



instruction manual Rev.1.3

Created by amuse oneself Inc.



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INDEX

1	For safe use	Safety precautions	002
		Precautions for use and safety	002
		Environmental conditions for use	003
		Precautions for storage and transportation	003
		How to dispose	003
		How to care the product	004
		For safe use of laser products	004
		Environmental considerations	005
2	Accessories		006
3	Name of each part	TDOT 3 GREEN	007
		TDOT GATEWAY	008
4	Setting	For DJI Matrice 300 RTK	009
5	Center-of-gravity calibration	For DJI Matrice 300 RTK	010
6	How to use TDOT 3 GREEN	Pre-flight preparation	011
		Flight	014
		Changing drone batteries during the measurement flight	015
		Landing and shutdown of TDOT 3 GREEN	016
		Acquiring the measurement data and Preview analysis (on-site confirmation)	017
7	How to use TDOT GATEWAY	How to charge	018
8	How to use TDOT STATUS (APP)		019
9	About the Eye Safe function		020
10	Status		021
11	Main specifications		023

※This manual is written in accordance with the Industrial Safety and Health Law and other related laws and regulations in Japan. When using the product outside Japan, follow the laws and regulations of the respective country and state.

Safety precautions (Please read carefully)

Please read this chapter carefully before using this product.

This section explains the necessary precautions to prevent harm to the user or others, or damage to property.

When using this product, please ensure safety in accordance with various laws and regulations.

Improper use of this product may cause injury to persons, property damage, or damage to the protection of the product.

1 Meaning of Indications

The following indications are used to classify and explain the degree of harm or damage that may result if the information in this manual is ignored and the product is used improperly.



WARNING

indicates a potentially hazardous situation that, if misused, could result in death or serious injury.



CAUTION

indicates a potentially hazardous situation that, if misused, could result in personal injury or property damage.

 Warning and  Caution are classified and explained by the following pictorial symbols.



Mandatory

This symbol indicates that there are certain items that must be complied with.



Prohibited

This symbol indicates prohibited items.



Caution

This symbol indicates items for which caution (including warning) is required.

Precautions for use and safety

This product is a device that generates Class 3R lasers. To avoid eye injury due to exposure, this product is equipped with an "Eye Safety function" that automatically reduces the laser output to Class 1M when the ground altitude is within 40m, but disassembling or modifying the device may cause it to stop functioning properly.

Also, this product is a precision instrument. Securely attach the product to the drone to prevent it from falling.

In addition, to use this product safely, please comply with the following items.



WARNING



Mandatory

Do not disassemble or modify the product. It may cause fire, electric shock, burns, laser exposure, or malfunction.



Mandatory

Make sure to attach the product to the drone in accordance with the method described in this instruction manual. Failure to do so may result in malfunction, damage to property, or injury due to falling.



Mandatory

Turn off the power of the drone before removal. Failure to do so may result in malfunction.



Mandatory

Do not intentionally stare at the laser emitted from this product or expose it to the eyes of people or animals. It may cause blindness.



Mandatory

Do not use this product at a voltage other than the indicated power supply voltage. It may cause fire, electric shock, or malfunction.



Mandatory

Do not short-circuit the terminals. It may cause overheating, fire, or failure due to high current.



Prohibited

Do not touch the product with wet hands. It may cause electric shock or a failure.



Prohibited

Do not give a large shock or vibration by dropping or falling. It may cause a malfunction.

**CAUTION****Mandatory**

When you need to get the power supply from the drone itself, please use the attached special cable and connect it correctly. Do not pull, twist, or damage the cable. It may cause fire, electric shock, or malfunction.

**Mandatory**

Touching the product after it has fallen may cause injury due to breakage of the glass or the case. Be sure to wear protective gloves.

**Prohibited**

Do not place containers with liquids such as water, beverages, or chemicals on the product. If liquid is spilled inside the unit, it may cause a fire, electric shock, or malfunction.

**Caution**

If you notice any abnormalities such as strange noises or smells, stop the operation immediately. It may cause a fire, electric shock, or malfunction.

**Caution**

This product is only for use with drones. Please refrain from using it with other than drones.

Environmental conditions for use

Please use this product in accordance with the environmental conditions (input power supply, operating temperature, and operating humidity) of the device that constitutes TDOT 3 GREEN.

**CAUTION****Prohibited**

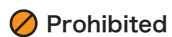
Do not use the product when it rains or snows. It may cause malfunction.

**Prohibited**

Do not use the product in a place subject to water drops, high humidity, or condensation. It may cause a fire, an electric shock, or malfunction.

**Prohibited**

Do not place the equipment directly on the ground. It may cause malfunction.

**Prohibited**

Do not install the product in a way that blocks the cooling fan or ventilation holes. It may cause a fire or malfunction.

**Caution**

Use the instrument in an environment with low AC power supply noise. It may cause degradation of measurement accuracy or malfunction.

**Caution**

Use the instrument in an ambient temperature range of 0°C to 40°C (no condensation). It may cause degradation of measurement accuracy or malfunction.

Precautions for storage and transportation

When transporting the product, use the dedicated hard case and do so properly.

**CAUTION****Mandatory**

Store the product correctly in the dedicated hard case, lock all parts, and transport the product with care to prevent it from falling or being shocked. Otherwise, it may cause injury or malfunction.

**Mandatory**

If the dedicated hard case is damaged, do not store the product in it. The case or the equipment may fall and cause injury.

**Prohibited**

Please be sure to clean each part of this product before storing it in the case, and make sure that no liquid remains on it. It may cause malfunction.

**Caution**

Store the product in a dry and dust-free environment away from direct sunlight. It may cause malfunction.

How to dispose

**CAUTION****Caution**

Do not dispose of this product by yourself. To dispose of it, please follow the Waste Disposal and Public Cleansing Law and entrust it to a licensed industrial waste disposal company.

How to care the product

Only clean the optical window of the LiDAR sensor. If there is dust or dirt on the optical window, it will adversely affect the performance of the LiDAR sensor. Cleaning it on a regular basis will help prevent this effect.



CAUTION



Mandatory

Use compressed air or canned air if there is dust on the optical window. Never wipe the optical window with dust, as it will cause further damage. If there is no visible dirt, there is no need to use tissue; it will adversely affect the performance of the LiDAR sensor.



Mandatory

Wipe dirt from the optical window. Never wipe with a dry lens tissue, as it will scratch the surface of the optical window. Use a wet lens tissue. Wipe slowly to remove dirt, rather than allowing it to reattach to the optical window surface. If the optical window is still dirty, it can be gently washed with a mild soap solution. This will adversely affect the performance of the LiDAR sensor.



Prohibited

Do not wipe with solvents such as benzene, thinner, etc. or detergents. It may cause discoloration, color fading, or damage.



Caution

Please turn off the power supply before maintenance. Failure to do so may result in fire, electric shock, malfunction, or injury.



Caution

Do not store the product in wet conditions. It may cause malfunction.

For the safe use of laser products

This product is a "Class 3R" laser product as defined by JIS laser product safety standard (JIS C 6802).

In order to avoid eye injury due to exposure, this product has an "Eye Safety Function" that automatically reduces the laser power to a safe level of "Class 1M" when the ground altitude is within 40m. To ensure safe use of the laser product, please note the following.



WARNING



Mandatory

Any operation or adjustment other than the procedures described in the manual may result in dangerous exposure to laser radiation.



Mandatory

Do not intentionally point it at the human body. Laser light is harmful to eyes and human body. If you suspect any damage caused by the laser beam, please get medical attention as soon as possible.



Mandatory

Do not look directly into the laser beam. There is a risk of eye damage.



Mandatory

Do not stare at the laser beam. There is a risk of eye damage.



Mandatory

Never look at the laser beam through optical instruments such as telescopes or binoculars. There is a risk of eye damage.



CAUTION



Caution

This product has an eye safety function against the laser beam, which can be deactivated by operating the key on TDOT GATEWAY to keep the product at full power, but its use is absolutely subject to the condition that no one is in the area exposed to the laser radiation. Please refrain from disabling it whenever possible.



Caution

Use the product in a condition where the laser beam is irradiated normally by conducting an inspection at the start of work, and by inspecting and adjusting the product at regular intervals.



Caution

Turn off the power when not in use.



Caution

Keep the laser beam away from the eyes of drivers and pedestrians. If the laser beam enters the eyes, blinking may cause inattention, which may lead to an unexpected accident.



Caution

Please set up the product so that it does not hit structures that reflect the laser light strongly, such as mirrors and glass windows. The reflected light of the laser is also harmful to the human body.



Caution

Wear protective goggles appropriate for the laser wavelength of 532nm when working in areas exposed to laser radiation.

Environmental considerations

Laser radiation range

TDOT 3 GREEN emits 60,000 pulses per second within 90° of the laser beam port. There is a risk of exposure to radiation. Do not look into the irradiation port. Operators must wear protective goggles appropriate for the laser wavelength of 532nm.

About altitude

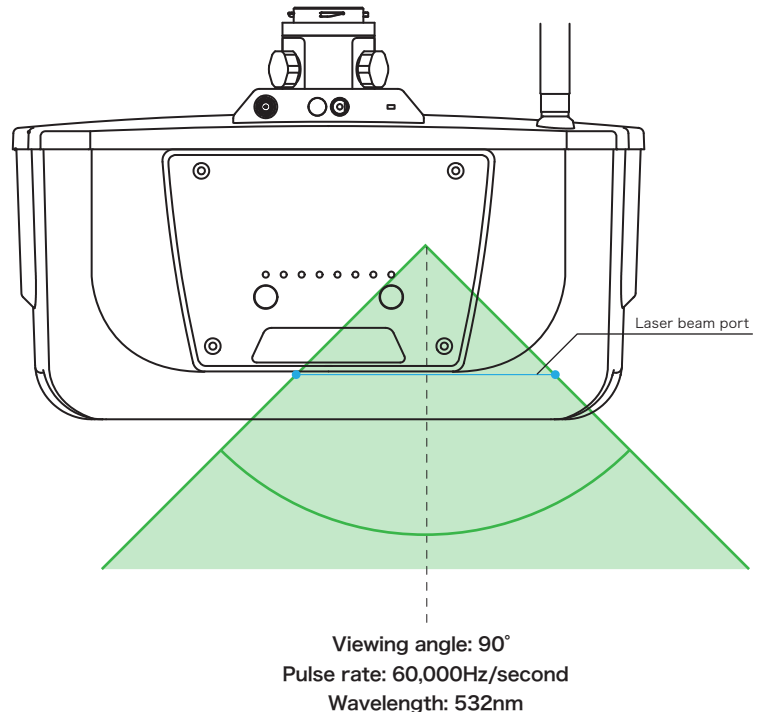
Follow the safety standards for drone operations. Do not operate at an altitude of more than 120 meters.

Temperature

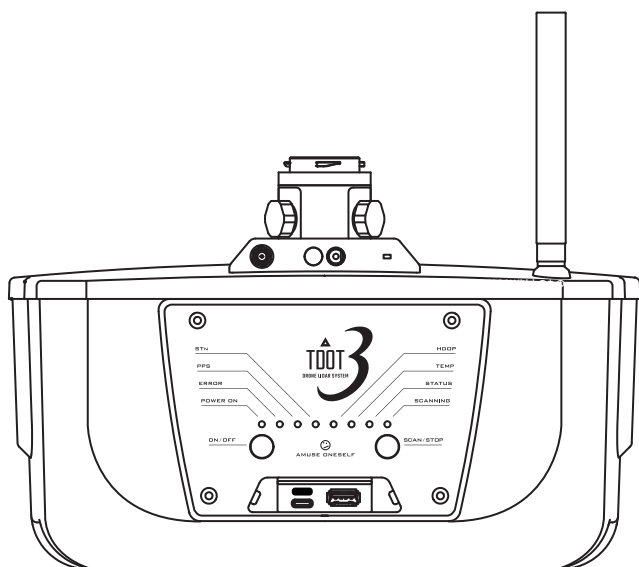
Use the product in mild weather conditions between 0 and 40 ° C (32 and 104 ° F). If the temperature exceeds 50 ° C (122 ° F), a safety device will be activated and the system will stop.

Use outdoors

TDOT 3 GREEN requires GNSS reception. Please be sure to use it outdoors, as it cannot be measured properly indoors.



Operators must wear protective goggles appropriate for the laser wavelength of 532nm.

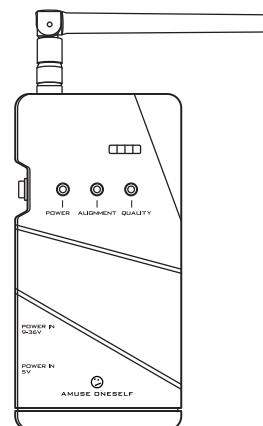


TDOT 3 GREEN

- A laser scanner system to be mounted on a drone for scanning.
- You can check the status in combination with TDOT GATEWAY.

**Power cable and mobile battery are not provided.
Please purchase the products compatible to the
following separately.**

Power supply	12-36V $\equiv$ $\ominus$ $\oplus$
	USB Type- C 5V (60W or more)



TDOT GATEWAY (TDOT Accessory)

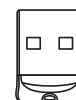
- You can monitor the status of TDOT 3 GREEN remotely.
- It sends the status to your smartphone app.

**Power cable and mobile battery are not provided.
Please purchase the products compatible to the
following separately.**

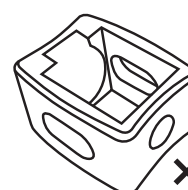
Power supply	9-36V $\equiv$ $\ominus$ $\oplus$
	USB Type-C 5V



Dedicated hard case

Instruction manual
(this document)USB memory stick
(64GB)

OPTION

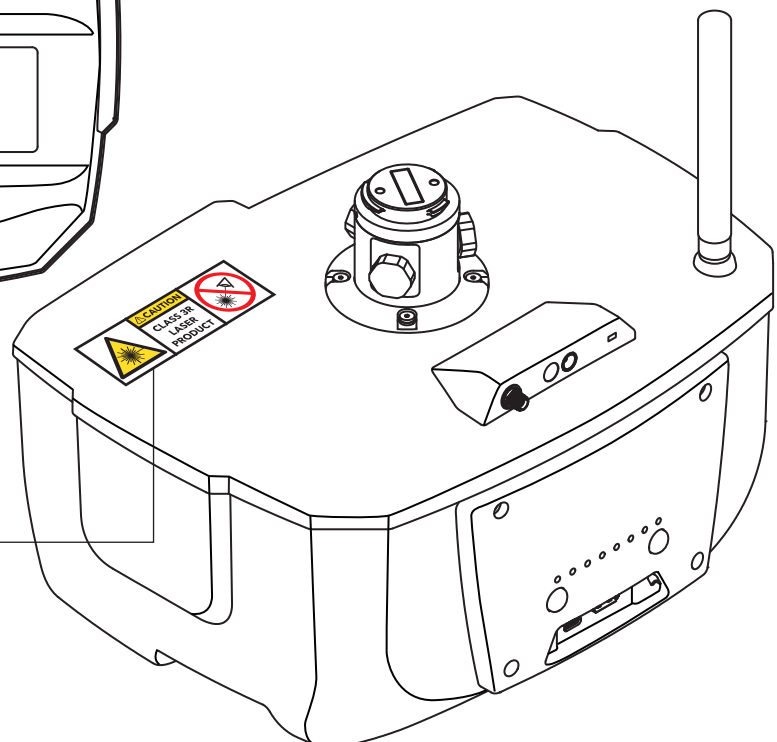
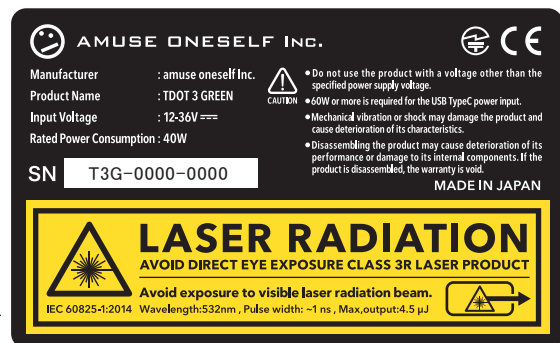
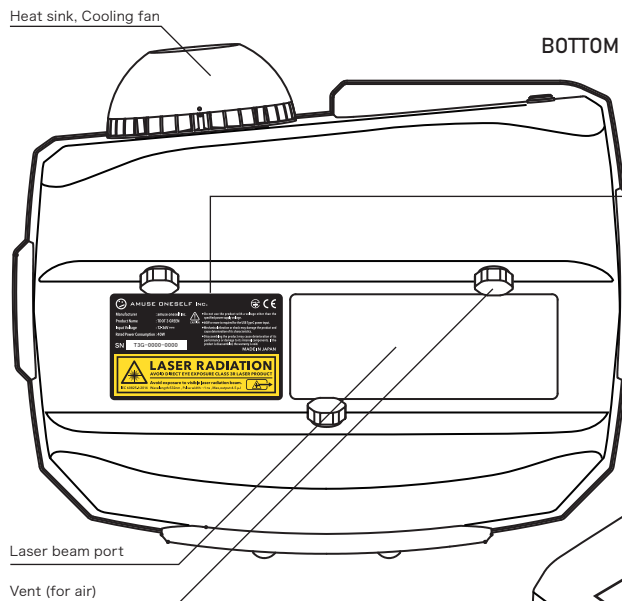
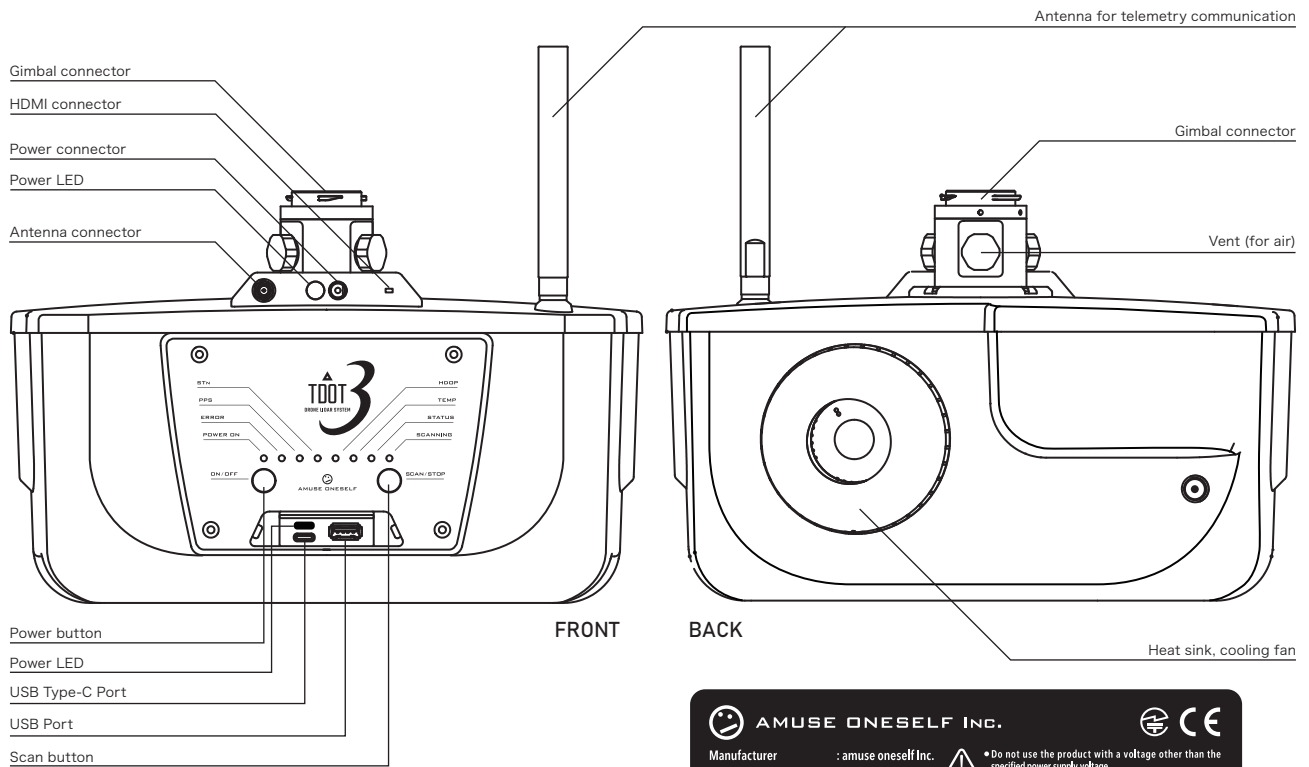
GNSS antenna
(for Matrice300RTK)

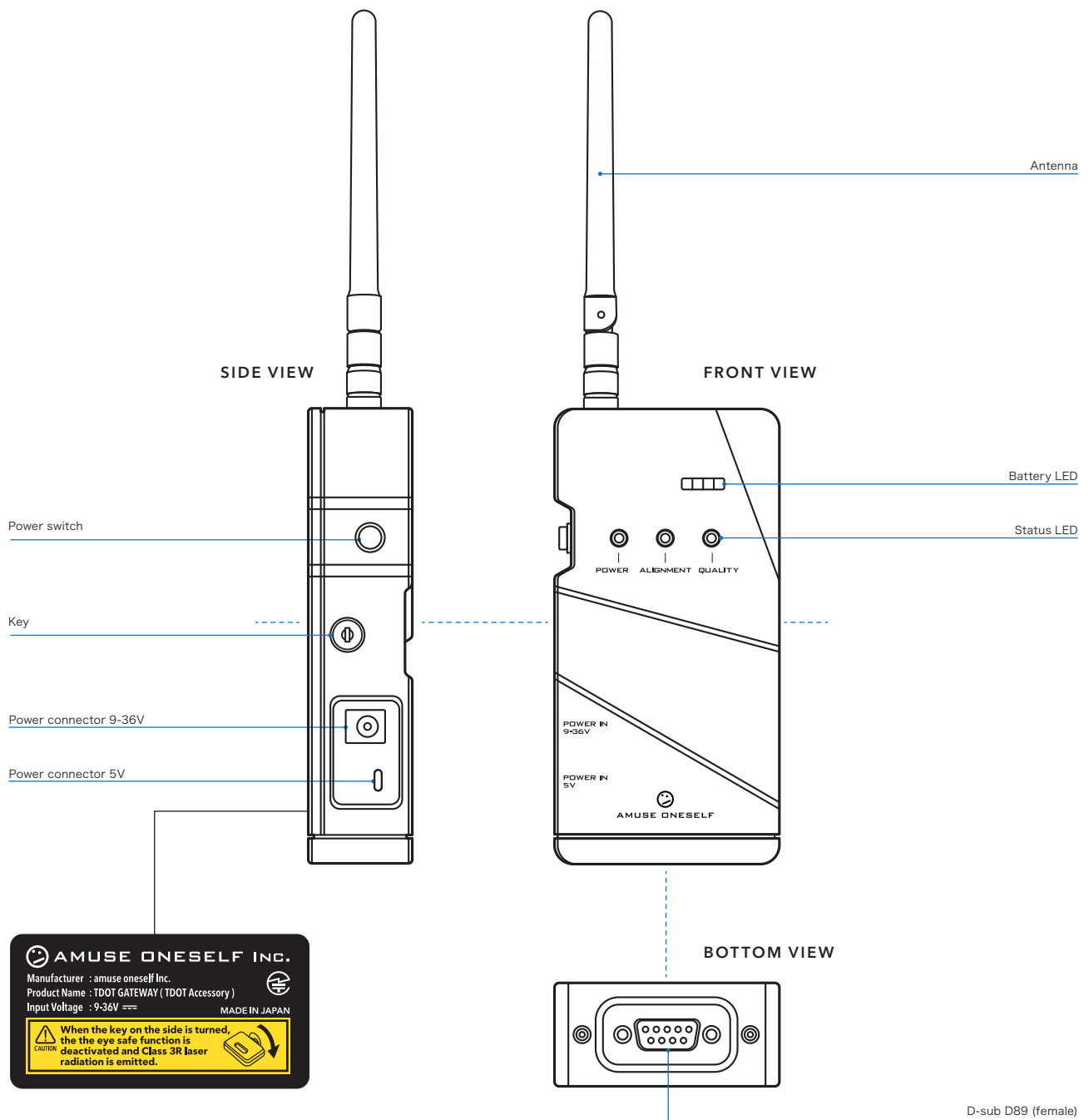
x4

Gimbal
reinforcement dampers
(for Matrice300RTK)

3

Name of each part TDOT 3 GREEN



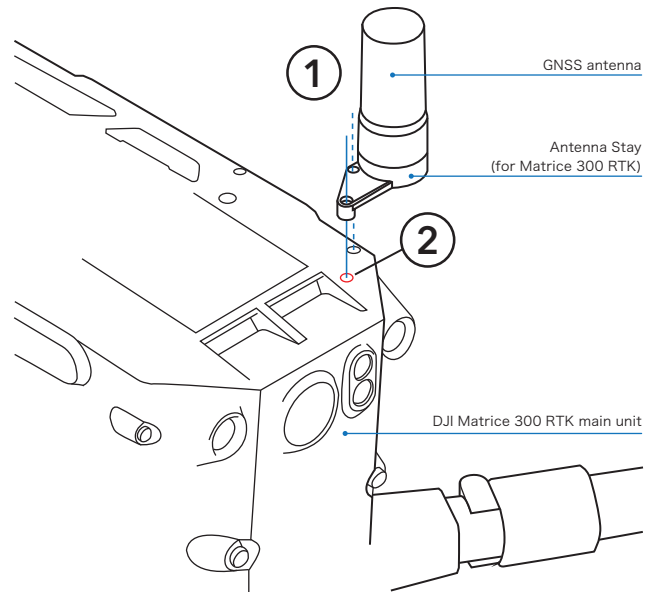


1

Installing the GNSS antenna

Use the dedicated antenna stay to attach the GNSS antenna.

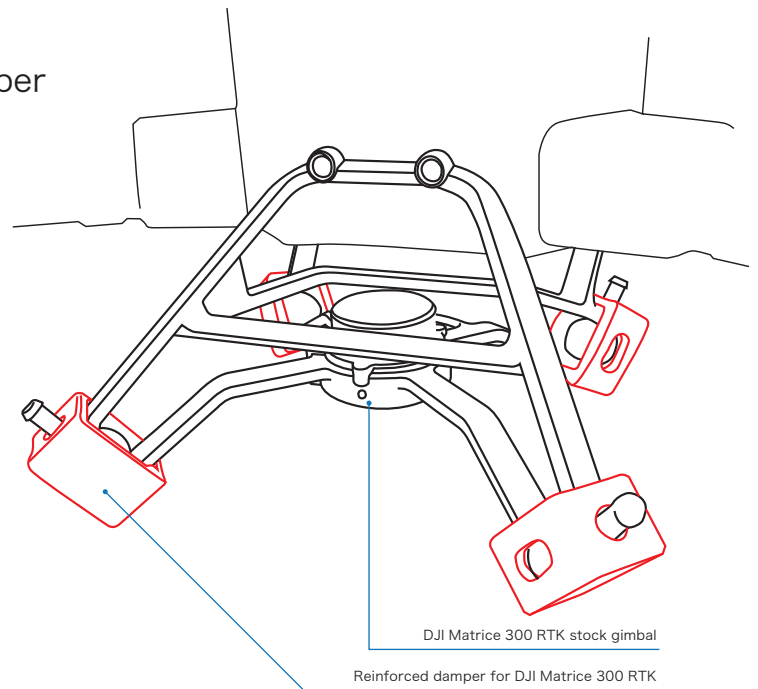
- ① Attach the antenna stay.
- ② Secure the antenna stay with the screws.



2

Installing the gimbal damper rubber

To strengthen the DJI Matrice 300 RTK's stock gimbal damper, install the special reinforcement damper. Simply cover the stock damper in four places.



1 What is center-of-gravity calibration?

DJI Matrice 300 RTK has a calibration function that recognizes the payload mounted to the drone and adjusts the center of gravity. Be sure to perform the center-of-gravity calibration in the following cases.

※For more information on center-of-gravity calibration, please refer to DJI Matrice 300 RTK user manual.

- **First flight in new condition.**
- **Last flight was conducted with no payload mounted.**
- **Last flight was conducted with a camera only.**
- **Last flight was conducted with a different equipment than TDOT 3 GREEN.**

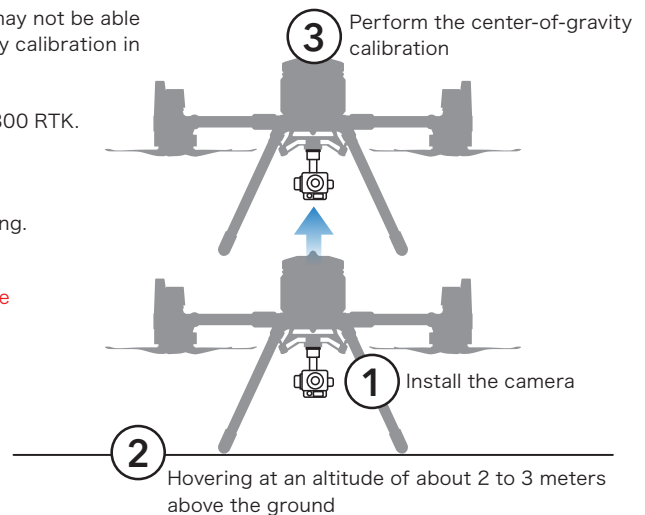
If any of the above apply to the case, flying with TDOT 3 GREEN installed may cause the drone to fall over due to a shift in the drone's center of gravity.

2 1st: Install the camera and perform the center of gravity calibration

If there is an extreme center of gravity shift, the drone may not be able to fly and may fall over. Always perform center-of-gravity calibration in order of lighter payload.

- ① Install a camera that can be attached to DJI Matrice 300 RTK.
- ② Fly the drone up to a height of about 2 to 3 meters above the ground and hover.
- ③ Perform the center-of-gravity calibration while hovering.

 There is a risk of falling down when performing center-of-gravity calibration. Be sure to perform the calibration from the ground.

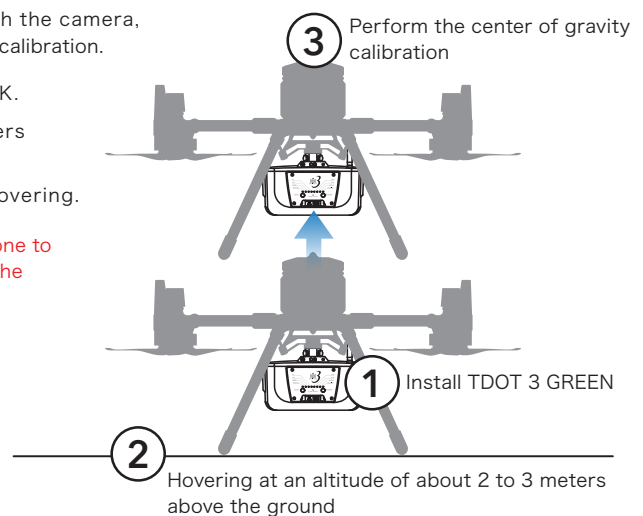


3 2nd: Install TDOT 3 GREEN and perform the center-of-gravity calibration

After performing the center of gravity calibration with the camera, install TDOT 3 GREEN and perform the center of gravity calibration.

- ① Install the TDOT 3 GREEN on DJI Matrice 300 RTK.
- ② Fly the drone up to a height of about 2 or 3 meters from the ground and hover.
- ③ Perform the center-of-gravity calibration while hovering.

 The center-of-gravity calibration may cause the drone to fall down. Be sure to perform the calibration from the ground.



This is the end of the process.

Please be sure to perform the center-of-gravity calibration if you have flown with other equipment before flying with TDOT 3 GREEN.

Pre-flight preparation

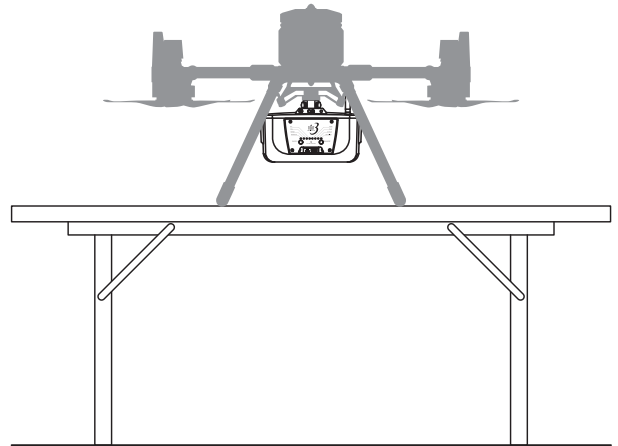
1 Wearing protective goggles

TDOT 3 GREEN is equipped with an eye safety function, but it is still a device capable of emitting Class 3R laser. Since there is a possibility of exposure, operators in areas exposed to laser radiation should wear protective goggles (optional) appropriate for 532nm laser wavelength.

2 Place the drone on a stable stand (recommended)

Blocking GNSS signal may adversely affect the acquired data. Place the drone on a horizontal and stable stand, such as a desk, as much as possible, and perform tasks other than landing on the stand so as not to cover the GNSS antenna.

! For DJI Matrice 300 RTK, the internal center of gravity may have shifted if a device other than TDOT 3 GREEN was installed and flown on the first or previous flight.
For details, please refer to Page 5.
Center-of-gravity calibration.

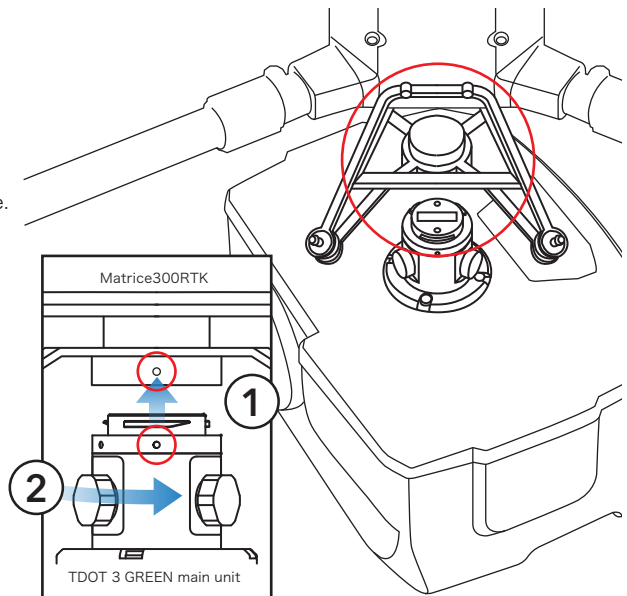


3 Installing TDOT 3 GREEN to the drone

Install TDOT 3 GREEN main unit to the gimbal of the drone.

- ① Match the mark of the gimbal connector and insert it.
- ② Turn the gimbal connector in the direction of the arrow to complete the installation.

! Make sure that the lock is securely in place. Improper installation may result in accidents such as falling.



4 Checking various connections

Please set up the following.

- ③ Connect GNSS antenna cable
- ④ Insert a USB memory stick for recording

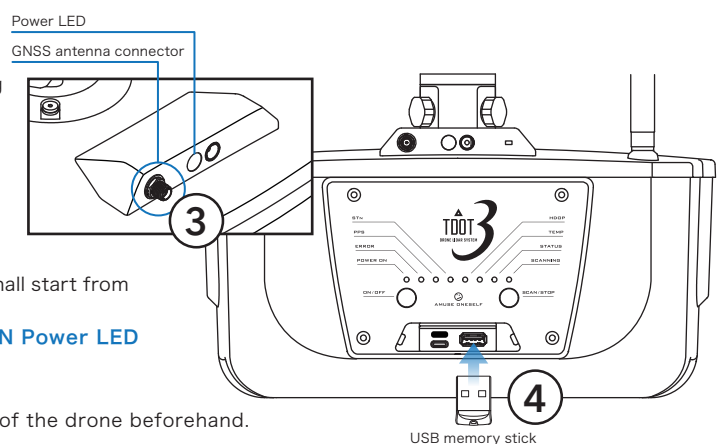
5 Activating the drone

Activate the drone.

When turning on the drone, the power supply shall start from the drone to TDOT 3 GREEN.

When power supply starts, TDOT 3 GREEN Power LED light turns green.

! Please perform the compass calibration of the drone beforehand.



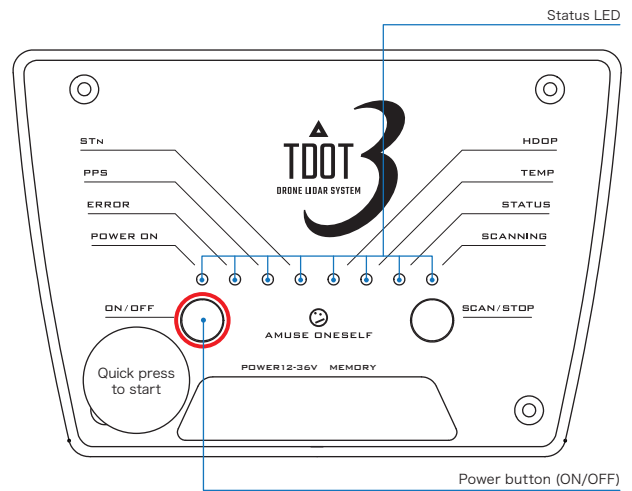
Pre-flight preparation

6 Startup of TDOT 3 GREEN

Press the Power button (ON/OFF) once, the system is activated. Do not start operation of TDOT 3 GREEN until the system start up process is completed.

How Status LED is displayed

- 1 POWER ON is lit green
- 2 Each Status LED is lit in order, so check all LEDs
- 3 POWER ON blinks
- 4 When POWER ON is lit, the startup is complete

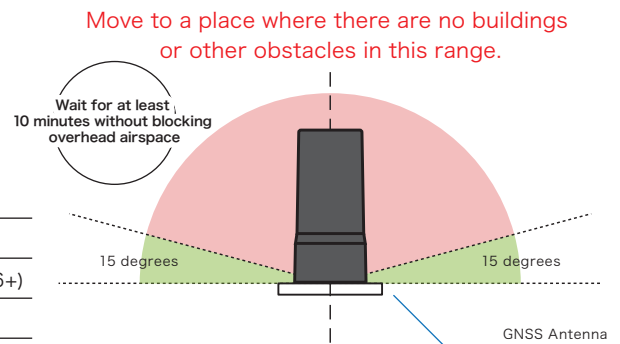


7 Wait for the status to be fixed (about 10 minutes)

When TDOT 3 GREEN is activated, it automatically starts searching GNSS. Make sure that the range of the GNSS antenna shown on the right is not blocked by any obstacles such as buildings as well as people. If there is any obstacle in the range, please move it.

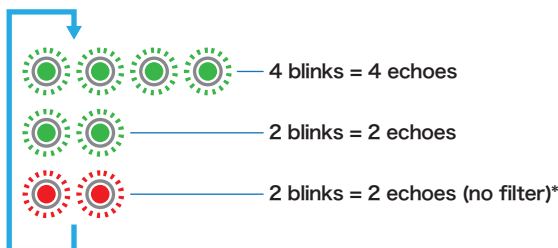
Please leave it for about 10 minutes or more and wait until Status LED becomes the recommended value.

PPS	➤ blinking green
Stn	➤ blinking 6+ times (blinking green means 6+)
HDOP	➤ blinking green 3 times and then on
SCANNING	➤ blinking green slowly



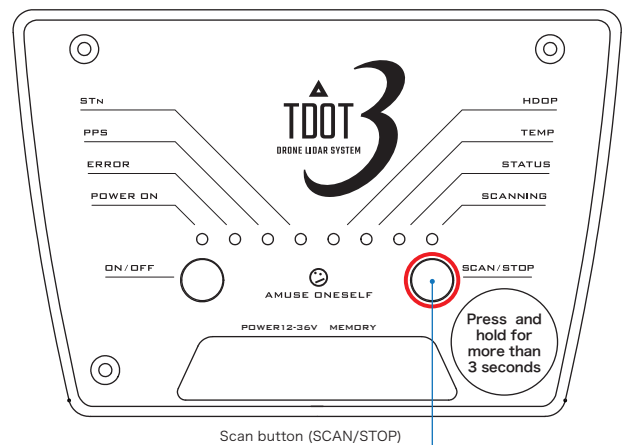
8 Changing the number of echoes

When you press and hold the "SCAN/STOP" button for three seconds or longer while the power of TDOT 3 GREEN is on, the status lamp of "SCANNING" changes to blinking, and the number of echoes can be changed. You can check the number of echoes by the number of blinks. (See the figure below.)



To change the number of echoes, press "SCAN/STOP" button once while in the echo number change mode. To determine the setting, press and hold the "SCAN/STOP" button for three seconds or more to determine the setting at the specified number of echoes.

*The laser has a filter function to automatically cut noise. 2 echo (no filter) mode is for acquiring data without filtering.



Pre-flight preparation

9 Displaying the status screen

Start DJI Pilot.

When TDOT 3 GREEN is turned on, the status transmission starts automatically.



Number of receiving satellites

Recommended value: 6 or more



HDOP (Balance of satellite positioning)

Recommended value: 2.9 or less



Alignment status (alignment status of the built-in INS)

The display shows "N/A" until the alignment is completed.



Scan Mode

The current mode is displayed.

- 4Echo ... Multi-echo (4 echoes)
- 2Echo ... 2 echoes (first and last)
- 2Echo NoFilter ... Data not filtered are also acquired



Scanning Status

The current laser output status is displayed.

- EyeSafe ... Safe power (Class 1M)
- Full Power ... Full power output (Class 3R)



Board Temperature(°C)

Displays the current temperature.



Laser driver temperature(°C)

The current laser driver temperature is displayed.

- 48°C or less ... Safe temperature
 - 49°C or higher ... Dangerous temperature. Stopping scanning is recommended.
- Emergency stop occurs at 52°C or higher.



TDOT Status

10 Preparing for TDOT GATEWAY

When the laser scanner is flown for the first time, it is necessary to calibrate the IMU (Inertial Measurement Unit) by performing an in-flight alignment (IFA), which is a combination of straight line and figure-8 flight.

To check the alignment status at hand, start TDOT GATEWAY.

Press and hold the power button to start.

When started, POWER of Status LED lights up blue.

If it does not light up, there is no communication. Please check the battery and power switch.

Perform TDOT 3 GREEN alignment flight with the GATEWAY power on. When the alignment is completed, Status LED will change to a blue light.

Status LED (QUALITY) is currently not used.

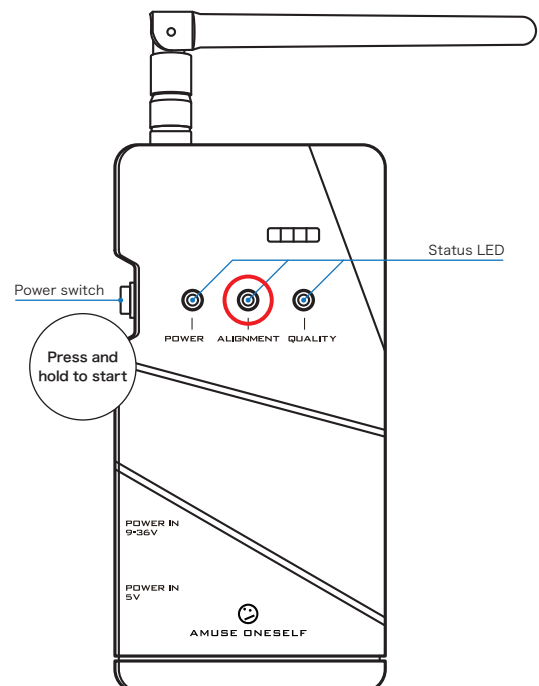
Status LED (ALIGNMENT)



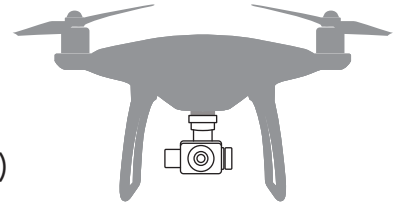
Green light (Alignment/GOOD)



Red light (Alignment/NG)



Flight



1 Test flight with a small drone (recommended)

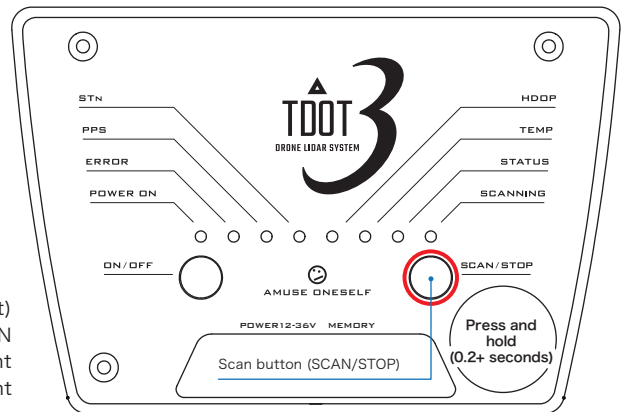
In order to confirm that there are no problems with the automatic navigation flight plan that has been created, please perform an automatic navigation flight using a small drone. Through the camera, you can check various conditions such as obstacle confirmation, altitude confirmation, and confirmation of the sky condition from the drone's behavior. After confirming that there are no problems with the flight, try to conduct the flight with the actual drone with TDOT 3 GREEN installed.

2 Start scanning

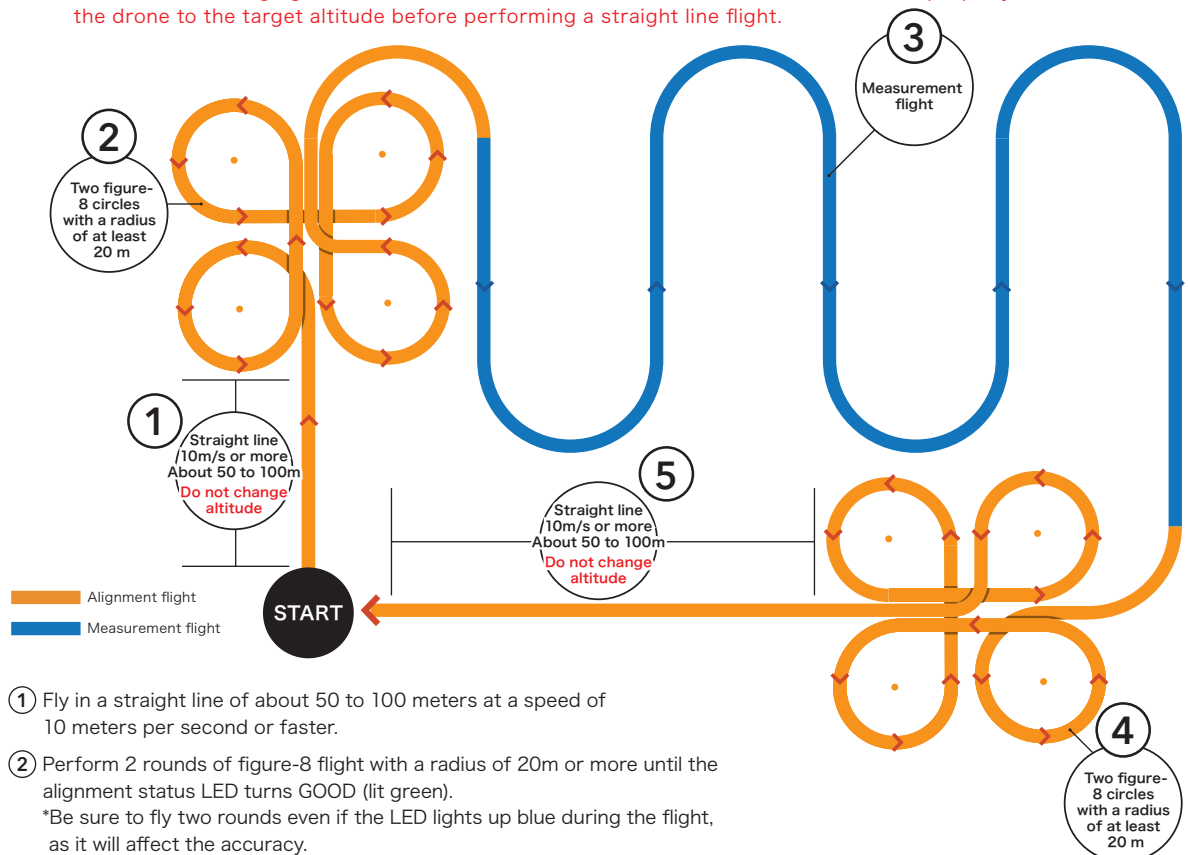
After confirming the FIX of Status LED, press the Scan Start button (SCAN/STOP) to start scanning. To prevent accidental contact, you need to press the button for at least 0.2 seconds to activate it. Please press the button slowly.

3 Start of flight

In order to calibrate the IMU (Inertial Measurement Unit) and improve the measurement accuracy, TDOT 3 GREEN flights must be preceded and followed by a figure-8 flight with a radius of at least 20 meters and a straight line flight with a speed of at least 10 meters per second.



The system will enter the alignment mode when you perform a straight line flight of more than 10 meters per second while changing the altitude. In this case, the IMU calibration cannot be done properly. Be sure to raise the drone to the target altitude before performing a straight line flight.



- ① Fly in a straight line of about 50 to 100 meters at a speed of 10 meters per second or faster.
- ② Perform 2 rounds of figure-8 flight with a radius of 20m or more until the alignment status LED turns GOOD (lit green).
*Be sure to fly two rounds even if the LED lights up blue during the flight, as it will affect the accuracy.
- ③ Start the measurement flight, and you can change the battery as long as the power supply to TDOT 3 GREEN is not stopped. Alignment flight is not required after changing the battery during the measurement flight.
- ④ Perform a figure-8 flight with a radius of 20m or more.
- ⑤ Fly in a straight line of about 50 to 100 meters at a speed of 10 meters per second or more.

Changing drone batteries during the measurement flight

1 Landing the drone

To change the batteries of the drone during measurement, first land the drone, and then stop the motor. Do not turn off the power of the drone.

2 Stopping the scan

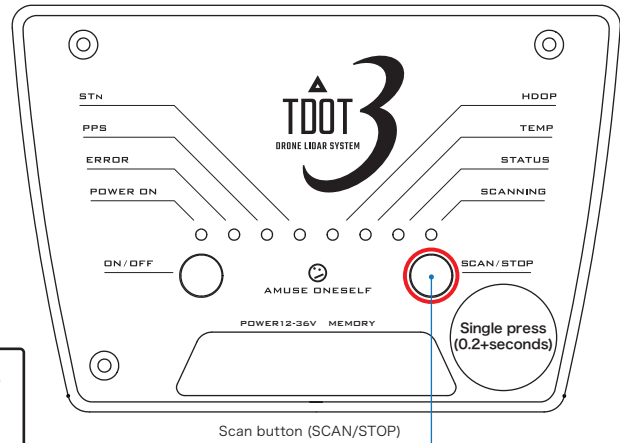
Press the Scan Stop button (SCAN/STOP) on TDOT 3 GREEN to stop the scan.

⚠ Do not disconnect or connect the power wire or shut down TDOT 3 GREEN.

When changing batteries, be sure to stop scanning.

If you continue without stopping

- In case the capacity of one measurement file exceeds 2GB, the subsequent data will not be written.
- In case the cycle gap between the IMU and the scan is caused by an error, all measurement data will not be usable.



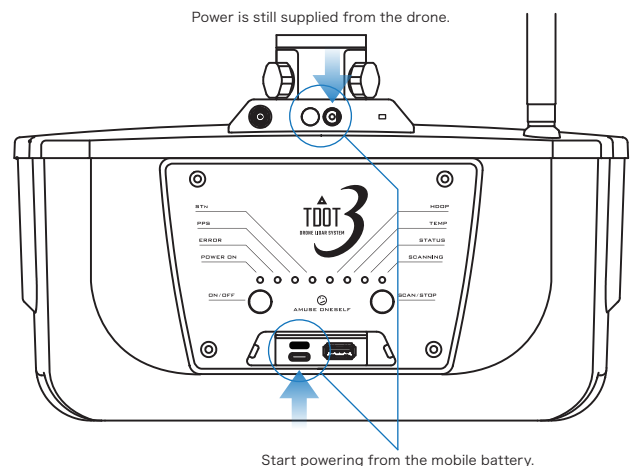
3 Connecting the mobile battery

For DJI Matrice 300 RTK

For DJI Matrice 300 RTK, the batteries can be changed one by one without shutting down power supply to the drone. Please refer to DJI Matrice 300 RTK manual for details. After replacing the batteries, please perform step **5**

For other drones

Connect the mobile battery to the power connector on the top or the bottom (USB-TypeC) of TDOT 3 GREEN, and start the power supply. (The power is supplied from both the drone and the mobile battery.) When power is supplied, the power LED near the connector turns on green; if the LED is off, power is not being supplied, so check the connection.



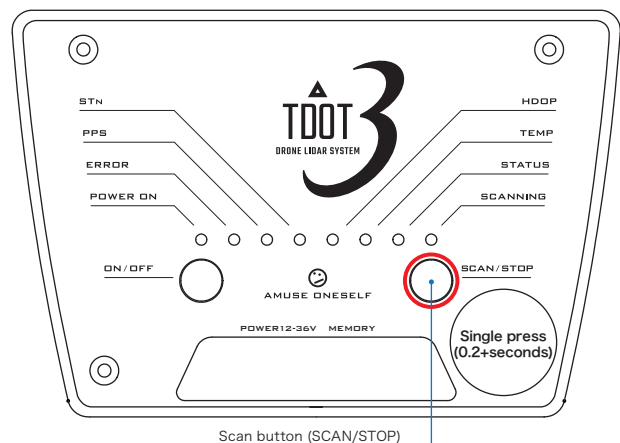
4 Turn off the power of the drone, and replace the drone battery.

After confirming the power supply from the mobile battery to TDOT 3 GREEN, please turn off the power of the drone and replace the batteries quickly. After replacing the batteries, turn on the drone, confirm that power is supplied from the drone, and remove the mobile battery.

⚠ There are some mobile batteries that recognize that power is being supplied from the drone and automatically stop supplying power to TDOT 3 GREEN to prevent excessive power supply. Please make sure that the power is being supplied from the mobile battery before turning off the drone.

5 Start scanning

When the flight is ready, press the Scan Start button (SCAN/STOP) on TDOT 3 GREEN to start the scan again and start the flight. Alignment flight is performed only twice, before and after the measurement flight. Alignment flight is not necessary during the measurement flight. Please restart from the measurement flight.



Landing and shutdown of TDOT 3 GREEN

1 Alignment flight

Perform an alignment flight at the end of the flight in the following order, and then land the drone.

The alignment flight at the end of the series of one survey

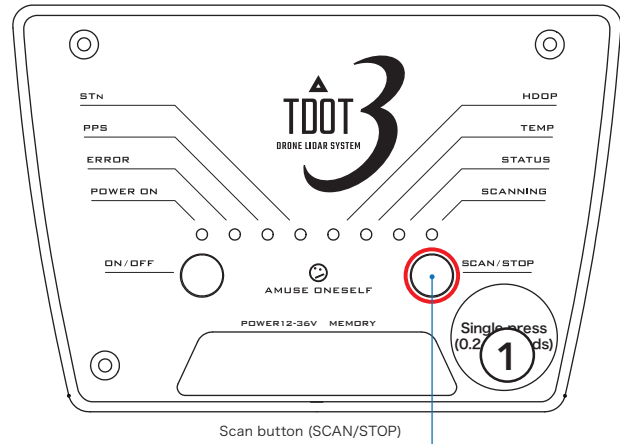
- 1 Two figure-8 flights of a 20-meter radius
- 2 50 to 100m straight line at 10m/sec

2 Landing and stopping the scan

Even if the drone took off from the table, be sure to land on the ground surface.

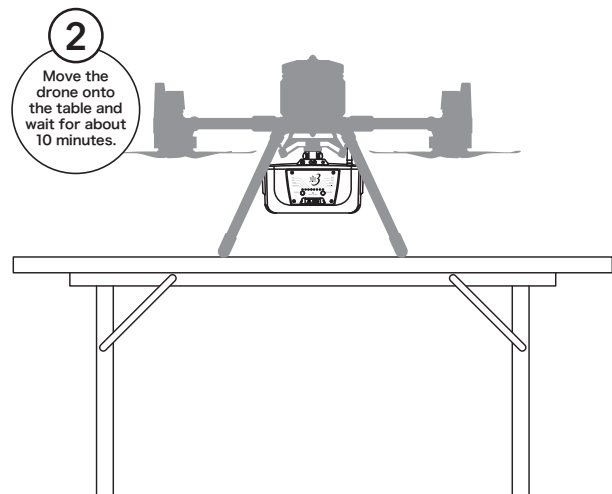
Confirm that the motor has stopped, and press the SCAN/STOP button on TDOT 3 GREEN to stop scanning.

**⚠ Please stop the scan only.
Do not shut down TDOT 3 GREEN yet.**



3 Move the drone onto the stand (recommended)

After the scan stops, immediately move the drone onto the stand/table so that the GNSS antenna is not obstructed.

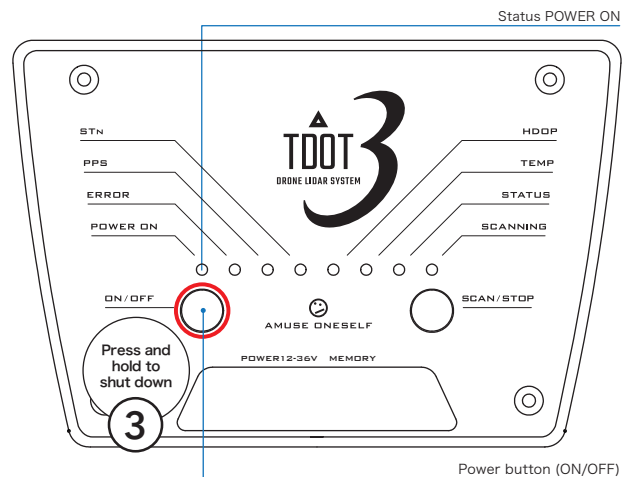


4 Wait for at least 10 minutes

Please do not turn off the power of TDOT 3 GREEN, and do not block the range of GNSS antenna, and wait for at least 10 minutes without moving it.

5 Shut down TDOT 3 GREEN by pressing and holding the power button.

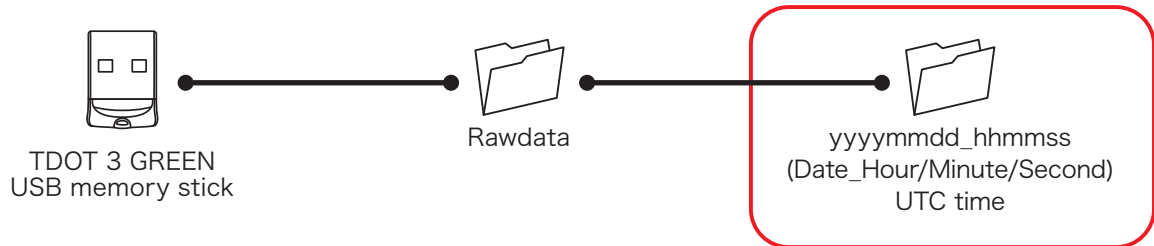
When you press and hold the power button (ON/OFF), the system starts shutdown process. When the shutdown process is completed, LED light of POWER ON turns off. The measurement is now complete. Then you can stop the power supply by turning off the drone.



Acquiring the measurement data - Preview analysis (on-site check)

1 Acquiring the measurement data

Please confirm on the spot whether the measurement data has been acquired respectively.
Remove the USB memory from TDOT 3 GREEN, and save the all files to the device (PC) for data confirmation.



Approximate capacity of a USB memory stick for a 15-minute measurement

Measurement data > 500MB

The USB memory provided with TDOT 3 GREEN is 64GB.

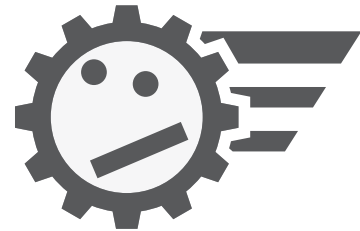
If the capacity is exceeded, the data cannot be acquired, so please back up the data to HDD, etc. as appropriate, and delete the date file in the USB memory. When formatting, **please format in exFAT format or FAT32 format.**

2 Preview analysis

Is there any omission in the acquired data?
Is the entire measurement area scanned without omission?
You can check the acquired data for any problems on the spot by reading it into the attached preview analysis application "TDOT PrePROCESSING".

Please be sure to check the data on site.

For details on how to use TDOT PrePROCESSING, please refer to the separate TDOT PrePROCESSING manual.



TDOT Pre PROCESSING

How to charge

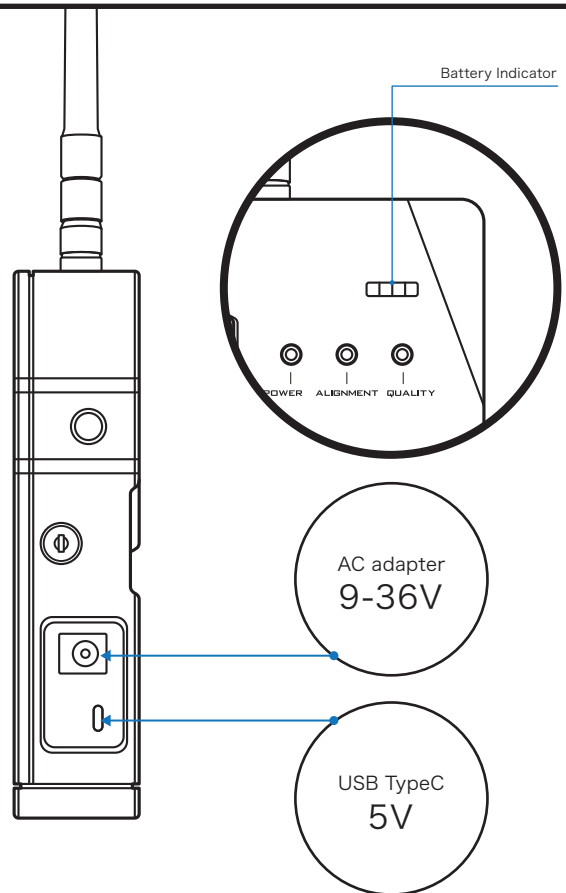
1 How to charge

When the AC adapter (9-36V) or USB TypeC (5V) is connected to the connector, the LED will blink and charging will start.

When all four LED gauges light up blue, the battery is fully charged.

Power cable and mobile battery are not included. Please purchase the products compatible to the following separately.

Power supply	9-36V 
	USB Type-C 5V 



DANGER

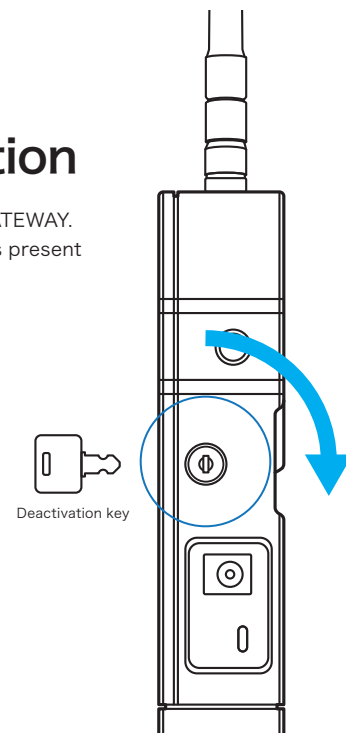
Deactivating the Eye Safety function

The Eye Safety function can be deactivated by using the key provided with TDOT GATEWAY. When the eye safety function is deactivated, it is absolutely necessary that no one is present in the area exposed to laser radiation.

The operator must wear protective goggles that block the 532nm laser wavelength.

Deactivation of the eye safety function poses a risk of exposure to laser radiation.

Please refrain from deactivating it whenever possible.



By downloading the application "TDOT STATUS" for Apple iPhone and iPad (sold separately), the status of TDOT 3 GREEN can be viewed in real time via Bluetooth connection with TDOT GATEWAY.

*This is an application to view the status in real time. TDOT 3 GREEN is required to view the status.

*This application is not compatible with previous models before TDOT 3 GREEN.

1 Download

Please search "TDOT STATUS" from AppleStore and download the application.
Downloading is free of charge.



<https://apps.apple.com/jp/app/tdot-status/id1563327356>

2 Start

When you start TDOT STATUS, you will get a message asking you to use "Bluetooth", so tap "OK".



3 Start TDOT GATEWAY

TDOT STATUS performs Bluetooth communication with TDOT GATEWAY. First, please start TDOT GATEWAY.

When communicating for the first time, the device ID of TDOT GATEWAY is displayed in the item of "Available Devices".

Devices that have been connected once will be recorded in the Registered Devices.

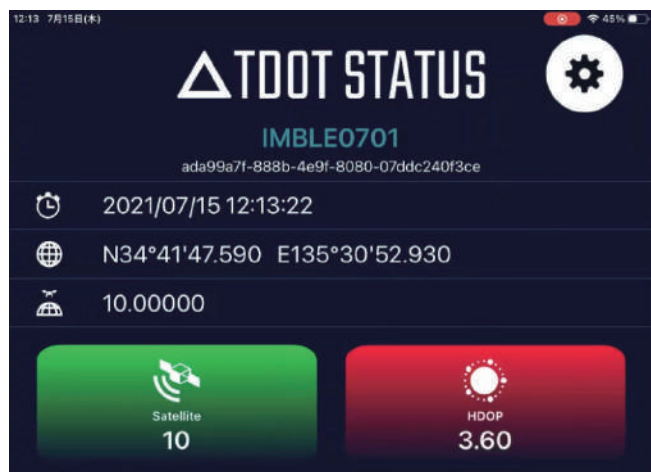
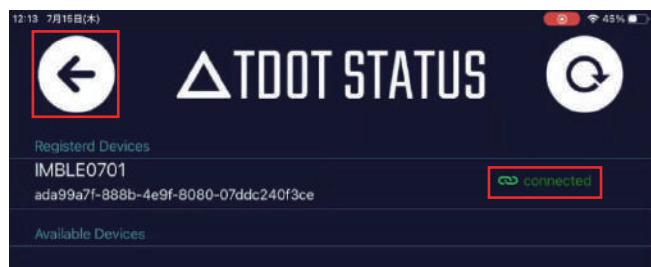
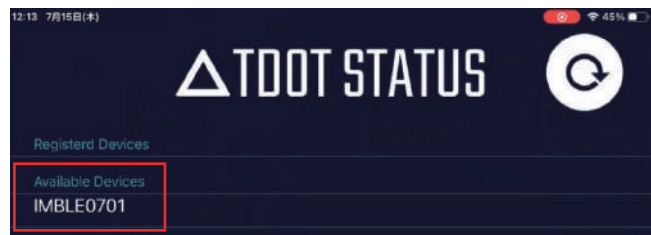
Please tap the ID to connect.

When the "Connected" message appears in green, you are good to go.

When you tap the back icon, the status of TDOT 3 GREEN will be displayed in real time.

This is how to use TDOT STATUS.

When TDOT 3 GREEN main unit and TDOT GATEWAY are not communicating, the status is not displayed. Please confirm the connection when the data is not sent.



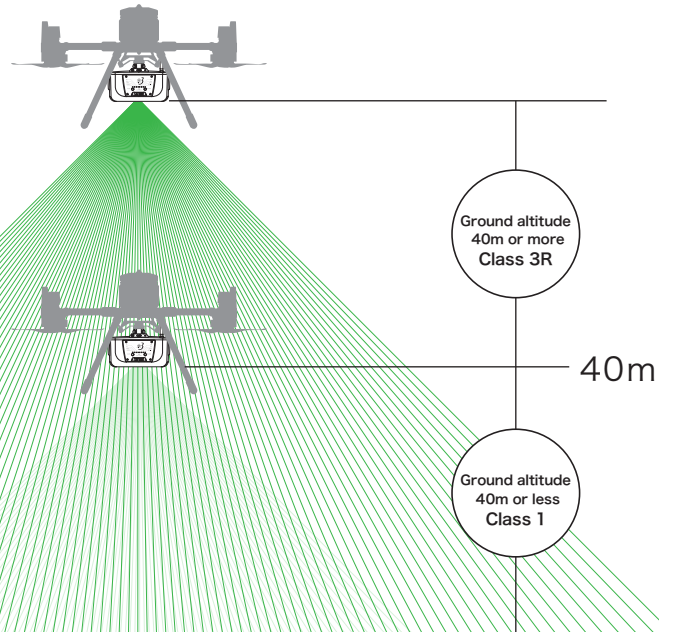
1 Eye Safe operating conditions

TDOT 3 GREEN uses a laser with an output power that is categorized as laser class 3R in the laser safety standard in JIS C 6802.

To ensure safe operation for the human body, a mechanism is provided to automatically change the output power depending on the ground altitude.

Ground altitude: 40m or less Class 1
Ground altitude: 40m or more Class 3R

Class 1 laser power is harmless to human health at altitudes up to 40m above ground level.

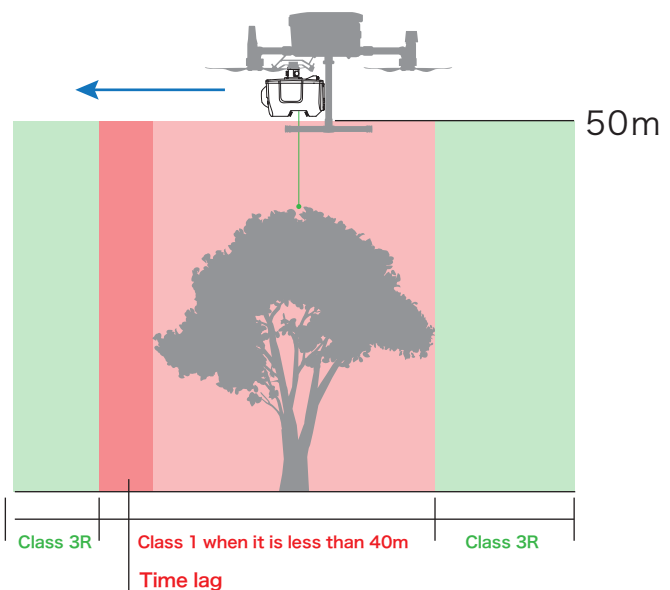


2 Eye safe operating range (2)

In the case of a flight plan created at an altitude of 50m above the ground, it will operate at Class 3R output because it is at an altitude of 50m above the ground. However, if the altitude drops below 40m above the ground due to trees, structures, undulations of the mountain, etc., the eye safety will automatically activate and the output will become Class 1.

In addition, there is a time lag even when the ground altitude exceeds 40 meters after the obstacle is cleared, and it takes time to return to Class 3R output.

For example, if for some reason the eye safety causes the laser to switch to Class 1 power, and then the laser reaches an altitude where the eye safety should be deactivated, but if the altitude is too high for the laser to reach the ground at Class 1 power, the eye safety may not be deactivated.

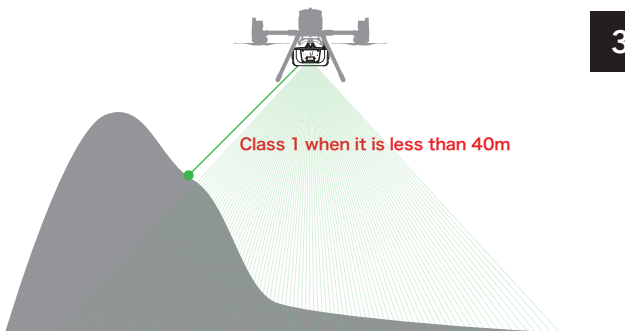


3 Eye safe operating range (3)

The identification of the ground altitude is judged in all directions with an irradiation angle of 90° for the TDOT 3 GREEN.

Even at the edge of the irradiation angle, if it falls below 40m due to an obstacle, the eye safety is activated.

Therefore, when operating TDOT 3 GREEN, be sure to create a flight plan that takes into account the altitude so that a ground clearance of 40 meters or more can be maintained.



Class 3R safety standard

This is a laser product in which direct observation in the beam may cause eye damage, but the risk of such damage is relatively small. The risk of eye damage increases with the length of exposure time, and intentional exposure to the eye is dangerous.

POWER ON

Status lamp related to power supply.

		
Unlit	Lit (green)	Blinks (green)
Power OFF	System is starting up	System check, etc.

ERROR

Blinks in red when an error occurs.

			
Blinks once (red)	Blinks twice (red)	Blinks three times (red)	Blinks slowly (red)
No recording medium or insufficient capacity	Scanner error and inspection required	INS error and inspection required	Other error and inspection required

PPS

Blinks in synchronization with PPS signal from GNSS receiver.

GPS is FIX (Quality = 1 or more)

HDOP is below 3.0

The number of receiving satellites is 6 or more

	
Blinks (red)	Blinks (green)
When the above conditions are not met	When the above conditions are met

STN

Blinks with the number of satellites captured.

	
Blinks (red)	Blinks (green)
5 or less satellites, not recommended	6 or more satellites, recommended

HDOP

Balance of satellite positions.

Unbalanced state, not recommended

Well-balanced state, recommended

								
Blinks 10 times (red)		Blinks 5 times (red)	Blinks 4 times (red)	Blinks 3 times (red)	Blinks 3 times (green)	Blinks twice (green)	Blinks once (green)	Lit (green)
8.5 to 9.5		4.5 to 5.4	3.5 to 4.4	3.0 to 3.4	2.5 to 2.9	1.5 to 2.4	1.0 to 1.4	0.1 to 0.9

STATUS

Status of INS. It is linked to the external LED because the status changes by the alignment flight.

Status	Power OFF	Power ON	After alignment flight (NG)	After alignment flight (GOOD)
Status LED				
	Unlit	Lit (red)	Lit (red)	Lit (green)
TDOT GATEWAY (ALIGNMENT)				
	Unlit	Lit (red)	Lit (red)	Lit (green)

TEMP

Status of internal temperature.

		
~40°C Lit (green)	41~48°C Blinks (red)	49°C~ Blinks (red)
Operating normally	Attention to temperature	System is forced to stop

SCANNING

Status of scanning.

					
Unlit	Scanning mode, Blinks slowly (red)	Scanning mode, Blinks slowly (blue)	Scanning mode, Lit (green)	Echo number change mode, Blinks twice (green)	Echo number change mode, Blinks four times (green)
Stopped	Ready	To start, To finish	Scanning	2 echoes	4 echoes

Number of received satellites		Number of captured satellites	
	 Red	 Green	
	Less than 5 satellites	Six or more satellites	
HDOP		Balance of satellite positioning	
	 Red	 Green	
	3.0 to 5.4	2.9 to 0.1	
Alignment status		Built-in INS alignment status	
	 Gray	 Green	
	N/A (before alignment flight (NG))	GOOD (after alignment flight (GOOD))	
Scan mode		Displays the current mode	
	 Green	 Green	 Yellow
	4 Echo	2 Echo	2 Echo No Filter
Scanning Status		Displays the current laser output status	
	 Blue	 Green	
	EyeSaftey (safe output (Class1M))	Full Power (Full power output (Class3R))	
Board Temperature(°C)		The current board temperature is displayed	
	 Green		
	No limit (No warning indication)		
Laser Driver Temperature(°C)		Displays the current laser driver temperature	
	 Red	 Green	
	49 to 52° C (Scanning forced stop at 52° C)	~48°C	

Product Specifications

Product name	TDOT 3 GREEN
Size (approx.)	W270 x D230 x H150mm
Weight (approx.)	2.7kg (main unit only / excluding antenna)
Input voltage	12-36V $\equiv$ $\ominus$ - $\oplus$ / USB Type-C 5V (60W or more)
Rated power consumption	40W
Radio frequency used	920MHz

Laser Scanner Specifications

Maximum measurement distance	$\geq 10\%$ 158m	$\geq 60\%$ 300m over
Distance measurement accuracy	$\geq 10\%$ ± 15 mm	$\geq 60\%$ ± 5 mm
Pulse rate	60,000Hz	
Viewing angle	90° ($\pm 45^\circ$)	
Echo switching	1st&Last / 4echo	
Scanning speed	30 scans/sec	
Laser wavelength	532 $\pm$ 1nm	
Maximum power	4.5 μ J	
Pulse width	~ 1 ns(0.7 ns -1.2 ns)	
Beam spread angle	1.5mrad	
Temperature range for operation	0 $\sim$ 40°C	
Product life span	10,000 hours	

INS specification*1

Positional accuracy	5mm
Heading	0.03°
Pitch/roll	0.006°
Velocity	0.01m/sec

Eye safety*2

Ground Altitude	< 40m : Class 1	> 40m : Class 3R(NOHD ³ : < 40m)
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Depth measurement capability

At a distance of 50m from the water surface	R=1.0, absorption coefficient=0.25(1/m) > 1.4 secchi *4
	R=0.5, absorption coefficient=0.25(1/m) > 1.25 secchi
	R=0.2, absorption coefficient=0.25(1/m) > 1 secchi

Lever arm (offset value from scanner origin)

DJI Matrice300RTK	Ref => IMU	X : 0.0239	Y : 0.0135	Z : 0.0689
	Ref => GNSS antenna	X : 0.0600	Y : 0.0600	Z : 0.3360

TDOT GATEWAY specification

Size (approx.)	W60 x D27 x H120mm
Input Voltage	9-36V $\equiv$ $\ominus$ - $\oplus$ / USB Type-C 5V
Battery capacity	Lithium polymer 3700mAh
Voltage	3.7V
Watt-hour rating	13.7Wh
Radio frequency used	920mhz

*1 Accuracy after post-processing with the cloud service "POST-PROCESSING CLOUD". A separate contract is required to use the service.

*2 It has the Eye Safe function that limits laser output depending on the ground altitude. Complies with laser class 1M.

*3 Nominal Ocular Hazard Distance (NOHD): The distance from the laser source where the beam irradiance or exposure is equal to the maximum permissible exposure to the eye. Even a laser beam has an angle of spread, so the farther away the beam is, the more it spreads, and as a result, the less energy enters per unit area. Even if the level is dangerous at the point of emission, it becomes a so-called safe level below MPE as you go farther away.

*4 A white disc with a diameter of 30 cm (transparency plate or secchi plate) is submerged in water, and the depth at which it is no longer visible is 1 secchi.



Malfunction?

Please contact our support desk if you see any unusual signs such as cracks in the body, broken glass in the laser beam port, strange noises from inside, or no correction of the error display by the system.

For support and inquiries, please contact the following

Manufacturer



AMUSE ONESELF INC.

Osaka Head Office
3F Kitahama 1-chome Heiwa Building,
1-1-14 Kitahama, Chuo-ku, Osaka 541-0041, Japan

Tokyo Branch Office
301, 13th Floor, Alea Shinagawa Building,
1-9-36 Konan, Minato-ku, Tokyo 108-0075, Japan

✉ info@amuse-oneself.com

🌐 <https://amuse-oneself.com>

