

ZED X



ZED X Camera and SDK Overview

The ZED X stereo camera combines powerful hardware and intelligent software to create an unrivaled solution for obstacle detection, navigation and process automation.

Built to function efficiently in harsh environments, the IP67-rated **ZED X** and **ZED X Mini** stereo cameras' robust aluminum body can withstand outdoor conditions, making it ideal for robots deployed in various sectors including agriculture, manufacturing, logistics.

ZED X | General Specifications

Wide-Angle 3D AI Camera

Combine long-range depth perception with AI to perceive your environment in 3D with up to a 120° wide-angle field of view.

IP67-rated Enclosure

Resistant to dust, water and humidity, the new ZED X is designed for outdoor applications and challenging medical, industrial, agricultural environments, and more.

Multi-camera synchronization

Hardware synchronisation for multiple connected cameras at frame-level within 100 microseconds. Capture RGB and depth images of the same scene with multiple cameras all triggered at the same time.

High Quality Lenses

Wide-angle 9-element all-glass dual lens with optically corrected distortion, and optional polarizing filter.

High-performance IMU

The all-new IMU combines a 16-bit triaxial accelerometer and gyroscope with vibration resistance, ultra low noise and bias for exceptional motion tracking

Secure GMSL2 Connection

GMSL2 connectivity is ideal for robotics. Transmit video without EMI and high data rate through a lockable interface to a Jetson Orin over a distance of up to 15M with low latency.

Technical Specifications

| | |
|-------------------|--|
| Output Resolution | Side by Side |
| 1200p | 2x (1920x1200) @60fps |
| 1080p | 2x (1920x1080) @60fps |
| 600p | 2x (960x600) @120fps |
| Interface | GMSL2 |
| Baseline | |
| ZED X | 12cm (4.72") |
| ZED X Mini | 5cm (1.97") |
| 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 | 400Hz 16-bits Accelerometer (up to 12g) 400Hz 16-bits Gyroscope (up to 1000°/s) |
| Warranty | 2-year hardware warranty |

Physical Specifications

| | |
|------------------|--|
| Dimensions | |
| ZED X | 163.4 x 31.8 x 36.7mm (6.44 x 1.26 x 1.45") |
| ZED X Mini | 93.6 x 31.8 x 36.7mm (3.69 x 1.26 x 1.45") |
| Weight | |
| ZED X | 239g (0.53lb) |
| ZED X Mini | 151g (0.34lb) |
| Connector | Serial Coax GMSL2 connector - FAKRA Z type |
| Mounting Options | 1/4"-20 UNC thread mount 2x M3 threads (bottom) 4x M4 threads (back) |
| Operating Temp. | -20°C to +55°C (-4°F to 131°F) |
| Power | Power via GMSL2 (PoC) |

System Requirements

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

ZED X | Lens Options

Focal Lengths available



2.2mm

The 2.2mm fixed focal lens offers an exceptionally wide field of view while also providing optically corrected distortion for enhanced image quality.

4mm

The 4mm focal length lens is perfect for an enhanced resolution and depth accuracy at longer ranges.

No More Reflections with Polarizing Filters.

Experience the highest image quality possible outdoors with the built-in polarizing filter. This filter effectively minimizes glare and reflections while enhancing color depth and overall quality.



ZED X Available Models

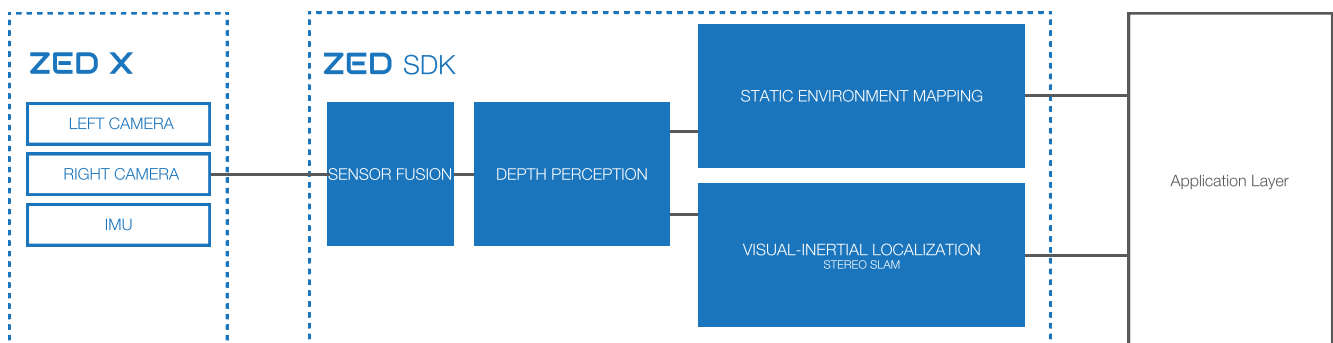
| Specifications | ZED X | ZED X Mini | ZED X 4mm | ZED X Mini 4mm |
|-------------------|---------------------------------|----------------------------|-------------------------------|-----------------------------|
| Polarizer | Polarizer Option Available | | | |
| Focal Length | 2.2mm (0.008") | | 3.8mm (0.16") | |
| Field of View | Max. 110°(H) x 80°(V) x 120°(D) | | Max. 80°(H) x 52°(V) x 91°(D) | |
| Aperture | f/2.2 | | f/1.8 | |
| TV Distortion | <5.7% | | <6.9% | |
| Depth Range Max | 0.3 to 20m | 0.1 to 8m | 1 to 35m | 0.15 to 12m |
| Depth Accuracy | 0.1% at 0.3m 3% at 8m | 0.1% at 0.1m 5.4% at 6m | 0.2% to 1m 3.1% at 15m | 0.1% to 0.15m 3.3% at 6m |
| Object Detection | Up to Max Depth (3D) | | | |
| Skeleton Tracking | Up to 8m | Up to 6m | Up to 15m | Up to 6m |
| SKU | | | | |
| Polarizer | ZED-311110 | ZED-312110 | ZED-311210 | ZED-312110 |
| No Polarizer | ZED-311120 | ZED-312120 | ZED-311220 | ZED-312120 |

General SDK Description

SDK Modules

| | |
|---------------------|--|
| Stereo Capture | The ZED X features dual lenses for capturing high-definition 3D video with an expansive field of view. It delivers two synchronized left and right video streams, processed by the Jetson's ISP, and provides images in RGB format on the host. |
| Depth Sensing | <p>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.</p> <p>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.</p> |
| Positional Tracking | The ZED X 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 rapidly reconstruct 3D maps for both expansive indoor and outdoor spaces. |
| 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 | Sensor Stack Specifications

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

Dual Image 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 |

Motion Sensors

| | |
|-----------------------------|--------------|
| Accelerometer Range | +/- 12G |
| Accelerometer Resolution | 0.36 mg |
| Accelerometer Noise Density | 3.2 mg |
| Gyroscope Range | +/- 1000 dps |
| Gyroscope Resolution | 0.03 dps |
| Gyroscope Noise Density | 0.10 dps |
| Sensitivity Error | +/- 0.5% |
| Output Data Rate | 400 Hz |

Sensors API

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



ZED X | Accessories

FAKRA Z Cable



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 | |
|---------------------------|------------|
| 0.3m (0.98ft) | CBL-310400 |
| 1.5m (4.92ft) | CBL-310100 |
| 5m (16.4ft) | CBL-310200 |
| 10m (32.8ft) | CBL-310300 |
| Female to Female | |
| 0.3m (0.98ft) | CBL-320100 |
| 1.5m (5ft) | CBL-320200 |
| 5m (16.4ft) | CBL-320300 |
| 10m (32.8ft) | CBL-320400 |
| Female to Female - 1-to-4 | |
| 0.5m (1.64ft) | CBL-320510 |

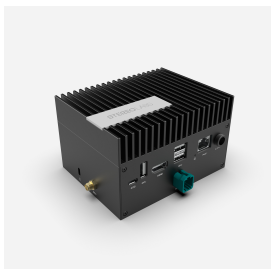
Capture Card



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

| | |
|------------------------|---------------------------------------|
| Compatibility | NVIDIA Jetson Xavier/Orin Platform |
| Max. Number of cameras | 2 |
| Deserializer | MAX96712 |
| Power | Via Samtec CSI port of the Jetson AGX |

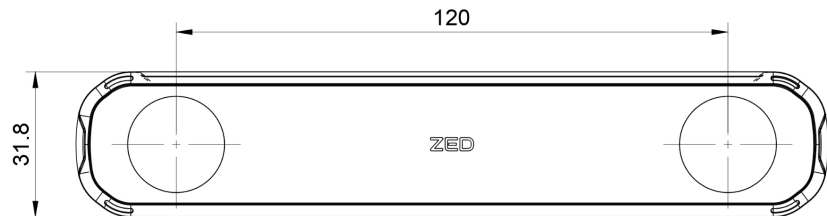
ZED Box Orin NX



The ZED Box, equipped with the latest NVIDIA Jetson Orin NX, serves as a robust AI gateway for autonomous robotics and advanced video analytics.

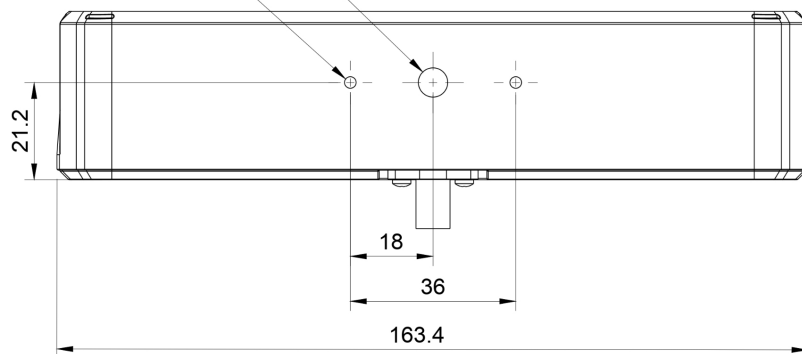
| | ZED Box Orin NX 16GB | ZED Box Orin NX 8GB |
|-------------------|--|---------------------|
| AI Performance | 100 TOPS | 70 TOPS |
| Compatible camera | ZED 2i Stereo Camera, ZED X Stereo Camera | |
| I/Os | 3x USB 3.2 Gen2 (10 Gbps) 1x Micro USB OTG (Flash) 1x Gigabit Ethernet 1x HDMI 4x Gigabit Multimedia Serial Links (GMSL2)** 1x WiFi 6 connectivity** 1x RTK GNSS GPS Ublox ZED F9P** | |

ZED X - 2.2mm

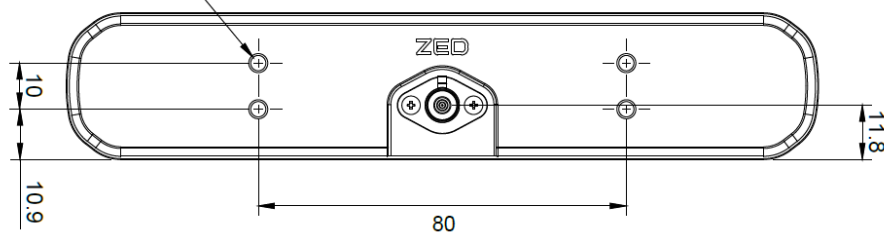


1x
Mounting hole
1/4"-20 UNC | Max Length: 6.4mm

2x
Mounting holes
M3x0.5 | Max Length: 6.4mm



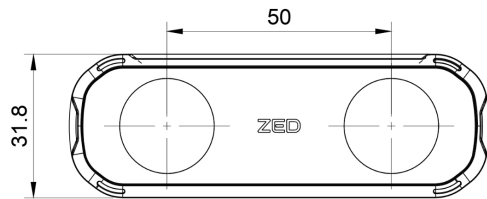
4x
Mounting holes
M4x0.7 | Max Length: 5mm



Dimensions are in mm

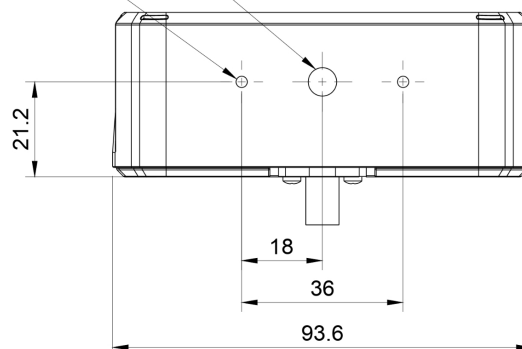
ZED X Mini | Technical Drawings

ZED X Mini - 2.2mm

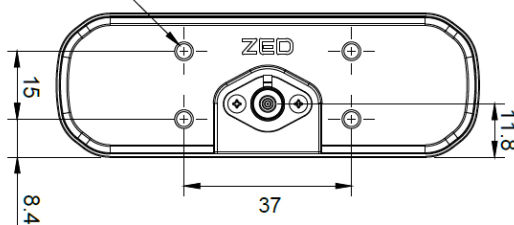


1x
Mounting hole
1/4"-20 UNC | Max Length: 5.9mm

2x
Mounting holes
M3x0.5 | Max Length: 5.9mm

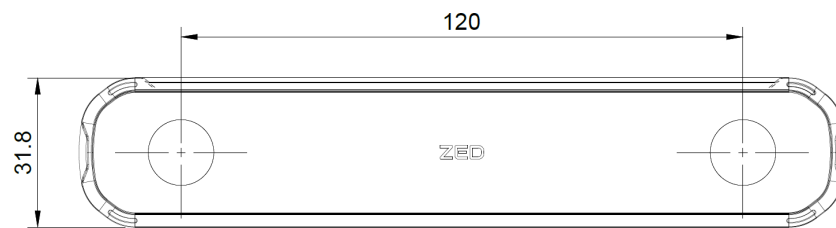


4x
Mounting holes
M4x0.7 | max Length: 5.1mm



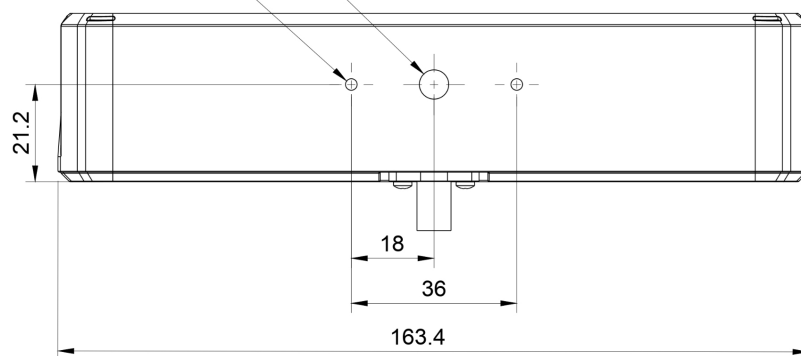
Dimensions are in mm

ZED X - 4mm

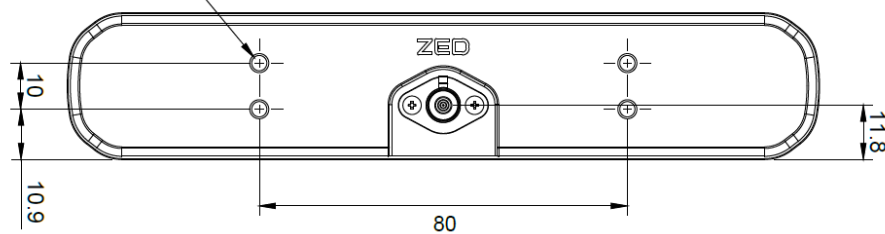


1x
Mounting hole
1/4"-20 UNC | Max Length: 6.4mm

2x
Mounting holes
M3x0.5 | Max Length: 6.4mm



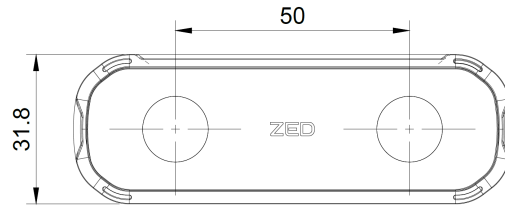
4x
Mounting holes
M4x0.7 | Max Length: 5mm



Dimensions are in mm

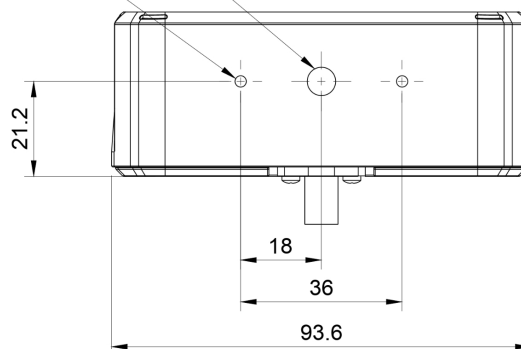
ZED X Mini | Technical Drawings

ZED X Mini - 4mm

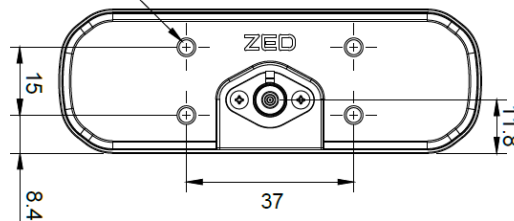


1x
Mounting hole
1/4"-20 UNC | Max Length: 5.9mm

2x
Mounting holes
M3x0.5 | Max Length: 5.9mm



4x
Mounting holes
M4x0.7 | max Length: 5.1mm



Dimensions are in mm