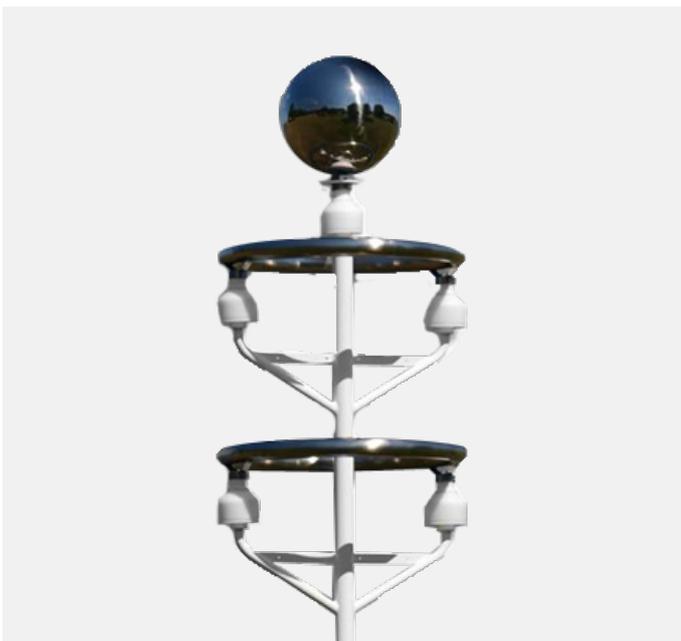


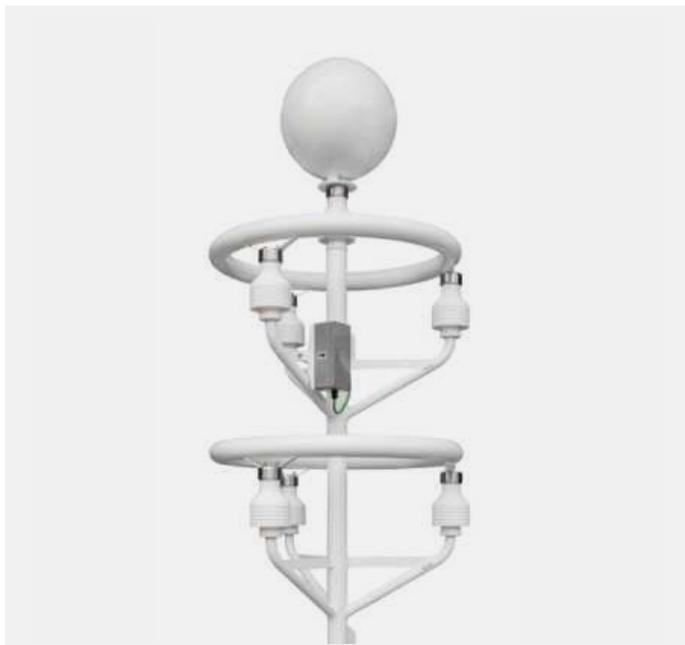
# BTD-300/350

## Thunderstorm (Lightning) Detector

The BTD-300 and BTD-350 are standalone sensors that reliably detect the presence of all forms of lightning to a range of 83 km. The unique quasi electrostatic operating principle gives the detector a very low false alarm rate and the ability to warn of the risk of overhead lightning. Virtually maintenance free, the sensor can operate with the supplied PC compatible display software, seamlessly integrate with sophisticated weather monitoring systems or directly activate local warning devices.



BTD-300 Thunderstorm Detector



BTD-350 Marine Thunderstorm Detector



Detects cloud-to-ground and cloud-to-cloud lightning



Warns of overhead lightning risk even before the first lightning discharge



Highly immune to radio interference



Meets FAA performance requirements for aerodrome use

### Lightning detection

Virtually all commercially available lightning detection sensors and systems use the reception of radio waves generated by lightning discharges as the primary detection technique. Whilst providing a sensitive method of detection the many other sources of radio waves such as arcs from electrical equipment, vehicle ignition systems and fixed or mobile transmitters can result in very high false alarm rates.

Lightning detection networks resolve this problem through the use of multiple sensors spaced tens or hundreds of kilometres apart combined with signal processing and triangulation. Such

networks are typically very costly to install and operate and are therefore only usually operated by national weather services. Standalone radio based lightning detectors often employ secondary measurements such as optical flash detection in an attempt to reduce false alarms and employ complex signal analysis to estimate range. These techniques are only partially effective, giving these older technology standalone lightning detectors a poor reputation due to their high false alarm rate and poor distance accuracy.

The BTD-300/350 uses quasi electrostatic measurements to avoid the problems associated with the detection of lightning

using radio waves and to provide the ability to issue warnings prior to the first discharge.

### **Electrostatic lightning detection**

When a lightning discharge occurs there is a significant transfer of electric charge which causes a disturbance in the atmospheric electric field detectable to a distance of more than a hundred kilometres. The low frequency (< 50 Hz) disturbance is detected by the three BTD-300/350 antennas and the signals are processed to both detect and range lightning discharges.

Due to the low frequency nature of the lightning discharge signal, the BTD-300/350 filters out the higher frequency electromagnetic radio waves which confuse other sensors. As virtually no manmade or natural source can disturb the Earth's electric field in same way as a lightning discharge, the BTD-300/350 has an almost zero false alarm rate.

All forms of lightning result in a neutralisation of charge within the thunderstorm. The associated disturbance in the atmospheric electric field enables the BTD-300/350 to detect all forms of lightning with high sensitivity. The rate at which the disturbance reduces with distance and the more uniform charge redistribution associated with lightning discharges allows the BTD-300/350 to determine range with greater accuracy than systems which rely solely on radio waves. By contrast the strength of radio waves produced by lightning varies significantly both with discharge type and between individual discharges, resulting in very poor range estimation performance for traditional radio based standalone lightning detectors.

### **True thunderstorm detection**

In many applications the thunderstorm detector is used to help protect people and equipment from the dangers of a lightning strike by providing advanced warning of a storm's approach. Detectors which rely on lightning alone are only effective if the storm is already producing lightning at a distance before moving closer towards the detector. If the first lightning strike of the storm is overhead there is no advanced warning and so no protection.

The electrostatic operating principle allows the BTD-300/350 to monitor the strength of the local electric field and the presence of charged precipitation, both of which are strong indicators of lightning risk. This allows the BTD-300/350 to provide warnings of the risk of an overhead strike even before any lightning has been produced, giving users time to take

the necessary safety measures ahead of the first strike.

### **Range and direction**

The BTD-300/350 has exceptional lightning detection and ranging capability as a result of the quasi-electrostatic design, but for those applications where knowledge of both the range and direction of lightning is necessary there is an optional direction finding module. The module uses traditional radio direction finding techniques but the output is qualified by the electrostatic ranging system to ensure only true lightning discharges are reported.

### **Applications**

There are many applications where the ability to reliably warn of the presence of thunderstorms can increase both safety and productivity. Aerodromes need to protect staff working on open airfields who can be especially vulnerable and face the added dangers associated with refuelling. Aircraft must also be made aware of the presence of thunderstorms in the critical take-off and approach zones.

Many industrial plants that process or store volatile chemicals may wish to suspend certain operations or maintenance activities when there is a risk of lightning that could cause catastrophic damage. Such interruptions are costly, making the reliable detection of thunderstorms an important cost control method. Maintenance workers on tall exposed plant or structures such as wind turbines are at particular risk from thunderstorms. Both their safety and productivity can be enhanced by reliable local thunderstorm warnings.

The leisure industry must also consider the risks posed by thunderstorms to customers and staff at outdoor events whether they are concerts, funfair rides, stadia or golf courses. Reliable thunderstorm detection allows the operator to take the appropriate action only when necessary, protecting both life and revenues.

### **Interfacing, connectivity and cost of ownership**

The BTD-300/350 can either interface directly to an integrated system or be operated using the supplied PC compatible display and logging software. Both RS-422 serial and Ethernet interface options are available to ease system integration. For true standalone operation the optional warning relay module allows the sensor to automatically sound alarms whenever a storm approaches, without the need for a computer connection or operator intervention.

Virtually maintenance free in operation the BTD-300/350

has a very low cost of ownership but can produce significant operational gains by ensuring only genuine thunderstorm warnings result in suspended operations.

The BTD-300/350 Field Test Unit is a simple battery powered device which simulates lightning in several range bands. It can be used as part of commissioning tests or during routine maintenance activities to enhance user confidence.



BTD-300 field test unit

### Technical parameters

<b>Detection</b>	cloud-to cloud, cloud-to-ground and intra-cloud lightning discharges
<b>Output</b>	Ethernet or serial data
<b>Detection efficiency</b>	<ul style="list-style-type: none"> <li>• 95 % for single lightning flash (any type)</li> <li>• 99 % for storm with 2 flashes</li> <li>• 99.9 % for storm with 3 flashes</li> <li>• for flashes within 56 km</li> </ul>
<b>Range</b>	83 km
<b>Range measurement uncertainty</b>	0 to 20 km $\pm$ 5 km 20 to 83 km $\pm$ 10 km
<b>Range measurement repeatability</b>	0 to 20 km $\pm$ 300 m 20 to 83 km $\pm$ 1000 m
<b>Range resolution</b>	10 m
<b>False alarm rate</b>	< 2 %
<b>Maximum flash rate</b>	120 per minute
<b>Time of flash</b>	nearest 10 ms (internal clock)
<b>Measurement principle</b>	passive, quasi electrostatic no moving parts
<b>Direction (optional)</b>	resolution 1°

### Outputs and reports

<b>Update rate</b>	2 s
<b>Serial outputs</b>	Ethernet (virtual com port) or RS-422
<b>Message content</b>	self-test status thunderstorm warning status flash time flash range flash direction (optional)

### Power requirements

<b>Sensor supply</b>	110 to 240 V AC 50 - 60 Hz universal
<b>Sensor power</b>	~ 10 W
<b>Extended heating (optional for BTD-300)</b>	30 W

## Additional features

<b>Warning state relays (optional)</b>	3 relays with volt free contacts: caution state, warning state and alert state can be disabled at user configurable times
<b>Warning thresholds</b>	user configurable

## Environmental parameters

<b>Operating temperature</b> - with extended heating (BTD-300)	-40 °C to 60 °C -50 °C to 60 °C
<b>Relative humidity</b>	0 % to 100 %
<b>Protection rating</b>	IP 66
<b>Wind</b>	to 50 ms <sup>-1</sup>

## Physical parameters

<b>Material</b>	stainless steel and power paint coated aluminium
<b>Weight</b>	25 kg
<b>Height</b>	2.460 mm
<b>Lifetime</b>	> 10 years

## Maintenance

<b>Self-test capability</b>	as standard
<b>Visual inspection</b>	6 to 12 months

## Certification and compliance

	<b>BTD-300</b>	<b>BTD-350</b>
<b>CE certified</b>	✓	✓
<b>EMC - general (EN61326: 1997, 1998, 2001, 2013)</b>	✓	✓
<b>EMC - marine (EN60945: 2002, sections 9.2.2 &amp; 9.2.3)</b>	×	✓
<b>Compliance with EN50536: 2011+A1: 2012 for a Class 1 detector</b>	✓	✓
<b>Corrosion resistance (EN60945: 2002, sections 8.12; EN60068-2-52: 1996 Test Kb)</b>	×	✓
<b>Vibration (EN60945: 2002, section 8.7; EN60068-2-6: 2008, test Fc)</b>	×	✓
<b>Performs in accordance with IEC 62793 for a Class A detector</b>	✓	✓
<b>RoHS and WEEE compliant</b>	✓	✓

## Included with sensor

The BTD-300/350 is delivered in sturdy recyclable foam filled packaging with:

- user manual and calibration certificates
- display and logging software

## Accessories - optional

<b>BTD.DIRUP (BTD-300)</b>	direction finder field upgrade
<b>BTD.FTU</b>	BTD-300 Field Test Unit / BTD-350 Field Test Unit
<b>BTD.SK300 / BTD.SK350</b>	BTD-300 Spares Kit / BTD-350 Spares Kit
<b>BTD.WTY300</b>	1 year extended warranty

