

# Reflected light lighter

## OI-21

### Technical description and user manual

ATTENTION! Due to ongoing modernization of the lighter, some minor features not affecting quality and operation may be not reflected in this manual.

#### 1. Purpose

The reflected light lighter OI-21 is purposed for work with biological microscopes Biolam-R, Biolam-S, Biolam-D, MBR, MBI-3, MBB-1. It is used for research of opaque and semi-transparent objects in usual and polarized light, in bright and dark field.

The lighter is made for work in macroclimatic regions with moderate and cold climate in laboratories at temperature from 10 to 35°C.

#### 2. Specifications

Objectives specifications are listed in the following table.

Objective name	System	Magnification	Numeric aperture	Work distance, mm	Linear field of view in the objects plane with 7x eyepiece and monocular attachment, mm
Epiobjective 9x0.20	Dry	9	0.20	5.40	1.8
Epiobjective 21x0.40	Dry	21	0.40	1.80	0.8
Epiobjective 40x0.65	Dry	40	0.65	0.61	0.4
Epiobjective 95x1.0	Oil immersion	95	1.00	0.41	0.17
Achromatic 95x1.25	Oil immersion	95	1.25	0.06	0.17

Maximum height of the object – 60mm

Light source– bulb RN8-20-1.

The lamp is powered from wall outlet (220±22 V, 50 Hz) through power source 9V 25W.

Consumption power, not more than – 75 W

Dimensions, not more than – 270x90x90

Weight, not more than – 0.9 kg

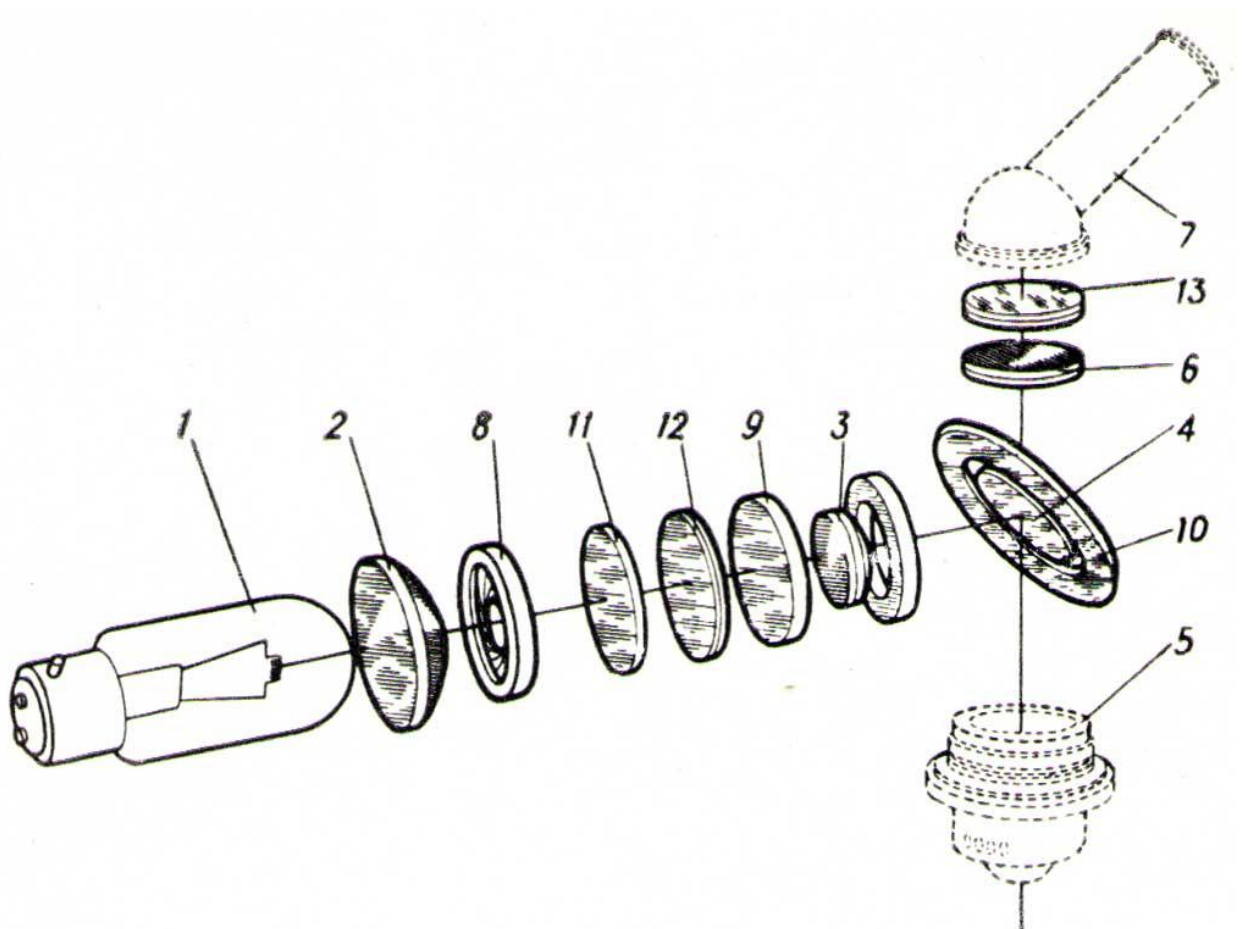
### 3. Delivery set

Delivery set of the lighter OI-21 consists of the lighter itself and set of objectives, filters and accessories.

Full list of the items can be found in the lighter passport.

### 4. Construction and principle of work

Optical diagram of the lighter is shown on the Picture 1.



Picture 1. Optical diagram

When you work in bright field, light beams comes from the light source 1 through collector 2 and lighter lens 3 to reflecting plate 4 that directs them into objective 5. After they pass through the objective 5, the light beams illuminate part of the object.

The beams reflected from the object come back through the objective 5 and reflective plate 4 to achromatic lens 6 to form the object image in the focal plane of the eyepiece 7.

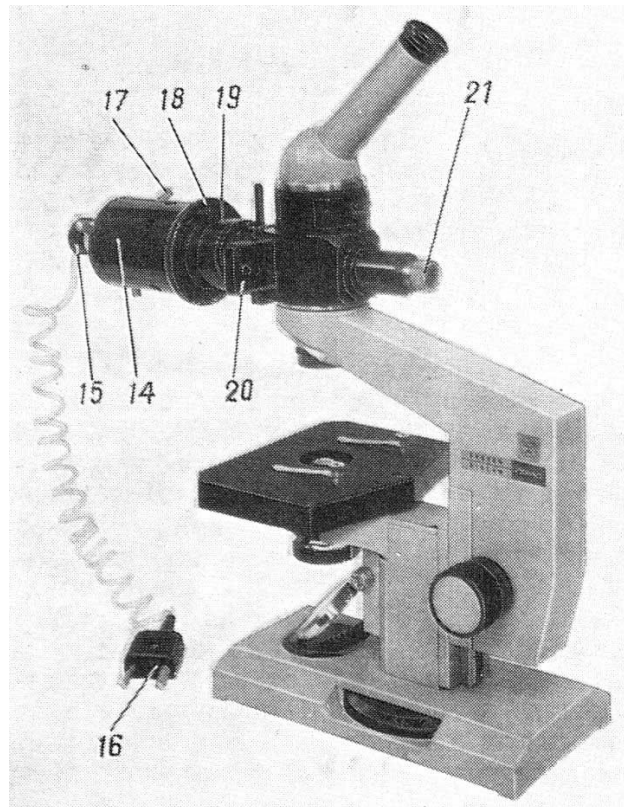
Field aperture 8 limits the object part down to size of the eyepiece field of view.

To research an object in dark field, it is necessary to include additional dark field diaphragm 9. In this case light beams drop onto mirror 10 in form of light ring. To achieve best effect during work in dark

field, you should remove the reflecting plate 4 from the light path. The beams reflect from the mirror 10, go to inner surface of the epiobjective built-in parabolic mirror, reflect from it and concentrate on the object. It is possible to install interchangeable color filter 11 after the collector and the field diaphragm.

To research object in polarized light, it is necessary to include the polarizer 12 and analyzer 13.

General view of the lighter is shown on the Picture 2.



**Picture 2. General view of the lighter installed onto microscope**

The lighter consists of the lamp 14 and housing holding the whole optical system. There is the lamp socket 15 with the bulb which is powered from the wall outlet through the power source 9V 25W. The bulb is connected to the power source with the plug 16.

The bulb can be centered with two thumbscrews 17, and can be aligned along axis by sliding the lamp socket inside the lamp. The lamp with bulb and collector can be detached from the lighter if you unscrew the threaded ring 18. The lever 19 is used to adjust light opening of the field diaphragm. Two holes in the lighter housing are used to insert color filters or polarizer. Slider 20 has a dark field diaphragm in it.

The lever 21 is used to include or remove the reflecting plate 4 (picture 1) used for work in bright field. An objective should be screwed into the bottom part of the lighter. Analyzer is inserted into the slot in the top part of the housing.

## **5. Marking**

Each lighter has a firm plate with code of the lighter, manufacturer logo, and serial number which first two digits means last two digits of the year when the lighter was made.

## 6. Safety guidelines

Possible source of danger when you work with the lighter is electrical current.

Construction of the lighter and power source excludes possibility of unintentional contact with parts under voltage.

It is necessary to ground the power source by means of the special contact on its housing before you plug it into the wall outlet.

When you installing the lamp socket into the lamp or replacing the bulb, the lighter should be unplugged from the wall outlet.

## 7. Setup and preparation for work

### 7.1. Unpacking

If the lighter was transported at negative temperature, it is necessary to keep it unpacked in the warm premise for at least 6 hours.

Open the package, take the power source, lighter and wooden box out of it, and remove wrapping paper.

Check the delivery set accordingly to the passport.

Check the lighter and its accessories to make sure that all parts are not damaged. You may proceed to use the lighter after this.

### 7.2. Preparation for work

Remove a revolving head from the microscope.

Install the lighter OI-21 into the place of eyepiece attachment as shown at the Picture 2, and secure it with the side screw.

## 8. Operation

To work in bright field you should set a 7x eyepiece into the inclined microscope attachment, screw 9x0.20 objective into the bottom part of the lighter, connect the plug 16 to the power source 9V 25W. Switch the bulb on. Place an object onto the microscope stage.

If the object has low height, you should put it onto the metal plate from the lighter delivery set. The plate should be placed on the microscope stage.

Open the field diaphragm fully with the lever 19, set the slider 20 to the "C" position, and focus the microscope on the object.

Take the 7x eyepiece out of the inclined attachment and replace it with the pinhole aperture.

Look through the pinhole and shift the lamp socket along axis to achieve sharp image of the filament in the output pupil of the objective. Use the thumbscrews 17 to center the filament image in the objective pupil.

Replace the pinhole with the eyepiece again, close the field aperture down to size of the eyepiece field of view, and proceed to research.

To work in dark field set the lighter as for work in bright field. Then use lever 21 to remove reflecting plate out of the light path, set the slider 20 to the "T" position, open the field aperture fully, and proceed to research.

To work in polarized light set the lighter as for work in bright field. Install a polarizer into one of the lighter housing slots, take the inclined attachment off, insert the analyzer into the place under it, put the attachment back on, and proceed to research.

If you want to take pictures using the lighter OI-21, but exposure is too big, use the bulb OP12-100 in the lamp of the OI-24 lighter. To do this, remove the lamp 14 and attach the lighter OI-24 (not included into delivery set). To protect a researcher's eye against bright light you should install special cone from the delivery set between the OI-24 and the lighter housing. The cone should be inserted into the housing with its narrow end.

## **9. Handling, storing and transportation**

### **9.1. Handling**

You should keep the lighter clean and prevent any damages. It is recommended to wipe the lighter housing with a soft cloth soaked with acid free vaseline and clean it with soft try cloth after this.

Pay special attention to cleanness of the optical parts. You should not touch them with your fingers. Clean those with soft cambric or linen cloth slightly soaked with anesthesia ether.

### **9.2. Storing and transportation**

When are not in use, keep the objectives, filters and lighter in the box.

If you need to move them to other premise, you should pack the box.

The lighter and accessories should not move during shakes.

It is permitted to transport the lighter with any king of covered vehicle.

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