



**NPZ**

NOVOSIBIRSK INSTRUMENT-MAKING PLANT, JSC

OPTICAL SIGHT

**PO104**

SERVICE MANUAL





# INTRODUCTION

This Operating Manual outlines the intended use, technical data, information about the design and operation principle of the optical sight (further in the text - optical sight) necessary for the proper operation and full use of its technical capabilities, as well as a list of possible malfunctions and methods of their correction using the tools and accessories.

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**OPTICAL SIGHT** PO104

# 1 DESCRIPTION AND OPERATION

## 1.1 Intended use

**1.1.1** The product TPRV.201219.008, full name - “Optical sight PO104”.

**1.1.2** The optical sight is designed for the sight shooting in daylight, twilight conditions using a standard gauge hunting weapon with a Picatinny rail mounting seat.

**1.1.3** The sight is operated at a temperature of minus 50°C to plus 50°C and relative air humidity of up to 98% at a temperature of 25°C.

**1.1.4** Due to the reticle illumination the sight shooting is possible in various conditions of the target environment.

**1.1.5** The sight is powered from CR2032 battery.

## 1.2 Technical specifications (properties)

### 1.2.1 The sight has the following specifications:

Table 1

Parameter	Value
switchable magnification	$(1 \pm 0.1) \times$ or $(4 \pm 0.2) \times$
angular field of sight, degrees, not less than: <ul style="list-style-type: none"><li>• in magnification of <math>1 \times</math></li><li>• in magnification of <math>4 \times</math></li></ul>	$24^\circ$ $6^\circ$
sight resolution limit, no more than: <ul style="list-style-type: none"><li>• in magnification of <math>1 \times</math></li><li>• in magnification of <math>4 \times</math></li></ul>	$20''$ $5''$
exit pupil, mm, not less than: <ul style="list-style-type: none"><li>• in magnification of <math>1 \times</math></li><li>• in magnification of <math>4 \times</math></li></ul>	14 7
eye relief distance from the last eyepiece's surface, mm, not less than	50



range of the eyepiece diopter setting, dptr, not less than	±3
range of bore-sighting, not less than: <ul style="list-style-type: none"> <li>• for windage</li> <li>• for elevation</li> </ul>	±0-10 ±0-10
sight alignment pitch, mil, no more than	0-00.2
rated power of battery, V	3.0
battery	CR2032, 1pce.
sight continuous operation in normal climatic conditions (further in the text - NCC), at least: <ul style="list-style-type: none"> <li>• average level of the reticle brightness h</li> </ul>	100
overall dimensions, mm, no more than	204x76x79
sight weight (with batteries), kg, no more than	0.65

## 1.3 Sight components

1.3.1 Scope of supply of the sight is given in Table 1.

Table 2

Description	Qty	Note
Optical sight PO104	1	
Battery cell CR2032 Duracell, USA	1	
<b>Tools and accessories kit</b>		
Cover	1	On sight
Napkin	1	
Spanner-screwdriver	1	
<b>Packed components</b>		
Box	1	
<b>Operational documents package</b>		
Operating Manual	1	

**1.3.2** Optionally the sight may be completed with shade and flap cover (to protect against glare) and with hood. These accessories are not included in the scope of supply.

## **1.4 Design and operation of the sight**

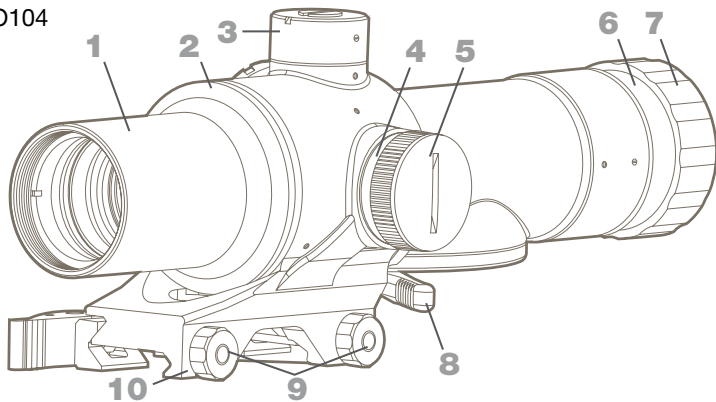
**1.4.1** The sight includes an interchangeable lens 1, casing 2, eyepiece 6 (Figure 1). Lower part of the casing 2 has quick-release clamps to install the sight on the weapon with the upper mounting seat like Picatinny rail – (quick-release clamps 12).

**1.4.2** The sight has the following controls:

- altitude 3 and direction 11 alignment mechanisms (further in the text - mechanisms 3 and 11);
- magnification switch handle 8 (further in the text - handle 8);
- hand-knob for activation and adjustment of the reticle illumination brightness 4 (hereinafter - hand-knob 4);
- hand-knob of the eyepiece diopter setting 7 (hereinafter - hand-knob 7).

**1.4.3** In the left area of the casing 2 there's a battery compartment designed for batteries installation. The product is powered from the battery cell CR2032 4 (Figure 10) installed in the battery compartment with the screw-in cover 5 (Figure 1).

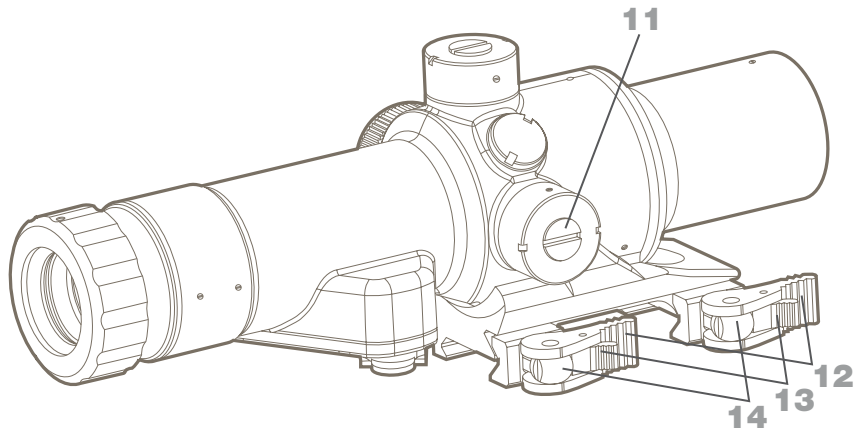
**Figure 1**  
Optical sight PO104



- 1** - lens;
- 2** - casing;
- 3** - elevation alignment mechanism;
- 4** - hand-knob for the reticle illumination activation and brightness adjustment;

- 5** - cover of battery compartment;
- 6** - eyepiece;
- 7** - eyepiece diopter setting hand-knob;

- 8** - magnification switch handle;
- 9** - fixing screws;
- 10** - stop;



**11** - windage alignment mechanism;  
**12** - quick-release clamps;

**13** - latch;  
**14** - axle.

**1.4.4** The sight switching on and off and adjustment of the reticle's illumination brightness is carried out by means of the hand-knob 4 (Figure 1).

The hand-knob 4 has the following positions 0-1-0-2-0-3-0-4-0-5-0-6-0, where 0 position corresponds to the active state of illumination, whereas 1,2,3,4,5,6 positions correspond to the active state with the brightness from minimal to maximal respectively.

**1.4.5** Change in the sight magnification is performed by means of handle 8. The design of the handle 8 excludes any accidental change of magnification during the sight operation.

**1.4.6** Elevation and windage alignment of sight is carried out by mechanisms 3 and 11, respectively. The point of impact (strike) is shifted by 2 cm when the target is 100 m away when the mechanisms are rotated until one click.

**1.4.7** The sight is mounted on the gun with its protruding stop 10 (Figure 1) into the slot of Picatinny rail and secured with two quick-release clamps 12. The stop 10 provides secure mounting of the sight on the gun and excludes its offset relative to the gun axis.

**1.4.7.1** Press the latch 13, turn the quick-release clamps 12;

**1.4.7.2** Mount the sight onto the Picatinny rail;

**1.4.7.3** Turn the quick-release clamp 12 until click of the latch 13;

**1.4.7.4** Check secure attachment of the sight on the rail by swinging the raffle.

To ensure more secure attachment of the sight, the following is required:

**1.4.7.5** Press on the latch 13, turn the quick-release clamp 12 on the sight mounted on the sight rail;

**1.4.7.6** Disengage the fixing screws 9 having pressed on the axle 14;

**1.4.7.7** Rotate the fixing screws 9 and then turn the handle to reach the required sight fixation on the sight rail.

**1.4.8** Cover 1 (Figure 10) is designed for protection of the eyepiece 6 (Figure 1) and lens 1 from any damage and atmospheric precipitations.

**1.4.9** The sight may have one of the three types of reticle: “Hunting cross”, “Fast Cross” or BDC (with a ballistic reticle). The sight’s fields of view with reticles, as well as dimensions shown in the Figures (shown in the mil distances, further in the text - mils) are given in Figures 2, 3, 4, 5, 6, 7.

**1.4.9.1** “Hunting cross” fields of view with magnifications of 1× and 4× are given in Figures 2 and 3, respectively.

The “hunting cross” reticle contains:

- aiming point located in the center of the cross-hair – “B” (Figure 2).
- circle “Б” - designed to facilitate finding of the aiming point;
- “Г” and “Д” marks - designed for the sight leveling (“Г” are seen only in magnification of 1×);
- “А” shows the sizes of the sight’s field of view in magnification of 4×.

**1.4.9.2** “Fast Cross” reticle fields of view with magnifications of 1× and 4× are given in Figures 4 and 5.

“Fast Cross” reticle contains:

- aiming point formed by a gap in the cross-hair – “B”;
- angle measuring scale consists of 12 circles “A” and 16 points “Б” (Figure 5);
- “A” circles correspond to the distances 0-10, 0-20, 0-30; (10,20,30 mil)
- “Б” points correspond to the distances 0-05,0-15,0-25,0-35; (5,15,25,35 mil)
- “Г” circle with gaps is intended to facilitate the recognition of the aiming point;
- conical marks are designed for leveling and finding the aiming point for the 1× magnification.

**1.4.9.3** The field of view with ballistic reticle (BDC) for magnifications of 1× and 4× is given in Figures 7 and 6, respectively.

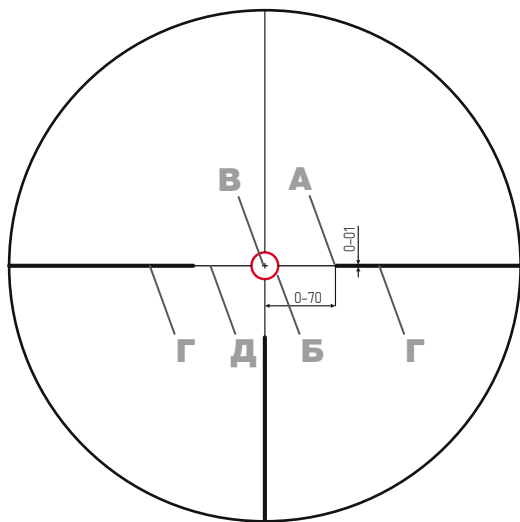


The ballistic reticle is designed for determining the distance to object (target), swift adjustment of the range and wind corrections.

The ballistic reticle contains:

- elevation scale, consisting of a number of points corresponding to the given gauge bullet flight trajectory from 300 to 800 m. For a 100 m range adjustment fire with the cross “Г” (Figure 6) the lower edge of the cross-hair corresponds to the bullet impact point at a distance of 300 m. The points located below correspond to the impact points at distances from 400 to 800 m;
- the windage scales for 5 and 10 m/s wind corrections, consisting of a set of points located on the left and right from the vertical scale;
- 300 - 800 m range-finding scale for a 1m vertical size target. The sizes of horizontal marks determine the 0.5 m target on the corresponding distances;
- central circle “Д” with gaps intended to find the central aiming point as formed by the gap in “Г” cross-hair.
- aiming sign looking as a “upturned chevron”. Horizontal lines of the chevron are intended for leveling the sight. The chevron is required to provide maximally swift guidance of the shooter’s sight to the central circle “Д” when magnification is 1×.

Examples of determining the range to a 1 m target using range-finding scale of the ballistic reticle (BDC) are shown in Figure 8.



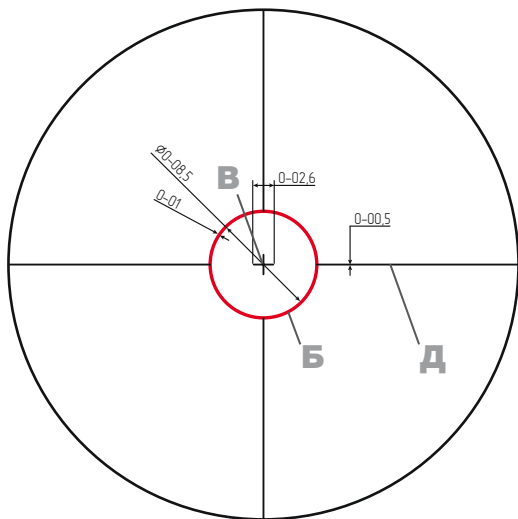
**Figure 2**

Sight's field of view with a "Hunting cross" reticle and magnification of 1x

Б" circle - designed for easy finding of the aiming point "B";

"B" - aiming point;

"Г", "Д" marks are intended for leveling.



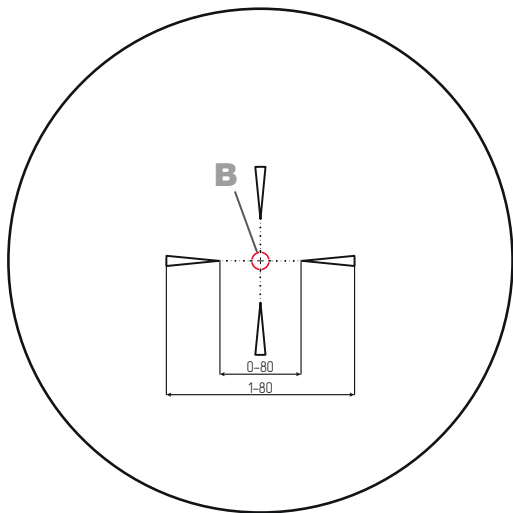
**Figure 3**

Sight's field of view with a  
“Hunting cross” reticle and  
magnification of 4×

“B” – aiming point;

“Д” line - intended for leveling  
the sight;

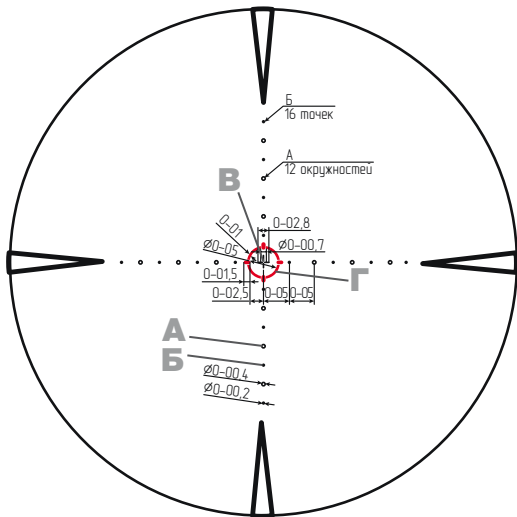
“Б” - intended for easy finding of  
“B” aiming point.



**Figure 4**

Sight's field of view with a "Fast cross" reticle and magnification of 1×

"B" - Aiming point. Dimensions are given in the mils.



**Figure 5**

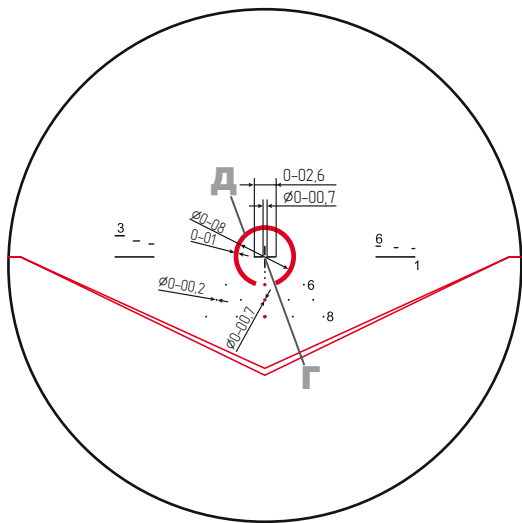
Sight's field of view with a "Fast cross" reticle and magnification of 4×

"Б" - aiming point;

"Г" circle on a 100 m range corresponds to the dimension 0.5 m;

"А" circles correspond to the distances 0-10,0-20,0-30;

"Б" points correspond to the distances 0-05, 0-15, 0-25, 0-35.

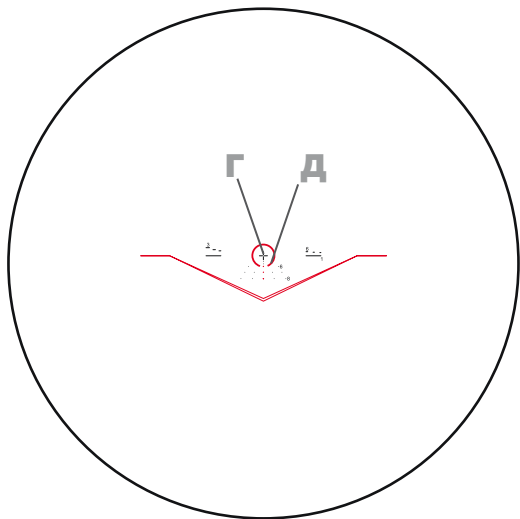


**Figure 6**

Sight's field of view with a ballistic reticle (BDC) and magnification of 4×

“Г” - aiming point;

“Д” - circle with gaps is intended to facilitate the recognition of the aiming point “Г”.

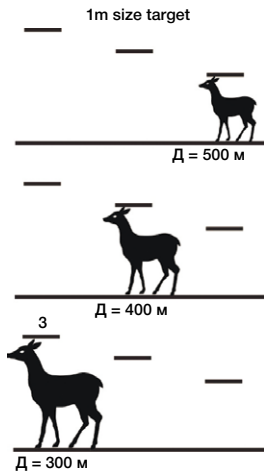


**Figure 7**

Sight's field of view with a ballistic reticle (BDC) and magnification of 1×

“Г” - aiming point;

“Д” - circle with gaps is intended to facilitate finding of the aiming point “Г”.



**Figure 8**

Examples of determining the range to a 1 m target using range-finding scale of the ballistic reticle (BDC)



**Figure 9**

Target No.4  
GOST R 52909-2008



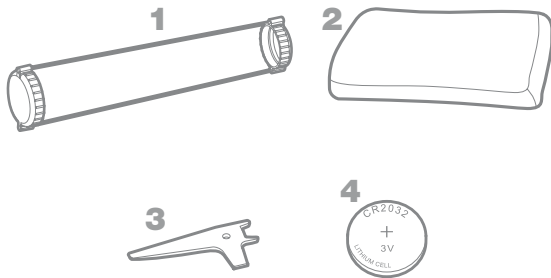
## 1.5 Measuring instruments, tools and accessories

**1.5.1** The list of tools and accessories (cover, spanner-screwdriver, napkin, box), required for operation and maintenance of the sight are given in Table 2. The guides for using the tools and accessories are provided in the appropriate sections of the Manual.

### Figure 10

Tools and accessories kit

- 1** - cover;
- 2** - napkin;
- 3** - spanner-screwdriver;
- 4** - battery CR2032.



## 1.6 Marking and sealing

**1.6.1** PO104 shall have the following marking on its casing TPRV.713346.002:

- code - “PO104”;
- manufacturer’s brand;
- serial number;
- Magnification “4x” and “1x”;
- direction of rotation of the diopter setting hand-knob “+|-”.

Marking on the alignment mechanisms TPRV.301311.001 and TPRV.301311.001-01:

- “2cm/100m”;
- “В-СТП-Н”; “П-СТП-Л”.

Marking on casing TPRV.713346.002 indicating the reticle illumination switch positions: “0”, “1”, “0”, “2”, “0”, “3”, “0”, “4”, “0”, “5”, “0”, “6”, “0”.

**1.6.2** The box has the following marking which contains:

- code “ΠΟ104” of the product;
- technical specifications
- description
- manufacturer’s brand;
- manipulation signs 1, 3, 11 as per GOST 14192-96;
- WEIGHT, kg;
- NET, kg.

## **1.7 Packing**

**1.7.1** As shown in the Table 1 the sight complete with all its components shall be placed separately into the hoods made of PE film Zirast, MM, sleeve 0.1 TU 2245-001-29424554-2002. The Operating Manual shall be packed into PE film Ts, sleeve 0.1, 1 grade, GOST 10354-82. Free ends of the hoods shall be sealed as per GOST 9.014-78. The complete device packed in hoods shall be placed in the box.

**1.7.2** The box is designed for handling, storage and transportation of the device.

## 2 OPERATING LIMITATIONS

2.1 Prior to using the sight read attentively the Operating Manual.

2.2 **ATTENTION!** PROTECT THE SIGHT AGAINST ANY SHOCKS AND DAMAGE.



**ATTENTION!** TO PROTECT THE SIGHT LENS AGAINST PRECIPITATION DURING THE USE AND TRANSPORTATION OF THE SIGHT MOUNTED ON GUN USE DEDICATED COVER.

**ATTENTION!** TIMELY REPLACE THE BATTERY CELL.

**NEVER** WORK WITH THE SIGHT IMPROPERLY SECURED ON THE GUN.

**ATTENTION!** NEVER USE THE TOOL TO FIX THE QUICK-RELEASE BRACKET.

## **3 PREPARING THE SIGHT FOR USE**

### **3.1 Mounting the sight on a gun**

**3.1.1** Mount the sight on a gun as follows:

- unscrew the cover 5 of the battery compartment (Figure 1);
- install the battery CR2032 4 (Figure 10);
- screw in the cover 5 of the battery compartment (Figure 1);
- mount the sight with its stop 10 into the slot of Picatinny rail;
- fix the quick-release clamps 12, having secured the sight position on the gun;

### **3.2 Bore-sighting the installed gun**

**3.2.1** Perform the bore-sighting on a gun as follows:

- install the sight on the gun as described in 3.1;
- set the magnification 4×, (Figure 1), moving the handle 8 (Figure 1);
- install the chest-level target No.4 as per GOST R 52909-2008 on a distance of 100 m away. The target is a sheet of paper with a green color silhouette on a 50x50 cm white background with white circles. The 10th circle is 100 mm in diameter, each next circle has a diameter by 100 mm larger than the previous one.

The gun comes on the aim at the center of the target (further in the text - aiming point) (Figure 9) (the target is not included into the sight's scope of supply);

- aim at the aiming point thoroughly and monotonously and make four single shots;
- on the target define the accuracy of the gun with the sight installed on it, location of the mean impact point (further in the text - MIP) and MIP offset from the aiming point.
- if MIP doesn't coincide with the aiming point by more than 2 cm, perform the bore-sighting using the spanner-wrench 3 (Figure 10) rotating the mechanisms 3 and 11 (Figure 1). It should be taken into account that the mechanisms' turn to one click corresponds to MIP offset by 2 cm on a distance of 100 m.

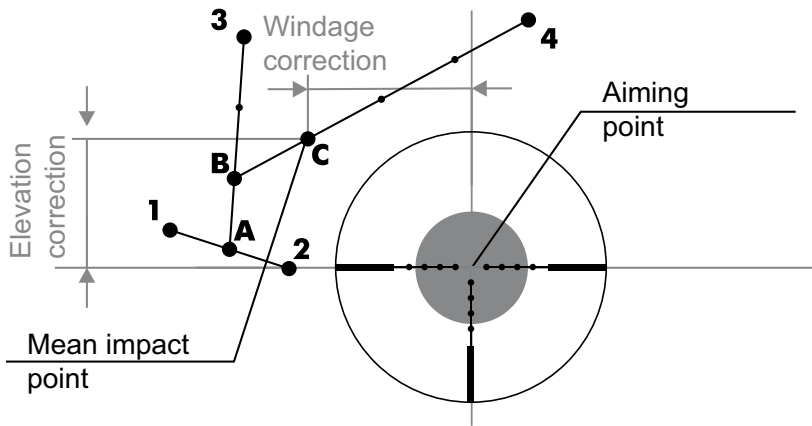
Windage and elevation offsets of mechanisms 3 and 11 (Figure 1):

- if MIP is higher than the aiming point, then, turn the mechanism 3 counterclockwise, in "H" direction;
- if MIP is lower than the aiming point, then, turn the mechanism 3 clockwise, in "B" direction;

- if MIP is located left of the aiming point, then, turn the mechanism 11 counterclockwise, in “П” direction;
- if MIP is located right of the aiming point, then, turn the mechanism 11 clockwise, in “Л” direction;
- if there’s no hit on the target install the target on a 25 m distance and repeat the steps as described above. It should be taken into account that the mechanisms’ turn to one click corresponds to MIP offset by 0.5 cm on a distance of 25 m;
- check the correctness of bore-sighting by repeating the shooting on a 100 m range;
- perform the bore-sighting until MIP doesn’t coincide with the aiming point.

To find the MIP (Figure 11):

- connect the two adjacent bullet holes with a straight line (1,2);
- divide the obtained straight section in two parts, designate with point “A” and from the point “A” draw a straight line to the third bullet hole (3);
- divide the obtained straight section in 3 equal parts, and from the point “B”, closest to the point “A”, draw a straight line to the fourth bullet hole (4);
- divide the obtained straight section in 4 equal parts;
- the obtained “C” point, closest to the “B” point, will be the resulting MIP.



**Figure 11**  
Scheme for MIP finding



## 4 INTENDED USE

### 4.1 Operating procedure

**4.1.1** Set the magnification 1× or 4×, moving the handle 8 (Figure 1). Rotate the handle 4 (Figure 1), turn on the illumination of reticle and adjust the brightness, set the sharp image by turning the hand-knob 7.

**4.1.2** Depending on the type of reticle in the sight, determine the range to target, if possible.

**4.1.3** Aim the gun onto the sight mark corresponding to the measured range (if there's a ballistic reticle in the sight), or make appropriate corrections using mechanisms 3 and 11 (Figure 1) and fire the gun.

**4.1.4** If any malfunctions are detected in operation of the device, check the following:

- fixing of the sight on the gun;
- whether the objective lens and eyepiece are free of dust, dirt, grease, frost and water;
- whether the sight power is on;
- whether the battery charge is sufficient;
- whether the battery 4 is inserted correctly in the sight (Figure 10).

#### 4.1.5 Possible malfunctions during the use of the sight are given in Table 3.

Table 3

<b>Description of malfunction</b>	<b>Probable cause</b>	<b>Remedy actions</b>
When rotating the hand-knob 4 (Figure 1) the sight's reticle illumination cannot be activated	Lowering the battery voltage below the ad-missible level	Replace the battery, for this purpose: <ul style="list-style-type: none"><li>• unscrew the cover 5 of battery compartment (Figure 1);</li><li>• replace the battery 4 (Figure 10);</li><li>• place back the cover 5 of the battery compartment (Figure 1).</li></ul>
When rotating the hand-knob 4 (Figure 1) the brightness of the sight's illumination cannot be adjusted	Lowering the battery voltage below the admissible level	Replace the battery, for this purpose: <ul style="list-style-type: none"><li>• unscrew the cover 5 of battery compartment (Figure 1);</li><li>• replace the battery 4 (Figure 10);</li><li>• place back the cover 5 of the battery compartment (Figure 1).</li></ul>
Image of terrain is fuzzy or poor	Misting or dirt on the external surfaces of the lens, eyepiece	Use napkin 2 (Figure 10) to wipe the exterior surfaces of the lens and the eyepiece

## **4.2 Bringing the sight from its working position to the travelling position**

### **4.2.1** Bringing the sight from its working position to the travelling position:

- release the quick release-clamps 12 (Figure 1)
- remove the sight from the gun;
- unscrew the cover 5 of the battery compartment, take the battery from the battery compartment 4 (Figure 10), screw in the cover of the battery compartment 5 (Figure 1);
- wipe the sight with napkin 2 (Figure 10);
- use cap 1 to cover the lens and the eyepiece;
- place into the box.

## **5 MAINTENANCE**

### **5.1 General Instructions**

**5.1.1** Being in operation the sight shall be kept clean, protected from moisture and dirt. The external surfaces of the optical parts shall always be clean.

To clean the external surfaces of the optical parts and contact areas of the sight and battery use the bleached felt, surgical moistur-absorbing cotton, alcohol-ester

mixture: 10% rectified cellulosic ethanol, high grade, and 90% ether for anaesthesia EN.

Minor contaminations like dust from the external surfaces of optical parts shall be removed with a cotton wool.

In order to remove any grease spots from the glass surface wipe it with clean felt or cotton wool. In case of severe dirt remove the contamination using solvent (alcohol, ester or their mixture) as follows::

- wrap some cotton on the end of a wooden stick;
- soak the cotton in the solvent, slightly shake to remove the rest of the solvent from the cotton;
- wipe the glass several time with soaked cotton, avoiding to touch the holder;
- replace the cotton and use dry cotton to wipe the surface in circular motions from the center to the edge, finish the cleaning.

Avoid the solvent being entrapped under the holder of the sight, because the sealing compound may dissolve in this way and the sight may loose its air-tightness.

Similarly, remove the oxidized spots from the contact areas of the sight and battery.

## 6 STORAGE

**6.1** Keep the sight in the box. It is allowed to store the sight together with the gun.

**6.2** The sight placed in box may be stored in an unheated dry room and under the shelter. The battery storage temperature is from 10° to 25°C.



**NEVER** PLACE THE SIGHT ON THE FLOOR, NEAR THE WINDOW, IN THE DIRECT SUNLIGHT.

**NEVER** STORE THE SIGHT IN ROOMS WHERE CHEMICALS, ACIDS, ALKALI ARE STORED.

## 7 TRANSPORTATION

**7.1** The sight in the box may be transported by any kind of transport to any distances without limits.

The boxes with packed sights shall be placed on the vehicles with the boxes' covers upwards and secured in such a way as to exclude their collision and displacement.



**NEVER** THROW, TURN OR TILT THE BOX, AND NEVER HOLD IT UNDER POURING RAIN.

## 8 ACCEPTANCE CERTIFICATE

The sight, serial number \_\_\_\_\_ was manufactured and accepted in accordance with mandatory requirements of state standards, applicable technical documentation and was found suitable for operation.

Type of reticle:

"Hunting Cross"                       "Fast Cross"                       Ballistic reticle (BDC)

Gauge \_\_\_\_\_

Date of manufacture \_\_\_\_\_  
(date, month, year)

QCD representative \_\_\_\_\_

Stamp here

---

Filled in the place of purchase

Date of purchase \_\_\_\_\_  
(date, month, year)

Seller \_\_\_\_\_  
(signature or stamp)

Shop stamp

## 9 MANUFACTURER'S WARRANTY

The manufacturer hereby warrants that this sight is fully compliant with the technical specifications provided the operation rules described in this Manual are observed.

The device warranty operation period is 24 months since the date it was sold to the Buyer, but no more than 36 months since the manufacturer's date.

The warranty doesn't cover the following sights:

- with mechanical damage;
- without Operating Manual;
- without official servicing;
- used with violation of the operation rules mentioned in this Manual.

The sight may be repaired under warranty at the following locations:

Joint-stock company

Novosibirsk Instrument-making plant (AO NPZ)

179/2, Novosibirsk, D. Kovalchuk str., 630049,

Tel.: +7 (383) 226-27-89      +7 (383) 216-08-46

Fax: +7 (383) 220-97-06      +7 (383) 236-77-27

E-Mail reception@ponpz.ru      npzkanc@ponpz.ru



# NOTES

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[www.npzoptics.com](http://www.npzoptics.com)