User’s Manual

Gyro Attachment AK-2M

Series 2.0

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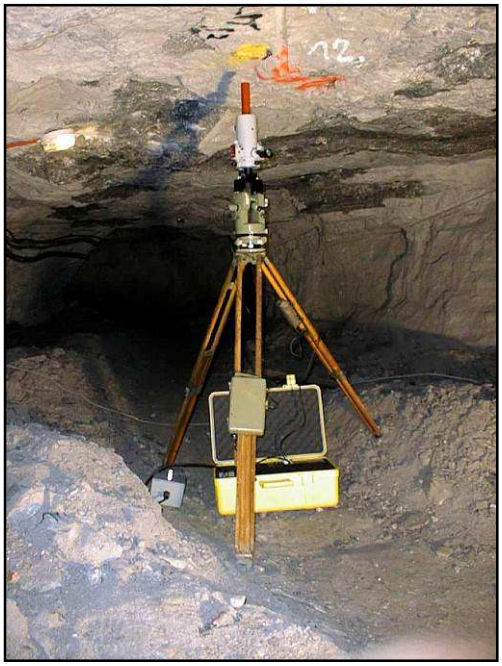
GERMANY

0. General Information

You have chosen a product that gives excellent value. The instrument consists of tried and proven components, modified in our facility to highest standards of accuracy. The modified instrument is particularly versatile and can be used in a wide variety of surveying applications. The user must, however, be familiar with the measuring procedures. It is essential that you read the manual carefully and thoroughly familiarize yourself with the operation of the instrument. We have taken great care with the compilation of the manual, however we are not liable for any damage that may occur as a result of erroneous or incomplete statements or descriptions in this manual. We reserve the right to make technical changes.



GYROMAX AK-2M in underground use in a cave
(attached to a WILD T-16)

This equipment is not designed for work in hazardous environment, like Methan gas !!! Please note that the unit or parts of it are not flameproof !!!

1. Gyroscopic Instruments

Gyroscopic attachments are precision instruments. Their use demands the greatest of care and complete familiarity with their operation, which is why we have compiled this manual. Accurate measurements are a result of practice and conscientious application of the suggested operating techniques. In order to assure a consistent high degree of accuracy, the instrument must be protected from shock and vibration and transported and stored only in the case furnished with it. It must be used only with the power source supplied by us. The instrument is for short time and short distance azimuth transfer. For continued accuracy, a calibration line on site is quite useful. For various reasons, this should be in proximity to the area to be measured.

1.1 Theodolite Gyroscopic Attachment AK-2M

The theodolite gyro attachment can only be used in conjunction with an angular measuring device, usually a theodolite. The theodolite is used solely as a goniometer, i.e. to measure horizontal angles. Several theodolites incorporate a compass. This facilitates setting up the gyro. ***Caution when using near electromagnetic fields. They have a strong effect on the magnetic orientation.*** An adapter connects the gyro to the theodolite. Most customers choose one of our adapters. The adapter should be so constructed that the gyro can be firmly attached, as there can be no rotation between the gyro and adapter and theodolite or total-station during measurements. This is assured by normal tightening of the attachment screws between the gyro and the adapter.
The AK-2M has its own telescope, which obviates the need for mechanical or optical aim adaptation.

The best results are achieved with a gyro adapter when external influences such as temperature gradients and ground vibration or tripod movement are kept to a minimum. Use the gyro only on a stable base or with massive tripods, consoles or on observation platforms. Protect the gyro from changes in temperature, such as direct sunlight. When taking observations on unsteady ground, the observer should not change his position relative to the instrument, as disturbing the motion of the gyro during measurement results in measurement errors.

1.2 Checking the Instrument prior to use

Check the lenses for fogging by looking in through the objective. Dull surfaces indicate fogging. As the gyro does not contain a hygroscopic agent, instruments with continually fogged optics must be cleaned at our facility. Fogging is a result of being in a moist environment, especially in combination with pressure differentials (rapid changes in elevation, air transport, working under conditions of high pressure).
The diopter selection ring must be free to turn from -3 to +3 diopters. All switches and controls should be checked for easy function.
The levels on the theodolite and gyro must be properly adjusted, otherwise measurement errors will occur and accuracy will be less.

2. Setting up the Instrument

The gyro should not be removed from its protective case until the theodolite is set up at the site to be measured. It is then secured to the theodolite, using the built-in adapter. The gyro should be held by the red mast and one of the horizontal adjusting screws. The gyro is equipped with a adapter special designed for your total station (See Fig. 1). Using LEICA theodolites there is a adapter which was made with numeric controlled milling center and could be changed with the top handle of the total station. The GYROMAX must be hold with one hand until the 2 srcews are fixed.
Make sure that the adapter is flat on the total station top and the screws are fastened !

The gyro is centered by means of the theodolite and the adapter. Horizontal adjustments and gyro azimuth are determined relative to the local plumb line, making it essential for both instruments to be levelled with bull's eye and spirit levels.

The levels must be adjusted both on the theodolite and on the gyro. This must be done before each measurement and also pointing north.
Because the gyro has its own telescope, it is not necessary to adjust the orientation of the gyro relative to that of the theodolite. While making angular measurements (difference between north and target) the position of the gyro relative to the theodolite must remain constant. ***Do not make any adjustments to the adapter / gyro / theodolite connection during angular measurements!***

Figure 1: Gyro Adapter for LEICA total station ´flexline´-series

Assembly

+ Set up theodolite (centering and levelling)

+ Attach the gyro and level using bull's eye level and base screws of the gyro

+ Attach power supply cable (Turn bull's eye level illumination switch ON; display illumination comes on and can be regulated using the potentiometer on the converter.

+ Attach remote control cable. Store remote control unit at top of tripod for later use.

+ Visual inspection of the instrument. All optical parts must be undamaged and free of fogging.

+ Rough orientation using compass or established directions

+ Allow instrument to reach thermal equilibrium (e.g. if stored in heated spaces and measuring at low temperatures and vice versa). Storage case should be opened immediately upon reaching the site.

Caution: **Do not subject power supply and converter to moisture!!**

Disassembly

+ Reverse order of above

+ After the instrument has been used in the rain or under conditions of high humidity, dry it with a soft cloth and store it in a warm, dry place with the lid of the protective case open. ***Do not store moist instruments in closed cases!***

3. Operation

3.1 Startup

Turn the converter switch (2/1) to ON. The indicator lamps of gyro (green) and battery (red) will be on continuous. The light on the gyro scale will be on and shows that the converter is in operation. Then the switch (2/3) is turned to the RUN position.

The green light only comes back on again when the gyro motor has come up to operating speed, i.e. is ready to begin measuring. One can tell the gyro has reached operational speed when the start-up sound changes to a high-pitched note. The storage case can now be closed. Caution: do not crush the cables! ***Always close case in wet weather!***
The red light for the BATTERY will light up during measurement if the current is lower than 23 Volts. You have to charge the battery.
The red lamp for PHASE will light up before and during measurement when gyro cable is crushed or defect or when after repair one of the phases is changed. Electronics unit has to be serviced in factory!

Running up the gyro: While the gyro comes up to speed, about 90 seconds from the time the converter is turned on, the gyro arresting mechanism, which was tightened for transport, is loosened (using the disc, note safety) to the point where it is freely moveable but the gyro can still be heard. Above the eyepiece there is the arresting mechanism indicator (Fig.2.1/3). This indicator shows : White = gyro arrested: Red = gyro free !!.

Under no circumstances the instrument should be turned fast, disassambled or moved from one place to another on indicator RED !!! Possible total break-down of the system !!!

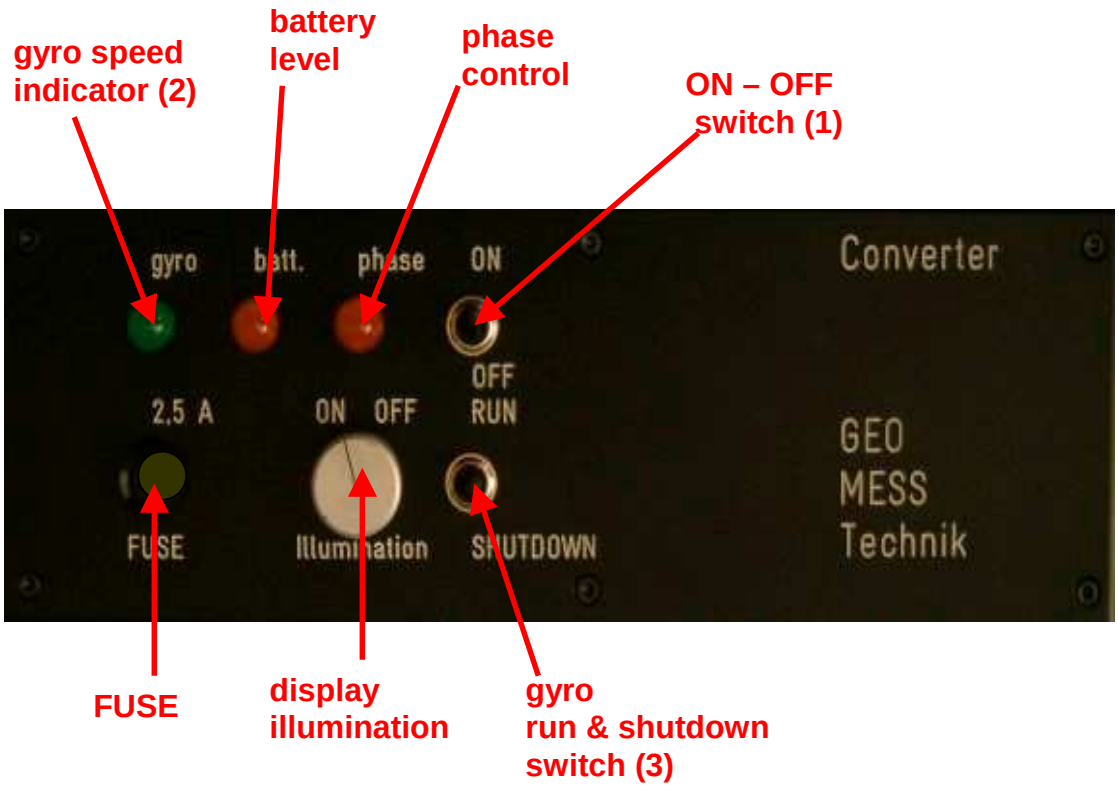
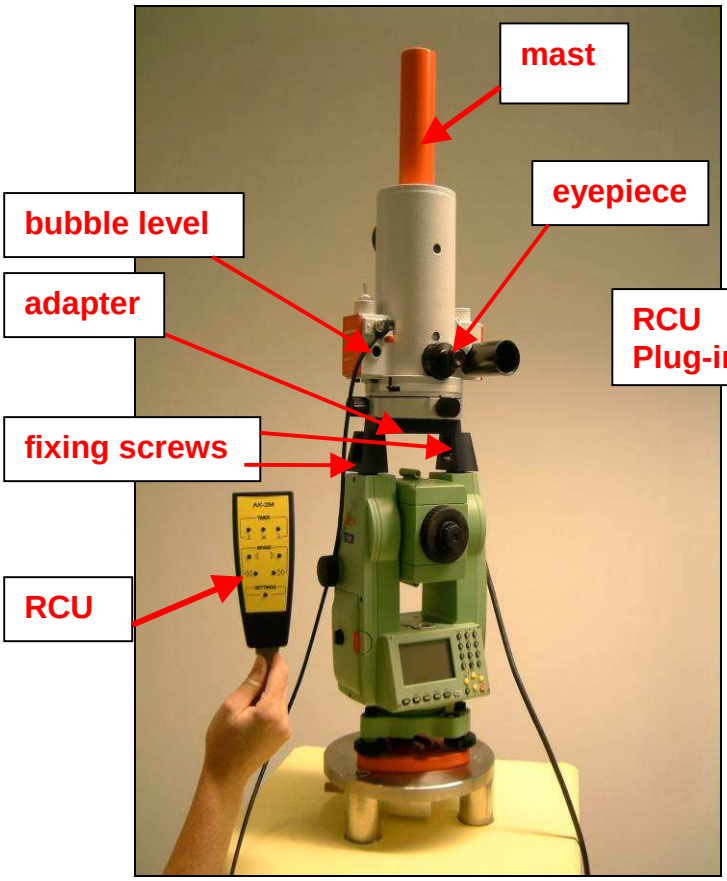
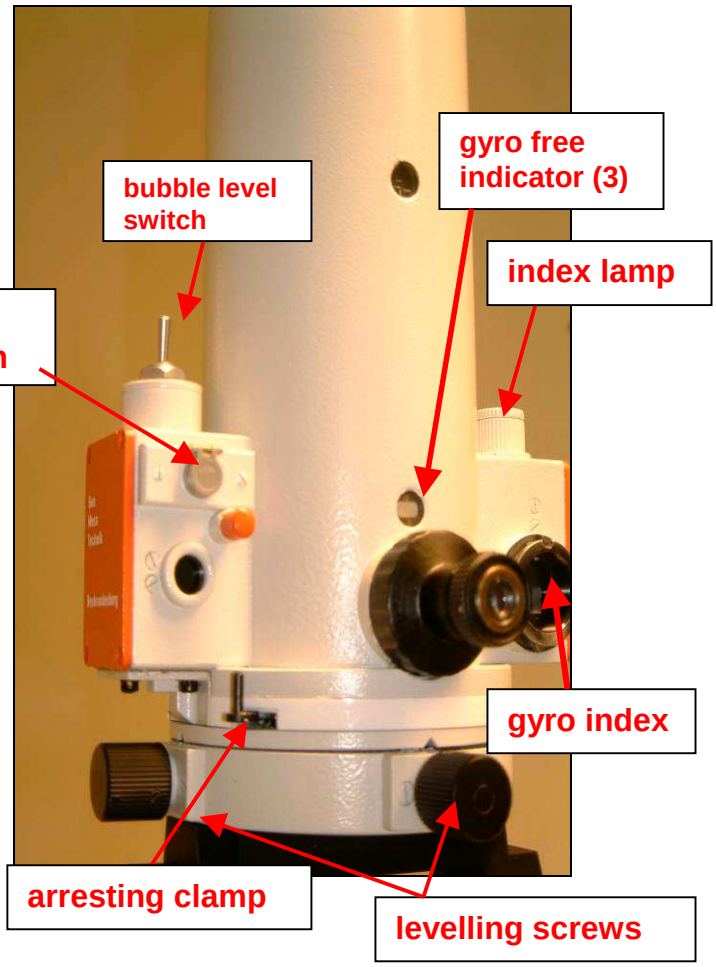


Figure 2: Converter controls





GYROMAX AK-2 on LEICA TCR-307 **GYROMAX AK-2M**

3.2 Preparation and Measurement

Releasing the gyro and limiting amplitude: When the green gyro speed indicator light (Fig. 2) comes back on, the gyro has reached its operating speed and the motor is freed by loosening the retaining ring. This is done by releasing the safety and turning the retaining ring (2.1/1) until the stop. The rather loud noise of the gyro motor becomes noticibly more quiet. During this procedure, any shock and vibration must be avoided. The moving light bar in the view port of the autocollimator system (Fig. 3) is now the visual representation of the gyro's oscillations. If the light bar moves toward one side or the other too rapidly, it can be influenced by moving one of the air brake buttons on RCU (Remote Control Unit) (2.1/2). Using a button with an arrow counter to the motion of the light bar has a damping effect; moving the lever in the same direction increases the speed of the light bar. ***The air brake buttons must not be used during a measurement!!***

Releasing the gyro must be done with the greatest possible care. Under no circumstances may the retaining ring (2.1/1) be rotated too fast, leading to a jerky release of the gyro. This can lead to an excessive velocity of the light bar with disturbingly high amplitude of its oscillations and, in addition, oscillations perpendicular to the index direction. This leads to increased observation times and decreased accuracy of readings. Jerky release of the gyro always results in extreme wear and tear on the suspension tape, and may lead to its breakage. This necessitates factory adjustment or replacement of the suspension tape with associated high costs!

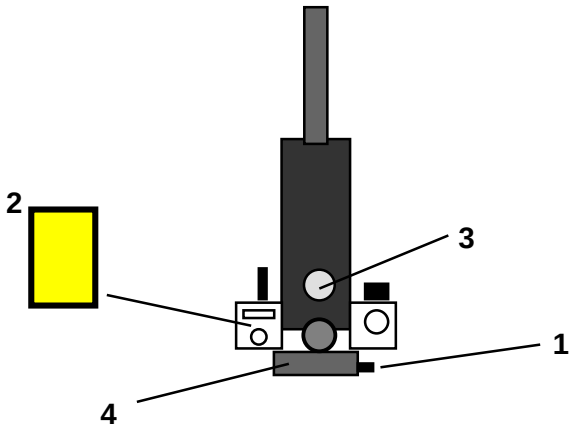


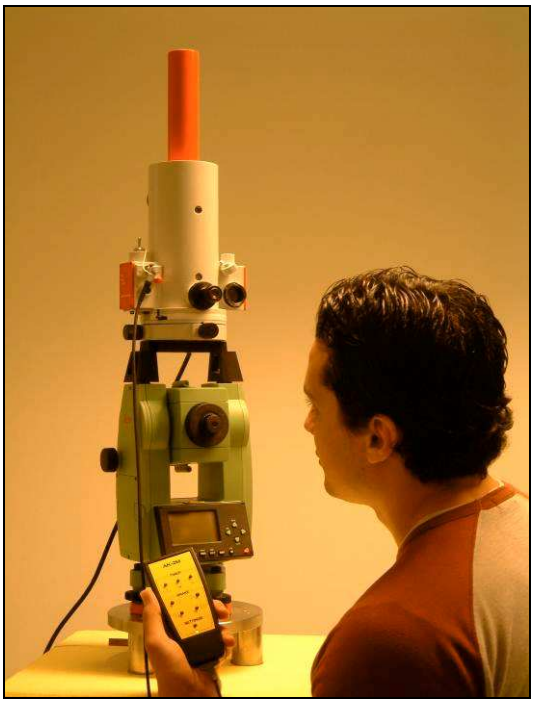
Figure 2.1 Working Parts AK-2M

3.2.1 Remote Control Unit (RCU)

Beginning with serie AK-2M the GYROMAX is combined with a remote control unit (see picture below). Using the RCU the gyro housing is free of movement during damping period. The RCU functions are :

1. damping of oscillation swinging while checking band torsion (gyro rotor stand still)
2. damping of oscillation swinging before gyro measurement (gyro rotor spinning)
3. control function for turning point method

Due to the different momentums in 1. and 2. the damping must be for point 1. lower and point 2. higher



GYROMAX AK-2M Remote Control Unit (RCU)

Figure 3: Remote Control Unit buttons for GYROMAX AK-2M

Explanation of RCU Panel

Damping function

The buttons inside ´BRAKE´ area on the RCU are used for low (band torsion test) or high damping function of the damping device. The damping device inside the gyro consists on a ´brake´ motor pumping air from East to West or opposite for damping the oscillation of the measurement cell.

The upper buttons  mean low pressure for band torsion test.

The lower buttons  mean higher pressure for spinning rotor damping.

Pressing a button causes acceleration in the direction of the black arrow signature. This could be observed by the light bar in the view port of the autocollimator system (Fig.3).

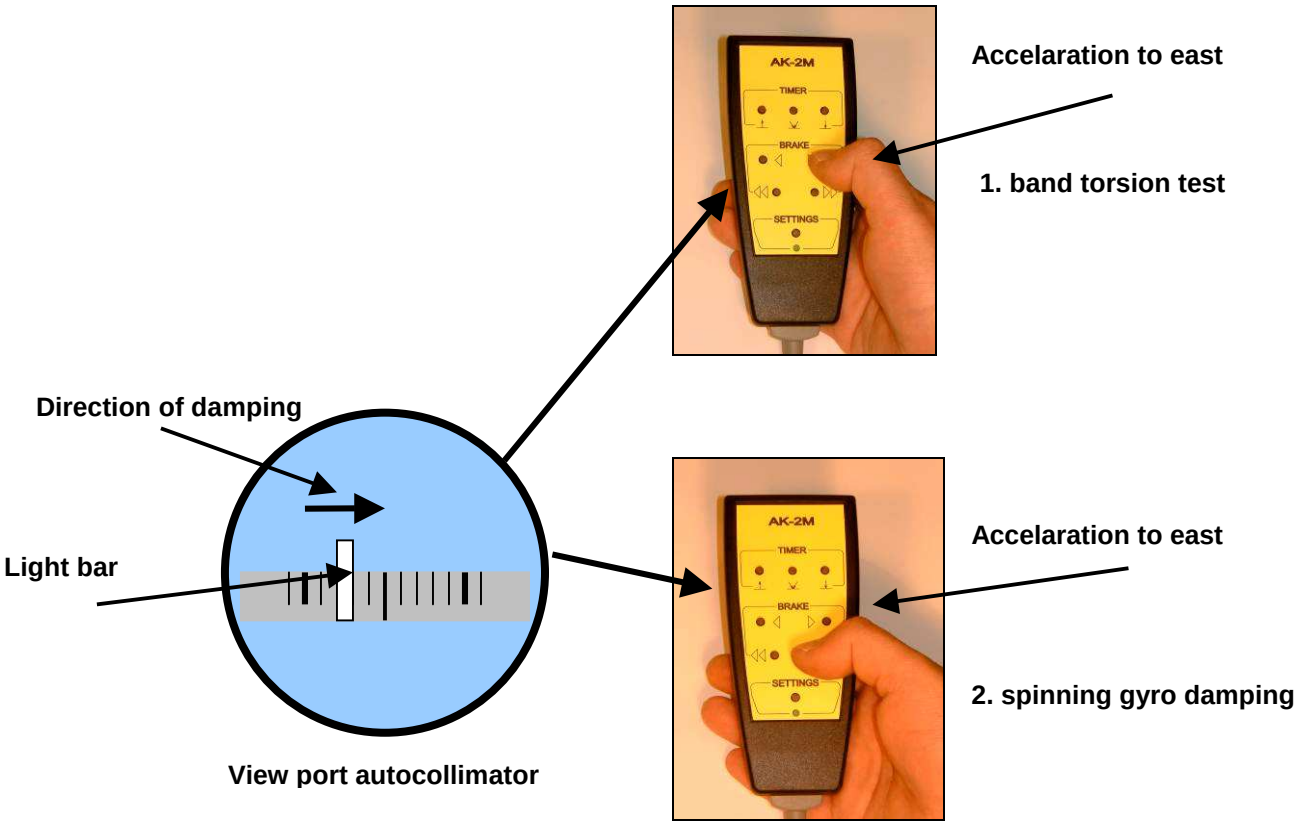
For optimal damping the air pressure must be adjusted by the SETTINGS function. Using to much air pressure causes a high velocity of the measurement cell. The light bar will leave the index scale and the cell reach the amplitude limiting stoppers. This causes a shock on the tape and will reduce accuracy !

All settings will be stored continuously in the memory and could be used frequent.

Attention

The timer data could be stored by activating the SETTING function once. Using the GYROMAX in one mine only, the swinging period of the spinning gyro is constant and therefore the time interval could be used continuously and started by pressing button no 2.

Using the gyro on different places (other geographical latitude) causes new periods by pressing button 1 and 3 as described above.



Use of Remote Control Unit for damping of oscillation swinging

Settings

In the area ´SETTINGS´ there is only one button. If this button is pressed once all other buttons will be used in the following modes and a long beep indicates the second function of the buttons 1-7 :

Button	Function
SETTINGS	set second function
1	lowering timing period
2	Start time period
3	end of repeating timing period
4	extending timing period
5	lowering air stream for band torsion test
6	enlarging air stream for band torsion test
7	lowering air stream for spinning rotor damping
8	enlarging air stream for spinning rotor damping
SETTINGS	end second function and store all changes to memory

In SETTINGS mode the green LED will flash.
The functions of the RCU should be trained before serious azimuth detection to have maximum efficiency.

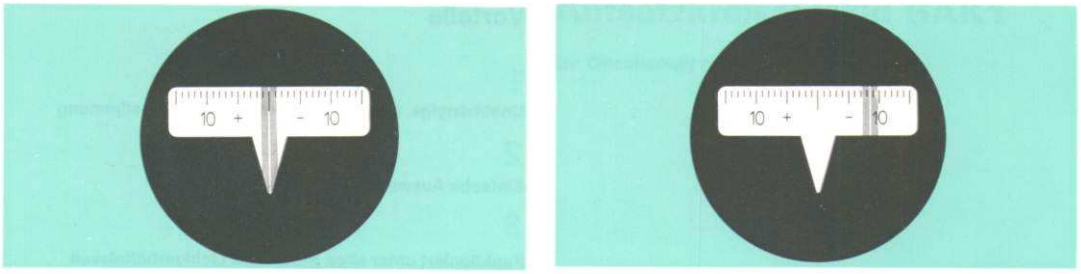
Measurements: The AK-2M allows three modes of measurement:

+ **Quick reading method**

+ **Turning point method**

+ **Pass through method**

The ***Quick reading*** method is usually used for rough orientation, and is usually combined with another method.
The Quick reading method and the ***Turning point*** method make use of the turning points of the gyro swing by continually adjusting the gyro using the vernier drive of the theodolite. In the process, light bar and fixed index are held in congruence (Fig.3,part 1).



part 1 **part 2**

Figure 3: Gyro index with light bar

The ***Pass through method*** is based on timing. Following rough orientation, the times for the oscillations east and west of the rough position are measured with a stop watch, if possible with (time 1 - time 2) function. Computation based on the time difference between the swings to the east and the west results in a correction of the direction for the preset rough orientation.

3.2.2 Quick Reading Method

The rapid method is a special, less accurate method of the turning point method. The oscillations of the gyro to the turning points are followed by continuously observing the movement of the light bar and its coincidence with the fixed index null point (Fig. 3). The time it takes for the gyro to swing from one turning point to the other is about 4 minutes; this value is latitude dependent. As the turning points are approached, the motion of the light bar slows appreciably; the precise coincidence of the light bar and the index null point must be carefully noted. At the turning points EAST and WEST the direction is read off the theodolite. The initial orientation is computed using the values for the two turning points and the directions r_{east} and r_{east} according to the formula

$$r_{north} = \left(\frac{r_{east} + r_{west}}{2} \right)$$

The accuracy achieved using this method is about 1mil = 0.06 gon.

3.2.3 Turning Point Method

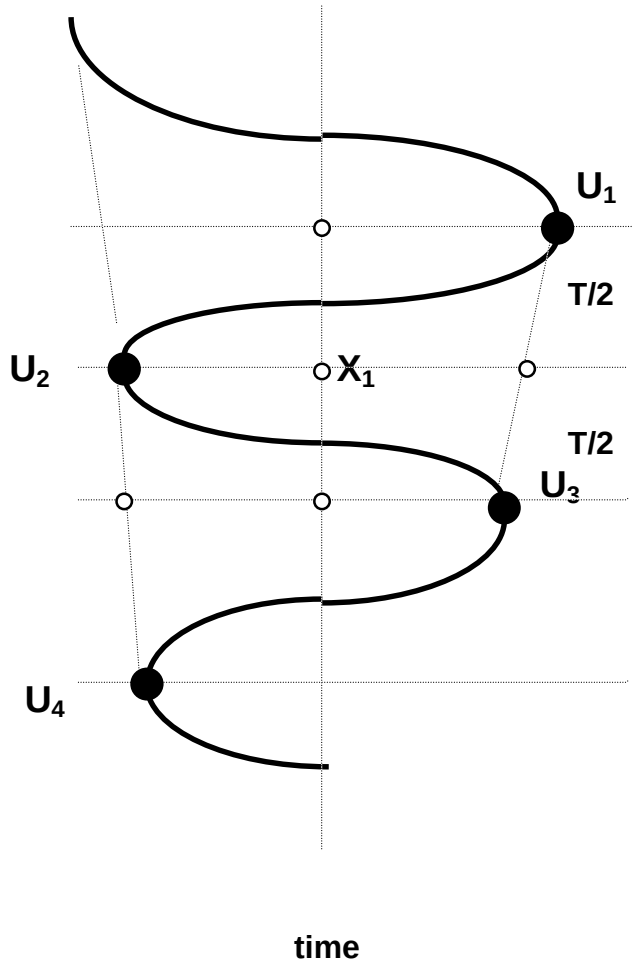


Figure 4: SCHULER Turning Point Method

The turning point method is carried out like the rapid method outlined above. The amplitude of the oscillations must be small enough to remain visible within the index window (Fig. 2). To achieve this, the AK-2M has an air brake, described in section 3.2. If the light bar moves to one side too rapidly, or if the amplitude of the oscillations is too great, the air brake lever (2.1/2) may be used to control it. Moving the air brake lever contrary to the motion of the light bar has a braking effect, moving it in the direction of the motion of the light bar has an accelerating effect. ***The air brake lever may not be used during a measurement!***

Near the index zero point the oscillation is limited by use of the air brake lever (2.1/2) so that the moveable light bar (with index marker) stands still. The amplitude becomes so small that one can observe the movements of the moveable index, given continuous correction and perfect coincidence of the fixed and moveable index. When a turning point is reached, the direction is read on the horizontal circle. After the observation is made, the moveable index is made to coincide with the fixed index again, by means of continual adjustment of the horizontal vernier of the theodolite. When the second turning point is reached, the angular direction is again read on the horizontal circle. The value for geographic north is calculated using the formulas below, with the values from an uninterrupted series of observations of

turning points taken at intervals of about 4 minutes. The literature suggests four turning point observations as an ideal value for the WILD/GAK instrument.
Calculations are based on the so-called SCHULER mean. The computation according to SCHULER is quite simple:

$$X_1 = \left(\frac{U_1 + U_3}{2} + U_2 \right) \bullet 0{,}5$$

$$X_2 = \left(\frac{U_2 + U_4}{2} + U_3 \right) \bullet 0{,}5$$

$$A = \frac{1}{n} \bullet \sum X_i$$

3.2.4 Pass-through method

In the pass-through method, the gyro remains oriented toward geographic north, as determined by the preliminary orientation process, for the entire duration of the pass-through observations. Preliminary orientation is either by compass or by the rapid method described above. The movements of the gyro are to be limited by means of the air brake so that the moveable index remains within the observation window at all times. The scale visible in the observation window (see Fig. 2) is used to determine the amplitude of the oscillations. A stopwatch with (time 1 - time 2) capability is recommended for timing when using this method. Pass-through time is checked when the moveable index passes through the null point of the scale, i.e. when it passes the fixed index.

Two methods can be used to take a reading. Either one may use the brightly illuminated strip, or the fine black line of the moveable index (light bar) located within this strip. In the table (appendix) the pass-through times are noted in column 1. The values are entered in line 1 or 2, according to the direction of motion. After the pass-through time is noted, the stop watch is reset. After the first pass-through, the fine black line within the brightly illuminated moveable index is observed until it reaches its first turning point, and the scale value noted in column 4 as oscillation limit to the right or left. These measurements are always positive values. At the next pass-through of the null-point the time is measured with the stop-watch and noted in column 1 under the first time notation. Now the gyro motion toward the opposite side is observed and the oscillation limit is read off the scale.

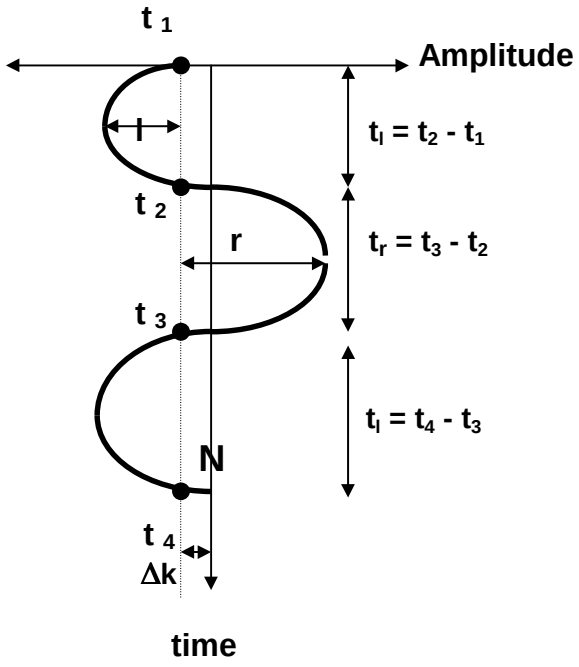


Figure 5: Diagram of the Pass-Through Method

This second amplitude value is entered in column 4 under the first, and a mean is calculated from the two, which represents the amplitude of the entire oscillation period.
The value **a** must be multiplied by factor **c** once per measurement. The factor **c** is a constant for the instrument; its importance is described in the following.
After computing **a** • **c**, which can be done with a slide rule, only the pass-through times of the moveable index through the null-point of the scale are timed and entered in column 1.

Since at least three minutes (dependant on latitude) pass between two cycles, the time can be used to perform the calculations with the values entered on the form. The time differential between two successive cycles is entered in column 2 as oscillation time. Oscillation times for movement of the moveable index to the right are assigned positive values, to the left are negative.
In column 3, enter the Δt_i calculated from the oscillation time differences between the values noted in column 2. Note the values, as Δt_i is to be multiplied with the product of **a • c** in column 4. The calculation of the correction of Δk_i can result either continuously from the individual values for Δt_i where k is a mean value of Δk_i, or from a mean value of Δt_i calculated from all Δt_i s at the end of the observation.

$$a = (r + l) / 2$$

$$\Delta t = t_r - t_l$$

$$\Delta k = \Delta t \cdot a \cdot c$$

$$N = N' + \Delta k$$

N' represents the position of the gyro after preliminary orientation. The value **N**' is read off the horizontal circle of the theodolite. The direction r_i to the target(s) is determined using the telescope, and is calculated using

$$A_i = N' + \Delta k + r_i + E$$

where

A_i	:	**Azimuth to target i**
Δk	:	**Correction factor of the pass-through method**
N'	:	**Direction of preliminary orientation**
E	:	**Calibration constant of the AK-2M**
r_i	:	**Directions to the targets**

4. Instrument Constants and Correction Values

4.1 Proportionality Factor C

The proportionality factor **C** is the relationship between the directional moment of the gyro and that of the tape. Since the directional moment of the gyro changes with geographic latitude, **C** is determined empirically for the site to be measured.
An observation is made, using the Turning Point Method. This results in a horizontal scale value for geographic north which is a Schuler mean of the individual horizontal scale values. If these horizontal scale values are reduced by a constant value, say +3' (= 3 mil = 0.18 gon) and if an observation according to the Turning Point Method is carried out in this position $\mathbf{N'_1}$, the values of $\mathbf{\Delta t_1}$ and $\mathbf{a_1}$ are obtained. Next, the horizontal scale value is enlarged by twice the value mentioned above (2x = 6' = 0.36 gon) to $\mathbf{N'_2}$. Another observation according to the Turning Point Method results in $\mathbf{\Delta t_2}$ and $\mathbf{\Delta a_2}$.
Using the data from these two observations taken symmetrical to the midpoint of the oscillations (Turning Point Method) with horizontal scale values of $\mathbf{N'_1}$ and $\mathbf{N'_2}$, **C** is calculated, being careful to take into account the positive or negative values. **C** remains constant for the site to be measured and for the supporting tape. (For areas around 50 degrees of latitude, **C** may be estimated at about 0.01' = 0.6 mgon/increment.

$$\mathbf{c = (N'_1 - N'_2) / (\Delta t_2 \cdot a_2 - \Delta t_1 \cdot a_1)}$$

4.2 Calibration Value E

according to DIN 18723, Part 7 (German Standard)

The calibration value **E** is a constant for the instrument. It represents the difference between the azimuth as determined by the gyro (raw value **U**) and the true value, both measured on a calibration line. To obtain **E** with the correct sign, (true value - measured value). For example: true value azimuth **X** and gyro measured value **X + dX**, then the calibration constant **E** is

	Az Soll	**=**	**X**
-	**Az Ist**	**=**	**X + dX**
calibration constant E		**=**	**- dX**

The calibration value should remain unchanged; however, before and after major projects it should be determined anew, using a calibration line, and entered in the gyro log. Long distance transport of the gyro, impact, or a deformation of the supporting tape (caused by incorrect release of the gyro) always necessitates checking the calibration value.

5. Observation Procedure (Summary)

1. Set-up

Set up the instrument, adjust for centering and horizontal accuracy

Preliminary orientation to magnetic north

Attach cable from converter to AK-2M

Attach battery

Switch converter ON (green light)
Switch to OPERATE (BETRIEB) (gyro runs up, green light goes out)

Loosen gyro cage (gyro still audible)

Check bull's eye level

2. Observation

When green light comes on, release gyro cage completely

Use air brake to stabilize light bar in middle of scale

Observe oscillations

Stop gyro (engage cage stop safety)

Switch on converter to BRAKE (BREMSEN)

When gyro comes to a rest, switch converter to OFF (AUS)

Aim at target and take reading off horizontal circle

3. Takedown

When observations are completed, remove cables and stow in case

Disassemble Gyro AK-2M in reverse order of assembly

Dry off as necessary

4. Computations

Compute azimuth

Include calibration value and possible convergence of meridians

6. Checkups

6.1 Checking torsion

The suspension tape is subject to permanent deformation through poor transport practices or incorrect releasing of the gyro cage. This should be checked from time to time. Mount the gyro on the theodolite and adjust horizontally. Attach power supply as described. The gyro is **not** started up. After carefully releasing the gyro, observe the oscillation of the light bar and if necessary, dampen with the air brake as described in section 3.2.1. The amplitude should be +/- 5-7 Increments. Read the turning points off the index. The oscillations should be symmetrical relative to the fixed index. A deviation of

(l - r) / 2	**≤**	**0,5 increments**

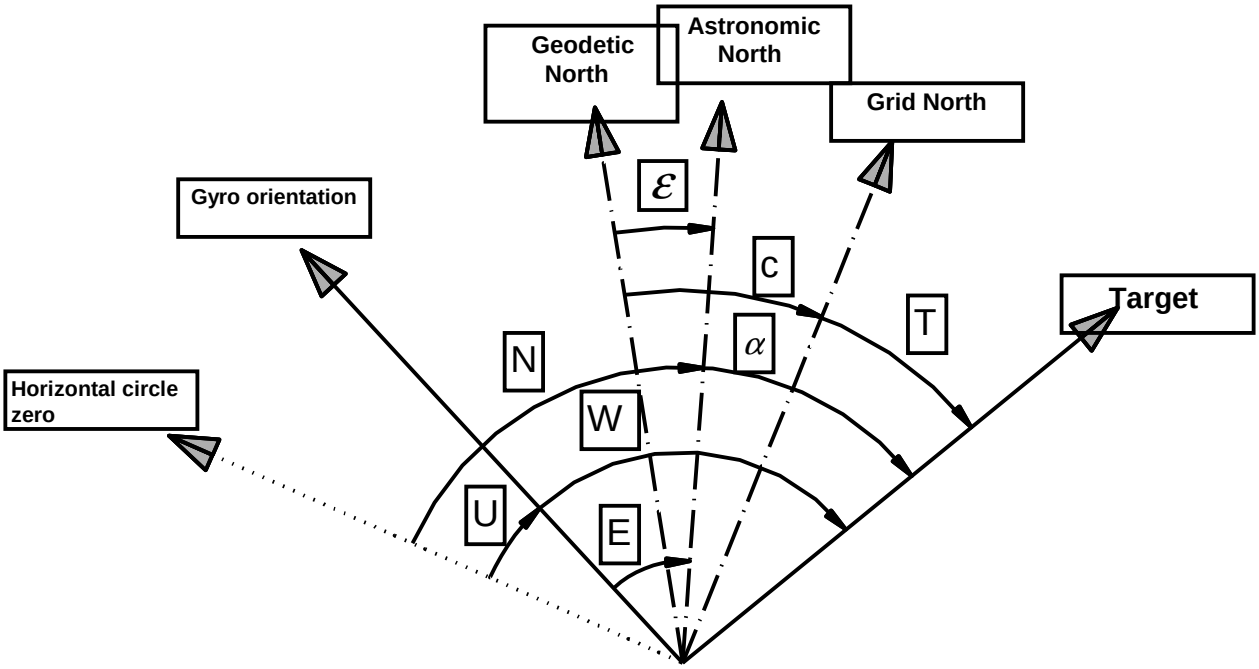
l : oscillation left
r : oscillation right

is permissable. If the deviation is greater, the null point of the tape should be adjusted. A jeweler's screwdriver with a blade width of 2mm is needed for older models. Recent models use 1mm hexagonal socket screws. As the instrument must be opened, any adjustments must be made in a clean, dry environment.
Unscrew and remove the red mast cover, giving access to the upper tape clamp. There are two slotted set-screws affixed tangentially to the clamp. These act as push - pull adjustments on the friction-fit carrier of the tape head. The carrier must be moved towards its normal center location. This is done by first loosening one screw, then tightening the other correspondingly. Usually adjustments on the order of magnitude of < ¼ turn of the screws suffice. **Caution! Do not overtighten the screws!**
Repeat this process until variations are < 0.5 increments. Replace red mast cover.
After March 1998 adjustment screws with hexagonal socket heads will be supplied for your convenience.

6.2 Battery check

There is a red battery condition light on the converter. If this lights up, the battery must be re-charged. The battery is a special gyro battery (24 volt). In case of battery problems, immediately stop the instrument and cage the gyro.

7. Summary of orientations



DIN 18723 Part 7:

Z **Direction**
Angle between horizontal circle zero and direction of observation

U **Gyro indication**
Angle between horizontal circle zero and gyro orientation

W **Gyro Angle**
Angle between gyro orientation and direction of observation

A **Astronomic Azimuth**
Angle between astronomic north and direction of observation

α **Geodetic Azimuth**
Angle between geodetic north and direction of observation

ε **Azimuthal plumb deviation component**
Angle between geodetic north and astronomic north

c **Meridian convergence**
Angle between grid north and astronomic north

T **Direction angle**
Angle between grid north and direction of observation

E **Instrument constant (Calibration value)**
Angle between gyro orientation and astronomic north

N **North**
Angle between horizontal circle zero and astronomic north

Appendix A:

REFERENCE 6.1 CHECKING TORSION

There is no need to adjust the tape zero position ! Please use tape zero factor for compensation.

Advantages are:

+ more accurate (changes of tape zero position are monitored during measurement)

+ no opening of unit (insertion of dust and humidity is avoided)

Appendix B:

REFERENCE 3.1 STARTUP

NOTE !

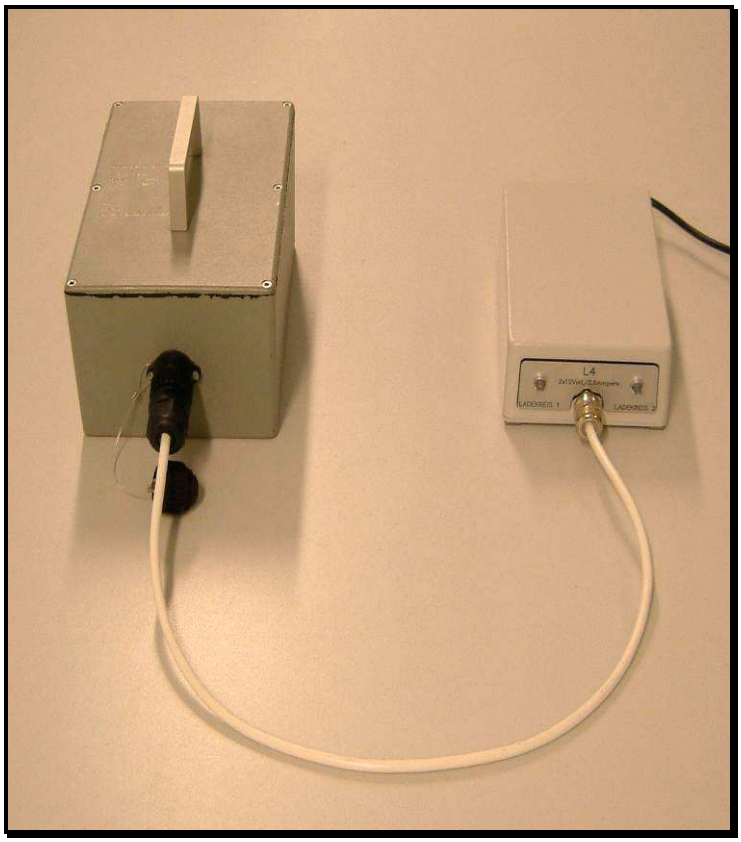
The battery light will be RED or FLASHING during gyro run up and run down when the battery is not full. This does not matter if the light is off during measurement.

If the RED light is on or flashing during measurement the battery must be charged or changed to a full one.

User's Manual

Charger L4/AK-2M

VERSION 1.20



GMT GeoMessTechnik
Mühlenstraße 9
D-17033 WULKENZIN
GERMANY

Wilhelm Heger

1. General:

The L4 charger is constructed of proven materials. It is intended for use with the gyro battery B3 only. Before using, read these instructions carefully!

Before charging, make sure that the batteries are undamaged. Under no circumstances attempt to charge defective batteries!

When the battery being charged reaches its design voltage, voltage is cut back in order to prevent overcharging the battery. The electronic limiting device assures that the battery is maintained at an optimal level, while preventing overcharging and formation of hazardous gasses.

2. Technical details:

Full charge: 2 x 13.8 volts

Charging current: max. 2.7 A

Operating voltage: 110-230 V automatic detection

3. Operation

Insert charging plug into battery socket and secure by using knurled nut. Always secure this nut before starting charger.
The charging unit shows 2 LEDs. One for each cell (battery has 2 cells).

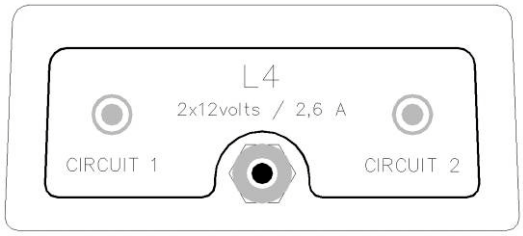


Figure 1 : charger front

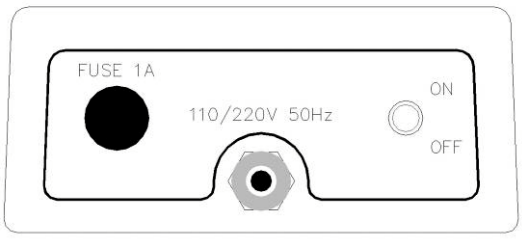


Figure 2 : charger rear

The LEDs will light continuously orange if no battery is connected.
→ !! Check cable if battery is connected and no light on !!

The charger is provided with indicators that show the rough charge of the battery while charging.

Battery attached to charger, plugged into mains

Battery empty (high power charging) : *Both red LEDs shows light*

Battery partly charged: *Both LED change to orange*

Battery fully charged: *ALL LEDs shows green light*

→ Disconnect mains or keep it on continuous charge

!! Only charge battery when it is needed !! (approx 1 day before)

!! Charge stored batteries frequently every 4 weeks !!

Attention !!!

Make sure that the battery is not situated on a hot place, hot machine or in the sun !!

Maximum time for a full charge: Normal rate : approx 3 hours

Use only in dry areas.

Do not exceed 25℃ when charging

Do not open device.

User's Manual

Gyro Battery B3/AK-2M

VERSION 1.01

GMT GeoMessTechnik Wilhelm Heger

Mühlenstraße 9
D 17039 Wulkenzin
GERMANY

1. General:

The Gyro Battery B3 is constructed of proven materials. It is intended for use with the gyro AK-1M and AK-2M only. Before using, read these instructions carefully!

The gyro battery is constructed of two lead battery cells. These are housed in an aluminum case, protected from dust and the elements. Do not allow the battery to come into contact with water. Do not burn or subject to temperatures over 45℃. Place protective cover over plug when transporting.

Charge only with charger L4. Before charging, make sure that the batteries are undamaged. Under no circumstances attempt to charge defective batteries! The former charging units could not be used with that batteries !!

When the battery being charged reaches its design voltage, voltage is cut back in order to prevent overcharging the battery. The electronic limiting device assures that the battery is maintained at an optimal level, while preventing overcharging and formation of hazardous gasses.
Maximum charging temperature should not exceed 25℃ .
Do not open.

2. Technical Data:

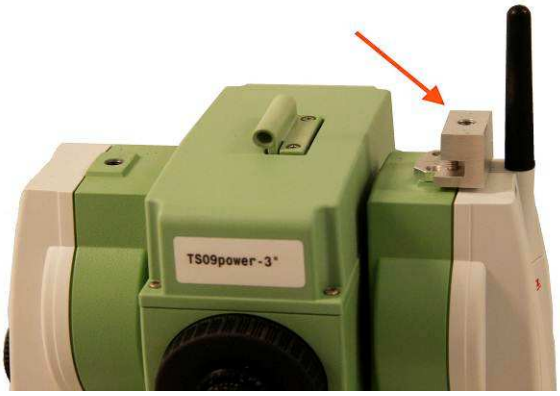
Voltage:	24 volts
Capacity	6,5Ah
Max. current:	3 A
Max. charging current:	2,5A
Charging time using L4 (fully discharged battery)	3 hours
Weight	ca. 5.3 kg

3. Operation

Connect only to the gyro attachment AK-1M and AK-2M. Remove protective cap. Attach cable to plug on battery and secure using knurled nut. Always secure before starting gyro. Disassembly in reverse order of assembly.
When battery is fully charged, gyro may be continuously operated for ca. 2.1 hours at ambient temperatures of ca. 20℃. Extremes of temperat ure will reduce battery capacity.

New adaptor for LEICA ´flexline´ total stations

The new ´flexline´ total stations are ideal for gyro measurements with the GYROMAX AK-2M because of the endless horizontal fine adjustment.
Best experience was to use LEICA total stations type 300/400/700/800. The grip design was also ideal for a mechanical adaptation.
The new ´flexline´total stations can be attached by removing one plastic part and set on a special alluminum attachment.



Alluminum replacement for plastic handle and gyro adaptor

The new adaptor consists of two parts. One is the replacement of the plastic holder for the plastic handle (original Leica). The second is the adaptor for the gyro attachment GYROMAX AK-2M.

adaptor for the gyro attachment GYROMAX AK-2M

The complete set is stable in orientation angle

and can be used also to carry the instrument with the plastic handle.

The aluminum replacement must be fixed by an authorized service workshop. There are only two screws to change. The new screws must be fixed by glue.

It has to be checked if the centering is to be tested by a special tool. There is no experience yet for that.