OLO

Tester of optical binoculars



Fig. 1. Photo of OLO test station

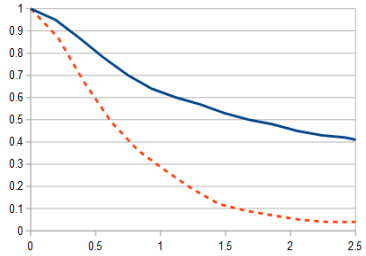


Fig. 2. MTF of two exemplary optical binoculars of different quality

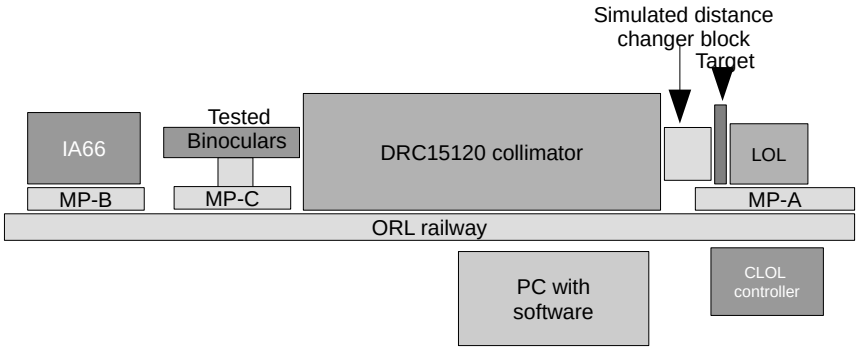


Fig. 3. Drawing of OLO modules



Fig. 4. Photo of exemplary binoculars - 7x45 PZO

1 Basic information

Optical binoculars are group of afocal optical systems (focal length equals to infinity) working in visible spectral range built using telescope design concept and consist of two separate telescopes align to point in the same direction.
Main task of optical binoculars is to generate high quality image of observed scenery that could be later evaluated by human observer. It is critical that image generated by a optical binoculars should be perceived as sharp by human observer.
There are many optical binoculars offered on international market of very different quality and price. There are many myths on quality of optical binoculars often supported only by brand of manufacturer.
OLO test station is a modular, quasi universal station for testing optical binoculars. This station enables measurement of a series of important parameters of optical binoculars: resolution, MTF (on – axis, off – axis), magnification, magnification disparity, distortion, FOV, transmission, transmission disparity, vignetting, eye relief, exit pupil diameter, interpuppilary distance, diopter range, horizontal/vertical collimation error, image rotation error and range finder plate position error. Tested optical binoculars can be accurately evaluated on basis of these parameters. OLO is a perfect tool for manufacturers, big buyers or repair workshops of optical binoculars.

2 How OLO is built?

OLO is built using a concept of computerized system that carries out analysis of reference images generated by tested optical binoculars.
OLO test station is built from a series of modules: LOL light source, CLOL controller, set of targets, set of pinholes, DRC15120 refractive collimator, MP-A, MP-B and MP-C mechanical platforms, IA66 image analyser, ORL railway, PC (or laptop), frame grabber, set of aperture reductions, and TOPO-B test software.
CLOL is a light source integrated with a reference movable targets that generate reference images. DRC15120 collimator is a high resolution refractive collimator that projects reference images into direction of tested optical binocular. MP-A is a mechanical platform that enables precision rotation of DRC15120 collimator in order to simulate off – axis targets. MP-B platform enables positioning of IA66 image analyser. MP-C platform enables positioning of tested optical binocular.

3 Range of tested binoculars

Table. 1. Range of tested binoculars

Parameter	Value
Objective aperture	10 – 100 mm
Eyepiece aperture	2 – 30 mm
Magnification range	1 – 40 x
Off – axis range	0^0 – 30^0
Simulated distance range	50 m – ∞

4 Test range and accuracy

Table. 2. Test range and accuracy

Parameter	Measurement range	Measurement relative uncertainty
Resolution	1.2 – 273.6 lp/mrad (target space)	≤ 10%
MTF	0- 2.5 lp/mrad (measurement at imaging plane) 0- 2.5 x M lp/mrad (measurement at object plane where M is magnification)	± 0.02 (at MTF >0.2) for on – axis ± 0.03 (at MTF >0.2) for off – axis (absolute value)
Magnification	1 – 40 x	≤ 2%
Distortion	Up to 20%	≤ 1% (absolute value)
FOV	Up to 14º	≤ 3%
Vignetting	0 to 2	≤ 3%
Transmission	0.2 to 1	≤ 1%
Exit pupil diameter	1 – 20 mm	≤ 0.2 mm (absolute value)
Eye relief	4 – 150 mm	≤ 1 mm (absolute value)
Diopter range	– 6 to + 6 diopter	0.1 diopter
Magnification disparity	Up to 20% but maximal measurable magnification 40x	≤ 1% (absolute value)
Transmission disparity	0 to 0.8	≤ 2%
Interpupillary distance	10 – 95 mm	≤ 0.2 mm (absolute value)
Collimation error (Horizontal or Vertical)	0 – 50 mrad	≤ 0.25 mrad (absolute value)
Image rotation error	0º – 45º	≤ 1' (absolute value)
Range finder plate position error	+ 0.25D to + 6D – 0.25D to – 6D	0.1 diopter

5 Versions

OLO test stations can be delivered in different versions. The version is described using a single letter code presented in the table below.

Table. 3. Definition of codes used to describe versions of OLO test station

Code	Test capabilities	List of measured parameters
OLO-X	Basic	Resolution, eye relief, exit pupil diameter, diopter range
OLO-Y	Medium	Resolution, MTF (on – axis, off – axis), magnification, magnification disparity, FOV, eye relief, exit pupil diameter, interpupillary distance, diopter range
OLO-Z	Expanded	Resolution, MTF (on – axis, off – axis), magnification, magnification disparity, distortion, FOV, transmission, transmission disparity, vignetting, eye relief, exit pupil diameter, interpupillary distance, diopter range, horizontal/vertical collimation error, image rotation error, range finder plate position error

Options:
1. AT826 optical table optimized for work with OLO test station.

6 Dimensions

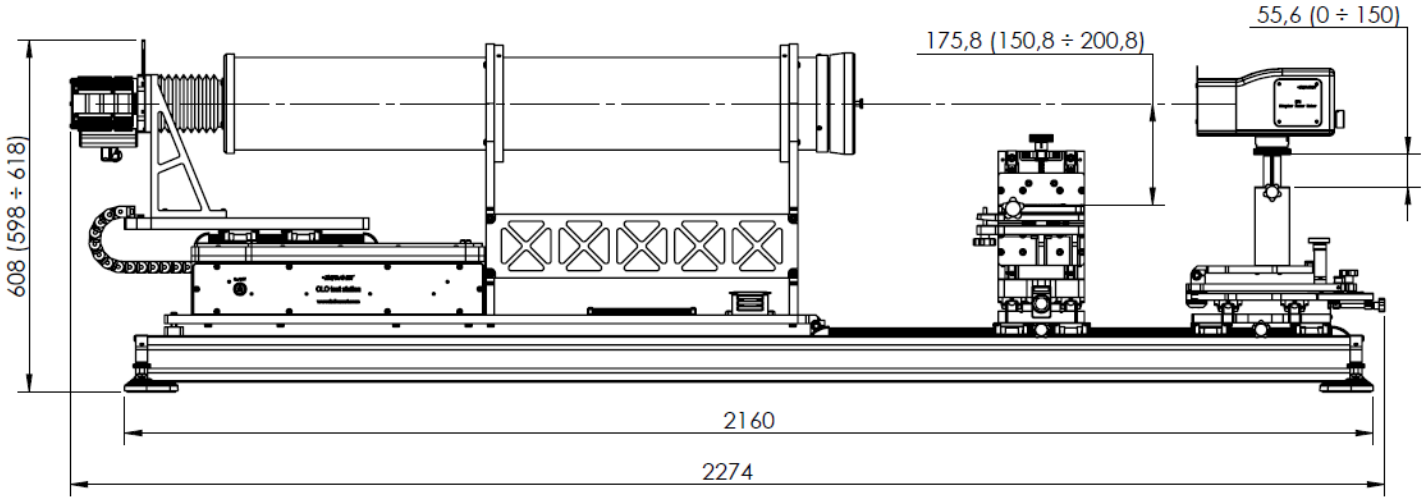


Fig. 5. Drawing of OLO test station

7 Why OLO station?

There is a wide range of optical binoculars available on the international market, varying greatly in quality and price. Numerous myths about binocular quality persist, often supported only by the manufacturer's brand. Claims regarding the performance of optical binoculars can be verified solely through the measurement of a set of key parameters. Such verification may be crucial in certain applications of binoculars, including military and security operations, search and rescue missions, astronomy, and other fields where reliability is essential.

Version 1.40

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