12 x 60 binoculars 60° and associated

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I. Introduction

We would like to present binocular 12 x 60 in our collection.
It is an exceptional example because it is a complete model;
- with a reticule illuminating lamp and battery box;
- in the original Kriegsmarine box marked with ***blc*** and with the stamp of acceptance of the Kriegsmarine "M" eagle and "IV/1"
- and with the original Bakelite rain cover on the strap for oculars;
- and with the original red rubber on the headrest.

This binocular was produced by Carl Zeiss Jena, during WWII marked as ***blc*** or ***rln,*** at the end of the war.

Pict 1; 12x60 blc Kriegsmarine model; ©Anna Vacani

The production number of the binocular, engraved at the bottom side is – **155022,** produced about 1943. According to the information published in the "green" book of Hans Seeger, on page 898, our binocular should be *rln* 6x30 models. It appeared that it is wrong information.

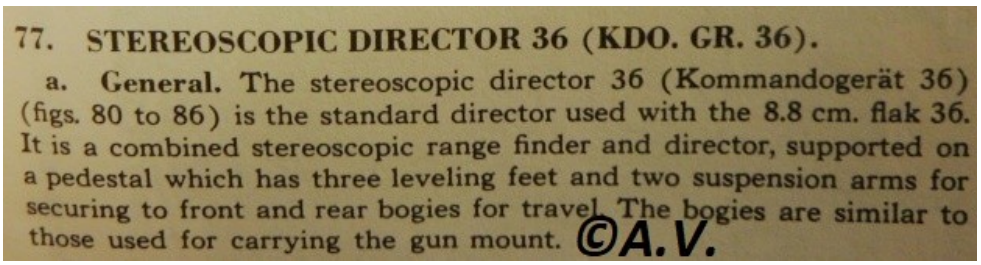
1. A few words about rangefinders

As we are reading in the book: "Die Schwere Flak 1933- 1945 – 8,8 cm, 10,5 cm, 12,8 cm, 15 cm – mit den Ortungs- und Feuerleitgeräten" – by Werner Müller.
Translated by Google - During the WWI since 1916 the distance was measured with 2m or 4m rangefinder.

"For more accurate determination of distance, experiments with rangefinders of 1 m.2 m. and 4 m. were continued.
The experiments in the development of fire control were blocked by the prohibition singed in the Versailles for the end of the WWI.
Since 1936 was big development in the field of rangefinders."

"The rangefinder Kommandogerät 36 (COMMANDER 36) was constantly developed and it worked on a geometric-linear basis. The 4 m rangefinder (short: Em 4mR (H)) was placed on the calculator. The firing values were transmitted electrically via a 108 core transmission cable to a distribution box in the middle of the battery and further to the guns of the guns. In case of failure of the lamp dispenser system, a telephone transmission to the guns was possible. Despite this very well working device, however, man-made errors were unavoidable in 13-man operation, which required the device.
To avoid these sources of error as much as possible since 1937, the company Zeift has been busy developing a device that can help humans with mechanical components such as more than 20 electric motors, switch boxes, cam bodies, and differentials. Friction gear and regulator should replace.
1940 came first a command device to the troop, under the name KAPPA DEVICE, the three-man operation on the stereo-effect rangefinder 4mE (R) 40 required two man on the computing device coupled with it, and a man at the collector with control box and machine set for the device and transmission current.
The name Kappa device had the new device according to the Greek letter Kappa, who in the Flakschießlehre (antiaircraft gun target shooting?) designated the course angle which this device could overlook.
The later name of this device was Kdo. Ger. 40, improves to Kdo.-Ger. 40B and 40C."

In our library, in the book - "German 88-MM Antiaircraft Gun Materiel" 29 June 1943 – Published by War Department Washington; Technical Manual No. E9-369A; you can read from these pictures:


77. STEREOSCOPIC DIRECTOR 36 (KDO. GR. 36).

a. General. The stereoscopic director 36 (Kommandogerät 36) (figs. 80 to 86) is the standard director used with the 8.8 cm. flak 36. It is a combined stereoscopic range finder and director, supported on a pedestal which has three leveling feet and two suspension arms for securing to front and rear bogies for travel. The bogies are similar to those used for carrying the gun mount. ©A.V.

And further following text;

b. Range Finder (Em. 4m. R. (H)).

(1) The 4-meter base stereoscopic range finder (Raumbildentfernungsmesser (Höhe)) adapted for height finding has magnification of 12x and 24x and a range scale reading from 500 meters (550 yd) to 50,000 meters (55,000 yd). It is clamped by two rings to the director for use and in travel is carried in a chest fitted with hand grips.

(2) A device for obtaining approximate height is fitted on the right end of the range finder tube. This consists of an arm pivoted at one end and engraved with a scale of ranges. A series of parallel lines graduated to the value of height are engraved on the disk to which the arm is pivoted. As the instrument is elevated, the disk carrying the scale rotates with the instrument. The arm, however, remains vertical, and the height line corresponding to the range on the range arm indicates target height (fig. 91).

(3) Two tracking telescopes are fitted on the range finder tube to the right and left of the stereoscopic eyepiece. These are employed for keeping the range finder on the target and have a cross wire reticle pattern.

(4) The range finder is turned in elevation by rotation of the elevating handwheel which is connected by gearing to a gear between the range finder tube and the left bearing ring.

(5) An optical lath is provided. When it is suspended on the supporting brackets, it provides an artificial infinity for test and adjustment of the range finder.

c. Director.

(1) The director includes a main casting, supported on a pedestal, and supporting a number of box enclosed mechanisms (figs. 92-95). The director determines and transmits the following data to the battery.

(a) Quadrant elevation.
(b) Future azimuth.
(c) Time of flight of projectile, expressed in fuze units.

(2) The values set into the director are:

(a) Present angular height.
(b) Present azimuth.
(c) Present slant range.

d. Setting Up.

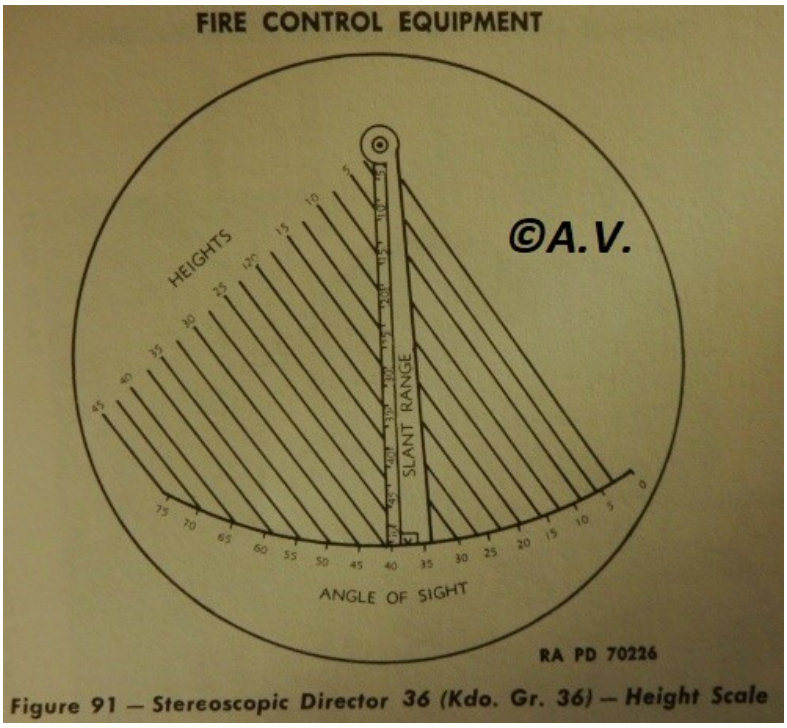
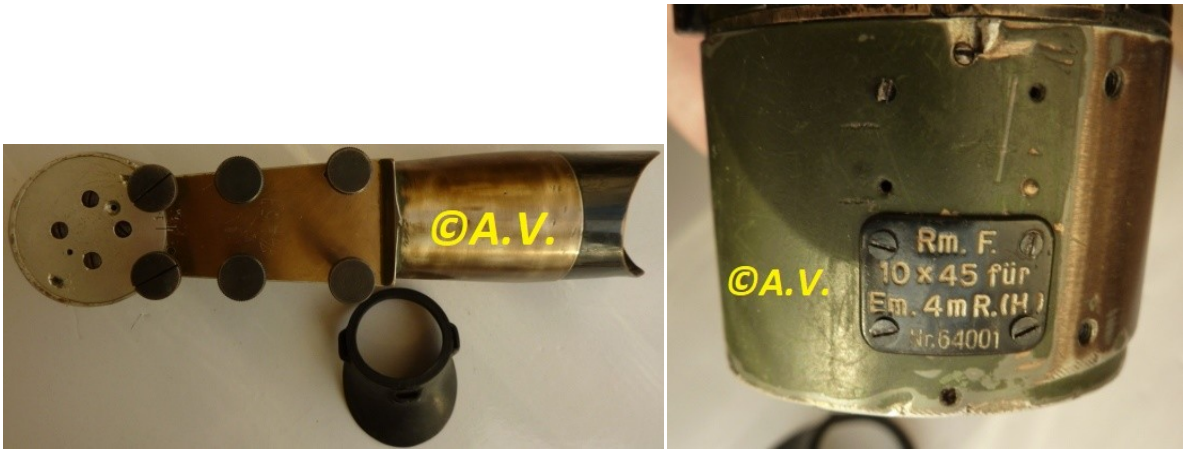


Figure 91 — Stereoscopic Director 36 (Kdo. Gr. 36) — Height Scale

Reading the complete description it is easy to understand how the whole system worked.

Corresponding to rangefinder model – Em. 4m. R. (H), here is one from our binoculars collection 10x45 monocular, which was fitted into – that model of the rangefinder:



Pict 2, 3, 4, 5; 10x45 monocular model for Em.4m R. (H); ©Anna Vacani
As far as today, we have not seen and heard about monocular of 12x60, produced by Carl Zeiss Jena.

The German rangefinder WWII and 12x60 binoculars displayed at the Atlantic Wall Open-air Museum, Raversijde near Ostend –Belgium.

The binoculars can be fitted underneath of the rangefinder for the sky observation, as you can see in the picture from Bundesarchiv files.

Bundesarchiv, Bild 101I-301-1957-12
Foto: Kurth | 1944 Sommer

File:Bundesarchiv Bild 101I-301-1957-12, Nordfrankreich, Flak-Entfernungsmesser.jpg

And the same Bundesarchiv file – on the top and bottom of the rangefinder:

Bundesarchiv, Bild 101I-301-1957-11
Foto: Kurth | 1944 Sommer

Bundesarchiv, Bild 101I-301-1957-13
Foto: Kurth | 1944 Sommer

Bundesarchiv_Bild_101I-301-1957-13,_Nordfrankreich,_Flak-Entfernungsmesser2

Looking closely into above picture, we can see that on the top of the rangefinder is visible the mounting plate, above the position of the underneath mounted binocular 12x60.

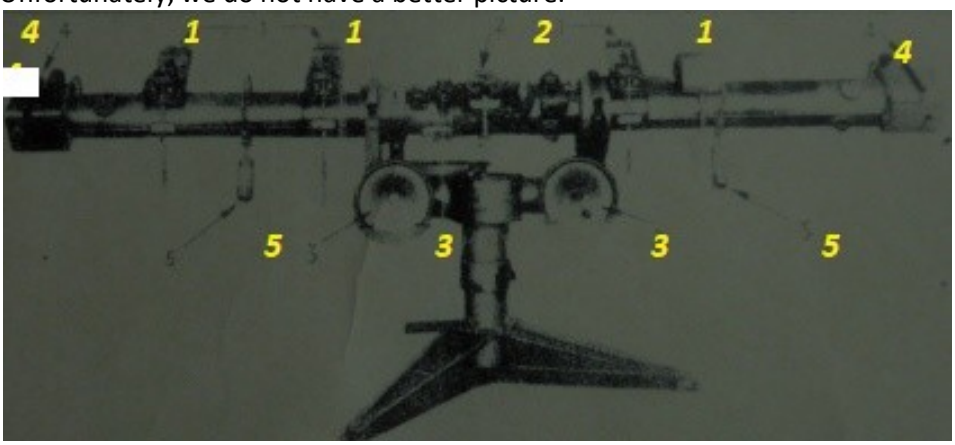
Another picture from Bundesarchiv files – Norway 1943;

Bundesarchiv, Bild 101I-110-1699-21
Foto: Faßhauer | 1943/1944

The description of this picture is in the book (in our collection) – "Die Schwere Flak 1933- 1945 – 8,8 cm, 10,5 cm, 12,8 cm, 15 cm – mit den Ortungs- und Feuerleitgeräten " – by Werner Müller:
„Ein Raumbildentfernungsmesser 4 m Em (R) 40 bei einer Einheit des Heeres in Norwegen 1943. Links steht der E2. Er richtet das Ziel der Seite nach an. In der Mitte steht der E-Meßmann, der E1 und rechts richtet der E3 das Ziel der Höhe nach an. Die Richtleute blicken dabei durch ein Doppelfernrohr. (BA) "

"The picture of Rangefinder 4 m EM (R), at a unit of the army in Norway 1943. To the left stands the E2. He points in the azimuth bearing to the target. In the middle stands the distance measuring man, the E1, and to the right the E3 points in the altitude bearing, the destination in height. The directional people look through a binocular."

In June 1945 was published technical data for rangefinder 4 meter Stereoscopic 40 – EM 4 m. R.40. Unfortunately, we do not have a better picture.



Pict 6; 4 m rangefinder Stereoscopic - 40 Em 4 m. R.40; ©Anna Vacani

The description of the features of this rangefinder:

1. *Three auxiliary binocular type telescopes; one for identification; two for lying.*
2. *Binocular, range takers eyepiece.*
3. *Layers' hand wheels on stand,*
4. *Open sight,*
5. *Slewing handles for traversing and elevation.*

Later the rangefinder 4 meter Stereoscopic 40 – EM 4 m. R.40 was delivered with separate metal container for 3 binoculars.

And the picture from *Signal Magazine*;

Picture from Signal Magazine – French edition; in our collection;

The translation under the picture (translation by Google):
Far in Bessarabie. Soviet planes are in sight. Using ultra-modern rangefinders, Romanian gunners of the DCA determine the site of enemy aircraft.

All kind of the rangefinders are illustrated and contain technical description in Carl Zeiss Jena documentation in the book: "*Optisches Gerät der deutschen Wehrtechnik – German Military Technology: The Optical Equipment. Descriptive documents circulated by Carl Zeiss, Jena, between 1930 and 1940; edited by: Dr. Hans Seeger*".

The 12x60 often were fitted to the large military rangefinders – 4 or 6 meters. Sometimes on the binoculars is printed a number. The numbers indicated the place on the rangefinder.

Pict 7; 12x60 bpd Goerz model with Nr2 (E2); ©Anna Vacani

2. 12x60 produced before WWII

12x60 was produced before the war. It was exceptionally good working. Mechanically it was constructed to the highest quality. It was painted black and marked Carl Zeiss Jena.
The filter mechanism was a work of art. It was mounted like half of a sphere. Each one containing filters.
The second version of 12x60 was very well made but it is not comparable to the first version on mechanical precision.
The constructions of these models were personally studied after dissembled.

3. The Second World War production

During the WWII 12x60 binoculars were produced by Carl Zeiss Jena – marked as *blc* and since Nov 1944 marked "*rln*" and other companies; C.P. Goerz *bpd* and *flm* (Somet).

Pict 8; 12x60 Carl Zeiss Jena, marked "rln" model with symbol "+"; Prod Nr 259427; ©Anna Vacani

The pictured model was intended to use in the low temperature environments. It has "+" symbol indicated that with this kind of grease the binocular can be used in temperature up to -40C.
Another one produced during WWII was by *C.P. Goerz* – marked *Bpd,* in the WWII code book we are reading - "*Bpd -Optische Anstalt C.P. Goerz G.m.b.H., Wien 75, Sonnleithnergasse 5."* And the letters groups of codes – *baa – bzz* were published in February 1941.

Model 12x60 was produced by Carl Zeiss factory *flm* as well. That information was published in the leaflet issued by the factory Somet, (in our collection) in late 1940s.
During WWII *flm* was produced 25x100 and 12x60 for rangefinders. It was marked "*flm"* as Feinapparate-Bau G.m.b.H*.,* Werk Thurn. The production of 25x100 *flm* began in 1944 in the same factory - Werk Thurn (Teplice in Czech, at the present time). Later after the war it was sold as Somet – Czechoslovakia Company. Next the Company was nationalised, about 1949-1950, and the name of the Company was changed again into Meopta.
The plate with code was placed on the binoculars' hood. The production numbers were located underneath of the prim housing; it was only applied to *blc, rln, flm* models. Later on the production numbers, on Somet and Meopta models, were placed on the top black housing cover of the prism box.

Pict 9; 25x100 marked "flm"; ©Anna Vacani

Pict 10; 25x100 marked code "flm"; ©Anna Vacani

Pict 11; 25x100 "flm" plate; ©Anna Vacani

This model 25x100 was used for 6 m rangefinders and 12x60 models were installed on 6 m and 4m rangefinders as well.

Pict 12; 12x60 Somet sold for Swedish market; ©Robert Forslund

Pict 13; 12x60 Somet with the place number on the rangefinder, sold for Swedish market; ©Robert Forslund

The Jumelle model was produced during WII as well.

Pict 14; 12x60 Jumelle model; ©Anna Vacani

It was made in many thousands by Carl Zeiss Jena- as a contract for French army which was collaborating with German army. The binoculars were marked in French language. This information we heard, in 1980s, from our friend specialist in the binocular fields, who was closed to the French military collectors, salesman and some authorities.
However, that information can be confirmed by the law established during WWII, in Germany. The optical equipment cannot be sold or exported with blooming optics. All Jumelle 12x60 were uncoated.
Another logical point is that when French army was fighting among German army, they should be equipped with proper optic items.
It is in some way controversial information, as far as today, nobody has seen that contract.
Next, the Jumelle model 12x60 appeared around it is a very late model of 12x60, produced towards the end of the war.
It is a very big question mark. At the time the model of that binocular was produced (as we had seen that model), France was free country.

II. Technical Description of our model

Our model of the binocular 12x60 with a 60 ° viewing angle, were installed on board ships and shore based Kriegsmarine rangefinder sites; specially on the stereoscopic 6 R telemeter as it is indicated on the nameplate.
As indicated the plate below, it was produced during WWII by Carl Zeiss Jena – marked “blc”.
Presumably it was manufactured about 1942-1943.

Pict 15; 12x60 “blc” plate; ©Anna Vacani

The description plates of the binoculars were produced from metal, before the war. Next before and during the war it was changed for plastic plates, as it was problem with the metal.

This model was also installed on other devices such as Kommandogerät (predictor) Flak-Batterie (Antiaircraft guns battery), blinded range meters and others.

The binoculars 12x60 were used for trigonometric calculation for shooting against ships or aircrafts. Our binocular was specially design for Kriegsmarine. The binocular was equipped with a special designed and marked "*blc*" sight, through which was possible to direct the optic to the object.
It is engraved with the mark of acceptance of the Kriegsmarine "M" eagle and "IV/1".

1; Binoculars Body and the mechanisms installed on the body and accessories

Pict 16; 12x60 blc Kriegsmarine model; ©Anna Vacani

The body

The body of the binocular was made from a very solid metal with light gray paint.
The shape of the binocular is very suitably designed. It is very comfortable to pick up and hold in hands the binocular, because the centre of gravity is perfectly calculated. The weight of the binocular (10 lbs = 4,5kg) is unnoticeable.
The binocular body consists of 3 parts; headrest, the objective sunshine hood, main body with the mechanism is placed on it.

1. - Main part of the body and optical system;

a) – Headrest, which is suspended on large screws that are moveable.
The headrest consists two parts, it is reclining. It can be folded away upwards or sideways. That element allows making an automatic adjustment to any size of the head of an observer and after adjustment of eye interpupillary distance.
Sometimes the rubbers fitted around the eyepieces were marked with war time stamps.

Pict 17; 12x60 blc Kriegsmarine model, the headrest; ©Anna Vacani

Pict 17 a; 12x60 the headrest part; ©Anna Vacani

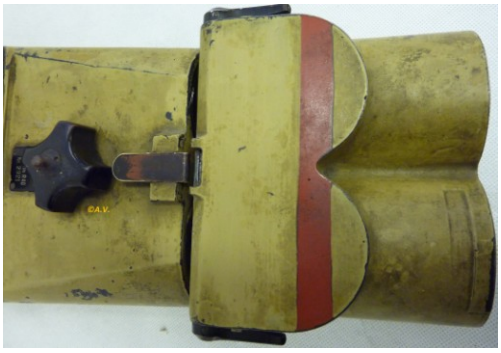
Our binocular has original red rubber on the headrest. Presumably, the binocular all time was stored in the box without access to the sun and the air therefore the rubber has not decomposed.

b) -The objective sunshine hood is hinged at the bottom and joined together on top of the binocular. The hoods are often missing.
To the hood, on our binocular, is screwed the *blc* plate with all description of the characteristics of this model. All other 12x60 models have these plates fitted to the main body (pictures below).
The reason for this placement is understandable. In this particular model of 12x60, on the main body is another plate of the reticule information fitted into the right ocular.

In 12x60 models the objective sunshine hoods are in four or five slightly different designs. One is as visible on our Kriegsmarine model, and another shape as visible in the 12x60 produced by Carl Zeiss Jena *blc* and C.P. Goerz – "*bpd*".

Pict 18; 12x60 bpd model; ©Anna Vacani

As visible in the picture, this Goerz model has the number "2" printed on the body by the *bpd* plate, on the left side. It indicates mounting positions of the binocular on the rangefinder.



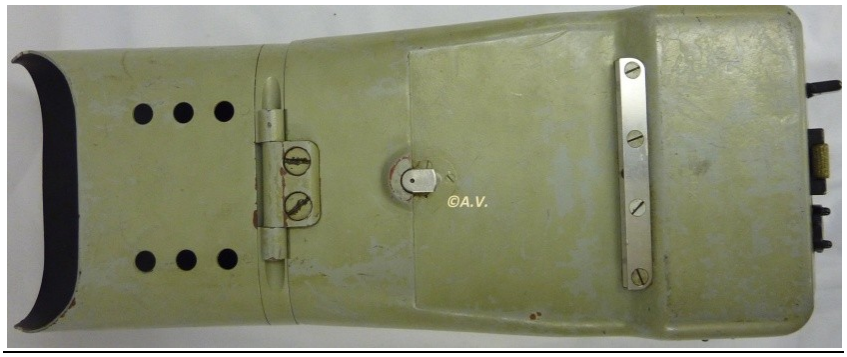
Pict 19, 20; 12x60 bpd model; sunshine hood; ©Anna Vacani

In our *blc* model the hood is attached in the same way, but *bpd* pictured model above, has a special feature – the lever on the side of the sunshade, which opening and closing perforated diaphragm inside of the hood.
During the daily observation the diaphragm can be swung down in front of the objectives. It will cause reduction of objective diameter and amount of light passing into the binocular during a sunny day.

Pict 21; 12x60 blc model; Prod Nr 269084; closed diaphragm inside of the hood; ©Anna Vacani

Our *blc* model does not have this feature.

All models have 4 or 6 holes in the hood. When the binocular was mounted on a ship the sea water easily flowed out from the hood.



Pict 22; 12x60 blc Kriegsmarine model; back side ©Anna Vacani

The Carl Zeiss Jena was produced both shape of sunshine hoods, marked as "*blc*" and "*rln*".

Pict 23; 12x60 blc; Prod Nr 269084; ©Anna Vacani

c) - Drying system

Pict 24; 12x60 blc; Prod Nr 269084; ©Anna Vacani

The 12x60 *blc* model has another feature. It is a drying air system. Opening the cover (top right in the above picture) it is visible only a hole, in some 12x60 binoculars. It is placed in optics housing – between the objective and prisms.

Pict 25, 26; a body of 12x60, in our collection; ©Anna Vacani

In some models of 12x60, in the hole visible in above picture, is fitted silica gel patron for drying the optics parts.

Pict 27, 28; 12x60 blc with silica gel patron; ©Martin Soerensen

This feature is visible in Russian copy of 12x60, as well.

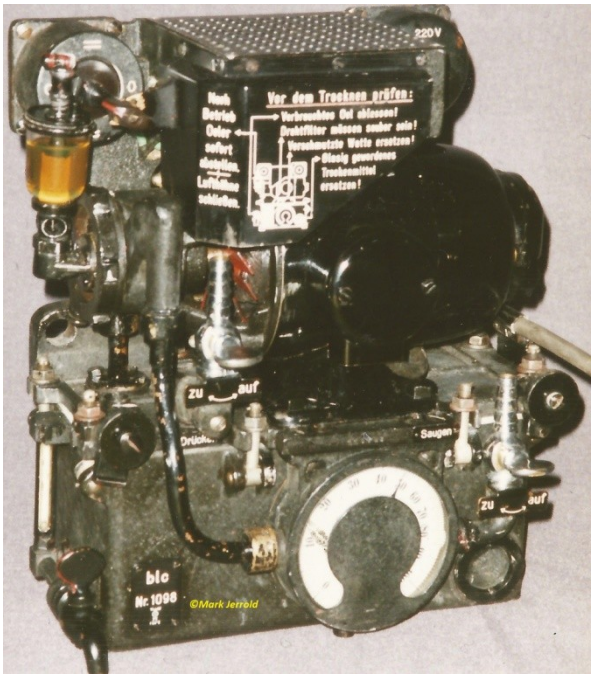
Pict 29; Russian 12x60; 1950s; ©Anna Vacani

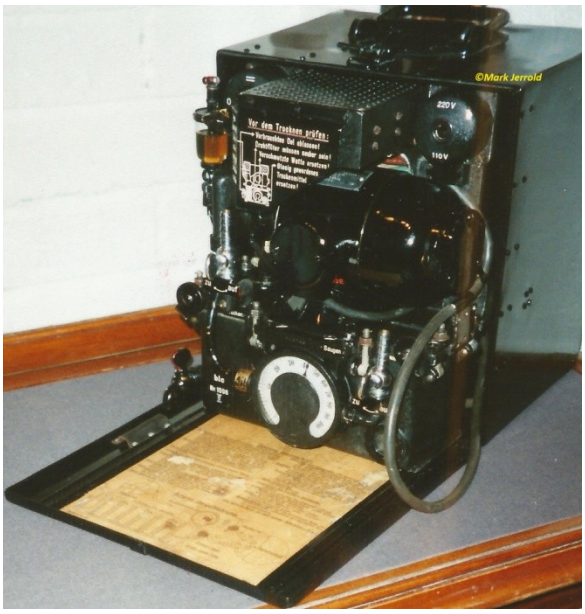
As it is visible in Goerz *bpd* and our *blc* Kriegsmarine models they do not have this feature.

Some models of 12x60, *rln* and "*blc*" and Somet, have features –"*trocken luft*" built in the optical compartment for drying air around the optics elements.

Pict 30 a, b, c; 12x60 rln trocken luft- air drying system ©Anna Vacani

Applying a special vacuum tool, it is possible to suck out the air around the optics. Carl Zeiss produced this apparatus and at the end of the war it was marked with the war time code "*blc*".



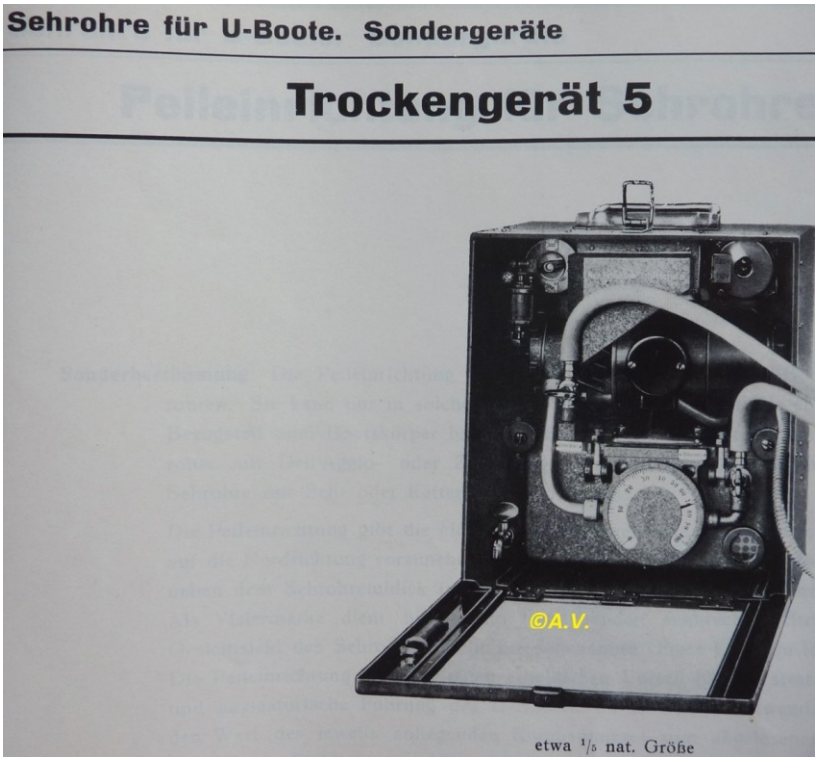


Pict 31, 32; air vacuum for 12x60 blc No 1098 and with swastika; ©Mark Jerrold ;(pictures are in our photographic library).

As it is visible the drying devices were produced by Carl Zeiss Jena, during the war as well. The instrument has own production number.

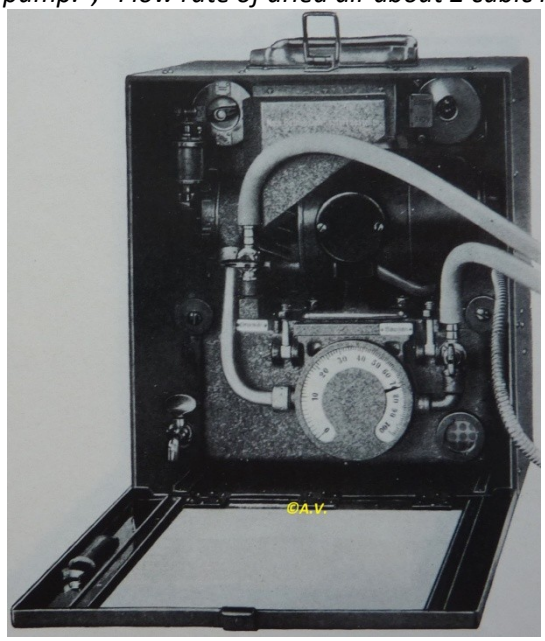
These instruments were very well illustrated in Carl Zeiss Jena documents. The pictures and technical descriptions are placed in the book: *"Optisches Gerät der deutschen Wehrtechnik – German Military Technology: The Optical Equipment. Descriptive documents circulated by Carl Zeiss, Jena, between 1930 and 1940; edited by: Dr. Hans Seeger".*

It appears that the drying devices were produced in two models – one for U-Boot instruments and second for others devices.



Pict 33; from the book: "Optisches Gerät der deutschen Wehrtechnik – German Military Technology: The Optical Equipment: Descriptive documents circulated by Carl Zeiss, Jena, [...]; in our collection

The U-Boot version has a little different technical specification. The electric motor is - "*Operation: It has universal electric motor for DC and single-phase AC for 110 125 and 220 volts drives an air pump"*
The other difference is the quantity of the air rate of drying air – "*Performance: Flow rate of dried air about 2 ½ cubic meters per hour."*
The model produced for other devices has different power of electric motor and performance:
"*A universal electric motor for DC and single-phase AC of 110 and 220 volts drives a circulation air pump."; "Flow rate of dried air about 2 cubic meters per hour."*



Pict 34; from the book: "Optisches Gerät der deutschen Wehrtechnik – German Military Technology:...]

The whole working system of the instruments is very interesting.
Let's look at the description of U-Boot version (Google translation):

Special provision: The drying device is used to dry the air inside optical devices, as far as these devices have an air inlet and an air outlet valve for connection of the drying device (e.g. submarine sight-tubes, directional sight tubes, telemeter, etc.).
Dehydration of optical equipment is required when the optical glasses are fogged inside, i. H. if the trapped air contains too much moisture.
The dryer is connected to the optical device by means of rubber hoses and corresponding connectors.
Operation: Bin universal electric motor for DC and single-phase AC for 110 125 and 220 volts drives an air pump.
This sucks out the moist air from the optical device to be dried and pushes it in succession through a moisture meter, an oil separator and several chambers filled with calcium chloride, in which the moisture is removed from the air.
Through a built-in filter any solid particles are retained. The thus dried and cleaned air is pushed back into the optical device.
Performance: Flow rate of dried air about 2 ½ cubic meters per hour.
Container: The drying unit is stored in one for storage and transport
Tin container housed.
Weights: drying unit, ready for use ..... about 14, 0 kg
Tin container, empty; about 4.5 kg!
This file of Carl Zeiss Jena (U-Boot) is dated – IV.1938. The file for other instrument is dated 1936.

The vacuum was connected into *trocken luft- air drying system* of the binocular, by rubber tubes and adapters.

Pict 35; air vacuum for 12x60; with Carl Zeiss Jena logo No 1052- produced before the war; ©Martin Soerensen

At this part of the description, it is right to mention, that to achieve the best picture from 12x60 it was not only applied the drying system. When binocular was used in a very low temperature, sometimes it was work with a set heating equipment to stop condensation on the eyepieces.

However, we have seen this system only in the Russian model. It is debatable if it is a copy of German Kriegsmarine model or a Russian invention.

Pict 36 a, b, c, d; 12x60 Russian heating equipment for eyepieces; ©Anna Vacani

This system was designed for two 12x60 binoculars installed on a rangefinder and for rangefinder itself. The rangefinder takes only two binoculars. Any user could not make a mistake with covers. All cups were connected with the cables systems. The external covers they are intended for the outside binoculars. The centre covers are fitted for the rangefinder's optic.
In the top of the covers is fitted a clear glass and in the aluminium ring is applied the heating element:

Pict 37; 12x60 Russian heating element for eyepieces; ©Anna Vacani

This small box with heating system was as a part of a bigger box containing two Russian 12x60 binoculars for use on the Russian rangefinder.

2. The mechanisms installed on top of the body of 12x60 blc Kriegsmarine;

a) - Interpupillary selection system installed underneath the left eyepiece. The eyepiece can be adjusted for eye interpupillary distance of every one observer by moving the lever below the eyepiece. The eyepiece is moving only horizontally. The observers can remember their numbers of interpupillary position, as it is engraved on the ring.

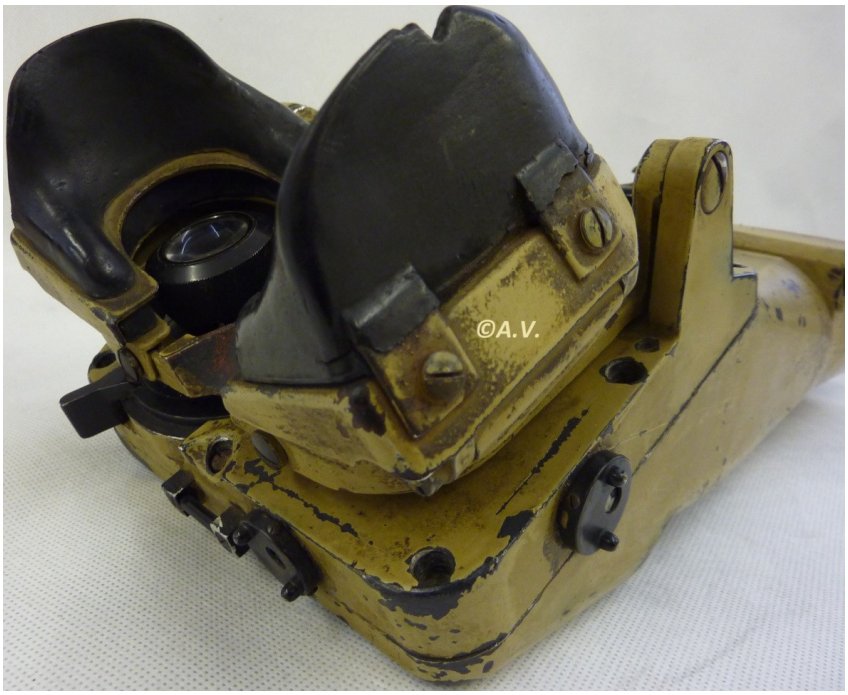
Pict 38 a & b; 12x60 blc Kriegsmarine model; Interpupillary distance mechanism; ©Anna Vacani

Pict 38 c; 12x60 & 25x100; blueprint of interpupillary distance mechanism; ©Anna Vacani

The binocular has independent eyepiece focusing system.

***b) - Adjustments for centralizing reticle*.**

The adjustments of the reticle can be done by using two holes; underneath of the right ocular (above Pict) and the second hole is on the side of the right ocular. Into these holes it has to be inserted Alan key. Through the front opening the reticle can be moved upward and downward. The side opening lets to move the reticle left or right.



Pict 39; 12x60 bpd model; openings adjustment for centralizing reticle ©Anna Vacani

Pict 40; the Alan key for adjustment centralizing reticle 12 x 60; © Martin Soerensen

c) - Two filters. On the body over the left ocular is a knob marked *Farbgläser*.
Turning this filter knob, you can select optional light – light gray or dark gray *(Pict 16; 24)*.

***d) - Tilt angle mechanism for the adjustment position of the headrest*.**
The mechanism is placed between filters and viewfinder. Twisting the screw causes it to elevate or lowered the headrest. It was very useful feature, when an observer used the binocular a long time *(Pict 16)* staying more comfortable and more focused for the vision.

e) - Sight; the mechanism is fitted above right eyepiece. The sight is specially designed.

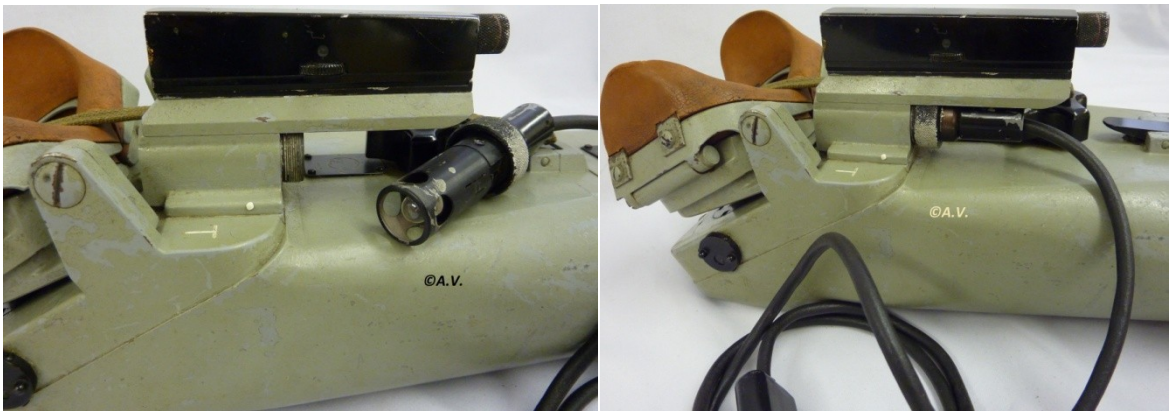
f) - Mechanism of mounting the binocular; the large knob on the front tightens the clamp on the bottom of the binocular for attaching mounting block to the rangefinder *(Pict 16 & 24)*.

Pict 41 a. b ; 12x60 blc Kriegsmarine model; original mounting block; ©Anna Vacani

The 4 larger hols are for screws to fix plate to rangefinder. The 2 smaller hols are to locate on dowel pins on the rangefinder. The original mounting blocks are very often missing. Some collectors are making a substitute of the blocks.

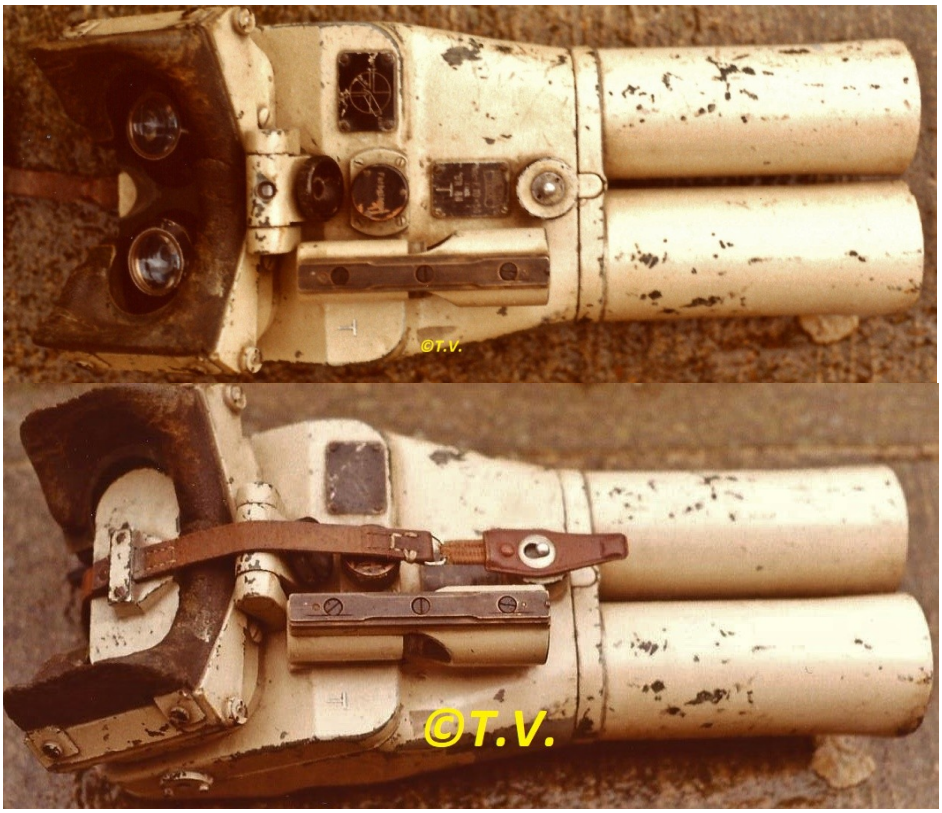
g) - The illuminating lamp for reticle.
The illumination of the reticle came from lamp mounted to the viewfinder through the illumination window underneath of the viewfinder.

Pict 42; 12x60 reticle illuminating window; ©Anna Vacani



Pict 43 a, b; 12x60 blc Kriegsmarine model; reticle illuminating lamp; ©Anna Vacani

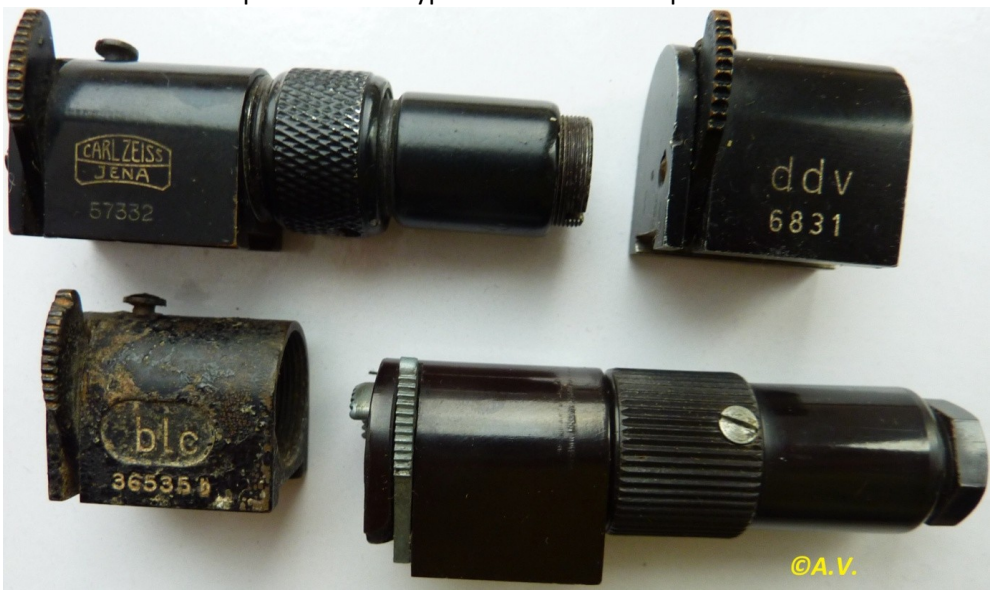
Only this model of 12x60 and 10x50 binoculars take this type of cable and special type of lamp.



Pict 44 a, b; 10x50 Carl Zeiss Jena; ©Terry Vacani

The 10x50 binocular model was produced before WWII. It was a small production.

Other 12x60 takes different type of cable and reticle lamp.
As it is visible in this picture other type of the reticle lamp were used as well.

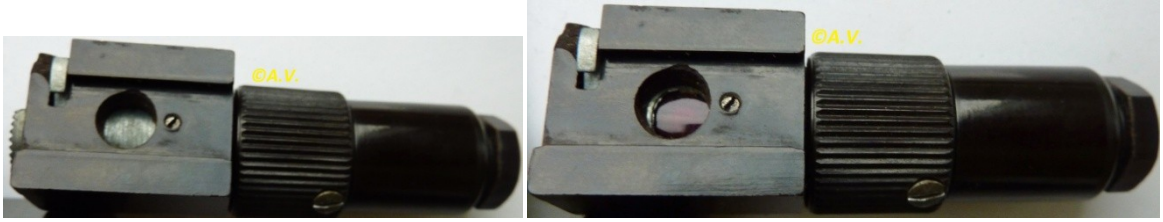


Pict 45; reticle illuminating lamps housings; ©Anna Vacani

Some of these parts of lamps were marked. Before the end of WWII they were produced from Bakelite – the bottom right in the above picture.
On the top of each reticle lamp housing is a knurled lever for fixing the lamp housing in place on a binocular. On the Carl Zeiss Jena and *blc* reticle lamp is visible small knob. Moving it is possible to dim the light on the reticle.

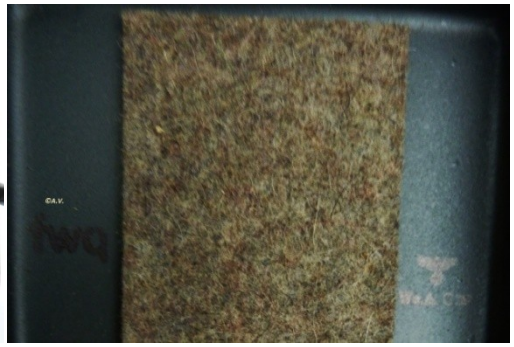
Pict 46 a; reticle illuminating lamps housings; left party closed, right opened; ©Anna Vacani

The Bakelite model was a little different. Moving the bottom knurled lever it appeared a red bulb.



Pict 46 b, c; Bakelite illuminating lamps housing; left closed, right opened; ©Anna Vacani

The cable was plugged into a box with three batteries – 4,5v to get power source for illuminating reticle.



Pict 47 a, b, c, d; box marked with blc and fwq for illuminating lamps housing; cable and lamps housing ©Anna Vacani

During the war the boxes were marked inside with the war codes.
Early battery boxes were made of leather outside.

2; Optics

All elements of optics system of the 12x60 are:

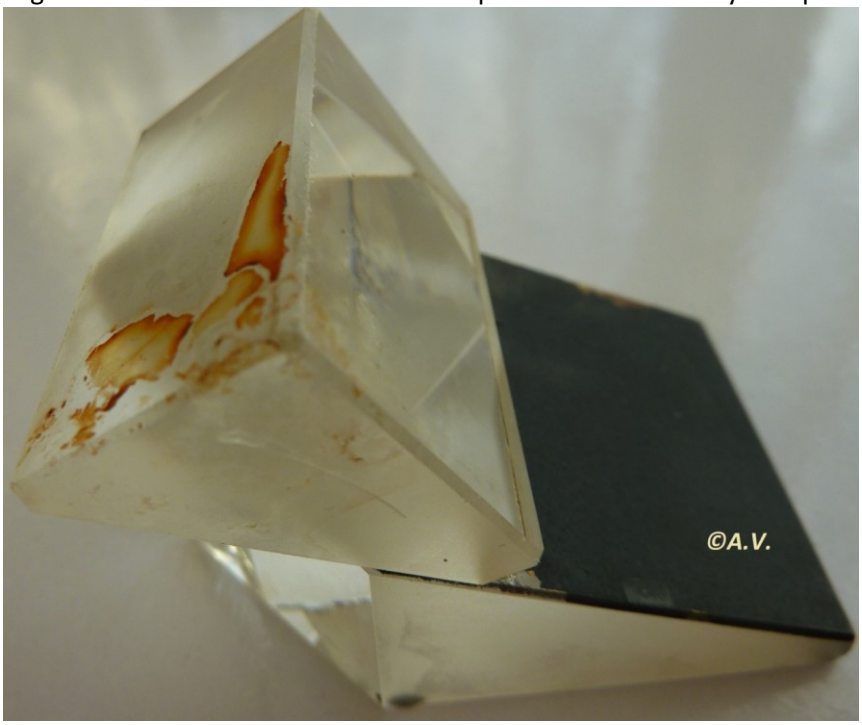
a) - The eyepieces

The oculars consists 4 elements;
- the top element is Plano-convex lens (Plano-convex lenses are positive focal length elements that have one spherical surface and one flat surface);
- metal spacer;
- double convex (positive lens);
- Spacer and a cemented pair of lenses with both outer faces convex and to inner one is convex and one is concave.

The eyepieces are individually focusing. The optic pupils are 5 mm.

b) - The prisms;

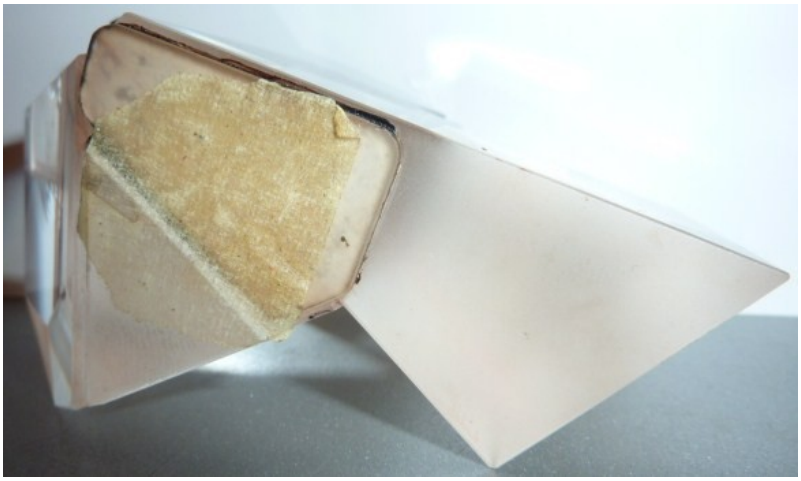
The prism arrangement is in some way peculiar, in this model. The model has only two prisms; the larger one has a silvered surface on one part. The silver is very well preserved.



Pict 48 a; 12x60 blc Kriegsmarine model; two prisms – bottom one is silvered; ©Anna Vacani

The prisms are cemented with balsam together. On outside of the two prism sections are cemented two small glass plates, with plaster of paris to strengthen structure.
This system usually is named – Deviation-Roof prism combination.

The prism system is absolutely different in 25x100 binocular. Comparing these two systems, we can see that the prism of 25 x 100 is not cemented but assembled by vacuum. It has two plates of glass which are hold on to the prism assembly with plaster on each side.
On the 25x100 prism it does not have a silvered surface, because the angle of the output of prism does not needed silvering.



Pict 48 b; 25x100 prism; ©Anna Vacani

c) - The objectives

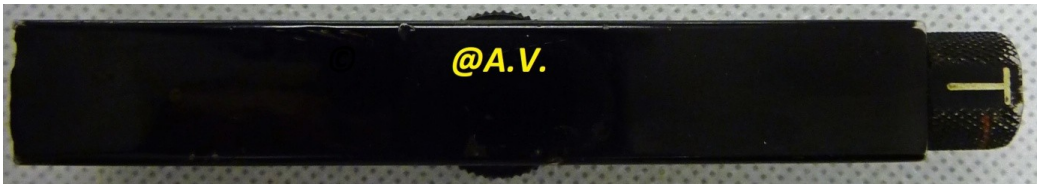
The objective consists of an achromatic two element cemented in 12x60.
When in 25x100 two elements are not cemented but divided by metal spacer. At the time when 25x100 and 12x60 were produced, the optical elements in the eyepiece were connected with balsam-glued. Unfortunately, this kind of glue was expanded under the influence of high temperature. This way of joining of lenses was applied to all eyelense in the early models of 25x100 and last models.

Often you can read that the objectives lenses were cemented. Unfortunately it is wrong information. We have seen and assembled many pairs of 25x100 binoculars and no one had cemented optics elements.
Making another comparison of these two binoculars – 12x60 and 25x100, we can mention that even it looks that optical construction is similar. It is more difficult to separate all parts and next to assemble it, in 12x60 models. The 25x100 models are much quicker to dismantle.

It is valuable to know that in 1944 decision was taken not to continue to produce the 200 mm *blc* binoculars, but to increase production of 25x100. The decision was made because it was more effective solutions of 25x100 then producing 200 mm models. It was too costly. The 25x100 *flm* model was produced in quantity and at the end of the war there was 2-3 thousand still in the factory. This information we obtain from the late Wijnand Albregts from Netherland, who went to the factory, in Czechoslovakia, a few years ago.

d) - Viewfinder

This element was produced by Carl Zeiss Jena and marked *blc* and has own production number, our viewfinder's number is - 215326.
This kind of auxiliary sight was used on many binoculars – 10x80 eug; 5x10x70; and early 25x100.
It could be easily removed from the sight elevation arm.
The site can be used during the day (T in the picture) and night (N) by turning the knob, on the site, to an appropriate position.



Pict 49; 12x60 blc sight; ©Anna Vacani

The viewfinder originally had a V-shaped line, that nowadays this luminous line is no longer luminous. The luminosity decreases rapidly after 15 years.
It is an inverted **V** sight. It is possible to increase illumination by turning the adjustment wheel, built in the sight; the black triangle will be moving down showing thicker **V**.

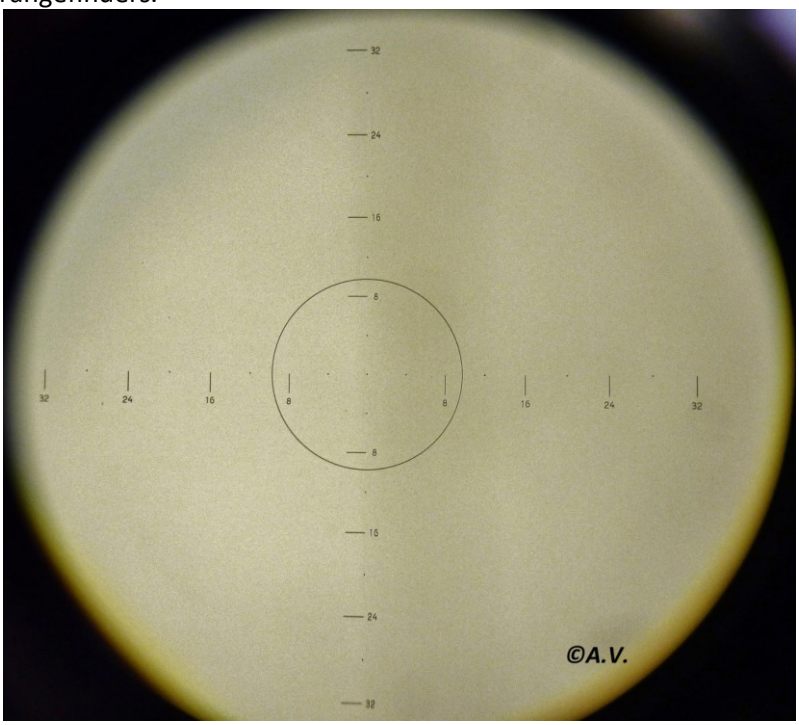
Pict 50 a, b; the illuminated sight; © Anna Vacani

Pict 51; 12x60 blc Kriegsmarine model; sight; ©Anna Vacani

The sight is of high quality.
The letter "T" indicates that the optic received blue anti-reflecting cover. The letter was placed in some different place on the binoculars' bodies.

e) – The reticule

On right side, in the ocular is placed a reticle. In the Kriegsmarine models this reticule is a special kind. It is not common to find this reticle. It is only fitted into binocular built for stereoscopic 6 meter rangefinders.



Pict 52; the reticule in our 12 x 60 blc Kriegsmarine model; © Anna Vacani

The reticule corresponds with the informative plate, placed on the binocular body.

P*ict 53; the plate on our 12 x 60 blc Kriegsmarine model; © Anna Vacani*

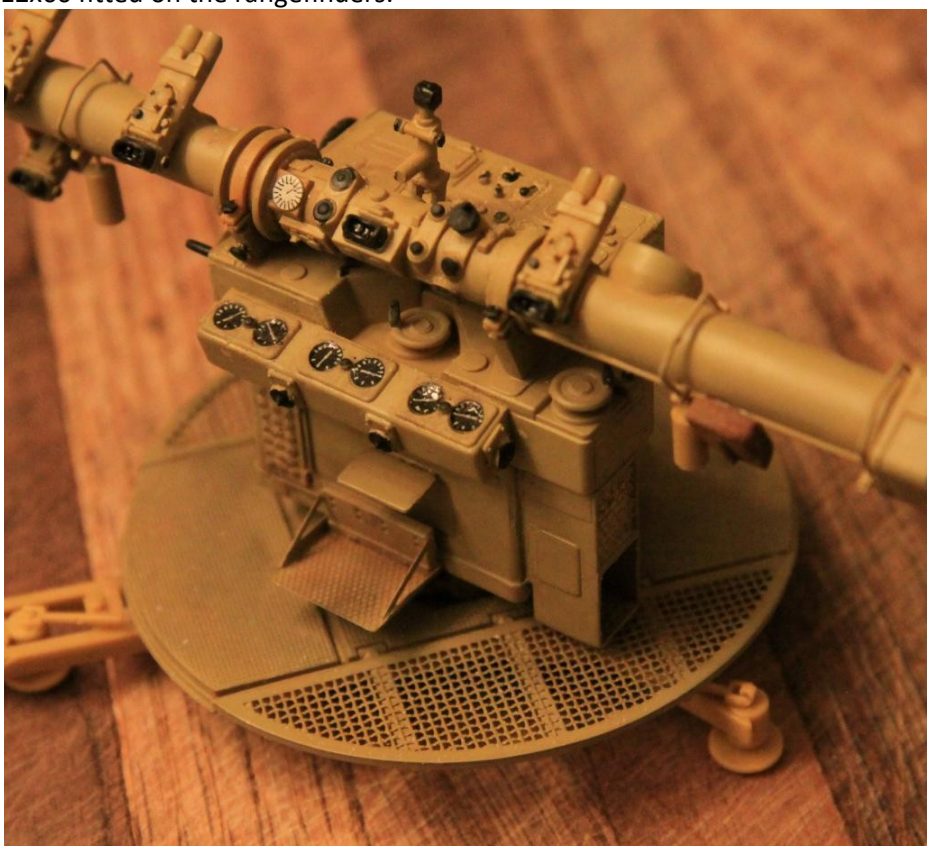
It helps to calculate a distance from an object.
The remaining binoculars described in this article have a common reticle.

Pict 54; the reticule in 12 x 60 bpd model; © Anna Vacani

III. Summarizing

The rangefinders on the time were built of 1m, 2m, 3 m, 4m and 6m. They were fitted with many models of the binoculars; 7x; 10x45; 10x45 monoculars (sometimes mounted as a pair); 10x50; 10x 80 eug; 12x60 and 25x100.
At the time many models fitted on the rangefinders had similar optical construction, with small differences; as 25x100; 10x80 eug or 10x50.
The 12x60 it is nice, good looking and well constructed binocular.

As we can see there are many enthusiasts in this field. You can buy some toys reproductions of 12x60 fitted on the rangefinders.



Source of the picture; www.lineol.deamtoolbg_imagesgal_w1308134606_354.jpg

Source of the picture; www.lineol.deamtoolbg_imagesgal_w1308134606_354.jpg

The article was written based on many and many years of experience with binoculars and their construction. And beside on the literature of our own library, including the military documents which in the past were restricted.

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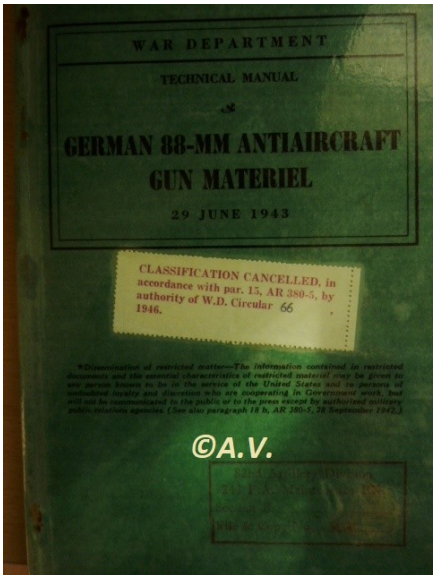

- Optisches Gerät der deutschen Wehrtechnik – German Military Technology: The Optical Equipment. Descriptive documents circulated by Carl Zeiss, Jena, between 1930 and 1940; edited by: Dr. Hans Seeger.

Note:
We will be happy to hear your comment.