OPTIKA Mérnökiroda kft / Engineering Ltd

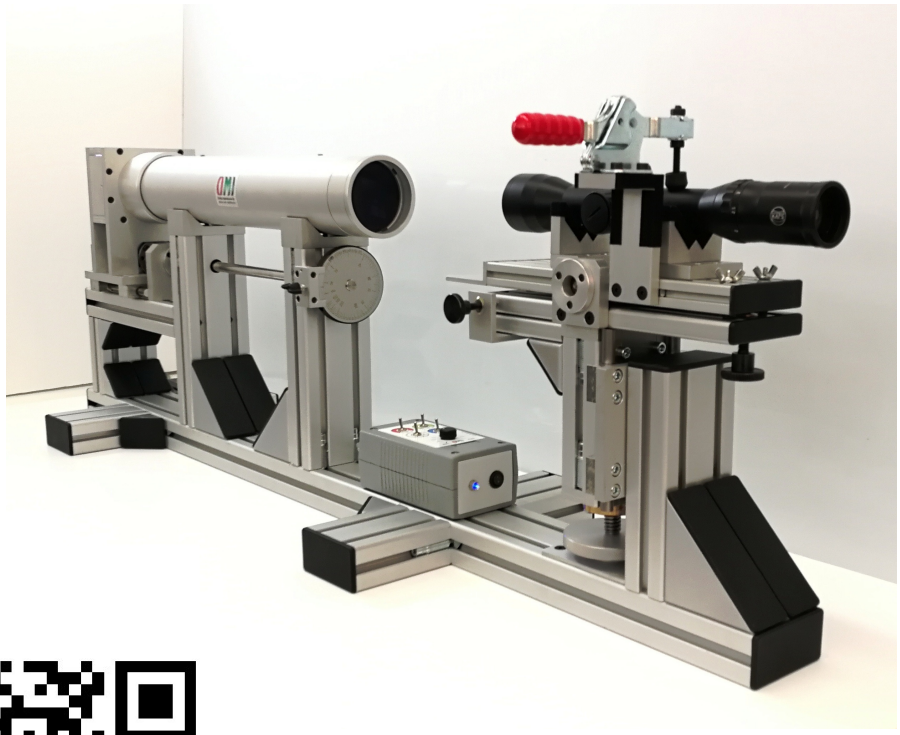
29-33 Konkoly-Thege Miklós út, 1121 Budapest, HUNGARY

Tel.: +36-1-392-2278, +36-30-950-1135 Fax.: +36-1-392-2555

www.omi-optika.hu info@omi-optika.hu

Focusable collimator for scope adjustment

Type: 8-030-000



User Manual

Budapest

- 2021 April -

Table of Contents

This document is a user manual for OMI 8-030-000 focusable collimator designed and manufactured by OPTIKA Mérnökiroda Kft. It provides the basic technical data, safety and operating instructions as well as detailed description on how to calibrate and maintain the instrument.

1. Included with the device

- Switched-mode power supply (Input: 90 – 264VAC, Output: 24VDC / 40W)

- User Manual

2. Technical Details

Distance Range: ∞ - 27 m

Power Input: 24V DC / 10W max.

Objective Lens: 70/500 AR coated air spaced achromatic doublet

Illumination of the reticle: white and RGB LEDs with adjustable bightness, separate switches for each color

Dimensions: 1160 x 280 x 395 mm

Focusing Mechanism: 16x10 precision ball screw, linear guide system

Test bench positioning: 3 DoF adjustment mechanism (1 x translational motion with lead screw; 2 x rotational motion with adjustment screws)

3. Principles of operation

A collimator is an optical device used for producing a beam of parallel rays. It consists of an objective lens fitted in a tube and an illuminated reticle placed at its focal plane. In this setting the image of the reticle is projeted at infinity (Diagram 1).

A focusable collimator allows for slight adjustments between the position of the objective lens and that of the reticle along the optical axis – thus providing the option to create setups where the image is projected at finte distances:

By moving the reticle away from the objective lens the rays leaving the reticle are being focused by the optics on the opposite side - forming a real image (Diagram 2).

Conversely, moving the reticle towards the objective lens results in a diverging beam and a virtual image at the apparent origin of the rays (Diagram 3).

When using the collimator for evaluation of parallax error in riflescopes it is operated in this third setting – that is the virtual image of the reticle is observed through the eyepiece and serve as a reference for parallax correction.

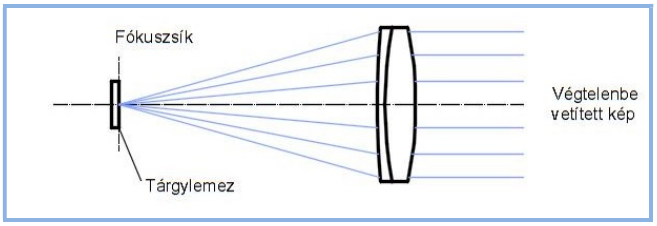


Diagram 1: Infinite distance setting

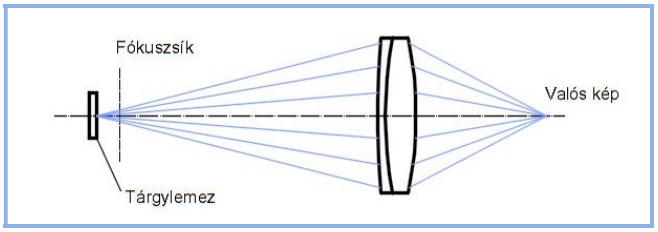


Diagram 2: Finite distance setting – real image

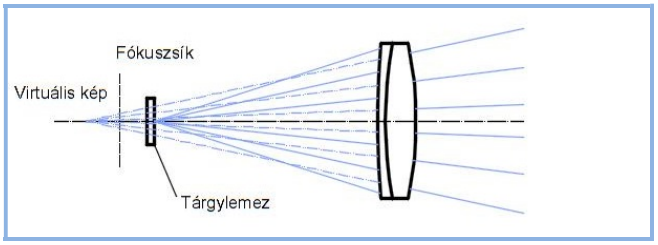


Diagram 3: Finite distance setting – virtual image

4. Calibration

4.1. Adjusting the position of the reticle

Ideally, the reticle is centered on the optical axis and the two lines of the crosshair point towards the vertial and horizontal directions respectively. Despite during factory calibration the reticle is positioned close to this ideal setting – further adjustments might be necessary, especially when high precision measurements are considered. A 3 DoF mechanism provides the interface for small adjustment using two pairs of set screws.

Adjustment steps:

- Remove screws (1) from maintenance holes
- Reaching through the maintenance holes loosen the fixing screws (5) of the reticle holder (4) with an allen key
- Adjust the position of the reticle with the set screws (2)
- Tighten fixing screws

1. Maintenance holes
2. Positioning screws (M3)
3. Reticle
4. Reticle Mount
5. Fixing Screws (M5)

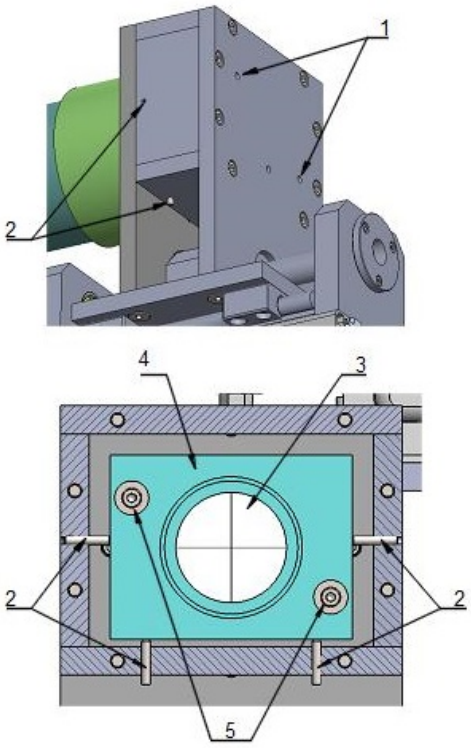


Diagram 4: Adjusting the reticle – axonometric and cross-sectional view

4.2. Calibration of the Collimator

The position of the virtual image can be set by turning the focusing wheel. To get a valid result when testing with the instrument the relative position of the mechanism moving the reticle and that of the focusing wheel should be fixed at the right value. This can be done by using a master scope as a reference whilst following the calibration steps described below. Under normal conditions – once the device is calibrated – no further adjustments are needed to maintain the calibrated state. However, it is recommended to verify with a master scope at certain intervals in order to assure the validity of the measurements (Repeating this process at yearly intervals is a good practice in most cases)

Calibration procedure using a master scope:

- Loosen the counter-nuts (4) on the movement limiting screws (3). Adjust the screws so that the sliding carriage can be moved in both directions from its center position equal to one turn of the focusing wheel
- Set the parallax on the master scope to a reference value. (in most cases it will be 100 or 300 meters)
- By turning the focusing wheel find the position where no parallax effect can be observed
- Fix the position by tightening the set screw (1) on the side of the sliding element of the carriage.
- Loosen the screws of the focusing wheel with an allen key and turn it until the mark corresponding to the reference value aligns with the one on the counter-piece. (diagram 5)

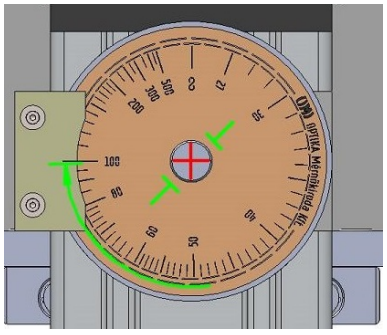
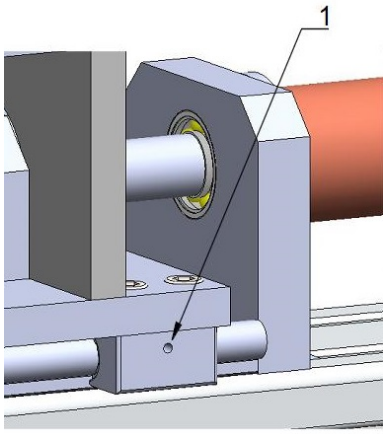
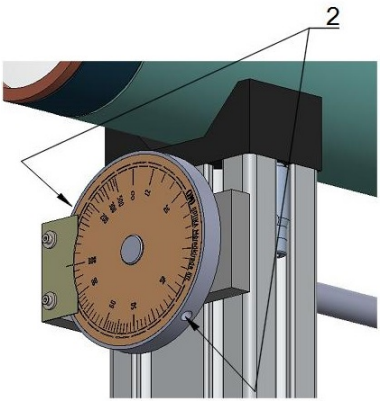


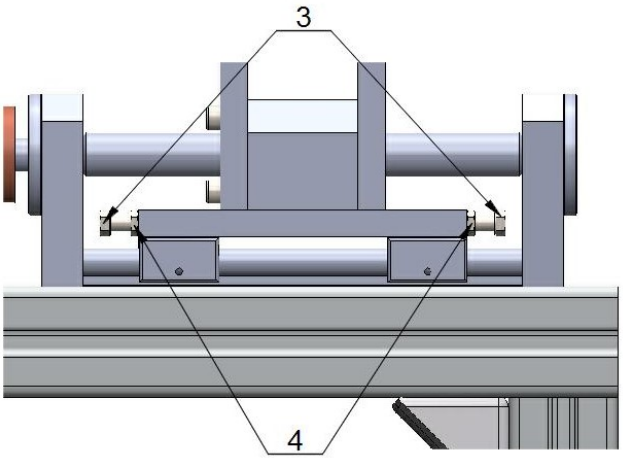
Diagram 5 Turning the focusing wheel on the fixed axis

- Fix the focusing wheel to the shaft again by tightening the set screws
- Loosen the set screws on the side of the sliding element of the carriage
- Adjust the movement limiting screws (3) so that the focusing wheel couldn't be turned over the maximum or below the minimum value of the scale.

1. Sets screws for temporarily fixing the sliding carriage (M3)
2. Focusing wheel fixing screws (M4)
3. Movement limiting screws (M5)
4. Counter nuts







5. Operating Instructions

The instrument is intended primarily for testing parallax error in riflescopes. Before using the device for measurement make sure that all the conditions described in section 7 are met.

Measurement procedure:

- Put the scope on the bench and use the clamp to fix it in place

Note: Some scopes may require the position of the support to be adjusted. Loosen the fixing screws and move the support pieces along the groove to the desired place. Tighten the screws (diagram 6).

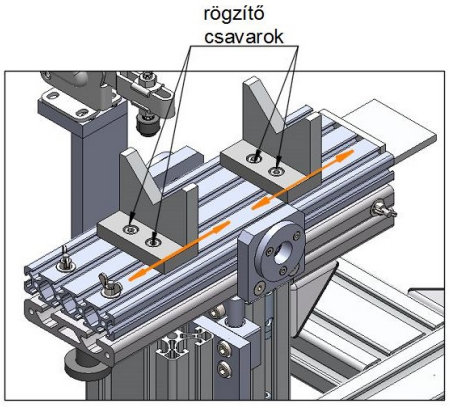


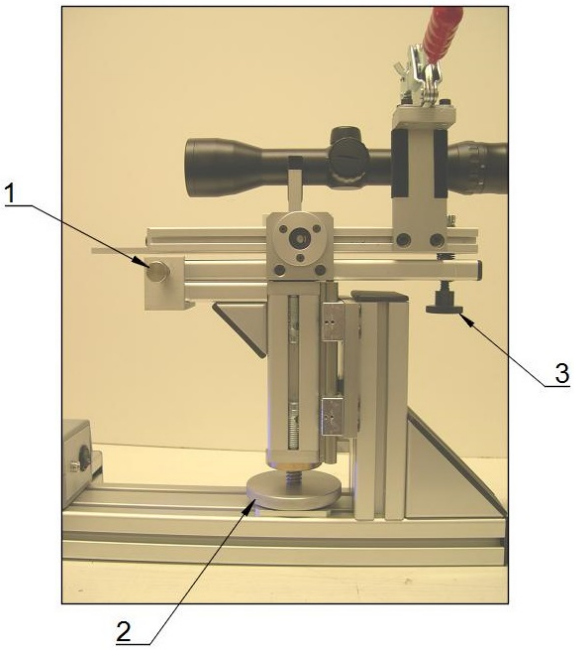
Diagram 6: Adjusting the support

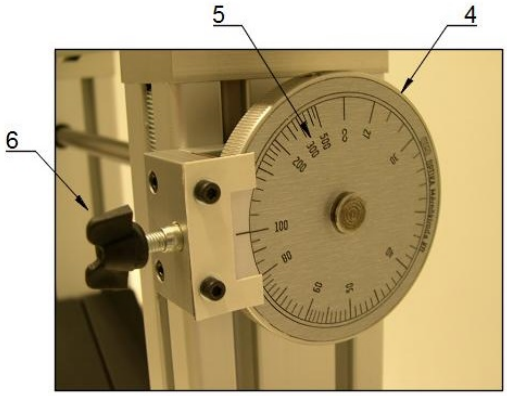
- Switch on the illumination of the reticle. Select the colour with the toggle switches and set the brightness by turning the potentiometer
- Turn the vertical adjustment wheel (2) until the optical axis of the collimator aligns with that of the scope
- Set the distance by turning the focusing wheel

Note: To fix the position of the focusing wheel tighten screw (6) from the side. This is to avoid displacement due to external mechanical effects

- Use adjusting screws (1) and (3) to align the image of the reticle inside the scope with that inside the collimator.
- By constantly altering the viewing angle check if parallax setting is according to the tolerances

1. Yaw angle adjusting screw
2. Vertical movement adjusting wheel
3. Pitch adjusting screw
4. Focusing wheel
5. Scale
6. Focusing wheel fixing screw





6. Illumination of the reticle

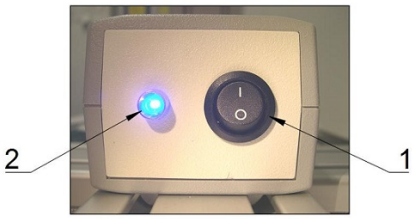
6.1. Adjusting the backlight

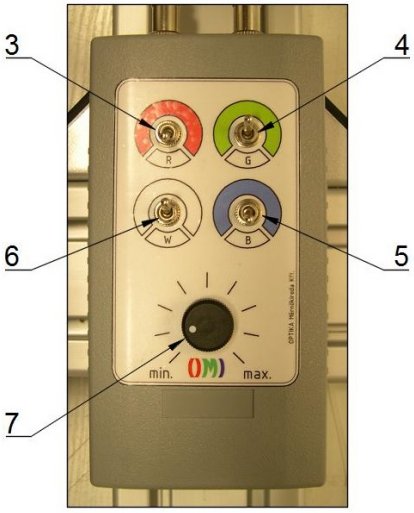
The reticle is illuminated by an RGBW LED from behind. Each LED of different colour is operated by a separate toggle switch while brightness can be adjusted with a potentiometer.

Backlight adjustment:

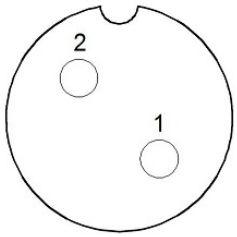
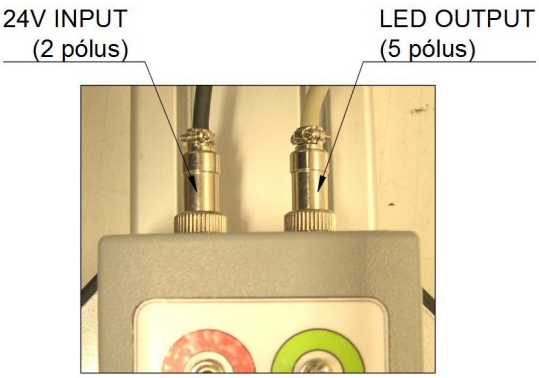
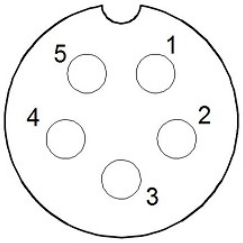
- Power up the device with the main switch (1) on the front panel.
- Select the colour of the illumination by using the toggle switches (3)-(5).
- Turn the potentiometer (7) to set the brightness of the illumination.

1. On/off switch
2. Power indicator LED
3. – 6. Toggle switches for colour selection
7. Brightness adjustment potentiometer





6.2. Electrical connection

<table>
<tr>
<td> 
</td>
<td rowspan="2"> 
</td>
<td> 
</td>
</tr>
<tr>
<td>1. +24V
2. GND</td>
<td>1. V+ / RED+
2. RED- / GREEN+
3. GREEN- / BLUE+
4. BLUE- / WHITE+
5. WHITE- / V-</td>
</tr>
</table>

7. Safety Instructions

- Opening the housing of the electronics may only be performed by a competent person. Contact manufacturer for assistance in case of failure.
- The device contains electronic components. Please do not use it in humid environment.
- Before mechanical adjustments make sure that no object is blocking the movements.
- Only voltages less than or equal to 24V DC are present in the device.

8. Maintenance

When undertaking annual maintenance it is recommended to verify calibrated state with a master scope in order to assure the validity of the measurements. If necessary, recalibrate instrument according to section 4.2.

Tasks to be performed annually:

Maintenance of the optical components

8.1. Maintenance of the optical components

Optical surfaces shoud be inspected and cleaned at yearly intervals by a competent person.

Take special care when handling optical parts as they are high value and sensitive components!

No other maintenance is required.