PORTABLE MOISTURE DETECTOR

LX-9024

(LOGSTOR, STAR PIPE & CWA
PULSE ALARM SYSTEMS)

USER MANUAL

levr

Ver. 2.6

1. General

The LX-9024 detector is designed to detect moisture in pre-insulated heating pipelines equipped with pulse alarm systems. The device is useful both during the installation and the operation of the pipeline. During the installation works, the detector facilitates correct assembly of the alarm system, and, later, moisture measurements allow to monitor the condition of the pipeline, particularly the moisture level between the carrier pipe and the casing pipe and the direction and velocity of the changes.

Manufacturers of pre-insulated pipes specify the minimum resistance value of polyurethane insulation for the maximum length of the heating pipeline section. For shorter sections, the minimum resistance value can be determined on the basis of the following formula:

$$R = R_{min} \frac{L_{max}}{L}$$

where:

- R_{min} – manufacturer's minimum polyurethane insulation resistance value in a heating pipeline section with the length equal to L_{max}
- L_{max} – manufacturer's maximum length of a heating pipeline section
- L [km] – length of the tested heating pipeline section ($L \leq L_{max}$)
- R [MΩ] – minimum polyurethane insulation resistance in a heating pipeline section with the length equal to L ($L \leq L_{max}$)

For example, the manufacturer of an alarm system with felt pads specified the following limits: R_{min} = 10kΩ for L_{max} = 1km.

The LX-9024 detector is equipped with an alphanumeric text display. Displayed text messages inform of the condition of the measurement circuit comprised of the: LX-9024 detector, carrier pipe, polyurethane insulation, copper wires and casing pipe.

2. LX-9024 Detector Description

The LX-9024 detector is equipped with a 2-line alphanumeric display which displays the following information:

- measured polyurethane insulation resistance,
- measured alarm loop resistance,
- calculated heating pipeline length,
- user-set default temperature value of the copper wire creating the alarm loop,
- temperature of the batteries powering the device.

Copper wire temperature is taken into account in the automatic calculation of pipeline length. The temperature value is set with the button on the right side of the casing. When pressed for the first time, the button causes the display to light up. Each subsequent pressing of the button changes the default copper wire temperature value by 10°C.

NOTES:

Accuracy of alarm loop resistance measurements depends on the quality of the following connections: detector – detector wires, detector wires – electrical connectors, electrical connectors – alarm wires, connection of the alarm wires at the end of the measured section of the alarm loop. (See fig. 1.) With time, resistance of the contacts of the above wires may rise from zero to several or dozen ohm. A resistance increase of 1Ω changes the value of the

calculated alarm loop length by over 40m. Resistance of the contacts can be measured by connecting the connector attached to the blue detector wire with the connector of the red wire. After turning it on, the detector will display the resistance value of the wires, together with the calculated length of the alarm loop. Unfortunately, contact resistance changes cannot be completely prevented. To guarantee measurement accuracy, clean the contacts periodically (e.g. with alcohol) or replace wires and connectors when necessary. One running meter of the alarm wire has a resistance of 0,012 ÷ 0,015Ω, and a 1000m long alarm loop (2 wires) has a resistance of about 24Ω. Therefore, measurements of the alarm loop resistance should produce results from almost zero to several dozen ohm.

Measurements of battery temperature are important to ensure that the working temperature range of the batteries is not exceeded. Often, battery temperature is the same as the temperature of the LX-9024 detector, which also has its own working temperature range.

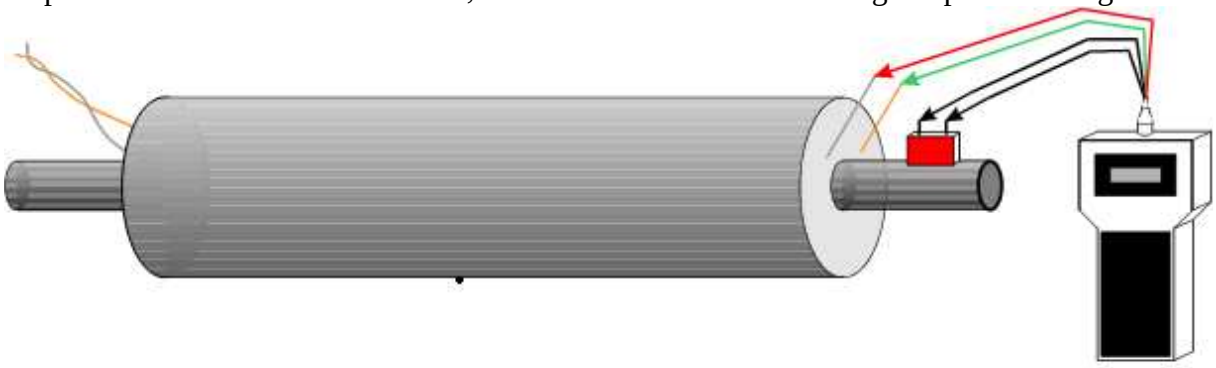

Fig. 1. LX-9024 connection diagram

The device can also display text messages, the meaning of which is explained below.

Kontakt? (Contact?)

The device should have a good connection with the carrier pipe (fig. 1) during polyurethane insulation resistance measurements. The connection is made with the magnetic connector and two black detector wires. Poor quality of the connection (high resistance) is signalled by the **Kontakt?** (**Contact?**) message. In such a case, start rubbing the connector along the carrier pipe until the message disappears.

Przerwana Pętla (Open Loop)

The above message may be caused by one of the following:

- poor contact between the detector wires and the wires of the alarm loop,
- no connection between the copper wires at the end of the tested pipeline section,
- no connection (break) between sections of the copper wire creating the alarm loop,
- poor quality (high resistance) of the connection(s) between sections of the copper wire creating the alarm loop.

If the **Przerwana Pętla** (**Open Loop**) message appears during measurements of a pipeline section shorter than 1000m, first check and, if necessary, correct the connections between the detector wires (green, red) and the copper wires of the alarm loop. If this brings no results, check if the copper wires are correctly connected at the end of the tested pipeline section. Then, if necessary, check if all sections of the copper wire are connected.

Finally, if all else fails, test the quality of individual connections (see fig. 2).

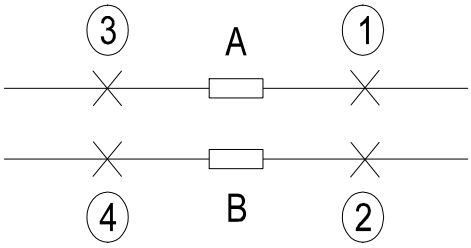

Fig. 2. Fragment of the alarm loop with connection points 1, 2, 3 & 4 for the secondary detector wire.

To test individual connections, connect the LX-9024 detector to one end of the alarm loop (fig. 1). Next, test subsequent connections between alarm loop sections by connecting the secondary detector wire with alligator clips (electrical connectors) at the end.

Connect the secondary wire to points 1 and 2 to check if the copper wires between the detector and points 1 and 2 are intact.

If the wires are intact, the length measurement result should reflect the actual length of the measured section. Now, connect the secondary wire to points 3 and 4. The detector should display the actual length of the measured section up to points 3 and 4. If the indicated length value is significantly higher (e.g. by 45m) than the actual length, proceed to determine the resistance of which of the two connections, A or B, is too high. Connect the secondary wire to points 1 and 4 to test connection B. If the length measurement result corresponds with the actual state, then connection B is correct. If there is a large discrepancy between the measurement result and the actual length of the section (up to connection B), correct the connection (by welding or clamping – depending on the type of alarm system).

Test connection A by connecting the secondary wire to points 2 and 3 and proceeding as described above. Finally, connect again the secondary wire to points 3 and 4 and see if the measurement results correspond with the actual length of the tested section to ensure that the located faults were removed. Then, disconnect the secondary wire and measure the length of the entire pipeline. If the measurement result corresponds with the actual length, then there are no faulty connections in other sections of the pipeline. Otherwise, keep testing and correcting the connections as described above until the measurements result corresponds with the actual pipeline length. Possible discrepancy should not exceed the measurement error (1%).

Akumulator 20% (20% Battery)

The above message appears when the battery of the device is 80% empty.

ładuj akumulator (recharge battery)

The above message appears when the battery of the detector requires charging. After displaying the message, the device turns off automatically.

The battery takes about 60 minutes to recharge with the manufacturer’s charger.

LX-9024

(Logstor, Alstom Power, ABB & CWA pulse alarm systems)

3. Technical Specifications:

1. Measurement results display ..... alphanumeric LCD display, 2x16 characters, backlit
2. Measurement voltage for polyurethane insulation measurements ..... 24V DC
3. Measurement ranges:
   - polyurethane insulation resistance ..... 0,1kΩ ÷ 200MΩ
   - alarm loop resistance ..... 0 ÷ 68Ω
   - temperature of the batteries powering the detector ..... -5 ÷ 50℃
4. Measurement accuracy:
   - polyurethane insulation resistance between 0,1kΩ ÷ 100MΩ ..... ± 5% ± 2 digits of the measured value
   - alarm loop resistance ..... ± 5% ± 2 digits *)
5. Text messages:
   - polyurethane insulation resistance measurement result ..... R=
   - polyurethane insulation resistance units ..... kΩ, MΩ
   - alarm loop resistance measurement result ..... r =
   - alarm loop resistance units ..... Ω
   - pipeline length measurement result ..... L=
   - pipeline length units ..... m
   - no electric contact between the device and the carrier pipe ..... Kontakt? (Contact?)
   - pipeline length measurement range exceeded ..... L > 2km
   - electric break in the alarm loop ..... Przerwana Pętla (Open Loop)
   - values and units of alarm wire temperature ..... 0 ÷ 80°C
   - batteries 80% empty ..... Akumulator 20% (20% Battery)
   - batteries empty ..... ładuj akumulator (recharge battery)
6. Power supply ..... NiCd 7,2V/700mAh battery pack
7. Working and storage temperature range ..... 5 ÷ 50℃
8. Casing tightness class IP65
9. Dimensions 223x105x40
10. Weight 450g

*) Pipeline length measurement accuracy depends on the resistance tolerance with which the alarm loop wires were made.