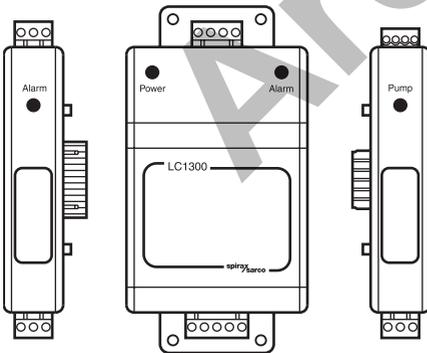


LC1300
Level Controller
Installation and Maintenance Instructions

- 1. Safety information*
- 2. General product information*
- 3. Installation*
- 4. Setting up the controller*
- 5. Wiring diagrams*
- 6. Commissioning*
- 7. Maintenance*
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1. Safety information

Your attention is drawn to any National or local regulations.

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, will invalidate the CE marking, and may cause injury or fatality to personnel.

Pressure equipment not bearing the CE mark is classified 'Sound Engineering Practice' in accordance with Article 3, Paragraph 3 of the Pressure Equipment Directive 97/23/EC.

Note: By law, SEP products cannot be marked with the CE symbol.

Warning

Isolate the mains supply before unplugging the controller as hazardous voltages are present at the terminals. This product complies with the requirements of Electromagnetic Compatibility Directive 89/336/EEC by meeting the standards of:

- EN 61326 : 1997 A1 + A2 Emissions Class B equipment Table 4.
- EN 61326 : 1997 A1 + A2 Immunity for Industrial Locations Annex A.

The following conditions should be avoided as they may create interference above the limits specified in EN 61326 (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.

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

1.1 Intended use

- Check that the product is suitable for use with the intended fluid.
- 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 overpressure or overtemperature occurrence, ensure a safety device is included in the system to prevent such over-limit situations.
- Determine the correct installation situation and direction of fluid flow.
- 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.
- Remove protection covers from all connections and protective film from all name-plates, where appropriate, before installation on steam or other high temperature applications.

Safe operation of these products can only be guaranteed if they are 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.

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 labelling 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.

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 which are not self-draining against frost damage in environments where they may be exposed to temperatures below freezing point.

1.15 Safety information - Product specific for 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/alarm systems. Consult the above authorities and a competent water treatment company.

1.16 Disposal

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.

1.17 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 information —

2.1 Description

The LC1300 is a modular level controller for use with conductivity level probes in conductive liquids. The controller is suitable for use with virtually all qualities of industrial waters from condensate or boiler water to salt solutions. It can be used in water with an electrical conductivity as low as 1 $\mu\text{S}/\text{cm}$ @ 25°C (77°F).

The LC1300 is of modular design and in its most basic form comprises a power/alarm module with a single alarm function. Smaller modular units are then added to the power/alarm module depending on the functions required. Modular units include pump on/off control or an additional alarm. Up to a maximum of one pump module and one additional alarm may be added to the power/alarm module.

The LC1300 has an automatic sensitivity level and filter function which allow it to give a precise response under the very different conductivity and turbulence conditions found in tanks and high output boilers.

Probe tips are energised with a maximum voltage of 3 Vac.

2.2 Applications

The LC1300 controller can provide the following functions:-

Power/alarm module	High or low alarm from a single probe input
Pump module	Pump control using two probe inputs
Alarm module	Extra alarm from a single probe input that can be configured for high or low alarm

2.3 Pressure/temperature limits

Controller	Maximum ambient temperature - controller	55°C (131°F)
	Minimum ambient temperature - controller	0°C (32°F)

2.4 Technical data

Mains supply voltage	99 - 264 Vac
Frequency	50 - 60 Hz
Maximum power consumption	6 VA
Maximum cable length (controller to probe)	30 m (98 ft)
Minimum conductivity when used with a Spirax Sarco LP10-4 probe	1 $\mu\text{S}/\text{cm}$ @ 25°C (77°F)
Altitude up to	2 000 m (6 561 ft)
Humidity	Maximum relative humidity 80% for temperatures up to 31°C (87.8°F) decreasing linearly to 50% relative humidity at 40°C (104°F)

3. Installation

WARNING

Isolate the mains supply before touching any of the controller terminal blocks as these may be wired to mains voltage.

To unplug the terminal blocks from their modules, pull the block vertically upwards or downwards. Side modular units are simply removed by pulling the module sideways away from the power/alarm module. The controller must be installed in an enclosure or control panel to provide impact and environmental protection (pollution degree 2). Spirax Sarco can provide suitable metal or plastic enclosures for the standard controller. The controller may be mounted on a 'top hat' DIN rail using the clip provided or the controller base screwed directly to a chassis plate (use No.8/4 mm roundhead screws).

Caution: Allow 15 mm (½") minimum clearance all round the unit for air circulation.

The controller is for installation category II (Overvoltage category) and must be installed in accordance with IEC 60364 or equivalent. For the US and Canadian markets, the controller must be wired in accordance with the National and Local Electrical Code (NEC) or Canadian Electrical Code (CEC). The controller and all connected mains circuits must be supplied by the same phase and have a common isolation system which meets the relevant requirements of IEC 60947-1 and IEC 60947-3 or equivalent. This must be positioned close to the controller and clearly identified as the disconnect device.

A quick blow 3 amp external fuse must be fitted in all phases of the controller and relay supply.

The relays are rated at 250 Vac maximum, to the following ratings:-

Relay rating table:

Version	Relay load type	Rating
Standard	Resistive at 250 Vac	3 A
	Inductive at 250 Vac	1 A
	Lamp or resistive at 240 Vac	3 A
	Tungsten filament at 240 Vac	1 A
UL Listed	AC motor at 240 Vac	¼ HP (2.9 A)
	AC motor at 120 Vac	⅓ HP (3 A)
	Pilot duty (control circuits/coils)	C300 (2.5 A)

Note:- the wiring diagrams (Section 5) show all relays in the power off position.

Screened cable is required for the probe. To comply with European EMC requirements use Pirelli/Prysmian FP200 or Delta Crompton Firetuf OHLS, 1 mm². The same type of cable may be used for the mains wiring. Use NEC Class 1 wiring for the UL version. Connect the screens as shown in the wiring diagrams (Section 5). Cabling should be installed in accordance with BS 6739 - Instrumentation in Process Control Systems: Installation design and practice or local equivalent.

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 and controller screen will only be connected to earth at one end. **Note: 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 (tank/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 the earth terminal of the probe and to the common terminal of the controller. 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.**

The pump input terminal has a maximum torque of 0.45 N m (4 lbf inch). The maximum torque to be applied to the other terminal screws is 0.8 N m (7 lbf inch).

4. Setting up the controller

4.1 To change the control and alarm functions

The power/alarm module can be configured for high or low alarm operation by connecting the link between terminals 1 and 2 (see Section 5, Wiring diagram). The additional alarm module, if fitted, may also be configured for high or low alarm operation by connecting the link as shown between terminals 10 and 11 on the alarm module. Pumping in or pumping out control is selected by the link between terminals 16 and 17 on the pump module.

Module	Action	Terminals	Link or no link
Power/alarm module	High alarm	1 and 2	Link
	Low alarm	1 and 2	No link
Pump module	Pumping in	16 and 17	No link
	Pumping out	16 and 17	Link
Alarm module	High alarm	10 and 11	Link
	Low alarm	10 and 11	No link

4.2 Probe sensitivity

The controller will operate correctly with a minimum water conductivity of 1 $\mu\text{S}/\text{cm}$ at 25°C (77°F).

4.3 Filter

The LC1300 has an automatic delay function to avoid spurious alarms or over frequent operation of the pump or solenoid valve. This delay is approximately 5 seconds.

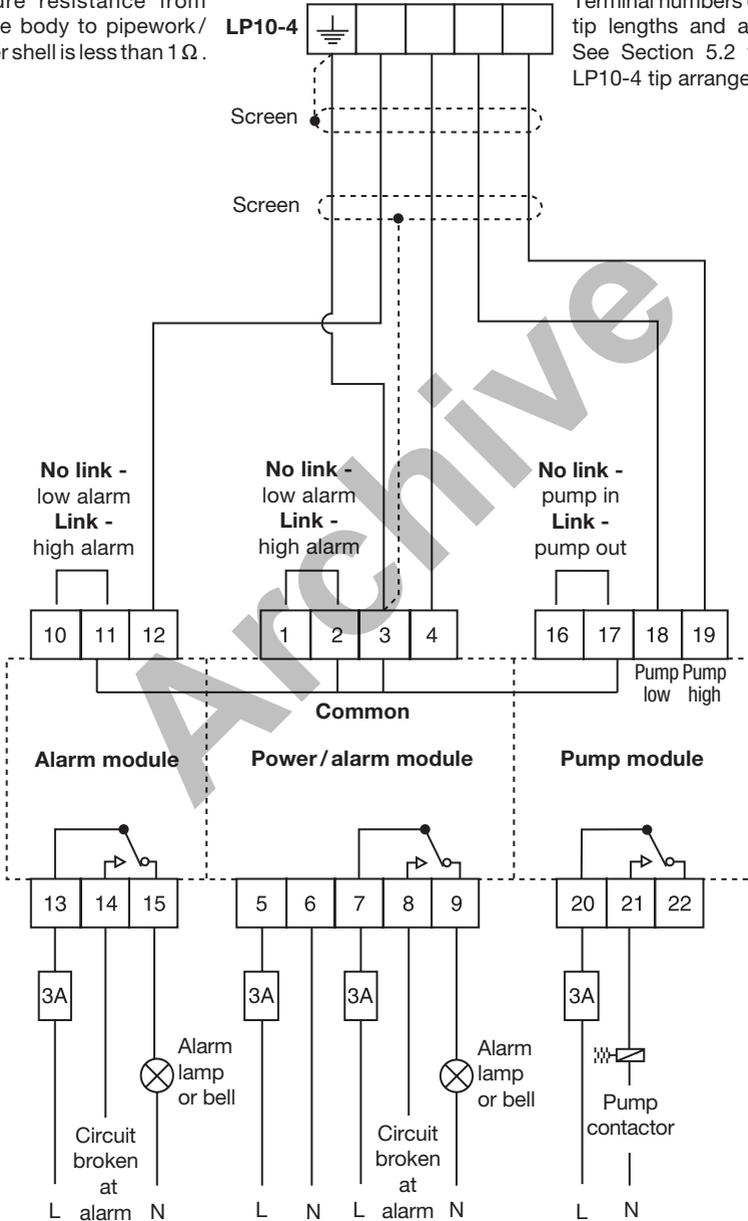
5. Wiring diagrams

5.1 General wiring diagram - LP10-4

(For the LP31 wiring diagram see Section 5.3)

Ensure resistance from probe body to pipework/boiler shell is less than 1 Ω .

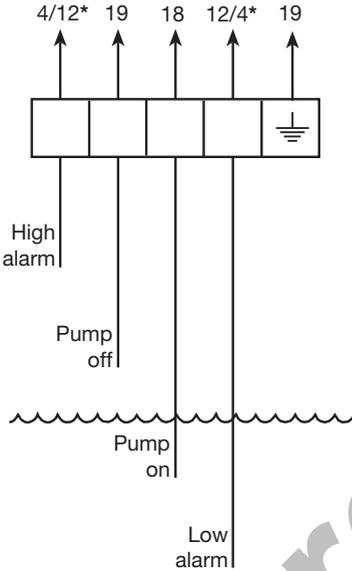
Terminal numbers depend on tip lengths and application. See Section 5.2 for typical LP10-4 tip arrangements.



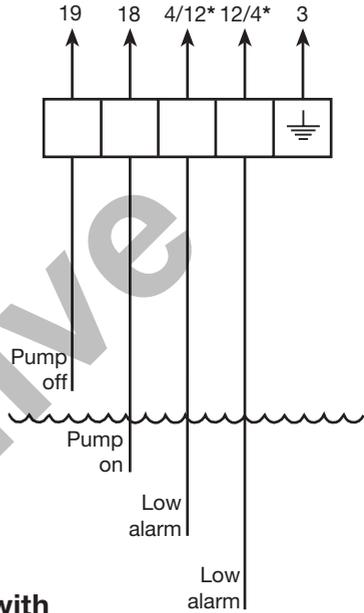
The wiring diagram shows water level control using a pump. Alternatively, a normally-closed solenoid valve could be used. Relays shown in de-energised state.

5.2 Typical LP10-4 tip arrangements

Pumping in with high and low alarms LC1300 terminals



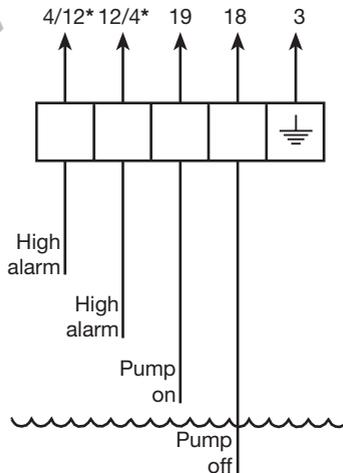
Pumping in with two low alarms LC1300 terminals



Warning:

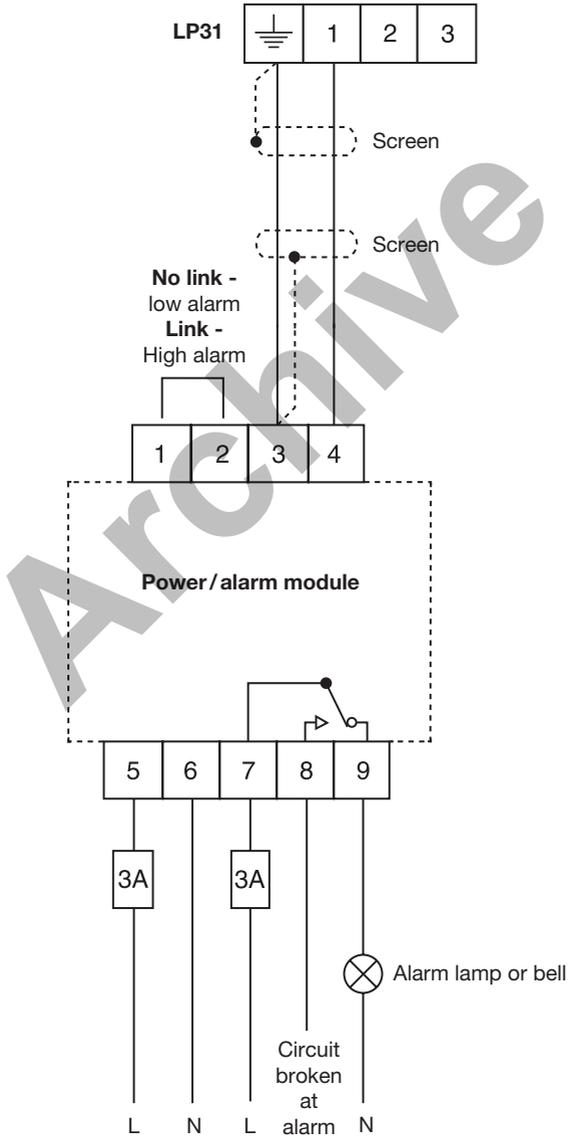
The earth lead is internally connected to the probe body and therefore earthed via the NPT or BSP thread. Do not connect this earth pin to other earths.

Pumping out with two high alarms LC1300 terminals



* Terminal numbers for the alarms in the LC1300 depend on which modules are configured for high or low alarms.

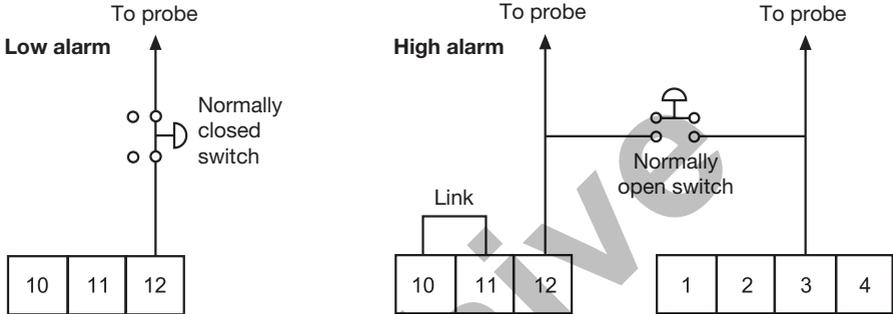
5.3 General wiring diagram



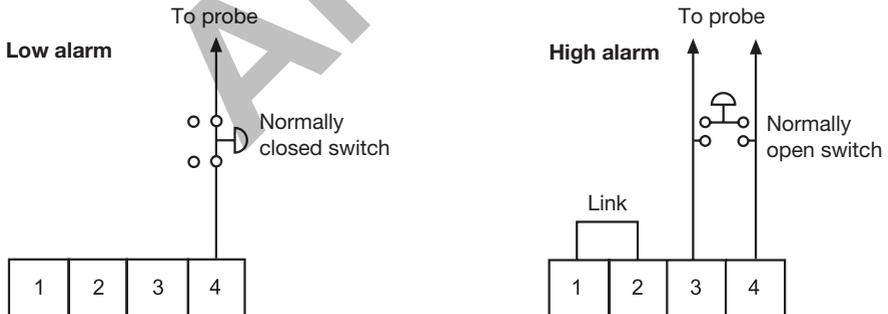
5.4 Optional external test switch diagrams

If an external test switch is required, it is possible to wire in a panel mounted switch as shown below. Depending on the function of the module, a Normally Open (**NO**) or a Normally Closed (**NC**) switch should be used. In order to prevent continuous alarms a spring loaded switch is recommended or a key operated switch.

Alarm module



Power alarm module



6. Commissioning

Control and alarm levels are set by cutting the probe tips to length. For details see the probe instructions.

To commission the controller proceed as follows:-

1. Ensure the controller is set up for the correct functions.
2. Alter the waterlevel in the tank or boiler so that it is at a normal level.
3. Alter the water level to the high and/or low level condition(s).
Check that the associated alarm circuit operates.
4. Alter the water level to the pump-on level.
Check that the pump starts and continues to run until the pump-off level is reached.

7. Maintenance

No special servicing or maintenance of the controller is necessary. Boiler water level controls and level alarms, however, do require 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.

8. Fault finding

Most faults that occur on commissioning are due to incorrect wiring or setting up. In the case of problems the following checklist may be helpful:

Sympton	Solution
No LEDs lit	Check mains power supply
High water alarm lit when water is at normal working level	Check links fitted
Low water alarm lit, pump continues to run after pump off position	Check probe screwed connection is correctly earthed.
Pump not operational over normal working range	Check pump links correctly fitted.