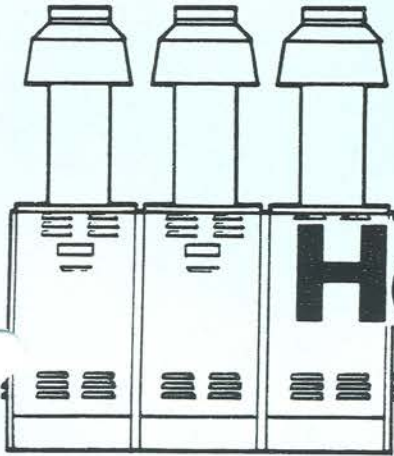
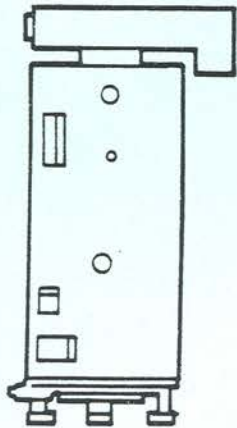
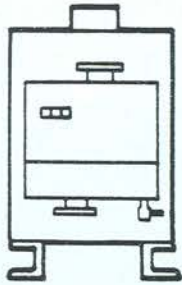


HAMWORTHY
heating products



Hamworthy Heating Products



**DR-SE 155-380 Series
Hot Water Storage Heaters
Installation, Commissioning
and Maintenance Manual**



BS 5750 Part 1
Certificate No. FM 10082

DR-SE 300

DR-SE 380

GAS FIRED STORAGE HEATERS
FOR DOMESTIC HOT WATER

INSTALLATION AND COMMISSIONING
INSTRUCTIONS FOR NATURAL GAS
WITH AN APPENDIX FOR L.P.G.

(WAS PUBLICATION NO HPM 2014 1188)

RENUMBERED 500001022 "A"

DELIVERY

All heaters are factory assembled and individually packaged and protected, they should be inspected on receipt and any damage immediately reported to Hamworthy head office, local office or agent.

To check the size of the heater, refer to the data label adjacent to the gas control valve.

DESCRIPTION

The DR-SE Series of automatic gas fired water storage heaters has a range of four units designated DR-SE 155, 190, 300, and 380. Each unit is fired by an atmospheric gas burner incorporating a permanent pilot and controlled by a multi-functional gas valve of the self energising type (no electrical supply required). This valve is fitted with an integral control thermostat for automatic temperature control and a high limit thermostat requiring re-light of the pilot to protect against overheat. A piezo unit is provided for ignition of the permanent pilot.

Flue gases from the combustion chamber pass through the heater via a single central fire tube which is fitted with a stainless steel retarder to ensure maximum heat transfer to water. The draught diverter supplied must be fitted in an unmodified condition to the top of the fire tube where it provides a spigot for connection to a vertical flue.

The internal surfaces of the vessel, coated with a high quality glass lining, together with a removable sacrificial magnesium anode, provides the best possible protection against waterside corrosion. The vessel is fully insulated and covered in a pre-coated sheet steel casing.

The connections provided on each heater are: cold water inlet, hot water outlet, secondary recirculation and a drain complete with drain cock. The DR-SE 300 and 380 are additionally provided with an inspection/clean out door.

The heaters are floor mounted units designed to provide hot water for domestic, commercial and industrial premises. They can be installed in single or multiple units and can also be used in conjunction with suitably sized additional storage tanks (not HEL supply).

Conversion kits can be supplied fitted or for site fitting which provide a 240 volt a.c. solenoid valve between the control valve and the burner, enabling the heater to be controlled from a time clock or interlock (ie, fan dilution flow switch).

TECHNICAL DATA

Technical data is shown in table 1.

Heater Connections

Water

Cold Feed	R1½	1½ in BSP External Taper
Hot Flow	R1½	1½ in BSP External Taper
Recirculation	Rc1 R1	1 in BSP (Internal) Taper DR-SE 300, 380 1 in BSP (External) Taper DR-SE 155, 190
Drain cock	¾ in BSP cock with 13 mm (½ in) hose connection	

Gas

Inlet pipe to Valve R $\frac{1}{2}$ $\frac{1}{2}$ in BSP (External) taper DR-SE 300, 380
 Rc $\frac{1}{2}$ $\frac{1}{2}$ in BSP (Internal) taper DR-SE 155, 190

Gas Cock (Union) 2xRc $\frac{1}{2}$ 2x $\frac{1}{2}$ in BSP Internal taper

Flue

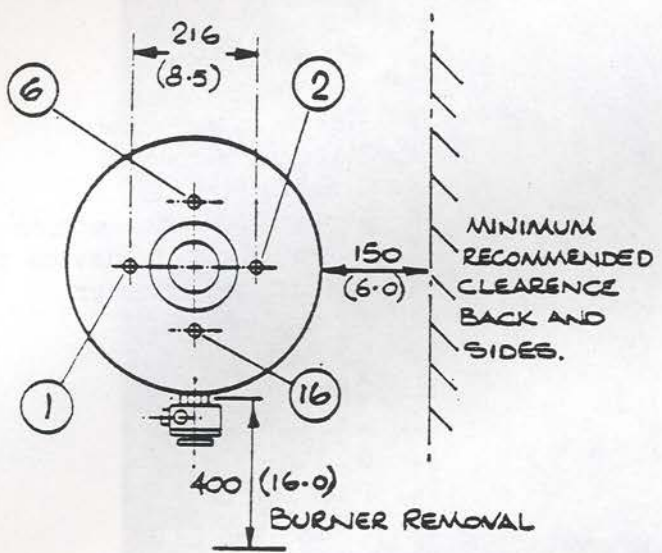
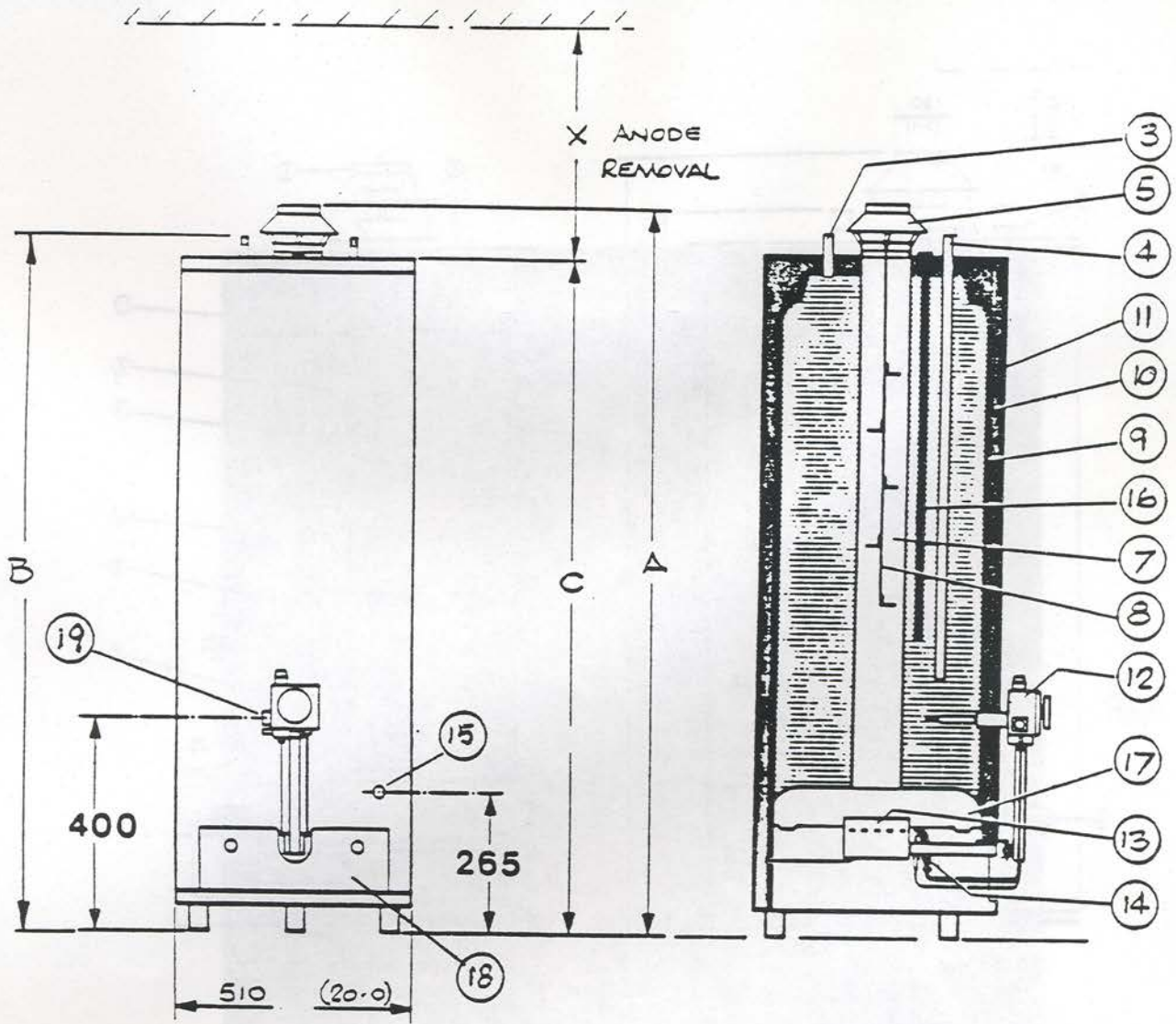
Draught Diverter 105 mm (4.1 in) on DR-SE 155, 190
 Spigot I.D. 130 mm (5.1 in) on DR-SE 300, 380

Nominal Bore 100 mm (4.0 in) on DR-SE 155, 190
 of flue outlet 125 mm (5.0 in) on DR-SE 300, 380

Detailed dimensions of all heaters are shown in figs 1a and 1b.

TABLE 1 - TECHNICAL DATA

MODEL		DR-SE 155	DR-SE 190	DR-SE 300	DR-SE 380
Input (Gross)	kW	11.5	12.9	18.30	23.52
	Btu/h	39,164	44,000	62,450	80,250
Output	kW	8.84	10.00	14.00	18.00
	Btu/h	30,150	34,120	47,770	61,420
Weight (filled)	kg	223	268	464	570
	lb	491	590	1022	1257
Maximum Working Head	mbar	53 (5.2)	53 (5.2)	53 (5.2)	53 (5.2)
	ft (p.s.i.g.)	174 (75)	174 (75)	174 (75)	174 (75)
Nominal Gas Inlet Pressure (Nat Gas)	mbar	17.5	17.5	17.5	17.5
	in w.g.	7	7	7	7
Maximum Gas Inlet Pressure	mbar	49	49	49	49
	in w.g.	19.7	19.7	19.7	19.7
Gas Burner Setting Pressure	mbar	8.0	7.5	11.4	12.1
	in w.g.	3.21	3.0	4.6	4.9
Injector Diameter	mm	3.0	3.2	3.5	4.0
	in	0.118	0.126	0.138	0.157
Injector Markings		300	320	350x6	400x6
Capacity	litres	155	190	300	380
	UK gal	34.0	41.8	66.0	83.6
Continuous Output with Δt of 44°C (80°F)	litres/h	172.5	195.6	271	349
	UK gal/h	38.0	43.1	59.7	76.8
Time to Recover Storage - Δt of 44°C (80°F)	min	54	59	66	66
Input Gas Rate (Nat Gas)	m ³ /h	1.066	1.2	1.71	2.20
	ft ³ /h	37.66	42.3	60.3	77.5



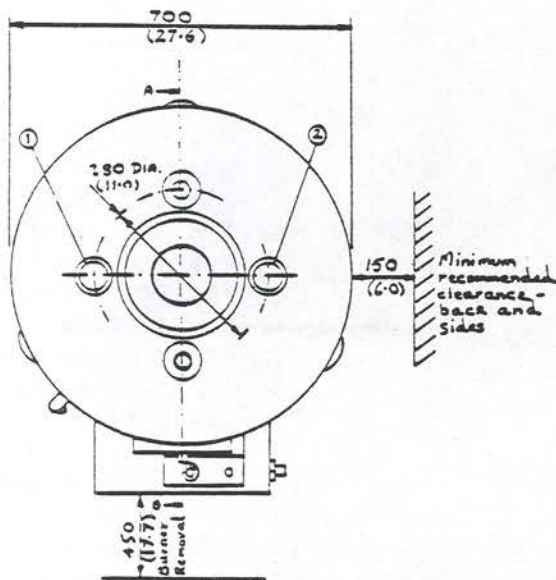
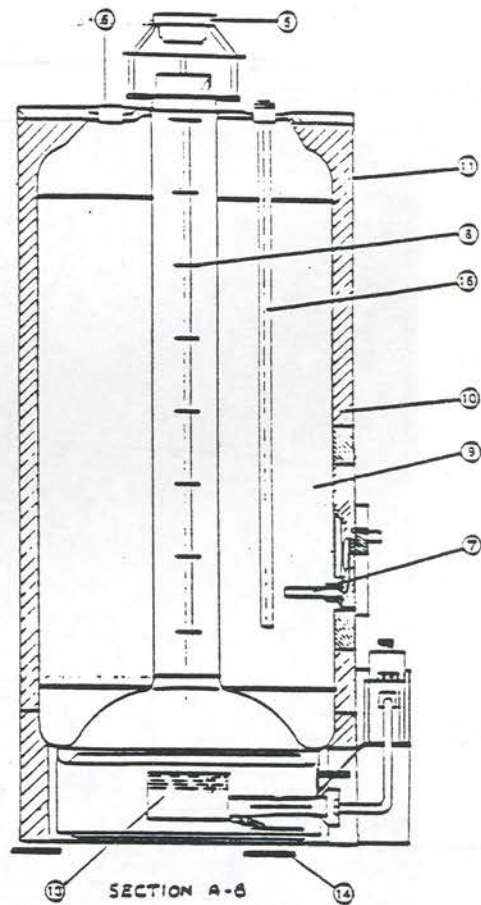
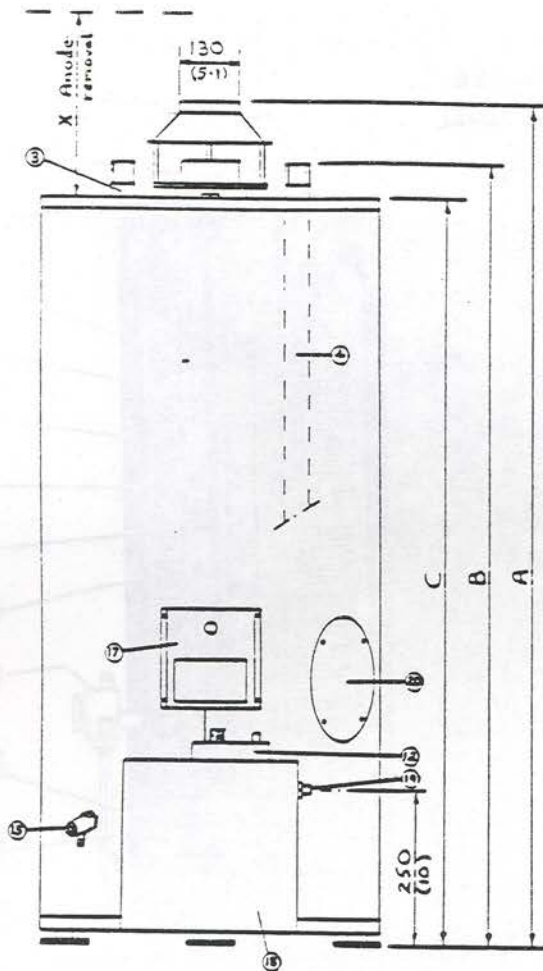
- 1 Hot water flow
- 2 Cold feed
- 3 Plastic insert-flow
- 4 Plastic insert-feed
- 5 Draught diverter
- 6 Recirculation connection
- 7 Heater tube
- 8 Exhaust gas retarder
- 9 Storage vessel
- 10 Insulation
- 11 Casing
- 12 Gas control valve
- 13 Burner
- 14 Pilot burner
- 15 Drain cock
- 16 Magnesium anode
- 17 Combustion chamber
- 18 Burner cover
- 19 Gas inlet connection

MODEL	DR-SE 155	DR-SE 190
A	1450 (57.08)	1720 (67.16)
B	1380 (54.33)	1620 (63.78)
C	1340 (52.75)	1580 (62.20)
X	675 (26.57)	800 (31.50)

DIMENSIONS IN MM (IN.)

DIMENSIONED VIEWS DR-SE 155, 190 WATER HEATER

fig. 1a



- 1 Hot water flow
- 2 Cold feed
- 3 Plastic insert-flow
- 4 Plastic insert-feed
- 5 Draught diverter
- 6 Recirculation connection
- 7 Overheat cut-off device pocket
- 8 Exhaust gas retarder
- 9 Storage vessel
- 10 Insulation
- 11 Casing
- 12 Gas control valve
- 13 Burner
- 14 Pilot burner
- 15 Drain cock
- 16 Magnesium anode
- 17 Thermostat cover plate
- 18 Burner cover
- 19 Gas inlet connection
- 20 Inspection port cover plate

Model	DR-SE 300	DR-SE 380
A	1620 (63.8)	1930 (76.0)
B	1520 (59.8)	1830 (72.0)
C	1485 (58.5)	1795 (70.7)
X	950 (37.4)	1150 (45.3)

dimensions in mm (in)

DIMENSIONED VIEWS DR-SE 300, 380 WATER HEATERS

Fig 1b

GENERAL REQUIREMENTS

The Gas Safety Regulations 1984 require that all gas appliances are installed by competent persons.

The installation of the heater must be in accordance with the relevant requirements of the Gas Safety Regulations, Building Regulations, and the Byelaws of the Local Water Undertaking. It should also be in accordance with any relevant requirements of the Local Gas Region and Local Authority and the relevant recommendations of the following documents:-

British Standard Codes of Practice:-

- C.P. 331: Installation of pipes and meters for Town Gas
Part 3: Low pressure installation pipes.
- B.S. 5376: Code of practice for selection and installation of gas space heating.
Part 2: Boilers up to 60 kW output.
- B.S. 6644: Specification for installation of gas fired hot water boilers of rated inputs between 60 kW and 2 MW (2nd and 3rd family gases).
- C.P. 342: Centralised hot water supply.
Part 1: Individual dwellings.
Part 2: Buildings other than individual dwellings.
- B.S. 5546: Code of practice for installation of gas hot water supplies for domestic purposes.
- B.S. 5440: Code of practice for gas appliances up to 60 kW output
Part 1: Flues
Part 2: Air Supply

British Gas Publications:-

- 1M/11: Flues for commercial and industrial gas fired boilers and air heaters.

LOCATION

The heater location should be such that a satisfactory flue system can be connected. An adequate air supply must be provided for combustion and ventilation (see table 4), and sufficient space allowed around the heater for servicing (see fig 1). The heater must be installed on a level concrete floor or plinth which is sufficient to support its weight when filled with water (see table 1).

Any combustible material adjacent to the heater and flue system must be so placed or shielded so as to ensure that its temperature does not exceed 65°C (150°F).

GAS SUPPLY

Service Pipes

The local Gas Region must be consulted at the installation planning stage in order to establish the availability of an adequate supply of gas.

An existing service pipe must not be used without prior consultation with the Local Gas Region.

Meters

If necessary, a new gas meter will be connected to the service supply pipe by the local Gas Region, or a local Gas Region contractor.

Gas Supply Pipes

Supply pipes must be fitted in accordance with C.P. 331:3. Pipework from the meter to the heater must be of adequate size and not smaller than the heater gas connection ($\frac{1}{2}$ in B.S.P.).

Booster Supplies

Where it is necessary to employ a gas pressure booster, the controls must include a low pressure cut-off switch at the booster inlet. The local Gas Region must be consulted before a gas pressure booster is fitted.

FLUE SYSTEM

The Hamworthy DR-SE Series of water heaters are designed to be used with natural draught flues. Flue systems must be designed in accordance with the current regulations and with reference to the British Gas Publication "Flues for Commercial and Industrial Gas Fired Boilers and Air Heaters" and B.S. 5440 Part 1. The following points should be noted:-

The correct draught diverter is packed with each heater. It should be fitted in an unmodified condition to the protruding section of the fire tube at the top of the heater.

a) DR-SE 155, 190

The spigot at the bottom of the draught diverter should be pushed fully home evenly over the tube ensuring that the diverter is in a vertical position and that the flue retarder is in its correct position located in the slots in the top edge of the fire tube (see fig 1a).

b) DR-SE 300, 380

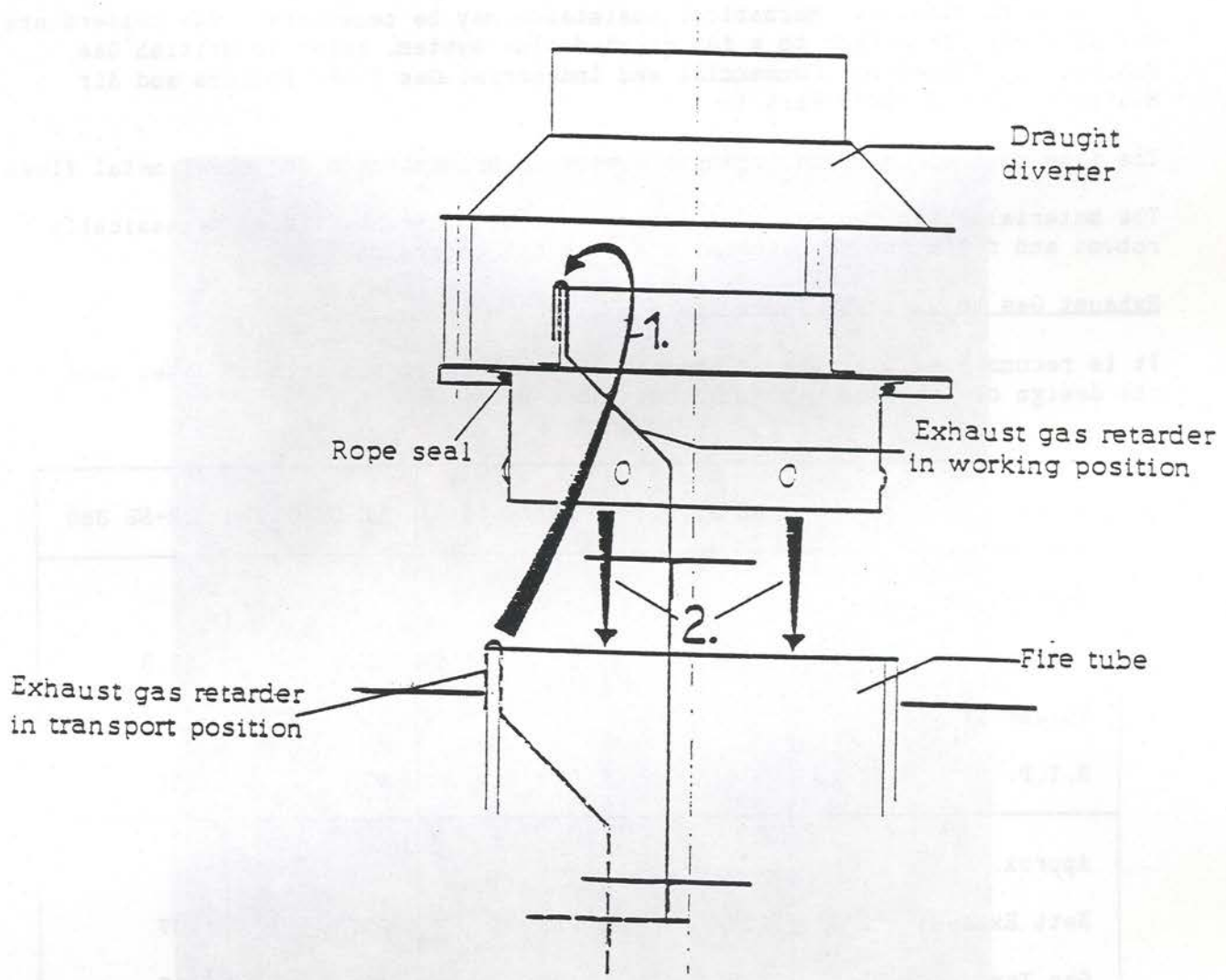
Before fitting the diverter hold it over the fire tube and lift the flue retarder from its transport position to hook over spigot lip on the diverter (see fig 2). Then lower diverter spigot into the fire tube and push home evenly ensuring the rope seal is in position and diverter is vertical.

Any flue system connected to the draught diverter must be self supporting and fitted inside the diverter top spigot.

ALLOWANCE MUST BE MADE IN THE FLUE SYSTEM FOR REMOVAL OF A SECTION CLOSE TO THE HEATER TO ENABLE THE DIVERTER AND RETARDER TO BE REMOVED FOR CLEANING.

The heaters must be located as near the chimney as possible the nearest heater being not more than 2 m (6 ft) away.

The flue system must be designed to achieve a suction condition at the draught diverter at all times the heater is firing. The vertical height of the flue should never be less than 1.2 m (4 ft). Any bends or additional resistances within the flue system must be compensated for by increasing the vertical height above the minimum.



RELOCATION OF RETARDER WHEN FITTING DRAUGHT DIVERTER
DR-SE 300 AND 380 ONLY

Fig 2

In some circumstances, mechanical assistance may be necessary. The heaters are suitable for connection to a fan diluted flue system, refer to British Gas Publication "Flues for Commercial and Industrial Gas Fired Boilers and Air Heaters" and B.S. 5440 Part 1.

The flue connection on the draught diverters are intended for sheet metal flues.

The materials used for the flue system must be non-combustible, mechanically robust and resistant to internal and external corrosion.

Exhaust Gas Volumes and Temperatures

It is recommended that the volume and temperature of the exhaust gases used for the design of the flue system are as shown below.

MODEL		DR-SE 155	DR-SE 190	DR-SE 300	DR-SE 380
Approx.					
Exhaust Gas	m ³ /h	16.3	18.3	25.9	33.3
Volume at					
N.T.P.	ft ³ /h	575	645	916	1180
Approx.					
Nett Exhaust	°C	257	257	257	257
Gas Temp	°F	495	495	495	495

Table 2 - Exhaust Gas Data

AIR SUPPLY

Adequate air for combustion and ventilation must be provided by means of openings at high and low level within the space housing the heater and directly communicating with the outside air. The air supply requirements specified in B.S. 5440 Part 2 and B.S. 6644 are summarised as follows:-

Total input rating of heaters	Position of Openings	Free Area of Opening (Air directed from outside)
Installation up to 730 kW (2,500,000 Btu/h)	High Level	4.5 cm ² per kW (1 in ² per 5,000 Btu/h)
	Low Level	9.0 cm ² per kW (2 in ² per 5,000 Btu/h)

Table 3 - General Air Requirements

MODEL	DR-SE 155	DR-SE 190	DR-SE 300	DR-SE 380
Free area of high level opening	50	55	83	106
cm ²				
in ²	7.5	8.5	12.5	16
Free area of low level opening	100	110	166	212
cm ²				
in ²	15	17	25	32

Table 4 - Air Supply openings per heater

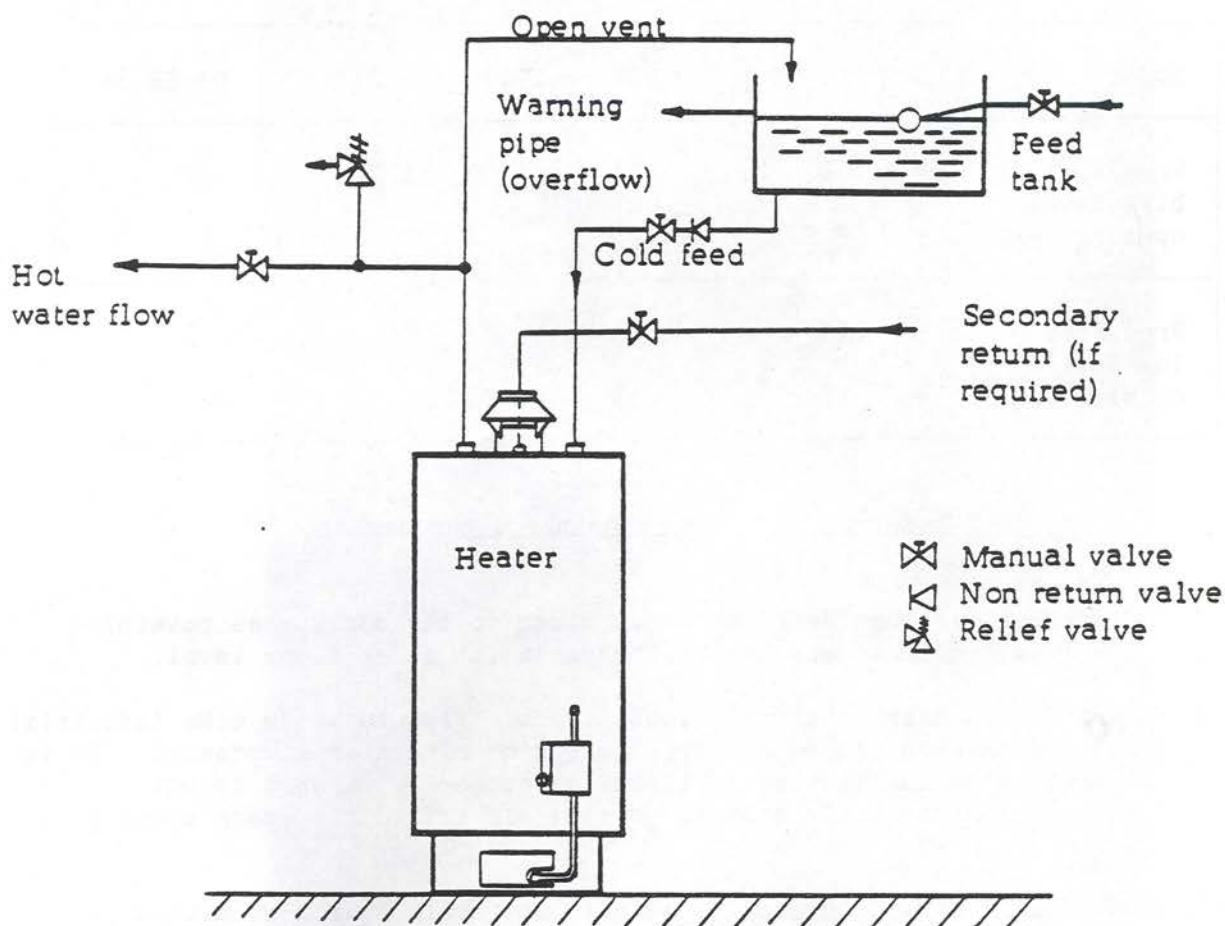
- NOTE 1: High level is considered to be as close to the ceiling as possible. Low level is considered to be 150 mm (6 in) above floor level.
- NOTE 2: Aerosols in hair dressing salons give off vapours as do some industrial processes which can cause rapid corrosion of heater components. It is therefore essential that in these instances the vapours do not contaminate the air supply to, or the air within the space housing the heaters.
- NOTE 3: Particular attention must be paid to any other equipment housed within the same space as the heater, which may use extract equipment. In this instance air supply must be by mechanical means at a greater rate than the total extract in order to ensure correct combustion and operation of the flue system.

WATER PIPEWORK INSTALLATION

A typical schematic installation for a DR-SE heater is shown in fig 3 and a multi heater installation in fig 4.

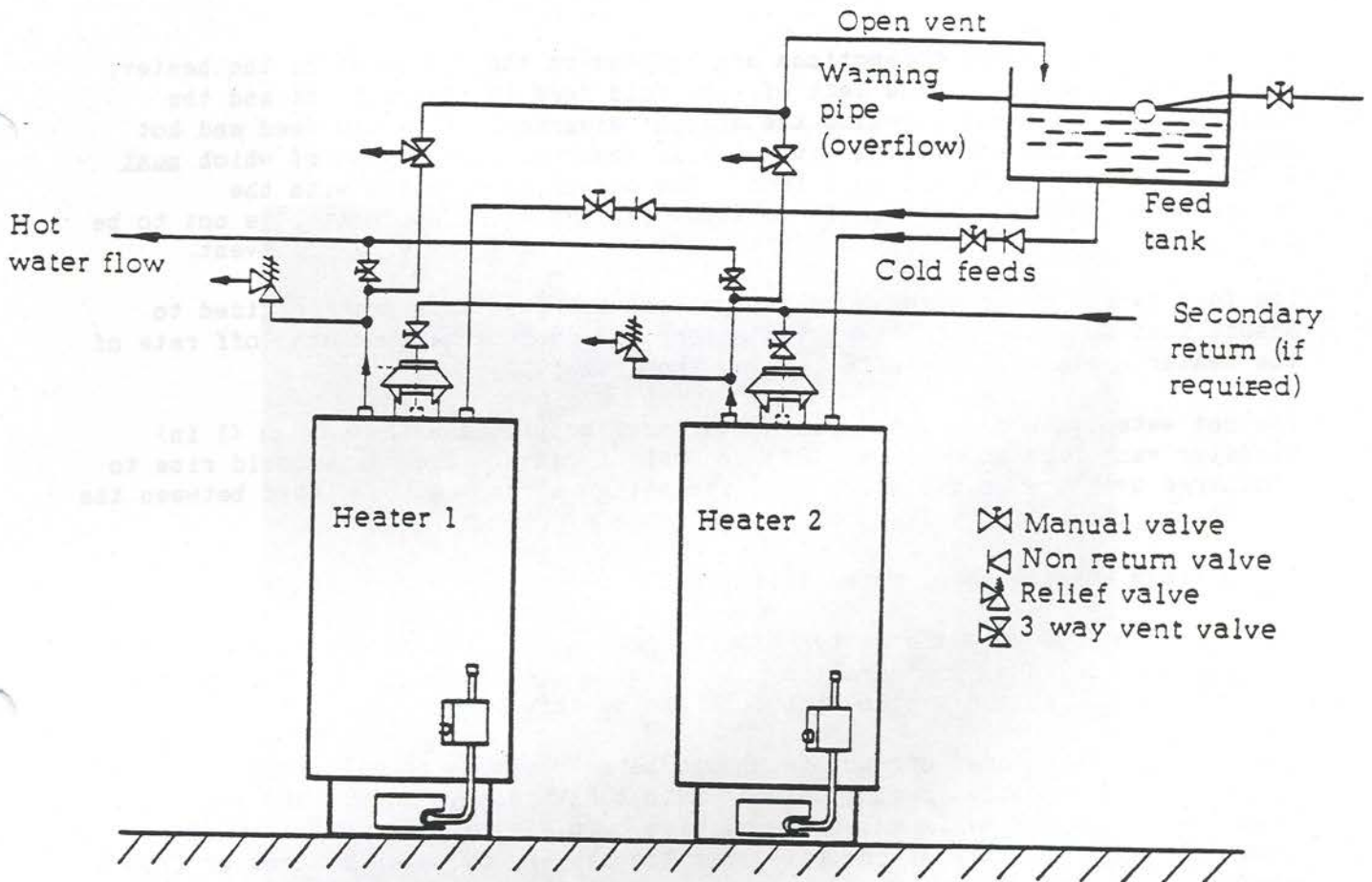
The heaters can also be installed in conjunction with a storage tank, typically as shown in fig 5. To ensure that the tank is brought up to temperature, a suitable pump should be installed between the heater and tank controlled by a thermostat in the tank. This enables hot water from the heater to circulate to the tank and secondary system (if fitted) at periods of no draw-off, thus keeping the whole system up to temperature at which point the pump will switch off.

For sizes of water connection refer to technical data.



TYPICAL SCHEMATIC PIPEWORK ARRANGEMENT - SINGLE HEATER

Fig 3



TYPICAL SCHEMATIC PIPEWORK ARRANGEMENT - MULTI HEATERS

Fig 4

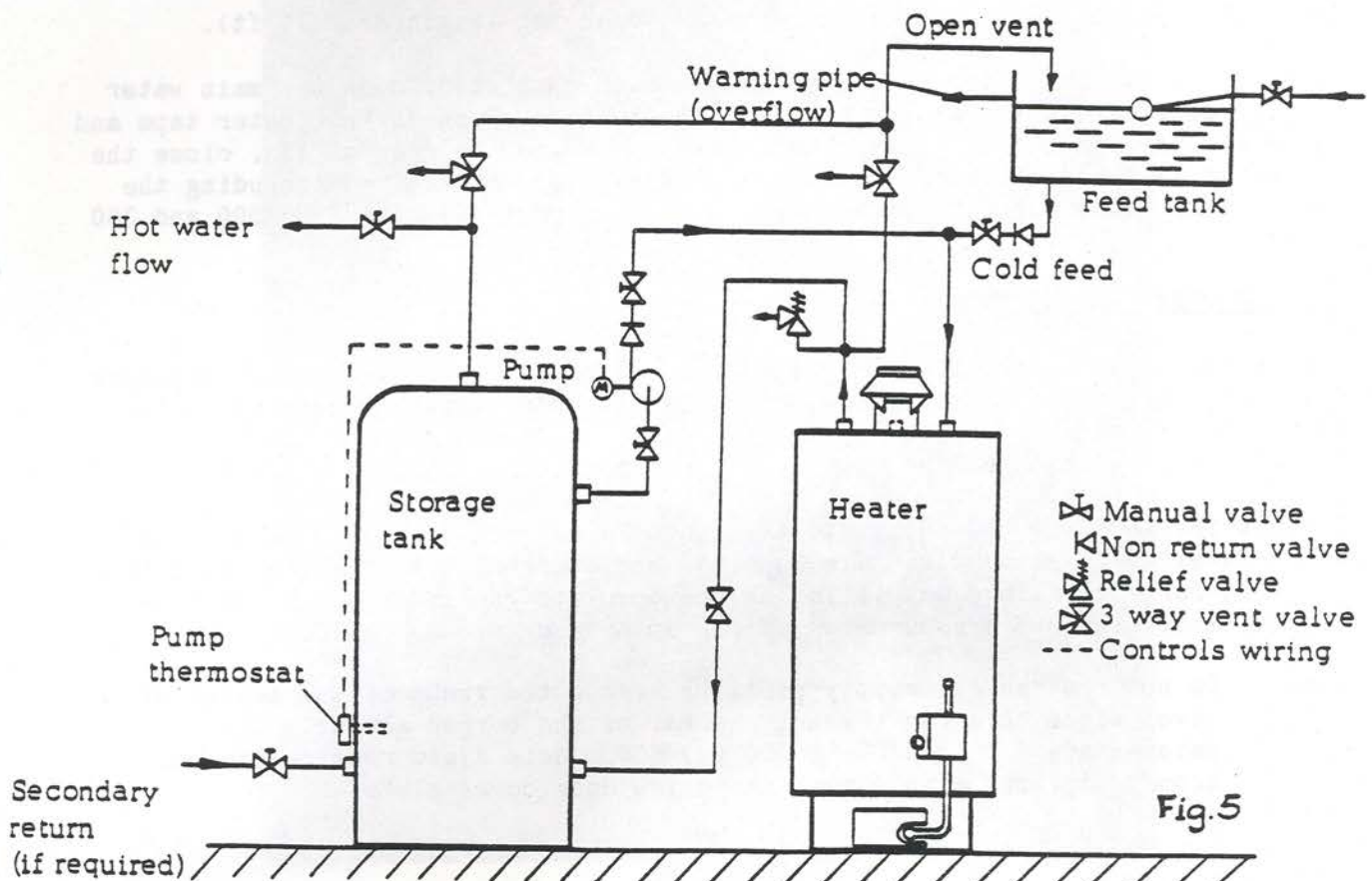


Fig.5

TYPICAL SCHEMATIC PIPEWORK ARRANGEMENT - HEATER WITH STORAGE TANK

All the water pipework connections are located on the top cover of the heater, the hot water supply to the left of, the cold feed to the right of and the recirculation connection behind the draught diverter. The cold feed and hot supply connections are fitted with plastic inserts, the longest of which must always be connected to the cold feed. The heater is supplied with the recirculation connection plugged. If the recirculation connection is not to be used it can be utilised for the fitting of the relief valve or open vent.

The feed tank and the water supply pipe from the feed tank must be sized to ensure that make-up water is equivalent or exceeds the maximum draw off rate of the heater system and any other system requirements.

The hot water flow pipe from each heater must be fitted with a 25 mm (1 in) diameter vent pipe and a 19 mm (3/4 in) relief valve. The vent should rise to discharge over the feed cistern. No isolating valves must be fitted between the heater and the relief valve/open vent.

For maximum working head, refer to table 1.

It is recommended that the heater should operate with not less than a 2 m (6 ft) working head but due consideration must be given to the highest position of any draw off points on the system when determining this height.

Dead legs to water draw off points should be as short as possible and in no case should they exceed the lengths laid down in the Water Bye-Laws. The Water Bye-Laws state that the maximum lengths of pipe supplying a hot water draw off tap, measured along the axis of the pipe from the heater, cylinder or tank or from a secondary circuit are as listed below.

Pipes not greater than 19 mm I.D. (3/4 in) - Max. dead leg length 12 m (40 ft).

Pipes in the range 19-24 mm I.D. (3/4-1 in) - Max. dead leg length 7.6 m (25 ft).

Pipes greater than 25 mm I.D. (1 in) - Max. dead leg length 3 m (10 ft).

After installation of the water system has been completed, open the main water supply valve, flush the system and fill the heater. Open the hot water taps and allow air to escape from the system. When the system is free of air, close the hot water taps and check for leaks on all the water connections including the drain cock, anode connections and the inspection port flange (DR-SE 300 and 380 only).

GAS PIPEWORK INSTALLATION

A 1/2 in BSP taper internal union gas cock is supplied tagged to the gas pipework. The cock can either be fitted direct to the gas inlet pipe or remote from the heater but in close proximity to it. In either case ensure that the cock is fitted with the union on the downstream (gas control valve leg of the pipework).

Connect the incoming gas supply to the gas cock on each heater, observing the notes detailed under section "Gas Supply", and conforming to the requirements of C.P. 331 Part 3. Before commissioning the complete gas installation must be purged, inspected and pressure tested for soundness to C.P. 331 Part 3.

Note: Do not run the gas supply pipework across the front of the heater at low level since this may prevent removal of the burner assembly for maintenance. On the DR-SE 300 and 380 models avoid running the gas supply pipework across the inspection door cover plate.

AUTOMATIC CONTROL - DR-SE 155 - 190

Automatic control of the heater centres around the Sit. AC3 safety and regulating control valve which incorporates the following:-

- a) Thermo-electric safety device.
- b) Temperature regulator.
- c) Pressure regulator, provided with facilities to be put out of service for 3rd family gases (LPG).
- d) Adjusting screw for pilot burner gas supply.
- e) Overtemperature thermostat.
- f) Inlet and outlet pressure points.

The "snap acting" temperature regulator is a gas control device requiring no external power source for it to operate as it is controlled by a thermally responsive expansion element, inserted directly through the tank wall into the water. Lying along side this is the overtemperature sensor also protruding directly into the water. Both devices are an integral part of the control valve and their entry point is also the means by which the valve is mounted to the heater. The control valve knob is marked 1 to 5 and corresponds to a temperature range of 40-70 °C. The overtemperature limit switch is also a thermo-electric safety device and prevents overheating of the water if the thermostat (temperature regulator) fails. It consists of a switch in series with the thermo-electric circuit. If the water temperature exceeds 82-94 °C (limit switch range) the switch opens, the thermocouple current is interrupted and the gas valve shuts down the pilot and main burner. The limit switch automatically resets when the water temperature falls below 50 °C after which time, the pilot may be relit and the main burner re-energised.

WARNING

Before restarting the appliance after an overlimit shutdown, it should be thoroughly checked for faults and rectified.

AUTOMATIC CONTROL - DR-SE 300 - 380

Automatic control of the heater centres around the BM751 multi functional gas control valve which incorporates an integral thermostat with a range of 40 °C to 70 °C (104 °F to 158 °F). The thermostat action is purely mechanical requiring no power supply and operating on the principle of fluid filled bellows, capillary and temperature sensing phial, the latter being located against the side of the heater vessel by means of a clamping bracket. The functions of the valve including the temperature setting are controlled by a single knob with an interlocked piezo unit, which only operates when the control knob is in the pilot gas position, to ignite the permanent pilot. Pilot flame failure is detected by a two piece thermocouple with a drop out time of 35 to 45 seconds. The two sections of the thermocouple are joined by a connection to each side of an overheat cut-off device (limit thermostat) located adjacent to the temperature sensing phial. The overheat cut-off device is of the manual reset type, the reset button being positioned on the thermostat cover plate beneath the black cover knob. The sensing element for this device is located in a pocket projecting into the vessel. The overheat cut-off device is non-adjustable and pre-set to operate at a temperature of 80 °C (176 °F). Should the device operate, the heater is immediately shut down, gas to both pilot and main burner being shut off. Manual re-ignition of the pilot flame is required to reinstate the heater in service, once the temperature has dropped. But the heater installation should be inspected to trace and isolate the cause of the problem before any further firing takes place.

COMMISSIONING

System Checks

Before attempting to commission any heater, ensure that any personnel involved are aware of what action is to be taken and begin by making the following checks:-

- a) Flueway passages to the chimney are clear.
- b) Adequate ventilation exists in the space housing the heater. See Table 4.
- c) The water system is vented, fully charged with water and ready to receive heat.
- d) The gas supply pipework is clear of any loose matter, tested for soundness and purged to CP: 331 Part 3.

Heater Checks

On each heater before attempting to light, check:-

- a) Draught diverter is correctly installed on top of the fire tube in an unmodified condition and the flue retarder is correctly positioned within the fire tube. Take particular care to check on DR-SE 300, 380 (see fig 2).
- b) Gas supply is connected but turned off, cock is closed, unions are tightened, test points are tight, burner is correctly positioned, the injector is tight and the pilot burner is connected from the control valve.
- c) For DR-SE 300, 380 only, that thermostat sensing phial and overheat cut-off device (limit thermostat) are correctly and securely positioned on their brackets against the surface of the heater vessel. Check overheat cut-off device sensing element is positioned correctly within thermostat pocket, remove black cover knob and press reset button fully to ensure device is reset. Check the thermocouple is connected and undamaged between the pilot burner, overheat cut-off device and control valve.
- d) Piezo unit is fitted securely on the gas pipe (DR-SE 155 - 190) or at the control valve (DR-SE 300 - 380) the lead is undamaged and pushed home on the spade connection and the spark electrode is fitted correctly and undamaged.
- e) If heater is controlled by a time clock or an additional electrical interlock, an electrically operated solenoid valve will be positioned in the main gas supply pipe from the control valve to the burner. Ensure electrical supply to this valve is switched off.

Note: A standard DR-SE Heater does not require a mains electrical supply.

Procedure for Initial Lighting and Adjustment

WARNING: IF THE PILOT LIGHT IS EXTINGUISHED EITHER INTENTIONALLY OR UNINTENTIONALLY, NO ATTEMPT SHOULD BE MADE TO RE-LIGHT THE GAS UNTIL AT LEAST 5 MINUTES HAVE ELAPSED.

Ensure arrow on control valve is in "●" position.

Ensure that the main gas cock has been turned off for at least 5 minutes before attempting to light heater - then open cock.

Ignition

Turn knob "M" to position ★, press and hold down. Ignite the pilot burner by operating the piezo electric unit several times (for location see Fig 6a). When the pilot flame has ignited continue to hold down knob "M" for about 10-15 seconds while the thermocouple generates enough current to secure the electro-magnetic latching, then release the knob slowly.

Pilot Rate Adjustment

The pilot adjustment screw is located on the right hand side of the valve body as viewed from the front of the heater just below the outlet pressure test point. To increase the pilot gas rate turn the adjusting screw anti-clockwise and to decrease turn clockwise.

Normal Operation

Turn the knob "M" to position I. Once the knob is released, it is to be set on position ●. Valve "D" will open allowing gas to the main burner via regulating valve "I". The burner will light. Turn knob "T" to the temperature (number) required and when reached the burner will go out (but the pilot will remain).

Setting the burner gas pressure

Allow the heater to initially operate at setting 1 (40 °C) and the main flame will go out after about 15-20 minutes. Attach a manometer to the gas pressure test point. (Just above the pilot adjusting screw to the right of the control valve block.) Set the control knob "T" to a higher setting - say 4 or 5 and measure the gas pressure when the burner lights. Check the pressure against what is stated in Table 1 or on the heater rating label. Adjust if necessary.

Adjusting the burner gas pressure

Remove control knob "T" (pull off). To increase pressure turn "PR. ADJ." screw clockwise. To reduce pressure turn "PR. ADJ." screw anti-clockwise.

Carefully replace knob "T" in its correct position.

Extinguish the main flame, remove manometer tube and seal test point, re-light main flame and allow heater to warm up again.

OPERATION OF DR-SE 300 - 380

Ignition

Light pilot flame by turning control knob to "★" position and depressing fully while repeatedly pressing the adjacent piezo unit button (see fig 6). Hold control knob fully pushed in for a further 20 seconds after the pilot is lit before releasing. The pilot flame should remain alight but if it is extinguished, return control knob to "●" position, depress once and wait 5 minutes before repeating procedure.

If the pilot flame does not light after several seconds repeatedly operating the piezo unit, revent the gas line to the outside of the building and check whether both spark and gas are present at the pilot.

Note: The flow rate of gas to the pilot burner is not adjustable at the gas control valve.

Having established the pilot flame, release control knob and switch on power supply to electrically operated valve (if fitted).

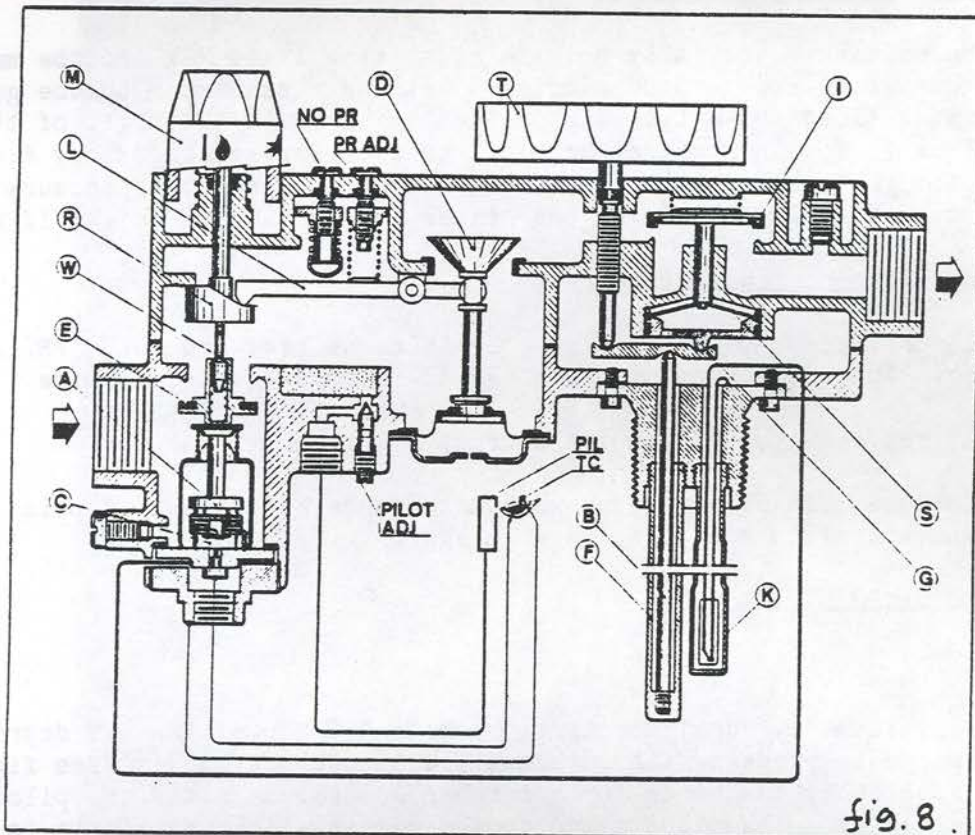
Normal Operation

Turn control knob on gas valve to position "6" when main valve will open and the burner will ignite.

Setting the burner gas pressure

After the heater has operated for approximately 10 minutes, turn control knob on gas valve to "★" position (pilot only).

Remove burner cover plate for access to the pressure test point which is located on the left hand side of the gas control valve adjacent to the gas supply connection to the burner (see fig 6b). Fit a manometer to the test point, return control knob to position "6" and measure the gas setting pressure. Check reading against pressure required in Table or on heater rating label. Adjust control valve regulator as necessary by removing plastic cap and, using a screwdriver, turning the metal adjusting screw beneath, clockwise to increase, anti-clockwise to decrease the pressure.



GAS CONTROL VALVE

CONTROL KNOBS

PRESSURE TEST POINT

BURNER COVER

BURNER FEED PIPE

PIEZO UNIT

PIEZO UNIT CLAMP

PILOT BURNER

IGNITOR LEAD

SEALING WASHER

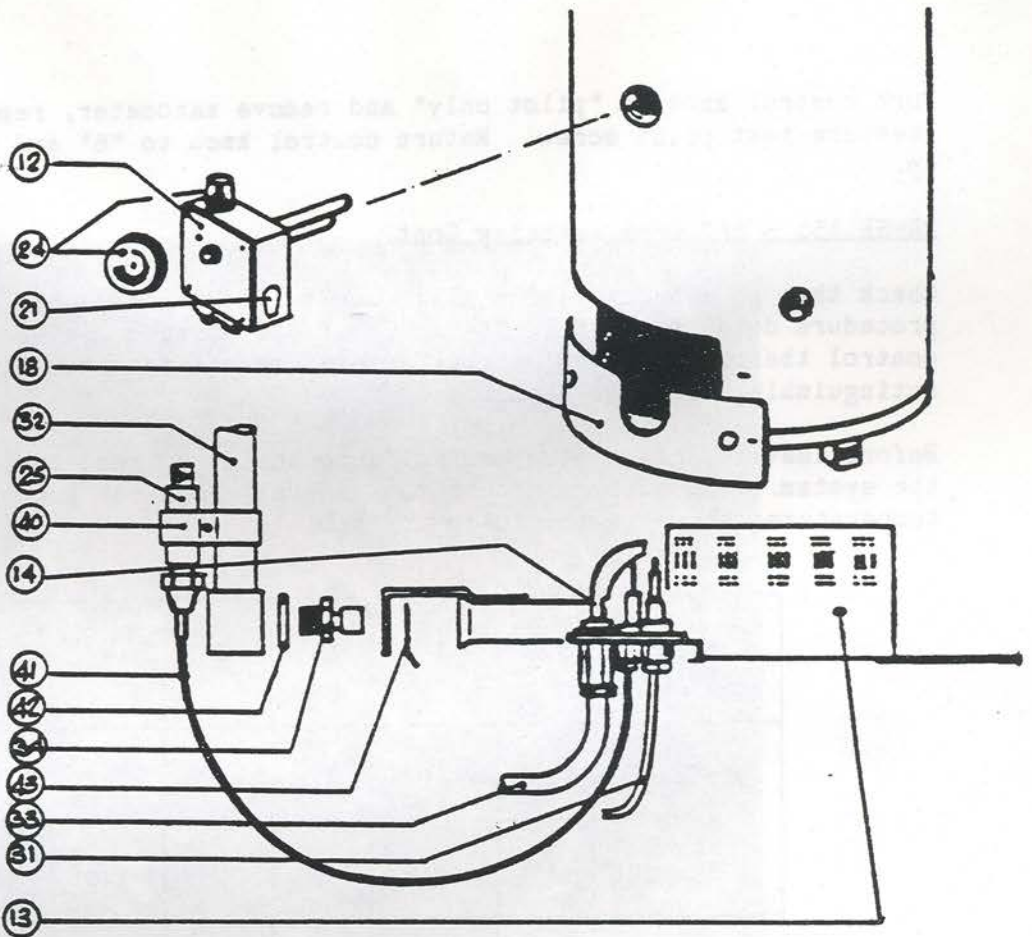
GAS INJECTOR

BURNER RETG CLIP

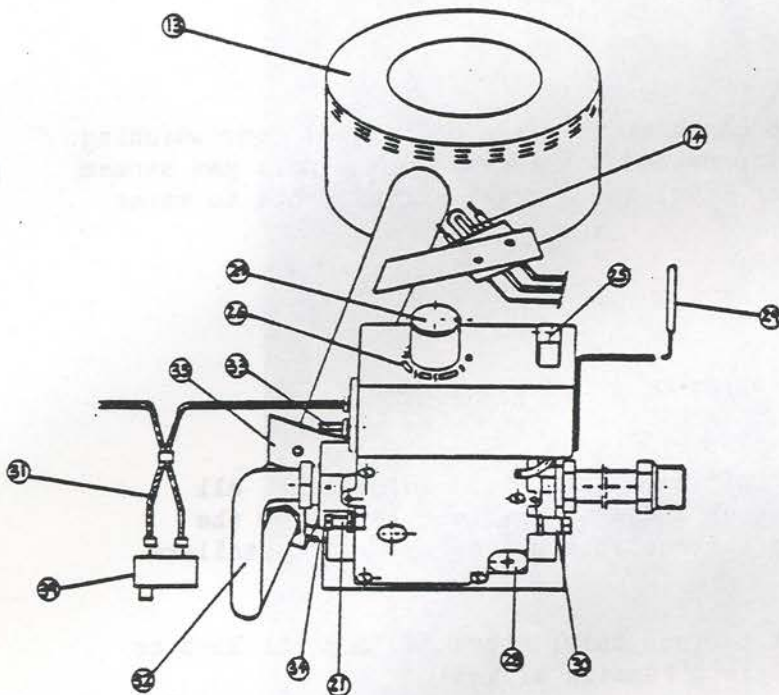
PILOT GAS PIPE

THERMOCOUPLE

MAIN BURNER



BURNER ASSEMBLY DRSE 155 - 190 Fig 6a



- 13 Burner
- 14 Pilot burner
- 21 Setting pressure test point
- 24 Gas valve control knob
- 25 Piezo unit button
- 26 Gas valve setting scale
- 28 Pressure regulator cover screw
- 29 Temperature sensing phial
- 30 Inlet pressure test point
- 31 Thermocouple
- 32 Burner feed pipe
- 33 Pilot burner feed pipe
- 34 Injector
- 35 Burner mounting bracket
- 39 Overheat cut-off device
(limit thermostat)

BURNER ASSEMBLY DR-SE 300, 330

Fig 6b

Turn control knob to "pilot only" and remove manometer, remembering to tighten pressure test point screw. Return control knob to "6" and allow system to warm up.

DR-SE 155 - 380 Commissioning Cont.

Check that no exhaust gas spillage occurs from the draught diverter: refer to procedure detailed in B.S. 5440. Check operation of any controls including the control thermostat by adjusting temperature setting thus lighting and extinguishing the main flame.

Before leaving, adjust the control knob to the correct temperature setting for the system. The numbers around the gas valve control knob are equivalent to the temperatures shown in the following table.

Control Knob Setting		1	2	3	4	5	6
DR-SE	°C	40	45	55	65	70	-
155 - 190	°F	104	113	131	149	158	-
DR-SE	°C	45	50	55	60	65	70
300 - 380	°F	113	122	131	140	149	158

Table 5 - Control Valve Temperature Settings

Combustion Check

It is advisable to make a combustion check at the time of initial commissioning. An exhaust gas sampling point is not provided but access to the main gas stream is available via the draught diverter. Utilise a right angled probe to enter the fire tube below the diverter.

For natural gas only:

Normal CO₂ = 8-9% by volume.

Normal CO level should not exceed 200 ppm or 0.02% by volume.

Both for dry gas sample.

Upon satisfactory completion of the initial lighting and adjustment, all subsequent operations involving light-up and shut down should follow the procedure set out in the lighting-up instructions stated in this installers guide.

Note: To shut down heater for short periods only: turn gas control knob to "★" position (pilot only - pilot remains alight).
To shut down heater for long periods: turn gas control knob to "●" position and depress: close manual gas cock.

SERVICING

Regular annual servicing is recommended. Although cleaning of the flue ways may not be necessary every year it is important that all controls and safety features are checked for operation.

WARNING: BEFORE PROCEEDING WITH ANY MAINTENANCE, TURN OFF THE GAS SERVICE COCK TO THE HEATER BEING SERVICED AND ISOLATE THE ELECTRICAL SUPPLY TO ANY ELECTRICAL CONTROL (IF FITTED).

Removal of Burner Assembly

DR-SE 155, 190

- a) Remove the combustion chamber door (lift off).
- b) Disconnect the pilot gas tube and thermocouple lead at the valve body.
- c) Pull the piezo ignitor lead from the ignitor base.
- d) Carefully ease away the burner retaining clip from around the main jet body, this will allow the burner assembly to be separated from the control valve and gas pipe assembly.
- e) Negotiate the burner assembly through the combustion door aperture. Note - the burner support plate which protrudes from beyond the burner across the combustion chamber will come out of its slot as the burner is being pulled forward.

DR-SE 300, 380

- a) Unscrew and disconnect the union on the downstream side of the manual gas cock.
- b) Remove the burner cover plate by pulling away from the heater at the bottom and lifting to disengage the top latches.
- c) Remove the four self tapping screws holding the thermostat cover plate in position.
- d) Pull the thermostat cover plate complete with the overheat cut-off device (limit thermostat) away from the heater taking care not to damage the capillary tubes.
- e) Remove the section of insulation beneath the cover plate to expose the thermostat sensing phial and the thermostat pocket.
- f) Lift and remove the thermostat sensing phial from behind its locating bracket.
- g) Loosen the screw in the thermostat pocket and by gently pulling the capillary tube, pull out the clamp plate, leaf spring and overheat cut-off device sensing phial.
- h) Locate the two hexagonal bars within the aperture at the bottom of the heater. These are extended screws which hold the burner assembly in position. Unscrew and remove both.

The complete burner assembly is now free and can be removed by withdrawing through the aperture at the bottom of the heater.

Servicing Burner Assembly

Check the main stainless steel burner for cleanliness. If necessary, clean with a brush to remove any accumulation of dust and debris from around the flame ports and venturi entry.

Check main injector for cleanliness. This must be removed for inspection. Use soft lint free material for cleaning - never use a metal scraper.

Ensure any disturbed screw thread is re-tightened correctly.

Examine the thermocouple for cleanliness and flame erosion, or damage to the lead - clean or replace as necessary.

Examine the spark electrode for cracks in the ceramic, flame erosion at the ignition tip or damage to the lead - clean or replace as necessary.

Examine the pilot burner for cleanliness - if pilot is contaminated with dust, clean the flame ports and on the DR-SE 300 - 380 the slotted air inlet. If necessary, release the nut securing the gas connection to the burner and withdraw the tube with captive olive. This frees the pilot injector which can be tapped out and cleaned. Ensure pilot injector is in correct position when re-assembling (see fig 7).

When the assembly has been cleaned check operation of Piezo system by turning control knob on gas valve to "★" position, depress and repeatedly press piezo button - a spark should appear between the electrode and the flame port of the pilot burner. If not check and replace piezo unit or electrode and cable as necessary.

NOTE: If the exhaust gas passage is to be cleaned proceed to the following paragraph before replacing the burner assembly.

Cleaning of Exhaust Gas Passageway

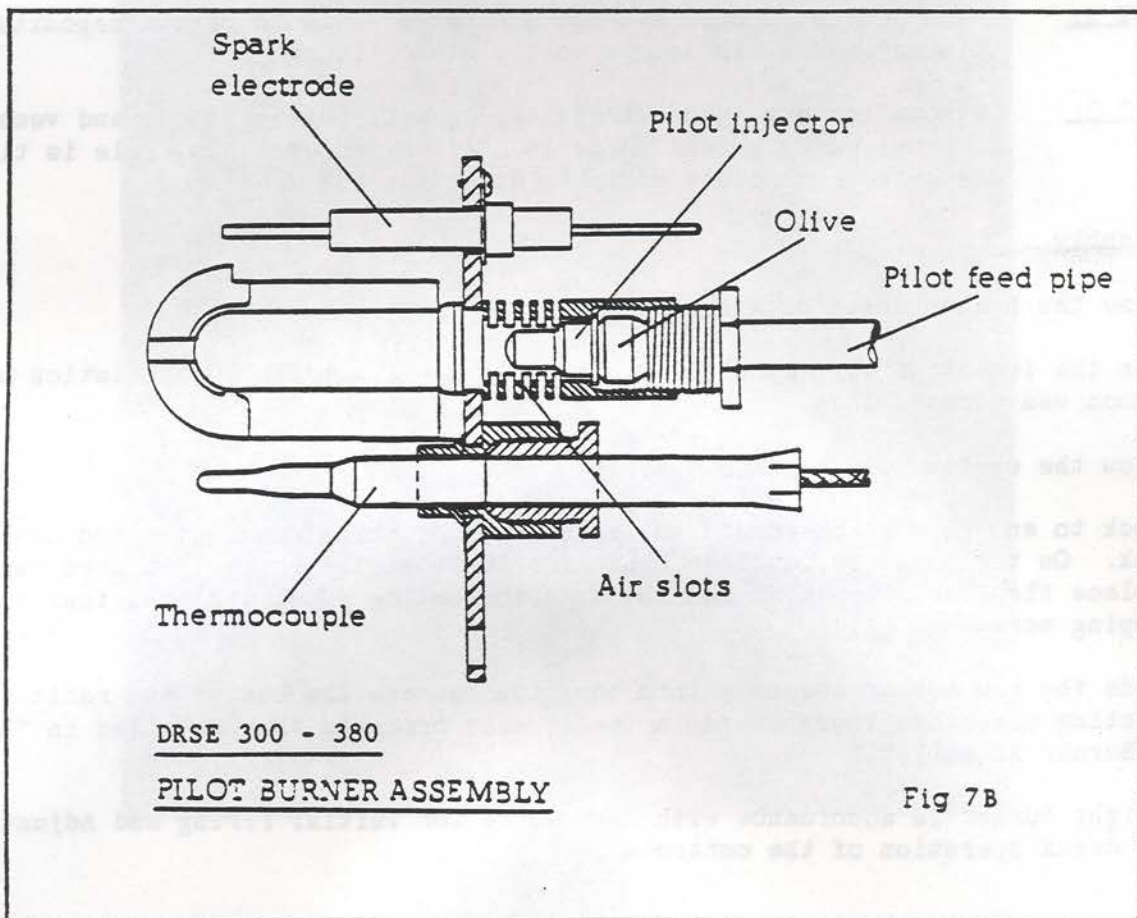
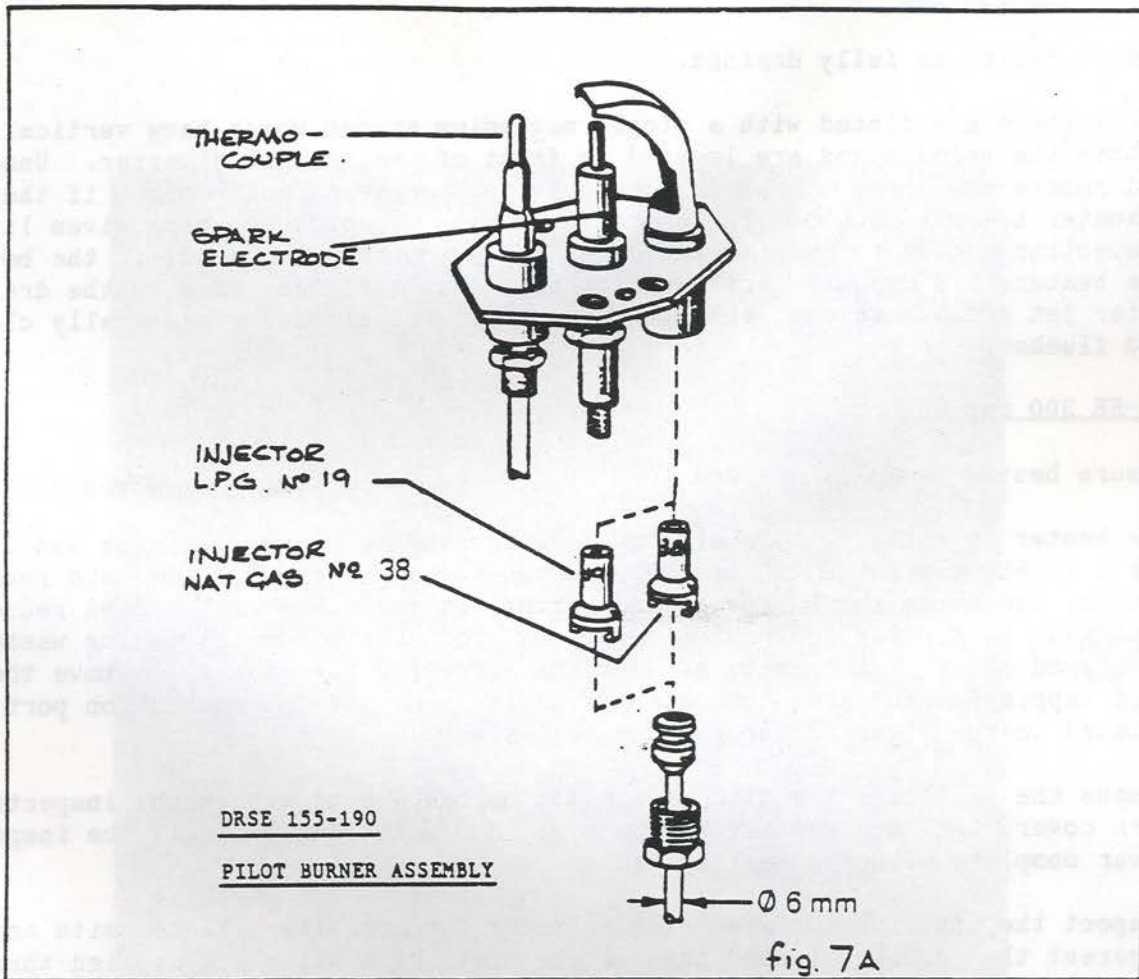
To gain access to the heater's fire tube, the draught diverter must first be removed. Ensure that the flue system is self supporting before removing section of flue above the diverter (a maintenance joint should have been provided for this purpose). Lift off the draught diverter but note on DR-SE 300 and 380 heaters this will also lift the exhaust gas retarder, which will require unhooking (see fig 2). Withdraw the retarder vertically from the fire tube and clean as necessary. Depending on the height available above the heater, the retarder may need to be flexed as it is withdrawn.

Examine the internal surface of the fire tube and if any deposits are apparent clean the tube with a stiff brush, collecting the debris in the condensate tray at the base of the heater. Clean out the condensate tray, replace the retarder, draught diverter and flue. On DR-SE 300 and 380 check retarder is correctly located and rope seal on diverter in position and in good condition - replace if necessary (see fig 2).

Inspection of Waterside Surfaces and Magnesium Anodes

NOTE: ON NO ACCOUNT REMOVE THE MAGNESIUM ANODE WITHOUT CHECKING TO ENSURE THAT THE HEATER IS ISOLATED ON FLOW, FEED AND CIRCULATION CONNECTIONS.

Isolate the cold feed, hot flow and circulation connections and 3 way vent valve if more than one heater is installed with a common vent. Connect a ½ in nominal bore hose to the drain cock connection at the bottom left hand side of the heater. Run the hose to a convenient drain and open the drain cock.



DR-SE 155 and 190

Ensure heater is fully drained.

The heaters are fitted with a single magnesium anodes which hang vertically within the vessels and are located in front of the draught diverter. Unscrew and remove the anode. Examine the anode for corrosion and replace if the diameter has been reduced to less than 15 mm. The anode opening gives limited inspection access to ascertain whether any deposits are present in the bottom of the heater. If deposits are apparent they can be flushed through the drain by a water jet applied through the opening, or the vessel can be chemically cleaned and flushed.

DR-SE 300 and 380

Ensure heater is fully drained.

The heater is fitted with a single anode located as above. Release and unscrew the 1 in BSP cap nut which secures the anode (35 mm across flats) and remove. Examine the anode for corrosion and replace if the diameter has been reduced to less than 18 mm (0.7 in). When replacing anode use a copper sealing washer to give good electrical contact between the anode and the vessel. Remove the four self tapping screws from the exterior casing panel of the inspection port located to the right of the gas control valve.

Remove the panel and the disc of insulation beneath to expose the inspection port cover. Release and remove the eight M10 bolts and take off the inspection cover complete with its sealing gasket.

Inspect the interior surfaces of the heater for deposits. If deposits are apparent they can be flushed through the drain by a water jet applied through the inspection port or the vessel can be chemically cleaned and flushed. After cleaning, replace the inspection port cover and sealing gasket.

NOTE 1: On no account should a metal scraper be used to remove deposits since this may result in damage to the glass lining.

NOTE 2: On some heaters, good electrical contact between anode and vessel may be provided by a bonding cable. If so, ensure this cable is tightly connected with clean contacts at either end.

Assembly

Close the heater drain cock and remove the hose.

Open the isolation valves on the heater cold feed, hot flow, circulation and common vent connections.

Allow the system to fill with water.

Check to ensure that there are no leaks from the anode connection and the drain cock. On the DR-SE 300 and 380 check for leaks at the inspection port and then replace the insulation disc and the exterior casing panel with the four self tapping screws.

Slide the gas burner assembly into position beneath the heater and refit the mounting plate and thermostats in the reverse order to that detailed in "Removal of Burner Assembly".

Relight burner in accordance with "Procedure for Initial Firing and Adjustment" and check operation of the controls.

RECOMMENDED SPARES

<u>Description</u>	<u>Used on</u>	<u>HEL Part No</u>
Sit AC3 Gas Control Valve	DRSE 155 - 190	747814199
BM751 Gas Control Valve	DRSE 300 - 380	747814090
Overheat Cut Off Device (Limit Stat)	DRSE 300 - 380	747433982
Thermocouple	DRSE 155 - 190	747439930
Thermocouple	DRSE 300 - 380	747439880
Pilot Burner (Natural Gas)	DRSE 155 - 190	361150082
Pilot Injector (Natural Gas)	DRSE 155 - 190	331101934
Pilot Burner (Natural Gas)	DRSE 300 - 380	361150066
Pilot Injector (Natural Gas)	DRSE 300 - 380	331101777
Spark Electrode	DRSE 155 - 190	333805409
Electrode Lead	DRSE 155 - 190	747704028
Spark Electrode C/W Lead	DRSE 300 - 380	333805318
Main Injector 300	DRSE 155	330513808
Main Injector 320	DRSE 190	330513824
Main Injector 350 x 6	DRSE 300	330513691
Main Injector 400 x 6	DRSE 380	330513709
Inspection Port Gasket	DRSE 300 - 380	339011754
Magnesium Anode (625 mm)	DRSE 155	339012067
Magnesium Anode (750 mm)	DRSE 190	339012075
Magnesium Anode	DRSE 300 - 380	339011515

INSTALLERS GUIDE SUPPLEMENT
DR-SE SERIES HOT WATER STORAGE HEATERS
FOR USE ON PROPANE AND BUTANE

To be used in conjunction with the main installers guide - Publication No CDH 3160 0687.

Description

The Hamworthy DR-SE range of direct gas fired hot water storage heaters can be supplied as standard to fire commercial Propane or Butane gases. The heaters are very similar to the natural gas models, the difference being:-

1a) ON THE DR-SE 155 - 190

The Sit AC3 multifunction control valve is so designed that it can be set in the LPG mode by making two simple adjustments with a screwdriver.

- i) Turn the "pilot adj" screw fully anti-clockwise.
- ii) Remove the plastic cap on the "No PR" screw and put the governor action "out of service" by screwing fully home.

Note: This is a factory modification on LPG appliances.

1b) ON THE DR-SE 300 - 380

The BM751 multifunctional control valve is a modified version which has the gas pressure regulating spring removed and the adjusting screw wound fully down. This effectively removes the pressure regulating facility, the regulator being locked fully open.

- 2) The injectors, both main and pilot are sized for Propane/Butane instead of natural gas. The burner remains the same for both natural gas and LPG (liquified petroleum gas).

Note: The gas cocks supplied are of the ball valve type suitable for both natural gas and LPG and are detailed in the main installers guide.

The operation of the heaters is exactly similar to those operating on natural gas but there is a very important difference with regard to the incoming gas pressure.

In line with British Standards, these heaters do not have appliance regulators (see 1) above) and hence the gas pressure to the burner is entirely dependant upon the incoming gas supply pressure. It is therefore VERY IMPORTANT that the incoming gas supply pressure measured before the manual gas cock is accurately set up to the following table (table 1) by means of adjustment to the main lock-up regulator at the gas supply point.

GAS TYPE	INLET PRESSURE	
	mbar	in w.g.
Propane	37	14.85
Butane	28	11.25

Table 1 - Gas Inlet Pressures 24

TECHNICAL DATA

MODEL		DR-SE 155	DR-SE 190	DR-SE 300	DR-SE 380
Input	kW	11.5	12.9	18.30	23.52
	Btu/h	39,164	44,000	62,450	80,250
Output (to water)	kW	8.84	10.0	14.00	18.00
	Btu/h	30,150	34,120	47,770	61,420
Gas Rate Propane	m ³ /h	0.44	0.49	0.70	0.90
	ft ³ /h	15.55	17.48	24.8	31.8
Gas inlet Pressure Propane	mbar	37	37	37	37
	in w.g.	14.85	14.85	14.85	14.85
Gas rate Butane	m ³ /h	0.35	0.39	0.55	0.71
	ft ³ /h	12.28	13.80	19.50	25.10
Gas inlet Pressure Butane	mbar	28	28	28	28
	in w.g.	11.25	11.25	11.25	11.25
Injector dia Propane/Butane	mm	1.7	1.8	2.15	2.45
	in	0.067	0.071	0.085	0.096
Injector marking		170	180	215x6	245x6

All other data is as shown for natural gas models in the main installers guide.

Gas rates shown above are based on calorific values as follows:-

Propane - 95.75 MJ/m³ (2520 Btu/ft³)

Butane - 121.5 MJ/m³ (3200 Btu/ft³)

GENERAL REQUIREMENTS

The installation of the heater must be in accordance with the relevant requirements of the Gas Safety Regulations, Building Regulations, IEE Regulations and the Byelaws of the Local Water Undertaking. It should also be in accordance with relevant recommendations of the publications referred to in the main installers guide together with the following additional document:-

British Standard Code of Practice:-

BS 5482 Part 1 - Domestic butane and propane gas burning installations.

INSTALLATION

The heaters should be installed in the same manner as described in the main installers guide.

COMMISSIONING

The heaters should be commissioned in exactly the same way as described in the main installers guide but the following additional points should be closely observed:-

- 1) Before attempting to light the heater, double check on the type of gas to be fired, and ensure that the injector size agrees with that in the literature and stamped on the heater rating label. The size of the injector can be found stamped on the brass injector itself.
- 2) Ensure that adequate ventilation is provided, particularly at low level. LPG is heavier than air so any spillage or leakage will result in a build-up of gas on the floor.
- 3) Ensure that the line pressure of the fuel before the gas cock is regulated to the correct figure ie, 37 mbar (14.85 in w.g.) for propane, 28 mbar (11.25 in w.g.) for butane.
- 4) Ensure that the LPG reaches the heater in a fully gaseous state since liquid gas is detrimental to the control valve and results in poor combustion.
- 5) Check all joints on the gas pipework including the burner assembly and pilot line for leaks.
- 6) It is not necessary to fit a manometer to the burner test point to check gas pressure since the correct inlet pressure should already have been set (see 3 above). At this inlet pressure, the burner input will be correct.

SERVICING

Follow the same procedures indicated in the main installers guide.

ADDITIONAL RECOMMENDED SPARES

<u>Description</u>	<u>Used on</u>	<u>HEL Part No</u>
Sit AC3 Gas Control Valve Adjusted for LPG	DRSE 155 -190	747814215
BM751 Gas Control Valve Modified for use on LPG	DRSE 300 - 380	747814108
Main Injector 170	DRSE 155	330513808
Main Injector 180	DRSE 190	330513824
Main Injector 215 x 6	DRSE 300	330513725
Main Injector 245 x 6	DRSE 380	330513733
Pilot Injector LPG	DRSE 155 - 190	330512934
Pilot Injector LPG	DRSE 300 - 380	330512479

LPG FUELS

IT IS STRONGLY RECOMMENDED THAT, ON LPG INSTALLATIONS, GAS DETECTION EQUIPMENT IS FITTED.

THIS EQUIPMENT SHOULD BE POSITIONED NEAR THE HEATER AND AT LOW LEVEL. IT IS ALSO IMPERATIVE THAT THE SPACE HOUSING THE HEATER IS VENTILATED AT HIGH AND LOW LEVEL TO THE REQUIREMENTS OF BS5440 PART 2 AND B.S. 6644 (SEE MAIN SECTION).

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Hamworthy Heating Limited
Shady Lane, Great Barr, Birmingham B44 9ER
Main switchboard tel: **0121 360 7000** fax: **0121 325 2309**

General enquiries **0121 360 7000**

Direct Email Addresses

Customer Services spares@hamworthy-heating.com
service@hamworthy-heating.com
technical@hamworthy-heating.com
sales.flues@hamworthy-heating.com

Hamworthy Heating Accredited Agents

North West England

Gillies Modular Services
210-218 New Chester Road, Birkenhead, Merseyside L41 9BG
tel: **0151 666 1030** fax: **0151 647 8101**

Southern Ireland

HEVAC Limited
Naas Road, Dublin 12, Ireland
tel: **00 3531 141 91919** fax: **00 3531 145 84806**

Northern Ireland

HVAC Supplies Limited
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tel: **02890 849826** fax: **02890 847443**

Scotland

McDowall Modular Services
14-46 Lomond Street, Glasgow, Scotland G22 6JD
tel: **0141 336 8795** fax: **0141 336 8954**

North East England

Allison Heating Products
17 Beech Road, South Shields, Tyne & Wear NE33 2QH
tel: **0191 455 7898** fax: **0191 455 7899**

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