PRE-INSULATED HEATING PIPELINES
STATIONARY STATUS METER
(PULSE ALARM SYSTEM)

MHL-300i

OPERATING MANUAL

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General information

The MHL-300i device is intended for monitoring 2 sections of a pre-insulated heating pipelines with a pulse alarm system. During a measuring cycle, measurements of polyurethane insulation resistance, sensor loop resistance, voltage appearing in an alarm system, as well as device autocalibration are executed. 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). In addition, failure states are signalled by an illuminated red LED diode. A user may set a limit value for polyurethane insulation resistance, below which failure will be signalled. The selected value appears on the display immediately after energizing the device.

Detailed data regarding the device are included in section **5. Technical data** herein.

1. Comments regarding the technical data of an MHL-300i device

Technical conditions of pulse alarm systems stipulate the minimum value for polyurethane insulation resistance for a maximum sensor loop length (heating pipelines section). In the case of shorter sections, this value shall be determined from the formula:

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

R [MΩ] - lowest permissible polyurethane insulation resistance value for a heating pipelines section length of $L \neq L_{max}$.

R_{min} [MΩ] - the minimum polyurethane insulation resistance value for an L_{max} maximum length of a heating pipelines, stated in the technical conditions

L [km] - length of the tested heating pipelines section, $L \neq L_{max}$.

L_{max} [km] - the maximum section length of a pre-insulated heating pipelines with a pulse alarm system, stated in the technical conditions.

Device indications and the provided formula may be used for potential expansion of a heating pipelines. They enable us to determine the value of polyurethane insulation resistance of a new section, in order for the resultant resistance of the entire pipelines to be larger than the minimum resistance value determined in the technical conditions of the alarm system.

A wide range of measured values of polyurethane insulation resistance enables to rather accurately track the speed and direction of variations for the moisture between the line and protective pipes. This enables you to distinguish the event of a leak from moisture confined within heating pipelines cable joints. The date of commencing repair works may also be forecast.

Interpreting L>L_{max} and PRZERWA (*GAP*) messages.

As inferred by the technical data of the device, the Zakres (*Range*) message appears when a measured resistance of an alarm loop adopts a value in the range of 210 Ω ÷ 100k Ω. The bottom limit corresponds to a sensor loop with a length of ca. 7000m and specific resistance of 0.015Ω/m. 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 L>L_{max} message. Whereas, in the first of the described cases, apart from low resistance of the polyurethane insulation, the device signals, via the "*" symbol, the lack of galvanic voltage (no moisture).

The **Przerwa** (*Gap*) message signals the lack of electrical contact between the terminations of the 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. However, in the case of moisture, galvanic voltage also appears. 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.

2. Specification of the MHL-300i 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.

3. Maintenance of the MHL-300i.

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.

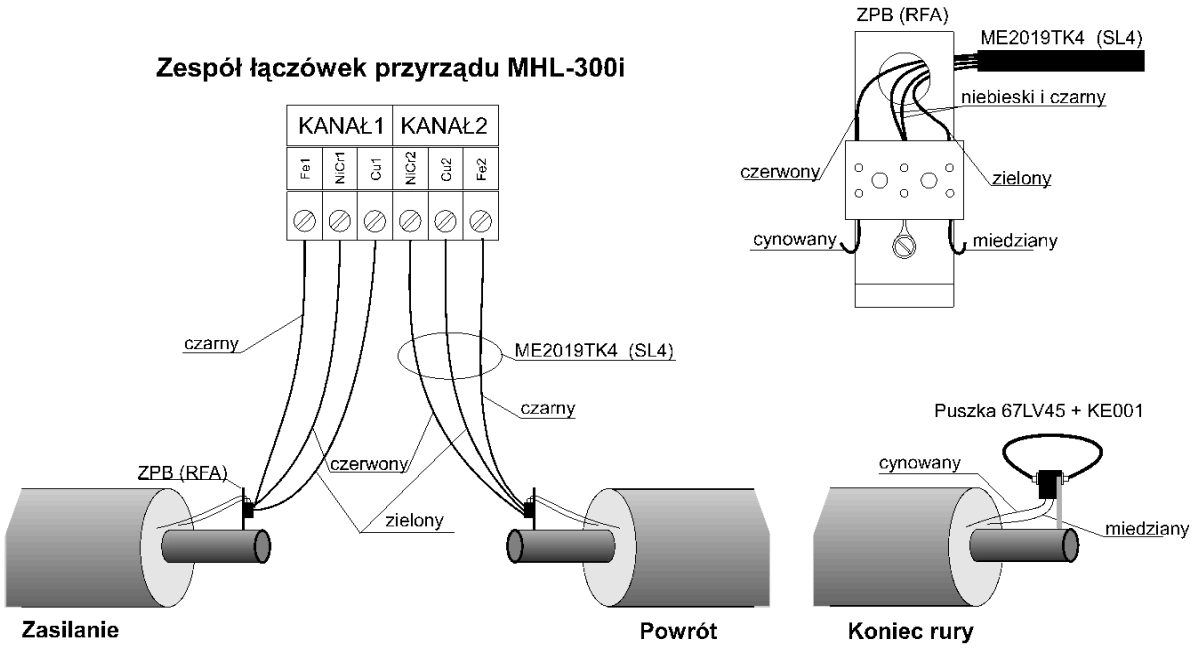
4. Decommissioning of an MHL-300i device.

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.

5. Installing an MHL-300i device on a measurement bench.

The device is supplied from an external plug-in power supply (12VDC, 1A). 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.
Below you can find the method for connecting an MHL-300i meter to a pulse alarm system.



All terminations should be executed through 67LV45 junction boxes.

MHL-300i

(pulse alarm system)

6. TECHNICAL DATA.

1. Number of monitored sections of a pre-insulated heating pipelines 2
2. Maximum length of a monitored heating pipelines section ..... 7000m)[1]
3. Manner of presenting measurement information ..... alphanumeric LCD display, 2x16 characters backlit; red LED diode
4. Measuring voltage ..... ±15V
5. Polyurethane insulation resistance measurement range ..... 0.1kΩ ÷ 200MΩ
   Polyurethane insulation resistance measurement accuracy: ..... ±5% reading value ±2 digits
6. Alarm loop resistance measurement range ..... 0 ÷ 210Ω)[1]
7. Alarm loop resistance measurement accuracy ..... ±5%
8. Heating pipelines section length measurement range ..... 0 ÷ 7000m)[1]
9. Measurement ranges distinguished with illuminated red LED diode with an AWARIA (*FAILURE*) sign:
   - Leak (moisture) resistance value range for the ALARM message ..... 0.1kΩ ÷ 1MΩ
     The selection is made with a switch in a 1;2;5 sequence.
     Examples: 10kΩ; 2kΩ; 500kΩ.
   - Resistance value range for a direct shorting between an alarm loop wire and a line pipe ..... 1Ω ÷ 0.45MΩ
   - Alarm loop maximum resistance value for a $L>L_{max}$ message ..... <100kΩ
   - Alarm loop minimum resistance value for a Przerwa (*Gap*) message ..... ≥100kΩ
10. Content and meaning of symbols and text messages:
    value of coded limit resistance of polyurethane insulation ..... XYkΩ
    symbols of measuring channels (heating pipelines sections) 1;2
    Value of polyurethane insulation resistance is larger than 200MΩ ..... Sucho (*Dry*)
    alarm loop state ..... Pętla (*Loop*) OK
    symbol of a direct shorting between a sensor loop wire and a line pipe. ..... *
    symbols of resistance units ..... Ω, kΩ, MΩ
    No connection between the device and a line pipe ..... Dołącz Rurę (*Connect Pipe*)
    measurement range for a heating pipelines section length measurement exceeded ..... $L>L_{max}$
    Electrical gap in a sensor loop ..... Przerwa (*Gap*)
11. Method of transmitting information to the data collection system:
    state of contacts (NO, NC, COM) of the ALARM connector (standard equipment);
    LPS -RS 232 digital data transmission module (standard equipment);
    LPS-MBus digital data transmission external module;
    LPS-ModBus digital data transmission external module;
    LPS-GSM radio data transmission external module.
12. Power supply ..... plug-in 12VDC,1A/230V 50Hz
13. Operating temperature range ..... +5 ÷ +50°C
14. .Maximum relative humidity value 80%
15. Casing tightness class IP40
16. Device dimensions 100x75x110

)[1] Standard setting. Settings are changed as per the conditions set out by a manufacturer of pre-insulated pipes. They apply to the maximum length of a heating pipelines (alarm loop length) and the permissible, minimum resistance of polyurethane insulation.