

PN22K DAY-NIGHT SIGHT

Service Manual

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Introduction

The Service Manual is intended for studying the design and operating rules of the PN22K day-night sight.

The Service Manual contains purpose, specifications, information on design and operation of the PN22K day-night sight required for proper and full use of its technical capability as well as the list of possible failures and methods of their elimination.

CAUTION! In the day time and in the twilight do not switch the sight to the Night mode without the light filter cap being put on the night channel objective.

Do not direct the sight with switched on night channel at glowing objects such as the sun, welding etc., and never observe such glowing objects as direct light of headlights, fire flame etc at night even with the light filter cap being put on.

Do not direct the sight with switched on IR illuminator at mirror-reflecting surfaces when the night channel is on.

1 DESCRIPTION AND OPERATION

1.1 Purpose

1.1.1 The combined PN22K day-night sight (hereinafter referred to as the “sight”) is designed to perform aimed firing at any time of the day with hunting weapon having side or upper mounting seats of dovetail type, and weapon having upper mounting seat of “Picatinny” rail (“Weaver rail”) type as well as transitional rail so that the customer can mount the sight on the weapon himself.

1.1.2 The sight is equipped with an image intensifier tube (hereinafter referred to as IIT) of 2⁺ or 3rd generation providing recognition range of 350 m or 450 m respectively. The sight with 2⁺ generation IIT is intended for operation under natural night illumination conditions of $(3-5) \times 10^{-3}$ lux, i. e. in the starlight without clouds and moonlight. The sight with the 3rd generation IIT is designed for operation at illumination of less than $(3-5) \times 10^{-3}$ lux in the presence of clouds and with no moon.

The built-in IR illuminator allows performing observation and aimed firing under low illumination conditions and in the full darkness.

The day channel allows operating the sight in the day time.

1.1.3 The sight is operated within the ambient temperature range from plus 40 °C to minus 40 °C and with relative humidity of up to 98 % at temperature of 25 °C.

1.2 Specifications

1.2.1 The sight and IIT main specifications shall correspond to those specified in Table 1.

Table 1

Specifications	Value
Recognition range, m:	
– with the 2 ⁺ generation IIT	350
– with the 3 generation IIT	450
Magnification, x	3
Field of view	11–12 °

Continuation of the table 1

Specifications	Value
Aperture ratio:	
– of the day channel	1:3.8
– of the night channel	1:1.6
Eye relief, mm	50
Adjustment pitch, cm/100 m	1
Adjustment range, cm/100 m	±80
Diopter adjustment, D	from minus 4 to plus 4
Supply voltage, V	1.2–1.5
Time of continuous operation of the device without battery replacement:	
– without illumination	16
– with illumination	3.5

1.2.2 The sight withstands a load of shot impact when firing with hunting rifled weapon with calibers of 5.6×39, 7.62×39, 7.62×54R, .223Rem., .308Win., .30-06. with different types of mounting seats.

1.2.3 Variable specifications for different modifications of the PN22K sight depending on the bracket are given in Table 2.

Table 2

Sight modifications	Overall dimensions, mm, max	Weight, kg, max	Figure	Note
PN22K	321.5×87×114.5	1.3	A.1	With transitional rail
PN22K-1	321.5×87×201	1.52	A.3	"Tiger", "Tiger-9", "Saiga-5.6S", "Saiga-20K", "Vepr"
PN22K-2	321.5×87×137.5	1.42	A.4	"Los-7", "Bars-4", "Bars-4-1"
PN22K-3	321.5×87×131	1.45	A.5	Weapon with "Picatinny" rail (Weaver rail)

1.2.4 The sight provides detection and recognition of targets as well as aimed firing at distances of direct shot under natural night illumination conditions, in the complete darkness and in the day time.

Recognition range ensured by the sight depends on natural night illumination, air transparency and contrast between the target and the background. Recognition range increases at higher illumination level, at moonlight night, upon availability of external lighting and if a target is located against light background (sand, snow). Under low illumination level, low cloud cover, decreased air transparency and a target being located against dark background (tillage, forest etc.) recognition range decreases.

1.3 Complete Set

1.3.1 The delivery set is to correspond to that specified in Table 3.

Table 3

Description	Quantity	Note
PN22K sight	1	
Bracket*	1	For self installation by the user
Nut*	1	
Screws M6×12	6	
Screws M6×25*	6	For PN22K-1
Rail*	1	
Spanner (S=2 mm)	1	
Spanner (S=4 mm)	1	
Spanner-screwdriver	1	
Napkin	1	
Bag*	1	
Case*	1	
Service Manual	1	
*Delivered according to the contract terms.		

1.4 Design and Operation

1.4.1 The sight consists of day 5 (Figure A.1) and night 18 channels and illumination channel combined with the day one.

The night channel consists of an objective 2, IIT and an eyepiece. The eyepiece is a common element for both night and day channels.

The day channel consists of an objective 4 and a rhombic prism providing channel switching. When the prism turns, IIT shuts off with the help of a limit switch and connection of objective 4 with eyepiece of the sight. The illumination channel and the day channel have common optical system and the illuminator serving to illuminate a target at night.

The channels location to one another is parallel.

The set of brackets allows the sight mounting nearly on all types of hunting weapon.





1.4.2 The sight is powered by 1 battery of AA type. Storage battery of AA type can be used.

1.4.3 The objective 2 is fitted with the light filter cap 1, which protects the objective against mechanical damages and provides the night channel operation in the day time and at dusk. At night, the cap 1 on rubber loops is flipped up.

When switching on the day channel or the illuminator, the protective cap 3 of the objective 4 is to be flipped up.

1.4.4 Reaching the sharp image of the reticle is performed by turning a knurling ring 12 located on the eyepiece.

1.4.5 The rubber eyeshield 11 on the eyepiece ensures comfortable sight operation and protects the eye against damage.

1.4.6 The side of the channel switching handwheel 7 with marks  and . When these letters are aligned with an angle on the body, night  or day  channel switches on respectively.

1.4.7 The handwheel position 15, corresponding to the night channel IIT switching on, is marked with a white dot; "off" position is marked with a red dot. Both positions are fixed (with a click). In 3–4 s after IIT switching on the eyepiece's field of view is to shine in green with black aiming marks of the reticle. The handwheel 15 is also used to switch on the reticle illumination with a red LED and to adjust brightness of the reticle marks in the sight's field of view. Brightness of the marks increases when turning the handwheel 15 clockwise. If the reticle blinks uninterruptedly, the power supply is discharged.

The IR illuminator switches on by setting the handwheel 14 to position marked with a white dot; when turning the handwheel 14 clockwise, brightness

of the observed object (target) illumination increases, while when turning the handwheel 14 counterclockwise, it decreases; when the handwheel 14 is in position marked with a red dot, the illuminator is off.

1.4.8 The sight alignment in direction L-R (left-right) and in height U-D (Up-Down) is performed by turning the handwheels 10 and 8 (Figure A.1) respectively.

1.4.9 A connecting pipe 9 is used to blow the sight with nitrogen at the manufacturing works.

1.4.10 Polarity to insert a battery is indicated on the cap 16 of the sight.

1.4.11 A bracket 1 (Figure A.2) with side mounting is used to mount the PN22K-1 sight on "Tiger", "Tiger-9", "Saiga-5.6S", "Saiga-20K" and "Vepr" carbines. To mount the sight on a weapon with side mounting seat, perform as follows:

- turn back the handle 5;
- place the sight from the side of a rifle butt and move it up along the mounting rail of a weapon 2 until the bracket 1 stops at the rail 2;
- push the handle 5 forward up to the stop, at that it should snap to the bracket 1;
- ensure secure fastening of the sight on the weapon.

Adjust the sight holding power as follows:

- remove the sight from the weapon;

- shift the latch 3 having released it from under the screw head 4;
- rearrange the handle 5 by the number of teeth providing secure fastening which excludes the sight swaying on the weapon;
- set the latch 3 in its place;
- ensure secure fastening of the sight on the weapon once more.

For using the sight on weapons of Saiga or Verp type it is required to additionally install the vail from the complete set between transition rail 13 (Figure A.1) and bracket 1 and fix by screws M6×25 (Figure A.2).

1.4.12 The bracket 1 (Figure A.4) is used to mount the PN22K-2 sight on “Los-7”, “Los-7-1”, “Bars-4” and “Bars-4-1” carbines with the upper mounting seat of dovetail type. The bracket 1 (Figure A.5) is used to mount the PN22K-3 sight on weapon with the top mounting seat of “Picatinny” rail (“Weaver rail”) type.

For this purpose it is required to set the sight on a weapon’s rail, move it up to the stop and tighten the nuts 2 with the spanner-screwdriver.

1.4.13 The transitional rail 18 (Figure A.1) allows to adapt the PN22K sight to the specific model of weapon. To perform this, contact the manufacturer or specialized gunsmith’s shop.

1.5 Measuring Tools, Tools and Accessories

1.5.1 The sight's complete set includes three spanners. A spanner-screwdriver is used to tighten the nuts 2 (Figures A.4, A.5) when mounting the sights PN22K-2 and PN22K-3 on the weapon.

A hex-nut spanner with section $S=2$ mm serves to screw off and down the retention screws in the adjusting mechanisms.

A hex-nut spanner with section $S=4$ mm serves to screw off and down the screws fastening the brackets to the sight.

1.5.2 The napkin is used to wipe external surfaces of optical parts and to clean battery compartment contacts.

1.5.3 The case is used to stow the complete set of the sight during transportation and storage.


1.5.4 The bag is used for the sight packing.

2 INTENDED USE

2.1 Operating Limitations

2.1.1 To ensure non-failure operation of the sight in service **it is banned:**

- to switch on the night channel in the day time and at dusk without the light filter cap 1 (Figure A.1) being put on the objective 2;
- to direct the sight at bright light sources (fire flame, glowing projectors, headlights etc.) at night even with the light filter cap 1 being put on;
- to direct the sight with switched on IR illuminator at mirror surfaces when the night channel is on.
- to cause mechanical damage to the sight.

2.1.2 When any glowing objects appear in the field of view of the sight's night channel, switch it on by setting the handwheel 7 to position  or the handwheel 15 to the position marked with a red dot.

2.1.3 On completion of the operation the sight should be switched off.

2.1.4 The IR illuminator shall be switched on for a short time.

Observation with the sight at night as well as target search shall be performed at minimum brightness of the reticle aiming marks.

2.1.5 Prevent short circuit between the power source and metal objects.

Upon operation completion it is recommended to remove the battery from the sight and keep it in a pocket of clothes until start of operation in order to avoid unintended switching on of the sight. This measure will also help to extend the battery life when ambient temperature is below zero.

2.1.6 Do not touch the optical parts with your hands. Remove dust, dirt and moisture from optical parts' surfaces with a napkin.



2.2 Preparation and Operation Procedure

2.2.1 To bring the sight into operating position and to test its performance, carry out as follows:

- fasten the sight on the weapon.

The sight swaying on the weapon or slipping is not allowed when firing.


- put the light filter cap 1 (Figure A.1) on the objective 2 if it was removed earlier;

- screw out the cap 17 and insert the battery according to the indicated polarity;
- screw the cap 17 tightly;
- set the handwheel 7 to required position  or .
- switch on the sight;
- by turning the ring 12 reach the required contrast of the reticle aiming marks in the field of view of the sight eyepiece.

Aiming is performed by the top of the central aiming mark (angle).

2.2.2 The weapon with the sight must be zeroed in.

Zeroing in is performed through the day channel in the following order:

- set the handwheel 7 to  position;
- place a target with dimensions 1x1 m at a distance of 100 m;
- fire 3–4 shots from the rest while carefully and evenly aiming with the top of the aiming mark (angle) in the center of a black circle of the target;
- determine mean point of impact (MPI) by holes in the target.

2.2.3 If MPI doesn't coincide with the aiming point (center of the target black circle), then adjust the sight as follows:

- loosen three bottom retention screws 1 (Figure A.3) using the S2 spanner from the sight set;
- while turning the handwheels 2 of **U-D** vertical correction and **R-L** horizontal correction, align MPI with the aiming point. At that one should consider that when turning the adjustment handwheel by one division (1 click), MPI shifting on the target, located at a distance of 100 m, is 1 cm.

Figure A.6 shows that three holes MPI is located 24 cm higher than the aiming point and 18 cm on the left from it. To shift MPI to the target center, turn the handwheel of vertical corrections down by 24 clicks (**D**), and the handwheel of horizontal corrections – by 18 clicks right (**R**).

While holding the adjustment handwheel 2, match the scale zero marking 3 with the index 4 and tighten the screws 1 (3 pcs) using the S2 spanner from the sight set.

Do not perform any corrections in the sight after zeroing in.

2.2.4 Considering the fact, that the day and night channels are spaced 4 cm apart by height, at night channel aiming the mean point of impact (MPI) will be shifted up by 4 cm compared with MPI obtained at day channel aiming.

To reduce or exclude the parallax between channels, it is recommended to do the following:

a) Split the shift error by putting down MPI obtained at day channel aiming by 2 cm lower than the aiming point.

For this purpose:

- loosen three retention screws 1 using the S2 spanner from the sight set;
- turn the **U-D** handwheel of vertical corrections 2 down (**D**) by two divisions (2 clicks);
- while holding the adjusting handwheel 2, match the scale zero marking 3 with the index 4 and tighten the screws 1 (3 pcs) using the S2 spanner from the sight set.

In this case when aiming with the day channel, MPI will be located lower than the aiming point by 2 cm, and when aiming from the night channel, it will be 2 cm higher than the aiming point.

b) Night channel aiming can be corrected by turning the handwheel of vertical corrections 8 (Figure A.1) clockwise down (**D**) by four divisions of the scale 3 (Figure A.3).

c) For more precise correction, fire 3–4 shots while aiming with the night channel and define practical difference between day and night channel MPI. When firing with the night channel, set real correction value using the handwheel 2.

2.2.5 Structurally, adjustments enable to set angles of aiming at a distance of 100, 200, 300 or 400 m. The adjustment mechanism scale is graduated in centimeters and mils of distance. One division value of the scale corresponds to 1 cm/100 m or 0-00.1 (0.1 of mil of distance).

To define angles of aiming in mils (mils of distance), use ballistic calculator.

3 MAINTENANCE

3.1 General Instructions

3.1.1 Under operation, keep the sight clean and protect it against dust and dirt. Optical parts' surfaces must always be clean.

To ensure non-failure operation of the sight, in service **it is banned:**

– to disassemble the sight;

– set the handwheel 7 (Figure A.1) to ● (night mode) position and the handwheel 15 to the position marked with a white dot in the day time and at dusk without the light filter cap 1 being put on the objective 2;

- to use other types of power supply;
- to store the sight with installed battery.

During the sight maintenance, perform the following actions:

- wipe the sight to remove dust, dirt and moisture;
- check power source contacts condition;
- use a clean napkin to remove fatty contamination from the glass surface, in case of severe contamination clean it using alcohol.

3.2 Safety Measures

3.2.1 Ensure secure fastening of the sight on the weapon to avoid injuries during operation.

3.2.2 Prevent excessive pressing of the eyeshield when operating the sight. To avoid eye injury, the eyeshield can be pressed only until a well-defined boundary of the sight's field of view appears.

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

4 TROUBLESHOOTING

4.1 If failures in the sight operation have been detected it is required to check:

- the sight fastening on a weapon;
- if the light filter cap 1 is put on the objective 2;
- if there is no dust, dirt, oil, frost or water on the objective and the eyepiece;
- if the battery charge is sufficient;
- if the sight is powered on;
- correct installation of the battery in the sight.

Draw special attention to the cleanness of battery contacts.

4.2 Both potential consequences of failures and damages and instructions on their elimination are given in Table 4.

Table 4 – List of potential failures

Failure	Probable cause	Method of elimination
IIT screen shining is low or absent	1 The battery is discharged 2 The battery is installed incorrectly 3 IIT is damaged	1 Replace the battery with a serviceable one 2 Insert the battery correctly according to polarity 3 Send the sight to repair shop
Brightness of image rises to the maximum and then falls to the extremely low level; or the image has oscillating brightness that obstructs sight operation	Light overload	Put the light filter cap on the night channel objective 2
Scene image is poor and smeared	Formation of dew or dirtying on the external surfaces of the objective and the eyepiece	Wipe external surfaces of the eyepiece and the objective with a napkin

Table 4 (continued)

Failure	Probable cause	Method of elimination
<p>Scene image is poor and smeared. There are flashes and blinks in the night channel's field of view of the sight</p>	<p>Formation of dew on the external surfaces of the objective, the eyepiece and photocathode of IIT</p>	<p>Send the sight to the repair shop to dry and seal</p>
<p>There are dark spots in the night channel's field of view that obstructs sight operation</p>	<p>IIT is damaged by exposure to point-light sources. Flaking of the photocathode or the screen of IIT</p>	<p>Send the sight to repair shop</p>
<p>Low illumination of the reticle or full absence of illumination when IIT is illuminated</p>	<p>1 The reticle illumination device is disabled 2 The battery is discharged</p>	<p>1 Send the sight to repair shop 2 Replace the battery</p>

5 STORAGE

5.1 Store the sight in a heated room with ambient temperature ranging from 5 °C to 35 °C during all year and with relative humidity not exceeding 85 %.

5.2 Store the sight in a bag (in the case) without battery.

6 ACCEPTANCE CERTIFICATE

PN22K _____, day-night sight, serial № _____, is manufactured in accordance with the requirements of mandatory state requirements, effective technical documentation and is found fit for operation.

Date of issue _____

Signatures _____

JSC «Shvabe – Defense and Protection»,
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Novosibirsk, 630049
Russia
e-mail: sales@npzoptics.ru. www.npzoptics.com

APPENDIX

List of Figures

Figure A.1 – PN22K Sight

Figure A.2 – General view of PN22K-1 sight

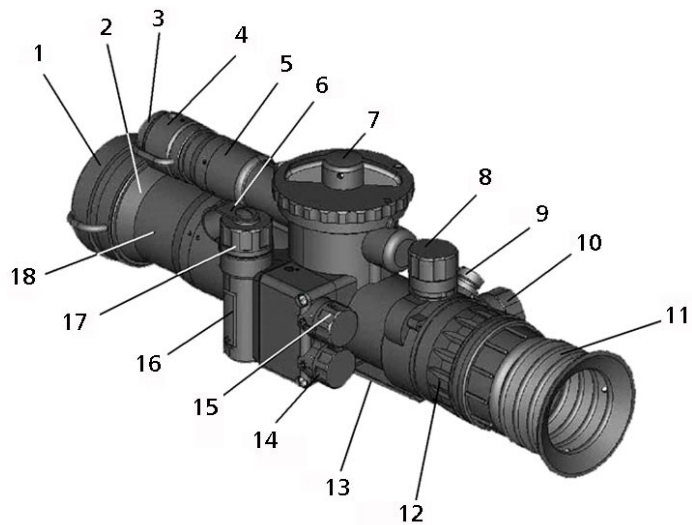
Figure A.3 – Sight adjustment

Figure A.4 – General view of PN22K-2 sight

Figure A.5 – General view of PN22K-3 sight

Figure A.6 – Zeroing target

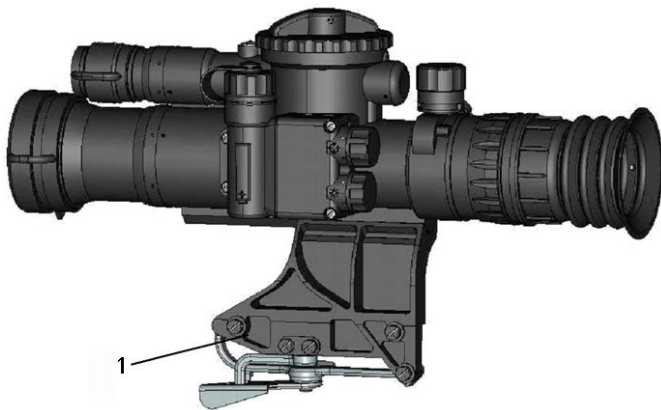
Figure A.7 – Field of view



1 – cap with light filter; 2 – objective; 3 – cap; 4 – objective; 5 – day channel;
6 – band; 7 – handwheel of switching the channels; 8 – handwheel H-D;
9 – connecting pipe; 10 – handwheel R-L; 11 – eyeshield; 12 – diopter ring;
13 – transitional rail; 14 – handwheel of switching the illumination;
15 – handwheel of switching the IIT and the reticle illumination; 16 – cap;
17 – cap; 18 – night channel

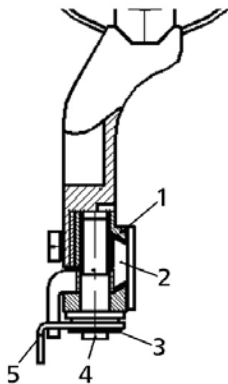
Figure A.1 – **PN22K Sight**

a) the sight with the bracket for side mounting rail of dovetail type



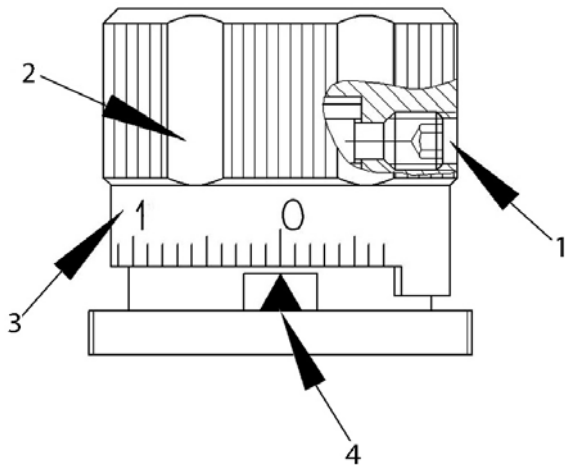
1 – bracket

b) the sight mounting on the weapon



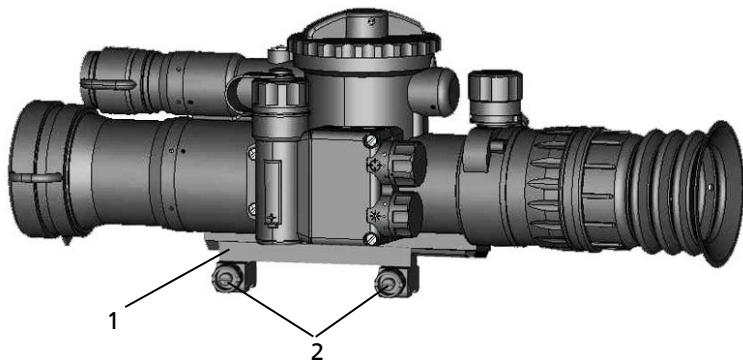
1 – bracket; 2 – mounting rail of the weapon;
3 – latch; 4 – screw; 5 – handle

Figure A.2 – **General view of PN22K-1 sight**



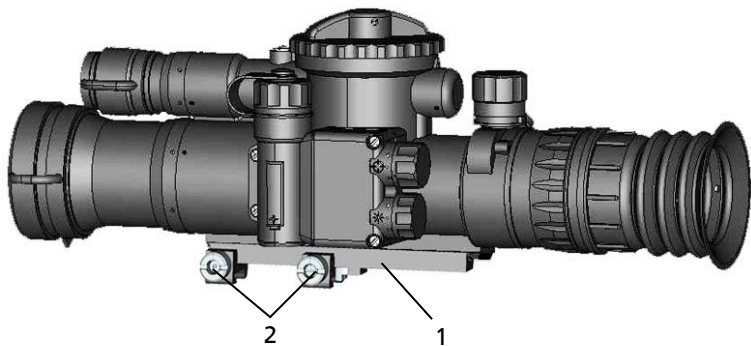
1 – screw; 2 – handwheel; 3 – scale; 4 – index

Figure A.3 – **Sight adjustment**



1 – bracket; 2 – nuts

Figure A.4 – **General view of PN22K-2 sight**



1 – bracket; 2 – nuts

Figure A.5 – **General view of PN22K-3 sight**

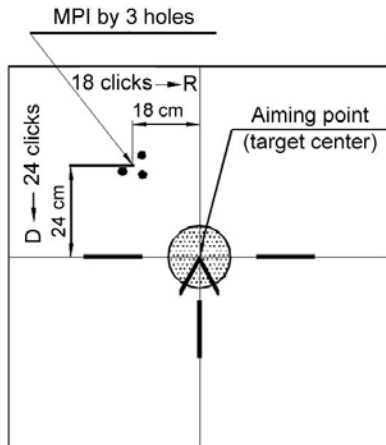


Figure A.6 – **Zeroing target**

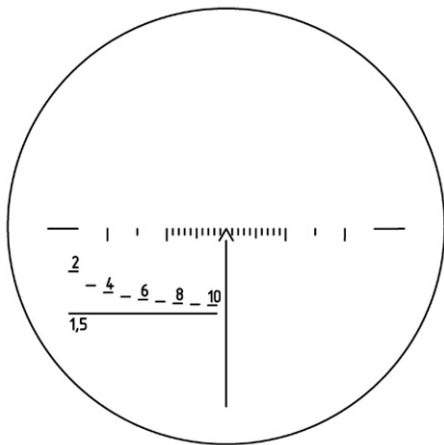


Figure A.7 – **Field of view**

