PRE-INSULATED HEATING PIPELINES STATIONARY STATUS METER

(RESISTANCE ALARM SYSTEM)

MHL-300r

OPERATING MANUAL

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1. General information

The MHL-300r device is intended for monitoring 2 sections of a pre-insulated heating pipelines with a resistance alarm system. Each measurement cycle involves measurements of polyurethane insulation resistance, MH moisture degree, heating pipelines length, alarm system voltage (e.g. galvanic voltage), the distance between a measuring position and leak location or the direct shorting of a sensor wire with a line pipe, as well as device autocalibration. Polyurethane insulation resistance is measured at two polarizations of the measuring voltage. Ambient temperature variations, as well as interference resulting from physical phenomena of electric nature present on a line pipe, do not affect measurement accuracy. Measurement information is presented on an alphanumeric display in the form of numerical values of measurement results and text messages. The backlit meter indication field consists of two rows containing 16-character fields each. Each row is assigned to one measurement channel (one sensor loop).

2. Comments regarding the technical data of an MHL-300r device.

An MHL-300r device measures the resistance of polyurethane insulation and an alarm loop. Insulation resistance value is converted into the MH moisture degree or the direct shorting C of an alarm wire and a steel pipe. The relationships between the insulation resistance value and the MH or C parameter are shown in table no. 1. Whereas, the alarm loop resistance value is automatically converted into the length of the tested heating pipelines section.

Polyurethane insulation degree of moisture (MH)	Direct shorting C of an alarm cable and a steel pipe	Polyurethane resistance value range
1	1	100Ω÷500Ω
2	2	500Ω÷1.2kΩ
3	3	1.2kΩ÷5kΩ
4	4	5kΩ÷20kΩ
5	5	20kΩ÷65kΩ
6	6	65kΩ÷200kΩ
7	7	200kΩ÷300kΩ
8	8	300kΩ÷450kΩ
9	—	450kΩ÷1MΩ
10	—	1MΩ÷3MΩ
11	—	3MΩ÷10MΩ
12	—	10MΩ÷20MΩ
13	—	20MΩ÷30MΩ
14	—	30MΩ÷50MΩ
0	—	>50MΩ

table 1

The technical conditions of a resistance alarm system stipulate that the maximum length of a resistance alarm loop is 1000 m. For this length, the polyurethane insulation degree of humidity should satisfy the condition - MH≥12.

The MHL-300r device is manufactured in two versions: with and without automatic leak/moisture/shorting locating. The localization is performed when the polyurethane insulation resistance value drops below 1MΩ.

Interpreting L>Lmax and PRZERWA (*GAP*) messages.

As inferred by the technical data of the device, the $L>L_{max}$ message appears when the measured resistance of an alarm loop adopts a value in the range of 12051Ω ÷ 100kΩ. The lower limit corresponds to a sensor loop length equal to 2000m, under the assumption that a NiCr8020 resistance wire was executed with a tolerance of ±3%. In practice, there are cases of bad execution of connections between alarm loop sections. Connection resistance increases loop resistance; therefore, it artificially extends it. A similar effect can be experienced in the event of moisture between broken ends of a wire forming an alarm loop. Exactly these two events are signalled by the Zakres (*Range*)**.** Whereas, in the second of the described cases, a device usually indicates a small MH degree (high moisture level).

The **Przerwa** (*Gap*) message signals the lack of electrical contact between the terminations of wires forming an alarm loop.

Reasons for distinguishing a leak from a short-circuit.

Leak and direct shorting of a sensor loop wire with a steel pipe are characterized by a relatively small value of resistance measured between a line pipe and an alarm loop wire. In addition, a leak distinguishes galvanic voltage present in an alarm system. The MHS-300r automatically locates each of these cases. However, for the services supervising a heating pipelines, there are important reasons to distinguish these two events. Starting with the fact that each of the events requires different technical preparation for failure removal and ending with the evaluation of the situation severity and response speed.

3. Specification of the MHL-300r operating environment.

The device is designed for operation in confined rooms. The meter operates within ambient temperature ranges of +5°C ÷ +50°C, while the relative humidity should not exceed 80%. The ambient storage temperature can vary from –40°C to +70°C.

After storage or transportation of the device at a temperature below +5°C, it is recommended to wait at least 3 hours before energizing. After such a period, the device should reach operating temperature.

The meter may not operate in rooms with high dustiness and in an atmosphere containing explosive or corrosive/aggressive gases.

The measurements errors of parameters and quantities presented in the technical data are obtained after 30 min. of meter operation at meter-appropriate ambient conditions.

4. Maintenance of the MHL-300r.

Use a clean, dry cloth to remove dust off the device casing. The formed soiling shall be removed with a cloth moistened with a 1% detergent solution. Greasy soiling can be removed with special preparations used to maintain the cleanliness of computer hardware. Use soft cloths or special wipes for cleaning computer screens for cleaning the transparent part of the casing. It is forbidden to use spirit, washing benzene and other solvents. Such cleaning agents may cause surface damage to the meter casing. After cleaning is completed, a device shall be wiped dry with a soft cloth. In the course of the aforementioned actions, make sure that large quantities of the cleaning fluids do not penetrate inside the meter.

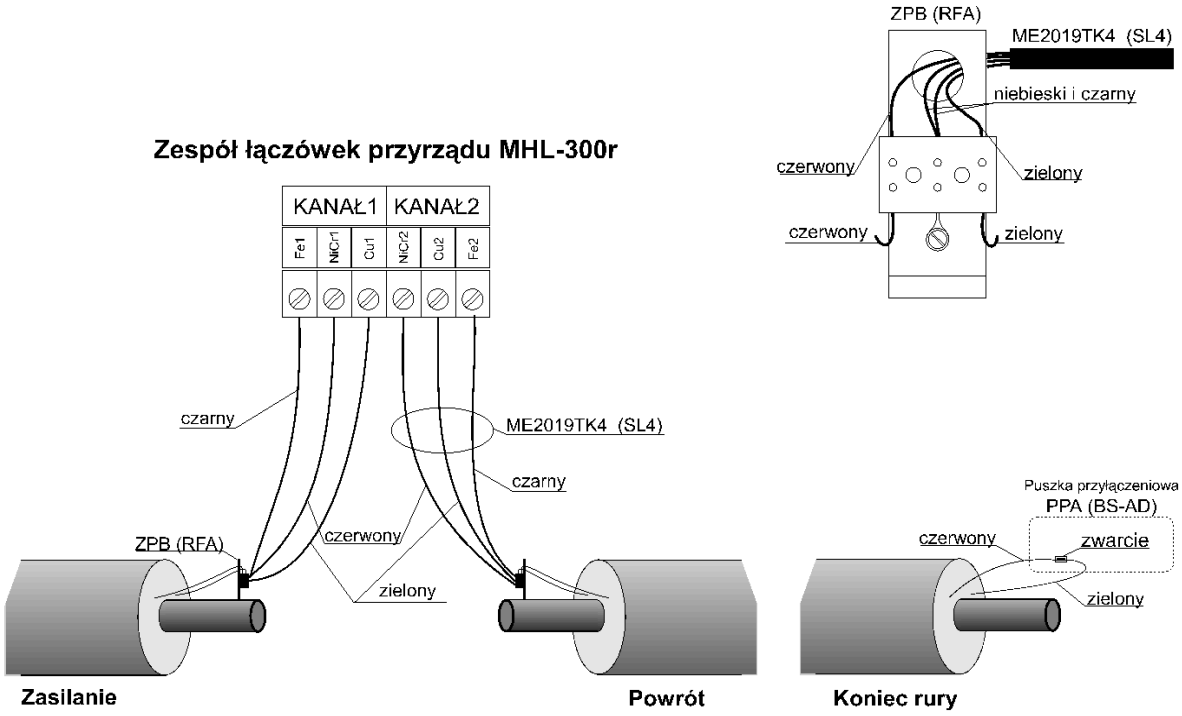
5. Decommissioning of an MHL-300r device.

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:

The symbol 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.

6. Installing an MHL-300r device on a measurement bench.

The device is supplied from an external plug-in power supply (12VDC1A/230V 50Hz).
The red termination of a power supply cable shall be connected to a terminal marked with "+", in the bay described with 12V. The second one, to the "-" terminal.
The figure below shows the method for connecting a device and a resistance alarm system.



MHL-300r

(resistance alarm system)

TECHNICAL DATA

1. Number of monitored sections of a pre-insulated heating pipelines 2
2. Maximum length of a monitored heating pipelines section 2000m
3. Measurement information presentation manner ..... backlit, alphanumeric LCD 2x20 characters, red LED diode with an AWARIA (*FAILURE*) sign
4. Polyurethane insulation resistance measurement range ..... 0.1kΩ÷200MΩ
   - Polyurethane insulation moisture degree measurement range. ..... MH 1÷14 and 0
   - Polyurethane insulation resistance measurement voltage ..... ±15V
   - Polyurethane insulation resistance measurement accuracy ..... ±5%±2 digits in terms of MH degree
5. Heating pipelines section length measurement range ..... 0 ÷ 2000m
   - Heating pipelines section length measurement accuracy ..... ± 2m)[1]
   - Measurement resolution 1m
   - Alarm loop maximum resistance value for a message Zakres (*Range*) ..... <100kΩ
   - Alarm loop minimum resistance value for a Przerwa (*Gap*) message ..... ≥100kΩ
6. Measurement range for the localization of a leak (moisture) or direct shorting of an alarm loop wire with a line pipe ..... 0 ÷ 2000m
   - Leak resistance value range ..... 0.1kΩ ÷ 9MΩ (MH = 1÷9)
   - Resistance value range for a direct shorting between an alarm loop wire and a line pipe ..... 1 Ω÷ 450kΩ
   - Localization accuracy of a leak (moisture) or a direct shorting between an alarm loop wire with a line pipe ..... ±2m ±0.2% of a tested heating pipelines section length
   - Measurement resolution 1m
   - Measurement range for the voltage present in an alarm system ..... 0÷14V
7. Content and meaning of symbols and text messages:
   - symbols of measuring channels (heating pipelines sections) 1;2
   - Polyurethane insulation moisture degree symbol ..... MH
   - Value of polyurethane insulation resistance is larger than 200MΩ ..... Sucho (*Dry*)
   - Symbol of heating pipelines section length L
   - Leak (moisture) symbol ..... W
   - Voltage unit symbol V
   - Symbol of a direct shorting between a sensor loop wire and a line pipe. C
   - Length unit symbol (metre) ..... m
   - No connection between the device and a line pipe ..... Dołącz Rurę (*Connect Pipe*)
   - Measurement range for a heating pipelines section length measurement exceeded ..... L>Lmax
   - Electrical gap in a sensor loop ..... Przerwa (*Gap*)
8. Method of transmitting information to the data collection system:
   - contact status (closed/open) of the ALARM junction;
   - LPS-RS232 digital data transmission module;
   - LPS-MBus digital data transmission external module;
   - LPS-ModBus digital data transmission external module;
   - LPS-GSM radio data transmission external module.
9. Power supply ..... plug-in 12VDC1A/230V 50Hz
10. Operating temperature range ..... +5 ÷ 50ºC
11. Maximum relative ambient humidity value 80%
12. Casing tightness class IP40
13. Device dimensions 100x75x110

)[1] Measurement accuracy of a heating pipelines section length depends mainly on the resistance values of a NiCr8020 conductor per one linear metre (execution tolerance).