

STREBEL

S-CB⁺ Boiler Range

Models +60 - +80 - +100 - +120 - +150 - +180

Wall Hung High Efficiency Condensing Boiler

Installation, Operating & Maintenance Manual



Please read and understand before commencing installation and leave the manual with the customer for future reference.



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INTRODUCTION

This manual is written for:

- The Installer.
- System Design Engineer.
- The Service Engineer.
- The User.

The following symbol is used in this manual:



Warning: Important information concerning the safety of persons and/or the appliance.

Strebel Ltd is not accountable for any damage caused by incorrect following the mounting instructions. For service and repair purposes use only original Strebel spare parts.

All documentation produced by the manufacturer is subject to copyright law.

1 SAFETY GUIDELINES

Carefully read all the instructions before commencing installation.

Keep these instructions near the boiler for quick reference.

The appliance should be installed by a skilled installer such as GAS SAFE registered person, electrical work carried out by a qualified person, all according to national and regional standards.

Failure to comply with these regulations could deem the warranty invalid. This appliance must be installed in accordance with the rules that apply and only be used in an adequately ventilated space conforming to standards in place.

Without written approval of the manufacturer the internals of the boiler may not be changed. When changes are executed without approval, the boiler certification becomes invalid.

Commissioning, maintenance and repair must be done by a skilled installer/engineer, according to all applicable standards and regulations.



What to do if you smell gas:

- Don't use any electrical equipment.
- Don't press any switches.
- Close the gas supply.
- Fully ventilate the room (open the windows and/or outdoor boiler room doors).
- Immediately warn the responsible person.



The manufacturer/supplier is not liable for any damage caused by inaccurately following these mounting instructions. Only original parts may be used when carrying out any repair or service work.



This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

These instructions are written for the installer of Strebel products and contain all necessary information on the installation and adjustment of S-CB+ Ranges of boilers. Please read these instructions fully before installation to ensure that all work is carried out correctly.

We suggest that you keep a copy of these instructions near the boiler.

These instructions together with those in any supplemental instruction booklet cover the basic principles to ensure the satisfactory installation of the boiler, although detail may need slight modification to suit particular local site conditions.

It is the law that all gas appliances and fittings are installed by a competent person (such as a Gas Safe registered installer) and in accordance with The Gas Safety (installation and Use) Regulations.

The relevant British standards for installation, codes of practice or rules in force and in accordance with the Manufacturers' instructions.

The installation must be carried out in accordance with the following regulations plus relevant codes & standards:

- Due consideration must be given to current Health & Safety Legislation while this product is being installed.
- Key Approved Documents to the Building Regulations, in the region of the United Kingdom that this product is being installed.
- The Local Building Regulations and Local water by-laws, the gas services area and the Local Authority recommendations.
- The appropriate British & European Standards for the type of installation and fuel used, including but not exclusively the following standards: -
 - o BS 5440: Part 2 (Flues and Ventilation).
 - o BS 6644: Installation of gas-fired hot water boilers of rated inputs between 70kW & 1.8MW
- The clean air act as defined by the local authority.
- The appropriate documents as produced by the Institution of Gas Engineers and Managers Documents (IGEM) for the type of installation and fuel used, including but not exclusively the following documents: -
 - o IGE/UP/1.
 - o IGE/UP/2.
 - o IGE/UP/4.
 - o IGEM/UP/10 Edition 4.
- If the product is being fuelled with LPG then the appropriate UKLPG Codes of Practice (CoP) should be referred to.
- Wiring to the appliance must be in accordance with the IEE (BS 7671) Wiring Regulations the Health and Safety Document No 635 "The Electricity at Work Regulations 1989" and any local regulations that apply.
- CP 342: Part 2, 1994. Code of practice for centralised hot water supply – buildings other than individual dwellings.
- CIBSE, Guides A, B and C.

Adhere to all regulations that are in force at the time of installation or service.

2 TECHNICAL DATA S-CB⁺ BOILERS

2.1 *Functional introduction*

The S-CB⁺ boilers are central heating boilers with a maximum high efficiency. Such a performance can be reached by, amongst other things, using a special heat exchanger made of stainless steel. This allows the flue gases to cool down below the condensation point, and so release extra heat. This has an immediate positive impact on the efficiency, exceeding the 100%.

The S-CB⁺ boiler is standard set for Natural gas G20 / G25.3

Gases used must meet the European standard EN 437.

Fuel used should have sulphur rates according to the European standard, a maximum annual peak over a short period of time of 150 mg/m³ and an annual average of 30 mg/m³.

Boiler control includes:

- Cascade control for up to twelve boilers.
- Remote operation and heat demand indication from each boiler.
- Weather compensation control.
- Hot water cylinder control.

Connections for:

- 0-10 VDC remote flow temperature (set point) control.
- 0-10 VDC remote burner input control.
- Outdoor temperature sensor.
- External central heating system pump.
- External hot water cylinder pump or diverter valve.

Cascade control

When using the integrated cascade control, a maximum of twelve boilers can be controlled in a cascade configuration. Using an appropriate external control, this number may be increased at will.

0-10 VDC connection available

The boiler flow temperature or power input can be controlled by an external 0-10 VDC signal. When a number of boilers are cascaded, and controlled by the integrated cascade control, the signal should be directed to the master boiler only. If an alternative control is used, more than one boiler may be controlled by a 0-10 VDC signal. A signal of 1,48 Volt will switch on the boiler(s), less than 1,4 Volt will switch off the boiler(s).

Time program

For both central heating and hot water function of the boiler, time programs with three programmable periods per day are available. These time programs are set and activated by entering the desired settings directly at the boiler control panel.

2.2 Technical Specifications Datasheet

GENERAL							
Product Identification Number	-	CE 0063 BP3254					
Classification	-	II2EK3B/P (Country Depending)					
Gas Appliance Type	-	B23, B23P, C13, C33, C43, C53, C63, C83					
Boiler Model		S-CB*60	S-CB*80	S-CB*100	S-CB*120	S-CB*150	S-CB*180
Dimensions (h x w x d)	mm	842 x 476 x 486				898 x 476 x 677	
Water content estimated	litre	3,9	5,0	6,5	8,3	10,4	12,9
Weight (empty)	kg	46	73	78	83	92	101
Flow/return connection (boiler)	inch	R 1"	R 1"	R 1"	R 1"	R 1¼"	R 1¼"
Flow/return connection (T-piece)	inch	Rp 1¼"	Rp 1¼"	Rp 1¼"	Rp 1¼"	Rp 1½"	Rp 1½"
Gas connection	inch	R ¾"	R ¾"	R ¾"	R ¾"	R 1"	R 1"
Flue duct flue/air inlet (* As supplied)	mm	80/125*	80/125*	100/150*	100/150*	100/150	100/150
Parallel connection (* As supplied)	mm	80-80	80-80	100-100	100-100	130-130*	130-130*

HEATING		Values min-max:					
Nominal input (Net)	kW	12,5 - 55,6	14,6 - 74,3	17,2 - 92,2	26,0 - 111	34,0 - 138	45,0 - 166
Nominal input (gross) (G20, G25.3)	kW	13,9 - 61,8	16,2 - 82,5	19,1 - 102	28,9 - 123	37,8 - 153	50,0 - 184
Nominal input (gross) (G31)	kW	13,6 - 60,4	15,9 - 80,8	18,7 - 100	28,3 - 121	37,0 - 150	48,9 - 180
Nominal input (gross) (G30/G31)	kW	13,5 - 60,3	15,8 - 80,2	18,6 - 99,7	34,7 - 120	36,8 - 150	48,8 - 180
Nom. output 80/60°C	kW	12,0 - 53,5	14,0 - 71,2	16,5 - 88,4	24,7 - 106	32,6 - 132	43,3 - 160
Nom. output 50/30°C	kW	12,9 - 57,4	15,2 - 77,5	18,0 - 96,2	27,2 - 116	35,5 - 144	47,3 - 175
Nom. output 37/30°C	kW	13,5 - 59,8	15,7 - 80,1	18,6 - 99,5	28,1 - 120	36,7 - 149	48,5 - 179
Efficiency 40/30°C DIN 4702-8	%	up to 110,6 % within the S-CB+ range					

GAS CONSUMPTION [EN437]		Values min-max:					
Natural gas G20	m ³ _{st} /h	1,32 - 5,88	1,54 - 7,86	1,82 - 9,76	2,75 - 11,8	3,6 - 14,6	4,76 - 17,6
Natural gas G25.3	m ³ _{st} /h	1,50 - 6,69	1,76 - 8,94	2,07 - 11,1	3,13 - 13,4	4,09 - 16,6	5,41 - 20,0
Propane gas G31 ¹	m ³ _{st} /h	0,51 - 2,27	0,60 - 3,04	0,70 - 3,77	1,06 - 4,54	1,39 - 5,65	1,84 - 6,79
Butane/Propane (B/P) G30/G31 ¹	m ³ _{st} /h	0,39 - 1,72	0,45 - 2,29	0,53 - 2,85	0,99 - 3,44	1,05 - 4,28	1,40 - 5,15
Gas supply pressure nom. ²	G20	mbar	20				
	G25.3	mbar	25				
	G31 ¹	mbar	30/37				
	G30/G31 ¹	mbar	50				

NOTES

¹ Using propane or butane/propane mixtures (B/P), maximum fan speed needs to be reduced (parameter P4BD)

² Min. and max. gas supply pressures according to EN437:

	p nominal [mbar]	p min [mbar]	p max [mbar]
G20	20	17	25
G25.3	25	20	30
G31	30	25	35
	37	25	45
G30/G31	50	43	57

Boiler Model			S-CB*60	S-CB*80	S-CB*100	S-CB*120	S-CB*150	S-CB*180
EMISSION [EN437]			Nominal values at min-max load:					
CO ₂ flue gas ³	G25.3/G20	%	8,7 - 9,0	8,7 - 9,0	8,7 - 9,0	8,7 - 9,0	8,7 - 9,0	8,7 - 9,0
	G31	%	9,3 - 10,3	9,3 - 10,3	9,3 - 10,3	9,3 - 10,3	9,3 - 10,4	9,3 - 10,5
	G30/ G31 (B/P)	%	9,3 - 10,4	9,3 - 10,4	9,3 - 10,4	9,3 - 10,4	9,3 - 10,5	9,3 - 10,6
NOx class (EN15502-1)		-	6					
Flue gas temperature at combustion air temperature = 20°C		°C	~ 85-95					
Mass flow flue gas [min-max] Q _{flue-gas} condensing		g/s	5,59-28,9	6,52-38,6	7,69-47,9	11,6-57,7	15,2-71,7	20,1-86,2
Available pressure for the flue sys- tem ⁴		Pa	200					
INSTALLATION								
Available pressure for the installation at	ΔT = 20 K	mWC	5,9	3,1	2,3	1,5	6,0	4,8
	ΔT = 25 K	mWC	7,0	5,5	5,0	4,4	9,0	7,9
Pressure boiler min-max.		bar	1,0 - 4,0 ⁵					
Max. flow temperature		°C	90					
ELECTRIC								
Maximum power consumption		W	240	265	270	280	505	520
Power supply		V/Hz	230/50					
Protection class		-	IPX4D					
NOTES								
³ CO ₂ of the unit measured/set without the boiler front panel in place				⁵ When the built-in water pressure <u>sensor</u> is replaced by a water pressure <u>switch</u> , water pressure may go up to 6,0 bar				
⁴ Maximum allowed combined resistance of flue gas and air supply piping at high fire								

2.3 ERP Specifications Datasheet

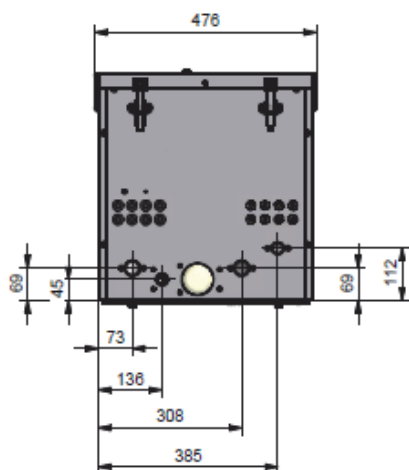
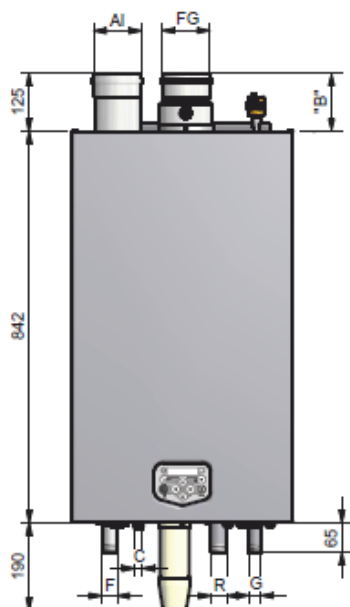
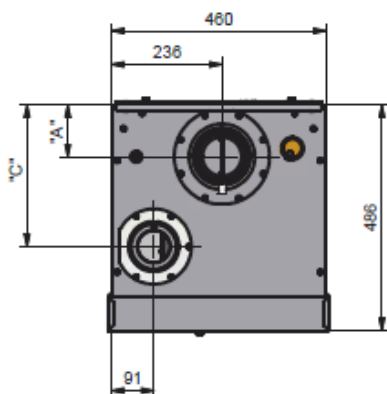
Technical parameters according the European ERP (Energy Related Products) legislation:

Boiler Model		*60	*80	*100	*120	*150	*180
Condensing boiler:		Yes	Yes	Yes	Yes	Yes	Yes
low temperature boiler:		Yes	Yes	Yes	Yes	Yes	Yes
B11 boiler:		No	No	No	No	No	No
Cogeneration space heater:		No	No	No	No	No	No
Combination heater:		No	No	No	No	No	No
	Unit:	Value	Value	Value	Value	Value	Value
Rated heat output	kW	53,5	72,1	89,4	107,7	132,9	159,9
P-rated (P4) at 60-80°C	kW	53,5	72,1	89,4	107,7	132,9	159,9
Heat output (p1) 30% at 30-37°C	kW	17,9	24,1	29,8	36,0	44,7	53,7
Seasonal space heating energy efficiency (η_s).	%	91,9	92,3	92,4	92,6	92,3	92,3
energy efficiency (η_4) at 60-80°C	%	86,8	87,4	87,4	87,4	86,8	86,8
energy efficiency (η_1) at 30-37°C	%	96,9	97,2	97,2	97,5	97,2	97,1
Auxiliary electricity consumption							
At full load (elmax).	kW	0,111	0,136	0,142	0,151	0,214	0,229
At part load (elmin)	kW	0,024	0,025	0,025	0,032	0,041	0,041
In standby mode (Psb)	kW	0,004	0,004	0,004	0,004	0,004	0,004
Other							
Standby heat loss (Pstby)	kW	0,063	0,067	0,071	0,076	0,084	0,094
Ignition burner power consumption (P _{ign})	kW	0,000	0,000	0,000	0,000	0,000	0,000
Annual Energy consumption (Q _{HE})	GJ	112	x	x	x	x	x
Emissions (Nox) of nitrogen oxides (EN15502-1:2012+A1:2015)	mg/kWh	32.1	39.1	35.3	39.3	36.3	36.6
Sound power level, indoors (EN 15036-1:2006)	dB	65	67	65	62	66	69

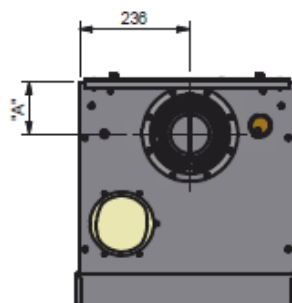
3 DIMENSIONS

3.1 S-CB⁺ 60-120

TWIN PIPE



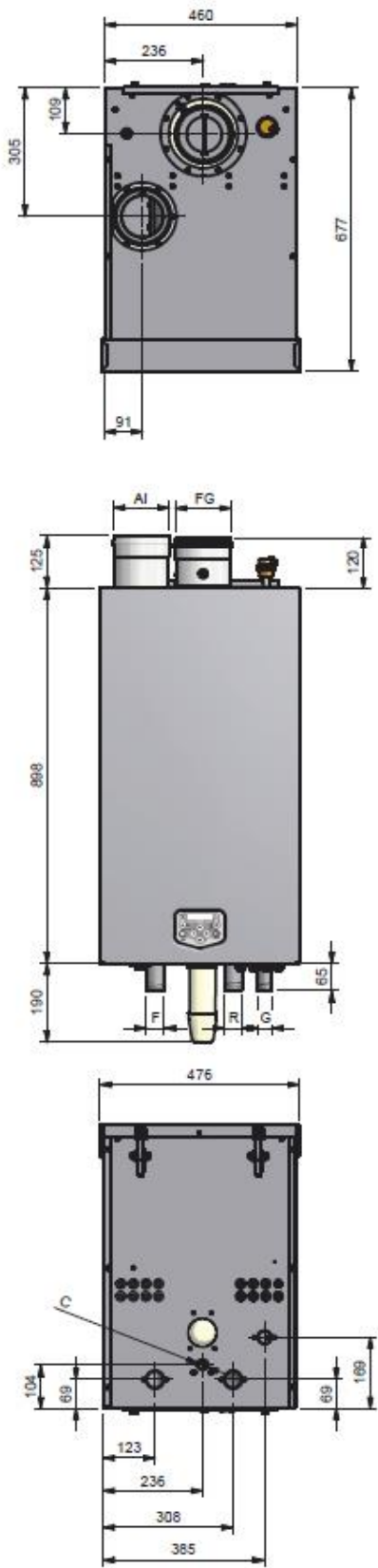
CONCENTRIC



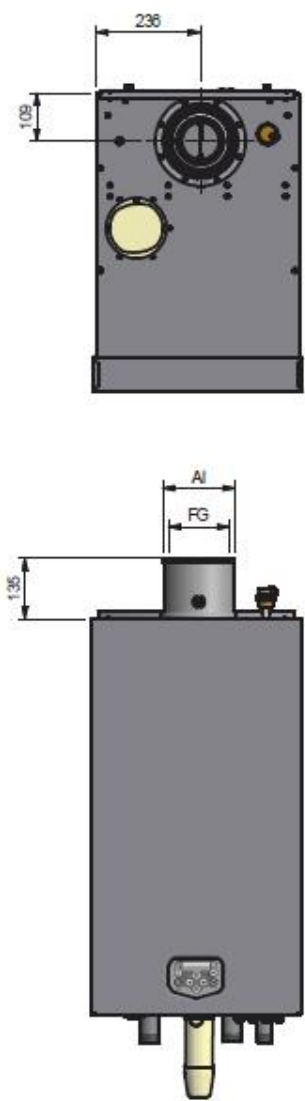
Connections		Twin pipe				Concentric (Standard Delivery)			
		+60	+80	+100	+120	+60	+80	+100	+120
FG AI	flue gas air inlet	80-80		100-100		80/125		100/150	
size "A"		112				155	112		
size "B"		135				150	135		
size "C"		308				N.A.			
F C R G	flow condensate return gas	R 1¼" (male) flexible hose Ø25/21 x 750 mm R 1¼" (male) R ¾" (male)							

3.2 S-CB+ 150-180

TWIN PIPE



CONCENTRIC



Connections		Twin pipe (Standard Delivery)	Concentric
FG	flue gas	130-130	100/150
AI	air inlet		
F	flow	R 1½" (male) flexible hose Ø25/21 x 750 mm	
C	condensate		
R	return		
G	gas	R 1½" (male) R 1" (male)	

4 ACCESSORIES AND UNPACKING

4.1 Accessories

Depending on the selected controlling behaviour for the central heating system and/or the optional use of a hot water cylinder, the following items can be supplied with the boiler. Ask your supplier for the specifications.

Item	Part Number
Outdoor (air) temperature sensor: 12kOhm@25°C (Terminals 1 & 2 of the boiler connections)	E04.016.585
External flow temperature sensor for system side of the low loss header: 10kOhm@25°C (Terminals 3 & 4 of the boiler connections)	E400376
Calorifier temperature sensor: 10kOhm@25°C (Terminals 5 & 6 of the boiler connections)	E400277
Room Controller "Open-Therm" RC (Modulating) with room sensor	S04.016.355
Room Controller "Open-Therm" RC (Modulating) no room sensor/to be used with E04.016.359	S04.016.358
External room sensor for the RC and RCH controller: 5kOhm@25°C	E04.016.359
External flow sensor for one heating zone: 5 kOhm@25°C	E04.016.363
Software + interface cable for programming the boiler with a computer/laptop	E400278

4.2 Flue Gas & Air Supply Conversion Kits - TWIN PIPE:

Boiler Model:	S-CB+ 60	S-CB+ 80	S-CB+ 100 + 120	S-CB+ 150 + 180
Twin Pipe Air and Flue Diameters:	Ø80mm	Ø80mm	Ø100mm	Ø130mm
Conversion Kit Concentric to Twin Pipe:	E61.001.162	E61.001.163	E61.001.164	E61.001.165
Fresh Air Intake Grills:	100973	100973	100970	100971

4.3 Flue Gas & Air Conversion Kits - CONCENTRIC:

Boiler Model:	S-CB+ 60	S-CB+ 80	S-CB+ 100 + 120	S-CB+ 150
Concentric pipe diameters air and flue:	Ø80/125mm	Ø80/125mm	Ø100/150mm	Ø100/150mm
Conversion kit twin pipe to concentric	E61.001.187	E61.001.170	E61.001.171	E61.001.172

4.4 Unpacking

The S-CB+ boiler will be supplied with the following documents and accessories:

- One "Mounting Instructions" manual for the installer.
- One suspension bracket with locking plate and bolts.
- Three spare nuts for mounting the burner plate, two spare fuses for the boiler control and a gas conversion sticker (all in a bag attached to the front of the gas valve).
- Bottom part of the siphon.
- Two T-pieces for the flow and return connections of the boiler in one brown box.

After delivery, always check the boiler package to see if it is complete and without any defects. Report any imperfections immediately to your supplier.

5 INSTALLATION OF THE S-CB⁺

5.1 General notes

At every side of the boiler at least 50 mm of clearance should be applied to walls or wall units, 350 mm above the top side of the boiler and 250 mm from the bottom of the boiler.

The installation area/room must have the following provisions:

- 230 V - 50 Hz power source socket with earth connection.
- Open connection to the sewer system for draining condensing water.
- A sound-deadening wall.

Note:

The wall used for mounting the boiler must be able to hold the weight of the boiler. If not, it is recommended to mount the boiler by means of a (cascade) frame.

Other considerations related to the boiler location.

- The ventilation of the boiler room must meet local and national standards and regulations, regardless of the selected supply of fresh air to the boiler.
- Both the air supply and the flue gas pipes must be connected to the outside wall and/or the outside roof.
- The installation area must be dry and frost-free.
- The boiler has a built-in fan that will generate noise, depending on the total heat demand. The boiler location should minimise any disturbance this might cause. Preferably mount the boiler on a brick wall.
- There must be sufficient lighting available in the boiler room to work safely on the boiler.
- When a boiler is positioned at the highest point of the installation, the supply and return pipes must first protrude 0,5 m above the top of the boiler, before these pipes go to the installation side. In other words, the water level must always be 0,5 meter above the top of the boiler and an automatic air vent must be installed in the supply or return pipe. A low-water level protection should also be installed at the installation side.
- Remind the positioning of electrical components in relation to the temperature sensitivity.
- Make sure there is an open connection with the sewer to drain the condensate. This connection should be lower than the condensate drain level of the boiler.

The boiler must be positioned and installed by a skilled installer in accordance with all applicable standards and regulations. Commissioning of the boiler must be done by a skilled service/commissioning engineer, who is trained for this type of boiler.

5.2 Mounting the boiler

Before mounting and installing the boiler the following connections should be considered:

- Flue gas system and the flue gas pipe connections.
- Air supply system and connections.
- Flow and return pipe connections.
- Condensate and pressure relief valve drainage.
- Power supply (preferably the power connection positioned above the boiler).
- Gas Pipe.



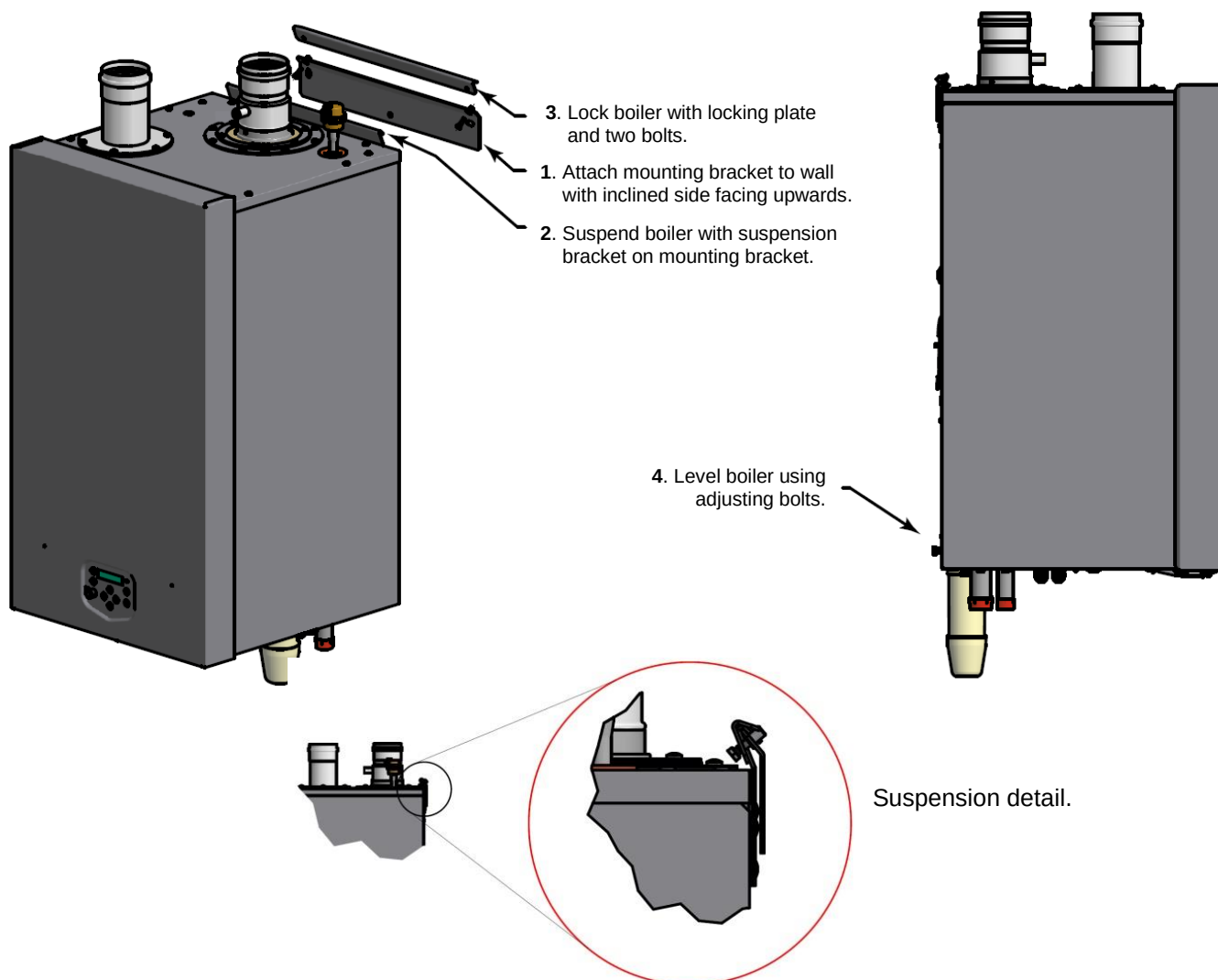
All lines/piping must be mounted free of tension. The weight of the installation components should be supported separately from the boiler so there will be no standing forces on the connections. This might influence the mounting position of the boiler.

Determine the position of the flow and return pipes by using the included suspension bracket or a suspension frame (when supplied).

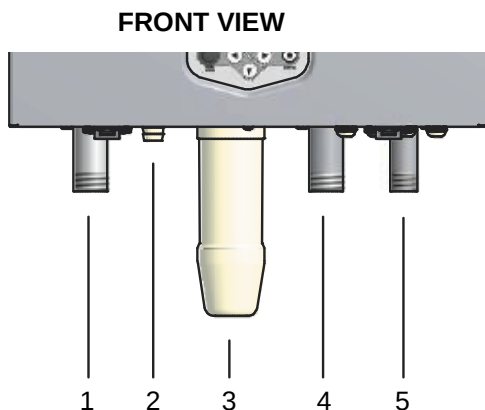
While marking the holes, ensure that the suspension bracket or frame is perpendicular and the boiler does not lean forward. If necessary adjust the position with the adjusting bolts at the lower rear side of the back panel (see drawing). When the adjusting bolts aren't sufficient, fill the gap behind the bolts to get the boiler in position. The exact boiler position lies between the boiler hanging level and hanging slightly backwards.

The boiler should not lean forward in the mounted position.

Lock the suspension bracket with the security cover before making any other connections to the boiler. This security cover will prevent the boiler from falling off the bracket. Don't use excessive force during the mounting of the boiler connections.

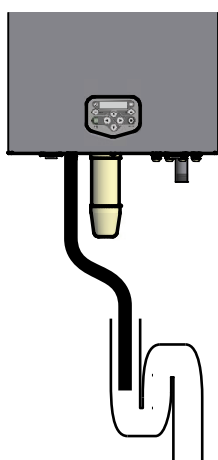


6 CONNECTIONS WATER SIDE



6.1 Boiler connections

- 1 – Flow CH.
- 2 – Condensate drain.
- 3 – Siphon cleaning point.
- 4 – Return CH.
- 5 – Gas.



6.2 Condensate drain connection

The condensate drain is placed at the centre, at the bottom of the boiler and has a $\frac{3}{4}$ inch hose discharge. Connect this flexible hose to the sewer system.

Use only plastic parts with the condensate drain. Metal lines are not allowed.

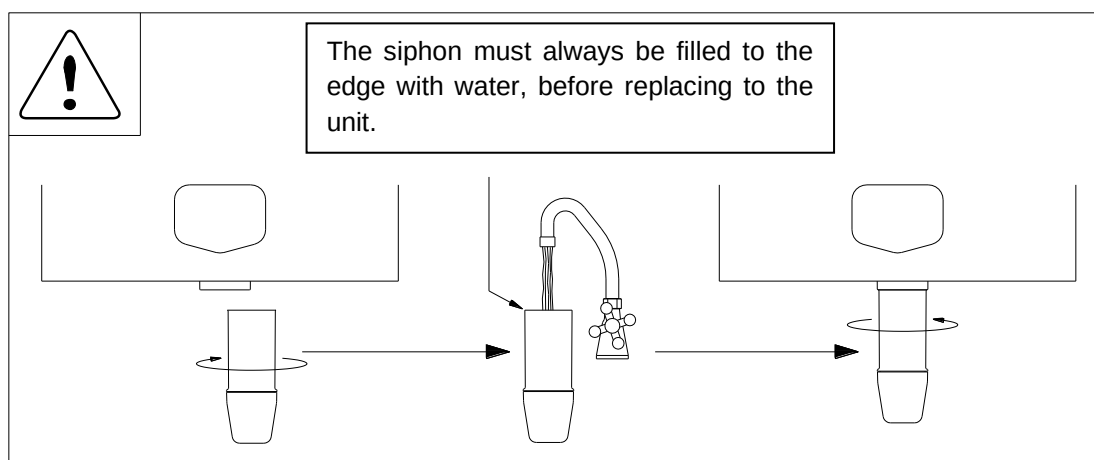
Blockage of this drain might damage the boiler. The drain connection is correct when the condensate can be seen flowing away, e.g. using a funnel. Any damage that might occur, when the drain is not installed correctly, is not covered by the warranty of the boiler.

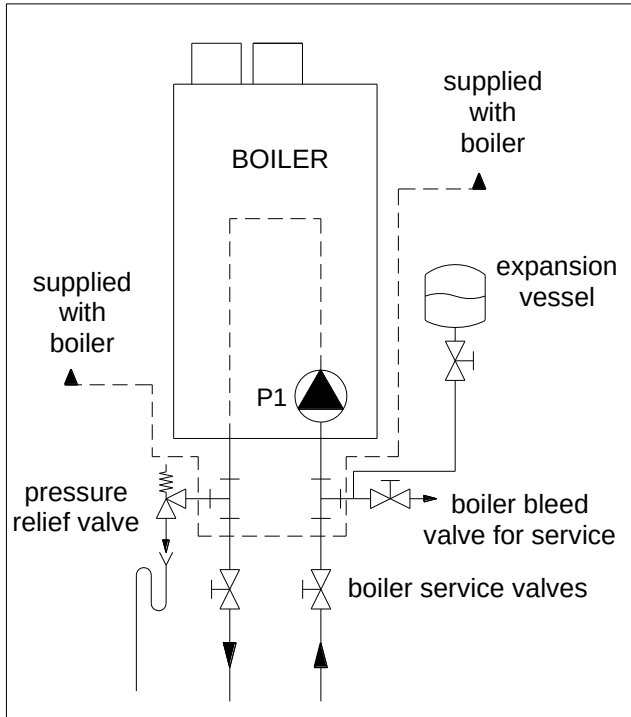
There should be an open connection of the condensate hose into the sewage system. A possible vacuum in the sewage system must never give the opportunity to suck on the boiler's condensate drain hose.



When mounting the bottom part of the siphon, before commissioning the boiler and/or after maintenance, the siphon must **ALWAYS** be completely filled with water.

This is a safety measure: the water in the siphon keeps the flue gases from leaking out of the heat exchanger via the condensate drain.





6.3 Flow and return connections

Two separate T-pieces are shipped with the boiler. These are applied for externally mounting the pressure relief valve and the boiler bleed valve for servicing the boiler. We advise to install two service valves in the flow and return pipes underneath the boiler, so the boiler can be isolated from the heating system and eventually disconnected, when needed.

When using a system pump, this pump should always be mounted in the return pipe of the heating system.

Do not use chloride-based fluxes for soldering any pipes of the water system.

6.4 The expansion vessel

The capacity of the expansion vessel must be selected and based on the capacity of the central heating system and the static pressure. Suggested is to fit the expansion vessel in the return pipe of the central heating system. It can be combined with the drain valve for service. See the above drawing.

6.5 Pressure relief valve

The boiler has no internal pressure relief valve. This should be installed close to the boiler in the flow pipe of the heating system. Each boiler needs to have its own pressure relief valve. It is advised to use the T-piece that is supplied with the boiler for this when not using the S-CB⁺ cascade pipework kits.

Advice is always to install service valves, so the boiler can be isolated from the heating system, when needed. Make sure that the pressure relief valve is mounted between the boiler and the service valves.

The specifications and size of the relief valve should be determined by the installer and must comply with all applicable regulations and boiler capacity.

6.6 Bypass

The boiler has no internal bypass. When many thermostatic valves are being used, the system should have a by-pass to allow an adequate flow when all thermostatic valves are closed. Instead of a bypass also a low-loss header can be used for this function.

The boiler flow will also be influenced when a pipe of the heating system is frozen / blocked. Make sure all heating pipes are free from the risk of frost. If there is the risk of freezing of the heating system, all the pipe section must be insulated and/or protected with the help of a tracing.

6.7 Pump functionality

Controlling the pump:

The pump speed is controlled by a PWM signal provided by the burner controller at a value causing a Delta T across the heat exchanger of 20°C at the whole burner modulation range.

When the boiler modulates down or up, also the pump speed decreases or increases, keeping delta T at 20°C until it reaches the end of its modulation range. Therefore, no commissioning valves should be installed on the primary pipework (boiler side).

Delta T monitoring:

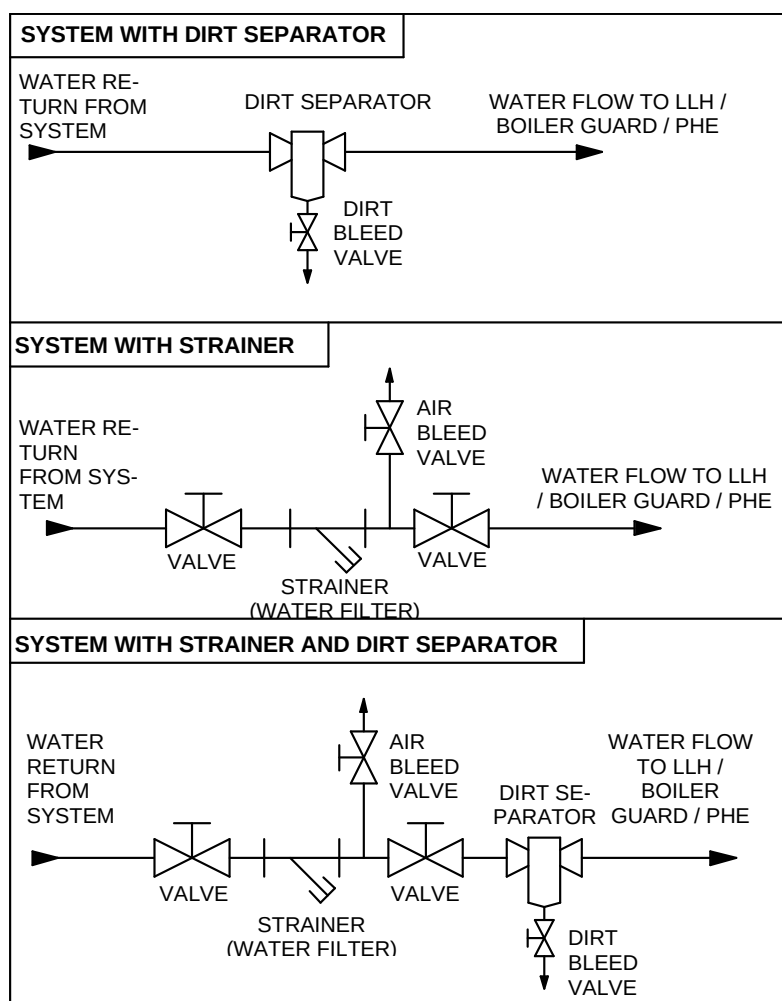
The delta T monitoring parameters are active. A malfunctioning of the pump, burner controller or a high resistance in the hydraulic system will cause a high Delta T and will therefore be detected by the burner controller. The display shows "dT Block" or "Flow / Return dT fault."

6.8 Frost protection

The boiler has a built-in frost protection that is automatically activating the central heating pump when the boiler return temperature (water) drops below the 5°C (programmable). When the boiler return temperature drops below the 3°C (programmable), the burner is also ignited. The pump and/or burner will shut down as soon as the return temperature has reached the 10°C (programmable). The mentioned temperatures are related to the temperatures measured by the RETURN sensor of the boiler. This frost protection function will not fire up the boiler in case of a "general blocking" of the burner demand.

NOTICE: This "Frost Protection" function is only useable for the boiler and not for the whole central heating system. Because it concerns a programmable setting, a boiler damaged by frost is not covered under warranty.

6.9 Installing a strainer and/or dirt separator



Always install a strainer (water filter) and/or a dirt separator on the system side after a low loss header / Strebel boiler guard / plate heat exchanger on the return pipe pipework – not on the boiler side (primary)! This will ensure that the water going to the boiler is free of any flow restrictions. When using a water filter always check a week after installation to determine the strainer cleaning interval. Advice is to mount valves before and after the strainer, including an air bleed valve, so the strainer can be isolated from the heating circuit for service operations. Clean water is very important, blocked and/or polluted heat exchangers, including failures and/or damages caused by this blockage are not covered by the warranty.

6.10 Water quality

The pH value of the water must be within the following limits: $7,5 < \text{pH} < 9,5$. This pH value is reached with the steady conditions. These steady conditions will occur, when after filling the heating system (pH around 7) with fresh water, the water will lose its air because of the air bleeding operation and heating up (dead water conditions).

Water hardness must be within the following limits:

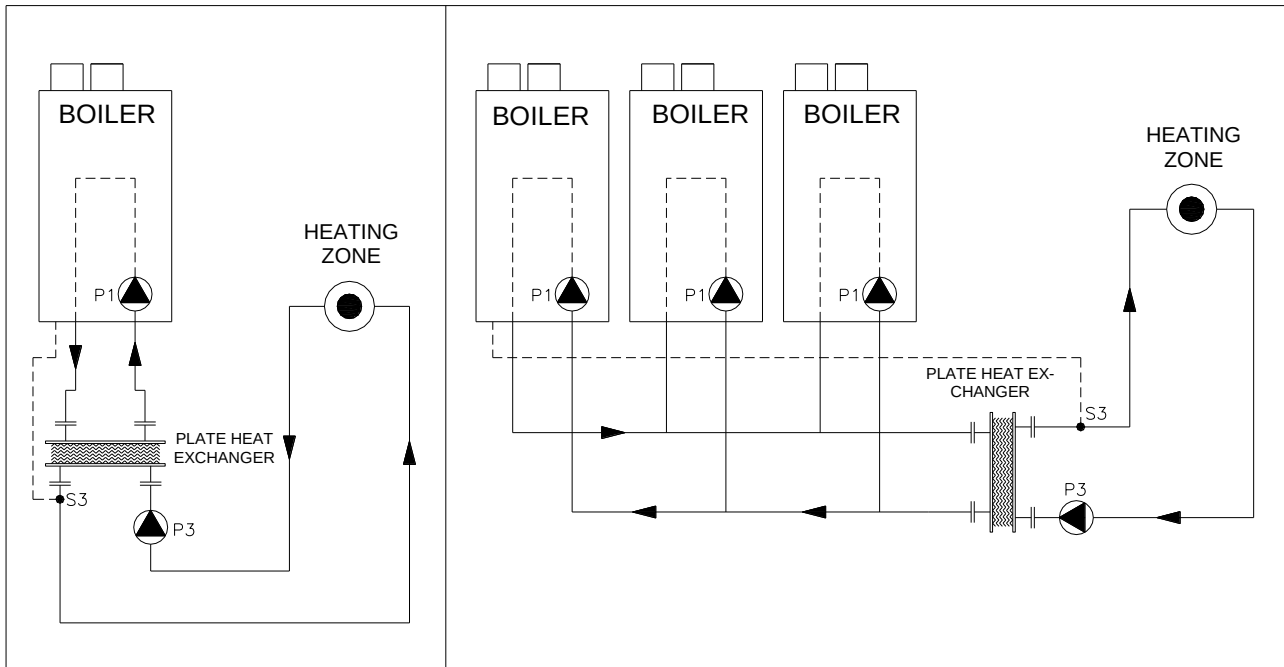
3,5° Clark (50 ppm CaCO_3) < total hardness < 10,5° Clark (150 ppm CaCO_3)

When the water might contain aluminium particles, this should be of a maximum of 0.2 mg/litre. If there is the risk of contamination of the water by any kind of debris/chemicals in the period after installing, a plate heat exchanger should be used to separate the boiler circuit from the heating circuit (see drawing below).

It is advised to prevent the possible air intake and water leakage of the central heating system. Fresh oxygenated water might damage the heat exchanger of the boiler and should therefore be prevented! Usual spots where air is most likely to seep in are: suction gaskets, pumps, air valve working as a venting pipe, o-rings / gaskets in stuffing box, under floor heating pipes.

6.11 Plastic piping in the heating system

When plastic pipes are used in the central heating system and **NOT** oxygen diffusion proof to standard DIN 4726, these should be separated from the boiler system by using a plate heat exchanger. Diffusion (through the plastic) can cause air to enter the heating system. This could damage the boiler, pumps and other components in the system. Be aware that plastic piping is often used in under floor heating systems. When no measures have been taken to prevent the entrance of air into the boiler system, the warranty of the boiler and any boiler part may be deemed invalid.



6.12 Automatic air vent

An automatic air vent is mounted on the boiler to remove the air from the water circuit.

NOTICE: This automatic air vent is only used for bleeding the air in the heat exchanger of the boiler. One or more external automatic air vent(s) and/or air separators must always be mounted in the heating system to take out the air trapped in the heating circuit.

DE-AERATION PROGRAM - When the unit is fired for the first time the unit starts a de-aeration program. One cycle means 5 seconds' pump running and 5 seconds pump off. A complete de-aeration program consists out of three cycles. The de-aeration program can be interrupted/stopped by briefly pressing the service button.

6.13 Automatic water filling systems

When using an automatic water refill system some precautions should be taken (fresh water is bringing fresh oxygen into the system), like installing a water meter to measure and evaluate the total water volume that is added to the system. This to detect and eliminate any water leakage as soon as possible.

When an automatic water refill system is used, some form of logging should take place to prevent continuously filling of the system with large amounts of oxygenated fresh water. This can happen when a leak in the system is not detected and the total added water amount is not being logged.

6.14 Water pressure

First and for all, the installation should be designed and built conform all applicable regulations and standards, including the right safety valves. IMPORTANT: Always keep the pressure in the boiler lower than the value at which its safety valve opens.

Sensor

A water pressure sensor is built into the boiler. With this sensor, the minimum water pressure in the boiler is 0.8 bar and the maximum pressure is 4.0 bar (sensor values). The recommended water pressure is between 1.5 and 2.0 bar.

The pressure sensor will stop the boiler from firing when the water pressure drops below 0.8 bar, and start the boiler firing again when the water pressure reaches above the 1.0 bar.

Higher pressure systems (e.g. in high buildings)

If pressures higher than 4,0 bar occur in the heating system, the best solution is to separate the system from the boiler by means of a plate heat exchanger. Now the boiler pressure can still be under 4,0 bar and the boiler control remains as described above.
Without plate heat exchanger, above 4,0 bar, a water pressure switch has to be built into the boiler instead of the water pressure sensor - the maximum allowed value in the boiler now is 6,0 bar and the boiler control needs to be adjusted.

6.15 Chemical water treatment

The chemical compatibility of several products for treatment of the central heating equipment has been tested on the heat exchangers and the boilers. A list with the corrosion inhibitors in preventative and curative treatment for gas fired central heating boilers can be supplied by Strebel Ltd.

6.16 Under floor heating

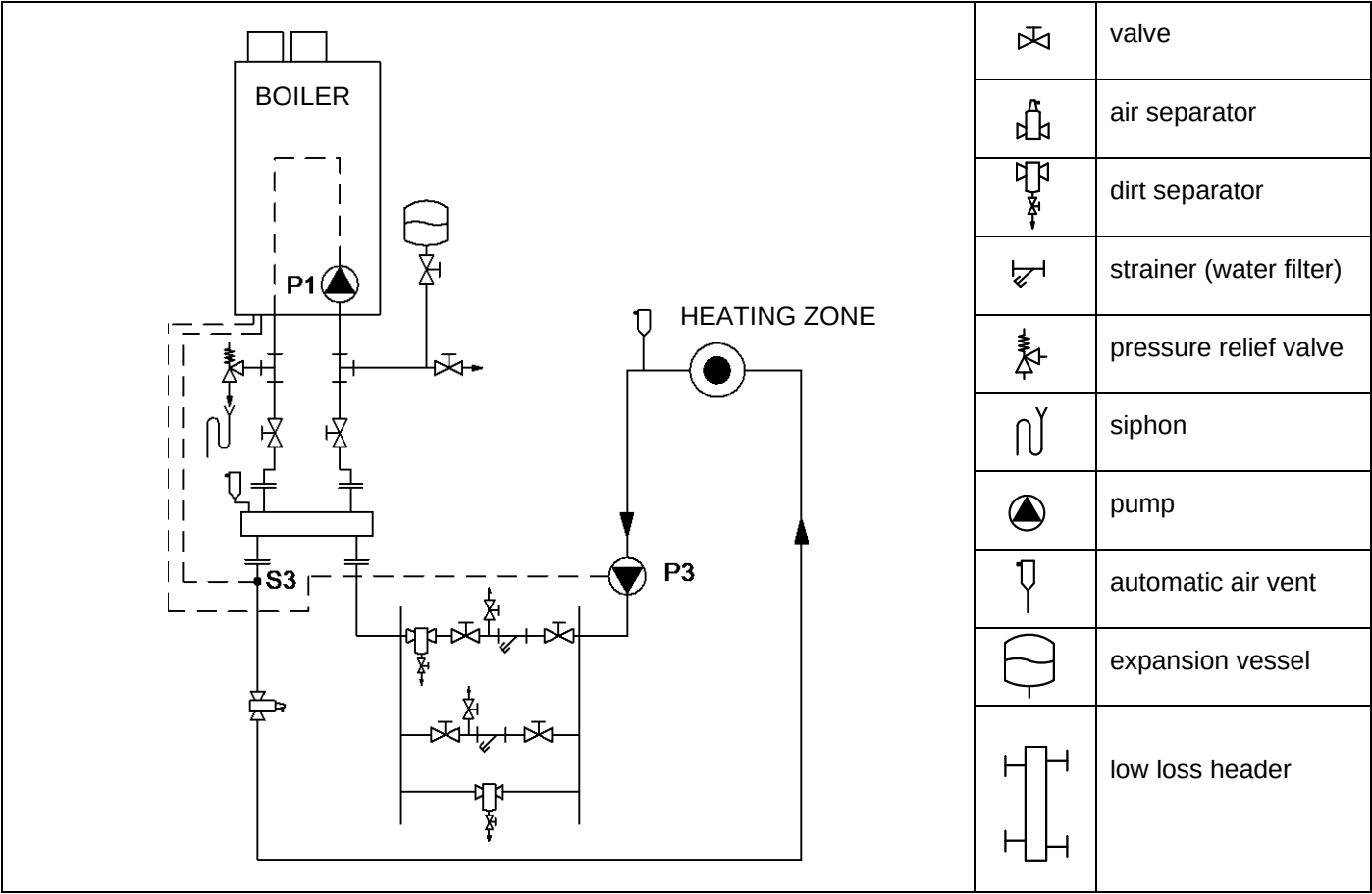
When using an under-floor heating system, the boiler circuit must be separated from the heating circuit with a plate heat exchanger.

6.17 Flush the system with fresh water

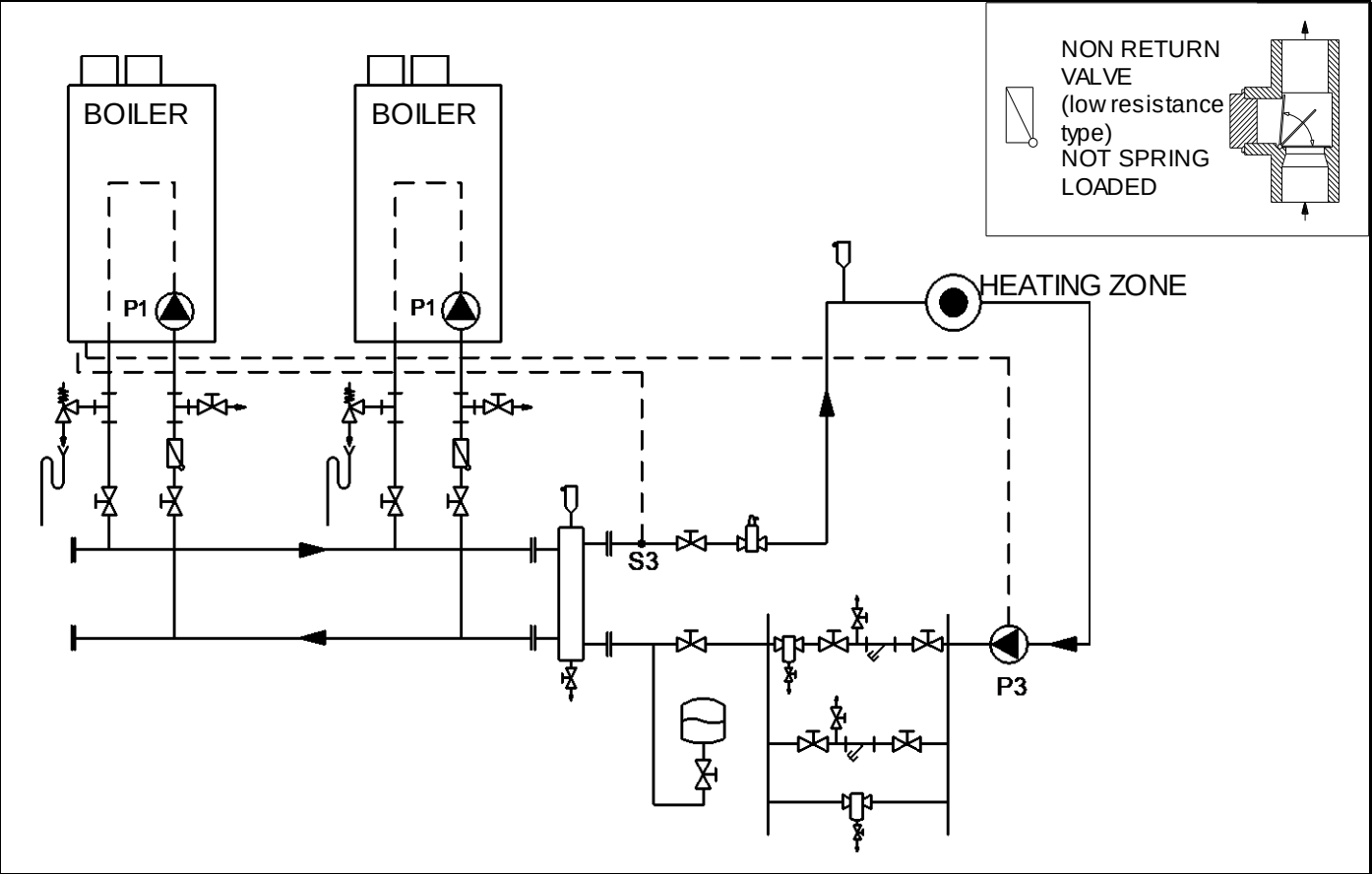
The water of the boiler and heating circuit should be free of any particles, debris and pollution. Therefore, the complete installation must always be thoroughly flushed with clean water before installing and using the boiler(s).

6.18 Installation examples

6.18.1 EXAMPLE OF A NORMAL SINGLE BOILER HEATING CIRCUIT WITH LOW LOSS HEADER (RECOMMENDED)



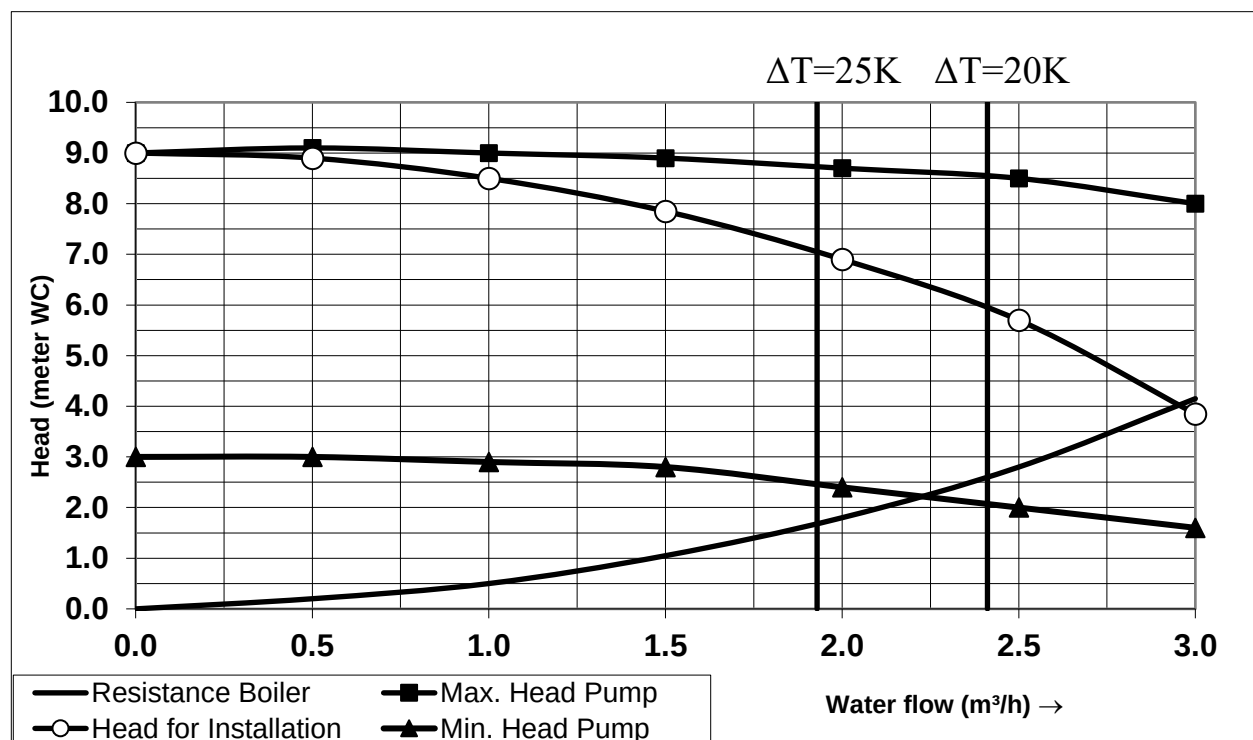
6.18.2 EXAMPLE OF A MULTIPLE BOILER HEATING CIRCUIT WITH LOW LOSS HEADER.



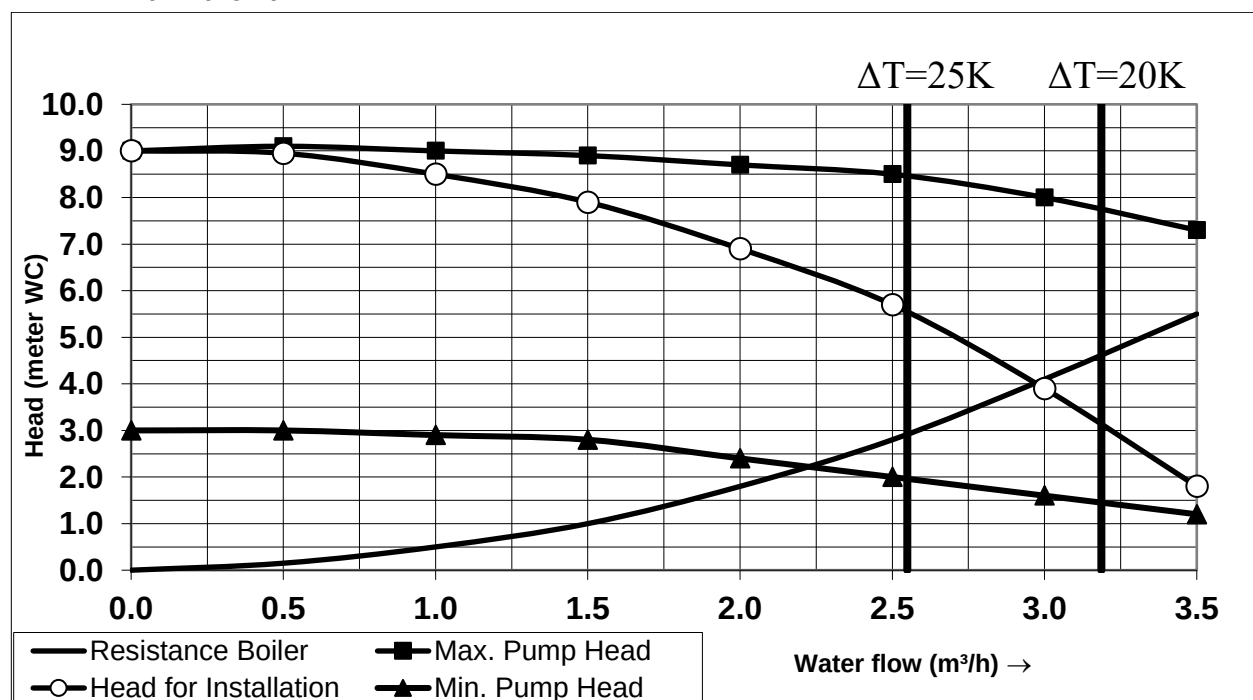
7 PUMP CHARACTERISTICS

7.1 Hydraulic graphs

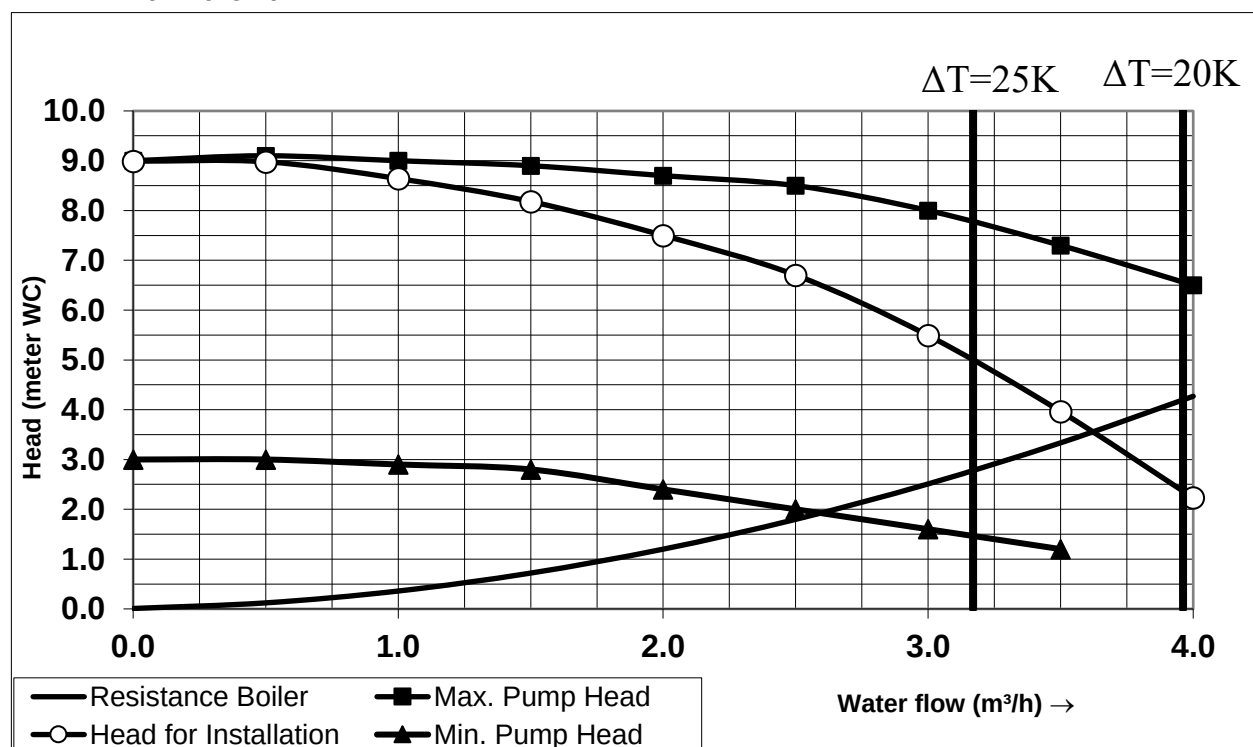
Boiler and pump graph S-CB⁺ 60. UPML 25-105PWM:



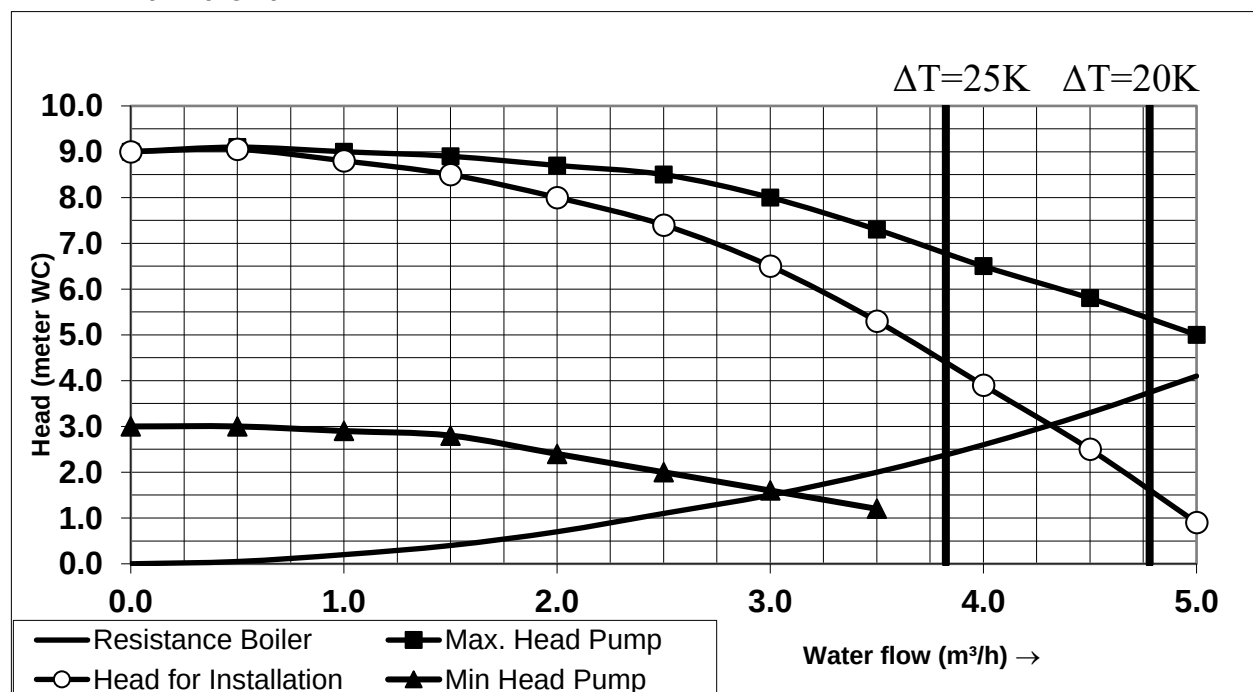
Boiler and pump graph S-CB⁺ 80. UPML 25-105PWM:



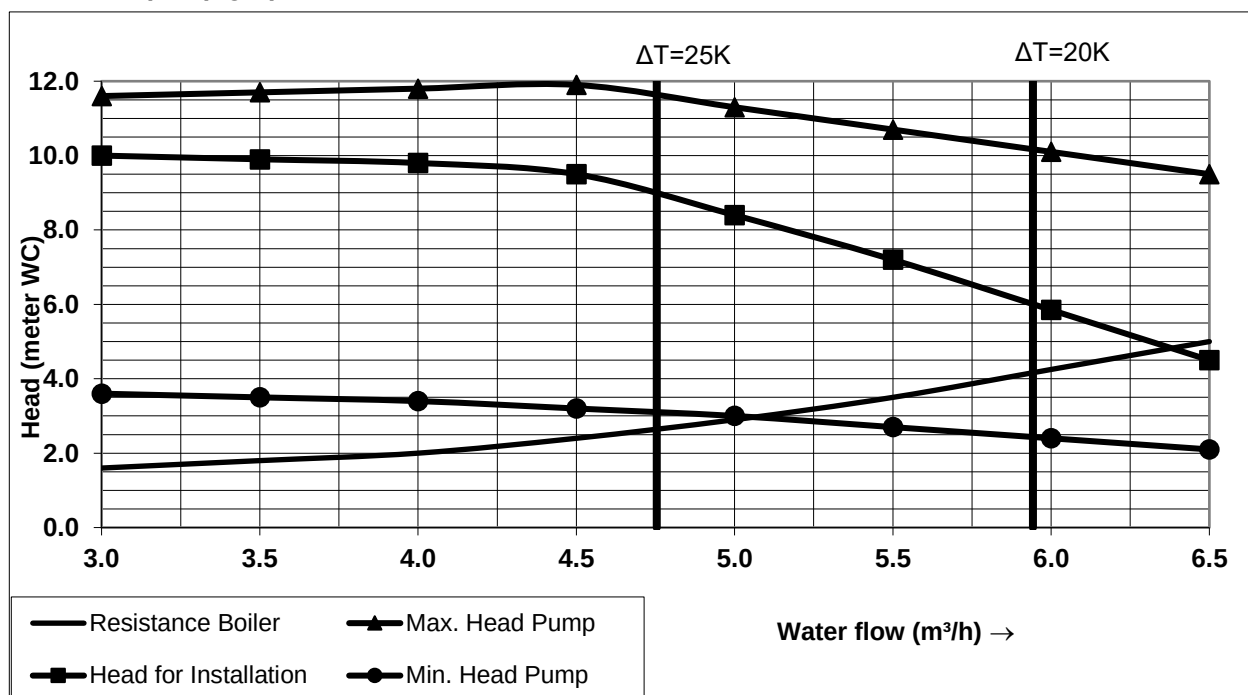
Boiler and pump graph S-CB⁺ 100. UPML 25-105PWM:



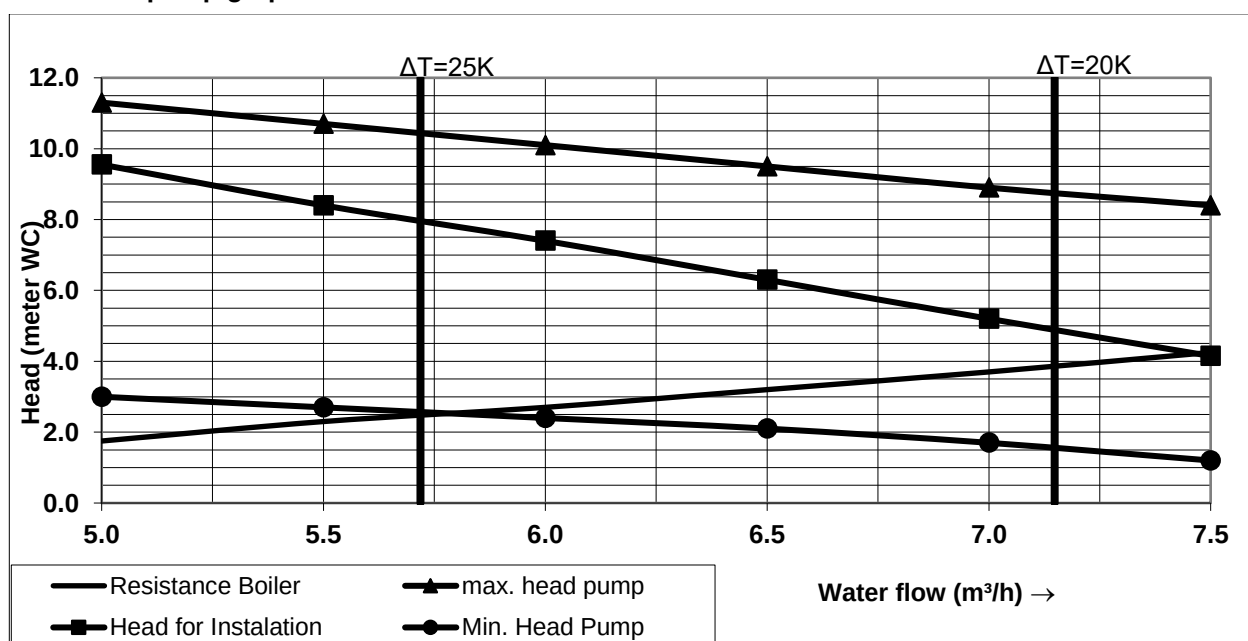
Boiler and pump graph S-CB⁺ 120. UPML25-105 PWM:



Boiler and pump graph S-CB⁺ 150. Wilo Stratos Para 30/1-12 PWM:



Boiler and pump graph S-CB⁺ 180. Wilo Stratos Para 30/1-12 PWM:



Explanation pump graph:

The S-CB⁺ range is equipped with high efficiency pumps, in the hydraulic graph there is a minimum and maximum head for the pump. This is the range in which the pump will modulate.

The pump speed is controlled by a PWM signal provided by the burner controller at a value causing a Delta T across the heat exchanger of 20°C at the whole burner modulation range.

7.2 *Pumps: maximum electrical power*

General

- The inrush current of a conventional pump is approximately $2\frac{1}{2}$ x its nominal current.
- The maximum switch current of the PCB is 5A.

When the two statements are combined, the conclusion is that nominal currents of pumps, controlled by the PCB, may not exceed 2A.

Pump P1 - Boiler Pump.

This modulating pump is part of the appliance. The speed and power consumption depends on the Delta T across the heat exchanger and is controlled by the burner controller.

Pump P2 - Calorifier Pump.

Pump P2 is a DHWi pump and is used when P4AA = 1, meaning the appliance is an indirect calorifier.

Pumps P1 and P2 are connected to one fuse of 5A, so their total nominal current may not exceed 5A. To limit the inrush current, the switching sequence has been modified so pump P2 always switches 100 m/s later than pump P1.

The maximum nominal current of pump P2 must also be 2A, again due to the inrush current.

3 Way Valve.

The combined nominal current of pump P1 and the 3-way valve must be smaller than 5A.

So, the inrush current of the 3-way valve must be lower than 3A.

Pump P3 - System Pump.

The nominal current of pump P3 must be equal to or lower than 2A.

Warning (EC pumps):

In case of using an electronic commutating pump, the relays 1, 2 or 3 may not be used for the power connection, because of the inrush current of the electronics of the pump.

Directly connect the pump to an external power supply.

Control connections of an EC pump can be established in several ways, set by parameter P5BN.

See chapter 11.1.7.

8 FLUE GAS AND AIR SUPPLY SYSTEM

8.1 *General*

The boiler has a positive pressure flue system. The available combined pressure drop for the inlet and outlet system is **200 Pa for the complete boiler range.**

Notice:

- Install the horizontal flue components with an angle of 3° downwards in the direction of the boiler (roughly equal to five centimetres for every linear meter). When not installed accordingly, it may result in condensate building up in the flue gas tube, eventually causing component failure.
- Wall flue terminals are generally used up to 60-80 kW. Using these terminals with larger capacities will give unpleasant large condensate clouds.
- When using a wall terminal, there is the possible risk of ice building-up on surrounding parts/structures, because the condensate will freeze. This risk should be taken into account during the design phase of the heating installation.

Note:

Because the flue gases can have a low temperature, the boiler needs to have a high efficiency approved stainless steel or plastic flue system. These materials, including the gaskets, should be usable for positive pressure flue gas systems and have a temperature class of **T120**.

8.2 C63 certified

In general, boilers are certified with their own flue gas material. For type B23, C13, C33, C43, C53, C83 systems, only use flue gas and air supply parts approved according to chapters 4.2 and 4.3.

If a boiler is C63 certified, no specific type flue gas material has been certified in combination with the boiler. In this case, the flue gas and air supply parts should comply with the applicable European standards (EN14989).

So, for type C63 systems flue gas and air supply parts from other suppliers can be used. It must be able to handle the condensate forming (W), transport, overpressure (P1) and must have a minimum temperature class of **T120**.

Also, it has to meet the requirements in the following chapters "flue terminal" and "air supply".

CE String Flue Gas Material (B23P)	European standard	Temperature class	Pressure class	Resistance to condensate	Corrosion resistance class	Metal: liner specifications	Soot fire resistance class	Distance to combustible material	Plastics: location	Plastics: fire behaviour	Plastics: enclosure
Min Requirements PP	EN 14471	T120	P1	W	1		O	30	I of E	C/E	L
Min Requirements SS	EN 1856-1	T120	P1	W	1	L20040	O	40			

A few examples of flue gas material suitable for S-CB⁺ boilers:

- CE String for Plastic PPs: EN14471 T120 P1 W 2 O(30) I C/E L
- CE String for Stainless Steel: EN1856-1 T250 P1 W V2-L50040 O (50)

When selecting flue gas systems, be aware that the minimum requirements are met. So only select flue gas materials having the same or better properties than this table.



Never use aluminum containing flue gas pipes for this boiler range.

Connecting diameters and tolerances:

mat	boiler	d _{nom}	D _{outside}	d _{inside}	L _{insert}
SS	S-CB+60,80	80	80 +0,3/ -0,7	81 +0,3/ -0,3	50 +2/ -2
SS	S-CB+100,120	100	100 +0,3/ -0,7	101 +0,3/ -0,3	50 +2/ -2
SS	S-CB+150,180	130	130 +0,3/ -0,7	131 +0,5/ -0,5	50 +2/ -2
PP	S-CB+ 60, 80	80	80 +0,6/ -0,6		50 +20/ -2
PP	S-CB+100, 120	100	100 +0,6/ -0,6		50 +20/ -2
PP	S-CB+150, 180	130	130 +0,9/ -0,9		50 +20/ -2

8.3 *Flue Terminal*



Never use aluminum containing flue gas materials for this boiler range

The flue terminal duct can be made of:

- Stainless steel in combination with **T120** gaskets.
- PP temperature class **T120**.

8.3.1 HORIZONTAL FLUE TERMINAL POSITIONING

Please refer to the relevant British Standards:

- BS 5440-2 – Flueing and Ventilation for Gas Appliances of Rated Input not Exceeding 70kW = (S-CB+60).
- BS 6644 – Installation of gas fired hot water boilers of rated inputs between 70kW – 1.8MW.

Please refer to the Institution of Gas Engineers and Manager Documents (IGEM):

- IGEM/UP/10 Edition 4 – Installation of gas fired hot water boilers of rated inputs between 70kW – 20MW.
***** Appendix 9 – Risk Assessment for Positioning of Horizontal Flues Terminations.**

8.3.2 VERTICAL FLUE TERMINAL POSITIONING

Please refer to the relevant British Standards:

- BS 5440-2 – Flueing and Ventilation for Gas Appliances of Rated Input not Exceeding 70kW = (S-CB+60).
- BS 6644 – Installation of gas fired hot water boilers of rated inputs between 70kW – 1.8MW.

Please refer to the Institution of Gas Engineers and Manager Documents (IGEM):

- IGEM/UP/10 Edition 4 – Installation of gas fired hot water boilers of rated inputs between 70kW – 20MW.

8.3.3 COMMON FLUE / DUCTS

Multiple boilers can be connected to a common duct. These flue gas systems for multiple boiler installations must always be engineered as zero or negative pressure systems; this to prevent the risk of recirculation of the flue gases. **In circumstances where a zero or negative pressure cannot be achieved, please call Strebel Ltd Technical Department for advice.**

8.4 *Air supply*

When an air supply duct is connected from the outside of the building to the boiler, the boiler will operate as a room-sealed boiler (closed boiler).

The air supply duct can be made of:

- PVC / PP
- Thin-walled aluminium
- Stainless steel

The air supplied for the boiler room ventilation shall be such that the maximum temperatures within the boiler house shall be:

- 25°C at floor level (or 100mm above floor level);
- 32°C at mid-level (1.5m above floor level); and
- 40°C at ceiling level (or 100mm below ceiling level).

8.4.1 COMBUSTION AIR QUALITY

Combustion air must be free of contaminants. For example: chlorine, ammonia and/or alkali agents, dust, sand and pollen. Remind that installing a boiler near a swimming pool, a washing machine, laundry or chemical plants does expose combustion air to these contaminants.

8.4.2 AIR SUPPLY THROUGH HUMID AREAS

When the supply duct will be placed in a boiler room with moist air (for example: greenhouses), a double walled supply duct or an insulated duct must be used to prevent the possible condensation at the outside of the duct. It is not possible to insulate the internal air pipes of the boiler and therefore condensation at the internal air canals must be prevented.

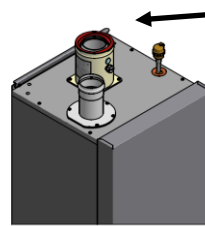
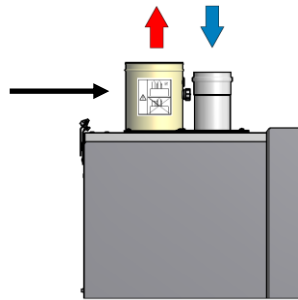
When roof mounted, the air supply duct needs to be protected against rain, so no water will be entering the boiler.

8.5 S-CB+ 60 Twin pipe version



The S-CB+60 boiler as shown in the picture below, is a twin pipe boiler with separate air inlet and flue outlet pipes. Do NOT connect a concentric pipe to this boiler.

Note the sticker on the flue pipe, indicating that this is a twin pipe boiler.



The twin pipe version is recognized by the two pipes, one of which has a **RED** ring cap.

8.6 Pipe heights and mutual distances on a flat roof

Height A

This is the height of the air inlet. A rain hood should prevent rain-water entering the air supply system.

When the inlet and outlet are mounted on a flat roof, the inlet should be at least 600 mm above the roof surface and at least 300 mm above the maximum snow level.

Example 1:

When the maximum snow level on the roof surface is 450 mm then the air inlet should be at $450 + 300 = 750$ mm. 750 mm is more than the minimum 600 so the height will be 750 mm.

Example 2:

When the maximum snow level on the roof surface is 150 mm then the air inlet should be at $150 + 300 = 450$ mm. 450 mm is less than the minimum 600 mm so the height will be 600 mm.

Height difference B

This is the distance between the flue outlet and the air inlet.

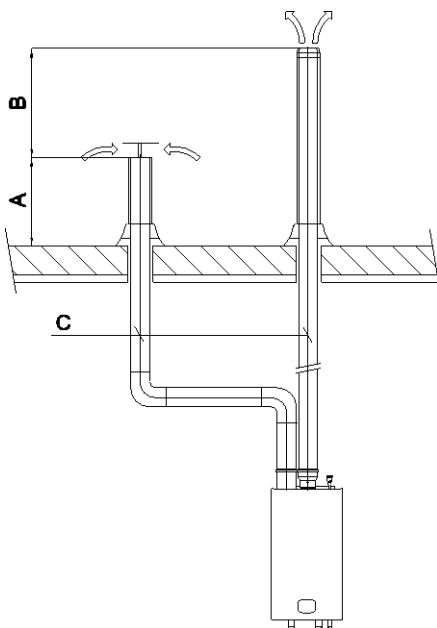
The flue gas outlet should be at least 700 mm above the air inlet. It is advised to be equipped with a conical outlet.

When no air inlet connection is applied on the roof, the flue outlet should be situated at least 1000 mm above the roof surface.

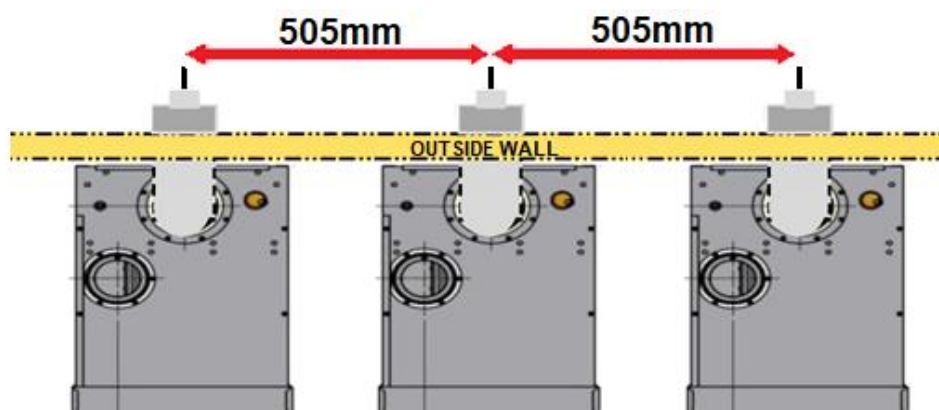
Distance C

The horizontal mutual distance at roof level.

This distance should be at least 700 mm.



8.7. Minimum Terminal Distance on Horizontal Terminations – Type C Flues Only



IMPORTANT!

The location of the wall terminals must be considered with regards to products of combustion potentially building up around the terminals thus allowing products of combustion to flow down the air intake flue into the S-CB+ boilers. The build-up of products of combustion can be caused by certain conditions such as poor cross flow or air caused by weather conditions, enclosures or adjacent buildings. If there are any doubts, then we would recommend one of the following:

- Wall Terminal c/w Exhaust Plume Kit – A standard kit will move the exhaust terminal 1 metre higher than the fresh air intake.
- Stagger the Coaxial Wall Terminals to increase the distance between the terminals – With this method, stagger the even number terminals higher than the odd number terminals. For example, terminals 1 – 3 will be the same height and terminals 2 – 4 will be higher, high enough to prevent build-up of combustion around the terminals.

Any boiler faults / failures caused by products of combustion flowing down the air intake flue due to building up around the terminals will not be covered by our manufacturer's warranty.

8.8 Horizontal Flue Run Risk Assessment

Using the below risk assessment as per IGEM/UP/10 appendix 9 to work out if the horizontal flue terminal position is suitable or not.

Type C appliances with net heat input exceeding 70kW and not exceeding 333kW low level flue discharge risk assessment (including net heat input for groups of appliances)			
No	Flue Position	Yes	No
1	Is the suggested flue terminal location within the distance of the formula shown in chapter 8.8.1 titled figure 12 line G of a road, path, track, thoroughfare, walkway, property boundary or an area which is used for general public access other than for maintenance purposes?		
2	Is the suggested flue terminal location within the distance of the formula shown in chapter 8.8.1 titled figure 12 line G to a playground, school yard, seating area where there may be public gathering?		
3	Is the suggested flue terminal location within the distance of the formula shown in chapter 8.8.1 titled figure 12 line G of a surface or building that may be affected by corrosion or deterioration from plume condensate?		
4	Is the suggested flue terminal location within the distance of the formula shown in chapter 8.8.1 titled figure 12 line G to an area where vehicles could be parked?		
5	Is the suggested flue terminal location within the distance of the formula shown in chapter 8.8.1 titled figure 12 line G of any trees, branches or shrubs?		
6	Is the suggested flue terminal location within the distance of the formula shown in chapter 8.8.2 titled figure 7 line Y to a wall when enclosed by two or more vertical walls		
7	Is the suggested flue terminal location within a light well?		
8	Are the products of combustion from the suggested flue terminal location likely to build up under certain conditions, due to poor cross flow or air caused by enclosures or adjacent structures that is likely to cause nuisance?		
9	Is the suggested flue terminal location likely to cause a nuisance to adjoining properties?		
Clean Air Act		Yes	No
10	Is the total net input of individual or group of flue terminals greater than 333kW net input?		
Building Regulations Part J		Yes	No
11	Is the suggested flue terminal position less than 300mm from the boundary of the property, as measured from the side of the terminal to the boundary?		

All above answers are **NO**

Flue Position is Suitable

Any above answers **YES**

Flue Position is Unsuitable

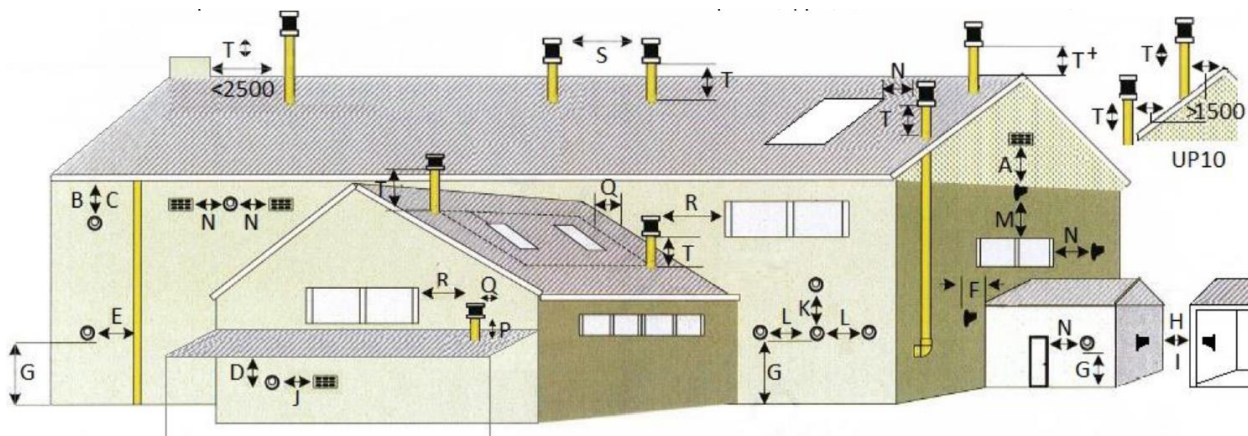
8.8.1 FIGURE 12 – LINE G

$$19.32 \times (\text{net heat input kW}) + 647.59 = \text{mm}$$

8.8.2 FIGURE 7 – LINE Y

$$7.232 \times (\text{net heat input kW}) + 93.708 = \text{mm}$$

8.9 Other Flue Terminal Minimum Distances



All measurements are in mm

Terminal Location		BS5440-2 Boilers rated < 70kW Net Input	Boiler Manufacturers & IGEM-UP-10 Boilers Rated >70kW <333kW Net Input (Fan Draught) Room Sealed (Type C Classification)
A	Directly below an opening into the building	300	2500
B	Below gutter soil pipes etc.	75	200
C	Below Eaves	200	200
D	Below balconies or car port roof	200*	Not Recommended **
E	From vertical drain or soil pipe etc.	150	150
F	From internal or external corners	300	If < 2500 - use plume kit & plume kit extensions
G	Above ground or balcony level	300	2000 with terminal guard – 3000 without
H	From a surface facing the terminal	600	$23.126 \times (\text{kW net input}) + 618.84$
I	From a terminal facing the terminal *	1200	$19.32 \times (\text{kW net input}) + 647.59$
J	From opening in a carport into a dwelling	1200*	Not Recommended **
K	Vertically from a terminal on the same wall	1500	2500mm
L	Horizontally from a terminal on the same wall	300	See Chap 8.7 = 505mm centre to centre
M	Above an opening into the building	300	$7.232 \times (\text{kW net input}) + 93.708$
N	Horizontally to an opening into the building	300*	$7.232 \times (\text{kW net input}) + 93.708$
P	Above a flat roof (Obstacle > 2500mm)	300	$4.5675 \times (\text{kW net input}) - 19.723$
P+	Above a flat roof (Obstacle < 2500mm)	300	$4.5675 \times (\text{kW net input}) - 19.723$
Q	From an adjacent wall (Edge of terminal)	300	If < 2500 - use plume kit & plume kit extensions
R	To an opening into the building	1000	$7.232 \times (\text{kW net input}) + 93.708$
S	From any other terminal	300	See Chap 8.6 = 700mm centre to centre
T	Above a >20 Deg Pitched Roof (BOT)	300	$4.5675 \times (\text{kW net input}) - 19.723$
T+	Above a >20 Deg Pitched Roof (BOT) - Valley	300	$4.5675 \times (\text{kW net input}) - 19.723$

*Positions not recommended **Risk assessment required (Chapter 9.11) BOT = Base of Terminal

8.10 Flue gas and air supply resistance table

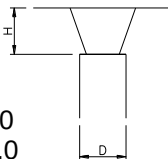
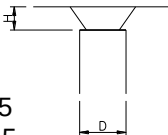
In the next section, for six typical flue gas outlet & air inlet configurations the maximum lengths of the straight pipes will be calculated. First all component resistance values are given in the next table:

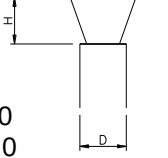
		*60	*80	*100	*120	*150	*180
FLUE GAS PIPING		RESISTANCE [Pa]					
straight tube/m	Ø [mm] *						
	80	5,0	8,0	-	-	-	-
	100	2,0	3,5	4,0	6,5	-	-
	130	0,45	0,8	1,2	1,8	3,8	6,0
45° bend	150	-	-	0,5	0,8	1,7	3,0
	80	2,5	4,0	-	-	-	-
	100	1,0	1,7	2,0	3,2	-	-
	130	0,2	0,4	0,6	0,8	1,9	3,0
90° bend	150	-	-	0,2	0,4	0,8	1,5
	80	5,0	8,0	-	-	-	-
	100	2,0	3,5	4	6,5	-	-
	130	0,4	0,8	1,2	1,8	3,8	6,0
Flue outlet zeta=0,05	150	-	-	0,5	0,7	1,7	3,0
	80	0,7	1,2	-	-	-	-
	100	0,3	0,5	0,8	1,1	-	-
	130	0,1	0,18	0,3	0,4	0,6	0,9
Flue outlet zeta=1	150	-	-	0,15	0,2	0,35	0,5
	80	13,8	24,0	-	-	-	-
	100	5,6	9,8	15,2	22,1	-	-
	130	2,0	3,5	5,3	7,8	12,0	17,3
Flue outlet zeta=1,5	150	-	-	3,0	4,4	6,8	9,8
	80	20,6	36,0	-	-	-	-
	100	8,5	14,8	22,8	33,2	-	-
	130	3,0	5,2	8,0	11,6	18,0	26,0
AIR SUPPLY PIPING	150	-	-	4,5	6,6	10,2	14,7
	Ø [mm] *	RESISTANCE [Pa]					
	80	4,0	7,5	-	-	-	-
	100	1,2	3,0	3,5	4,0	-	-
straight tube/m	130	0,35	0,75	0,8	1,1	1,2	2,0
	150	-	-	0,3	0,4	0,6	1,2
45° bend	80	2,0	3,5	-	-	-	-
	100	0,6	1,5	1,7	2	-	-
	130	0,2	0,4	0,4	0,5	0,6	1,0
	150	-	-	0,15	0,2	0,3	0,6
90° bend	80	4,0	7,0	-	-	-	-
	100	1,2	3,0	3,5	4,0	-	-
	130	0,3	0,7	0,8	1,1	1,2	2,0
	150	-	-	0,3	0,4	0,6	1,2
Air inlet zeta =1	80	10,4	18,1	-	-	-	-
	100	4,2	7,4	11,4	16,7	-	-
	130	1,5	2,6	4,0	5,8	9,1	13,1
	150	-	-	2,3	3,3	5,1	7,4
CONCENTRIC PARTS		RESISTANCE [Pa]					
roof terminal	Ø [mm] *						
	80/125	34	61	-	-	-	-
wall terminal	100/150	-	-	39	45	69	86
	80/125	13	22	-	-	-	-
straight tube/m	100/150	-	-	19	24	40	48
	80/125	9	12	-	-	-	-
45° bend concentric	100/150	-	-	8	10	14	16
	80/125	5	7	-	-	-	-
90° bend concentric	100/150	-	-	8	9	14	16
	80/125	8	13	-	-	-	-
conc./par. adaptor	100/150	-	-	11	13	22	28
	80/125	10	14	-	-	-	-
	100/150	-	-	16	22	40	56

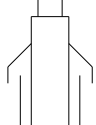
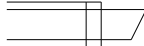
* Never reduce pipe diameters relative to boiler connections

Values printed in grey applicable for larger pipe diameters than boiler connection

NOTICE: This table may only be used for a single flue/air system for one boiler. Do NOT use this table for common flue systems with cascaded boilers.

FLUE GAS OUTLET	
zeta=0 open outlet	
zeta=0,05 conical outlet	
H/D=1,0 zeta=1,0	
H/D=0,5 zeta=1,5	

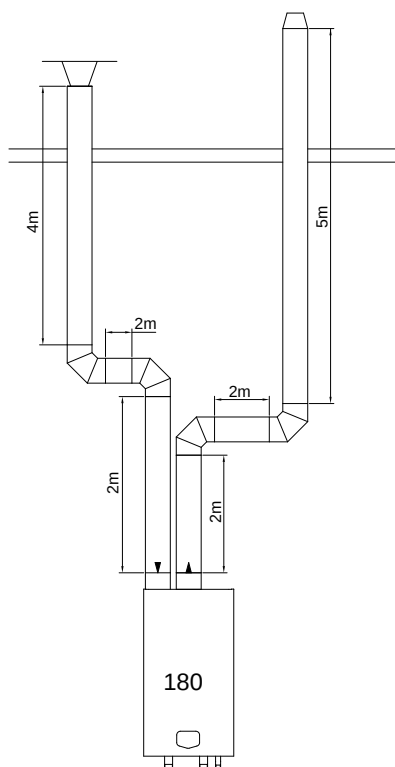
AIR INLET	
H/D=1,0 zeta=1,0	

CONCENTRIC FLUE GAS OUTLET AIR INLET	
ROOF	
WALL	

8.11 Six typical examples

- A:** Twin pipe system with separate pipes for flue gas and air supply **C63**
B: Twin pipe system with separate pipes and concentric roof terminal **C33**
C: Single pipe for flue gas outlet only (air supply from boiler room) **B23**
D: Concentric pipe for flue gas/air supply (roof-mounted) **C33**
E: Concentric pipe for flue gas/air supply (wall-mounted) **C13**
F: Separate air supply duct & flue duct in different pressure zone **C53**

8.11.1 EXAMPLE A: TWIN PIPE SYSTEM (C63)



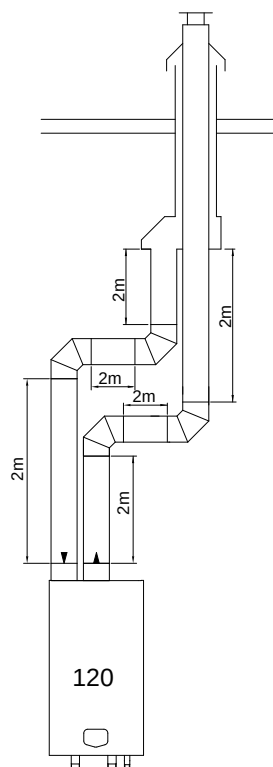
Calculation example with given lengths: checking resistance

Boiler Model:		S-CB ⁺ 180			
Flue gas	Diameter: 130 mm		Number	Pa	Pa total
	Straight tube m ¹	total	9	6	54
	Bend	90°	2	6	12
	Flue outlet	conical	1	0,9	0,9
	Total resistance flue gas outlet:				66.9
Air supply	Diameter: 130 mm		Number	Pa	Pa total
	Straight tube m ¹	total	8	2	16
	Bend	90°	2	2	4
	Air inlet	H/D = 1,0	1	13,1	13,1
	Total resistance air supply:				33,1
Total resistance flue gas outlet and air supply:					100 Pa

The total resistance is less than 200 Pa. This flue gas / air supply system is functional.

Be aware: Our specific resistance values are used in this example. Flue and air pipes of other supplier can have other values.

8.11.2 EXAMPLE B: TWIN PIPE SYSTEM WITH CONCENTRIC ROOF TERMINAL (C33) – NON STREBEL SUPPLY

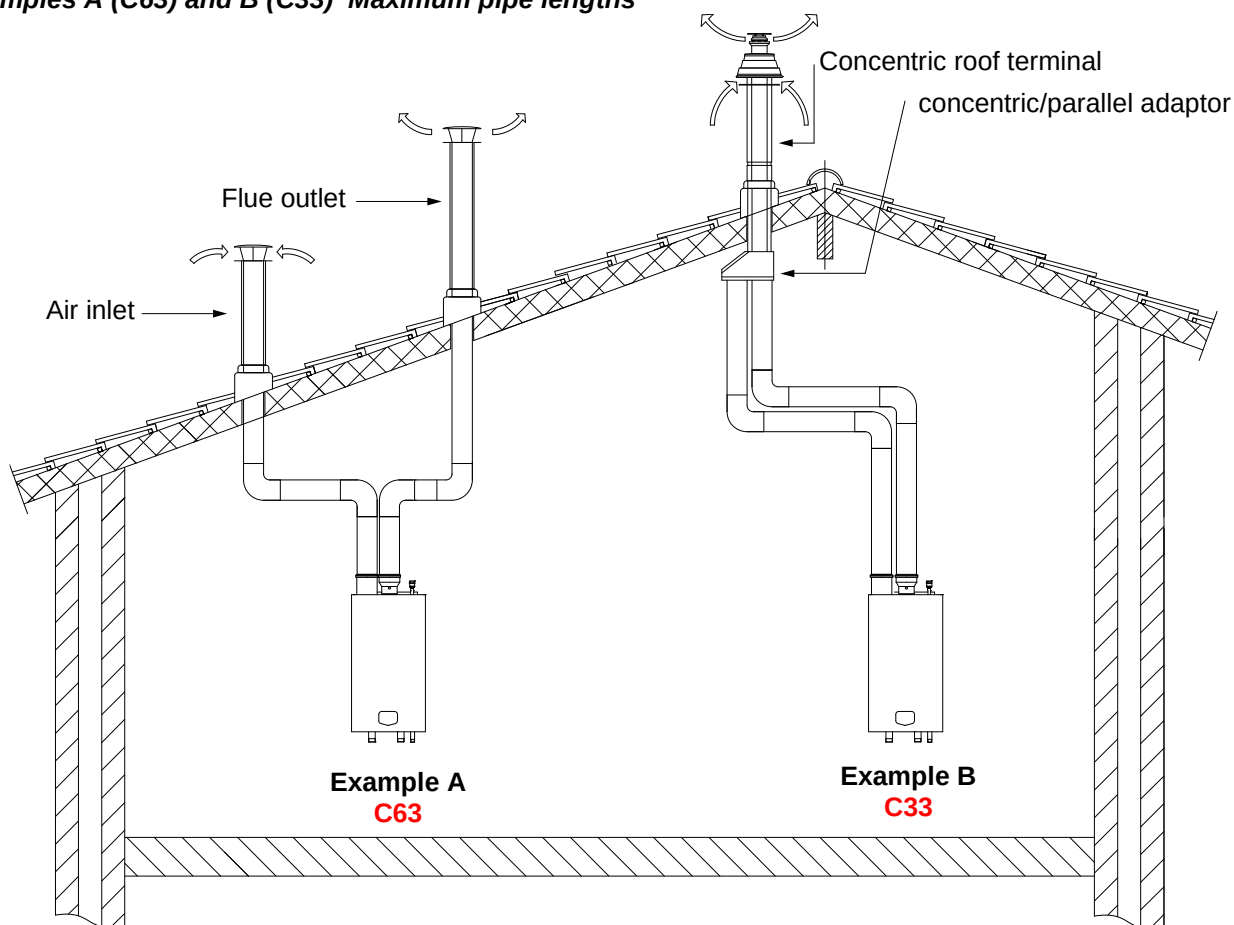


Calculation example with given lengths: checking resistance

Boiler Model:		S-CB ⁺ 120			
Flue gas	Diameter: 100 mm		Number	Pa	Pa total
	Straight tube m ¹	total	6	6,5	39
	Bend	90°	2	6,5	13
	Roof terminal	concentric 150/100	1	45	45
	Adaptor conc./par.	150/100	1	22	22
	Total resistance flue gas outlet:				119
Air supply	Diameter: 100 mm		Number	Pa	Pa total
	Straight tube m ¹	total	6	4	24
	Bend	90°	2	4	8
Total resistance air supply:					32
Total resistance flue gas outlet and air supply:					151 Pa

The total resistance is less than 200 Pa. This flue gas / air supply system is functional.

Examples A (C63) and B (C33) Maximum pipe lengths

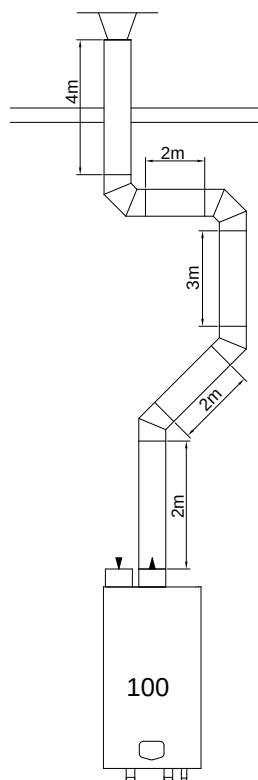


Example A (C63)						
Boiler Model →	+ 60	+ 80	+ 100	+ 120	+ 150	+ 180
Diameter air inlet [mm]	80	80	100	100	130	130
Diameter flue outlet [mm]	80	80	100	100	130	130
Diam. roof terminals [mm]	80	80	100	100	130	130
Maximum pipe length (inlet + outlet together) [m]	27,5	18,0	31,5	24,0	44,5	30,0

Example B (C33)						
Boiler Model →	+ 60	+ 80	+ 100	+ 120	+ 150	+ 180
Diameter air inlet [mm]	80	80	100	100	130	130
Diameter flue outlet [mm]	80	80	100	100	130	130
**Concentric roof terminal [mm]	80/125	80/125	100/150	100/150	130/200	130/200
Maximum pipe length (inlet + outlet together) [m]	21,0	12,0	23,0	16,5	40,5	25,5

**** The concentric / parallel adaptor is a non Strebel Supply.**

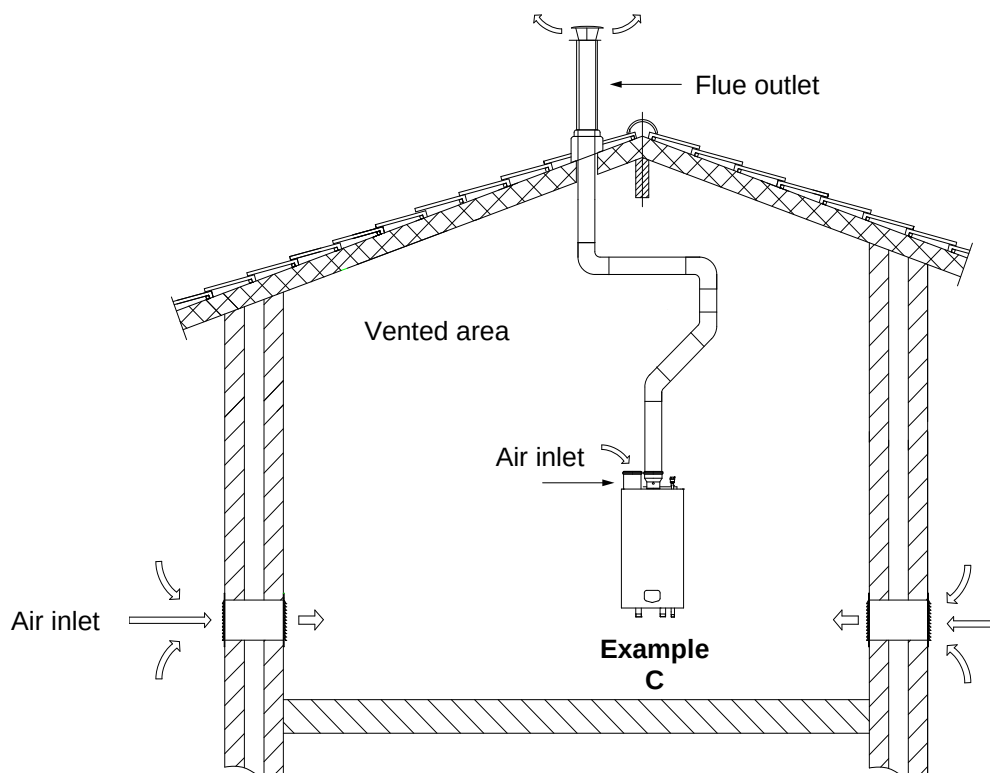
8.11.3 EXAMPLE C: SINGLE FLUE GAS OUTLET. AIR SUPPLY FROM BOILER ROOM



Calculation example with given lengths: checking resistance

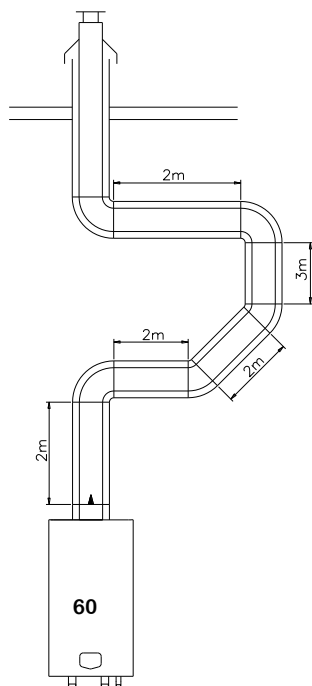
Boiler Model:		S-CB ⁺ 100			
Flue gas	Diameter:	100 mm	Number	Pa	Pa total
	Straight tube m ¹	total	13	4	52
	Bend	90°	2	4	8
	Bend	45°	2	2	4
	Flue outlet	H/D = 1,0	1	15,2	15,2
	Total resistance flue gas outlet:				79,2

The total resistance is less than 200 Pa. This flue gas / air supply system is functional.



Example C (B23, B23P)						
Boiler Model →	+ 60	+ 80	+ 100	+ 120	+ 150	+ 180
Diameter air inlet [mm]	80	80	100	100	130	130
Diameter flue outlet [mm]	80	80	100	100	130	130
Diam. roof terminal [mm]	80	80	100	100	130	130
Maximum pipe length (total outlet length) [m]	36,5	21,5	46,5	27,5	49,5	30,0

8.11.4 EXAMPLE D: CONCENTRIC FLUE GAS/AIR SUPPLY PIPE (ROOF-MOUNTED)

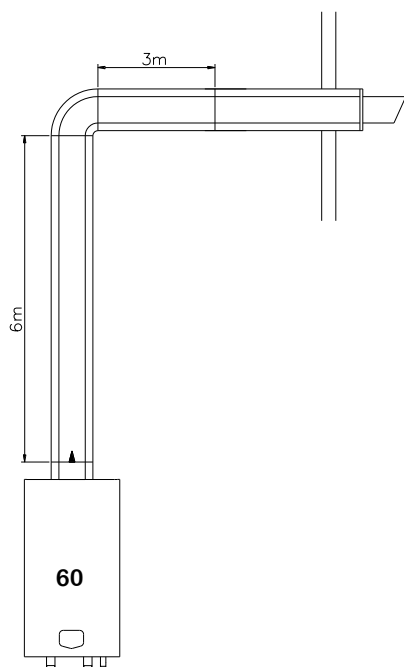


Calculation example with given lengths: checking resistance

Boiler Model:		S-CB ⁺ 60 (C33)			
Concentric	Diameter: 80/125 mm.		Number	Pa	Pa total
	Straight tube m	total	11	9	99
	Bend	90°	3	8	24
	Bend	45°	2	5	10
	Concentric terminal	roof	1	34	34
	Total resistance flue gas outlet and air supply (concentric):				167

The total resistance is less than 200 Pa. This flue gas / air supply system is functional.

8.11.5 EXAMPLE E: CONCENTRIC SYSTEM WALL OUTLET C13(WALL-MOUNTED)

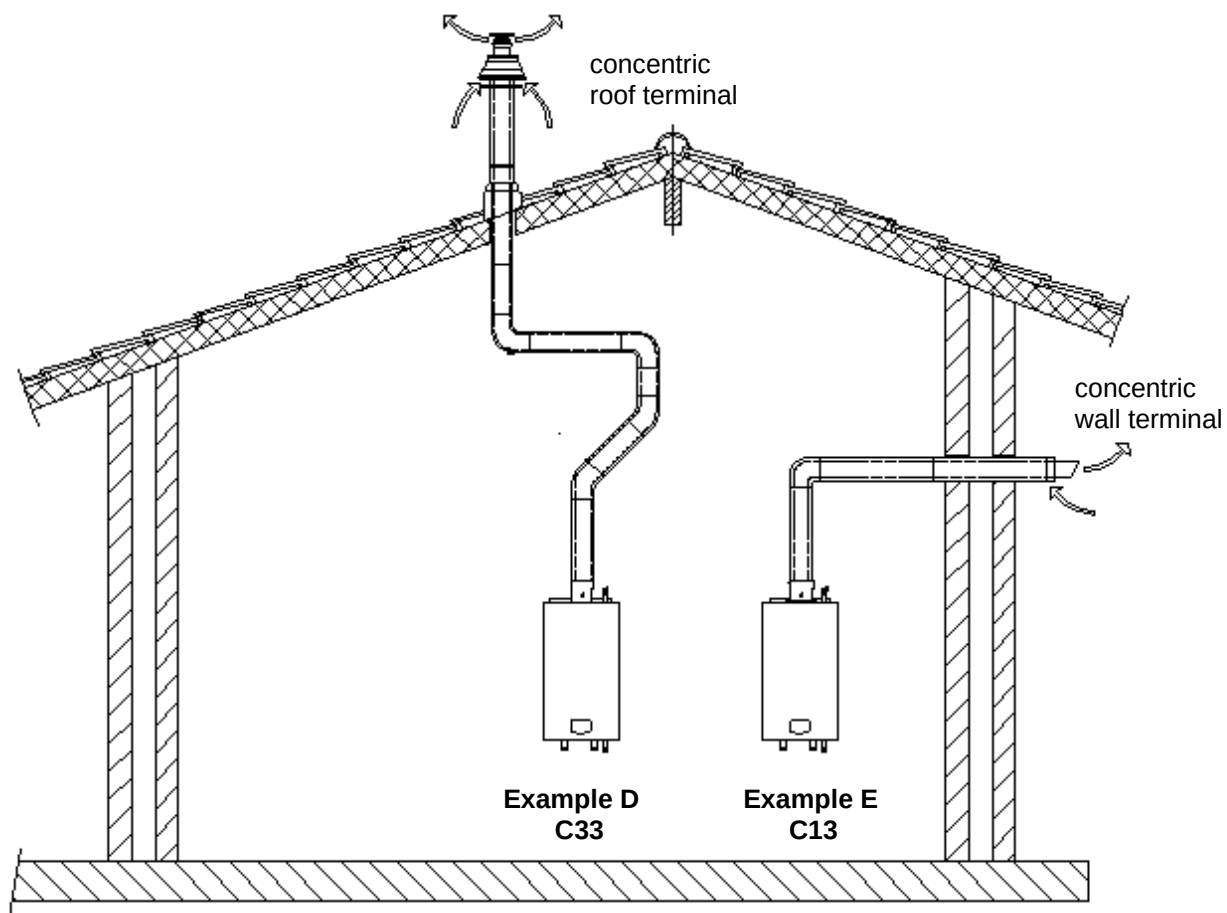


Calculation example with given lengths: checking resistance

Boiler Model:		S-CB ⁺ 60			
Concentric	Diameter: 80/125 mm		Number	Pa	Pa total
	Straight tube m	total	9	9	81
	Bend	90°	1	8	8
	Concentric terminal	wall	1	13	13
	Total resistance flue gas outlet and air supply (concentric):				102

The total resistance is less than 200 Pa. This flue gas / air supply system is functional.

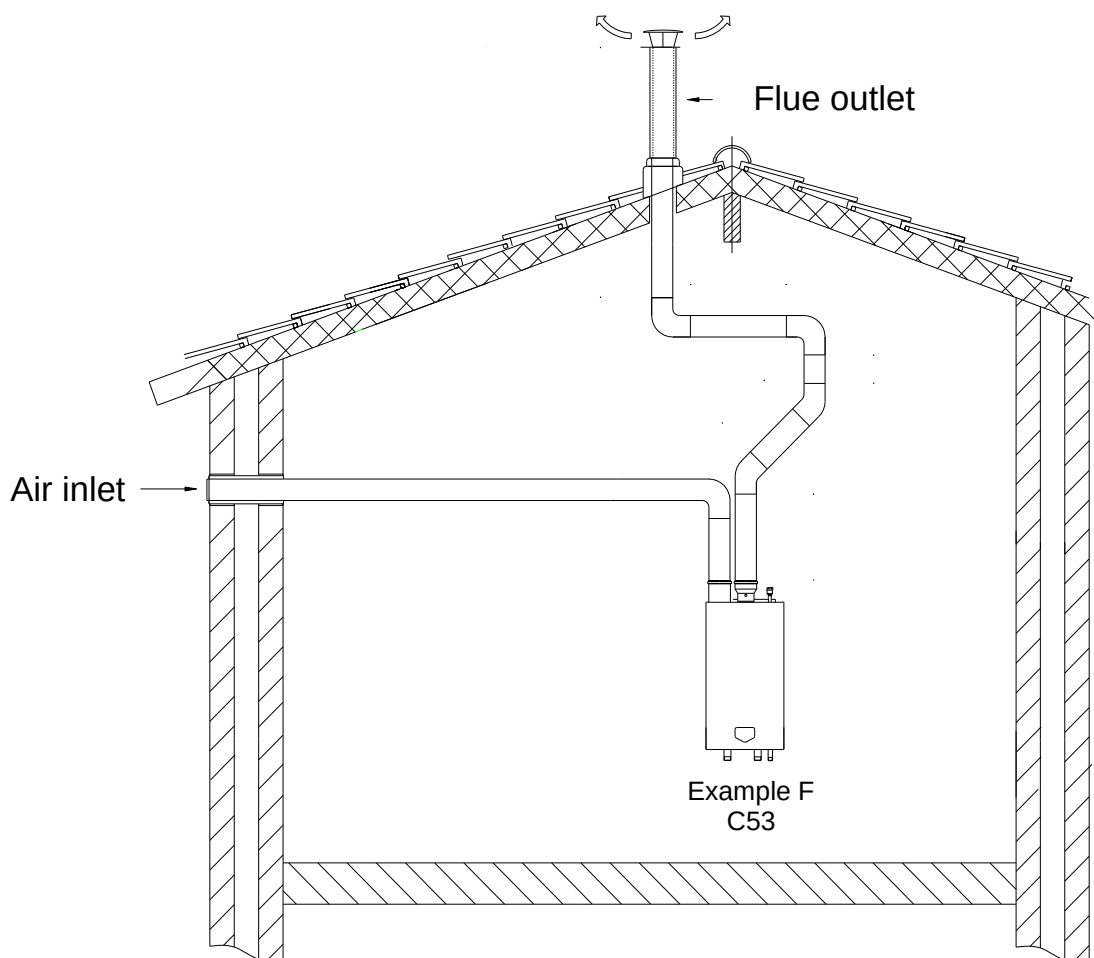
Examples D and E maximum pipe lengths



Example D (C33)						
Boiler Model →	+ 60	+ 80	+ 100	+ 120	+ 150	+ 180
Diameter concentric pipe [mm]	80/125	80/125	100/150	100/150	NOT RECOMMENDED (choose B,C or E)	
Concentric roof terminal [mm]	80/125	80/125	100/150	100/150		
Maximum pipe length [m]	13,5	6,0	12,0	7,5		

Example E (C13)						
Boiler Model →	+ 60	+ 80	+ 100	+ 120	+ 150	+ 180
Diameter concentric pipe [mm]	80/125	80/125	100/150	100/150	100/150	100/150
Concentric wall terminal [mm]	80/125	80/125	100/150	100/150	100/150	100/150
Maximum pipe length [m]	18,5	12,5	19,0	14,0	7,0	4,0

8.11.6 EXAMPLE F: SEPARATE AIR SUPPLY DUCT & FLUE DUCT IN DIFFERENT PRESSURE ZONE (C53)



Example F (C53)						
Boiler Model →	+ 60	+ 80	+ 100	+ 120	+ 150	+ 180
Diameter wall terminal [mm]	80	80	100	100	130	130
Diameter air inlet [mm]	80	80	100	100	130	130
Diameter air inlet/ flue outlet [mm]	80	80	100	100	130	130
Diameter roof terminal [mm]	80	80	100	100	130	130
Maximum pipe length (inlet + outlet together) [m]	30	14	38	19	42	23

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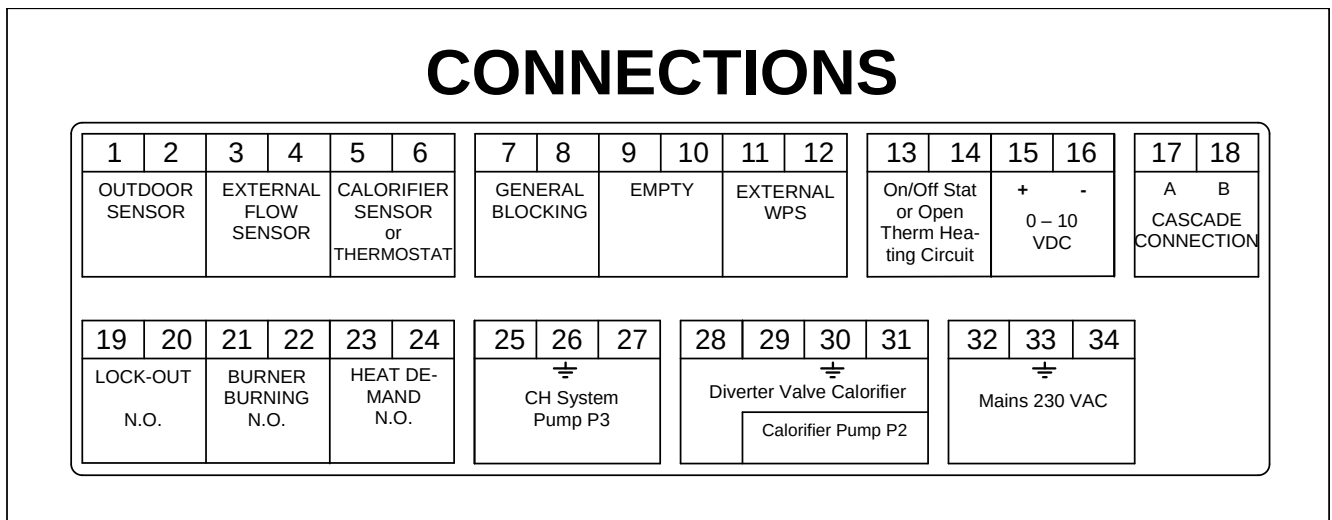
9 ELECTRICAL INSTALLATION

9.1 General

All the wiring is connected to a separate connector that is fitted in a socket. The connector can be taken from the sockets without loosening the wiring. The connections are placed on top of the display panel and can be accessed by removing the boiler front door and the connector protection cover.

- For operation the boiler needs a power supply of 230 Vac 50Hz.
- The boiler connections are not life/neutral sensitive (the boiler is not phase-sensitive).
- The wiring for the connections can be entered at the bottom of the boiler through the cable glands.
- **NOTICE:** Before starting to work on the boiler, it must be switched off and the power supply to the boiler must be disconnected.
- Electrical wiring should be installed according to all applicable standards and regulations.
- Working on the boiler should only be done by a qualified service engineer that is skilled in working on electrical installations and according to all applicable standards.

9.2 Electrical connections

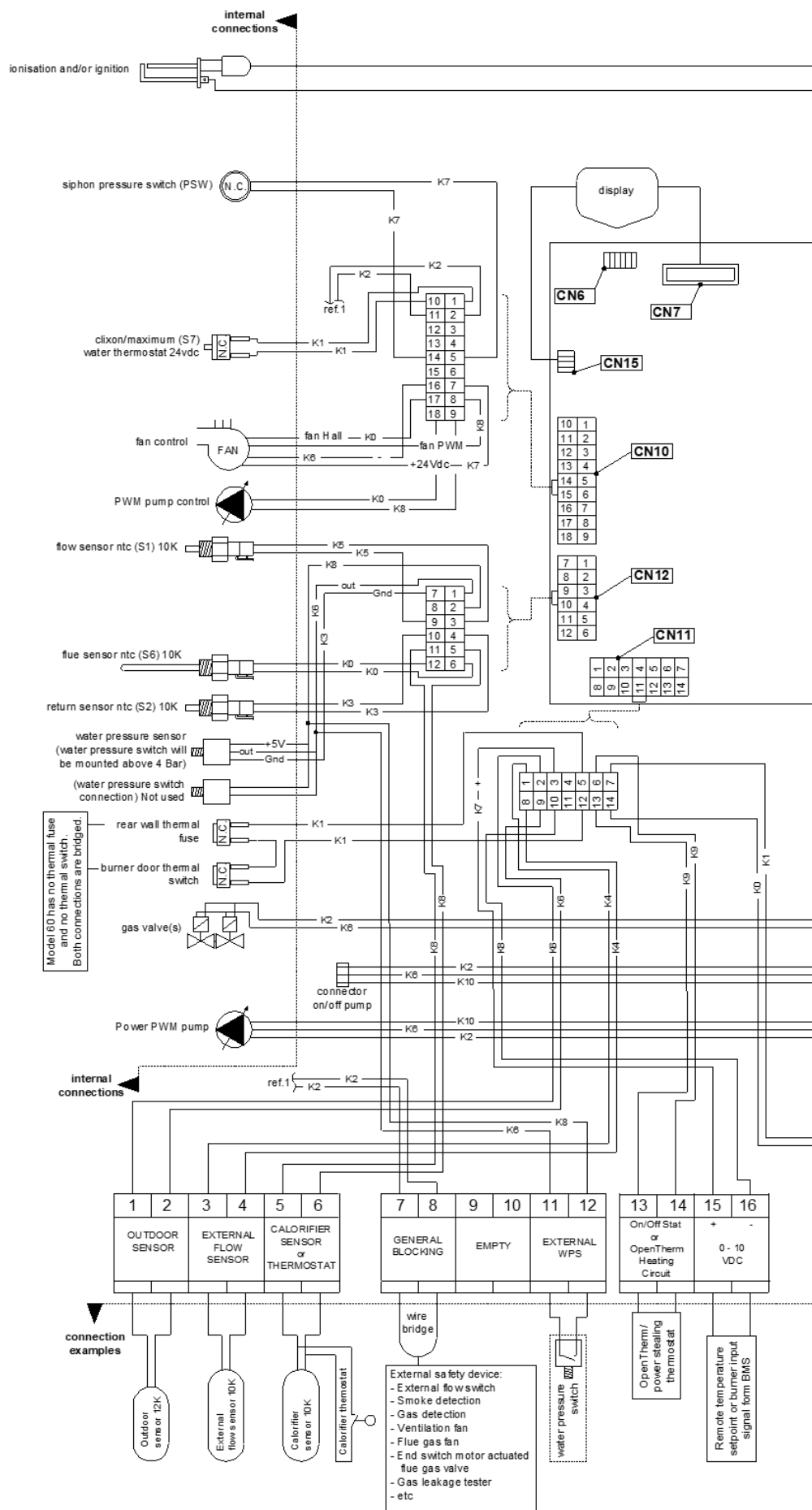


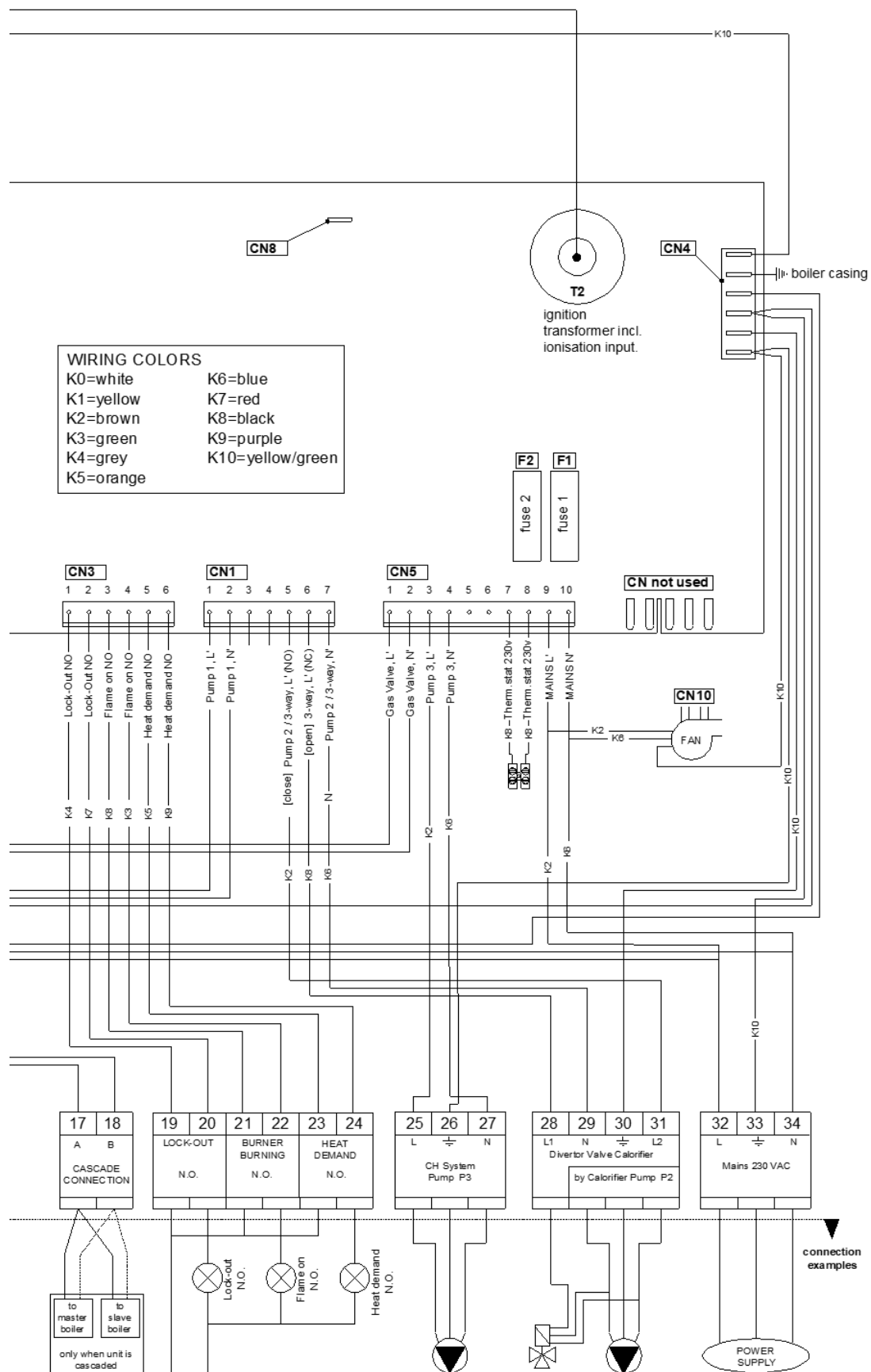
9.3 Explanation of the connections

1-2	OUTDOOR SENSOR
When an outdoor temperature sensor is connected, the boiler will control the flow water temperature by using a calculated setting, which is relative to the outdoor temperature. PARAMETER: No parameter settings needed.	
3-4	EXTERNAL FLOW SENSOR
When a low loss header is used, this sensor measures the flow temperature at the system side. The sensor must be mounted on the supply pipe at the system side, just behind the low loss header. NOTICE: The sensor must be used when boilers are cascaded with the internal cascade manager. PARAMETER: No parameter settings needed.	
5-6	CALORIFIER SENSOR or THERMOSTAT
When an indirect hot water tank is installed, a hot water sensor must be connected to these terminals. In case of a DHW heat demand, the set point will be shown in the display. An external on/off thermostat can also be connected to these terminals. When there is heat demand (terminals 5 and 6 are bridged) the flow temperature going to the heating coil(s) will be shown in the display.	

7-8	GENERAL BLOCKING
A heat demand that will start the burner will be blocked when terminals 7 and 8 are not bridged. This connection is for the use of external safety devices (terminals must be bridged for allowing burner to fire).	
9-10	EMPTY
11-12	EXTERNAL WATER PRESSURE SWITCH
A water pressure sensor is mounted in the boiler. As an option a water pressure switch can be installed. The sensor can be replaced by the water pressure switch, which can be wired to the terminals. When terminals 11-12 are not bridged, the boiler will lock-out. PARAMETER: A parameter change is needed.	
13-14	ON/OFF STAT OR OPENTHERM HEATING CIRCUIT
OPTION 1: An ON/OFF thermostat can be connected. The boiler will use the set/programmed flow temperature for the heating system when these terminals 13 and 14 are bridged. OPTION 2: An OpenTherm (OT) controller can be connected to the terminals 13 and 14. The boiler software will detect and use this OpenTherm signal automatically.	
15-16	0-10 VDC CONTROL SIGNAL
These terminals are used for an external 0-10 VDC control signal. PARAMETER: A parameter change is needed. NOTICE: Terminal 15 [+] (positive) and terminal 16 [-] (negative).	
17-18	CASCADE CONNECTION
These connections are used when boilers are cascaded with the internal cascade manager for controlling the total cascade. NOTICE: Connect all terminals 17 and all terminals 18 together, do not switch between these terminals.	
19-20	LOCK-OUT OR PUMP ON/OFF
This contact is N.O. (normally open). When the unit is in lock-out this contact will close. This contact can also be used for the switching of a pump with a separate control input connection; then a parameter change is needed. Up to 230V is permitted through this relay.	
21-22	BURNER BURNING OR EXTRA BOILER OR PUMP ON/OFF
This contact is N.O. (normally open). When the unit starts the burner and detects the flame, this contact will be closed. This contact can also be used to control an external boiler or for the switching of a pump with a separate control input connection; in both latter cases a parameter change is needed.	
23-24	HEAT DEMAND OR PUMP ON/OFF
This contact is N.O. (normally open). When the unit receives any heat demand this contact will close. This contact can also be used for the switching of a pump with a separate control input connection; then a parameter change is needed. Up to 230V is permitted through this relay.	
25-26-27	CH SYSTEM PUMP P3
Connections for a central heating system pump (P3). Nominal pump current of P3 may not exceed 2 A, therefore its power may not exceed 460 W.	
28-29-30-31	DIVERTER VALVE CALORIFIER
When using a hot water tank, a 3-way valve or a pump (P2) can be used to divert hot water to the heating coil of the water tank. This 3-way valve will open, when the hot water storage tank has a heat demand. PARAMETER: A parameter change is needed. 28 = L1 wire (heating position); 29 = Neutral wire; 30 = Ground wire; 31 = L2 wire (hot water position). The inrush current of the 3-way valve may not exceed 3 A, see also chapter 7.2.	
29-30-31	CALORIFIER PUMP P2
When using a hot water tank, a 3-way valve or a pump (P2) can be used to divert hot water to the heating coil of the tank. This pump will start when the hot water storage tank creates a hot water demand. PARAMETER: A parameter change is needed. Nominal pump current of P2 may not exceed 2 A, therefore its power may not exceed 460 W.	
32-33-34	POWER SUPPLY
The power supply connection of the unit. 32 = Phase wire; 33 = Ground wire; 34 = Neutral wire.	

9.4 Electrical schematics





9.5 Sensor values

SENSOR	SENSOR TYPE	SENSOR VALUE
S1	Internal flow sensor	NTC-10K-B3977
S2	Internal return sensor	NTC-10K-B3977
S3	External flow sensor	NTC-10K-B3977
S4	Water tank sensor	NTC-10K-B3977
S5	Outdoor sensor	NTC-12K-B3740
S6	Flue gas sensor	NTC-10K-B3977

Conversion table temperature vs. resistance outdoor sensor NTC-12k B3740

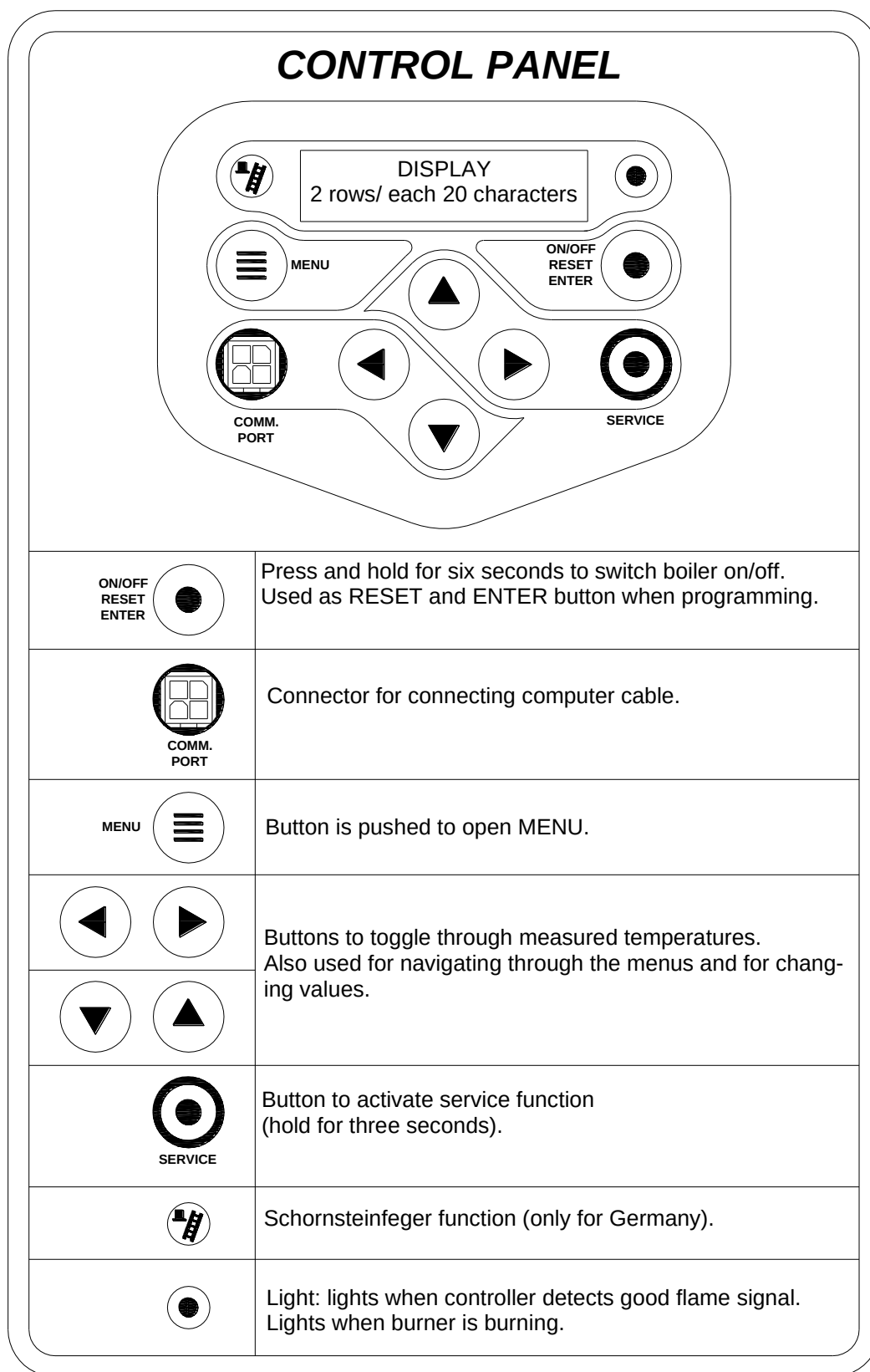
Temperature (°C)	Resistance (Ω)	Temperature (°C)	Resistance (Ω)
-50		0	36130
-45		5	28600
-40		10	22800
-35		15	18300
-30	171800	20	14770
-25	129800	25	12000
-20	98930	30	9804
-15	76020	35	8054
-10	58880	40	6652
- 5	45950	45	5522

Conversion table temperature vs. resistance all sensors except outdoor sensor. NTC-10k B3977

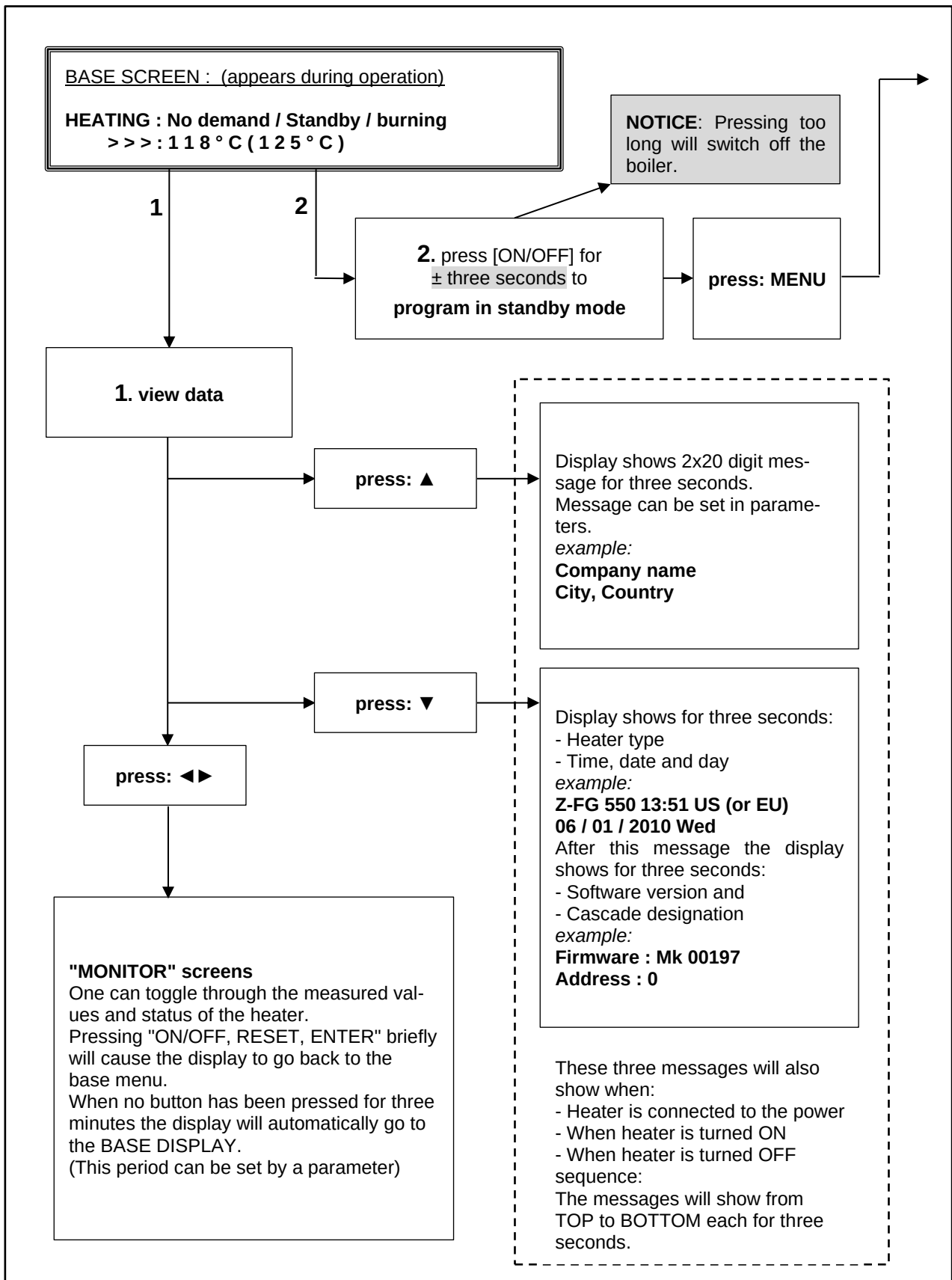
Temperature (°C)	Resistance (Ω)	Temperature (°C)	Resistance (Ω)	Temperature (°C)	Resistance (Ω)	Temperature (°C)	Resistance (Ω)
-30	175203	20	12488	70	1753	120	387
-25	129289	25	10000	75	1481	125	339
-20	96360	30	8059	80	1256	130	298
-15	72502	35	6535	85	1070	135	262
-10	55047	40	5330	90	915	140	232
-5	42158	45	4372	95	786	145	206
0	32555	50	3605	100	677	150	183
5	25339	55	2989	105	586	155	163
10	19873	60	2490	110	508	160	145
15	15699	65	2084	115	443	165	130

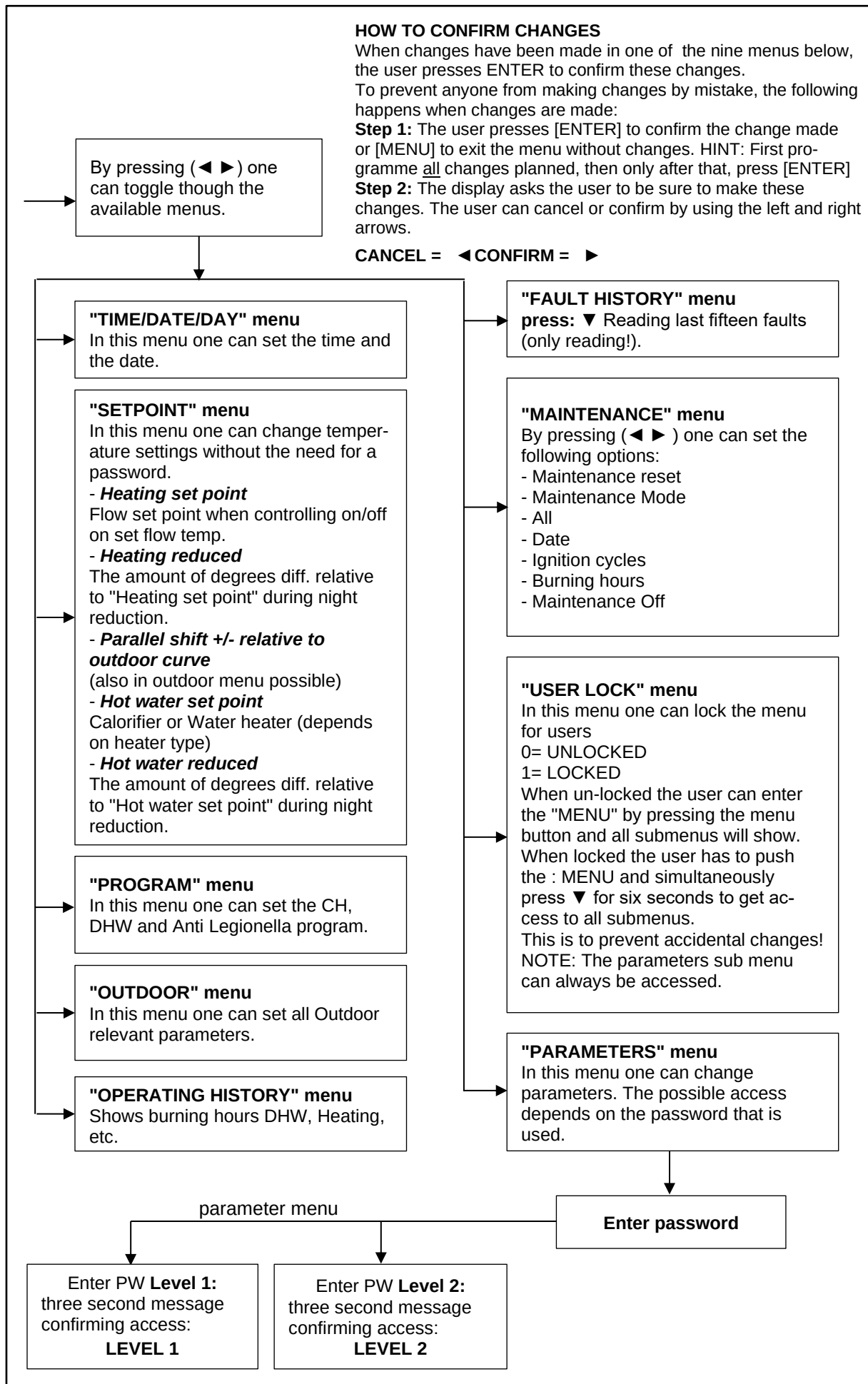
10 USER INTERFACE

10.1 Control panel / display unit



10.2 Control panel menu structure





10.3 Display during operation

During normal operation the text in the display shows the status of the boiler. In the following graphs the several displays during normal operation are explained.

Display at HEATING DEMAND

Heat demand type:				Actual status:			
H	E	A	T	I	N	G	:
N	o	d	e	m	a	n	d
>	>	>	:	1	2	3	.
				4	°	C	(
							1
							2
							3
							.
							4
							°
							C
							)
cascade communication indicator				temp. set point			
				control sensor showing the measured temperature. Can be turned off by P5 BJ			

When heat is needed for the calorifier the text "HEATING" changes into "HOTWATR".

When there is no heat demand it always shows heating.

Display at HOT WATER DEMAND

Heat demand type:				Actual status:			
H	O	T	W	A	T	R	:
N	o	d	e	m	a	n	d
>	>	>	:	1	2	3	.
				4	°	C	(
							1
							2
							3
							.
							4
							°
							C
							)
cascade communication indicator				temp. set point Thermostat > coil flow temp. Sensor > water temp.			
				control sensor showing the measured temperature Can be turned off by P5 BJ			

Explanation "Actual status" screen

Actual status:

B o i l e r o f f

When boiler is switched off (only text in the display during this status).

N o d e m a n d

No heat demand signal coming from the room thermostat and tank sensor (open).

S t a n d - b y

Room thermostat & tank sensor/thermostat detect heat demand but set point is reached.

P r e - p u r g e

The fan is purging before a burner start attempt.

P r e - i g n i t i o n

Ignition starts before opening of the gas valve.

I g n i t i o n

The ignitor is igniting.

P o s t - p u r g e

The fan is purging after burner is switched off.

B u r n i n g 1 0 0 %

When the burner is firing, also the actual rpm% is shown.

Explanation "Cascade communication indicator"

NO CASCADE COMMUNICATION

> > > no.1

Always showing the fixed ">>>"

CORRECT CASCADE COMMUNICATION

> > > no.1

> > > no.2

Showing alternating no.1 & no.2 with one second interval.

10.4 Monitor screens

During normal operation and stand-by, the [◀] and [▶] buttons can be used to show some boiler information, including measured temperatures, settings and data. In the following graphs is explained which values can be shown in the display. When no button is activated for 2 minutes, the display will return to its status display.

Pressing [◀] or [▶] while being at the "operating screen" toggles through the screens below.

When pressing [ON/OFF], [RESET], [ENTER] or [MENU] at any time the display returns to the base menu.

SCREEN: 1

T 1	F l o w	1 2 3 , 9 ° C	Measured value by the internal flow sensor.
T 2	R e t u r n	1 2 3 , 9 ° C	Measured value by the internal return sensor.
		O p e n	Shown when controller doesn't detect this sensor.
		S h o r t e d	Shown when sensor wires or sensor itself is shorted.

SCREEN: 2

T 3	E x t e r n a l	1 2 3 , 9 ° C	Measured value by the external sensor.
T 4	C a l o r i f i	1 2 3 , 9 ° C	Measured value by the tank sensor.
		O p e n	Shown when controller doesn't detect this sensor.
		S h o r t e d	Shown when sensor wires or sensor itself is shorted.

SCREEN: 3

T 5	O u t d o o r	1 2 3 , 9 ° C	Measured value by the outdoor sensor.
T 6	F l u e	1 2 3 , 9 ° C	Measured value by the flue gas sensor.
		O p e n	Shown when controller doesn't detect this sensor.
		S h o r t e d	Shown when the sensor wires or the sensor itself is shorted.

SCREEN: 4

d T F l o w R e t u r n	1 2 3 , 9 ° C	Temp. difference between internal flow & return sensor.
d T F l u e R e t u r n	1 2 3 , 9 ° C	Temp. difference between flue gas & internal return sensor.

SCREEN: 5

d T E x t R e t u r n	1 2 3 , 9 ° C	Temp. difference between external & internal return (ΔT LLH).
S i g n a l	P o w e r	External supplied 0-10 Volt dc signal.
	S e t p o i	"Power" = power input control or "Setpoi" = set point control.

SCREEN: 6

F a n s p e e d	9 9 9 9 r p m	Actual fan speed in rpm.
F a n s p e e d	1 0 0 %	Actual fan speed % of maximum allowable fan speed.

Fan maximum RPM: The maximum actual rpm may be lower than the maximum rpm set point. The fan may not be able to reach the maximum rpm set point, because of the unit's resistance, which is still correct according to the design of that specific unit.

SCREEN: 7

F l a m e s i g n a l	1 0 0 μ A	Flame signal given in μA.
W a t e r P r e s s u r e	1 , 0 b a r	Shows water pressure when sensor is connected.

SCREEN: 8

P u m p 1 H e a t e r	O f f	Pump 1 (HEATER PUMP) On or Off.
P u m p 1 S i g n a l	1 0 0 %	Modulating signal Pump 1 in (%).

SCREEN: 9

P u m p 2 C a l o r i f i	O f f	Shows when the calorifier pump is "ON" or "OF".
3 - w a y V a l v e H e a t i n g		Signal to the 3-way valve: "HEATING" or "HOTWATER".

SCREEN: 10

P u m p 3 S y s t e m	O f f	Shows when the system pump is "ON" or "OF".
h h : m m D D / M M / Y Y Y Y D a y		hh=hour; mm=minutes; DD=day; MM=month; YYYY=yr; Day o/t week

SCREEN: 11

C	a	s	c		D	e	s	i	g	n				0					0 = MASTER, 1 11 = SLAVES	
C	a	s	i	n	f			0	1	2	3	4	5	6	7	8	9	A	B	Displays number, priority and state of cascade boilers.

DESCRIPTION "CASCINFO" Screen 11

Shows the number of boilers connected with the cascade. The Master/Lead boiler is designated as 0. Slave/Lag boilers will be designated 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B. When a "-" is used instead of a number, then that boiler is either not connected, or in a lockout mode and not available for the cascade. When an "x" is used instead of a number, then that boiler is connected, but in lockout mode.

When a "d" is displayed instead of a number, then that boiler is handling a DHW demand.

When the number is flashing, then that boiler is providing heat to the cascade. When the leading boiler is changed according to the set priority change time, then that boiler's address will be shown first in the row of numbers.

Example 1: "3 4 5 - - - - - 0 1 2"

Six are boilers present and nr. 3 has priority.

Example 2: "3 4 x - - - - - d 1 2"

Six boilers are present and nr. 3 has priority. Boiler 0 is heating up an indirect DHW tank. Boiler 5 is present, but in a lock-out.

SCREEN: 12

C	a	s	c		P	o	w	e	r		9	9	9	%		9	9	9	%	% heat demand of total (cascade) power available (%).
D	u	a	i		B	u	r	n	e	r	:				N	o				Heat exchanger equipped with two burners: "Yes" or "No".

SCREEN: 13

M	a	x		T	h	e	r	m						O	p	e	n			Status of the maximum thermostat: "Open" or "Closed".
G	e	n		B	l	o	c	k						C	l	o	s	e	d	Status of the general blocking contact: "Open" or "Closed".

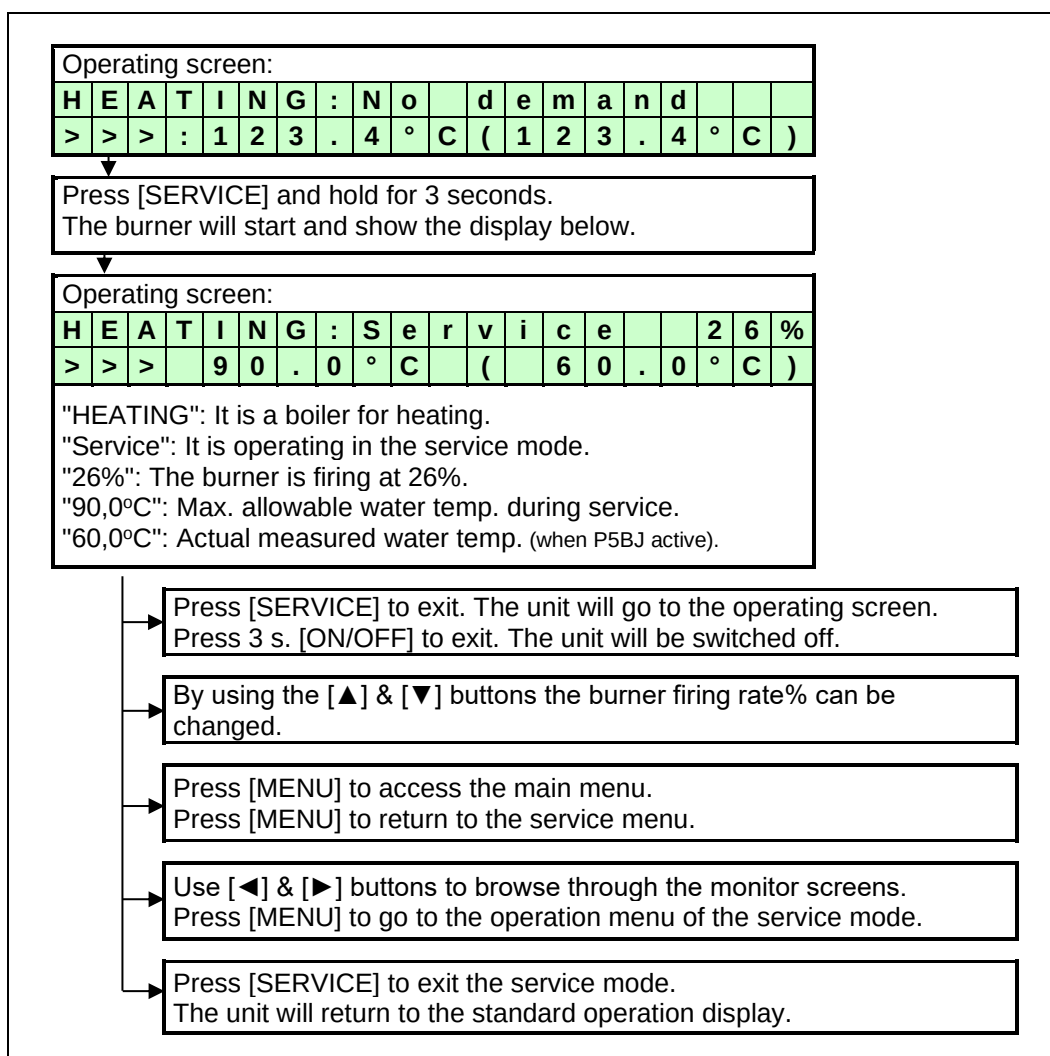
SCREEN: *14

S	i	p	h	o	n		p	r	e	s	s			C	l	o	s	e	d	Status of the siphon pressure switch: "Open" or "Closed".
N	R	V		C	o	n	t	a	c	t				O	p	e	n			Status of the non-return valve contact: "Open" or "Closed".

* REMARK: at screen 14: No NRV used in this type of boiler.

10.5 Service function

The following graphs describe how to use the service function.

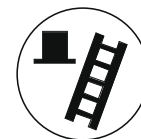


10.6 Schornsteinfeger function

The following graphs describe how to use the Schornsteinfeger function.

NOTICE: This function is required for Germany and can be activated by parameter (P5 BK). The standard factory setting for this function is "OFF".

The purpose of this function is to have an easy interface for the "Schornsteinfeger" in Germany, to be able to do their required testing on the boiler. This is a simplified function similar to the normal service function of the boiler.



When the "Schornsteinfeger" button is pressed for 3 seconds:
the heater will fire at **minimum firing rate (%)**

In this state the display shows:

F	l	u	e	s	e	r	v	i	c	e	m	o	d	e			
P	o	w	e	r	:		M	i	n	i	m	u	m				

When the button is pressed (briefly) again:
the heater will fire at **50% firing rate**

In this state the display shows:

F	l	u	e	s	e	r	v	i	c	e	m	o	d	e			
P	o	w	e	r	:		5	0	%								

When the button is pressed (briefly) again:
the heater will fire at **maximum firing rate (%)**

In this state the display shows:

F	l	u	e	s	e	r	v	i	c	e	m	o	d	e			
P	o	w	e	r	:		M	a	x	i	m	u	m				

When the button is pressed briefly again:
the heater will return to the normal operation mode.
The "Schornsteinfeger" function is switched off.

NOTES:

When the heater is burning during Schornsteinfeger function (when top display line shows "Flue service mode") and no button is pressed for 12 minutes, the boiler will return automatically to the normal operation mode. The "Schornsteinfeger" function will be switched off.

The "Schornsteinfeger function" can be activated for the user by programming a parameter (P5 BK)

All regular temperature safety controls remain active and the boiler/water heater pump and the system pump are running.

10.7 Programming in standby mode

Standby

Use the standby mode for modifying boiler settings without interaction with the boiler control. Changes are effectuated by leaving standby mode.

Properties of standby mode:

- Keys are active and the menu is accessible.
- Burner does NOT respond to an external heat demand.
- All control functions are active: pumps, fans and cascade are operational, recirculation and frost protection are working.

How to programme the boiler:

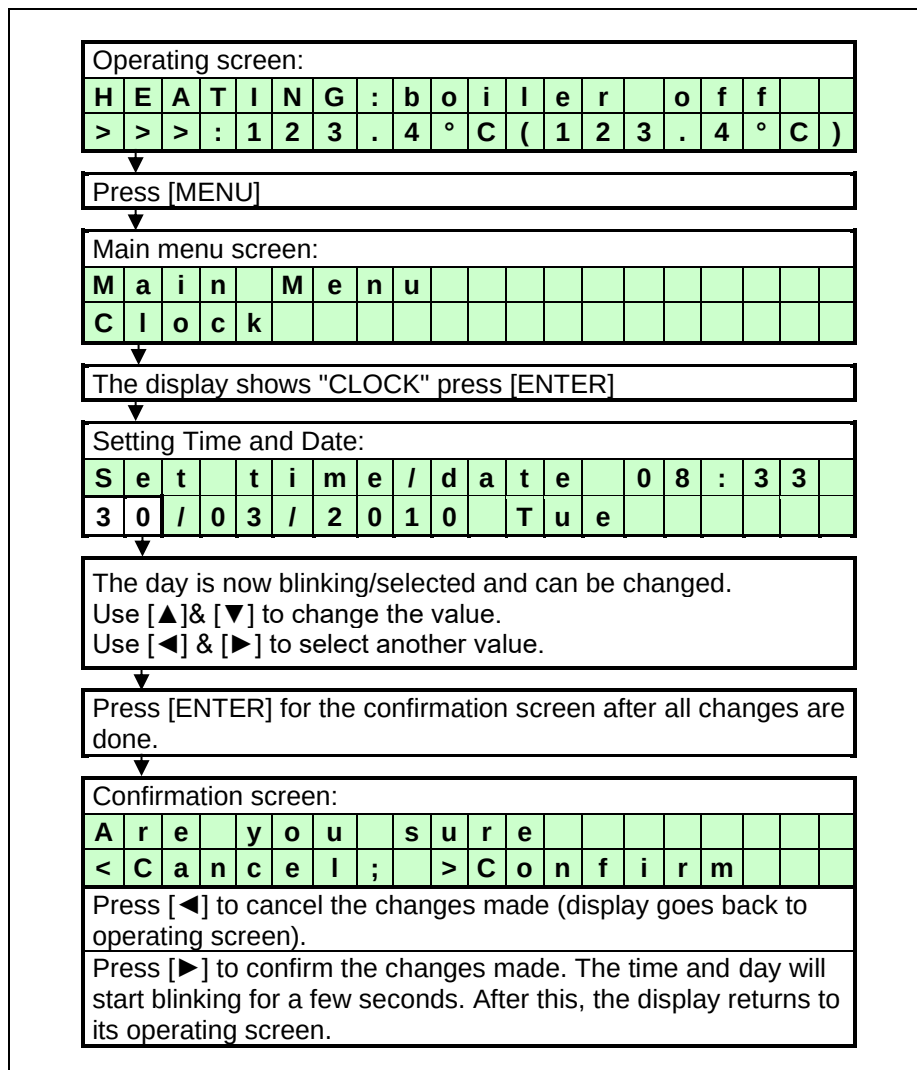
- First disconnect or shut down the room thermostat and/or other external controllers from the boiler. The CH pump and fan will stop after a short delay time.
- Switch the boiler in standby mode by pressing [ON/OFF] for three seconds.
- The next display screen should appear:

Display message	H	E	A	T	I	N	G	:	b	o	i	l	e	r		o	f	f		
	>	>	>	:	1	2	3	.	4	°	C	(	1	2	3	.	4	°	C	)

- Program the boiler at the control panel (see the following sections).
- Terminate programming mode by pressing [MENU], or [ENTER] and NO ◀ or YES ▶.
- Reactivate the boiler by pressing [ON/OFF] for three seconds again.

10.8 Setting the time & date

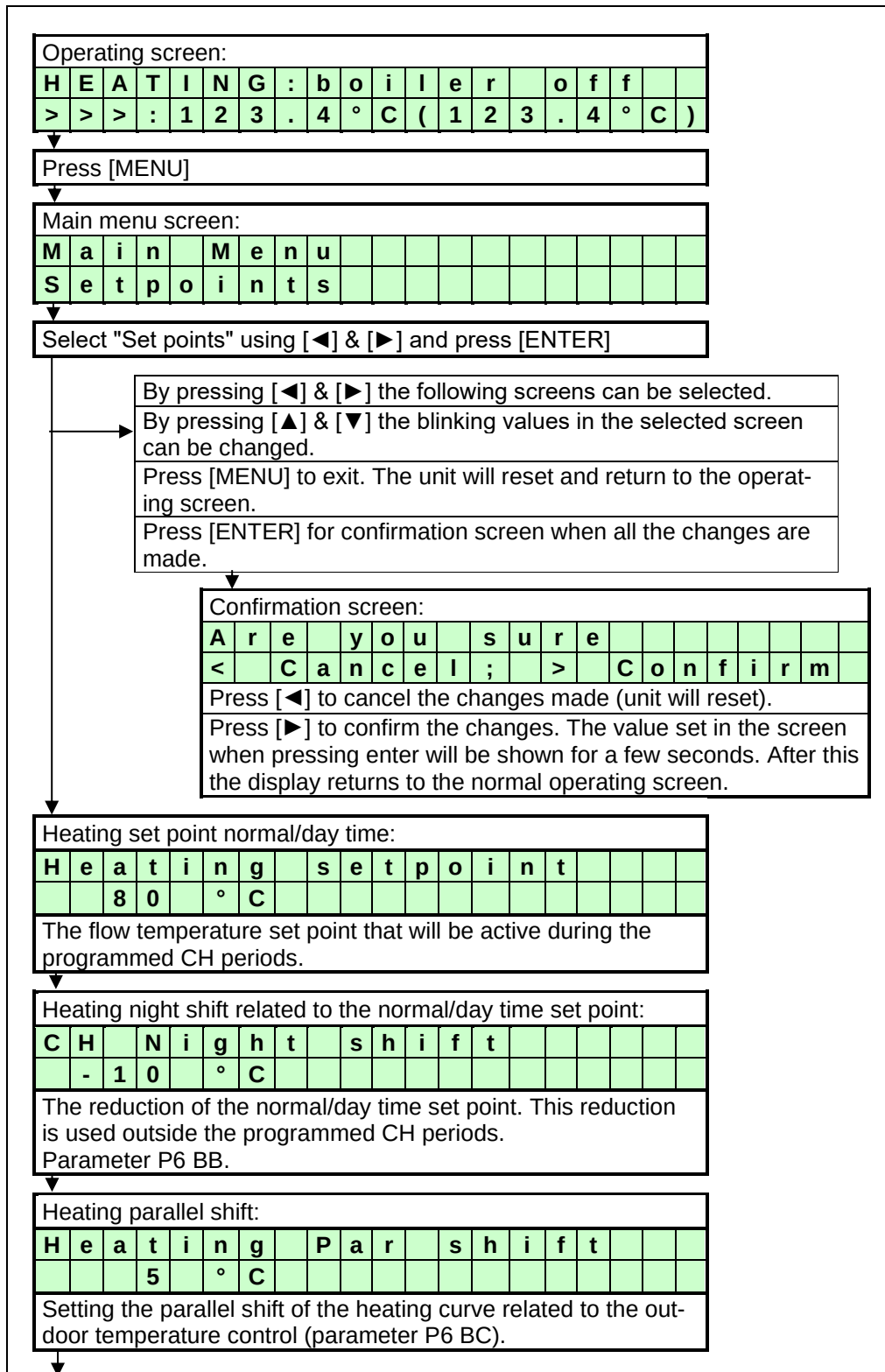
The following graphs describe how to programme the time and date of the unit.



10.9 Settings

The following graphs describe how to program the heating and hot water set points.

NOTICE: The hot water set points are only displayed, when the boiler is programmed as an indirect hot water boiler or direct hot water boiler. See parameter P4 AA for the exact boiler configuration.



↓

DHW set point normal/day time: (parameter P4 AA = 1/2)															
D	H	W		s	e	t	p	o	i	n	t				
		6	0		°	C									
This is the water temperature set point that is active during the programmed DHW periods (parameter P4 AA = 1/2).															

↓

DHW set point reduction: (parameter P4 AA = 1/2)															
D	H	W		R	e	d	u	c	e						
		1	0		°	C									
The reduction of the DHW set point related to normal/day time set point. This reduction is used outside the programmed DHW periods (parameter P4 AA = 1/2).															

NOTICE:
 The max. actual DHW temperature will never exceed the value set at "Heating Setpoint" regardless the set DHW setpoint. If higher DHW setpoints are needed the Heating Setpoint has to be set higher also.

10.10 Setting the timer programs

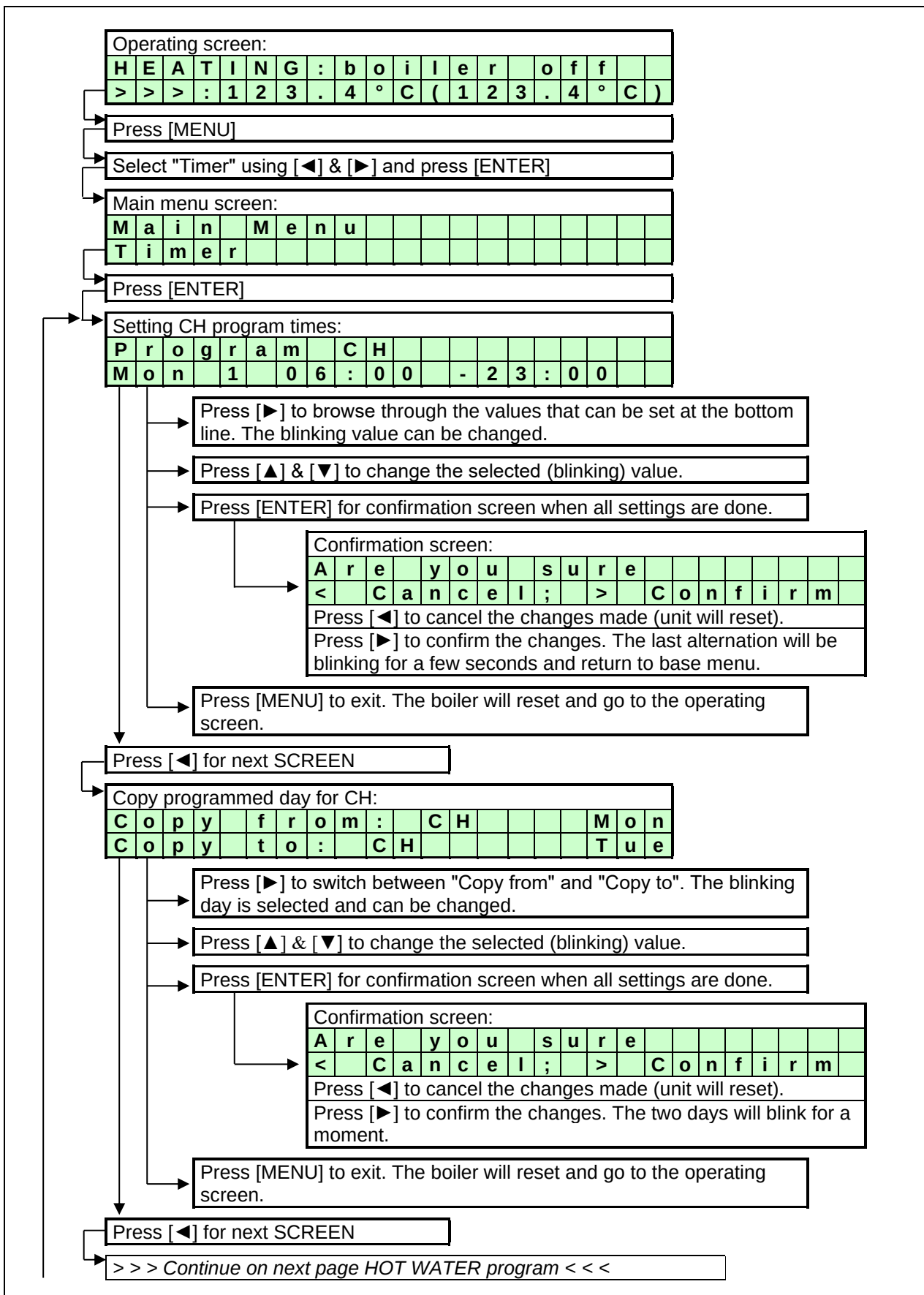
Three different programs can be set with the boiler, these are:

- CH program
- DHW program
- Anti-Legionnaires' disease (pasteurisation) program

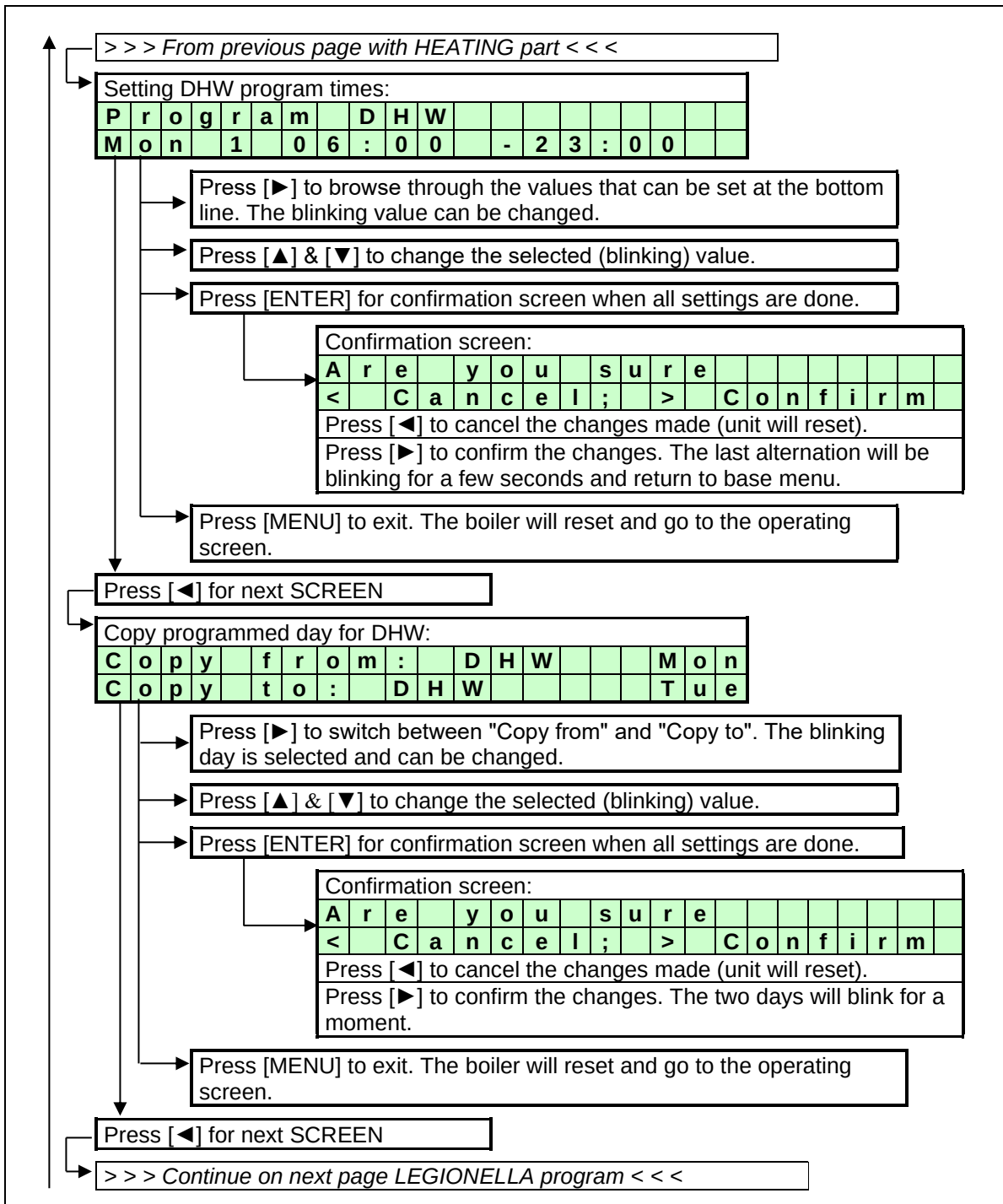
HEATING PROGRAM

Three programmed periods each day can be set (period 1, period 2 and period 3). During these periods the unit will use the normal CH and DHW set points. Outside the programmed period(s) the unit will use the reduced temperature as set point. When no time is programmed for a period, it will not be used.

(Example: no time programmed in period 3 on Monday > "**Mon 3** --:-- --:--").

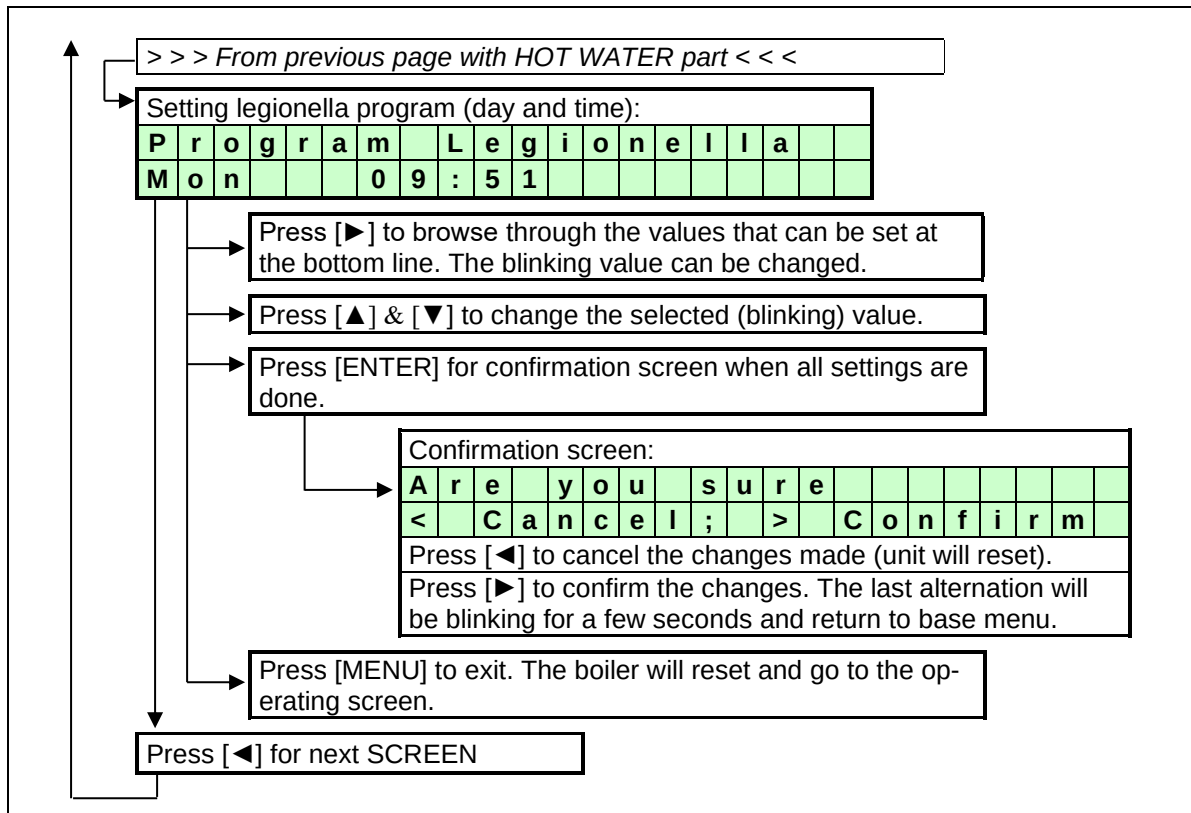


HOT WATER PROGRAM



ANTI LEGIONNAIRES' DISEASE PROGRAM

The anti-Legionnaires' disease (pasteurisation) program of the boiler can only be used when the boiler is set as an "indirect" boiler configuration or a "direct" hot water boiler configuration. Only these configurations can activate the day and time program of the anti-Legionnaires' disease function. See the following graphs. The standard factory setting for this function is "OFF".



10.11 Setting the outdoor specifications

PARAMETERS FOR SETTING THE OUTDOOR GRAPH

When using this function the flow temperature is calculated based on the measured outdoor temperature. The relation between the outdoor temperature and the flow temperature can be programmed with the following parameters. This setting creates the so called "heating curve".

The boiler will recognise an outdoor sensor when it is connected. When the sensor is detected the boiler controller will control the flow temperature based on the heating curve that is programmed.

P5 AA OutsidesPres. (1=On 0=Off)

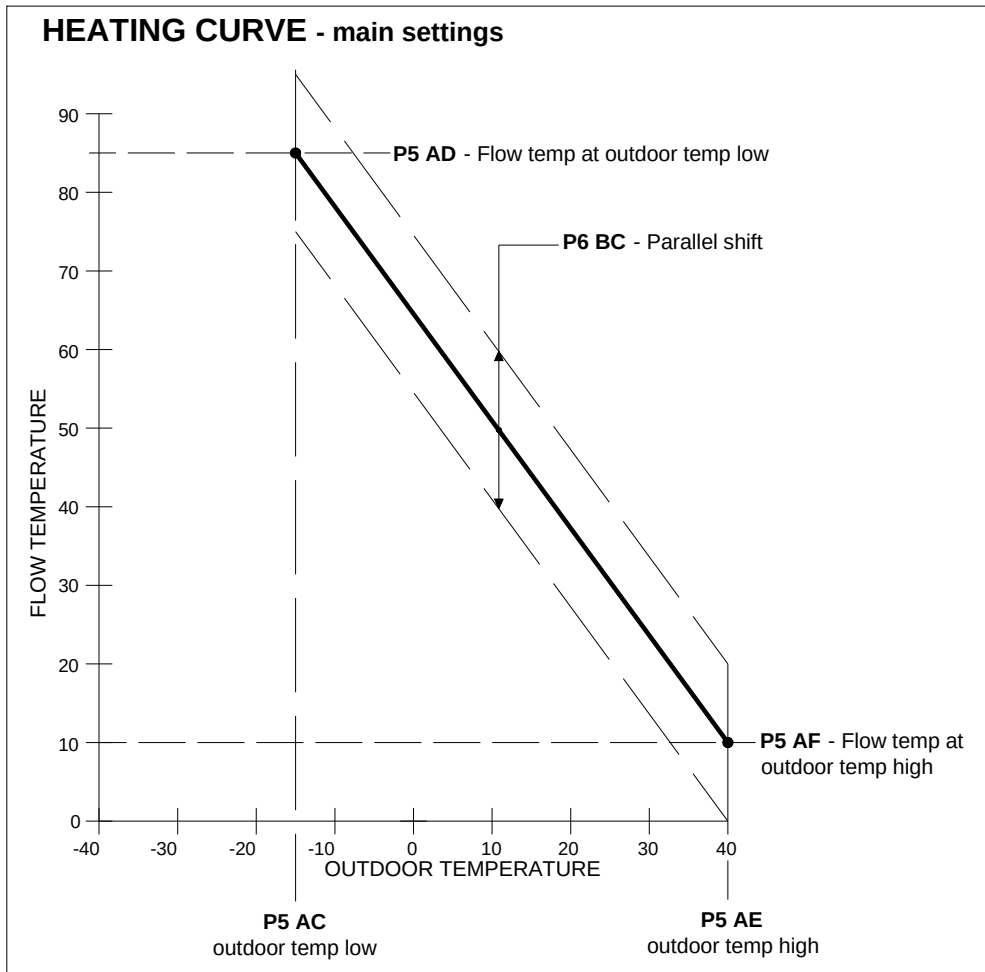
Outside sensor present.

Setting this parameter to "On" a fault message will be displayed in case of a interrupted connection to the outdoor sensor or if the measured outdoor temperature exceeds 60°C (defective sensor).

0 => No fault message at interrupted outdoor sensor connection. Boiler keeps burning using the value of the external or internal flow sensor instead of the outdoor sensor.

1 => Interrupted sensor wiring causes a fault message to occur at the display Boiler keeps burning using the value of the external or internal flow sensor instead of the outdoor sensor.

OUTDOOR GRAPH (see also next page)



Curve and values only for illustration purposes, programmed parameter values can deviate!

P5 AC Heat curve minimum outdoor temperature (°C)

This sets the minimum outdoor temperature at which one wants the maximum flow temperature that is set.

P5 AD Heat curve flow temperature at minimum (°C)

This sets the desired maximum flow temperature at the set minimum outdoor temperature.

P5 AE Heat curve maximum outdoor temperature (°C)

This sets the maximum outdoor temperature at which one wants the minimum flow temperature that is set.

P5 AF Heat curve flow temperature at maximum (°C)

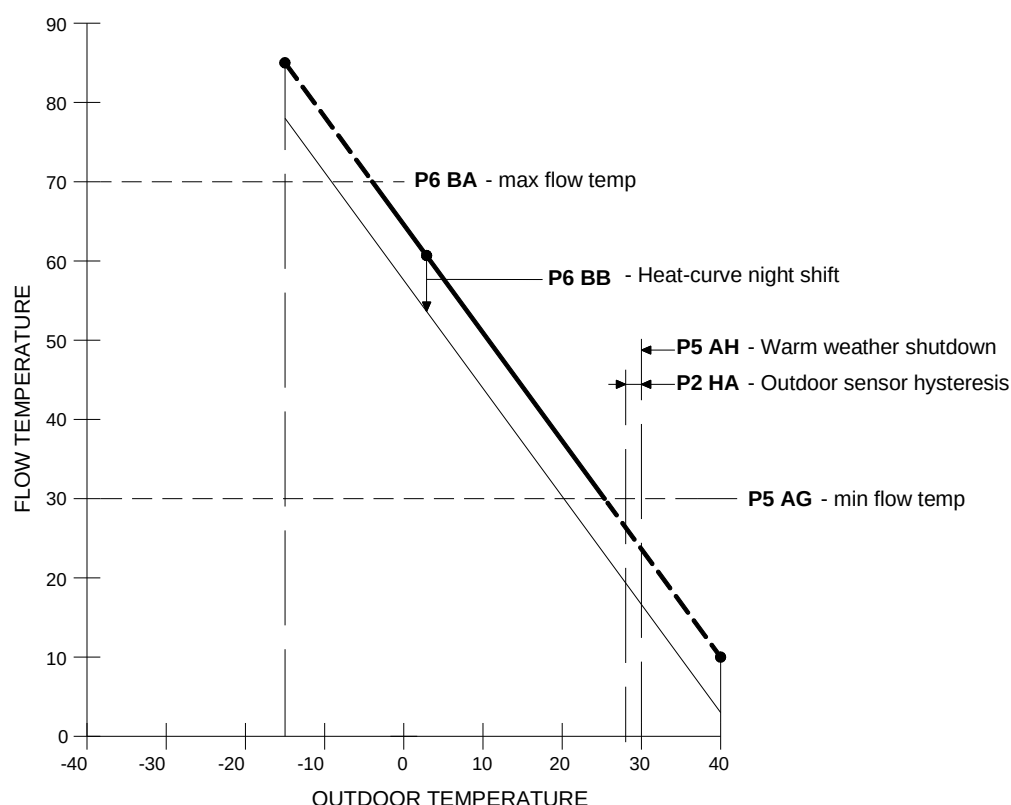
This sets the desired minimum flow temperature at the set maximum outdoor temperature.

P6 BC Heat curve parallel shift (°C)

The heating curve is set by the parameters. Next to these setting done by the installer, the end user has the freedom to influence the flow temperature by doing a parallel shift setting. In this parameter the margins are set within which the user can increase and decrease the calculated flow temperature relative to the calculated flow temperature by the heating curve that is set.

Additional settings of the heating curve P.T.O. →

HEATING CURVE - additional settings



Curve and values only for illustration purposes, programmed parameter values can deviate!

P5 AG Heat curve minimum flow temperature (°C)

The flow temperature will never be lower than the flow temperature set in parameter P5AG. The minimum temperature is limited, even if the calculated set temperature, according to the heating curve, would be lower.

P5 AH Summer outdoor temperature central heating (°C)

If the outdoor temperature is higher than set in P5AH the heat demand for heating will be blocked.

P5AR Outdoor sensor 10K or 12K resistance (1 or 0)

Depending to the used type of sensor this parameter can be set. Set to '0' when using a so called 12k NTC sensor (sensor resistance is 12 kohm at 25°C) Set to '1' when using a so called 10k NTC sensor (sensor resistance is 10 kohm at 25°C) Default the parameter = 0, so the used sensor is assumed to be 12 kΩ.

P2 HA Outdoor sensor hysteresis (°C)

If the outdoor temperature reaches the temperature set in P5 AH (warm weather shutdown) the unit won't start for heating. If the measured outdoor temperature drops P5 AH minus P2 HA the boiler can start up for heating again.

P6 BA CH user setting (°C)

The flow temperature will never be higher than the flow temperature set in parameter P6BA. The maximum temperature is limited, even if the calculated set temperature, according to the heating curve, would be higher.

P6 BB Heat curve night shift (°C)

The temperature reduction during the night, relative to the setting determined by the heat curve

DISPLAY

The following graphs describe how to program the outdoor graph settings.

Operating screen:																
H	E	A	T	I	N	G	:	b	o	i	l	e	r	o	f	f
>	>	>	:	1	2	3	.	4	°	C	(	1	2	3	.	4
																)

Press [MENU]

Select "Outdoor" using [◀] & [▶] and press [ENTER]

Main menu screen:															
M	a	i	n		M	e	n	u							
O	u	t	d	o	o	r									

Press [◀] & [▶] to browse through the screens that are shown below.

Press [▲] [▼] to change the blinking value in the selected screen.

Press [MENU] to exit. The unit will reset and go to the operating screen.

Press [ENTER] for confirmation screen after all changes are made.

Confirmation screen:															
A	r	e		y	o	u		s	u	r	e				
<		C	a	n	c	e	l	;		>		C	o	n	f
															r
Press [◀] to cancel the changes made (unit will reset).															
Press [▶] to confirm the changes made. The time and day will start blinking for a few seconds. After this, the display returns to its operating screen.															

0	1				O	u	t	s	i	d	P	r	e	s	
											0				

P5 AA

0	2				H	C	m	i	n	O	u	T	m	p	
							-	1	5		°	C			

P5 AC

0	3				H	C	m	i	n	F	l	T	m	p	
								8	5		°	C			

P5 AD

0	4				H	C	m	a	x	O	u	T	m	p	
								2	0		°	C			

P5 AE

0	5				H	C	m	a	x	F	l	T	m	p	
								2	0		°	C			

P5 AF

0	6				H	C	m	i	n	F	l	L	i	m	
								2	0		°	C			

P5 AG

0	7				S	u	m	S	h	D	w	n	O	u	
								3	0		°	C			

P5 AH

0	8				H	C	m	a	x	F	l	L	i	m	
								8	5		°	C			

P6 BA

0	9				H	C	n	g	h	t	s	h	f	t	
							-	1	0		°	C			

P6 BB

0	A				H	C	p	a	r	a	s	h	f	t	
								5			°	C			

P6 BC

0	B				O	u	t	S	1	2	k	1	0	k	
									0						

P5 AR

10.12 Checking the operating history

The following graphs describe how to check the operating history of the boiler.

Operating screen:

H	E	A	T	I	N	G	:	b	o	i	l	e	r	o	f	f		
>	>	>	:	1	2	3	.	4	°	C	(	1	2	3	.	4	°	C)

Press [MENU]

Select "Operate" using [◀] & [▶] and press [ENTER]

Main menu screen:

M	a	i	n		M	e	n	u										
O	p	e	r	a	t	e												

Press [◀] & [▶] to browse through the 5 screens.

Press [MENU] or [ENTER] to exit. The unit will return to the operating screen.

SCREEN: 1

O	p	e	r	a	t	i	n	g		h	i	s	t	o	r	y					
P	o	w	e	r	O	n				h	r	s				1	3	1	4	0	0

Top line: Shows the operating history menu is activated.

Bottom line: Total hours the boiler is connected to power supply and switched on.

SCREEN: 2

h	r	s	C	h				T	o	t						1	0	0	0	0	0	0
h	r	s	D	h	w			T	o	t						1	0	0	0	0	0	0

Top line: Total burning hours for heating.

Bottom line: Total burning hours for domestic hot water.

SCREEN: 3

h	r	s	C	h				<	5	0	%					1	0	0	0	0	0	0
h	r	s	C	h				=	>	5	0	%				1	0	0	0	0	0	0

Top line: Burning hours for heating while the burner was firing less than 50%.

Bottom line: Burning hours for heating while the burner was firing equal or higher than 50%.

SCREEN: 4

h	r	s	D	h	w			<	5	0	%		:			1	0	0	0	0	0	0
h	r	s	D	h	w			=	>	5	0	%		:		1	0	0	0	0	0	0

Top line: Burning hours for hot water while the burner was firing less than 50%.

Bottom line: Burning hours for hot water while the burner was firing equal or higher than 50%.

SCREEN: 5

T	i	a	1	0	0	0	0	0	0	F	i	a				1	0	0	0	0	0	0
S	s	I	1	0	0	0	0	0	0	S	s	t				1	0	0	0	0	0	6

Top line: Shows Total Ignition Attempts (Tia) & Failed Ignition Attempts (Fia)

Bottom line: Shows Soft Starts last (Ssl) & Soft Starts Total (Sst)

10.13 Checking the fault history

The following graphs describe how to check the fault history of the boiler.

Operating screen:

H	E	A	T	I	N	G	:	b	o	i	l	e	r		o	f	f		
>	>	>	:	1	2	3	.	4	°	C	(	1	2	3	.	4	°	C	)

Press [MENU]

Select "Faulthist" using [◀] & [▶] and press [ENTER]

F	a	u	l	t	h	i	s	t							N	o	.	0	1
2	1	/	0	4	/	2	0	1	0	W	e	d		2	2	:	2	3	A

▲ blinking alternately ▼

S	i	p	h	o	n		S	w	i	t	c	h							
S	v	9	9	9	/	C	U	M	9	9	9	/	R	9	9	9	9	,	5

Press [◀] & [▶] to browse through the last ten faults.

Press [MENU] or [ENTER] to exit. The unit will return to the operating screen.

The fault menu shows the last ten faults. For each fault the display blinks between the two screens shown above. The top line of the top screen shows the fault number and the bottom line of the top screen shows the date, day and time the fault occurred. On the top line of the bottom screen the fault type is displayed. The bottom line shows the following:

SV: The total amount of this fault that has occurred after the last time that the service history was erased (after service was done).

CUM: The total amount of this fault. The total amount cannot be erased after service; this shows the fault history of the boiler (electronics) since the start of operation.

R: Shows the elapsed time in hrs. between the moment the fault occurred and the moment it was reset.

10.14 Setting the maintenance specifications

The following graphs describe how to check and program the maintenance settings. The standard factory setting for this function is "OFF".

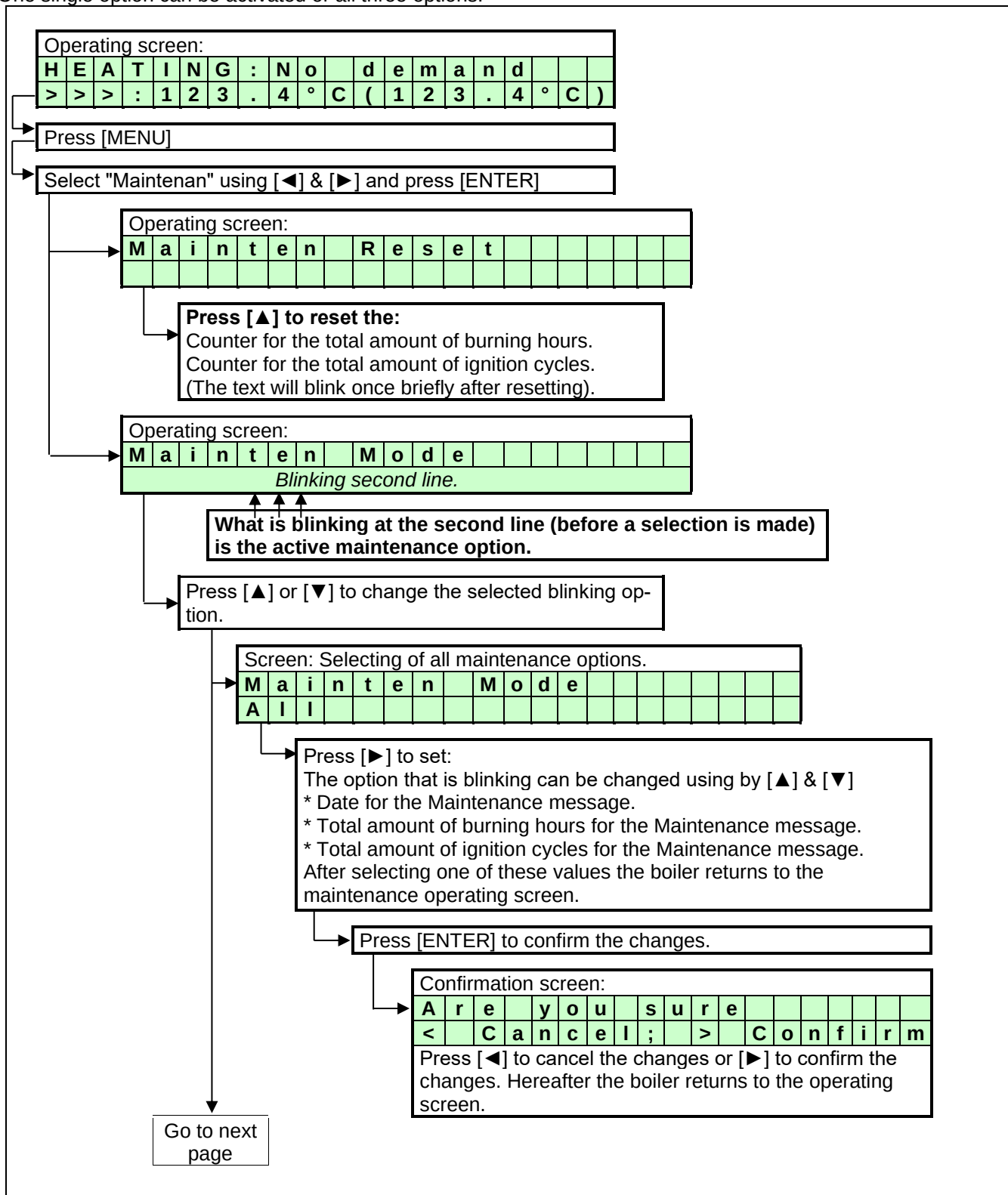
MAINTENANCE SETTINGS

The unit can be programmed in such a way that an automatic maintenance message is displayed.

There are three options that can be selected. A maintenance message appears after:

- * A programmed date is reached.
- * An amount of burning hours is reached.
- * An amount of ignition cycles is reached.

One single option can be activated or all three options.



From previous page

Screen: Selecting message at certain date.

M	a	i	n	t	e	n		M	o	d	e								
D	a	t	e																

Press [▶] to set:
The date for the maintenance message.

Press [◀] to:
Return to maintenance mode selection.

Press [▶] to browse through the values that can be set
at the bottom line.
The blinking value can be changed with [▲] & [▼]

Press [ENTER] to confirm the changes.

Confirmation screen:

A	r	e		y	o	u		s	u	r	e								
<		C	a	n	c	e	l	;		>		C	o	n	f	i	r	m	

Press [◀] to cancel the changes or [▶] to confirm the
changes. Hereafter the boiler returns to the operating
screen.

Screen: Message after total amount of ignition cycles.

M	a	i	n	t	e	n		M	o	d	e								
I	g	n	i	t	i	o	n		c	y	c	l	e	s					

Press [▶] to set:
The total amount of ignition cycles for the Maintenance message.

Press [◀] to:
Return to maintenance mode selection.

The blinking value can be changed with [▲] & [▼]

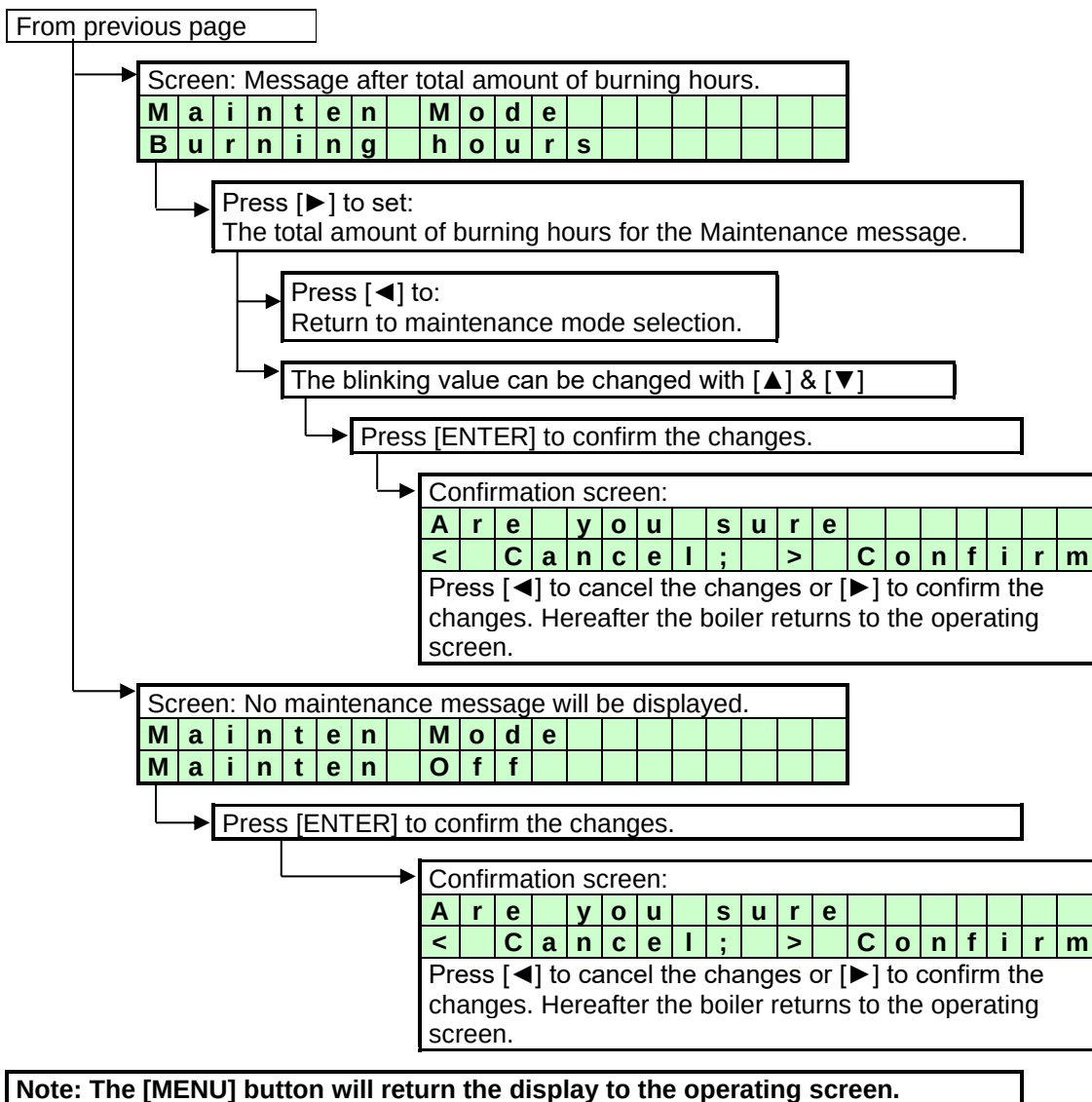
Press [ENTER] to confirm the changes.

Confirmation screen:

A	r	e		y	o	u		s	u	r	e								
<		C	a	n	c	e	l	;		>		C	o	n	f	i	r	m	

Press [◀] to cancel the changes or [▶] to confirm the
changes. Hereafter the boiler returns to the operating
screen.

Go to
next page



BE AWARE : This function is standard turned OFF. We offer this programmable function to the installer to use as a reminder. Because it concerns a free programmable function, the application of it cannot be used as an argument in warranty cases.

Our units must be maintained every twelve months whatever the settings/working of this function.

It is and remains the responsibility of the end user to have the unit maintained every twelve months.

10.15 Setting the user lock

The following graphs describe how to activate the user lock of the display. The standard factory setting for this function is "OFF".

The **"USER LOCK"** menu.

In this menu the boiler can be locked for (end-)users.

0 = UNLOCKED

1 = LOCKED

When the boiler is unlocked, the user can enter the MENU by pressing the menu button and all screens will show up.

When the boiler is locked, the user has to push the [MENU] button together with the [▼] button for 5 s. to access all menu screens.

This function is to prevent accidental changes!

NOTICE: The PARAMETER screen always accessible.

Operating screen:

H	E	A	T	I	N	G	:	N	o		d	e	m	a	n	d			
>	>	>	:	1	2	3	.	4	°	C	(	1	2	3	.	4	°	C	)

Press [MENU]

Select "User lock" using [◀] & [▶] and press [ENTER]

User lock screen:

S	e	t		U	s	e	r	l	o	c	k	=	0						
			0																

The "0" is now blinking/selected and can be changed.

Use [▲] & [▼] to change the value.

0 = User lock function OFF

1 = User lock function ON

Press [ENTER] for the confirmation screen after the selection has been made.

Confirmation screen:

A	r	e		y	o	u		s	u	r	e								
<		C	a	n	c	e	l	;		>		C	o	n	f	i	r	m	

Press [◀] to cancel the changes (the unit will reset and the display returns to the operating screen).

Press [▶] to confirm the changes. The changed value will be blinking for a few seconds. After this, the display returns to the operating screen.

NOTICE:

Using the [MENU] button during the User lock display, will reset the boiler and the boiler will return to the operating screen. Changes will be neglected in this case.

10.16 Setting the parameters at the control panel

The functions of the controller are embedded in the electronics by means of parameters. The values and settings hereof can be programmed by a skilled and trained service engineer with the help of a computer (laptop), the correct software and an interface cable. A selection of these parameters can be programmed at the control panel of the unit itself, without the use of a computer.

The following table gives a list of these last-mentioned parameters. NOTICE: Only the password for level 1 is issued in this manual. "More advanced" parameters need to be programmed by a skilled and trained service engineer with access to level 2.

When 'Modify = no', the parameter can only be programmed at level 2

PASSWORD:
1342

MENU		PARAMETER	DESCRIPTION	UNITS	TEXT DISPLAY	LEVEL 1 Modify
HEATING	A	1 P5BE	Step modulation (1=on 0=off)	-	S t e p m o d u l	no
		2 P5AO	Blocking offset flow temperature control	°C	H E s O f f 1 3	yes
		3 P5AP	Proportional range temperature control	°C	H E s P r b 1 3	no
		4 P5AL	Hysteresis CH Flow temperature control	°C	H E s c D i f 1 3	yes
		5 P2IC	Integration time temperature control	s	H E s I n t 1 3	no
		6 P2MI	Blocking offset System CH temperature control	°C	H E c O f f 3	yes
		7 P2MJ	Proportional range System CH temperature control	°C	H E c P r b 3	no
		8 P2MK	Integration time CH temperature control	s	H E c I n t 3	no
		9 P5AB	Timer Contact (1=on)	-	T i m e r C o n t	yes
DHW	B	1 P4AB	DHW Pump Config 0=Pump 1=TWV	-	D H i p m p / t w v	yes
		2 P5CB	Flow temperature DHW tank low	°C	D H i f l o w L O	yes
		3 P5CK	Flow temperature DHW tank hi	°C	D H i f l o w H I	yes
		4 P5CL	Low Flow temperature time DHW	min	D H i L O t i m e	yes
		5 P5CD	Legionella temperature	°C	L e g i o t e m p	no
		6 P5CI	Legionella hyst DHW tank temperature	°C	L e g i o h y s t	no
		7 P5CJ	Legionella hold time (0=off)	min	L e g i o h o l d	no
		8 P2KI	CH interrupt by Legionella (0=yes)(1=no)	-	L e g i o i n t r	no
		9 P2LC	Regulation temperature offset DHWd	°C	D H d s c O f f 2	yes
		A P2MN	Proportional range DHWd modulation	°C	D H d s c P r b 2 3	no
		B P2LD	Regulation temperature hysteresis DHWd	°C	D H d s c D i f 2	yes
		C P2MO	integration time DHWd modulation	s	D H d s c I n t 2 3	no
		D P2ML	Sys temp blocking offset DHW tank	°C	D H d s c O f f 3	yes
		E P2MM	Sys temp blocking hysteresis DHW tank	°C	D H d s c D i f 3	yes
		F P5CA	Hysteresis DHW tank temperature	°C	D H i s c D i f 4	yes
		G P2KH	Gradient heat demand detect DHW tank temperature	°C	D H i d e t g r a d	yes
CASCADE	C	1 P2MA	Max number extra boilers	-	M a x C a s c U n t	no
		2 P5DA	Bus address boiler	-	B u s a d r e s s	no
		3 P5DC	Dhw on entire cascade(0) only master(1)	-	D H i c a s / m a s	no
		4 P5DE	Extra Boiler output enable(1)	-	E x t r a u n i t	yes
		5 P5DF	Cascade detection (0=standalone 1=Leader)	-	C a s S i / M a	no
		6 P5BL	Power off total cascade (1)	-	P w r O f f T o C a	no
		7 P5DB	Number of boilers with common flue 0=None	-	C o m F l u N u m	no
GENERAL	D	1 P5BB	Analogue input Config (0=off 1=temp 2=power)	-	A n I n p C o n	yes
		2 P5AI	Minimum Temperature 0-10V input	°C	0 - 1 0 M i n T m p	yes
		3 P5BI	Altitude (in amounts of 100 ft.)	100 ft	A l t * 1 0 0 f t	yes
		4 P2LK	Max cooling time	min	M a x C o o l T i m	yes
		5 P5BJ	Temperature display 1=on	-	T e m p O n D i s p	yes
		6 P4AA	DHW 0=off 1=Indirect 2=Direct	-	D H W 1 = i 2 = d	no
		7 P4AD	pressure 0=off 1=sensor and 2=switch	-	c o n f i g	no
		8 P4BD	Gas type values 0-2	-	g a s t y p e	no
		9 P4BE	Soft start type values 0-2	-	c o n f i g	no
		A P5BN	Pump modes 0-4	-	c o n f i g	no

For extensive explanation see Ch. 11: 'Controlling options and settings'

IMPORTANT: Do not change the parameters P2LC, P2LD, P2ML, P2MM and P5BI; they are present in the controller for different purposes than CH control. Changing these parameters may affect boiler operation negatively.

Parameter Screens & Explanation, see next pages →

Operating screen:

H	E	A	T	I	N	G	:	N	o	d	e	m	a	n	d				
>	>	>	:	1	2	3	.	4	°	C	(	1	2	3	.	4	°	C	)

Press [MENU]

Select "Parameter" using [◀] & [▶] and press [ENTER]

Parameter menu:

I	n	s	t	a	l	i	e	r		c	o	d	e						
									0	0	0	0							

Enter the 4-digit code with the [◀] & [▶] and the [▲] & [▼] buttons and select [ENTER]

The code will blink a few seconds and when entered correctly, the following parameters will be displayed.

NOTICE: These codes are user based and give access to a selected amount of parameters, which can be changed (Installer level 1/2).

Menu A: Heating

A	1				S	t	e	p		m	o	d	u	l					
									1										

Function to activate the step modulation:

0 = Off

1 = On

Menu A: Heating

A	2				H	E		s		o	f	f	1	3					
									4		°	C							

CH supply temperature setting. This parameter is the offset of the programmed CH temperature.

Menu A: Heating

A	3				H	E		s		P	r	b	1	3					
									2	5		°	C						

Select the CH supply temperature control. This parameter is the proportional range of the selected CH supply temperature.

Menu A: Heating

A	4				H	E		s	c	D	i	f	1	3					
									1	0		°	C						

Select the CH supply temperature control. This parameter is the hysteresis of the selected CH supply temperature.

Menu A: Heating

A	5				H	E		s		I	n	t	1	3					
									6	0		S	e	c					

Select the CH supply temperature control. This parameter is the integration time of the selected CH supply temperature.

Menu A: Heating

A	6				H	E				c	O	f	f	3					
										4		°	C						

Select the cascaded boilers supply temperature control. This parameter is the offset of the selected CH supply temperature of EACH boiler of the total cascade.

The screen texts on these pages are standard part of the software and apply to CH systems (boilers) and/or DHW devices (water heaters).

Menu A: Heating

A	7					H	E				c	P	r	b		3				
											2	5		°	C					

Select the cascaded boilers supply temperature control.
This parameter is the proportional range of the selected CH supply temperature of EACH boiler of the total cascade and of the external (cascade) sensor.

Menu A: Heating

A	8					H	E				c	I	n	t		3				
											8	0		S	e	c				

Select the cascaded boilers supply temperature control.
This parameter is the integration time of the selected CH supply temperature of EACH boiler of the total cascade and of the external (cascade) sensor.

Menu A: Heating

A	9					T	i	m	e	r	C	o	n	t						
											0									

Function to activate "external time controller":
0 = Off
1 = On
Connect to 13-14. Contact closed = daytime setting,
Contact open = night-time setting.

Menu B: Hot water

B	1					D	H	i	p	m	p	/	t	w	v					
											1									

Hot water function of the boiler by:
0 = pump
1 = 3-way valve

Menu B: Hot water

B	2					D	H	i	f	l	o	w		L	O					
											2	5		°	C					

Hot water function of the boiler. This parameter is the CH supply temperature LOW level with an indirect hot water demand.

Menu B: Hot water

B	3					D	H	i	f	l	o	w		H	I					
											8	5		°	C					

Hot water function of the boiler. This parameter is the CH supply temperature HIGH level with an indirect hot water demand.

Menu B: Hot water

B	4					D	H	i		L	O	t	i	m	e					
											1		M	i	n					

Hot water function of the boiler. This parameter is the selectable time period after which the boiler switches from LOW to HIGH set point with an indirect hot water demand.

The screen texts on these pages are standard part of the software and apply to CH systems (boilers) and/or DHW devices (water heaters).

Menu B: Hot water

B	5					L	e	g	i	o		t	e	m	p				
										8	5		°	C					

Pasteurisation function of the boiler. This parameter is the selected hot water temperature during the pasteurisation function of the boiler.

Menu B: Hot water

B	6					L	e	g	i	o		h	y	s	t				
										2		°	C						

Pasteurisation function of the boiler. This parameter is the selected hysteresis during the pasteurisation function of the boiler.

Menu B: Hot water

B	7					L	e	g	i	o		h	o	l	d				
										2		M	i	n					

Pasteurisation function of the boiler. This parameter is the selected time period for the pasteurisation function of the boiler.

Menu B: Hot water

B	8					L	e	g	i	o		i	n	t	r				
										0									

Pasteurisation function of the boiler. This parameter controls if the CH demand can be interrupted by the pasteurisation function of the boiler.

0 = Yes

1 = No

Menu B: Hot water

B	9					D	H	d	s	c	O	f	f	2					
										4		°	C						

Function for the direct hot water boiler.
This parameter is de off set of the selected HW temperature of the boiler.

Menu B: Hot water

B	A					D	H	d	s	c	P	r	b	2	3				
										2	0		°	C					

Function for the direct hot water boiler.
This parameter is the proportional range of the selected HW temperature of the boiler.

Menu B: Hot water

B	B					D	H	d	s	c	D	i	f	2					
										1	0		°	C					

Function for the direct hot water boiler.
This parameter is the hysteresis of the selected HW temperature of the boiler.

The screen texts on these pages are standard part of the software and apply to CH systems (boilers) and/or DHW devices (water heaters).

Function for the direct hot water boiler.
This parameter is the integration time of the selected HW temperature of the boiler.

Function for the cascaded direct hot water boilers.
This parameter is the offset of the selected HW temperature
of the cascaded boilers.

Function for the cascaded direct hot water boilers.
This parameter is the hysteresis of the selected HW temperature of the cascaded boilers.

Function for the indirect hot water supply of the boiler (tank).
This parameter is the hysteresis of the selected HW temperature of the calorifier/tank.

Function for the indirect hot water supply of the boiler (tank). This parameter detects an (an accelerated) hot water demand, when a larger (water) amount is being used.

Function for the cascading of the boiler(s).
This parameter sets the total amount of cascaded boilers.
(Max. 12 boilers).

Function for the cascading of the boiler(s).
This parameter determines the address of the boiler for the
total cascading control.
Master = 0. Slave 1 = 1 etc.

Function for the cascading of the boiler(s).
This parameter determines if only the Master boiler or all boilers of the cascade are used for indirect hot water.
0 = All
1 = Master

The screen texts on these pages are standard part of the software and apply to CH systems (boilers) and/or DHW devices (water heaters).

Menu C: Cascade

C	4					E	x	t	r	a		u	n	i	t				
											0								

Function for the cascading of the boiler(s).
This parameter is activated when an external (extra) boiler is connected to the Master boiler. Connect to the Master connections 21-22.

Menu C: Cascade

C	5					C	a	s		S	i	/	M	a				
											0							

Function for the cascading of the boiler(s).
This parameter sets the function of the boiler at a cascade alignment
0 = Single / Slave unit
1 = Master unit

Menu C: Cascade

C	6					P	w	r	O	f	f	T	o	C	a			
											0							

Function for the cascading of the boiler(s).
This parameter determines the function of the Slave boilers when the Master boiler is switched off.
0 = Slave boiler(s) continue operation
1 = Slave boiler(s) switch off

Menu C: Cascade

C	7					C	o	m	F	l	u	N	u	m				
											0							

Function for the cascading of the boiler(s).
This parameter determines the number of cascaded boilers that are implemented with a common flue system.

Menu D: General

D	1					0	-	1	0	V	c	o	n	t	r			
											0							

Function for the external control of the boiler by using a 0-10 Volt signal (Connections 15-16).
0 = No external control
1 = Control based on temperature setting
2 = Control based on power setting

Menu D: General

D	2					0	-	1	0	M	i	n	T	m	p			
										2	0		°	C				

Function for the external control of the boiler by using a 0-10 Volt signal (Connections 15-16).
Control based on temperature (setting 1).
The minimum (desired) CH water temperature when supplying a 1,4 Volt signal.

Menu D: General

D	3					A	l	t		*		1	0	0	f			
											0							

Function for setting the location height (above sea level) of the boiler.
NOTICE: dimensions in English feet. One unit = 100 ft.
Use this function only in consultation with the supplier / manufacturer.

The screen texts on these pages are standard part of the software and apply to CH systems (boilers) and/or DHW devices (water heaters).

10.17 Fault codes display

The following graphs describe the lock out codes of the boiler. A lock out code can only be removed by a manual resetting of the boiler.

NOTICE: Before resetting the boiler always check the boiler, central heating system and all components corresponding to the related lock out description. Never just reset the boiler, before analysing the possible cause of failure.

10.17.1 LOCK-OUT CODES

Having a lockout means that the boiler needs a manual reset to start operating again.

When the boiler is in lockout the backlight of the display is blinking on and off.

Explanation >

9	9	9	,	5	:	h	r	s
---	---	---	---	---	---	---	---	---

 = time elapsed after fault & message.

Explanation >

P	u	m	p	1	o	n
---	---	---	---	---	---	---

 = status of the pump during fault.

Display message	C	l	i	x	o	n	F	a	u	l	t									
F15	p	u	m	p		o	n					9	9	9	,	5		h	r	s

Reason Heat exchanger fuse or burner door clixon exceeded maximum allowed value.

Display message	F	a	i	l	e	d	b	u	r	n	e	r	s	t	a	r	t			
F8	p	u	m	p		o	n					9	9	9	,	5		h	r	s

Reason Boiler is not starting after the programmed starting attempts.

Display message	F	a	l	s	e	f	l	a	m	e	s	i	g	n	a	l				
F10	p	u	m	p		o	n					9	9	9	,	5		h	r	s

Reason Flame signal is detected while it cannot be expected.

Display message	F	a	n	s	p	e	e	d	i	n	c	o	r	r	e	c	t			
F11	p	u	m	p		o	n					9	9	9	,	5		h	r	s

Reason The controller does not detect a correct fan speed.

Display message	F	l	a	m	e	l	o	s	t											
F9	p	u	m	p		o	n					9	9	9	,	5		h	r	s

Reason Flame detected during normal operation, but was lost while running.

Display message	F	l	o	w	h	i	g	h	T	e	m	p								
F1	p	u	m	p		o	n					9	9	9	,	5		h	r	s

Reason Flow temperature exceeds the limit which has been set in the parameters.

Display message	F	l	o	w	R	e	t	u	r	n	d	t	f	a	u	l	t			
F16	p	u	m	p		o	n					9	9	9	,	5		h	r	s

Reason Temperature difference between flow and return exceeds limitation value, or 'dT block or delta direct block' has occurred three times.

Display message	F	l	o	w	s	e	n	s	o	r	e	r	r	o	r					
F0	p	u	m	p		o	n					9	9	9	,	5		h	r	s

Reason Flow sensor not detected by the boiler caused by faulty connection/sensor.

Display message	F	l	u	e	s	e	n	s	o	r	e	r	r	o	r					
F6	p	u	m	p		o	n					9	9	9	,	5		h	r	s

Reason Flue gas sensor not detected by the boiler caused by faulty connection/sensor.

Display message	F	l	u	e	t	e	m	p	t	o	o	h	i	g	h					
F7	p	u	m	p		o	n					9	9	9	,	5		h	r	s

Reason Flue gas temperature exceeds the limit more than 3 times within a certain time frame.

Display message	F	l	u	e	t	e	m	p	h	i	g	h						
										9	9	9	,	5		h	r	s

Reason Flue gas temperature has exceeded the limit.

Display message	G	e	n		B	l	o	c	k									
										9	9	9	,	5		h	r	s

Reason The general blocking circuit is activated during operation = contact 7-8

Display message	L	i	n	e		f	a	u	l	t								
										9	9	9	,	5		h	r	s

Reason Wrong electrical power supply is connected (not 50 or 60 Hz, 220-240 Volt).

Display message	O	u	t	d	o	o	r		s	e	n	s	o	r		f	a	i	l
										9	9	9	,	5		h	r	s	

Reason Outdoor temperature has exceeded the blocking temperature.

Display message	R	e	t	u	r	n		t	e	m	p		h	i	g	h			
												9	9	9	,	5		h	r

Reason Return temperature has exceeded the blocking temperature, but the return temperature has not exceeded the lock-out value.

Display message	T	2	-	T	1		h	i	g	h									
												9	9	9	,	5		h	r

Reason Temperature difference T2-T1 has exceeded the blocking value.

Display message	W	a	t	e	r	p	r	e	s	s	u	r	e		f	a	u	l	t
												9	9	9	,	5		h	r

Reason Water pressure is too low or too high.

10.17.3 MAINTENANCE ATTENTION MESSAGES

The following graphs describe the messages at the boiler display. Depending on the selected and activated options for the boiler, it is possible that some messages will show up at the display. For example, a maintenance message after a certain programmed date has been reached. The boiler will operate independently of these messages.

The display shows alternating the base screen and this message, while the backlight is blinking.

The boiler is operating but will count the exceeding hours.

A parameter must be changed, after service, to remove this message.

Display message	N	e	e	d	s		M	a	i	n	t	e	n	a	n			0	.	0
	I	g	n	i	t	i	o	n		c	y	c	l	e	s			h	r	s

Reason Maintenance option of total amount of ignition cycles has been reached.

Display message	N	e	e	d	s		M	a	i	n	t	e	n	a	n			0	.	0
	D	a	t	e													h	r	s	

Reason Maintenance option of the date has been reached.

Display message	N	e	e	d	s		M	a	i	n	t	e	n	a	n			0	.	0
	B	u	r	n	i	n	g		h	o	u	r	s				h	r	s	

Reason Maintenance option of total amount of burning hours has been reached.

Display message	N	e	e	d	s		M	a	i	n	t	e	n	a	n			0	.	0
	A	l	l														h	r	s	

Reason One of the abovementioned maintenance options has been reached.

11 CONTROLLING OPTIONS AND SETTINGS

11.1 General

The following paragraphs describe some general functions of the boiler and their possible use.

11.1.1 EXTRA BOILER CONTROL

When all units (cascaded) are firing at their maximum it is possible to start an extra “external” heating source. This unit can be connected to the “Burner Burning” contacts (connection 21-22).

P5DE Extra Boiler output enable (1) (display C4)

When this parameter is set 1, the contact “Burner Burning” will close, but only when all units are firing at a certain (programmable) input percentage. The standard factory setting for this function is “OFF”.

11.1.2 MAX COOLING TIME

The fan will cool down the heat exchanger according to the temperature settings (parameters) of the software. With this cooling parameter the maximum run time of the fan can be programmed.

P2LK Max cooling time (display D4)

This function is not used for central heating boilers.

11.1.3 TEMPERATURE DISPLAY ON/OFF

Selection for showing the measured temperatures at the operation display of the boiler.

P5BJ Temperature display 1=on (display D5)

The measured temperature at the operation display.

0 = not visible

1 = visible

11.1.4 WATER PRESSURE

P4AD pressure 0=off, 1=sensor, 2=switch.

When the water pressure exceeds 4 bar a pressure switch must be used instead of the sensor (suitable till 4 bar). With the switch, pressure can go up to 6 bar.

In this case, remove the pressure sensor and replace it by the pressure switch. Now set the parameter at the control panel by changing “D7 config” from 1 into 2.

11.1.5 GAS TYPE SELECTION

Settings for gas types: natural gas, propane or butane-propane mixture (B/P).

P4 BD Gas type (0=standard, 1=propane, 2=B/P) (display D8)

This parameter is set 0 for the common used gas types such as natural gas G20 or G25.3.

By setting this parameter 1 for propane, fan speed is reduced.

Set this parameter 2 for B/P.

0 = Natural Gas (G20 or G25.3)

1 = Propane

2 = B/P

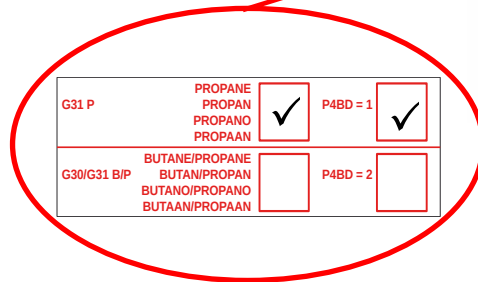
By each setting, the relevant Soft start settings are automatically adjusted, depending on its main setting P4BE, see next chapter 11.1.6.



In case of gas conversion, paste the corresponding sticker at the appropriate position in the boiler and mark the square for the used gas type. Also mark the square, indicating that the correct value has been set for parameter P4BD.

G31 P	PROPANE PROPAN PROPANO PROPAAN	☐	P4BD = 1	☐
	BUTANE/PROPANE BUTAN/PROPAN BUTANO/PROPANO BUTAAN/PROPAAN	☐	P4BD = 2	☐

(In the example on the right, 'propane' and 'P4BD = 1' have been marked).



11.1.6 SOFT START OPTION

Start parameters can be modified to achieve better start behaviour, in case of noise or other difficulties. This is done by reducing the fan ramp-up speed. Two reduced settings are available (I and II).

P4 BE Soft start (0=normal, 1=reduced fan ramp-up speed (I), 2=reduced fan speed ramp-up (II)) (display D9).

- 0 = normal start-up
- 1 = reduced fan ramp-up speed (I)
- 2 = reduced fan ramp-up speed (II)

11.1.7 PUMP MODE (EC TECHNOLOGY)

When using a pump with Electronic Commutation technology and start-stop function, with a separate control connection, this parameter determines the relay for switching the pump on and off.

P5 BN Pump mode (0=modulating, 1=relay1, 2= relay2, 3= relay3) (display DA)



Do not use the 230 Vac relay for the main power supply of the pump, but directly connect the pump to an external power supply.

A modulating pump with PWM control: the power supply is directly connected to the mains, the PWM connection is connected to CN10, contacts 9 and 18.

Pumps with an on/off control can be switched by one of the relay connections "lock-out", "burner burning" or "heat demand". Choose a connection which is not yet used.

- 0 = PWM 0-100% modulating pump, connection **CN10**, connectors 9 and 18
- 1 = Start-stop through relay **1**, connectors 19 and 20 (lock-out)
- 2 = Start-stop through relay **2**, connectors 21 and 22 (burner burning)
- 3 = Start-stop through relay **3**, connectors 23 and 24 (heat demand)
- 4 = Do not use (reserved for future applications).

11.2 Heating

The following paragraphs describe the different functions of the boiler and their related “controlling behaviour settings” as a central heating boiler.

11.2.1 CONTROLLING BEHAVIOUR SETTINGS

The factory settings for all heating applications are working fine and it is therefore advised not to change these settings. Always consult the manufacturer for advice if changes to parameter settings are needed.

P5 AO Blocking offset flow temperature control (display A2)

The amount of degrees the measured temperature exceeds the active flow temperature set point before the heat demand stops. Only active when the unit is controlled by the internal flow sensor (S1) and used for single unit control.

P5 AL Hysteresis CH flow temperature control (display A4)

The amount of degrees that the measured temperature must drop, relative to the active flow temperature set point + Offset (Parameter **P5 AO**), before the heat demand starts. This function is active when the unit is controlled by the internal flow sensor (S1) and used for single units. When controlling cascaded units with an external flow sensor (S3), this sensor will be used.

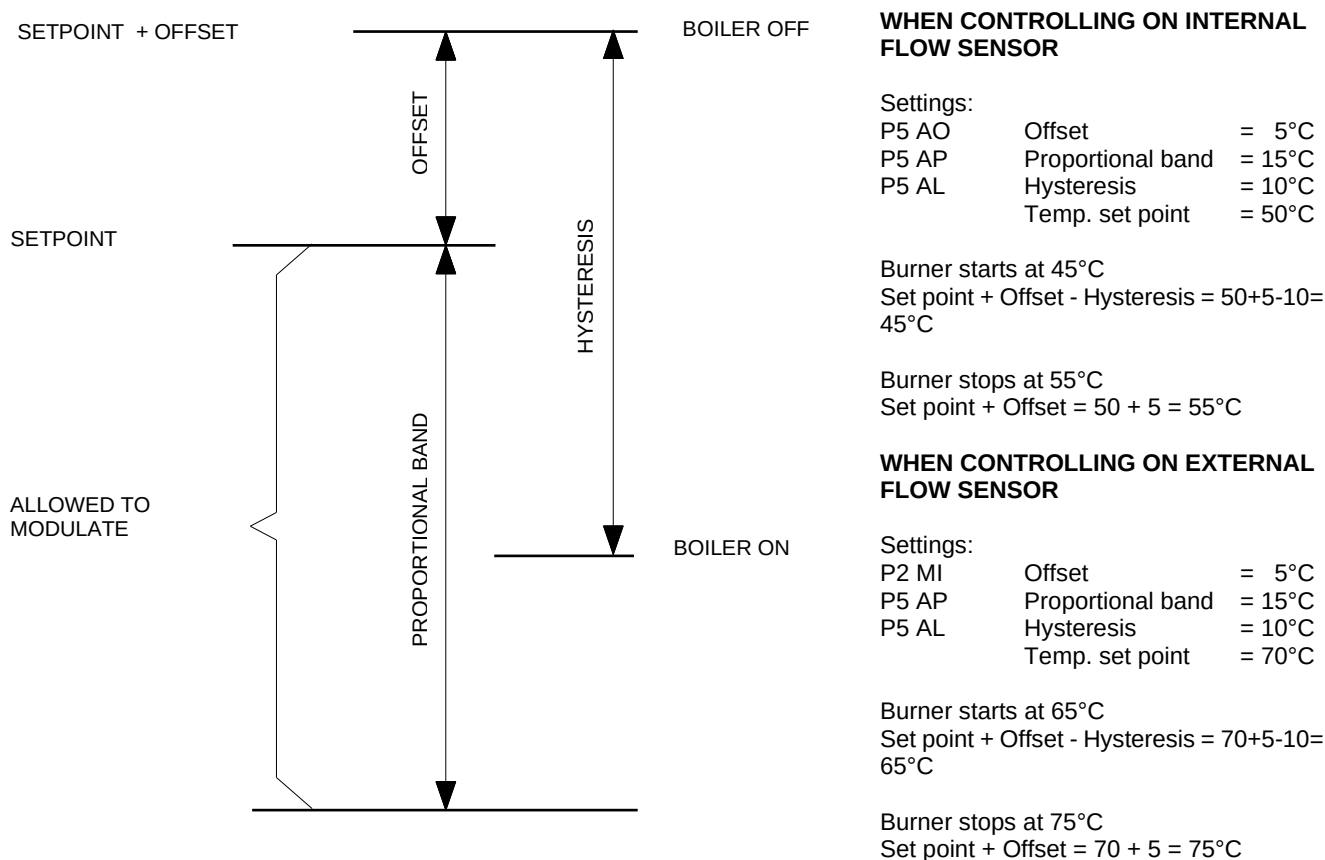
P5 AP Proportional range single heating boiler (display A3)

The proportional range for controlling the flow temperature of the boiler. This function is active when the unit is controlled by the internal flow sensor (S1) and used for single units. When controlling cascaded units with an external flow sensor (S3), this sensor will be used.

P2 MI Blocking offset system CH temperature control (display A6)

The amount of degrees the measured temperature exceeds the active flow temperature set point before heat demand stops. Only active when the unit is controlled by an external flow sensor (S3).

The following graph shows the relation between the several parameters.



Graph and values only for illustration purposes, programmed parameter values can deviate!

11.2.2 ROOM THERMOSTAT ON/OFF

A room thermostat with a fixed set point and using an ON/OFF control can be connected to the boiler (Connections 13-14). Changing the flow temperature set point and activation of a timer program can be done by this room thermostat or by programming the boiler settings. See chapter 10.10

11.2.3 ROOM THERMOSTAT OPEN-THERM

An RC Open Therm controller can be connected to the boiler for temperature reading(s) and remote programming (connections 13-14).

11.2.4 OUTDOOR TEMPERATURE RELATED FLOW CONTROL

The flow temperature can be calculated by using the measured outdoor temperature for controlling the boiler. See for detailed information Chapter 10.11.

11.2.5 0-10V (DC) REMOTE FLOW TEMPERATURE SET POINT

The flow temperature is controlled by connecting an external 0-10V (dc) signal to the boiler (connections 15-16).

P5 BB Analogue input config (0=off 1=temperature 2=power) (display D1)

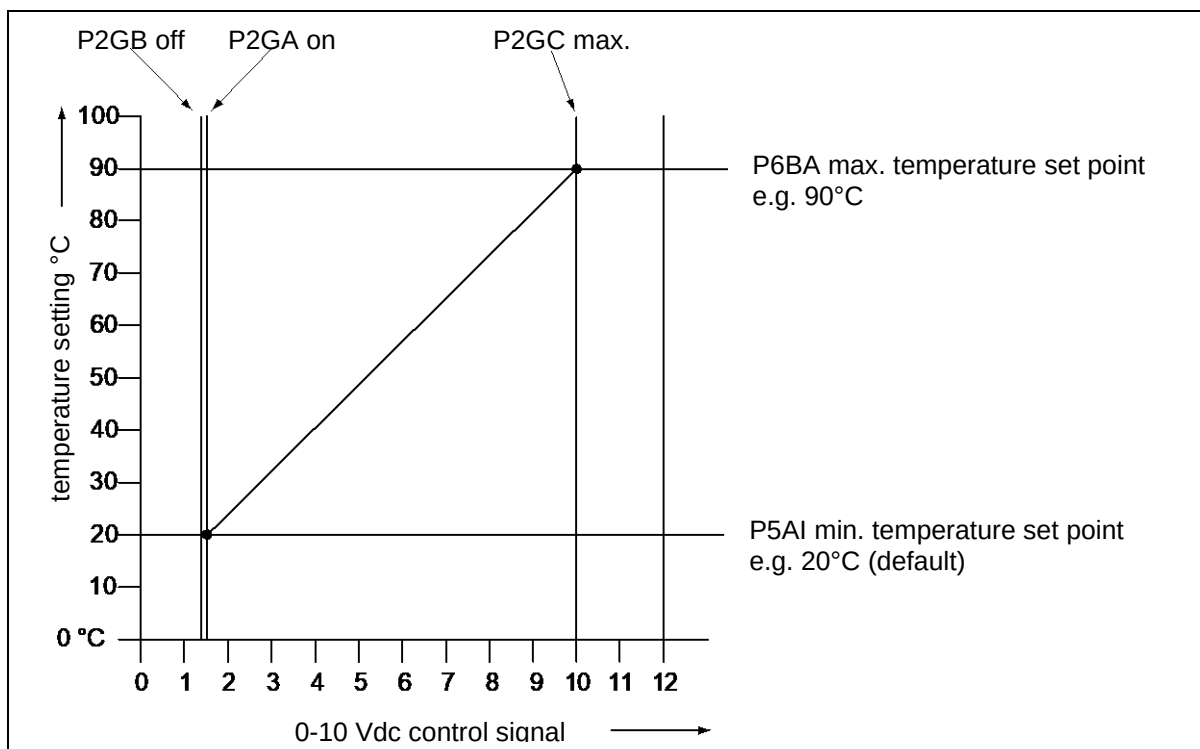
This parameter must be set at "1" so the supplied 0-10V dc signal will control the temperature set point. Possible settings are:

- 0 = 0-10 V control off
- 1 = 0-10 V temperature set point control active
- 2 = 0-10 V burner input control active

P5 AI Minimum temperature 0-10V input (display D2)

The standard starting temperature of the heat demand, when the minimum voltage signal is sent to the boiler. The factory settings for all heating applications are working fine and it is therefore advised not to change these settings. Always consult the manufacturer for advice if parameter changes are needed.

See also the following graph for the relation between the temperature and the control signal



Curve and values only for illustration purposes, programmed parameter values can deviate!

11.2.6 0-10V (DC) REMOTE BURNER INPUT CONTROL

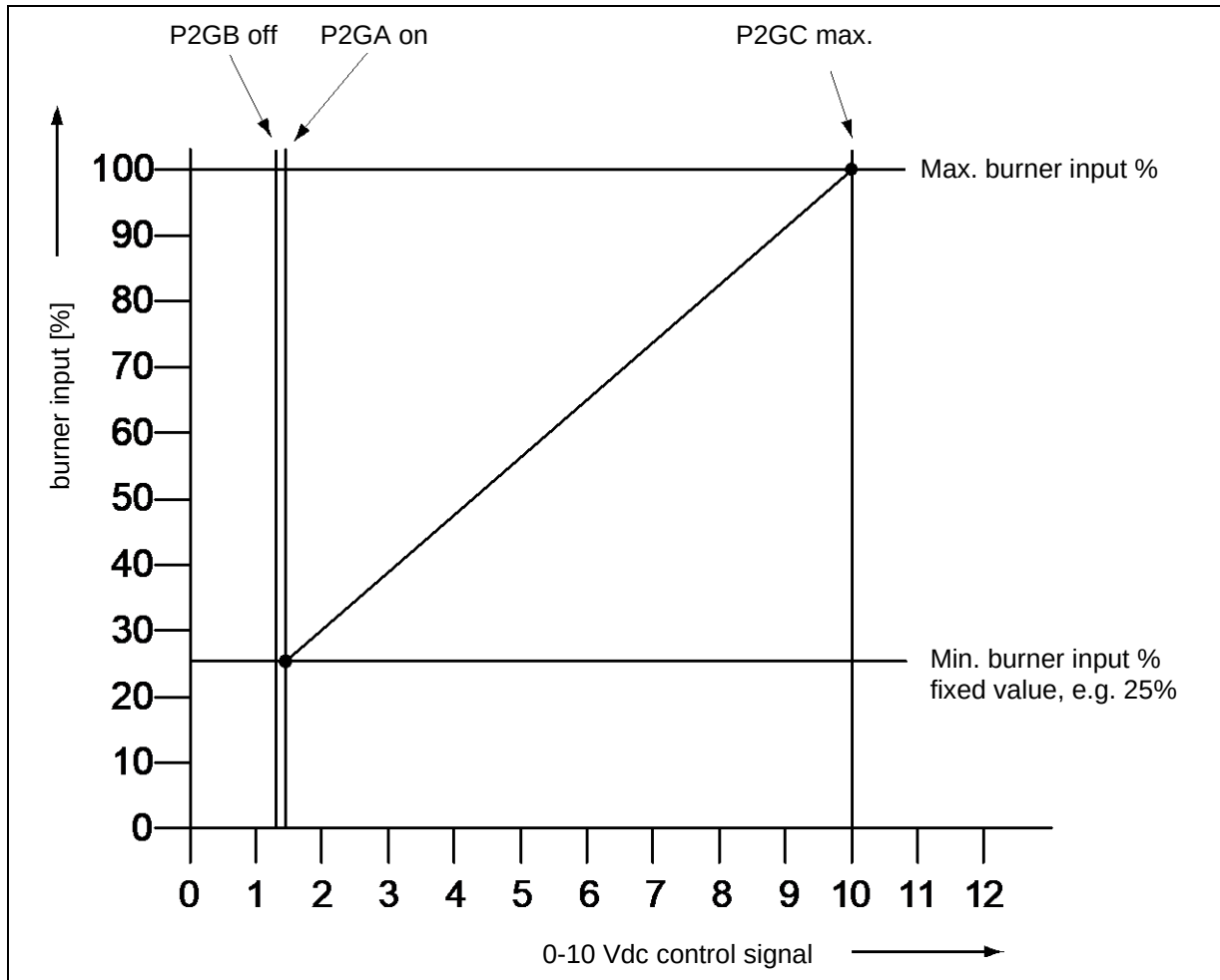
The burner input is controlled by connecting an external 0-10V (dc) signal to the boiler (connections 15-16).

P5 BB Analogue input config (0=off 1=temperature 2=power) (display D1)

This parameter must be set at "2" so the supplied 0-10V dc signal will control the burner input. The standard factory setting is "1", temperature set point control. Possible settings are:

- 0 = 0-10V control off
- 1 = 0-10V temperature set point control active
- 2 = 0-10V burner input control active

See also the following graph for the relation between the burner input and the control signal.



Curve and values only for illustration purposes, programmed parameter values can deviate!

11.2.7 TIMER CONTACT FUNCTION

This function can be activated when using an external night reduction timer for heating. This timer contact can be connected to the thermostat terminals (connections 13-14).

P5 AB Timer contact (1=on) (display A9)

When this parameter is activated and...

- The thermostat terminals are bridged (timer contact closed), the normal daytime temperature is used as set point.
- The thermostat terminals are not bridged (timer contact open), the night reduced temperature is used as set point.

11.3 Indirect hot water/calorifier

The following paragraphs describe the different functions of the boiler and their related “controlling behaviour settings” as a central heating boiler with an indirect hot water function.

11.3.1 PUMP AND 3-WAY VALVE CONTROL

See chapter 19 for several installation examples of the boiler and the preferred functions. When the boiler is used as an indirect boiler for both central heating and hot water function, this hot water function can be activated by using a DHW pump (calorifier pump (pump 2)) or a 3-way valve.

P4 AB DHW Pump config 0=Pump 1=TWV (display B1)

With this parameter it is programmed if the flow to the indirect water tank (calorifier) is controlled by a pump (0 = pump) or a 3-way valve (1 = TWV).

11.3.2 TANK THERMOSTAT

An external thermostat can be connected to the boiler (connections 5-6). When there is a hot water demand and the tank thermostat closes, the boiler will start for the hot water demand. The calorifier/tank pump will be activated or in case of a 3-way valve, this valve will turn to the position to supply heat to the tank coil(s). In case of a heat demand and hot water demand, the (central) heating pump will switch off until the hot water demand ends.

P4 AB DHW pump Config 0=Pump 1=TWV (display B1)

With this parameter it is programmed if the flow to the indirect water tank (calorifier) is controlled by a pump (0 = pump) or a 3-way valve (1 = TWV).

11.3.3 TANK SENSOR

A tank sensor can be connected to the boiler. The tank (hot water) set point and related controlling parameters are set in the boiler controller. A hot water demand is detected by the boiler, when the sensor (water) temperature drops below the set point. The calorifier/tank pump will be activated or in case of a 3-way valve, this valve will turn to the position to supply heat to the tank coil(s). In case of a heat and hot water demand at the same time, the heating pump will switch off until the hot water demand is stopped (water temperature is reached).

P5 CA Hysteresis DHW tank temperature (display BF)

The amount of degrees that the hot water temperature in the indirect water tank/calorifier needs to drop relative to the hot water set point, before the heat demand is send to the boiler.

11.3.4 LOW/HIGH FLOW TEMPERATURE TO TANK COIL

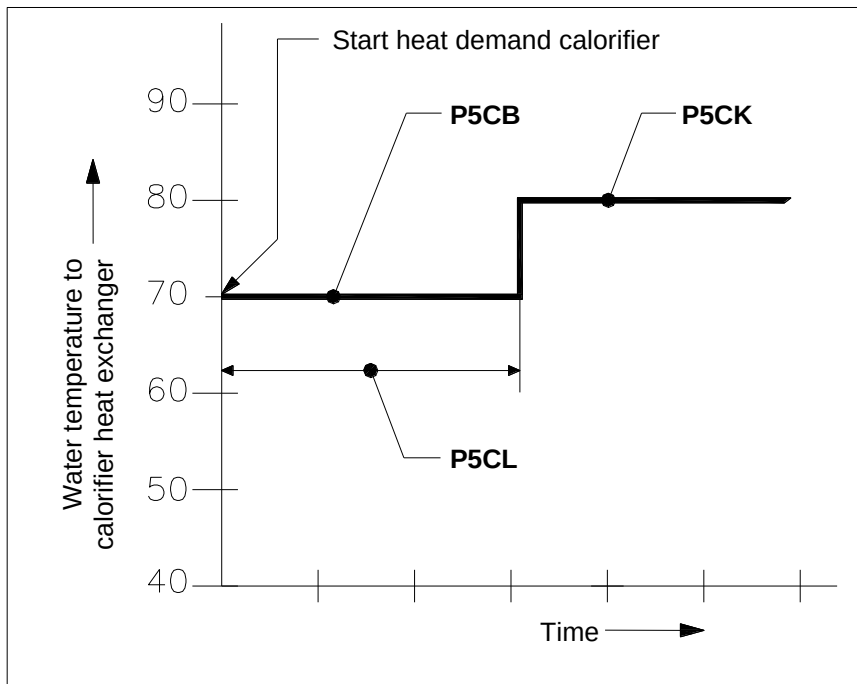
This function can only be used for an “indirect” programmed boiler (parameter **P4 AA** = 1).

Normally for a regular calorifier a fixed flow temperature of 85°C is supplied to the calorifier heat exchanger in case of a heat demand. This hot water flow will indirectly heat up the water in the calorifier tank.

The parameters for this function can be configured for both low and high calorifier operation.

This function operates as follows:

When there is a heat demand, the boiler supplies water to the heat exchanger of the calorifier, according to the flow temperature set in parameter **P5 CB**. When the heat demand remains for the period set in parameter **P5 CL**, the flow temperature set point will change to a higher temperature, which is set in parameter **P5 CK**. This situation continues until the heat demand ends.



The reason for this function is that the boiler by supplying a lower flow temperature to the heat exchanger of the calorifier, can stay in its condensing mode (if the temperature is low enough) and thus operate at a higher efficiency level. When it takes too long ($> \mathbf{P5\ CL}$) to heat up the tank with this low temperature mode, the flow temperature set point will change to a higher setting to make sure that the hot water set point is reached.

P5 CB Flow temperature DHW tank low (display B2)

The low level flow temperature to the tank coil(s) in case of a calorifier/indirect hot water demand. This “two staged” function is added to keep the boiler in the condensing mode as long as possible.

P5 CK Flow temperature DHW tank high (display B3)

The high level flow temperature to the tank coil(s) in case of a calorifier/indirect hot water demand.

P5 CL Low flow temperature time DHW (display B4)

The programmed period for changing the set point of the water flow temperature from low to high. The standard factory setting for this function is “OFF”.

11.3.5 HEATING AND HOT WATER SWITCHING TIME

This function can only be used for an “indirect” programmed boiler (parameter **P4 AA = 1**).

In case there is a heating demand and the unit is operating for this heating demand, also a hot water demand can be activated. A hot water demand always has priority, this means that the unit will switch to hot water operation. When the hot water demand remains for a longer period, there will be no heat supply for/to the central heating system during this period. Not supplying any heat for/to the central heating system might cause undesirable temperature fluctuations. The following parameters can be used to program the preferred settings.

P5 CL Low flow temperature time DHW (display B4)

The period during which the set point of the water flow temperature (to the heating coil(s) of the calorifier) will switch from “low” to “high”.

P5 CF Max runtime DHW during CH demand

The programmed period for the boiler to operate for DHW demand in case of a CH demand. After this period the boiler will switch to operate for CH demand, even when there is still a DHW demand.

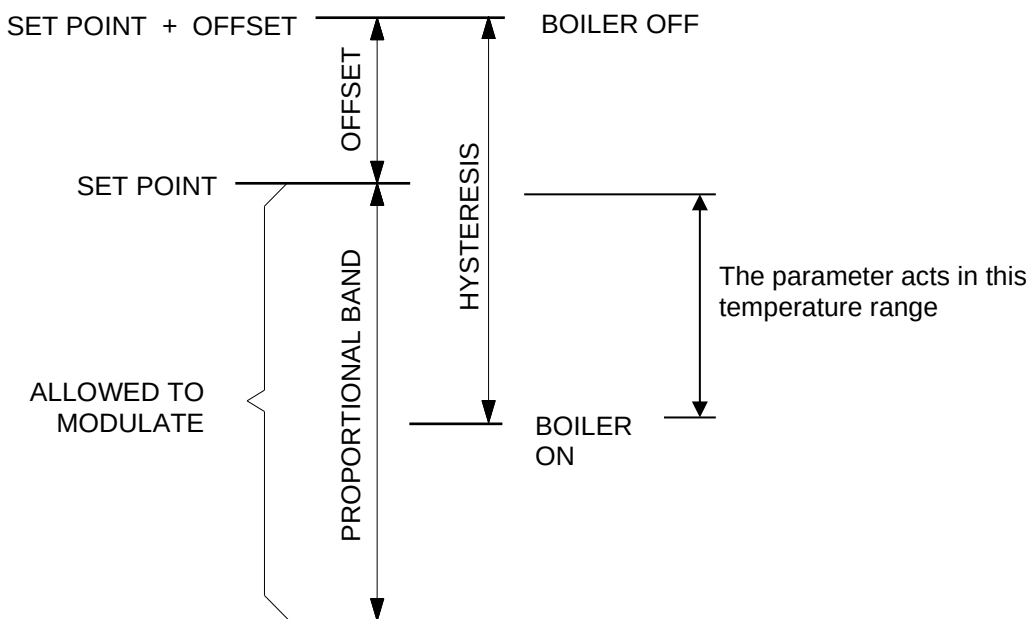
P5 CM Max runtime CH during DHW demand

The programmed period for the boiler to operate for CH demand in case of a DHW demand. After this period the boiler will switch to operate for DHW demand, even when there is still a CH demand.

The standard factory setting for this function is that the hot water demand always has priority and that no switching between the heat and hot water demand happens, when both are active.

11.3.6 HEATING AND HOT WATER SWITCHING AT SUDDEN TEMPERATURE DROP

This function can be used to detect indirect water tank/calorifier heat demand in case of a sudden temperature drop within the range between the set point and the (minimum) value at which the boiler is normally switched on. For this parameter is chosen the value of the temperature drop detected within one second, at which an immediate indirect hot water demand is activated.



P2KH Gradient heat demand detect Dhw tank temperature (display BG)

See the given explanation. The standard factory setting for this function is “OFF”.

11.3.7 ANTI-LEGIONNAIRES' DISEASE FUNCTION (PASTEURISATION)

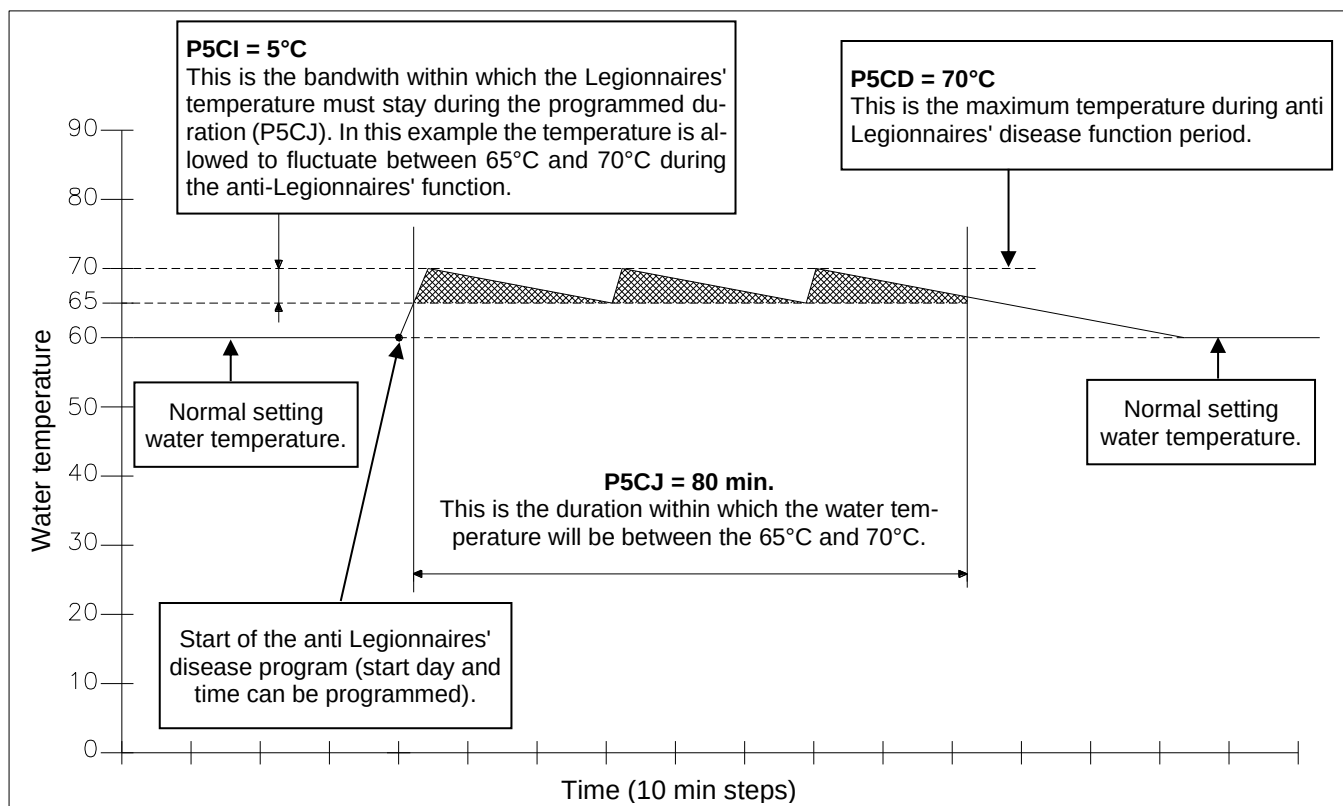
This function can only be used for an "indirect" programmed boiler (parameter **P4 AA** = 1), on which a DHW program is active.

To prevent Legionnaires' disease the boiler (software) provides a function for heating up the hot water storage tank (once a week) to a higher water temperature then the normal active hot water set point. Also the period, that this "higher" water temperature function must be active, can be programmed.

NOTICE: The standard factory setting for this Legionnaires' disease (pasteurisation) function is "OFF". To activate this Legionnaires' disease function some parameters must be programmed by the manufacturer/supplier. The starting day and time of this Legionnaires' disease function can be programmed at the control panel of the boiler.

There are several parameters being used for this function. Three of these parameters are shown in the following graph.

With parameter **P2 KI** the heating (CH) demand can be interrupted to provide heat for the anti-Legionnaires' disease demand. When no interruption is activated the boiler will wait for the end of the heat demand before the anti-Legionnaires' disease function starts. The standard factory setting for this function is "OFF".



Curve and values only for illustration purposes, programmed parameter values can deviate!

The settings of these parameters **P5 CI**, **P5 CJ** and **P5 CD** must be programmed according to the national and/or local anti-Legionnaires' disease preventing regulations.

The setting of these parameters can only be done by the manufacturer/supplier of the boiler or by a technician with access to programming level 2, at the control panel of the unit without the use of a computer.



NOTICE: The use and activation of this function won't guarantee a Legionnaires' disease free installation. The responsibility for a Legionnaires' disease free installation remains at the end-user/owner.

11.4 Cascade control

→ The following information is also found in the specific cascade manual, supplied standardly with Strebel Ltd cascade accessories or on request.

Before commissioning a cascade installation, a number of parameters have to be changed. These parameters can be programmed on the unit itself, without the use of a computer.



Changes in parameter may only be carried out by a skilled commissioning/service engineer, who has had specific training for setting up the S-CB⁺ range boilers. He will be able to check whether the installation functions correctly after the parameter change has been done.

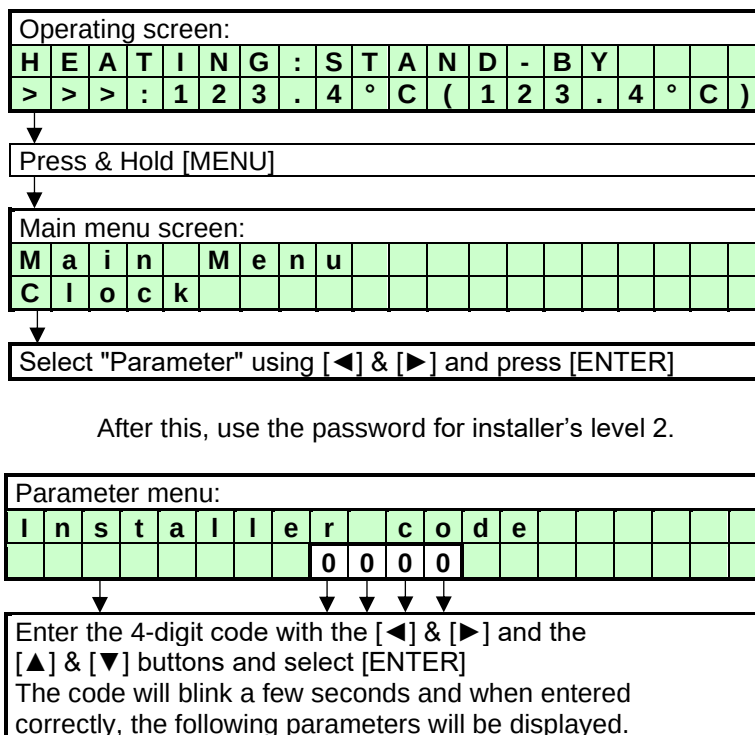
For programming **all parameters** of the boilers one needs to have a laptop with the appropriate S-CB⁺ software and an interface cable for connecting the laptop to the boiler control. This software is used for programming but also shows all measured temperatures and cascade behaviour during operation and service/fault history.

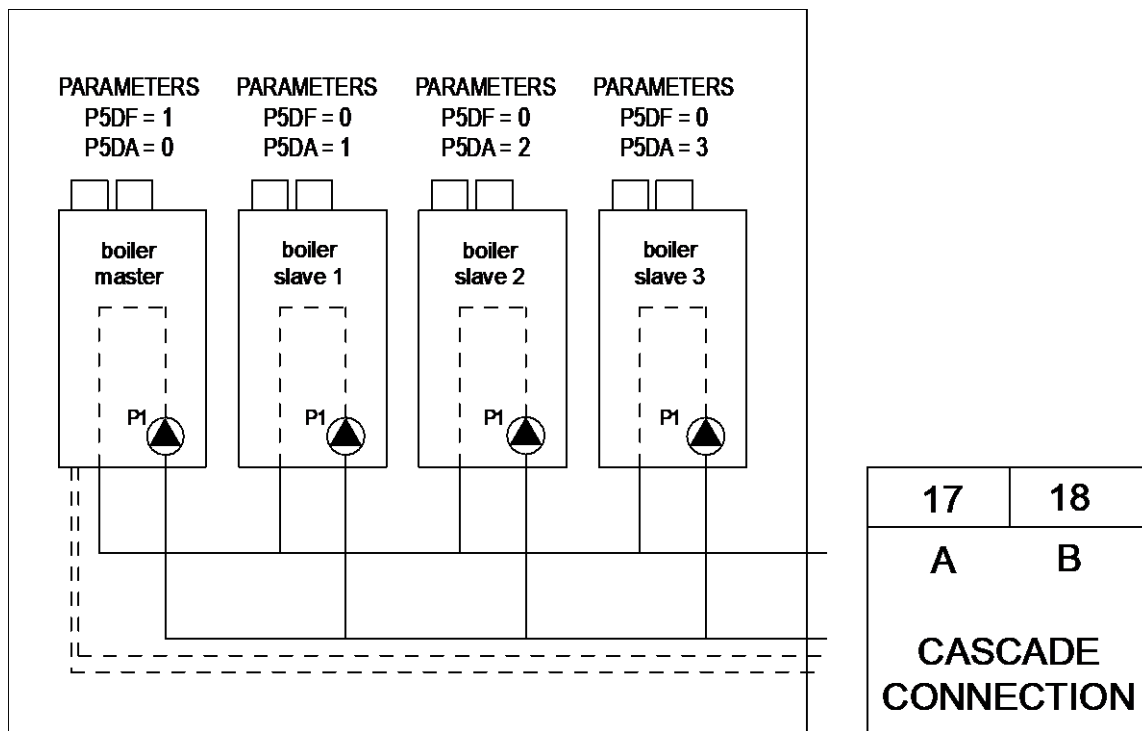
11.4.1 PARAMETER SETTINGS FOR CASCADED BOILERS

Before programming the cascaded boilers, make sure that all boilers are connected (wire) with each other. Use connection 17 and 18 of each boiler.

Remind: Do not alternate these connections, so always connect 17 to 17 and 18 to 18.

After connection every boiler must be programmed. This can be done at the control panel. Press the [MENU] button and select the [PARAMETER] menu. See graphics below.





Now for every single boiler of the cascade the following two parameters must be selected and programmed according to the above drawing.

Master:

C5 P5 DF1
C2 P5 DA 0

Slave 1:

C5 P5 DF0
C2 P5 DA 1

Slave 2:

C5 P5 DF0
C2 P5 DA 2
And so on.

Menu C: Cascade															
C	5					C	a	s		S	i	/	M	a	
										0					

Function for the cascading of the boiler(s).
This parameter sets the function of the boiler at a cascade alignment
0 = Single / Slave unit
1 = Master unit

Menu C: Cascade															
C	2					B	u	s		a	d	d	r	e	s
										0					

Function for the cascading of the boiler(s).
This parameter determines the address of the boiler for the total cascading control.
Master = 0, Slave1 = 1, etc.

When the correct parameter is set, this must be confirmed at the confirmation screen. After activation, the value will blink for a few seconds while the parameter is programmed into the boiler.

When cascade connection is programmed correctly the boiler display will show the following.

Explanation "Cascade communication indicator"

NO CASCADE COMMUNICATION

> > > no.1

Always showing the fixed ">>>"

CORRECT CASCADE COMMUNICATION

> > > no.1

> > > no.2

Showing alternating no.1 & no.2 with 1 second interval.

11.4.2 MONITOR SCREENS

To obtain cascade information, see Chapter 10.4.

11.4.3 OUTPUT CONTROL AND BOILER SEQUENCE

The total cascade set-up will act as one single big boiler, switching on- and off boilers, depending on the total load necessary to adjust and keep the flow temperature at the calculated value.

When the heat demand rises, more boilers are switched on, and when heat demand falls, one or more boilers will be switched off. The boiler that was switched on last, will be switched off first, see table below.

To distribute operating hours equally over all boilers, the working sequence of the boilers will change every two hours.

Hour	Switching ON sequence	Switching OFF sequence
X	Master – Slave 1 – Slave 2 – Slave 3 – Slave 4 – Slave 5 – Slave 6 – Slave 7	Slave 7 – Slave 6 – Slave 5 – Slave 4 – Slave 3 – Slave 2 – Slave 1 – Master
X+2	Slave 7 – Master – Slave 1 – Slave 2 – Slave 3 – Slave 4 – Slave 5 – Slave 6	Slave 6 – Slave 5 – Slave 4 – Slave 3 – Slave 2 – Slave 1 – Master – Slave 7
X+4	Slave 6 – Slave 7 – Master – Slave 1 – Slave 2 – Slave 3 – Slave 4 – Slave 5	Slave 5 – Slave 4 – Slave 3 – Slave 2 – Slave 1 – Master – Slave 7 – Slave 6
X+6	Slave 5 – Slave 6 – Slave 7 – Master – Slave 1 – Slave 2 – Slave 3 – Slave 4	Slave 4 – Slave 3 – Slave 2 – Slave 1 – Master – Slave 7 – Slave 6 – Slave 5
.....		

Table: boiler sequence example of an eight boiler cascade.

In this table a total of eight boilers (one master, seven slaves) is mentioned as an example, in practice the maximum number in a cascade, without extra (external) control, is twelve boilers.

12 COMMISSIONING THE BOILER

12.1 First: flushing the heating system with the S-CB⁺ Isolated.

After installation of the boiler the first step, before commissioning, is to flush the whole heating installation with fresh water to remove pollution, debris and other materials that might cause a blocking with the **S-CB⁺ isolated from the system**. This must also be done with heating installations, where only the boiler is replaced.

12.2 Second: filling & venting the boiler and the system

After flushing the boiler and the installation the system can be filled with fresh water. Fill the boiler and the heating system by using the appropriate filling valve. The water pressure of the system normally lies between 1,5 and 2,0 bar.

NOTICE: Use the following aspects to prevent corrosion of the central heating system:

- Filling water: Do not use any additives for the water of the central heating system. The pH value of the water should be more than 5 (If this pH value is less, please contact the supplier).
- Ensure that any used "plastic" pipes are oxygen diffusion-proof in accordance with DIN 4726/4729. If not, make sure that the boiler circuit is separated from the heating circuit by a plate heat exchanger. This way no oxygen that entered the heating system through these pipes can reach the boiler.
- Check the total heating system for any leaks. This to prevent oxygen entering the system through these leaks.

The boiler has an automatic air vent situated on top. This vent must be opened during the filling of the boiler and the heating system to make sure that no air/oxygen is trapped in the heat exchanger of the boiler. NOTICE: Check that the screw cap has been loosened at least one twist. Shortly after putting the boiler into operation, check the water pressure and add or lose some water to obtain the required pressure.

During these proceedings, make sure that no water can enter the boiler and make contact with the electrical parts.

12.3 Third: check the water flow

Before the boiler will be started it must be sure that the boiler pump is functioning and that there is a water flow over the heat exchanger. Check the electrical power supply of the boiler; if this is connected correctly, the display will show:

Display message	B	o	i	l	e	r	o	f	f										
Reason	Boiler is not active. To activate the boiler press [ON/OFF] button for <u>six</u> seconds.																		

Display message	H	E	A	T	I	N	G	:	b	o	i	l	e	r	o	f	f		
Reason	Boiler is standby. To activate the boiler press [ON/OFF] button for <u>three</u> seconds.																		

Activate the boiler by pressing the [ON/OFF] button for six resp. three seconds. After this the following display will appear:

Display message	H	E	A	T	I	N	G	:	N	o		d	e	m	a	n	d		
Reason	Boiler is active, but there is no heat demand.																		

When no water is present in the boiler or the water pressure is too low or high, the boiler will go into lock-out and will show a corresponding message in the display.

Display message	W	a	t	e	r	p	r	e	s	s	u	r	e		f	a	u	l	t
Reason	Water pressure is too low or high.																		

By pressing the [SERVICE] button of the boiler, the boiler can be started without a heating demand. The boiler will start to fire and also the pump will start to run. Firing of the boiler without water flow (but filled with water!) will cause the so called “boiling noises”. Check during this “service function” operation also the flow and return temperatures of the boiler by pressing the [◀] button once. The temperature difference of the flow and return must be between 13°C and 25°C at high fire. This temperature difference indicates that there is a sufficient water flow over the boiler; this water flow protects the heat exchanger against possible damage caused by a thermal overload.

Another safety feature of the boiler, to make sure that there is enough water flow over the boiler, is the monitoring of the flow and return temperatures (T1 and T2). When the temperature difference (delta T) between the flow and return exceeds a certain (set) value, the following warning messages will be shown in the display.

Display message	T	2	-	T	1		h	i	g	h									
											9	9	9	,	5		h	r	s

Reason Temperature difference T2-T1 has exceeded the blocking value, as set in the parameters.

Display message	d	T		B	I	O	C	K											
											9	9	9	,	5		h	r	s

Reason Temperature difference T1-T2 has exceeded the blocking value.

When the T1-T2 value exceeds the lock-out setting, the boiler will switch off and the following lock out code will be shown at the display.

Display message	F	I	O	w	R	e	t	u	r	n		d	t		f	a	u	l	t		
F16	p	u	m	p		o	n					9	9	9	,	5			h	r	s

Reason Temperature difference between flow and return exceeds limitation value, or 'dT block or delta direct block' has occurred three times.

When these messages appear and/or the boiler will lock out, it means that there is not enough flow over the boiler. In this case check the functioning of the pump.

The boiler has no built in water-flow switch. If there is the possible risk of a water-flow blockage of the (external) heating system, the following pre-cautions can be taken to ensure a water flow over the boiler:

- Separate the boiler circuit from the (external) heating circuit by using a low loss header or plate heat exchanger.

During and after the commissioning of the boiler, the operation of the boiler pump must be checked, before leaving the installation room.

NOTICE: Always check the running of the pump before firing the boiler.

13 STARTING THE BOILER

13.1 General

Check the gas pressure available at the gas connection pipe of the boiler. Use the pressure nipple (3) of the gas safety valve for this measurement.

The gas valve pictures on page 96 show the position of the pressure nipple (3) for the complete boiler range.

The gas input pressure for the boiler to operate properly under the correct load must be **more than 20 mbar at high fire**.

13.2 Firing for the first time

After the commissioning of the boiler and the described previous actions, the boiler display will show the following graph.

Display message	H E A T I N G : N o d e m a n d
Reason	> > > : 1 2 3 . 4 ° C (1 2 3 . 4 ° C) Boiler is active, but there is no heat demand.

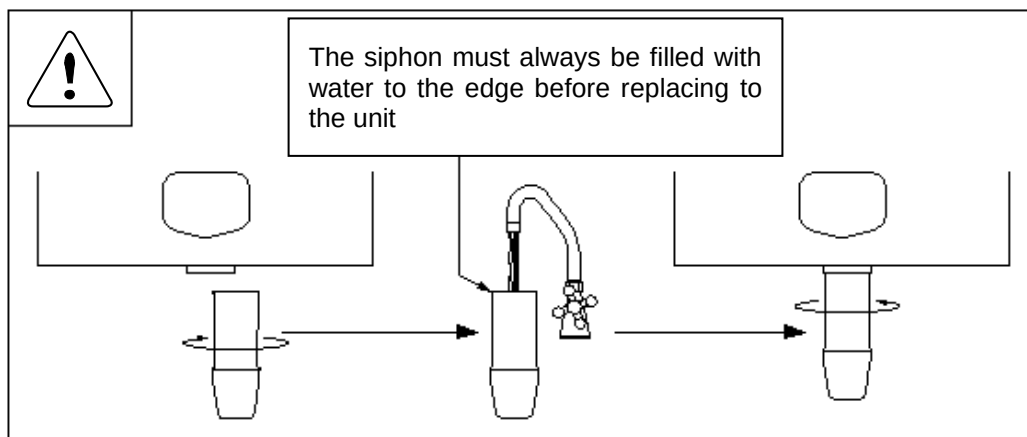
The display describes:

- The actual operation for heating or hot water.
- If there is a heat demand activated.
- The temperature setting/
- The temperature measured/



When mounting the bottom part of the siphon, before commissioning the boiler and/or after maintenance, it must **ALWAYS** be completely filled with water.

This is a safety measure: the water in the siphon keeps the flue gases from leaking out of the heat exchanger via the condensate drain.



When the boiler receives a heat demand the electronics will start the operation of the boiler. Before the boiler is used, the boiler burner must be adjusted and set at the minimum and maximum load.

14 ADJUSTING AND SETTING THE BURNER



Before carrying out any adjusting of the burner, carefully read this complete chapter.

14.1 Introduction

The burner must always be adjusted in the next situations:

- A.** - A new boiler is installed
- As part of a service/maintenance check, in case the CO₂ values turn out to be incorrect.
- B.** - The gas control safety valve has been (re)placed
- Another type of gas is applied: gas conversion

Adjustment procedures for situation **A** are described in chapter **14.2** and for situation **B** chapter **14.3**.

In either of the four cases described in **A** and **B**, always check the gas/air ratio of the combustion figure (CO₂) at maximum and minimum input. First set the boiler at max. load and subsequently at min. load, and repeat if necessary.

Gas types and valves

The right type of valve must be selected, depending on the gas type. Gas types G20, G25.3 and G31 are commonly used; the boilers are standard equipped with the A+C-class valves required for these types of gas.

Set-up of this chapter:

First, all necessary values are given in three tables in chapter 14.1.1. A drawing of the gas valve(s) and setting screws is given in chapter 14.1.3. In chapter 14.1.5 a general scheme, conform which the adjustments must be carried out, is presented in table form. In chapters 14.2 and 14.3, a description is given of how to proceed in cases **A** and **B** respectively. In chapter 14.4, finally, two main procedures used in the previous sections are described in detail.

14.1.1 ADJUSTMENT TABLES

Table 1: CO₂ values for maximum and minimum load.

gas type ¹⁾		CO ₂ [%]			O ₂ [%]	
G20, G25.3	Boiler Model	max load	min load		max load	min load
	* 60-180	9,0 - 9,2	8,5 - 8,7		4,5 - 4,8	5,4 - 5,7

propane G31 ³⁾	boiler type	max load	min load		max load	min load
	* 60-120	10,3 - 10,5	9,1 – 9,3		4,9 - 5,2	6,7 – 7,0
	* 150	10,4 - 10,6			4,7 - 5,0	
	* 180	10,5 - 10,7			4,6 - 4,9	

B/P ^{3) 4)} G30/ G31	boiler type	max load	min load		max load	min load
	* 60-120	10,4 - 10,6	9,1 – 9,3		5,1 - 5,4	7,0 – 7,3
	* 150	10,5 - 10,7			4,9 - 5,2	
	* 180	10,6 - 10,8			4,8 - 5,1	

1 Cf. EN437.

2 All values measured without front door. The CO₂ / O₂ values should always be between the values set in this table. Nominal values can be found in Technical specifications datasheet page ...

3 Fan settings must be changed by altering parameter P4BD (display D8). (only by a skilled mechanic).

4 B/P: Propane/butane mixture.



Using propane or butane/propane mixtures (B/P), maximum fan speed needs to be reduced by changing parameter P4BD.

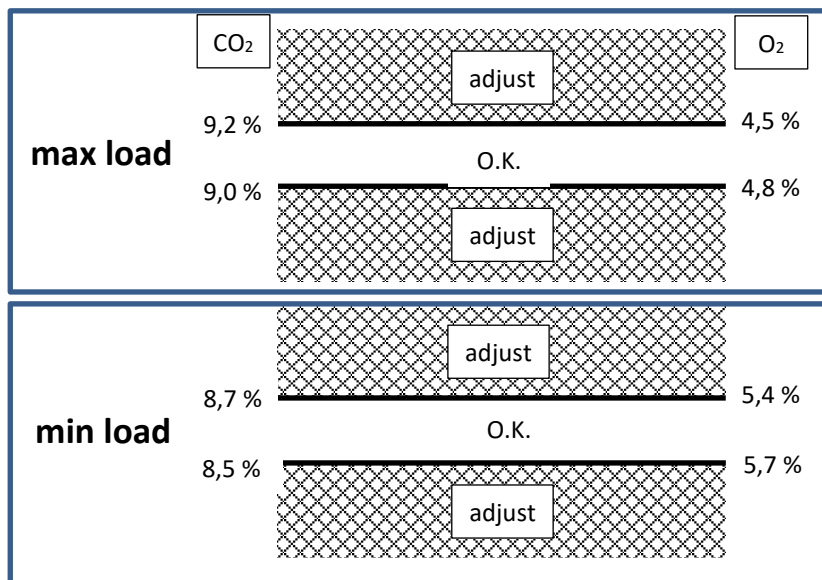
To make adjustments easier, values of table 1 are presented in the following figures. The CO₂ / O₂ values should always be between the values set in this figure.

Nominal values can be found in the Technical specifications datasheet at the beginning of this manual. All values are measured without front door.

Gas type G20, G25.3

The CO₂ level may never be in the hatched area.

S-CB⁺ 60 - 180

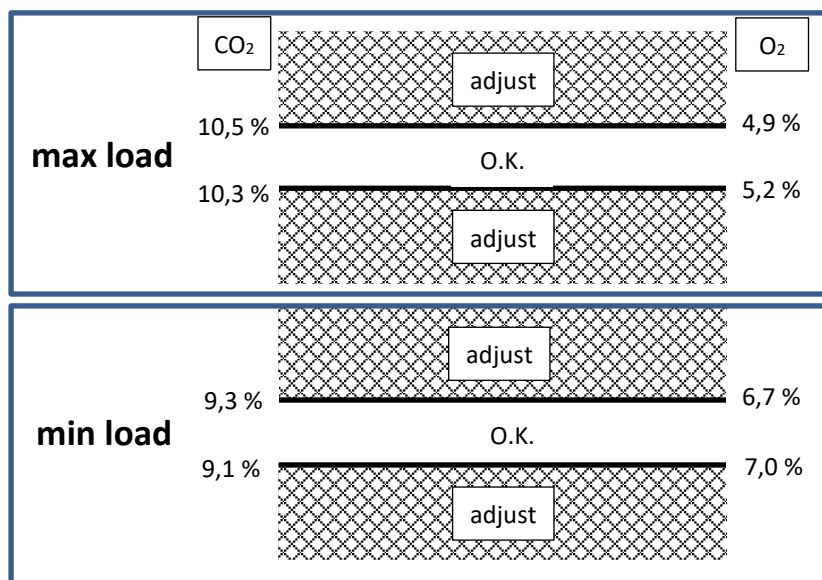


Propane G31:

Fan settings must be changed by altering parameter P4BD (display D8). (only by a skilled mechanic).

The CO₂ level may never be in the hatched area.

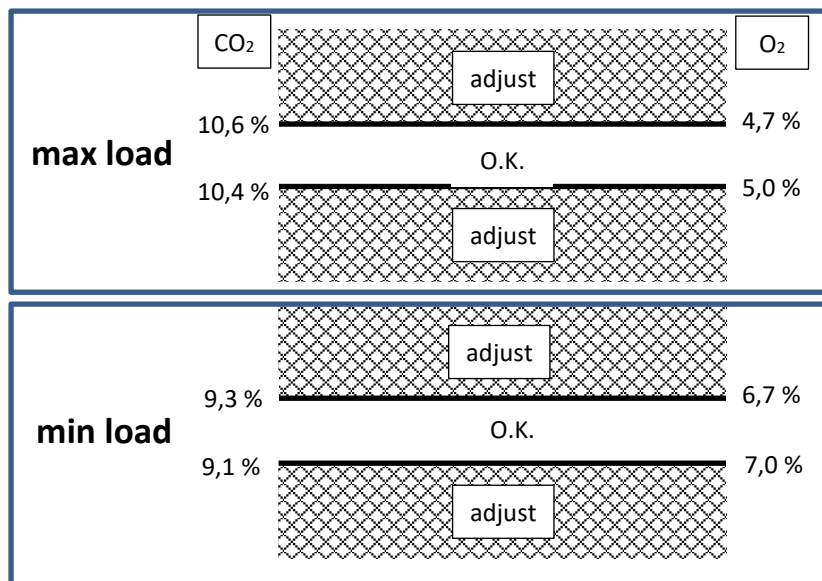
S-CB⁺ 60 - 120



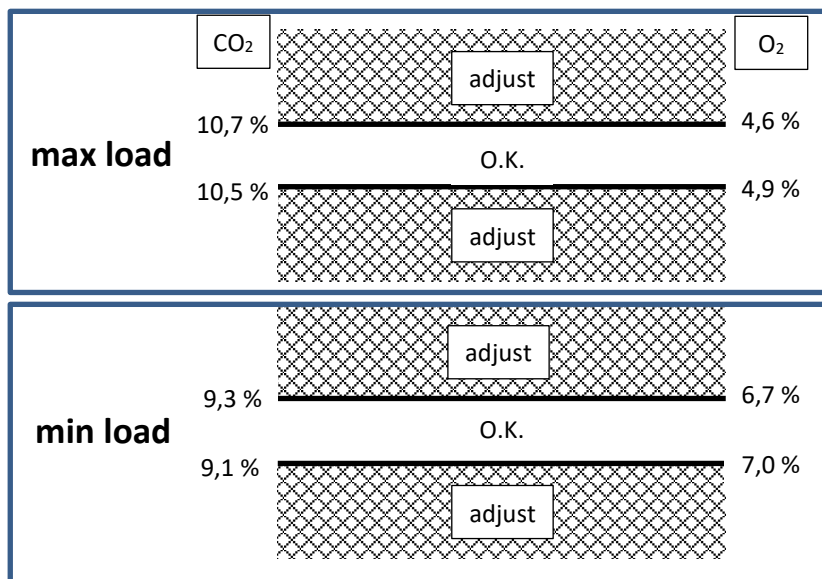
>>> cont. Propane G31:

The CO₂ level may never be in the hatched area.

S-CB⁺ 150



S-CB⁺ 180



B/P: Propane/ Butane mixture G30/ G31:

Fan settings must be changed by altering parameter P4BD (display D8). (only by a skilled mechanic).
The CO₂ level may never be in the hatched area.

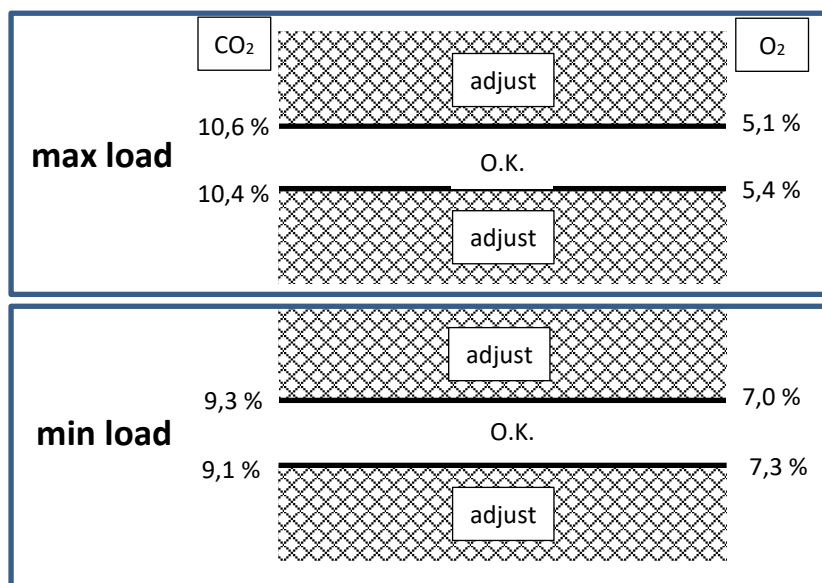
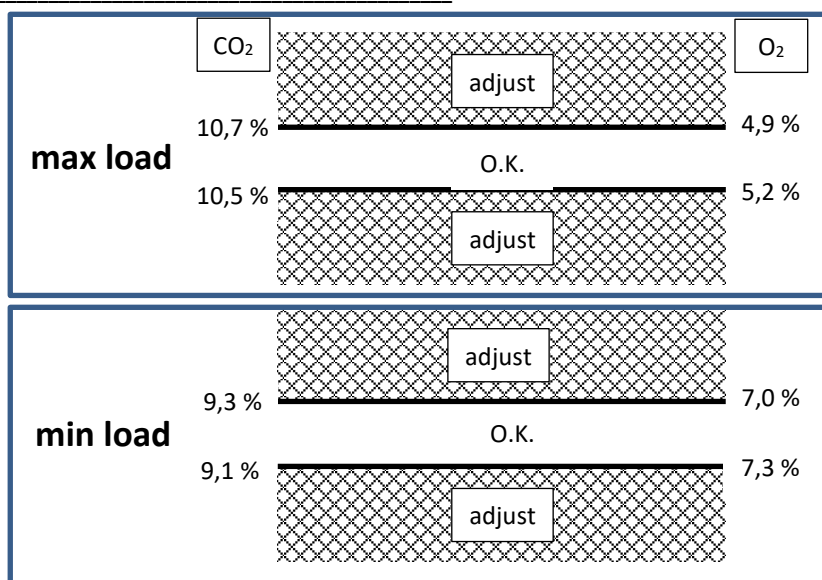
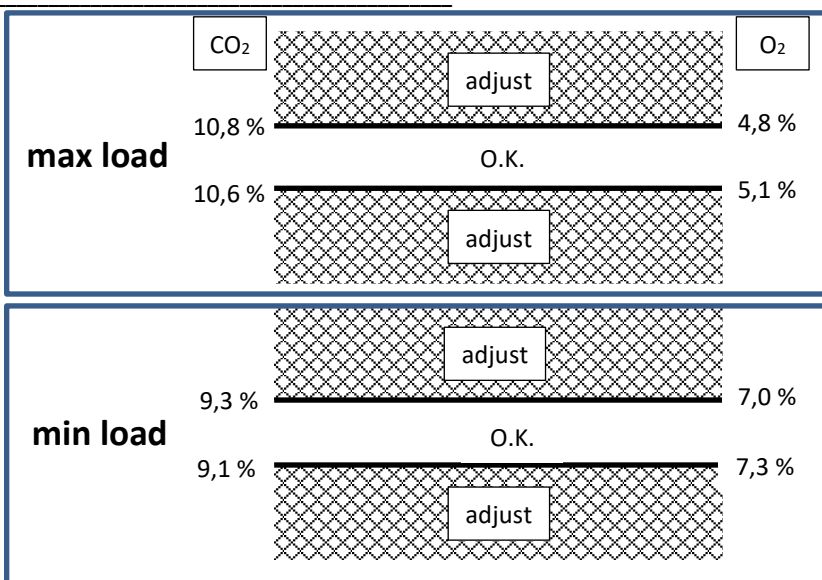
S-CB⁺ 60-120**S-CB⁺ 150****S-CB⁺ 180**

Table 2 pre-adjustment settings gas valves (G27 for Poland)

Boiler Model	number of turns open (counter clockwise)		
	Nat. gas G20 / G25.3 / G27	Propane G31	Butane/Propane B/P G30/G31
S-CB⁺ 60	1	0,5	0,25
S-CB⁺ 80	1,5	0,75	0,5
S-CB⁺ 100	3,5	1,5	1,25
S-CB⁺ 120	2,25 *	1 *	0,75 *
S-CB⁺ 150	2,25 *	1 *	0,75 *
S-CB⁺ 180	4,25 *	2,25 *	2 *

* Both gas valves must be opened this number of turns.

Table 3 Pressure adjustment settings LEFT valve

Contact your boiler supplier for the right settings when converting to a not mentioned type of gas

Boiler Model	"p-out" pressure at gas valve		
	nat. gas G20 / G25.3	propane G31	Butane/Propane B/P G30/G31
S-CB⁺ 120	-2 to 0 Pa	-4 to -2 Pa	-5 to -3 Pa
S-CB⁺ 150	-2 to 0 Pa	-7 to -5 Pa	-8 to -6 Pa
S-CB⁺ 180	-2 to 0 Pa	-7 to -5 Pa	-8 to -6 Pa



Maximum fan speed has to be reduced to convert the boiler into a propane or B/P appliance. Setting of parameter P4BD.

A sticker has to be pasted after converting the boiler into a propane or B/P appliance. Mark the used gas and the parameter setting on this sticker.

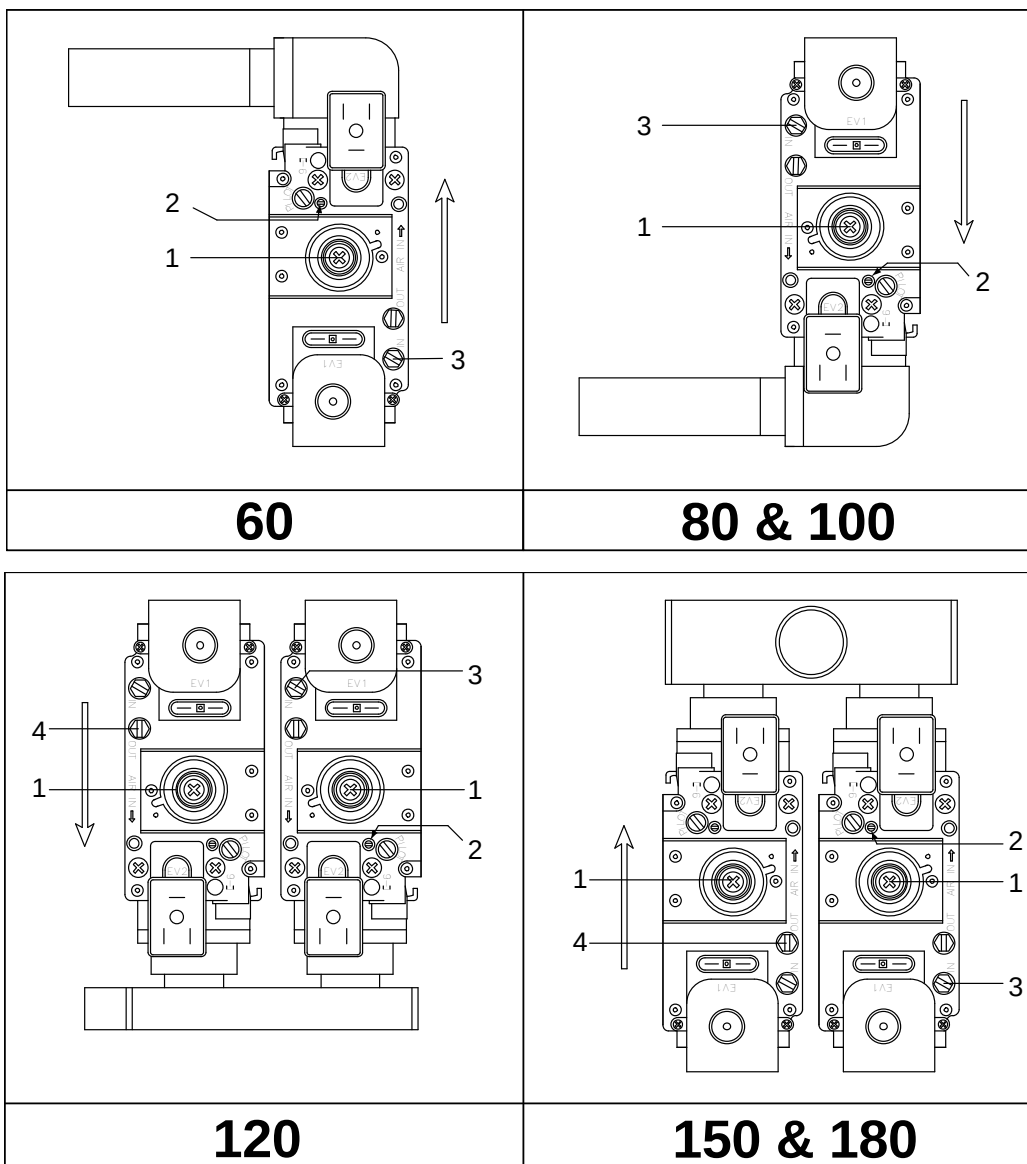
G31 P	PROPANE PROPAN PROPANO PROPAAN		P4BD = 1	
G30/G31 B/P	BUTANE/PROPANE BUTAN/PROPAN BUTANO/PROPANO BUTAAN/PROPAAN		P4BD = 2	

See Chapter 14.3.

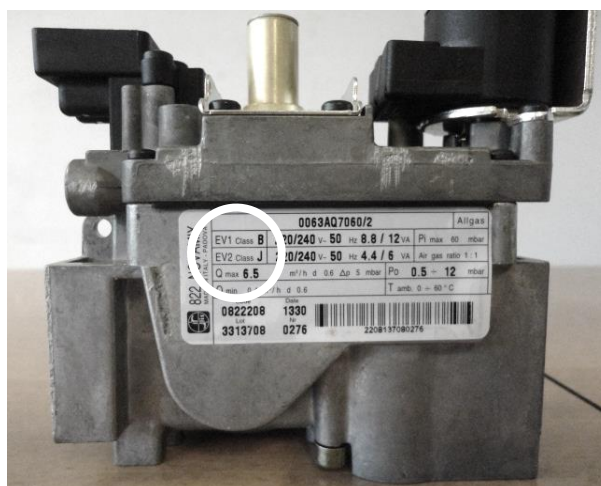
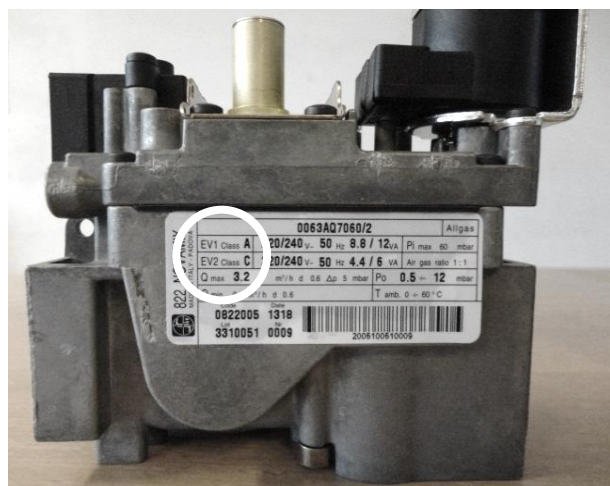
14.1.3 SETTING SCREWS GAS VALVE(S): DRAWINGS



NOTICE: Do NOT mistake the screw marked 'PILOT' for screw 2.
→ Screw 2 is the **SMALL** screw immediately next to the pilot screw.



14.1.4 GAS VALVE CLASSES A+C AND B+J (B+J ONLY FOR POLAND)



These pictures show the difference between an A+C and a B+J valve.
Notice the class being denoted on the ID plate of the valve.

14.1.5 ADJUSTMENT ACTIONS: GENERAL SCHEME

General scheme for adjustment of the gas valve(s). Check this scheme for an overview.

To complete all necessary adjustments in right order, follow case **A** or **B** top-down through the scheme (**B** involves a few extra steps (grey text blocks)):

	GENERAL SCHEME SETTING STEPS					
	Case A New boiler or service check	Case B Valve replacement or gas conversion				
	continue ↓	First close (both*) screw(s) [2], then set them in accordance with table 2				
	SWITCH TO SERVICE MODE					
	continue ↓	If burner doesn't start, open (RIGHT*) screw [2] ¼ turn extra				
	Setting at maximum load					
Procedure 1	[▲] Set burner at maximum load					
	Measure CO ₂ at flue gas outlet; use (RIGHT*) screw [2] to adjust according table 1 or figures.					
	<table><tr><td>CO₂ ↓</td><td>↻ [2]</td></tr><tr><td>CO₂ ↑</td><td>↻ [2]</td></tr></table>			CO ₂ ↓	↻ [2]	CO ₂ ↑
CO ₂ ↓	↻ [2]					
CO ₂ ↑	↻ [2]					
	Setting at minimum load					
	continue ↓	only → +120, 150, 180	[▼] set burner at minimum load			
			use LEFT screw [1] to match "p-out" with table 4			
Procedure 2	[▼] Set burner at minimum load					
	measure CO ₂ at flue gas outlet; use (RIGHT*) screw [1] to adjust according table 1 or figures.					
	<table><tr><td>CO₂ ↓</td><td>↻ [1]</td></tr><tr><td>CO₂ ↑</td><td>↻ [1]</td></tr></table>			CO ₂ ↓	↻ [1]	CO ₂ ↑
CO ₂ ↓	↻ [1]					
CO ₂ ↑	↻ [1]					
Repeat procedure 1						
Repeat procedure 2						
Keep repeating until values match table values best						
Boiler returns to NORMAL MODE after 40 min. OR by pressing [SERVICE] button						

* in case of a double valve (S-CB*120, S-CB*150 and S-CB*180)

For an extensive description consult the next two sections (choose which is applicable, **A** or **B**):

14.2 Adjusting in case of a new boiler, or after maintenance (case A)

14.2.1 GENERAL REMARK

For all adjusting steps under **A** the measured CO₂ values shall be according table 1 or figures

14.2.2 CHECKING AND ADJUSTING AT MAXIMUM LOAD

Adjust at maximum load by carrying out procedure 1.

14.2.3 CHECKING AND ADJUSTING AT MINIMUM LOAD

Adjust at minimum load by carrying out procedure 2.

14.3 Adjusting in case of valve replacement or gas conversion (case B)



Maximum fan speed must be reduced to convert the boiler into a propane or B/P appliance. Setting parameter P4BD.

14.3.1 GENERAL REMARKS

In case **B**, a distinction is made between the setting of boilers containing a single valve (S-CB+ 60-S-CB+ 100) and boilers with a double valve (S-CB+ 120-S-CB+ 180).

All adjustments must result in CO₂ according table 1 or figures.

Checking and adjusting at maximum load S-CB+ 60 / S-CB+ 80 / S-CB+ 100

The boilers 60, 80 and 100 all have single gas valves, see previous gas valve drawings.

- First, turn setting screw [2] of the gas valve clockwise until you feel resistance. This means that the valve is closed, *do not try to tighten the screw any further*.
- Now turn screw [2] counter clockwise (open), according to the number of turns in table 2 or 3 for the used boiler and gas type.

After this, adjust at maximum load by carrying out procedure 1.

If the burner doesn't start up in service mode, turn screw [2] a quarter turn counter clockwise open, and try again.

14.3.2 CHECKING AND ADJUSTING AT MINIMUM LOAD S-CB +60 / +80 / +100

Adjust at minimum load by carrying out procedure 2.

IMPORTANT: Toggle between high fire and low fire to make fine-tuning adjustments (adjusting the minimum setting affects the maximum setting and contrariwise).



In case of gas conversion, paste the corresponding sticker at the appropriate position in the boiler and mark the square for the used gas type. Also mark the square, indicating that the correct value has been set for parameter P4BD.

(In the example on the right, 'propane' and 'P4BD = 1' have been marked).

G31 P	PROPANE PROPAN PROPANO PROPAAN	☒	P4BD = 1	☒
G30/G31 B/P	BUTANE/PROPANE BUTAN/PROPAN BUTANO/PROPANO BUTAAN/PROPAAN	☐	P4BD = 2	☐



For adjusting double gas valves S-CB +120 / +150 / +180 see next page →

The boilers S-CB +120, +150 and +180 all have double gas valves.

First connect a manometer to "p-out" = measuring point [4] of the **left** gas valve (see drawing).

- Now, turn setting screws [2] of both gas valves clockwise until you feel resistance. This means that the valves are closed, do not try to tighten the screws any further in the closed position.
- After this, turn screws [2] of both left and right hand gas valve counter clockwise (open), according to the number of turns in table 2 or 3 for the used boiler and gas type.

From now on **only** use the **right-hand** gas valve for adjustments on high fire.

Adjust the right valve at maximum load by carrying out procedure 1.

If the burner doesn't start up in service mode, turn screw [2] a quarter turn counter clockwise further open, and try again.

14.3.4 CHECKING AND ADJUSTING AT MINIMUM LOAD S-CB+ 120 / +150 / +180.

Adjusting these boilers at minimum load in case B involves extra measurements, to get both valves balanced:

Use the [▼] button to decrease the actual load of the service (percentage) to the minimum. The following screen will appear:

Display message	H	E	A	T	I	N	G	:	S	e	r	v	i	c	e		2	6	%
	>	>	>		1	2	3	.	4	°	C	(	1	2	3	.	4	°	C

Boiler is activated and operates at service mode at 26% (minimum).

See table 4 for pressure settings "p-out" gas valve for the used boiler and gas type.

Use screw [1] on the **left-hand** gas valve to adjust the measured pressure at "p-out" to the right value according to table 4. Be sure the manometer has been zeroed out prior to making this setting.

Below, the influence of turning screw [1] is described.

Turning counter clockwise → less gas → a drop-in CO₂ → a drop in measured pressure at "p-out"
Turning clockwise → more gas → a rise in CO₂ → a rise in measured pressure at "p-out"

After "p-out" has been set according table 4, the CO₂ level at low fire must be set again. Use values of table 1 and/or figures.

Adjust screw [1] of the **RIGHT-hand** valve to set the CO₂ at minimum load by carrying out procedure 2.

Again, toggle between high fire and low fire to make fine-tuning adjustments (adjusting the minimum setting affects the maximum setting and contrariwise).

If the valves have been set correctly, "p-out" left should equal "p-out" right. As an additional test, one could check this by measuring "p-out" at the RIGHT valve, i.e. at measuring point 4 on the right valve.

This pressure should be in the same range of pressure as the left valve, so in accordance with table 4 again.

If, after all setting steps have been carried out properly, the values of left and right "p-out" are still very different, contact your supplier.

14.4 Adjusting procedures

Procedures 1 and 2, referred to in the previous chapters 14.2 and 14.3, are described here:

Procedure 1: Adjust at maximum load

In case **B** (replacement of gas valve or gas conversion): consult chapter 14.3. before starting procedure 1 below.

Carry out the next 4 steps:

1. Press [SERVICE] button for about 3 seconds.

Display message	H	E	A	T	I	N	G	:	S	e	r	v	i	c	e		2	6	%
	>	>	>		1	2	3	.	4	°	C	(	1	2	3	.	4	°	C

Boiler is activated and operates at service mode at 26% (minimum). (example)

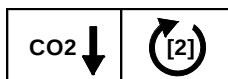
2. Press [▲] button until maximum load is reached:

Display message	H	E	A	T	I	N	G	:	S	e	r	v	i	c	e		1	0	0	%
	>	>	>		1	2	3	.	4	°	C	(	1	2	3	.	4	°	C	)

Boiler is activated and operates at service mode at 100% (maximum). (example)

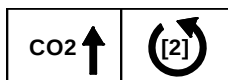
3. Measure the CO₂ percentage at the flue gas outlet.
4. By setting screw [2], adjust the gas valve to obtain the CO₂ value of table 1 or the figures.
NOTICE: For the S-CB⁺ 120, 150 and 180 boilers use only the Right-side gas valve for adjusting.

Decrease CO₂ percentage



Turn screw [2] right (clockwise)

Increase CO₂ percentage



Turn screw [2] left (counter clockwise)

The service operation of the boiler will be active for 40 minutes.
After this period the boiler will return to normal operation.

Procedure 2: Adjust at minimum load.

In case **B** (gas conversion or replacement of gas valve): consult chapter 14.3. before starting procedure 2 below.

Carry out the next three steps:

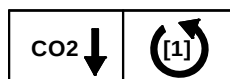
1. Press [▼] button until minimum load is reached.

Display message	H	E	A	T	I	N	G	:	S	e	r	v	i	c	e		2	6	%
	>	>	>		1	2	3	.	4	°	C	(	1	2	3	.	4	°	C

Boiler is activated and operates at service mode at 26% (minimum).

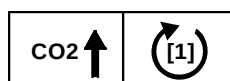
2. Measure the CO₂ percentage at the flue gas outlet.
3. By setting screw [1], adjust the gas valve to obtain the CO₂ value of table 1.
NOTICE: For the S-CB⁺ 120, 150 and 180 boilers use only the RIGHT-side gas valve for adjusting.

Decrease CO₂ percentage



Turn screw [1] left (counter clockwise)

Increase CO₂ percentage



Turn screw [1] right (clockwise)

The service operation of the boiler will be active for 40 minutes.
After this period the boiler will return to normal operation.

15 PUTTING THE BOILER OUT OF OPERATION

It is recommended to have the boiler operational all year round to prevent any frost damage during the winter and/or rotating parts getting jammed during other times of the year (built in boiler safety features).

15.1 Out of operation: on/off function

To be used when the appliance must be put out of operation for a long period because of a defect or another safety risk.

Act as follows:

- Disconnect or switch off the room thermostat and/or other external controllers from the boiler. The CH pump and fan will stop after a short time.
- Switch off the boiler by pressing the [ON/OFF] button for six seconds.
- Make sure that the following display screen is visible.

[illegible]

Properties of the 'off' function:

- The keys do NOT respond and the menu is NOT accessible.
- The burner does NOT respond to an external heat demand.
- The boiler CAN, however, be switched on again by pressing the [ON/OFF] button.
- Pumps, fans and cascade (if applicable) are operational, and so are both recirculation protection (if applicable) and frost protection.
- NOTICE: Pump 3 (CH pump) is switched OFF, but this is NOT the case when the boiler is in a cascade.
- To reactivate the boiler, switch on the burner by pressing [ON/OFF] for six seconds again.



The frost protection module can still activate the burner.
To prevent this, switch off this protection or put the boiler in 'power off' mode.

15.2 Out of operation: power off

To assure that the boiler cannot become active at all anymore, power should be cut off completely.

Act as follows:

- Disconnect or switch off the room thermostat and/or other external controllers from the boiler. The CH pump and fan will stop after a short time.
- Switch off the boiler by pressing the [ON/OFF] button for six seconds.
- Make sure that the following display screen is visible.

[illegible]

- Switch off the electrical power supply of the boiler (remove connection from the wall socket, or switch off the main power).
- Close the gas valve / gas supply.
- In case of possible frost damage: drain both the boiler and the heating system.

NOTICE: Before starting to drain the boiler, first start draining the heating system and subsequently open also the two drains of the boiler.

16 FAULT CODES.

16.1 Lock-out codes

IMPORTANT:
To avoid electric shocks, disconnect electrical supply before performing troubleshooting. To avoid burns, allow the unit to cool before performing troubleshooting. Be aware that a fault code is an indication that the unit or the system needs attention. When repeatedly having faults, these should not be neglected. The first step is to check if the unit is installed according to the instructions. If not, first make sure the installation complies with the installation manual. Always check the fuses on the control board before replacing any major components. A blown fuse can prevent the controller or other components from operating. Most faults can also be caused by a bad wiring and/or connections, even if it is not specifically mentioned. With every fault, it is wise to check wiring and connections (at both ends) that connect to the safety device/component that generates the fault.

LOCK-OUT CODES:
Having a lockout means that the boiler needs a manual reset to start operating again. When the boiler is in lockout the backlight of the display is blinking on and off. Explanation > 9 9 9 , 5 : h r s = time elapsed after fault/message. Explanation > P u m p 1 o n = status of the pump during fault.

Display message	C l i x o n F a u l t
F15	p u m p o n 9 9 9 , 5 h r s
Reason	Heat exchanger fuse or burner door clixon exceeded maximum allowed value.
Cause:	
	The thermal fuse of the heat exchanger has opened permanently.
Corrective action:	
	Switch off the electrical power and gas supply and contact supplier.
Cause:	
	The burner door clixon has opened.
Corrective action:	
	Remove the burner door of the heat exchanger and check the burner door gasket for leakage. Check the burner door for deformation; when it deforms, it must be replaced. Check the heat exchanger for dirt and check that the flue is not blocked. If heat exchanger is clean, reset manually the clixon itself and reset the boiler.

Display message F8	F a i l e d b u r n e r s t a r t p u m p o n 9 9 9 , 5 h r s
Reason	Boiler not operational after four starting attempts.
Cause:	No spark.
Corrective action:	Check the ignitor/ignition electrode and replace/clean if necessary. Check the state of the ceramic insulator. A small crack can prevent the spark to form at the end of the electrode. Check the distance between the electrode pin, earth pin and burner. Check the state of the ignition cable and replace if necessary. Check the state of the earth wire/connection of the ignitor and replace if necessary. Check the state of the sparkplug cap and replace if necessary. Check power supply. Voltage must be 230 Vac nom. Check for proper electrical grounding of unit. Bad ignition transformer. Replace the burner control of the unit.
Cause:	Ignition spark is present, but no flame results.
Corrective action:	Check if all gas valves in the supply line are completely open. Check if there is no air in the gas supply (start-up new systems). Check if the gas valve opens. When there is power supply to the gas valve, but the valve does not open, the gas valve must be replaced. Check if the gas valve opens. When there is no power supply to the gas valve check the gas valve wiring/connections. Check if the gas valve settings are correct and adjust if necessary. Check if the gas pressure is correct and sufficient. Check if the air supply is open/not blocked.
Cause:	Flame, but not enough ionisation to establish the flame.
Corrective action:	Check the ignitor/ignition electrode and replace/clean if necessary. Check the state of the ceramic insulator. Check the distance between the electrode pin, earth pin and burner. Check the state of the ignition wire (also the ionisation wire) and replace if necessary. Check the state of the earth wire/connection of the ignitor and replace if necessary. Check for proper electrical grounding of unit. Check power supply. Voltage must be 230 Vac nom. Check the state of the sparkplug cap and replace if necessary.

Display message F10	F a l s e f l a m e s i g n a l p u m p o n 9 9 9 , 5 h r s
Reason	Flame signal detected, while boiler should not fire for operation.
Cause:	The flame detection circuit detects a flame which is not supposed to be present.
Corrective action:	Check the ignition/ionisation electrode and make sure it is clean (or replace it). Check the power supply voltage for a correct polarity. Check the power supply for bad frequency or voltage peaks. Check external wiring for voltage feedback. Check the internal wiring for bad connections. Check if the gas valve is closing correctly. Replace the burner control.

Display message F11	F a n s p e e d i n c o r r e c t p u m p o n 9 9 9 , 5 h r s
Reason	Actual fan speed differs from the unit rpm set point.
Cause:	
	An incorrect fan speed is detected.
Corrective action:	
	Check the 4-wired wiring and connections at the fan and at the main control board. Check the 3-wired power supply wiring and connections at both ends. Replace the fan. Replace the main control board.

Display message F9	F l a m e l o s t p u m p o n 9 9 9 , 5 h r s
Reason	Flame signal lost during operation.
Cause:	
	Bad gas supply pressure.
Corrective action:	
	Be aware that the specified gas pressure must be met during all operation conditions. Check if all gas valves in the supply line are completely open. Check if the dirt filters mesh in the gas valve inlet is clean. Check if the external dirt filter in the gas supply line is not blocked. Check if an external gas pressure regulator is selected/installed correctly. Check the gas pressure that is supplied to the building > call the supplier if necessary.
Cause:	
	Bad gas valve or gas valve settings.
Corrective action:	
	Check and set gas valve settings.
Cause:	
	Bad electrode, electrode wiring/connection (bad ionisation signal).
Corrective action:	
	Check ionisation signal. Check the ignitor/ignition electrode and replace/clean if necessary. Check the state of the ceramic insulator. Check the distance between the electrode pin, earth pin and burner. Check the state of the ignition wire (is also ionisation wire), and replace if necessary. Check the state of the ignitor earth wire/connection and replace if necessary. Check for proper electrical grounding of unit.
Cause:	
	Bad flue gas and/or air supply system.
Corrective action:	
	Check if the design of the flue gas and air supply system complies with the max. combined resistance as specified. Check if the flue gas and air supply system is installed according a good installation practice by a skilled installer. Check all seals in the flue gas and air supply system.
Cause:	
	External factors.
Corrective action:	
	Check if there were extreme weather/wind conditions when the fault occurred. Check if the boiler room pressure is equal to the pressure at the position of the flue gas outlet (when combustion air is drawn from the boiler room).

Display message F1	F	I	O	W	h	I	G	H	T	E	M	P							
	p	u	m	p		o	n					9	9	9	,	5		h	r
Reason:	Max. flow temperature exceeds limitation (lock-out) value.																		
Cause:	The water flow is restricted.																		
Corrective action:	Check functioning of the pump. Check/open all valves that might restrict the water flow through the unit. Check for an external system pump that influences flow through the unit. Check if the system resistance exceeds the spare capacity of the unit pump.																		

Display message F16	F	I	O	W	R	E	T	U	R	N		d	t		f	a	u	l	t	
	p	u	m	p		o	n					9	9	9	,	5		h	r	s
Reason:	Temperature difference between flow and return exceeds limitation value, or 'dT block or delta direct block' has occurred three times.																			
Cause:	The water flow through the unit is too low.																			
Corrective Action:	Check functioning of the pump. Check/open all valves that might restrict the water flow through the unit. Check for an external system pump that influences the flow through the unit. Check if the system resistance exceeds the spare capacity of the unit pump. Make sure the heat exchanger is clean. Heat exchanger fouling (partly blockage) will increase the resistance causing the water flow to drop.																			

Display message F0	F	I	O	W		s	e	n	s	o	r		e	r	r	o	r			
	p	u	m	p		o	n						9	9	9	,	5		h	r
Reason:	Flow sensor is not detected.																			
Cause:	Bad wiring/connection in the flow sensor circuit.																			
Corrective action:	Check for loose wiring/connections in the flow sensor circuit.																			
Cause:	Bad temperature sensor causing a fault signal.																			
Corrective action:	Replace flow sensor.																			

Display message F6	F	I	U	E		s	e	n	s	o	r		e	r	r	o	r			
	p	u	m	p		o	n					9	9	9	,	5		h	r	s
Reason	Flue sensor is not detected by the boiler PCB.																			
Cause:																				
Bad wiring/connection in the flue gas sensor circuit.																				
Corrective action:																				
Check for loose wiring/connections in the flue gas sensor circuit.																				
Cause:																				
Bad temperature sensor causing a fault signal.																				
Corrective action:																				
Replace flue gas sensor.																				

Display message F7	F l u e t e m p t o o h i g h p u m p o n 9 9 9 , 5 h r s
Reason	Flue gas temperature exceeded 3 times limitation value within a certain period.
Cause: Heat exchanger polluted and not able to transfer enough heat to system water.	
Corrective action:	
Check and clean heat exchanger.	
Cause: Bad flue gas sensor or sensor connection (partly shorted).	
Corrective action:	
The sensor is of the type NTC. This means if the temperature rises, the resistance lowers. A partly shorted sensor will drop its resistance and therefore 'measure' a raise in temperature when actually there is none. Check for moist in the sensor connections or replace sensor.	
Cause: There is no water in the unit while firing.	
Corrective action:	
This is an unlikely situation while all the safeties for checking the water presence didn't detect anything. Only a lot of air in the system/unit (under pressure) can cause the water pressure switch to switch while no water is present. Also, the water leak detection did not react. Bleed all air from the unit so the heat from combustion can be transferred to the water and won't disappear through the flue system.	
Cause: Heat exchanger failure.	
Corrective action:	
This is an unlikely situation but when there is severe damage to the heat exchanger, the combustion product will not be able to transfer all heat to the system water. The heat that is not transferred will convert to an increased flue gas temperature.	

Display message F12	p r o g r a m m i n g e n d p u m p o n 9 9 9 , 5 h r s
Reason	Programming of the parameters completed successfully.
Cause: Programming of the parameters completed successfully.	
Corrective action:	
This message occurs to confirm the end of programming. Pressing RESET will return the unit in normal operating status.	

Display message F13	P a r a m / H a r d w f a u l t p u m p o n 9 9 9 , 5 h r s
Reason	Failure during programming of the parameters.
Cause: Programming of the parameters NOT successfully completed	
Corrective action:	
Unit is not in standby mode (fan must not run during programming). Check programming wire and connections and try again. Check if the software complies with the PCB. Replace the programming wire. Replace the display PCB.	

Display message F1	R e t u r n h i g h T e m p p u m p o n 9 9 9 , 5 h r s
Reason:	Maximum return temperature exceeds limit value.
Cause: Systems that pre-heats the boiler return temperature too much/high.	
Corrective Action:	
Reduce pre-heat temperature of external heat source.	
Cause:	
The need for heat in the system suddenly drops causing hot return water to the boiler.	
Corrective Action:	
Dampen external heating system control to prevent sudden boiler temperature rise.	

Display message F3	R	e	t	u	r	n	s	e	n	s	o	r	e	r	r	o	r		
	p	u	m	p		o	n					9	9	9	,	5		h	r
Reason	Return sensor is not detected by the boiler PCB.																		
Cause:	Bad wiring/connection in the return sensor circuit.																		
Corrective action:	Check for loose wiring/connections in the return sensor circuit.																		
Cause:	Bad temperature sensor causing a fault signal.																		
Corrective action:	Replace return sensor.																		

Display message F19	S	i	p	h	o	n	s	w	i	t	c	h								
	p	u	m	p		o	n					9	9	9	,	5		h	r	s
Reason	Siphon pressure switch detects high pressure in the flue/siphon system.																			
Cause:	There is too much resistance in the flue gas circuit causing high pressure in the heat exchanger at the flue gas side.																			
Corrective action:	Check if the flue gas system is blocked. Extreme failing of the heat exchanger also causes the resistance to rise. Check the state of the heat exchanger and clean if necessary. Check the flue gas system diameter & length (most likely in a new system).																			
Cause:	The condensate drain system is blocked. The condensate will build up above the measuring point of the pressure switch and creates a static pressure larger than the measuring point.																			
Corrective action:	Check if the condensate drain hose between the heat exchanger and the siphon is open, so the condensate can flow freely to the siphon. Check if the siphon is free of debris that might block the condensate flow and clean the siphon if necessary. Check the condensate drain hose between the siphon and the condensate drain point in the external installation. Condensate must be able to flow freely.																			
Cause:	The condensate drain hose must have an open connection to the external system. If not, pressure fluctuations in the building drainage system can have effect on the pressure in the heat exchanger of the boiler.																			
Corrective action:	Make sure that there is an open connection between the siphon hose and the drainage system of the building installation. The condensate should flow in the drainage system through a freely "breathing" connection, so pressure fluctuations of the external drainage system cannot affect the pressure in the heat exchanger of the boiler.																			
Cause:	Blockage of the pressure signal hose going to the pressure switch.																			
Corrective action:	Check the pressure signal hose and clean or replace if necessary.																			
Cause:	Bad pressure switch causing a fault signal.																			
Corrective action:	Replace the pressure switch.																			
Cause:	Bad wiring/connection in the pressure switch circuit.																			
Corrective action:	Check for loose wiring/connections in the pressure switch circuit.																			

Display message F17	W	a	t	e	r		h	i	g	h		l	i	m	i	t				
	p	u	m	p		o	n					9	9	9	,	5		h	r	s
Reason	Maximum thermostat exceeds limitation value.																			
Cause:	The water flow is restricted.																			
Corrective action:	Check functioning of the pump. Check/open all valves that might restrict the water flow through the unit. Check for an external system pump that influences the flow through the unit. Check if the system resistance exceeds the spare capacity of the unit pump.																			

16.2 Blocking codes:

The display is not blinking but is lightened up during the blocking period.

The boiler is blocking an action, because of an extraordinary situation. This action will be continued after stabilisation of this situation.

Display message	A n t i c y c l e t i m e 9 9 9 , 5 h r s
Reason	The controller received a new heat demand too fast after the last ended demand.
Cause:	Opening and immediately thereafter closing of the external thermostat.
Corrective action:	Controlled water flow cools down too quickly after loss of heat demand. Controlled water flow heats up too quickly after start of heat demand. Immediately opening and closing of the external thermostat. Check switching differential of the ON/OFF thermostat. Controller settings need to be changed. Be aware that the standard settings work fine for all common systems. When anti-cycling is active, because of immediate heating or cooling of the controlled water flow/temperature, it concerns an unconventional system.

Display message	C a s c a d e B l o c k 9 9 9 , 5 h r s
Reason	One of the boilers of the cascade is in a lock-out.
Cause:	The unit is programmed in such a way that none of the boilers in a cascade will fire, if one has a lockout. One unit has a lockout and therefore the whole cascade is blocked.
Corrective action:	Troubleshoot the fault of the unit in lock-out.

Display message	d T b l o c k 9 9 9 , 5 h r s
Reason	Temperature difference between flow and return has exceeded the blocking value, but not the lock out value.
Cause:	The water flow through the unit is too low.
Corrective action:	Check functioning of the pump. Check/open all valves that might restrict the water flow through the unit. Check for an external system pump that influences the flow through the unit. Check if the system resistance exceeds the spare capacity of the unit pump. Make sure the heat exchanger is clean. Heat exchanger fouling (partly blockage) will increase the resistance causing the water flow to drop.

Display message	F l o w t e m p h i g h 9 9 9 , 5 h r s
Reason:	Flow temperature has exceeded the blocking temperature, but it has not exceeded the lock-out value.
Cause:	The water flow is restricted.
Corrective action:	Check functioning of the pump. Check/open all valves that might restrict the water flow through the unit. Check for an external system pump that influences the flow through the unit. Check if the system resistance exceeds the spare capacity of the unit pump.

Display message	F l u e t e m p h i g h 9 9 9 , 5 h r s
Reason	Flue gas temperature has exceeded the limit.
Cause:	Heat exchanger polluted and not able to transfer enough heat to the system water.
Corrective action:	Check and clean heat exchanger.
Cause:	Bad flue gas sensor or sensor connection (partly shorted.)
Corrective action:	The sensor is of the type NTC. This means when the temperature rises, its resistance decreases. A partly shorted sensor will drop its resistance and therefore 'measure' a raise in temperature when actually there is none. Check for moist in the sensor connections or replace the sensor.
Cause:	There is no water in the unit while firing.
Corrective action:	This is an unlikely situation while all the safeties for checking the water presence didn't detect anything. Only a lot of air in the system/unit (under pressure) can cause the water pressure switch to switch while no water is present. Also, the water leak detection did not react. Bleed all air from the unit so the heat from combustion can be transferred to the water and won't leave through the flue system.
Cause:	Heat exchanger failure.
Corrective action:	This is an unlikely situation but when there is severe damage to the heat exchanger, the combustion product will not be able to transfer all heat to the system water. The heat that is not transferred will convert to an increased flue gas temperature.

Display message	G e n B l o c k 9 9 9 , 5 h r s
Reason	General blocking circuit is activated during operation (general blocking contacts 7-8).
Cause:	The circuit connected to the general blocking terminals is not closed.
Corrective action:	Check all external components that are connected to the general blocking terminals and check why the contact is not closing during heat demand.
Cause: if used in combination with flow switch:	The water flow through the unit is too low.
Corrective action:	Check functioning of the pump and the flow switch. Check/open all valves that might restrict the water flow through the unit. Check for an external system pump that influences flow through the unit. Check if the system resistance exceeds the spare capacity of the unit pump. Make sure the heat exchanger is clean. Heat exchanger fouling (partly blockage) will increase the resistance causing the water flow to drop.

Display message	L	i	n	e	f	a	u	l	t										
	p	u	m	p	o	n					9	9	9	,	5		h	r	s
Reason	Bad power supply																		
Cause:	The supplied power does not comply with the specifications.																		
Corrective action:	Check if the power supply is connected correctly to the unit. Check the voltage and frequency (should be Life Neutral, Gnd > 230 Vac / 50 Hz). Make sure there is no signal failing or voltage peaks in the power supply.																		

Display message	O	u	t	d	o	o	r	s	e	n	s	o	r	f	a	i	l		
											9	9	9	,	5		h	r	s
Reason	No outdoor sensor detected.																		
Cause:																			
The unit is programmed to check if an outdoor sensor is present and does not detect an outdoor sensor.																			
Corrective action:																			
Check for loose wiring/connections in the outdoor sensor circuit. Check the state of the outdoor sensor and replace if necessary.																			

Display message	R	e	t	u	r	n		t	e	m	p		h	i	g	h				
												9	9	9	,	5		h	r	s
Reason	Return temperature has exceeded the blocking temperature, but it has not exceeded the lock-out value.																			
Cause:																				
Systems that pre-heats the boiler return temperature too much/high.																				
Corrective action:																				
Reduce pre-heat temperature of external heat source.																				
Cause:																				
The need for heat in the system suddenly drops causing hot return water to the boiler.																				
Corrective action:																				
Dampen external heating system control to prevent sudden boiler temperature rise.																				

Display message	T	2	-	T	1		h	i	g	h										
												9	9	9	,	5		h	r	s
Reason	Difference between T2 and T1 has exceeded the blocking value which has been set in the parameters. (Return temp higher than flow)																			
Cause:																				
The water flow through the unit is too low.																				
Corrective action:																				
Check functioning of the pump. Check/open all valves that might restrict the water flow through the unit. Check for an external system pump that influences flow through the unit. Check if the system resistance exceeds the spare capacity of the unit pump. Make sure the heat exchanger is clean. Heat exchanger fouling (partly blockage) will increase the resistance causing the water flow to drop.																				

Display message	W	a	t	e	r	p	r	e	s	s	u	r	e	f	a	u	l	t		
												9	9	9	,	5		h	r	s
Reason	Water pressure is too low or high.																			
Cause:																				
The water pressure in the system is too high.																				
Corrective action:																				
Check if the system pressure is too high after (re)filling. Make sure that there is a pressure relief valve and expansion vessel installed in the system, according to the applicable standards. Check if there is an open connection between the unit and the relief valve plus expansion vessel. Be aware that if the unit is installed in the basement of a tall building, only the static pressure of the water column above the units can raise above the maximum allowable limits. Make sure that this is not the case.																				
Cause:																				
The water pressure in the system is too low.																				
Corrective action:																				
Check if there is no leakage in the system that causes the pressure to drop. Fix any leakage and fill the system. Check if there is an external system pump that sucks water through the boiler, causing an under pressure (bad installation design).																				

16.3 Maintenance attention function

The display shows alternately the base screen and this message, while backlight is blinking. The boiler is operating, but will count the exceeding hours.
A parameter must be changed, after service, to remove this message.

Display message	N	e	e	d	s		M	a	i	n	t	e	n	a	n			0	.	0
	I	g	n	i	t	i	o	n		c	y	c	l	e	s			h	r	s
Reason	Maintenance option of total amount of ignition cycles has been reached.																			
Display message	N	e	e	d	s		M	a	i	n	t	e	n	a	n			0	.	0
	D	a	t	e													h	r	s	
Reason	Maintenance option of the date has been reached.																			
Display message	N	e	e	d	s		M	a	i	n	t	e	n	a	n			0	.	0
	B	u	r	n	i	n	g										h	r	s	
Reason	Maintenance option of total amount of burning hours has been reached.																			
Display message	N	e	e	d	s		M	a	i	n	t	e	n	a	n			0	.	0
	A	l	l														h	r	s	
Reason	One of the abovementioned maintenance options has been reached.																			



This function/message is standard not activated, but can be activated/set by a trained engineer. This function does not overrule the need for annual maintenance. The end user is always responsible for arranging annual maintenance.

17 MAINTENANCE

17.1 General

For a good, safe and long-time operation of the boiler it is advised to carry out maintenance and service on the boiler at least once a year.

Maintenance and inspection of the boiler should be carried out at the following occasions:

- When a number of similar error codes and/or lock-outs appear.
- At least every twelve months' maintenance must be done to ensure safe and efficient operation.
Damage caused by the lack of maintenance will not be covered under warranty
- An overhaul of all serviceable gaskets needs to be completed once every 3 years – a S-CB+ service kit is available as a spare.

MAINTENANCE REMINDER FUNCTION.

← See previous page.

BE AWARE: This function is standard turned off. We offer this programmable function to the installer to use as a reminder. Because it concerns a free programmable function the use of it cannot be used as an argument in warranty cases. Our units must be maintained every twelve months whatever the settings/working of this function.

It is and remains the responsibly of the end user to have the unit maintained every twelve months.

For more information about this maintenance mode see chapter 10.14, 'Setting the maintenance specifications'.

Service intervals

The normal service frequency for the boiler is once a year. Every year the boiler should be cleaned and checked, according to the maintenance procedures. If there is doubt whether the boiler is operating with the correct water and/or combustion air quality, it is advised that a first check is already executed after six months. This check serves to determine the frequency of the future services. The maximum interval between two services is a year.



INSPECTION AND MAINTENANCE MUST BE EXECUTED FOR A SAFE AND EFFICIENT OPERATION OF THE BOILER.

17.2 Inspection & maintenance

Inspection, maintenance and the replacement of boiler parts should only be done by a skilled service engineer. Apart from the maintenance proceedings it is advised to have a log chart for every boiler that describes the following aspects:

- Serial number.
- Date and time of maintenance.
- Name of maintenance engineer.
- Which parts were exchanged during maintenance.
- Which settings (software) were changed during maintenance.
- Special remarks / findings.
- Future aspects that need extra attention.
- Additional aspects: measurement reports, complaints by the (end)-user, lock-out codes, etc.

During maintenance, the following parts and aspects of the boiler should be checked and inspected.

NOTICE: Before starting to work on the boiler:

- Switch off the electrical power to the boiler (service switch and/or unplug boiler).
- Close the gas valve to block gas supply to the boiler.

Customer comments

Comments and remarks from the customer should be analysed and used to find probable causes for any occurring problems and complaints.

Service history

The operational and fault history (total amount and since the last service) of the boiler can be retrieved with the help of a computer, correct software and an interface cable. This information can be used to specify the maintenance and service proceedings in relation to the boiler (parts).

Water leakage

The water pressure of the heating installation should be more than 1.0 bar and at a maximum of 2.0 bar in normal operation. When the water pressure drops below the minimum occasionally, there might be a water leak. Check the boiler and the complete heating installation for any water leakages and have these repaired.

Flue gas & air supply

The flue gas pipes and the air supply pipes must be checked for gas tightness. Also check if the mounting of these pipes is correct, safe and not damaged. Check the rooftop of the boiler housing for signs of water leakage and traces of water coming from the air supply pipe, the air vent or any condensate coming from the flue gas pipes.

Gas supply & safeties

The gas pipes must be checked for gas tightness. Also check if the mounting of these pipes is correct, safe and not damaged. Any built-in safeties should be checked for a correct functioning.

Remove complete burner unit

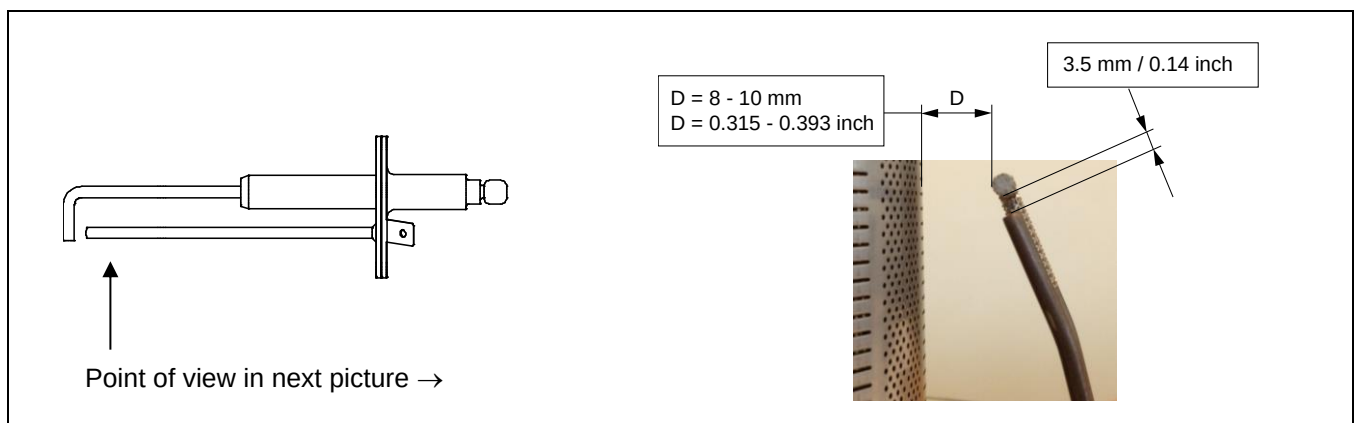
The complete burner unit consists of the fan, the burner plate and the internal burner. To remove this part for an internal heat exchanger check: remove the six M6 nuts, the ignition cable and the thermal fuse cables. After this, take out the complete burner unit by moving it forward out of the boiler housing. **NOTICE:** Watch out not to damage the burner plate insulation during this operation. While removing the complete burner unplug both of the electrical and controlling cables of the fan. After all this dismantle the air gas mixing box on the suction side of the fan and check the blade wheel of the fan.

Burner

Check the burner surface to see if it has damages, signs of rust and/or cracks. When the burner surface is damaged the burner must be replaced. The burner can be cleaned by using a soft (non-metallic) brush. The dust can be removed with a vacuum cleaner or pressurized air.

Ignition / ionisation electrode

When the complete burner is removed, it is very easy to check the ignition electrode. First check if the distances between the electrodes and between the electrode and the burner are according to the graph below. When these are not correct, try to bend the electrodes in the right position. Notice: the electrodes undergo high temperatures, therefore the electrodes become hard and are difficult to bend. While bending used electrodes they might break or burst. Check the electrode, after bending, for any tear/crack and signs of rust. When they are burst/cracked or rusty, replace the electrode. Also replace the electrode when there is a crack in the ceramic insulation of the electrode. When the electrode is replaced, also the gasket should be renewed.



Burner door gaskets

When these gaskets have changed colours at some parts, the rubber has cured and/or has damages, these gaskets must be replaced. Notice: only use the gaskets that are supplied by the boiler manufacturer.

Fan

When the fan blades are polluted and dirty, carefully clean the blades with a soft brush. Notice: do not use too much force on the blades or else the fan might be out of balance and run irregularly, causing noises and fan failures. Check the fan also for any water damages. In doubt always replace the fan of the boiler.

Insulation

The insulation of the heat exchanger (located on the rear wall inside the heat exchanger and burner door) must be inspected. If this insulation disk shows any signs of (water) damage or degradation it should be exchanged. Also check if there are any indications in the burner room of a high condensate level (caused by a blocked siphon) that might have wetted the rear wall insulation. When this has happened the rear wall insulation should also be replaced. Only use the insulation disk that is supplied by the boiler manufacturer.

The same procedure must be applied on the insulation and gaskets fitted on the burner door.

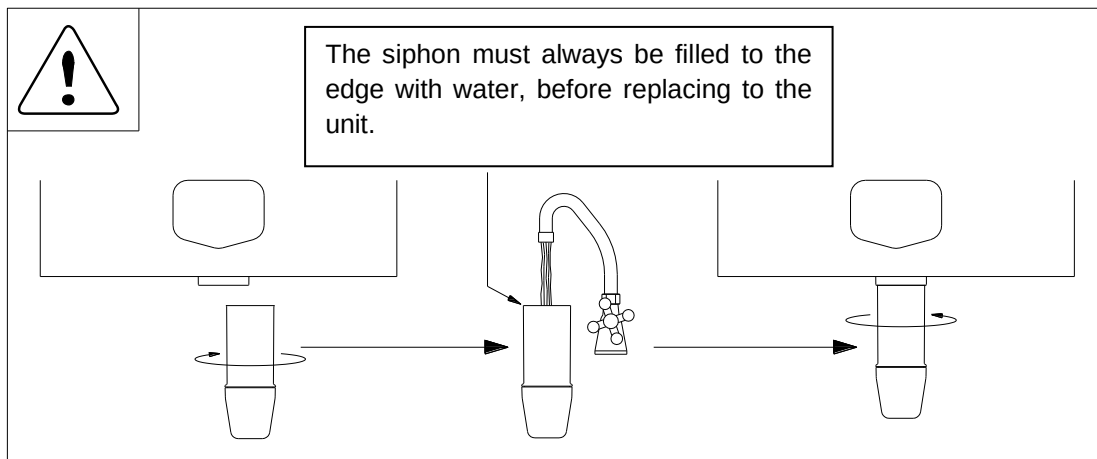
Siphon

Disassemble the siphon and clean every part of it. Check the siphon connection of the heat exchanger for any blocking or pollution and clean it (if necessary). Check the functioning of the siphon by pouring clean tap water in the burner room (when burner door is removed). This water will exit the heat exchanger by the siphon. Notice: don't wet the rear wall insulation.



When mounting the bottom part of the siphon, before commissioning the boiler and/or after maintenance, the siphon must **ALWAYS** be completely filled with water.

This is a safety measure: the water in the siphon keeps the flue gases from leaking out of the heat exchanger via the condensate drain.



Heat exchanger and burner room

After the removal of the complete burner unit check if there is any debris and dirt in the heat exchanger. The coils of the heat exchanger can be cleaned by using a **non-metallic** brush. After this the dirt and dust can be removed with a vacuum cleaner and by flushing the burner room with water. Don't forget afterwards to clean the siphon once again.

Gas/air ratio

With every service check and/or maintenance of the boiler always check the gas/air ratio by measuring the CO₂ percentage (flue gas) at the maximum and minimum load of the boiler. If necessary adjust these values. See for information chapter 14 "Adjusting and setting the burner".

Pump

Check the electrical parts and the motor of the pump for a correct functioning. The pump must generate a sufficient water flow over the (heat exchanger of) the boiler. When the pump produces noise, is operational for more than five years or has signs of water leakage it is recommended to replace the pump as a precaution.



When defects and abnormalities are found by the service engineer during service and maintenance and these are not repairable, this information should be reported to the owner/end-user of the installation. Also, the owner/end-user should be advised how to fix these defects and these defects should be reported in the service report / log file of the boiler.



During service and maintenance, the gas, supply air, flue gas and condensate connections are disconnected, checked and replaced. Make sure that all these components are mounted correctly before commissioning the boiler again.



Cleaning the burner room with acid or alkali products is prohibited.

Mounting the burner door correctly back onto the heat exchanger:

IMPORTANT:

Before mounting the burner door, make sure that its gaskets and insulation are in excellent shape.

If any signs of damage or ageing are present, these parts must be replaced.

The burner door must be mounted back on the heat exchanger as follows:

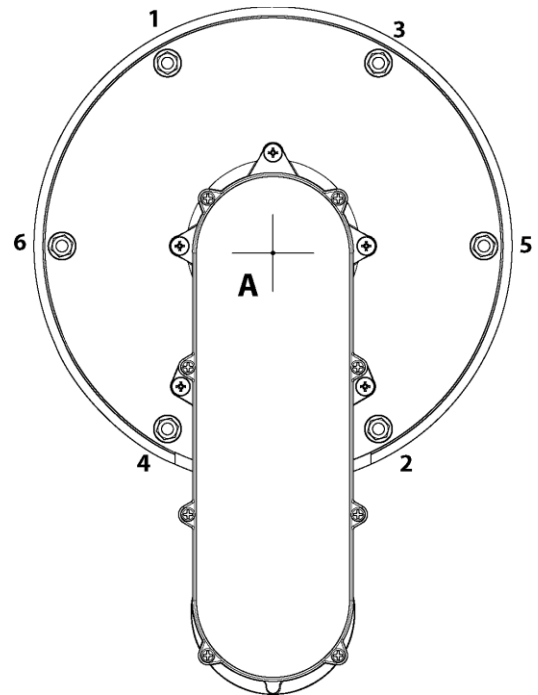
- Place the burner door with its holes over the six threaded studs.
Careful! When handling too rough or misplacing the holes over the threaded studs, the burner door insulation and/or gaskets can be damaged.
Assure yourself that the door is well positioned with respect to the threaded studs, before pushing it onto the exchanger.
- Now keep the burner door firmly in place by pushing the gas/air nose with one hand at the middle at point A.
- Then turn-tighten the flange nuts with the other hand as far as possible onto the threaded studs.

Now the burner door is in place and the nuts can be tightened with a torque key.

- Tighten the nuts in the order given in the picture.
- The specified torque value for tightening the burner door flange nuts are **8 Nm**.

Tighten in given order.

Torque value = 8 Nm



18 USER INSTRUCTIONS

After installing and commissioning of the boiler, demonstrate the operation of the entire central heating system to the end-user. The user should be made familiar with all safety precautions of the boiler and the installation. The user should be instructed that service and maintenance of the boiler is required every twelve months. Regular service and maintenance is essential for a safe and proper operation of the boiler. Hand over the documents supplied with the boiler.

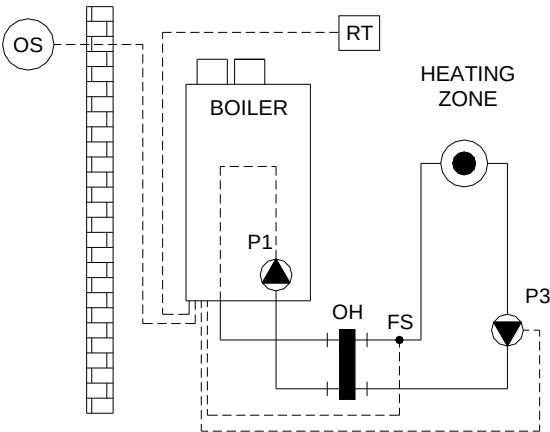
19 INSTALLATION EXAMPLES

The following schematics present several ways of mounting the heating installation:



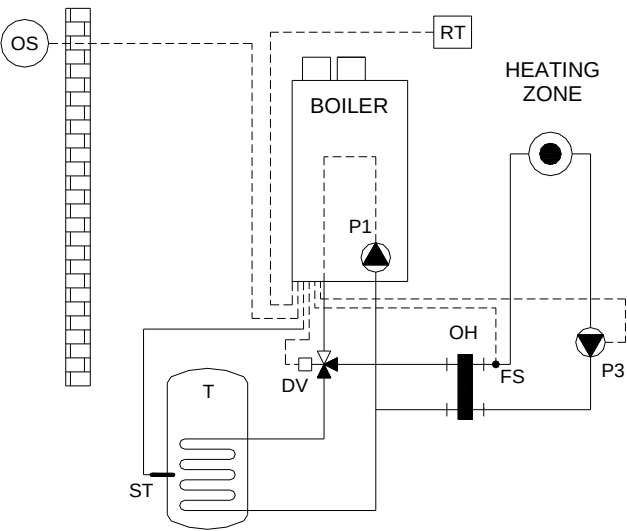
All schematics are purely functional. Safety components must be added conform all applicable standards and regulations.

System Type 1



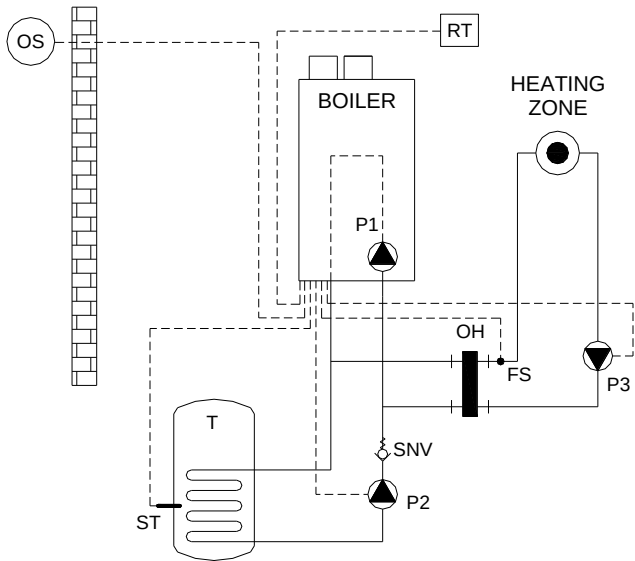
Code 1	Name	Wire terminal	Part No.
P1	built-in boiler pump		
P3	optional heating pump	25-26-27	
RT	modulating room unit with timer	13-14	S04.016.355
FS	flow temperature sensor	3-4	E04.016.304
OH	low loss header		
OS	outdoor temperature sensor	1-2	E04.016.585
No parameter change required			

System Type 2



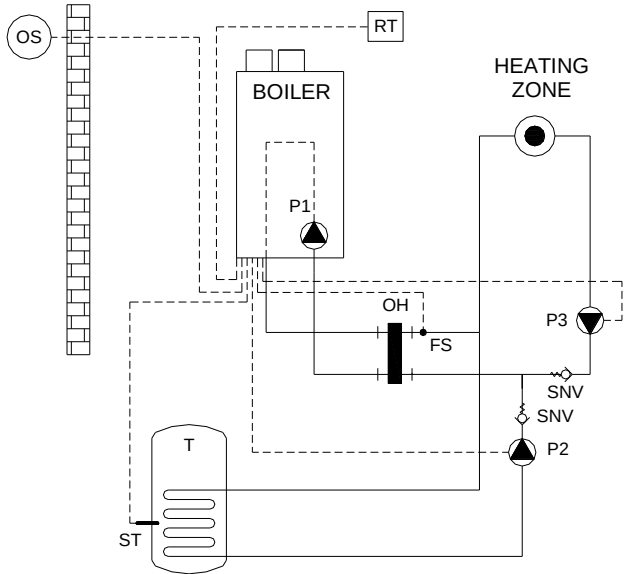
Code 2	Name	Wire terminal	Part No.
P1	built-in boiler pump		
P3	optional heating pump	25-26-27	
RT	modulating room unit with timer	13-14	S04.016.355
T	calorifier		
ST	calorifier thermostat or tank sensor	5-6	E400277
OH	low loss header		
FS	flow temperature sensor	3-4	E04.016.304
DV	diverter valve (3-way-valve)	28-29-30-31	
OS	outdoor temperature sensor	1-2	E04.016.585
Parameter change required			

System Type 3



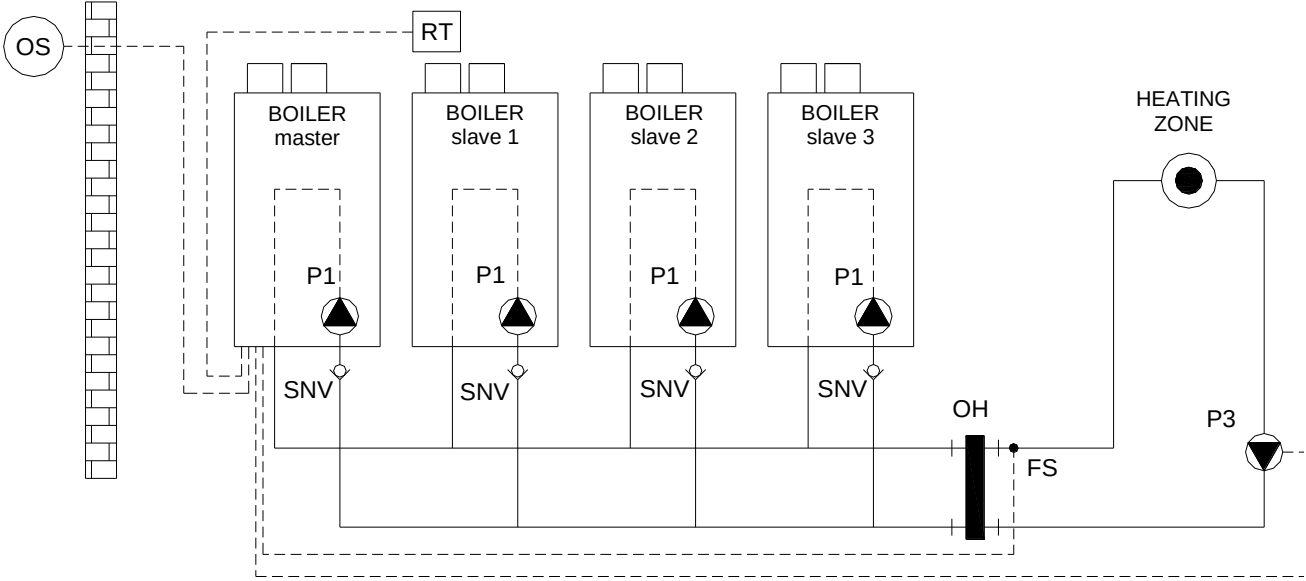
Code 3	Name	Wire terminal	Part No.
P1	built-in boiler pump		
P3	optional heating pump	25-26-27	
RT	modulating room unit with timer	13-14	S04.016.355
T	calorifier		
P2	HWS primary pump	29-30-31	
ST	calorifier thermostat or tank sensor	5-6	E400277
OH	low loss header		
FS	flow temperature sensor	3-4	E04.016.304
SNV	non-return valve (low resistance type)		
OS	outdoor temperature sensor	1-2	E04.016.585
Parameter change required			

System Type 4



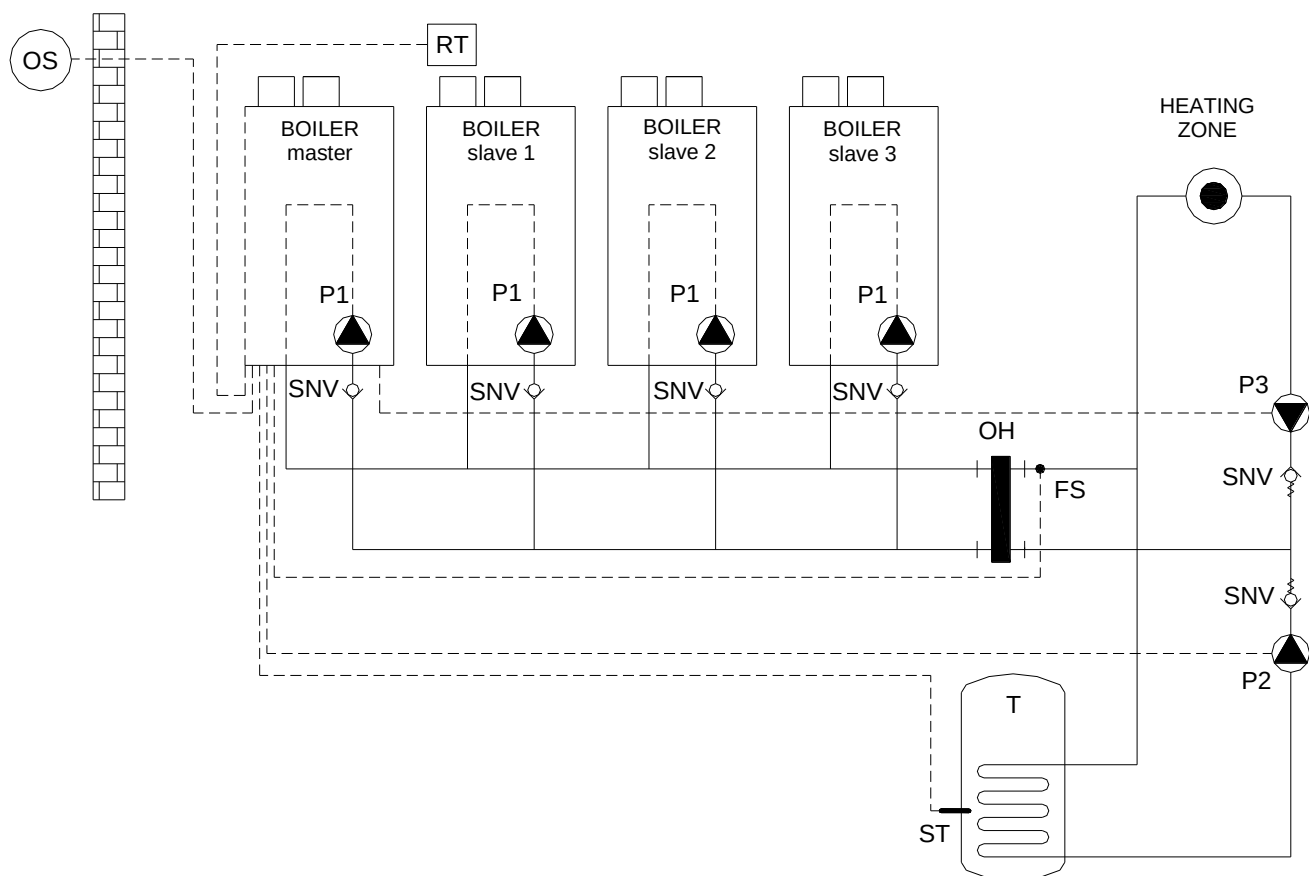
Code 4	Name	Wire terminal	Part No.
P1	built-in boiler pump		
P3	optional heating pump	25-26-27	
RT	modulating room unit with timer	13-14	S04.016.355
P2	HWS primary pump	29-30-31	
T	calorifier		
ST	calorifier thermostat or tank sensor	5-6	S04.016.303
OH	low loss header		
FS	flow temperature sensor	3-4	E04.016.304
SNV	non return valve (low resistance type)		
OS	outdoor temperature sensor	1-2	E04.016.585
Parameter change required.			

System Type 5



Code 5	Name	Wire terminal	Part No.
P1	built-in boiler pump		
P3	optional heating pump	25-26-27	
RT	modulating room unit with timer	13-14	S04.016.355
SNV	non-return valve (low resistance type)		
OH	low loss header		
FS	flow temperature sensor	3-4	E04.016.304
OS	outdoor temperature sensor	1-2	E04.016.585
Parameter change required			

System Type 6



Code 6	Name	Wire terminal	Part No.
P1	built-in boiler pump		
P3	optional heating pump	25-26-27	
RT	modulating room unit with timer	13-14	S04.016.355
SNV	non-return valve (low resistance type)		
P2	HWS primary pump	29-30-31	
T	calorifier		
ST	calorifier thermostat or sensor	5-6	E400277
OH	low loss header		
FS	flow temperature sensor	3-4	E04.016.304
OS	outdoor temperature sensor	1-2	E04.016.585
Parameter change required.			

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