

# STREBEL



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## TECHNICAL MANUAL

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# REX BOILER

## STEEL BOILER RANGE

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231001 v.1

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### 1 GENERAL WARNINGS

Each generator is provided with a **manufacture plate** that can be found in the envelope with the boiler documents. The plate lists:

- Serial number or identification code;
- Rated thermal output in kcal/h and in kW;
- Furnace thermal output in kcal/h and in kW;
- Types of fuels that can be used;
- Max operating pressure.

A **manufacture certificate** is also provided which certifies the hydraulic test positive performance.

The installation must be performed in compliance with the regulations in force by **professionally qualified personnel**. The term "professionally qualified personnel" means persons with specific technical skills in the sector of heating system components.

Incorrect installation may cause damage to persons, animals or objects for which the manufacturer cannot be held responsible.

**At the first start up**, all regulation and control devices positioned on the control panel should be checked for efficiency. The **guarantee** shall be valid only upon compliance with the instruction given in this manual.

Our boilers have been built and tested in observance of EEC requirements and, as a consequence, CE-marked. EEC directives are as follows:

- **Directive on Gas** 90/396/EEC
- **Directive on Output** 92/42/EEC
- **Directive on Electromagnetic Compatibility** 89/336/EEC
- **Directive on Low Voltage** 73/23/EEC

**IMPORTANT:** This boiler has been designed to heat hot water at a temperature inferior to the boiling temperature at atmospheric pressure and must be connected to a heating plant and/or a domestic hot water plant within the limits of its performance and output.

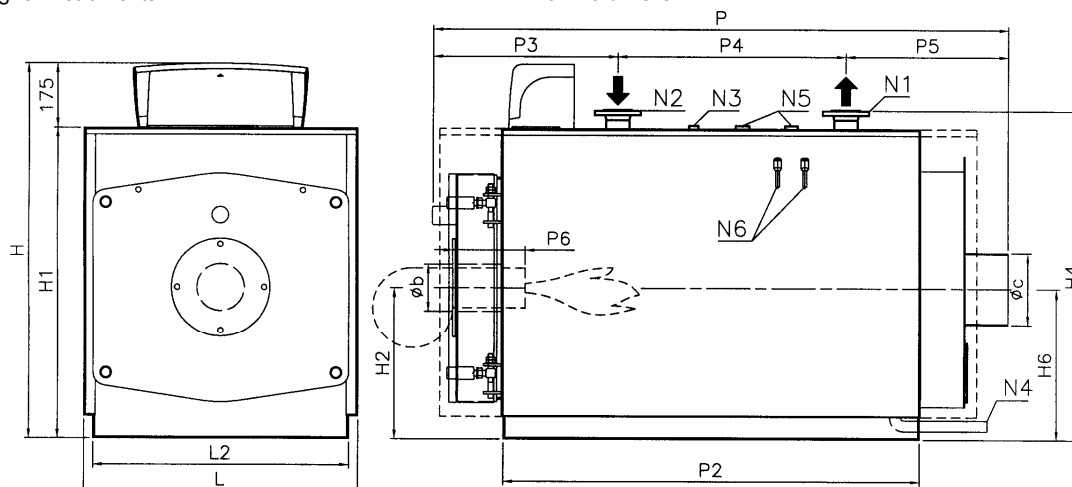
# TECHNICAL SPECIFICATIONS

## 2 TECHNICAL SPECIFICATIONS

### 2.1 REK 7÷130 - REX K 25÷130 BOILER

N1 - Flow  
N2 - Return  
N3 - Fitting for instruments

N4 - Lower fitting  
N5 - Fitting for safety valve, if included (see table)  
N6 - Bulb wells



Characteristics	Heat output		Furnace output		Efficiency 100% (N.C.V.) %	Minimum output		Pressure losses flue gas side mbar	Press. losses water side (ΔT=12°C) mbar	Max working pressure bar	Capacity l	Weight kg
	kW	kcal/h	kW	kcal/h		kW	kcal/h					
REX 7 *	70	60.000	76	65.360	92,11	35	30.000	0,8	9	5	105	216
REX 8 *	80	69.000	87	74.820	91,95	40	34.000	1,0	9	5	105	216
REX 9 *	90	77.000	98	84.280	91,84	45	39.000	0,8	10	5	123	258
REX 10 *	100	86.000	109	93.740	91,74	50	43.000	1,0	12	5	123	258
REX 12	120	103.000	131	112.660	91,60	60	52.000	1,1	13	5	123	258
REX 15	150	129.000	163	140.180	92,02	75	65.000	1,2	14	5	172	346
REX 20	200	172.000	218	187.480	91,74	100	86.000	1,9	15	5	172	346
REX 25 - K 25	250	215.000	272	233.920	91,91	125	108.000	2,0	15	5	220	431
REX 30 - K 30	300	258.000	325	279.500	92,31	150	129.000	2,0	16	5	300	475
REX 35 - K 35	350	301.000	380	326.800	92,11	175	151.000	2,9	18	5	356	542
REX 40 - K 40	400	344.000	434	373.240	92,17	200	172.000	4,1	20	5	360	584
REX 50 - K 50	500	430.000	542	466.120	92,25	250	215.000	4,2	22	5	540	853
REX 62 - K 62	620	533.000	672	577.920	92,26	310	267.000	6,4	27	5	645	963
REX 75 - K 75	750	645.000	813	699.180	92,25	375	323.000	5,2	25	5	855	1205
REX 85 - K 85	850	731.000	921	792.060	92,29	425	366.000	7,2	27	5	855	1205
REX 95 - K 95	950	817.000	1030	885.800	92,23	475	409.000	5,2	32	5	950	1417
REX 100 - K 100	1020	877.000	1106	951.160	92,22	510	439.000	4,0	26	5	1200	1843
REX 120 - K 120	1200	1.032.000	1301	1.118.860	92,24	600	516.000	5,5	30	5	1200	1843
REX 130 - K 130	1300	1.118.000	1409	1.211.740	92,26	650	559.000	6,5	32	5	1200	1843

Dimensions	H	H1	H2	H4	H6	L	L2	P	P2	P3	P4	P5	P6	Øc	Øb	N1	N2	N3	N4	N5	N6
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	DN/in	DN/in	DN/in	in	in	in
REX 7 *	1030	855	415	911	415	750	700	1055	630	413	240	402	200-250	200	130	50	50	1"	1"	-	1/2"
REX 8 *	1030	855	415	911	415	750	700	1055	630	413	240	402	200-250	200	130	50	50	1"	1"	-	1/2"
REX 9 *	1030	855	415	911	415	750	700	1195	755	513	265	417	200-250	200	130	50	50	1"	1"	-	1/2"
REX 10 *	1030	855	415	911	415	750	700	1195	755	513	265	417	200-250	200	130	50	50	1"	1"	-	1/2"
REX 12	1030	855	415	911	415	750	700	1195	755	513	265	417	200-250	200	130	50	50	1"	1"	-	1/2"
REX 15	1080	905	440	961	440	800	750	1440	1000	513	475	452	200-250	250	160	50	50	1"	1"	-	1/2"
REX 20	1080	905	440	961	440	800	750	1440	1000	513	475	452	200-250	250	160	50	50	1"	1"	-	1/2"
REX 25 - K 25	1180	1005	440	1061	440	800	750	1690	1250	513	725	452	200-250	250	160	50	50	1"	1"	-	1/2"
REX 30 - K 30	1180	1005	490	1061	490	900	850	1690	1250	523	700	467	200-250	250	180	65	65	1"	1"	-	1/2"
REX 35 - K 35	1180	1005	490	1061	490	900	850	1690	1250	523	980	437	200-250	250	180	65	65	1"	1"	-	1/2"
REX 40 - K 40	1190	1015	500	1095	500	940	890	1900	1502	600	850	450	230-280	250	225	80	80	1"	1"	1"1/4 <sup>(1)</sup>	1/2"
REX 50 - K 50	1380	1205	610	1285	610	1160	1110	1950	1502	663	850	437	270-320	300	225	80	80	1"	1"1/4	1"1/4	1/2"
REX 62 - K 62	1380	1205	610	1285	610	1160	1110	2240	1792	663	1150	427	270-320	300	225	80	80	1"	1"1/4	1"1/4	1/2"
REX 75 - K 75	1510	1335	675	1417	675	1290	1240	2255	1753	704	1100	451	270-320	350	280	100	100	1"	1"1/4	1"1/2	1/2"
REX 85 - K 85	1510	1335	675	1417	675	1290	1240	2255	1753	704	1100	451	270-320	350	280	100	100	1"	1"1/4	1"1/2	1/2"
REX 95 - K 95	1510	1335	675	1417	675	1290	1240	2500	2003	704	1200	596	270-320	350	280	100	100	1"	1"1/4	1"1/2	1/2"
REX 100 - K 100	1660	1485	750	1568	750	1440	1390	2500	2003	704	1200	596	270-320	400	280	125	125	1"	1"1/4	1"1/2	1/2"
REX 120 - K 120	1660	1485	750	1568	750	1440	1390	2500	2003	704	1200	596	270-320	400	280	125	125	1"	1"1/4	1"1/2	1/2"
REX 130 - K 130	1660	1485	750	1568	750	1440	1390	2500	2003	704	1200	596	270-320	400	280	125	125	1"	1"1/4	1"1/2	1/2"

\* Boiler exempt from fire prevention tests

<sup>(1)</sup> One fitting only

## TECHNICAL SPECIFICATIONS

### 2.2 REX 140÷350 BOILER

N1 - Flow

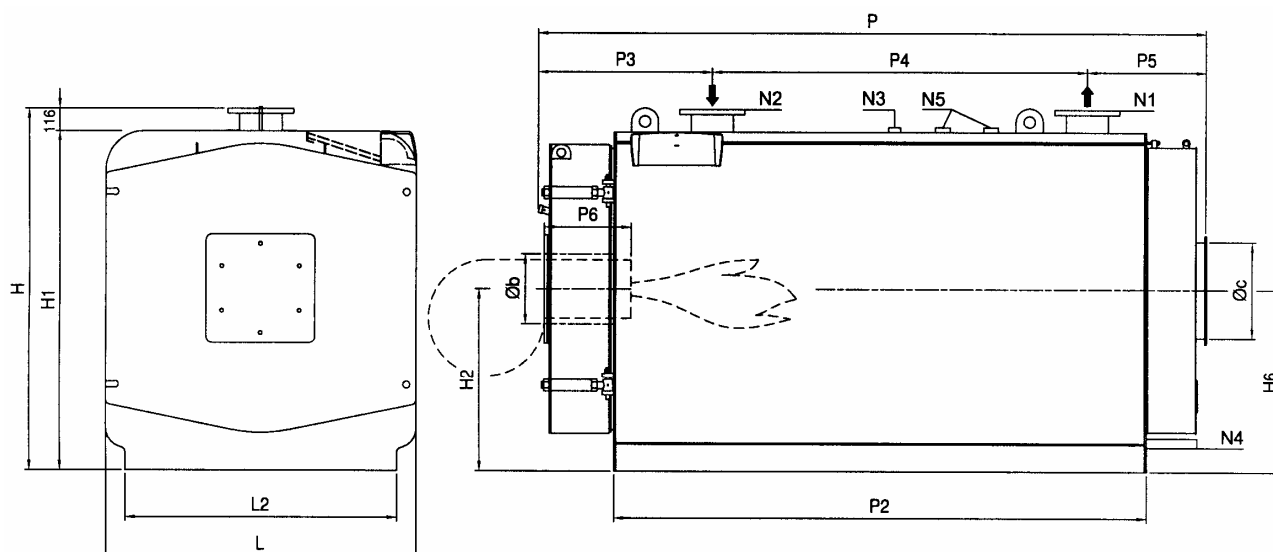
N2 - Return

N3 - Fitting for instruments

N4 - Lower fitting

N5 - Fitting for safety valves

N6 - Bulb wells



Characteristics	Heat output		Furnace output		Efficiency 100% (N.C.V.) %	Minimum output		Pressure losses flue gas side mbar	Press. losses water side (ΔT=12°C) mbar	Max working pressure bar	Capacity l	Weight kg
	kW	kcal/h	kW	kcal/h		kW	kcal/h					
<b>REX 140</b>	<b>1400</b>	1.204.000	1517	1.304.620	92,29	700	602.000	6,0	28	5	1500	2600
<b>REX 160</b>	<b>1600</b>	1.376.000	1733	1.490.380	92,33	800	688.000	6,5	32	5	1650	2600
<b>REX 180</b>	<b>1800</b>	1.548.000	1950	1.677.000	92,31	900	774.000	7,0	37	5	1650	2750
<b>REX 200</b>	<b>2000</b>	1.720.000	2167	1.863.620	92,29	1000	860.000	6,0	35	5	2000	3650
<b>REX 240</b>	<b>2400</b>	2.064.000	2600	2.236.000	92,31	1200	1.032.000	7,5	40	5	2300	3900
<b>REX 300</b>	<b>3000</b>	2.580.000	3250	2.795.000	92,31	1500	1.290.000	8,0	49	5	3150	5200
<b>REX 350</b>	<b>3500</b>	3.010.000	3792	3.261.120	92,30	1750	1.505.000	9,0	60	5	3650	5700

Dimensions	H	H1	H2	H6	L	L2	P	P2	P3	P4	P5	P6	Øc	Øb	N1	N2	N3	N4	N5	N6
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	DN/in	DN/in	DN/in	in	in	in
<b>REX 140</b>	<b>1746</b>	1630	880	880	<b>1470</b>	1270	<b>2886</b>	2300	831	1300	755	350-400	400	320	150	150	1"	1"1/4	1"1/2	1/2"
<b>REX 160</b>	<b>1746</b>	1630	880	880	<b>1470</b>	1270	<b>2886</b>	2300	831	1300	755	350-400	400	320	150	150	1"	1"1/4	1"1/2	1/2"
<b>REX 180</b>	<b>1746</b>	1630	880	880	<b>1470</b>	1270	<b>3096</b>	2510	771	1850	475	450-500	400	320	150	150	1"	1"1/4	1"1/2	1/2"
<b>REX 200</b>	<b>1876</b>	1760	945	945	<b>1600</b>	1400	<b>3220</b>	2510	903	1550	767	450-500	500	360	200	200	1"	1"1/4	2"	1/2"
<b>REX 240</b>	<b>1876</b>	1760	945	945	<b>1600</b>	1400	<b>3480</b>	2770	903	1950	627	450-500	500	360	200	200	1"	1"1/4	2"	1/2"
<b>REX 300</b>	<b>2146</b>	2030	1080	1080	<b>1870</b>	1670	<b>3480</b>	2770	903	2050	527	450-500	550	400	200	200	1"	1"1/4	2"	1/2"
<b>REX 350</b>	<b>2146</b>	2030	1080	1080	<b>1870</b>	1670	<b>3935</b>	3225	903	2050	982	450-500	550	400	200	200	1"	1"1/4	2"	1/2"

# TECHNICAL SPECIFICATIONS

## 2.3 REX DUAL 14÷70 BOILER

N1 - Flow

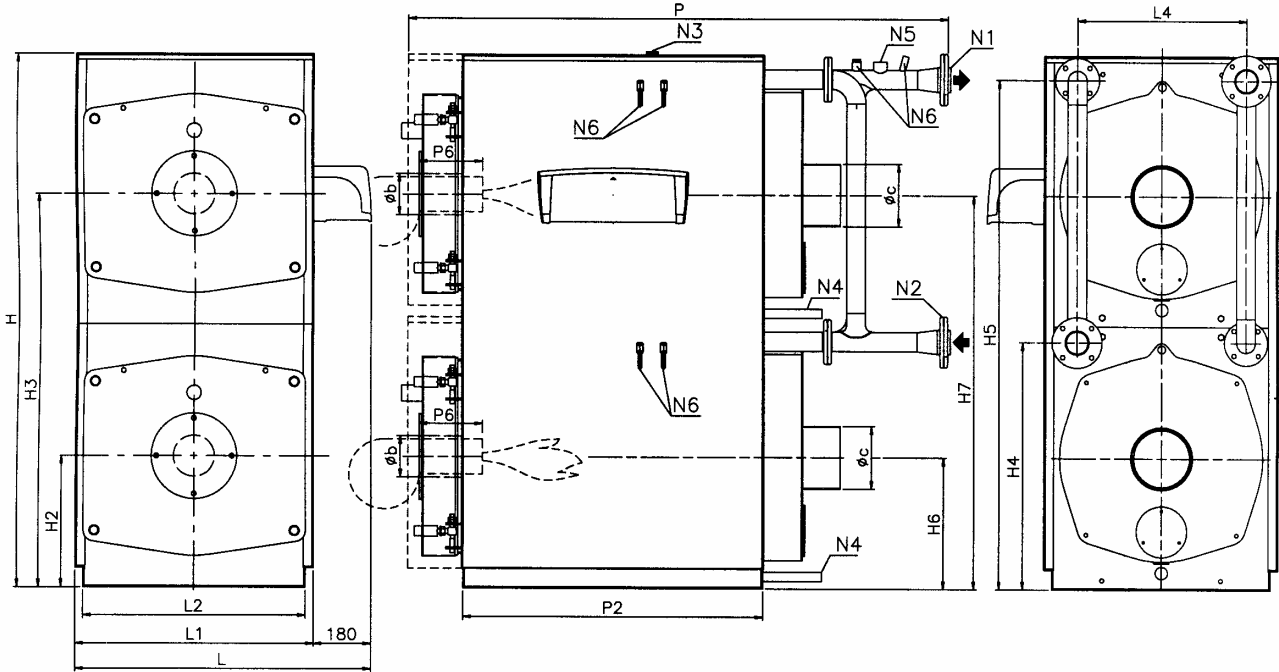
N2 - Return

N3 - Fitting for 2<sup>nd</sup> safety valve (only for type 500)

N4 - Lower fitting

N5 - Fitting for instruments

N6 - Bulb wells



Characteristics	Heat output		Furnace output		Efficiency	Minimum output		Pressure losses	Press. losses water	Max working	Capacity	Weight
	kW	kcal/h	kW	kcal/h	100% (N.C.V.)	%	kW	kcal/h	flue gas side	side (ΔT=12°C)	pressure	l
REX DUAL 14	140	120.000	152	130.720	92,11	70	60.000	0,8	11	5	210	442
REX DUAL 16	160	138.000	174	149.640	91,95	80	69.000	1,0	11	5	210	442
REX DUAL 18	180	155.000	196	168.560	91,84	90	77.000	0,8	12	5	246	536
REX DUAL 20	200	172.000	218	187.480	91,74	100	86.000	1,0	14	5	246	536
REX DUAL 24	240	206.000	262	225.320	91,60	120	103.000	1,1	15	5	246	536
REX DUAL 30	300	258.000	326	280.360	92,02	150	129.000	1,2	16	5	344	776
REX DUAL 40	400	344.000	436	374.960	91,74	200	172.000	1,9	17	5	344	776
REX DUAL 50	500	430.000	544	467.840	91,91	250	215.000	2,0	17	5	440	882
REX DUAL 60	600	516.000	650	559.000	92,31	300	258.000	2,0	18	5	600	969
REX DUAL 70	700	602.000	760	653.600	92,11	350	301.000	2,9	20	5	712	1114

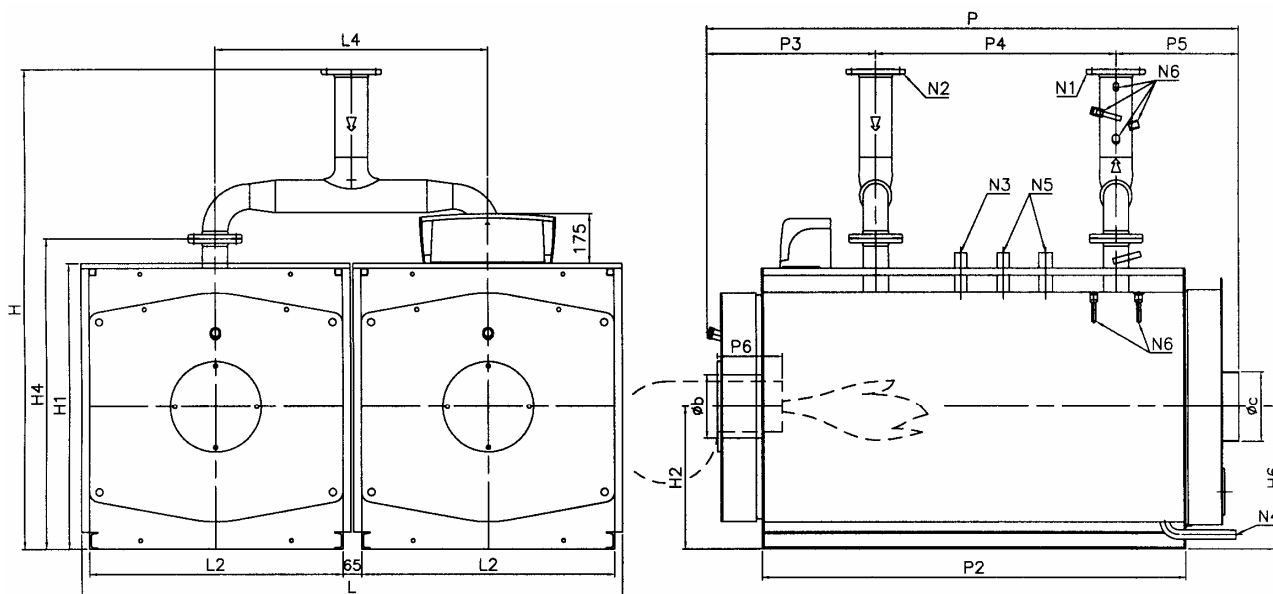
Dimensions	H	H2	H3	H4	H5	H6	H7	L	L1	L2	L4	P	P2	P6	Øc	Øb	N1	N2	N3	N4	N5	N6
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	DN/in	DN/in	DN/in	in	in	in
REX DUAL 14	1693	415	1245	780	1610	415	1245	930	750	700	540	1370	630	200-250	200	130	65	65	1"	1"	1"	1/2"
REX DUAL 16	1693	415	1245	780	1610	415	1245	930	750	700	540	1370	630	200-250	200	130	65	65	1"	1"	1"	1/2"
REX DUAL 18	1693	415	1245	780	1610	415	1245	930	750	700	540	1470	755	200-250	200	130	65	65	1"	1"	1"	1/2"
REX DUAL 20	1693	415	1245	780	1610	415	1245	930	750	700	540	1470	755	200-250	200	130	65	65	1"	1"	1"	1/2"
REX DUAL 24	1693	415	1245	780	1610	415	1245	930	750	700	540	1470	755	200-250	200	130	65	65	1"	1"	1"	1/2"
REX DUAL 30	1793	440	1320	830	1710	440	1320	980	800	750	590	1745	1000	200-250	250	160	80	80	1"	1"	1"	1/2"
REX DUAL 40	1793	440	1320	830	1710	440	1320	980	800	750	590	1745	1000	200-250	250	160	80	80	1"	1"	1"	1/2"
REX DUAL 50	1793	440	1320	830	1710	440	1320	980	800	750	590	2000	1250	200-250	250	160	80	80	1"	1"	1"	1/2"
REX DUAL 60	1993	490	1470	930	1910	490	1470	1080	900	850	690	2000	1250	200-250	250	180	80	80	1"	1"	1"	1/2"
REX DUAL 70	1993	490	1470	930	1910	490	1470	1080	900	850	690	2250	1500	200-250	250	180	80	80	1"	1"	1"	1/2"

## TECHNICAL SPECIFICATIONS

### 2.4 REX DUAL 80=260 BOILER

N1 - Flow  
N2 - Return  
N3 - Fitting for instruments

N4 - Lower fitting  
N5 - Fitting for safety valves  
N6 - Bulb wells



Characteristics	Heat output		Furnace output		Efficiency 100% (N.C.V.) %	Minimum output		Pressure losses flue gas side mbar	Press. losses water side (ΔT=12° C) mbar	Max working pressure bar	Capacity l	Weight kg
	kW	kcal/h	kW	kcal/h		kW	kcal/h					
REX DUAL 80	800	688.000	868	746.480	92,17	400	344.000	4,1	20	5	720	1167
REX DUAL 100	1000	860.000	1084	932.240	92,25	500	430.000	4,2	22	5	1080	1705
REX DUAL 124	1240	1.066.000	1344	1.155.840	92,26	620	533.000	6,4	27	5	1290	1925
REX DUAL 150	1500	1.290.000	1626	1.398.360	92,25	750	645.000	5,2	25	5	1710	2409
REX DUAL 170	1700	1.462.000	1842	1.584.120	92,29	850	731.000	7,2	27	5	1710	2409
REX DUAL 190	1900	1.634.000	2060	1.771.600	92,23	950	817.000	5,2	32	5	1900	2833
REX DUAL 200	2040	1.754.000	2212	1.902.320	92,22	1020	877.000	4,0	26	5	2400	3686
REX DUAL 240	2400	2.064.000	2602	2.237.720	92,24	1200	1.032.000	5,5	30	5	2400	3686
REX DUAL 260	2600	2.236.000	2818	2.423.480	92,26	1300	1.118.000	6,5	32	5	3000	3686

Dimensions	H	H2	H4	H6	L	L2	L4	P	P2	P3	P4	P5	P6	Øc	Øb	N1	N2	N3	N4	N5	N6
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	DN/in	DN/in	DN/in	in	in	in
REX DUAL 80	1690	500	1095	500	1901	890	955	1872	1502	600	850	422	230-280	250	225	100	100	1"	1"	1"1/4 <sup>(1)</sup>	1/2"
REX DUAL 100	1880	610	1285	610	2341	1110	1175	1950	1502	663	850	437	270-320	300	225	100	100	1"	1"1/4	1"1/4	1/2"
REX DUAL 124	1900	610	1285	610	2341	1110	1175	2240	1792	663	1150	427	270-320	300	225	125	125	1"	1"1/4	1"1/4	1/2"
REX DUAL 150	2155	675	1417	675	2600	1240	1305	2255	1753	704	1100	451	270-320	350	280	150	150	1"	1"1/4	1"1/2	1/2"
REX DUAL 170	2155	675	1417	675	2600	1240	1305	2255	1753	704	1100	451	270-320	350	280	150	150	1"	1"1/4	1"1/2	1/2"
REX DUAL 190	2155	675	1417	675	2600	1240	1305	2500	2003	704	1200	596	270-320	350	280	200	200	1"	1"1/4	1"1/2	1/2"
REX DUAL 200	2405	750	1568	750	2900	1390	1455	2500	2003	704	1200	596	270-320	400	280	200	200	1"	1"1/4	1"1/2	1/2"
REX DUAL 240	2405	750	1568	750	2900	1390	1455	2500	2003	704	1200	596	270-320	400	280	200	200	1"	1"1/4	1"1/2	1/2"
REX DUAL 260	2405	750	1568	750	2900	1390	1455	2500	2003	704	1200	596	270-320	400	280	200	200	1"	1"1/4	1"1/2	1/2"

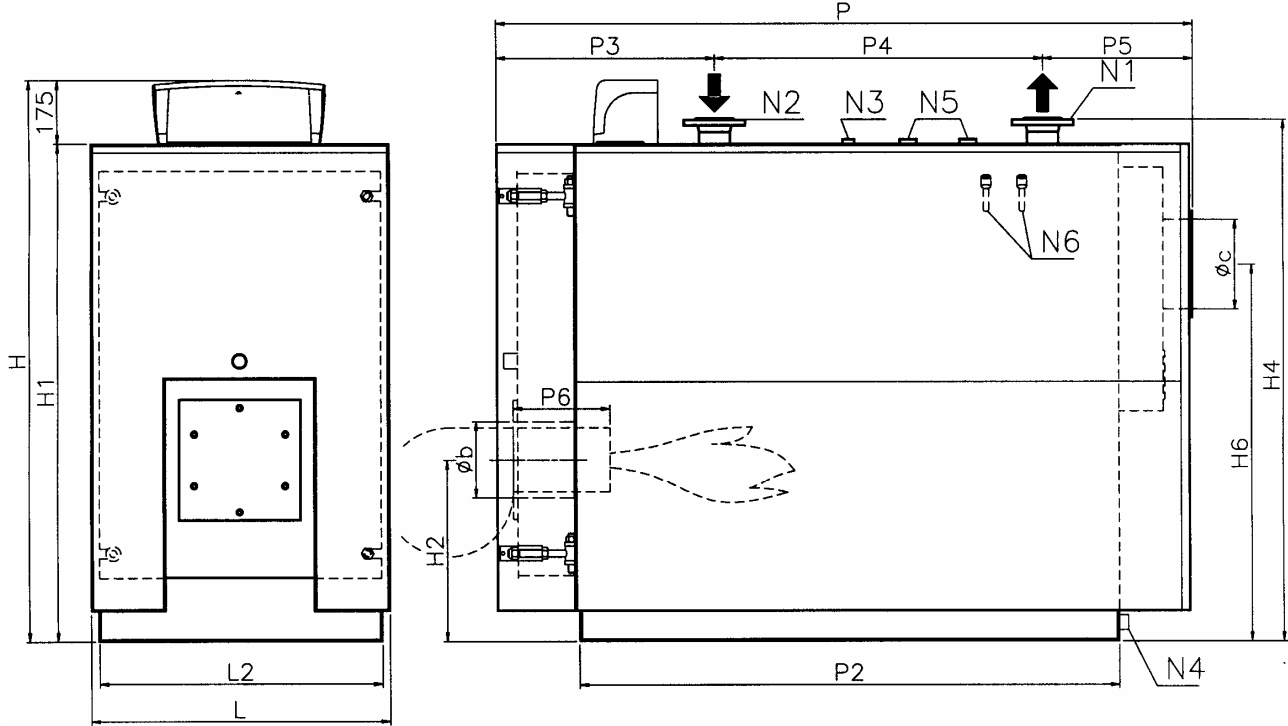
(1) One fitting only

# TECHNICAL SPECIFICATIONS

## 2.5 STR BOILER

N1 - Flow  
 N2 - Return  
 N3 - Fitting for instruments

N4 - Lower fitting  
 N5 - Fitting for safety valve/valves  
 N6 - Bulb wells



Characteristics	Heat output		Furnace output		Efficiency 100% (N.C.V.) %	Minimum output		Pressure losses flue gas side mbar	Press. losses water side ( $\Delta T=12^{\circ}C$ ) mbar	Max working pressure bar	Capacity l	Weight kg
	kW	kcal/h	kW	kcal/h		kW	kcal/h					
STR 20	232	200.000	252	216.720	92,06	116	100.000	2,0	16	5	320	780
STR 25	291	250.000	314	270.040	92,68	145,5	125.000	2,5	18	5	320	780
STR 30	349	300.000	378	325.080	92,33	174,5	150.000	3,0	20	5	390	980
STR 35	407	350.000	448	385.280	90,85	203,5	175.000	4,0	25	5	390	980

Dimensions	H	H1	H2	H4	H6	L	L2	P	P2	P3	P4	P5	P6	$\phi c$	$\phi b$	N1	N2	N3	N4	N5	N6
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	DN/in	DN/in	DN/in	in	in	in
STR 20	1375	1200	440	1292	900	750	700	1900	1410	685	800	415	270-320	250	180	65	65	1"	1"	1"	1/2"
STR 25	1375	1200	440	1292	900	750	700	1900	1410	685	800	415	270-320	250	180	65	65	1"	1"	1"	1/2"
STR 30	1465	1290	460	1382	950	800	750	1950	1460	685	850	415	270-320	250	225	80	80	1 1/4"	1 1/4"	1"	1/2"
STR 35	1465	1290	460	1382	950	800	750	1950	1460	685	850	415	270-320	250	225	80	80	1 1/4"	1 1/4"	1"	1/2"



## 3 INSTALLATION

Before **connecting** the boiler, perform the following operations:

- Thoroughly clean all the **system pipes** in order to remove any foreign matter that could affect correct operation of the boiler;
- Check that the **flue** has an **adequate draught**, that there is no narrowing of passages and that it is free from debris; also check that other appliances do not discharge into the flue (unless designed to serve several utilities). See the regulations in force.

### 3.1 THERMAL PLANT

#### 3.1.1 BOILER ROOM

As a rule, regulations in force should be always observed. Premises in which boilers will be installed should be sufficiently ventilated and guarantee access for ordinary and extraordinary maintenance operations.

#### 3.1.2 FLUE

The pressurised boiler that now equips your heating system is so-called because it uses a burner provided with fan which introduces into the combustion chamber the exact amount of air necessary in relation to the fuel and maintains an overpressure in the furnace equivalent to all the internal resistances of the flue gas path as far as the boiler exhaust. At this point the fan pressure should have dropped to zero to prevent the flue connection pipe and the lower area of the flue itself from being under pressure and combustion gas leaks occurring in the boiler room.

The **connection pipe** from the boiler to the base of the flue must slope upwards in the direction of the flue gas flow with recommended gradient of no less than 10%. Its path must be as short and straight as possible with the bends and fittings rationally designed in accordance with air duct criteria

The paragraph Technical Specifications specifies the flue connection diameters of the boilers for lengths of up to 1 metre. For more winding paths, the diameter must be suitably enlarged.

# INSTALLATION

## 3.2 HYDRAULIC CONNECTION

### 3.2.1 HOT WATER HEATING SYSTEM WITH CLOSED EXPANSION VESSEL - Furnace output $\leq$ 300.000 kcal/h - pressure 5 bar (Fig. 1)

The generator must be provided with:

- a - Safety valve
- b - Expansion vessel (connected with a hose  $\geq$  18 mm diameter)
- c - Regulation thermostats
- d - Safety thermostat
- e - Cut-off pressure switch
- f - Well for control thermometer
- g - Pressure gauge with flange for control pressure gauge
- h - Heat discharge valve or fuel on-off valve.
- N1 - Flow
- N2 - Return
- N3 - Instrument fitting
- N4 - Lower fitting:
  - N4a recirculation (anticondensate pump)
  - N4b expansion vessel fitting
  - N4c filling/drain
- N6 - Bulb wells (thermometer, pump consent thermostat, regulation thermostat, safety thermostat).

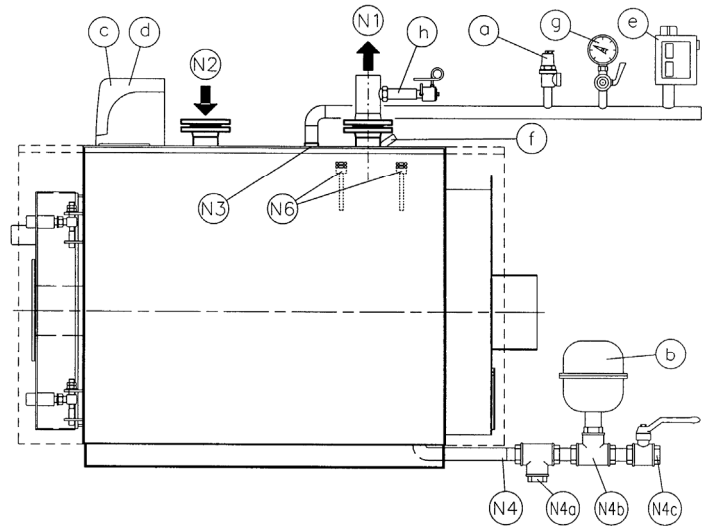


Fig. 1

### 3.2.2 HOT WATER HEATING SYSTEM WITH CLOSED EXPANSION VESSEL - Furnace output $>$ 300,000 kcal/h - pressure 5 bar (Fig. 2)

The generator must be provided with:

- a - 1 safety valve
- 2 safety valves if output is  $>$  500,000 kcal/h
- b - Expansion vessel
- c - Regulation thermostats
- d - 1st safety thermostat
- e - 2nd safety thermostat
- f - Cut-off pressure switch
- g - Well for control thermometer
- h - Pressure gauge with flange for control pressure gauge
- i - Heat discharge valve or fuel on-off valve
- N1 - Flow
- N2 - Return
- N3 - Instrument fitting
- N4 - Lower fitting:
  - N4a recirculation (anti-condensate pump)
  - N4b expansion vessel fitting
  - N4c Filling/drain
- N5 - Safety valves fitting
- N6 - Bulb wells (thermometer, pump consent thermostat, regulation thermostat, safety thermostat)

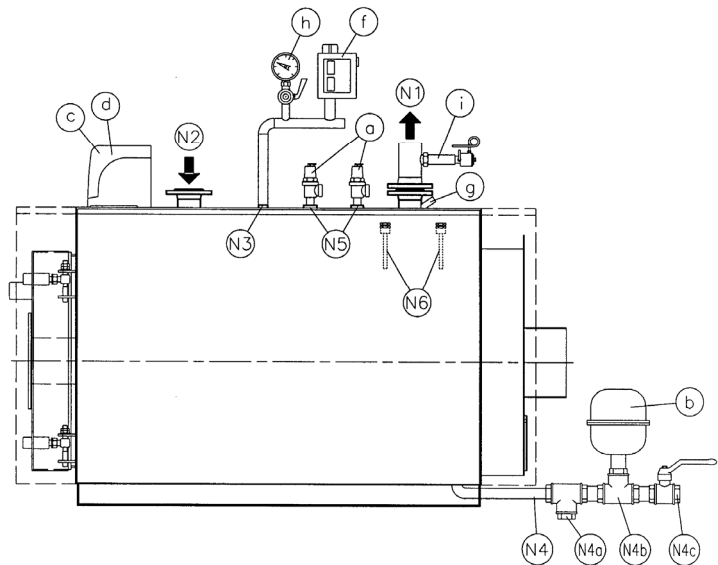


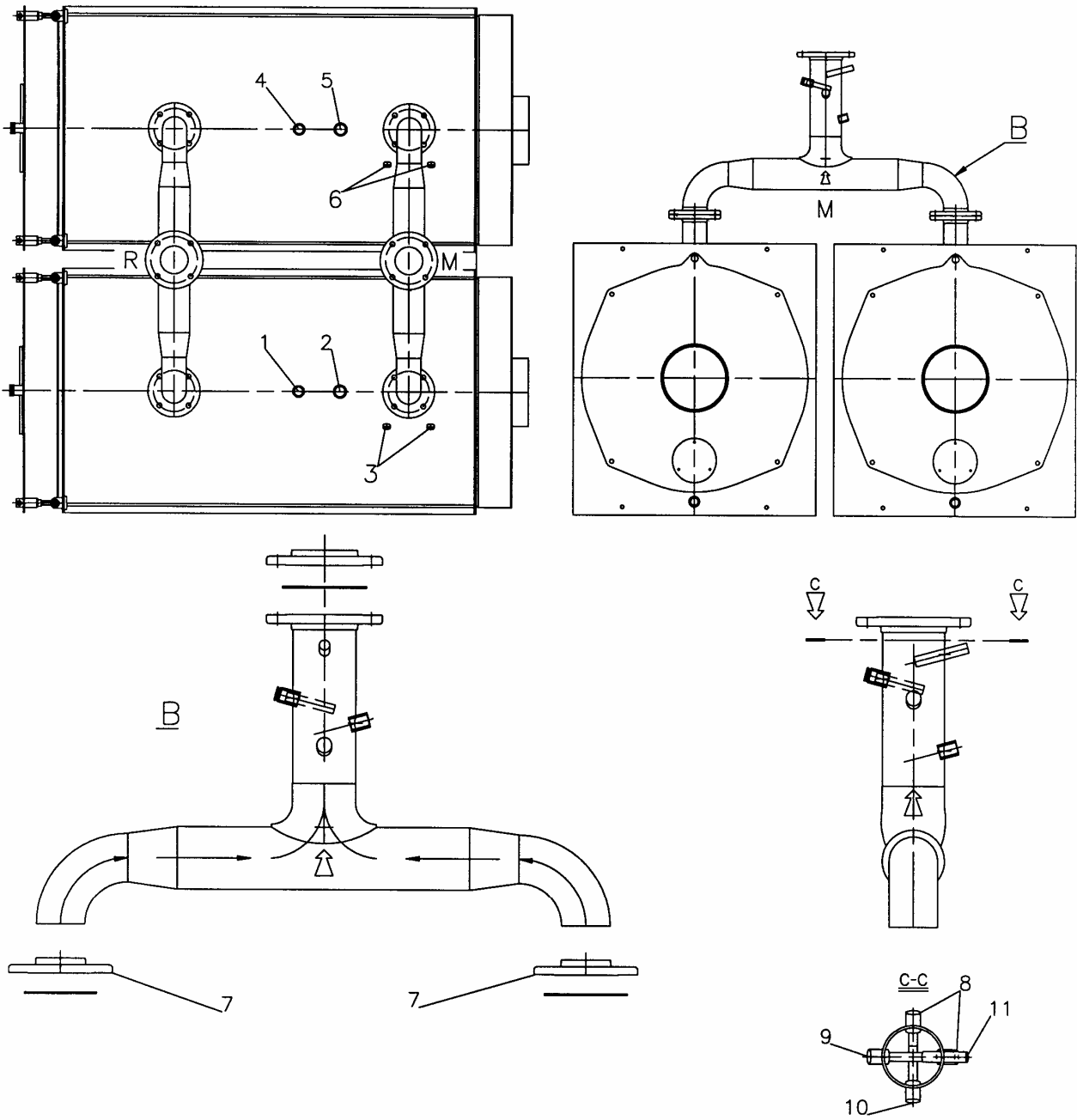
Fig. 2

Ensure that the hydraulic pressure measured after the reduction valve on the supply pipe does not exceed the operating **pressure specified on the rating plate of the component** (boiler, heater etc.).

- As the water contained in the heating system increases in pressure during operation, ensure that its maximum value does not exceed the maximum hydraulic pressure specified on the component rating plate (5 bar).
- Ensure that the safety valve outlets of the boiler and hot water tank, if any, have been connected to an exhaust funnel in order to prevent the valves from **flooding the room** if they open.
- Ensure that the pipes of the water and heating system **are not used as an earth connection** for the electrical system as this can seriously and very rapidly damage the pipes, boiler, heater and radiators.
- Once the heating system has been filled, you are advised to close the supply cock and keep it closed so that **any leaks from the system** will be identified by a drop in hydraulic pressure indicated on the system pressure gauge.

# INSTALLATION

## 3.2.3 REX DUAL 80+260 POSITIONING INSTRUMENTS



**Key**

- 1. Pressure switch fitting
  - 2. 1<sup>st</sup> safety valve fitting or thermal drainage 1<sup>st</sup> safety
  - 3. 1<sup>st</sup> boiler circulator consent thermostat and safety thermostat bulb wells
  - 4. Manometer fitting with control manometer flange
  - 5. 2<sup>nd</sup> safety valve fitting or thermal drainage 1<sup>st</sup> safety
  - 6. 2<sup>nd</sup> boiler circulator consent thermostat and safety thermostat bulb wells
  - 7. Flanges to weld after the definitive and correct positioning of the boilers
  - 8. 1<sup>st</sup> and 2<sup>nd</sup> boiler fuel valve bulbs wells
  - 9. Boiler thermometer bulb well
  - 10. 1<sup>st</sup> and 2<sup>nd</sup> boiler bi-thermostats bulbs well, digital regulator thermal-resistance (optional)
  - 11. Temperature test bulb wells
- M. Flow  
R. Return

### 3.3 ELECTRICAL CONNECTION

Electrical systems of thermal plants designed only for heating purposes **must comply with numerous legal regulations which apply to in general as well as specifically to each application or fuel type.**

### 3.4 REX/REX K/STR CONTROL PANEL (Fig. 3)

The control panel supplied with the boilers is made of self-extinguishing plastic and houses the regulation and safety instruments:

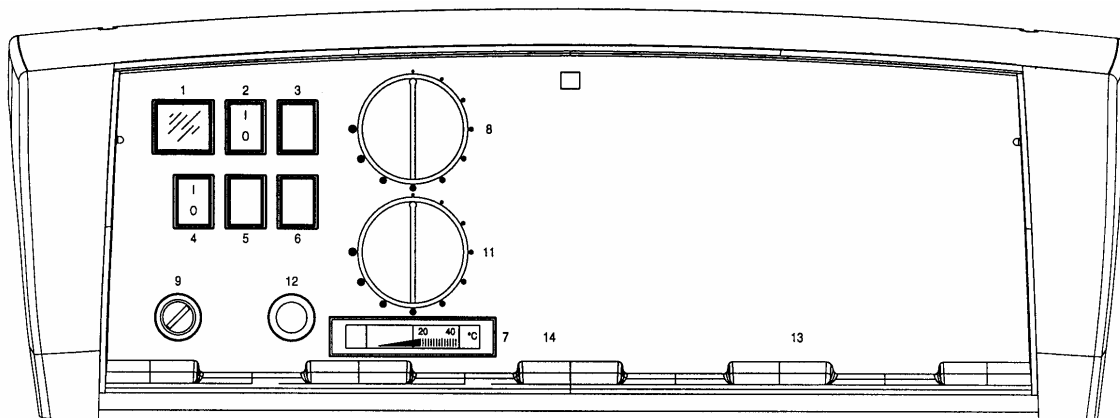


Fig. 3

#### KEY

- 1 PANEL LIVE
- 2 BURNER SWITCH N. 1
- 4 HEATING PUMP SWITCH
- 7 BOILER THERMOMETER
- 8 CONTROL THERMOSTAT N. 1
- 9 SAFETY LIMIT THERMOSTAT N. 1
- 11 CONTROL THERMOSTAT N. 2

The upper part of the control panel can be rotated to gain access to the terminal board and uncoil the thermostat and thermometer capillaries. A copy of the wiring diagram is contained inside the control panel cover. The **regulation thermostats (TR1-TR2)** have an operating range from 60° to 90° and can be set by the user by means of the front knob.

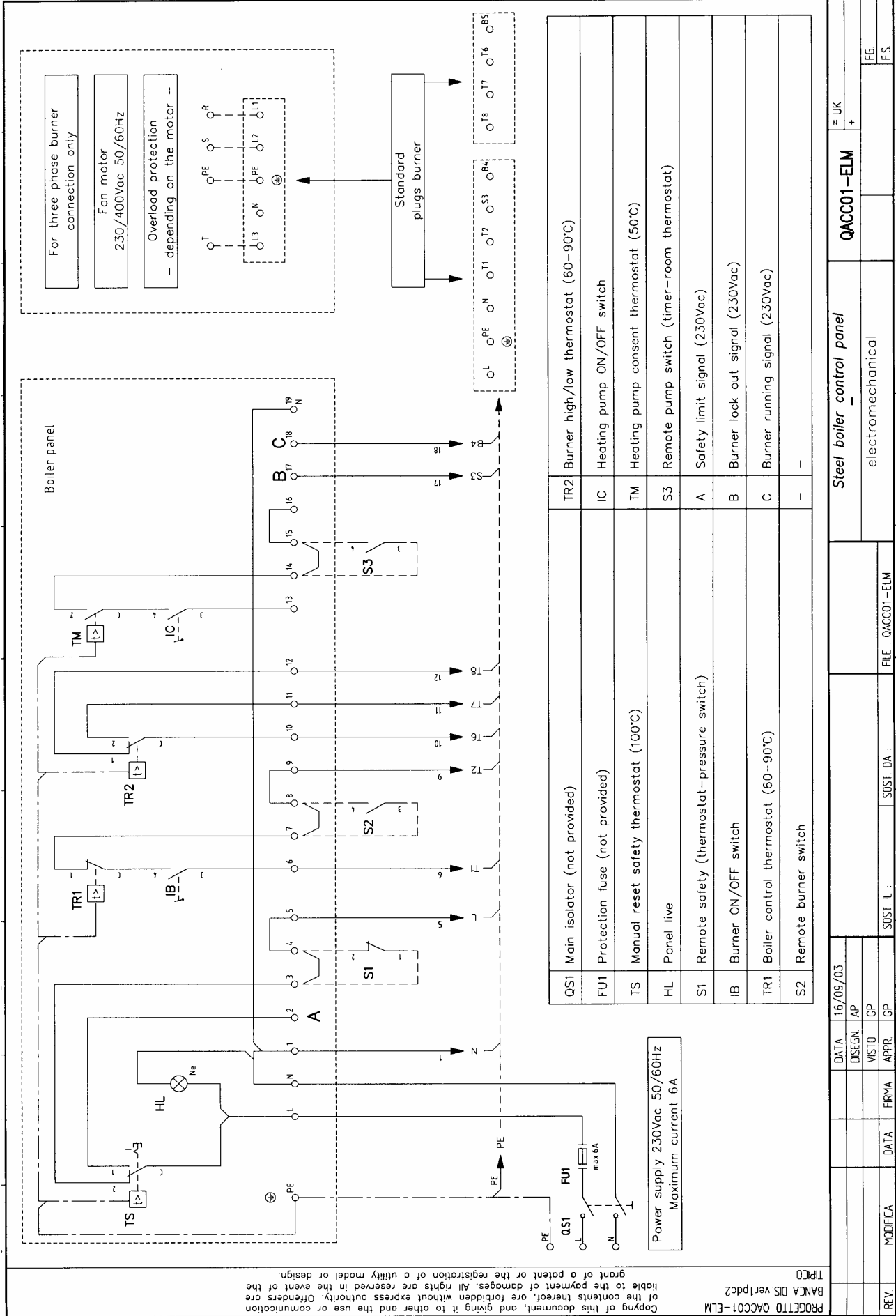
**Safety thermostats (TS)** has a fixed setting of 100 (+0/-6)°C and can be manually reset in accordance with Ministerial Decree 1/12/75 «R».

**Circulator consent thermostat (TM)** has a fixed setting of 50°C with a working range of 6°C: at start-up, with the heating system cold, this permits higher boiler temperatures to be maintained thus reducing the risk of flue gas condensation.

For correct installation, refer to the boiler casing assembly instructions.

# INSTALLATION

## 3.4.1 REX/REX K/STR WIRING DIAGRAM



PROGETTO	QACC01-ELM	Steel boiler control panel	QACC01-ELM	= UK
REV.	MODIFICA	DATA	FIRMA	APPR.
		16/09/03		
		DATA	DISIGN.	AP
		VISTO	GP	
		SIST. DA	SIST. IL	
		FILE	QACC01-ELM	
		electromechanical		FG
				FS

## 3.5 REX DUAL OPERATING PRINCIPLES

The boiler consists of 2 units of same capacity and one only control panel for both units. Each unit can work independently and the boiler can be operated partially. This means that all panel controls (burner switches, thermostats and thermometers) have been doubled. See paragraph 4.5 on connection. As an example, bi-thermostats TR1 and TR2 can be adjusted so that there is a 10°C intervention difference between each other (do not forget that knobs have a 43° to 85° regulation range with a 1/2 turn rotation about). Flow water temperature after 2 equal flows have been mixed corresponds to mean flow temperature of two units

### 3.5.1 REX DUAL CONTROL PANEL (Fig. 4)

The standard control panel is made of plastic with IP40 protection degree and houses the regulation and safety instruments:

The upper part of the control panel can be rotated to gain access to the terminal board and uncoil the thermostat and thermometer capillaries. A copy of the wiring diagram is contained inside the control panel.

**The regulation bi-thermostats (TR1 and TR2)** have an operating range from 43° to 85° and can be set by the user by means of the front knob. The temperature differential of each bi-thermostat is fixed and approx. 7°C.

**Safety thermostats (TS1 and TS2)** have a fixed setting of 100 (+0/-6)°C and can be manually reset in accordance with Ministerial Decree 1/12/75 «R».

**Circulator consent thermostats (TM1 and TM2)** have a fixed setting of 45°C with a working range of 6°C: at start-up, with the heating system cold, this permits higher boiler temperatures to be maintained thus reducing the risk of flue gas condensation.

For correct installation, refer to the boiler casing assembly instructions..

**Note:** both hour meters start each time their own burner starts. It is recommended that the numbers displayed by both hour meters are monitored . This helps guarantee that burners have almost the same number of working hours.

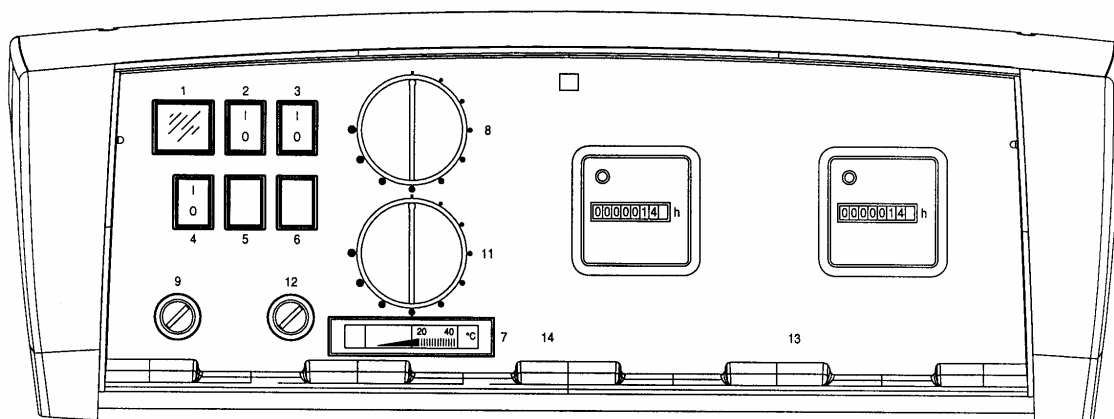


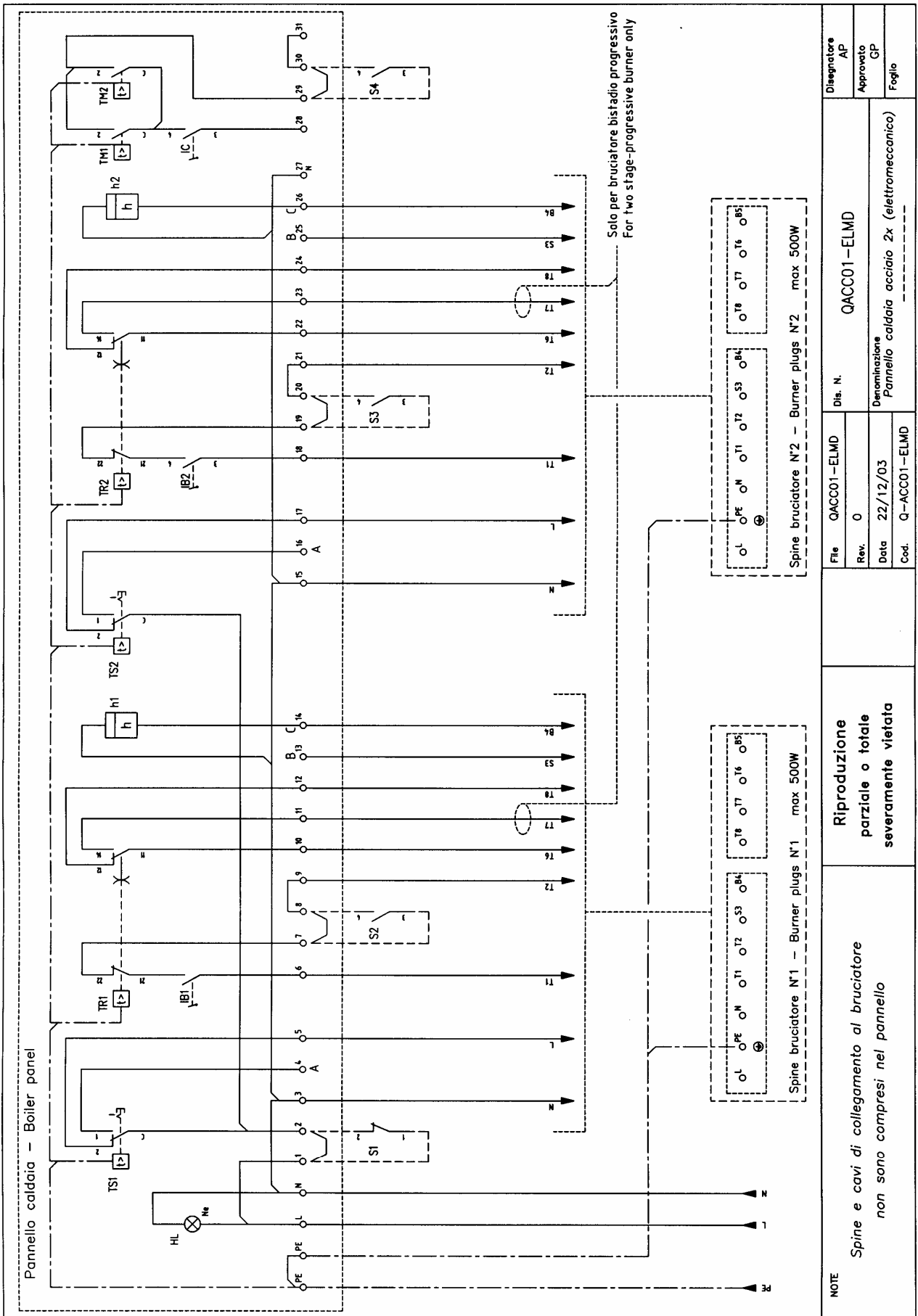
Fig. 4

#### KEY

- 1 PANEL LIVE
- 2 BURNER SWITCH N. 1
- 3 BURNER SWITCH N. 2
- 4 HEATING PUMP SWITCH
- 7 BOILER THERMOMETER
- 8 CONTROL THERMOSTAT N. 1
- 9 SAFETY LIMIT THERMOSTAT N. 1
- 11 CONTROL THERMOSTAT N. 2
- 12 SAFETY LIMIT THERMOSTAT N. 2
- 13 HOURS RUN METER BOILER N. 1
- 14 HOURS RUN METER BOILER N. 2

# INSTALLATION

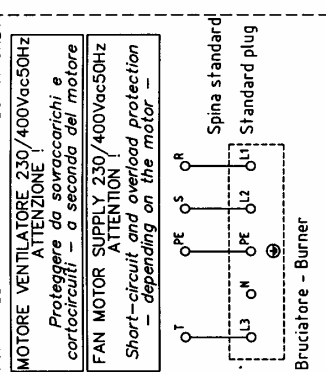
## 3.5.2 REX DUAL WIRING DIAGRAM



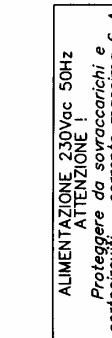
<b>File</b> QACC01-ELMD	<b>Dis. N.</b>	<b>Disegnatore</b>	<b>AP</b>
<b>Rev.</b> 0		<b>Approvato</b>	<b>GP</b>
<b>Data</b> 22/12/03	<b>Descrizione</b> Pannello caldaia acciaio 2x (elettromeccanico)		
<b>Cod.</b> Q-ACC01-ELMD	<b>Foglio</b>		

# INSTALLATION

COLLEGAMENTI SOLO PER BRUCIATORE TRIFASE  
FOR THREE PHASE BURNER CONNECTION ONLY

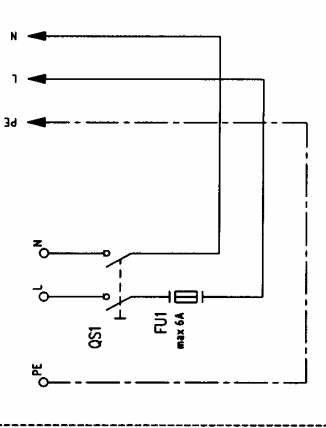


MOTORE VENTILATORE 230/400Vac50Hz  
ATTENZIONE!  
Proteggere da sovraccarichi e cortocircuiti - a seconda del motore



FAN MOTOR SUPPLY 230/400Vac50Hz  
ATTENZIONE!  
Short-circuit and overload protection - depending on the motor

ALIMENTAZIONE 230Vac 50Hz  
ATTENZIONE!  
Proteggere da sovraccarichi e cortocircuiti - corrente massima 6 A



POWER SUPPLY 230Vac 50Hz  
ATTENZIONE!  
Short-circuit and overload protection max current 6 A

Segnale	Funzione/Use Type	Funzione/Use Type
SA	Interruttore generale (a cura dell'installatore)	Comando circolatore impianto esterno
FU1	Fusibile di protezione (a cura dell'installatore)	Segnalazione di blocco TS1-TS2
S1	Sicurezza esterna caldaie (termostato-prestato)	Segnalazione di blocco bruciatori
TS1	Termostato di sicurezza caldaia N1, riarmo manuale (100°C)	Segnalazione di funzionamento bruciatori
IB1	Interruttore ON-OFF bruciatore N1	Segnalazione presenza tensione
TR1	Termostato a 2 stadi, regolazione caldaia N1 (47-85/43-80°C)	-
S2	Comando bruciatore N1 esterno	-
h1	Contatore funzionamento bruciatore N1	-
TS2	Termostato di sicurezza caldaia N2, riarmo manuale (100°C)	-
IB2	Interruttore ON-OFF bruciatore N2	-
TR2	Termostato a 2 stadi, regolazione caldaia N2 (47-85/43-80°C)	-
S3	Comando bruciatore N2 esterno	-
h2	Contatore funzionamento bruciatore N2	-
IC	Interruttore circolatore impianto	-
TM1-TM2	Termostati consenso avviamento circolatore (45°C fisso)	-

NOTE

Spine e cavi di collegamento al bruciatore  
non sono compresi nel pannello

Riproduzione  
parziale o totale  
severamente vietata

File QACC01-ELMD  
Rev. 0  
Data 22/12/03  
Cod. Q-ACC01-ELMD

Disegnatore AP  
Approvato GP  
Foglio

Dis. N. QACC01-ELMD  
Denominazione  
Pannello caldaia acciaio 2x (elettromeccanico)



## INSTALLATION

### 3.6 INVERTING THE DOOR APERTURE

If the door is to be opened to the opposite side, act as follows:

1. Switch the outside nut (or bush) of one hinge with the diametrically opposite closure bush; then at the hinge side, fasten the cone to the door with the inside nut.
2. Repeat the operation for the other hinge.
3. For any adjustment needed, act on the specific hinge nuts.

### 3.7 BURNER CONNECTION

Before installation you are advised to thoroughly clean the inside of all the fuel supply system pipes in order to remove any foreign matter that could affect correct operation of the boiler. See technical specification tables and check the max pressure value inside the furnace. The value found on the table may also increase by 20% if heavy oil is used instead of gas or light oil; furthermore the following checks should also be carried out:

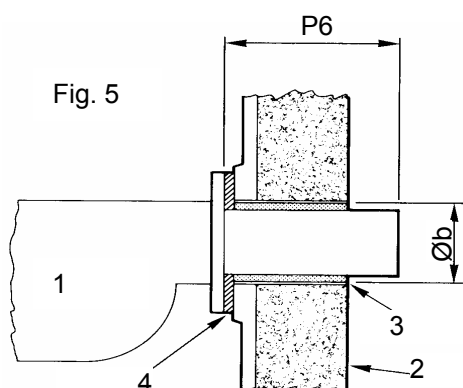
- a) Check the internal and external seal of the fuel supply system;
- b) Regulate the fuel flow according to the power required by the boiler;
- c) Check that the boiler is fired by the correct type of fuel;
- d) Check that the fuel supply pressure is within the values specified on the burner rating plate;
- e) Check that the fuel supply system is sized for the maximum flow rate necessary for the boiler and that it is provided with all control and safety devices provided for by the regulations referred to above;
- f) Check that the boiler room vents are sized in order to guarantee the air flow established by the regulations referred to above and that they are in any case sufficient to obtain perfect combustion.

In particular, when using gas:

- g) Check that the feeding line and the gas ramp comply with the regulations in force;
- h) Check that all the gas connections are sealed;
- i) Check that the gas pipes are not used as earth connections for electrical appliances.

If the boiler is not going to be used for some time, close the fuel supply cock or cocks.

**IMPORTANT: check that the air spaces between the burner draught tube and the manhole are suitably filled with thermoinsulating material (Fig. 5).** The boiler is supplied with a piece of ceramic rope. Should this not suit the burner used, use a braid of different diameter but same material.



KEY:

1. Burner
2. Manhole
3. Thermoinsulating material
4. Flange

All details on the draught tube length (**P6**), the diameter of the burner hole (**Øb**) and the pressurization are included in the par. Technical Specifications.

### 4 ASSEMBLY

#### 4.1 REX K ASSEMBLY (Fig. 6-7)

Ensure that installation premises floor is even and perfectly horizontal.

For perfect welding, use acid or rutile cored electrodes (check codes AWS E6020 or AWS E6013 or E44LA3 or E44LC3).

- a) Put the boiler rear plate (1) on the floor with the hinges pointing down and ensure that it is perfectly levelled (mark the middle of the plate sides in order to position correctly the furnace and the tube nest).
- b) Position the furnace (2) on the internal edge of the front plate (1) keeping the longitudinal welding of the furnace in the lower part of the boiler. **Ensure that plate and furnace are perfectly perpendicular when coupling them.**
- c) Weld the furnace (2) onto the front plate (1) along the outer circumference.
- d) Add the top tube nest part (3) (the return stub which can be recognised by its flow trap (4) welded inside the tube nest, must be close to the front tube plate). **For positioning, ensure that the flanged stub hole axis is aligned with the sign previously marked on the plate middle.** For easy centering, check height **A** between the tube nest edge and the plate edge. Spot-weld the middle only.
- e) Position the lower tube nest (5) in respect of height **B** and spot-weld it only in the lower middle part of the rear plate (1).
- f) Spot-weld the two tube nest parts (3) and (5)
- g) Position the rear tube plate (6) and insert the tie rod or the stiffening stub (8) in the furnace.
- h) Weld the rear tube plate (6) and the tie rod or stiffening stub (8), carefully avoiding any damage to the four threaded rivets or screws which will be used to secure the smokebox.
- i) Weld all the nest (3) and (5) onto the rear plate (1).
- j) Now, smoke tubes (7) can be inserted and welded on the rear plate tube (6) keeping the boiler in upright position or (but welding will be more difficult) horizontally; the choice will depend on the size of premises and the equipment available to turn the boiler upside down. **Caution: smoke tuber (7) must protrude 3 mm from the front plate (1) and approx. 10 mm from the rear plate (6).**
- k) Spot-weld the drain (N4) and ensure that it is perpendicular to the front plate (1) and parallel to the tube nest.
- l) Position the boiler horizontally. For this reason, a lifting hook is supplied that can be conveniently welded to the tube nest in order to simplify the boiler overturning. Remember not to have this hook protruding from the casing.
- m) Weld the two parts of the tube nest (5) and (6) longitudinally as well as the furnace inside (2) to the front plate (1); you can simplify this operation by using rolls for rotating.
- n) Weld both ½" couplings (N6) onto the tube nest (3) after having ensured that the bulb sheaths inclination is correct to avoid that sheaths are not blocked by smoke tubes; remove sheaths when welding. Weld the two flanged stubs (N1) and (N2) for flow and return, ensuring that flanges are perfectly horizontal. Weld the instrument fitting (N3) and fittings (N5) if included in the supply.
- o) Weld smoke tubes (7) onto the rear plate (1).
- p) Ensure that plate shapes (1) and (6) have not been altered and weld on plate surface the side frames (9).
- q) Weld the square tubes (10) that support the casing and, if part of the supply, weld also the side ones keeping height **C**.
- r) Carry out the hydraulic test under 7.5 bar pressure. **FILL THE GUARANTEE WITH THE TEST DATE.**
- s) Install the manhole (11) and the smoke box (12).
- t) Touch-up visible parts by using the paint supplied.

**Warning: before start up insert turbolators in the tube nest pushing until their reach the tube plate.**

# ASSEMBLY

## Key

- 1. Front tube plate
- 2. Furnace
- 3. Upper tube nest
- 4. Flow trap
- 5. Lower tube nest
- 6. Rear tube nest
- 7. Smoke tubes
- 8. Tie rod or stiffening stub
- 9. Side frame
- 10. Square tubes
- 11. Manhole
- 12. Smokebox
- N1 Flow
- N2 Return
- N3 Instrument fitting
- N4 Lower fitting
- N5 Fitting for safety valve and expansion vessel
- N6 Bulb wells

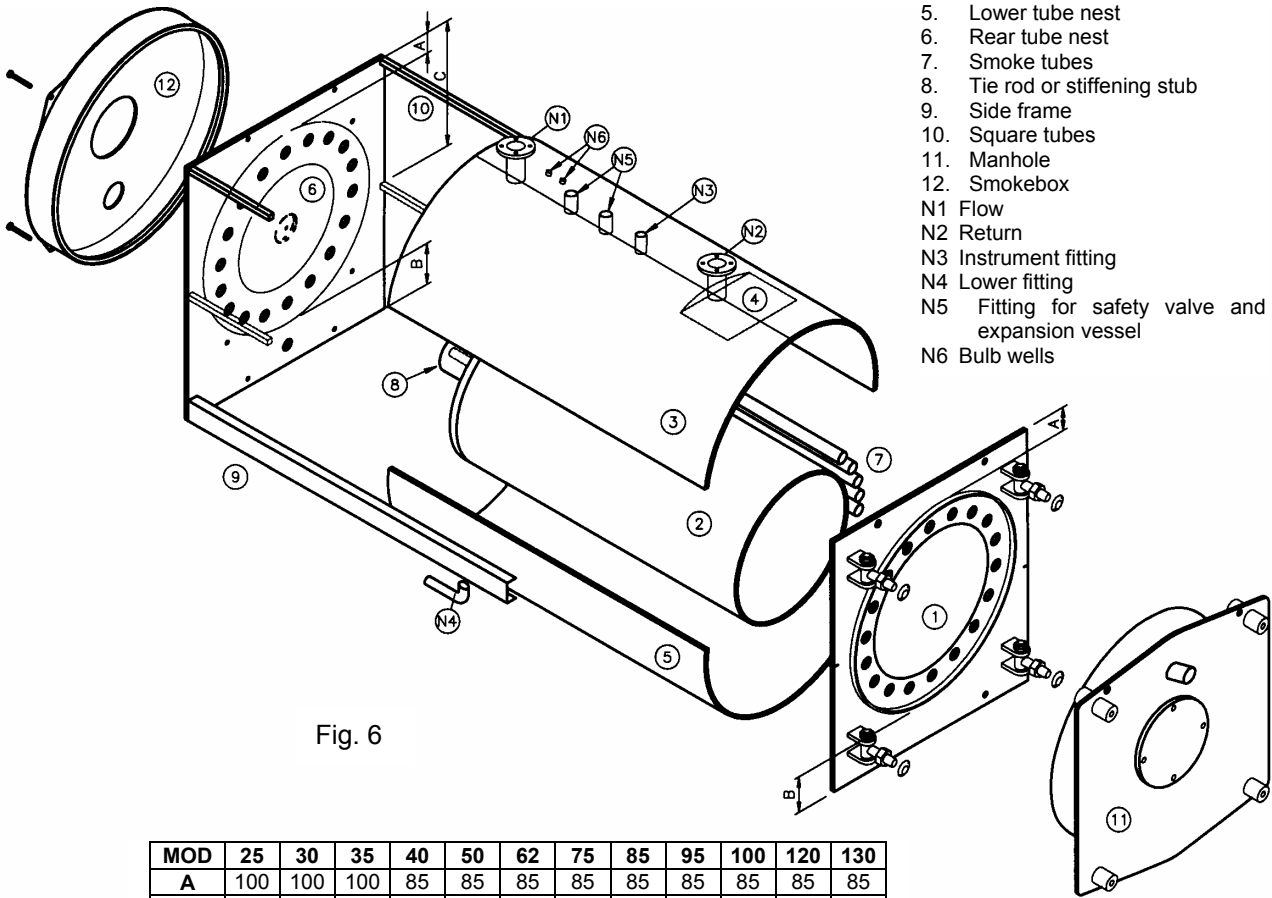


Fig. 6

MOD	25	30	35	40	50	62	75	85	95	100	120	130
A	100	100	100	85	85	85	85	85	85	85	85	85
B	100	100	100	95	125	125	125	125	125	125	125	125
C	-	-	-	-	550	550	605	605	605	680	680	680

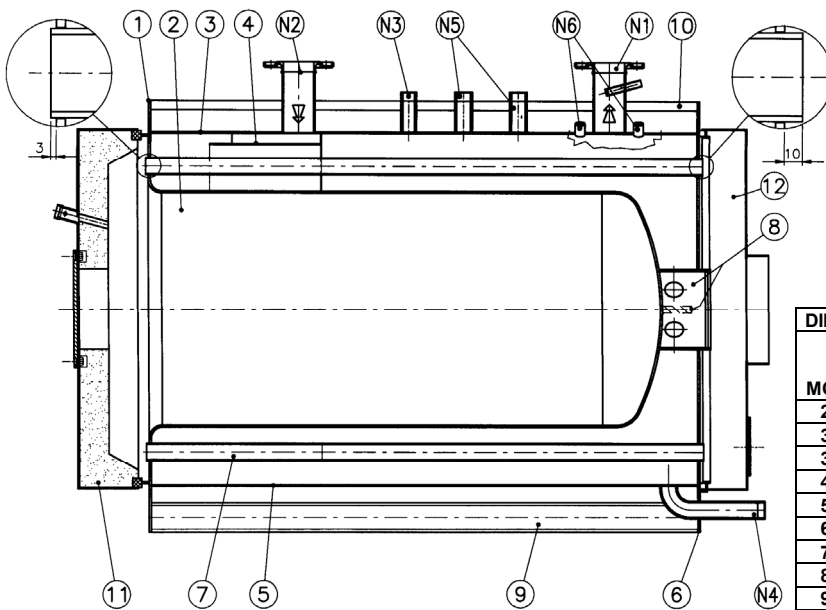


Fig. 7

MOD.	Furnace			Manhole		
	Ø mm	length mm	weight kg	width mm	height mm	weight kg
25	450	1240	67	750	680	65
30	500	1240	73	850	778	90
35	500	1490	88	850	778	110
40	545	1490	115	890	807	110
50	645	1500	145	1100	984	180
62	645	1790	172	1100	984	180
75	690	1800	227	1240	1130	210
85	690	1800	227	1240	1130	210
95	690	2050	257	1240	1130	210
100	790	2065	316	1390	1270	235
120	790	2065	316	1390	1270	235
130	790	2065	316	1390	1270	235

**4.2 REX 7÷40/REX K 25÷40 BOILER CASINGS (Fig. 8)**

- a) Wrap the glass wool around the boiler body leaving the bulb well (P) on the right side exposed.
- b) Insert the wires connecting the burner to the control panel in the lower slits of panel (1S) and (1D), allowing for the opening direction of the manhole.
- c) Fit the panel (1S), inserting the upper fold into the square tube and the lower fold to the boiler side frame.
- d) Fit the upper panel (2S) on the boiler and fit on this panel the control panel; uncoil the thermometer and thermostat capillaries and insert the bulbs in the wells.
- e) Fit panel (1D) as indicated under point b); fit panel (2D) ensuring that the capillaries are inserted in the slot provided in the panel itself. Securing the control panel.
- f) Secure the upper panels by screws and close the passage holes with special caps (see figure)

**Super-isolation (on request)**

- g) Fit panels (3) and (4) connecting them to the side panels.

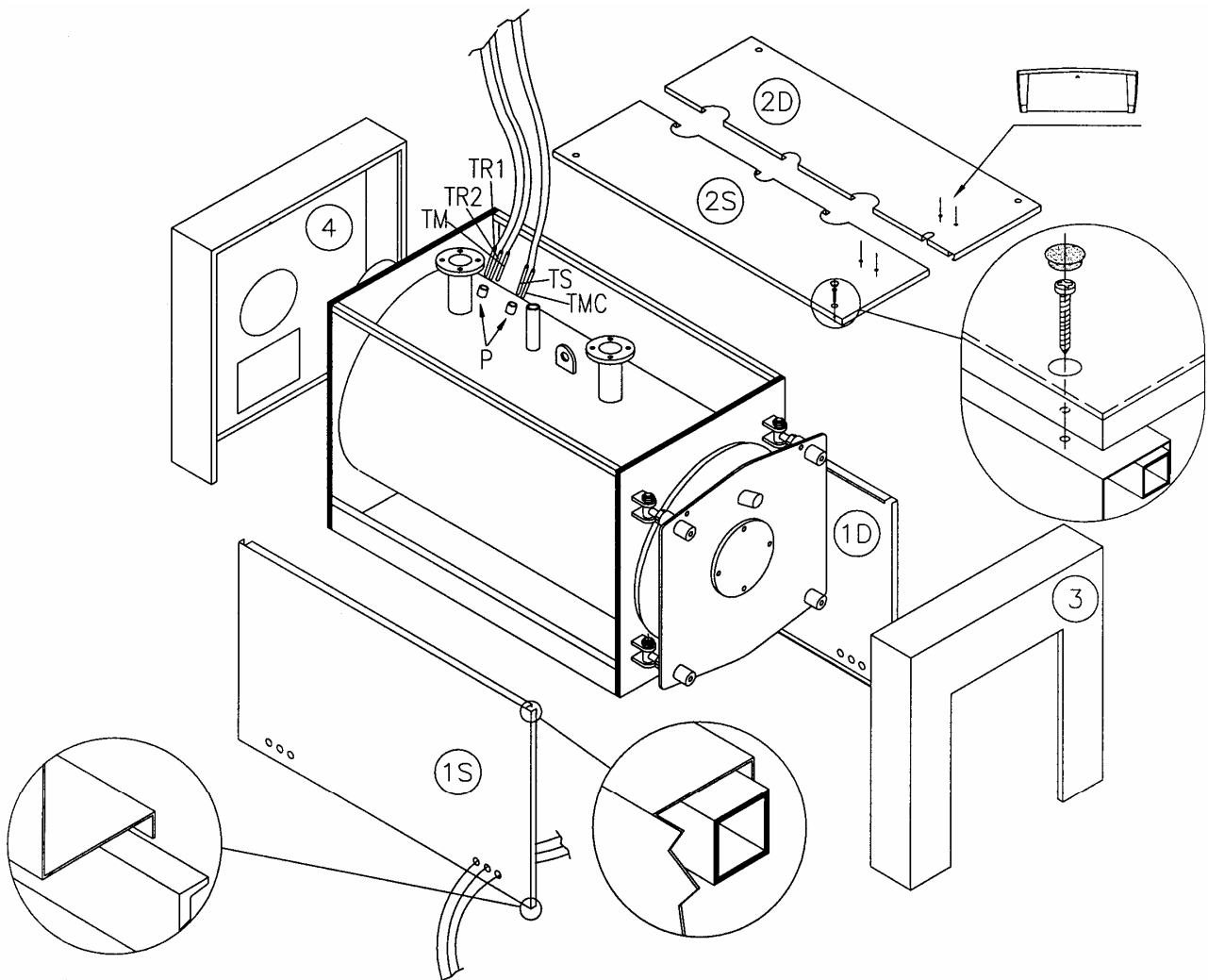


Fig. 8

**Key:** P Bulb wells – TR1-TR2 Regulation thermostats - TS Safety thermostat - TM Circulator consent thermostat - TMC Boiler thermometer.

## ASSEMBLY

### 4.3 REX/REX K 50÷130 BOILER CASINGS (Fig. 9)

- Wrap the glass wool around the boiler body leaving the bulb well on the right side exposed.
- Insert the wires connecting the burner to the control panel in the lower slits of panel (1S) and (1D), allowing for the opening direction of the manhole.
- Fit the lower panel (1S), inserting the fold into the square tube and repeat the same procedure with the upper panel (2S).
- Fit the upper panel (3S) on the boiler; fit the control panel on the panel (3S); uncoil the thermometer and thermostat capillaries and insert the bulbs in the wells.
- Fit the panels (1D) (2D) and (3D) ensuring that the capillaries are inserted in the slot provided in the panel (3D); securing the control panel to panel (3D).

#### Super-isolation (on request)

- Fit the panels (5S) and (5D), connecting them to the side panels by means of the brackets; fit the front panels (4B) and (4A) connecting them to panels (5S) and (5D). Close the manhole casing by fitting the upper panel (6) secured by screws; close holes with special caps (see figure).
- Fit the panels (8S) and (8D), connecting them to the side panels by means of the brackets; fit the rear panels (9B) and (9A) connecting them to panels (8S) and (8D). Close the smokebox casing by fitting the upper panel (10) secured by screws; close holes with special caps (see figure).

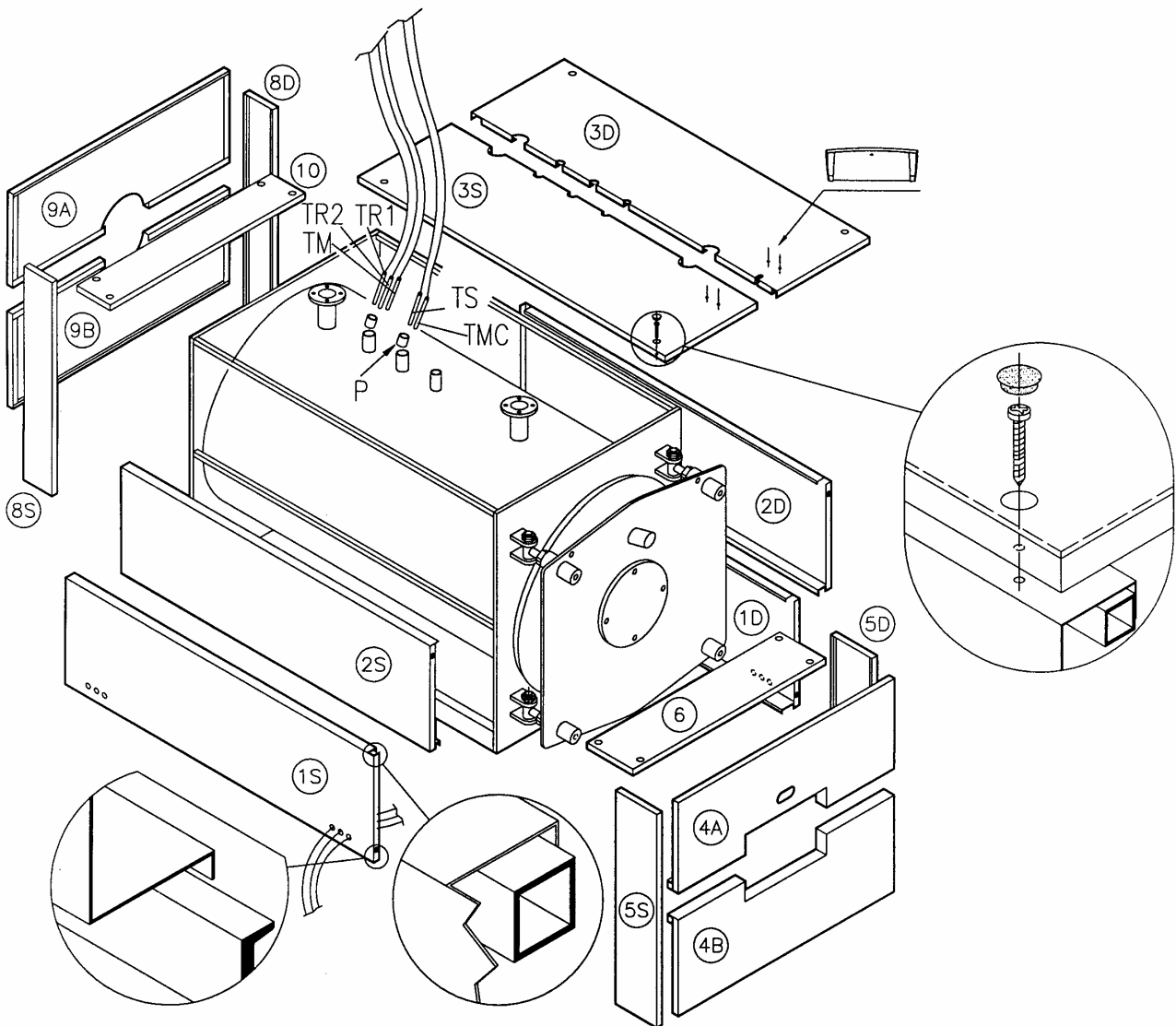


Fig. 9

**Key:** P Bulb wells – TR1-TR2 Regulation thermostats – TS Safety thermostat - TM Circulator consent thermostat - TMC Boiler thermometer.

**4.4 REX DUAL BOILER CASINGS (Fig. 10)**

- a) Wrap the glass wool around the boiler body leaving the bulb well (P) on the right side exposed.
- b) Open control panel and, through the casing holes (P1 or P2) insert bulbs in their wells (see figure). Fit the control panel.
- c) Fit panels (P1, P2, P3 and P4) inserting the upper fold into the square tube and the lower fold to the boiler side frame.
- d) Fit panel (P5).
- e) Fit the control panel with electrical connections

**NOTE: FOR THE POSITIONING OF THE REX DUAL 80÷260 BOILER'S BULBS SEE PAR. 3.2.3.**

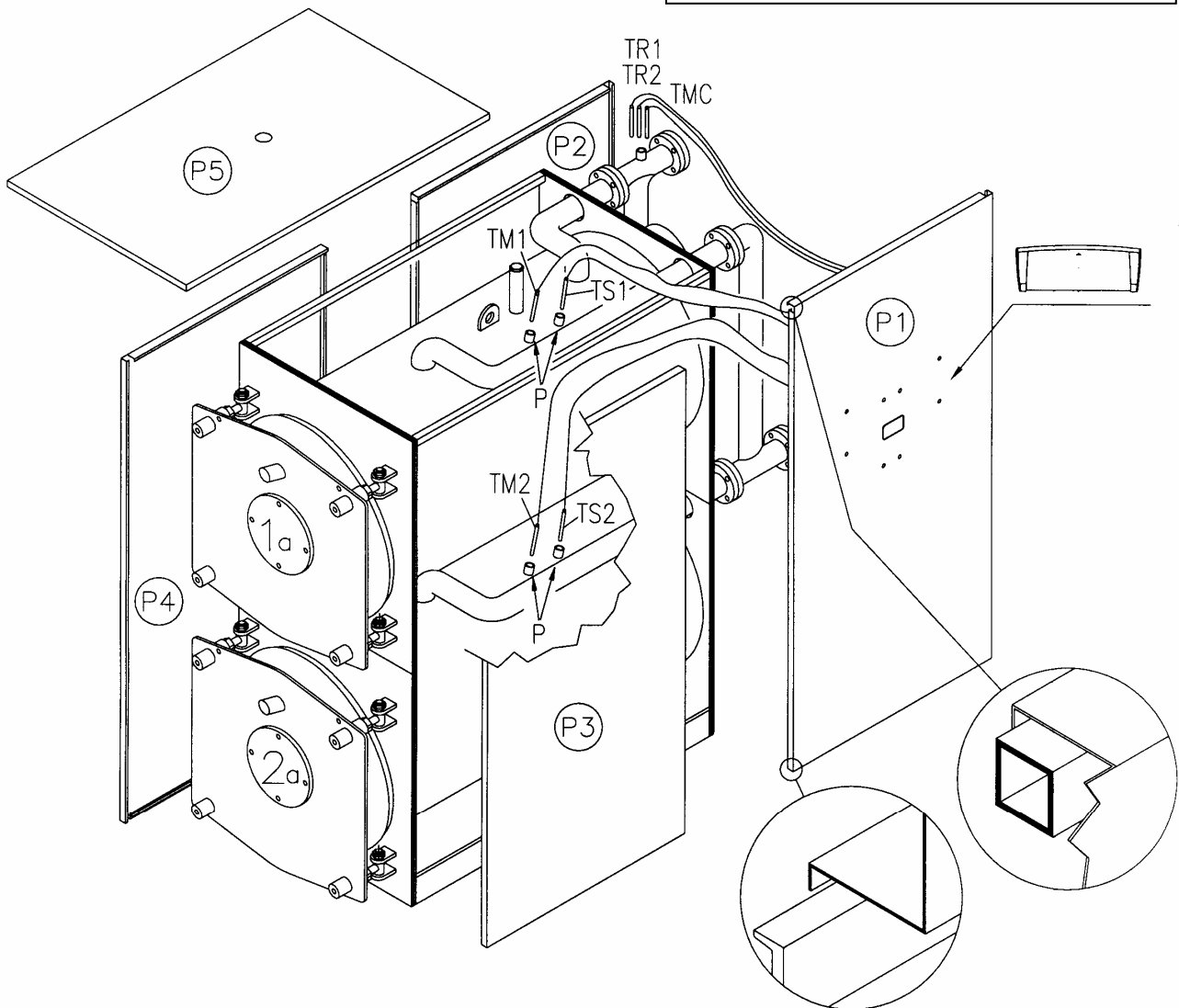


Fig. 10

**Key:** P Bulb wells - TR1 1<sup>st</sup> boiler regulation thermostat - TR2 2<sup>nd</sup> boiler regulation thermostat - TS1 1<sup>st</sup> boiler safety thermostat - TS2 2<sup>nd</sup> boiler safety thermostat – TM1 1<sup>st</sup> boiler circulation consent thermometer - TM2 2<sup>nd</sup> boiler circulation consent thermometer - TMC boiler thermometer.

## ASSEMBLY

### 4.5 STR BOILER CASINGS (Fig. 11)

- Wrap the glass wool around the boiler body leaving the bulb well on the right side exposed.
- Insert the wires connecting the burner to the control panel in the lower slits of panel (1S) and (1D), allowing for the opening direction of the manhole.
- Fit the lower panel (1S), inserting the fold into the square tube and repeat the same procedure with the upper panel (2S).
- Fit the upper panel (3S) on the boiler; fit the control panel on the panel (3S); uncoil the thermometer and thermostat capillaries and insert the bulbs in the wells.
- Fit the panels (1D) (2D) and (3D) ensuring that the capillaries are inserted in the slot provided in the panel (3D); securing the control panel to panel (3D).
- Fit the panels (4S) and (4D), connecting them to the side panels by means of the brackets; fit the front panel (5) connecting it to panels (4S) and (4D). Close the manhole casing by fitting the upper panel (6).
- Fit the back panel (7), connecting it to the side panels by means of the brackets.

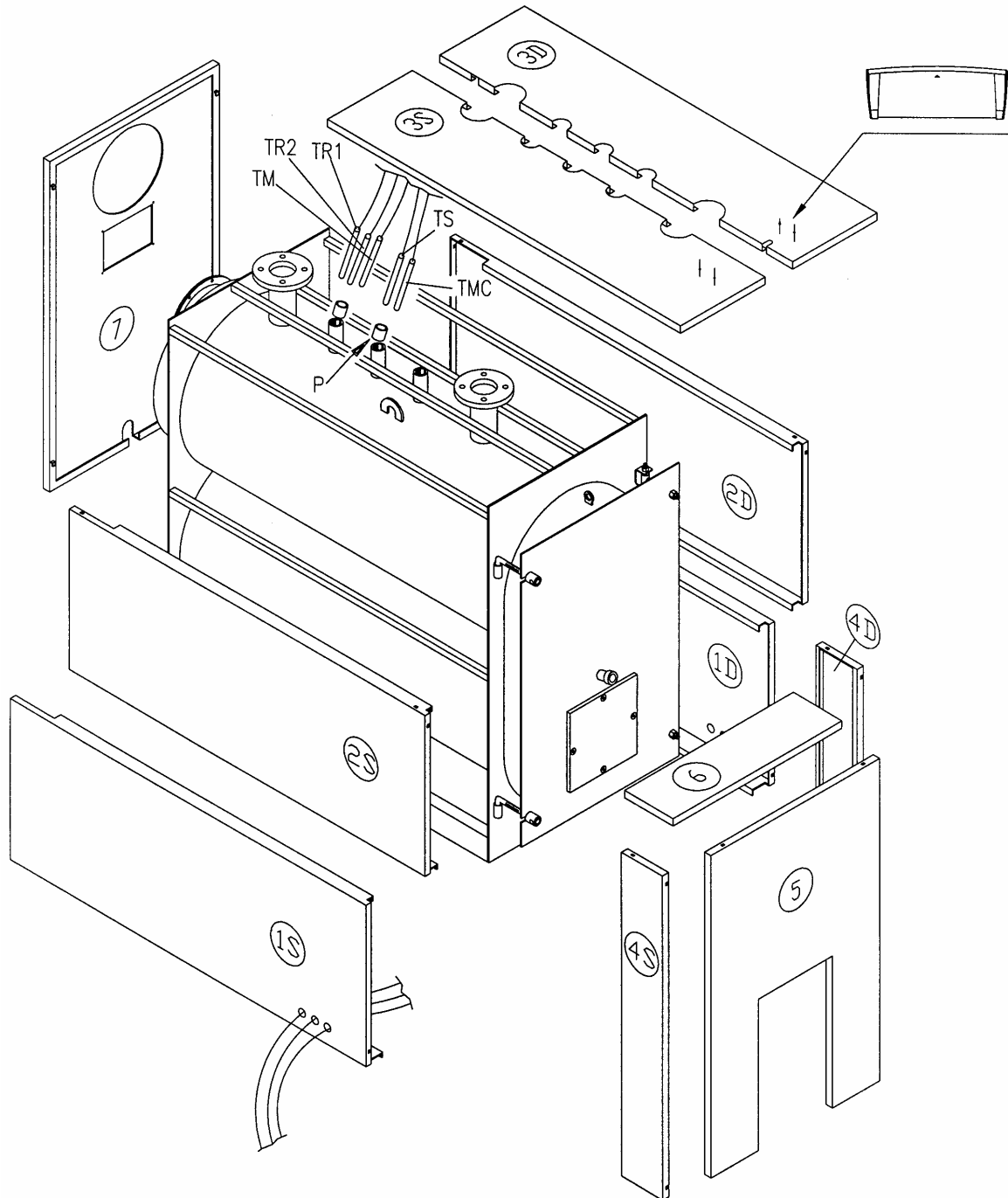


Fig.11

**Key:** P Bulb wells – TR1-TR2 Regulation thermostats – TS Safety thermostat - TM Circulator consent thermostat - TMC Boiler thermometer.

## 5 START UP

**WARNING:** Before start up insert wholly turbolators into the smoke tubes ensuring that they have been pushed inside for at least 100 mm.

### 5.1 PRELIMINARY CHECKS

Before starting the boiler, check that:

- The **rating plate** specifications and power supply network (electricity, water, gas or fuel oil) specifications correspond;
- The burner **power range** is compatible with the power of the boiler;
- The boiler room also contains the instructions for the burner;
- The **flue gas exhaust pipe** is operating correctly;
- The **air inlet supply** is well dimensioned and free from any obstacle;
- The **manhole**, the **smokebox** and the **burner plate** are closed in order to provide a complete flue gas seal;
- The system is **full of water** and that any **air pockets** have therefore been eliminated;
- The **anti-freeze** protections are operative;
- The water **circulation pumps** are operating correctly.
- The expansion vessel and the safety valve(s) have been connected correctly (with no interception) and are properly operating.
- Check the electrical parts and thermostat operation.

### 5.2 WATER TREATMENT

The most common phenomena that occur in heating systems are:

#### - Scaling

Scale obstructs heat transfer between the combustion gases and the water, causing an abnormal increase in the temperature of the metal and therefore reducing the life of the boiler.

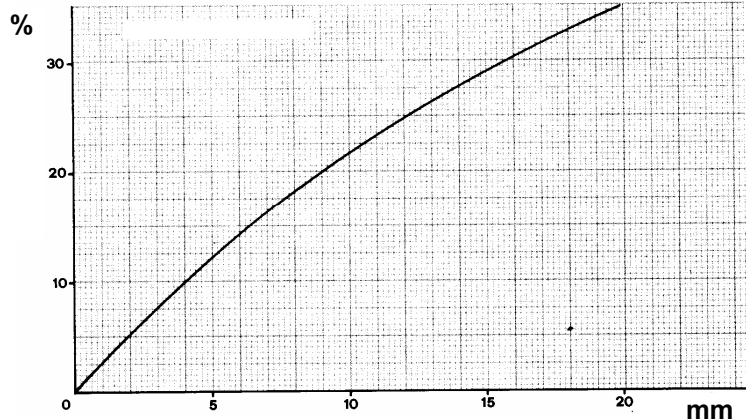
Scale is found mostly at the points where the wall temperature is highest and the best remedy, at construction level, is to eliminate areas that overheat.

Scale creates an insulating layer which reduces the thermal transfer of the generator, affecting system efficiency. This means that the heat produced by burning the fuel is not fully exploited and is lost to the flue.

#### Scale diagram

#### Key

% % fuel not used  
mm mm scale



#### - Corrosion on the water side

Corrosion of the metal surfaces of the boiler on the water side is due to the passage of dissolved iron through its ions ( $Fe^{+}$ ). In this process the presence of dissolved gases and in particular of oxygen and carbon dioxide is very important. Corrosion often occurs with softened or demineralised water which has a more aggressive effect on iron (acid water with  $Ph < 7$ ): in these cases, although the system is protected from scaling, it is not protected against corrosion and the water must be treated with corrosion inhibitors.

### 5.3 FILLING THE SYSTEM

**The water must enter the system as slowly as possible and in a quantity proportional to the air bleeding capacity of the components involved. Filling times vary depending on the capacity and characteristics of the system but should never be less than 2 or 3 hours.**

In the case of a system with closed expansion vessel, water must be let in until the pressure gauge indicator reaches the static pressure value pre-set by the vessel.

Heat the water to maximum temperature and never over  $90^{\circ}C$ . During this operation the air contained in the water is released through the automatic air separators or through manual bleed valves. The water discharged from the system with elimination of the air is made up by the automatic or manual filling valve.



## 6 OPERATION

### 6.1 OPERATING CHECKS

The heating system must be correctly operated to ensure perfect combustion as far as possible with reduced emissions of carbon monoxide, unburnt hydrocarbons and soot into the atmosphere, and to avoid hazards and damage to people and goods.

Guide to combustion values:

FUELS	%CO <sub>2</sub>	Flue gases temperature	% CO
Gas	10	190°C	0 – 20 ppm
Gas oil	13	195°C	10 – 80 ppm
Heavy oil	13.5	200°C	50 – 150 ppm

A diagram is provided in which the system efficiency is obtained according to the flue gas temperature, the ambient temperature and the percentage of carbon dioxide (CO<sub>2</sub>). Dispersions through the boiler casings are not considered.

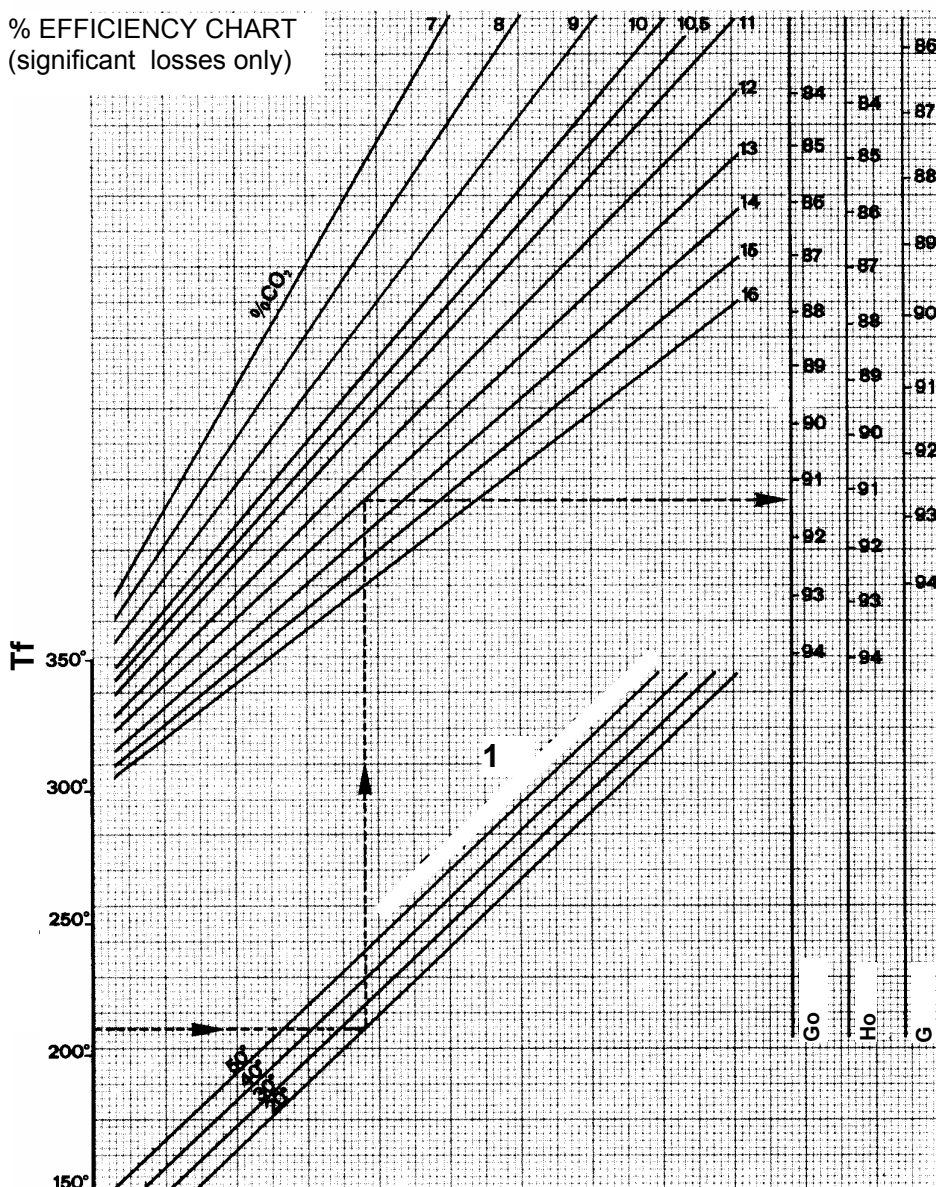
Example:

Fuel used .....GAS OIL

%CO<sub>2</sub>.....13 %

Ambient temperature.....20 °C

Efficiency.....91.4 %



Key:

**Tf** Flue gas temperature – **Ta** Ambient temperature °C – **Go** Gas oil – **Ho** Heavy oil – **G** Gas

## EJERCICIO

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Pressurisation values should be included in the range given in the table of technical specifications.

### WARNING

The differential temperature between boiler flow and return must not exceed 15°C in order to prevent thermal shock to the boiler structures. The temperature of the return water must be above 55°C in order to protect the boiler from corrosion due to condensation of the flue gases on cold surfaces; for this purpose it is useful to install a 3 or 4-way mixing valve. The guarantee does not cover damages caused by condensate.

A recirculation pump (anticondensate pump) must be installed to mix the cold returns. This pump should have a minimum flow rate equal to approximately 5 m<sup>3</sup>/h or equal to 1/3 or 1/4 of the heating system pump flow rate.

It is necessary to keep the burner switch always switched on in order to maintain water temperature equal approximately to the value set through the thermostat.

If the flue gas seal is poor in the front part of the boiler (manhole and burner plate) or the back part (smokebox), the closing tie rods of the individual parts must be adjusted; if this is not sufficient, the seals must be replaced.

### CAUTION

Do not open the manhole and do not remove the smokebox while the burner is working. Always wait few minutes after the burner has been switched off until the insulating parts are cooler.

## 6.2 CLEANING AND SERVICING

Close fuel supply and disconnect the electrical mains before starting any cleaning and servicing operations.

As economic running depends on cleaning of the exchange surfaces and regulation of the burner, the following operations should be performed:

- Clean the tube bundle and turbolators with the appropriate tube-brush every month for heavy oil-fired boilers, every three months for gas oil-fired boilers and once a year for gas-fired boilers. Cleaning schedule depends on plant features.

Quick cleaning can be performed by opening the front manhole only, taking the turbolators out and cleaning the tubes with a tube-brush. For more thorough cleaning, the smokebox must be removed to eliminate carbon deposits from the rear side.

- Have the burner calibration checked by professionally qualified personnel;
- Have the water circulating in the system analysed and provide for adequate treatment to avoid the formation of scale which initially reduces the efficiency of the boiler and in the long term will permanently damage it, making it unserviceable;
- Check that the refractory castings in contact with the flue gases are in perfect condition and if not, replace them;
- Periodically check the efficiency of the system regulation and safety instruments.
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