

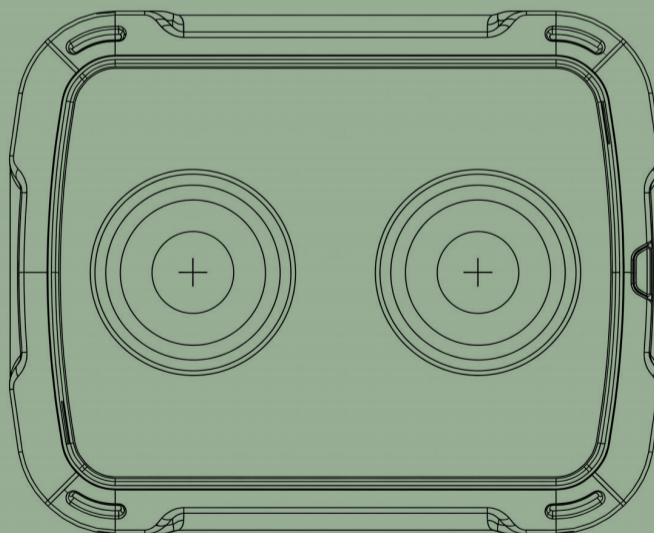
*ZED X Nano

Stereo Camera & SDK Overview

The ZED X Nano redefines spatial perception for the next generation of autonomous systems by combining unmatched performance with an exceptionally small, ultra-light form factor.

Designed for deep integration, it embeds directly into humanoid wrists and robotic grasping setups, providing high-resolution, short-range depth sensing.

This makes it the essential perception engine for pick-and-place workflows, humanoid manipulation, and complex Physical AI deployments.



DRAFT - Rev1.0

*ZED X Nano

General Specifications

Ultra-small form factor

The ZED X Nano is designed to overcome spatial limitations and integrates into highly constrained areas, making it the perfect solution for humanoid wrists integration and space limited environments.

Short-range efficiency

Featuring an 18mm baseline and a depth range spanning 3cm to 2m, the ZED X Nano delivers exceptional depth precision at short distance, ideally suited for high-precision grasping operations.

Made for physical AI

Purpose-built for Physical AI, the ZED X Nano enables humanoid eye-hand coordination. Wrist-mounting ensures a continuous view of manipulated objects, bypassing the head-mounted sensor occlusions.

Global Shutter HD 60fps

The global shutter sensor delivers distortion-free imaging with smooth Full HD capture at 60fps. It ensures sharp detail and reliable performance in fast-moving, high-dynamics applications.

High-performance IMU

A built-in vibration-resistant IMU enhances localization accuracy, making the camera highly reliable for high-precision robotic manipulation.

Secure GMSL2 connection

GMSL2 connectivity enables low-latency, EMI-resistant video transmission up to 15m. The lockable interface ensures a secure, high-bandwidth connection to edge computing platforms.

Technical Specifications

Output Resolution	Side by Side
1200p	2x (1920x1200) @60fps
1080p	2x (1920x1080) @60fps
600p	2x (960x600) @120fps
Interface	GMSL2
Baseline	18mm (0.71")
Image Sensors	
Size	1/2.6" sensors
Resolution	Dual 2.3M pixels sensors with 3-micron pixels
Format	16/10
Shutter Sync	Electronic Synchronized Global Shutter
Motion Sensors	200 Hz 16-bits Accelerometer (up to 12g) 200 Hz 16-bits Gyroscope (up to 1000°/s)
Environment	
Operating Temp.	-20°C to +60°C (-4°F to 140°F)
Relative Humidity	90% at 40°C
Vibrations	2g RMS @ 3-500Hz, 1h/axis
Warranty	2-year hardware warranty

System Requirements

System	NVIDIA Jetson AGX Orin NVIDIA Jetson Orin NX
OS	Jetson Linux (L4T) v35.1 or newer

Physical Specifications

Dimensions	42.0 x 30.5 x 33.8mm (1.65 x 1.20 x 1.33")
Weight	75g (0.17 lb.)
Connector	Serial Coax GMSL2 connector - FAKRA Z type
Mounting Options	1x 1/4"-20 UNC thread (bottom) 2x M3 threads (bottom)
Power	Power via GMSL2 (PoC) 1.46W (0.122A 12V)

Optical Specifications

Depth Range Max	0.03m to 2.0m (0.1ft to 6.56ft)
Ideal Range	0.05m to 1.5m (0.16ft to 4.92ft)
Depth Accuracy	<0.2% at 0.05m (0.16ft) <1.2% at 1.5m (4.92ft)
Focal Length	2.8mm (0.11")
Field of View	Max. 92°(H) x 65°(V) x 102°(D)
Aperture	f/2.5
TV Distortion	< -1.10%
Object Detection	Up to Max Depth (3D)

*ZED X Nano Sensors Specifications

ZED X Nano seamlessly fuses visual and inertial data to enhance spatial awareness, position tracking, and motion-related tasks. Humanoids application require the ability to sense, decide, and act. The ZED X Nano fulfil the necessary sensing technology for successful deployment.

Dual Image Sensors

Sensors

Sensor Type	1/2.6" 2.3MP RGB
Array Size	1928 x 1208 pixels
Pixel Size	3μm x 3μm
Shutter	Electronic synchronized global shutter
Output Resolution (Side by side)	2x 1920x1200 @15/30/60fps 2x 1920x1080 @15/30/60fps - cropping mode 2x 960x600 @ 15/30/60/120fps - binning 2x2 mode
Output Format	RAW10
Max S/N Ration	38 dB
Dynamic Range	71.4 dB
Sensitivity	22.3Ke/Lux*s
Camera Control	Exposure, analog & digital gain, gamma, white balance, saturation, sharpness, denoising, brightness, contrast

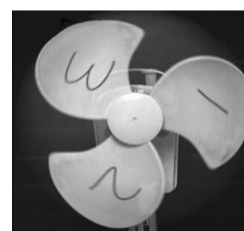
Motion Sensors

Accelerometer Range	+/- 12G
Accelerometer Resolution	0.36 mg
Accelerometer Noise Density	2.3 mg
Gyroscope Range	+/- 1000 dps
Gyroscope Resolution	0.03 dps
Gyroscope Noise Density	0.20 dps
Sensitivity Error	+/- 0.5%
Output Data Rate	200 Hz

Distortion free images of fast moving objects



Rolling Shutter

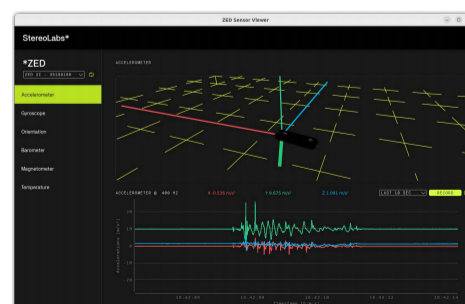


Global Shutter

Sensors API

You can access these sensors and acquire sensor data by using the Sensors API.

Please visit stereolabs.com/docs for tutorials.

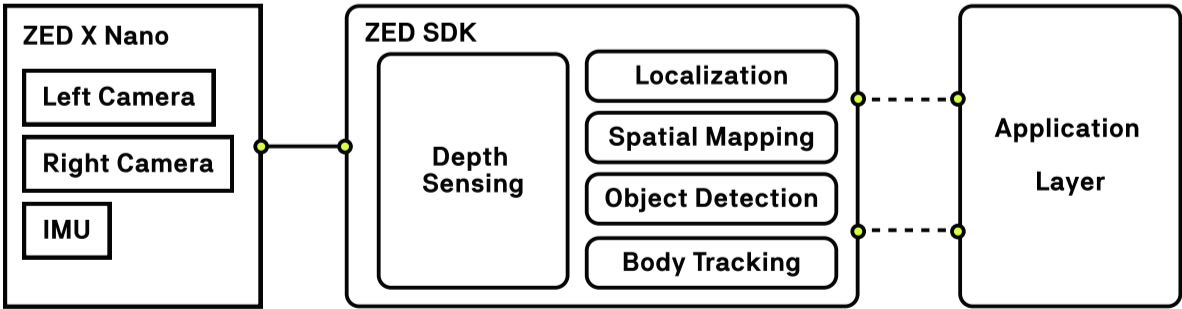


SDK Modules

Stereo Capture	The ZED X Nano features dual lenses for capturing high-definition 3D video with a focus on near-field accuracy. It delivers two synchronized video streams, processed by the integrated ISP, to provide high-fidelity RGB images on the host.
Depth Sensing	
Depth Map	Depth maps captured by the ZED X store a distance value (Z) for each pixel (X, Y) in the image. The distance is expressed in metric units (meters for example) and calculated from the back of the left eye of the camera to the scene object.
3D Point Cloud	A point cloud can be seen as a depth map in three dimensions. While a depth map only contains the distance or Z information for each pixel, a point cloud is a collection of 3D points (X,Y,Z) that represent the external surface of the scene and can contain color information.
SLAM Localization	
Positional Tracking	The ZED X Nano uses visual tracking of its surroundings to understand the movement of the user or system holding it. As the camera moves in the real-world, it reports its new position and orientation. This information is called the camera 6DoF pose. Pose information is output at the frame rate of the camera, up to 100 times per second in WVGA mode.

Spatial Mapping	The ZED continually scans its environment, generating a 3D map in real-time. This map is updated as the device moves and captures new scene elements. Thanks to its ability to perceive distances beyond the capabilities of conventional RGB-D sensors, the camera can accurately reconstruct 3D maps of complex close-range environments.
Object Detection	Object detection involves identifying objects within an image. Leveraging depth sensing and 3D data, the ZED camera offers both 2D and 3D positional information for objects within the scene. Starting with ZED SDK 3.6, users can employ custom detectors via the API, with 2D detections being processed alongside 3D information, including object position and 3D bounding boxes. More informations in the documentation.
Body Tracking	Body tracking module focuses on skeleton bone detection and tracking. A detected bone is represented by its two end points also called keypoints. The ZED camera provides 2D and 3D information for each keypoint as well as local rotation. The ZED SDK supports four body formats: 18 or 34, 38 keypoints.

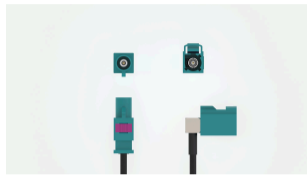
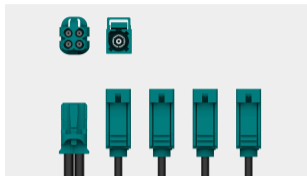
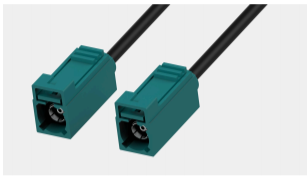
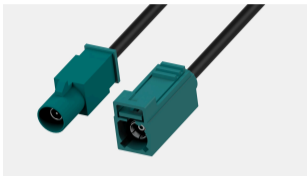
Functional SDK Diagram



*ZED X GS Accessories

FAKRA Z Cables

A wide range of camera cables are readily available, tailored to diverse requirements and applications, offered in varying lengths to suit both compact and expansive setups.



Male to Female	
0.5m (1.6ft)	CBL-310800
1.5m (4.93ft)	CBL-310100
5m (16.4ft)	CBL-310200
10m (32.8ft)	CBL-310300
15m (49.2ft)	CBL-310400

Female to Female	
0.3m (0.98ft)	CBL-320100
1.5m (4.93ft)	CBL-320200
5m (16.4ft)	CBL-320300
10m (32.8ft)	CBL-320400

Female to Female 1-to-4	
0.5m (1.64ft)	CBL-320510

Right-Angle Extension	
0.3m (0.98ft)	CBL-310500
0.5m (1.6ft)	CBL-310900

ZED Box Embedded Computers

Stereolabs ZED Boxes are powered with NVIDIA Jetson Orin modules and serves as a robust AI embedded computers for autonomous robotics and AI applications.



Model	ZED Box Orin NX
Jetson Modules	Orin NX 8GB, NX 16GB
I/Os	3x USB 3.2 Gen2 (10 Gbps) 1x Gigabit Ethernet 1x HDMI 4x GMSL2 ** WiFi 6 connectivity 1x RTK GNSS GPS Ublox ZED F9P**

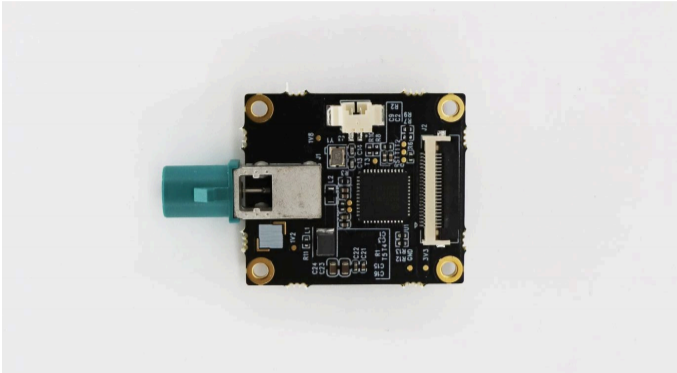
Model	ZED Box Mini
Jetson Modules	Orin Nano 4GB, Nano 8GB, NX 8GB
I/Os	2x GMSL2 1x USB 3.0 (5 Gbps) 1x Gigabit Ethernet 1x HDMI WiFi 6 connectivity**

** Available as options.
The Multiband GNSS antenna ANN-MB-00 is an additional accessory.

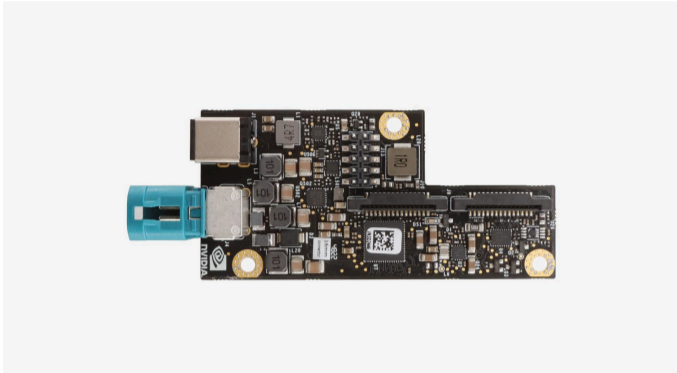
*ZED X Nano Accessories

Capture Cards

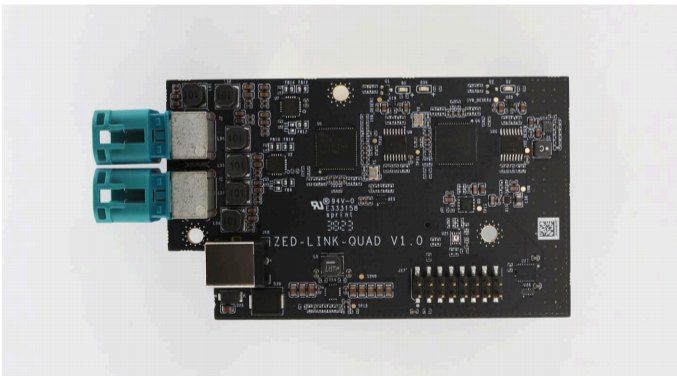
To capture the ZED X Nano on the NVIDIA Jetson AGX platform, one solution is to utilize a GMSL2 capture card that directly connects to the Jetson's CSI port.



Model	ZED Link Mono Capture Card
Compatibility	NVIDIA Jetson Orin Platform (NX/Nano)
Max. number of cameras	Capture 1x GMSL2 camera input in SD/HD, up to 1920x1200@60fps
Deserializer	MAX9296A
Power	Requires external 9-19V power supply



Model	ZED Link Duo Capture Card
Compatibility	NVIDIA Jetson Orin Platform (AGX/NX/Nano)
Max. Number of cameras	Capture 4x GMSL2 camera input in SD/HD, up to 1920x1200@30fps
Deserializer	MAX96712
Power	Connects to and is powered by the Samtec port of the Orin Developer Kit. Requires external power supply for NX/Nano (9V-19V) when using MIPI port



Model	ZED Link Quad Capture Card
Compatibility	NVIDIA Jetson Orin Platform (AGX)
Max. number of cameras	Capture 8x GMSL2 camera input in SD/HD, up to 1920x1200@30fps
Deserializer	2 x MAX96712
Power	Requires external 9-19V power supply

*ZED X Nano Technical Drawings

