robokit compact sealed system

installation guide

Installation & Maintenance Instructions

E & O.E

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IOM 096 25-08-17

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1. General

Sealed primary central heating systems are the most commonly used form of heating system throughout Europe and the rest of the world.

Sealed central heating systems should not be confused with un-vented mains pressure hot water systems, which apply only to the secondary hot water supply side of a combined heating and hot water system.

From an installer's viewpoint, therefore, there is no requirement to be registered or to notify any authority when fitting a sealed primary heating system.

The ease of installation makes it particularly attractive to the installer, eliminating the feed and expansion tank and associated pipework, and thus reducing the risk of corrosion and noise in the system.

Advantages can be summarised as follows:

- System flexibility due to component location options.
- Cost savings due to considerably reduced installation time.
- No feed and expansion tank, hence avoiding over pumping problems, risk of freezing etc.
- Longer life due to virtual elimination of corrosion problems.
- Noise reduction due to higher system pressure, boiler noise (localised boiling) is significantly reduced or eliminated.
- Low maintenance costs, as equipment is virtually maintenance free, other than for periodic operational checks.

2. Essential Components and Locations

NOTE: Domestic sealed heating systems should take due account of the following British Standards:

BS 7074: Part 1: 1989 – "Application, selection and installation of expansion vessels and ancillary equipment for sealed water systems – Part 1. Code of practice for domestic heating and water supply".

BS EN 12828: 2012 + A1: 2014 – "Heating systems in buildings - Design for water based heating systems".

The essential components of a sealed system are:

- Diaphragm Expansion Vessel (complying with BE EN 13831: 2007 - "Closed expansion vessels with built in diaphragms for installation in water")
- Safety Valve (pressure relief valve)
- Pressure Gauge
- Filling Point (means for system filling, make-up and venting).

The expansion vessel is the key component and should have an acceptance volume sufficient to accommodate the volume change (expansion) of system water when heated from 10°C up to full operational temperature or beyond under fault conditions (see Section 4).

The expansion vessel should be connected to the system at a point close to the pump inlet in order to maintain positive pressures throughout the system.

Suitable expansion vessel locations are given in Fig. 1, depending on pump position.

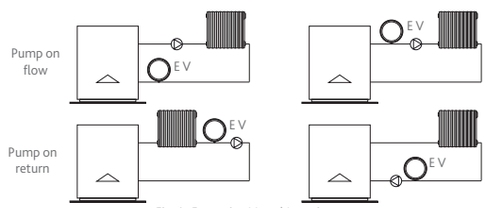


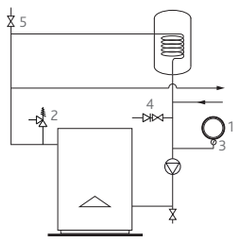
Fig. 1 -Expansion Vessel Location

The safety valve should be fitted either on, or close, to the boiler on the flow pipe.

The pressure gauge should be fitted preferably close to the expansion vessel and/or the boiler, in such a position that it can be easily read from the filling point.

The filling point should be near the key components, particularly the pressure gauge, and should be a temporary connection to allow filling from the water mains, incorporating a double check valve and isolating valves.

Fig. 2 illustrates a typical sealed system layout.



1 Expansion vessel
2 Safety valve
3 Pressure gauge
4 Filling point
5 Automatic air vent

Fig. 2 Typical System

3. Components and Assemblies Available

Full details of all available Robokit Compact components are given in individual data sheets.

The following list summarises the components supplied - * indicates key essential components.

1.* Expansion Vessel with integral mounting bracket
2.* Safety Valve – pressure relieve valve.
2.* Pressure gauge
4.* Filling Loop
5. Assembly connector

Robokit Compact Components

The Vessel

The Robokit Compact expansion vessels conform to the essential requirements of PED 97/23/EC Directive and BS EN 13831 and are constructed in two halves, which are retained by a crimped collar to give a pressure tight seal.

The water side is provided with a male thread, for the expansion pipe. The air side has an air charging valve of the kind used for tyres, protected by a large plastic cap. The standard finish is an epoxy coated red. The maximum working pressure is 4 bar and the maximum system temperature is 110°C.

The Safety Valve

The safety valves available are in a range of sizes from ½" to 1" BSP and are available with either male or female connections.

For use with domestic installations they come complete with a compression nut and olive to make it easy for the installer to fix the discharge pipe without the need for unnecessary "expensive fittings".

Altecnic's range of safety valves are used by leading manufacturers in the UK. The valves used on potable and the domestic hot water are WRAS approved products.

The Filling Loop

Primarily designed to comply with the requirements of the water authorities. The filling loop allows a temporary connection to the heating system for the filling operation.

The installation must be in accordance with the Water Supply (Water Fittings) Regulations G24.1 and G24.2.

Robokit Compact Component

Mounting Bracket

Robokit Compact expansion vessels have an integral mounting bracket which allows positive mounting.

Expansion vessels should not be left unsupported.

Sealed System Kit with Expansion Vessel

The Robokit Compact sealed system kit contains the expansion vessel and all the essential components required for a sealed system installation. The sealed system kit with expansion vessel is the easiest kit to install and comprises of:

Safety valve complete the gauge including a 15mm coned outlet connection. The filling loop with a removable braided hose, isolation valve and double check valve in accordance with BS6282 and built in isolation valve.

The system pressure gauge to facilitate easy circuit pressurisation. The assembly connector has tappings for direct system connection via a 15mm nut and olive cone, and direct connection for the expansion tank.

The sealed system kit with expansion vessel offers the installer all the components required for the heating system in accordance with the British Standards.

4. Expansion Vessel Sizing

BS7074: Part 1: 1989 gives full details of the accurate method of calculating the required expansion vessel capacity, assuming that full and accurate design information is available, particularly total system water content.

However, in practice, it is often not possible to calculate the system water content with any certainty, and therefore estimates must be made.

The following volume approximations can be used to give a reasonable estimate of total system volume.

Conventional cast iron or steel boiler	10 litres
Low water capacity boiler	3.5 litres
Small bore pipework	1 litre per kW of system output
Microbore pipework	7 litres
Steel panel radiators	8 litres per kW of system output
Low water capacity radiators	2 litres per kW of system output
Hot water cylinder calorifier	2 litres.

NOTE: As an approximation, BS7074: Part 1 suggests that a figure of 12 litres/kW of boiler output could be used to estimate total system water content – this would be generous for most systems

Having determined the total system water content, expansion vessel sizing can be considered, taking into account the other system design factors.

Robokit Compact expansion vessels are supplied pre-charged at 1.5 bar (suitable for system static heads up to 15 metres) and the safety valve is normally pre-set at 3 bar (British Standard specification).

For standard conditions therefore, the following table can be used to select the required expansion vessel volume.

Where a vessel of the selected size is not available, the next larger standard size must be used from the Altecnic range.

Note that the vessel volume figures in the table take account of possible overheat fault conditions, as recommended in BS7074: Part 1.

4. Expansion Vessel Sizing

Capacities of Expansion Vessels							
Safety valve setting	3.0 barg						
Vessel charge and initial system pressure	0.5 barg	1.0 barg	1.5 barg		0.5 barg	1.0 barg	1.5 barg
Total water content of system - litre	Vessel Volume - litre				Vessel Volume - litre		
25	2.1	2.7	3.9	275	22.9	30.0	42.9
50	4.2	5.4	7.8	300	25.0	32.7	46.8
75	6.3	8.2	11.7	325	27.0	35.7	50.7
100	8.3	10.9	15.6	350	29.1	38.1	54.6
125	10.4	13.6	19.5	375	31.2	40.9	58.5
150	12.5	16.3	23.4	400	33.3	43.6	62.4
175	14.6	19.1	27.3	425	35.4	46.3	66.3
200	16.7	21.8	31.2	450	37.5	49.0	70.2
225	18.7	24.5	35.1	475	39.6	51.8	74.1
250	20.8	27.2	39.0	500	41.6	54.5	78.0
Multiplying factor for other system volumes	0.0833	0.109	0.156		0.0833	0.109	0.156

5. Installation - Notes for Guidance

IMPORTANT: – Attention to these notes for guidance will help to ensure a trouble-free and effective installation. The requirements of the relevant British Standards, Water By-laws and other regulations should always be met.

British Gas, DOE/PSA, local authorities and other specifiers stipulate that all sealed system equipment should conform to the relevant British Standard – Altecnic equipment does comply and is approved by the appropriate authority.

Note that unvented hot water systems for mains fed hot water supply are totally separate systems and use different components. These unvented systems are governed by Section 6.3 of the Building Regulations

5.1 The Boiler

- Solid fuel boilers should not be used with sealed systems.
- Gas and oil fired boilers should incorporate a manual-reset high limit thermostat (in addition to the control thermostat) suitable for use with sealed systems. This requirement is important and should be carefully checked. Please refer to the boiler manufacturer.

5.2 The DHW Cylinder

- Must be of an indirect coil type or a direct cylinder fitted with an immersion calorifier, which is suitable for the system pressure.
- Under no circumstances should a single feed indirect cylinder be used with a sealed system.

5.3 The Expansion Vessel

- Sensible generous sizing is recommended to avoid later problems.
- As a guide, the expansion vessel is undersized if the pressure gauge indicates 2.65 bar or above when the boiler is at maximum temperature with all radiators in circulation. In such a case, a larger (or additional) expansion vessel is required. (Note that the safety valve will commence over-pressure discharge at around 3 bar).
- The point of connection of the expansion vessel into the system is important (Section 2), but the physical location of the vessel can be anywhere convenient, giving maximum flexibility.

5.3 The Expansion Vessel

- If a system is extended, an expansion vessel of increased volume (or an additional vessel) may be required, unless previous provision has been made for the extension.
- The vessel charge pressure (1.5 bar standard) should not be less than the static head pressure at the centre of the expansion vessel. For static heads greater than 15 metres, the vessel charge pressure should be increased (Schrader valve on vessel).

5.4 The Safety Valve (Pressure Relief Valve)

- Should be fitted to the top of the boiler or to the flow pipe near the boiler.
- There should be no other valves or restrictions between the safety valve and the boiler.
- Discharge from the safety valve must be to a safe location clear of the boiler, such that
  - it is visible,
  - it cannot discharge over people,
  - it cannot cause damage to property, electrical components or wiring.
  - it is preferably at low level.
- It is recommended that a tundish is fitted to the outlet of the safety valve and that the discharge pipe is at least the same size as the connection to the valve.
- The fall on the discharge pipe should prevent blockage through freezing and ensure water disposal.
- ***Under no circumstances should the discharge connection on the safety valve be plugged or otherwise blocked.***

5.5 The Pressure Gauge

- Should be fitted in a position where it can be seen when filling or topping-up the system, preferably at the same point as the expansion vessel.
- Set the pointer at the cold-fill pressure. This will help to identify future loss of pressure due to leaks.

5.6 The Filling Point/Loop

- Do not make a connection to the mains water supply without including a double check valve and an isolating valve. Such a connection must not be permanent.
- The filling loop incorporates a double check valve and 2 isolation valves in compliance with Water By-laws, to allow direct connection to the water mains.
- To comply with the requirement for the connection to be temporary, the flexible hose should be disconnected after filling and pressurising the heating system.
- If water replacement/re-pressurisation is necessary, the hose can be temporarily re-connected.

5.7 Venting

- High point(s) in the system should be vented using suitable sited automatic air vent(s).
- Consideration should also be given to fitting an additional automatically vented air separator to assist in purging air from the system.

5.8 General

- Where an existing system is to be converted to a sealed system, check carefully that all the existing system components are suitable and can accommodate the higher operating pressures.

6. Testing and Commissioning

The completed installation should be flushed out to remove solid particles and chemical residues which could otherwise cause damage within the system.

Proceed as follows after flushing:

- Fill system and vent all high points, pump and radiators.
- Examine for leaks and rectify where necessary.
- Put the boiler and pump into operation and allow the system to heat up to normal operating temperature for 1 hour. Turn off boiler and pump and allow the system to cool. Check again for any leakages and restore the system design pressure if necessary.

6. Testing and Commissioning

- Check the operation of the safety valve by manually operating the lifter mechanism.
- Test the operation of the high limit thermostat according to the boiler manufacturers instructions.

7. Maintenance

The sealed system equipment itself is virtually maintenance-free, but periodic checks can be made to ensure that the system continues to operate reliably and effectively.

- Check the pressure gauge when the system is cold to identify any loss of pressure below the set point. Any pressure loss could be due to air venting or a system leak. Re-pressurise if necessary and keep under observation.
- Check the charge pressure of the expansion vessel by applying a car tyre pressure gauge to the air valve under the cap. This should be carried out with the system cold and the pressure increased if necessary using a car tyre pump.
- Check the operation of the safety valve by manually operating the lifter mechanism.

8. Fault Finding

If these Installation Guidance Notes are read and adhered to, system faults should be minimal. However, the following is a list of possible faults, which can be encountered, particularly if recommendations are ignored. Possible causes and solutions are also proposed.

8.1 Fault: System pressure greater than 2.65 bar (hot)

Possible Causes:
(i) Expansion vessel too small.
(ii) Boiler control thermostat out of calibration.
(iii) Expansion vessel pre-charge too high.

Refer to Sections: 4, 5.1, 5.3, 5.7.

8.2 Fault: Safety valve discharges water when system hot.

Possible Causes:
(i) Expansion vessel too small.
(ii) Boiler control thermostat out of calibration.
(iii) Expansion vessel pre-charge too high.
(iv) Safety valve faulty.

Refer to Sections: 4, 5.1, 5.3, 5.4, 5.7.

8.3 Fault: Safety valve discharges water when system cold.

Possible Causes:
(i) Safety valve not seating correctly due to debris/build-up.
(ii) Safety valve faulty.

Action: Manually lift safety valve and rotate seat to clear debris.

8.4 Fault: System pressure too low when cold.

Possible Causes:
(i) Air vented from system (particularly when system new).
(ii) Leakage(s) from system.--
(iii) Expansion vessel charge too low.

Refer to Sections: 5.3, 5.5, 5.6, 5.7, 5.8, 6.7.

8.5 Fault: Safety valve does not discharge at pressure in excess of 3 bar.

Possible Causes:
(i) Safety valve set too high.
(ii) Safety valve seat seized.
(iii) Safety valve outlet blocked.

Refer to Sections: 5.3, 5.4, 6.7.

We reserve the right to amend any of the information without prior notice.

NOTE: For further installation guidance please refer to the boiler manufacturer's installation instructions and Building Regulations 2010 part G3 'Hot water supply and systems'.