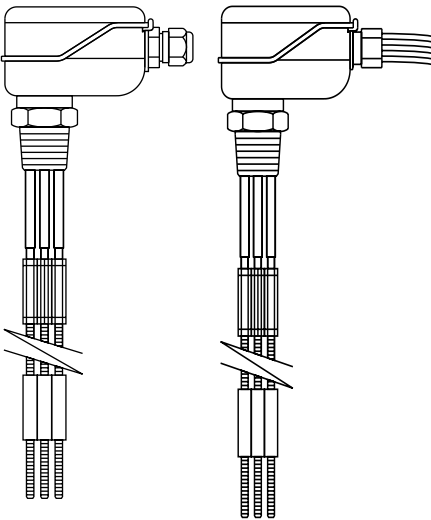


LP10-4
Level Probe
Installation and Maintenance Instructions



- 1. *General safety information*
- 2. *General product information*
- 3. *Installation*
- 4. *Wiring*
- 5. *Maintenance*

1. General safety information

Your attention is drawn to Safety Information Sheet IM-GCM-10 as well as to any National or local regulations.

Safe operation of the product depends on it being properly installed, commissioned and maintained by a qualified person in compliance with the operating instructions.

It is essential to comply with general installation and safety instructions for pipeline and plant construction, as well as to make proper use of tools and safety equipment.

The product is designed and constructed to withstand the forces encountered during normal use. Use of the product for any other purpose, or failure to install the product in accordance with these Installation and Maintenance Instructions, could cause damage to the product and may cause injury or fatality to personnel.

Additional Safety Notes:

Level control and level limiting/alarm products in steam boilers

Products/systems must be selected, installed, operated, and tested in accordance with:

- Local or National standards and regulations.
- Guidance Notes, (Health and Safety Executive PM5 in the UK).
- The requirements of Approvals Authorities.
- Boiler Insurance Bodies.
- Boiler manufacturer's specifications.

Two independent low water limiting/alarm systems must be installed on steam boilers. Level probes must be installed in separate protection tubes/chambers, with sufficient clearance between the tips, and earth.

Each probe must be connected to an independent controller. The alarm relays must isolate the boiler heat supply at low alarm status.

A high water alarm may be part of the water level control, or a separate system. An independent high water alarm system must be fitted if it is considered a safety requirement. In this case, the relays must simultaneously isolate the feedwater supply and the boiler heat supply at high alarm status. All boiler water limiters/alarms require regular functional testing.

A suitable water treatment regime must be used to ensure continuous safe and correct operation of the control and limiter systems. Consult the above authorities and a competent water treatment company.

Warning

If this product is not used in the manner specified by this IMI, then the protection provided may be impaired.

2. General product information

2.1 Description

The Spirax Sarco LP10-4 level probe is used with a Spirax Sarco LC1300 controller to provide on/off level control and alarm functions in steam boilers, tanks, or other vessels. The probe is also suitable for use with a wide range of conductive liquids.

2.2 Technical data

	UL listed version NPT		Standard version BSP	
Nominal pressure rating	PN40		PN40	
Maximum pressure	30 bar g	(435 psi g)	32 bar	(464 psi g)
Maximum temperature	235°C	(455°F)	239°C	(462°F)
Maximum ambient temperature	70°C	(158°F)	70°C	(158°F)
Protection rating	IP54		IP54	
Pollution degree	3		3	
Maximum cable length (probe / controller)	30 m	(98 ft)	30 m	(98 ft)
Minimum conductivity (when used with LC1300 controller only)	1 μ S/cm @ 25°C (77°F).			

2.3 How the LP10-4 level probe works

The LP10-4 has four detachable tips which are cut to length on installation to give the required switching levels. The probe body is earthed through its 1" screwed connection, and the boiler or tank normally forms the earth return path. If the probe is to be used in a non-conductive tank, (concrete or plastic, for example), use one of the tips as an earth return, or provide a separate earthing rod or plate.

When a tip is immersed in a conductive liquid it completes an electrical circuit to earth. When the level drops below the tip, the resistance to earth becomes high, signalling to the controller that the tip is out of the liquid.

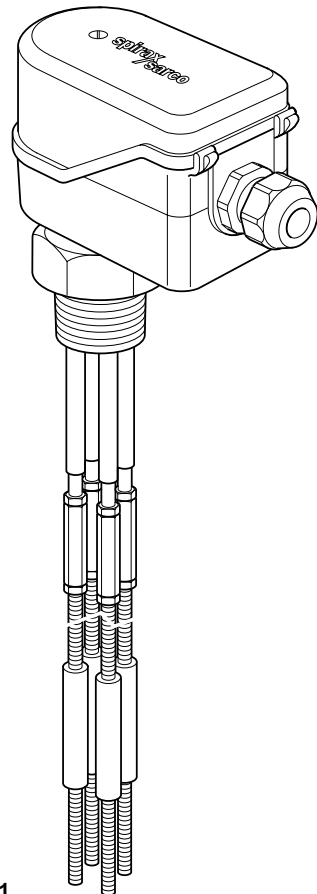
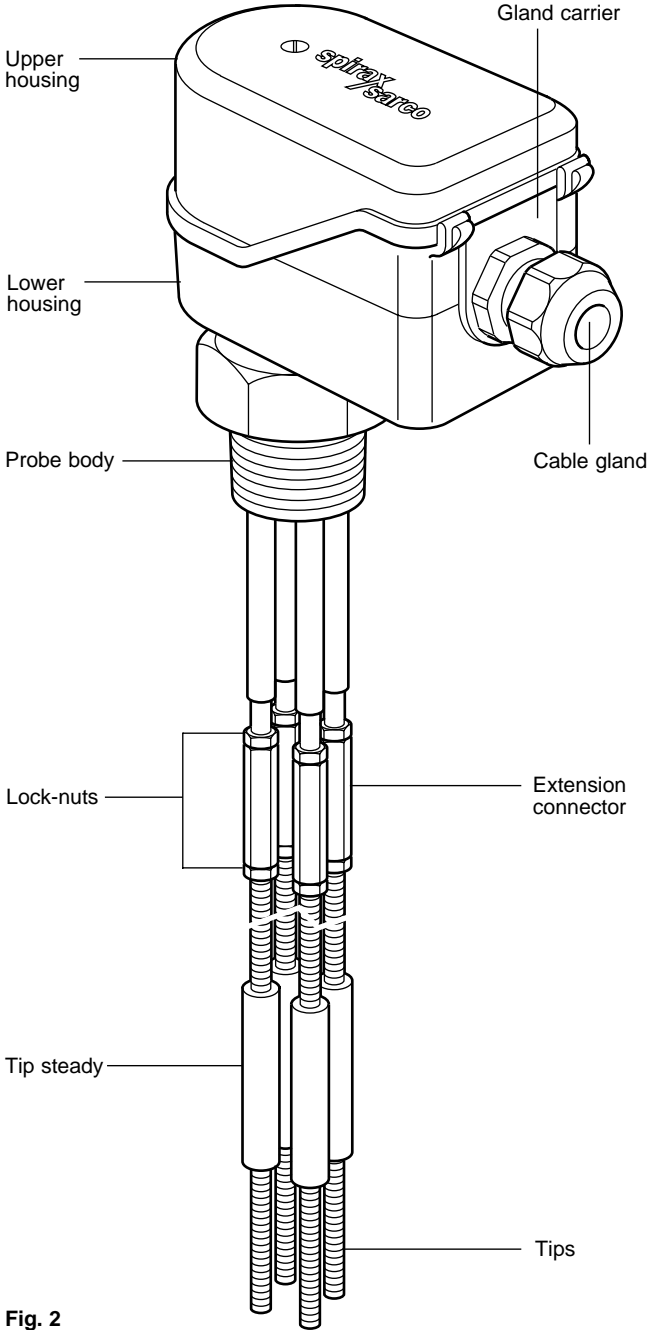


Fig. 1

Standard version



UL listed version

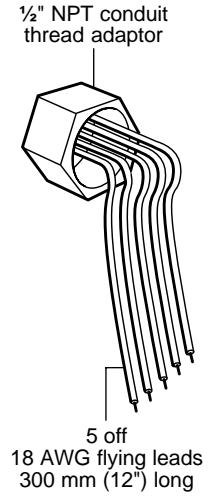


Fig. 2

3. Installation

3.1 General

For steam boiler applications, the probe may be installed in an external chamber or inside the boiler. A protection tube must be used for boiler shell installations, and suitable designs are shown in separate literature.

WARNING

Though two probes may be installed in one protection tube, where two low water level alarms are required in a boiler, these must be completely independent. Separate probes, in separate protection tubes or chambers, and separate controllers must be used.

Wherever possible the boiler manufacturer should be consulted for advice on the working and alarm water levels.

WARNING

Under certain circumstances the water level inside a boiler can be different to that shown in the gauge glass. Separate literature on this subject is available from Spirax Sarco.

Do not install the probe outdoors without additional weather protection. The probe is designed for installation in a 1" BSP parallel (Rp1), or 1" NPT threaded flange. These threads should always be specified for new installations.

The tip steady provides lateral support as well as insulating the tips from each other.

The switching levels are at the extreme end of the probe tips, which are cut to length to give the required alarm or pump signals to the controller.

Probe tips are supplied in sets of four, 1 000 mm (3.28 ft) long, complete with coupling pieces, lock-nuts, and two steadies. Two tip assemblies may be joined together if necessary to give a maximum total tip length of 2 095 mm (6.87 ft).

WARNING

The tip steady is an essential part of the probe and must be fitted. Failure to fit the tip steady may lead to short-circuits between the tips, or by the tips touching the protection tube - a potentially hazardous situation.

3.2 Installation procedure

CAUTION: To avoid bending or twisting the probe tips, it is important to support the probe along its length when handling, particularly if the probe is over 1 m (39") long. Do not allow the probe tips to rotate in the probe body when tightening the connectors or lock-nuts.

- Fit the four tips to the probe using the extension connectors and lock-nuts provided.
- Ensure that the extension connectors are threaded fully onto the probe tips.
- Tighten the lock-nuts.
- Align the probe tips, and make sure they are more or less the same length, so that all tips will fit into a tip steady.
- Place a tip steady over the end of the tips.
- Using the plastic cap from the packaging or other suitable protector, smartly tap the steady onto the probe tips with the flat of the hand. Once started in this way, the tip steady can be temporarily positioned quite easily by sliding it down the tips.
- Fit the second tip steady in the same manner (see Fig. 3).
- If used, fit the second set of extension connectors, probe tips, and two more steadies in the same way (see Fig. 4).
- Tighten the connector lock-nuts.

WARNING

Failure to tighten the connector lock-nuts fully may lead to tips becoming loose or falling off.

- Ensure the water is at the first required level. This could, for example, be the low alarm level. (Typically, levels sensed by a four tip probe might be high alarm, pump off, pump on, and low alarm).
- Mark a metal rod with a water-soluble felt pen, and dip the boiler to find the depth from the top of the probe mounting flange to the water level. Alternatively, take the level from a gauge glass.
- Transfer this level to the probe tip, and measuring from the underside of the probe body, mark the position of the proposed cut (nick with a file or hacksaw) on the probe tip, **15 mm (0.6") less than the dipped length** - double check before cutting the probe to length. See Fig. 3.
- Repeat this procedure for the other tips.
The probe tips are identified by coloured sleeves on the standard version, and colour coded flying leads on the UL listed version:-

Brown	Tip 1	Orange	Tip 3	Black	Earth
Red	Tip 2	Yellow	Tip 4		

Position the lowest tip steady(ies), above the water level if possible. The steady should support all probe tips, and be at least 15 mm (0.6") away from the end of the shortest tip(s). The maximum length for an unsupported tip is 250 mm (9.8"). The minimum tip length is 75 mm (3") (no extension connector fitted). See Fig. 3.

If a probe steady is fitted to less than all four probe tips, cut off the unused section of the tip steady to avoid it catching on the probe mounting flange when removing the probe for maintenance. See Fig. 4.

3.3 Install the probe as follows:

- Ensure both male and female threads (1" BSP taper / 1" NPT, 41 A/F) are in good condition.
- Use up to three turns (no more) of PTFE thread sealing tape on the probe thread.
WARNING: 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.

3.4 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 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.

Fig. 3
Standard installation (for probes up to 1 000 mm (39"). For installations up to 2 095 mm (6.87 ft), see Fig. 4.

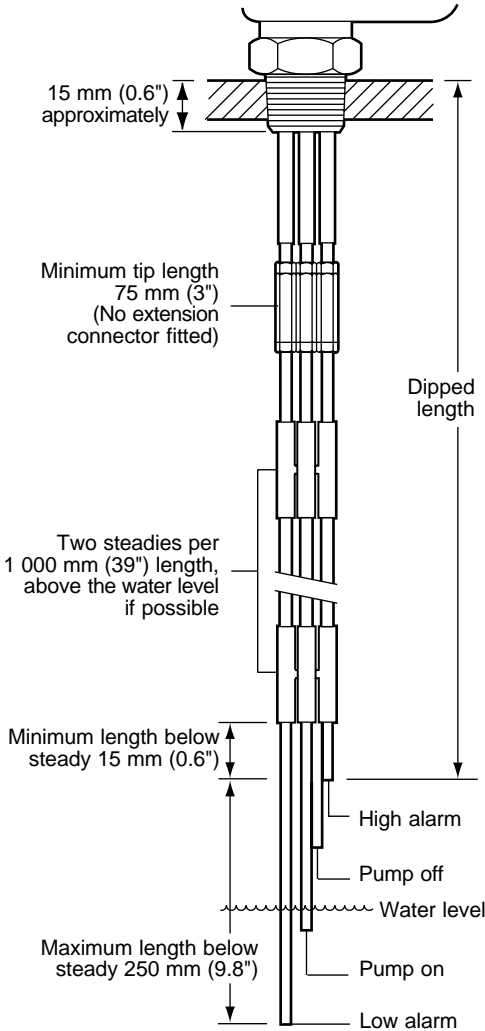
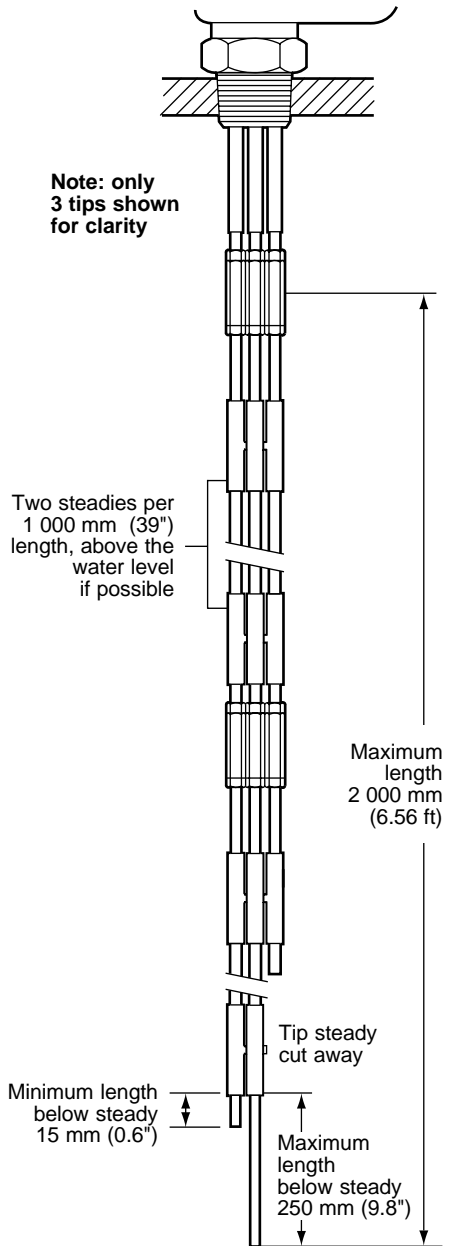


Fig. 4
Installation for 1 000 mm to 2 000 mm (39" to 6.56 ft) depth, extended using second probe tip, extension connectors and steady.



4. Wiring

4.1 General information

Cabling should be installed in accordance with BS 6739 - Instrumentation in Process Control Systems: Installation design and practice or local equivalent. For the US and Canadian installations, the probe must be wired in accordance with the local and National Electrical Codes (NEC), or Canadian Electrical Code (CEC)

4.2 Cable specification

Use 5-core (or 4-core and earth) 1 mm² (18 - 16 AWG), high temperature screened cable. This may be solid or stranded, with a maximum length of 30 m (98 ft) for the LC1000, or 100 m (328 ft) for the LC1300. Pirelli FP200 or Delta Crompton Firetuf OHLS are two suitable types for the standard probe.

4.3 Connection

Remove the upper housing screw to gain access to the wiring terminals.

The standard version is supplied with four crimp terminals for connection to the probe tips. An un-insulated crimp ring terminal is supplied for the probe body earth connection. It can be fitted to either of the two M3 female threads, (see Fig. 5).

An additional screw and crimps are provided, together with coloured sleeves for easy identification of wiring. A connector set is available as a spare from Spirax Sarco, Stock No. 4024480.

Caution: - Do not use standard crimps – the ones supplied are a special high temperature type. Use a dual-purpose crimp tool (for insulated and un-insulated crimps) to make the connections, e.g. RS Components 534-806 or Farnell 210-511.

A M20 cable gland is provided for cable with an overall diameter of 5 mm - 12 mm. The probe can be connected to Pg16, ½" BSP, ½" NPT or M20 threaded flexible conduit by removing the gland and fitting a back nut (an M20 back nut is supplied with the product).

The UL version is supplied with five 18 AWG, 12" long colour coded flying leads. These are to be cut to length and connected to terminals housed in a suitable metal terminal box.

A ½" NPT conduit adapter is provided to connect a length of flexible conduit between the probe and terminal box.

WARNING:

The flying leads supplied are rated to 392°F (200°C). This temperature must not be exceeded. Do not install low voltage cables near high voltage cables or switchgear, as this may reduce the performance of, or cause damage or damage to the product. Probe cables must not use the same conduit/wiring trays as power cables or other wiring.

Ensure internal wires (flying leads) and crimp terminals have not been stressed or damaged during installation. Remove upper housing and check wiring before commissioning the system.

The wiring loom may be disconnected and removed from the LP10-4 probe without disturbing the cable gland:-

- Remove the upper housing and lift the gland carrier, complete with wiring, out of the lower housing. Ensure that sufficient cable or flexible conduit length is provided and to ensure that no strain is placed on the unit.
- Do not over-tighten upper housing screw.

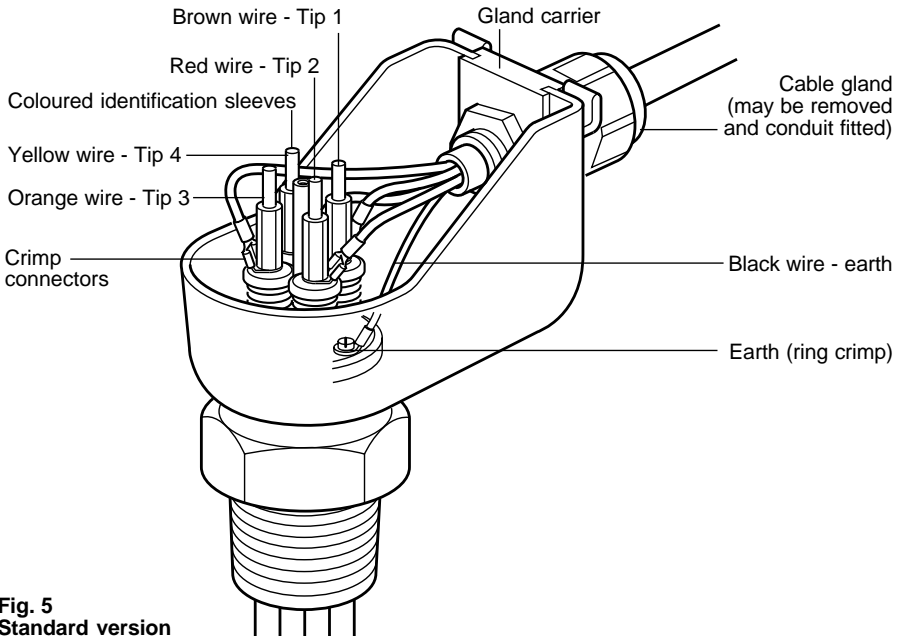


Fig. 5
Standard version

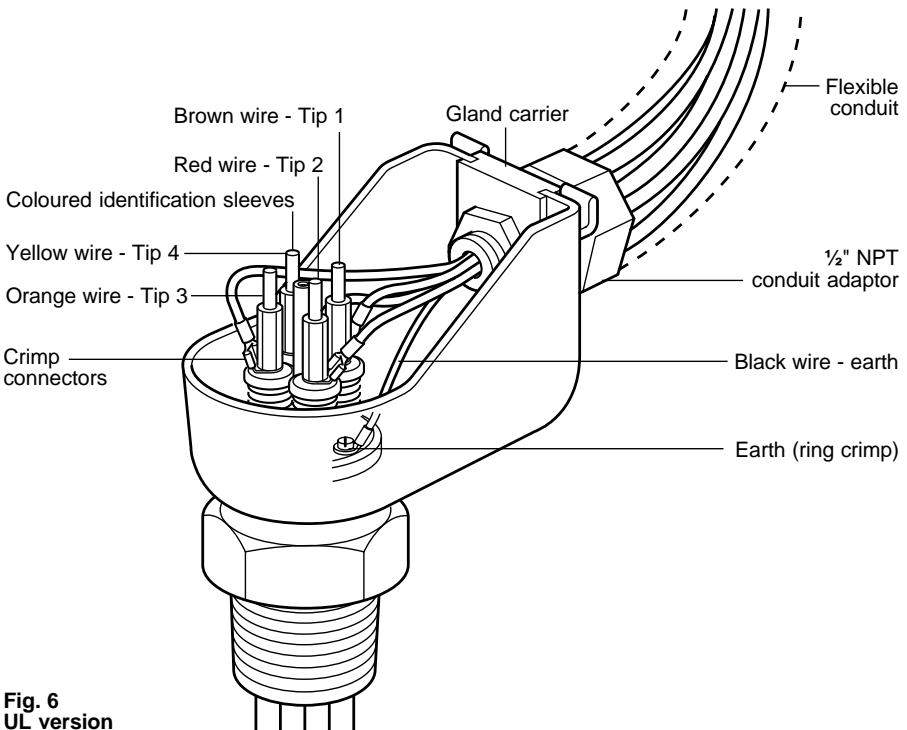


Fig. 6
UL version

4.4 Screen connection

An earth current loop is created if a wire or screen is connected between two earth points, which are at different potential (voltage). If the instructions are followed correctly, then the probe cable screen will only be connected to earth at one end.

Note. The probe earth terminal is a functional earth rather than a protective earth.

A **protective earth** provides protection from electric shock under a single fault condition. This product is protected by double insulation and therefore does not require a protective earth.

A **functional earth** is used in order for the product to operate. In this application, the earth (boiler shell) is used as the common of the probe. It also provides a sink/drain for any electrical interference.

- Ensure that the screen is connected to earth terminal of the probe and to the common terminal of the controller.
- Ensure the common terminal of the controller is not internally earthed (all Spirax Sarco boiler controls are internally isolated from earth).
- The common terminal of the controller must only be earthed via the probe.

Caution:

Do not connect the common terminal to an earth local to the controller.

To do so may induce an earth current loop, which may reduce the performance or damage the product.

4.5 Wiring diagrams

Fig. 7 Standard version

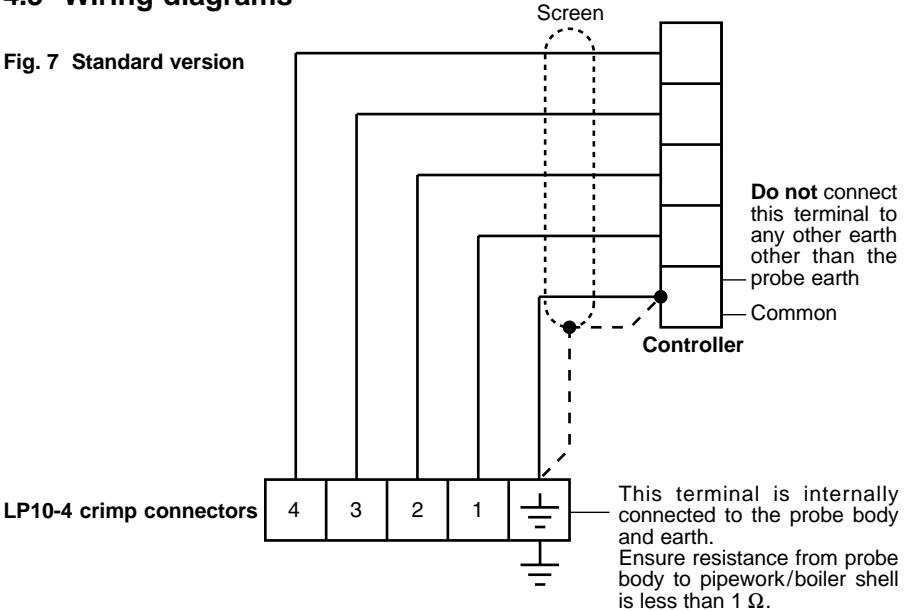
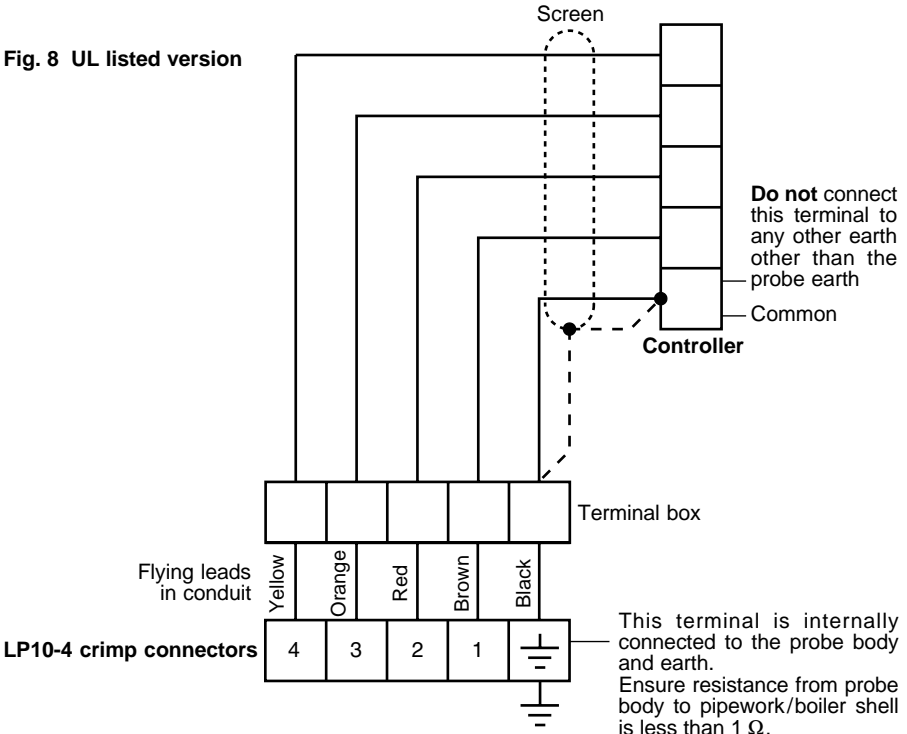


Fig. 8 UL listed version



5. Maintenance

No special maintenance is required. Steam boiler water level controls do, however, require regular testing in accordance with National and Regional regulations, and in the UK, Guidance Notes published by the Health and Safety Executive.

The UK Health and Safety Executive recommends that boiler controls should be inspected at least at quarterly intervals. We recommend that this frequency is also followed outside the UK unless National or Regional regulations state otherwise.

Where regular tests are carried out properly in a well run boiler house with good water treatment, it may be that only an annual inspection of the probe is required.

This is a matter, however, for the user to decide in liaison with the boiler inspector in order to determine a sensible inspection programme to suit the individual boiler plant.

We recommend that the inspection is carried out as follows:

- Depressurise and vent boiler/vessel, - observe safety precautions.
- Disconnect the electrical supply to controller.
- Remove probe upper housing and inspect for dirt or moisture.
- Disconnect wiring and remove probe.
- Clean housing if necessary.
- Check condition of probe.
- Clean probe tips and insulation if necessary with a cloth or soft bristle brush - **do not** use abrasive or conductive products such as steel wool.

WARNING

If scale is present on the probe, it will also be forming on the boiler, and a competent water treatment specialist must be consulted as soon as possible.

- Check that all extension connector lock-nuts are tight.
- Inspect the probe controller wiring, and the controller supply wiring.
- Check the controller for damage.
- Reassemble and carry out a full functional check of the equipment.

Available spares

Connector set

Stock No. 4024480
