ASTRO KIT REVIEW

TTS-160 Panther mount

It exudes class and quality, but can you prowl the night sky in style with this innovative Scandinavian telescope mount? Ade Ashford finds out.

You can remove the counterweight arms and Losmandy-format saddle and attach a sidemount Vixen-style dovetail saddle to either side of the altitude axle. This way, two telescopes each up to about 8kg in weight may be mounted simultaneously for a versatile photo-visual setup. Image: Niels Haagh.

At a Glance

TTS-160 Panther mount

Weight:	17.3kg (mount) 12.1kg (tripod and pier extension) 2 × 4kg stainless steel counterweights.
Manufacturer:	Track The Stars, Denmark; trackthestars.com
Email:	nth@trackthestars.com
Supplier:	Peak 2 Valley Instruments; Tel. (UK) 07957 242235; www.peak2valleyinstruments.co.uk
Email:	telescope@sky.com

UK Price list

TTS160A mount head with handpad, cables carry bag	£2880
TTS160B top mount arm	£349
TTS160J folding pier with carry bag	£729
TTS160C counter weights 2 × 4kg with carry bag	£199
TTS160D counter weights 2 × 8kg with carry bag	£289
TTS160G telescope rOTAtor with carry bag	£849
TTS160F mini pier	£259
TTS160H side mount dovetail saddle	£169
TTS alt-az standard set-up with pier, 4kg weights	£4157
TTS equatorial standard set-up with pier, rOTAtator, 4kg weights	£5006
TTS Mammoth mount head	£9275

While many of us dream of owning a back-garden observatory, most of us have to take our telescope(s) away from home if we are to enjoy a sky devoid of obscuring buildings, trees and/or light pollution. Even if a rural idyll is a short drive away, we can struggle with mounts that are difficult to carry, set up, and time-consuming to align – particularly if imaging is our aim. Dissatisfied with off-the-shelf solutions, Danish mechanical engineer Niels Haagh resolved to design and build a high-precision computerised mount from scratch.

Haagh cites the construction of a complete six-inch (150mm) Newtonian in a suitcase for a 1986 trip to observe Halley's Comet from the Australian outback as the genesis of his quest for the ideal portable mount. A keen astrophotographer with nearly four decades of experience, he founded Track The Stars as a privately owned Danish business in 2004, releasing the first incarnation of the TTS-160 mount three years later. Niels Haagh handles the company's mechanical engineering, while business partner Jesper Rubech Rasmussen looks after the electronics. This review focuses on the current TTS-160 Panther alt-azimuth mount, employing the ExactDrive (more on that later) that made its debut in 2010.

Overview and first impressions

The mount's drive system, bearings and electronics (except for the handpad controller, more of which anon) are contained within a smooth satin-black anodised cylinder 16cm in diameter and 50cm high topped by an 8cm radius hemispherical dome. The internal components are well-protected from moisture and contaminants. The upper 20cm of the cylinder rotates, providing the mount with tracking in azimuth.

A seven-hour integration was required for this image of the open cluster NGC 1893 (associated with the HII region IC 410) in Auriga, using a Borg 125SD at f/3.9 plus a CentralDS/Canon 60D in conjunction with Astrodon 5nm OIII and 5nm H-alpha filters. An autoguided TTS-160 Panther mount equipped with a TTS rOTAtor to eliminate field rotation provided accurate tracking for the session. Image: Chris Howey/ Alpha Quadrant Observatory.

The TTS-160's altitude axis passes through the base of the crowning 16cm-diameter dome, the stubby axles on either side attached (in the default configuration) to slotted counterweight arms joined to a top saddle configured to accept a Losmandy D-type dovetail. Twin 4kg stainless steel counterweights are sufficient for instruments up to about 10kg in mass. With a pair of 8kg counterweights, the TTS-160 is designed to carry a very respectable 20kg (~45lb) optical tube payload.

If you wish to opt for a compact solution and save on weight, you have the option to remove the counterweight arms and Losmandy-format saddle. Each altitude axle on either side of the mount can then accommodate a sidemount Vixen-style dovetail saddle. This way, two telescopes, each up to about 8kg in mass, may be mounted simultaneously, making for a very versatile photo-visual set-up.

Track The Stars have designed a compact pier base for the TTS-160 in matching satin-black anodised aluminium. When not in use the 16cm diameter, 60cm long cylinder houses an ingenious fully assembled tripod in collapsed form. When deployed, the pier base – which has three integral threaded tensioning rods to provide extreme rigidity – places the pier head 76cm off the ground on three feet 100cm apart. The mount head and pier base are locked together by a bolt tightened by turning a disc – no tools are required. From ground level to the top of the Losmandy dovetail saddle is about 129cm. If you prefer to use your own tripod, Track The Stars can provide a pier adapter to suit most set-ups.

Speedy set up

Compact and easy to pack in the trunk or footwell of even the smallest car when travelling to dark skies, a typical TTS-160 Panther package comes in

Track The Stars' TTS-160 Panther mount with the TTS rOTAtor makes a formidable imaging platform – even when laden with a fully-equipped Borg 125SD f/3.9 (with focal reducer) apochromat, CDS Cooled DSLR, and Orion Mini Guide scope/QHY5 – as evidenced by Chris Howey's stunning deep-sky images accompanying this article. Image: Chris Howey/Alpha Quadrant Observatory.

four padded neoprene cylindrical transport bags in a striking orange and black livery: two bags 60 × 20cm in size, weighing 17.3kg (mount) and 12.1kg (tripod and pier extension), plus two more 20 x 20cm in size, containing the handpad and cables and the 2 × 4kg stainless steel counterweights.

One of the great selling points of the TTS-160 is that it can be set up on ground that is merely approximately level and no polar alignment is necessary (just alignment on one or more named stars or a planet), the whole process from unpacking to observing is achieved in about ten minutes. This claim is certainly true. I found that with minimal practice I could unpack and assemble the mechanical parts in around three minutes, attach the optical tube and cables in a similar amount of time, setting aside around five minutes to get an accurate two-star alignment.

Whereas I always feel a sense of trepidation when hefting my fully laden Celestron C11 onto the steeply inclined Losmandy saddle of its CGEM mount in the dark, I felt relaxed attaching this 14kg optical tube to the horizontal saddle of the TTS-160 with the counterweights fully extended prior to balancing, as the mount was naturally stable in this set-up configuration – even with the twin altitude locks disengaged.

The handpad, alignment and tracking

Anyone familiar with the computerised hand controllers supplied with Celestron, Meade or Sky-Watcher mounts largely know what to expect: a two- or four-line alphanumeric display with a numeric keypad and menu buttons to select the various celestial object categories. The TTL-160 Panther's handpad is so radically different as to represent a paradigm shift in computerised GoTo mount control. There are no numeric buttons on the elliptically-shaped unit since the designers reasoned that in the cold it can be hard to press conventional buttons wearing gloves anyway. Instead, there is a central multi-line red LED alphanumeric display and three knobs: that's it!

The TTS-160's handpad display is contextual, so each control – there are two altitude knobs, one on either side, and an azimuth knob in the lower centre of the display – can be rotated to select a menu item, or pressed to confirm an operation. The TTS-160 is supplied with a 34-page manual and the configuration and use of the handpad is covered in considerable detail. The unit contains a real-time clock with battery backup that needs to be configured only upon on its first use and the observer's location needs to be established. As befits a portable mount, multiple observing locations can be saved.

Given that the TTS-160 knows the time and saved location on subsequent start-ups, for casual observing one may align on a single named star or planet and, by turning the altitude and azimuth knobs on the handpad, direct the telescope towards it. The controls are so intuitive to use – the faster one spins the altitude or azimuth knob, the quicker the mount slews about that axis (up to a maximum of 3.5 degrees/second). As you approach the alignment target, turn the appropriate axis knob more slowly for refined pointing – there are no sudden changes in tracking speed. At all slew speeds the spring-loaded worm gears and rollers of the internal ExactDrive are refreshingly quiet, minutely responsive and backlash-free. True to its name, the Panther purrs when tracking.

The TTS-160 tracks the chosen object as soon as it is selected, but for precise GoTo pointing over the whole sky or for astrophotography it is necessary to perform a two- or three-star alignment. The handpad has built-in planet, bright star, Messier, NGC and IC catalogues, or you can enter your own GoTo co-ordinates. Once accurately aligned, the TTS-160 nails every selected object with enviable precision; it is a delight to use. According to the review mount's handpad splashscreen, it was running Track The Stars v1.2 software, firmware version build 322 03/01/2015. The firmware can be updated through a PC interface. When not in use, the handpad conveniently sticks to magnetic pads on either side of the mount – no holster necessary.

Note that while the TTS-160 Panther mount can be slewed manually in altitude prior to alignment by unlocking the altitude axis clamps, the azimuth axis friction drive needs to be loosened from the

The TTL-160 Panther's handpad is so radically different in form and operation from others on the market as to represent a paradigm shift in computerised GoTo mount control. There is a central multi-line red LED alphanumeric display and three knobs: that's it. The display is contextual, so each control – there are two altitude knobs on either side and an azimuth knob in the lower centre of the display – can be rotated to select a menu item, or pressed to confirm an operation. Image: Ade Ashford.

In 2012, Track The Stars introduced the rOTAtor, a field rotation compensator that sits between the mount's Losmandy D-type dovetail saddle and the optical tube, connected to and controlled by the TTS-160's handpad. The rOTAtor duplicates the Losmandy saddle and adds mere centimetres to the height of the mount. For most areas of the sky, the rOTAtor eliminates image field rotation for CCD imaging or DSLR exposures of several minutes length before it reaches its rotation stop and needs to be reset – a simple process using the handpad's built-in software.

default setting if one wishes to move the mount in azimuth by hand. This is covered in the manual, but once aligned it must be moved using the internal motors via the handpad or external computer control. Incidentally, the mount has a standard RS232 port and accepts LX200 protocol commands supported by most desktop planetarium software via the supplied cable. ASCOM drivers for LX200 work too. Alternatively, you may control the TTS-160 wirelessly via a smartphone or tablet using a WiFi-to-serial adapter such as SkyFi.

The rOTAtor and astrophotography

Given that the TTS-160 Panther is an alt-azimuth mount, it possesses a number of advantages over an equatorial, since one doesn't need to see Polaris or polar align, plus it can track for hours through the meridian. Naturally, when tracking near the zenith the mount is moving rapidly in azimuth and the image field is rotating rapidly – neither being a problem for visual use, but undesirable for astrophotography. In 2012, Track The Stars introduced the rOTAtor, a field rotation compensator that sits between the mount's Losmandy dovetail saddle and the optical tube, and is connected to and controlled by the TTS-160's handpad. The rOTAtor completely eliminates image field rotation for CCD imaging or DSLR exposures. Depending on the position in the sky the rOTAtor can de-rotate for 1-2 hours before it reaches it's rotation stop and needs to be reset – a simple process using the handpad's built-in software.

So, how well does the system work? The literature states that the mount's ExactDrive has a periodic error (PE) of +/– six arcseconds accuracy about both axes. In tests with my HyperStar3-enabled Celestron C11 Schmidt–Cassegrain and twin 8kg counterweights necessary to balance it, the TTS-160 Panther carried the mass with ease, slewing and tracking with aplomb. Regarding overall tracking error without guiding, in azimuth the mount displays an impressively smooth peak-to-peak PE of around 10 arcseconds in azimuth and around 14 arcseconds in altitude. A QHY Mini Guidescope Kit and a QHY5-II autoguider in conjunction with PHD2 software works well with this mount, as witness the superb images captured by UK astro-imager Chris Howey.

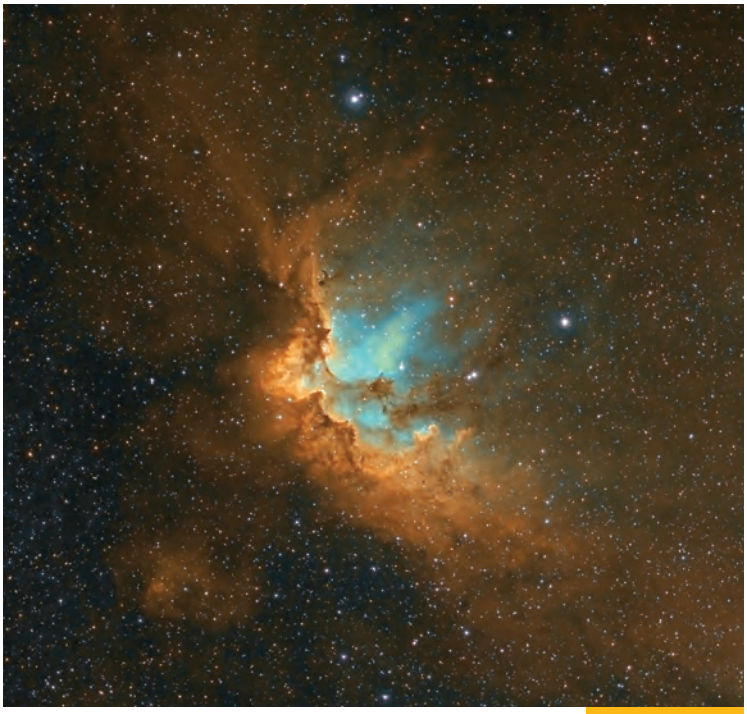
Conclusions

In daring to think outside the box, designers and engineers Niels Haagh (mechanics) and Jesper Rasmussen (electronics) have applied the Danish design principles known and loved throughout the world to an innovative game-changer of a mount. It looks, feels and operates like no other commercial unit, exuding a confident air of quality in stainless steel, brass and anodised aluminium. If your optical tube and accessories exceed the TTS-160 payload limit of around 20kg (~45lb), a heavy-duty TTS-300 mount for observatory installation is available.

With such a well-conceived and engineered mount any niggles are refreshingly minor, but worth mentioning nonetheless. The TTS-160 Panther requires a 12V DC supply rated at 3A, which is easily provided via a rechargeable battery pack in the field, but I would like to have seen a more secure means of attaching the power plug, as the cable rotates with the mount. Given its premium status, I would also like to have seen a built-in LiIon battery like that supplied with the Celestron Evolution, for example.

The TTS-160 is considerably more expensive than other alt-azimuth solutions, such as the iOptron AZ PRO or the Sky-Watcher AZ-EQ6GT, but with the TTS-160 you are paying for low-volume, bespoke precision engineering that will last a lifetime. Furthermore, the mount has enthusiastic support from its manufacturers and a growing fan base worldwide.

Ade Ashford has been reviewing astronomical equipment for over 20 years.



The Wizard Nebula imaged using an autoguided TTS-160 Panther mount equipped with a TTS rOTAtor to eliminate field rotation. The mount carried a Borg 125SD at f/3.9 and a ZWO ASI1600MM camera. Image: Chris Howey/Alpha Quadrant Observatory.

The TTS-160 Panther mount's twin stainless steel counterweight arms are slotted to accept and easily balance two 4kg or 8kg stainless steel counterweights, depending on optical payload. Image: Ade Ashford.