Contents

Description of GK0-A Equipment

a) Specifications

Telescope magnification	21×
Objective aperture	1.2 in. (30 mm)
Shortest sighting distance	2.5 ft. (0.75 m)
Diameter of field at 1000 ft.	30 ft.
Multiplication constant	100
Addition constant	0
Sensitivity of spherical level	20' per 2 mm
Leveling range of compensator	± 30'
Working accuracy of compensator	± 3"
Mean error for 1 km, double run	± 2.5 mm
Diameter of azimuth circle	2.4 in. (60 mm)
Reading by estimation with magnifier	0.1 gon, 0.1°
Weight of instrument	4.2 lbs. (1.9 kg)
Weight of carrying case	1.8 lbs. (0.8 kg)
Dimensions of carrying case	10.3×5.9×4.7 in. (26×15×12 cm)

b) Standard Equipment and Accessories

1 GK0-A level with transverse diopter in plastic carrying case with tool compartment containing: 1 hexagonal socket wrench with screwdriver, 1 plumb bob;
1 tripod no. 150B with wooden extension legs and plastic protection cap or:
1 GK0-AC level with horizontal circle (400 gon or 360°), without transverse diopter. Same equipment as GK0-A. Accessories available upon request:
Tripod no. 150A with fixed wooden legs,
Adapter plate no. 112.290.4001 for centering tripod,
Stadia and leveling rod no. 1, 3m, 4m or 5m.
Leveling rod no 5E (metric), with upright figures, length 3 or 4m.

c) Short Description

Construction Features

The Kern GK0-A is a rugged construction level that is simple and convenient to operate. The objective is effectively protected against damage due to falls by a shield projecting from the housing. The bull's-eye level is within the housing. It can a viewed directly from above or from the eyepiece end by means of a prism. There ist no reversal laterally or longitudinally in the prism view. A friction coupling replaces the customary horizontal clamp. The slow-motion is continuous and is operated by either one of two knobs located on opposite sides of the instrument. The focusing drive is also continuous so it can always be turned in the same direction. The GK0-A has cross-sighting eyepieces that establish a line perpendicular to the line of sight of the level on either side.
The GK0-AC has a built-in horizontal circle that is read by means of a magnifying lens. Both 360° and 400 gon circles are available.

GK Principle

Like all Kern levels the GK0-A has no leveling screws. The conical bearing surface of the instrument base sits on the spherical surface of the tripod head. Coarse leveling is accomplished by shifting the instrument on this spherical surface until the bull's-eye level is centered. The combination of jointed-head (GK) principle with automatic leveling of the line of sight and upright telescope image offers the user the ultimate in simple, timesaving operation.

Automatic

When the coarse leveling is finished the compensator automatically completes the fine leveling. The compensation unit has an optical image-reversion system. It is suspended with its counterweight from a horizontal axis by means of a precision ball bearing. Damping is provided by the field of a magnet.

Warning Diaphragm

When the coarse leveling is inadequate a red warning diaphragm appears at either the upper or lower edge of the field of view of the telescope, depending on the direction of inclination of the instrument. Further leveling is required.

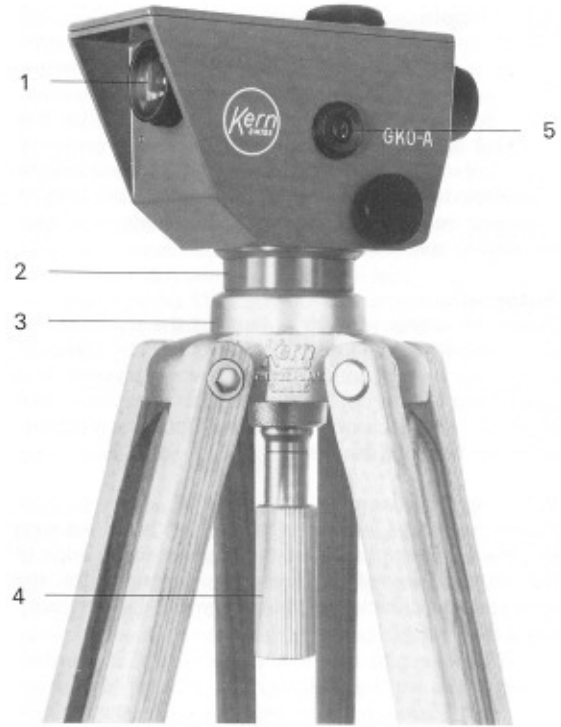


Fig.1 GKO-A with transverse diopter
1 Objective
2 Instrument base
3 Tripod head
4 Fastening screw
5 Traverse diopter

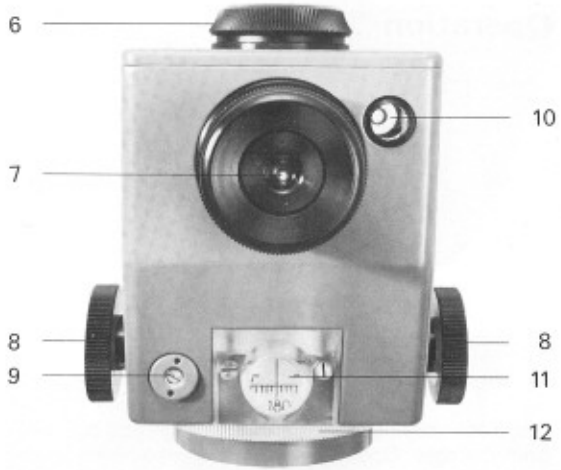


Fig. 2 GKO-AC with horizontal circle
6 Focusing knob
7 Eyepiece
8 Horizontal slow motion drive
9 Adjusting screw for the action of the horizontal slow motion drive
10 Bull's-eye level
11 Circle reading magnifier
12 Knurled ring for circle orientation

Operation

a) Unpacking and Packing the Instrument

Grasp the carrying strap above the toggle and pull away from the case. Open the cover and remove the instrument from the case, overcoming the resistance of the retaining spring. To replace the instrument in the case, hold the instrument with the telescope parallel to the longitudinal axis of the case and the eyepiece over the tool compartment. Then push the instrument in, making sure that the retaining spring snaps back into place.

b) Setting Up

Set up the tripod, treading in the legs. Place the instrument on the tripod and engage the threads of the central fastening screw but do not tighten. Grasp the instrument base with both hands and shift the intrument over the spherical surface until the bull's-eye level is centered (Fig. 3). Now the central fastening screw should be tightened moderately.

Fig. 3 Rough leveling with both hands

c) Preparation of Telescope

The eyepiece must be focused accurately on the reticule. To do this, point the telescope at a moderately bright, uniform background such as the sky. With both eyes open view the distant background. Using the eye customarily used to observe, sight the reticule with the same eye position, and focus the crosshairs sharply by turning the eyepiece ring. Now sight a fixed object 200 or 300 feet away, focusing it with the objective focus. Move the eye up and down while viewing this object through the telescope. If the reticule lines appear to move over the object, refocus the objective until the lines appear to be fixed on the object. Clarify the image with the eyepiece focus and check again by moving the eye up and down.

d) Measuring with the GK0-A

Heights

Point at the rod by turning the instrument and sighting along one edge of the instrument housing. Accidental rotation of the instrument is prevented by a friction coupling: there is no need to release and then retighten a clamp screw. Next the horizontal slow-motion drive is turned until the rod image lies approximately in the center of the reticule. Now focus the telescope until the rod image is clear and sharp. Thanks to the automatic compensator the instrument is ready and the reading can now be taken on the rod. In Fig. 4 the rod reading is 1.105 m.

Distances

With the two stadia hairs, one above and one below the horizontal cross-hair, distance can be measured simply. The multiplication constant is 100. The reading of the rod intercept between the stadia hairs in centimeter units gives the distance in meters. In Fig. 4 the distance is 20.5 m.

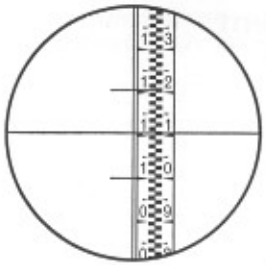


Fig. 4
Telescope image
Height: 1.105 m
Distance: 20.5 m

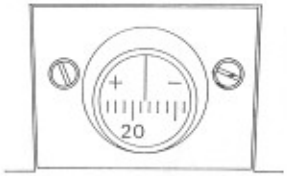


Fig. 5
Circle reading: 18.5 gon

Angles

When the GK0-A or GK0-AC is used on layout work or tachymetric surveys, the instrument must be centered over a fixed ground point. For such set-ups the plumb bob found in the tool compartment is attached to the central fastening screw. Centering is accomplished in the usual manner.

Only right angles can be laid out or checked with the GK0-A, using the cross-sighting eyepiece. However, the GK0-AC can be used to lay out or check any angle. The horizontal circle can be set to any reading with the knurled ring (12, Fig. 2). In Fig. 5 the circle reading is 18.5 gon.

Testing, Adjustment and Maintenance

a) Leveling Test

The only testing that need be done by the user concerns the horizontal position of the line of sight. This can best be done by a simple leveling test.

Choose two points A and B about 60 yards distant from each other, which will be used as elevation points, for instance, two pavement stones or two wooden pegs. Set up the instrument in the middle M according to figure 6a and read the heights L_{1A} and L_{1B} on the rods.

According to figure 6a, the difference between the two values $L_{1A} - L_{1B} = \Delta h$, is the correct difference in heights even if the instrument is out of adjustment, i.e. if the sighting line is not in a horizontal plane. Then, place the instrument according to figure 6b about 3 feet behind the ground point A and repeat the readings. If the instrument ist out of adjustment, the difference between the new readings will be $L_{2A} - L_{2B} \neq \Delta h$, i.e., the result is not the correct difference Δh. It is necessary to adjust. The reading of rod A is hardly influenced by the error which effects mostly the reading of rod B. Therefore, the adjusting screws must be set until the correct value $L_{2B} = L_{2A} - \Delta h$ is read on the rod.

The instrument is adjusted only if the error exceeds 2mm. After the adjustment, repeat the whole operation.

Fig. 6a Leveling test
1 = sighting line 2 = horizon

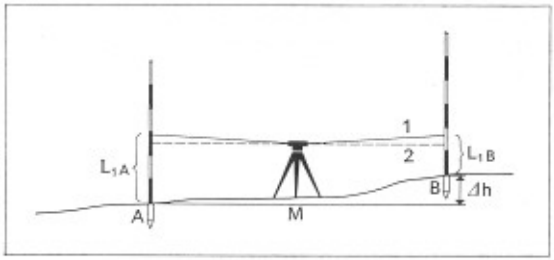
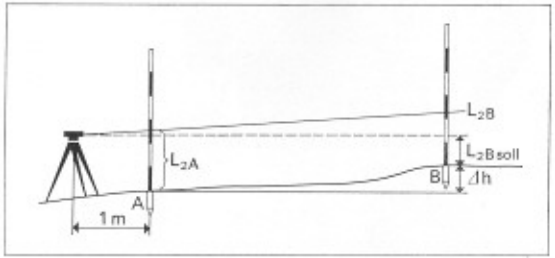


Fig. 6b Leveling test
$L_{2B\,soll}$ = correct value



Example: units: cm

Station M		Station 8 feet behind A		Adjustment	
L_{1A}	145.7	L_{2A}	132.5	L_{2A}	132.5
L_{1B}	82.4	L_{2B}	70.4	Δh	63.3
Δh	63.3	$L_{2A} - L_{2B}$	62.1 $\neq \Delta h$	set L_{2B} to	69.2

The adjustment is made with the upper and lower of the four screws on the eyepiece which raise or lower the reticule. In raising the reticule the upper screw must first be loosened so that the lower screw is free to push. In lowering the reticule the lower screw is loosened before the upper is tightened (Fig. 7).

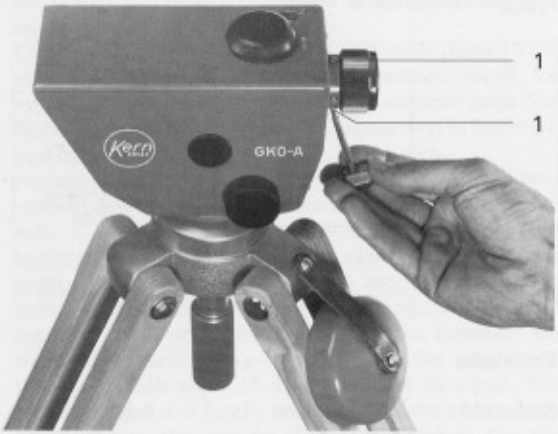


Fig. 7 Adjustment of the line of sight
1 Adjusting screws

b) Bull's-eye Level

To test the adjustment of the bull's-eye level, center the bubble and then rotate the instrument through 360°. If the bubble moves outside the circle it should be adjusted using the three screws marked 1 in Fig. 8.

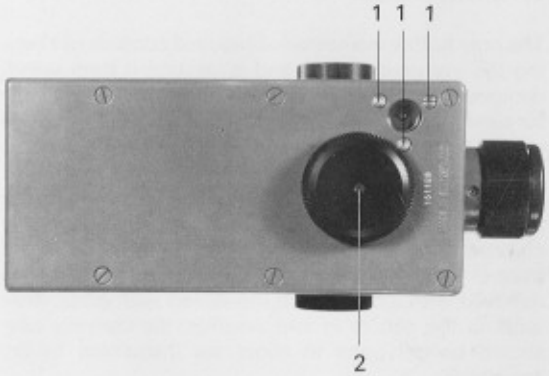


Fig. 8 Adjustment of the bull's-eye level
1 Adjusting screws for the bull's-eye level
2 Adjusting screws for the action of the focusing drive

c) Operating Elements

The user can adjust the action of the focusing drive and the horizontal slow-motion drive when necessary using screw 2 (Fig. 8) and screw 9 (Fig. 2).

d) Tripod

The tripod leg joints should be tight enough to allow the leg to fall slowly to the ground under its own weight when released from a horizontal position. The adjustment is made by turning the screws at the tripod head with the hexagonal wrench.

e) Maintenance

The only further maintenance required consists of keeping the instrument clean and protecting it from water, dampness and dust. Do not use oil, grease or kerosene for cleaning. Dirty or damp instruments should be wiped with a dry cloth. The cleaning of the optical elements requires special care. Careless handling may result in scratches on the lenses. Dust must first be removed with the brush and only then can the lenses be polished with a chamois or knitwear cloth which must be free from any trace of oil. Oil and grease stains or fingerprints can be removed with a clean cloth moistened with ether. After work in the rain or in wet weather, the carrying case should be left open to allow the instrument to dry completely.

Instruction manual

Automatic Construction Level GK0-A

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Mechanical, Optical and
Electronic Precision Instruments