

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

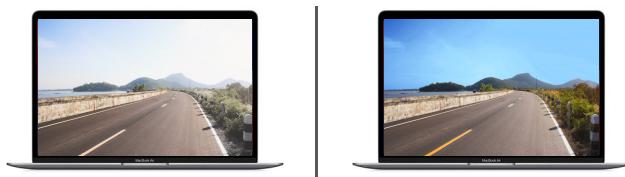
The 2.2mm fixed focal lens offers an exceptionally wide field of view while also providing optically corrected distortion for enhanced image quality.

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

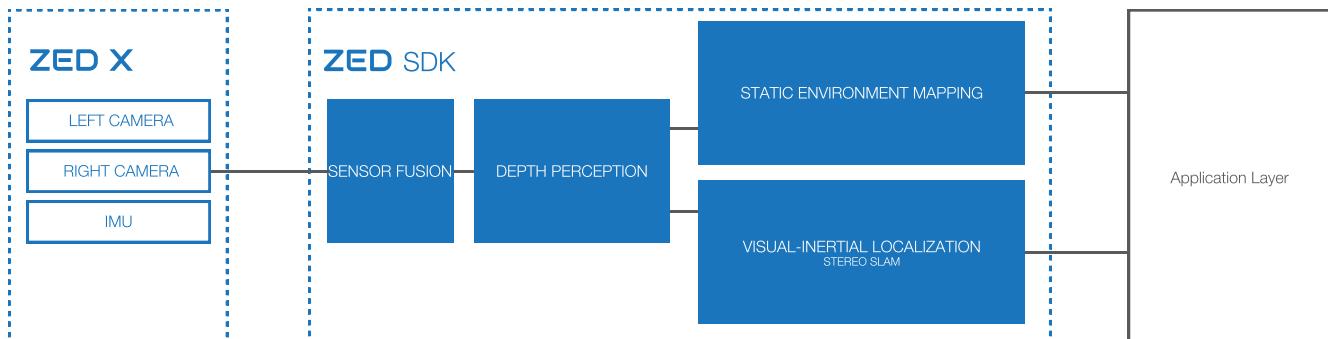
Specifications	ZED X	ZED X Mini	ZED X 4mm	ZED X Mini 4mm
Polarizer	Polarizer Option Available			
Focal Length	2.2mm (0.008")		3.8mm (0.16")	
Field of View	Max. 110°(H) x 80°(V) x 120°(D)		Max. 80°(H) x 52°(V) x 91°(D)	
Aperture	f/2.2		f/1.8	
TV Distortion	<5.7%		<6.9%	
Depth Range Max	0.3 to 20m	0.1 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 No Polarizer	ZED-311110 ZED-311120	ZED-312110 ZED-312120	ZED-311210 ZED-311220	ZED-312110 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

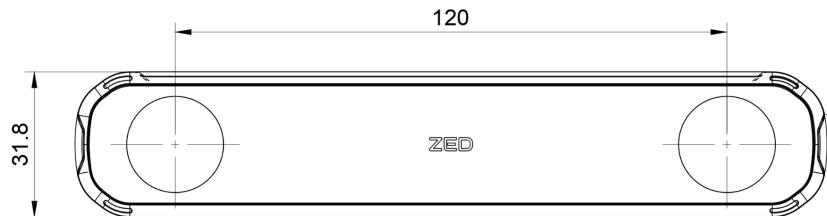


The ZED Box, equipped with the latest NVIDIA Jetson Orin NX, serves as a robust AI gateway for autonomous robotics and advanced video analytics.

	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**	

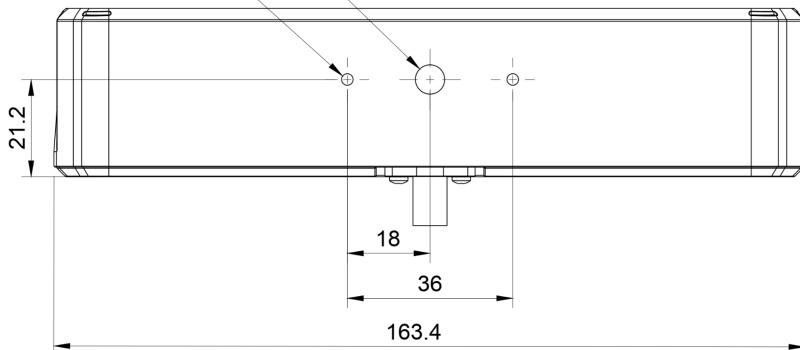
ZED X | Technical Drawings

ZED X - 2.2mm

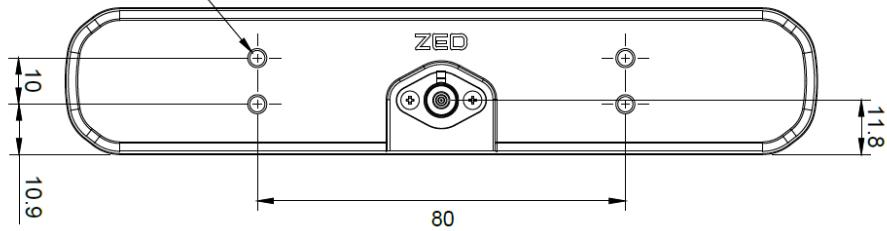


1x
Mounting hole
1/4"-20 UNC | Max Length: 6.4mm

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



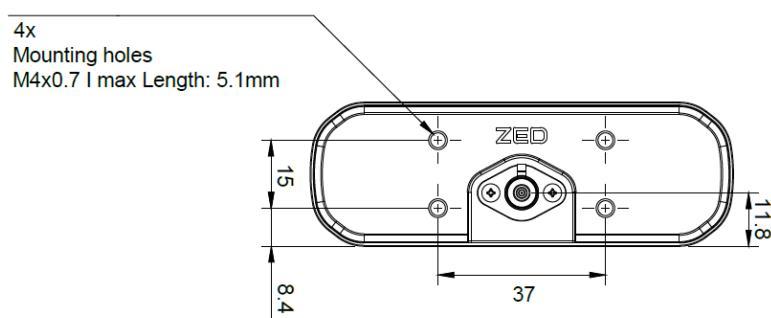
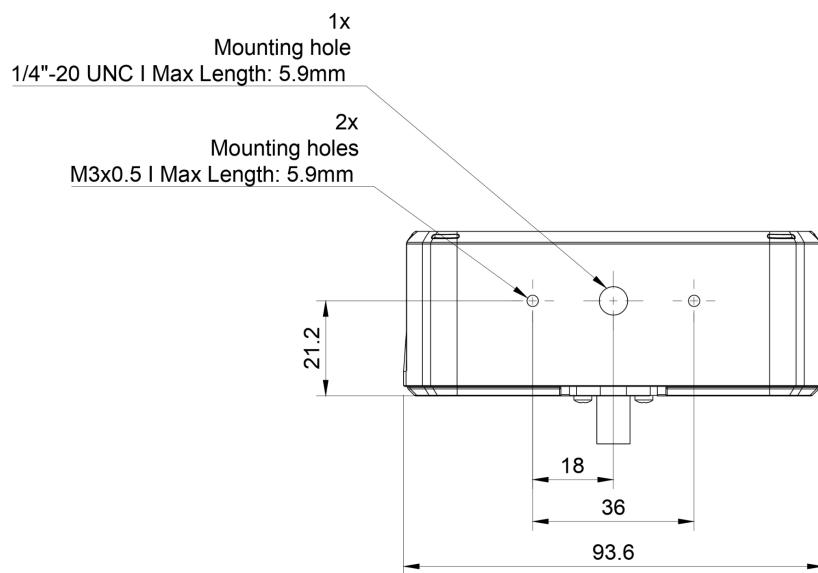
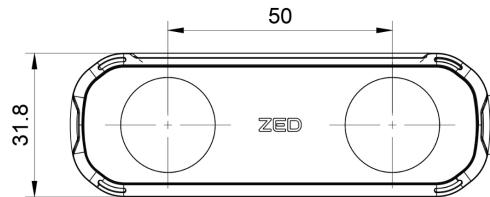
4x
Mounting holes
M4x0.7 | Max Length: 5mm



Dimensions are in mm

ZED X Mini | Technical Drawings

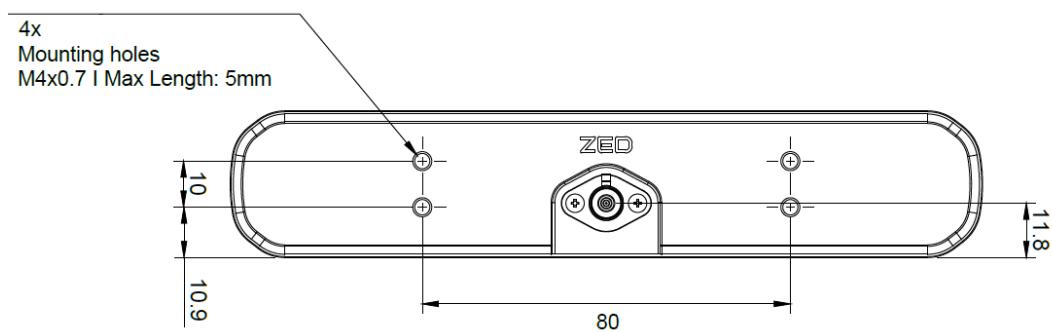
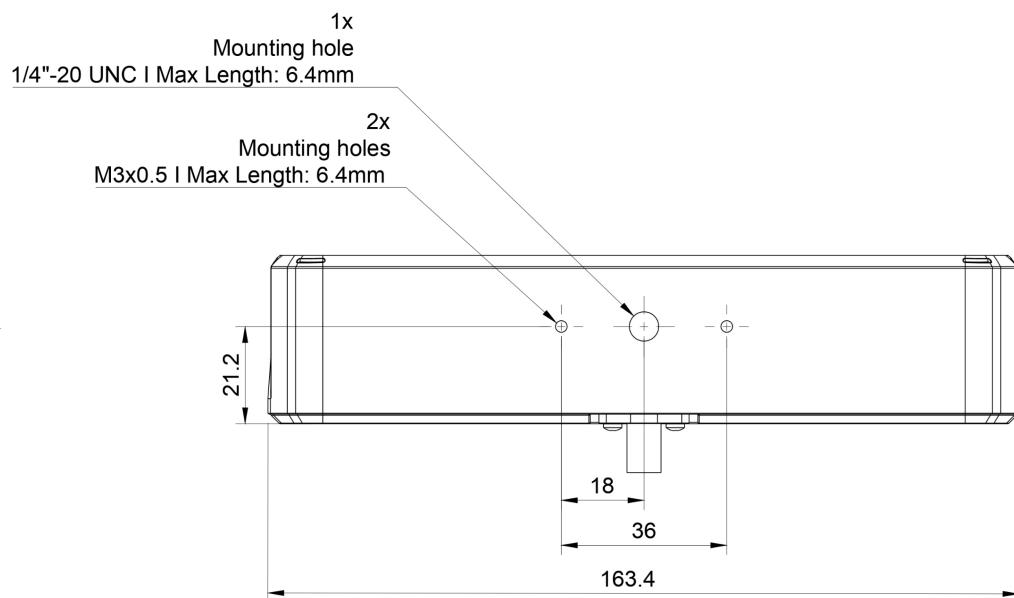
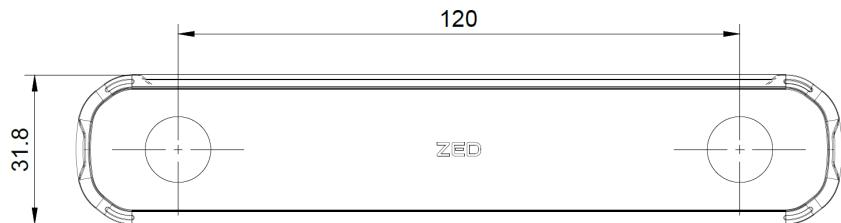
ZED X Mini - 2.2mm



Dimensions are in mm

ZED X | Technical Drawings

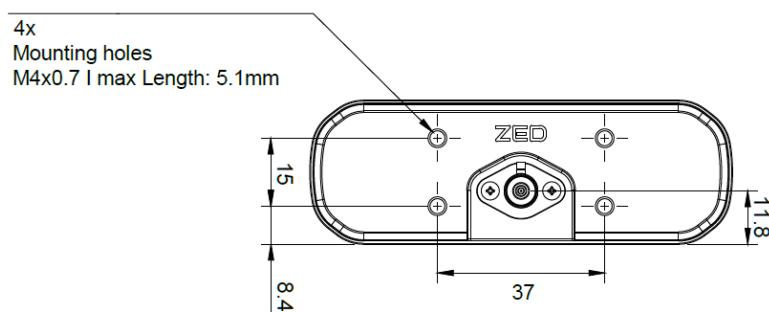
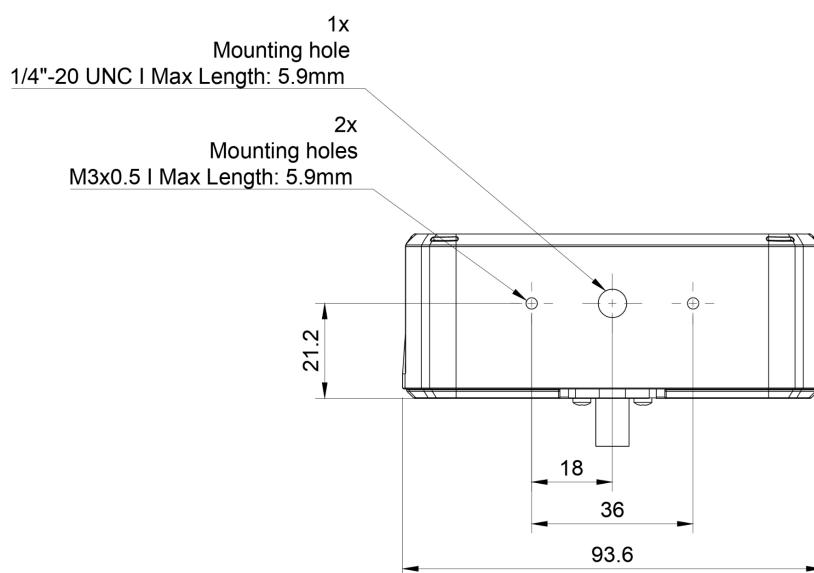
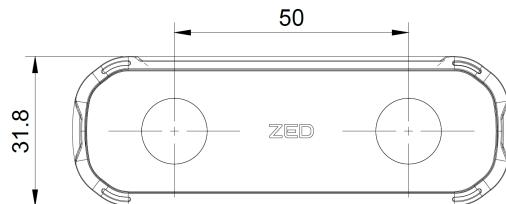
ZED X - 4mm



Dimensions are in mm

ZED X Mini | Technical Drawings

ZED X Mini - 4mm



Dimensions are in mm