mo-sys
StarTracker Max
Optical Camera Tracking System

TAKE YOUR PRODUCTION TO THE MAX

Maximum Precision

Real-time Camera Tracking Solution for Virtual Production and AR

Mo-Sys pioneered random marker-based camera tracking technology with the introduction of StarTracker. Trusted by the world's leading broadcasters, film producers, OEMs and events companies, StarTracker has the largest installed base of any professional camera tracking solution.

StarTracker Max has been developed with the benefit of this unrivalled 25 years' experience, and marks the beginning of an exciting new platform, building on trusted StarTracker technology. The new, lightweight, and miniaturised StarTracker Max leverages improved hardware and algorithms to produce Mo-Sys' most accurate tracking solution to date.

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Absolute tracking for film, broadcast, education, and corporate virtual production

- **Professional camera tracking -** StarTracker Max has been designed to handle the rigours of professional level broadcast and film applications in the largest studios, with ceilings 16 m high and beyond.

- **Unrivalled tracking accuracy** – Mo-Sys StarTracker Max does not drift. Tracking remains accurate and there is no need for time-consuming and costly daily recalibration.

- **Compatible with digital markers** – StarTracker Max is fully compatible with Brompton digital markers. This is useful when working in LED volumes with ceiling panels.

StarTracker Max
Key features

High performance tracking & future proof design

StarTracker Max utilises our most powerful platform yet with an exciting future of game-changing capabilities yet to be announced, together with guaranteed access to future software/firmware updates. Max offers high resolution and high framerate performance for cinematic applications and film speeds, such as 24 fps together with Auto-Aligner technology which simplifies sensor calibration.

Powerful processing

Just like the original StarTracker, StarTracker Max does not require any additional PC, all processing is handled within the miniaturised 500g unit which simplifies set-up and ensures smooth operation.

StarTracker Max
Key features

Intuitive user interaction

The new, simple web-based user interface features user-friendly time-saving wizards. Star maps can be created, aligned and easily deployed to other StarTrackers on the network and the system can be managed from any device, e.g. PC, phone, or tablet. More detailed power features can still be accessed via the familiar touch screen or VNC network connection.

Unobtrusive and lightweight

StarTracker Max utilises a new miniaturised, ultra-lightweight design which significantly reduces on-camera clutter and minimises Steadicam operator fatigue.

One-time set-up and autonomous operation

StarTracker Max offers one-time simple set-up and autonomous operation combined with mission critical reliability. Once calibrated StarTracker Max works without requiring an operator, and a useful visual indicator confirms tracking status when a monitor is not used.

StarTracker Max
Key features

Maximum mounting possibilities

StarTracker Max is traditionally mounted directly to the video camera, where it can track on pedestals, cranes, jibs, steadi and cable cams. The sensor can be mounted on a bracket or directly to the processor unit and angled for optimal view of the stars thanks to the integrated secure rosette connection.

Improved connectivity

Reliability has been further improved with the use of individual and robust connectors for ethernet, sync, power and lens data. Powering is via DTAP* for powering from cameras, batteries or via the supplied mains PSU. A GrassValley-integrated processor unit is also available for LDX-86 cameras for reduced cabling and external boxes; tracking data is available via IP from the camera and CCU.

High-speed recording

StarTracker Max enables high-speed recording and/or data output at a multiple of genlock, up to 250 fps for high-speed filming and reduced latency.

*Optional 4-pin XLR, RED 2-pin Lemo and others available

StarTracker Max
Key features

Customisation

A REST-based interface enables custom user programs and scripts to control and interact with StarTracker Max, for example loading lens files.

Flexible tracking output

Tracking data can be simultaneously sent to 3 IP destinations + 1 broadcast destination; the port and protocol can be individually set for each. Tracking delays can be ignored on a per-output basis, making synchronisation between LED walls, set extensions and other virtual elements easier.

Robust tracking

A wider field of view and optical tracking through +/- 180-degrees of angular tilt and roll offers maximum freedom of movement (stars can be placed on the walls and floor to maintain tracking, even when rolled upside down). With ceiling mounted stars, the camera can be pointed almost straight down and StarTracker Max will maintain accurate tracking.

StarTracker Max
Key features
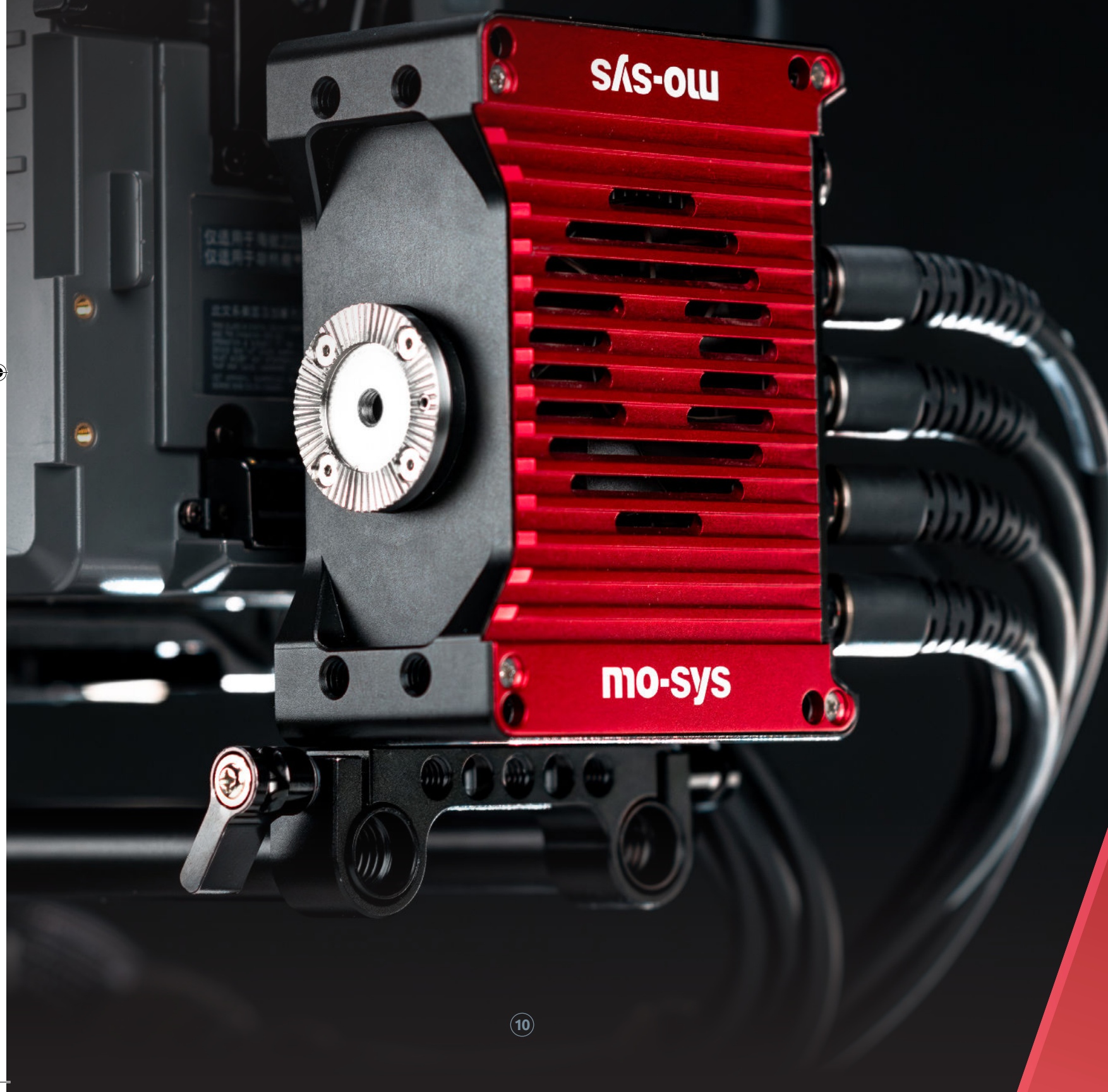
StarTracker Max
Key features

Resilience and reliability

StarTracker Max is unaffected by powerful studio lighting. Creative lighting changes are possible because StarTracker Max uses a different spectrum of light to track. Mo-Sys retro-reflective "stars" can be applied randomly above the lighting grid and do not restrict the studio lights in any way.

Excellent synchronisation

StarTracker Max enables fast camera movement to keep talent perfectly framed while maintaining accurate AR and VR asset positioning.

StarTracker Max
Key features

6-axis tracking with lens zoom, focus and iris

Precision blending of photo-realistic 3D virtual graphics with the real world, delivering an immersive mixed reality experience. An optional cable is required for Fujinon Premista.

Export tracking data

Using the recorder in Mo-Sys VP Pro*, our plug-in for Unreal, tracking data can be recorded and freely exported as FBX files for use in postproduction
*requires active VP Pro license.

StarTracker
Customer quotes

"We're just not worried about Mo-Sys. We've done 80+ productions and never had an issue with StarTracker." **Mark Pilborough-Skinner, Head of Virtual Production, Garden Studios**

"We've been using Mo-Sys, and StarTracker specifically for 3 years. Once you set it up, turn it on and within a couple of seconds it locks in and we're ready to do our virtual productions. Day after day we've been using the same Star Map for three years and its just rock solid, every time we turn it on. Every time we do a VR installation, we always recommend Mo-Sys because it is, in our opinion, the most reliable, rock solid camera tracking you can get." **Chris Tornow, Pfinix Creative Group**

"StarTracker is extremely robust, once it's set up and calibrated, which doesn't take long, you come in in the morning, turn it on and it just knows where it is, and it is bullet proof, and that's exactly what you want. It's one less thing we need to worry about". **Jim Rider, Virtual Production Supervisor**

"We've been using StarTracker for almost two years now and its an incredibly stable system." **Tim Moore, CEO, Vu Technologies**

"The StarTracker performed brilliantly. It really is a wonder product." **Danny Popkin, Technical Manager, BBC Studios**

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System Information

	StarTracker	StarTracker Max
Axes tracked	6DOF: position & rotation 2 lens: (zoom, focus)	6DOF position & rotation + 3 lens: (zoom, focus, iris)
Camera mounting	Any (ped, jib, steadicam, handheld)	Any (ped, jib, steadicam, handheld, cable cam)
Lenses encoded	External - Canon, Fujinon, film lenses Internal (Serial) - Canon & Fujinon	External - Canon, Fujinon, film lenses, Iris Internal (serial) - Canon, Fujinon, Premista
Power consumption	40W	30 W peak (approx. 20 W average)
Voltage range	14-24 V DC	12–20 V DC
LED ring wavelength	850 nm (IR) 455 nm (blue) on request	755 nm (IR)
Tracking server / PC	Not required	Not required
Display	Not required for daily operation after initial setup	Not required for daily operation after initial setup
STUDIO SPACE		
Min studio size	No lower limit (subject to seeing min stars)	No lower limit (subject to seeing min stars)
Max studio size	100 x 100 m (no explicit limit)	100 x 100 m (no explicit limit)
Min ceiling height	>0.3m from sensor*	>0.3m from sensor*
Max ceiling height	16+ m* (no artificial restrictions)	16+ m* (no artificial restrictions) *with appropriately sized and spaced stars
Lighting restrictions	No restrictions	No restrictions
Number of studios/tracker	No limit (subject to map memory storage)	No limit (subject to map memory storage)
Number of studios/tracker	No limit	No limit
TRACKING METHOD		
Lens	External encoders or VR lens readout	External encoders or VR lens readout
Position/rotation	Tracks randomly positioned retro-reflective stickers Patent confirmed: EP2962284A2	Tracks randomly positioned retro-reflective stickers Patent confirmed: EP2962284A2
Protocol	Mo-Sys F4, FreeD	Mo-Sys F4, FreeD
Connection	UDP (IP) via RJ45 socket	UDP (IP) via industrial connector Serial (RS422) via industrial connector
Genlock	Analogue SDI, BnB, Tri-Level	Analogue SDI, BnB, Tri-Level
Min delay	1 field (NTSC: 16.6 ms)	1 field (NTSC: 16.6 ms)

Comparison Table

	StarTracker	StarTracker Max
STAR DOTS		
h = average floor-star height		
Diameter	Between 1-15 cm depending on height	Between 1-15 cm depending on height
Spacing	Approx 1/10 floor-star height	Approx 1/10 floor-star height
Minimum visible to track	8 (20+ well-spaced recommended)	8 (20+ well-spaced recommended)
Configuration	Ceiling, wall or floor mounted Stickers or LED wall markers*	Ceiling, wall or floor mounted Stickers or LED wall markers* * Needs sensor unit version without filter
ACCURACY		
Positional	Approx 0.03% of h (nominal*)	Approx 0.03% of h (nominal*)
Angular	Approx 0.003 deg (nominal*)	Approx 0.003 deg (nominal*)
Encoding	16 bit	16 bit
Time to find pose after tracking loss	< 1 s (nominal)	< 1 s (nominal)
Drift accumulation	No drift accumulation	No drift accumulation
Daily optical calibration	None required	None required
Sensor <-> camera offset calibration	Auto-Aligner	Auto-Aligner Sensor position presets on film camera Extra-sensory positioning
DIMENSIONS		
Sensor Unit	7.5 x 7.5 x 7.5cm	4 x 4 x 9cm
Processor Unit	19 x 14 x 5cm	11 x 8 x 5cm
WEIGHT		
Sensor Unit	400g	250g
Processor Unit	1450g	450g

*As an optical system the accuracy depends on the distribution of stars visible to the sensor and their position in 3D space. Note: exact specifications are subject to change.

For more information
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