mo·sys

StarTracker
In-studio Optical Camera Tracking System

VISION IN MOTION

The world's leading broadcasters, major motion film producers, OEM and events companies depend on StarTracker daily throughout their facilities

Real-time Precision Camera Tracking for Virtual Production

Mo-Sys Engineering is an innovator of technical solutions which advance Virtual Production workflows. With over 25 years' experience, Mo-Sys pioneered marker-based camera tracking technology with the introduction of StarTracker.

With the largest installed base of any professional camera tracking vendor, StarTracker offers users unrivalled tracking accuracy across 6 axis, simple one-time set-up and autonomous operation, combined with mission critical reliability.

Absolute tracking for film and broadcast

- **Professional camera tracking** – StarTracker is intended for professional broadcast and film applications with studios up to 20m in height

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

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

"As the top optical tracking system, Startracker is our choice for our studios and we've been impressed with the system's ease of use and low latency. Its proved itself to be a very robust and reliable tracking system and that's what our clients expect when they use our facilities."

Dan Hamill, Co-founder and Commercial Director at 80six
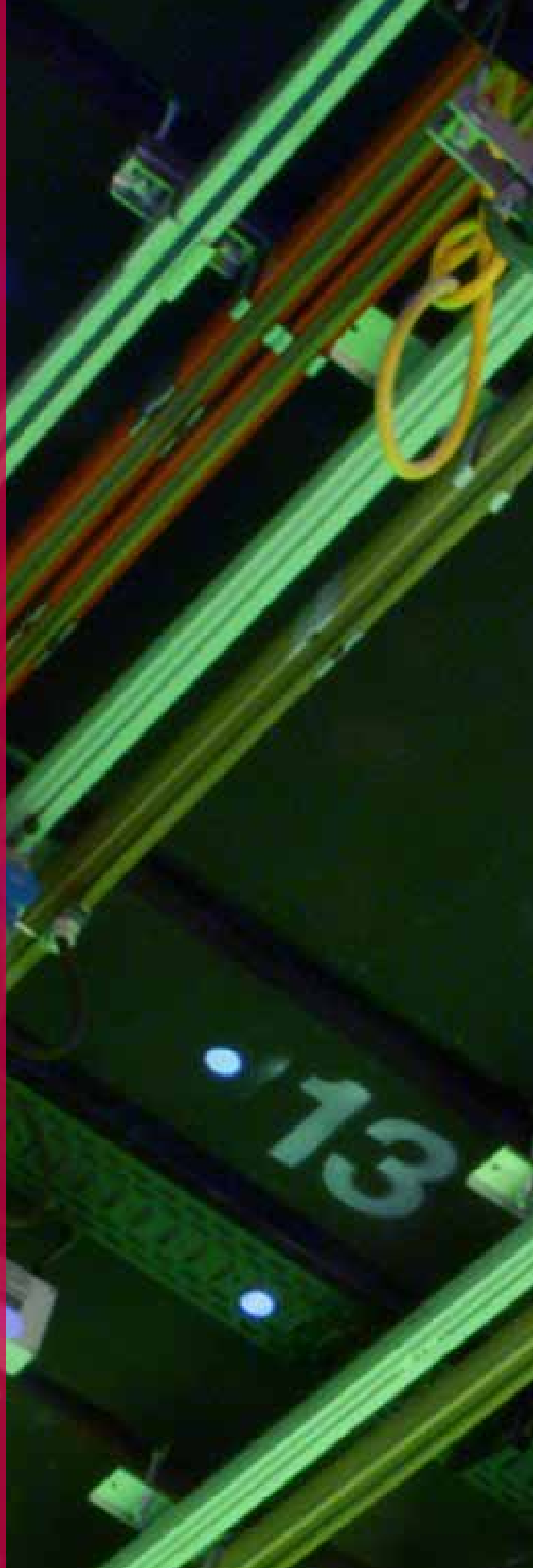
Key Features

In-studio optical camera tracking

- **Robust tracking** – Far-reaching 120-degree field of view optical tracking offers maximum freedom of movement. The camera can be pointed almost straight down and StarTracker will maintain accurate tracking

- **Resilience and reliability** – StarTracker is unaffected by powerful studio lighting. Creative lighting changes are possible because StarTracker 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 enables fast camera movement to keep talent perfectly framed while maintaining accurate AR and VR asset positioning

- **Autonomous operation** – once calibrated StarTracker works without requiring an operator, minimising the cost of operation

- **6-axis tracking with lens zoom and focus** – precision blending of photo-realistic 3D virtual graphics with the real world, delivering an immersive mixed reality experience

Unobtrusive & Flexible mounting

StarTracker can be mounted above, offset to the side, pointing up or down. It is traditionally mounted directly to the video camera but can also be used to track other objects such as cranes

Patented Technology

- **Unique retro-reflective markers** – StarTracker tracks from a random constellation of retro-reflective markers mounted to the ceiling or floor

- **Wired or wireless operation** – particularly useful in live broadcast, wireless operation can be utilised to provide Steadycam operators with maximum freedom

- **Largest installed base of any professional camera tracking vendor** – trusted by broadcasters, OEM manufacturers, major motion films, events companies, and enterprises across the world. Multiple re-orders from broadcasters further validate the system

- **Integrated by OEM partners: Vinten, Cartoni, Shotoku, Grass Valley, Panasonic** – no other camera tracking vendor is utilised and trusted by so many OEM vendors

- **Patented technology** – Mo-Sys pioneered marker based camera tracking, and as the leader in the space continues to develop the technology

- **Auto Aligner** – rapid studio calibration technology, minimising setup time prior to shooting

- **Custom lens profiling** – StarTracker includes custom lens profile support, provided by Mo-Sys directly, enabling even greater realism to your mixed reality content

- **Expandable and upgradable** – whether you have a green screen virtual studio, or LED wall virtual studio, StarTracker is the only tracking system you'll need

- **VP Pro** – our feature rich direct integration to Unreal Engine for interfacing tracking and lens data. This is the first product from our Unreal Engine development team, several more products (Including patent pending technologies) will be announced shortly

- **VP Studio Manager** – a remote system for setting up multiple StarTracker systems via a single interface. Makes set up and camera lens changes simple to administer

"Virtual production opens many new possibilities, such as filming multiple locations in one day on one stage. With that freedom comes complexity. Mo-Sys camera tracking provides a constant in a world that is continuing to evolve."

Mark James, Cinematographer
Photo Credit: Gary Adcock
Camera: FUJIFILM X-T3

"We've used every kind of tracking system out there over the last few decades and the StarTracker has proven to be the most stable and reliable system."

Paul Lacombe, DisruptAR

"I just find that the StarTracker is extremely robust, once its set-up and calibrated, which doesn't take long, you come in in the morning and turn it on and it just knows where it is, it's just bullet proof and that's exactly what you want."

Jim Rider, Final Pixel

"We always recommend Mo-Sys because it is, in our opinion the most stable and the most rock solid camera tracking that you can get."

Chris Tornow, Pfinix Creative Group

"We've been using the Mo-Sys StarTracker for almost 2-years now and its an incredibly stable system. You turn it on, and it works every time. I highly recommend them."

Tim Moore, Vu Technologies

System information

StarTracker

Axes tracked	6DOF: position & rotation 2 lens: (zoom, focus)
Camera mounting	Any (ped, jib, steadicam, handheld)
Lenses encoded	External - Canon, Fujinon, film lenses Internal (Serial) - Canon & Fujinon
Power consumption	20 W
Voltage range	12-24 V DC
LED ring wavelength	850 nm (IR) 455 nm (blue) on request
Tracking server / PC	Not required
Display	Not required for daily operation after initial setup

Studio space

Min studio size	No lower limit
Max studio size	100 x 100 m (no explicit limit)
Min ceiling height	>0.3 m from sensor*
Max ceiling height	16+ m*
Lighting restrictions	No restrictions *with appropriately sized and spaced stars
Number of studios/tracker	No limit
Number of trackers/studio	No limit

Tracking method

Lens	External encoders or VR lens readout
Position/rotation	Tracks randomly positioned retro-reflective stickers Patent confirmed: EP2962284A2
Protocol	Mo-Sys F4
Connection	UDP (IP) via RJ45 socket
Genlock	Analogue SDI, BnB, Tri-Level
Min Delay	1 field (NTSC: 16.6 ms)

Star dots

h = average floor-star height	
Diameter	Between 1-15 cm depending on height
Spacing	Approx 1/10 floor-star height
Minimum visible to track	11 (20+ well-spaced recommended)
Configuration	Ceiling or floor mounted

Accuracy

Positional	Approx 0.03% of h (nominal*)
Angular	Approx 0.01 deg (nominal*)
Encoding	16 bit

*As an optical system the accuracy depends on the distribution of stars visible to the sensor and their position in 3D space

Time to find pose after tracking loss	< 1 s (nominal)
Drift accumulation	No drift accumulation
Daily optical calibration	None required

Dimensions

Sensor Unit	7.5 x 7.5 x 7.5cm
Processor Unit	19 x 14 x 5cm

Weight

Sensor Unit	390g
Processor Unit	1450g

For more information

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