*ZED X

StereoLabs*

Camera and
SDK Overview

The ZED X stereo camera combines powerful hardware and intelligent software to create an unrivalled 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 aluminium body can withstand outdoor conditions, making it ideal for robots deployed in various sectors including agriculture, manufacturing, logistics.
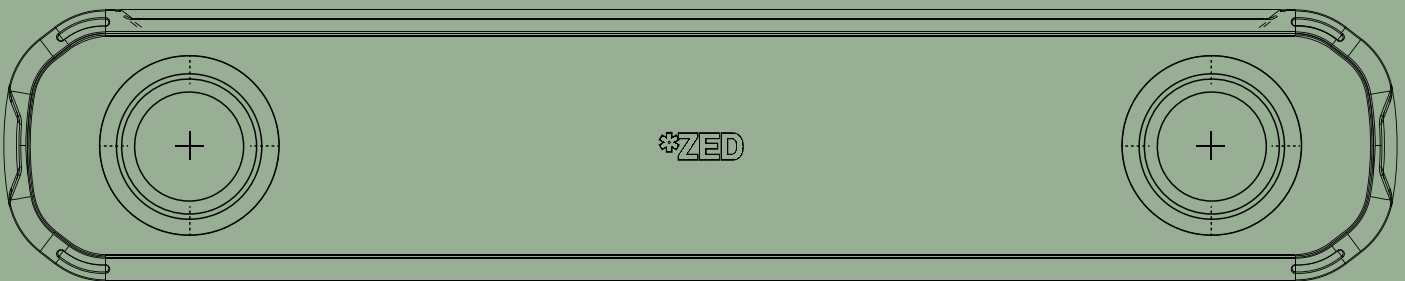
*ZED X General Specifications

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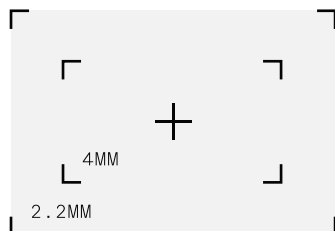
2.2mm
2.2mm fixed focal lens offers an exceptionally wide field of view while also providing optically corrected distortion for enhanced image quality.

4mmm
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

Part number	ZED X	ZED X Mini	ZED X 4mm	ZED X Mini 4mm
Polarizer	Polarizer Option Available			
Focal Length	2.2mm (0.008")		3.8 mm (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)			
Connector	FAKRA Z Connector Type			
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

*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.
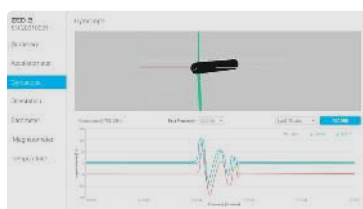
Dual Image Sensors

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

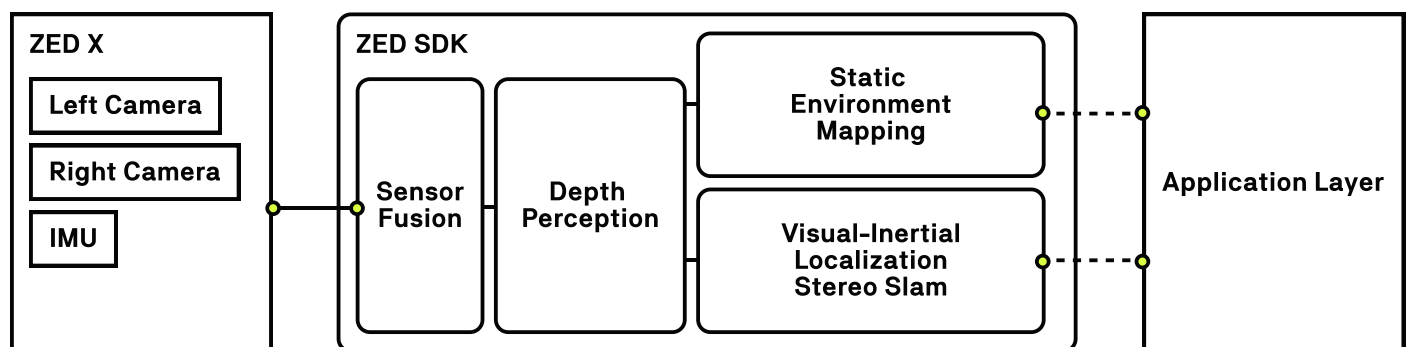You can access these sensors and acquire sensor data by using the Sensors API.

*ZED X SDK

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

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.

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
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 (4.93ft)	CBL-310100
5m (16.4ft)	CBL-310200
10m (32.8ft)	CBL-310300

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

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.

AI Performance	16GB – 100 TOPS / 8GB – 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
Accessories

Capture Cards

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.
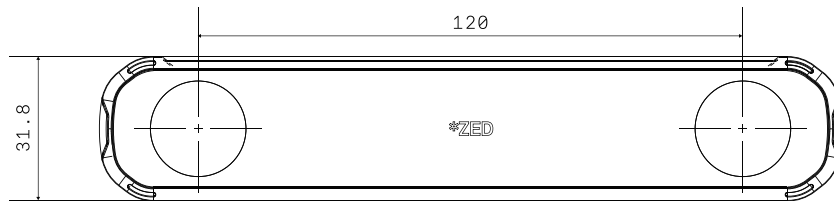
ZED Link Duo Capture Card

Compatibility	NVIDIA Jetson Xavier/Orin Platform
Max. number of cameras	Capture 1x GMSL2 camera input in SD/HD/4K up to 4K@30.
Deserializer	MAX9296A
Power	Requires external 12-19V power supply.

ZED Link Duo Capture Card
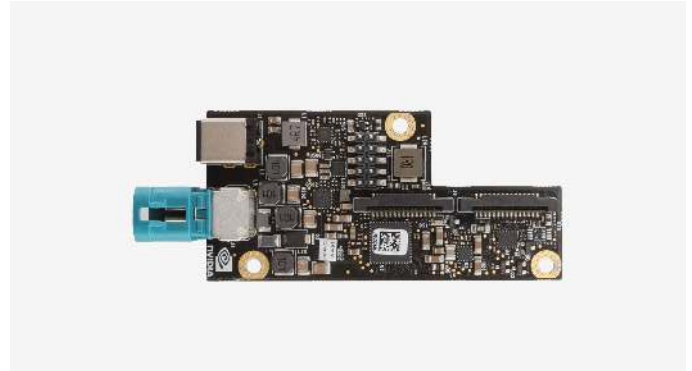
Compatibility	NVIDIA Jetson Xavier/Orin Platform
Max. Number of cameras	Capture 2x GMSL2 camera inputs in SD/HD/4K up to 4K@30.
Deserializer	MAX96712
Power	Connects to and is powered by the CSI port of the Orin/Xavier Developer Kit.

ZED Link Quad Capture Card

Compatibility	NVIDIA Jetson Xavier/Orin Platform
Max. number of cameras	Capture 4x GMSL2 camera inputs in SD/HD/4K up to 4K@30.
Deserializer	2 x MAX96712
Power	Requires a 12-19V external power supply.

*ZED X
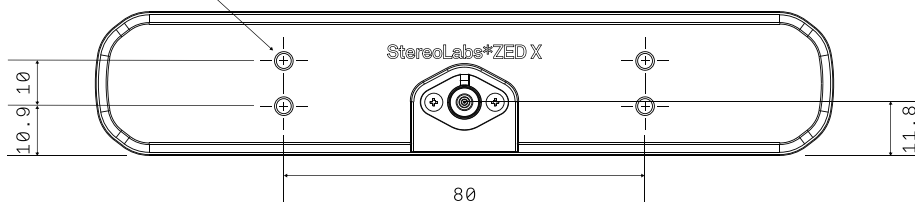# Technical Drawings

ZED X - 2.2mm

120

31.8

*ZED

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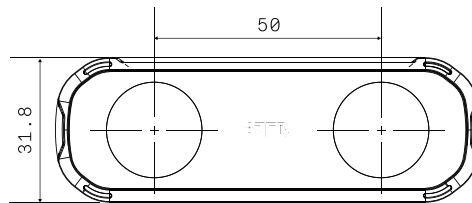Max Length:6.4mm

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

21.2

18

36

163.4

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

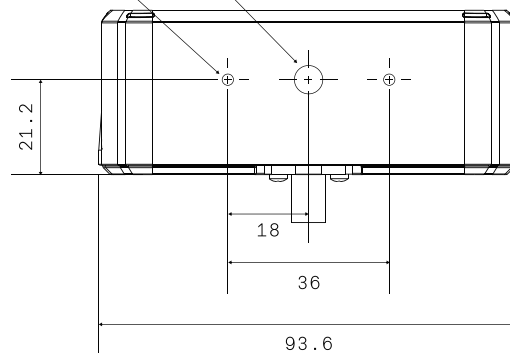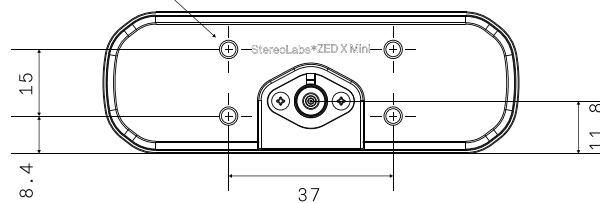StereoLabs*ZED X

10.9 10

11.8

80

*ZED X Mini
Technical Drawings

ZED X MINI - 2.2mm

50

31.8

1x
Mounting holes
1/4"-20 UNC|
Max Length: 5.9mm
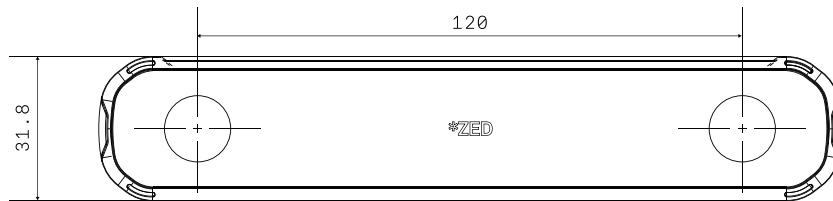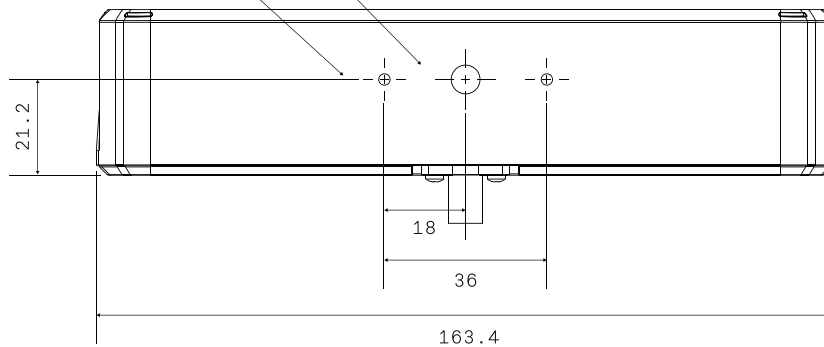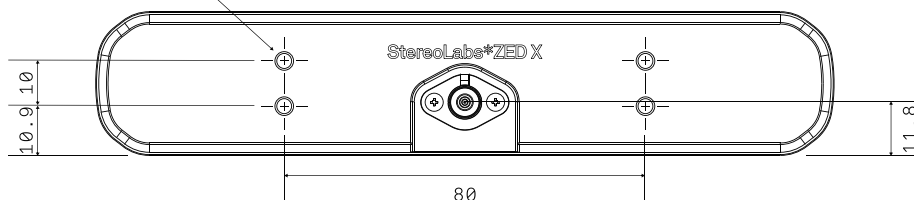
2x
Mounting holes
M3x0.5|
Max Length: 5.9mm

21.2

18

36

93.6

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

15

11.8

8.4

37

*ZED X
Technical Drawings

ZED X - 4mm

120

31.8

*ZED

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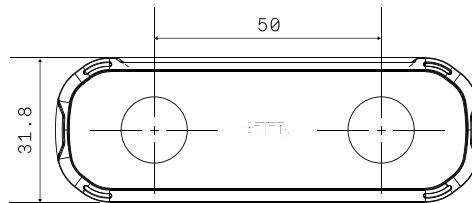Max Length:6.4mm

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

21.2

18

36

163.4

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

10.9 10

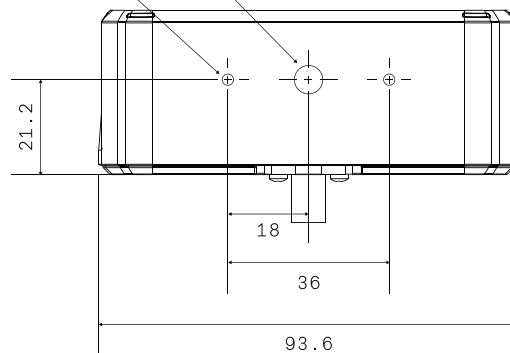StereoLabs*ZED X

11.8

80

*ZED X Mini
Technical Drawings

ZED X MINI - 4mm

50

31.8

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

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

21.2

18

36

93.6

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

15

8.4

11.8

37