MHS BOILERS

Installation and User Guide

MK Jetstream

Cast Iron Boiler

320 - 1017 kW

Assembly, Operating and Maintenance Instructions

CE

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01/02/06

INTRODUCTION

The MK is a cast iron sectional boiler for pressure jet oil firing or forced draught gas firing which is constructed in three pass horizontal flue gas circulation principle. MK series are CE Marked on PIN CE-0645 BO118 to

Gas Appliances Directive (90/396/EEC)
Boiler Efficiency Directive (92/42/EEC)
Electromagnetic Compatability Directive (89/336/EEC)
Pressure Equipment Directive (97/23/EC)

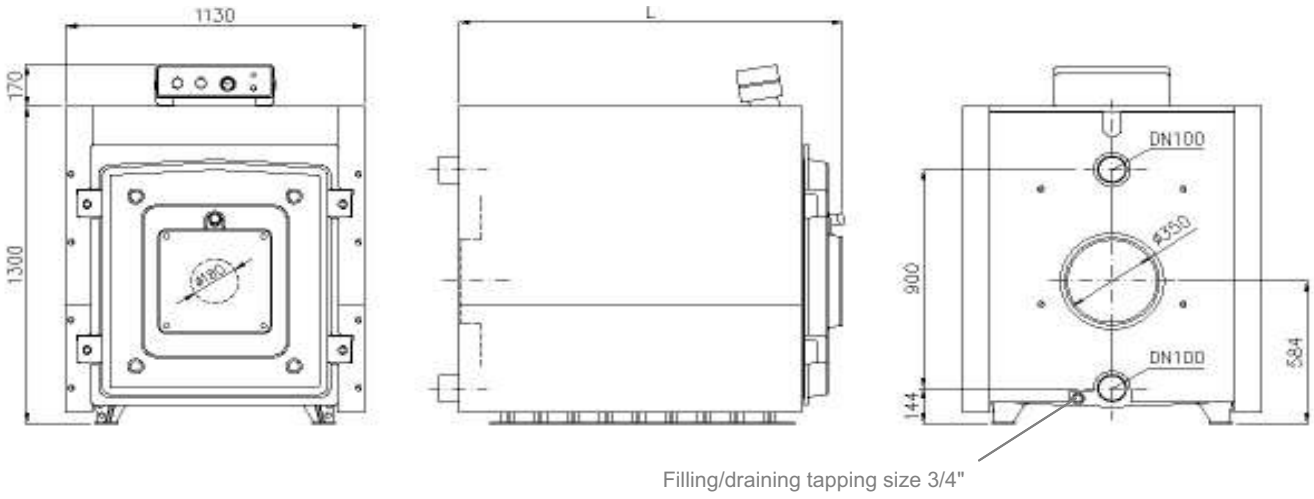
and conforms the requiremets of
EN 303/1: Heating boilers with forced draught burners - Terminology, general requirements, testing and marking
EN 303/2: Heating boilers - Part 2: Heating boilers with forced draught burners - Special requirements for boilers atomizing oil burners
EN 303/3: Heating boilers-Part 3: Gas fired heating boilers-Assembly comprising a boiler body and a forced draught burner
TRD 702: Steam boiler plants with hot water generators of group II

MK series boilers are suitable for central heating and indirect hot water supply at working pressures not exceeding 6 bars, and working temperatures not exceeding 120 C. The boiler must never be used for direct water supply.

MK Jetstream Cast Iron Boiler for oil and gas firing

Boiler type			MK8	MK9	MK10	MK11	MK12	MK13	MK14	MK15	MK16	MK17	MK18	MK19	MK20
Number of sections			8	9	10	11	12	13	14	15	16	17	18	19	20
Product-ID number-Notified body			CE 0035												
Rated heat output **(Natural gas, LPG, diesel-oil)**		kW	320	378	436	494	552	611	669	727	785	843	901	959	1017
		Mcal/h	275	325	375	425	475	525	575	625	675	725	775	825	875
Rated heat output **(Fuel-oil No.2)**		kW	224	264	327	370	413	456	499	542	585	628	675	718	762
		Mcal/h	193	244	281	318	355	392	429	466	503	540	580	618	656
Flue gas resistance		Mmwg	5.7	11.1	18.3	27.0	35.0	38.0	44.0	49.0	55.0	56.0	57.0	60.0	66.0
Fire chamber	diameter	mm	570												
	depth	mm	953	1035	1214	1343	1472	1730	1859	1988	2117	2246	2375	2504	1601
Length L		mm	1409	1537	1665	1784	1921	2177	2305	2433	2561	2689	2817	2945	2049
Burner mouting dimensions	diameter	mm	180												
	depth	mm	Mn 125												
Return/flow connections		DN	100 (4")												
Flue gas temperature		°C	190			192	180	178	175	173	170	185	190	195	200
Flue connection diameter		mm	350 (1)												
Weight (boiler block)		kg	1551	1710	1868	2049	2206	2365	2533	2702	2857	3015	3172	3331	3489
Weight (water content)		lt	213	247	275	302	330	358	386	413	441	469	496	524	552
Weight (flue gas content)		lt	504	564	624	684	744	804	864	924	984	1044	1104	1164	1224
Heating surface of boiler		m²	17.5	19.8	22.1	24.4	26.7	29.0	31.3	33.6	35.9	38.2	40.5	42.8	45.1
Stand-by losses		kcal/h	313	357	397	436	477	517	558	597	637	678	717	757	800
		Watt	363	414	460	505	555	600	650	692	740	786	831	878	928
Flow temperature control		°C	30-90												
Max boiler temperature		°C	120												
Max operating pressure		bar	6	6	6	6	6	6	6	6	6	6	6	6	6
Heat input	Natural gas, LPG, diesel-oil	kW	351	415	479	543	607	735	799	863	926	990	1054	1118	671
	Fuel-oil	kW	249	315	363	410	459	555	602	650	698	749	793	848	507

(1): In series MK 8-12, flue connection diameter could be reduced minimum to 250 mm by using a flue spigot adaptor.



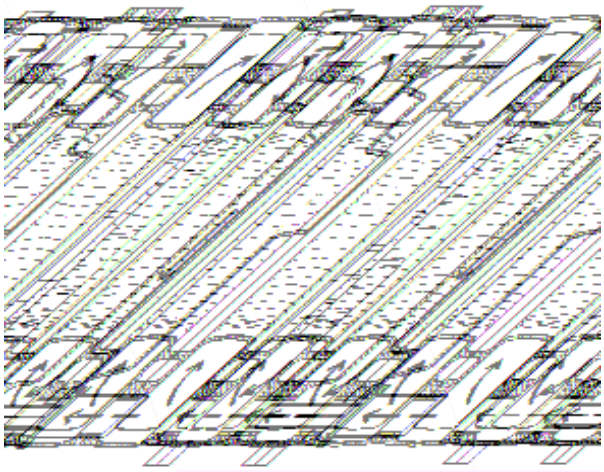
Jetstream Technology

Jetstream is a PATENTED NEW TECHNOLOGY developed particularly to prevent flue gas condensation in the boiler. It is based on increasing the temperature of cold return water to boiler, mixing it with hot circulating water inside boiler. This is accomplished by a jet effect created by a distribution pipe fixed to the return connection of the boiler.

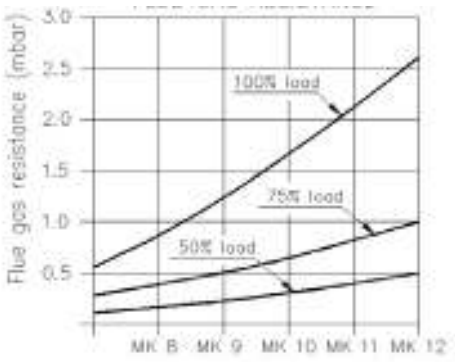
The cold return water is injected into boiler via a distribution pipe. This injection results in a pressure drop at the end of the pipe, creating a vacuum. This vacuum sucks hot delivery water of rear section/sections down to the cold water side, and a mixture of cold and hot water makes the cold water temperature increase. Thus, the main reason of flue gas condensation in the boiler is eliminated. A reverse flow of hot delivery water in the rear section of the boiler protects the section against excessive thermal shocks.

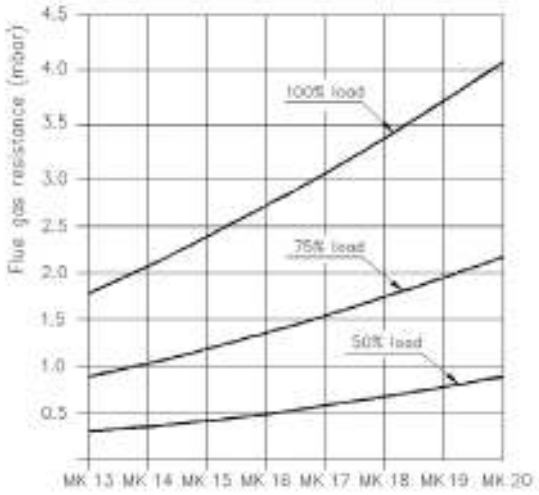
MK Jetstream is operated in non-condensing mode if the lowest return water temperatures to boiler given in the following table are maintained at thermal equilibrium at nominal heat output:

Fuels	Lowest return temperatures (^{o}C)
Natural gas, LPG	40
Diesel-oil, Fuel-oil	30

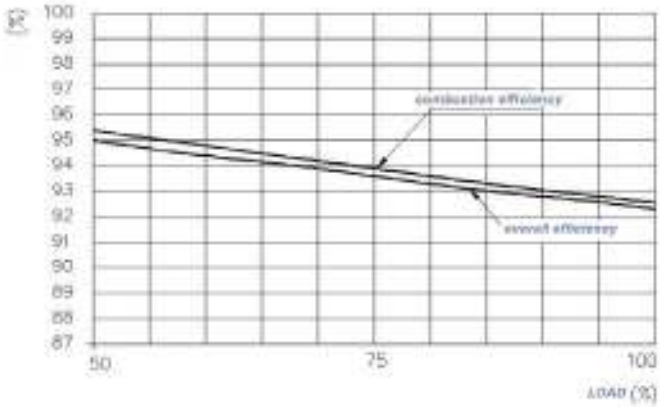


Gas resistance inside the boiler



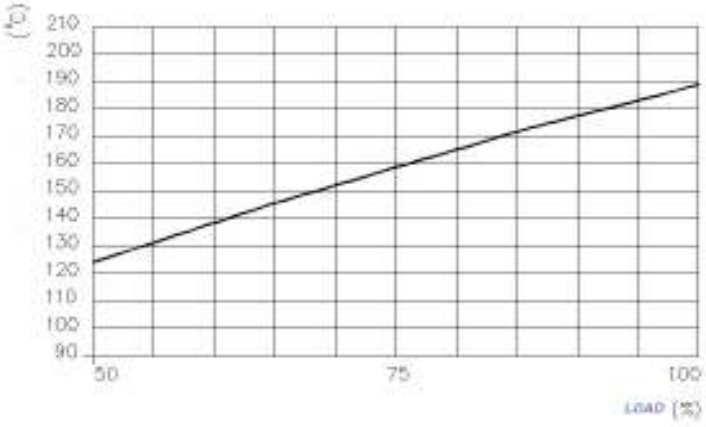


Efficiencies



Values given according to average boiler water temperature of 70 C

Flue gas temperatures



Values given according to average boiler water temperature 70 C, ambient temperature 20 C

Oil Supply

MK series boilers can only be fired with liquid fuels having following specifications:

Kerosene	viscosity at 20 C: 1.2 cSt or viscosity at 100 F: 28 Second
Light oil (EL)	viscosity at 20 C: 4- 6 max cSt or viscosity at 100 F: 35 Second
Gasoil (D)	viscosity at 20 C: 4- 6 max cSt or viscosity at 100 F: 35 Second
Light/medium fuel oil	viscosity at 50 C: 150 cSt max or viscosity at 100 F: 625 Second

ATTENTION ! In case of firing with fuel oils, the heat input to boiler must alwals be slightly reduced to required values in order to perform better at related outputs of boiler as described in technical boiler data. Any failure due to lack of technical precautions, firing with fuels not suitable for boilers, and operation without taking recommendations given further in this manual into consideration, will always be in responsibility of end-user.
A single pipe oil supply with oil at a slight positive pressure is generally required though the burners own oil pumps can provide some lift of the oil depending on the volume flow and the lift required. For dual fuel burners a two pipe oil supply system is generally recommended unless the burner is fitted with an oil pump clutch. An oil filter and isolating valve should be provided and the burner connected to the oil supply with a flexible oil hose. The hose and filter are generally supplied with the burner.

Gas Supply

The local gas supply authority should always be contacted at the design state 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.

ATTENTION ! The matching of burner model, burner and compele gas train size must be carried out in accordance with supplied inlet gas pressure and fuel type to be fired. When sizing the burner and gas train, all pressure losses inside the boiler, burner and gas train, and in piping from burner inlet to main gas meter must always be taken into consideration. A reduce in boiler output due to wrong matching of any component should be avoided before installation of whole system.

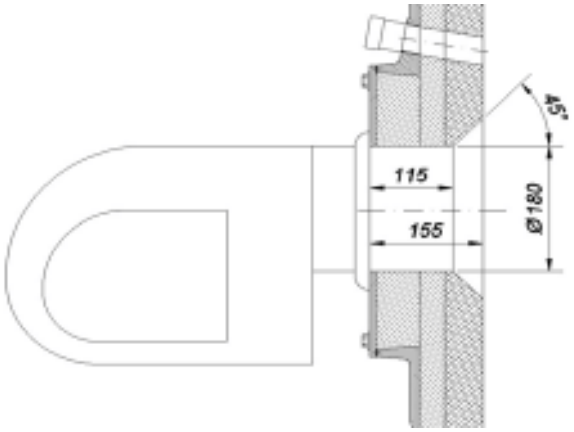
Burner

MK boiler must be fired only with a CE APPROVED BURNER. DemirDöküm will not be held responsible for any damage of failure due to use of a non approved burner.

It is not recommended to increase the diameter of hole in the middle of front refractory to make the mounting of burner easier. If there is a space left between the hole in front door refractory and burner tube after the mounting, this space must be fed with rock-wool or ceramic-fibre based insulation material to improve heat insulation. Otherwise, further heat loss may result in damage on front door.

Should the diameter of burner head is greater than that of the hole in front door refractory, the diameter of the hole must be increased so that the burner passes smoothly through the hole. Front refractory must be protected against breaking during mounting and dismounting of burner.

Pressurized burner of 2800 rpm (blowing type) must be used with the boiler. Barrel of the burner to be mounted on the boiler should fit the burner connection mouth depth, indicated in the technical specifications table.



Water side of boiler

The fully watercooled sections are joined by cast iron conical nipples, and distribution pipe fitted to the return ensures even the temperature distribution throughout the boiler. 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 stub-pipes at the rear of the boiler, outboard the casing

Under no circumstances should the boiler be fired when its circulation volume is less than a recommended minimum volume calculated according to the following formula:

$$\frac{kWOutput}{70} = m^3 / h$$

The following table provides hydraulic resistances at various water volumes relativ to boiler Dt flow/return. The difference between flow and return temperatures of the bolier should not be greater than 20 C to provide convenient operating conditions in the boiler:

Type	Minimum Circulation	∆t=10°C		∆t=15°C		∆t=20°C	
		Water volume	Hydraulic Resistance	Water volume	Hydraulic Resistance	Water volume	Hydraulic Resistance
	m^3/h	m^3/h	mbar	m^3/h	mbar	m^3/h	mbar
MK8	4.6	27.5	57.7	18.3	25.6	13.8	14.7
MK9	5.4	32.5	83.5	21.7	37.2	16.3	21.0
MK10	6.3	37.5	113.1	25.0	50.2	18.8	28.6
MK11	7.1	42.5	145.6	28.3	64.5	21.3	38.5
MK12	7.9	47.5	185.3	31.7	82.5	23.8	51.7
MK13	8.8	52.5	249.0	35.0	110.7	26.3	62.5
MK14	9.6	57.5	305.4	38.3	135.5	28.8	76.5
MK15	10.4	62.5	368.1	41.7	163.7	31.3	92.2
MK16	11.3	67.5	309.5	45.0	137.5	33.6	77.0
MK17	12.1	75.5	384.4	48.3	163.1	36.3	92.0
MK18	12.9	77.5	431.1	51.7	183.2	38.8	107.9
MK19	13.8	82.5	501.4	55.0	211.6	41.3	125.5
MK20	14.6	87.5	578.7	58.3	244.7	43.8	144.8

Flue design and chimney installation

Boilers must be connected to a chimney by using the shortest flue canal possible which should be insulated by mineral wool or similar material. Flue canal must be placed at a rising slope of 10°-45° between flue and chimney. Conditions creating higher resistance to gas flow such as elbows should be avoided in flue canal. The flue canal outlet to the boiler should not support the weight of chimney.

At discharge from the boiler, the flue gasses should be in a balanced state, consequently, the function of the chimney is only for the disposal of the flue gasses to atmosphere. Chimney calculations should be carried out in compliance with the standards. Conditions of existing chimney should be checked and proper precautions should be taken against excessive cooling and condensation (such as applying a chimney sheet made of stainless steel grade 316 and surrounding with insulation). Positive draught conditions must be avoided. Negative draught conditions should be contained within -3 mm wg. for optimum boiler performance.

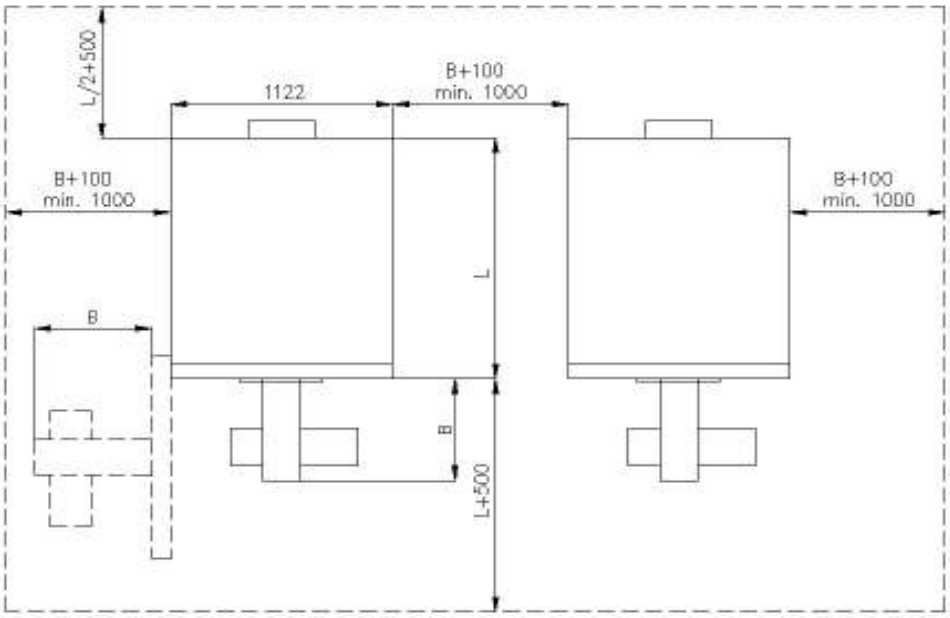
The following table shows typical flue gas volumes at gross flue temperature of 190°C and ambient air temperature of 20°C.

PREPARATIONS BEFORE ASSEMBLY

Boiler type	Output	Typical flue gas volume							
		Light oil (E) CO2=13%		Naturalgas E CO2=9.5%		Naturalgas LL CO2=9%		Towngas CO2=11%	
	kW	g/sec	kg/h	g/sec	kg/h	g/sec	kg/h	g/sec	kg/h
MK 8	320	149.3	537.3	156.7	564.1	164.4	591.8	151.5	545.4
MK 9	378	176.3	634.7	185.1	666.4	194.2	699.0	179.0	644.2
MK10	436	203.4	732.1	213.5	768.6	224.0	806.3	206.4	743.1
MK11	494	230.4	829.5	241.9	870.9	253.8	913.5	233.9	841.9
MK12	552	257.5	926.9	270.3	973.1	283.5	1020.8	261.3	940.8
MK13	610	284.5	1024.3	298.7	1075.4	313.3	1128.0	288.8	1039.6
MK14	669	321.0	1123.4	327.6	1179.4	343.6	1237.1	316.7	1140.2
MK15	727	339.1	1220.8	356.0	1281.7	373.4	1344.4	344.2	1239.1
MK16	785	366.2	1318.2	384.4	1383.9	403.2	1451.6	371.6	1337.9
MK17	843	393.2	1415.6	412.8	1486.2	433.0	1558.9	399.1	1436.8
MK18	901	420.3	1512.9	441.2	1588.4	462.8	1666.2	426.6	1535.6
MK19	959	447.3	1610.3	469.6	1690.7	492.6	1773.4	454.0	1634.5
MK20	1017	474.4	1707.7	498.0	1792.9	522.4	1880.7	481.5	1733.3

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 bolier for servicing and maintenance



ATTENTION !

Boiler room should not be used for any other applications, floor should always be kept dry and clean. Any obstacles in front of ventillation openings must be avoided. The boiler room air openings must conform to the norms prevailing locally.
Any irregular electricity installations in boiler room should be replaced.
The circulating water in boiler and heating system must never be taken out for any domestic usage.
Water level should be checked periodically with a hydrometer.Nnever add water to the system when boiler is hot. Never drain the water unless it is necessary.
Should odour is sensed in boiler room, first close the valve before gas flow meter. Never use match and never smoke in boiler room. Never turn electricity on/off. Ventilate the room opening doors and windows and consult authorized installer staff or Gas Dealer Company immediately.
Follow instructions for periodic cleaning and maintenance operations whose procedures given further in this manual.

PREPARATIONS BEFORE ASSEMBLY

The boilers can be installed directly onto a smooth level floor of non-combustible material. A steel baseframe and a 50 mm thick mineral wool mat to insulate the underneath of the boiler are included in the supply. A raised plinth shall be used. It is recommended that the plinth be at 200 mm high and sized to the dimensions of casing of the boiler given as in the following table:

Recommended dimensions of plinths (mm)													
Type	MK8	MK9	MK10	MK11	MK12	MK13	MK14	MK15	MK16	MK17	MK18	MK19	MK20
Width	1130												
Lenght	1410	1540	1665	1785	1925	2050	2180	2305	2435	2565	2690	2820	2945
Height	200												

Water Circulation System

The system design must provide water flow rates commensurate with boiler output and the temperature difference between flow and return should not exceed 20 C, or 25 C at most.

The return temperatures due to oil type fired should not be lower than the degrees given in «Technical Informations» to operate the boiler in non-condensing mode. In this case, your boiler can be operated without using a by-pass pump and there will be no condensation in the boiler. As the flow temperature of your boiler can be changeable meeting different heat requirements of the system without any condensation, the hydraulic circuit no more needs any devices to adjust the hot water temperature such as three-way valves.

Should the system is operated at temperatures below than those mentioned above, a by-pass pump or a three/four-way motor vane should be used to increase the return temperature particularly in conditions natural gas or LPG used.

A by-pass pump must be used, should the system has a three way motor vane, because of the principle of preventing condensation in the boiler.

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 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.

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

Safety of water circulation system

For heating systems with maximum boiler temperature up to 100 C:

The system can be built either open vented or pressurized. In case of open vented heating system an open type expansion tank acoording to DIN 4807 Part 2 shall be installed at the heighest level of hydraulic circuit. Delivery and return lines between expansion tank and boiler shall be constructed in aacordance with DIN 4750. No globe valves must be installed on delivery and return safety lines. Safety lines should be attached to inlet and outlet lines of boiler at points as close as possible to boiler, using the shortest possible vertical way between expansion tank and boiler.

A hydrometer shall be installed on delivery line from boiler at a same level with top of boiler. After filling heating system, the minimum water level should be recorded on hydrometer in order to check water level during operation.

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

For heating systems with maximum boiler temperature up to 120 C:

In this case, each heating circuit is constructed pressurized and shall be equipped with diaphragm or spring-tensioned pressure relief valves according to TRD 721.

Each heating system can be equipped with up to three pressure relief valves. For boiler nominal heat outputs 350 kW and above, the pressure relief valve shall be connected to an open relaxation pot for safety of system. If this can not be established, an additional safety temperature and a maximum pressure limiter should be installed on the boiler.

The sizes of diaphragm pressure relief valves on inlet or outlet of boiler according to boiler nominal heat output are outlined below:

Boiler output in kW	50	100	200	350	600	900
Connection to outlet	G 1/2"	G 3/4"	G 1"	G 1 1/4"	G 1 1/2"	G 2"
Connection to inlet	G 3/4"	G 1"	G 1 1/4"	G 1 1/2"	G 2"	G 2 1/2"

Requirements on filling water

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 at the filling and auxiliary water
100 < Q in kW <350	**1**	No requirement is needed, if content of Calcium Hydrocarbonate (CA(HC03)) is max 2 mol/m³, 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/m³
1000 < Q in kW	**3**	In this case, 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 Vmax, which can be re-fed without softening as filling and auxiliary water, is determinable after equation (9) the VDI 2035 sheet 1:

Vmax in m³ **=** 0,0313 x Q in kW **/** Concentration of (CA(HC03)) in mol/m³

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

For heating systems with maximum boiler temperature above 100 C, the following requirements on circulating water shall also be ensured in accordance with TRD 612:

	Salt-free		Salty
Electrical conductivity at 25 C (µS/cm)	≤30	≤30-100	>100-1500
pH degree at 25 C	9-10,4	9-10,5	9-10,5
Oxygen (O2) (mg/lt)	<1,0	<0,05	<0,02

We strictly recommend to use 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 limescale, and thus prevent

- Boiler noise,
- Sticking pumps,
- Radiator cold spots,
- Unestimatad thermal shocks on boiler sections,

saving energy and extending whole heating circuit operation life.

For pre-commission of system we will recommend Copal or Alphi-11 protectors from Fernox Ltd.

MK Jetstream Delivery Mode

An MK boiler delivered unassembled consists of following parts:

1. Boiler block: A block of sections, smokehood and front door is delivered on a tread for an easy shipping. The sections are assembled in the boiler room. Refractories for combustion chamber insulation are mounted on the rear section at the factory. Smokehood is fixed to rear section and, front door refractories are placed in factory.

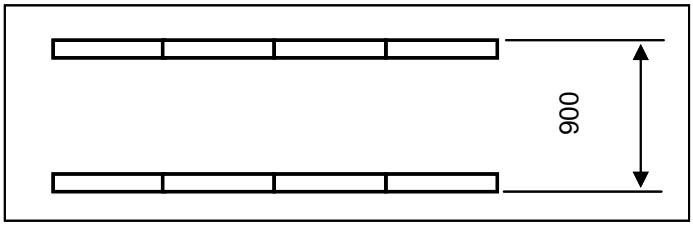
Each MK boiler block is shipped in two pieces:
1.1. Standart pallette of intermediate/rear sections + smokehood
From MK 8 to MK 14, four pieces of intermediate sections, rear section, and smokehood is delivered on one pallette. From MK 15 to MK 20, nine pieces of intermediate sections, rear section and smokehood is delievered on one pallette. Smokehood is fixed to rear section, rear cleaning covers and refractory of combustion chamber on rear section are fitted to their correspondant places before shipment from factory. Intermediate sections are shipped disassembled
1.2. The remaining pallette of intermediate sections + front section
The rest of intermediate sections, front section and front door of boiler are shipped on one pallette. Intermediate sections are delivered disassembled. Front door refractories and insulations are placed and fixed before shipment. Front door is fixed temporarely onto front section for a secure shipment. Before assembly of boiler in site, front door should be detached from front section. The materials used in the assembly of the boiler block such as nipples, fiberglass ropes,flow and return connections, retarders are delivered with in remaining palette of intermediate sections+ front section group.

2. Casing/insulation box: This box contains all casings and baseframes (if required) together with all insulations of an MK boiler. Auxillary piping system for series MK 12 and above, and retarders set of boiler, and control panel are also supplied in this box.

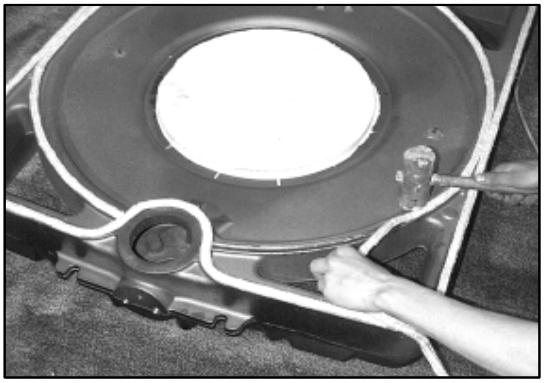
Assembly of Boiler Group

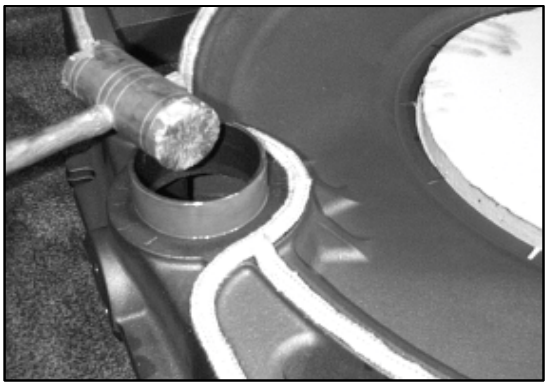
Numbers in the parenthesis refer to position numbers in the exploded drawing.

1. Place steel profiles (174) which are used as baseframes of the boiler parallel to each each other as shown in Fig. 1. There are four baseframes for MK 8-10, six for MK 11-15, and eight for MK 16-20.



2. Start with the rear section (1), clean all rope grooves on the section using a wire brush. Clean nipple ports using cloth and paraffin. Apply adhesive to the rope grooves on the front side of the section Fit continuous lengths of 12 mm dia. Rope (5) in each groove of the section starting with the outer grrove. Tape the ends of each rope to avoid unravelling. Apply red lead dye onto nipples and place nipples (4) squarely in each nipple port, and using a wooden mallet, lightly tap nipple into the port to secure.

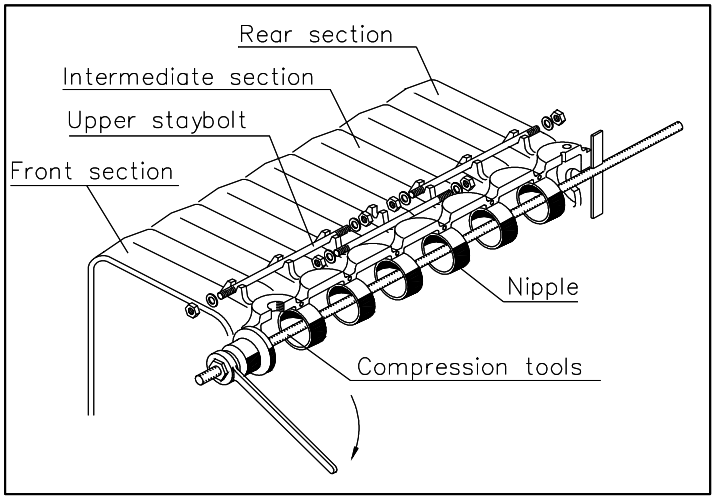




3. Take an intermediate section (3) and prepare the section as described above. Do not fit rope into the grooves on the side of intermediate section facing towards the rear section. Likewise, fit ropes only to one side of the other intermediate sections which are to be assembled later.
Place the rear section at the end of the baseframes. With its unroped side facing towards the rear, fit the intermediate section squarely onto nipples of the rear section and secure by using a wooden mallet. Ensure that rope on rear section remains in correct position

4. Continue boiler assembly repeating the same procedures with other intermediate sections. Apply "Compression Tools" passing them through bottom and top nipples as shown in following scheme and accordance with the table headed "Usage order of compression tools", until the rope between each section is firm. The gap between each section should be 4-5 mm (check the gap using a screwdriver blade).

Usage order of staybolts	
L means L=610 mm staybolt S means L=480 mm staybolt	
MK 8	L + S
MK 9	L + L
MK 10	S + S + S
MK 11	S + L + S
MK 12	L + L + S
MK 13	L + L + L
MK 14	S + S +S + L
MK 15	L + S + L + S
MK 16	L + L + L + S
MK 17	L + L + L + L
MK 18	S + L + S + L + S
MK 19	L + L + S + L + S
MK 20	L + L + L + L + S



Usage order of compression tools					
Model	First application (Nr of sections)	Second application (Nr of sections)	Third application (Nr of sections)	Fourth application (Nr of sections)	Fifth application (Nr of sections)
MK 8	4	8			
MK 9	5	9			
MK 10	4	8	10		
MK 11	4	8	11		
MK 12	4	8	12		
MK 13	5	8	13		
MK 14	4	8	11	14	
MK 15	4	8	12	15	
MK 16	4	8	12	16	
MK 17	5	9	13	17	
MK 18	4	8	12	13	18
MK 19	4	8	12	16	19
MK 20	4	8	13	17	20

After each application of compression tools, fit staybolts (to secure group of sections to each other) (8,9) with M16 nuts (11) and washers (10).

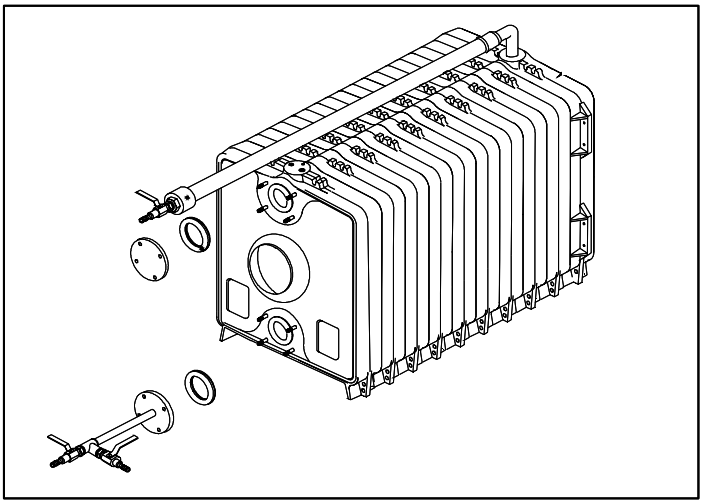
Do not use excessive force to tighten the nuts up on the staybolts, from 48 to 54 Nm (35 - 40 lbf/ft) torque is recommended.

5. Prepare the front section (2) for the assembly. Apply special adhesive called fiberfrax supplied in accessory box into grooves of front section facing towards the front door. Fit fiberglass rope braided 16x16 mm (29) in the grooves of the front section. Fit the front section and make final usage of Boiler Compression Tools and correctly align the sections. Fit staybolts (8,9) with M16 nuts (11) and washers (10).

Fit two 2" plugs (22) into the ports of front section. For MK 8 and 9, fit plug 1 1/2" (181) on top of the front section. For MK 10 and above, fit elbow 1 1/2" (182) on top of the front section, and auxillary pipe (184) to the elbow. For MK 12 and above, there are two auxiliary pipes. In that case, bring them together using pipe union (183). Piping from the elbow should be raised slightly and connected into the main rear flow outside the boiler without fouling the top and rear casing. Fit studs M16x65 (20) to return and flow connections of the rear section.

Hydraulic test

Fit 1/8" plug (155) supplied in accessory box into 1/8" hole on top of the rear section (with P2-A standard control panel, this hole is not used). For 1/2" and 3/8" instrument tappings on top of the rear section, use 1/2" and 3/8" pockets for bulbs supplied within the standard control panel or any suitable plugs. Fit a 3/4" plug into drain connection of the rear section. Use hydraulic test apparatus of MK boiler. Fit bottom test flange with two globe valves and test gasket to return connection. Fit blank flange and the other gasket to flow connection as shown in following scheme. Fit closing piece with a gate valve to the end of the auxiliary pipe to.



Connect a hydraulic press to one of the globe valves on test flange fitted to return connection. Fill the boiler with water by connecting the other valve on test flange to the water circuit. Meanwhile, release the air left in the boiler via pocket bulbs holes on top of the rear section. When the water comes out of the holes, fix the pocket bulbs again. Turn the valve connected to circuit off and turn the other valve connected to the hydraulic press on. Pressurize the system via the pump on hydraulic press until the pressure gauge reaches the test pressure.

Hydrostatic test shall be carried out at a pressure gauge of 1.43 x P; where, P is the maximum operating pressure of boiler. Duration of test should be at least 30 minutes.

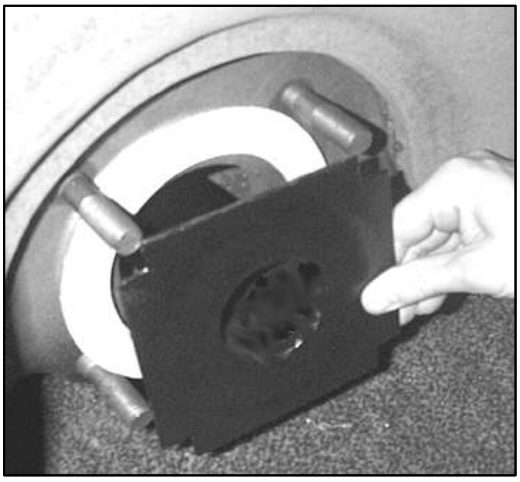
The hydrostatic test must always be carried out before boiler being jacketed or heat insulated, and connected to heating circuit.

After hydrostatic test, "Boiler Assembly Certificate" shall be filled in and signed by the erector/installer. In order to warranty terms of boiler to be put into operation, make sure that this certificate is completed, signed, and sent to manufacturer. We recommend you to ask for a copy of assembly certificate from erector/installer.

For installations in Germany, every hydrostatic test shall be carried out under technical supervision of TÜV Rheinland.

We recommend you to ask your erector/installer to record the data of boiler group such as boiler shipment group serial numbers, production date etc. which will help both installer and manufacturer use for optimum customer care and technical feedback.

6. Fit distribution pipe (271/272) with gasket (12) squarely into the return connection in any position as shown in following pictures. Fit flanged stub-pipes (13) with their gaskets (12) to the flow and return connections on the rear section. Fix the stub-pipes using M16 nuts (11) and washers (10).



7. Fit second pass raterders (67,70,72) in each of the four inner passages. Fit third pass retarders (76,79,83) in each of the four corner passages with the upon ends of the tubes facing towards the front section. After placing all the retarders, pull them towards the front section side as much as possible.

ASSEMBLY INSTRUCTIONS

Jasket assembly
MK 8-11

1. Fit cast iron hinges (229) used for carrying front door onto front section using two pieces of M12x50 allen screws (32) for each hinge. When fitting hinges to front door, place front support sheets (247) between front door and hinges.

2. Place boiler block insulation (265) squarely on top boiler block. For MK 8 and 9, there is one piece of boiler block insulation. However, for MK 10 and 11, boiler block insulations consitst of two equal parts(265,266). For these series, place two pieces of block insulations placing one after another. After placing block insulations, secure both ends of insulation part/parts to lower staybolts by using 4 insulation springs (251) for each insulation part Make a hole of 75 mm in diameter on side of insulation piece that corresponds to sensor pocket fitted on top of rear section.

3. Fit the pieces of the insulation underneath the boiler block (149). Ensure that aluminium backed faces are facing downwards.

4. Fit left and right rear support sheets (249) to smokehood by using M12 nuts (23) and A13 washers (267). Rear support sheets are fixed to rear section by the help of M12x60 studs (232) that are used for assembly of smokehood to rear section.

5. Fit left and right hand side lower casings (LH is pos. 237, and RH is pos.236) onto front and rear support sheets as shown in following photos. Fix lower side casing onto front support sheet (248). Fix lower side casing onto rear support sheet by using two pieces of M8x20 setscrews (245) and A9 washers (246).

6. Fit a special pin(250) securing it via M4 nut (214,215) on each LH and RH side upper casing. These special pins will help upper side casings to be secured against vibration during operation.

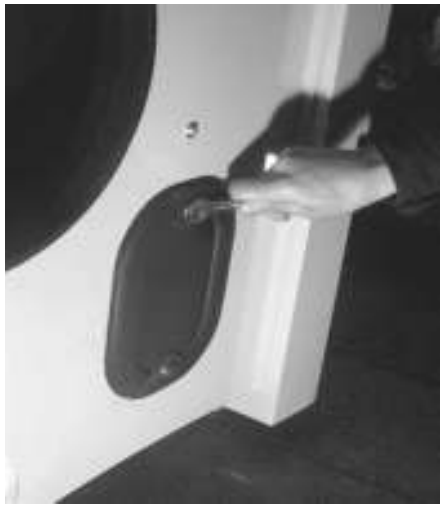
7. Fit left and right hand side upper casings (LH is 235, and RH is 234) on top of LH and RH side lower casings securing onto front and rear support sheets. Make sure that special pin on upper side casing coincides with the hole on lower side casing. Fix upper side casing onto rear support sheet by using two pieces of M8x20 setscrews (245) and A9 washers (246). Fix upper side casing onto front support sheet by using two pieces of special M8x20 setscrew (248).


REAR VIEW


FRONT VIEW

8. Fit rear insulation LH and RH pieces (242) onto smokehood as shown in following photo.

9. Fit rear casings (240 and 241) onto smokehood by using four special M8x20 setscrews (248). Rear casing consists of two simetric parts (LH is pos. 241 and RH is pos. 240) like rear insulations. After fitting the other part of rear casing, connect corresponding sides of rear casings together by 3 self tapping screws to secure.



10. Apply fiberfrax adhesive into grooves on cleaning cover ports of smokehood, and fix rope fiberglass braided 9 mm. dia. (244) into the grooves There are two cast iron cleaning covers. Cleaning covers (243) are fitted onto smokehood by using 2 pieces of M8x20 setscrews (245) and A9 washers (246).

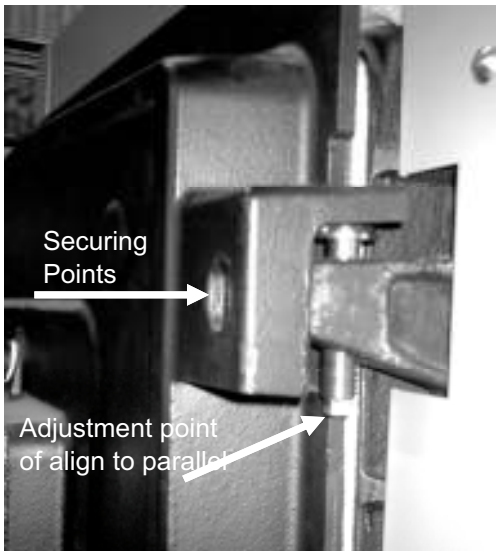
11. Likewise in Clause 6, fit two special pins (250) securing them via M4 nuts (214,215) on each LH and RH upper side casings.These special pins will help top casings to be secured against vibration during operation. Place top casings front and rear pieces (238 and 239) on top of upper side casings.

12. Before assembly of front door, first decide the side of the hinging (from LH or RH opening). Screw hinge pins (230a) into threaded holes on correspondant hinges (LH or RH due to opening of front door). Screw an M20 nut onto each hinge pin as shown in following photo. Hang front door (227) on M20 nuts (36) to establish the attachment to front door. The position of front door up and downwards is adjusted by these M20 nuts.

Adjust the alignment of front door to ensure that it compresses squarely onto fibreglass rope on front section. Fix front door to front section using four pieces of M16x40 setscrews (228) and A17 washers (223).

13. Screw in the special setscrew(230b) into hole of upper hinge by using a screwdriver in order to make front door aligned parallel to floor while closing.

Lift the front door by using a wrench from the bottom of the special setscrew during closing.



14. Secure the door by using four M16x40 setscrews and washers.

Jasket assembly MK 12-20

1. Apply the same procedure as described in Clauses 1, 2, and 4 of previous chpater, for series MK 12 to MK 20.

2. Fit auxillary baseframes for side casing assembly for series MK 12 to 20. First, fix front/rear baseframes (260) securing it by an M16 nut (11,10) on correspondant end of lower staybolts (8 or 9). Apply the same procedure for opposite side (see following photos). As all front/rear baseframes are all the same in terms of construction, any mis-placement is prevented.

Fit intermediate baseframes (261) to front and rear baseframes (260) using four pieces of special M8x20 setscrews (248) for each side.

3. Place boiler block insulation front piece (265,266) on top of boiler block, and secure insulation to lower staybolts by insulation springs(251) as described in Clause 2 of previous chapter.

4. Fit right and left hand side lower casing front pieces (LH is pos. 257, and RH is pos. 256) on side baseframes (260+261+260), fixing them onto front support sheets (247) via two pieces of special M8x20 sectscrews (248). Additionally secure lower casing front pieces onto side baseframes by a a special M8x20 setscrew (248) for each. See following photos.

5. Fit LH and RH lower side casings rear pieces on LH and RH side baseframes (260+261), fixing them onto rear support sheets (249) via M8x20 setscrews (245) and A9 washers(246). Additionally secure lower casing rear pieces onto side baseframes by a special M8x20 setscrew (248) for each.

6. Fit eight pieces of special assembly pin (264) into clinched nuts on each vertical baseframe (262). Fix vertical baseframe onto side casing lower parts front piece (256 and 257), first passing lower two special assembly pins (264) through holes on items 256 and 257, and then pushing item 262 downwards (see photo on the left side). Fix upper support sheet (263) onto LH and RH vertical baseframes by M8x20 setscrews (245) and A9 washers (246) (see photo below). Item 263 may be placed either with its bending side towards forward or backward so that it can always be supported by upper staybolts for a secure baseframe system.

7. Place remaining pieces of boiler block insulations (265,266). If placement of boiler block insulation piece is blocked by upper support sheet, cut this insulation sheet to complete the placement.

8. Fit a special pin (248) securing it via M4 nut (214,215) on each LH and RH side upper casing front and rear pieces. These special pins will help upper side casings to be secured against vibration during operation. Fit LH and RH upper side casings front pieces (LH is pos. 253, RH is pos. 252) onto coinciding upper piece, securing them on front support sheets via two pieces of special M8x20 setscrews (248) as shown in following photo. When fitting upper side casings, make sure that, the pins (264) on item 262 lock correspondant holes on side casings.

9. Fit LH and RH upper side casings rear pieces (LH is 255, RH is 254) onto lower side casings, following the same procedure. For assembly of top casings, rear insulations and rear casings, follow the same procedure with MK 8 -12 series.

Electrical Installation

1. Before assembly of control panel on top casing front piece (238), pass the capillary tubes of the panel through the large hole on the top casing. Fix control panel (160) onto the top casing using 4 self tapping screws S 4.8x9.5

2. Place the bulbs of the control and safety thermostats into 1/2" pocket and the bulb of boiler thermometer into 3/8" pocket fitted on the rear section routing all the capillary tubes underneath top casings but on the top side of the insulation blanket. Secure the bulbs of the instruments into the pockets with the clips supplied.

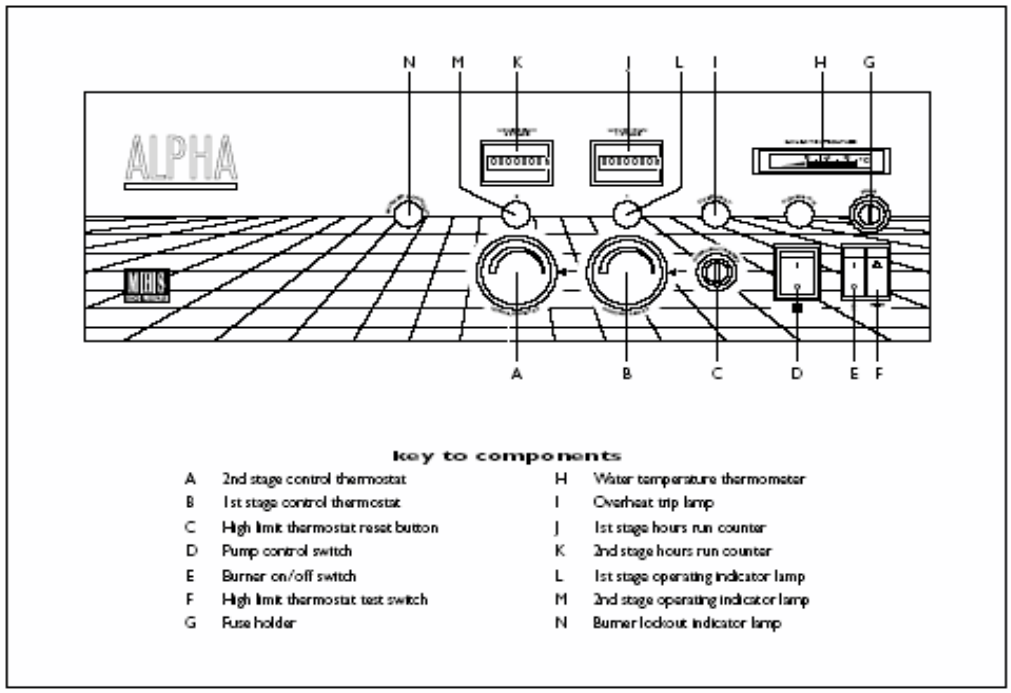
3. Fit top casing front panel mounted with the control panel onto the boiler.

4. Pass electrical wiring through prepared hole in rear of side casing and route cables into control panel making sure that cables are on the top side of the insulation. Make electrical connections in accordance with Mandatory Regulations and Codes of Practice, and follow burner manufacturers instructions.

The main electrical supply should be taken from a local fused isolator having a minimum contact separation between the poles of 3 mm, and taken to the phase, neutral and earth connection in the boiler control panel.
The burner connection cables from the boiler control panel should be routed through the top and side panels, then shall pass under side panel to the burner, ensuring that the cables are placed on the outside of the boiler insulation blankets and within flexible conduit if required.
All cables should be suitable for a service temperature of 100 C and a load of 10 Amp, and have a minimum cross sectional area of 1,5 mm2.

This appliance must be earthed.

Control panel

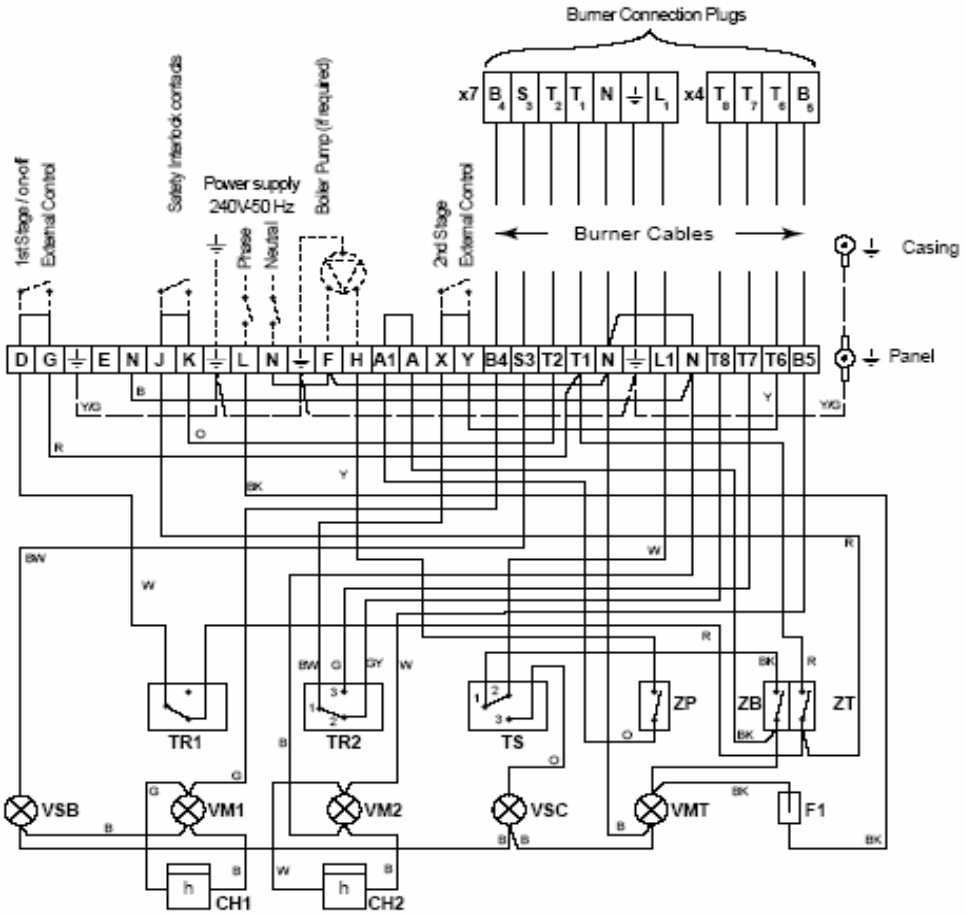


key to components

A	2nd stage control thermostat	H	Water temperature thermometer
B	1st stage control thermostat	I	Overheat trip lamp
C	High limit thermostat reset button	J	1st stage hours run counter
D	Pump control switch	K	2nd stage hours run counter
E	Burner on/off switch	L	1st stage operating indicator lamp
F	High limit thermostat test switch	M	2nd stage operating indicator lamp
G	Fuse holder	N	Burner lockout indicator lamp

Detail of the P3 climatic control panel can be found in the separate literature for this item.

Standard Boiler Control Panel Electrical Diagram



Index

CH1	1st Stage hours run meter
CH2	2nd Stage hours run meter
F1	6,3 AT protection fuse
TR1	1st Stage control thermostat
TR2	2nd Stage control thermostat
TS	Limit thermostat
VM1	1st Stage indicator lamp
VM2	2nd Stage indicator lamp
VMT	Power "ON" light
VSB	Burner lockout lamp
VSC	Boiler overheat lamp
ZB	Burner ON/OFF switch
ZP	Pump switch
ZT	Test switch

Cable Colour Identification

R	Red
O	Orange
GY	Gray
Y	Yellow
BK	Black
V	Violet
G	Green
B	Blue
W	White
BW	Brown
Y/G	Yellow/Green

Blue wire: N Neutral
Yellow/Green: Earth

Important: Maximum current that can switched per output is 2A (cos. o,7) which corresponds to an output of about 400W. Provide a contractor relay for any output above that value.

Notes: Remove link D - G and install volt free contact to achieve remote external on/off control

Remove link x-y and install volt free contact to achieve remote high / low control - As appropriate and for high / low burners only

MAINTENANCE AND CLEANING

Before servicing boiler for any reason, first switch off all electrical supply and close oil or gas valves.

Periodic inspections

1. Cleaning of heat transfer surfaces of the boiler (at least once a month with light-oil, and and once a week with light/medium fuel-oil firing as necessary).
2. Controls incorrectly set (thermostats etc.)
3. Fumes (odours) especially toxic.
4. Noise (excessive or unusual)
5. Flue gas leakage (soot deposits / marks)
6. Vibration (excessive or unusual)
7. Fuel or water leakage
8. Burner settings control using flue gas analyser.

Cleaning

Before starting to clean the boiler:

1. Isolate by switching off electrical supplies at the mains, and valve-off fuel supplies.
2. Cover control panel and burner to protect from any harm.

To clean the boiler:

1. Open the front door (227)
2. Remove all retarders inside the flue gas passages. Prepare the cleaning brush, combining items 170,171, and 172 (item 172 should be used for long combustion chambers, high capacities). Remove any deposits from combustion chamber and flue gas passages using cleaning brush.
3. Clean the retarders somewhere outside the boiler and check their conditions.
4. Check the condition of the fiberglass braided rope (29) between front door and front section and replace it if it is required.
5. Re-fit all the retarders with their original positions, close the front door and check that it compresses squarely onto front section.
6. The deposits, collected at the bottom of the smokehood and forced to drag into the same place during the cleaning of the third flue gas passages, should also be removed. For that operation, undo the rear cleaning covers (243) on the smokehood. Clean all deposits and check the conditions of rear cleaning cover seals (244) and replace them if it is required. Re-fit cleaning covers and casing.
7. Check the condition of the fiberglass ropes in front of the burner ring (62) and replace if it is required.
8. Uncover the control panel and the burner.
9. Re-connect the boiler to external supplies.
10. Start the boiler and check for performance.
11. If it is possible, a flue gas analysis should be carried out to check the combustion.

To shut down the boiler

Switch off the electrical supply and decrease the control thermostats on boiler control panel to the minimum set point. If switching off for an extended period e.g. Holidays, turn off the gas or oil supplies at the service and isolating gas or oil cock on the burner.

Care of the boiler

1. Do not shut down the boiler if freezing conditions are expected unless a frost protection thermostat (e.g. Optional P3 econoy panel use) has been incorporated within the boiler.
2. Do not obstruct the airvents, grilles or other air openings in the boiler room, and ensure a clear path of combustion and ventillation air to the burner.
3. Do not store objects on or near the burner, boiler, and flue.
4. Do not use propellant sprays or chemicals particularly chlorine based chemicals in the vinicity of the boiler.
5. The boiler must be service at least one a year by authorized staff.

To light the boiler

1. Check that the gas cock or the isolating valve is on.
2. Switch on the electrical supply, programmer, and the On/Off button on the boiler control panel (in case of P3 econoy panel).
3. Set the knob of control thermostat to desired outlet water temperature (in case of P2 control panel).
4b The burner should now start pre-ventillation and then fire.

Fuel leakage

1. If there is fuel leakage from your boiler, first stop the system and shut down the gate valve at the outlet of the fuel tank. If a gas leak is suspected (e.g. Odour in the boiler room) do not use a naked flame to locate the leak, or turn on or off any electrical switches. Consult your authorized service staff or registered persons from local gas dealer company.
2. If there is leakage from fuel tank, it must be removed.

Electrical failure

1. The boiler will not work, if the electricity is cut off. The boiler will start automatically when the electircity is on.
2. In the case of lower voltages, the boiler stops running for a while for safety. In that case, please search for the causes of low voltage, and install a regulator if necessary.

Boiler operational failures

If the burner can not be operated; check that there is enough fuel in the tank, and the gate valve at the outlet of the tank is opened. If the burner could not be operated again, it means that, the burner nozzle may be clogged, or the positions of electrodes may be changed. In this case, consult our authorized staff. If the boiler stops suddenly and, is never operated again; the battery in the timer may be exhausted. Check it and consult our authorised staff.

Radiator heating problem

If the raditaors can not be heated; refer to followings:

1. There may be air in the circuit; it must be removed.
2. There may be pressure drop in the circuit. If the pressure gauge on the manometer of the heating system is below the minimum safe value, water must be added to the circuit.
3. The thermostat setpoint may be rather low; the setpoint degree must be increased.
4. The room unit or programmable timer on the control panel may be in service. The adjustments of these devices must be checked again.

Safety thermostat fault

In the case of safety thermostat lock-out; first check to make sure that the water level is enough. If there is any leakage from the circuit, remove it, and add water to the system, and reset the safety thermostat. If the same fault appears again, the safety thermostat may be faulty. Consult our authorised staff.

Gas leak out from boiler body

1. The leakage may be due to insufficient insulation of the cleaning covers; in that case
2. Check the condition of other insulations such as fibreglass ropes between each section, between front door and front section.
3. There may not be enough fresh air circulation from the burner to combustion chamber. The conditions must be improved.

Control of substances hazardous to health

For the type of material and where used in MK JETSTREAM boiler refer to the following chart:

1. PAINTS:

General purpose black undercoat	NOT APPLICABLE
High temperature black coating	Sections Burner plate
Powder coating	All jackets Baseframes Control panel front/rear panel

2. INSULATION AND SEALS

Rock-wool insulation board	Front door
Glass-wool insulation board (aluminum backed)	Sections Smokehood
Fibre-glass rope and tape	Front door Burner plate Section joints Smokehood
Ceramic-fibre board	Front door
CFC free polyurethane spray/foam	NOT APPLICABLE
Refractory brick	NOT APPLICABLE
Asbestos products	NOT APPLICABLE

3. SEALANTS

Red-lead dye	Nipples
Ceramic/mineral compound gasket (Isoplan/Frenzelit)	Flanged stub pipes Water distribution pipe
Flexible adhesive compound	Inter section joints
Water jointing flax	Tappings on sections
Grey paste jointing compound (Unipak A/S)	Tappings on sections
Wet mix jointing compound (Fiberfrax fixwool type1000)	Front door
Fire cement	NOT APPLICABLE
Gas jointing compound	NOT APPLICABLE

Specific data sheets are available on request from DEMRAD AS for those materials but the following material handling and first aid procedures should in all cases be observed.

Paints, Sealants, and Heating Fuel-oil

1. These materials contain organic solvents and should be used in a wel ventillated area away from naked flames.
2. Do not allow to come into contact with the skin, eyes, inhale or swallow.
3. Use barrier cream or gloves to protect the skin, and goggles to protect the eyes from accidental contact.
4. Small quantities can be removed from clothes or skin with a proprietary paint remover or hand cleaning prdouct.
5. If inhaled, remove sufferer into fresh air, if swallowed clean mouth with and drink fresh water but do not induce vomitting.
6. If in the eye, irrigate the eye with clean water and seek medical attention.

Sharp edges

Care should be taken when handling sheet metal panels that do not have safety or folded edges.

Lifting cast iron sections

Care should be taken when lifting cast iron sections as they can weigh up to a few hundred kilograms and DEMRAD AS can confirm the weight of each individual section if required.

HEALTH AND SAFETY INFORMATION

Building of Boilers

When building the boiler, the section should always be built on a level base capable of supporting the full weight of the boiler and the sections should always be supported on blocks of wood or props when positioning before finel bolting up. An unsupported section should never be left unattended.

Natural gas

By law, only a competent qualified person registered from local gas delivery company can install, commission or service the gas appliance unless otherwise stated according to mandatory regulations.

Thermal Insulation

1. Avoid contact with skin, eyes or inhaling dust.
2. If cutting insulation then do so in a well ventillated area using gloves to protect the hands, goggles to protect the eyes, and a disposable dust mask
3. If a skin reaction or eye irritation is experienced then discontinue working with the material and seek medical advice.

Devices under pressure

1. Avoid contact with the parts of heating system under pressure during operation of boiler. These dangerous parts are such that:
   - Boiler sections
   - Boiler inlet and outlet lines
   - Safety lines
   - Pressure relief devices installed on heating system
2. Never attempt to drain water from heating system when the boiler is being operated

High temperature surfaces

Avoid contact with parts and surfaces having high temparutares which will be hazardous for human such as:

- Boiler front door
- Inlet and return lines (even if isolated)
- Flue spigot
- Connection between flue outlet and chimney
- Circulator pumps, expansion vessels

Burner

As boiler is operated with a high speed rotating forced draught burner, do not attempt to touch burners rotating parts and electrical or electronical accessories

Control panel

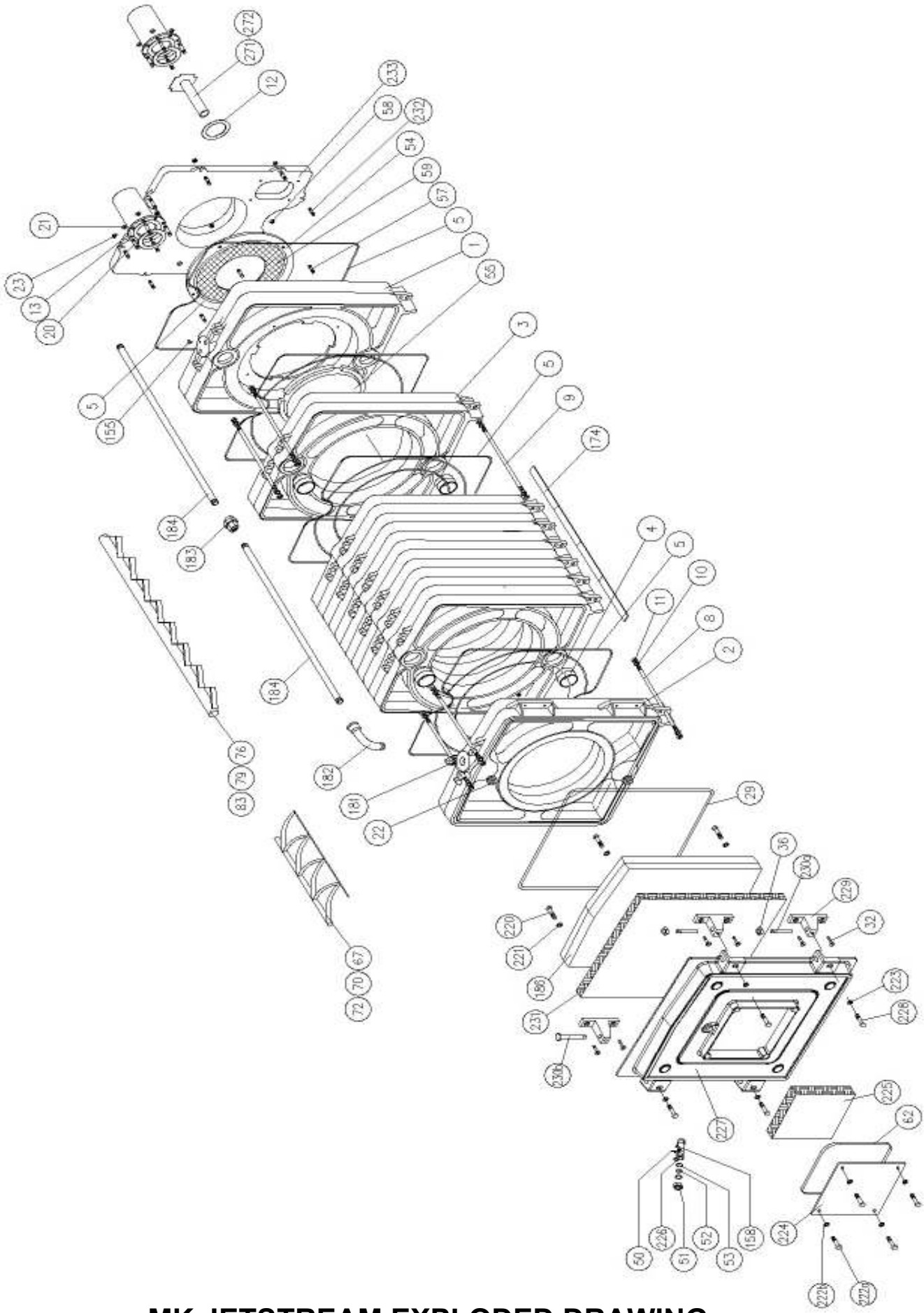
Do not attempt to interfere boiler control panel and main control panel of boiler room when the boiler is being operated or unless electricity has been cut off from the mains.

Oil tank

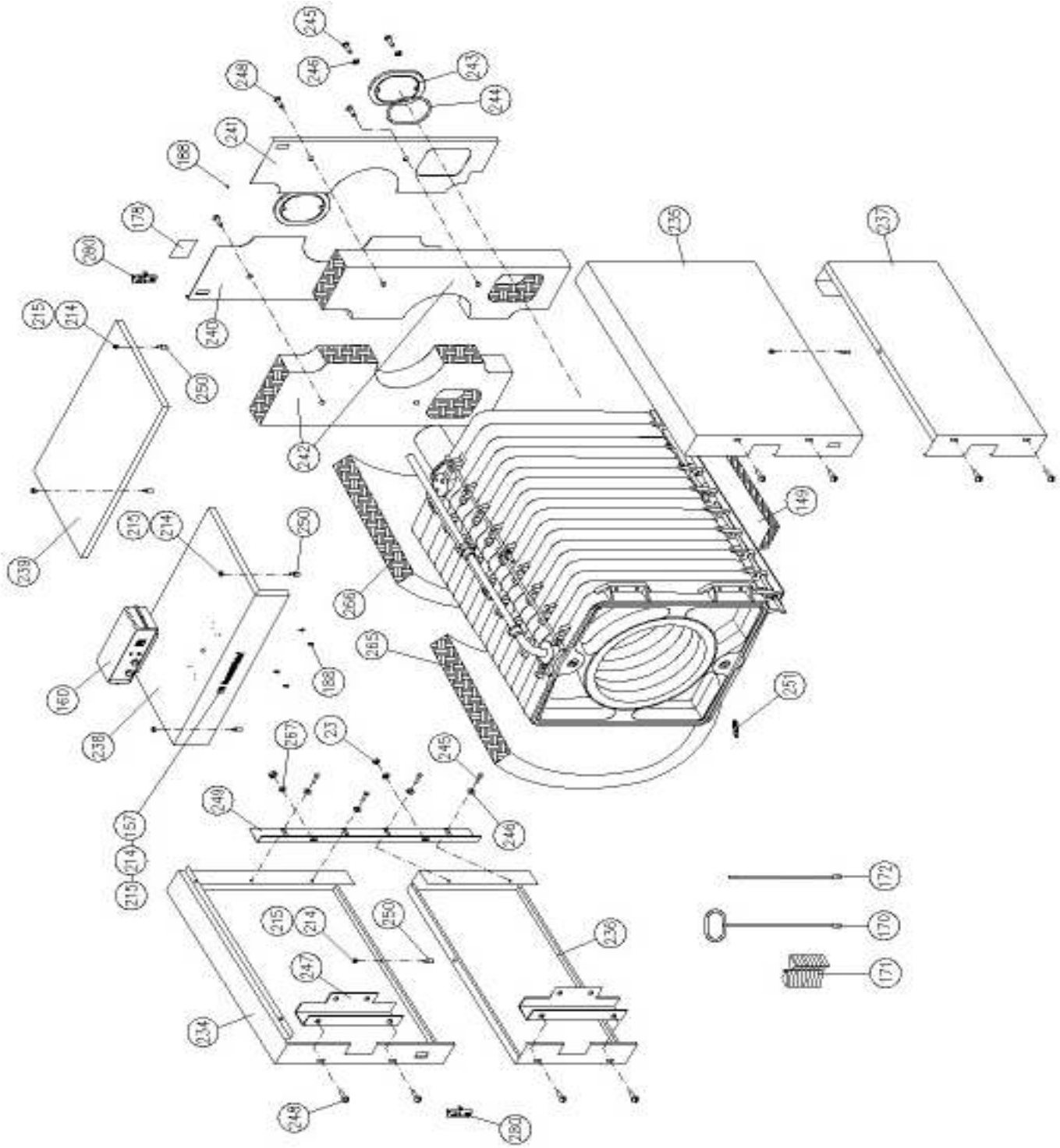
Never carry out any welding operation unless the oil tank is emptied and cleansed.

Boiler room

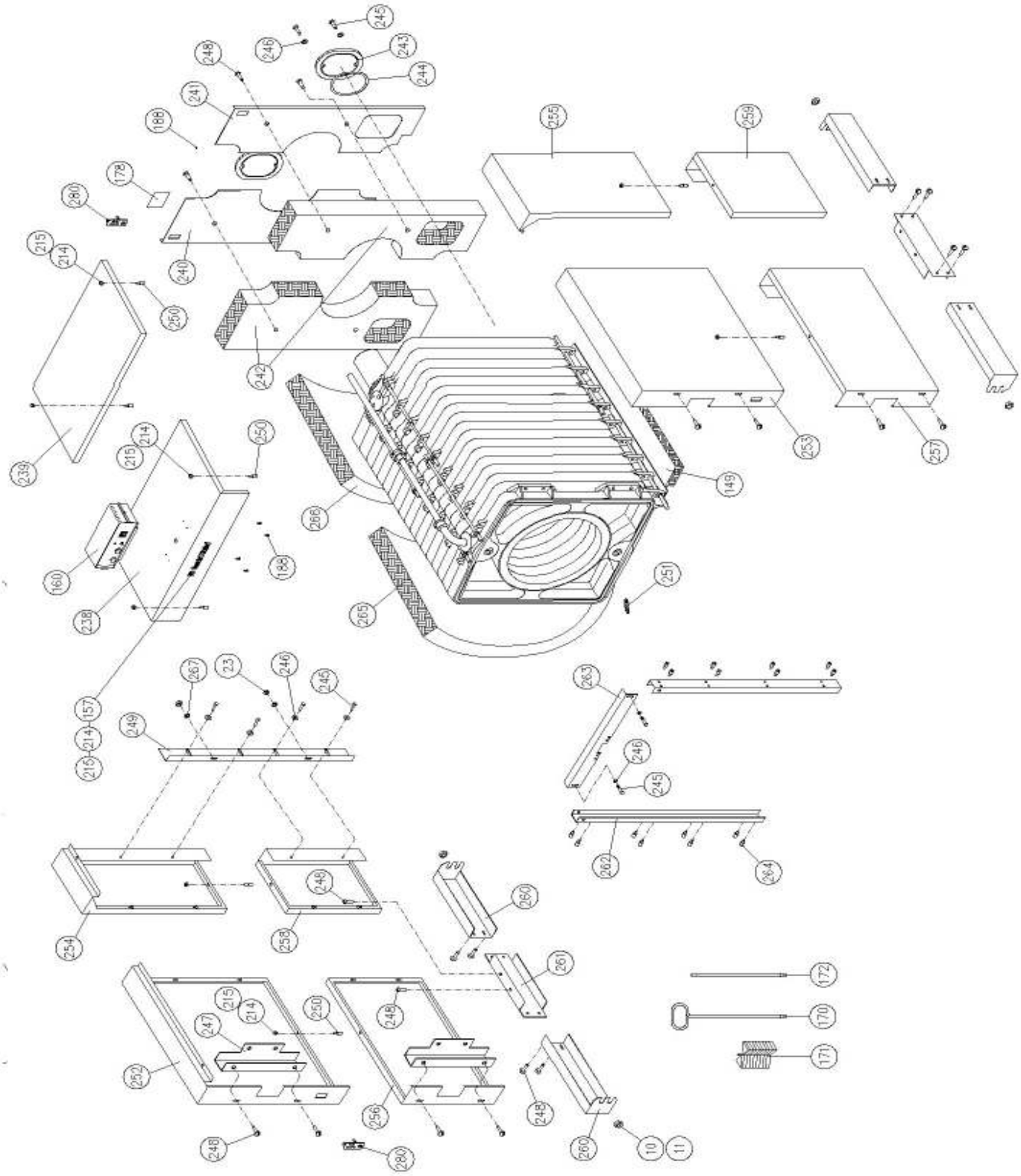
Ensure that the boiler room has an easy access to outside in case of danger in heating system.



MK JETSTREAM EXPLODED DRAWING (BOILER GROUP)



MK JETSTREAM EXPLODED DRAWING
(INSULATIONS AND OUTER CASINGS for MK 8-11)



MK JETSTREAM EXPLODED DRAWING
(INSULATIONS AND OUTER CASINGS for MK 12-20)

BOILER GROUP REGISTRATION

MK Jetstream Boiler Group Registration

Model	: MK	
Capacity	:	kW
Serial Nr.	:	
Date of Manufacture	:	
Boiler Group Nr.1	:	
Boiler Group Nr.2	:	
Date of Assembly	:	
Date of Commission	:	

Assembled by:

Commissioned by:

Authorised dealer:

Manufactured by:

35 Nobel Square
Basildon Essex
SS13 1LT
01268 591010
01268 724064

MHS BOILERS	**BOILER ASSEMBLY CERTIFICATE**	**Form Nr. : 2.009 F 14 R2**

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

END USER	**CONTACT PERSON**	:
	ADDRESS	:
	TELEPHONE	:

DEALER	**COMPANY NAME**	:
	ADDRESS	:
	TELEPHONE	:

ERECTOR	**COMPANY NAME**	:
	ADDRESS	:
	TELEPHONE	:

HYDROSTATIC TEST DATA

Assembled MK ..... Boiler group tested at

Ps = 1. 5 x Pmax = 1.5 x ..... = ... Bars *

where Pmax is the maximum operating pressure of heating system;

for a duration of 30 minutes, and

☐ **No leakage detected**

☐ **Leakages detected and corrected on following points:**

1.
2.
3.
4.
5.

COMMENTS

OTHER FAULTS OR DEFICIENCIES DETECTED

TESTED BY:	**APPROVED BY ** :**
DATE and SIGNATURE	**DATE and SIGNATURE**

THIS BOILER ASSEMBLY CERTIFICATE SHALL BE BROUGHT TO THE AUTHORISED DEALER

** Referred to EC Pressure Equipment Directive (97/23/EC), and TRD 702.*

** Hydrostatic tests for installations in Germany shall be carried out under provision and approval of TÜV Rheinland.*

MHS
BOILERS

Konformitaetserklaerung

Gemaeß der unten angegebenen Richtlinien

Produktbezeichnung	:	Heizkessel Typ MK
Name und Anschrift der benannten Stelle	:	TÜV Anlagentechnik GmbH / TÜV Immisionsschutz und Energiesysteme GmbH Am Grauen Stein 51105 Köln

Benannte Stelle	Angewandte Normen	Weitere angewandte Gemeinschaftsrichtlinien	Kessel Typen	Konformitacts-bewertungsver - fahren
0035 TÜV TAT	97 / 23 / EG Druckgeraete - Richtlinie	TRD 702	MK 8 – MK 20	B + D
0085 DVGW	90 / 396 / EG Gasgeraete - Richtlinie	EN 303	MK 8 – MK 20	B + C
0645 TÜV TIE	92 / 42 /EG Wirkungsgrad - Richtlinie	EN 303	MK 8 u. MK 9	B + C
-	EMV – RL	EN 50081-1 EN 50082-1	MK 8 – MK 20	-
-	Niederspannung – RL	EN 60335-1	MK 8 – MK 20	-

Wir, die Firma Türk DemirDöküm Fab. A.S. Oranize Sanayi Bölgesi 3. Cadde 16400 Inegöl/ Bursa, erklaeren hiermit , dass die oben genannten Heizkessel den zutreffenden Bestimmungen der o.g. Richtlinien entsprechen.

Bei einer nicht mit uns abgestimmten Aenderung des Produktes verliert diese Erklaerung ihre Gültigkeit. Die Sicherheitshinweise in der Dokumentation, Betriebs- und Bedienungsanleitung sind zu beachten.

Inegöl, den 08.04.2003

Mustafa KAHVECIOGLU
Türk DemirDöküm Fab.A.Ş.