Air-Rops®

AR-Quad Rollover Protection System

ES MANUAL DE USUARIO Y MANTENIMIENTO
EN USER AND MAINTENANCE MANUAL
FR GUIDE D'UTILISATION ET D'ENTRETIEN
IT MANUALE INFORMATIVO DI USO E MANUTENCIONE
DE GEBRAUCHS UND WARTUNGSANWEISUNG

AT-T0063-01 ENGLISH

1 AR-Quad® - INFORMATION MANUAL FOR OPERATION AND MAINTENANCE

All information contained in this publication is based on the latest product information at the time of publication. Due to continuous improvements in the design and production quality of components, some minor discrepancies may arise between the actual AR-Quad system and the information presented in this publication. The representations and/or procedures in this publication are intended for reference purposes only. No liability can be accepted for omissions or inaccuracies. Any reproduction or re-use of the representations and/or procedures contained, either in whole or in part, is forbidden.
The original instructions for this AR-Quad system are in Spanish. Other languages are provided as translations of the original instructions.

1.1 Introductory notes

Thank you for choosing AR-Quad®!
Your advice and some prestigious national and international collaboration, together with the most advanced technologies available and the rigorous tests carried out during the development phase, have made it possible to create a product designed to offer safety, comfort and performance at the highest levels.

WARNINGS
Before using the AR-Quad®, please read this operation and maintenance manual carefully and make sure you have understood its contents. If you have any questions or problems concerning the use of the AR-Quad®, please contact Air Rops NA 2012 S.L. or your nearest Authorized Service Center. Keep this manual in a safe place for future reference. Air Rops NA 2012 S.L. reserves the right to make changes at any time and without prior notice to improve this manual, structural parts, electronic parts, and/or management control software of the AR-Quad® system.

WARNINGS
The AR-Quad® system you have just purchased (hereinafter referred to as "System" and/or "AR-Quad®") consists of two subunits; Electronic Control Unit (ECU) and the roll-over protection structure (AR-Quad® structure).

The installation of the AR-Quad® system MUST be performed by an Authorized Technical Service ONLY. Do not modify, cancel, or remove any of the peripherals installed on the machine. For any incident, problem or suggestion related to the AR-Quad® system, do not hesitate to contact our Authorized Technical Service. To locate the nearest technical service or to contact AR-Quad® directly, please send an e-mail to info@air-rops.es. For questions regarding technical support or the AR-Quad® warranty, please contact www.air-rops.es.

1.2 Authorized Technical Services

This section describes the conditions to be fulfilled by the Authorized Technical Services of the AR-Quad® system

The AR-Quad® system may be installed by machinery, equipment and components workshops as the only service providers capable of maintaining and repairing them. For this purpose, there is a specific document with the minimum requirements to be met by the Authorized Technical Services.

2 INDEX

3 DEFINITIONS

For the purposes of this manual and the AR-Quad® system, the following definitions are considered:

1. Machine: The term machine in this manual covers any quad or quad with independent suspension on both axles, fitted with low pressure tyres, straddled by a handlebar for steering control and for utility use only, such as agricultural and livestock equipment, maintenance of green areas or for non-sporting recreational and not off-road.
2. Off-road: Off-road driving activity on steep terrain with obstacles and steep slopes or any driving outside of the usual range considered normal.
3. Protection area: It's the surface of the expanded AR-Quad structure.
4. Safety Zone: Space surrounding the driving position within which injuries to the operator are minimised in the event of a rollover.
5. Maintenance of green areas: Machines used in the transport, care and maintenance of predominantly herbaceous sports facilities, including golf courses, sports fields, meadows and gardens.
6. Authorized Technical Service: Manufacturer's representative authorized by the manufacturer to install and maintain the AR-Quad® system.
7. Operator: Driver or any other person related to the use or maintenance of the machine.

4 SAFETY RECOMMENDATIONS AND INSTRUCTIONS

The following are general recommendations on the use of the system and safety instructions.

1. **IMPORTANT: The "Important Messages", are those that carry the symbol of ⚠ and appear in this manual indicating instructions or procedures related to safety and particularly significant for the correct operation of the AR-Quad® device, and must therefore be followed as faithfully as possible and in a mandatory manner. Failure to implement them violates the preventive and safety instructions and puts the operator and poeple in his environment at risk of serious or fatal injury.**
    a. ⚠ **Read this manual before using this product. Failure to follow the instructions and safety precautions in this manual may result in serious injury or death.**

b. ⚠ Read and observe carefully all warning or important messages in this manual.

c. ⚠ Read all symbols/pictograms that have a relevant meaning in order to use the product with maximum safety.

d. ⚠ Carefully follow the procedure for transport, assembly and maintenance

2. ⚠ WARNING: The AR-Quad® is a smart device intended for use in machines. It consists of two units: a subsystem called "Electronic Control Unit" or "Control System" (hereinafter "ECU") and a subsystem called "Automatic Rollover Protection Structure" (hereinafter "AR-Quad structure or structure"). Both subsystems have to be installed in the machine by an Authorized Technical Service. The ECU is capable of identifying the machine's tipping condition and transmitting the activation signal to the inflator built into the AR-Quad structure.
3. ⚠ WARNING: The machine operator must recognize that the AR-Quad® is a safety system.
4. ⚠ WARNING: All the mandates and orders of this manual in any of the sections must be followed scrupulously, because this implies a safe use of the machine. The entire manual is directed to the correct use of the system for the sole purpose of ensuring proper operation during normal use of the machine and during the tipping / rollover condition.
5. ⚠ WARNING: If adequate personal protective equipment is not available in conjunction with an unfolded ROPS and seat belt, the tipping of a machine can result in personal injury or death. AR-Quad® has been designed to offer comfort and an optimal level of protection, but no product can offer complete protection if not used properly. Every operator must be trained and familiar with the activity or task he performs and must be aware of his capabilities and the limits inherent in the same activity and the machine he uses, knowing its potential risks. Air-ROPS NA 2012 S.L. declines all responsibility in the event of material damage or personal injury resulting from incorrect use of the product.
6. ⚠ WARNING: This manual contains the instructions for the operation and maintenance of the AR-Quad® system, and within these instructions, those concerning preventive and protective safety are highlighted.

7. ⚠ WARNING: This manual includes mandatory warning or importance messages for the maintainer and the user.
8. ⚠ WARNING: The AR-Quad® is intended to achieve the highest level of safety, meeting the essential health and safety requirements, but more so as it is a safety structure activated by a pyrotechnic inflator whose released energy causes a violent reaction during the expansion of the safety structure
9. ⚠ WARNING: The operator must comply with the safety conditions imposed by the manufacturer in this manual
10. ⚠ WARNING: When driving any machine, the operator must wear personal protective equipment appropriate to the activity or task to be performed and the machine to be driven, such as: appropriate clothing to the station, protective gloves and shoes, gaiters, helmet and any other element that may prevent or reduce injuries in case of overturning
11. ⚠ WARNING: Try to stay within the safety zone generated by the AR-Quad® structure. In the event of a rollover, the operator must bend down towards the handlebars and hold on tightly to stay in the safety zone.
12. ⚠ WARNING: In the event of a semi-overturn caused by an obstacle or a bump in the road, the operator must turn off the contact or disable the system by means of the switch provided for this purpose before leaving the machine. Switching off the contact prevents the AR-Quad® from being activated if the machine should accidentally tip over during handling, with the operator being outside the safety zone.
13. ⚠ WARNING: If during the driving the AR-Quad structure collides against solid and resistant elements, resulting in marks or dents, the system must be checked in an Authorized Technical Service to rule out any anomaly.
14. ⚠ WARNING: As it is a safety element that is mounted on machines with a prolonged exposure to working conditions, the risk of collisions and impact exists, so in case the operator identifies the smallest detail (either a blow, dent, misalignment...), he must take the AR-Quad® to an Authorized Technical Service
15. ⚠ WARNING: Avoid rollover risk situations by being attentive to the warning signals emitted by the ECU through the optical and acoustic interfaces.

16. ⚠ WARNING: Keep AR-Quad® system away from heat sources. Only use the AR-Quad® at temperatures between -15° and 70° Celsius. Exposure of the System to extreme temperatures may compromise its operation.
17. ⚠ WARNING: Proper maintenance is essential for the proper functioning of the system. For more information, see the paragraph on maintenance.
18. ⚠ WARNING: Do not modify the AR-Quad® or any of its components in any way. Any modification may compromise the functionality of the AR-Quad® and consequently its roll-over protection function, its warning function and its function to inhibit unwanted activation.
19. ⚠ WARNING: Do not connect any external electrical equipment or battery to the existing wiring. Modification of components of the AR-Quad® is permitted only to Authorized Technicians.
20. ⚠ WARNING: The functionality of the AR-Quad® should be carefully checked before each use according to the instructions in this manual. In the event of an error condition or other indication of system malfunction, contact your nearest Authorized Service Center.
21. ⚠ WARNING: The AR-Quad® and the machine on which it is installed must be kept out of the reach of children, to avoid any possible personal risk.
22. ⚠ WARNING: If you see any signs of malfunction, turn off the ignition, and contact your nearest Authorized Service Center.
23. ⚠ WARNING: In case of activation, the possibility of reassembling the AR-Quad structure must be evaluated, so it must be taken to an Authorized Technical Service. Until then the structure will remain in its deployed position.
24. ⚠ WARNING: Never add decorations, ribbons, patches or any other element on the AR-Quad structure. Without the authorization of air-ROPS.
25. ⚠ WARNING: Never jump out of the seat or extend arms and legs as these actions carry a serious risk associated with rolling over.

26. ⚠ WARNING: Never attach anything to the AR-Quad® structure without the consent of air-ROPS. If, due to working circumstances, the machine has to be towed with the help of another auxiliary machine, it is forbidden to attach any type of sling, chain, cable or other element to the AR-Quad® structure.
27. ⚠ WARNING: Never place any type of load or object on the upper pillar of the AR-Quad® structure. In case of overturning, this weight could be thrown off, impacting the operator, passer-by or animal, with possible fatal consequences. These considerations must be taken into account both with the machine running and when it is not running.
28. ⚠ WARNING: Never use the AR-Quad® for any purpose other than passive rollover protection.
29. ⚠ WARNING: Never sit near, lean on or even stand on the AR-Quad® structure. The AR-Quad® only protects the safety zone occupied by the machine operator, so that anyone outside these defined places will be at risk in the event of a rollover.
30. ⚠ WARNING: The AR-Quad is designed for use by one person only. Never carry any passenger supported and less incorporated in the AR-Quad® structure.
31. ⚠ WARNING: Never force the operation of the AR-Quad®. It can create risky situations for the operator and bystanders.
32. ⚠ WARNING: Never expose the AR-Quad® elements to fire, sparks, flames or other types of extreme heat.
33. ⚠ WARNING: Never expose the AR-Quad® elements to electrostatic discharges, including welding operations. Welding operations on the AR-Quad structure is forbidden.
34. ⚠ WARNING: Exposure of the AR-Quad® elements to sources of electromagnetic radiation should be avoided.
35. ⚠ WARNING: Never take advantage of the AR-Quad®'s protection, to make a risky driving, forcing the risk of overturning.
36. ⚠ WARNING: Make sure that the warning labels are perfectly legible. They should be replaced if they are damaged or lost.

37. ⚠ **WARNING: Update safety mandates and maintenance tips every six months through the AR-Quad website (AR-Quad Manual).**

4.1 Warning pictograms

This section describes the safety warning pictograms placed on the structure.

Turn off the engine and remove the key before carrying out any maintenance or repairs	It is mandatory to read the user's manual before operating the AR-Quad	Prohibition to hook or anchor any element to the AR-Quad® structure	No external forces or loads on the AR-Quad® structure	It is forbidden to subject the elements of the AR-Quad® to electrostatic discharges	No welding work on the AR-Quad® structure	No passengers allowed. Never support or incorporate into the AR-Quad® structure	It is forbidden to expose the elements of the AR-Quad® to fire, sparks, flames or other types of extreme heat	It is forbidden to expose the elements of the AR-Quad® to sources of electromagnetic radiation

The warning pictograms are placed on one of the vertical uprights of the AR-Quad structure

WARNING Keep the pictograms clean. Remove dirt with a clean, damp cloth when necessary. Replace pictograms if they are destroyed, missing, painted or illegible.

5 PURPOSE AND INTENDED USE OF AR-Quad®

The AR-Quad® system is designed to protect the driver of the machine from low speed rollovers. The AR-Quad system is not designed to protect against rollover due to tripped and sliding rollovers as well as rollovers due to medium and high speeds.
The AR-Quad system offers effective protection when using the machine in these conditions and on rough terrain with poor ground visibility, slippery or poorly compacted, as well as when operating the machine on slopes.

5.1 Intended use of the machine equipped with the AR-Quad system

. The use of the AR-Quad is authorized for use on machines with the following characteristics:

1. Use only on machines with an independently suspended rear axle
2. Exclusive use on utility type machines: agricultural, grazing, travel, maintenance and excursions
3. Exclusive use of a driver without passengers
4. Exclusive use with approved safety helmet
5. Speeds below 40 km/h
6. Maximum weight of the machine 500 kg

⚠ WARNING: Do not use the AR-Quad® for purposes other than those specified in the "Safety Recommendations and Instructions" section.

⚠ WARNING: The system is designed to provide effective protection during low-speed static or semi-static rollovers. The use of the machine at speeds above 40 km/h does not guarantee the correct functioning of the system and its roll-over protection function.

⚠ WARNING: Do not use the AR-Quad® for trial use, jumps, pirouettes

⚠ WARNING: Do not use the AR-Quad® with additional passengers to the driver

⚠ WARNING: Do not use the AR-Quad® with persons who are in close proximity to the machine

⚠ WARNING: The AR-Quad® must be used with an approved safety helmet

⚠ WARNING: Do not use the AR-Quad® for racing and competition

⚠ WARNING: Maximum speed for protection shall not exceed 40 km/h.

⚠ WARNING: The AR-Quad® should never be used in a recreational and competition-type machine

5.2 Protection provided by the AR-Quad® System

The AR-Quad® is an automatic protection structure, i.e. it is activated in the event of a rollover without the need for the operator to intervene in its activation, and provides the machine operator with protection against lateral and longitudinal rollover. During a lateral rollover, the system has been designed to avoid, in situations of intended use, a machine rotation greater than 90°. The AR-Quad® automatically expands bi-directionally "vertically and horizontally" when an irreversible rollover situation of the machine is detected. At this point, a supplementary protection area is generated, minimizing injuries to the driver due to crushing or asphyxiation. In addition, the system prevents the machine from rolling over, thus reducing the material damage caused during a rollover.
The AR-Quad® structure is a metal structure that forms a tubular base arch, which incorporates a pyrotechnic inflator, and an ECU that manages the system's functions. Functions include the deployment of the structure when the activating conditions are achieved as well as alerting the driver of dangerous situations and system status. For this purpose, the ECU manages optical and acoustic warning devices to alert and warn the driver of dangerous situations or system malfunctions.
AR-Quad® is a passive protection system, that is, it acts to minimize or prevent injuries in the event of rollover, not to prevent it. The acoustic and luminous indicators offer active protection as they alert the driver to the potential proximity of an irreversible rollover.
It is possible to rearm the system after a rollover. To do so, you must contact an Authorized Technical Service.

5.3 AR-Quad® System Features

The AR-Quad® is a crush protection system with a pyrotechnic activation device. Legally the system is considered as a "machine" under the application of the European Directive 2006/42/EC on the placing of machinery on the market and Directive 2013/29/EC on the placing of pyrotechnic articles on the market (pyrotechnic article for vehicles).
Air-ROPS has issued the EC Certificate of Conformity after the AR-Quad® system has passed the "EC Type Examinations" by the Notified Bodies that have certified that the AR-Quad® system meets the provisions of both directives.

5.3.1 Directive 2006/42/EC

EC type-examination has been issued by the notified body AENOR (NB 0099) according to file A13/0099DL0509.
To verify the performance of the AR-Quad® system in accordance with Directive 2006/42/EC, please refer to the table below:

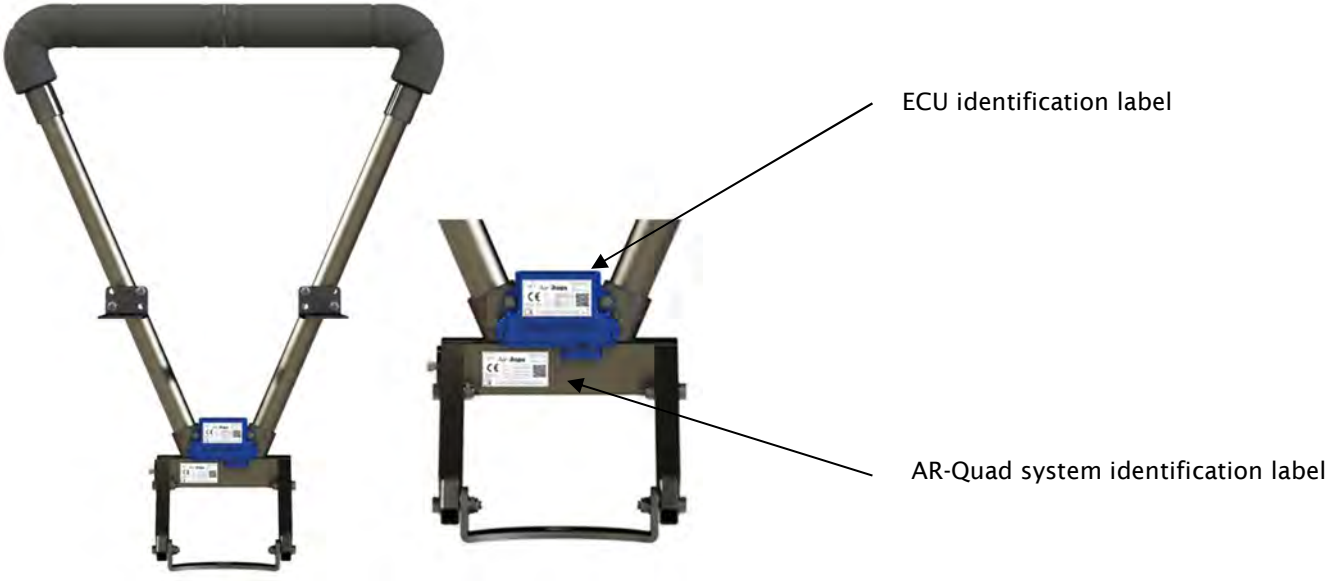
Description	Standard	Result
ECU Functional Safety Requirement	EN-ISO 25119:2018 - Tractors and machinery for agriculture and forestry Safety-related parts of the control system	AgPLr = C, compliant.
Climate and environmental testing of the ECU	ISO 15003:2006 - Agricultural engineering — Electrical and electronic equipment — Testing resistance to environmental conditions	Machine type: MA/MD Location: LF
Evaluation of the activation condition and deployment time	Evaluation and deployment of automatic roll-over protection structures	Deployment time: <250 ms
Evaluation of the corrosion and salt spray resistance of the AR-Quad® structure	ISO 9227:2007 - Corrosion tests in artificial atmospheres -- Salt spray tests	1000 h. SST. Deployment time <250ms after corrosion test
Functional, climatic and environmental requirements of the pyrotechnic inflator	SAE/USCAR24-2 AK-LV 15	Compliant
Static resistance AR-Quad® structure	EN-ISO 3471	M=500kg. Compliant

5.3.2 Directive 2013/29/EC

The EC type-examination has been issued by the notified body INERIS (NB 0080) according to file 0080P1170012.
To verify the performance of the AR-Quad® system according to the 2013/29/EC directive, according to the table below:

Description	Standard	Result
Fire test	IN 14451-2 / 4.6	No projections. Compliant
Activation function test	IN 14451-2 / 4.9	No projections. Compliant

5.4 Location of the identification labels



5.5 Instructions for understanding the AR-Quad® System identification labels

Marking of the AR-Quad® structure and Electronic Control Unit provided in accordance to Directive 2006/42/EC and Directive 2013/29/EC.

AR-Quad® Structure Identification Label

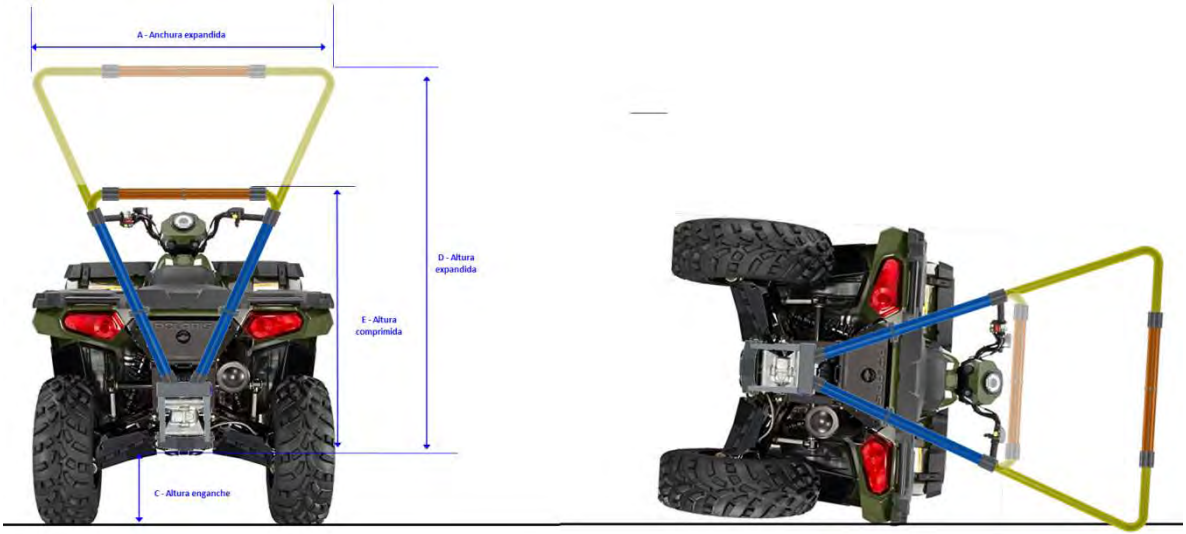
ECU Identification Label

Symbol	Description
Air-Rops	Manufacturer's Name, Brand and Address
Ref	AR-Quad system reference / electronic control unit
Model	Air-ROPS system model
Made in	Country of manufacture of the system
Batch no.	Manufacturing batch
A13/0099DL0509	Directive 2006/42/EC compliance registration number
0080P1170012	Registration number in accordance with directive 2013/23/EC
8727040821	Certificate number of the system for the UK market
	Symbol reminding of the need to read the Installation and Operating Instructions accompanying the system
UK CA	UK mark certifying the conformity of the system with the UK market regulations

CE	CE mark certifying the conformity of the system with the directives 2006/42/EC and 2013/29/EC

5.6 AR-Quad® System Protection Area

The protection area of the expanded AR-Quad® structure is that which will prevent, depending on the speed of the machine and the conditions of the terrain, the machine from overturning an angle greater than 90º.



5.7 AR-Quad® System Usage, Integrity and Efficiency

The functions for which the AR-Quad® has been designed will be performed correctly only when the AR-Quad® structure and the Electronic Control Unit are correctly installed by the Authorized Technical Services and when the AR-Quad® system is operated and maintained in accordance with this user manual.

⚠ WARNING: If the system is activated, the AR-Quad® structure must be rearmed or replaced. To do so, the user must contact Air-ROPS' Authorized Technical Service.

⚠ WARNING: The function of the AR-Quad® is to reduce the risk of injury by providing a safety zone in the event of a rollover accident. However, it should be noted that the AR-Quad® system cannot protect against twisting, bending or extreme movements. NO ROLLOVER PROTECTION SYSTEM CAN PROTECT YOU FROM ALL POSSIBLE ACCIDENT IMPACTS AND THEREFORE ENSURE TOTAL PROTECTION AGAINST INJURY.

5.7.1 Maximum mass, mass repartition and towing capacity

The maximum mass of the machine in which the AR-Quad is installed cannot exceed 500 kg. Including auxiliary equipment and attachments installed on the machine.
The mass of the AR-Quad equipment is supported by the rear axle; therefore, the load capacity of this axle is reduced by 18 Kg. This mass of 18 kg must be reduced from the maximum allowable mass indicated by the manufacturer of the machine for the rear axle or rear rack.
The towing capacity of the machine is not affected.

5.8 Information on the materials used

It is hereby certified that the construction materials are suitable, non-toxic and non-harmful products as provided for in Regulation (EC) 1907/2006 (R.E.A.C.H) - Annex XVII. It should be noted that these materials are free from azo dyes which, by cleavage of one or more azo groups, may release dangerous aromatic amines, in accordance with the instructions of Regulation (EC) 1907/2006 (R.E.A.C.H.) - Annex XVII. In addition, articles placed on the market do not contain any substances of very high concern (SVHC), identified in accordance with Article 59 and indicated in the "Candidate List" published by ECHA (European Chemical Agency), in concentrations higher than 0.1% weight by weight. The gases contained in the inflator are the same as those used in airbags, directly in contact with people.

5.9 AR-Quad® System Lifetime

The life of the protection system will depend on the care that the user takes in its conservation and maintenance.
Every year ask the AR-Quad Authorized Technical Service for a maintenance control and possible revision of the components susceptible to deterioration.

WARNING: Before using the machine, check the integrity of the AR-Quad® system to identify wear, breakage and/or damage. In case of doubt, please contact your nearest Authorized Service Center.

WARNING: The service life of the AR-Quad® System is 15 years from the date shown on the nameplate label. Once the 15 years have passed, the correct functioning of the same cannot be guaranteed. To guarantee operation beyond the service life of the system, it must be replaced.

6 DESCRIPTION OF THE AR-Quad SYSTEM

6.1 Notes

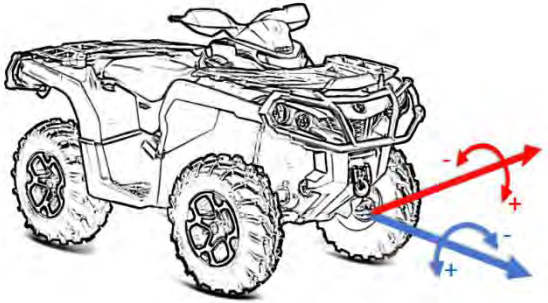
WARNING: The AR-Quad® is a safety system for machines intended for off-road use and whose protection is effective in semi-static rollovers and speeds below 40 km/h. At higher speeds and in the event of a violent overturn, no rollover protective system can guarantee the absence of injury

It consists of two different units: "Electronic Control Unit" and "AR-Quad® structure". The first is a set of sensors, interfaces and electronic components that perform the function of monitoring the inertial state of the machine, alerting the driver of system errors and malfunctions and activating the inflator that expands the AR-Quad® structure.
The AR-Quad® structure. Together with the built-in inflator and locking mechanism, serves to protect the driver from being crushed and asphyxiated in the event of a rollover.

6.2 Operation and Activation of the AR-Quad® System

The AR-Quad® acts when an irreversible rollover is detected. It is a fully automatic system, independent of the will of the operator, with the aim of minimizing personal and material damage caused by rollovers. The Electronic Control Unit (ECU) detects the irreversible tipping condition and activates the gas generator which expands the tubular structure to the extended and locked position.
The ECU is equipped with inertial sensors that analyze the dynamics of the machine in real time. The system algorithms process the information provided by the sensors and determine whether the activation conditions are achieved. The algorithms monitor the dynamics on the two longitudinal, transversal and vertical axes.
Every machine, from a certain angle to the horizontal, enters a phase of unstable equilibrium and, once the point of no return is reached, the machine overturns. This angle from which the machine tilts can vary depending on the position of the center of gravity, track width and wheelbase. The dynamics can also affect the speed of the machine's rotation around its axes.
When the activation condition in the ECU (trigger condition) is achieved, a signal (electrical impulse) is sent to the gas inflator. This signal will cause the activation and release of the high-pressure gas inside the AR-Quad® structure. After the

activation, and in a time below 150 ms, the gases released cause the structure to expand and lock (after reaching its maximum opening position), preventing the machine from rolling, respecting a safety zone and preventing or reducing the serious or fatal injuries that potentially occur as a result of the rollover.

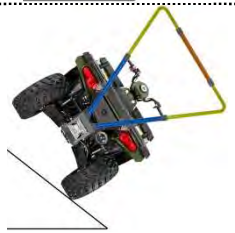


The AR-Quad system activates in lateral and longitudinal rollovers

Lateral +: Lateral rollover to the right
Lateral -: Lateral rollover to the left
Longitudinal +: Longitudinal rollover to the front
Longitudinal -: Longitudinal rollover to the rear

The following sequence serves as example of the activation of the AR-Quad® during a lateral roll.

Sequence	Weather	Approximate angle of inclination	Description
	t + 0.020s	α + 0.18°	Tilt angle monitoring by the ECU's internal sensors This is the time it takes for the sensors to transform the inertial movement into an electrical impulse.

	t + 0.025s	α + 0.9°	Evaluation of the tipping condition The signal from the internal and external sensors is processed by the ECU which determines if the conditions for activating the inflator are met. If the conditions stipulated in the algorithm are met, the ECU sends an activation signal to the inflator
	t + 0.030s	α + 1.2°	The gas inflator is activated The gas pump is activated by the electric current supplied by the ECU. The ignitor activates the pyrotechnic charge to release the gas at high pressure inside the structure
	t + 0.055s	α + 3°	The gas is completely released The inflator has released all the gas inside the structure
	t + 0.250s	α + 18°	The structure is fully deployed and locked. The pressure generated inside the structure causes a reaction in the moving parts that makes it expand vertically and horizontally until it reaches the interlocking position. The interlocking system locks the moving part.

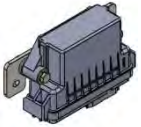
6.3 AR-Quad® ® System Components

The AR-Quad® system consists of 2 subsystems:

- AR-Quad® Structure
- Electronic Control Unit (ECU)

The location of each of the elements is shown below for reference

(a) AR-Quad® Structure



(b) ECU (integrated into structure)

(c) System disconnection, Muting switch*

(d) Optical interface

(e) Acoustic interface

* The system disconnection switch and the acoustic and optical interfaces are installed on the console and/or handlebar of the machine.

6.3.1 AR-Quad® Structure

6.3.1.1 Components

The AR-Quad® structure consists of 3 main elements

- Expandable structure
- Gas generator
- Locking mechanism

6.3.1.2 Expandable structure

The expandable structure is responsible for providing the structural resistance during tipping, housing and protecting the inflator and the interlock mechanism.

6.3.1.3 Inflator

The inflator is the device that stores energy in the form of compressed gas and allows it to be released with the electrical signal supplied by the ECU. Unlike the gas generated by chemical reactions, the inflators store inert gas at very high pressure and release it through a pyrotechnic igniter.

WARNING: The inflator is strategically installed inside the structure. For your safety, it's manipulation is prohibited. Any tampering with the inflator may compromise the proper functioning of the system and the safety of the driver and his environment.

6.3.1.4 Locking mechanism

The locking mechanism enables the structure to remain locked in its deployed position. It is an automatic mechanical system of extreme simplicity, which results in great reliability. Another advantage of the locking mechanism is that it is protected from external aggressions because it is located inside the expandable structure.

6.3.2 Electronic Control Unit (ECU)

6.3.2.1 Central unit

The central unit manages the system's safety functions related to monitoring, activation and warning: Acquisition, processing and analysis of sensor data and, if necessary, the generation of the inflator activation signal. Additionally, it manages the user interface through the system input elements (power and switch) and the outputs or user alerts (optical and acoustic interface of the AR-Quad® System status).
The ECU has been developed and validated in compliance with the ISO25119:2018 standard on functional safety of safety-related electronic control systems.

⚠ WARNING: The central unit is strategically installed to detect the angle of inclination of the machine. For your safety, do not manipulate or change its position. Any tampering with the central unit may compromise the proper functioning of the system and the safety of the driver and his environment.

6.3.2.2 Manual muting switch (user interlock)

To avoid unwanted deployment of the structure during maintenance operations and particular situations where a person may be in the vicinity of the system, a switch has been installed by which the protection function of the AR-Quad system can be overridden.

⚠ WARNING: The manual muting switch must be activated when the use of the machine differs from the intended use specified in section 5.1 or when maneuvering or operating with people in the vicinity of the machine.

When the AR-Quad system is turned off via the manual muting switch, the AR-Quad® will not function and the ECU will alert the operator optically and acoustically via the external interfaces.

6.3.2.3 Acoustic interface

It consists of a small buzzer to emit acoustic warnings. The duration and the number of beeps allow to differentiate the type of alert or the error code identified by the ECU.
The acoustic interface allows the operator to be alerted to a system malfunction due to an internal error diagnosed by the ECU.

The ECU also alerts the operator if the angle of inclination of the machine becomes dangerous. In this case the acoustic interface will also alert the operator to this condition so that he can return to a safe working condition.
When the manual muting switch is activated, the system will warn the operator with acoustic warnings.

6.3.2.4 Optical Interface

It consists of LED diode with 3 possible colors: red, yellow or green.
The optical interface allows the AR-Quad® system to alert the operator of a system malfunction due to internal errors.
The ECU also alerts the operator if the angle of inclination of the machine becomes dangerous. In this case the optical interface will also alert the operator to this condition so that he can return to a safe working condition.
When the manual muting switch is activated, the system will warn the operator with optical warnings.

6.3.3 External Peripheral Connector

The pairing between the Electronic Control Unit and the rest of the elements of the system is provided by the means of a watertight connector. This connector allows the connection of the input and output peripherals necessary for the proper functioning of the system.

Main connector

Main connector and external peripherals

6.3.3.1 Power connection

The power connection consists of 2 poles, one for ground and one for voltage. These are connected to the machine's main battery with activation via the ignition key.

6.3.3.2 Optical warning connection

The optical warning connection consists of 3 poles connected to the LED on the control panel.

6.3.3.3 Acoustic warning connection

The acoustic warning connection consists of 2 poles that are connected to the buzzer installed on the machine.

6.3.3.4 Manual disconnect switch connection

The manual disconnect switch connection consists of 2 poles connected to the handlebar switch.

6.3.3.5 Inflator connection

The inflator connector allows the connection of the ECU with the pyrotechnic inflator.

6.3.4 Notes

WARNING: The installation of the AR-Quad® Electronic Control Unit, user interfaces and AR-Quad® system structure MUST be performed by an Authorized Technical Service ONLY. Do not modify or remove any of the peripherals installed on the machine. The ECU will detect if any of the peripherals has been tempered alerting of a system error. If necessary, contact AR-Quad® Authorized Technical Service.

6.4 AR-Quad® System On/Off

The system is switched on and off using the machine ignition switch. When the ignition is activated, the AR-Quad® system will be activated.
Alternatively, the deployment function can be deactivated using the manual muting switch.

7 OPERATION OF THE ELECTRONIC CONTROL UNIT (ECU)

7.1 Notes

The ECU not only informs about the correct operation and pairing of the AR-Quad® system, but also serves to alert and communicate to the user a series of useful information.
The ECU uses the external interfaces to communicate the system status and operating alarms to the operator.
The natural state of the AR-Quad® system working properly is:

- Optical interface: Continuous green color
- Acoustic interface: Off

When a dangerous tilt threshold is reached the system status is:

- Optical interface: Continuous yellow color
- Acoustic interface: Continuous beep

Returning to the natural state when the alert threshold is abandoned.
The operating logic, information, and warning /error codes are described in the following sections.

WARNING: The AR-Quad® system's electronic control unit is equipped with inertial sensors that process the machine's movement and position. Their orientation and position is of vital importance for the proper functioning of the system. Under no circumstances should the position of the electronic unit be modified or altered. Modification of this could lead to safety risks with serious consequences.

7.2 Operating Logic – System States

The ECU monitors the status of the system (internal and external diagnostics), the inertial state of the machine alerting the operator to dangerous situations and activates the inflator in situations of irreversible tipping and warns the operator of operating errors through acoustic and optical alerts.
Once the startup phase has been successfully completed, the ECU constantly checks the manual switch connection, data consistency, internal diagnostics, and the connectivity of the operator and inflator interfaces, thus alerting the operator (via the optical and acoustic interfaces) to any detected faults.

7.2.1 Start-up (EQ0)

When the ignition is turned on, the ECU enters the EQ0 startup state where it performs the start-up system diagnosis. Among others:

- Internal diagnostics
  - correct operation of the sensors, microcontroller and pyrotechnic driver
  - consistency in processed data, starting angle, etc.
- External diagnostics:
  - connection of the operator interfaces: buzzer and led
  - correct connection of the gas generator

During this phase the system will beep to ensure that the buzzer is working properly and the led will light up consecutively to confirm its correct operation.

7.2.2 Standby (EQ1)

If the manual disconnection switch is activated, the system is disabled and the ECU will enter the EQ1 standby state alerting the operator with alternating beeps and flashing the yellow LED.
This manual disconnection switch is intended to be used during maintenance operations of the machine or when the operation of the machine is performed near bystanders.

WARNING: When the manual disconnection switch is active, the roll-over protection safety function will be disabled. The ECU will not activate the inflator even if the activation condition is reached.

7.2.3 Operation (EQ2)

When the manual disconnection switch is deactivated and no internal system errors are detected, the ECU enters the normal operating state, EQ2. In this state the buzzer is off and the led remains on green.

7.2.4 Alert (EQ3)

When a tipping hazard situation is detected, the system will enter the EQ3 alert state. In this state the buzzer beeps with increasing frequency according to the level of risk. During the alert state, the LED will remain yellow and blinking. If the risk situation disappears, the system returns to EQ2 status.

7.2.5 Activation (EQ4)

If the risk situation does not decrease and the irreversible rollover condition is achieved, the ECU will enter the EQ4 activation status. In this state the inflator is activated and the structure is deployed. The buzzer remains activated and the led active in red color.

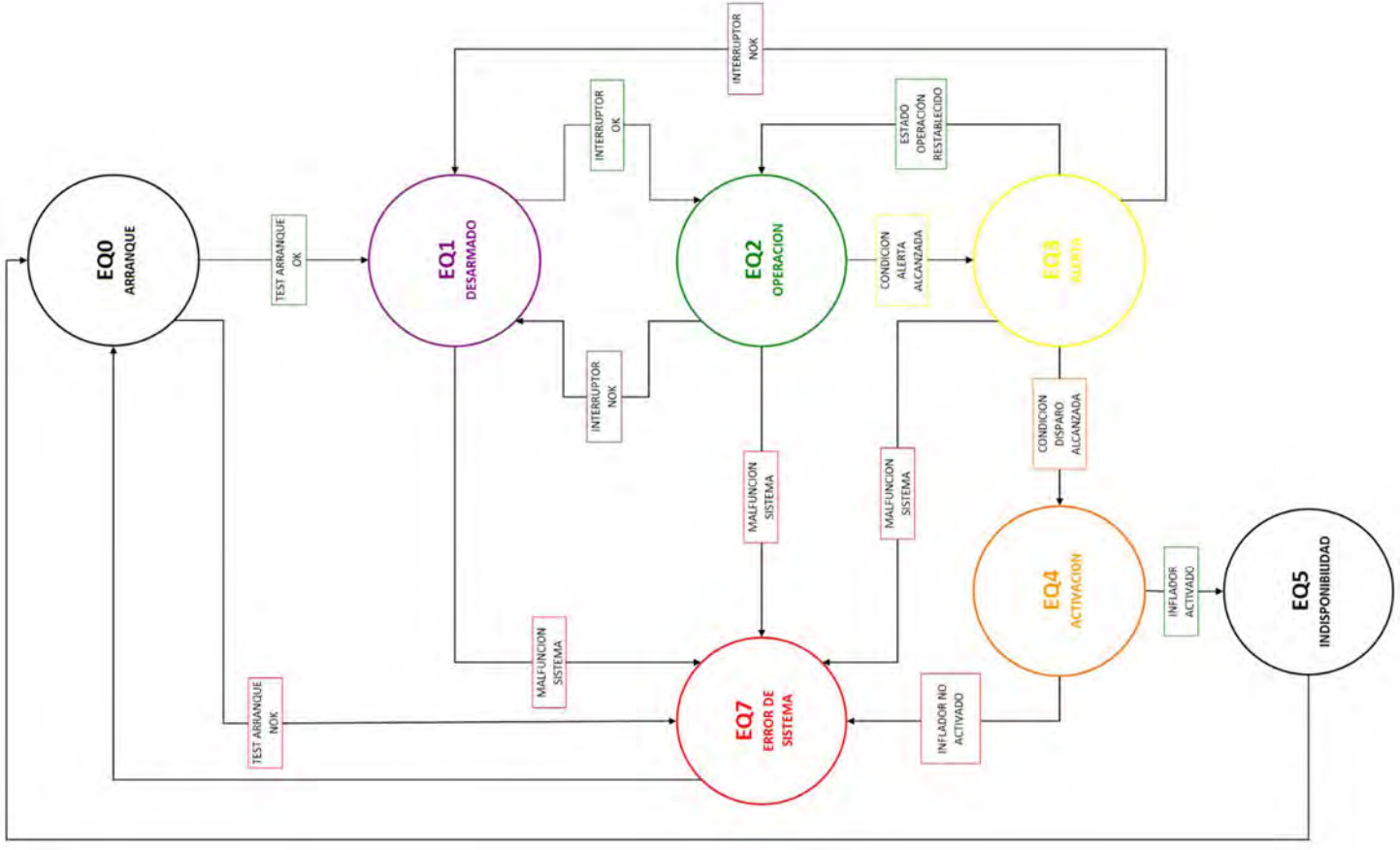
7.2.6 Unavailable (EQ5)

When the system has activated the inflator and the structure has been deployed to its locking position, the ECU reaches the EQ5 state in which the system is disabled until the inflator is exchanged by a new one. In this state the buzzer emits intermittent beeps and the led remains on in red.

7.2.7 System error (EQ7)

When the ECU detects an error related to the internal diagnostics or external peripherals (buzzer, led and inflator), the ECU switches to EQ7 and the system is disabled (safety function disabled). In this state the buzzer is continuously activated and the led will remain on continuous red to alert the operator that there is a problem in the system.

WARNING: In the event of a fault, the system will be disabled and the roll-over protection safety function will be disabled. The ECU will not activate the inflator even if the activation condition is reached. You must contact the AR-Quad Authorized Technical Service.


EQ0
ARRANQUE
TEST ARRANQUE OK
EQ1
DESARMADO
INTERRUPTOR OK
INTERRUPTOR NOK
EQ2
OPERACION
ESTADO OPERACION RESTABLECIDO
INTERRUPTOR NOK
CONDICION ALERTA ALCANZADA
EQ3
ALERTA
CONDICION DISPARO ALCANZADA
MALFUNCION SISTEMA
MALFUNCION SISTEMA
EQ4
ACTIVACION
INFLADOR ACTIVADO
EQ5
INDISPONIBILIDAD
MALFUNCION SISTEMA
TEST ARRANQUE NOK
EQ7
ERROR DE SISTEMA
INFLADOR NO ACTIVADO

7.3 Listing and description of AR-Quad® system alerts

7.3.1 Notes

The AR-Quad® system is equipped with a self-diagnostic system that alerts the operator in the event of a malfunction.

7.3.2 Alert codes

Each system state has a defined sequence of optical and acoustic alerts. The alerts for each state are summarized in the table below:

SYSTEM STATUS	OPTICAL WARNING (LED DIODE)	BEEP PATTERNS (BUZZER)
Start-up - EQ0	Red-Yellow-Green flashing	1 beep “- “
Standby - EQ1	Flashing yellow	Alternate beeps “- - - - -“
Operation - EQ2	Fixed green	Off “ “
Alert - EQ3	Flashing yellow or red	Variable frequency beeps “- -- --- ----“
Activation - EQ4	Red continuous	Continuous beep “----------“
Unavailable - EQ5	Red continuous	Alternate beeps “- - - - -“
System error - EQ7	Red continuous	Continuous beep “----------“

If the ECU detects a fault, the system enters the EQ7 state where all safety functions are disabled. In this state, the red LED and buzzer remain activated. In this state the system is not operational, and it is necessary to go to the authorized technical service to restore the system to operational status.

WARNING: In the event of a fault, the protection offered by the AR-Quad® system will NOT activate until the fault is resolved. You must contact the AR-Quad Authorized Technical Service.

WARNING: Under no circumstances should the external peripherals and/or user interfaces be manipulated by overriding or bypassing them "tricking the system" for specific needs of any kind.

WARNING: Under no circumstances should the electronic control unit (ECU) be manipulated.

7.3.3 Measures to be taken in case of system error

In the event of a system error message (status EQ7) the machine must be stopped immediately and a system reboot using with the ignition must be performed. If system has not recovered from the error after this test the, the operator must turn off the manual disconnection switch and visit the nearest Authorized Technical Service.

WARNING: In the event of a fault, the roll-over protection safety function will be disabled. The ECU will not activate the inflator / structure even if a rollover occurs and the activation condition is reached. You must contact the AR-Quad Authorized Technical Service.

8 AR-Quad® SYSTEM MAINTENANCE

8.1 Notes

The AR-Quad® system has been designed and built according to the highest quality standards to guarantee correct operation over time. However, regular maintenance of the system is advisable and involves some simple operations.

WARNING: Update the safety requirements and maintenance tips every six months through the AR-Quad website (AR-Quad Manual).

8.1.1 Cleaning and maintenance of the machine

Although the system is prepared to last many years of active use, in the harshest conditions, some guidelines that we detail here shall be followed.
When washing the machine, certain rules must be observed to prevent damage to the external peripherals, the AR-Quad® structure and the ECU.
Do not use pressurized water or steam cleaners near the hand switch, user interfaces and the ECU. Also, do not use these types of cleaners near the connectors or at the junction between the movable and fixed part of the AR-Quad® structure.
Do not use harsh chemicals or solvents on the system disconnection switch, user interfaces and the ECU. Also, do not use this type of products near the connectors nor the seals between the movable and fixed part of the AR-Quad® structure.
If ordinary and extraordinary maintenance operations on the machine require the main connector or the ECU to be temporarily removed, always contact the Authorized Service Centre for detailed information. Any modification of the interfaces and ECU could cause anomalies to the system and create dangerous situations, even voiding the automatic protection function that will result in the cancellation of the guarantee and the responsibility of Air-ROPS.

WARNING: When the machine is to be tilted for a supervision or repair, the battery shall be disconnected, ignition must be switched off, the system disconnection switch must be off and no bystanders shall be present. Failing to do so

8.1.2 Maintenance of the ECU

Use a soft cloth to clean the ECU and its connections. Do not use aggressive chemicals (i.e., alcohols, solvents) . Avoid direct application of abrasive pads and water hoses.
Also avoid direct contact with oils and gasoline, as this could damage the components and electrical connections.
Periodically check the condition of the cables, the integrity of the housing and the fixation of the coupling system, in particular the condition of the clamping pins. Ruptures and cracks could encourage the entry of contamination and compromise the operation of the system. If there is any sign of damage, take the system to the technical service for repair.
Ensure that the marking label is perfectly legible. It should be replaced if it is damaged or lost.

8.1.3 System disconnection switch maintenance

The manual switch should be regularly inspected by visual inspection for possible shock, rust or any other sign of structural failure. If a malfunction is detected, the switch must be replaced.

8.1.4 Maintenance of the operator alert interfaces

The user alert interfaces have to be regularly inspected by visual inspection for possible shocks or any other sign of structural failure. If a malfunction is detected, the alert interface has to be replaced.

8.1.5 AR-Quad® Structure Maintenance

The AR-Quad structure should be inspected regularly for dents or dings in any of its tubes. If dents are detected in any of your pipes, you should contact an authorized service center.
The tightening of the system's anchor bolts to the machine as well as the ECU's anchor bolts should be checked periodically.
If the warning labels have been damaged, they must be replaced with new ones.
Make sure that the protective sleeve is correctly fitted to the upper crosshead of the structure and that it has not been significantly damaged during use.

WARNING: Check the AR-Quad® weekly, by means of visual inspection of possible blows, or any other sign of structural failure, because as it is a safety element, it must be in perfect condition so that when it has to act, it does so correctly.

Check the anchorage parts and bolts every six months, watching their state of tightness, avoiding any slack, however small it may be.

⚠ WARNING: Do not use aggressive chemicals or solvents on the AR-Quad® structure.

⚠ WARNING: Make sure that the warning labels are perfectly legible. They should be replaced if they are damaged or lost.

⚠ WARNING: The shelf life of the AR-Quad® frame is 15 years from the date of manufacture as indicated on the frame marking label. After 15 years, the correct functioning of this structure cannot be guaranteed and it must be replaced.

9 PROGRAMMED MAINTENANCE OF THE AR-Quad® SYSTEM

9.1 Notes

The AR-Quad® System must be maintained on a scheduled basis for one year from the date of purchase.

9.2 Scheduled maintenance of the ECU

Scheduled maintenance of the Electronic Control Unit consists of a visual check of the equipment installed on the machine according to the checklist below:

- Monitoring the status and operation of external sensors
- Checking the state of wear of the connection cables of the external sensors
- Monitoring the status and operation of user interfaces
- Checking the state of wear of the connection cables of the user interfaces
- Control of the state and operation of the ECU
- Control of the state of the ECU support
- Checking the state of wear of the connection cables to the inflator

9.3 Scheduled maintenance of the AR-Quad® structure

Scheduled maintenance of the AR-Quad® frame consists of a visual check of the frame installed in the machine according to the checklist below:

- Permanent deformation or torsion.
- Missing, damaged or loose mounting elements.
- Mounting elements that are of a lesser degree than specified.
- Any cracks in the structure (structural members and/or welds)
- Significant corrosion.
- Modifications, i.e. unauthorized welding or drilling.
- Missing or unreadable labels.

- Any unauthorized repairs.
- Control of the surface condition of the structure
- Checking the state of the connection and the wall bushing of the pyrotechnic inflator
- Checking the condition of the protective structure coating
- Monitoring the status of the locks
- Control of the state of the anchors

10AR-Quad® SYSTEM CERTIFICATION

10.1 Certification according to the Machinery Directive 2006/42/EC

Mechanical resistance

- ISO 3471 - Mechanical resistance

Environmental resistance

- ISO 9227 - Salt spray resistance

Functional test

- Deployment time

10.2 Certification according to the pyrotechnic articles directive 2013/29/EC

Category

- Vehicle pyrotechnics, category P1

EC type-examination

- DSC-15-155811-08074A, AgCE 127

10.3 Certification of the Electronic Control Unit according to agricultural machinery standards

Functional safety

- ISO 25119 - Tractors and machinery for agriculture and forestry Safety-related parts of the control system

Mechanical and environmental testing

- ISO 15003 - Thermal compatibility
- ISO 15003 - Shock and vibration
- ISO 15003 - IP protection
- ISO 15003 - Chemical compatibility
- ISO 15003 - Electromagnetic compatibility
- ISO 15003 - Electrical compatibility

10.4 Certification of the gas inflator according to Automotive standards

CE Marking

- 0589-P1-000131. Directive 2007/23/EC "Pyrotechnic articles for machinery
- EN-ISO 14451

Automobile approval

- USCAR 24-2
- AK-LV 15

10.5 Certification according to UK requirements SI 2019/696

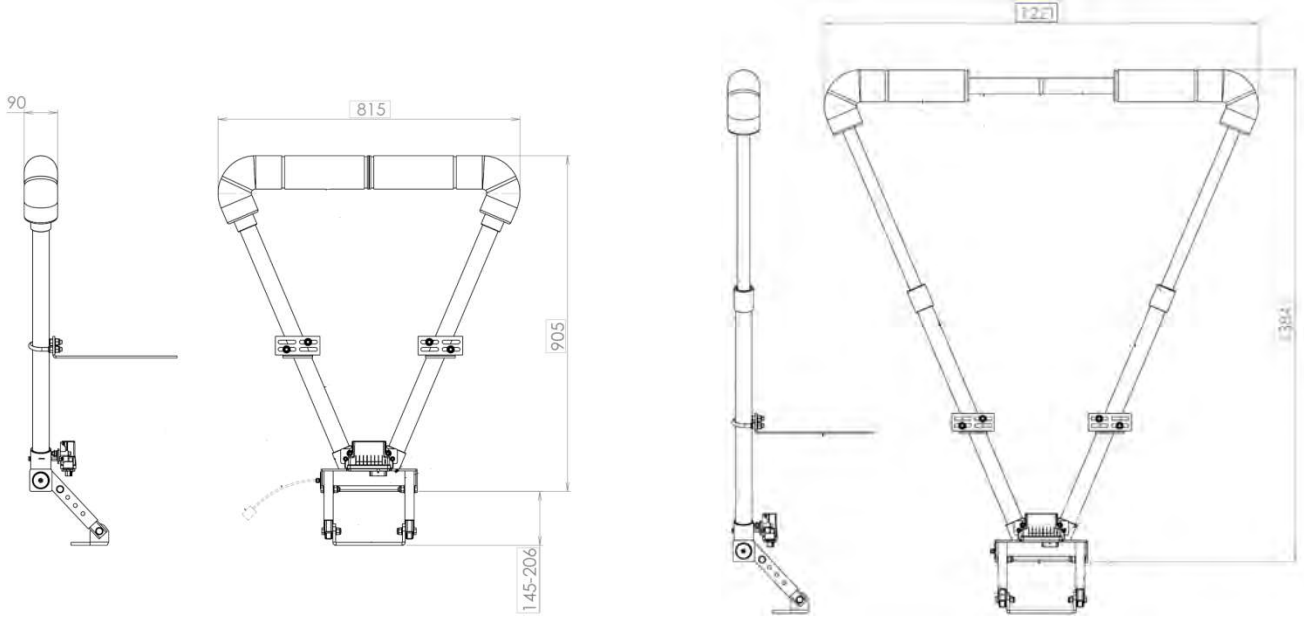
SAFENET LIMITED

UK type of approval

- Supply of Machinery (Safety) Regulations 2008 SI 2008/1597, as amended by SI 2011/1043, SI 2011/2157 and SI 2019/696.

11AR-Quad SYSTEM SPECIFICATIONS

STRUCTURE		
Mass	18	kg
Dimensions when folded	815x905x90	mm
Dimensions displayed	1221x1384x90	mm
Position of the center of gravity when folded	(0,560,97)	mm
Salt spray resistance	720	h
IP	67	
Maximum authorized weight of the machine	500	Kg



ECU		
Mass	150	g
Dimensions	130x80x42	mm
Supply voltage	30 max.	V
Maximum operating temperature	-40/+85	˚C
Maximum consumption	300	mA
Storage temperature	-40/+100	˚C
Sealing	IP69	

Resistance to fluids	Standard farm used	
Vibration	Alternating and resonance	
Impact	30g, 18ms	
Salt spray test	48	h
Humidity/temperature cycles	10 days //-40/85 ºC	
Electromagnetic Compatibility	Broadband, narrowband, immunity	ISO 14982
Electrical transients	1,2a,2b,3a,3b	ISO 7637-2
Electrostatic discharge	4 kV	ISO 10605
Electrical tests	Overvoltage, undervoltage, short circuit, reverse polarity	ISO 15003
MTTF	116	years

CONNECTOR	
Operating temperature	-40 ˚C to +85 ˚C
Sealing	IP6K7, IP6K9K
Mechanical tests	SAE/USCAR-2
Crimping test	SAE/USCAR-21
Electrical testing	SAE/USCAR-2
Environmental Tests	SAE/USCAR-2 (temperature class 3)

BUZZER	
Sealing	IP68
dB	85dB
Operating temperature	-30 ˚C to +85 ˚C
Weight	15g

LED	
Sealing	IP67

Operating temperature	-40 ˚C to +85 ˚C
Maximum viewing angle	60º
Maximum panel width	4 mm
Tightening torque	75 cNm

Air-ROPS reserves the right to make changes without prior notice.

12TROUBLESHOOTING

During the start-up phase (ignition on) the LED light doesn't work and/or the buzzer doesn't beep.		
1	No power supply to the ECU	
	1.1	Check the battery connectors if they have become loose
	1.2	Check the power supply harness integrity (positive and negative)
	1.3	Check that the connection of the main wiring harness connector to the ECU is correct
2	The connection of the LED and/or buzzer with the ECU has some problem	
	2.1	Check the integrity of the LED and buzzer harness
	2.2	Check that the connection of the main wiring harness connector to the ECU is correct
WARNING: If after performing tasks 1.1, to 2.2 the buzzer and LED don't work the AR-Quad system is not operating and the rollover protection function is not available. Take the quad bike to the nearest dealer to have it fixed.		

During the start-up phase (ignition on) the LED and buzzer work but the system enters error state		
1	The attitude check algorithm is detecting a rollover condition. During start-up the ECU checks that the ECU is not in rollover condition.	
	1.1	Place the vehicle flat on the ground and reset the ignition switch
2	The LED or Buzzer are not properly connected to the ECU. The ECU monitors that the connection of the LED and buzzer is correct	
	2.1	Check the LED and buzzer harness integrity
	2.2	Check that the connection of the main wiring harness connector to the ECU is correct
3	The inflator is not properly connected to the ECU. The ECU monitors that the connection of the inflator is correct.	
	3.1	Check the inflator harness integrity
	3.2	Check that the connection of the inflator connector to the ECU is correct

4	The temperature of the ECU exceeds maximum permitted values	
	4.1	Make sure that the ECU is not placed near sources of heat such as engine or exhaust
5	The ECU is reporting an internal error	

WARNING: If after performing tasks 1.1, to 4.1 the ECU does not return to the Operational state, the AR-Quad system is not operating and the rollover protection function is not available. Take the quad bike to the nearest dealer to have it fixed.

During the operational phase of the AR-Quad the system enters error state		
1	The LED or Buzzer are not properly connected to the ECU. The ECU monitors that the connection of the LED and buzzer is correct	
	1.1	Check the LED and buzzer harness integrity
	1.2	Check that the connection of the main wiring harness connector to the ECU is correct
2	The inflator is not properly connected to the ECU. The ECU monitors that the connection of the inflator is correct.	
	2.1	Check the inflator harness integrity
	2.2	Check that the connection of the inflator connector to the ECU is correct
3	The temperature of the ECU exceeds maximum permitted values	
	3.1	Make sure that the ECU is not placed near sources of heat such as engine or exhaust
4	The ECU is reporting an internal error	

WARNING: If after performing tasks 1.1, to 3.1 the ECU does not return to the Operational state, the AR-Quad system is not operating and the rollover protection function is not available. Take the quad bike to the nearest dealer to have it fixed.

13F.A.Q.

1. Can it be activated by a sudden jump of the machine?

The AR-Quad system is designed for use in low-speed agricultural environments. The system is not effective for dynamic tipping and use conditions outside the agricultural environment. High acceleration environments such as sports or competition use could lead to system failures or unplanned activations

2. How do I know it's operational under any circumstances?

The AR-Quad system has a system to alert the operation of the same. If, after the contact has been made and before the start of the operation, the alerts are activated, the system remains in failure mode and you must go to the technical service

3. How do I know if the system is not operational?

The system will not be operational in the following circumstances:

- Contact not actuated (operation light will be off)
- The indicator light is red (fixed) and/or the buzzer is on continuous beep.

4. I've dumped, how can I rearm the structure?

It is necessary to go to an authorized technical center where they will review the system and determine the repair procedure.

5. If the machine catches fire, will it be activated?

Yes, it's possible that the gas pump will be activated. The activation of the structure will depend on whether or not the seals are still operational.

6. In a very violent crash it can be activated?

No. The system is designed to activate only when there is static or dynamic tipping (when there is angular rotation speed).

7. If I get in your position, I can safely move the anchors

No, it is not possible to modify the installation of the protection system in any way. Any operation should be approved and carried out by the authorized technical center

8. If I also install an outdoor cabin, it will act in case of overturning even if it is cushioned by the outdoor cabin

It is not possible to install any additional elements above the protective structure.

9. Can I wrap the top in sacks, so that it serves as a support for carrying things?

It is not possible to install any additional elements on the upper crosshead of the protection structure. If you want to install any additional element to the fixed supports you have to contact AR-Quad to determine its feasibility.

10. In a semi-overturned repair, or having removed the control system and not remembering it, if I turn the vehicle on for checks, what can happen?

You are not authorized to remove the ECU from its holder. The control system has redundant mechanisms for alerting before activation:

- The contact: For any maintenance operation it is necessary to remove the contact from the machine
- The user interlock: For any maintenance operation, the interlock must be deactivated.
- During startup, the ECU monitors the angle. If the activation condition is met during startup, the ECU enters the safe state alerting the operator.
- Audible and visual alerts: As you approach the activation condition, the system issues progressive alerts.

11. If I change my vehicle, I can use the set and reuse it

You must go to an Authorized Technical Service, where they will be able to evaluate the viability of the change and carry out the installation if it is affirmative.

12. Why should the muting switch and ignition be disconnected when servicing?

The muting switch of the AR-Quad and the machine ignition must be switched off in the event of maintenance to prevent unintentional operation of the AR-Quad® structure due to unintentional tipping in the workshop.

13. Can I move my AR-Quad® from one machine to another?

You must go to an Authorized Technical Service, where they will be able to evaluate the viability of the change and carry out the installation if it is affirmative.

14. Does the system warn me if the machine approaches a rollover situation?

Yes, the system will warn you acoustically and/or visually if the machine starts to tilt to levels where there is a risk of tipping over. If you receive this indication, you must take extreme precautions, correcting the path to place the machine with a lower inclination.

15. What should I do if the structure has been deployed?

You must go to the Authorized Technical Service, where the system will be replaced.

16. How can I contact the manufacturer or locate an Authorized Service Center?

You can do it through the WEB (www.air-rops.es)

14CONTACT DETAILS

Air-ROPS NA 2012 S.L..
Iturrama nº10 6º-C
31007 - Pamplona (Province of Navarra), Spain
Tel: +00 34 615436234
Website: www. air-rops.es
E-mail: info@air-rops.es

15WARRANTY TERMS

15.1 Notes

With the purchase and installation of an AR-Quad®, the buyer accepts these conditions with the manufacturer of the AR-Quad®.

15.2 System manufacturer

1. The manufacturer states that in accordance with the conditions referred to in point (4) The AR-Quad® is designed to reduce damage and decrease the overall risk of injury in the event of a rollover, when the machine is used responsibly and always in accordance with the mandates of this manual and the recommendations of the machine manufacturer.
2. The manufacturer provides a bona fide adaptable model of AR-Quad®, but does not guarantee that it will fit all makes and models. It will be the purchaser (self-service technician, service center, or the manufacturers of the machines that install the AR-Quad®) who will be responsible for the assembly of the AR-Quad®, according to the recommendations of the manufacturer of the AR-Quad®. Consequently:
3. It is the buyer's responsibility to determine the suitability of the AR-Quad® for the specific make and model of machine to which the AR-Quad® is to be fitted and always in compliance with the manufacturer's instructions.
    a. The System Manufacturer does not accept any claims when:
        i. The Authorized Technical Service does not comply with the handling and assembly requirements of the specifications detailed in the installation manual.
        ii. Damage to persons, goods or third parties of any kind is caused as a result of the AR-Quad® manufacturer's failure to comply with the provisions of this manual, such as
            1. Damage during transport and handling during unpacking and assembly.
            2. The location, suitability and strength of the strengths or resilience and solidity of the brackets (or adapter parts)
            3. Corrosion of any kind.
            4. Abuse or misuse of both the AR-Quad® and the machine
            5. Damage in any case, including rollover.

6. Incorrect or badly assembled.
7. Readjustments of the AR-Quad® for improper use.
8. The changes in dynamics and weight set as a limit for the carrying machine.
9. Non-compliance with stipulated conditions, maintenance and safety requirements
10. Damage during use, due to negligence, misdirection, collisions, etc.
11. Injuries of any kind.
12. Damage caused by handling, theft (of parts), etc. Until they reach the buyer, they will be the responsibility of the intermediary or commercial chain or representative.

iii. If, despite the above, the manufacturer is obliged to pay damages to any person, that liability shall, to the extent permitted by law, be limited to the cost of replacing the defective AR-Quad® or the sum of 500 Euros. This choice will be left to the manufacturer.

15.3 Authorized AR-Quad® System Service

The manufacturer of the AR-Quad® establishes the requirements of the Authorized Technical Services, which, among others, must

1. Evaluate the suitability of the AR-Quad® model to the machine where it will be mounted.
2. The suitability, location, strength of the strong points and the solidity of the adaptation brackets where the structure of the AR-Quad® is supported.
3. Make sure that all components of the AR-Quad® are correctly installed before assembly.
4. The correct and safe assembly of the components of the AR-Quad® according to the installation manual.
5. The Authorized Technical Service is responsible for all labor costs in the event of a warranty claim and must return suspected defective parts to the place of purchase for evaluation by the manufacturer or its agents of the warranty claim.

15.4 AR-Quad® System Buyer

The Buyer (and other users) of the AR-Quad® agree to the Terms of Warranty and the sales contract on the terms indicated. The Buyer, operator (and other users) of the AR-Quad® agrees to:

1. Comply with any safety instructions in the owner's manual or any other safety warnings on the system.

2. Assess the benefits, risks and limitations that may arise from operating the machine, including the use of other attachments and towed accessories.
3. Comply with any other safety measures appropriate for work, such as operator training, use of the indicated personal protective equipment (PPE), etc.
4. Do not take unnecessary risks that may increase the probability of tipping over because you feel protected by having an AR-Quad® equipped.
5. Keep the AR-Quad® in good condition.
6. Replace the AR-Quad® in the event of a rollover.
7. It assumes that the AR-Quad®, is supplied with the design, materials and elements using the most current technology available.
8. He shall be responsible for any damage or injury suffered by other users whom he has allowed to drive the machine, without giving or requiring them the prevention training corresponding to the tasks to be carried out, as well as requiring them to read the AR-Quad® manufacturer's manual and the implications on their responsibility of not complying with the requirements set out therein, and assume for these users, the responsibility that the manufacturer may have on such users for any claims of failure by the Authorized Technical Service, Distributor or the Manufacturer, with respect to the manufacture, distribution, sale and/or installation of the AR-Quad®. All this for the purposes of the corresponding compensation.

WARRANTY TERMS

Vehicle model _____

AR-Quad serial number/plate # _____

Date of purchase _____

Name Installer or Authorized Technical Service / VAT number _____

Name AR Quad Buyer _____

Ar Quad Buyer Address _____

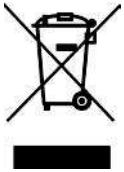
Phone/email AR Quad Buyer _____

The installer or technical service declare that has read the installation manual and certifies that the installation has been done following the given instructions.
The Buyer declares that have read the user manual.
The installer or technical service and the buyer declare their conformity with the warranty conditions

Signature Installer or Authorized Technical Service	Buyer's Firm	Company Air-ROPS

Send a scanned copy of section 15 including this page with all pages duly signed to info@air-rops.es or use warranty activation tool in Air Rops webpage.

16ANNEX A: DISPOSAL OF THE PRODUCT



ATTENTION, the AR-Quad® system contains electronic components and a high-pressure gas generator that cannot be disposed of as traditional waste. Dismantling and disposal of the system must be carried out by a recognized, specialized center. You can also contact the AR-Quad Authorized Technical Service who will be able to indicate the nearest center for proper disposal.
WARNING, improper disposal of the product may lead to dangerous situations or contamination of the environment.

EU DECLARATION OF CONFORMITY

1. Product designation: **Automatic rollover protection system AR-QUAD**
2. Name and address of the manufacturer(s):
   AIR-ROPS NA 2012 S.L.
   Iturrama nº10, 6-C
   31007, Pamplona, Spain
3. This declaration of conformity is issued under the sole responsibility of the manufacturer.
4. Object of the declaration (identification of product allowing traceability):
   Air-ROPS, automatic rollover protective system. Traceability according to serial number "DDMMYY-hhmmss"
5. The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:
   Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast).
6. References to the relevant harmonised standards used or references to the other technical specifications in relation to which conformity is declared:
   - ***EN-ISO 25119:2018***
   - ***ISO 15003:2006***
   - ***EN-ISO 14982***
   - ***EN ISO 3471:2008***
   - ***EN 14451-2, §4.6 y 4.9***
   - ***EN 14451-9, §4.7, 4.8 y 6.2***
7. The notified body **AENOR (0099)** was responsible for the EU-type examination - module B - as regards with the Essential Safety Requirements of the Directive 2006/42/EU and issued the certificate **A13/0099DL0509**.
8. Additional information: **The object of the declaration includes the Air-ROPS Electronic Control Unit (ACU) which enables the declared object to function as intended without altering the essential health and safety requirements.**

15847262D FRANCISCO JAVIER BAZTARRIKA (R: B71093843)
Firmado digitalmente por 15847262D FRANCISCO JAVIER BAZTARRIKA (R: B71093843)
Fecha: 2020.10.26 12:25:48 +01'00'

Signed for and on behalf of **Air-ROPS NA 2012 S.L.**

Pamplona	October the 1st	Francisco Javier Baztarrika Navarro, Administrator
Place of issue	*Date of issue*	*Name, function, signature*

EU DECLARATION OF CONFORMITY

1. Product designation: **Pyrotechnic rollover protection structure Air-ROPS**
2. Name and address of the manufacturer(s):
   AIR-ROPS NA 2012 S.L.
   Iturrama nº10, 6-C
   31007, Pamplona, Spain
3. This declaration of conformity is issued under the sole responsibility of the manufacturer.
4. Object of the declaration (identification of product allowing traceability):
   Air-ROPS, automatic rollover protective structure. Traceability according to serial number "DDMMYY-hhmmss"
   - ***YY:Year***
   - ***MM: Month***
   - ***DD: Day***
   - ***ss: seconds***
   - ***mm: Minutes***
   - ***hh:Hour***
5. The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:
   Directive 2013/29/EU of the European Parliament and of the Council of 12 June 2013 on the harmonisation of the laws of the Member States relating to the making available on the market of pyrotechnic articles (recast).
6. References to the relevant harmonised standards used or references to the other technical specifications in relation to which conformity is declared:
   - ***Technical data sheet of the Air-Rops, Reference AR-T0031, Revision 00, dated 03/10/2016;***
   - ***Technical drawing 000-00001, Revision 00, dated 06/08/2015;***
   - ***NF EN ISO 14451 standards series: Pyrotechnic articles - Pyrotechnic articles for vehicles.***
7. The notified body **INERIS (0080)** was responsible for the EU-type examination - module B - as regards with the Essential Safety Requirements of the Directive 2013/29/EU and issued the certificate **0080.P1.17.0012.**
   The notified body **INERIS (0080)** performed the assessment of the Conformity to type based on quality assurance of the production process - module D of the Directive 2013/29/EU - and issued the certificate nr **AgCE 127-AIR.**
8. Additional information: **The object of the declaration includes the Air-ROPS Electronic Control Unit (ACU) which enables the declared object to function as intended without altering the essential health and safety requirements.**

15847262D FRANCISCO JAVIER BAZTARRIKA (R: B71093843)
Firmado digitalmente por 15847262D FRANCISCO JAVIER BAZTARRIKA (R: B71093843)
Fecha: 2020.10.26 12:26:48 +01'00'

Signed for and on behalf of **Air-ROPS NA 2012 S.L.**

Pamplona	October the 1st	Francisco Javier Baztarrika Navarro, Administrator
Place of issue	*Date of issue*	*Name, function, signature*