Operation and Installation manual

THISION WH

Contents

Safety

General regulations
Application
Norms and regulations

General regulations
This documentation contains important information, which is a base for safe and reliable installation, commissioning and operation of the THISION L boiler. All activities described in this document may only be excecuted by authorized companies.

Changes to this document may be effected without prior notice. We accept no obligation to adapt previously delivered products to incorporate such changes.

Only original spare parts may be used when replacing components on the boiler, otherwise warranty will be void.

Application
The THISION water heater may be used for hot water production purposes only.

Norms and regulations
When installing and operating the boiler, all applicable norms (european and local) should be fulfilled:

- Local building regulations for installing combustion air and flue gas systems;
- Regulation for connecting the water heater to the electrical appliance;
- Regulations for connecting the water heater to the local gas network;
- Norms and regulations according to safety equipment for heating systems;
- Any additional local laws/regulations with regard to installing and operating heating systems.

The THISION L **boiler is CE approved and applies to the following European standards:**

92 / 42 / EEC
Boiler efficiency directive

2009 / 142 / EEC
Gas appliance directive

2006 / 95 / EEC
Low voltage directive

2004 / 108 / EEC
EMC directive

EN 483
Gas-fired central heating boilers - Type C boilers of nominal heat input not exceeding 70 kW

EN 15420
Gas-fired central heating boilers - Type C boilers of nominal heat input exceeding 70 kW, but not exceeding 1000 kW

EN 15417
Gas-fired central heating boilers - Specific requirements for condensing boilers with a nominal heat input greater than 70 kW but not exceeding 1000 kW

EN 50165
Electrical equipment of non-electric appliances for household and similar purposes - Safety requirements

EN 15502-1
Gas-fired central heating boilers - Part 1: General requirements and tests

EN 55014-1 (2000)
Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission

EN 55014-2 (1997)
Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 2: Immunity - Product family standard

EN 61000-3-2 (2000)
Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current 16 A per phase)

EN 61000-3-3 (2001)
Electromagnetic compatibility (EMC) - Part 3-3: Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current 16 A per phase and not subject to conditional connection

EN 60335-1 (2002)
Household and similar electrical appliances - Safety - Part 1: General requirements

EN 60335-2-102 (2006)
Household an similar electrical appliances: Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections

Additional national standards

Germany:
RAL - UZ 61 / DIN 4702-8

Switzerland:
SVGW
EKAS-Form. 1942: Flüssiggas-Richtlinie Teil 2
Vorschriften der kantonalen Instanzen (z.B. Feuerpoilizeivorschriften)

Netherlands:
GASKEUR BASIS
GASKEUR SV
GASKEUR HR107

Belgium:
HR TOP

Safety Provisions

Conditions

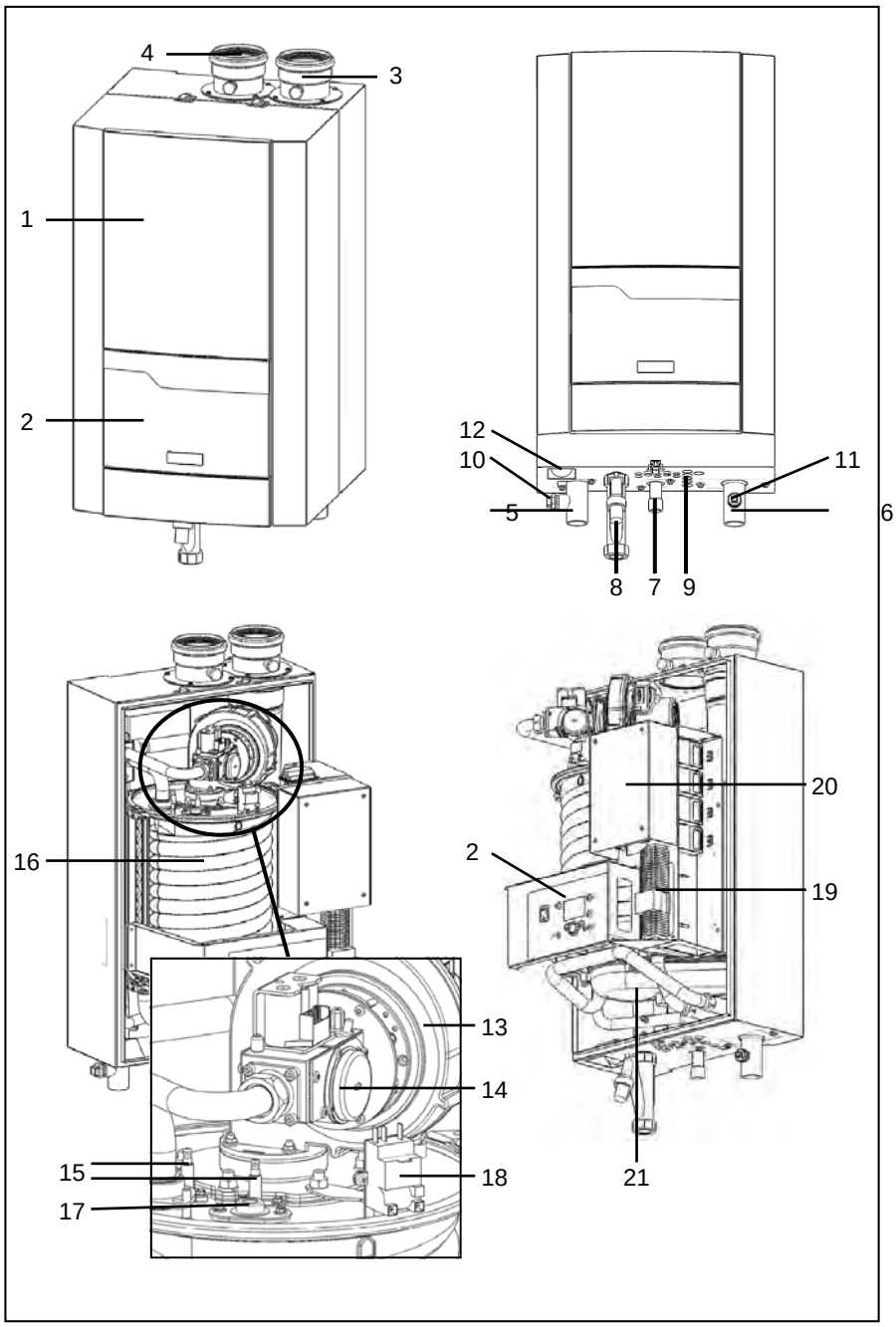
It is a statutory requirement that all gas appliances are installed in accordance with the manufactures instructions and all current regulations in force, all instructions should be fully read before installing or using the appliance.
All installations should be carried out by competent persons as described in the Gas Safety (Installation & Use) Regulations. i.e. GasSafe registered and holding current certification.
The work must be carried out by a competent person as described in the I.S. 813 Domestic Gas Installations with reference to the following codes of practices.
The Manufacturers instructions MUST NOT be taken in any way as overriding statutory obligations.

This boiler has been tested and certified to comply with all necessary European directives, latest building regulations and efficiency requirements for the SEDBUK scheme and as been approved with an efficiency band rating of A and is CE marked and complies with
92/42/EEC Efficiency of Hot Water Boilers Directive
90/396/EEC Gas Appliance Directive
93/68/EEC Low Voltage Directive (was 73/23)
92/31/EEC Electromagnetic compatibility Directive
I.S. 813 Domestic Gas Installations
The Thision WH should be installed in compliance with
The building regulations (Scotland-consolidated)
Building Regulations (Northern Ireland)
Building Regulations
Water fittings regulations or water bylaws in Scotland
Local water company bylaws

The boiler should not be modified in any way. Any modifications will invalidate the gas approval and invalidate the warranty.

ATTENTION: High Voltage
Before opening the boiler casing for maintenance or servicing the 230VAC main supply to the boiler must be disconnected!!

Layout of water heater
Operating principle



Layout of water heater
The THISION water heater consists of the following main components:

1 Casing
2 Control panel
3 Flue gas connection (+ test point)
4 Air intake connection (+ test point)
5 Flow water connection
6 Return water connection
7 Gas connection
8 Syphon
9 Input for wiring
10 Connection for safety valve
11 Connection for fill/drain valve
12 Manometer
13 Fan
14 Gas valve
15 Ignition and ionisation electrodes
16 Heat exchanger
17 Inspection window
18 Ignition transformer
19 Electrical input connections
20 Controller
21 Condensate receptacle

Operating principle
The THISION WH is a fully modulating water heater. The control unit of the water heater adapts the modulation ratio automatically to the heat demand required. This is done by controlling the speed of the fan. As a result, the whirlwind mixing system will adapt the gas ratio to the chosen fan speed, in order to maintain the best possible combustion figures and therewith the best efficiency. The flue gases created by the combustion are transported downwards through the heat exchanger and leave the boiler at the top into the chimney connection. The return water from the system enters the boiler in the lower section, where is the lowest flue gas temperature in the boiler. In this section condensation takes place. The water is being transported upwards through the heat exchanger, in order to leave the boiler at the flow connection. The cross flow working principle (water up, flue gas down) ensures the most efficient combustion results.

Thision WH

The Thision WH is a standalone DHW charging system that consists of a buffer tank, plate heatexchanger and a boiler.

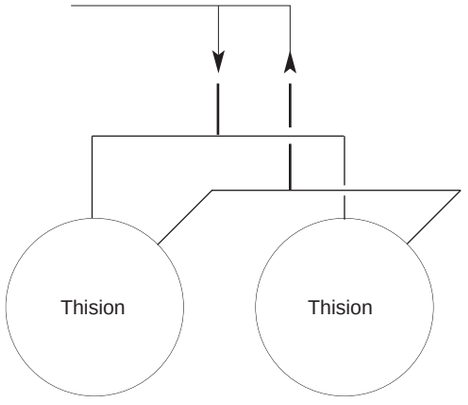
The System is suitable for use in any building with medium to large water usage, such as swimming pools, gyms , sports clubs, fitness centres etc.

The Thision WH has been designed for ease of installation. For the unit to provide DHW a minimum of the following is required to be installed from the system to the unit:
1. 230Vac electrical supply
2. Mains cold water supply
3. DHWS secondary flow pipework
4. DHWS secondary return pipework
5. Gas supply pipework
6. Condense drain pipework
7. Flue gas outlet & Air intake pipework

Installing 2 Thision WH in parallel

The Thision WH is a standalone unit that functions exceptionally. Where there is a high demand for hot water there is an option to connect two units together in parallel. It is essential that the units are connected such that flow is distributed evenly through both units

Ensure that pipework is equal from both units to the secondary flow and secondary return connection.

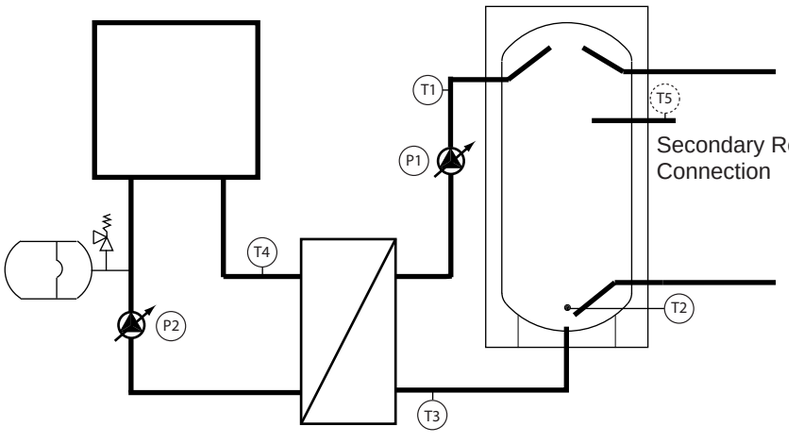


Plan View of two Thisions in parallel

Caution!

The capacity of the built in water recirculation pump is 600 l/hr at the 20 kPa setting. The maximum loss of the flow and recirculation system occurs at 65°C flow and 60°C return (3.kw). A greater loss will cause a lower return temperature and therefore a longer loading period.

Hydraulic System Diagram



Legend:

P1: Loading Pump

P2: Boiler Pump

T1: Loading Temperature Sensor

T2: Start Temperature Sensor

T3: Shut Down Temperature Sensor

T4: Primary Flow Temperaure Sensor

T5: Secondary Return Temperature Sensor (optional sensor required)

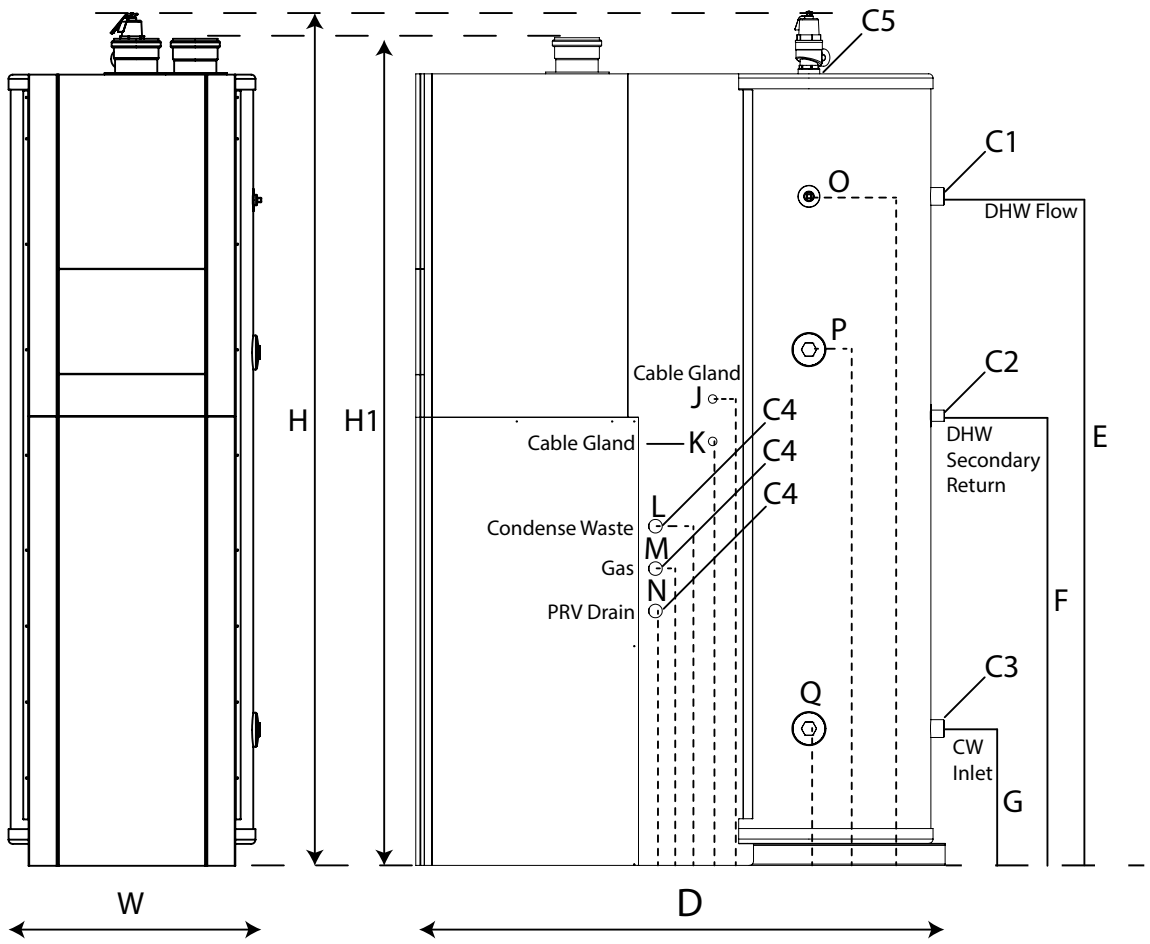
Technical data

		THISION L 65	THISION L 85	THISION L 120
Nominal heat output at 80-60ºC max/min	kW	60.8/10.1	81.1/13.4	111.6/18.7
Nominal heat output at 75-60ºC max/min	kW	60.9/10.1	81.3/13.4	111.8/18.7
Nominal heat output at 40/30ºC max/min	kW	63.9/11.1	85.3/14.8	120.0/20.6
Nominal heat input Hi max/min	kW	62.4/10.4	83.3/13.8	114.3/19.2
Efficiency at 80/60ºC	%	97.4	97.4	97.6
Efficiency at 40/30ºC	%	102.4	102.4	105.0
Annual efficiency (NNG 75/60ºC)	%	106.2	106.2	106.2
Annual efficiency (NNG 40/30ºC)	%	>110	>110	>110
Standstill losses (T_{water} = 70ºC)	%	0.20	0.20	0.20
Max. condensate flow	l/h	3.5	4.8	7.7
Gas consumption H-gas max/min (10,9 kWh/m^3)	m^3/h	5.7/1.0	7.6/1.3	10.5/1.8
Gas consumption L-gas max/min (8,34 kWh/m^3)	m^3/h	7.5/1.2	10.0/1.7	13.7/2.3
Gas consumption LPG. max/min (12,8 kWh/kg)	kg/h	4.9/0.8	6.5/1.1	8.9/1.5
Gas pressure H-gas	mbar	20	20	20
Gas pressure L-gas	mbar	25	25	25
Gas pressure LPG	mbar	30/50	30/50	30/50
Maximum gas pressure	mbar	50	50	50
Flue gas temperature at 80/60ºC max/min	ºC	76/63	76/63	76/63
Flue gas temperature at 40/30ºC max/min	ºC	55/39	55/39	55/39
Flue gas quantity max/min	m^3/h	119/19	159/25	213/35
CO_2 level natural gas H/E/L max/min	%	8.5/8.5	8.5/8.5	8.7/8.5
CO_2 level liguid gas P max/min	%	-/-	-/-	-/-
NOx level	mg/kWh	39	39	39
CO level max/min	mg/kWh	98/7	98/7	98/7
Max. permissible flue resistance max/min	Pa	150/15	150/15	200/15
Water volume	l	3.5	4.8	7.7
Water pressure max/min	bar	6/1	6/1	6/1
Max. water temperature (High limit thermostat)	ºC	100	100	100
Maximum temperature setpoint	ºC	90	90	90
Nominal water flow at dT=20K	m^3/h	2.6	3.4	4.8
Hydraulic resistance at nominal water flow	kPa	16	29	22
Electrical connection	V	230	230	230
Frequency	Hz	50	50	50
Mains connection fuse	A	10	10	10
IP class	-	IPX4D	IPX4D	IPX4D
Power consumption boiler max/min (excl. pump)	W	98/26	167/38	228/36
Power consumption 3-step pump (optional)	W	150	205	210
Power consumption speed controlled pump (opt)	W	124	124	130
Weight (dry) with 250L cylinder	kg	160	168	190
Weight (dry) with 500L cylinder	kg	170	178	200
Weight (wet) with 250L cylinder	kg	413.5	422.8	447.7
Weight (wet) with 500L cylinder	kg	673.5	682.8	707.7
Noise level at 1 meter distance	dB(A)	-	-	-
Ionisation current minimum	µA	3	3	3
PH value condensate	-	3.2	3.2	3.2
CE certification code	-	CE-0063CM3576		
Water connections	-	R1.1/4"	R1.1/4"	R1.1/2"
Gas connection	-	R3/4"	R3/4"	R1"
Flue gas connection	mm	100	100	100
Air intake connection (for room sealed use)	mm	100	100	100
Condensate connection	mm	22	22	22

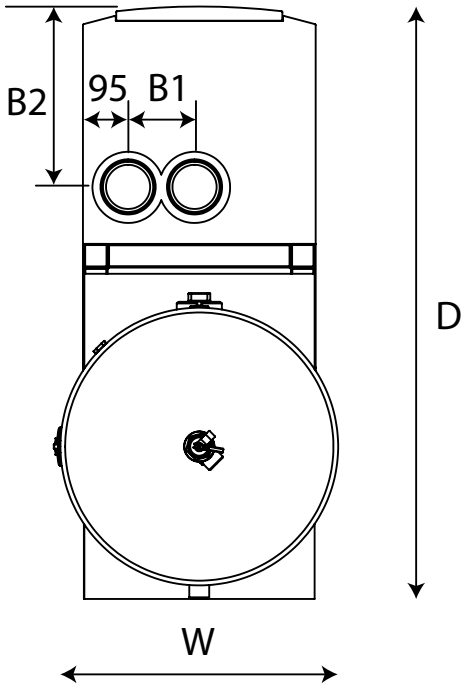
Technical data

DHW Performance Data		THISION L 65	THISION L 85	THISION L 120
10 min peak output at 60ºC (250L storage)	L	424	481	568
1st hour continous output at 60ºC (250L storage)	L	1292	1640	2163
10 min peak output at 60ºC (500L storage)	L	674	731	818
1st hour continous output at 60ºC (500L storage)	L	1542	1890	2413
Continuous operation at 60ºC	L	1042	1390	1913
Electrical Data				
Maximum Power Consumption	W	328	397	458
Electrical Supply	V	230	230	230
Frequency	Hz	50	50	50
Fuse Rating	A	10	10	10

Technical data

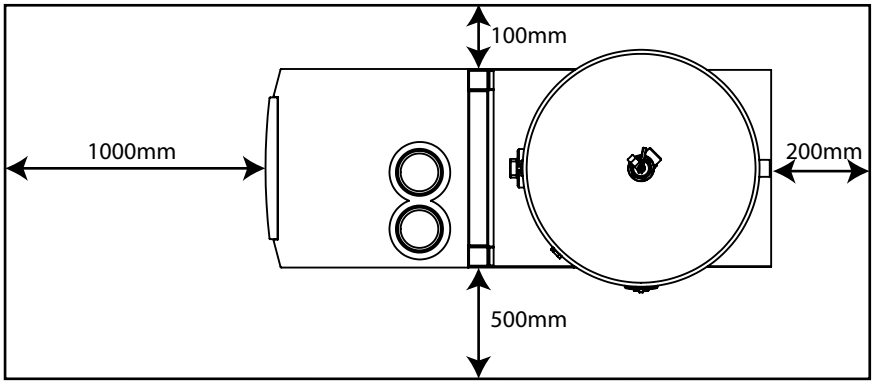


Dimensions		Thision WH 250 - 65/85	Thision WH 500 - 65/85	Thision WH 250 - 120	Thision WH 500- 120
W	mm	585	750	585	750
B1	mm	140	140	140	140
B2	mm	380	380	480	480
D	mm	1248	1423	1346	1516
H	mm	2015	1879	2015	1879
H1	mm	1952	1821	1952	1821
C1	BSP	1 1/4 “	1 1/2 “	1 1/4 “	1 1/2 “
C2	BSP	3/4 “	3/4 “	3/4 “	3/4 “
C3	BSP	1 1/4 “	1 1/2 “	1 1/4 “	1 1/2 “
E	mm	1578	1483	1578	1483
F	mm	1061	1082	1061	1082
G	mm	323	352	323	352
J	mm	1100	1000	1100	1000
K	mm	1000	900	1000	900
L	mm	800	450	800	450
M	mm	700	350	700	350
N	mm	600	250	600	250
O	mm	1578	1483	1578	1483
P	mm	1215	1122	1215	1122
Q	mm	323	352	323	352
C4	BSP	3/4 “	3/4 “	3/4 “	3/4 “
C5	BSP	1 “	1 “	1 “	1 “

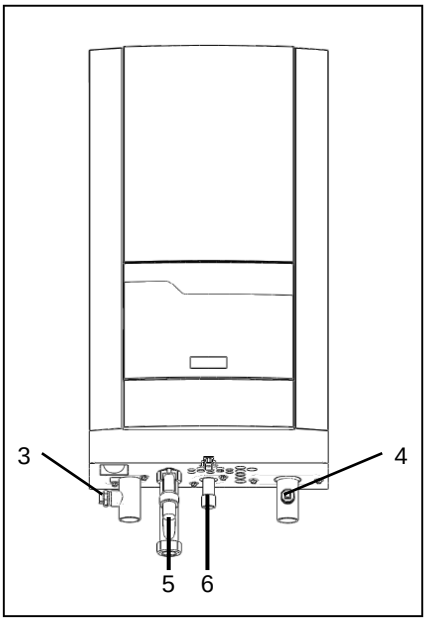


Installation

Water heater installation
Connecting the water heater



Water heater installation
The boiler should be positioned in a frost-proof boiler room. If the boiler room is on the roof, the boiler itself may never be the highest point of the installation.
When positioning the boiler, please note the recommended minimum clearance in the picture. When the boiler is positioned with less free space, maintenance activities will be more difficult.



Connecting the water heater
This chapter will explain how to make all connections to the boiler with regard to:

- Hydraulic connections
- Condensate drain connection
- Gas connection
- Flue gas connection
- Air intake connection
- Electrical connection

The boiler should always be connected in such a way, that the system applies to all relevant standards and regulations (European, national and local). It's the responsibility of the installer to ensure that all standards and regulations are respected.

Hydraulic connections (1,2,3,4)

The Thision WH should be connected to the mains water supply, The concentration of chloride in the water supply should be less than 200mg/l. Should the hardness be measured at more than 14°dH then a softener should be installed to bring the hardness down to between 6°dH and 8°dH.

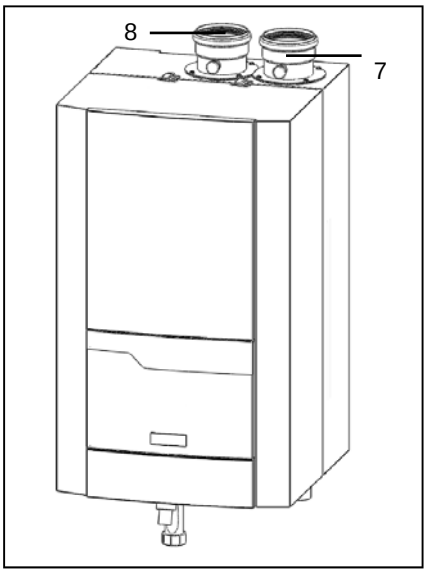
Condensate connection (5)
After filling with water, the syphon (included in delivery) should be installed to the connection (5) at the bottom of the water heater. Connect the hose to the draining system in the boiler room. The connection to the draining system should always be done with an open connection, in order to avoid flooding the boiler in case of a blocked drain.

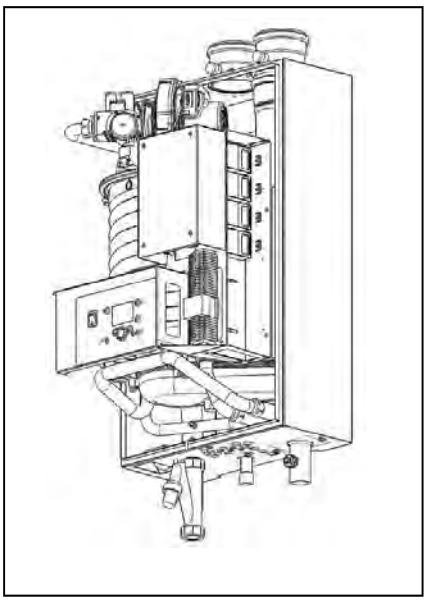
Gas connection (6)
The gas connection must be made by an authorized installer in accordance with the applicable national and local standards and regulations.

Connect the gas line from the system tension free to the gas connection (6) of the boiler. A gas cock should be mounted directly behind the boiler.

Caution!
When installing the Thision WH a mains water kit must be used. The DHWS flow connection should be protected against a vacuum by use of an anti-vacuum valve.

Connecting the water heater





Flue gas connection (7)
Regulations for the construction of flue gas systems are very different for each country. It should be ensured that all national regulations with regard to flue gas systems are respected.

Connect the flue gas system to the flue gas connection (7) of the water heater, use flue gas systems with seamless connections only. It's not necessary to make a separate condensate drain for the flue gas system, as the condensate will be drained via the syphon of the boiler.

Please note the following issues:

- It's recommended to use stainless steel or PPS fluegas systems
- The diameter of the flue gas system must be chosen by calculation according to the national regulations
- Construct the flue gas system as short as possible (for maximum length see planner documentation)
- Construct horizonal ways with a minimum angle of 3º

Air intake connection (8)
The air intake can be connected in case of room sealed installation. The diameter should be calculated according to the national regulations, together with the flue gas system. The total resistance of both systems should never overcome the maximum permissible resistance of the fan inside the boiler (see also chapter: Technical data).

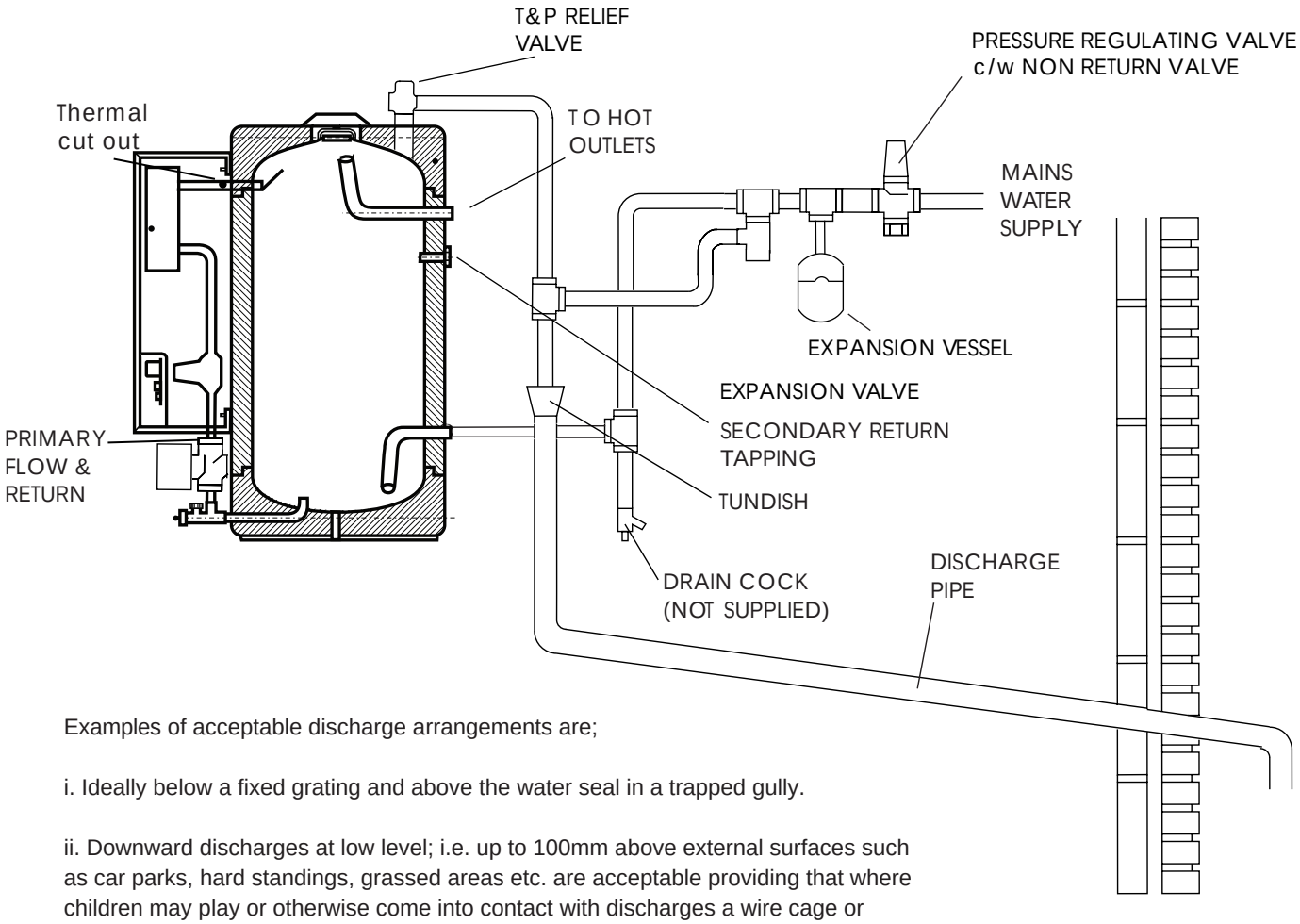
Electrical connection
The electrical connection must be made by an authorized installer in accordance with the applicable national and local standards and regulations.

For the power supply it's necessary to use a mains isolator switch with a contact opening of at least 3 mm within the boiler room. This switch can be used to switch off the power supply for maintenance purposes.

Unvented Applications

The Thision WH can be fed directly from the mains supply to the property without the need for seperate feed cisterns or vent pipes. It is supplied complete with all its necessary inlet and safety controls, thermal cut out and two port motorised valve.

Schematic installation details for unvented applications



Examples of acceptable discharge arrangements are;

i. Ideally below a fixed grating and above the water seal in a trapped gully.

ii. Downward discharges at low level; i.e. up to 100mm above external surfaces such as car parks, hard standings, grassed areas etc. are acceptable providing that where children may play or otherwise come into contact with discharges a wire cage or similar guard is positioned to prevent contact, whilst maintaining visibility.

iii. Discharges at high level; e.g. into a metal hopper and metal downpipe with the end of the discharge pipe is clearly visible (tundish visible or not) or onto a roof capable of withstanding high temperature discharges of water and 3m from any plastic guttering systems that would collect such discharges (tundish visible).

iv. Where a single pipe serves a number of discharges, such as in blocks of flats, the number served should be limited to not more than 6 systems so that any installation discharging can be traced reasonably easily. The single common discharge pipe should be at least one pipe size larger than the largest individual discharge pipe (D2) to be connected. If unvented hot water storage systems are installed where discharges from safety devices may not be apparent i.e. indwellings occupied by blind, infirm or disabled people, consideration should be given to the installation of an electronically operated device to warn when discharge takes place.

Note: The discharge will consist of scalding water and steam. Asphalt, roofing felt and non metallic rainwater goods may be damaged by such discharges.

Worked example of discharge pipe sizing.

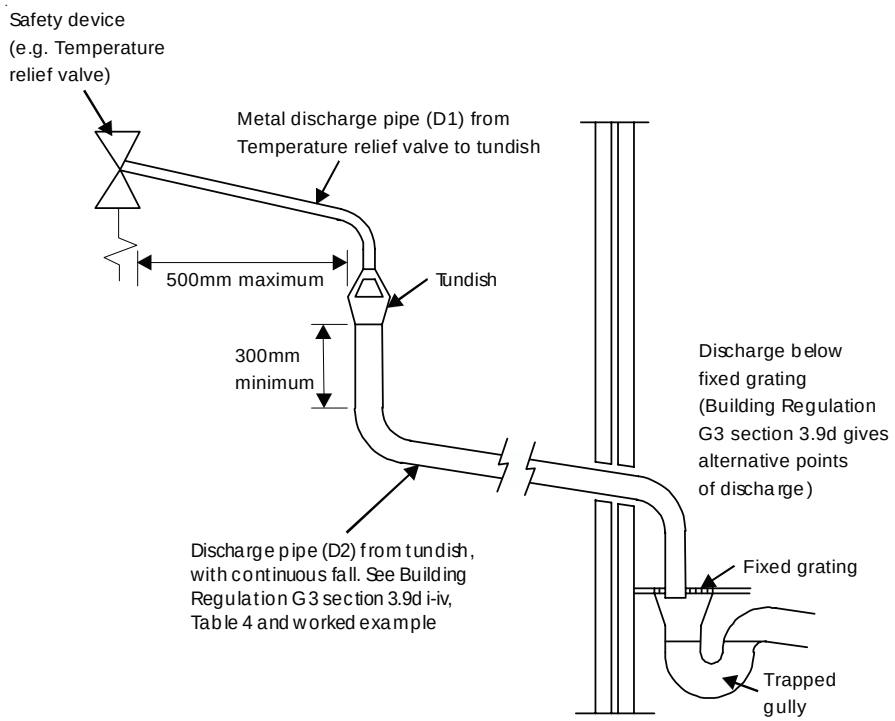
The example below is for a G1/2 temperature relief valve with a discharge pipe (D2) having 4 No. elbows and length of 7m from the tundish to the point of discharge.

From Table 1:
Maximum resistance allowed for a straight lenght of 22mm copper discharge pipe (D2) from a G1/2 temperature relief valve is 9.0m.
Subtract resistance of 4 No. 22mm elbows at 0.8m each = 3.2m
Therefore permitted length equates to 5.8m.
5.8m is less than the actual length of 7m therefore calculate the next largest size.
Maximum resistance allowed for straight lenght of 28mm copper discharge pipe (D2) from a G1/2 temperature relief valve equates to 18m.
Subtract resistance of 4 No. 28mm elbows at 1.0m each = 4.0m
Therefore the maximum permitted length equates to 14m.
As the actually length is 7m, a 28mm (D2) copper pipe will be satisfactory.

Sizing of copper discharge pipe (D2) for common T&P relief valve sizes

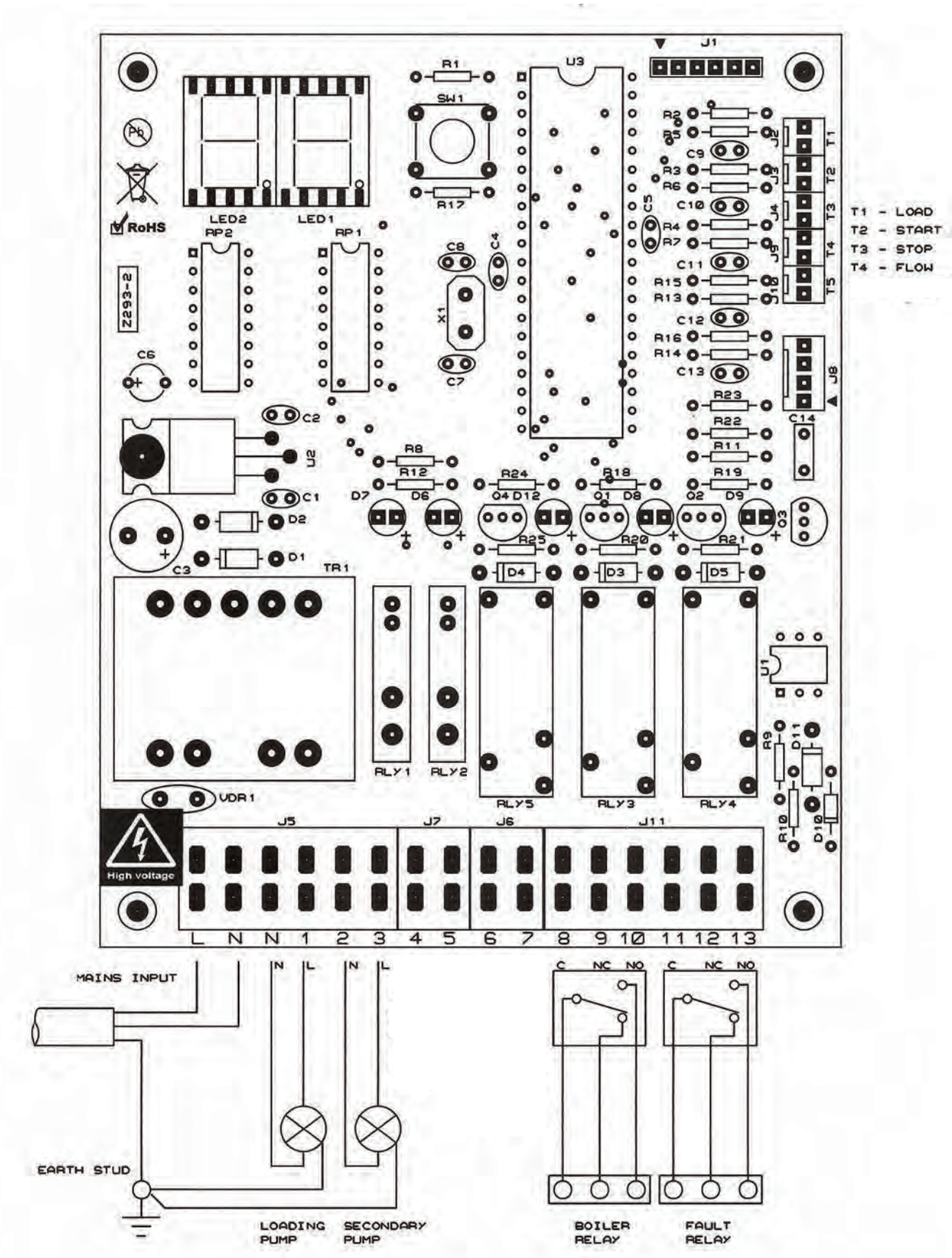
Valve outlet size	Minimum size of discharge pipe D2	Minimum size of discharge pipe D2 from tundish	Maximum resistance allowed, expressed as a length of straight pipe (i.e. no. elbows or bends)	Resistance created by each elbow or bend
G1/2	15mm	22mm	up to 9m	0.8m
		28mm	up to 18m	1.0m
		35mm	up to 27m	1.4m
G3/4	22mm	28mm	up to 9m	1.0m
		35mm	up to 18m	1.4m
		42mm	up to 27m	1.7m
G1	28mm	35mm	up to 9m	1.4m
		42mm	up to 18m	1.7m
		54mm	up to 27m	2.3m

Schematic discharge pipe arrangement



Cylinder Controls

Electrical Connections



Water and hydraulic system

Commissioning of the water heater should be carried out by authorised personnel only. Failure to respect this condition makes the guarantee void. A protocol of the commissioning should be filled out (see end of this manual for example of commissioning protocol).

This chapter explains the commissioning of the water heater with the standard water heater controller. When an additional controller is installed, please refer to its manual for commissioning the controller.

Filling and venting the domestic hot water system

Step 1: Open the furthest outlet from unit

Step 2: Open the mains cold water supply until all the air has been eliminated from the outlet

Step 3: Open the valve on the reciculation circuit, when all of the air has been eliminated close the outlet

Step 4: Check pipework for leaks

Temperature Setting

The Thision WH is factory set at 65˚C DHW flow and 60˚ DHW return, the temperature can only be adjsuted using specialist equipment.

Further Commissioning

Once the system has been completely filled and vented the unit can be connected to the electrical supply.
All DHWS settings are pre-set.

Ensure the following are operating correctly.

The recirculation pump should operate continuously, ensure the pump is running

The load pump will operate intermittently, ensure the pump turns freely

The boiler should operate when the loading pocess has started

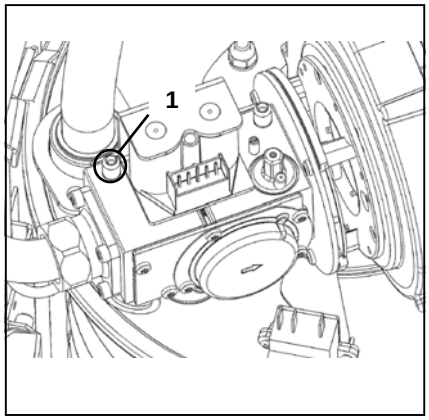
The loading process will stop when the sytem has reached the required temperature

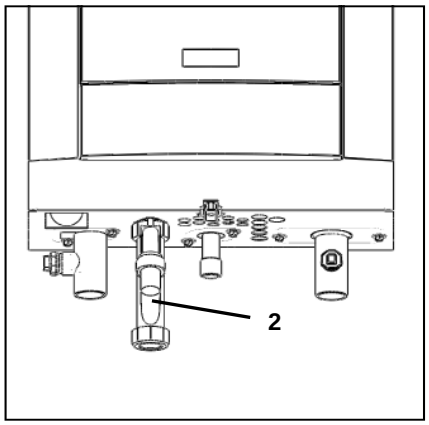
During the loading process the pumps speed will be altering this can lead to a pulsing sound from the pumps but is not damaging to their operation

Display codes during use:
The display will show various codes during operation including the unit flow temperature.

Commissioning

Gas supply
Condensate connection
Flue and air intake connections





Gas supply
Check the gas supply connection to the boiler for tightness. If any leakage is found, reseal the leakage before starting the boiler!

Remove any air between the gas valve and the gas line. This can be done at the test point (1) at the gas pressure switch. Don't forget to close the test point afterwards!

Check the gas type and values with the local gas company, in order to know for which gas type the boiler should be commissioned.

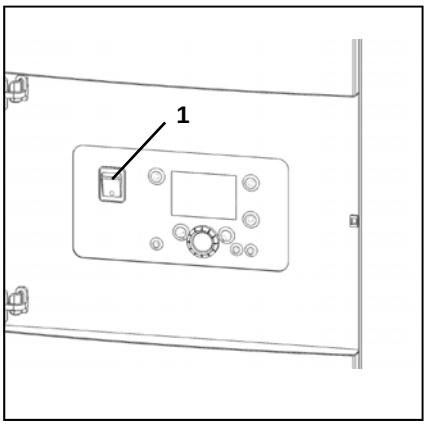
Condensate connection
Remove the syphon (2) from the condensate connection. Fill it with water and place it back in the original position. Make sure the syphon is filled before starting the boiler, in
order to prevent flue gases discharging through the condensate connection!

Flue and air intake connections
Check whether the flue and air intake systems are made according to the national and local regulations. Installations which don't comply with the regulations, are not allowed to be commissioned.

Make sure that all connections are free.

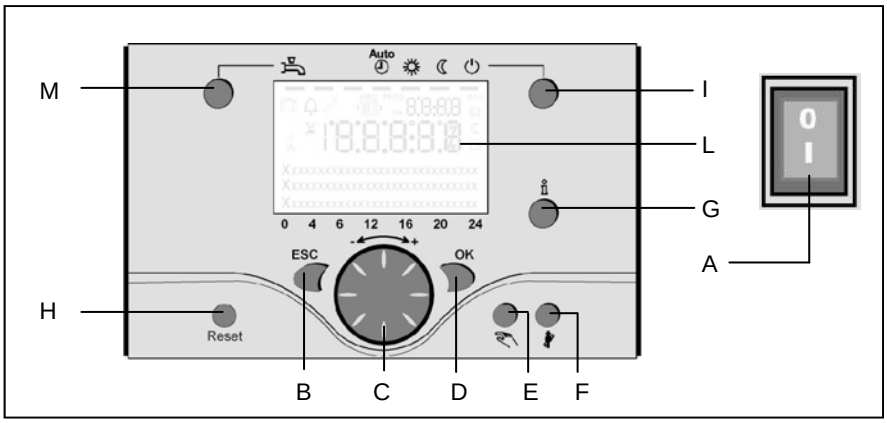
The size of flue gas and air intake connections may not be reduced.

Prepare water heater for first startup



Legend:

A On/off switch
B Return (ESC)
C Room temperature control
D Confirmation (OK)
E Manual mode
F Chimney sweeper mode
G Info mode
H Reset button
I Operation mode heating zone(s)
L Display
M Operation mode DHW



Preparation for first startup

Open the gas supply;
Enable the power supply to the boiler;
Switch on the boiler with the on/off switch (1);
Make sure the boiler is in standby mode (K);
Check the pump operation: make sure the pump runs in the right direction;
Release all air from the pump motor.

It‘s recommended to put the boiler on 50% load after the first startup, as this is the best starting point to do a proper combustion analysis. This can be done with the following procedure:

Push button I >3 Sek, the boiler goes into controller Stopp mode.
Push the Info button (G), the actual boiler load (%) appears in the display;
Choose „set up“ (confirm with OK button), now the boiler load can be changed by rotating the wheel (C) and confirming the 50% setting with the OK button.

After checking the combustion values (see next page), the controller Stopp mode can be stopped by pushing the control mode button (I) >3 Sek.

Cylinder Diagnosis

It is possible to view the operational data of each of the Thision WH i.e. temperatures, this is achieved by holding the button on the cylinder controller for approximately 5 seconds. The diagnosis number is shown for 1 second then the value for 3 seconds.

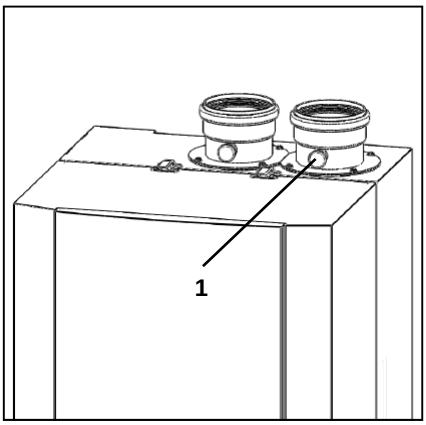
The diagnosis setting can be exited by holding the button for 5 seconds or if the button is not depressed for 10 minutes.

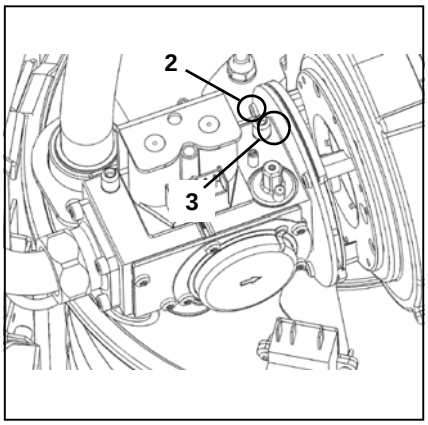
So software version
D0 Operating Status
D1 Current T1 temperature
D2 Current T2 temperature
D3 Current T3 temperature
D4 Current T4 temperature
D5 N/A
D6 Load pump P1 speed (rpm)
D7 Required temperature

Temperature Setting

The Thision WH is factory set for 60°C DHW flow and can be adjusted by 5°C by switching the unit off and back on whilst holding the control button on the PCB.

Combustion analysis





Combustion check at full load
Start the water heater in controller stop mode and go to 50% load. Now the boiler operates at 50% load. Allow the boiler to stabilise the combustion for 3 minutes. Then increase the waterheater load step by step up to 100%. Check the gas pressure on the inlet of the gas valve while increasing the water heater load: the gas pressure should never go below the minimum required value ➔ see technical data. When an (optional) minimum gas pressure switch is connected, this must be set to 75% of the required gas pressure.

Check the combustion settings via the test point in the chimney connection (1). If necessary, correct the settings with the small adjustment screw at the top of the gas valve (2).

Combustion check at minimum load
Switch the water heater to minimum load (0%). Check the combustion settings the same way as described for full load. If necessary, correct the settings with the large adjustment screw at the top of the gas valve (3).

Combustion check at 50% load
An additional reference check of combustion values at 50% load is recommended in order to check if the gas valve is set in such way, that the modulating behaviour is normal. The CO_2 value should be in between the settings of full load and minumum load. CO value should be equal to full load and minimum load values.

Make sure that the boiler is set to automatic operation and controller stop mode is disabled after the combustion test is finished.

Combustion settings max. load for natural gas G20 / G25		
		TH-L 65-85
$CO_{2,\ max}$	%	8.5±0.2
CO_{max}	ppm	< 70
		TH-L 100-145
$CO_{2,\ max}$	%	8.7±0.2
CO_{max}	ppm	< 70

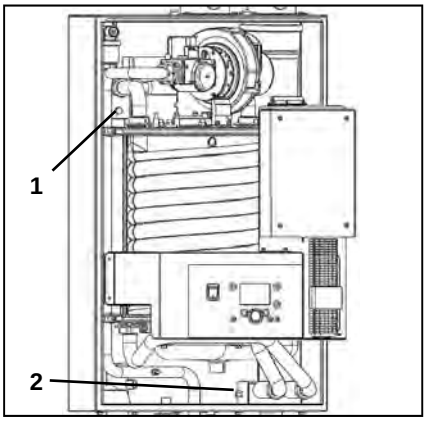
Combustion settings max. load for LPG G31		
Convert boiler before operation (see coversion kit instruction)		
		TH-L 65-85
$CO_{2,\ max}$	%	-
CO_{max}	ppm	-
		TH-L 100-145
$CO_{2,\ max}$	%	-
CO_{max}	ppm	-

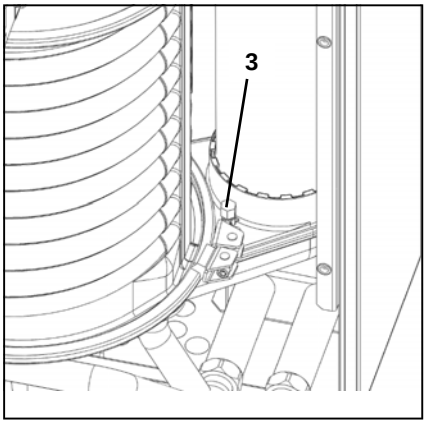
Combustion settings min. load for natural gas G20 / G25		
		TH-L 65-145
$CO_{2,\ min}$	%	8.5 ± 0.2
CO_{min}	ppm	< 30

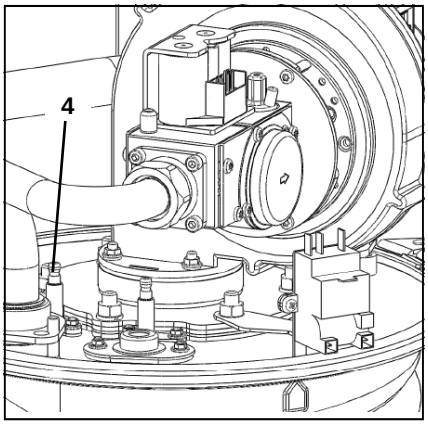
Combustion settings min. load for LPG G31		
Convert boiler before operation (see coversion kit instruction)		
		TH-L 65-145
$CO_{2,\ min}$	%	-
CO_{min}	ppm	-

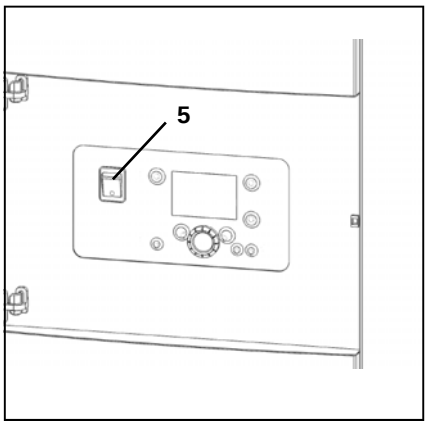
Commissioning

Check functionality of safety devices
Gas tightness check
Water heater shut down









Check functionality of safety devices
All safety devices have to be checked on good functioning. Safety devices on a standard water heater are a water flow temperature sensor, water return temperature sensor, flue gas temperature sensor and ionisation electrode. These devices can be checked as described below.

Flow temperature sensor (1)
Disconnect the plug from the sensor while the water heater is switched on. This should result in a lockout no. 20. The lockout should disappear as soon as the plug is placed back in position, the water heater will restart.

Return temperature sensor (2)
Disconnect the plug from the sensor while the water heater is switched on. This should result in a lockout no. 40. The lockout should disappear as soon as the plug is placed back in position. The water heater will restart.

Flue gas temperature sensor (3)
Disconnect the plug from the sensor while the water heater is switched on. The should result in a lockout no. 28. The lockout should disappear as soon as the plug is placed back in position, the boiler will restart.

Ionisation electrode (4)
Remove electrical connection from the ionisation electrode while the water heater is running, the water heater will go to lockout no. 128. The water heater will try to restart. With the electrical connection removed, the restart will result in lockout no. 133. When the connection is remade the restart will be successful.

Measuring the ionisation current can be done by mounting a multi-meter (set to µA) in between the ionisation electrode and its electrical connection. The ionisation current should always be above 1.2 µA, in normal conditions it will be 6 µA and above.

Gas tightness check
Check the gas tightness of all sealed connections with an approved soap or electronic gas analyzer, for example:

- Test points;
- Bolt connections;
- Gaskets of mixing system, etc.

Water heater shut down
When the water heater will not be used for longer periods, shut down the boiler by following procedure:

- Switch the boiler in standby operation (K);
- Switch off the boiler with the on/off switch (5);
- Disable power supply to the boiler by deactivating the mains isolator switch in the boiler room;
- Close the gas supply to the boiler.

Lockouts

In case of a lockout, a warning symbol (🔔) and a flashing error code appears on the display. The cause of a fault should first be determined and eliminated before the boiler is being reset. The table below shows all possible lockouts with indication of possible cause.

Error code	Description of error
0	No error
10	Outside temperature sensor error
20	Boiler temperature 1 sensor error
26	Common flow temperature sensor error
28	Flue gas temperature sensor error
30	Flow temperature 1 sensor error
32	Flow temperature 2 sensor error
38	Flow temperature primary controller sensor error
40	Return temperature 1 sensor error
46	Return temperature cascade sensor error
47	Common return temperature sensor error
50	DHW temperature 1 sensor error
52	DHW temperature 2 sensor error
54	DHW primary controller sensor error
57	DHW circulation temperature sensor error
60	Room temperature 1 sensor error
65	Room temperature 2 sensor error
70	Buffer storage tank temperature 1 sensor error
71	Buffer storage tank temperature 2 sensor error
72	Buffer storage tank temperature 3 sensor error
73	Collector temperature 1 sensor error
74	Collector temperature 2 sensor error
82	LPB address collision
83	BSB wire short-circuit
84	BSB address collision
85	BSB RF communication error
91	EEPROM error lockout information
98	Extension module 1 error (collective error)
99	Extension module 2 error (collective error)
100	2 clocktime masters (LPB)
102	Clocktime master without reserve (LPB)
103	Communication error
105	Maintenance message
109	Boiler temperature supervision
110	STB lockout
111	TW cutout
121	Flow temperature 1 (HC1) supervision
122	Flow temperature 2 (HC2) supervision
125	Pump supervision error
126	DHW charging supervision
127	Legionella temperature not reached
128	Loss of flame during operation
129	Fan error or LP error
130	Flue gas temperature limit exceeded
131	Burner fault
132	GP or LP error
133	No flame during safety time
146	Configuration error collective message

Lockouts

Error code	Description of error
151	Internal error
152	Parameterization error
153	Unit manually locked
160	Fan error
162	LP error, does not close
164	Error heating circuit flow switch
166	LP error, does not open
171	Alarm contact H1 or H4 active
172	Alarm contact H2 (EM1, EM2 or EM3) or H5 active
173	Alarm contact H6 active
174	Alarm contact H3 or H7 active
178	Limit thermostat heating circuit 1
179	Limit thermostat heating circuit 2
183	Unit in parameterization mode
193	Pump supervision error after flame on
216	Fault boiler
217	Fault sensor
241	Flow sensor solar sensor error
242	Return sensor solar sensor error
243	Swimming pool temperature sensor error
270	Limit function
317	Mains frequency outside permissible range
320	DHW charging temperature sensor error
324	BX same sensors
325	BX / extension module same sensors
326	BX / mixing group same sensors
327	Extension module same function
328	Mixing group same finction
329	Extension module / mixing group same function
330	Sensor BX1 no function
331	Sensor BX2 no function
332	Sensor BX3 no function
333	Sensor BX4 no function
334	Sensor BX5 no function
335	Sensor BX21 no function (EM1, EM2 or EM3)
336	Sensor BX22 no function (EM1, EM2 or EM3)
337	Sensor BX1 no function
338	Sensor BX12 no function
339	Collector pump Q5 not available
340	Collector pump Q16 not available
341	Solar Collector sensor B6 not available
342	DHW sensor B31 not available
343	Solar integration not available
344	Solar controlling element buffer K8 not available
345	Solar controlling element swimming pool K18 not available
346	Solid fuel boiler pump Q10 not available
347	Solid fuel boiler comparison sensor not available
348	Solid fuel boiler address error

Lockouts

Error code	Description of error
349	Buffer return valve Y15 not available
350	Puffer address sensor
351	Primary controller / system pump address error
352	Pressureless header address error
353	Common flow sensor B10 not available
371	Flow temperature 3 (heating circuit 3) supervision
372	Limit thermostat heating circuit 3
373	Extension module 3 error (collective error)
349	Buffer return valve Y15 not available
350	Puffer address sensor
351	Primary controller / system pump address error
352	Pressureless header address error
353	Common flow sensor B10 not available
371	Flow temperature 3 (heating circuit 3) supervision
372	Limit thermostat heating circuit 3
373	Extension module 3 error (collective error)
386	Fan speed has lost valid range
388	DHW error no function
426	Feedback flue gas damper
427	Configuration flue gas damper
431	Sensor primary heat exchanger
432	Functional earth not connected
433	Temperature primary heat exchanger to high

Cylinder Lockouts

Error code	Description of error
01	TT1 sensor fault
02	TT2 sensor fault
03	TT3 sensor fault
04	TT4 sensor fault
05	TT5 sensor fault
06	Low temperature for extended time
07	Frost protection active
08	Boiler fault
09	No communication with boiler

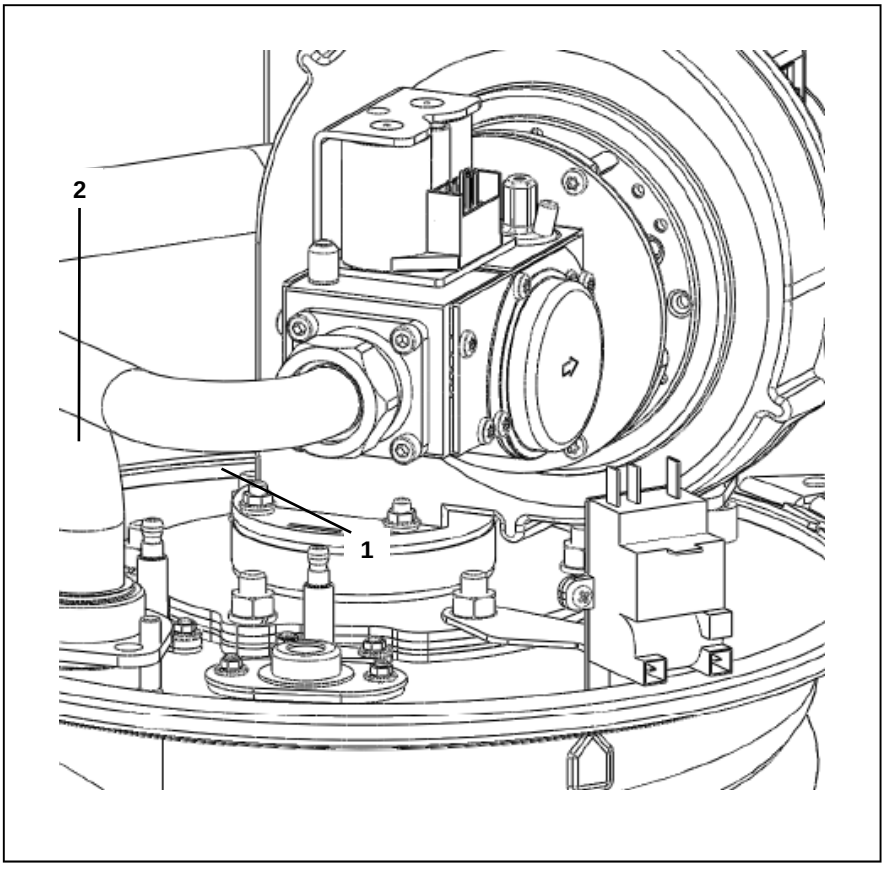
Checklist
Replacing the electrodes

Maintenance of the water heater should be carried out by authorized personnel only.

In order to ensure continued good and safe operation of the water heater, it should be inspected at least once per year. A maintenance protocol should be filled out (see end of this chapter for example of maintenance protocol).

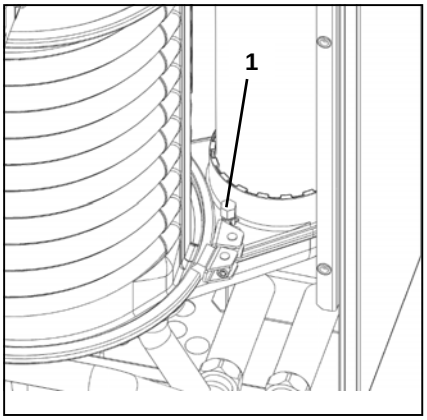
Checklist
The following activities must be carried out, see following paragraphs for an extensive description of the main activities:

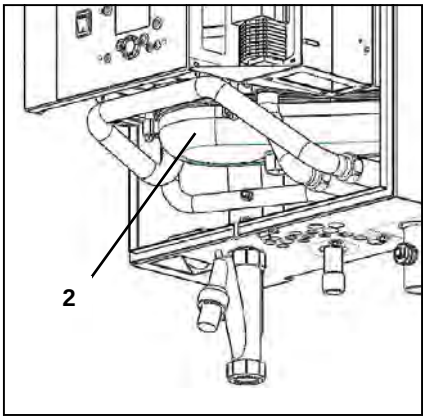
Replace the ignition and ionisation electrodes;
Clean the condensate receptacle;
Clean and refill the syphon;
Inspect the combustion chamber, clean if necessary (DON'T use water !);
Check the water pressure of the system;
Check the water quality of the system water as well as supply water;
Check/correct the combustion values at full and mimimum load with a combustion analyzer;
Check the gas pressure to the water heater;
Check the tightness of all sealed connections and test points;
Check the functionality of all safety devices;
Fill out a maintenance protocol.



Replacing the electrodes
The electrodes are positioned on the top side of the boiler. Replace the ignition electrode (1) and ionisation electrode (2) as shown on the picture.

Cleaning the condensate receptacle
Cleaning and refilling the syphon
Inspection of combustion chamber





Cleaning the condensate receptacle

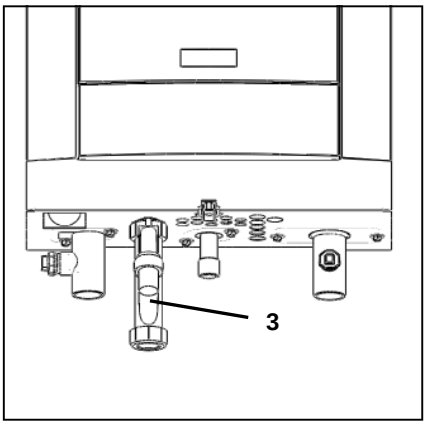
Disconnect the plug of the fluegas temperature sensor (1);

Remove the condensate receptacle (2);

Clean the receptacle;

Mount the condensate receptacle;

Connect the plug of the fluegas temperature sensor.

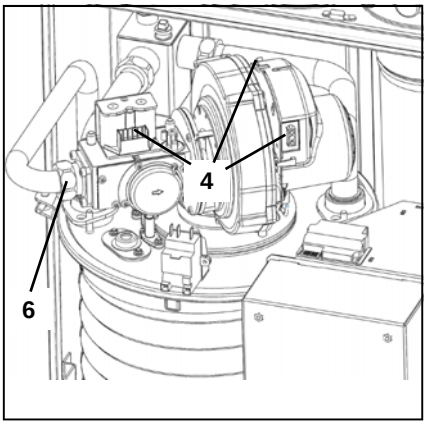


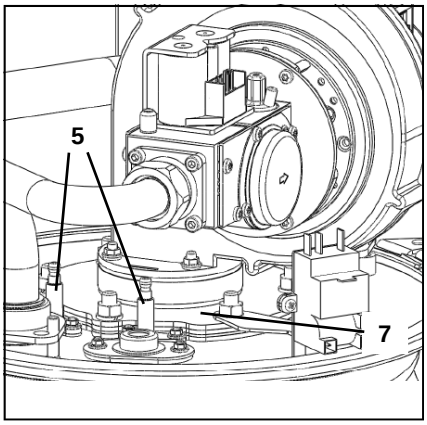
Cleaning and refilling the syphon

Remove the syphon (3) from the condensate connection;

Clean and fill it with fresh water;

Mount the syphon back in the original position.





Inspection of combustion chamber

For inspection of the combustion chamber the mixing system and burner must be disassembled.

Switch off the boiler and close the gas supply;

Remove the electrical connection from the fan and gas valve (4);

Remove the electrical connection from the electrodes (5);

Undo the gas connection at the inlet of the gas valve (6);

Disassemble the top plate incl. mixing system (7);

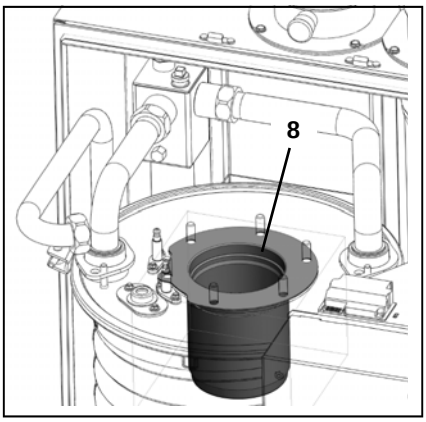
Remove the burner from the combustion chamber (8);

Inspect the combustion chamber and clean it with a vacuumcleaner if necessary;

Assemble all components in opposite order;

Open the gas supply and check all connections for gas leakage;

Switch on the boiler.



Maintenance

Water pressure and quality
Check if the water pressure and quality meet the requirements. Consult the chapter “commissioning: water and hydraulic system” for more detailed information.

Draining and cleaning the cylinder

It is possible to clean out the cylinder using fresh mains cold water if so desired. To carry out this operation isolate and disconnect all water supplies and ensure all electrical supplies are isolated. Run a drain hose from the drain valve to an operating drain, then connect a controlled mains water supply to the unit, drain the unit fully and then slowly supply water to the unit at the rate of drainage. carry on at this rate until the water running out of the bottom of the cylinder runs clear, then carry out two full fills and drains.
Reconnect and re-commission.

Combustion analysis
Check the combustion at full load and minumum load, correct the settings if necessary. An additional reference check at 50% load is recommended. Consult the chapter “commissioning: combustion analysis” for more detailed information.

Gas pressure
Check the dynamic pressure of the gas supply to the boiler, when the water heater is running at full load.

Gas tightness check
Check the tightness of all sealed connections with an approved soap or electronic analyzer, for example:

Test points;

Bolt connections;

Gaskets of mixing system, etc.

Safety devices
Check the functionality and the settings of all safety devices connected. Consult the chapter “commissioning: Check functionality of safety devices” for more detailed information.

Maintenance Protocol

Maintenance Protocol THISION L				
Project				
Boiler type		Project		
Serial number		Address		
Year		City		
Nominal load (Hi)	[kW]	Date		
Nominal output (Hi)	[kW]	Engineer		
System				
Water pressure	[bar]			
Water pH	[-]			
Water hardness	[ºdH]			
Water chloride	[mg/l]			
Water ΔT full load	[ºC]			
Water Δp_{boiler}	[kPa]			
Water flow	[m^3/h]			
Pump setting	[-]			
Safety devices				
High limit setting	[ºC]	Water flow sensor checked	☐	
Temp. limiter setting	[ºC]	Fluegas sensor checked	☐	
Min. gas pressure switch setting	[mbar]	Water flow switch checked	☐	
Ignition time burner	[sec]			
Combustion analysis				
	100% load	**50% load**		**Min. load**
Gas consumption	[m^3/h]	[m^3/h]		[m^3/h]
Gas pressure	[mbar]	[mbar]		[mbar]
CO_2	[%]	[%]		[%]
O_2	[%]	[%]		[%]
CO	[ppm]	[ppm]		[ppm]
NOx	[ppm]	[ppm]		[ppm]
$T_{atmospheric}$	[ºC]	[ºC]		[ºC]
$T_{fluegas}$	[ºC]	[ºC]		[ºC]
$T_{water, flow}$	[ºC]	[ºC]		[ºC]
$T_{water, return}$	[ºC]	[ºC]		[ºC]
Ionisation current	[µA]	[µA]		[µA]
p_{fan}	[mbar]	[mbar]		[mbar]
$p_{top\ panel}$	[mbar]	[mbar]		[mbar]
$p_{combustion\ chamber}$	[mbar]	[mbar]		[mbar]
Remarks				

Commissioning protocol

Commissioning Protocol THISION L				
Project				
Boiler type		Project		
Serial number		Address		
Year		City		
Nominal load (Hi)	[kW]	Date		
Nominal output (Hi)	[kW]	Engineer		
System				
Water pressure	[bar]	Installation:	Roof top	☐
Water pH	[-]		Ground floor	☐
Water hardness	[ºdH]		Basement	☐
Water chloride	[mg/l]		Other:	☐
Water ΔT full load	[ºC]	Hydraulics:	Low velocity header	☐
Water Δp_{boiler}	[kPa]		Plated heat exchanger	☐
Water flow	[m^3/h]		Bypass boiler	☐
Pump setting	[-]		Other:	☐
Safety devices				
High limit setting	[ºC]	Water flow sensor checked		☐
Temp. limiter setting	[ºC]	Fluegas sensor checked		☐
Min. gas pressure switch setting	[mbar]	Water flow switch checked		☐
Ignition time burner	[sec]			

Combustion analysis			
	100% load	**50% load**	**Min. load**
Gas consumption	[m^3/h]	[m^3/h]	[m^3/h]
Gas pressure	[mbar]	[mbar]	[mbar]
CO_2	[%]	[%]	[%]
O_2	[%]	[%]	[%]
CO	[ppm]	[ppm]	[ppm]
NOx	[ppm]	[ppm]	[ppm]
$T_{atmospheric}$	[ºC]	[ºC]	[ºC]
$T_{fluegas}$	[ºC]	[ºC]	[ºC]
$T_{water, flow}$	[ºC]	[ºC]	[ºC]
$T_{water, return}$	[ºC]	[ºC]	[ºC]
Ionisation current	[µA]	[µA]	[µA]
p_{fan}	[mbar]	[mbar]	[mbar]
$p_{top\ panel}$	[mbar]	[mbar]	[mbar]
$p_{combustion\ chamber}$	[mbar]	[mbar]	[mbar]

Remarks

Service:

ELCO GmbH
D - 64546 Mörfelden-Walldorf

ELCO Austria GmbH
A - 2544 Leobersdorf

ELCOTHERM AG
CH - 7324 Vilters

ELCO Netherlands / Rendamax B.V.
NL - 6465 AG Kerkrade

ELCO Belgium n.v./s.a.
B - 1731 Zellik

ELCO Italia S.p.A.
I - 31023 Resana

ELCO UK / MHS Boilers ltd.
UK - Basildon, Essex, SS15 6SJ

ELCO France / Chaffoteaux SAS
F - 93521 Saint-Denis Cedex