

**STATIONARY FAULT DETECTOR
FOR PREINSULATED DISTRICT HEATING PIPELINES
(PULSE ALARM SYSTEM)**

ACN-4N



USER MANUAL

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1. General

The ACN-4N instrument is designed to monitor 4 sections of a preinsulated district heating pipeline with a pulse alarm system. Every section can have a length of up to 2000 m along the sensor wire.

The technical requirements for alarm systems specify the minimum resistance of polyurethane insulation for the maximum length of a district heating pipeline. If the measured resistance is lower than the minimum value, this indicates a leak. The ACN-4N instrument screen will display the value of the preset minimum resistance (550 Ω on standard) on the screen immediately after the power supply is switched on. Apart from leaks, the instrument also indicates breaks in the alarm circuit and direct contact (short circuit) of the sensor wire with the carrier pipe.

Information on the condition of the monitored sections of the district heating pipeline is communicated in the form of numerical measurement results, text messages and LED indication. It is also possible to transmit information to a data acquisition system. The simplest way of doing this is to accordingly set the contacts of the relays connected to the connector with the "ALARM" description. Accurate data recorded by the instrument can be sent via digital transmission (ACN4MT module, ACN4RS module) or by radio via the GSM network (ACN4GSM module). The selected module is placed inside the instrument.

2. Methods of presentation and types of information displayed on the front panel of the ACN-4N instrument

Information about the condition of the monitored sections of the district heating pipeline with the alarm system is presented on the front panel of the ACN-4N instrument in the form of numerical measurement results, text messages (LCD alphanumeric display) and light signals (LEDs).

The LEDs indicate the following conditions of the alarm system of the monitored district heating pipeline and inform about the placement of a data transmission module inside the instrument.

LED, green Description: STAN DOBRY (GOOD CONDITION)	When the LED is lit, four monitored sections of the preinsulated district heating pipeline are in good condition.
LED, red Description: AWARIA (FAULT)	When the LED is lit, at least one out of four monitored sections of the district heating pipeline is in bad condition.
LED, yellow Description: TRANSMISJA (TRANSMISSION)	If the LED is lit up continuously, the instrument has a correctly installed data transmission module. Blinking indicates an installation error.

The alphanumeric display of the ACN-4N instrument provides more specific measurement information. The reading area consists of two lines, each containing sixteen character spaces (2x16). All messages displayed by the instrument are listed below in the form in which they appear, complete with comments that expand upon and clarify their contents.

550 Ω ACN4N8_v06N

After connecting power supply voltage, the ACN-4N instrument will display the entered minimum voltage (50–550 Ω) and the number of the existing software version. It is assumed that if the results of polyurethane insulation resistance measurements are lower than the minimum resistance, this indicates a leak. This assumption is correct when the district heating pipeline and alarm system are correctly installed.

**1: STAN 1026 Ω
DOBRY (GOOD
CONDITION)**

District heating pipeline section with the indicated number (1–4) is in good condition. In addition to the text message, the instrument can also display the current resistance between the copper wire and the carrier pipe in the first line. The resistance displayed with this text message is within the range of 151–1200 Ω. Above 1200 Ω, the digits are replaced by four horizontal dashes (---- Ω).

**1: AWARIA (FAULT) 1124 Ω
Przerwa (Break)**

In the district heating pipeline section with the indicated number (1–4), there is an electrical break in the circuit of the alarm system. It may be caused by external mechanical damage of the district heating pipeline or incorrect connection between sections of the copper wire of the alarm system. It may also be a result of a break in the connection between the instrument and the alarm system. The first line of the display may indicate the measured value of polyurethane insulation resistance. The resistance displayed with this text message is within the range of 151–1200 Ω. Above 1200 Ω, the digits are replaced by four horizontal dashes (---- Ω).

**1: AWARIA (FAULT) <50 Ω
Zwarcie (Short circuit)**

In the district heating pipeline section with the indicated number (1–4), there is direct contact (short circuit) between the copper wire and the carrier pipe. It is assumed that in case of a short circuit, the measured resistance between the copper wire and the carrier pipe is lower than 50 Ω. This is the information displayed in the first line of the screen.

**1: AWARIA (FAULT) 142 Ω
Wilgoć (Moisture)**

District heating pipeline section with the indicated number (1–4) is characterised by high moisture. It is assumed that if the measured polyurethane insulation resistance is within 50–550 Ω, this means that there is a leak from the carrier pipe. In practice, the resultant resistance of several damp fittings can be approximately the same as resistance of a leak.

1: AWARIA (FAULT) 142 Ω Przerwa Wilgoć (Break Moisture) In the district heating pipeline section with the indicated number (1–4), there is moisture (leak) and a break in the alarm system. The comments concerning the displayed information are similar to those relating to “AWARIA-Przerwa” (FAULT – Break) and “AWARIA-Wilgoć” (FAULT – Moisture) messages.

The information included in the comments to the displayed messages indicates that the preinsulated district heating pipeline may be in **GOOD CONDITION** but have moisture between the carrier pipe and the copper wire. The resistance values (151–1200 Ω) displayed by the instrument indicate the current moisture and the direction and rate of changes. This is a significant advantage of the ACN-4N instrument in comparison with other similar detectors. The displays used in ACN-4N detectors with the Russian language may be backlighted. To activate temporary backlighting, press the K button located on the right side panel of the housing. The duration of backlighting is approximately 2.4 min. In other display types, backlighting is not necessary.

The ACN-4N instrument can activate an external alarm device (audible or light alarm) in case of a fault in the monitored district heating pipeline. The control signal is binary: closed or open contact of the relay. Instrument power outage is also indicated as a fault. The contacts of the relay are connected to the connector with the ALARM description.

Fig. 1. Status of “Alarm” connector contacts

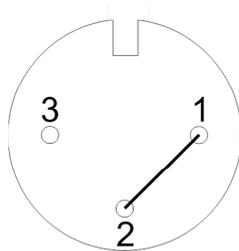


Illustration of the status of connector contacts for indication of **STAN DOBRY (GOOD CONDITION)** (the green LED is lit)

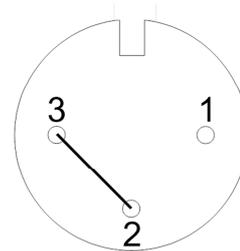


Illustration of the status of connector contacts for indication of **AWARIA (FAULT)** (the red LED is lit)

3. Methods of connecting the ACN-4N instrument to the district heating pipeline with an alarm system

Fig. 2. Method of connecting the wires of four alarm loops
The connections are made using 67LVxx coaxial cables.

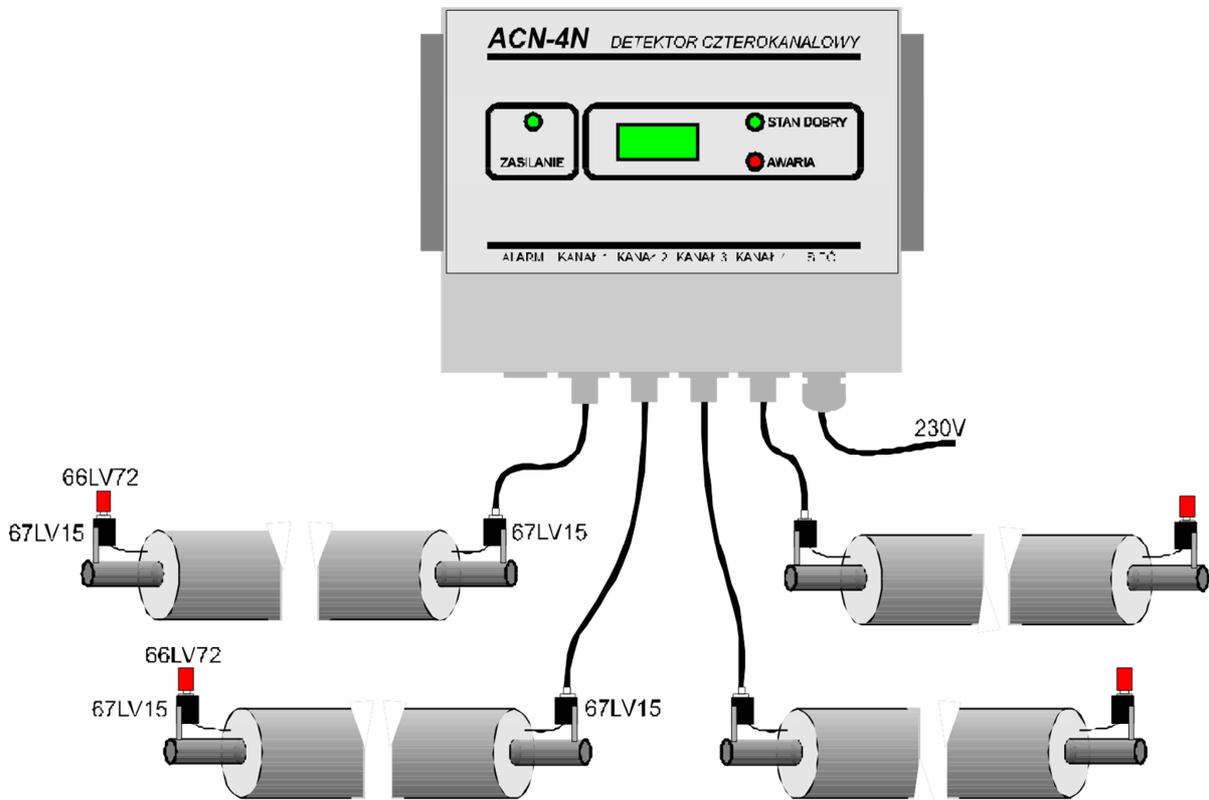
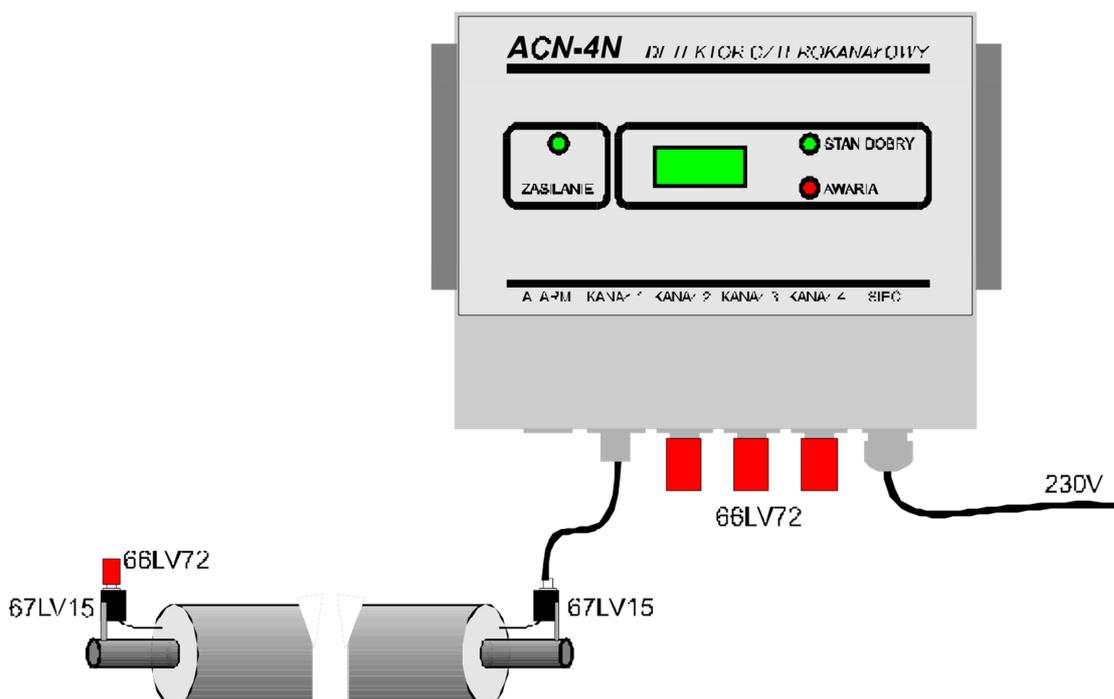


Fig. 3 Method of connecting the wires of one alarm loop
The connections are made using 67LVxx coaxial cables.



4. Description of the operating environment of the ACN-4N instrument

The instrument is designed for indoor operation. The instrument operates correctly within an ambient temperature range of +5°C to +50°C, and relative humidity should not exceed 80%. During storage of the instrument, the ambient temperature should be within the range of -40°C to +70°C.

If the instrument was stored or transported at a temperature of less than +5°C, it should not be connected to power supply for at least 3 hours. After this time, the instrument should reach the operating temperature.

The instrument cannot be used in dusty areas and in atmospheres containing explosive or corrosive gases.

The accuracy of measurements of parameters and quantities indicated in the technical specifications is reached after 30 minutes of instrument operation in suitable environmental conditions.

5. Cleaning the ACN-4N instrument

A clean, dry cloth should be used to remove dust from the housing of the instrument. Other dirt should be removed with a cloth dampened with a 1% detergent solution. Greasy impurities can be removed with special products used to clean computer hardware.

Transparent parts of the housing should be washed with soft cloths or with dedicated cloths for washing computer screens. Using spirit, petroleum naphtha or other solvents is not allowed. Such cleaning agents may cause surface damage to the housing of the instrument. After cleaning, the instrument should be wiped dry with a soft cloth.

Care should be taken during cleaning to prevent large amounts of the cleaning liquids from getting inside the instrument.

6. Periodic inspections of the ACN-4N instrument

Verification tests should be conducted every 2 years to check if the instrument operates correctly. The tests should be carried out as follows:

1. Disconnect the measurement cables from the ports of the instrument marked: "KANAŁ 1-4" (CHANNEL 1-4).
2. Screw 66LV72 port plugs (4 pieces) into the ports marked: "KANAŁ 1-4" (CHANNEL 1-4). A green LED should turn on within three minutes to indicate good condition. The contacts of the "Alarm" connector should have the status depicted in figure 1 on page 4.
3. Screw 66LV72T port plugs (4 pieces) into the ports marked: "KANAŁ 1-4" (CHANNEL 1-4). A red LED should turn on within three minutes to indicate a fault. The contacts of the "Alarm" connector should have the status depicted in figure 1 on page 4. The LCD screen should sequentially display the "Przeciek" (Leak) and "Przerwa" (Break) messages for all four measurement channels.

After the measurement, connect the cables connecting "KANAŁ 1" (CHANNEL 1) and "KANAŁ 4" (CHANNEL 4) measurement ports of the instrument with the alarm system of the district heating pipeline.

7. Disposal of the ACN-4N instrument

In accordance with the Act of 29/7/2005 on waste electrical and electronic equipment (Journal of Laws, item 1495), the following symbol has been placed on the instrument:



This symbol means that it is prohibited to discard waste equipment together with any other waste. Users of equipment marked with this symbol are obliged to transfer it to dedicated companies that collect waste equipment. These obligations arise from Articles 35 and 36 of the above-mentioned act.

ACN-4N

(pulse alarm system)

8. Technical specifications:

1. Number of monitored sections of the district heating pipeline 4
2. Maximum length of monitored sections of the district heating pipeline 2000 m
3. Method of displaying measurement information alphanumeric screen, 2x16 characters,
4. Minimum polyurethane insulation resistance..... preset: 100 Ω –550 Ω at 50- Ω increments*)
5. Polyurethane insulation resistance measuring accuracy..... $\pm 10\%$
6. Signal description:
 - In every monitored section of the district heating pipeline, the insulation resistance is LED, green greater than 550 Ω ; four Description: STAN DOBRY (GOOD CONDITION) alarm systems are undamaged.....
 - At least in one of the four monitored sections LED, red of the district heating pipeline, the insulation Description: AWARIA (FAULT) resistance does not exceed 550 Ω and/or at least one alarm system is damaged.....
7. Characteristics and contents of displayed information:
 - Identification number of the district heating pipeline section 1–4
 - Insulation resistance greater than 550 Ω , undamaged alarm system STAN DOBRY (GOOD CONDITION)
 - Insulation resistance not greater than 550 Ω AWARIA (FAULT) and/or electrical break in the alarm circuit
 - Leak (insulation resistance not greater than 550 Ω) Wilgoć (Moisture)
 - Short circuit (isolation resistance lower than 50 Ω) Zwarcie (Short circuit)
 - Electrical break in the alarm system Przerwa (Break)
 - Range of displayed insulation resistance 50 1200 Ω between the alarm wire and the steel pipe
8. Description of the “ALARM” output used to control an external alarm device:
 - Contacts are open in case of the “AWARIA” (FAULT) status or power outage.
 - Acceptable contact voltage:
 - AC 30 V
 - DC 24 V
 - Connection power 30 W (DC); 60 VA (AC)
 - Maximum continuous load current 1 A (DC); 0.5 A (AC)
9. Method of communication with data acquisition systems:
 - Status of relay contacts connector with the ALARM description
 - ACN-RS232 module (Modbus-RTU protocol)
10. Power draw (without using data transmission modules) 3 VA
11. Power supply specifications 230 V 50 Hz
12. Operating temperature range 0 to +50°C
13. Relative humidity up to 80%
14. Housing protection rating IP54
15. Appliance class B
16. Instrument dimensions 210x200x120
17. Instrument weight 1560 g

*) Factory setting: 550 Ω