innesto
AUTONOMY UNIT

innesto is an autonomy unit developed by **aitronik s.r.l.** to transform agricultural machinery into semi-autonomous or fully autonomous vehicles. The solution enables manufacturers to **reduce development costs** and accelerate **time-to-market**, without the need to redesign the machines' original mechanical architecture.

Hardware and sensors

The **control unit** is designed to meet rugged specifications for industrial and off-road environments and integrates the following sensing components:

- **IMU Sensor**
- **GNSS Receiver:** RTK GNSS system (single or dual antenna) for high-precision absolute positioning and heading determination in open-field environments.
- **LiDAR**: Multi-layer 3D LiDAR sensor for environmental perception, 3D mapping, and navigation in complex environments.
- [ON REQUEST] **Computer Vision**: Intelligent 3D camera for driving assistance, obstacle detection/ classification, and collision avoidance.

Software

The **innesto** software is built on a container-based architecture, with layered parameter management to simplify vehicle-specific calibration for each customer or vehicle type.

Its modular approach ensures **full control** and maximum flexibility when modifying, customizing, and fine-tuning the system for new vehicles, while streamlining and accelerating software update deployment.

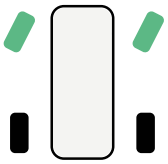
User interface and remote control

System interaction and vehicle monitoring are managed through:

- **Web UI**: Browser-based interface accessible from any device. A white-label solution that can be customized in terms of operational functionalities and branding.
- **Real-time telemetry**: Live monitoring of vehicle operating status, navigation performance, and sensor health.
- **Diagnostics and maintenance:** Built-in remote support capabilities for off-site data analysis, remote assistance, and fast, targeted technical interventions without the need for on-site visits.

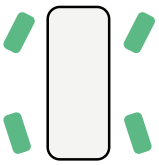
Supported vehicle configurations

innesto is designed to interface natively with a wide range of drive-by-wire vehicles, directly supporting the following vehicle kinematics:



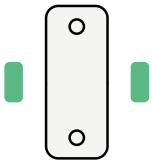
Ackermann steering

Standard steering configuration with one fixed axle and one steerable axle.



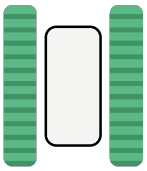
Four-wheel steering

High-maneuverability configuration in which both axles are steerable.



Differential drive

Standard two-wheel differential drive configuration.



Skid-steer / tracked drive

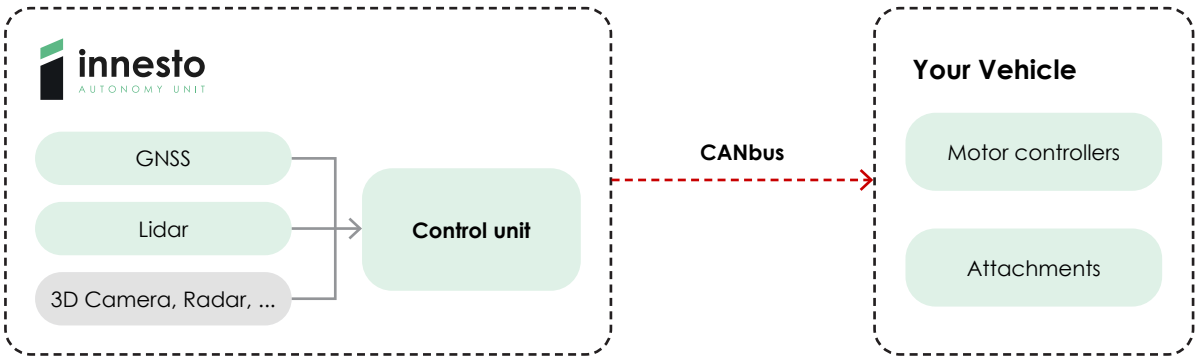
Vehicles operating on continuous tracks or equipped with 4–6 non-steerable wheels.

Technical data

Enclosure / Mounting	Flanged aluminum enclosure
Enclosure dimensions	217 × 253 × 93 mm
Enclosure weight	Approx. 2.75 kg
Wired interfaces	CAN bus, Ethernet, RS232
Wireless connectivity	4G, Wi-Fi, Bluetooth
Ingress protection rating	IP65
Operating temperature	−25°C to +60°C
Power supply	12–36 V DC
Power consumption	25 W max.

The unit supports flexible installation in any orientation. For optimal operation, it is recommended that one face be parallel to the ground and, where possible, perpendicular to the direction of travel. innesto is developed in strict accordance with major European and international industrial and safety standards.

Logical system architecture



Implementation roadmap

The integration of **innesto** follows a parallel engineering workflow, combining functional and safety analysis with vehicle hardware setup, designed to deliver tangible, measurable results within short development timeframes.

Project prerequisite: the innesto implementation process requires the involvement of a specialized partner to ensure compliance with the applicable Machinery Directive/Regulation. Manufacturers may work with their trusted consultants or rely on the network of experts recommended by aitronik.

01

Initial assessment and requirements analysis

- Verify the host vehicle's drive-by-wire compatibility.
- Where drive-by-wire capabilities are not available, identify the modifications required to enable electronic control of the relevant vehicle functions.
- Define the required functionalities and perform a preliminary assessment of safety requirements.
- Evaluate and select the necessary sensors.

02

Electronic system preparation

- Assess the vehicle's onboard electronic control unit (ECU).
- If the ECU cannot handle automatic control inputs alongside manual commands, modify or integrate the system accordingly.
- Select, define, and implement the most suitable communication protocol.

03

Safety architecture

Perform a detailed assessment of the safety architecture and implement the required safety control logic.

04

Setup, development and fine-tuning

- Install and configure the onboard hardware.
- Implement the required operational functionalities within innesto and progressively refine system performance.

05

System integration and final validation

- Complete the integration of all system components.
- Perform smoke tests to verify basic system integration and functionality.
- Conduct field tests to validate operational performance, navigation robustness, and active safety.

06

Final milestone: first operational machine

TECHNICAL & SALES SUPPORT

Have questions or want to learn more?

Whether you're exploring our solutions, considering a partnership, or looking to understand how aitronik can help you achieve your goals, our team is here to support you.

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