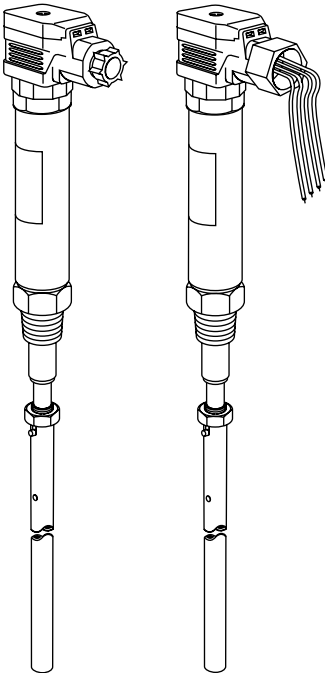


LP30

**High Integrity Low Level Alarm Probe
Installation and Maintenance Instructions**



1. *General safety information*
2. *General product information*
3. *Installation*
4. *Wiring*
5. *Probe clearance test procedure*
6. *Maintenance*
7. *Spare parts*

1. General safety information

Your attention is drawn to Safety Information Leaflet IM-GCM-10, as well as to any National or Regional regulations.

The boiler must be depressurised and vented to atmosphere before installation of the probe. Wherever possible the boiler manufacturer should be consulted for advice on the working and alarm water levels.

Under certain circumstances the water level in a boiler can be different to that shown in the gauge glass.

Separate literature is available from Spirax Sarco on this subject.

Do not install the probe outdoors without additional weather protection.

Drain/vent holes must be kept clear - do not cover.

2. General product information

2.1 General description

The Spirax Sarco LP30 level probe is used with the Spirax Sarco LC3000 level controller to provide a high integrity, self-monitoring low level alarm signal, usually in a steam boiler. It consists of a probe body with a removable cable socket, and a separate screw-on probe tip. The tip is retained with a roll pin, and held in place with a lock-nut. Two level probes and controllers are normally installed on each boiler to provide two independent low alarms. In many countries this provides first low alarm and second low alarm. The probe is suitable for boiler pressures of up to 32 bar g (464 psi g).

2.2 Available tip lengths mm (inches)

500 (19.7), 1000 (39.4) and 1500 (59).

2.3 Limiting conditions

Nominal pressure rating	PN40	
Maximum boiler pressure	32 bar g	(464 psi g)
Maximum temperature	239°C	(462°F)
Hydraulic pressure test	60 bar g	(870 psi g)
Maximum ambient temperature	70°C	(158°F)
Maximum probe cable length	50 metres	(164 ft)
Cable socket protection rating	IP65	

2.4 How the LP30 works

The probe has a level sensing tip (probe tip) and a comparator tip. The earth return path is via the body connection.

Under normal operating conditions, the probe tip is immersed, and the resistance to earth is low. When the water level drops below the probe tip the resistance to earth becomes high, causing the controller to give a low level alarm signal.

The comparator tip compensates for any leakage to earth caused by scale, dirt, or internal moisture, ensuring a low water alarm signal even under adverse conditions.

A DIN 43650 cable socket is supplied with each unit and is provided with a Pg 11 cable gland, or, for the UL/FM version, a ½" NPT conduit thread adaptor with four flying leads.

WARNING: It is essential that the probe tip does not touch any part of the boiler. Standards require that the tip is at least 14 mm (½") from the protection tube, and this must be checked when the probe is installed. See Section 5, 'Probe clearance test procedure'.

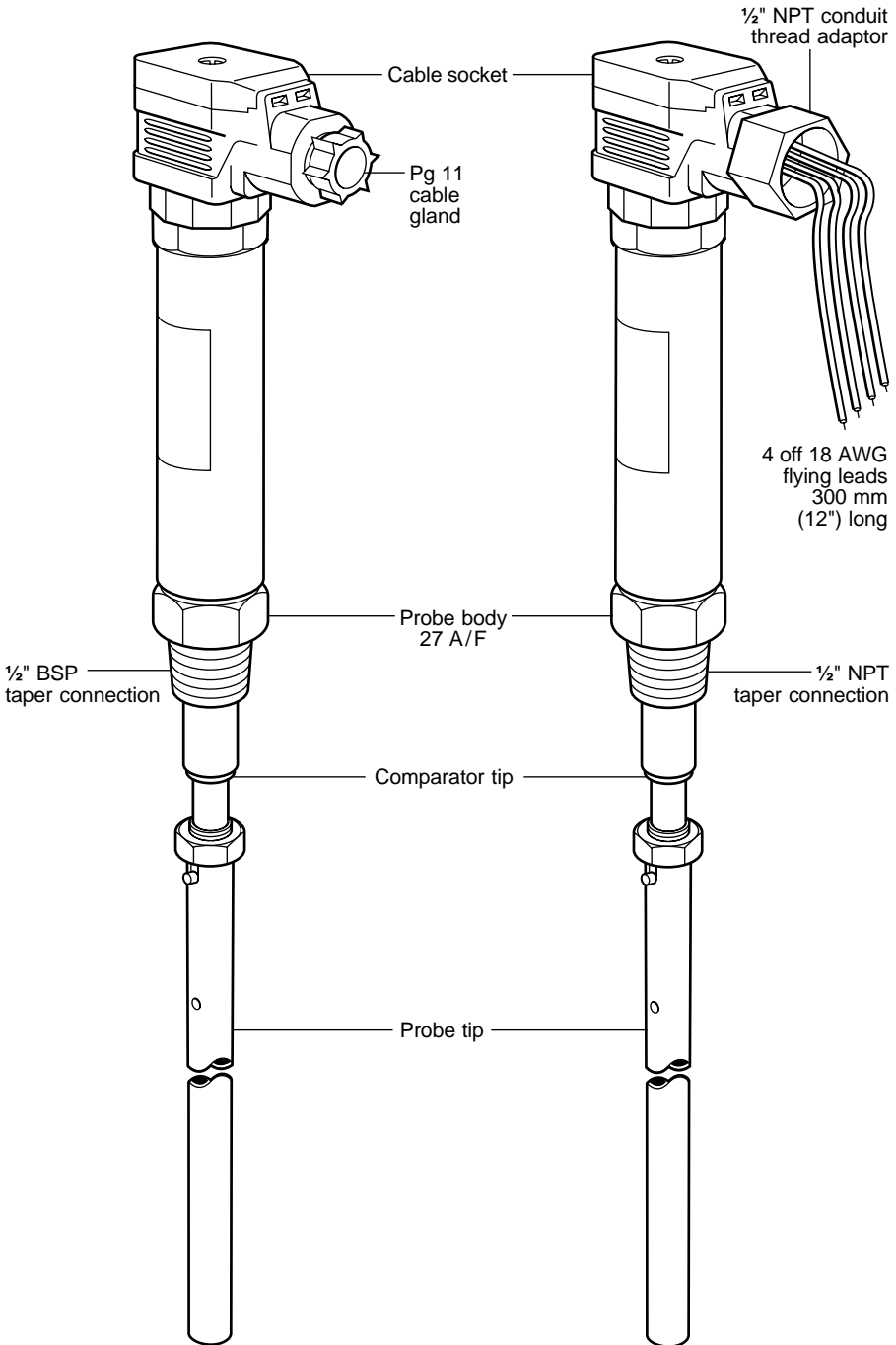


Fig. 1
LP30 Standard version

Fig. 2
LP30 UL/FM version

3. Installation

Before proceeding with any installation or maintenance read Section 1, 'General safety information'.

When the probe is to be installed in the boiler, ensure it is positioned at least 1 metre (39") from any safety valve or steam take-off, as increased localised water levels may occur.

3.1 Deciding on the low alarm levels

In most shell boilers the water will 'swell' when it is firing, such that the actual water level will be higher than the level shown in the gauge glass. In practice this can be up to 50 mm (2") in very large boilers reducing to about 10 mm ($\frac{3}{8}$ ") in smaller ones. We recommend, therefore, that the second low level alarm should be well above the bottom of the gauge glass when the boiler is cold, as this will reduce when the boiler is firing. The first low level alarm may be 20 mm ($\frac{3}{4}$ ") above second low level alarm (see Fig. 3). Wherever possible the boiler manufacturer should be consulted for advice on the working and alarm water levels.

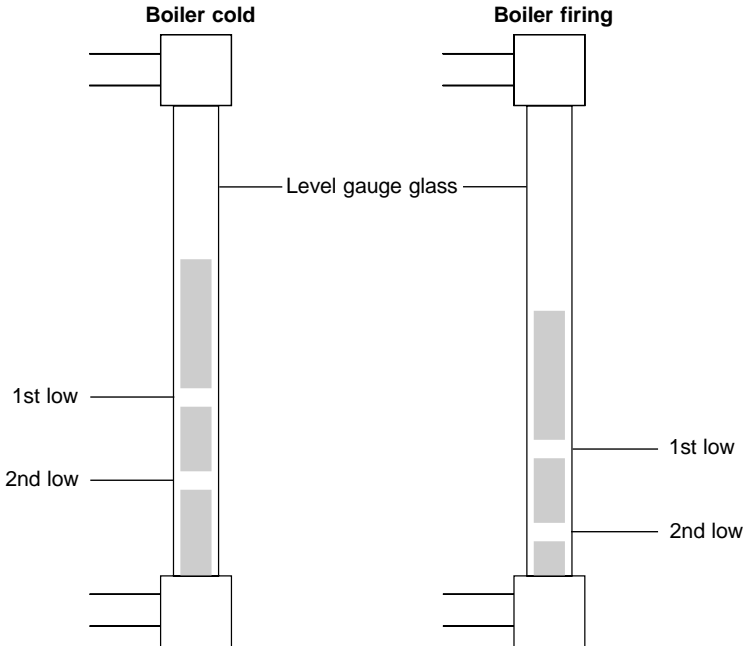


Fig. 3 Typical low alarm levels

3.2 Protection tube

The probe must be installed in a protection tube when used for low level alarm in a steam boiler. The protection tube provides a relatively steady water level, shielding the probe from the turbulence in the boiler. Two separate protection tubes must be provided, one for the first low level alarm and one for the second low level alarm. A typical protection tube is shown in Fig. 4. Dimensions and construction may be varied to suit the application, but a tube of at least 80 mm (3") diameter is recommended.

Flange lagging is recommended, particularly on larger boilers or boilers with a working pressure over 10 bar g (145 psi g). Do not lag the probe.

Do not cover vent and drain holes on the body.

Note: When making flanged or screwed joints, ensure that excess jointing compound does not enter the boiler.

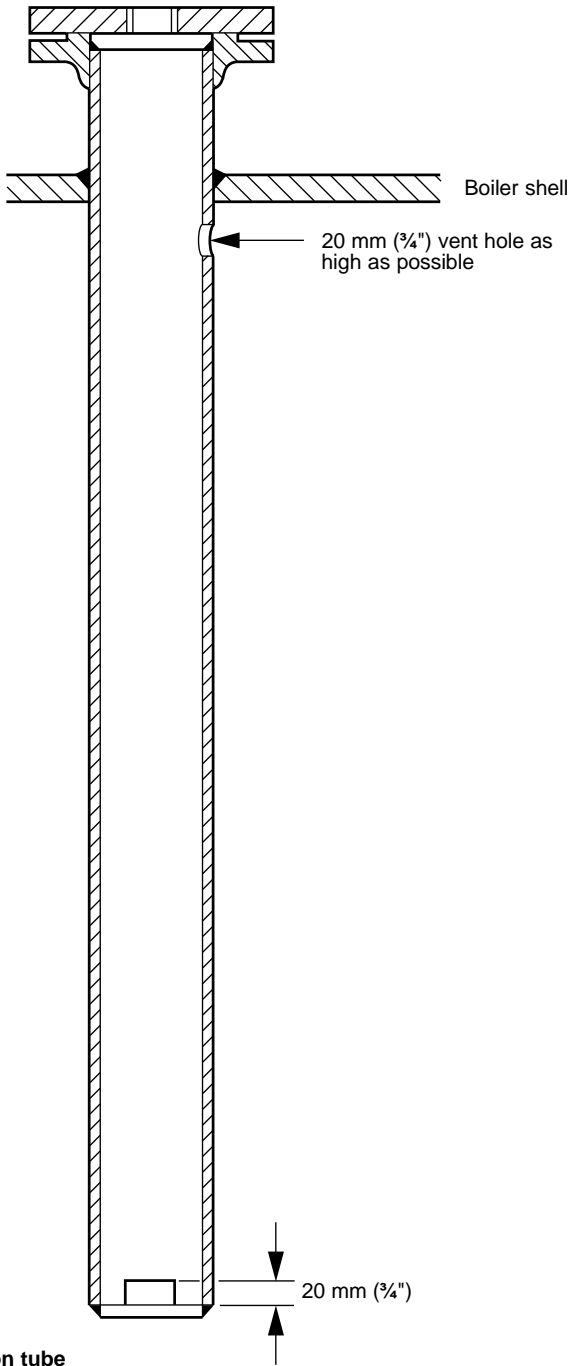


Fig. 4 Typical protection tube

3.3 Cutting the probe tip

The probe is normally installed vertically, but for probe tip lengths up to 500 mm (20") it may be inclined by up to 45° from the vertical. The low alarm switching level is at the extreme end of the probe tip, which is cut to length to give the required alarm level.

LP30 probe tips are retained by a thread, pin and lock-nut:

- Earlier probes were retained by two pins only.
- A compatible tip is available to special order.

For existing installations, it is important to check which type of connection is used before cutting the probe tip to length.

3.3.1 Procedure for cutting threaded tip (current type):

- Screw the lock-nut onto the probe fully, but do not tighten it at this stage.
- Use an M6 spanner on the flats of the probe tip connector to prevent it rotating.

WARNING: If the threaded end of the connector is allowed to rotate in the probe body, the internal wiring will be damaged.

- Screw the probe tip onto the probe until the hole in the probe lines up with the bottom of the slot in the probe tip (see Fig. 5).
- Support the assembly and tap in the retaining pin until an equal length protrudes from each side of the probe tip.
- Tighten the lock-nut onto the probe tip (5-7 N m, 4-5 lbf ft).
- Ensure the boiler water is at the required low alarm level.
- Mark a line down the length of the probe tip using a water-soluble felt pen.
- Temporarily fit the probe and tip to the boiler ($\frac{1}{2}$ " BSP taper for standard LP30 and $\frac{1}{2}$ " NPT for UL/FM versions), hand tight, without using PTFE tape.
- Remove the probe and note the point at which the ink is dissolved by the water.
- Use a fine hacksaw to cut the probe tip to this length (see Fig. 6).
- De-burr tip.
- Carry out the probe clearance test procedure (see Section 5, 'Probe clearance test procedure', page 10) and record the results.

Note: A chart is provided on page 13 for recording this data.

3.3.2 Procedure for cutting two-pin tip (earlier type):

- Ensure the boiler water is at the required low alarm level.
- Fit probe tip to probe body and align locating holes.
- Support the assembly and tap in the two retaining pins until an equal length protrudes from each side of the probe tip.
- Mark a line down the length of the probe tip using a water-soluble felt pen.
- Temporarily fit the probe and tip to the boiler ($\frac{1}{2}$ " BSP taper for LP30 and $\frac{1}{2}$ " NPT for UL/FM versions), hand tight, without using PTFE tape.
- Remove the probe and note the point at which the ink is dissolved by the water.
- Use a fine hacksaw to cut the probe tip to this length (see Fig. 6).
- De-burr tip.
- Carry out the probe clearance test procedure (page 10) and record the results (pages 12 and 13).

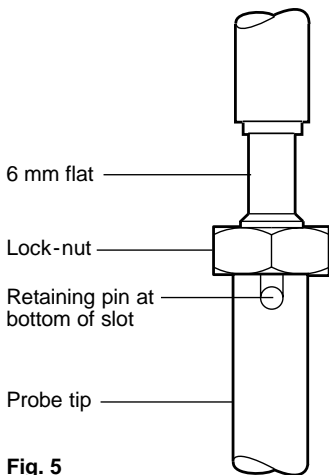


Fig. 5

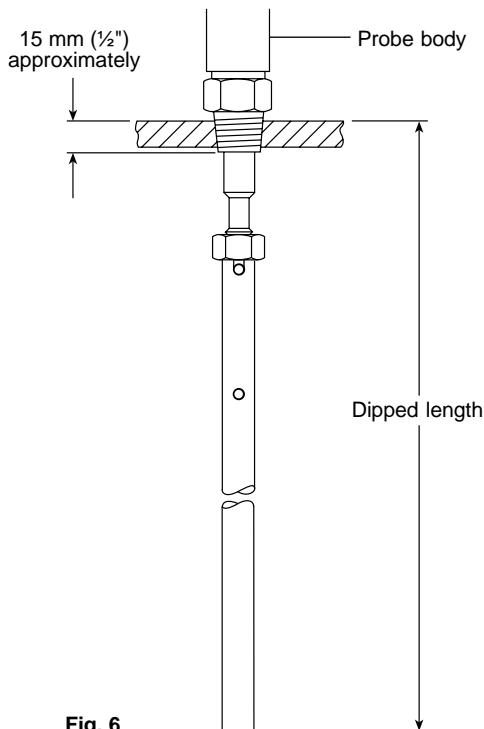


Fig. 6

3.3.3 Install the probe as follows:

- Ensure both male and female threads are in good condition.
- Use up to three turns (no more) of PTFE thread sealing tape on the probe thread.
- **WARNINGS: Do not use excessive tape. Do not use paste type jointing compound.**
- Fit and tighten the probe by hand initially
- Use a suitable spanner to tighten the probe. Under no circumstances use a pipe wrench.
- Due to the nature of a taper/parallel joint it is not possible to recommend tightening torque figures.
- Do not overtighten - there should always be visible thread on the probe.
- **Note:** The probe thread will not 'bottom out' (i.e. probe body hexagon contacts the face of the female screwed connection), unless there is excessive wear or an out-of-tolerance female thread, in which case it will be necessary to replace or re-work the flange or connection.

3.3.4 Subsequent removal and refitting:

WARNING: Ensure boiler or vessel is depressurised and vented to atmosphere before attempting to unscrew or remove the probe.

- Always use the correct size spanner - not a pipe wrench.
- Inspect male and female threads for signs of damage, which may have occurred through overtightening, leading to torn threads or even localised cold welding (galling/picking up).
- If damage has occurred replace the probe.

4. Wiring

Refer to the relevant controller documentation/wiring diagram for full information, including screen connection details.

Cabling should be installed in accordance with BS 6739 - Instrumentation in Process Control Systems: Installation design and practice or local equivalent. For US and Canadian installations the probe must be wired in accordance with the National and Local Electrical code (NEC) or the Canadian Electrical code (CEC). Wiring should be carried out using 4 core, 1 mm² (18-16 AWG), high temperature screened cable, with a maximum length of 50 metres (165 ft). Pirelli FP 200 or Delta Crompton Firetuf OHLS are two suitable types for the standard LP30. For the UL/FM version, Class 1 screened cable with a suitable temperature rating (75°C/167°F minimum) must be used to connect the terminal box to the controller.

Ensure that sufficient cable length is provided to allow removal of the cable socket and to ensure that no strain is placed on the unit.

To unplug the cable socket, remove the central screw.

Note: To provide environmental protection the probe is supplied with a gasket between the cable socket and the probe connector. To maintain environmental integrity, ensure the gasket is always present when reconnecting cable socket and that all contact surfaces are clean and undamaged.

To gain access to the connector block within the cable socket, remove the central screw and withdraw the hinged cover.

The connector block on the standard LP30 maybe rotated in 90° steps to facilitate wiring:

- Remove the retaining screw and withdraw socket.
- Remove connector block and reposition as required.

Note: It is not possible to rotate the connector block on the UL/FM version.

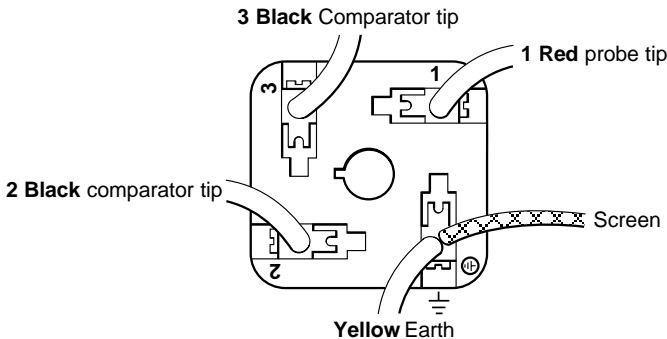


Fig. 7 View of connector block removed from cable connector

UL / FM version

The socket is supplied with four 18 AWG, 300 mm (12") long colour coded flying leads. These are to be cut to length and connected to a suitable metal terminal box. A length of flexible metal conduit is required between the probe and the terminal box to provide environmental protection and easy electrical connection. The cable socket is provided with a ½" NPT conduit adaptor for this purpose.

WARNING:

The flying leads supplied with the probe are rated to 221°F (105°C). This temperature rating must not be exceeded.

The flexible conduit and terminal box are not to incorporate any other control wiring as this may damage or reduce the performance of the product.

It is not possible to rotate the cable socket in 90° steps, as with the non-listed LP30. To do so may damage the internal wiring.

Ensure that any condensation which might build up in the conduit network is prevented from accumulating in the probe cable connector and terminal box.

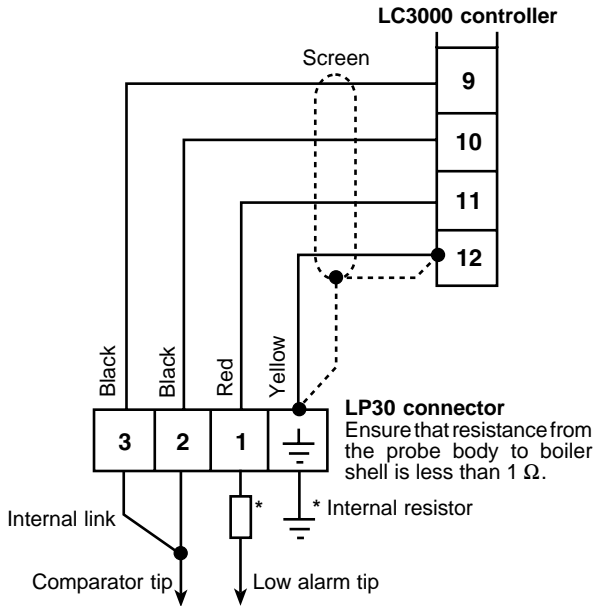


Fig. 8 Standard version

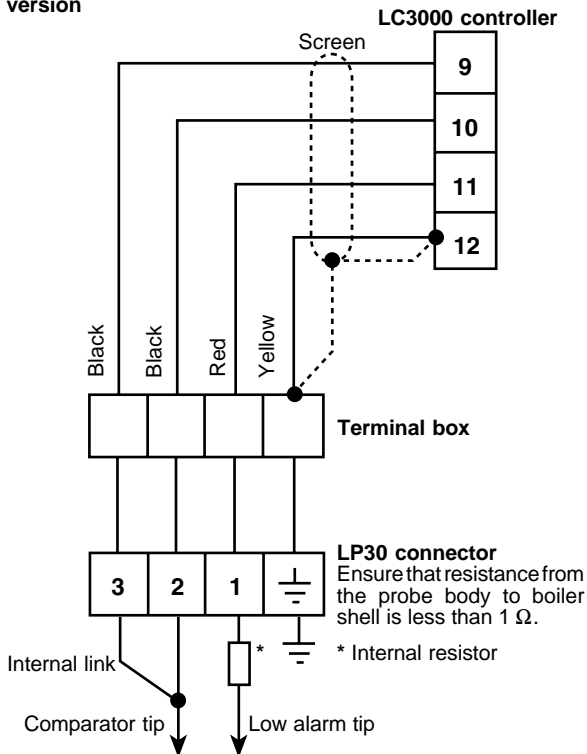


Fig. 9 UL/FM version

— 5. Probe clearance test procedure —

5.1 Introduction

To ensure safe, correct operation of the system, it is essential that the probe tip does not touch any part of the boiler or protection tube. Standards require that the probe tip has at least 14 mm ($\frac{9}{16}$ ") clearance.

This test confirms that the LP30 probe is installed correctly. The test must be done on initial installation, and each time the probe is removed from the boiler, e.g. for annual inspection. A pair of 'checking wires' are used in conjunction with an Insulation Resistance Tester (meter) to test if there is less than 14 mm ($\frac{9}{16}$ ") radial clearance from the tip end. This is indicated by a 'short circuit' (i.e. a reading less than infinity).

When correctly carried out, the test will ensure that the final probe tip position is at least 14 mm ($\frac{9}{16}$ ") from the protection tube. See Fig. 10.

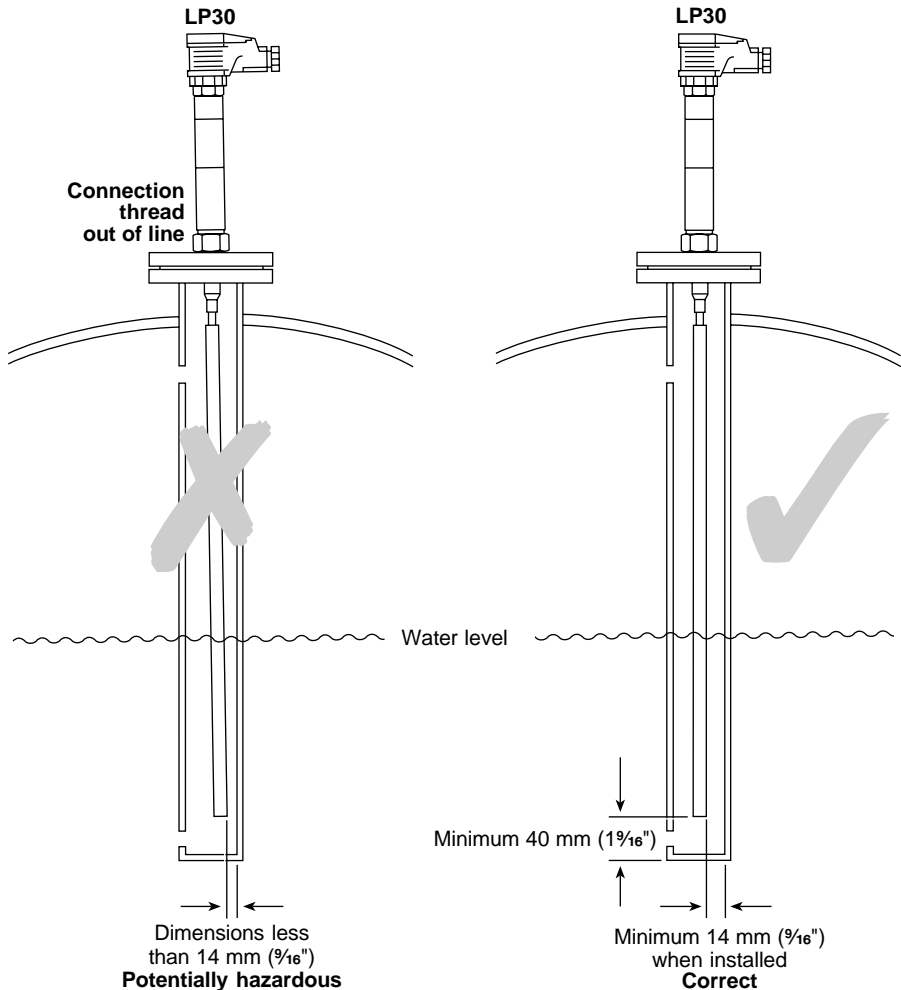


Fig. 10

5.2 Test method

1. Drain water level to at least 50 mm (2") below alarm level and vent boiler or vessel to atmosphere.
2. Remove probe (if installed) and fit a pair of checking wires to the end of the probe tip, 90° relative to each other and a maximum 10 mm ($\frac{3}{8}$ ") from the tip end - see Figs. 11 and 12.
3. Carefully pass probe through screwed connection and into the protection tube. The checking wires will deflect to allow them to pass through, and then spring back to their original positions.
4. Screw down probe by hand, without using PTFE tape.
5. Attach the earth lead of the meter to the boiler and the live lead to pin 1 of the probe connector. Check the contact to boiler with the meter.
6. Activate meter and observe display. Slowly unscrew probe one full turn (without unduly rocking the probe).
7. If no short circuit is found, disconnect the meter leads, unscrew and withdraw the probe, taking care not to catch the checking wires on the underside of the screwed connection.
8. Remove checking wires and install probe as described in Section 3, 'Installation'.
9. Low alarms must be functionally tested by lowering the water level before the boiler is allowed to run unsupervised.
Separate literature describes this procedure.
10. Complete the clearance record sheet (see page 12 and 13).

WARNING: It is essential to remove the checking wires from the probe before commissioning the boiler or vessel. Failure to do this could lead to the low alarms not working.

If a short circuit was found during the test then further investigation is needed. Some possible reasons are listed below:

- Probe tip bent or not attached properly.
- Protection tube and/or screwed connection out of alignment.
- Protection tube not of large enough bore and/or not deep enough (the tube should be at least 40 mm ($1\frac{1}{8}$ ") deeper internally than the end of the probe, see Fig. 10).

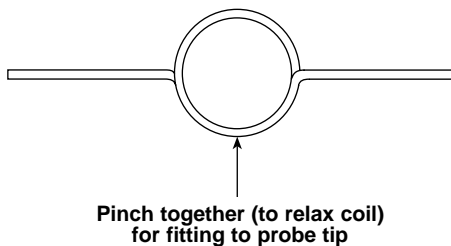


Fig. 11

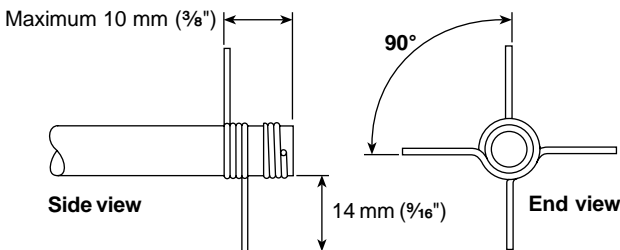


Fig. 12

6. *Maintenance*

No special maintenance is required, apart from an annual inspection and cleaning of the probe assembly. It is particularly important to clean the threaded contact surfaces between the tip extension and the probe central electrode (use fine abrasive paper). More frequent cleaning is recommended where the quality of boiler water might cause a build-up of insulative scale or oxide on the probe.

Boiler water level controls, however, do require regular testing and inspection. For specific testing instructions for Spirax Sarco systems please see separate literature.

7. *Spare parts*

Available spares

LP30 tip retaining pins	Stock No. 4024780	Pack of 10
Clearance checking set	Stock No. 4024781	1 set (2 springs)

