

ASSEMBLY, OPERATING AND MAINTENANCE
INSTRUCTIONS

TECHNICAL INFORMATION
AK2 SERIES

GAS FIRED BOILERS
WITH
ATMOSPHERIC
BURNERS

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1. INTRODUCTION

The AK2 is a cast iron sectional boiler for gas firing with atmospheric burner.
The AK2 series are CE marked on product identification number 86/AT/574 to:

Gas Appliances Directive (90/396/EEC)

Boiler Efficiency Directive (92/42/EEC)

Electromagnetic Compatibility Directive (89/336/EEC)

and conforms to the requirements of

EN 656: Gas-fired central heating boilers; Type B boilers of nominal heat input exceeding 70 kW but not exceeding 300 kW.

EN 50081-1: Electromagnetic compatibility. Generic emission standard. Residential, commercial and light industry

EN 50082-1: Electromagnetic compatibility. Generic immunity standard. Residential, commercial and light industry

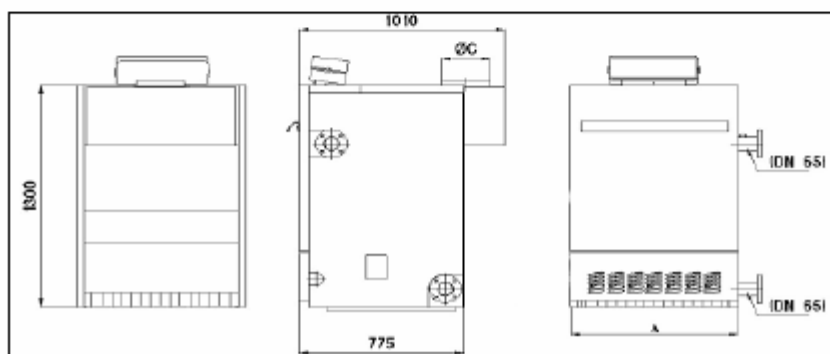
The AK2 series boilers have been designed for firing natural gas and LPG with a two stage operation whose nominal heat outputs ranging from 81,4 kW to 260,5 kW.
Boiler series are supplied with P2-AK control panels for two stage operation (minimum/maximum/off) as standard accessory, or P3 control panels for automatic regulation in respect with outside and room temperatures on special request.
P3 control panels will also be used for controlling mixing circuit and domestic hot water supply circuit with additional system safety features.

The AK2 series boilers are suitable for central heating and indirect hot water supply at working pressures not exceeding 6 bars, and working temperatures not exceeding 110 C.
The boiler must never be used for direct heating water supply.

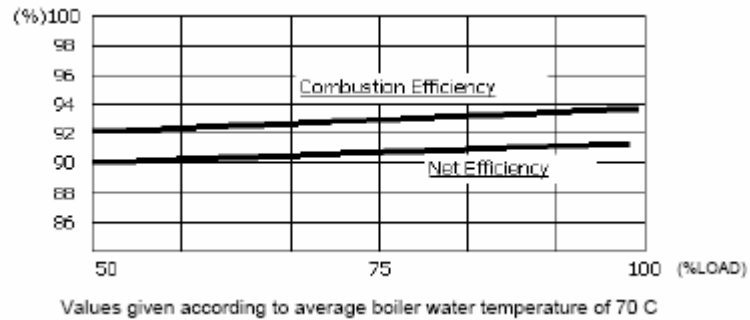
2. TECHNICAL INFORMATION

AK2 SERIES BOILERS TECHNICAL SPECIFICATIONS TABLE

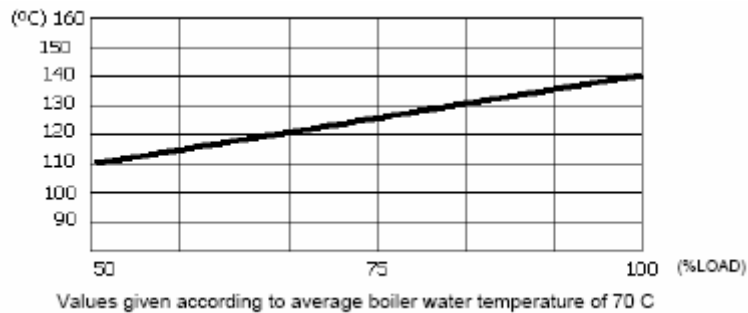
Boiler type		AK2 6	AK2 7	AK2 8	AK2 9	AK2 10	AK2 11
Number of sections		6	7	8	9	10	11
Product ID number/Notified body		86/AT/574 ^ CE 0086					
Heat output (Natural gas, LPG)	kW	81,4	97,7	114,0	130,2	146,5	162,8
	Mcal/h	70	84	98	112	125	140
Heat input (Natural gas, LPG)	kW	89,2	107,3	125,0	142,6	161,1	178,5
	Mcal/h	76,7	92,3	107,5	122,6	138,5	153,5
Net efficiency at 100% load	%	91,2	91,0	91,2	91,3	90,9	91,2
Net efficiency at 90% load	%	93,0	92,9	92,9	93,3	93,1	93,3
Max operating pressure	bar	6	6	6	6	6	6
Max operating temperature	°C	110	110	110	110	110	110
Flow temperature control	°C	30 – 90					
Gas category		L _{1H} & L ₁₊					
Max gas inlet pressure	Natural gas	bar	20 to 60				
	LPG	bar	60				
Gas inlet size	G	1"	1"	1"	1"	1"	1"
Return flow connections	DN	65 (2 1/2")					
Flue gas temperature	°C	128 at nominal heat input					
Flue outlet	mm	225	250	250	250	300	300
Weight (boiler block)	kg	410	475	540	605	670	735
Weight (water content)	lt	74	84	94	104	114	124
Stand-by losses	kcal/h	216	245	274	304	333	362
	Watt	251	285	318	353	387	421
Height	mm	1300 (without control panel)					
Depth	mm	775					
Length (A)	mm	744	849	955	1060	1166	1271
Number of burners		5	6	7	8	9	10



2.1. EFFICIENCIES

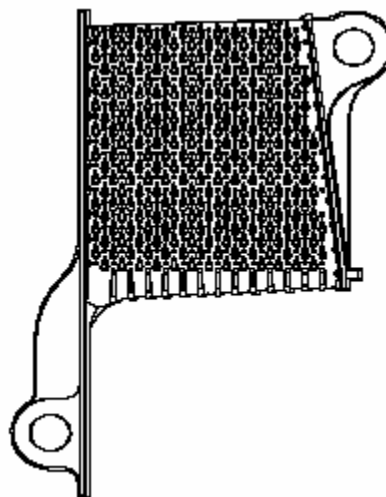


2.2. FLUE GAS TEMPERATURES



2.3 SECTION DESIGN

The original heat surface design unique to AK2 series boilers in the form of water drops yield optimum heat transfer rate to boiler water with minimized resistance in the flue. Thanks to latest flexible casting technology, The AK2 ensures maximum reliability and longer life with high thermal stress resistance.



2.4. SAFETY FEATURES

A safe operation throughout the lifetime of boiler is ensured by employing the following components within the unit:

- * Gas low pressure safety switch
- * Ionization control
- * Chimney sensor
- * Gas inlet filter
- * 3 thermostats to control boiler water temperature

2.5 BURNER

The special design AK2 series atmospheric burners hold the following technical features:

- * Stainless steel body
- * Low CO and NOx emissions without pollutant release in environment.
- * Operation with low noise levels
- * A two stage operation in accordance with supplied control panels saves energy, and ensures more comfort.
- * Less requirements of maintenance
- * Improved combustion with LPG

2.6. WATER SIDE OF BOILER

The fully water cooled sections are joined by cast iron conical nipples. The cast iron sections are to BS.1452 Grade 200 with 7 mm wall thickness. Return and flow connections to heating system are provided by flanged stub-pipes on either left or right hand side of boiler outside of the casing.

For ease of installation, the flow and return connections can be arranged on different or the same side.

However, the gas inlet pipe must be installed on the opposite side to the return connections.

Under no circumstances should the boiler be fired when its circulation volume is less than the recommended minimum volume calculated according to the following formula:
The table below provides hydraulic resistances at water volumes relative to boiler Δt flow/return. The difference between flow and return temperatures of the boiler should not be greater than 20 C to provide convenient operating conditions in

$$\frac{kW \text{ Output}}{70} = m^3 / h$$

Boiler Type	Heat Output kW	Min. Circulation Rate m ³ /h	$\Delta T = 20^\circ \text{C}$	
			Water Volume m ³ /h	Hydraulic Resistance mbar
AK2 6	81,4	1,2	4,1	20
AK2 7	97,7	1,4	4,9	24
AK2 8	114	1,6	5,7	28
AK2 9	130,2	1,9	6,5	32
AK2 10	146,5	2,1	7,3	36
AK2 11	162,8	2,3	8,1	40

3. PREPARATIONS BEFORE ASSEMBLY

3.1. FLUE DESIGN AND CHIMNEY INSTALLATION

Boilers must be connected to a suitably sized flue, using the shortest flue route possible, starting from the flue spigot of the draught diverter where there is a flue ring for easy connection, which should be insulated by mineral wool or similar material. The flue route must be placed at a rising slope of 10°-45° between appliance and the flue riser.

Conditions creating higher resistance to gas flow such as elbows should be avoided in the flue. The flue must self supporting and should not use the appliance as a support.

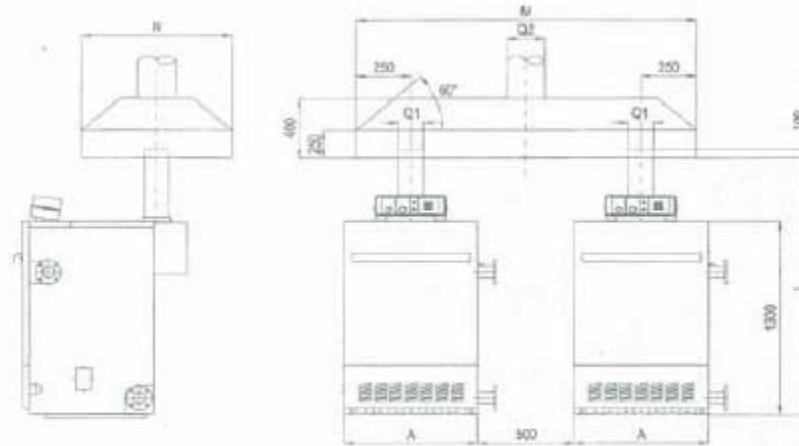
At discharge from the boiler, the flue gasses should be in a balanced state, consequently, the function of the flue is only for the disposal of the flue gasses to atmosphere via a required draught.

Flue calculations should be carried out in compliance with the standards and mandatory regulations.

Conditions of existing flue should be checked and proper precautions should be taken against excessive cooling and condensation (such as applying a flue liner made of stainless steel grade 316 and surrounding with insulation).

Positive draught conditions must be avoided. Negative draught conditions should be contained within <-5 mm wg at a level of 85 cm above flue ring of the draught diverter for optimum boiler performance.

For installations of two boilers with connection to the same flue, the following technical regulations shall be taken into consideration: and refer to current IGE guidance.



Boiler Type	A	Chimney Q1	Chimney Q2	L	M	N
	mm	mm	mm	mm	mm	mm
AK2 6	744	225	300	2000	1969	650
AK2 7	849	250	350	2000	2099	650
AK2 8	955	250	350	2000	2205	650
AK2 9	1060	250	350	2000	2310	650
AK2 10	1166	300	450	2100	2466	800
AK2 11	1271	300	450	2100	2571	800

3.2. GAS SUPPLY

The installation must be in accordance with relevant standards and mandatory regulations. The local gas supply authority should always be contacted at the design stage to ensure an adequate supply is available. An existing service pipe must not be used without prior consultation with the local gas supply authority and the supply must be made through a suitable meter.

3.3. VENTILATION

The installation must be in accordance with relevant standards and mandatory regulations, in respect to the following table. Adequate fresh air circulation must be ensured in boiler room for efficient and safe operation of whole boiler system.

For natural ventilation grilles with minimum free areas given in following table for a single boiler shall be provided at high and low level, unless otherwise stated in local regulations. Upper and lower ventilation grilles should be installed as close as possible to levels of the floor and ceiling of boiler room.

Maximum vertical distance between the upper grille and the ceiling level should be 40 cm, and 50 cm between the lower grille and the floor level.

For exposed boiler houses, grilles should be provided on two or more external walls and care should be taken in siting boilers so that they are not affected by adverse draughts or situated next to powerful fans or other such equipment.

For underground boiler houses, or those where communication with the outside is not possible then mechanical ventilation may be used. Volumes of air for mechanical ventilation are given in following table.

For mechanically ventilated boiler houses it is possible to have mechanical inlet air at low level and natural extract air at high level, all volumes and grilles should be designed on the values given in the same table.

It is not allowed to have natural inlet air and mechanical extract. In all cases of mechanical ventilation the fans should be interlocked so that the boiler will not run unless the fans are running.

Boiler Type	Heat Output	Flue Spigot	Ventilation grilles free areas (cm ²)		Ventilation air flow (m ³ /h)	
			Natural		Mechanical	
			Low	High	Low	High
AK2 6	81,4	225	673	336	322	132
AK2 7	97,7	250	753	377	387	158
AK2 8	114	250	834	417	451	185
AK2 9	130,2	250	914	457	516	211
AK2 10	146,5	300	994	497	580	237
AK2 11	162,8	300	1075	538	645	264

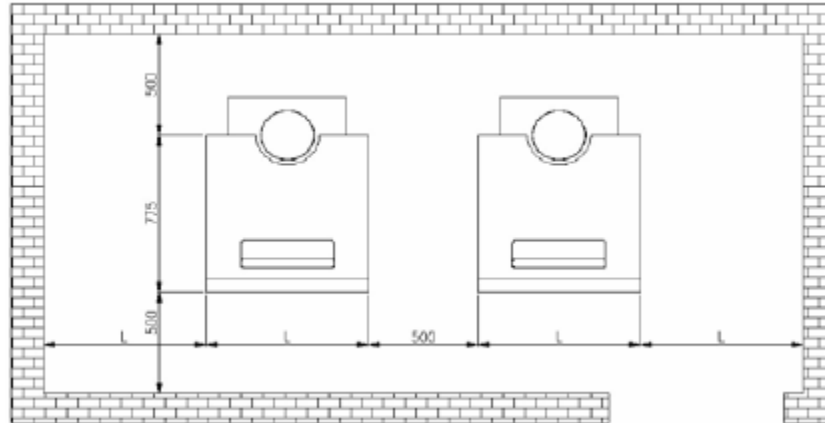
NOTES:

* For natural ventilation, given values refer to free air inlet/outlet areas. The size of grille should be arranged as 1,5 times of free air area.

* For mechanical ventilation, fans should be selected considering the pressure losses contained throughout ventilation duct.

3.4. BOILER ROOM ARRANGEMENT

The installation must be arranged in accordance with Mandatory Regulations and Codes of Practice. The following sketch shows the recommended minimum dimensions of clearance around the boiler for servicing and maintenance.



As boilers are equipped with a water distribution pipe which is installed from return connection through the boilers lower waterways, there should be enough space available to enable the removal of the distribution tube (length = the width of the appliance) to the return water connection side.

The boiler flow and return connections, and thus the position of water distribution pipe may be arranged either on the right or left hand side of boiler in respect with boiler room size and heating system installation.

Before assembly of the boiler sections, a raised plinth should be constructed in boiler room to support the boiler weight in accordance with following recommended dimensions:

Recommended dimensions of plinth (mm)						
Boiler Type	AK2 6	AK2 7	AK2 8	AK2 9	AK2 10	AK2 11
Width	800	900	1000	1100	1250	1325
Length	850	850	850	850	850	850
Height	100	100	100	100	100	100

The boiler room should not be used for any other applications; the floor should always be kept dry and clean. Any obstacles in front of ventilation openings must be avoided.

The boiler room air openings must conform to the norms prevailing locally. Any irregular electrical installations in boiler room should be replaced.

The circulating water in the boiler and heating system must never be taken out for any domestic usage.

Water level should be checked periodically with a hydrometer.

Never add water to the system when boiler is hot.

Never drain the water unless it is necessary.

Follow the instructions for the annual cleaning and maintenance operations detailed later in this document to ensure optimum reliability and performance of the appliance.

3.5. WATER CIRCULATION SYSTEM

The system design must provide water flow rates commensurate with the boiler output and the temperature difference between flow and return should not exceed 20 C.

Water levels should be checked regularly and any leakages corrected in order to keep system water make-up to a minimum, because excessive make-up will lead to salt deposits forming in the boiler waterways causing local overheating and damage to the boiler sections. Where there is doubt as to the quantity of water make-up, a water meter should be fitted.

Boiler water systems should be thoroughly flushed and cleaned before a new boiler is installed and the system water should be treated by a reputable specialist and best practice observed. Consideration should be given to the fitting of sludge traps and strainers if site conditions warrant them.

For heating systems with maximum boiler temperature up to 100 C, the necessary water purification shall be in accordance with VDI 2035:

Boiler capacity range	Nr.	Requirements of the filling and auxiliary water
100 < Q in kW < 350	1	No requirement is needed, if content of Calcium Hydrocarbonate ($CA(HCO_3)$) is max 2 mol/m ³ , and if no more than the triple water filling of the plant does not take place.
350 < Q in kW < 1000	2	Like 1, however content of Calcium Hydrocarbonate is max. 1,5 mol/m ³
1000 < Q in kW	3	In this case, the quantity of water, which can be fed without softening, is to be determined after VDI 2035 equation (9). If the system needs more filling and auxiliary water, this must be demineralized.

The maximum quantity of water V_{max} , which can be re-fed without softening as filling and auxiliary water, is determinable after equation (9) the VDI 2035 sheet 1:

$$V_{max} \text{ in m}^3 = 0,0313 \times Q \text{ in kW} / \text{Concentration of } (CA(HCO_3)) \text{ in mol/m}^3$$

The quality of water is important. The recommended hardness of water: 1-3 mol/m³
(1 mol/m³=5.6 dH), PH:8-9.5

NOTE !

We strictly recommend the use of water treatment products in heating system prior to first operation of the boiler. Such water pre-commission products will protect the heating system against any further attack from corrosion or lime scale, and thus prevent.

Boiler noise,
Sticking pumps,
Radiator cold spots,
Un-estimated thermal shocks on boiler sections, saving energy and extending whole heating circuit operation life.

For pre-commission of the system is essential to maintain full appliance warranties.

Failure to apply and maintain the correct water treatment to prevent the formation of scale and corrosion within the heating system will render all appliance warranties null and void.

3.6. SAFETY OF WATER CIRCULATION SYSTEM

The system can be either open vented or pre-pressurized.

In the case of open vented heating systems, an open type expansion tank according to DIN 4807 Part 2 shall be installed at the highest level of hydraulic circuit.

The Open vent and Cold feed pipework between expansion tank and boiler shall be constructed in accordance with DIN 4750.

No globe valves must be installed on open vent or cold feed pipework.

The open vent and cold feed pipework should be attached to flow and return pipework of the boiler at points as close as possible to boiler, using the shortest possible vertical way between the expansion tank and boiler.

A hydrometer shall be installed on delivery line from the boiler at a same level with top of boiler.

After filling the heating system, the minimum water level should be recorded on hydrometer in order to check water level during operation.

In the case of pre-pressurized heating systems a pressure relief valve according to TRD 721 shall also be installed on heating system to ensure safety besides closed type expansion vessel.

3.7. GENERAL REMARKS ON HEATING SYSTEM

Gas supply line, water delivery system, and electrical installation circuit must not come into contact each other.

Gas supply line must never be routed throughout the boiler to burner, and must be made of non-combustible material.

The appliance must be EARTHED!. AK2 boiler should not be used in places where there is no earthing line available, or there is insufficient earthing application.

The mains supply must be 230 V AC and 50 Hz.

Boiler electrical installation must be able to be separated from the net supply by suitable means. Circuit breaking switch which has at least 3 mm space between contacts must be used in electrical installation.

The electrical and mechanical installations on the boiler itself or in the heating system should not be interfered with, and no change in settings are carried by unauthorised staff.

This may result in further operational errors and danger in boiler room.

The safety accessories should not be touched for any reason. In cases of failure in operation resulting in gas leakage, the local gas supply authority must be contacted.

The boiler should not be fired with any source other than the installed pilot ignition system.

The flue sensor operates at 230 V AC, and thus should never be touched in all cases unless main electrical supply to heating system has been turned off for a maintenance operation or seasonal shutdowns.

The boiler should not be installed where there is risk of in contact with flammable or explosive materials.

The water delivery system and hot water supply circuit should be protected against any dirt by strainers.

If a three or four way motor valve is installed in water delivery system, a shunt-pump between flow and return connections of boiler must be used.

Automatic air relief valves should be installed where there is risk of high temperatures and vapour formation.

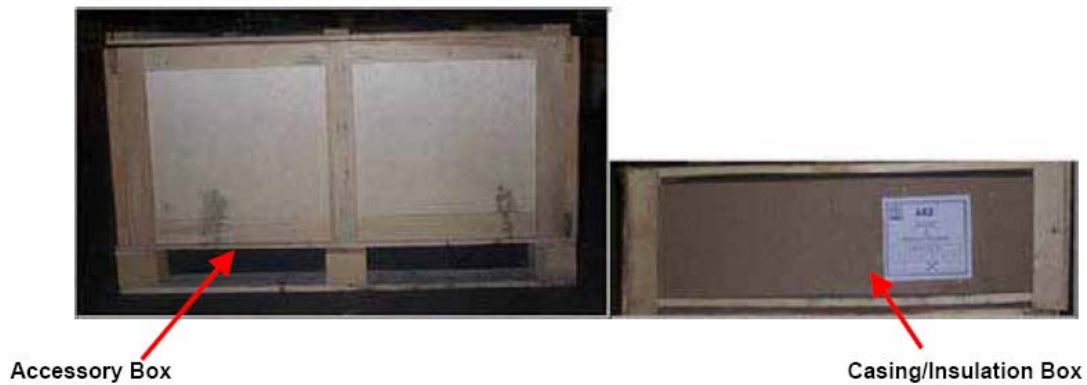
4. ASSEMBLY INSTRUCTIONS

4.1. AK SERIES BOILERS DELIVERY MODE

4.1.1. Boiler block: Disassembled boiler sections are delivered attached together on a pallet.

4.1.2. Accessory box: A standard accessory box contains the materials used in the assembly of the boiler block such as nipples, fibre-glass ropes, flow and return connections, gas pipes, control panel, retarders, draught diverter, gas valves and its accessories.

4.1.3. Casing/insulation box



Picture 4-1. AK2 boiler delivery mode.

4.2. ASSEMBLY OF BOILER GROUP

Numbers in parameters, refer to position numbers in exploded drawing:

1. Start with left or right section (6,2), clean nipple ports and nipples using cloth and paraffin. Apply red lead dye onto nipples (3) (Pic. 4-2) and place nipples squarely in each nipple port and, using a wooden mallet, lightly tap nipple into port to secure (Pic. 4-3).



Picture 4-2.



Picture 4-3.

2. Apply grey paste jointing compound into paste grooves of right or left section and coinciding face of one intermediate section (Pic 4-4) sufficient amounts which is supplied as standard in accessory box.

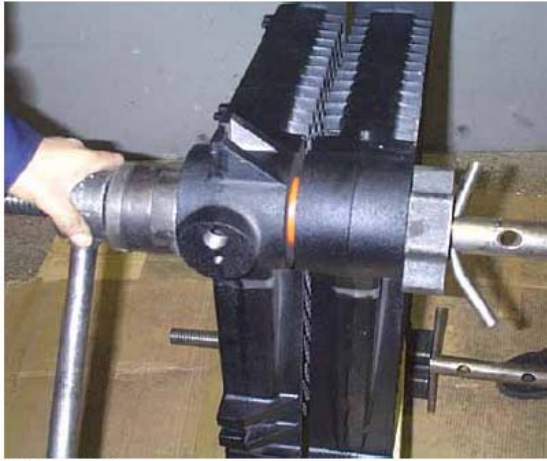


Picture 4-4.



Picture 4-5.

3. Fit the intermediate section (5) squarely onto nipples of the right or left section and secure by using a wooden mallet. Check the condition of grey compound between sections, and apply additional compound if there are spaces free of this compound, or where the amount of the compound is not sufficient. Make sure that compound grooves are sealed thoroughly (Pic 4-5).
4. Continue boiler assembly repeating the same procedures with other intermediate sections. Apply "Compression Tools" routing them through bottom and top nipples as shown in following picture. We recommend to carryout a compression process after fitting 2 or 3 intermediate sections at most for better secure of flue gas system (Pic 4-6).



Picture 4-6.



Picture 4-7.

5. After assembly of all sections, apply compression tools for the last time, and before loosening them, fit upper and lower stay bolts (7) using M12 nuts and A13 washers (9,8). After fitting all the stay bolts, leave whole free length towards to one side of the boiler (Pic 4-7). Do not use excessive force to tighten the nuts up on the stay bolts, from 48 to 54 Nm (35 - 40 lbf/ft) torque is recommended.



Picture 4-9.

6. Fit flanged stub-pipes (27) with their gaskets (16) to the flow and return connections on right or left section. Fix the stub-pipes using M12 nuts (19) and A13 washers (18) (Pic 4-9).

7. Fit pocket (R3/4") for capillary tubes (10) on left or right section in respect with water flow side (Pic 4-10). In case of P3 economy panel usage, fit a R1/8" pocket on the same left or right section as well. In standard delivery a R1/8" plug should be used for covering this threaded hole. Fit R3/4" and R1/8" plugs on opposite side section.

Picture 4-10.



8. Fit blank flanges (17) on right or left sections opposite to the flow and return connections using gaskets (16), M12 nuts and A13 washers (18 and 19).

Picture 4-11.



9. Hydraulic test

At this stage, these connections must be pressure tested by blanking off the flow and return connections. Fill the boiler through a gate valve installed on return blank flange line, and venting through a gate valve installed on flow blank flange line.

Hydraulic test shall be carried out at a gauge pressure of $1.5 \times P$; where, P is the maximum operating pressure of boiler. Duration of test should be at least 30 minutes.

The hydraulic test must always be carried out before the boiler being jacketed or heat insulated, and connected to heating circuit. After a successful hydraulic test, the boiler should now be connected to the heating system, and the system water should be treated as given previously.

10. Place flue gas retarders into between sections as shown in Pic 4-12. Fix ceramic-fibre insulation sheet (40) in pieces onto surfaces where draught diverter is going to be fitted (Pic 4-13). Apply special adhesive compound between section and insulation sheet. Fit draught diverter (41) onto boiler group by M8x30 setscrews (42), A8.4 washers (43) and M8 nuts (44) as shown in Pic 4-14.

Picture 4-12.



Picture 4-13.



Picture 4-14.

11. Fit caps for side sections (22), and fit this group after placing the insulation by 2 pieces of M5x15 set screws (24) and A5.3 washers (23) as shown in Pic 4-16.



Picture 4-16



Picture 4-19.

13. Fit combustion chamber base plate (34) inside the chamber as shown in Pic 4-19.

14. Fit M12x40 studs (35) onto boiler left and right hand sections. Apply fibre-glass rope dia 10 mm supplied within accessory box to surfaces where gas manifold is to be fitted, with help of grey paste compound.

Fit gas manifold (36) by support of above studs, and secure it using M12 nuts (38) and A13 washers (37).

Ensure that gas manifold compresses squarely onto boiler sections and is air-tight.



Picture 4-20.



Picture 4-21.

4.3. ASSEMBLY OF BOILER INSULATION AND CASING GROUP

1. Place M12x25 sect screws (32) routing from fire chamber towards to left and right hand sides. Fit side casing support profiles (33) to items 32 via M12 nuts (19) and A13 washers (18) as shown in Pic 4-22.



Picture 4-22

2. Wrap front insulation (48), rear insulation (52) and side insulations (54+54) around boiler body and secure insulation parts using galvanized wire dia 1 mm supplied with the boiler. cover un-insulated areas, and connect insulation parts together using aluminium backed tape. Fit draught diverter insulation part likewise explained below (Pic 4-23).

3. Place side casings (55+55) onto support profiles (33), and fix them onto draught diverter using self tapping screws 4.8x9.5 (56) as shown in Pic 4-24 and 25.

4. Fit front inner casing (49) onto front insulation part by the help of item (35) of gas manifold assembly, and M12 nuts (38) and A13 washers (37). Secure front inner casing to upper Stay bolt (7) using 3 pieces of fixing piece (50), and self tapping screws ST5.5 (51) as shown in Pic 4-26.

5. Likewise fit rear inner casing (53) onto side casings (55) by the help of self tapping screws. Picture 4-26.



Picture 4-23



Picture 4-25.



Picture 4-26.

6. Place top casing front (93) and rear (90) parts on side casings.
7. Place front casing upper (98) and lower (97) parts having finished the installation of the gas train.



Picture 4-27.

4.4. ASSEMBLY OF GAS TRAIN

The gas inlet to the gas manifold can either be arranged on the left or right hand side. Here, the only regulation is to place gas inlet on the opposite side to the return water connection.

1. Start with assembling straight flanges (102) on the gas pipe on the gas manifold as shown in Picture 4-29.
2. Place the gas valves according to correct flow direction. Place the gas valves respectively as shown in Picture 4.30 :



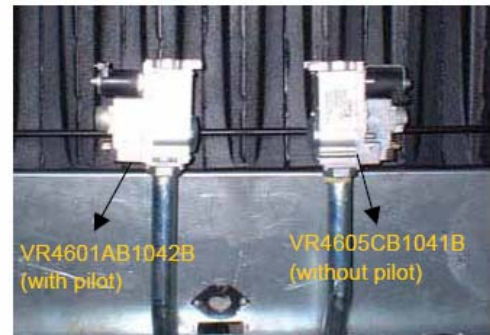
Right Side : Gas valve without pilot (**VR4605CB1041B**) (101)

Left Side : Gas valve with pilot (**VR4601AB1042B**) (100)

Maximum operating pressure is **60 mbar** !



Picture 4-29.

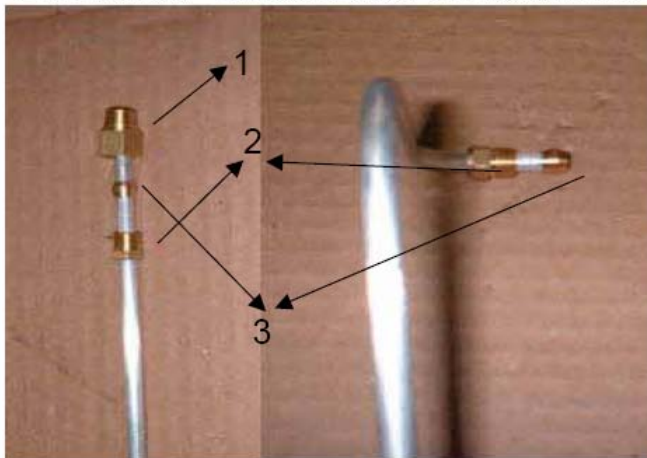


Picture 4-30.

3. Prepare the pilot gas pipe as seen in the Picture 4-31.

4. Mount the pilot gas pipe as seen in Pic 4-32.

1. Valve side fitting 2. Pilot group fittings 3. Pilot group thimbles



Picture 4-31.



Picture 4-32.

5. Mount the pilot burner (107) caring that the rectification electrode curve is above the burner as seen in the Picture 4-32. Rectification electrode is on the left side, ignition is right side.

Do not forget to insert / place the pilot burner injector.

For Natural Gas : 0,40 mm

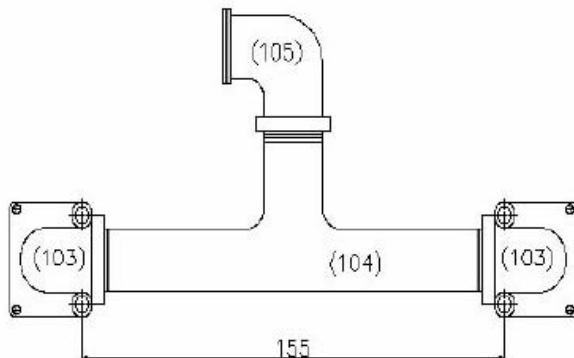
For Propane : 0,25 mm



Picture 4-32.

6. Prepare the T-union gas pipe (104) with elbow (105) and flanges (103) as seen in the Picture 4-33.

Do not forget to place O-Rings with flanges.



Picture 4-33.

7. Mount the T-Union and main gas inlet pipe (106). Fix the minimum pressure switch (117) as seen in Picture 4-34.

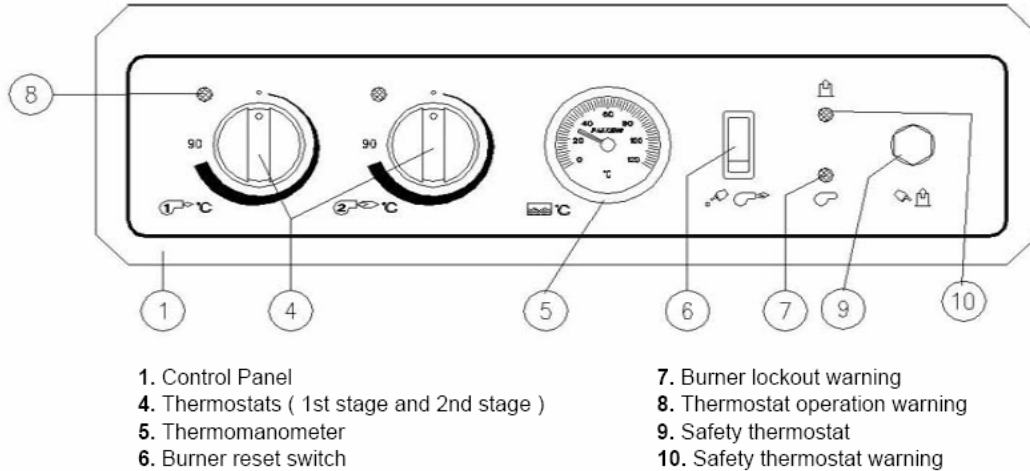


Picture 4-34.

4.6. ELECTRICAL INSTALLATION

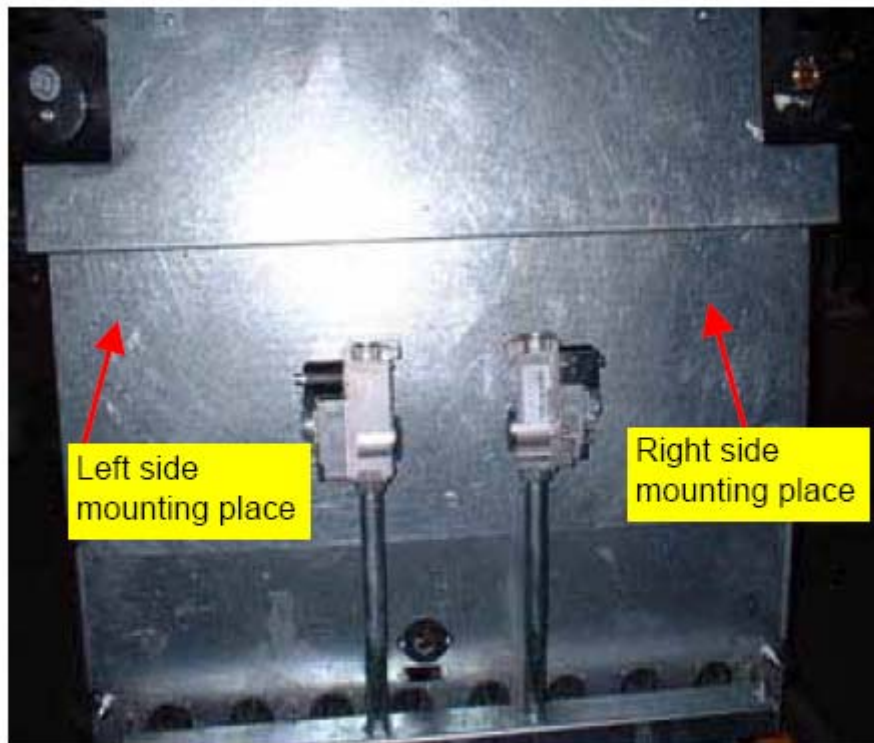
All electrical installations must be carried out in accordance with relevant standards and mandatory regulations.

AK2 boilers can be operated by the P2-AK control panel. Find the electrical diagram of P2-AK in Diagram 4-1.



P2-AK will be delivered with ignition controller (Satronic DKG 972) (113) and ignition transformer (114) which are mounted on assembly plate (118).

Mount the assembly plate (118) to the opposite side of gas inlet on inner casing (49) as seen in Picture 4-35.



Picture 4-35.

1. Connect the main cables properly. **Brown** : Phase **Blue** : Neutral **Yellow-Green** : Earth

Boiler electrical installation must be able to be separated from net supply by suitable means.

Use a circuit breaking switch which has at least 3 mm space between contacts.

2. Pilot burner connection is explained below :

- a. Connect the ignition electrode to the ignition transformer (114). b. Connect the Rectification electrode cable to the **Terminal 1** in Satronic DKG-972 (113).

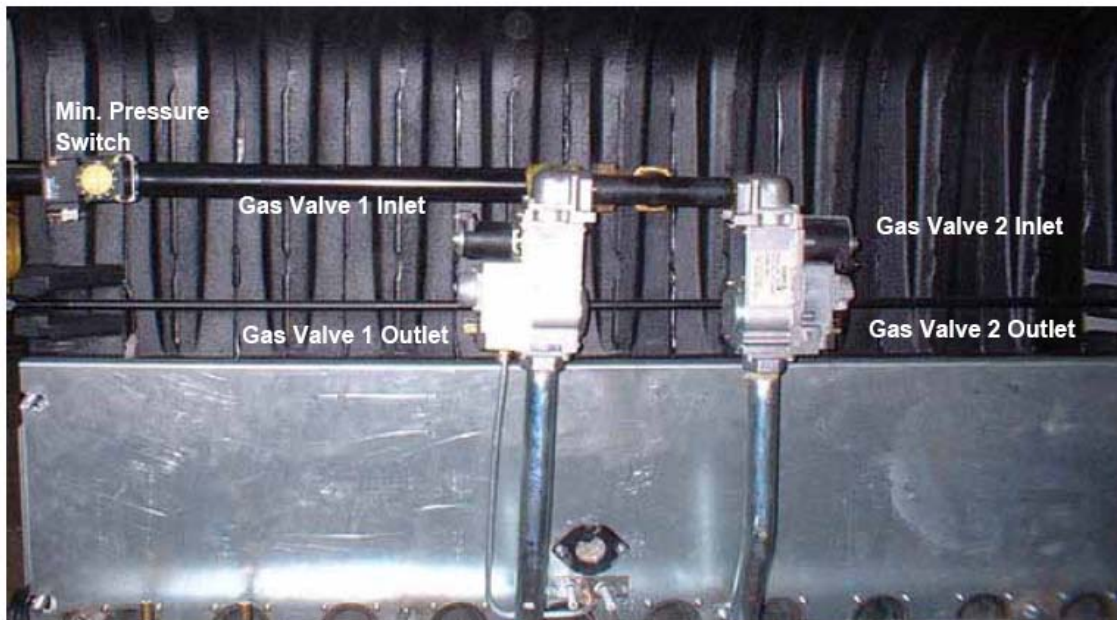


Picture 4-36



Picture 4-37

2. Make the cable connections of gas valves, minimum gas pressure switch (117) and chimney sensor (86) according to the label on the cables. See the positions in the Picture 4-38



Picture 4-38.

Diagram 4-1. Electrical installation and wiring scheme of AK boiler.

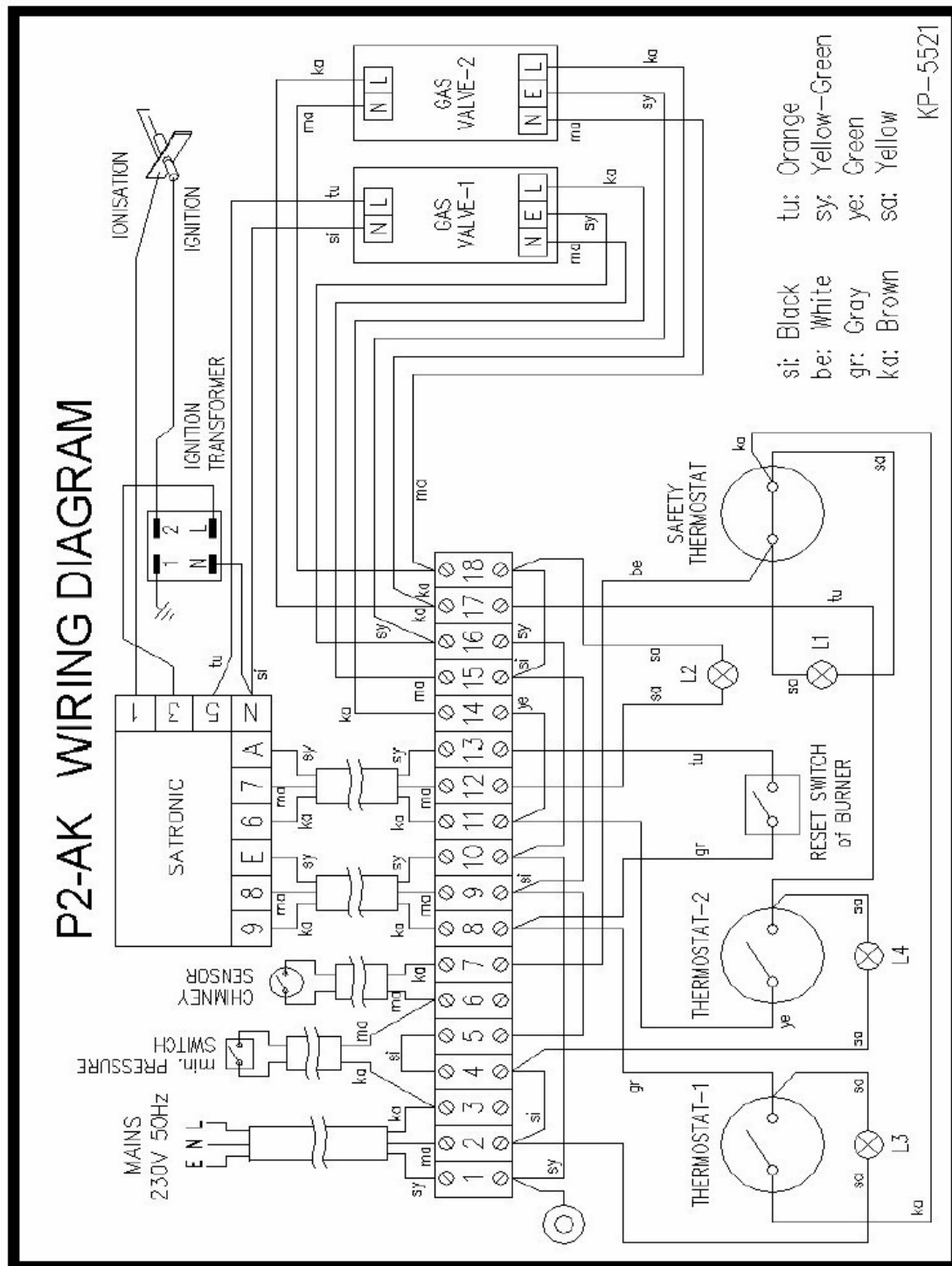


Diagram 4-1.

4. After having finished connecting cables, use cable holders in order to route the cable safely inside the boiler. There are 4 holes for cable holders on the top casing front part and side casings. Use 4.8x13 screws to fix the cable holders.



Picture 4-39.

5. Pass capillary tubes of first stage, second stage and safety thermostats and thermometer to the pocket as seen in Picture 4-40.
The end of the capillary tubes must be placed tight in the pocket for optimum sensing of the water temperature. For this reason, use safety ring (12) and special spring (11).



Picture 4-40.

5. OPERATION

Before operation and adjustments of boiler gas train accessories, ensure that all mechanical, electrical, and hydraulic installations are completed and checked, and comply with relevant standards, mandatory regulations and instructions provided with this manual. Check that flue conditions and sealing is appropriate and complies with local regulations.

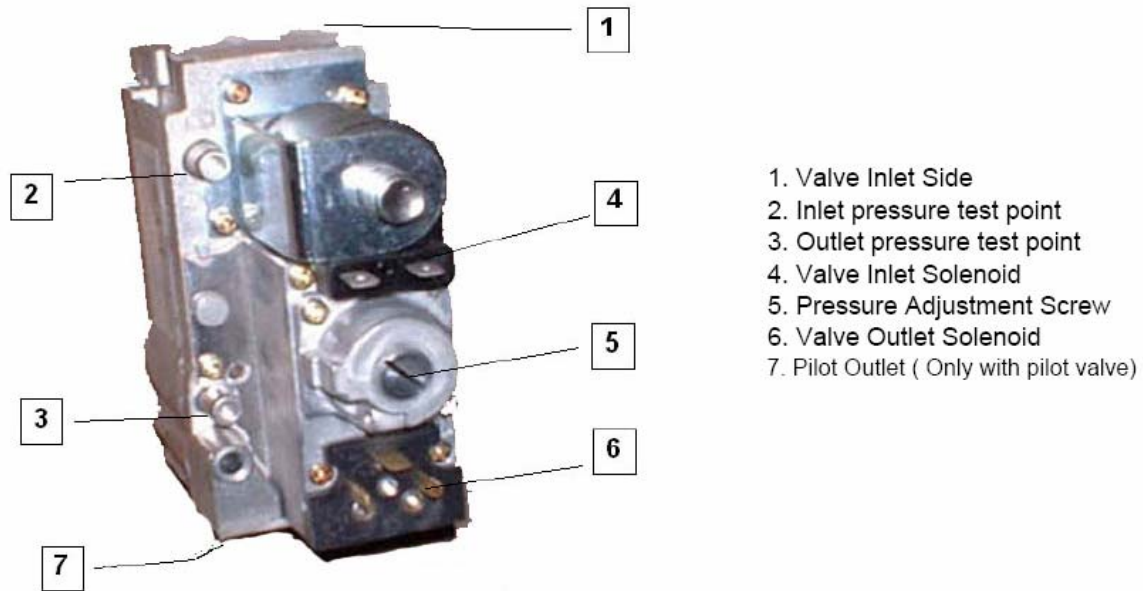
5.1. GAS VALVES

Two gas valves are used in AK2 boilers :

Honeywell gas valve with pilot VR4601AB1042B (100)

Honeywell gas valve without pilot VR4605CB1041B (101)

Maximum inlet pressure is 60 mbar !



Picture 5-1.

5.2. MINIMUM GAS PRESSURE SWITCH SETTING

Detach transparent top cover of minimum gas pressure switch (item 4 on Pic 5-1) by loosening 2 screws.

The outer ring of the switch dial which is scaled 5 to 50 mbar.

The black rectangle is set to required pressure level for starting boiler sequence.





When this set is completed and boiler is started, if the inlet pressure reaches a level pointed by ↑ sign, the sequence goes on, but when the inlet pressure decreases below a level pointed by ↓ sign the boiler sequence is stopped automatically.

Set value of minimum pressure switch according to different gas inlet pressures are as follows:

For natural gas, inlet pressure is 20 mbar, set value is 15 mbar

For propane, inlet pressure is 37 mbar, set value is 30 mbar

For propane, inlet pressure is 25 mbar, set value is 20 mbar

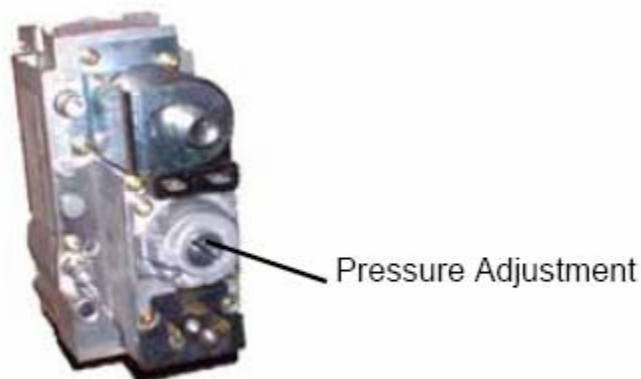
Installation position							
	<p>Standard installation position; if a different installation position is used, pay attention to the changed operating points:</p> <table> <tr> <td>GW 3...50 A6</td><td>approx. $\pm 0,6$ mbar</td></tr> <tr> <td>GW 150 A6</td><td>approx. ± 1 mbar</td></tr> <tr> <td>GW 500 A6</td><td>approx. ± 3 mbar</td></tr> </table>	GW 3...50 A6	approx. $\pm 0,6$ mbar	GW 150 A6	approx. ± 1 mbar	GW 500 A6	approx. ± 3 mbar
GW 3...50 A6	approx. $\pm 0,6$ mbar						
GW 150 A6	approx. ± 1 mbar						
GW 500 A6	approx. ± 3 mbar						
	When installed horizontally, the pressure switch switches at a pressure higher.						
	When installed horizontally overhead, the pressure switch switches at a pressure lower.						
	When installed in an intermediate installation position, the pressure switch switches at pressure deviating from the set reference value.						

5.3. BURNER PRESSURE SETTINGS

In order to adjust the pressure, use pressure adjustment screw on gas valve as seen on Picture 5-2.

Turn clockwise for increasing pressure (+)

Turn counter clockwise for decreasing pressure(-)



Picture 5-2.

Turn the main gas supply valve on, and ensure that the minimum required gas pressure at the inlet of gas train is reached.

Turn on the first stage and second stage thermostats. Ignition control unit will start to ignite the burner.

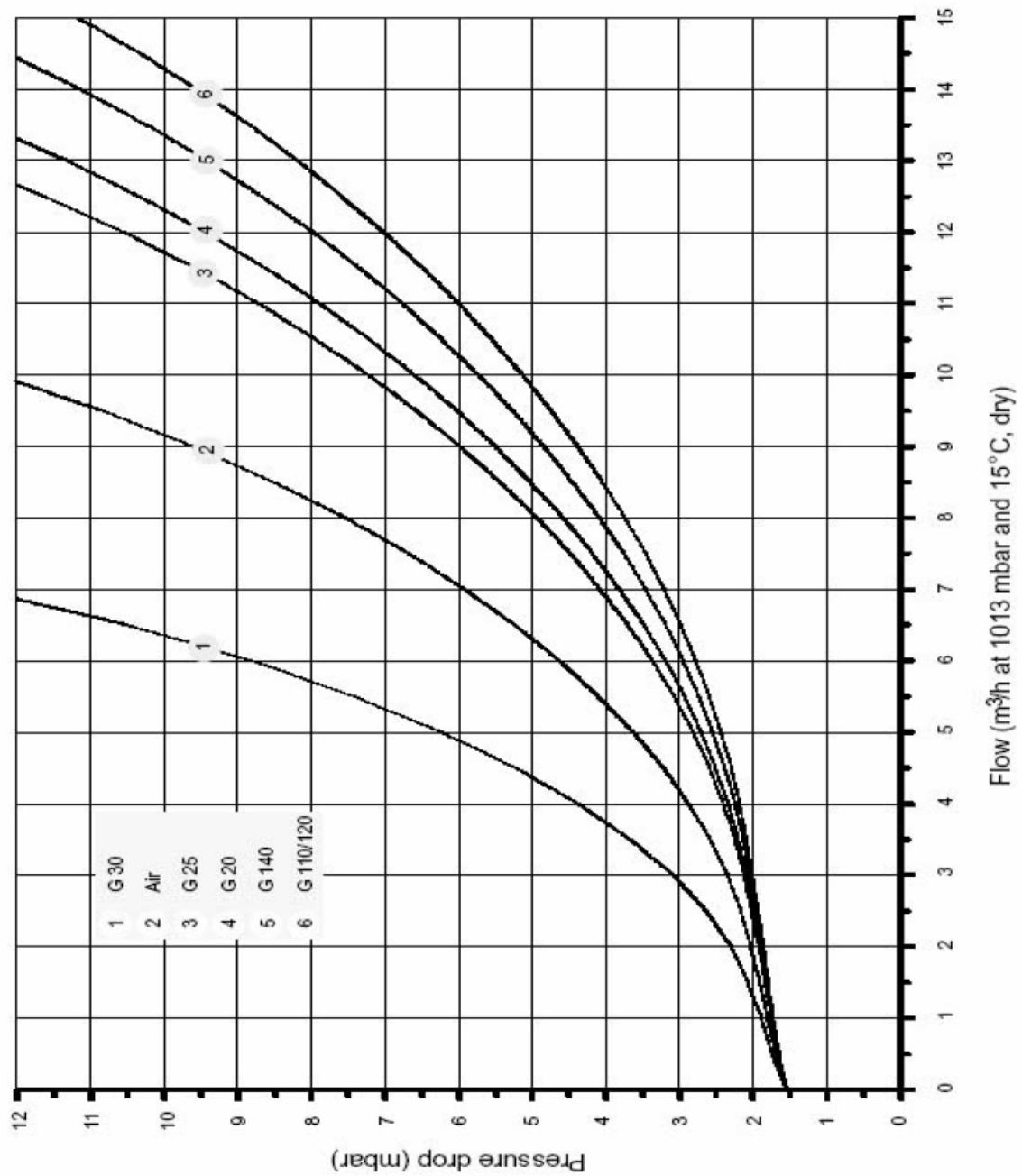
In THE case of flame error, use burner reset switch on P2-AK.

If pilot flame occurs, boiler will start to run. At this stage, measure the gas pressure from manifold measurement point according to desired values given below.

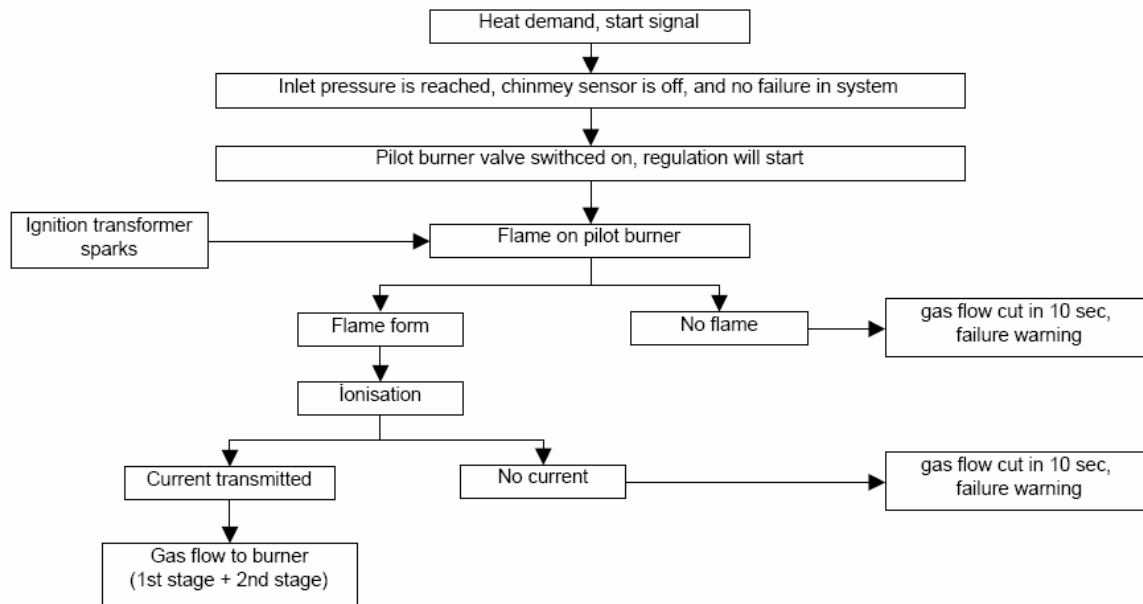
While setting first stage pressure, turn off the second stage thermostat.

Gas type	Inlet Pressure	High input 1st+2nd stage pressure set	Low input 1st stage (main stage) pressure set	Burner Nozzle	Pilot Burner Nozzle
Natural gas	20 mbar	13,5 mbar	8,5 mbar	3,5	0,45
Propane	60 mbar	34 mbar	17 mbar	2,2	0,25

5.4. CAPACITY CURVE OF GAS VALVE



5.5. GAS VALVE OPERATIONAL SEQUENCE



6. MAINTENANCE AND CLEANING

6.1. PERIODIC INSPECTIONS

The periodic inspections throughout the boilers operating life should be provided for better and high efficient performance of boiler.

The following inspections must be carried out:

1. Inspection of control accessories (thermostats etc..)
2. Fumes (odours) detect in boiler room
3. Flue gas leakage control
4. Flue gas analysis

Additionally, the following controls should not be forgotten before and after every heating season:

1. Adjustment and cleaning of the heating system (pumps, gate valves etc) and chimney, fixing any irregularity.

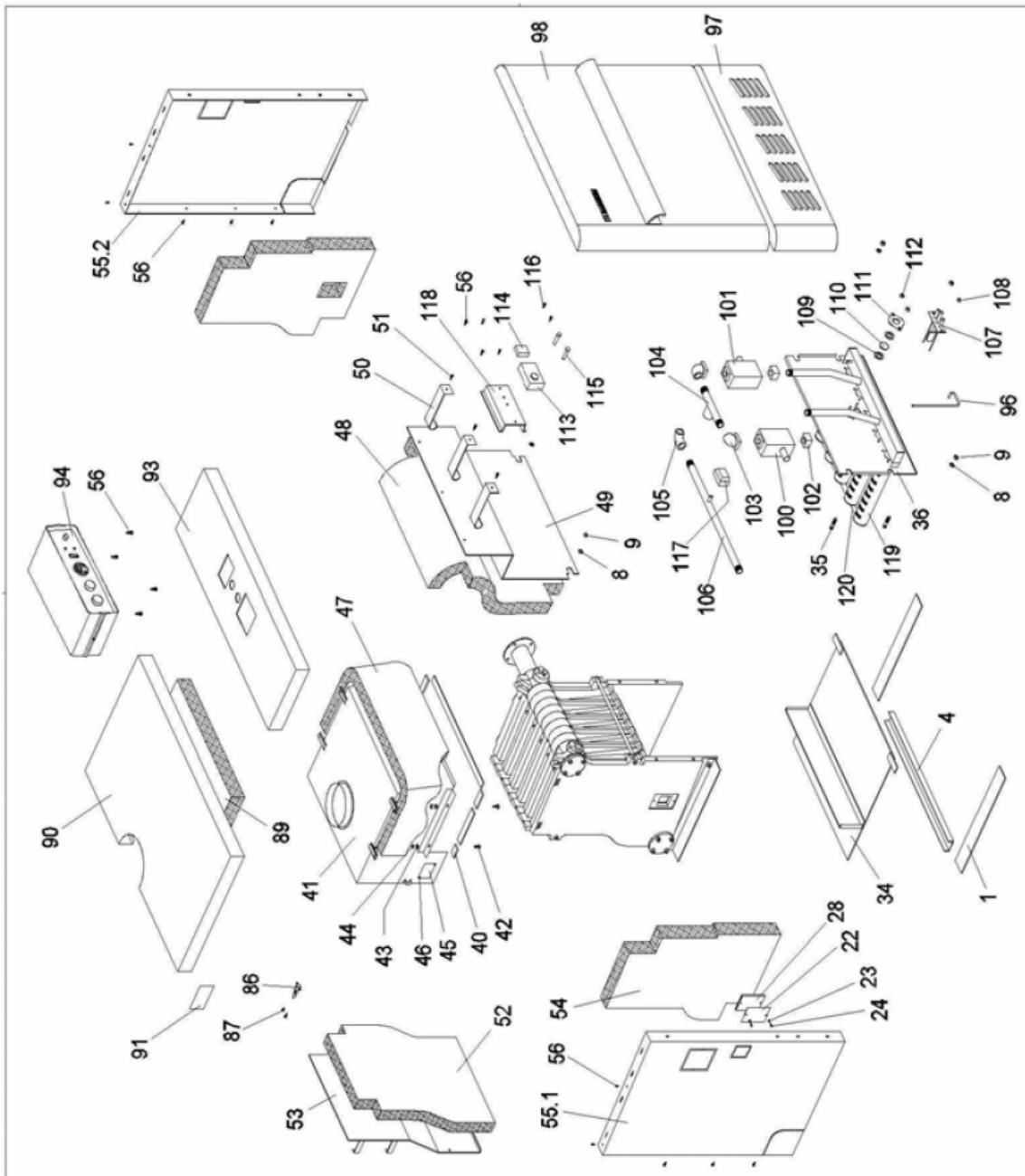
6.2. BOILER CLEANING

An increase of about 100 °C in flue gas temperature due to soot contained on boiler heating surfaces will result in approximately 5% decrease in overall efficiency.

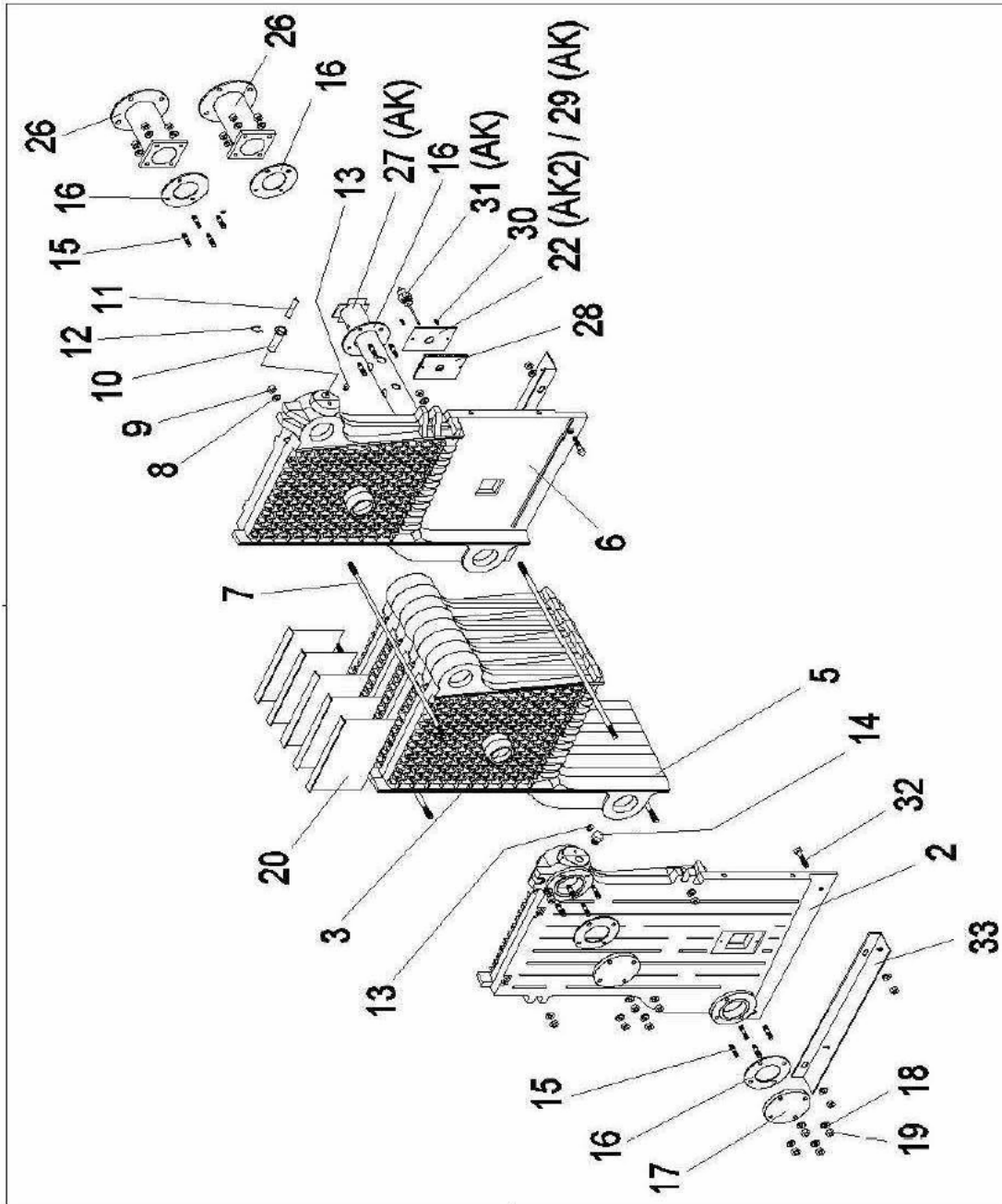
Before starting to clean the boiler heating surfaces:

1. Isolate by switching off all electrical supplies at the mains.
2. Valve-off gas supplies.
3. Cover boiler control panel.
4. Remove the gas train and accessories.
5. Remove all casing panels to gain access to the combustion chamber, heat exchanger and internal flue ways.
6. Using suitable tools clean all areas thoroughly.
7. Clean all component of the gas train, paying particular attention to the injectors and burners bars. Dismantling where appropriate to gain greater access.
8. Reassembly all components and casings and ensure correct and safe operation of the boiler.
9. Undertake a gas soundness test on all disturbed joints.
10. Check and adjust where necessary the burner pressures at high and low fire.
11. Undertake flue gas analysis at high and low fire to ensure correct and full combustion.
12. Reset all controls to their 'as found' position.
13. Complete all required paperwork upon completion.

7. EXPLODED DRAWINGS - GENERAL



7.1. EXPLODED DRAWINGS - BOILER GROUP DETAIL





Boiler Assembly Test Certificate

BOILER DATA	MODEL :	BOILER GROUP NR.1 :
	RATED OUTPUT :	BOILER GROUP NR.2 :
	FUEL TYPE :	DATE OF MANUFACTURE :
	SERIAL NR. :	

END USER	CONTACT PERSON :
	ADDRESS :
	TELEPHONE :

DEALER	COMPANY NAME :
	ADDRESS :
	TELEPHONE :

ERECTOR	COMPANY NAME :
	ADDRESS :
	TELEPHONE :

HYDROSTATIC TEST DATA	Assembled Boiler group tested at
	$P_s = 1.5 \times P_{max} = 1.5 \times \dots = \dots$ Bars
	where P_{max} is the maximum operating pressure of heating system;
	for a duration of 30 minutes, and
	<input type="checkbox"/> No leakage detected
	<input type="checkbox"/> Leakages detected and corrected on following points:
	1.
	2.
	3.
	4.
	5.

COMMENTS	OTHER FAULTS OR DEFICIENCIES DETECTED

TESTED BY:
DATE and SIGNATURE

THIS BOILER ASSEMBLY CERTIFICATE SHALL BE BROUGHT TO THE AUTHORISED DEALER
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