THERMAL IMAGING MULTIFUNCTIONAL DEVICE

Lite VIPER by NITEHOG™

INSTRUCTION MANUAL

SAFETY INSTRUCTIONS

Important Usage Instructions

1.Read Before Use: Carefully read this manual before using the device to ensure safe and proper operation.

2.Testing: Thoroughly test the device before use, especially if it has been in storage for an extended period.

3.Disassembly: Do not disassemble the device. Repairs should only be performed at authorized service centers.

4.Optical Surfaces:

1. Always keep the external optical surfaces clean.
2. Avoid touching the optical surfaces with bare hands.
3. Protect the device from sand and seawater, as they can damage the optical coatings.

5.Sunlight: Never point the device directly at the sun.

6.Image Performance:

1. Image quality depends on the environment and atmospheric conditions.
2. Contrast may vary based on the time of day. For instance, at sunset, temperature differences between objects are more pronounced, resulting in better contrast.

7.Storage:

1. Remove the battery if the device will be stored for a long period.
2. Store the battery in polyethylene bags to prevent contact with metal.
3. Recharge the battery every 2–3 months to maintain its condition.

8.Condensation:

1. Condensation may form on external optical surfaces in the following cases:
    1. When moving the device between cold and warm environments.
    2. If the device's temperature differs significantly from the ambient temperature.
    3. In high-humidity conditions.
2. Condensation typically disappears once the device's temperature equalizes with the environment. Use the provided cleaning cloth to remove any moisture. Anti-fog sprays or the included rubber accessories can help prevent condensation.
3. Note: Condensation on the objective lens does not affect the device's performance.

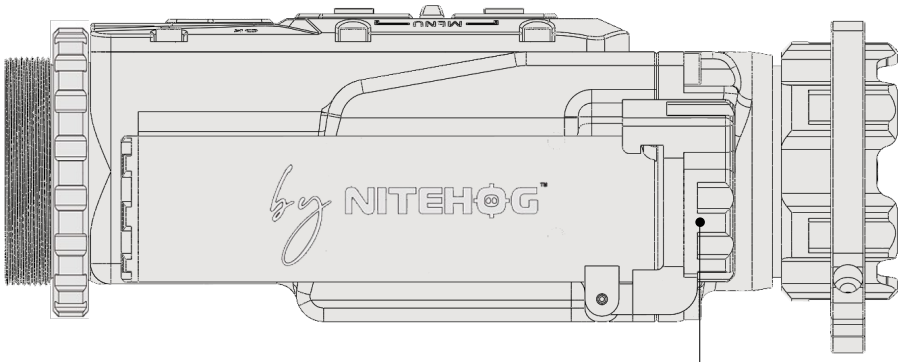
9.Cleaning: Clean lens surfaces gently with the provided cleaning cloth.

Content

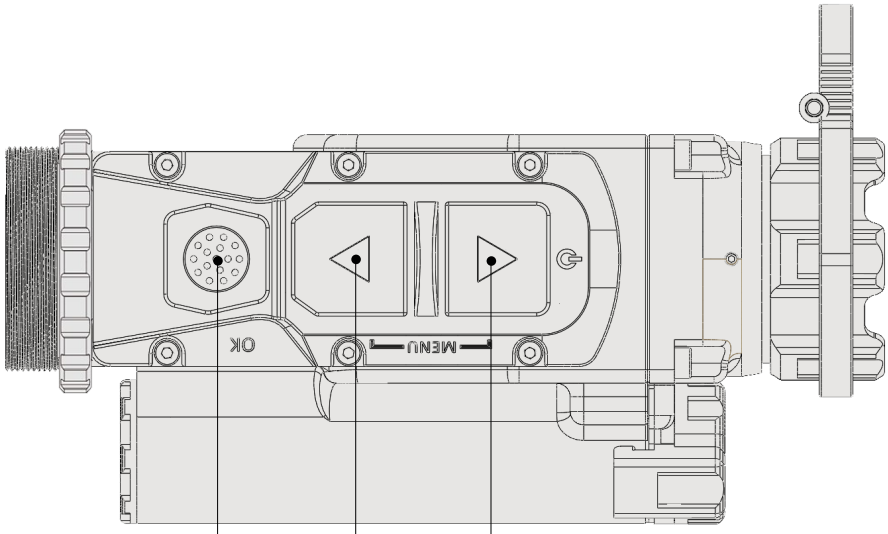
1 Delivery Set

N	Description	QTY.	
1	Thermal imaging multifunctional device Viper 35 Lite		1
2	Transport Box		1
3	Pouch / Soft bag		1
4	Cleaning Cloth		1
5	Battery 18650		1
6	Accessory Box		1
7	User Manual		1
8	Quality Certificate		1

2 Device Overview



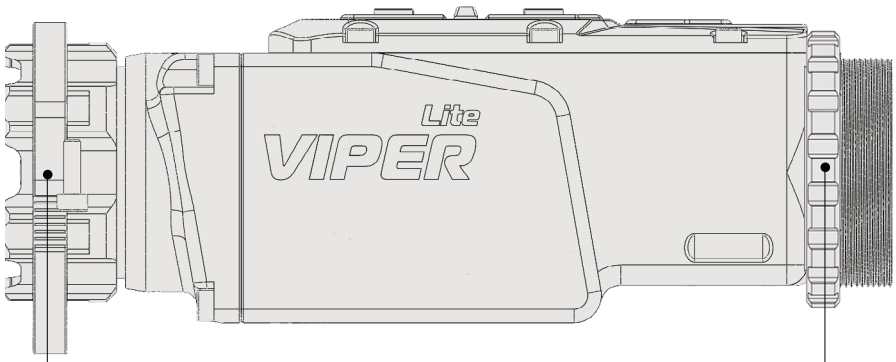
BATTERY CAP



BRIGHTNESS/POLARITY

NUC (NON-UNIFORMITY CORRECTION)

ON/OFF / DIGITAL ZOOM



OBJECTIVE FOCUS RING

ATTACHMENT PLACE

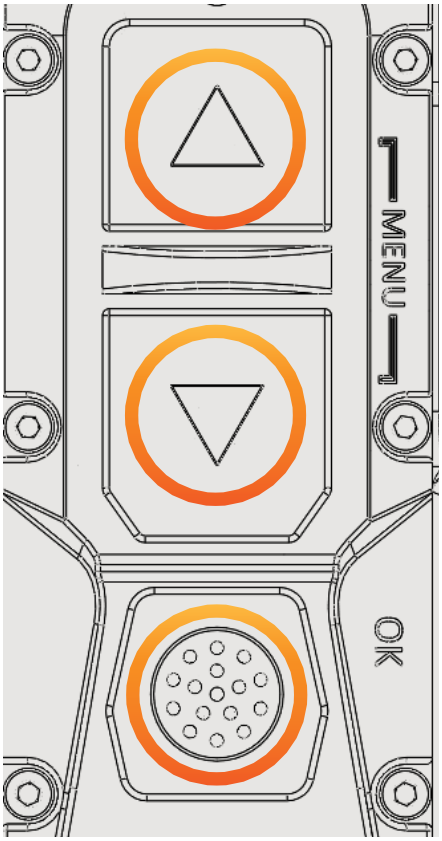
3 Technical Parameters

DETECTOR	
Detector Type	Microbolometer
Resolution	320 x 240
Pixel	12 μm
Spectral range	7 ÷ 14 μm
Thermal Sensitivity (NETD)	Under 35 mK
OPTICS	
Objective lens	35 mm
Magnification	1x
FOV	6.3° (H) X 4.7° (V)
FOV(H×V), m @100m	11 m x 8.23 m(100m)
F/#	1.2
Close-up range	3m
Eye relief	25mm
Exit pupil diameter	20mm
Material & Coating	Germanium, Hard Carbon Coating on the External Surface
THERMAL IMAGING PERFORMANCE	
Brightness / Contrast	Automatic / Advanced Image Processing
Image Polarity	User Selectable (White Hot / Black Hot/Red Hot/ Isotherm)
Menu	Dropdown Menu / OSD
IFOV	0.34 mrad
NUC	Automatic / Manual
VIDEO	
Frame Rate	60 Hz progressive
Digital Zoom	x2, x4
Viewfinder Luminance	Manual via OSD

POWER	
Power Source	1x18650 Li-Ion rechargeable
Operating Times	Up to 5 hours with 1 x 18650 Li-Ion @ 25°C
STATIC RANGE PERFORMANCE	
Human Detection Range (human figure 1.8 x 0.5m)	1380 m
Human Recognition Range (human figure 1.8 x 0.5m)	460 m
ENVIRONMENTAL CHARACTERISTICS	
Operating Temperature Range	-25°C to +50°C
Storage Temperature Range	-30°C to +55°C
Mechanical Vibration	Sinusoidal, 40 m/s², 10 to 80 Hz
Index of Protection	IP 66
PHYSICAL CHARACTERISTICS	
Dimensions H x W x L	46 x 63 x 133 mm
Weight without Batteries and Accessories	Under 255 g

4 Description of Controls

BUTTONS	SHORT PRESS	LONG PRESS
▲	Digital zoom/in observation mode	Power ON/OFF
	Infobox/in Clip-on mode	---
▼	NUC activating	---
OK	Changes between four values of the display luminance	When you are not in the Menu function: Inverts the image between white and black mode In the menu function: quick Menu exit
OK + ▼	Switch between Clip-on and observation mode	---



4.1 ON/OFF/DIGITAL ZOOM

Long press of the ▲ button powers **ON/OFF** the device.
Short press of the ▲ button in monocular mode activates the digital zoom x2, x4.

The current digital zoom is shown at the top-right corner of the screen.

Note!

The digital zoom reduces the quality of the image!

For a larger and scalable image and to facilitate the operating with the menu during the initial individual adjustment, please switch to surveillance mode.

- Quick function for switching between surveillance and clip-on mode: hold down the **OK** button and the ▼ button simultaneously. The pictogram for indication of the respective mode appears in the center of the image for 2 seconds.

4.2 NUC (NON-UNIFORMITY CORRECTION)

The picture quality highly depends on the sensor temperature. Minimal change in temperature is reflected in visible imperfections of the picture - vertical lines, the appearance of light and dark pixels, etc.

We recommend the use of Auto mode, in which the calibration frequency depends on the temperature characteristics of the sensor. The NUC algorithm can be activated manually by pressing the ▼ button. When Auto NUC function is activated, the following symbol  will be displayed on the screen for 5 sec., after that, the pictogram will disappear. The symbol  will appear in the top left corner on the screen and will be highlighted in red as a warning for 2 seconds before the NUC is performed automatically.

When the Auto NUC function is deactivated the symbol  will disappear and the NUC procedure will be carried out manually only when pressing the ▼ button.

4.3 BRIGHTNESS / POLARITY

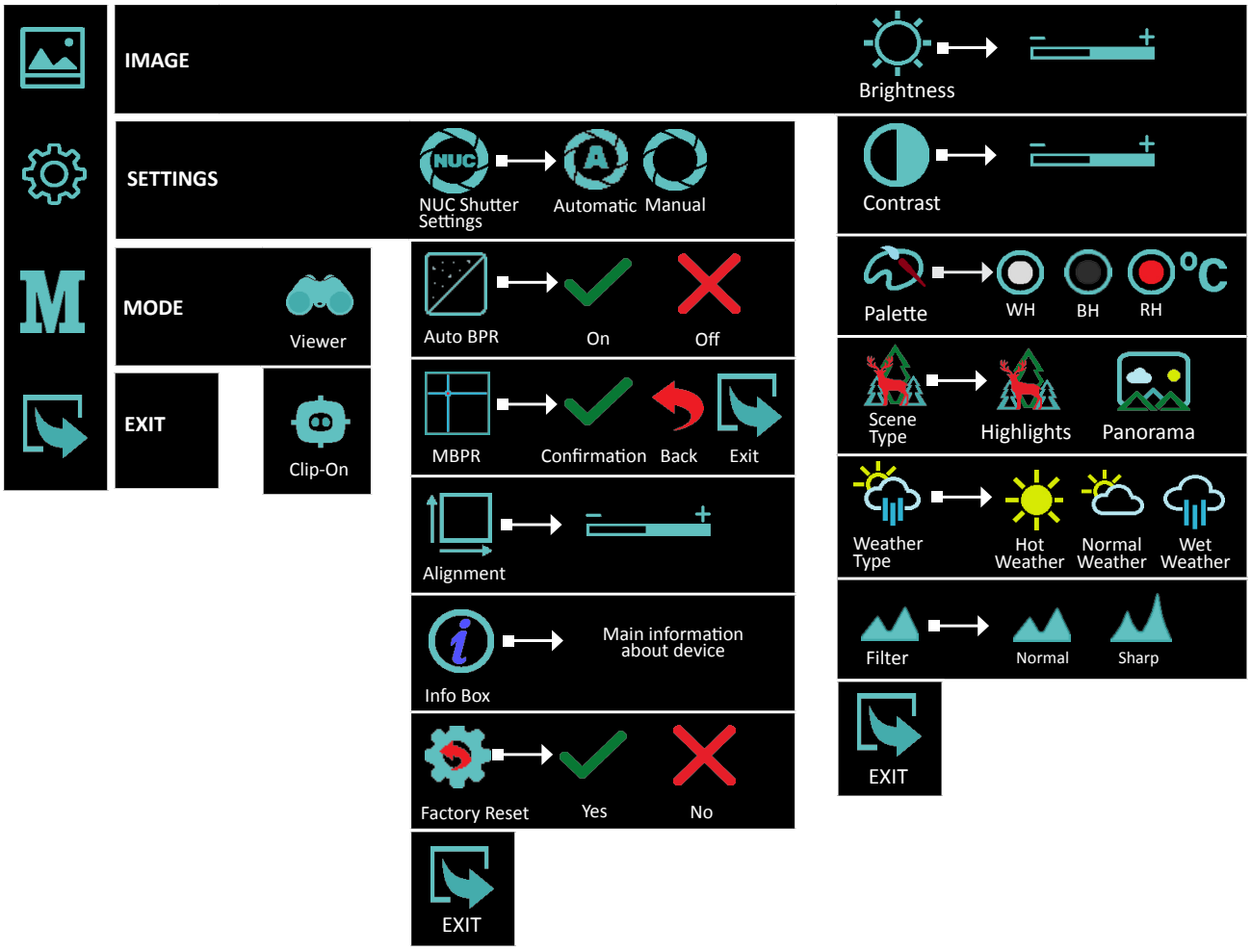
The device has three fixed and one user adjustable values of the display luminance, marked with the following icons: 

When using the device in low lighting conditions and for an extended period of time, consider lowering the brightness levels to extend the battery life and to avoid eye fatigue. A single short press of the button **OK** shows the current Luminance value. Pressing the button again in close succession will cycle through the available luminance values. The value of the manual luminance option can be configured through the user menu. Press and hold the **OK** button for more than 2 seconds to invert the image, i.e. warm object appear in black hot or in white hot and vice-versa. The change of polarity is denoted by the **BH** or **WH** symbols that appear on the screen for 2 seconds.

5 Menu

5.1 APPEARANCE

Select **Brightness** to adjust the level of image brightness from 1 to 4 by pressing the **Up** or **Down** button, and press the **OK** button to save, and exit to the upper interface.



Attention!

When the **Menu** is activated and the user is inactive for more than 20 seconds, the **Menu** is automatically deactivated.

The function is not active in the **Alignment** and Manual Bad Pixel Replacement (**MBPR**) sub-menus.

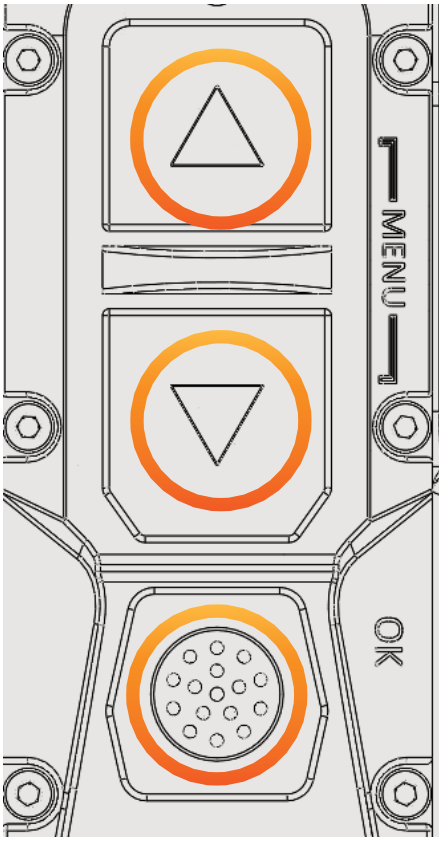
Note!

To quickly exit the device **Menu** function, hold down the **OK** (**Brightness**) button for more than 3 seconds.

5.2 NAVIGATION

Attention!
The buttons ▲, ▼ and **OK** are dual purpose buttons!

BUTTONS	SHORT PRESS
▲ + ▼	Activates the menu
▲	Moves the cursor up
▼	Moves the cursor down
OK	Function select

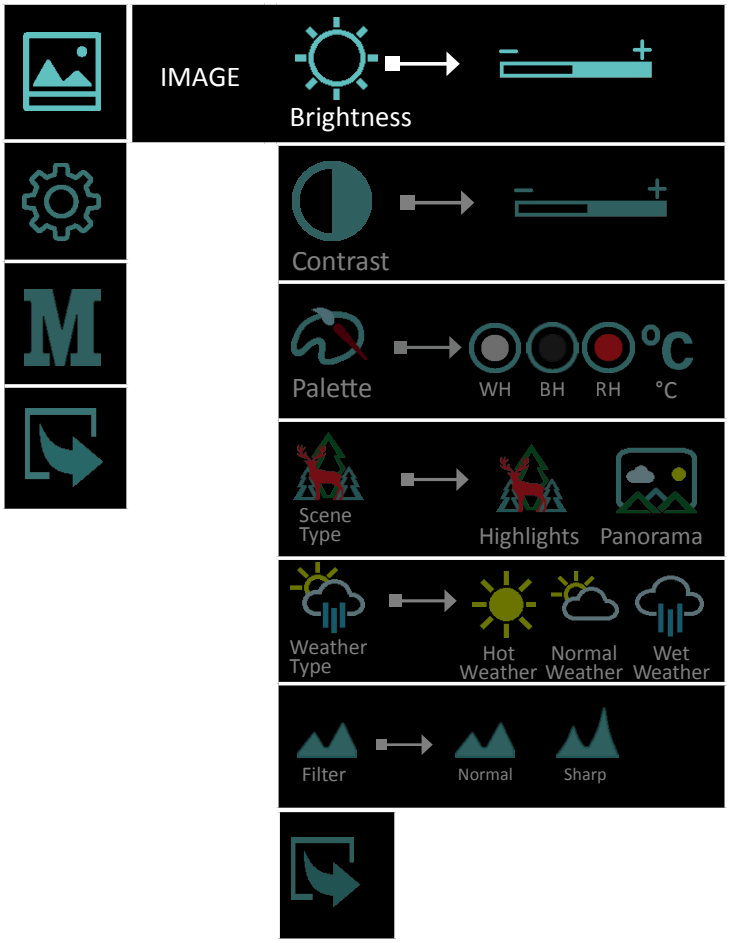


5.3 IMAGE

5.3.1. BRIGHTNESS

Selecting **Brightness** gives the opportunity to set your own user-defined level of image brightness.

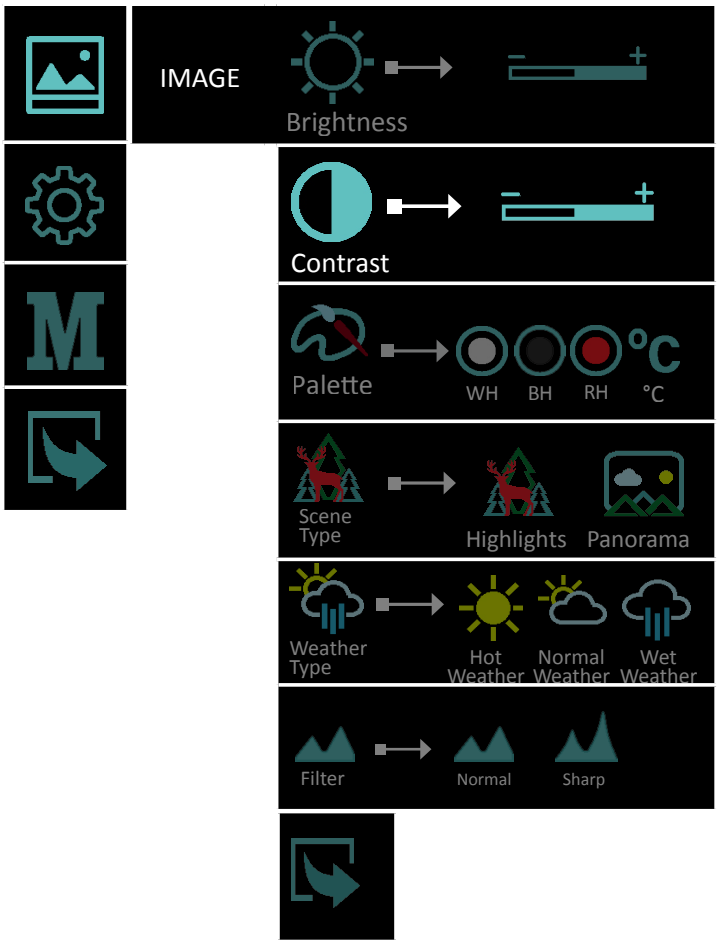
Brightness is not related with the **Luminance** adjustment performed by the button **OK**!

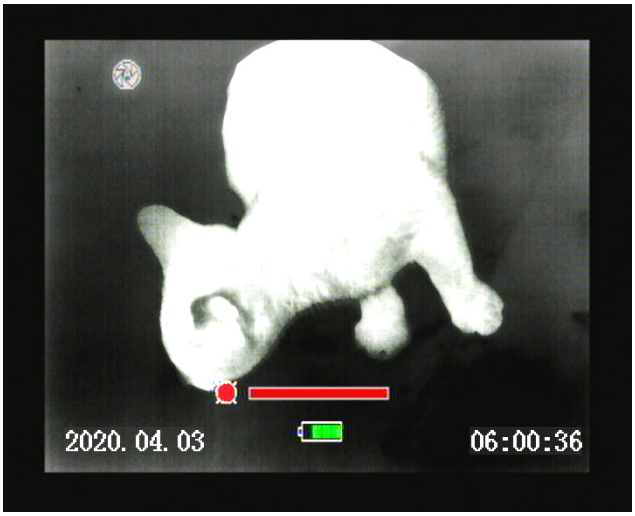


5.3.2 CONTRAST

Selecting **Contrast** gives the opportunity to set your own user-defined level of image contrast (**Gain**).

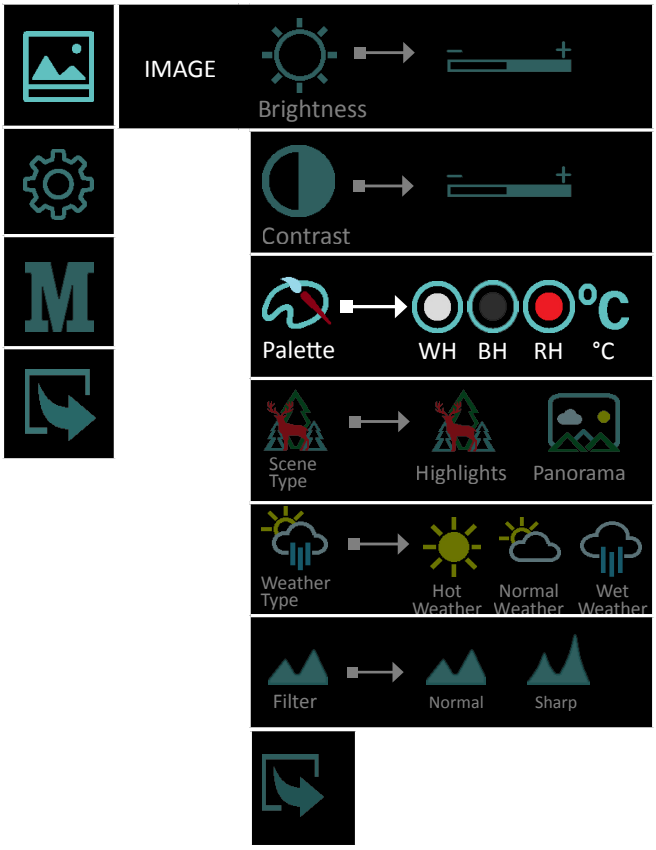
Increasing the contrast value will ensure better object contrasting and easier detection. However this will decrease the details on the observed object. Decreasing the contrast value will make the details visible.





5.3.3 PALETTE

A variety of color palettes can be used: **White Hot**, **Black Hot**, **Red Hot** and **Isotherm**.



White Hot and **Black Hot** - Choosing **Black Hot** (warmer objects appear in black) and **White Hot** (warmer objects appear in white) is up to user's personal preference.

Red Hot - recommended mode for prolonged observation. The image is red black to minimize the blue light emitting **from the display and is more** comfortable on the eyes.

Isotherm - the objects above the threshold temperature are colored in different shades of red.

The temperature threshold can be set (increase/decrease) by the temperature scale shown.

Increasing the threshold value ignores the colorization of the colder objects.

This option is highly dependent from the distance to the object. It is highly recommended to try different values of the threshold in the daily usage to find the right value for your personal preference.

5.3.4 SCENE TYPE

Selecting **Contrast** gives the opportunity to set your own user-defined level of image contrast (**Gain**).

Two types of auto contrasting, for better performance:

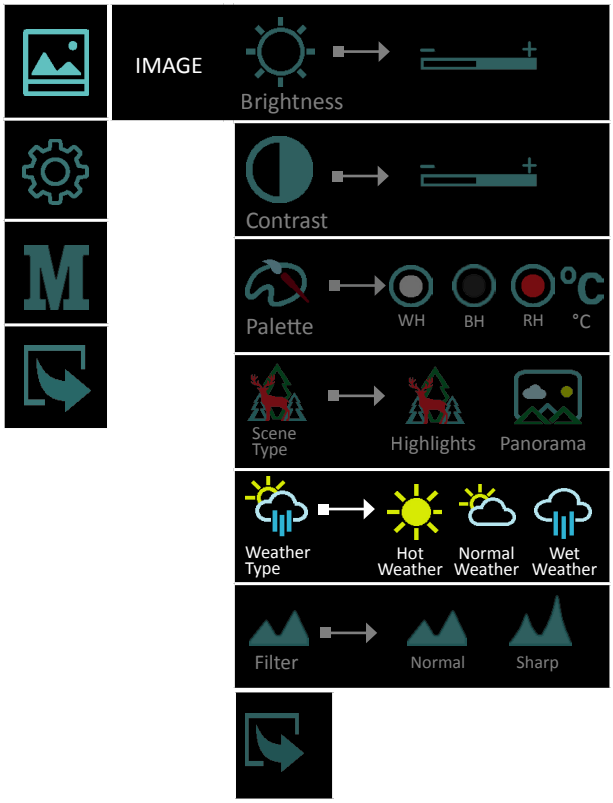
Highlights - this type of image contrasting is suitable for detection and observation.

Panorama – The picture is very stable during changes in the dynamics of the scene. Suitable for observing panoramic scenes with combination of: forest and sky, earth and sky, scenes on the horizon, etc.

5.3.5 WATHER TYPE

Selecting **Contrast** gives the opportunity to set your own user-defined level of image contrast (**Gain**).

The image quality is strongly depending on weather conditions. When the weather is wet (fog, rain,etc.) the dynamic range of the scene is reduced, causing the contrast of the image to lower. To prevent this effect, this option provides a filter, that enhances the details of the low contrast image in wet weather conditions (incl. fog and haze). You may choose between 3 filters:



Hot Weather

Normal Weather

Wet Weather

Wet and foggy weather conditions with Normal Weather Type Filter

Wet and foggy weather conditions with Wet Weather Type Filter

Note!

During good weather conditions please select (**Normal weather**). Otherwise the image will be noisy.

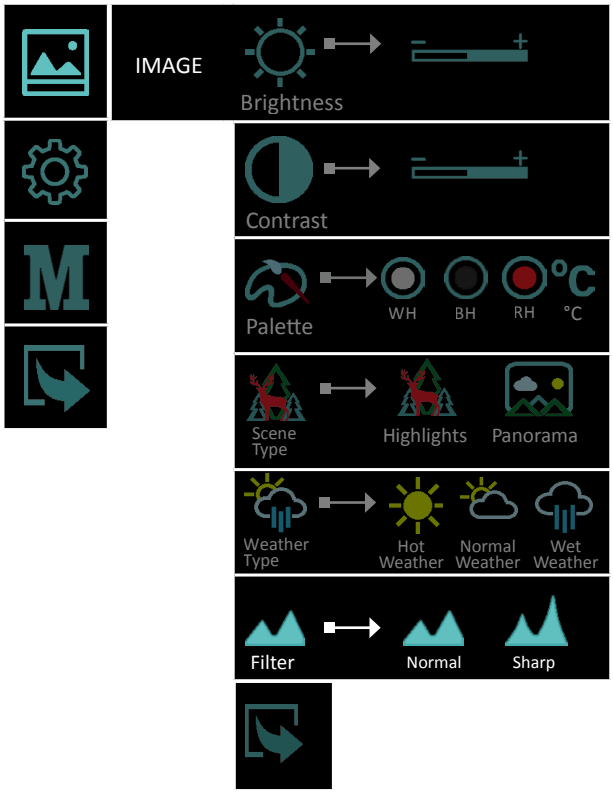
5.3.6 FILTER

For a more detailed image and clear edges, you can switch on the **Nitehog Image Razor** (**NIR**) sharpening filter for more image details.

Available options:

Normal

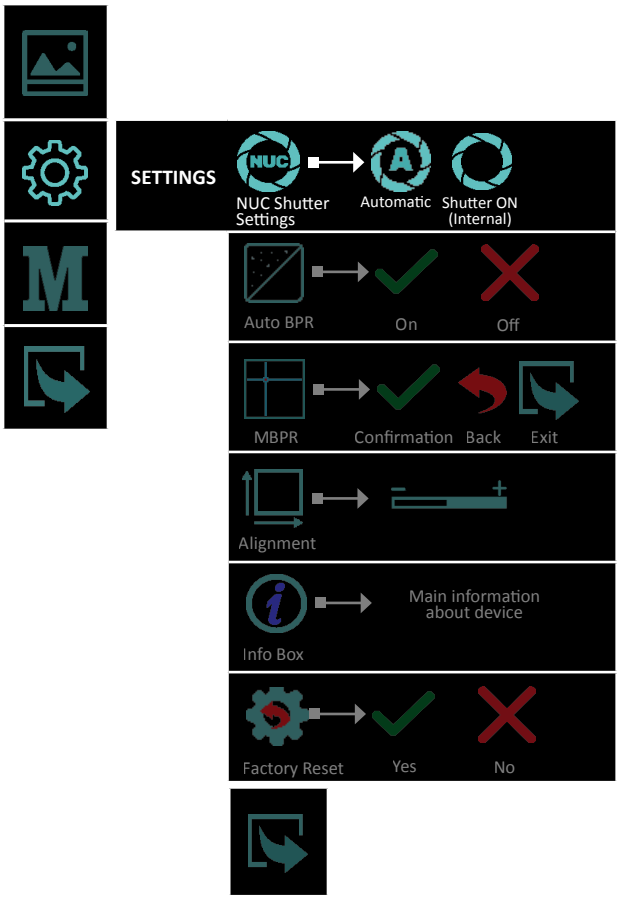
Sharp



5.4 SETTINGS

5.4.1 NUC SHUTTER SETTINGS

Through the menu the user has access to three modes of calibration of the microbolometer and the sensor of the device. We recommend the use of Automatic mode, in which the calibration frequency depends on the temperature characteristics of the sensor.



- **Automatic mode** - The calibration is performed automatically at regular intervals and with a shutter mechanism located in the device.

Important!

The factory NUC settings of the device are in Automatic mode!

- **Manual mode** - The calibration is performed by the user, by pressing and holding the ▼ button for more than 2 seconds, at desired intervals, with a shutter mechanism located in the device. It is not necessary for the user to cover the lens with an external barrier.

Important!

In manual calibration mode (NUC), the pictogram for the respective is permanently displayed.

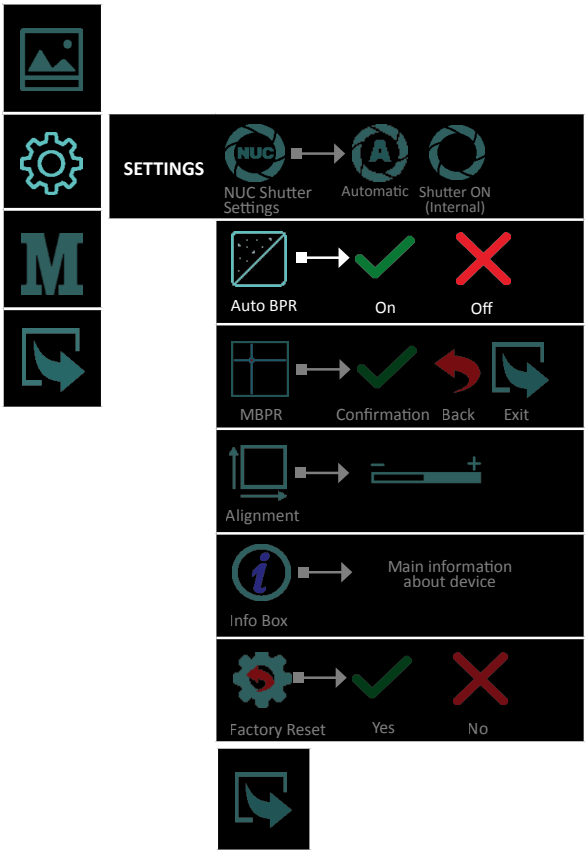
When the user switches to **Auto NUC** from some other calibration mode, the icon appears on the display for 5 seconds and then disappears.

5.4.2 AUTO BPR

The **AUTO BPR** functionality gives the opportunity to automatically correct and clear bad pixels that have appeared on the microbolometer.

Important!

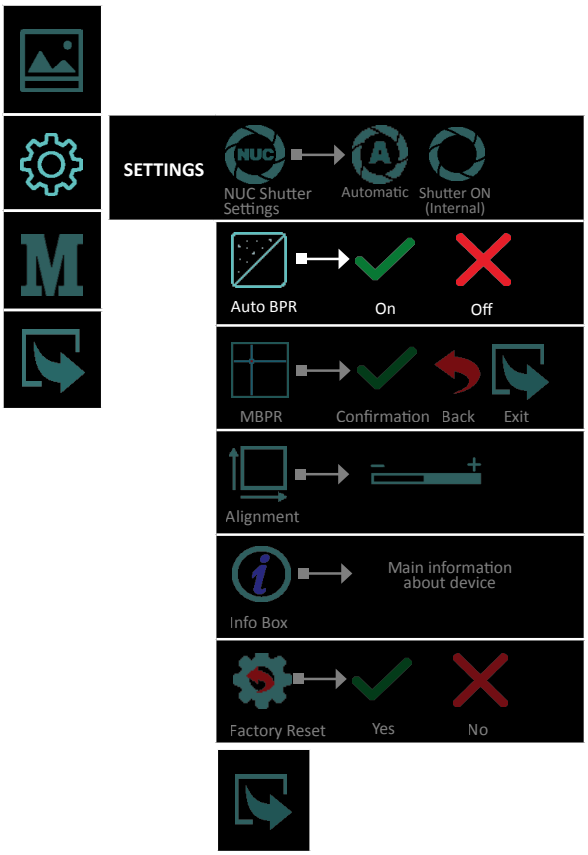
When observing small objects over long distances, we recommend that the **Auto BPR** function be turned off, so that it does not affect negatively the detection of the observed object.



5.4.3 MANUAL BPR (MBPR)

The device offers a function for manual correction of defective pixels.

This functionality gives the opportunity to manually correct and clear bad pixels that have appeared on the microbolometer array.



Important!

When observing small objects over long distances, we recommend that the Auto BPR function be turned off, so that it does not affect negatively the detection of the observed object.

Instructions and working steps for "bad" pixels removal:

- BPR procedure should happen after calibration of the device. This calibration can be activated by pressing the ▼.

If the NUC procedure does not resolve the issue with the bad pixels, then remove the defective pixel by using the MBPR function in the **Settings** menu.

- Activate the **MBPR** function with choosing icon with a short press of the **OK** button;
- The screen is scaled in HD format, and a cross marker appears on it. The marker is a fine cross, the lines of which extend throughout the active picture area. The cross (marker) will disappear automatically after 15 seconds of inactivity;
- First, move the cross horizontally with a short press of ▲ and ▼ but-

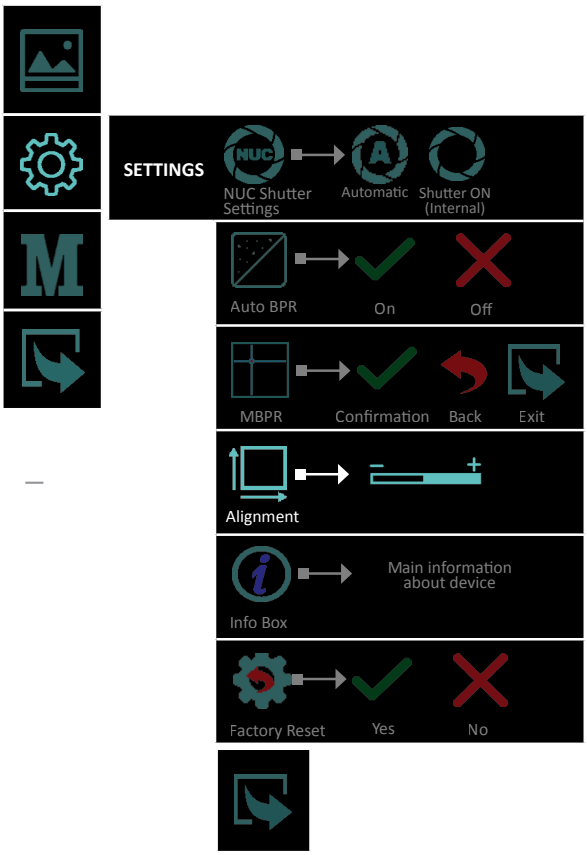
tons. The vertical line must match the damaged pixel. After confirmation with a short press of the **OK** button, start moving the cross vertically, the horizontal line to match the position of the damaged pixel. By holding the navigation buttons, the marker moves 10 pixels per step. If the desired position is not reached, the actions may be repeated until the marker matches the desired pixel;

- Set the defective pixel with a long press of the **OK** button;
- The defective pixel is cleared, the cross marker disappears for visual inspection,  (confirmation) and  (back) and  (exit) icons appears on the screen;
- In case of match and success the actions are confirmed with a short press of the **OK** button over  icon;
- If you want to restore the last cleared pixel choose  icon with a short press of the **OK** button;
- After confirmation with  icon, the pixel correction is confirmed and saved.
- A cross marker  should appear again on the display for subsequent adjustments. Then you can proceed to clear the next defective pixels by moving the marker as described;
- If there are no more bad pixels for correction, you can exit the correction screen in the following ways:
- Restart the device. The last adjustments are going to be saved automatically;
- Select any normal pixel, long press the brightness button for the menu;
- The pictograms  ,  and  appears on the screen;
- Select the  icon, which action returns you to the Settings menu.

5.4.4 ALIGNMENT

With **Alignment** function, you can precisely align the optical axis of the day sight and the clip-on attachment. The manufacturing process of the device ensures the shooting precision tolerance up to **3 cm at 100 m**. By this Alignment function, you can achieve much better accuracy.

Entering the **Alignment** function allows shifting the image in all directions to align it to the day scope zero, The X and Y values showing the current position of the image and If the impact point is different than the center point of the day scope, the image should be moved in a direction opposite of the impact point by changing the X and Y values (up/down or left/right).



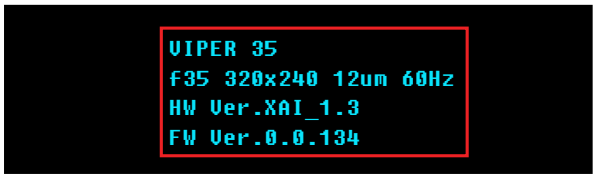
The action is performed with the ▲ (up/right) and ▼ (down/left) buttons. Switching between directions is performed by short pressing the **OK** button.

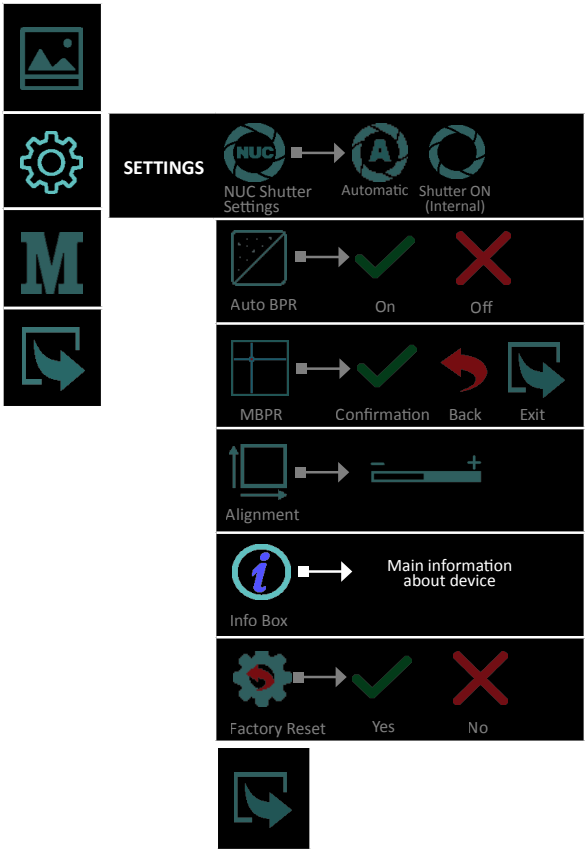
Move the image so that the point of impact matches with the center point of the day scope.

Example: If the impact point is right below the impact point of the day scope, the image should be moved up and left.

5.4.5 INFO BOX

The customer can get up-to-date information about the device, such as main technical characteristics and firmware information.

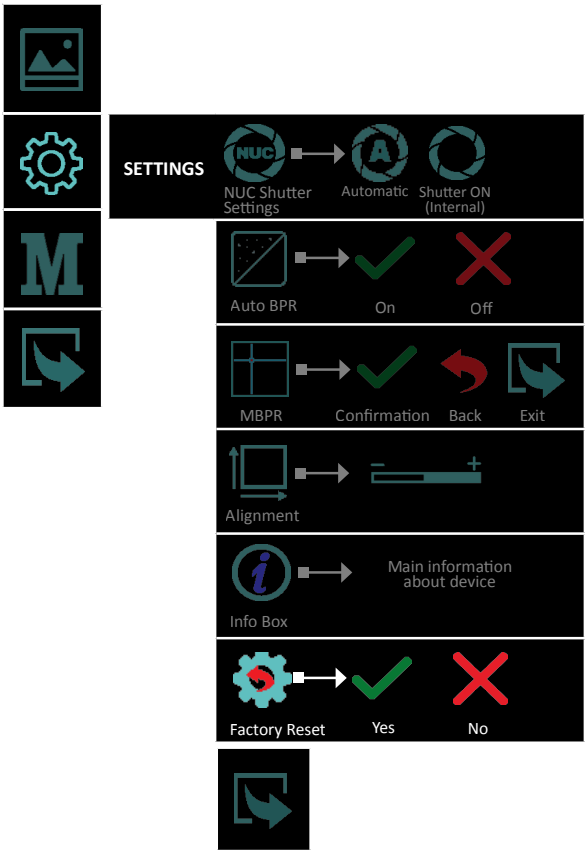




5.4.6 FACTORY RESET

By selecting and confirming this feature all factory settings of the device are restored, including the alignment of the front attachment.

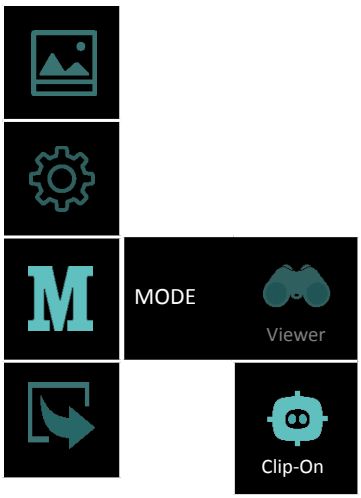
During the factory reset process, the user receives information about the progress on the display.



Attention!

By performing the **Factory Reset** procedure, you will delete all the settings saved on the device, including the alignment with the day optical sight!

5.5 MODE



To use VIPER as a clip-on device select **Mode** > **Clip-On** from the menu.

All important on-screen elements are displayed in the central area of the image. The reason is the reduced field of view of the daysight by higher magnifications.

The digital zoom is locked. The ▲ button calls up the Infobox, which gives the information about the current settings of the device.

For a larger and scalable image and to facilitate the operating with the menu during the initial individual adjustment, please switch to surveillance mode.

Quick function for switching between surveillance and clip-on mode: hold down the button **OK** and the ▼ button simultaneously. The pictogram for indication of the respective mode appears in the center of the image for 2 seconds.

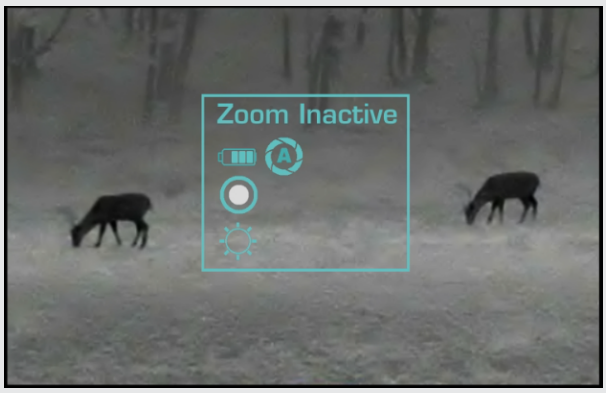
When reaching a low battery state the device gives a warning in the top left corner of the central area. There is a possibility to ignore it by pressing the ▲ button.

Note!

It is recommended to use up to 3x magnification of the primary optical unit in order to keep the menu and all submenus visible in clip-on mode.

Note!

In **Clip-on mode** the digital zoom is locked. The ▲ button calls up the Infobox, which gives information about the current settings of the device.

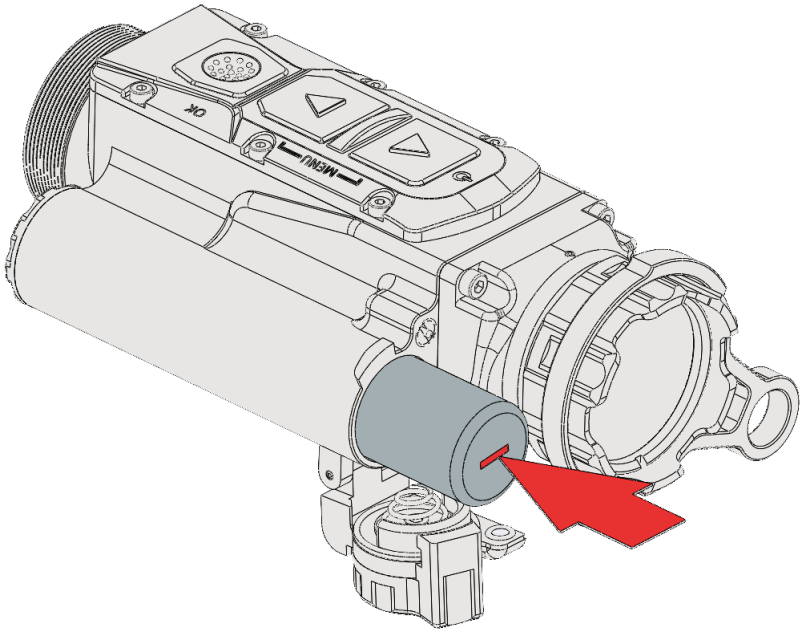


6 Battery Use

6.1 BATTERY REPLACEMENT

The device is powered through 1 piece of 18650 Li-Ion rechargeable battery.

The battery replacement instructions are presented below.



Note!

Attempting to power on the device, when the battery is fully depleted, will cause a red indicator to blink for a few seconds.

Important!

Always place the battery using the correct battery orientation (shown in the battery holder) to avoid damaging the device.

Note!

The batteries are not covered by the warranty!

Important!

Please keep all batteries away from moisture.

Note!

Make sure the device is turned off before replacing the battery.

6.2 TIPS FOR PROPER BATTERY CARE AND USE

- Use the correct size and type of battery specified in the technical description and user manual.
- Keep the battery contact surfaces and the battery compartment contacts clean. For this purpose you can use a clean pencil rubber or a rough cloth each time you replace the battery.
- Remove the battery from the device when in storage for a longer period of time.
- Make sure that you insert the battery into your device properly (with the + (plus) and – (minus) in the correct position).
- Store batteries in a dry place at normal room temperature.
- Extreme temperatures reduce battery performance.
- Do not attempt to recharge a battery, unless it is specifically marked as "rechargeable."

7 Attachment

7.1 INSTALLATION IN FRONT OF THE DAYTIME RIFLE SCOPE

The clip-on thermal device comes with a M33x0.75 collimator thread (2 on the next page), that matches different types of fixed adapter rings and adapters (3 on the next page).

Note!

During shooting with the clip-on thermal device VIPER attached to the daytime rifle scope with help of the fixed adapter. The adapter could move along the daytime rifle scope. The size of this movement depends on the tightening force of the locking thumb and recoil force of the weapon and could be equal to 1 mm on each shot. This movement is allowed and does not affect the impact point. The position of the adapter should be controlled after each shot in the shooting sequence.

Tip

Mark both - the clip-on and the daytime rifle scope and check markers for displacement after each shot.

Warning!

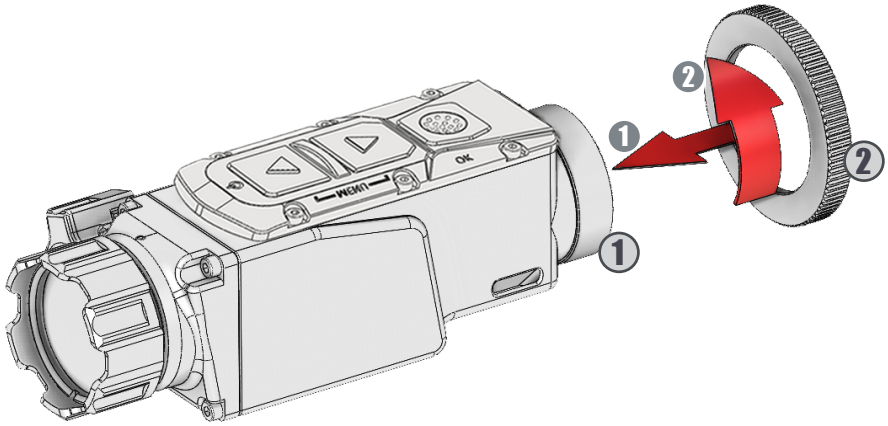
Use of this device may be restricted by national regulations. You should consult with local authorities prior to using the clip-on thermal device VIPER.

Note!

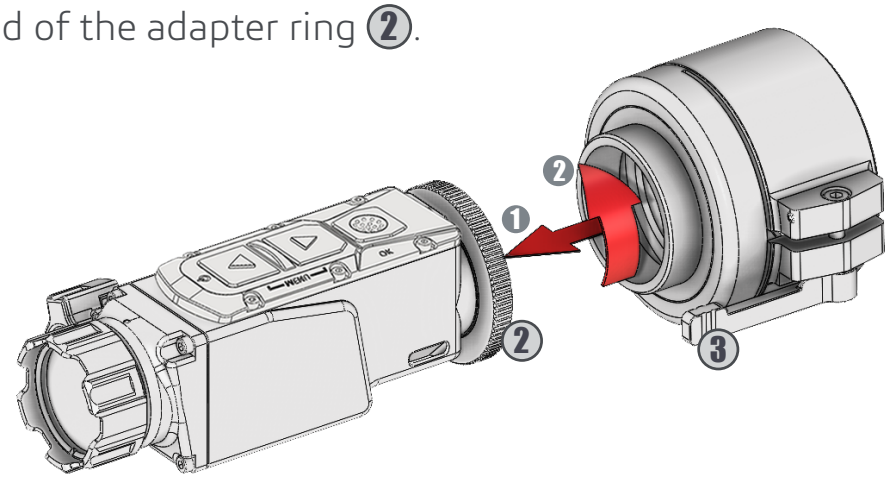
Images used in the following instructions are for illustrative purposes only. Diameter and the appearance of the adapter ring may vary due to the diameter of the used daytime rifle scope and the manufacturer of the adapter ring.

Mount your clip-on thermal device in front of the daytime rifle scope as follows:

1 Turn the adapter ring ② clockwise and screw it into the thread ①, located on the back side of the device until stops.

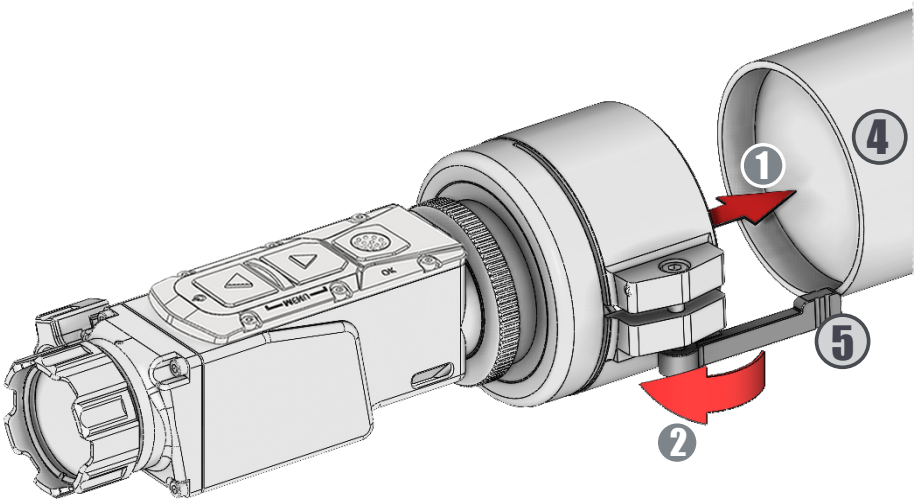


2 Turn the fixed adapter ring ③ clockwise and screw it on the inner thread of the adapter ring ②.



3 Position the clip-on thermal device to the daytime rifle scope with the control buttons located on top.

Put the clip-on thermal device with the fixed adapter on the front of the daytime rifle scope ④ and fix it with the adapter thumb ⑤.



8 Operating With The Device

The advantage of being mounted in front of a daytime rifle scope is that the clip-on thermal device does not affect the rifle scope zero and keeps all tactical features of a daytime rifle scope intact.

After attaching the clip-on thermal device VIPER to the daytime rifle scope follow the next steps for operation with the device:

① Always check the adjustment of the daytime rifle scope (diopter adjustment, parallax, adjustment, etc.)

② Switch on the device.

③ Set the required magnification of the daytime rifle scope. Choose the object of observation and focus the objective lens of the device by using the lens focusing ring of the front of the objective.

⑤ The fire adjustment of the system that includes both the daytime rifle scope and VIPER clip-on thermal device should be performed in accordance with the instructions for adjustment of the daytime rifle scope.

⑥ Turn off the device after use and remove the battery from the compartment to avoid battery leakage.

Note!

When mounted in front of the daytime rifle scope VIPER can change zeroing no more than 3 cm. This is connected to changes in the weapon balance, light distortions in the daytime rifle scope, and technological limits of the adjustment of the VIPER clip-on thermal device.

Note!

For maximum image quality through the daytime rifle scope, we recommend using a rifle scope magnification up to 3x.

9 Storage

To maximize the life of your device and to protect it from damage we recommend storing it in the individual packaging in which you received it.

Before storing it, be sure to clean the device (remove any moisture, dust or traces of dirt)!

Make sure that the battery compartment is empty and there aren't any traces of moisture in it.

For shorter periods of time, the device can be safely stored in a suitable soft bag or a cartridge box.

The premises in which the device is kept for long term have to be dry, enclosed, unheated and ventilated.

When storing the device for a longer period of time, make sure that it is kept in a dry, enclosed, unheated and ventilated space. Do not subject the device to excessive temperatures outside the range of [-30:50°C], relative humidity that is greater than 80% and long periods of direct sunlight.

10 Transportation

The product should be transported only with its original packaging.

Before each transportation, the product should be neatly packed in its original packaging (transport bag) and all other items and accessories should be carefully and securely placed in the transport box.

11 Product Description

The VIPER device allows detection of objects that emit energy in the infrared spectrum. The equipment can operate in rain, fog and total darkness in a completely passive mode (without additional illumination). The active matrix is microbolometer, working in the wavelength range from 7 to 14 µm. The unique design of the device makes it reliable and ergonomic.

The body is made of strong, ultra-lightweight magnesium alloy and has been applied with matt anti-reflective coating. The device's functions can be accessed through the buttons, while the OSD (on-screen-display) provides status information about it's current condition.

12 Principle Of Operation

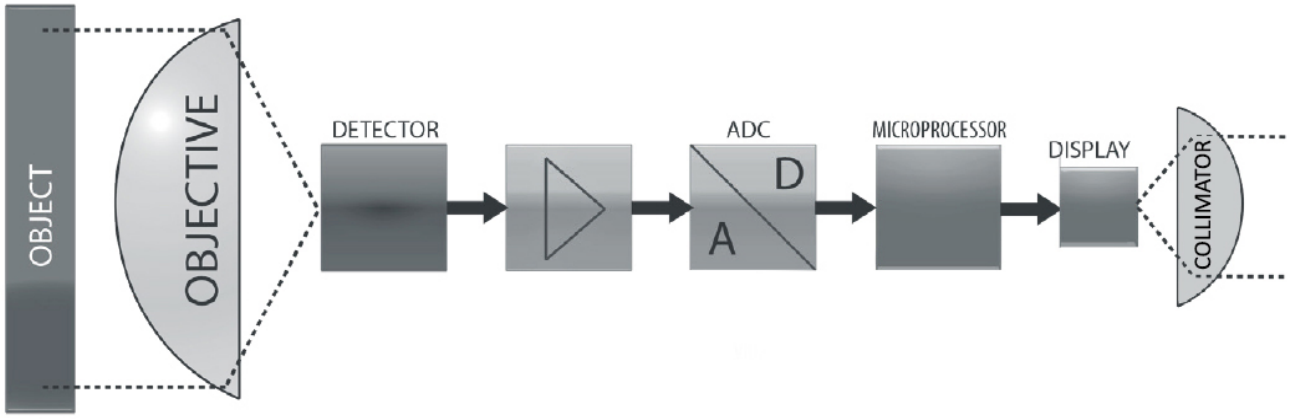
Thermal cameras detect temperature by recognizing and capturing different levels of infrared light. This light is invisible to the naked eye, but can be felt as heat if the intensity is high enough.

All objects emit some kind of infrared radiation, and it's one of the ways that heat is transferred. If you hold your hand over some hot coals on the grill, those coals are emitting a ton of infrared radiation, and the heat is transferring to your hand. Furthermore, only about half of the sun's energy is given off as visible light — the rest is a mix of ultraviolet and infrared light.

The hotter an object is, the more infrared radiation it produces. Thermal cameras can see this radiation and convert it to an image that our eyes can see.

A special germanium objective lens focuses the infrared energy emitted by all of the objects in field of view of the device. The focused radiation is scanned by an array of infrared-detector elements. The detector elements create a detailed temperature pattern of the observed scene called a thermogram. The signal generated by the detector elements is passed through an analog-to-digital converter and translated into discrete electric impulses. The impulses are sent to an image-processing unit, a circuit board with a dedicated chip that improves the image quality and converts the infor-

mation from the elements into data for the display. The signal-processing unit sends the information to the display, where it is displayed as a different shade of gray depending on the intensity of the infrared emission. The combination of the impulses from all of the detector's elements creates the final image.



13 Troubleshooting

Typical faults and their external signs	Possible causes	Possible solutions
When the device is turned on there is no image on the screen	- Poor contact with the batteries - Wrong battery polarity - Depleted battery - Display brightness is set to minimum - Problem with the battery cap - Display problem - Detector problem	- Check batteries and battery compartment contacts and clean them, if necessary with the cleaning cloth. Replace or recharge the batteries - Adjust the brightness through the menu - Replace the battery cap - Return the device for maintenance
The image of the area is weak and foggy	- Contamination over the external surfaces of the objective and/or the eyepiece/collimator - Contamination of the internal surfaces of the objective and/or the eyepiece/collimator	- Clean all external surfaces with a napkin or the LensPen - Return the device for maintenance
The image is smudged/ negative like image	- NUC is on external mode - NUC mechanism is stuck	- Cover the lens by hand and press the N button or switch to internal NUC and press the N button - If on internal NUC the mechanics do not move when pressing the N button (you do not hear acoustic click), return the unit to the factory for maintenance.
The image is smeared or grainy	- Wrong weather type or image filter is selected	- Try other image filters or weather types until you reach the desired image appearance
The panel buttons do not function	- Electronics boot failure - Electronics malfunction	- Restart the device - Return the device for maintenance

Typical faults and their external signs	Possible causes	Possible solutions
The Auto NUC is not working	- External NUC mode is selected - Shutter is stuck	- Switch to internal NUC and press N button - Return the device for maintenance
The ZOOM is not working	- Clip-on mode is selected (if applicable) - Electronics boot failure - Electronics malfunction	- Select monocular mode (if applicable) - Restart the device - Return the device for maintenance
The image on the display is blurred and out of focus	- Device is not focused on the observed distance - The eyepiece/collimator back lens are dirty - Opto-mechanical malfunction	- Focus on the target object - Clean the collimator lens - Return the device for maintenance
There are fewer or no details in the image and there is too much exposure of the object	- Contrast level is high	- Decrease Contrast level
The scene background is too dark	- Low Contrast level - Low Brightness level	- Increase Contrast level - Increase Brightness level
The image is too dark	- Low Luminance level - Low Brightness level	- Increase display Luminance level - Increase Brightness level
The clip-on goes off when shooting	- Poor contact with the batteries - Problem with the battery cap - Display problem	- Check batteries and battery compartment contacts and clean them, if necessary, with the cleaning cloth. Replace the batteries. - Check that the battery cap is tightly closed - Return the device for maintenance
There is a shift of the impact point relative to the daily sight scope	- Incorrectly parallax adjustment of the daily optic sight - Improper attachment of the clip-on to the daily optical sight - Ammunition changed - The clip-on needs additional adjustment	- Set the parallax correctly of the daily optic sight - Check the attachment of the clip-on to the daily optical sight - Check your ammo - Make additional adjustments with the alignment function
There are defective pixels on the display	- Damage in the microbolometer array caused by shooting or other mechanical impacts	- Correct defective pixels with the MBPR function in settings or use Auto BPR function