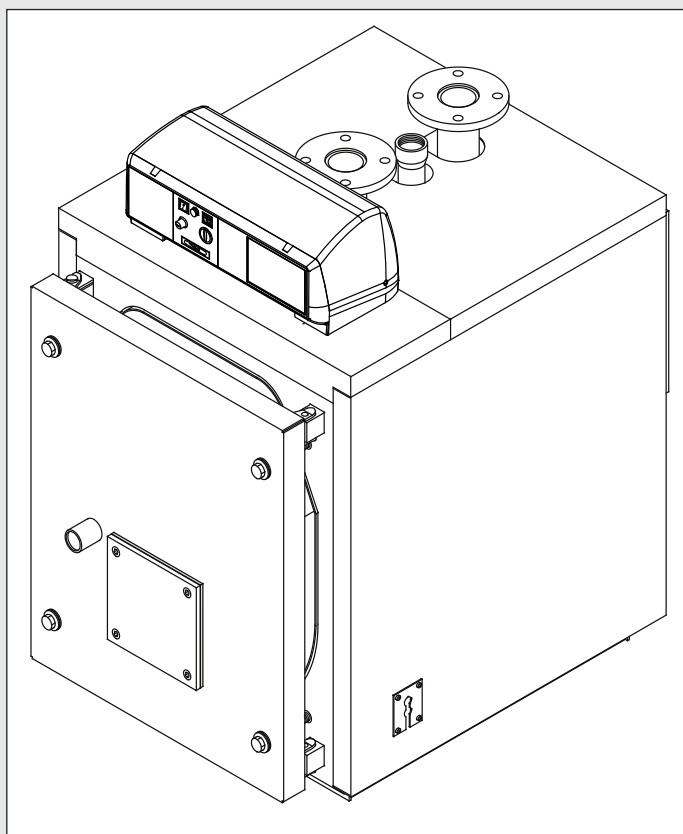


# Unical<sup>®</sup>

## *TRISTAR 2S*



**INSTALLATION, USE  
AND MAINTENANCE  
(to be kept by the consumer)**

# General information

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**Attention: this manual contains instructions for the exclusive use of the professionally qualified installer and/or maintenance technician in compliance with current legislation.**

**The user is NOT qualified to intervene on the boiler.**

**The manufacturer will not be held liable in case of damage to persons, animals or objects resulting from failure to comply with the instructions contained in the manuals supplied with the boiler.**

# 1 GENERAL INFORMATION

## 1.1 - SYMBOLS USED IN THE MANUAL

Pay special attention when reading this manual to the parts marked by the symbols:



**DANGER!**  
Serious danger for  
personal safety and life



**ATTENTION!**  
Possible hazardous situation  
for the product and the environment



**NOTE!**  
Suggestions for the  
user

## 1.2 - APPROPRIATE USE OF APPLIANCE



The TRISTAR 3G 2S appliance has been built according to the current level of engineering and acknowledged technical safety rules.

Nonetheless, if improperly used, dangers could arise for the safety and life of the user and other persons or damage to the equipment or other objects.

The appliance is intended to operate in hot air circulation heating systems. Any other use must be considered improper.

UNICAL shall not be held liable for any damage resulting from improper use; in this case the user is fully responsible for the risk.

Use according to the intended purposes also includes careful compliance with the instructions in this manual.

## 1.3 - WATER TREATMENT (see specific booklet)



- The hardness of the feed water conditions the frequency at which the domestic hot water exchanger must be cleaned.
- If the water has a hardness greater than 15°f, we recommend using water softeners, chosen according to the characteristics of the water.
- We recommend checking and cleaning the domestic hot water exchanger at the end of the first year of use and every two years thereafter; on this occasion, also check the state of wear of the anode.

## 1.4 - INFORMATION FOR SYSTEM MANAGER



- The user must be instructed concerning the use and operation of his heating system, in particular:
- Deliver these instructions to the user, as well as other documents concerning the appliance inserted in the envelope inside the packaging. The user must keep this documentation for future consultation.
- Inform the user about the importance of the air vents and the flue gas exhaust system, highlighting their essential features and the absolute prohibition of modifying them.
- Inform the user concerning controlling the system's water pressure as well as operations to restore it.
- Inform the user concerning correct temperature control, control units/thermostats and radiators for saving energy.
- Remember that the system must receive regular maintenance at least once a year and a combustion analysis must be performed in the timetable foreseen by standards in force.
- Should the appliance be sold or transferred to a new owner or if you move and leave the appliance, always make sure that the instruction booklet accompanies it in order to be consulted by the new owner and/or installer.

## General information

### 1.5 - SAFETY WARNINGS



#### **ATTENTION!**

The appliance must be installed, adjusted and maintained by professionally qualified personnel, in compliance with standards and provisions in force. Incorrect installation can cause damage to persons, animals and objects for which the manufacturer cannot be held responsible.



#### **DANGER!**

**NEVER** attempt performing maintenance or repairs on the boiler on your own initiative.

Any work must be done by professionally qualified personnel.

We recommend stipulating a maintenance contract.

Insufficient or irregular maintenance can jeopardise the operating safety of the appliance and cause damage to persons, animals and objects for which the manufacturer cannot be held responsible.



#### **Modifying parts connected to appliance**

Do not modify the following parts:

- the boiler
- the gas, air, water and electricity lines
- the flue gas pipe, safety valves and heating water drain pipe
- the construction parts which affect the operating safety of the appliance.



#### **Attention!**

To tighten or loosen the screwed fittings, use only appropriate fixed spanners.

Incompliant use and/or inappropriate tools can cause damage (e.g. water or gas leakage).



#### **ATTENTION!**

##### **Indications for propane gas-fired appliances**

Make sure that the gas tank has been deaerated before installing the appliance.

For state-of-the-art deaeration of the tank, contact the LPG supplier or a person qualified in compliance with law.

If the tank has not been professionally deaerated, ignition problems could arise.

In that case, contact the supplier of the LPG tank.



#### **Smell of gas**

Should a smell of gas be perceived, follow these safety guidelines:

- do not turn electric switches on or off
- do not smoke
- do not use the telephone
- close the gas shut-off valve
- air out the area where the gas leakage has occurred
- inform the gas supplier or a company specialised in installation and maintenance of heating systems.



#### **Explosive and easily flammable substances**

Do not use or store explosive or easily flammable materials (e.g. petrol, paints, paper) in the room where the appliance is installed.

## 1.6 - TECHNICAL DATA PLATE

The technical data plate is adhesive and is included in the document case; it must be applied by the installer on the outside of the casing.

The serial number of the boiler is on the riveted plaque on the front plate of the body (front right top side).

### CE marking

The CE marking certifies that the boilers meet:

- The essential requirements of the gas appliance directive (90/396/EEC).
- The essential requirements of the electromagnetic compatibility directive (89/336/EEC).
- The essential requirements of the efficiency directive (92/42/EEC).

Model	<input type="text"/>		
S.N°	<input type="text"/>	Year	<input type="text"/>
	GAS		SOLID
Fuel type:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1	2	3
Pn	<input type="text"/> kW	<input type="text"/> kW	
Pcond	<input type="text"/> kW	<input type="text"/> kW	
Qmax	<input type="text"/> kW	<input type="text"/> kW	
Adjusted Qn	<input type="text"/> kW	<input type="text"/> kW	
	<input type="text"/>	<input type="text"/>	
PIN	<input type="text"/>	<input type="text"/>	
	Stock <input type="text"/> l	PMS <input type="text"/> bar	T max <input type="text"/> °C
	Stock <input type="text"/> l	PMW <input type="text"/> bar	T max <input type="text"/> °C
	230 V - 50 Hz		
	See Burner - Vedi Bruciatore - Voir Bruleur		
Note:			

## Legenda

Symbol	EN	IT
Model	Boiler Model	Modello Caldaia
S.N° (*)	Serial Number: see on boiler body	Matricola: vedi il numero di fabbricazione sul corpo caldaia
Year	Year of manufacturing	Anno di costruzione
Fuel type:	Fuel 1 - Gas 2 - Oil 3 - Heavy Oil	Combustibile 1 - Gas 2 - Gasolio 3 - Nafta
Pn	Nominal OUTPUT	Potenza Utile nominale
Pcond	Condensing nom. output	Pot. Utile nom. in condensazione
Qn	Nominal heat INPUT	Portata Termica nominale
Adjusted Qn	Adj. for nom. heat input	Portata Termica Regolata a ...
CE	Surveillance notified body	Ente di sorveglianza CE
PIN	P.I.N. code	Numero Identificazione Prodotto
	BOILER heating circuit:	Circuito riscaldamento CALDAIA:
Stock	Water content	Contenuto acqua
PMS	Max. Working Pressure	Pressione Massima d'Esercizio
T.max	Max. Working Temperature	Temperatura Massima d'Esercizio
	D.H.W. TANK:	BOLLITORE A.C.S.
Stock	Water content	Contenuto acqua
PMW	Max. Working Pressure	Pressione Massima d'Esercizio
T.max	Max. Working Temperature	Temperatura Massima d'Esercizio
	Electrical power supply	Alimentazione Elettrica
	Destination Countries: ( SEE BURNER )	Paesi di destinazione: ( vedi bruciatore )
Note	( Condensing boiler )	( caldaia a condensazione )

### ATTENTION

Wherever the boiler operates with an air-blown gas-fired burner, the appliance, not belonging to any category among those considered in Annex II of the Legislative Decree 93 of 25/02/2000 (Implementation of the Directive 97/23/EC regarding pressurised equipment), and moreover being considered by the Directive 90/396/EEC (Gas-fired appliances - transposed in Italy with Italian Presidential Decree 661 of 15/11/1996) to which art. 1 comma 3 paragraph "f.5" refers, is excluded from the range of application of the decree itself.

### 1.7 - GENERAL WARNINGS

The instruction booklet is an integral and essential part of the product and must be kept by the user or system manager.

Read the warnings contained in this instruction booklet carefully as they provide important guidelines regarding installation, use and maintenance safety.

Keep the booklet with care for further consultation.

Installation and maintenance must be performed in compliance with standards in force according to the instructions of the manufacturer and by qualified and certified personnel in compliance with law.

By professionally qualified personnel we mean: personnel with specific technical skill in the field of heating system components for civil use, domestic hot water production and maintenance. Personnel must have the qualifications provided for by current legislation.

Incorrect installation or improper maintenance can cause damage to persons, animals or objects for which the manufacturer is not responsible.

Before performing any cleaning or maintenance, disconnect the appliance from the energy mains by acting on the switch of the system and/or through the specific cut-off devices.

Do not obstruct the terminals of the intake/exhaust ducts.

In case of failure and/or malfunctioning of the appliance, switch it off and do not try to repair it or intervene on it directly. Contact only personnel qualified in compliance with law.

Any repairs must be performed solely by personnel authorised by Unical using original spare parts only. Failure to comply with the above can jeopardise the safety of the appliance.

To guarantee appliance efficiency and its correct operation, yearly maintenance must be performed by qualified personnel.

Should you decide not to use the appliance, parts entailing potential sources of hazard must be made safe.

Should the appliance be sold or transferred to a new owner or if you move and leave the appliance, always make sure that the instruction booklet accompanies it in order to be consulted by the new owner and/or installer.

Only original accessories must be used for all appliances with optionals or kits (including electric).

This appliance is intended solely for the use for which it was expressly designed. Any other use is to be considered improper and therefore dangerous.

2

## TECHNICAL FEATURES AND DIMENSIONS

### 2.1 - TECHNICAL FEATURES

TRISTAR 2S boilers are the horizontal cylindrical type with flame inversion in furnace and third flue gas pass in tubes.

The construction fully complies with prescriptions laid down in EN 303 part 1.

The components of the pressurised part, such as sheets and pipes, are made in certified carbon steel, according to the EURONORM 25 and EURONORM 28 tables.

Welding devices and procedures are approved by TÜV (D) - UDT (PL) - SA (S) and ISPESL (I).

Up until model TST 560 2S, the furnace is bonded to the rear tube plate.

For models TST 680 2S ÷ TST 3100 2S, the furnace is free to expand (it is only sustained by the front tube plate).

For models from TST 3500 to TST 6100, the furnace is bonded to the rear tube plate.

The boilers are equipped with an opening door on the right or left. The outer shell is covered with a glass wool insulation mattress 60 mm thick (from model TST 80 2S to model TST 250 2S), 80 mm thick (from model TST 300 2S to model TST 560 2S), 100 mm thick (from model TST 680 2S to model TST 2350 2S), 80

mm thick (from model TST 2700 2S to model TST 3500 2S), in turn protected by a mineral fibre fabric.

From models from TST 3900 2S to TST 6100 2S the outer shell is covered with a lamella mat 50 mm thick, in turn protected by an aluminium sheet.

The top part of the shell is provided with hooks for lifting the boiler. Note: TRISTAR 3G 2S boilers are intended to operate with ON/OFF type GAS burners; as an alternative, they can be equipped with a dual-stage or modulating burner, as long as the minimum heat output in the first flame or in modulation does not drop below 60% the furnace load.

The boilers are provided with two ½" connections for conduits with an inside diameter of 15 mm (suitable to house 3 bulbs each).

The shell has holes at the sides for the cable glands of the power, pumps, burner cables and those of any other auxiliary device.

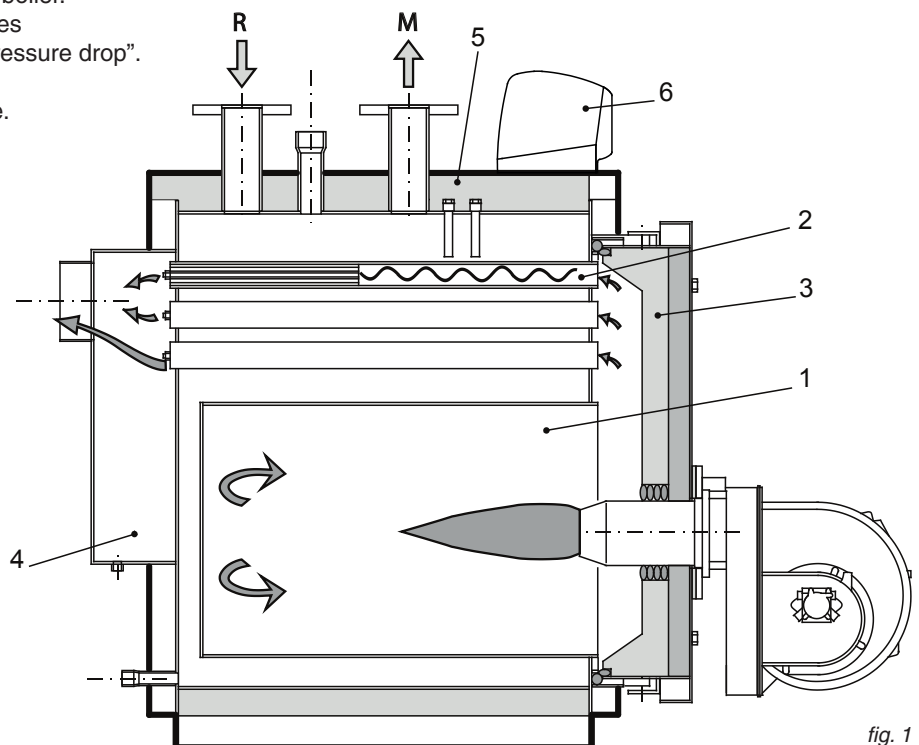
### 2.2 - MAIN COMPONENTS

TRISTAR 2S boilers are equipped with a blind cylindrical furnace, in which the central flame of the burner is reversed peripherally towards the front, from whence the combustion gases enter the smoke pipes. At the end of the pipes they are gathered in the smoke chamber and sent to the chimney.

The combustion chamber is always pressurised while the burner is operating, within the power range of the boiler.

For the value of this pressure, see the tables on pages 9÷14, in the column "Flue gas pressure drop".

The chimney must be calculated so that no positive pressure is detected at its base.



- 1 Furnace
- 2 Smoke pipes with smoke diverters (from model TST 300 2S)
- 3 Door with flame control warning light
- 4 Smoke chamber
- 5 Body insulation
- 6 Panel board

fig. 1

## Technical features and dimensions

### 2.3 - SMOKE TURBULATORS

TRISTAR boilers are designed to be used within an output range in order to improve seasonal efficiency and coupling with each heating system.

The heat output must therefore be adjusted upon commissioning, based on the guidelines of the Thermotechnical Engineer, and always within the range provided for each boiler on pages 9 - 14 by the burner technician who will determine the fuel flow rate.

In all cases, **turbulators must be positioned inside their respective smoke pipes, resting on the internal aluminium profiles.**

The burner must be commissioned under the responsibility of a qualified burner technician authorised by the manufacturer.

On that occasion, a complete operating report must be drafted.

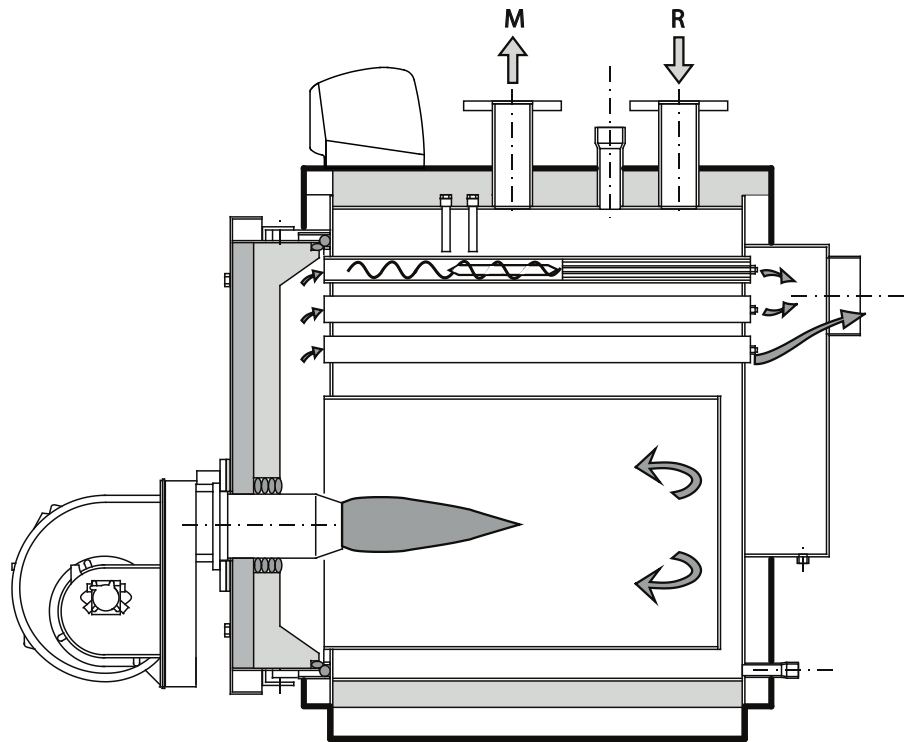
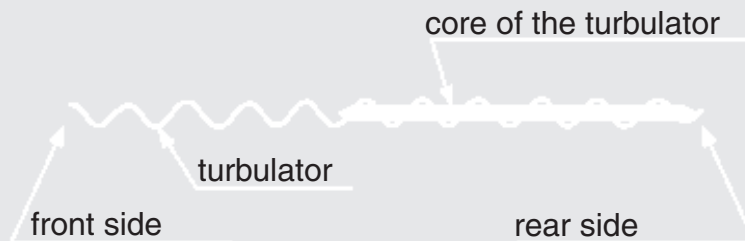


fig. 2

#### POSITIONING OF THE CORE INSIDE THE TURBULATOR (ONLY for MODELS from TST 300 2S to TST 870 2S)





# Technical features and dimensions

## 2.4 - DIMENSIONS - TRISTAR 80÷250 2S

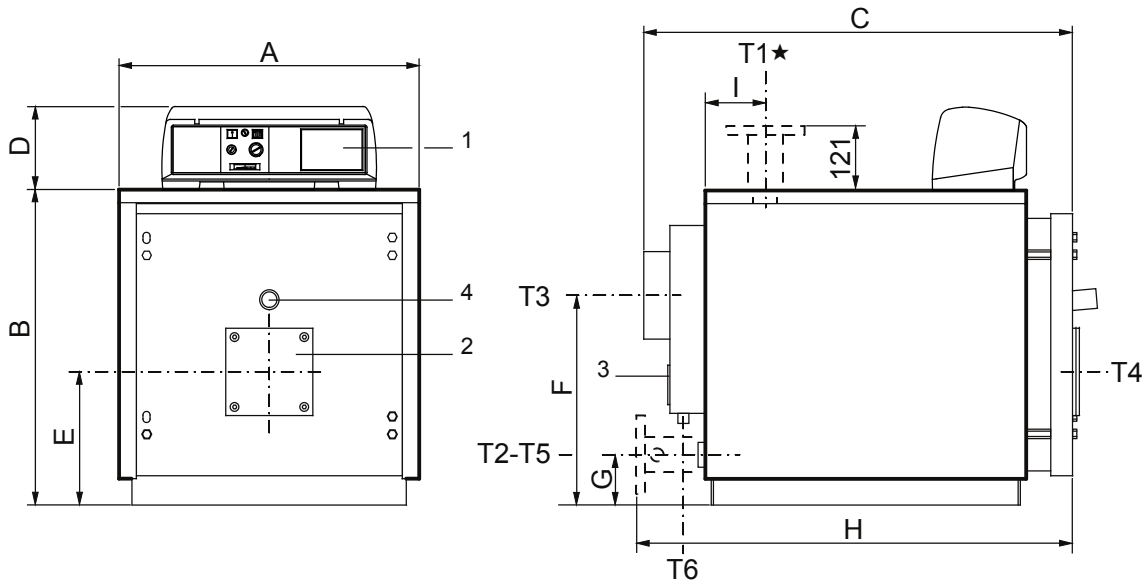


fig. 3

- 1 Panel board
- 2 Burner connection flange
- 3 Smoke chamber cleaning door
- 4 Flame control warning light
- T1 Heating flow
- T2 Heating return
- T3 Chimney connection
- T4 Burner connection
- T5 Boiler drain
- T6 Condensation drain

TRISTAR 2S	Useful output	Furnace output	Boiler capacity	Water side pressure drop (**)	Flue gas pressure drop	Maximum operating pressure boiler bar	Weight	T1 T2 UNI 228 UNI 2278 PN16	CONNECTIONS			
Model	kW	kW	l	m.w.c.	mm.w.c.		kg		T3 Øe mm	T4 Øi mm	T5 UNI 228	T6 Øe mm
<b>TST 80 2S</b>	60÷80	63.3÷85.2	86	0.08÷0.15	3.8÷6.8	5	221	G 1½	200	130	G ¾	40
<b>TST 120 2S</b>	90÷120	94.6÷127.4	126	0.06÷0.11	6.1÷10.8	5	325	G 2	200	180	G ¾	40
<b>TST 160 2S</b>	120÷160	125.8÷169.4	151	0.11÷0.20	8.9÷15.8	5	366	G 2	200	180	G ¾	40
<b>TST 200 2S</b>	150÷200	157÷211.3	203	0.10÷0.17	11.1÷19.7	5	505	DN 65	250	180	G ¾	40
<b>TST 250 2S</b>	187.5÷250	195.8÷263.6	247	0.12÷0.22	13.3÷23.6	5	583	DN 65	250	180	G ¾	40

TRISTAR 2S DIMENSIONS									
Model	A mm	B mm	C mm	D mm	E mm	F mm	G mm	H mm	I mm
<b>TST 80 2S</b>	690	722	995	190	305	480	115	--	147
<b>TST 120 2S</b>	760	812	1210	190	350	500	130	--	157
<b>TST 160 2S</b>	760	812	1390	190	350	500	130	--	157
<b>TST 200 2S</b>	860	937	1442	190	421	580	165	1487	258
<b>TST 250 2S</b>	860	937	1692	190	421	580	165	1737	258

(\*) In the TRISTAR 200 2S and TRISTAR 250 2S models, connections T1 and T2 are flanged.

(\*\*) Pressure drops corresponding to a thermal variation of 15K.

### DETAIL FOR DOOR DRILLING TST 80 2S

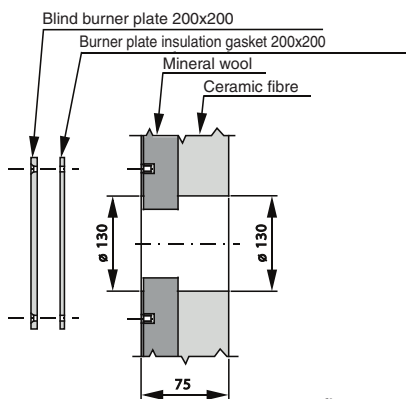


fig. 4

### DETAIL FOR DOOR DRILLING TST 120 2S÷TST 250 2S

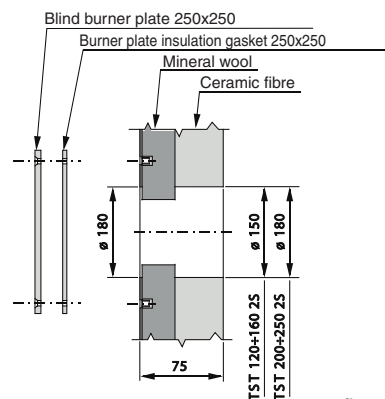
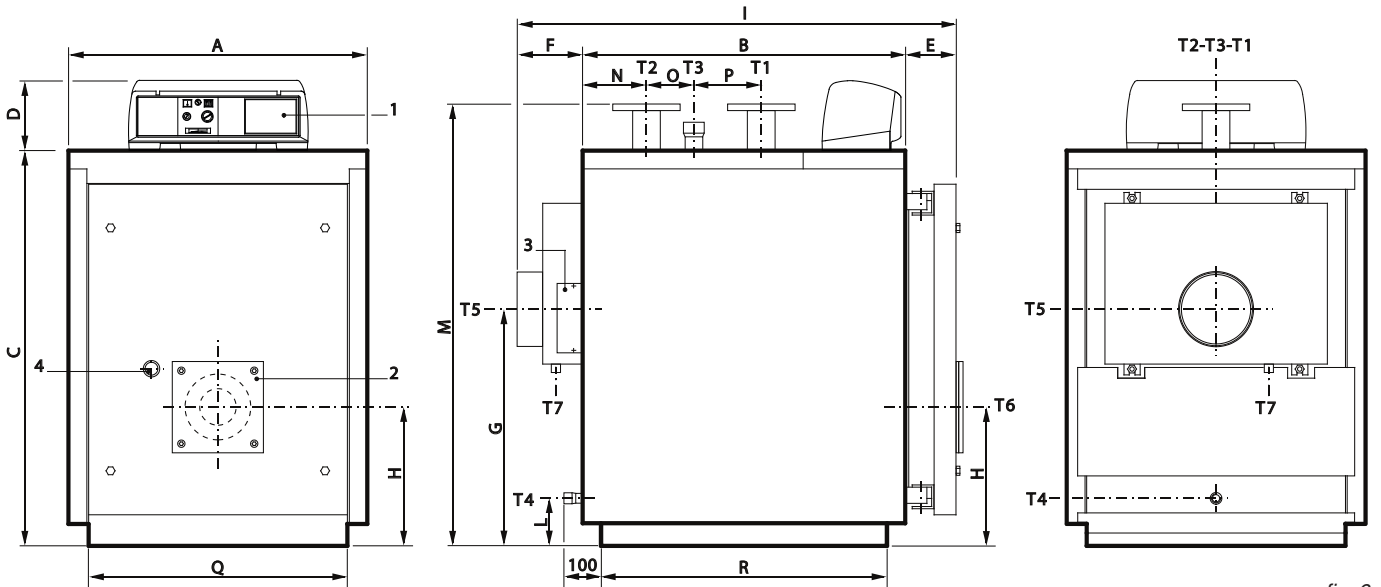


fig. 5

# Technical features and dimensions

## TRISTAR 300÷560 2S



- 1 Panel board
- 2 Burner connection flange
- 3 Smoke chamber cleaning door
- 4 Flame control warning light

- T1 Heating flow
- T2 Heating return
- T3 Expansion vessel connection
- T4 Boiler drain

- T5 Chimney connection
- T6 Burner connection
- T7 Condensation drain

fig. 6

TRISTAR 2S	Useful output	Furnace output	Boiler capacity	Water side pressure drop (**)	Flue gas pressure drop	Maximum operating pressure boiler	Weight	CONNECTIONS					
								T1 T2	T3	T4	T5	T6	T7
Model	kW	kW	l	m.w.c.	mm.w.c.	bar	kg	UNI 2278 PN16	UNI 228	UNI 228	Øi mm	Ø mm	Øe mm
<b>TST 300 2S</b>	225÷300	234.6÷315.8	298	0.12÷0.22	15.9÷28.4	6	665	DN 80	G 2	G ¾	250	220	40
<b>TST 370 2S</b>	277.5÷370	288.8÷388.7	398	0.08÷0.14	18.1÷32.2	6	845	DN 100	G 2	G ¾	250	220	40
<b>TST 450 2S</b>	337.5÷450	351÷472.4	462	0.11÷0.20	20.2÷35.8	6	986	DN 100	G 2	G ¾	250	220	40
<b>TST 560 2S</b>	420÷560	436.8÷587.9	565	0.17÷0.30	23.7÷42.1	6	1119	DN 100	G 2	G ¾	300	220	40

TRISTAR 2S		DIMENSIONS															
Model	A	B	C	D	E	F	G	H	I	L	M*	N	O	P	Q*	R*	
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	
<b>TST 300 2S</b>	860	1210	1182	190	140	191	708	400	1541	130	<b>1310</b>	215	340	250	<b>750</b>	<b>1112</b>	
<b>TST 370 2S</b>	890	1275	1352	190	140	191	748	440	1606	125	<b>1485</b>	255	285	315	<b>780</b>	<b>1177</b>	
<b>TST 450 2S</b>	890	1470	1352	190	140	191	748	440	1801	125	<b>1485</b>	255	480	315	<b>780</b>	<b>1372</b>	
<b>TST 560 2S</b>	890	1780	1352	190	141	192	748	440	2113	125	<b>1485</b>	255	790	315	<b>780</b>	<b>1684</b>	

(\*) Minimum dimensions for boiler room access.

(\*\*) Pressure drops corresponding to a thermal variation of 15K.

### DETAIL FOR DOOR DRILLING TST 300 2S÷TST 560 2S

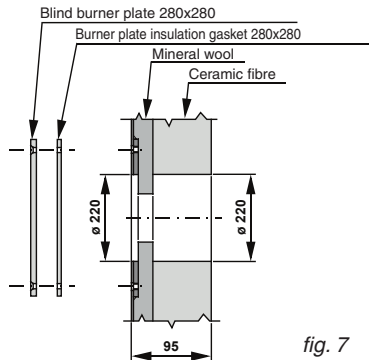


fig. 7

## Technical features and dimensions

### TRISTAR 680÷870 2S

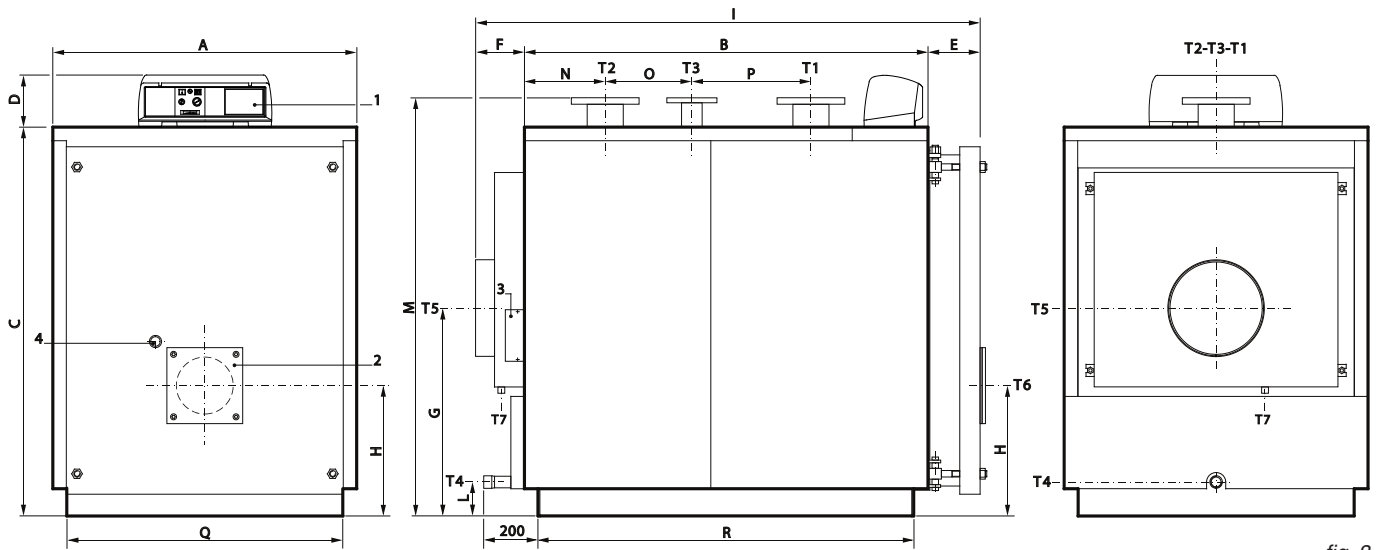


fig. 8

1 Panel board

2 Burner connection flange

3 Smoke chamber cleaning door

4 Flame control warning light

T1 Heating flow

T2 Heating return

T3 Expansion vessel connection

T4 Boiler drain

T5 Chimney connection

T6 Burner connection

T7 Condensation drain

TRISTAR 2S	Furnace output	Furnace output	Boiler capacity	Flue gas pressure drop(**)	Flue gas pressure drop	Maximum operating pressure boiler	Weight	CONNECTIONS					
								T1	T3	T4	T5	T6	T7
Model	kW	kW	l	m.w.c.	mm.w.c.	bar	kg	UNI 2278 PN16	UNI 2278 PN16	UNI 228	Øi mm	Ø mm	Øe mm
<b>TST 680 2S</b>	510÷680	530.4÷713.9	671	0.12÷0.21	27.8÷49.4	6	1435	DN 125	DN 65	G 1¼	350	270	40
<b>TST 780 2S</b>	585÷780	608.4÷818.9	753	0.15÷0.27	30.7÷54.5	6	1557	DN 125	DN 65	G 1¼	350	270	40
<b>TST 870 2S</b>	652.5÷870	678.6÷913.4	836	0.19÷0.33	33÷58.6	6	1656	DN 125	DN 65	G 1¼	350	270	40

TRISTAR 2S		DIMENSIONS														
Model	A mm	B mm	C mm	D mm	E mm	F mm	G mm	H mm	I mm	L mm	M* mm	N mm	O mm	P mm	Q* mm	R* mm
<b>TST 680 2S</b>	1122	1605	1432	190	195	190	765	480	1989	125	1540	298	435	440	1020	1504
<b>TST 780 2S</b>	1122	1800	1432	190	195	190	765	480	2184	125	1540	298	630	440	1020	1699
<b>TST 870 2S</b>	1122	1995	1432	190	195	190	765	480	2379	125	1540	298	825	440	1020	1894

(\*) Minimum dimensions for boiler room access.

(\*\*) Pressure drops corresponding to a thermal variation of 15K.

#### DETAIL FOR DOOR DRILLING TST 680 2S÷TST 870 2S

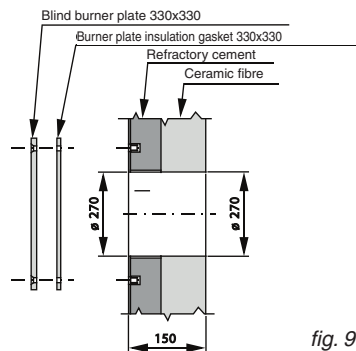


fig. 9

# Technical features and dimensions

## TRISTAR 1000÷2350 2S

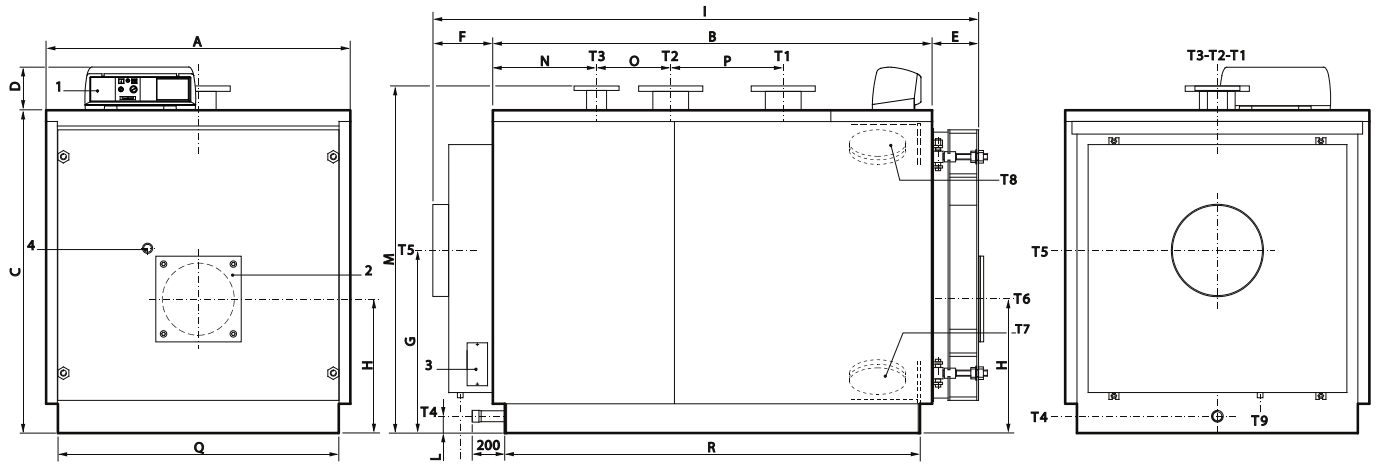


fig. 10

- 1 Panel board
- 2 Burner connection flange
- 3 Smoke chamber cleaning door
- 4 Flame sight glass

- T1 Heating flow
- T2 Heating return
- T3 Expansion vessel connection
- T4 Boiler drain

- T5 Chimney connection
- T6 Burner connection
- T7 Boiler air bleed
- T8 Inspection door

- T9 Condensation drain

TRISTAR 2S Model	Useful output kW	Furnace output kW	Boiler capacity l	Water side pressure drop(**) m.w.c.	Flue gas pressure drop mm.w.c.	Maximum operating pressure boiler bar	Weight kg	CONNECTIONS					
								T1 T2 UNI 2278 PN16	T3 UNI 2278 PN16	T4 UNI 228	T5 Øi mm	T6 Ø mm	T9 Øe mm
TST 1000 2S	750÷1000	780÷1049.8	1040	0.11÷0.19	35.9÷63.9	6	1970	DN 150	DN 80	G 1½	400	320	40
TST 1180 2S	885÷1180	920.4÷1238.8	1242	0.15÷0.26	38.6÷68.6	6	2175	DN 150	DN 80	G 1½	400	320	40
TST 1400 2S	1050÷1400	1092÷1469.8	1418	0.15÷0.26	42.1÷74.9	6	2975	DN 175	DN 100	G 1½	450	320	40
TST 1650 2S	1237.5÷1650	1287÷1732.3	1617	0.20÷0.36	45.5÷80.9	6	3465	DN 175	DN 100	G 1½	450	320	40
TST 2000 2S	1500÷2000	1560÷2099.7	2086	0.16÷0.28	40.5÷72	6	4390	DN 200	DN 125	G 1½	520	380	40
TST 2350 2S	1762.5÷2350	1833÷2467.1	2324	0.21÷0.38	43.2÷76.9	6	4700	DN 200	DN 125	G 1½	520	380	40

TRISTAR 2S Model	DIMENSIONS															
	A mm	B mm	C mm	D mm	E mm	F mm	G mm	H mm	I mm	L mm	M* mm	N mm	O mm	P mm	Q* mm	R* mm
TST 1000 2S	1352	1952	1432	190	207	187	810	595	2346	180	1540	461	330	500	1250	1846
TST 1180 2S	1352	2292	1432	190	207	187	810	595	2686	180	1540	461	670	500	1250	2186
TST 1400 2S	1462	2282	1542	190	227	272	880	640	2781	75	1650	561	510	550	1360	2176
TST 1650 2S	1462	2652	1542	190	227	272	880	640	3151	75	1650	561	880	550	1360	2546
TST 2000 2S	1622	2692	1702	190	259	274	950	690	3225	75	1810	661	670	700	1520	2590
TST 2350 2S	1622	3014	1702	190	258	273	950	690	3545	75	1810	662	990	700	1520	2910

(\*) Minimum dimensions for boiler room access.

(\*\*) Pressure drops corresponding to a thermal variation of 15K.

### DETAIL FOR DOOR DRILLING TST 1000 2S÷TST 1180 2S

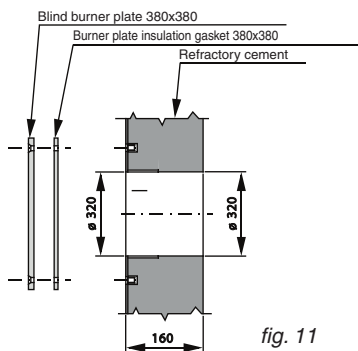


fig. 11

### DETAIL FOR DOOR DRILLING TST 1400 2S÷TST 1650 2S

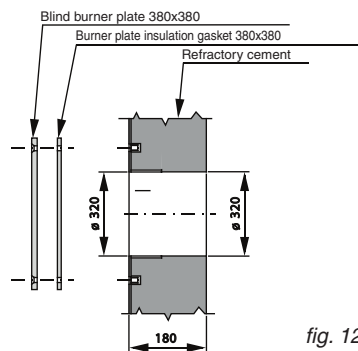


fig. 12

### DETAIL FOR DOOR DRILLING TST 2000 2S÷TST 2350 2S

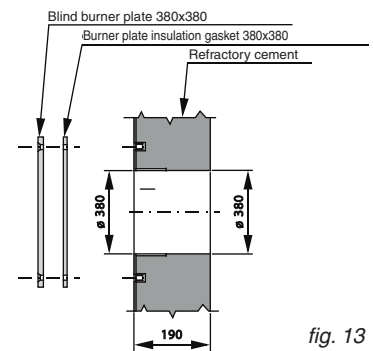


fig. 13

# Technical features and dimensions

## TRISTAR 2700÷3500 2S

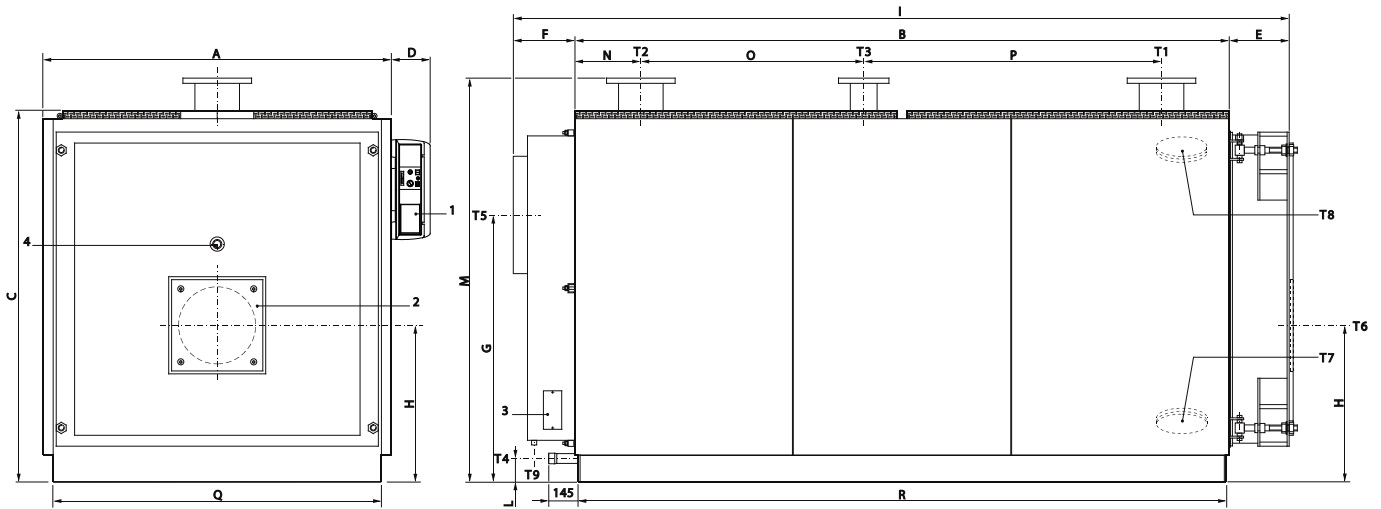


fig. 14

- |                               |                                |                       |                       |
|-------------------------------|--------------------------------|-----------------------|-----------------------|
| 1 Panel board                 | T1 Heating flow                | T5 Chimney connection | T9 Condensation drain |
| 2 Burner connection flange    | T2 Heating return              | T6 Burner connection  |                       |
| 3 Smoke chamber cleaning door | T3 Expansion vessel connection | T7 Boiler air bleed   |                       |
| 4 Flame sight glass           | T4 Boiler drain                | T8 Inspection door    |                       |

TRISTAR 2S	Useful output kW	Furnace output kW	Boiler capacity l	Water side pressure drop(**) m.w.c.	Flue gas pressure drop mm.w.c.	Maximum operating pressure boiler bar	Weight kg	CONNECTIONS				
								T1 T2 UNI 2278 PN16	T3 UNI 2278 PN16	T4 UNI 228	T5 Øi mm	T6 Ø mm
<b>TST 2700 2S</b>	2025÷2700	2106÷2834.6	2667	0.28÷0.50	45.6÷81	6	5370	DN 200	DN 125	G 1½	570	380
<b>TST 3100 2S</b>	2325÷3100	2418.1÷3254.5	4142	0.37÷0.66	43.3÷76.9	6	6990	DN 200	DN 125	G 1½	620	400
<b>TST 3500 2S</b>	2625÷3500	2730.1÷3674.5	4455	0.37÷0.65	50.4÷89.5	6	7790	DN 250	DN 125	G 1½	620	400

TRISTAR 2S	DIMENSIONS															
	Model	A mm	B mm	C mm	D mm	E mm	F mm	G mm	H mm	I mm	L mm	M* mm	N mm	O mm	P mm	Q* mm
<b>TST 2700 2S</b>	1720	3230	1830	190	295	310	1315	772	3835	115	<b>1990</b>	325	1100	1470	<b>1620</b>	<b>3200</b>
<b>TST 3100 2S</b>	1970	3194	2090	190	325	360	1535	915	3879	144	<b>2271</b>	377	1060	1420	<b>1870</b>	<b>3164</b>
<b>TST 3500 2S</b>	1970	3594	2090	190	325	360	1535	915	4279	144	<b>2271</b>	777	1060	1420	<b>1870</b>	<b>3564</b>

(\*) Minimum dimensions for boiler room access.

(\*\*) Pressure drops corresponding to a thermal variation of 15K.

### DETAIL FOR DOOR DRILLING TST 2700 2S

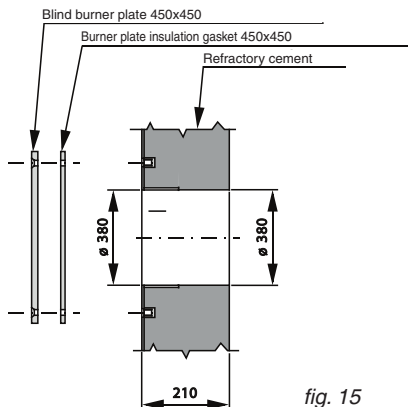


fig. 15

### DETAIL FOR DOOR DRILLING TST 3100 2S÷TST 3500 2S

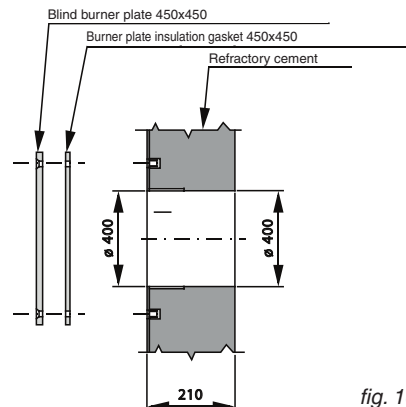


fig. 16

# Technical features and dimensions

## TRISTAR 3900÷6100 2S

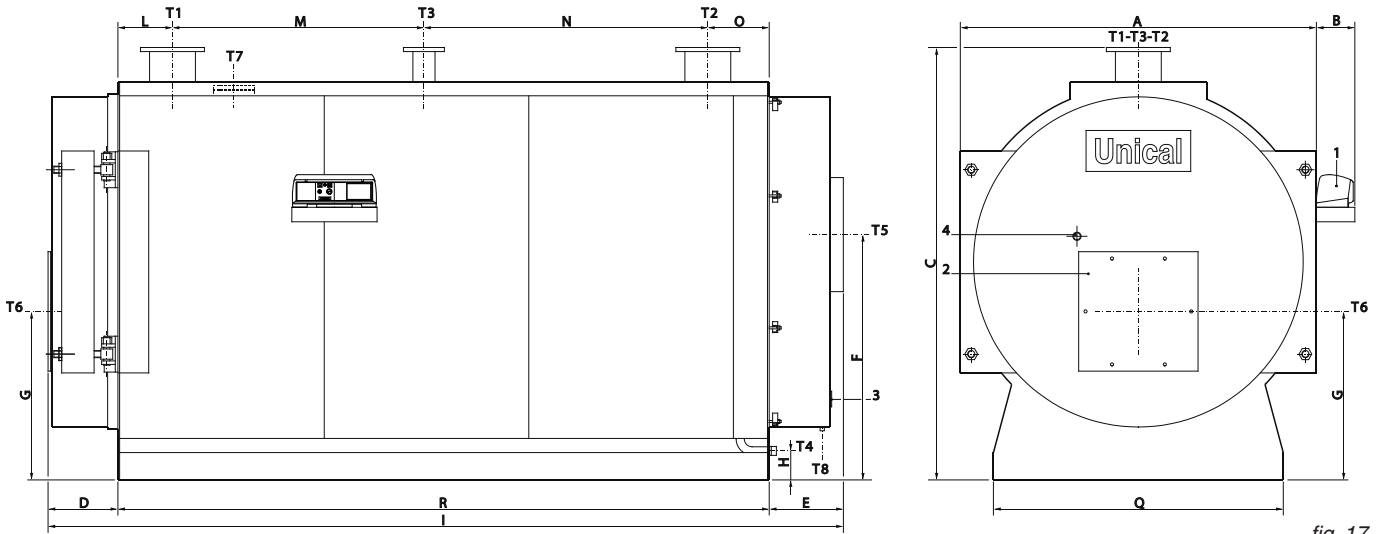


fig. 17

- 1 Panel board
- 2 Burner connection flange
- 3 Smoke chamber cleaning door
- 4 Flame sight glass
- T1 Heating flow
- T2 Heating return
- T3 Expansion vessel connection
- T4 Boiler drain

- T5 Chimney connection
- T6 Burner connection
- T7 Inspection door
- T8 Condensation drain

TRISTAR 2S	Useful output	Furnace output	Boiler capacity	Water side pressure drop(**)	Flue gas pressure drop	Maximum operating pressure boiler bar	Weight	CONNECTIONS							
								T1 T2	T3	T4	T5	T6	T7	T8	
Model	kW	kW	l	m.w.c.	mm.w.c.		kg	UNI 2278 PN16	UNI 2278 PN16	ISO 7/1	Øi mm	Ø mm	Ø mm	Øe mm	
<b>TST 3900 2S</b>	2925÷3900	3042.1÷4094.4	6012	0.28÷0.50	44.4÷78.6	6	8630	DN 250	DN 125	Rp 1½	660	500	133	40	
<b>TST 4400 2S</b>	3300÷4400	3432.1÷4619.3	6012	0.35÷0.63	56.6÷100.5	6	8630	DN 250	DN 125	Rp 1½	660	500	133	40	
<b>TST 4800 2S</b>	3600÷4800	3744.1÷5039.3	7058	0.42÷0.75	50.5÷92.2	6	9675	DN 250	DN 125	Rp 1½	660	500	133	40	
<b>TST 5200 2S</b>	3900÷5200	4056.1÷5459.2	7058	0.50÷0.88	59.3÷105.4	6	9675	DN 250	DN 125	Rp 1½	660	500	133	40	
<b>TST 5700 2S</b>	4275÷5700	4446.1÷5984.1	7909	0.59÷1.05	49.5÷90.5	6	13060	DN 250	DN 125	Rp 1½	720	500	133	40	
<b>TST 6100 2S</b>	4575÷6100	4758.1÷6404.1	7909	0.68÷1.21	56.7÷100.7	6	13060	DN 250	DN 125	Rp 1½	720	500	133	40	

TRISTAR 2S		DIMENSIONS													
Model	A mm	B mm	C* mm	D mm	E mm	F mm	G mm	H mm	I mm	L mm	M mm	N mm	O mm	Q* mm	R* mm
<b>TST 3900 2S</b>	2088	226	<b>2533</b>	417	485	1437	987	170	4738	323	1475	1665	363	<b>1700</b>	<b>3826</b>
<b>TST 4400 2S</b>	2088	226	<b>2533</b>	417	485	1437	987	170	4738	323	1475	1665	363	<b>1700</b>	<b>3826</b>
<b>TST 4800 2S</b>	2214	240	<b>2653</b>	437	515	1550	1007	167	4928	323	1475	1815	363	<b>1700</b>	<b>3976</b>
<b>TST 5200 2S</b>	2214	240	<b>2653</b>	437	515	1550	1007	167	4928	323	1475	1815	363	<b>1700</b>	<b>3976</b>
<b>TST 5700 2S</b>	2380	240	<b>2860</b>	509	595	1650	1100	224	5484	325	2920	670	465	<b>1850</b>	<b>4380</b>
<b>TST 6100 2S</b>	2380	240	<b>2860</b>	509	595	1650	1100	224	5484	325	2920	670	465	<b>1850</b>	<b>4380</b>

(\*) Minimum dimensions for boiler room access.

(\*\*) Pressure drops corresponding to a thermal variation of 15K.

### DETAIL FOR DOOR DRILLING TST 3900 2S÷TST 5200 2S

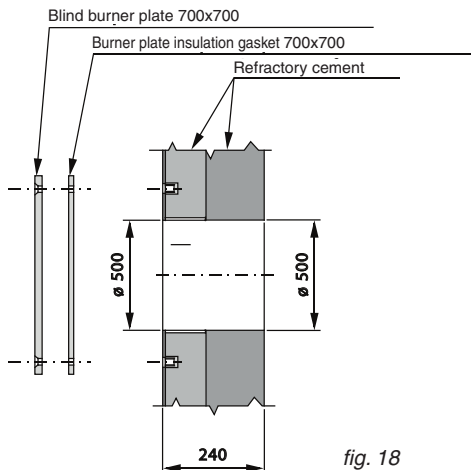


fig. 18

### DETAIL FOR DOOR DRILLING TST 5700 2S÷TST 6100 2S

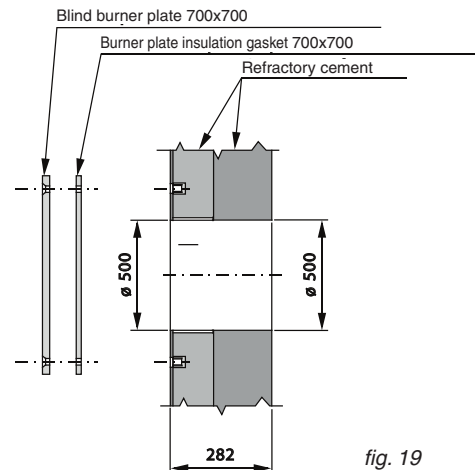


fig. 19

## 2.5 - OPERATING DATA ACCORDING TO UNI 10348

	TST 80 2S	TST 120 2S	TST 160 2S	TST 200 2S	TST 250 2S	TST 300 2S	TST 370 2S	TST 450 2S	TST 560 2S
Nominal heat output	60÷80	90÷120	120÷160	150÷200	187.5÷250	225÷300	277.5÷370	337.5÷450	420÷560
Thermal output of furnace	63.3÷85.2	94.6÷127.4	125.8÷169.4	157÷211.3	195.8÷263.6	234.6÷315.8	288.8÷388.7	351÷472.4	436.8÷587.9
Heat efficiency at nominal load (100%)	94.7÷93.8	95.1÷94.2	95.4÷94.5	95.5÷94.6	95.7÷94.8	95.9÷95	96.1÷95.2	96.1÷95.2	96.1÷95.2
Heat efficiency at 30% load	94.9÷94.0	95.3÷94.4	95.6÷94.7	95.7÷94.8	95.9÷95	96.1÷95.2	96.3÷95.4	96.3÷95.4	96.3÷95.4
Combustion efficiency at nominal load (100%)	95.4÷94.6	95.7÷94.9	95.9÷95.1	96.1÷95.2	96.2÷95.4	96.4÷95.5	96.3÷95.4	96.3÷95.5	96.3÷95.5
Heat loss at casing (min.-max.)	0.6÷0.7	0.6÷0.6	0.5÷0.6	0.5÷0.6	0.5±0.6	0.5±0.5	0.2÷0.2	0.2÷0.2	0.2÷0.2
Heat loss at chimney with burner on (min.-max.)	4.6÷5.4	4.3÷5.1	4.1÷4.9	3.9÷4.8	3.7±4.6	3.6±4.5	3.7±4.6	3.7±4.5	3.7±4.5
Heat loss at chimney with burner off (min.-max.)	0.1÷0.1	0.1÷0.1	0.1±0.1	0.1±0.1	0.1±0.1	0.1±0.1	0.1±0.1	0.1±0.1	0.1±0.1
Flue gas temperature if-ta (min.-max.)	94.9±111.7	88.6±105.7	84.4±101.5	80.8±97.9	77.2±94.3	74.5±91.9	76.6±94.9	75.4±93.4	75.4±93.4
CO <sub>2</sub> content	9.8÷9.8	9.8÷9.8	9.8±9.8	9.8±9.8	9.8±9.8	9.8±9.8	9.8±9.8	9.8±9.8	9.8±9.8
Flue gas mass flow rate (min.-max)	95±128	142±191	189±255	236±318	294±396	353±475	434±584	528±710	657±884

	TST 680 2S	TST 780 2S	TST 870 2S	TST 1000 2S	TST 1180 2S	TST 1400 2S	TST 1650 2S	TST 2000 2S	TST 2350 2S
Nominal heat output	510÷680	585÷780	652.5÷870	750÷1000	885±1180	1050÷1400	1237.5±1650	1500±2000	1762.5±2350
Thermal output of furnace	530.4±713.9	608.4±818.9	678.6±913.4	780±1049.8	920.4±1238.8	1092±1469.8	1287±1732.3	1560±2099.7	1833±2467.1
Heat efficiency at nominal load (100%)	96.1÷95.2	96.1±95.2	96.1±95.2	96.1±95.2	96.1±95.2	96.1±95.2	96.1±95.2	96.1±95.2	96.1±95.2
Heat efficiency at 30% load	96.3±95.4	96.3±95.4	96.3±95.4	96.3±95.4	96.3±95.4	96.3±95.4	96.3±95.4	96.3±95.4	96.3±95.4
Combustion efficiency at nominal load (100%)	96.3±95.5	96.3±95.5	96.3±95.5	96.3±95.5	96.3±95.5	96.3±95.5	96.3±95.5	96.3±95.5	96.3±95.5
Heat loss at casing (min.-max.)	0.2÷0.2	0.2±0.2	0.2±0.2	0.2±0.2	0.2±0.2	0.2±0.2	0.2±0.2	0.2±0.2	0.2±0.2
Heat loss at chimney with burner on (min.-max.)	3.7±4.5	3.7±4.5	3.7±4.5	3.7±4.5	3.7±4.5	3.7±4.5	3.7±4.5	3.7±4.5	3.7±4.5
Heat loss at chimney with burner off (min.-max.)	0.1±0.1	0.1±0.1	0.1±0.1	0.1±0.1	0.1±0.1	0.1±0.1	0.1±0.1	0.1±0.1	0.1±0.1
Flue gas temperature if-ta (min.-max.)	75.4±93.4	75.4±93.4	75.4±93.4	75.4±93.4	75.4±93.4	75.4±93.4	75.4±93.4	75.4±93.4	75.4±93.4
CO <sub>2</sub> content	9.8±9.8	9.8±9.8	9.8±9.8	9.8±9.8	9.8±9.8	9.8±9.8	9.8±9.8	9.8±9.8	9.8±9.8
Flue gas mass flow rate (min.-max)	797±1073	914±1231	1020.1±1372.9	1172±1578	1383±1862	1641±22095	1935±2609	2345±3156	2755±3708

## OPERATING DATA ACCORDING TO UNI 10348

<b>GAS-FIRED</b>	<b>TST 2700 2S</b>	<b>TST 3100 2S</b>	<b>TST 3500 2S</b>	<b>TST 3900 2S</b>	<b>TST 4400 2S</b>	<b>TST 4800 2S</b>
Nominal heat output	kW 2025÷2700	2325÷3100	2625÷3500	2925÷3900	3300÷4400	3600÷4800
Thermal output of furnace	kW 2106÷2834.6	2418.1÷3254.5	2730.1÷3674.5	3042.1÷4094.4	3432.1÷4619.3	3744.1÷5039.3
Heat efficiency at nominal load (100%)	% 96.1÷95.2	96.1÷95.2	96.1÷95.2	96.1÷95.2	96.1÷95.2	96.1÷95.2
Heat efficiency at 30% load	% 96.3÷95.4	96.3÷95.4	96.3÷95.4	96.3÷95.4	96.3÷95.4	96.3÷95.4
Combustion efficiency at nominal load (100%)	% 96.3÷95.5	96.3÷95.5	96.3÷95.5	96.3÷95.5	96.3÷95.5	96.3÷95.5
Heat loss at casing (min.-max.)	% 0.2÷0.2	0.2÷0.2	0.2÷0.2	0.2÷0.2	0.2÷0.2	0.2÷0.2
Heat loss at chimney with burner on (min.-max.)	% 3.7÷4.5	3.7÷4.5	3.7÷4.5	3.7÷4.5	3.7÷4.5	3.7÷4.5
Heat loss at chimney with burner off (min.-max.)	% 0.1÷0.1	0.1÷0.1	0.1÷0.1	0.1÷0.1	0.1÷0.1	0.1÷0.1
Flue gas temperature if-ta (min.-max.)	°C 75.4÷93.4	75.4÷93.4	75.4÷93.4	75.4÷93.4	75.4÷93.4	75.4÷93.4
CO <sub>2</sub> content	% 9.8÷9.8	9.8÷9.8	9.8÷9.8	9.8÷9.8	9.8÷9.8	9.8÷9.8
Flue gas mass flow rate (min.-max)	kg/h 3166÷4261	3635÷4892	4104÷5523	4573÷6154	5159÷6943	5628÷7575

<b>GAS-FIRED</b>	<b>TST 5200 2S</b>	<b>TST 5700 2S</b>	<b>TST 6100 2S</b>
Nominal heat output	kW 3900÷5200	4275÷5700	4575÷6100
Thermal output of furnace	kW 4056.1÷5459.2	4446.1÷5984.1	4758.1÷6404.1
Heat efficiency at nominal load (100%)	% 96.1÷95.2	96.1÷95.2	96.1÷95.2
Heat efficiency at 30% load	% 96.3÷95.4	96.3÷95.4	96.3÷95.4
Combustion efficiency at nominal load (100%)	% 96.3÷95.5	96.3÷95.5	96.3÷95.5
Heat loss at casing (min.-max.)	% 0.2÷0.2	0.2÷0.2	0.2÷0.2
Heat loss at chimney with burner on (min.-max.)	% 3.7÷4.5	3.7÷4.5	3.7÷4.5
Heat loss at chimney with burner off (min.-max.)	% 0.1÷0.1	0.1÷0.1	0.1÷0.1
Flue gas temperature if-ta (min.-max.)	°C 75.4÷93.4	75.4÷93.4	75.4÷93.4
CO <sub>2</sub> content	% 9.8÷9.8	9.8÷9.8	9.8÷9.8
Flue gas mass flow rate (min.-max)	kg/h 6097÷8206	6683÷8995	7152÷9626



3

## INSTALLATION INSTRUCTIONS

### 3.1 - GENERAL WARNINGS



**ATTENTION!**

This boiler is intended solely for the use for which it was expressly designed. Any other use is to be considered improper and therefore dangerous.

This boiler heats water at a temperature lower than the atmospheric pressure boiling temperature.



**ATTENTION!**

The appliances are designed to be installed inside suitable rooms or technical spaces only. The appliances cannot be installed or operate outdoors. Outdoor installation can cause malfunctioning and be dangerous. Choose specifically designed appliances for outdoor installation.



Before connecting the boiler, have professionally qualified personnel:

- a) Thoroughly wash all the piping of the system to remove any residue or impurities which could jeopardise proper operation of the boiler.
- b) Check that boiler is set up to operate with the available type of fuel.  
This can be seen written on the package and on the technical feature plate.
- c) Check that the chimney/flue has an appropriate draught, without any bottlenecks, and that no exhausts from other appliances are inserted, unless the flue has been implemented to accommodate several utilities according to specific standards and prescriptions in force. Only after this check can the fitting between the boiler and chimney/flue be mounted.



**ATTENTION!**

In rooms with the presence of aggressive vapours or dust, the appliance must operate independently from the air inside the installation room!



**ATTENTION!**

The appliance must be installed by a qualified technician with the technical-professional requirements according to law 46/90 which, under his own responsibility, guarantees compliance with standards according to good practice rules.



The boiler must be connected to a central heating system and/or domestic hot water supply network compatible with its efficiency and output.

## Installation instructions

### 3.2 - INSTALLATION STANDARDS

The appliance must be installed in compliance with the instructions provided in this manual.

It must be installed by a professionally qualified technician, **who shall assume the responsibility of respecting all local and/or national laws published in the official journal, as well as applicable technical standards.**

**TRISTAR 2S** is a steel boiler which can be combined with air-blown burners fired by gas of category **I12H3+**.

Contact the gas supplying company before installing the appliance.

The following standards, rules and prescriptions must be observed to perform installation. This list is indicative and not complete, needing to follow the progress of the "state-of-the-art".

Standard UNI 7129

Design, installation and maintenance of gas systems for household use supplied by distribution network (NATURAL GAS).

Standard UNI 11137-1

Guidelines for inspection and restoration of the sealing of indoor systems in operation

Standard UNI 7131

Design, installation and maintenance of liquefied petroleum gas (LPG) systems for household use not supplied by distribution network.

Standard UNI 10412 of December 1994.

Hot water heating systems. Safety prescriptions.

FIELD OF APPLICATION: thermal potentials greater than 35 kW (30,000 kcal/h).

LAW March 5, 1990 N° 46 and relative applicative regulation by Italian Presidential Decree 447 of December 6, 1991 (and subsequent amendments).

Safety standards for systems

FIELD OF APPLICATION: without thermal potential limits.

STANDARD UNI EN 676, November 1998.

Air-blown gas-fired burners.

Safety prescriptions.

LAW January 9, 1990 N° 10 and relative applicative regulation by Italian Presidential Decree. 412 of 26 August 1993 (and subsequent modifications), Italian Presidential Decree n°551 of 21.12.1999.

Regulation with amendments to Italian Presidential Decree. n° 412 concerning design, installation, operation and maintenance of thermal systems in buildings, in order to reduce energy consumption.

FIELD OF APPLICATION: without thermal potential limits.

Law n°186 of 01.03.1968

Installation standard IEC 64-8 / II ed.

Electric systems using rated voltage no greater than 1000 V AC and 1500 V DC.

Installation standard IEC 64-8 / II ed.

Electric systems in buildings intended for residential and similar use.

Approval art. 44 Community Law of 2001 "INSTALLATION OF HEAT GENERATORS" suppression of last period comma 10 DPR551/99, (0.4 m<sup>2</sup> ventilation).

Directives concerning boiler rooms, building regulations and combustion heating provisions in the country of installation must also be respected.

The appliance must be installed, commissioned and undergo maintenance according to the current "state-of-the-art".

This also holds for the hydraulic system, the flue exhaust system and the installation room.

## 3.3 - HANDLING



The boiler can be handled easily, lifting it by means of upper hook/s or shifting it on rollers underneath the sturdy base longerons.

If necessary for clearance purposes, the door and the smoke chamber can be removed to make it easier to enter the boiler room.

## 3.4 - POSITIONING IN BOILER ROOM

The boiler must be installed in compliance with standards and prescriptions in force.

The room must be well ventilated by openings with a total surface no less than 1/30 the surface of the boiler room, with a minimum of 0.5 m<sup>2</sup>.

The ventilation openings must be permanent, communicating directly with the outside and must be positioned high or low according to standards in force.

The location of the ventilation openings, the fuel supply circuits, electric energy supply and lighting must comply with current legal provisions in relation to the type of fuel used.

It is recommended to install the boiler as close to the chimney connection as possible.

To make it easier to clean the smoke circuit, in front of the boiler, there must be a free space no less than the length of the boiler body and, in any case, never less than 1300 mm. Check that with the door opened 90°, the distance between the door and the adjacent wall is at least the length of the burner.

The boiler can be placed directly on the floor as it is equipped with a base.

However it is useful to provide a flat, level cement plinth capable of bearing the weight of the boiler full of water.

When positioned on the plinth, the dimensions must be at least **Q x R** (see dimensions table).

When installation has been performed, the boiler must be perfectly horizontal and stable (to reduce vibrations and noise).

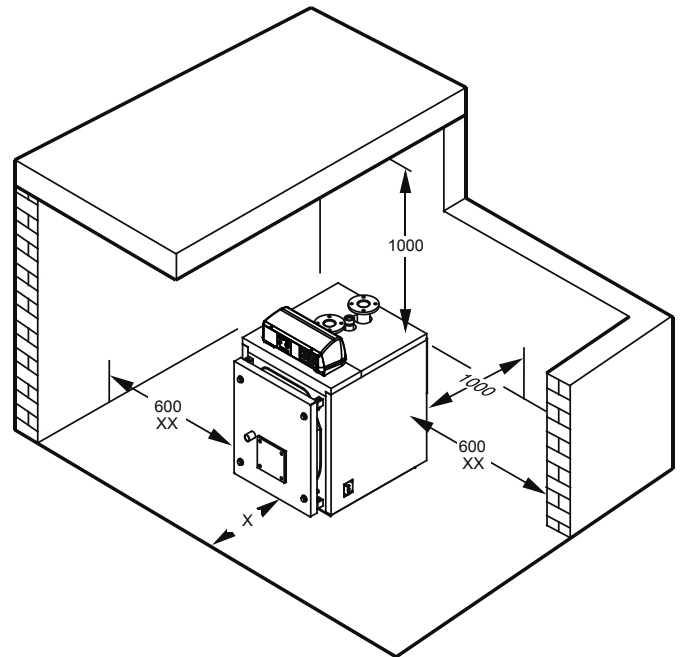


fig. 20

*x = not less than the length of the boiler body (dimensions in mm); in any case, never less than 1300 mm.  
xx = see instructions to the side.*

## 3.5 - BURNER

The burners operating with the TRISTAR 3G 2S boilers must have the EC certification and comply with:

- Gas appliance directive (90/396/EEC);
  - EMC Directive - Electromagnetic Compatibility (89/336/EEC).
- They must also be approved according to the specifications:
- UNI EN 676 - air-blown burners for gaseous fuel.
  - Efficiency Directive (92/42 EEC).

### 3.5.1 - Choosing the burner

The correct choice and adjustment of the burner are fundamental for optimal operation of the boiler and therefore must be done carefully and not underestimated.

The burner must be chosen verifying that its firing rate (fuel capacity - combustion chamber pressure) is compatible with the same features declared for the boiler.

Remember that pressure drops on the flue side of the boiler, namely combustion chamber backpressure, refer to zero pressure at the base of the chimney.

It is also recommended that the burner blast tube be no shorter than the minimum dimension shown in the following table and that the flame which must be implemented be suitable for the characteristics of the combustion chamber.

In order to take advantage of the whole heat exchange surface of the blind bottom furnaces, use burners capable of providing a "long and narrow" flame in any operating condition, namely even at the minimum output when controlling two or more stages or modulating.

Flames which are too short cause overheating in the front of the furnace and combustion products, not sufficiently cooled, entering the smoke pipes at too high temperatures can seriously damage the generator.

## Installation instructions

The manufacturing companies of the burners can supply the dimensions of the flames which their appliances develop, especially those approved based on the standards indicated above.  
Further information is provided in the chapter "Commissioning".

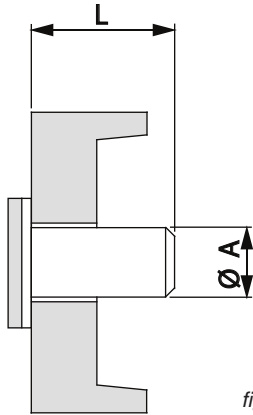


fig. 21

DIMENSIONS OF BURNER BLAST TUBE

BOILER TYPE	$\varnothing A$ mm	L mm
TST 80 2S	130	150
TST 120÷250 2S	180	170
TST 300÷560 2S	220	250
TST 680÷870 2S	270	270
TST 1000÷1180 2S	320	300
TST 1400÷1650 2S	320	320
TST 2000÷2350 2S	380	350
TST 2700 2S	380	400
TST 3100÷3500 2S	400	400
TST 3900÷5200 2S	500	520
TST 5700÷6100 2S	500	630

### 3.5.2 - INSTALLING THE BURNER

Before assembling the burner it is necessary to check the position of the turbulators inside the pipes: each tube must be provided with its own turbulator and this must be positioned as shown in the table at page 8.

The burner must be mounted to the door of the boiler guaranteeing perfect sealing of the combustion products.

The burner is supplied with a **piece of ceramic fibre cord which must be placed on the blast tube of the burner to fully seal the space between the blast tube and the slot in the door.**

Make sure that no gaps remain between the blast tube and the slot on the refractory material inside the door.

Should a cone larger than the diameter of the blast tube be mounted, it must be removed before mounting the burner on the support plate and put back afterwards.

With the burner mounted, check that the flexible hoses of the liquid fuel and the electric cables are long enough to allow the door to open 90°.

For gas-fired burners, flexible hoses cannot be used for connections. Therefore it must be equipped with a threaded or flanged joint for disconnecting the final section of the gas adduction tube.

### 3.6 - CONNECTING FLAME CONTROL WARNING LIGHT TO BURNER

The flame control warning light is provided with a 1/8" threaded connection (pos. 1) upon which a 9 mm pressure test nipple is mounted. It can be used with a silicon tube to measure the counter pressure in the combustion chamber.

In place of this test nipple, which must be kept, an appropriate fitting will be mounted to connect the flame control warning light directly to the pressure chamber downstream the burner fan by means of a copper tube.

The air blown by the fan will conveniently cool the warning light glass and keep it from blackening.

If the cooling tube is not connected to the warning light, it could break.

**ATTENTION: the flame control warning light can be very hot; therefore pay the utmost attention.**

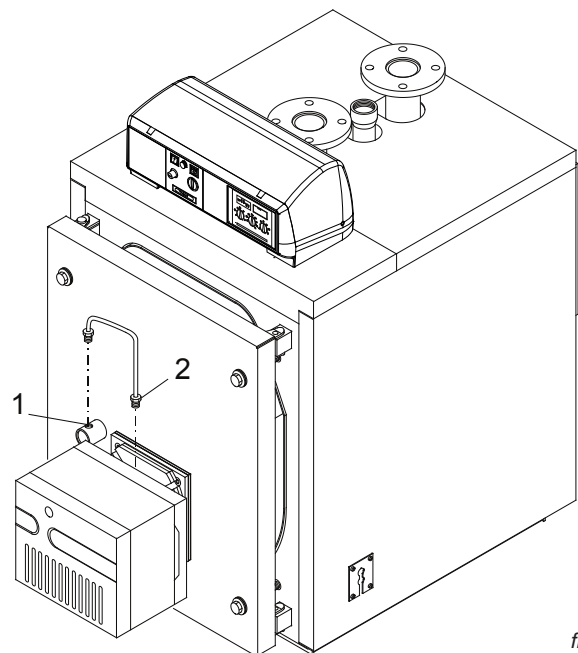


fig. 22

## 3.7 - FURNACE DOOR: ADJUSTMENT, OPENING AND CLOSING

### IMPORTANT

- The door of the boiler must be opened when it is cooled off to avoid damaging the fibre due to thermal shock.
- The insulation fibre of the door can show cracks after a short time of operation; this however does not reduce its insulation capacity nor jeopardise its lifespan.
- The door fibre is easy to replace and is covered by a two-year warranty.

### 3.7.1 - "TST 80 2S÷TST 250 2S" BOILERS

The door on all these models can be adjusted in the vertical, transverse and axial directions in the following manner:

- **Adjustment in the vertical direction:** release the hinges on the door (screws with self-locking nut) and relock them after adjustment.
- **Adjustment in the transverse direction:** release the hinge supports on the front plate boiler body and relock them after the adjustment.
- **Adjustment in the axial direction:** by adjusting the locking screws.

### 3.7.2 - "TST 300 2S÷TST 560 2S" BOILERS

For all these models, the door is hinged and fixed according to the layout in fig. 23.

In these cases the door is mounted with four identical hinges: the two on the left side, with pin inserted, are normally used as rotation hinges (from right to left), while the two on the right are used as closing hinges; the door is then secured with 4 screws. It will be exactly the opposite when the door is opened from left to right.

To invert rotation, just move the pins to the opposite side.

The following adjustments can be made on the door of these boiler models:

- A) Adjustment in the vertical direction:** it can be achieved only by inserting suitably thick washers below the hinge on which the door turns.
- B) Adjustment in the transverse direction:** loosen the hinges fixed on the front plate of the boiler and move them sideways.
- C) Adjustment in the axial direction:** by adjusting the tightening screws.

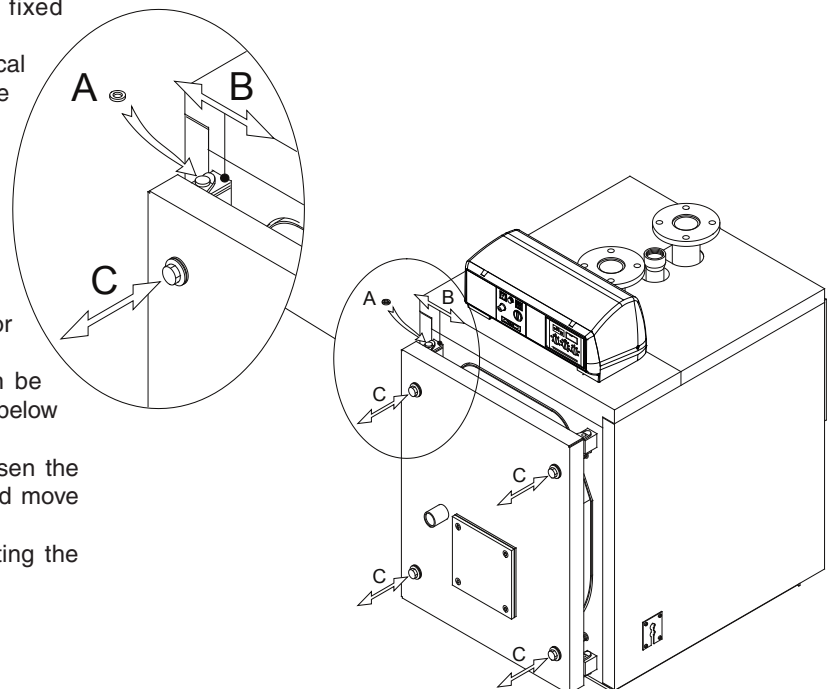


fig. 23

## Installation instructions

### 3.7.3 - "TST 680 2S÷TST 870 2S" BOILERS

For all these models, the door is hinged and fixed according to the layout in fig. 24.

In these cases, the two hinges on the left are normally used as rotation hinges (from right to left) while the two on the right are used as closing hinges.

It will be exactly the opposite when the door is opened from left to right.

To invert rotation, just move the rear locknuts to the opposite side.

The following adjustments can be made on the door of these boiler models:

- A) Adjustment in the vertical direction:** by acting on the nut of the upper hinge pin on which the door turns.
- B) Adjustment in the transverse direction:** loosen the hinges fixed on the front plate of the boiler and move them sideways.
- C) Adjustment in the axial direction:** by adjusting the tightening nuts.

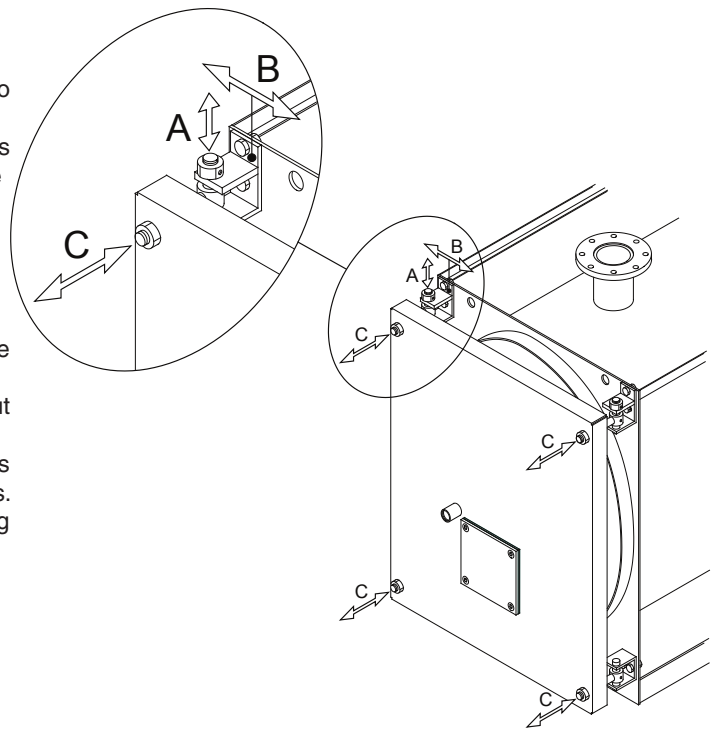


fig. 24

### 3.7.4 - "TST 1000 2S÷TST 6100 2S" BOILERS

For all these models, the door is hinged and fixed according to the layout in fig. 25.

In these cases, the two hinges on the left are normally used as rotation hinges (from right to left), while the two on the right are used as closing hinges.

It will be exactly the opposite when the door is opened from left to right.

To invert rotation, just move the door support bushings.

The following adjustments can be made on the door of these boiler models:

- A) Adjustment in the vertical direction:** by acting on the nut of the upper hinge pin on which the door turns.
- B) Adjustment in the transverse direction:** loosen the hinges fixed on the front plate of the boiler and move them sideways.
- C) Adjustment in the axial direction:** by adjusting the tightening nuts.

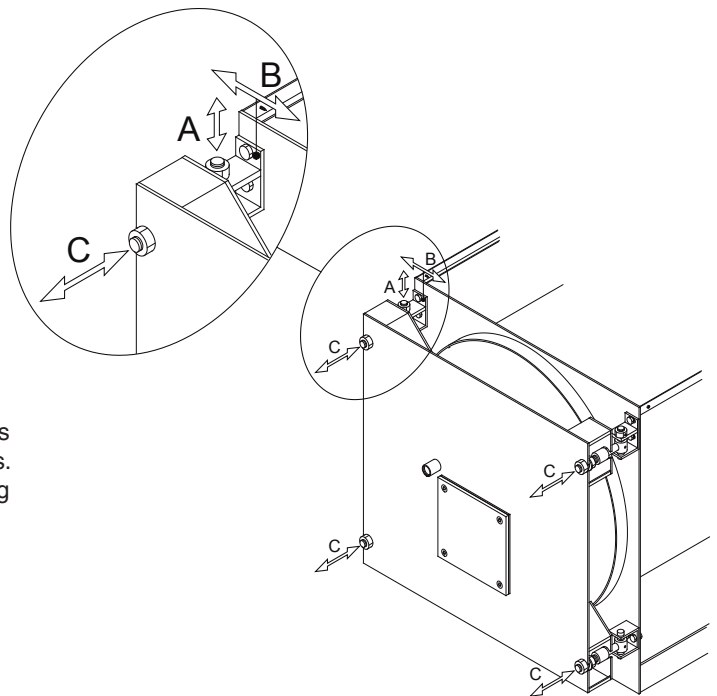


fig. 25

### 3.7.5 - IMPORTANT NOTE

Before opening the door of the furnace, take the following safety measures:

- Close the fuel supply (diesel oil or gas) to the burner.
- Cool the boiler off by having water circulate and then disconnect electrical power.

- Place a sign on the boiler with the following text: **DO NOT USE, BOILER MAINTENANCE UNDERWAY, OUT OF SERVICE.**

## 3.8 - CONNECTING FLUE EXHAUST PIPE

To connect the flue gas exhaust pipe, local and national standards must be respected (see Standards UNI-CIG 7129 point 4 and 7131 point 5).

The TRISTAR 2S boiler can be attached to the chimney in different ways; straight pipes or elbows can be used to exit from the rear, on the left, on the right, or else vertically to enter into the flue at a higher level.

It is recommended to insulate the pipe connecting to the chimney to reduce heat loss and noise.

**Along the section connecting the boiler to the flue there must be suitable points for measuring flue gas temperature and analysing combustion products.**



**Use only exhaust pipes suitable for the type of fuel used.**

**The supplier will have no contractual or extra-contractual liability for damage caused due to incorrect installation and use and anyway failure to comply with the instructions provided by the manufacturer.**

**When performing replacement installations, ALWAYS replace the flue gas exhaust accessory as well. The flue must comply with standards in force.**

## 3.9 - CONDENSATION DRAINAGE

### CONDENSATION UPON COMMISSIONING

While the boiler is reaching the operating temperature, a good amount of condensation can be formed due to the low temperature of the flue gas.

In these conditions, it could be useful to have the condensation drained into the sewage. For this purpose, the smoke chamber is equipped with an attachment which the exhaust pipes will be connected to according to the following notes.

When the operating temperature has been reached - see notes in chap. 3.22 "COMMISSIONING" - it is important to check whether more condensation has been formed.

This can be checked by direct inspection through the cleaning doors of the smoke chamber.

If not, after having verified the actual fuel flow rates, the operating temperature should be increased.

The condensation drainage in the sewer must be:

- implemented as to prevent releasing gaseous combustion products into the environment or sewer (siphoning);
- dimensioned and implemented to allow the correct outflow of liquid waste preventing any leakage;

- installed in such a way as to prevent the liquid contained in it from freezing in the intended operating conditions;
- mixed for example with household waste water (washer, dishwasher drainage, etc.) for the most part with basic pH in order to form a buffer solution to be then introduced in the sewer system.

Condensation must not stagnate in the combustion product drainage system (for this reason the evacuation duct must slope at least 30 mm/m towards the drain) except for a liquid seal, present in the drainage siphon for the evacuation of combustion products (which must be filled after assembly and must remain at least 25 mm high with the boiler running - see fig. 26).

Do not discharge condensation through gutter drainpipes due to the risk of it turning into ice and the deterioration of the materials usually used in making the drainpipes (consult local hygiene regulations).

The drain fitting must be visible.

Due to the acidity level of the condensation (pH from 3 to 5) only suitable plastic materials must be used for the drain piping (special optional kits with neutraliser salts for acid condensation are available).

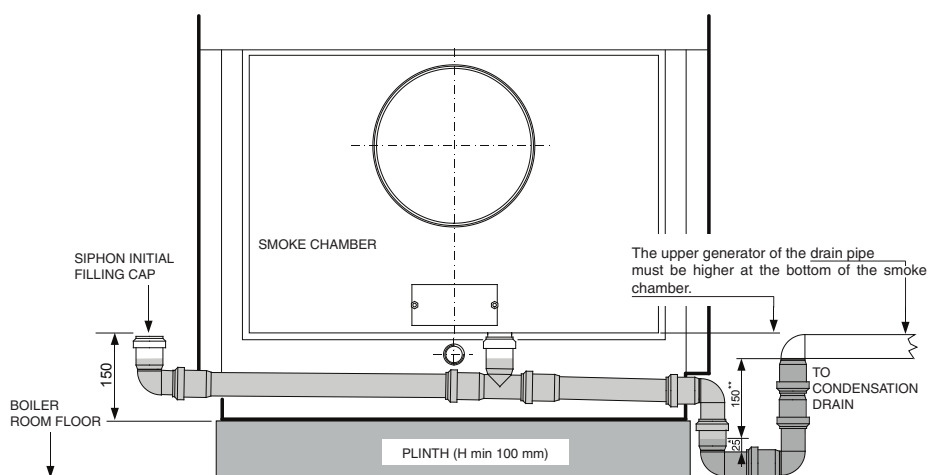


fig. 26

\* Minimum safety siphon set by the standard.

\*\* Minimum head with boiler running at maximum power.

**If you do not want to or cannot create a plinth, the boiler can be mounted at ground level and a sump at least 100 mm deep can be made to house the siphon.**

## Installation instructions

### 3.9 - CONNECTING BOILER TO SYSTEM



**Attention!**  
Before connecting the boiler to the heating system, thoroughly clean the piping with an appropriate product in order to eliminate metallic residue from processing and welding, oil and grease which could be present and which, reaching the boiler, could alter its functioning.

Do not use solvents to wash the system as they could damage the system and/or its components.

Failure to comply with the instructions of the following manual can cause damage to persons, animals and objects for which the manufacturer cannot be held responsible.



**Attention!**  
Make sure that there are no mechanical tension points while connecting the pipes to avoid the risk of leakage!

Heating flow and return pipes must be connected to the boiler at the respective fittings as indicated on pages 9, 10, 11, 12 and 14.

For the dimensioning of the heating circuit pipes, you must take into account pressure drops caused by radiators, thermostatic valves, radiator stopping valves and by the configuration of the system.

The laying of the pipes must be designed taking every necessary precaution to avoid air pockets and to facilitate continuous degassing of the system.



Make sure that the pipes of the water and heating system are not used as earthing electrodes of the electric or telephone system. They are absolutely not suitable for this type of use. Serious damage could result for the piping, boiler and radiators in a short amount of time.

#### Heating system safety valve discharge

Provide a drain pipe with a funnel and a siphon leading to an appropriate drainage at the heating safety valve. This drainage must be controlled on sight.



**Attention!**  
If this precaution is not taken, triggering of the safety valve can cause damage to persons, animals and objects for which the manufacturer cannot be held responsible.

### Connection of expansion vessel



TRISTAR 2S boilers are suitable for operating with forced water circulation both with the expansion vessel opened or closed.

An expansion vessel is always necessary to compensate the increase in water volume due to heating.

The connection pipes of the expansion vessel will start from the T3 attachment (see DIMENSIONS TABLES) and must have no shut-off valve.

### Connecting the filling / draining tap

A specific tap can be connected to the T4 attachment at the rear of the boiler for filling and draining.

#### 3.9.1 - RECIRCULATION PUMP

TRISTAR 2S boilers must always operate with forced water circulation and a minimum return temperature of 55°C.

It is therefore recommended to use a recirculation pump, which also has an anti-condensation function, installed between the flow and return connections upstream the mixer valve.

This pump is dimensioned according to the formula:

$$Q = P \times 22$$

where **Q** = Flow rate in l/hr

**P** = Nominal output of boiler in kW  
and **hydraulic head** 1÷2 m H<sub>2</sub>O

### 3.10 - FILLING THE SYSTEM



**Attention!**

Do not mix the heating water with incorrect concentrations of antifreeze or anti-corrosion substances! This could damage the gaskets and cause noise during operation.

Unical will not be held liable for damage to persons, animals or objects due to failure to comply with the instruction above.

When all system connections have been completed, the circuit can be filled.

This operation must be performed carefully, respecting the following phases:

- open the radiator air release valves;
- open the filling tap gradually, making sure that the automatic air release valves installed on the system work properly;
- close the radiator air release valves as soon as water comes out;
- check the pressure gauge until pressure reaches approximately 1 bar;
- close the filling tap and bleed air once again through the radiator air release valves;
- make sure that all the connections are watertight;



## Installation instructions

- after commissioning the boiler and bringing the system to the operating temperature, stop the pumps and repeat the air bleed operations;
- let the system cool off and, if necessary, return the water pressure to 1 bar.



### NOTE

The water pressure in the heating system must not drop below 1 bar; open the filling tap on the boiler when the pressure is too low. This operation must be performed with a cooled system.



### NOTE

If the boiler was without electric power, after a certain idle period, the pump could be blocked. Before turning on the main switch, the pump must be unblocked by operating as follows: Introduce a screwdriver in the hole below the protective screw in the centre of the pump intended for this purpose and turn the pump shaft clockwise. After having unblocked the pump, tighten the protective screw and make sure there is no water leakage.



### ATTENTION!

After removing the protective screw, a small amount of water could leak out. Dry off all wet surfaces before powering the boiler.

## 3.11 - GAS CONNECTION



### Danger!

The gas connection must be carried out only by a qualified installer who must respect and apply that foreseen by relevant laws in force in the local prescriptions of the supply company. Incorrect installation can cause damage to persons, animals and objects for which the manufacturer cannot be held responsible.



Before installation, we recommend a thorough inner cleaning of all fuel adduction piping to remove any residue which could jeopardise proper operation of the boiler.



### Attention!

Make sure that there are no mechanical tension points while connecting gas to avoid the risk of leakage!



### If you smell gas:

- Do not turn electric switches on or off, use a telephone or any other object which can create sparks;
- Immediately open doors and windows to create an air current to air out the room;
- Shut the gas cocks;
- Request the intervention of professionally qualified personnel.



As a precaution against gas leaks, we recommend installing a monitoring and protection system consisting of a gas leak detector coupled with a shut-off solenoid valve on the gas feed line.

The supply pipes must have a cross-section sufficient for the flow rate of the burner.

You should nonetheless comply with the "General installation regulations" laid down in the standards UNI 7129, UNI 7131 and UNI 11137-1.

Before commissioning an internal gas distribution system and therefore before connecting it to the gas meter, check its sealing carefully.

If any part of the system is out of sight, the sealing test must be done before the pipes are covered.

Before connecting the appliances, the system must be tested with air or inert gas at a pressure of at least 100 mbar.

The following operations and checks must also be performed while commissioning the system:

- Open the meter and air release valve to bleed the air from the piping of the appliances, performing the same operation for each appliance.
- With the appliances closed, check that there are no gas leaks. The pressure gauge must show no pressure drop during the second quarter of an hour from the start of the test. Gas leaks must be found with a soapy solution or similar product and eliminated. Never look for gas leaks with an open flame.

## Installation instructions

### 3.12 - PACKAGING

**TRISTAR 2S** boilers are supplied complete with the door and smoke chamber assembled, while the casing and insulation are included in separate cardboard package(s).

The panel and accessories are inside the combustion chamber. Before starting installation, make sure that the length and width of the boiler body received correspond respectively to the dimensions **M**, **Q** and **R** of the boiler you have ordered, provided on the previous tables, and that the boxes containing the casing, or part of it, are marked as in the table at the bottom of the page.

**The casing of boilers from TST 80 2S to TST 450 2S**, complete with insulation mattresses, is contained in one box.

**The casing of boilers from TST 560 2S to TST 2000 2S is contained in 3 boxes.**

**The casing of the TST 2350 2S boilers is contained in 4 boxes.**

**The casing of the TST 2700 2S and TST 3100 2S boilers is contained in 3 boxes.**

**The casing of the TST 3500 2S boilers is contained in 4 boxes.**

**Boilers included between the TST 3900 2S and TST 6100 2S models, are supplied with casing.**

In addition to the panel board packed in its own box, the following accessories are found in the combustion chamber:

- 1 box containing hydraulic connection flanges, with relative gaskets and bolts, cylindrical brush to clean pipes.
- 1 box containing the cores of the turbulators
- cleaning brush extensions.
- turbulator extractor.

- ceramic fibre cord to insulate between burner blast tube and door.

Upon reception, make sure that the supply is complete and undamaged.



Keep the packaging material (cardboard boxes, straps, plastic bags, etc.) **out of the reach of children as they are potential sources of danger.**

**Unical** will not be held liable for damage to persons, animals or objects due to failure to comply with the above instruction.



The document envelope, besides the appliance, contains:

- Hydraulic test certificate.
- Heating system booklet.
- System manager operating instructions.
- Installation and maintenance instruction booklet.
- Warranty.
- Local ventilation requirements label.

**N.B.:** For models from **TST 80 2S** to **TST 250 2S** (ref. fig. 27 and 28) and from **TST 300 2S** to **TST 450 2S** (ref. fig. 29 and 30), the casing and insulation are contained in 1 marked box:

29658 (TST 80 2S)  
29659 (TST 120 2S)  
29660 (TST 160 2S)  
29661 (TST 200 2S)  
29662 (TST 250 2S)  
50056 (TST 300 2S)  
50057 (TST 370 2S)  
50058 (TST 450 2S)

**N.B.:** For the **TST 560 2S** model (ref. fig. 29 and 30) and for models from **TST 680 2S** to **TST 870** (ref. fig. 31 and 30), and from **TST 1000 2S** to **TST 2000 2S** (ref. fig. 32 and 35), the casing and insulation are contained in 3 marked boxes:

50059 (front casing TST 560 2S)  
50060 (rear casing TST 560 2S)  
50061 (top casing TST 560 2S)  
50062 (front casing TST 680 2S)  
50063 (rear casing TST 680 2S)  
50064 (top casing TST 680 2S)  
50062 (front casing TST 780 2S)  
50065 (rear casing TST 780 2S)  
50066 (top casing TST 780 2S)  
50062 (front casing TST 870 2S)  
50067 (rear casing TST 870 2S)  
50068 (top casing TST 870 2S)  
50069 (front casing TST 1000 2S)  
50070 (rear casing TST 1000 2S)  
50071 (top casing TST 1000 2S)  
50069 (front casing TST 1180 2S)  
50072 (rear casing TST 1180 2S)

50073 (top casing TST 1180 2S)  
50074 (front casing TST 1400 2S)  
50075 (rear casing TST 1400 2S)  
50076 (top casing TST 1400 2S)  
50074 (front casing TST 1650 2S)  
50077 (rear casing TST 1650 2S)  
50078 (top casing TST 1650 2S)  
50079 (front casing TST 2000 2S)  
50080 (rear casing TST 2000 2S)  
50081 (top casing TST 2000 2S)

**N.B.:** For the **TST 2350 2S** model (ref. fig. 33 and 35) the casing and insulation are contained in 4 boxes.

For models **TST 2700 2S** and **TST 3100 2S** (ref. fig. 34 and 35), the casing and insulation are contained in 3 boxes.

For the **TST 3500 2S** model (ref. fig. 34 and 35) the casing and insulation are contained in 4 marked boxes:

50079 (front casing TST 2350 2S)  
50082 (rear casing TST 2350 2S)  
50083 (top casing TST 2350 2S)  
50084 (central casing TST 2350 2S)  
30111 (front casing TST 2700 2S)  
30112 (rear casing TST 2700 2S)  
30113 (central casing TST 2700 2S)  
30114 (front casing TST 3100 2S)  
30115 (rear casing TST 3100 2S)  
30116 (central casing TST 3100 2S)  
30114 (front casing TST 3500 2S)  
30115 (rear casing TST 3500 2S)  
30116 (central casing TST 3500 2S)  
30543 (rear casing TST 3500 2S)

## 3.13 - ASSEMBLY OF CASING

TRISTAR 80÷250 2S

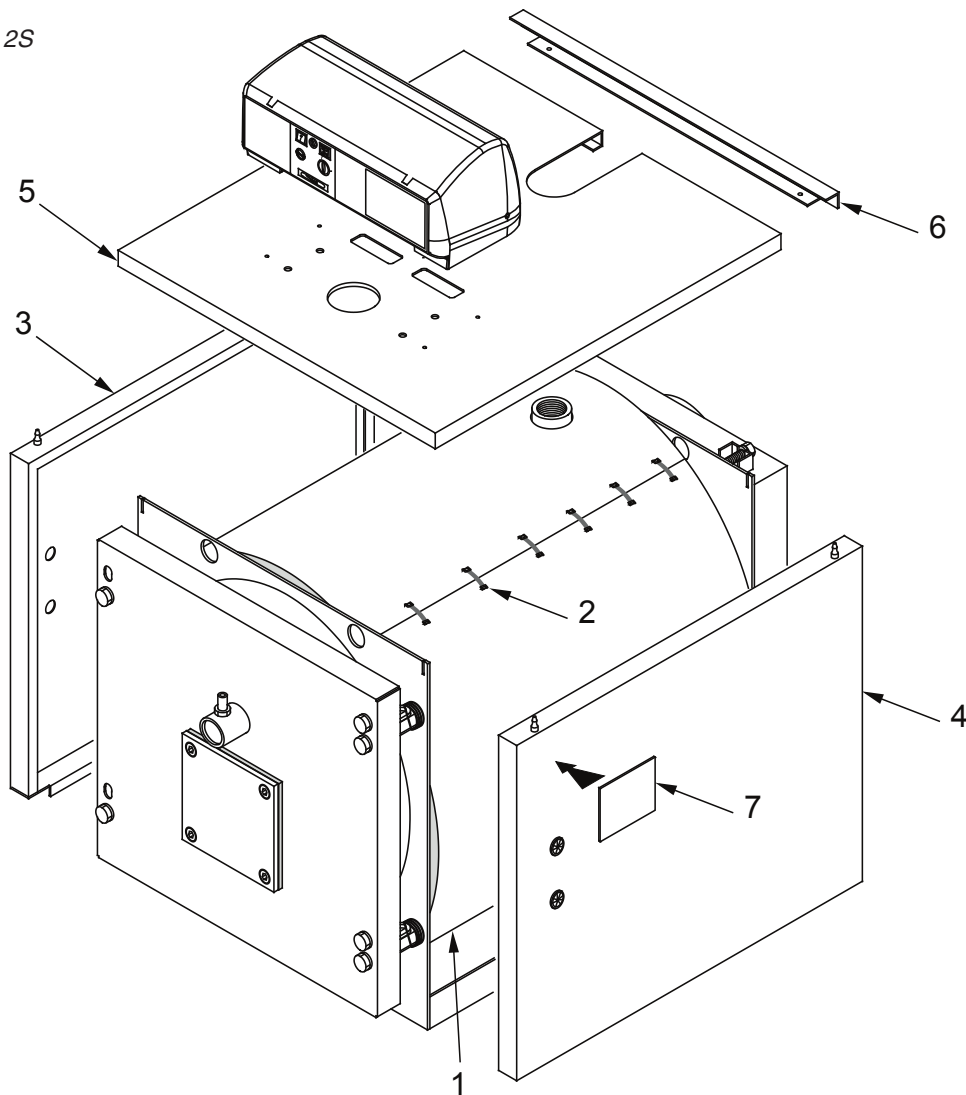


fig. 27

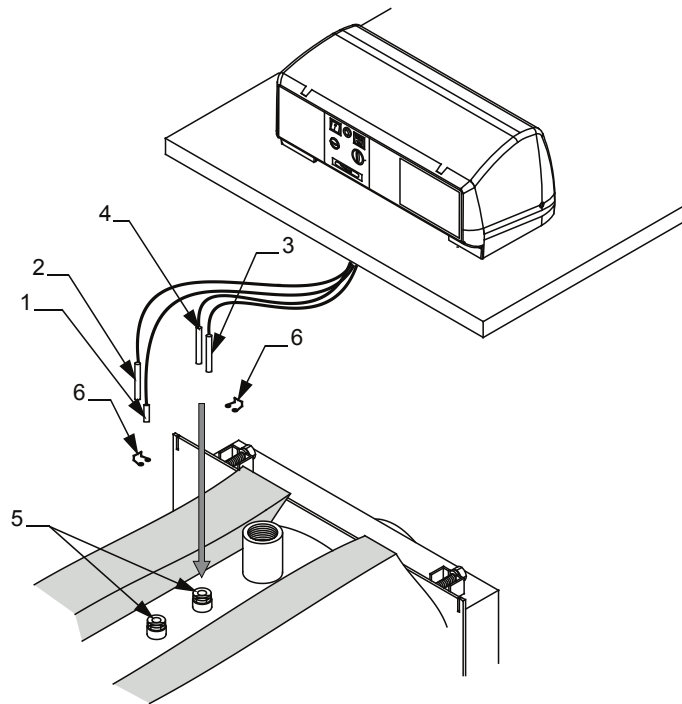
### Assembly sequence (Ref. fig. 27 and 28)

- A) Mount the insulation (pos. 1) of the boiler body and secure the 2 edges with the contact springs (pos. 2) supplied in the accessory box, hooking them to the external fabric part of the insulation.
- B) Position the side panels (pos. 3 and 4) with the lower bend inside the L-shaped profile at the base of the boiler body and hook the upper part in the plate cuts.  
To determine which is the right side and which is the left side, refer to the cable glands: they must face the front of the boiler.
- C) Rotate the cover of the panel board frontwards after having removed the two screws on the side and insert the electric inlet cables and the outlet probe capillaries through the slots at the base.  
Fix the panel board to the upper panel (pos. 5).  
Fit the upper panel pos. 5, complete with panel board, to the two sides of the casing.
- D) Insert into the conduits the bulbs of the instruments as indicated in fig. 28, pass the electric cables through the side cable glands from the preferred side and wire the panel board to the power line, to the burner and to any pumps, etc.  
Close the cover of the electric control board.

- E) Fix the reinforcement pos. 6, to the top panel pos. 5 and press it until joining the junction pin to the sides.
- F) Fix the installation and boiler data plate (pos.7) to the side panel after having degreased the relevant part with the specific solvent.

**The plates are included in the document envelope.**

## Installation instructions



- 1 Thermometer probe
- 2 Working thermostat probe
- 3 Safety thermostat probe
- 4 Minimum thermostat probe
- 5 Probe bulb holders
- 6 Capillaries fixing spring

fig. 28

### Assembly sequence (Ref. fig. 29)

- A) Mount the insulation (pos. 1) of the boiler body and secure the 2 edges with the elastic straps (pos. 2) supplied in the accessory box, hooking them to the external fabric part of the insulation.
- B) Position the side panels (pos. 3 and 4) with the lower bend inside the L-shaped profile at the base of the boiler body and hook the upper part in the plate cuts.  
To determine which is the right side and which is the left side, refer to the cable gland plates (pos. 11): they must face the front of the boiler.
- C) Fix the middle rear panel (pos. 15) and the top rear panel (pos. 8) with the specific self-threading screws.
- D) Rotate the cover of the panel board frontwards after having removed the two screws on the side and insert the electric inlet cables and the outlet probe capillaries through the slots at the base.  
Fix the panel board to the upper panel (pos. 10).  
Fit the upper panel pos. 10, complete with panel board, to the two sides of the casing.
- E) Insert into the conduits the bulbs of the instruments as shown in Fig. 30 and wire the panel board to the power line, to the burner and to any pumps, etc.  
Close the cover of the electric control board.  
Guide the burner plug through the side plate (pos. 11) on the preferred side and secure the cable with the cable gland supplied.  
Fasten the plates (pos. 11) to the sides of the casing.  
Secure the electric cables coming out from the rear of the boiler with the cable clamps, tightening them moderately.
- F) Fit the upper longitudinal panels (pos. 12 and 13) hooking them to the sides.
- G) Fix the installation and boiler data plate (pos.14) to the side panel after having degreased the relevant part with the specific solvent.

**The plates are included in the document envelope.**

TRISTAR 340÷560 2S

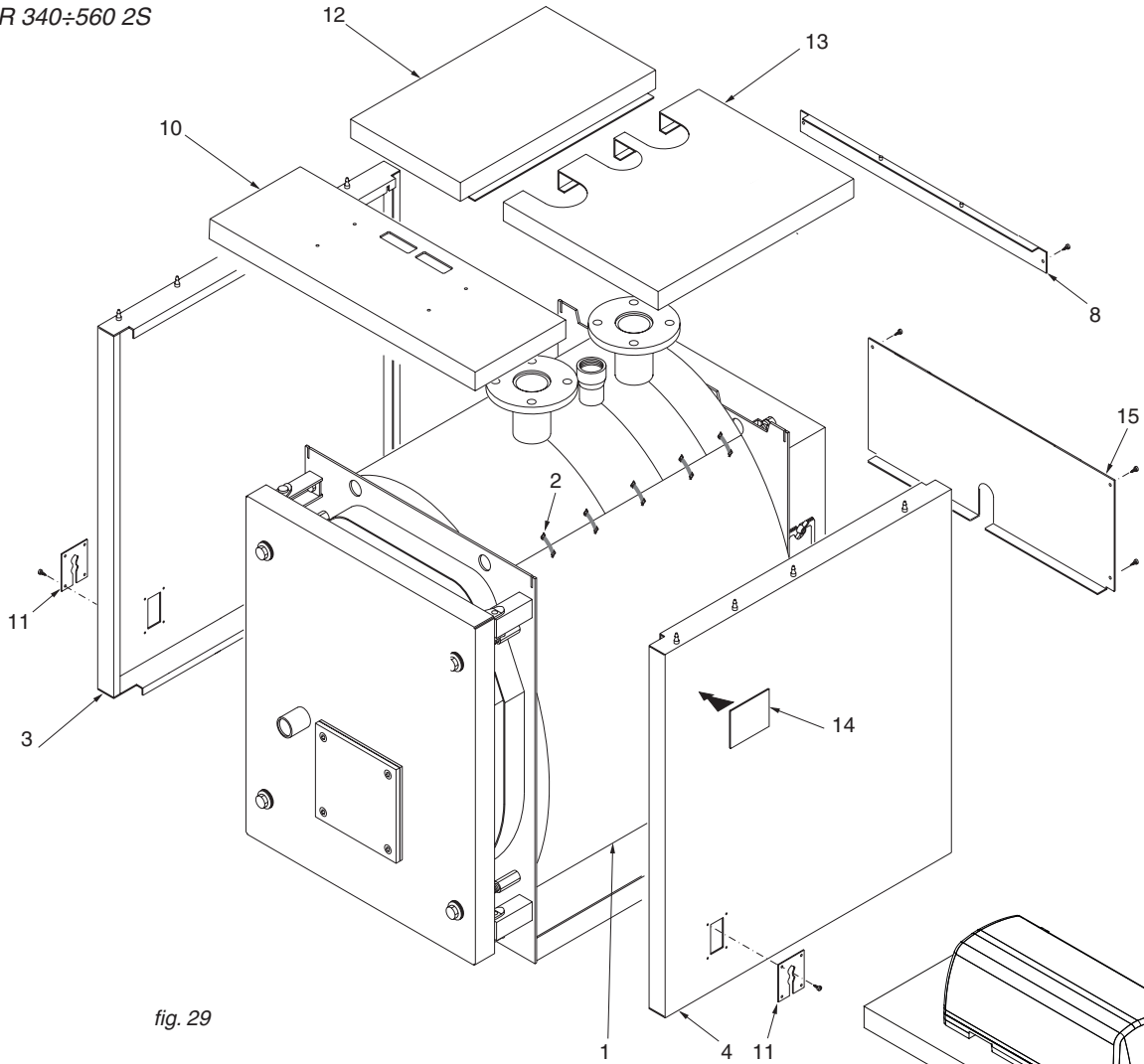


fig. 29

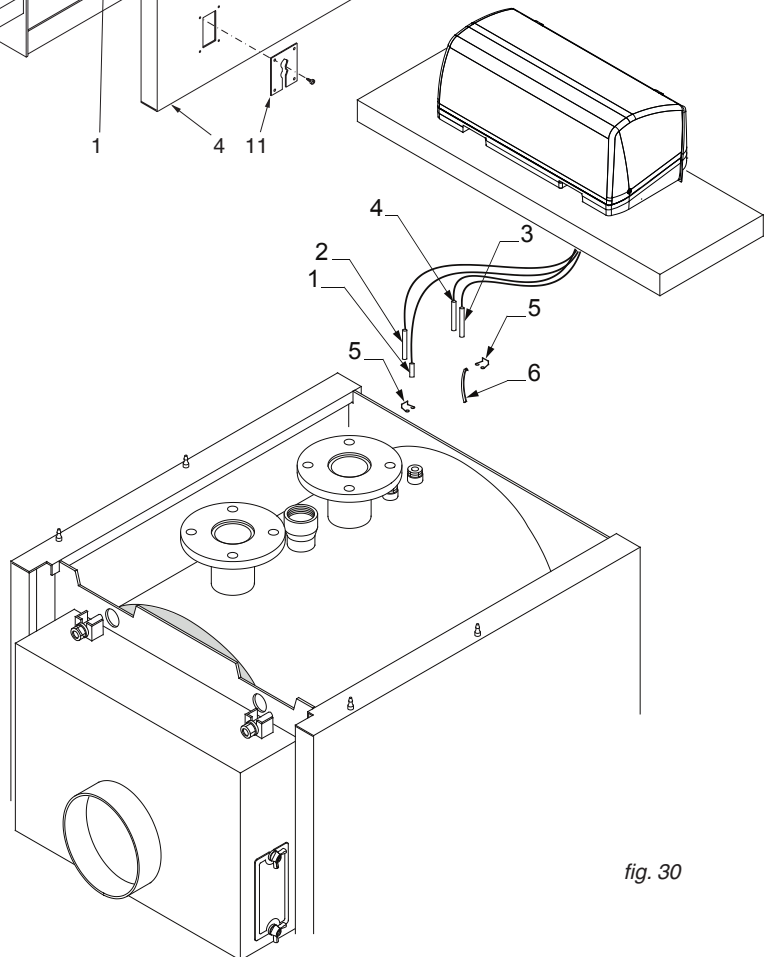


fig. 30

- 1 Thermometer probe
- 2 Working thermostat probe
- 3 Safety thermostat probe
- 4 Minimum thermostat probe
- 5 Safety spring
- 6 Contact spring

## Installation instructions

### Assembly sequence (Ref. fig. 31)

- A) Mount the insulation (pos. 1) of the boiler body and secure the 2 edges with the elastic straps (pos. 2) supplied in the accessory box, hooking them to the external fabric part of the insulation.
- B) Position the side panels (pos. 3a, 3b and 4a, 4b) with the lower bend inside the L-shaped profile at the base of the boiler body and hook the upper part to plate junction profiles. To determine which is the right side and which is the left side, refer to the cable gland plates on the front panels (pos. 5): they must face the front of the boiler. Fasten the 4 countersunk screws (pos. 8) to the two sides 3b and 4b on the inner rear side.
- C) Press fit the bottom rear panel (pos. 9) and fasten the top rear panel (pos. 10) to the screws pos. 8.
- D) Rotate the cover of the panel board frontwards after having removed the two screws on the side and insert the electric inlet cables and the outlet probe capillaries through the slots at the base. Fix the panel board to the upper panel (pos. 12). Fit the upper panel pos. 12, complete with panel board, to the two sides of the casing.
- E) Insert into the conduits the bulbs of the instrumentsire nelle guaine i bulbi degli strumenti come indicato in Fig. 30 and wire the panel board to the power line, to the burner and to any pumps, etc. Close the cover of the electric control board. Guide the burner plug through the side plate (pos. 5) on the preferred side and secure the cable with the cable gland supplied. Fasten the plates (pos. 5) to the sides of the casing. Secure the electric cables coming out from the rear of the boiler with the cable clamps, tightening them moderately.
- F) Fit the upper longitudinal panels (pos. 13 and 14) hooking them to the sides.
- G) Fix the installation and boiler data plate (pos.15) to the side panel after having degreased the relevant part with the specific solvent.
- The plates are included in the document envelope.**

TRISTAR 680-870 2S

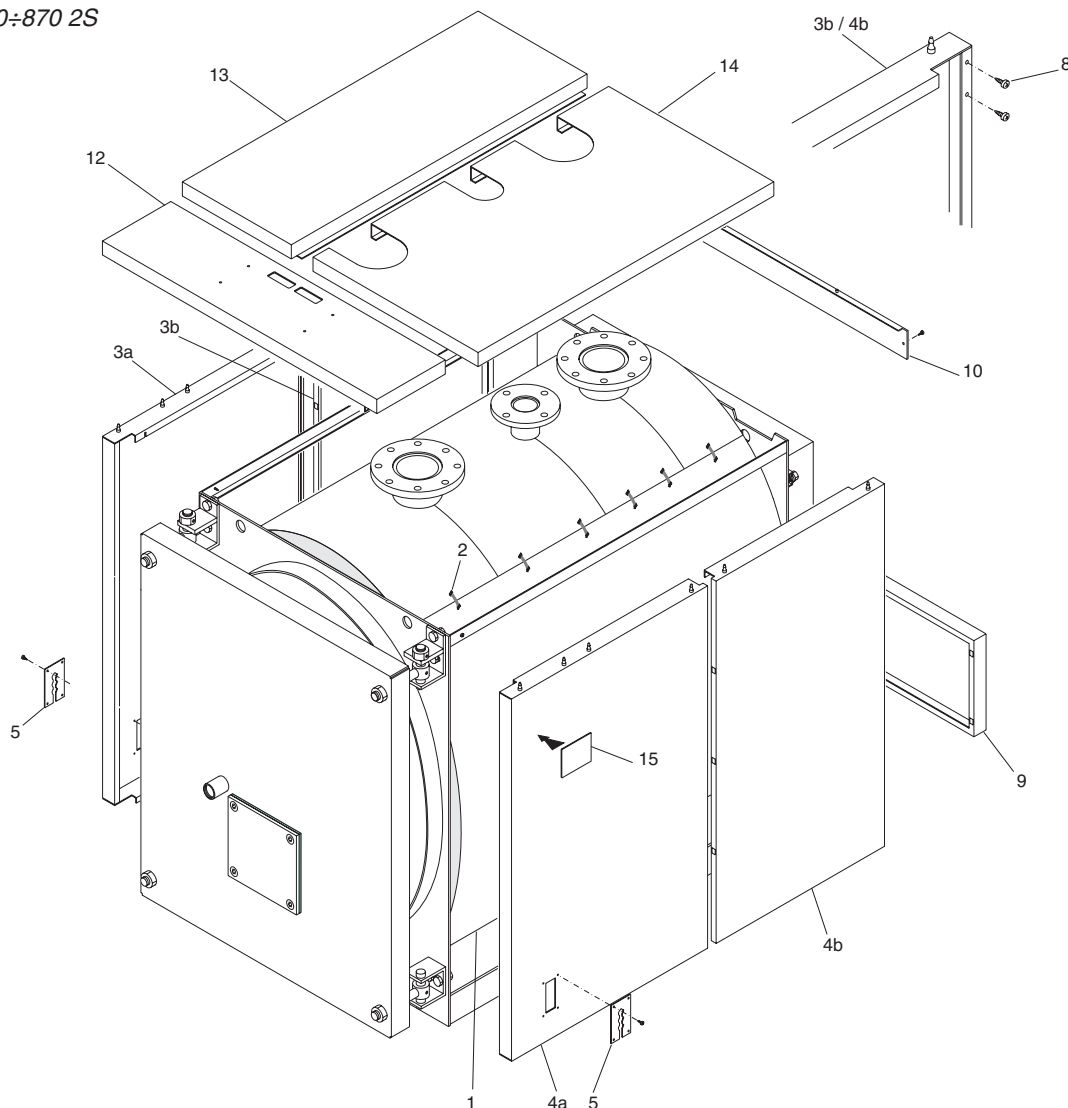


fig. 31

## Assembly sequence (Ref. fig. 32)

A) Mount the insulation (pos. 1) of the boiler body and secure the 2 edges with the elastic straps (pos. 2) supplied in the accessory box, hooking them to the external fabric part of the insulation.

Perform a sufficient cut on the top part near the bulb holders.

B) Position the side panels (pos. 3a, 3b and 4a, 4b) with the lower bend inside the L-shaped profile at the base of the boiler body and hook the upper part to plate junction profiles.

To determine which is the right side and which is the left side, refer to the cable gland plates on the front panels (pos. 5): they must face the front of the boiler.

C) Fit the upper rear panel (pos. 7).

D) Rotate the cover of the panel board frontwards after having removed the two screws on the side and insert the electric inlet cables and the outlet probe capillaries through the slots at the base.

Fix the panel board to the upper panel (pos. 9.)

Fit the upper panel pos. 9, complete with panel board, to the two sides of the casing.

E) Insert into the conduits the bulbs of the instruments as indicated in fig. 35 and wire the panel board to the power line, to the burner and to any pumps, etc.

Close the cover of the electric control board.

Guide the burner plug through the side plate (pos. 5) on the preferred side and secure the cable with the cable gland supplied.

Fasten the plates (pos. 5) to the sides of the casing.

Secure the electric cables coming out from the rear of the boiler with the cable clamps, tightening them moderately.

F) Fit the upper longitudinal panels (pos. 10 and 11) hooking them to the sides.

G) Fix the installation and boiler data plate (pos.12) to the side panel after having degreased the relevant part with the specific solvent.

**The plates are included in the document envelope.**

TRISTAR 1000÷2000 2S

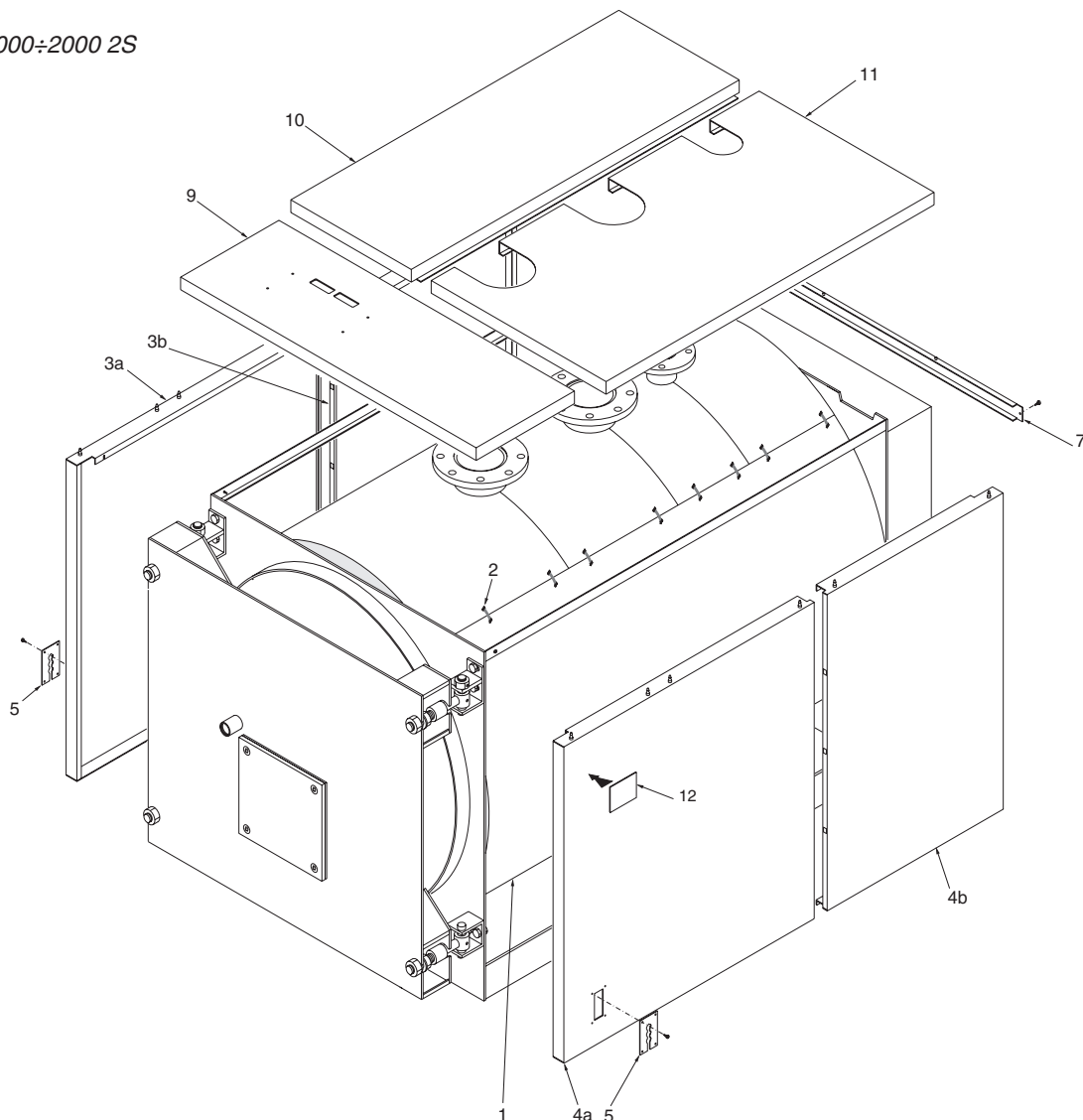


fig. 32

## Installation instructions

TRISTAR 2350 2S

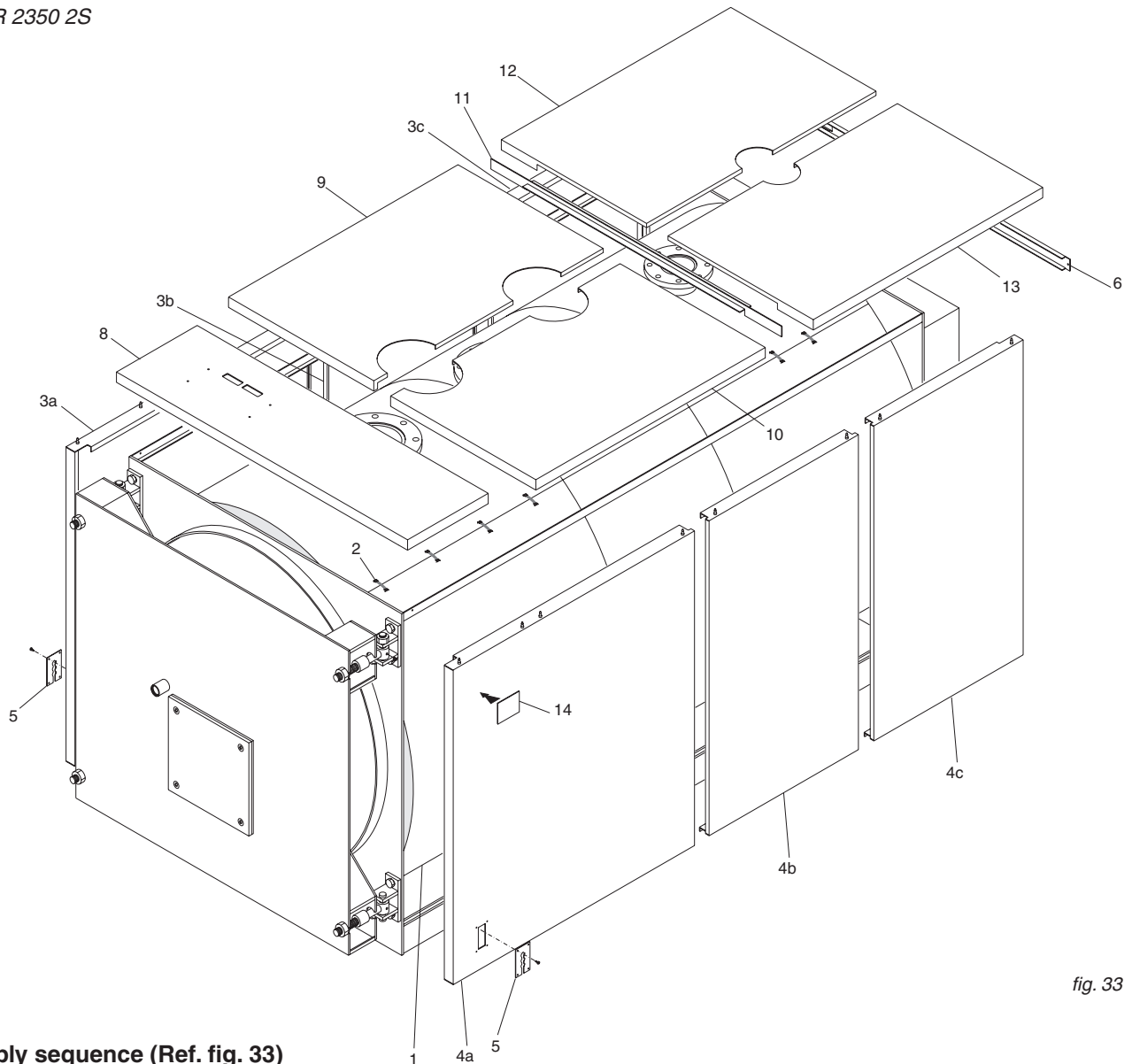


fig. 33

### Assembly sequence (Ref. fig. 33)

A) Mount the insulation (pos. 1) of the boiler body and secure the 2 edges with the elastic straps (pos. 2) supplied in the accessory box, hooking them to the external fabric part of the insulation.

Perform a sufficient cut on the top part near the bulb holders.

B) Position the side panels (pos. 3a, 3b, 3c and 4a, 4b, 4c) with the lower bend inside the L-shaped profile at the base of the boiler body and hook the upper part to plate junction profiles. To determine which is the right side and which is the left side, refer to the cable gland plates on the front panels (pos. 5): they must face the front of the boiler.

C) Fit the upper rear panel (pos. 6.)

D) Rotate the cover of the panel board frontwards after having removed the two screws on the side and insert the electric inlet cables and the outlet probe capillaries through the slots at the base.

Fix the panel board to the upper panel (pos. 8.)

Fit the upper panel pos. 8, complete with panel board, to the two sides of the casing.

E) Insert into the conduits the bulbs of the instruments as indicated in fig. 35 and wire the panel board to the power line, to the burner and to any pumps, etc.

Close the cover of the electric control board.

Guide the burner plug through the side plate (pos. 5) on the preferred side and secure the cable with the cable gland supplied.

Fasten the plates (pos. 5) to the sides of the casing.

Secure the electric cables coming out from the rear of the boiler with the cable clamps, tightening them moderately.

F) Fit the upper longitudinal panels (pos. 9 and 10) hooking them to the sides.

G) Mount the top panel support (pos. 11), inserting it below the top panels - rear side.

H) Fit the upper longitudinal panels (pos. 12 and 13) hooking them to the sides.

I) Fix the installation and boiler data plate (pos. 14) to the side panel after having degreased the relevant part with the specific solvent.

**The plates are included in the document envelope.**



TRISTAR 2700 - 3500

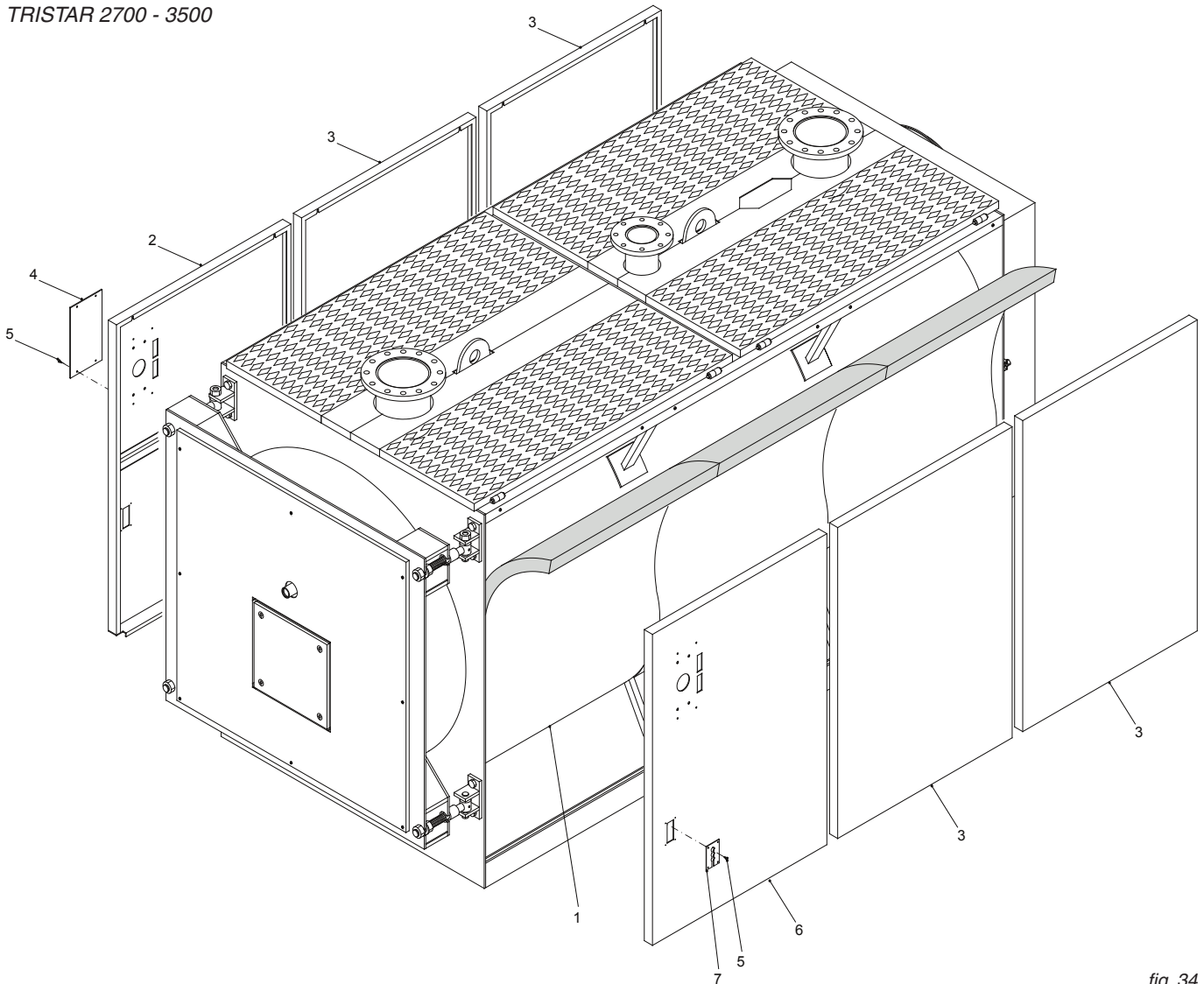


fig. 34

## Assembly sequence (Ref. fig. 34)

A) Mount the insulation (pos. 1) of the boiler body and secure the 2 edges with the elastic straps supplied in the accessory box, hooking them to the external fabric part of the insulation. Perform a sufficient cut on the top part near the bulb holders.

B) **Note: for the TST 3500 2S model, aside from the rear panels pos. 3 (2 per side), 2 side panels are supplied (400 mm long) (not viewed) which must be mounted on the back of the boiler, 1 per side.**

Position the left side panels (pos. 2 and 3) with the lower bend inside the L-shaped profile at the base of the boiler body and hook the upper part in the screws fastened on the top longitudinal pipe.

To determine which of the front sides is right and which is left, refer to the holes to fix the panel board; it must face the front of the boiler.

The hole-covering panel pos. 4 is already mounted.

C) Position the right side panels (pos. 6 and 3) with the lower bend inside the L-shaped profile at the base of the boiler body and hook the upper part in the screws fastened on the top longitudinal pipe.

D) Fix the panel board to the side panel (pos. 6).

Rotate the cover of the panel board frontwards after having removed the two screws on the side and insert the electric inlet cables and the outlet probe capillaries through the slots at the base.

E) Insert into the conduits the bulbs of the instruments as indicated in fig. 35 and wire the panel board to the power line, to the burner and to any pumps, etc.

Close the cover of the electric control board.

Guide the burner plug through the side plate (pos. 7) on the preferred side and secure the cable with the cable gland. Fasten the plates (pos. 7) to the sides of the casing.

F) Fix the installation and boiler data plate to the side panel after having degreased the relevant part with the specific solvent.

**The plates are included in the document envelope.**

## Installation instructions

### Probe insertion sequence

Following this sequence, insert the probes of the instruments in the bulb holder/s on the top of the boiler (Ref. fig. 35): of the thermometer (pos.1), of the working thermostat (pos. 2), of the safety thermostat (pos. 3), of the minimum thermostat (pos. 4). It is recommended to insert the probes all the way in the relative bulb holders for best contact. Then insert the contact spring (pos. 6) and fasten the capillaries with the spring/s (pos. 5).

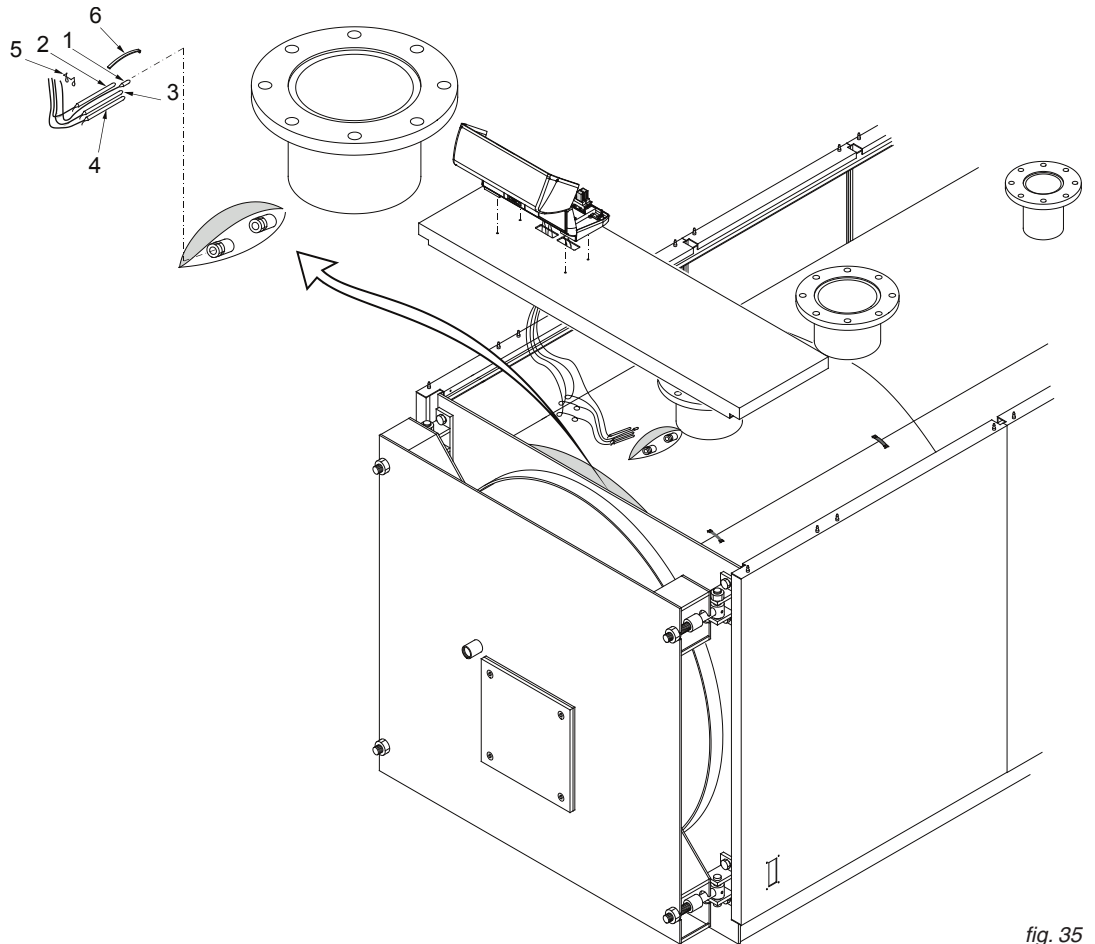


fig. 35

### Assembly sequence (Ref. fig. 36)

The **TRISTAR 3900 2S ÷ TRISTAR 6100 2S** boilers are supplied with casing, for the mounting of the panel board, do the following:

- A) Dismount the right upper walkways (pos. 1 and 2).
- B) Fix the support box of the panel board to the bracket on the right side of the boiler.
- C) Remove the lower cover pos. 4 from the support box of the panel board.  
Fasten the panel board (pos. 5) to the support box pos. 3.
- D) Rotate the cover of the panel board frontwards after having removed the two screws on the side and insert the electric inlet cables and the outlet probe capillaries through the slots at the base.

Insert the thermostat probe capillaries in the tube designed for their passage, that is placed under the casing (see detail "A").

Pay special attention when unrolling the capillaries and insert the bulbs in the two holders, inserting the contact springs and blocking the capillaries with the fixing springs.

- E) After having carried out the electric connections, close the panel board and reposition the lower cover of the support box.
- F) Remount the upper walkways.

TRISTAR 3900÷6100 2S

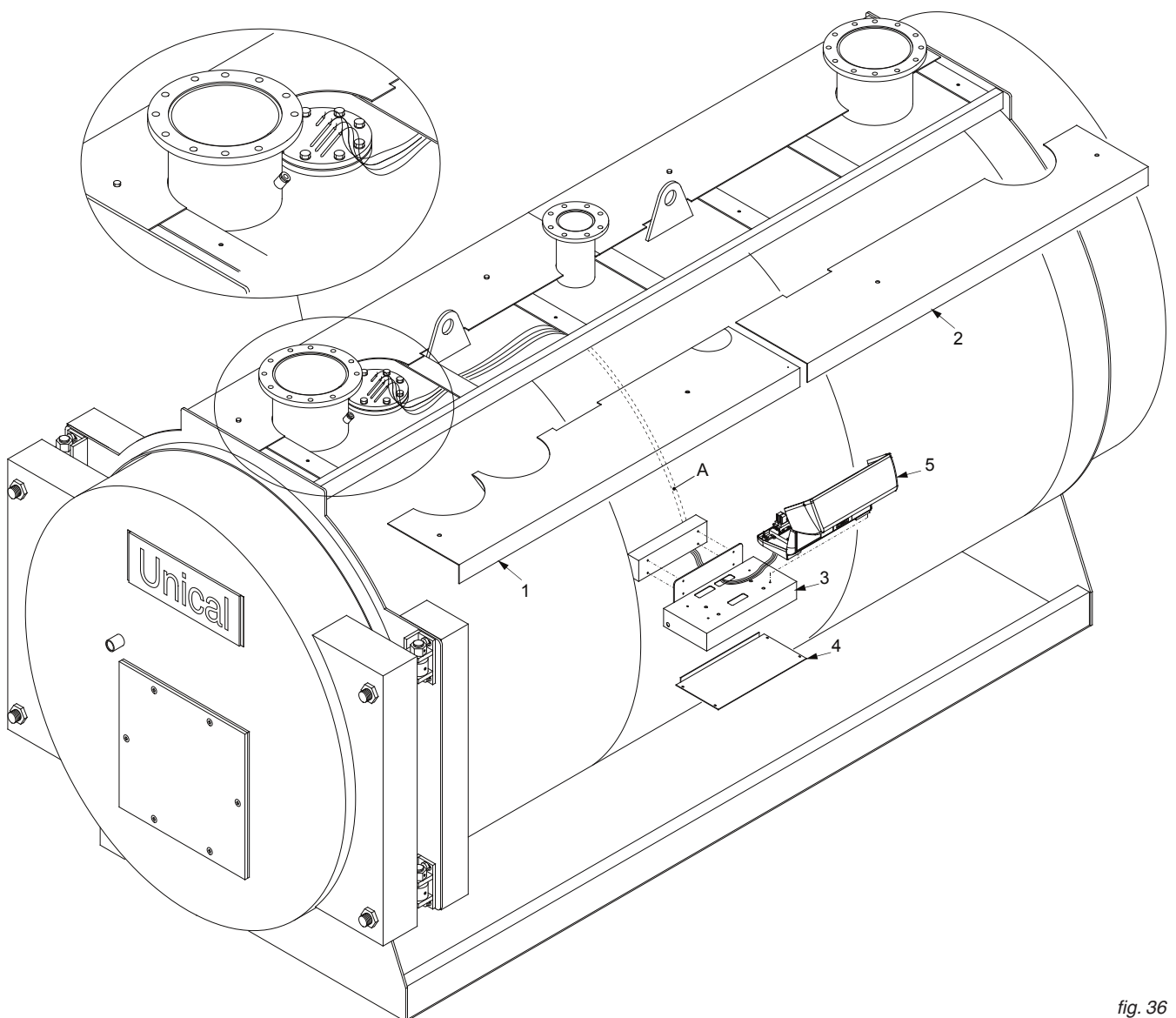


fig. 36

## Installation instructions

### 3.14- ELECTRICAL CONNECTIONS

#### General warnings

The electrical safety of the appliance is guaranteed only when it has been properly connected to an efficient earthing system carried out as intended by safety standards in force: pipes of the gas, water and heating systems are absolutely unsuitable as earthing electrodes.

It is necessary to verify this fundamental safety requirement. If in doubt, have the electric system carefully checked by professionally qualified personnel as the manufacturer is not liable for damage caused by failure to provide an earthing system.

Have professionally qualified personnel check that the electric system is adequate for the maximum power absorbed by the appliance, indicated on the data plate. Make sure in particular that the cross-section of the cables is suitable for the power absorbed by the appliance.

Adapters, multiple sockets and/or extension cords cannot be used to power the appliance.

Use of any type of component using electric energy requires the observance of some fundamental rules, such as:

- do not touch the appliance with wet and/or moist parts of the body and/or in bare feet;
- do not pull the electric cables;
- do not leave the appliance exposed to atmospheric agents (rain, sun, etc.) unless expressly designed;
- do not allow children or unskilled persons to use the appliance.

### 230V electric power supply connection

The electrical connections are illustrated in chap. 3.16, 3.17, 3.18, 3.19, 3.21.

The boiler installation requires a connection to a 230 V - 50 Hz electric mains: this connection must be properly carried out as provided for by current IEC regulations.



#### **Danger!**

**Only a qualified technician may perform the electrical installation.**

**Before performing connections or any type of operation on electrical parts, always disconnect electrical power and make sure that it cannot be reconnected accidentally.**

Remember that a bipolar switch must be installed on the boiler power line with over 3 mm between contacts, easy to access, making maintenance quick and safe.



The power cable must be replaced by authorised technical personnel. Failure to comply with the above can jeopardise the safety of the appliance.

## 3.15 - STANDARD PANEL BOARD

The main switch **11** powers the board and the equipment connected to it.  
 Switches **12** and **13** in turn cut power to the burner and to the system pump.  
 Thermostat **32** adjusts the working temperature of the boiler.  
 The working thermostat is provided with two switching contacts to control the two-stage burners.

The differential between the two contacts is 6°C (not adjustable).  
 The minimum thermostat, which can only be accessed after having lifted the cover of the electric control board, stops the system pump until the boiler reaches the temperature of 50°C.  
 The electric power line of the boiler's control board must have a switch with protective fuses.

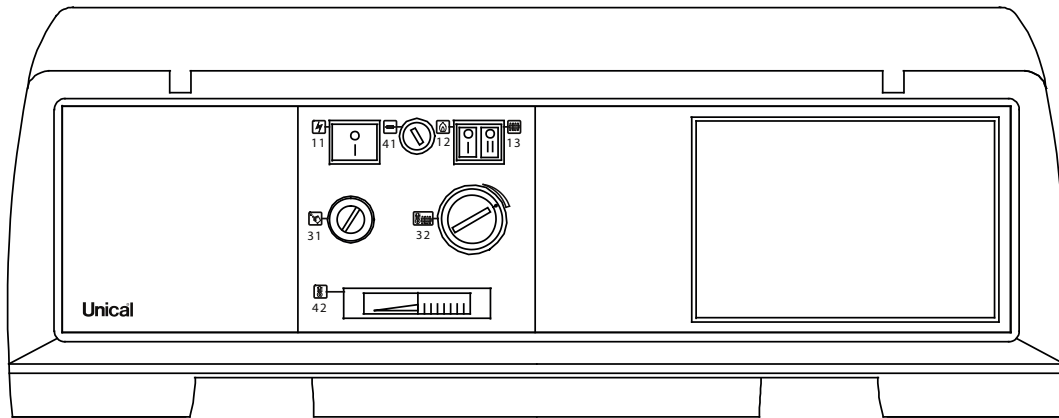


fig. 37

- |                                     |                       |
|-------------------------------------|-----------------------|
| 11 Main switch with indicator light | 32 Working thermostat |
| 12 Burner switch                    | 41 General fuse       |
| 13 System pump switch               | 42 Boiler thermometer |
| 31 Safety thermostat                |                       |

**For use of the panel board, see the system manager instruction booklet**

**If the Room thermostat is mounted, remove bridge 11-12**

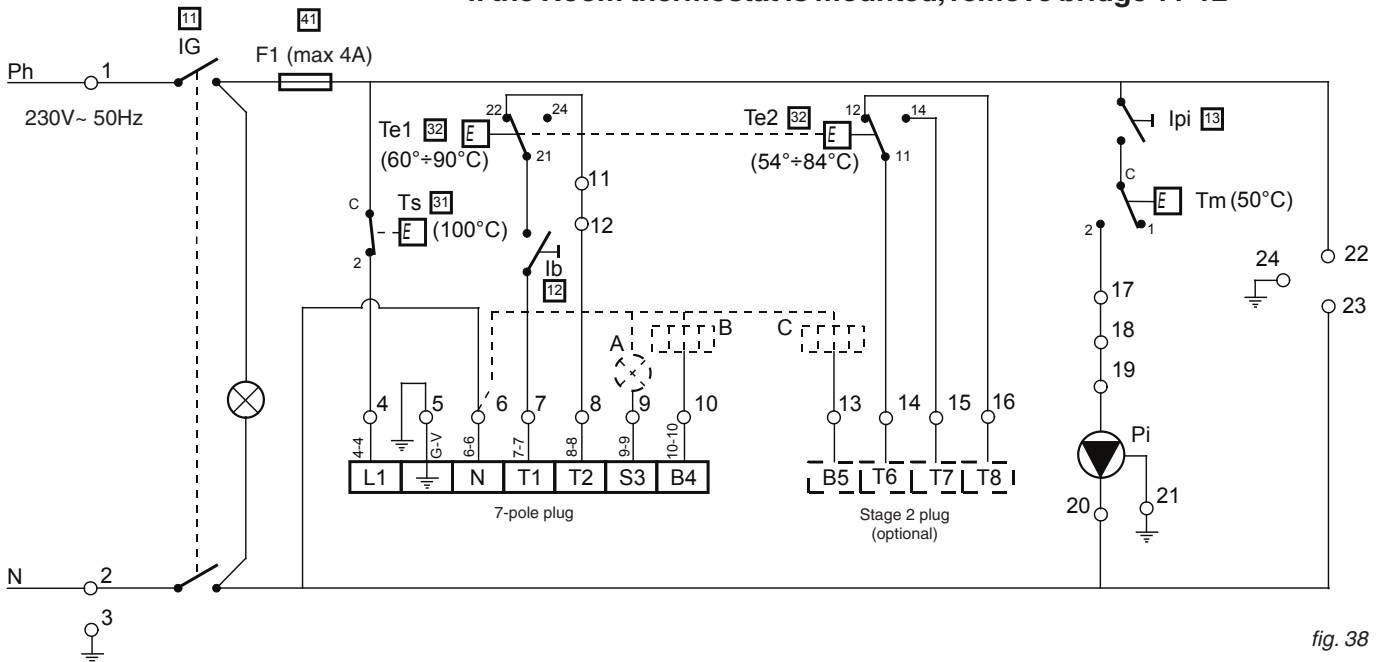


fig. 38

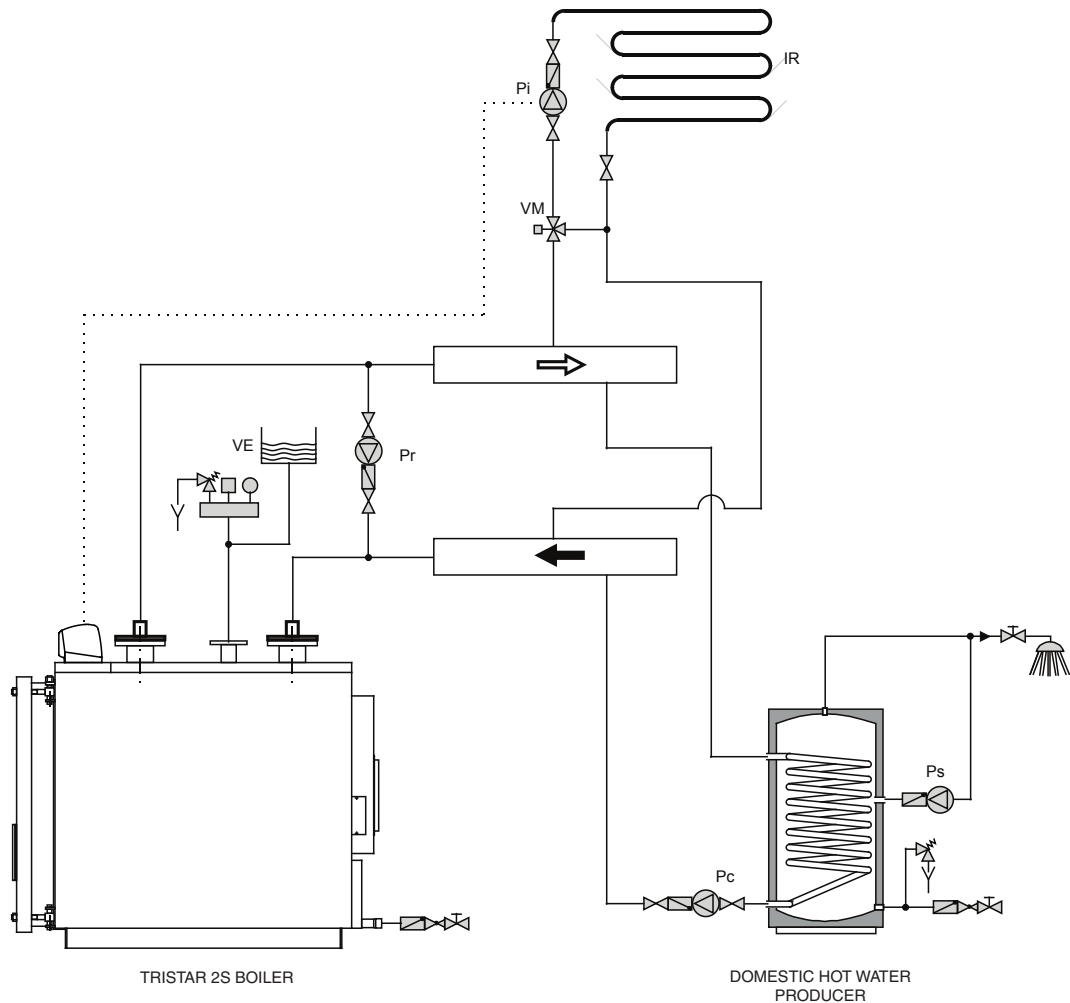
- |                                     |  |   |
|-------------------------------------|--|---|
| Ph Phase (230V ~50Hz)               | Te1 Working thermostat stage 1 (60°C±90°C) | Pi System pump                          |
| N Neutral                           | Te2 Working thermostat stage 2 (54°C±84°C) | A Possible repetition of burner block   |
| F1 General fuse (max 4A)            | Tm Minimum thermostat (50°C)               | B Possible working hour counter stage 1 |
| lb Burner switch                    | Ts Safety thermostat (100°C)               | C Possible working hour counter stage 2 |
| IG Main switch with indicator light |  |   |
| lpi System pump switch              |  |   |
| Ta Room thermostat                  |  |   |

## Installation instructions

### 3.16- HYDRAULIC AND ELECTRICAL SYSTEM CONNECTION

Fig. 39 and 40 show the typical layout of the connection of the boiler to the heating system with production of domestic hot water.

Remember that TRISTAR 2S boilers operate with forced circulation.



#### Key:

- Pr* = recirculation pump
- VM* = zone mixer valve
- Pi* = heating system pump
- VE* = expansion vessel
- IR* = heating system distribution
- Ps* = domestic water recirculation pump
- Pc* = domestic hot water production charge pump
- TA* = room thermostat

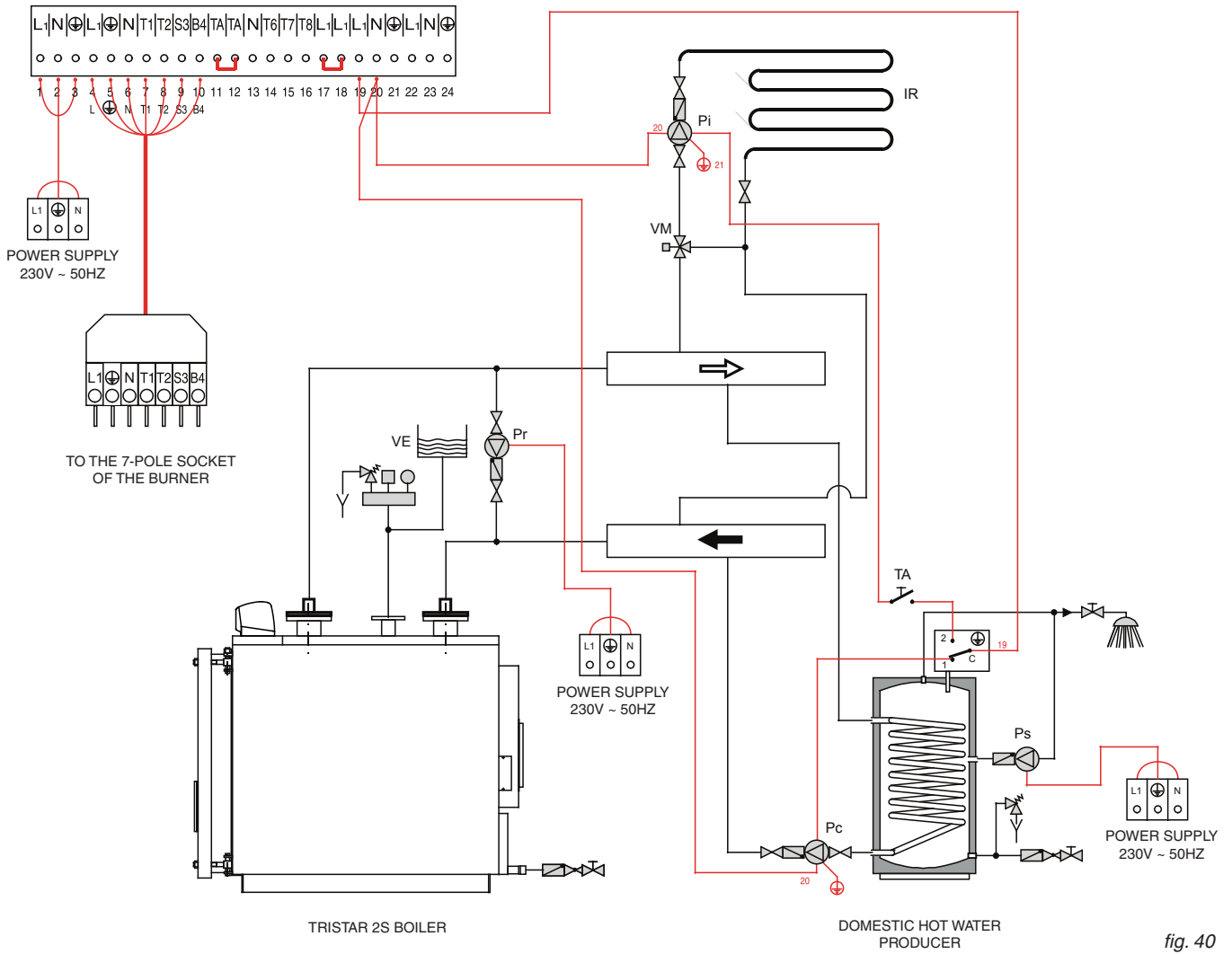
The standard panel board of the TRISTAR 2S boiler automatically switches the burner off when the temperature in the boiler reaches the value set on the control thermostat.

It also manages the system pump, which will only be activated when the minimum boiler temperature of 50°C has been reached (anti-condensation protection temperature).

The pump will switch off when the lower threshold of 50°C (decreasing) is reached.

The panel is set up to manage dual-stage or modulating burners. With this layout configuration, the DHW storage tank loading pump will have the priority over the heating system pump.

fig. 39



**NOTE: With absorption beyond 4A, place adequate contactors between the panel board and the loads**

## Installation instructions

### 3.17 - OPTIONAL PANEL BOARD

The main switch [11] powers the board and the equipment connected to it.

Switches [12] and [13] in turn control the burner and the mixed zone system pump.

Switches [14] and [15] control the direct zone system pump and the storage tank pump.

The thermostat adjusts the working temperature of the boiler: to achieve this, the thermostat must be placed at maximum full-scale pos. [32].

Any operation of the second stage of the burner will be managed by the heat control.

The default setting of the heating controller stops the system pump until the boiler reaches the temperature of 50°C.

The electric power line of the boiler's control board must have a switch with protective fuses.

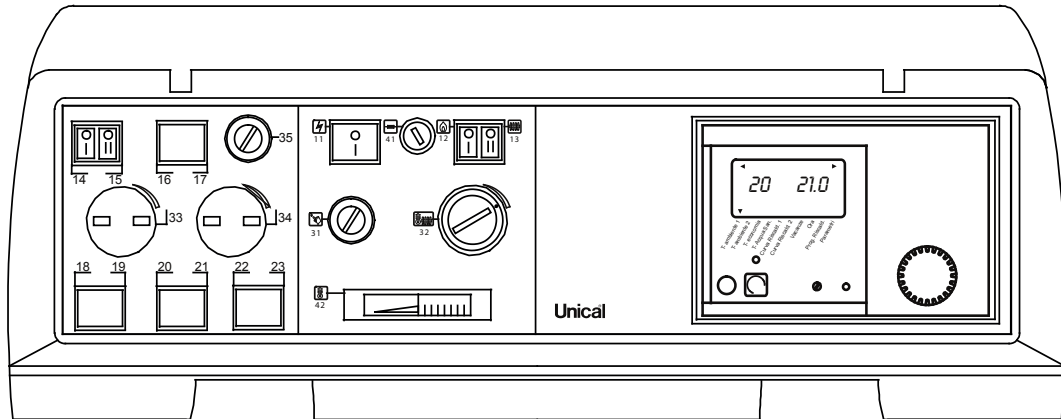


fig. 41

- 11 Main switch with indicator light
- 12 Burner switch
- 13 Mixed zone system pump switch
- 14 Direct zone system pump switch
- 15 Storage tank pump switch

- 31 Safety thermostat
- 32 Working thermostat
- 41 General fuse
- 42 Boiler thermometer

For use of the panel board, see the system Manager instruction booklet

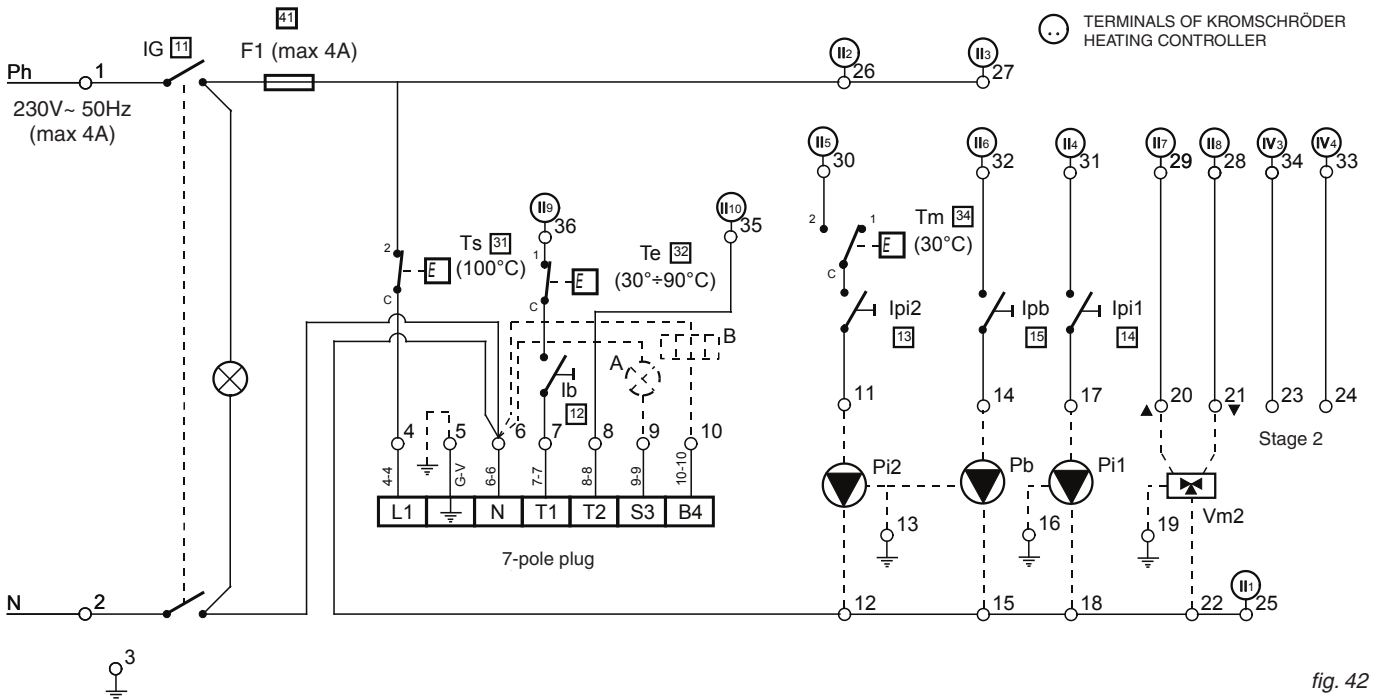


fig. 42

- Ph Phase (230V ~50Hz)
- N Neutral
- F1 General fuse (max 4A)
- lb Burner switch
- IG Main switch with indicator light
- lpi1 System pump 1 switch
- lpi2 System pump 2 switch

- lpb Storage tank pump switch
- Pb Storage tank pump
- Pi1 Direct zone system pump
- Pi2 Mixed zone system pump
- Te Working thermostat
- Tm Minimum thermostat

- Ts Safety thermostat (100°C)
- Vm2 Mixer valve
- A Possible repetition of burner block
- B Possible working hour counter stage 1



3.18 - LAYOUT OF PROBE CONNECTION ON HEATING CONTROLLER code 30680

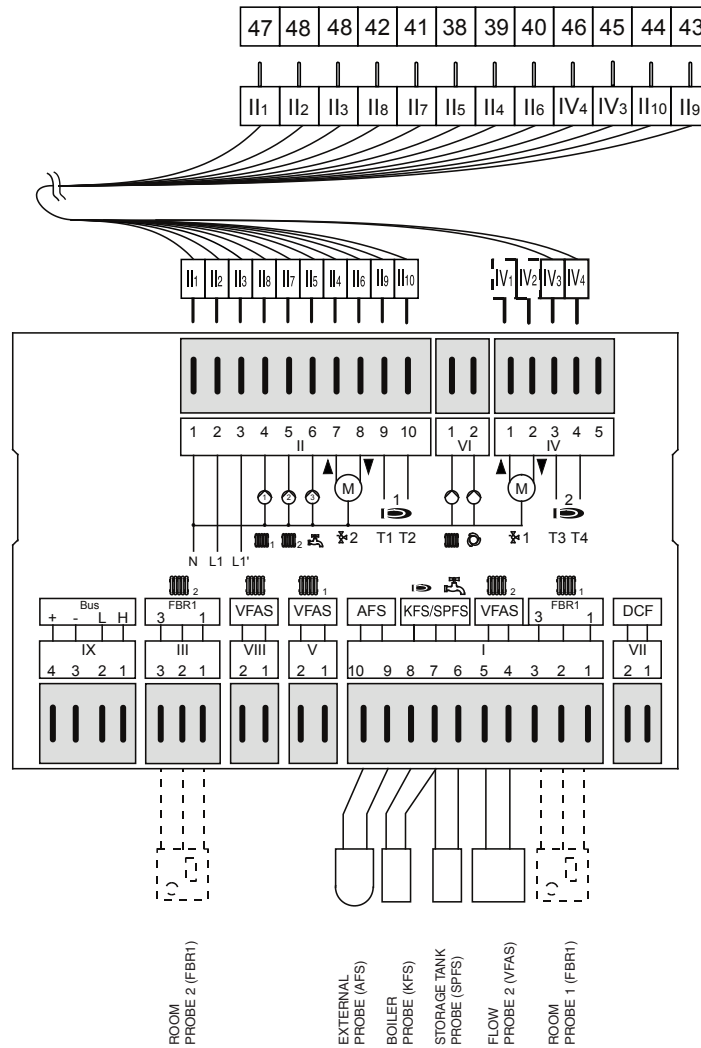


fig. 43

The heating controller probes (boiler, storage tank, external, flow) are included in the supply; the ambient probes 1 and 2 are optional; the mixer valve and relative control motor are not included in the supply.

Should ambient probes be mounted (optional), the room temperature will only be determined with the boiler curve set by the program.

**If you intend on mounting 2 boilers in sequence, please contact our after-sales service.**

3.19 - PROGRAMMING THE HEATING CONTROLLER


For that which concerns adjustment or programming of the heating controller, see the instruction booklets attached to the device.

The following are the default parameters which cannot be modified.


As far as parameters which can be programmed by the user according to his requirements, see the system manager instruction book.


## Installation instructions


### PARAMETERS PROGRAMMABLE BY TECHNICIAN AND PROTECTED BY ACCESS CODE

INSTALLATION			
Description	Value range	Default	Individual values
CODE NUMBER	0000 - 9999	ENTRY	
CODE NUMBER (variation)	0000 - 9999	0000	
BUS ID <sup>1</sup>	(00), 01 - 15	01	
BUS ID <sup>2</sup>	(00), 01 - 15	02	
AF SUPPLY	00,01 (off/on)	01 = ON	
TEMPERATURE MASTER	00, 01 (OFF / ON)	00 = OFF	
MAX-BOILER	30 °C - 110 °C	80 °C	
MIN-BOILER	10 °C - 80 °C	60 °C	
T-WARM-UP	10 °C - 85 °C	50 °C	
L. MIN.	00, 01, 02	00	
HYSTERESIS	5K - 20K	5 degrees	
HYSTERESIS TIME	00 min - 30 min	10 min	
BURNER TIME 2	00 min - 30 min<P>	10 min	
BURNER HYSTERESIS 2	2K - 20K<P>	2 degrees	
HEAT SEQ TEMP (*)	0h - 250h	0h (*)	
RELAY FUNCT	00 - 08	00	
T MULTI-PROBE	30 °C - 90 °C	30 °C	
MFR HYSTERESIS	2K - 10K	5 degrees	
RELAY 2 FUNCT	00 - 03	00	
SCREED	00 - 01 (OFF / ON)	00 = OFF	
SCREED PROGRAM	see heating controller booklet		
RETURN	Exit level using 		

\* NOTE: For cascade boilers, the technical installation parameter HEAT SEQ TEMP is 250h

DOMESTIC HOT WATER PRODUCTION			
Description	Value range	Default	Individual values
CHARGE PUMP	00 - 01 (OFF / ON)	01 = ON	
PARALLEL PUMP	00, 01, 02, 03	00	
DHW TEMPERATURE	00 °C - 50 °C	20 °C	
DHW HYSTERESIS	5K - 30K	5 degrees	
DHW TIME	00 min - 30 min	00 min	
INLET TEMPERATURE	00, 01 (OFF / ON)	00 = OFF	
THERM FUNCT	00, 01 (OFF / ON)	00 = OFF	
RETURN	Exit level using 		

HEATING CIRCUIT 1			
Description	Value range	Default	Individual values
HEATING CIRCUIT FUNCTION	00 - 04	00	
PUMP FUNCTION	00, 03	00	
MIXER OPEN (not in hot water circuit)	5 - 25	16	
MIXER CLOSED (not in hot water circuit)	5 - 25	12	
MAX FLOW TEMPERATURE	20 °C - 110 °C	80 °C	
MIN FLOW TEMPERATURE	10 °C - 110 °C	10 °C	
FROST PROTECTION TEMP	- - - - (-15)°C - (5)°C	0	
OUTSIDE TEMP DELAY	0:00 - 24:00	1	
HEATING SLOPE DISTANCE	0K - 50K	5 degrees	
REDUCTION	00 - 01 (OFF / ON)	01 = ON	
RETURN	Exit level using 		

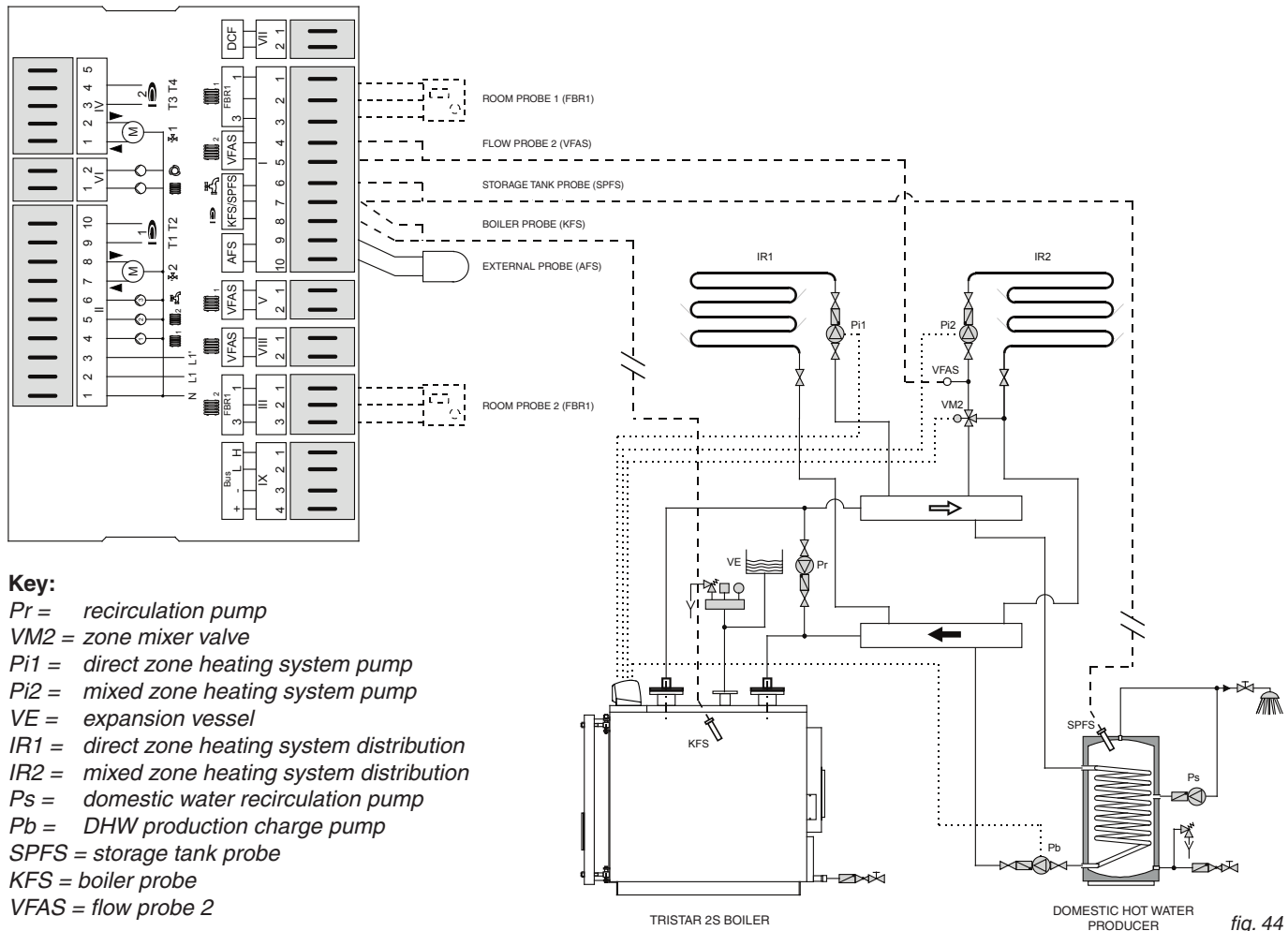
HEATING CIRCUIT 2			
Description	Value range	Default	Individual values
HEATING CIRCUIT FUNCTION	00 - 04	00	
PUMP FUNCTION	00, 03	00	
MIXER OPEN (not in hot water circuit)	5 - 25	16	
MIXER CLOSED (not in hot water circuit)	5 - 25	12	
MAX FLOW TEMPERATURE	20 °C - 110 °C	45 °C	
MIN FLOW TEMPERATURE	10 °C - 110 °C	10 °C	
FROST PROTECTION TEMP	- - - - (-15)°C - (5)°C	0	
OUTSIDE TEMP DELAY	0:00 - 24:00	1	
HEATING SLOPE DISTANCE	0K - 50K	5 degrees	
REDUCTION	00 - 01 (OFF / ON)	01 = ON	
RETURN	Exit level using 		

## Installation instructions

### 3.20 - HYDRAULIC AND ELECTRIC SYSTEM CONNECTION WITH OPTIONAL PANEL BOARD

Fig. 44 and 45 show the typical layout of the connection of the boiler to the heating system consisting of 2 zones one of which controlled by a motorised mixer valve.

DHW production can also be managed. Remember that TRISTAR 2S boilers operate with forced circulation.



The optional panel board of the TRISTAR 2S boiler automatically switches the burner off when the temperature in the boiler reaches the value set on the heating controller. It also manages the pump to fill a storage tank for DHW production.

Two distinct heating zones are managed automatically based on the data detected by the boiler, external, ambient and flow probes.

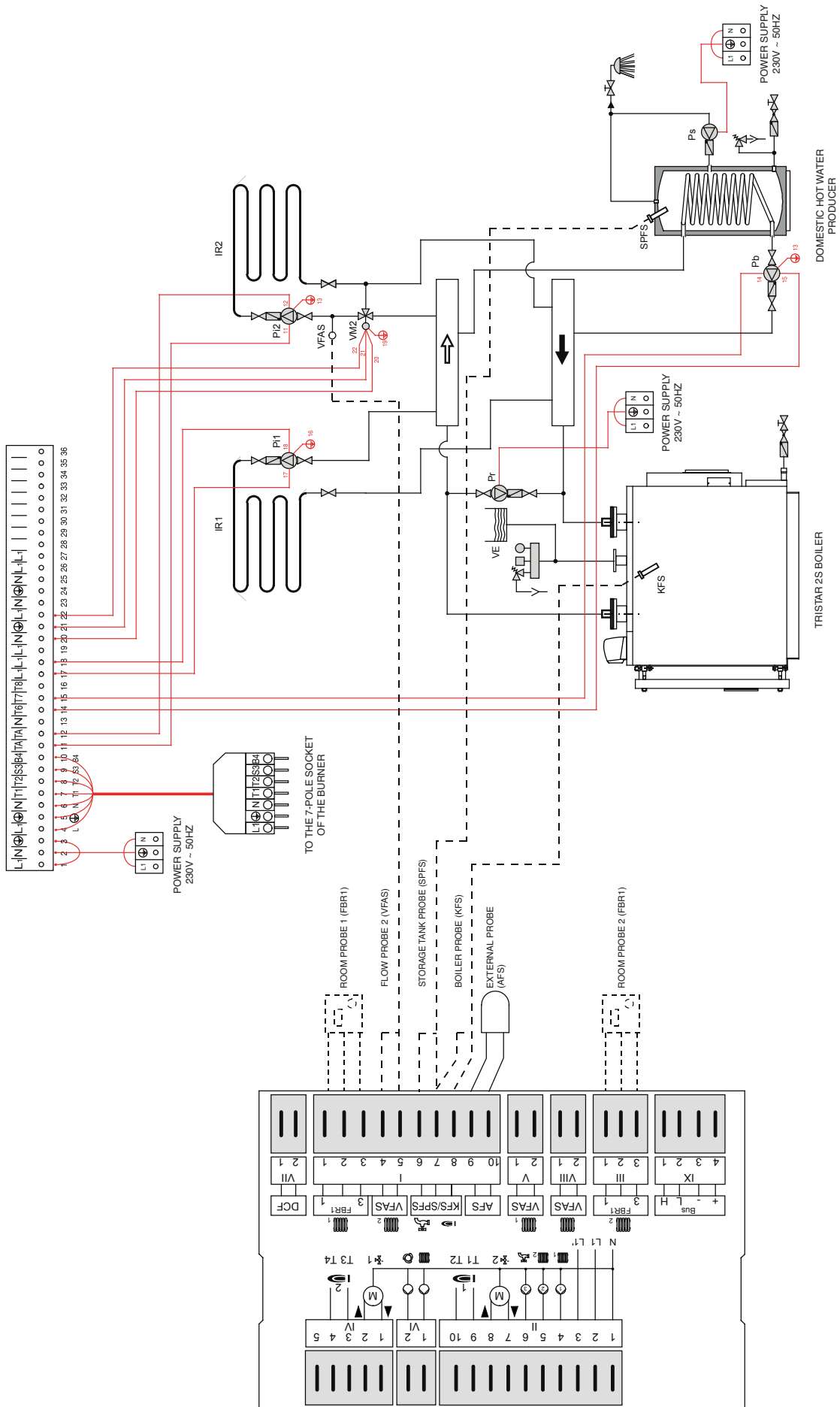
The main system pump (mixed zone) will only be activated when the minimum boiler temperature of 50°C has been reached (anti-condensation protection temperature).

The pump will switch off when the lower threshold of 50°C (decreasing) is reached.

The panel is set up to manage dual-stage or modulating burners. With this layout configuration, the DHW storage tank loading pump will have the priority over the heating system pump.

The heating controller is capable of controlling various system configurations:

- one direct zone system without mixer valve: the flow probe must not be mounted; the control unit only commands the system pump 1.
- one zone system with motorised mixer valve: the flow probe (downstream the mixer valve) must be fitted; the control unit commands the system pump 2 and the mixer valve 2.
- system with 2 zones: one direct and one with mixer valve; the control unit controls: the system pump of the direct zone 1, the mixer valve 2 and the system pump 2 of the mixed zone.



**NOTE: With absorption beyond 4A, place adequate contactors between the panel board and the loads**

fig. 45

### 3.21 - COMMISSIONING

#### Preliminary checks



**Commissioning must be done by professionally qualified personnel. Unical will not be held liable for damage to persons, animals or objects due to failure to comply with the above instruction.**

Before commissioning the boiler, check that:

- installation complies with standards UNI 7129 and 7131 for the gas part and with standards IEC 64-8 and 64-9 for the electrical power;
- the adduction of combustion air and flue gas evacuation are performed correctly according to that laid down by standards in force (UNI 7129/7131);
- the fuel feed system is dimensioned according to the flow rate required for the boiler and is provided with all safety and control systems prescribed by current standards;
- the power supply of the boiler is 230V - 50Hz;
- the system is filled with water (approximately 1 bar pressure on the pressure gauge with the pump stopped);
- any system shut-off gate valves are open;
- the gas feed valves are open;
- there is no gas leakage;
- the external main switch is connected;
- the system safety valves are not blocked and are connected to the sewer system drainage;
- there is no water leakage;
- ventilation conditions and minimum distances are guaranteed to perform maintenance.

#### Switching boiler on and off

To switch the boiler on and off, see the “SYSTEM MANAGER OPERATING INSTRUCTIONS” booklet.

#### Information for system manager

The system manager must be instructed concerning the use and operation of his heating system, in particular:

- Give the system manager the “SYSTEM MANAGER OPERATING INSTRUCTIONS”, as well as the other appliance documents inserted in the envelope inside the packaging. **The system manager must keep this documentation for future consultation.**
- Inform the system manager about the importance of the air vents and the flue gas exhaust system, highlighting their essential features and the absolute prohibition of modifying them.
- Inform the system manager concerning control of the system's water pressure as well as operations to restore it.
- Inform the system manager concerning correct control of temperatures, control units/thermostats and radiators to save energy.
- Remember that the system must receive regular maintenance at least once a year and a combustion analysis must be performed in the timetable foreseen by standards in force.
- Should the appliance be sold or transferred to a new owner or if you move and leave the appliance, always make sure that the instruction booklet accompanies it in order to be consulted by the new owner and/or installer.

**TRISTAR 2S boilers are forced circulation boilers: it is therefore necessary to make sure that water circulates while the boiler is running.**

Do not allow the burner to run without the system pump being activated; otherwise the safety thermostat could be triggered.

**The return temperature must not drop below 50°C** to avoid, or at least limit, flue gas condensation which causes premature deterioration of the boiler.

**The working temperature of the boiler can therefore be adjusted between 60 and 80°C.** Room temperature will be regulated by the mixer valve commanded by the heating controller.

The system must slowly reach the operating temperature, with the eventual insertion in the secondary ring circuit, to avoid the temperature from dropping below 50°C.

It is always recommended to install an anti-condensation or recirculation pump (between the flow and return lines of the boiler).

Returns to low temperatures, below 50°C, cause the flue gas to condense corroding the heat exchange surfaces. You must therefore pay the utmost attention while operating the system.

**Corrosion caused by acid condensation of combustion products is not covered by the warranty as it is attributable to operation of the system alone.**

## 3.22 - ADJUSTING THE BURNER



The following instructions are intended exclusively for **service personnel authorised by the manufacturer of the burner.**

Burner calibration and preliminary operations are described in the burner's instruction booklet.

Gas-fired burners are equipped with a gas valve with which the flow rate can be determined: upon commissioning the actual thermal flow rate **must always** be controlled by means of the counter on the main piping, making sure it is not below the minimum value on the data plate of the boiler.

When the burner is adjusted properly, the following values should be obtained, measured at the chimney by a specific analyser.

With natural gas:

- CO<sub>2</sub> = 9÷10%

- Flue gas temperature ≅ 125÷140°C

(values for boiler cleaned with water at ~ 70°C).

The flow rate of the fuel should be adjusted to the actual requirement of the system.

## 3.23 - REMOVING FLUE GAS TURBULATORS

TRISTAR 2S boilers have been designed to be used at the declared nominal output.

TRISTAR 2S boilers are equipped with flue gas turbulators inside each smoke duct (see page 8).

The correct position of the turbulators inside the smoke pipes determines the heat output of the boiler and therefore the flue gas temperature at the chimney.

Upon commissioning, after at least 30 minutes, it is advisable to check the flue gas temperature at the chimney.

Aside from the cleaning tools, each TRISTAR 2S boiler is equipped with a special extractor which allows to pull the turbulators from the smoke pipes.

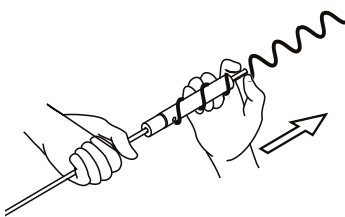
In the reinsertion phase of the turbulators, comply with the position measurements indicated on page 8.

### Extraction of turbulators

Detail 1:

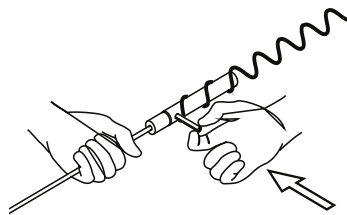
Mount the brush rod on the turbulator extractor.

Pull the pin from the extractor.



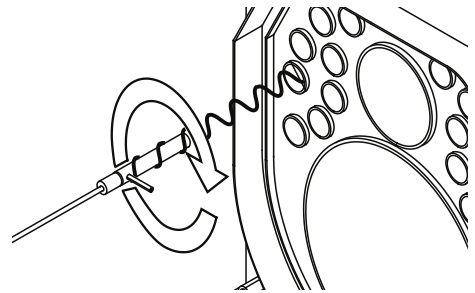
Detail 2:

Put the pin in the cross hole using a hammer.



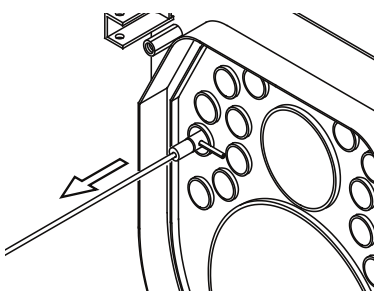
Detail 3:

Screw the extractor onto the turbulator.



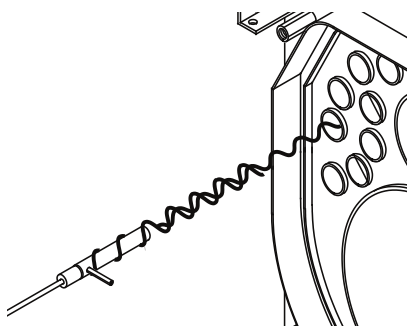
Detail 4:

Turn until the turbulator is released.



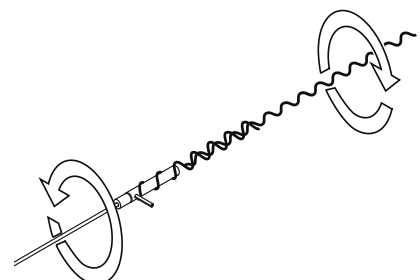
Detail 5:

Remove the turbulator.



Detail 6:

Turn the extractor anticlockwise and release the turbulator.



The procedure from detail 3 to 6 must be repeated for all turbulators.

fig. 41

# 4

## INSPECTIONS AND MAINTENANCE



Inspections and maintenance performed professionally and according to a regular schedule as well as the use of original spare parts are of the utmost importance for fault-free operation of the boiler and to guarantee its long life.

**Yearly maintenance of the appliance is mandatory in compliance with Laws in force.**



**Failure to perform Inspections and Maintenance can entail material and personal damage.**

We therefore recommend stipulating an inspection or maintenance contract.

Inspections help to determine the actual status of the appliance and to compare it with the nominal status. This is done through measuring, controls and observation.

Maintenance is required to eliminate any differences between the actual status and the nominal status. This is normally done by cleaning, setting and replacing individual components subject to wear.

Maintenance intervals and their extent are determined by a specialist based on the status of the appliance ascertained through inspection.

Inspection and maintenance jobs must be performed in the order shown on page 49.

### Inspection and maintenance instructions



To assure long-term functioning of your appliance and to avoid altering its approved status, only original Unical spare parts must be used.

Before proceeding with maintenance, always perform the following operations:

- Disconnect the electric mains switch.
- Isolate the appliance from the electric mains by means of an isolated device with a contact opening of at least 3 mm (e.g. safety devices or power switches) and make sure that it cannot be re-connected accidentally.
- Close the gas shut-off valve upstream the boiler.
- Close any shut-off valves on the heating flow and return pipes.

After having completed all maintenance work, always perform the following operations:

- Open the heating flow and return pipes.
- If necessary, restore the heating system pressure until it reaches the static pressure relative to the highest point of the system.
- Open the gas shut-off valve.
- Reconnect the appliance to the electric mains and engage the switch.
- Make sure the appliance is gas tight and watertight.
- Vent the heating system and restore pressure if necessary.

**Should you decide to temporarily deactivate the boiler, you must:**

- a) intercept the supplies: electric, water and fuel;
- b) empty the water system if antifreeze is not used.



### Boiler body maintenance



**Danger!**  
Before performing any maintenance, make sure the boiler and its components have cooled down.

Disconnect the boiler from the electric mains and shut the gas supply to the appliance.



**Attention!**  
Before cleaning the boiler body, protect the panel board against any water sprays.

Once a year, at the end of the heating season, the boiler must receive a general cleaning.

Before performing any maintenance, make sure that all the precautions referred to in the previous point have been taken.

To proceed with maintenance you must:

- disconnect power by acting on the main switch;
- remove the burner, which could be overhauled at the same time;
- open the furnace door to access the combustion chamber;
- remove the smoke chamber access door;
- extract the smoke turbulators;
- brush the smoke ducts energetically to remove any trace of filth.

### Check condition of gaskets and insulation fibres



The insulation fibre of the door can show cracks after a short time of operation; this however does not reduce its insulation capacity nor jeopardise its lifespan. Check the condition of the seal gasket which must not show signs of deterioration; if so, it must be replaced, using only original spare parts.

Check the condition of the smoke chamber inspection cover gasket.

Replace it if worn, using only original spare parts.

### Maintenance of burner

Burner maintenance must be carried out by personnel authorised by its manufacturer (or else the warranty shall be terminated).

### Checking ignition electrode

Burner maintenance must be carried out by personnel authorised by its manufacturer (or else the warranty shall be terminated).

### Components to check during yearly inspection

COMPONENT:	VERIFY:	CONTROL/INTERVENTION METHOD:
Ts (safety thermostat)	Does the thermostat place the boiler in safety when overheating?	Bring the boiler to operating temperature with the pumps stopped.
System expansion vessel	Does the vessel contain the right amount of air?	Check the nitrogen pressure. Pressurise the boiler (open the pump bleeder). Open the heating circuit closing valves.
Door gaskets	Does smoke seep through the door gaskets?	Further tighten the door screws. Replace the sealing gasket and, if needed, the internal gasket of the door.
Smoke chamber gaskets	Does smoke seep through the smoke chamber gaskets?	Further tighten the smoke chamber locking nuts. Replace the sealing gaskets.
Smoke turbulators	Are the smoke turbulators in place and the smoke ducts clean?	Perform a general cleaning with the supplied brush.





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