This mount knows that it is a mount

The GM1000HPS mount is built for the demanding observer using photographic instruments up to a weight of 25kg – 55 lbs (counterweights not included).

The mount is driven by two AC servo motors with timing belt reduction and zero-backlash. Both axes feature a classic worm to wormwheel pairing. The wormwheels are made of bronze (B14), have a diameter of 125mm and 250 teeth. 20mm alloy steel is used for the worms. The axes themselves are made of 30mm diameter alloy steel for maximum rigidity.

The double dovetail mounting plate offers maximum compatibility with instruments from other telescope manufacturers.

The complete electronics is integrated into an easily removable, independent control box. All connectors of motors, encoders and hand pad are fixed with security lock screws.

The mount can be fully controlled with the included professional 4-lines standalone keypad, no external PC needed, not even for highly demanding jobs like satellite tracking.

The internally heated keypad is optimized for all light conditions – day and night – and for deep temperatures. It can be operated with gloves. Both the display and the ergonomic keys feature a red backlight.

The mount can be controlled with common software packages by connecting it to a PC with RS-232 serial port, Ethernet or WiFi, via the proprietary 10micron ASCOM driver or conventional compatible command protocols. Furthermore, a dedicated software (included) can be used to create a “virtual keypad”, replicating exactly the functions of the physical keypad. The RS-232 port also allows the direct control of Baader Domes without PC.
This flexibility makes the GM1000 HPS an ideal mount for remote-controlled observatories. This mount knows that it is a mount.

The object database contains many star catalogs and deep-sky objects up to 16th magnitude. Solar system objects can be tracked with non-sidereal speed. Orbital elements of comets, asteroids and artificial satellites can be loaded into the mount, so that these objects can be tracked directly using the standalone keypad (without an external PC).

The usage of a model containing up to 100 stars makes the pointing accurate (visit www.10micron.de/downloads for the “Automated model maker for 10Micron GM mounts” by Per Frejvall). Modeling allows correction of classical polar alignment and conic errors, and also of the most important flexure terms of the optical tube. This way it is possible to obtain pointing accuracies in the order of 20 arcseconds RMS. The same model can be used in order to obtain the maximum tracking accuracy, compensating also for the atmospheric refraction (depending on local atmospheric pressure and temperature).

A series of auxiliary functions provide automated align procedures for precisely aligning the mount to the celestial pole.

You may save and recover the alignment data of different observing sessions. This function is very useful if you have many instruments in different setups, each one requiring different flexure corrections (mount models).

Tracking through the meridian – a typical problem with German mounts – is solved by allowing tracking for up to 30° past the meridian (configurable) in both directions. In this way any object can be tracked for at least four hours.

The resulting tracking accuracy makes autoguiding unnecessary for most projects. The absolute encoders on both axes allow to obtain a typical tracking error below 1 arcsecond. However it is still possible to autoguide using the ST4-compatible port or through the serial/Ethernet connection, with a guide rate configurable from 0.1x to 1x. The guide rate can be automatically corrected for the target declination, there is no need of recalibrating the autoguiding parameters when observing at different declination.
Designed for field use, the GM1000HPS is easily transportable. The main body of the mount without the counterweight shaft has a weight of only 19.5 kg – 43 lbs.

All functions of the mount are targeted to obtain maximum flexibility for actual field conditions.

The mount can be switched on and off using the dedicated connector on the control box panel and it can be parked in different user-defined positions.

You can use the electronic balance functions in order to balance your instrument without unlocking the clutches.

A Baader-dome can be controlled without an external PC or Laptop via RS-232 serial port. Once configured with your instrument parameters, the firmware is able to make all the calculations required for positioning the dome slit in front of your optical tube for almost all instrument configurations.

The HPS-series mounts are equipped with a pair of ultra-high resolution absolute encoders, directly mounted at the right ascension and declination axis.

This technology has already been used in professional observatories, where high costs and complexity is not an issue. Measuring the rotation angles of the axes directly allows to compensate for most of the mechanical errors, such as periodic errors and transmission backlash. However, this requires systems with very high resolution.

In the past few years this technology could also be found in amateur astronomers’ instruments, often paired with the use of direct drive technology where motors are mounted directly on the mount’s axes – without any mechanical reduction gear.

10Micron GM mounts need no homing and are much less prone to motor stall and adverse balancing conditions or heavy windload/gusts than direct-drive mounts.

10Micron GM mounts: Delivering results, reliability & rock solid dependability, also for your remote observatory.
GM 1000 HPS

High Precision – for your astronomical future

GM 1000 HPS

MAIN ACCESSORIES

Power converter 12V/24V 5Ah
converts 12 V input into 24 V 5 A output,
for field use. ONLY use with 12 V battery.
#2457577A

Counterweights 3kg / 6kg
#1452072 / #1452073

Stabilized power supply AC
converts 230 V input into 24V.
#1451070

Heavy steel pillar + flange
conical shape, with inner cabling tubes.
80/100/115/125/134/145/155/165 cm
#2451120 + #2451131

3" dovetail bar w/o holes
Losmandy-style, Length: 300 / 400 / 500mm
#1452125 / #1452130 / #1452131

90° Changeplate for 3" LODUAL
dovetail Adapter required to mount
the LODUAL double mounting plate on the GM1000 mount.
#1451045

3" LODUAL double mounting plate
balancing design, Losmandy-style, for
mounting of two telescopes. Center-to-center distance 27 cm.
#1452105

Baader RA/DEC torque wrench
allows easy operation of GM 1000 HPS axes
knobs without indicating too much force
#2450070

“Economy” T-Pod, Aluminium
Heavy duty Baader aluminium tripod 75-110cm,
black anodized, carrying bag, 6.9kg weight
#2451010

ARIES Tripod, Aluminium
including accessory tray and waterproof
cordura carrying bag. 75 – 115cm,
80kg payload, weight: 13kg
#1451055

90° Changeplate
for 3" LODUAL
not included

Included with GM 1000 HPS
Tripod/Pillar Adapter Flange
Black anodized aluminium, incl. screws
#1451090

Included with GM 1000 HPS
Standard base adapter flange
incl. knobs, screws and azimuth block for tripods/pillars
#1451052

Missing something?

More accessories
on next page and
www.10micron.de

More accessories
on next page and
www.10micron.de
### ADDITIONAL ACCESSORIES

Everything you need for your GM 1000 HPS mount

- **#1451063** Prof. Flight-Case (2 pcs)
  - Head- and Counterweight-Flight-Case set (trolley + hand case).
  - With internal padding and aluminum reinforced corners/edges

- **#1451062** TTX01 Hardcase-Set (2 pcs)
  - Two trolley cases for total protection against water, dust, chemicals, impact & drop. With internal padding

- **#1451067** Carrying bag
  - Reinforced cordura carrying bag with handles. Designed to recycle the shaped padding included with the standard pack

- **#1451066** Special foam fitted transport cardboard box
  - Shaped inner padding and sturdy cardboard box with handles

- **#1451065** Mount protective cover
  - Cordura cover with upper zip, can be placed on the mount even with payload attached

- **#1452059** Professional 4-Lines Keypad
  - from aluminum with heated screen to equip any old mount with firmware 2.x and higher. Stand-Alone!

- **#1455005** WiFi Upgrade board
  - Wi-Fi connection with access point and routing function. Included with HPS mounts from 11/15

- **#1455006** GPS receiver module
  - Directly connected to the mount, provides the exact time and coordinates of the observation site

- **#2455030** Remote module switch
  - including cable, manual, power supply, web interface and smartphone app. A must for observatories.

- **#1452072 / #1452073** | 2pc counterweight set of 3kg and 6kg - stainless steel with 30mm diameter

- **#1451055** ARIES Aluminium tripod (complete with upholstered Cordura transport-bag)

- **#1451062 | TTX01 Travelcase-set (1 Trolleycase for GM 1000 HPS mount /1 hard case for counter weights), total protection against water, dust, chemicals, impact & drop

- **#1451070 | Power-Supply outdoor type 230V / 24V- 4A - 90W

- **#1455010 | PERSEUS Software Package. Astronomy simulation software and mount control via PC

Please note: Mount is not included in the Upgrade Package

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**GM 1000 HPS UPGRADE-PACKAGE**

The perfect addition to complete your GM 1000 HPS mount

- **#1452072 / #1452073** | 2pc counterweight set of 3kg and 6kg - stainless steel with 30mm diameter
- **#1451055 | ARIES Aluminium tripod (complete with upholstered Cordura transport-bag)
- **#1451062 | TTX01 Travelcase-set (1 Trolleycase for GM 1000 HPS mount /1 hard case for counter weights), total protection against water, dust, chemicals, impact & drop
- **#1451070 | Power-Supply outdoor type 230V / 24V- 4A - 90W
- **#1455010 | PERSEUS Software Package. Astronomy simulation software and mount control via PC

**Please note:** Mount is not included in the Upgrade Package

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Attention: ALL 10 MICRON mounts should ONLY be used with approved power supplies from this brochure or our price list. Damages induced by using third party power supplies may result in loss of warranty! For more Information visit [www.10micron.de/warranty](http://www.10micron.de/warranty)
PUSHING THE PERFORMANCE ENVELOPE

The effort to improve performances never stops

The most important features defining the performance of an astronomical mount are the tracking accuracy and maximum slew speed. Constant technological evolution allows to continuously improve these numbers. From the first GM2000 FS2 mounts with stepper motors to the GM3000 HPS, tracking accuracy has been improved by an order of magnitude and the pointing speed has been improved by a factor of three.

High slew speed is required for many astronomical applications. Searching for supernovae, asteroids or exoplanets, where images from a large number of different objects are required in minimum time, as well as tracking artificial satellites.

On the other hand an excellent tracking accuracy is required for high-resolution deep-sky imaging, in order to simplify or completely get rid of complex autoguiding systems, which can be a killing source of errors or breakdowns for remote controlled observatories.

FIFTEEN YEARS OF HISTORY

More than fifteen years of experience in astronomical manufacturing

The 10micron mount line was born in 2000 with the clear aim of providing products with high quality standard: equatorial mounts, altazimuth mounts and tripods – always designed for best performance.

The complete range of traditional german equatorial mounts from GM 1000/2000/3000/4000 HPS, up to the special application AZ2000 HPS and AZ5000 / AZ8000 DDS altazimuth mounts, the 10micron product range is dedicated to serve the most demanding imagers and university level observeratories as well.
10 MICRON HPS MOUNTS

Unguided imaging, satellite tracking, high-precision spectroscopy and much more

The new generation of 10Micron HPS mounts is only available in UV-stabilized hardened black anodizing. This surface looks as if it were a structurized paint. But the observation shows that it is durable and much more scratchproof than ordinary black paint, while it shows a deep and luste- rous black that will stay impermeable to aging.

DRIVE MECHANICS

- Self-locking, high-precision worm-wheel drives with classic friction clutches
- Internal wiring – no external mount cables
- High torque Servo DC motors eliminate imbalance motor stall
- Proprietary motor-electronics for easy servicing

DRIVE ELECTRONICS

- Absolute on-axis encoders in RA & Dec, featuring more than 10 million increments (interpolated), fully encapsulated and calibrated
- Up to 0.6° RMS tracking accuracy – for long duration and unguided imaging
- Closed loop (encoder controlled) satellite tracking – speed: up to 20°/s (GM 2000)
- Extremely low power consumption and miniature format (20 x 15 x 8 cm) electronics
- After an observing session, the entire electronics box (motor electronics with Linux computer) and HC can be easily detached and protected from premature aging and moisture damage – Virtual Key- pad on PC available for remote control
- Service friendly design – electronics box and HC can be easily exchanged for service, without returning the precisely adjusted HPS mount

FIRMWARE

- Dual Tracking, automatic refraction (configurable) and flexures correction functions implemented – the only way for perfect unguided tracking during long exposures
- Intuitively operated V.2 software, proprietary motor control system with temperature compensated clock and integrated into an onboard Linux computer – intelligence built-in
- No external PC or laptop mandatory in the field – all functions in the onboard computer can be accessed via stand-alone hand control unit (HC)
- Precise multi-star pointing models, entering satellite and comet trajectories, programming individual observing sessions and much more
- Well documented firmware and drivers, working autonomously w/o additional planetarium software, without need for external RS-232 converters / USB ports
- Excellent documentation in English and German
- Electronic balance – requiring one time balancing only
- Ultra stable pointing models for safe East/West load reversal – no change of pointing model necessary when changing accessories. Recordable models database for different telescope setups
- Precise polar alignment – software aided and accomplished within minutes
- Fully remote controlled via your observatory PC with 30/100/1000LANandWiFi/optionalwith – perfectly prepared for your future Internet observatory
- Manual, automatic (Clock Sync proprietary software) or GPS based time, leap seconds support for the different timescales of UT1 and UTC
- Remote diagnostics web assist option w. dedicated server

DRIVE MECHANICS

- German Equatorial Mount
- Weight (mount w/o acc.) ~ 19.5 kg – 43 lbs
- Weight, Uprate portable version (mount) ~ 18.9 kg – 40 lbs + 15 kg – 33 lbs (without accessories)
- Instrument payload capacity 25 kg – 55 lbs
- Latitude range 0° – 90° (optional)
- Altitude fine adjustment range +/- 7.5°
- Counterweight shaft 30 mm diameter, stainless steel, weight 1.7 kg – 3.7 lbs
- Axes 30 mm diameter, alloy steel
- Bearings Pre-loaded tapered roller bearings
- Worm wheels 18-teeth, 12° mm diameter, B14, B14, bronze
- Worms 20 mm diameter, tempe- rated alloy steel, grinded and lapped
- Go-to speed Adjustably from 2° to 15°
- Motors 2 axes AC servo brushes
- Power supply 24 V DC
- Power consumption - 0.6 A while tracking - 1 A at maximum speed - 4 A peak
- Error +/− 1 A while tracking at maximum speed
- Firmware features
- User defined mount parking positions, ZAars and 3Asr alignment function, up to 100 alignment stars for modeling, correction of polar alignment and orthonormality errors, estimate of average pointing error, storage of multiple pointing models, sidereal, solar and lunar tracking speed adjustable on both axes, declination-based autoguide speed control, adjustable horizon height limit, pointing and tracking past model, assisted
- Firmware automatic balance adjustment, automatic (Clock Sync proprietary software) manual or GPS time & site coordinates
- Communication ports RS-232 port, GPS port, autoguide ST-4 standard port, Ethernet 10/100/1000 port
- Database Stands by Common Names, Bayer designation, Flamsteed designation, Bright Star Catalogue, SAAO, HIP, HD, PPM, ADS, GCOS, Deep-sky M, NGC, IC, PSC J2G limited up to mV = 16. Solar system: Sun, Moon, planets, asteroids, comets, artificial satellites, Equatorial and altazimuth coordinates. User defined objects. Quick slew positions recall for frequent focusing or useful operation.
- Keypad control Hugged keypad with metal housing and reliable professional micro switches. Large graphic display – heated for operation under lowest temperatures, dimmable display and keyboard with backlit keys, five information menu lines for coordinates, object information and symbols showing mount status and active external connections and accessories. All the functionality of the mount is available through the keypad without requiring an external PC
- PC control Remote control via RS-232, Ethernet, proprietary 10Micron ASCOM driver, LX200 compatible protocol, update of firmware and orbital elements of comets, asteroids and artificial satellites via RS-232 or Ethernet, PC virtual KeyPad control panel via RS-232 or Ethernet, Integrated Wi-Fi for connection with smartphones and tablets and any wireless network.

Specifications

<table>
<thead>
<tr>
<th>Mount Type</th>
<th>GM 1000</th>
<th>GM 2000</th>
<th>GM 3000</th>
<th>GM 4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (mount w/o acc.)</td>
<td>19.5 kg – 43 lbs</td>
<td>18.9 kg – 40 lbs + 15 kg – 33 lbs (without accessories)</td>
<td>66 kg – 143 lbs</td>
<td>125 kg – 276 lbs</td>
</tr>
<tr>
<td>Instrument payload capacity</td>
<td>25 kg – 55 lbs</td>
<td>50 kg – 110 lbs</td>
<td>100 kg – 220 lbs</td>
<td>150 kg – 330 lbs</td>
</tr>
<tr>
<td>Latitude range</td>
<td>0° – 90° (optional)</td>
<td>0° – 70°</td>
<td>0° – 70°</td>
<td>0° – 70°</td>
</tr>
<tr>
<td>Altitude fine adjustment range</td>
<td>+/- 7.5°</td>
<td>+/- 1°</td>
<td>+/- 1°</td>
<td>+/- 1°</td>
</tr>
<tr>
<td>Counterweight shaft</td>
<td>30 mm diameter, stainless steel, weight 1.7 kg – 3.7 lbs</td>
<td>40 mm diameter, stainless steel, weight 4 kg – 9 lbs</td>
<td>50 mm diameter, stainless steel, weight 8 kg – 18 lbs</td>
<td>60 mm diameter, stainless steel, weight 13 kg – 29 lbs</td>
</tr>
<tr>
<td>Axes</td>
<td>30 mm diameter, alloy steel</td>
<td>30 mm diameter, alloy steel</td>
<td>30 mm diameter, alloy steel</td>
<td>30 mm diameter, alloy steel</td>
</tr>
<tr>
<td>Bearings</td>
<td>Pre-loaded tapered roller bearings</td>
<td>Pre-loaded tapered roller bearings</td>
<td>Pre-loaded tapered roller bearings</td>
<td>Pre-loaded tapered roller bearings</td>
</tr>
<tr>
<td>Worm wheels</td>
<td>18-teeth, 12° mm diameter, B14, B14, bronze</td>
<td>18-teeth, 24 mm diameter, B14, B14, bronze</td>
<td>30 teeth, 189 mm diameter, B14 bronze</td>
<td>43 teeth, 320 mm diameter, B14 bronze</td>
</tr>
<tr>
<td>Worms</td>
<td>20 mm diameter, tempered alloy steel, grinded and lapped</td>
<td>24 mm diameter, tempered alloy steel, grinded and lapped</td>
<td>32 mm, 24 mm diameter, tempered alloy steel, grinded and lapped</td>
<td>32 mm, 32 mm diameter, tempered alloy steel, grinded and lapped</td>
</tr>
<tr>
<td>Go-to speed</td>
<td>Adjustably from 2° to 15°</td>
<td>Adjustably from 2° to 20°</td>
<td>Adjustably from 2° to 15°</td>
<td>Adjustably from 2° to 8°</td>
</tr>
<tr>
<td>Motors</td>
<td>2 axes AC servo brushes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply</td>
<td>24 V DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>0.6 A while tracking - 1 A at maximum speed - 4 A peak</td>
<td>0.7 A while tracking - 1 A at maximum speed - 5 A peak</td>
<td>1 A while tracking - 5 A at maximum speed - 6 A peak</td>
<td>1.5 A while tracking - 5 A at maximum speed - 8 A peak</td>
</tr>
</tbody>
</table>

High Precision – for your astronomical future

14
The development of 10micron products is aimed to provide
best performance and maximum ease of use

The availability of more and more advanced and
flexible astronomical imaging systems opens new
ways to work on the sky: today, ultra-high definition and ultra-high speed imaging is within the
amateur’s reach, way more as predicted ten years ago.
10micron’s products evolved at the same pace, in
terms of tracking, pointing accuracy and speed. The
HPS-series mounts are at the peak of this process.

Every observer knows that when you are under the sky
you have little time and each set up operation comes
with the risk of compromising the night. Having excel-
lent performance on paper means nothing if you need
too many complex set up operations.

This is the reason why 10micron mounts are designed
for the user’s needs, and not to enforce the mount’s
way of operation onto the user.

10micron mounts are now used in open field as well
as in remotized sites, in educational observatories as
well as in the extreme climates of northern Canada
and the Atacama desert.