicated by the solid line curve for each model. The shaded area beneath each pressure lift curve indicates the applicable operating range for that booster model.

A booster should be selected for the maximum gas flow rate of the appliance(s) and the maximum pressure lift required between the gas supply pressure and the minimum gas pressure required by the appliance(s).

NOTE: Pressure losses through installation pipework and valves / fittings should be added to the difference between the gas supply pressure and the appliance(s) minimum gas pressure requirement, to calculate the total minimum pressure lift required from the booster.

BOOSTER SELECTION Fig 5

EXAMPLE

1,900 kW boiler of 93.6% net efficiency with 7.9 mbar flue gas pressure drop.
Available gas supply pressure 20 mbar.

Required burner net firing capacity 2,030 kW, or 210 Nm^3/h (for Natural Gas net CV of 9.67 kWh/Nm^3)

The Riello gas burner match for this required firing capacity and boiler flue gas pressure drop is the model RS 2000/M (or RS 200/E) BLU.

If a VGD 65/1 gas train is selected for the burner, the Minimum Gas Supply Pressure (MGP) required at the inlet to the gas train is;

Boiler Flue Gas Pressure Drop	7.9 mbar
Burner Head Pressure Drop	25.5 mbar
VGD 65/1 Gas Train Pressure Drop	12.9 mbar
MGP required at Gas Train Inlet	46.3 mbar

The Minimum Pressure Lift required from the Booster is therefore;

MGP required at Gas Train Inlet	46.3 mbar
Gas Supply Pressure	20.0 mbar
Minimum Pressure Lift required	26.3 mbar
Booster Gas Flow required	210.0 Nm^3/h
Booster Minimum Pressure Lift required	26.3 mbar

BOOSTER SELECTION - RB300

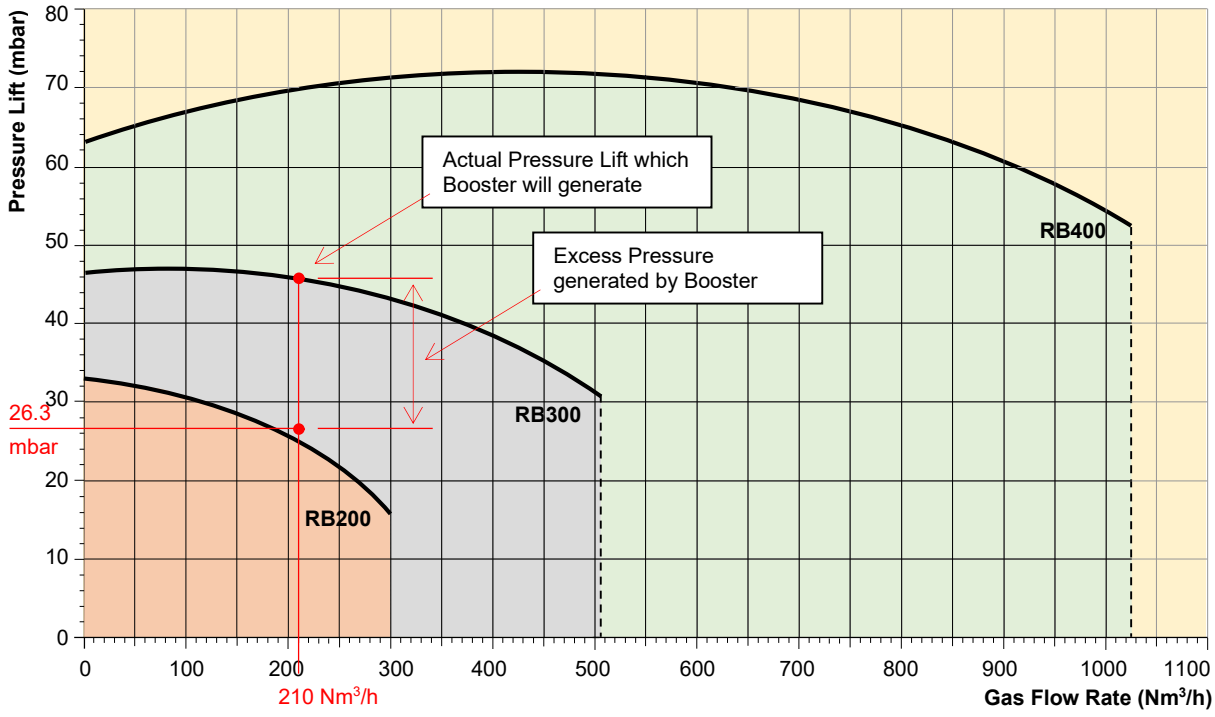


Fig. 5 indicates the booster required for this boiler / burner combination is the RB300.

NOTE: 26.3 mbar Pressure Lift is required from the Booster, but with a Gas Flow of 210 Nm3/h, the Actual Pressure Lift generated by the RB300 is 45.1 mbar.

BOOSTER INSTALLATION GUIDELINES

- A gas booster is an integral part of the burner fuel supply and control system.
- Installation should only be carried out by a competent person.
- Reference should be made to the 'Institution of Gas Engineers Utilisation Procedures IGEM/UP/2, Gas Installation Pipe-work, Boosters and Compressors on Industrial and Commercial Premises' and any subsequent additions and amendments.

BOOSTER LOCATION

- The booster should be located in a clean dry and well ventilated area, on a level, sound and incombustible surface. The ambient air temperature should not exceed 40ºC.

- The booster should be positioned as close to the burner as is practicably possible in order to minimise the length of pipework subjected to the higher operating pressures.

- Riello RB Boosters ***should not be installed*** in a governor or meter room.

- Boosters ***should not be installed*** in an Air Compressor Plant Room unless completely unavoidable. If this is necessary then the booster position must not compromise access for maintenance of both compressor and booster.
  Also ***the air inlet of the compressor <u>MUST</u> be ducted from outside the plant room.***

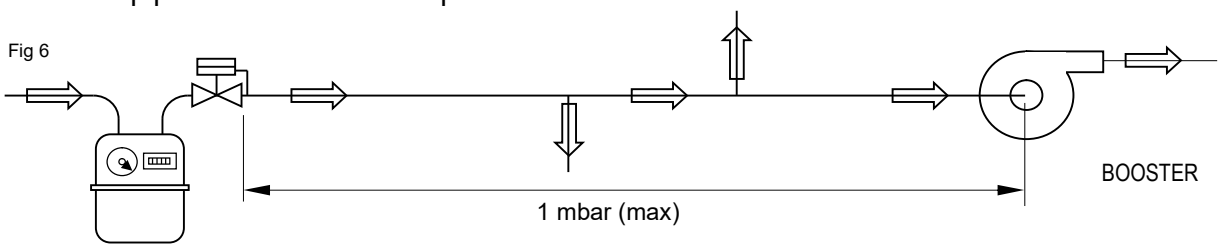
BOOSTER INSTALLATION PIPEWORK

Pipework between Meter Governor and Booster

The size of the pipework between the gas meter governor and the booster is the most critical item in any gas booster installation.

- Minimise pressure drop between the meter governor and booster.
  - This is to avoid adverse effects on equipment 'upstream' of the booster.
    Size pipework for 1 mbar drop maximum.

Fig 6



If the pipework between the meter governor and booster is undersized then this will result in a reduced gas supply pressure to any appliances upstream, causing possible equipment malfunction and maybe even a safety hazard.

Pipework between Booster and Burner

- This should also be sized to give the minimum pressure drop between the booster and burner. This pipe run will not necessarily be the same diameter as the booster outlet or the burner gas train inlet connection.

<u>NOTE</u>

There is a chart attached as Appendix 1 to this manual to aid in pipework size selection.

To minimise stress on the booster body, the Riello RB booster MUST be fitted with anti-vibration mountings and flexible gas connectors between the booster flanges and the inlet and outlet pipe work.

Flexible gas connections and anti-vibration mountings also assist in reducing any noise transmission in the gas pipework.

Gas pipework connections to the inlet and outlet of the booster require flanged fittings (BS4504, PN16), which must also be accurately aligned and supported in order to minimise stress on the booster housing.

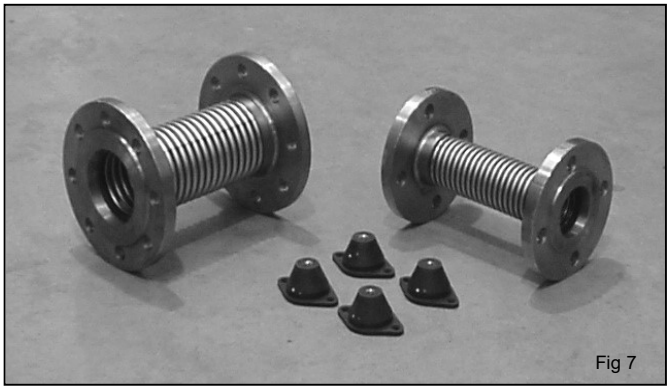


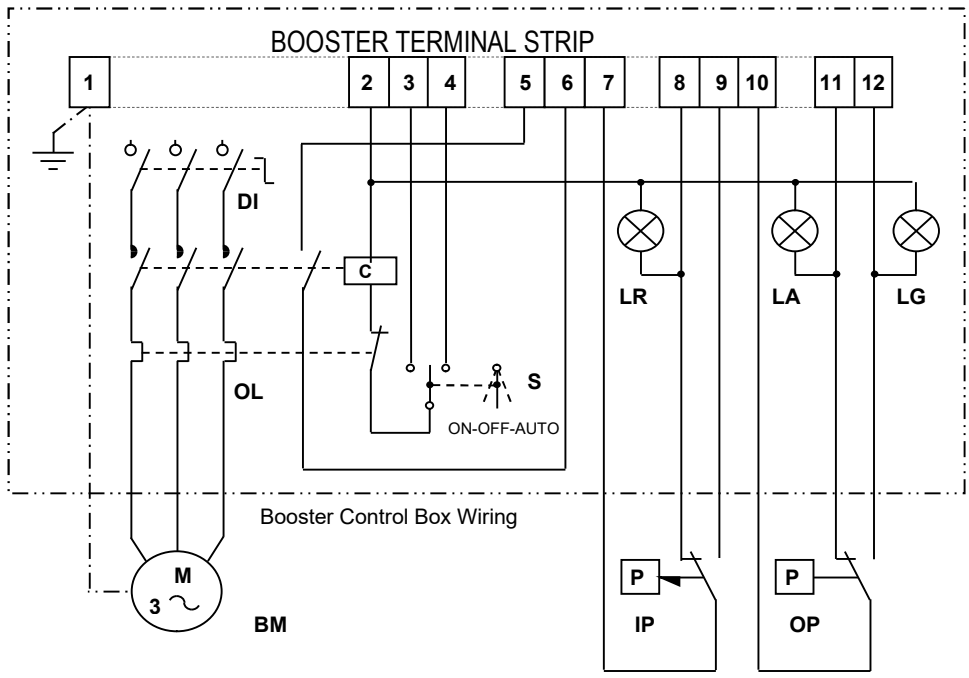
Fig 7

The flexible gas connection connections should not be used to correct or accommodate misaligned pipework. Their function is to reduce vibration and stress on the booster and pipework when the booster is in operation.

Any changes in pipe size (reducing or increasing) should be made as close to the booster inlet or outlet as possible. Smooth transition fittings or pipework should be used to minimise pressure losses.

ELECTRICAL INSTALLATION

BOOSTER WIRING – FACTORY SET **(Fig 8)**



KEY TO WIRING SCHEME

DI - Door Interlocked Isolator

BM - Booster Drive Motor

C - Motor Contactor

OL - Motor Overload Protection

IP - Low Inlet Gas Pressure Switch (Manual Reset)

OP - Low Outlet Gas Pressure Switch

LR - Red Indicator Lamp (Low Inlet Pressure)

LA - Amber Indicator Lamp (Low Outlet Pressure)

LG - Green indicator Lamp (Booster Run)

S - ON-OFF-AUTO Selector Switch

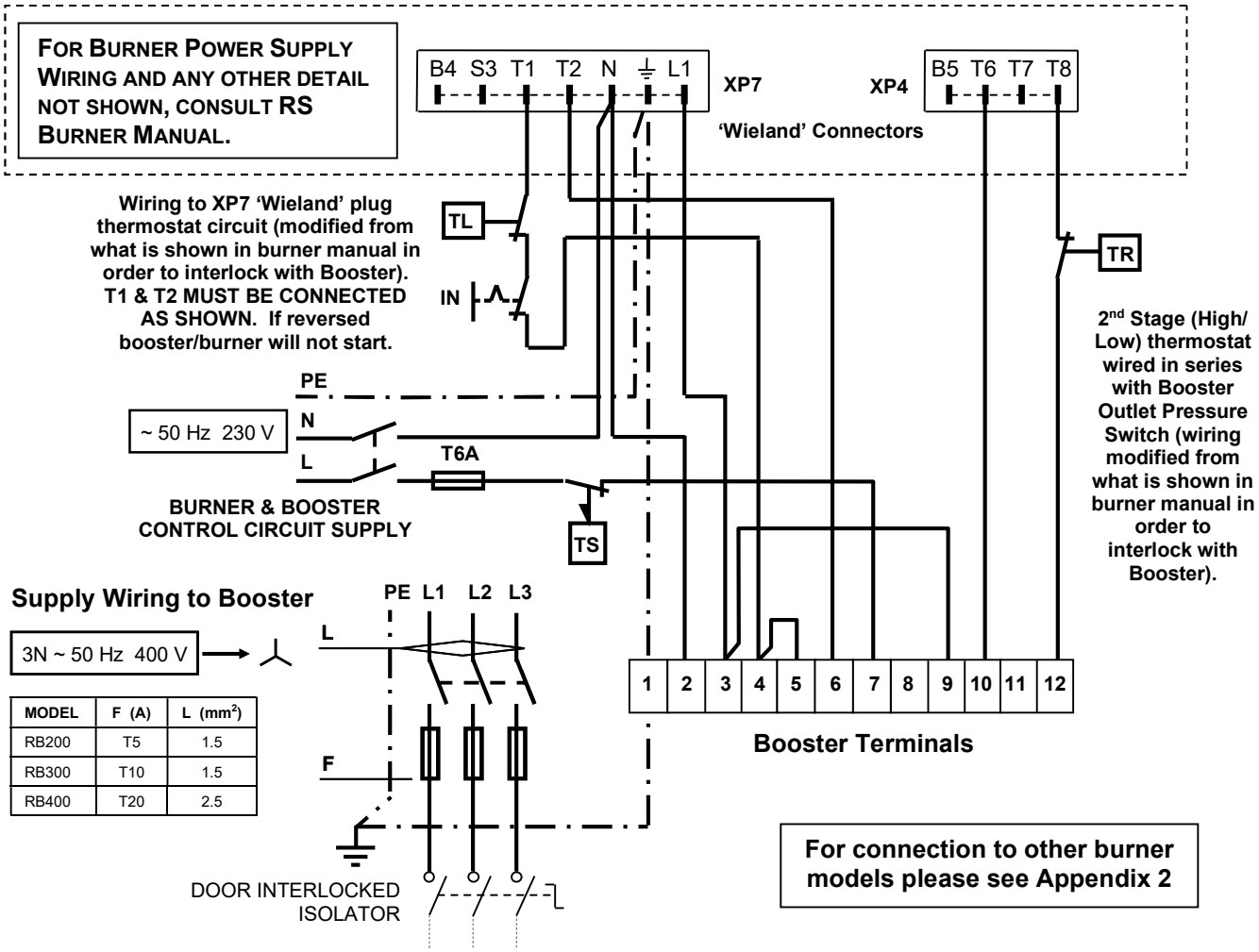
All RB boosters are supplied ready for connection to a 400 V, 3 Ph, 50Hz* power supply.
*RB200 boosters can be supplied with a 230 V, 1 Ph Drive Motor by special request.

See diagram below, fig. 9, for connection from burner control to booster terminal box.

BOOSTER EXTERNAL WIRING & CONNECTIONS TO THE BURNER

Use flexible cables in accordance with EN 60-335-1 regulations:
If Rubber Sheath use at least HO5-RR-F
If PVC Sheath use at least HO5-VV-F
Cable size 1.5mm² minimum for power connections.
Remove close-off 'grommets' from the booster terminal box and fit suitable conduit connections. The final length of connection to the terminal box must be in flexible conduit/cable. Ensure adequate motor protection fuses are fitted and the control fuse is provided in the burner control supply.

Connections to RS70, RS100, RS130 & RS190 Burner **(Fig 9)**



MODEL	F (A)	L (mm²)
RB200	T5	1.5
RB300	T10	1.5
RB400	T20	2.5

Wired as above, booster will operate as follows;

Switch 'S' in ON position - Booster will RUN whenever burner has a Live feed.
Switch 'S' in AUTO position - Booster will RUN only when thermostat calling for heat.
Loss of inlet pressure - IP will shutdown booster and burner
(Bypassing IP, even temporarily, is a breach of the Gas Act and could cause a serious safety hazard.)
Loss of outlet pressure* - Burner will be enabled to RUN in Low Fire ONLY.

* See commissioning notes on setting and testing Outlet Pressure Switch (OP), page 10, for further instruction.

Note regarding Booster Operation

Boosters may be run continuously as long as the appliance is on demand, but controlling the booster using the boiler thermostat circuit will reduce electrical consumption.

Continuous running places less wear on the booster motor, drive and bearings, than does starting and stopping with the boiler thermostatic control. It also causes less potential gas pressure fluctuation in the booster supply pipework.

BOOSTER COMMISSIONING

Riello gas booster assemblies are tested for gas tightness using air at pressures up to 0.7 bar during manufacture. Do not test the booster Fan Chamber assembly by hydraulic pressure, as this will damage bearing seals on the fan assembly.

PRE-COMMISSIONING CHECKS

- Remove the belt guard and check the drive belt and pulleys to ensure they are free from building dust, dirt and harmful abrasive materials.
- Ensure that the earth terminal in the booster control box is connected to the supply earth.
- Check the direction of rotation is as shown by the arrow on the Fan Chamber.

Do not run boosters without pipework connected to the inlet and outlet.

PRESSURE SWITCHES

Inlet Pressure Switch (IP)

IP should be adjusted on site to cut off the booster at the minimum pressure advised by the local gas supply authority. Units are supplied with switches set to a low level that must be reset on site.
Connect a manometer to the test point on the side of IP and adjust the setting dial as required; anti-clockwise to increase setting and clockwise to reduce.
When IP switches the booster MUST shut down at once and require operation of the manual push button to re-start.
It is recommended that IP is set to 50% of the gas supply pressure at entry to the booster when running at full load; with a minimum setting of 10 mbar.
Example: Inlet pressure with (all) appliance(s) running at full load = 26 mbar. Set IP at 13 mbar.
Inlet pressure with (all) appliance(s) running at full load = 18 mbar. Set IP at 10 mbar.

Testing IP Operation

- Adjust IP to the required setting (normally 10 mbar).
- Shut down all but one of the burners / appliances fed by the booster.
- Slowly close the booster inlet isolating valve reducing pressure in 1 m bar increments waiting 10 seconds at each step to allow for the response time.
  (If the burner / appliance should shutdown due to its own thermostatic control before the low pressure cut-off switch reaches its cut off pressure, it will be necessary to wait until the burner / appliance can again be operated before recommencing the test.)
- Note the setting at which the pressure switch shuts down the booster and the response time, i.e. from the time the pressure is reached to the time the switch cuts out. This can be achieved for example by observing the pressure switch indicator light.
- This should be less than 3 seconds. If shut down takes longer than 3 s. then the setting of IP should be raised until shut down at 10 mbar within 3 s. is achieved.
- Shut down the one remaining burner to maintain safety.
- Observe that on restoration of pressure (opening inlet valve) the booster does not restart.
- Push IP reset to restart booster.
- If there is a fault it should be corrected before the booster is operated again.

On completion of a satisfactory test record ‘Cut-Off Pressure’ and ‘Response Time’ as part of the booster commissioning procedure.

If all is correct re-start the booster and the burner(s) appliance(s) supplied by it.

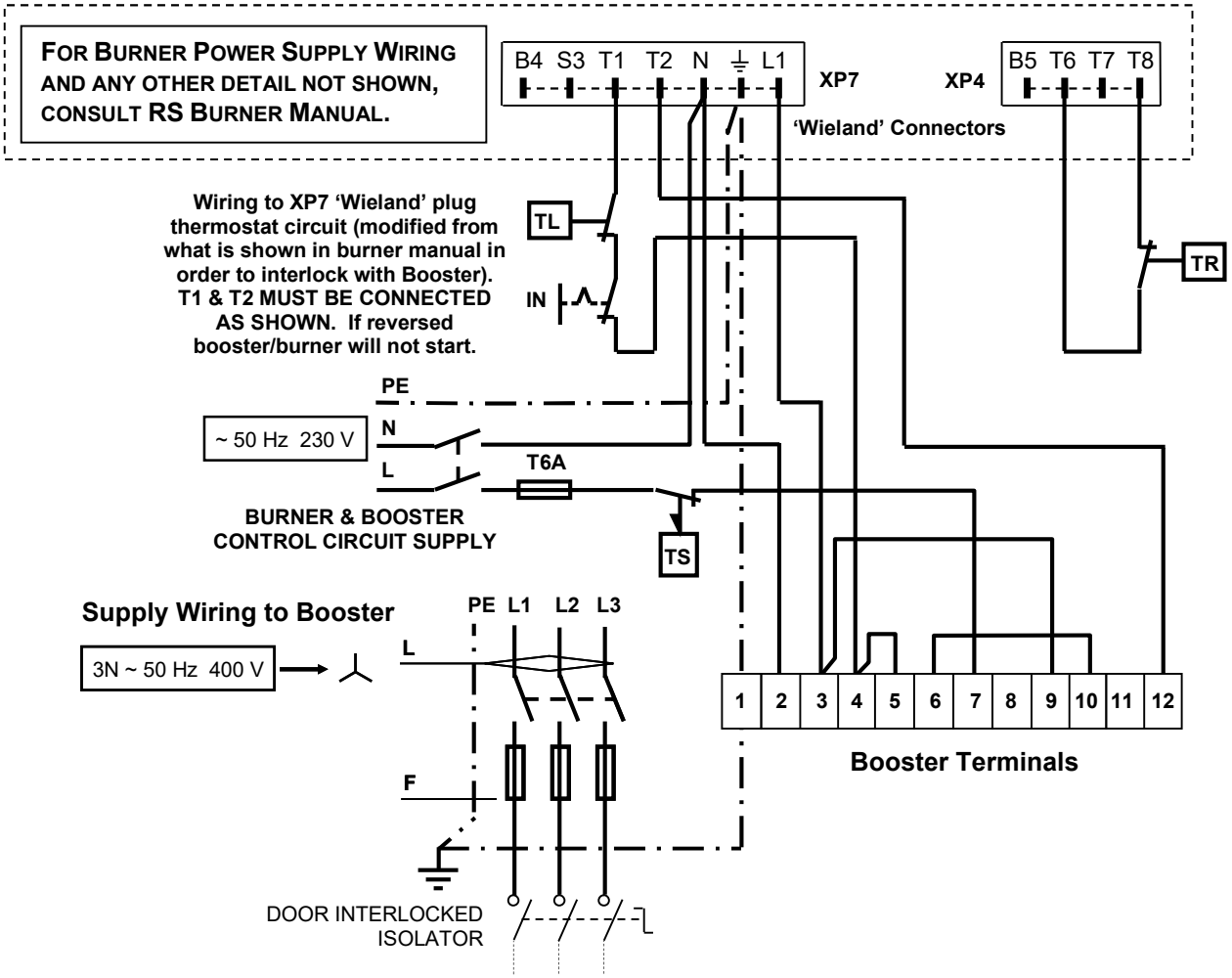
Outlet Pressure Switch (OP)

OP is adjusted in the same way as IP and should be set as required to prove a minimum boosted pressure is available to the burner when the booster is running.

If the burner is connected as per fig. 9, page 9, then loss of Outlet Pressure will cause the burner to close down to LOW FIRE operation. To ensure that the burner operation remains safe in this eventuality, isolate the 3-phase power supply to the booster and switch on the burner. The burner should light and run in low fire mode only.
Check the flue gas emissions and ensure that the combustion remains 'clean' and satisfactory.

IF THE COMBUSTION IS NOT SATISFACTORY DURING THIS TEST THEN THE CONTROL WIRING MUST BE CHANGED FROM THAT SHOWN IN FIG. 9.
REMOVE 'OP' FROM THE BURNER 'HIGH/LOW' CIRCUIT AND WIRE IT INTO THE BURNER 'THERMOSTAT' CIRCUIT, IN SERIES WITH THE BOOSTER MOTOR AUXILIARY CONTACT. (SEE FIG. 10 BELOW)

Connections to RS70, RS100, RS130 & RS190 Burner if 'OP' test as above is not satisfactory **(Fig 10)**



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Switch 'S' in AUTO position - Booster will RUN only when thermostat calling for heat.
Loss of inlet pressure - IP will shutdown booster and burner
(Bypassing IP, even temporarily, is a breach of the Gas Act and could cause a serious safety hazard.)
Loss of outlet pressure - OP will shutdown burner.

MAINTENANCE

- It is a recommendation of British Standard BS8487:2007 that:
    - Drive belts should be replaced annually
    - Flexible connectors must be replaced every 5 years
    - Bearing assemblies must be replaced every 5 years irrespective of perceived bearing condition
- Belts and pulleys should be kept free from grease and dirt. Do not apply belt dressing.
- Replacement belts may be obtained by quoting the reference number affixed to the belt guard of every booster. A spare belt is supplied with each new machine.
- The motor mounting arrangement incorporated in all models ensures correct belt tension at all times and requires no maintenance.

BELT REPLACEMENT

- Isolate gas supply.
- Isolate electric supply.
- Remove drive guard.
- Remove existing belt.
- Clean pulleys.
- Lift motor platform and position new belt on both pulleys, smooth side of belt in contact with pulley faces.
- Ensure that belt will run centrally on pulley faces.
- Replace belt guard.

DRIVE PULLEYS

If the running surface of any pulley becomes damaged it should be replaced immediately or belt life will be reduced.
When replacing pulleys check their alignment before fitting the belt and securing fixing screws tightly on shafts.

BOOSTER BEARING ASSEMBLIES

A rise in noise level indicates that bearings are in need of replacement.

The motor bearings are of the sealed type, lubricated for life. Do not attempt to give additional lubrication.

In the event of replacement fan bearings being needed the recommended procedure is to replace the housing, bearing, impeller and pulley assembly completely.

Fan Bearing Replacement Procedure

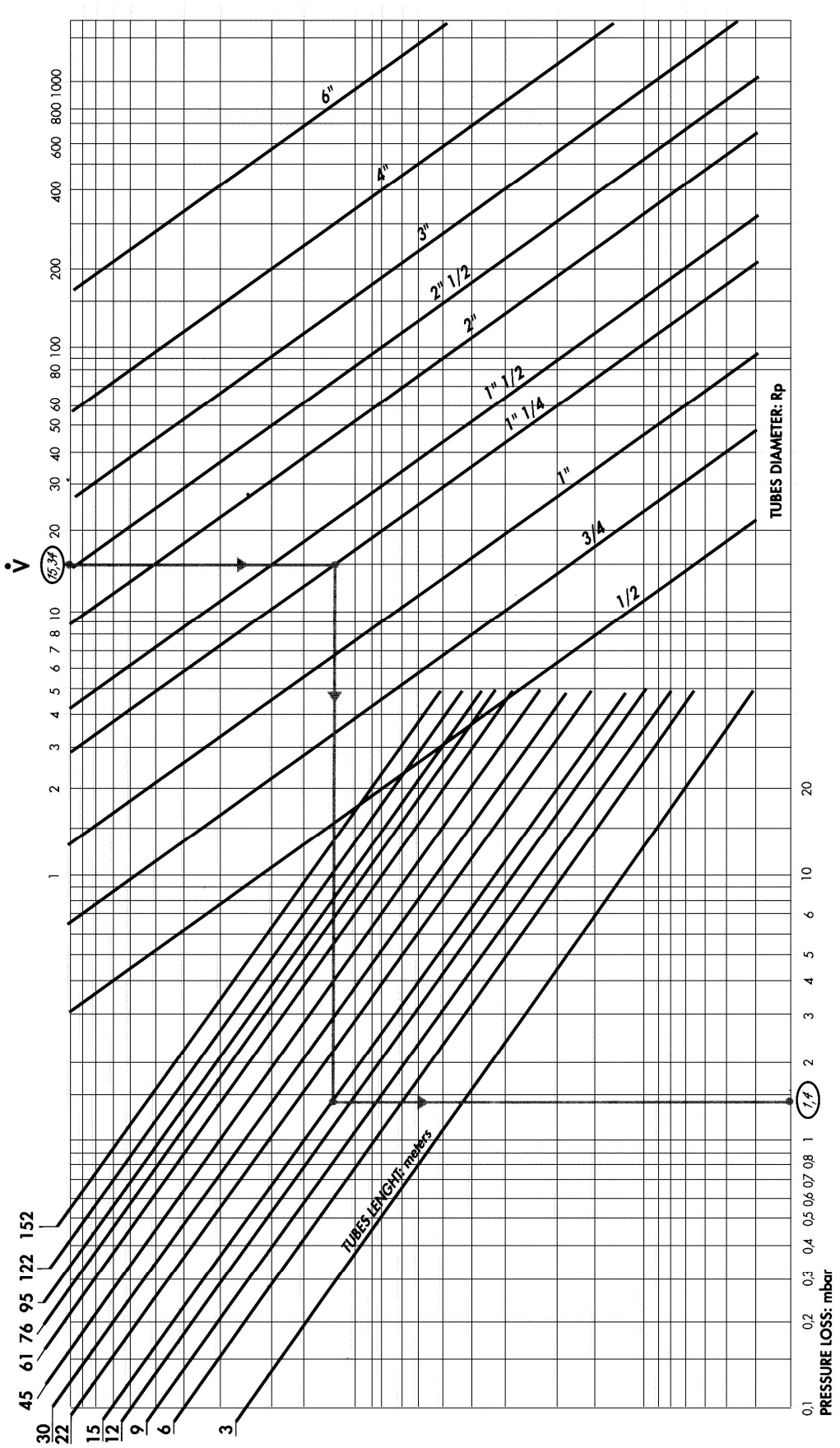
- Isolate electric supply.
- Remove drive guard.
- Remove belt.
- Remove nuts securing the bearing assembly to the fan housing.
- Prise off the bearing assembly. Take care not to damage joint face.
- Clean mating faces and apply a sealing compound, “Loctite” Plastic Gasket or equivalent, before fitting replacement assembly. Allow to set according to maker’s recommendations. This treatment is essential in order to maintain gas-tightness.
- Do not over-tighten nuts securing bearing assemblies as this might cause damage to the fan chamber.
- After re-fitting bearing assembly always check alignment of pulleys.
- Replace belt cover.

APPENDIX 1

PIPE SIZING GUIDANCE: **(Fig 11)**

$$\dot{V} = \frac{\text{Gas flow } [m^3/h]}{f}$$

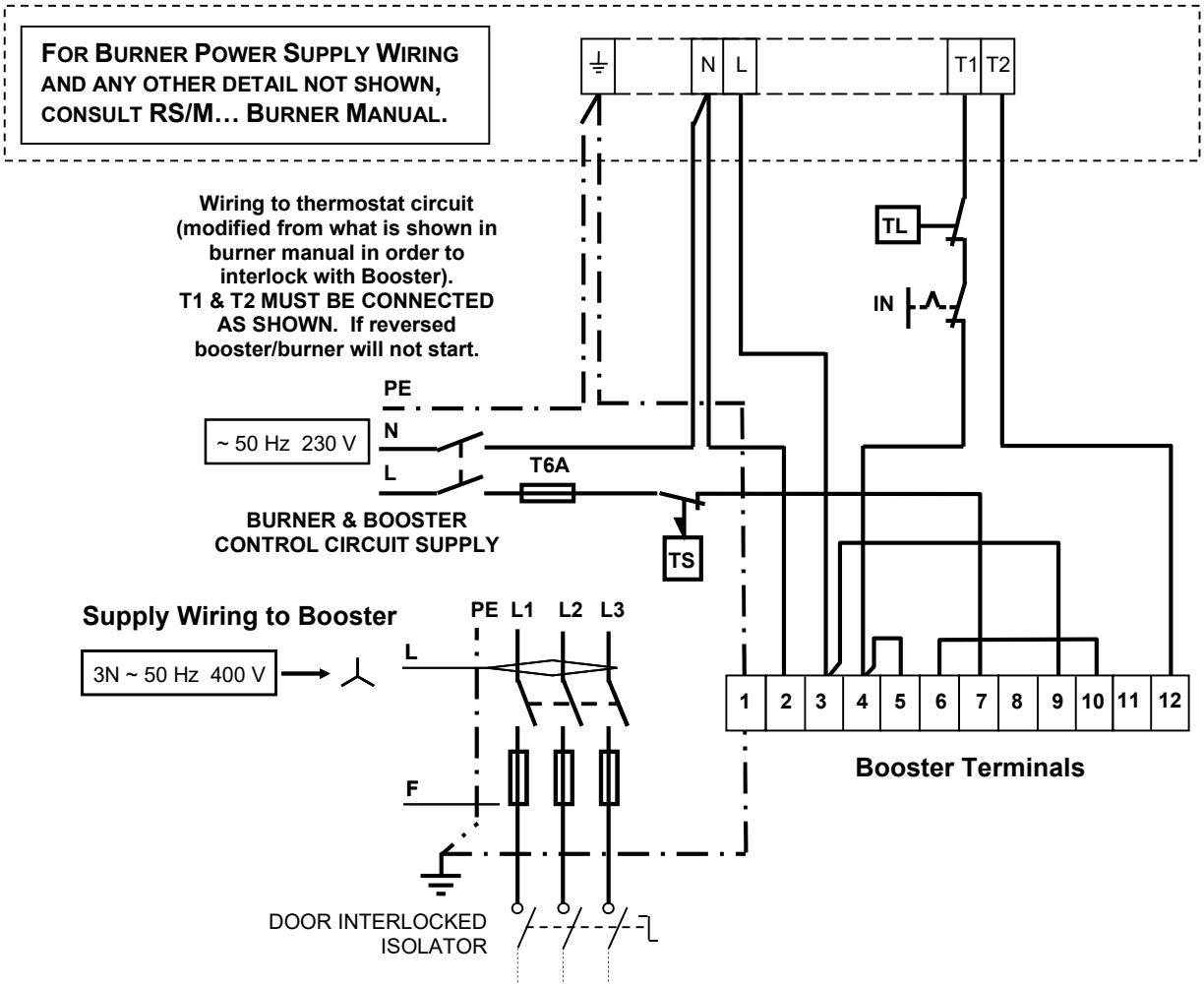
$$f = \begin{cases} 1 & \text{- G20} \\ 0{,}62 & \text{- G31} \\ 1{,}18 & \text{- G110} \end{cases}$$



APPENDIX 2

ADDITIONAL BURNER / BOOSTER ELECTRICAL CONNECTION DIAGRAMS:

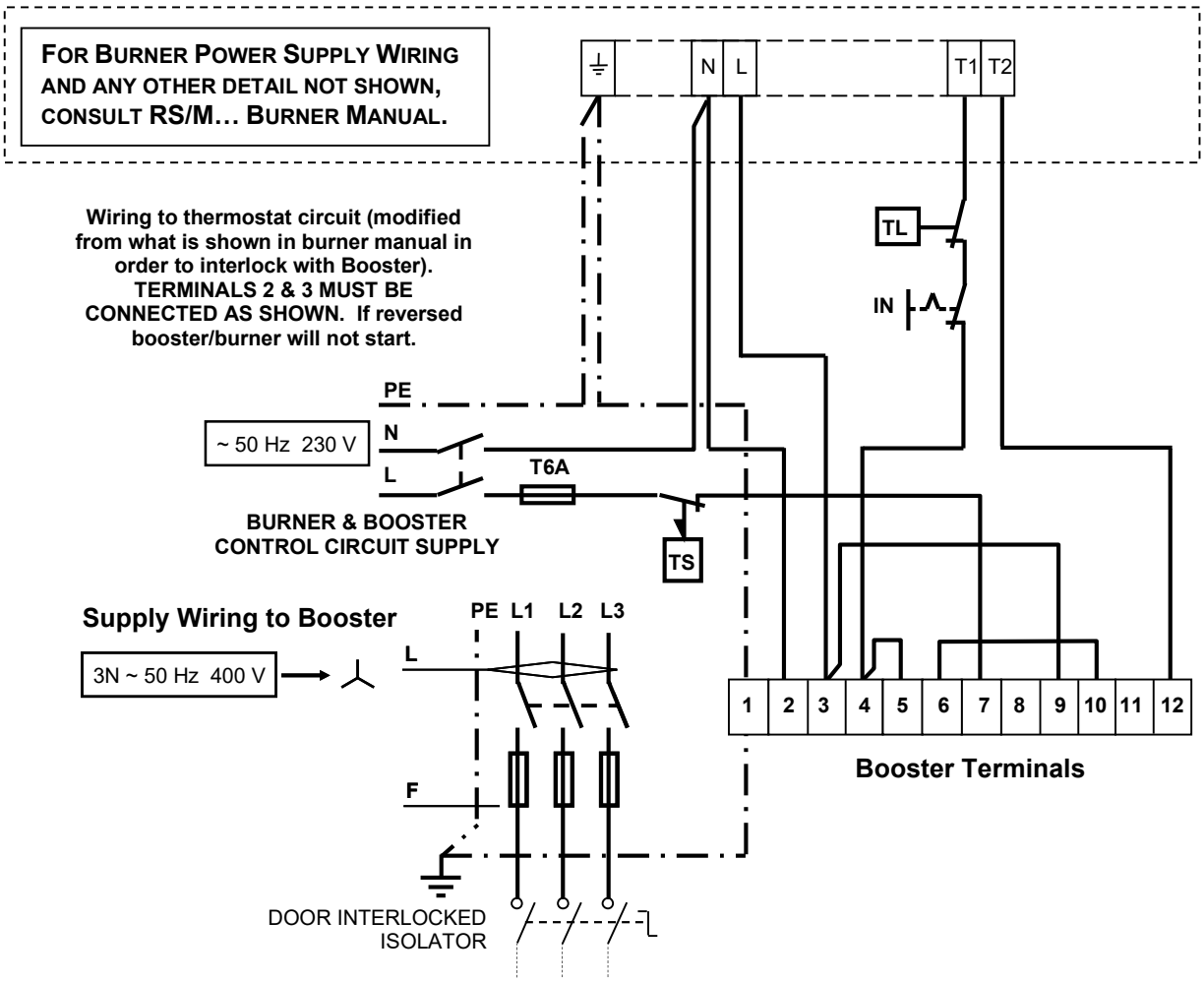
Connections to RS70/M, RS100/M, RS130/M, RS190/M **(Fig 12)**



Wired as above, booster will operate as follows;

Switch 'S' in ON position - Booster will RUN whenever burner has a Live feed.
Switch 'S' in AUTO position - Booster will RUN only when thermostat calling for heat.
Loss of inlet pressure - IP will shutdown booster and burner
(Bypassing IP, even temporarily, is a breach of the Gas Act and could cause a serious safety hazard.)
Loss of outlet pressure - OP will shutdown burner.

Connections to RS68/M BLU, RS120/M BLU, RS160/M BLU **(Fig 13)**



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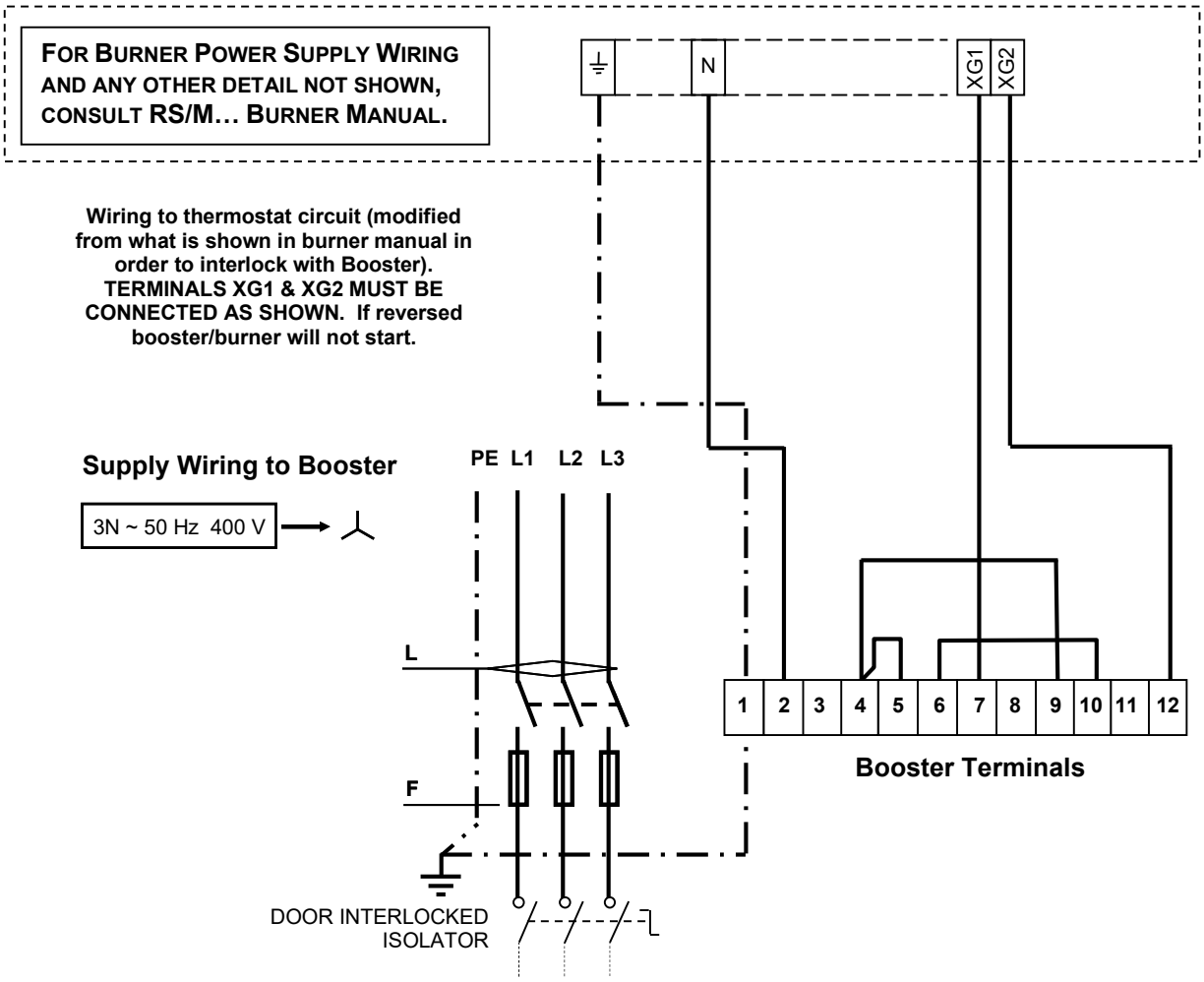
Switch 'S' in AUTO position - Booster will RUN only when thermostat calling for heat.
Loss of inlet pressure - IP will shutdown booster and burner
(Bypassing IP, even temporarily, is a breach of the Gas Act and could cause a serious safety hazard.)
Loss of outlet pressure - OP will shutdown burner.

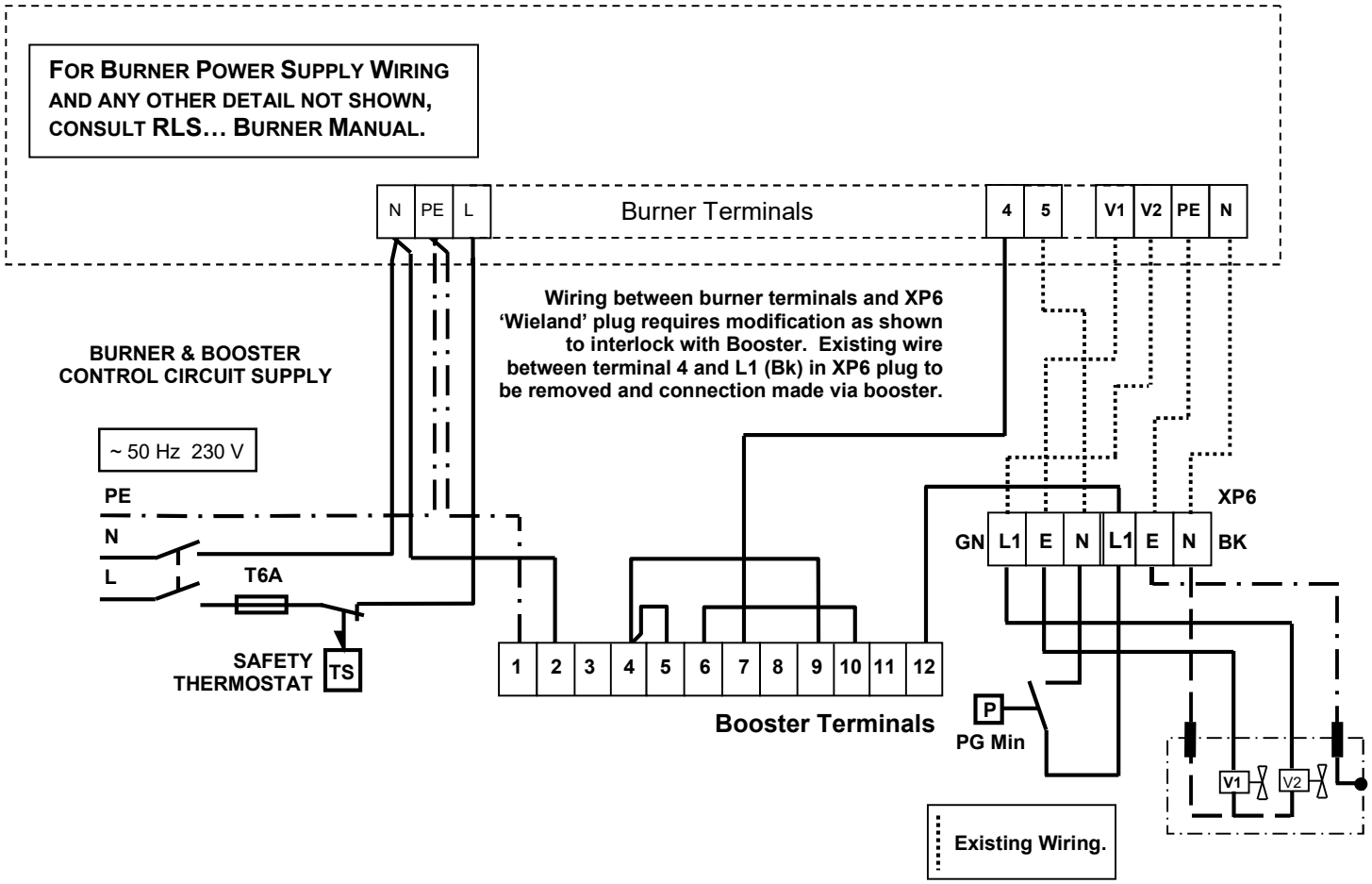
Connections to RS / RLS300/M BLU, 400/M BLU, 500/M BLU & 800/M BLU (**Fig 14**)



Wired as above, booster will operate as follows;

Switch 'S' in AUTO position - Booster will RUN only when thermostat calling for heat.
Loss of inlet pressure - IP will shutdown booster and burner
(Bypassing IP, even temporarily, is a breach of the Gas Act and could cause a serious safety hazard.)
Loss of outlet pressure - OP will shutdown burner.

Connections to RLS70, RLS100 & RLS130 (FIG 15)

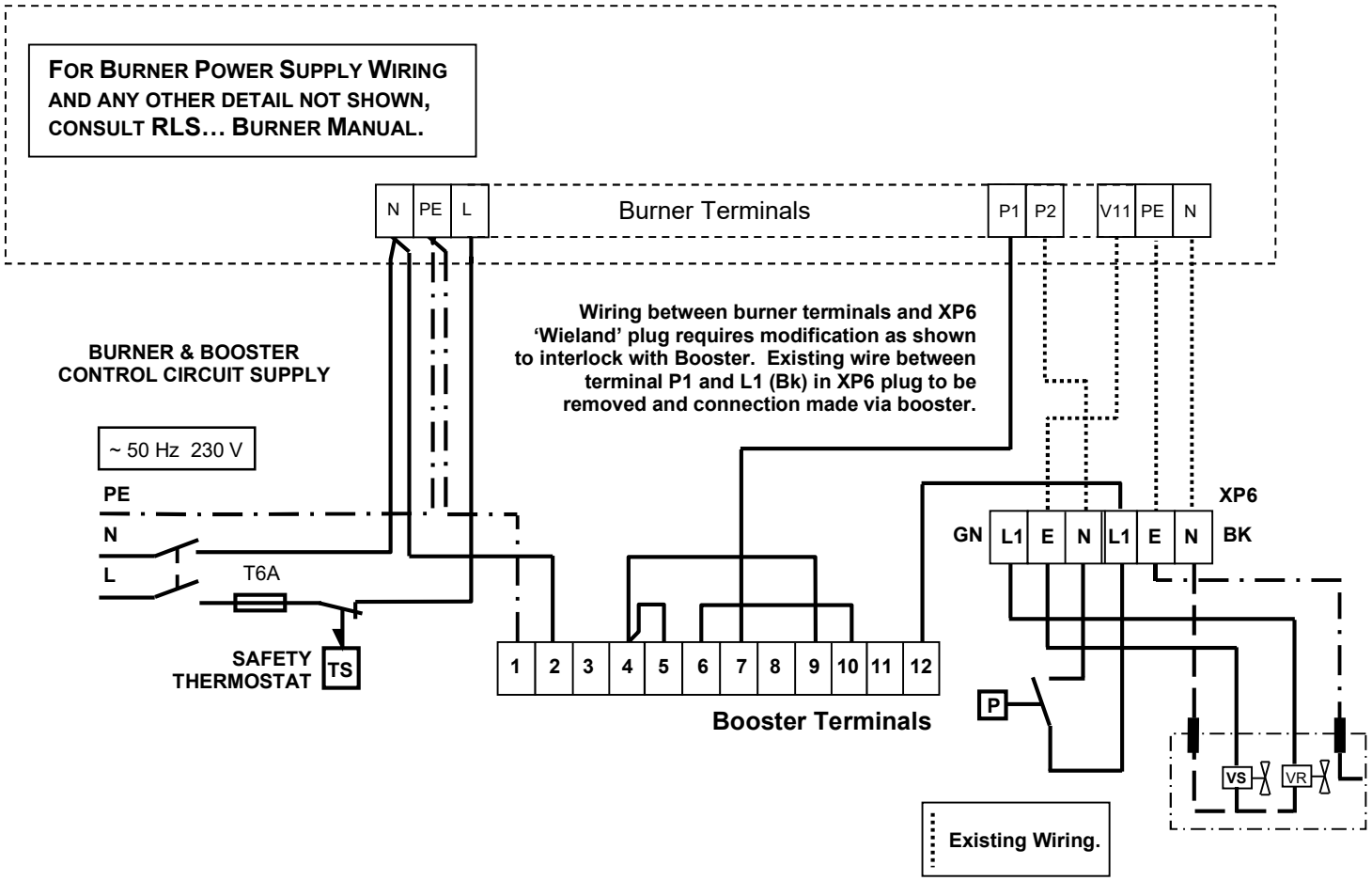


Wired as above, booster and burner will operate as follows;

Burner 'OIL-OFF-GAS' Switch
Switch in OIL position - Booster will not operate
Switch in GAS position - Booster will operate when burner required to fire

Booster Switch 'S'
Switch in AUTO position - Booster will RUN only when enabled by burner.
Loss of inlet pressure - IP will shutdown booster and burner
(Bypassing IP, even temporarily, is a breach of the Gas Act and could cause a serious safety hazard.)
Loss of outlet pressure - OP will shutdown burner.

Connections to RLS68/M MX, RLS120/M MX & RLS160/M MX (FIG 16)



Wired as above, booster and burner will operate as follows;

Burner 'OIL-OFF-GAS' Switch
Switch in OIL position - Booster will not operate
Switch in GAS position - Booster will operate when burner required to fire

Booster Switch 'S'
Switch in AUTO position - Booster will RUN only when enabled by burner.
Loss of inlet pressure - IP will shutdown booster and burner
(Bypassing IP, even temporarily, is a breach of the Gas Act and could cause a serious safety hazard.)
Loss of outlet pressure - OP will shutdown burner.

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