



DOT BAS v6.1

Wireless Tilt and Operating Hours Sensor

User Manual



CONTENTS

- GENERAL INFORMATION 3
- TECHNICAL SPECIFICATIONS 4
- MOBILE APP 5
- OPERATING MODES 7
- ANGLE MODE..... 8
- BUCKET MODE 10
- BLADE MODE 12
- ROTATION PARALLEL TO THE AXIS 14
- ROTATION PERPENDICULAR TO THE AXIS 16
- VIBRATION MODE 18
- DIAGNOSTICS 20
- BATTERY REPLACEMENT 21
- MINI ADVERTISING PACKET FORMAT 22
- WARRANTY TERMS 23
- PACKAGE CONTENTS 24

GENERAL INFORMATION

DOT BAS v6.1 is a wireless (Bluetooth) sensor for monitoring:

- tilt relative to the Earth (0 to 180 degrees);
- rotation in both directions (clockwise and counterclockwise), with the sensor mounted either parallel or perpendicular to the rotation axis;
- moving mechanisms (crane booms, buckets, dump trucks, snow removal equipment and special-purpose machinery);
- vibration, to count operating hours of internal combustion engines and electric motors.

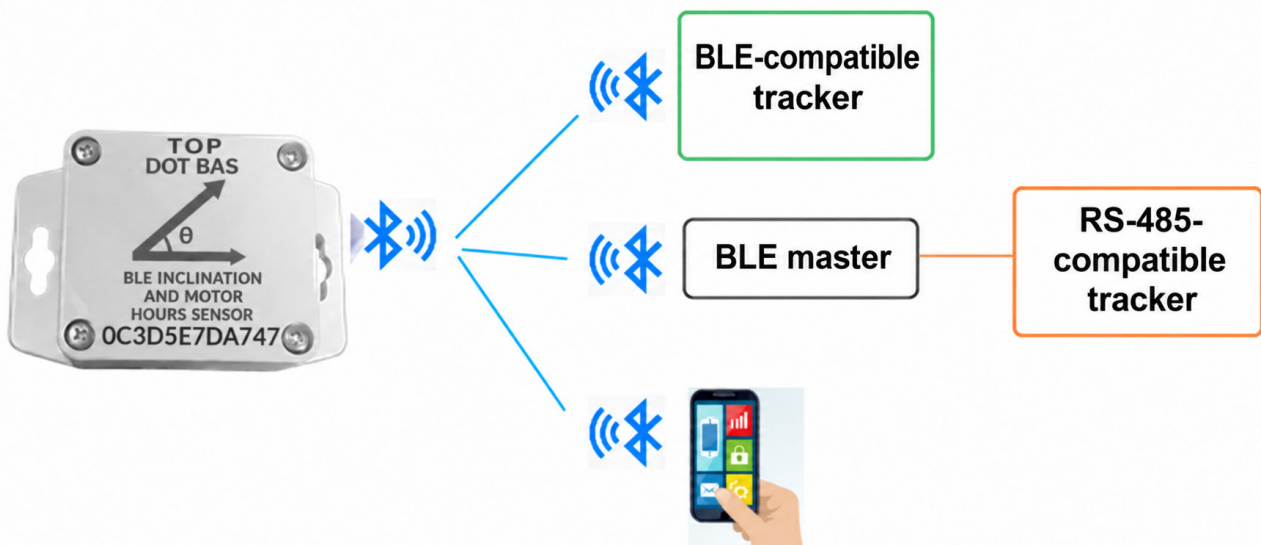
Operating hours are counted in all operating modes.

Data is transmitted to external devices using several Bluetooth Low Energy (BLE) protocols:

- **Closed** — data is transferred over a connection (for specialized applications).
- **Open** — the Escort DU-BLE protocol; data is transmitted in advertising packets.
- **Mini** — an extended advertising format designed for minimum power consumption.

The data format is described in the protocol section.

See MINI ADVERTISING PACKET FORMAT.



TECHNICAL SPECIFICATIONS

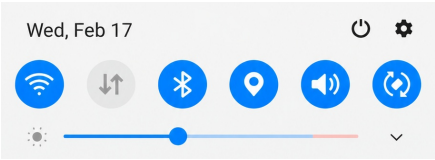
Parameter	Notes	Value
Housing dimensions, mm	Including mounting brackets	95 x 58 x 35
Ingress protection	Dust-tight; temporary immersion to a depth of up to 1 metre	IP67
Weight, g	Including battery	110
Battery capacity, mAh	ER14505 battery	2700
Replaceable battery		Yes
Current consumption, μ A		26
Estimated battery life, years*	Based on average consumption	4
Operating temperature, $^{\circ}$ C	Depends on the battery	-40 to +80
Accelerometer		Yes
Temperature sensor	Built-in	Yes
Communication interface	Bluetooth	BLE compatible 4.0 to 5.3
Programmable transmit power, dBm	Range up to 30 metres	+6
Receiver sensitivity, dBm		-98
Configuration and diagnostics		Mobile app
Mobile app	iOS / Android	Yes

MOBILE APP

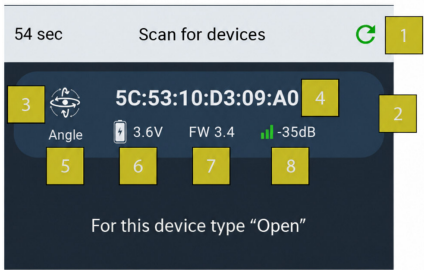
The Sensor Configurator app for Android and iOS allows you to view live data and change sensor settings.

Download the app: [Android](#) | [iOS](#)

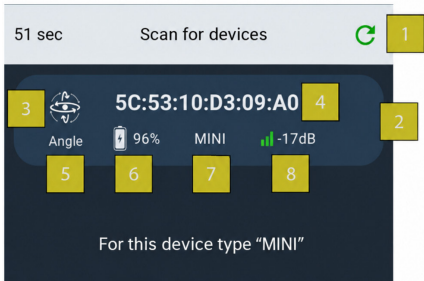
When launched for the first time, the app asks you to enable Bluetooth and Location. Grant the requested permissions.



The scan screen displays all detected sensors as tiles. Sensors are sorted automatically by signal strength: the closer a sensor is to the phone, the higher it appears in the list. Icons identify the sensor type, such as fuel level sensor, temperature sensor, relay or tilt sensor. Each tile displays the relevant sensor information.

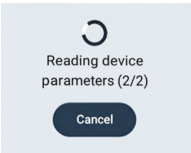


1	Scan again button.
2	Sensor tile.
3	Sensor type icon.
4	Sensor MAC address.
5	Sensor operating mode.
6	Current battery voltage.
7	Sensor firmware version.
8	Sensor signal strength.



1	Scan again button.
2	Sensor tile.
3	Sensor type icon.
4	Sensor MAC address.
5	Sensor operating mode.
6	Battery charge level, %.
7	Advertising format.
8	Sensor signal strength.

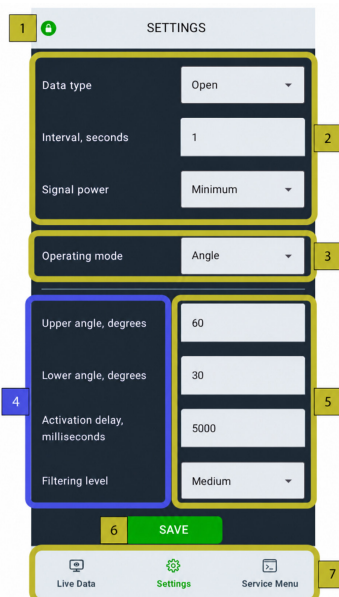
To connect to a sensor, tap its tile. A pop-up window displays the connection status.



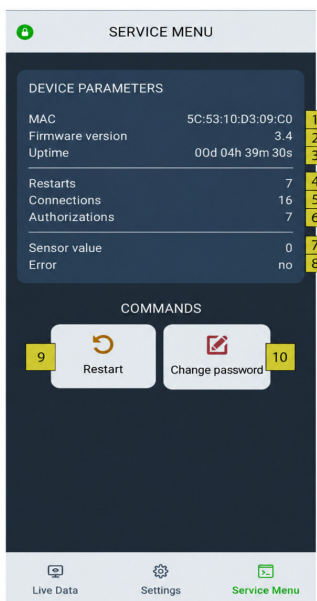
After a few seconds, the sensor connects and the app displays three tabs: “Live Data”, “Settings” and “Service Menu”.



A	Return to the scan screen.
B	Connection status and error indicator.
C	Sensor MAC address with a quick-copy icon.
D	Animated sensor orientation indicator.
E	Sensor status indicators.
F	Calibration button.
G	Tabs for switching between screens.



1	Authentication and settings lock icon.
2	Advertising settings. For advanced users only.
3	Sensor operating mode selection.
4	Sensor parameter names.
5	Parameter values.
6	Save settings button.
7	Tabs for switching between screens.



1	Sensor MAC address.
2	Current sensor firmware version.
3	Total sensor uptime since the last restart.
4	Number of software or hardware restarts.
5	Number of successful app connections to the sensor.
6	Number of successful authentications for sensor configuration.
7	Raw sensor data used for diagnostics.
8	Error code and description.
9	Software restart of the device.
10	Change the configuration password (authentication required).

OPERATING MODES

The sensor supports several operating modes. Select the mode appropriate for your application and configure its parameters correctly.

Storage mode is intended for sensor storage and transportation.

In this mode, the measurement circuitry is disabled to minimize power consumption. To activate the sensor, authenticate on the Settings screen and select the required operating mode.

Angle mode monitors the tilt of moving mechanisms relative to the Earth.

Bucket mode monitors excavator operation.

The sensor enters the “Triggered” state when the bucket is active.

Blade mode monitors snow removal vehicles and similar special-purpose machinery.

Rotation Parallel to the Axis mode monitors concrete mixers when the sensor is installed parallel to the drum rotation axis.

Rotation Perpendicular to the Axis mode monitors concrete mixers when the sensor is installed perpendicular to the drum rotation axis.

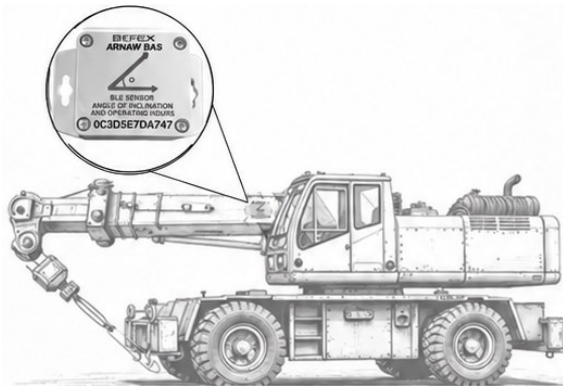
Vibration mode monitors generators, portable powered equipment and similar mechanisms driven by electric motors or internal combustion engines.

The sensor counts operating hours in each operating mode. Counting starts automatically when the sensor enters the “Triggered” state and pauses in the “Not triggered” state until the next trigger event.

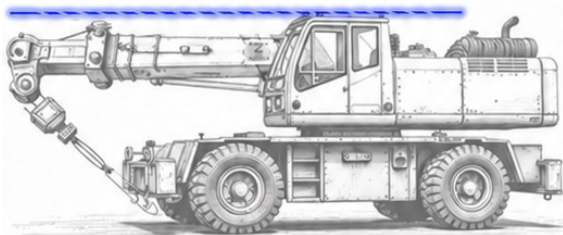
ANGLE MODE

Angle mode monitors moving mechanisms.

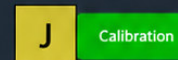
The sensor can be installed on a dump truck, crane boom, refuse truck or similar equipment.



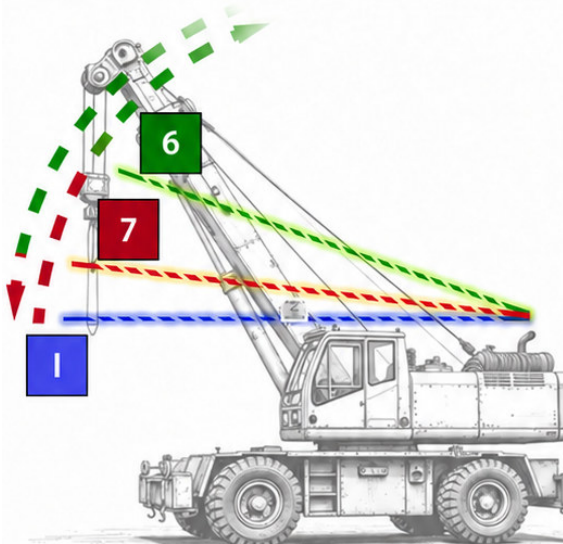
Install the sensor on the most movable part of the mechanism.



Assemble the mechanism and press the **"Calibration"** button on the "Live data" screen.



Make sure that after calibration the angle on the "Live data" screen is equal to **zero**.

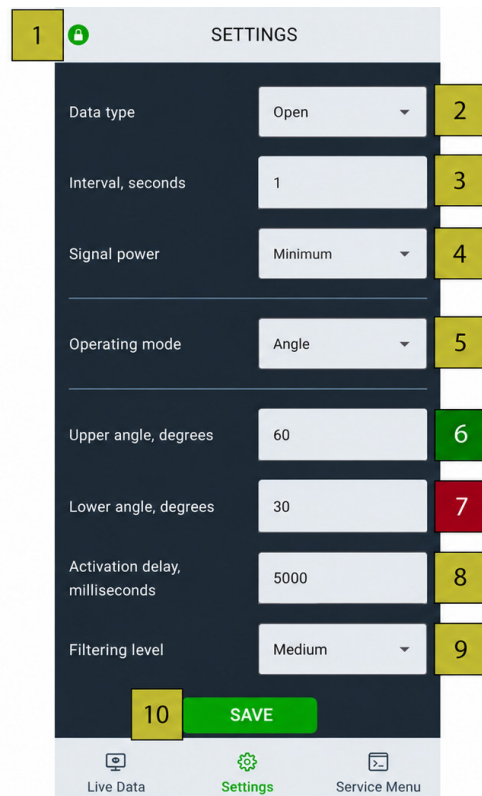
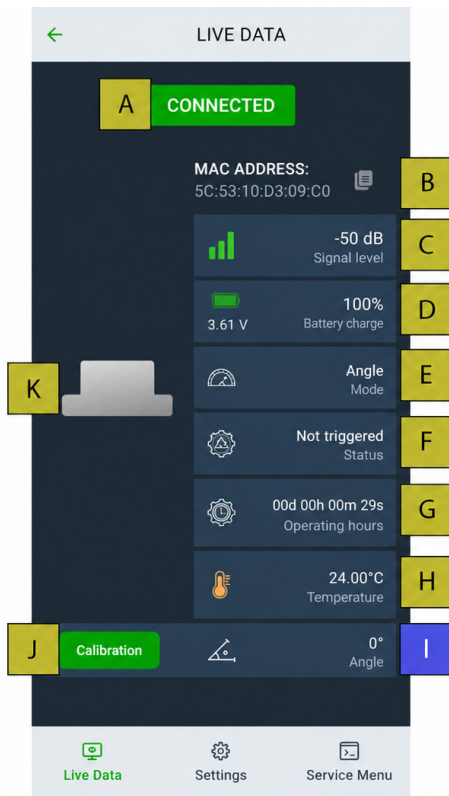


Make sure that when the value of the **"Upper angle"** sensor is in the **"Triggered"** state.



Make sure that when the value of the **"Lower angle"** sensor is in the **"Not triggered"** state.

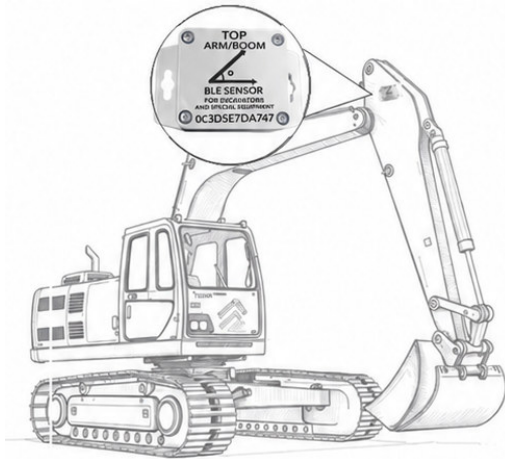




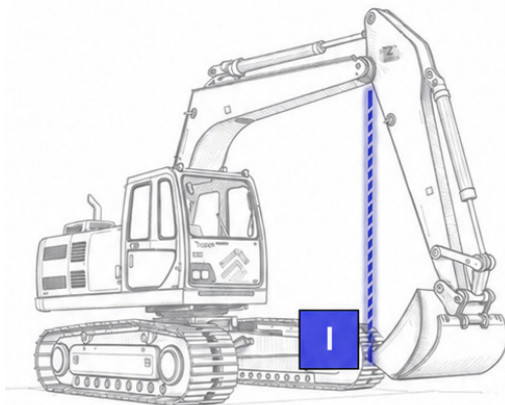
A	Connection status and error indicator. For error details, open “Service Menu”.	1	Authentication and settings lock icon. Default password: 00000000.
B	Sensor MAC address with a quick-copy icon.	2	Three advertising formats are available. For advanced users only.
C	Live signal strength indicator. Its colour changes from green to red when the signal drops to -75 dBm.	3	Advertising interval (1–2 seconds). More frequent transmissions increase power consumption.
D	Battery voltage and charge level (%). The indicator changes from green to red when the voltage drops to 3.3 V.	4	Transmit power adjustment. Maximum power increases energy consumption.
E	Operating mode indicator with a dynamic icon.	5	Sensor operating mode selection.
F	Trigger state indicator with a dynamic icon.	6	The sensor enters the “Triggered” state when the angle exceeds this value.
G	Operating hours counter. Updates every 5 seconds while triggered. Resets when the operating mode changes.	7	The sensor enters the “Not triggered” state when the angle falls below this value.
H	Current sensor temperature.	8	Minimum active duration required to enter the “Triggered” state.
I	Current sensor tilt angle.	9	Smoothing applied to measurement data.
J	Calibration button.	10	Save settings button.
K	Animated sensor orientation indicator.		

BUCKET MODE

This mode monitors excavator bucket operation and counts its operating time. After installing the sensor, fold the bucket and tap “Calibration” on the “Live Data” screen. Make sure the sensor reads 0 degrees with the bucket folded, regardless of the orientation of the mounting surface.



Install the sensor on the most movable part of the mechanism, where the angle change amplitude will be maximum during equipment operation.

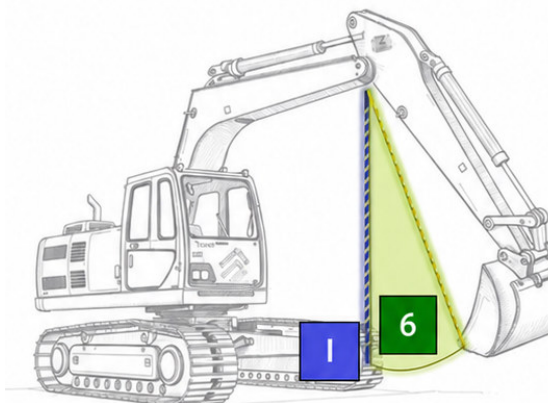


Place the mechanism in a transport position with the minimum number of clearances. Press the “Calibration” button on the screen “Current data”.

J Calibration

Make sure that the angle on the “Current data” screen is equal to zero.

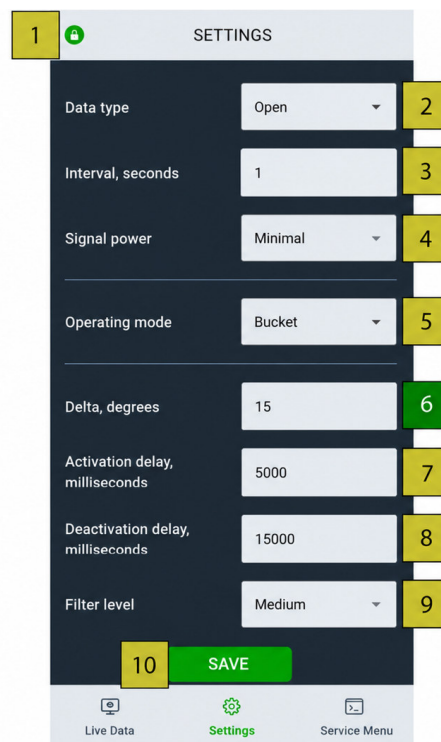
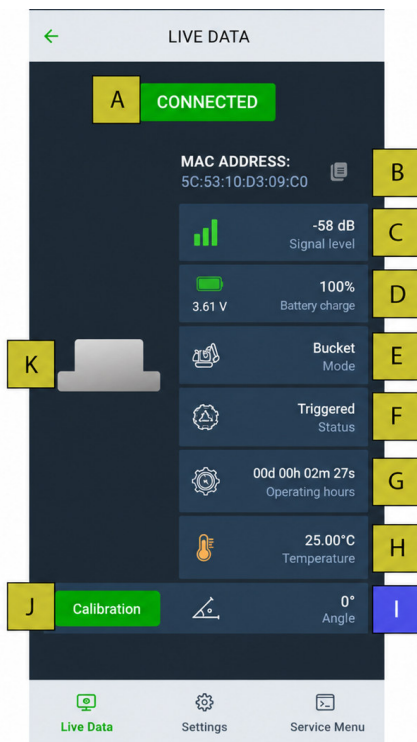
I  0°
angle



Make sure that when the mechanism moves within the specified “Delta” value, the sensor switches to the “Triggered” state.

6 Delta, degrees 15

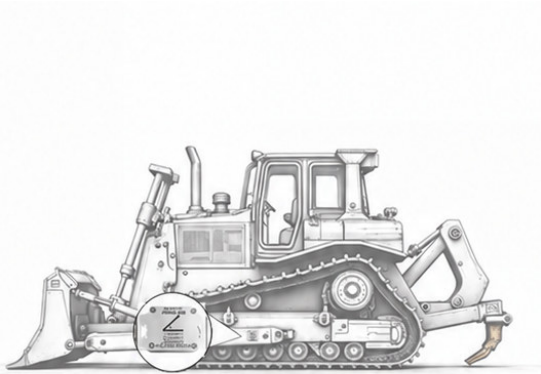
F  Triggered state



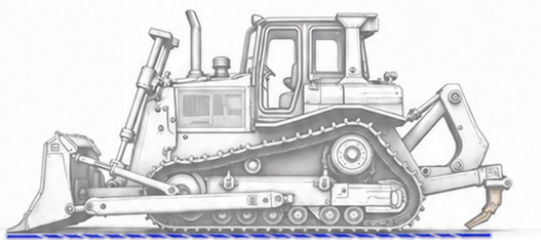
A	Connection status and error indicator. For error details, open “Service Menu”.	1	Authentication and settings lock icon. Default password: 00000000.
B	Sensor MAC address with a quick-copy icon.	2	Three advertising formats are available. For advanced users only.
C	Live signal strength indicator. Its colour changes from green to red when the signal drops to -75 dBm.	3	Advertising interval (1–2 seconds). More frequent transmissions increase power consumption.
D	Battery voltage and charge level (%). The indicator changes from green to red when the voltage drops to 3.3 V.	4	Transmit power adjustment. Maximum power increases energy consumption.
E	Operating mode indicator with a dynamic icon.	5	Sensor operating mode selection.
F	Trigger state indicator with a dynamic icon.	6	Angle threshold relative to the last idle position. Exceeding it returns the sensor to the “Triggered” state.
G	Operating hours counter. Updates every 5 seconds while triggered. Resets when the operating mode changes.	7	Minimum bucket activity duration required to enter the “Triggered” state.
H	Current sensor temperature.	8	Minimum bucket inactivity duration required to enter the “Not triggered” state.
I	Current sensor tilt angle.	9	Smoothing applied to measurement data.
J	Calibration button.	10	Save settings button.
K	Animated sensor orientation indicator.		

BLADE MODE

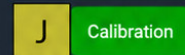
This mode monitors snowploughs, graders, bulldozers and similar equipment. After installing the sensor, lower the blade into its working position and tap “Calibration” on the “Live Data” screen. Make sure the sensor reads 0 degrees and is in the “Triggered” state when the blade is in its working position.



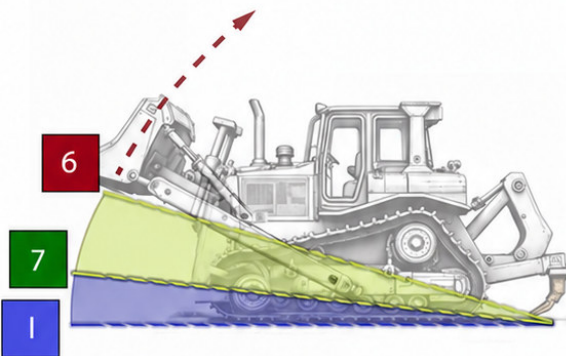
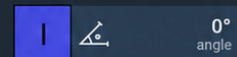
Install the sensor on the most movable part of the mechanism



Move the blade mechanism to the **working position** and press the “**Calibration**” button on the “Current data” screen.



Make sure that after calibration the angle on the “Current data” screen is equal to **zero**.

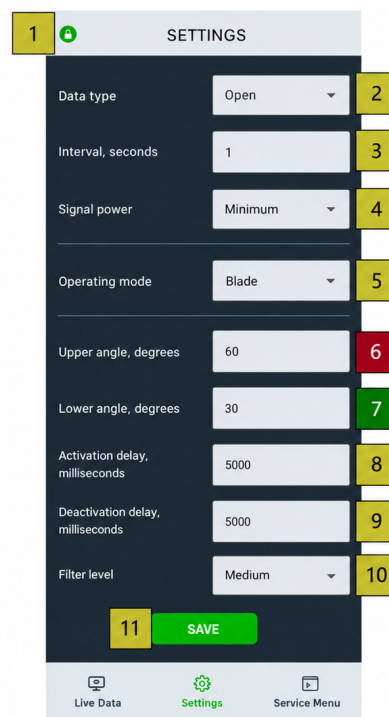


Make sure that when the mechanism is raised to the value of the “**Lower angle**” the sensor switches to the “**Not triggered**” state. Make sure that when the mechanism is raised above the value of the “**Upper angle**” the sensor immediately switches to the “**Not triggered**” state.



Make sure that when the mechanism is moved to the **working position**, the sensor switches to the “**Triggered**” state.





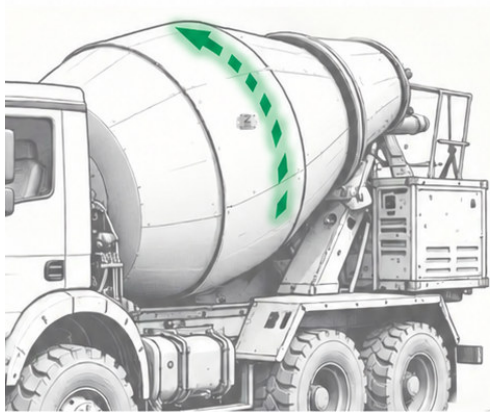
A	Connection status and error indicator. Error descriptions are available in “Service Menu”.	1	Authentication and settings lock icon. Default password: 00000000.
B	Sensor MAC address with a quick-copy icon.	2	Three advertising formats are available. For advanced users only.
C	Live signal strength indicator. Its colour changes from green to red when the signal drops to -75 dBm.	3	Advertising interval (1–2 seconds). More frequent transmissions increase power consumption.
D	Battery voltage and charge level (%). The indicator changes from green to red when the voltage drops to 3.3 V.	4	Transmit power adjustment. Maximum power increases energy consumption.
E	Operating mode indicator with a dynamic icon.	5	Sensor operating mode selection.
F	Trigger state indicator with a dynamic icon.	6	Angle threshold at which the sensor immediately enters the “Not triggered” state.
G	Operating hours counter. Updates every 5 seconds while triggered. Resets when the operating mode changes.	7	Angle threshold at which the sensor enters the “Not triggered” state after the trigger-off delay.
H	Current sensor temperature.	8	Minimum bucket inactivity duration required to enter the “Not triggered” state.
I	Current sensor tilt angle.	9	Smoothing applied to measurement data.
J	Calibration button.	10	Save settings button.
K	Animated sensor orientation indicator.		

ROTATION PARALLEL TO THE AXIS

This mode monitors concrete mixers with the sensor installed parallel to the drum rotation axis. Observe the required sensor housing orientation during installation to ensure correct detection of the drum rotation direction.



Install the sensor on the mixer drum, strictly observing the orientation of the sensor body (as shown in the image).



Rotate the drum several times counterclockwise to make sure the rotation direction has been identified.

F Rotate counterclockwise status

The count of rotations and operating hours starts.

I -5 rotations **G** 00d 00h 00m 07s operating hours

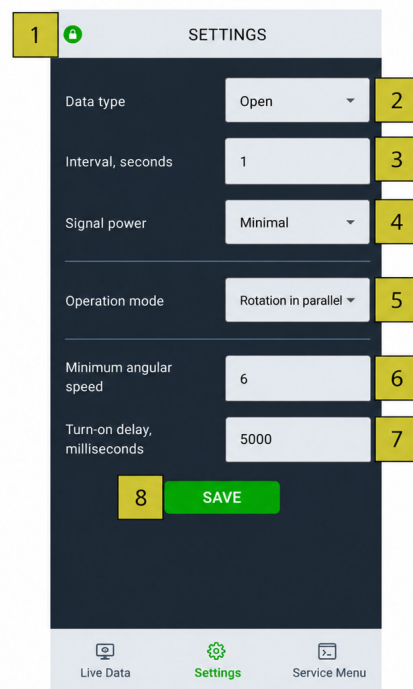


Rotate the drum several times clockwise to make sure the rotation direction has been identified.

F Rotate clockwise status

The count of rotations and operating hours starts.

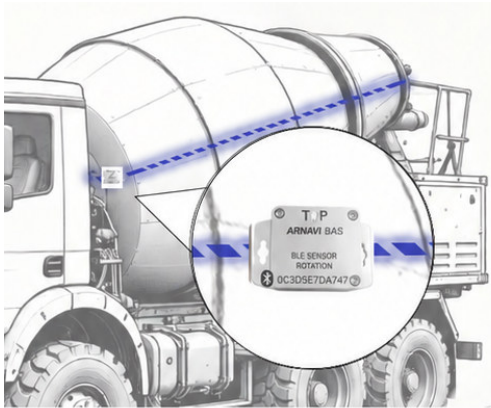
I -5 rotations **G** 00d 00h 00m 07s operating hours



A	Connection status and error indicator. Error descriptions are available in “Service Menu”.	1	Authentication and settings lock icon. Default password: 00000000.
B	Sensor MAC address with a quick-copy icon.	2	Three advertising formats are available. For advanced users only.
C	Live signal strength indicator. Its colour changes from green to red when the signal drops to -75 dBm.	3	Advertising interval (1–2 seconds). More frequent transmissions increase power consumption.
D	Battery voltage and charge level (%). The indicator changes from green to red when the voltage drops to 3.3 V.	4	Transmit power adjustment. Maximum power increases energy consumption.
E	Operating mode indicator with a dynamic icon.	5	Sensor operating mode selection.
F	Trigger state indicator with a dynamic icon.	6	Minimum angular speed required to detect rotation.
G	Operating hours counter. Updates every 5 seconds while triggered. Resets when the operating mode changes.	7	Minimum concrete mixer activity duration required to enter the “Triggered” state.
H	Current sensor temperature.	8	Save settings button.
I	Current sensor tilt angle.		
J	Calibration button.		
K	Animated sensor orientation indicator.		

ROTATION PERPENDICULAR TO THE AXIS

This mode monitors concrete mixers with the sensor installed perpendicular to the drum rotation axis.



Install the sensor on the tank strictly following the orientation of the sensor housing (as shown in the image).



Make a few rotations of the tank counterclockwise to make sure the detected rotation direction is **counterclockwise**,

F rotation counterclockwise status

the count of **rotations** and **operating hours** has started.

I -5 rotations **G** 00d 00h 00m 07s operating hours

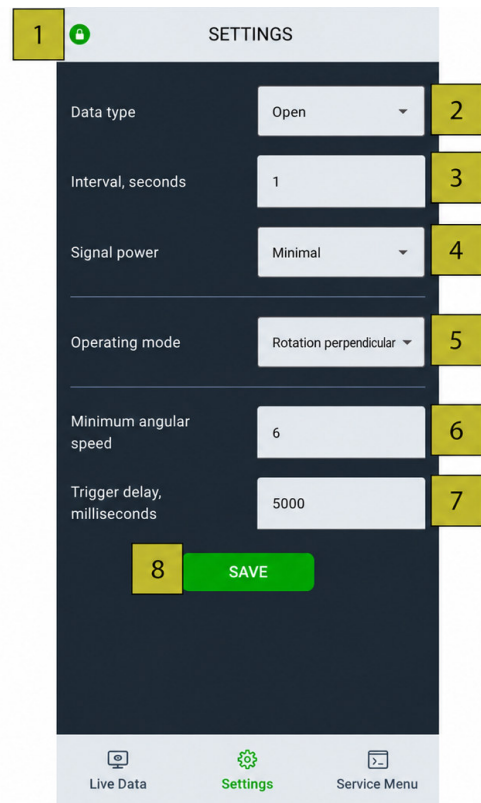


Make a few rotations of the tank clockwise to make sure the detected rotation direction is **clockwise**,

F rotation clockwise status

the count of **rotations** and **operating hours** has started.

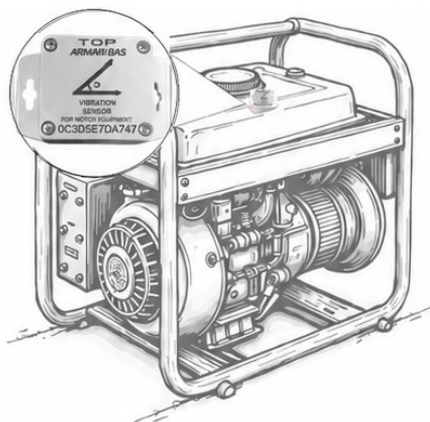
I -5 rotations **G** 00d 00h 00m 07s operating hours



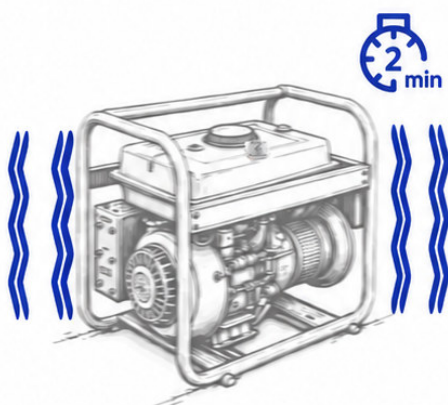
A	Connection status and error indicator. Error descriptions are available in "Service Menu".	1	Authentication and settings lock icon. Default password: 00000000.
B	Sensor MAC address with a quick-copy icon.	2	Three advertising formats are available. For advanced users only.
C	Live signal strength indicator. Its colour changes from green to red when the signal drops to -75 dBm.	3	Advertising interval (1–2 seconds). More frequent transmissions increase power consumption.
D	Battery voltage and charge level (%). The indicator changes from green to red when the voltage drops to 3.3 V.	4	Transmit power adjustment. Maximum power increases energy consumption.
E	Operating mode indicator with a dynamic icon.	5	Sensor operating mode selection.
F	Trigger state indicator with a dynamic icon.	6	Minimum angular speed required to detect rotation.
G	Operating hours counter. Updates every 5 seconds while triggered. Resets when the operating mode changes.	7	Minimum concrete mixer activity duration required to enter the "Triggered" state.
H	Current sensor temperature.	8	Save settings button.
I	Current sensor tilt angle.		
J	Calibration button.		
K	Animated sensor orientation indicator.		

VIBRATION MODE

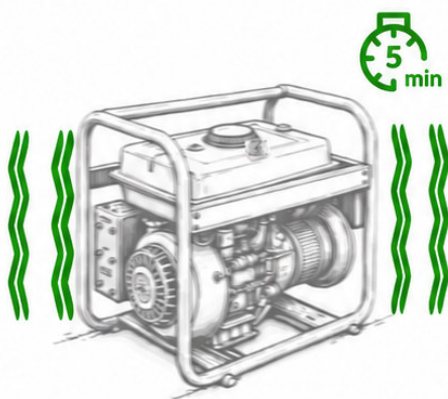
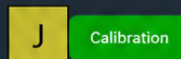
This mode monitors petrol generators, portable powered equipment and other mechanisms driven by electric motors or internal combustion engines.



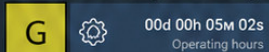
Install the sensor on a dry, even surface away from heat-generating equipment. Make sure that the sensor housing is securely attached.



Start the engine and let it run at operating condition for 2 minutes. After 2 minutes of operation, press the **Calibration** button on the screen "Live Data".

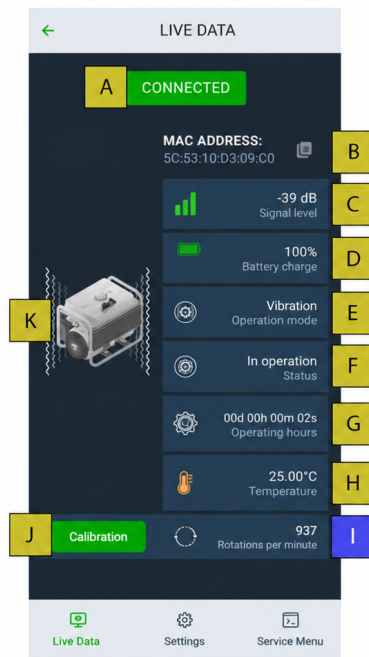


After 5 minutes from engine start, make sure that the **operating hours** counter has started and is working correctly.



Stop the engine and make sure that the sensor status has changed to **"Not triggered"**.





A	Connection status and error indicator. Error descriptions are available in “Service Menu”.	1	Authentication and settings lock icon. Default password: 00000000.
B	Sensor MAC address with a quick-copy icon.	2	Three advertising formats are available. For advanced users only.
C	Live signal strength indicator. Its colour changes from green to red when the signal drops to -75 dBm.	3	Advertising interval (1–2 seconds). More frequent transmissions increase power consumption.
D	Battery voltage and charge level (%). The indicator changes from green to red when the voltage drops to 3.3 V.	4	Transmit power adjustment. Maximum power increases energy consumption.
E	Operating mode indicator with a dynamic icon.	5	Sensor operating mode selection.
F	Trigger state indicator with a dynamic icon.	6	For advanced users only. This value is set automatically during calibration.
G	Operating hours counter. Updates every 5 seconds while triggered. Resets when the operating mode changes.	7	Minimum concrete mixer activity duration required to enter the “Triggered” state.
H	Current sensor temperature.	8	Save settings button.
I	Current sensor tilt angle.	9	For advanced users only. This value is set automatically during calibration.
J	Calibration button.	10	Smoothing applied to measurement data.
K	Animated sensor orientation indicator.	11	Save settings button.

DIAGNOSTICS

The sensor has a built-in self-diagnostic system.

If the built-in motion sensor (accelerometer) fails or the battery is low, the app displays a diagnostic value in the temperature indicator or the Error field in “Service Menu”.

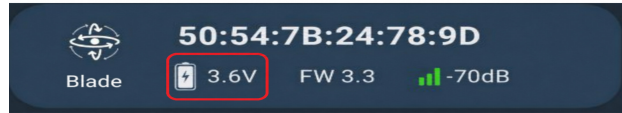
For remote diagnostics, the same temperature values are sent to the tracking device and then to the monitoring system.

-127 — battery depleted.

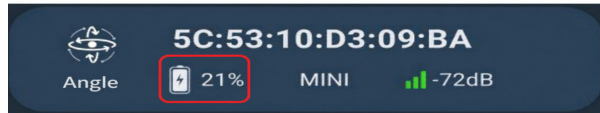
-128 — accelerometer fault.

BATTERY REPLACEMENT

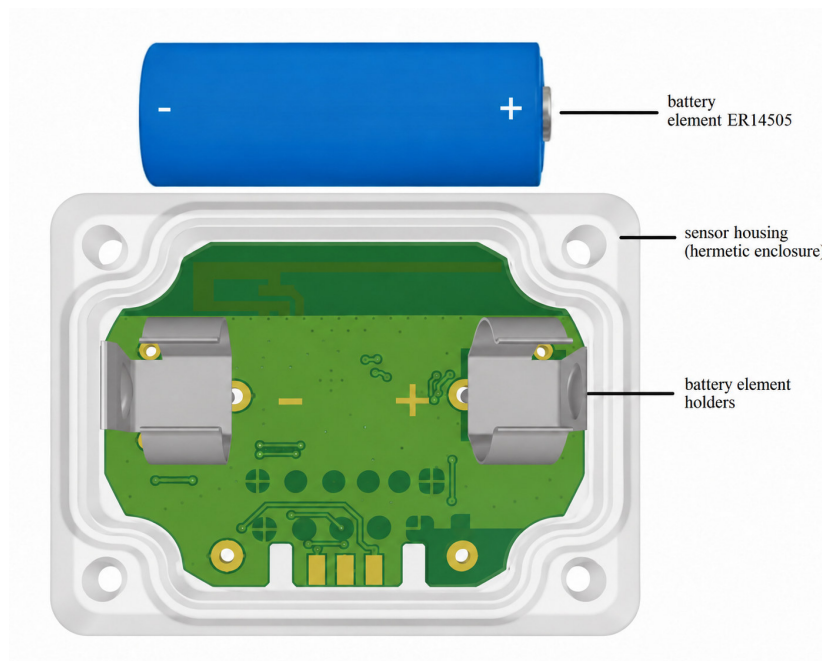
The sensor is powered by a replaceable ER14505 battery. Check its condition in the monitoring system or the mobile app. Simply find the sensor on the scan screen to view its battery level.



Alternative display



Replace the battery when its voltage drops to 3.3 V or its charge level falls below 10%. Unscrew the cover screws and remove the cover. Hold the sensor PCB and pull the battery at its centre to release it from the holders. Install a new battery, observing the polarity marked on the PCB. If the sensor does not appear on the app scan screen after replacement, remove the new battery and reinstall it after 15 minutes.



Always observe the correct polarity when replacing the battery!

MINI ADVERTISING PACKET FORMAT

The sensor broadcasts readings in an advertising packet. No Bluetooth connection is required: scanning is sufficient. The packet contains several blocks defined by Bluetooth. The table below describes the “Manufacturer specific data” block containing the sensor readings.

Example packet (hexadecimal)	Byte position	Field	Data range	Description
0EFF160F650601500085B001006012		0xFF = Manufacturer data; length = 0x0E	0x0EFF	
	[1,2]	Manufacturer prefix	0x160F	Constant
	[3]	Sensor type — tilt sensor	0x65	Constant
	[4]	0x0EFF	0,4,5,6,9,10, 32	0 — storage; 4 — perpendicular rotation; 5 — parallel rotation; 6 — angle; 9 — bucket; 10 — blade; 32 — vibration
	[5]	Trigger event	0..2	Rotation modes (parallel and perpendicular): 0 — no rotation; 1 — clockwise; 2 — counterclockwise. Vibration mode: 0 — no motion; 1 — motion; 2 — engine running. Other modes: 0 — not triggered; 1 — triggered.
	[6,7]	Signed number of complete revolutions / Engine speed (rpm) / Angle (degrees)	-360...360	Rotation modes: complete revolutions. Vibration mode: current engine speed in rpm. Other modes: angle in degrees.
	[8,9,10, 11]	Operating time 0x0001B085 or 110725 seconds	00h...FFFFFFFFh	Operating time in seconds, for all modes.
	[12]	Battery charge level, %; 60h = 96%	0... 100	
	[13]	Temperature in degrees Celsius; 12h = 18 °C	-128...127	

To receive data using this protocol, use “Universal Integration” on DOT tracking devices or an equivalent feature provided by the third-party tracker manufacturer.

WARRANTY TERMS

The equipment is designed for long-term, autonomous, maintenance-free operation.

The warranty period starts on the date of initial installation, provided that installation is performed by an installer authorized by the manufacturer. The installation date and installer details must be recorded on the warranty card and certified with the installer's stamp.

WARRANTY REPAIR OR REPLACEMENT DOES NOT APPLY IN THE FOLLOWING CASES:

- Failure to follow the operating instructions;
- Mechanical damage, whether external or internal;
- Faults caused by foreign objects, insects or liquids entering the device;
- Chemical, electrochemical, electrostatic or extreme thermal damage;
- Damage caused by power, communication or cable networks that do not comply with applicable national standards;
- Damage caused by components that do not meet the manufacturer's technical requirements;
- Repair or preventive maintenance during the warranty period by persons not authorized by the manufacturer;
- Damage to or removal of the manufacturer's seals;
- Malfunctions caused by external effects on the equipment or the electrical circuit to which it is connected;
- Faults caused by third parties or unforeseen circumstances unrelated to the manufacturer's obligations.

PACKAGE CONTENTS

No .	Item	Qty	Notes
1	DOT BAS v6.1 wireless tilt sensor	1	Including the battery
2	Packaging	1	
3	Product passport	1*	Optional

Note: The manufacturer reserves the right to change the package contents without reducing the product's performance or functionality.