Clyde Established 1920

Natural Gas
90 kW

LP Gas

90 kW

Clyde Alkon 90

Floor standing condensing boilers

- ***Fully modulating burner and efficiency of up to 109.1% ncv***
- ***Modulating integral pump***
- ***Modular arrangement of floor standing boilers that simply bolt together***
- ***Cascade of up to 8 boilers (2 x 4) without additional frames or manifold***
- ***Aluminium/silicon/magnesium heat exchanger resists corrosion***
- ***Counter flow heat exchange maximises heat transfer & thermal efficiency***
- ***For internal and external installations***

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Qualified for Energy Technology List www.eca.gov.uk

Engineering Data Sheet 814/1

May 2010

General information

Operating principles

The Alkon 90 is a floor standing condensing boiler with a counter flow heat exchanger with heat exchange pins that ensure a constant rate of heat transfer through the aluminium body. It has a fully-modulating, down-firing pre-mix gas burner (refer Figs 1 and 2). When operating in condensing mode with a flow of 50°C and a return of 30°C, it will give efficiencies of up to 109.1% (ncv). The combustion air fan and venturi (11) accurately control the volumes of gas and air and mix them in a sealed chamber prior to ignition. This ensures that there is optimum combustion at any point in the modulation range of the boiler. A small flame is held on the entire surface of the plaque burner.

An integral boiler circulation pump (3) ensures an even and constant flow through the heat exchanger - refer page 8. This pump modulates to match flow rate to heat output and increases the overall operating efficiency of the Alkon 90 boiler.

System circulating pumps should be hydraulically separated from the boiler(s) by a low velocity header.

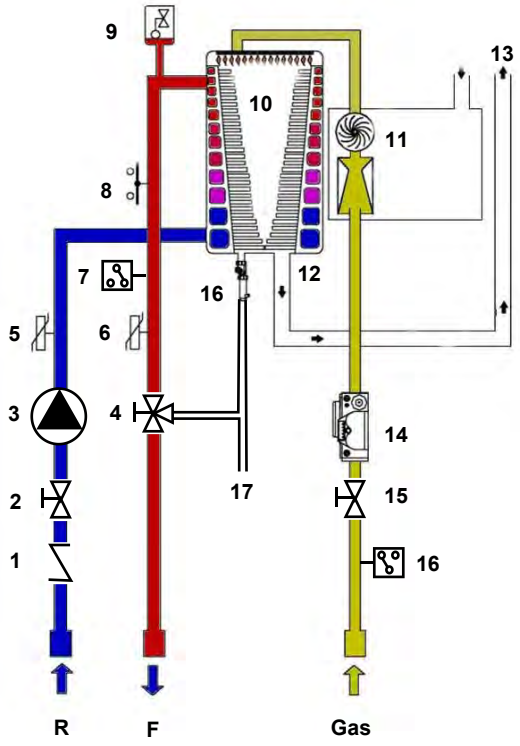


Fig 1 Diagram of operating principles

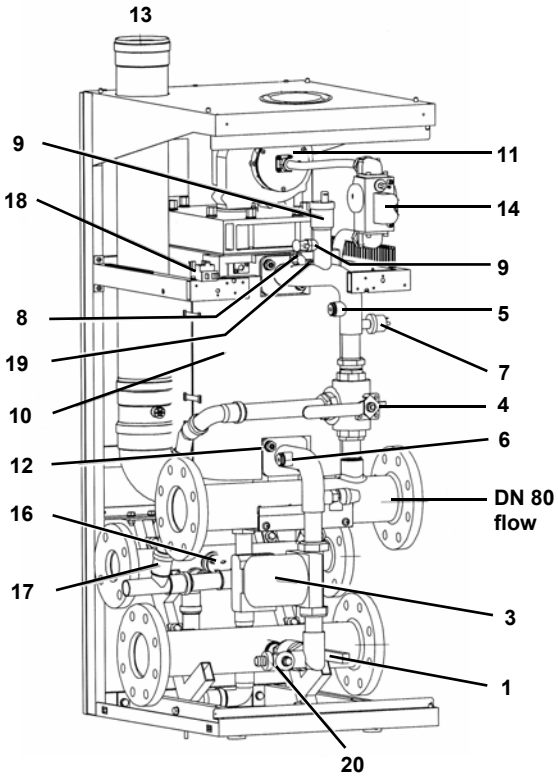


Fig 2 Component identification for Alkon 90 boiler

Key to Figs 1 & 2

1 Non-return valve
2 Isolating valve
3 Modulating pump
4 3-way drain cock
5 Flow temperature sensor
6 Return temperature sensor
7 Low water pressure switch
8 Limit thermostat
9 Air vent
10 Heat exchanger
11 Combustion air fan and venturi
12 Condensate level sensor
13 Exhaust gas outlet (100 mm diameter)
14 Gas valve
15 Gas isolating valve
16 Low gas pressure switch
17 Condensate trap and drain
18 Ignition electrode
19 Ionisation electrode
20 Drain cock

General information

Application

Alkon 90 boilers are manufactured and tested in accordance with the Gas Appliances Directive 90/396/EEC, the Boiler Efficiency Directive 92/42/EEC, the Low Voltage Directive 2006/95/EC, the Electromagnetic Compatibility Directive 2004/108/EC, EN 483, EN 625, and EN 677 and CE marked accordingly. They are suitable for use in LTHW heating systems with a maximum operating pressure of 8.0 bar and a maximum working temperature of 90°C (see Technical data).

Alkon 90 boilers are suitable for use with Group H second family gases (eg natural gas, G20), and Group P third family gases (eg propane, G31). and Butane/Propane mix (G30).

The boiler is suitable for use in pressurised (sealed) or open vented heating systems with a minimum static head of 0.5 bar. It is not suitable for use as a direct water heater. Where potable water is required, a matching calorifier or plate heat exchanger must be provided in the system.

Statutory requirements

The installation and commissioning of the boiler must be carried out by a qualified engineer in accordance with the instructions provided.

Gas supplies and gas burners must be installed, serviced and commissioned by a qualified person, eg. a Gas Safe registered engineer.

Handling

Offloading, dry storing and placing of equipment in the boiler room is the responsibility of the installer.

Equipment must be dry stored and protected from frost. Cartons must not be crushed or otherwise damaged.

Commissioning

Clyde undertake commissioning of boilers. Commissioning charges do not include servicing during the guarantee period, although this may be carried out under service contract or to specific order. Boilers should be commissioned in line with CIBSE Commissioning Code B.

Servicing

The importance of regular maintenance cannot be over-emphasised if maximum efficiency is to be maintained. Customers are strongly advised to place the equipment under service contract immediately commissioning is complete.

Guarantee

Subject to correct handling, installation and operation, all equipment is guaranteed for twelve months from the date of despatch. Boiler heat exchangers are guaranteed for a period of two years from the date of manufacture.

The guarantee is not valid if the boiler is not installed in accordance with these instructions (please refer to page 5), becomes blocked with debris and/or carbonate deposits from the system water and/or there is no documented evidence of commissioning by Clyde or their appointed engineer.

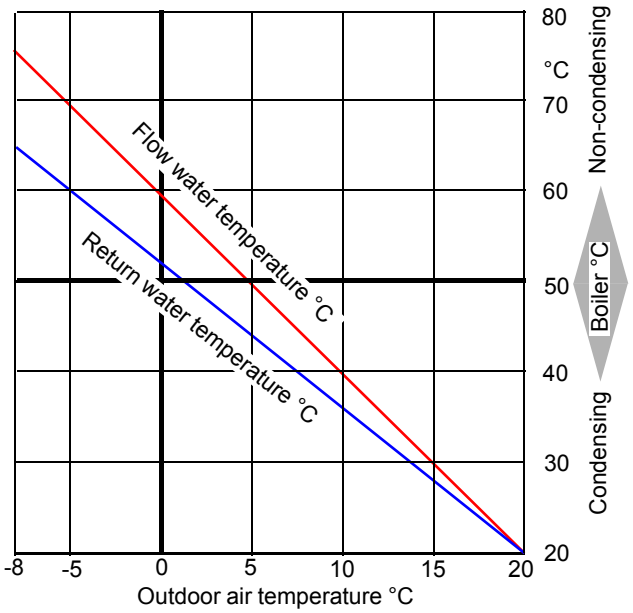
Boiler Log book

A boiler log book that provides a permanent record of commissioning and servicing data and measurements is supplied with every boiler. It is recommended that the owner ensures that this log book is kept safe and brought up to date on every occasion that routine or emergency work is carried out on the boiler.

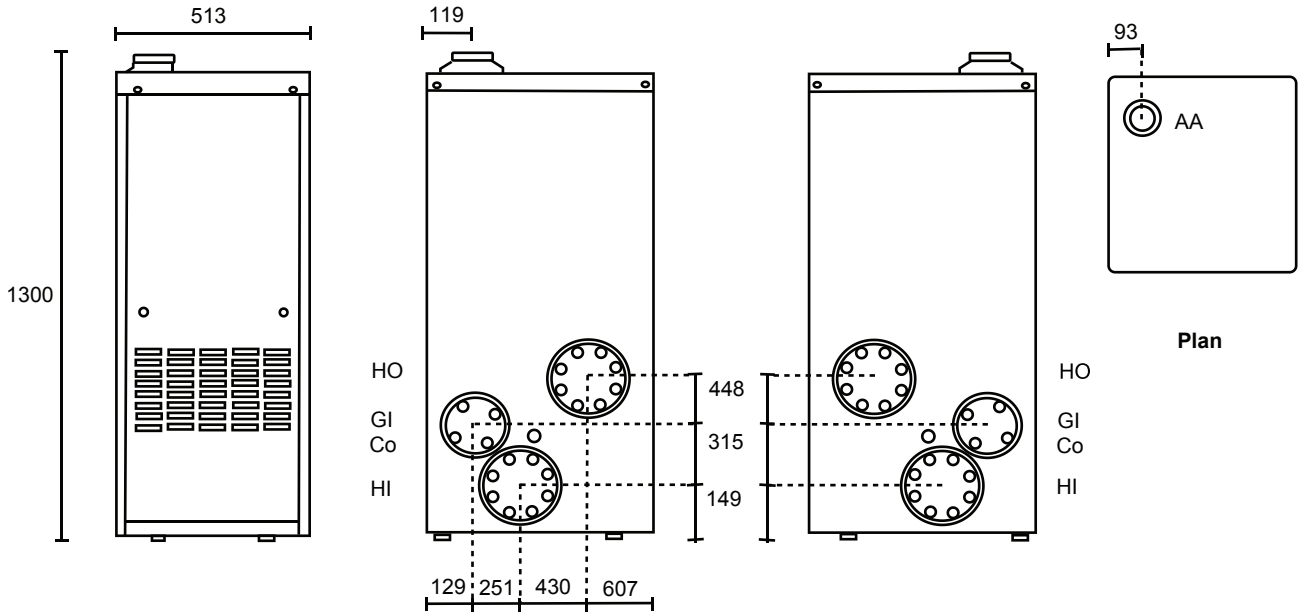
Emitter sizing (radiators)

The boiler will operate in condensing mode whenever the return water is below 50°C and will reach its full potential if the flow water temperature is also below 50°C. However, the latter condition will mainly occur when the boiler is heating an underfloor heating scheme or transiently when recharging a DHW storage tank from cold. By careful design of a traditional heating system with radiators, and with weather compensating control in operation, the return water temperature can be held below 50°C for most of the heating season, only rising above this figure when outdoor temperatures are below zero.

For optimum performance, calculate heat losses on the basis of a 20°C internal temperature and a -8°C outdoor air temperature. With no added factors, size the radiators on the basis of published EN 442 data (ΔT50) and size the system pump for a 20°C temperature drop. In most cases this will ensure that the boiler begins to operate in condensing mode when the outdoor air temperature rises above 1°C and becomes fully condensing when the temperature is above 5°C. For heating schemes in buildings where the occupants have special needs, different environmental conditions may apply and further advice must be sought.



Dimensions and technical data



Dimensions

Boiler model / output		kW	90
Boiler flow connection	HO		DN 80
Boiler return connection	HI		DN 80
Condensate outlet	Co	mm	32
Gas Inlet	GI		DN 50
Flue connection	AA	mm	100

Technical data

Flow 50°C / Return 30°C

Heat output (ncv)	Max	kW	93.6
Heat output (ncv)	Min	kW	24
Heat input (ncv)	Max	kW	90
Efficiency (ncv)	100	%	104
Efficiency (ncv)	30	%	109.1

Flow 80°C / Return 60°C

Heat output (ncv)	Max	kW	87.5
Heat output (ncv)	Min	kW	21.1
Heat input (ncv)	Max	kW	90
Efficiency (ncv)	100	%	97.26
Efficiency (ncv)	30	%	96.03
Flue gas temperature rise at full load		°C	38.5
Flue gas mass flow		kg/s	0.039
CO_2 in flue gas (1)	min/max	%	8.8 / 9.6
CO in flue gas (0% of O2)	min/max	mg/kWh	21.5 / 104.4
Cnodensate volume at max rate		kg/h	14.54
Natural gas consumption (gross cv) (2)		m³/h	8.36
N0x Emissions		mg/kWh	35.62
Boiler seasonal efficiency (3)		%	97.41
Dry weight		kg	135
Water volume		l	10
Maximum allowable temperature		°C	90
Maximum hydraulic working pressure		bar	8
CE Registration number			1312BR4926
Electrical protection			X5D
Max electrical power consumption		W	303

Notes : (1) Measured at the flue gas adaptor (2) Based on GCV 38.76 MJ/m³

(3) Calculated from the non-domestic heating and cooling compliance guide for conformance with ADL2A and ADL2B 2006 using the formula $HA_{seasonal} = 0.81H_{30\%} + 0.19H_{100\%}$

Water flow rates and hydraulic resistances

Water flow rate at 20°C temp. rise	l/s	1.12
Hydraulic resistance at 20°C temp. rise	kPa	22

Installation requirements

Regulations governing installation

Alkon boilers should be installed in accordance with all prevailing regulations and codes of practice, including the Building Regulations, Health and Safety Regulations PM5, Water Bylaws and the current Gas Safety (Installation and Use) Regulations. Detailed relevant guidance will also be found in;

BS 6644 :2005 Installation of appliances exceeding 70 kW net input
BS 5449 Forced circulation hot water central heating systems for domestic premises
CIBSE AM14: 2010 Non-domestic hot water heating systems
CIBSE Guides B and C and Commissioning Code B
Institution of Gas Engineers Utilization Procedures 1, 1A, 2, 4, 7 and 10.

Water treatment

Alkon 90 boilers have an aluminium/silicon/magnesium alloy heat exchanger and care must be exercised to ensure that the system water and any water treatment is compatible.
Whenever a new boiler is connected to an existing system, the pipework must be thoroughly cleaned and flushed. This is to remove debris, rust particles, carbonate deposits and any existing water treatment that might be incompatible with the heat exchanger. New systems must also be thoroughly flushed to remove debris and flux deposits. Clyde recommend that a permanent means of filtration be fitted into the return pipework, such as a sludge trap, hydrocyclone or full flow duplex filters. The boiler guarantee will be invalid if waterways are blocked by debris or carbonate deposits.
The pH value of the system water should be measured to ensure that it is between 6.5 and 8. Temporary hardness (calcium carbonate and magnesium carbonate) can be removed by boiling and its effects limited by preventing ingress of fresh, untreated water. Permanent hardness must not exceed 15° FR (150 mg/litre calcium carbonate). The boiler guarantee will be invalidated by the use of incorrect or incompatible water treatment. Specialist advice should be obtained, eg from;

Fernox Tel. 01483 793200

For full information on cleaning, flushing and protecting hot water systems, refer to BSRIA Application Guide AG 1/2001.

Deaeration

It is a condition of warranty that there is effective air separation and removal from the system. The air separator should be fitted at the hottest part of the system.

Boiler condensate

Alkon 90 boilers have a 32 mm flexible condensate drain that is compatible with standard plastic waste pipe. Do not use other materials, as they will corrode. The pipe size must not be reduced and there must be a continuous fall to drain. As a further precaution against freezing, condensate pipes should be run internally whenever possible and lagged when run externally.

Pressurisation of systems

Alkon 90 boilers should be installed as part of a pressurised (sealed) or open vented system with a minimum pressure of 0.5 bar. The maximum allowable pressure for the boilers is 8 bar. They are not to be used with a gravity circulation system.

Boiler location

Alkon 90 boilers can be installed external to a building if the optional top weather cover is fitted. The boiler must be mounted on a sound, smooth and level plinth of non-combustible material, capable of supporting its weight. The boiler location must be frost-free and adequately ventilated (see below). Contamination of the combustion air by inflammable vapours, high dust levels or halogenated hydrocarbons will constitute a safety hazard and will damage the boiler.
The following minimum clearances around the boiler should be observed;

Front 500 mm
Sides 500 mm

Air supply and ventilation

Adequate air for combustion and ventilation is essential to the safe operation of a boiler. The air for combustion and ventilation requirements of either BS 6644:2005 or IGEM/UP/10 must be met. Table 1 shows the requirements of BS 6644:2005 for boilers with a Type B flue. This standard requires natural ventilation at both high and low levels to the outside air, and is based on the net input of the boilers.
BS 6644:2005 calls for additional ventilation if a boiler is used for more than 50% of the time during the summer or if the ambient temperature of the plant room ceiling exceeds 40°C.

Ventilation direct to outside air	Total kW input (net)
Low level	4 cm² per kW of total rated net input
High level	2 cm² per kW of total rated net input

Table 1 Ventilation for multiple boiler installations in a boiler room complying with BS 6644:2005

Heat exchanger hydraulic resistance

The Alkon 90 boiler has a high resistance heat exchanger. The boilers should be hydraulically separated from the heating distribution system by either a low velocity header or a plate heat exchanger. With this arrangement, the boiler pump can be located in the return (where water temperature is lowest) regardless of the location of the system distribution pumps.

The boiler is supplied with an integral modulating pump that will ensure flow through the heat exchanger and low velocity header. The advantage offered by a modulating pump over a constant volume circulator is that the ΔT between flow and return is maximised at all times by the control of mass flow, thus increasing heat exchanger efficiency.

Low velocity headers

Low velocity headers are used to separate hydraulically the boilers from the rest of the system. In addition to helping maintain a minimum flow through the boiler, they create a low velocity region for system dirt to be deposited and separation of air from the system water. Used in conjunction with a system filter (refer page 5), they are invaluable when connecting a new boiler to an existing system.

Low velocity headers should always be vertical and sized for a maximum water velocity of 0.5 m/s. Alkon 90 low velocity headers are designed to ensure a water velocity of 0.2 m/s or less and for ΔT10 / 20, so will be suitable for most systems. Fig 3 shows dimensions for the low velocity header supplied by Clyde, and Table 3 shows dimensions for a ΔT10 / 20 system.

If the heating distribution system has been designed for < ΔT20 and a low velocity header has not been installed, the boiler(s) will not provide heat into the system at their rated heat output.

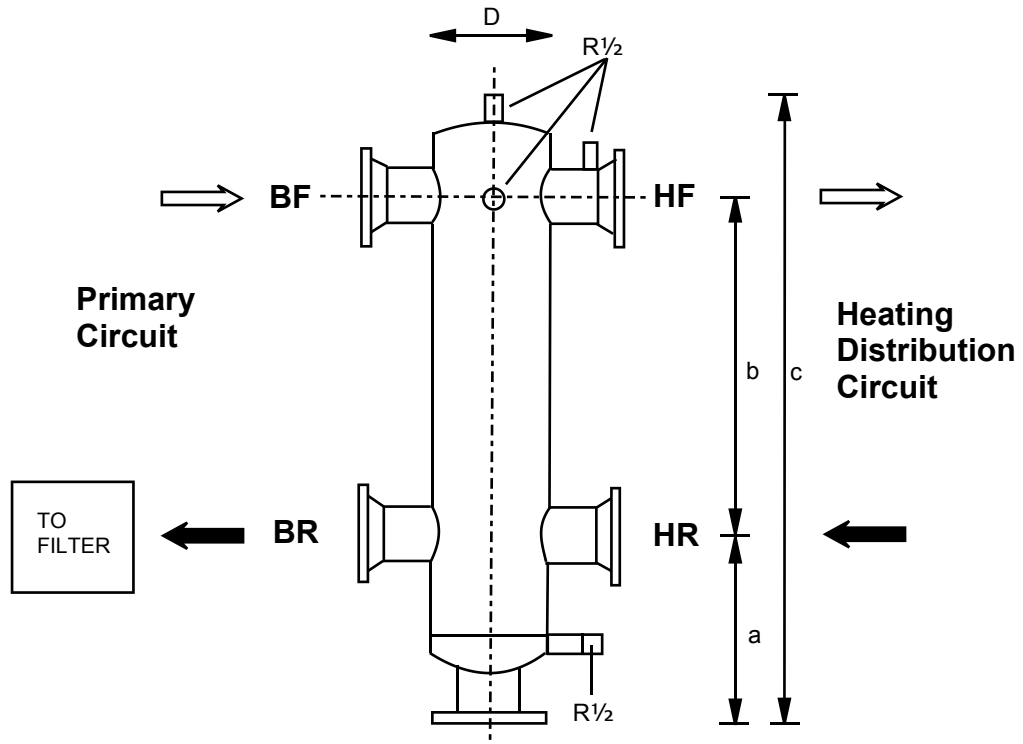


Fig 3 Design for a low velocity header

Number of boilers in cascade	D mm ΔT 10 / 20	Boiler Flow / Boiler Return ΔT 10 / 20	Heating Flow / Heating Return ΔT 10 / 20	a mm	b mm	c mm
1	DN 125	DN 65 (PN 16)	DN 65 (PN 16)	500	1000	1740
2	DN 125	DN 65 (PN 16)	DN 65 (PN 16)	500	1000	1740
3	DN 200	DN 100 (PN 16)	DN 100 (PN 16)	500	1000	1740
4	DN 200	DN 100 (PN 16)	DN 100 (PN 16)	500	1000	1740

Table 3 Low velocity header dimensions for ΔT 10 / 20 system

Boiler wiring diagram

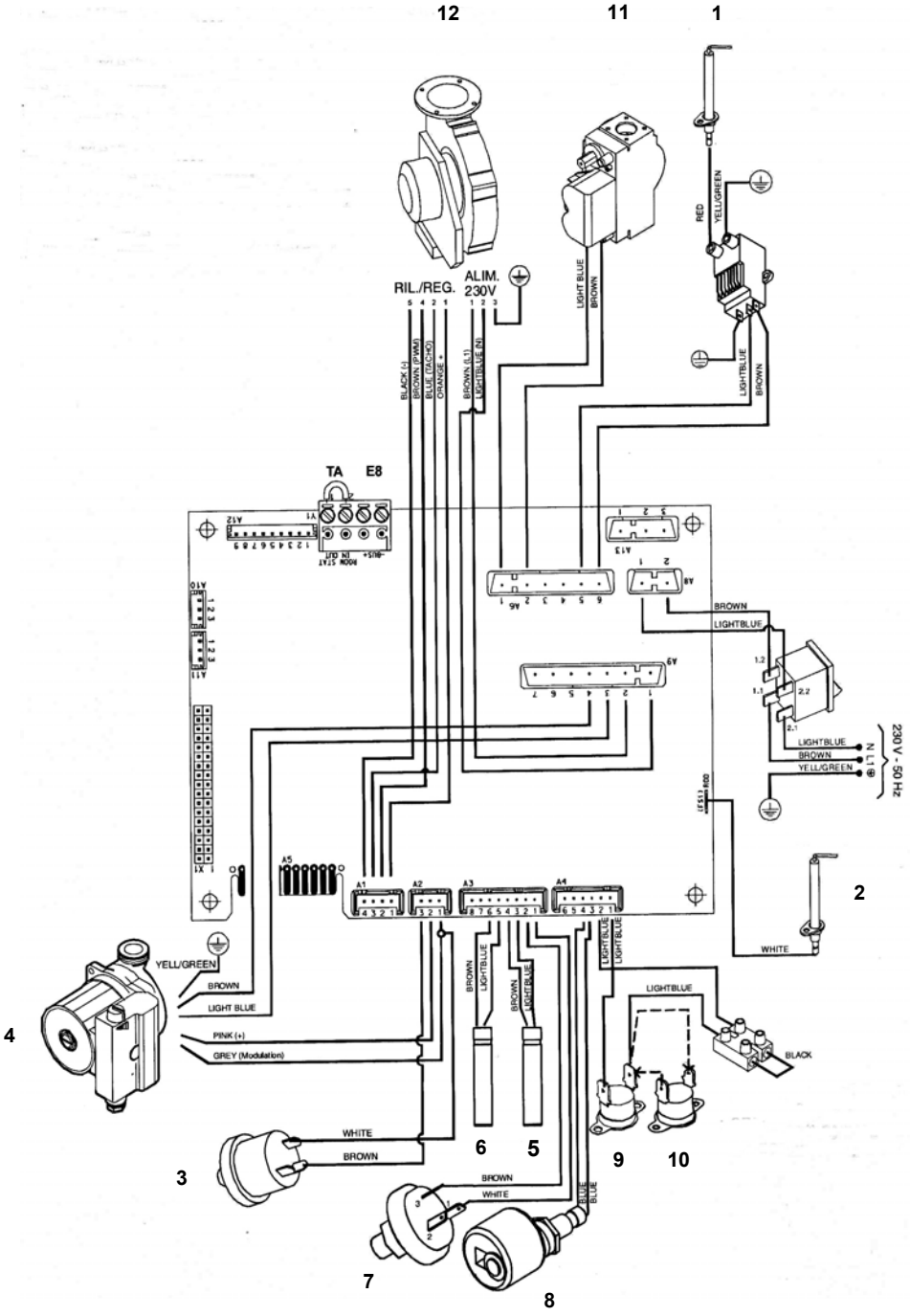


Fig 4 Schematic wiring diagram

Key to Fig 4

1	Ignition electrode assembly
2	Ionisation electrode
3	Minimum water pressure switch
4	Modulating pump
5	Flow temperature sensor
6	Return temperature sensor
7	DHW temperature sensor (optional)
8	Limit thermostat
9	Flue gas temperature limit thermostat (optional)
10	Gas valve
11	Modulating fan speed control

Mains connection

Each Alkon 90 boiler requires a permanent mains supply of 230V 50Hz, protected by a 3 Amp fuse. The electrical supply to the boiler must be installed in accordance with current IEE (BS 7671) Regulations. A separate supply and isolating switch is required for each boiler, with at least 3 mm separation for both the phase and neutral poles.

Individual boiler operation

Alkon 90 boilers can operate independently of external controls, controlled by their internal flow and return thermostats. To control boiler operation with a basic room thermostat, programmable room thermostat or time clock, remove the link between terminals 1 and 2 on the boiler Y1 terminal board and connect to these - see fig 4.

Cascade control, weather compensation and DHW control

The addition of an E8 heating controller, connected to terminals 3 and 4 of the Y1 terminal board, will provide the following functions;

- Cascade control of up to 8 boilers
- DHW generation via a calorifier with loading pump, giving DHW priority
- Temperature control of one or two heating circuits. The options are one directly controlled index circuit with a mixer for a secondary circuit, or direct control of the DHW circuit as the index, with two mixers for the two heating circuits
- Weather compensation
- Integration of a solar thermal system

The E8 controller can be built into a plant room control panel, mounted on the wall, or supplied with an optional wall mounting box that also serves as a boiler controls wiring centre. An E8 controller is supplied as part of the cascade kit for 2, 3 and 4 boilers, and as an optional extra for single-boiler configurations if DHW control, temperature control of more than one heating zone or weather compensation is required.

Outside air sensor, DHW temperature sensor and heating circuit sensors are supplied with the E8 controller. A DHW complete wiring kit is also available. Refer to the Alkon 90 installation manual for full details and schematics.

Building and Energy Management Systems

A single E8 controller will be required if one or more boilers are to be controlled by a 0 - 10V signal from a BMS or EMS. If the overall control is by a Modbus Network, the E8 controller should be replaced with a single Boiler Communications Module (BCM) as the controlling interface. Refer to Alkon 90 installation manual for full details and schematics.

Key to figs 5 to 8

Items supplied as part of standard boiler frame and pipework kits

1	Alkon 90 master boiler with side panels and flanges
2	Alkon 90 slave boiler
7	Low velocity header connection pipework
8	Y-filter section
9	Low velocity header
10	E8 controller (not shown) is standard for 2, 3 and 4 boiler cascades, and optional for single boiler installations (see above)

Items supplied as optional extras to standard boiler frame and pipework kits

3	Safety device pipework manifold
4	Safety device housing
5	Safety device kit comprising limit temperature thermostat, maximum pressure switch, manometer, thermometer, common gas and water safety valves and boiler expansion vessel
6	Top cover for exterior use
11	BCM (Boiler Communications Module - not shown)
12	CGCPU Pressurisation unit (not shown)
13	DHW control wiring kit (not shown)

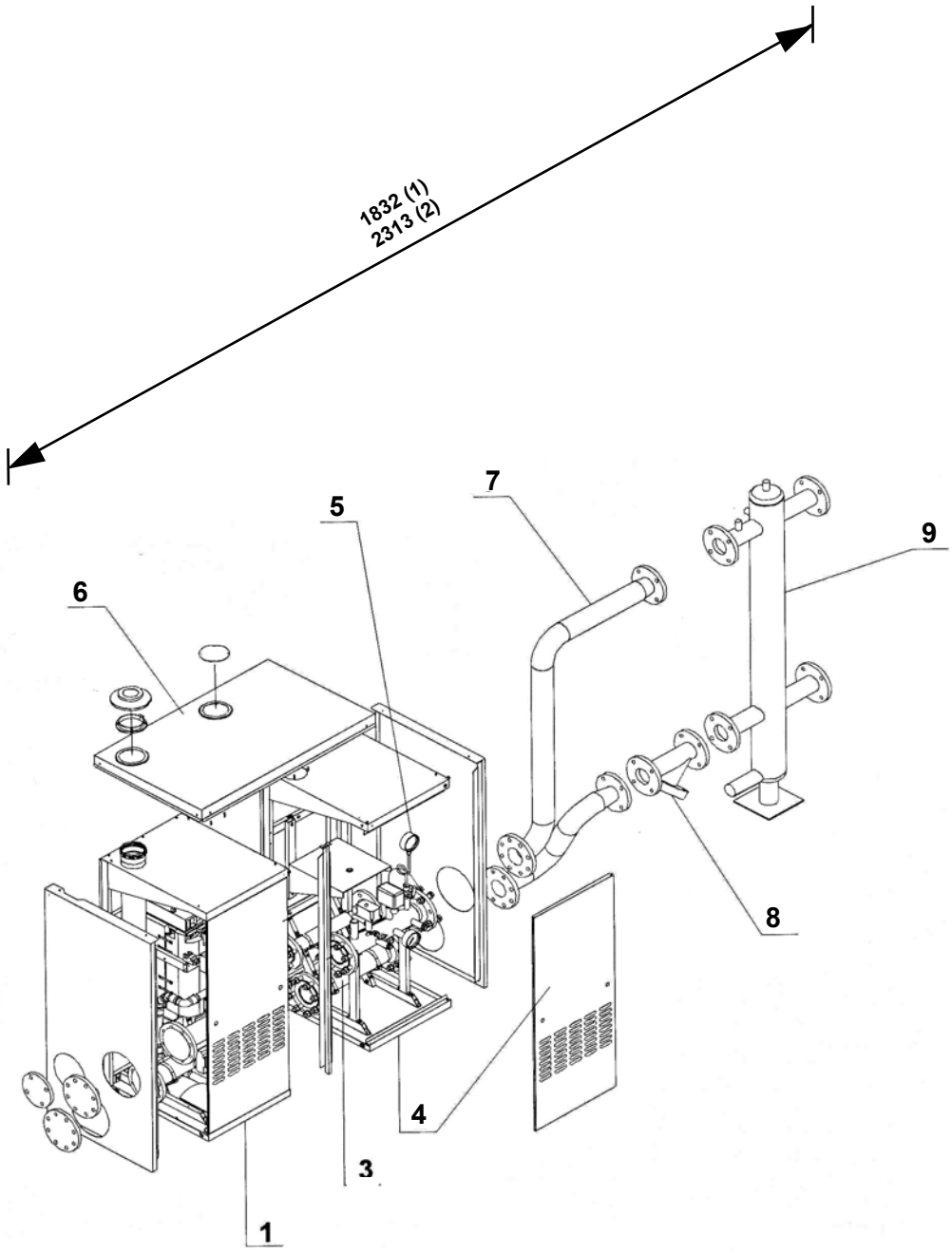


Fig 5 1-boiler frame and pipework

Notes;

(1) Overall length of the standard frame and pipework kit, which does not include items 3, 4 and 5.

(2) This is the overall length including items 3, 4 and 5. These items are a safety device kit including housing, manifold, controls and boiler expansion vessel. These are optional items only and must be specifically ordered if required.

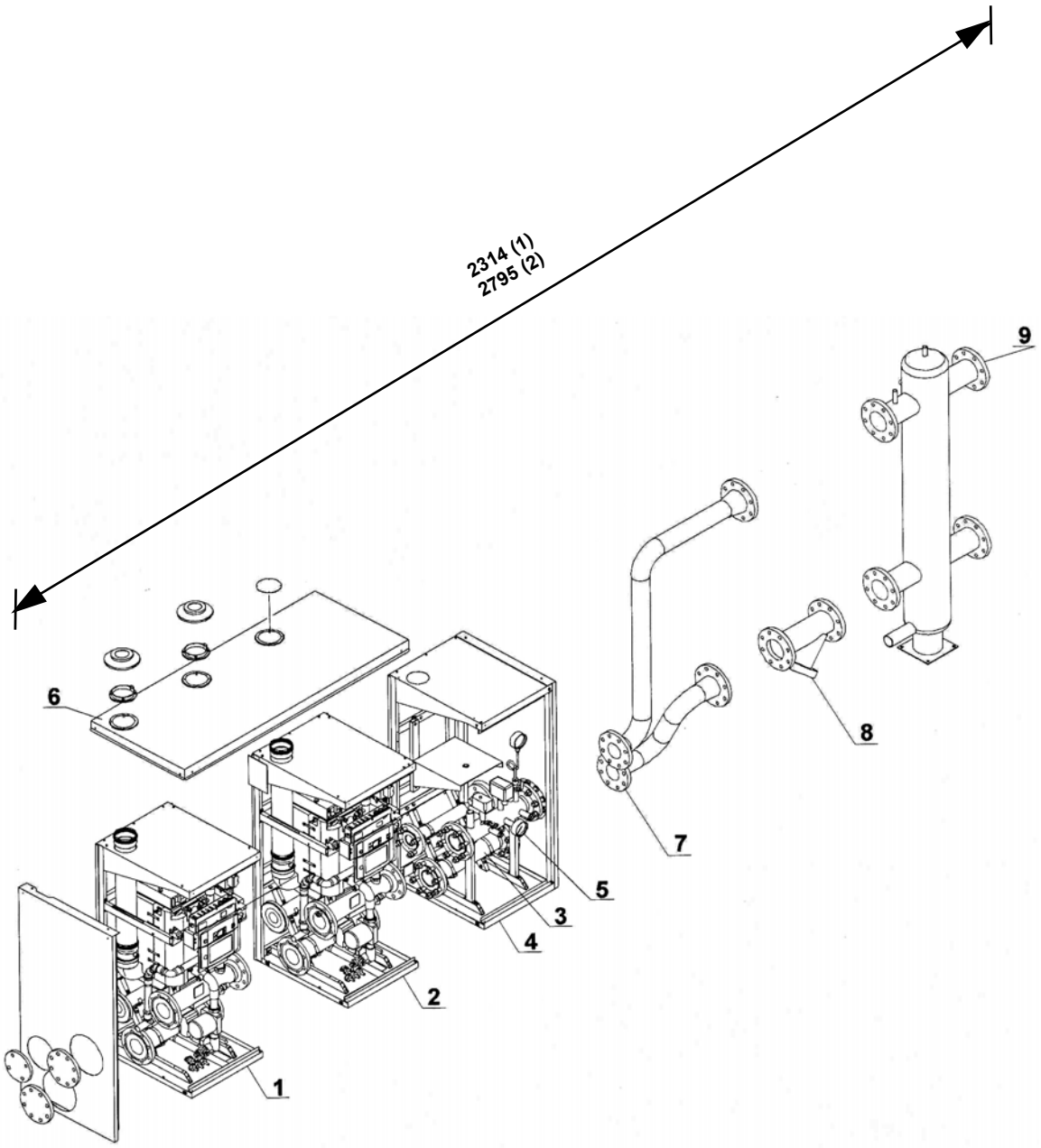


Fig 6 2-boiler frame and pipework

Notes;

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(2) This is the overall length including items 3, 4 and 5. These items are a safety device kit including housing, manifold, controls and boiler expansion vessel. These are optional items only and must be specifically ordered if required.

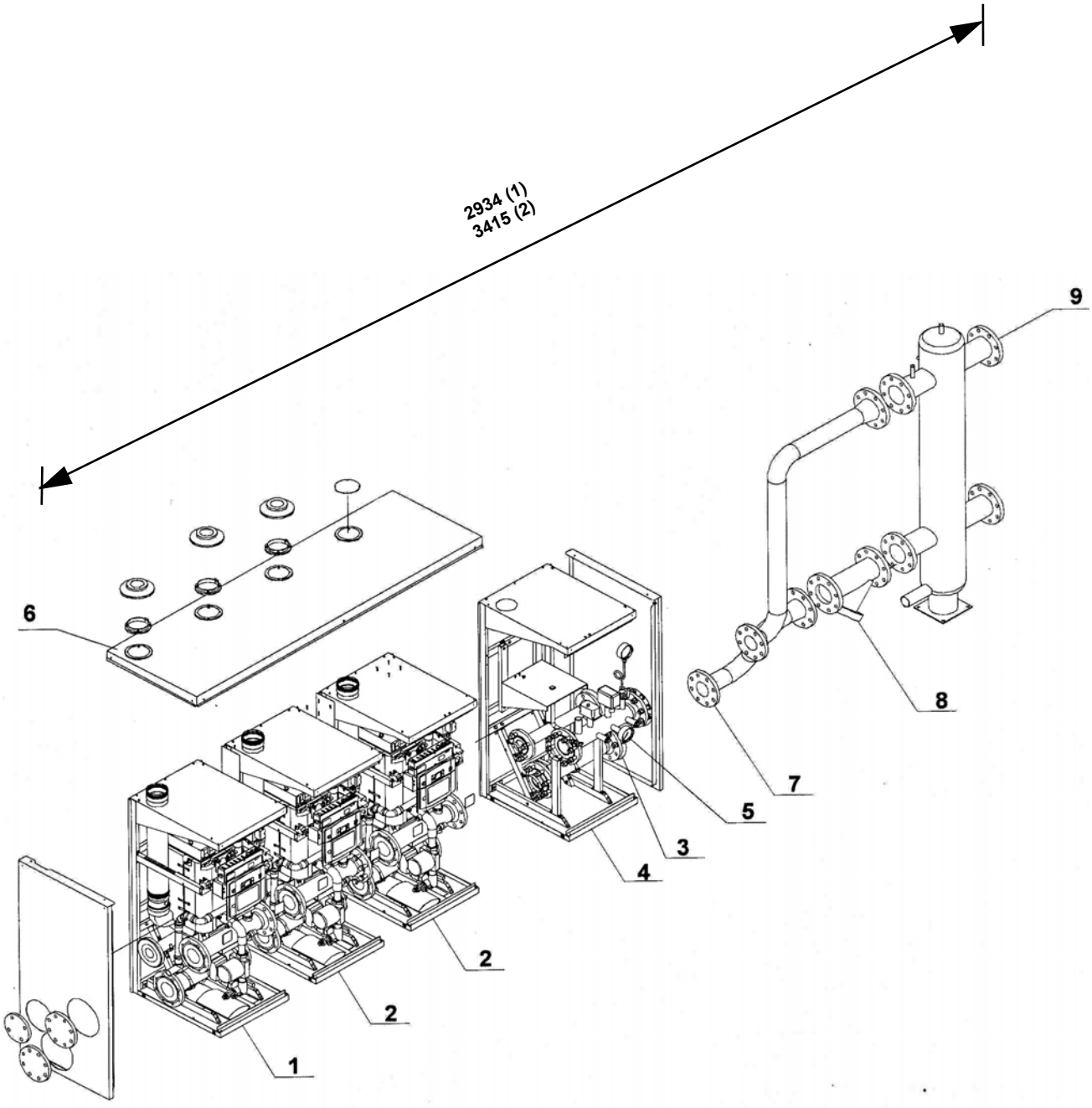

Fig 7 3-boiler frame and pipework

Notes;

(1) Overall length of the standard frame and pipework kit, which does not include items 3, 4 and 5.

(2) This is the overall length including items 3, 4 and 5. These items are a safety device kit including housing, manifold, controls and boiler expansion vessel. These are optional items only and must be specifically ordered if required.

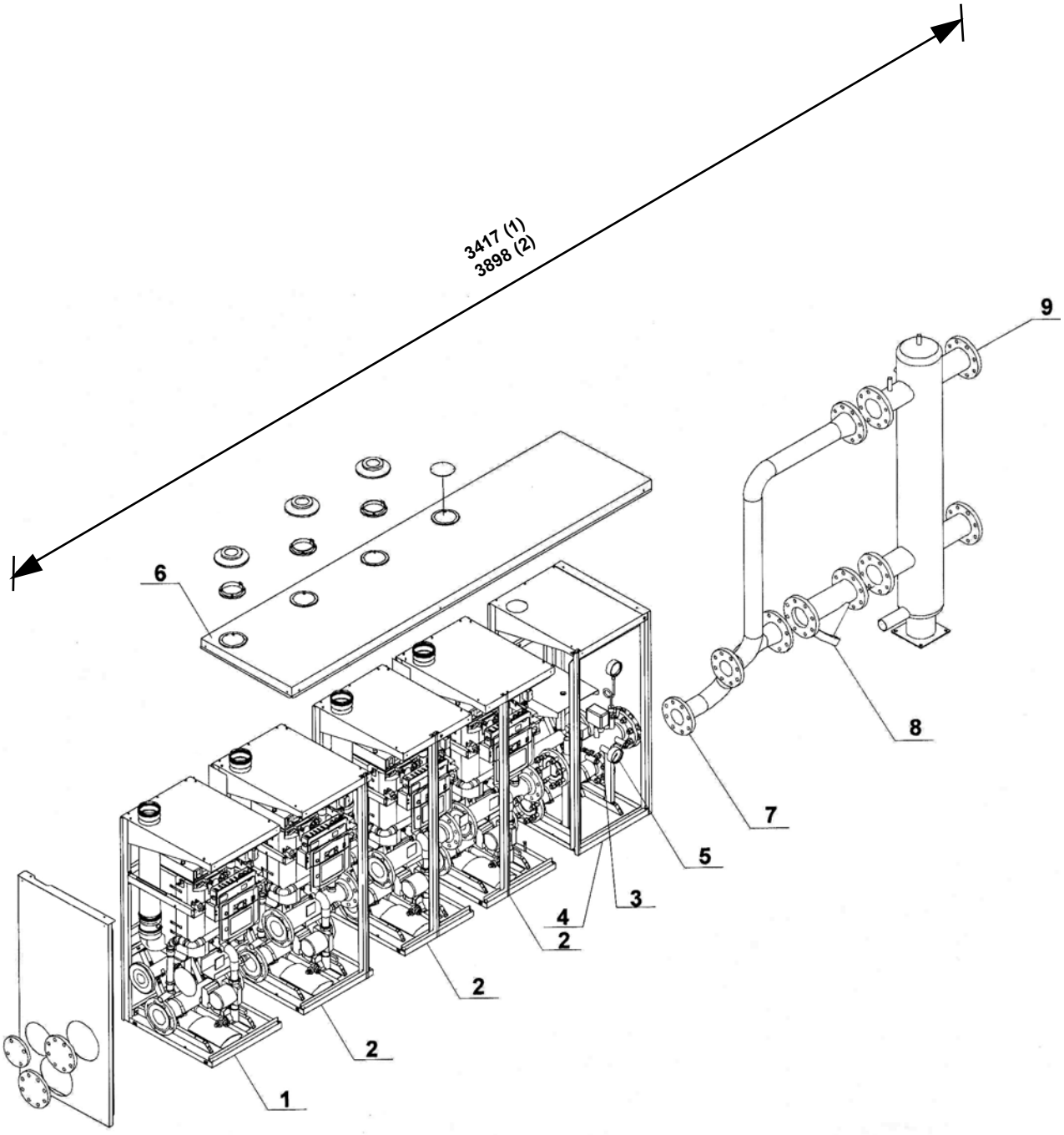

Fig 8 4-boiler frame and pipework

Notes;

(1) Overall length of the standard frame and pipework kit, which does not include items 3, 4 and 5.

(2) This is the overall length including items 3, 4 and 5. These items are a safety device kit including housing, manifold, controls and boiler expansion vessel. These are optional items only and must be specifically ordered if required.

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