STREBEL
S-WG+ 35 - 55 Range

Floor Standing High Efficiency Condensing Water Systems

Installation, Operating & Maintenance Manual



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

STREBEL
HEATING TECHNOLOGY

2025-03-28 v1

TABLE OF CONTENTS

INTRODUCTION 6

1. SAFETY GUIDELINES 6
1.1 IMPORTANT TECHNICAL WARNINGS AND GUIDELINES 7
1.2 SAFETY VALVE 9

2. TECHNICAL DATA S-WG+ 35 & 55 WATER HEATERS 10
2.1 FUNCTIONAL INTRODUCTION 10
2.2 TABLE TECHNICAL SPECIFICATIONS 11
2.3 TABLE TECHNICAL SPECIFICATIONS ERP 12
2.4 ERP SPECIFICATIONS WATER TANKS. 12

3 DIMENSIONS 13
3.1 WATER HEATERS S-WG+ 35 13
3.2 WATER HEATERS S-WG+ 55 14
3.3 TANK 230 - 300 - 500 – 750 LITRE 15

4 ACCESSORIES AND UNPACKING 18
4.1 UNPACKING 18
4.2 ACCESSORIES 18

5 INSTALLATION OF THE S-WG+ 19
5.1 GENERAL NOTES 19
5.2 MOUNTING THE WATER HEATER AND TANK 20
5.2.1 Water heater mounting 20
5.2.2 Tank positioning 20

6 FLUE GAS AND AIR SUPPLY SYSTEM 21
6.1 GENERAL 21
6.2 TYPE OF FLUE GAS SYSTEMS. 22
6.3 C63 CERTIFIED 23
6.4 AIR SUPPLY 24
6.4.1 Combustion air quality 24
6.4.2 Air supply through humid areas 24
6.5 FLUE TERMINAL 24
6.5.1 Horizontal Flue Terminal Positioning 24
6.5.2 Vertical Flue Terminal Positioning 24
6.5.3 Common Flue / Ducts 25
6.6 HEIGHTS ABOVE THE ROOF. 25
6.7 MINIMUM TERMINAL DISTANCE ON HORIZONTAL TERMINATIONS – TYPE C FLUES ONLY 26
6.8 HORIZONTAL FLUE RUN RISK ASSESSMENT 26
6.8.1 Figure 12 – line G 27
6.8.2 Figure 7 – line Y 27
6.9 OTHER FLUE TERMINAL MINIMUM DISTANCES 27
6.10 FLUE GAS AND AIR SUPPLY RESISTANCE TABLE 28
6.10.1 Flue gas and air supply resistance table 28
6.10.2 Six typical examples 29
6.10.3 Example A: Twin pipe system (C63). 29
6.10.4 Example B: Twin pipe system with separate pipes and concentric roof terminal (C33). 29
6.10.5 Ex. C: Single pipe for flue gas and air supply from water heater room. (B23, B23P) 31
6.10.6 Ex. D: concentric pipe with roof outlet (C33). 32
6.10.7 Ex. E: concentric system (wall outlet C13). 32
6.10.8 Air supply and flue gas outlet at different pressure zones (C53) 34

7 ELECTRICAL INSTALLATION 35
7.1 GENERAL 35
7.2 ELECTRICAL CONNECTIONS 35
7.3 FUNCTION OF THE ELECTRICAL CONNECTIONS OF THE WATER HEATER 36
7.4 SENSOR VALUES 37
7.5 ELECTRICAL SCHEMATICS 38

8 THE S-WG+ 35 & 55 WATER HEATER 40
8.1 WATER QUALITY - IMPORTANT 40

8.2 FROST PROTECTION 40
8.3 LEGIONELLA PROGRAM 40
8.4 FLOW MONITORING 41
8.5 WATER PRESSURE SWITCH 41

9 THE S-WG+ SANITAIRY SYSTEM: INSTALLATION INSTRUCTIONS 42
9.1 THE S-WG+ 35 & 55 SYSTEM 42
9.1.1 Stand-alone set-up 42
9.1.2 Cascade set-up 43
9.2 CONTROL 44
9.2.1 Tank sensor 44
9.2.2 General control 44
9.3 WATER HEATER AND TANK: CONNECTIONS AND CONNECTION SIZES 45
9.3.1 Connecting the tank to the water heater 45
9.3.2 Connecting the tank to your DHW installation 46
9.3.3 Condensate drain connection 47
9.3.4 Pipe length and Diameters. 48

10 USER INTERFACE 49
10.1 CONTROL PANEL / DISPLAY UNIT 49
10.2 CONTROL PANEL MENU STRUCTURE 50
10.3 DISPLAY DURING OPERATION 52
10.4 MONITOR SCREENS 53
10.5 SERVICE FUNCTION 55
10.6 SCHORNSTEINFEGER FUNCTION 56
10.7 PROGRAMMING IN STANDBY MODE 57
10.8 SETTING THE TIME & DATE 57
10.9 SET POINTS 58
10.10 SETTING THE TIMER PROGRAMS 59
10.11 CHECKING THE OPERATING HISTORY 62
10.12 CHECKING THE FAULT HISTORY 63
10.13 SETTING THE MAINTENANCE SPECIFICATIONS 64
10.14 SETTING THE USER LOCK 67
10.15 SETTING THE PARAMETERS AT THE CONTROL PANEL 68
10.16 FAULT CODES DISPLAY 75
10.16.1 Lock-out codes 75
10.16.2 Blocking codes 76
10.16.3 Messages 78

11 CONTROLLING OPTIONS AND SETTINGS 79
11.1 GENERAL 79
11.1.1 Max cooling time 79
11.1.2 temperature display on/off 79
11.1.3 Gas type selection 79
11.1.4 Soft start option 80
11.1.5 Tank sensor sensitivity 80
11.2 WATER HEATER OPTIONS 80
11.2.1 0-10 VDC remote flow temperature set point 80
11.2.2 anti-Legionnaires' disease (pasteurization) function 81
11.3 CASCADE CONTROL 82
11.3.1 Parameter settings for cascade set-ups 82
11.3.2 Monitor screens 84
11.3.3 Output control and water heater sequence 84

12 COMMISSIONING THE WATER HEATER 85
12.1 FIRST: FLUSHING THE WATER HEATER WITH WATER 85
12.2 SECOND: FILLING & VENTING THE WATER HEATER AND THE SYSTEM 85
12.3 THIRD: CHECK THE WATER FLOW 85

13 STARTING THE WATER HEATER 87
13.1 GENERAL 87
13.2 FIRING FOR THE FIRST TIME 87

14 ADJUSTING AND SETTING THE BURNER 88
14.1 INTRODUCTION 88
14.1.1 Gas valve adjustment: tables 88

14.1.2 adjustment values ... *89*
14.1.3 Setting screws gas valve(s): drawings ... *90*
14.1.4 Adjustment actions: general scheme ... *91*
14.2 ADJUSTING IN CASE OF A NEW WATER HEATER, OR AFTER SERVICE (CASE A) ... 91
14.2.1 General remark ... *91*
14.2.2 Adjusting at maximum load ... *91*
14.2.3 Adjusting at minimum load ... *91*
14.3 ADJUSTING AFTER GAS VALVE REPLACEMENT, OR IN CASE OF GAS CONVERSION (CASE B) ... 92
14.3.1 General remarks ... *92*
14.3.2 Adjusting at minimum load S-wg+ 35 & S-wg+ 55 ... *92*
14.4 ADJUSTING PROCEDURES ... 93

15 PUTTING THE WATER HEATER OUT OF OPERATION ... 94
15.1 OUT OF OPERATION: ON/OFF FUNCTION ... 94
15.2 OUT OF OPERATION: POWER OFF ... 94

16 FAULT CODES, BLOCKING CODES ... 95
16.1 LOCK-OUT CODES ... 95
16.2 BLOCKING CODES ... 100
16.3 MAINTENANCE ATTENTION FUNCTION ... 103

17 MAINTENANCE ... 104
17.1 GENERAL ... 104
17.2 INSPECTION & MAINTENANCE ... 104

18 USER INSTRUCTIONS ... 107

INTRODUCTION

This manual is written for:
- The Installer.
- The 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 these instructions before commencing installation.
Keep this manual near the water heater for quick reference.

The appliance should be installed by a skilled installer according to all applicable standards and regulations.
Failure to comply with these regulations could deem the warranty invalid.

Without written approval of the manufacturer the internals of the water heater may not be changed. When these changes are executed without approval, the water heater certification is 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:

- Do NOT use any electrical equipment.
- Do NOT press any switches.
- Close the gas supply.
- Ventilate the room (open the windows and/or outside water heater room doors).
- Immediately warn the installer.



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



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.

1.1 Important technical warnings and guidelines

For **FAULT CODES** - See chapter 16.

The S-WG+ 35 & 55 domestic hot water systems will, for a long period, comfortably meet your requirement of hot water of the right temperature at the right hour, provided that a few important conditions have been fulfilled regarding the installation.

Please follow all instructions and recommendations presented in this manual, especially the ones concerning the next important topics:

- Water quality (also see chapter 8.1)

  A first necessary condition is the quality of the water to be heated in the DHW water heater. Three values matter: hardness, total amount of dissolved solids and acidity. If water quality does NOT meet the requirements the system may be seriously damaged in time and the manufacturer's warranty will be invalid.

  - Hardness should not exceed 205 PPM $CaCO_3$ (11,5°dH)
  - TDS (Total Dissolved Solids) should not exceed 450 PPM
  - Hardness and TDS together may not exceed 450 PPM
  - pH value should be between 6,5 and 7,5, measured cold

  The actual values can be retrieved at your local water supplier.

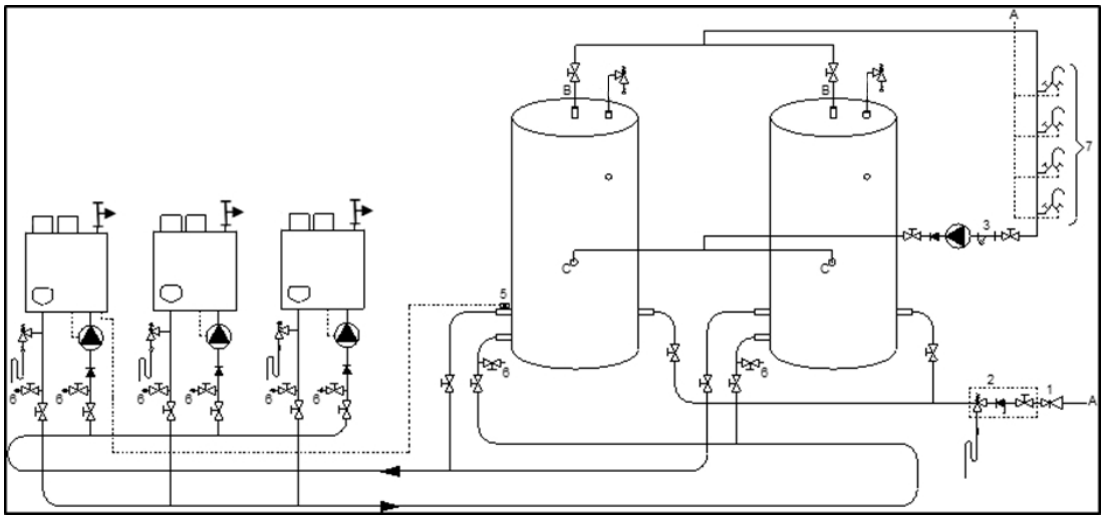
  If water quality doesn't meet the abovementioned requirements, a water treatment installation should be installed to improve water quality to the required levels, if possible.

- Water flow velocity and pump

  Always use the supplied pump for this heater, the software and parameters are specially set for this type of pump. All specifications and settings in this manual also refer to this specific pump.
  The maximum water flow velocity must be lower as 1 m/sec when using copper pipes.

  ⚠ The applied pump must be controlled by the water heater control only. If, for any reason, an external pump control is applied *without written approval from Strebel Ltd*, then the complete warranty on the S-WG+ 35 & 55 water heater and all delivered parts will become invalid.

- Cascading.
  It is possible to cascade heaters and/or tanks, different pumps and pipe diameters are needed. Use the S-WG 35 & 55 heater if more capacity is needed instead of cascading. Should for any reason cascading be needed, please connect all water heaters and tanks according to the scheme below:



Following the instructions and recommendations given in the referred paragraphs will highly improve the functioning and considerably lengthen the life time of your DHW system.

Warnings and guidelines (continuation)

Furthermore, for S-WG+ appliances the next instructions and recommendations apply:

- **!** *Never use aluminum or aluminum containing flue gas outlet*
- **!** *Always fill the siphon before commissioning the water heater*
- **!** *Always set the gas valves during commissioning the water heater, for the first time and after maintenance and/or installation changes*
- **!** *Never change the parameters P4AD, P4AA and P5BI*
- **!** *Never place a valve between the safety valve and the water heater*
- **!** *In a log, keep track of all situations regarding the appliance: what, when, by whom, what actions and/or changes, what communication has been performed*

Strebel Ltd are not liable for any damage caused by inaccurately following these mounting instructions. Only Strebel Ltd parts may be used when carrying out any repair or service works.

Do not use chlorine based products for brazing.

When commissioning the water heater, the running of the water heater pump must be checked before leaving the installation.
By pressing the service button during a couple of seconds the water heater can be fired independently from the thermostat circuit. Firing the water heater without water flow (but filled with water) will cause a boiling noise.

The flow and return temperature are checked continuously. The temperature difference may not exceed the programmed value belonging to the actual power mode. If it does, the water heater will go in a lock-out.

The applied DHW pump must be controlled only by the water heater control. If, for any reason, an external pump control is applied *without written approval from Strebel Ltd*, the complete warranty on the S-WG+ water heater and all supplied parts will become invalid.

Minimum water pressure 1 bar.

Fuel used should have Sulphur rates that comply with the next values: a maximum annual peak over a short period of 150 mg/m^3 and an annual average of 30 mg/m^3 maximum.

Combustion air must be free of contents of chlorine, ammonia, alkali agents. The air near a swimming pool, a washing machine or a laundry is containing these contents.

The water heater is used in combination with a hot water tank without any other heat exchanger; the water heater should be equipped with a safety relief valve. In some cases, also the tank should be equipped with a T&P relief valve. Always apply all applicable installation standards and regulations.

The connection for a remote DHW Stat is based on an OpenTherm bus system or an on/off timer.
For correct connections of the thermostat see page 35.

At first installation, the built-in automatic air vent should be open.

LEGIONNAIRES' DISEASE

An anti-Legionella function is present in the software but is default turned OFF.
See chapter 8.3 and for the programming options see chapter 11.2.2.

PROPANE GAS

If propane gas is to be used for this water heater, fan speed must be reduced by altering parameter P4BD. See chapter 11.1.3.

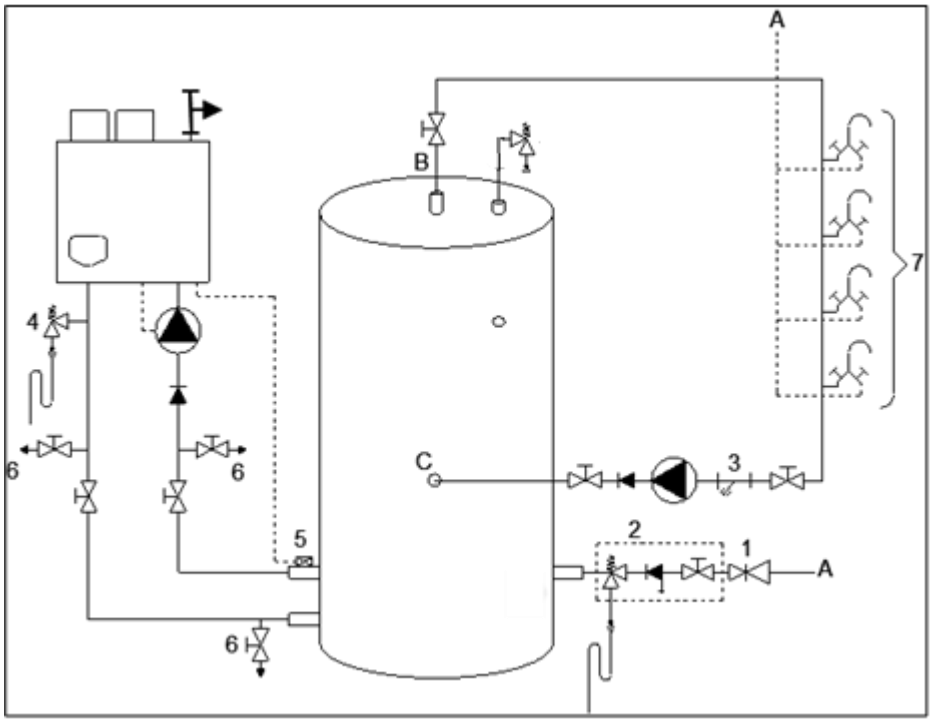
1.2 Safety valve

NOTE – On a S-WG 35/230 and S-WG 55/230, if the premade pipework is used then a safety valve is not required between the WG heater and the water tank. The safety valve can be fitted directly into the cylinder which will protect both the heater and the tank as the premade pipework does not have any isolation valves.

There is no safety relief valve or other safety relevant component shipped with the heater. It's up to the judgement of the installer/system-designer and applicable standard(s) to subscribe and mount a right safety valve.

Between the water heater and the safety valve, DO NOT apply a closing valve or any other form of narrowing, because this might disturb the correct functioning of the safety valve.

The S-WG+ 35 & 55 water heater and tank should be installed by a skilled installer according to all applicable standards and regulations for tap water installations. Use the next scheme as guideline. When multiple water heaters and tanks are applied, every combination should be equipped with its own safety valve.



	PUMP
	NON RETURN VALVE
	VALVE
	SAFETY VALVE
	MANUAL AIRVENT

	FILTER
	INLET COMBINATION - Overflow - Controllable return valve - Valve
	PRESSURE REGULATING VALVE

A) Service pipe inlet
B) Hot water supply circulation
C) Circulation return

1) Pressure relief valve (mandatory in case service water pressure is too high)
2) Inlet combination with valve (mandatory)
3) Apply filter if necessary (recommended)
4) A suitable safety valve must be mounted near the water heater (mandatory) This safety valve may never be isolated from the water heater by means of a ball valve
5) Remote tank sensor (necessary) → mounting hereof: see chapter 9.2.1.
6) Drain valve (recommended)
7) Hot and cold water mixers

SAFETY COMPONENTS

NB! The picture shows an example of a functional installation. The safety components as shown in the picture are NOT necessarily conform all applicable standards and regulations.

ALWAYS have the system installed by a skilled installer. Safety must be added according to all applicable standards and regulations.

2. TECHNICAL DATA S-WG+ 35 & 55 WATER HEATERS

2.1 Functional introduction

The S-WG+ water heater is standard set for Natural gas G20
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 150 mg/m^3 and an annual average of 30 mg/m^3.

Water heater control includes the next programmable features:
- Remote operation and heat demand indication from each water heater
- Anti-Legionnaires' disease function
- 0-10 VDC remote flow temperature (set point) control
- NB! 0-10 VDC remote *burner power input* control is NOT possible for this type of direct fired water heaters.

0-10 VDC connection available
The water temperature can be controlled by an external 0-10 VDC signal. A signal of 1.48 Volt will switch on the water heater(s), less than 1.4 Volt will switch off the water heater(s).

Time program
Time programs with three programmable periods per day are available. These time programs are activated at the control panel and offer great flexibility in controlling the water heater's day and night temperatures as well as the anti-Legionella settings.

2.2 Table technical specifications

GENERAL				
Product Identification number			**CE 0063 BR3537**	
Classification			Country depending II2EK3P	
Gas Appliance Type			B23; C13, C33, C43, C53, C63, C83	
Type water heater			**S-WG+ 35**	**S-WG+ 55**
Dimensions (h x w x d)	mm		**516 x 405 x 310**	
Water content est.	Litre's		2,3	3,4
Weight dry	kg		22	26
In- and outlet water connection	inch		R 1½"	R 1½"
Gas connection	inch		R ¾"	R ¾"
Flue/air concentric	mm		80/125	80/125
Flue/air twin pipe	mm		80/80	80/80
DOMESTIC HOT WATER		**Values min-max:**		
Nominal input (Net)	kW		10,1 – 33,7	14,0 – 51,0
Nominal input (gross) (G20 G25.3 G31)	kW		11,2 – 37,4	15,6 – 58,8
Nom. output 80/60°C	kW		9,6 - 32,1	13,4 - 50,5
Nom. output 50/30°C	kW		10,4 – 34,7	14,2 – 53,7
Nom. output 37/30°C	kW		10,8 – 36,3	15,1 – 57,1
GAS CONSUMPTION gases acc. to EN437 **Values min-max:**				
Natural gas G25.3	m^3_{st}/u		1,24 – 4,15	1,72 – 6,51
Natural gas G20	m^3_{st}/u		1,07 – 3,57	1,48 – 5,60
Propane gas G31 [1]	m^3_{st}/u		0,41 – 1,38	0,57 – 2,16
Gas supply pressure nom. [2]	G25.3	mbar	25	
	G20		20	
	G31		30/37	

EMISSION			**Nominal values at min-max load**	
CO_2 flue gas min-max [3]	G25.3/G20	%	8,7 - 9,0	**8,7 - 9,0**
	G31	%	9,5 - 10,5	9,5 - 10,5
NOx class [EN15502-1]		-	**6**	
Temperature flue gas at combustion air temp = 20°C		°C	~ 85-95	
Mass flow flue gas [min-max] $Q_{fluegas}$ condensing		g/s	3,86 - 17,48	5,78 - 27,44
Available pressure for the flue system [4]		Pa	100	120

INSTALLATION			
Max. water temperature	°C	75	
Pressure WW-system min-max	bar	1,0 – 8,0	
Relief valve pressure max	bar	10	
Max. available pump pressure for the installation at ΔT = 17 K	mWK	2.8	2.7

Type water heater		S-WG+ 35	S-WG+ 55
ELECTRIC			
Power consumption (without pump).	W	55	90
Power supply	V / Hz	230 / 50	
Protection class		IPX4D	

NOTES

1 Using propane G31, maximum fan speed needs to be reduced (parameter P4BD)

2 Below, a table is given in which the min. and max. gas supply pressures are mentioned acc. to EN437

	p nom.[mbar]	*p min [mbar]*	*p max [mbar]*
G25.3	*25*	*20*	*30*
G20	*20*	*17*	*25*
G31	*30* *37*	*25* *25*	*35* *45*

3 CO_2 of the unit measured/set without the water heater front door in place

4 Maximum allowed combined resistance of flue gas and air supply piping at high fire

2.3 Table technical specifications ERP

Type water heater:		**S-WG+ 35**	**S-WG+ 55**
Load profile		XL	XXL
Water heating energy efficiency class		**A**	**A**
	Unit:		
Water heating energy efficiency (η_{wh})	**%**	**85,5**	**86,9**
Daily fuel consumption (Q_{fuel})	GJ	0,079	0,100
Daily electricity consumption (Q_{elec})	kWh	0,169	0,194
Annual fuel consumption (AFC)	GJ	17	22
Annual electricity consumption (AEC)	kWh	37	43
Emissions (Nox) of nitrogen oxides (EN15502-1:2012+A1:2015)	mg/kWh	36	33
Thermostat temperature setting	°C	55 - 70	55 - 70
Sound power level, indoors(Lwa)(EN 15036-1:2006)	dB(A)	61	61

A S-WG+ water heater appliance should be installed with a water tank.
The efficiency of the complete installation depends on:

- type of water tank.
- type of circulation pump.
- insulation of the connecting pipes.
- volume of the water tank.
- length of the connecting pipes.

Depending on the applied tank volume, the load profile might be higher.

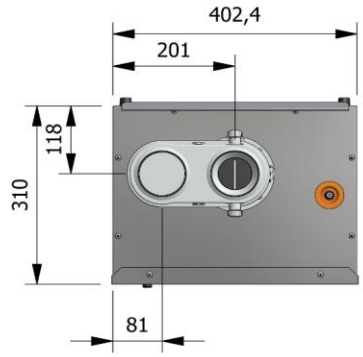
2.4 ERP specifications Water Tanks.

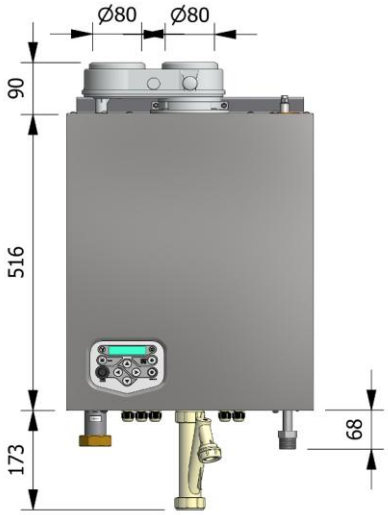
Water Tank Type:		**230L**	**300L**	**500L**	**750L**
Energy label		C	B	B	C
Standing loss (S)	Watt	78,8	62	75	98
Storage volume (V)	Litre	240	304	491	764

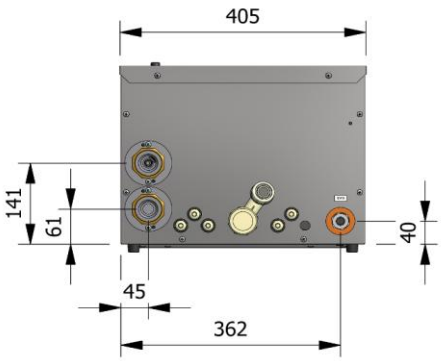
3 DIMENSIONS

3.1 Water heaters S-WG+ 35

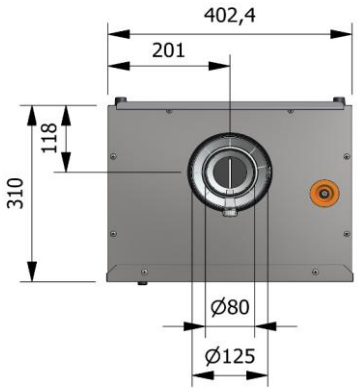
TWIN PIPE

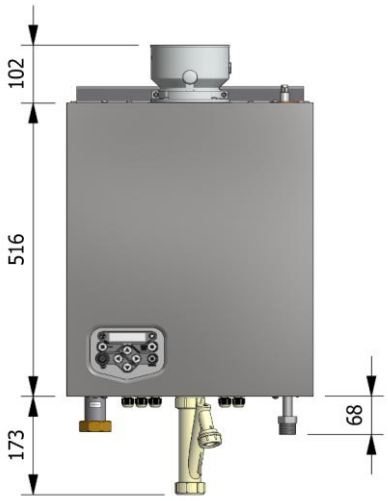


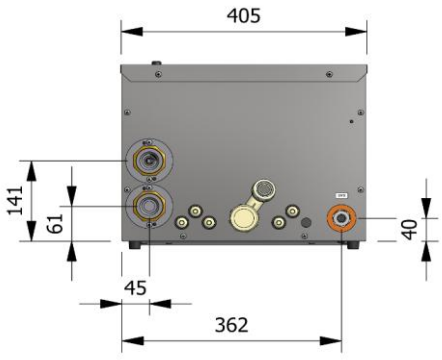




CONCENTRIC



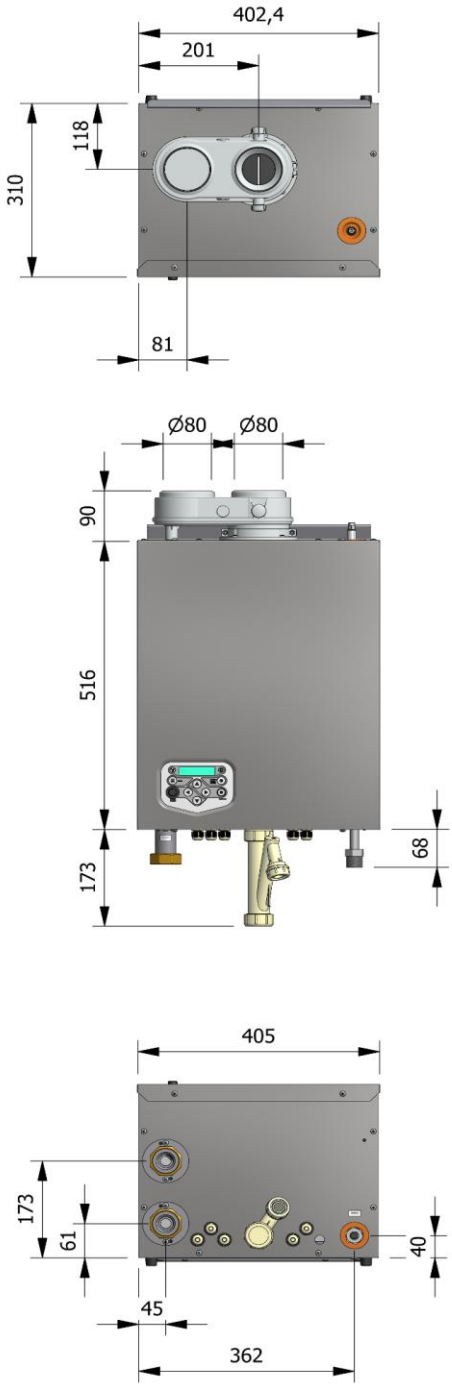




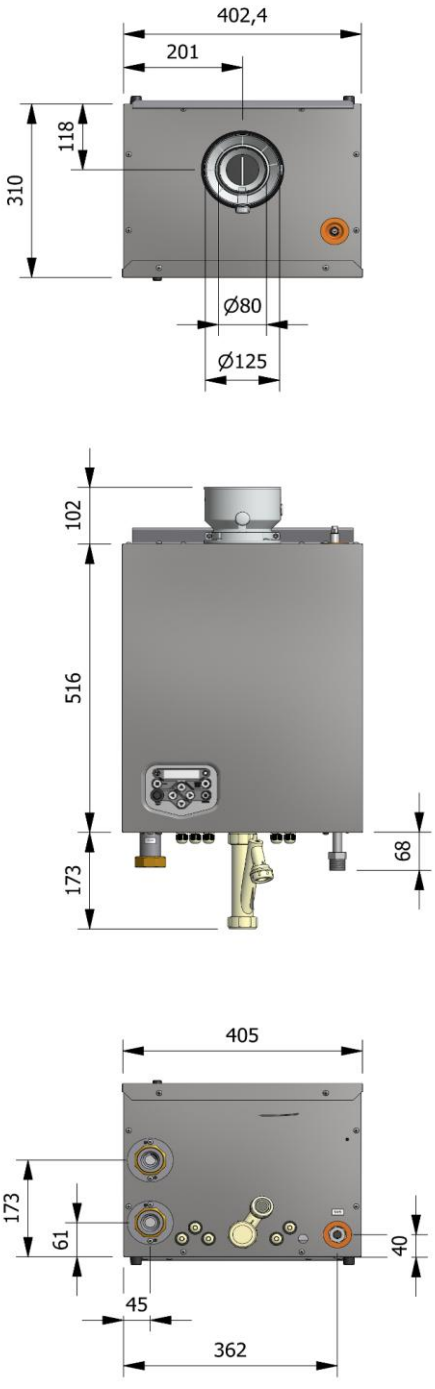
Connections S-WG+35	Twin pipe	Concentric
Flue gas	Ø80	Ø 80
Air inlet	Ø80	Ø125
Cold water inlet	R 1½" (swivel)	
Hot water outlet	R 1½" (swivel)	
Gas	R ¾" (male)	
Condensate	Flexible hose Ø25/21 x 750 mm.	

3.2 Water heaters S-WG+ 55

TWIN PIPE



CONCENTRIC

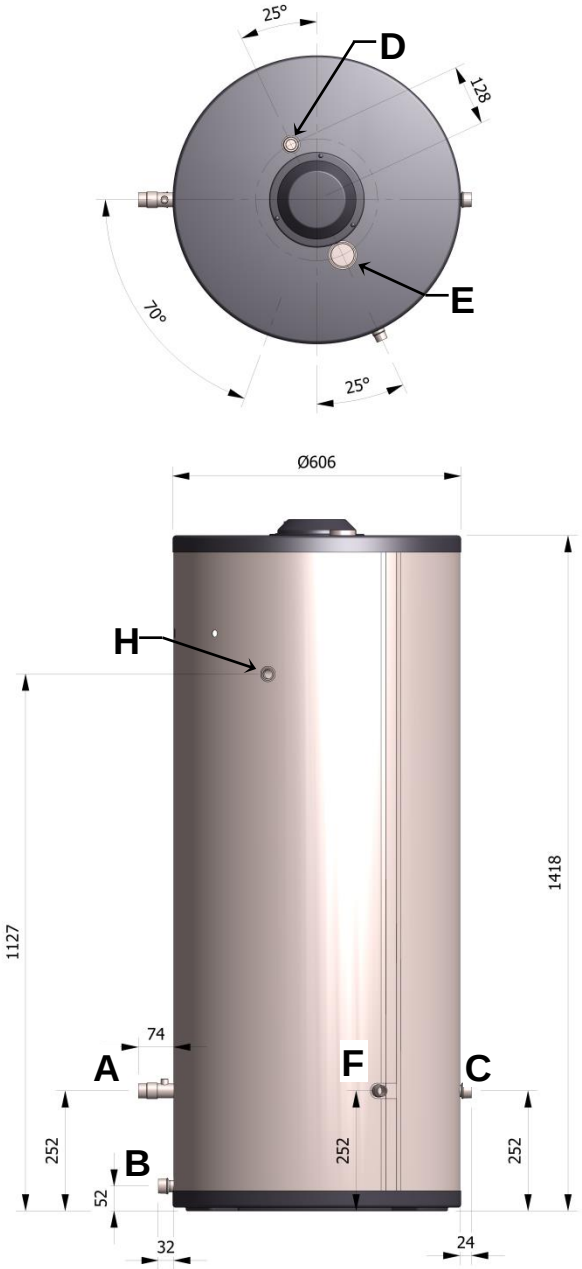


Connections S-WG+55	Twin pipe	Concentric
Flue gas	Ø80	Ø 80
Air inlet	Ø80	Ø125
Cold water inlet	R 1½" (swivel)	
Hot water outlet	R 1½" (swivel)	
Gas	R ¾" (male)	
Condensate	flexible hose Ø25/21 x 750 mm.	

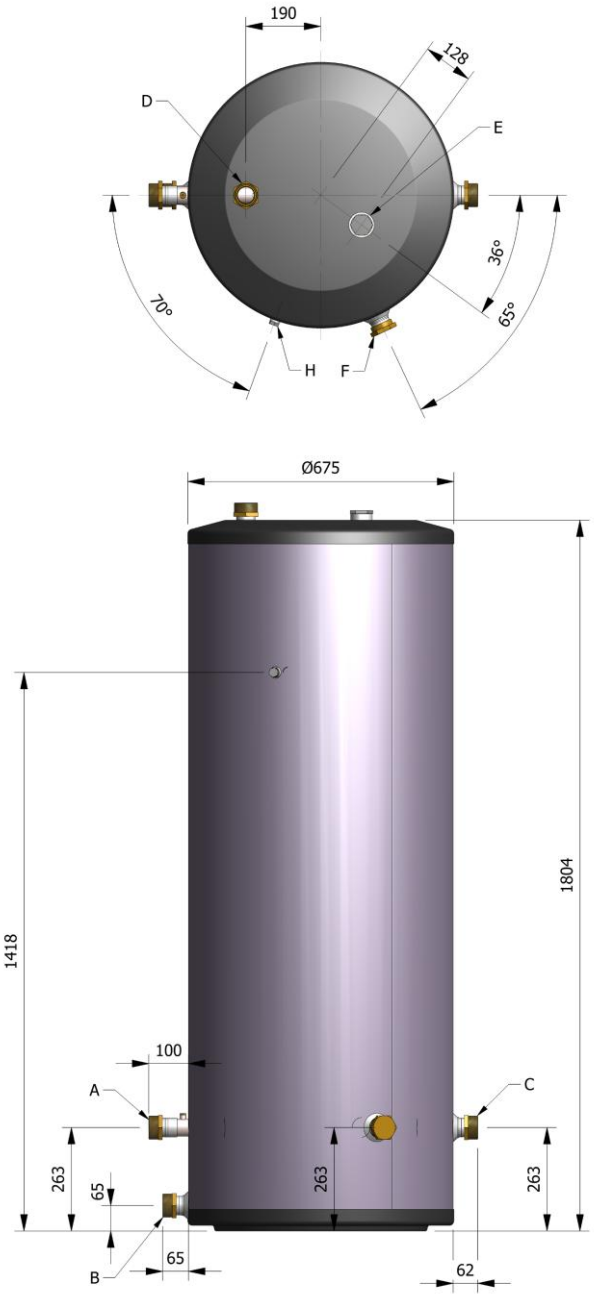
3.3 Tank 230 - 300 - 500 – 750 Litre

For the connections, marked **A-H** see chapter 9.3.2.

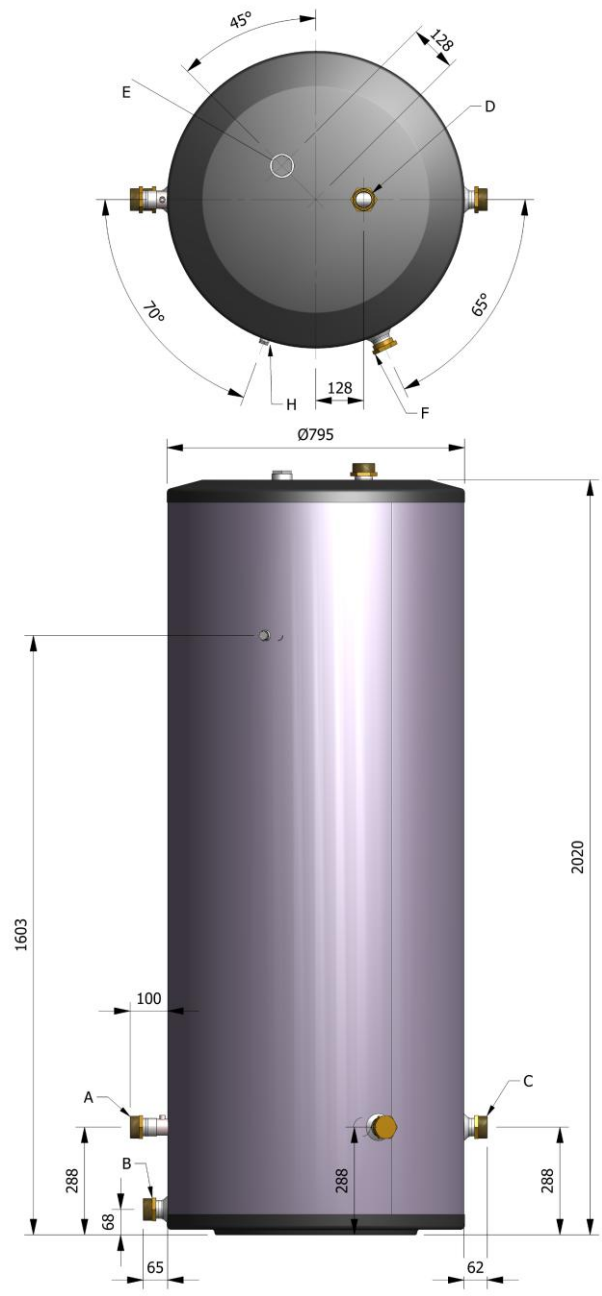
230 Litre



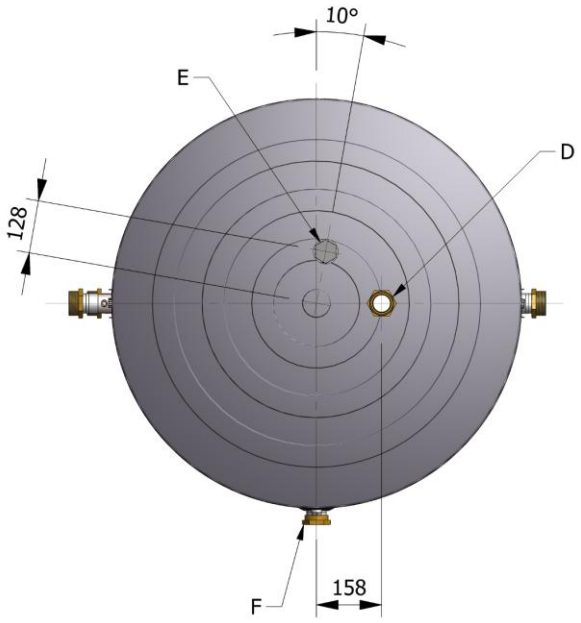
300 Litre

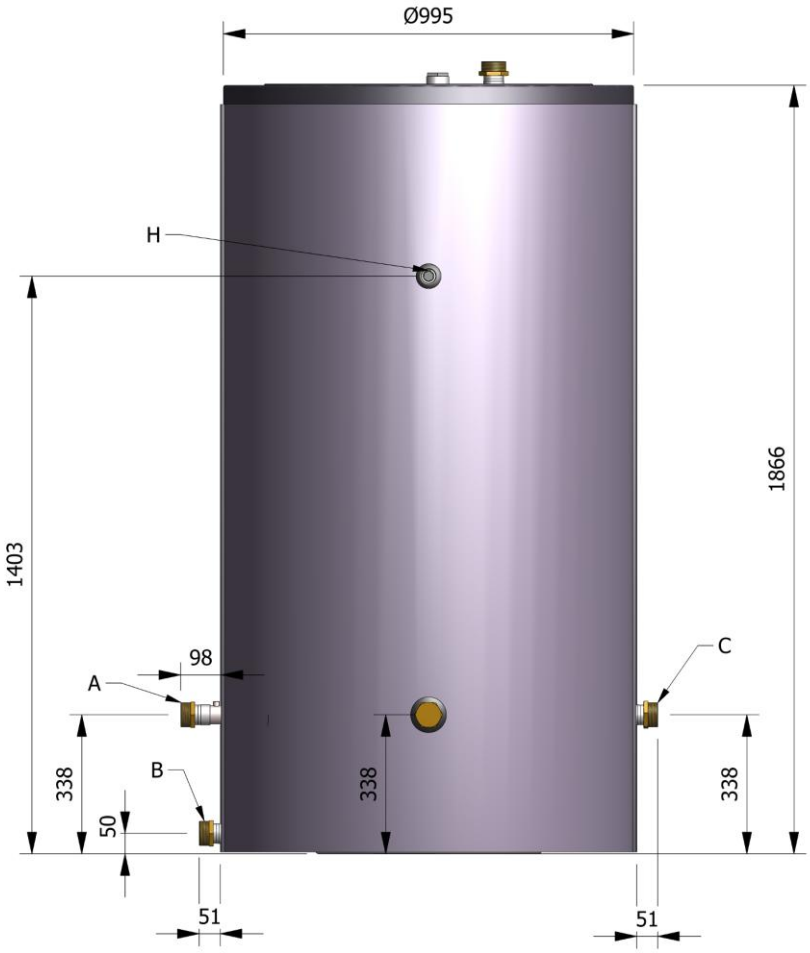


500 Litre



750 Litre





4 ACCESSORIES AND UNPACKING

4.1 Unpacking

The S-WG+ water heater will be supplied with the following documents and accessories:

- One “Installation, Operating and Maintenance” manual.
- One suspension bracket with locking plate and bolts.
- Attached to the front of the gas valve:
  - Two spare fuses.
  - Three spare nuts for mounting the burner plate.
  - A gas conversion sticker.
- Temperature sensor with connector, Siphon drain hose and a dirt catcher siphon.
- Double Nipple (2 pieces) with gaskets and support nipples to be used for the flow and return pipe.
- Pump Grundfos UPXML GEO 25-125-N-180.

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

4.2 Accessories

Depending on the selected way of controlling the system, the following items can be supplied with the water heater.
Ask your supplier for the specifications.

Item	**Part Nº.**
External DHW-Tank threaded temperature sensor 10kOhm@25°C (supplied with the water heater), to be mounted in the screw hole on the tank outlet to the water heater.	E04.016.677
External DHW-Tank pipe temperature sensor 10kOhm@25°C for tank types without screw hole in the outlet to the water heater – Strap on Sensor.	E04.016.304
Warm water thermostat RCH.	S04.016.658
Hot water tank, stainless steel, 230 litre.	100556
Hot water tank, stainless steel, 300 litre.	100557
Hot water tank, stainless steel, 500 litre.	103801
Hot water tank, stainless steel, 750 litre.	100559
Baseplate 150 – 500 litre tanks.	E400302
Baseplate 750 litre tank.	E400309
Pump Grundfos UPXML GEO 25-125-N-180	E400280
Software and interface cable to program the water heater with a computer/laptop	E400278

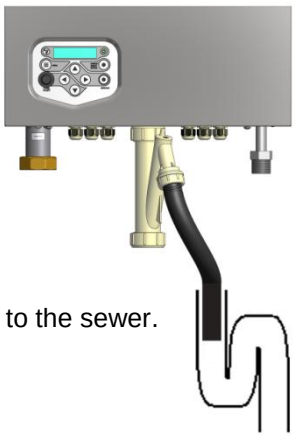
5 INSTALLATION OF THE S-WG+

5.1 General notes

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

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
- Gas connection.



Open connection to the sewer.

Note:
The wall used for mounting the water heater must be able to hold the weight of the water heater. If this is not the case it is recommended to mount the water heater on a (cascade) frame.

Other considerations related to the water heater location:

- The ventilation of the plant room must meet all applicable standards and regulations, regardless of the selected supply of fresh air to the water heater location.
- Both the air supply and the flue gas tubes must be connected to the outside wall and/or the outside roof.
- The installation area must be dry and frost-free.
- The water heater has a built-in fan that will generate noise, depending on the total heat demand. The water heater location should minimize any disturbance this might cause. Preferably it is suggested to mount the water heater on a brick wall.
- There must be sufficient lighting available in the plant room to work safely on the water heater.
- 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 water heater.

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

5.2 Mounting the water heater and tank

5.2.1 WATER HEATER MOUNTING

Before mounting and installing the water heater the following connections should be considered:

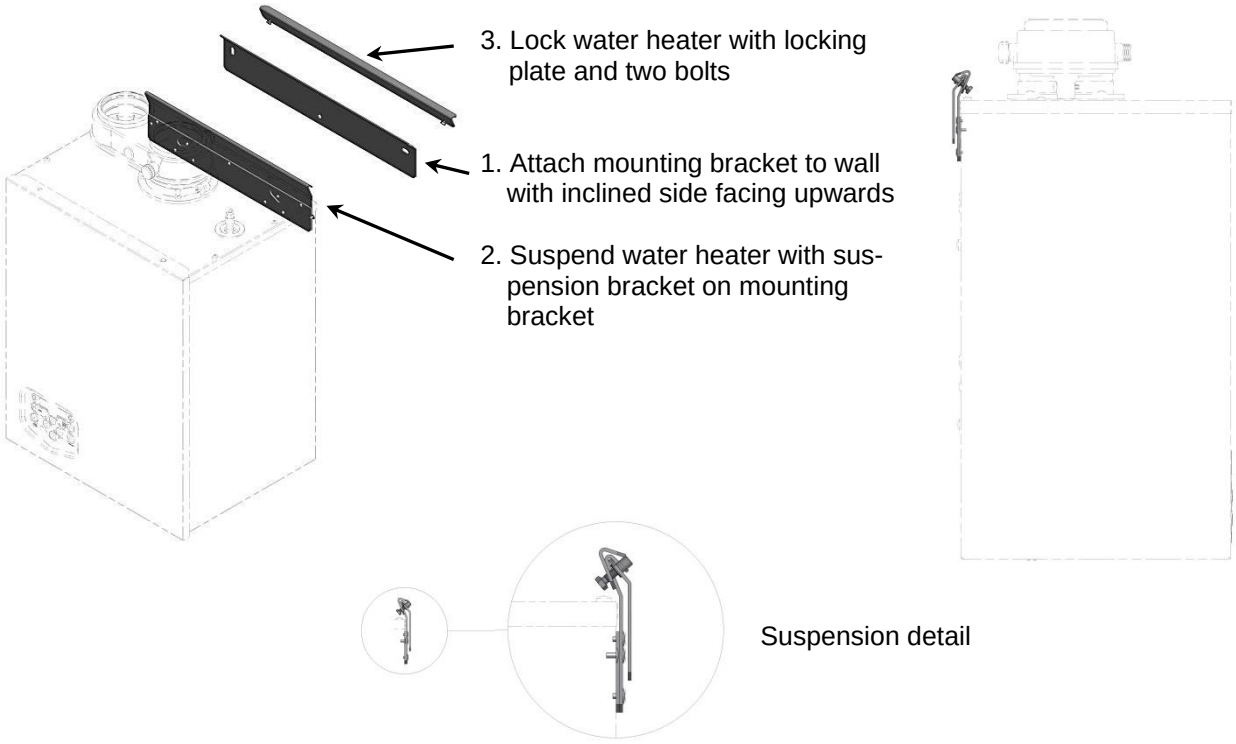
- Flue gas system and the flue gas pipe connections.
- Air supply system and connections.
- 'Cold in' and 'hot out' pipe connection.
- Condensate and pressure relief valve drainage.
- Power supply (preferably the power connection is positioned above the water heater).
- Gas connection.

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

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 water heater 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 water heater in position. The exact water heater position lies between the water heater hanging level and hanging slightly backwards.

The water heater should not lean forward in the mounted position.

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



5.2.2 TANK POSITIONING

The tank must be placed on a stable floor, but not too far from the water heater(s).

***** NB! This floor must be able to hold the weight of the water filled tank(s).

6 FLUE GAS AND AIR SUPPLY SYSTEM

6.1 General

The water heater has a positive pressure flue system. The available combined pressure drop for the air inlet and flue gas outlet system, for a single water heater type:

- S-WG$^+$ 35 = 100 Pa.
- S-WG$^+$ 55 = 120 Pa.

It's not allowed to use an overpressure system for a multiple water heater installation, always contact the manufacturer for advice.

Notice:

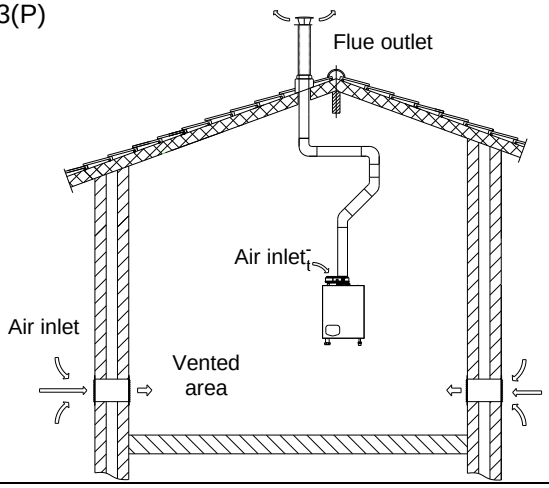
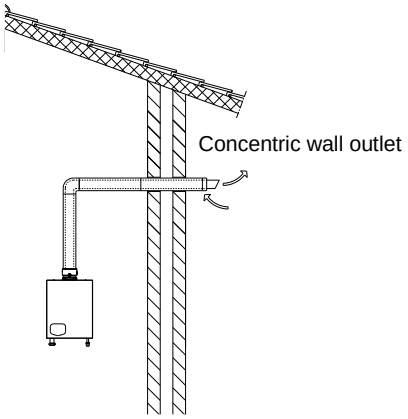
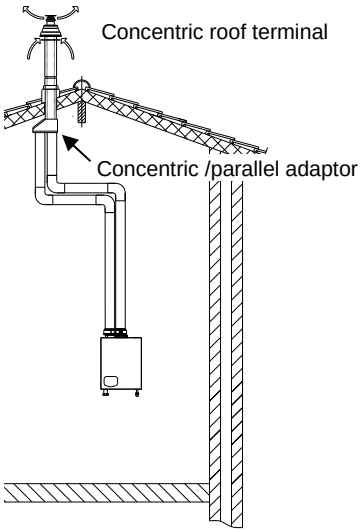
- Install the horizontal flue components with an angle of 3° downwards in the direction of the water heater (roughly equal to five centimeters for every linear meter). When not installed accordingly, it may result in condensate building-up in the flue gas tube, eventually causing component failure.
- 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 considered during the design phase of the DHW installation.

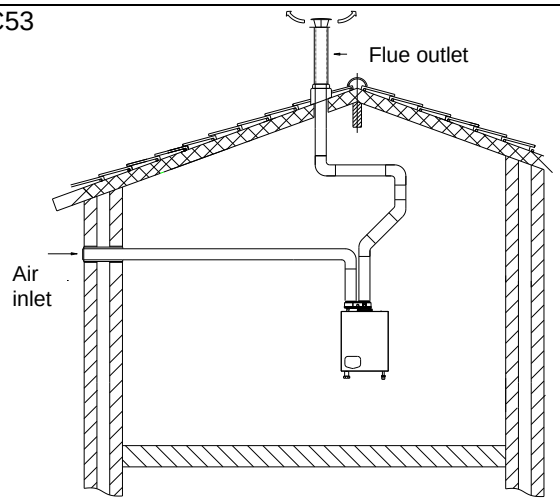
Note:

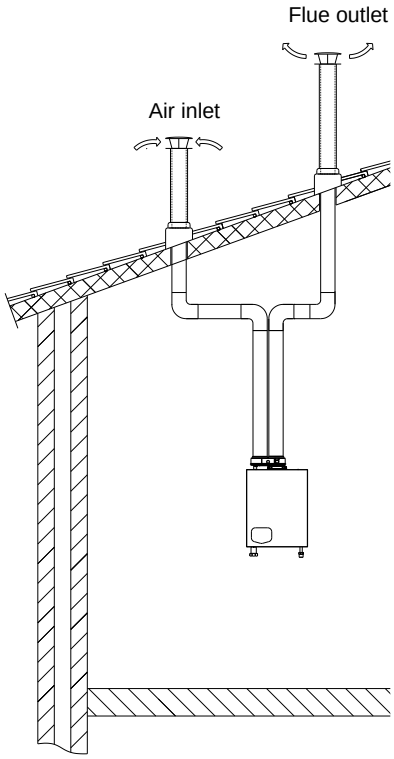
Because the flue gases can have a relatively low temperature, the water heater needs to have a high efficiency approved stainless steel or plastic flue system. These materials should be usable for the applied pressure in the flue gas system, be condensate proof and have a temperature class of **T120.**

6.2 Type of flue gas systems.

Please contact your supplier in case of C43 and C83 applications.

Type according EN 15502-2-1: 2012	Perfor-mance	Description
B23(P)  	Open Air supply from room	* Roof terminal * Without draught diverter * Water heater room air supply. * P = overpressure systems See: Six typical examples - example C **Be aware:** The installation room must have sufficient air supply vents. These vents must be open and may not be closed or blocked. Requirements at NEN 3028 paragraph 6.5
C13  	Closed Air supply from outside	*Wall outlet. *Air supply inlet and flue gas outlet at the same air pressure zone. (a combined wall outlet e.g.). When used with separated air supply inlet and flue gas outlet the outlets must be within a square of 50 cm See: Six typical examples - example E
C33  	Closed Air supply from outside	* Flue terminal at the roof. * Air supply inlet and flue gas outlet located at the same air pressure zone (a combined roof terminal e.g.). When used with separated air supply and flue gas outlet the outlets must be within a square of 100cm. And the distance between the planes of the two transits must be smaller as 50 cm See: Six typical examples - example B

<table>
<tr>
<td>C53

</td>
<td>Closed
Air supply from outside</td>
<td>*Separate air supply duct
*Separate flue gas discharge duct.
* Air supply inlet and flue gas outlet at different air pressure zones. But not at opposite walls.

See: Six typical examples - example F</td>
</tr>
<tr>
<td>C63

</td>
<td>Closed
Air supply from outside</td>
<td>* Appliance sold without flue/air-inlet ducts
* The flue gas parts are not part of the water heater. The water heater is intended to be connected to a separately approved and marketed system for the supply of combustion air and discharge of combustion products.
Condensate can go to the water heater.
* Air supply inlet and flue gas outlet not at opposite walls
* Technical data:
<table>
<tr><td>nominal $T_{flue\ gas}$</td><td>85°C</td></tr>
<tr><td>nominal $Q_{fluegas}$</td><td>See 2.2[1)]</td></tr>
<tr><td>maximum $T_{fluegas}$</td><td>95°C</td></tr>
<tr><td>min. load $T_{fluegas}$</td><td>35°C</td></tr>
<tr><td>min. load $Q_{fluegas}$</td><td>See 2.2[1)]</td></tr>
<tr><td>nominal % CO_2</td><td>See 2.2[1)]</td></tr>
<tr><td>max. allowed draft</td><td>70Pa</td></tr>
<tr><td>max. pressure drop inlet-outlet</td><td>See 2.2</td></tr>
<tr><td>max $T_{air\ supply}$</td><td>40°C</td></tr>
<tr><td>max recirculation</td><td>10%</td></tr>
</table>
1) table technical specifications

See: Six typical examples - example A</td>
</tr>
</table>

6.3 C63 certified

In general, water heaters 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 chapter 4.2 and chapter 4.3.

If a water heater is C63 certified, no specific type flue gas material has been certified in combination with the water heater. 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) and transport, overpressure (P1) and must have a minimum temperature class of **T120**. Also, it must meet the requirements in the following chapters "air supply" and "flue terminal".

CE string flue gas material	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. req. PP	EN 14471	T120	P1	W	1		O	30	I of E	C/E	L
min. req. SS	EN 1856-1	T120	P1	W	1	L20040	O	40			

A few examples of flue gas material suitable for S-WG+ water heaters:

- 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 aluminium containing flue gas pipes in these water heaters.

Connecting diameters and tolerances:

mat	water heater	d_{nom}	$D_{outside}$	d_{inside}	L_{insert}
SS	C35 / C55	80	80 +0,3/ -0,7	81 +0,3/ -0,3	50 +2/ -2
PP	C35 / C55	80	80 +0,6/ -0,6		50 +20/ -2

6.4 Air supply

When an air supply duct is connected from the outside of the building to the water heater, the water heater will operate as a room-independent water heater (closed water heater). The air supply duct can be made of:

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

6.4.1 COMBUSTION AIR QUALITY

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

6.4.2 AIR SUPPLY THROUGH HUMID AREAS

When the supply duct will be placed in a water heater 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 water heater 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 water heater. No water is allowed to enter the water heater through the air inlet canal at any time.

6.5 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.**
-

6.5.1 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
- BS 6644 – Installation of gas fired hot water boilers of rated inputs between 70kW – 1.8MW.

Please refer to the Instition 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 Postioning of Horizontal Flues Terminations.**

6.5.2 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.
- BS 6644 – Installation of gas fired hot water boilers of rated inputs between 70kW – 1.8MW.

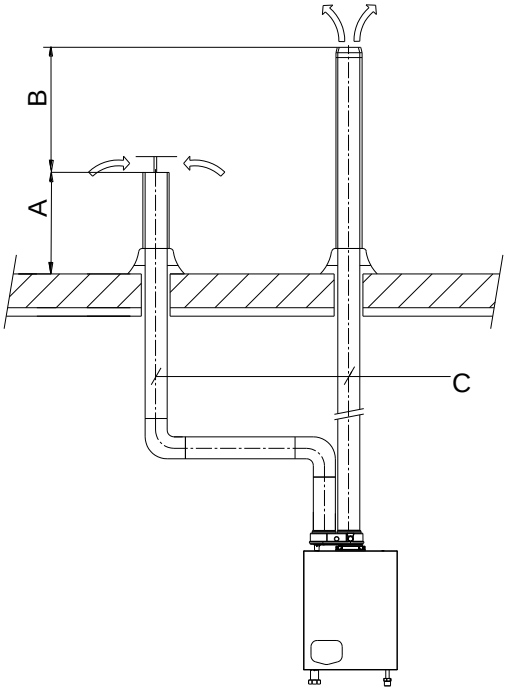
Please refer to the Instition of Gas Engineers and Manager Documents (IGEM):

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

6.5.3 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.**

6.6 Heights above the roof.



Height A

This is the height of the air inlet. A rain hood should prevent rainwater 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.

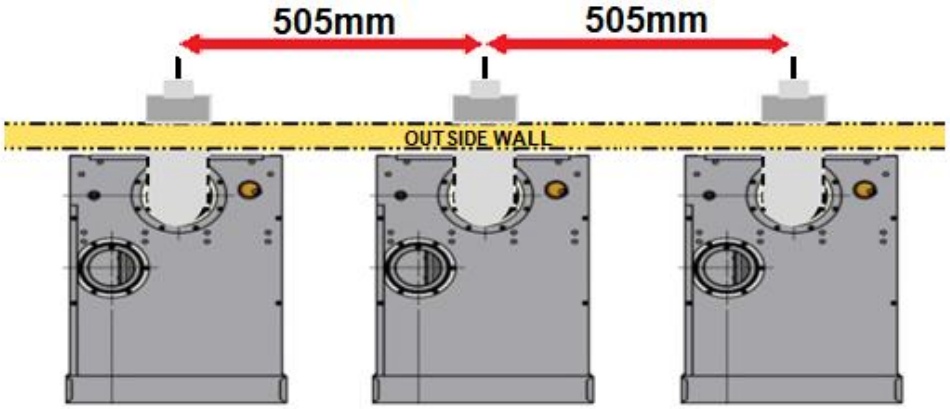
Height difference B

This is the height difference 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.
A single flue outlet should be situated at least 1000 mm above the roof surface.

Distance C

The horizontal distance between the flue gas pipe and air inlet pipe at roof level.
This distance should be at least 700 mm.

6.7 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-WG+ heaters. 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.

6.8 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 6.8.1 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 6.8.1 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 6.8.1 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 6.8.1 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 6.8.1 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 6.8.2 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 in Unsuitable

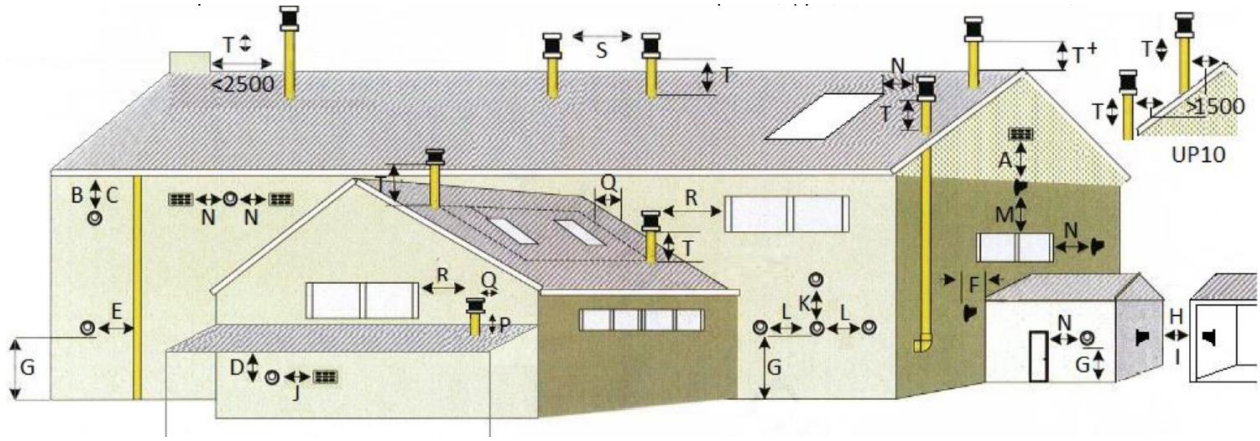
6.8.1 FIGURE 12 – LINE G

19.32 x (net heat input kW) + 647.59 = mm

6.8.2 FIGURE 7 – LINE Y

7.232 x (net heat input kW) + 93.708 = mm

6.9 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)
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
H	From a surface facing the terminal	600	23.126 x (kW net input) + 618.84
I	From a terminal facing the terminal *	1200	19.32 x (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 x (kW net input) + 93.708
N	Horizontally to an opening into the building	300*	7.232 x (kW net input) + 93.708
P	Above a flat roof (Obstacle > 2500mm)	300	7.232 x (kW net input) + 93.708
P+	Above a flat roof (Obstacle < 2500mm)	300	4.5675 x (kW net input) + 19.723
Q	From an adjacent wall (Edge of terminal)	300	4.5675 x (kW net input) + 19.723
R	To an opening into the building	1000	7.232 x (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 x (kW net input) + 19.723
T+	Above a >20 Deg Pitched Roof (BOT) - Valley	300	4.5675 x (kW net input) + 19.723

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

6.10 Flue Gas and Air Supply Resistance Table

The load of the heater is affected by the resistance of the air supply and flue gas system. This is caused by the controller of the heater regarding the gas-/ air link. The maximum power does not drop more than 5% of the power mentioned at the heaters data plate at a total (flue gas and air supply) resistance of 100 Pa (S-WG+35) and 120Pa (S-WG+55).

In the next sections, calculation examples will be given to determine allowed lengths of the flue gas and air supply pipes. First, the component resistance data are given in the next table:

6.10.1 FLUE GAS AND AIR SUPPLY RESISTANCE TABLE

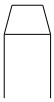
		Ø [mm]	Resistance [Pa]	
Item			**S-WG+35**	**S-WG+55**
Flue gas discharge	straight tube/m	80	4	5,3
	45° bend	80	2	2.7
	90° bend	80	4	5,3
	outlet. zeta = 0.05	80	0,2	0,4
	outlet. zeta = 1.0	80	3,5	9,2
	outlet. zeta =1.5	80	5,3	12,6
Air supply	straight tube/m	80	3	4,1
	45° bend	80	1,5	2,1
	90° bend	80	3	4,1
	inlet. zeta =1.0	80	4	10,2
Concentric	roof terminal	80/125	30	55
	outside wall terminal	80/125	25	40
	straight tube/m	80/125	7	10
	90° bend	80/125	8	14
	45° bend	80/125	5	9
	Concentric /parallel adaptor	80/125	7	10

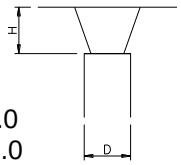
FLUE GAS DISCHARGE

zeta=0
open outlet

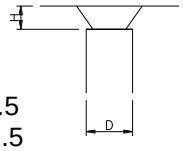


zeta=0.05
conical outlet





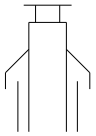
H/D=1.0
zeta=1.0

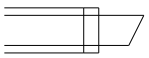


H/D=0.5
zeta=1.5

CONCENTRIC FLUE GAS OUTLET AND AIR SUPPLY

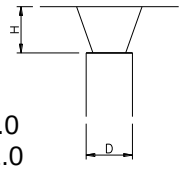
ROOF





WALL

AIR SUPPLY



H/D=1.0
zeta=1.0

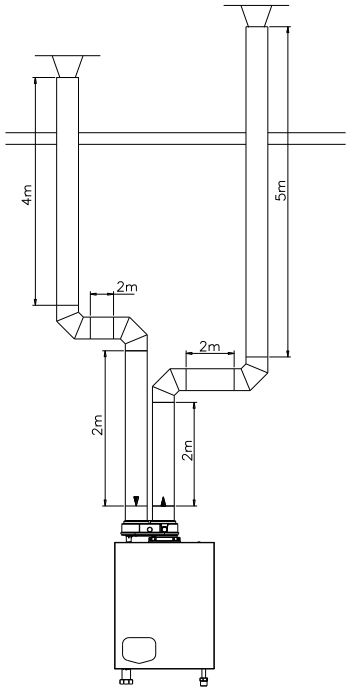
NOTICE: This table can only be used for a single flue/air system for one water heater. Do NOT use this table for common flue/air systems with cascaded water heaters

Also, using concentric pipes there is a second restriction. The maximum allowed length straight concentric pipe to be used is 20 m. (flue gas pipe + air supply pipe).

6.10.2 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 water heater 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**

6.10.3 EXAMPLE A: TWIN PIPE SYSTEM (C63).

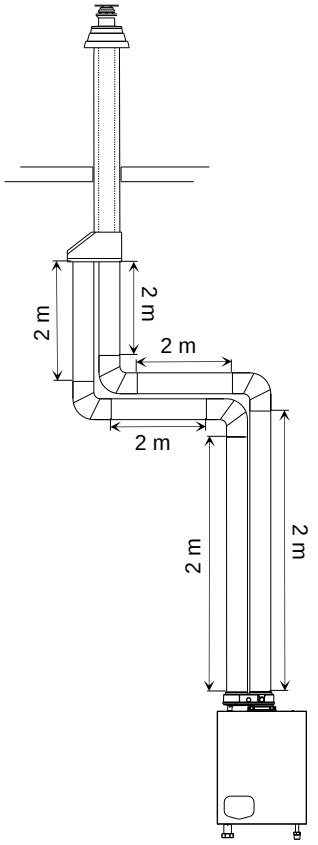


Calculation example with given lengths: checking resistance

Water heater type:		**S-WG+ 35**			
Flue gas	**Diameter: 80 mm**		**Number**	**Pa**	**Pa total**
	Straight tube m¹	total	9	4	36,0
	Bend	90°	2	4	8,0
	Flue outlet	zeta = 1	1	3,5	3,5
	Total resistance flue gas outlet:				**47,5**
Air supply	**Diameter: 80 mm**		**Number**	**Pa**	**Pa total**
	Straight tube m¹	total	8	3	24,0
	Bend	90°	2	3	6,0
	Air inlet	zeta = 1	1	4	4,0
	Total resistance air supply:				**34,0**
Total resistance flue gas outlet and air supply:					**81,5**

The total resistance is less than 100 Pa. This flue gas / air supply system is functional.
Be aware: Strebel Ltd specific resistance values are used in this example. Flue and air pipes of other supplier can have other values.

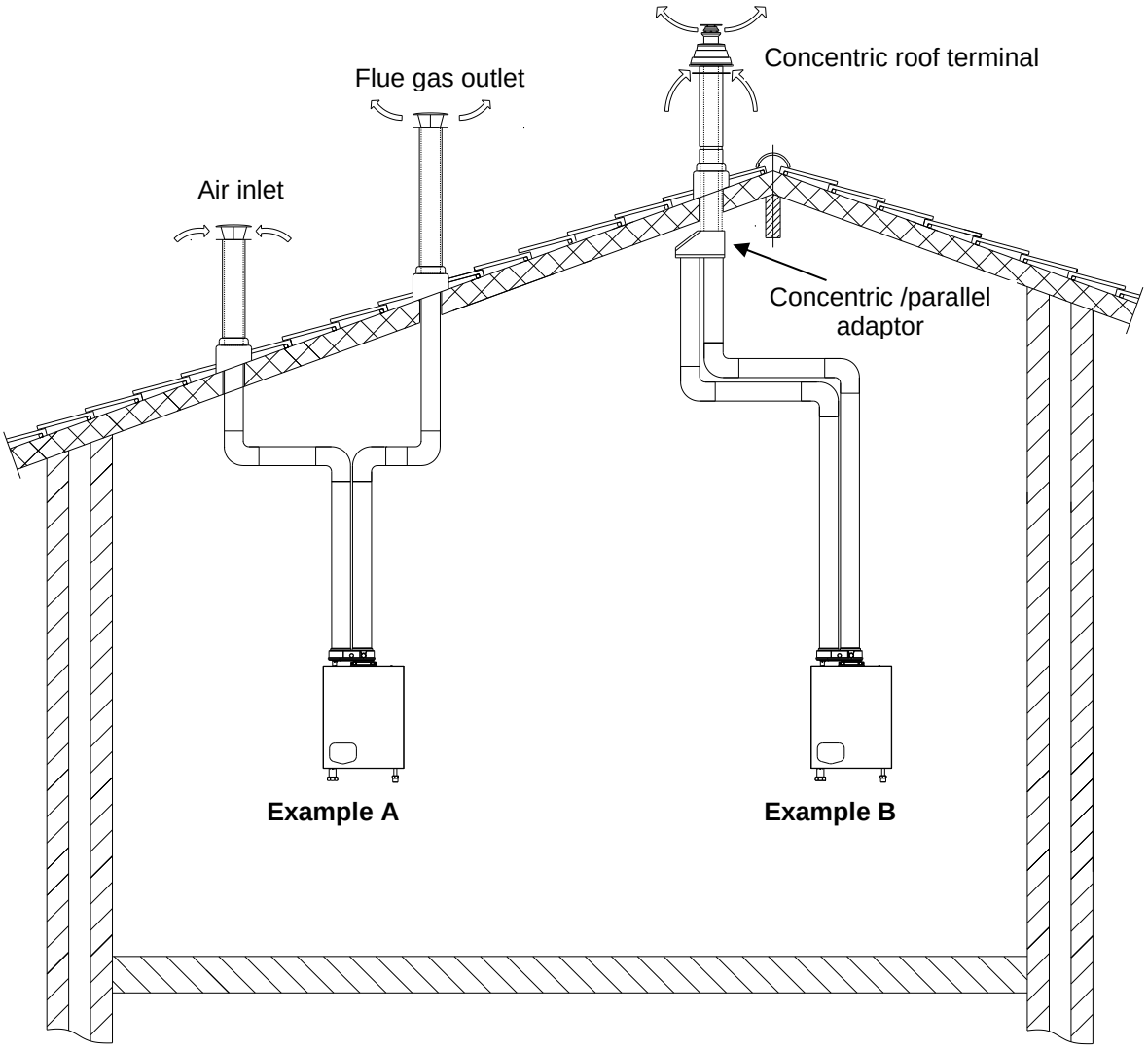
6.10.4 EXAMPLE B: TWIN PIPE SYSTEM WITH SEPARATE PIPES AND CONCENTRIC ROOF TERMINAL (C33).



Water heater type:		**S-WG+ 55**			
Flue gas	**Diameter: 80 mm**		**Number**	**Pa**	**Pa total**
	Straight tube m¹	total	6	5,3	31,8
	Bend	90°	2	5,3	10,6
	Total resistance flue gas outlet:				**42,4**
Air supply	**Diameter: 80 mm**		**Number**	**Pa**	**Pa total**
	Straight tube m¹	total	6	4,1	24,6
	Bend	90°	2	4,1	8,2
	Total resistance air supply:				**32,8**
Roof terminal		concentric 80/125	1	55	**55,0**
Adaptor		par-conc	1	10	**10**
Total resistance flue gas outlet and air supply:					**140,2**

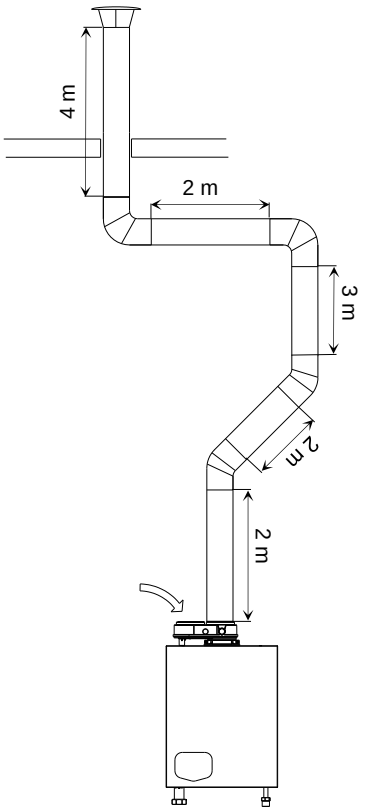
The total resistance exceeds 120 Pa. This flue gas / air supply system is NOT functional.

Example A (C63) and B (C33) maximum pipe lengths



	Example A (C63)			Example B (C33)	
Water heater type →	**+ 35**	**+ 55**		**+ 35**	**+ 55**
Diameter air inlet [mm]	80	80		80	80
Diameter flue outlet [mm]	80	80		80	80
Diameter roof terminal [mm]	80	80		80/125	80/125
Maximum pipe length [m] (inlet + outlet together)	**19**	**15**		**12**	**6**

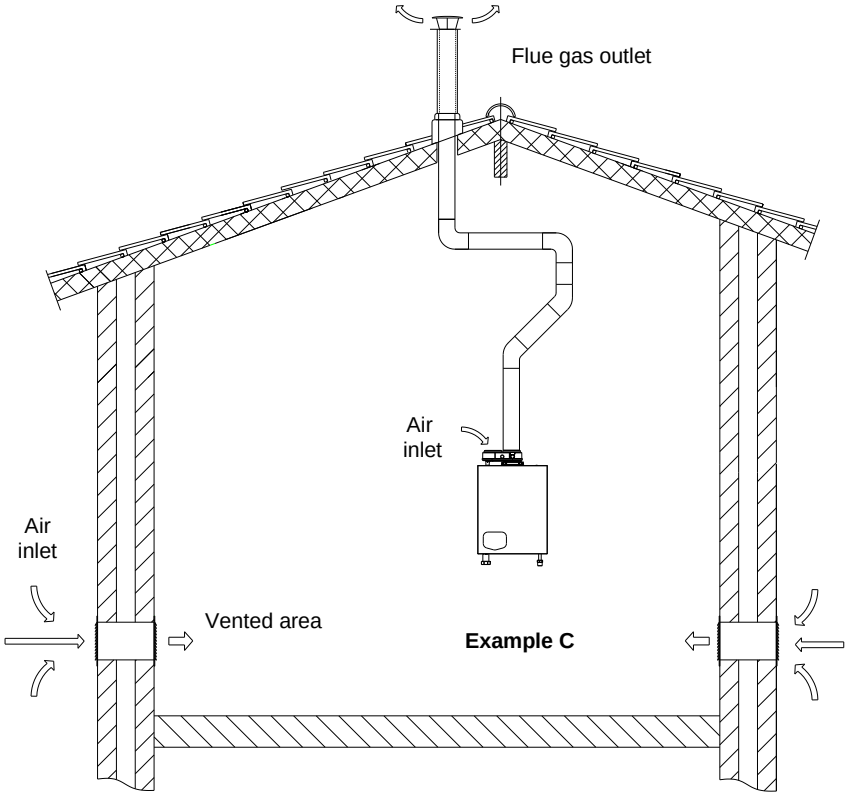
6.10.5 EX. C: SINGLE PIPE FOR FLUE GAS AND AIR SUPPLY FROM WATER HEATER ROOM. (B23, B23P)



Calculation example with given lengths: checking resistance

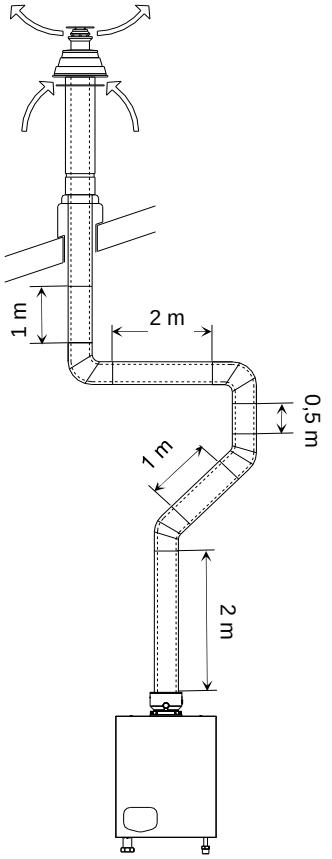
Water heater type:		**S-WG+ 35**			
Flue gas	**Diameter: 80 mm**		**Number**	**Pa**	**Pa total**
	Straight tube m¹	total	13	4	52,0
	Bend	90°	2	4	8,0
	Bend	45°	2	2	4,0
	Flue outlet	H/D = 1,0	1	3,5	3,5
	Total resistance flue gas outlet:				**67,5**

The total resistance is less than 100 Pa. This flue gas / air supply system is functional.



Maximum pipe lengths		**Example C (B23, B23P)**	
Water heater type →		**+ 35**	**+ 55**
Diameter air inlet	[mm]	80	80
Diameter flue outlet	[mm]	80	80
Diam. roof terminals	[mm]	80	80
Maximum pipe length (inlet + outlet together)	**[m]**	**21**	**17**

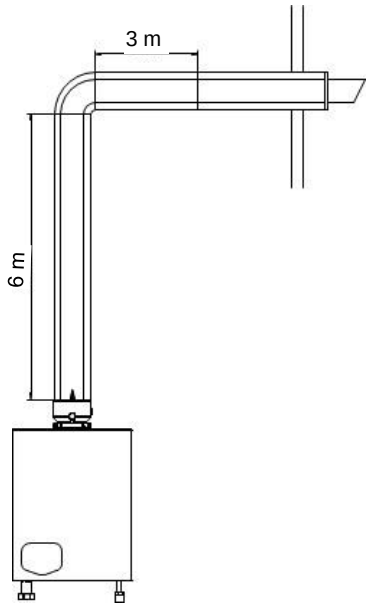
6.10.6 EX. D: CONCENTRIC PIPE WITH ROOF OUTLET (C33).



Water heater type:		S-WG+ 55			
Flue gas and air supply	Diameter: 80 mm		Number	Pa	Pa total
	Straight tube m¹	total	6,5	10	65,0
	Bend	90°	2	14	28,0
	Bend	45°	2	9	18,0
	Outlet/Inlet	80/125	1	55	55,0
	Total resistance flue gas outlet and air supply				**166,0**

The total resistance exceeds 120 Pa so this flue gas / air supply system is NOT functional. Use larger pipe diameters or a shorter total pipe length.

6.10.7 EX. E: CONCENTRIC SYSTEM (WALL OUTLET C13).

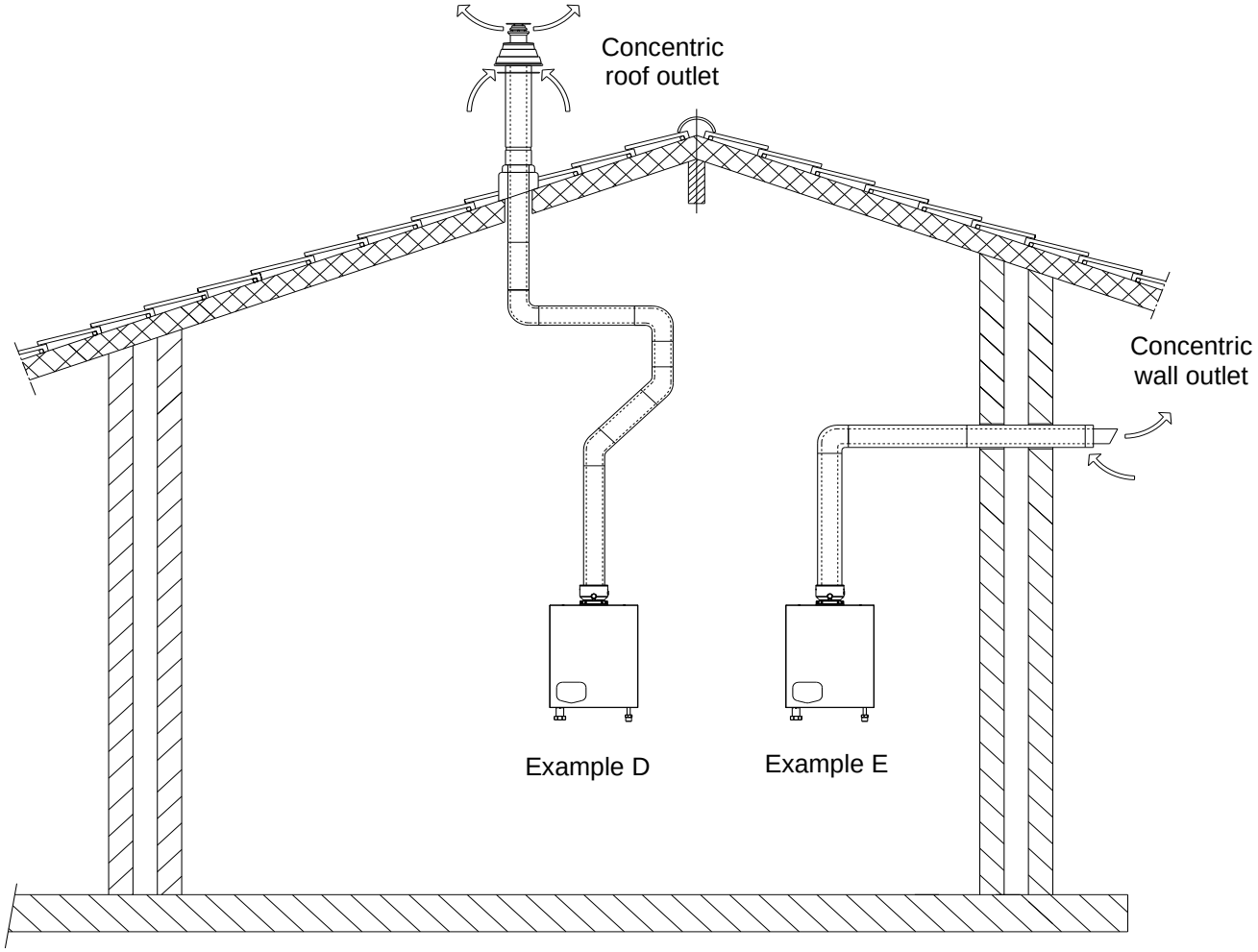


Calculation example with given lengths: checking resistance

Water heater type:		S-WG+ 35			
Concentric	Diameter: 80/125 mm		Number	Pa	Pa total
	Straight tube m¹	total	9	7	63
	Bend	90°	1	8	8
	Conc. Wall outlet	wall	1	25	25
	Total resistance flue gas and air outlet: (concentric)				**96**

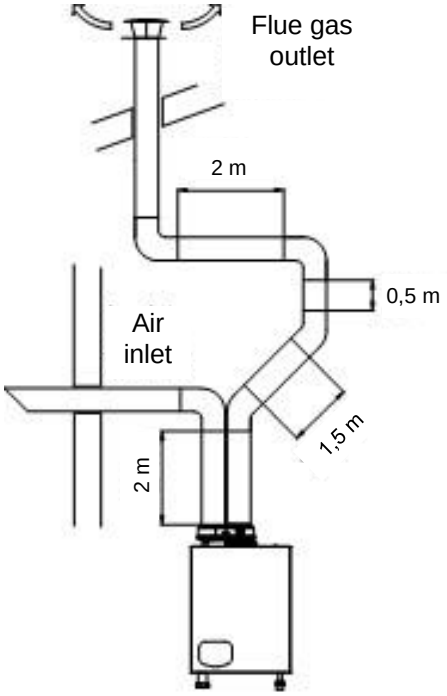
The total resistance is less than 100 Pa. This flue gas / air supply system is functional.

Example D and E maximum pipe lengths



	Example D (C33)				Example E (C13)	
Water heater type →	**+ 35**	**+ 55**			**+ 35**	**+ 55**
Diameter conc. pipe [mm]	**80/125**	**80/125**			**80/125**	**80/125**
Conc. Roof outlet [mm]	**80/125**	**80/125**			**80/125**	**80/125**
Maximum pipe length [m]	**6**	**1**			**9**	**6**

6.10.8 AIR SUPPLY AND FLUE GAS OUTLET AT DIFFERENT PRESSURE ZONES (C53)

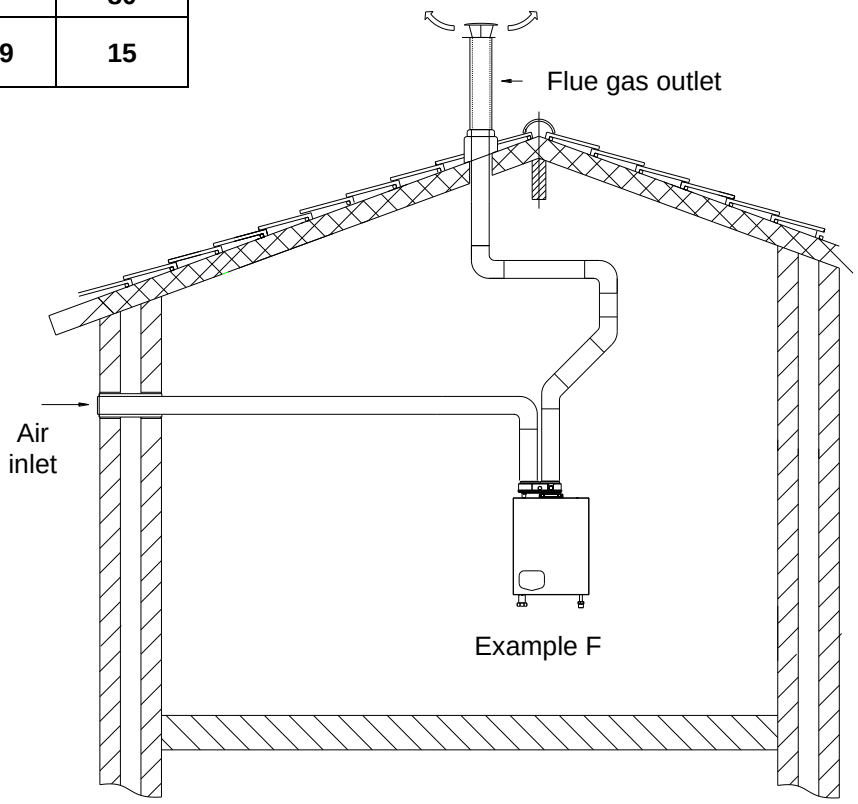


Calculation example with given lengths: checking resistance

Water heater type:		S-WG+ 55			
Flue gas	**Diameter: 80 mm**		**Number**	**Pa**	**Pa total**
	Straight tube m¹	totaal	6	5,3	31,8
	Bend	45°	2	2,7	5,4
	Bend	90°	2	5,3	10,6
	Flue gas outlet	zeta = 1	1	9,2	9,2
	Total resistance flue gas outlet:				**57,0**
Air	**Diameter: 80 mm**		**Number**	**Pa**	**Pa total**
	Straight tube m¹	totaal	2	4,1	8,2
	Bend	90°	1	4,1	4,1
	Air inlet	H/D = 1,0	1	10,2	10,2
	Total Resistance Air supply:				**22,5**
Total Resistance Air supply and Flue gas outlet:					**79,5**

The total resistance is less than 120 Pa. This flue gas / air supply system is functional.

	Example F	
Water heater type →	**+ 35**	**+ 55**
Diameter wall outlet [mm]	**80**	**80**
Diameter air inlet [mm]	**80**	**80**
Diameter flue gas outlet [mm]	**80**	**80**
Diameter roof outlet [mm]	**80**	**80**
Maximum pipe length [m] (inlet and outlet)	**19**	**15**



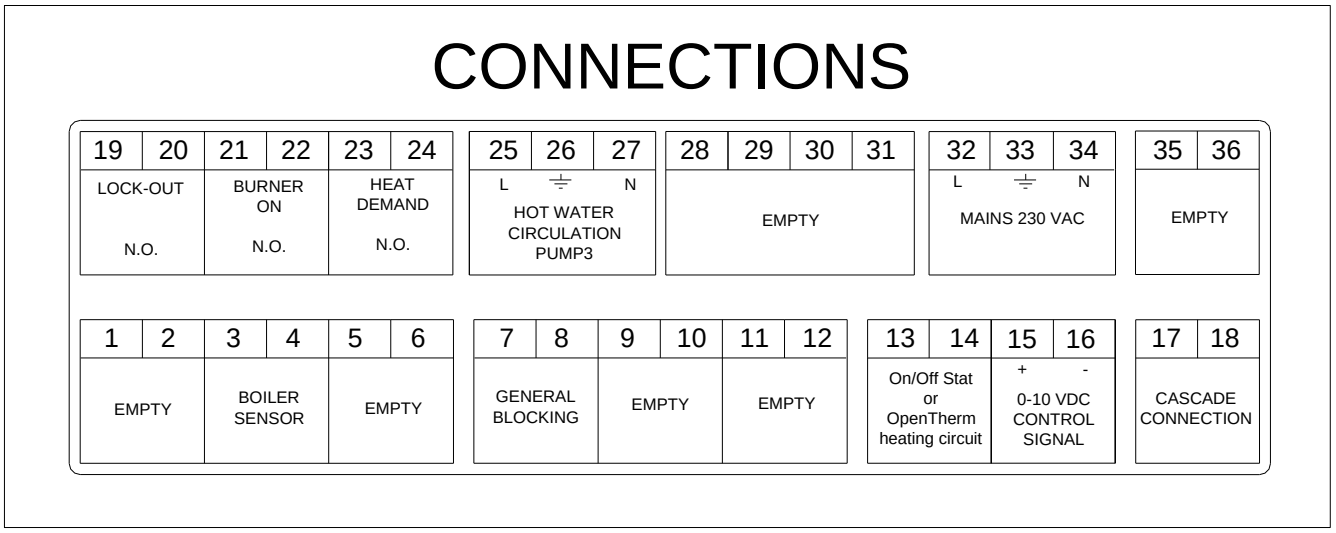
7 ELECTRICAL INSTALLATION

7.1 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 water heater front door and the connector protection cover.

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

7.2 Electrical connections



7.3 Function of the electrical connections of the water heater

1-2	**EMPTY**
Do not connect any cable to these connections	
3-4	**TANK SENSOR**
This external tank sensor measures the water temperature at the system side. The sensor must be mounted on the return pipe at the system side, close to the tank. PARAMETER: No parameter settings needed.	
5-6	**EMPTY**
Do not connect any cable to these connections	
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	**EMPTY**
Do not connect any cable to these connections	

13-14	**ON/OFF STAT OR OPENTHERM WATER TANK**
OPTION 1: an ON/OFF thermostat can be connected. The water heater will use the set/programmed tank temperature when these terminals 13 and 14 are bridged. OPTION 2: an OpenTherm (OT) controller can be connected to the terminals 13 and 14. The water heater 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. (PARAMETER: A parameter change is needed).	
21-22	**BURNER ACTIVE OR EXTRA WATER HEATER 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 (extra) water heater. This contact can also be used for the switching of a pump with a separate control input connection. (PARAMETER: A parameter change is needed).	
23-24	**BURNER 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. (PARAMETER: A parameter change is needed).	
25-26-27	**CIRCULATION PUMP P3**
This contact can be used to connect an “old type” on-off pump. (Not a high efficiency pump). Pump is switched off, when there is no heat demand, after post running time.	
28-29-30-31	**EMPTY**
Do not connect any cable to these connections.	
32-33-34	**POWER SUPPLY**
The power supply connection of the unit. 32 = phase wire; 33 = ground wire; 34 = neutral wire.	
35-36	**EMPTY**
Do not connect any cable to these connections.	

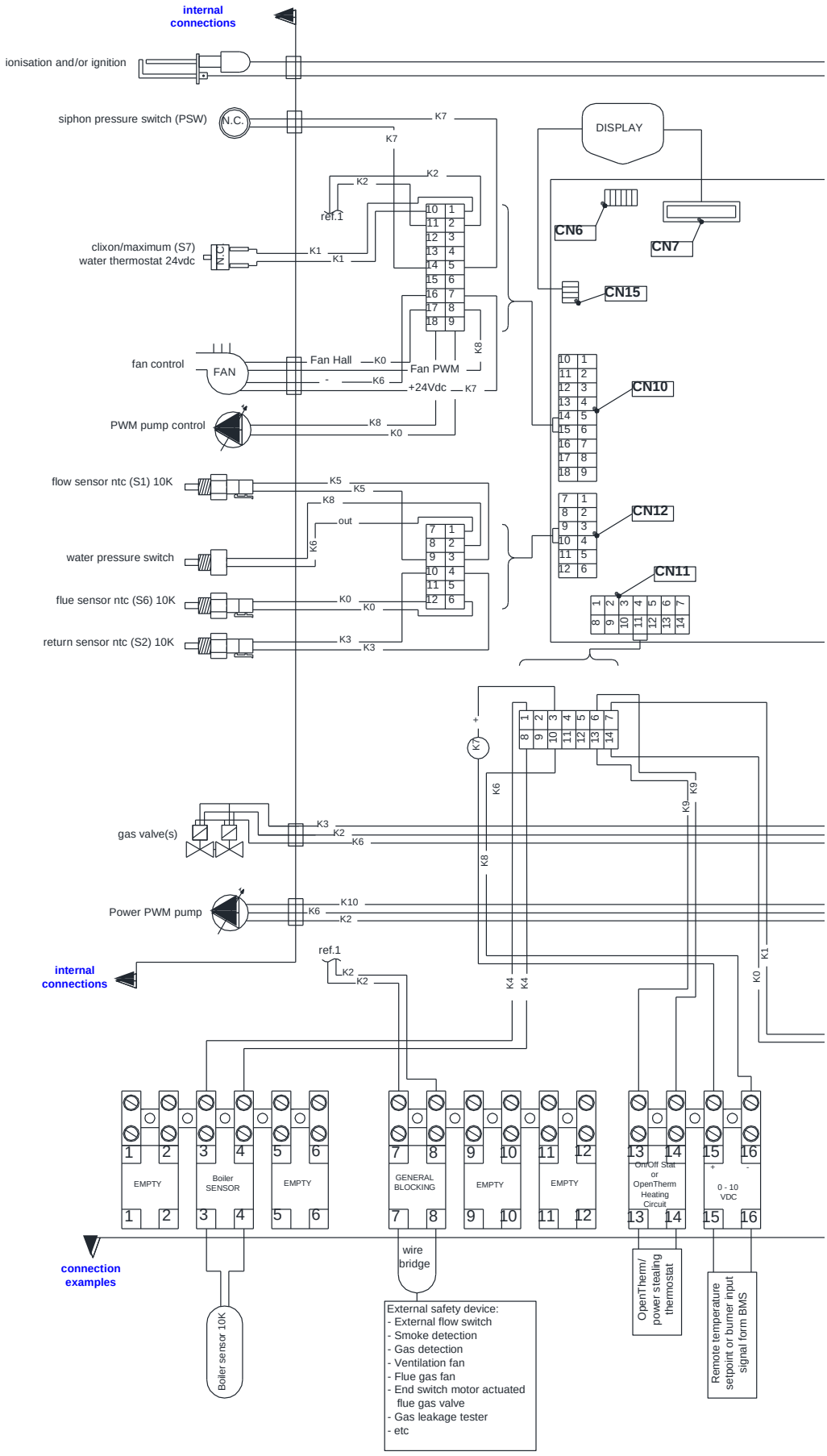
7.4 Sensor values

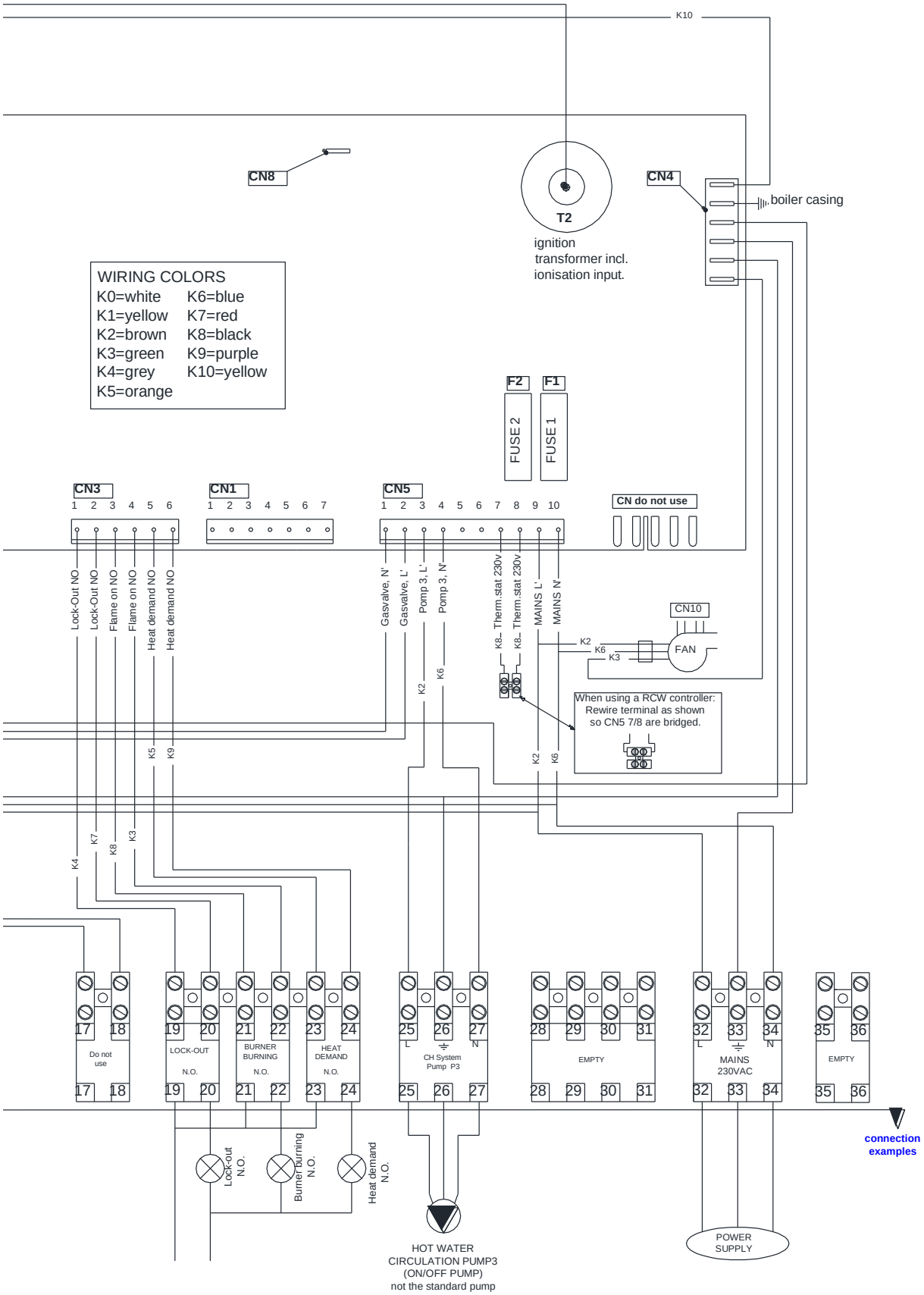
SENSOR	SENSOR TYPE	SENSOR VALUE
S1	Internal flow sensor	NTC-10K
S2	Internal return sensor	NTC-10K
S3	Tank sensor	NTC-10K
S6	Flue gas sensor	NTC-10K

Conversion table: temperature vs. resistance for all sensors NTC-10k

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

7.5 Electrical schematics




K10
CN8
T2
ignition
transformer incl.
ionisation input.
CN4
boiler casing
WIRING COLORS
K0=white K6=blue
K1=yellow K7=red
K2=brown K8=black
K3=green K9=purple
K4=grey K10=yellow
K5=orange
F2
F1
FUSE 2
FUSE 1
CN3
CN1
CN5
CN do not use
Lock-Out NO
Lock-Out NO
Flame on NO
Flame on NO
Heat demand NO
Heat demand NO
Gasvalve, N'
Gasvalve, L'
Pomp 3, L'
Pomp 3, N'
Therm.stat 230v
Therm.stat 230v
MAINS L'
MAINS N'
CN10
FAN
When using a RCW controller:
Rewire terminal as shown
so CN5 7/8 are bridged.
Do not use
LOCK-OUT N.O.
BURNER BURNING N.O.
HEAT DEMAND N.O.
CH System Pump P3
EMPTY
MAINS 230VAC
EMPTY
Lock-out N.O.
Burner burning N.O.
Heat demand N.O.
HOT WATER CIRCULATION PUMP3 (ON/OFF PUMP) not the standard pump
POWER SUPPLY
connection examples

8 THE S-WG+ 35 & 55 WATER HEATER

8.1 Water Quality - Important

The on-site incoming cold water supply must not exceed the below valves:

- Hardness should not exceed 205 PPM CaCO3 (11.5 dH).
- TDS (Total Dissolved Solids) should not exceed 450 PPM.
- Hardness and TDS together may not exceed 450 PPM.
- PH value should be between 6.5 and 7.5 - measured cold.

The above values for the site where the water heater is going to fitted, can be retrieved from the local water supplier. If water quality doesn't meet the above-mentioned requirements, a water treatment installation / softener should be installed to improve water quality to the required levels. We do not recommend the use of magnetic type of water conditioners with these units, as experience of these fitted in the system with S-WG range has found that they DO NOT produce a satisfactory result.

Having an installation which meets or is better (lower hardness) than the above values does not guarantee that scale will not form in the heat exchanger as there are many variables to why scale can form i.e. temperature requirements, volume of water passing through the water heater, velocity through the units, etc. Therefore, failure of the heat exchanger due to scale formation or blockage due to other solids in the water is not covered by warranty.

Minimum Water Hardness = 80 PPM or 80 mg/L $CaCO_3$ (= 4.5°dH)
Minimum TDS = 100 PPM
Water that's under these minimum values normally has a pH value which is aggressive and corrosive.

NEVER install a direct heated water system in an area where water quality does not comply with above mentioned values.

If the water hardness is too high, a water treatment installation should be installed reducing the water hardness within acceptable level.

8.2 Frost protection

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

NOTICE:
- This frost protection function is only protecting the water heater and not the whole sanitary system.
- This frost protection function is only useable if water circulation through the system is possible - if not, the water heater goes in a lock-out.
- Because it concerns a programmable setting, a water heater damaged by frost is not covered under warranty.

8.3 Legionella program

To avoid contamination of the water with Legionnaires' disease, a special anti-Legionella program is present in the software of the water heater control, the settings of which are freely programmable.
NB! This option is default turned 'OFF', the responsibility for a Legionella-free installation lies with the end-user.
See chapter 11.2.2 for an extensive explanation of how to use this option.

8.4 Flow monitoring

Flow:
In the control of the water heater an extensive flow monitoring function has been implemented. If the temperature difference between incoming cold water and outgoing hot water gets too high, this indicates a too small water flow through the appliance.

Safety actions:

If the temperature difference exceeds the maximum at a certain load, *for a longer time than specified in the software*, the display will show 'Delta direct block' and the appliance will *block:* it switches immediately to reduced power. Power is then slowly increased to the required level again. The fourth time, so after three of these blockings, the water heater will go in *lock-out* (F16) and the display shows 'FlowReturn dT fault'.

At very bad flow rates (*temperature difference for 10 seconds exceeding a certain entered safety value*), the appliance will skip the blockings and immediately go in lock-out: F16, display 'FlowReturn dT fault'.

In *Service mode,* the appliance will immediately go in lock-out when the maximum value corresponding to the applied power is exceeded, skipping the blocking procedures that apply at normal operation. Again F16, display 'FlowReturn dT fault'.

NB! All values of this flow monitoring have been programmed by Strebel Ltd to get the best performance combined with a long-life time.

8.5 Water pressure switch

Water pressure getting too low indicates a blocking of the water flow. If that is the case, heat from the flue gases cannot be transferred and will flow away through the flue gas channels. Also overheating of the heat exchanger and/or other parts of the system could occur, if no measures would have been taken. For this reason, a water pressure switch, *WPS*, has been integrated in all S-WG+ 35 & 55 system models.

Operating values
The water pressure switch has one Normally Open (NO) contact, meaning the contact is open in rest position when no pressure is applied. As soon as the system has been filled and the pressure exceeds 0.85 bar, the switch closes, enabling operation. If, by any cause, the pressure drops below 0.75 bar, the system will be blocked.

In this case the display will show:

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.

Check if there is any leakage or maybe the pressure in the service pipe has dropped down.
See also chapter 16.2 'Blocking codes'.

9 THE S-WG+ SANITAIRY SYSTEM: INSTALLATION INSTRUCTIONS

9.1 The S-WG+ 35 & 55 system

The system is set up as shown in the next example showing a combination of a water heater and a tank. Other combinations are possible as well. Contact your supplier regarding cascading possibilities.

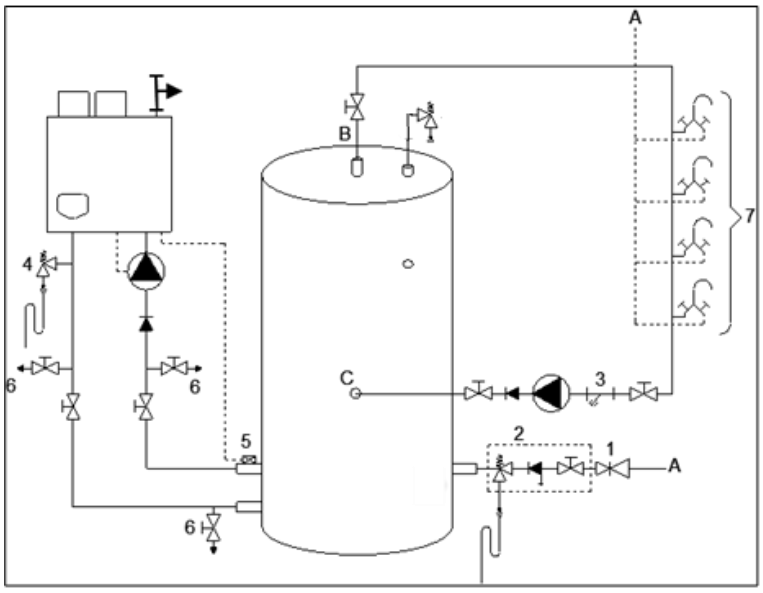
SAFETY COMPONENTS

NB! The pictures in chapter 9.1.1 and 9.2 show examples of functional installations. The safety components as shown in these pictures are NOT necessarily conform all applicable standards and regulations.

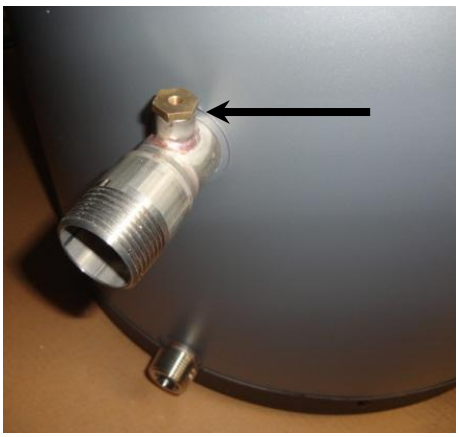
ALWAYS have the installation installed by a skilled installer. Safety must be added according to all applicable standards and regulations.

9.1.1 STAND-ALONE SET-UP

The basic form of a S-WG+ installation is one water heater with one tank.
Shown in the picture are the principle components and connections.



Example of a combination of one water heater and one tank



Position tank sensor on tanks

Tank sensor: see chapter 9.2.1.

	PUMP
	NON-RETURN VALVE
	VALVE
	SAFETY VALVE
	FILTER
	INLET COMBINATION - Overflow - Controllable return valve - Valve
	PRESSURE REGULATING VALVE
	Manual Air vent.

Extra explanation:

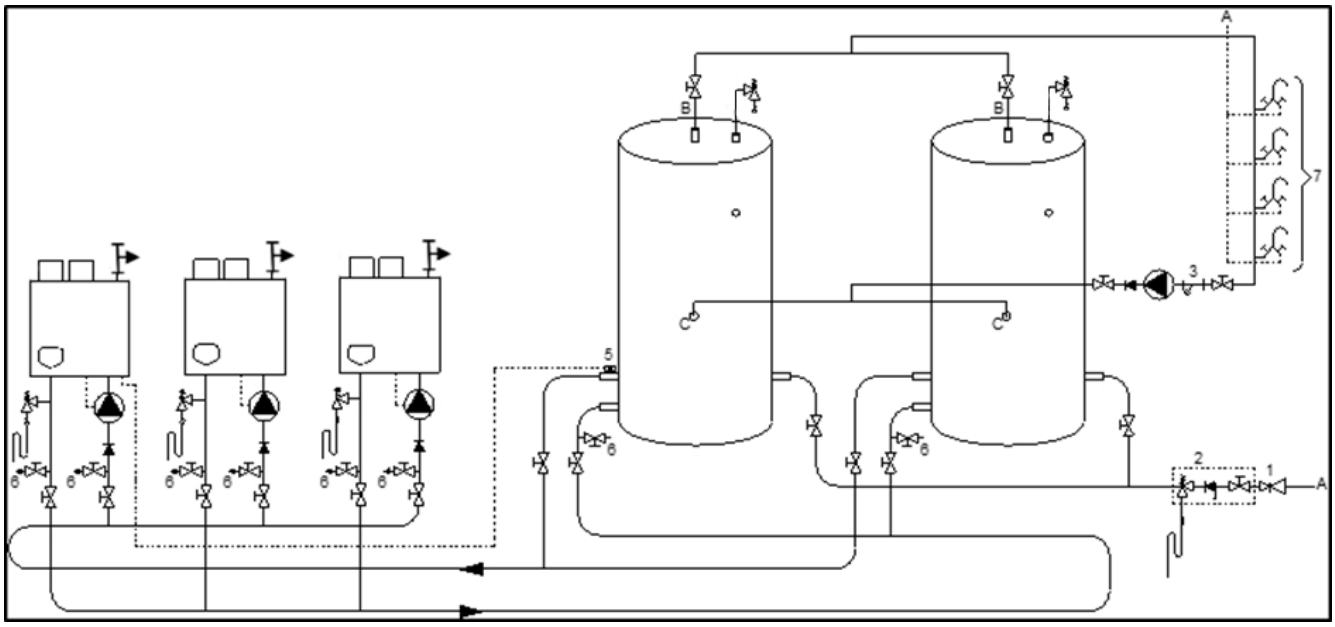
1) Pressure relief valve (mandatory in case service pipe pressure is too high).
2) Inlet combination with valve (mandatory).
3) Apply filter if necessary (recommended)
4) A suitable safety valve must be mounted near the water heater (mandatory) [1]
   This safety valve may never be isolated from the water heater by means of a ball valve
5) Mount remote tank sensor in the screw hole on the return pipe (see picture) (necessary)
   When screwing is not possible, mount the tank sensor on the return pipe as close as possible to the tank [2]
6) Drain valve (recommended)
7) Hot and cold water mixers

A) Cold water inlet (service pipe)
B) Hot water supply circulation
C) Circulation return

9.1.2 CASCADE SET-UP

S-WG+ 35 & 55 water heaters and tanks can be installed cascaded in a number of possible combinations according to the instructions in the next paragraphs.

For advice about all requirements concerning pipe diameters and pump selection consult the factory or your supplier. This will improve both the well-functioning and the life time of your installation.



	PUMP
	NON RETURN VALVE
	VALVE
	SAFETY VALVE
	AUTOMATIC AIR VENT
	FILTER
	INLET COMBINATION - Overflow - Controllable return valve - Valve
	PRESSURE REGULATING VALVE

Example of a combination of three water heaters and two tanks

Extra explanation:

1) Pressure relief valve (mandatory in case water pressure is too high)
2) Inlet combination with valve (mandatory)
3) Apply filter if necessary (recommended)
4) A suitable safety valve must be mounted near the water heater (mandatory) [1]
   This safety valve may never be isolated from the water heater by means of a ball valve
5) Mount remote tank sensor in the screw hole on the return pipe of one tank (see picture) (necessary)
   When screwing is not possible, mount the tank sensor on the return pipe as close as possible to one of the tanks [2, 3]
6) Drain valve (recommended)
7) Hot and cold water mixers

A) Cold water inlet (service pipe)
B) Hot water supply circulation
C) Circulation return

Notes:

- Connections on the water heater side should **always** be executed as drawn in the picture above.
- [1] *Always apply safety components according to all applicable regulations.*
- [2] Sensor mounting: p.t.o.
- [3] In case of more than one tank, mount the tank sensor on one of the tank outlets. The temperature of this tank will be assumed to be representative for all, provided that the installation design is correct.
- In the inlet (return) connection of the water heater no check valve is recommended.
- All designs and tables in the next paragraphs go up to eight water heaters max. If needed, the water heater control can handle up to twelve water heaters.
- For large capacity installations (more than <u>two</u> water heaters) consult the factory or your supplier.

9.2 Control

9.2.1 TANK SENSOR

With the S-WG+ water heater, a threaded sensor or Strap-on pipe sensor is supplied as tank sensor.
On a new water tank, this threaded sensor can be mounted on the return pipe right away.

The use of this threaded sensor is also recommended for existing tank set-ups, because its controlling behavior is more stable than that of the strap-on pipe sensor.

When this threaded sensor is used on an existing tank set-up, a reducing nipple may be needed, to be able to mount the sensor on the return of the tank, provided that this return has a threaded socket, i.e. this tank is not older than from 2008.

On other tanks, generally the supplied threaded sensor cannot be applied; the existing pipe sensor must be kept in use and be connected to the water heater control. Check that this sensor has been placed on one tank return, as close as possible to this tank. Or use an immersion tank sensor NTC 10kohm.



E04.016.677 Threaded sensor (M5x5) with Molex connection.

- Supplied with the water heater, cable with Molex connector included.



E04.016.304 Strap-on pipe sensor.

- Available including connecting cable.

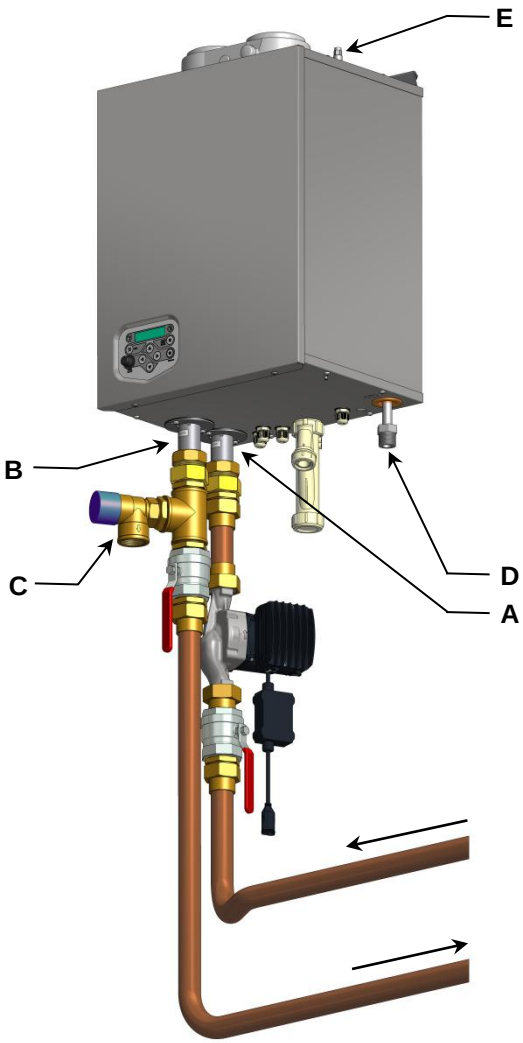
9.2.2 GENERAL CONTROL

- There is no need for a sensor *in* the tank, because when the pump starts to run, the tank sensor of the water heater is measuring the water temperature of the tank.
- When no water is drawn from the tank, the tank sensor is measuring the water temperature in the tank.
- After ending a heat demand, the pump has a post turning time.
- On the control panel, the tank or hot water temperature can be set.
- When an RCW remote wall controller is connected to the wire terminal (13) and (14), the setting of the tank temperature can be done with this controller (Open Therm bus), also the night or weekend reduction of tank temperature.
- During a period of no tapping, the temperature inside the tank is maintained at the Setting temperature automatically.
- A safety control stops the water heater from firing, when the temperature difference between flow and return gets higher than allowed at the actual load (flow monitoring (ΔT function).
- Parameters: the default of the parameters of the water heater control have been set for this type of tanks.

9.3 Water heater and tank: connections and connection sizes

9.3.1 CONNECTING THE TANK TO THE WATER HEATER

- Connect the **pump** by means of couplings and a piece of copper pipe to connection A of the water heater (note the flow direction of the pump).
- Connect both pump cables (Power supply and control) to the right pump connectors. Cables are located at the bottom of the heater (Strapped with a ty-rap)
- Connect the inlet of the pump to the **upper** of the two close above each other located connections of the tank, labelled 'return to water heater'.
- Connect connection B of the water heater to the **lower** of the two close above each other located connections of the tank, labelled 'flow from water heater'. Also, make a tap point in this line at the lowest point.



WATER HEATER CONNECTIONS

A = inlet cold water

B = outlet hot water

C = overpressure safety valve

D = gas

E = Manual air vent

9.3.2 CONNECTING THE TANK TO YOUR DHW INSTALLATION

(See picture on next page →)

- Connect the fresh water supply to the **single** connection C, labelled 'cold in', opposite to A and B which were used for connecting the water heater. For the application of inlet combination, (control) valves, etc. all applicable regulations should be met.
- Connect the DHW connection on top of the tank, labelled 'hot out', to your DHW installation.
- Connect the recirculation line to connection F, labelled 'circulation return', on the side of the tank, at the same height as inlet C.

The tanks have the following DHW connections:

- COLD IN for inlet of fresh water.
- HOT OUT for outlet of DHW.
- water heater return for connection to inlet of water heater.
- water heater flow for connection to outlet of water heater.
- CIRCULATION RETURN for recirculation of DHW from installation to tank.

There are also connections for:

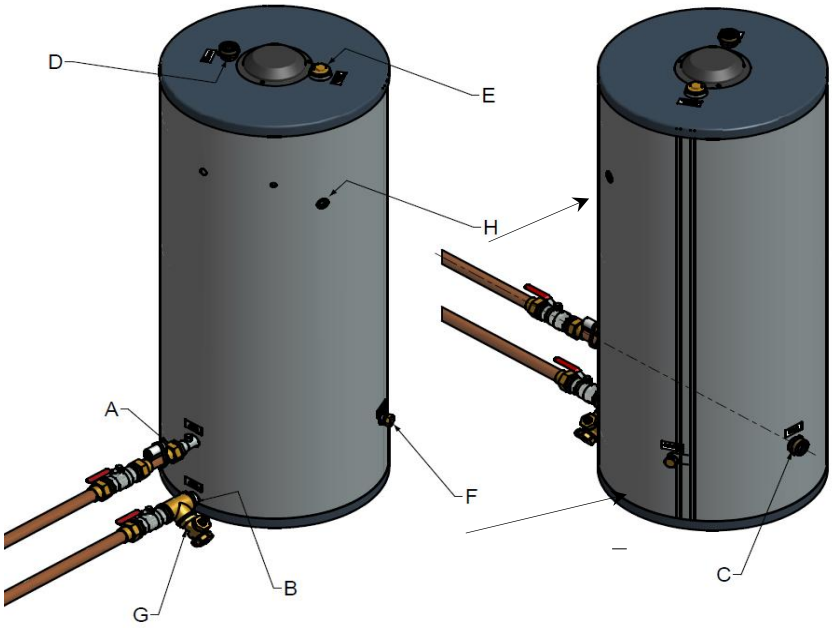
- Thermometer (on the side at ± ¾ of height of the tank)
- Connection for T&P valve (mounted on top) according to the applicable standards and regulations. Even if a T&P valve must be applied, the safety at the water heater's side, on position C (← see previous page), should be maintained at all times.

Tank connection sizes:

Code	Connection	M / F	Remarks	230 L	300 L	500 L	750 L
A	return to water heater	M	incl. reducing ring excl. reducing ring	- R 1"	R 2" R 1½"	R 2" R 1½"	R 2" R 1½"
B	flow from water heater	M	incl. reducing ring excl. reducing ring	- R 1"	R 2" R 1½"	R 2" R 1½"	R 2" R 1½"
C	cold water inlet	M	incl. reducing ring excl. reducing ring	- R 1"	R 2" R 1½"	R 2" R 1½"	R 2" R 1½"
D	DHW outlet	M	incl. reducing ring excl. reducing ring	- R 1"	R 2" R 1½"	R 2" R 1½"	R 2" R 1½"
E	free connection (T&P valve)	F	incl. plug	Rp1½"	Rp 1½"	Rp 1½"	Rp 1½"
F	circulation return	M	incl. cap	R ¾"	R 1½"	R 1½"	R 1½"
G	bleed valve	-	-	-	-	-	-
H	thermometer connection	F	incl. plug	Rp ½"	Rp ½"	Rp ½"	Rp ½"

M = Male / External thread ; F = Female / Internal thread.

The reducing ring is factory-fitted to **D**

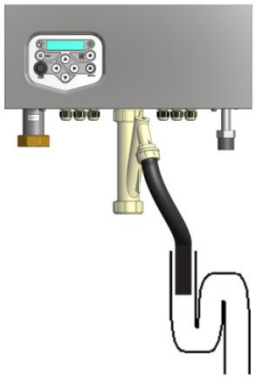


9.3.3 CONDENSATE DRAIN CONNECTION

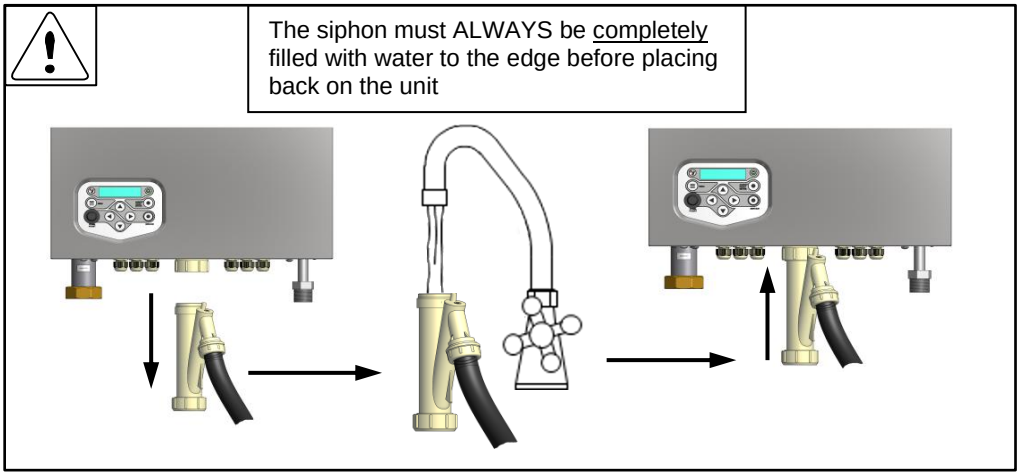
The condensate drain is placed at the center at the bottom of the water heater and has a ¾ inch hose discharge. Connect this flexible hose to the sewer system.
Use only plastic parts with the condensate drain. Metal lines are not allowed.

Blockage of this drain might damage the water heater. 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 water heater.

There should be an open connection between the condensate hose and the sewage system, to make sure that any pressure difference between the two can never affect the condense water level and hence the functioning of the water heater:



open connection



When mounting the bottom part of the siphon, before commissioning the water heater 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 entering the plant room via the condensate drain.

9.3.4 PIPE LENGTH AND DIAMETERS.

When the water heater and tank are separated over some distance, the interconnecting pipes may only have a certain maximum length, dependent of the number of bends and the like components.
For every applied component, a so-called 'equivalent length' is deducted from the total allowed.

Equivalent length:

- Length of the connecting pipes from the water heater' to the tank may not exceed a certain measure. Components, such as bends and the like, contribute to the total length by their so-called 'equivalent lengths'.
- To achieve the new maximum length, the equivalent lengths of the applied components must be deducted from the allowed length without components (first column of the table).

General remark: diameters may never be chosen smaller than specified in the tables; flow must remain guaranteed.

Diameter copper pipe		mm	**35x1,5**	**42x1,5**
maximum straight length +35 flow and return	S-WG+ 35	m	163,5	439,6
maximum straight length +55 flow and return	S-WG+ 55	m	60,2	162,0
equiv. Length 90^0 knee R=0,5xD	S-WG+ 35 & 55	m/knee	1,6	2,0
equiv. Length 90^0 knee R=1xD	S-WG+ 35 & 55	m/knee	0,8	1,0
equiv. Length 45^0 bend R=1xD	S-WG+ 35 & 55	m/bend	0,6	0,7
equiv. Length fully ported ball valve	S-WG+ 35 & 55	m/valve	0,3	0,4

Tanks				
equiv. Length tank 230L	S-WG+ 35	m/tank	36,5	98,1
equiv. Length tank 300/500/750L	S-WG+ 35	m/tank	7,3	19,6
equiv. Length tank 230L	S-WG+ 55	m/tank	33,5	90,0
equiv. Length tank 300/500/750L	S-WG+ 55	m/tank	16,7	45,0

Example calculation:
A project has following specification:
A S-WG+ 55 with tank type 300L Tank. Also 2 x 90^0 bend R=0,5xD and 2 x fully ported ball valve, and copper pipe 35x1,5 mm must be used.

According the table the maximum available pipe length between tank and 35 & 55 is 60,2 m (Return and Flow).
Equivalent length of the tank type 300L is -16,7m (regarding a S-WG+ 55).
Equivalent length of both bends 2 x 90^0 R=0,5XD is 2 x -1,6 = -3,2m.
Equivalent length of both fully ported ball valves is 2 x -0,3 = -0,6m.

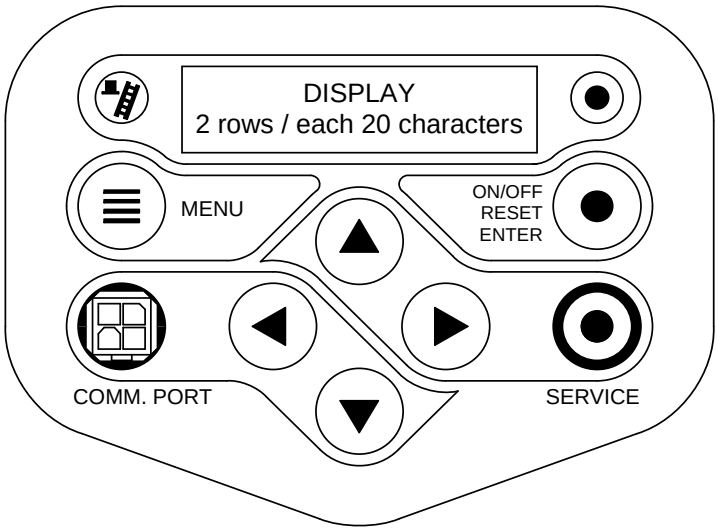
Total equivalent length is -16,7 -3,2 - 0,6 = -20,5 m.
Available length Return and Flow = 60,2 – 20,5= 39,7m.

So, distance between S-WG+ 35 & 55 and Tank is always smaller as 39,7 / 2 = 19,8 meter (Be aware of the vertical pipes).

The applied pump must be controlled only by the S-WG+ water heater control. If, for any reason, an external pump control is applied without written approval of Strebel, then the complete warranty on the water heater and all delivered parts will become invalid.

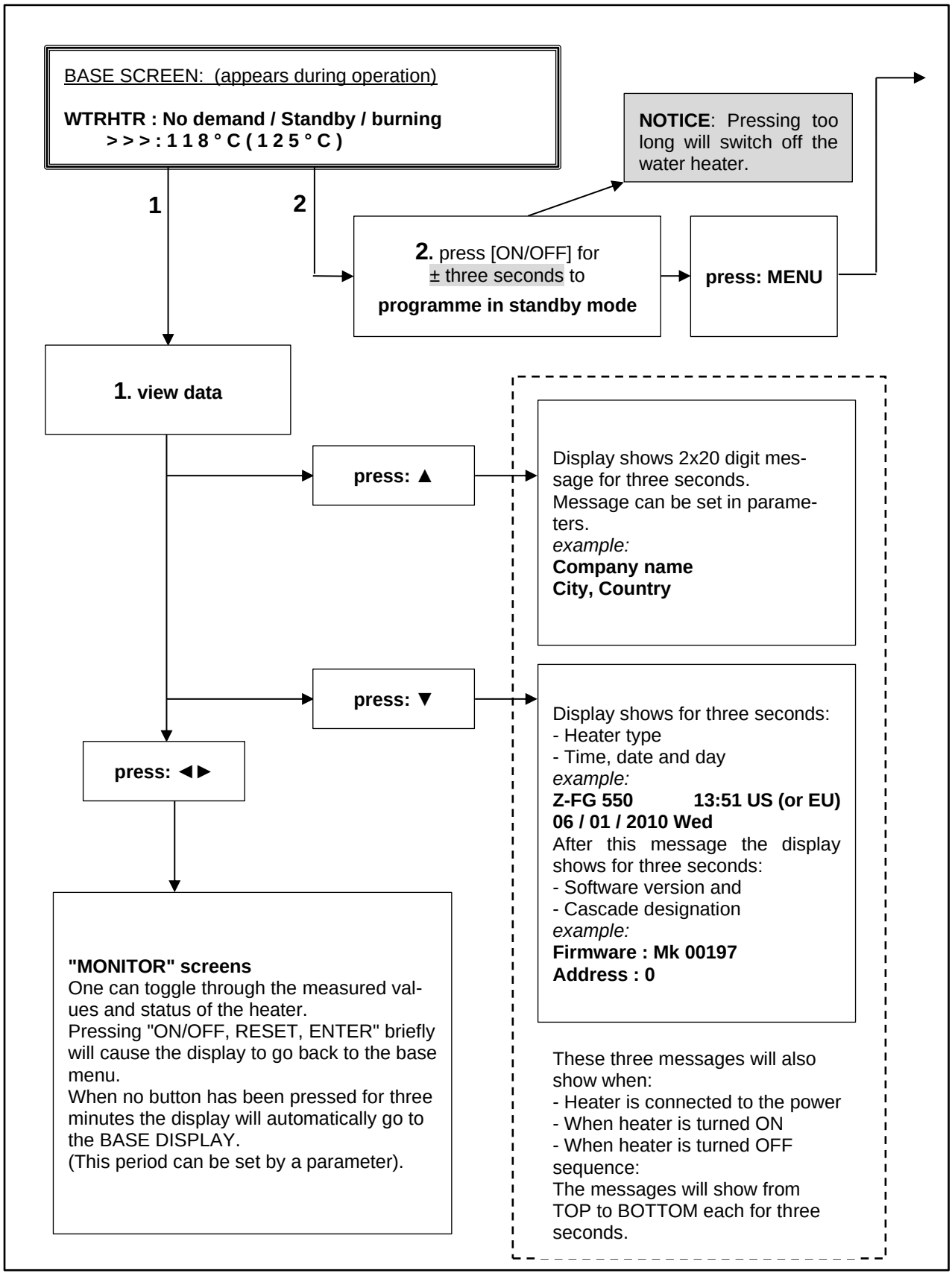
10 USER INTERFACE

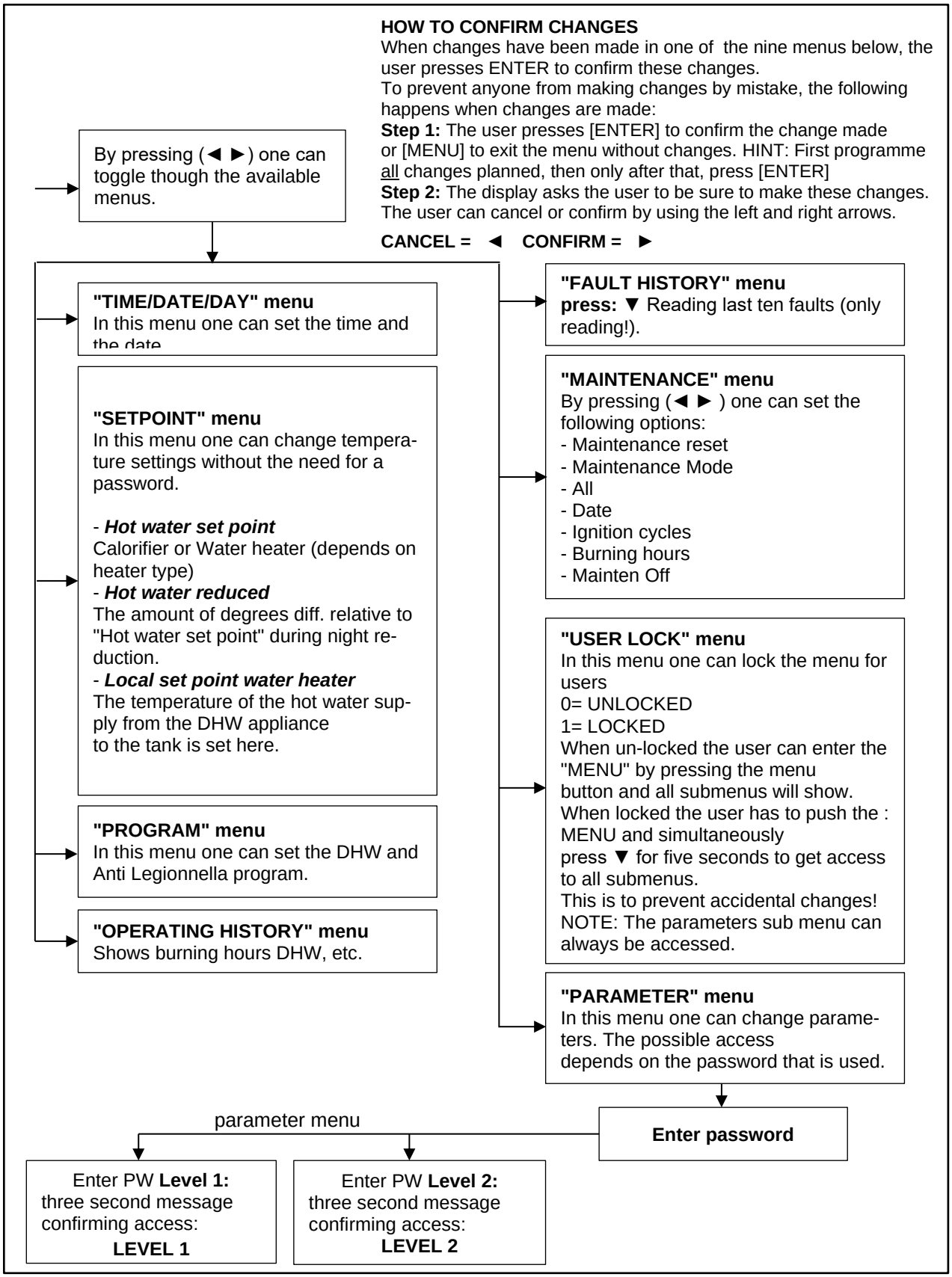
10.1 Control panel / display unit



ON/OFF RESET ENTER	Press and hold for three seconds for stand-by/progr. mode Press and hold for six seconds to switch boiler on/off. Used as RESET and ENTER button when programming.
COMM. PORT	Connector for connecting computer cable.
MENU	Buttons can be pushed to open menu [hold for one second].
◀ ▶ ▼ ▲	Buttons to toggle through measured temperatures. These are also used for navigating through the menus and used for changing values.
SERVICE	Button to activate service function. [hold for three seconds].
	Schornsteinfeger function (only for Germany).
	Light: will light up when controller sees good flame signal. Lights when burner is burning.

10.2 Control panel menu structure




HOW TO CONFIRM CHANGES
When changes have been made in one of the nine menus below, the user presses ENTER to confirm these changes.
To prevent anyone from making changes by mistake, the following happens when changes are made:
Step 1: The user presses [ENTER] to confirm the change made or [MENU] to exit the menu without changes. HINT: First programme all changes planned, then only after that, press [ENTER]
Step 2: The display asks the user to be sure to make these changes. The user can cancel or confirm by using the left and right arrows.
CANCEL = ◄ CONFIRM = ►
By pressing (◄ ►) one can toggle though the available menus.
"TIME/DATE/DAY" menu
In this menu one can set the time and the date
"SETPOINT" menu
In this menu one can change temperature settings without the need for a password.
- Hot water set point
Calorifier or Water heater (depends on heater type)
- Hot water reduced
The amount of degrees diff. relative to "Hot water set point" during night reduction.
- Local set point water heater
The temperature of the hot water supply from the DHW appliance to the tank is set here.
"PROGRAM" menu
In this menu one can set the DHW and Anti Legionnella program.
"OPERATING HISTORY" menu
Shows burning hours DHW, etc.
"FAULT HISTORY" menu
press: ▼ Reading last ten faults (only reading!).
"MAINTENANCE" menu
By pressing (◄ ►) one can set the following options:
- Maintenance reset
- Maintenance Mode
- All
- Date
- Ignition cycles
- Burning hours
- Mainten Off
"USER LOCK" menu
In this menu one can lock the menu for users
0= UNLOCKED
1= LOCKED
When un-locked the user can enter the "MENU" by pressing the menu button and all submenus will show.
When locked the user has to push the : MENU and simultaneously press ▼ for five seconds to get access to all submenus.
This is to prevent accidental changes!
NOTE: The parameters sub menu can always be accessed.
"PARAMETER" menu
In this menu one can change parameters. The possible access depends on the password that is used.
Enter password
parameter menu
Enter PW Level 1:
three second message confirming access:
LEVEL 1
Enter PW Level 2:
three second message confirming access:
LEVEL 2

10.3 Display during operation

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

Display at WATER HEATER / HOT WATER DEMAND

Heat demand type:								Actual status:											
W	A	T	R	H	T	R	:	S	T	A	N	D	-	B	Y				
>	>	>	:	1	2	3	.	4	°	C	(	1	2	3	.	4	°	C	)

cascade communication indicator	setpoint water temp.	temp. measured by tank sensor. Can be turned off by P5 BJ

Explanation "Actual status" screen

Actual status:
B o i l e r o f f
When water heater 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 igniter 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 standby, the [◄] and [►] buttons can be used to show some water heater information, including measured temperatures, settings and data. In the following graphs is explained which values can be shown at the display. When no button is activated for three 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		
T1 Flow	123,9°C	Measured value by the internal flow sensor.
T2 Return	123,9°C	Measured value by the internal return sensor.
	Open	Shown when controller doesn't detect this sensor.
	Shorted	Shown when sensor wires or sensor itself is shorted.

SCREEN: 2		
T3 External	123,9°C	Measured value by the external sensor.
T4 Calorifi	123,9°C	Measured value by the tank sensor.
	Open	Shown when controller doesn't detect this sensor.
	Shorted	Shown when sensor wires or sensor itself is shorted.

SCREEN: 3		
T5 Outdoor	123,9°C	Measured value by the outdoor sensor.
T6 Flue	123,9°C	Measured value by the flue gas sensor.
	Open	Shown when controller doesn't detect this sensor.
	Shorted	Shown when sensor wires or sensor itself is shorted.

SCREEN: 4		
dT FlowReturn	123,9°C	Temp. difference between internal flow & return.
dT FlueReturn	123,9°C	Temp. difference between flue gas & internal return.

SCREEN: 5		
dT ExtReturn	123,9°C	Temp. difference between external & internal return (ΔT LLH).
Signal	Power	External supplied 0-10 Volt dc signal.
	Setpoi	"Power" = power input control or "Setpoi" = set point control.

SCREEN: 6		
Fan speed	9999rpm	Actual fan speed in rpm.
Fan speed	100%	Actual fan speed % of maximum allowable fan speed.

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 its design.

SCREEN: 7		
Flamesignal	100µA	Flame signal given in µA.
WaterPressur	1,0bar	Shows water pressure when sensor is connected.

SCREEN: 8		
Pump1 Heater	Off	Pump 1 (HEATER PUMP) On or Off.
Pump1 Signal	100%	Modulating signal Pump 1 in (%).

SCREEN: 9		
Pump2 Calori	Off	Shows when the calorifier pump is "ON" or "OF".
3-way Valve	Heating	Signal to the 3-way valve: "HEATING" or "HOTWATER".

SCREEN: 10		
Pump3 System	Off	Shows when the system pump is "ON" or "OF".
hh:mm DD/MM/YYYY	Day	hh=hour; mm=minutes; DD=day; MM=month; YYYY=yr; Day of the week

SCREEN: 11	
Casc Design 0	0 = MASTER, 1 ..... 11 = SLAVES
Casinf 0123456789AB	Displays number, priority and state of cascade water heaters.

DESCRIPTION "CASCINFO" Screen 11

Shows the number of water heaters connected with the cascade. The master/lead water heater is designated as 0. Slave/lag water heaters will be designated 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B. When a "-" is used instead of a number, then that water heater 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 water heater is connected, but in lockout mode.
When the number is flashing, then that water heater is providing heat to the cascade. When the leading water heater is changed according to the set priority change time, then that water heater's address will be shown first in the row of numbers.

Example 1: "3 4 5 - - - - - - 0 1 2"
There are six water heaters present and nr. 3 has priority.

Example 2: "3 4 x - - - - - - 0 1 2"
There are six water heaters present and nr. 3 has priority. Water heater 5 is present, but in a lock-out.

SCREEN: 12	
Casc Power 999% 999%	% heat demand of total (cascade) power available (%).
Dual Burner: No	One heat exchanger equipped with two burners: "Yes" or "No".

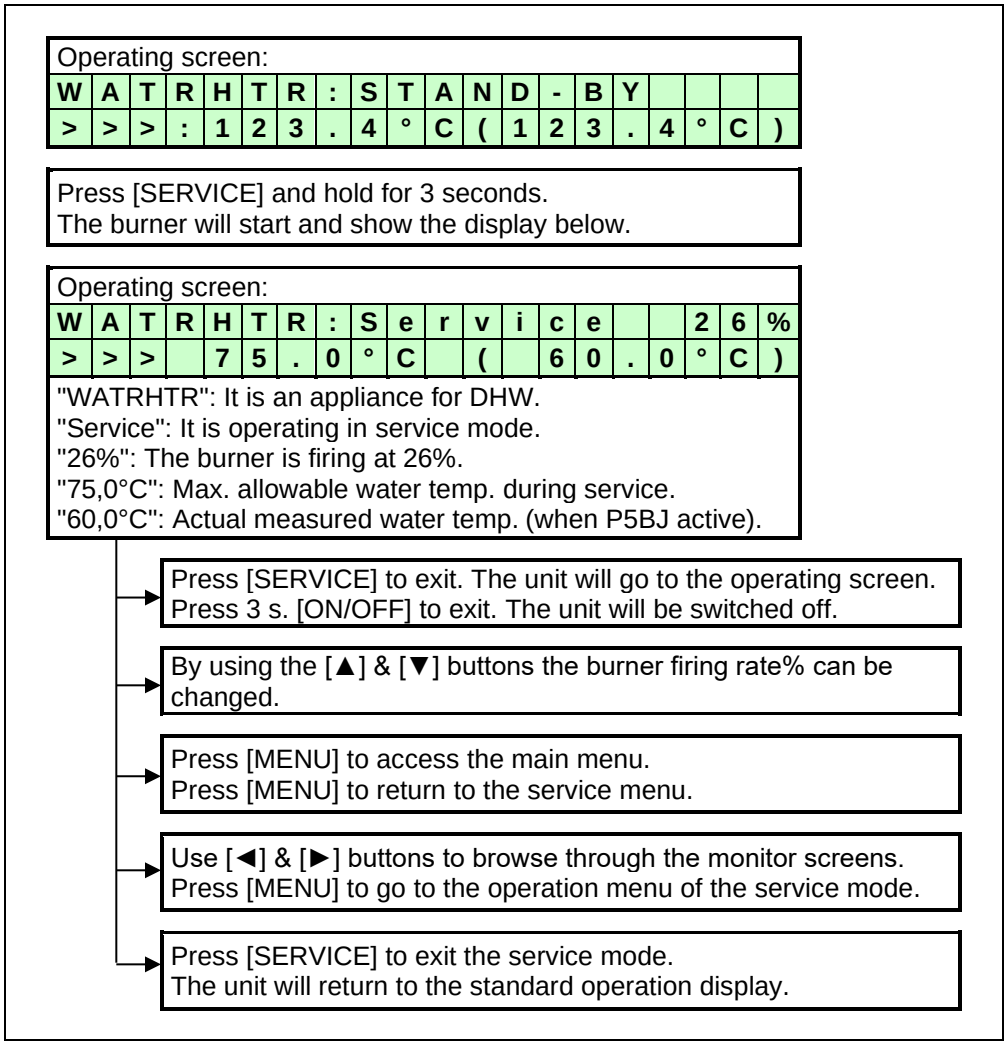
SCREEN: 13	
Max Therm Open	Status of the maximum thermostat: "Open" or "Closed".
Gen Block Closed	Status of the general blocking contact: "Open" or "Closed".

SCREEN: 14	
Siphon press Closed	Status of the siphon pressure switch: "Open" or "Closed".
NRV Contact Open	Status of the non-return valve contact: "Open" or "Closed".

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

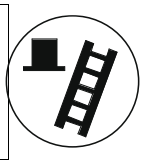
10.5 Service function

The following graphs describe how to use the service function.



10.6 Schornsteinfeger function

The purpose of this function is to have an easy interface for the "Schornsteinfegers" in Germany, to be able to do their required testing on the water heater. This is a simplified function similar to the normal service function of the water heater. The standard factory setting for this function is “OFF”., use parameter P5BK to set this function to on.



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 water heater 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 water heater pump and system pump are running.

10.7 Programming in standby mode

Standby
Use the standby mode for modifying water heater settings without interaction with the water heater 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 ON: pumps, fans and cascade are operational, recirculation and frost protection are active.

How to program the water heater:

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

Display message	W A T R H T R : b o i l e r _ o f f _ _
	> > > : 1 2 3 . 4 ° C (1 2 3 . 4 ° C)

- Program the water heater at the control panel (see the following sections).
- HINT: First program all changes planned, then only terminate programming mode by pressing [MENU], or [ENTER] and NO ◄ or YES ►.
- Reactivate the water heater by pressing [ON/OFF] for three seconds again.

10.8 Setting the time & date

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

Operating screen:
W A T R H T R : b o i l e r _ o f f _ _
> > > : 1 2 3 . 4 ° C (1 2 3 . 4 ° C)

Press [MENU]

Main menu screen:
M a i n _ M e n u _ _ _ _ _ _ _ _ _ _ _
C l o c k _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

The display shows "CLOCK" press [ENTER]

Setting Time and Date:
S e t _ t i m e / d a t e _ 0 8 : 3 3 _
3 0 / 0 3 / 2 0 1 0 _ T u e _ _ _ _ _ _

The day is now blinking/selected and can be changed.
Use [▲] & [▼] to change the value.
Use [◄] & [►] to select another value.

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

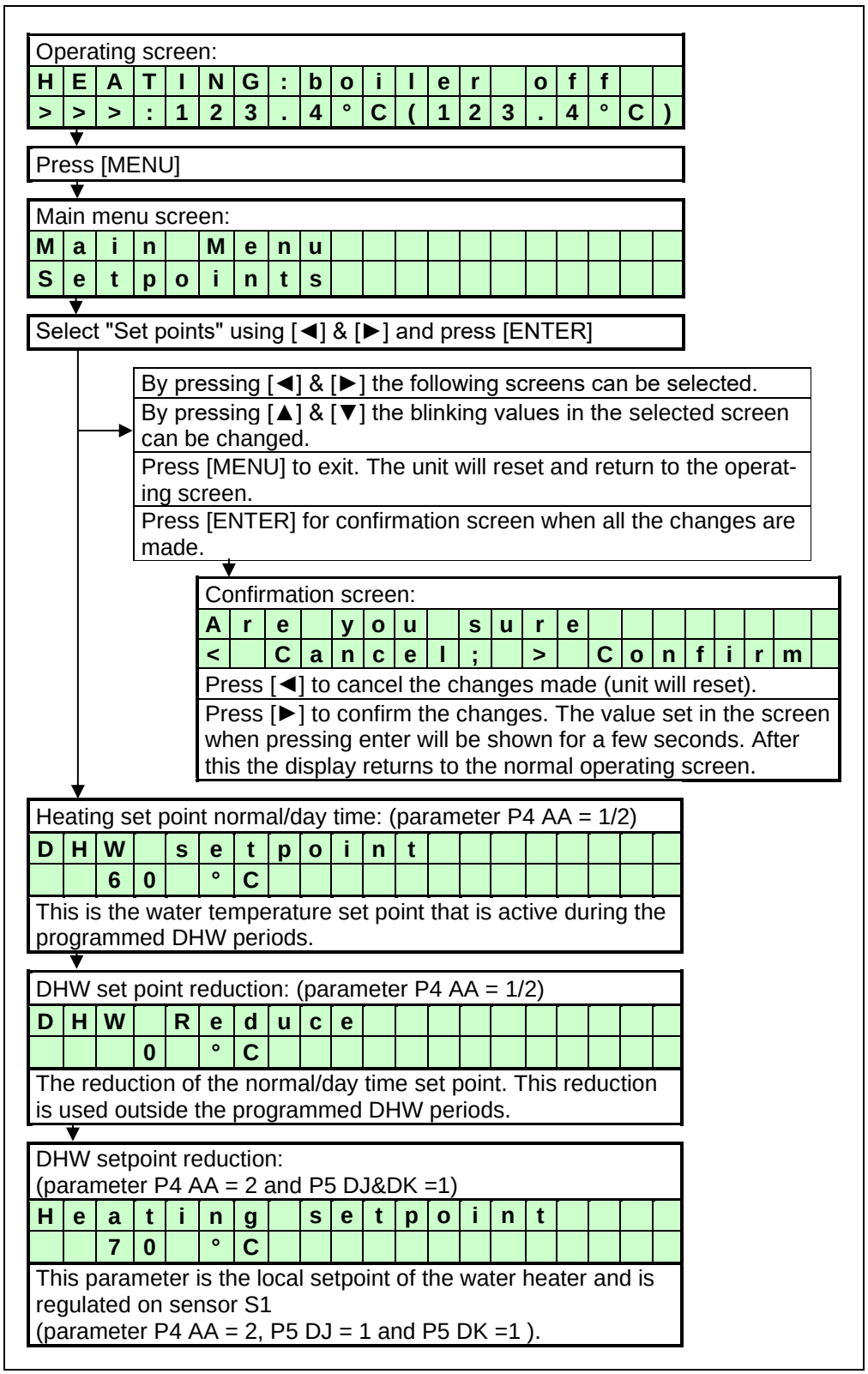
Confirmation screen:
A r e _ y o u _ s u r e _ _ _ _ _ _ _ _
< C a n c e l ; _ > C o n f i r m _ _ _

Press [◄] to cancel the changes made (display goes back to operating screen).

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.

10.9 Set points

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



BE AWARE:
The value set at “Heating Setpoint” has to be equal or higher as the value set at “DHW Setpoint”
“Heating Setpoint” sets the maximum possible flow temperature of the heater (The maximum temperature of the water to the tank).

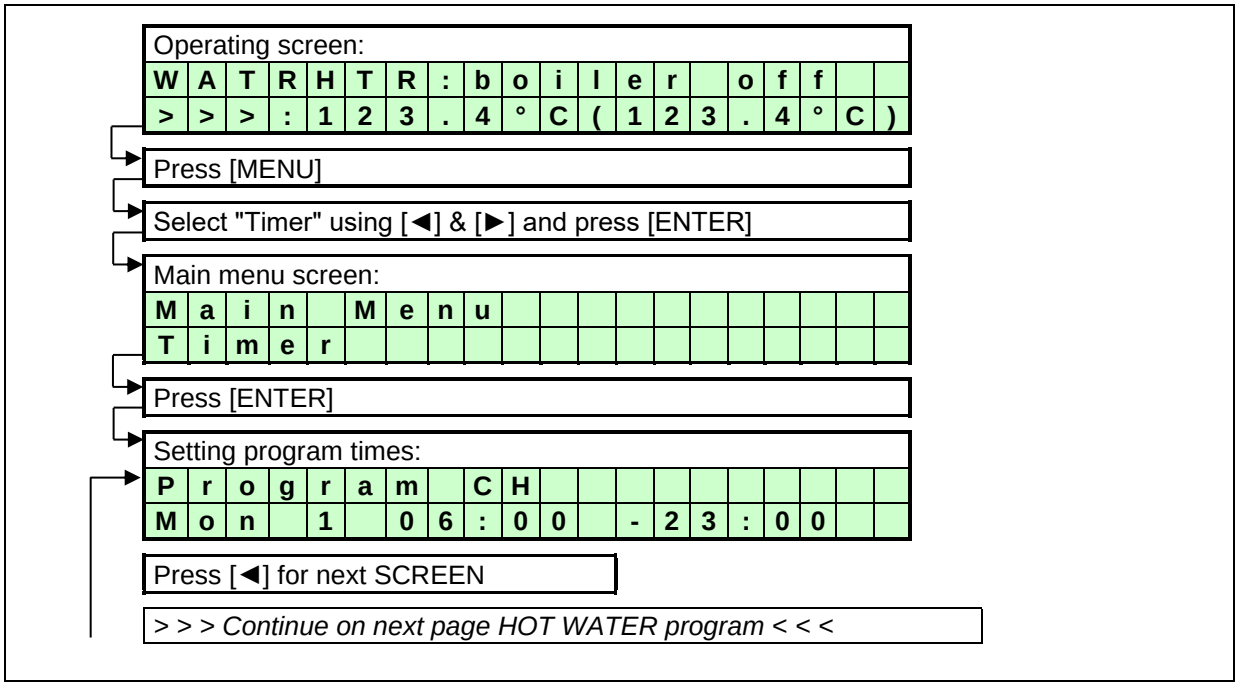
10.10 Setting the timer programs

Two different programs can be set with the water heater, these are:

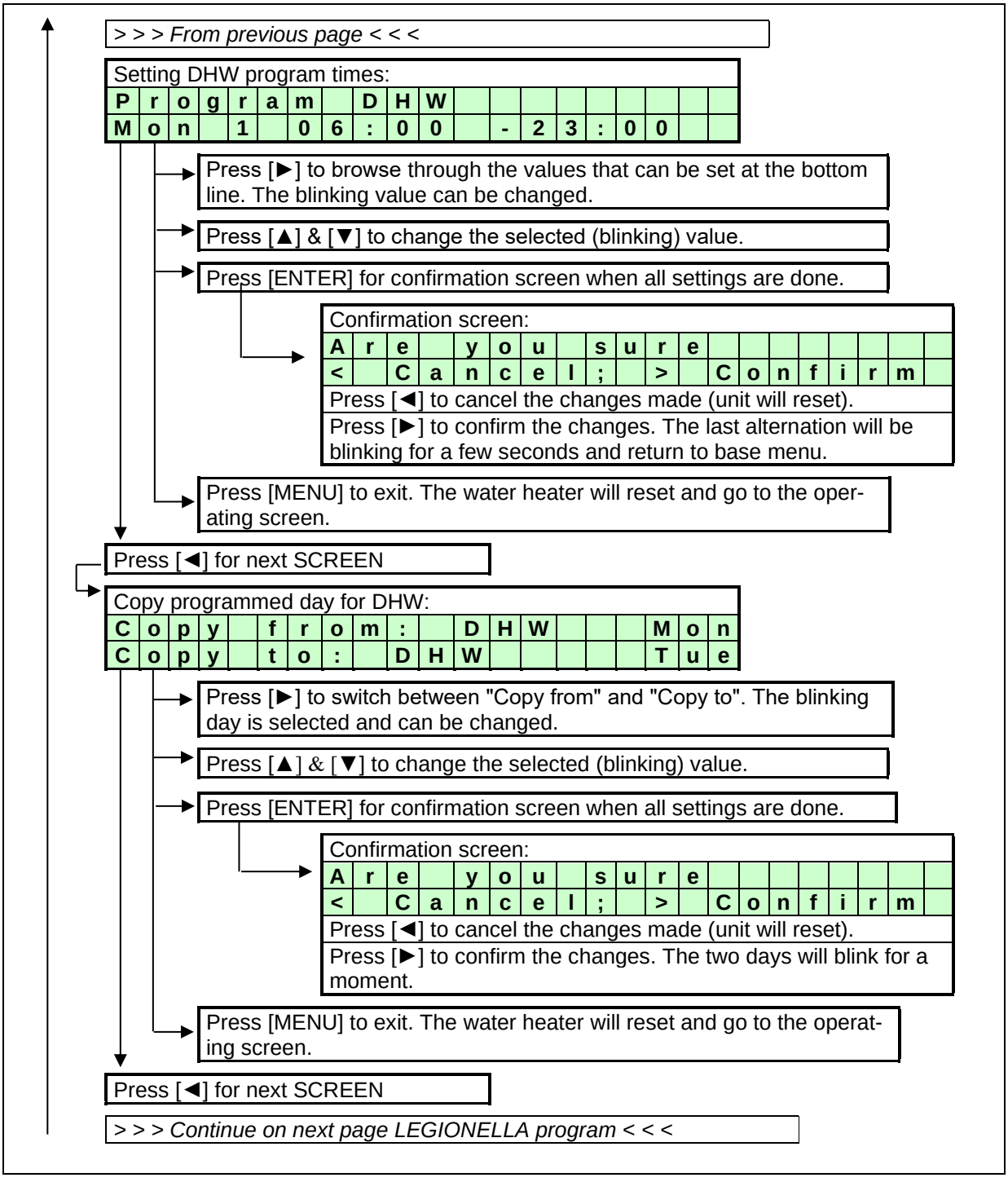
- DHW program
- Anti-Legionnaires' disease (pasteurization) program

START PROGRAMMING

Three programmed periods each day can be set (period 1, 2 and 3). During this period, the unit will use the normal DHW set point. 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 --:-- ---:--"**).

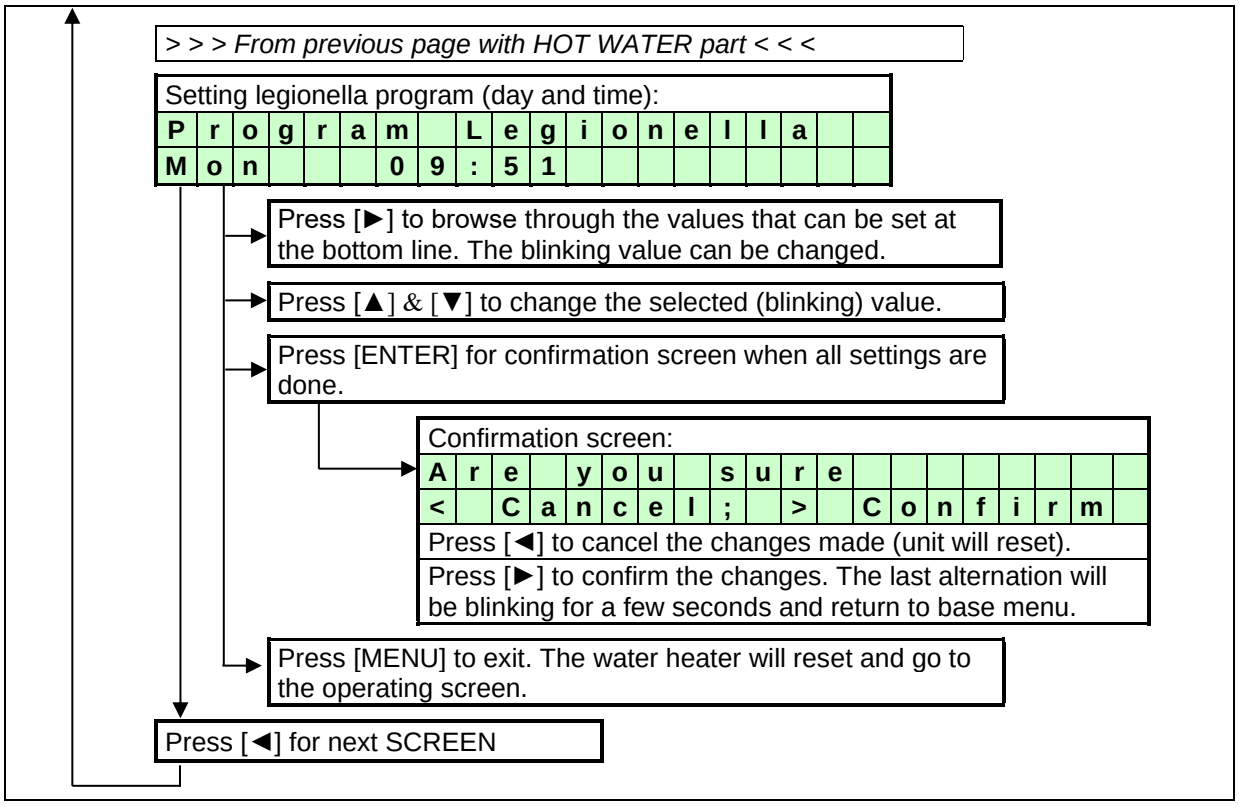


HOT WATER PROGRAM



ANTI LEGIONNAIRES' DISEASE PROGRAM

See the following description. The standard factory setting for this function is "OFF".



10.11 Checking the operating history

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

Operating screen:																		
W	**A**	**T**	**R**	**H**	**T**	**R**	**:**	**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 water heater 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**	**F**	**i**	**a**			**1**	**0**	**0**	**0**	**0**	**0**
S	**s**	**l**	**1**	**0**	**0**	**0**	**0**	**0**	**S**	**s**	**t**			**1**	**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**)

10.12 Checking the fault history

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

Operating screen:																	
W	**A**	**T**	**R**	**H**	**T**	**R**	**:**	**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 ▼

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 10 faults.

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

The fault menu shows the last 10 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 water heater (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.

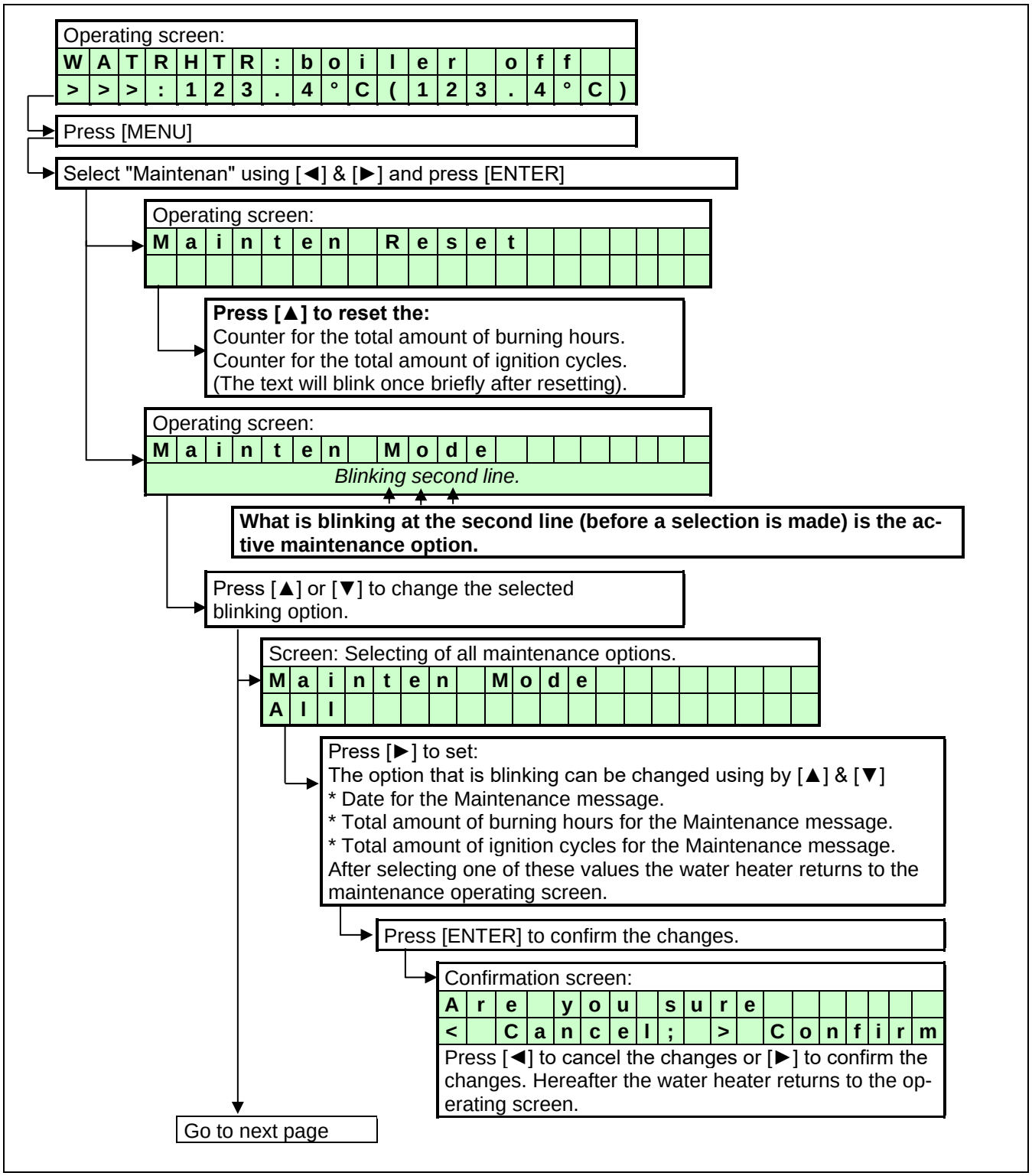
10.13 Setting the maintenance specifications

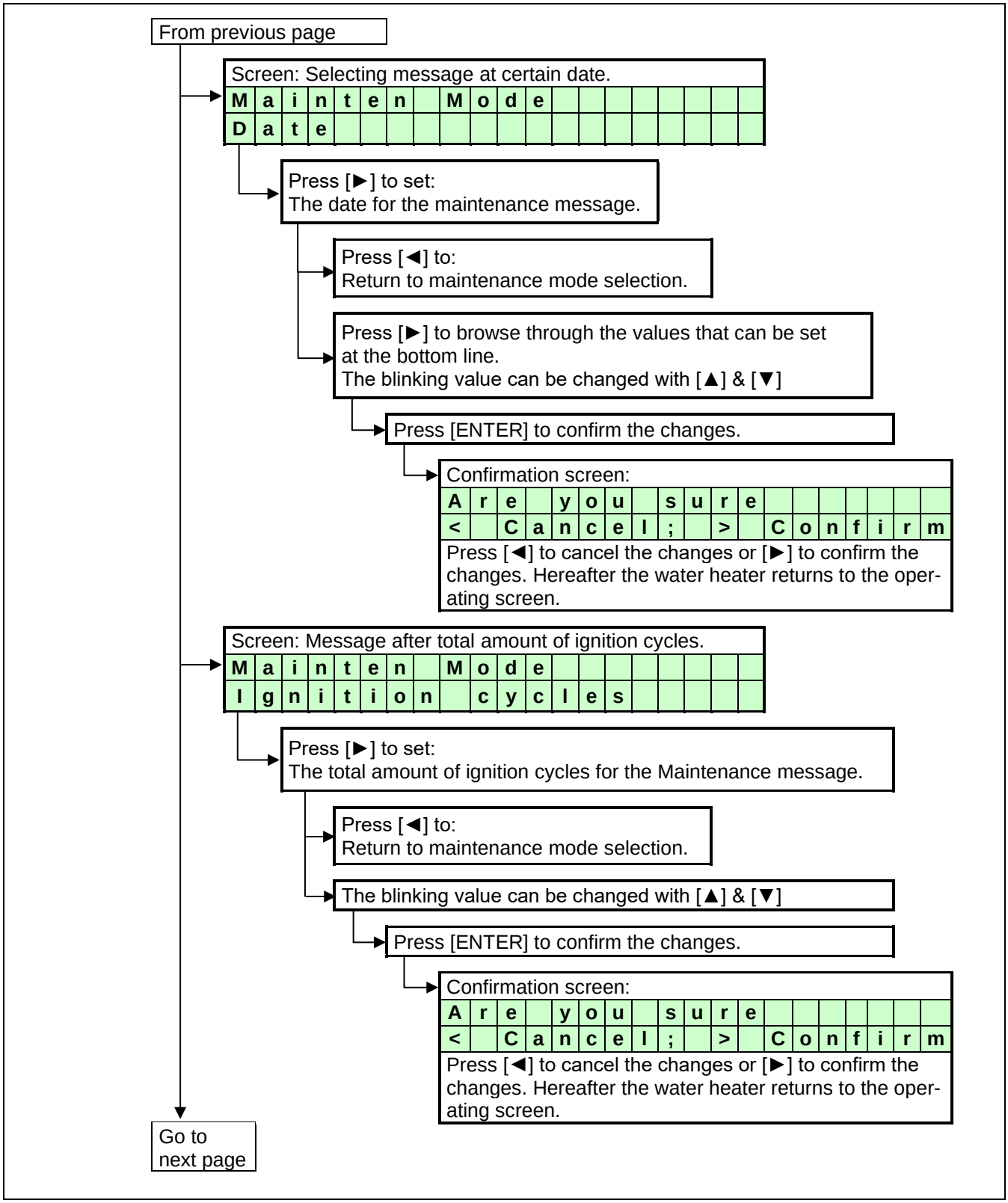
MAINTENANCE SETTINGS

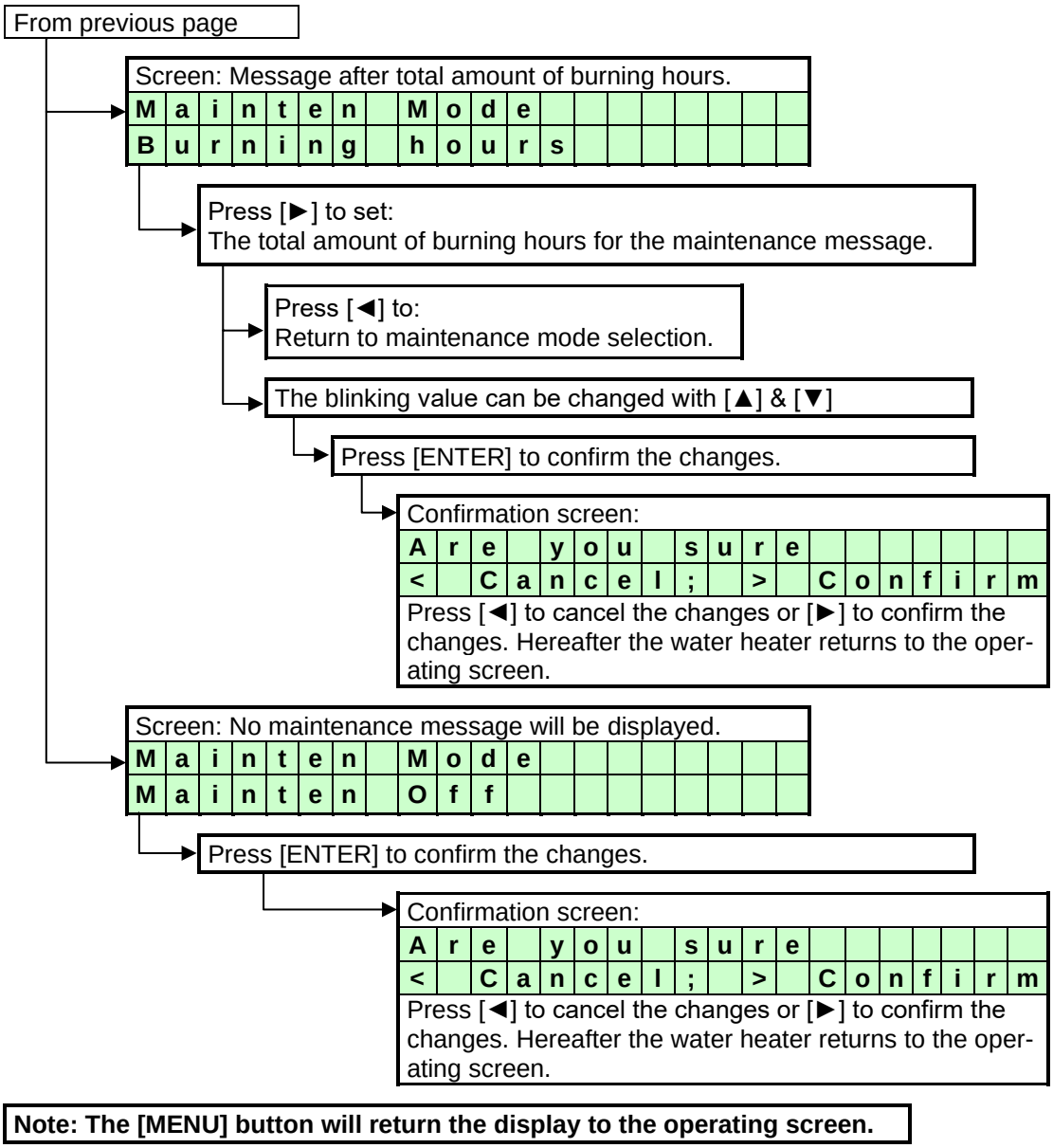
The unit can be programmed in such a way that an automatic maintenance message is displayed.
There are three options that can be selected. A maintenance message appears after:

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

A single option can be activated or all three options.




From previous page
Screen: Selecting message at certain date.
Maintenn Mode
Date
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:
Are you sure
< Cancel; > Confirm
Press [◄] to cancel the changes or [►] to confirm the changes. Hereafter the water heater returns to the operating screen.
Screen: Message after total amount of ignition cycles.
Maintenn Mode
Ignition cycles
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:
Are you sure
< Cancel; > Confirm
Press [◄] to cancel the changes or [►] to confirm the changes. Hereafter the water heater 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 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.

10.14 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 water heater can be locked for (end-) users. 0 = UNLOCKED 1 = LOCKED
When the water heater is unlocked, the user can enter the MENU by pressing the menu button and all screens will show up.
When the water heater 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	:	b	o	i	l	e	r		o	f	f		
>	>	>	:	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 water heater and the water heater will return to the operating screen. Changes will be neglected in this case.

10.15 Setting the parameters at the control panel

The functions of the controller are embedded in de 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			PARA-METER	DESCRIPTION	UNITS	TEXT DISPLAY	LEVEL 1 Modify
HEATING	A	1	P5BE	Step modulation (1=on 0=off)	-	Step modulation	no
		2	P5AO	Blocking offset flow temperature control	°C	HE s Of ff 13	yes
		3	P5AP	Proportional range temperature control	°C	HE s Pr rb 13	no
		4	P5AL	Hysteresis CH Flow temperature control	°C	HE sc Di ff 13	yes
		5	P2IC	Integration time temperature control	s	HE s In tt 13	no
		6	P2MI	Blocking offset System CH temperature control	°C	HE c Of ff 3	yes
		7	P2MJ	Proportional range System CH temp. control	°C	HE c Pr rb 3	no
		8	P2MK	Integration time CH temperature control	s	HE c In tt 3	no
		9	P5AB	Timer Contact (1=on)	-	Timer Contact	yes
DHW	B	1	P4AB	DHW Pump Config 0=Pump 1=TWV	-	DHpmp/twv	yes
		2	P5CB	Flow temperature DHW tank low	°C	DHiflow L O	yes
		3	P5CK	Flow temperature DHW tank hi	°C	DHiflow H I	yes
		4	P5CL	Low Flow temperature time DHW	min	DHi LOtime	yes
		5	P5CD	Legionella temperature	°C	Legio tempe	no
		6	P5CI	Legionella hyst DHW tank temperature	°C	Legio hyst	no
		7	P5CJ	Legionella hold time (0=off)	min	Legio hold d	no
		8	P2KI	CH interrupt by Legionella (0=yes)(1=no)	-	Legio int r	no
		9	P2LC	Regulation temperature offset DHWd	°C	DHdsc Of ff 2	yes
		A	P2MN	Proportional range DHWd modulation	°C	DHdsc Pr rb 23	no
		B	P2LD	Regulation temperature hysteresis DHWd	°C	DHdsc Di ff 2	yes
		C	P2MO	integration time DHWd modulation	s	DHdsc In tt 23	no
		D	P2ML	Sys temp blocking offset DHW tank	°C	DHdsc Of ff 3	yes
		E	P2MM	Sys temp blocking hysteresis DHW tank	°C	DHdsc Di ff 3	yes
		F	P5CA	Hysteresis DHW tank temperature	°C	DHisc Di ff 4	yes
		G	P2KH	Gradient heat demand detect DHW tank temp.	°C	DHidetg rad	yes
CASCADE	C	1	P2MA	Max number extra heaters	-	MaxCascUnt	no
		2	P5DA	Bus address heater	-	Bus adress	no
		3	P5DC	Dhw on entire cascade(0) only master(1)	-	DHicas/mas	no
		4	P5DE	Extra Heater output enable(1)	-	Extra unnit	yes
		5	P5DF	Cascade detection (0=standalone 1=Leader)	-	Cas Si/Ma	no
		6	P5BL	Power off total cascade (1)	-	Pwr OffTo Ca	no
		7	P5DB	Number of heaters with common flue 0=None	-	Comflu Nu um	no
GENERAL	D	1	P5BB	Analogue input Config (0=off 1=temp)	-	An Inp Co n	yes
		2	P5AI	Minimum Temperature 0-10V input	°C	0-10 Min Tm p	yes
		3	P5BI	Altitude (in amounts of 100 ft.)	ft*100	Alt *100 ft	yes
		4	P2LK	Max cooling time	min	Max Cool Tim m	yes
		5	P5BJ	Temperature display 1=on	-	Temp Onoff p	yes
		6	P4AA	DHW 0=off 1=Indirect 2=Direct	-	DHW 1=In 2=Di d	no
		7	P4AD	pressure 0=off 1=sensor and 2=switch	-	conf igg	no
		8	P4BD	Gas type values 0-2	-	gas type e	no
		9	P4BE	Soft start type values 0-2	-	conf igg	no
		A	P5BN	Pump modes 0-3	-	conf igg	no

For extensive explanation see Ch. 0: ‘Controlling options and settings’.

IMPORTANT: Do not change the parameters P4AA, P4AD and P5BI; they are present in the controller for different purposes than DHW control. Changing these parameters may affect water heater operation negatively and can cause unsafe situations.

Parameter screens + concise explanation see next pages →

Operating screen:

W	A	T	R	H	T	R	:	b	o	i	l	e	r		o	f	f		
>	>	>	:	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	l	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 number 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.

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

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

Select the cascaded heaters supply temperature control.
This parameter is the offset of the selected CH supply temperature of EACH water heater of the total cascade.

Menu A: Heating

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

Select the cascaded water heaters supply temp. control.
This parameter is the proportional range of the selected CH supply temperature of EACH water heater of the total cascade and of the external (cascade) sensor.

Menu A: Heating

	A	**8**				**H**	**E**			**c**	**l**	**n**	**t**		**3**			
										8	**0**		**S**	**e**	**c**			

Select the cascaded water heaters supply temp. control.
This parameter is the integration time of the selected CH supply temperature of EACH water heater 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 water heater 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 water heater. 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 water heater. This parameter is the CH supply temperature HIGH level 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	**4**				**D**	**H**	**i**		**L**	**O**	**t**	**i**	**m**	**e**			
											1		**M**	**i**	**n**			
Hot water function of the water heater. This parameter is the selectable period after which the water heater switches from LOW to HIGH set point with an indirect hot water demand.																		

Menu B: Hot water																		
	B	**5**				**L**	**e**	**g**	**i**	**o**		**t**	**e**	**m**	**p**			
										8	**5**		**°**	**C**				
Pasteurization function of the water heater. This parameter is the selected hot water temperature during the pasteurization function of the water heater.																		

Menu B: Hot water																		
	B	**6**				**L**	**e**	**g**	**i**	**o**		**h**	**y**	**s**	**t**			
											2		**°**	**C**				
Pasteurization function of the water heater. This parameter is the selected hysteresis during the pasteurization function of the water heater.																		

Menu B: Hot water																		
	B	**7**				**L**	**e**	**g**	**i**	**o**		**h**	**o**	**l**	**d**			
											2		**M**	**i**	**n**			
Pasteurization function of the water heater. This parameter is the selected time period for the pasteurization function of the water heater.																		

Menu B: Hot water																		
	B	**8**				**L**	**e**	**g**	**i**	**o**		**i**	**n**	**t**	**r**			
											0							
Pasteurization function of the water heater. This parameter controls if the CH demand can be interrupted by the pasteurization function of the water heater. 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 heater. This parameter is de off set of the selected HW temperature of the water heater.																		

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 heater. This parameter is the proportional range of the selected HW temperature of the water heater.																		

Menu B: Hot water																		
	B	**B**				**D**	**H**	**d**	**s**	**c**	**D**	**i**	**f**	**2**				
										1	**0**		**°**	**C**				
Function for the direct hot water heater. This parameter is the hysteresis of the selected HW temperature of the water heater.																		

Menu B: Hot water

	B	**C**				**D**	**H**	**d**	**s**	**c**	**I**	**n**	**t**	**2**	**3**			
									2	**0**	**0**		**S**	**e**	**c**			

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

Menu B: Hot water

	B	**D**				**D**	**H**	**d**	**s**	**c**	**O**	**f**	**f**	**3**				
											4		**°**	**C**				

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

Menu B: Hot water

	B	**E**				**D**	**H**	**d**	**s**	**c**	**D**	**i**	**f**	**3**				
											8		**°**	**C**				

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

Menu B: Hot water

	B	**F**				**D**	**H**	**i**	**s**	**c**	**D**	**i**	**f**	**4**				
											5		**°**	**C**				

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

Menu B: Hot water

	B	**G**				**D**	**H**	**i**	**d**	**e**	**t**	**g**	**r**	**a**	**d**			
											3		**°**	**C**				

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

Menu C: Cascade

	C	**1**				**M**	**a**	**x**	**C**	**a**	**s**	**c**	**U**	**n**	**t**			
										1	**1**							

Function for the cascading of the water heater(s).
This parameter sets the total number of cascaded water heaters (max. twelve water heaters).

Menu C: Cascade

	C	**2**				**B**	**u**	**s**		**a**	**d**	**r**	**e**	**s**	**s**			
											0							

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

Menu C: Cascade

	C	**3**				**D**	**H**	**i**	**c**	**a**	**s**	**/**	**m**	**a**	**s**			
											0							

Function for the cascading of the water heater(s).
This parameter determines if only the Master water heater or all water heaters 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

C4	Extra unit
	0

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

Menu C: Cascade

C5	Cas Si/Ma
	0

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

Menu C: Cascade

C6	PwrOffToCa
	0

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

Menu C: Cascade

C7	ComFluNum
	0

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

Menu D: General

D1	0-10Vcontr
	0

Function for the external control of the water heater 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 (NOT possible for Consul+)

Menu D: General

D2	0-10MinTmp
	20 °C

Function for the external control of the water heater 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

D3	Alt * 100f
	0

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

Menu D: General

	D	**4**				**M**	**a**	**x**	**C**	**o**	**o**	**l**	**T**	**i**	**m**			
											2		**M**	**i**	**n**			

Function for setting the maximum overrun time of the fan (maximum 10 minutes).
0 = Switch off

Menu D: General

	D	**5**				**T**	**e**	**m**	**p**	**O**	**n**	**D**	**i**	**s**	**p**			
											1							

Function to show the (measured) temperature of the water heater at the display.

Menu D: General

	D	**6**				**D**	**H**	**W**		**1**	**=**	**i**	**2**	**=**	**d**			
											1							

Function to set up the CH and HW boiler options.
0 = CH only (direct)
1 = CH/HW function (indirect)
2 = HW only (direct)
For Consul+ this parameter has been set 2.

Menu D: General

	D	**7**				**c**	**o**	**n**	**f**	**i**	**g**							

Function for the setting of the water pressure.
Up to 4 bar a sensor is used, up to 6 bar a switch.
0 = off
1 = sensor
2 = switch

Menu D: General

	D	**8**				**g**	**a**	**s**	**t**	**y**	**p**	**e**						

Function to select the gas type (according to EN 437)
0 = standard
1 = G31
2 = Do NOT use.

Menu D: General

	D	**9**				**c**	**o**	**n**	**f**	**i**	**g**							

Function for setting the 'soft start' option
0 = normal start-up
1 = reduced fan ramp-up speed (I)
2 = reduced fan ramp-up speed (II)

Menu D: General

	D	**A**				**c**	**o**	**n**	**f**	**i**	**g**							

Function: Pump mode
0 = normal
1 = relay **1**, connector 19 and 20 (lock-out)
2 = relay **2**, connector 21 and 22 (burner burning)
3 = relay **3**, connector 23 and 24 (heat demand)
4 = Do not use (reserved for future applications).

10.16 Fault codes display

The following graphs describe the lock out codes of the water heater. A lock out code can only be removed by a manual reset of the water heater. NOTICE: Before resetting the water heater always check the water heater, DHW system and all components corresponding to the related lock out description. Never just reset the water heater, before analyzing the possible cause of failure.

10.16.1 LOCK-OUT CODES

Having a lockout means that the water heater needs a manual reset to start operating again.
When the water heater is in lockout the backlight of the display is blinking on and off.

Explanation > **999,5:hrs** = time elapsed after fault & message.

Explanation > **Pump1 on** = status of the pump during fault.

Display message	**Failed burner start**
F8	**pump on 999,5 hrs**

Reason Water heater is not starting after the programmed starting attempts.

Display message	**False flame signal**
F10	**pump on 999,5 hrs**

Reason Flame signal is detected while it cannot be expected.

Display message	**Fan speed incorrect**
F11	**pump on 999,5 hrs**

Reason The controller does not detect a correct fan speed.

Display message	**Flame lost**
F9	**pump on 999,5 hrs**

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

Display message	**Flow high Temp**
F1	**pump on 999,5 hrs**

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

Display message	**FlowReturn dt fault**
F16	**pump on 999,5 hrs**

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

Display message	**Flow sensor error**
F0	**pump on 999,5 hrs**

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

Display message	**Flue sensor error**
F6	**pump on 999,5 hrs**

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

Display message	**Flue temp too high**
F7	**pump on 999,5 hrs**

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

Display message	**Param/Hard w fault**
F13	**pump on 999,5 hrs**

Reason Fault during programming of the water heater software parameters.

Display message	p	r	o	g	r	a	m	m	i	n	g		e	n	d					
F12	p	u	m	p		o	n					9	9	9	,	5		h	r	s

Reason Software parameters have been programmed.

Display message	R	e	t	u	r	n		h	i	g	h		T	e	m	p				
F1	p	u	m	p		o	n					9	9	9	,	5		h	r	s

Reason The maximum return temperature as set in the parameters is exceeded.

Display message	R	e	t	u	r	n		s	e	n	s	o	r		e	r	r	o	r	
F3	p	u	m	p		o	n					9	9	9	,	5		h	r	s

Reason Return sensor not detected caused by faulty connection/sensor.

Display message	S	i	p	h	o	n		s	w	i	t	c	h							
F19	p	u	m	p		o	n					9	9	9	,	5		h	r	s

Reason The pressure switch detects a high pressure in the flue/siphon system.

Display message	W	a	t	e	r		h	i	g	h		l	i	m	i	t				
F17	p	u	m	p		o	n					9	9	9	,	5		h	r	s

Reason Maximum thermostat (clixon) measured a too high flow temperature.

10.16.2 BLOCKING CODES

The following graphs describe the blocking codes of the water heater. A blocking code is a temporary blocking of the water heater, because of an extraordinary situation. The water heater will continue to operate after stabilisation of this situation.

The display is not blinking, but is lightened up during the blocking period.
The water heater is blocking an action because of an extraordinary situation. This action will be continued after elimination of the extraordinary 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 quick after the last demand.

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 cascaded water heaters causes an error, because of a lock out.

Display message	D	e	a	i	r	a	t	i	o	n										
												9	9	9	,	5		h	r	s

Reason The heater starts its deairation function and will return to normal operation.

Display message	D	e	l	t	a		D	i	r	e	c	t		b	l	o	c	k		
												9	9	9	,	5		h	r	s

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

Display message	F	l	o	w		h	i	g	h		D	H	W							
												9	9	9	,	5		h	r	s

Reason Set point return (tank) temp. DHW (S3) is higher than Setp. heating = flow temp.

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

Reason The flow temperature has exceeded the blocking temperature.

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	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 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	s

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	s

Reason Water pressure is too low or too high.

Display message	W	A	T	R	H	T	R	:	T	3		E	x	t	e	r	n	a	l	
	>	>	>	:		6	0	.	0	°	C	(	-	3	0	.	7	°	C	)

Reason T3 external tank sensor is not connected to the terminals

10.16.3 MESSAGES

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

MAINTENANCE ATTENTION MESSAGE

The display shows alternating the base screen and this message, while the backlight is blinking.
The water heater 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 sections describe some general functions of the water heater and their possible use.

11.1.1 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) [min.]

The fan will cool the heat exchanger according to parameter P2 LJ, but the fan will never run for cooling longer than the period programmed with this parameter P2LK. “0” = cooling function off.
For S1 > local set point P6BA – P2LJ → fan starts after 1 minute and stops after 3 minutes
During post pump circulation, no post ventilation takes place.

11.1.2 TEMPERATURE DISPLAY ON/OFF

Selection for showing the measured temperatures in the operation display of the water heater.

P5BJ Temperature display 1=on (display D5)

The measured temperature in the operation display.

0 = not visible
1 = visible

11.1.3 GAS TYPE SELECTION

Settings for gas types: natural gas or propane.

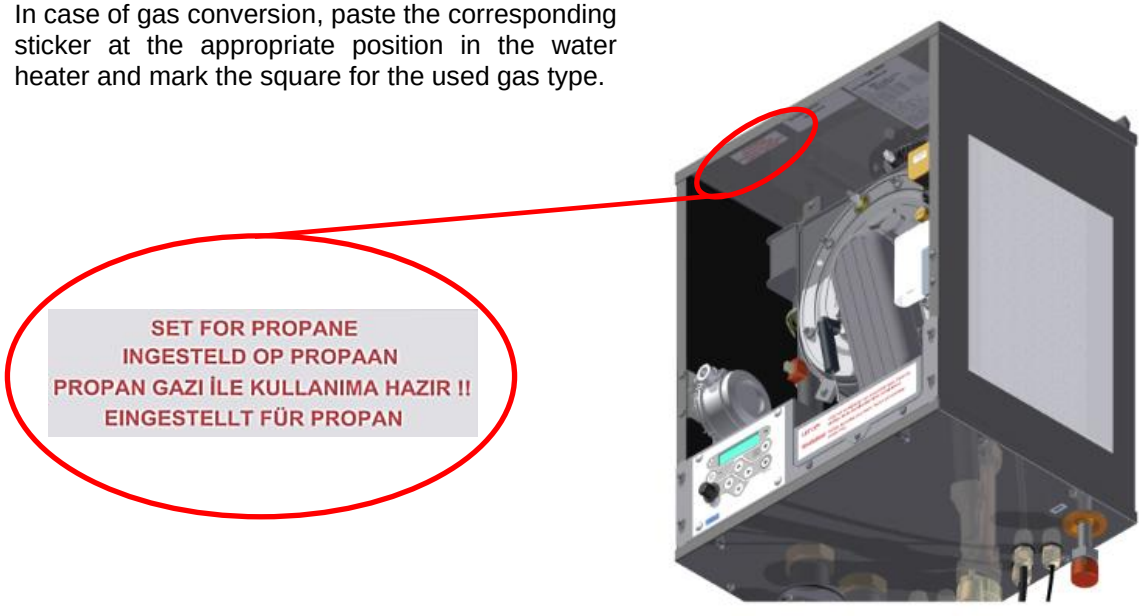
P4BD Gas type (display D8) 0=standard, 1=propane, 2=Do NOT use.

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 (G31) the fan speed is reduced.

0 = standard gas (e.g.: natural gas)
1 = propane
2 = Do NOT use

By each setting, the relevant Soft start settings are automatically adjusted, depending on its main setting P4BE, see next section chapter 11.1.4.

In case of gas conversion, paste the corresponding sticker at the appropriate position in the water heater and mark the square for the used gas type.



11.1.4 SOFT START OPTION

Start parameters can be modified to achieve better start behavior, 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).

P4BE **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)

11.1.5 TANK SENSOR SENSITIVITY

P2KH **Gradient heat demand detection DHW tank temperature (display BG) [0.1°C]**

With S3 in use as tank sensor, it is possible to detect a fast cooling down of the tank through a large DHW flow. The sensitivity of this sensor can be set in parameter P2KH in tenths of degrees.

11.2 Water heater options

11.2.1 0-10 VDC REMOTE FLOW TEMPERATURE SET POINT

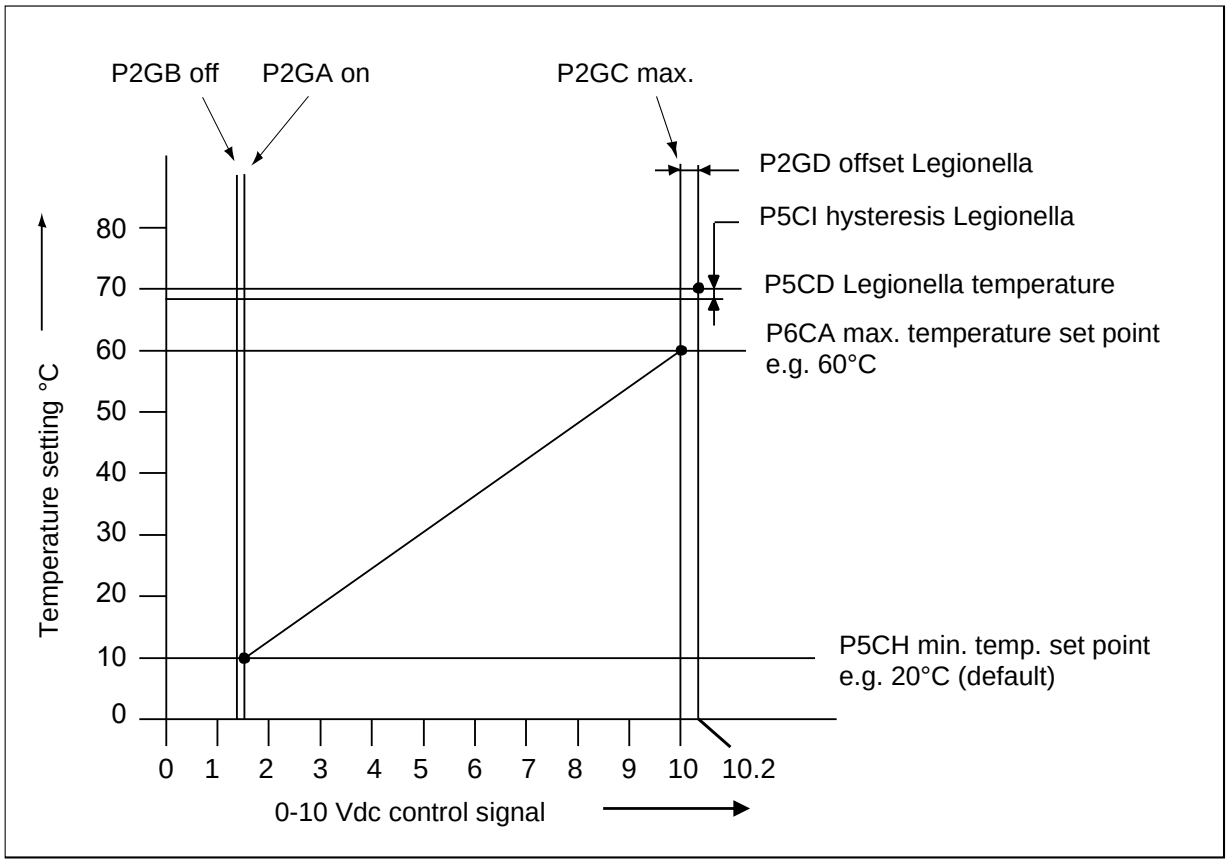
The hot water temperature is controlled by connecting an external 0-10 VDC signal to the water heater (connections 15-16).

P5BB **Analogue input Config (0=off 1=temp) (display D1).**

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

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

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



The graph is only for illustration purposes, parameter values in the water heater can deviate.

BE AWARE: Legionella cycle starts at 10.2 Volts.

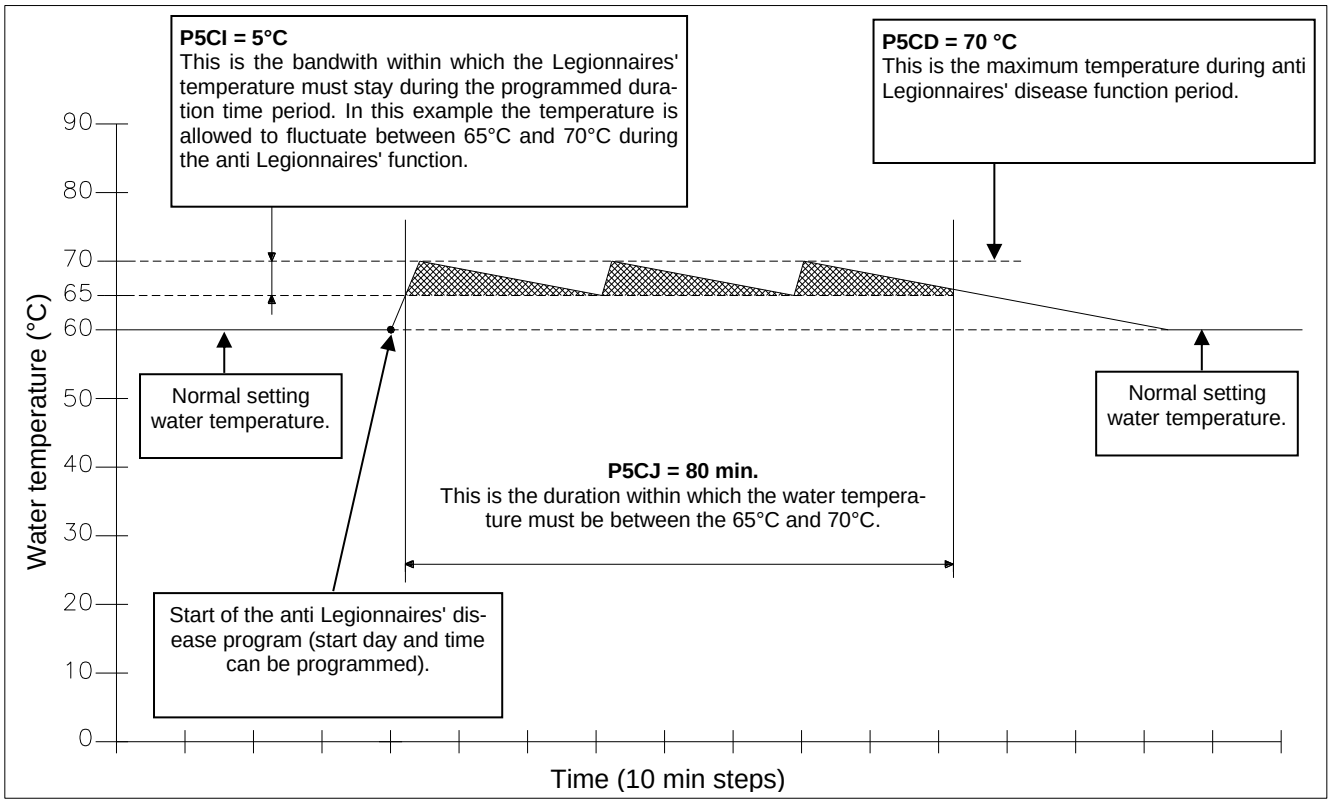
11.2.2 ANTI-LEGIONNAIRES' DISEASE (PASTEURIZATION) FUNCTION

To prevent Legionnaires' disease, the water heater (software) provides a function for heating up the hot water storage tank (once a week or every day) to a higher water temperature than the normal active hot water set point. Also, the period, that this "higher" water temperature function must be active, can be programmed in P7BV start time (0:00) and P7BW (8) and is standard switched off.

Also, an external 0-10 Vdc signal can be used to activate the pasteurization function, by making the 0-10 V signal higher than 10,2 V.

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

Several parameters are used for this function. Three of these parameters are shown in the following graph.



The graph is only for illustration purposes, parameter values in the water heater can deviate.

The settings of these parameters P5CI, P5CJ and P5CD must be programmed according to all applicable anti Legionnaires' disease preventing regulations.

The setting of these parameters can only be done by the manufacturer/supplier of the water heater 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.

11.3 Cascade control

→ *Below information can also be found in the cascade manual added to the cascade or available on request.*

Before commissioning a cascade installation, a number of parameters has to be adjusted.
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 Consul+ range water heaters. He will be able to check whether the installation operates correctly after the parameter change has been done.

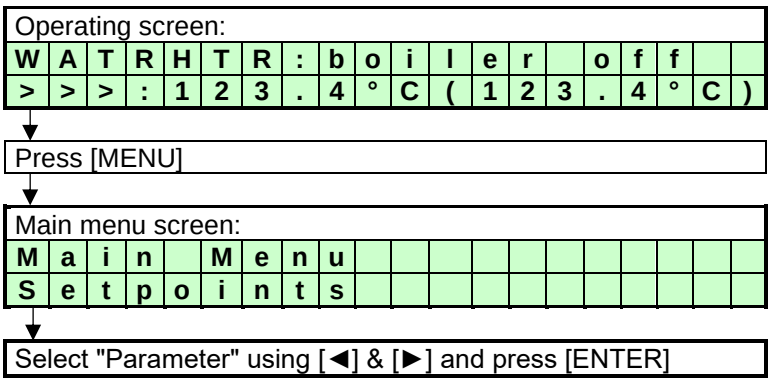
For programming **all parameters** of the water heaters, one needs to have an interface cable for connecting the laptop to the water heater control and a laptop with the appropriate S-WG+ software. Both are available as one service set, part.no. E400278. This software is used for programming but also shows all measured temperatures and cascade behaviour during operation and service/fault history.

11.3.1 PARAMETER SETTINGS FOR CASCADE SET-UPS

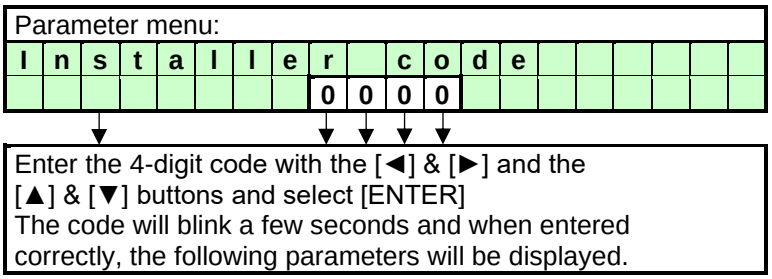
Before programming the cascaded water heaters, make sure that all water heaters are connected (wire) with each other. Use connection 17 and 18 of each water heater.

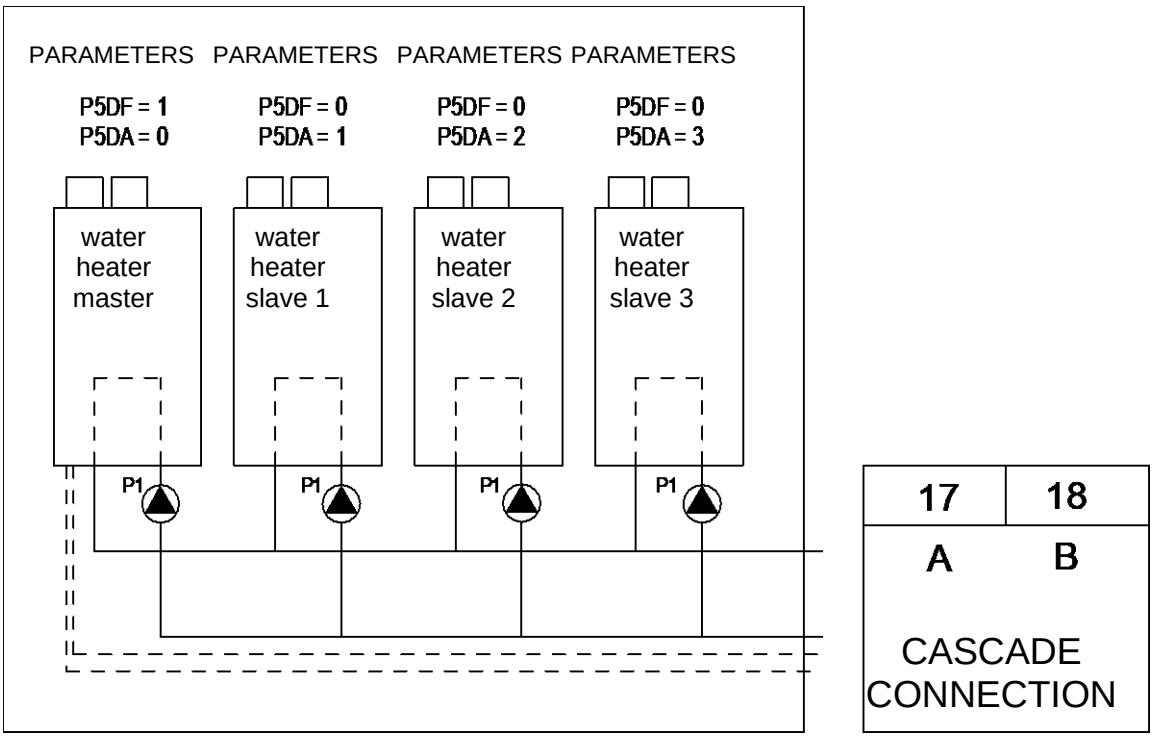
Remind: do not alternate these connections, so always connect 17 to 17 and 18 to 18.

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



After this, use the password for installer's level 2.





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

Master:
C5 P5 DF **1**
C2 P5 DA **0**

Slave 1:
C5 P5 DF **0**
C2 P5 DA **1**

Slave 2:
C5 P5 DF **0**
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 water heater(s). This parameter sets the function of the water heater at a cascade alignment 0 = Slave unit 1 = Single / Master unit																		

Menu C: Cascade																		
	C	**2**				**B**	**u**	**s**		**a**	**d**	**d**	**r**	**e**	**s**	**s**		
											0							
Function for the cascading of the water heater(s). This parameter determines the address of the water heater 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 water heater.

is continued p.t.o. →

When cascade connection is programmed correctly the water heater 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.

11.3.2 MONITOR SCREENS

To obtain cascade information, see chapter 10.4 on page 53.

11.3.3 OUTPUT CONTROL AND WATER HEATER SEQUENCE

The total cascade set-up will act as one single big water heater, switching on- and off water heaters, depending on the total load necessary to adjust and keep the flow temperature at the calculated value.
When the heat demand rises, more water heaters are switched on, and when heat demand falls, one or more water heaters will be switched off. The water heater that was switched on last, will be switched off first, see table below.

To distribute operating hours equally over all water heaters, the working sequence of the water heaters 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: water heater sequence example of an eight water heater cascade.

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

12 COMMISSIONING THE WATER HEATER

12.1 First: flushing the water heater with water

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

12.2 Second: filling & venting the water heater and the system

After flushing the water heater and the installation the system can be filled with fresh water by opening the water supply valve of the system and opening all the taps that are on the system. The water pressure of the system should be between a minimum of 1 bar and a maximum of 8 bar, also depending on the applied pressure safety valve.

BE AWARE: The S-WG+ water heater has a manual air vent situated at the top panel of the water heater. This vent must be opened during the filling of the water heater and the DHW system to make sure that no air/oxygen is trapped in the heat exchanger of the water heater.

NOTICE: Make sure that, during flushing and filling, no water can reach any electrical parts of the water heater.

12.3 Third: check the water flow

Before the water heater will be started, be sure that the pump is functioning and that there is a water flow through the heat exchanger. Check the electrical power supply of the water heater. When this is connected correctly, the display will show:

Display message	**B**	**o**	**i**	**l**	**e**	**r**		**o**	**f**	**f**										

Reason Water heater is not active. To activate the water heater press [ON/OFF] button for six seconds.

Display message	**W**	**A**	**T**	**R**	**H**	**T**	**R**	**:**	**b**	**o**	**i**	**l**	**e**	**r**		**o**	**f**	**f**		
	>	**>**	**>**	**:**	**1**	**2**	**3**	**.**	**4**	**°**	**C**	**(**	**1**	**2**	**3**	**.**	**4**	**°**	**C**	**)**

Reason Water heater is standby. To activate the water heater press [ON/OFF] button for three seconds.

Activate the water heater by pressing the ON/OFF button for six resp. three seconds. After this the following message will appear:

Display message	**W**	**A**	**T**	**R**	**H**	**T**	**R**	**:**	**N**	**o**		**d**	**e**	**m**	**a**	**n**	**d**			
	>	**>**	**>**	**:**	**1**	**2**	**3**	**.**	**4**	**°**	**C**	**(**	**1**	**2**	**3**	**.**	**4**	**°**	**C**	**)**

Reason Water heater is active, but there is no heat demand.

When there is no water present in the water heater or the water pressure is too low, the water heater 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**	
												9	**9**	**9**	**,**	**5**		**h**	**r**	**s**

Reason Water pressure is too low or too high.

By pressing the [SERVICE] button of the water heater, the water heater can be started without a heating demand. The water heater will start to fire and also the pump will start to run. Firing of the water heater without a 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 water heater by pressing the [◄] button once. The temperature difference of the flow and return must be at least 13°C and maximum 25°C. This temperature difference indicates that there is (enough) water flow over the water heater; this water flow prevents the heat exchanger of possible damage caused by a thermal overload.

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

Display message	**T2-T1 high**
	999,5 hrs

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

Display message	**Delta Direct block**
	999,5 hrs

Reason The temperature difference between flow and return has exceeded the blocking value

When this temperature difference exceeds the lock-out setting, the water heater will switch off and the following lock out code will be shown at the display.

Display message **F16**	**Flow Return dT fault**
	pump on 999,5 hrs

Reason Temperature difference between flow and return exceeds limitation value, or ‘dT block or delta direct block has occurred 3 times.

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

The water heater has a built-in water pressure switch. If water pressure of the system drops under a certain limit, the water heater will go in a lock-out.

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

NOTICE: Always check the running of the pump before firing the water heater.

13 STARTING THE WATER HEATER

13.1 General

Check the gas pressure available at the gas connection pipe of the water heater. Use the pressure nipple (3) of the gas safety valve for this measurement. The gas pressure for the water heater, to operate properly under the correct load, must be at least 20 mbar.
The picture at page 84 shows the position of the pressure nipple (3) at the gas valve.

The S-WG+ water heater has a manual air vent situated at the top panel of the water heater. This vent must be opened during the filling of the water heater. Make sure that, during flushing and filling, **no water can reach any electrical parts of the water heater.**

13.2 Firing for the first time

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

Display message	**W**	**A**	**T**	**R**	**H**	**T**	**R**	**:**	**N**	**o**		**d**	**e**	**m**	**a**	**n**	**d**			
	>	**>**	**>**		**1**	**2**	**3**	**.**	**4**	**°**	**C**	**(**	**1**	**2**	**3**	**.**	**4**	**°**	**C**	**)**

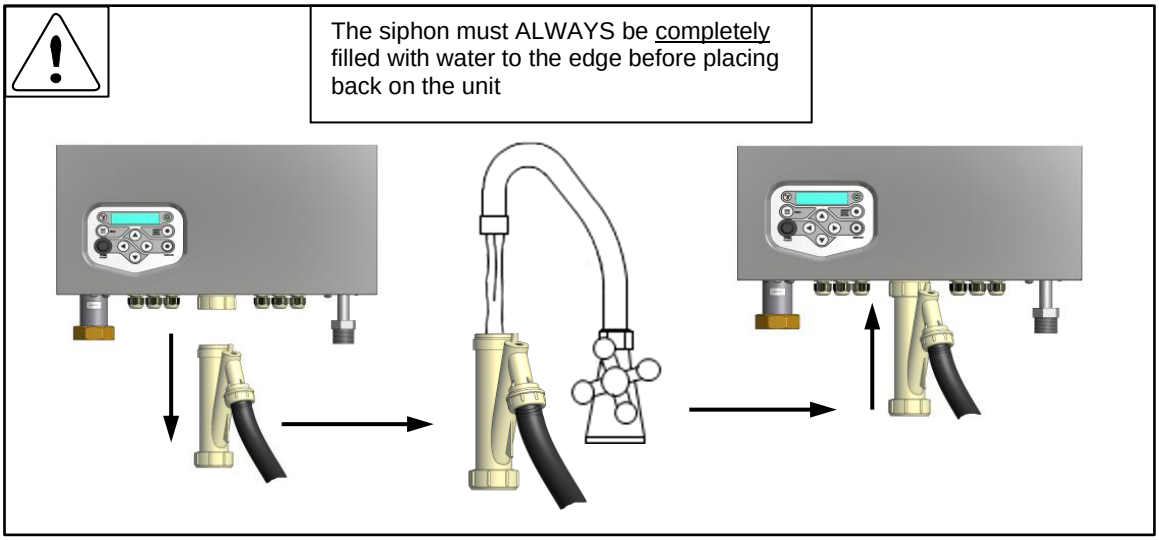
Reason Water heater is active, but there is no heat demand.

The display describes:

- The actual operation
- If a heat demand is activated
- The temperature setting
- The temperature measured

When mounting the bottom part of the siphon, before commissioning the water heater 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.



When the water heater receives a heat demand the electronics will start the operation of the water heater. Before the water heater is used, the 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 water heater is installed
- As part of a service/maintenance check, in case the CO_2 values turn out to be incorrect

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

B. - The gas control safety valve has been (re)placed
- Another type of gas is applied: gas conversion

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

In either of the four cases described in **A** and **B**, always check the gas/air ratio of the combustion figure (CO_2) at maximum and minimum input. First set the water heater at maximum load and subsequently at minimum load, and repeat if necessary.

Set-up of this chapter:
First, all necessary values are given in the tables at chapter 14.1.1. A drawing of the gas valve(s) and setting screws is given in chapter 14.1.3 on the next page. In chapter 14.1.4 a general scheme, conform which the adjustments must be carried out, is presented. After that, in chapter 14.2 and 14.3 a thorough 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 GAS VALVE ADJUSTMENT: TABLES

Table 1

			Gas Type:	
Water Heater Type	**Load**	**Output**	**Nat.gas G20 [1]/ G25.3 [1]**	**Propane G31 [1, 3]**
S-WG+ 35 & S-WG+ 55	**max. load**	**CO_2 (%)**	**9,0 - 9,2**	**10,5 - 10,7**
		O_2 (%)	4,5 - 4,8	4,6 - 4,9
	min. load	**CO_2 (%)**	**8,5 - 8,7**	**9,3 - 9,5**
		O_2 (%)	5,4 – 5,7	6,4 - 6,7

1 According EN437
2 All values are measured without front panel. The CO_2 / O_2 values should always be between the values set at this table. Nominal values can be found at the Technical specifications datasheet page.
3 Fan settings must be changed by altering parameter P4BD (display D8) (only by a skilled service engineer)

Table 2

Pre-adjustment settings gas valve for S-WG+ water heaters:

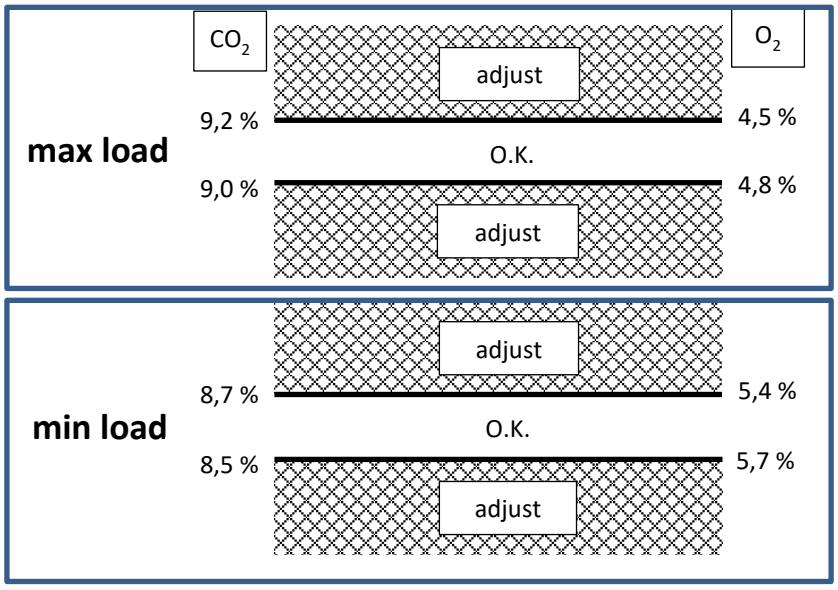
Water heater type	**Number of turns open (counter clockwise)**	
	nat. gas G20 / G25.3	**propane G31**
S-WG+ 35	0,5	0,25
S-WG+ 55	1,0	0,5

The maximum fan speed must be reduced to convert the water heater into a propane (G31) appliance. Set parameter P4BD.

14.1.2 ADJUSTMENT VALUES

To make adjustments easier, values of table 1 are presented in the following figures.
The CO_2 / O_2 values should always be between the values set in this figure.
Nominal values can be found in the Technical specifications table at the beginning of this manual.
All values are measured without front door.

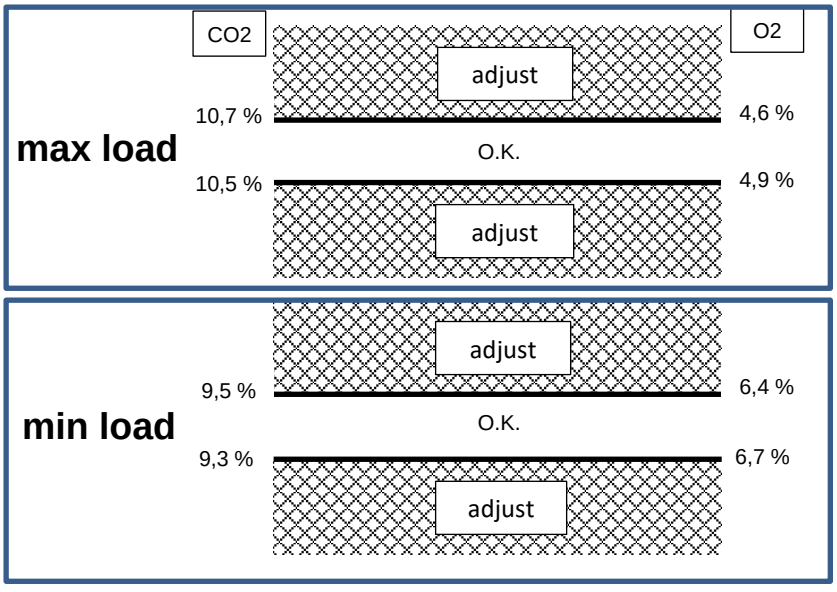
G20, G25.3



Propane G31

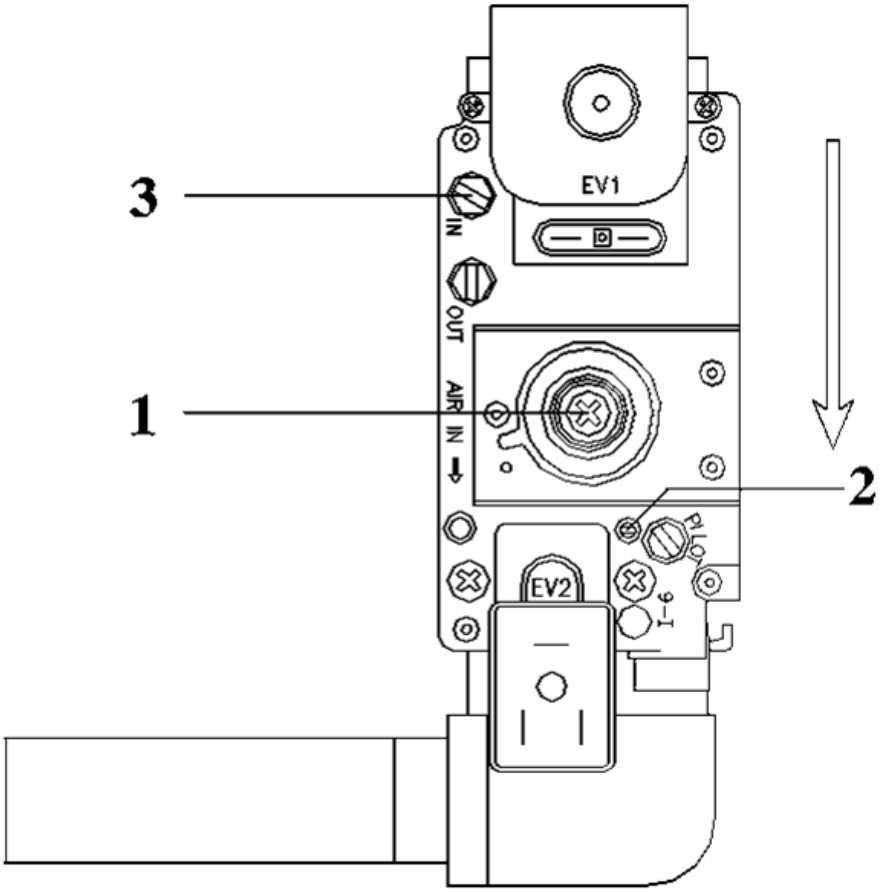
Fan settings must be changed by altering parameter P4BD (display D8). (only by a skilled mechanic).
The CO_2 level may never be in the hatched area.

Propane: G31



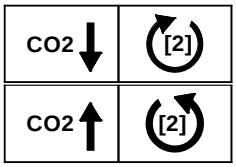
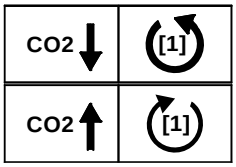
14.1.3 SETTING SCREWS GAS VALVE(S): DRAWINGS

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 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 fields)):

<table>
<tr><td></td><td colspan="2">GENERAL SCHEME SETTING STEPS</td></tr>
<tr><td></td><td>Case A</td><td>Case B</td></tr>
<tr><td colspan="2">Continue ↓</td><td>First close screw [2], then set them in accordance with table 2</td></tr>
<tr><td></td><td colspan="2">SWITCH TO SERVICE MODE</td></tr>
<tr><td colspan="2">Continue ↓</td><td>If burner doesn’t start, open (RIGHT*) screw[2] ¼ turn extra</td></tr>
<tr><td></td><td colspan="2">Setting at maximum load</td></tr>
<tr><td rowspan="2">Procedure 1</td><td colspan="2">[▲] Set burner at maximum load</td></tr>
<tr><td colspan="2">Measure CO_2 at flue gas outlet;
use (RIGHT*) screw [2] to
match value with table 1 or the figure
</td></tr>
<tr><td></td><td colspan="2">Setting at minimum load</td></tr>
<tr><td rowspan="2">Procedure 2</td><td colspan="2">[▼] Set burner at minimum load</td></tr>
<tr><td colspan="2">Measure CO_2 at flue gas outlet;
use (RIGHT*) screw [1] to
match value with table 1 or the figure
</td></tr>
<tr><td colspan="3">Repeat procedure 1</td></tr>
<tr><td colspan="3">Repeat procedure 2</td></tr>
<tr><td colspan="3">Keep repeating until values match table values best or the figure</td></tr>
<tr><td colspan="3">Water heater returns to NORMAL MODE after 40 min. OR by pressing [SERVICE] button</td></tr>
</table>

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

14.2 Adjusting in case of a new water heater, or after service (case A)

14.2.1 GENERAL REMARK

For all adjusting steps under **A** the measured CO_2 values shall be according table 1 or figures, no adjustment is necessary. If, however, larger deviations are measured, adjustment now must be made until the measured value reaches the above-mentioned specifications.

14.2.2 ADJUSTING AT MAXIMUM LOAD

Adjust at maximum load by carrying out procedure 1.

14.2.3 ADJUSTING AT MINIMUM LOAD

Adjust at minimum load by carrying out procedure 2.

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

14.3.1 GENERAL REMARKS

All adjustments must result in CO_2 percentages within the specification mentioned at the table or figure.

Adjusting at maximum load S-WG+ 35 & S-WG+ 55
These heaters have single gas valves.

- 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 for the used water heater 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, and try again.

14.3.2 ADJUSTING AT MINIMUM LOAD S-WG+ 35 & S-WG+ 55

Adjust at minimum load by carrying out procedure 2.

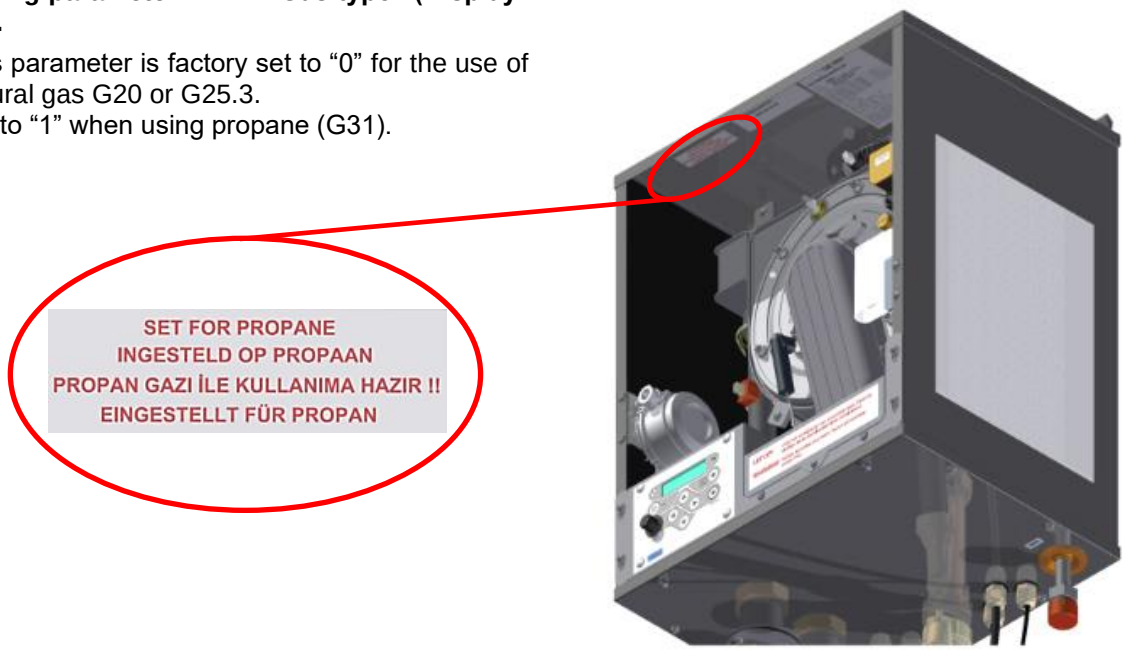
IMPORTANT: Toggle between high fire and low fire to make fine-tuning adjustments (adjusting the minimum setting affects the maximum setting and contrariwise).

⚠ In case of gas conversion, paste the corresponding sticker at the appropriate position in the water heater.

SET FOR PROPANE
INGESTELD OP PROPAAN
PROPAN GAZI İLE KULLANIMA HAZIR !!
EINGESTELLT FÜR PROPAN

Changing to another type of gas also needs setting parameter "P4BD Gas type" (Display D8).

This parameter is factory set to "0" for the use of natural gas G20 or G25.3.
Set to "1" when using propane (G31).



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** (gas conversion or replacement of gas valve): 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	**W**	**A**	**T**	**R**	**H**	**T**	**R**	**:**	**S**	**e**	**r**	**v**	**i**	**c**	**e**			**2**	**6**	**%**
	>	**>**	**>**		**1**	**2**	**3**	**.**	**4**	**°**	**C**	**(**	**1**	**2**	**3**	**.**	**4**	**°**	**C**	**)**

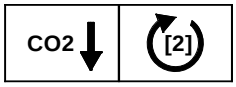
Water heater is activated and operates at service mode at 26% (minimum).

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

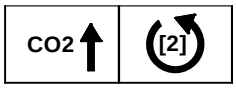
Display message	**W**	**A**	**T**	**R**	**H**	**T**	**R**	**:**	**S**	**e**	**r**	**v**	**i**	**c**	**e**		**1**	**0**	**0**	**%**
	>	**>**	**>**		**1**	**2**	**3**	**.**	**4**	**°**	**C**	**(**	**1**	**2**	**3**	**.**	**4**	**°**	**C**	**)**

Water heater is activated and operates at service mode at 100% (maximum).

3. Measure the CO_2 percentage at the flue gas outlet.
4. By setting screw [2], adjust the gas valve to obtain the CO_2 value of table 1 or figure.

Decrease CO_2 percentage 

Turn screw [2] right (clockwise)

Increase CO_2 percentage 

Turn screw [2] left (counter clockwise)

The service operation of the water heater will be active for 40 minutes.
After this period the water heater 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.*

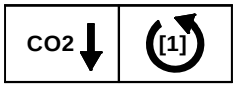
Carry out the next 3 steps:

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

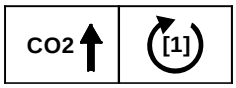
Display message	**W**	**A**	**T**	**R**	**H**	**T**	**R**	**:**	**S**	**e**	**r**	**v**	**i**	**c**	**e**			**2**	**6**	**%**
	>	**>**	**>**		**1**	**2**	**3**	**.**	**4**	**°**	**C**	**(**	**1**	**2**	**3**	**.**	**4**	**°**	**C**	**)**

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

2. Measure the CO_2 percentage at the flue gas outlet.
3. By setting screw [1], adjust the gas valve to obtain the CO_2 value of table 1 or figure.

Decrease CO_2 percentage 

Turn screw [1] left (counter clockwise)

Increase CO_2 percentage 

Turn screw [1] right (clockwise)

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

15 PUTTING THE WATER HEATER OUT OF OPERATION

It is recommended to have the water heater 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 water heater 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 tank thermostat and/or other external controllers from the water heater. The pump and fan will stop after a short time.
- Switch off the water heater by pressing the [ON/OFF] button for six seconds.
- Make sure the following display screen is visible.

Display message	**B**	**o**	**i**	**l**	**e**	**r**		**o**	**f**	**f**									

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 water heater CAN, however, be switched on again by pressing the [ON/OFF] button.
- Pump(s), fan(s) and cascade (if applicable) are operational, and so are both recirculation protection (if applicable) and frost protection.
- To reactivate the water heater, switch on the burner by pressing [ON/OFF] for six seconds again.



The frost protection module can still activate the burner(s).
To prevent this, switch off this protection or put the water heater in 'power off' mode (next paragraph).

15.2 Out of operation: power off

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

Act as follows:

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

Display message	**B**	**o**	**i**	**l**	**e**	**r**		**o**	**f**	**f**									

- Switch off the electrical power supply of the water heater (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 water heater and the DHW system.

- NOTICE: Before draining the water heater, first start draining the DHW system and subsequently open also the two drains of the water heater.

16 FAULT CODES, BLOCKING 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.

16.1 Lock-out codes

A lockout means that the water heater needs a manual reset to start operating again.
When the water heater is in lockout the backlight of the display is blinking on and off.

Explanation > **999,5:hrs** = time elapsed after fault message.

Explanation > **Pump 1 on** = status of the pump during fault.

Display message **F8**	**Failed burner start** **pump on 999,5 hrs**
Reason	Water heater 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 water heater 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 water heater room pressure is equal to the pressure at the position of the flue gas outlet (when combustion air is drawn from the water heater room).	

Display message F1	Flow high Temp pump on 999,5 hrs
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	Flow Return dt fault pump on 999,5 hrs
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	Flow sensor error pump on 999,5 hrs
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	Flue sensor error pump on 999,5 hrs
Reason	Flue sensor is not detected by the water heater 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 **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 water heater.	
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 water heater.	
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:	
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 water heater is blocking an action, because of an extraordinary situation. This action will be continued after eliminating the extraordinary 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 heater received a heat demand too fast after the last 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 water heaters of the cascade is in a lock-out.
Cause:	
The unit is programmed in such a way that none of the heaters 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 e l t a D i r e c 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
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 h i g h D H W**
	9 9 9 , 5 h r s
Reason:	Setpoint return (tank)temperature DHW (S3) is higher than setpoint heating = flow temperature (S1)
Cause: Wrong setting of parameter: P6BA Heating setpoint below P6CA DHW setpoint	
Corrective action:	
Adjust the heating setpoint through the display: menu, settings, heating setpoint	

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	**Gen Block** / **999,5 hrs**
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 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.	
causes. A partly shorted sensor will drop its resistance and therefore measure a raise in temperature when actually there is none.	
Display message	**Line fault** / **pump on** **999,5 hrs**
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.	
Cause: Heat exchanger failure.	
Display message	**Return temp high** / **999,5 hrs**
Reason	Return temperature has exceeded the blocking temperature, but it has not exceeded the lock-out value.
Cause: Systems that pre-heats the water heater return temperature too much/high.	
Corrective action: Reduce pre-heat temperature of external heat source.	
Cause: The need for heat suddenly drops causing hot return water to the water heater.	
Corrective action:	
Dampen external heating system control to prevent sudden heater 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 water heater, causing an under pressure (bad installation design).	

Display message	W A T R H T R : T 3 E x t e r n a l > > > : 6 0 . 0 ° C (- 3 0 . 7 ° C)
Reason:	T3 external tank sensor is not connected to the terminals.
Cause:	
The sensor is not connected to the terminal, or the wire is broken. The sensor is malfunctioning.	
Corrective Action:	
Connect the sensor to the terminals 3 and 4. Check the wires from the sensor to the terminals. Check the sensor on resistance 10K at 25°C.	

16.3 Maintenance attention function

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

Display message	**Needs Maintenan 0.0** **Ignition cycles hrs**
Reason	Maintenance option of total amount of ignition cycles has been reached.

Display message	**Needs Maintenan 0.0** **Date hrs**
Reason	Maintenance option of the date has been reached.

Display message	**Needs Maintenan 0.0** **Burning hours hrs**
Reason	Maintenance option of total amount of burning hours has been reached.

Display message	**Needs Maintenan 0.0** **All hrs**
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 water heater, it is advised to carry out maintenance and service at least every twelve months. Both safety and life time will thus be improved. Omission of preventive and corrective maintenance can have warranty consequences.

Maintenance and inspection of the water heater 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 lack of maintenance will not be covered under warranty.

MAINTENANCE REMINDER FUNCTION.
See last 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 section 10.13 'Setting the maintenance specifications'.

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



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

17.2 Inspection & maintenance

Inspection, maintenance and the replacement of water heater 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 water heater 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 water heater should be checked and inspected.
NOTICE: Before starting to work on the water heater:
- Switch off the electrical power to the water heater (service switch and/or unplug water heater)
- Close the gas valve to block gas supply to the water heater

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

Service history
The operational and fault history (total amount and since the last service) of the water heater 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 water heater (parts).

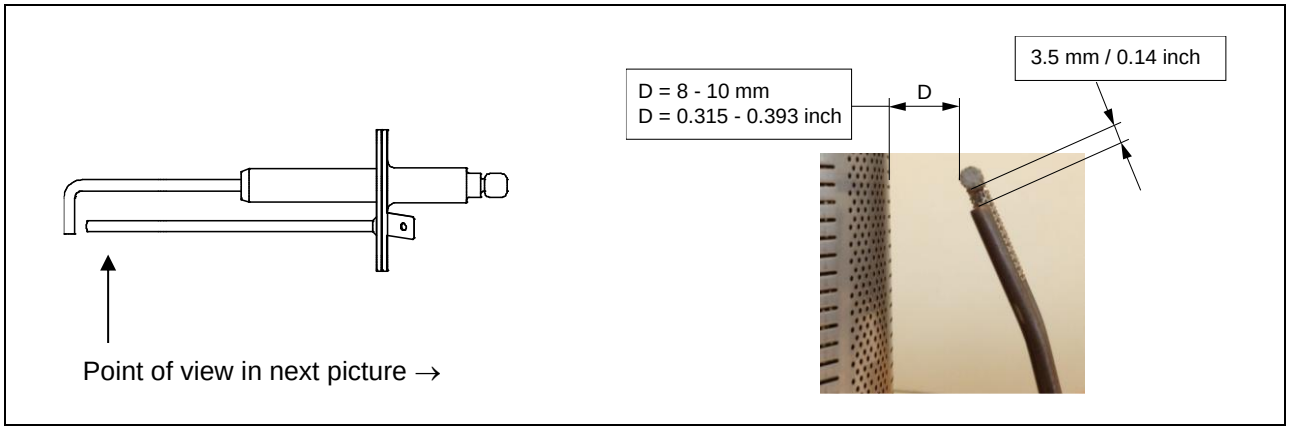
Flue gas & air supply
The flue gas pipes and the air supply pipes must be checked for gas tightness. Also check if the mounting of these pipes is correct, safe and not damaged. Check the rooftop of the water heater housing for signs of water leakage and traces of water coming from the air supply pipe, 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 6 x M6 nuts and the ignition cable. After this take out the complete burner unit by moving it forward out of the water heater housing. NOTICE: watch out for the burner plate insulation that it won't be damaged during this operation. While removing the complete burner unplug both electrical and controlling cables of the fan. After all this, disassemble 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 oxidation and/or is cracked. 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 / ionization electrode
When the complete burner is removed, it is also 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 being bent, used electrodes might break or burst. Check the electrode, after bending, for any tear/crack and signs of oxide. When they are burst/cracked or oxidized, replace the electrode. Also replace the electrode when there is a crack in the ceramic insulation of the electrode. When the electrode is to be replaced, also the gasket should be renewed.

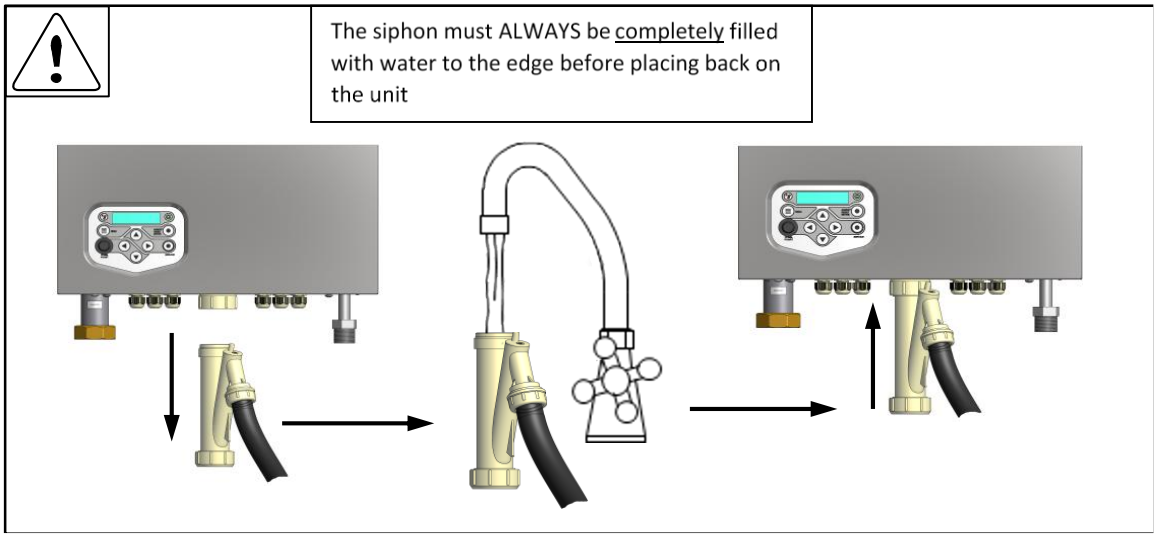


Burner door gaskets
When these gaskets have changed colours at some parts, the rubber has cured and/or has damages, these gaskets must be replaced. Notice: only use the gaskets that are supplied by the water heater manufacturer.

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 water heater.

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 of a high condensate level in the burner room (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 water heater 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.



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.

Cleaning the burner room with acid or alkali products is prohibited.

Gas/air ratio
With every service check and/or maintenance of the water heater always check the gas/air ratio by measuring the CO_2 percentage (flue gas) at the maximum and minimum load of the water heater. If necessary adjust these values, see for information chapter "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) water heater. 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 water heater.

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 water heater again.

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:

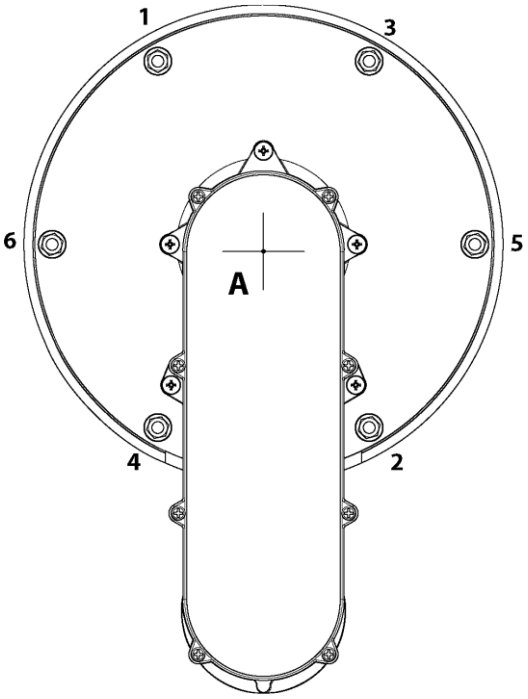
- Place the burner door with its holes over the six threaded studs.
  Careful! When handling too rough or misplacing the holes over the threaded studs, the burner door insulation and/or gaskets can be damaged.
  Assure yourself that the door is well positioned with respect to the threaded studs, before 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 below.
- The specified torque value for tightening the burner door flange nuts is **5 Nm.**

Tighten in given order

torque value = 5 Nm



18 USER INSTRUCTIONS

After installing and commissioning of the water heater demonstrate the operation of the entire DHW system to the end-user. The user should be made familiar with all safety precautions of the water heater and the installation. The user should be instructed that service and maintenance of the water heater is required every twelve months. Regular service and maintenance is essential for a safe and proper operation of the water heater. Hand over the documents that are supplied with the water heater.

Strebel Ltd
Unit 10, Invincible Industrial Estate,
Invincible Road, Farnborough,
Hampshire, GU14 7QU.

T 01276 685422
F 01276 685405
E info@strebel.co.uk
I www.strebel.co.uk

CE

STREBEL
HEATING TECHNOLOGY

STREBEL LTD RESERVE THE RIGHT TO CHANGE ANY SPECIFICATIONS ON THIS BOILER RANGE WITHOUT NOTICE

Further information on our complete product range is available from our website.

CAST IRON – CONDENSING – STEEL SHELL – WATER HEATERS – RENEWABLES

FLUES – ACCESSORIES.