FIRE ALARM SYSTEMS

TIRAS



# Input/output device AM-Multi+

**Operation manual** AAZCh. 425532.017 OM

1O206

EN 54

DSTU ISO 9001:2015

Serial number:

Firmware version:

**Contents**

1 Purpose ..... 3
2 General information ..... 3
3 Construction ..... 4
3.1 Connection terminals ..... 6
3.2 Indication on the board ..... 6
4 Installation and preparation for work ..... 7
4.1 Safety requirements ..... 7
4.2 Installation of the device ..... 7
4.3 Connection ..... 8
4.3.1 Addressable interface connection ..... 8
4.3.2 IN inputs connection ..... 9
4.3.3 Alert output connection ("OUT1", "OUT2") ..... 10
4.3.4 Power outputs ("+24V") connection ..... 10
4.3.5 Main power connection (220V) ..... 11
4.3.6 Backup power connection (battery) ..... 11
4.3.7 M-OUT2R and M-LOOP modules installation ..... 12
5 Technical features ..... 13
Appendix A (reference).Calculation of battery capacity ..... 14
Appendix B. Scheme of electric connections ..... 16

This manual contains technical and functional characteristics, instructions for installation and operation of the addressable input/output device with built-in power supply equipment and short-circuit isolator AM-Multi+ (further – the device), which is used as part of addressable fire alarm systems, based on the fire control panels Tiras PRIME A.

To avoid possible errors in the operation and damage to the equipment, before installation, adjusting and operation the device, read this manual, which is provided with the device.

**List of abbreviations**

SCI – short circuit isolator;

FCP – fire control panel Tiras PRIME A;

AFAS – addressable fire alarm system;

AI - addressable interface;

Battery - rechargeable battery;

PSU – power supply unit,

SC - short circuit;

**Terms and definitions**

**Addressable fire alarm system (AFAS)** is a group of components in a system of a certain configuration, that can detect, and notify on fire and generate signals to take appropriate measures.

**Addressable device -** a device that connects to the AI (detectors, modules, except FCP).

**Parametric input -** input for monitoring the status of external devices by the value of the resistance of their sensors.

**Siren –** a sound or light-and-sound device designed to alert people about the need to evacuate from areas where a fire has been detected;

## 1 Purpose

The device is designed for:

- increasing the number of AFAS inputs;
- increasing the number of transistor AFAS outputs;
- increasing the number of relay AFAS outputs;
- increasing the number of AI in AFAS;
- management of alert outputs and their power supply;

## 2 General information

The device provides:

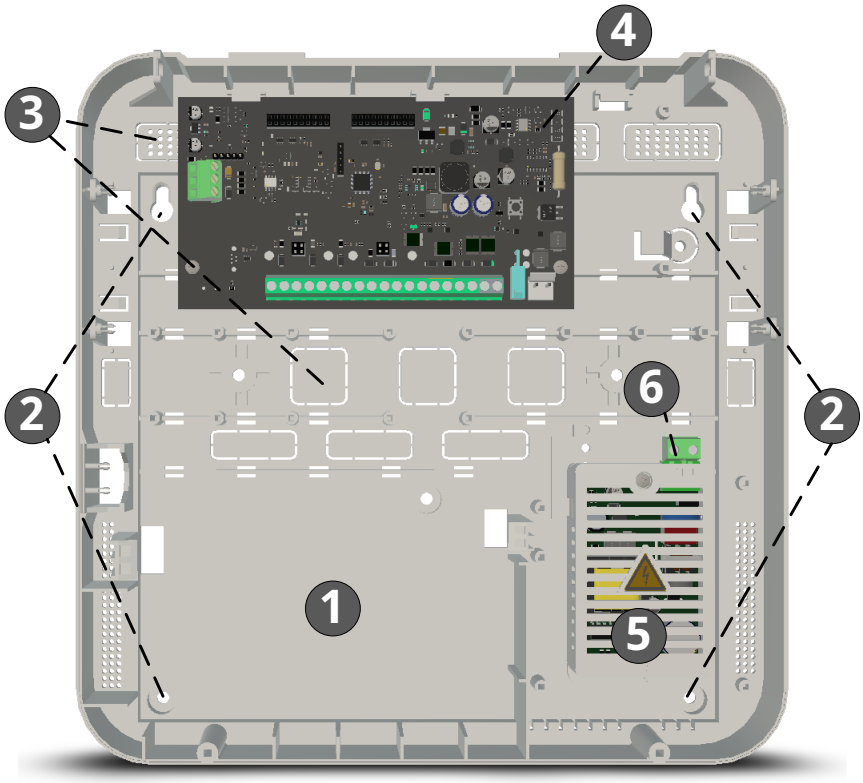
- 5 universal parametric inputs (IN);
- 2 controlled alarm outputs (OUT);
- 2 24V power outputs (with protection);0
- backup power – 12V battery with a capacity of 7 A·h;
- smart charger with battery capacity control;
- switching power supply 35 W;
- connection of additional modules (up to 2):
  - M-OUT2R (two additional relay outputs);
  - M-LOOP (additional AI).

**3 Construction**

The appearance of the device is shown in Fig. 1. Appearance with the cover removed is shown in Fig. 2. The appearance of the main board of the device is shown in Fig. 3.

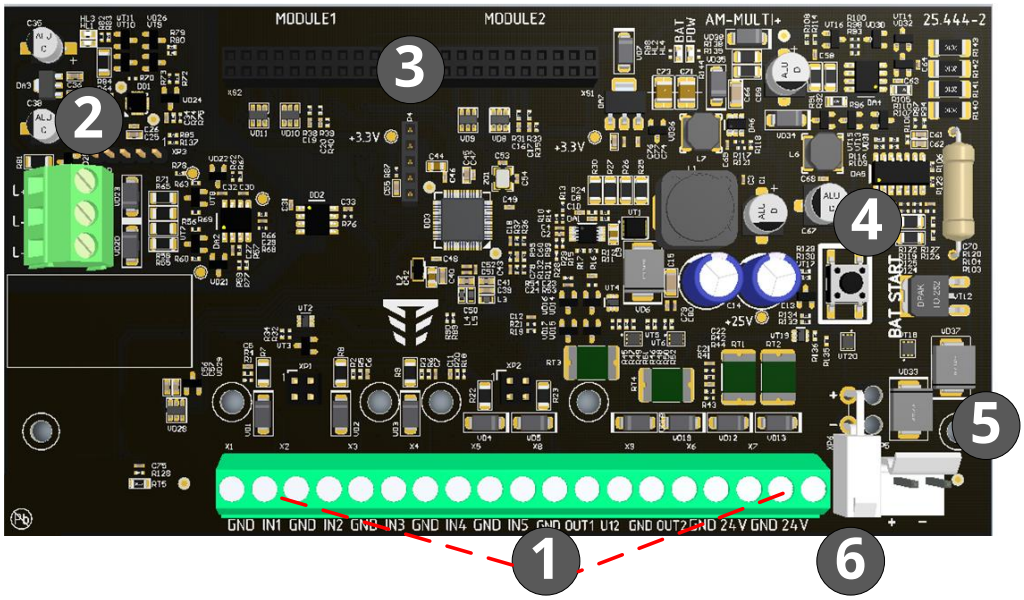


Figure 1 - Appearance of the device




1. Place for installation of the battery;
2. Holes for mounting on the wall (see section 4.2);
3. Holes for cable entry;
4. Main board of the device;
5. Main power supply;
6. 220V main connection connector;

Figure 2 - Appearance of the device with the cover removed




1. Terminals for connection inputs and outputs of the device;
2. Terminals for connection of the addressable interface;
3. Connector for installation additional modules;
4. “BAT START” button.
5. Main PSU connection connector;
6. Connector for connection the battery cable;

Figure 3 - Appearance of the main board of the device

### 3.1 Connection terminals

The list of terminals and their functions are given in table. 3.1. The location of the device terminals is shown in Fig.3.

Table 3.1 - Description of connection terminals.

| Terminal name | Functional characteristic |
|---|---|
| **Address interface connection** | |
| L+ | AI positive wire connection terminal |
| L- | AI negative wire connection terminal. There are two terminals, divided by SCI. |
| **Connection of inputs and outputs of the device** | |
| IN1 – IN5 | Universal parametric inputs (controlled parameter - resistance of the connected line, see table 5.1). |
| GND | Common input with circuit ground potential. |
| OUT1- OUT2 | Alert outputs (transistor outputs). |
| U12 | Power input alarm outputs. |
| 24V | Power outputs of external devices 24V. |
| **Connector-plugs** | |
| Module1 | Optional module installation connector 1. |
| Module2 | Optional module installation connector 2. |

### 3.2 Indication on the board

LED indicators located on the board are used to indicate the operation modes and status of the device. Assignment of indicators:

1) HL1 (green):

- blinking 1 time in 4 s - standby mode indication;
- blinking with an interval of 0.5 s (for not more than 4 s) - indication of the process of registering the device in the AI.

2) HL3 (red): double blinking – the indication of a fault.

3) HL2 **BAT** (green):

- blinking 4 times in a row - battery capacity 80-100%;
- blinking 3 times in a row - battery capacity 60-80%;
- blinking 2 times in a row - battery capacity 40-60%;
- blinking 1 time - battery capacity 20-40%;
- glows - battery life is depleted;
- not lit - capacity measurement was not performed.

3) HL4 **POW** (green):

- lit - at least one of the power sources is working.

**Note**. Alternate flashing indicators HL1, HL3 - the device is marked for visual search in the area.

## 4 Installation and preparation for work

### 4.1 Safety requirements

**Make all connections when the supply voltage of the device is switched off.**

4.1.1 During the installation and operation of the device, the service personnel should be guided by the "Rules of technical operation of electrical installations of consumers" and "Rules of safety in the operation of electrical installations of consumers".

4.1.2 Installation, removal and maintenance of the device should be performed with the supply voltage switched off.

4.1.3 Installation, removal and maintenance work on the device should be carried out by personnel who have a qualification group in electrical safety not lower than III.

4.1.4 Fire safety rules should be followed fire when carrying out work.

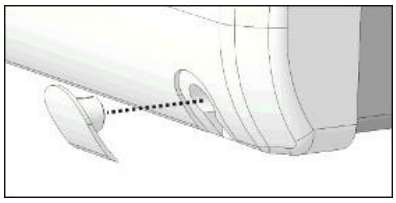
### 4.2 Installation of the device

The device can be installed in premises with regulated climatic conditions with a temperature from -5 to +40 °C. The design of the device provides its installation on the wall.

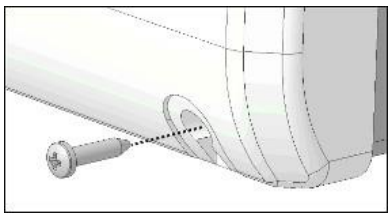
At the place of installation of the device, a 220V power line should be provided, protected by a circuit breaker with parameters in accordance with the technical features of the device.

If a third-party power supply is used for powering of alarm devices or addressable components connected to this device, the cross-section of the power wires should be selected based on their length and rated current consumption.

**Installation:**



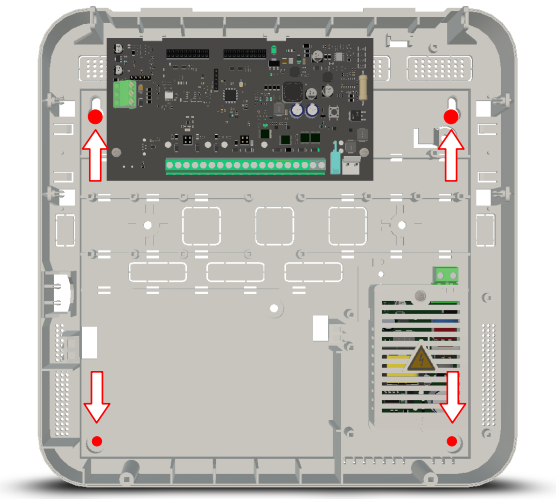
1. Remove 2 plugs from the bottom of the case.



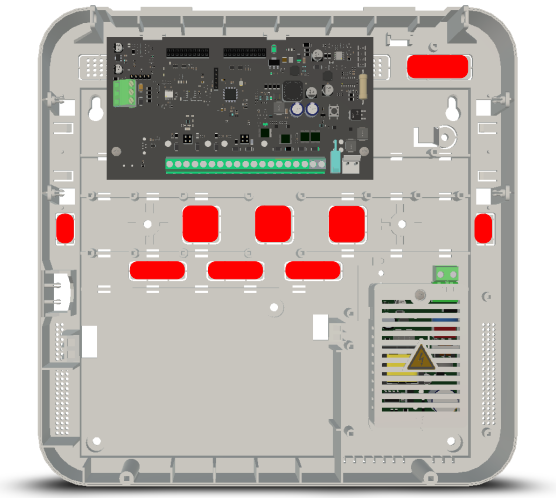
2. Unscrew the 2 screws fixing the cover.



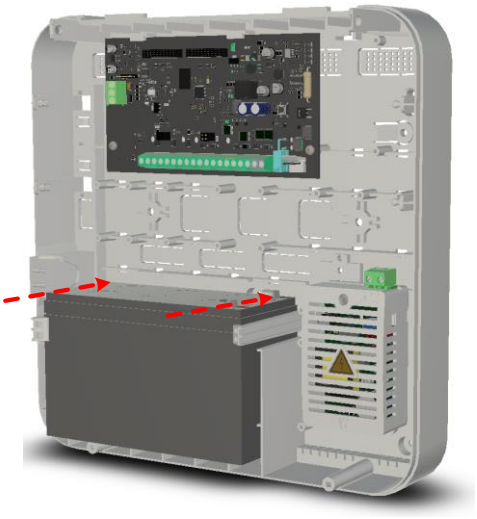
3. Remove the cover.



4. Attach the device enclosure to the wall, align the condition of the enclosure with a construction level and mark the upper 2 holes. Drill holes for dowels in the planned places. Install dowels, screws and hang the enclosure. The diameter of the holes for attaching the device is 5 mm.
5. Mark 3 holes for fixing (one in the middle of the case, two - at the bottom), remove the case.
6. Drill holes for dowels in the planned places. Install the dowels.
7. To break out necessary holes for cable entry.



8. Enter the connection cables.
To ensure protection class IP30, a special cable gland of the appropriate size (depending on the cable type) should be used at the cable entry points.
9. Fasten the enclosure to the wall with 3 screws. Holes for fixing - 4.2 mm.
10. Make the necessary connections (see section 4.3). Install the modules (see sections 4.3.9-4.3.10).).

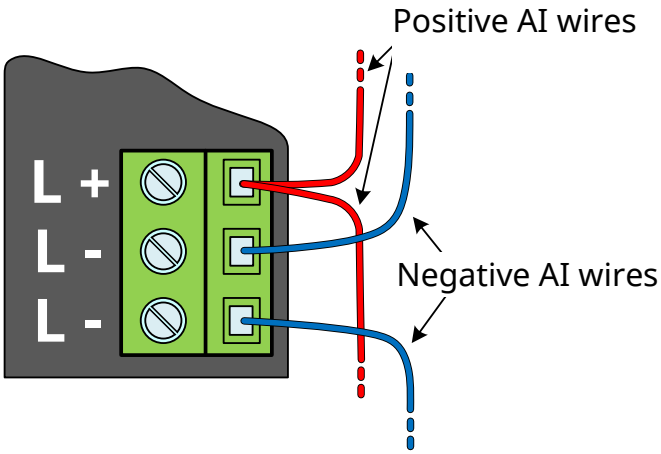


11. Install and connect the battery (see section 4.3.8).
12. Assemble the case, having executed points 1-3 in reverse order.

### 4.3 Connection

#### 4.3.1 Addressable interface connection

The device is used as part of the AFAS, built on the basis of FCP "Tiras PRIME A". The general scheme of connections is shown in fig. B.1. The scheme of connection the device to the address line is shown in Fig. 4.




**Notes.**

1 Positive AI wires - AI wires connected to terminals L1-L4 of the FCP;

2 Negative AI wires - AI wires connected to terminals G1-G4 of the FCP.

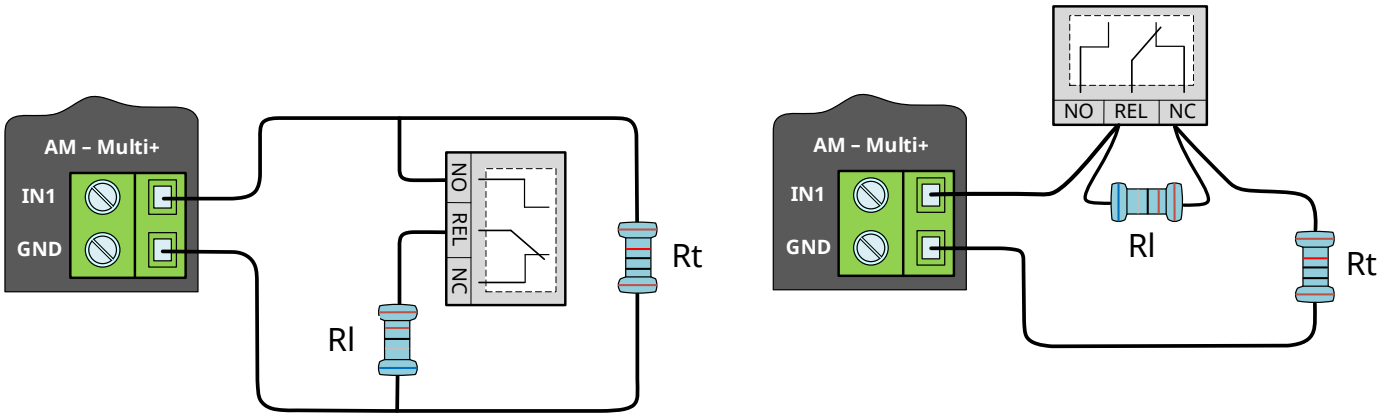
Figure 4 - Diagram of connection to the address line

### 4.3.2 IN inputs connection

The device has 5 universal parametric inputs IN (controlled parameter - resistance of the connected line, see table 5.1) for connection of activation devices. An example of the activation device as a relay is shown (Fig. 5)

**It is also possible to use the button as an activation device with compliance to the line resistance (Table 5.1).**

| | |
|---|---|
| | **IN inputs are not intended to connect non-addressable detectors.** |




а) б)

Figure 5 – Connection diagram of IN inputs

Figure 5 shows:

a) Diagram of connecting of the relay with NO contact in parallel with the terminal resistor Rt.

b) Diagram of connecting of the relay with NC contact in series with the terminal resistor Rt.

Rt is the terminal resistor, its resistance value should satisfy the conditions of formation of the standby mode in accordance with table 5.1;

Rl is the additional resistor, its resistance value should satisfy the conditions of formation of the active mode when the relay is triggered (Fig. 6).

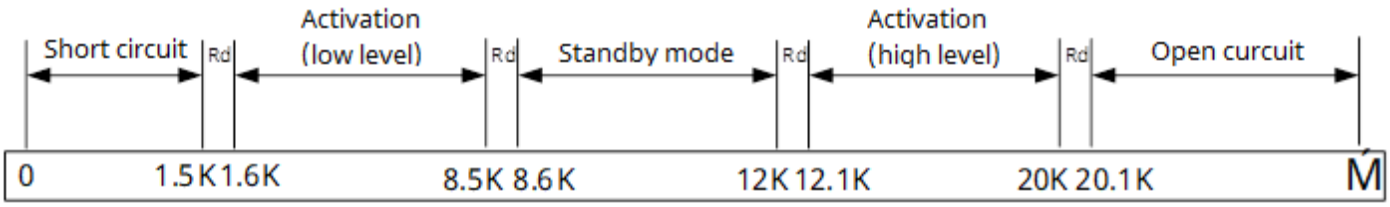



Figure 6 - Diagram line of resistance value according to the mode of the device

**Notes**.

1 When choosing the values of resistances Rt and Rl, you should take into account the total resistance of the line when the relay is triggered, this value should not be equal to Rd - the resistance of the indeterminate state of the line.

2 Switching the device to the activation warning mode is possible only from the standby mode, in case of fault (short circuit or open circuit), restoring of the device is possible when returning to the standby mode.

### 4.3.3 Alert output connection ("OUT1", "OUT2")

The device contains 2 alert connection outputs. Connection of sirens is shown in fig. 7. When powering the sirens from the device's own output - it is necessary to install a jumper between the input U12 and output +24V. If the current consumption of the detectors exceeds the load capacity of the device output +24V, it is necessary to use an auxiliary power supply. At the end of the warning line, a terminal resistor of 10 kO, 0.5 W is installed.

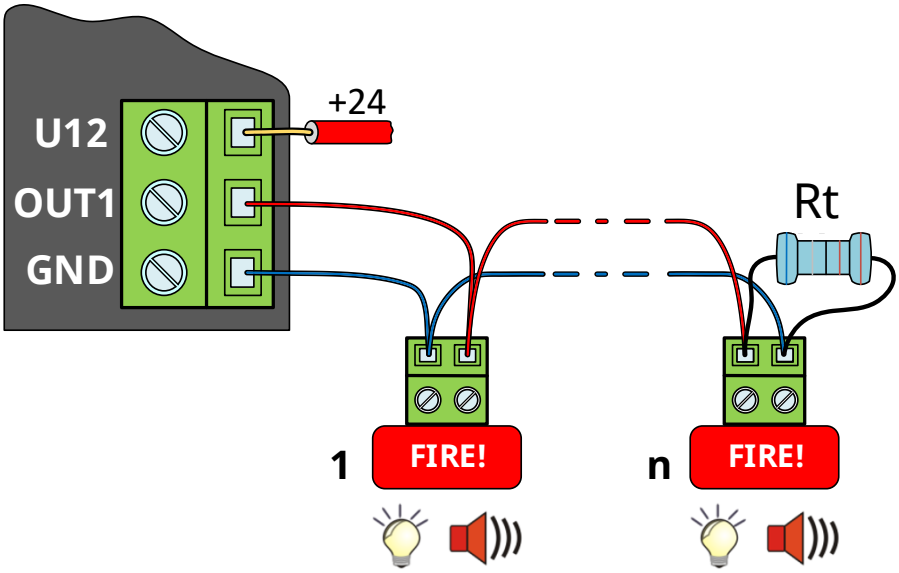



Figure 7 – Connection diagram of the alarm outputs

### 4.3.4 Power outputs ("+24V") connection

The device contains 2 power outputs of external devices, with a voltage of 24 V and a maximum load current of 400 mA (for each output). Each output has a self-resetting fuse with a maximum load current of 500 mA. The outputs on the main board are marked "+ 24V".



**To restore the normal state of the output fuse "+ 24V" after its operation, it is necessary to remove the load from the output for a few seconds.**

### 4.3.5 Main power connection (220V)

The main power is connected via the connector on the PSU of the device. Insert the cable (Fig. 8) into the terminal socket of the connector and connect it to the plug of the device. After connection the 220V main connectors, the wire should be fixed with a tie, see fig. 9. For main power connection it is recommended to use a cable with a cross section of conductors not less than 0.75 $mm^2$



**Before connection the main power cable to the device connector, make sure that there is no voltage on the cable wires.**

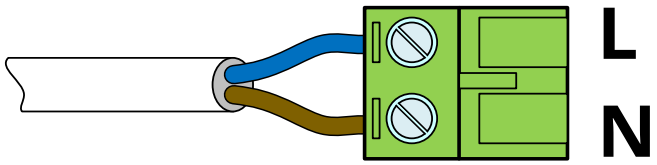



Figure 8 – Connection of 220V connector

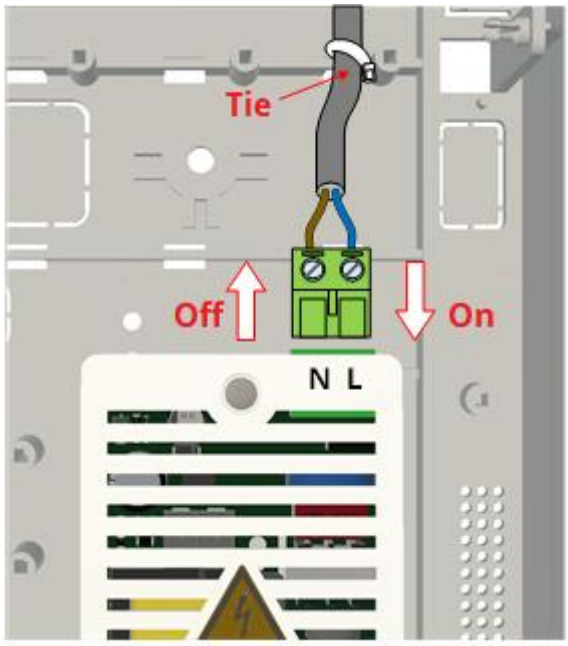



Figure 9 - Connection and fixing the 220V network cable

### 4.3.6 Backup power connection (battery)

As a backup power supply of the device use one sealed lead-acid battery with a voltage of 12V, capacity 7 A·h or 9 A·h. The battery is connected to the terminals "+" (red) and "-" (black). The device monitors the internal resistance and voltage of the battery - at a voltage less than 11.5V generates a message: "Battery fault - low voltage", and disconnects the battery when the voltage drops to 10.5 V to prevent damage to the battery. Current consumption from the battery after disconnection the device is absent. The charger contains protection against incorrect battery connection.

The charger performs 3 stages of battery charging:

• charging with current (without voltage limitation, taking into account the temperature), up to about 80% of capacity;

• DC voltage charging (2V less than the value of charge voltage 1 in the first stage, taking into account the temperature);

• relaxation - disconnection of the charger, the process of self-discharge (storage) of the battery. In this mode, the batteries are ready to provide backup power to the device. If the 220V network fails, the transition to the battery is automatic.

After reaching the self-discharge threshold, the charging cycle is repeated. Battery voltage regulation temperature range from 0 °C to 50 °C.

To start the device from the battery (without 220V network) it is necessary to connect the battery and press the "BAT START" button (Fig. 3), hold it until the LED indication HL4 (POW). An example of calculation the capacity of the backup power supply is given in Appendix A.

### 4.3.7 M-OUT2R and M-LOOP modules installation

The M-OUT2R and M-LOOP modules are mounted on top of the device board in the appropriate connectors (Fig. 3, Item 4). It is possible to install two identical modules on the device board.

To install the module, you need to install the plastic holders on the main board of the device (holders included in the set M-OUT2R and M-LOOP) and install the module on the main board of the device by connecting the module connector to the device connector 4).

When the M-OUT2R module is installed, two relay outputs (dry contact type) appear.

When installing M-LOOP modules, additional address interfaces appear.

The modules are set in accordance with the FCP operation manual.

**Up to 250 address components can be connected to AM-MULTI+, regardless of the number of M-LOOP modules installed.**

An example of the M-LOOP module installation and its connection terminals is shown in Fig. 15.

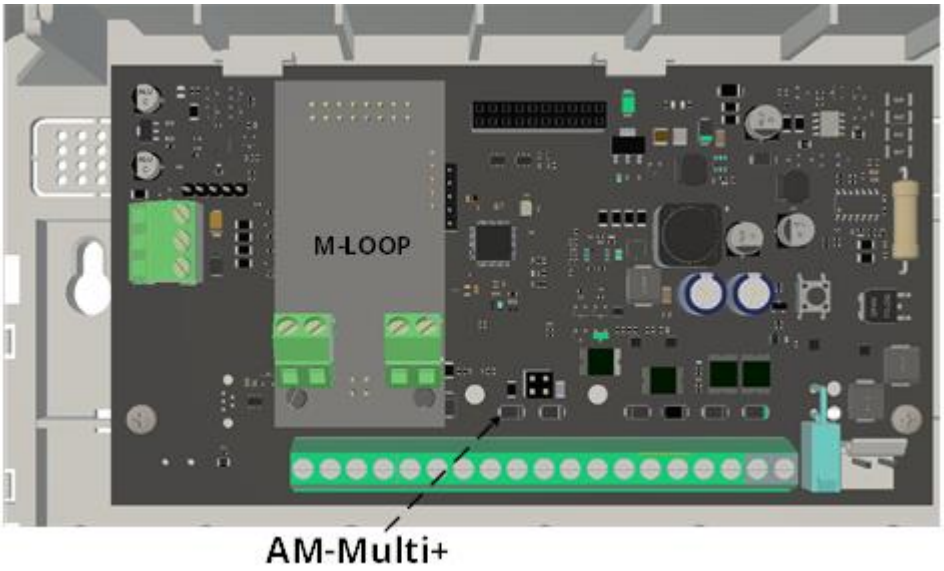



Figure 15 - Device with M-LOOP module installed

## 5 Technical features

Table 5.1 - Main technical features

| Name | Value |
|---|---|
| **General** | |
| Overall dimensions WxHxD, mm, not more than | 280 x 280 x 85 |
| Weight without battery, kg, not more than | 1,6 |
| Enclosure protection class | IP30 |
| Average operating time per failure, h, not less than | 40 000 |
| Average service life, years, not less than | 10 |
| Fault detection time, s, not more than | 10 |
| **Power supply** | |
| The main power supply, voltage (V), frequency (Hz) | 187-242, 50±1 |
| Backup power supply (battery), voltage (V)/capacity (A·h) | 12/ 7 |
| Battery charging current, mA, not more than | 500 |
| Permissible internal total resistance of the battery and its connection circuit, $Ri_{max}$, Ohm, not more than | 1,0 |
| Output voltage of the integrated PS, V | 10,5-15,5V |
| Current consumption from the integrated PSU in all modes, Imin[1], mA, not less than | 0,05 |
| Long-term current consumption from the integrated PSU with the maximum loadings, Imax_a[2], A, no more than | 2.3A |
| Long-term load current of outputs "+ 24V" (each), mA, no more than | 400 |
| Self-resetting fuse on outputs "+ 24V" (for everyone), mA | 500 |
| Supply voltage through AI, V | 20 – 25 |
| Current consumption from AI, standby mode /fault mode, mA, not more, | 0,25/0,35 |
| **SCI** | |
| SCI opening voltage, V, not more than | 15,0 |
| Restoring voltage SCI, V, not less than | 4,2 |
| Current through SCI in the closed state, mA, not more than | 65 |
| SCI opening current, mA, not more than | 75 |
| Leakage current through SCI (in the open state), mA, not more than | 4,2 |
| The transient resistance of the SCI in the closed state, Ohm, not more than | 0,09 |
| **Parametric inputs IN1 – IN5** | |
| Line resistance in the state of short circuit, kOhm, not more than | 0 – 1,5 |
| Line resistance in the state of activation (low level), kOhm | 1,6 – 8,5 |
| Line resistance in the standby mode, kOhm | 8,6 – 12 |
| Line resistance in the state of activation (high level), kOhm | 12,1 - 20 |
| Line resistance in the state of open circuit, kOhm, not less than | 20,1 - ∞ |
| **Output OUT1 and OUT2** | |
| Output supply voltage OUT, V | 21,0 – 29,7 |
| Output current, mA, not more than | 800 |
| Line resistance in standby mode, kOhm | 1 – 19 |
| Line resistance in the short circuit state, kOhm | 0 – 0,9 |
| Line resistance in the state of open circuit, kOhm | 20 - ∞ |

## Appendix A
## (reference)
## Calculation of battery capacity

A.1 Battery capacity is calculated in order to ensure the operation of the device, addressable components, connected to it, and other devices of the AFAS in the absence of a primary power source. According to DSTU-N CEN/TS 54-14:2009 AFAS should work only from the battery during:

- provided that there is a connection with the FCP "Tiras PRIME A", but when the term of fault detection exceeds 24 hours – not less than 30 hours in the standby mode and additionally not less than 30 minutes in the fire alarm mode;

- if the site has spare parts, repair personnel and a backup power generator - not less than 4 hours in standby mode and additionally not less than 30 minutes in fire alarm mode.

A.2 An example of calculation battery capacity is given below. The number of components is set separately for each device. Necessary actions:

a) make a list indicating the types of components and the number of components of each type that are connected to the device according to the project (Table A.1);

b) according to the operation documents to determine the current consumption of each of the types of components in the standby mode and fire alarm mode;

Table A.1

| Component of AFAS | $I_s$, mA | $I_f$, mA | Number of components, pcs. |
|---|---|---|---|
| AM-Multi+ | 30 | 30 | 1 |
| M-LOOP | 18 | 21 | 2 |
| DETECTO SMK100 | 0,09 | 0,19 | 200 |
| DETECTO SMK110 | 0,13 | 0,2 | 16 |
| DETECTO MNL110 | 0,12 | 0,32 | 8 |
| Siren OSZ (24V) | - | 70 | 5 |
| Siren OS (12 / 24V) | - | 35 | 8 |
| $I_s$ - current consumption of the component in the "standby" mode;<br>$I_f$ - current consumption of the component in the "Fire" mode. | | | |

c) calculate the total current consumption of components of each type, and then the total current consumption in the standby mode and in the fire alarm mode:

- current consumption of components in the standby mode:

$$\mathbf{I_s = I_s\ (AM\text{-}Multi+) + I_s\ (M\text{-}LOOP) + I_s\ (SMK100) + I_s\ (SMK110) + I_s\ (MNL110);}$$

$$\mathbf{I_s = 30x1 + 18x2 + 0.09x200 + 0.13x25 + 0.12x8 = 0.069\ A.}$$

- current consumption of components in the mode of fire alarm:

$$\mathbf{I_f = I_f\ (AM\text{-}Multi+) + I_f\ (M\text{-}LOOP) + I_f\ (SMK100) + I_f\ (SMK110) + I_f\ (MNL110) + I_f\ (siren\ OSZ) + If\ (Siren\ OC);}$$

$$\mathbf{I_f = 30x1 + 18x2 + 0.09x200 + 0.13x25 + 0.12x8 + 70x5 + 35x8 = 0.725\ A.}$$

d) calculate the required capacity of all batteries for the standby mode by multiplying the received total current in the standby mode by the number of hours in the standby mode, then calculate the required capacity of all batteries for the fire alarm mode by multiplying the received total current in the fire mode by hours in the alarm mode:

- in the device uses one 12 V battery with a capacity of 7 A·h or 9 A·h. The calculations use 24 V components, so the current consumption from the battery of 12 V components should be multiplied by 2:

$$\mathbf{I_s = 0.069x2 = 0.138\ A;}$$
$$\mathbf{I_f = 0.725x2 = 1.55\ A.}$$

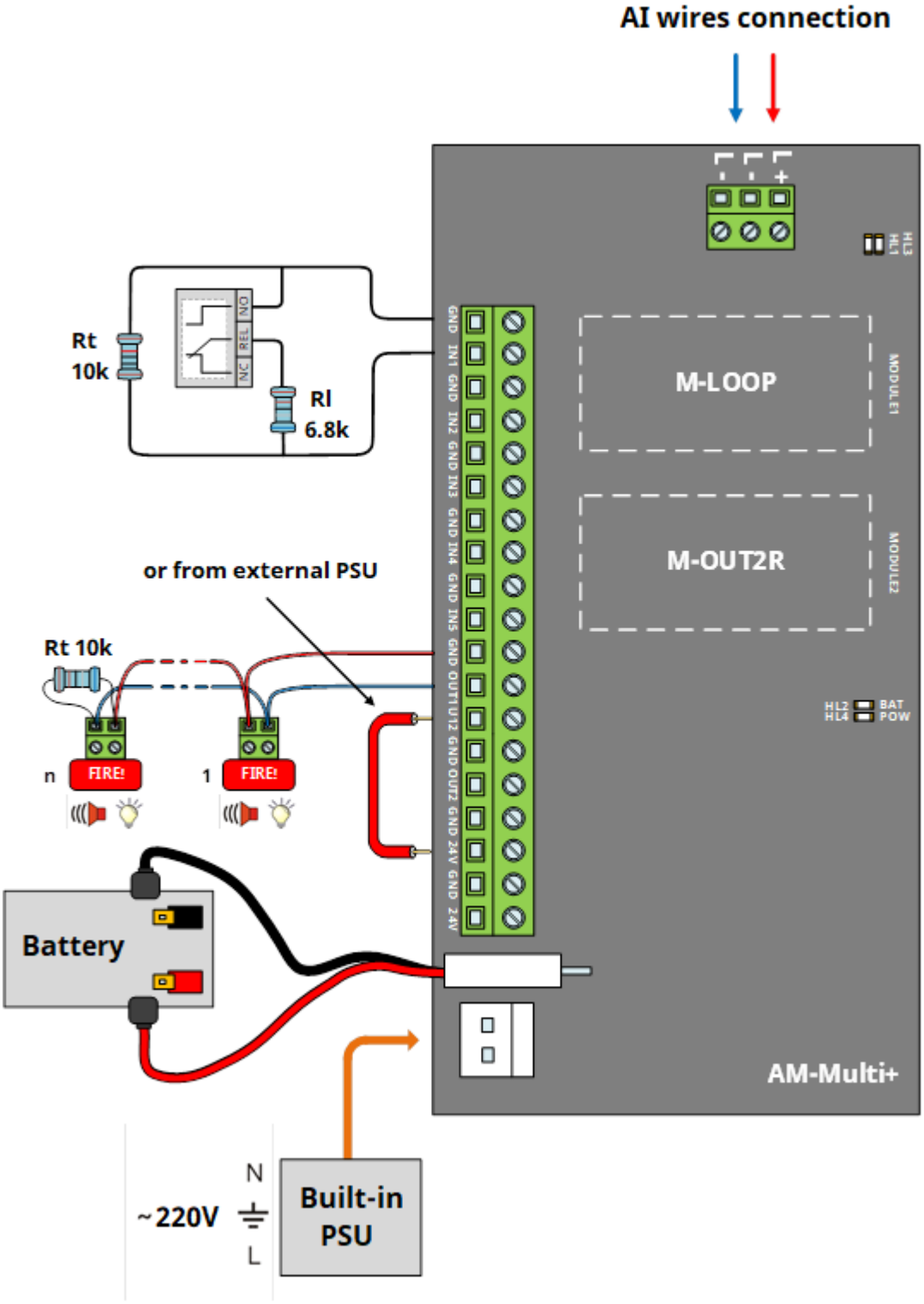
- provided that there is a connection with the FCP "Tiras PRIME A", but when the term of elimination of power failure is not more than 24 hours:

$$\mathbf{C_{battery} = (0.138\ x30, + 1.55\ x\ 0.5)\ x1.25 = 6.08\ A{\cdot}h.}$$

A stock of 25% is taken into account. In this case, a battery with a capacity of 7 A * h is enough.

A.3 When calculating the required capacity of the battery for the device, it should be borne in mind that the device is part of the AFAS, so the service life of the device from the battery should be not less than that set for the AFAS according to project requirements. If the required calculated battery capacity is greater than the capacity of the battery installed in the device enclosure, it is necessary to additionally use an external PSU(PS2415, for example).

**Appendix B**
**Scheme of electric connections**



Edited on 09.09.2022

TIRAS

**tiras.technology**

Producer:
**Tiras-12 LTD**
21021, Ukraine, Vinnytsia, 2nd Lane, Khmelnytske shosse, 8

In case you have any questions, please contact:

**Sales department:** market@tiras.ua
**Technical support:** support@tiras.ua
**Warranty and post-warranty service:** otk@tiras.ua

**Telephones (multichannel):**
+38 (067) 564-73-75
+38 (095) 282-76-90