

**PRE-INSULATED NETWORK
STATIONARY INDICATOR**
(LOGSTOR, STAR PIPE, CWA impulse alarm system)

ACN - 4N



OPERATING INSTRUCTION

levr

1. General information

The ACN-4N device is intended to control 4 sections of a pre-insulated heat distribution network with an impulse alarm system. Each of the sections may be up to 2000 m in length (sensor loop length).

The specifications of the impulse alarm systems define the lowest acceptable resistance of the polyurethane insulation for the maximal length of the network's section (sensory loop). It is assumed that a resistance lower than the minimal value indicates a leak. When the device is turned on, the value of the set border resistance (manufacturer's settings - 550Ω) is displayed at the very beginning. Apart from indicating leaks, the device is able to signalize an electrical break and a direct contact (short-circuit) between the copper sensor wire with the carrier pipe. The information about controlled sections is displayed as numerical measurement values, text communicates and signals by LED lights. There is also a possibility of transmitting the information to the data collecting system. The easiest way of realization of the signaling function is to set the terminal connectors of the transmitter in the "ALARM" socket. The precise data stored in the device may be sent using digital transmission (ACN4MT, ACN4RS modules) or via GSM network (ACN4GSM module). The chosen module type is installed in the device.

2. Display characteristics and types of data displayed on the faceplate of the ACN-4N device

The messages concerning the state of the controlled sections of the heat distribution with an alarm system are displayed on the faceplate of the ACN-4N device as numerical measurement values, text messages (alpha-numeric LCD display) and light signals (LED lights).

The LED lights, when on, signal the alarm system states described below, and inform about the data transmission module installed in the device.

Led lights, green Description: STAN DOBRY ['OK STATE']	LED light on informs that the four controlled sections of the pre-insulated heat distribution network are operating properly.
LED lights, red Description: AWARIA [MALFUNCTION]	LED light on informs, that at least one of the four monitored sections of a heat distribution network is not operating correctly
LED lights, yellow Description: TRANSMISSION	If the light is continuously on, it means that a data transmission module is properly installed in the device. Blinking informs of an installation error.

The alpha-numeric display of the ACN-4N provides more accurate measurement data. The display field is composed by two lines, each with 16 digits (2 x 16). Below is the list of all messages displayed. The form in which they are displayed has also been presented. Additionally, information is provided that extends and explains their meaning and rationale.

550 Ω ACN4N8_v06N (50÷550Ω)	The ACN-4N device, after connecting to the power supply, displays the set value of border resistance and the version of the software installed. It is assumed that when the values of polyurethane resistance measurements are
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lower than the border resistance, there is a leak. This assumption is correct when the heating network and its alarm installation have been performed correctly.

**1: STAN 1026 Ω [STATE 1026 Ω]
DOBRY [OK]** The heating section with the displayed number (1÷4) is in good technical state. Apart this text message additional data presented in the first line may include the current value of resistance between the copper wire and the carrier pipe. The range of resistances displayed along this text message is between 151÷1200 Ω . Above 1200 Ω the numbers will be replaced by four hyphens (---- Ω).

**1: AWARIA 1124 Ω
[MALFUNCTION 1124 Ω]
PRZERWA ['BREAK']** The heating section with the displayed number (1÷4) is experiencing an electrical break in the sensor loop of the alarm system. The break may result from an external damage to the heating network or a faulty connection between the sections of the copper wire constituting the sensor loop. An additional possibility to be taken into consideration is an electrical break in the connection of the device and the sensor loop. The first line may display the measured value of the polyurethane insulation resistance. The range of resistances displayed along this text message is between 151÷1200 Ω . Above 1200 Ω the numbers will be replaced by four hyphens (---- Ω).

**1: AWARIA <50 Ω
[MALFUNCTION <50 Ω]
Zwarcie [Short-circuit]** The heating section with the displayed number (1÷4) There is a 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 value between the copper wire and the carrier pipe is below 50 Ω . And this information is displayed in the first line.

**1: AWARIA 142 Ω
[MALFUNCTION 142 Ω]
Wilgoć [Humidity]** The heating section with the displayed number (1÷4) is characterized with a too high humidity. It is assumed that if the measured polyurethane insulation resistance is between 50÷550 Ω , there is a leak. In practice it is possible, that overall resistance of a few humid muffs may give a resistance value indicating a leak.

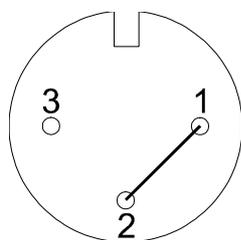
**1: AWARIA 142 Ω
[MALFUNCTION 1124 Ω]
Przerwa Wilgoć
[Break Humidity]** The heating section with the displayed number (1÷4) is experiencing humidity (leak) and an electrical break in the sensor loop. The text messages displayed are similar to the comments AWARIA - Przerwa [MALFUNCTION - Break] and AWARIA - Wilgoć [MALFUNCTION - Humidity]

From the information contained in the comments to the text messages it can be gathered that **STAN DOBRY [OK STATE]** of an pre-insulated heating network allows existence of humidity between the carrier pipe and the copper wire. The displayed resistance value (151÷1200Ω) allows to show the current humidity level as well as the speed and direction of its changes. It is one of the bigger benefits provided by the ACN-4N device in comparison to other devices of the same type.

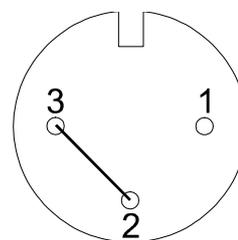
The Russian language displays used in the ACN-4N devices may be back-lighted. This function may be turned on for a short time by pressing a "K" button. The button is located on the right side of the casing. The messages will be back-lighted for about 2.4 minutes. In the other types of displays used the back-light function is not required.

The ACN-4N device may turn on an external alarm device (sound, light) in case of a malfunction in the controlled heat distribution network. The control signal has two possible states: open or closed connectors of the transmitter. Lack of power is also indicated as a malfunction. The transmitter's connectors end in a socket designated ALARM.

Dia. 1 Possible placement of the connectors in the „Alarm” socket.



The connectors state for the **STAN DOBRY [OK STATE]** (green LED light on)



The connectors state for the **AWARIA [MALFUNCTION]** (red LED light on)

3. Additional equipment

3.1 ACN4RS digital data transmission module

ACN-2Z device may be equipped with an ACN4RS module that allows for digital transmission of sensory data. The transmission type choice (e.g. RS232, RS485) is chosen by the user. The data transmission connection socket is labeled ALARM/ The transmitted data include an unique module number, number (1÷4) of the controlled pre-insulated heat distribution network with an alarm system, and the code for its current state (dobry, przeciek, przerwa, zwarcie) [ok, leak, break, short-circuit). The ACN4RS module is installed inside the ACN-4N device.

ATTENTION: The transmitter and the digital data transmission use the same connector socket

labeled ALARM. Both functions cannot be used at the same time.

3.2 The ACN4GSM digital data transmission module

The ACN-4N device may be equipped with the ACN4GSM module with an external antenna for data transmission using a GSM network. The data concerning the state of the controlled heat distribution network and the alarm system are transferred as a Short Text Message to a chosen phone number. The change of the addressee's phone number may be performed remotely. The Short Text Message is automatically sent whenever there is a state

change in one of the four controlled sections of a heating network, or is sent on request by the supervising user.

When the ACN-4N device is connected to a power supply (230V 50Hz), a first measurement cycle is performed (four channels), which ends with the measurement data being displayed on the installed ACN4GSM module. The data is displayed in four ticks. The content and form of the displayed messages is provided below.

Kod [Code]: 05

The first tick shows the machine code of the device. For the ACN-4N the code is 05.

Nr seryjny [S/n]:

$X_{12}X_{11}X_{10}X_9X_8X_7X_6X_5X_4X_3X_2X_1$

Second display tick. It shows serial number of the device consisting of 12 numbers.

Telephone no.:

$Y_{11}Y_{10}Y_9Y_8Y_7Y_6Y_5Y_4Y_3Y_2Y_1$

Third display tick. It shows telephone number with the country code at the beginning without the "+" sign, after which a report on the state of the heating network and alarm system is sent.

Further measurement data do not have such functionality.

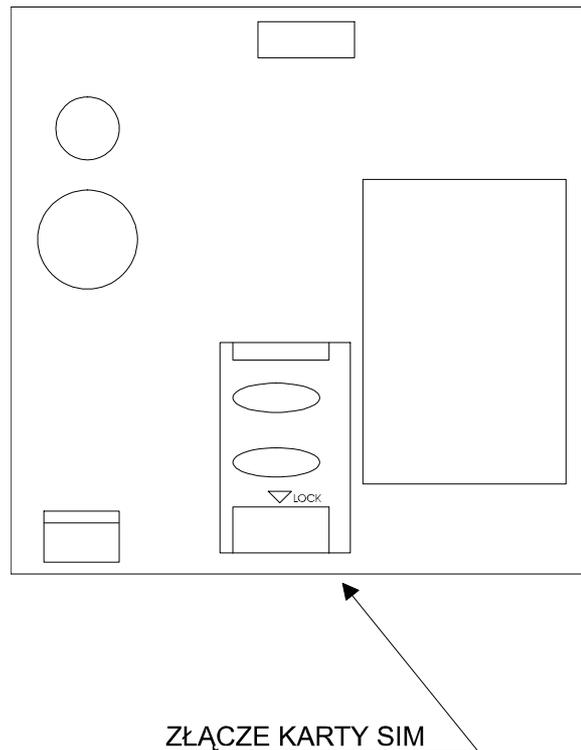
If the data saved in the memory of the ACN4GSM module is incorrect or their format is incorrect, the ACN-4N device displays error codes for the errors encountered. In practice, this option may only activate during the manufacturer's initiation of the device.

3.3 SIM card installation

The SIM card that is to be installed, should have a set PIN number in a form of a number 1000, or have the PINM authorization disabled.

In order to install the SIM card in the device, follow the below steps:

- Unscrew the faceplate (with the LCD display)
- Locate the pcb with the module and the SIM card slot (see the diagram);
- Open the card slide and correctly insert the SIM card inside.
- Close and lock the slide by moving it down in accordance with the LOCK arrow, up to a distinctive "click".



If the SIM card is not inserted, or it is inserted incorrectly, the yellow LED light labeled TRANSMISJA [TRANSMISSION] -located on the faceplate of the device, blinks with a frequency of about 5Hz. The blinking occurs only after a full measurement cycle has been completed (four channels).
 After the proper SIM card installation, the device should be re-assembled and put into operation/

3.4 Changing the addressee's phone number

Changing the phone number that is used by the device to send the messages requires sending a Short Text Message to the device.
 The message should have the following form:

w05x2A3B5691F41Dy48123456789z

where:

- 05** – manufacturer's code of the ACN-4N device;
- w, x, y, z** - markers;
- 2A3B5691F41D** - the 12-digit serial number (the one to the left is an example) of the ACN4GSM module installed;
- 48123456789** - the telephone number with the country code (here 48) without the "+" sign (the number to the left is an example).

After receiving and decoding the request, the device replays with a Short Text Message containing

ACN-4N nr [no.]: 2A3B5691F41D NUMER ZMIENIONY [NUMBER CHANGED]

It is possible that the message detailing the number change has an incorrect form. This error will be signaled by the ACN-4N device by sending a Short Text Message with the following content:

ACN-4N nr: 2A3B5691F41D BLEDNY KOD

The number change operation should be re-attempted but without making any mistakes.

3.5 Sending information concerning the state of the controlled sections of the heating network and the alarm system.

An example Short Text Message containing a report about the state of the four controlled sections of a heating network may have the following content:

ACN-4N nr: 2A3B5691F41D K1:dobry K2:wilg K3:wilg zerw K4:zerw

It contains the following information:

ACN-4N - device type;

2A3B5691F41D - the 12-digit serial number (the one to the left is an example) of the ACN4GSM module;

K1 .. K4 - symbol of the controlled channel (measured section of the heat distribution network);

dobry, wilg, zerw - state description or the shortened version of the error message: stan dobry,

wilg. (leak) [humidity], zerw. [electrical break in the sensor loop].

The above example contains all the separate states of the heating network and the alarm system. The „wilg” [humidity] indicates one of three possibilities: humidity level of the polyurethane insulation exceeded, a leak or a short-circuit between the copper sensor wire and the carrier pipe. The joint characteristic of the three above states is a level of the polyurethane insulation resistance. lower than the set border value/ Humidity and electrical break may coexist in a controlled section of the heating network. And they are signaled as that/

As it was mentioned before, the information is sent after every status change in any of the controlled channels, or when so requested by the authorized user. An example of a Short Text Message requesting the stored data to be sent to the user by the ACN-4N device is presented below:

w05x2A3B5691F41Ds

05 - manufacturer's designation of the ACN-4N device type

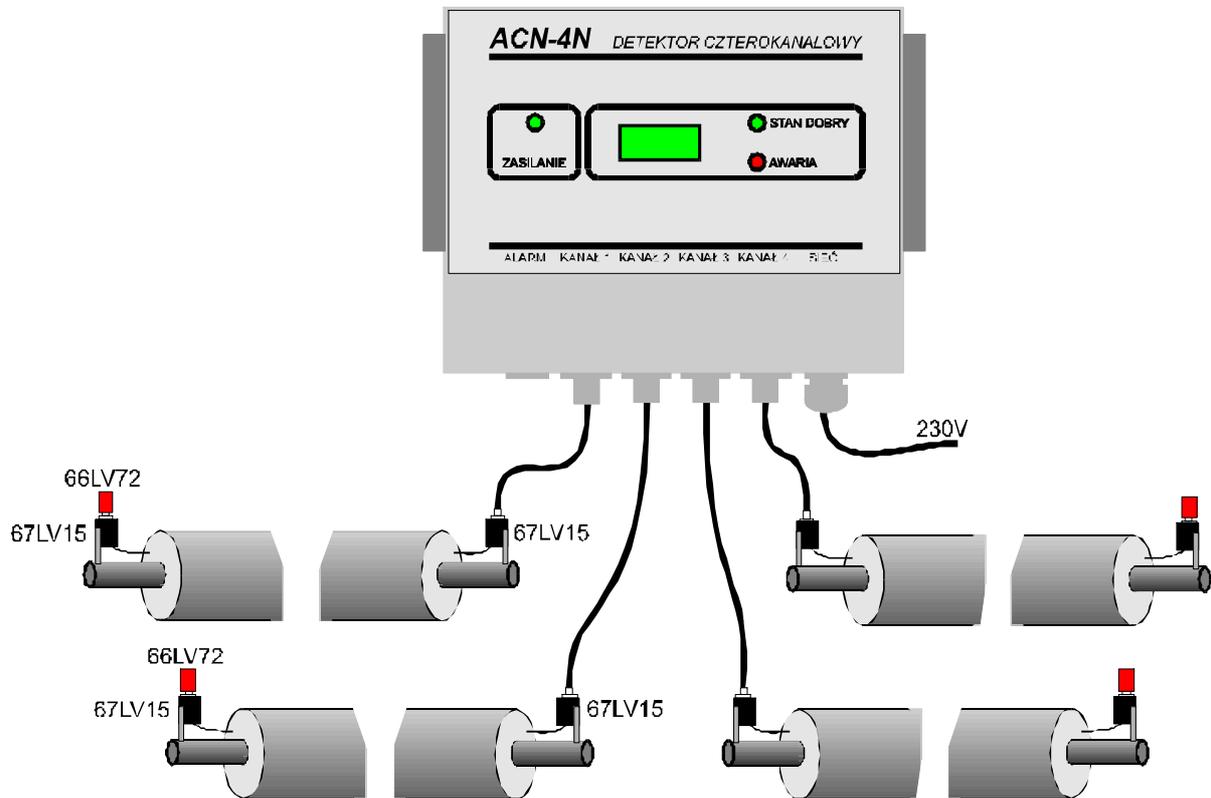
w, x, s - markers

2A3B5691F41D - an example of a serial number of the ACN4GSM. module (six bytes in a hexagonal format).

4. Methods of connecting the ACN-4N device to a heat distribution network with an alarm system

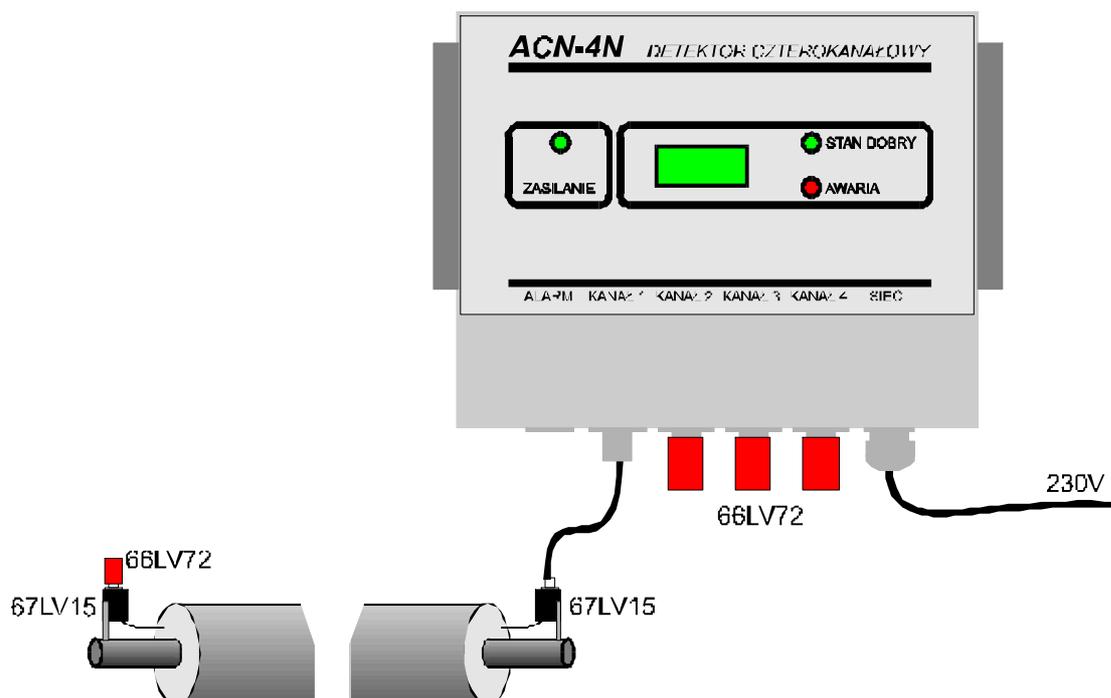
Dia. 2 Method for connecting wires from 4 control loops.

Connections are to be made using 67LVxx concentric cables.



Dia. 3 Method of connecting wires of a single control loop.

Connections are to be made using 67LVxx concentric cables.



5. Working conditions for ACN-4N

The device is intended for use in closed spaces. The device operates properly in the following ambient conditions: temperature from $+5^{\circ}\text{C}$ ÷ $+50^{\circ}\text{C}$, relative humidity not higher than 80%. When the device is stored the range of allowable temperatures is from -40°C to $+70^{\circ}\text{C}$.

After storing or transporting the device in temperature below $+5^{\circ}\text{C}$ it is recommended to wait at least 3 hours before switching on the device. After the above time the device should reach proper operating temperature T.

The device cannot be used in spaces characterized by high dustiness, or containing explosive or highly corrosive gasses.

The measurement errors given in the specifications are achieved after 30 minutes of operation in proper conditions.

6. Maintenance of ACN-4N device

To remove dust from the device's casing use a clean, dry cloth. The remaining stains or dirt is to be removed by using a cloth soaked in 1% solution of a cleaning agent. Greasy stains should only be removed by using a cleaning agent for computer parts. The transparent part of the casing should be cleaned using a soft cloth or special tissues used to clean computer screens. Using white spirit, naphtha, or other solvents to clean the device is prohibited. Using such agents may result in damage to the device's casing. When the device has been cleaned, it should be wiped dry using a soft cloth.

When performing cleaning activities, care should be taken not to allow significant amount of cleaning liquids inside the device.

7. Periodic inspection of ACN-4N

In order to assure proper operation of the device, it should undergo control testing every two years. The testing should be performed in the following manner:

1. Remove the measuring wires from the device's sockets described as KANAŁ 1-4 [CHANNEL 1-4].
2. Screw 66LV72 tips (4 pcs.) onto KANAŁ 1-4 [CHANNEL 1-4] sockets. In up to three minutes two green LED lights should turn on, indicating "OK state". The connectors of the "Alarm" socket should be in position shown on Dia.1 on page 4.
3. Screw 66LV72 tips (4 pcs.) onto KANAŁ 1-4 [CHANNEL 1-4] sockets. In up to three minutes two green LED lights should turn on, indicating "AWARIA" [MALFUNCTION] state. The connectors of the "ALARM" socket should be in a position displayed on Dia. 1 on page 4. The LCD display should sequentially show messages "Przeciek" ["Leak"] and ["Brake"] for all four controlled channels.

After the testing is finished, the measuring wires should be reconnected to the device's sockets, connecting the device to the sensor loop of the heat distribution network.

ACN-4N

(alarm system Alstom Power / ABB)

8. TECHNICAL CHARACTERISTICS

1. Number of monitored sections of a heat distribution network 4
2. Maximal length of the section 2000m
3. Display of the measurement data alphanumeric display 2 x 16 digits
4. Boundary resistance of the polyurethane insulation set: 100Ω ÷ 550Ω every 50Ω*)
5. Accuracy of the resistance measurement ±10%
6. Display characteristics:
 - Each section has resistance Led lights, green
higher than 550Ω; the four sensor loops are not damaged Description: STAN DOBRY ['OK STATE']
 - At least in one of the controlled sections LED lights, red
of the heating network the insulation's resistance is below 550Ω Description: AWARIA [MALFUNCTION]
and (or) at least one sensor loop is damaged
7. Characteristics of the displayed messages:
 - Number of the section 1÷4
 - Insulation resistance higher than 550Ω, sensor loop not damaged STAN DOBRY ['OK STATE']
 - Insulation resistance not higher than 550Ω AWARIA [MALFUNCTION]
or (and) electric break in the sensor loop
 - Insulation resistance not higher than 550Ω Wilgoć [Humidity]
 - Zwarcie [Break] (insulation resistance lower than 50Ω) Zwarcie [Short-circuit]
 - Electric break in the sensor loop PRZERWA ['BREAK']
 - Range of insulation resistance displayed 50 ÷ 1200Ω
between the alarm loop and the steel pipe
8. Characteristics of "ALARM" socket used to control external signaling device:
 - Connectors open in case of "AWARIA" [MALFUNCTION] or lack of power.
 - Permissible voltage on the connectors:
 - alternating current 30 V
 - direct current 24 V
 - Connecting power 30 W - DC 60VA-AC
 - Maximal direct current load 1A-DC, 0.5A-AC
9. Methods of communication with data collecting systems:
 - State of the transmitter's connectors Connector socket labeled ALARM
 - Digital data transmission ACN4MT module
ACN4RS module
 - GMS radio transmission ACN4GSM module
10. Power use (without the data transmission modules) 3VA
11. Power source 230V 50Hz
12. Operating temperature range 0÷50°C
13. Housing class IP54
14. Insulation protection class B
15. Device measurements 210x200x120
16. Device weight 1560g

*) Manufacturer's settings: 550Ω