



Badger Meter Europa GmbH

2-wire level transmitter

Model L2xx

INSTALLATION AND OPERATION MANUAL

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1. Installation

1.1 Mounting the instrument

There are four methods of mounting the L2xx

- ?? Suspended from the cable.
- ?? Suspended from a 1/2" NPT conduit.
- ?? Screwed into a pipe coupling threaded 2 inch/2,5 inch NPS. It is important that only the correct thread is mated with the L2xx otherwise the assembly will be damaged.
- ?? Screwed into a flange with a 2 inch/2,5 inch NPS thread and then bolted to a mating flange on the vessel. The use of a rubber o-ring is recommended.

1.2 Precautions when mounting

- ?? To prevent spurious echo signals, the L2xx must be mounted perpendicular to the surface being monitored.
- ?? It is strongly recommended that the L2xx is mounted off the centre axis; the axes of the vessel and the instrument must therefore not coincide. To eliminate echoes emanating from the wall, the axis of the L2xx must be far enough from the vessel wall.
- ?? The L2xx must be mounted at least above the maximum anticipated liquid level:

L206	=	250 mm / 10"
L208	=	300 mm / 12"
L210	=	400 mm / 16"
L215	=	500 mm / 20"

1.3 Electrical installation

- ?? Please refer to the connection diagram for the wiring details; always ensure that shield is connected to a proper ground or earth point.
- ?? Make sure that the L2xx always receives an absolute minimum of 17 Volts. Recorders and controllers can take their share of the available voltage; always check how much voltage they are taking in the loop.
- ?? Make sure appropriate cabling is used. From the cable's typical resistance and the length of the cable in the installation, one can calculate how much voltage is used in the loop by the cable.

?? The connection between the L2xx and the customer supplied indicator/recorder is effected by means of a 2 conductor shielded pair cable. The maximum permissible cable distance is 1km/3280ft.

2. Description and application

The L2xx is an ultrasonic transducer used for determining and transmitting liquid levels from within open or enclosed vessels. The compact integral assembly includes: the level sensing instrument, temperature compensation instrument to ensure accurate level indications throughout the temperature range and electronic circuitry, in a totally encapsulated and virtually chemically inert casing. The casing consists of a ABS electronics housing and a Tefzel/PVC nose part. LED's are fitted to the L2xx casing to verify that the assembly is functioning properly.

3. Principle of operation

Short controlled ultrasonic pulses emanating from the L2xx transducer are aimed at a target surface. After filtering-out any noise present, the time taken for the reflected pulses to strike the sensor surface are converted to linear measurements and conveyed to the remote indicator/recorder as a current value.

4. Setting-up the model L2xx

The L2xx is set-up for the minimum level (? ZERO), and the maximum level (? SPAN), by means of momentarily contacting the respective areas marked ? SPAN and ? ZERO on the surface of the assembly with the magnetic key supplied.

4.1 Precautions

The use of 2 conductor shielded pair cable is recommended to eliminate noise emanating from induced voltages.

The L2xx must be handled with care to prevent damage to the transducer which is situated near the front surface of the nose.

Touching a magnet to the circled ? SPAN and ? ZERO areas on the housing sets the L2xx's operating distances. The L2xx has internal non-volatile storage and even when power is removed, will always remember the last set reference levels.

a) On site procedure

Zero level (? ZERO – 4mA):

- ?? Aim instrument at the correct target. If this is done on a tank, ensure that tank is at the right level.
- ?? Contact ? ZERO (on housing) with the magnetic key until LED B lights to indicate that set-up mode has been entered, remove key.
- ?? LED B turns off to indicate that the minimum level has been accepted, this process may take up to 10 seconds. Subsequently, LED A continues with green on and red flashes.
- ?? If LED B does not turn off during setup the measuring conditions may be insufficient. (See trouble shooting assistance)
- ?? The new level is saved only at the point where LED B turns off. When setting the level, do not move the instrument while LED B is on.

Maximum level (? SPAN – 20 mA):

This procedure is identical to the zero level operation except that the ? SPAN contact is used.

Note: Prolonged contact of the magnetic key on the ? SPAN or ? ZERO targets should be avoided.

b) Setting-up in the workshop

Instead of setting up the L2xx on site, it might be more convenient to do this in the workshop: Point the nose of the L2xx at walls which are at horizontal distances equivalent to the maximum level ? SPAN and minimum level ? ZERO, respectively. Follow the on site method described above.

5. LED indication



LED A: GREEN is ON and RED is FLASHING

The L2xx is functioning satisfactorily within the set range.

LED A: RED is ON and GREEN is FLASHING

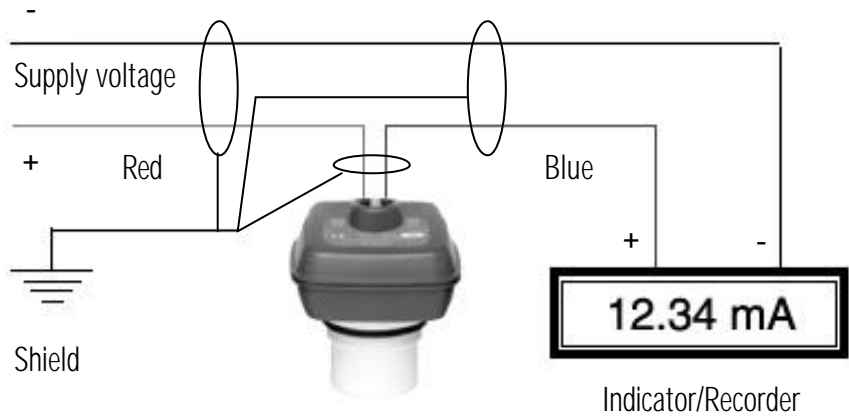
In this condition: If LED B is also on, a weak echo is received.
If LED B is off, the instrument sees an echo outside the set range.

If this condition persists, the instrument will set the default current after approximately sixty seconds.

LED B: ON during operation

The L2xx is re-evaluating echo conditions.

6. Connection diagram



7. Specifications for the model L2xx

Range	: L206 = 0,25 m / 10" up to 6 m / 20 ft L208 = 0,30 m / 12" up to 8 m / 26ft L210 = 0,40 m / 16" up to 10,00 m /33 ft L215 = 0,50 m / 20" up to 15,00 m / 50 ft in liquids at 23°C / 74°F
Current output	: 4-20 mA span directly or inversely proportional
Accuracy	: Better or equal to +/- 0.25% of maximum span at constant temperature
Resolution	: 3 mm / 0.12"
Point setting	: By magnetic key, non-volatile storage
Status indication:	Two visible LED's
Fault current	: 22 mA
Loop load	: $R_{max} = \frac{V_{supply} - 17}{22} \text{ k}\Omega$
Beam angle	: 8° / 9° / 10° / 11° at -3 dB boundary
Frequency	: L206 = 50-55 kHz, L208 = 45-50 kHz, L210 = 40-45 kHz, L215 = 35-40 kHz
Storage t°	: -40°C / -40°F to 80°C / 176°F
Operating t°	: -20°C / -4°F to 60°C / 140°F, please note that instrument has internal temperature compensation.
Container	
pressure	: 200 kPa (28 psi) above atmospheric
Enclosure rating:	IP68 submersible
Mass (approx.)	: 1kg / 2.2 lb including integral 5 m cable, L215 = 1.2 kg
Dimensions	: Width : 105 mm / 4.1" L215 = 105 mm / 4.1" Length : 112 mm / 4.4" L215 = 120 mm / 4.7" Overall height : 112 mm / 4.4" L215 = 112 mm / 4.4"
Housing details	: UV resistant ABS housing and Tefzel/PVC nose.
Mounting	: Suspended from cable or 1/2" NPT conduit, mounted in 2"/2,5" NPS flange.
Supply voltage	: 17 V to 30 V DC (max.) 24 V DC typical operating voltage
Protection	: Protected against reverse polarity and voltage surges.
Certifications	: Eex ia IIC T6 (Tamb = -20°C to 60°C) IA No: SABS S/S828 X Ui = 28 V; li = 93; Pi = 0.65 W; Li = 4 uH; Ci = 100 nF

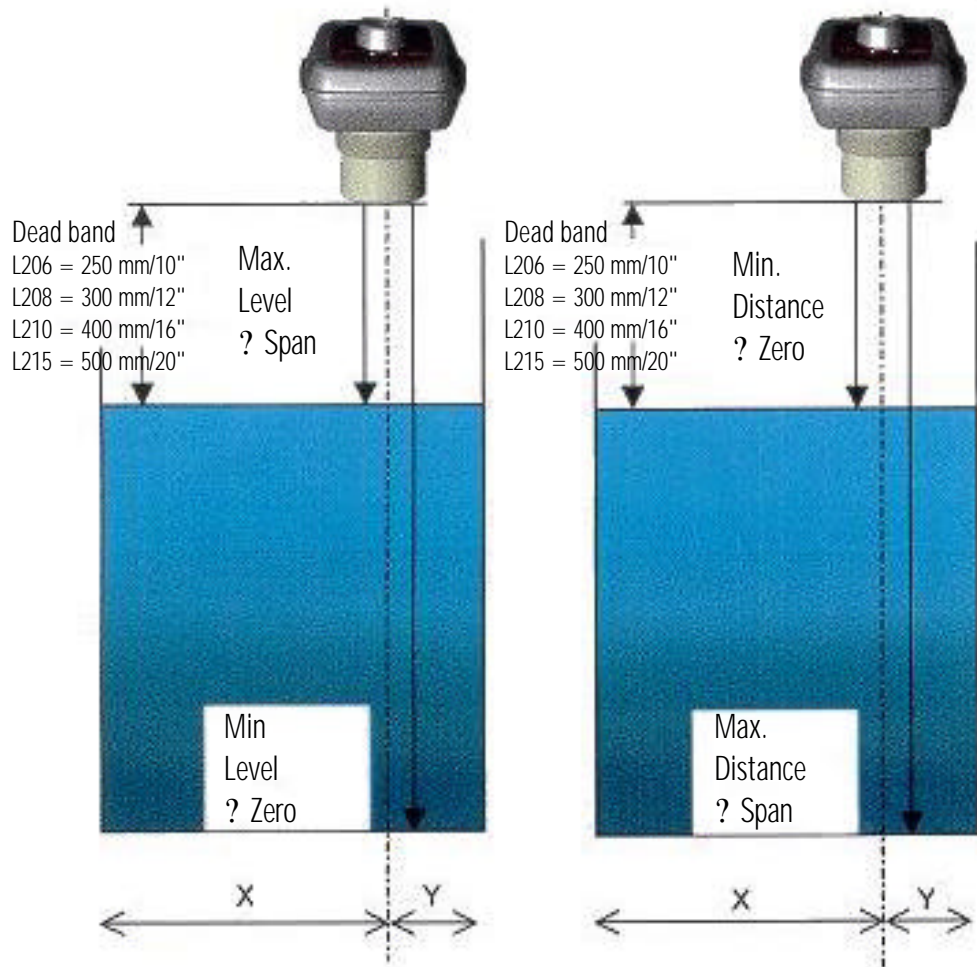
IEC61326-1 / IEC801-3 / EN55011

Because of our policy of ongoing development, the specifications given here are subject to change without notice.

8. Installation details

Level measurement

Distance measurement



Preferred installation is where $X \approx Y$

Some tolerance on the end-points can be expected due to rapid temperature fluctuations; always program the controller to switch pumps / valves before the absolute limits are reached. Alternatively set the instrument to operate outside the tank's physical limits. Please note that the L2xx can never measure deadbands below above mentioned.

9. Trouble shooting assistance

a) Instrument lights do not switch on:

?? Check that polarity of supply is correct, red wire for positive, blue wire for negative.

?? Check the voltage across the instrument; it must be greater than 17 V and less than 30 V.

?? Check that the circuit is complete; insert a meter to check if a current is present. The current should be greater than 30 mA and should at least be 3.8 mA.

b) Instrument switches ON but indicates RED LED On with GREEN flashes:

?? Target may be out of range; ensure that the L2xx is pointing at the right surface.

?? Ensure that the instrument is set for the correct range; use ? SPAN and ? ZERO to set span and zero. Note: Do not set span and zero at the same distance.

?? Ensure that the instrument is audibly "clicking", if unsure feel the nose front for vibration. This should occur at a frequency of between 2 to 4 clicks per second.

c) With the instrument calibrated correctly and a theoretical current value calculated, it indicates an unexpected current value:

?? Check the voltage across the instrument; it must be above 17 V and below 30 V.

?? In the case of a closed tank, check that the instrument is mounted off-center. Multiple echoes can interfere with the measurement. Note: It is not possible to run 2 units in the same tank.

?? Ensure that pipes or ladders do not obstruct the acoustic path.

?? If the instrument is mounted in a flange, ensure that a rubber O-ring is used to mechanically isolate the instrument from vibrations.

- d) Instrument goes to default current (22 mA):
- ?? Target is out of range; ensure that the L2xx is pointing perpendicular at the right surface.
 - ?? Ensure that the instrument is set for the correct range; use ? SPAN and ? ZERO to set span and zero. Note: Do not set span and zero at the same distance.
 - ?? Ensure that the instrument is audibly "clicking", if unsure feel the nose front for vibration. This should occur at a frequency of between 2 to 4 clicks per second.
 - ?? Tank level may go beyond the set range.
- e) The instrument current level goes "wrong way" (or: the instrument indicates level the wrong way):
- ?? Generally the instrument's current is set to drop when the target moves further away. If this is not the case or if this is not required, set the span and zero correctly by re-calibrating. The ? ZERO point is always 4 mA and the ? SPAN point is always 20 mA, it is up to the user to determine at what physical distances they are set.
- f) Instrument current occasionally jumps:
- ?? Target may be out of range; please ensure that the instrument is pointing perpendicular to the correct surface.
 - ?? Ensure that the instrument is set for correct range; use ? SPAN and ? ZERO to set span and zero. Note: Do not set span and zero at the same distance.
 - ?? Check the voltage across the instrument; it must be above 17 V and below 30 V.
 - ?? In the case of a closed tank, check that the instrument is mounted off-center. Multiple echoes can interfere with the measurement and mounting the instrument off-center will assist.
 - ?? Ensure that pipes or ladders do not obstruct the acoustic path.
 - ?? If instrument is mounted in a flange, ensure that a rubber o-ring is used to mechanically isolate the instrument from vibrations.
 - ?? Ensure that the shield of the instrument's cable is connected to a solid ground or earth point.

10. Warranty

Badger Meter warrants meters and parts manufactured by it and supplied hereunder to be free from defects in materials and workmanship for a period of 18 months from date of shipment or 12 months from date of installation, whichever period shall be shorter.

If within such period any meters or parts shall be proved to Seller's satisfaction to be defective, such meters or parts shall be repaired or replaced at Seller's option. Seller's obligation hereunder shall be limited to such repair and replacement and shall be conditioned upon Seller's receiving written notice of any alleged defect within 10 days after its discovery and, at Seller's option, return of such meters or parts to Seller, f.o.b. its factory.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS OR IMPLIED WARRANTIES WHATSOEVER INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES (EXCEPT OF TITLE) OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Badger Meter shall not be liable for any defects attributable to acts or omissions of others after shipment, nor any consequential, incidental or contingent damage whatsoever.

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