NIGHT VISION
MONOCULAR PN21K

Service manual

CONTENTS

	Page
Introduction	4
1 Description and operation of monocular	5
1.1 Purpose	5
1.2 Specifications	6
1.3 Nomenclature list	8
1.4 Design and operation of monocular	9
2 Proper use	13
2.1 Operational limitations	13
2.2 Monocular usage	14
2.3 List of possible malfunctions	15
3 Maintenance of monocular	17
3.1 Safety measures	17
3.2 Maintenance procedures	17
4 Acceptance certificate	19
Appendix A List of figures	20

INTRODUCTION

The service manual is intended for studying and proper use of night vision monocular PN21K (hereinafter referred to as the monocular). The service manual contains purpose, specifications, information about design and operation of the monocular, list of possible malfunctions.

1 DESCRIPTION AND OPERATION OF MONOCULAR

1.1 Purpose

1.1.1 Night Vision Monocular PN21K is intended for covert surveillance and ground movement, car driving, maps reading, repairing of technical equipment, photo- and video recording as well as for aiming the weapon at the target under night conditions when completed with infrared aiming device.

1.1.2 The monocular is designed to operate within a temperature range from +50 °C to -40 °C and relative humidity up to 95% at temperature + 25 °C.

1.1.3 The monocular is powered by one AA battery 1.5 V.

1.2 Specifications

Table 1

Specifications	1^x	3^x	5^x
Recognition range (under illumination $(3\text{-}5)\times10^{-3}$ lx), m, not less	180	300	500
Magnification, x, not less	1	3	5
Field of view, deg, not less	36	12.5	7.5
Focus range, m	0,25÷∞	10÷∞	15÷∞
Diopter adjustment, D		±3	
Eye relief, mm, not less		30	
Exit pupil, mm, not less		25	

Continuation of the table 1

Specifications	1x	3x	5x
Battery life without IR illuminator using, h:			
at temperature from 0 °C to 50 °C		24	
at temperature from 0°C до -40 °C		2	
Supply voltage, V		1.5	
Overall dimensions (without headmount), mm	150×60×52	238×76×72	260×80×79
Weight of monocular without battery and headmount, g, not more	300	570	730
Weight of monocular with objective lens 1x, battery, headmount, g, not more	850	—	—
Weight of binocular without battery and headmount, g, not more	650	1190	—

1.3 Nomenclature list

1.3.1 The delivery set of the monocular must correspond to the one indicated in table 2.

Table 2

Name	Quantity	Note
Night vision monocular PN21K	1	
Service manual	1	
Optional		
Objective lens 3^x AL5.917.920		
Objective lens 5^x AL5.917.921		
Mounting mechanism on helmet AL6.069.031		
Joining bracket AL6.139.399		
Headmount AL6.838.025		
Headmount AL6.838.026		
Joining ring AL9.141.271÷AL9.141.271-09		For mounting photo, video cameras (see table 3)

Continuation of the table 2

Name	Quantity	Note
Bag for binocular set		
Bag AL6.165.077 (for monocular)		
Bag AL6.165.076 (for monocular with headmount)		
Bag AL6.165.077-01 (for objective lens 3^x)		
Bag AL6.165.077-02 (for objective lens 5^x)		
Bag AL6.165.082 (for binocular with headmount)		

1.4 Design and operation of monocular

1.4.1 The night vision monocular PN21K is an electron-optical device, the operating principle of which is based on conversion (intensifying) of a low light image to visible level. Monocular consists of body 2, eyepiece 7, infrared (IR) illuminator 4 and removable objective lens 1 (Figure A.1). The body 2 includes the image intensifier tube (IIT) and power supply unit with battery compartment. To increase recognition range of objects it is necessary to use one of removable objective lenses 3x or 5x. The eyeshield 8 provides comfortable operation and protects an eye from injury. There is a special seat 6 in the upper part of the body,

intended for mounting and fastening of the monocular on the headmount or the joining bracket. Clear image is provided by focusing the objective lens and diopter adjustment of the eyepiece. IR illuminator is situated in the front part of the monocular and used when illumination of the object is insufficient. The monocular and IR illuminator are switched on by pressing the button 3 on the cover of the body. AA battery 1.5V GOST 28125-89 is placed in the battery compartment which is closed with cover 5. Light filter for objective lens of the monocular provides operation of the device under increased illumination level.

1.4.2 Monocular usage can be expanded with the help of additional set of accessories. The following versions of the devices are available:

– monocular 1^{x};
– monocular 3^{x}**;**
– monocular 5^{x};
– monocular on the headmount;
– monocular on the helmet;
– binocular 1^{x};
– binocular 3^{x}
– binocular 1^{x} on the headmount;
– binocular 1^{x} on the helmet.

1.4.3 The headmount (Figure A.7) is designed for mounting the monocular (binocular) on a head. The headmount design includes the rim, where the bracket for monocular mounting is situated. The monocular is mounted on the headmount seat of dovetail type 6 (Figure A.1) and fastened with the screw 5 (Figure A.7). The bracket with the monocular can be moved in a vertical direction along the vertical rails 2 with the help of the clamps 1 by pressing them from two sides. The bracket with the monocular can be moved in a horizontal direction from one eye to another by loosening screw 4. By pressing the button 3, it is possible to flip up the bracket with the monocular fastened on it. The straps are provided for fixation the headmount on a head.

The length of the straps is regulated individually. Close fit of the headmount to a face is provided with elastic shock absorber. Rest on a chin provides uniform load distribution on the head of observer.

Monocular can be mounted on a helmet in the same way with the help of mounting mechanism (Figure A.8).

1.4.4 Two monoculars, connected together with the special joining bracket (Figure A.3), form a binocular with magnification 1x or 3x depending on the objective lens applied (Figure A.5, Figure A.6).

To assemble a binocular it is necessary to mount monoculars' seats (Figure A.4) in turn on rails of the joining bracket (Figure A.3) up to the stop. Then it is needed to fix them simultaneously with the screw 1 (Figure A.5).

Binocular with magnification 1x, assembled in compliance with the instruction, can be mounted on a headmount (Figure A.9) or a helmet.

1.4.5 For carrying out of night photo and video recording it is needed to set one of the rings AL9.141.271 ... AL9.141.271-09 into the eyepiece with thread M25x0.75, beforehand having taken off the eyeshield. Depending on the type of photo, video camera, the rings have the following joining sizes, see table 3.

Table 3

Designation	Joining size
AL9.141.271	M37×0.75-6g
-01	M40,5×0.5-6g
-02	M49×0.75-6g
-03	M52×0.75-6g
-04	M55×0.75-6g

Continuation of the table 3

Designation	Joining size
AL9.141.271-05	M58×0.75-6g
-06	M72×0.75-6g
-07	M77×0.75-6g
-08	M82×1-6g
-09	M86×1-6g

2 PROPER USE

2.1 Operational limitations

2.1.1 **WARNING! Daylight can damage the switched on monocular.**

It is prohibited to switch on the monocular in a daytime and under high local illumination at night without protective light filter on the objective lens as well as observe brightly illuminated objects in the night time.

2.2 Monocular usage

2.2.1 Remove the cover 5 (Figure A.1).

2.2.2 Insert the battery into the battery compartment in accordance with designation, marked on the monocular body.

2.2.3 Replace the cover 5. In a daytime switch on the monocular only with light filter put on the objective lens 1.

2.2.4 Press the button 3 with duration of less than 1.5 seconds and, observing through the eyepiece 7, assure the screen of image intensifier is shining. Get a sharp image of screen pattern by turning the eyepiece 7. Turn the objective lens 1 to focus on the observed object.

2.2.5 If illumination of the object is insufficient, activate the IR illuminator by repeated pressing the button 3 (with duration of more than 1.5 seconds). When IR illuminator is switched on, the red spot indicator starts shining at the edge of the field of view. Press again the button 3 (with duration of more than 1.5 seconds) to switch off the IR illuminator. The red spot indicator becomes dim.

2.2.6 Brief pressing of the button 3 switches off the monocular (regardless of IR illuminator state).

2.2.7 A red spot starts blinking in the field of view, if the battery is low. This indicates the necessity of replacement of the battery.

2.2.8 The monocular is provided with automatic IIT screen brightness control. If object illumination exceeds the allowed maximum, the brightness of IIT screen automatically declines till its total fading out. Switch off the device by brief press on the button 3 to prevent damage of IIT. Repeated switching on of the monocular is carried out in accordance with ordinary procedure.

2.3 List of possible malfunctions

2.3.1 If any failure is detected during the monocular operation, first check the following:

– whether the battery is inserted in accordance with its polarities;

– whether the battery charge is sufficient;

– whether the contacts of the battery and battery compartment are clean;

– whether the objective lens and the eyepiece are free of dust, dirt, oil, frost and water.

If the malfunctions, listed in the table 4 are not possible to eliminate or other malfunctions are found, appeal to repair shop.

Table 4

Malfunction	Probable ground	Method of elimination
Screen of IIT does not shine	Battery is improperly inserted	Insert the battery in accordance with its polarities
Red spot blinks on the edge of the field of view	Battery is low	Replace battery with new one
Image brightness rises to the maximum and then falls to the extremely low level; or the image has the oscillating brightness that obstructs monocular operation	Light overload	Put light filter on the objective lens
Poor or blurred image quality	External surfaces of eyepiece and objective lens are damp or dirty	Wipe the objective lens or the eyepiece with flannel or cotton wool

3 MAINTENANCE OF MONOCULAR

3.1 Safety measures

3.1.1 The monocular is safe to handle due to its principle of operation, design, used materials and components.

3.1.2 Ensure firm fastening of the monocular onto the headmount or helmet before using.

3.1.3 To avoid pollution of the environment it is recommended to dispose used batteries in the special places, assigned for this purpose.

3.2 Maintenance procedures

3.2.1 Prevent the monocular against impacts, dirt, moisture and temperature shocks during service. After using in damp weather it is necessary to wipe and dry out the monocular. If the monocular has been brought indoors from a frost it is not recommended to open the bag or take it out within one hour. Protect the monocular against sustained direct sunlight exposure. Prevent an invasion of direct sunlight into the monocular objective lens. The monocular should be stored in a

dry heated room at temperature not less than 5°C far from heaters. Remove the battery from battery compartment prior to storing the monocular. The contacts of battery compartment should be free of corrosion signs. Use a clean napkin or a cotton wool wetted with alcohol to clean the optical surfaces.

4 ACCEPTANCE CERTIFICATE

4.1 Night Vision Monocular PN21K , serial No. _____ , is manufactured in accordance with technical documentation and is fit for operation.

Date of issue _____

Signatures _____

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APPENDIX A

List of figures

Figure A.1 – Night vision monocular PN21K. Appearance
Figure A.2 – Monocular with removable objective lenses 3^x, 5^x. Appearance
Figure A.3 – Joining bracket AL6.139.399
Figure A.4 – Joining of two monoculars into binocular with the help of joining bracket
Figure A.5 – General view of 1^x binocular
Figure A.6 – General view of binocular with 3^x objective lenses
Figure A.7 – Placing of monocular on a headmount
Figure A.8 – Placing of monocular on a helmet
Figure A.9 – Mounting of binocular on a headmount with the help of mounting mechanism

1 – objective lens; 2 – body; 3 – button;
4 – IR illuminator; 5 – cover of battery compartment;
6 – seat; 7 – eyepiece; 8 – eyeshield

Figure A.1 – **Night vision monocular PN21K. Appearance**

Figure A.2 – **Monocular with removable objective lenses 3^{x}, 5^{x}. Appearance**

1 – rails for joining of monoculars;
2 – rail for mounting on a headmount

Figure A.3 – **Joining bracket AL6.139.399**

1 – joining bracket; 2 – seats

Figure A.4 – **Joining of two monoculars into binocular with the help of joining bracket**

1 – screw; 2 – joining bracket

Figure A.5 – **General view of 1ˣ binocular**

Figure A.6 – **General view of binocular with 3ˣ objective lenses**

1 – clamps for vertical shift; 2 – vertical rails;
3 –button for flipping up of monocular;
4 – screw for shift of monocular to right or left eye;
5 – screw for mounting of monocular

Figure A.7 – **Placing of monocular on a headmount**

Figure A.8 – **Placing of monocular on a helmet**

Figure A.9 – **Mounting of binocular on a headmount with the help of mounting mechanism**