



M24 Electronic Nose

Explosive detection through artificial intelligence for humanitarian demining

M24 is a chemical detection solution designed to support humanitarian demining operations in complex scenarios, where traditional technologies lose effectiveness. The system combines volatile organic compound (VOC) sensors with artificial intelligence models to identify chemical signatures associated with hidden explosives.

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The Operational Challenge

Detecting explosives in the field remains a slow, risky, and uncertain task

Global scale of the problem

More than **60 million unexploded antipersonnel mines** worldwide. In Colombia alone, more than **2,500 km²** are contaminated, affecting rural communities and hindering territorial development.



Limitations of current technologies

- **Optical and infrared methods:** low effectiveness against buried, degraded, or vegetation-covered explosives
- **Canine detection:** valuable but costly, limited availability, and dependent on specific operational conditions
- **Metal detectors:** high false positive rate due to metallic debris in the ground



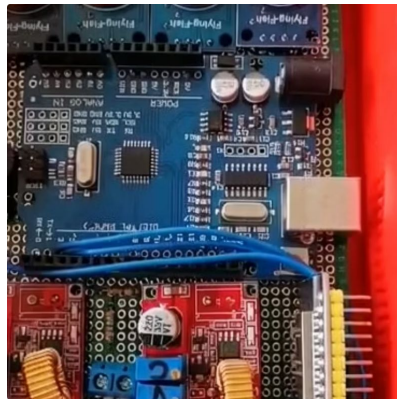
What is M24?

A portable electronic nose for non-contact detection



Force multiplier device

M24 expands the search capacity of demining teams without increasing operator exposure. It is portable, rugged, and designed for hostile environments.



VOC-based detection

Uses a chemical sensor array to capture volatile organic compounds emitted by explosives, even when buried or in the process of degradation.



Reduction of false positives

Its logic is not based on detecting metal, but on identifying chemical signals, significantly reducing false positives associated with metallic scrap in the field.



How M24 Works

Chemical detection sensors + real-time intelligent classification

Preprocessing

Filtering and normalization
of chemical signals.

AI/ML Classification

Field-trained models identify
patterns.

VOC Capture

Sensor array detects traces
in the air.

Real-Time Alert

System delivers immediate
decision support.

The system captures VOC traces emitted by explosives and processes those signals through AI/ML models trained on field data to recognize patterns consistent with explosive materials. This approach is especially effective in scenarios where visual inspection, thermal imaging, or direct surface analysis underperform. The combination of chemical sensors and algorithmic intelligence delivers a useful support signal for on-the-ground decision-making.



Detectable Explosive Elements HTG DIDO Ver 1.88 2022

Compound	Grams	Distance Time detection <10 seconds			
		10 cm	20 cm	30 cm	40 cm
Pentolite	30	99,5%	95,3%	90,1%	83,2%
TNT	30	99,8%	97,5%	92,4%	90,6%
ANFO	10	97,8%	92,3%	86,8%	52,2%
ANFO + Diesel	10	99,4%	94,7%	86,1%	59,7%
RDX	30	90,2%	83,5%	78,4%	69,1%
Ammonium nitrate	30	98,1%	95,6%	90,8%	87,4%

Where M24 Delivers the Most Value

Specialized for hostile environments and low-visibility conditions

Dense jungle and heavy vegetation

M24 was designed to operate in high-humidity conditions, dense vegetation, and elevated ambient chemical noise — environments representative of the challenges faced by the CCCM.

Explosives buried up to 30 cm

The system was designed to detect volatile traces from explosives buried up to 30 cm deep under real field conditions.



Specialized tool

Its primary value is not as a universal solution, but as a niche tool for zero-visibility scenarios, high operational risk, and intense ambient chemical noise.





Operational Integration

Manual use today, scalable autonomy tomorrow

Current configuration

M24 can be integrated as a portable device attached to the head of a traditional metal detector, enabling dual field search. This mode of use facilitates adoption because it fits into existing routines and provides the operator with an additional layer of information for faster, safer decision-making.

Future vision

The system architecture is designed to integrate into ground rovers and unmanned platforms, keeping the operator away from the danger zone. A command and control center is also envisioned for centralized management of patrols of dozens of M24 units deployed simultaneously in the field.



Technology Comparison

Technical positioning of M24 against other approaches

Criterion	Raman / Infrared	Canine Detection	M24 Electronic Nose
Buried explosives	Limited	Effective	Effective (up to 30 cm)
Humid environments and jungle	Low performance	Variable	Designed for it
Scalability	Medium	Low	High
Continuous availability	High	Limited (fatigue)	Continuous
False positives (metals)	Variable	Low	Reduced
Autonomous integration	Limited	Not applicable	In development

M24 does not seek to replace all existing technologies, but to occupy a specific high-value niche: the chemical detection of conventional buried explosives in hostile, low-visibility environments.



Maturity and Current Validation

From technical concept to initial validation with relevant partners

Current status: TRL 4

The project has completed laboratory tests and an initial base of validated technical verification. The current priority is to expand the evidence, comparative benchmarking, and validation under representative operational conditions.

- ✓ The test field scheme developed could also be used to test other detection technologies for the same purpose.

Partner and collaborator network

Armies of Chile

Operational link and access to real-world scenarios

CCCM

the landmine action in Colombia



UDLA & Autnonoma University

Scientific backing and technical development



What We're Looking for from ITG

Collaboration to validate, compare, and integrate



Access to controlled and field testing

We are looking for testing environments that allow us to validate M24's performance across different operational contexts, including conditions representative of tropical jungle and contaminated European zones.



Technical benchmarking and operational feedback

We are interested in comparing M24 with other technical approaches, receiving direct feedback from operators, and refining priority use cases for the humanitarian sector.



Access to competitive funding

We want to learn about, evaluate, and participate in financing mechanisms that provide viability to reduce development times for the new M24 version and its delivery to the CCCM.



Building a responsible adoption pathway

Our goal is to build, together with the community, a serious pathway for testing, integration, and responsible adoption — rather than simply presenting a technology.



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Thanks



Geneva International Centre
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