

Smart Telescopes

Will they replace regular astrophotography equipment?

What are Smart Telescopes?

- A smart telescope is an all-in-one, computerized telescope that uses a built-in camera, internal computer, and smartphone app to automatically find, track, and photograph deep-sky objects.

How do Smart Telescopes Work?

- **Auto-alignment:** They use a process called plate solving to take a quick photo of the stars, figure out where they are pointed, and align themselves without user help.
- **Tracking:** Internal motorized mounts move automatically to keep pace with the Earth's rotation so your target stays centered.
- **Live-stacking:** They capture many short digital exposures in a row and layer them together on the fly to remove noise and reveal faint colors in deep space.
- **Portability:** Many models are compact and lightweight, making them easy to transport compared to conventional multi-piece astrophotography gear.

What Smart Telescope Products are available?

Brand	Primary Focus	Notable Models
ZWO (Seestar)	Budget-friendly, highly capable all-in-one scopes.	Seestar S50 Pro, Seestar S30 Pro
DWARFLAB	Ultra-compact, dual-lens scopes for both wildlife and astronomy.	Dwarf Mini, Dwarf 3, Draco
Vaonis	Premium design, stylized aesthetics, and sharp refractor optics.	Vespera 2, Vespera Pro
Unistellar	Digital reflectors with citizen-science integration.	Odyssey Pro, eQuinox 2, eVscope 2
Celestron	Traditional optics giant building heavy-duty, premium smart observatories.	Origin Mark II

Specs and Prices of Some Smart Telescopes

Model	Aperture	F / L	Sensor / MP	Price (USD)
ZWO Seestar S30	30 mm	150 mm	Sony IMX662 / 2 MP	\$399
DWARFLAB DWARF mini	30 mm	150 mm	Sony IMX662 / 2 MP	\$420
ZWO Seestar S50	50 mm	250 mm	Sony IMX462 / 2 MP	\$549
DWARFLAB DWARF 3	35 mm	150 mm	Sony IMX678 / 8 MP	\$549
ZWO Seestar S30 Pro	30 mm	160 mm	Sony IMX585 / 8.3 MP	\$699
ZWO Seestar S50 Pro	50 mm	260 mm	OmniVision OS08B10 / 8.3 MP	\$999
Vaonis Vespera 2	50 mm	250 mm	Sony IMX585 / 8.3 MP	\$1,690
DWARFLAB DRACO ***	90 mm	340 mm	OmniVision OV50Q40 / 12 MP / 50 MP	\$1,400
Celestron Origin Mark II	152 mm	335 mm	Sony IMX678 / 8.4 MP	\$4,299
Unistellar eVscope 2	114 mm	450 mm	Sony IMX347 / 7.7 MP	\$4,999

Pros of Smart Telescopes

- **Easy Setup:** You can unpack and start viewing or photographing the night sky in just a few minutes without tedious alignment or manual star-hopping.
- **Automatic Targeting:** Internal software (plate solving) figures out where the telescope points and locks onto cosmic objects for you.
- **Live Stacking:** Digital sensors layer multiple short exposures instantly to reveal colorful nebulae and galaxies that look invisible through a traditional eyepiece.
- **Portability:** Most units are compact, lightweight, and run on built-in rechargeable batteries, making them easy to take to dark-sky sites.
- **Light Pollution Reduction:** Software processing helps pull out deep-sky details even when you observe from bright urban or suburban backyards.

Cons of Smart Telescopes

- **Not Upgradable:** The all-in-one design means you cannot swap out the camera sensor, upgrade the lens, or change the magnification later.
- **Poor for Planets:** Small lenses and fixed focal lengths struggle to show close-up, high-detail views of Jupiter, Saturn, or Mars.
- **No Direct Eyepiece:** Most models display images on your phone or tablet screen rather than letting you look directly at the night sky with your eye.
- **Fast Obsolescence:** Because they rely heavily on rapidly changing technology and software updates, older models can lose support or drop in resale value quickly.
- **Battery and App Reliance:** If your phone dies, loses Wi-Fi connection, or experiences compass calibration glitches, operating the telescope becomes difficult.

DwarfLabs Dwarf Mini

- A couple of months ago, DwarfLabs had a sale on the Dwarf Mini. I decided to give one a try. This device weighs less than 2 lbs and is very portable, even can fit into a backpack. Here are some specs:
- Optical & Camera Specifications
 - Telephoto Lens: 150 mm focal length (approx. 1,016 mm full-frame equivalent), f/5, with a 30 mm aperture.
 - Telephoto Sensor: Sony STARVIS 2 IMX662 (1/2.8-inch), 2.9 μm pixels, outputting 1920 × 1080 (approx. 2.07 MP) resolution.
 - Wide-Angle Lens: 6.7 mm focal length (approx. 45 mm full-frame equivalent).
 - Wide-Angle Sensor: OmniVision OV02K10 (1/2.8-inch), outputting 1920 × 1080 resolution.

Dwarf Mini More Specs

- Performance & Operation

- Tracking Modes: Alt-Azimuth and Equatorial (EQ) mode.
- Max Exposure: Up to 90 seconds per sub-exposure in EQ mode.
- Rotation Range: 225° for the lens arm and 360° for the base.
- Built-in Filters: Dark-frame calibration, Astro (CLS) light-pollution filter, and Dual-Narrowband (Ha/OIII) filter, plus a physical magnetic solar filter.

- Power & Connectivity

- Battery: Built-in 7000 mAh battery providing roughly 4 hours of astrophotography use (supports external USB-C charging).
- Storage: 64 GB internal storage.
- Connectivity: Wi-Fi (2.4GHz / 5GHz), Bluetooth 5.0, and NFC one-touch connection.

High Point Scientific Review

- Here is a review from High Point Scientific showing you the features and operation of the Dwar4f Mini:
- <https://www.youtube.com/watch?v=0xnsy15Mgqw>

My Experience with the Dwarf Mini (1)

- When I tried my Dwarf Mini, I attached it to a tripod I already had which allowed me to adjust the tripod head to align the Mini with the North Celestial Pole.
- The instructions that displayed on the app screen were very easy to follow to get proper alignment. Being polar aligned allowed me to take 90 second exposures without getting any field rotation.
- The alignment required me to be outside for a short period of time. Once finished, I brought my iPad inside and did any further settings from there.
- My iPad and the Mini were connected via my local network instead of using the adhoc built-in network of the Mini. Using your local network gives you a better distance connection.
- I decided to try imaging the Lagoon Nebula (M8) as my object.

My Experience with the Dwarf Mini (2)

- I proceeded to set up 90sec exposures using the Duo-Band filter (H-a + OIII).
- I selected M8, the Mini centered it, and started imaging. I let it run for almost 3 hours.
- Once finished, I sent the stacked image up to DwarfLabs for processing using their Stellar Studio.
- A few minutes later a finished product came down.
- The results were OK, but I thought it could be a little better.
- Apparently, they use the stacked image on the screen for processing. I found that the current stacked image can be adjusted during the stacking process, so I will have to try that in the future.



Stellar Studio Processed Image

Processing on my Computer

- I decided to try processing the raw files on my computer to see if I could get better results.
- I had come across a new piece of image processing software called AstroWizard.
- It claimed to be much simpler to use and would give remarkable results. So I gave it a try along with its newest partner Stacking Wizard.
- I stacked the raw images along with the darks that the Mini had created and sent the result to the AstroWizard program for processing.
- I followed all the steps and made some adjustments along the way and came up with the following:



AstroWizard did the trick

- I found this version a little better.
- Next month I will run through using AstroWizard hopefully with a new object if the monsoon finally decides to die.

The Future has arrived

- DwarfLabs has released its next generation smart telescope called the Draco.
- This is their answer to ZWO's new S50 Pro.
- The specs on this, if true, are unbelievable.
- It comes in two versions: Standard and SHO version.
- Standard is \$1400, SHO is \$1600.
- The SHO version has an additional dual-band filter for Sulphur and OIII. It replaces the internal solar filter that the Standard version has. The SHO will include an external solar filter for solar viewing.

Draco Optical & Imaging Specs

- Aperture: 90 mm (3.54")
- Focal Length: 340 mm
- Focal Ratio: f/3.8
- Main Sensor: 1/1.3-inch OmniVision OV50Q40 CMOS (50 MP native; 2×2 pixel binning outputs 12 MP images with 2.4μm effective pixels)
- Wide-Angle Sensor: 50 MP OmniVision OV50E40 (23.3mm equivalent / 5.56mm focal length)
- Guiding: Dedicated internal monochrome guide camera and real-time guiding corrections
- Max Single-Frame Exposure: Up to 300 seconds (5 minutes)

Draco Hardware & Features

- Cooling & Dew Control: Built-in TEC (thermoelectric cooling) sensor cooling that channels waste heat toward the front optics for dew prevention
- Field De-Rotation: Rotating sensor mechanism that physically counters field rotation in Alt-Az mode
- Storage & Battery: 128 GB internal storage; 10,000 mAh battery rated for roughly 5 hours of use
- Connectivity: USB-C to Ethernet support for stable remote connections
- Weight: 5.5 kg (approx. 12.1 lbs)

What does this mean?

- Imaging planets is now available. How good it will be is yet to be determined.
- With the rotating sensor, Alt-Az Mode can be used for longer exposures as the rotating sensor eliminates field rotation.
- With built-in guiding, tracking is stabilized.
- Cooled sensor reduces noise.
- There are no independent reviews of the Draco yet, so it remains to be seen if there are any hidden flaws in it.