IM-P402-131
AB Issue 3

LC3050
Level Controller
Installation and Maintenance Instructions

1. Safety information

Safe operation of this product can only be guaranteed if it is properly installed, commissioned, used and maintained by qualified personnel (see Section 1.11) in compliance with the operating instructions. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

In the UK, your attention is drawn to IEE Regulations (BS 7671). Elsewhere, other regulations will normally apply.

All wiring materials and methods shall comply with relevant EN and IEC standards where applicable.

Warning

This product is designed and constructed to withstand the forces encountered during normal use. Use of the product other than as a level limiter, or failure to install the product in accordance with these Instructions, product modifications or repair could:

- **Cause injury or fatality to personnel.**
- **Cause damage to the product / property.**
- **Invalidate the CE marking.**

These instructions must be stored in a safe place near the product installation at all times.

Warning

LP30 level probe and LC3050 level controller
LP31 level probe and LC3050 level controller

The above products comply with the requirements of the European Pressure Equipment Directive 97/23/EC and carry the CE mark. They are classed as Safety Accessories and therefore fall within Category 4 of the Directive.

This product complies with Electromagnetic Compatibility Directive 2004/108/EC and all its requirements.

This product meets all the Requirements of the Directive and is suitable for Class A Environments (eg Industrial). The LC3050 meets the requirements of the Directive by meeting the Controlling standard:

- **EN 61326-1: 2006 - Electrical equipment for measurement control and laboratory use - EMC requirements Part 1: General requirements.**

In addition the LC3050 meets the EMC requirements of the following standards:

- **EN 12953-9: 2007- Shell boilers Part 9: Requirements for limiting devices of the boiler and accessories.**
- **EN 12952-11: 2007 - Water-tube boilers and auxiliary installations Part 11: Requirements for limiting devices of the boiler and accessories VdTÜV Directive water level 100:2006.**

The product may be exposed to interference above the limits of Heavy Industrial Immunity if:

- **The product or its wiring is located near a radio transmitter.**
- **Excessive electrical noise occurs on the mains supply. Power line protectors (ac) should be installed if mains supply noise is likely. Protectors can combine filtering, suppression, surge and spike arrestors.**

- **Cellular telephones and mobile radios may cause interference if used within approximately 1 metre (39") of the product or its wiring. The actual separation distance necessary will vary according to the surroundings of the installation and the power of the transmitter.**

This product has been type-tested as a Special Design Water Level Limiter by meeting the Standard:

- **VdTÜV requirements for water level control and limiting devices, water level 100 (07.2006).**

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

Static precautions (ESD)

Static precautions must be observed at all times to avoid damage to the product.

Level control and level limiting 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 Inspection Bodies.**
- **Boiler manufacturer's specifications.**

Two independent low water limiting 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.

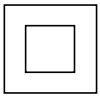
A high water alarm may be part of the water level control, or a separate system. An independent high water alarm system must be fitted if it is considered a safety requirement.

In this case, the relays must simultaneously isolate the feedwater supply and the boiler heat supply at high alarm status. All boiler water limiters require regular functional testing.

The level probe and controller is only part of the safety system. To complete the system, additional circuitry (wiring, relays, alarm bell / lamp etc.) is required.

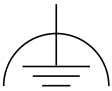
A suitable water treatment regime must be used to ensure continuous safe and correct operation of the control and limiter systems. Consult the above authorities and a competent water treatment company.

Symbols



Equipment protected throughout by double insulation or reinforced insulation.

Functional earth (ground) terminal, to enable the product to function correctly.
Not used to provide electrical safety.

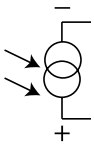


Clean earth / ground.

Safety earth.

Caution, risk of electric shock.

Caution, risk of danger, refer to accompanying documentation.



Optically isolated current source or sink.

Caution, Electrostatic Discharge (ESD) sensitive circuit. Do not touch or handle without proper electrostatic discharge precautions.

ac, alternating current.

1.1 Intended use

i) Check that the product is suitable for use with the intended fluid.

ii) Check material suitability, pressure and temperature and their maximum and minimum values. If the maximum operating limits of the product are lower than those of the system in which it is being fitted, or if malfunction of the product could result in a dangerous over-pressure or over-temperature occurrence, ensure a safety device is included in the system to prevent such over-limit situations.

iii) Determine the correct installation situation and direction of fluid flow.

iv) Spirax Sarco products are not intended to withstand external stresses that may be induced by any system to which they are fitted. It is the responsibility of the installer to consider these stresses and take adequate precautions to minimise them.

v) Remove protection covers from all connections and protective film from all name-plates, where appropriate, before installation on steam or other high temperature applications.

1.2 Access

Ensure safe access and if necessary a safe working platform (suitably guarded) before attempting to work on the product. Arrange suitable lifting gear if required.

1.3 Lighting

Ensure adequate lighting, particularly where detailed or intricate work is required.

1.4 Hazardous liquids or gases in the pipeline

Consider what is in the pipeline or what may have been in the pipeline at some previous time. Consider: flammable materials, substances hazardous to health, extremes of temperature.

1.5 Hazardous environment around the product

Consider: explosion risk areas, lack of oxygen (e.g. tanks, pits), dangerous gases, extremes of temperature, hot surfaces, fire hazard (e.g. during welding), excessive noise, moving machinery.

1.6 The system

Consider the effect on the complete system of the work proposed. Will any proposed action (e.g. closing isolation valves, electrical isolation) put any other part of the system or any personnel at risk?

Dangers might include isolation of vents or protective devices or the rendering ineffective of controls or alarms. Ensure isolation valves are turned on and off in a gradual way to avoid system shocks.

1.7 Pressure systems

Ensure that any pressure is isolated and safely vented to atmospheric pressure. Consider double isolation (double block and bleed) and the locking or labeling of closed valves. Do not assume that the system has depressurised even when the pressure gauge indicates zero.

1.8 Temperature

Allow time for temperature to normalise after isolation to avoid danger of burns.

1.9 Tools and consumables

Before starting work ensure that you have suitable tools and/or consumables available. Use only genuine Spirax Sarco replacement parts.

1.10 Protective clothing

Consider whether you and/or others in the vicinity require any protective clothing to protect against the hazards of, for example, chemicals, high/low temperature, radiation, noise, falling objects, and dangers to eyes and face.

1.11 Permits to work

All work must be carried out or be supervised by a suitably competent person. Installation and operating personnel should be trained in the correct use of the product according to the Installation and Maintenance Instructions.
Where a formal 'permit to work' system is in force it must be complied with. Where there is no such system, it is recommended that a responsible person should know what work is going on and, where necessary, arrange to have an assistant whose primary responsibility is safety.
Post 'warning notices' if necessary.

1.12 Handling

Manual handling of large and/or heavy products may present a risk of injury. Lifting, pushing, pulling, carrying or supporting a load by bodily force can cause injury, particularly to the back. You are advised to assess the risks taking into account the task, the individual, the load and the working environment and use the appropriate handling method depending on the circumstances of the work being done.
Electronics products:- Electrostatic discharge - Appropriate ESD precautions, (e.g grounded wrist strap, static dissipative work area) must be taken when handling to avoid personal injury or damage to the product.

1.13 Residual hazards

In normal use the external surface of the product may be very hot.
Many products are not self-draining. Take due care when dismantling or removing the product from an installation.

1.14 Freezing

Provision must be made to protect products that are not self-draining against frost damage in environments where they may be exposed to temperatures below freezing point.

1.15 Disposal

On disposal of the unit or component, appropriate precautions should be taken in accordance with local / National regulations.
Unless otherwise stated in the Installation and Maintenance Instructions this product is recyclable and no ecological hazard is anticipated with its disposal providing due care is taken.

1.16 Returning products

Customers and stockists are reminded that under EC Health, Safety and Environment Law, when returning products to Spirax Sarco they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk. This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

2. General product and delivery information

2.1 General description

The Spirax Sarco LC3050 is a level limiting alarm suitable for use in conductive liquids as a high or a low alarm.

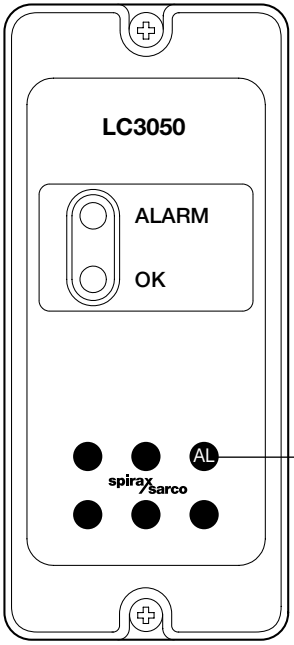
It can be used in steam or hot water boilers up to 239ºC @ 32 bar g.

The LC3050 is defined as a special design electronic water level limiter in the context of EN 12952-11-2007.

It is designed for use with Spirax Sarco high or low level, self-monitoring, high integrity level probes.

The LC3050 is a dual voltage unit, 220 / 240 Vac or 110 / 120 Vac with LED indication of the following conditions:-

Green	Normal Level
Red	Level alarm - Boiler water low /high



WARNING; In most countries, steam boilers operating with limited supervision require two self-monitoring level probes and controllers to provide two independent low level alarms. A high level alarm is also advised, and is compulsory in some countries.

WARNING: The minimum conductivity is 30 µS/cm or 30 ppm.

The product can be panel, DIN rail or chassis mounted.

The front panel has two LEDs, indicating normal and alarm conditions, and a test button (AL).

Press and hold this button to test the alarm. This provides a full test of the probe, controller, and associated circuits.

The other buttons on the keypad are non-functional.

Fig. 1 Keypad button identification

2.2 The LC3050 cyclic self-testing function

An automatic cyclic test of the probe, probe cable and controller is carried out every few seconds by internally simulating a fault in the probe.

A test button is fitted so that a full test of the probe, controller, and associated circuits can be carried out.

Provision is made for the wiring of a remote test button if required.

2.3 Equipment delivery, handling and storage

Factory shipment
The product is tested, calibrated and inspected prior to shipment, to ensure reliable operation.

Receipt of shipment
At the time of delivery each carton should be inspected for possible external damage. Any visible damage should be recorded immediately on the carrier's copy of the delivery slip.

Each carton should be unpacked carefully and its contents checked for damage. If it is found that some items have been damaged or are missing, notify Spirax Sarco immediately and provide full details. In addition, damage must be reported to the carrier with a request for their on-site inspection of the damaged item and its shipping carton.

Storage
If the product is to be stored for a period prior to installation, the environmental storage conditions should be at a temperature between 0°C and 65°C (32°F and 149°F), and between 10% and 90% relative humidity (non-condensing).

Ensure there is no condensation within the unit before installing and connecting the power.

The LC3050 is normally configured to warn of a change in level outside the normal limits for steam or hot water boilers, tanks or vessels, by engaging an alarm relay.

Inputs

The product accepts inputs from the LP30 low level probe or the LP31 high level probe.

Function

The LC3050 compares the resistance to earth from the probe, through the water, to the boiler or vessel shell. If a change in water level causes this resistance to change beyond a set limit, a timer is engaged which alters the state of an internal relay after a pre-set delay. This signal is used to trigger an alarm.

A compensation tip on the probe compensates for any leakage to earth caused by scale, dirt, or internal moisture, ensuring an alarm signal even under adverse conditions.

The product can communicate via an infrared link between adjacent boiler house controllers (Spirax Sarco products only). The LC3050 is designated as a slave unit only – see Section 7, Communications.

4. Mechanical installation

Note: Read the 'Safety information' in Section 1 before installing the product.

Caution: Allow 15 mm spacing between multiple units for air circulation.

Do not attempt to open the product;
It is sealed and has no replaceable parts or internal switches.

Do not cover or obstruct the infrared beam between products.

The product must be installed in a suitable industrial control panel or fireproof enclosure to provide impact and environmental protection. A minimum of IP54 (EN 60529) or Type 3, 3S, 4, 4X, 6, 6P and 13 (UL50 / NEMA 250) is required.

4.1 Environmental conditions

Install the product in an environment that minimises the effects of heat, vibration, shock and electrical interference (see Section 1 'Safety information').

Do not install the product outdoors without additional weather protection.

4.2 Installation on a DIN rail

The product is provided with a clip and a set of self-tapping screws to secure it to a 35 mm DIN rail. On the rear of the enclosure, two sets of holes are provided to give two height positions. The clip can be adjusted to give further positions. Locate the clip onto one set of holes and secure it using the two screws provided. Ensure the spring clip is fully engaged with the rail.

Warning: Only use the screws provided with the product.

4.3 Installation on a chassis plate:

- Drill holes in chassis plate as shown in Figure 2.
- Fit unit to chassis plate and secure with 2 screws, nuts and washers, using the slots provided at the top and bottom of the case.

Warning: Do not drill the product case or use self-tapping screws.

4.4 Installation in a panel cutout:

(Minimum panel thickness 1 mm if the bezel is used).

- The product has integral threaded inserts (M4 x 0.7) at the top and bottom of the front panel.
- Two M4 x 25 mm screws are provided, together with fibre washers and a bezel.

Warning:
Do not use screws over 25 mm in length – danger of electric shock.

- Cut the panel to the dimensions given in Figure 2. Drill the screw holes in the panel in the positions indicated.
- Remove the backing from the gasket supplied and apply to front face of the product.
- The bezel can be used to enhance the appearance of the panel cutout. If required, fit this to the outside of the panel.
- Fit the unit from the rear of the panel, and secure using the screws, washers (and bezel) provided.
- Tighten the M4 screws to 1.0 - 1.2 Nm.

Warning: Do not drill the product case or use self-tapping screws.

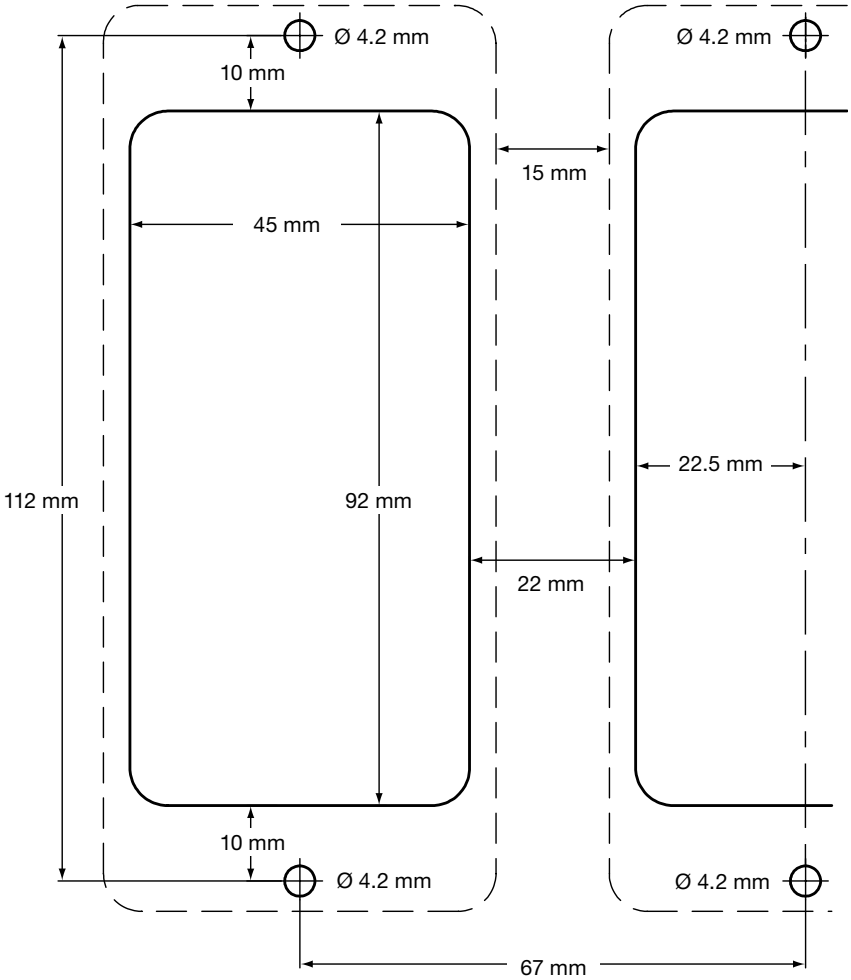


Fig. 2 Chassis plate / panel – cutout diagram

Fixing template cutout notes:

- Solid line indicates cutout required for panel mounting.
- Broken line indicates product outline.
- A minimum gap of 15 mm between units must be provided for product cooling.
- Mounting hole dimensions are the same for both panel and wall mounting.

5. Electrical installation

Note: Before installing read the 'Safety Information' in Section 1.

Warning:
Isolate the mains supply before touching any of the wiring terminals as these may be wired to hazardous voltages.
Use only the connectors supplied with the product, or spares obtained from Spirax Sarco Limited. Use of different connectors may compromise product safety and approvals. Ensure there is no condensation within the unit before installing and connecting the power.

5.1 General wiring notes

Every effort has been made during the design of the product to ensure the safety of the user but the following precautions must be observed:

1. Maintenance personnel must be suitably qualified to work with equipment having hazardous live voltages.

2. Ensure correct installation. Safety may be compromised if the installation of the product is not carried out as specified in this IMI.

3. The design of the product relies on the building installation for overcurrent protection and primary isolation.

4. Overcurrent protection devices rated at 100 mA must be included in all phase conductors of the installation wiring. If overcurrent protection is included in both supply wires then the operation of one must also cause the operation of the other. Refer to IEC 60364 (Electrical Installations of Buildings) or National or Local standards for full details of requirements for overcurrent protection.

5. A 3 A quick-blow overcurrent protection device must be fitted to the relay circuit(s).

6. Relay contacts must be supplied on the same phase as the mains supply.

7. The product is designed as an installation category III product.

8. Install wiring in accordance with:

   - IEC 60364 - Low-voltage electrical installations.
   - EN 50156 Electrical Equipment for furnaces and ancillary equipment.
   - BS 6739 - Instrumentation in Process Control Systems: Installation design and practice or local equivalent.
   - National and Local Electrical Code (NEC) or Canadian Electrical code (CEC) for the US and Canadian markets. Note; use NEC Class 1 wire with a temperature rating greater than 75°C. If the cable is to be exposed to a higher temperature, then a higher temperature rating needs to be selected.

9. It is important that the cable screens are connected as shown in order to comply with the electromagnetic compatibility requirements.

10. All external circuits must meet and maintain the requirements of double / reinforced installation as stated in IEC 60364 or equivalent.

11. Additional protection must be provided to prevent accessible parts (e.g. signal circuits) from becoming Hazardous Live if a wire or screw is accidentally loosened or freed. Ensure all wires are secured to at least one other wire from the same circuit. The attachment must be as close to the terminal block as possible but must not apply undue stress on the connection. Example: Use a cable tie to secure the live and neutral wire together. If one wire becomes loose the other wire will prevent it from touching accessible parts.

12. A disconnecting device (switch or circuit breaker) must be included in the building installation. It must:

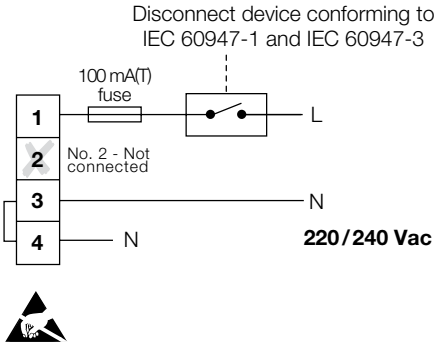
- Have a rating with sufficient breaking capacity.
- Be in close proximity to the equipment, within easy reach of the operator, but not fitted in a position that makes it difficult to operate.
- Disconnect all phase conductors.
- Be marked as the disconnecting device for the product.
- Not interrupt a protective earth conductor.
- Not be incorporated into a mains supply cord.
- Comply with the requirements for a disconnecting device specified in IEC 60947-1 (Specification for low-voltage switchgear and control gear General rules) and IEC 60947-3 (Switches, disconnectors, switch-disconnectors and fuse-combination units).

13. See Section 10 'Technical information' for terminal and cable specification.

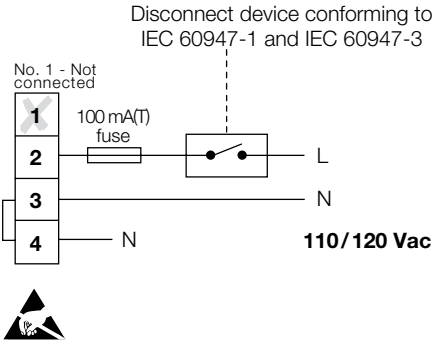
5.2 Mains wiring notes:

1. Read Section 5.1, General Wiring notes, before attempting to wire the supply to the product.

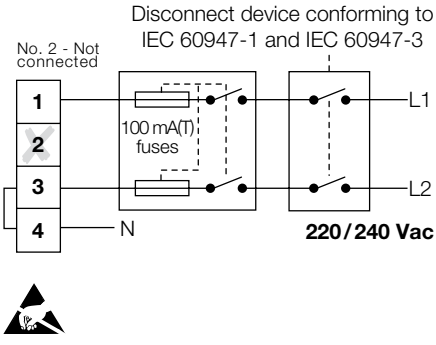
2. Fuses must be fitted in all live conductors.



Note: Remove mains warning label completely (including any residue) before connecting the mains wiring.

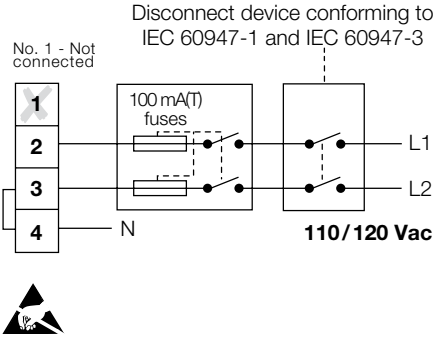


Note: Remove mains warning label completely (including any residue) before connecting the mains wiring.



Note: Remove mains warning label completely (including any residue) before connecting the mains wiring.

Fig. 3 220/240 Vac supply



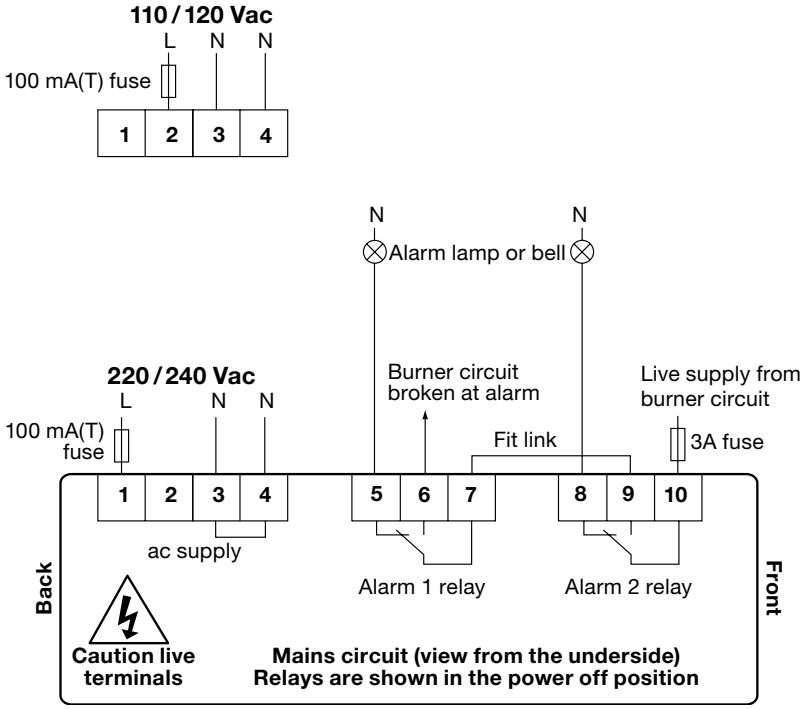
Note: Remove mains warning label completely (including any residue) before connecting the mains wiring.

Fig. 4 110/120 Vac supply

3. Double or reinforced insulation must be maintained between:

- Hazardous live conductors (mains and relay circuits) and
- Safety extra low voltages (All other components/connectors/conductors).

4. The wiring diagrams show relays and switches in the **Power off** position.



220/240 Vac mains input – Live T1 – Neutral T3 or T4

110/120 Vac mains input – Live T2 – Neutral T3 or T4

Fig. 5 Selecting the operating voltage

5.3 Probe wiring

The maximum cable length for all transducers is 50 m (164 ft).

LP30 and LP31 UL probes only

The LP30 and LP31 UL probes are supplied with four 18 AWG, 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. See the LP30 and LP31 Installation and Maintenance Instructions for further details.

5.4 Signal wiring notes

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

The 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 has 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 is used as a sink or drain for any electrical interference. The earth terminal must be connected to a local earth in order to conform to the EMC directive.

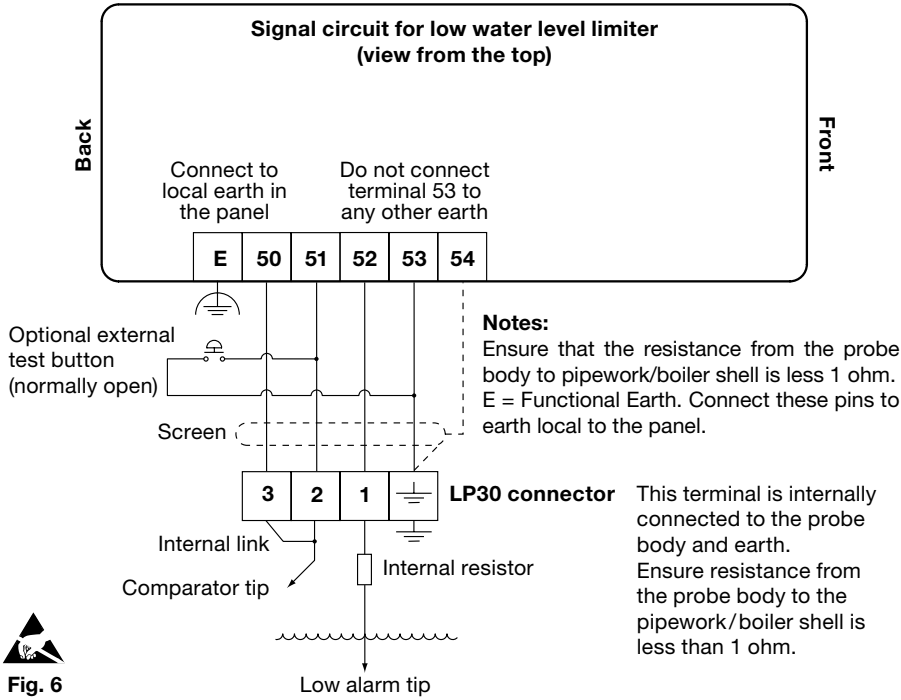


Fig. 6

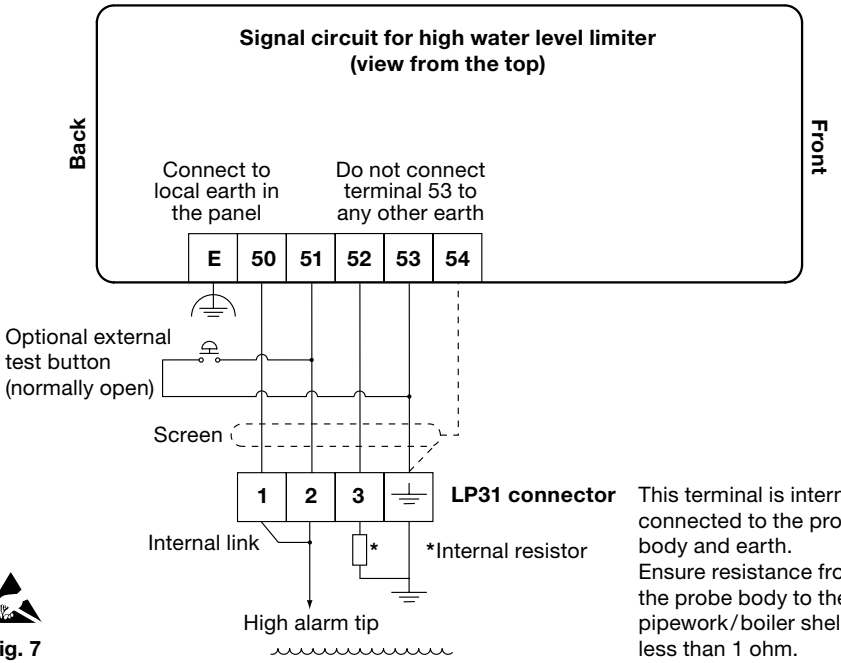


Fig. 7

Notes:
Ensure that the resistance from the probe body to pipework/boiler shell is less 1 ohm.

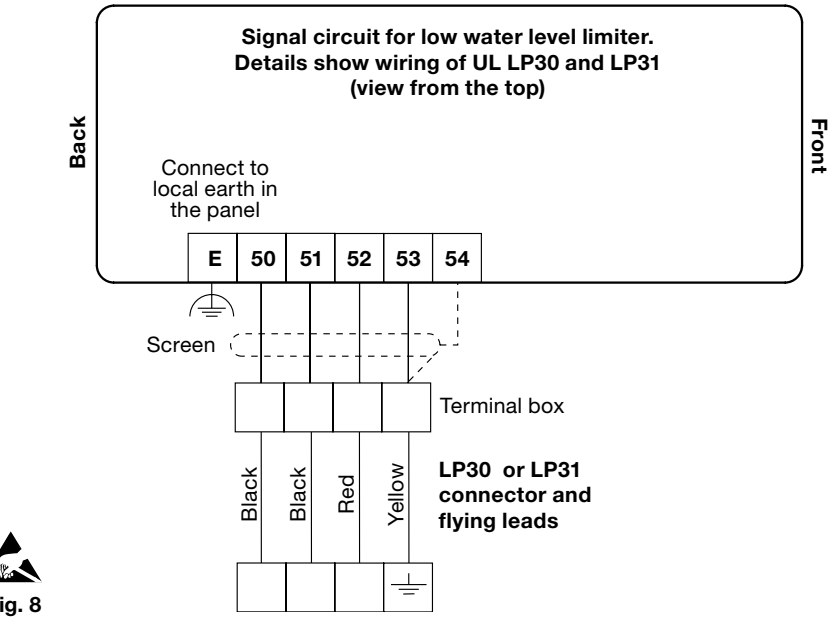


Fig. 8

6.1 General information

With the water level normal the green LED will be lit, and the boiler panel will indicate a normal water level. The green LED briefly extinguishes every few seconds showing that the automatic cyclic test is being carried out.

To carry out a manual test:

1. With the water level normal, press and hold the AL button until the green (normal) LED extinguishes and the red (alarm) LED lights (approximately 5 - 6 seconds).
The boiler panel indicators should signal alarm.

2. Release the test button — After a short delay, the green LED will light and the red LED will extinguish, showing that the internal checking circuits have been verified. The boiler panel indicators will return to normal.
If there is an external lockout circuit in the boiler panel this will need to be reset.

3. If the optional external test button has been connected, press and hold it until the same test sequence occurs, (approximately 5 - 6 seconds).

4. Lower the boiler water level to below the low alarm level (low alarm), or raise the water level to above the high alarm level (high alarm).
The green LED will extinguish and the red LED will light. The boiler panel indicators will go to alarm.

5. Alter the water level to normal — The controller relays will re-energise and allow the burner to fire (after resetting any lockout).

For specific testing instructions for Spirax Sarco systems please see separate literature.

Press and hold this button to test the alarm. This provides a full test of the probe, controller, and associated circuits.

The other buttons on this product are non-functional.

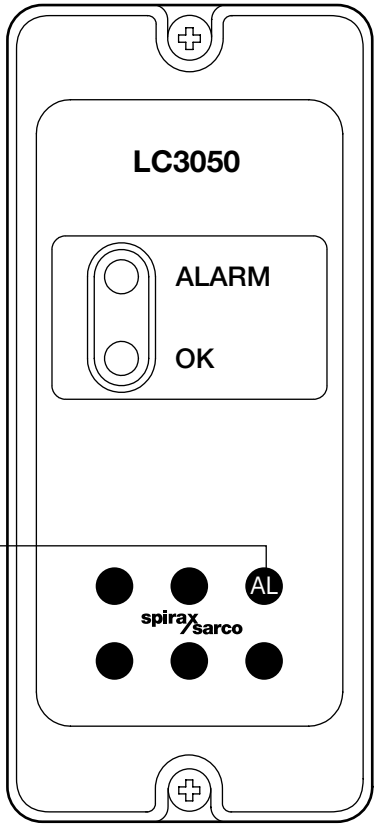


Fig. 9 Keypad and defnitions

7.1 Infrared (IR)

All products in the range can communicate via an infrared bus between adjacent controllers. It enables the parameters of up to seven slave products to be passed to a master product fitted with RS485 (products with a graphics display). The LC3050 is designated a slave unit.

The product connected to the RS485 networks must be fitted on the left of all the slaves fitted to the IR bus (Figure 10) and have 'master' selected in the 'output-comms' menu.

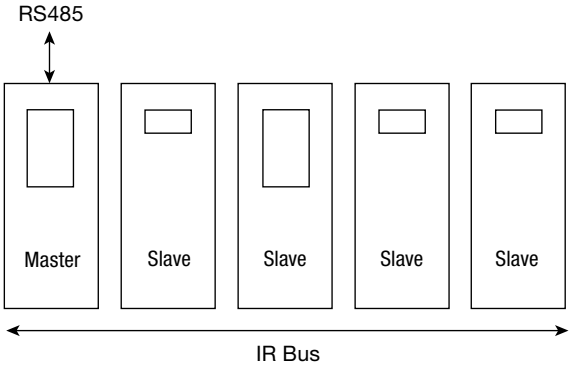


Fig. 10

Two or more IR buses can share the same enclosure or DIN rail by selecting another IR master. Master 2 will ignore bus 1. See Figure 11.

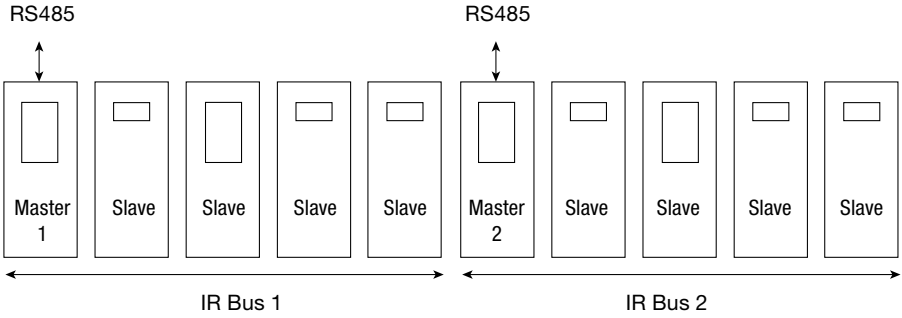


Fig. 11

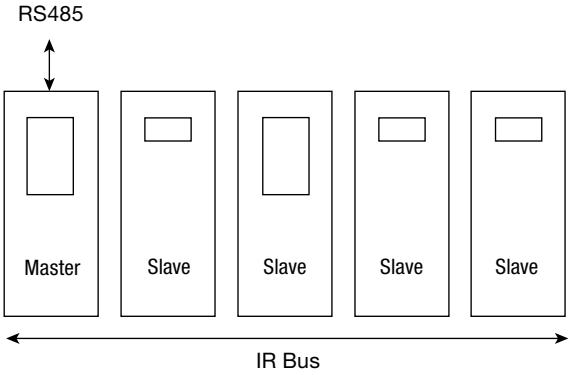
To add another slave into an existing IR bus, re-select 'master'.

Only an IR master can pass the IR bus parameters to the RS485 network. If a slave is also connected to the RS485 network, only its parameters are passed.

Caution: Do not cover or obstruct the infrared beam between products.

7.2 RS485 addressing

An offset is added to the register addresses (see above) for each device, depending on their position on the IR bus, i.e. the master's offset is 0, the device to its right hand side has an offset of 100, the one to its right 200 and so on.



IR address	1	2	3	4	5
RS485 Offset	0	100	200	300	400

Fig. 12

Note: Read the 'Safety information' in Section 1 before starting any maintenance.

8.1 Cleaning instructions

Use a cloth dampened with tap/de-ionized water or isopropyl alcohol. Use of other cleaning materials could damage the product and invalidate the CE marking.

No special servicing, preventative maintenance or inspection of the product is required.

Boiler water level controls and level alarms, however, do require regular testing and inspection. General guidance is given in Health and Safety Executive Guidance Note PM5. For specific instructions for the Spirax Sarco system please see separate literature.

LP30

Clean and inspect the LP30 annually, particularly the threaded contact surfaces between the tip extension and the probe central electrode.

More regular cleaning is advised where the quality of boiler water might cause a build-up of insulative scale or oxide on the probe.

9. Fault finding

The most likely time for faults to occur is during installation and commissioning. The most common type of fault is incorrect wiring. If for any reason a fault occurs on the product, the instructions in this section will allow the fault to be isolated and corrected.

WARNING:
Before fault finding read the Safety information in Section 1 and the General wiring notes in Section 5.1.

Please note that there are hazardous voltages present and only suitably qualified personnel should carry out fault finding.

The product must be isolated from the mains supply before investigating any problems.

Safety may be compromised if the fault finding procedures are not carried out in line with this manual.

Symptom	Action
1 **No LEDs lit**	**1.** Switch off the mains supply to the product. **2.** Check all wiring is correct. **3.** Ensure the mains live wire is connected to terminal 1 for 220/240 Vac or terminal 2 for 110/120 Vac. **4.** Check external fuse(s) are intact. Replace if necessary. **5.** Check the mains supply is within specification. **6.** Switch on the mains supply. If the symptoms are still present return the product for examination. Consider the likelihood that the product has been damaged from mains borne surges/spikes. Consider installing an additional ac power line protector between the product and the mains supply. The protector needs to be positioned close to the product to gain full protection.

Symptom	Action
2 **Red LED stays on (LP30 low alarm)**	**1.** Probe cable to 'low alarm tip' connection is open circuit. **2.** Comparator tip shorted to earth. **3.** Earth open circuit. **4.** Probe wires crossed. **5.** Low alarm tip shorted to comparator tip.
3 **Red LED stays on (LP31 high alarm)**	**1.** Probe cable to 'high alarm tip' shorted to earth. **2.** Probe cable to probe terminal 3 is open circuit. **3.** Earth open circuit. **4.** Probe wires crossed.
4 **Red and green LEDs stay on (LP30 low alarm)**	**1.** Probe cable to 'low alarm tip' is shorted to earth. **2.** Probe wires crossed. **3.** Comparator tip open circuit.
5 **Red and green LEDs stay on (LP31 high alarm)**	**1.** Probe cable to 'high alarm tip' is open circuit (probe terminals 1 or 2). **2.** Probe wires crossed.

Symptom	Action
6 **Green LED flashes quickly on start-up, then red LED lights for about 12 seconds. Green LED then flashes approximately every 4 seconds**	**1.** No fault present – Controller self-checking circuitry has simulated a fault at the moment it was switched on, but is working normally.
7 **A high or low water alarm has occurred**	**1.** Check the actual level in the boiler immediately. If the level is in the alarm area, then take action to normalise the level. **2.** If an alarm has occurred and the level is normal, switch off the boiler and investigate the fault immediately.
8 **Controller internal thermal fuse blown**	**1.** Check the mains supply voltage is lower than 264 Vac or 132 Vac, and that the ambient temperature inside the control panel is less than 55°C (131°F). If either of these limits has been exceeded, it is possible that the controller internal thermal fuse has blown and that the controller will need to be replaced. **2.** Ensure the probe supply voltage is approximately 2 - 2.5 Vac between terminals 52 and 53 of the controller, or terminal 1 and earth of the probe.

10. Technical information

10.1 For technical assistance

Contact your local Spirax Sarco representative. Details can be found on order/delivery documentation or on our web site: **www.spiraxsarco.com**

10.2 Returning faulty equipment

Please return all items to your local Spirax Sarco representative. Please ensure all items are suitably packed for transit (preferably in the original cartons).

Please provide the following information with any equipment being returned:

1. Your name, company name, address and telephone number, order number and invoice and return delivery address.
2. Description and serial number of equipment being returned.
3. Full description of the fault or repair required.
4. If the equipment is being returned under warranty, please indicate:
   - Date of purchase.
   - Original order number.

10.3 Power supply

Mains voltage range	220/240 Vac setting (198 V to 264 V)
	110/120 Vac setting (99 V to 132 V)
Frequency	50 - 60 Hz
Power consumption	230 V/30 mA or 115 V/60 mA

10.4 Environmental

General		Indoor use only
Maximum altitude		2 000 m (6 562 ft) above sea level
Ambient temperature limits		0 - 55°C (32 - 131°F)
Maximum relative humidity		80% up to 31°C (88°F) decreasing linearly to 50% at 40°C (104°F)
Overvoltage category		III
Pollution degree		2 (as supplied)
		3 (when installed in an enclosure) - Minimum of IP54 or UL50 / NEMA Type 3, 3S, 4, 4X, 6, 6P or 13. See Section 4, Mechanical installation.
Enclosure rating (front panel only)		NEMA type 4 hose down only (UL approval), and IP65 (verified by TRAC Global)
Torque rating for panel screws		1 - 1.2 Nm
LVD (safety)		Electrical safety EN 61010-1
		UL61010-1
		CAN/CSA C22.2 No. 61010-1
EMC	Immunity/Emissions	Suitable for heavy industrial locations
Enclosure	Colour	Light grey (similar to RAL7035)
	Material	ABS polycarbonate plastic
Front panel	Colour	Pantone 294 (blue)
	Material	Silicone rubber, 60 shore.
Solder		Tin/lead (60/40%)

10.5 Cable / wire and connector data

Mains and signal connector

Termination	Rising clamp plug-in terminal blocks with screwed connectors
Cable size	0.2 mm² (24 AWG) to 2.5 mm² (14 AWG).
Stripping length	5 - 6 mm

Caution:- Use only the connectors supplied by Spirax Sarco Ltd. Safety and Approvals may be compromised otherwise.

Level probe cable/wires

Type	High temperature
Shield type	Screened
Number of cores	4
Gauge	1 - 1.5 mm² (18 - 16 AWG)
Maximum length	50 m (164 ft)
Recommended type	Prysmian (Pirelli) FP200, Delta Crompton Firetuf OHLS

10.6 Input technical data

Level

Minimum conductivity	30 µS/cm or 30 ppm

10.7 Output technical data

Relay(s)

Contacts	2 x single pole changeover relays (SPCO)
Voltage ratings (maximum)	250 Vac
Resistive load	3 amp @ 250 Vac
Inductive load	1 amp @ 250 Vac
ac motor load	¼ HP (2.9 amp) @ 250 Vac
	$^{1}/_{10}$ HP (3 amp) @ 120 Vac
Pilot duty load	C300 (2.5 amp) - control circuit/coils
Electrical life (operations)	3 x 10^5 or greater depending on load
Mechanical life (operations)	30 x 10^6

Infrared

Physical layer	IrDA
Baud	38400
Range	10 cm
Working angle	15°
Eye safety information	Exempt from EN 60825-12: 2007 Safety of laser products- does not exceed the accessible emission limits (AEL) of class 1

11. Appendix - Data registers

Parameters and register data

Register	Parameters
0	6 - Identity **Note:** When the device is an IR slave and there is a temporary error in the IR Master-Slave comms, an offset of +32768 is added to the identification value of that particular slave stored in the master's database.
1	Alarm status ~ 01 = normal or 00 = alarm
2	-
3	-
4	-
5	-
6	-
7	-
8	-
9	-

The format of the register data is 16 bit integer, with the most significant byte transmitted first.