NAVIEN Condensing Blue Flame Oil-Fired Boiler

Service Manual

Getting Service

If your boiler requires service, you have several options for getting service:

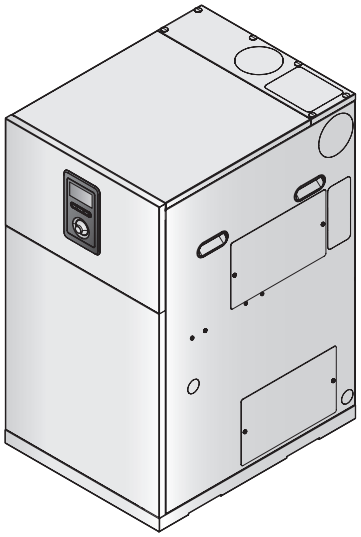
- Contact an official Technical Assistance Service (TAS) at 0844 332 2323 or go to the website (www.navien.co.uk).
  For warranty service, always contact an official Technical Assistance Service (TAS) first.
- Contact the technician or professional who installed your boiler.

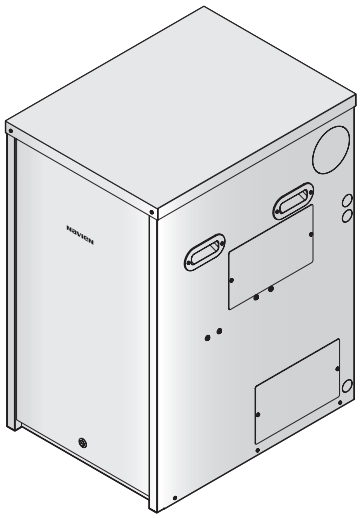
When contacting an official Technical Assistance Service (TAS), please have the following information available:

- Model number
- Serial number
- Date purchased
- Installation location and type
- Error code, if any appears on the front panel display

Version: 1.00 (Sep. 2019)

KD NAVIEN **Navien LTD**
Building 2, Guildford Business Park, Guildford, GU2 8XH
TEL 0844 332 2323 www.navien.co.uk





NAVIEN

Condensing Blue Flame Oil-Fired Boiler

Service Manual

Installation Location	Type	Model
Internal	Regular	LCB700-21RS LCB700-28RS LCB700-36RS
	System	LCB700-21LS LCB700-28LS LCB700-36LS
	Combi	LCB700-21LC LCB700-28LC LCB700-36LC
External	Regular	LCB700-21RSX LCB700-28RSX LCB700-36RSX
	System	LCB700-21LSX LCB700-28LSX LCB700-36LSX
	Combi	LCB700-21LCX LCB700-28LCX LCB700-36LCX

Keep this manual near this boiler for future reference whenever maintenance or service is required.

⚠ WARNING

If the information in these instructions is not followed exactly, a fire or explosion may result, causing property damage or personal injury.

- **Do not store or use petrol or other flammable vapours and liquids in the vicinity of this or any other appliance.**
- **Installation and service must be performed by a qualified installer or service agency.**

WRAS CE 0086 energy saving trust endorsed product OFTEC™ ErP SEDBUK A

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Revisions

Version	Description of changes	Date
1.0	First Issue	June/2019

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Warranty

Annual service

For Navien warranty to be valid an annual service must be carried out by a suitably qualified installer every year after installation. The cost of this annual service is not included in the warranty.

Your Warranty Conditions

Navien Condensing Blue Flame Oil-Fired Boilers are covered by a 2-year manufacturers warranty as standard, with extended warranties of up to 10 years.

For Navien warranty to be valid an annual service must be carried out by a suitably qualified installer every year after installation.

1. Navien Warranty registration is simple. Just complete the Warranty Registration Card and return to Navien within 30days of installation. The details of installation will be then be automatically registered within Navien Service Management System. Alternatively, please telephone one of our Warranty Registration Advisors on 0844 332 2323.
2. Navien offers a 10-year warranty on Condensing Blue Flame Oil-Fired Boiler LCB700. However, this is subject to Terms and Conditions. For more information please telephone one of our Warranty Registration Advisors on 0844 332 2323.
3. The completed Benchmark Checklist will be required in the event of any warranty work and may be required by the local Building Control Inspector.
4. The cost of this annual service is not included in the Warranty.
5. The start-up and annual service are to be carried out by a suitably qualified installer.
6. Navien Warranty will be null and void in the following cases:
   - If the annual service by a suitably qualified and Oftec registered installer has not been carried out.
   - If the boiler has not been installed in accordance with the applicable laws and regulations for this type of appliance.
   - If the boiler has not been started up immediately after its installation, by a suitably qualified installer.
7. Failure to install in strict compliance with the Installation & Operation Manual procedures, failures due to misuses or incorrect installation, use of nonsuitable power or fuel, supply with water with physical or chemical properties causing incrustation or corrosion, incorrect handling of the appliance and, in general, for any reason beyond Navien's control, are excluded from this warranty. This warranty does not affect the consumer's rights as stipulated by law.
8. If your Navien boiler develops a fault your first action should be contact your installer, as his professional assessment is needed under the terms of Navien Warranty. If you are unable to contact your installer, please phone Navien Service: 0844 332 2323 or visit Navien website: www.navien.co.uk

Suitable Use

The LCB700 boiler is designed with all the necessary safety systems. Unsuitable use of the appliance for a purpose it was not designed for entails risk of damage to the boiler or property, and even of injury to the user and other persons.

The LCB 700 boiler is designed to generate heat for domestic hot water and to be connected to central heating systems. Any use other than the above will be considered unsuitable use of the boiler. In such cases the manufacturer/supplier shall not be liable for any damage caused, and the user will be liable for the damage. Correct use of the boiler includes reading the user and installation instructions and all applicable documents, and complying with the maintenance and inspection conditions.

Everyday Care

Clean the outside of the boiler with a damp cloth with a little detergent. Do not use abrasive products to clean the boiler.

Waste Recycling and Disposal

Observe the applicable national regulations and standards concerning waste disposal.

The Boiler

Neither the floor standing boiler or its accessories are to be disposed of with the domestic waste. Ensure the appliance and its accessories, where applicable, are suitably disposed of.

Packaging

The transport packaging will be disposed of by the specialist technician who carried out the installation.

IMPORTANT

- The oil nozzle and braided oil hoses supplied with the boiler are only covered for the first 12 months until the first service. Both of these components must be changed at the first service and on every other annual service thereafter.
- Do not let the fuel supply run out before you re-order. There may be Sludge in the bottom of the storage tank, this may be pulled into the oil lines and oil pump. It is recommended that the boiler is turned off when the oil tank is refilled and that the fuel is allowed to settle for an hour before the boiler is turned back on.

Abbreviations and Definitions

Abbreviation	Definition
APS	Air Pressure Sensor
DHW	Domestic Hot Water
EMI	Electromagnetic Interface
GPM	Gallons Per Minute
HTL	High Temperature Limiter
PCB	Printed Circuit Board
RPM	Revolutions Per Minute

1. Safety Information

The following safety symbols are used in this manual. Read and follow all safety instructions in this manual precisely to avoid unsafe operating conditions, fire, explosion, property damage or personal injury.

DANGER

Indicates an imminently hazardous situation which, if not avoided, could result in severe injury or death.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in injury or death.

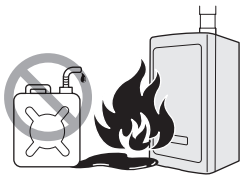
CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in property damage.

Note

Used for emphasis or for providing useful information not directly connected with the surrounding text but of importance to the user.

DANGER



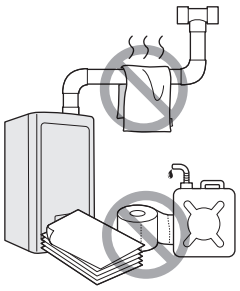
If oil fumes or leaks from the appliance:

- Extinguish any naked flames.
- Isolate the electrical supply.
- Isolate the fuel supply to the boiler.
- Rectify the fault.

Do not use or store flammable products, such as petrol, solvents, or adhesives in the same room or area as the boiler.

- The boiler has a main burner flame that can turn on at any time and can ignite flammable vapours. Vapours from flammable liquids can explode and catch fire, causing severe burns.
- Vapours cannot be seen and are heavier than air. They can travel long distances along the ground and can be carried from other rooms to the boiler's main burner flame by air current.
- Keep all flammable products far away from the boiler and store them in approved containers. Keep the containers closed tightly and out of the reach of children and pets.

⚠ WARNING



- **Do not store or use petrol or other flammable liquids near this boiler.**
  Doing so may result in fire or explosion.
- **Do not place combustibles, such as newspapers or laundry, near the boiler or flue system.**
  Doing so may result in a fire.
- **Do not place or use hair sprays, spray paints, or any other compressed gases near the boiler or flue system, including the flue termination.**
  Doing so may result in fire or explosion.
- **Do not operate the boiler with the front cover opened.**
  Doing so may result in fire or carbon monoxide (CO) poisoning, which may result in property damage or personal injury.
- **Do not operate this boiler without proper flue system.**
  Doing so may result in fire or carbon monoxide (CO) poisoning, which may result in property damage or personal injury.
- **Do not touch the power cord or internal components of the boiler with wet hands.**
  Doing so may result in electric shock.

⚠ WARNING

This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.

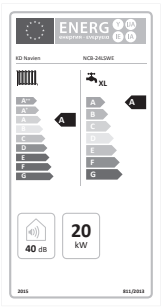
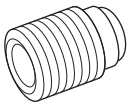
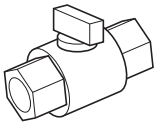
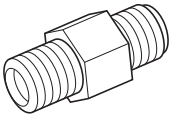
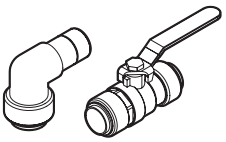
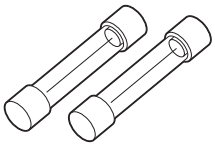
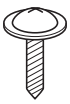
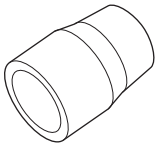
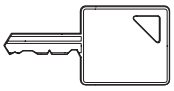
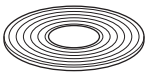
ⓘ CAUTION

- **Do not turn on the boiler unless the water and oil supplies are fully opened.**
  Doing so may damage the boiler.
- **Do not turn on the water if the cold water supply shut-off valve is closed.**
  Doing so may damage the boiler.
- **Do not use this boiler for anything other than its intended purpose, as described in this manual.**
- **Do not remove the front cover unless the power to the boiler is turned off or disconnected.**
  Failure to do so may result in electric shock.
- **When servicing the controls, label all wires prior to disconnecting them.**
  Failure to do so may result in wiring errors, which can lead to improper or dangerous operation. Verify proper operation after servicing.
- **Do not use unapproved replacement or accessory parts.**
  Doing so may result in improper or dangerous operation and will void the manufacturer's warranty.
- **Do not place anything in or around the flue terminals, such as a clothes line, that could obstruct the air flow in or out of the boiler.**

2. About the Boiler

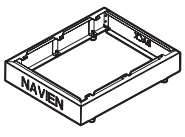
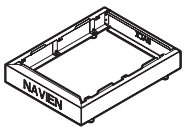
2.1 Items Included

When you open the box, you will find the following items with the boiler. Check the box for each of the following items before installing the boiler. If it seems like there is a problem, do not use the boiler. Contact your supplier. Keep the included items out of the reach of children, as they can be dangerous. When you no longer wish to use the boiler, disable any parts that could be potentially hazardous.

		
Installation & Operation Manual	ErP Label	Oil Pump Return Line Plug
		
Oil Line Cut Off Valve	Oil Line Nipple	Pre-plumbing Kit
		
Fuse	Flue Fixing Screw	Reducer (36 kW)
		
Key (External Model) (x2)	Condensate Pipe Packing (External Model)	Dust Cap for Automatic Air Vent

2.2 Accessories

The following optional accessories are available for the boiler.

	
Support (Internal Model) (Height: Max. 140 mm)	Support (External Model) (Height: Max. 140 mm)

2.3 Specifications

The following tables list the general specifications and energy consumption for the boiler.

DESCRIPTION			UNITS	Internal Model			External Model		
				21RS 21LS 21LC	28RS 28LS 28LC	36RS 36LS 36LC	21RSX 21LSX 21LCX	28RSX 28LSX 28LCX	36RSX 36LSX 36LCX
Heat Input	Stage 1/Stage 2		kW	17/22	22/29	30/37	17/22	22/29	30/37
Heat Output	80/60℃	Stage 1/Stage 2	kW	16/21	21/28	29/36	16/21	21/28	29/36
	50/30℃	Stage 2	kW	23.0	30.3	39.0	23.0	30.3	39.0
Water capacity	Heat Exchanger		ℓ	14	13.5	16.4	14	13.5	16.4
	Storage Tank(Combi Models)		ℓ	30	30	30	30	30	30
Central Heating	Flow Rate(△t 20℃)		ℓ/min	15	20	25.8	15	20	25.8
	Waterside resistance(△t 20℃)		mbar	130	200	220	130	200	220
	Max. Operation Pressure		bar	3			3		
	Supply Temp. Control Range		℃	40 – 85 (Default 85)			40 – 85 (Default 85)		
Domestic Hot Water	Max. Operation Pressure		bar	10			10		
	Supply Temp. Control Range		℃	30 – 60 (Default 50)			30 – 60 (Default 50)		
Connection	Central Heating	supply	㎜	Φ22	Φ22	Φ28	Φ22	Φ22	Φ22(Φ28)
		return	㎜	Φ22	Φ22	Φ28	Φ22	Φ22	Φ22(Φ28)
	DHW(Domestic Hot Water) Outlet		㎜	Φ15	Φ15	Φ15	Φ15	Φ15	Φ15
	DCW(Domestic Cold Water) Inlet		㎜	Φ15	Φ15	Φ15	Φ15	Φ15	Φ15
	Condensate		㎜	Φ21.5			Φ21.5		
	Oil		inch	1/4" BSP Male			1/4" BSP Male		
	Flue System	Flue Size	㎜	Coaxial Φ100/60 (plastic)			Coaxial Φ100/60 (plastic)		
		Max. horizontal length	m	20			20		
		Max. vertical length	m	21			21		
		90˚ elbow length	m	1.3			1.3		
		45˚ elbow length	m	1			1		
Electrical	Power supply		V/Hz	AC 230 V/50 Hz			AC 230 V/50 Hz		
	Fuse		A	250 V (Φ5×20), 5 A/3.15 A			250 V (Φ5×20), 5 A/3.15 A		
	Consumption		W	95	105	125	95	105	125
	Circulation Pump (System/Combi Model)		W	60	60	60	60	60	60
Safety shut off			℃	95			95		
Flue gas temperature			℃	Less than 70			Less than 70		
Sealed System	System pre-charged pressure		bar	1			1		
	Maximum operating pressure		bar	3			3		
	Expansion vessel (System/Combi Model)		ℓ	12			12		
General Data	Dimensions	Regular/System Models models(RS,RSX/LS,LSX)	㎜	470×600×860			515×673×882		
		Combi models(LC,LCX)		600×600×860			650×673×900		
	Weight (NET)	Regular models(RS,RSX)	kg	58	59	62	64	65	68
		System models(LS,LSX)	kg	66	67	70	72	73	76
		Combi models(LC,LCX)	kg	91	92	95	98	99	102

Product Datasheet On Energy Consumption

The following product data complies with the requirements of EU Regulations No. 811/2013 and No. 812/2013 as supplement to the Directive 2010/30/EU.

Product data	Symbol	Unit	LCB700		
			21RS, RSX 21LS, LSX 21LC, LCX	28RS, RSX 28LS, LSX 28LC, LCX	36RS, RSX 36LS, LSX 36LC, LCX
Condensing boiler	-	-	Yes	Yes	Yes
Low-temperature** boiler	-	-	No	No	No
B1 boiler	-	-	No	No	No
Combination heater (LC, LCX models)	-	-	Yes	Yes	Yes
Rated heat output	Prated	kW	21	28	36
Seasonal space heating energy efficiency	η_S	%	93	93	93
Energy efficiency class	-	-	A	A	A
Useful heat output					
At rated heat output and high temperature regime*	P_4	kW	21.23	28.38	36.51
At 30 % of rated heat output and low temperature regime**	P_1	kW	6.75	8.87	11.53
Useful efficiency					
At rated heat output and high temperature regime*	η_4	%	92.13	92.48	92.27
At 30 % of rated heat output and low temperature regime**	η_1	%	97.63	97.56	97.91
Auxiliary electricity consumption					
At full load	elmax	kW	0.0935	0.1013	0.1242
At part load	elmin	kW	0.0281	0.0268	0.0328
In standby mode	P_{SB}	kW	0.0016	0.0018	0.0017
Other items					
Standby heat loss	P_{stby}	kW	0.0731	0.0843	0.0731
Ignition burner power consumption	P_{ign}	kW	0	0	0
Emissions of nitrogen oxides (only gas or oil fired)	NO_x	mg/kWh	57.2	62.5	63.2
Sound power level (External Model)	L_{WA}	dB	49	52	56
Additional data for combination heaters					
Declared load profile	-	-	XL	XL	XL
Daily electricity consumption	Qelec	kWh			
Annual electricity consumption	AFC	kWh			
Daily fuel consumption	Qfuel	kWh			
Annual fuel consumption	AFC	GJ			
Water heating energy efficiency	ηwh	%			
Water heating energy efficiency class	-	-	B	B	B

* High-temperature regime means 60 °C return temperature at heater inlet and 80°C feed temperature at heater outlet.
** Low temperature means for condensing boilers 30°C, for low-temperature boilers 37°C and for other heaters 50°C return temperature (at heater inlet).

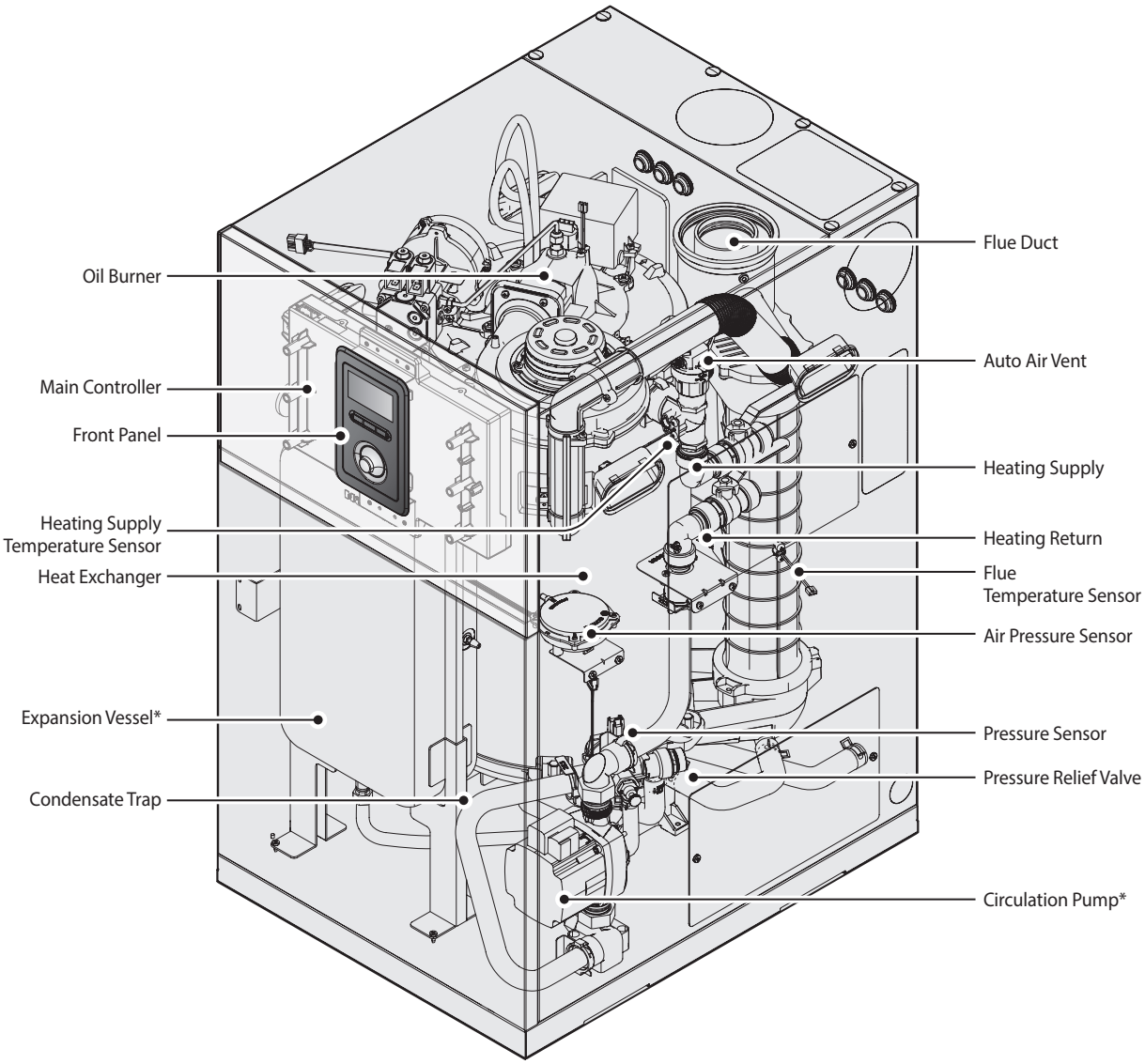
Specific Precautions

Read the user's information and installation manual before the application is assembled, installed or maintained.

2.4 Components

Internal Model

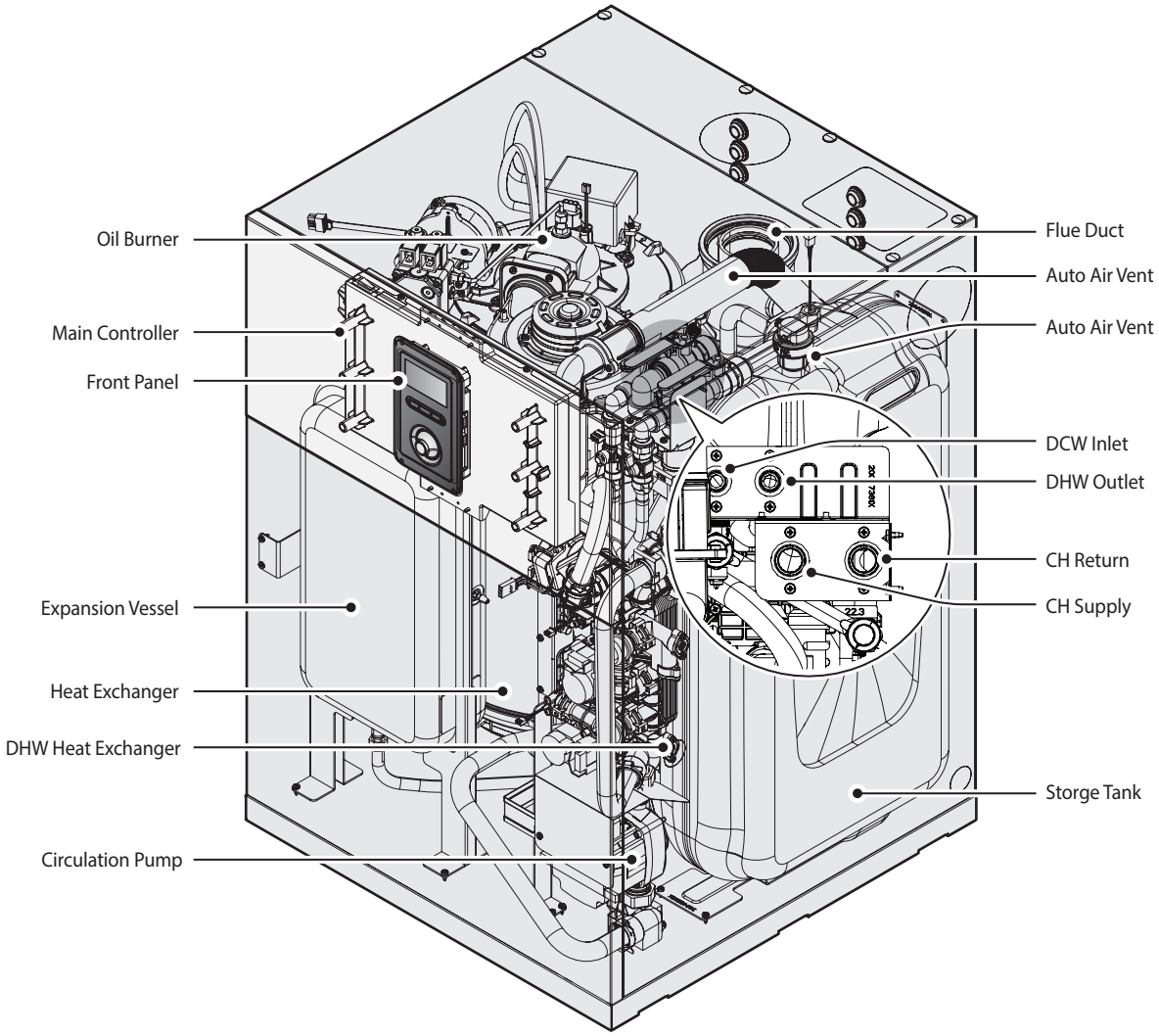
The following diagram shows the key components of the boiler. Component assembly diagrams and particular parts lists are included in the Appendixes.



* The expansion vessel and circulation pump are not included in the regular model.

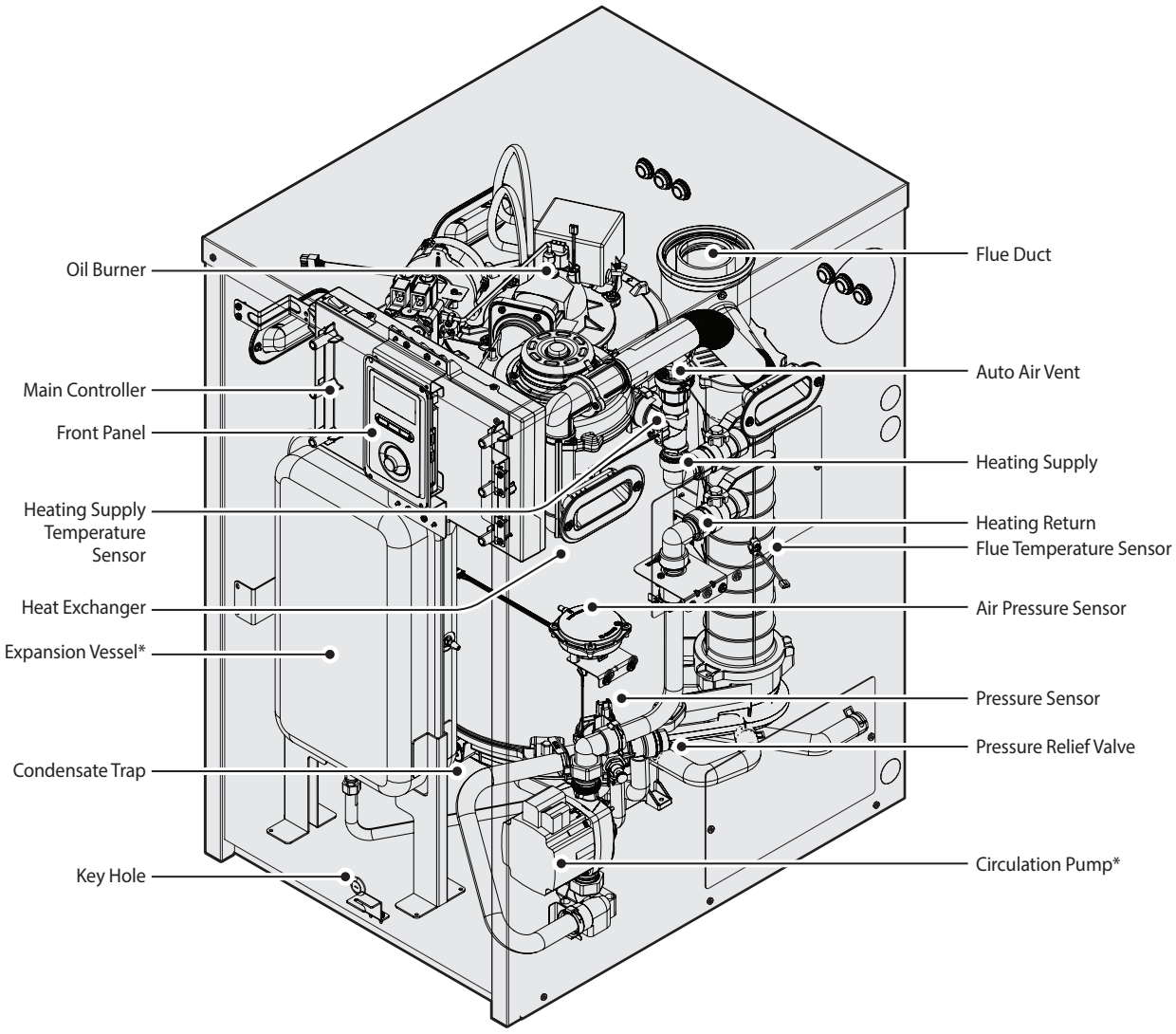
Combi Internal Model

The following diagram shows the key components of the boiler. Component assembly diagrams and particular parts lists are included in the Appendixes.



External Model

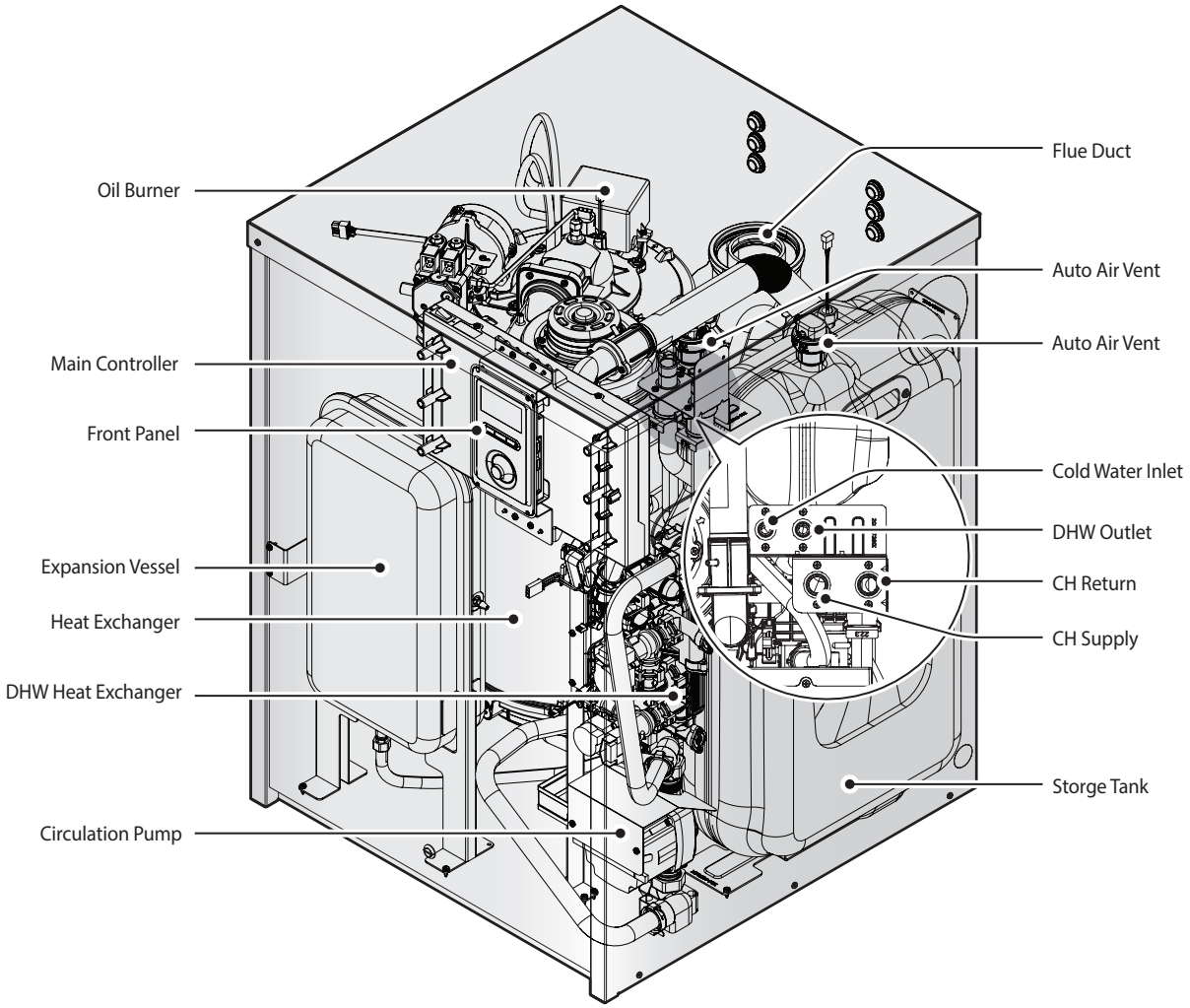
The following diagram shows the key components of the boiler. Component assembly diagrams and particular parts lists are included in the Appendixes.



* The expansion vessel and circulation pump are not included in the regular model.

Combi External Model

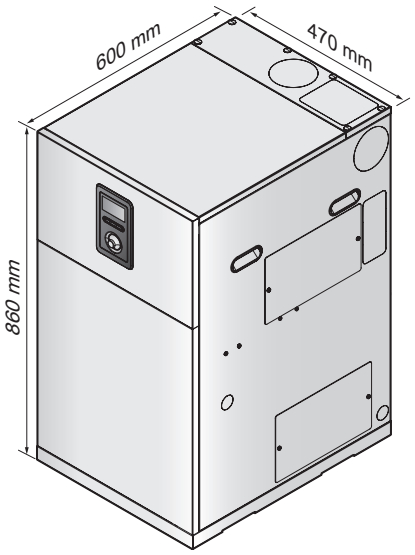
The following diagram shows the key components of the boiler. Component assembly diagrams and particular parts lists are included in the Appendixes.



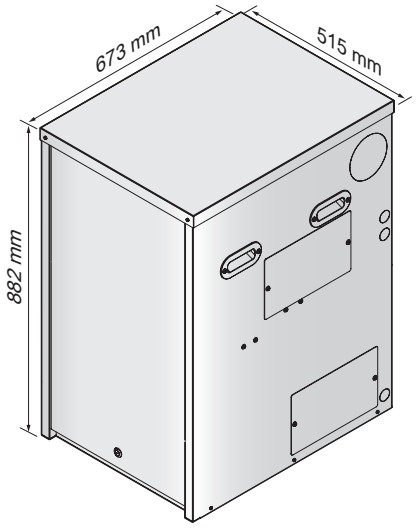
2.5 Dimensions

The following diagrams show the dimensions of the boiler and the table lists the supply connections.

Internal Model



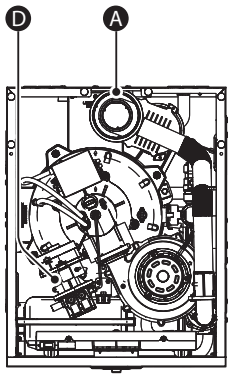
External Model



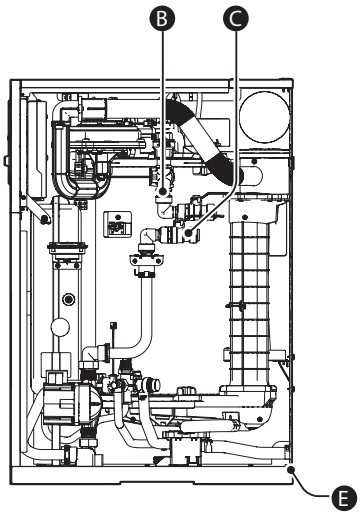
Supply Connections

Symbol	Description	LCB700		
		21RS, RSX 21LS, LSX	28RS, RSX 28LS, LSX	36RS, RSX 36LS, LSX
A	Flue Exhaust	Φ60/100		
B	Central Heating Supply	Φ22	Φ22	Φ22(Φ28)
C	Central Heating Return	Φ22	Φ22	Φ22(Φ28)
D	Oil Supply Inlet	1/4" Ball Valve (Female)		
E	Condensate Drain	More than Φ21.5 (Plastic Pipe)		

Top View

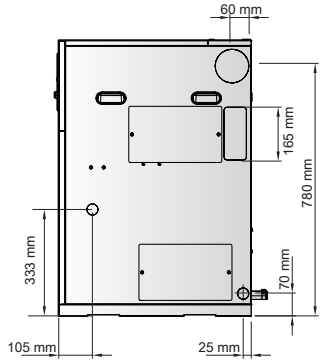


Right View

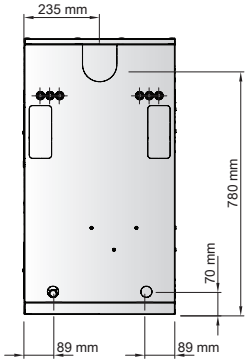


Internal Model

Right View

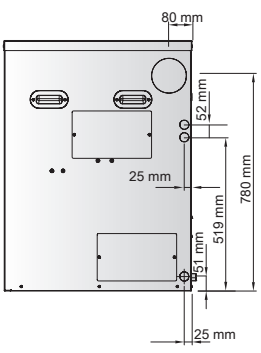


Back View

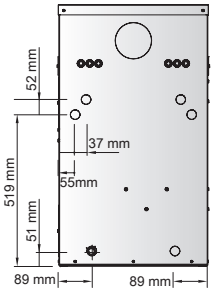


External Model

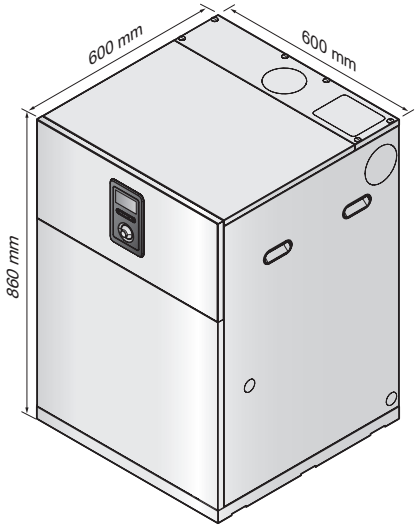
Right View



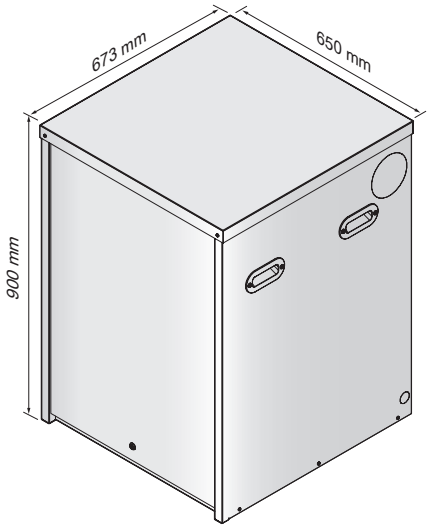
Back View



Combi Internal Model



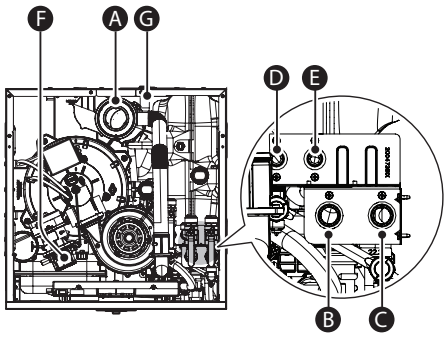
Combi External Model



Supply Connections

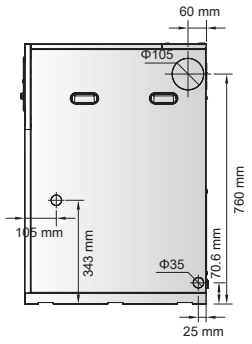
Symbol	Description	LCB700		
		21LC, LCX	28LC, LCX	36LC, LCX
A	Flue Exhaust	Φ60/100		
B	Central Heating Supply	Φ22	Φ22	Φ28
C	Central Heating Return	Φ22	Φ22	Φ28
D	DCW Inlet	1/4" Ball Valve (Female)		
E	DHW Outlet	More than Φ21.5 (Plastic Pipe)		
F	Oil Supply Inlet	1/4" Ball Valve (Female)		
G	Condensate Drain	More than Φ21.5 (Plastic Pipe)		

Top View

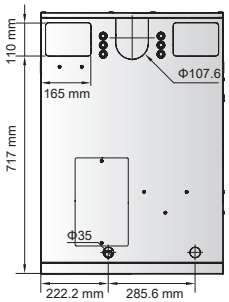


Internal Model

Right View

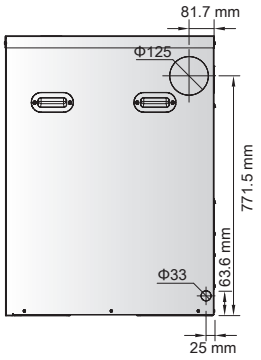


Back View

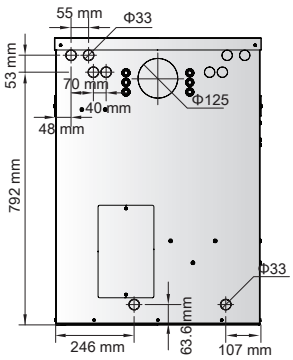


External Model

Right View

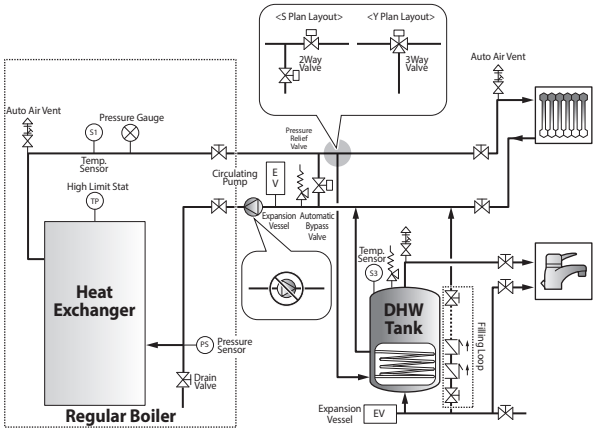


Back View



3. Installing the Boiler

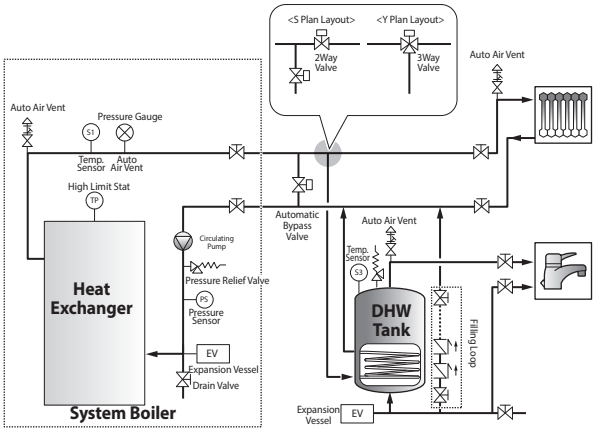
3.1 Central Heating and DHW Cycle



<Regular Boiler Heating & DHW Cycle>

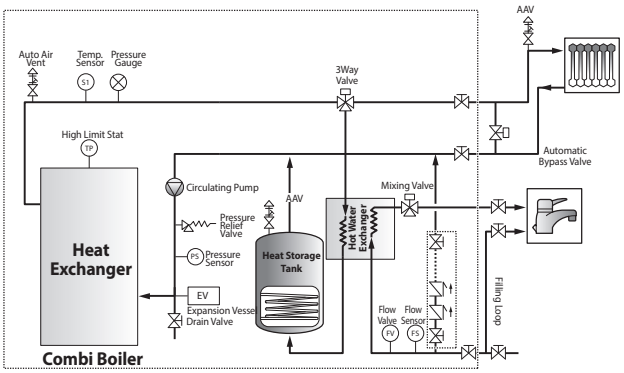
⚠ CAUTION

When installing an optional circulating pump, ensure that it is installed in the proper direction. Also, install the circulator pump to the return pipe and allow it to circulate hot water towards the boiler. If a circulator pump is installed in the wrong direction, the boiler's heat exchanger cannot be vented properly, which may damage the boiler and cause it to malfunction.



<System Boiler Heating & DHW Cycle>

Note Refer to "4.6 Setting the DIP Switches" to control the boiler using the external CH Controller and DHW Tank.



<Combi boiler Heating & DHW Cycle>

When installing the system, follow these guidelines:

Use only pipes, fittings, valves, and other components (such as solder), that are approved for use in potable water systems.

Tighten the connection valves with care to avoid damage.

The external hydraulic bypass valve is required.

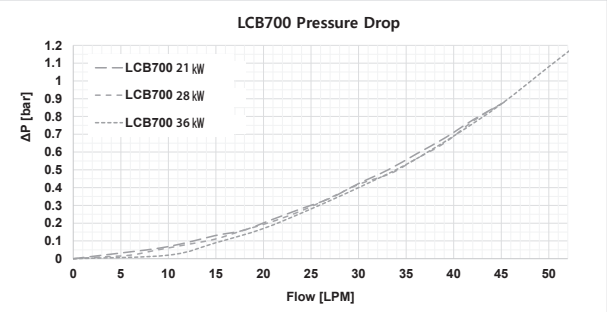
An additional expansion vessel must be installed to the system in the central heating return.

3.2 Central Heating System

When connecting the central heating system, follow these guidelines:

- Carefully tighten all connections to avoid damage to fittings.
- After installing the boiler, check the central heating system's operation and inspect for leaks.

Items		Unit	Model		
			21RS/RSX 21LS/LSX	28RS/RSX 28LS/LSX	36RS/RSX 36LS/LSX
△t 10°C	Flow Rate	lpm	30.1	40.1	51.6
	Head	m	4.3	7.0	11.1
△t 15°C	Flow Rate	lpm	20.1	26.8	34.4
	Head	m	2.1	3.5	5.2
△t 20°C	Flow Rate	lpm	15.1	20.1	25.8
	Head	m	1.2	2.0	3.0
△t 25°C (Minimum)	Flow Rate	lpm	12	16	20
	Head	m	0.9	1.2	1.7



Note Refer to the performance curve to select a pump that suits your application. The boiler can supply up to a maximum of 100 W current at the boiler pump connection terminal.

Water Quality Standards for Appliance Quality Assurance

The water supplied to the boiler must satisfy the water quality requirements on the following table.

Water Chemistry	Standards for Appliance Quality Assurance
Hardness	Below 200 ppm
Chloride Concentration	Below 150 ppm (Below 4 ppm of residual chlorine)
TDS (Total Dissolved Solids)	Below 500 ppm
pH	6.5–8.5

- **The water hardness must be below 200 ppm.**
  Using water with a hardness above 200 ppm for the boiler may create lime scale inside the boiler and cause a product malfunction. Use a water softener to satisfy the standards for appliance quality assurance (below 80 ppm is recommended).

  Note Using indirect heat exchange through a plate-type heat exchanger is an exception.

- **The chloride concentration of water must be below 150 ppm (below 4 ppm of residual chlorine).**
  Using the water with a chloride concentration above 150 ppm or 4 ppm for residual chlorine for the boiler may cause a product malfunction due to corrosion.
- **The pH must be between 6.5 and 8.5.**
  - Using water with a pH below 6.5 may cause a product malfunction due to corrosion.
  - Using water with a pH above 8.5 may cause a product malfunction due to lime scale created inside the boiler.

  Note The following situations adversely impact the quality of the appliance

- **The water supplied to the boiler does not satisfy the water quality requirements in the table above.**
  - Using chemically unbalanced water for the boiler may cause a product malfunction or reduce the product lifetime.
- **Water below the minimum circulation flow rate is supplied to the boiler (to see detailed flow rate information, refer to the "3.2 Central Heating System" on page 21.**
  - Using water that is below the minimum circulation flow rate for the boiler may cause a product malfunction due to the creation of lime scale inside the boiler or a reduction in product efficiency. If the flow rate is lower than the minimum rate, use an external pump (below 100 W) to maintain a flow rate above the minimum. Also, ensure the pipes used for the boilers are not blocked and check if there are any pressure drops.

⚠ CAUTION

If the water supplied to the boiler does not satisfy the water quality requirements, contact an authorised technician or licensed professional to avoid product malfunctions due to poor water quality before supplying water to the boiler.

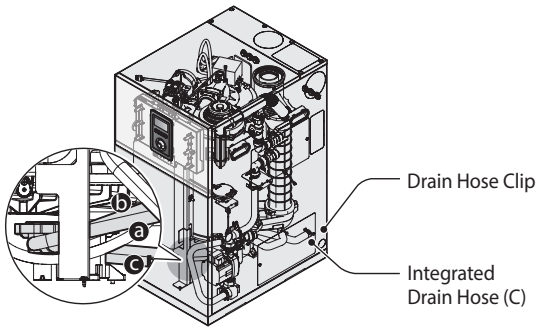
3.3 Condensate Drain Line

The Navien LCB700 boiler creates condensation when it operates. This condensation has an acidic pH of 2-5. Follow all local codes and regulations when disposing of condensate from the boiler. We recommend draining the condensate into the Navien condensate neutralizer kit, as the alkali in the kit will neutralize the acid in the condensate. However, other suitable water disposal methods may be used in accordance with local codes.

To connect the condensate drain:

1. Connect an integrated drain hose to the 21.5 mm at the bottom of the boiler.

   Use only corrosion-resistant material for the integrated drain hose, such as PVC or CPVC. Do not reduce the size of the integrated drain hose to less than 21.5 mm. The integrated drain hose can be connected to the condensate trap using a condensate trap hose. The hose connection must be secured with a drain hose clip.



Symbol	Description
a	Pressure relief valve drain hose
b	System drain hose
c	Integrated drain hose

2. Place the free end of the integrated drain hose into an appropriate drain.

3. If you are using a condensate pump, ensure that the pump allows for up to 3 LPH of drainage for each boiler in the system.

4. If you are not using a condensate pump, ensure that the integrated drain hose is pitched downward at a minimum slope of 6 mm per 30 cm.

Note Water must be poured into the exhaust connection to fill the condensate trap.

⚠ CAUTION

For correct installation and trouble free operation of the appliance the following advice should be followed:

- All condensate pipework must 'fall' from the appliance by a minimum of 3 degrees (52 mm per metre) to ensure adequate condensate flow.
- The pipework route must allow air to be supplied back to the appliance for correct operation of the condensate trap.
- Connection to a rainwater down pipe must include an air break.

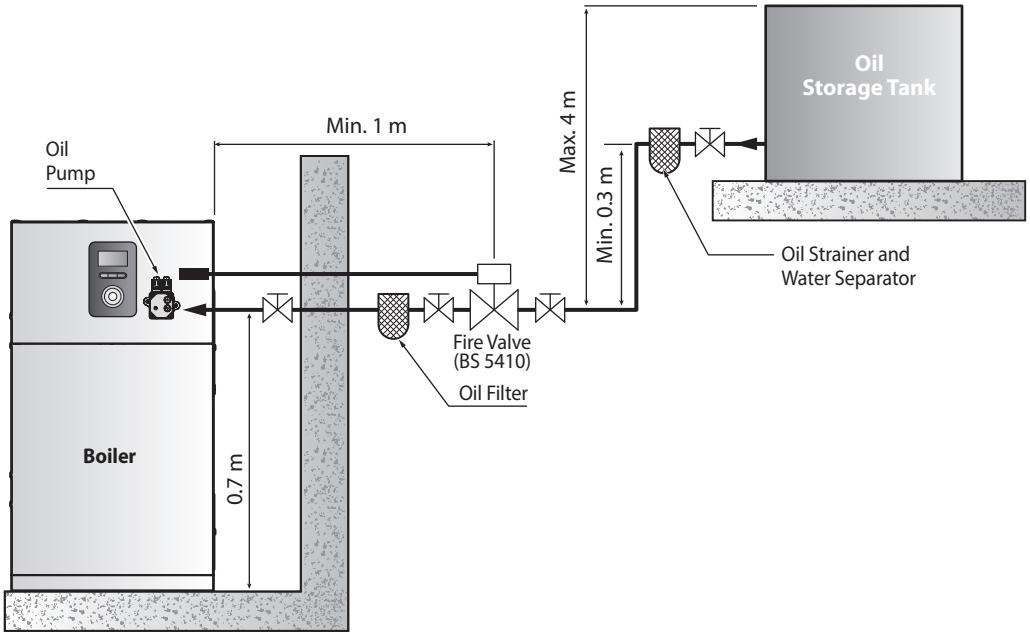
Also:

- Keep external pipework as short as possible and not exceed 3 metres length. If the external pipes exceed 3 metres in length, use a support (optional) to adjust the height of the boilers installed on the floor.
- External pipework should be increased to a minimum diameter of 32mm and ideally be insulated.
- Minimise the number of bends and connectors.
- Remove burrs after cutting pipe.
- Remove surplus solvent from the interior of the pipe.

3.4 Oil Supply

Single Pipe Gravity Feed System

The oil storage tank must be positioned so that the oil level does not exceed 4 metres above the level of the boiler oil pump and, in addition, the oil level must be at least 300 mm above the oil pump. Where the maximum oil level in the oil storage tank exceeds 4 metres, a head breaking device must be installed between the tank and the boiler oil pump.



Double Pipe Sub-Gravity Feed System

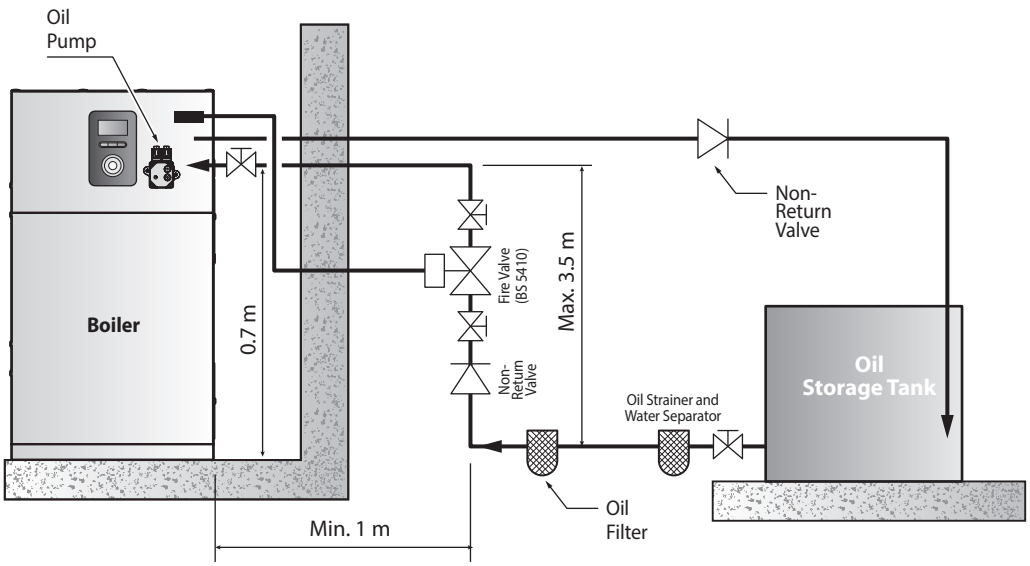
With the storage tank outlet below the burner, a two pipe system should be used. The return pipe should be at the same level in the tank as the supply pipe, both being 75 to 100 mm above the base of the tank. The pipe ends should be a sufficient distance apart so as to prevent any sediment from being disturbed by the return entering the supply pipe.

Make sure that the bottom of the tank is more than 3.5 m below the burner.

A non-return valve should be fitted in the supply pipe together with the filter and fire valve. A non-return valve should be fitted in the return pipe if the top of the tank is above the burner.

The pump vacuum should not exceed 0.4 bar. Beyond this limit gas is released from the oil.

For guidance on the installation of top outlet fuel tanks and suction oil supply sizing, see OFTEC technical book 3.



Single Pipe Suction Lift with De-Aerator System

When the storage tank is below the burner, an alternative to a two pipe system can be achieved using an oil de-aerator. This effectively removes the air from the oil supply on a single pipe lift.

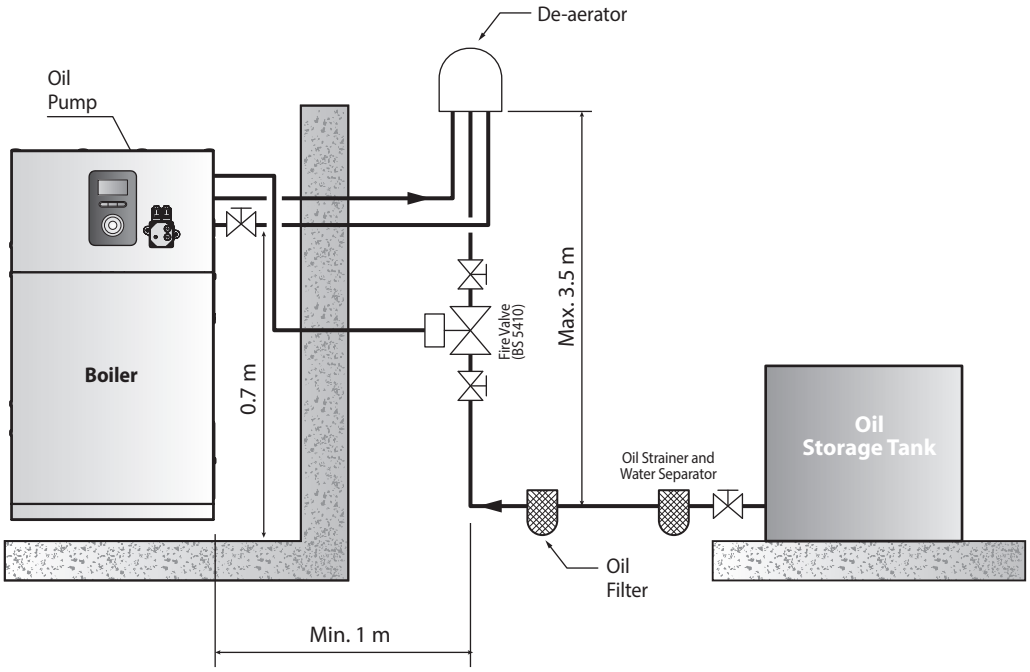
The maximum suction height 3.5 metres. The oil tank must be positioned below the oil pump. Create an inlet and return loop between the de-aerator and oil pump.

A non-return valve must be incorporated within the de-aerator or fitted to the oil line between the oil storage tank and the de-aerator.

A top feed oil tank fitted with a de-aerator using an internal non-return valve should have any non-return valves fitted in the base of the tank to the suction line removed to assist purging air from the oil line.

The de-aerator is connected close to the boiler as a two pipe system as shown in the following illustration. Refer to the manufacturer's instructions supplied with the de-aerator.

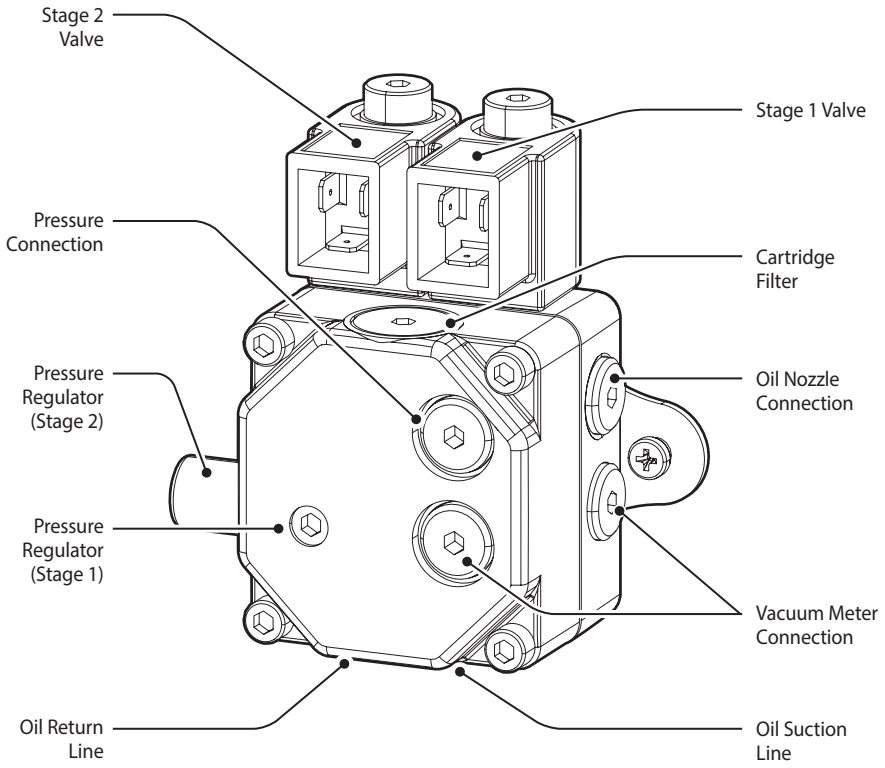
The de-aerator must be mounted vertically, as shown in the following illustration.



Burner Oil Connection

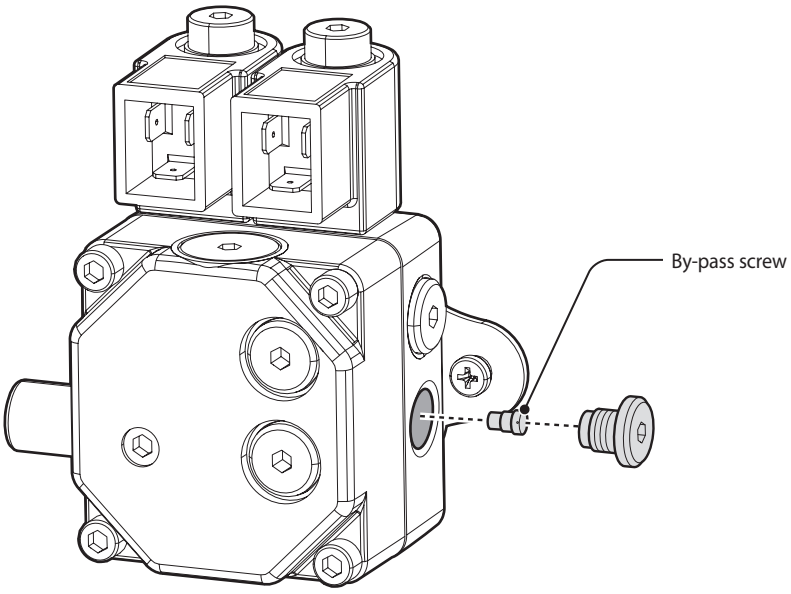
The oil pump is supplied for use with a double pipe oil supply system.

The oil pump return line plug is supplied in the boiler accessory pack.



< Oil Pump >

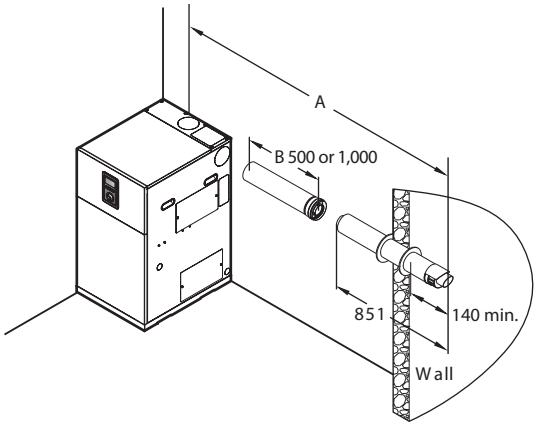
For use on a single pipe system, remove the by-pass screw.



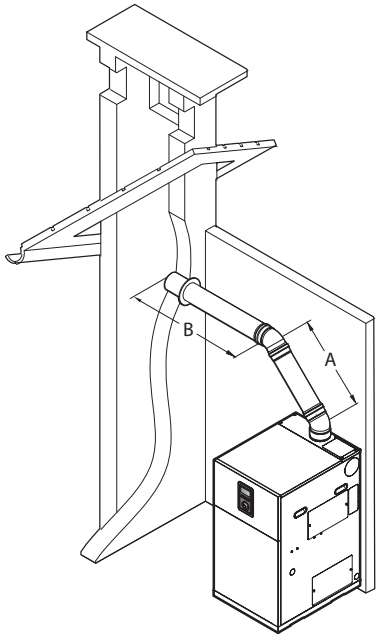
< Single Pipe System >

3.5 Flue Systems

Standard Removal System

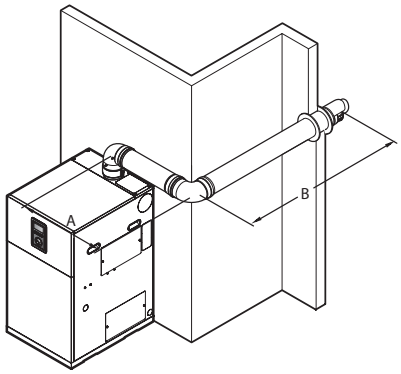


Ø60/100 => Max. length: A=20 m
Ø80/125 => Max. length: A=68 m



Ø60/100 => Max. length: A+B-(1 x 45°elbow) = 20-1 = 19 m
Ø80/125 => Max. length: A+B-(1 x 45°elbow) = 68-1 = 67 m

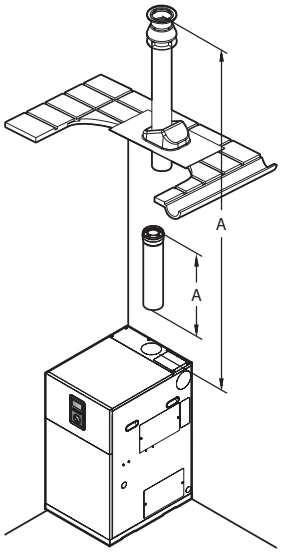
Extended Removal System



Ø60/100 => Max. length: A+B-(1 x 90°elbow) = 20-1.3 = 18.7 m
Ø80/125 => Max. length: A+B-(1 x 90°elbow) = 68-2.2 = 65.8 m

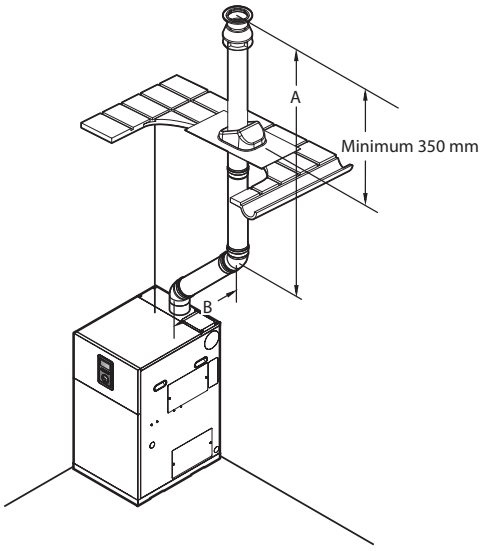
Pipe Diameter (mm)	Maximum Length (m)	Elbow	Equivalent Length (m)
Ø60/100	20	45°	1.0
		90°	1.3
Ø80/125	68	45°	1.0
		90°	2.2

Standard Removal System



Ø60/100 => Max. length: A=21 m
Ø80/125 => Max. length: A=70 m

Extended Removal System



Ø60/100 => Max. length: A+B-(1 x 45°elbow) = 21-1 = 20 m
Ø80/125 => Max. length: A+B-(1 x 45°elbow) = 70-1 = 69 m

Pipe Diameter (mm)	Maximum Length (m)	Elbow	Equivalent Length (m)
Ø60/100	21	45°	1.0
Ø80/125	70		

Maximum Total Length

Type	Pipe Diameter (mm)	Orientation	Maximum Length (m)
Coaxial	Ø60/100	Horizontal	20
		Vertical	21
	Ø80/125	Horizontal	68
		Vertical	70

Equivalent Length of Elbows and Adapters

Type	Pipe Diameter (mm)	Elbow	Equivalent Length (m)
Coaxial	Adapter Ø60/100 -> Ø80/125	-	0.5
	Ø60/100	45°	1.0
		90°	1.3
	Ø80/125	45°	1.0
		90°	2.2

Terminating the Flue

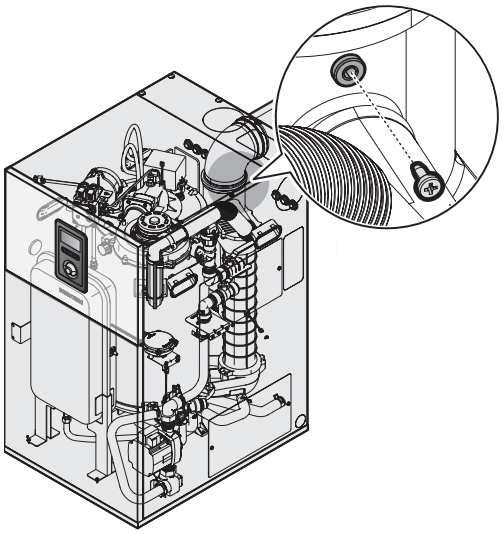
Before installing the boiler, determine what type of flue termination is appropriate for the installation location and situation. The subsections that follow describe some typical flue configurations.

⚠ CAUTION

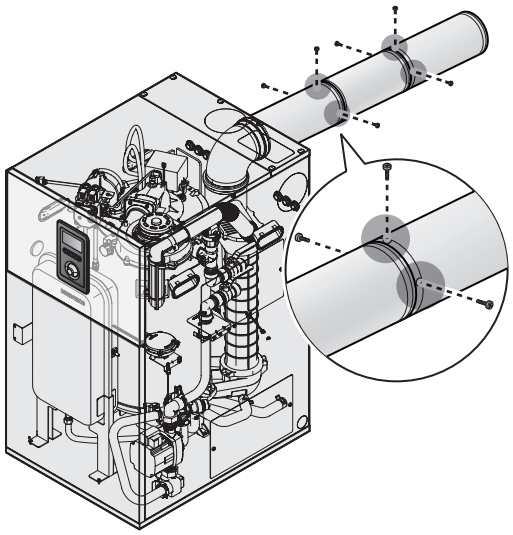
Minimum Clearance to Metering devices and Relief equipment. Maintain a minimum horizontal clearance of 1.22 m from electric meters, gas meters, regulators, and relief equipment. Do not install the boiler above or below electric meters, gas meters, regulators, or relief equipment unless a 1.22 m horizontal clearance is maintained.

Fixing the Flue

After installing the flue vent, fasten the screw to fix the flue vent to the flue duct. (Use screws supplied by Navien.)



Flue connections must be firmly pressed together so that the gaskets from an airtight seal. To ensure optimum joint connection, it is recommended to secure with three self tapping screws. Secure the flue to the wall or ceiling with pipe clamps or perforated hanger iron.



⚠ WARNING

The screw must be fastened completely to fix the flue vent to the flue duct. If it is not properly fastened, it can result in excessive levels of carbon monoxide, which can lead to severe personal injury. Flue vent installation should be performed only by a licensed professional.

3.6 Power Supply

⚠ WARNING

- Improperly connecting the power supply can result in electrical shock and electrocution. Follow all applicable electrical codes of the local authority having jurisdiction.
- When connecting the boiler to the power supply, do not touch the power cord or internal components of the boiler with wet hands. Doing so may result in electric shock.

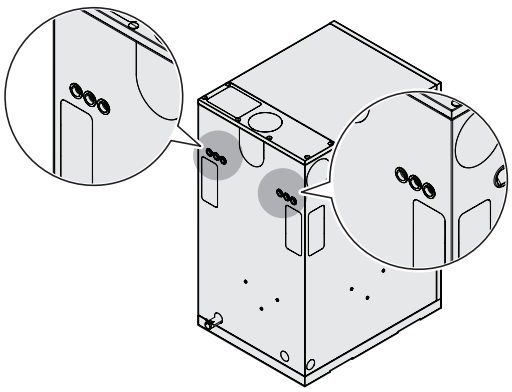
Connecting the power supply should be performed only by a licensed professional.

When connecting the power supply, follow these guidelines:

- Do not connect the electric supply until all piping is complete and the boiler has been filled with water.
- Do not connect the boiler to a 110-120 V AC power supply. Doing so will damage the boiler and void the warranty.
- All the Navien LCB boilers are supplied with a factory-installed, 3 core wire (Live, Neutral, Earth). The boiler's current rating is 3 A and can be plugged into any grounded electrical outlet adjacent to the boiler. A dedicated power supply is not required.
- The boiler must be electrically grounded. If wiring the boiler directly to a power supply, do not attach the ground wire to oil or water pipes as plastic pipe or dielectric unions may prevent proper grounding.
- We recommend using a surge protector to protect the boiler from power surges.
- If there is a power failure in cold weather areas, the freeze prevention system in the boiler will not operate and may result in the heat exchanger freezing. In cold areas where power failures are common, you must completely drain the boiler to prevent damage if power cuts last for extended periods. Damage caused by freezing is not covered under warranty.

⚠ WARNING

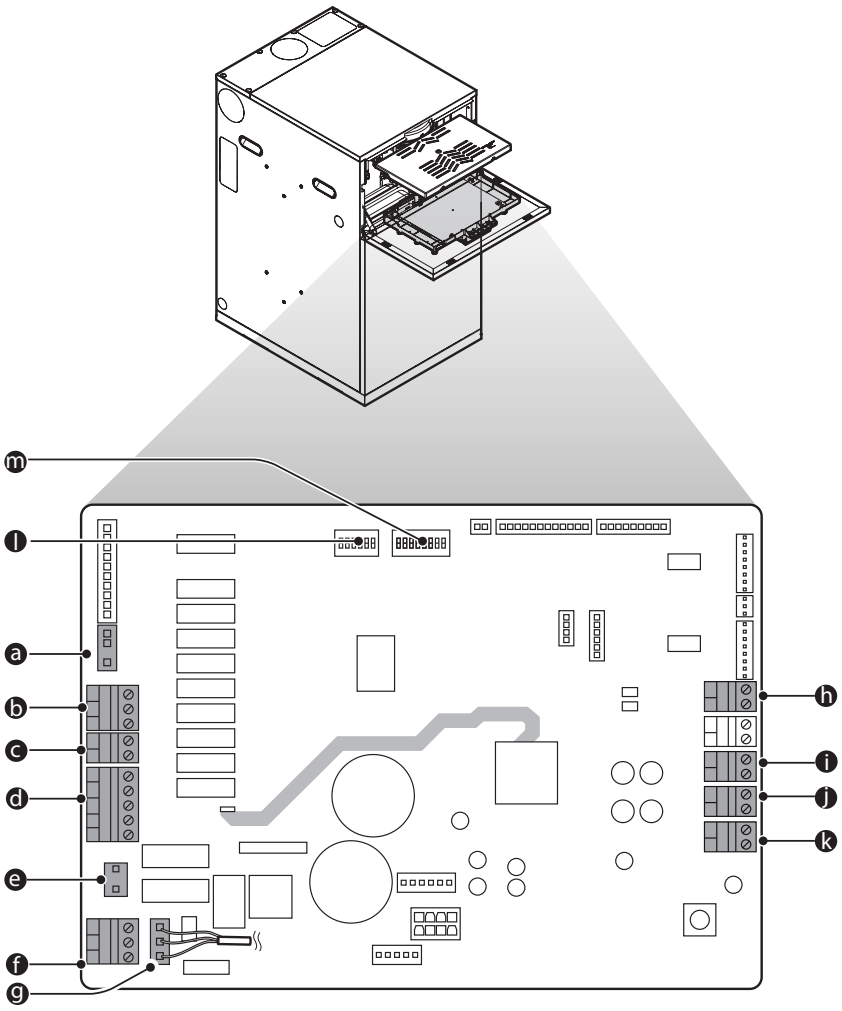
When connecting cables to the boiler through the rubber stopper on the back of the boiler, cut a hole (or an X) into the rubber stopper to ensure the cables can pass through the rubber stoppers. Removing the rubber stoppers and connecting cables to the boiler may damage the cables, due to the boiler housing's sharp edges, and result in electric shock.



4. System Details

4.1 About the Main Controller

Refer to the following illustration for the main controller (PBA) wiring description.



Part	Ref	Applications
AC application	a	System/Combi: Internal recirculation pump Regular: External recirculation pump
	b	Combi: 3 Way Valve (Internal) System/Regular: DHW Valve (S,Y plan)
	c	System/Regular: CH Valve (S, Y, W plan)
	d	Junction box connection 1. CH_ON 2. DHW_ON 3. DHW_OFF 4. AC Thermostat (Switched Live) 5. L **Note** The AC Thermostat (Switched Live) and L terminals must be shorted using a jumper.
AC power line	e	Power S/W
	f	Power out: CONZ3 (Connected to the wiring centre)
	g	Power in: CONZ1 (AC Power supply) **Note** The power cord is connected to the CONZ1 (POWER IN) port by default. 1. Live (L) 2. Neutral (N) 3. Earth (PE)
DC application	h	Outdoor temp sensor
	i	CH thermostat
	j	Cylinder stat
	k	OpenTherm
DIP Switches	l	Main Controller
	m	Front Panel

4.2 Setting the Heating Demand

Set the heating demand on the DIW switch. To use the DHW tank, control the panel for DHW settings.

4.2.1 CH Demand Setting

The DIP SW on the circuit board that configures source of the heat demand is listed in the following table.

Switch2	Function	Setting	
6 & 7 & 8	CH Heat Demand	Switched Live	6-OFF, 7-OFF, 8-OFF
		CH thermostat	6-ON, 7-OFF, 8-OFF
		Navien Thermostat	6-OFF, 7-ON, 8-OFF
		OT RC	6-ON, 7-ON, 8-OFF
		Not used	6-OFF, 7-OFF, 8-ON
		Not used	6-ON, 7-OFF, 8-ON
		Not used	6-OFF, 7-ON, 8-ON
		Not used	6-ON, 7-ON, 8-ON

4.2.2 DHW Tank Demand Setting (System/ Regular)

You can set the DHW tank demand on the 4-3 DHW Call Signal menu.

Item	Description
4-1 DHW Thermostat	Aquastat
4-2 Wiring Centre	When VCU-10R (wiring centre) is connected to the boiler

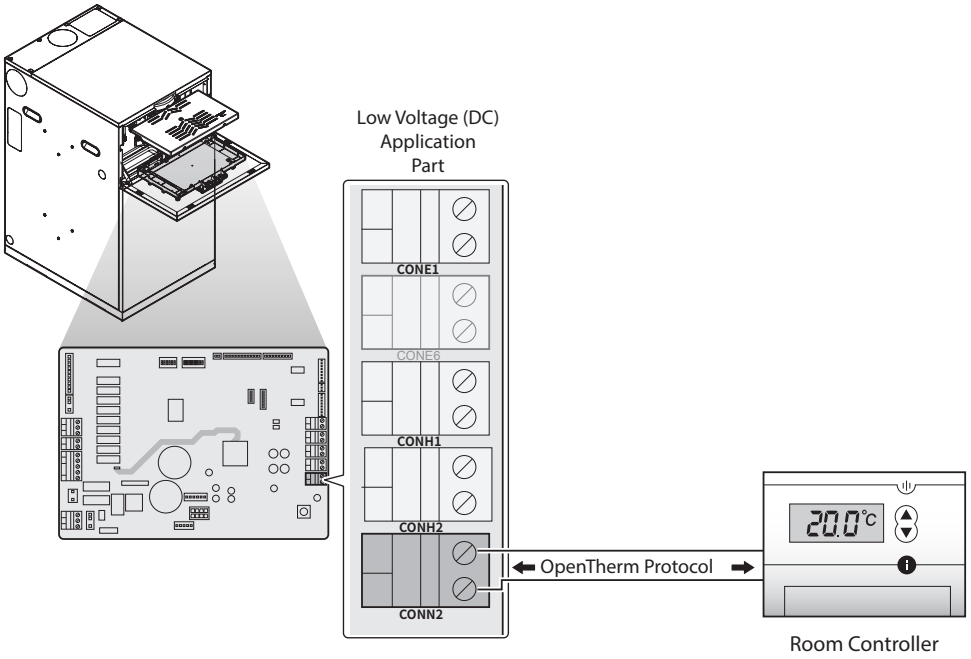
Note The 4-2 Wiring Centre menu is displayed only when the CH heat demand is set to Navien Thermostat and the wiring centre (VCU-10R) is connected to the boiler.

4.3 Connecting Applications - Low Voltage (DC) Application Part

These connections are low voltage DC only and 240 V AC is not to be fitted to these terminals. Doing so may damage the PCB and will not be covered under warranty.

4.3.1 Connecting the OpenTherm

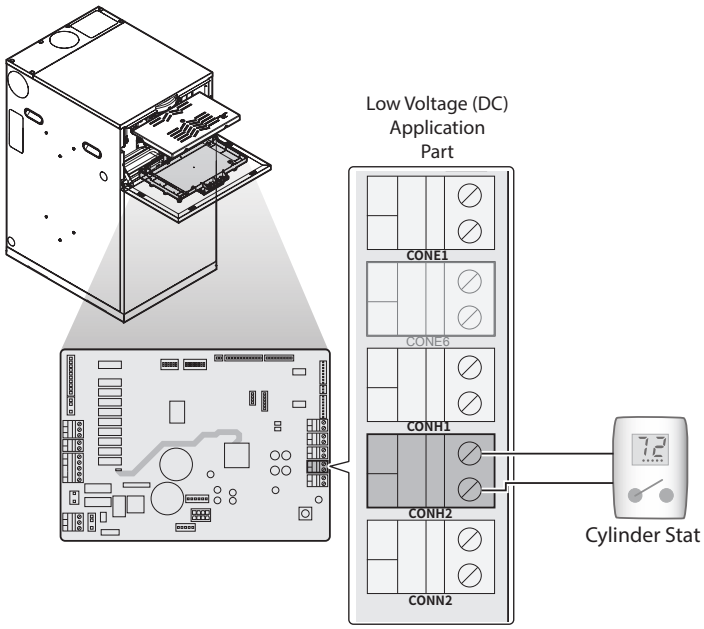
The boiler is designed to be connected to an OpenTherm. The OpenTherm cables are to be connected to the CONN2 in the low voltage (DC) application part.



Note OpenTherm® is an industry standard modulating control available from several control manufacturers and the LCB700 boiler has an OpenTherm® interface. This enables our modulating range of OpenTherm® room controls to be connected without any further modifications.

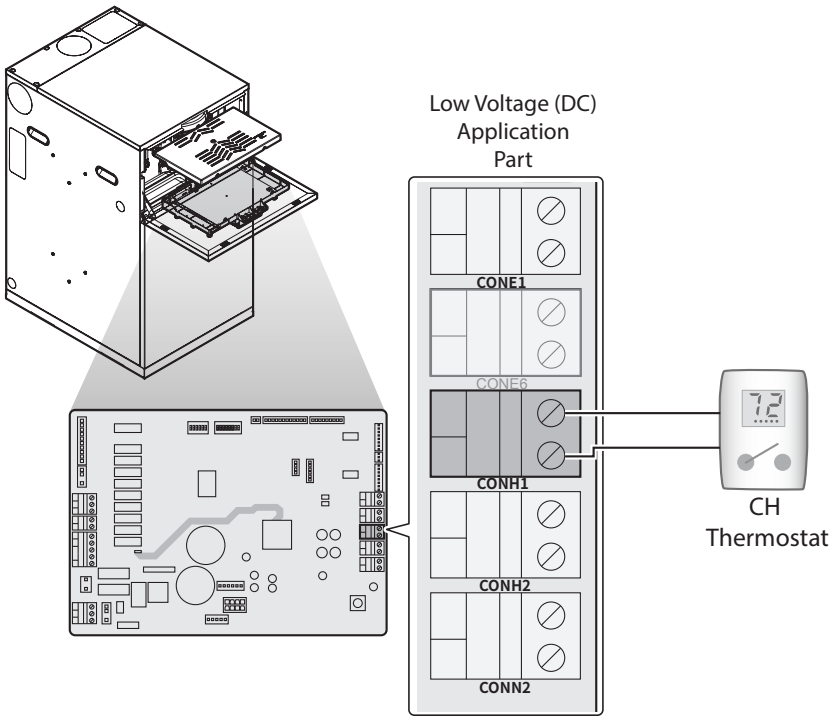
4.3.2 Connecting the Cylinder Stat

The boiler is designed to be connected to a cylinder stat. The thermostat cables are to be connected to the CONH2 in the low voltage (DC) application part.



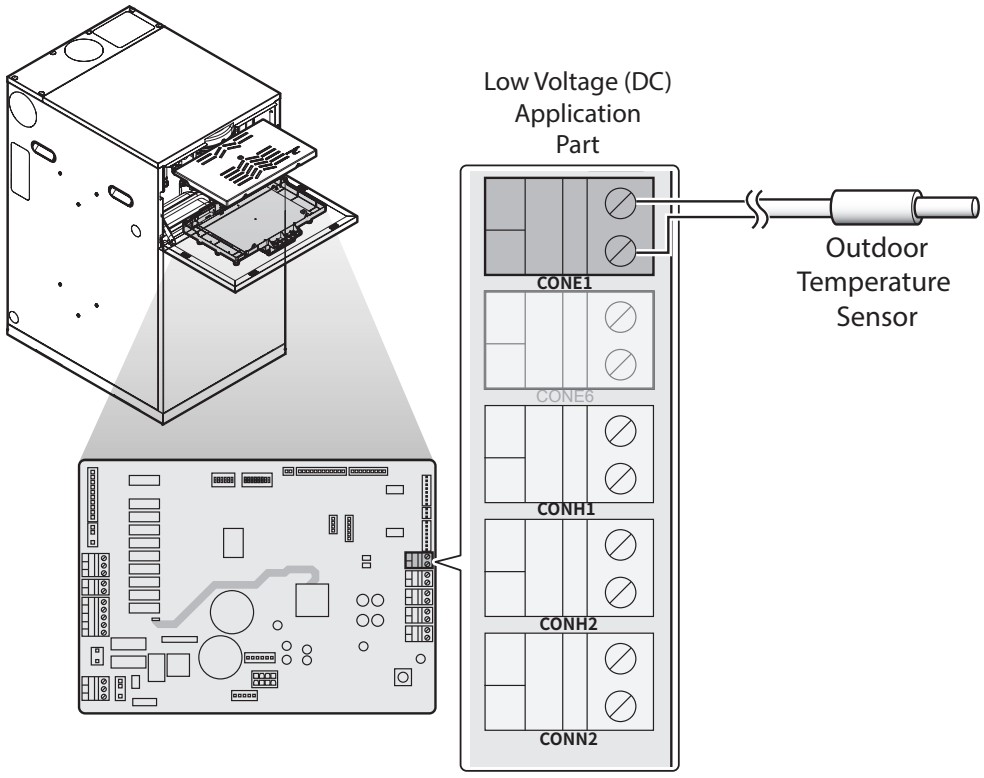
4.3.3 Connecting the CH Thermostat

The boiler is designed to be connected to a CH thermostat. The CH thermostat cables are to be connected to the CONH1 in the low voltage (DC) application part.



4.3.4 Connecting the Outdoor Temperature Sensor

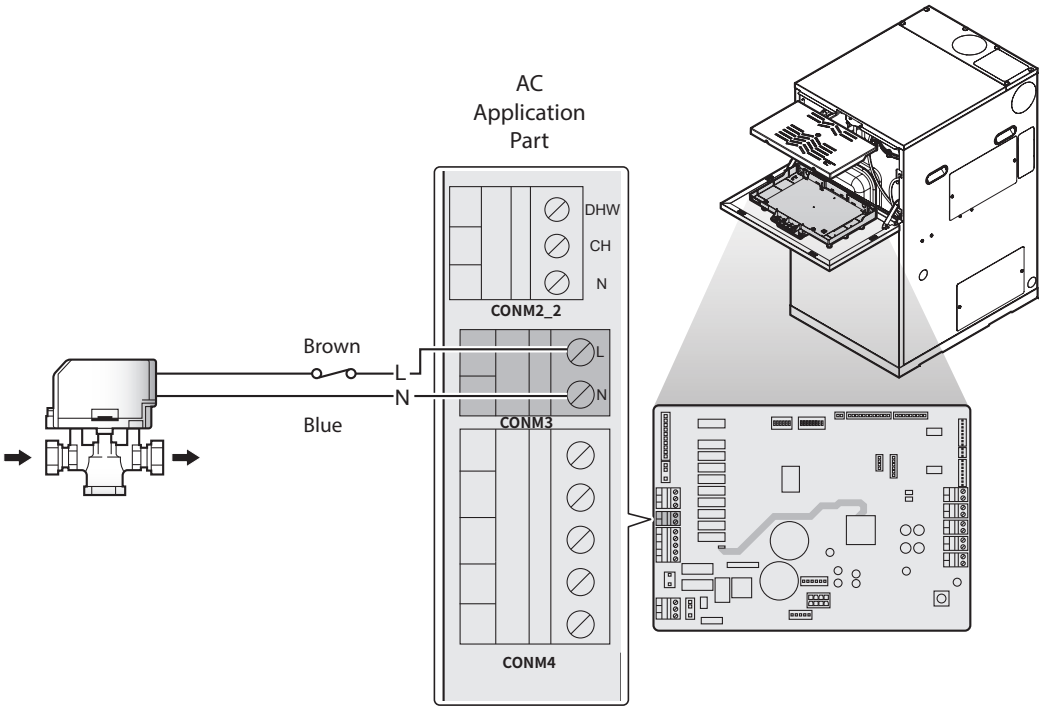
The boiler is designed to be able to function with an outdoor temperature sensor. The sensor cables are to be connected to the CONE1 in the low voltage (DC) application part.



4.4 Connecting Applications to the AC Application Part

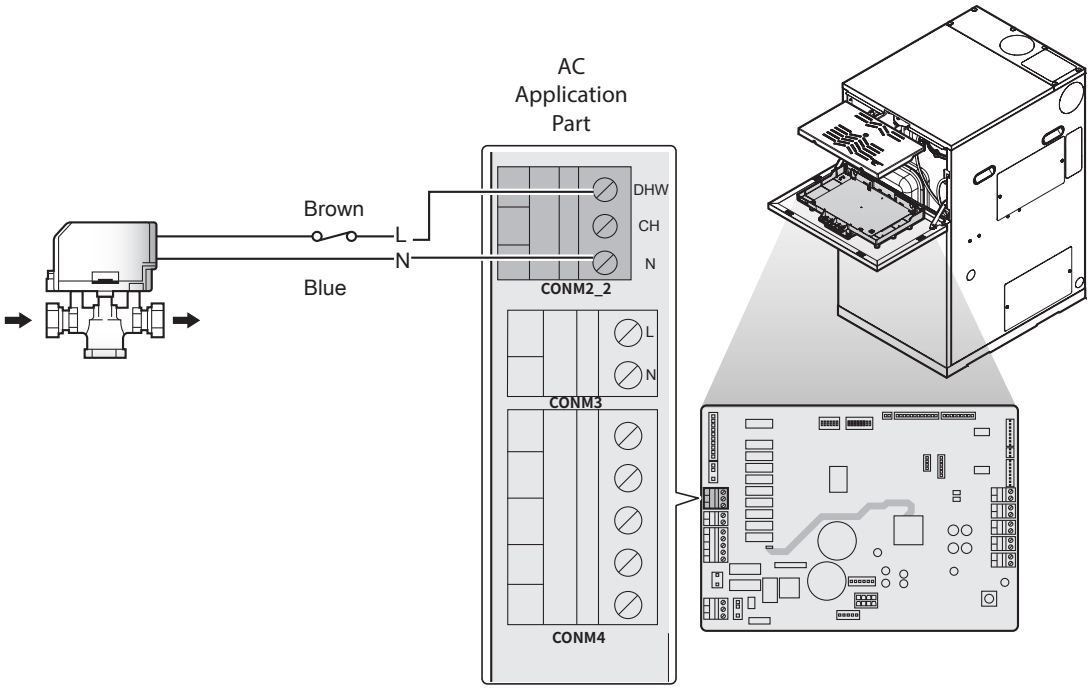
4.4.1 Connecting the 2 Port Diverter Valve (CH)

The boiler is designed to be connected to a 2 port diverter valve (CH). The valve cables are connected to the terminals 1 (L) and 2 (N) of the CONM3 in the AC application part. It only operates when there is an operating signal from the CH thermostat.



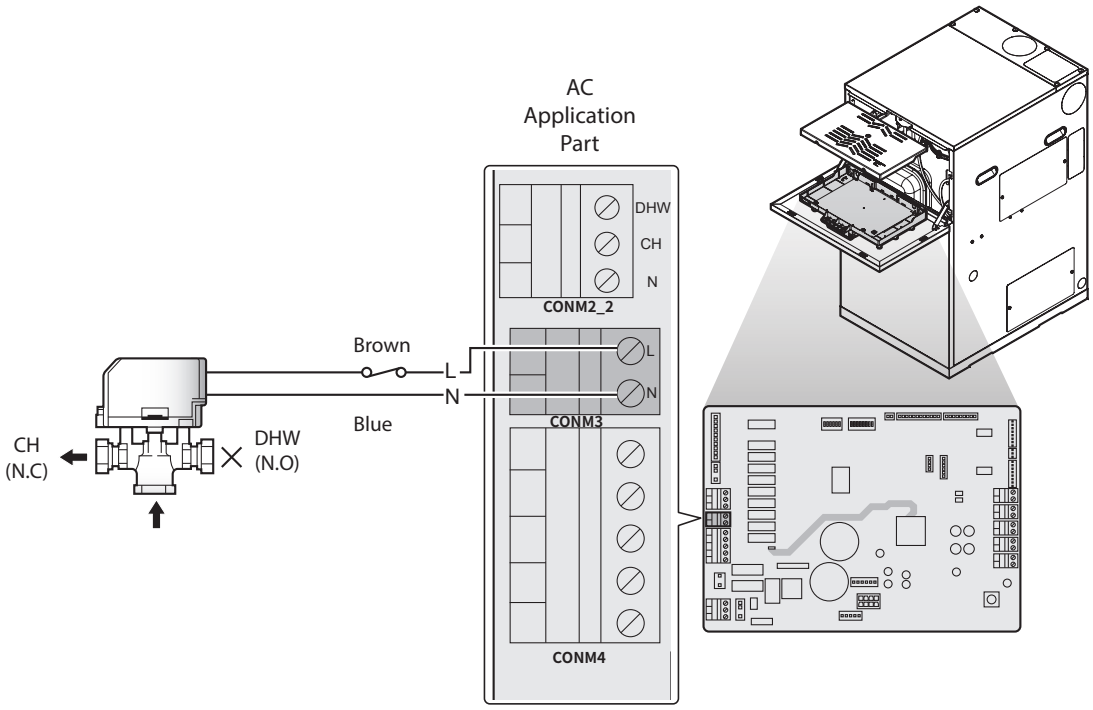
4.4.2 Connecting the 2 Port Diverter Valve (DHW)

The boiler is designed to be connected to a 2 port diverter valve (DHW). The valve cables are connected to the terminals 1 (L) and 3 (N) of the CONM2_2 in the AC application part. It only operates when there is an operating signal from the cylinder stat.



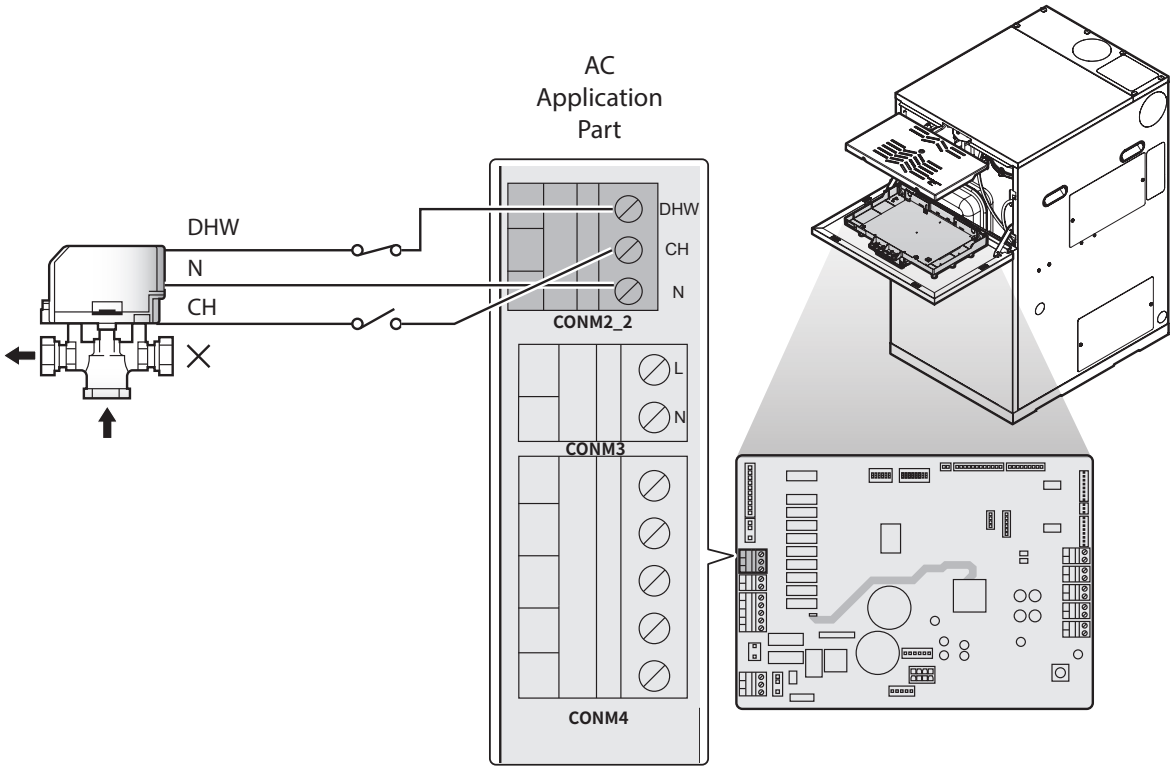
4.4.3 Connecting the 3 Port Diverter Valve

The boiler is designed to be connected to a 3 port diverter valve. The valve cables are connected to the terminals 1 (L) and 2 (N) of the CONM3 in the AC application part. It only operates when there is an operating signal from the cylinder stat or CH thermostat.



4.4.4 Connecting the 3 Way Valve (Type C Contact)

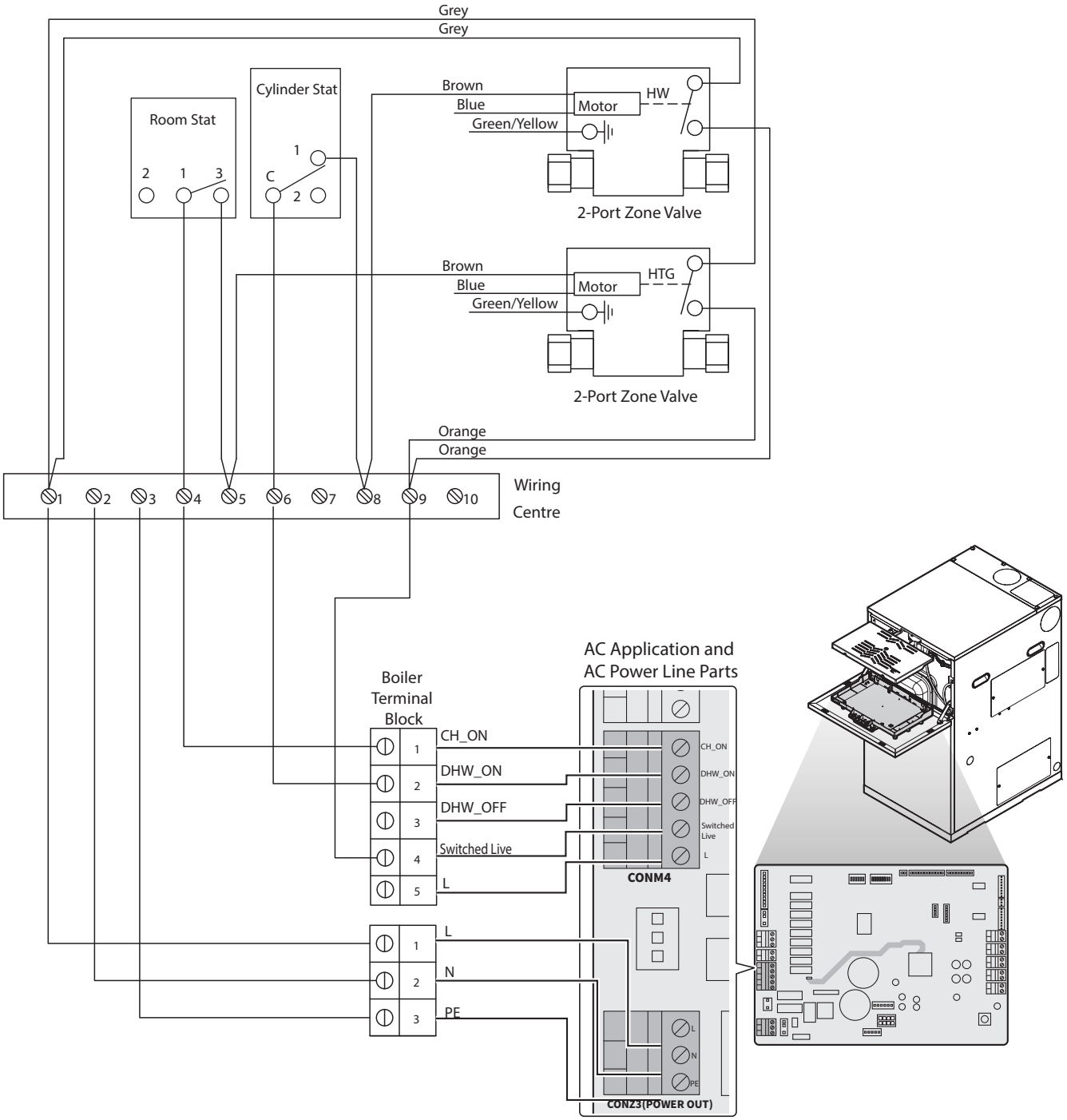
The boiler is designed to be connected to a 3 way valve (Type C Contact). The valve cables are connected to the terminals DHW, CH and N of the CONM2 in the AC application part. It only operates when there is an operating signal from the cylinder stat or CH thermostat.



4.5 Connecting Applications to AC Application Part (With Junction Box)

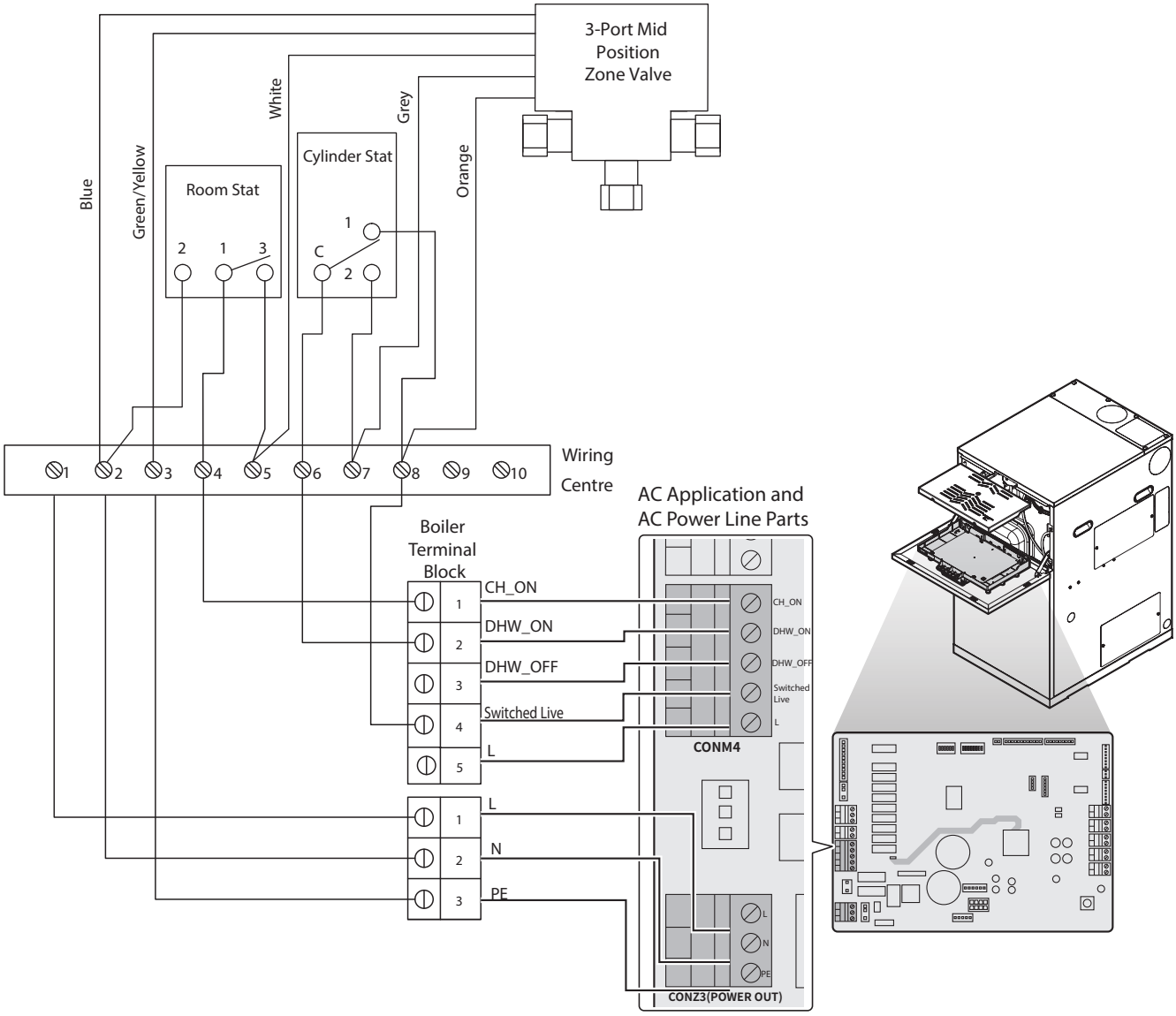
4.5.1 Connecting the Junction Box Connection (S Plan)

The boiler is designed to be connected to a junction box (S Plan). The Junction box cables are connected to the terminals 1-5 of the CONM4 in the AC application part and the CONZ3 (POWER OUT) in the AC power line part.



4.5.2 Connecting the Junction Box Connection (Y Plan)

The boiler is designed to be connected to a junction box (Y Plan). The Junction box cables are connected to the terminals 1-5 of the CONM4 in the AC application part and the CONZ3 (POWER OUT) in the AC power line part.



4.6 Setting the DIP Switches

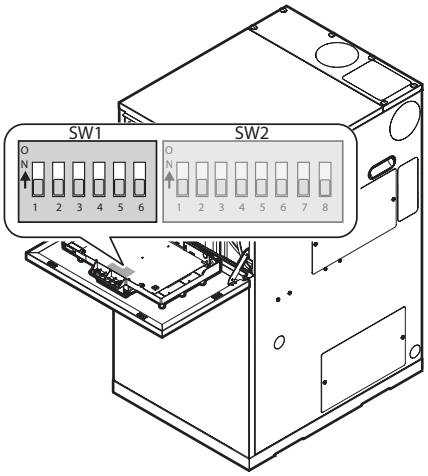
> **CAUTION**
>
> **Do not remove the front cover unless the power to the boiler is turned off or disconnected.** Failure to do so may result in electric shock.

The boiler has 2 sets of DIP switches on the main controller (PBA) and 2 sets of DIP switches on the front panel. DIP switches are used to control the functionality of the boiler. Set the DIP switches appropriately, based on the installation environment.

4.6.1 PCB DIP Switches

DIP Switch 1 (Set of 6)

The DIP SW 1 on the circuit board configures operation status, and boiler model/capacity.

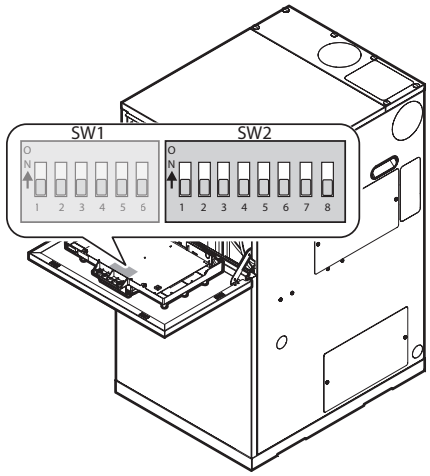


Switch 1	Function	Setting	
1 & 2	Operation Status	Normal (Default)	1-OFF, 2-OFF
		Stage 1 (Low)	1-OFF, 2-ON 1-ON, 2-ON
		Stage 2 (High)	1-ON, 2-OFF
3	Boiler Type	Solo (System/Regular)	3-OFF
		Combi	3-ON
4	Not Used	Internal	4-OFF
		External	4-ON
5 & 6	Capacity	21 kW	5-OFF, 6-OFF
		28 kW	5-ON, 6-OFF
		36 kW	5-OFF, 6-ON
		Not Used	5-ON, 6-ON

4.6.2 Front Panel DIP Switches

DIP Switch (Set of 8)

The DIP SW 2 on the circuit board configures the fuel selection, country, makeup water method, and source of the heat demand.



Switch 2	Function	Setting	
1 & 2	Fuel Type	Kerosene	1-OFF, 2-OFF
		Light Oil*	1-ON, 2-OFF
		Not Used	1-OFF, 2-ON
		Not Used	1-ON, 2-ON
3	Not Used	Not Used	3 - OFF
		Not Used	3 - ON
4	Not Used	Not Used	4 - OFF
		Not Used	4 - ON
5	Not Used	Not Used	5 - OFF
		Not Used	5 - ON

Switch 2	Function	Setting	
6 & 7 & 8	CH Heat Demand	Switched Live	6-OFF, 7-OFF, 8-OFF
		CH Thermostat	6-ON, 7-OFF, 8-OFF
		Navien Thermostat	6-OFF, 7-ON, 8-OFF
		OT R/C	6-ON, 7-ON, 8-OFF
		Not Used	6-OFF, 7-OFF, 8-ON
		Not Used	6-ON, 7-OFF, 8-ON
		Not Used	6-OFF, 7-ON, 8-ON
		Not Used	6-ON, 7-ON, 8-ON

* Refer to the manufacturer's instructions when using light oil.

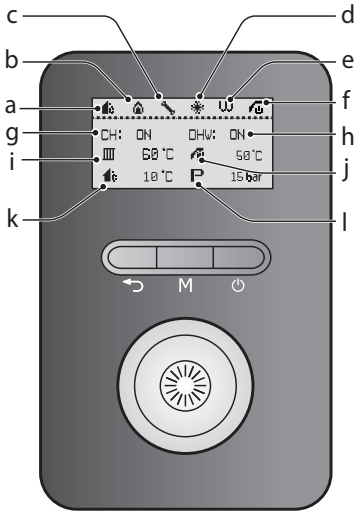
4.7 Front Panel

4.7.1 Using the Front Panel

The front panel allows you to adjust the temperature and view the operating status or error codes. Remove the protective film from the front panel before using it.

4.7.1.1 Icons and Digital Display

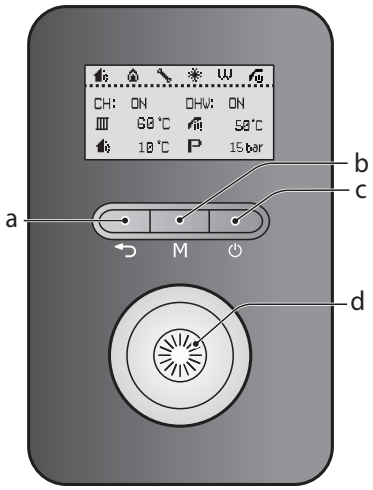
The icons and digital display on the front panel provide important information required for the boiler's operation. Refer to the following table for detailed information.

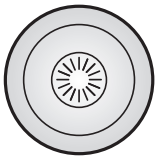


a		**Outdoor temperature compensation (OTC)** Displayed when the outdoor temperature compensation (OTC) is enabled.	**b**		**Combustion** Displayed when the burner is combusting.
c		**System fault** Displayed when a system fault is detected.	**d**		**Anti-freeze** Displayed when the boiler is operating in anti-freeze mode.
e		**Schedule programming mode** Displayed when the boiler's schedule programming operation is set.	**f**		**DHW preheat** Displayed when the DHW preheat feature is enabled.  Always On Weekly Intelligent
g		**Central heating demand** Indicates the central heating demand is present.	**h**		**DHW demand** Indicates that DHW demand is present.
i		**Central heating set temperature** When the central heating temperature is set: Displays the currently set central heating temperature. When the central heating temperature is not set: Displays the current supply water temperature.	**j**		**DHW set temperature** When the DHW temperature is set: Displays the currently set DHW temperature. When the DHW temperature is not set: Displays the current supply water temperature when using the DHW thermostat. Displays the current DHW tank temperature when using the DHW sensor.
k		**Outdoor temperature** Displays the outdoor temperature.	**l**		**System pressure** Displays the internal water pressure of the boiler system.

4.7.1.2 Buttons and Command Dial

Using the buttons and the Command dial on the front panel, you can turn on or off the boiler, monitor the current operation status, and set the values required for the boiler's operation, such as central heating and DHW supply temperatures. Refer to the following table for detailed information.

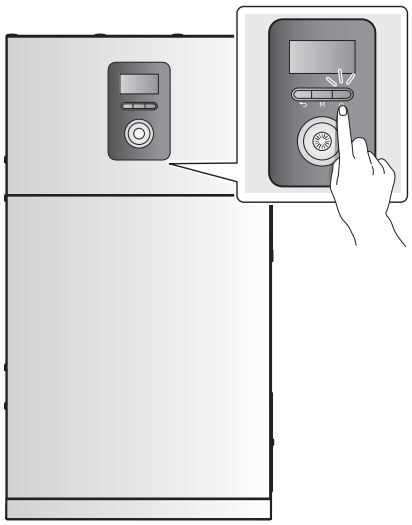


a		**Back button** Return to the previous menu or screen.	b		**Mode button** Enter the boiler's main menu.
c		**Power button** Turn on or off the boiler.	d		**Command dial** Rotate to switch between menu items, or to increase/decrease values. Press to make a selection or to confirm changes.

Displays the internal water pressure of the boiler system.

4.7.2 Turning the Boiler on or off

To turn the boiler on or off, press the Power button (⏻) for 0.3 seconds.



When the power is on, the boiler automatically enters normal operation mode, and the boiler's operating conditions are displayed on the screen.

Note

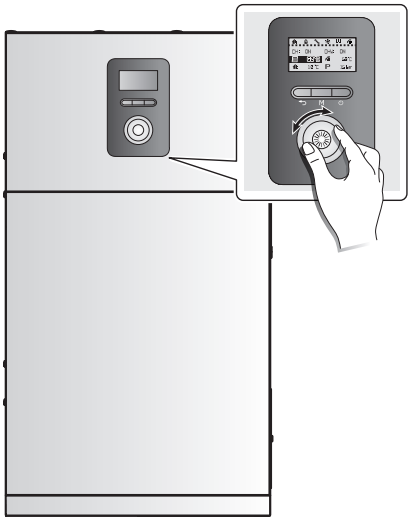
- The boiler status icons remain displayed when the boiler is turned off.
- To prevent formation of soot, the minimum running time of the burner in the boiler is 2 minutes and 30 seconds. Therefore, if you turn off the boiler within 2 minutes and 30 seconds of it being turned on, the burner does not stop running immediately.

4.7.3 Adjusting the Temperature

4.7.3.1 Adjusting the Central Heating Temperature

To adjust the heating temperature:

1. In normal operation mode, rotate the Command dial (⚙) . The central heating temperature (▥) is highlighted on the screen.



2. Press the Command dial (⚙) to select the central heating temperature (▥). The highlighted section will flash.

3. Rotate the Command dial (⚙) to the right or left to increase or decrease the temperature.
4. Press the Command dial (⚙) to confirm the new temperature.
5. Press the Back button (⮌) to return to normal operation mode, or rotate the Command dial (⚙) to adjust other operation conditions.

You can adjust the temperature while the highlighted section is flashing. Once the flashing stops, the current temperature setting is stored.

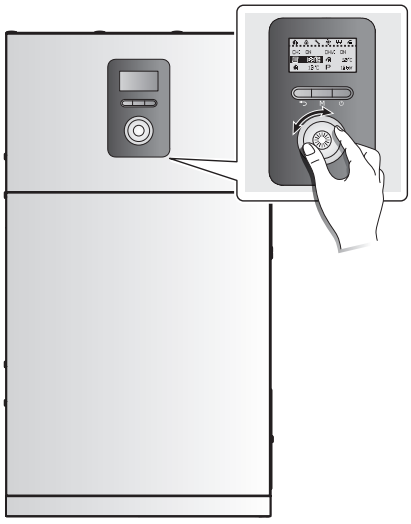
Note

- The central heating temperature cannot be adjusted when the Outdoor Reset Control is used.
- The central heating temperature cannot be adjusted if the boiler is operating as a sub unit in a cascade system. The main unit's set temperature will be displayed on the screen.
- In case of outdoor reset sensor malfunction, the boiler will operate at this set temperature.
- Take note of the original heating temperature in case you want to restore it to the default.
- The default central heating supply water temperature range is 40°C (Absolute MIN) to 85°C (Absolute MAX).
- The default central heating return water temperature range is 30°C (Absolute MIN) to 65°C (Absolute MAX).
- You can adjust the temperature ranges in the parameter settings menu.
- The boiler will retain your settings during a power outage.

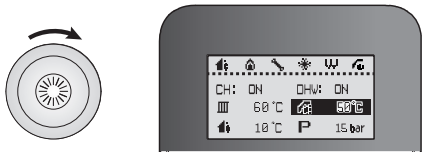
4.7.3.2 Adjusting the DHW Temperature

To adjust the water temperature:

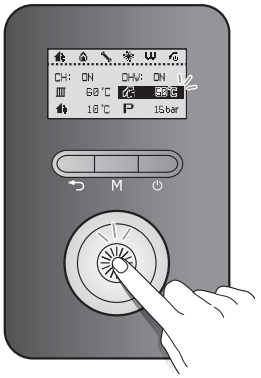
1. In normal operation mode, rotate the Command dial (). The central heating temperature () is highlighted on the screen.



2. Rotate the Command dial () to the right to select the DHW temperature ().



3. Press the Command dial () to select the indirect DHW temperature (). The highlighted section will flash.



4. Rotate the Command dial () to the right or left to increase or decrease the temperature.
5. Press the Command dial () to confirm the new temperature.
6. Press the Back button () to return to normal operation mode, or rotate the Command dial () to adjust other operation conditions.

You can adjust the temperature while the display is flashing. Once the display stops flashing, the current temperature setting is stored.

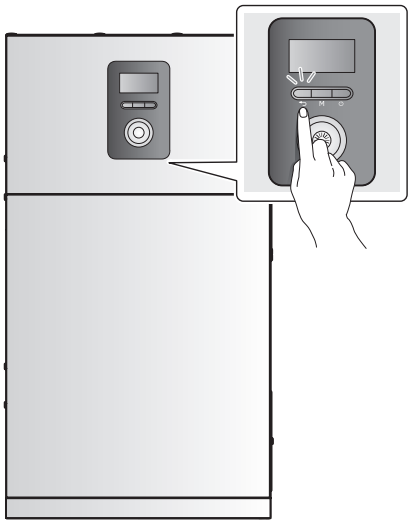
Note

- Take note of the original DHW indirect supply temperature in case you want to restore it to the default.
- The default DHW temperature range is 40°C (Absolute MIN) to 85°C (Absolute MAX).
- You can adjust the temperature ranges in the parameter settings menu.
- The boiler will retain your settings during a power outage.
- System/Regular boilers: The default DHW Supply Temperature range is 40°C (Absolute Min) to 85°C (Absolute Max).
- Combi boilers: The default DHW Temp range is 30°C (Absolute Min) to 60°C (Absolute Max).

 Displays the internal water pressure of the boiler system.

4.7.3.3 Resetting the Boiler

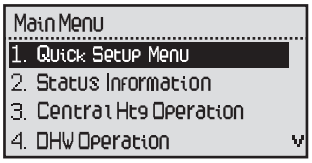
If an error message appears during boiler operation, reset the boiler to resolve the problem. Press the Back button (⮌) on the front panel to reset the boiler.



If resetting the boiler does not solve the problem, refer to the Troubleshooting section of this manual or contact Technical Support at 0844 332 2323.

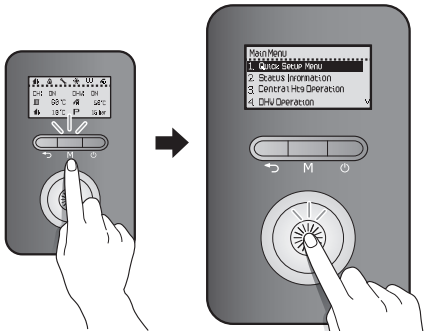
4.7.4 Accessing Basic Menu Items

In the Main Menu screen, you can view the boiler's operating conditions, configure the central heating and DHW temperatures, and review error history. Press the Menu button (M) to enter the Main Menu screen.



4.7.4.1 Quick Setup Menu

The Quick Setup Menu is designed to help configure the boiler settings after installation is complete. To enter the Quick Setup Menu, press the Menu button (M), and select "1.Quick Setup Menu".

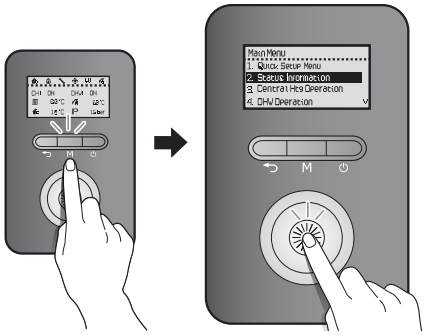


Press the Back button (⮌) to return to the previous screen.

Item	Description
1. OTC ON/OFF	Set the outdoor temperature compensation control settings.
1-1 K-Factor	Set the K-factor value.
1-2 WWSD Temp	Set the WWSD temperature.
2. DHW ON/OFF	Set the DHW operation.
3. DHW Call Signal (System/Regular Boiler Only)	Set the demand type for the DHW operation.
4. Time Setting	Set the system clock (RTC). • Display format: YYYY.MM.DD/ HH:MM:SS

4.7.4.2 Viewing Basic Information

To view information about the boiler, press the Menu button (M), and then select "2. Status Information".



Rotate the Command dial ( ) to switch between the information items. Press the Command dial ( ) to select an item and view the information.

Press the Back button ( ) to exit information view mode.

System/Regular Models

Item	Description
1. Operation State	Current Operation State
2. Heat Capacity	Heat capacity (Low or High)
3. CH Set Temp	Central heating set temperature (°C)
4. DHW Set Temp	DHW indirect supply set temperature (°C)
5. Supply Temp	Heating supply temperature (°C)
6. Burner Temp	Burner housing sensor temperature (°C)
7. Outdoor Temp	Outdoor temperature (°C)
8. Water Press	Water pressure (bar)
9. Flame Value	Flame detector AD value • Flame On: 8bit AD values equal to or lower than 70 • Flame Off: 8bit AD values equal to or higher than 175
10. Fan Target RPM	Set the fan speed (RPM)
11. Fan Current RPM	Current fan speed (RPM)
12. Fan Target APS	• Set APS voltage (V)
13. Fan Current APS	Set the oil pump speed (RPM)
14. Oil Pump Target RPM	Current oil pump speed (RPM)
15. Oil Pump Current RPM	Oil Pump speed(RPM)
16. Exhaust Temp	Exhaust temperature (°C)
17. OTC ON/OFF	OTC Status (Enable/Disable)
18. K-Factor	K-Factor for the OTC
19. Model	Model type
20. Type	Boiler type
21. Oil	Oil type
22. Main F/W ver	Main firmware version
23. Panel F/W Ver	Panel firmware version

Combi Models

Item	Description
1. Operation State	Current Operation State
2. Heat Capacity	Heat capacity (Low or High)
3. CH Set Temp	Central heating set temperature (°C)
4. DHW Set Temp	DHW set temperature(°C)
5. Supply Temp	Heating supply temperature (°C)
6. Burner Temp	Burner housing sensor temperature (°C)
7. Outdoor Temp	Outdoor temperature (°C)
8. Water Press	Water pressure (bar)
8. Inlet Temp	Inlet temperature(°C)
9. DHW Temp	DHW temperature(°C)
10. Outlet2 Temp	DHW outlet2 temperature(°C)
11. Tank Temp	DHW pre-heat tank temperature(°C)
12. Water Press	Water pressure (bar)
13. Flame Value	Flame detector AD value • Flame On: 8bit AD values equal to or lower than 70 • Flame Off: 8bit AD values equal to or higher than 175
14. Fan Target RPM	Set the fan speed (RPM)
15. Fan Current RPM	Current fan speed (RPM)
16. Fan Target APS	• Set APS voltage (V)
17. Fan Current APS	Set the oil pump speed (RPM)
18. Oil Pump Target RPM	Current oil pump speed (RPM)
19. Oil Pump Current RPM	Oil Pump speed(RPM)
20. Exhaust Temp	Exhaust temperature (°C)
21. OTC ON/OFF	OTC Status (Enable/Disable)
22. K-Factor	K-Factor for the OTC

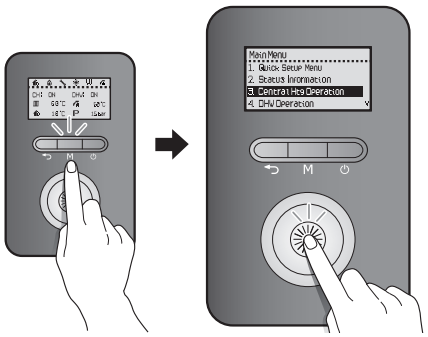
 Displays the internal water pressure of the boiler system.

Item	Description
23. Model	Model type
24. Type	Boiler type
25. Oil	Oil type
26. Main F/W ver	Main firmware version
27. Panel F/W Ver	Panel firmware version

Note The fan motor controls APS, so the Fan Target RPM is only for your reference.

4.7.4.3 Setting the Central Heating Operation

To set the boiler's central heating operation, press the Menu button (M), and then select "3. Central Htg Operation".



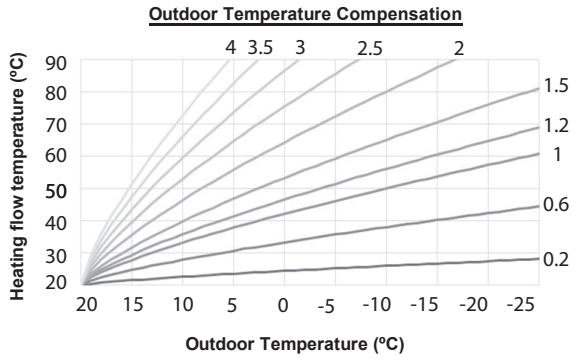
Rotate the Command dial (◎) to switch between the list items or to increase/decrease setting values. Press the Command dial (◎) to select an item or to confirm after making changes.

Press the Back button (↩) to return to the previous screen or menu.

Item	Description
1. Central Htg ON/ OFF	Enable or disable central heating operation. • Setting range: Enable/Disable • Default: Enable
1-1 CH Set Temp	Set the central heating target temperature (°C) • Setting range: 40-85°C • Default: 85°C This option is available only when "1. Central Htg ON/OFF" is set to "Enable".
2. OTC ON/OFF	Enable or disable the outdoor temperature compensation control option.
2-1 K-Factor*	K-Factor for the central heating
2-2 WWSD Temp	Set the Warm Weather Shut-down temperature. • Setting range: OFF, 10°C – 40°C • Default: OFF
2-3 WWSD On Diff	Set the differential temperature to deactivate the Warm Weather Shutdown. • Setting range: 1°C – 20°C • Default: 3°C
3. CH Control Method (System/ Regular Only)	Select the heating control type. 1: Supply Temperature 2: Return Temperature • Default: Supply Temperature

* When the boiler is connected to an outdoor temperature sensor (optional), functioning may be activated according to outdoor temperature conditions and K-factor values using the parameters.

The graph shows how the set temperature is determined. K-factor values can be set using the front panel or the Smart Room Controller.

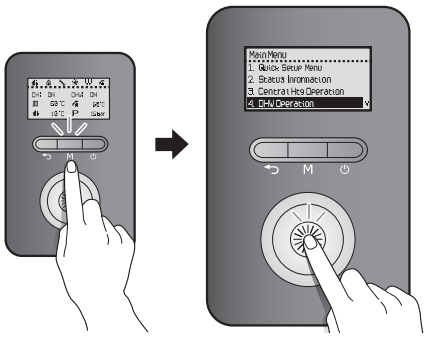


If there is an input from the outdoor temperature sensor, OTC (Outdoor Temperature Compensation) control will be enabled automatically. Also, if there is no input from the outdoor temperature sensor, OTC control will be disabled automatically.

OTC control can be enabled or disabled by the room thermostat signals. If the room thermostat is on (short), and the set supply water temperature calculated by the outdoor temperature and the K-factor values is above 30°C, OTC control is enabled. If the set supply water temperature is below 30°C, OTC control is disabled.

4.7.4.4 Setting the DHW Operation

To set the boiler's indirect (System/Regular) or direct (Combi) DHW operation, press the Menu button (M), and then select "4. DHW Operation".



Rotate the Command dial ( ) to switch between the list items or to increase/decrease setting values. Press the Command dial ( ) to select an item or to confirm after making changes.

Press the Back button ( ) to return to the previous screen or menu.

System/Regular Models

Item	Description
1. DHW ON/OFF	Set the DHW operation.
2. DHW Supply Set Temp	Set the DHW tank supply water temperature. • Setting range: 40 – 85°C • Default: 85°C
3. DHW Call Signal	Select a device for sensing the DHW demand. 1. DHW Thermostat 2. Wiring Centre: This option is available only when CH Demand is set to Navien Thermostat.

Combi Models

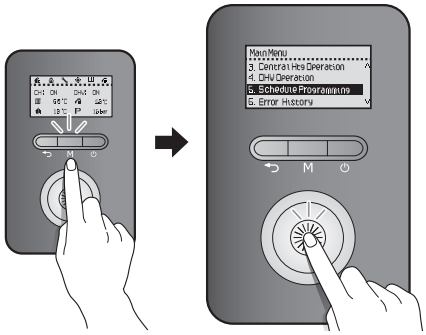
Item	Description
1. DHW ON/OFF	Set the DHW operation.
2. DHW Supply Set Temp	Set the DHW tank supply water temperature. • Setting range: 40 – 85°C • Default: 85°C
3. DHW Set Temp	Set the DHW temperature. • Setting range: 30 – 60°C • Default: 50°C

* DHW Priority Time refers to the time duration that the boiler will give priority to DHW over central heating (Combi boiler only).

 Displays the internal water pressure of the boiler system.

4.7.4.5 Setting the Schedule Programming Operation

To set the boiler's schedule programming operation, press the Menu button (M), and then select "5. Schedule Programming".



Rotate the Command dial (⊛) to switch between the list items or to increase/decrease setting values. Press the Command dial (⊛) to select an item or to confirm after making changes.

Item	Description
1. CH_Schedule	Set the central heating weekly timer.
2. DHW_Schedule	Set the DHW tank (System/Regular) or DHW PreHeat (Combi) Weekly Timer.
3. Schedule Check	Check the weekly schedule.

Note To select this option, you must set up the Time settings in the Configuration menu.

If you select an item, you can select the certain day to schedule the central heating or DHW modes.

System/Regular Models - Central Heating or DHW Mode

Item	Description
1. 7 Day	Schedule a command for each day of the week.
2. 5 + 2 Day	Schedule a command for weekday and weekend.
3. 5 + 1 + 1 Day	Schedule a command for weekdays, Saturdays, and Sundays.
4. OFF (Not Used)	Disable the schedule function.

Combi Models - Central Heating Mode

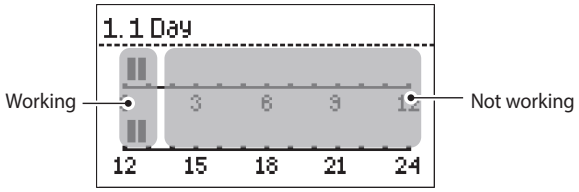
Item	Description
1. 7 Day	Schedule a command for each day of the week.
2. 5 + 2 Day	Schedule a command for weekday and weekend.
3. 5 + 1 + 1 Day	Schedule a command for weekdays, Saturdays, and Sundays.
4. OFF (Not Used)	Disable the schedule function.

Combi Models - DHW Mode

Item	Description
1. Always On	Preheat always ON.
2. Intelligent	The boiler analyzes your hot water consumption pattern and preheats the water when the set conditions are met.
3. Weekly	Set the DHW mode settings to be the same as space heating mode.
4. OFF (Not Used)	Disable the schedule function.

Set the Weekly Schedule

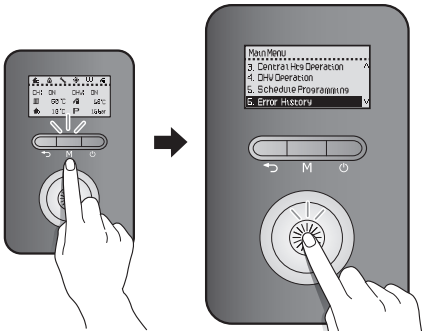
When setting up the Weekly option, select 'Weekly,' and select between 1 Day, 3 Day, and 7 Day to go to the Schedule menu.



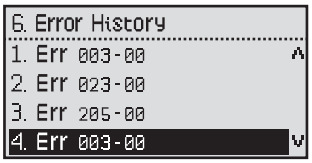
Rotate the Command Dial (⊛) to choose the scheduled time. You can choose the time in 30 minutes intervals.

4.7.4.6 Viewing Error History

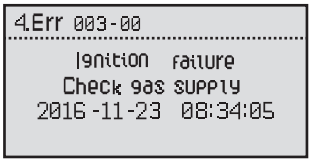
To view the error history, press the Menu button (M), and then select "6. Error History".



A list of 10 recent errors are displayed on the screen, with the most recent error displayed at the top of the list.



Rotate the Command dial (⊛) to switch between the list of errors. Press the Command dial (⊛) to select an error to view detailed information.



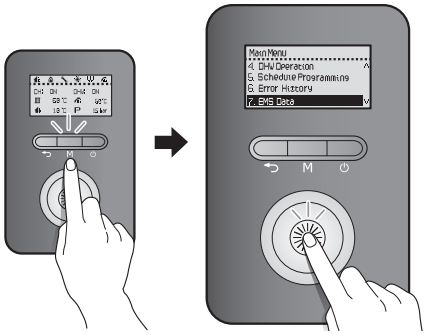
Press the Back button (⮌) to return to the previous screen or menu.

Note

- The front panel display flashes in red and the error icon is displayed (flashing) when a level 1 error is detected. You can press the Command dial (⊛) to enter error display mode. Boiler operation is maintained during a level 1 error.
- A level 1 error is automatically cleared when the problem is resolved.
- You can press the Power button (⏻) to clear a level1 error. Then the error is cleared if the problem has been resolved.

4.7.4.7 Viewing Other System Information

To view the miscellaneous system information, press the Menu button (M), and then select "7. EMS Data".



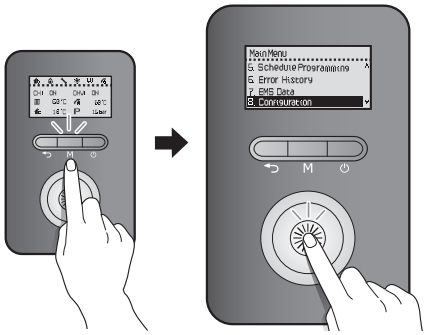
Rotate the Command dial (⊛) to switch between the information items. Press the Command dial (⊛) to select an item and view the information.

Press the Back button (⮌) to return to the previous screen or menu.

Item	Description
1. CH Operation Time	View monthly central heating operation logs.
2. DHW Operation Time	View monthly DHW operation logs.
3. Oil Consumption	View monthly oil consumption.

4.7.4.8 Setting the Display Options

To set the front panel display options, press the Menu button (M), and then select "8. Configuration".



Rotate the Command dial (⊛) to switch between the list items or to increase/decrease setting values. Press the Command dial (⊛) to select an item or to confirm after making changes.

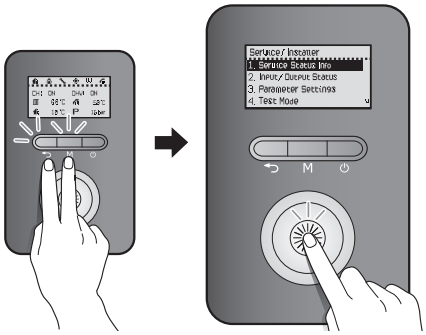
Press the Back button (⮌) to return to the previous screen or menu.

Item	Description
1. Language	Select the display language. 1. English • Default: English
2. °C/°F Setting	Select the temperature unit. 1. Celsius (°C) 2. Fahrenheit (°F) • Default: Celsius (°C)
3. PSI/BAR Setting	Select the water pressure unit. 1. PSI 2. BAR • Default: BAR
4. Time Setting	Set the system clock (RTC). • Display format: YYYY.MM.DD/ HH:MM:SS
5. Backlight Time Setting	Set the backlight time. • Setting range: 0 – 60 sec • Default: 2 sec

4.7.5 Accessing Advanced Menu Items

4.7.5.1 Viewing Service Information

To view service information about the boiler, press the Back button (⮌) and the Menu button (M) simultaneously for 3 seconds, and then select "1. Service Status Info".



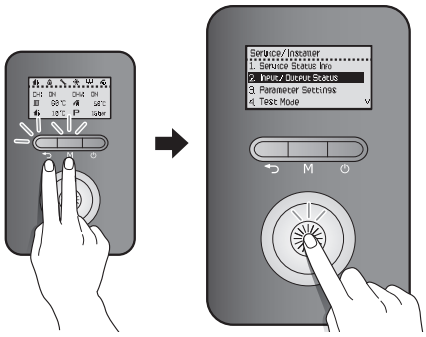
Rotate the Command dial (⊛) to switch between the information items. Press the Command dial (⊛) to select an item and view the information.

Press the Back button (⮌) to return to the previous screen or menu.

Item	Description
1. Elapsed Time After Install	Elapsed time since installation
2. HEX Overheat - No. of Times	Number of times the heat exchanger high limit stat has activated
3. Flame Loss - No. of Times	Number of times a flame loss/misfire has occurred
4. 2nd ignition - No. of Times	Number of second ignition attempts
5. 3rd ignition - No. of Times	Number of third ignition attempts

4.7.5.2 Viewing Input and Output Status

To view the boiler's input and output status, press the Back button (⮌) and the Menu button (M) simultaneously for 3 seconds, and then select "2. Input/Output Status".



Rotate the Command dial (⊛) to switch between the information items. Press the Command dial (⊛) to select an item and view the information.

Press the Back button (⮌) to return to the previous screen or menu.

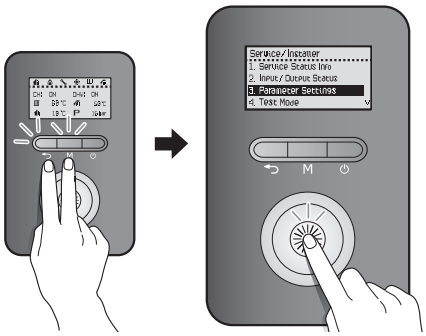
Item	Description
1. CH Switched Live Status	CH switched live input status
2. CH Thermostat Status	CH thermostat input status
3. DHW Thermostat Status	DHW thermostat input status
4. Boiler Pump Status	Boiler pump output status
5. 2 Way Valve	2 Way valve output status
6. 3 Way Valve	3 Way valve output status
7. HTL Input Status	HTL input status

4.7.5.3 Setting the Operation Parameters

To set the boiler's operation parameters, press the Back button (⮌) and the Menu button (M) simultaneously for 3 seconds, and then select "3. Parameter Settings".

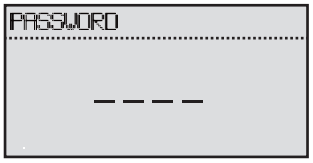
CAUTION

Parameters must be set by a qualified professional with an extensive understanding of the boiler system. Setting parameters improperly may lead to property damage or injury.



In the password screen, rotate the Command dial (⊛) to change numbers and places, and press the Command dial (⊛) to enter the password.

The factory default password is "1234".



After entering the parameter setting screen, rotate the Command dial (⊛) to switch between the parameters or to increase/decrease setting values. Press the Command dial (⊛) to select a parameter or to confirm after making changes.

Press the Back button (⮌) to return to the previous screen or menu.

System/Regular Models

 Displays the internal water pressure of the boiler system.

Item	Description
1. Supply MIN Set-point	Set the central heating supply minimum temperature. • Setting range: 25°C – [MAX Set-point – 20°C] • Default: 40°C
2. Supply MAX Set-point	Set the central heating supply maximum temperature. • Setting range: [MIN Set-point + 20°C] – 85°C • Default: 85°C
3. CH Burning Off Diff	Set the temperature range for turning off central heating. • Setting range : 0°C – 30°C • Default : 2°C
4. CH Buring On Diff	Set the temperature range for turning on central heating. • Setting range : 1°C – 30°C • Default : 13°C
5. Anti Fast Cycling Time*	Set the anti-fast cycling time. • Setting range: 0 – 20 min • Default: 3 min
6. Burner Switching Diff	Set the temperature range for the SH combustion switch. • Setting range: 5°C– 30°C • Default: 5°C
7. Freeze protection	Set the pump freeze protection temperature. • Setting range: 6°C – 10°C • Default: 10°C **Note** The system freeze protection temperature is set based on the pump freeze protection temperature.
8. Boiler Pump Delay	Set the boiler pump off delay time. • Setting range: 30 – 40 min • Default: 40 min
9. Low Pressure	Set the low water pressure. • Setting range: 0.1 – 1.2 bar • Default: 0.4 bar
10. Oil CMPS Rate	Set the oil consumption compensation rate. • Setting range : -25% – 25% • Default : 0 %
11. Service Notif Time	Set the time for service notification. • Setting range: 30 – 3650 days (10 years) • It can be set in 10 day increments. • Default: 1820 days (5 years)
12. Service Notif Cycle	Set the service notification according to the operating times. • Setting range: 300 – 36500 cycles • It can be set in 100 cycle increments. • Default: 18200 cycles
13. Factory Reset	Initialize all parameter settings (panel and main controller) to factory default.
14. P/W Change	Change the parameter setting password. Rotate the Command dial (⊛) to change numbers and places, and press the Command dial (⊛) to save the new password.

Combi Models

Item	Description
1. Supply MIN Set-point	Set the central heating supply minimum temperature. • Setting range: 25°C – [MAX Set-point – 20°C] • Default: 40°C
2. Supply MAX Set-point	Set the central heating supply maximum temperature. • Setting range: [MIN Set-point + 20°C] – 85°C • Default: 85°C
3. CH Burning Off Diff	Set the temperature range to turn off central heating. • Setting range : 0°C – 30°C • Default : 2°C
4. CH Buring On Diff	Set the temperature range to turn on central heating. • Setting range : 1°C – 30°C • Default : 13°C
5. Anti Fast Cycling Time*	Set the anti-fast cycling time. • Setting range: 0 – 20 min • Default: 3 min
6. DHW Pre-Heat Set Temp	Set the DHW Pre-Heating Set temperature. • Setting range: [DHW Set Temp + 10°C] – 80°C • Default: 75°C
7. DHW Burning Off Diff	Set the temperature range to turn off Domestic Hot Water. • Stting range: 0°C – 30°C • Default: 0°C

Item	Description
8. DHW Buring On Diff	Set the temperature range to turn on Domestic Hot Water. • Setting range: 1°C – 30°C • Default: 20°C
9. Burner Switching Diff	Set the temperature range of SH combustion switch. • Setting range: 5°C– 30°C • Default: 5°C
10. Freeze protection	Set the pump freeze protection temperature. • Setting range: 6°C – 10°C • Default: 10°C **Note** The system freeze protection temperature is set based on the pump freeze protection temperature.
11. Boiler Pump Delay	Set the boiler pump off delay time. • Setting range: 30 – 40 min • Default: 40 min
12. Low Pressure	Set the low water pressure. • Setting range: 0.1 – 1.2 bar • Default: 0.4 bar
13. Oil CMPS Rate	Set the oil consumption compensation rate. • Setting range : -25% – 25% • Default : 0 %
14. Service Notif Time	Set the time for service notification. • Setting range: 30 – 3650 days (10 years) • It can be set in 10 day increments. • Default: 1820 days (5 years)
15. Service Notif Cycle	Set the service notification according to the operating times. • Setting range: 300 – 36500 cycles • It can be set in 100 cycle increments. • Default: 18200 cycles
16. Factory Reset	Initialize all parameter settings (panel and main controller) to factory default.
17. P/W Change	Change the parameter setting password. Rotate the Command dial (⊛) to change numbers and places, and press the Command dial (⊛) to save the new password.

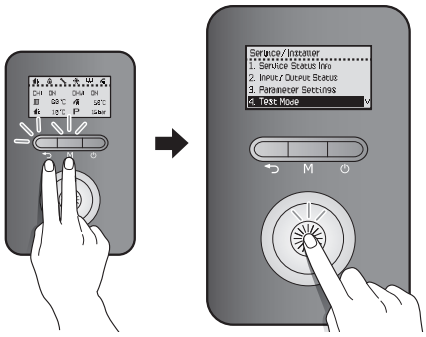
Note

- If you enter an incorrect password 10 times or make no inputs for 5 minutes, the boiler will return to Normal mode.
- To return to the previous mode, press the Reset button.
- The factory default password is "1234".
- If you make no inputs for 10 seconds in the Parameter Edit mode, the current parameter value will be saved automatically.
- Press and hold the Back button (⮌) in Parameter Edit mode for 5 seconds to reset individual parameters to their default values.
- When you reset one of the following parameters, the corresponding parameter will be reset automatically:
  - Supply Min or Max capacity limit
  - Return Min or Max capacity limit

* The anti-fast cycling time is the duration that the boiler stops its central heating operation when the central heating supply or return temperatures reach the set values for boiler operation stop temperatures. The boiler will not resume central heating until the duration elapses, even when the central heating supply or return temperatures return to within the set ranges.

4.7.5.4 Diagnosing the Boiler System

To run a series of test procedures for a system diagnosis, press the Back button (⮌) and the Menu button (M) simultaneously for 3 seconds, and then select "4. Test Mode".



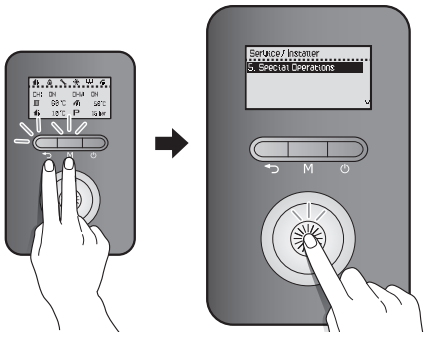
Rotate the Command dial (◎) to switch between the test procedures. Press the Command dial (◎) to run a test procedure.

Press the Back button (⮌) to return to the previous screen or menu.

Item	Description
1. Fan Motor	Test the fan operation by manually changing the fan speed. • From a stopped state, the fan speed gradually increases and reaches the top speed, and then the fan speed decreases until the fan stops operating. • Rotate the Command dial (◎) to run or stop the fan test.
2. Oil Pump	Test the fan operation by manually changing the pump speed. • Test the Oil Pump Operation. The Oil Pump is turned on as soon as you enter the test mode. • Press the Command dial (◎) to toggle the oil pump operation. Test the boiler pump operation.
3. Boiler Pump	Test the boiler pump operation. • The boiler pump is turned on as soon as you enter the test mode. • Press the Command dial (◎) to toggle the pump operation (On -> Off/Off -> On).
4. 2 Way Valve	Test the 2 way valve operation. • The 2 way valve is turned on as soon as you enter the test mode. • Press the command dial (◎) to toggle the valve operation (On -> Off/Off -> On). **Note** This option is not performed on Combi boilers.
5. 3 Way Valve	Test the 3 way valve operation. • The 3 way valve is turned on as soon as you enter the test mode. • Press the command dial (◎) to toggle the valve operation [On(DHW) -> Off(CH)/Off(CH) -> On(DHW)].
6. Flow Control Valve (Combi Only)	Test the Flow control Valve operation. • Rotate the valve from its current position to fully open (0%), then fully closed (100%) and then back to the starting position while checking feedback. • Display of the valve close ratio % display of "FEEDBACK" when detecting the feedback
7. Mixing Valve (Combi Only)	Test the Mixing Valve operation. • Rotate the valve from tis current position to fully open (0%), then fully closed (100%) and then back to the starting position while checking feedback. • Display of the valve close ratio % display of "FEEDBACK" when detecting the feedback

4.7.5.5 Setting the Special Operation Modes

To operate the boiler in special operation modes, press the Back button (⮌) and the Menu button (M) simultaneously for 3 seconds, and then select "5. Special Operations".



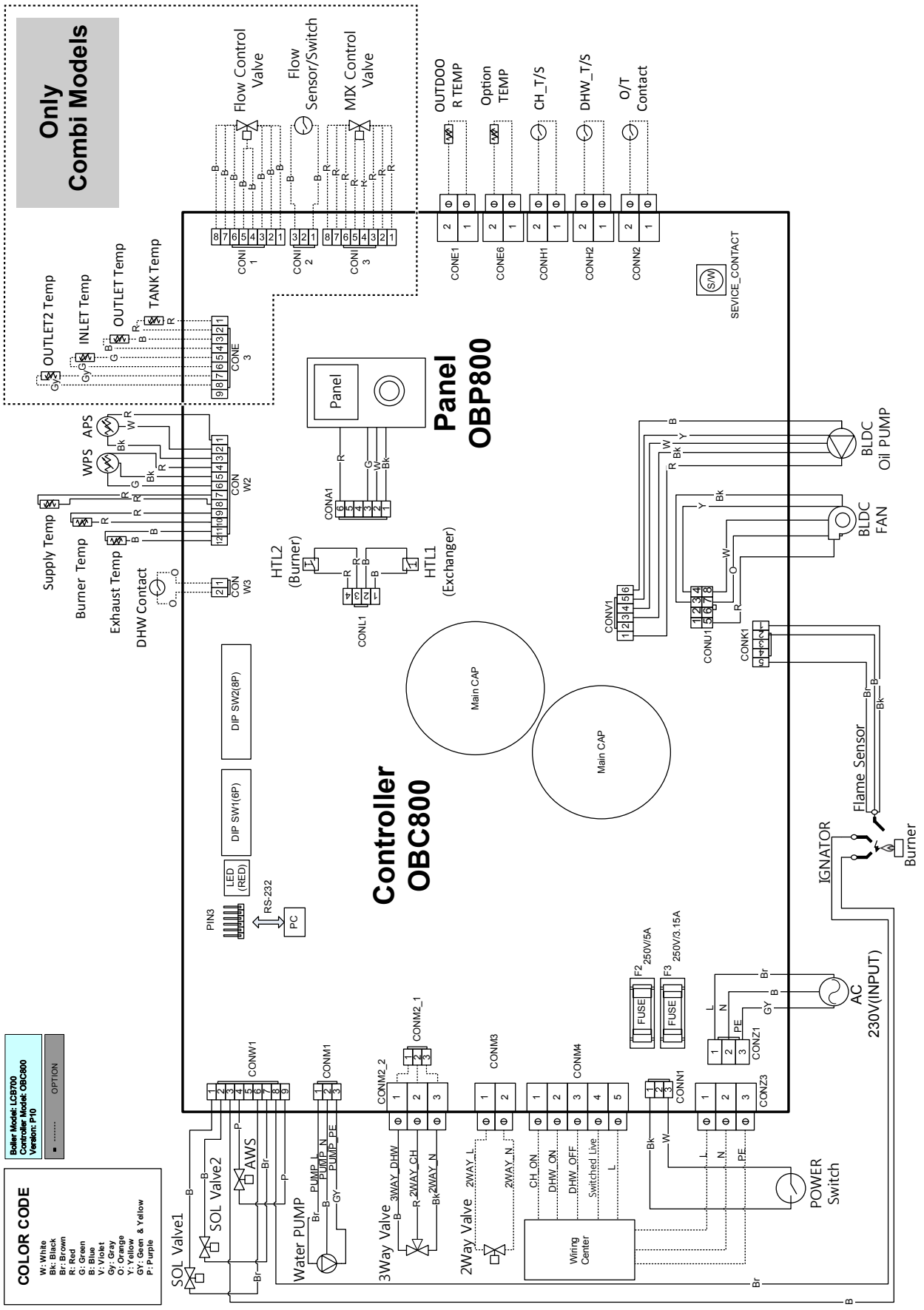
Rotate the Command dial (⭘) to switch between the operation modes. Press the Command dial (⭘) to select an operation mode.

The boiler resumes operation in normal operation mode if no input is detected for 3 hours.

Press the Back button (⮌) to return to the previous screen or menu.

Item	Description
1. Normal (Default)	Set the boiler to run in normal operation mode.
2. Stage 1 (Low)	Set the boiler to run in stage 1 (low) operation mode.
3. Stage 2 (High)	Set the boiler to run in stage 2 (high) operation mode.

4.8 Wiring Diagram



5. Troubleshooting

5.1 Error Self-diagnostic/Action

Classification	Error Code	Description	Reset	Self-diagnostic/Action
Combustion	E001	Overheating of Heat exchanger	Manual	1. An error occurs when the supply water temperature increases more than 1.5°C per second. 2. Operate the circulation pump for more than 3 minutes. 3. Clean the strainer.
	E003	Ignition failure	Manual	An ignition failure error occurs after three consecutive safety blocks. 1. Check if the fuel tank is properly supplying fuel. 2. Check if the oil pump is operating properly. 3. Check if the ignition transformer is operating properly. 4. Clean the UV sensor if the boiler switches off immediately after ignition.
	E004	False flame detection	Auto	An error occurs if a flame is detected before combustion. 1. Check if the UV sensor is operating properly.
	E012	Flame loss	Manual	An error occurs if a flame is lost during combustion. 1. Check if the fuel tank is properly supplying fuel. 2. Check if the oil pump pressure is within the proper operating range. 3. Check the exhaust for any backflow.
	E016	Heat exchanger overheat	Manual	An error occurs when heat exchanger overheats during combustion. 1. Turn the boiler off for a minimum of 30 minutes and restart the boiler. 2. Check that all valves and filters are open and the air release valve is operating properly. 3. Check the external circulation pipe direction for regular type boilers, the pipe should return from the top of the heat exchanger to the bottom of the heat exchanger.
	E030	Abnormal exhaust temperature	Manual	An error occurs when the exhaust thermistor registers at 110°C or more. 1. Turn the boiler off for at least 30 minutes and restart the boiler. 2. Check all valves and filters are open and the air release valve is operating properly. 3. Check the DIP switch settings. 4. Check the turbulence within the heat exchanger tube.
	E031	Combustion chamber cover overheat	Manual	An error occurs when the exhaust thermistor registers at 110°C or more. 1. Turn the boiler off for at least 30 minutes and restart the boiler. 2. Check all valves and filters are open and the air release valve is operating properly. 3. Check the DIP switch settings. 4. Check the turbulence within the heat exchanger tube.
	E046	Abnormal operation: Heat exchanger overheating sensor	Auto	An error occurs in the case of abnormal operation in the heat exchanger high limit stat. 1. Check the heat exchanger high limit stat. 2. Check if the heat exchanger high limit stat is properly connected.
	E047	Abnormal operation: Exhaust thermostat	Manual /Auto	An error occurs in the case of abnormal operation in the exhaust thermistor. 1. Check the exhaust thermistor connection. 2. Check if the exhaust temperature sensor is properly connected. 3. Check the resistance of the sensor (Stop operating and lower the temperature before checking).
	E056	Abnormal operation: Oil pump	Manual	An error occurs in the case of abnormal operation in the oil pump. 1. Clean the oil pump filter. Refer to "8.2 Maintenance Schedules" on page 117. 2. Check if the oil pump is stuck. If there is moisture in the fuel supply, remove moisture from the oil pump. 3. Check the oil pump assembly and connections. 4. Check the oil pump motor is operating properly.

Classification	Error Code	Description	Reset	Self-diagnostic/Action
Air Circulation	E109	Abnormal operation: Fan	Manual	An error occurs in the case of abnormal operation in the fan. 1. Check and clean the intake pipe and hose 2. Check and clean the fan motor. 3. Check for proper voltage from PCB. Replace fan if PCB voltage is normal.
	E110	Exhaust blockage (Condensate blockage)	Manual	An error occurs when exhaust or condensate flue is blocked during combustion. 1. Check the flue for obstructions. 2. Check and clean the intake pipe and hose. 3. Remove flue if possible to verify flue blockage. 4. Check the condensate trap and drain piping for obstruction or blockages.
	E127	Abnormal operation: APS	Auto (Manual)	An error occurs in the case of abnormal operation of the APS before fan operation. 1. Check if the APS connection is properly connected.
	E144	Burner thermistor open or short circuit	Alarm	An error occurs in the case of abnormal operation of the burner thermistor casing. 1. Check the thermistor and wire connections are secure. 2. Check the resistance of the sensor (Stop operating and lower the temperature before checking).
	E157	Abnormal operation: APS Hose	Manual	An error occurs in the case of abnormal operation of the APS. 1. Check if the hose is properly connected and not bent. 2. Check if the hose is connected to the correct piping.
Central Heating Circulation	E205	Heating supply thermistor open or short circuit	Auto	An error occurs in the case of abnormal operation in the DHW supply temperature sensor. 1. Check the thermistor and wire connections are secure. 2. Check the resistance of the sensor (Stop operating and lower the temperature before checking). 3. Check the pump connection
Water Supply	E302	Low water pressure	Manual	An error occurs when low water pressure is detected. 1. Open the water supply valve and add water below 1.0 bar.
	E352	High water pressure	Manual	An error occurs when high water pressure is detected. 1. Check incoming water pressure and any activity at pressure relief valve.
	E353	Abnormal operation: Water pressure sensor	Auto	An error occurs in the case of abnormal operation in the water pressure sensor. 1. Check the water pressure sensor.
DHW Circulation	E407	DHW Outlet thermistor Open or Short Circuit	Alarm	An error occurs in the case of abnormal operation in the DHW Outlet temperature sensor. 1. Check the thermistor and wire connections are secure. 2. Check the resistance of the sensor (Stop operating and lower the temperature before checking). 3. Check the pump connection
	E421	DHW Inlet thermistor Open or Short Circuit	Alarm	An error occurs in the case of abnormal operation in the DHW Inlet temperature sensor. 1. Check the thermistor and wire connections are secure. 2. Check the resistance of the sensor (Stop operating and lower the temperature before checking). 3. Check the pump connection
	E441	DHW Outlet 2 thermistor Open or Short Circuit	Alarm	An error occurs in the case of abnormal operation in the DHW Outlet 2 temperature sensor. 1. Check the thermistor and wire connections are secure. 2. Check the resistance of the sensor (Stop operating and lower the temperature before checking). 3. Check the pump connection

Classification	Error Code	Description	Reset	Self-diagnostic/Action
DHW Circulation	E445	Abnormal operation: Mixing valve	Alarm	An error occurs in the case of abnormal operation in Mixing valve. 1. Check the Mixing valve and wire connections are secure.(Stop operating before checking).
	E480	DHW Tank thermistor Open or Short Circuit	Alarm	An error occurs in the case of abnormal operation in the DHW Tank temperature sensor. 1. Check the thermistor and wire connections are secure. 2. Check the resistance of the sensor (Stop operating and lower the temperature before checking).
Controller (PCB)	E515	Abnormal operation: Relay feedback (PCB)	Manual	An error occurs in the case of abnormal operation in the controller circuits (resistance, TR, etc.). 1. Check the PCB.
	E517	Abnormal operation: DIP switch setting (PCB)	Manual	An error occurs in the case of abnormal DIP switch settings. 1. Check the DIP switch settings on the PCB.
	E594	Abnormal operation: EEPROM (PCB)	Alarm/ Manual	An error occurs in the case of abnormal operation in the controller EEPROM. 1. Check the PCB.
Controller (MCU)	E615	Abnormal operation: Input and memory (MCU)	Manual	An error occurs in the case of abnormal operation in the controller MCU (RAM, ROM, Stack malfunction, etc.). 1. Check the PCB.
Installation	E740	Abnormal operation: Outdoor temperature sensor	Auto	An error occurs in the case of abnormal operation of the outdoor temperature sensor. 1. Ensure that the outdoor reset curve is configured properly. 2. Check the outdoor temperature sensor wiring 2 connection.
	E782	Abnormal operation: Main panel communication	Auto	An error occurs in the case of an abnormal connection between the front panel and the main controller. 1. Check the connection between the front panel and the main controller.
	E783	Abnormal operation: OpenTherm remote control	Auto	An error occurs in the case of an OpenTherm remote control communication error. 1. Check the OpenTherm remote control connection.
	E787	Abnormal operation: Reset device	Manual/ Power Reset	An error occurs in the case of a reset signal malfunction. 1. Turn the main controller off and restart it.

If any of the above solutions do not resolve the problem with the Boiler, contact Navien's Technical department.

There will be error codes displayed on the front panel and recorded on the PCB board (within the unit) of any problems or failures that occur with the Boiler.

IMPORTANT

To reset the Boiler, either press the [Reset] button on the front panel or disconnect, then reconnect electrical power to the boiler.

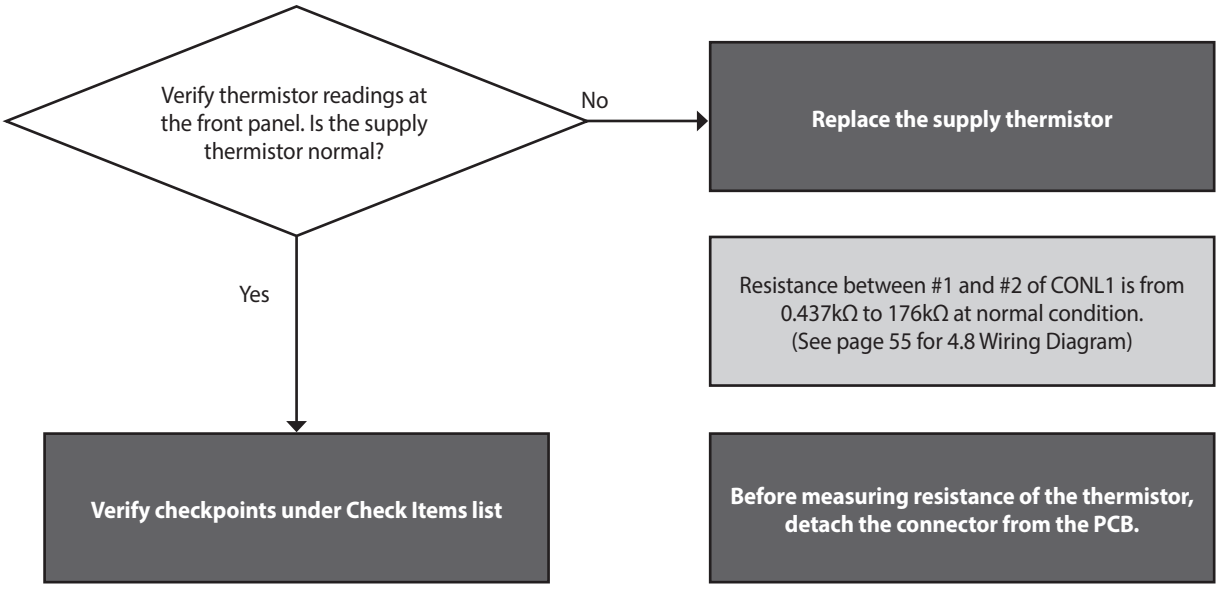
5.2 Error Conditions and Check Items

5.2.1 001 Error

Error occurrence conditions and check items

Error	Description
E001 Overheating of Heat Exchanger	1. Error is detected after post-purge when the water supply temperature sensor and combustion is normal. 2. If the cumulative temperature exceeds 1.5 degrees per second, (supply temperature - 102°C) combustion will stop and "E001" will be displayed on the front panel. 3. If an E001 error occurs once or twice, the boiler will do a safety shutdown. After three (3) times, the boiler will enter lock-out mode.
Check items	1. Check the circulation pump (external) operating status. Run Pump Test Mode. 2. Check if the strainer of the heating piping is clogged. 3. Check if the main heat exchanger is clogged. 4. Check the heating inlet/outlet valve and distribution piping for any obstructions. 5. Check the PCB DIP S/W capacity setting. 6. Check if the PCB is operating properly.

Scenario



Check method

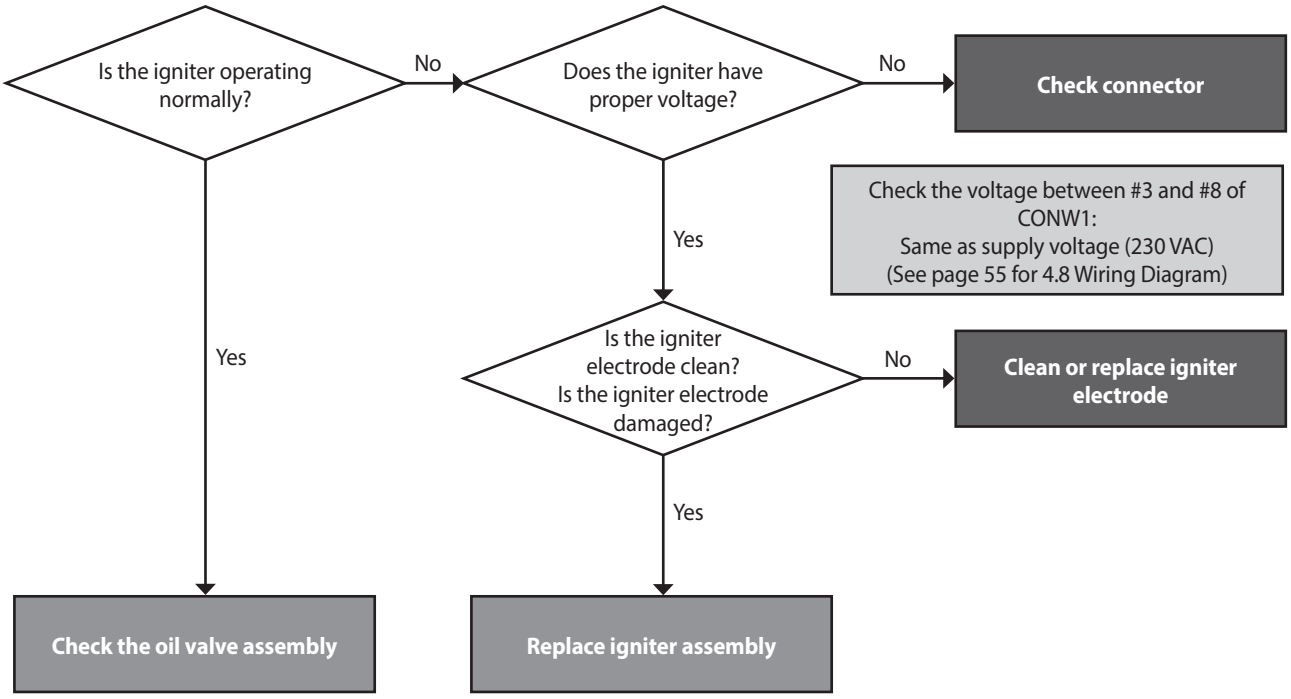
Fault	Possible Causes	Check method
Abnormal circulation	Defective circulation pump(external)	If the unit is in error condition, the circulation pump and fan run continuously. In the event the unit is not in error condition, enter Test mode for the connection.
	The heating strainer is clogged	1. Check if the strainer is clogged with debris 2. Check the cause of debris if the strainer is clogged (Aluminium distributor oxidized steel, etc.)
	The main heat exchanger is clogged.	Separate the inlet/outlet pipe from the main heat exchanger, and blow air through the heat exchanger to check if the pipe is clogged.
	Valve closed	Check heating inlet/outlet valve and heating manifold piping. At least one valve on the heating manifold must always be open.
Other potential issues	Model setting	Sudden increase of temperature due to PCB DIP S/W model setting error.
	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.

5.2.2 003 Error

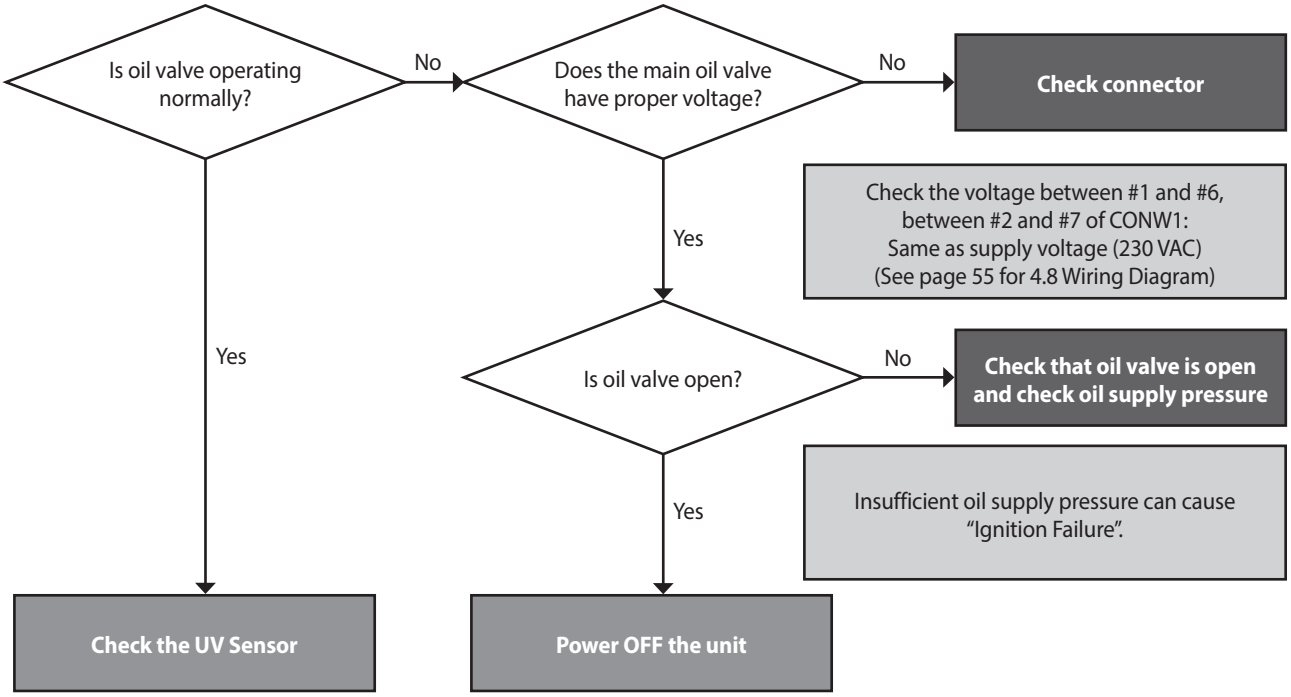
Error occurrence conditions and check items

Error	Description
E003 Ignition failure	If the supply of fuel and ignition are turned off by the safety shutdown function, repeat the restart (operation according to pre-purge, pre-ignition, fuel supply, and flame detection) and count the number of safety shutdowns to cause three consecutive ignition errors (during a combustion shutdown the safety shutdown number will reset).
Check items	1. Check if the gas supply valve is open and use a manometer to verify proper supply pressure. 2. Check the electrode gap, electricity discharge, or deformation of the flame rod. 3. Check the operation of the ignition transformer (ignition state, input power: AC 230 V) 4. Check the operation of the Oil control valve (AC 230 V, coil short circuit, solenoid valve). 5. Check the flame rod, wiring and grounding. 6. Check if the air pressure hose is broken or clogged. 7. Check if the air pressure sensor works properly. 8. Check the PCB DIP switch settings. 9. Check the flue and air supply for any collected water (for vertical vent installations). 10. If the issues continue despite checking the items above, replace the PCB.

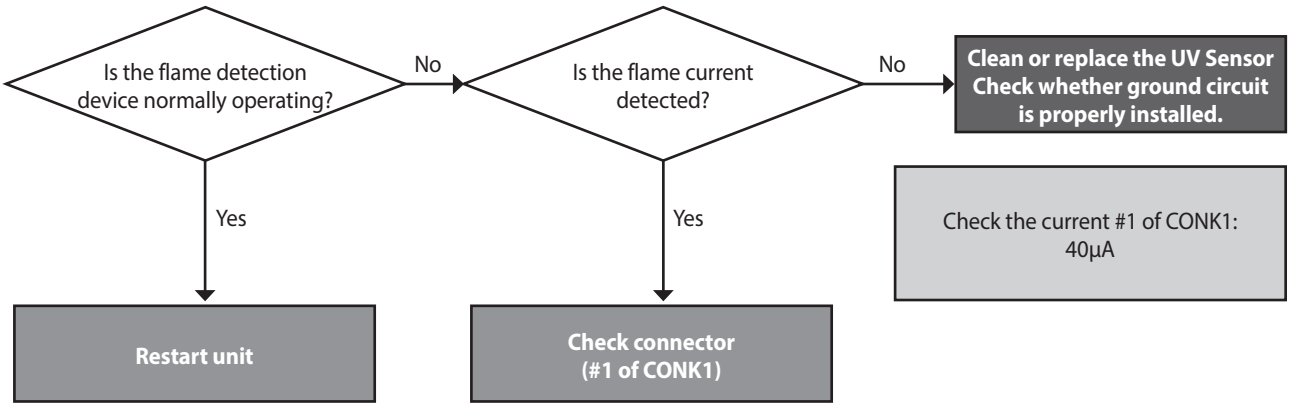
Scenario1



Scenario2



Scenario3



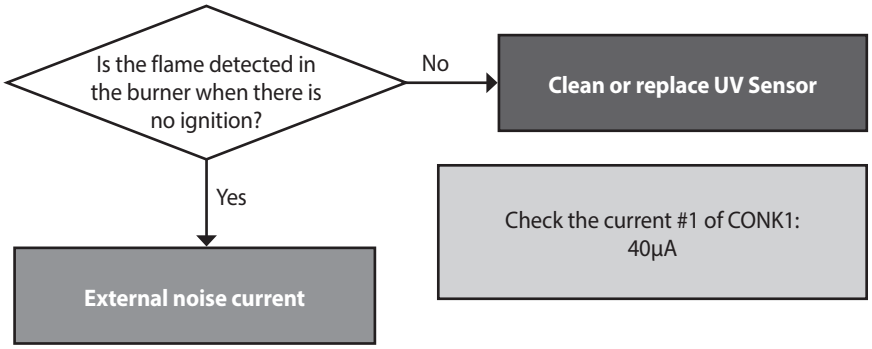
Check method

Fault	Possible Causes	Check method
Ignition failure	Oil supply error	1. Check if the oil tank is filled or oil valve is open. 2. Check if the oil pump is properly operating. 3. Check the oil nozzle for blockage.
	Defective electrode gap and shape	1. Check that the electrode gap is within 3 ± 0.5 mm. 2. Check the electrodes for debris and contamination.
	No spark from electrode	1. Check for cracks in the electrode insulation. 2. Check the ignition transformer input and output connection. 3. Check if the ignition transformer is operating properly.
Repeated ignition-out	Flame sensing error	1. Check the location of the flame, if there is any deformation or foreign substance, repair or replace the part. 2. Check the UV Sensor wire for proper connection and/or damage. 3. Use a multi-meter to measure the flame sensing current (normally over 40 μA).
	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.

5.2.3 004 Error

Error occurrence conditions and check items

Error	Description
E004 False-flame detection	1. If a flame signal is detected continuously for 3 seconds before combustion, a false-flame error (E004: automatically cleared) will be displayed on the front panel. 2. During standby (state 20), false-flame errors are not detected, • The boiler will stop and display a false flame error (E004: automatically cleared) in the following states: 21 (3-Way valve change), 30 (No air check), 32 (Fan start-up), 40 (Pre-purge), 42 (Oil pump control) • When flame is detected in state 41 (Inter-purge) and 43 (Pre-Ignition) status will change to state 60 (post-purge) and operate according to false-flame detection error. 3. The current state is maintained when a false-flame is detected once (100 msec) during the main loop and will shift to a false-flame error if detected for more than 3 seconds.
Check items	1. Check defective on the main oil valve. 2. Check if proper spark is discharged from the electrode. 3. Check if oil is supplied within the proper pressure range. 4. Check the PCB and replace if defective.



Check method

Fault	Possible Causes	Check method
Error before/after combustion	Discharge of electricity from electrode	Spark discharges from electrode to flame rod at ignition. Replace or correct location of flame detecting UV Sensor.
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.

5.2.4 012 Error

Error occurrence conditions and check items

Error	Description
E012 Flame loss	If a flame signal is detected when the system is performing post-purge, the fuel supply will be stopped and state 74 (post-purge), fuel supply, and flame detection will repeat.
Check items	1. Check if the oil is properly supplied to the boiler. 2. Check for exhaust gas backflow. 3. Check if the controller is properly operating.

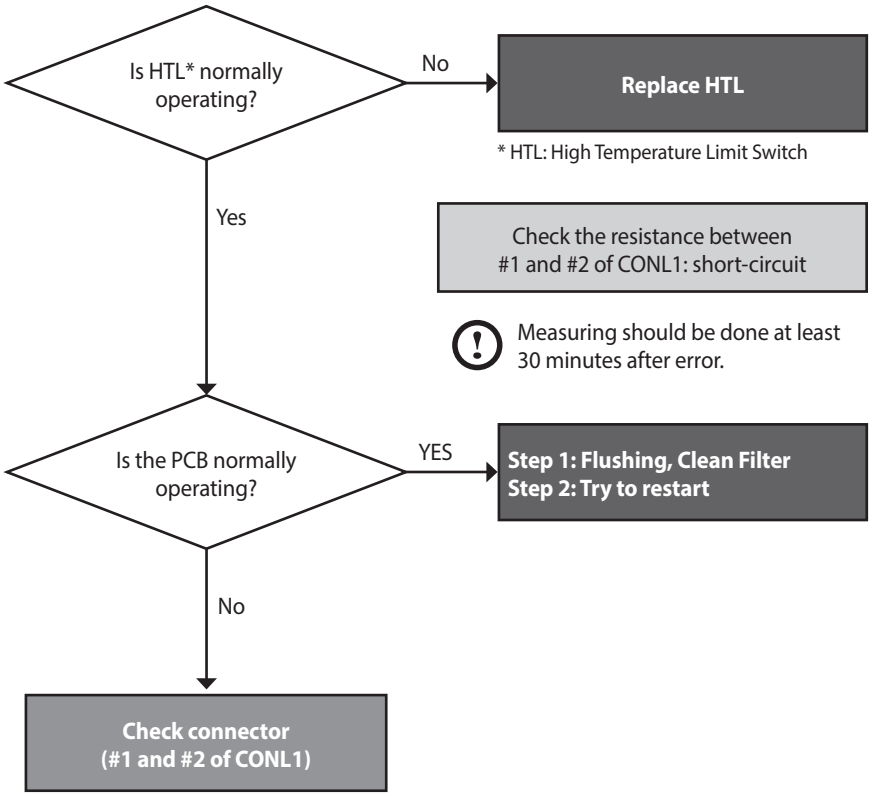
Check method

Fault	Possible Causes	Check method
Flame loss and noise occurs after ignition	Oil supply error	1. Check if the oil tank is filled or oil valve is open. 2. Check if the oil pump is properly operating. 3. Check the oil nozzle for blockage.
	Exhaust gas backflow	1. Check the exhaust flue for CO_2 and O_2. • O_2: If the detected level is under 20.8%, there is exhaust backflow. • CO_2: If the detected level is over 0%, there is exhaust backflow.
	PCB DIP switch setting error	Check the PCB DIP switch settings (See section 4.6 Setting the DIP Switches).
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.

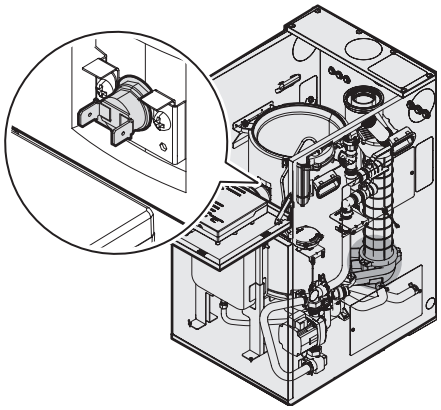
5.2.5 016 Error

Error occurrence conditions and check items

Error	Description
E016 High limit stat overheated	• For 15 seconds from the start of combustion, the heat exchanger high limit stat open state is not determined, even if the heat exchanger is overheated and the high limit stat opens. At this time, the high limit stat opens to turn off the SOL valve power and perform the same operation as flame loss during combustion. • If the heat exchanger high limit stat opens after overheating during combustion (15 seconds after combustion start) and flame loss occurs, and the high limit stat is open for more than 0.5 seconds during the 1 second flame loss detection, a heat exchanger overheat error message (E016: manually cleared) will be displayed on the front panel. If the heat exchanger overheat is detected, when combustion is stopped, no error message will be displayed and combustion shutdown is maintained until the heat exchanger overheat signal disappears. At this time, if the supplied water temperature is below 60℃, a heat exchanger overheat sensor error (E046: automatically cleared) will be displayed on the front panel.
Check items	



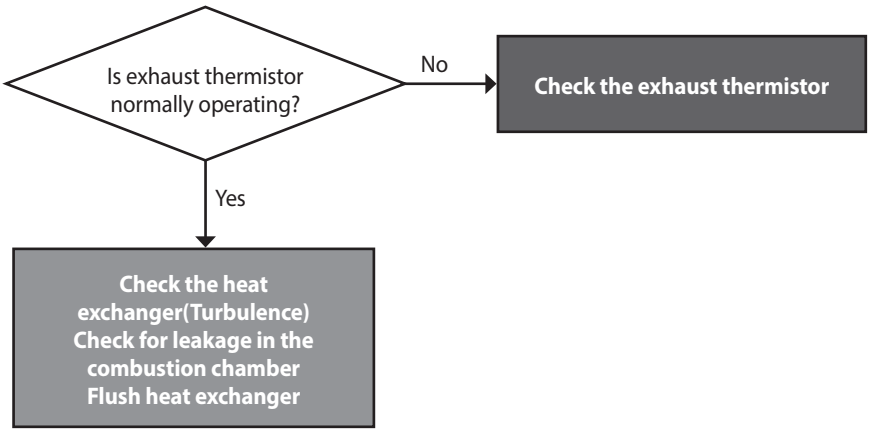
Check method

Fault	Possible Causes	Check method
Defective safety device	Defective high limit stat	Check if the contact point of the high limit stat is defective. • Use a multi-meter to see if the resistance is normal (0.3Ω) or abnormal (∞). 
Other trouble	Capacity setting	A PCB DIP S/W capacity setting error can suddenly increase the space heating water temperature (see section 4.6 Setting the DIP Switches).
	Heat exchanger assembly overheated	The surface temperature rises due to heavy scale deposits in the heat exchanger assembly. • Flush the heat exchanger assembly.
	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.

5.2.6 030 Error

Error occurrence conditions and check items

Error	Description
E030 Exhaust gas temperature error	• If the exhaust temperature sensor detects a temperature of over 110℃ for more than 10 seconds, combustion will stop and the exhaust temperature error message (E030: automatically cleared) will be displayed on the front panel and a post-purge will start. • If the exhaust temperature is below 60℃ during post-purge, the error message will be cleared and combustion will restart. • If exhaust temperature is over 60℃ after post-purge exhaust temperature error message (E030: manually cleared) will be displayed on the front panel. When there is continuous heat demand after exhaust gas temperature is over 110℃ and stops combustion and the exhaust temperature is under 60℃ during post-purge and combustion restarts 3 times, the exhaust gas temperature error message (E030: manually cleared) will be displayed. (If heat demand is gone, the detection count is reset.)
Check items	1. Check if the high limit stat operates normally. 2. Check if the PCB works properly.



Check method

Fault	Possible Causes	Check method
Heat exchanger overheated	Damaged or clogged heat exchanger	1. The error occurs due to high exhaust gas temperature caused by a damaged or clogged heat exchanger. 2. Flush the heat exchanger to remove scale deposits. 3. Replace the heat exchanger if it is damaged or cannot be unclogged.
	Turbulence removed from inner heat exchanger assembly	Check the turbulence in the heat exchanger fire tube. • Check the tube for any misplaced objects or debris and make sure all parts are properly assembled.
Defective part	Defective temperature sensor	Defective contact point of the exhaust gas high limit stat 110°C Max • Check connection of the high limit stat. • If the resistance is abnormal, replace the temperature sensor. • Check the output temperature displayed on the PCB.
	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.

5.2.7 031 Error

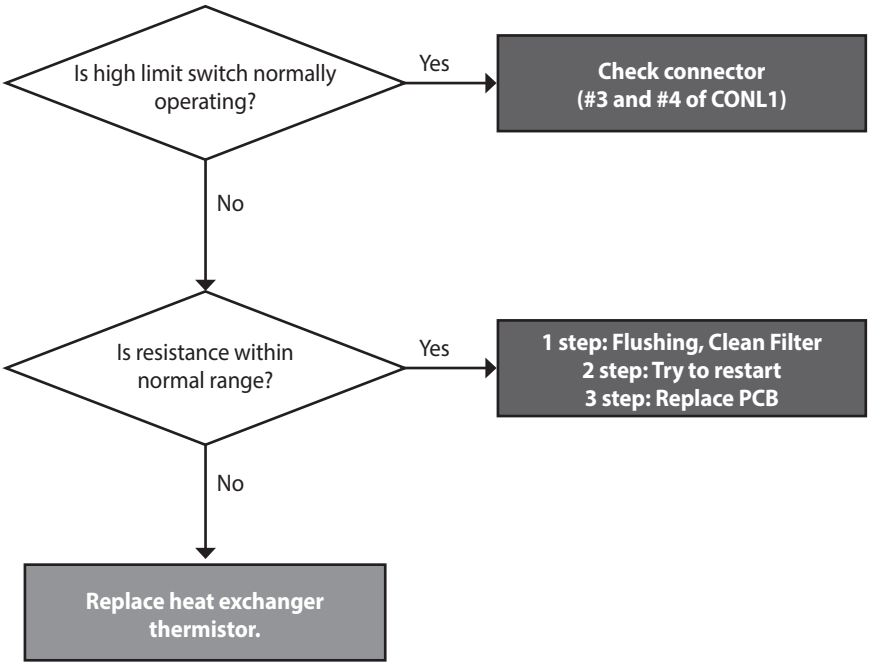
Error occurrence conditions and check items

Error	Description
E031 Burner high limit stat overheated	1. If the burner high limit stat is open for more than 1 second more than once, a burner overheat error (031: manually cleared) will be displayed on the front panel. • If an error occurs during combustion, the boiler performs post-purge 1, post-purge 2, and lock-out (SOL valve, ignition transformer lock.) • If an error occurs during non-combustion, the boiler performs lock-out (SOL valve, ignition transformer lock.) 2. When manually reset with no burner overheat sensor signal, the error message is cleared.
Check items	1. Turn OFF the system for at least 30 minutes then restart. 2. Check the packing between the combustion chamber cover and burner. 3. Check the combustion chamber cover and the inner insulation for damage.

5.2.8 046 Error

Error occurrence conditions and check items

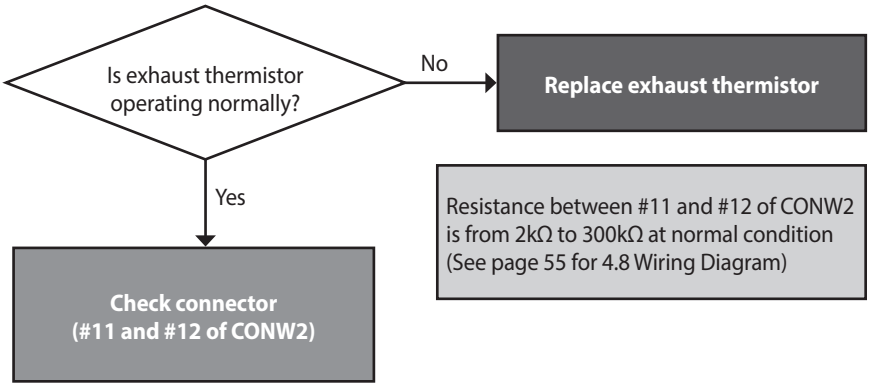
Error	Description
E046 Abnormal heat exchanger overheat sensor	The boiler displays abnormal heat exchanger overheat sensor (E046: automatically cleared) and continues safety-shutdown if the heat exchanger is not overheated (16), the supply water temperature is below 60°C in during combustion stop, and heat exchanger overheat is detected for more than 10 seconds.



5.2.9 047 Error

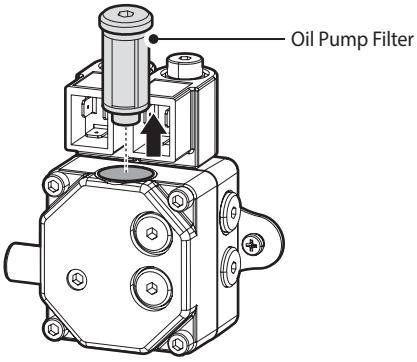
Error occurrence conditions and check items

Error	Description
E047 Exhaust thermostat error	1. If the exhaust gas temperature sensor 10-bit AD value is over 1020 (resistance value approx. 894.4K Ω) for more than 3 seconds after performing post-purge 1, stop and restart combustion. If this action is performed three times consecutively, the exhaust gas sensor error (E047: manually cleared) will be displayed on the front panel. 2. If the exhaust gas temperature sensors 10-bit AD value is below 50 for more than 3 seconds the exhaust gas sensor error (047: manually cleared) will be displayed on the front panel. (The AD value must be checked regardless of combustion status, and the resistance for 50 AD is approx. 0.155K Ω)



5.2.10 056 Error

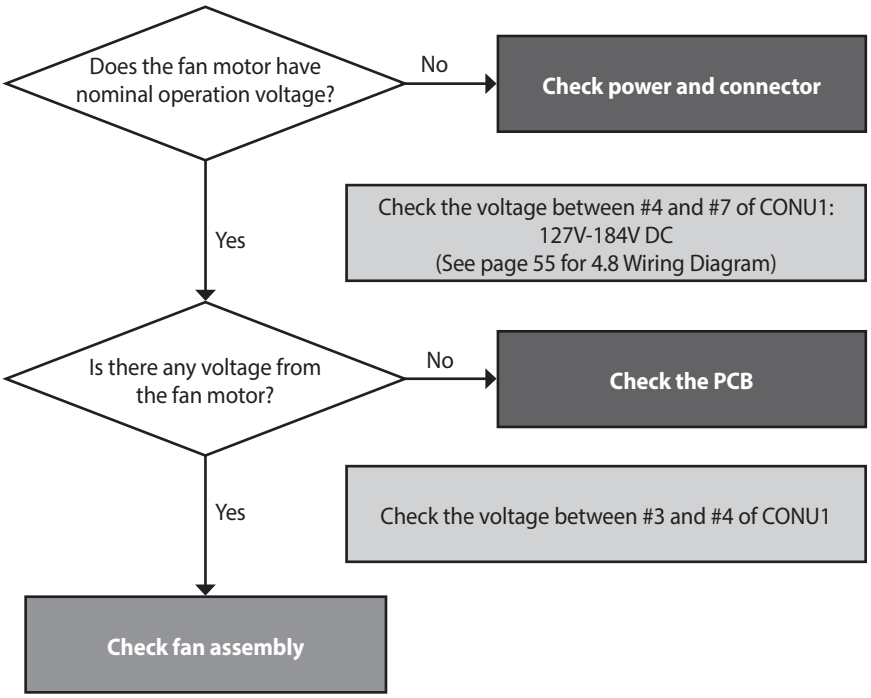
Error occurrence conditions and check items

Error	Description
E056 Oil pump error	An error occurs during an abnormal oil pump RPM action.
Check items	1. Clean the oil pump filter. Refer to "8.2 Maintenance Schedules" on page 117.  2. Check if the oil pump is stuck. If there is moisture in the fuel supply remove moisture from the oil pump. 3. Check the oil pump couplings and connections. 4. Check the oil pump motor.

5.2.11 109 Error

Error occurrence conditions and check items

Error	Description
E109 Fan motor RPM error	1. If 0 RPM is detected during fan action, stop combustion and perform the abnormal fan check procedure. The abnormal fan check procedure entails turning the fan off and performing fan RPM control for 10 seconds. 2. If over 0 RPM is detected during abnormal fan check procedure and fan RPM control fan check procedure ends, and normal operation starts. 3. If 0 RPM is detected after the abnormal fan check procedure, the abnormal fan error message (E109: manually cleared) will be displayed and the boiler will go into lock-out mode.
Check items	1. Check if the fan motor works normally using the component test mode. 2. Check the power supply to the fan (Black + Red, approx. DC 127–184 V). 3. If RPM is significantly low while the fan works and the power supply is normal, replace the fan motor. 4. If the fan connector is wet due to any reason including leakage, take corrective action by powering the unit OFF, then drying the components completely before continuing operation. 5. Check for loose connection of white connector that attaches the fan motor to the PCB.



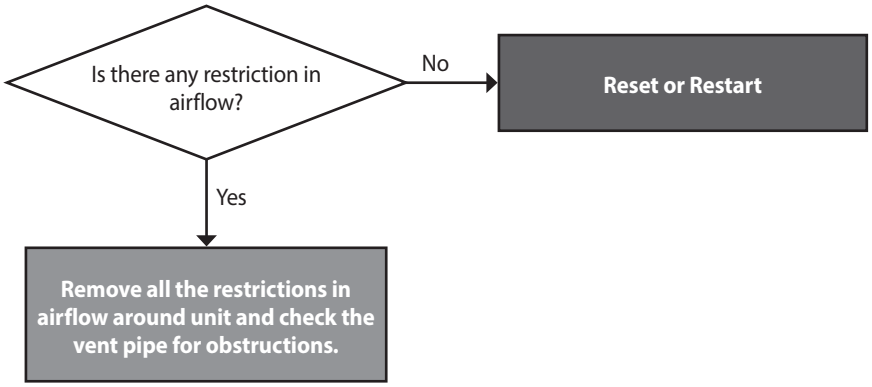
Check method

Fault	Possible Causes	Check method
Fan action error	No fan operation	1. Check the power supply to the blower. • Black + Red, approx. DC 127–184 V 2. Replace the PCB if voltages are abnormal. (When replacing the PCB, turn off the unit and then wait for at least 10 seconds before proceeding.) 3. If the issue continues despite the checking the items above, replace the fan motor.
Fan motor RPM error	Defective rotator	1. If RPM is significantly low while the fan is operating and the power supply is normal. Follow the instructions listed below and replace the fan. 1) Off the power switch to the unit and then wait for about 10 seconds until the remaining voltage completely discharges. 2) Disconnect the fan cable and then re-connect it. 3) Plug the power cable and turn on the unit. 4) Fan Auto Adjusting verifies error conditions for error code E109. If an E109 error occurs, enter the Fan Test Mode and verify fan RPM and APS input voltage. 5) If RPM is low or there is a sensor circuit error, replace the fan. Indicates an imminent hazardous situation which, if not avoided, may result in minor or moderate injury. 2. If the issue continues despite checking the items above, replace the PCB.

5.2.12 110 Error

Error occurrence conditions and check items

Error	Description
E110 Exhaust blockage (Condensate blockage)	An error occurs when condensate or exhaust flues are closed or blocked. 1. An error is detected when APS is below standard and fan RPM is over standard for 10 seconds. • If the abnormal exhaust closure error message (E110: manually cleared) is displayed during combustion, combustion will be stopped followed by a post-purge and lock-out. • If the abnormal exhaust closure error message (E110: manually cleared) is displayed when the boiler is not combusting, the boiler will go into lock-out. 2. After a manual reset, the error will be cleared and the boiler will start an exhaust closure check.
Check items	1. Check if the condensation drain line or the drain is clogged. 2. Check the flue and exhaust to verify proper installation and clearances. (Circulation of exhaust gas generates noise.) 3. Check if the air supply/exhaust flue is clogged (rainwater may collect inside from an improperly installed air supply/exhaust pipe). 4. Make sure that venting is sloped downwards towards the unit for proper condensate drainage. 5. Make sure that internal damper is moving freely with no obstructions. 6. Defective air pressure sensor or PCB.



Check method

Fault	Possible Causes	Check method
110E Exhaust blockage	Abnormal flow of intake air supply/exhaust	1. Air supply/exhaust vent for any blockages. 2. Blocked condensate drain 3. If the air pressure sensor hose is broken or clogged. 4. Replace the old PCB with the latest version.
Condensate drain error	Condensate drain error	Exhaust air is blocked due to condensate drain error. • Check if the condensate hose or the siphon is frozen. • Check if the condensate hose is kinked. • Remove bottom of trap and verify it is not blocked.
Defective air supply/ exhaust flue	Deformed or clogged flue	1. Check the exterior of the flue for damage and obstructions. 2. Check if rainwater is collected due to vertical installation of the air intake pipe.
	Exhaust gas flows in through the supply pipe	If the exhaust gas enters into the air supply pipe, abnormal combustion may cause E110. • Check the installation of the flue.

5.2.13 127 Error

Error occurrence conditions and check items

<table>
<tr><th>Error</th><th>Description</th></tr>
<tr><td>E127
Abnormal operation: APS</td><td>Abnormal APS operation (E127: automatically cleared) detects open circuits, short circuits, abnormal APS operation before pre-purge or fan operation and go into safety-shutdown or lock-out.

1. Safety-shutdown activation conditions
• APS abnormal open: APS AD value is below 3 for more than 3 seconds.
• APS abnormal short: APS AD value is over 240 for more than 3 seconds.
• APS abnormal default value: APS AD value is over 60 for more than 3 seconds and the fan stopped for more than 30 seconds with an RPM of 0.

2. Lock-out activation conditions
• APS unresponsive.

If the conditions match [During Pre-purge APS_AD value < Before Pre-purge APS_AD value + 3] restart pre-purge action is over 10 with no APS change.

<table><tr><th>Status</th><th>APS value update before pre-purge conditions</th></tr><tr><td>Activation after error cleared</td><td>10 seconds after fan output if off, APS values are updated. (combustion starts once APS values is updated before pre-purge)</td></tr><tr><td>Normal activation</td><td>10 seconds after fan output if off, APS values are updated.</td></tr></table>
APS values are not updated when an abnormal exhaust temperature error (automatically cleared) is cleared.</td></tr>
</table>

5.2.14 144 Error

Error occurrence conditions and check items

Error	Description
E144 Burner thermistor open or short circuit	1. If the burner thermistor 10-bit AD value is below 50 for more than 3 seconds or over 1011 for 3 seconds, an abnormal burner thermistor error (E144: alarm) will be displayed. 2. If the burner thermistor 10-bit AD value is between 50 and 1011 for more than 3 seconds, the error will be cleared.

5.2.15 157 Error

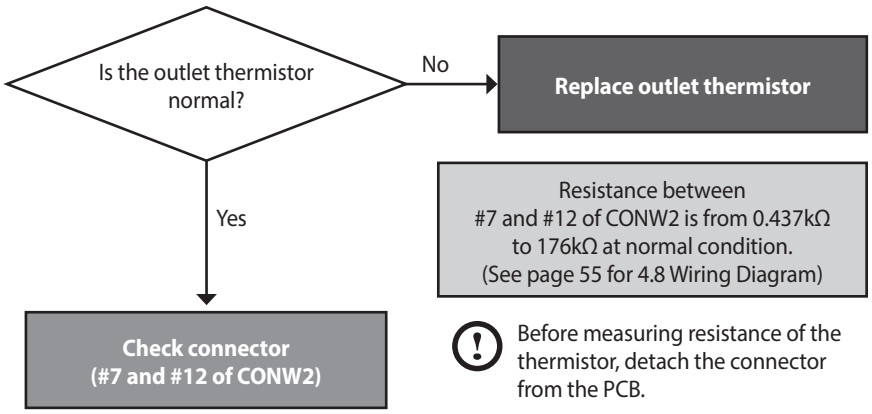
Error occurrence conditions and check items

Error	Description
E157 Abnormal operation: APS Hose	An error occurs when the APS fails to light the flame when controlling APS for 25 seconds over 10 consecutive times.

5.2.16 205 Error

Error occurrence conditions and check items

Error	Description
E205 Heat exchanger output temperature sensor open	• If DHW temperature sensor's 10-bit AD value is below 50 (approx. 0.24V) for more than 3 seconds continuously. • If DHW temperature sensor's 10-bit AD values is over 1012 (approx. 4.94V) for more than 3 seconds continuously.
Check items	1. Check if the heat exchanger output temperature sensor connector is wet due to any reason, including leakage. 2. Replace the defected heat exchanger output temperature sensor. 3. Check circulation pump (external type) operating status and for proper flow through the space heating line. 4. Check the voltage on the PCB to verify proper power to the pump. If there is no voltage, replace PCB. Otherwise, bleed out air from the system before resetting the unit. If issue persists, replace the pump.



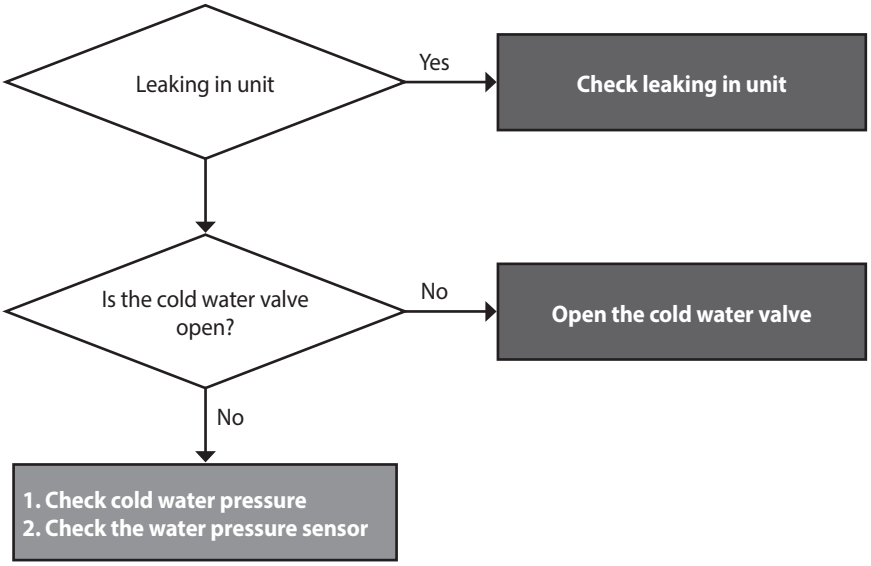
Check method

Fault	Possible Causes	Check method
Defective sensor	Defective temperature sensor connector	Check if the temperature sensor is open and if the connector is connected properly.
	Temperature sensor	Check the resistance of the temperature sensor. (Defective if it is 30kΩ or higher) • Replace the temperature sensor if the resistance value is abnormal. • Check the temperature displayed on the front panel.
Possible Issues	Defective circulation pump(external)	Check power supply to the circulation pump
	Defective PCB	If the issues continue despite checking the items above, replace the PCB.

5.2.17 302 Error

Error conditions and Check Items

<table>
<tr><th>Error</th><th>Description</th></tr>
<tr><td>E302
Low water pressure</td><td>If the automatic water pressure sensor detects that the water pressure is lower than [the standard water pressure] for more than three seconds consecutively, the system determines that there is no water in the boiler and piping and an error message of low water pressure (“302,” manually cleared) is displayed.
However, if a malfunction occurs when the water pressure sensor is in the Open or Short status, the low water pressure error will not be determined.
The standard water pressure over the low water pressure can be set on the panel, and the setting method is shown as below.
<table>
<tr><th>Parameter Setting</th><th>Setting range</th><th>Default</th></tr>
<tr><td>Low Pressure</td><td>0.1 bar – 1.2 bar</td><td>0.4 bar</td></tr>
</table>
</td></tr>
<tr><td>Check items</td><td>1. Check if water leaks from the heating pipe.
2. Check if the water supplied pipe open.
3. Check the water pressure sensor.</td></tr>
</table>



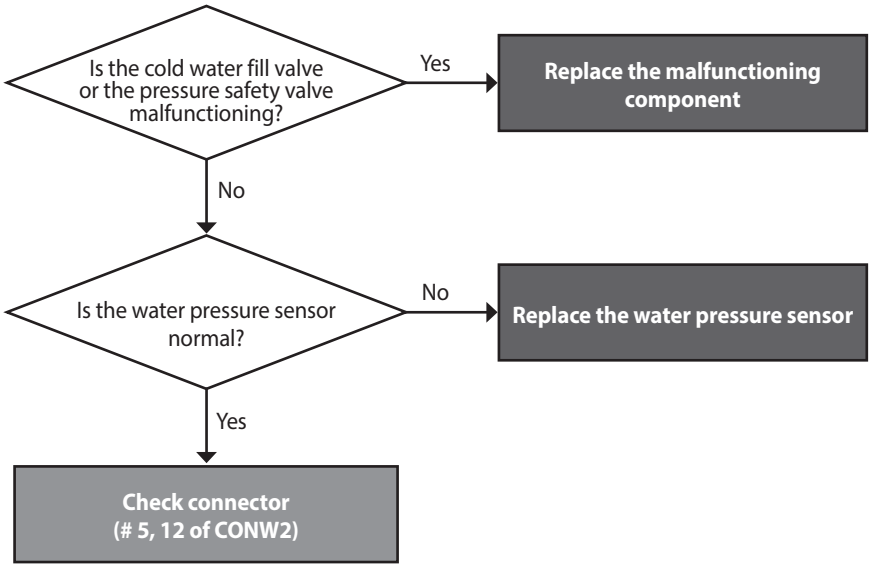
Check method

- If the error occurs during combustion, stop the combustion and perform post-purge 1 and switch to Lock-out.
- If the error occurs while the combustion is stopped, keep the combustion stopped and switch to Lock-out.
- Keep all pumps (the boiler, zone pumps) stopped (other than when running Pump Test Mode).
- However, when setting the zone valve system, ensure that all pumps (the boiler, system, hot water) and the zone valves are stopped (other than when running Pump Test Mode).
- Error releasing condition: The error is cleared when the water pressure has been detected as higher than [the standard water pressure] consecutively for more than three seconds and manual reset is performed. However, in the case of water pressure malfunctions, the error is cleared when manual reset is performed regardless of the detected water pressure.

5.2.18 352 Error

Error conditions and Check Items

Error	Description
E352 High water pressure	1. If the electronic water pressure detector detects high water pressure (over 3.9 bar) for more than 3 seconds, the boiler will stop and the high water pressure detected message (352/3520 - Service code, automatically cleared) will be displayed. 2. In case the electronic water pressure detector opens or short circuits, the high water pressure error will be cleared and water pressure will be properly detected.
Check items	1. Check if the cold water pipe input water pressure sensor is wet due to any reason, including leakage. 2. Check the controller.



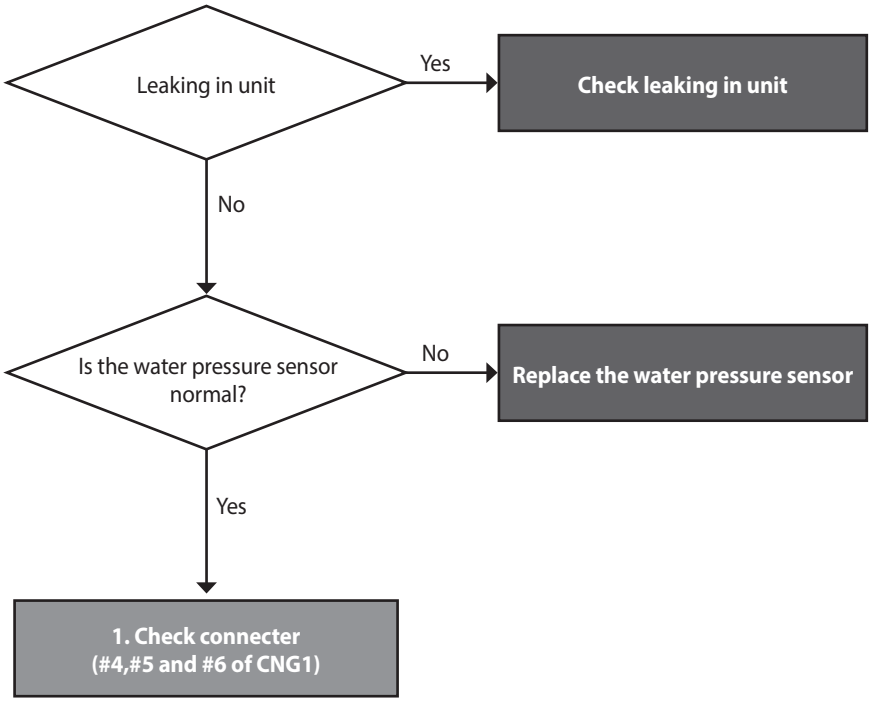
Check method

- If the error occurs during combustion, stop the combustion and perform post-purge 1 and switch to Safety Shut-down
- If the error occurs while the combustion is stopped, keep the combustion stopped and switch to Safety Shut-down

5.2.19 353 Error

Error conditions and Check Items

Error	Description
E353 Abnormal water pressure sensor	If an error (under 0.3V or over 2.8V) in the water pressure sensor is detected continuously for 3 seconds, The system displays the error message E353 on the front panel. If this occurs, the boiler initiates shutdown.
Check items	1. Check if the cold water pipe input water pressure sensor is wet due to any reason, including leakage. 2. Replace the water pressure sensor. 3. Check the controller.



Check method

Fault	Possible Causes	Check method
Abnormal water pressure sensor	Defective water pressure sensor	1. Check the sensor is not frozen during the winter. 2. Check the output voltage. (Normal state: 0.3–2.8V) 3. Replace the PCB if power is not supplied.

5.2.20 407 Error

Error occurrence conditions and check items

Error	Description
E407 DHW outlet thermistor open or short circuit	1. If the DHW outlet thermistor 10 bit AD value is lower than 50 for more than 3 seconds, "E407" will be displayed on the front panel. 2. If the DHW outlet thermistor 10 bit AD value is higher than 1012 for more than 3 seconds, "E407" will be displayed on the front panel.
Check items	1. Check if the DHW Outlet temperature sensor connector is wet due to any reason, including leakage. 2. Replace the defected heat exchanger output temperature sensor. 3. Check circulation pump (external type) operating status and for proper flow through the space heating line. 4. Check the voltage on the PCB to verify proper power to the pump. If there is no voltage, replace PCB. Otherwise, bleed out air from the system before resetting the unit. If issue persists, replace the pump.

5.2.21 421 Error

Error occurrence conditions and check items

Error	Description
E421 DHW Inlet thermistor open or short circuit	1. If the DHW inlet thermistor 10 bit AD value is lower than 50 for more than 3 seconds, "E421" will be displayed on the front panel. 2. If the DHW inlet thermistor 10 bit AD value is higher than 1012 for more than 3 seconds, "E421" will be displayed on the front panel.
Check items	1. Check if the DHW Inlet temperature sensor connector is wet due to any reason, including leakage. 2. Replace the defected heat exchanger output temperature sensor. 3. Check circulation pump (external type) operating status and for proper flow through the space heating line. 4. Check the voltage on the PCB to verify proper power to the pump. If there is no voltage, replace PCB. Otherwise, bleed out air from the system before resetting the unit. If issue persists, replace the pump.

5.2.22 441 Error

Error occurrence conditions and check items

Error	Description
E441 DHW outlet 2 thermistor open or short circuit	1. If the DHW outlet 2 thermistor 10 bit AD value is lower than 50 for more than 3 seconds, "E441" will be displayed on the front panel. 2. If the DHW outlet 2 thermistor 10 bit AD value is higher than 1012 for more than 3 seconds, "E441" will be displayed on the front panel.
Check items	1. Check if the DHW Outlet 2 temperature sensor connector is wet due to any reason, including leakage. 2. Replace the defected heat exchanger output temperature sensor. 3. Check circulation pump (external type) operating status and for proper flow through the space heating line. 4. Check the voltage on the PCB to verify proper power to the pump. If there is no voltage, replace PCB. Otherwise, bleed out air from the system before resetting the unit.

5.2.23 445 Error

Error occurrence conditions and check items

Error	Description
E445 Abnormal operation: Mixing valve	1. If the feedback signal is not detected for more than 10 seconds continuously while the mixing valve is fully opened in conformity with the conditions (STEP 0), "E445-1" will be displayed on the front panel. 2. If the feedback signal is detected for more than 1 second continuously while the mixing valve is closed in conformity with the conditions and STEP 500 or higher, "E445-2" will be displayed on the front panel.
Check items	1. Check if the Mixing valve is wet due to any reason, including leakage. 2. Check the thermistor and wire connections are secure. 3. Check the voltage on the PCB to verify proper power to the valve. If there is no voltage, replace PCB. 4. If issue persists, replace the Mixing valve.

5.2.24 480 Error

Error occurrence conditions and check items

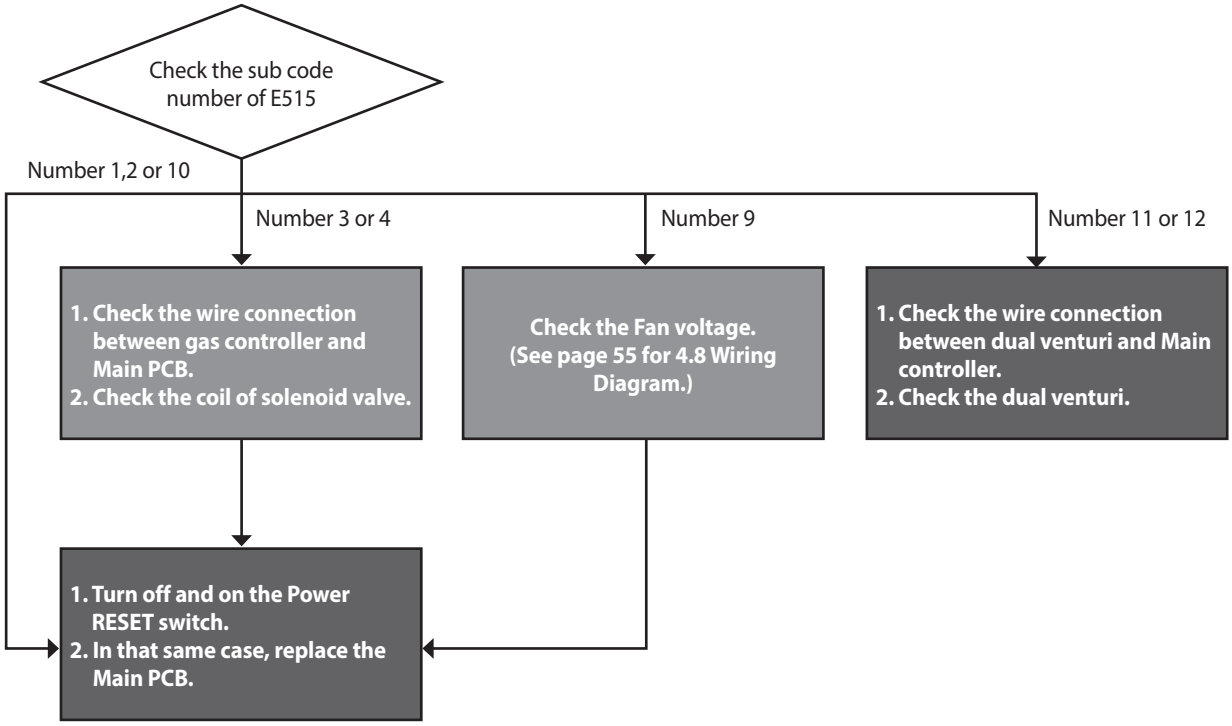
Error	Description
E480 DHW tank thermistor open or short circuit	1. If the DHW tank thermistor 10 bit AD value is lower than 50 for more than 3 seconds, "E480" will be displayed on the front panel. 2. If the DHW tank thermistor 10 bit AD value is higher than 1012 for more than 3 seconds, "E480" will be displayed on the front panel.
Check items	1. Check if the DHW tank temperature sensor connector is wet due to any reason, including leakage. 2. Replace the defected heat exchanger output temperature sensor. 3. Check circulation pump (external type) operating status and for proper flow through the space heating line. 4. Check the voltage on the PCB to verify proper power to the pump. If there is no voltage, replace PCB. Otherwise, bleed out air from the system before resetting the unit. If issue persists, replace the pump.

5.2.25 515 Error

Error conditions and Check Items

Error	Description
E515 Relay feedback (PCB) error	This function determines abnormal operation in the controller and displays the controller error message (E515/E615) in case of an abnormal MCU operation (RAM, ROM, stack malfunctions etc.) or inner circuit malfunctions (resistance, TR etc.). • If MOV1 feedback input detects abnormal operation for more than 1.5 seconds in the MOV1 feedback check state, the MOV1 error (E515: manually cleared) will be displayed. • If MOV2 feedback input detects abnormal operation for more than 1.5 seconds in the MOV2 feedback check state, the MOV2 error (E515: manually cleared) will be displayed. • If there is no EEPROM communication after boiler restart, an EEPROM communication error ("59401") will be displayed, and the boiler will perform normal operation. (Communication errors are automatically cleared after at least one normal EEPROM communication.) • If redundancy is incoherent during non-volatile read error during boiler restart, the EEPROM safety redundancy error (59402) will occur and the boiler goes into lock-out mode. (If manually reset, the error is automatically cleared.) • If EEPROM communication fails during non-volatile read error read during boiler restart, the EEPROM safety communication error (59403) will occur and the boiler goes into lock-out mode. (If manually reset, the error is automatically cleared.) • If abnormal WD-RSS2 operation (E515/02-sub) occurs, the boiler automatically clears 2 times and determines an error on the 3rd time. (Abnormal operation count is cleared after normal operation or error message.) • If abnormal monitoring device operation (515/10-sub) occurs, the boiler automatically clears 2 times and determines an error on the 3rd time. (Abnormal operation count is cleared after normal operation or error message.) • When the monitoring device error (E515/10-sub) is automatically cleared MCU2 circuits

Error	Description
Check items	1. Defective PCB. 2. Check with a multi-meter if the PCB is supplied with the proper voltage (AC 102–132 V). 3. Check the wire connection. 4. Disconnect the ground wire, then check the PCB.



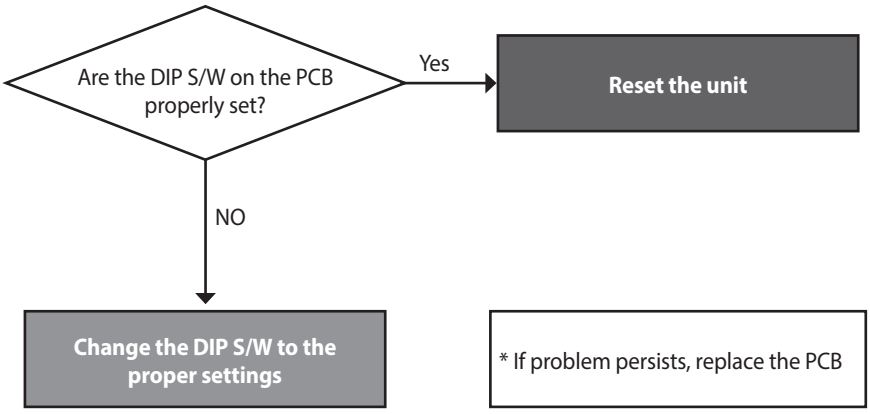
Check method

Fault	Possible Causes	Check method
PCB or Electrical supply	Defective PCB	Replace the PCB if there is an error with the PCB internal circuit.
	Power supply error	Check with a multi-meter if the PCB is supplied with the proper voltage. • Check with a multi-meter if the voltage at the electrical outlet is AC 102–132 V
	Power supply grounding noise	Power supply grounding noise causes malfunction. • Disconnect ground from the grounding terminal inside the unit, and check if the PCB is operating normally.

5.2.26 517 Error

Error conditions and Check Items

Error	Description
E517 DIP switch setting (PCB) error	Check for abnormal DIP switch settings when turning on the boiler. If there is no abnormal DIP switch operation no error message will be displayed.



5.2.27 594 Error

Error conditions and Check Items

Error	Description
E594 EEPROM (PCB) error	If the communication is abnormal in parts of PCB, the system displays E594 on the PCB
Check items	Check the PCB.

Check method

Fault	Possible Causes	Check method
E594 Error	Abnormal communication by PCB	1. Click the Reset button on Front panel. 2. Turn the POWER to the unit OFF then ON. Disconnect then reconnect power if necessary. 3. If the system still displays E594, replace the main PCB.

5.2.28 615 Error

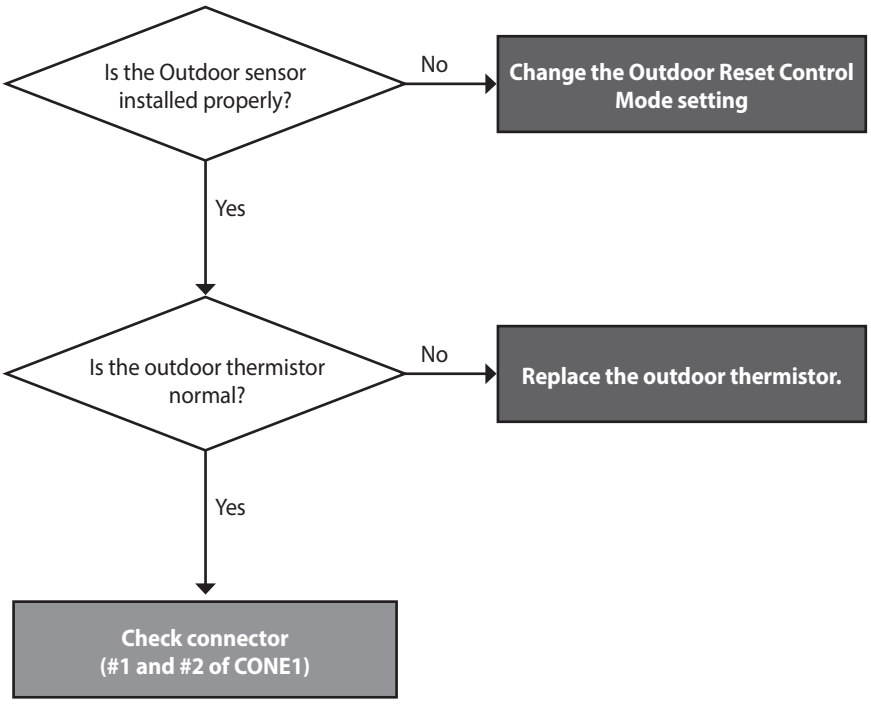
Error occurrence conditions and check items

Error	Description
E615 Input and memory (MCU) error	Abnormal signal input by PCB.
Check items	1. Turn the POWER RESET switch OFF then ON (or unplug and replug the power supply. 2. If the system still displays E615, replace the main PCB.

5.2.29 740 Error

Error conditions and Check Items

Error	Description
E740 Outdoor temperature sensor error	If an error (under 2.2kΩ or over 122.2kΩ) in the outdoor sensor is detected continuously for 3 seconds, The system displays the error message E740 on the front panel. If this occurs, the boiler changes the control mode from Reset Curve Mode to Normal Mode.
Check items	1. Check the parameter setting 2. Check the outdoor sensor.

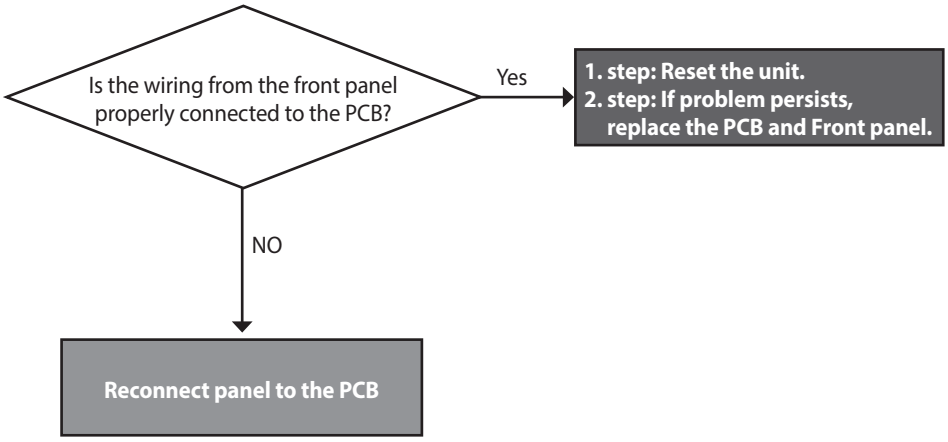


5.2.30 782 Error

Error occurrence conditions and check items

Error	Description
E782 Main panel communication error	If a communications error between the main controller and front panel continues over 60 seconds.

Error occurrence conditions and check items



5.2.31 783 Error

Error occurrence conditions and check items

Error	Description
E783 OpenTherm remote control error	Abnormal room control operation occurs when the main controller does not receive a signal for more than 60 consecutive seconds while the heat demand DIP switch settings are in the OT room control. (6-ON/7-ON/8-OFF) (An error occurs as both open circuits and short circuits)

5.2.32 787 Error

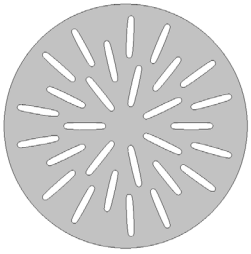
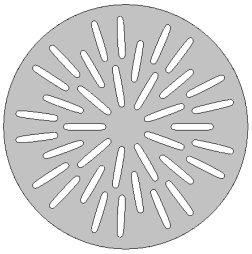
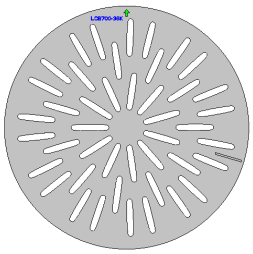
Error occurrence conditions and check items

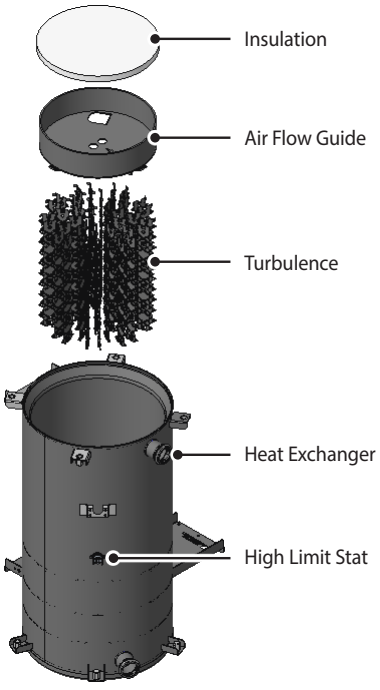
Error	Description
E787 Reset device error	Error 787-2 occurs when reset signal is input over 6 consecutive times within 15 minutes of first reset signal. (reset signal input in 5 seconds of previous reset signal are ignored and not counted.)

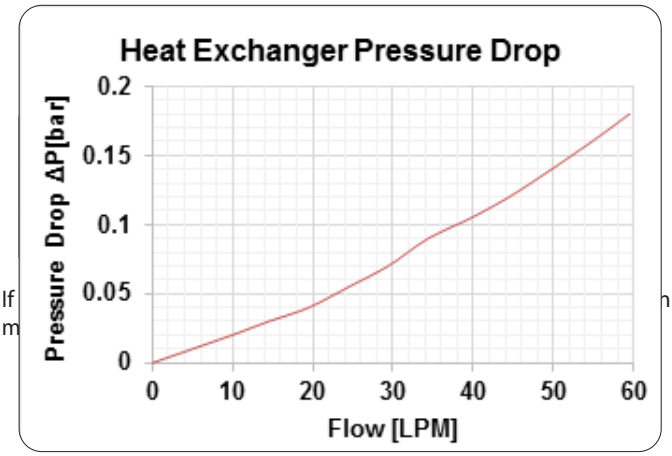
6. Key Components Description

6.1 Heat Exchanger Assembly

Item	Description
Heat exchanger	Stainless condensing single body heat exchanger
Maximum operation pressure	3.0bar
Type	Fire tube type

Classification	21kW	28kW	36kW
Size	Φ270 × 517H	Φ270 × 517H	Φ300 × 517H
Water Capacity	14.0ℓ	13.5ℓ	16.4ℓ
Tube Plate			
Fire Tube	28ea	36ea	44ea
High limit stat	PTS-12N/Off 95℃, On 80℃/Resistance range: < 1.0 Ω		





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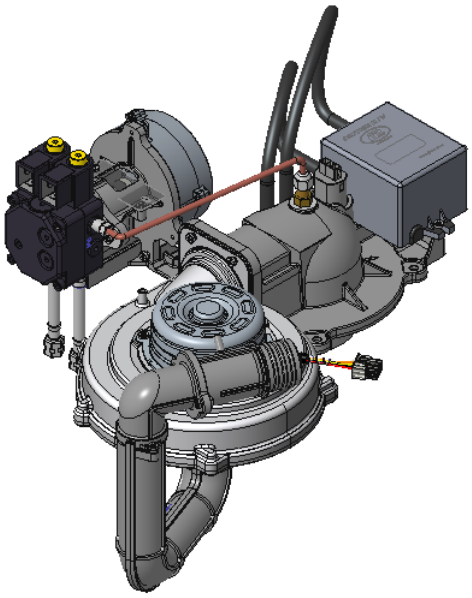
6.2 Burner Assembly

Item	Description
Burner	Blue Flame Oil Burner
Combustion type	Downward reverse combustion type
Fuel type	Kerosene, Light Oil
Control	2-Stage (High/Low)

Fuel usage		21kW		28kW		36kW	
Kerosene	Oil Nozzle	0.55G 80° ES		0.75G 80° ES		1.0G 80° ES	
	Low/High	Low	High	Low	High	Low	High
	Oil Pressure	6.5 bar	11.5 bar	6.5 bar	9.5 bar	6.5 bar	10 bar
Light Oil	Oil Nozzle	0.45G 80° S		0.55G 80° S		0.65G 80° S	
	Oil Pressure	9.5 bar	13.5 bar	9.5 bar	14 bar	9.5 bar	14 bar

<Assembly>



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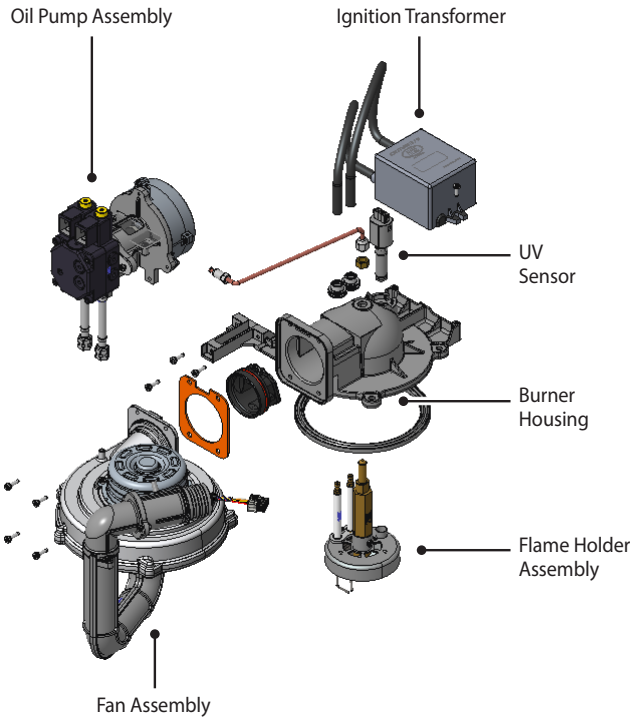
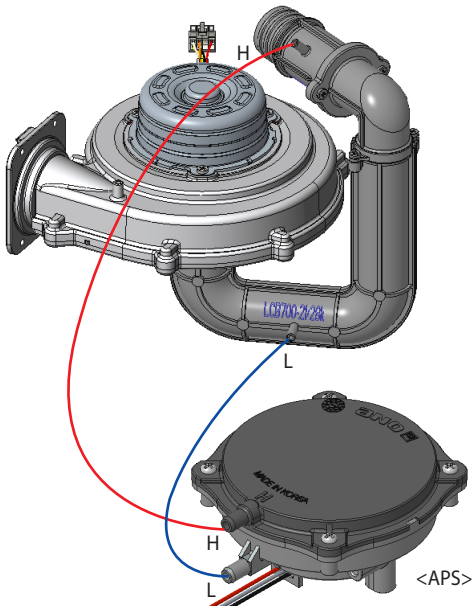


6.2.1 Burner Assembly

Item	Description
Fan Motor	3-Phase DC brushless Motor
Fan	Turbo Fan

		21kW	28kW	36kW
Fan		LCB700 21/28K		LCB700 36K
Intake Pipe	1	Φ30		Φ37
	2	Φ30		Φ37
	3	Φ34		Φ43
	Orifice	Φ21	Φ30	Φ32
APS		KDN-APS-02-D(4V, 30㎜H₂O)		

<Assembly>



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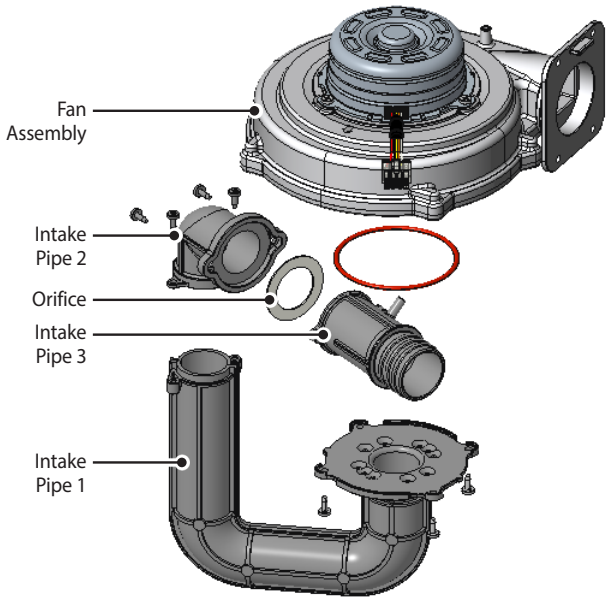
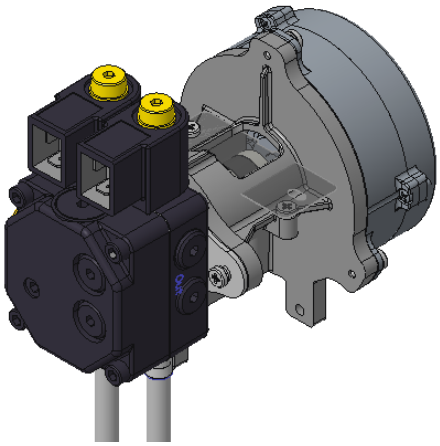


6.2.2 Oil Pump Assembly

Item		Description
Oil Pump	Type	2-Stage Control, BFP 52E-3, Danfoss
	Operating Speed	3,000rpm
	Max. starting Torque	0.1 Nm
Coupling		Oldham Coupling, Φ20, POM
Oil Pump Motor		BLDC Motor, CCW, 41W
Flexible Oil Hose		NBR, 7/16"-20 UNF

<Disassembly>



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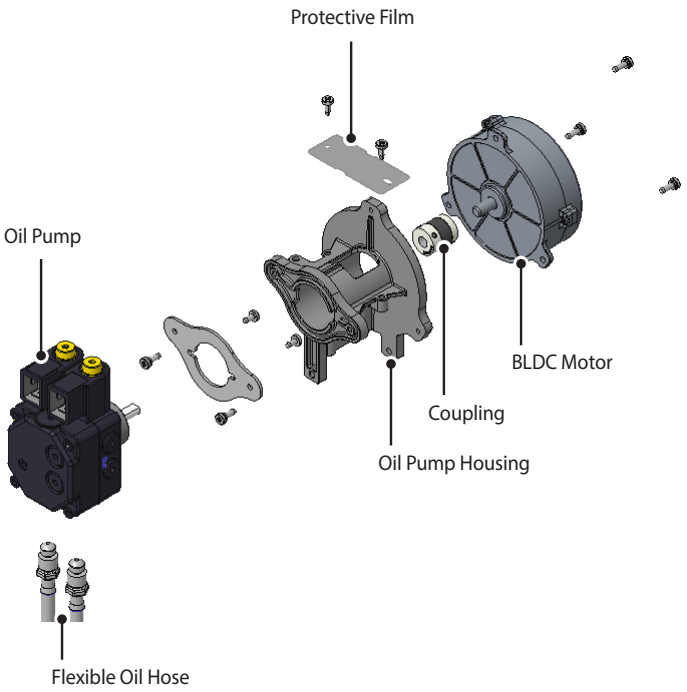
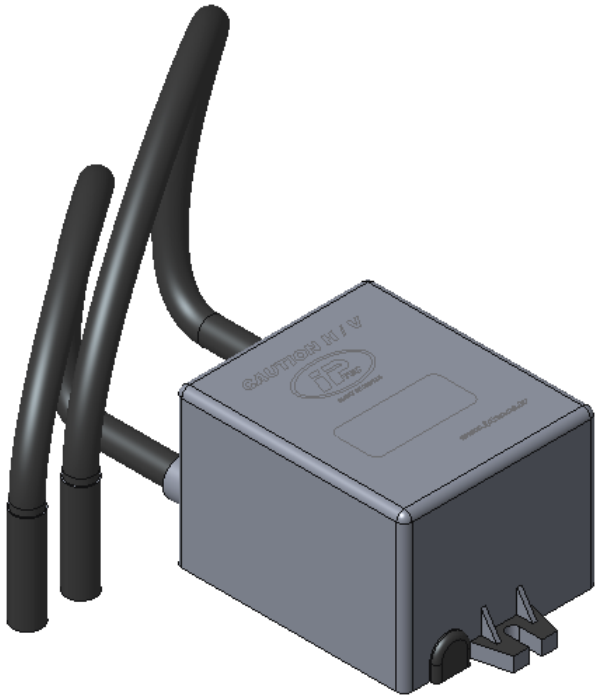


6.2.3 Ignition Transformer

Item	Description
Input	AC230V/50Hz/Max. 50W/Min 100㏁
Output	18kV/40mA/10–22kHz



6.2.4 Flame Holder Assembly

Item		21kW	28kW	36kW
Air Nozzle		Φ20	Φ23	Φ25
Oil Nozzle	Kerosene	0.55G 80˚ ES	0.75G 80˚ ES	1.0G 80˚ ES
	Light Oil	0.45G 80˚ S	0.55G 80˚ S	0.65G 80˚ S

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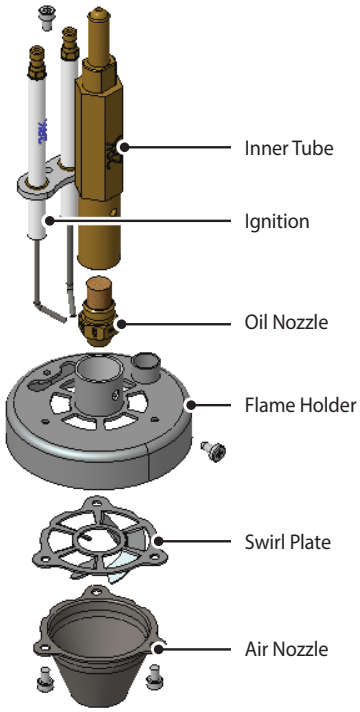
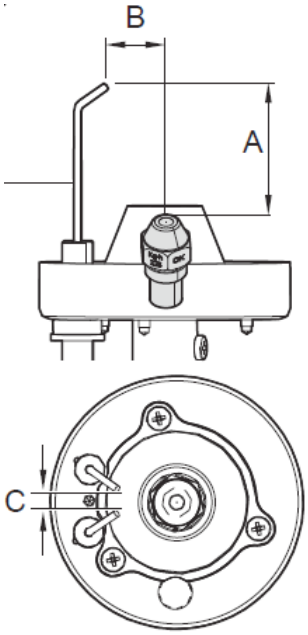


< Ignition Dim. for Flame Holder Assembly >



Model		21RS/RSX 21LS/LSX	28RS/RSX 28LS/LSX	36RS/RSX 36LS/LSX
Ignition Dim.	A	32 mm	37 mm	42 mm
	B	18 mm	20 mm	26 mm
	C	3±0.5 mm	3±0.5 mm	3±0.5 mm

6.2.5 UV Sensor

Item	Description
Type	UV1, Danfoss
Signal output	max. 100 µA
Recommended min. signal output	65 µA
Signal for no light	max. 5 µA
Ambient temperature	-20–+70°C, short time operation up to 75°C

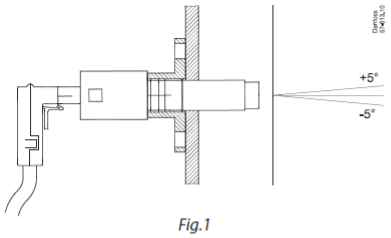


Fig.1

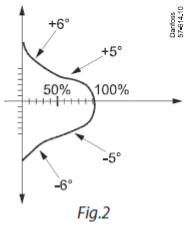


Fig.2

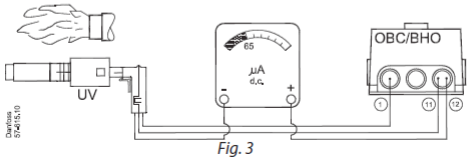
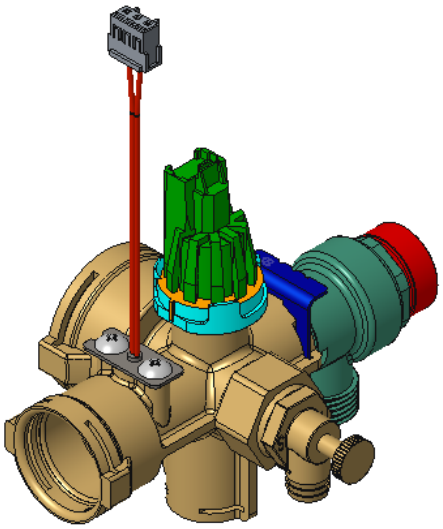


Fig. 3

6.3 Inlet Adapter Assembly

Item	Description
Pressure Sensor	0–4.5bar/Marquardt
Pressure Relief Valve	3bar/Caleffi
Temperature Sensor	-20–100℃
Drain Valve	1/2"

<Assembly>



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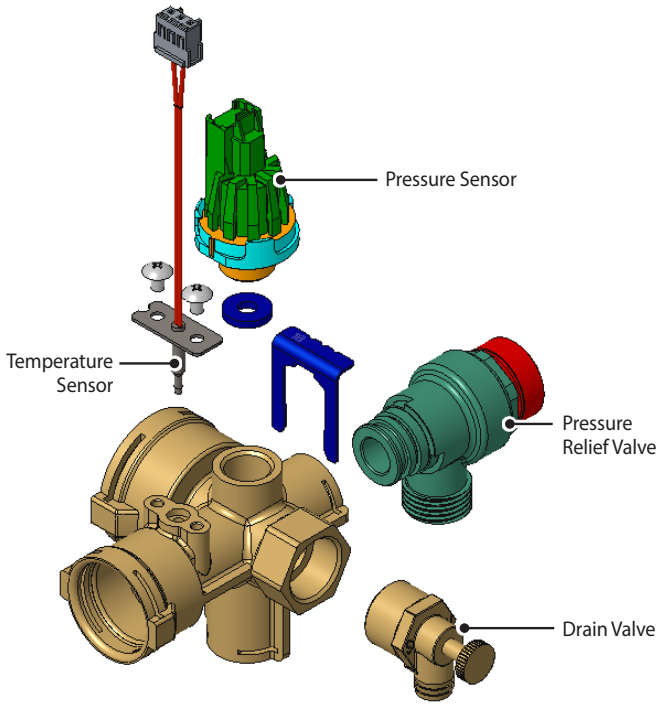
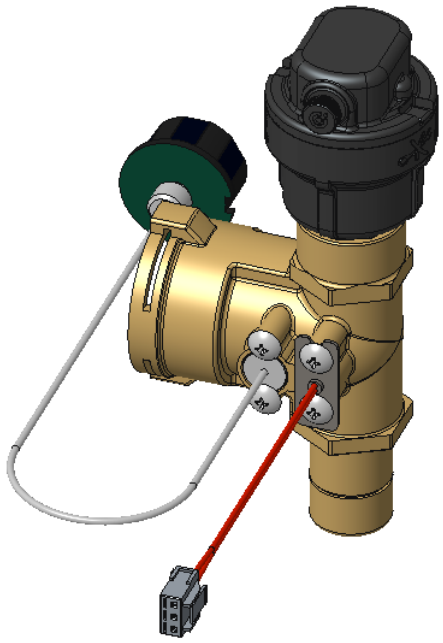


6.4 Outlet Adapter Assembly

Item	Description
Air Vent	0–4.5bar/Marquardt
Pressure Gauge	Measuring range: 0–4bar
Temperature Sensor	-20–100℃

<Assembly>



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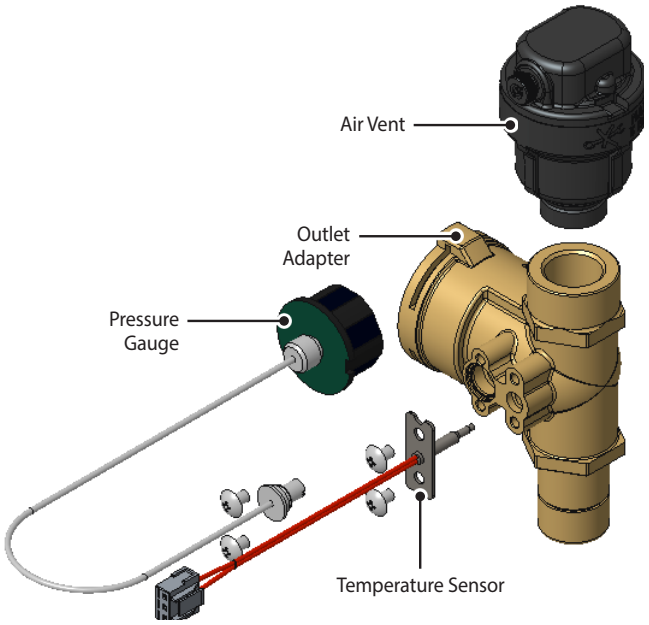
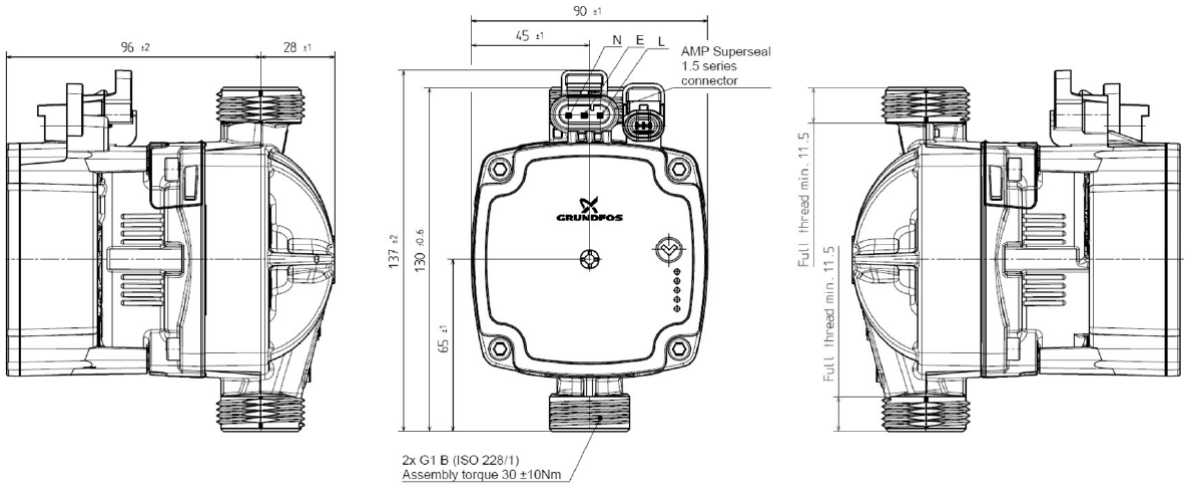


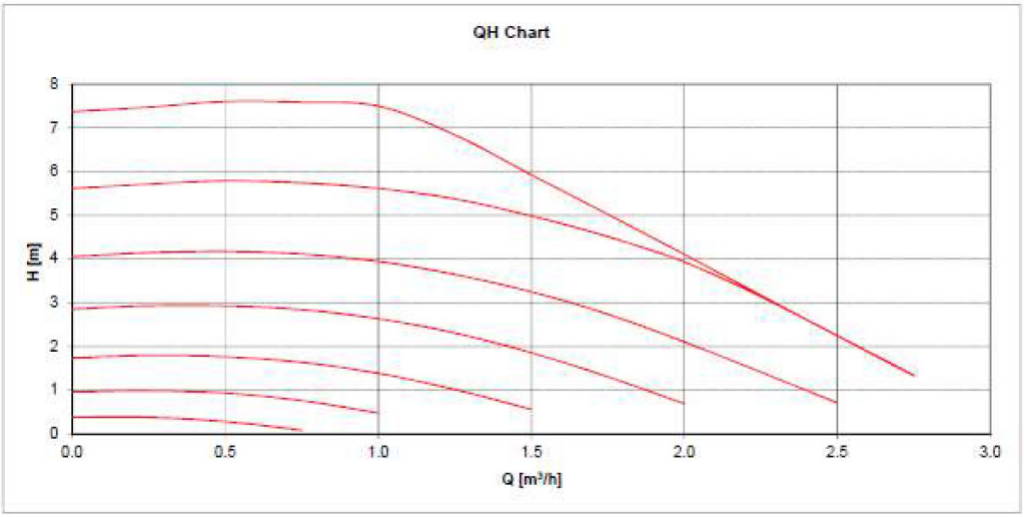
6.5 Circulation Pump

Item	Description
Model	UPM3 FLEX AS 15-75 CIL3/Grundfos
Power Consumption	2–60W
Max. Head	7.5m

Dimensions

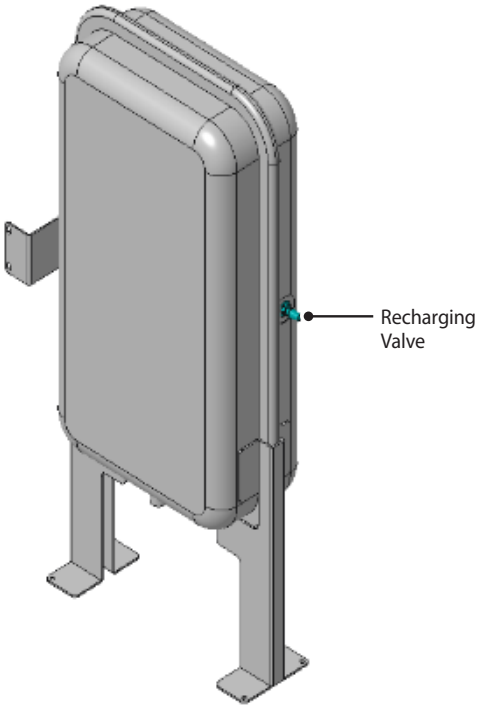


QH Chart



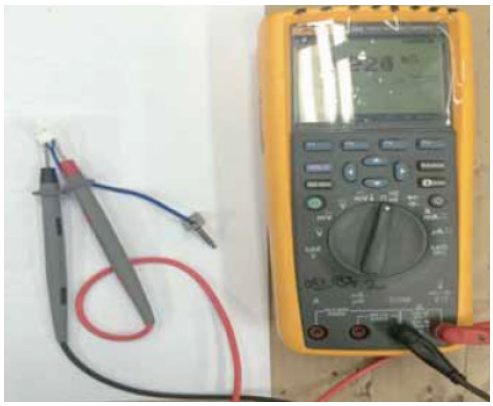
6.6 Expansion Vessel

Item	Description
Capacity	12 Liters
Max. Operating Pressure	3.0 bar
Pre Charge	1.0 bar



6.7 Thermistor

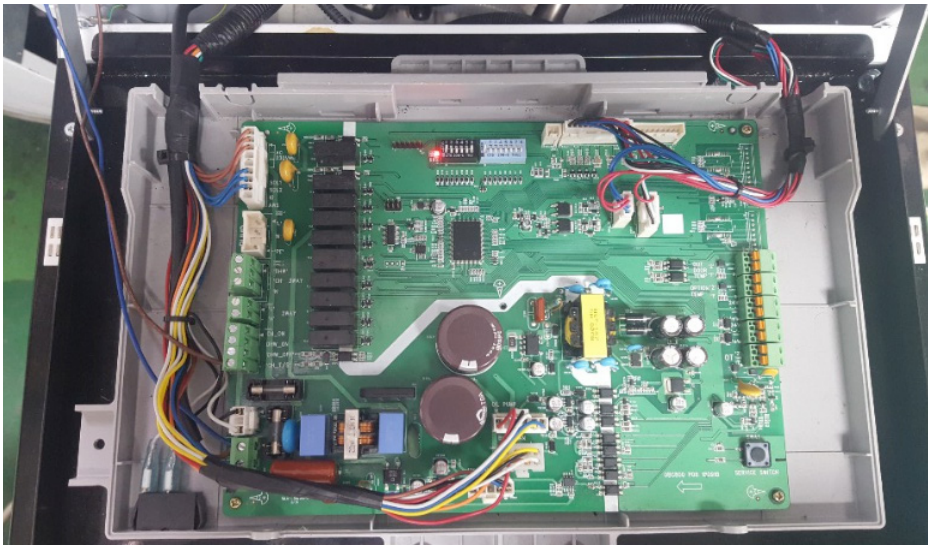
Item	Thermistor	Exhaust Limit Temperature Sensor
Model	PR3JM-K38E-KD90	PLR3TM-K44I-KD135
Failure	Unable to measure water temperature in the boiler. If any of the thermistors fail, an error code appears before starting operation. If resistance values are off, the boiler will produce temperature fluctuations in hot water.	
Error Code	E047, E205, E218, E278, E279	
Diagnostic	1. Check wire connections are secure. 2. Check the resistance of the sensor (Stop operating and lower the temperature before checking).	



Check if the hot water temperature sensor is open (Error type: MΩ Open)

Temp(°F)	Thermistor(kΩ)	Exhaust Limit Temperature Sensor(kΩ)
32 – 40	17.9 – 25.4	113.6 – 180.7
40 – 50	14.5 – 20.3	89.2 – 139.5
50 – 60	11.4 – 16.4	67.5 – 108.5
60 – 70	9.4 – 12.8	51.5 – 81.1
70 – 80	7.5 – 10.4	41.5 – 61.3
80 – 90	6 – 8.2	32.2 – 48.9
90 – 100	5.1 – 6.6	26.3 – 37.6
100 – 110	4.1 – 5.7	20.83 – 30.4

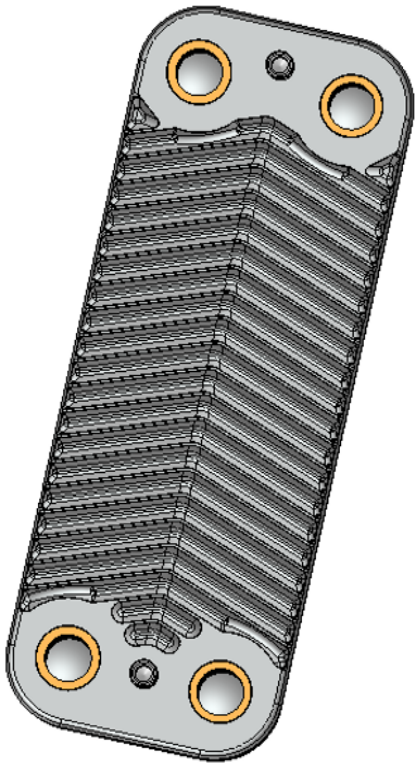
6.8 Main Controller

Item	Description
Model	Regular: OBC800H-EU/System: OBC800S-EU/Combi: OBC800C-EU
Power	AC 230V 50Hz
Communication	Front Panel: UART communication
	OT communication: exterior signal input
	

6.9 Front Panel

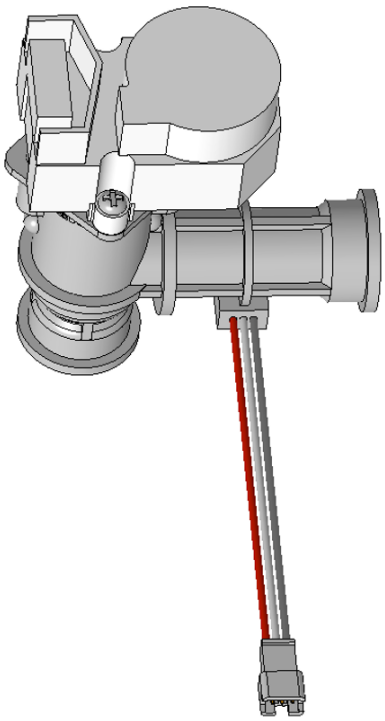
Item	Description
Model	OBP800
Power	DC 24V
Controller communication	UART communication

6.10 Heat Exchanger for How Water Spply

Item	Description
Plate Material	STS
	

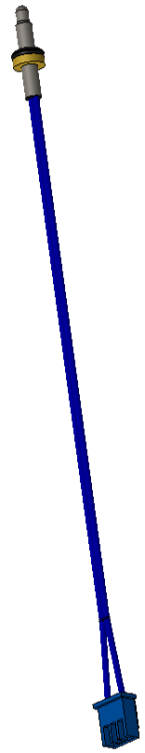
6.11 Flow Control Valve

Item	Description
Power (Motor)	DC 12 V
Feature	Integral flow sensor

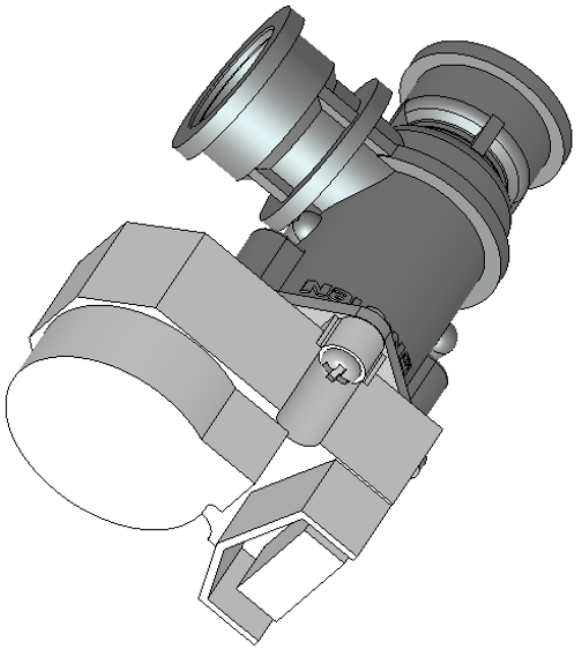


6.12 Thermistor

Item	Description
Housing	SMH250-03
Terminal	YST-025

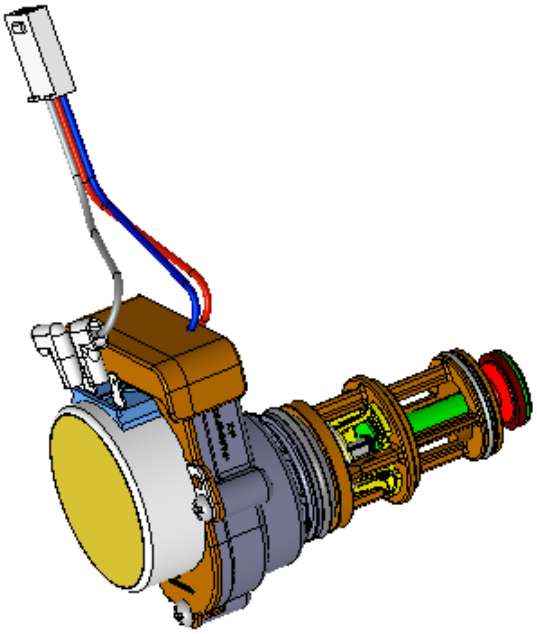


6.13 Mixing Valve

Item	Description
Power (Motor)	DC 12 V
	

6.14 3-Way Valve

Item	Description
Power (Motor)	AC 220 V, AC 240 V (50 Hz, 60 Hz)
Feature	Integral bypass



7. Replacement of Parts

7.1 Replacement Procedure

CAUTION

1. When performing maintenance and/or servicing the boiler, always turn off the electric power, oil and water shut-off valve. Wait for the boiler to become cool. Be careful to avoid injury to your fingers on sharp edges.
2. Drain all water from the boiler when removing the waterway components.
3. Before any disassembly, make sure that all issues and error codes are properly diagnosed.
4. Handle all parts carefully.
5. When reassembling, prevent any foreign substance, i.e. dust, etc. from entering back into the boiler.
6. Check the burner connections, combustion chamber cover, condensate trap, and exhaust duct for exhaust gas leaks.
7. Check the performance and operation after the boiler has been serviced.

When performing maintenance, use appropriate tools to disassemble and reassemble the boiler. A flashlight and magnetic tip are also recommended. Navien recommends the use of a parts tray to hold small parts and screws. All of the hardware is essential to the proper operation of the unit upon re-assembly.

Note When disassembling and reassembling the boiler, refer the components diagram & parts list.

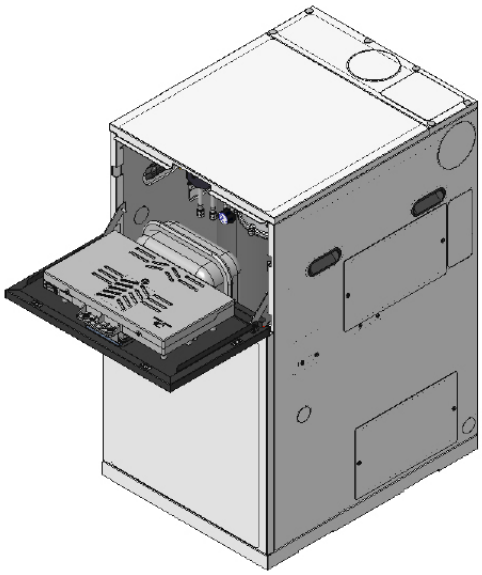
7.2 Components Replacement Instructions

CAUTION

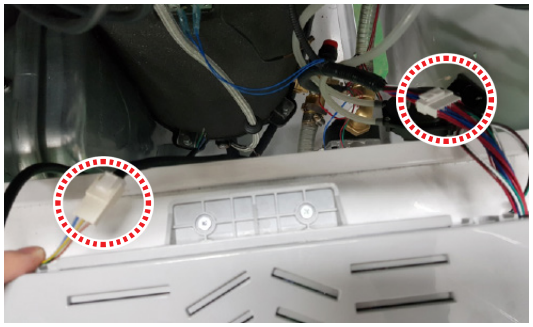
When performing maintenance and/or servicing the boiler, always turn off the electric power, shut off the water valve, and disconnect it from the fuel source. Do not clean or perform maintenance without disconnecting fuel or power from the boiler. Doing so may result in electric shock. The boiler may remain hot for several minutes after it is turned off. To prevent burns, wait until the boiler has cooled down before cleaning.

7.2.1 Main Controller

1. Pull open the upper front cover and place on the latch to secure it.



2. Disconnect the burner connection and the sensor connection.



3. Remove the two screws holding the controller from the boiler case.

4. Disconnect the controller inner cable connectors.

5. Remove the four screws from the front panel to disconnect and replace the controller.

6. Reconnect all the cables connected from the controller.

7. Reset the DIP switches.

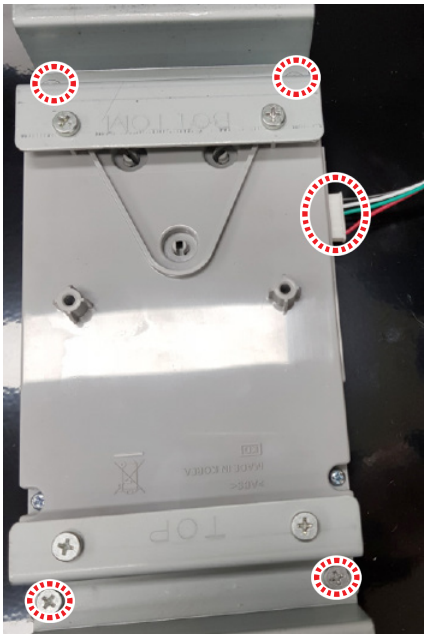
8. Open the oil valve and turn the power on.

Note Make sure to match the cable colors and pin types when connecting the cables to the controller. Do not use excessive force during disassembly and reassembly, as this may damage the connector or PCB.

7.2.2 Front Panel

1. Disconnect the controller as shown in 7.2.1.

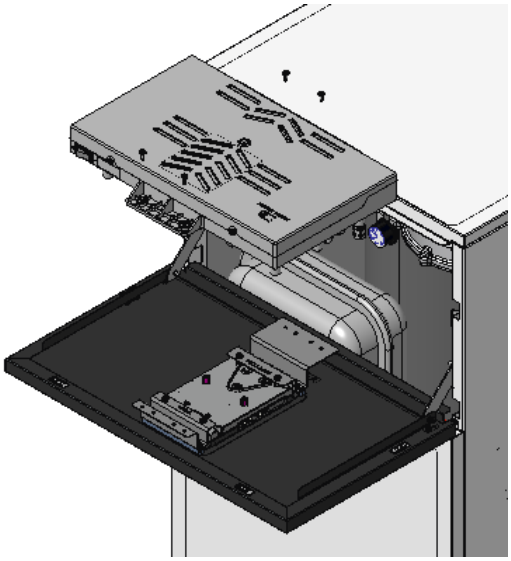
2. Disconnect the front panel connector and remove the four screws from the secure bracket.



3. Replace the front panel and install the fixing bracket.

4. Set the proper DIP switch settings for the front panel.

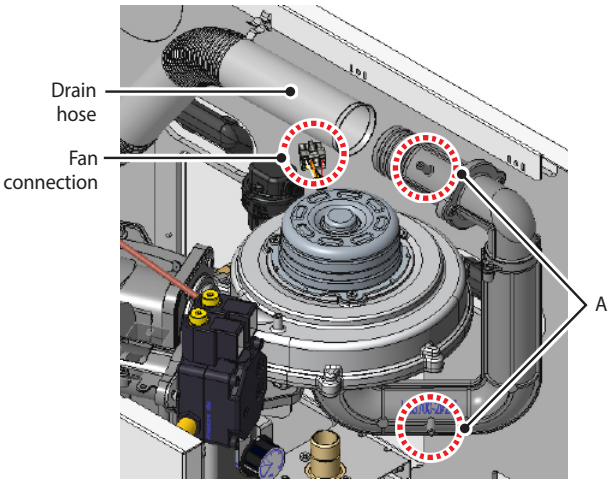
5. Reinstall the front panel and reassemble the main controller.



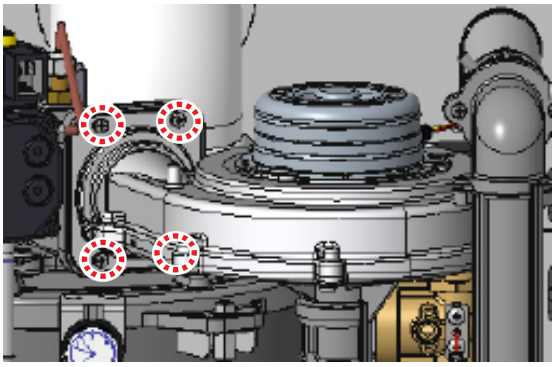
6. Open the oil valve and turn on the power.

7.2.3 Fan

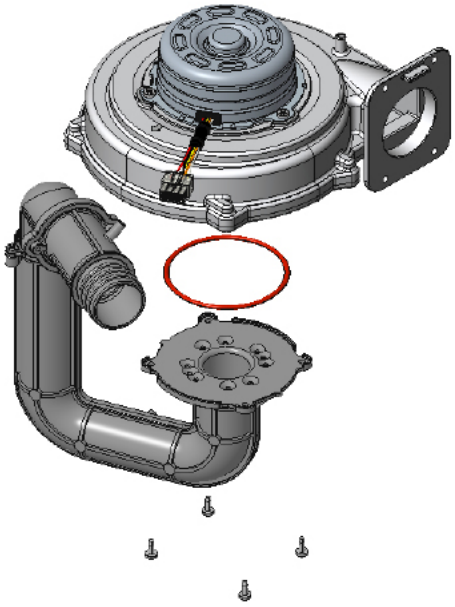
1. Disconnect the APS hose and drain the hose from the intake pipe.
2. Disconnect the fan wiring connection from the fan.



3. Remove the four screws securing the fan.



4. Remove the intake pipe and packing from the old pipe and install to the replacement fan.



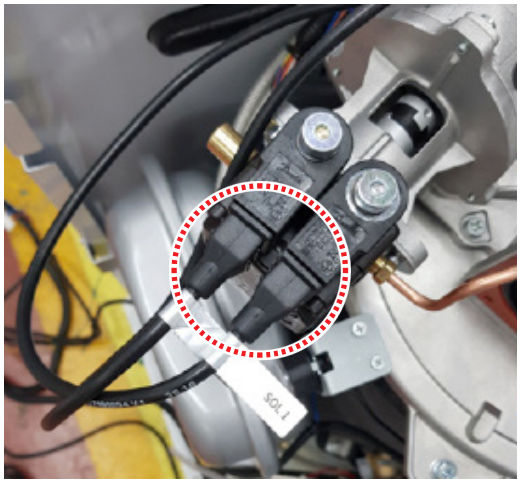
5. Install the replacement fan onto the burner and connect fan wiring connection and APS hose.

CAUTION

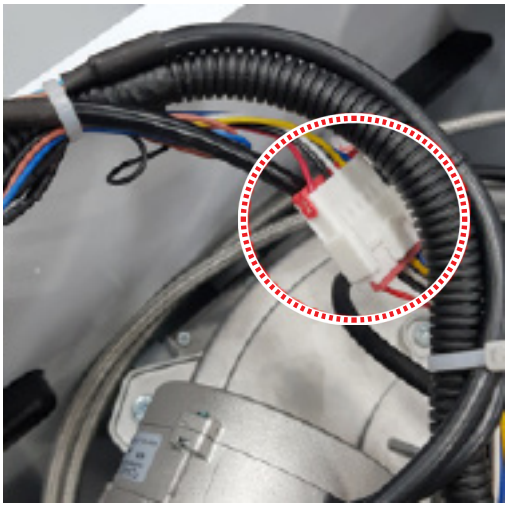
Make sure to properly connect the “H” and “L” pressure when installing the APS hose. (Refer to 7.2.1) If improperly connected, errors, noises, and incomplete combustion may occur.

7.2.4 Oil Pump Assembly

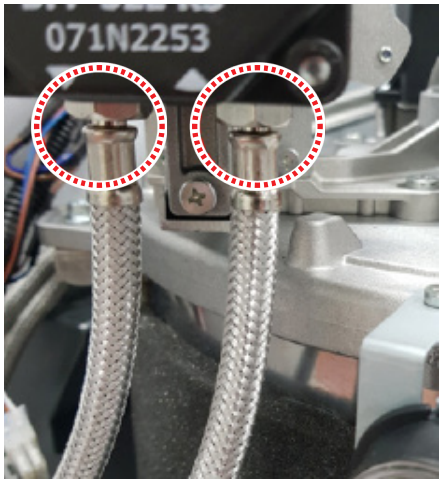
1. Disconnect the oil pump power connection Sol 1 and Sol 2.



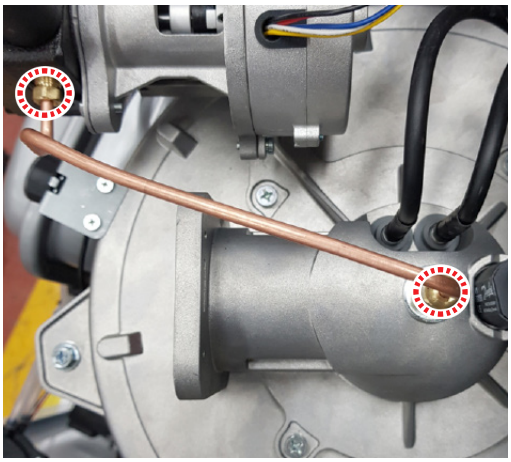
2. Disconnect the motor connection from the oil pump assembly.



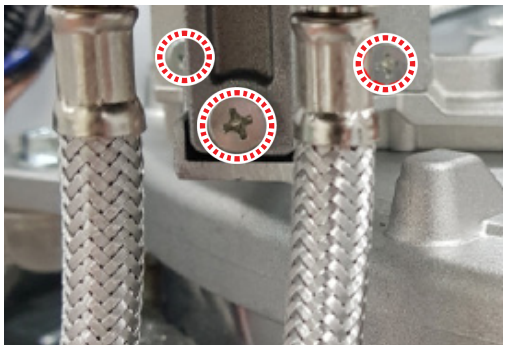
3. Disconnect the two flexible hoses. (Residue oil may leak from the flexible hoses.)



4. Disconnect the oil supply pipe.



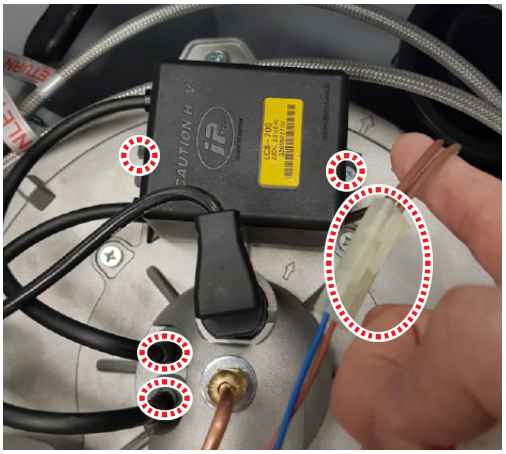
5. Remove the three screws securing the oil pump assembly.



6. Reassemble in reverse order with the replacement oil pump assembly.

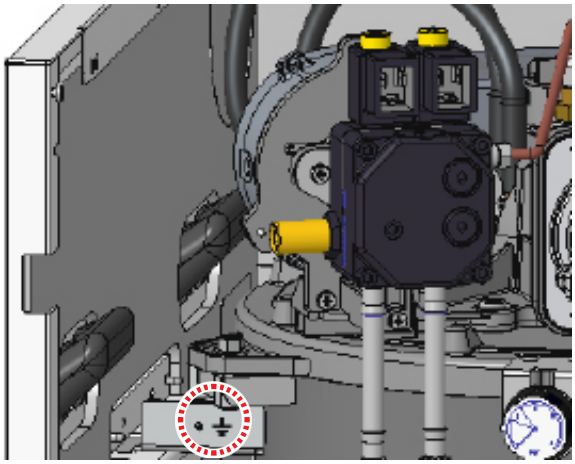
7.2.5 Ignition Transformer

1. Disconnect the ignition transformer connection.
2. Disconnect the output grounding cable from the ignition transformer.
3. Remove the two screws securing the ignition transformer.
4. Reassemble in reverse order with the replacement ignition transformer.

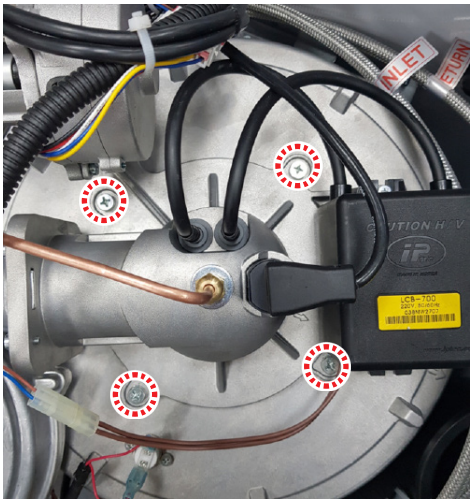


7.2.6 Oil Nozzle

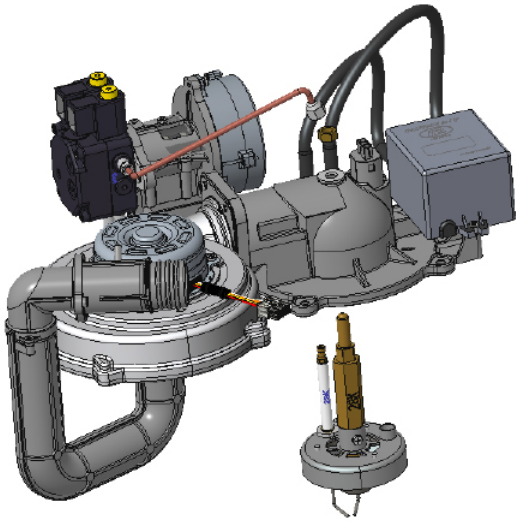
1. Disconnect the burner connection.
2. Disconnect the grounding cable.



3. Disconnect the drain pipe hose and APS hose from the intake pipe.
4. Remove the four screws securing the burner.



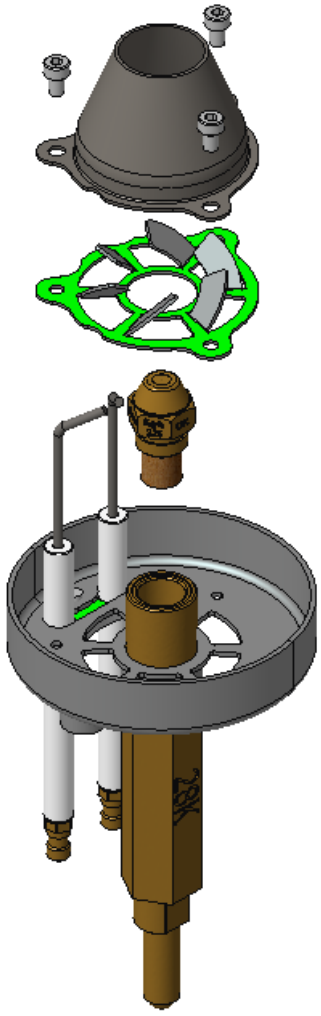
5. Disconnect the burner from the combustion chamber.
6. Disassemble the inner tube nut and copper oil pipes, and remove the ignition transformer output from the electrodes output.
7. Remove the flame holder assembly from the burner assembly.



8. Remove the three screws securing the air nozzle, to the flame holder assembly, and replace the oil nozzle.

CAUTION

When assembling and disassembling the oil nozzle use two spanners, one to secure the inner tube and one to assemble and disassembly the oil nozzle. When assembling the sealant in the oil nozzle, make sure to assemble with a force of more than 25 Nm. Oil leaks from the nozzle may lead to flames loss errors or combustion errors and may leave soot in the boiler.



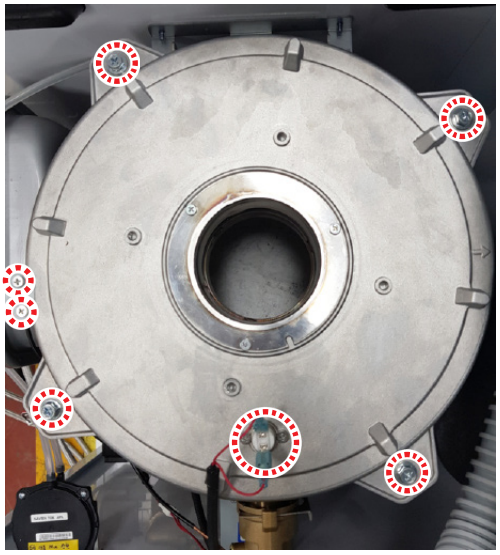
9. Reassemble in reverse order with the replacement oil nozzle.

CAUTION

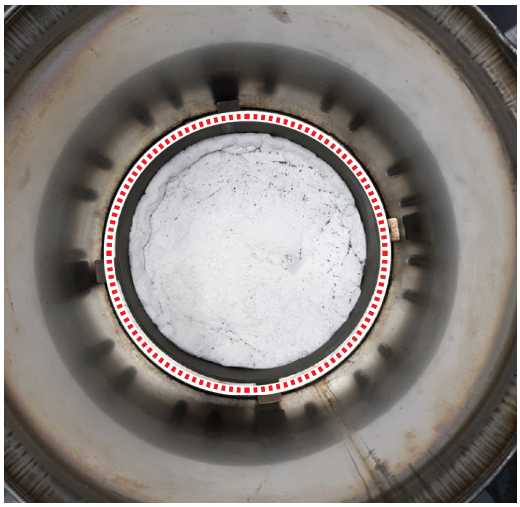
Check the electrode gap and position after replacing the oil nozzle.(Refer to 7.2.4) Improper electrode gaps and position may cause flame loss error (E003).

7.2.7 Cleaning the Combustion Chamber

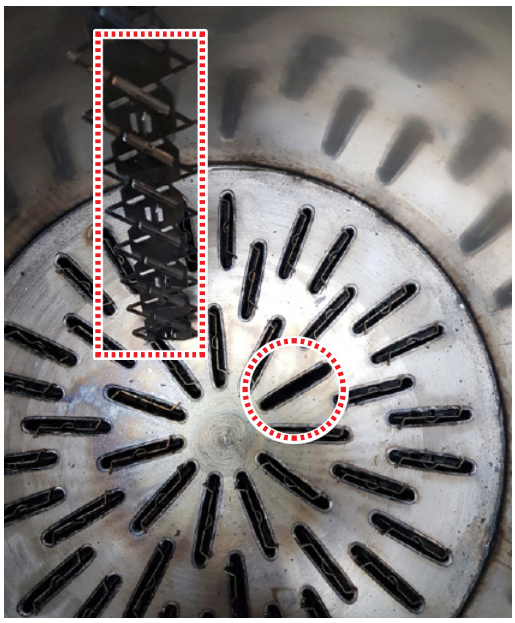
1. Disassemble the burner first, and clean electrodes of any debris or contamination.
2. Disconnect the combustion chamber cover high limit stat cable connection.
3. Disassemble the pressure sensor.
4. Remove the four bolts securing the combustion chamber cover and the two screws securing the pressure gauge bracket.



5. Disconnect the air flow guide from the combustion chamber, and clean the air flow guide.

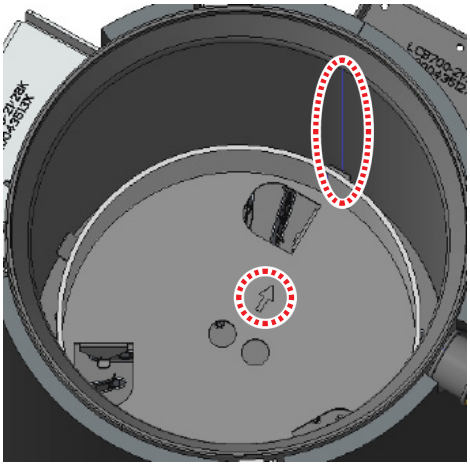


6. Remove the turbulence from the tube.



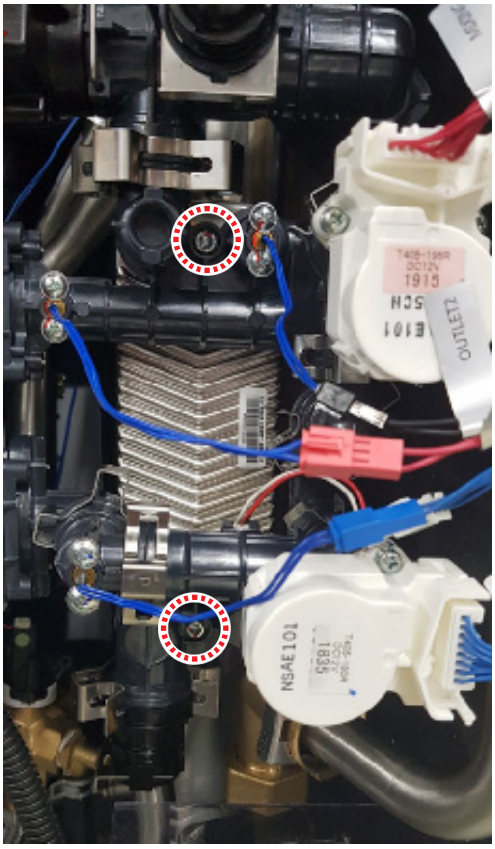
7. Clean the combustion chamber, and use water if needed. If water is used during the cleaning process, make sure to disassemble and clean the condensate trap and water hose.

8. Reassemble in reverse order. Make sure to align the arrows or weld line to properly assemble the air flow guide.



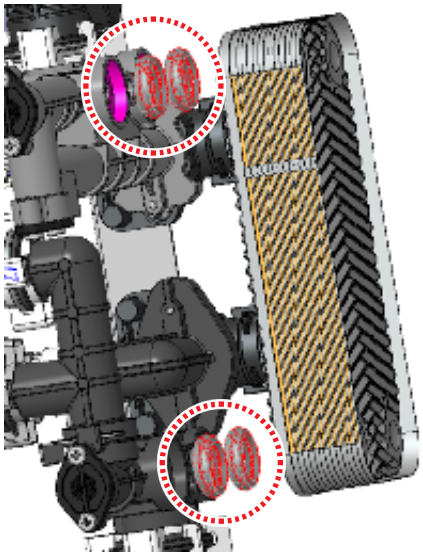
7.2.8 Plate-type Heat Exchanger

1. Turn off the power of the boiler.
2. Close the water supply valve.
3. Drain the heating water inside the boiler completely.
4. Loosen the two hex bolts.



5. Strongly push the plate-type heat exchanger backwards strongly.

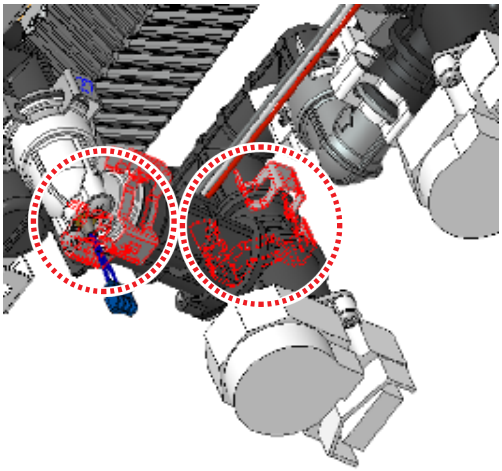
Note Make sure to keep the 4 packings of the exchanger safely.



7.2.9 Flow Control Valve

1. Turn off the power of the boiler.
2. Close the water supply valve.
3. Remove the connector on the flow control valve.

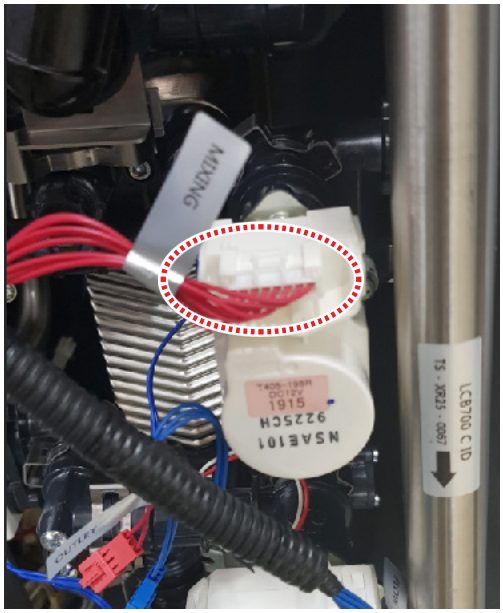
4. Remove the 2 clips fixing the flow control valve.



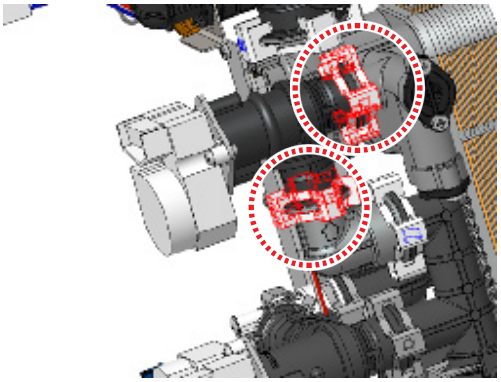
5. Replace the flow control valve.

7.2.10 Mixing Valve

1. Turn off the power of the boiler.
2. Close the water supply valve.
3. Drain the heating water inside the boiler completely.
4. Remove the connector on the mixing valve.



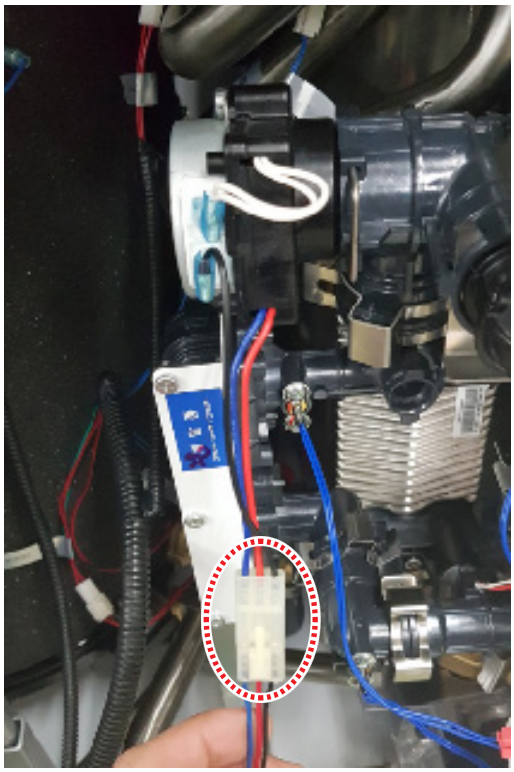
5. Remove the 2 clips fixing the mixing valve.



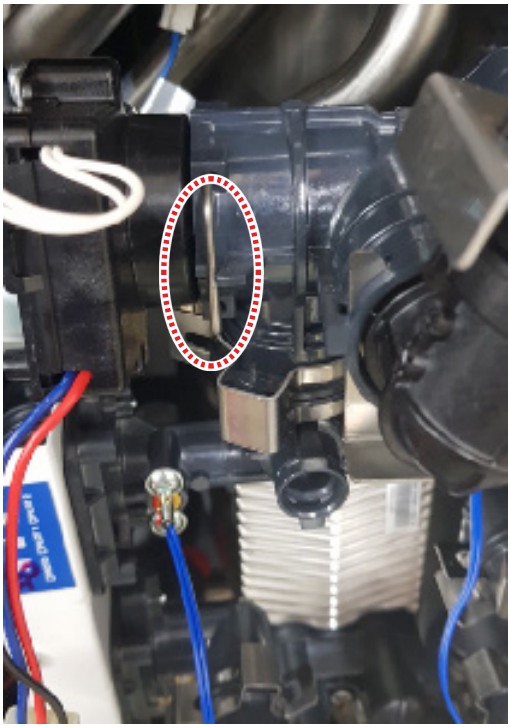
6. Replace the mixing valve.

7.2.11 3-way Valve

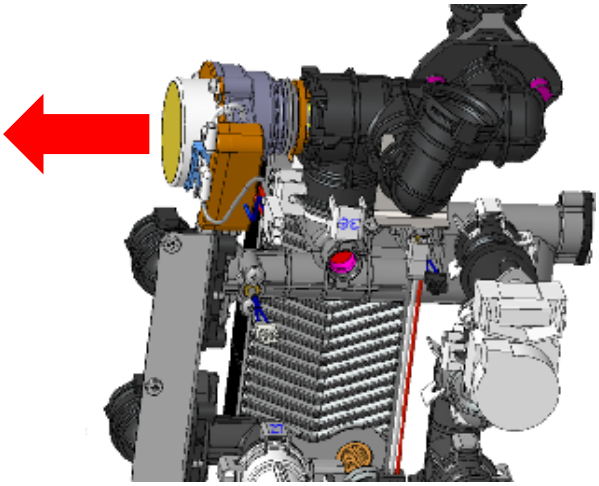
1. Turn off the power of the boiler.
2. Close the water supply valve.
3. Remove the connector on the 3-way valve.



4. Remove the 2 clips fixing the 3-way valve.



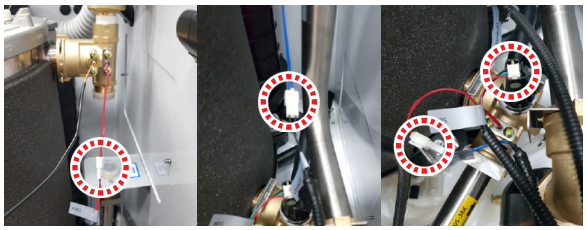
5. Remove the 3-way valve by holding and strongly pulling its motor body forward.



6. Replace the 3-way valve.

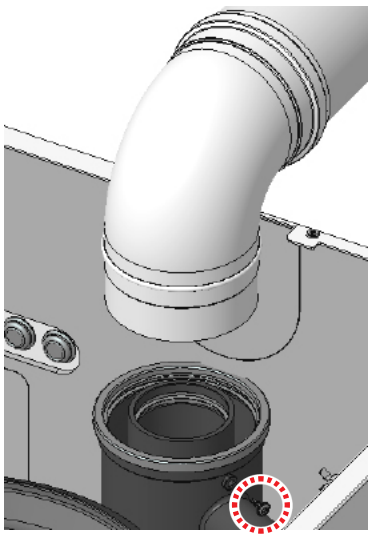
7.2.12 Heat Exchanger

1. Turn off the DHW return and supply valve.
2. Disconnect the DHW return adapter thermistor and pressure sensor connector.
3. Disconnect the DHW return adapter thermistor connector.
4. Disconnect the exhaust thermistor connector from the exhaust duct.



5. Open the drain valve of the lower return adapter to drain the boiler. Disconnect the air vent from the upper outlet adapter to drain faster.

6. Remove the screw securing the flue and disconnect it.

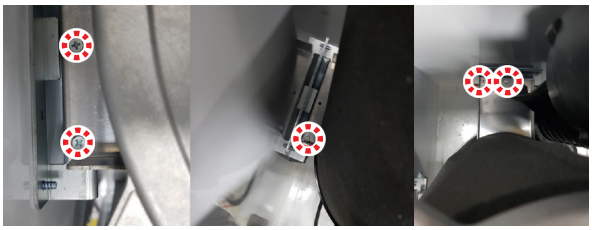


7. When draining is complete, disconnect the DHW return adapter expansion vessel hose, pressure relief valve hose, and drain hose.

8. Disconnect the supply and return pipe.

9. Remove the expansion vessel.

10. Remove the screws securing the bracket on the back and side of the heat exchanger.



11. Remove the heat exchanger. The heat exchanger is heavy, so make sure to properly support it when removing it from the boiler.

12. Install the replacement heat exchanger, and reassemble in reverse order

8. Inspection and Maintenance Schedule

8.1 Annual Servicing

In order to maintain its safe and efficient operation, it is recommended that the boiler is serviced annually.

CAUTION

The boiler should be inspected annually only by a qualified service technician. Failure to service and maintain the boiler and system could result in equipment failure.

Inspection

- Visual inspection for general signs of corrosion
- Checking and adjusting the oil/air ratio
- Checking Flue Gas
- Carrying out a Water Leak Test in Operation
- Carrying out an oil leak test in operation
- Checking Hot Water Temperature and Flow
- Checking Noise
- Checking flue systems
- Checking the PCB and Panel

Maintenance

- Draining the boiler and cleaning the inlet water filter
- Cleaning the Return Filter
- Cleaning the intake air filter
- Flushing the heat exchanger
- Replacement of parts

8.2 Maintenance Schedules

Owner maintenance	
Daily	• Check boiler area • Check pressure/temperature gauge
Monthly	• Check flue piping • Check condensate drain
Periodically	• Check flue termination screens
Every 6 months	• Check boiler piping (oil and water) for leaks
Non-heating season	• Shut boiler down (unless boiler used for domestic hot water)

Service technician (See the following instructions)	
Annual Start-up	General: • Address reported problems • Inspect interior; clean and vacuum if necessary • Clean condensate trap and fill with fresh water • Check for leaks (water, oil, flue, condensate) • Verify flue and air lines are in good condition and sealed tight • Check system piping • Check control settings • Check ignition and UV sensor (clean and reposition) • Clean oil filter • Replace old flexible oil hose and oil nozzle with new ones • Check wiring and connections If combustion or performance indicate need: • Clean heat exchanger • Remove and clean return adapter filter

8.3 Maintaining the Boiler

8.3.1 Cleaning the Boiler

> **CAUTION**
>
> Make sure the boiler is turned off and the power supply is disconnected before cleaning the boiler. The boiler may remain hot for several minutes after it is turned off. To prevent burns, wait until the boiler has cooled down before cleaning.

To clean the boiler, wipe the outside with a damp cloth. Use a non-acidic, non-abrasive cleaner to remove any surface stains. The front panel is moisture resistant, but it is not waterproof. Keep it as dry as possible.

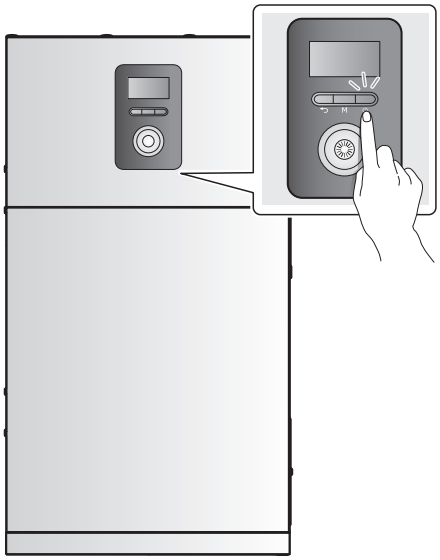
8.3.2 Draining the Boiler

You will need to drain either both the central heating side and domestic hot water (DHW) side, or one side only before performing maintenance tasks, such as cleaning the adapter filter, or to prevent the boiler from freezing when it will not be used for an extended period.

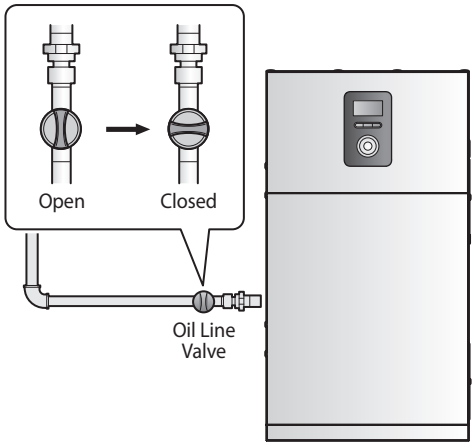
Refer to "2.5 Dimensions" on page 18 for details about part locations.

To drain the boiler:

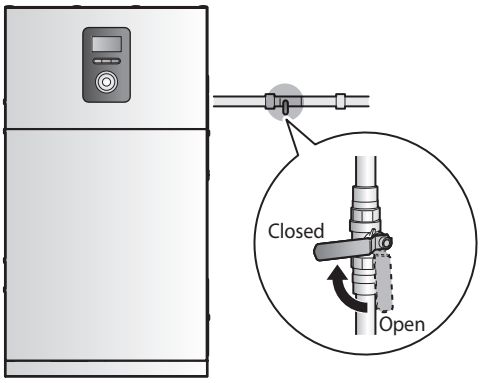
1. Place a bucket under the boiler, to collect the residual water inside the boiler.
2. Press the Power button (⏻) on the front panel to turn off the boiler.



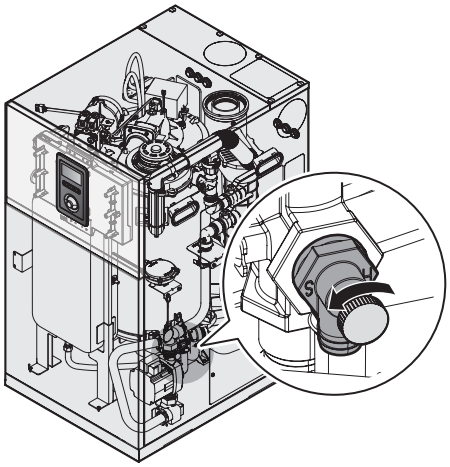
3. Disconnect the power supply from the boiler.
4. Close the oil line valve.



5. Close the water supply valve on the inlet to the boiler. If there is no valve, turn off the water supply at the water main.



6. Close off any heating zones that do not require draining and open a drain valve to drain the central heating side.



7. Open all domestic hot water taps completely to drain the water heating side. The water that remains in the plumbing lines will drain out.
8. Open the pump drain valve.
9. Allow the residual water to drain from the boiler.
10. When the water is completely drained out, close the drain valve.

Note To refill the boiler, follow the steps above in reverse.

8.3.3 Protecting the Boiler from Freezing

CAUTION

Damage due to freezing is not covered by the Navien limited warranty.

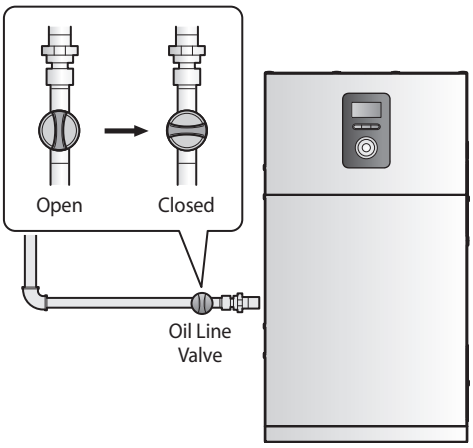
If the boiler is connected to a circuit that could freeze, the circuit pipes must be suitably insulated. All pipes installed outdoors must be insulated according to applicable legislation. The boiler electronic control includes a freeze protection function that prevents the boiler from freezing in very cold weather. It remains on standby and takes priority over all other boiler functions while the boiler is connected to the electrical mains and oil supply, i.e. it remains enabled even when the boiler is in standby position.

To ensure that the boiler does not freeze, follow these guidelines:

- **Do not unplug the power supply cord**, except for routine maintenance. The boiler has a freeze protection function that requires electricity. The freeze protection function will operate regardless of whether or not the power is turned on or off, as long as the electric supply is still connected.
- **Do not close the oil valve**, except for routine maintenance, as this will limit additional freeze protection.
- **If the boiler will not be used for an extended period**, drain the boiler. If the power or oil supplies must be disconnected for an extended period, drain the boiler. Freezing damage may occur if there is water remained in the boiler in cold weather.

If hot water will not flow and you suspect that the boiler is frozen, follow these steps:

1. Press the Power button (⏻) on the front panel to turn off the boiler.
2. Close the oil line valve.



3. Open the hot water tap that is closest to the boiler.
4. Use a hair dryer or a portable electric heater to heat up both the primary and secondary heat exchangers.
5. Check every few minutes to see if water is running at the open tap.
6. When the water starts flowing again, check the boiler and piping for leaks. If you detect any leaks or the boiler is not operating properly, contact an authorised technician or licensed professional.

Note This boiler requires very little maintenance, however a qualified technician should inspect the boiler at the beginning of every heating season and/or when there is a problem.

8.3.4 Maintaining the Parts

⚠ WARNING

- Follow the service and maintenance procedures given throughout this manual and in component literature shipped with the boiler. Failure to perform the service and maintenance could result in damage to the boiler or system.
- Failure to follow the directions in this manual and component literature could result in severe personal injury or substantial property damage.
- The boiler should be inspected annually only by a qualified service technician. In addition, the maintenance and care of the boiler must be performed to assure maximum boiler efficiency and reliability. Failure to service and maintain the boiler and system could result in equipment failure.
- Electrical shock hazard – Turn off power to the boiler before any service operation on the boiler except as noted otherwise in this instruction manual. Failure to turn off electrical power could result in electrical shock, causing severe personal injury.

Addressing the Reported Problems

Inspect any problems reported by the owner and correct before proceeding.

Inspecting the Installation Area

1. Verify that boiler area is free of any combustible materials, petrol and other flammable vapours and liquids.
2. Verify that air intake area is free of any of the contaminants listed in Installation & Operation Manual. If any of these are present in the boiler intake air vicinity, they must be removed. If they cannot be removed, reinstall the air and flue lines per the Installation & Operation Manual.

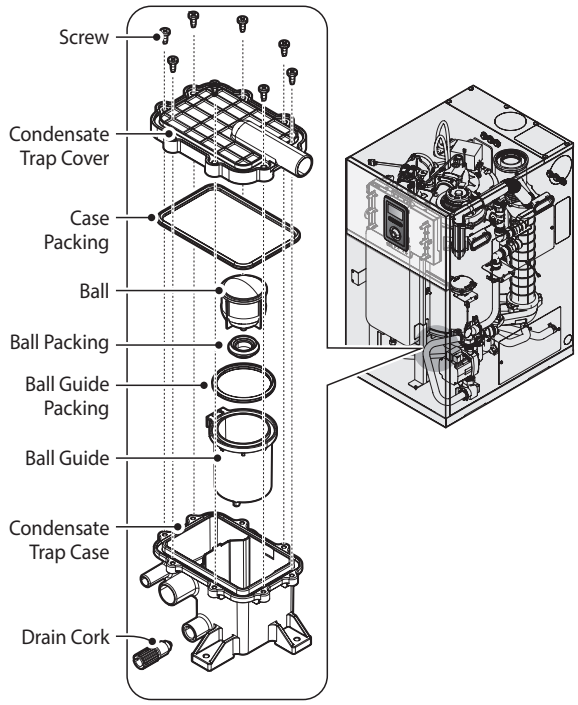
Inspecting the Boiler Interior

1. Remove the front cover and inspect the interior of the boiler.

components. Remove any obstructions.

Cleaning the Condensate Trap

1. Loosen the eight screws on the condensate trap cover and remove the cover, case packing, ball, ball packing, ball guide packing, and ball guide.



2. Inspect the condensate drain line, condensate fittings, condensate trap, and the drain cork.
3. Remove any sediment from the trap.
4. Fill with fresh water until the water begins to pour out of the drain.

Checking all Piping for Leaks

Eliminate all system or boiler leaks. Continual fresh makeup water will reduce boiler life. Minerals can build up in sections, reducing heat transfer, overheating heat exchanger, and causing heat exchanger failure. Leaking water may also cause severe property damage.

1. Inspect all water and oil piping and verify to be leak free.
2. Look for signs of leaking lines and correct any problems found.

Checking the Flue System and Air Piping

1. Visually inspect the entire gas flue system for blockage, deterioration or leakage. Repair any joints that show signs of leakage.
2. Verify that boiler flue discharge and air intake are clean and free of obstructions.

⚠ WARNING

Failure to inspect for the above conditions and have them repaired can result in severe personal injury.

Checking the Water System

1. Verify all system components are correctly installed and operational.
2. Check the cold fill pressure for the system. Verify it is correct (must be a minimum of 0.8 bar).
3. Watch the system pressure as the boiler heats up (during testing) to ensure pressure does not rise too high.

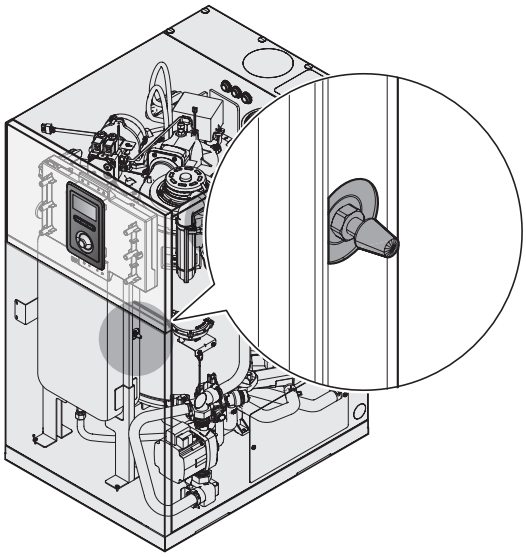
Note

- If the system contains glycol, test for proper concentration as recommended by manufacturer.
- Excessive pressure rise indicates expansion vessel sizing or performance problem.

4. Inspect automatic air flues and air separators. Remove air flue caps and briefly press push valve to flush flue.
5. Replace caps. Make sure flues do not leak. Replace any leaking flues.

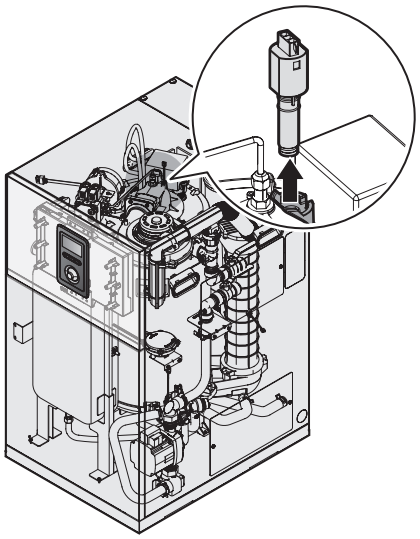
Checking the Expansion Vessel Gas Pressure

1. Check the expansion vessel gas pressure, and calibrate if necessary.
2. The gas pressure in the boiler expansion vessel is 1 bar. If the boiler is operated with a gas pressure below 1 bar, the pressure relief valve may activate.

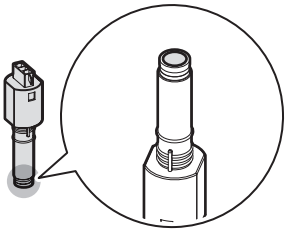


Inspecting the Flame Detector UV Sensor and Ignition

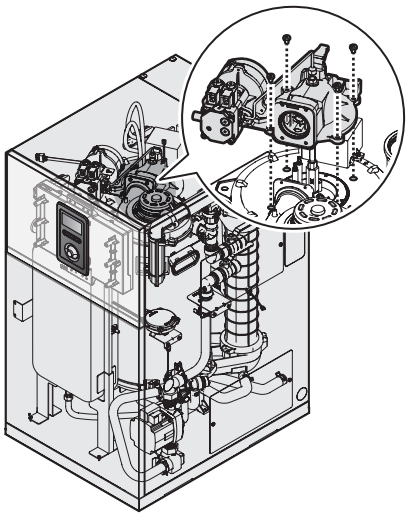
1. Remove the flame detector UV sensor at the bottom of the burner by pulling it.



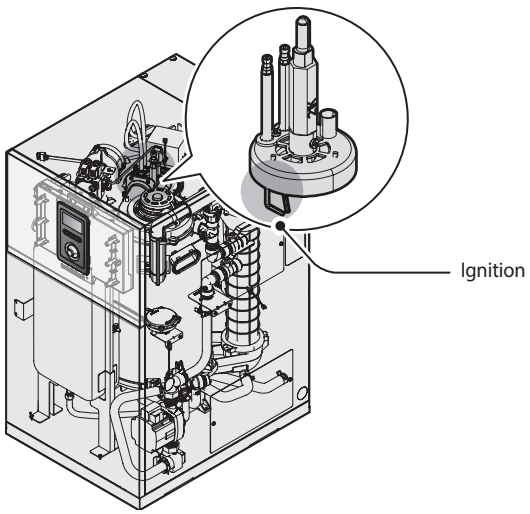
2. Remove any deposits accumulated at the bottom of the UV sensor.



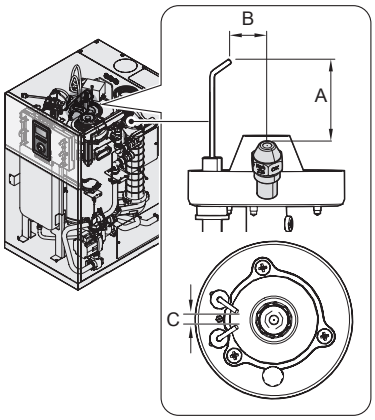
3. Remove the fan and burner assembly.



4. Remove any deposit accumulated on the ignition.



Note Refer to the following illustrations and table for details about the ignition dimension.



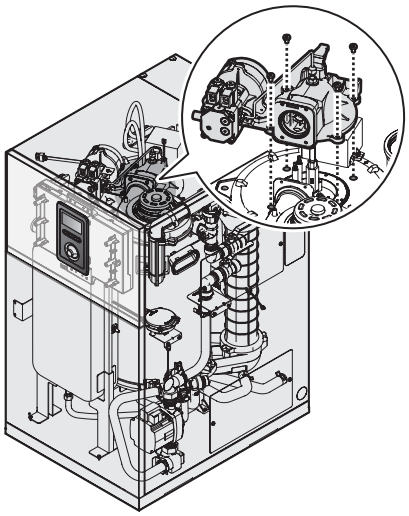
Model		21RS/RSX 21LS/LSX	28RS/RSX 28LS/LSX	36RS/RSX 36LS/LSX
Ignition Dim.	A	32 mm	37 mm	42 mm
	B	18 mm	20 mm	26 mm
	C	3±0.5 mm	3±0.5 mm	3±0.5 mm

Replacing the Flexible Oil Hose and Oil Nozzle

CAUTION

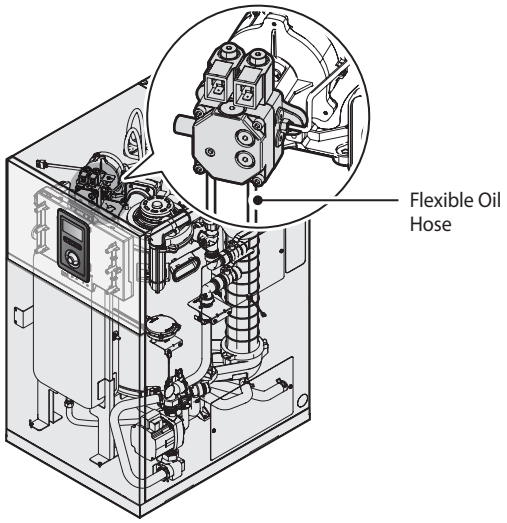
Using a worn-out flexible oil hose for a long time may block the nozzle. A blocked nozzle will result in the formation of soot and the burner will not ignite properly which may lead to property damage or injury.

1. Remove the fan and burner assembly.

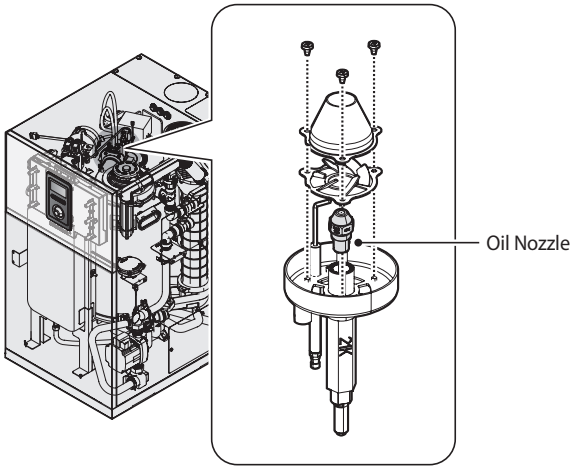


2. Replace the old flexible oil hoses with new ones.

Model				21RS/RSX 21LS/LSX	28RS/RSX 28LS/LSX	36RS/RSX 36LS/LSX
"Kerosene" UK Standard Heating Oil	"ES" Pattern Oil Nozzle	Oil Nozzle		0.55G 80˚ ES	0.75G 80˚ ES	1.0G 80˚ ES
		Oil Pressure	Low	6.5 bar	6.5 bar	6.5 bar
			High	11.5 bar	9.5 bar	10 bar
"Light Oil" EU Standard Heating Oil	"S" Pattern Oil Nozzle	Oil Nozzle		0.45G 80˚ S	0.55G 80˚ S	0.65G 80˚ S
		Oil Pressure	Low	9.5 bar	9.5 bar	9.5 bar
			High	13.5 bar	14 bar	14 bar



3. Remove the three screws on the burner housing and replace the old oil nozzle with new one.



Checking the Ignition Ground Wiring

1. Check that the ground wire is in good condition and securely attached to the boiler casing.
2. Check ground continuity of wiring using a continuity tester.
3. Replace ground wires if ground continuity is not satisfactory.

Checking all Boiler Wiring

Inspect all boiler wiring, making sure wires are in good condition and securely attached.

Checking the Control Settings

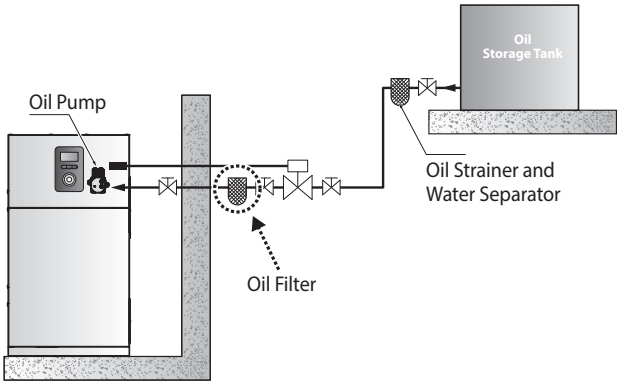
Check settings of external limit controls (if any) and adjust if necessary.

Performing Start-up and Checks

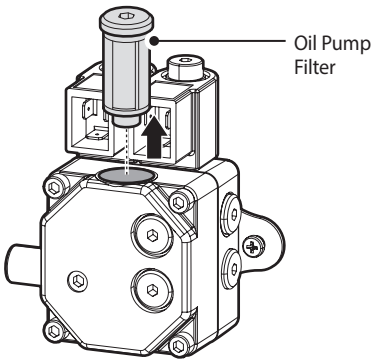
1. Start boiler and make sure that the boiler is operating properly.
2. Verify cold fill pressure is correct and that operating pressure does not go too high.

Cleaning the Oil Filter in the Oil Pump

1. Refer to the following illustration to see the location of the oil pump.

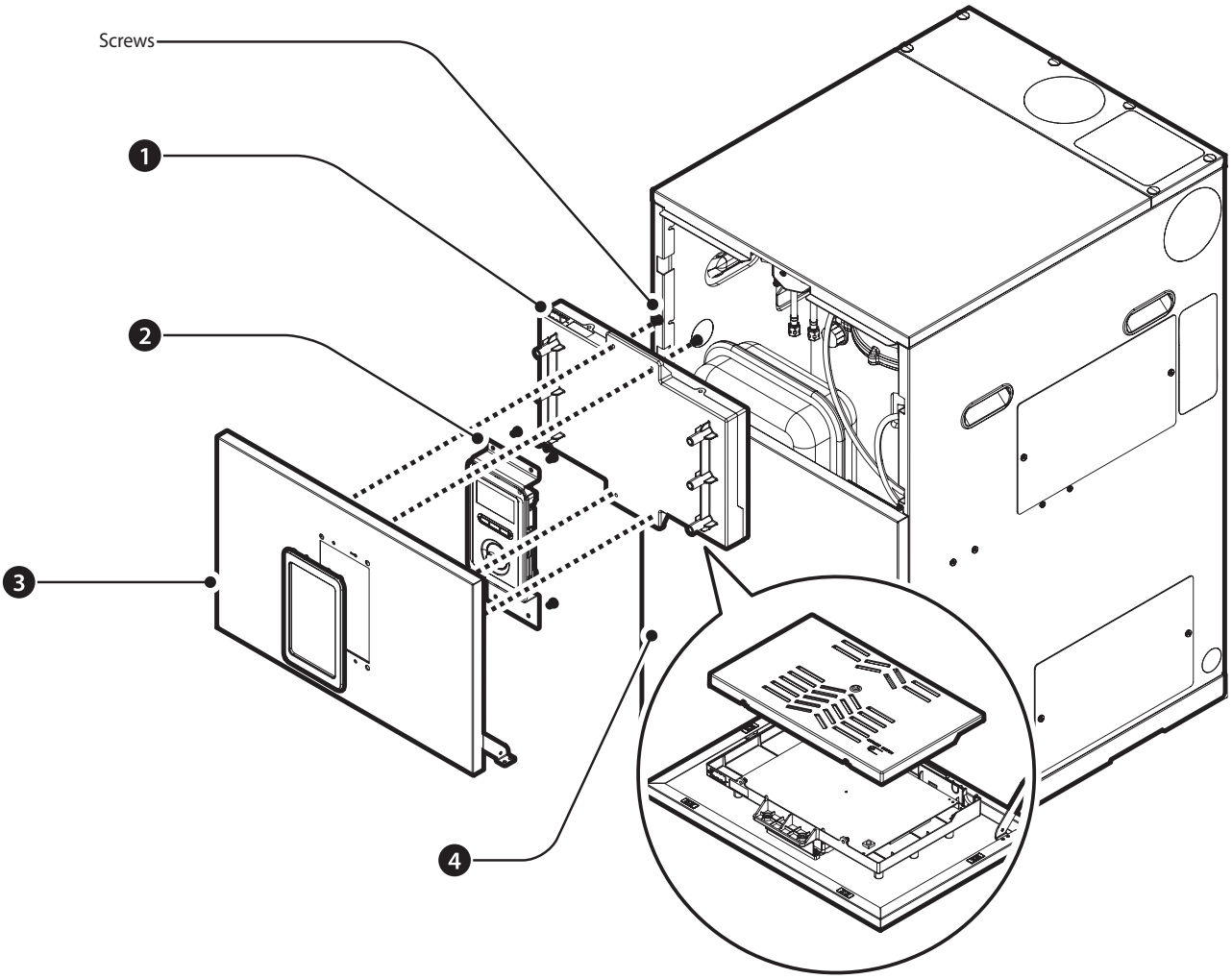


2. Pull out the oil pump filter from the oil pump and remove any deposits that have accumulated around the filter.



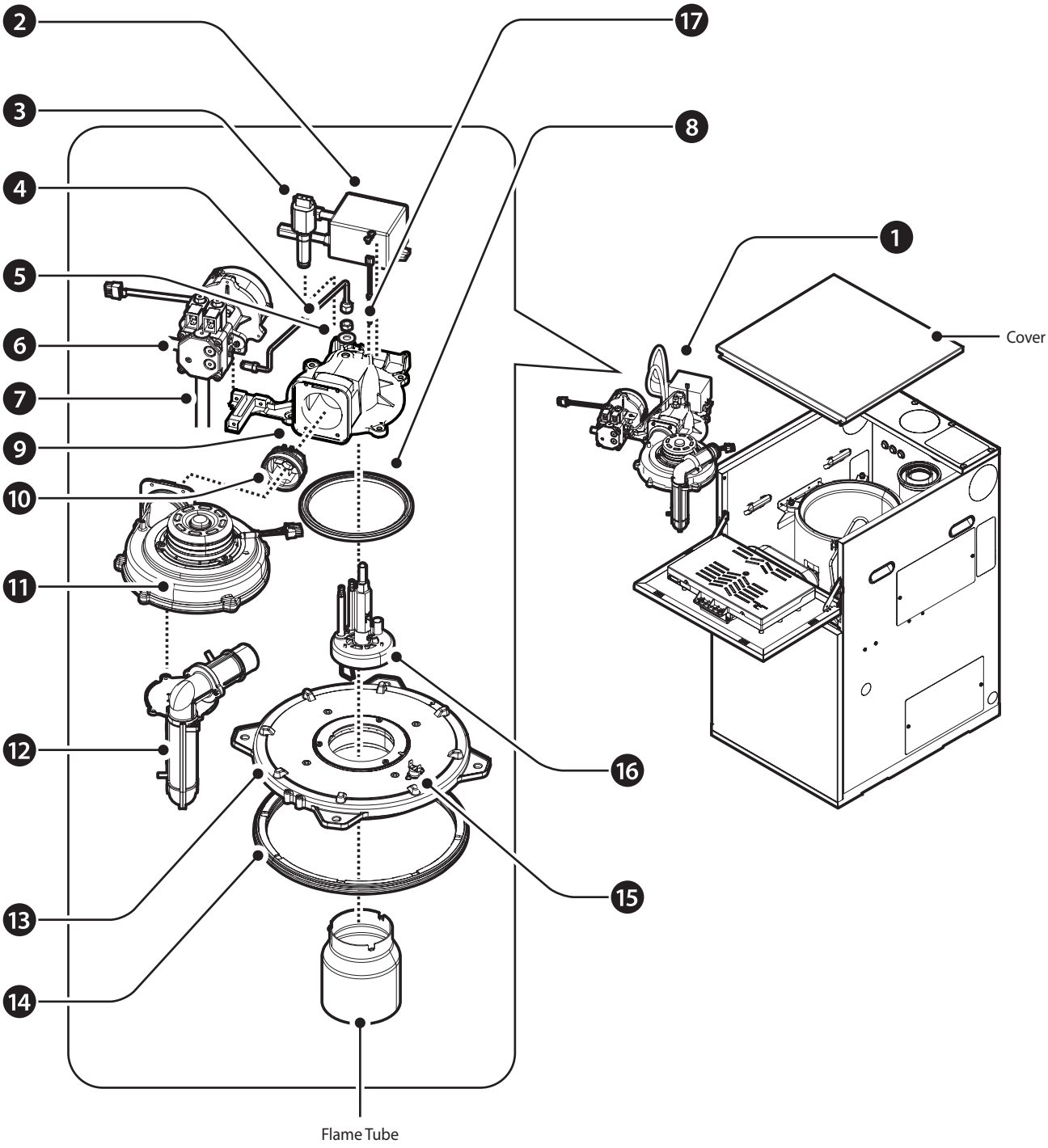
9. Components Diagram and Part List

9.1 Controller and Panel

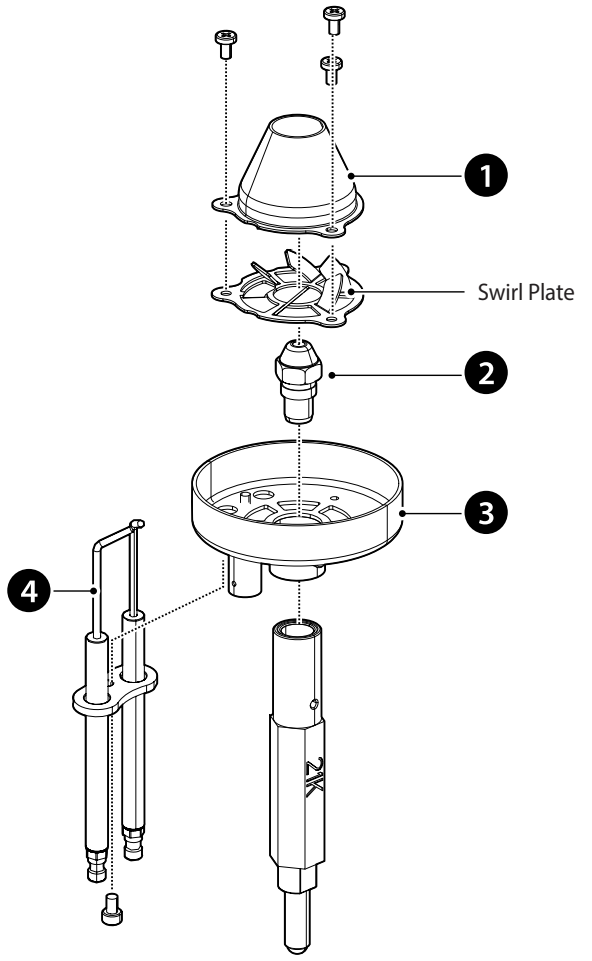


#	Description	Part #	Remark
1	Controller	30021889A	System
	Controller	30021890A	Regular
	Controller	30021891A	Combi
2	Panel	30021314A	
3	Front Case	20043423A	Internal(System/Regular)
	Front Case	20046860A	Internal(Combi)
	Front Case	20044629A	External(System/Regular)
	Front Case	20047456A	External(Combi)
4	Front Bottom Case	20043419A	Internal(System/Regular)
	Front Bottom Case	20046830A	Internal(Combi)

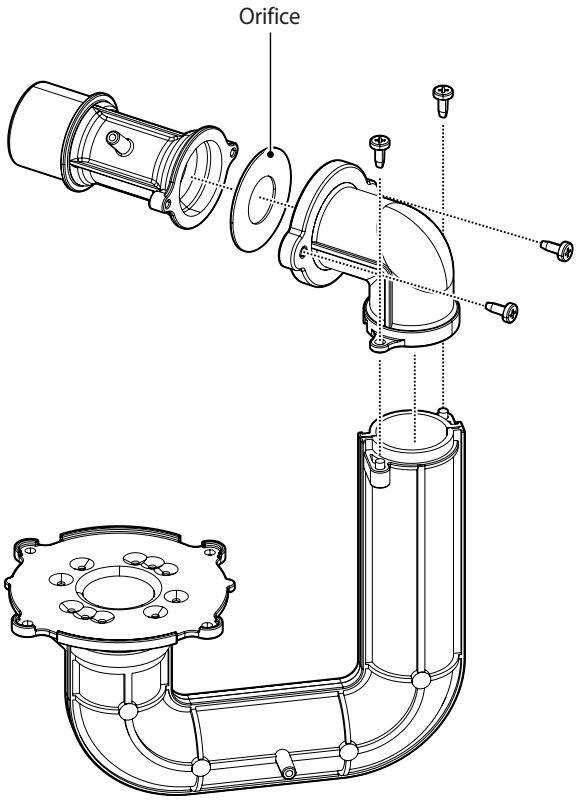
9.2 Burner



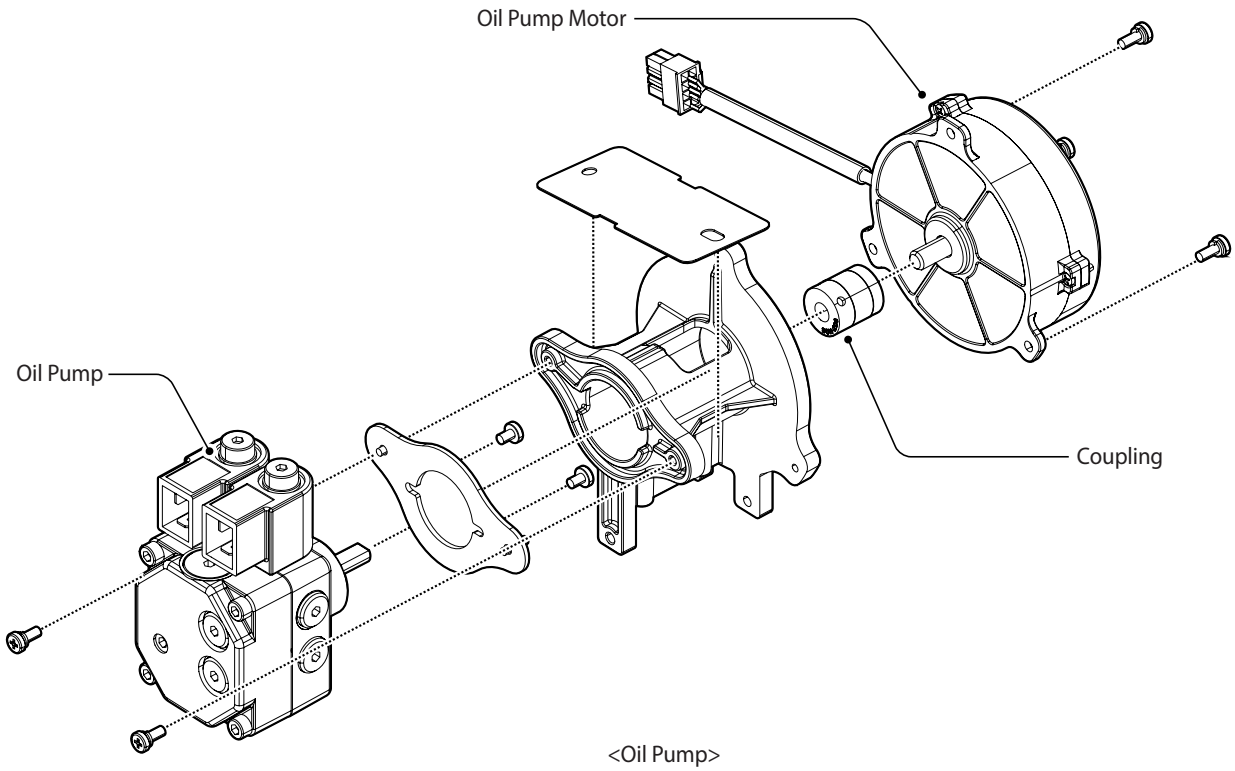
#	Description	Part #	Remark
1	Burner Assembly	30021123A	21 kW
	Burner Assembly	30021124A	28 kW
	Burner Assembly	30021125A	36 kW
2	Ignition Transformer	30021149A	
3	UV Sensor	30021145A	
4	Oil Pipe	30021150A	
5	Nut - Oil Inner Tube Fix	20009942A	
6	Oil Pump Assembly	30021151A	
7	Flexible Oil Hose	20010105E	
8	Packing for Burner House	20043392A	
9	Packing for Fan	20042399A	
10	Back Draft Damper	30008825A	
11	Fan Assembly	30021329A	21/28 kW
	Fan Assembly	30021328A	36 kW
12	Intake Pipe Assembly	30021807A	21 kW
	Intake Pipe Assembly	30021809A	28 kW
	Intake Pipe Assembly	30021827A	36 kW
13	Combustion Top Cover Assembly	30021121A	21/28 kW
	Combustion Top Cover Assembly	30021823A	36 kW
14	Packing for Combustion Cover	20043390A	21/28 kW
	Packing for Combustion Cover	20044609A	36 kW
15	High Limit Stat for Combustion Cover	30014887A	
16	Flame Holder Assembly	30021142A	21 kW
	Flame Holder Assembly	30021143A	28 kW
	Flame Holder Assembly	30021144A	36 kW
17	Temperature Sensor	30020489A	



<Flame Holder Assembly>



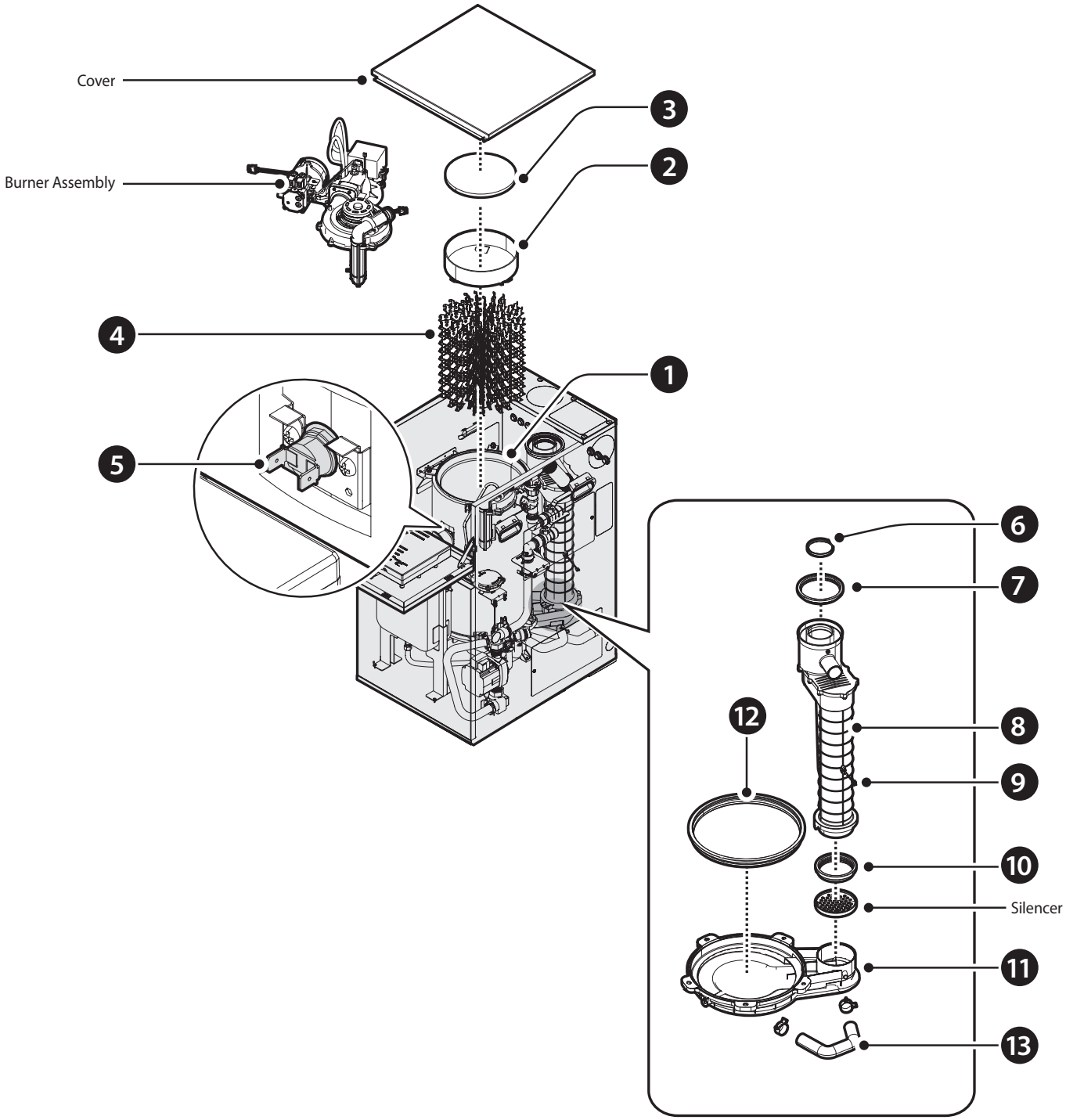
<Intake Pipe>



<Oil Pump>

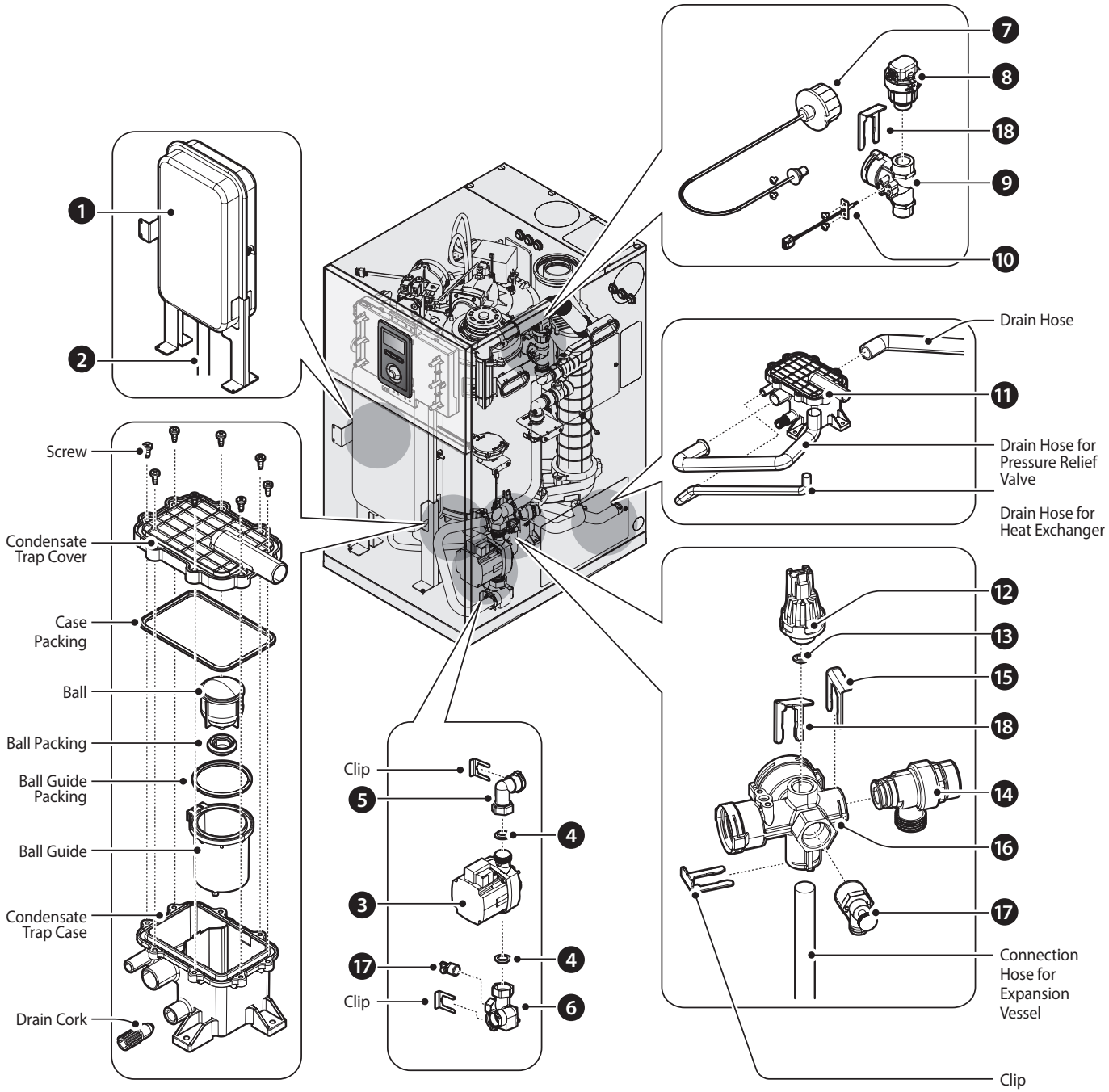
#	Description	Part #	Remark
1	Air Nozzle	20043449A	21 kW
	Air Nozzle	20043450A	28 kW
	Air Nozzle	20043451A	36 kW
2	Oil Nozzle (Kerosene)	20043603A	21 kW
	Oil Nozzle (Kerosene)	20043604A	28 kW
	Oil Nozzle (Kerosene)	20043605A	36 kW
	Oil Nozzle (Light-Oil)	20047433A	21 kW
	Oil Nozzle (Light-Oil)	20047434A	28 kW
	Oil Nozzle (Light-Oil)	20047435A	36 kW
3	Flame Holder	30021071A	
4	Ignition	30022883A	21 kW
	Ignition	30022884A	28 kW
	Ignition	30022885A	36 kW

9.3 Heat Exchanger Turbulence and Exhaust Duct



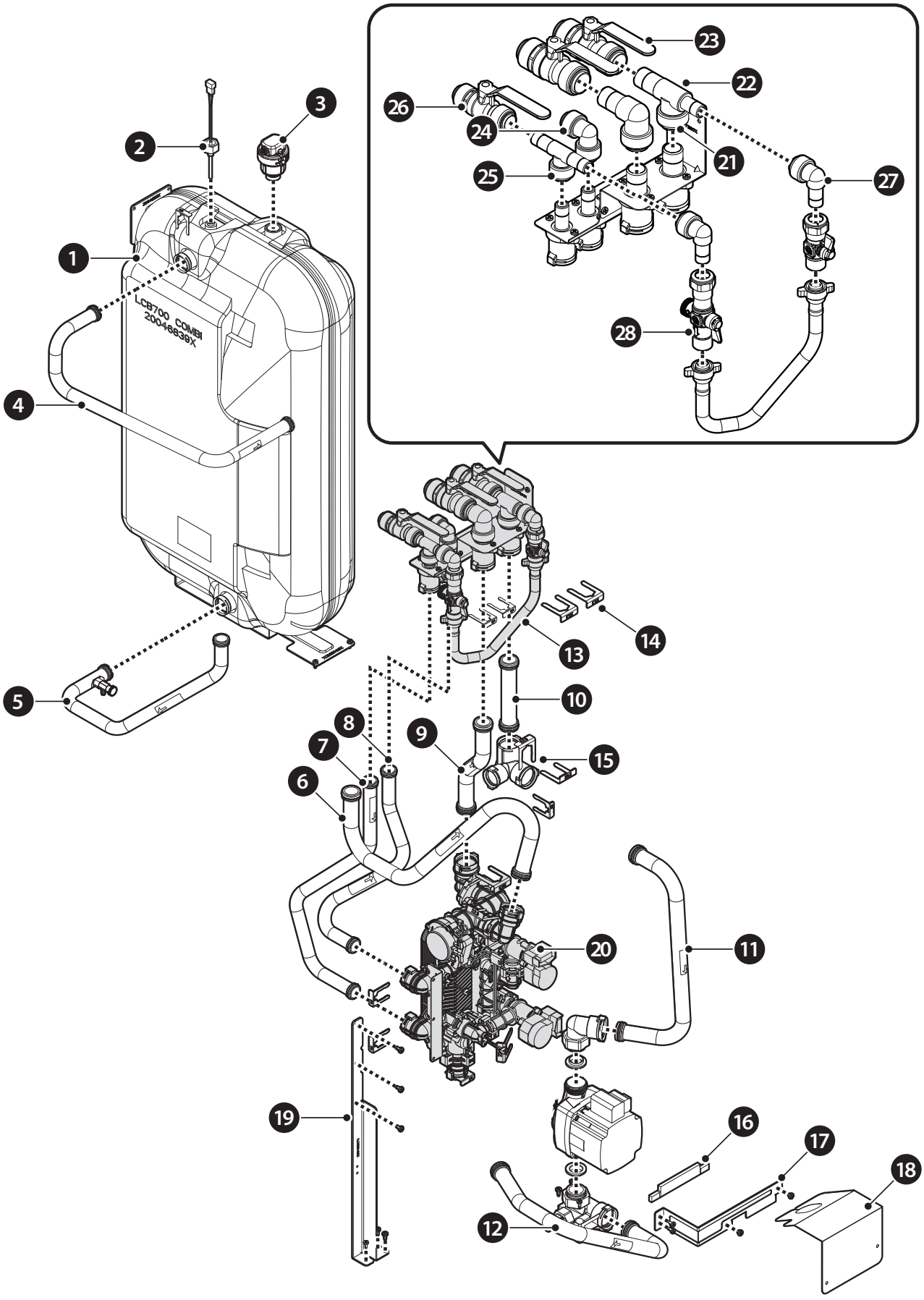
#	Description	Part #	Remark
1	Heat Exchanger	30021066A	21 kW
	Heat Exchanger	30021067A	28 kW
	Heat Exchanger	30021068A	36 kW
2	Guide for Combustion	30021083A	21/28 kW
	Guide for Combustion	30021204A	36 kW
3	Insulation	20043518A	
4	Turbulence	20043515A	
5	High Limit Stat for Heat Exchanger	30002557A	
6	Packing for Exhaust	20029713A	
7	Air Supply Packing	20043645A	
8	Exhaust Duct	30021130A	System/Regular
		30023172A	Combi
9	Temperature Sensor	30020489A	
10	Packing for Exhaust Duct	20040241A	
11	Condensate Pan	30021084A	21/28 kW
	Condensate Pan	30021825A	36 kW
12	Packing for Condensate Pan	20043394A	21/28 kW
	Packing for Condensate Pan	20044605A	36 kW
13	Condensate Discharge Hose	30021085A	

9.4 Water Piping Parts



#	Description	Part #	Remark
1	Expansion Vessel	30022587A	System/Combi
2	Flexible Hose	20043593A	System/Combi
3	Circulation Pump	30022230A	System/Combi
4	Packing	20044484A	System/Combi
5	Pump Inlet Adapter	30022969A	System/Combi
6	Pump Outlet Adapter	30022970A	System/Combi
7	Pressure Gauge	30020258A	
8	Air Vent	30023517A	
9	Central Heating Supply Water Adapter	20043463A	System/Regular
		20047273A	Combi
10	Temperature Sensor	30012907A	
11	Condensate Trap	30022910A	
12	Pressure Sensor	30014699A	
13	Pressure Sensor Packing	20006873A	
14	Pressure Relief Valve	30002251A	
15	Clip	20007837B	
16	Central Heating Return Water Adapter	20043464A	
17	Drain Valve	20043465A	
18	Clip	20040255A	

9.5 DHW Parts


LCB700 COMBI
20048838X
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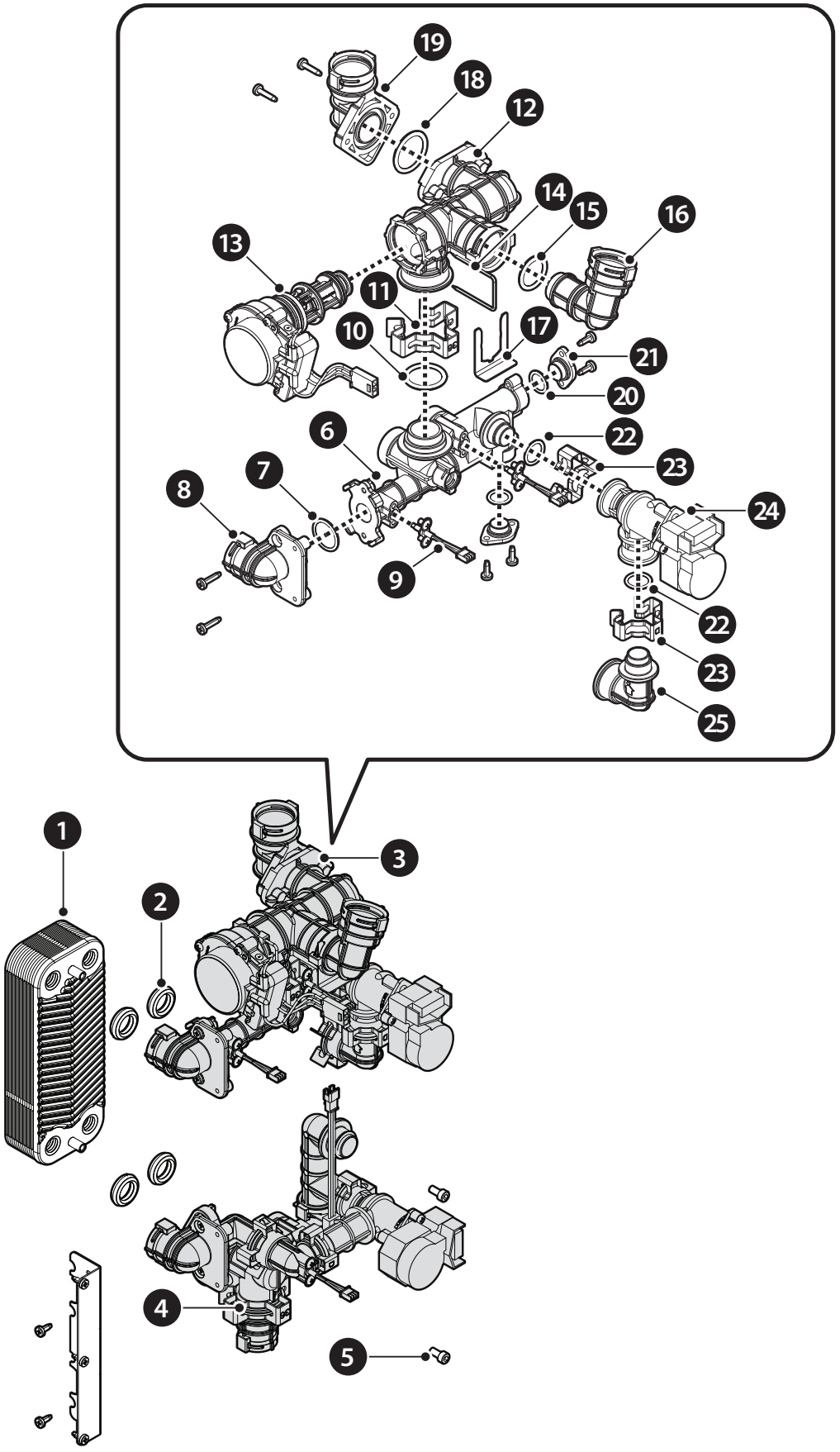
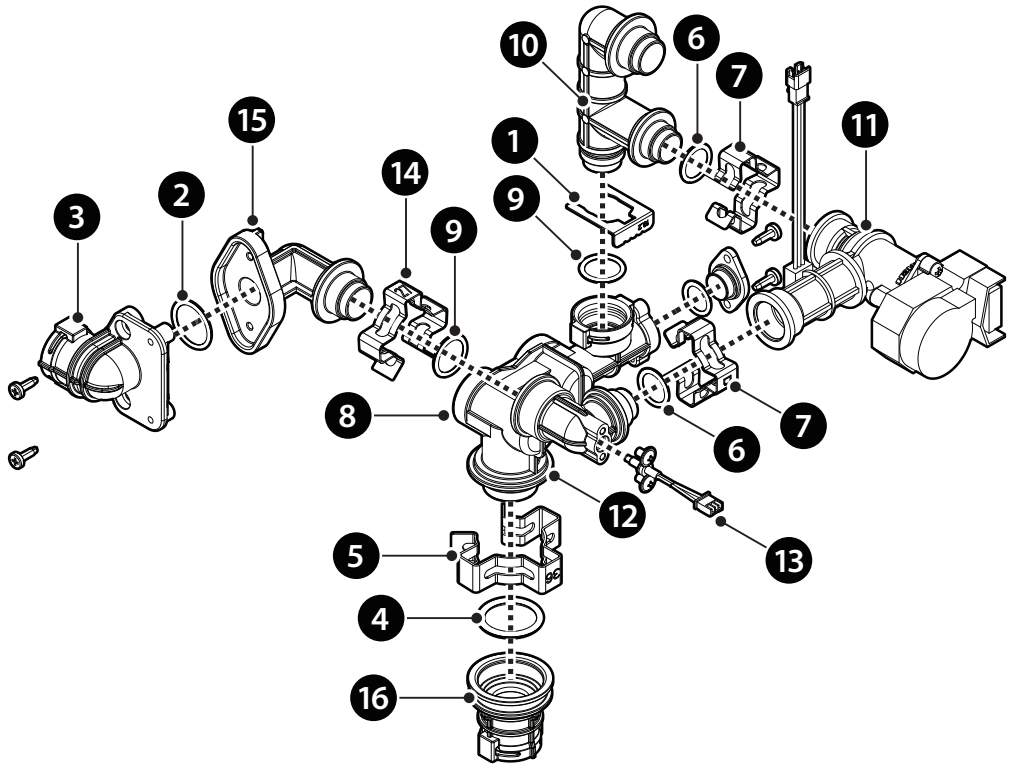
#	Description	Part #	Remark
1	Storage Tank	30022441A	
2	Temperature Sensor	30002659A	
3	Air Vent	30023517A	
4	Pipe_Tank Outlet	30023511A	
5	Pipe_Tank Inlet	30023282A	
6	Pipe_Heat Exchanger Outlet	30023512A	
7	Pipe_Domestic Cold Water Inlet	30023281A	
8	Pipe_Domestic Hot Water Outlet	30023280A	
9	Pipe_Heating Outlet	30023285A	
10	Pipe_Heating Return	30013508A	
11	Pipe_Heating Return_Pump	30023287A	
12	Pipe_Heat Exchanger Inlet	30023513A	
13	Clip_STS430,Φ19.2×1t	20007733B	
14	Clip_STS430,Φ22.3×1t	20033662A	
15	Adaptor_Heating Return_tank	20046875A	
16	Packing_Fix Pump	20047567A	
17	Bracket_Fix Pump	20047564A	
18	Film_Protection Pump	20047565A	
19	Bracket_DHW Block	20046827A	
20	DHW Block Assembly	30023207A	
21	Push Fit Elbow_Φ22	30023732A	
22	Push Fit Tee_Φ22	30023732A	
23	Push Fit Valve_Φ22	30023732A	
24	Push Fit Elbow_Φ15	30023732A	
25	Push Fit Tee_Φ15	30023732A	
26	Push Fit Valve_Φ15	30023732A	
27	Push Fit Elbow_Male_Φ15	30023732A	
28	Filling Loop	30023733A	

9.6 DHW Block and Heating Supply Assembly



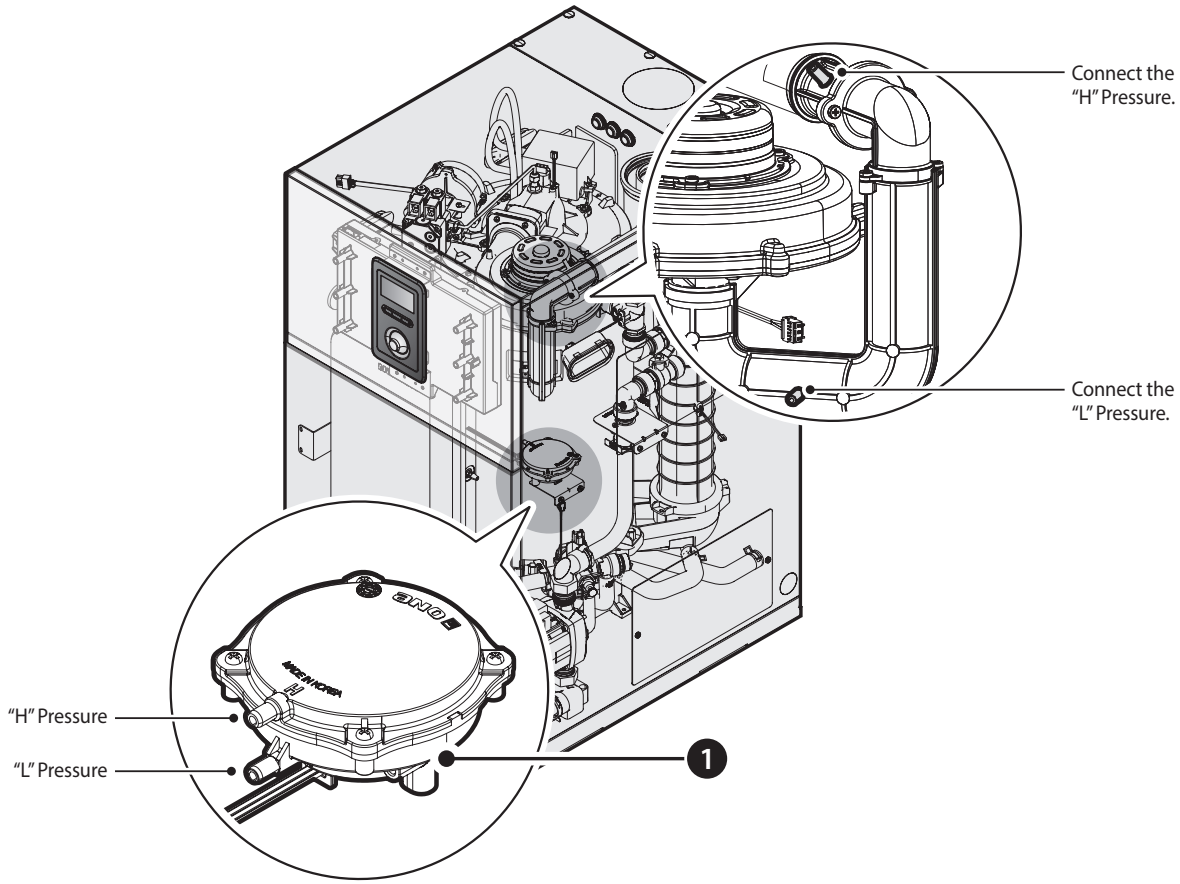
#	Description	Part #	Remark
1	DHW Heat Exchanger	30018296A	
2	Packing_DHW Heat Exchanger	20035234B	
3	DHW_Heating Supply Assembly	30023439A	
4	DHW_Cold Water Inlet Assembly	30023438A	
5	Bolt_Hex Wranch M5×10L	20009865A	
6	Manifold_Heating Supply	20044482A	
7	O-ring_P22	20018011A	
8	Adaptor_DHW_In/Outlet	20047162A	
9	Temperature Sensor	30015178A	
10	O-ring_P26	20032409A	
11	Clip_Φ36	20017724A	
12	Heating Water Return	20046493A	
13	3-Way Valve	XXXXXXXXA	
14	Clip_Wire_3-Way Valve	20029414A	
15	O-ring_P22	20033699A	
16	Adaptor_3-Way Inlet	20047160A	
17	Clip_STS430,Φ19.2×1t	20007733B	
18	O-ring_P28	20022142A	
19	Adaptor_Heating Water	20047161A	
20	O-ring_P14	20011438A	
21	Cap	20017744A	
22	O-ring_P16	20017210A	
23	Clip_D_Φ25	20007859A	
24	Mixing Valve	30011532A	
25	Adapter_Elbow	20025962B	

9.7 DHW Cold Water Inlet Assembly



#	Description	Part #	Remark
1	Clip_STS430,Φ19.2×1t	20007733B	
2	O-ring_P22	20018011A	
3	Adaptor_DHW_In/Outlet	20047162A	
4	O-ring_P26	20032409A	
5	Clip_Φ36	20017724A	
6	O-ring_P16	20017210A	
7	Clip_D_Φ25	20007859A	
8	Manifold_Cold Water Inlet	20044471A	
9	O-ring_P18	20006947A	
10	Adapter_Connect	20044469A	
11	Water Adjust Valve	30008247A	
12	Adapter_Elbow_Temp. Sensor	20044470A	
13	Temperature Sensor	30022207A	
14	Clip_Φ27	20017726A	
15	Adapter_DHW Outlet	20044477A	
16	Adapter_Manifold Connect	20047163A	

9.8 APS Hose Connection Locations



#	Description	Part #	Remark
1	Air Pressure Sensor	30022962A	

Memo