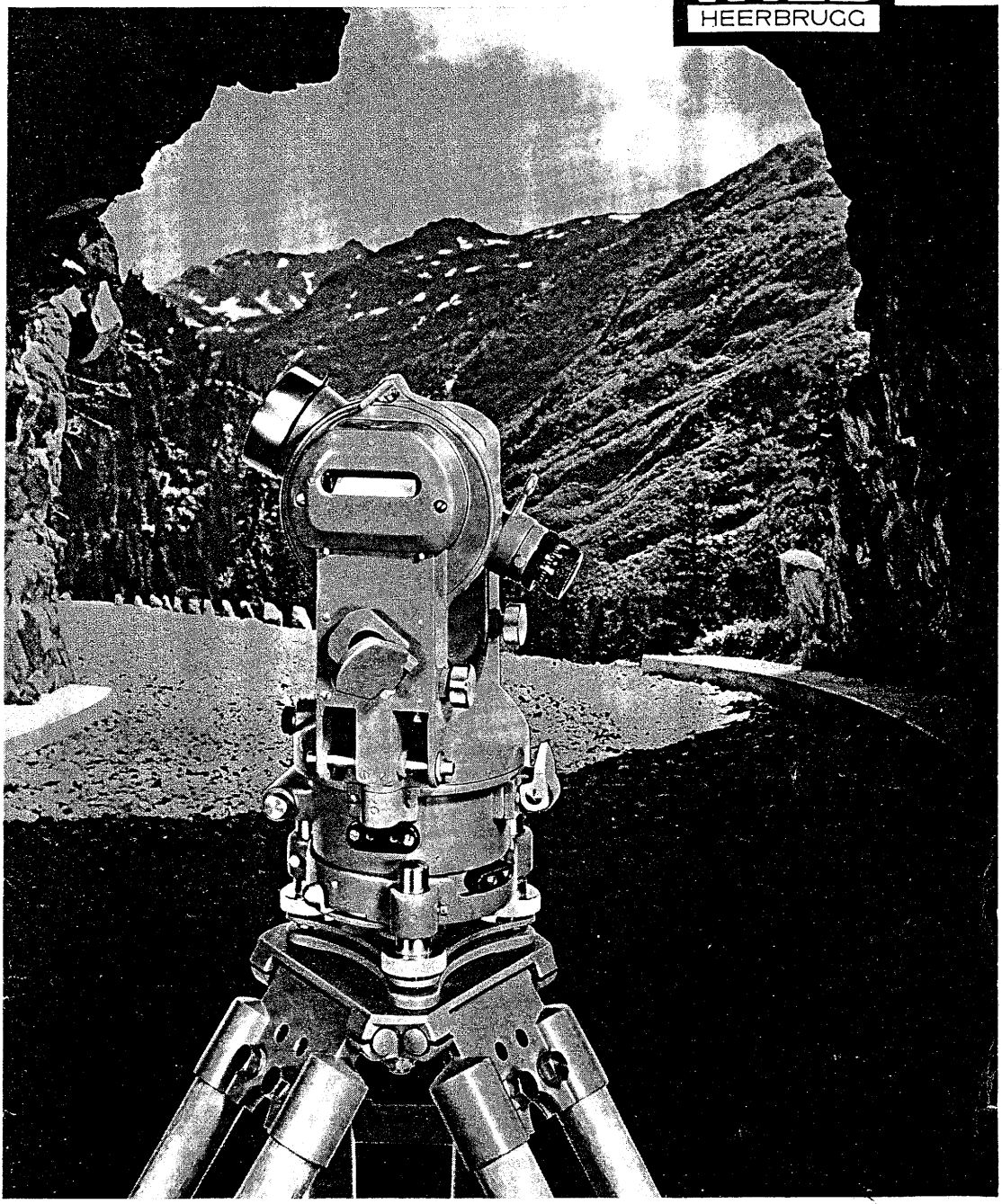
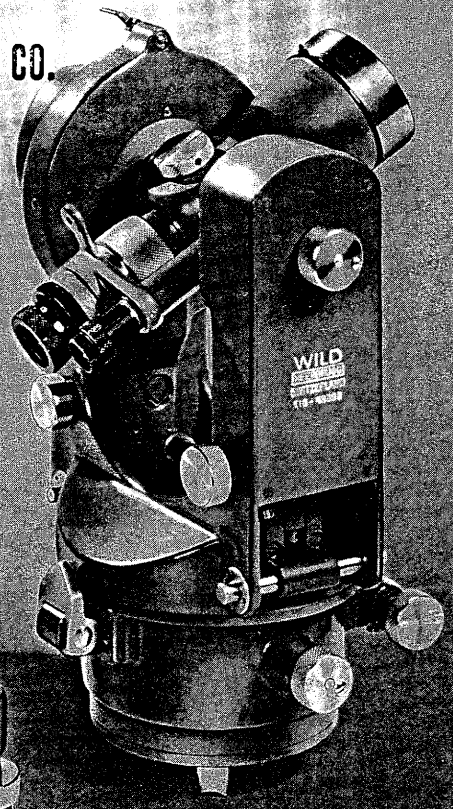
WILD
HEERBRUGG



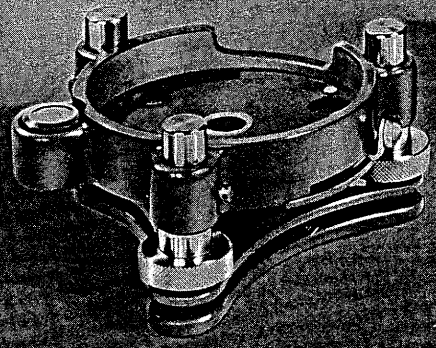
Tacheometer Theodolite T 16

Tacheometer Theodolite WILD T 16

The world-wide success of the T1 double centre Theodolite is due to a large extent to its exemplary clearness of design and reliability of circle readings. However the micrometer was found to be somewhat slow of action, which fact is due in part to the easy run of the micrometer drum. In the course of the years the demands for quicker circle readings piled up and since the scale microscopes of the new RDS and RDH reduction tacheometers have met with approval everywhere, it was the logical thing to do to provide the T1 with the same arrangement. In this connection this instrument underwent a close check of all its parts. The result was a new instrument, the tacheometer theodolite T16.



The lower part of the T 16, the tribrach, can be removed. Even without tribrach the instrument has a stable rest.



Its main technical features are the following

Diameter of objective . . . . . 40 mm (1.58′)
Magnifying power. . . . . 28 x
Shortest focusing distance . . . . . 1,40 m (4′/₂′)
Horizontal circle, divided into single degrees, all of which are numbered . . . . . 79 mm (3,1′)
Vertical circle: same arrangement
Circle reading with scale microscope . . . . . 60′
or 100ᶜ
Estimation to ′/₁₀ th of a minute
Circle clamp fastening horizontal circle to alidade.

1 circular level
1 plate level, centrally arranged between the standards, sensitivity 30″ per 2 mm.
1 vertical circle level for coincidence setting, sensitivity 30″ per 2 mm.
Built-in optical plumb in alidade, giving upright image. Detachable tribrach for forced centring, with new clamping device. Packing in metal container where the instrument is fixed near its center of gravity.
Tripod XVIa with rigid legs, XVIb with sliding legs
Total length of both tripods . . . . . 1.60 m (5′/₂′)
lenght of XVIb model folded . . . . . 0.93 m (3′)

Weights:

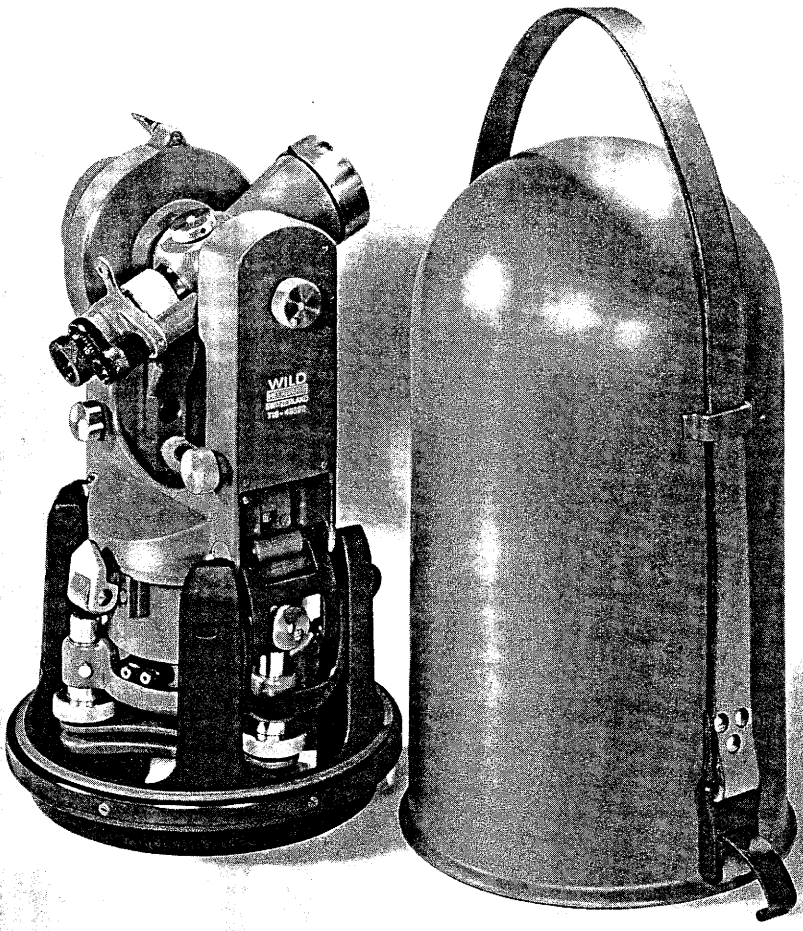
Instrument . . . . . 10 lbs.
Container, comprising ground plate and metal hood . . . 3⁴/₄lbs.
Tripod XVIa with rigid legs . . . . . 12′/₄lbs.
Tripod XVIb with sliding legs . . . . . 12′/₂lbs.

The standard equipment comprises:

1 T16, 360° or 400ᵍ
1 metal container, consisting of base plate and hood
1 tripod XVIa or XVIb

Furthermore the following accessories can be supplied:

Electric illumination
Telescope level
Tubular compass
Circular compass
Traverse equipment
Optical plumb for zenith and nadir sights
Objective prism
Precision telemeter
Diagonal eyepieces
Eyepiece prisms
Polar attachment



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Container

The metal container consists of a base plate and steel hood. The instrument rests on two supports by means of two bolts and is fixed to the supports with two locking levers. Its center of gravity is near the middle between the two bolts. ——

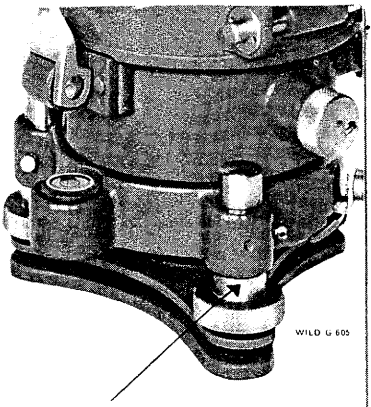
Tribrach

The tribrach of the theodolite is detachable. An ingenious new locking device holds instrument and tribrach together. It eliminates any play and can be unlocked only by actuating a spring lever. For traversing the tribrach can take either a target or an optical plumb for zenith or nadir sights, or else a stadia rod.

The foot screws are completely enclosed and dustproof and are adjustable in run.

A circular level provides for quick approximate centring.

The main fixing screw which is permanently fastened to the tripod head and which serves for fastening the theodolite to the star-shaped base plate, carries a central hole so as to permit use of the optical plumb. The plumb-bob is provided with a plug-in sleeve to be introduced into the fixing-screw from below and which is then fastened by a quarter turn. It is therefore possible to use either optical plumb or plumb-bob.



The foot screws of the T 16 are fully dustproof and remain always clean.

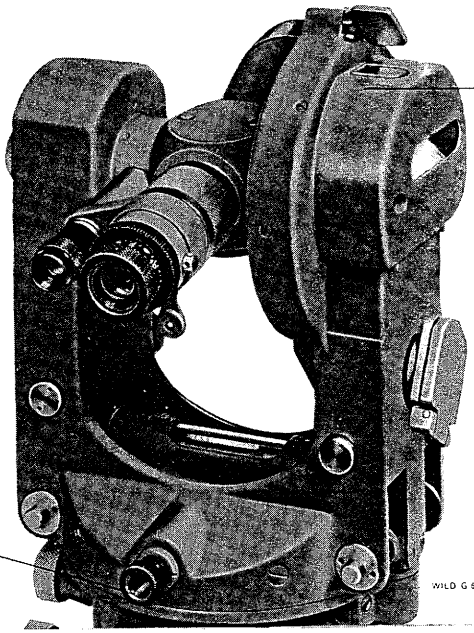
The Theodolite

Levels

The plate level is to be found centrally between the standards, thus making for minimum bubble deviation when turning the alidade.
The vertical circle level is completely encased and practically safe from all outside influences. The bubble ends as viewed through a prism system can be coincided with a tangent screw. Observation is effected over a tiltable mirror.

Optical Plumb

The optical plumb is built into the revolving part of the instrument (alidade) where it can always be checked by a half-turn. The image of the ground under the tripod appears true to life. Therefore the theodolite can be centred on the tripod without much effort.



The vertical circle level is completely built-in and therefore protected from any disturbing outside influence.

Axles system

Axle bush, vertical axle and circle Socket casing are made of chemically tempered steel. The cylindrical axle bush is conically ground at the upper end. The axle itself rests on balls which move in this conical opening and ensure an easy and smooth movement of the alidade without any play. This arrangement corresponds to the one in the T1, T2, T3 and T4 theodolites, of well-proved reliability.
The circle socket and the horizontal circle itself can be fastened to the alidade with the circle clamp. Therefore the repeating device of the T1 consisting of lower clamp and tangent screws is superfluous.

Clamps and tangent screws

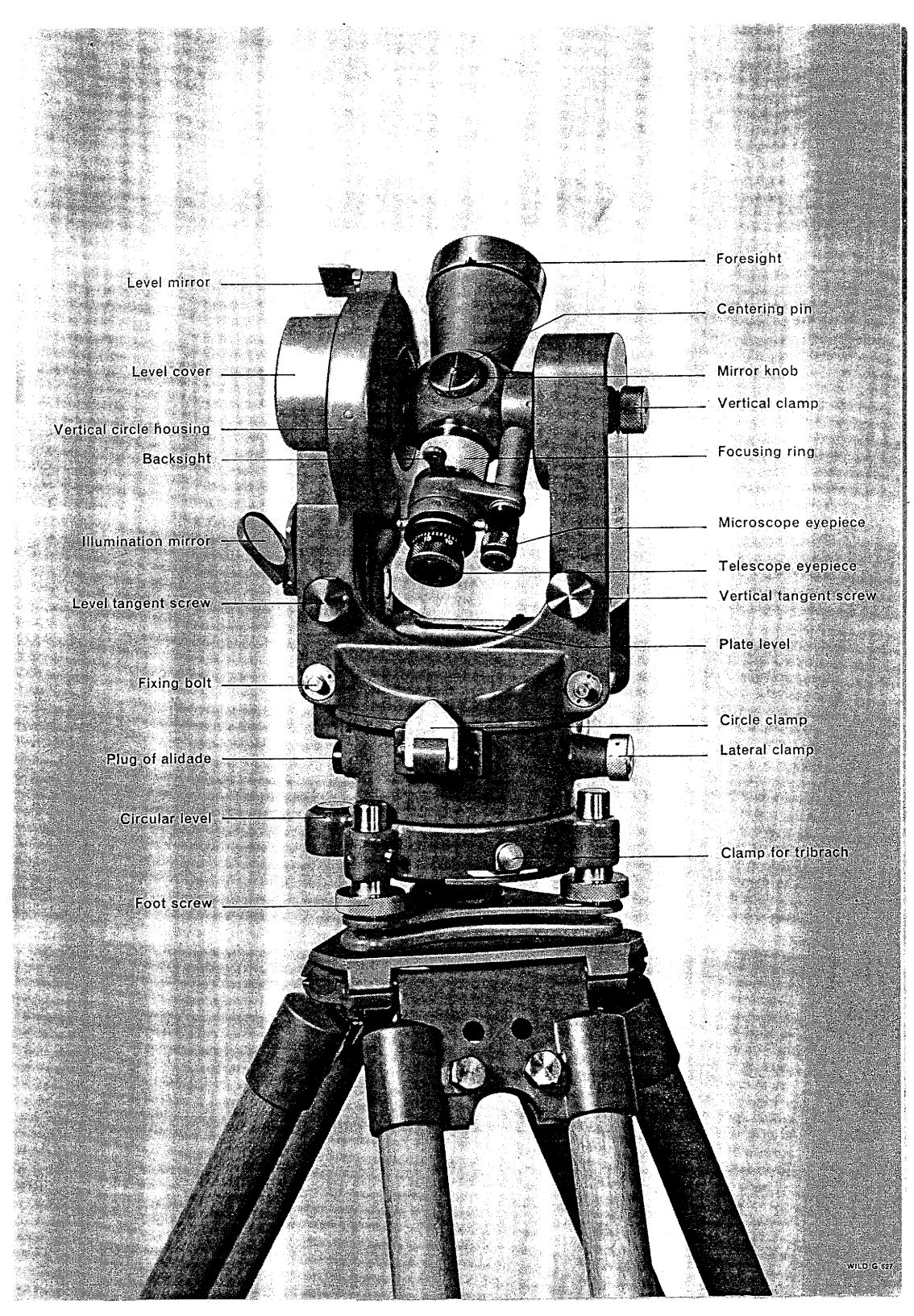
Horizontal clamp and horizontal tangent screw as used for pointing the telescope in the lateral sense are placed side by side and at the same height. They are completely encased and functionally placed. The vertical clamp also is suitably placed on the standard opposite of the vertical circle and at the same height as the horizontal axis. The vertical tangent screw is to be found lower on the same standard. Height clamp and vertical tangent screw are also completely enclosed.
The above mentioned circle clamp is actuated by a tilting lever, screwed to the front of the horizontal circle casing.

Telescope

The T16 has the same telescope of 40 mm free objective opening and 28 x magnifying power as the T1 and T2 models. The new 4-lens optics recently computed give an excellent corrected image.
Focusing of the reticle is done by turning the eyepiece which is divided into dioptries, whereas the telescope image is focused with the concentric metallic ring. The eyepiece is kept in place by a bayonet-type mount so as to be easily interchangeable with a diagonal eyepiece.
The reticle carries 1:100 stadia lines, the addition constant is nil.
Two horizontal pull action screws serve for correcting the collimation error. The telescope is reversible both ways.

Circle readings

A rotatable tilting mirror situated externally on the standard serves for illuminating both circles.
The reading microscopes are provided with minute scales. The figures on page 9 show the circle images for 360° and 400g.
A fact specially worth mentioning is the arrangement of the pictures, the one of the horizontal circle being below, the one of the vertical circle above. Furthermore the minute scales grow from left to right according to our manner of writing, and any other arrangement would be a potential source of error.
The opinions as to the accuracy of these readings are widely varying. Therefore we recommend for each user to determine the measuring error with a few test measurements, being careful always to estimate tenths of intervals, even if the division lines appear thick as compared to the interval, as is the case with 400g division.


Foresight
Level mirror
Centering pin
Level cover
Mirror knob
Vertical clamp
Vertical circle housing
Backsight
Focusing ring
Microscope eyepiece
Illumination mirror
Telescope eyepiece
Level tangent screw
Vertical tangent screw
Plate level
Fixing bolt
Circle clamp
Plug of alidade
Lateral clamp
Circular level
Clamp for tribrach
Foot screw
WILD G 627

To this end one measures in both telescope positions the angle between two target points, the instrument being stably placed. This measurement is repeated for various positions of the circle. 10 independent measurements should be made at least. Each mean of the results obtained in both telescope positions gives an angle value. From all these angle values the arithmetic mean is formed and from the deviations of the single values from the mean the square error can be computed in the well known manner.

By repeated measurements of an angle of 36° between two targets (collimators) an experienced observer at our factory obtained the following results:

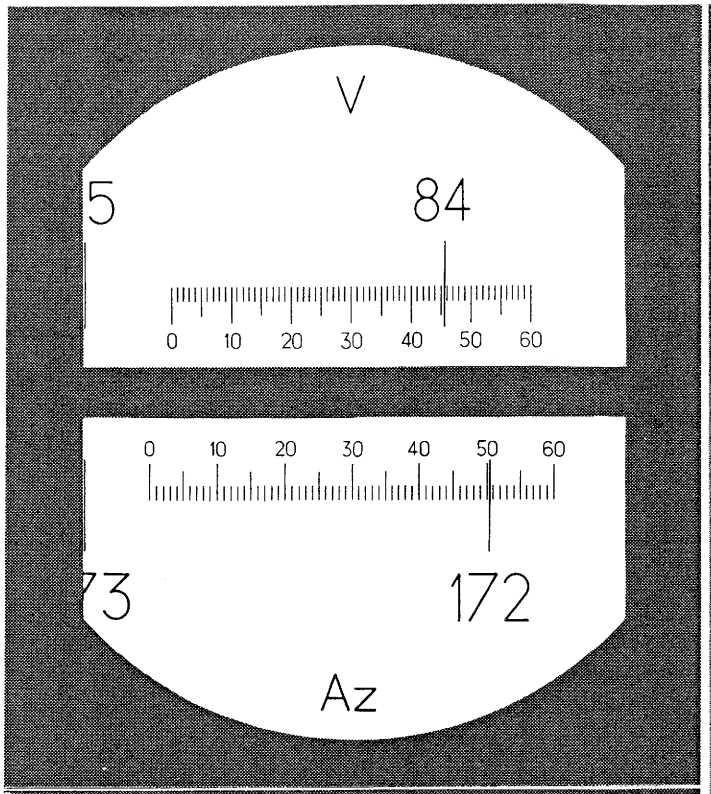
Mean error of an angle measured once in both telescope positions:

400^g division	$\pm$ 4.7^{cc}
360° division	$\pm$ 1″.9

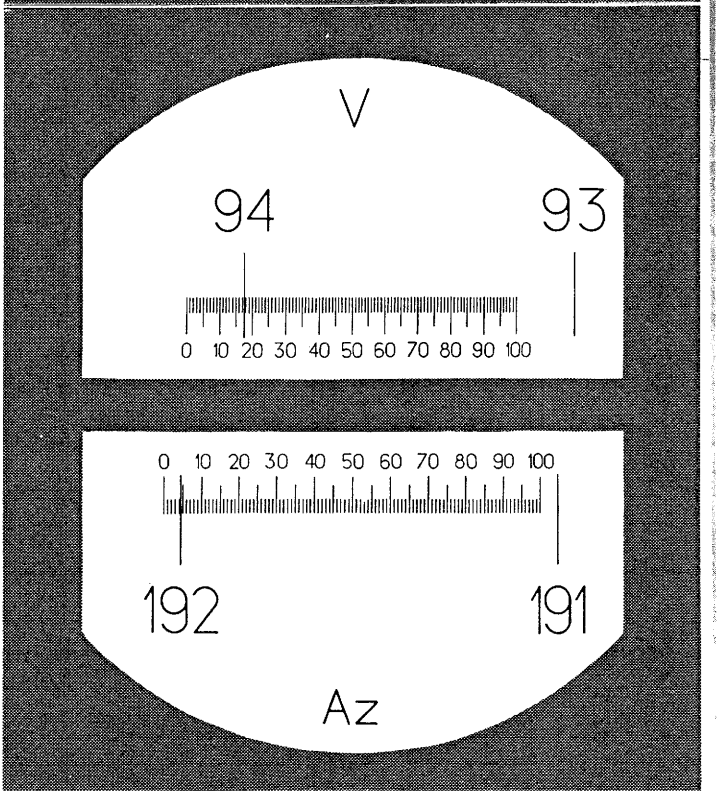
These errors apply only to the angle measurement since the pointing error can safely be neglected when using collimators. The above results are however not chance values, since any moderately experienced observer can do likewise, provided he has normal eyesight. When observing in the field, the pointing error must be added.

From the above table it can clearly be seen that estimating tenths of a division gives accurate results not only for 360° but also for 400^g division. When measuring angles to a high degree of accuracy one will always estimate tenths of an interval and observe in both telescope positions so as to eliminate systematic errors (collimation error, inclination of horizontal axis, circle excentricity). When reading to the minute only is required, it suffices to observe in **one** telescope position only.

Reading Examples



360°
Vertical circle 84° 45′ 6
Horizontal circle 172° 50′ 4



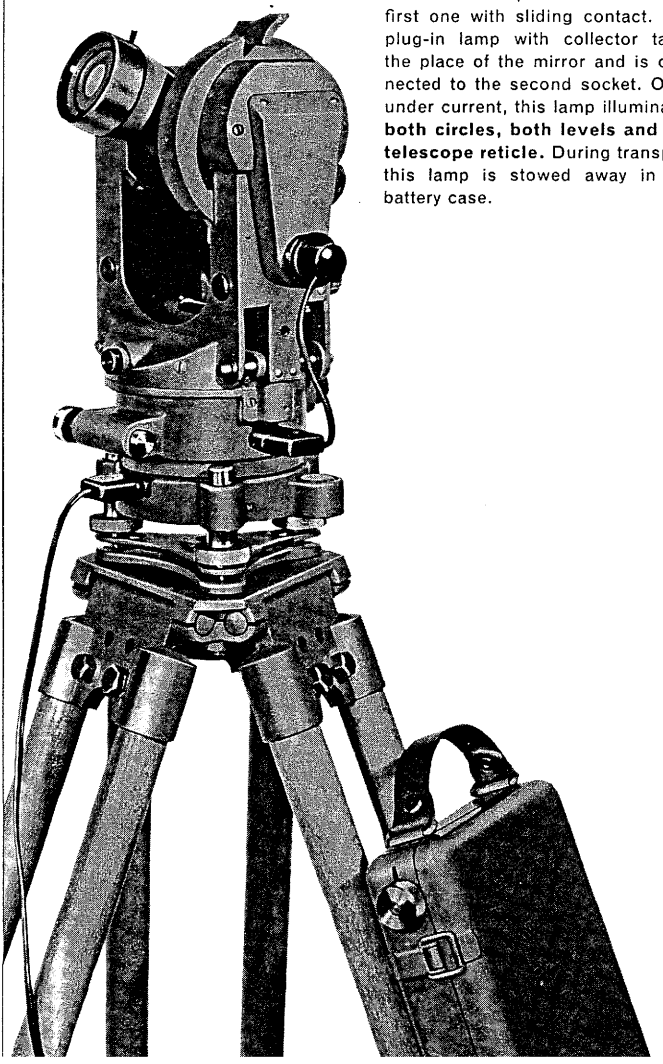
400g
Vertical circle 94.175g
Horizontal circle 192.045g

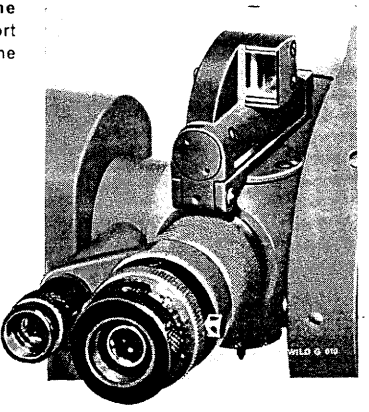
Accessories

The field of use of this instrument is further widened by a complete range of accessories.

Electric illumination

The lower housing of the theodolite is provided with a socket whereby the battery case attached to the tripod can be connected to the instrument. A second socket is provided in the alidade, connected to the first one with sliding contact. The plug-in lamp with collector takes the place of the mirror and is connected to the second socket. Once under current, this lamp illuminates **both circles, both levels and the telescope reticle.** During transport this lamp is stowed away in the battery case.

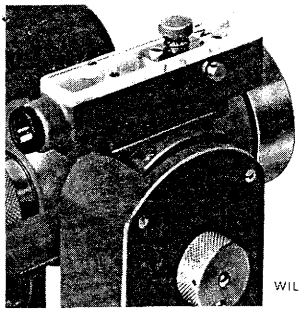




Telescope level

for leveling

Though it is quite possible to use the T 16 for leveling by making use of vertical circle and vertical circle level, many observers prefer the telescope level. In telescope position two (telescope eyepiece over eyepiece of optical plumb) a cover plate, fastened by two screws is visible the middle of the telescope body. This cover can be unscrewed and the telescope level fastened with the same two screws. The level is provided with prisms for coincidence setting. Accuracy is 1 mm in 100 metres.

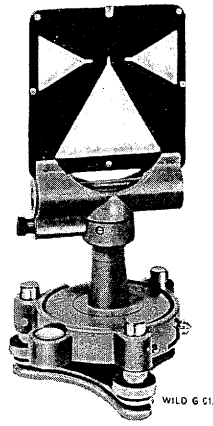


Tubular compass

This tubular compass is screwed to the standard above the vertical clamp. In view of the needs in mining the compass housing has a translucent top which permits illumination of the interior from above with a miner's lamp and to coincide the crooked ends of the needle clearly visible on white background.

Traversing equipment

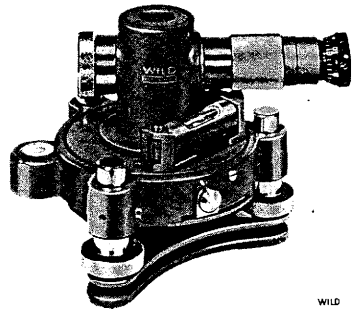
When measuring traverses the instrument and targets or poles must alternately be centred over the traverse points. This operation is a tedious one and a potential source of errors.

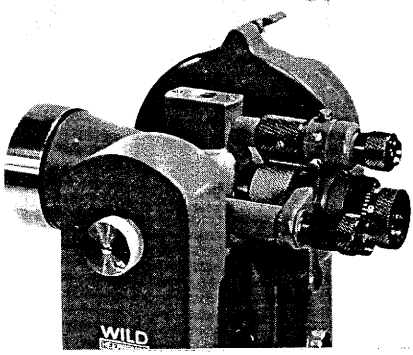


In the case of short traverse legs, frequent in mining, this influence might lead to appreciable errors. In order to reduce the time needed for centring and to eliminate centring errors, the method of forced centring is used. This equipment consists of the instrument with detachable tribrach, two additional tribraches with one target each and three tripods.
One tripod each is stationed over three consecutive traverse points. On the middle one the theodolite will be stationed whereas the targets are on the outer ones, centrically over the traverse point (Instrument and target have an optical plumb). After measuring the angle between the two targets the remotest tripod is carried forward to the next traverse point, while instrument and target of the two other points are interchanged, the centring thus being kept intact all the while.

Zenith Plummet for the Wild T 16 Theodolite

A simple and practical accessory with which the T 16 Theodolite can be centered vertically below a point located above the instrument. It advantageously replaces the plumb bob, which is awkward to handle and inaccurate. Particularly suited for underground work in mines, tunnels, galleries, etc.
Accuracy of centering 1 to 2 mm at a height of 10 m.
Sharply focused image from 0,25 m to infinity.
Magnification 2,5 x.



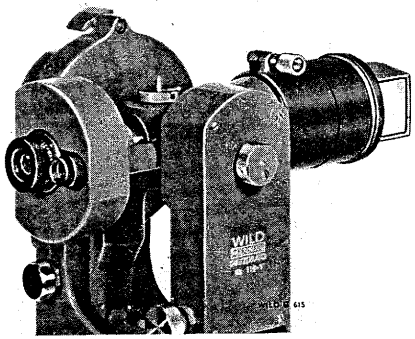


Optical plumb for zenith and nadir sights

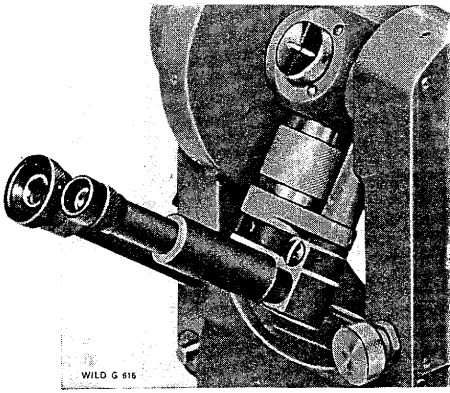
This optical plumb can be set into the T 16 tribrach. It permits sights to be taken perpendicularly above or below from 25 cm (10 in.) to infinity. This device greatly facilitates zenithal sights in mining. Telescope magnification is 5 x. The two levels, rectangular to each other have a sensitivity of 1' (360°).

Objective prism

This rotatable pentagonal prism is particularly suitable for reporting directions through narrow vertical pits. The direction to be reported must be given over the pit by a reference point placed at some distance. At the bottom of the pit two horizontal rods are placed perpendicular to the direction to be reported. These rods should be placed as far apart as the width of the pit permits. The wider this space the more accurate the report will be. With the objective prism and being careful



to keep the telescope horizontal the reference point is sighted. Then, without moving the telescope, turn the prism in such a manner as to read first the foreward then the backward rod on the botton of the pit. These measures are repeated with the telescope in reserve position always being careful not to touch either vertical clamp or vertical tangent screw. One thus obtains a second reading each for foreward and backward rod. The straight line connecting the middles of the two readings of each rod is the sought-for direction.



Diagonal eyepieces

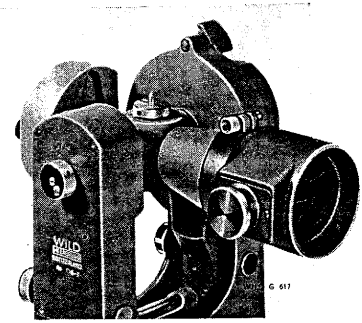
These are used for sighting up to the zenith. Putting them in place is easily done becouse of a bayonet type eyepiece mount. The microscope eyepiece must be screwed off while the corresponding broken eyepiece can simply be slipped into place.

Eyepiece prisms

For inclined sights up to 25° from the zenith these eyepieces are used, one for the telescope and one for the microscope. Sun glasses can be fixed to the telescope prism.

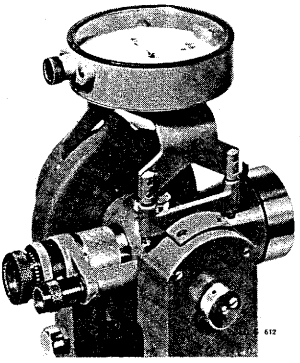
Precision telemeter DM 1

The DM 1 telemeter which can be slipped over the telescope objective allows to read distances up to 100 m. with an accuracy of 1–2 cm. At the point to be measured a rod-carrier for horizontal rod is stationed. On this rod the decimetres can be read with a vernier, whereas the centimetres are read off the instrument's micrometer drum. By a suitable arrangement of the measuring wedges the personal error is compensated to a large extent. In case of inclined sights the results must be multiplied by the cosine of the angle of inclination for reduction to the horizontal. The difference of altitude is obtained by multiplying with the sine of the inclination angle.



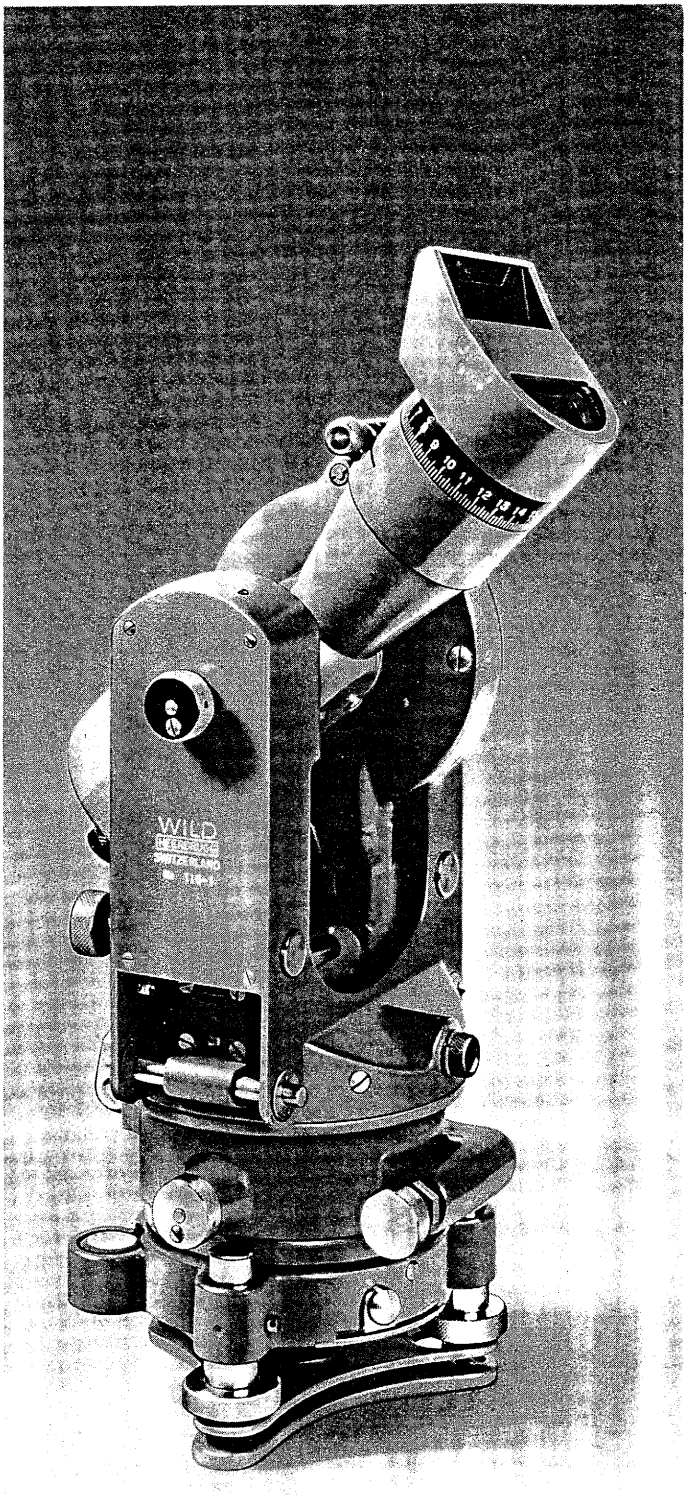
Circular compass

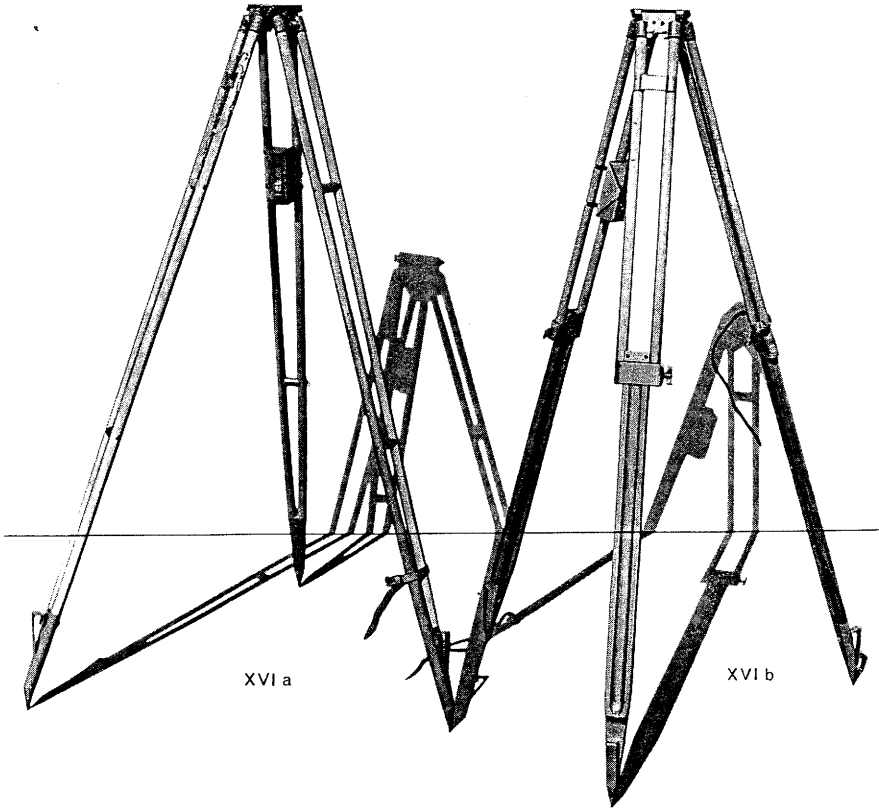
This compass is set into a special holder which latter is screwed to the standard. A horizontal eyepiece which can be adapted to the observer's visual acuity gives a clear picture of the bright compass disc with degree division, which can be read to $^1/_{10}$ th of a degree with an index line. In darkness this division can be lighted from above with any lamp. However electrique c. c. lamps must not be used, since these will deflect the compass needle.



Polar attachment

On the northern hemisphere the geographic north and latitude as well as the local sidereal time can easily be determined to 1 minute of arc resp. 1–2 minutes of time with the polar attachment. To this end, the North star (α ursae minoris) and star β of the same constellation are pointed upon.
South of the equator this accessory cannot be used.



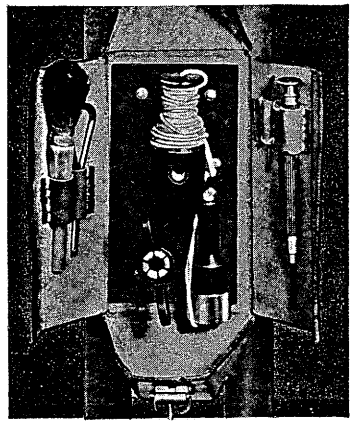


XVI a

XVI b

The tripods

The theodolite T16 is available with two types of tripods: XVIa with rigid legs (length 1.6 m/5.2ft.) or XVIb with sliding legs (lengths 0.93 m/3 ft. to 1.6 m/5.2 ft.). Both types are unusually stable and allow observations to be taken even when a strong wind is blowing.



A leather pouch, containing the following items, is attached to the tripod: 1 plumb-bob with plug-in sleeve, 1 key for tripod, 1 screw-driver, 1 dust brush, 2 adjusting pins.

Speed and accuracy of reading are the main features of this new instrument. Thanks to its surprisingly high accuracy it lends itself to traversings and 4th order triangulations. However it can also be used on building sites or in mining and even moderately experienced observers will be able to handle it without difficulty.
Where difficult conditions are apt to jeopardize the success of a measurement the T16 will see it through. Wherever it is possible to point it, the circle can also be read.

T16 stands for quick and reliable measurements

Wild Heerbrugg Ltd. Heerbrugg/Switzerland
Optical Precision Instrument Makers
Phone (071) 7 24 33 – Cables: Wico Heerbrugg

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