Mag-01H Fluxgate Declinometer/Inclinometer

The Mag-01H Declinometer/Inclinometer (D/I) system comprises a single axis fluxgate magnetometer (type Mag-01H), a fluxgate probe (type Mag A), and a WILD T1 steel-free theodolite. A steel-free tripod is available if required. The WILD T1 micrometer theodolite has a resolution of 6 seconds (this can be estimated to 3 seconds). A manual for the WILD T1 theodolite is available on request.

Each pre-used WILD T1 theodolite is meticulously converted to be steel-free and restored as far as possible to its original condition. After conversion, each theodolite is rigorously checked for magnetic hygiene and is guaranteed to be non-magnetic. The initial set-up procedure includes checking the magnetic cleanliness of the theodolite at each stage of assembly. The optical/magnetic collimation error is set to less than 20 seconds.

On request, the Mag-01H D/I can be checked against a reference system at a magnetic observatory for an additional charge.

The Mag-01H and Mag Probe A can be mounted on the customer's theodolite. We can provide a mounting adaptor for the WILD T1, Zeiss (010, 015 and 020 A or B) and Yom theodolites. Under these conditions, we cannot guarantee the magnetic cleanliness of the theodolite or the results produced by the instrument.

A training video for users of the system is available on the Bartington Instruments website.

Measurements of declination and inclination

This system provides fast, accurate and convenient measurements of the declination and inclination of the geomagnetic field.

The geomagnetic field varies with time, both in intensity and direction. These parameters are monitored continuously by magnetic observatories. The baselines of instruments that perform continuous recording are checked for drift and corrected through absolute measurements by instruments including a D/I system.

The system can also be used to check compass calibration.

The Mag-01H D/I system is useful in gas exploration when directional drilling is involved. This technique uses magnetometers to monitor the direction of the drilling head. Precise measurements of declination and inclination are required to avoid errors caused by local variations in the field, mostly owing to the local geology. These can be obtained by performing a survey using the Mag-01H D/I system.

(Measurement resolution is limited by the prevailing geomagnetic conditions, the skill of the operator and the mechanical stability of the tripod, if used.)

Mag-01H Single Axis Fluxgate Magnetometer

This battery powered instrument provides the drive for the probe and processes its output to show the field strength on a 4-digit display, updated at 2 readings per second. An analogue output is also provided.

The Mag-01H may be fitted with an audio output indicator, on request. This facility enables the operator to seek the null position without continuously monitoring the digital display. A sensitivity switch can be used to select 1nT or 0.1nT resolution.

The non-magnetic internal battery provides 20 hours of continuous use and can be recharged via the mains adaptor or vehicle connector. Battery voltage is displayed for several seconds after switch-on and an audible alarm indicates when recharging is required. The magnetometer and cable incorporate shielding against radio frequency interference.

Specification – Mag-01H instrument	
Measuring range	±0.1nT to ±0.2mT
Bandwidth: x1 sensitivity	DC to 10Hz (-3dB) at 20µT p-p. Roll off -12dB per octave
Calibration accuracy	0.1%
Maximum resolution	0.1nT
Zero field offset	±1nT
Offset drift	0.01nT/°C
Scaling temperature coefficient	<10ppm/°C
Operating temperature range	-10°C to +50°C
Relative humidity	80% non-condensing
Dimensions (H x W x D)	65 x 155 x 175mm
Weight	950g
Enclosure material	High impact ABS
Liquid crystal display: x1 sensitivity x10 sensitivity	4 1/2 digit autoranging Displays 0 to 20µT with 1nT resolution and 20 to 200µT with 10nT resolution Displays 0 to 2µT with 0.1nT resolution and 2 to 20µT with 1nT resolution
Front panel: On/off switch Probe input Charge indicator Sensitivity control	 Switches on internal battery 6 pole waterproof Fischer connector Illuminated when external supply connected Increases the sensitivity by a factor of 10
Rear panel: Battery charger inlet Analogue output x1 sensitivity x10 sensitivity Output impedance	 2.1mm socket 6-18V DC 0.5A max., polarity protected, continuous or intermittent use 4mm insulated sockets 100µT/V, ±500µT max, 1nT resolution 10µT/V, ±50µT max, 0.1nT resolution 1kΩ
Battery	Lead acid

The unit is provided with a carrying bag.

Mag A Probe

The Mag A probe contains a fluxgate element selected for high rejection of orthogonal fields. The element is extremely high quality, very stable and well aligned with little offset. The probe alignment will normally be stable to 1 minute of arc over the suggested two-year calibration period. Re-adjustment is seldom required.

The fluxgate element converts the static terrestrial field into an alternating signal. The Mag-01H instrument converts this signal into a feedback current, which is applied to a precision solenoid within the probe to maintain the element in null field.

The magnetometer converts this current into a precise and stable measurement of the field. A mechanically isolated enclosure protects the sensor from accidental misalignment. The probe has a strong but highly flexible 5-metre cable for connection to the Mag-01H instrument.

Each probe is individually calibrated to a standard traceable to the UK National Physical Laboratory.

Probes and electronics units are fully interchangeable, with a cumulative calibration uncertainty of 0.25%.

Specification - Mag A Probe	
Calibration accuracy	0.1%
Collimation error	<20 seconds (collimation adjustment by joystick and clamp)
Fluxgate element	Temperature coefficient <10ppm/°C, length 55mm, with precision feedback solenoid
Operating temperature range	-20°C to +80°C
Dimensions (H x W x D): with WILD T1 theodolite with Zeiss theodolite	 32.5 x 106* x 50mm 25 x 100* x 50mm * Add on 10mm for cable gland
Weight	250g
Protective enclosure	Aluminium housing, mechanically isolated from element mounting
Connecting cable: length core-screen capacitance resistance	4-core overall screened high flexibility audio grade with 6 pole Fischer connector 5m standard (alternative lengths available) 160pF/m 92Ω/km

WILD T1 Steel-free theodolite

These optical theodolites are no longer manufactured, so the units supplied are pre-used instruments which have been reconditioned and converted to be non-magnetic. All magnetic components have been replaced by a non-magnetic equivalent. The horizontal and vertical axis bearings have been replaced with specially plated phosphor bronze parts, and the steel ball-race removed from the horizontal axis. The WILD axis lubrication system ensures that these parts require zero maintenance.

The resetting mechanism for the horizontal circle is redundant in this application and has been eliminated to give enhanced accuracy. All theodolites undergo a rigorous check for magnetic hygiene and are guaranteed to be non-magnetic.

The steep sighting prisms (SSP) improve the reading of the scale in the case of a near horizontal field. Without them, fields inclined less than 45° from the horizontal cannot be measured. The limit, using the SSP, becomes 18° (25° using the telescope SSP).

Theodolite (steel-free)	Scaling division	Estimation	Directional accuracy*
WILD T1 (360 °)	6 seconds	3 seconds	3 seconds

* The directional accuracy is given as the standard deviation to DIN 18723 of a direction measured in two telescope positions.

Weight with fluxgate sensor fitted	5.85kg
Weight in carrying case	8.75kg

A separate manual for the WILD T1 theodolite is available on request.

Accessories
AC mains adaptor for 110/220/240V with outlet adaptors
Vehicle charging connector 12V DC output (12-24V input)
Operation Manual for Mag-01H Declinometer/Inclinometer and WILD T1 theodolite
Screwdriver
Orange filter and sun filter
Lens cap
Polycarbonate carrying case for Mag-01H and accessories
Case weight: 5.1kg including equipment

Optional extras	
Steel-free tripod (5/8 - 11 UNC)	Tripod weight: 6.1kg (8kg packaged)
Steep sighting prisms	
Audio output	
Calibration check at Hartland Point Observatory	
Chemiluminescent light sources (for night use)	
Pillar mounting adaptor (5/8 - 11 UNC) with pins on a 120mm PCD	