

# DRONE DETECTION SYSTEM

# AARTOS DDS

## ADVANCED AUTOMATIC RF TRACKING AND OBSERVATION SOLUTION

Detects/Tracks any kind of UAV // Real-time remote controllable // All-in-one solution



### Highlights:

- Extremely high detection range of up to 50 km
- Locates drone swarms and drone operators
- Ultra-wide frequency range (20 MHz - 20 GHz)
- 360-degree dome coverage with high tracking accuracy

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**MADE IN GERMANY**

# Highlights

- ✓ Real-time measurement of the RF emissions from drones / UAVs, jammers, phones etc.
- ✓ Tracks and locates the operator(s) controlling the drone(s)
- ✓ Extremely high coverage, up to 50 km (airport-solutions) depending on the drone type
- ✓ Detects and locates unlimited numbers of drones at the same time
- ✓ Detects more than 99% of all commercial drones (even pre-programmed)
- ✓ Identification of the drone type (e.g. DJI Phantom 4)
- ✓ Works in urban environment (cities, airports, events etc.)
- ✓ Allows 24/7 recording and monitoring without any gaps
- ✓ Ready for use within a minute (portable version)
- ✓ Multi-system setups show position and altitude
- ✓ DF measurement accuracy up to ITU class A
- ✓ Enhanced temperature range (desert installations)
- ✓ Unlimited in size & numbers of receivers, arbitrary scalable and expandable
- ✓ High sensitivity even in urban environment, due to switchable sector-amps
- ✓ Covers a frequency range of 20 MHz to 20 GHz
- ✓ 3D multi-functional flight pass view
- ✓ High tracking accuracy of up to 1°
- ✓ Works at night, in fog and bad weather
- ✓ 360° coverage
- ✓ Made in Germany



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# Aaronia AARTOS DDS

## Anti-UAV system to monitor, detect and defeat unwanted drones

After four years of development, Aaronia introduced its drone detection system – the AARTOS DDS. The system is designed to detect the intrusion of unwanted drones by using real time directional measurements of the drone's electromagnetic emissions (including its remote control). It warns users of the DDS of incoming drones and sends alerts.

## Drones can be more than just a nuisance

The increasingly easy access to mini/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, commercially and non-commercially available drones are among the most quickly evolving technological threats to military and civilian interests. In the US, a commercial drone reportedly alarmed the Secret Service in March 2015 when the UAV flew too close to the President's golf resort.



**New !** *The AARTOS DDS Container: Stand-alone for up to 3 months*

## Detection range

The system has no limitation with regard to its detection range. Usually, the detection range is the same (or better) as the usable distance between the operator and the drone, thus depending on the transmitter power of the drone/its operator. Taking into account the various drone types and topography, this range can be up to 50 km or more.

## Early detection

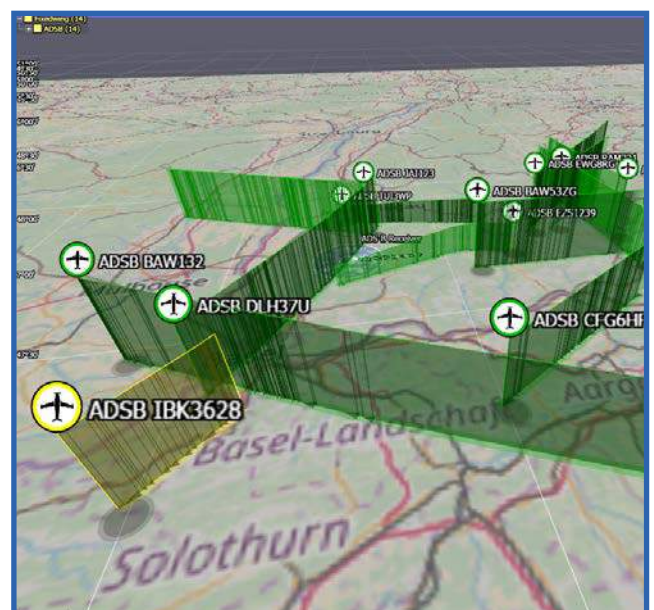
The AARTOS Drone Detector triggers an alarm as soon as a remote control sends a signal, which is even before the actual drone is airborne. Countermeasures can therefore be initiated at a much earlier stage.

## Aaronia Drone Detector - Can be used anywhere

The drone detection system can be used virtually anywhere. Typical use cases include the protection of borders, events, residential areas, governmental facilities as well as commercial/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/area to be monitored.

## Hardware

The drone detector is based on the Aaronia IsoLOG 3D antenna, a real-time spectrum analyzer (XFR V5 PRO, RR or RF Command Center) and a special software plug-in for the RTSA Suite software. Combining all these elements allows for 24/7 monitoring and recording with uninterrupted data streaming. The system saves considerable measurement time, and is both compact and flexible. It can be set up at virtually any place you need to surveil/protect.



**New!** Integrated 3D ADS-B, FLARM and FANET flight-tracker



## Countermeasures

The system can be extended to include an automated, integrated jammer that can effectively prevent a drone from receiving RF contact/signals, thus forcing it into fail-safe mode, e.g. to land or to hover. The interference is extremely selective so that other RF channels are not impaired.

Besides being highly selective, the jammer is extremely directional and only jams in the direction of the incoming UAV.

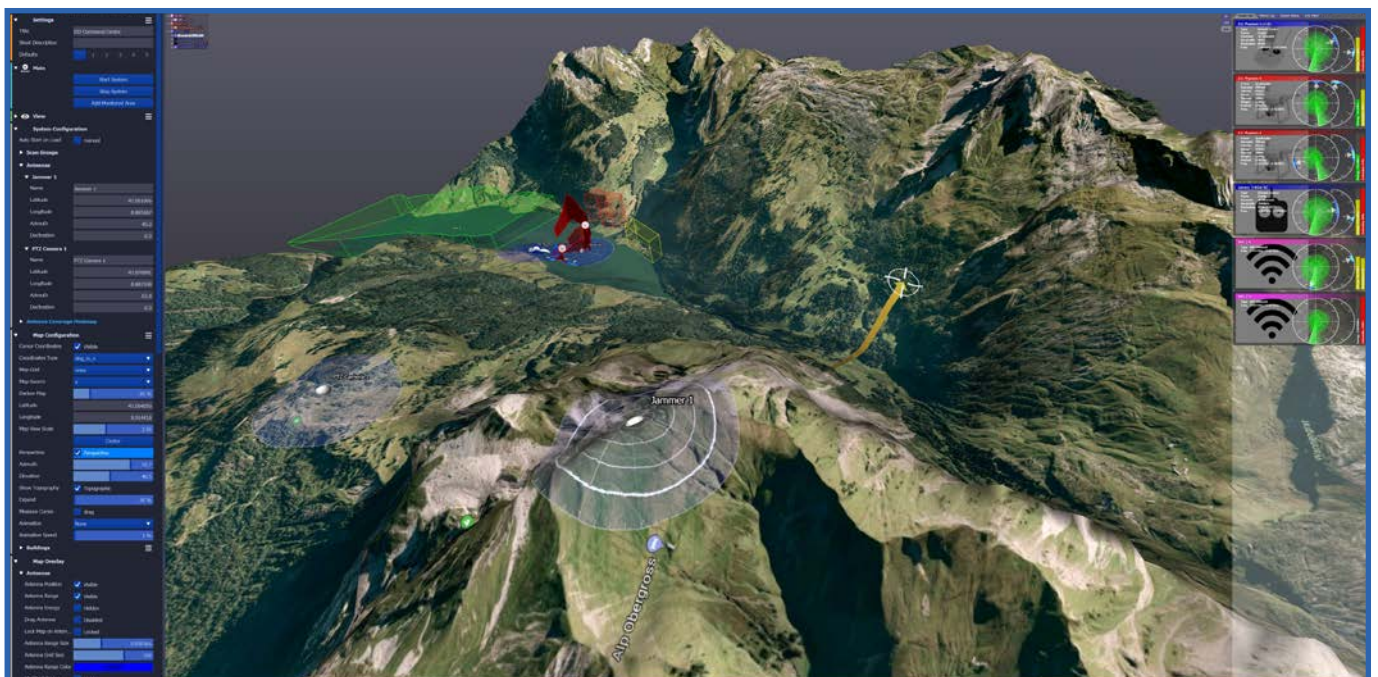
## Advantages of a radio communication solution

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

- **Safe detection without false alarms**  
The system can not be confused by 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 a signal, hence 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 (via its downlink signals) and the corresponding remote control, the direction of both can be immediately tracked. When two or more systems are used, the exact position can be determined via triangulation.

## Made in Germany

The Aaronia AARTOS DDS is developed/designed, individually assembled and calibrated in Germany. This guarantees highest production standards.



*AARTOS GIS: Unique real time 3D topographic view*



## The different ways to display drone detection information



The 3D view expands on the 2D perspective by adding a visual layer of the drone's altitude information (when using multiple drone detection systems).

It is clearly structured, easy to understand and navigate, thus very similar to map solutions offering satellite images.



Even more sophisticated than the 3D 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.

# Jammer Integration

## Mobile Manpack-Jammer



Omni- and directional antenna,  
covers **5 bands**,  
**120 W** (range up to 2.5 km) output

## Automatic Corner-Jammer (180°)



2 sectors with 2 antennas,  
covers **7 - 8 bands**,  
**180 W** (range up to 3 km) or  
**650 W** (up to 6 km) output

## Automatic Omni-Jammer (360°)



4 sectors with 4 antennas,  
covers **14 - 16 bands**,  
**360 W** (range up to 3 km) or  
**1300 W** (up to 8 km) output

## Jammer disclaimer

The AARTOS CMS (Counter-Measure Solutions) can only be sold to entities with proper government approval for the deployment of jammers. Contact us for more information at [mail@aaronia.de](mailto:mail@aaronia.de).



*Powerful jammer setup tool: Sectors, omni and even complex beamforming shapes can be constructed or imported.  
This enables the user to see the coverage of every jammer and frequency on the GIS display.*



# 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 with the RF detection mechanisms of the AARTOS Drone Detection System.

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

Should a drone switch to autonomous flying mode whilst being tracked by our Visual Detection System then the tracking will continue regardless.

### General technical specifications

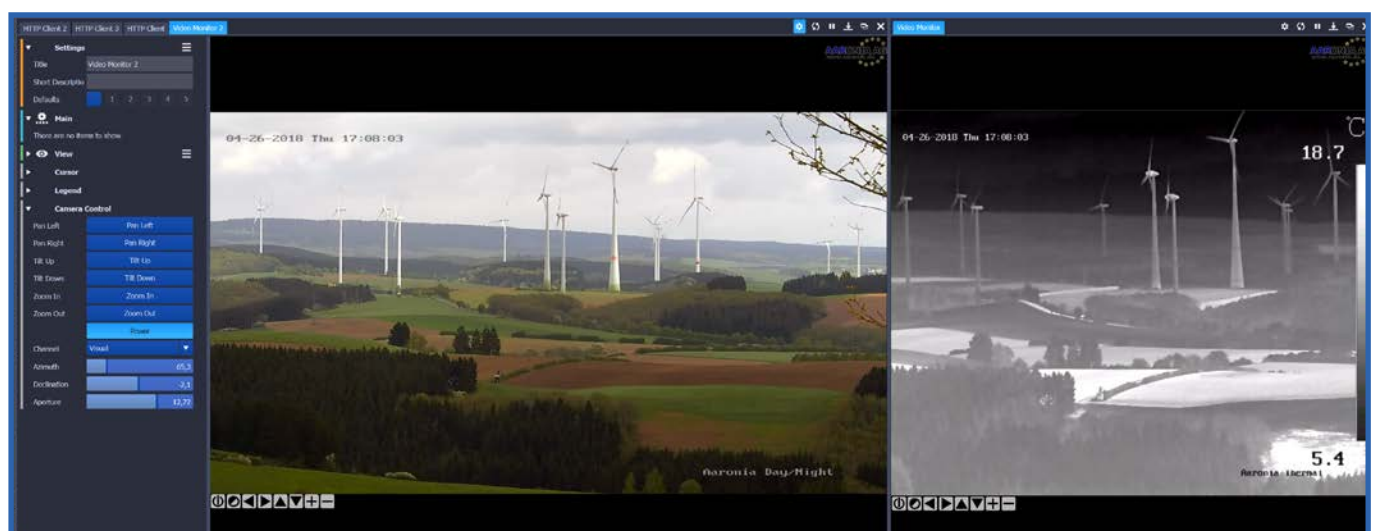
- Working temperature: -35° C to 60° C
- Working humidity: 90% or less
- Power: 24 V/AC, 120 W
- Lightning protection and more

### PTZ (movement range and speed)

- Pan: 360° continuous rotation
- Tilt: From -90° to +40° (auto flip)
- Pan speed: Configurable, from 0.1°/s to 110°/s
- Tilt speed: Configurable, from 0.1°/s to 110°/s

### Features

- Thermal camera for day & night protection
- Sophisticated algorithm for tracking and analysis
- Camera max. resolution - 1920 x 1080 px
- Thermal module max. resolution - 640 x 512 px
- 12 m minimum focusing distance
- 49x optical zoom
- 16x digital zoom
- IP66 protection level/grade

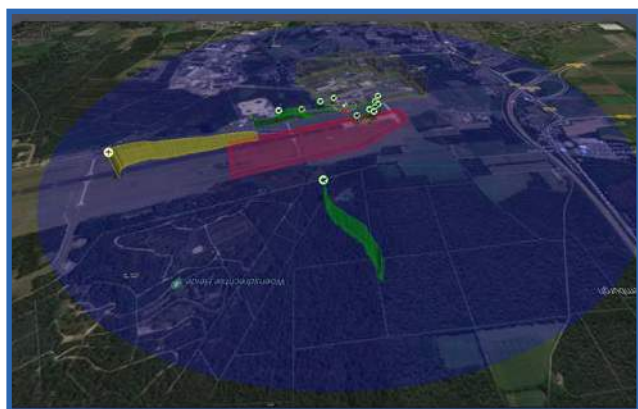


Full HD camera view (left side) and the thermal camera view (right side) in the RTSA suite pro software.

# Radar Integration



*AARTOS supports powerful 3D radar integration*



*Radar range visualization with a click*

## More than just drone detection

Using a sophisticated radar system, the AARTOS DDS can automatically determine and display the exact position, flight direction, altitude, speed and classification of an inbound drone. The trajectory of the flight can be tracked in realtime as a 3D model.

The system distinguishes between birds, fixed-wing drones and propeller drones. When a flying object/UAV enters the area designated for protection, a multi-alarm can be configured.



# Customer Hardware Integration

Because software is key!



*AARTOS drag and drop construction setup*

## Complete customization

The required equipment can be configured in detail to customer requirements. The end customer receives hardware tailored to their specific needs, with all components chosen individually. This guarantees the optimal drone detection performance in a specific area.



*Typical setup for drone detection*

# System Versions

## X3 (Mobile)

Designed as an easily portable drone and jammer detection device, this setup is lightweight and comfortable to carry. In addition, it offers long battery life.

## X7 (Advanced)

The X7 combines precision in drone detection with a very high detection range. Perfectly suited for both single-system and multi-grid system setups, it features a 16-sector IsoLOG 3D antenna-array and a spectrum analyzer (Command Centre, XFR Pro or Rugged Rack).

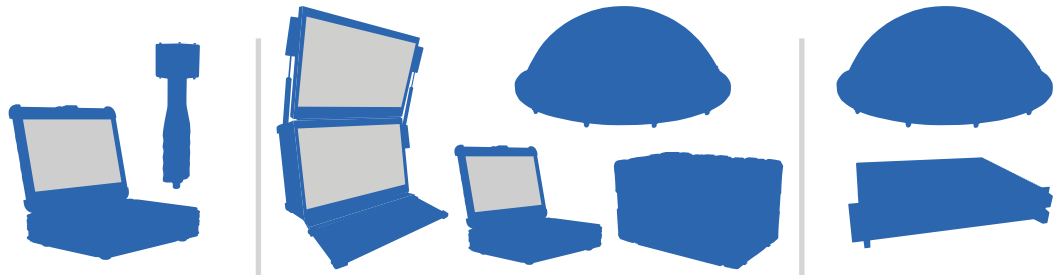
## X5 (Base)

This system includes an analyzer (Command Center, XFR Pro or Rugged Rack) and an 8-sector IsoLOG 3D antenna-array. With regard to drone detection systems, the X5 can be used as a very cost-efficient way to cover large areas.

## X9 (Ultra Wideband)

Highest precision and range meet ultra-sideband monitoring - the X9 combines these features, allowing for instant, real-time detection on multiple bands (instead of one instant or multiple via hopping). The system consists of a 16-sector IsoLOG 3D antenna-array and an UWB unit.

# System Versions

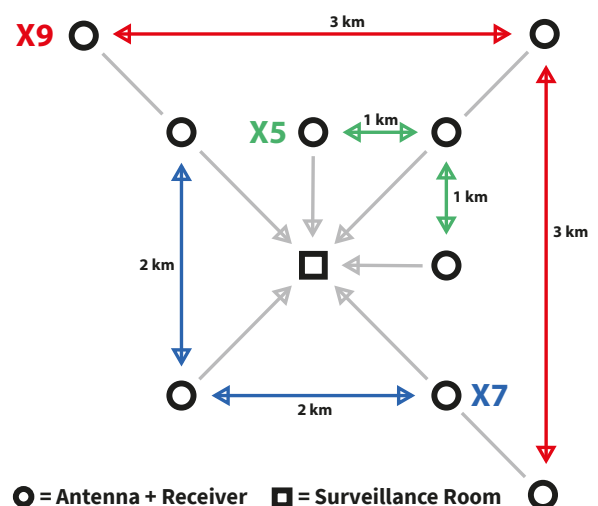


	X3	X5	X7	X9
Range	500 m - 2 km	1 km - 2 km	2 km - 5 km	3 km - 7 km (Airport solution 50 km)
Sectors	Omni directional	8	16	16
Tracking accuracy (Line of sight)	Omni directional	4 - 6°	1 - 3°	1 - 3°
ITU class for tracking accuracy	-	B	A	A
Amps	1	2	2	2
Simultaneous band coverage	Hopping	Hopping	Hopping	Real-Time
Receivers	1	1	1 (Optional 2)	4 (unlimited additional receivers)
Scalable	No	Yes	Yes	Yes
Recommended grid distance	-	1 km	2 km	3 km
Included equipment	V5 XFR Pro, IsoLOG 3D Mobile	Command Center / XFR Pro /RR, IsoLOG 3D	Command Center / XFR Pro /RR, IsoLOG 3D	UWB, RR, IsoLOG 3D
Jammer option	Manual	Manual or Automatic	Manual or Automatic	Manual or Automatic

## Scalable

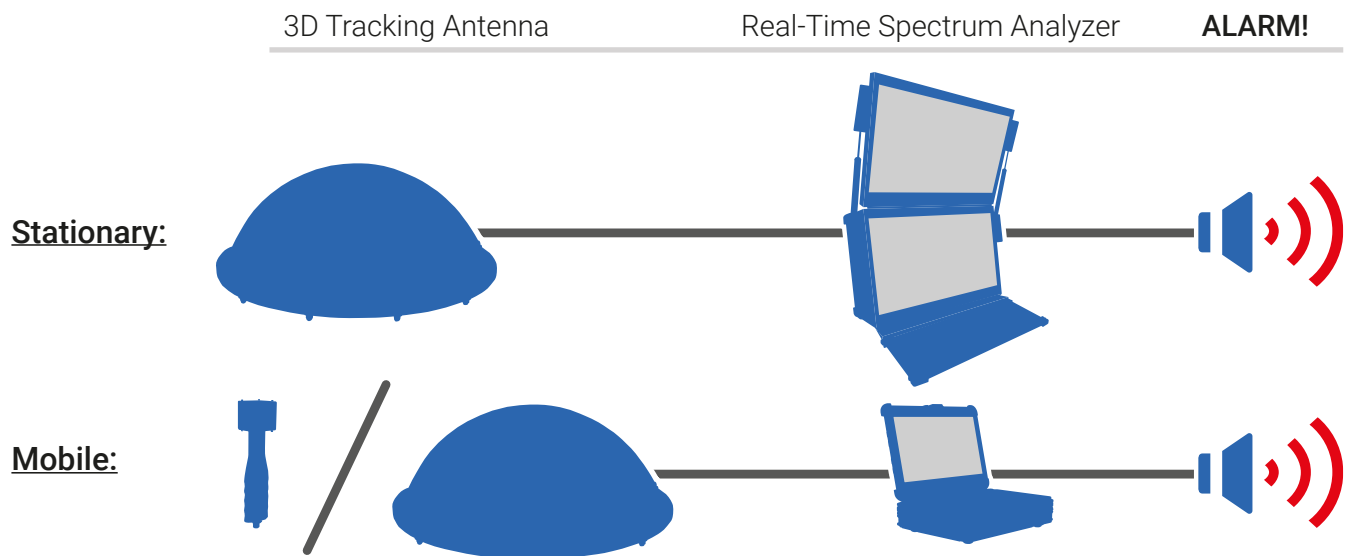
When using the AARTOS DDS as a scalable grid solution for drone and RF detection, we recommend placing the antenna + receiver combos apart from each other at a reasonable distance, thus ensuring the best and most comprehensive coverage and detection. For the X5, we recommend a maximum distance of 1 km, 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.



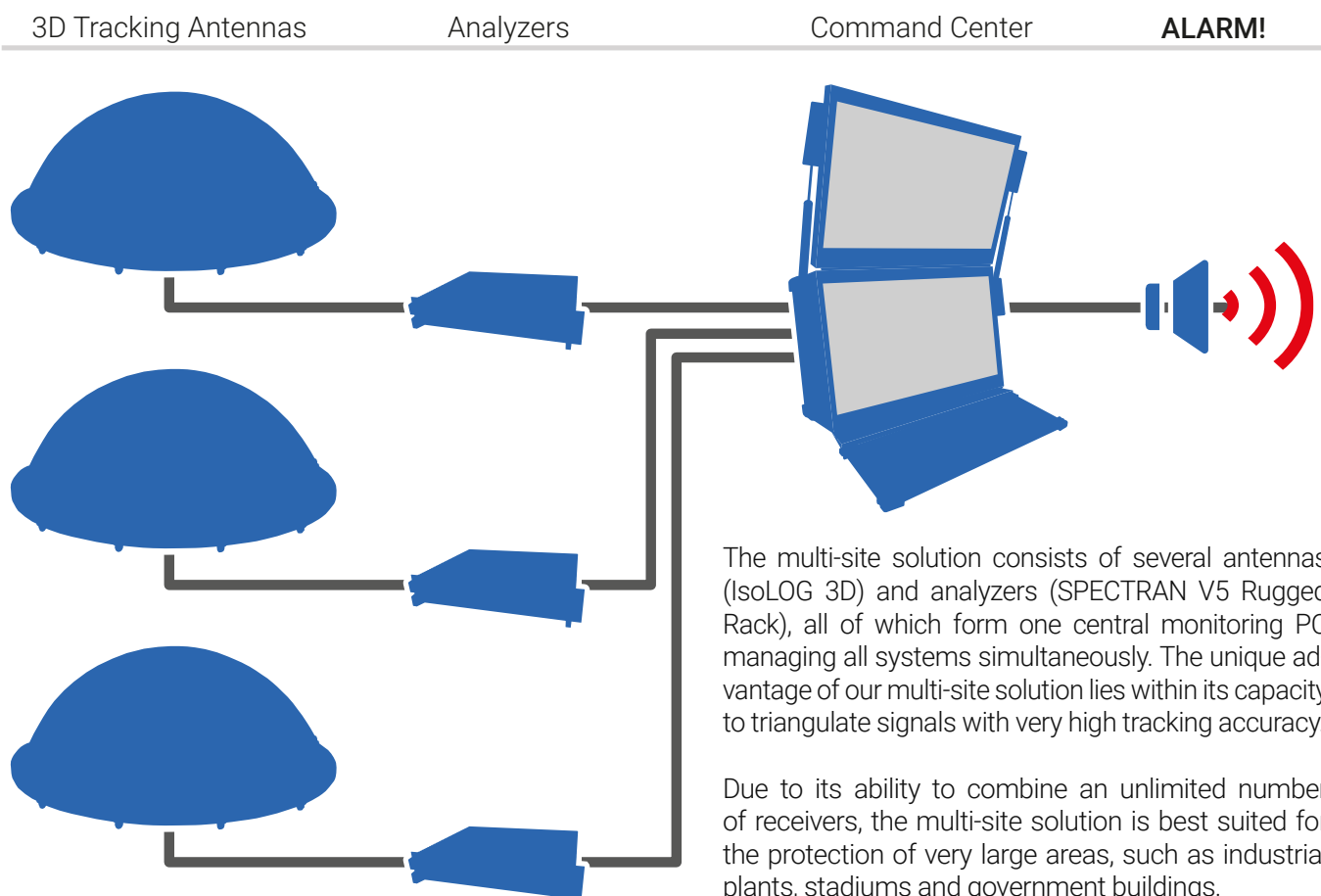


# Single Site Solution (portable)



The single-site solution is set up and ready to use within a few minutes. Based on a stationary or mobile spectrum analyzer (e.g. the RF Command Center or the XFR V5 PRO, see also p. 12) as well as the 3D direction tracking antenna IsoLOG 3D, this system is perfectly suited for the surveillance of smaller areas, e.g. a house or a prison.

## Multi Site Solution



# Formfactor Versions



## Portable analyzer

In terms of portable solutions, the SPECTRAN V5 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.

Perfect for rapid deployment in the field - once the Iso-LOG 3D antenna is set up and connected to the XFR Pro, drones can be easily detected.

## Stationary analyzer

The SPECTRAN V5 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 software.

Both its hardware and large displays make the Command Center the perfect stationary system.



## Grid / Indoor / Outdoor 19" Rack

The SPECTRAN V5 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 a 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, remote controllable and requires almost no maintenance.

## Ultra-Wideband analyzer

The high-performance UWB Recorder is our analyzer array. It allows the real-time monitoring of multiple bands (without frequency hopping).

The analyzer is available as a PC system, a 19" version or a server rack, with a real-time bandwidth of up to 20 GHz. With regard to uncompromising stationary or grid solutions, this is the system of choice.





# Antenna Versions

## IsoLOG 3D 80



### 8 sectors with 16 antennas

Frequency range: 400 MHz (20 MHz) to **8 GHz**

Tracking accuracy (line of sight): **4 to 6°**

## IsoLOG 3D 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

Standard	400 MHz to 8 GHz
VLF Extender to 20 MHz	optional
SHF Extender to 20 GHz	optional

#### 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 x 960 x 380 mm
Weight	approx. 22 kg
RF Output	N (50 Ohm)

#### Frequency range

Standard	400 MHz to 8 GHz
VLF Extender to 20 MHz	optional
SHF Extender to 20 GHz	optional

#### Additional options

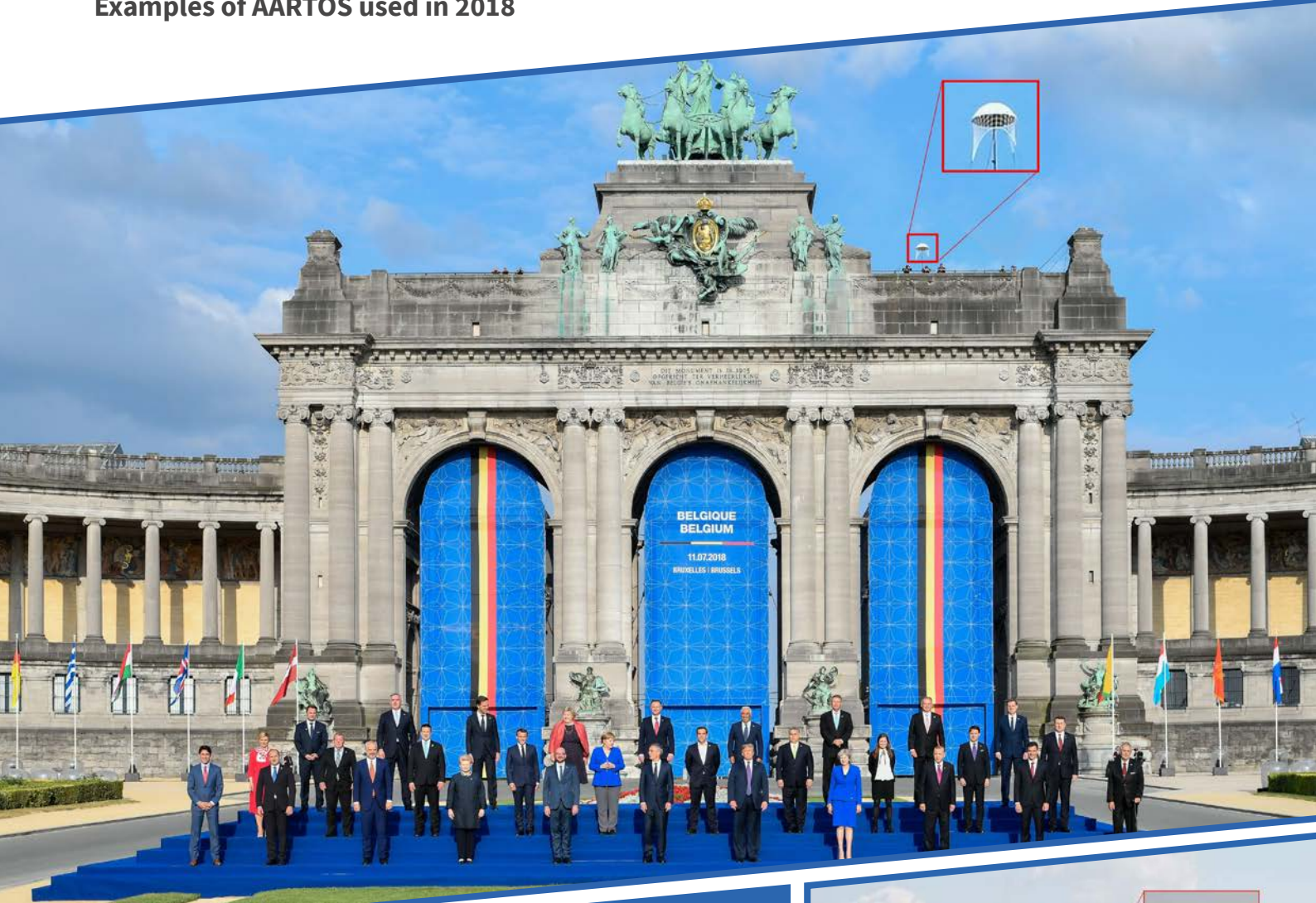
Internal GPS receiver	Yes
Internal low-noise pre-amplifiers	Yes (included)
Customized color (RAL table)	Yes (standard - white)

#### 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 x 960 x 380 mm
Weight	approx. 25 kg
RF Output	N (50 Ohm)

# Latest References

## Examples of AARTOS used in 2018



### 2018 NATO summit protected against drones by Aaronia's AARTOS system

Aaronia's AARTOS drone detection system was the exclusive RF-based counter-UAV solution protecting the 2018 NATO Summit in Brussels.

Multiple systems were placed on top of the NATO headquarters as well as the Triumphal Arch at the Cinquantenaire (Jubelpark), the place of the delegation dinner. Reacting to the growing threat posed by unmanned aircraft systems, AARTOS was handpicked by the Belgian Police.



This may come as no surprise, as it is the only RF-based detection system to meet all of the police requirements, with a special focus on multi-target, high-range detection in urban environments.



# Latest References

## Examples of AARTOS used in 2018



**Aaronia's AARTOS DDS protected the summit meeting of Kim Jong Un and Donald Trump**



Aaronia AG, the specialist for advanced RF and MW technology based in Strickscheid, Germany, was proud to provide their AI-based drone detection system AARTOS for the protection of the 2018 North Korea–United States summit in Singapore.

Aaronia CEO Thorsten Chmielus commented: „We are delighted to be a part of this historical and unique event, protecting the summit against drones. This is great testimony to the unrivaled capabilities of our AARTOS system, and the significance it is gaining internationally.“ Since drone technology is becoming more and more readily accessible, the use of micro/mini UAV is beginning to pose a potential threat to national and commercial security. AARTOS, the fully automated drone detection system, detects emissions from any RF signal and analyses them in great

detail and with high precision. These signals may stem from the “hopping patterns” of drones and their remote controls, but also from other sources such as cell phones capable of detecting even the most cutting-edge 4G-based drone systems.”

The AARTOS system uses a unique ultra-high range (10 - 15 km) 360-degree dome coverage. The detection technology is based on the patented AARONIA IsoLOG 3D Tracking Array Antenna, the UWB real-time RF receiver SPECTRAN V5 as well as a complex AI-based tracking system. In addition, the system incorporates a live/real-time situation awareness display that depicts highly detailed 3D flight trajectories.

- OVER 50 INSTALLATIONS IN 2017 -  
(300+ CURRENTLY IN PREPARATION))



## CUSTOMER GROUPS

- Militaries & Police Forces (Ground & Air)
- Convoys
- Airports
- Power plants
- VIP security services
- Border patrols
- Government buildings  
(e.g. embassies, prisons)
- Events (Concert, Political, Sport,...)
- Seaports / Marinas
- Private Properties

# AARTOS DDS REFERENCES