dtbird® dtbat®

Bird & Bat Monitoring

Collision Risk Reduction

Onshore & Offshore

APRIL 2025

More than 15 years protecting birds and bats with presence in more than 16 countries

We develop, manufacture and install technologies to make wind energy compatible with wildlife conservation through automatic and real-time protection.

Liquen Consultoría Ambiental S.L. is committed to the protection and care of biodiversity in wind farms.

dtbird dtbat

DTBird® system is a combination of the following modules:

Scalable and
Tailor-Made Projects

01 _ **Detection Module**

02 _ **Acoustic Collision Avoidance Module**

03_ **Stop Control Module**

01

Detection Module

Collision Control

Cámaras

01 | Detection Module

Collision Control

Cabinet on ground level in the tower

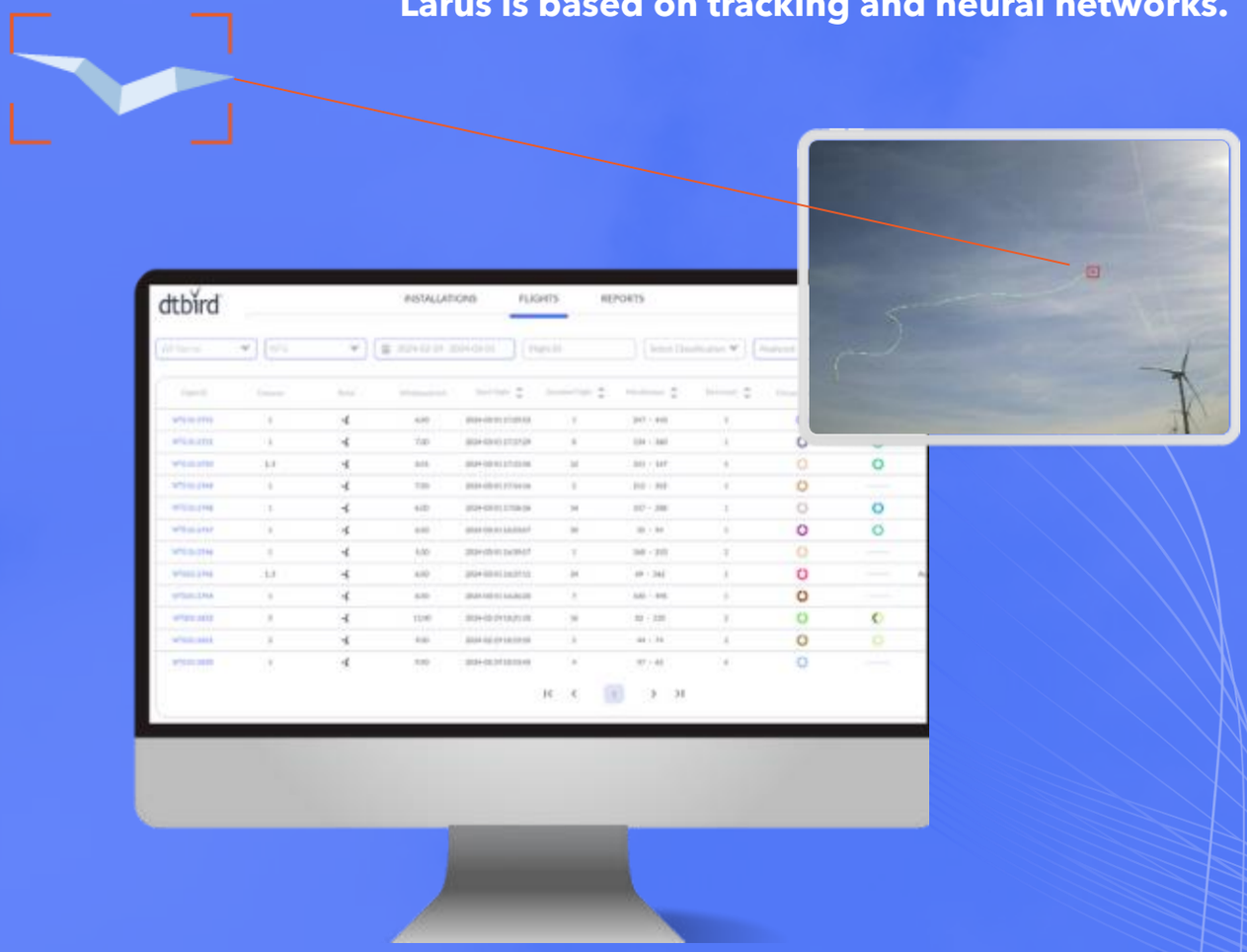
One or two rings of cameras fixed around the tower

Cameras

01 _ **Detection Module**
Collision Control

Larus
Detection Software

Detects the presence of birds automatically and in real time using Larus software. Larus is based on tracking and neural networks.

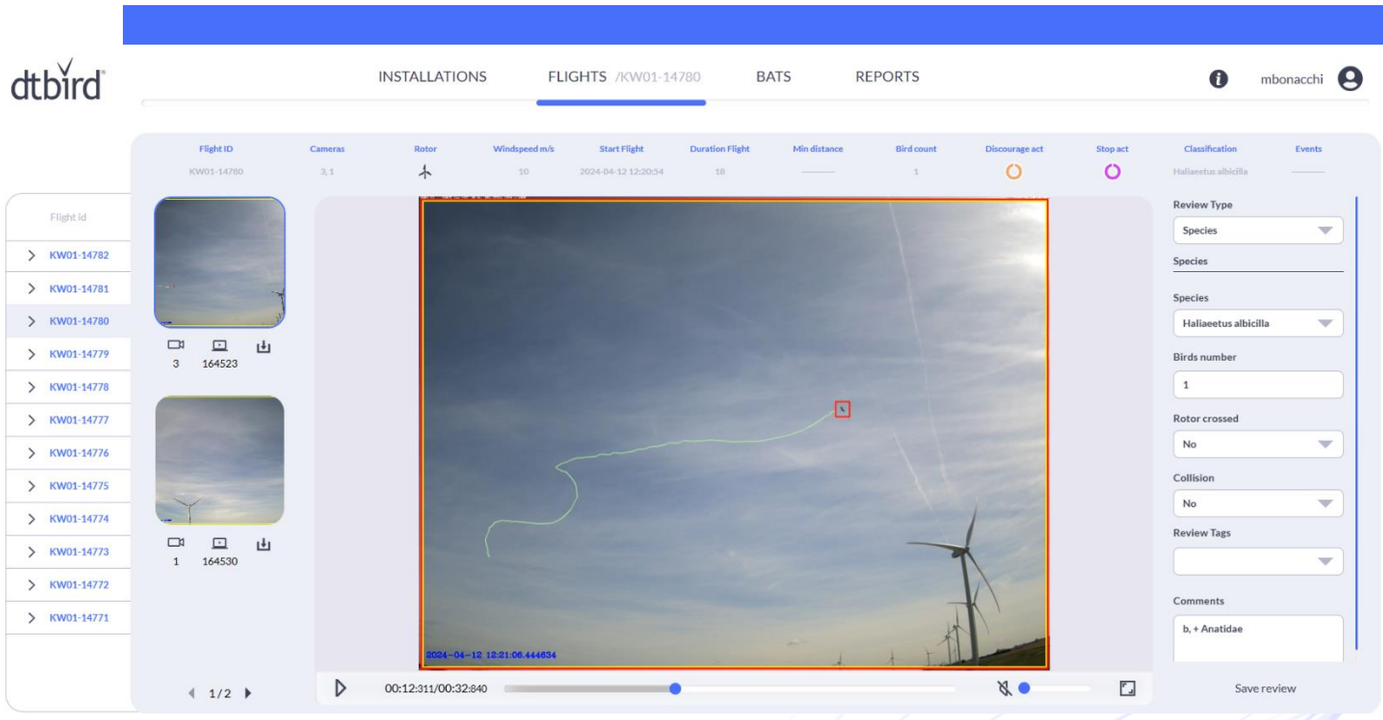


Highlights

- **Continuous process of improving detectability and reducing false positives.**
- **Detection between blades.**
- **Access to videos with integrated zoom, data and graphics through the NEST Platform.**
- **Automatic marking of flights with a higher probability of recording a collision.**

01 _ **Detection Module**
Collision Control

Larus
Detection Software



- **Available remotely**
- **2 access levels**
- **WTG operational parameters**
- **Bird flight data + Reporting tools**
- **Videos recordings**
- **Potential collision indicator**

01 _ **Detection Module**
Collision Control

Falco Model

Onshore Projects

We recommend combining rings (F4+F6) or (F4+F8)
See details on the following pages

F4	**Ring of 4 cameras**
F6	**Ring of 6 cameras**
F8	**Ring of 8 cameras**

Falco Model

Onshore Projects

F4

Recommended for small turbine and medium and large target birds

- Bird monitoring, collision control and shutdown
- Ring with 4 cameras, with 360° horizontal and 58° vertical angles
- For turbine with rotor diameter < 90 m
- For birds with wingspan > 100 cm
- Bird detection distance at **400 m, 200 m***

F6

Recommended for turbine of any size, including medium and small target birds

- Bird monitoring and shutdown
- Ring of 6 cameras, with 360° horizontal and 33° vertical angles
- For turbine of any size
- For birds with wingspan > 60 cm
- Bird detection distance at **700 m, 300 m***

F8

Recommended for turbine of any size, including small target birds

- Bird monitoring and shutdown
- Ring of 8 cameras, with 360° horizontal and 26° vertical angles
- For turbine of any size
- For birds of any size
- Bird detection distance at **800 m, 320 m***

*Maximum detection distance for a bird with a 2,2 m wingspan. Maximum detection distance (absolute and average).

Falco Model

Onshore Projects

F4+F6

Recommended for turbine of any size, including medium and small target birds (2 rings of cameras)

- Bird monitoring, collision control and shutdown
- Ring with 4 cameras, with 360° horizontal and 58° vertical angles
- Ring of 6 cameras, with 360° horizontal and 33° vertical angles
- For turbine of any size
- For birds with wingspan > 60 cm
- Bird detection distance at **700 m, 300 m***

F4+F8

Recommended for turbine of any size, including medium and small target birds (2 rings of cameras)

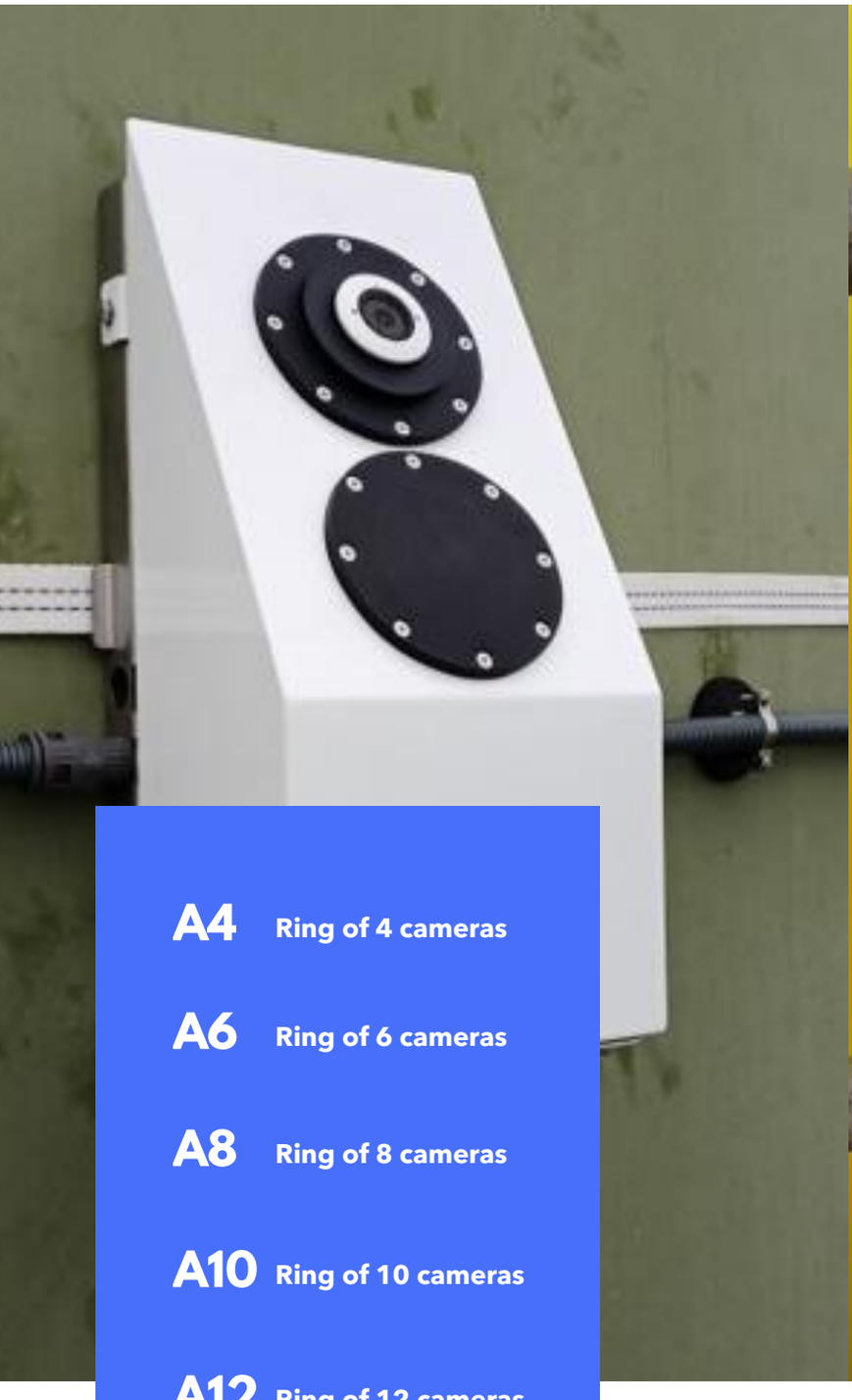
- Bird monitoring, collision control and shutdown
- Ring with 4 cameras, with 360° horizontal and 58° vertical angles
- Ring of 8 cameras, with 360° horizontal and 26° vertical angles
- For turbine of any size
- For birds of any wingspan
- Bird detection distance at **800 m, 320 m***

*Maximum detection distance for a bird with a 2,2 m wingspan. Maximum detection distance (absolute and average).

01 _ **Detection Module**
Collision Control

Albatross Model

Offshore Projects
Onshore for Extreme Climates



A4 Ring of 4 cameras

A6 Ring of 6 cameras

A8 Ring of 8 cameras

A10 Ring of 10 cameras

A12 Ring of 12 cameras

Albatross Model

Offshore Projects
Onshore for Extreme Climates

A4

Recommended for small turbine and medium and large target birds

- Bird monitoring, collision control and shutdown
- Ring with 4 cameras, with angles of 360° horizontal and 50° vertical. Cameras (95°x50°)
- For turbine with rotor diameter < 90 m
- For birds with wingspan > 100 cm
- Bird detection distance at **400 m, 200 m***

A6

Recommended for turbine of any size, including medium and small target birds

- Bird monitoring, collision control and shutdown
- Ring with 6 cameras, with angles of 360° horizontal and 33° vertical. Cameras (60°x33°)
- For turbine of any size
- For birds with wingspan > 60 cm
- Bird detection distance at **550 m, 300 m***

A8

Recommended for turbine of any size and medium and large target birds

- Bird monitoring, collision control and shutdown
- Ring with 8 cameras, with angles of 360° horizontal y 90° vertical. Cameras (95°x50°)
- For turbine of any size
- For birds of any wingspan
- Bird detection distance at **400 m, 200 m***

*Maximum detection distance for a bird with a 2,2 m wingspan. Maximum detection distance (absolute and average).

Albatross Model

Offshore Projects
Onshore for Extreme Climates

A10

Recommended for turbine of any size, including medium and small target birds

- Bird monitoring, collision control and shutdown
- Ring with 10 cameras, with angles of 360° horizontal and 83° vertical. 6 cameras (60°x33°) and 4 cameras (95°x50°)
- For turbine of any size
- For birds with wingspan > 60 cm
- Bird detection distance at **700 m, 300 m***

A12

Recommended for turbine of any size, including small target birds

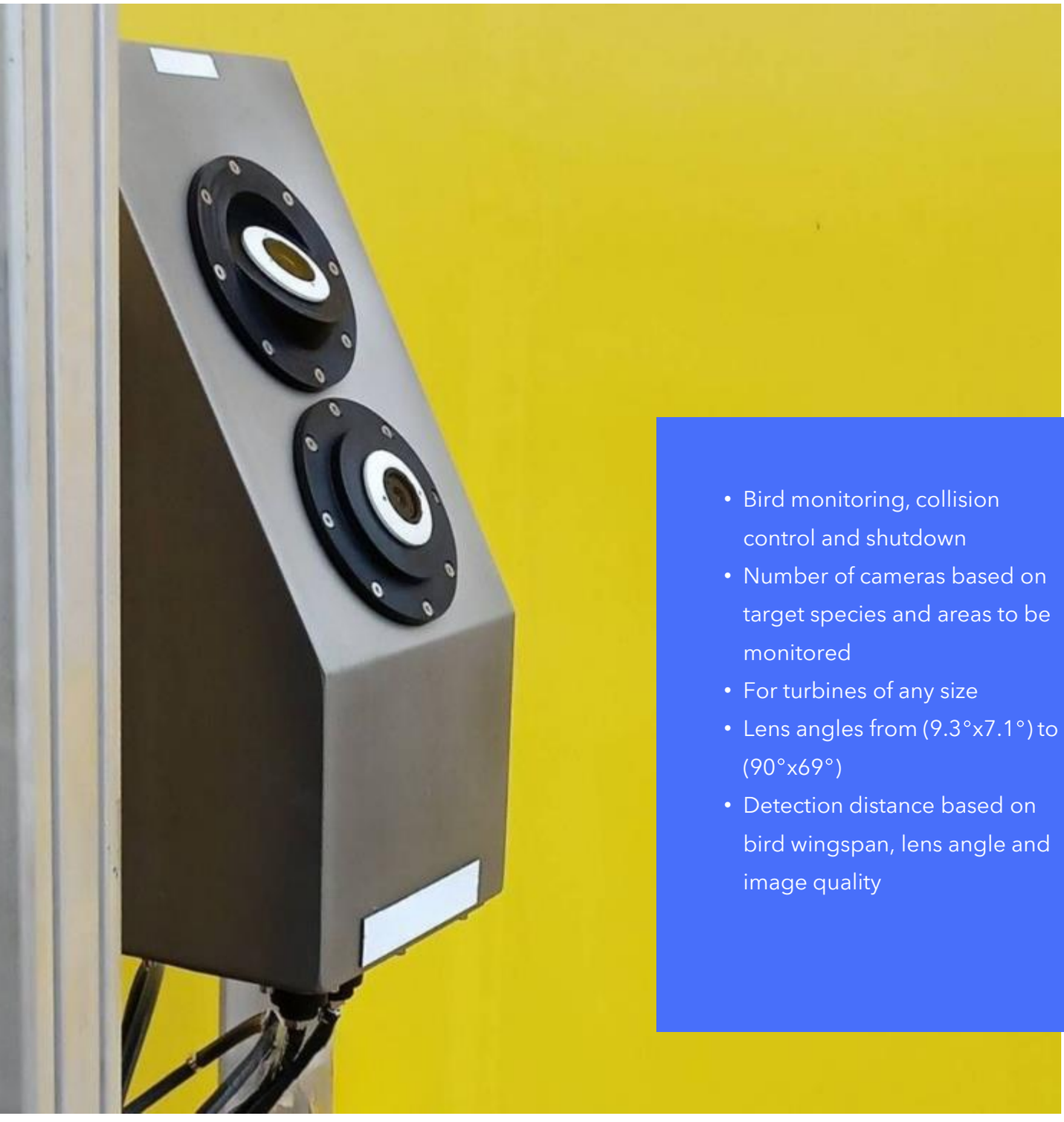
- Bird monitoring, collision control and shutdown
- Ring with 12 cameras, with angles of 360° horizontal and 76° vertical. 4 cameras (95°x50°) and 8 cameras (45°x26°)
- For turbine of any size
- For birds of any wingspan
- Bird detection distance at **800 m, 320 m***

*Maximum detection distance for a bird with a 2,2 m wingspan. Maximum detection distance (absolute and average).

01 _ **Detection Module**

Thermal

Thermal camera rings for night detection



- Bird monitoring, collision control and shutdown
- Number of cameras based on target species and areas to be monitored
- For turbines of any size
- Lens angles from (9.3°x7.1°) to (90°x69°)
- Detection distance based on bird wingspan, lens angle and image quality

02

Acoustic Collision Avoidance Module

02 | Acoustic Collision Avoidance Module

Optional

Nacelle Speakers

Tower Speakers

The system emits warning and discouraging artificial sounds in the presence of birds at potential risk of collision.

Approximately 120 dBA is emitted per speaker. Higher acoustic pressures may harm birds or people, and lower pressures will not produce a deterrent effect.

Reduction of number of collision risk flights and reduction of the fight time in collision risk.

Speaker Rings
Optional

D4

- Ring of 4 speakers on the wind turbine tower < 30m from the lowest tip of the blade
- For turbine with rotor diameter < 60 m

D4 Nacelle

- 4 speakers in the Nacelle of the wind turbine
- Used in combination with D4 or D6

D6

- Ring of 6 speakers on the wind turbine tower at < 20m from the lowest tip of the blade
- For turbine with rotor diameter between 60 - 90 m

D4 + D4 Nacelle

- Ring of 4 speakers on the wind turbine tower < 30m from the lowest height of the blade
- Ring of 4 speakers in the Nacelle
- For turbine with rotor diameter between 90 – 130 m

D6 + D4 Nacelle

- Ring of 6 speakers on the wind turbine tower at < 20m from the lowest height of the blade
- 4 speakers in the Nacelle
- For turbine with rotor diameter > 130 m

We recommend combining the rings D4+D4Nacelle or D6+D4Nacelle.

Parameters

Detection Parameters	
F4 – A4 – A8 Models	**F6 - F8 – A6 – A10 – A12 Models**
Maximum detection distance : 400 - 280 m (Golden Eagle - Red Kite)	Maximum detection distance: 800 - 550 m (Golden Eagle - Red Kite)
Neural Network	
Tracking	

Deterrence Parameters	
F4 –A4 – A8 Models	**F6 - F8 – A6 – A10 – A12 Models**
WTG in motion	
Minimum 3 consecutive detections at distance less than: 200 -150 m (Golden Eagle - Red Kite)	

03

Stop Control Module

The stop control module is a software that is installed in all DTBird models.

The customer decides whether to activate the software or not and the desired configuration: minimum, basic, standard or high protection.

The configuration parameters are presented in the following table

Parameters

Detection Parameters	
F4 –A4 – A8 Models	**F6 - F8 – A6 – A10 – A12 Models**
Maximum detection distance: 400 - 280 m (Golden Eagle - Red Kite)	Maximum detection distance: 800 - 550 m (Golden Eagle - Red Kite)
Neural Network	
Tracking	

Shutdown Parameters	
F4 –A4 – A8 Models	
WTG in motion	
Bird is approaching the WTG	
Minimum Configuration	
Triggering distance below 125 - 100 m (Golden Eagle - Red Kite)	Average % of flights that launch the Stop: 15%
Basic Configuration	
Triggering distance below 200 - 175 m (Golden Eagle - Red Kite)	Average % of flights that launch the Stop: 20%
Standard Configuration	
Triggering distance below 250 - 150 m (Golden Eagle - Red Kite)	Average % of flights that launch the Stop: 30%

Parameters

Shutdown Parameters	
F6 - F8 – A6 – A10 – A12 Models	
WTG in motion	
Bird is approaching the WTG	
Minimum Configuration	
Triggering distance below 325 - 250 m (Golden Eagle - Red Kite)	Average % of flights that launch the Stop: 15%
Basic Configuration	
Triggering distance below 500 - 350 m (Golden Eagle - Red Kite)	Average % of flights that launch the Stop: 20%
Standard Configuration	
Triggering distance below 600 - 450 m (Golden Eagle - Red Kite)	Average % of flights that launch the Stop: 30%
High Protection Configuration	
Triggering distance below 700 - 550 m (Golden Eagle - Red Kite)	Average % of flights that launch the Stop: 45%

For Offshore wind farms, we recommend the use of shutdowns by bird activity thresholds.

DTBird® Autonomous PTZ

(for monitoring at High Voltage Lines, Meteorological Towers, etc.)

DTBird®
Autonomous PTZ

Daylight camera (Horizontal lens angle 56° → 2°)

Solar panel with integrated lithium battery

Most frequent maximum detection distance

For Red Kite (1.5m wingspan)
depending on lens angle

55° - 500 m
45° - 545 m
30° - 600 m
15° - 660 m

DTBat® System Bats

The DTBat® system detects bats with microphones

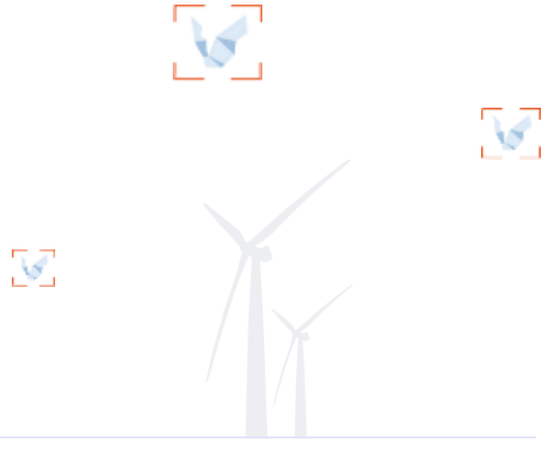
It is used for:

- **Bat monitoring**
- **Mortality mitigation**

Available Modules

01 _ **Detection Module**

02 _ **Stop Control Module**



DTBat® System Diagram

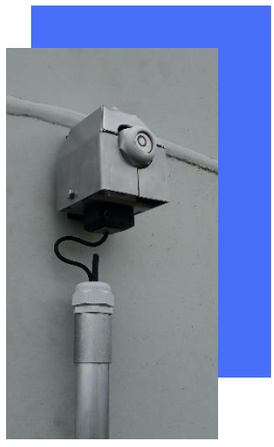
Tower Microphone

Nacelle Microphone

Tower Microphone (1,4 cm hole)

Cabinet & Ultrasound Detector at ground level

Tower Microphones



DTBat® models are chosen and installed according to:

- **Target Species**
- **WTG Dimensions**

DTBatQ2

- Bat monitoring and shutdown
- System with two microphones installed on the tower
- Standard model

DTBatQ3

- Bat monitoring and shutdown
- System with two microphones installed on the tower and one microphone in the Nacelle
- It is recommended for projects that include high-flying resident or migratory species

Scalable and tailor-made projects

Automatic species identification available

dtbird® dtbat®

AUTOMATIC COLLISION RISK REDUCTION

Your scalable solution for bird and bat protection

Thank you for your attention

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