TESTER

LX 9024

(PULSE ALARM SYSTEM**)**

OPERATING MANUAL

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Ver. 17.12

1. INTRODUCTION

The LX 9024 meter is designed for measuring pre-insulated heating pipelines with a pulse alarm system. The device may be used both during the pipelines construction, as well as operation process. Using the device in the course of assembly work enables correct execution of an alarm circuit. Whereas during the operation process, based on the obtained measurement results, it is possible to assess the actual technical condition of a pre-insulated heating pipelines. It mainly involves the level of moisture between the line and protective pipes, and the direction and speed of undergoing changes.

The technical conditions provided by each manufacturer of pre-insulated piping state the value of polyurethane insulation resistance for a maximum length of a heating pipelines section. The minimum polyurethane insulation resistance value for shorter sections is calculated based on the formula:

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

where:

R_{min} – minimum polyurethane insulation resistance value for a heating pipelines with an L_{max} length, which was determined by the manufacturer.

L_{max} – maximum heating pipelines section length determined by the manufacture

L [km] - heating pipelines section length; $L \leq L_{max}$

R [MΩ] – minimum value of polyurethane insulation resistance for a heating pipelines section with a length of L; $L \leq L_{max}$

For example, in the case of an alarm system with felt shims, the developers of this solution set out a condition: $R_{min} = 10k\Omega$ for $L_{max} = 1km$.

A backlit, alphanumeric LCD display is used in the LX 9024 devices. It enables text messages. They concern characteristic states of a measuring system, comprising of: an LX 9024 meter, a steel pipe, polyurethane insulation, copper wires and a protective pipe.

2. DESCRIPTION OF THE LX 9024.

The LX 9024 meter utilizes a two-row alphanumeric display, which shows the following measurement information:

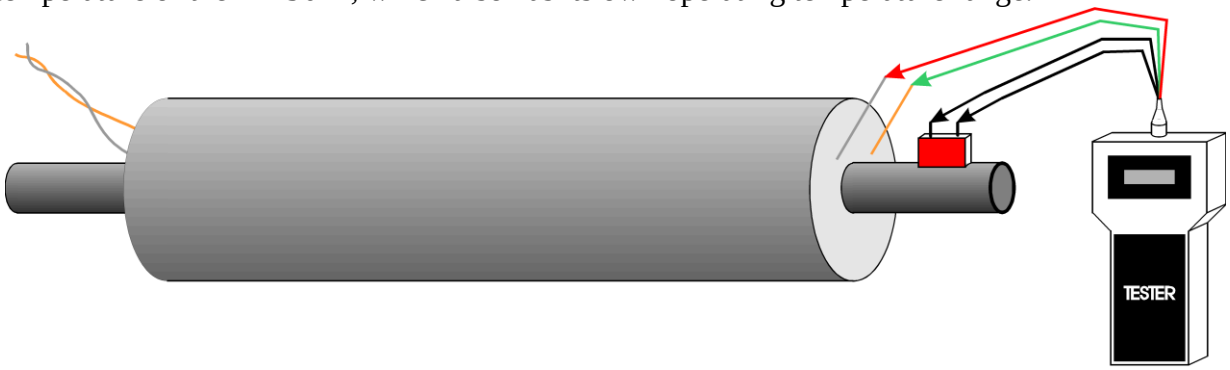
- polyurethane insulation resistance measurement result value;
- measured alarm loop resistance value;
- calculated heating pipelines length;
- a user-determined, assumed temperature value of alarm loop forming copper wires;
- temperature of the batteries supplying the device.

The value of the entered temperature of copper wires is taken into account during automatic calculation of a heating pipelines length. The entry is made via a switch located on the right side of the casing. Pressing it for the first time illuminates the display. Each next press, with a backlit display, changes the expected temperature of copper wires by 10°C.

NOTES:

Alarm loop resistance measurement accuracy depends on the quality of the following connections: device - measuring leads, measuring leads - electrotechnical grippers,

electrotechnical grippers - sensor wires, sensor wire shorting at the end of the measured alarm loop section. (See fig. 2.) After a certain period of using the instrument, the resistances of contacts in these connections may increase from almost a zero to a few or a few dozen Ohms. An increase in the resistance equal to 1Ω results in a change of the automatically calculated alarm loop length by over 40m. The contact resistance may be measured by shorting the gripper on the blue measuring lead with a gripper of the red measuring led. After turning on the device, the connection resistance value will be displayed, converted into the length of the alarm loop. Unfortunately, this resistance cannot be characterized by permanence, even in the short term. Therefore, it is recommended to periodically clean the contacts with a special preparation (e.g. alcohol) or even replace the wires and grippers. Besides, when performing the measurements, it is good to remember that one linear metre of a sensor wire has a resistance of 0.012 ÷ 0.015Ω, and 1000m of an alarm loop (2nd wire) around 24Ω. When measuring the resistance of sensor wires, the obtained measurement result values should fall within the range of almost a zero to several dozen Ohms.
A measurement of the current battery temperature is important, since they have their own operating temperature range. In many cases, the battery temperature is the same as the temperature of the LX 9024, which also has its own operating temperature range.



Rys.2 Sposób połączenia przyrządu LX 9024 z obwodem systemy alarmowego

Apart from measurement information, text messages are also displayed. Below you can find their contents and explained meaning.

Kontakt (*Contact*)?

The device must have good contact with a steel pipe (fig. 2) during the polyurethane insulation resistance measurement. The connection is executed via a magnetic terminal and two black measuring leads. Bad contact quality (resistance too high) is signalled by a "Kontakt (*Contact*)?" message. In such a case, rub the terminal against the steel pipe, until the message disappears.

Przerwana Pętla (*Interrupted Loop*).

The reason for displaying this message may be one of the below:

- bad contact between measuring wires of the meter and the wires forming an alarm circuit;
- no connection between the copper wires at the end of the tested section of the pre-insulated heating pipelines;
- no connection (break) between successive segments of copper wires forming an alarm circuit;

- bad quality (too high resistance of the connection / connections between individual copper wire sections forming an alarm circuit).

If the “Przerwana Pętla (*Interrupted Loop*)” is displayed when measuring a pre-insulated heating pipelines with a length smaller than 1000m, searching for the reasons of this information appearing should begin with checking, and potential correction, of the connections between the measuring leads of the meter (green, red) and the copper wires of an alarm circuit. When this action does not provide the expected results, check, whether there is good contact between copper wires at the end of the measured pipelines section. If need be, next, check whether all the connections (if available) between individual copper wire sections were executed.
The quality of individual connections is checked only at the very end (see fig. 3).

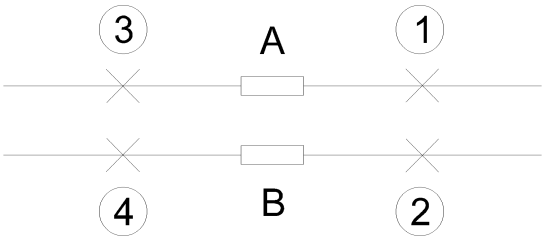


Fig. 3 The figure shows an alarm circuit fragment with market points 1;2;3;4, to which an auxiliary measuring lead shall be connected.

For this purpose, add an LX 9024 measuring device to one end of an alarm loop of a pre-insulated pipelines (fig. 2). Next, starting from this place, check the connection quality of subsequent sections of the alarm system, using an auxiliary measuring lead terminated with “burpees” (electrotechnical grippers).

Connecting a lead to point 1 and 2 enables checking, whether any of the copper wires had been broken in segment between the measurement device - points 1, 2.
In the case of no break, a length measurement result should correspond to the actual state. Next, connect the auxiliary measuring lead to points 3 and 4. The device should show the value of the measured pipelines section length to points 3, 4, similar as the actual state. If an indication of the meter is significantly higher (e.g. by 45m), it must be determined, which of the two connections (A; B) has too high a resistance. For this purpose, connect a measuring lead to, e.g., points 1;4. This way, the B connection is checked. If the length measurement result is the same as the actual one, connection B is correctly executed. Whereas, when there is a significant discrepancy between the meter indications and the actual pipelines section length (to connection B), the connection shall be corrected (resoldered or cramped - depending on the alarm system type). Connection A is checked by adding an auxiliary measuring lead to points 2 and 3. Proceed according to the aforementioned pattern. To end with, reconnect the lead at point 3 and 4, in order to check, whether the localized defects had been removed. An obtained length measurement result, which is the same as the actual length is a confirmation. Next, disconnect the auxiliary lead and measure the length of the entire pipelines. Should the indicated value be the same as the actual one, it means that there are no more bad connections on the other pipelines sections. Otherwise, the search continues according to the aforementioned pattern. The search lasts until the length indicated by an LX 9024 device is the same as the actual length of the tested pipelines. Possible differences should not largely exceed the measurement error (1%) of the meter.

Akumulator (*Battery*) 20%.

This message appears when the battery supplying the device is discharged in 80%.

ładuj akumulator (*charge battery*).

This message appears when the battery supplying the device requires charging, and is followed by automatic deactivation of the meter.
Battery charging with a default charger takes approximately 60 minutes.
Used batteries shall be placed in containers intended for this purpose.

3. Decommissioning of an LX-9024 device.

Pursuant to the provisions of the Act of 29 July 2005 on used electrical and electronic equipment (Journal of Laws, item 1495), the device bears a following symbol:

It means that it is forbidden to place used equipment with any waste. A user of equipment marked in this manner is obliged to hand the equipment over to relevant companies dealing with collecting used equipment. The obligations arise from art. 35 and 36 of the aforementioned act.

LX-9024
(pulse alarm system)

TECHNICAL DATA:

1. Manner of presenting measurement information .....alphanumeric LCD display, 2x16 characters .....backlit
2. Polyurethane insulation resistance measurement voltage ..... ±24V DC

3. Measurement ranges:
   - Polyurethane insulation resistance measurement .....0.1k ÷ 200M
   - Alarm loop wires resistance measurement .....0 ÷ 68Ω
   - Temperature measurement of device supplying batteries ..... -5 ÷ 50°C

4. Measurement errors:
   - Polyurethane insulation resistance accuracy in the range of 0.1kΩ ÷ 100MΩ ..... ±5% ±2 digits of the measured value
   - Alarm loop wires resistance measurement accuracy ..... ±5% ± 2 digits *)

5. Characteristics and meaning of text messages:
   - Polyurethane insulation resistance measurement result symbol..... R=
   - Polyurethane insulation resistance units ..... kΩ, MΩ
   - Alarm loop wires resistance measurement result symbol..... r =
   - Alarm loop wires resistance units .....Ω
   - Heating pipelines length measurement result symbol..... L=
   - Heating pipelines length units .....m
   - No electrical contact between the device and a line pipe ..... Kontakt (*Contact*)?
   - Measurement range exceeded when measuring heating pipelines length ..... L > 2km
   - Electrical gap in an alarm loop wire .....Przerwana Pętla (*Interrupted Loop*)
   - Values and units of the alarm loop wires temperature ..... 0 ÷ 80°C
   - Signalization of an 80% depletion of power supply batteries ..... Akumulator (*Battery*) 20%
   - Device supply batteries discharged ..... ładuj akumulator (*charge battery*)

6. Power supply ..... NiCd 7.2V/700mAh battery package

7. Operating and storage temperature range ..... 5 ÷ 50°C

8. Casing tightness class IP65

9. Dimensions..... 223x105x40

10. Device weight 450g

*) Heating pipelines length measurement accuracy depends on the resistance tolerance applied to the execution of alarm loop wires.