SECURITY SENSOR

BARRIER-M500
BARRIER-M300
BARRIER-M200
BARRIER-M100
BARRIER-M50

User Manual

EU-type examination CERTIFICATE
(Radio Equipment Directive 2014/EU, Annex III)
No. 0120-CC-V0008-20

2020

Contents

The present User Manual covers Protection Linear Microwave Bistatic sensors BARRIER-M (general purpose) (referred to as the sensors for all the modifications) produced in five modifications: BARRIER-M50, BARRIER-M100, BARRIER-M200, BARRIER-M300, BARRIER-M500 differing in dimensions and maximum range of operation.

The User Manual contains information necessary for learning the sensors and their operation principle, mounting, powering the sensors and their correct exploitation.

The sensors contain the transmitter unit (referred to as Tx unit) and receiver unit (referred to as Rx unit). The principle of operation is based on generation in the space between the Tx unit and Rx unit of the electromagnetic field forming a volumetric detection zone in a shape of a stretched ellipsoid of rotation and on registration of the alteration of this field in the receiver in case of crossing the detection zone by an intruder.

The sensor triggers by breaking the contacts of the executive relay.

The sensors are to be used by the staff having learnt the present User Manual and having practical skills in exploitation of technical security devices.

Start-up works and technical maintenance of the sensors in deployment site are to be made by the staff having learnt the present User Manual.

1 Description and Operation of the sensor

1.1 Purpose of the Sensor

1.1.1 The Protection Linear Microwave Bistatic sensors BARRIER-M (general purpose) are intended for the protection of flat open sites, for generation and transmission of the alarm signal to the control panel in case of intruder crossing the protected site.

1.1.2 The sensors generate the alarm signal in the following cases:

- when the detection zone is crossed by an intruder (a man from 50 kg and from 165 cm high) with the speed from 0,1 to 10 m/s «at his full height» or «bent» with the probability not less than 0,98;
- when the remote control signal is applied to the Tx unit;
- when there is no signal from the Tx unit;
- when an external electromagnetic field affects the Rx unit with the purpose to mask it. It is allowed not to have the alarm signal when an external electromagnetic field affects the Rx unit, in this case the sensor keeps its working capacity;
- when any of the units taking part in forming the detection zone is masked by a screen;
- when an unauthorized access to the control units takes place whether power on or off;
- when the power supply voltage drops below 9 V;
- when Tx unit or Rx unit fails.

1.1.3 The sensors do not generate the alarm signal in the following cases:

- when a secondary standard target with linear dimensions up to 0,2 m is moving within the detection zone at the distance of not less than 5 m from the units;
- when transport or a group of people is moving outside the detection zone at the distance more than 1,5 m from the limit of the detection zone to the roadside where such moving is possible;
- when raining and snowing up to 40 mm/h;
- when thick fog takes place;
- when solar radiation takes place;
- when winding up to 30 m/s;
- when VHF emission in the band of 150-175 MHz up to 40 W takes place at the distance more than 6 m.

1.1.4 The sensors exploitation conditions

- operating temperature range from minus 50^0C to plus 80^0C;
- relative air humidity up to 100% at the temperature of 25^0C with condensation of moisture.

1.2 Technical Specifications

1.2.1 The configuration of the detection zone formed by the sensors installed on poles, maximum operation range of the sensors, minimum operation range of the sensors, width of the sensors detection zone, height of the sensors detection zone are given in Figure 1.1 and Tables 1.1, 1.2.

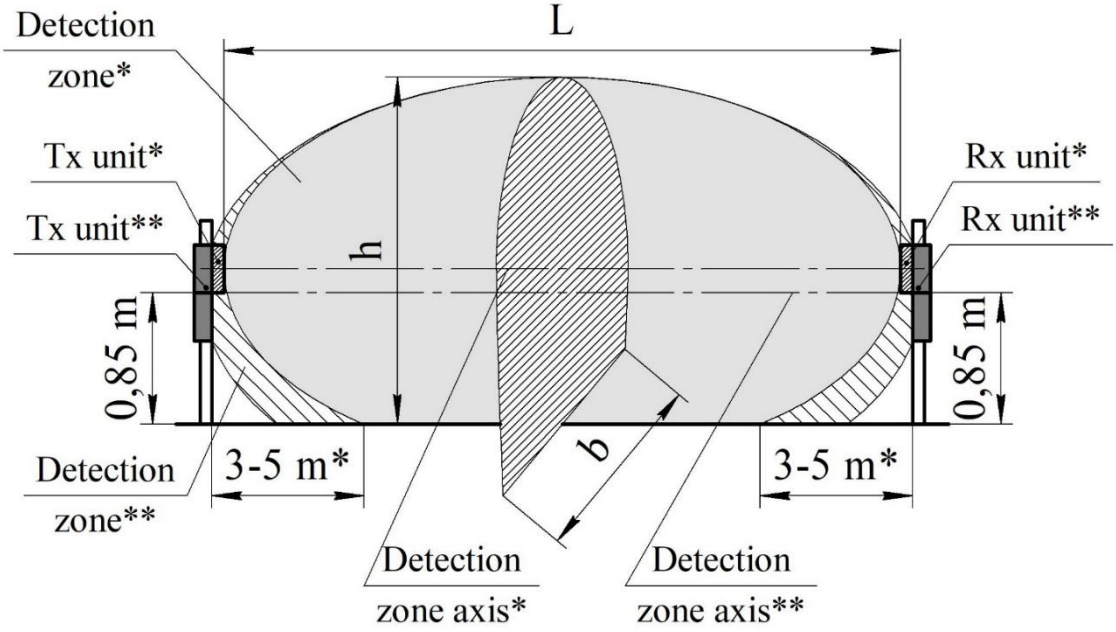


Figure 1.1 – The configuration of the detection zone formed by the sensors installed on poles

Notes

* For the sensors BARRIER-M50, BARRIER-M100, BARRIER-M200: at the distance of 3-5 m from the poles, where the sensors Tx and Rx units are installed, the probability of detecting the intruder moving «bent» is less than 0,98, because a man can pass lower the detection zone.

** For the sensors BARRIER-M300, BARRIER-M500: the probability of intruder detection by the sensors is equal on all the range of the detection zone and is 0,98, however the height of the detection zone close to the sensors Tx and Rx units is reduced.

Table 1.1 – Maximum and minimum operation range of the sensors, width of the detection zone

Names of sensors	Maximum operation range (L), m	Minimum operation range (L), m	Width of the detection zone (b), m, up to
BARRIER-M50	50	5	1,0
BARRIER-M100	100	10	1,5
BARRIER-M200	200	10	2,1
BARRIER-M300	300	10	2,7
BARRIER-M500	500	10	3,5

Table 1.2 – Height of the sensors detection zone

Names of sensors	Height of the detection zone (h), m, not less than
BARRIER-M50	1,3*
BARRIER-M100	1,5*
BARRIER-M200	1,6*
BARRIER-M300	1,8*
BARRIER-M500	1,8*
* In the middle of the sector at the maximum range	

1.2.2 The parameters of the sensors BARRIER-M (general purpose) correspond to the values given in P. 1.2.1 while meeting the requirements on installation according to Figure 1.2 and Table 1.3.

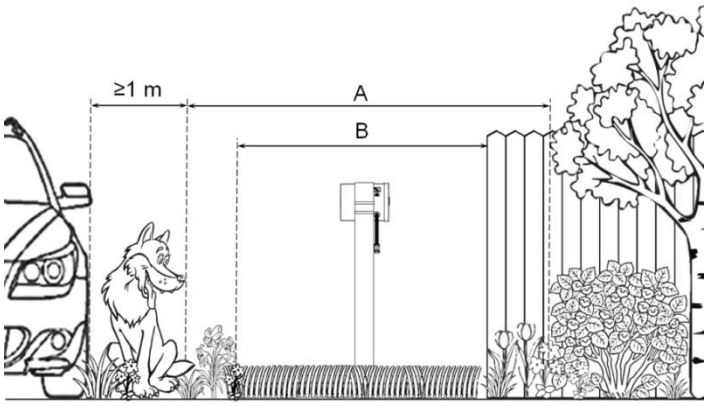


Figure 1.2 – Configuration of the protected site

Table 1.3 – Requirements to the parameters of the protected site

Length of the sector, m	10	25	50	100	200	300	500
Width of Zone A, m, not less	1,1	1,6	2,0	2,5	3,0	3,7	4,5
Width of Zone B, m, not less	0,5	0,7	1,0	1,5	2,1	2,7	3,5

Notes

1 Zone A should be free of:
- shrubs, trees, gates moving under the wind, etc.;
- moving people, animals.

2 No transport moving closer than 1 m from Zone A is allowed.

3 Provide in Zone B:
- grass up to 0,3 m high;
- snow up to 0,5 m high;
- irregularities of the ground up to ±0,3 m high;
- no foreign immobile objects and buildings (separate poles not closer than 0,5 m from the axis of the sector are allowed).

1.2.3 The shape of the detection zone generated by the sensors BARRIER-M50, BARRIER-M100, BARRIER-M200 installed on the fence, maximum operational range of the sensors, maximum width of the sensors detection zone, maximum height of the sensors detection zone are given in Figure 1.3 and Table 1.4.

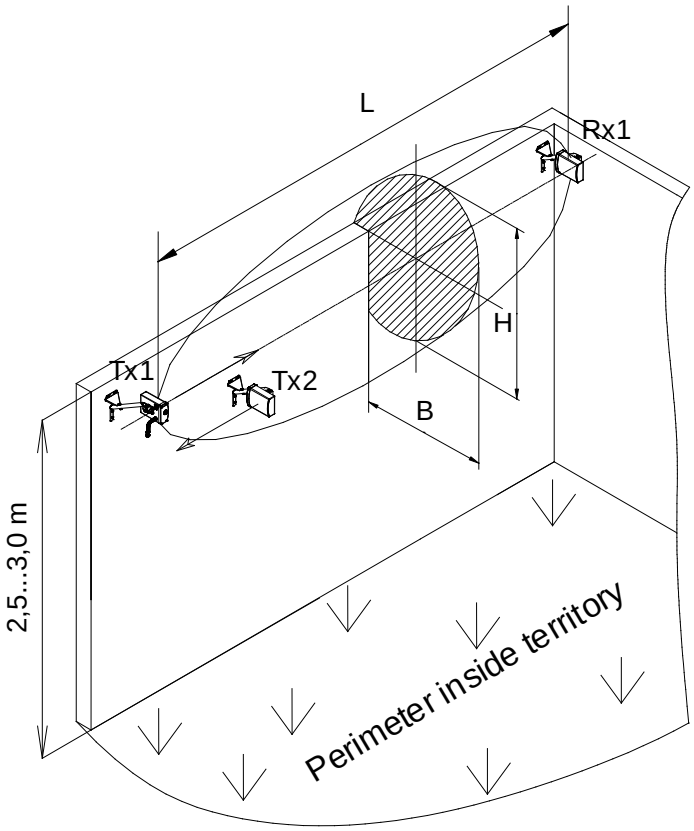


Figure 1.3 – The shape of the detection zone generated by the sensors BARRIER-M50, BARRIER-M100, BARRIER-M200 installed on the fence

Table 1.4 – Maximum operational range, maximum width of the detection zone, maximum height of the detection zone of the sensors BARRIER-M50, BARRIER-M100, BARRIER-M200 installed on the fence

Name of sensors	Maximum length of the sector (L), m	Maximum width of the DZ (B), m	Maximum height of the DZ (H), m
BARRIER-M50	40	1,0	1,0
BARRIER-M100	100	1,5	1,5
BARRIER-M200	100	1,5	1,5
Note – Maximum width (B) and maximum height (H) of the detection zone correspond to the given values in case the sensor is correctly configures according to P.2.3.8.			

1.2.4 The sensors operation frequency is 24,15 ± 0,10 GHz.
1.2.5 The sensors work by eight frequency channels (8 frequency letters).
1.2.6 The Tx and Rx units are synchronized by the radio beam.
1.2.7 The margin of the received radio signal is not less than 15 dB at the maximum operation range of the sensors.
1.2.8 The time of the sensors technical readiness after power supply is ON is up to 60 s.
1.2.9 The duration of alarm is not less than 3 s.
1.2.10 The sensors recovery time to normal state after alarm is up to 10 s.
1.2.11 The sensors are powered from a direct current source with voltage from 9 t 30 V.
1.2.12 The sensors current consumption does not exceed 45 mA in all the band of supply voltage.
1.2.13 The parameters of the executive relay: maximum commutated current up to 0,1 A, maximum voltage up to 50 V, resistance in the closed state up to 110 Ohm (together with the elements of lightning guard).
1.2.14 Load parameters of TAMPER button: current up to 0,2 A, voltage up to 80 V.
1.2.15 The sensors operation can be controlled remotely (see P. 3.3.2.1).
1.2.16 The sensors have LED indication of the state.
1.2.17 The input circuits of Tx unit and Rx unit are protected from short electric pick-up (including storm) with amplitude up to 900 V.
1.2.18 The sensors are immune to electromagnetic interference according to GOST R 50009-2000, severity level 2.
1.2.19 The sensors contain two units – transmitter unit (Tx) and receiver unit (Rx), protection level IP55 each.
1.2.20 The sensors can be configured and controlled in-field using the laptop working on Windows platform.
1.2.21 The sensors can be configured and controlled in-field using the tablet working on Android platform.
1.2.22 The sensors can be configured and controlled remotely using the computer.
1.2.23 Alarm and operation information is transmitted via the interface RS-485.
1.2.24 The Tx unit and Rx unit design assures maximum values of angles of rotation:
- on a bracket – not less than 60^0 in horizontal plane and not less than 80^0 in vertical plane;
- about a support – 360°.

1.2.25 Mean time to failure – not less than 60000 hours.
1.2.26 Full mean lifetime – not less than 8 years.
1.2.27 Weight of the sensors including fixing elements, up to:
- 2,9 kg for the sensors BARRIER-M300, BARRIER-M500;
- 1,4 kg for the sensors BARRIER-M200, BARRIER-M100, BARRIER-M50.

1.3 Contents of the Device

1.3.1 There are several modifications of the sensors depending on the maximum operation range (see Table 1.5).

Table 1.5 – Modifications of the Protection Linear Microwave Bistatic sensors BARRIER-M (general purpose)

Name
Security sensor BARRIER-M50
Security sensor BARRIER-M100
Security sensor BARRIER-M200
Security sensor BARRIER-M300
Security sensor BARRIER-M500

1.3.2 The completion of the sensors is given in Table 1.6

Table 1.6 – The completion of the Protection Linear Microwave Bistatic sensors BARRIER-M (general purpose)

Name	Q-ty	Note
1	2	3
Protection Linear Microwave Bistatic sensor BARRIER-M50		
Transmitter unit	1	
Receiver unit	1	
Mounting kit	1	see Table 1.7
Kit of instruments and accessories	1	see Table 1.8
User Manual	1	
Passport	1	
Package	1	

Continuation of Table 1.6

1	2	3
Protection Linear Microwave Bistatic sensor BARRIER-M100		
Transmitter unit	1	
Receiver unit	1	
Mounting kit	1	see Table 1.7
Kit of instruments and accessories	1	see Table 1.8
User Manual	1	
Passport	1	
Package	1	
Protection Linear Microwave Bistatic sensor BARRIER-M200		
Transmitter unit	1	
Receiver unit	1	
Mounting kit	1	see Table 1.7
Kit of instruments and accessories	1	see Table 1.8
User Manual	1	
Passport	1	
Package	1	
Protection Linear Microwave Bistatic sensor BARRIER-M300		
Transmitter unit		
Receiver unit		
Mounting kit		see Table 1.7
Kit of instruments and accessories		see Table 1.8
User Manual		
Passport		
Package		
Protection Linear Microwave Bistatic sensor BARRIER-M500		
Transmitter unit	1	
Receiver unit	1	
Mounting kit	1	see Table 1.7
Kit of instruments and accessories	1	see Table 1.8
User Manual	1	
Passport	1	
Package	1	

1.3.3 The contents of the mounting kit is given in Table 1.7.

Table 1.7 – The contents of the MK

Name	Q-ty	Note
1	2	3
1 Mounting kit containing of:		
1.1 Input of the corrugated hose	2	
1.2 Corrugated tube PA601013F0	2	L=0,75 m
1.3 Buckle 70-90	4	
2 Mounting kit containing of:		
2.1 Bracket	2	
2.2 Washer	2	
2.3 Bolt DIN 933-M8x20-A2-70	2	
2.4 Washer DIN 9021-8-140 HV-A2	2	
2.5 Washer DIN 127-B 8-A2-70	2	
2.6 Input of the corrugated hose	2	
2.7 Corrugated tube PA601013F0	2	L=0,75 m
2.8 Buckle 70-90	4	

1.3.4 The contents of the kit of instruments and accessories is given in Table 1.8.

Table 1.8 – The contents of the KIA

Name	Q-ty	Note
1	2	3
1 Kit of instruments and accessories containing of:		
1.1 Cable USB A-B	1	
2 Kit of instruments and accessories containing of:		
2.1 Cable USB A-B	1	
2.2 Spanner	1	S=4 mm

The purpose and the way of installation of additional products are given in the present User Manual and exploitation documentation.

1.4 Structure and Operation

1.4.1 The sensors contain two units – transmitter unit (Tx unit) and receiver unit (Rx unit).

1.4.2 Structure of the sensors BARRIER-M50, BARRIER-M100, BARRIER-M200.

1.4.2.1 The Tx unit (overall dimensions 195,5x154,5x100 mm) (see Figure 1.4) contains a plastic housing with a microwave module and a modulator with configuration

elements. The housing contains a parabolic insertion. The housing is closed with a cover. On the bottom face of the housing there are two holes preventing the condensate inside the Tx unit. On the cover there is a sight bar to make it easy to adjust the sensor. The configuration elements are covered with a cap. The cap is protected against unauthorized opening with a button. On the back face of the housing there is a bracket for pole mounting of the unit. Use the 5-core cable brought out from the unit through the input of the corrugated hose to connect the Tx unit to the junction box or power supply unit.

1.4.2.2 The Rx unit (overall dimensions 195,5x154,5x100 mm) (see Figure 1.4) contains a plastic housing with a microwave module and processing board with configuration elements. The housing contains a parabolic insertion. The housing is closed with a cover. On the bottom face of the housing there are two holes preventing the condensate inside the Rx unit. On the cover there is a sight bar to make it easy to adjust the sensor. The configuration elements are covered with a cap. The cap is protected against unauthorized opening with a button. On the back face of the housing there is a bracket for pole mounting of the unit. Use the 8-core cable brought out from the unit through the input of the corrugated hose to connect the Tx unit to the junction box or power supply unit.

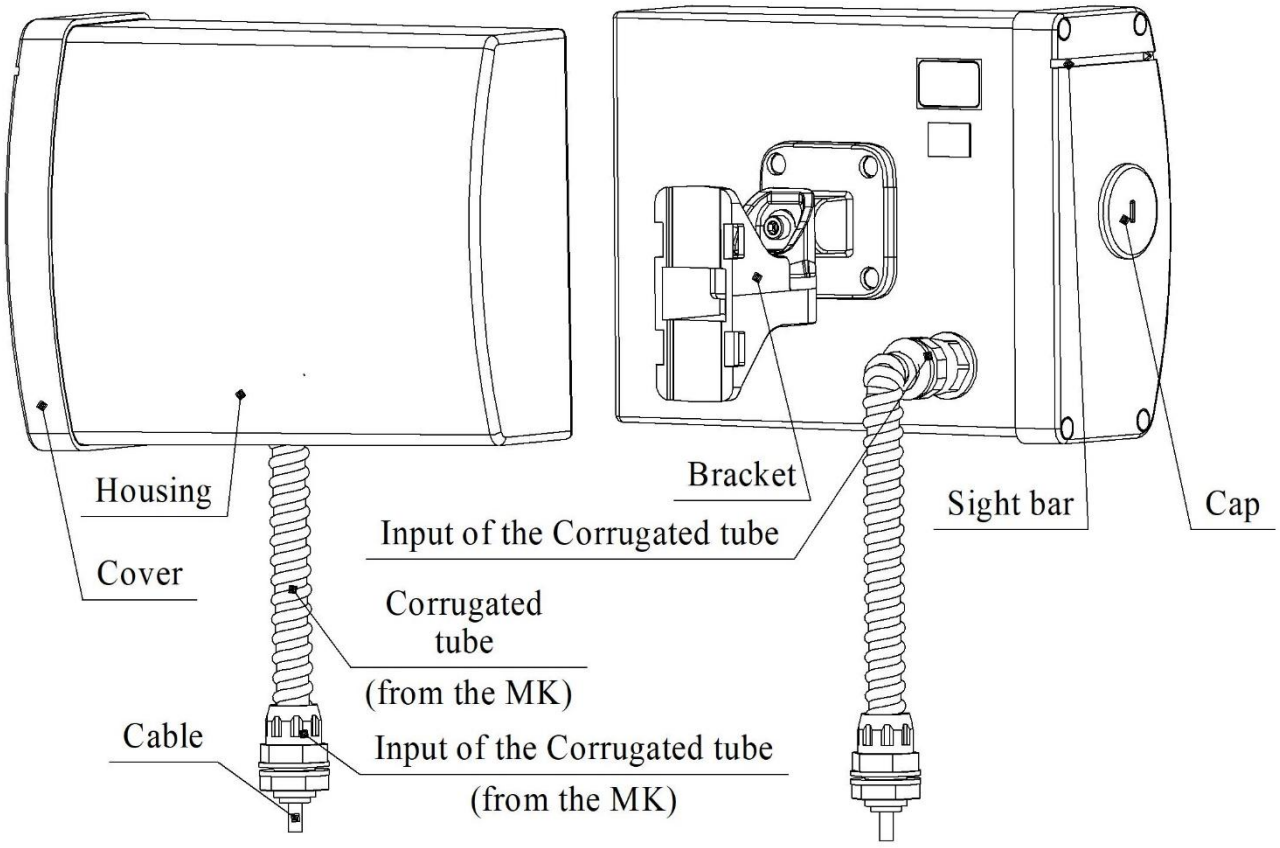


Figure 1.4 – The design of the Tx unit (Rx unit) of the sensors BARRIER-M50, BARRIER-M100, BARRIER-M200

Note – The appearance of the input of the corrugated hose and input of the corrugated tube may differ depending on the shipment conditions

1.4.3 Structure of the sensors BARRIER-M300, BARRIER-M500

1.4.3.1 The Tx unit (overall dimensions 395x182x100 mm) (see Figure 1.5) contains two connected with each other plastic housings, with microwave modules and parabolic insertions inside. The upper housing contains the modulator with configuration elements. The housings are covered with covers. The lower cover contains three holes, preventing the condensate inside the Tx unit. On the upper cover there is a sight bar to make it easy to adjust the sensor. The configuration elements are covered with a cap. The cap is protected against unauthorized opening with a button. The unit contains a bracket for pole mounting. Use the 5-core cable brought out from the unit through the input of the corrugated hose to connect the Tx unit to the junction box or power supply unit.

1.4.3.2 The Rx unit (overall dimensions 395x182x100 mm) (see Figure 1.5) contains two connected with each other plastic housings, with microwave modules and parabolic insertions inside. The upper housing contains the processing board with configuration elements. The housings are covered with covers. The lower cover contains three holes, preventing the condensate inside the Rx unit. On the upper cover there is a

sight bar to make it easy to adjust the sensor. The configuration elements are covered with a cap. The cap is protected against unauthorized opening with a button. The unit contains a bracket for pole mounting. Use the 8-core cable brought out from the unit through the input of the corrugated hose to connect the Rx unit to the junction box or power supply unit.

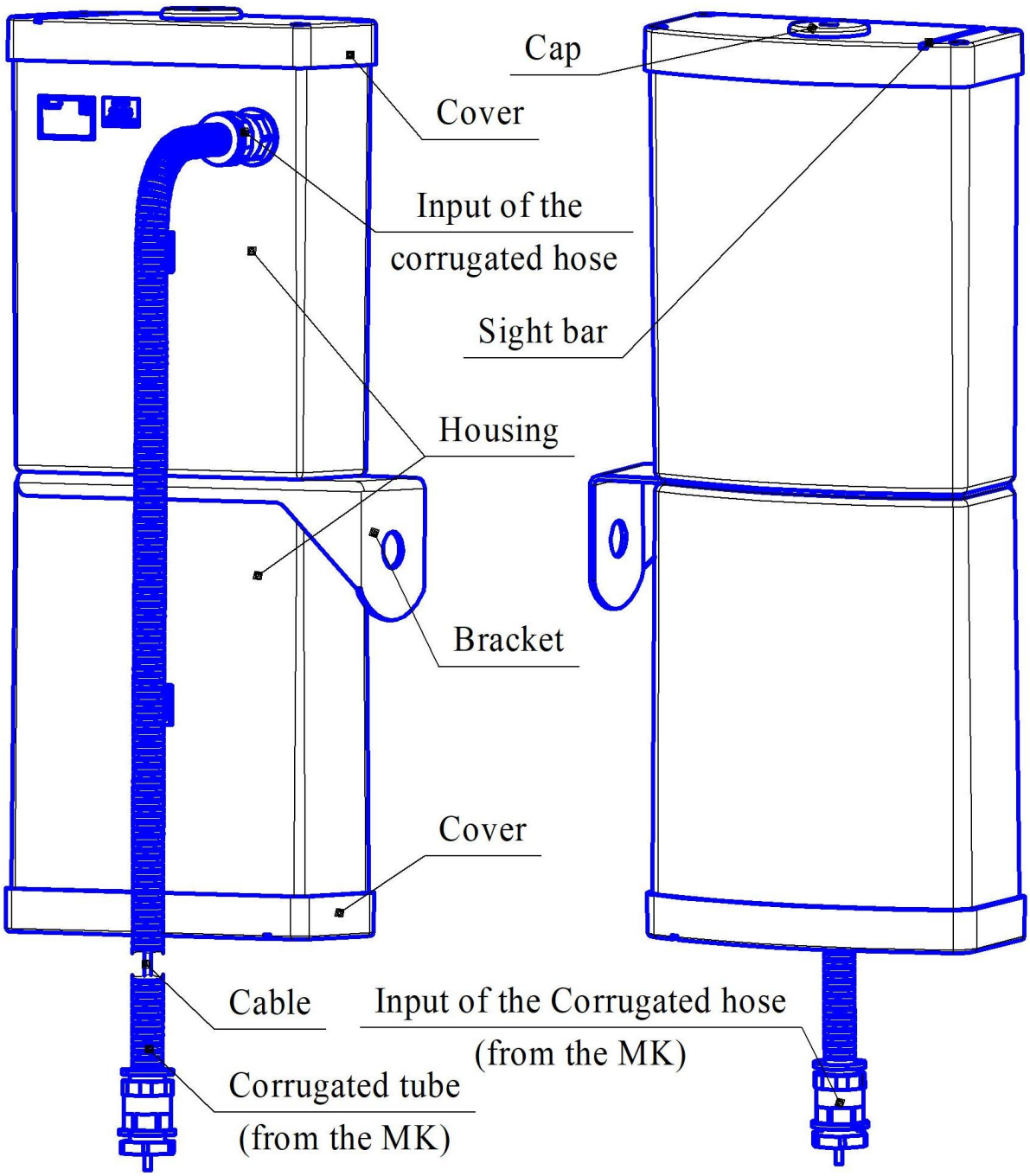
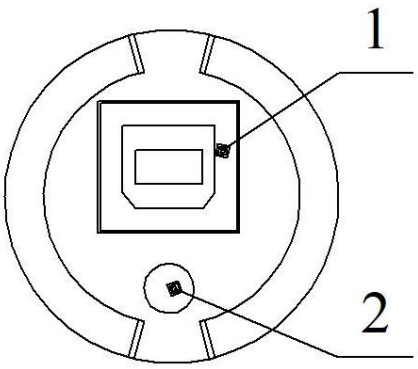


Figure 1.5 – The design of the Tx unit (Rx unit) of the sensors BARRIER-M300, BARRIER-M500

Note – The appearance of the input of the corrugated hose and input of the corrugated tube may differ depending on the shipment conditions.

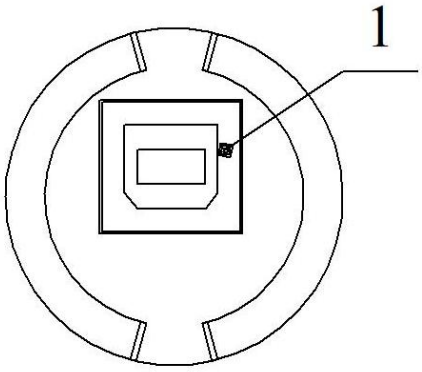
1.4.4 Configuration elements of the sensors BARRIER-M (general purpose)

1.4.4.1 The location of the configuration elements under the cap of the Tx unit (Rx unit) are given in Figures 1.6, 1,7.



1 – socket «TEST»;
2 – indicator of the sensors state.

Figure 1.6 – Configuration elements of the Rx unit of the sensors BARRIER-M (general purpose)



1 – socket «TEST».

Figure 1.7 – Configuration elements of the Tx unit of the sensors BARRIER-M (general purpose)

1.4.5 The principle of operation of the sensors

1.4.5.1 The principle of operation of the sensors is based on making in the space between the Tx unit and Rx unit the electromagnetic field generating a volumetric detection zone in a shape of a stretched ellipsoid of rotation and on registering the alteration of this field in the Rx unit in case of crossing the detection zone by an intruder.

1.4.5.2 The intrusion of a man into the detection zone generates the alteration of the signal amplitude on the input of the Rx unit. The signal coming to the input goes through the amplifier and on its output the signal is compared with the threshold values according to the target algorithm, with that the useful signal is separated from the noise. In case the analysis results show that the signal alteration on the input of the Rx unit is caused by the intruder’s crossing, the Rx unit generates the alarm signal.

1.4.5.3 The reception and indication of alarm signals is made by security systems (panels) controlling the relay contacts. In case of alarm the normally closed relay contacts are broken.

1.4.5.4 The alarm information is duplicated via the interface RS-485.

1.4.6 Operation of the sensors

1.4.6.1 After the sensor is powered, it makes self-performance test during up to 60 s. In case self-performance test is successful the sensors goes to stand-by mode. When triggering the sensor generates the alarm signal not less than 3 s long. After that the sensor goes to normal state in up to 10 s.

1.5 Measuring Devices, Instruments and Accessories

1.5.1 In order to provide adjustment and configuration of the sensors during exploitation use the following devices:

- laptop on Windows with the cable USB A-B (not included into the delivery kit);
- tablet on Android with the cables USB A-B (not included into the delivery kit) and OTG (not included into the delivery kit);
- remote PC connected to the sensor via the interface RS-485 using the interface converter.

1.6 Marking

1.6.1 The sensors marking contains:
- trademark of the factory manufacturer;
- name of the sensor unit;
- factory serial number;
- year and quarter of manufacture.

1.6.2 The transport and consumer package marking contains:
- name of the sensor;
- name of the factory manufacturer, its trademark;
- postal address, telephone (fax) number, e-mail and official Website in Internet of the factory manufacturer;
- conformity marks;
- packing date;
- handling symbols and transportation conditions symbols.

1.7 Package

1.7.1 The sensors are packed into the transport and consumer package, assuring the safety of the products packed during transportation and storage according to the manufacturer documentation.

2 Intended Use

2.1 Operating Limitations

2.1.1 The sensors are to be used in conditions according to p. 1.1.4. of the present User Manual only.

2.1.2 The shape and parameters of the sector where the sensors will be installed and its requirements are to meet the requirements given in P. 1.2.2.

2.1.3 Maximum inclination of the sector is 40º.

2.1.4 The alteration of the signal depends on the height and weight of the person, his speed of crossing, place of crossing the sector and landscape shape.

2.1.5 The signal on the input of Rx unit can be changed under the influence of interference factors, for example: precipitations, vegetation, small animals, electromagnetic noise, moving of tree branches, doors fallen into the detection zone comparable in amplitude with the intrusion of a man.

2.1.6 The following factors can influence the level of the input signal of Rx unit: location of long buildings or objects (fence, walls, etc.) within or in the immediate proximity of the detection zone, landscape irregularities, snow or vegetation on the site. In this case the shape of the detection zone is deformed due to rereflection and interference.

2.1.7 On sites with extra storm danger it is necessary to use external lightning guard units (LGU). It is recommended to use lightning guard units in case the connection lines is more than 300 m.

2.2 Preparation for Use

2.2.1 Safety Measures

2.2.1.1 Mounting, start-up works, service of the products can be made by persons comprehensively studied the present User Manual.
2.2.1.2 Follow the safety standards of work with hardware under operating voltage up to 1000 V during technical service of the product.
2.2.1.3 IT IS PROHIBITED TO MOUNT AND START-UP THE PRODUCT DURING STORM DUE TO RISK OF ELECTRIC SHOCK DURING STORM DISCHARGE FROM PICK-UP IN COMMUNICATION LINE.
2.2.1.4 Power off the sensors to lay and cut the cables and to connect them to sensors units.
2.2.1.5 The sensors units are powered from direct current source with voltage 5 … 30 V or from the alternative current mains with voltage 220 V. That is why it is necessary to study the exploitation documentation on the power supply unit before starting works.
2.2.1.6 Installation, maintenance and repair of sensors can be made by persons got through special instructions and passed exams on safety standards.

2.2.2 Unpacking and examining of the product

2.2.2.1 Examine carefully the package and make sure that it is not damaged before opening. Check the presence of Quality Department stamp on the package before opening.
2.2.2.2 Open the package inside the building or under the roof. Avoid ingestion of precipitations and aggressive environment on the sensors during opening.
2.2.2.3 Check the sensor completion.
2.2.2.4 Check the presence of Quality Department stamp in the sensor passport.
2.2.2.5 No mechanical damage like deep scratches, defects are allowed on the sensor surface.

2.3 Installation and Configuration of the Sensors

2.3.1 General Guide

2.3.1.1 Locate the sensors on the exploitation site according to the requirements of the present User Manual and project recommendations on the security system.
2.3.1.2 Technologic sequence of mounting procedures is determined on the basis of operational comfort.
2.3.1.3 The sensors installation should assure comfortable feed through of cables and free access to them during mounting, exploitation, service.

2.3.1.4 Do electrical fitting of the sensors, connection to junction boxes and power supply unit according to the security system project.

2.3.2 Installation procedure of the sensors BARRIER-M (general purpose).

2.3.2.1 Meet the requirements of P. 2.1.2.

2.3.2.2 Mark the perimeter for the placed of installation of poles.

2.3.2.2.1 Overlap the detection zones of the adjacent sectors (see Figure 2.1) for continuous long protection boundary. Overlapping is necessary to avoid crossing the detection zone under or above Tx unit (Rx unit) close to the pole.

It is not allowed to co-install Tx unit and Rx unit of the adjacent sectors. Correct installation of the units of the adjacent sectors is – Tx unit with Tx unit, Rx unit with Rx unit.

Install sensors with different frequency letters on adjacent sectors. Repeat sequentially the frequency letter from 1 to 8 when installing the sensors on the sectors following in succession assuring maximum distance between the sensors with the same frequency letters.

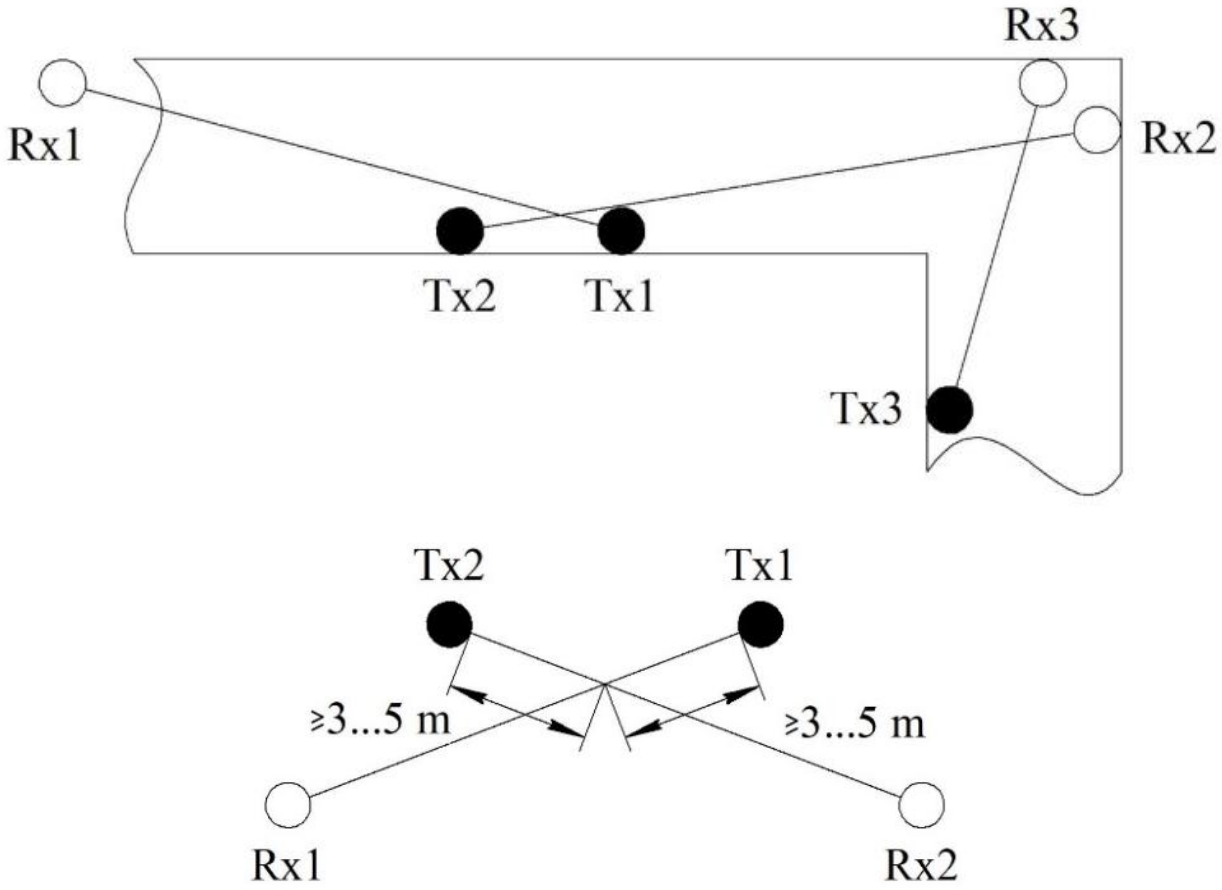


Figure 2.1 – Example of perimeter marking for sensors installation

2.3.2.2.2 For continuous long protection boundary with the sensors BARRIER-M300, BARRIER-M500 it is allowed to install two Tx units (Rx units) on one pole without overlapping the detection zones of adjacent sectors (see Figure 2.2).

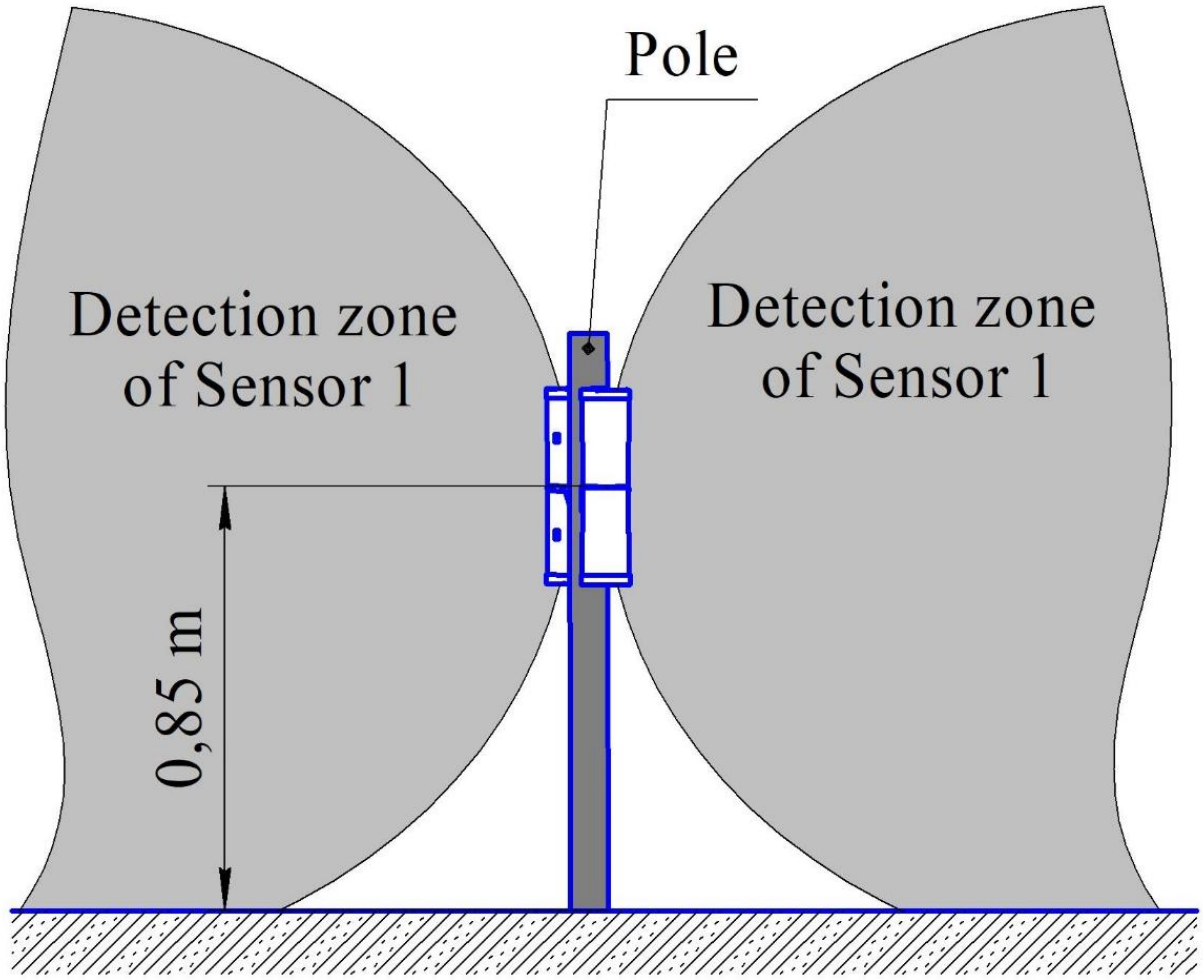


Figure 2.2 – Installation of Rx units (Tx units) of the sensors BARRIER-M300, BARRIER-M500 on one pole without overlapping the adjacent detection zones

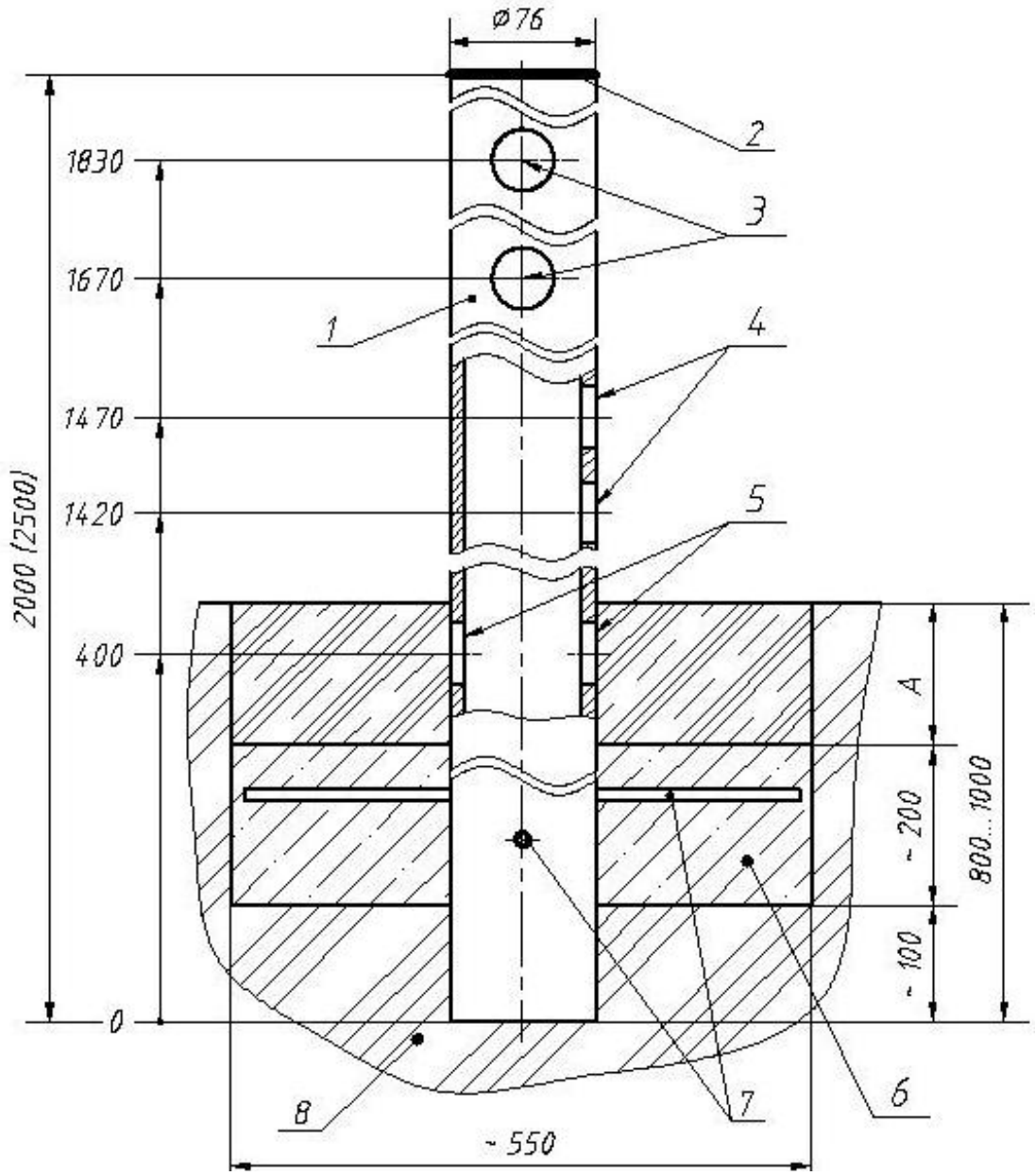
Note – With this method of installation of the sensor units (standard height of installation of the units is 0,85m from the earth surface) the detection probability of an intruder crossing the detection zone «at his full height» or «bent» (height of a bent person is 0,9-1,0 m), is equal on all the range of the detection zone and is 0,98, however the height of the detection zone close to the sensor units reduces.
If the reducing of the height of the detection zone close to the sensor units is critical, follow the procedure in P. 2.3.2.2.1.

2.3.2.3 Install the poles. It is recommended to use metal tubes 70 … 90 mm in diameter for poles. Assure the height of the pole not less than 1100 mm above the ground. In

regions with much snow assure the height of the pole not less than 1500 mm above the ground.

2.3.2.4 It is possible to install the poles SUPPORT-2 and SUPPORT-2,5 with concreting. The poles are made of metal tube 76 mm in diameter and differ in length (2 m and 2,5 m accordingly). The design of the poles previews dowel bars for fixing in concrete and holes to insert the cable.

2.3.2.5 Assure the height of the pole not less than 1100 mm above the ground.
The example of installation of the pole SUPPORT-2 (SUPPORT-2,5) is given in Figure 2.3.



1 - SUPPORT-2 or SUPPORT-2,5;
2 - plastic cap;
3 - holes for inserting the sensor cable inside the pole;
4 - holes for inserting the mains cable and sensor cable;
5 - holes for inserting the mains cable;
6 - concrete (gravel);
7 - dowel bars preventing unauthorized dismantling of the pole;
8 - ground.

Figure 2.3 – The example of installation of the pole SUPPORT-2 (SUPPORT-2,5)

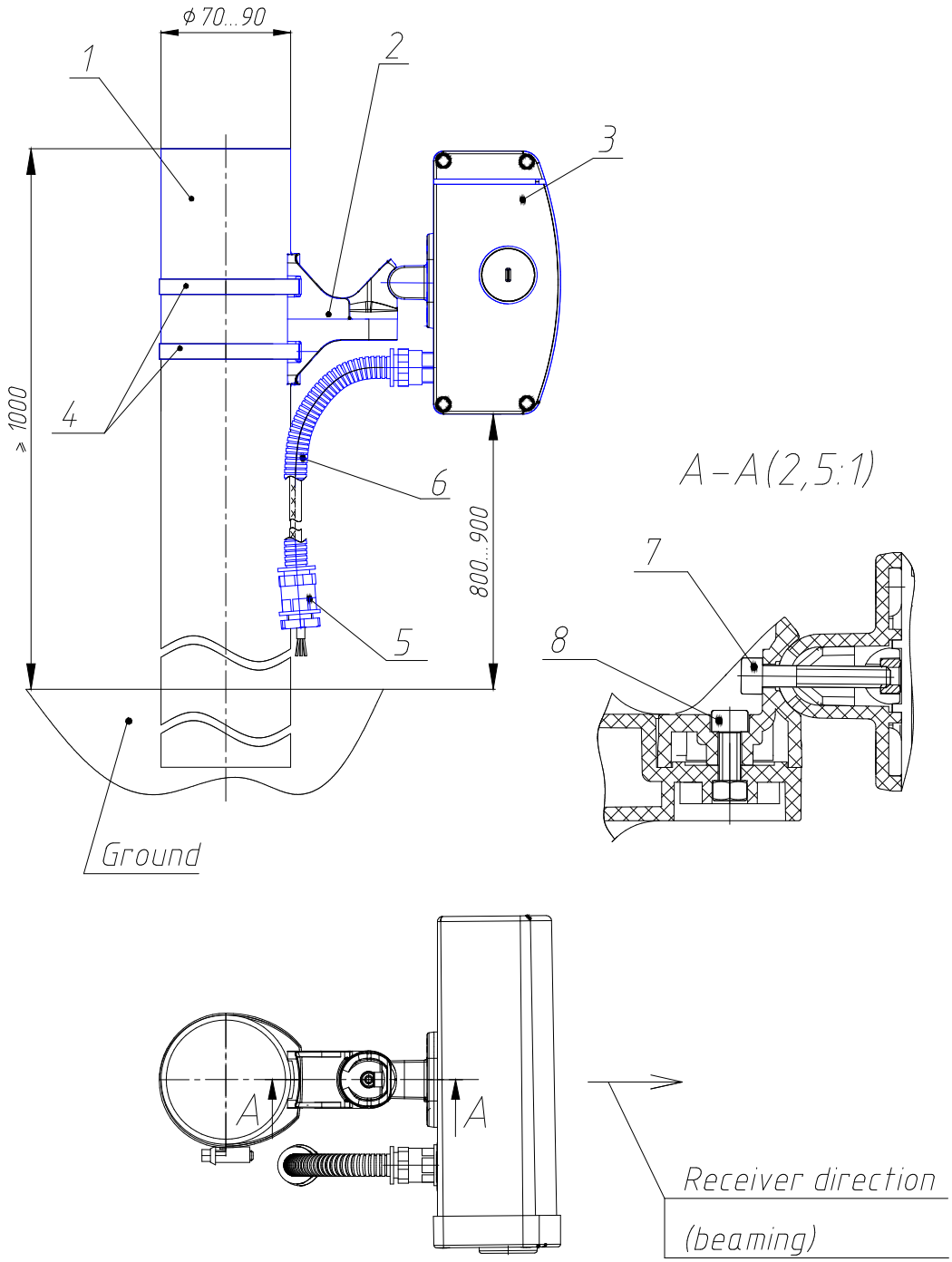
2.3.2.6 Lay the mains cables according to the security system project.
It is recommended to use cables with screen or metal cover.
Choose the cables cross-section to assure the supply voltage not less than 9 V on every sensor unit.
It is not recommended to lay mains cables close to the source of strong electromagnetic noise (power cables, antenna systems, etc.) and use free cable cores to retranslate pulse signals.

2.3.2.7 In case the security system project previews the use of junction boxes JB and power supply units PSU-U-24-0,7, it is necessary to install them on the pole together with the sensor units from inner part of the protected perimeter using the buckles from the delivery kit. In order to insert the cable of Tx unit (Rx unit) protected by the corrugated tube inside the junction box, dismantle one of the cable glands PG9 of the junction box (power supply unit) and install the plug (from the MK) with the corrugated tube inside the hole.
It is recommended to use one power supply unit PSU-U-24-0,7 for the power supply of two adjacent sensors. Taking into account the fact that the power supply unit PSU-U-24-0,7 has five free contact terminal blocks, it is allowed not to use the junction box on the pole where the power supply unit is installed.

2.3.3 Mounting of the sensors BARRIER-M50, BARRIER-M100, BARRIER-M200 on a pole

2.3.3.1 Use two Buckles pos. 4 (from the MK) to install the Tx unit (Rx unit) with Bracket pos. 2 on Pole pos. 1 (see Figure 2.4). Use buckles 12 mm wide (not included into the MK) to fix the sensor on a pole of bigger diameter.
The height of installation of Tx Unit (Rx unit) in absence of snow cover should meet the value given in Figure 2.4.
ATTENTION! CORRECT ORIENTATION OF TX UNIT (RX UNIT) ON THE BRACKET – DRAIN HOLES DOWN!

2.3.3.2 Insert the cable of Tx unit (Rx unit) inside the corrugated tube pos. 6 (from the MK). Install the input of the corrugated hose pos. 5 (from the MK) on the corrugated tube.
IMPORTANT! THE CORRUGATED TUBE IS DEFINITELY TO BE INSTALLED.



1 – pole;
2 – bracket;
3 – Tx unit (Rx unit);
4 – buckle – 2 pcs.;
5 – input of the corrugated hose – 1 pc.
6 – corrugated tube – 1 pc.;
7 – screw (from the Bracket kit);
8 – screw (from the Bracket kit).

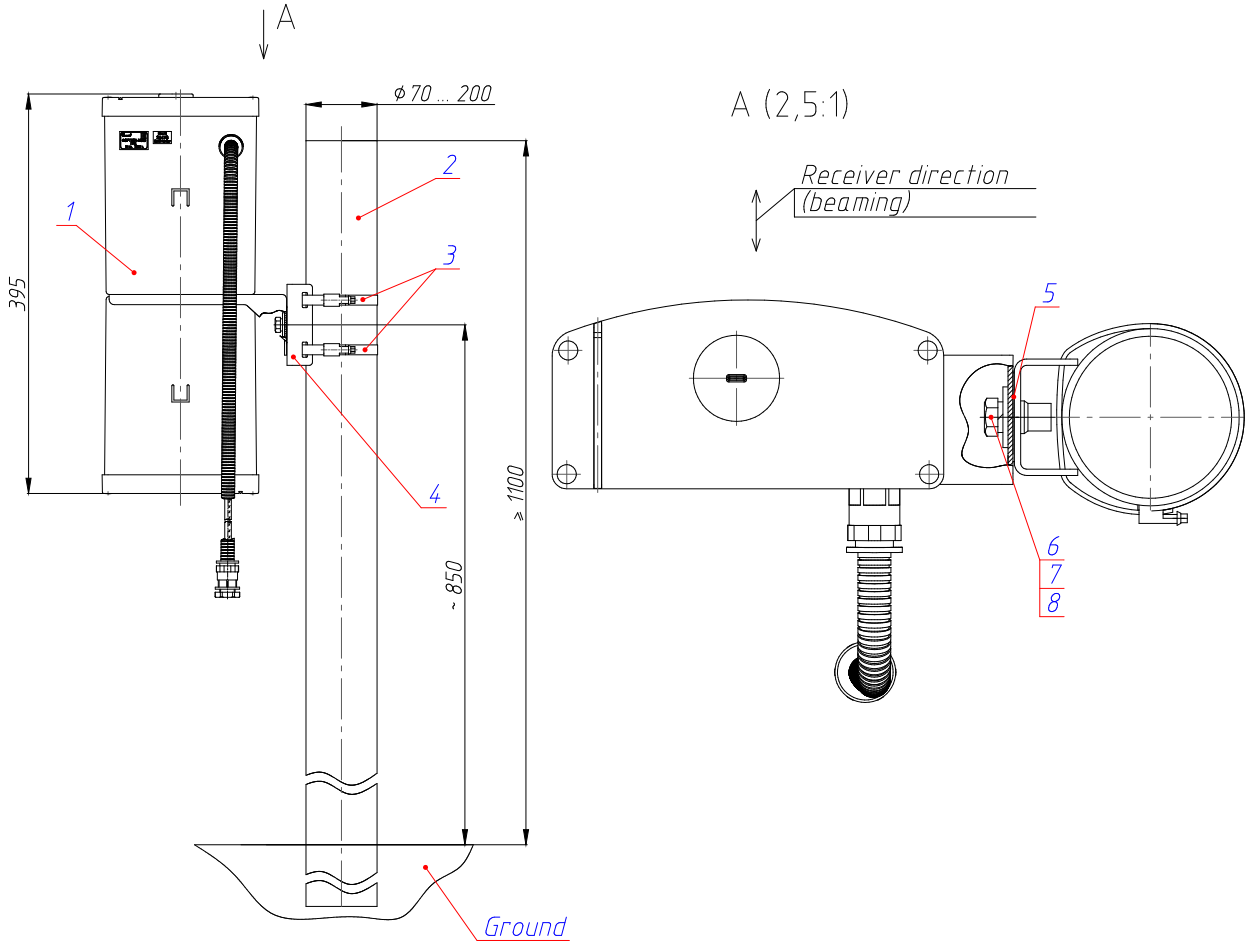
Figure 2.4 – Installation of the Tx unit (Rx unit) of the sensors BARRIER-M50, BARRIER-M100, BARRIER-M200 on a pole

Note – Dimensions in mm.

2.3.4 Mounting of the sensors BARRIER-M300, BARRIER-M500 on a pole

2.3.4.1 Use two buckles pos. 3 (from the MK) to install the bracket pos.4 (from the MK) on the pole pos.2, as shown in Figure 2.5. Fix the bracket on the pole. It is allowed to remove long free ends of buckles.

2.3.4.2 Install the plastic washer pos.5 (from the MK) between the bracket pos.4 and the unit bracket using the bolt pos.6, washers pos.7 and pos.8 (from the MK), fix the Tx unit (Rx unit) on the bracket pos.4.



1 – Tx unit (Rx unit);
2 – pole;
3 – buckle – 2 pcs.;
4 – bracket;
5 – plastic washer;
6 – bolt M8;
7 – washer 8;
8 – spring washer 8

Figure 2.5 – Installation of the Tx unit (Rx unit) of the sensors BARRIER-M300, BARRIER-M500 on a pole

Note – Dimensions in mm.

2.3.5 Installation of the sensors BARRIER-M (general purpose) on BRACKET-1000, BRACKET-1250.

2.3.5.1 If it is impossible to install the poles and there is a rigid fence, we recommend using BRACKET-1000, BRACKET-1250 to mount the sensors BARRIER-M (general purpose). BRACKET-1000, BRACKET-1250 is intended for fence or wall installation of sensors and junction boxes.

2.3.5.2 Look through BRACKET-1000, BRACKET-1250 exploitation documentation for detailed information on fence mounting.

2.3.5.3 Mount the sensors on BRACKET-1000, BRACKET-1250 according to P. 2.3.3.

2.3.5.4 The example of installation of bistatic sensors using BRACKET-1000, BRACKET-1250 with overlapping the detection zones to avoid dead zones is given in Figure 2.6. In case of overlapping the detection zones, the bracket of the adjacent sector is located within the detection zone of the sensor. The bracket of the adjacent sector reduces the signal a little, so it is required to reduce the length of the sensor detection zone (L) for 1/3 respectively to the parameters given in Table 1.1.

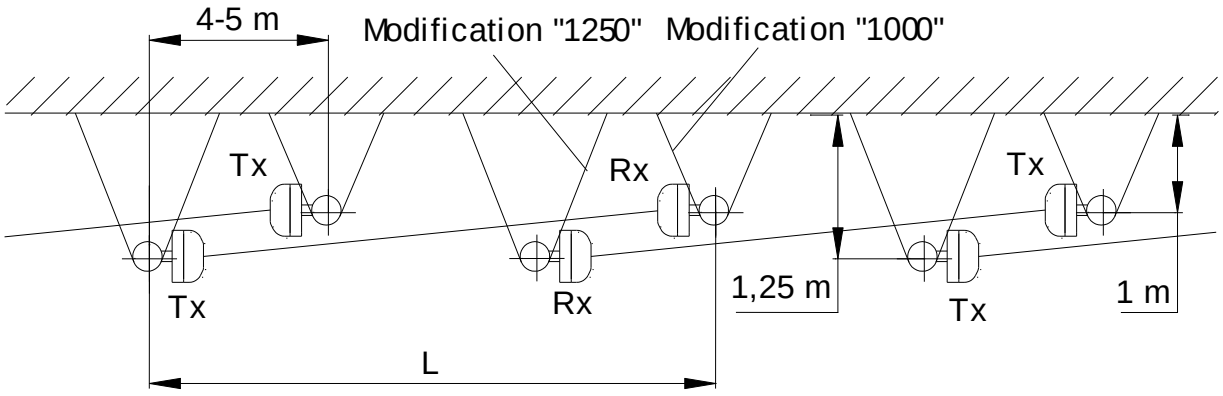


Figure 2.6 – Example of installation of the sensors BARRIER-M (general purpose) on BRACKET-1000, BRACKET-1250 with overlapping the detection zones

2.3.6 Procedure of installation of the sensors BARRIER-M50, BARRIER-M100, BARRIER-M200 on the protected surface.

2.3.6.1 When you use the sensors BARRIER-M50, BARRIER-M100, BARRIER-M200 to protect the fence from climbing over or to protect from intrusion through windows, use the outboard brackets BRACKET-500M, BRACKET-350M to mount the sensors on the protected surface, the brackets' carry-over from the fence to the sensors center is 500, 350 mm accordingly:

– use BRACKET-500M if the top of the fence is «blocked» with physical protection means (armor-clad rolled razor wire, armor-clad barbed wire, etc.);
– use BRACKET-350M if there are no physical protection means by the top of the fence.

Use BRACKET-120M with the carry-over 120 mm from the fence to the sensor center if the direction of beaming of the unit is perpendicular to the bearing surface or within the angle limits (90° ± 40°).

ATTENTION! IF YOU USE THE SENSORS TO PROTECT THE FENCE FROM CLIMBING OVER, IT IS NECESSARY TO INSTALL THE SENSORS ON BRACKET-350M OR BRACKET-500M BY THE TOP OF THE FENCE.

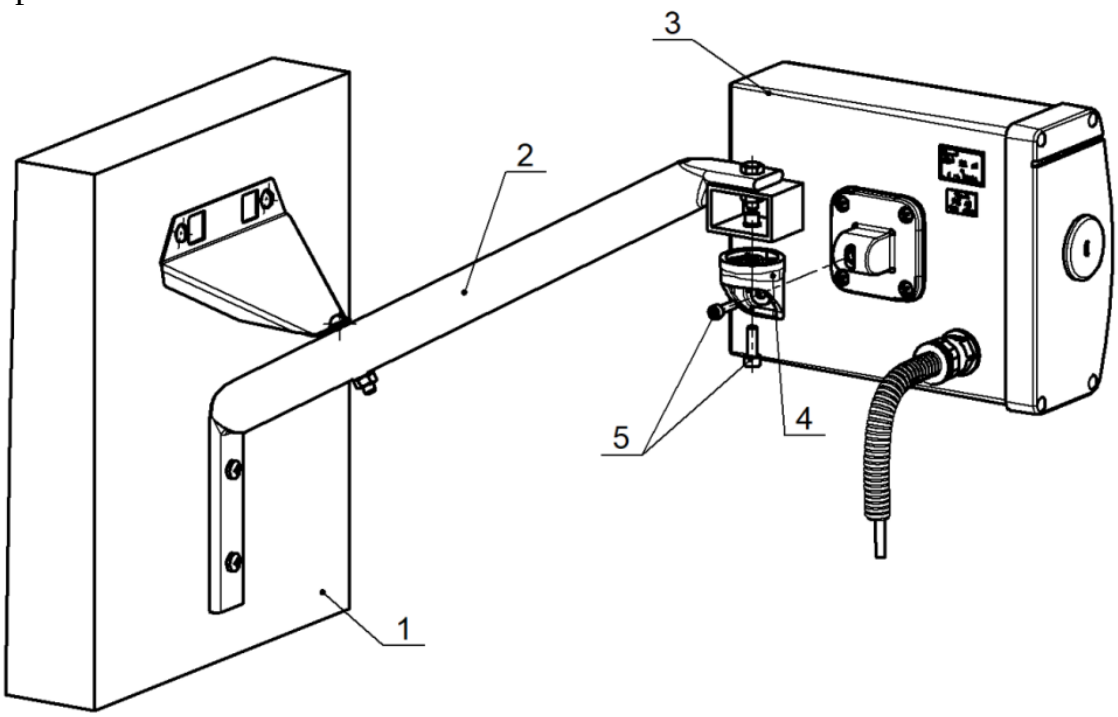
2.3.6.2 Mounting procedure of the sensors BARRIER-M50, BARRIER-M100, BARRIER-M200 on BRACKET-350M or BRACKET-500M (Figure 2.7).

2.3.6.2.1 Install BRACKET-350M (BRACKET-500M) on the protected surface according to its exploitation documentation.

2.3.6.2.2 Use the spanner from the KIA to disassemble the bracket of the Rx unit (Tx unit), unscrewing the two screws pos.5.

2.3.6.2.3 Turn the profile pos.4 on 180º relative to starting position and screw it to the Rx unit (Tx unit) using the screw pos.5.

2.3.6.2.4 Fix the Rx unit (Tx unit) on «BRACKET-350M» («BRACKET-500M») using the screw pos.5.



1 – fence;
2 – BRACKET-350M (BRACKET-500M) – 1 pc.;
3 – Rx unit (Tx unit) – 1 pc.;
4 – profile (from the kit of Rx unit (Tx));
5 – screw (from the kit of Rx unit (Tx)) – 2 pcs.

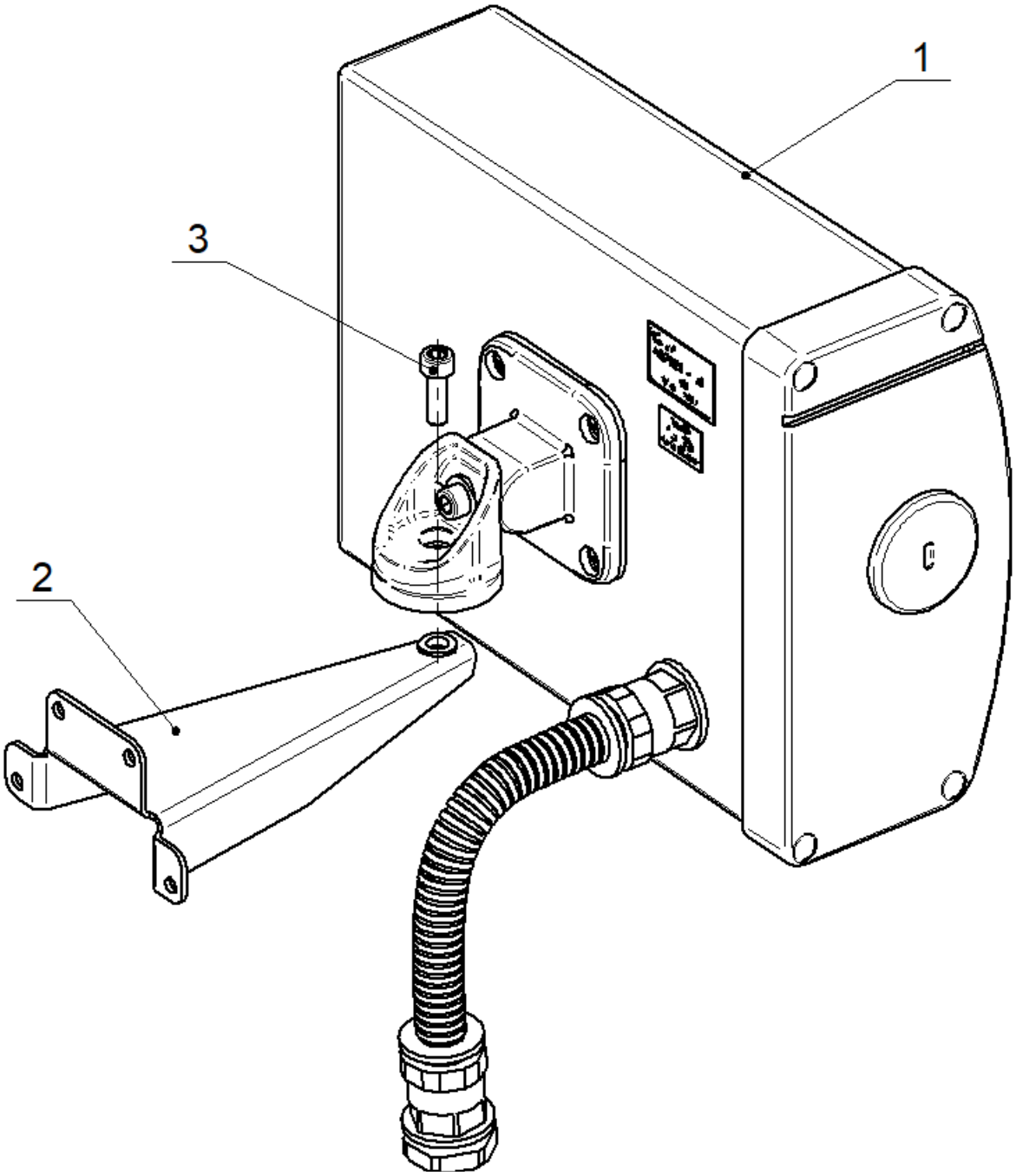
Figure 2.7 – Installation of the Rx unit (Tx unit) on BRACKET-350M (BRACKET-500M)

2.3.6.3 Mounting procedure of the sensors on BRACKET-120M (Figure 2.8).

2.3.6.3.1 Install BRACKET-120M on the protected surface according to its exploitation documentation.

2.3.6.3.2 Use the spanner from the KIA to dismantle the component for pole fixing unscrewing the screw pos.3 from the Rx unit (Tx unit) bracket.

2.3.6.3.3 Fix the Rx unit (Tx unit) on BRACKET-120M using the screw pos.3.



1 –Rx unit (Tx unit); 2 – BRACKET-120M; 3 – screw M5

Figure 2.8 – Installation of the Rx unit (Tx unit) on BRACKET-120M

2.3.6.4 The examples of installation of the sensors using the outboard brackets BRACKET-500M, BRACKET-350M, BRACKET-120M are given in Figure 2.9.

2.3.6.5 Angles of turn of the Tx unit (Rx unit) on the outboard brackets:

- in horizontal plane – 180°;
- in vertical plane: upwards – on the angle of 17°, downwards – on the angle of 45°.

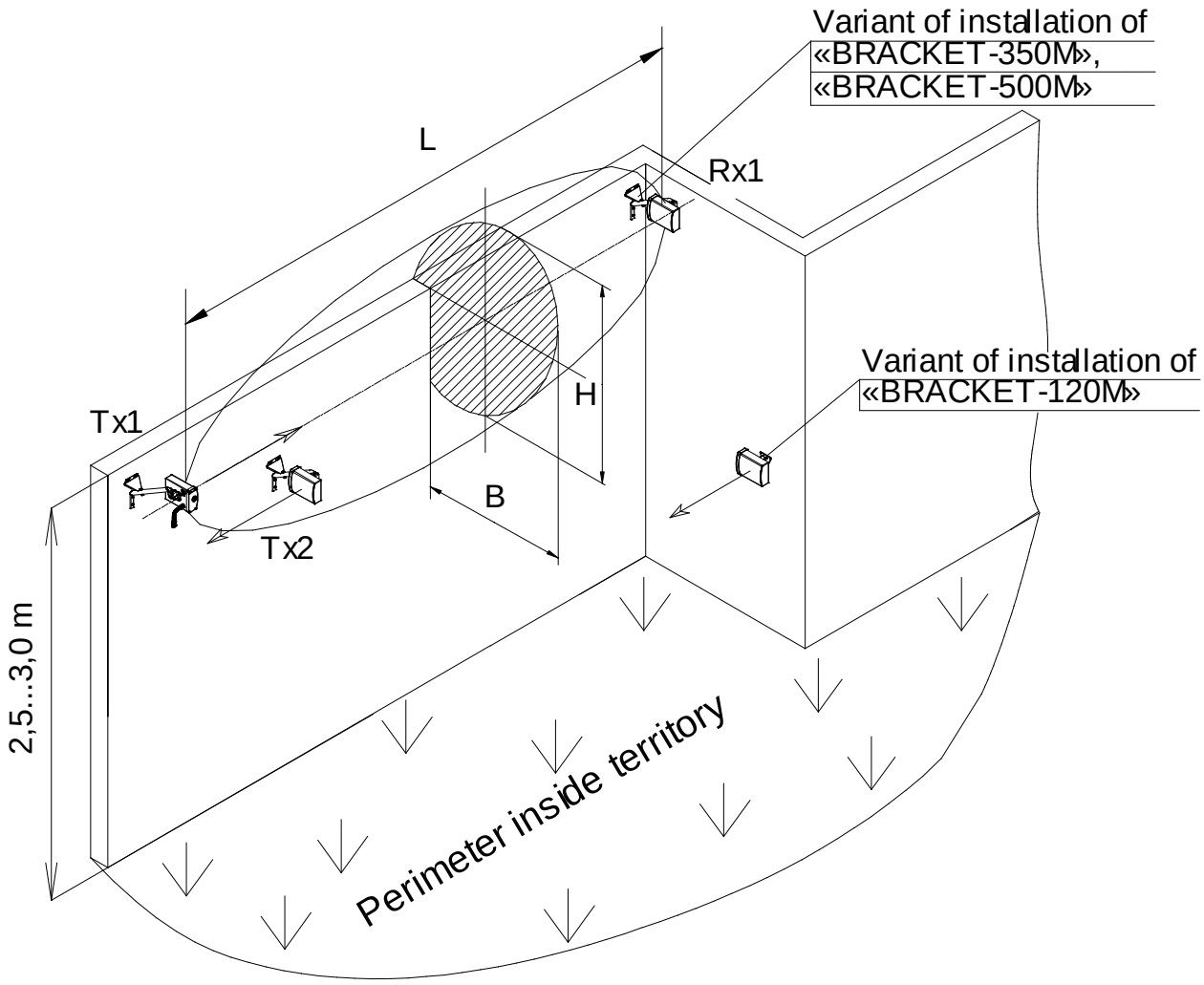


Figure 2.9 – Examples of installation of the sensors using the outboard brackets BRACKET-500M, BRACKET-350M, BRACKET-120M

Notes

1 The height of installation of the units for the protection of the top of the fence is equal to the height of the fence ±100 mm.

2 Material and dimensions of the fence are not rated.

3 Assure the rigidity of the fence construction.

2.3.7 Connection of the Sensor

2.3.7.1 Make the necessary connections of power supply circuits, signal circuits, remote control circuits according to the project diagram for the security alarm system. Rx unit and Tx unit are connected with their own cables, the conductor purpose is specified by its colour. Table 2.1 contains information on Rx unit and Tx unit colours and purpose of cables wires.

ATTENTION! IT IS STRICTLY PROHIBITED TO GROUND DIRECTLY THE SENSORS CIRCUITS. IT IS REQUIRED TO USE THE EXTERNAL LIGHTNING GURAD UNIT LGU-6.

Table 2.1 – Purpose of cable wires

Rx unit	
Wire colour	Purpose
white	power supply «+»
brown	power supply «-»
green	TAMPER button contacts
grey	
yellow	Executive relay contact (NC)
pink	
red	A (RS-485)
blue	B (RS-485)

Tx unit	
Wire colour	Purpose
white	power supply «+»
brown	power supply «-»
green	Remote control (TEST) +5 … 30 V
yellow	TAMPER button contacts
pink	

2.3.7.2 The type and nominal value of the end element of the alarm system loop (resistor, condenser, diode) are specified by the control panel connected to the sensor. Mostly often it is a resistor. Nominal resistance of this resistor should take into account the resistance of the executive relay contacts (approximately 10 Ohm), limiting resistor of lightning guard circuit (100 Ohm) and the resistance of the alarm system loop (depends on the cable type and length chosen).

2.3.7.3 The contacts of the TAMPER button can be connected to the control panel in two ways:

– for Rx unit (Tx unit): by separate loop, in this case the customer receives information on opening the cover of Rx unit (Tx unit) by separate signal. The alarm signal on opening the cover of Rx unit (Tx unit) will come even when the sensor power supply is off;
– for Rx unit: the contacts of the TAMPER button are connected sequentially with the executive relay contacts. In this case the alarm signal will come either at

triggering of the executive relay or opening the cover of Rx unit to one channel of the control panel.

2.3.7.4 The diagram of connection the sensor using the junction box JBS-15 is given in Figure 2.10. The contacts of the TAMPER button are connected sequentially with the executive relay contacts. An additional button for applying the remote control signal to the sensor is to be installed in the guard room.

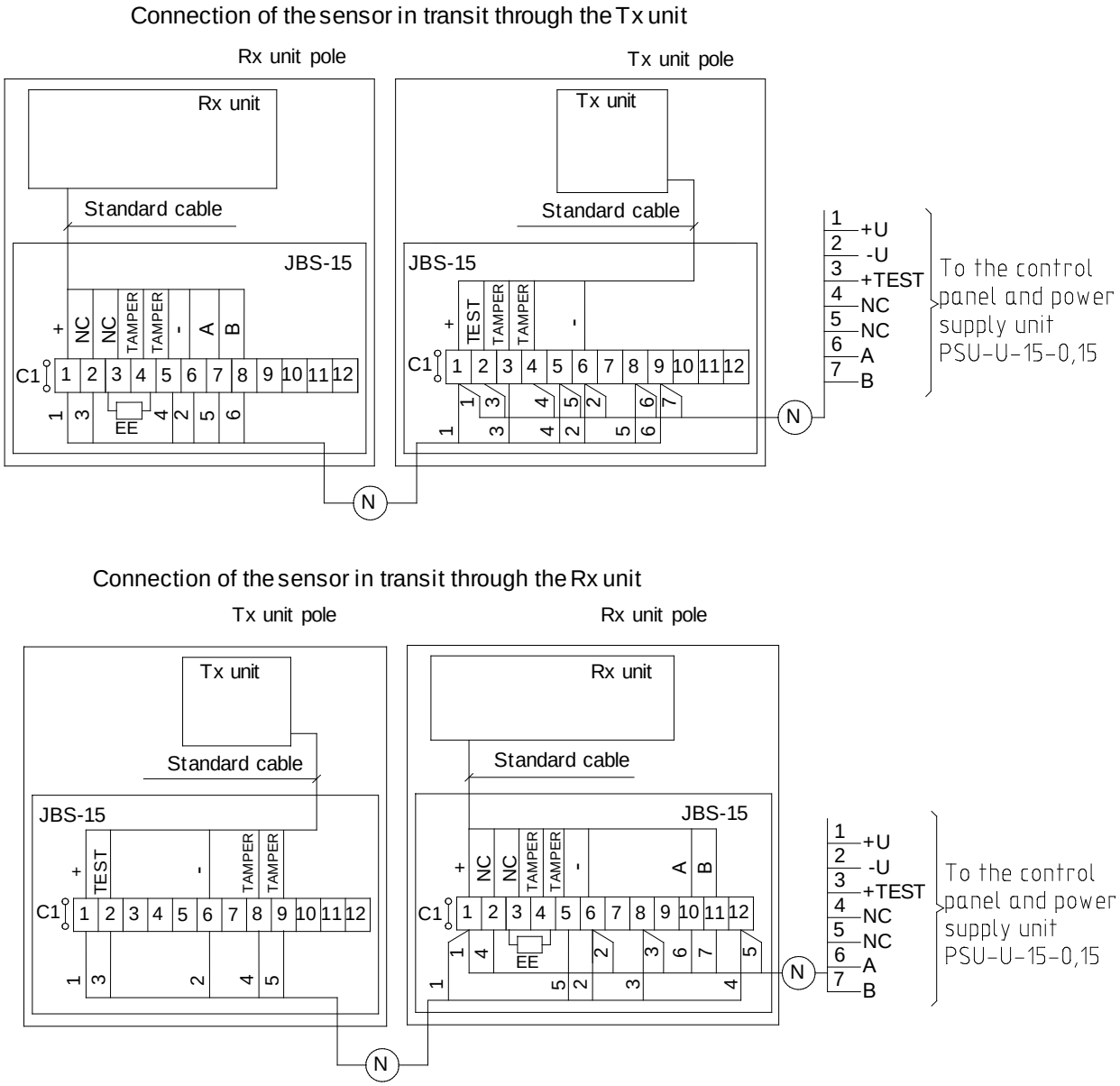


Figure 2.10 – Diagram of connection the sensor using the junction box JBS-15.

2.3.7.5 Use junction boxes JBM-30 (for 30 circuits) or JBB-84 (for 84 circuits) for long perimeters for commutation of site cables.

2.3.7.6 The diagram of connection the sensor using the external lightning guard unit LGU-6 is given in Figure 2.11. Install the external lightning guard unit LGU-6 close to sensor Rx unit (Tx unit). Optimal location – instead of junction box (if the number of commutated circuits does not exceed 8).

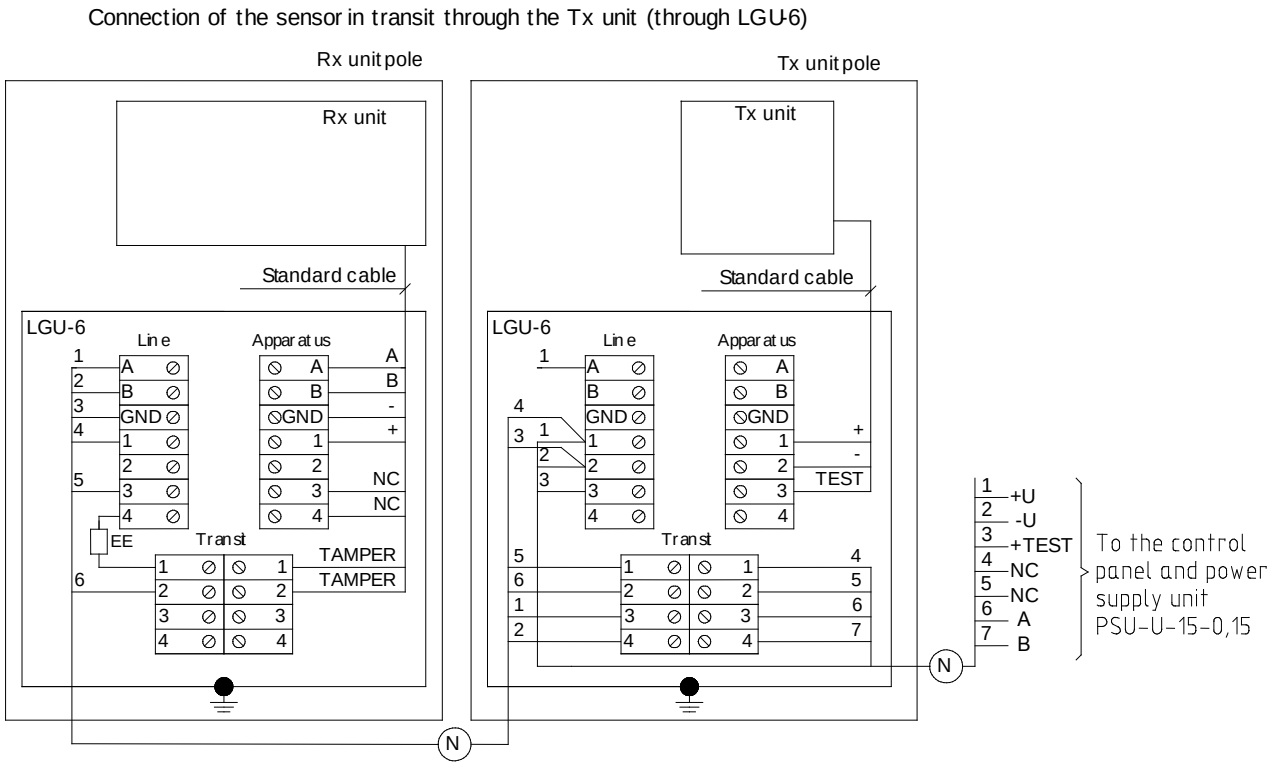


Figure 2.11 – Diagram of connection the sensor using the external lightning guard unit LGU-6.

2.3.8 Preparation for operation and adjustment of the sensors

2.3.8.1 Check if the power and output sensor circuits are connected correctly. Power the sensor.

2.3.8.2 The adjustment of Tx unit and Rx unit is made in horizontal and vertical planes to receive maximum signal value of Tx unit.

2.3.8.3 Two persons are required to adjust the sensor. One person is located near the Tx unit, the other one near the Rx unit.

2.3.8.4 Make rough adjustment and exact adjustment to assure the sensors operability.

2.3.8.5 Follow the steps below for the sensors rough adjustment:

– loose the screws pos.7 and pos.8 (see Figure 2.4) of the Tx unit and Rx unit of the sensors BARRIER-M50, BARRIER-M100, BARRIER-M200;
– loose the buckles pos.3 and the bolt pos.6 (see Figure 2.5) of the Tx unit and Rx unit of the sensors BARRIER-M300, BARRIER-M500;

– turn Tx unit and Rx unit in vertical and horizontal planes to direct them one to another using the sight bar.

2.3.8.6 Exact adjustment of the sensors using the laptop on Windows platform

2.3.8.6.1 Before beginning the work:
– install the virtual COM-port driver on the laptop;
– install the software Config BARRIER-M Series (referred to as SW). SW is available on the Website www.SECURITY-SENSOR.com.

2.3.8.6.2 Remove the cap of the configuration units of Tx unit, turning it counterclockwise using a screwdriver for screws with straight slot with wide blade.

2.3.8.6.3 Connect the laptop using the cable USB A-B (from the KIA) to the socket «TEST» of Tx unit.

2.3.8.6.4 Install one of eight frequency letter using the SW.

2.3.8.6.5 Disconnect the cable, replace the cover of the configurations elements of the Tx unit, turning it clockwise up to the stop.

2.3.8.6.6 Remove the cap from the configuration elements of the Rx unit.

2.3.8.6.7 Connect the laptop using the cable USB A-B (from the KIA) to the socket «TEST» of the Rx unit. (configuration hints are given in the program installed).

2.3.8.6.8 Use the SW to install one of eight frequency letters corresponding to the frequency letter installed on Tx unit.

2.3.8.6.9 Turn the sensor to the adjustment mode. State indicator is blinking red in adjustment mode.

2.3.8.6.10 Quietly turn Tx unit and Rx unit in vertical and horizontal planes to achieve maximum signal level in the «green» zone.

2.3.8.6.11 Tighten the screws pos.7 and pos.8 of the sensors BARRIER-M50, BARRIER-M100, BARRIER-M200 (see Figure 2.4);
Tighten the buckles pos.3 and the bolt pos.6 of the sensors BARRIER-M300, BARRIER-M500 (see Figure 2.5).

2.3.8.7 The sensor previews the possibility to set the maximum speed of the intruder's crossing the detection zone. Reducing of maximum speed increases the sensor interference immunity. The sensor is delivered with the maximum speed of the intruder's crossing the detection zone equal to 10 m/s (high) set at the factory. The speed can be reduced up to 4 m/s (medium) and up to 1 m/s (low). Examples: open site – high speed; zone between the fence and the warning obstacle (the intruder cannot pick up speed) – medium speed; installation by the top of the fence – low speed.

2.3.8.8 Configuration of the sensors sensitivity

2.3.8.8.1 Exit from the adjustment mode to the main (stand-by) mode to configure the sensitivity. The state indicator is glowing green constantly in the stand-by mode.

2.3.8.8.2 Use the arrow «SENSITIVITY» to set the minimum sensitivity value (10%).

2.3.8.8.3 Make **test crossings** of the protected sector to configure the sensors sensitivity. Make test crossings of the protected sector «at full height» or «bent» at different

distances from the Tx unit and Rx unit. It is recommended to begin crossing the protected sector in the middle of the protected sector. After every crossing leave the detection zone on 1-2 m and make pause from 5 to 7 s, otherwise the results of the previous crossing may influence the next one.

2.3.8.8.4 Cross the protected sector with the speed of 0,1 … 10 m/s perpendicular to the detection zone axis. Parameters of the operator crossing the sector should meet the parameters of a standard target: weight from 50 to 70 kg and height from 165 to 180 cm.

2.3.8.8.5 Make test crossings of the protected sector. In case of alarm signal the indicator turns from green to red for not less than 3 s. If you have no alarm after crossing, use the arrow «SENSITIVITY» to set bigger sensitivity value and make another crossing.

2.3.8.8.6 Make test crossings at all the range of the protected zone especially in problem places of the protected zone: in hollows, on hills, near fences, buildings, tree trunks within the detection zone, etc.

2.3.8.8.7 Increase the sensor triggering sensitivity if necessary.

Note – There is a risk of many false alarms caused by different noise in case of too increased sensitivity. There is a risk of non detection of an intruder in case of too reduced sensitivity.

2.3.8.9 Estimation of the level of noise in the sensor stand-by mode

2.3.8.9.1 The level of noise is displayed with the green (red in case of alarm) colour in the field «SENSITIVITY».

Important! In ideal situation with no external actions the level of noise is zero. The actions of an intruder or noise increase the signal and after the signal achieves the level of threshold the sensor triggers. Comparing the level of noise in case of no intrusion and the level of triggering threshold we can estimate the noise situation on the site.

2.3.8.9.2 In case the level of noise achieves a half of the triggering threshold, take measures to reduce the noise and probability f false alarms accordingly. Follow the steps below:

- check if the site meets the requirements given in P.1.2.2 (branches, high grass, moving objects can cause the noise especially when it is windy);
- estimate the influence of moving objects (vehicles, people, animals) close to the detection zone to the level of noise;
- estimate the electromagnetic situation within the detection zone (presence of powerful radio frequency emitters) by deactivating or covering «its own» transmitter in the adjustment mode.

After you found out the reason of high noise, take measures to remove it or exclude the influence to the sensor.

Note – It is possible to estimate the value of useful signal respectively to the level of triggering threshold during the test crossing.

2.3.8.10 Disconnect the cable USB A-B from the socket «TEST» of the Rx unit.

2.3.8.10.1 Replace the cap of configuration units of the Rx unit turning it clockwise up to the stop using a screwdriver for screws with straight slot with wide blade.

2.3.8.11 Exact adjustment of the sensors using a tablet on Android platform

2.3.8.11.1 The tablet is connected to the Rx unit (Tx unit) using the cable USB A-B (from the sensor KIA) and the cable OTG. *The cable OTG to connect the tablet to the sensor is purchased locally*.

2.3.8.11.2 Install the software BARRIER-M UNI (referred to as the SW) on the tablet under Android before beginning of work. SW is available of the Website www.SECURITY-SENSOR.com and on Play Market.

2.3.8.11.3 Remove the cap of configuration units of the Tx unit turning it counter clockwise up to the stop using a screwdriver for screws with straight slot with wide blade.

2.3.8.11.4 Connect the tablet to the socket «TEST» of the Tx unit.

2.3.8.11.5 Use the SW to install one of eight frequency letters.

2.3.8.11.6 Disconnect the cable; replace the cover of configuration units of the Tx unit turning it clockwise.

2.3.8.11.7 Remove the cap of configuration units of the Rx unit.

2.3.8.11.8 Use the cables USB A-B and OTG (from the sensor «BARRIER-M» KIA), connect the tablet to the socket «TEST» of the Rx unit.

2.3.8.11.9 Use the SW to install one of eight frequency letters corresponding to the frequency letter set on the Tx unit.

2.3.8.11.10 Configure the sensor according to pp. 2.3.8.6.9 – 2.3.8.10.1

2.3.8.12 Testing of the state of the sensor remotely using the PC under Windows connected to the sensors via the interface RS-485

2.3.8.12.1 A three wire variant of the interface RS-485 and a converter with electrical isolation are required to connect the remote PC to the sensors. It is recommended to use the interface converter USB/RS-485 with isolation MOXA UPort 1130i to as the converter. The diagram of connection of the remote PC to the sensors via the interface RS-485 is given in Figure 2.12.
The maximum quantity of the sensors in one line (PC port) – 31.

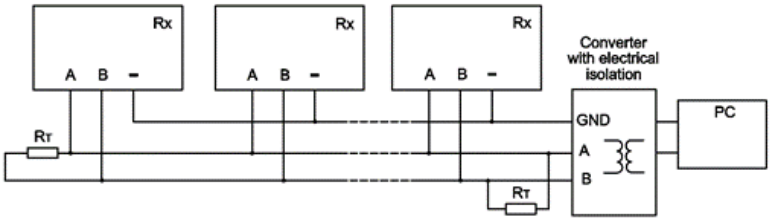


Figure 2.12 – The diagram of connection of the remote PC to the sensors via the interface RS-485

2.3.8.12.2 The example of lightning protection of the line RS-485 is given in Figure 2.13. The lightning guard unit α is recommended for use in all the situations. The

lightning guard unit β is recommended for use in case the segment of the interface line from the sensor to the next device is more than 500 m. In case of shorter lengths of the communication line the elements integrated into the sensor serve as the lightning guard.

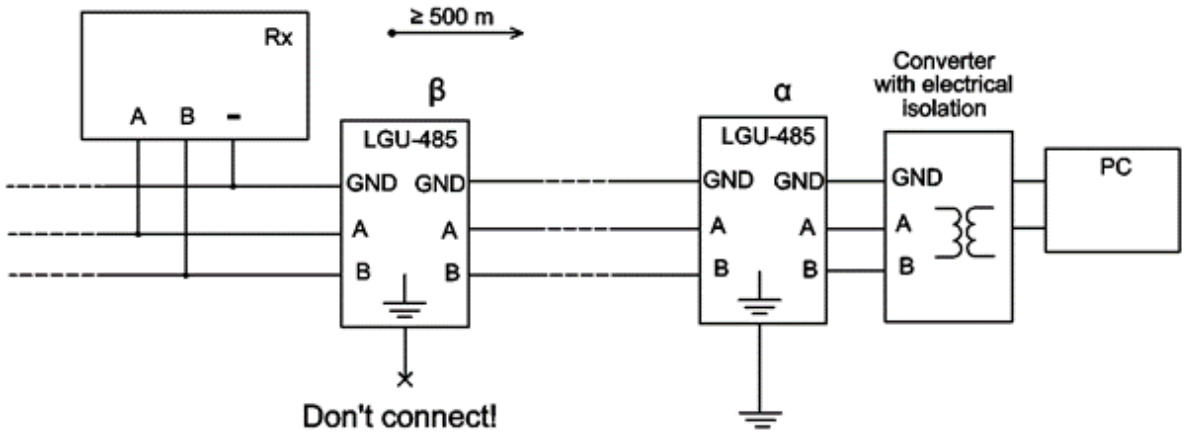


Figure 2.13 – Example of lightning protection of the line RS-485

IMPORTANT: ONLY ONE LIGHTNING GUARD UNIT FROM ALL THE UNITS CONNECTED TO THE LINE SHOULD BE CONNECTED TO THE GROUND. IT IS NECESSARY TO USE SPECIAL LIGHTNING GUARD UNITS FOR INTERFACE LINES.

2.3.8.12.3 Before beginning the work:
- install the virtual COM-port driver on the PC;
- install the software Config BARRIER-M Series (referred to as SW). SW is available on the Website www.SECURITY-SENSOR.com.

2.3.8.12.4 Configure the sensor using the remote PC according to pp. 2.3.8.6.9 – 2.3.8.10.1.

2.3.8.13 After the sensor is configured, it is recommended to test it during 2 … 3 days to reveal end correct possible mistakes in mounting and configuration.

2.3.9 Operation of the sensors BARRIER-M50, BARRIER-M100, BARRIER-M200 with reflectors REFLECTOR-360 (REFLECTOR-820)

2.3.9.1 In order to make the breaking of the sensor detection zone on difficult perimeter sites use REFLECTOR-360 or REFLECTOR-820.

2.3.9.2 When the sensor is used with REFLECTOR-360 (see Figure 2.14) the total length of the detection zone L1+L2 (where L1 – distance between Tx and the reflector, L2 – distance between the reflector and Rx) should not exceed:

– 25 m – for the sensors BARRIER-M50;
– 50 m – for the sensors BARRIER-M100, BARRIER-M200.

When the sensors BARRIER-M are used with REFLECTOR-820 the total length of the detection zone L1+L2 should not exceed:

– from 15 to 25 m – for the sensor BARRIER-M50;
– from 25 to 50 m – for the sensors BARRIER-M100, BARRIER-M200.

With that the shape of the detection zone, its width and height for the piece L1 (L2) are the same as for the sensor sector with the length L1 (L2) when used without the reflector.

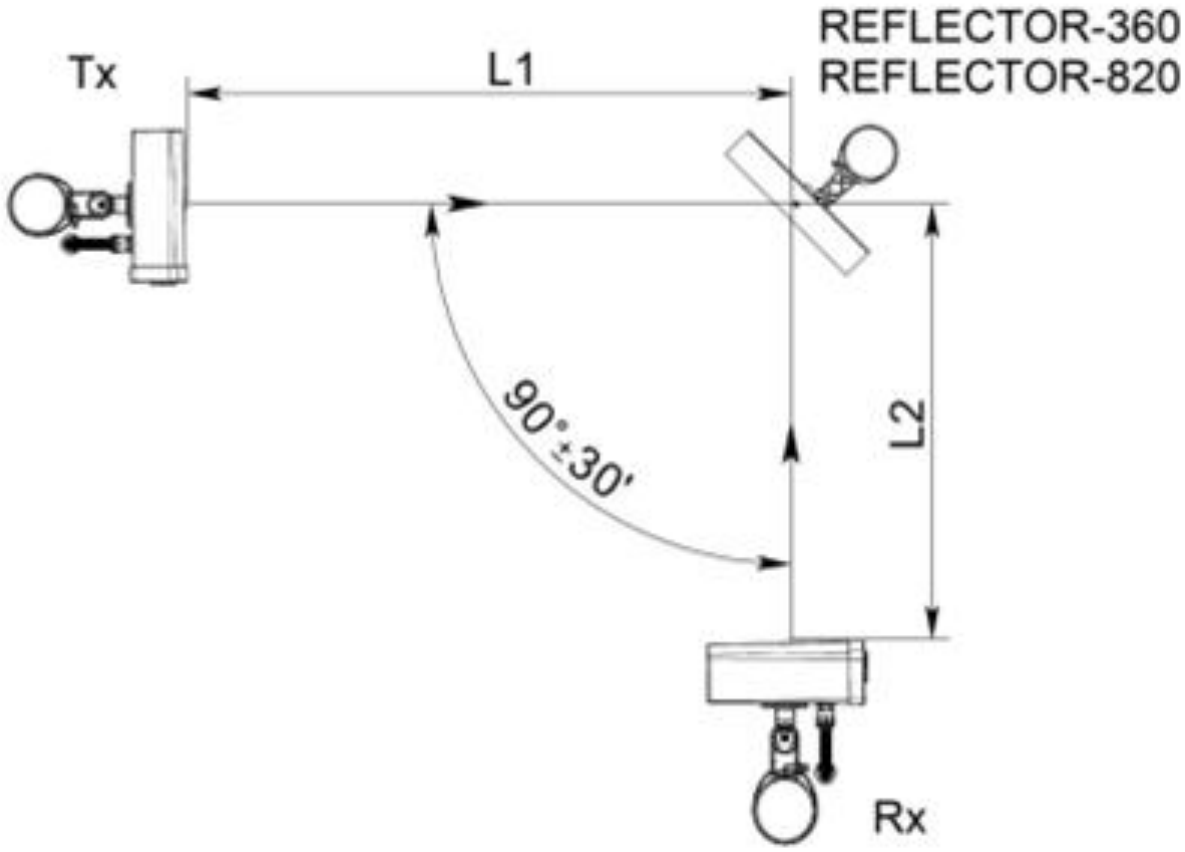


Figure 2.14 – Installation of the sensors using REFLECTOR-360 (REFLECTOR-820)

2.3.9.3 The procedure of installation and configuration of the sensors using the reflectors REFLECTOR-360 (REFLECTOR-820)

2.3.9.3.1 Mount the Tx unit, Rx unit and the reflector according to pp. 2.3.1-2.3.3 of the present User Manual and Figure 2.14. Mount the Tx unit, Rx unit and the reflector on the same height respectively to the ground.

2.3.9.3.2 Make rough adjustment of the Tx unit and Rx unit towards the center of the reflector.

2.3.9.3.3 Open the cover of Rx unit and connect the laptop (tablet) to the socket «TEST».

2.3.9.3.4 Power the sensors.

2.3.9.3.5 Changing the position of the reflector, Tx unit and Rx unit turning them in vertical and horizontal planes achieve the presence of the signal.

2.3.9.3.6 Depending on the device connected make exact adjustment and configure the sensitivity of the sensor Rx unit according to pp. 2.3.8.6 – 2.3.8.8 (2.3.8.11, or 2.3.8.12) of the present User Manual following the principles of the sequential adjustment, ie. begin by adjusting the Tx unit, then the reflector and finish by adjusting the Rx unit.

3 Technical Service

3.1 General Instructions

3.1.1 Timely and complete technical service during exploitation is one of the important conditions to maintain the sensors in working order and to keep the stability of parameters during the mean life time.

3.1.2 Technical service is not required during storage and transportation.

3.1.3 Perform all the works given in the appropriate schedule during the technical service. Correct the failures and revealed.

3.2 Safety Measures

3.2.1 IT IS PROHIBITED TO PERFORM TECHNICAL SERVICE BEFORE AND DURING STORM, RAIN AND SNOW FALL.

3.2.2 IT IS PROHIBITED TO USE FAILED INSTRUMENTS OR DEVICES.

3.3 Technical Service Procedure

3.3.1 Technical service of the sensors previews scheduled performing of the complex of preventive works. The volume and periodicity of works are given in Table 3.1

Table 3.1 – Schedule and periodicity of technical service

Technical service works	Periodicity month
Checking of the sensors operability	+
Checking of the sensors appearance	+
Checking of the protected sector state	+

3.3.2 Checking of the sensors operability

3.3.2.1 In order to check remotely the sensors operability, apply the voltage of 5 … 30 V to the circuit «TEST» of the Tx unit from the control panel respectively to the sensor power supply «–». The sensor should trigger.

3.3.3 Checking of the sensors appearance

3.3.3.1 Check the integrity of the Tx unit and Rx unit, pay attention to the absence of dents, corrosion, damage of coating, cracks. In case of presence of corrosion signs remove if with a rag with kerosene and put an anti-corrosion agent.

3.3.3.2 Check the Tx unit and Rx unit for the absence of dust, dirt, snow and ice from the side of beaming and receiving and clean them if necessary.

3.3.3.3 Check the tightening of fixing parts fixing the sensor units to the pole or protected surface, tighten the fixing parts if necessary.

3.3.3.4 Check the state of connection cables from the sensor units to the junction box.

3.3.4 Checking of the protected sector state

3.3.4.1 Check the protected sector for the absence of foreign objects causing false alarms.

3.3.4.2 Check the height of grass cover during seasonal works. In case grass exceeds the allowed height (see P. 1.2.2), remove it.

3.3.4.3 The changing of height of snow cover on the protected site may reduce the input signal on the Rx causing false alarms. Remove the snow or change the height of installation of the Rx unit and Tx unit on the poles.

After you change the height of installation of the Rx unit and Tx unit, adjust and configure the triggering threshold according to the procedures given in the present User Manual.

4 Troubleshooting Guide

4.1 The list of possible failures is given in Table 4.1.

Table 4.1 – The list of possible failures

Failure, External manifestation	Possible reason	Repair
1	2	3
1 Constant alarm on the control and indication device.	1 Communication line is damaged. 2 Different frequency letters in the Tx and Rx units.	Check the cable integrity and connection. Restore the communication line. Install the same frequency letters in the Tx and Rx units.
	3 Incorrect sensor adjustment. 4 The Tx unit failed. 5 The Rx unit failed.	Make exact adjustment of the Tx unit and Rx unit. Replace the Tx unit. Replace the Rx unit.
2 False alarms of the sensor.	1 Influence of moving trees in the detection zone. 2 Influence of moving high grass on the site. 3 Reduced input signal on the Rx unit caused by the change of snow cover higher than allowed. 4 Moving of animals within the detection zone. 5 Too low thresholds on the Rx unit. 6 The sensor is not correctly adjusted.	Check the site and remove possible noise factors. Check if the thresholds of the receiver are set correctly. Make exact adjustment of the Tx unit and Rx unit.
3 No alarm after crossing the detection zone.	1 Too high thresholds on the Rx unit. 2 Incorrect sensor adjustment.	Check if the thresholds of the Rx unit are set correctly. Make exact adjustment of the Tx unit and Rx unit.

5 Storage

5.1 Store the sensors in factory package on racks in the warehouse.

5.2 Use heated warehouse with the temperature inside from plus 5^0C to plus 40^0C, humidity up to 80%.

5.3 No vapour of acid, alkaline and other chemically active substances causing the corrosion are allowed in the warehouse.

5.4 Strictly follow the manipulation marks on the package during storage.

5.5 Mean shelf life time in the factory package at the temperature from plus 5^0C to plus 40^0C and the humidity 95% at the temperature of 35^0C is not less than 3 years.

6 Transportation

6.1 Packed sensors can be transported by vehicles on roads with asphalt covering without any limitation in distance and speed, on dirt roads up to 500 km with the speed up to 40 km/h. Transportation parameters by railway, river and air transport are to be conformed with the group of conditions C of GOST P 51908-2002.

6.2 Climatic conditions for transportation:

- ambient temperature from minus 50^0C to plus 60^0C;
- relative humidity up to 98% at the temperature of plus 25^0C;
- atmospheric pressure from 84 to 107 kPa (from 630 to 800 mm Hg).

6.3 Strictly follow the manipulation marks on the package during transportation.

7 Utilization

7.1 The sensors are to be utilized after expiry date. The sensors are to be utilized by the operating company according to actual standard and rules of the country. The sensor does not contain any ecologically dangerous elements.

The list of registration of changes

Change	Sheets (pages) numbers				Total number of sheets (pages) in the documents	Document number	Incoming number of the accompanying document and date	Signature	Date
	changed	replaced	new	canceled					