The GM 3000 HPS mount is built for observatories with instrumentation up to a weight of 100 kg – 220 lbs (counterweights not included). It is ideal for remote observatories, and its loading capacity allows for mounting instruments like 200 mm diameter refractors, 300 mm diameter Newton reflectors, 450 mm diameter Cassegrains and so on.

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 244mm and 315 teeth in right ascension, and a diameter of 192mm and 250 teeth in declination. 32mm (24mm respectively) tempered alloy steel is used for the worms. The axes themselves are made of Ø 80mm (right ascension) and Ø 50mm (declination) alloy steel for maximum rigidity.

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. Only one cable connects the control box to the mount.

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 RA- and DEC-axes form an internal cable channel for guiding all cabling through the mount. This is a deciding advantage for re-
mote observatories to avoid cable wrapping and cable breakage.

The mount uses 24V, the average required power when slewing is only 75W. This allows mount usage even in locations with limited power supply. There is also no risk of 230 V insulation.

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 GM3000 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 15 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.

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 TECHNOLOGY

HPS stands for High Precision and Speed, representing the essence of the latest 10micron mounts. High precision, thanks to an innovative and exclusive absolute encoder paired with 10micron manufacturing. High speed, thanks to high performance electronics and AC servo motors.

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 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 3000 HPS II

Main Accessories

5” dovetail bar w/o holes
500mm length
#1454560

5” dovetail clamp
strong plate with 3 locking blocks
#1454550

Counterweight 20kg
stainless steel
#1452082

Stabilized power supply AC
converts 240 V input into 27V
#1452070

Steel pier Adapter
to mount on top of pillar or leveling flange
#1453090

Baader 8” Planewave clamp
suitable for 10Micron/Baader 8” dovetail bar
#1454540 as well as for Planewave OTA’s
CDK 17, CDK 20 and CDK 24
#2451555

8” dovetail bar w/o holes
500mm length
#1454540

Adapter to mount 3” clamps
threaded for 10 Micron clamps or
3” / Pan EQ clamps
#1453545

Adapter to mount on top of pillar or leveling flange
#1453090

Baader Pan EQ dual clamps
to hold 44mm EQ dovetails, bottom has 3”
dovetail built-in with brass clamping blocks
190 / 230 / 370 mm long
#2451525 / #2451566 / #2451565

Missing something?
More accessories on next page and
www.10micron.de

8

Stabilized power supply AC
converts 240 V input into 27V
#1452070

Heavy steel pillar + flanges
Octagonal pillar, dual wall design with inner
cabling tubes. Flanges available in straight or 20°
80/100/115/125/134/145/155/165 cm
#2451120 + #2451186 / #2451183 (20°)

Baader Sidewing
Use on left or right side. Allows
adaptation of additional plates/ clamps (see also page 11)
#2451568

Baader Baseplate 400 mm
for Sidewings
allows amongst other things the adap-
tation of Baader Guidescope rings
(size I, II, and III)
#1500340

Baader Sidewing
use on left or right side. Allows
adaptation of additional plates/ clamps (see also page 11)
#2451568

Baader 8” Planewave clamp
suitable for 10Micron/Baader 8” dovetail bar
#1454540 as well as for Planewave OTA’s
CDK 17, CDK 20 and CDK 24
#2451555

8” dovetail bar w/o holes
500mm length
#1454540

Adapter to mount 3” clamps
threaded for 10 Micron clamps or
3” / Pan EQ clamps
#1453545

Adapter to mount on top of pillar or leveling flange
#1453090

Baader Pan EQ dual clamps
to hold 44mm EQ dovetails, bottom has 3”
dovetail built-in with brass clamping blocks
190 / 230 / 370 mm long
#2451525 / #2451566 / #2451565

Missing something?
More accessories on next page and
www.10micron.de

8
ADDITIONAL ACCESSORIES

Everything you need for your GM 3000 HPS mount

Missing something? More accessories on www.10micron.de

ADDITIONAL ACCESSORIES

#1453100
Wooden pallet-box shown with (mounted) Pier ad-
apter #1453090. Both items are mandatory for safe mount trans-
portation.

#1453072
Extended connector cable from mount to control box, for GM
3000/4000, length 2.5m. Longer cables not available due to
risk of signal loss.

#1482010
StickStation (USB-Weatherstation) delivers high precision data of
barometric pressure, temperature, relative humidity and dew-point

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

#1454105
GPS receiver module
Directly connected to the mount, provides the exact time and coor-
dinates of the observation site.

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

BAADER 8" SIDEWING SYSTEM

The perfect addition to complete your GM 3000 HPS mount

Telescopes above 12" OTA-diameter must not be
fastened with a 3" dovetail bar, severe torsion will
inevitably happen. For this reason we supply an 8"
dovetail system which can firmly hold OTA diam-
eters up to 24" in diameter and 150kg weight.

For fastening auxiliary telescopes without any tor-
sion as well, we supply a system of sidebars (Baad-
er Sidewings plus additionales plates/clamps, see
above) that firmly fasten onto the 8" dovetail clamp.

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
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.

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 observatories as well.
10 MICRON HPS MOUNTS

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

The generation of 10Micron HPS mounts is only available in UV-stabilized hardened black anodizing. This surface looks as if it were a structured paint. But it is long-lasting and much more scratchproof than ordinary black paint, while it shows a deep and lustrous 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 unguided imaging.
- Closed loop (encoder controlled) satellite tracking
- Speed / speed – up to 20°/s (GM 2000)
- Extremely low power consumption and miniature format (20 x 15 x 8cm) 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 necessary in the field – all functions in the onboard computer can be accessed via stand-alone hand control unit (HC)
- Precise multistar pointing models, entering satellite and comet trajectories, programming individual observing sessions and much more
- Well documented firmware and drivers, working autonomously with additional planetary 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 10/100/1000LANandWiFi/Floption included – 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

GM 3000 HPS

High Precision – for your astronomical future

GM 1000 HPS

- Mount Type
- Weight (mount w/o acc.)
- Weight, Uberrorable volume (mount)
- Instrument payload capacity
- Latitude range
- Azimuth fine adjustment range
- Counterweight shaft
- Axes
- Bearings
- Worms
- Motors
- Power supply
- Power consumption
- Go-to speed

Technical data

<table>
<thead>
<tr>
<th>Specification</th>
<th>GM 1000</th>
<th>GM 2000</th>
<th>GM 3000</th>
<th>GM 4000</th>
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<tbody>
<tr>
<td>Mount Type</td>
<td>GM 1000 HPS and TEC 140</td>
<td>German Equatorial Mount</td>
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<tr>
<td>Weight (mount w/o acc.)</td>
<td>19.5 kg</td>
<td>33 kg</td>
<td>55 kg</td>
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<td>Weight, Uberrorable volume (mount)</td>
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<td>72 lbs</td>
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<td>Instrument payload capacity</td>
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<td>Azimuth fine adjustment range</td>
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<td>40 mm diameter, stainless steel, weight 4 kg</td>
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<td>Bearings</td>
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<td>Pre-loaded tapered roller bearing</td>
<td>Pre-loaded tapered roller bearing</td>
<td>Pre-loaded tapered roller bearing</td>
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<tr>
<td>Worms</td>
<td>20 mm diameter, tempered alloy steel, grinded and tapped</td>
<td>24 mm diameter, tempered alloy steel, grinded and tapped</td>
<td>32 mm / 24 mm diameter, tempered alloy steel, grinded and tapped</td>
<td>32 mm diameter, tempered alloy steel, grinded and tapped</td>
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<td>Motors</td>
<td>2 axes AC servo brushes</td>
<td>2 axes AC servo brushes</td>
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<td>Power consumption</td>
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<td>- 0.7 A while tracking</td>
<td>- 1 A while tracking</td>
<td>- 1.5 A while tracking</td>
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<td>- 3 A at maximum speed</td>
<td>- 3 A at maximum speed</td>
<td>- 3 A at maximum speed</td>
<td>- 5 A at maximum speed</td>
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<td></td>
<td>- 4 A peak</td>
<td>- 5 A at maximum speed</td>
<td>- 5 A at maximum speed</td>
<td>- 8 A peak</td>
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<td>Go-to speed</td>
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<td>Adjustable from 2°/s to 20°/s</td>
<td>Adjustable from 2°/s to 8°/s</td>
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</tbody>
</table>

For more information, visit 10micron.com

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We reserve the right for errors and manufacturers modification
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 excellent 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.

AZ 2000 mount in NyAlesund at 80° North latitude