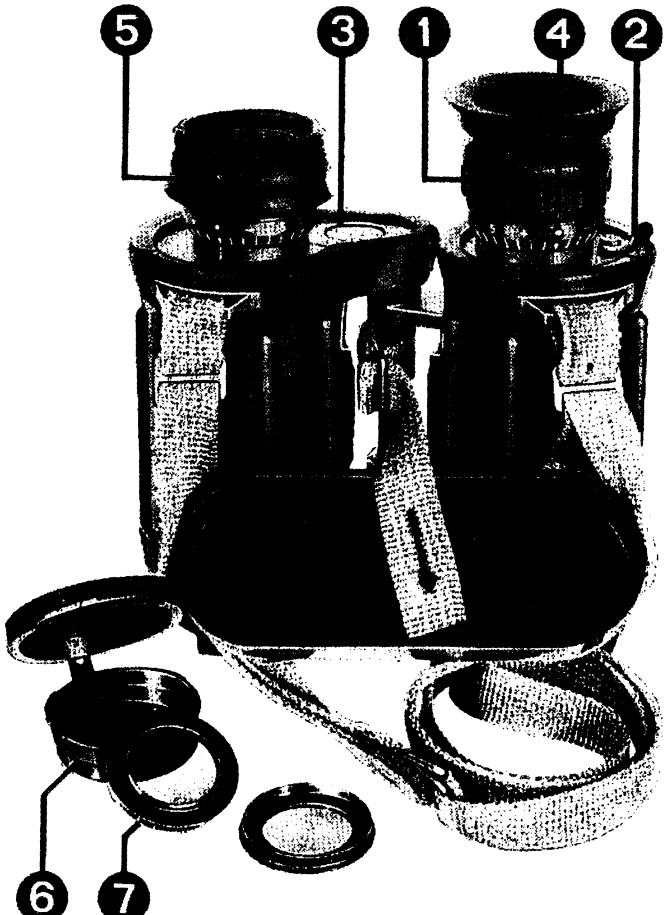
EDF 7 x 40
Binocular Field Glass

Description and Use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1. Definition

The EDF 7×40 is a binocular field glass with eyepiece adjustment, with infrared reconnaissance facility and illuminated reticle.

The EDF 7×40 is supplied without case, it is protected against environmental influences by a rugged soft rubber enclosure.

2. Purpose of use

The dust- and water-proof EDF 7×40 is intended for use under aggravated climatic conditions of field use.
With the EDF 7×40 the following tasks can be fulfilled:

- Observation of the field of operation during the daytime and in twilight.
- Measurement of angles in horizontal and vertical direction.
- Determining the distance of targets (height 2.5 m) and of targets whose dimensions are known.
- Reconnaissance of infrared sources.

3. Specification

Magnification	7×
Diameter of entrance pupil	40 mm
Diameter of exit pupil	5.7 mm
Back focal distance of exit pupil s_{AP}	> 20 mm
Visual field 2 δ	7.5° or 131 m at 1 000 m distance
Geometrical luminosity	32.65
Twilight efficiency	16.7
Diopter setting range	± 7 dpt
Weight	1 000 g

4. Description of components and functional elements

Imaging optical system –

modern styled system of a direct-vision prism binocular. Minimum dimensions and extreme reduction in weight are ensured by its compact design without thereby restricting the optical main parameters as they have so far been implemented by top-quality instruments of classical design.
The EDF 7×40 has been ruggedized so that it will withstand maximum climatic and dynamic loads. Besides these merits its nuclear radiation resistance is of particular importance, so that even with nuclear radiation loads the EDF 7×40 retains its ability of use.

Objective –

designed as an air-gap objective with forward-positioned principal planes, resulting in a shortening of the intersection length of rays and thus in a low overall height.

Eyepiece –

consisting of a cemented lens system with a back focal distance s_{AP} of more than 20 mm (protective mask eyepiece)

Optical inversion system –

consisting of a roof prism and a semi-pentagonal prism. This combination allows the realization of the straight-vision design.

IR detector –

for the reconnaissance of infrared light sources. It is accommodated in the left telescope and is swung in the path of rays in case of need. The activation of the detector is effected by means of UV filter through the daylight.

Reticle and reticle illumination –

housed in the right telescope. The reticle division is in accordance with the topographic artillery measure system, and is based on a circle with a radius of 1 000 m and a circumference of 6 280 m.

To simplify calculation this circumference was divided into 6 000 equal parts, each of which corresponds to approximately 1 m per line (written 0–01). The error amounts to about 5 % and must be taken into account in exact calculations.
The reticle illumination consists of a tritium luminous element, which is mounted on the periphery of the reticle. The luminous element has a useful life of at least 7 years. During this time illumination is free of maintenance. The regulation of the reticle illumination for adaptation to the environmental brightness is achieved with the dim switch.

Eyeshields –

formed rubber parts capable of being folded which allow the observation with the bare eye despite the long pupil's intersection length. When the eyecups are folded over, observation is made possible with protective mask or spectacles (5 Fig. 1).

Eyepiece cap –

a formed plastic part for the protection of eyepiece lenses against rain and mechanical action in the transport position. It is fixed to the carrying strap and is removable (4 Fig. 2).

Objective lids –

formed plastic parts for the protection of the front lenses against contaminations and mechanical action in the transport position.
They are fixed to the objective shock absorbers (5 Fig. 2).

Objective shock absorbing parts –

formed rubber parts removable for maintenance purposes and serving for the protection of the objectives against shock and impact (3 Fig. 2).

Jacket parts –

formed rubber parts which are removable for maintenance and serve for the protection of the device against shock and impact. For better handling they are provided with longitudinal flutes (2 Fig. 2).

Joint –
a toggle joint for varying the interpupillary distance from < 60 mm to 75 mm.

Carrying strap –
a synthetic textile strap for carrying the binocular around the neck without any case. It is fixed to strap lugs and adjusted by sliders to the proper length.

Splice strap –
a synthetic textile strap for additionally fixing the device to a button of the uniform during a march. It is fixed on the joint axle (7 Fig. 2)

5. Accessories

Neutral filters –
non-selectively absorbing filters which in observations of or against intensively shining objects are attached to the eyepieces. In this way the luminous density is attenuated by 50 % (7 Fig. 1).

Filter case –
a formed plastic part for storing the attachable neutral filters. Its storage is required to be in conformance with the ruling military specifications (6 Fig. 1).

6. Use of the binocular

6.1. Proper holding

The more steady the picture in the telescope, the greater the reliability during observation. In observation the eyepiece cap is gently pressed with the thumbs from below against the binoculars. The objective lids are freely suspended. The eyeshields are firmly placed against the eyebrows so that spurious light is prevented from penetrating from the side.
When the binocular is held freely it is advisable to press the upper arm firmly against the body, to breathe in and hold the breath for some moments. For longer periods of observation or with natural movements a relatively steady position can be achieved by leaning the upper body against an object or supporting the elbows. Unsteadiness in holding will have a negative effect, so that the efficiency of the binoculars is not fully utilized.

6.2. Interpupillary adjustment

So as to achieve a large circularly bounded visual field, the binocular has to be adapted to the various eye distances of the users. This adaptation is made by folding the binocular in the central joint, until the visual fields of the right and left telescope are brought to complete coincidence. The graduation (1 Fig. 2) on the joint now indicates the setting of the distance being valid for the particular user. The engraving marks the eye distances of 60 mm, 65 mm and 70 mm.

6.3. Distance setting and compensation of eye deficiencies

The EDF 7×40 is a double telescope with single eyepiece focussing. For observations of objects at a certain distance it is necessary to sharply focus the desired image by means of the eyepieces. First, both eyepieces are turned with the milled rings in „-|-" direction. The setting is made separately for the right and left eye in two steps:

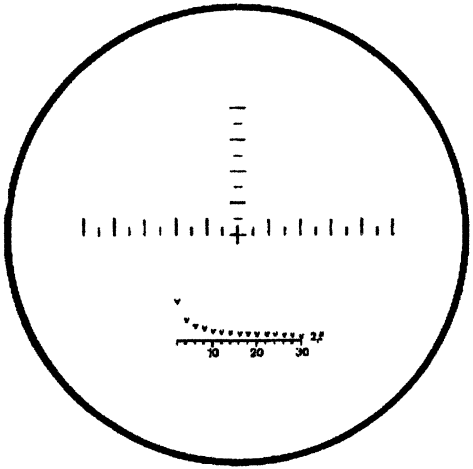
– Sight the observation object; then close the right eye and focus to maximum image sharpness for the left eye by turning the milled ring on the left eyepiece.

– Then close the left eye and sight the same object. Focus to maximum sharpness for the right eye with the milled ring of the right eyepiece.

Thus the distance and the eyes' deficiency compensation (observation without spectacles) are simultaneously correctly set. For repeated observations of objects in the same distance range the correct setting can previously be made by means of the mnemonic scale on the eyepieces.
To facilitate the setting in darkness the zero mark on the mnemonic scale of the eyepieces has the form of a tactile hump (4 Fig. 1). In zero position the hump is opposite the strap's lug.

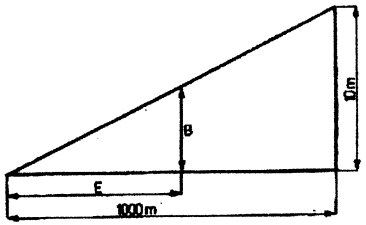
6.4. Use of reticle

The reticle of the EDF 7×40 is divided so that one interval (spacing between two long lines) is 0–10, i. e. at a distance of 1 000 m one interval corresponds to a height or width of 10 m.



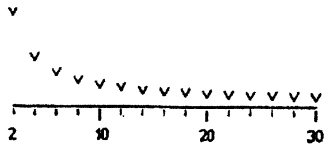
1 Intervall $\hat{=}$ 0–10

Applying the proportional equation
one can calculate the distance E to target if the base B at target is known, or vice versa.



$$\frac{E}{B} = \frac{100}{\text{Intervalle}}$$

An additional distance scale allows the distance of 2.5 m high objects to be estimated.



height 2,5 m
at (2 ... 30)×100 m
distance

Arrange a 2.5 m high object between the horizontal scale and the V-mark defining the object. The corresponding scale division is the measure for distance. The spacing between two scale divisions corresponds to 200 m. The reticle is illuminated by a tritium luminous element. In darkness, the reticle image becomes visible after some time of eye adaptation. Brightness can be regulated by the dim switch (2 Fig. 1) located on the right telescope. In observation position, dimming is effected by the switch being actuated downwards.

In twilight, the unlit scale can be seen with better contrast within a short period, if the illumination is switched off.

6.5. Use of IR detector

The IR detector serves for the reconnaissance of infrared light sources. A bright, diffuse light spot is produced on the luminous screen when infrared radiation appears. In that way a light source that is unvisible to the naked eye can be reconnoitred. However, a definite picture cannot be observed.

The reconnaissance distance depends on the intensity of the light source; e. g. it is ca. 1 500 m for a 45 W IR projector (full beam). When not in use, the IR detector is located under a UV translucent filter (3 Fig. 1), so that the luminous coating can be reactivated by the UV portion of daylight.

For swinging the luminous screen into the path of rays, turn the knurled ring on the left eyepiece clockwise (passing the slightly felt mechanical stop) and tilt the EDF 7×40 (in observation position) to the left. During this action, the IR detector slides into the path of rays on a guide way. After that, turn the knurled ring of left eyepiece back to the initial position. To swing away the detector after use, follow same procedure, but this time tilting the binocular to the right.

6.6. Use of eyeshields

The EDF 7×40 is equipped with special eyepieces for observation with spectacles or gas mask allowing the full visual field of the instrument to be utilized. For that purpose, fold over the rubber eyeshields. In case no spectacles or masks are used, unfold eyeshields (1 Fig. 1).

6.7. Use of neutral filters

Neutral filters (accessories) are used as anti-dazzle means in observations of intensively shining objects or against bright surround fields.
Slightly press the filters into the notched ring located on the eyepiece end. To ensure tight fitting of the filters, bend the spring lugs on filter mount accordingly.

7. Handling and storing

The EDF 7×40 is a high-quality optical instrument requiring careful treatment and storing. Its robust design and the strong rubber jacket must not induce the user to treat the instrument carelessly. For correct handling, adhere to the following instructions:

- Carry the EDF 7×40 on the chest, with the strap around the neck. Adjust the length of the carrying strap so that chafing of EDF against belt buckle and other items of equipment is excluded.
- When not used for observation for some time, fix the EDF 7×40 to the uniform by means of the button strap. Attach eyepiece cap and close objective lids.
- In transport on vehicles, never place the EDF down without securing it against dropping. Never suspend it from vehicle parts by the strap.
- All movable parts (i. e. eyepiece, joint, dim switch) have smooth motions limited by mechanical stops. In case these parts show stiff motion, never use force. Never try to move these parts past the stops.
- In case of rain, snow or heavy dust, do not remove eyepiece cap and objective lids longer than necessary for observation.
  Principally, keep exposure of the EDF 7×40 to direct sun radiation and rain as short as possible.
- Do not try to open the EDF. Repairs may be carried out by specially trained personnel only.
- Store the EDF in accordance with effective military directions. Before stowing it away, set the interpupillary distance to 70 mm and attach eyepiece cap. Make sure that rubber eyeshields do not get deformed.

8. Cleaning

For cleaning the EDF, you may remove eyepiece cap, eyeshields, button strap and carrying strap, jacket and objective shock absorbing parts. The jacket can be detached after two clamps (6 Fig. 2) have been removed. EDF's must be dry before cleaning, i. e. they should be dried in the shade during summer, and in closed rooms in winter, but not near radiators, or other heat sources. In winter, let the EDF adopt ambient temperature before cleaning it.

First clean outward mechanical parts from soil by a brush. In case of heavy soiling and after continuous use, remove jacket and shock absorbing parts, too. Remove sand and dust from the outward optical parts and neutral filters by a clean, dry hairbrush. For fine cleaning of the optics, wipe with a flannel cloth in circular movements from centre to edge (breathe on, if required).

Important! Do not soil optical parts with oil, and do not touch them with the fingers. Rubbing too forcefully with the flannel cloth and remaining dust on the optical parts may destroy the transparent antireflection coating.
The cleaning of the inner optical parts and the interchange of components and subassemblies must not be carried out but by specially equipped optical workshops.

9. Checking the EDF 7×40

For the maintenance of the EDF 7×40, check the following points from time to time:

(1) Completeness and outward condition of parts and accessories:
- eyepiece cap, two eyeshields, two jacket parts, two objective shock absorbing parts, two objective lids, one button strap and one carrying strap. None of these detachable parts should be missing. The complete accessories consist of a filter container and two neutral filters.
- Scratches and dents affecting the instrument's operation or sealing are inadmissible.

(2) Condition of the optical components:
- Impurities, damages and cementing flaws visible from the eyepiece end in the form of spots, threads, leaves or ramifications, impeding observation and measurement, are inadmissible.
- Loose parts inside the instrument are inadmissible.

(3) Image position:
- Vertical and horizontal lines of objects must be imaged as such.
- A deviation of more than 1° compared with object is inadmissible.
- Deviations of more than 1° between the two telescopes are inadmissible.

(4) Setting of reticle:
- Horizontal and vertical lines of reticle must be in horizontal and vertical positions, resp., when EDF 7×40 is in horizontal position and an interpupillary distance of 65 mm is set.
- Permissible deviation: ±3°.

(5) Parallelism of optical axes (double image):
- The picture must not „jump" from top to bottom nor from the left to the right, when user opens and closes his right and left eyes alternatingly in rapid succession.
- A double image is not admissible.

(6) Function of eyepieces:
- Free rotation of eyepieces must be ensured.
- The reticle image must be in focus simultaneously with the object observed in the right telescope.

(7) Function of reticle illumination:
- Free turning of the dim switch must be ensured.
- Image brightness must be adjustable by actuating the dim switch (check in a darkened room).
- Check the function of the tritium luminous element (emission of light) in a darkened room.
- Failure of illumination is inadmissible.

(8) Function of IR detector:
- IR detector must easily swing out of and into the path of rays.

(9) Function of folding bridge joint:
- Uniform motion of the two telescopes between the mechanical stops must be ensured.
- Non-uniform and restricted motion of the telescopes is inadmissible.

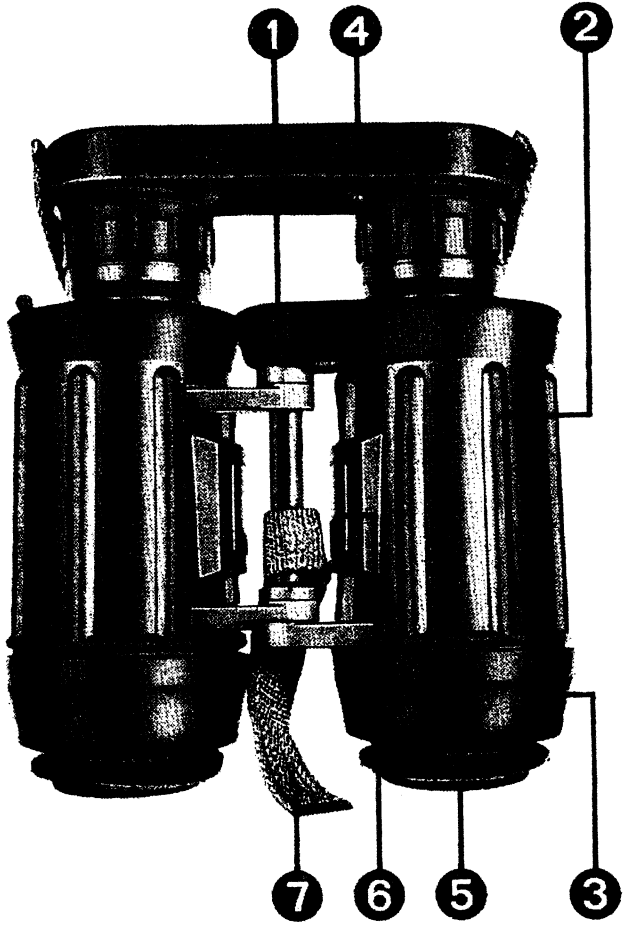
Attention!

The tritium element of the reticle illumination shows weak radioactivity, but is not injurious to health when built in.

The EDF 7×40 has been designed and built in accordance with Radiation Protection Design Permission SBZ 17 12 80 given by the SAAS.

Opening of the instrument by the user is not permitted!

In case of failure of illumination, forward instrument to service workshop in unopened condition.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