WORLD’S MOST SUCCESSFUL DRONE DEFENSE SYSTEM
HUNDREDS OF INSTALLATIONS WORLDWIDE!

- NEW! Real-time ALL frequency monitoring (NO bands), detects any drone at any frequency!
- Real-time AI frequency monitoring and 3D DF, including height information
- Scalable for huge sites and borders
- Extremely high detection range of up to 50 km
- 360°A/90°E full dome coverage with high tracking accuracy
- Detects and tracks 3G, 4G and 5G drones
- Ultra-wide frequency range (9KHz to 20GHz)
- All-in-one solution, multi-sensor support, latest AI-based software
- Locates drone swarms and drone operators

www.aaronia.de
NEW! Unique technology: **real-time ALL frequency monitoring (NO bands)**
NEW! Real-time 3D DF frequency monitoring for all frequencies and directions at the same time
NEW! Up to 48THz/s sweep speed
NEW! Detects 3G, 4G and 5G drones
NEW! Up to 50 km detection range
NEW! Latest AI-based multi-target image and RF pattern recognition
NEW! Optical triangulation with multiple PTZ cameras
NEW! Ultra-wide frequency range (9kHz to 20GHz)
NEW! Multi-frequency, multi-directional swarm attack detection
NEW! Able to detect pre-programmed drones
NEW! Can be switched to a fully automatic mode (no operator required)
NEW! 360° azimuth and full 90° elevation gapless full dome coverage with high tracking accuracy
NEW! Provides real-time measuring of the RF emissions from drones/UAVs, jammers, phones, etc.
NEW! Tracks and locates the operator(s) controlling the drone(s)
NEW! Identifies the drone make and model (e.g. DJI Phantom 4)
NEW! Enables 24/7 seamless recording (tracking and/or raw data) and monitoring
NEW! 3D DF measurement accuracy up to ITU class A
NEW! Scalable for huge sites (airports, cities, borders, even countrywide installations)
NEW! Tested and running under most adverse weather conditions (night, fog, rain, etc.)
NEW! Enhanced temperature range (desert installations)
NEW! All-in-one solution (RF, radar, camera and software)
NEW! Setup and ready to use within a minute (portable version)
NEW! Powerful mobile app with automatic multi-level threat alerts and threat map display
NEW! Hardware and software made in Germany

Highlights
After five years of development, Aaronia introduces its latest drone detection system – the AARTOS DDS Generation 6. Designed to detect intruding drones, the system is based on real-time directional measurements of a drone's electromagnetic emissions (including its remote control). AARTOS DDS users receive warnings about incoming drones and alerts.

Drones – more than just a nuisance

Increasingly easy access to mini and micro UAVs makes them a growing potential threat to national and commercial security. Easy to produce, cheap to buy, simple to fly, and hard to detect, drones available commercially and non-commercially count among the most quickly evolving technological threats to military and civilian interests. In March 2015, a commercial drone reportedly alarmed the Secret Service when the UAV got too close to the President's golf resort.

Detection range

Our system’s detection range outmatches its targets. Under normal circumstances, the detection range is equal to (or better than) the maximum distance between the operator and the drone, depending on the transmitter power of the drone and/or its operator. Taking into account factors such as drone type and topography, the range of the AARTOS DDS can reach 50 km and further.

Early detection

The AARTOS Drone Detector triggers an alarm as soon as a remote control starts sending signals, even before the drone is actually airborne. Countermeasures can therefore be initiated at a very early stage.

Ready for action when you need it

Aaronia’s drone detection system can be used virtually anywhere. Typical use cases include the protection of borders, sports events or concerts, residential areas, government facilities as well as commercial or industrial sites such as nuclear plants. Available as a single-site or multiple-site solution, the system can be adjusted to the characteristics of the respective terrain to be monitored.

Hardware

The drone detector is based on our IsoLOG 3D DF antenna, real-time spectrum analyzers (XFR V6 PRO, Rugged Rack or RF Command Center) and a special software plug-in for the RTSA Suite Pro software. Combining all these elements allows for 24/7 monitoring and recording with uninterrupted data streaming. The system saves considerable measuring time and is both compact and flexible. It can be set up at virtually any place you need to monitor or protect.
Countermeasures

The system can be extended to include an automated integrated jammer which effectively prevents a drone from receiving RF signals, thus activating its fail-safe mode, e.g. to hover and land safely or return to its point of origin.

This interference is extremely selective in order to make sure other RF channels are not impaired. Aside from being highly selective, the jammer is directional and will only jam signals in the direction of the incoming UAV.

Advantages of a radio communication solution

RF detection of drone signals has significant advantages compared to other methods such as radar, optical and acoustic detection:

- **Safe detection – no false alarms**
  Our system does not mistake UAVs for other flying objects such as birds, balloons or kites.

- **Early detection**
  The AARTOS Drone Detector already triggers an alarm as soon as a remote control sends its first signal, even before the actual drone is airborne. Countermeasures can therefore be initiated at an early stage.

- **Tracking the drone operator**
  Since the Aaronia AARTOS DDS detects both the drone (by its downlink signals) and its corresponding remote control, the movement of both can be tracked immediately. If two or more DDS systems are deployed, triangulation can determine the exact position.

Made in Germany

The Aaronia AARTOS DDS is developed, designed, individually assembled and calibrated in Germany. This guarantees highest production and quality standards.
Efficient drone detection requires intuitive display modes

Simultaneous 2D Top-Down & 3D View

A top-down 2D perspective is the most commonly used drone detection visualization. Clearly structured, it is easy to understand and navigate because of its similarity to common satellite-image-based map solutions.

The 3D view expands on the 2D perspective by adding the drone's altitude information (this mode requires multiple drone detection systems). In addition, the 3D view makes it easier to evaluate distances between different objects on the map.

3D Topographic View

The topographic mode displays the surrounding terrain's surface, depicting hills, mountains, peaks and valleys. Combined with our 3D building system, the topographic view creates the most accurate representation of the surrounding area.

Advanced 3D Model View

The 3D view is able to integrate 3D models of complex areas (e.g. cities, airports, etc.). This very realistic view greatly improves the usability of the AARTOS drone detection system for end users.
Powerful jammer setup tool: Sectors, omni and even complex beam-forming shapes can be constructed or imported. This enables users to view the coverage of every jammer and frequency on the GIS display.

Mobile Handheld Jammer

- Directional antenna, covers a total of 4 bands, 32 W (up to 1.5 km range)

Automatic Sector Jammer (180°/360°)

- 2/4 sectors with 2/4 antennas, covers up to 15 bands, 180 W/360W (up to 3 km range) or 650 W/1300W (up to 8 km range)

360° Programmable Automatic Sector Jammer

- 8 sectors with 8 antennas, covers all bands, 240 W (up to 4 km range) or 800 W (up to >8 km range)

Jammer disclaimer

The AARTOS CMS (Countermeasure Solutions) can only be sold to entities with proper government approval for the deployment of jammers. For more information, contact us at mail@aaronia.de.
EO/IR Camera Integration

Additional protection through visual detection (optional)

Among the latest additions to the AARTOS DDS is the optional Visual Detection System - a fully integrated optical and thermal drone detection solution, perfectly matched to the RF detection mechanisms of the AARTOS Drone Detection System.

This option enables the user to actually spot detected drones, even from afar, and identify potentially dangerous payloads attached to the drone, such as explosives.

Tracking will continue even if a drone goes into autonomous flying mode while being tracked by the Visual Detection System.

General technical specifications

- Operating temperature: -40° C to 65° C
- Operating humidity: 10 - 100% RH
- Power: 24 V/AC, 120 W
- Lightning protection and more

Features

- Thermal camera for day & night protection
- Sophisticated tracking and analysis algorithm
- Max. camera resolution of 1920 × 1080 px (full HD)
- Max. thermal module resolution of 640 × 480 px (scaled up to 800 × 600 px)
- 30x optical zoom
- 12x digital zoom
- IP66-certified protection

PTZ (movement range and speed)

- Pan: 360° continuous rotation
- Tilt: From -90° to +45° (auto flip)
- Pan speed: Configurable, from 0.05°/s to 120°/s
- Tilt speed: Configurable, from 0.05°/s to 65°/s
More than just drone detection

Using an optional, sophisticated radar system, the AARTOS DDS can automatically determine and display the exact position, flight direction, altitude, speed and classification (i.e. make and model) of an inbound drone. The trajectory of the flight can be tracked in real-time as a 3D model.

The system distinguishes between birds, fixed-wing drones and propeller drones. When a UAV enters the designated no-fly zone, a multi-alarm can be configured.
Because software is key

Complete customization

The required equipment can be configured in detail to match customer requirements. End customers receive hardware tailored to their specific needs, with all components chosen individually. This guarantees optimal drone detection performance in any given terrain or area.

System Versions

**AARTOS DDS X3 (Laptop)**

Portable solution, omnidirectional, range: 500 m - 2 km

Designed to be used as a concealed and portable drone and jammer detection device, the setup is lightweight and offers a battery life of 1.5 hours. Equally easy to operate and carry, the system is ready to use within half a minute.

**AARTOS DDS X5 (Base)**

4 - 6° accuracy, range: ~ 1 - 2 km

The base system consists of one analyzer (V6 XFR Pro) and one IsoLOG 3D DF antenna array with 8 sectors. It is a highly cost-effective solution, which can be used to cover medium sized areas.

**AARTOS DDS X7 (Advanced)**

1 - 3° accuracy, range: ~ 2 - 5 km

Highest-precision drone detection combined with an extremely high detection range. The system consists of a 16 sector IsoLOG 3D DF antenna array and a spectrum analyzer (V6 Command Center, V6 XFR Pro or V6 Rugged Rack). Perfect for both single-system and multi-grid system setups.

**AARTOS DDS X9 (PRO)**

1 - 3° accuracy, range: ~ 5 - 14 km (50 km)

The X9 combines highest precision and ultra-wide-band monitoring for instant, real-time detection over multiple bands (instead of one instant or multiple via hopping). The system consists of an IsoLOG 3D DF antenna array with 16 sectors and the UWB unit, perfect for ultra-high-range drone detection grids.
## System Versions

<table>
<thead>
<tr>
<th>Range</th>
<th>500 m - 2 km</th>
<th>1 km - 2 km</th>
<th>2 km - 5 km</th>
<th>5 km - 14 km (Airport solution 50 km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sectors</td>
<td>Omnidirectional</td>
<td>8</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Tracking Accuracy</td>
<td>Omnidirectional</td>
<td>4° to 6°</td>
<td>2° to 4°</td>
<td>1° to 3° (only with 2nd receiver)</td>
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<tr>
<td>Multi Frequency Swarm</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Swarm Attack</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ITU Class for Tracking</td>
<td>-</td>
<td>B</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Accuracy</td>
<td></td>
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<tr>
<td>Amplifier Stages</td>
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<td>3</td>
<td>3</td>
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<td>Simultaneous Band</td>
<td>Hopping</td>
<td>Hopping</td>
<td>Hopping</td>
<td>Stitching/Hopping</td>
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<tr>
<td>Coverage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweep/Scan Speed</td>
<td>500 GHz/s</td>
<td>1 THz/s</td>
<td>2 THz/s - 4 THz/s</td>
<td>8 THz/s - 48 THz/s</td>
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<tr>
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<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Receivers</td>
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<td>1</td>
<td>2</td>
<td>4 (unlimited additional receivers)</td>
</tr>
<tr>
<td>Scalable</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Recommended Grid Distance</td>
<td>-</td>
<td>-</td>
<td>2 km</td>
<td>3 km</td>
</tr>
<tr>
<td>Equipment Included</td>
<td>V6 XFR Pro, IsoLOG 3D Mobile</td>
<td>V6 XFR Pro, IsoLOG 3D DF</td>
<td>Command Center / Remote Rack, IsoLOG 3D DF</td>
<td>Remote Rack, IsoLOG 3D DF</td>
</tr>
<tr>
<td>Automatic Jamming Option</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Radar Option</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>PTZ Support</td>
<td>No</td>
<td>No</td>
<td>Single</td>
<td>Multi</td>
</tr>
</tbody>
</table>

### Scalable

When using the AARTOS DDS as a scalable grid solution for drone and RF detection, we recommend placing the antenna and receiver combos apart from each other at a reasonable distance, to ensure the best and most comprehensive coverage and detection. For the X7 a maximum distance of 2 km and for the X9 a maximum distance of 3 km.

The grid system can be conveniently remote-controlled from a central location.
It takes only a few minutes to set up and deploy the single site solution. With a stationary or mobile spectrum analyzer (e.g. the RF Command Center or the XFR V6 PRO) as well as the 3D direction-tracking antenna IsoLOG 3D DF, this system is perfectly suited for the surveillance of smaller areas, e.g. a house or a correctional facility.

The multi-site solution consists of several antennas (IsoLOG 3D DF) and analyzers (SPECTRAN V6 Rugged Rack) to feed a central monitoring PC which manages all systems simultaneously. The unique advantage of our multi-site solution lies in its ability to triangulate signals with very high accuracy.

Due to its ability to combine an unlimited number of receivers, the multi-site solution is best suited for the protection of very large areas such as industrial plants, stadiums and government buildings.
Portable Rugged Laptop Analyzer

For portable solutions, the SPECTRAN V6 XFR Pro is the system of choice. This rugged, military-grade laptop features a powerful Intel i7 processor as well as an integrated spectrum analyzer.

This model is perfect for rapid deployment in the field - all it takes to detect drones is to set up the IsoLOG 3D DF antenna and connect it to the XFR Pro.

Portable Command Center Analyzer

The SPECTRAN V6 Command Center was designed with the latest and most powerful hardware and can also be configured to your personal requirements and requests. Two 4K displays depict all the information processed by the RTSA Suite Pro software. Both its hardware and twin 24" sunlight-readable displays make the Command Center the perfect stationary system.

Portable Rugged 19” Rack

The SPECTRAN V6 Rugged Rack is highly versatile and can be used in different ways: as an indoor or outdoor analyzer with multiple configurations for remote detection, or as part of an antenna-analyzer grid, allowing for the coverage of large areas as well as the triangulation of drones and their operators. The rack is water- and dustproof for outdoor use, remotely controllable and requires almost no maintenance.

Stationary Cooled Outdoor 19” Rack

This IP65 Outdoor Rack is equipped with a double insulated housing plus efficient cooling modules to handle a temperature range from -30° to 60° Celsius. A high-end sand filter enables it to withstand sand storms. The Outdoor Rack resists all environmental conditions and is the best choice for permanent outdoor installations of the AARTOS system.
# 3D DF Antenna Versions

## IsoLOG 3D DF-80

- **8 sectors with 16 antennas**
- Frequency range: 400 MHz (20 MHz) to 8 GHz
- Tracking accuracy (line of sight): 4° to 6°

### Frequency Range

<table>
<thead>
<tr>
<th>Standard</th>
<th>400 MHz to 8 GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>VLF Extender to 20 MHz</td>
<td>optional</td>
</tr>
<tr>
<td>SHF Extender to 20 GHz</td>
<td>optional</td>
</tr>
</tbody>
</table>

### Additional Options

- **Internal GPS Receiver**: Yes
- **Internal Low-Noise Pre-Amplifiers**: Yes (included)
- **Customized Color (RAL Table)**: Yes (standard - white)

### Measurements & Operating Specifications

- **Operating Temperature**: -30° to +60° C (-22° to 140° F)
- **Storage Temperature**: -40° to 70° C (-40° to 158° F)
- **Dimensions**: 960 × 960 × 380 mm
- **Weight**: approx. 22 kg
- **RF Output**: N (50 Ohm)

## IsoLOG 3D DF-160

- **16 sectors with 32 antennas**
- Frequency range: 400 MHz (20 MHz) to 8 GHz
- Tracking accuracy (line of sight): 1° to 3°

### Frequency Range

<table>
<thead>
<tr>
<th>Standard</th>
<th>400 MHz to 8 GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>VLF Extender to 20 MHz</td>
<td>optional</td>
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<tr>
<td>SHF Extender to 20 GHz</td>
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</tbody>
</table>

### Additional Options

- **Internal GPS Receiver**: Yes
- **Internal Low-Noise Pre-Amplifiers**: Yes (included)
- **Customized Color (RAL Table)**: Yes (standard - white)

### Measurements & Operating Specifications

- **Operating Temperature**: -30° to +60° C (-22° to 140° F)
- **Storage Temperature**: -40° to 70° C (-40° to 158° F)
- **Dimensions**: 960 × 960 × 380 mm
- **Weight**: approx. 25 kg
- **RF Output**: N (50 Ohm)
Multiple systems were placed on top of NATO headquarters as well as the Triumphal Arch at the Cinquantenaire (Jubelpark), the location of the delegation dinner. In response to the growing threat posed by unmanned aircraft systems, the Belgian Police handpicked AARTOS. This may not be surprising as it is the only RF-based detection system to meet all police requirements, with a special focus on multi-target, high-range detection in urban environments.

Aaronia CEO Thorsten Chmielus: “We are delighted to have been a part of this historical and unique event, protecting the summit against drones. This is a great testimony to the unrivaled capabilities of our AARTOS system and its increasing international significance.” Since drone technology is becoming more readily accessible, the use of micro or mini UAVs is starting to pose a potential threat to national and commercial security. The fully automated AARTOS Drone Detection System detects emissions from any RF signal and is able to analyze them in great detail and with high precision. Such signals may stem from “hopping patterns” sent by drones and their remote controls, but also from other sources such as cell phones. AARTOS is capable of detecting even the most cutting-edge 4G-based drone systems. The AARTOS system offers a unique ultra-high range (up to 50 km for a DJI P4 FCC) 360° dome coverage. Its detection technology is based on the patented Aaronia IsoLOG 3D DF Tracking Array Antenna, the UWB real-time RF receiver SPECTRAN V6 as well as a complex AI-based tracking system. Additionally, the system incorporates a real-time situation awareness display which depicts highly detailed 3D flight trajectories.
International Airport Installations
AARTOS rollout for international airports around the globe

Muscat International Airport
Oman Airports has approved Aaronia’s AARTOS DDS in cooperation with R & N Khimji LLC as the appropriate solution for drone detection at Muscat International Airport.

Heathrow International Airport
Heathrow International Airport in the UK use the AARTOS DDS. These installations use our latest 3D model feature for the complete airport area (including buildings, bridges, towers, etc.).

ASEAN International Airports
Our latest installations: ASEAN international airports use the AARTOS Drone Detection System.
CUSTOMER GROUPS

- Military & police forces (ground & air)
- Convoys
- Airports
- Power plants
- VIP security services
- Border patrols
- Government buildings (e.g. embassies, correctional facilities)
- Events (concerts, political events, sports etc.)
- Seaports / marinas
- Private properties

REFERENCES

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- OVER 100 INSTALLATIONS IN 2019 -
(HUNDREDS CURRENTLY IN PREPARATION)