

# LCS1350

## Level Switch

### Installation and Maintenance Instructions

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1. Safety information
2. General product information
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# 1. Safety information

The equipment may only be installed, electrically connected and commissioned by suitable persons with the relevant instruction/training.

Maintenance and modification may only be performed by authorised staff who have undergone specific instruction/training.



## Danger

The terminal strips of the equipment are live during operation!

There is a risk of serious injury due to electric shock!

Always cut off the power supply to the equipment before installing, removing or connecting terminal strips!



## Important

The name plate specifies the features of the equipment. Do not commission or operate any item of equipment that does not have its own specific name plate.

## Directives and standards

### VdTÜV Bulletin BP WASS 0100-RL

The LCS1350 level switch, in combination with the LP10-4, LP11-4, or LP41 level probe, is type approved to the VdTÜV Bulletin "BP WASS 0100-RL".

The VdTÜV "BP WASS 0100-RL" describes the requirements for water level control and limiting equipment.

### LV (Low Voltage Directive), EMC (Electromagnetic Compatibility), RoHS (Restriction of Hazardous Substances)

The equipment conforms to the requirements of the Low Voltage Directive 2014/35/EU, the EMC Directive 2014/30/EU and the RoHS Directive 2011/65/EU.

### ATEX (Atmosphère Explosible)

The equipment must not be used in potentially explosive atmospheres, in accordance with European Directive 2014/34/EU.

## 2. General product information

### 2.1 Intended use

The LCS1350 level switch can be used in conjunction with an LP10-4, LP11-4 or LP41 conductive level probe as an interval level control system in pressurised steam and hot-water plants and in condensate and feedwater tanks.

The LCS1350 level switch also indicates two alarm states, which can be configured as MIN or MAX.

### 2.2 Function

The LCS1350 level switch measures using the conductivity principle and makes use of the electrical conductivity of the water to do this.

The level switch is designed for different conductivities and for connection to four probe tips in total.

The level switch functions as an interval level control system (inlet/discharge/switchable), and also indicates when the water reaches two independent alarm states, which can be configured as MIN or MAX.

The switchpoints for water level control and for the MIN or MAX levels are determined by the length of the respective probe tips.

For water level control, the level switch recognises whether the probe tips are immersed or out of the water and, depending on which function is set, it switches the switch output contact, which then turns the feedwater pump on or off, for example. The Pump LED lights up when the level switch has switched the feedwater pump on, for example.



Fig. 1

#### 2.2.1 Behaviour in the event of MIN/MAX water level alarms

When the MIN or MAX water level is reached, the level switch recognises that the corresponding probe tip is immersed or no longer immersed. When the off delay has elapsed, the relevant Alarm 1/2 output contact is switched. The alarm 1/2 LED simultaneously lights up red.

#### 2.2.2 Alarm simulation

A "AL" button is pressed to begin a test sequence. During the test sequence, the MIN or MAX alarm is simulated, see table on page 13.

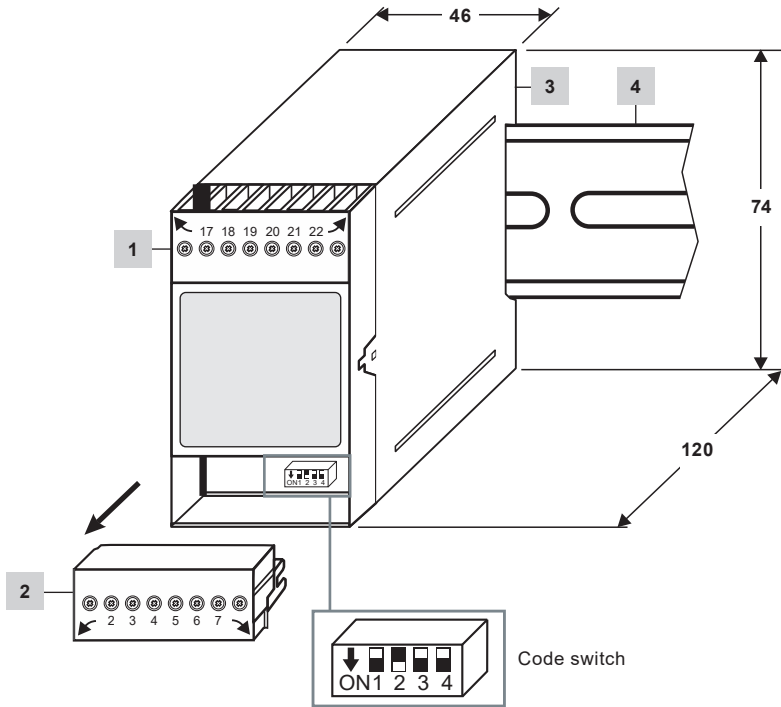
#### 2.2.3 Behaviour in the event of error messages

If faults occur in the level probe and/or the electrical connection, the integrated relays are de-energised.

Alarm and fault indications are displayed by LEDs, see page 18.

# 3. Mechanical installation

## 3.1 Dimensions (approximate) in mm



Item	
1	Upper terminal strip
2	Lower terminal strip
3	Housing
4	Support rail TH 35, EN 60715

Fig. 2

## 3.2 Installation in control cabinet

The LCS1350 level switch is clipped onto a type TH 35, EN 60715 support rail in the control cabinet. Figure 2, Item 4.

### 3.3 Name plates

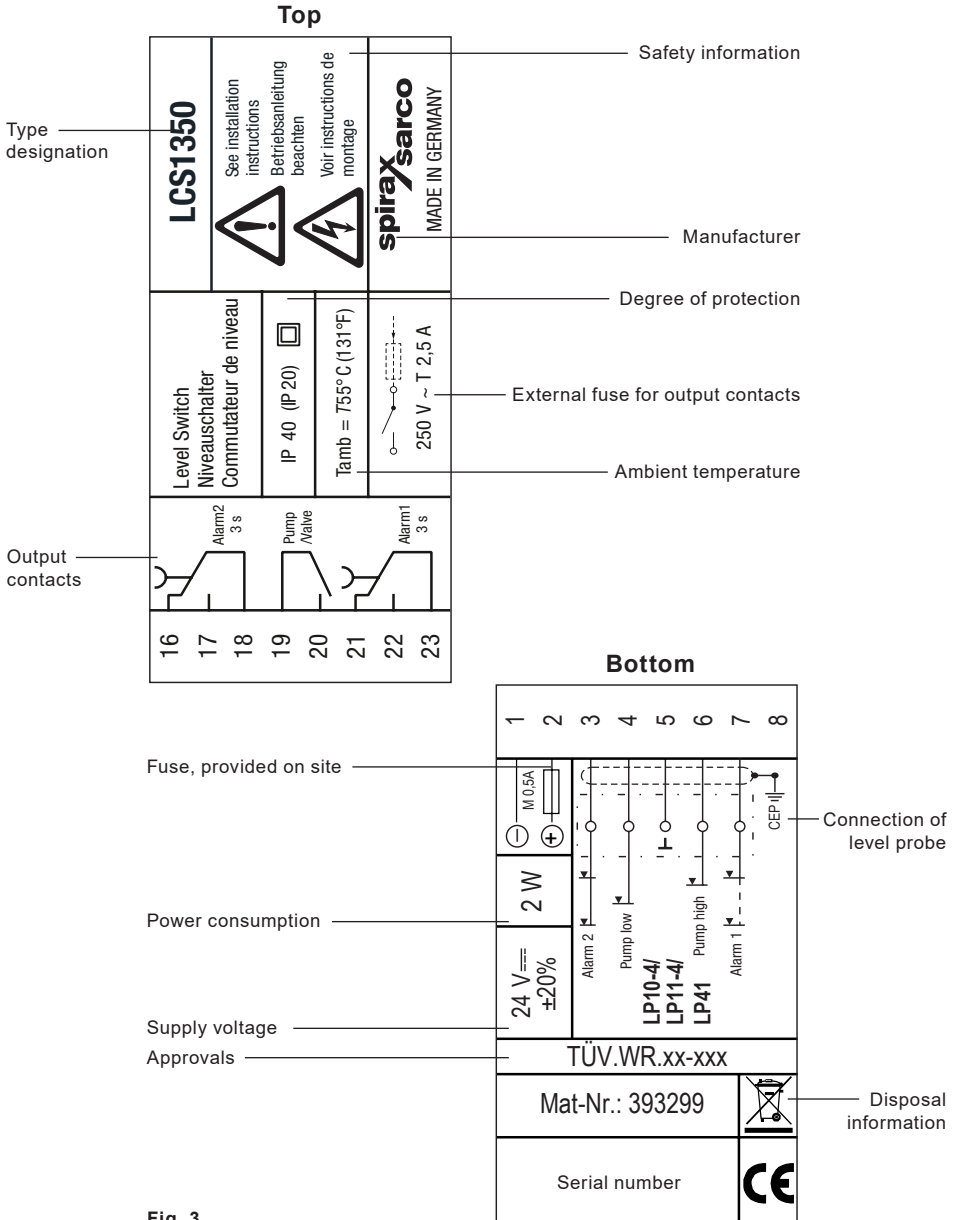


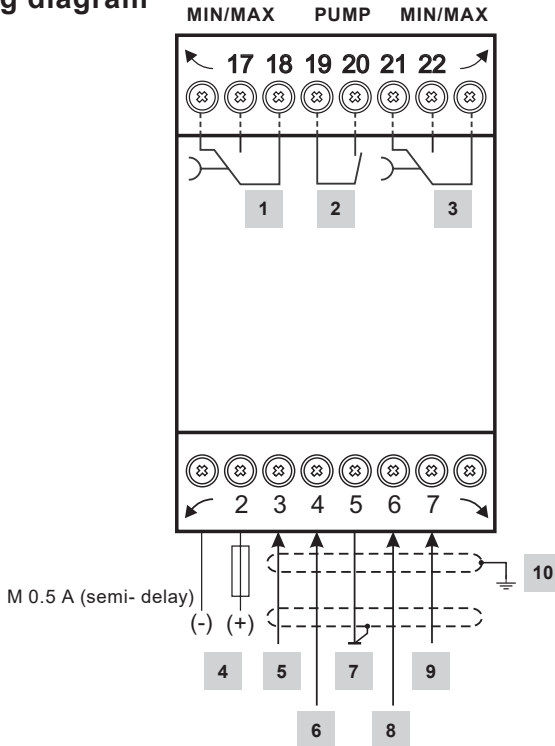
Fig. 3

LCS1350 Level Switch

**spirax/sarco**

# 4. Electrical installation

## 4.1 Wiring diagram



Item	
1	Alarm 2 (MIN/MAX) output contact, de-energizing delay 3 seconds
2	Output contact (ON/OFF) for pump activation
3	Alarm 1 (MIN/MAX) output contact, de-energizing delay 3 seconds
4	Supply voltage connection 24 Vdc with semi-delay fuse M 0.5 A provided on site
5	Alarm 2 (MIN/MAX) probe tip
6	Pump low probe tip (see nameplate)
7	Functional earth in the LP10-4, LP11-4 or LP41 probe (tank or reference probe tip), with screen connection
8	Pump high probe tip (see nameplate)
9	Alarm 1 (MIN/MAX) probe tip
10	Central earthing point (CEP) in control cabinet

Fig. 4

## 4.2 Supply voltage connection

The equipment must be supplied with 24Vdc from a SELV (Safety Extra Low Voltage ) power supply. An external 0.5A semi-delay fuse must also be fitted.

This power supply unit must be electrically isolated from dangerous live voltages and meet the requirements for double or reinforced insulation in accordance with one of the following standards:

EN 50178, EN 61010-1, EN 60730-1, EN60950-1 or EN 62368-1.

## 4.3 Connection of output contacts

Wire the upper terminal strip 1 (terminals 16-23, Fig. 4) according to the desired switching functions.

Provide an external slow-blow 2.5 A fuse for the output contacts.

When inductive loads are switched off, voltage spikes are produced that may have a major adverse effect on the operation of control and measuring systems. Connected inductive loads must therefore have interference suppression (RC combination) as per the manufacturer's specifications.

## 4.4 Connecting the level probe

The LCS1350 level switch can be combined with the LP10-4, LP11-4 or LP41 level probe.

For connecting the equipment, please use a screened, multi-core control cable with a minimum conductor size of 0.5 mm<sup>2</sup>, e.g. LiYCY 5 x 0.5 mm<sup>2</sup>, maximum length 100 m.

Wire the terminal strip as shown in the wiring diagram (Fig. 4).

Connect the screen as shown in the wiring diagram.

Route the connecting cable between items of equipment separately from power lines.



### Important

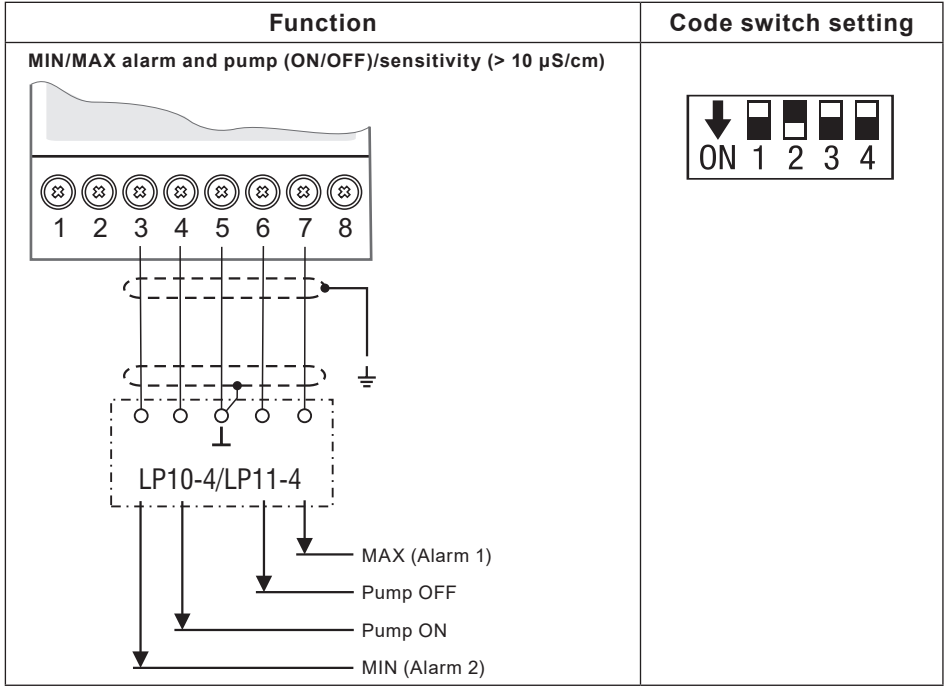
- Please commission the equipment as described in the LP10-4, LP11-4 or LP41 installation and operating manuals.
- Route the connecting cable between items of equipment separately from power lines.
- Do not use unused terminals as support point terminals.

## 4.5 Tools

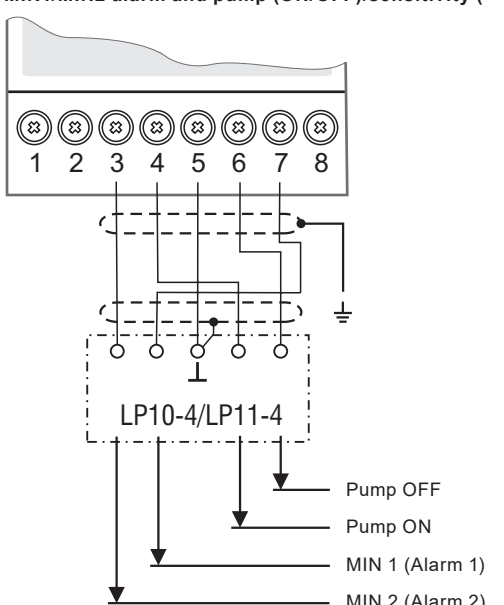
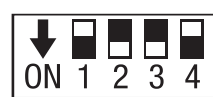
Screwdriver size 3.5 x 100 mm, fully insulated to VDE 0680-1.

# 5. Connection examples

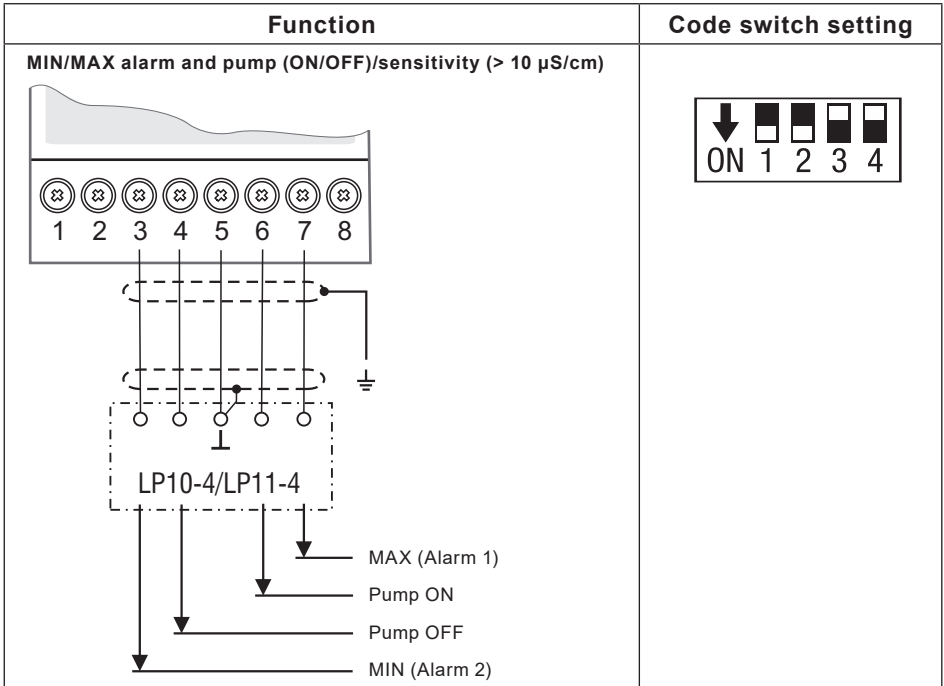
## 5.1 Inlet control

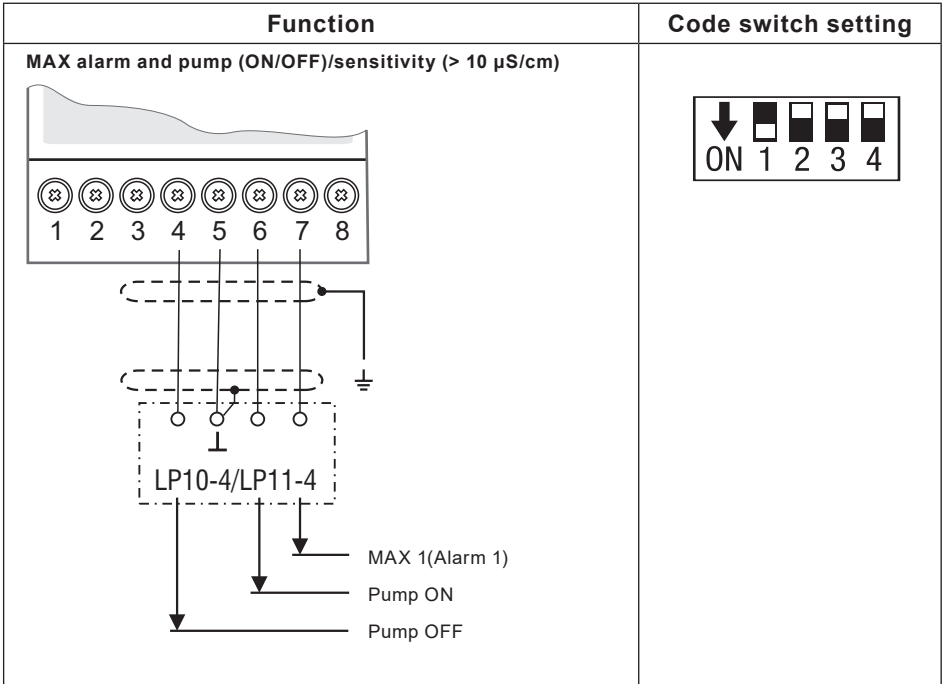
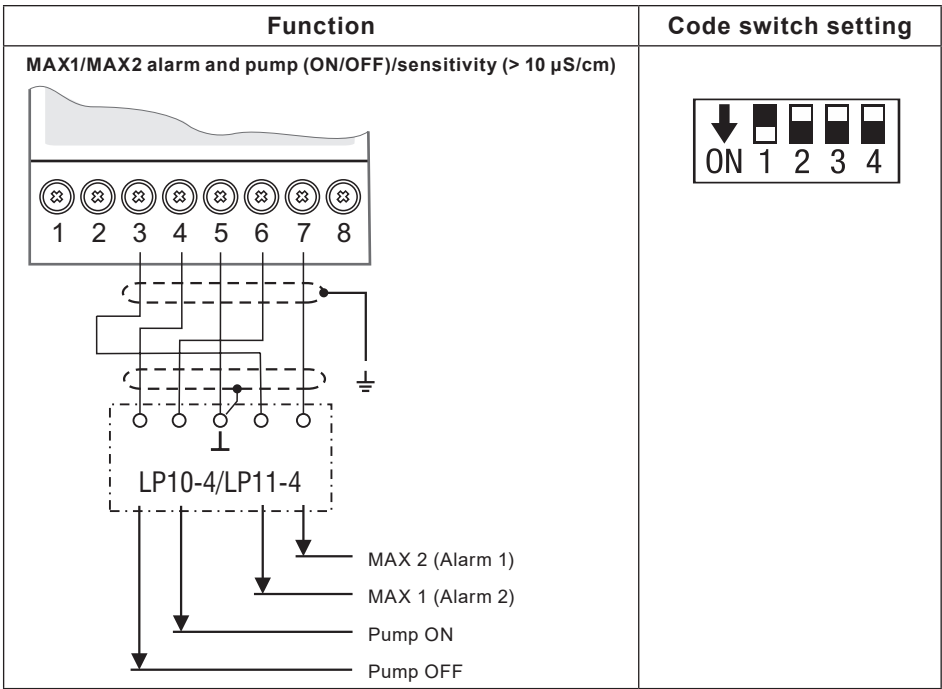




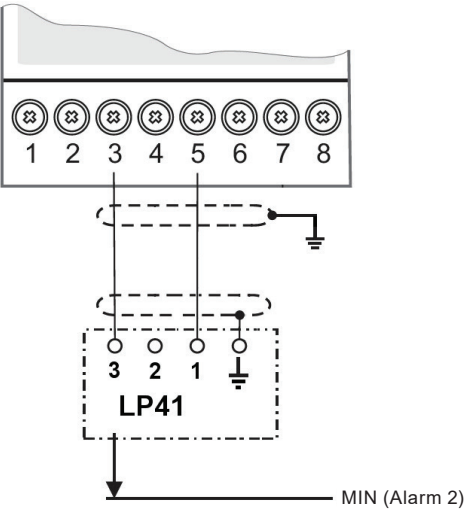
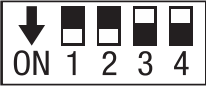
Function	Code switch setting
<p><b>MIN1/MIN2 alarm and pump (ON/OFF)/sensitivity (&gt; 10 <math>\mu</math>S/cm)</b></p>  <p>MIN1/MIN2 alarm and pump (ON/OFF)/sensitivity (&gt; 10 <math>\mu</math>S/cm)</p> <p>1 2 3 4 5 6 7 8</p> <p>LP10-4/LP11-4</p> <p>Pump OFF</p> <p>Pump ON</p> <p>MIN 1 (Alarm 1)</p> <p>MIN 2 (Alarm 2)</p>	 <p>ON 1 2 3 4</p>

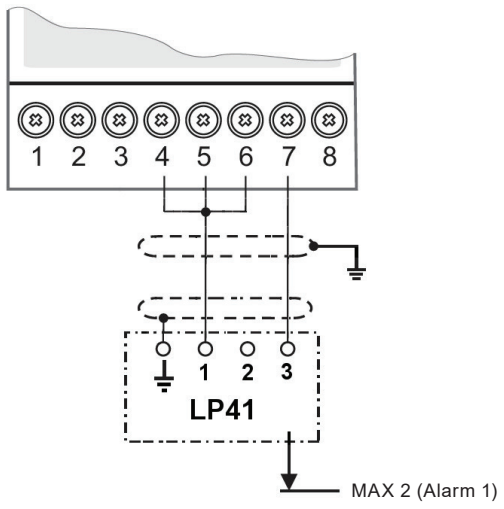

## 5.2 Discharge control

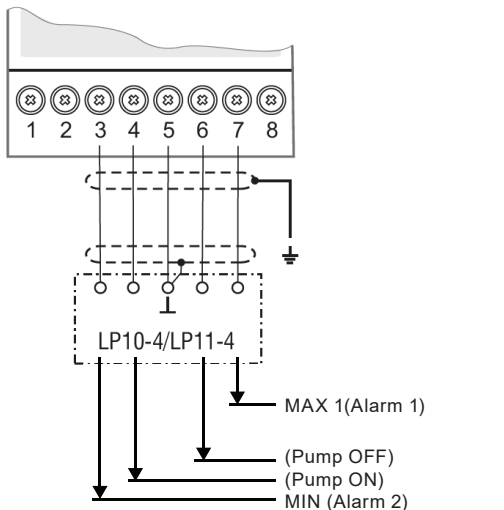





### 5.3 LCS1350 and LP41 connection examples

Function	Code switch setting
<p><b>MIN Alarm only with LP41 (discharge, &gt; 10 μS)</b></p> 	

Function	Code switch setting
<p><b>MAX Alarm only with LP41 (inlet, &gt; 10 <math>\mu</math>S)</b></p> 	

Function	Code switch setting
<p><b>MIN and MAX Alarm only with LP11-4 (inlet, &gt; 10 <math>\mu</math>S)</b></p> 	 <p>Pump is not used but the rods have to be wired to avoid plausibility check errors. Cut the rods as followed:</p> <ul style="list-style-type: none"> <li>- Pump ON at least 1cm above MIN</li> <li>- Pump OFF at least 1cm above pump ON</li> </ul>

# 6. Commissioning

## 6.1 Factory settings

- De-energizing delay: 3 sec. (factory set)
- Function: Inlet control
- Sensitivity: > 10  $\mu\text{S}/\text{cm}$  at 25 °C
- AL1: Max
- AL2: Min

Code switch **C**: S1 = OFF, S2 = ON, S3 = OFF, S4 = OFF

See Figure 5

## 6.2 Changing factory settings



### Danger

The upper terminal strip of the equipment is live during operation.

There is a risk of serious injury due to electric shock!

Always cut off the power supply to the equipment before installing, removing or connecting the terminal strip!

## 6.3 Changing the function and input of the level transmitter

The input and function are determined by the setting of code switch **15**. To make changes, you can access the code switch as follows:

- Switch off the supply voltage.
- Remove the lower terminal strip (Fig. 5).
- Insert a screwdriver between the terminal strip and the front frame, to the right and left of the arrow markings.
- Release the terminal strip on the right and left sides, by turning the screwdriver in the direction of the arrow.
- Remove the terminal strip.

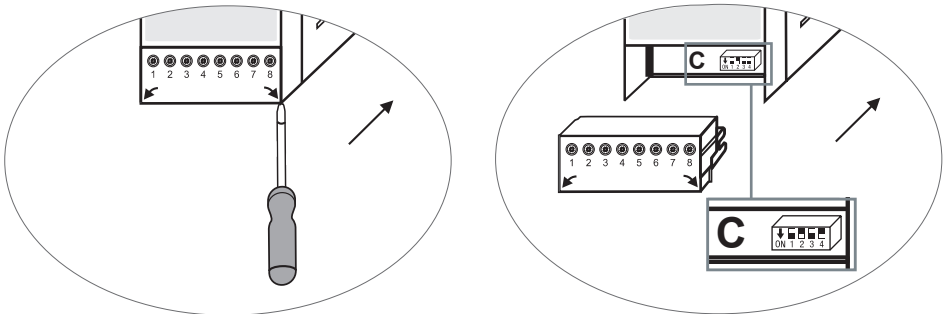



Fig. 5

When your changes are complete:

- Refit the lower terminal strip.
- Switch the supply voltage back on. The equipment restarts.

If you wish to change the input or the function, set code switch C S1 to S4 in accordance with Table 1 below.

**Table 1**

Code switch C	 Toggle switch, white			
	S 1	S 2	S 3	S 4
Inlet control	OFF			
Discharge control	ON			
Alarm 2 = MIN/Alarm 1 = MIN		ON	ON	
Alarm 2 = MAX/Alarm 1 = MIN		OFF	ON	
Alarm 2 = MIN/Alarm 1 = MAX		ON	OFF	
Alarm 2 = MAX/Alarm 1 = MAX		OFF	OFF	
Sensitivity > 10 µS/cm (factory setting)				OFF
Sensitivity > 0.5 µS/cm				ON

grey = factory setting

## 6.4 Checking the switchpoints and function

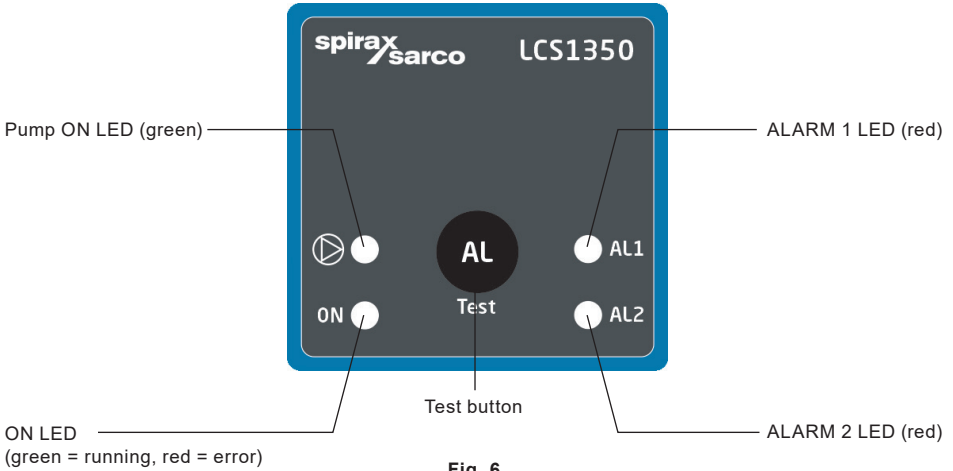


Fig. 6

<b>Start</b>		
Switch on supply voltage	All LEDs light up briefly (self-test) The ON LED lights up red The Alarm 1/2 LEDs light up red The Pump LED lights up green	The system is started and tested.
<b>Normal operation</b>		
The system is working within the desired parameters	The ON LED lights up green	Status display during normal operation
	Depending on the water level, the Alarm 1/2 LEDs and Pump LED light up	
<b>Checking the switchpoint and function (inlet control)</b>		
Reduce the water level until it is below the "Pump ON" level. The "Pump ON" probe tip is no longer immersed.	The Pump LED lights up green	The pump relay is energised. Contacts 19/20 are closed.
Fill the tank until the water is above the "Pump OFF" level. The "Pump OFF" probe tip is immersed.	The Pump LED does not light up	The pump relay is de-energised. Contacts 19/20 are open.
<b>Checking the switchpoint and function (discharge control)</b>		
Fill the tank until the water is above the "Pump ON" level. The "Pump ON" probe tip is immersed.	The Pump LED lights up green	The pump relay is energised. Contacts 19/20 are closed.
Reduce the water level until it is below the "Pump OFF" level. The "Pump OFF" probe tip is no longer immersed.	The Pump LED does not light up	The pump relay is de-energised. Contacts 19/20 are open.



<b>Checking the switchpoint and function (MAX alarm)</b>		
Fill the tank until the water is above the MAX level. The MAX probe tip is immersed.	LED AL1 or AL2 flashes red, depending on the configuration	The off delay is in progress.
	LED AL1 or AL2 lights up red, depending on the configuration	The delay time has elapsed. The MAX relay is de-energised. MAX output contacts* 21/23 are closed, 22/23 are open. * Factory setting of output contacts Alarm 1 = MAX
<b>Checking the switchpoint and function (MIN alarm)</b>		
Reduce the water level until it is below the MIN level. The MIN probe tip is no longer immersed.	LED AL1 or AL2 flashes red, depending on the configuration	The off delay is in progress.
	LED AL1 or AL2 lights up red, depending on the configuration	The delay time has elapsed. The MIN relay is de-energised. MIN output contacts* 16/18 are closed, 17/18 are open. * Factory setting of output contacts Alarm 2 = MIN

## 6.5 Operation

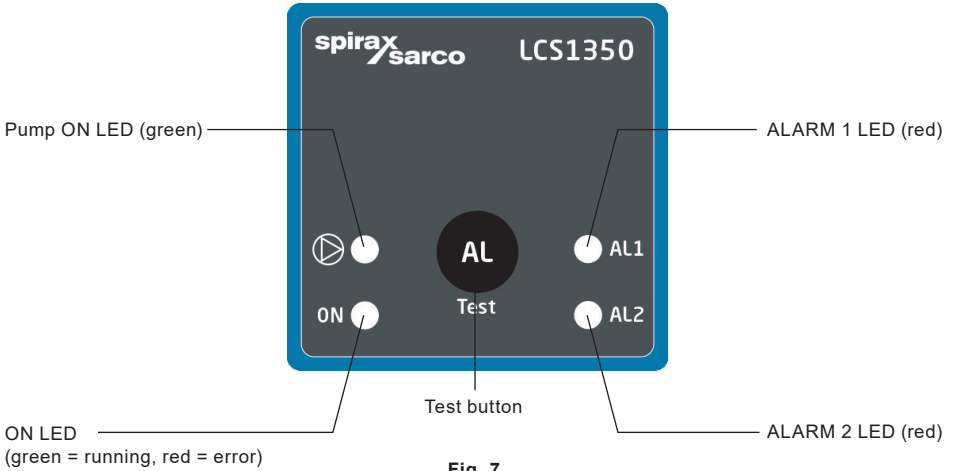



Fig. 7

Inlet control		
The water has dropped below the "Pump ON" water level switchpoint.	The Pump LED lights up green	The pump relay is energised. Contacts 19/20 are closed.
The water has risen above the "Pump OFF" water level switch- point.	The Pump LED does not light up	The pump relay is de-energised. Contacts 19/20 are open.
Discharge control		
The water has risen above the "Pump ON" water level switchpoint.	The Pump LED lights up green	The pump relay is energised. Contacts 19/20 are closed.
The water has dropped below the "Pump OFF" water level switchpoint.	The Pump LED does not light up	The pump relay is de-energised. Contacts 19/20 are open.
Behaviour on the occurrence of a MAX alarm		
The water is above the "MAX level" switchpoint.	LED AL1 or AL2 flashes red, depending on the configuration	The off delay is in progress.
	LED AL1 or AL2 lights up red, depending on the configuration	The delay time has elapsed. The MAX relay is de- energised. MAX output contacts* 21/23 are closed, 22/23 are open. <b>* Factory setting of output contacts Alarm 1 = MAX</b>


Behaviour on the occurrence of a MIN alarm						
The water has dropped below the "MIN level" switchpoint.	LED AL1 or AL2 flashes red, depending on the configuration		The off delay is in progress.			
	LED AL1 or AL2 lights up red, depending on the configuration		The delay time has elapsed. The MIN relay is de- energised. MIN output contacts* 16/18 are closed, 17/18 are open. <b>* Factory setting of output contacts Alarm 2 = MIN</b>			
Test of MIN alarm and MAX alarm						
Action	Display and function					
In operating mode: <b>Water level between MIN and MAX</b> Press and hold the test button.	Step	Alarm 1 LED	Output contact Alarm 1	Alarm 2 LED	Output contact Alarm 2	Runtime
	1	flashes	energised	OFF	energised	3 s
	2	lights up	de-energised	OFF	energised	3 s
	3	OFF	energised	OFF	energised	1 s
	4	OFF	energised	flashes	energised	3 s
	5	OFF	energised	lights up	de-energised	3 s
	6	OFF	energised	OFF	energised	3 s
Test complete, release test button. Device switches to operating mode.	<b>Note:</b> If you continue holding the test button, the test sequence will start again. You can interrupt the test sequence at any time by releasing the test button.					

	<h3>Plausibility check</h3> <p>If the probe tips were installed the wrong way round when the equipment was brought into service, both alarm LEDs flash to alert the user.</p>
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If Alarm 1 and 2 are both configured as MIN or MAX alarms, there is no plausibility check of the two probe tips.


# 7. Fault finding

## 7.1 Display, diagnosis and troubleshooting

	<p><b>Important</b></p> <p>Please check the following before fault diagnosis:</p> <p><b>Supply voltage:</b> Is the level switch supplied with the voltage specified on the name plate?</p> <p><b>Wiring:</b> Does the wiring conform to the wiring diagram?</p> <p><b>Probe:</b> Do the probe tips have the correct length, and are they correctly assigned on the level switch?</p>
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Indication of system faults							
Type of fault/ malfunction	Relay			LEDs			
	Alarm 1	Pump	Alarm 2	ON	Pump	1	2
Interruption to power supply	de-energised	de-energised	de-energised	off	off	off	off
The probe tips are connected the wrong way round	de-energised	de-energised	de-energised	green	off	flashes red	flashes red
Internal error	de-energised	de-energised	de-energised	red	off	flashes red	flashes red

	<p><b>Important</b></p> <p>For further diagnosis, please refer to the LP10-4, LP11-4 or LP41 installation and operating manual.</p>
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	<p><b>Note</b></p> <p>In the event of a level switch malfunction, the MIN or MAX alarm is triggered and the equipment restarts. If the process is continually repeated, the equipment must be replaced.</p>
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## 7.2 Action against high-frequency interference

High-frequency interference can be caused by out-of-phase switching operations. If such interference occurs and results in sporadic failure, we recommend taking the following action to suppress interference:

- Provide inductive loads with RC combinations as per manufacturer's specifications.
- Route the connecting cable to the level probe separately from power lines.
- Increase the distance from sources of interference.
- Check the connection of the screen to the central earthing point (CEP) in the control cabinet and in the probe connector.
- Suppress HF interference using hinged-shell ferrite rings.

## 7.3 Replacing/taking the equipment out of service

- Switch off the power supply and cut off power to the equipment.
- Remove the upper and lower terminal strips (Fig. 8)
- Insert a screwdriver between the terminal strip and the front frame, to the right and left of the arrow markings.
- Release the terminal strip on the right and left sides, by turning the screwdriver in the direction of the arrow.
- Remove the terminal strips.
- Release the white sliding fixture at the bottom of the housing and take the device off the support rail

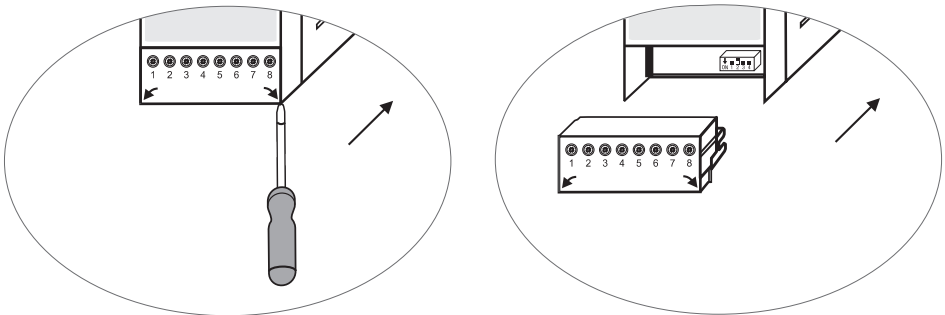


Fig. 8

## 7.4 Disposal

The equipment must be disposed of in accordance with statutory waste disposal provisions.

**In the event of faults that cannot be remedied with the aid of this manual, please contact our Technical Customer Service.**

## 8. Technical information

<b>Supply voltage</b>	24 Vdc +/- 20%
<b>Fuse</b>	external 0.5 A (semi-delay)
<b>Power consumption</b>	2 W
<b>Connection of level probe</b>	4 x inputs for LP10-4, LP11-4 or LP41 level probe, four-pin, reference and shield
<b>Probe tip voltage</b>	5 Vss
<b>Sensitivity</b> (water conductivity at 25 °C), switchable	> 0.5 µS/cm < 1000 µS/cm or > 10 µS/cm < 10,000 µS/cm
<b>Outputs</b>	2 floating changeover contacts, 8 A 250 Vac/30 Vdc cos φ = 1 (MIN/MAX). De-energizing delay 3 seconds (MIN/MAX alarm) 1 floating open/close contact, 8 A 250 Vac/30 Vdc cos φ = 1 (pump). Inductive loads must have interference suppression (RC combination) as per the manufacturer's specification. Contacts requires an external T2.5A fuse for protection.
<b>Displays and controls</b>	1 push-buttons for test function, 1 x multicolour "ON" LED (green/red) - for indicating the operating state and internal errors (green = running, red = power up, malfunction or internal error) 1 x red "Alarm 1" LED for indicating a MIN/MAX alarm 1 x red "Alarm 2" LED for indicating a MIN/MAX alarm 1 x green "Pump" LED for indicating the ON/OFF pump status 1 4-pole code switch for configuration.
<b>Housing</b>	Housing material, base: black polycarbonate; front: grey polycarbonate Conductor size: 1 x 4.0 mm <sup>2</sup> solid, per wire, or 1 x 2.5 mm <sup>2</sup> per lead with sleeve to DIN 46228, or 2 x 1.5 mm <sup>2</sup> per lead with sleeve to DIN 46228 (min. Ø 0.1 mm) Terminal strips can be removed separately Housing attachment: Mounting clip on support rail TH 35, EN 60715
<b>Electrical safety</b>	Degree of contamination 2 for installation in control cabinet with degree of protection IP 54, fully insulated. Overvoltage category III.
<b>Degree of protection</b>	Housing: IP 40 to EN 60529 Terminal strip: IP 20 to EN 60529
<b>Weight</b>	approx. 0.2 kg
<b>Ambient temperature</b>	0 °... 55 °C
<b>Transport temperature</b>	-20 ... +80 °C (<100 hours), only switch on after a defrosting period of 24 hours.
<b>Storage temperature</b>	-20 ... +70 °C, only switch on after a defrosting period of 24 hours.
<b>Relative humidity</b>	max. 95%, no moisture condensation
<b>Approvals:</b>	TÜV Certificate VdTÜV Bulletin "BP WASS 0100-RL" Requirements for water level control and limiting equipment Type approval no.: TÜV · XX · XX-XXX (see name plate)

### Contents of package

1 x Level switch LCS1350  
1 x Installation and Maintenance Instructions

## 9. Technical assistance

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

**[www.spiraxsarco.com](http://www.spiraxsarco.com)**

### **Returning faulty equipment**

Return all items to your local Spirax Sarco representative. 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:
  - a. Date of purchase.
  - b. Original order number.

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LCS1350 Level Switch

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