# Model BTD-350

## Marine Thunderstorm Detector and Warning of Lightning Risk

*Standalone lightning detector, especially constructed for the marine environment*

*Warns of overhead thunderstorm risk before the first lightning discharge*

*Unique quasi-electrostatic operating principle virtually eliminates false alarms*

**METEODATA**
**Datalogger / Transmitter Unit**
**(3G / GPRS, Line, Radio or Satellite)**

### KEY FEATURES & BENEFITS

- Detects charged precipitation - warns of overhead lightning risk even before the first lightning discharge
- Highly immune to EM interference which is the major cause of false alarms in traditional standalone detectors
- 83km (45 NM) detection range exceeds the US Federal Aviation Administration requirements
- Detects cloud-to-ground as well as the weaker but more common cloud-to-cloud lightning
- Provides information for enhanced CAP437 reporting of thunderstorms
- Developed for marine applications both on and offshore
- Certified for marine operation for salt spray, vibration and EMC
- Virtually maintenance free
- Meets EN50536:2011+A1:2012 requirements for a Class 1 detector
- Meets IEC 62793 performance requirements for a Class A detector

**The BTD-350 Marine Thunderstorm Detector has been designed specifically for use in the marine environment. Its structure has been strengthened to withstand the rigours aboard large vessels with all surfaces coated with a marine grade painting system. The BTD-350 reliably detects the presence of all forms of lightning, out to a range of 83km. The unique quasi-electrostatic operating principle gives the detector a very low false alarm rate and the unique ability to warn of the risk of overhead lightning, even before the lightning has started. Virtually maintenance free, the BTD-350 can operate with the supplied PC display software, seamlessly integrate into sophisticated weather monitoring systems or directly activate local warning lights or sounders.**

## Lightning Detection

Virtually all commercially available lightning detection sensors and systems use the detection of radio waves generated by lightning discharges as the primary measurement technique. Whilst providing a sensitive method of detection the many other sources of radio waves such as arcs from electrical motors and 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



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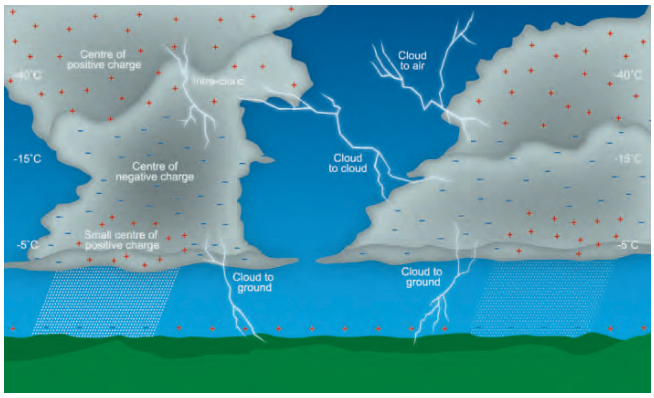
effective, giving these older technology standalone lightning detectors a poor reputation due to their high false alarm rate and poor distance accur acy.

The BTD-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-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-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-350 has an almost zero false alarm rate.




*The BTD-350 can detect cloud to cloud, cloud to air, cloud to ground and intra-cloud lightning*

All forms of lightning result in a neutralisation of charge within the thunderstorm. The associated disturbance in the atmospheric electric field enables the BTD-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-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.

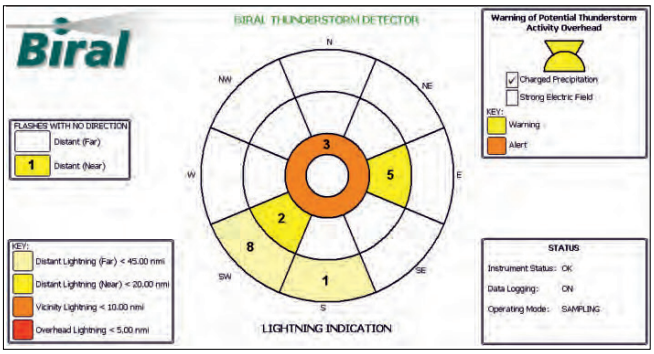
## True Thunderstorm Detection

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-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-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-350 has exceptional lightning detection and ranging capability as a result of the quasi-electrostatic design, this is augmented by the inclusion of a direction finder 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 marine applications where the ability to reliably warn of the presence of thunderstorms can increase both safety and productivity. These include during the loading and unloading of LPG and LNG when both the shore-side and vessel is at serious risk from lightning strikes. Similar risks also exist at oil terminals when making load transfers. Support and maintenance vessels for off-shore operations of wind turbines are also particularly susceptible to localised thunderstorms due to their proximity to the tall turbine structures. Helideck operations on marine oil and gas platforms also require advance warning of an approaching thunderstorm as helicopters are particularly susceptible to lightning strikes. Maintenance workers on tall exposed plant or structures such as off-shore rigs and wind turbines are at particular risk from thunderstorms. Both their safety and productivity can be enhanced by reliable local thunderstorm warnings.

The BTD-350 is designed and tested to cope with marine applications, where severe weather, salt water corrosion and platform vibration produce a challenging environment for environmental sensors. The sensors metalwork is corrosion-resistant stainless steel and aluminium, further protected by marine-grade paintwork. Reinforcement to the antenna supports prevents damage from excessive vibration as may be experienced aboard large vessels.

## Interfacing, Connectivity and Cost of Ownership

The BTD-350 can either interface directly to an integrated system or be operated using the supplied PC compatible display and logging software. Both RS422 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



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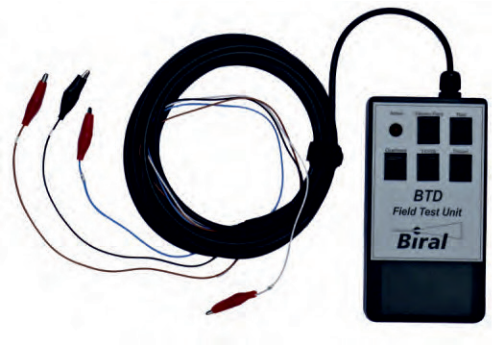
approaches, without the need for a computer connection or operator intervention.

Virtually maintenance free in operation the BTD-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-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 Field Test Unit*

## Sensor Configuration Information

For a detailed explanation of the configuration options please refer to the table below.

**BTD350 - BTD-350 Thunderstorm (Lightning) Detector**

**Heating:**
- **NH** - No additional heating

**Data Output:**
- **TE** - Ethernet output
- **TD** - RS422 Serial

**Relay Output:**
- **NR** - Without relay outputs
- **WR** - Including relay outputs

**Configuration:**
- **RC** - Regular configuration
- **SC** - Special configuration

| BTD350 | NH | | | |
|---|---|---|---|---|

***Example:*** ***BTD350.NH.TE.WR.RC*** (Please use this code when ordering your sensor).

## Configuration Options Explained

| Option | Description |
|---|---|
| Data Output | The sensor may be configured to communicate over either Ethernet or serial RS422.<br>Option **TE**: Ethernet communication<br>Option **TD**: RS422 Serial communication |
| Relay Output | The sensor can be supplied with three relays each representing a warning level.<br>Option **NR**: Without relay option<br>Option **WR**: With relay option |
| Configuration | Reserved for customer specific configurations.<br>Option **RC**: No customer specific configuration<br>Option **SC**: Special customer specific configuration. The exact nature of the configuration will be defined in a separate document. |



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# Technical Specifications

## Measurement

| | |
|---|---|
| Detects | Cloud-to-Cloud, cloud-to-ground and intra-cloud lightning discharges |
| Output | Ethernet or Serial data |
| Detection efficiency | 95% for single lightning flash (any type)<br>99% for storm with 2 flashes<br>99.9% for storm with 3 flashes<br>For flashes within 56km |
| Range | 83km (51 statute miles) |
| Range Measurement Uncertainty | 0 to 20km ±5km<br>20 to 83km ±10km |
| Range Measurement Repeatability | 0 to 20km ±300m<br>20 to 83km ±1000m |
| Range Resolution | 10m |
| False alarm rate | <2% |
| Maximum flash rate | 120 per minute |
| Time of flash | Nearest 10ms (internal clock) |
| Measurement principle | Passive, quasi-electrostatic<br>No moving parts |
| Direction | Resolution 1° |

## Outputs and Reports

| | |
|---|---|
| Update rate | 2s |
| Serial outputs | Ethernet (virtual com port) or RS422 |
| Message content | Self-test status<br>Thunderstorm warning status<br>Flash time<br>Flash range<br>Flash direction |

## Power Requirements

| | |
|---|---|
| Sensor supply | 110 to 240Vac 50-60Hz universal |
| Sensor power | ~10W |

## Environmental

| | |
|---|---|
| Operating temperature | -40°C to +60°C |
| Relative hunidity | 0 – 100% RH |
| Protection rating | IP66 |
| Wind | To 50ms$^{-1}$ |

## Certification & Compliance

| | |
|---|---|
| CE Certified | |
| EMC - General | EN 61326:2013 |
| EMC - Marine | EN 60945:2002, Sections 9.2.2 & 9.2.3 |
| Corrosion resistance | EN 60945:2002, Sections 8.12<br>EN 60068-2-52:1996 Test Kb |
| Vibration | EN 60945:2002, Section 8.7<br>EN 60068-2-6:2008, Test Fc |
| Meets EN50536:2011+A1:2012 requirements for a Class 1 detector | |
| Meets IEC 62793 performance requirements for a Class A detector | |
| RoHS and WEEE compliant | |

## Additional Features

| | |
|---|---|
| Warning state relays (optional) | 3 Relays with volt free contacts:<br>Caution state, Warning state and Alert state<br>Can be disabled at user configurable times |
| Warning thresholds | User configurable |

## Physical

| | |
|---|---|
| Material | Stainless steel and powder paint coated aluminium |
| Weight | 25kg |
| Height | 2,460mm |
| Lifetime | >10 years |

## Maintenance

| | |
|---|---|
| Self-test capability | As standard |
| Visual inspection | 6 to 12 months |

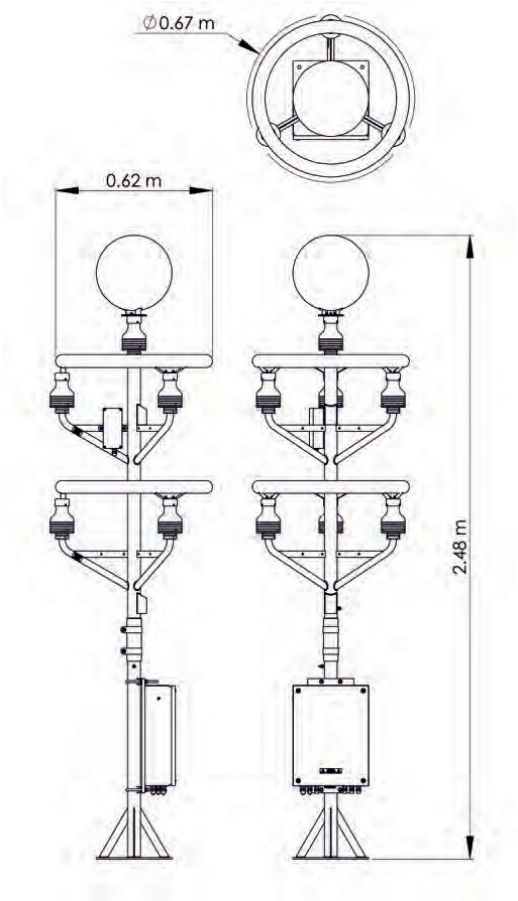
## Included with Sensor

The sensor is delivered in sturdy recyclable foam filled packaging with:
- Display and logging software
- User manual and calibration certificates

## Accessories – Optional

| | |
|---|---|
| BTD.FTU | BTD-350 Field Test Unit |
| BTD.SK350 | BTD-350 Spares Kit |

*Specifications are subject to review and change without notice. E&OE.*



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