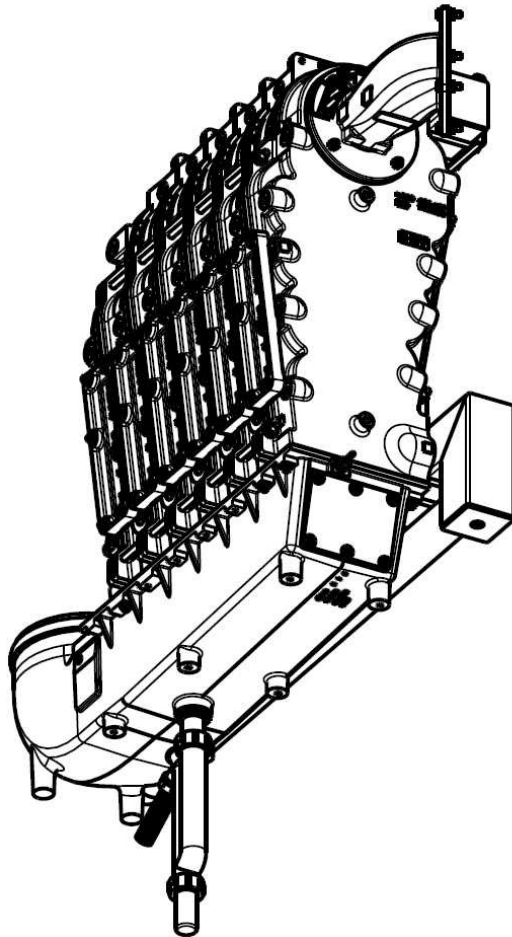Aluheat BV
WTB series

Type 120-4
Type 160-5
Type 200-6
Type 240-7
Type 280-8

INSTRUCTIONS FOR USER

If you have any questions concerning the use of your Boiler installation, don't hesitate to ask your installer. It is in your own interest and that of the installer that you are familiar with the functioning of your appliance.

Operation

Water, coming from the radiators or from the DHW unit is heated in the aluminium heat exchanger. The CH or DHW pump quarantees circulation of water. The air needed for combustion is sucked in by a speed controlled fan. At low boiler temperatures the flue gasses can be cooled down to such a level that condensing occurs. This water is drained via a built in syphon. This drainage must never be blocked. A burner controller with built in micro processor takes care of the electrical regulation of the boiler.

Topping up

A built in manometer indicates if the water pressure is high enough. As soon as the waterpressure drops below 1 bar topping up is necessary. If topping up becomes necessary more than 10 times a year, the installation should be checked by an installer.

Disconnect from the mains. Connect the filling hose from the cold water tap to the fill through the boiler drain cock. Before tightning the coupling in the installation slowly fill the hose with water allowing any air to escape. Now open the fill and drain cock and slowly fill the installation till a pressure between 1.5 and 2.0 bar is reached. When finished connect again to the main.

De-airing

To remove air present in radiators and boiler, de-airing is necessary. Disconnect from the main. Open all the radiatorcocks. De-air all the radiators starting with the ones on the lowest floor. After de-airing check the water pressure and eventually top up (if waterpressure has dropped below 1 bar). Connect to the main again.

Putting into operation

Adjust the room thermostat to your desired setting. The boiler will commence its starting procedure.

Bolier flow temperature

The burner controller adjusts the flow temperature between 20° and 80 °C.
Re- setting of this temperature can be done with help of the buttons on the control panel. The installation manual provides instructions for setting the flow temperature.

DHW temperature (if applicable)

Ex works the DHW temperature is set to a value of 65 °C. This set value can be changed into a value between 40 and 70 °C with help of the buttons on the control panel. If the DHW device has a thermostat the DHW temperature can be adjusted by setting this thermostat.

Switching off the boiler

During summer time the room thermostat can be set to a lower value if you don't want the boiler to operate. During winter or during a longer period of absence this temperature should never be set lower than 15°C. **Don't** switch off the power. During

a period of frost **all** the radiators should be partly or totally opened to avoid danger of freezing.

The integrated pump control will activate the pump every 24 hours for a period of 5 minutes. Only when work on the boiler is being carried out should the boiler be switched off and the gas cock isolated (Ask the installer to show where it is located).

Boilers will not start

First check the following
• Is the room thermostat properly set?
• Is the boiler connected to the main? Power supply present?
• Is the gas cock opened?
• Are the radiator valves open?
• Is the water pressure in the installation higher than 1 bar?
• Is the system vented thoroughly?

A fault is indicated by a flashing code on the display. It is very important for the sake of a correct diagnosis to observe this flashing code and advise your installer. Before contacting your installer press the reset button on the control panel. If the error occurs more often contact your installer.

Maintenance
A yearly inspection of the boiler to be done by your installer is necessary. The life-time and the reliability of the installation are improved by doing so.The casing of the boiler can be cleaned with a soft cloth (no abrasives). Never use solvents like thinners!
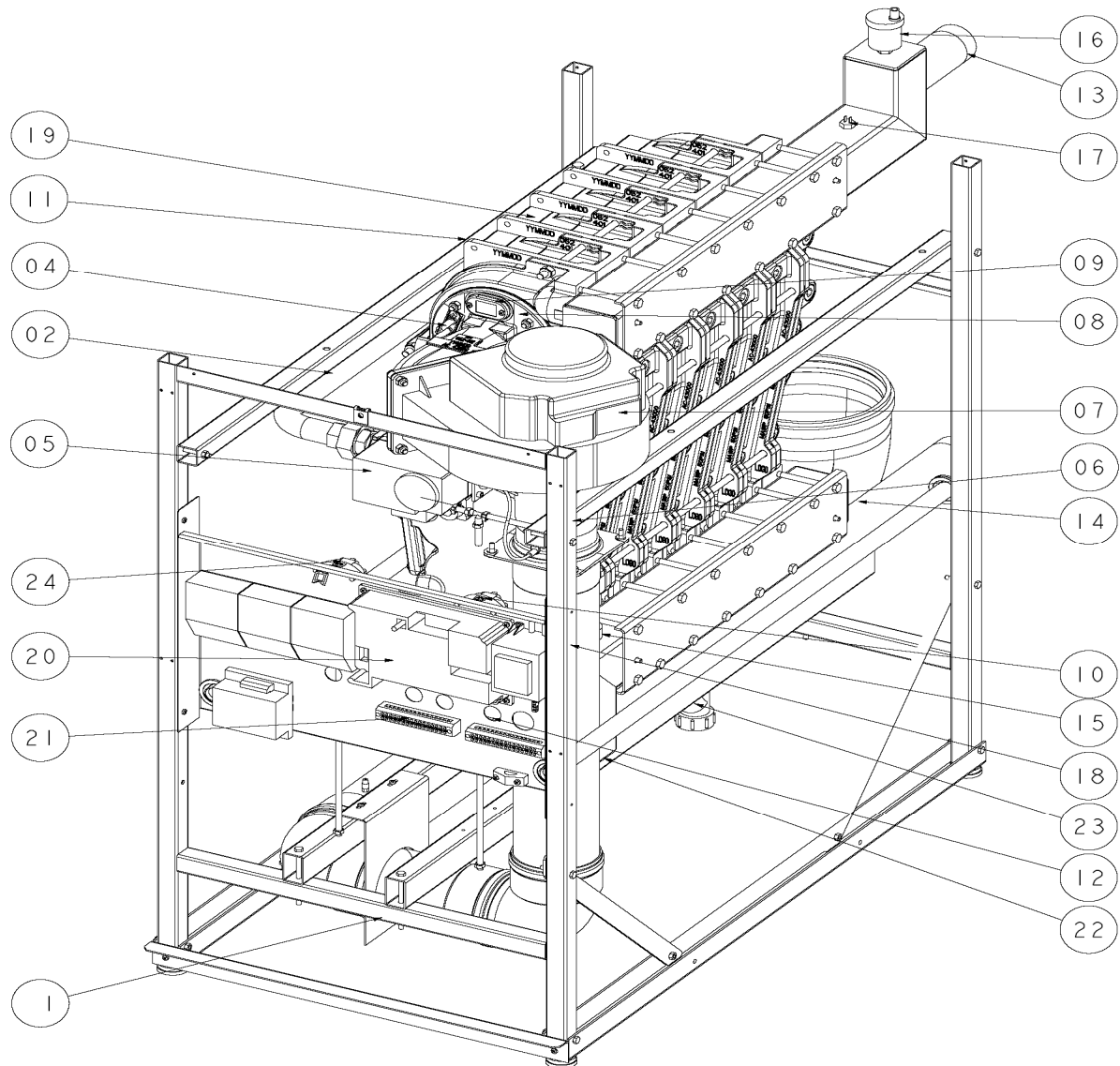
Take care
The air supply (for air needed for combustion) and the chimney parts are essential parts for satisfactory functioning of the boiler. Changes on these systems by non qualified persons are not allowed just like the settings of the gasvalve. The gas/air ratio is set to a lambda value of approximately 1.26. This corresponds with a CO_2 level of 9.3%.

For further information see installation manual.

1   DESCRIPTION BOILER

1	Air supply	14	Return
2	Gas pipe	15	Water pressure switch
4	Ignition and ionisation electrode	16	Auto air vent
5	Gasvalve	17	Flow NTC
6	Venturi	18	Return NTC
7	Fan	19	Overheat limiter (NTC)
8	Burnerhood	20	Boiler-controller MCBA
9	Sight glass	21	Terminal strip
10	Air pressure switch	22	Fill and drain cock
11	Flue gas NTC	23	Syphon
12	Sump inspection cover	24	Syphon pressure switch
13	Flow		

2   TECHNICAL DATA

Superior Model No.	120	160	200	240	280
Number of sections	4	5	6	7	8
General					
Nominal input max load (kW)	115.9	160	200	240	280
Nominal input min load (kW)	22	27	44	48	52
Nominal output max load 80-60°C (kW)	112.9	155.8	196.8	236.2	275.5
Nominal output min load 80-60 °C (kW)	21.3	26.2	43.1	47	51
Nominal output max load 50-30°C	119.1	164.5	207.8	249.4	290.9
Nominal output min load 50-30°C	23.7	29	47.3	51.6	55.9
Efficiency based on net CV					
Efficiency max load 80-60°C (%)	97.4	97.4	98.4	98.4	98.4
Efficiency min load 80-60°C (%)	97	97	98	98	98
Efficiency max load 50-30°C (%)	102.8	102.8	103.9	103.9	103.9
Efficiency 30% load 30°C return (%)	107.5	107.5	107.5	107.5	107.5
Combustion and flue system					
Approximate gas consumption m³/hr (Max load)	12.1	16.1	20.1	24.2	28.2
Gas connection (Male)	1"	1"	1"	1"	1"
Flue gas temperature max load 80-60°C	65-70	65-70	65-70	65-70	65-70
Maximum flue gas volume m³/min	3.5	4.2	4.8	5.5	5.9
Gas side resistance (mm)	1.1	1.5	2.0	2.7	3.6
CO_2 content max load G20 (%)	9.3	9.3	9.3	9.3	9.3
CO_2 content min load G20 (%)	9.1	9.1	9.1	9.1	9.1
Nox class	5	5	5	5	5
Water					
Max flow temperature °C	90	90	90	90	90
Minimum/maximum operating pressure bar	0.8/6	0.8/6	0.8/6	0.8/6	0.8/6
Content of heat exchanger (l)	15.3	18	22.9	25.6	28.4
Maximum water flow m³/hr	10.3	13.6	16.4	19.1	21.8
Maximum DT max load/min load (degC)	25/35	25/35	25/35	25/35	25/35
Water resistance 20 degC DT (mbar) at full load 80-60°C	80	80	90	90	100
Electrics					
Supply (V/ph/Hz)	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50
Fuse rating (AT)	6.3	6.3	6.3	6.3	6.3
Maximum power consumption (W)	260	320	320	320	320
Weight and Dimensions					
Dry Weight (kg)	160	180	210	227	245
Length over casing mm	850	850	1090	1090	1090
Length to flow and return mm	1007	1007	1317	1317	131.7
Length to c.line of chimney mm	942	942	1207	1207	1207
Width	640	640	640	640	640
Height mm	1190	1190	1190	1190	1190
Connections					
Flue connection (mm)	150	150	200	200	200
Air connection (mm)	110	110	110	110	110
Flow and return connection	R2	R2	R2	R2	R2
Condensate connection	R3/4	R3/4	R3/4	R3/4	R3/4
Relative standby losses (%)	0.84	0.68	0.52	0.36	0.2

2.1 COMPONENT MATRIX

Overview of main components used in Superior ;

Part Superior Model No.	120	160	200	240	280
Part					
Boiler control Honeywell MCBA 5407	YES	YES	YES	YES	YES
Fan MVL 230 V	RG175	G1G170	G1G170	G1G170	G1G170
Gas valve Honeywell 24V	VR8615v	VR820	VR825	VR825	VR825
Venturi Honeywell	VMS 030	VMU185	VMU300	VMU335	VMU335
Burner	L=257	L=341	L=425	L=509	L=593
Flange for GIG 175	YES				
Seal between flange	YES				
Flange gas valve/venture 120	YES				
Silencer air inlet L=695	YES				
Silencer air inlet L=585		YES	YES	YES	
Silencer flue-gas round 200mm			YES	YES	
Silencer flue-gas round 150mm	YES	YES			
NTC 12 k ¼" BSP L=50 x D5	4	4	4	4	4
Water low pressure device 1.05/0.83 bar	YES	YES	YES	YES	YES
Air pressure switch 160 Pa in and 140 Pa out	YES	YES	YES	YES	YES
Syphon pressure switch 5.3 mbar out	YES	YES	YES	YES	YES
Gas pressure switch 13/10 mbar	YES	YES	YES	YES	YES

3 DIMENSIONS

120-160

200-240-280
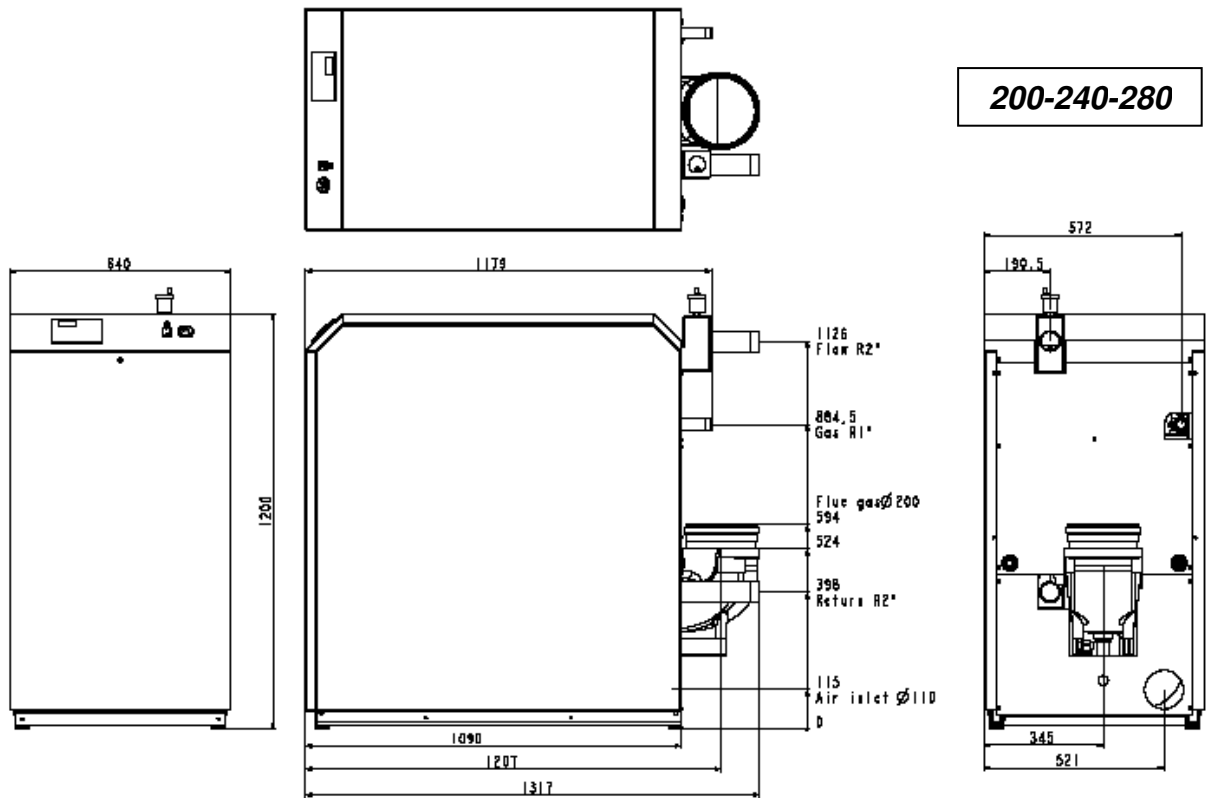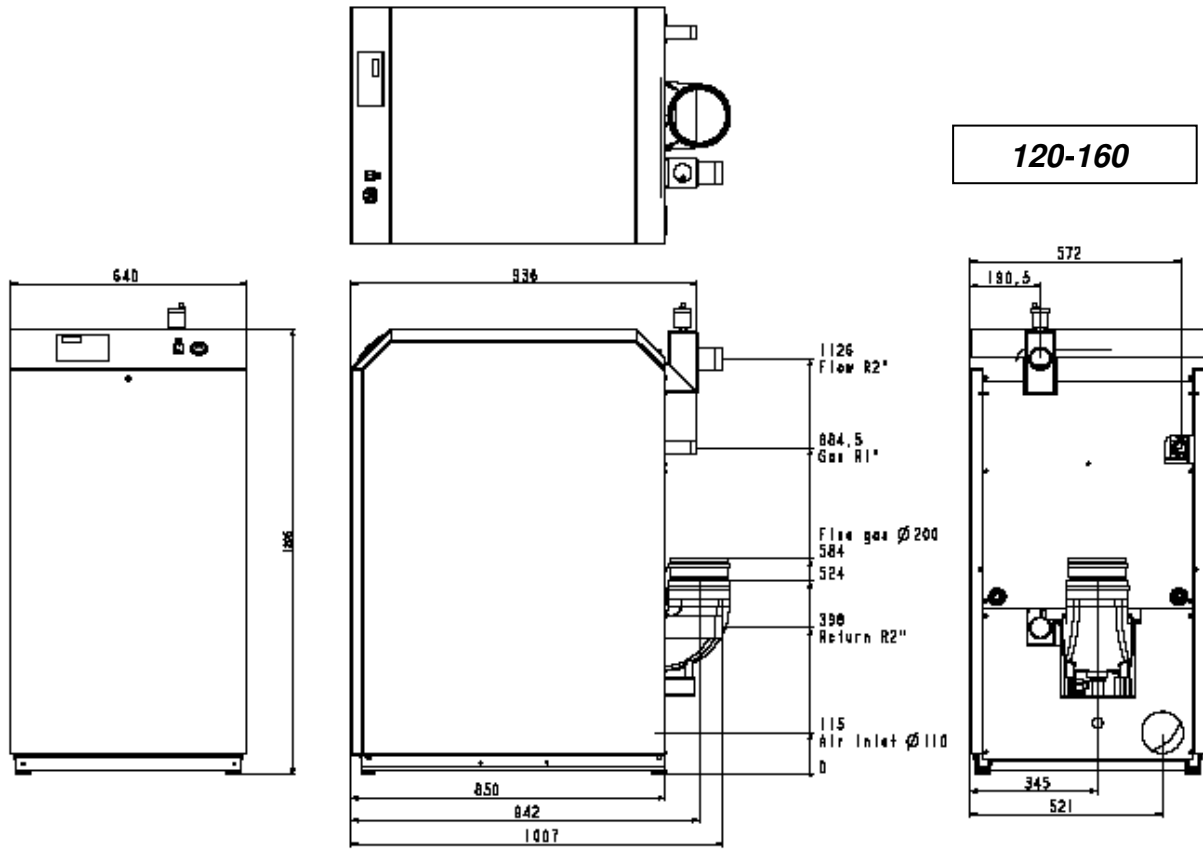
4   OPERATION

4.1   General

The Superior is a room sealed boiler, equipped with a cast aluminium heat-exchanger. During heat demand the pump is activated by the controller. After zero-check of the air pressure switch the fan speeds up to airflow-check fanspeed. Once the air pressure switch is closed the fan goes to ignition fanspeed. After 5 seconds pre-purge on ignition fanspeed, the water pressure switch, gas pressure switch and syphon pressure switch are checked. When all pressure switches are closed, the ignition is released.

The air needed for combustion is taken in from the outside by the fan. The air is transported through a gas/air mixing device creating a negative pressure. This negative pressure is an indication for the amount of air being transfered. The pressure is supplied to the gas-valve by an internal tube. The gas valve automatically adjusts the right amount of gas that will be injected into the venturi and that will be mixed with the air-flow. This mixture is supplied to the burner.

The ignition and flame-control of the mixture is done by an electrode that is mounted beside the burner.

The temperature control and safeguarding is done with the use of NTC's. Data coming from these NTC's is processed by the controller (MCBA) that takes care of control and safe-guarding of the boiler.

4.2   Central Heating (CH)

4.2.1   On-off room thermostat

As standard the boiler is programmed for using an on-off room thermostat. The room thermostat has to be connected to the pin nrs. 24 + 25 on the terminal strip The desired flow temperature is adjustable, but as standard is set to 80°C.

At CH heat request from the roomthermostat (and no DHW heat request present) the CH-pump is activated after 16 seconds. The controller will adjust the burner-input in such a way that a flow-temperature of 80°C towards the CH-circuit is achieved.

4.2.2   Optional 0-10V

Optionally the boiler can be programmed to use a 0-10V DC signal. This DC signal should be connected to pin nrs. 37 (0 VDC) and 38 (+) on the terminal strip.

For 0-10 V control based on capacity, the setting of parameter 45 has to be changed into "02".

For 0-10 V control, based upon flow temperature, the setting of parameter 45 has to be changed into "03".

Following the 0-10 V DC input, the controller will adjust the burner-input to the correct capacity or the correct flow-temperature to the CH-circuit.

The maximum desired flow temperature is adjustable, but as standard is set to 80°C.

At CH heat demand from a 0-10 VDC signal (with no DHW heat demand present) the CH-pump is activated after 16 seconds.

Notice : Take care that the 0-10 V DC signal is disturbance free!

4.2.3 Optional outdoor sensor

The boiler is prepared to work with an outdoor sensor.
To get the controller working with an outdoor sensor, it is only necessary to connect the outdoor sensor to numbers 31 and 32 on the terminal strip. The outdoor sensor is then automatically detected by the controller and the flow temperature is regulated according to the standard built-in heating curve as shown by the thick line in the figure below ;

Standard heating curve
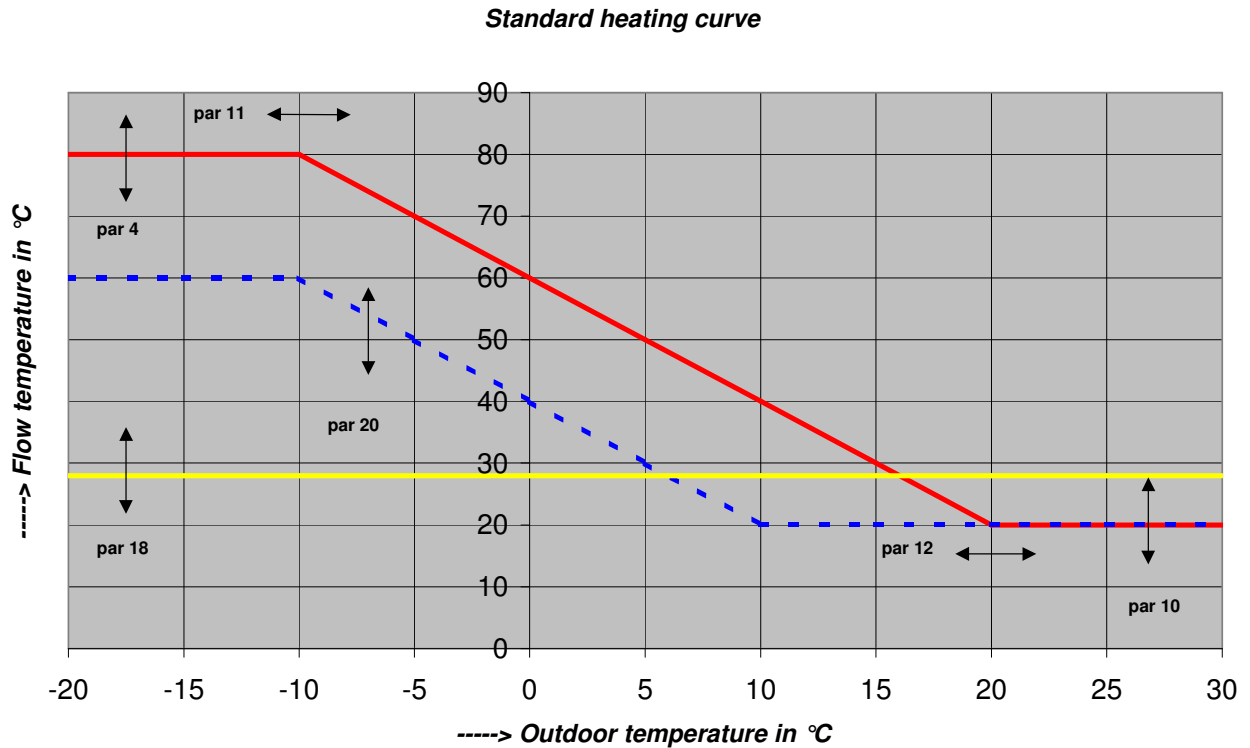
This heating curve can be adjusted by varying the parameters in the software.

If room thermostat is "OFF", the boiler will stop.

If par 45 is changed from "00" into "01" , the flow temperature will be controlled according the dotted line when room thermostat is "OFF".
This is used for parallel shift eg during night time.

The outdoor sensor can be ordered from your supplier.

The sensor should be installed on the north-side of the building at a height of approximately 2 meters.

Notice : The resistance of the outdoor NTC should be 12 kOhm at 25°C.
Also see table of resistance for NTC's at 6.6.2

4.2.4 Optional digital communication

The boiler is also prepared for digital communication with room thermostats with communication protocols like Open-Therm, EBV, TEM and Siemens.

If one chooses this option, a so-called "clip-in" interface needs to be mounted in the controller. This clip-in can be ordered at Aluheat. The digital room thermostat needs to be connected to numbers 29 and 30 (+) on the terminal strip.

The clip-in can also be used for communication with a digital cascade controller.

4.2.5 Slow start

Standard setting of the boiler involves the "slow start" principle in order to avoid the boiler and installation being heated up too quickly.

After ignition at 1800 rpm the boiler modulates down to a low speed of 1600 rpm for appr. 1 minute.

Subsequently the boiler speeds up gradually until a set capacity or set temperature has been reached.

Also see figure below ;

Slow start
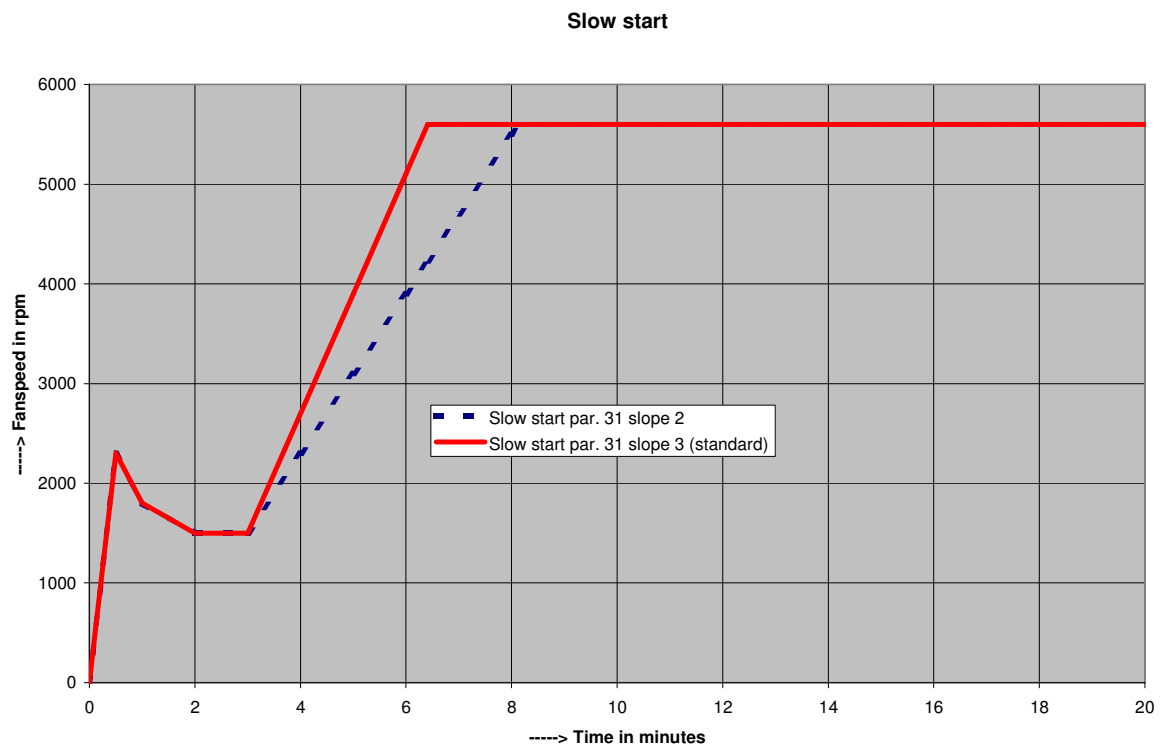
4.2.6 Protection against insufficient flow through boiler

The boiler should be protected against insufficient flow (also see 6.3.2). This is done by checking the difference in temperature between flow and return (called ΔT).

If flow decreases the ΔT will rise. The ΔT safe-guarding principle is as follows;

At $\Delta T > 25$ the boiler starts modulating

At $\Delta T > 30$ the boiler will operate on minimum load

At $\Delta T > 35$ the boiler will shut off and the boiler will be in a blocked mode for 2 minutes, indicated by "**b 30**" on the display.

The boiler control will generate a lock-out after 13 consecutive blocks within 1 heat demand. This error will be indicated by flashing "**E 30**" on the display.

4.3   Domestic Hot Water preparation (DHW)

4.3.1   External storage tank with thermostat

As standard the DHW configuration is set to use storage tank + tank thermostat + 230 VAC DHW pump. For this parameter 46 is standard set to 13.

The 2 wires of the tank thermostat need to be connected to numbers 33 and 34 on the terminal strip.

For hydraulic connection of an external storage tank to the boiler one should either use a 230 VAC DHW pump or a 230 VAC spring-loaded 3-way valve.

If using a 3-way valve change parameter 46 - 1st digit from 1 into 2
If using a tank NTC change parameter 46 - 2nd digit from 2 into 3.

For electrical connection see wiring diagram at 6.6.1.

Heat demand for hot water is generated by switching of the storage tank thermostat. The tank thermostat also determins the hysteresis (difference in ºC between on and off of the boiler) for keeping the storage tank at temperature.

The standard storage tank set temperature is 60ºC.
During operation the boiler will heat up untill a flow temperature of 80ºC is reached.

Notice : in case of a CH heat demand, immediately after finishing the heat demand for DHW, there is a chance of hot water flowing into the CH system (hot shot).

4.3.2   External storage tank with NTC sensor

In case the storage tank is equipped with an NTC sensor, the setting of parameter 46 has to be changed from "13" to "12".
Notice : The resistance of the NTC sensor must have a value of 12 kOhm at 25°C.
The 2 wires of the tank NTC sensor need to be connected to numbers 33 and 34 on the terminal strip.
Heat demand and maintaining temperature of the storage tank is done at an adjustable temperature. As standard this temperature is set with parameter 1 to 60°C.

4.3.3 General behaviour with external storage tank

In case of persistent heat demand the boiler will regulate to a flow temperature of 80ºC. If the flow temperature exceeds 85ºC, the boiler will switch off temporarily, indicated by "**6**" + flow temperature in the display. The boiler will resume DHW-operation when the flow temperature has decreased below 75ºC.

The boiler will finish hot water preparation as soon as the tank thermostat has switched off, or the tank NTC has reached the set temperature of 60ºC. Subsequently the warm water pump will continue to run for appr. 2 minutes, showing "**8**" in the display.

After 90 minutes continuous hot water operation, the boiler switches to central heating in order to prevent cooling down of the building.

Disabling hot water operation : press and hold the ‒ button for three seconds.
Display will show "d off" shortly.
Alternative way for disabling is to change setting of parameter 2 to "0".
Result of this is that the controller will ignore any heat demand for warm water.

Enabling hot water operation : press and hold the ‒ button for three seconds.
Display will show "d on" shortly.
Alternative way for enabling is to change setting of parameter 2 to "1".

Notice : At outputs ≥ 40 kW double separation between exchanging media is required.

4.4   Accessories

4.4.1   AM3-2 module
This optional module has 3 relay outputs which are configured for the following functions ;
K1 for flame signal
K2 for external gas valve
K3 for additional 230 VAC DHW pump
Aluheat article number of AM3-2 module is 046-308

4.4.2   AM4 module
This optional module has 1 relay output and 1 analogue input.
The relay is configured for alarm output (both block and lock).
The analogue input is configured for flow temperature of 2nd heating circuit.
Note that in case of a secondary heating circuit it is also necessary to order
an AM3-11 module as described in 4.4.3.
Aluheat article number of AM4 module is 048-324

4.4.3   AM3-11 module
This optional module has 3 relay outputs which are configured for following functions ;
K1 for pump 2nd circuit
K2 for mixer close
K3 for mixer open
Set 2nd circuit as slave, change parameter 45-1 to 0.
This module is not available at Aluheat and should be ordered from Honeywell

5   BOILER CONTROL

5.1   Control Panel
The control panel has 6 buttons, a 4-digit display and a PC connection as shown in the figure below.
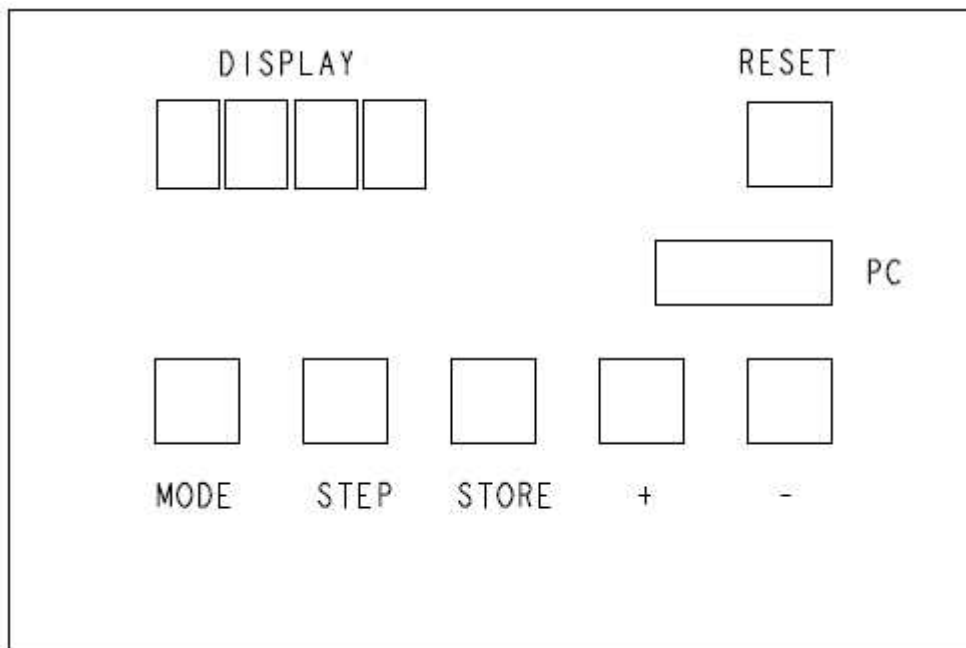
5.2   Operation information on the display

By pressing the "mode-button" several times the following modes are displayed respectively ;

PARA :   parameter mode (for changing parameters)
INFO :   monitor mode (e.g. to read temperature sensors)
stby   :   stand-by (normal operation)

With service-code also the following modes can be displayed, respectively ;
FAN   :   fanspeed in rpm
ERRO: error mode
COM   :   displays communication with interface

If no button is pressed again for a 15 minute period, the display will automatic revert to stand-by mode.

During normal operating mode the status (1st digit) and flow temperature
(2 last digits) are displayed on the control panel.

	Meaning of status in normal operation mode
status	**meaning**
0	no heat request
1	ventilation
2	ignition
3	burner on in CH-mode
4	burner on in DHW-mode
5	waiting for air pressure switch
6	burner off because $T_{flow} > T_{set}$ or anti-cycle time
7	Post pump time after heat demand CH
8	Post pump time after heat demand DHW
9	burner off : 9 alternated with b-code (also see 8.4) flow temperature T1 > 95°C return temperature T2 > 95°C delta T (Tflow-Treturn) > 35°C too fast temperature increase (°C/sec) flue gas temperature T5 > 95°C gas- or water pressure switch open (block 2,5 minutes) insufficient air transport (blocked air / flue-way)
A	Adjust 3-way valve towards CH or DHW
H	Service mode : burner forced to maximum load
L	Service mode : burner forced to minimum load

5.3   Parameter-mode (PARA)

Press the "mode-button" several times until the display shows "**PARA**".
Then press "**STEP**"; the display shows 1 + 2 digits.

The dot following the first digit is illuminated continuously, indicating that the parameter-mode is active.
The first digit shows the program step.

Going through the whole parameter list is possible by pressing the "STEP-button" several times.

Pressing **+** and **–** buttons changes the values shown by the last two digits.
This changed value will be activated by pressing the "store-button".

A blinking of the number shows the confirmation of the change.

parameter	description
1	storage tank temperature 20 to 70°C
2	DHW-mode on/off
3	CH-mode on/off
4	Flow temperature 20 to 90°C

The first 4 parameters are freely accessible. The remaining parameters are only accessible by entering the service-code.

To return back to normal operation mode (STBY) the "MODE-button" should be pressed several times.

"STBY" is only shown for a short moment in the display ; after this the status and flow temperature are displayed.

5.4   Monitor mode (INFO)

Press the "mode-button" several times until the display shows "**INFO**".
Then press "**STEP**" ; the display shows 1 + 2 digits.
The dot following the first digit is blinking, indicating that the monitor-mode is activated.
The first digit shows the function, the last two digits show the value.

By pressing the step-button several times all functions will be displayed ;

function	description
1	T1 flow temperature
2	T2 return temperature
3	T3 storage tank temperature (if sensor is present)
4	T4 outdoor temperature
5	T5 flue-gas temperature
6	calculated flow temperature
7	temperature increase (°C/sec) NTC 1 flow
8	temperature increase (°C/sec) NTC 2 return
9	temperature increase (°C/sec) NTC 3 storage tank
A	T6 flow temperature second CH-circuit
b	water pressure analog (if present, option)
C	T7 heat-exchanger-block temperature
d	temperature increase (°C/sec) on NTC heat-echanger-block
E	ionisation current
F	analog input
G	analog output
H	MCBA internal temperature
I	number of CH ignitions (100-th./10-th.)
	seg e number CH of ignitions (thousands/hundreds)
	seg c number CH of ignitions (tens/ones)
J	CH burner hours high (100-th./10-th.)
	seg e CH burner hours medium (thousands/hundreds)
	seg c CH burner hours low (tens/ones)
L	number of DHW ignitions (100th./10-th.)
	seg e number of DHW ignitions (thousands/hundreds)
	seg c number of DHW ignitions (tens/ones)
N	DHW burner hours high (100-th./10-th.)
	seg e DHW burner hours medium (thousands/hundreds)
	seg c DHW burner hours low(tens/ones)

Notice : If storage tank sensor or outdoor sensor is not connected, this will be displayed as –37 under function 3 and 4.

Pressing the mode-button several times makes it possible to return to the normal operating mode (STBY).

5.5   Service-mode

For servicing purposes it is possible to make the boiler run on max. load or on min. load (CH-loads);
Press the "mode-button" several times until the display shows "**STBY**" for a moment. After this the normal operating status (1+2 digits) is shown.
By pressing simultaneously the mode and the – button for 3 seconds makes the character "**L**" visible on the display. This is service-mode "min. load" ; the boiler will run on minimum load for 15 minutes.
By pressing simultaneously the mode and the + button for 3 seconds makes the character "**H**" visible on the display. This is service-mode "max. load" ; the boiler will run on maximum load for 15 minutes.
After 15 minutes the service-mode will end automatically.
It is possible to stop at an earlier stage by pressing the + and the – button simultaneously.
For service purposes it is possible to set the boiler to a fixed fanspeed between minimum and maximum CH-fanspeed.
For this parameter 47 has to be set : 0 = min fanspeed and 100 = max fanspeed.
Parameter 47 is only accessible after entering the service-code. This fixed fanspeed mode will be displayed with a "T" followed by the flow-temperature.
After 15 minutes this mode will end automatically.

5.5.1   Disabling CH request

The CH function can be disabled by pressing the **+** button for 3 seconds ; the boiler will ignore any CH heat requests. The display will shortly show "c OFF".
Alternative way for disabling CH is to change setting of parameter 3 to "0".

Frost protection of the boiler and anti pump-sticking function remain active.

If the **+** button is pressed once again for 3 seconds the boiler will return to normal condition. The display will shortly show "c on".
Alternative way for enabling CH is to change setting of parameter 3 to "1".

5.5.2   Service code

To acces the service-level of the controller it is necessary to enter the service-code. This is done as follows ;
1. Press the mode-button several times until **STBY** is shown shortly on the display
2. Then simultaneously press MODE and STEP and hold for 3 seconds.
3. The display shows **CODE**. Release the MODE and STEP buttons.
4. After pressing STEP the character **C** appears followed by a two digit number.
5. Change number to service-code "54" by pressing the + or - button.
6. Shortly press STORE; as a confirmation the code number will blink two times.
7. The service-code is now active.
Shortly press MODE a few times to return to normal operating mode (STBY).

5.6   Tacho mode (FAN)

This mode is only accessible after entering the service-code.
Press the "mode-button" several times until the display shows "**FAN**".
Then press STEP.
The actual fanspeed is visible in 4 digits.
Pressing the mode-button several times makes it possible to return to the normal operating mode (STBY).

5.7   Error mode (ERRO)

This mode is only accessible after entering the service-code.
Press the "mode-button" several times until the display shows "**ERRO**".
Then press STEP.
The display will show numbers.
The first digit is blinking indicating that the error-mode is active.
The first digit displays the function, the last two digits display the value.
By pressing STEP several times all 7 functions can be displayed.

function	description
1	error code
2	status at moment of error
3	flow temperature at moment of error
4	return temperature at moment of error
5	storage tank temperature at moment of error
6	temperature of heat-exchanger block at moment of error

Using a PC with appropiate soft-and hardware makes it possible to read out the last 8 errors.

Pressing the mode-button several times makes it possible to return to the normal operating mode (STBY).

5.8   Parameter settings

	end user settings (free access) ;	using display	using PC	
1.	T3set DHW	60	60	"°C"
2.	DHW system	01	On	"off|on|pump cont"
3.	CH system	01	On	"off|on|pump cont"
4.	T1top CH-mode	80	80	"°C"

5.8 Parameter settings

	service settings (acces code 54)	using display					using PC		
10.	T1foot CH-mode	20					20		" ℃"
11.	T4 minimum	-10					-10		" ℃"
12.	T4 maximum	20					20		" ℃"
13.	T4 frost protection	-2					-2		" ℃"
14.	T4 correction	0					0		" ℃"
15.	T6top for 2nd CH circuit	40					40		" ℃"
16.	T6foot for 2nd CH circuit	20					20		" ℃"
17.	T6hysteresis for 2nd CH circuit	3					3		" ℃"
18.	Tblocking (0 = off)	28					28		" ℃"
19.	Booster time (0 = no booster)	0					0		"Minutes"
20.	Tparallel shift	20					20		" ℃"
21	Tplus : setvalue addition for DHW	20					20		" ℃"
		80	120	160	200	240	280		
22/23.	Maximum fanspeed CH	5900	5500	5800	5500	5900	5600		rpm
24/25.	Maximum fanspeed DHW	5900	5500	5800	5500	5900	5600		rpm
26/27.	Min. fanspeed CH and DHW	1600	1300	1200	1400	1350	1300		rpm
28.	Ignition fanspeed (x100)	1800	1800	1800	1800	1800	1800		rpm
29.	Fanspeed during forced low time (x100)	1600	1600	1600	1600	1600	1600		rpm
30.	Force burner low after CH start	06			54				"seconds"
31.	1st. slow start, temperature difference				10				" ℃"
31.	2nd slow start, fanspeed increment	-93			3 x 400				"rpm/min"
32	CH postpump time	15			15				"Minutes"
33.	DHW postpump time	11			112.2				"Seconds"
34.	CH modulation hysteresis on	05			5				" ℃"
35.	CH modulation hysteresis off	05			5				" ℃"
36.	DHW modulation hysteresis on	03			3				" ℃"
37.	DHW modulation hysteresis off	03			3				" ℃"
38.	DHW detection hysteresis on	03			3				" ℃"
39.	DHW detection hysteresis off	03			3				" ℃"
40.	CH blocking time	00			0				"Seconds"
41.	DHW blocking time	00			0				"Seconds"
42.	DHW -> CH blocking time	05			51				"Seconds"
43.	DHW time-out (max time for DHW)	90			90				"minutes"
44-1	1st digit : cascade adress	0			0				
44-2	2nd digit : RMCI address	8			8				
45-1	1st digit : 2nd CH-circuit	0			off				
45-2	2nd digit : CH type	0			room thermostat				
46-1	1st digit : DHW control 3-WV or pump	1			DHW pump				
46-2	2nd digit : DHW-type	3			tank + thermostat				
47.	Manual fanspeed	-01			-01				%
48-1	1st PWM-pump level during purge	4			4				
48-2	2nd PWM-pump level during postpump	1			1				
49.	PWM pump to low level (T1-T2)	10			10				℃"
50.	PWM pump to high level (T1-T2)	20			20				" ℃"
51.	PWM pump hysteresis (T1-T2)	05			5				" ℃"
52-1	1st PWM pump high level (level 3)	?			15				" (*4 +40)%"
52-2	2nd PWM pump low level (level 2)	?			0				"*4 %"
53.	1st pump settings for CH and DHW	0			0				
53.	2nd low/off cycle	0			Not active				

6   INSTALLATION

6.1   Installing the boiler

Take into account the local regulations and those that are prescribed by national law or authorities.

1. The boiler has to be installed in an area were it is allowed to install it.
   Make sure that this area is protected against the danger of freezing.
2. The area should be ventilated sufficiently in order to get rid of excess heat.
3. When delivered the boiler is on a pallet. The frame is mounted on two u-profiles.
   You can put 2 straps from one side beneath the boiler to the other side.
   With these straps and a few persons you can lift the boiler from the pallet.
4. Install the boiler on a flat non-combustible floor and level it by using its positioning bolts.
5. A minimum free space of 50 cm should be left on each side of the boiler for servicing purposes.
6. Remove the sealing/protection caps from the connection tubes.
   Notice: dirty water can come out of the boiler.
7. Fill the condensate trap with clean water.
   This can be done by flushing some water into the cast aluminium exhaust connection on the back. This water will then drain back to the syfon and fill it.

6.2   Frost protection

The <u>boiler</u> is protected against frost.
During longer periods of absence in the winter, the installation should remain functioning by partly opening the radiator valves.
Don't set the room thermostat to a lower value than 15 °C.

If the flow NTC senses a temperature lower than 7ºC the CH-pump will be activated. If temperatures keeps dropping the boiler will start at a flow temperature of 3ºC and it will run on minimum load till the flow NTC senses a temperature of 10 °C and the return NTC senses a temperature of 5ºC. The CH-pump will stay running for another 15 minutes. **This is only a protection for the boiler and does not protect the installation and its radiators against freezing.**

To protect frost sensitive radiators against frost it is possible to connect a frost thermostat in parallel with the room thermostat.
Another possibility is the use of an outdoor sensor in combination with parameter 13 ; the CH pump will be activated if the outdoor temperature drops below the set value (standard setting –2 °C).

6.3   Water connection

6.3.1   Pump
The boiler does not have a built in CH-pump. Therefore a CH-pump should be supplied and fitted by the installer. A pump should be selected to match the hydraulical resistance of the boiler and the installation.
In the graph below can be found the resistance characteristics for size of boiler

Hydraulical pressure-drop WTB 80,120,160,20,240,280
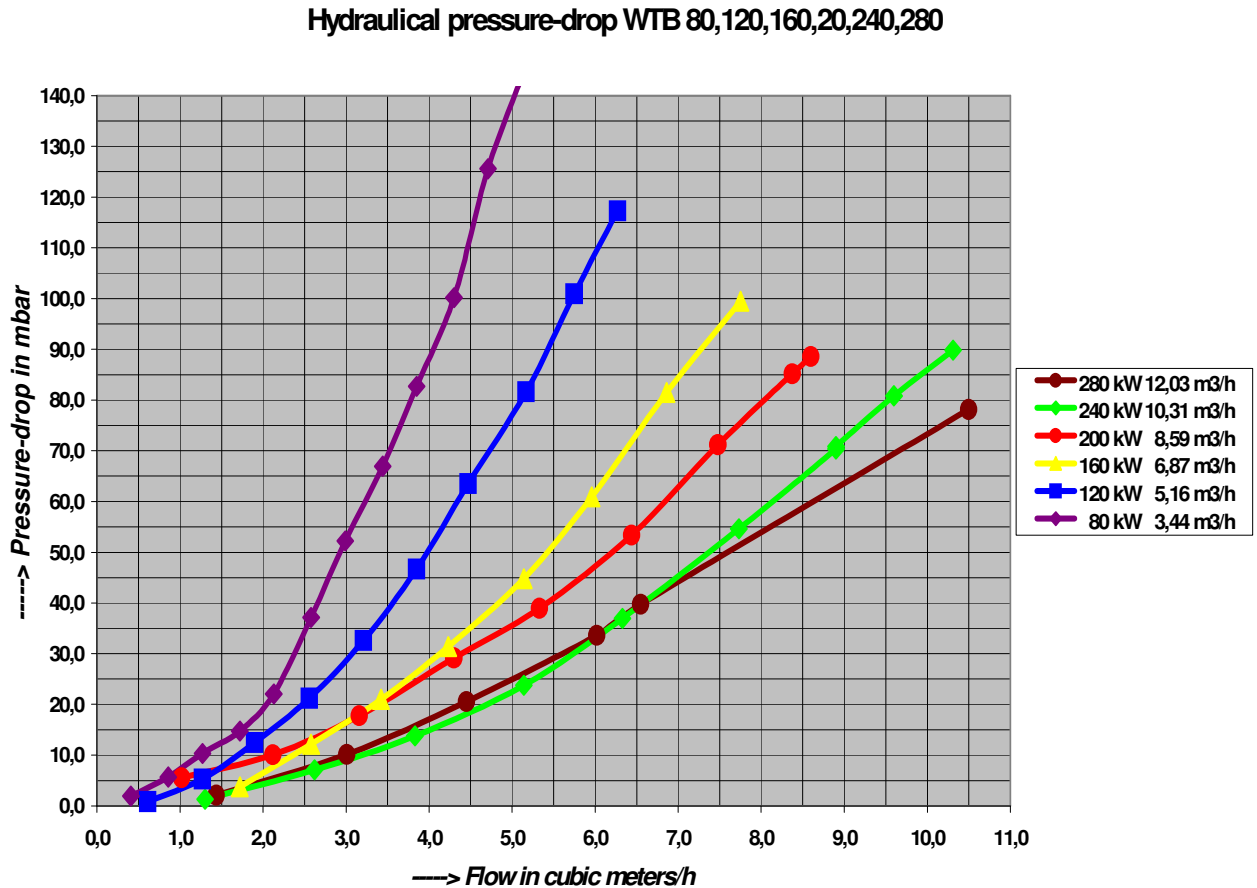
The power supply for the CH-pump or relay needs to be connected to the boiler terminal strip nrs 7 + 8 + 9.

Maxiumum current for CH-pump relay is 1 A
If more than 1 A is required an auxiliary relay should be added.

6.3.2 Minimum flow

The minimum flows as indicated in the table beneath should be guaranteed.

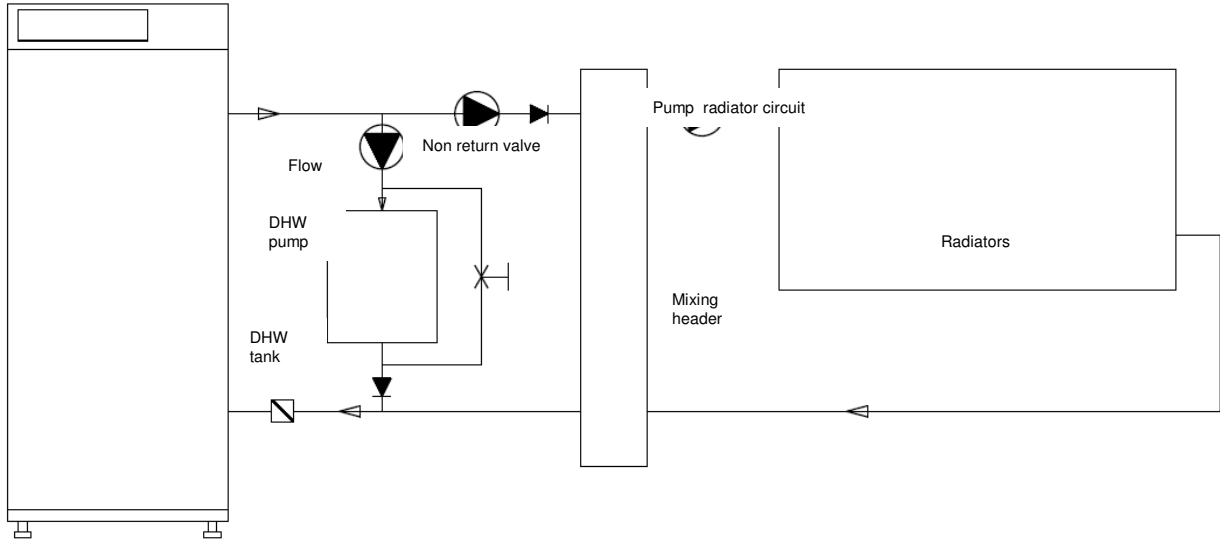| Boiler type	minimum load	ignition load *	maximum load
If flow temperature reaches 90 degrees modulation should always start and above 95 degrees the boiler must block			
WTB 280			
modulation start at delta T	25	25	**25**
operating on minimum load at delta T	30	**30**	30
blocking for at least 2 minutes at delta T >	**35**	35	35
minimum required flow in m³/h	1,28	2,58	9,62
WTB 240			
modulation start at delta T	25	25	**25**
operating on minimum load at delta T	30	**30**	30
blocking for at least 2 minutes at delta T >	**35**	35	35
minimum required flow in m³/h	1,18	2,1	8,25
WTB 200			
modulation start at delta T	25	25	**25**
operating on minimum load at delta T	30	**30**	30
blocking for at least 2 minutes at delta T >	**35**	35	35
minimum required flow in m³/h	1,08	1,88	6,87
WTB 160			
modulation start at delta T	25	25	**25**
operating on minimum load at delta T	30	**30**	30
blocking for at least 2 minutes at delta T >	**35**	35	35
minimum required flow in m³/h	0,66	1,26	5,5
WTB 120			
modulation start at delta T	25	25	**25**
operating on minimum load at delta T	30	**30**	30
blocking for at least 2 minutes at delta T >	**35**	35	35
minimum required flow in m³/h	0,54	1,09	4,12
WTB 80			
modulation start at delta T	25	25	**25**
operating on minimum load at delta T	30	**30**	30
blocking for at least 2 minutes at delta T >	**35**	35	35
minimum required flow in m³/h	0,49	0,7	2,75

*note if a controller is used that goes into non volatile lock-out after 13 consecutive blocks within 1 heat demand the flow as mentioned in the second column (ignition load) does not have to be guaranteed. However the flow as mentioned in the first and in the third column should always be guranteed.

6.3.3 Samples of installation configurations

Pump radiator circuit

Non return valve

Flow

DHW
pump

Radiators

DHW
tank

Mixing
header

The following two pages show some possible installation configurations.

Boiler circuit with DHW pump (boiler output > DHW output) and 1 group of radiators

Non return valve

Filter

Filter

On/off or modulating room thermostat

Pump radiator circuit

Non return valve

Flow

Boiler circuit with one group of radiators

Radiators
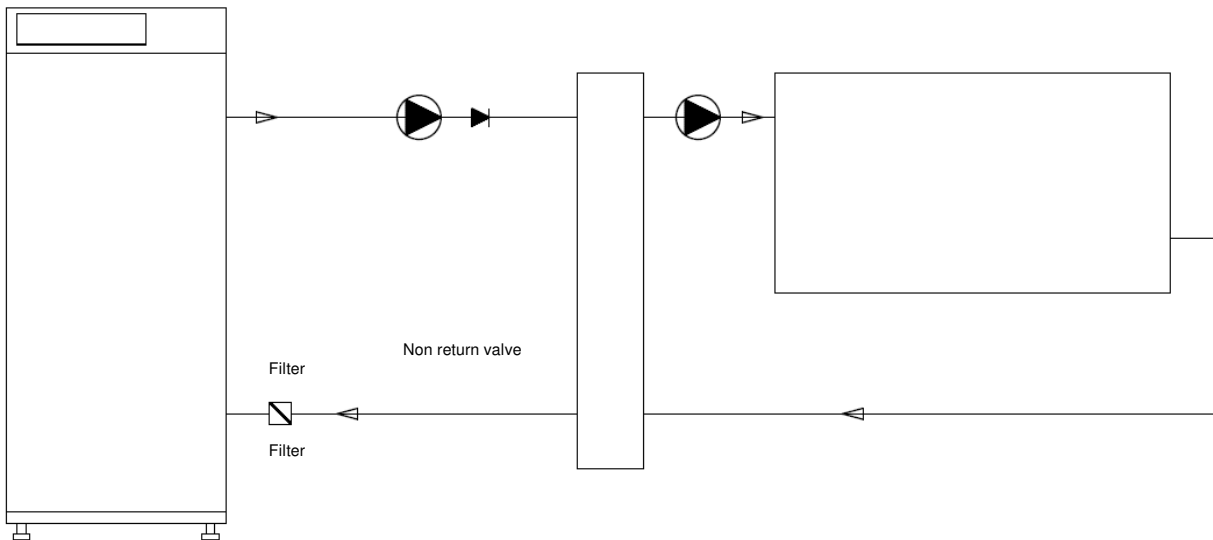
Mixing
header

On/off or modulating room thermostat
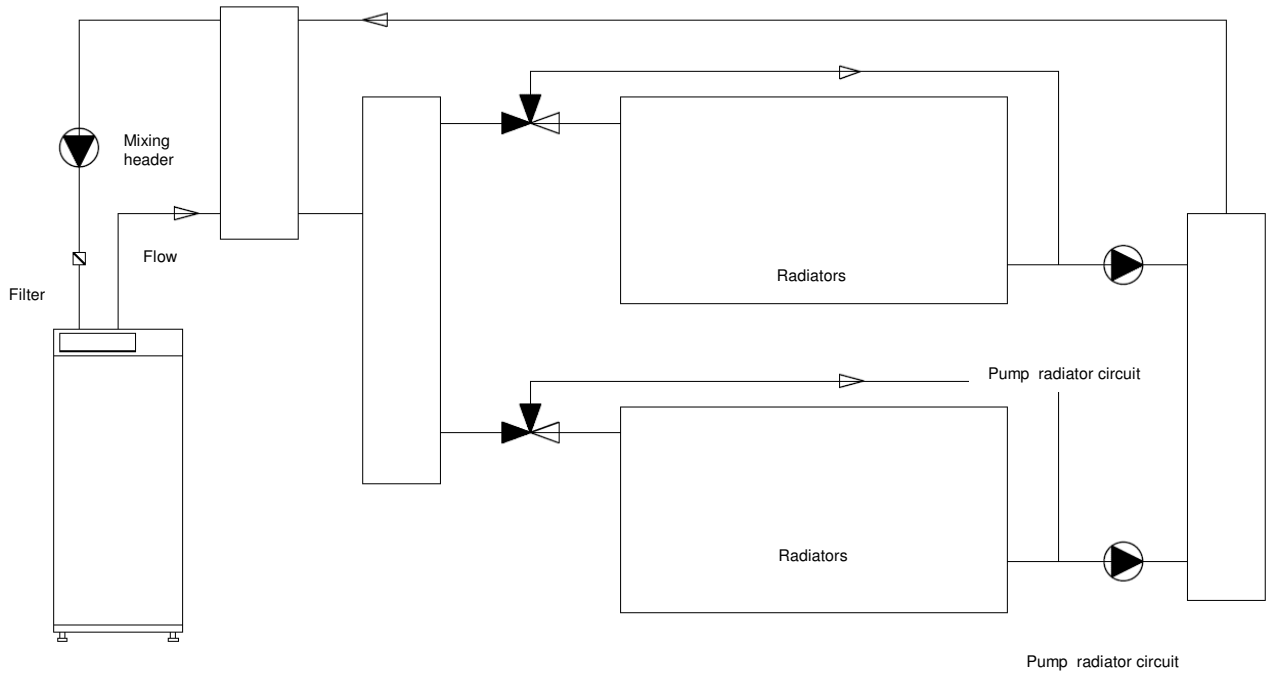
Boiler circuit with more groups of radiators
Outdoor sensing and pre-control on boiler flow temperature
Each group of radiators has its own outdoor sensing control
Curve of boiler flow temperature is on a 5 degrees higher level than the highest curve
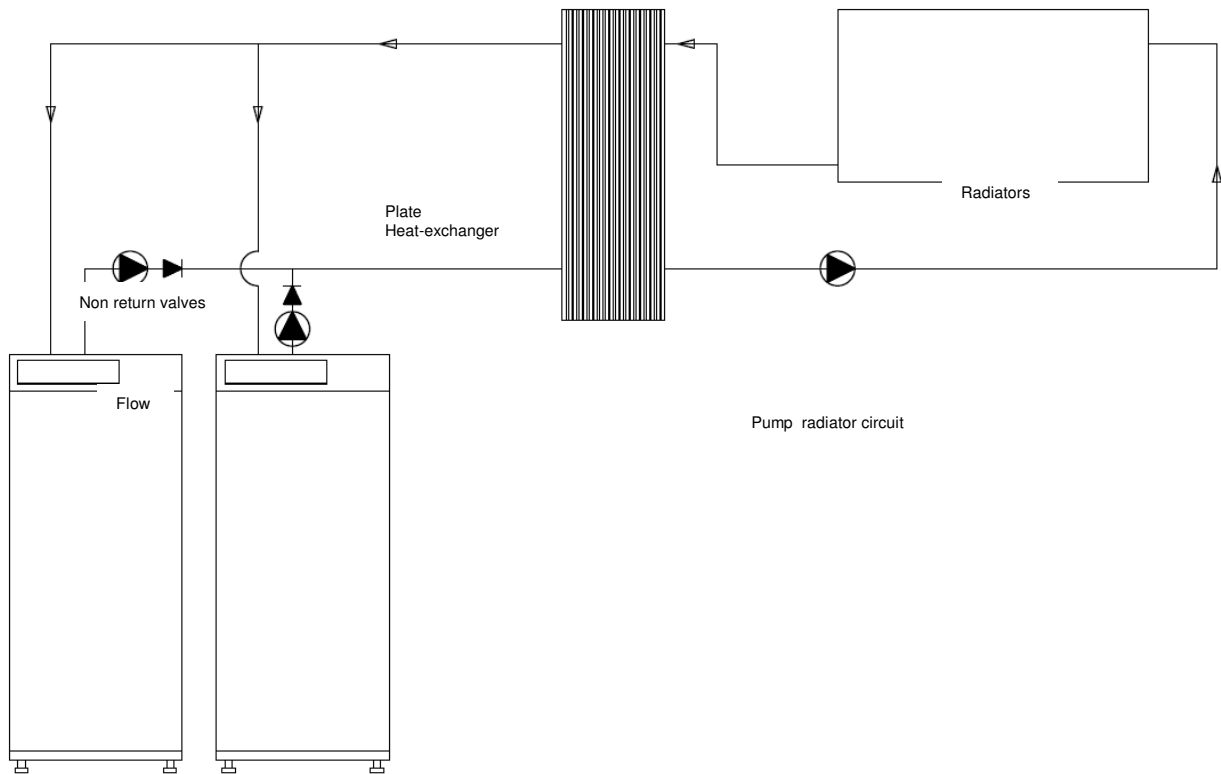
of the groups of radiators

Cascade with two boilers with group(s) of radiator(s) with outdoor control or
room thermostat. Plate heat-exchanger added to avoid pollution of the boilers

6.3.4 Water-treatment

- Before filling up the installation (old and new), the installation should be rinsed thoroughly with clean water from the tap. Preferably using water treatment cleaning products as listed below.
- The pH should be kept between 6,5 and 8,5 at all times
- The maximum allowed content of chlorides is 250 mg/ltr.
- At total hardness of 11,2 ºD (= 2 mmol/litre) the total volume of filled, refilled and topped up water must not exceed 20 litres / kW
  If this hardness value is exceeded then the total amount of filling, refilling and topping up water is calculated using the following formula : (11/hardness in ºD) x value given above.
  Example ; in case of water hardness of 15 ºD : (11/15) x 20 = 14,7 ltr/kW.
  If larger values are achieved the water should be softened.
  The water may only be partly softened until a value of 20 % of its original value, so if the initial hardness is 15 ºD, then it may only be softened to 3,0 ºD
  Note that water softening by means of ion exchange principle is not allowed.
  Never fill the installation with demineralised or destilled water because it will corrode the aluminum heat exchanger severly.
- The conductivity of the non treated installation water must not exceed the value of 600 µs/cm.
  If the installation water is treated with one of the products described below and according to the manufacturers instructions, the conductivity must not exceed 2000 µs/cm.
  If the conductivity is higher than the values mentioned, empty the system, flush and fill with clean tap water, preferably by adding the recommended cleaning products.
- There are many products available on the market which pretend to clean and protect heating systems. Unfortunately there are only a few that have really proven this in practice.Therefore Aluheat only allows the following quality products for water treatment ;
  Producer : Fernox   www.fernox.com
  - Cleaner F3   :   removes corrosion, lime and sludge
  - Protector F1   :   protects against corrosion, lime and sludge
  - Alphi-11   :   anti-freeze and protection against corrosion and lime
  Producer : Jenaqua GmbH   www.jenaqua.eu
  - Jenaqua 100 :   general protection
  - Jenaqua 200 :   de-scaling
  - Jenaqua 300 :   cleaning of grease and flux for new installations
  - Jenaqua 400 :   cleaning of sludge for old installations
  - Jenaqua 500 :   anti-freeze and general protection
  Note that these products have to be used strictly in accordance with the water treatment manufacturers instructions.

Furthermore we strongly recommend the following ;
- Use the above mentioned water treatment protection products to fill and protect the installation
- Use a log book to record waterfilling, refilling, topping up, water quality measurements and water treatment
- Only use diffusion tight material, especially for under floor heating
- always mount de-airing devices at the highest points in the installation.
- install valves in the installation near the boiler and on strategic locations (anticipating on future expansions of the system) to avoid fills, refills and topping up as much as possible.
- install a water meter to check the amount of filled, refilled and topped up water.
- install a filter in the return.
- install an extra heat-exchanger to separate the boiler from the installation in case of any doubts.
- avoid leakages and if there is a leakage repair as soon as possible.

6.3.5 Water connection general
1.   Water connections for flow and return are size 2"
2.   The installation must have a pressure relief valve and an expansion vessel. The capacity of this vessel should be sufficient for the installation.
3.   To avoid locking out of the boiler control it is recommended to install a by-pass in the installation to guarantee the minimum flow through the boiler.
       The by-pass valve should be mounted as far away from the boiler as possible to have the biggest possible content of the bypass-circuit (also a big radiator without valves could be used).
4.   Drain the condensate using a funnel and a stench-trap to the sewer.
5.   At the highest point of the installation a venting device should be installed.

6.4 Gas connection
1. The gas connection should be made according to the applicable rules and regulations.
2. The gaspipe of the boiler has connection R 1"
3. In order to avoid blockage of the gasvalve, ensure that there is no dirt left in the gas pipework serving the boiler.
4. The highest allowable inlet pressure for the gasvalve is 50 mbar.
5. Check the heat input of the boiler.

6.5   Air-supply and flue-gas connection

Air connection   :   All types have an air connection ø 110 mm
Flue gas connection   :   ø 150 mm for types 80, 120, 160
                              ø 200 mm for types 200, 240, 280

Possibilities for air / flue system ; B23   B33   C13   C33   C43   C53   C63   C83

As standard the boiler is delivered as type B23 ; the air is taken from inside the jacket. If one wants to take fresh air from outside, then first a plastic pipe ø 110 x appr. 1 m has to be connected to the air inlet inside the casing.

For this the frontcover, topcover and left side cover need to be removed. Rotate the existing short air inlet pipe 90 degrees down towards the back. Make sure that the silicon tube remains connected to the short air inlet pipe. Other pipes should be connected to this pipe in order to take the air from outside.

The boilers can produce flue gas with very low temperatures, what leads to condensation in the flue pipes and flue terminal. Therefore one should always fit an ice-free terminal.

A vertical terminal is recommended.

It is also recommended that a full aluminium flue system is used. If a non-aluminium flue system is used, the condensate from it must be drained before it flows back into the aluminium parts of the boiler. This must be done, otherwise aggressive condensate from the non-aluminium flue system can corrode the aluminium parts of the boiler.

Air supply and flue-outlet should be in the same pressure area.
If the inlet air contains dust or dirt a filter should be installed in the air-supply.

Flue-outlet and air-supply calculations;

The total pressure drop available for the flue-outlet and air-supply is given in the table below.
If the combined inlet/outlet system consumes more than the allowed maximum, this will result in an unacceptable drop of more than 5% of the heat input.

The table below gives an indication of the maximum length (in mtrs) for parallel air-supply and flue-outlet pipes.

type	max. allowed pressuredrop	parallel ø110/ø150	parallel ø110/ø200	parallel ø150/ø150	parallel ø180/ø180	parallel ø200/ø200
80	100 Pa	32 m		110 m		
120	100 Pa	14 m		50 m		
160	150 Pa	12 m		27 m	112 m	
200	150 Pa		9 m		75 m	120 m
240	150 Pa		6 m		45 m	82 m
280	150 Pa		4 m		33 m	60 m

Remark :
-One bend 45° equals in resistance approx. 1 m straight pipe.
-One bend 90° equals in resistance approx. 2 m straight pipe.

Note : C4 and C6 appliances may only be equipped with KOMO and Gastec QA materials and terminals that are approved according to GASTEC norm nr 83.
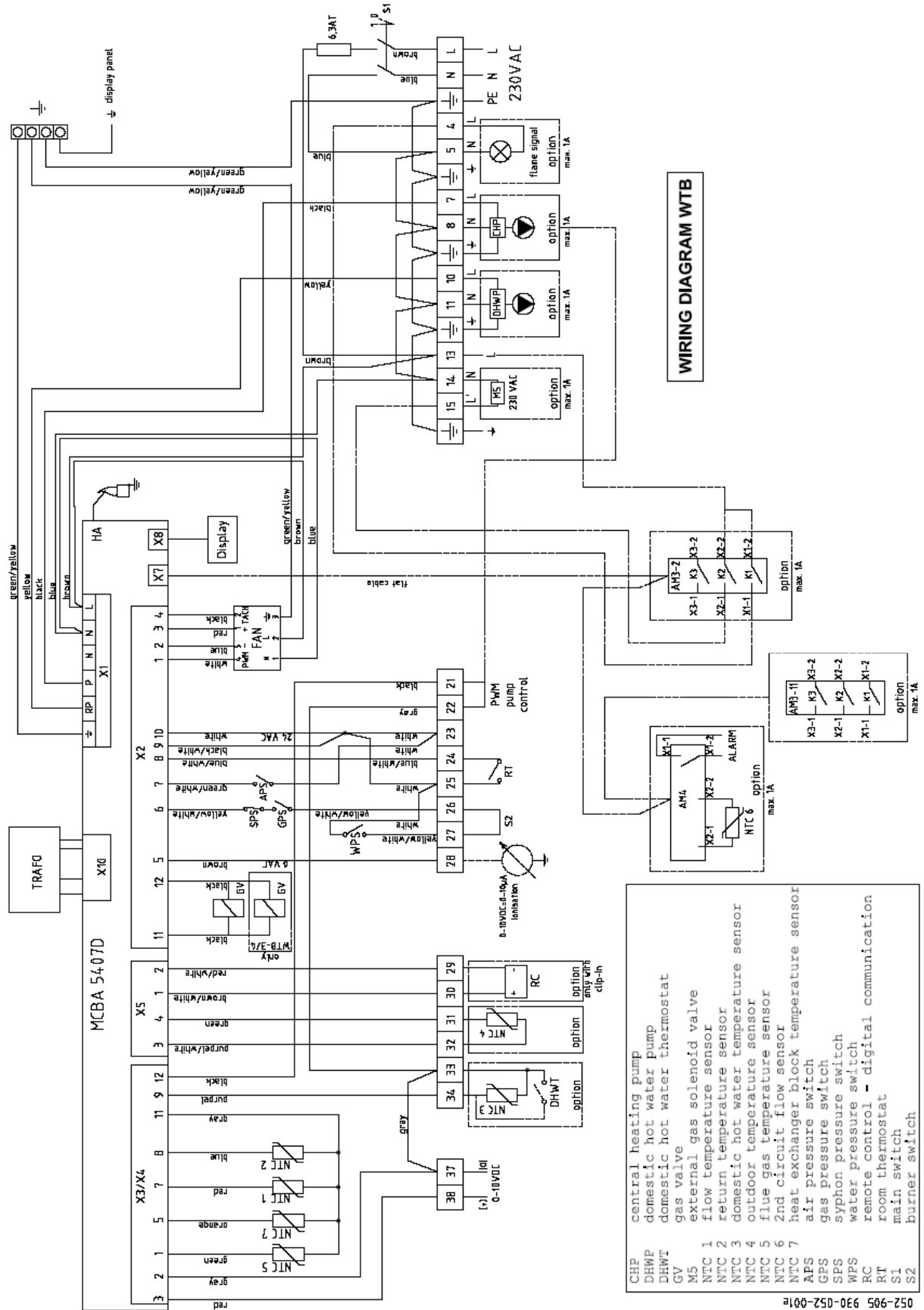Where non-aluminium flue-gas materials are used the condensate should be collected before entering the boiler. The chimney-pieces that are already present in the sump are part of the boiler and must not be removed.

6.6   Electrical connection

1. The electrical installation should be in accordance with national and local regulations.
2. As standard the boiler is configured for 230V/1ph / 50 Hz
3. The terminal strip is accessible by opening the front cover behind which the control is mounted.
4. The boiler should be connected to the mains electricity supply (position L, N and earth on the terminal strip). Connection should be made using a double-pole mainswitch with an opening gap of at least 3 mm between the contacts.
    Use the plastic tube on the right side to put the 230V cables through.
5. It is not permitted to change the internal wiring fitted by the manufacturer.
6. The maximum permitted cross sectional area of the wire is 0,75 mm^2. The contacts of the room thermostat have to be potential free.
    The On-Off room thermostat should be connected to the numbers 24 and 25 of the strip.
    The 0-10 V DC should be connected to the numbers 37 and 38
    Digital communication to the numbers 29 and 30.
    Use the plastic tube on the left side to put the low voltage cables through.
7. For connection of a clock thermostat that is fed with a 24 V supply from the boiler 2,4 VA on numbers 23 and 28 of the strip is available.
8. If a storage tank is connected to the boiler, the tank thermostat (or the tank NTC) should be connected to the numbers 33 and 34 on the strip.
    Note that a tank NTC should have a 12 kohm at 25 ºC (see NTC table at 6.6.2.)
9. The CH pump should be connected to the numbers 7 + 8 + 9 on the strip.
    Maximum current is 1A.
10. The DHW pump (or 230 VAC 3-way valve) should be connected to numbers 10 + 11 + 12 on the strip. Maximum current 1A.
11. If the CH pump or DHW pump consumes more than 1 A, it needs to be switched by an auxiliary relay.
12. The main-fuse (6,3 A) is near the on/off switch on the right side of the control panel.

Also see wiring diagram on next page

6.6.1 Wiring diagram

WIRING DIAGRAM WTB

CHP	central heating pump
DHWP	domestic hot water pump
DHWT	domestic hot water thermostat
GV	gas valve
M5	external gas solenoid valve
NTC 1	flow temperature sensor
NTC 2	return temperature sensor
NTC 3	domestic hot water temperature sensor
NTC 4	outdoor temperature sensor
NTC 5	flue gas temperature sensor
NTC 6	2nd circuit flow sensor
NTC 7	heat exchanger block temperature sensor
APS	air pressure switch
GPS	gas pressure switch
SPS	syphon pressure switch
WPS	water pressure switch
RC	remote control - digital communication
RT	room thermostat
S1	main switch
S2	burner switch

052-905 930-052-001e

6.6.2 Table resistance NTC's

temperature [°C]	resistance [Ω]
- 20	98.200
- 15	75.900
- 10	58.800
- 5	45.900
0	36.100
5	28.600
10	22.800
15	18.300
20	14.700
25	**12.000**
30	9.800
35	8.050
40	6.650
45	5.520
50	4.610
55	3.860
60	3.250
65	2.750
70	2.340
75	1.940
80	1.710
85	1.470
90	1.260
95	1.100
100	950

6.7 Pneumatic connections

A pneumatic diagram is given in the figure below.
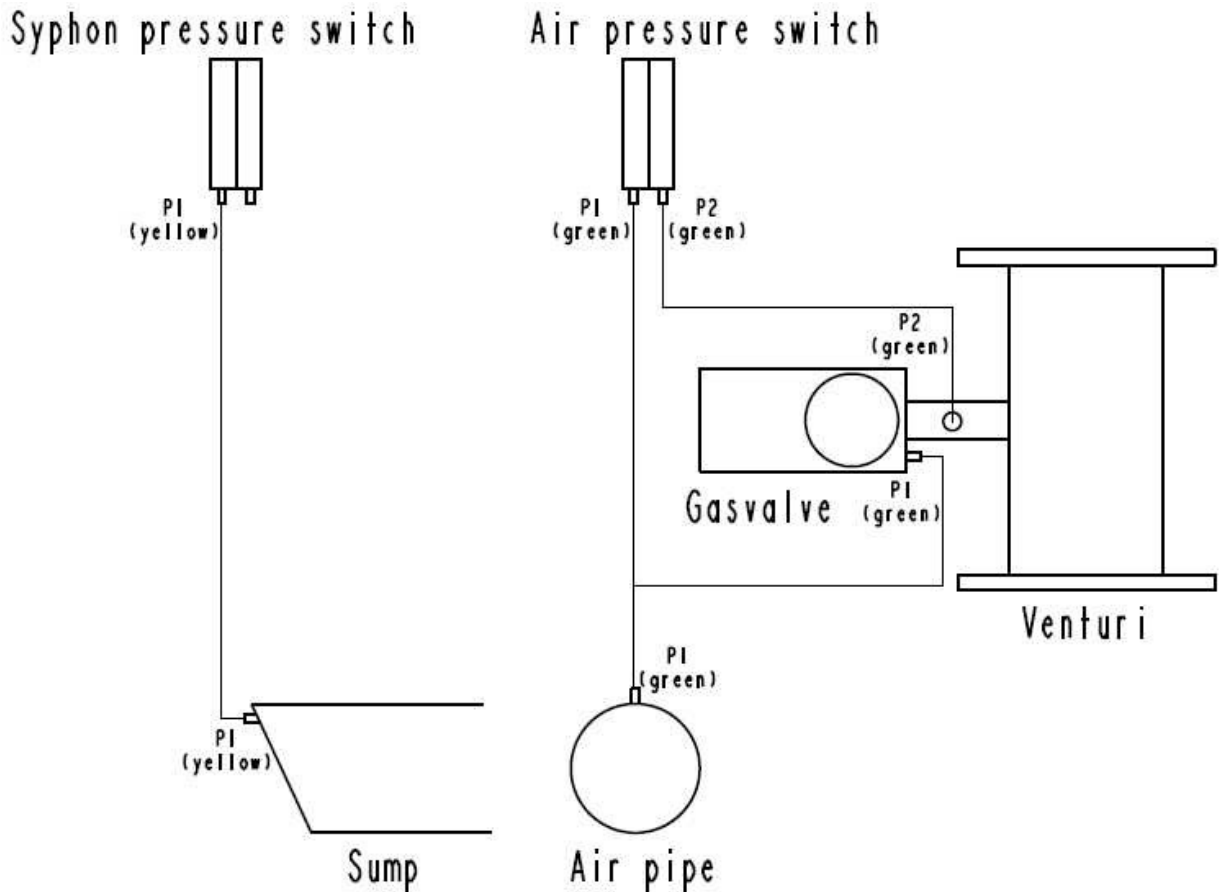
The syphon pressure switch, connected to the sump (P1 yellow), prevents overflow of the syphon if there is too high a back pressure in the chimney.

The air pressure switch, connected to the air pipe (air needed for combustion (P1 green)) and the venturi (P2 green), checks the amount of air (by means of a Δp measurement) before start.

6.8 PC-connection
For information regarding connection of a PC to the boiler please contact your supplier.

7   PUTTING INTO OPERATION

1. Fill and vent the installation. Fill the boiler until a pressure between 1.5 and 2 bar is achieved. The maximum working pressure is 6 bar. The boiler (not the installation !) is vented by a built in automatic venting device.

2. Check all gas and water connections thoroughly for leaks.

3. Vent the gastube.

4. As standard the boiler is set for G20 gas.
   Check that the correct category of gas is being supplied to the boiler.

5. Check the inlet pressure : 20 mbar

6. Switch the boiler on setting the mains switch on the control panel of the boiler to position 1.

7. Create a heat demand.

8. Just before ignition the control checks if the contacts of the gas pressure, syphon pressure and water pressure switches are closed.
   If not, the boiler will lock out and the display will show a blinking **b 26** code.
   After appr. 3 minutes the boiler will automatically initiate a new start cycle.

9. If gas, water and syphon pressure are o.k. the burner will ignite.

10. Thoroughly check the flue-gas joints for leakage.

11. Check the heat input and the gas pressure at maximum load.

12. Heat up the installation, then switch off the boiler.

13. Vent the installation again, topping up the water system water pressure if required.

14. Explain the function and operation of the boiler to the user.

15. Explain to the user the significance of error codes and the need to report them when requesting service engineer support.

16. After installation the datasheet as shown in chapter 9.1 should be filled in.
    This has to be repeated at every service-interval.

17. Safely store the Installation and the User manual preferably in close proximity to the boiler.

7.1 Gas Category

The types of gas and supply pressures vary per country.

In the table below the gascategory and supply pressure are listed per country.

| country	category	pressure	pressure
AT	II2H3P	H-20 mbar	P-50 mbar
BE	I2E(R)B or I3P	E-20/25 mbar	P-37 mbar
CH	II2H3P	H-20 mbar	P-50 mbar
CZ	II2H3P	H-20 mbar	P-30 mbar
DE	II2ELL3P	ELL-20 mbar	P-50 mbar
DK	II2H3P	H-20 mbar	P-30 mbar
ES	II2H3P	H-20 mbar	P-37 mbar
FI	II2H3P	H-20 mbar	P-30 mbar
FR	II2Esi3P	E-20/25 mbar	P-37 mbar
GB	II2H3P	H-20 mbar	P-37 mbar
GR	II2H3P	H-20 mbar	P-37 mbar
HU	II2H3P	H-25 mbar	P-30 mbar
IE	II2H3P	H-20 mbar	P-37 mbar
IS	I3P		P-30 mbar
IT	II2H3P	H-20 mbar	P-37 mbar
LU	II2E3P	E-20 mbar	P-37 mbar
NL	II2L3P	L-25 mbar	P-30 mbar
NO	II2H3P	H-20 mbar	P-30 mbar
PL	II2H3P	H-20 mbar	P-30 mbar
PT	II2H3P	H-20 mbar	P-37 mbar
SE	II2H3P	H-20 mbar	P-30 mbar
SL	II2H3P	H-20 mbar	P-30 mbar
LET			
EST			
LIT			

7.2   Adjustment % CO₂ and check on input

The boiler is equipped with an automatic gas/air regulator. This means that the amount of gas is regulated depending on the amount of air. The % CO_2 needs to be adjusted according to the table below ;
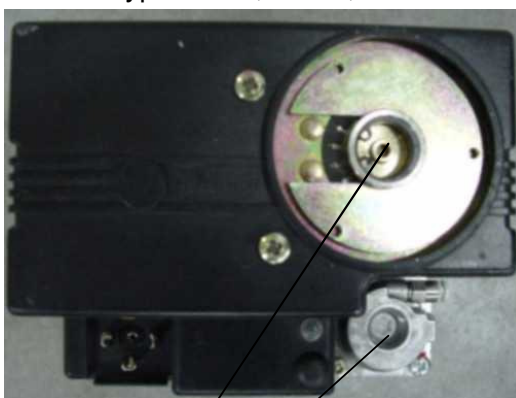
Type of boiler	Gas type	inlet pressure	%CO₂ on max load	%CO₂ on min load
120-4	G20 / G25	20 / 25 mbar	9,3 ± 0,2	9,1 ± 0,2
160-5	G20 / G25	20 / 25 mbar	9,3 ± 0,2	9,1 ± 0,2
200-6	G20 / G25	20 / 25 mbar	9,3 ± 0,2	9,1 ± 0,2
240-7	G20 / G25	20 / 25 mbar	9,3 ± 0,2	9,1 ± 0,2
280-8	G20 / G25	20 / 25 mbar	9,3 ± 0,2	9,1 ± 0,2

The boiler has a gas valve which is connected to a venturi. See figure below ;
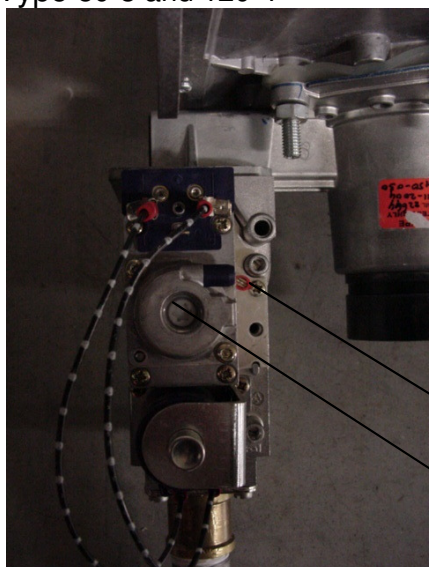
Type 80-3 and 120-4   Type 160-5, 200-6, 240-7 and 280-8

Throttle

Off-set

Adjustment for max. load ;
- put the boiler into service-mode **H** (press MODE and **+** button for 3 sec)
- wait until the boiler is stable and measure %CO2
- if required, correct CO_2 with the throttle ; turning to the right gives a lower CO_2 percentage (a ½ turn (180°) gives a change of approximately 0,2 %CO_2)
- service-mode H can be finished by pressing the **+** and the **–** button simultaneously for 3 seconds.

Adjustment for min. load ;
- put the boiler in to service-mode **L** (press MODE and **-** button for 3 sec)
- wait until the boiler is stable
- if required, correct the CO_2 with the offset ; turning to the right gives a higher CO_2 percentage   Notice : this offset adjustment is very sensitive : half a turn (180°) gives a change of approximately 1 % CO_2.
- service-mode L can be finished by pressing the **+** and the **–** button simultaneously for 3 seconds.

After 15 minutes in service mode H or L the boiler will automatically return to its normal operating conditions.

Check on heat input
In the table below the relationship between nominal input and rpm and gasflow is given ;

Nominal input	80	115,9	160	200	240	280	**[kW H$_i$]**
Fanspeed	5900	5500	5800	5500	5900	5600	**[rpm]**
Gasflow G20	8,1	12,1	16,1	20,1	24,2	28,2	**[m^3/h]**

Notice : the minimum input CH and DHW is the same and is set to a fixed value of 20, 22, 27, 44, 48 and 52 kW.

If the gasflow is too low there is probably dirt (obstruction) in the air/flue system. Check and if necessary clean. The gasflow must be checked again.

7.3   Adjustment for propane (G31)

At the factory the boiler is set for operation on natural gas.
If the installation is supplied with propane, the max load fan speed and %CO2 need to be adjusted according following table ;

Type	gas type	fan speed max load	%CO$_2$ max load	%CO$_2$ min load
80-3	G31	5400	10,6 ± 0,3	10,3 ± 0,3
120-4	G31	5000	10,6 ± 0,3	10,3 ± 0,3
160-5	G31	5200	10,6 ± 0,3	10,3 ± 0,3
200-6	G31	5000	10,6 ± 0,3	10,3 ± 0,3
240-7	G31	5300	10,6 ± 0,3	10,3 ± 0,3
280-8	G31	5000	10,6 ± 0,3	10,3 ± 0,3

First adjust the fan speed ;
 • fan speed max load CH can be adjusted by means of parameter 22
 • fan speed max load DHW can be adjusted by means of parameter 24

Then adjust the %CO2 by means of the procedure as described in **7.2**
First adjust at max load, then adjust at min load and finally re-check at max load.

After these adjustments the gas type labelling should be modified ;
 • remove old sticker G20 or G25 and put new sticker G31 on
 • remove old sticker gas-inlet pressure and put new sticker inlet pressure on

Fan speed for ignition and minimum load for G31 remains the same as for natural gas.

8   ERRORS

8.1   General

If there is no data visible on the display, the fuse (6.3 AT) in the controlpanel near the mainswitch should be checked (as well as the position of the on/off switch) and should if necessary be replaced (after the cause for break down has been determined).

THIS FUSE IS PART OF THE 230 V CIRCUIT.
SO FIRST SWITCH OFF AT THE MAINS!

If there is still no data visible on the display, one has to check if there is 230 VAC supply on the connections "L" and "N" of connector X1 in the MCBA.
Also see electrical wiring diagram.

If there is no supply, then 230 V fuse F1 2 AF inside the MCBA should be renewed.
Notice : for this it is **not** necessary to unscrew the MCBA from the mounting plate
Release the three security clips (on the right side, left upper corner and left lower corner) with a long thin screw driver. Then remove the black protective cover of the MCBA. Replace the 230 V fuse F1 2AF inside the MCBA.
The blown fuse could be caused by a short-circuited pump. That is why the CH-pump and eventually the DHW pump should also be checked.

If the 230 V fuse is o.k. and the display is still blank, then the flat-cable of the display should be checked. If this one is also ok, the MCBA should be replaced.

If there is something shown on the display but there is no further activity, it could be that the fuse F3 4 AT inside the MCBA is blown. This fuse should be checked.

If you are not sure there is any heat demand, you can force the boiler to start by pressing buttons MODE and **+** simultaneously for 3 seconds.

At heat demand, the boiler control will perform zero-check of the air pressure switch before starting the fan (**5** in display). After that the fan will start and wait for air pressure switch to close. As soon as APS has closed, code "**1**" will appear in display.
APS closes at $\Delta P > 1,6$ mbar
If there is a problem with APS, display will show code **b 08, b 28, b 29,b 61 or b 65**.

Subsequently 5 seconds prepurge (code "**1**" in display).

The boiler control checks the status of the built-in pressure switches for water, gas and syphon just before ignition ; Water pressure should be > 1.2 bar
Gas pressure should be > 14 mbar
Syphon pressure should be < 4 mbar
If one of those switches is open, the control will lock out for 2.5 minutes.
This is indicated on the display by "**b 26**".   No resetting required.
After 2.5 minutes a new cycle starts during which the pressure switches are checked again. If switches are closed, the boiler will automatically operate again.
If not, 2.5 minutes later it will lock out again. Those lock outs will continue repeatedly until pressure switches are all closed.

8.2   DHW errors

Boiler does not respond to DHW heat request
- Check the storage tank-NTC or thermostat and its wiring
  (also see electrical wiring diagram).
- Check if hot water preparation is switched on (parameter 2 must be 1 or 2)

Insufficient DHW flow
- Dirty filters in taps.
- Insufficient waterpressure.

DHW temperature too low
- Tapping flow too high
- Setting of temperature (parameter 1) too low
- Leakage 3-way valve (towards CH-circuit)
- Faulty DHW pump
- DHW operation set to off (parameter 2)
- Storage tank-NTC or thermostat and or wiring defect.
- Input too low due to too much resistance in air/flue system.

Boiler operates only for DHW
- Storage tank-NTC or thermostat defect and or its wiring.
- 3-way valve defect (remains in direction towards storage tank)

8.3   CH-errors

CH circuit stays cold
- Incorrect connection to the main.
- Main switch off.
- Room thermostat defect, incorrect wiring, setting too low
- Outdoor sensor and/or its wiring defect.
- CH operation off (parameter 3 must not be 0)
- 3-way valve defect (remains in direction towards storage tank)

8.4   Errors and lock outs

Errors and lock outs are indicated by flashing codes on the display.

An error is a so-called non volatile lock-out. This means that it is a final stop and that a manual reset is required to enable normal operation again (eg max temp limit).
An error is displayed by an **E** followed by a two digit fault-code.

A block is only a temporary stop ; the boiler will automaticly resume normal operation after the cause of block is solved (eg gas pressure too low).
It is not necessary for the customer to press the RESET-button.
A block is displayed by a **b** followed by a two digit fault-code.

The cause of error or block can be found with the help of the error-list.
The conditions under which the error occurred can be read out either by the error-mode on the display or with the help of a PC.

After the cause of error has been determined and the error has been solved, the boiler can be put back into operation again by pressing the "reset"-button.

If the main power is interrupted after an error has occurred, the original error-code will not be displayed again. In this case the display will show error " **E 04** " after the main is switched on again.
The original error code is lost.

Kind of error		description
Flame signal	00	Check if the gasvalve is powered (24V). If it is, the controller (MCBA) needs to be replaced. If not, the gasvalve could be defective. Check for wet ignition electrode
No flame signal	02	Check if there is a gas-flow. Check ignition wiring and ignition electrode. Check position of throttle on gasvalve. If no sparks are visible, the resistance of the ignition-cable should be measured. The resistance of the cable including the caps should be 1000 Ohm.
Control		**03, 04, 05, 06, 07, 11, 13, 14, 15, 16, 17, 43, 44, 60 and 115** indicate an internal failure. If after several resets this failure keeps coming back, the controller should be replaced.
Control	Fuse 26	24 V glass-fuse in MCBA defect gas pressure or water pressure too low or syphon pressure (exhaust pressure) too high
Temperature sensing	24	NTC1 and NTC 2 connections reversed
	31	NTC 1 (flow) short-circuited
	32	NTC 2 (return) short-circuited
	33	NTC 3 (storage tank) short-circuited
	35	NTC 5 (flue-gas) short-circuited
	36	NTC 1 (flow) open circuit
	37	NTC 2 (return) open circuit
	38	NTC 3 (storage-tank) open circuit
	40	NTC 5 (flue-gas) open circuit
	107	NTC 7 (heat-exchanger block) short-circuited
	108	NTC 7 (heat-exchanger block) open circuit
	110	NTC 7 (heat-exchanger block) temperature too low
Airflow	08	Air pressure-switch not closed
	28	Fan does not work / no tacho signal.
	29	Fan stays active / open control
	61	Air pressure-switch won't open
	65	Not enough power for fan
Maximum temperature	18	Flow temperature too high (> 100 °C). Check for sufficient system flow. Check if pump is running (light vibration of pump-housing should be noticable).
	19	Return temperature too high
	25	Too fast increase of flow-temperature : probably no flow
	30	Temperature-difference between flow and return too high
	52	NTC 5 (flue-gas) too high temperature
	83	NTC 6 (second circuit) too high
	109	NTC 7 (heat-exchanger block) temperature too high
	111	Maximum difference between T7 and T2 exceeded
	112	too fast increase of heat exchanger block temperature
Water pressure	62	Low water pressure (in case of optional analog sensor)

9   MAINTENANCE
Maintenance should always be done by a qualified installer.
Every year this maintenance service-interval should be done (see also 9.1)

Put the boiler into operation on max. load in the service-mode **H** (see description 5.5 service-mode). Determine the heat input of the boiler. Check %CO_2.
Compare the heat input with the one measured on installation. If the heat input is now considerably lower then there probably is an obstruction in the air inlet or the flue-outlet or in the boiler itself.
Switch off the boiler. First check the air-inlet and the flue-outlet.
Disconnect from the main. Remove the front cover, top cover and side cover.
Remove the syphon and clean it.

Remove the inspection cover* of the sump on the front side beneath the control.
The inner part of the sump and the bottom part of the heat-exchanger can be inspected and, if necessary, cleaned.
If the bottom part of the heat-exchanger is clogged, the inspection covers on the left-side of the heat-exchanger should be removed*. Using a special tool (see figure below) makes it possible to clean the heat-exchanger lids partially .
In case of pollution of the sump it is also advisable to inspect the upper part of the heat-exchanger as well. Remove the fan* together with the burnerhood*, the gasvalve* and the gastube*. Now the burner* is visible and can be taken out and inspected. If necessary clean the cold side with a vacuum cleaner (or carefully with compressed air) and a nylon brush (**never use a steel brush**). Inspect the combustion chamber. In case of a polluted heat-exchanger it can be cleaned with water. Check the burner sealing* and replace if necessary.
Refill the condensate trap with clean water and reconnect it.
Check the electrode, especially the distance between the two pins (3,5± 0,5 mm). Replace electrode if necessary.
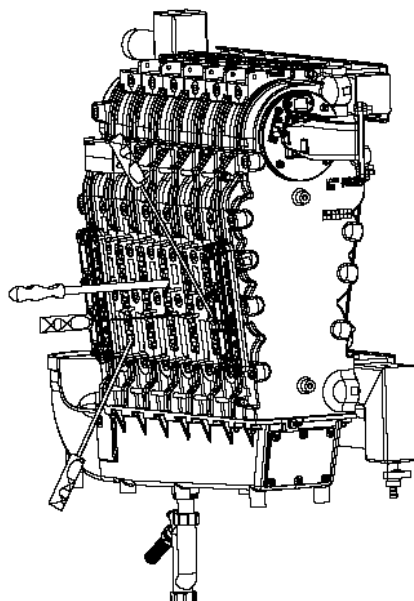Put everything back in its place. Check the CO_2-content and correct if necessary.
Check the gas-parts for leakages.
Check the flue-gas parts for flue-gas leakages and condensate leakages.
Notice : be carefull during inspection not to damage sealings.
All damaged and/or by ageing or other causes influenced sealings should be replaced.

9.1 Service-maintenance table

When putting the boiler into operation for the first time, we advice that the following be measure, load, CO2, CO, T flow, T return, ΔP air pressure switch and P syphon pressure switch and write the values down in the table below.

Measure these values when the boiler is in equilibrium at maximum load.
You can force the boiler to maximum load by pressing the display buttons "MODE" and " + " simultaneously for 3 seconds (also see chapter 5.5).

During periodical maintenance we advise that you measure and write down the above values also and compare them eith the previous values, analysing any change.

date	gasflow $[m^3/h]$ or load [kW]	CO_2 [%]	CO [ppm]	T_{flow} [℃]	T_{return} [℃]	ΔP air pressure switch [mbar]	P siphon pressure switch [mbar]

At the factory the maximum load of the boiler was measured within 5% tolerance of the nominal load.
In the field the load can decrease due to more resistance in the boiler, the air inlet or the exhaust outlet or a malfunctioning of the fan.

At maximum load the installation should be designed for nominal ΔT of 15 K to 20 K.
When the ΔT is higher than 25 K, the boiler cannot run on maximum load anymore and will start to modulate as water flow through the boiler is insufficient.
T flow and T return can be read in "info mode" on the display (see 5.4)
Valves, malfunctioning pumps, dirt, corrosion products from the installation, dirty filters etc. can have negative impact on water flow through the boiler.

Before ignition the boiler control checks ΔP air pressure switch during prepurge. After prepurge the ΔP aps is ignored by the boiler control. If the value is decreasing over the years, this could indicate e.g. malfunctioning of the fan, polluted air inlet, polluted burner, polluted heat exchanger or polluted exhaust system.

Syphon pressure (P sps) should be smaller than the maximum allowable flue resistance. If P sps is too high (> 5.3 mbar), the boiler will be stopped.
In this case the exhaust system is probably blocked.

10 DRAWINGS

10.1   EXPLODED VIEW HEAT-EXCHANGER

Drawing 801-052-006 sheet 4
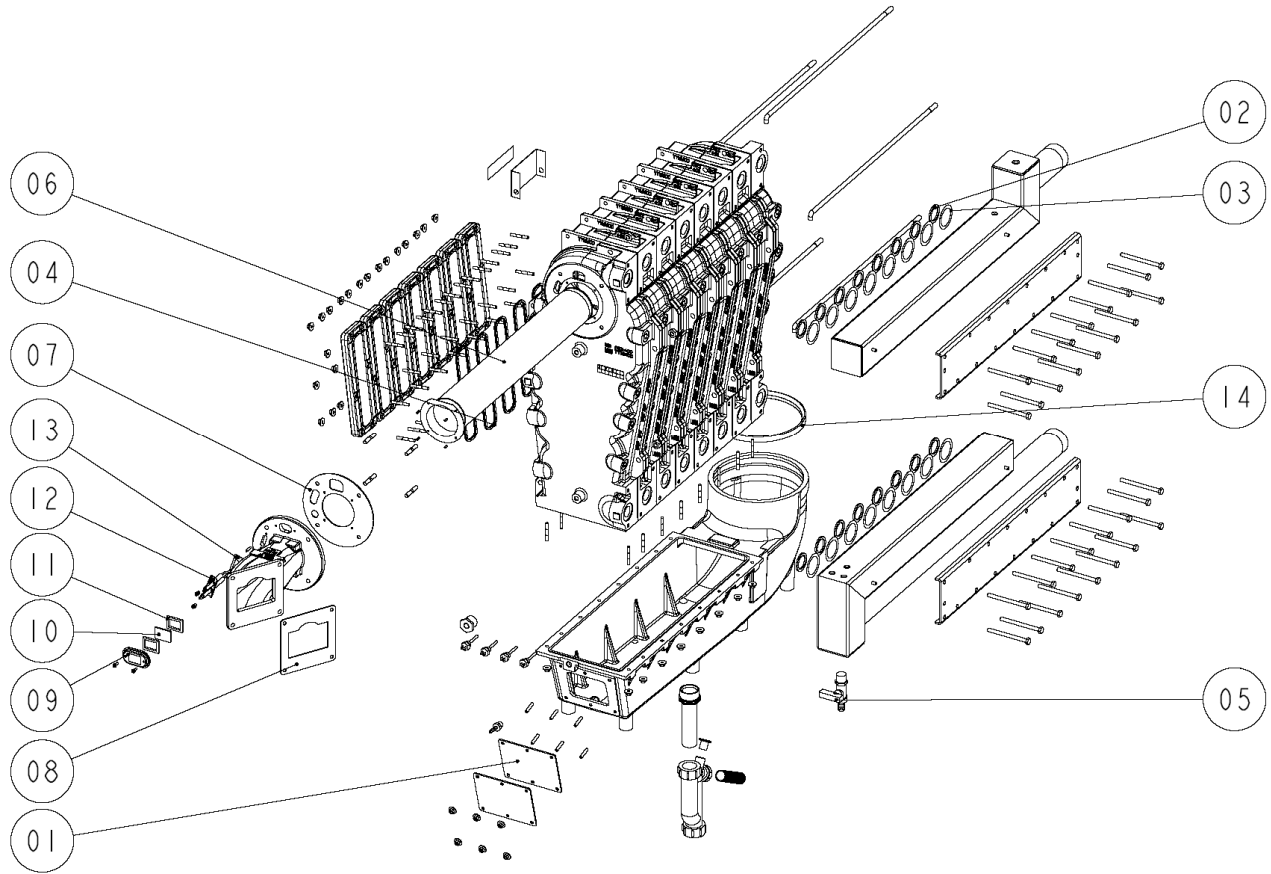
10.2 EXPLODED VIEW FRAME AND CASING

Drawing 800-052-002--05   sheet 5