



ATOMTEX[®]

Scientific and Production Unitary Enterprise

**AT2522
RADIATION DETECTOR
(ALPHA SENSOR)**

User's Manual



Contents

- 1 Description and operation3
 - 1.1 Purpose3
 - 1.2 Specifications4

1.3	Complete set	6
1.4	Description and operation	7
1.5	Marking	8
1.6	Packaging	8
2	Pre-start procedure	9
2.1	General information	9
2.2	Power ON and OFF	9
2.3	Charging the battery	9
3	Intended use	10
3.1	General information	10
3.2	Standard use	10
3.3	Using the “AlphaSensor” program	12
4	Maintenance	19
5	Storage	20
6	Transportation	21
7	Disposal	21
8	Acceptance certificate	22
9	Packing list	22
10	Commissioning certificate	23
11	Manufacturer's warranty	23
12	Claim information	24
	Appendix A Replacement of the light protection film	26

The purpose of this User's Manual is to explain the operation principle and design of AT2522 Radiation detector (Alpha sensor) (further referred to as alpha sensor). It contains main specifications and other data to provide correct and fully-functional operation of alpha sensors.

The following abbreviations are used throughout this User's Manual:

- PC – Personal computer
- SW – Software.

1 Description and operation

1.1 Purpose

2 Alpha sensor is an indicator of radioactivity and is designed for quick assessment of surface contamination by alpha nuclides, i.a. polonium-210.

3 Alpha sensor belong to the type of portable devices and is suitable for radiation control professionals as well as for individuals interested in radiation situation at workplace, living and recreation areas, as well as for training purposes.

4 Operating conditions:

- Ambient air temperature From $-20\text{ }^{\circ}\text{C}$ to $+50\text{ }^{\circ}\text{C}$
- Relative humidity with air temperature $\leq 35\text{ }^{\circ}\text{C}$
without condensation $\leq 95\text{ }%$
- Atmospheric pressure From 84 to 106.7 kPa.

5 IP40 protection rating against ingress of water, dust and foreign particles according to GOST 14254-2015.

6 Meets electrical safety requirements of GOST IEC 61010-1-2014 for Class III equipment according to GOST 12.2.007.0-75 (Pollution degree 2).

7 Alpha sensor cannot be operated in explosion hazard zones.

7.1 Specifications

8 Alpha sensor triggers audio, vibration and visual alarm in case of detection of surface contamination by alpha-active radionuclides.

9 Detection time of surface contamination of 0.1 Bq/cm^2 does not exceed 1 s.

10 Initialization time does not exceed 5 s.

11 Electric power supply is provided by a built-in rechargeable battery.

12 Time of continuous operation with fully-charged battery is at least 500 h when the display is OFF, and at least 40 h when the display is ON.

13 Alpha sensor survives the following conditions:

- Ambient air temperature from $-20 \text{ }^\circ\text{C}$ to $+50 \text{ }^\circ\text{C}$
- Relative air humidity up to 95 % (non-condensing, $\leq 35 \text{ }^\circ\text{C}$)
- Atmospheric pressure from 84 to 106.7 kPa
- Sinusoidal vibration in the frequency range from 10 Hz to 55 Hz and shift amplitude of 0.35 mm
- Constant magnetic fields and alternating fields of network frequency with intensity of up to 400 A/m.

14 Alpha sensor in transport packaging survives the following conditions:

- Ambient air temperature from $-20 \text{ }^\circ\text{C}$ to $+50 \text{ }^\circ\text{C}$
- Relative air humidity up to 100 % (at $40 \text{ }^\circ\text{C}$)
- Impacts with acceleration of 98 m/s^2 (10g), where impact duration is 16 ms and the number of shocks is (1000 ± 10) in each of three mutually perpendicular axes.

15 The weight does not exceed 0.17 kg.

16 Overall dimensions does not exceed $106 \times 60 \times 31 \text{ mm}$.

17 EMC compatibility requirements of STB GOST R 51522-2001:

- Electromagnetic emission requirements of STB EN 55011-2012 (Group 1)
- Immunity to electrostatic discharge conforms to requirements specified in GOST 30804.4.2-2013, test level 2 (contact discharge) and test level 3 (Air discharge), performance criterion A
- Immunity to radio-frequency electromagnetic field of STB IEC 61000-4-3-2009, test level 2 and performance factor A.

18 Index of reliability:

- Mean time to failure ≥ 10000 h
- Mean operating life ≥ 10 years
- Mean time to recover Up to 1 h.

19 Alpha sensor contains no precious materials or non-ferrous metals.

19.1 Complete set

20 Contents of delivery kit are listed in Table 1.1.

Table 1.1

Name, type	Serial Number	Q-ty	Note
1 AT2522 Radiation detector (Alpha sensor)		1	
2 USB-microUSB cable		1	
3 Set of spare light-protection films		1	5
4 “AlphaSensor” Software		1	On external media
5 User's Manual		1	Including Software User's Manual

20.1 Description and operation

20.1.1 Operating principle

The principle of alpha sensor's operation is based on the detection of alpha particles emitted from the tested surface by ZnS(Ag) scintillation detector with dimensions of 55×45×1 mm.

20.1.2 Design

See Figure 1.1 for general view of Alpha sensor.



Figure 1.1

Alpha sensor consists of housing and removable protection plate which covers the detector. A display is located on the front face of the housing.

A USB connector for charging the built-in battery and for connecting the alpha sensor to a PC is located on the end face of the housing.

20.2 Marking

21 Marking labels are generated automatically by dedicated software.

22 The end face marking is made by a film label with adhesive layer and has the following information:

- Name and designation of alpha sensor
- Serial number
- Manufacturing year
- Manufacturer's trademark
- “Made in Belarus” caption.

23 Marking of packaging complies with requirements in GOST 14192-96 and design documentation.

24 Main, additional and informational signs are made typographically.

24.1 Packaging

25 The packaging is a box with alpha sensor and supplied accessories inside.

26 Pre-start procedure

26.1 General information

27 Read this User's Manual thoroughly before the start of alpha sensor operation.

28 Remove the alpha sensor and accessories from the packaging box.

29 Check the list of standard equipment of the alpha sensor according to 19.1.

30 Perform visual inspection of alpha sensor and its accessories:

- Make sure there is no visible mechanical damage to housing
- Make sure the USB-microUSB cable is operable and marking text is legible.



30.1 Power ON and OFF

31 Alpha sensor powers on automatically when the protective plate is removed and powers off when the protective plate is reattached to the housing.

31.1 Charging the battery

32 In normal conditions the built-in battery can be charged by the USB-microUSB cable from the delivery set connected to a USB port of a PC.

33 Charge the built-in battery while the alpha sensor is powered off.

Displaying the “” icon indicates that the battery is charging, while the “” icon indicates that the battery charging process is over. Then the alpha sensor goes to trickle charge mode and can remain in it for quite a long time.

Note: Regular continuous or permanent operation with fully charged battery when alpha sensor is connected to external power supply can result in battery degradation and then to early failure. For this reason it is recommended to remove external power source when the battery is full.

In order to restore capacity of the battery including after a long period of storage it is necessary to perform the “full charge – full discharge” cycles two or three times.

Charging time of an empty battery is about 3 h.

34 Intended use

34.1 General information

35 Exercise caution during operation of the alpha sensor. Carefully protect it from bumps and drops.

36 Operate the alpha sensor with caution to avoid damage to the light protection film; otherwise it results in alpha sensor's malfunction. Damaged films can be replaced by User according to instructions in Appendix A.

37 Take care not to contaminate the alpha sensor by radioactive material during use. It is possible to check the alpha sensor for radioactive contamination in the following sequence:

- Remove the protective plate and put the alpha sensor on a clean sheet of paper
- Absence of audio and visual alarm is the indication of no contamination of alpha sensor. If an alarm has been activated, then it is necessary to perform alpha sensor's deactivation as described in 42.

37.1 Standard use

37.1.1 Quick assessment of surface contamination by alpha-emitting radionuclides is the representative means of assessing dangers from surfaces contaminated by radioactive materials as a source of subsequent internal irradiation.

37.1.2 Surface contamination by alpha-emitting radionuclides can be assessed in places of work with open sources of ionizing radiation as well as in premises with a possibility of contamination by transportation of radioactive substances on various objects (tools, overalls and shoes) or by flowing air. Select the place for assessment of surface contamination by alpha-active radionuclides based on the analysis of previous data on premise contamination and information on potential transfer of radioactive substances to these premises.

37.1.3 Perform assessment of surface contamination by alpha-active radionuclides in the following sequence:

- Remove the protection plate from alpha sensor
- Put the alpha sensor on the surface which is assumed to be contaminated by radioactive material
- Wait about 5 s. Absence of audio and visual alarm is the indication of no contamination.
- Move the alpha sensor to the next point.

When radioactive contamination has been detected, alpha sensor activates audio and visual (or vibration) alarms, displays the estimated value of alpha particles count rate from the surface. Find the borders of contaminated area by moving the alpha sensor over the tested surface at a height not more than 5 mm. The higher the contamination level, the higher is the alarm frequency.

37.1.4 The process of alpha sensor operation allows the potential of false positives. It is possible to distinguish a false positive from a real contamination alarm in the following way:

- When an alarm has been triggered, remove the alpha sensor from the test surface
- Wait a few seconds and then move the alpha sensor to its original position on the test surface
- If there is no alarm, then it is considered to be a false positive. If there is an alarm, then a radioactive contamination shall be considered as present.

37.2 Using the “AlphaSensor” program

37.2.1 Purpose of the “AlphaSensor” program

The “AlphaSensor” program (further referred to as the program) is designed to display alpha sensor’s readout in the process of radiation situation control.

The program has the following options:

- Display current count rate value
- Alpha sensor’s parameters setup
- Indication of measuring sensor status and charge level
- Indication of rechargeable battery and processor status
- Battery overheating alert.

37.2.2 Execution environment

Program operator shall be familiar with operating system of the PC and be able to use it. This User's Manual does not describe standard principles of launching and closing applications, as well as how to run commands in menus, tool bars, and other actions.

Minimum hardware requirements:

- For 32-bit systems: A PC with Intel or compatible 2 GHz or higher processor; 2 GB RAM memory or more; minimum 10 GB free disc space; one free USB port
- For 64-bit systems: A PC with a 2.4 GHz or higher processor; 2 GB RAM memory or more; minimum 10 GB free disc space; one free USB port.

Minimum software requirements:

- A 32/64-bit version of operating system Windows 7, Windows 8 or Windows 10.

37.2.3 Install/uninstall

The program shall be installed by a user with system administrator privileges. Install the “AlphaSensor” program by running the “Setup.exe” installation package file. When standard program installation procedure is over, the “AlphaSensor” shortcut appears on the desktop (see Figure 3.1). The “ATOMTEX” group with a shortcut for starting the “AlphaSensor” program will be created in the “START” menu.



Figure 3.2

Note: If installation procedure is interrupted by messages that the running program is not a valid program, click “Yes” and continue installation.

Use standard Windows tools to uninstall the program from your operating system. Operating system keeps settings after the program has been uninstalled.

37.2.4 Start/Exit procedure

Start the program by double clicking the program icon on the PC desktop by the left mouse button or use the “START” button in lower-left screen corner (“Programs→ATOMTEX→AlphaSensor”).

Use standard Windows tools to exit the program.

37.2.5 Parameter settings

Configure the connection to alpha sensor to provide proper operation of the program. Select the “Settings” menu on the main menu bar. This will open the “Settings” window (see Figure 3.2).

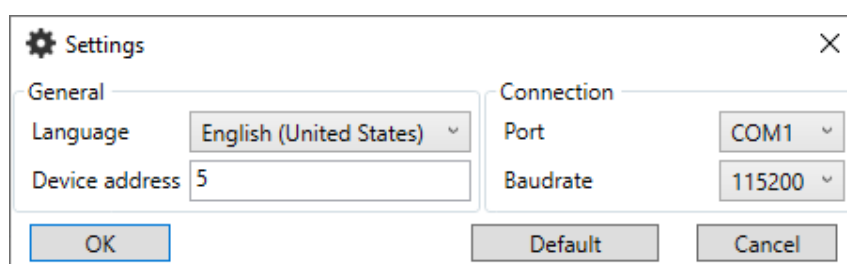


Figure 3.3

The “Settings” window contains the following options:

- Select the language of program interface
- Select the device address
- Select the COM-port address
- Select the baudrate.

All settings will be reverted to manufacturer’s by clicking the “Default” button.

37.2.6 Using the program

The main program window has the following elements (see Figure 3.3):

- Main program window (“Settings”, “Device control”, “About”)
- Battery status
- Working window
- Status bar.

Main menu

Battery status

Working window

Status bar

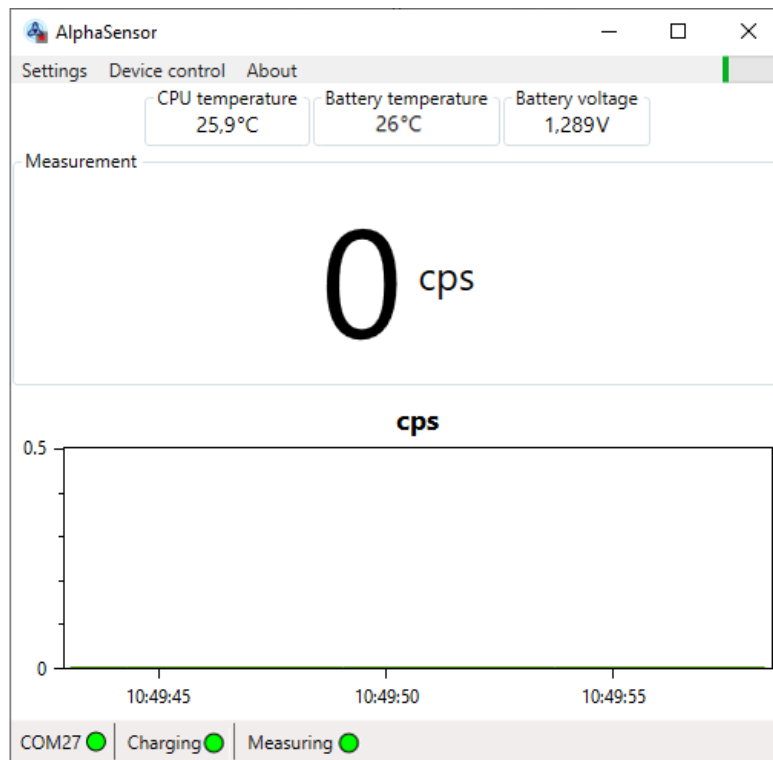


Figure 3.4

Working window area contains the following elements:

- Alpha sensor status indicators: “CPU temperature”, “Battery temperature”, “Battery voltage”
- “Measurement” area, which displays the count rate. In standby mode (the protection plate is attached to the alpha sensor’s housing) the screen displays a zero count rate value against gray background. In measurement mode (the plate is removed) the background of the “Measurement” area is white
- Count rate chart (the last 30 measurements are displayed).

The status bar displays the following information:

- The name of the port and the indicator of alpha sensor’s connection to a PC: green – connected, red – no connection
- The “Charging” indicator: green – the charge is in progress, red – the charging is completed
- The “Measuring” indicator: green – measurement mode, red – standby mode.

37.2.7 “Device control” window

The “Device control” (see Figure 3.4) is available for adjusting the alpha sensor’s settings. When the window opens, it displays the current alpha sensor’s parameters. New settings can be stored by clicking the “Send changes” button. When the indicator is green,

the new settings are successfully stored, when the indicator is red, the settings are not stored. Make a new attempt to store the settings in case the settings have not been stored.

The “Device control” window has three tabs: “Events”, “Signals” and “Functions”.

Event types:

- “Device ON”
- “Device OFF”
- “Radiation detection”
- “Display ON”
- “Battery LOW”.

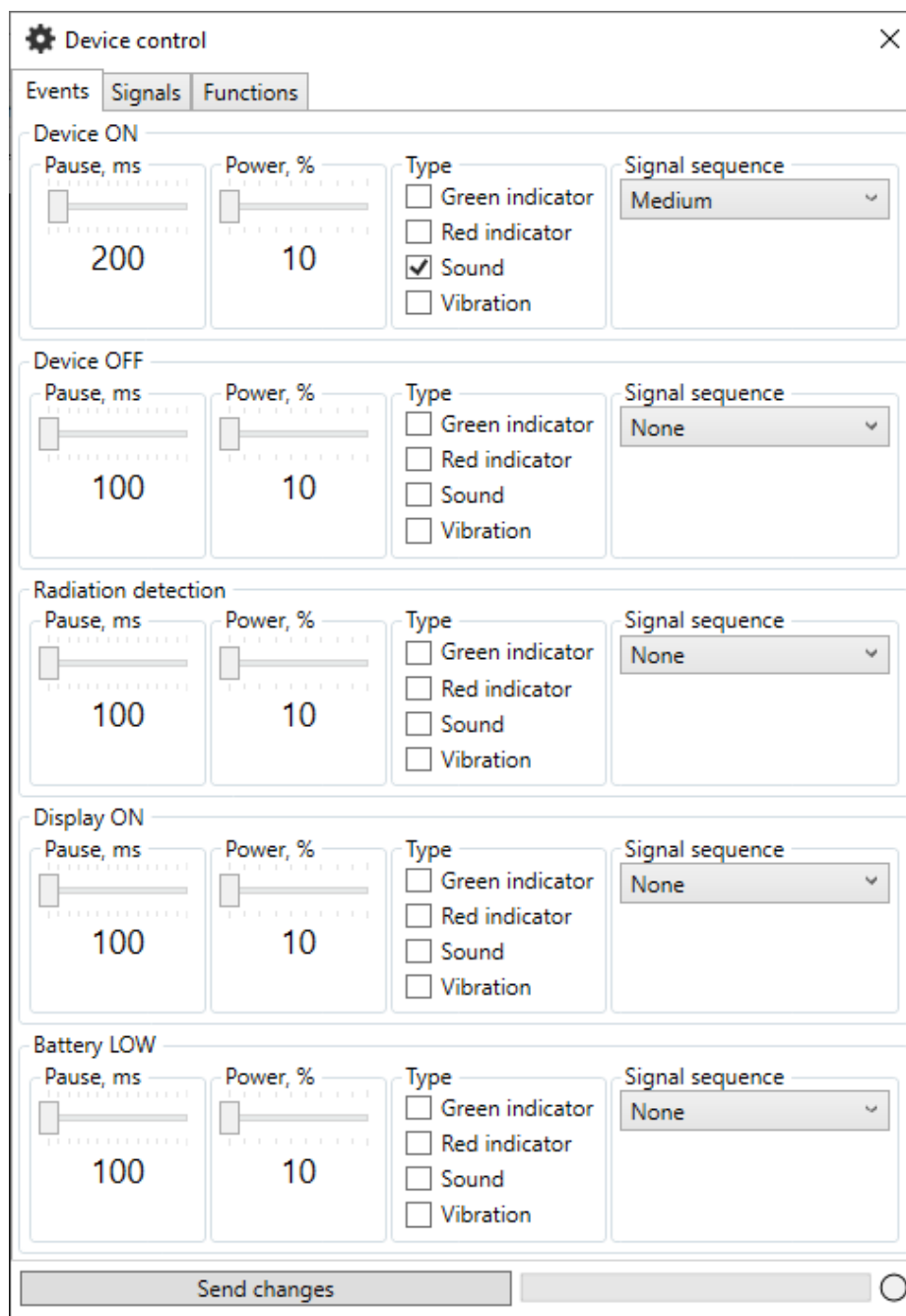


Figure 3.5

The following parameters can be adjusted for each event: pause (the delay before the signal), power, type and sequence of the signals. The parameters selected for the pause,

power and sequence of the signals for each specified signal type. To deactivate an event select the “None” option for the signal sequence or deactivate all signal types.

The “Signals” tab (see Figure 3.5) can be used for adjusting the sound and screen settings. The screen activation parameters will be accessible in the measurement mode.

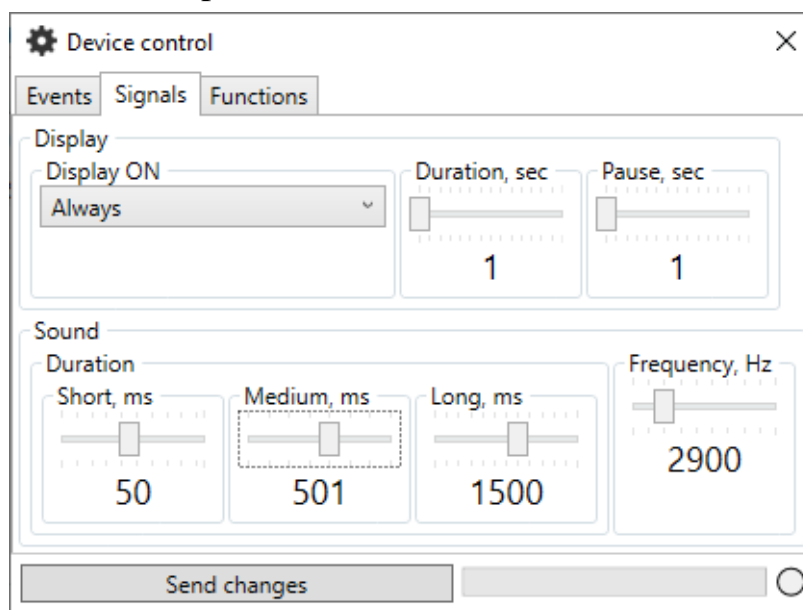


Figure 3.6

Screen behaviour:

- “Always” – the screen is always active
- “Detection” – the screen activates for the specified time only when a source of radiation has been detected
- “Detection with date and time” – the screen becomes activated when the protection plate has been removed, displays date and time indication for the specified period and then the screen becomes activated only when a source of radiation has been detected
- “Detection with date, time and pause” – the screen becomes activated when the protection plate has been removed, displays date and time indication for the specified period and then the screen becomes activated only when a source of radiation has been detected. The specified pause will be applied between activations of the screen
- “Detection with pause” – the screen becomes activated for the specified period only when a source of radiation has been detected. The specified pause will be applied between activations of the screen.

The “Device control” tab (see Figure 3.6) can be used to adjust the alpha sensor’s functions.

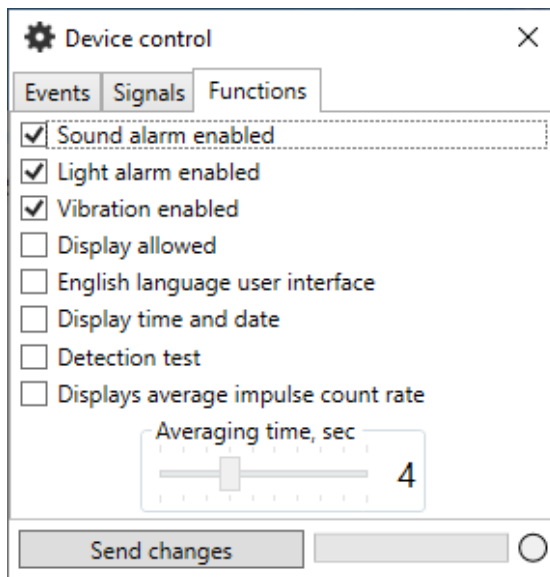


Figure 3.7

37.2.8 "About" window

The information about the "AlphaSensor" program can be selected in the "About" main menu bar (see Figure 3.7).



Figure 3.8

37.2.9 Troubleshooting

Errors may be encountered in the process of alpha sensor operation with corresponding messages displayed in the working window of the program:

- The “No port” message – the connection indicator turn red. Verify the connection settings or check the connection to a PC
- The “Waiting for data” message – the connection indicator is green. Verify the connection setting (COM-port, baudrate and device address) or check the alpha sensor’s connection to a PC
- The “Connection failed with device” message – the connection indicator is green. Power ON and OFF the alpha sensor and reconnect it to a PC. If the error persists, please contact the manufacturer
- The “Connection failed with device” message – the connection indicator is green. Verify the connection setting (COM-port, baudrate and device address) or reconnect the alpha sensor to a PC. If the error persists, please contact the manufacturer
- The “Battery overheating. Turn off the charge!” message. Disconnect the alpha sensor from a PC, wait some time to make sure the alpha sensor has cooled down. Connect the alpha sensor to a PC. Please avoid using it in rooms with high air temperature.

38 Maintenance

39 Maintenance is necessary to keep the alpha sensor ready for operation and to ensure fail-safe performance throughout its life.

40 Maintenance consists in preventive activities performed at least monthly.

41 Preventative activities include the following:

- External check
- Check the contents of alpha sensor's delivery set according to 19.1.
- Remove dust and impurities from external surfaces of alpha sensor and accessories, wipe with decontaminating solution.

42 In case of radioactive contamination of alpha sensor the decontamination is required. Do this by replacing the alpha sensor's light protection film by a new one, wipe the alpha sensor's housing thoroughly with a cloth soaked in decontaminating solution (synthetic cleaning agent), then with a cloth soaked in warm water, and then wipe dry.

43 If integrity of light protection films are at doubt, then perform the light protection check. Remove the protection plate from alpha sensor, position the entrance window at the distance of 40 – 50 cm from a 40-Watt incandescent lamp and power on the lamp. The light protection film is damaged if the alpha sensor generates an alarm.

The alpha sensor's light protection is considered to be sufficient, if there is no alarm in the presence of additional light source.

If the light protection film is damaged, self-replace it according to instructions in Appendix A.

44 Storage

45 Before commissioning store the alpha sensor indoors in the manufacturer's packaging at an ambient temperature from +5 °C to +40 °C and relative humidity $\leq 80\%$ (+25 °C).

46 If the alpha sensor has been removed from its original packaging, store it at ambient air temperature from +10 °C to +35 °C, relative air humidity $\leq 80\%$ (+25 °C).

47 Dust, acid and alkaline vapours, aggressive gases and other corrosive impurities content in premises where alpha sensors are stored must not exceed the content of corrosion-active substances for Type I atmosphere (conventionally clean atmosphere) according to GOST 15150-69.

48 Charge the battery to 100 % before storing.

49 Transportation

50 The alpha sensor in original packaging allows transportation in any means of covered land transport and in pressure-sealed aircraft compartments with ambient air temperature range $-20\text{ }^{\circ}\text{C}$ to $+55\text{ }^{\circ}\text{C}$ and relative humidity $\leq 100\%$ ($+40\text{ }^{\circ}\text{C}$).

51 Thoroughly secure the properly packaged alpha sensor inside transportation carrier. The properly packaged alpha sensor shall be located and secured in transportation carrier to ensure its stable position and eliminate the possibility of bumps against the carrier walls.

52 Position of alpha sensor's shipping container shall correspond to warning signs and signatures printed on shipping container.

53 Disposal

54 Dispose of the alpha sensor and its accessories as appropriate.

55 Acceptance certificate

56 The AT2522 Radiation detector (Alpha sensor), serial No. _____, has been manufactured and accepted in accordance with state standard mandatory requirements and effective technical documentation and is recognized as suitable for operation.

Head of QA

Stamp

Signature

Full name

yyyy, mm, dd

57 Packing list

58 The AT2522 Radiation detector (Alpha sensor), serial No. _____, has been packaged by ATOMTEX SPE according to requirements provided in effective technical documentation.

Position

Signature

Full name

yyyy, mm, dd

59 Commissioning certificate

60 The AT2522 Radiation detector (Alpha sensor), serial No. _____, was commissioned at _____.

Date of commissioning

Stamp

Signature

Full name

61 Manufacturer's warranty

62 The manufacturer guarantees that the alpha sensor is in compliance with basic parameters and specifications set forth in the present User's Manual, that the user observes operation, transportation and storage rules and regulations.

63 Warranty period is 18 months from the day of alpha sensor's commissioning or upon expiration of shelf life period.

64 Shelf life is 6 months from the day of alpha sensor's manufacturing.

65 In case of alpha sensor's failure within the warranty period the owner has a right for free repair.

Note: If the alpha sensor and its accessories have been damaged whether mechanically or otherwise due to consumer fault, all claims for quality issues and warranty repair will be rejected.

66 The warranty period shall be extended for the period of claim remedy up to the moment of recommissioning.

67 Warranty and post-warranty service is performed by the manufacturer.

68 Warranty liability expires in the end of warranty period.

69 The manufacturer provides servicing of its products on contract basis.

For **all service questions** please use the following contact information:

Republic of Belarus,

220005, Minsk, Gikalo 5

ATOMTEX SPE

Tel. (+375-17) 290-23-11,

repair@atomtex.com.

70 Claim information

71 If a fault in the alpha sensor has been detected within the warranty period, the User shall complete a damage repair claim on necessity of alpha sensor's repair and its shipping to manufacturer at the following address:

**Republic of Belarus,
220005, Minsk, Gikalo 5
ATOMTEX SPE
Tel./Fax (+375-17) 292-81-42,
E-mail: info@atomtex.com**

72 Claims are not accepted in the following cases:

- The warranty period has expired
- If the User does not observe operation, storage and transportation rules and conditions listed in User's Manual.

73 The description of the fault and all repairs must be filled into the claim registration Table 12.1.

Table 12.1

Notification number and date	Claim summary (the number and date of damage claim)	Measures taken to resolve faults and results of warranty repair	Date of commissioning (the number and date of the allowed claim)	Time for which the warranty period has been extended	Position, last name and signature of warranty repairer

Appendix A

Replacement of the light protection film.

Replace the damaged alpha sensor's light protection films after removing the protection plate in the following order (Figure A.1):

- Remove the clamping bracket, protection grid and the light protection film
- Take off spare films from a special box.

WARNING! DO NOT TOUCH THE PROTECTION SCREEN WHILE REPLACING THE LIGHT PROTECTION FILMS. HANDLE THE LIGHT PROTECTION FILM BY THE FRAME TO WHICH IT IS ATTACHED. STORE SPARE FILMS IN THE SPECIAL BOX ONLY!

- Install a new light protection film into the alpha sensor.
Make sure the metal frame to which the light protection film is glued faces outside
- Reattach the protection grid
- Reattach the clamping bracket
- Perform the alpha sensor's light protection film check according to 43.



Figure A.1