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THERMAL HUNTING RIFLESCOPE

Dedal-T2.380 Hunter LRF

Operation Manual

WARNING

❖ *Identify your target EXACTLY before shooting to guarantee safe operations with the riflescope!*

ATTENTION!!!

❖ *CLASS 1 laser safe eye.*
❖ *Exposure to the laser beam may be dangerous!*
❖ *Avoid directing this riflescope to anybody's eyes.*

ATTENTION!

❖ ***Do not aim the sight at intensive heat sources such as the Sun, working welding equipment, fire, etc. This may damage the riflescope partially or completely!***

❖ ***Remove batteries from the riflescope to prevent electrolyte leakage and corrosion of electrical contacts if the riflescope is not in use for a long period.***

❖ ***Non-observance of the rules of installation on a weapon, use and storage of the riflescope may void the manufacturer's warranty.***

1 DEVICE APPEARANCE



Figure 1. Device appearance and controls

1 – Power button (On/Off)

2 – 1×/2×/4× button (Digital Zoom in sight mode/Menu Exit)

3 – Fast entry button (Decrease Value)

4 – Menu button (Menu/Ok/Fast Colour Scheme Change)

5 – Fast entry button (Increase Value)

7 – Body of the scope

8 – Objective (50 mm F/1.2)

9 – Eyepiece

10 – Manual focus adjustment knob

11 – Built-in laser rangefinder

12 – Eyepiece rubber

13 – Battery compartment tightening screw

14 – ADT adapter for fixation rail

15 – Battery compartment cap

16 – Video output connector cap

17 – Rangefinder button

18 – Rangefinder remote control connector

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The present operation manual describes functioning and operational rules of the Dedal-T2.380 Hunter LRF thermal vision Riflescope (further: Riflescope).

2 RIFLESCOPE DESIGNATION AND KEY FEATURES

The Riflescope is designated for hunting, terrain surveillance and aimed shooting under any illumination (day, night, dusk and complete darkness) and any weather conditions (rain, fog, snowfall, etc.).

The operational principle of the Riflescope is based on the transformation of the infrared emission from subjects and objects into a visible image that is easy for perception.

The Riflescope can be mounted on the majority of hunting rifle types with various mounting adapters such as EAW (Apel), MAK, Blaser, weaver/Picatinny rail or on the side rail of the rifles Tiger, Saiga, etc.

Key Features:

- ✓ Modern high quality fast infrared sensor
- ✓ Automatic image control system
- ✓ Dynamic contrast system allowing for better target identification
- ✓ Automatic calibration system of the shutterless sensor
- ✓ Dead pixels removal
- ✓ Internal focusing system that perfectly keeps the point of aim
- ✓ Digital zoom 2×/4×/8×
- ✓ Built-in laser rangefinder
- ✓ Passive rangefinder
- ✓ Over 4 hours of continuous operation
- ✓ Ability to work with an external battery pack
- ✓ Video recording with an external device
- ✓ Fast start time (not more than 3 seconds)
- ✓ Five types of reticle
- ✓ Entry and storage of own ballistic adjustments
- ✓ Long eye relief
- ✓ Compatibility with various weapons
- ✓ Hermetically sealed
- ✓ Shockproof
- ✓ Compact
- ✓ Lightweight

3 TECHNICAL PARAMETERS

Table 1*

Parameter, unit of measurement	Value
SENSOR	
Frequency, Hz	50
Resolution, pixels	384×288
Detector pitch, microns	17
Type	Uncooled bolometer array (FPA)
Sensitivity wavelength range, microns	from 8 to 14
Thermal sensitivity (NETD), mK	<70
Calibration principle	Programmatic (shutterless)
OBJECTIVE LENS	
Focal length	50 mm F/1.2
Manual focusing range	from 5 m to ∞
Optical magnification	3.5
Reticle adjustment step in the CLIP-ON mode, cm @100m range	1.7
Field of view, ° (horizontal x vertical)	7.4×5.6
EYEPIECE	
Eye relief, mm	50
Diopter adjustment range	From -3 to +3
DISPLAY	
Array type	AMOLED

Resolution, pixels	800×600
LASER RANGEFINDER	
Operational wavelength, nm	905
Measurement range, m	10...600 (±1)
POWER SOURCE	
Battery type	CR123
Number of batteries	2
Voltage, VDC	6 (3.5..6.5)
PHYSICAL CHARACTERISTICS	
Dimensions without rail mount, mm (LxWxH), not more	260×105×80
Weight without rail mount, kilograms, not more	0.83
ENVIRONMENTAL CHARACTERISTICS	
Operating temperature, °C	From -40 to +50
Humidity at 25 °C, %	from 0 to 98
Time of continuous operation under T=20 °C, hours	4

* Technical parameters of the Riflescope may be improved without prior notice of the customer.

This Riflescope employs a system of automatic calibration of the shutterless sensor, which permanently optimizes Riflescope performance. This option together with the dynamic contrast system delivers optimal image without any manual adjustments.

NOTE:

- ***As a consequence of above mentioned systems functioning some visual noise in the form of vertical stripes and grain effects may be visible on the screen under certain conditions. These insignificant disturbances will practically vanish from sight when a thermally contrast target appears in the field of view.***

4 DELIVERY SET

STANDARD DELIVERY SET		
1	Riflescope Dedal-T2.380 Hunter LRF with the protection cap, eyepiece rubber and ADT adapter for the mounting rail	1 pc.
2	Batteries CR123*	2 pc.
3	Cleaning optical cloths set*	1 pc.
4	Video cable TVR-01	1 pc.
5	Remote control for the laser rangefinder RC-02	1 pc.
6	Protective bag	1 pc.
7	Operation manual	1 pc.
8	Warranty card	1 pc.
AUXILIARY DELIVERY SET (upon request under a special order)		
9	Mounting rail	1 pc.
10	Allen wrench for tightening of the mounting rail screws	1 pc.
11	Optics cleaning liquid*	1 pc.
12	External battery pack	1 pc.
13	Cable TRW-01 for the battery pack	1 pc.
14	Video recorder (Mini DVR)	1 pc.
15	Hard case	1 pc.

* Not covered by warranty

Technical parameters and device delivery set may be changed by the manufacturer without prior notice of the customer

5 RIFLESCOPE DESIGN AND OPERATION

5.1 Start-up and Shutdown

Turn on the riflescope by pressing and holding button **(1)** (Fig. 1) for more than two seconds until the image appears on the screen.

Two-three seconds later the observed image appears in the field of view together with the service and auxiliary information (Fig. 2).

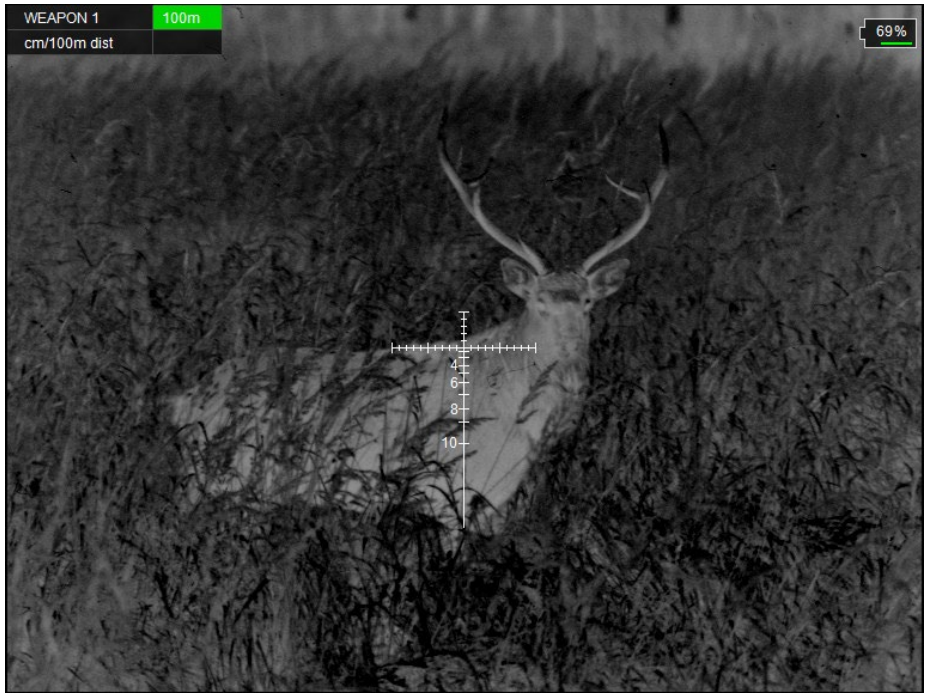


Figure 2. Riflescope Field of View

Adjust the eyepiece and focus the objective lens as described below to achieve optimal sharpness of the observed objects.

- The dioptric correction of the eyepiece can be changed from -3 to +3. To adjust the dioptre setting, rotate the eyepiece **(9)** (Fig. 1) gripping its ribbed surface **(12)** and achieve the best clarity of the reticle and/or service symbols.
- Focusing of the objective lens is adjusted by rotating the knob **(10)** (Fig. 1) to achieve optimal sharpness of the observed objects.

Usually, the observed image does not require any preliminary adjustments since the embedded sophisticated software performs image processing automatically.

Turn off the riflescope by pressing and holding button **(1)** (Fig. 1) for more than two seconds.

5.2 Indicators in the Field of View

5.2.1 Permanent Indicators

The following information is displayed in the upper left corner:

- Selected weapon (WEAPON 1, WEAPON 2,3, etc.)
- Shooting distance, this stands for the distance, to which the ballistic correction of the reticle is set.
- The shooting distance has two output modes.
- The table cell will be highlighted in **GREEN** if the reticle is located at the zeroing distance of the weapon;
- The table cell is highlighted in **RED** if the reticle is shifted considering the ballistic correction.



Figure 3. Examples of the Displayed Selected Weapon

NOTE:

- ***If the reticle is located between two ballistic marks, shooting distance calculation will be performed automatically (the distance will be shown in brackets).***
- ***Shooting distance calculation will not be performed if the value of the entered ballistic correction exceeds the maximum previously entered for the used weapon.***

The second line shows units of the ballistic correction (centimetres or angular thousandths of the distance (t.d.) / milliradians (mils) / minutes of angle (MOA)) and its value.

If the ballistic correction was not entered, its value will not be displayed.

The reticle (see 6.3.3) is shown in the centre of the screen.

The **Battery Charge Indicator** is displayed in the upper right corner. The battery charge information is counted in percent.

5.2.2 Auxiliary Indicators

- **Error Indicator** points to an error made by the user (Fig. 4) together with the error code, which allows the user to determine the cause of the error (see Appendix 4).



Figure 4. Error Indicator

- **Button Assignment Indicator** prompts to a particular assignment of each button **(2-5)** when the user wants to do something in the selected mode (Fig. 5). This indicator is shown as determined by the software **only** (for example, while weapon zeroing).

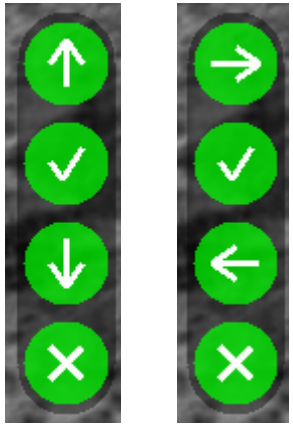


Figure 5. Examples of the Button Assignment Indicator

5.3 Display Brightness Adjustment

Factory pre-set of buttons **(3)** and **(5)** (Fig. 1) corresponds to display brightness adjustment. Fast press and release of button **(5)** increase display brightness. Fast press and release of button **(3)** decrease display brightness. The set brightness level is shown on the screen in the shape of the Sun (Fig. 6) that indicates exact information about display brightness.



Figure 6. Examples of the Display Brightness Indicator

This indicator appears during display brightness changing **only**.

If the assignment of buttons **(3)** and **(5)** was changed during operation, you can return to their initial settings that allow fast brightness changing (see 5.5).

5.4 Change of Digital Zoom

The **Dedal-T2.380 Hunter** riflescope with 50 mm F/1.2 objective lens has 3.5× optical magnification. The overall scope magnification is calculated as the multiplication of digital and optical magnifications. For example, with digital zoom 4× the resulting magnification will be 14×.

Digital zoom changing is performed by fast pressing of button **(2)** (Fig. 1). Each next pressing toggles 1×, 2×, 4× and 8× digital zoom in the cycle. This means that pressing of button **(2)**, when the digital zoom is set to 8×, changes digital zoom to 1x (without digital zoom), and so on.

When you are changing digital zoom, the Digital Zoom Indicator appears in the field of view (Fig. 7). It looks like a loupe showing digital magnification **only**.

You can also turn off certain modes of scaling duplication (see 6.3.8).



Figure 7. Examples of the Digital Zoom Indicator

5.5 Buttons Assignment

The riflescope software works in several modes, and functional assignments of the buttons are different for each mode.

- **Main Mode** is activated right after switch-on;
- **Menu Mode** is activated in the menu;
- **Parameters Changing Mode** is activated when some of the parameters are being changed.

5.5.1 Main Mode

In this mode, the following functions are assigned to the buttons **(2-5)** (Fig.1):

- Fast press and release of button **(2)** switches digital zoom on and off;
- Press and hold of button **(2)** for more than two seconds resets the entered ballistic correction and digital zoom;
- Fast press and release of button **(4)** toggles between two black and white colour schemes (hot-black or hot-white) and the pre-set third colour scheme (see 6.4) in the following order: hot-black – hot-white – colour – hot-black;

- Press and hold of button **(4)** for more than three seconds calls the menu mode;
- You can assign several different functions to buttons **(3)** and **(5)**. These buttons can perform any of the following (see 6.5.1):
  - ✓ control fast changes of shooting distance with **50 metres** step;
  - ✓ change display brightness;
  - ✓ shift along the ballistic scale with the **0.17 mil** (1.7 cm @100m distance) (1 pixel) step.

NOTE:

❖ ***For faster entry of the ballistic correction, press and hold button (3) or (5) in the assigned mode "Click 1.7 mils". After delay that corresponds to 5 clicks, the reticle will disappear, and speed of changing of ballistic correction will increase twice. The chosen distance will be displayed in the left upper corner of the screen.***

In the **Main Mode**, you can fast re-assign buttons **(3)**, **(5)**. If you want to know the current button assignment, press one of these buttons and its assignment will be shown in the upper right corner of the screen (brightness, shift along the ballistic table with 50 meters step or shift along the screen with one-pixel step). To change the current assignment momentarily, fast press and release OK button **(4)** while the button assignment indicator is lit on. After that, the internal algorithm changes the button designations.

5.5.2 Menu Mode

In this mode, the following functions are assigned to the buttons **(2-5)**:

- Fast press and release of button **(2)** cancel the current action and returns to the previous menu;
- Fast press and release of button **(3)** switch to the next menu line;
- Fast press and release of button **(4)** confirm the current action and switches to the next menu;
- Fast press and release of button **(5)** switch to the previous menu line;
- Continuous press of button **(2)** leads to immediate exit from any menu excluding the Weapon Selection section.

You can observe objects on the screen in the menu mode.

5.5.3 Parameters Changing Mode

In this mode, the following functions are assigned to the buttons **(2- 5)**:

- Fast press and release of button **(2)** exit the editing mode without saving of the made changes;
- Fast press and release of button **(3)** decrease the edited parameter;
- Fast press and release of button **(4)** exit the editing mode with saving of the made changes;
- Fast press and release of button **(5)** increase the edited parameter.

5.6 Video Recording

Video recorder (for example, KS-760A model) connection is performed as follows:

- Unscrew cap **(16)** (Fig.1) and plug the video cable (included into delivery set) into the riflescope video connector;
- Attach the RCA cable to the video recorder;
- Connect yellow plug of the RCA cable to the riflescope video cable through the adapter (included in the delivery set);
- Follow the instructions as set by the video recorder operation manual.

5.7 Use of External Battery Pack

The connection of the external battery pack with the riflescope is performed as follows:

- Install USB connector of the cable TPW-01 (sold separately) into the battery pack;
- Unscrew cap **(16)** (Fig.1) and plug the other side of the TPW-01 cable into the riflescope video connector;
- Follow the instructions as set by the battery pack operation manual.

6 User Menu Structure

During operation, the user can change operational shooting distance, ballistic correction, display brightness and image contrast. It is possible to change various riflescopes settings through the operational menu.

The logical structure of the software menu is presented in Fig. 8.

Enter the main menu by pressing button **(4)** (Fig. 1) for more than two seconds. The appearance of the main (operational) menu is shown in Figure 8.

The menu window appears in the lower left corner of the screen and consists of the following lines:

- ✓ Active line;
- ✓ Non-active lines;
- ✓ Menu name.

When you enter the menu, absolute coordinates of the reticle appear in the left upper corner of the screen (these are the values of the last zeroing for the given weapon). The coordinates are shown only in the menu mode.



Figure 8. Menu Appearance

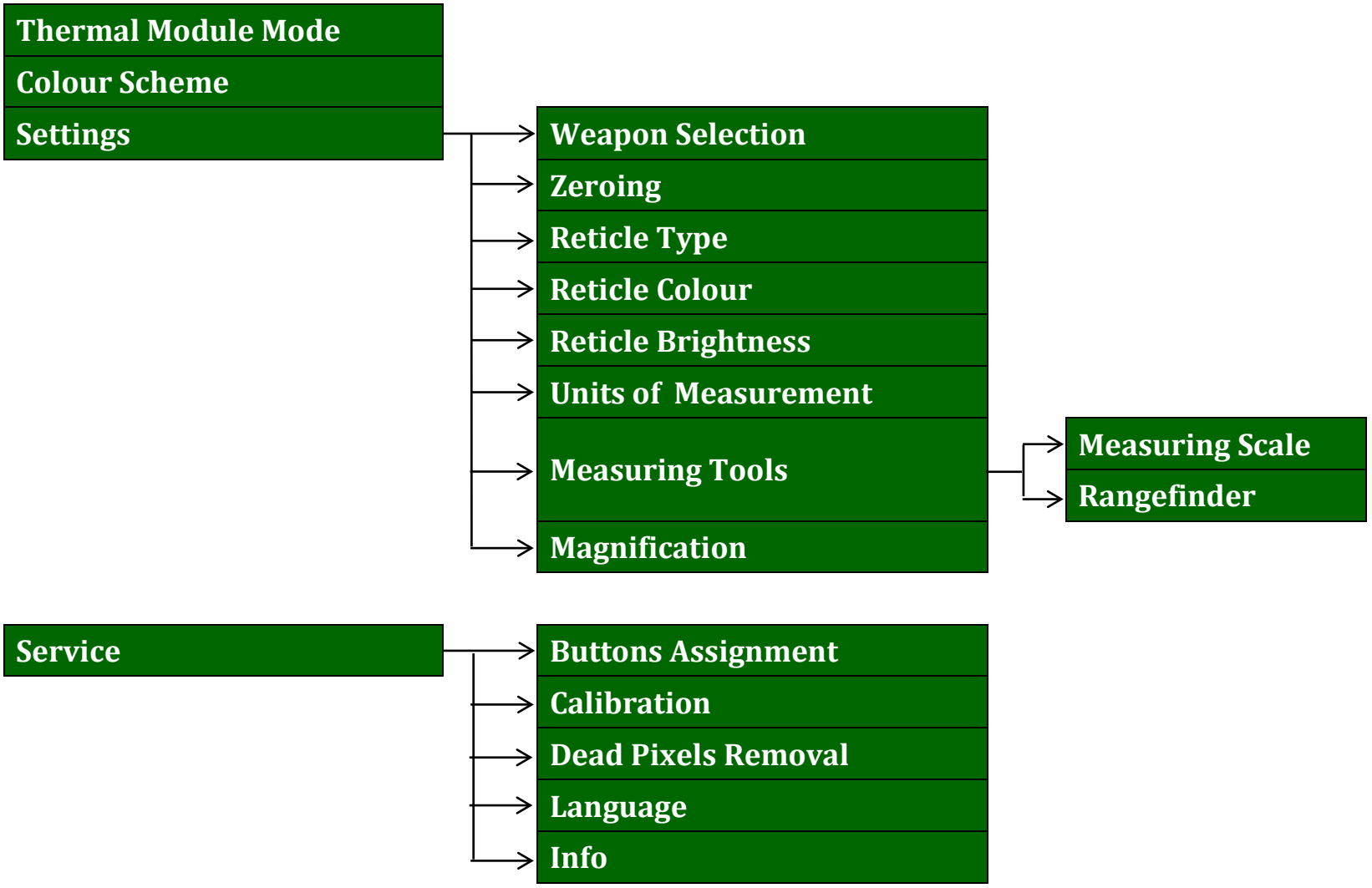


Figure 9. Operational Menu Structure

6.1 Thermal Module Mode Menu

You can choose one of four pre-set automatic modes for the thermal module (Fig. 11). These modes have different factory pre-set levels of contrast and noise reduction. Select one for the best image quality.



Figure 10 – Thermal Module Mode Menu

6.2 Colour Scheme Menu

The Colour Scheme menu applies one of 8 pre-programmed algorithms of image colour processing depending on the temperature of the observed subjects and objects (see Fig. 11).

If you set the colour scheme, it will be added to two inverse black and white options as the third user-defined scheme, which can be toggled by fast pressing of button **(4)**.

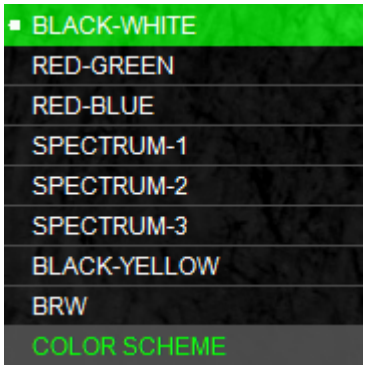


Figure 11 – Colour Scheme Menu

6.3 Settings

6.3.1 Weapon Selection Menu

In this section, you can memorize (and change later) ballistic corrections and zeroing values for up to 8 (eight) types of weapons.

If you plan using the riflescope with one of the eight previously pre-set weapon types, you can select the actual weapon with button **(4)**, and the riflescope memory will activate the saved ballistic values for this particular weapon. The weapon type and zeroing range for this type will appear in the upper left display corner in the blue rectangle (see Fig. 2).

The reticle type will correspond to the one selected in the RETICLE SETTINGS section.

If the reticle type is set to BALLISTIC, the screen will show the particular ballistic reticle for this specific weapon type.



Figure 12. Weapon Selection Menu

You can skip the ballistic correction entry. In this case, only zeroing values will be remembered.

To call the entry or editing menu of the ballistic tables, highlight the selected weapon and then press and hold button **(4)** for three seconds (Fig.12).



Figure 13. Ballistic Table Editing Menu

Select the first distance, for example, 100 meters. Enter corrections by pressing buttons **(3)** and **(5)** with 0.17 mil (1.7cm @100m distance) adjustment step. Confirm the entered values by pressing button **(4)** (OK).

Proceed to the second distance by pressing button **(5)**. Repeat corrections entry with buttons **(3)** and **(5)** confirming the entered values by pressing button **(4)** (OK).

Corrections at all other distances are entered in the same way.

The table should be filled up to the maximum effective shooting range of the weapon.

After you finish ballistic data entry, you must quit the menu by pressing button **(2)**.

The centre of the activated reticle will correspond to the entered zero.

NOTE:

- ***Ballistic corrections are entered in cm @100m distance units (or thousandths of distance, t.d.).***
- ***If you do not plan entering corrections at suggested range, you can select the option (---). The software allows entering corrections for distances from 50 to 2000 meters with 50 meters step.***
- ***The first zero correction value must correspond to the real zeroing distance.***
- ***Negative corrections cannot be entered.***
- ***Select the option (---) for all distances shorter than the zeroing distance.***
- ***Entry of two and more (ballistic zeroes) is treated specially by the software. If you enter the second (ballistic zero) at any distance, all data entered for closer distances as well as the second (ballistic zero) will be removed from the table.***
- ***When entering new ballistic data, you must be sure that the previously entered ballistic data is absent (or just remove it).***
- ***Check the ballistic reticle appearance after ballistic data entry procedure. The reticle must have a similar shape as is normally used in other scopes. Vertical line of the reticle contains marks at the distances, for which ballistic corrections were entered. At distances divisible by 100m you will see a digit, which nominates the distance in hundreds meters. If the marks are located close to each other, the digits do not appear.***
- ***If the marks on the ballistic reticle are located without any visible system, it is most likely that a mistake occurred in the ballistic data entry procedure. This must be corrected.***

6.3.2 Zeroing Menu

The Zeroing menu is designated for the reticle positioning with horizontal and vertical adjustments.



Figure 14. Elevation Adjustment Menu



Figure 15. Windage Adjustment Menu

When you enter the ADJUSTMENT section or after more than one second of inactivity, the auxiliary indicator showing the buttons designation in this menu section appears in the right part of the screen. An auxiliary cross, which is required to perform the zeroing with just one shot (see 10.1), appears right in the middle of the screen.

The user will be suggested to enter vertical adjustment first and horizontal adjustment at the next step. You can save the zeroing results by pressing button **(4)**.

Also, the two text lines informing about the shift of the mean impact point appear in the upper left corner:

- Absolute coordinate, which denotes reticle centre shift relative to the centre of the screen (shown in BLACK colour in the fourth line);
- Current correction to the mean impact point, which has been just entered (shown in **RED** colour in the fifth line).

If you save the current correction to the mean impact point, the software will request the zeroing distance automatically (see Fig. 16). You must enter the zeroing distance and press button **(4)**. The software will return you to the Settings menu.



Figure 16. Zeroing Distance Entry

6.3.3 Reticle Type Menu

You can select one of the following six reticle types:

✓ No Reticle

✓ MIL-DOT

✓ Cross (the cross size is 2×2 mils, the circle radius is 3 mils)

✓ Dot (the circle radius is 3 mils)

✓ MIL-EXT (MIL-DOT with the extended lower vertical);

✓ BALLISTIC and BALLISTIC-2 (one of the eight ballistic reticles for the Weapon 1, 2, 3 as entered and activated by the user).

The BALLISTIC-2 reticle has additional marks at ½ mil (with digital zoom equal to 2×) and angular corrections at each distance multiple to 100 metres (see Fig.17):

- up to 300– 3 mil to each side;
- from 400 to 600 m – 4 mil;
- from 700 to 900 m – 5 mil;
- from 1000 to 1200 m – 6 mil;
- from 1300 to 1500 m – 7 mil;
- from 1600 to 1800 m – 8 mil;
- from 1900 to 2000 m – 9 mil.

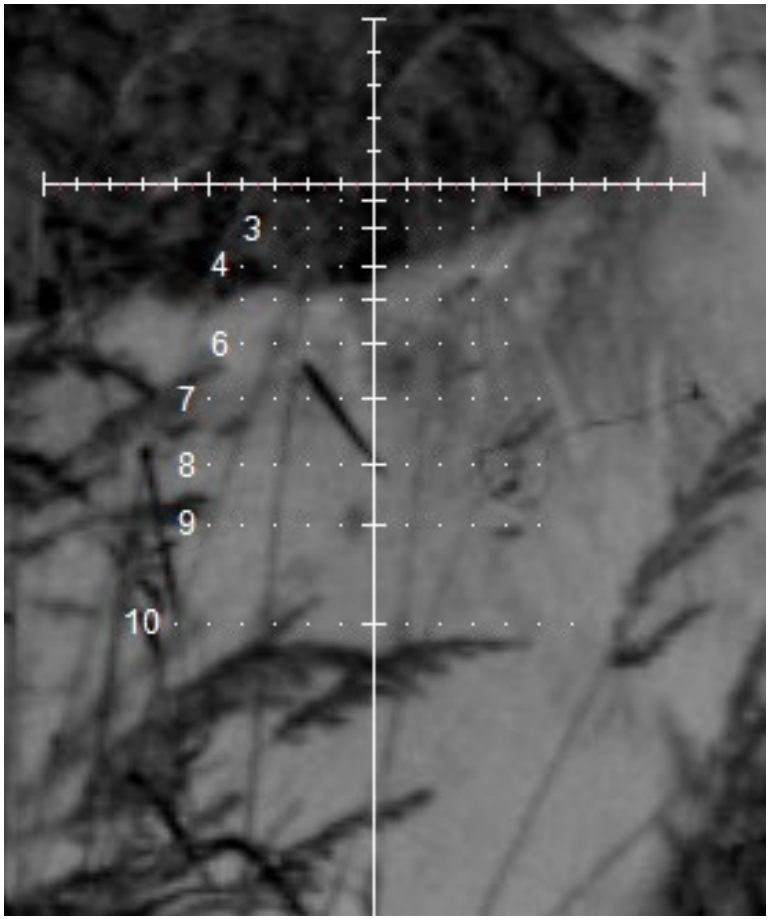


Figure 17. BALLISTIC-2 Reticle

Geometric dimensions of the MIL-DOT reticle and algorithm of determining distance to the target by MIL-DOT marks are described in Appendices 1 and 2.

6.3.4 Reticle Colour Menu

You can select reticle colour in the Reticle Colour menu (Fig. 18). In this menu, you will see a list with five options of the reticle colour: green, yellow, red, white and black.



Figure 18. Reticle Colour Menu

6.3.5 Reticle Brightness Menu

You can choose one of three options for reticle brightness: minimum, average and maximum (Fig. 19).



Figure 19. Reticle Brightness Menu

6.3.6 Units of Measurement Menu

You can choose one of three options for units of measurement for the ballistic correction entries: cm / 100m, mil or MOA (see Fig. 20).



Figure 20. Units of Measurement Menu

6.3.7 Measuring Tools Menu

The Measuring Tools section contains two subsections, Measuring Scale Menu and Rangefinder Menu.

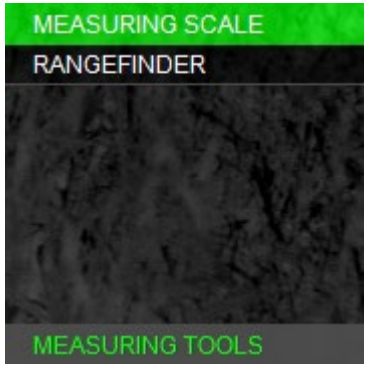


Figure 21. Measuring Tools Menu

6.3.7.1 Measuring Scale

This section allows switching the measuring scale on and off.

The measuring scale is shown in the main mode in the lower left corner of the screen (see Fig. 22).

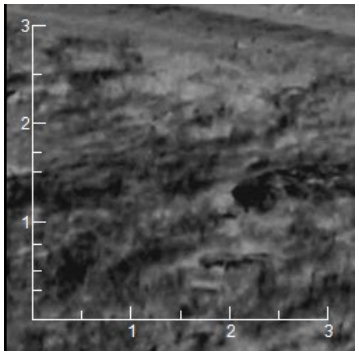


Figure 22. Measuring Scale

The notches on the vertical scale mark the following sizes (ascending, in metres): 0.3, 0.5, 0.76, 1.0, 1.5, 1.7, 2.0, 2.5, 3.0. The notches on the horizontal scale mark the following sizes (ascending, in metres): 0.5, 1.0, 1.5, 2.0, 2.5, 3.0.

The measuring scale allows assessment of the distance to the observed object if you know its linear size. To do so, proceed as follows:

- Assign the fast entry buttons **(3)** and **(5)** to the CLICK 50M or CLICK 1.7CM for fast entry of the shooting distance;
- Select the weapon with the filled ballistic table;
- Aim the riflescope so that the measuring scale overlaps the object. For example, if you know that the object (a boar) is 1.5 metres long, change the size of the scale so that the length of the object (the boar) on the measuring scale corresponds to 1.5 metres. The distance to the object will be shown in the upper left corner in the first line.

When you measure distance with the scale, the centre of reticle moves to the corresponding aim point with the proper ballistic correction automatically. This algorithm significantly improves the shooting speed.

If the BALLISTIC or BALLISTIC-2 reticle was selected, position of the cross corresponding to the zeroing position remains marked with a notch of a different colour.

The measuring scale also allows indirect assessment of the object size. To do so, proceed as follows:

- Assign the fast entry buttons **(3)** and **(5)** to the CLICK 50 M or CLICK 1.7 CM for fast entry of the shooting distance;
- Select the weapon with the filled ballistic table;
- Set the closest known or estimated distance to the target in the upper left corner (see Fig. 2) with the fast entry buttons **(3)** and **(5)**;

- Estimate vertical and horizontal dimensions of the target by the corresponding scales.

For more precise distance assessment with the measuring scale, use digital zoom button **(2)**.

6.3.7.2 Laser Rangefinder

This section allows using the built-in laser rangefinder.

The rangefinder is switched on by pressing its POWER ON button **(17)** (see Fig.1) or the button on the remote control (included in the delivery set). The rangefinder mark will appear on the screen. The next press of button **(17)** will perform the distance measuring. The rangefinder switches off automatically after 5…7 seconds of inactivity.

The RANGEFINDER menu contains the following options:

- MEASURE ONLY
- MEASURE + CORRECTION
- ZEROING

In the MEASURE ONLY mode the distance to your target is measured with each pressing of button **(17)** or the remote control button**.** The result of measurement appears on the screen near to the reticle.



Figure 23. Rangefinder Mark

In the MEASURE+CORRECTION mode the reticle is shifted automatically to the measured distance (only if the ballistic table was filled up to this distance and beyond). In this case the measured distance and calculated correction also appear on the screen.

The size of the rangefinder mark is 2×2 mils.

The rangefinder is zeroed to the 200 meters distance in the manufacturing process. If you want to change the rangefinder mark position, you can do this in the RANGEFINDER

ZEROING section with buttons **(3)** and **(5)**. In this case the factory position of the mark is shown on the screen in blue colour.

6.3.8 Zoom Menu

In this section, you can select the zoom mode and exclude some not used digital zooms. For example, if you select the mode **1-2**, digital zooms 4× and 8× will be excluded from the zoom set.

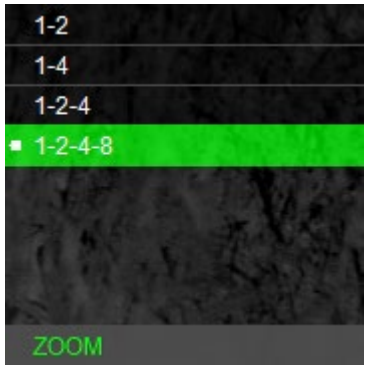


Figure 24. Zoom Menu

6.4 Service Menu

The SERVICE menu reassigns fast entry buttons **(3)** and **(5)**, selects interface language selection, performs sensor calibration, removes dead pixels and provides information about the software version.



Figure 25. Service Menu

6.4.1 Assignment of the Fast Entry Buttons

You can assign the following functions to the fast entry buttons **(3)** and **(5)** (see Fig. 26):

Selection of the option CLICK 50M means that each press and release of button **(5)** will increase the set operational shooting distance by 50 meters, and each press and release of button **(3)** will decrease operational shooting distance by 50 meters. The value of the entered ballistic correction will be taken from the ballistic table.

Selection of the option CLICK 1.7 CM means that each press and release of button **(5)** will shift the mean impact point by 1.7 cm up at 100 meters distance, and each press and release of button **(3)** will shift it down in the same way.

Selection of the option BRIGHTNESS +/- means that each press and release of button **(5)** will increase display brightness, and each press and release of button **(3)** will decrease it.

When you press buttons **(3)** and **(5)** in the main menu mode, their assignment will be shown in the upper right corner of the screen.



Figure 26. Fast Entry Buttons Assignment Menu

NOTE

- ***If the ballistic table of the current weapon type is empty (ballistic correction haven't been entered), shifting the reticle along the ballistic trajectory becomes IMPOSSIBLE!***

6.4.2 Calibration

Calibration (equalization) of the sensor thermal sensitivity is performed automatically by the embedded software, and therefore there is no need for manual calibration. It is recommended to work with the Riflescope in the AUTO mode.

However, this section allows performing manual calibration and setting the calibration mode (Fig. 27).



Figure 27. Calibration Menu

If you notice a minor dissimilarity of the image, you can perform forced calibration. To do so, close the objective lens cap, enter the CALIBRATION menu and press button **(4)**.

ATTENTION!

- ***During calibration, the objective lens must be closed. If you perform calibration with the open objective lens cap, you will get a negative darkened image.***
- ***If you activate the option CALIBRATION AT STARTUP, the objective lens cap must be closed when you turn the riflescope on.***

Calibration will take few seconds.

6.4.3 Dead Pixels Removal

If you notice defective pixels on the screen, you can remove them from the menu. To do this, enter the corresponding menu section and select the line **Execute**.

6.4.4. Language Selection Menu

In this section, you can select one of the several languages: Russian, English, and others (Fig. 28). The exact set of languages depends on the country of destination and may be changed without prior notice.



Figure 28. Language Selection Menu

6.4.5 Information

In this section, you can see the Riflescope model name and software release code (Fig. 29).

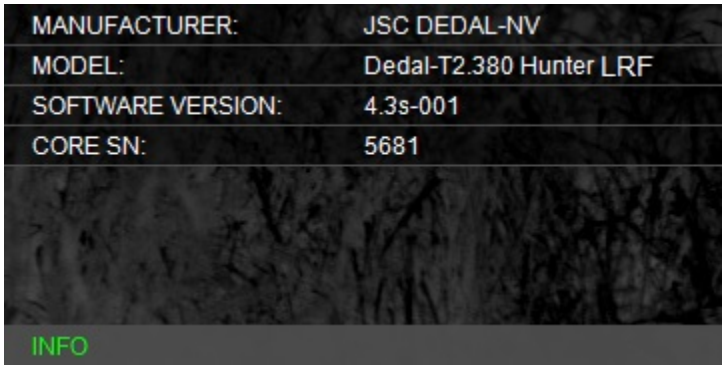


Figure 29. Information Screen

7 PREPARATION FOR USE

7.1 Adaptation to the hunting rifle

The riflescope **Dedal-T2.380 Hunter LRF** is delivered with the glued (ADT) adapter for the mounting rail (see Fig. 1).

Address the Dedal-NV company or a specialized arms workshop to adapt the riflescope (to install the mounting adapter and fix it with screws and glue for comfortable and correct positioning in relation to the shooter's head). The workshop should be experienced in the adaptation of the **Dedal** riflescopes. You can also perform the adaptation yourself following the rules explained in the handbook **Rules of Adaptation of Dedal-T Riflescopes on Hunting Rifles**. This handbook can be obtained from the **Dedal-NV** head office.

The riflescope **Dedal-T2.380 Hunter LRF** can be used with different types of mounts, which provide reliable fixation of the unit on a particular weapon. The most popular mount models are presented in Figure 30:

1 – SMN_WP-2525
2 – SPDT
3 – Apel-Rail
4 – MAK2000
5 – MAK5750 (5760)
6 – MAK5072 (5062)
7 – MAK5092 (Blaser)
8 – WP02

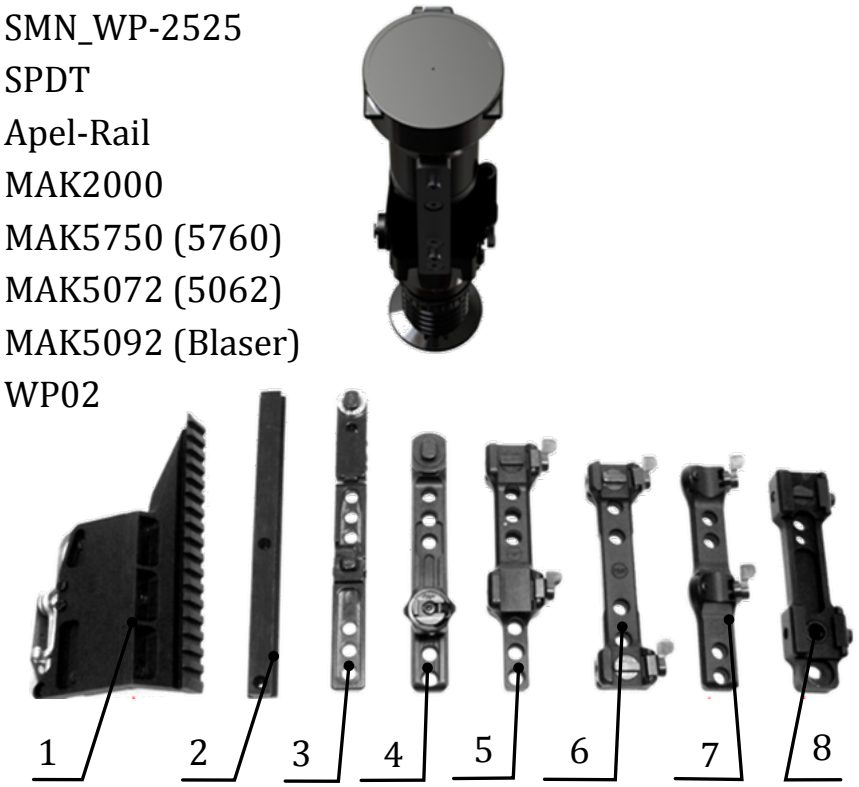


Figure 30. Mounting rails

Using of the side mount (weapon types (Tiger", (Saiga", etc.) is performed with the intermediate rail MAK5750 (5760) of Weaver/Picatinny standard.

ATTENTION!

- ***When adapting the riflescope, mount it in such a way that the eyepiece rubber will not be deformed when the shooter's head is comfortably positioned.***
- ***If you use a large calibre rifle (the muzzle energy is over 4500 J), the riflescope must be positioned so that the distance between the edge of the eyepiece rubber and the closest point of the shooter's face is at least 10-15 mm.***
- ***Improper mounting, and/or the use of a mount that is not certified by the Dedal-NV company can lead to permanent shift of the mean point of impact while shooting.***

7.2 Batteries Installation

The riflescope is powered by two batteries CR123. Ensure that the batteries are inserted into the riflescope in accordance with the labeling inside the battery compartment, and they are adequately charged.

To change the batteries, remove the screw **(13)** (Fig.1) of the battery compartment cap and replace the old batteries by new ones observing their polarity.

8 Adjustment (Zeroing) of the Riflescope on the Weapon

Before zeroing, ensure that the riflescope is installed on the weapon in accordance with the recommendations given in Chapter 7.1 of this Manual.

If there is no reticle in the field of view (the NO RETICLE option has been chosen through the menu), the reticle must be activated first.

To activate the reticle, you must enter the menu by pressing and holding button **(4)** (Fig. 1) for more than two seconds. Select the following options from the main menu: RETICLE SETTINGS / RETICLE TYPE then select the type of your choice and press OK. Your choice will be saved in the memory. Leave the menu by pressing button **(2)** (Fig. 1). The chosen reticle will remain in the field of view. If the riflescope is being used for the first time, or it was reset to the factory default values, the reticle is located directly in the centre of the screen.

Adjustment on the weapon is performed as follows:

- Lock the weapon on a shooting stand;
- Place a target or choose a point of aim;

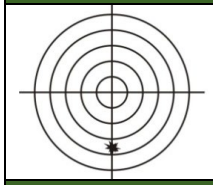
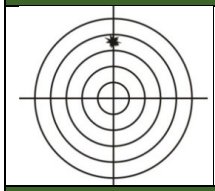
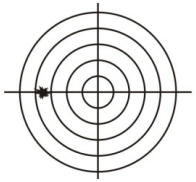
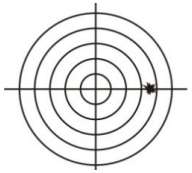
- Aim the weapon at the target using iron sight installed on the weapon (if possible). At this stage you can use a laser boresighter (LBS) or muzzle boresight telescope (MBS), both to be purchased separately;
- Using the menu and navigation buttons, achieve overlapping of the reticle crosshair with the point of aim indicated by the iron sight or LBS (MBS);
- Take the weapon from the stand and remove the LBS (MBS);
- Make 3-4 single shots, carefully and in the same manner aiming at the target or the point of aim;
- Determine shots grouping and mean impact point position in accordance with the shooting instructions (a grouping of shots is considered normal if it falls under grouping standard for this type of weapon when used without a riflescope);
- Enter the required correction of mean impact point (see Table 2). When you shift the reticle in any direction from zero (centre) position, the operator prompting of the mean impact point shift is shown in the upper left corner of the screen as direction and value per 100 metres of range. The control shots can be performed without leaving the adjustment menu;
- Make the control shots and ensure that the point of aim coincides with the mean impact point. Make the adjustment one more time, if necessary;
- Save the current reticle position by pressing button **(4)** (Fig. 1). Information about the entered adjustments is shown in the upper left corner of the screen;
- Exit the menu by pressing button **(2)**.
- The riflescope is now ready for operation.

ATTENTION!

❖ ***It is necessary to keep in mind that the principle of operation of thermal riflescopes demands some specific features from targets, which are used for zeroing. If the target has the same temperature as its environment, it is very possible that the shooter will not see it through the riflescope. A possible solution is to put a warmer object behind the target. This can be, for instance, a burning candle, a hot object, a plastic bottle with hot water, etc.***

The Mean Impact Point (MIP) Correction

Table 2

When the MIP is below the point of aim:	
	Enter the main menu, select the SETTINGS option, and then select the ZEROING option. Shift the mean impact point up using button **(5)** to the correct position.
When the MIP is above the point of aim:	
	Enter the main menu, select the SETTINGS option, and then select the ZEROING option. Shift the mean impact point down using button **(3)** to the correct position.
When the MIP is to the left of the point of aim:	
	Enter the main menu, select the SETTINGS option, and then select the ZEROING option. Skip Elevation Adjustment by pressing button **(4)**. Shift the mean impact point to the right using button **(3)** to the correct position.
When the MIP is to the right of the point of aim:	
	Enter the main menu, select the SETTINGS option, and then select the ZEROING option. Skip Elevation Adjustment by pressing button **(4)**. Shift the mean impact point to the left using button **(5)** to the correct position.

8.1 "Single Shot" Zeroing

The Riflescope software can perform zeroing with a "single shot" method. Do this as follows:

- Turn on the Riflescope, activate the reticle (SETTINGS / RETICLE TYPE);
- Shoot one time aiming the centre of the reticle to the target centre;
- Enter the SETTINGS menu and select the line ZEROING without pressing button **(4)**;
- Align the reticle centre with the target centre and activate the ZEROING menu by pressing button **(4)**. The image on the screen will become "frozen";
- Using buttons **(3)** and **(5)** align the appeared auxiliary cross with the impact point saving the results by pressing of button **(4)** twice for vertical and horizontal adjustments;
- Enter the zeroing distance and save it by pressing button **(4)**.

8.2 Saving of the Zeroing Results into Memory

The same Riflescope can be zeroed on different weapons with different ammunition and under different conditions. Results of the last zeroing are saved in the riflescope memory automatically after you exit the menu.

You can see the saved coordinates of the mean impact point counted from the centre of the screen when you enter the Main Menu. They appear in the upper left corner of the screen.

RECOMMENDATION:

- ***It makes sense to write down the reticle position in the table in the Appendix 4 of this manual.***
- ***This traditional method of information saving is the most reliable, because the data, which is written down, allows you always to check or restore true mean impact point position without real shooting by just taking it from the Appendix 4 table. This way excludes erroneous input and its saving as a new zero, electronic glitches, or erroneous actions by another user.***

9 RIFLESCOPE OPERATION RULES

9.1 Initial Operations

The sequence of Riflescope switching on and off and its adjustment are described in Chapter 5.1.

9.2 Shooting at Zeroing Distances

Activate the reticle and select the weapon (see 6.3.1.1).

In the upper left corner, you will see the highlighted selected weapon and distance, at which this weapon was zeroed in the centre of the reticle. Shoot when the target is in the centre of the reticle.

9.3 Shooting at Distances Exceeding Zeroing Distance

Shooting at mid and far ranges with the Riflescope can be performed by applying two methods: by aiming with the bullet drop compensating reticle marks and by entering the ballistic correction, which shifts the reticle into the position that corresponds to the required distance.

9.3.1 Bullet Drop Compensation Shooting

The bullet drop compensation shooting utilizes additional marks of the ballistic reticle.

To activate the ballistic reticle you must enter the menu SETTINGS/RETICLE TYPE and select the type BALLISTIC or BALLISTIC-2. You should also choose the weapon with the filled ballistic table (see 6.3.1).

The ballistic reticle becomes shown on the screen. In the upper left corner, you will see the highlighted selected weapon and distance, at which this weapon was zeroed in the centre of the reticle. Shooting at longer distances should be performed when the target is located at the reticle mark, which corresponds to this distance. For example, if you want to shoot at 600 meters distance, you should overlap the target by the mark with the digit **(6)** beside it.

9.3.2 Ballistic Correction Entry through Shooting Distance Change

The riflescope allows fast entry of the shooting distance correction with 50 metres step. This entry takes exact ballistics of the chosen weapon into account. To do this, you must select the weapon and assign CLICK 50m function to the fast entry buttons through the SERVICE / BUTTONS ASSIGNMENT menu. After you exit this menu, you will see the selected weapon type and current shooting distance in the upper left corner. The weapon type and shooting distance, which corresponds to the reticle position, will be shown in the upper left corner of the screen.

To change the shooting distance, press buttons **(3)** or **(5)**. Each press and release will decrease (increase) the shooting distance by 50 metres.

After each change, the information in the upper left corner will indicate the following: weapon type, shooting distance and current ballistic correction in cm per 100m counted from the zero mark, which corresponds to the zeroing distance.

In this case, aiming should be made with the centre of the reticle.

NOTE

- ***If you have selected the BALLISTIC reticle, it will appear on the screen only at the zeroing distance. At all other distances set by the fast input buttons, the ballistic reticle will be substituted with the MIL-DOT reticle.***

9.3.3 Ballistic Correction Entry through the System of "Clicks"

The riflescope allows entering ballistic corrections with smaller steps, which are evaluated with the help of, for instance, a ballistic calculator. Such entry requires significant time and is not the operational one.

To activate this function, choose the option CLICK 1.7cm in the menu SERVICE / BUTTONS ASSIGNMENT. This will mean that with each press and release of button **(5)** the reticle crosshair will be shifted down (mean impact point will shift up). Respectively, with each press and release of button **(3)** the reticle crosshair will be shifted up (mean impact point will shift down). The step of this shift is 1.7 cm at 100 metres of shooting distance.

The upper left corner of the screen will show the total value of the mean impact point shift is centimetres for 100 metres of the shooting distance and the zeroing distance, from which the ballistic correction was calculated.

10 MARKING

The Riflescope marking contains its model name and serial number.

11 PACKAGING

The Riflescope is delivered in accordance with the main delivery set (see Chapter 4). The auxiliary delivery set must be agreed between the buyer and the manufacturer and costs separately from the main delivery set.

12 TECHNICAL SERVICE

Technical service comprises external appearance inspection and supplied delivery set completeness check.

The external appearance of the Riflescope must correlate to the technical documentation. Dents on external surfaces are not allowed. All fixtures must be tightened. Rotation and spontaneous unscrewing of parts during operation are not allowed. All moving components of the riflescope must be moved smoothly without backlash and jamming.

It is recommended to periodically clean the external optical parts with the supplied cloth to protect them from moisture and dust.

13 TRANSPORTATION AND STORAGE

Store the Riflescope in the supplied protective bag or a hard case with the protective objective lens cap on. Store the Riflescope at temperatures from than 10°C to 35°C with relative humidity not exceeding 85%. Remove the batteries from the Riflescope during extended periods of non-operation to avoid batteries leakage.

Transportation of the Riflescope in the protective bag or hard case can be performed by any transport to any distance, including transportation by air in a hermetically sealed compartment.

Preserve the Riflescope from impacts, direct sunlight, rain, snow, and dust.

If the Riflescope is installed on a weapon, the protective bag in the upright position can protect it against unfavourable weather conditions.

14 UTILIZATION

The Riflescope does not present a danger to humans or nature. Only metal alloy parts of the Riflescope are subjects for recycling. If necessary, request the list of the alloys content from the manufacturer.

15 TROUBLESHOOTING

Table 3

Malfunction description	Troubleshooting solution
The riflescope does not work	Check whether the batteries are installed properly. Check the charge of the batteries. Replace them if they are weak.
The target does not appear in focus	Rotate the eyepiece (9) (Fig.1) until you get a clear image of the reticle. Then achieve the best-focused image of the target by rotating the objective (10). If the image cannot be focused as described in this manual, clean the lenses. They could be moisturized or dusty.
Condensation accumulates on the parts	It is recommended to use periodically a special protective anti-misting liquid in order to avoid misting of the objective lens in cold conditions. This liquid is included in the auxiliary delivery set.
Dots on the screen	Production technology of the display allows a small amount of dark and bright dots in the image. These dots may also appear after some usage. Most of the appeared dots can be removed by using the function DEAD PIXELS REMOVAL (see 6.4.3).

ATTENTION!

- ***While the Riflescope is operating, presence of one or several darker or lighter segments (spots, stripes) in the field of view is allowed. Mostly often, these segments appear if there is a large temperature gradient between the place, where the observer is located, and the outside environment. For example, this may happen when you observe the terrain from a warm room through an open window. In some cases, these segments can be removed by using the CALIBRATION function with the closed objective lens lid.***

Appendix 1. Description of the MIL-DOT Reticle

The Mil-Dot reticle (Fig. 31) depicts angular dimensions in thousandths of the distance (t.d.) or milliradians (mils). The same reticle is shown in Figure 31 with dimensions in metres at 100 metres distance.

In Figure 31, 1 mil (1 t.d.) is the distance between the centres of the reticle marks. The distance between the crosshair and the first mark is 1 mil. In the metric system of units, the distance between two marks is equal to 10cm @100m of the shooting distance.

The minimal value of one click for zero correction is 1.7cm @100m.

The total range of windage/elevation adjustments is no less than 20 mils (2m @100m) in each direction.

NOTE

A unit of 1 milliradian (1 mil) is the angular measurement unit that is equal to:

1 mil = 1 t.d. (thousandth of distance)
1 mil = 10 cm @100 m range
1 mil = 3.438 MOA (minutes of angle)

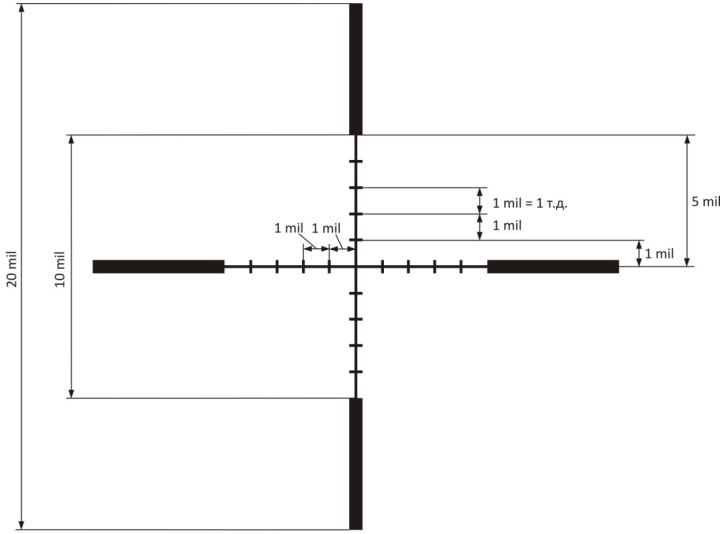


Figure 31. Mil-Dot reticle (dimensions in milliradians or thousandths of distance)

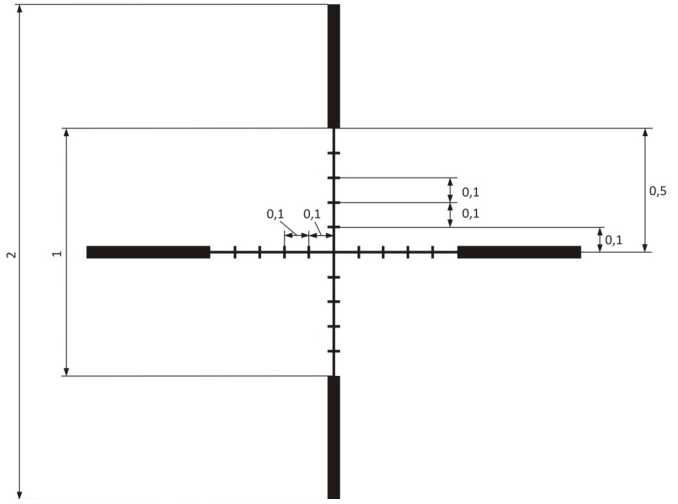


Figure 32. Mil-Dot reticle (dimensions in meters at 100m distance)

Appendix 2. Range Finding to a Target with Help of the MIL-DOT Reticle

The Mil-Dot reticle provides the possibility to calculate the distance to the target with a reasonable accuracy to acquire this target (or correct the side shift of the bullet caused by the wind).

Do the following to calculate the distance:

1 Evaluate real vertical size of the acquired target.

2 Place the reticle crosshair so that the vertical dimension of the target coincides with a reticle mark.

3 Calculate the target height, evaluating it in a number of marks (mils). The more precise your evaluation is, the more precise will be your distance calculation, which is particularly important for small targets or targets located farther than 450 metres.

4 The distance to the target can be determined by the formula:

$L=\frac{(H\times 1000)}{h}$, where L is the distance to the target, H is the real height of the target, and his its height in the mil-dot scale.

Figure 33 shows an example of distance estimation to a boar, which is 1.5 meters in length, with the riflescope Mil-Dot reticle.

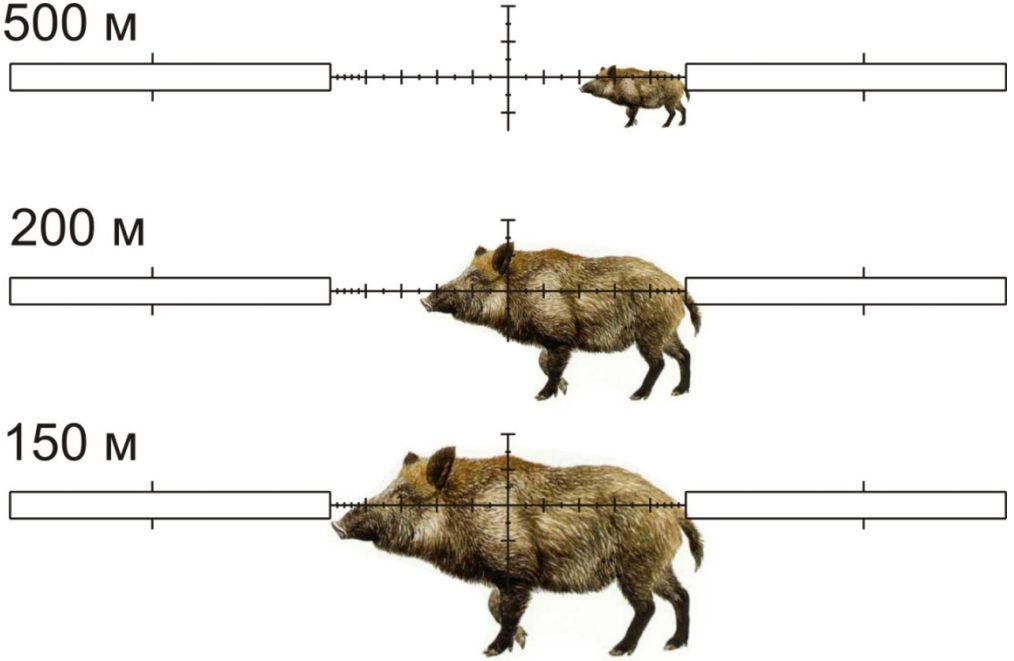


Figure 33. Distance calculation with the help of the Mil-Dot reticle

You can also determine the distance to targets with sizes from 30 centimetres to 2 meters with the Reference Tables 4 and 5

Table 4 – Evaluation of distance to the target

Target size in mils (t.d.)	Distance to the target, m						
	Real target height, cm						
	30	40	50	60	70	80	90
1.00	300	400	500	600	700	800	900
1.25	240	320	400	480	560	640	720
1.50	200	267	333	400	467	533	600
1.75	171	229	286	343	400	457	514
2.0	150	200	250	300	350	400	450
2.5	120	160	200	240	280	320	360
3.0	100	133	167	200	233	267	300
3.5	86	114	143	171	200	229	257
4.0	75	100	125	150	175	200	225
4.5	67	89	111	133	156	178	200
5.0	60	80	100	120	140	160	180
5.5	55	73	91	109	127	145	164
6.0	50	67	83	100	117	133	150
6.5	46	62	77	92	108	123	138
7.0	43	57	71	86	100	114	129
7.5	40	53	67	80	93	107	120
8.0	38	50	63	75	88	100	113
8.5	35	47	59	71	82	94	106
9.0	33	44	56	67	78	89	100
9.5	32	42	53	63	74	84	95
10.0	30	40	50	60	70	80	90

Table 5 – Evaluation of distance to the target

Target size in mils (t.d.)	Distance to the target, m				
	Real target height, m				
	1.00	1.25	1.50	1.75	2.00
2.0	500	625	750	875	1000
2.5	400	500	600	700	800
3.0	333	417	500	583	667
3.5	286	357	429	500	571
4.0	250	313	375	438	500
4.5	222	278	333	389	444
5.0	200	250	300	350	400
5.5	182	227	273	318	364
6.0	167	208	250	292	333
6.5	154	192	231	269	308
7.0	143	179	214	250	286
7.5	133	167	200	233	267
8.0	125	156	188	219	250
8.5	118	147	176	206	235
9.0	111	139	167	194	222
9.5	105	132	158	184	211
10.0	100	125	150	175	200

Appendix 3. List of Software Errors

The errors list with the error numbers and recommendations on how to correct them is given in Table 6.

Table 6

Error number	Description	Recommendation
1	You cannot enter the ballistic correction mode if the reticle type is chosen as NO RETICLE.	Choose any other type of reticle from the RETICLE TYPE menu.
11	The mean impact point shift is limited by the software.	If you cannot shift the reticle to the correct position with the software, check the correctness of the riflescope mounting on the weapon.
12	You cannot enter the windage/elevation adjustment mode if the reticle type is chosen as NO RETICLE.	Choose any other type of reticle from the RETICLE TYPE menu.
21	You cannot magnify the image when you shift down the ballistic reticle too low.	To magnify the image, try to move the reticle to the previous zeroing distance.
22	The software limits shifting in the ballistic table relative to the screen centre.	You can continue shooting with the ballistic drop compensation method.
31	The ballistic table does not contain the zeroing distance (“ballistic zero) is absent).	Work with the ballistic reticle is impossible without entered zeroing distance. In this case, the software will assign 50 metres distance as zeroed automatically.

Appendix 4. Table of the Reticle Positions after Zeroing

Table 7. Reticle positions after zeroing

Weapon type	Ammunition type	Zeroing range, m	Temperature, °C	Current position of the mean impact point
				V
				H
				V
				H
				V
				H
				V
				H
				V
				H
				V
				H
				V
				H
				V
				H

Weapon type	Ammunition type	Zeroing range, m	Temperature, °C	Current position of the

				mean impact point
				V
				H
				V
				H
				V
				H
				V
				H
				V
				H
				V
				H
				V
				H
				V
				H
				V
				H
				V
				H

Dedal-T2.380 Hunter LRF

Operation Manual
Ver. 4.3s

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