

MOISTURE MONITOR (RESISTANCE ALARM SYSTEM)

LPS-2RI



USER MANUAL

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1. General

The LPS-2RI monitor is designed to monitor two sections of a pre-insulated heating pipeline equipped with a resistance alarm system. During each measurement cycle, the device measures the MH moisture level of polyurethane insulation, the length of the heating pipeline, and the distance between the measurement point and leakage or short circuit between the alarm wire and the carrier pipe. The device calibrates automatically during each cycle. The MH moisture level is measured for two measurement voltage polarizations. Measurement accuracy is not affected by environmental temperature changes or by electrical activity in the carrier pipe. Measurement results are displayed on an alphanumeric display as digital values and text messages. The highlighted display has two lines, 16 characters each. Each line corresponds to one of the measurement channels (one alarm loop).

2. Technical Notes

Technical specifications of alarm systems include the minimum resistance value of polyurethane insulation for the maximum length of the alarm loop (heating pipeline section). For shorter sections, the minimum resistance value can be determined on the basis of the following formula:

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

- R [MΩ] – minimum polyurethane insulation resistance value in a heating pipeline with the length equal to L ($L \leq L_{\max}$)
- R_{\min} [MΩ] – manufacturer's minimum polyurethane insulation resistance value in a heating pipeline section with the length equal to L_{\max}
- L [km] – length of the tested heating pipeline section ($L \leq L_{\max} = 1\text{km}$)
- L_{\max} [km] – manufacturer's maximum length of a pre-insulated heating pipeline section with a pulse alarm system

Measurement results and the above formula can be used when the pipeline is to be extended to determine the polyurethane insulation resistance of the added section, so that the resulting resistance of the pipeline is higher than the minimum resistance value specified by the manufacturer of the alarm system.

The minimum length of a heating pipeline section at which the LPS-2RI monitor remains accurate is 50m. In such cases, the measured polyurethane insulation resistance should be not lower than 200MΩ.

The wide measurement range of the device makes it possible to accurately monitor the velocity and direction of moisture changes between the carrier pipe and the casing pipe, allowing to distinguish leakage from moisture locked in the pipe joints and to determine the right moment for initiating repair works.

ZAKRES (RANGE) and PRZERWA (BREAK) messages

As stated in technical specifications, the **Zakres (Range)** message appears when the measured alarm loop resistance value is between $12051\Omega \div 100\text{k}\Omega$. The lower limit is applicable for alarm loops which are 2000m long, as long as the NiCr8020 resistance wire was manufactured with +5% tolerance. Sometimes, the connections between alarm loop sections are poorly made, and the resistance of the connection increases the resistance of the

loop, as a result of which the loop appears longer than it really is. A similar situation occurs when there is moisture between two broken ends of the alarm loop wire. The occurrence of one of the above situations is signalled by the **Zakres (Range)**. The appearance of moisture between broken ends of the wire can be distinguished by the low value of the MH parameter (high moisture level).

The **Przerwa (Break)** message signals that there is no electric contact between the ends of the alarm loop wires.

Reasons for distinguishing leakage and short circuit

In case of a leakage or a short circuit of the alarm loop wire and the carrier pipe, the measured resistance between the pipe and the wire has low values. Although the LPS-2RI device automatically locates both of these fault types, it is important for pipeline supervisors to know whether the fault is caused by a leakage or a short circuit, in order to choose the right equipment, correctly estimate the seriousness of the situation and decide when to act.

3. Working Environment

The monitor is designed for indoor use. Working temperature ranges from +5°C to +50°C, and the relative humidity of the working environment should not exceed 80%. Storage temperature ranges from -40°C to +70°C.

If the device was stored or transported in temperatures below +5°C, it should be kept in working temperature for at least 3 hours before powering it on.

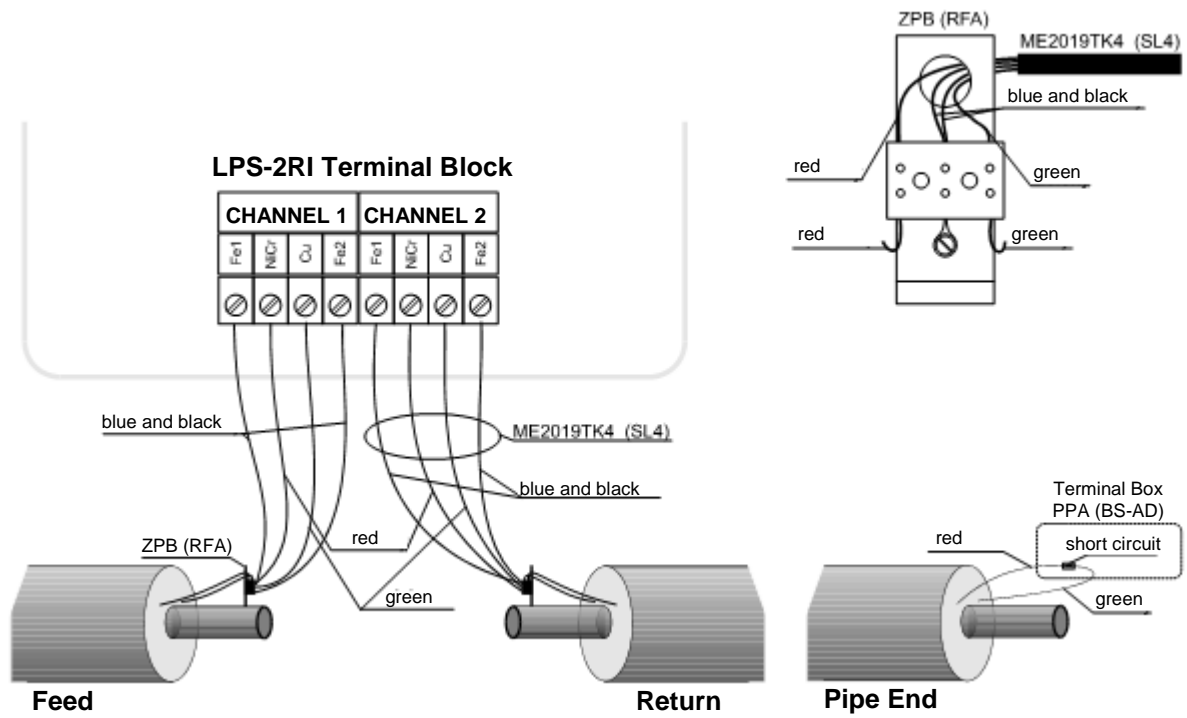
Do not use the monitor in dusty, explosive or corrosive environments.

Declared measurement accuracy is achieved after the device has been used for 30 minutes in proper environmental conditions.

4. Maintenance

Remove dust from the casing with a dry, clean cloth. Dirt should be removed with a cloth moistened with 1% detergent solution. Greasy spots should be removed with special products designed for cleaning computers. To clean the display, use either soft cloths or special antistatic cloths designed for cleaning computer screens. Do not use alcohol, petrol or other solvents which could damage the casing of the monitor. After cleaning, wipe the device dry with a soft cloth. Ensure that the cleaning fluids do not get into the monitor.

5. Connection Diagram



LPS-2RI*(resistance alarm systems)***6. Technical Specifications**

1. Number of monitored pipeline sections.....	2
2. Maximum length of the monitored pipeline section.....	2000m
3. Measurement results display.....	alphanumeric display, 2x16 characters, backlit, red AWARIA (FAULT) LED
4. Polyurethane insulation moisture level measurement range.....	MH 1÷14 and 0
5. Polyurethane insulation MH moisture level measurement voltage.....	±15V
6. Pipeline section length measurement range.....	0 ÷ 2000m
• pipeline section length measurement accuracy.....	± 2m) ¹
• measurement resolution.....	1m
• max. resistance of the alarm loop for the Zakres (Range) message.....	<100kΩ
• min. resistance value of the alarm loop for the Przerwa (Break) message.....	≥100kΩ
7. Measurement range of leakage (moisture) or short circuit localisation.....	0 ÷ 2000m
• leakage resistance measurement range.....	0,1kΩ ÷ 0,9MΩ (MH = 1÷ 9)
• short circuit resistance measurement range.....	1Ω ÷ 450kΩ
• leakage (moisture) or short circuit localisation accuracy.....	± 2m ± 0,2% of the pipeline length
• measurement resolution.....	1m
8. Text messages:	
• symbols of measurement channels (heating pipeline sections).....	1;2
• polyurethane insulation moisture level symbol.....	MH
• polyurethane insulation resistance is greater than 200MΩ.....	Sucho (Dry)
• pipeline section length symbol.....	L
• leakage (moisture) symbol.....	P
• symbol of the short circuit of the alarm loop and the carrier pipe.....	C
• length unit (meter) symbol.....	m
• no connection between the monitor and the carrier pipe.....	Dołącz Rurę (Connect Pipe)
• heating pipeline section length measurement range exceeded.....	Zakres (Range)
• electrical break in the alarm loop.....	Przerwa (Break)
9. Communication with the data system:	
• state of the ALARM contacts (closed/open)	
• LPS-RS digital transmission module	
• LPS-GSM wireless transmission module	
10. Power supply.....	230V 50Hz
11. Working temperature range.....	0 ÷ 50°C
12. Casing tightness class.....	IP65
13. Dimensions.....	210x200x120

)¹ Length measurement accuracy depends primarily on the resistance value of the NiCr8020 wire per one running meter (manufacturing tolerance).