dji ZENMUSE L2 Accurate LiDAR and Photogrammetry User Guide

Contents

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Product Usage Instructions

Warnings:

1. Do not modify or adjust the gimbal as it has been calibrated for specific camera and lens.
2. Use only with compatible DJI aircraft with latest firmware versions.
3. Avoid exposing LiDAR to strong energy sources.
4. Exercise caution in low visibility conditions to maintain detection range.
5. Clean the optical window with appropriate materials to avoid negative effects on performance.
6. Avoid dropping the product and calibrate using DJI TERRA if needed.

Installation:
Ensure proper installation following Figure A to maintain the damper balls' service life.

Camera Controls:
Use the DJI RC Plus remote controller to switch between point cloud and visible light views, preview point cloud effects, and control the gimbal and camera.

- L1/L2/L3/R1/R2/R3 Buttons: Access specific functions in Camera View in DJI Pilot 2 App.

FAQ

- **Q: Can I use the product with any camera or lens?**
  A: No, the gimbal has been calibrated for specific camera and lens compatibility.
- **Q: How should I clean the optical window?**
  A: Use compressed air, isopropyl alcohol, or a lens cloth. Avoid substances containing alcohol, benzene, or thinners.

Disclaimer

By using this product, you signify that you have read, understand, and accept the terms and conditions of this guide and all instructions at https://enterprise.dji.com/zenmuse-l2/downloads. EXCEPT AS EXPRESSLY PROVIDED IN AFTER-SALES SERVICE POLICIES AVAILABLE AT HTTPS://WWW.DJI.COM/SERVICE/POLICY, THE PRODUCT AND ALL MATERIALS AND CONTENT AVAILABLE THROUGH THE PRODUCT ARE PROVIDED “AS IS” AND ON “AS AVAILABLE BASIS” WITHOUT WARRANTY OR CONDITION OF ANY KIND.

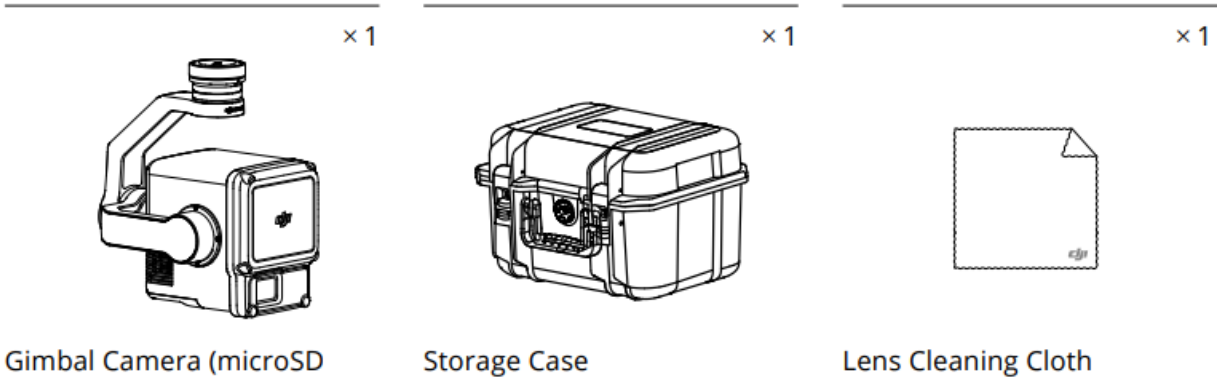
SAFETY WARNINGS

1. The ZENMUSETM L2 has been calibrated specifically for the designated camera and lens before leaving the factory. No physical or mechanical modification or adjustment of the gimbal is required or recommended. DO NOT add any other component or device to the camera such as a filter or lens hood.
2. Only use the L2 with specified compatible DJITM aircraft. Make sure the firmware of the aircraft and the remote controller are the latest versions.
3. DO NOT expose the LiDAR to strong sources of energy such as a laser beam or any other LiDAR in use. Otherwise, the LiDAR may be permanently damaged.
4. Be careful when using the L2 in conditions with low visibility such as foggy or stormy weather as the detection range may be reduced.
5. DO NOT touch the optical window of the L2. Dust and stains on the optical window can negatively affect the performance. Use compressed air, isopropyl alcohol, or a lens cloth to clean the optical window correctly. Refer to the L2 User Manual for more information on how to clean optical windows. DO NOT use substances containing alcohol, benzene, thinners, or other flammable substances to clean or maintain the RGB mapping camera.
6. DO NOT drop the L2. Calibrate the L2 using DJI TERRATM if the point cloud data is inaccurate or the output is layered.

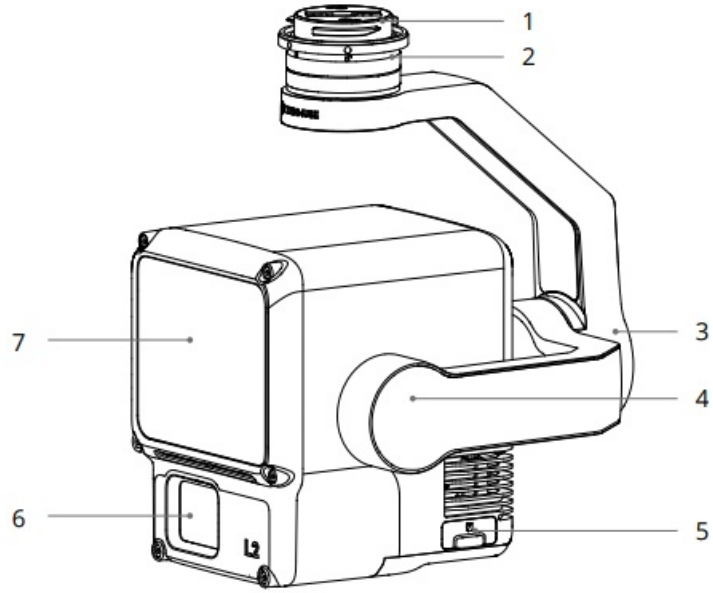
Introduction

The Zenmuse L2 integrates a LiDAR module, a high-accuracy IMU, and an RGB mapping camera on a 3-axis stabilized gimbal, which can be used with specified compatible DJI aircraft. With Point Cloud LiveView, users can take a quick view of the 3D point cloud effect in the DJI PILOTTM 2 app. When used with DJI Terra, the L2 offers a complete solution that generates point cloud output and extracts ground points to generate DEM results, which efficiently completes highly accurate reconstructed models of complex structures.

In the Box

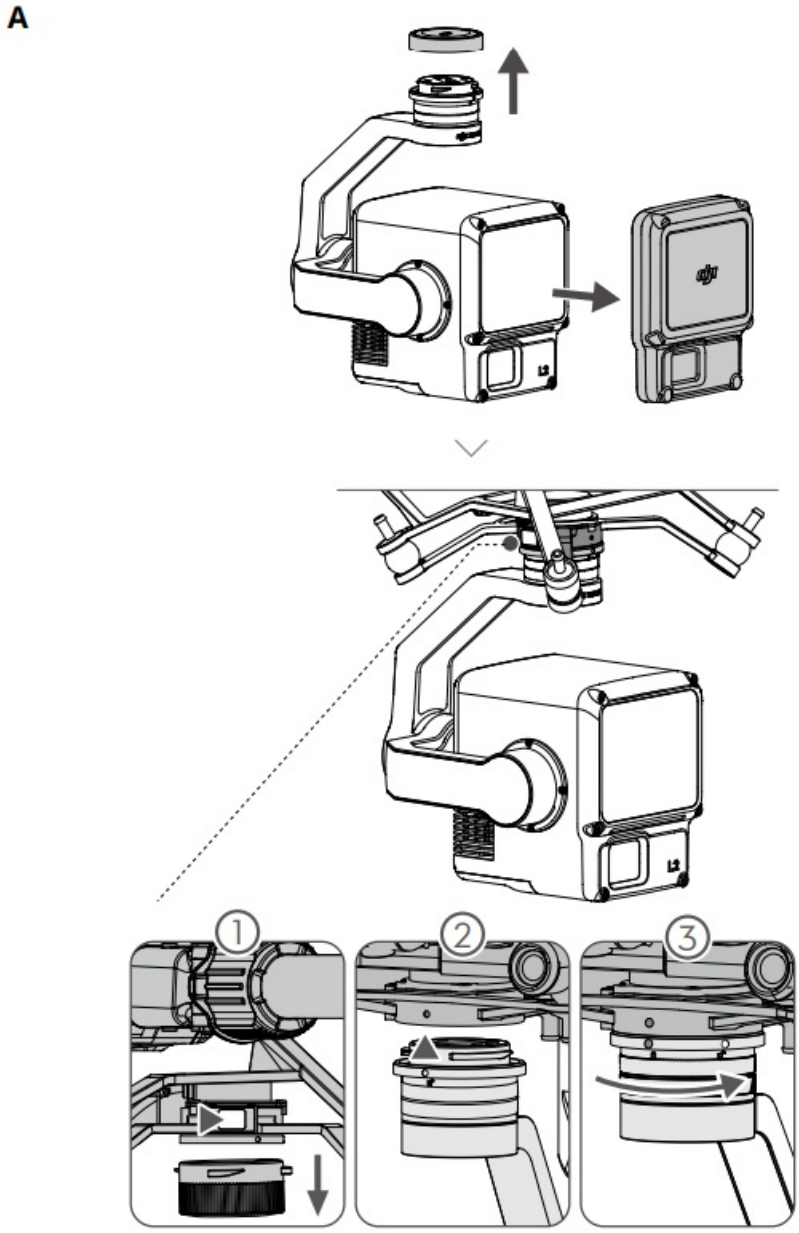


OVERVIEW



1. Gimbal Connector
2. Pan Motor
3. Roll Motor
4. Tilt Motor
5. microSD Card Slot
6. RGB Mapping Camera
7. LiDAR

Installation

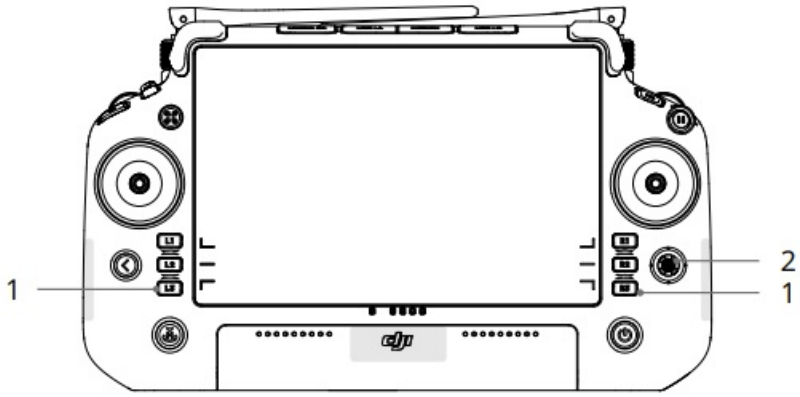


- To ensure the mapping accuracy, make sure the L2 is mounted on a single downward gimbal connector with the cable connected to the right USB-C port (when facing the aircraft).
- Make sure the gimbal connector on the aircraft is positioned correctly when mounting. Otherwise, the L2 cannot be mounted.
- Only remove the L2 after powering off the aircraft.
- Remove the L2 by pressing the button on the aircraft to detach the gimbal and camera.
- Make sure the microSD card slot cover is firmly in place to prevent dust or moisture entering during usage or transportation.
- To avoid burns, DO NOT touch the camera case and the optical window when powering on.
- Detach the gimbal from the aircraft during transportation or storage. Otherwise, the service life of the damper balls may be shortened or they may even be damaged.

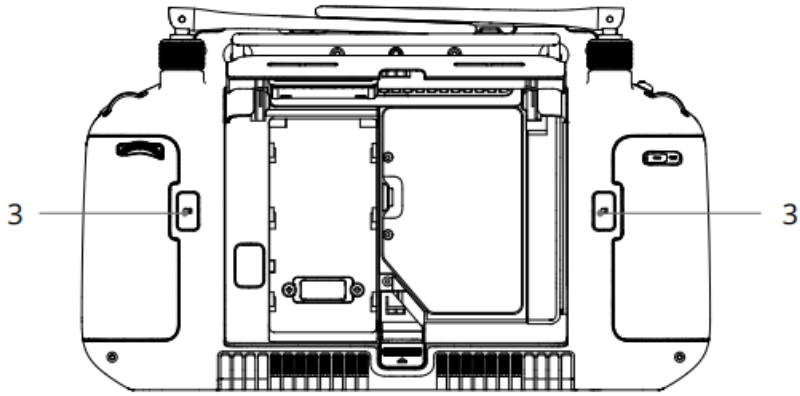
Camera Controls

Remote Controller
With the buttons on the DJI RC Plus remote controller, users can switch between point cloud and visible light live views, preview the point cloud effect, and control the gimbal and camera.

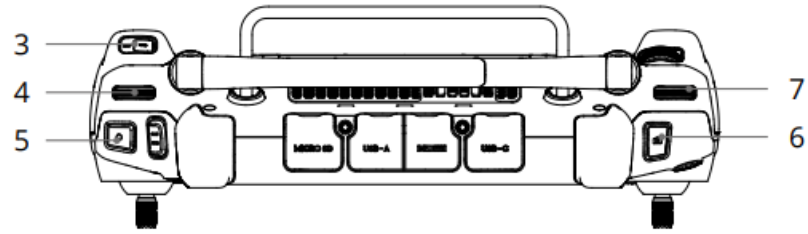
1. L1/L2/L3/R1/R2/R3 Buttons: go to Camera View in DJI Pilot 2 to view the specific functions of these buttons. Refer to the DJI Pilot 2 App section for details.



2. 5D Button*



3. Customizable C1/C2/C3 Buttons*
4. Left Dial: adjust the tilt of the gimbal.

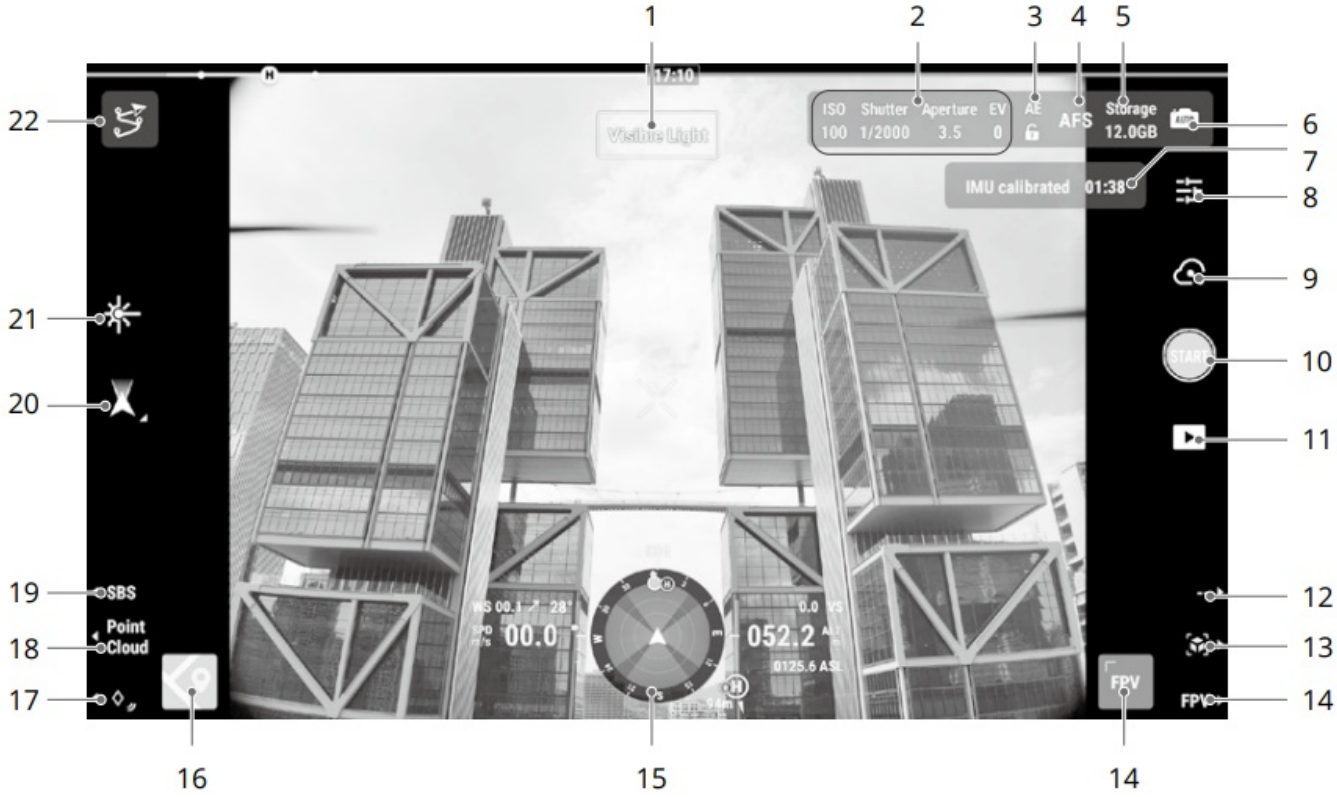


5. Record Button: press once to start or stop recording.
6. Focus/Shutter Button: press the button halfway down for autofocus and all the way down to take a photo.
7. Right Dial: adjust the pan of the gimbal.

* The function of these buttons can be customized in the DJI Pilot 2 app.

DJI Pilot 2 App

In DJI Pilot 2 app, users can perform a flight mission or use Manual mode to record point cloud data, preview the model and take a quick view of 3D point cloud effect.



1. View Type
2. Camera Parameters
3. Auto Exposure Lock
4. Focus Mode
5. Storage Info
6. Exposure Settings
7. IMU Calibration Status
8. Camera Settings
9. Recording Mode (Shutter/Video Record/Point Cloud Record)
10. Shooting Button
    (Shutter/Video Record/Point Cloud Record)
11. Playback
12. Switch Coloring Coding (point cloud view)
13. Preview
14. FPV Camera View
15. Navigation Display
16. Map View
17. Laser PinPoint
18. Visible Light/Point Cloud Toggle
19. Single/Side-By-Side View Toggle
20. Gimbal Mode
21. Laser Ranging
22. Flight Route Library

The above image is for reference only. The actual interface varies according to the app version.

Mission Flight

Users can create a flight mission to record point cloud data in DJI Pilot 2 and import the recorded data into DJI Terra for high-precision model reconstruction.

Getting Started

1. Make sure the L2 is correctly installed on the single downward gimbal connector of the aircraft, and that the aircraft and remote controller are linked after powering on.
2. Go to camera view in DJI Pilot 2, select ••• and then Precise Positioning Setting. Choose the RTK service type, and make sure that the status of RTK positioning and heading both display FIX.
3. Adjust the camera parameters on the upper right corner of camera view according to the surroundings. Make sure the photo is well exposed. Tap AUTO to switch exposure modes. It is recommended to set Auto mode for recording point cloud data.

Recording Point Cloud Data

To record point cloud data, create a flight mission or begin a manual flight. The following uses an Area Route as an example.

1. Enter the camera view in DJI Pilot 2 and tap , select Create a Route, and then Area Route. Tap on the map view, and drag the boundary point to adjust the range of the mapping area.
2. Choose the aircraft, and then select Zenmuse L2, LiDAR Mapping. Set the Payload Settings, Advanced Settings, and other parameters. It is recommended to set the Side Overlap (LiDAR) to above 20%, the Scanning Mode to Repetitive, the altitude to 150 m, the flight speed to 15 m/s, and to enable Calibrate IMU.
3. Tap to save the task and tap to upload and execute the flight mission.
4. Power off the aircraft after the mission is completed and remove the microSD card from the L2. Insert the microSD card into a computer and check the point cloud data and other files in the DCIM folder.

Read the Zenmuse L2 User Manual for more information about setting parameters for Photogrammetry missions, and recording point cloud data with Mission and manual flights.

Reconstruction in DJI Terra

Follow the steps below to reconstruct point cloud data in DJI Terra.

1. Launch DJI Terra and select New Mission. Then create and save a point cloud post-processing mission.
2. Select in the mission editing view and import the folder from the microSD card. The folder will be named according to the time the first point cloud data was recorded.
3. Click to start reconstruction and wait until it is completed.
4. Open the current mission folder to check the result of the reconstruction.
    - Read the DJI Terra User Manual for more information about how to configure and use a reconstruction in DJI Terra.

Specifications

General	
Dimensions	155×128×176 mm
Weight	905 ± 5 g
Power	28 W (typical), 58 W (max.)
IP Rating	IP54
Operating Temperature	-20° to 50° C (-4° to 122° F)
Supported Aircraft	Matrice 350 RTK, Matrice 300 RTK (Requires DJI RC Plus remote controller)
System Performance	
Detection Range [1]	450m @50% reflectivity, 0 klx 250m @10% reflectivity, 100 klx
Point Cloud Rate	Single return: max. 240,000 pts/s Multiple returns: max. 1,200,000 pts/s
System Accuracy [2]	Vertical: 4 cm @ 150 m Horizontal: 5 cm @ 150 m
Real-Time Point Cloud Coloring Coding	Reflectivity, Altitude, Distance, RGB
LiDAR	
Ranging Accuracy (RMS 1σ) [3]	2 cm @ 150 m
Maximum Returns Supported	5
FOV	Repetitive scanning pattern: 70°×3° Non-repetitive scanning pattern: 70°×75°
Laser Wavelength	905 nm
Laser Safety	Class 1 (IEC 60825-1:2014) (Safe for eyes)
RGB Mapping Camera	
Sensor	4/3 CMOS, 20 MP
Photo Size	5280×3956
Focal Length	24 mm (equivalent)
Shutter Speed	Mechanical shutter: 1/2000-2 s
ISO	Photo: 100-6400
Aperture Range	f/2.8-f/11
Supported File System	exFAT
Photo format	JPEG/DNG (RAW)
Gimbal	
Stabilization System	3-axis (tilt, roll, pan)
Angular Vibration Range	0.01°
Mounting	Detachable DJI SKYPORT
Controllable Rotation Range	Tilt: -120° to +30° Pan: ± 90°

Data Storage	
Raw Data Storage	Photo/IMU/Point cloud/GNSS/Calibration files
Supported microSD Cards	microSD: Sequential writing speed of 50 MB/s or above and a UHS-I Speed Grade 3 rating or above; Max capacity: 256 GB
Post-Processing Software	
Supported Software	DJI Terra
Data Format	DJI Terra supports exporting standard format point cloud models: Point cloud format: PNTS/LAS/PLY/PCD/S3MB Trajectory file format: sbet.out/sbet.txt

1. Measured using a flat target with a size larger than the laser beam diameter, perpendicular angle of incidence, and with an atmospheric visibility of 23 km. In low-light environments, the laser beams can achieve the optimal detection range. If a laser beam hits more than one target, the total laser transmitter power is split and the achieveable range is reduced.
2. The accuracy was measured under the following conditions in a DJI laboratory environment: using an Area Route mission with Calibrate IMU enabled in DJI Pilot 2, and using repetitive scanning with the RTK in the FIX status. The relative altitude was set to 150 m, flight speed to 15 m/s, gimbal pitch to -90°, and each straight segment of the flight route was less than 1500 m. Choose objects with obvious angular features for data collection. DJI Terra was used for postprocessing with Optimize Point Cloud Accuracy enabled. If not enabled, the vertical accuracy is 4 cm and the horizontal accuracy is 8 cm.
3. Measured in an environment of 25° C (77° F) with a target of 80% reflectivity at a distance of 150 m. The actual environment may differ from the testing environment. The figure listed is for reference only.

Compliance Information

FCC Compliance Statement
Supplier's Declaration of Conformity
Product name: DJI L2
Model Number: ZL2
Responsible Party: DJI Research LLC
Responsible Party Address: 17301 Edwards Road, Cerritos, CA 90703
Website: www.dji.com
We, DJI Research LLC, being the responsible party, declares that the above-mentioned model was tested to demonstrate complying with all applicable FCC rules and regulations.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

ISED Compliance
CAN ICES-003 (B) / NMB-003(B)

EU & UK Compliance Notice

Compliance Statement: SZ DJI TECHNOLOGY CO., LTD. hereby declares that this device (DJI L2) is in compliance with the essential requirements and other relevant provisions of the Directive 2014/30/ EU.
A copy of the EU Declaration of Conformity is available online at **www.dji.com/euro-compliance**
EU contact address: DJI GmbH, Industriestrasse 12, 97618, Niederlauer, Germany
Compliance Statement: SZ DJI TECHNOLOGY CO., LTD. hereby declares that this device (DJI L2) is in compliance with the essential requirements and other relevant provisions of Electromagnetic Compatibility Regulations 2016.
A copy of the GB Declaration of Conformity is available online at **www.dji.com/euro-compliance**

Environmentally friendly disposal
Old electrical appliances must not be disposed of together with the residual waste, but have to be disposed of separately. The disposal at the communal collecting point via private persons is for free. The owner of old appliances is responsible to bring the appliances to these collecting points or to similar collection points. With this little personal effort, you contribute to recycle valuable raw materials and the treatment of toxic substances.

CLASS 1 CONSUMER LASER PRODUCT:
EN50689:2021/ EN60825- 1:2014+A11:2021/ IEC60825-1:2014. Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825- 1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.

Caution use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

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Contact
DJI SUPPORT

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大疆行业应用服务公众号

https://enterprise.dji.com/zenmuse-l2/downloads

Documents / Resources

	**dji ZENMUSE L2 Accurate LiDAR and Photogrammetry** [pdf] User Guide ZENMUSE L2 Accurate LiDAR and Photogrammetry, ZENMUSE L2, Accurate LiDAR and Photogrammetry, LiDAR and Photogrammetry, Photogrammetry

References

- **User Manual**