
Testing of animal identification devices

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The International Committee for Animal Recording (ICAR) paid considerable attention to animal identification already in the early 1980ies, and the first standards date back to this period. The number of countries using Identification and Registration (I&R) systems has increased rapidly during this period. Traditionally I&R systems were mostly used for pedigree and performance recording, but today they are used in many countries as an essential element of: artificial insemination schemes, subsidy schemes, traceability, disease control and to secure market access. Changes in livestock farming have created an environment for the introduction of new technologies that, in turn, require knowledge and experience in specific areas and international agreements or standards.

ICAR plays a very important role by developing international guidelines and standards for identification devices, in cooperation with the International Organization for Standardization (ISO). In June 2007, ISO appointed ICAR as Registration Authority (RA) competent to register manufacturer codes used in the Radio Frequency Identification (RFID) of animals, in accordance with ISO 11784 (Radio-frequency identification of animals - Code structure) and ISO 11785 (Radio-frequency identification of animals - Technical concept).

As for ICAR Guidelines, ISO 11784 and ISO 11785 are approved and accepted by all ICAR members (from 50 countries), and considering that ISO standards are approved by ISO members (from 162 countries), these documents have an international acceptance.

The aim of ICAR approvals of identification devices is:

- To have international approval acceptable worldwide.
- To protect ICAR members, national authorities and farmers, as end-users, by identifying good quality devices.
- To keep the costs of tests and approvals low.

The first section of ICAR Guidelines (www.icar.org/pages/recording_guidelines.htm) describes the general requirements for the identification system:

- The recorded animal identity must be the animal's official identity in the member country and identification number must be unique to that animal nationwide.
- Where the identity of an individual animal is not unique, the record must so state (e.g. flock identities for goats/sheep). The identity number used for a flock or herd must be unique to that flock or herd nationwide.
- The animal's identity must be visible.

Summary

Identification devices

- The animal's identity should never be re-used.
- The animal's identification device/method must comply with national legislative requirements.
- Animals, which lose their identity device must be re-identified, wherever possible, with their original number, provided that there is evidence that the animal is being correctly identified. Where this is not possible, a cross reference to the original number must be maintained.

ICAR has defined the requirements for testing and approval of identification devices in Section 10 of ICAR Guidelines.

Permanent identification devices can be divided into two categories:

- Simple identification devices such as conventional plastic or metallic eartags, which may have both visual and machine readable symbols (e.g. numerals and barcodes).
- Electronic identification devices like RFID transponders and the corresponding transceivers. RFID transponders used in animal identification are:
 - Injectable transponders.
 - Electronic eartag transponders.
 - Electronic ruminal bolus transponders.
 - Tag attachments.

Testing and approval of the conventional tag

In cooperation with French specialists, ICAR has developed test protocols designed to ensure that ICAR approval will meet the demands of animal industry and authorities worldwide. Testing and approval of conventional tags is described in Section 10.7 of ICAR Guidelines. The ICAR procedure for testing considers the following issues:

- Ease of application and use.
- Efficiency of animal recognition.
- Durability and tamperproof quality.
- Animal welfare.

Testing of the eartag is always coordinated by ICAR and the test consists of two phases: preliminary test and laboratory test. Both tests must be done by ICAR approved test laboratories.

Preliminary tests include:

- Test of machine-readable printing, if requested by the manufacturer.
- Locking mechanism checks. The primary purpose of these tests is to verify that the male to female locking mechanism, once correctly applied using the compatible pliers, cannot be subsequently dismantled in such a way that would allow the tag to be re-used in a different animal, i.e. that tampering with the locked tag in a potentially fraudulent way, renders the tag unusable.

The aim of the preliminary test is to assess conformance of the eartags with the information given in the application form and to detect any major failure including damage of the tag at application, possible unlocking without deformation, and inappropriate design considering welfare requirements.

Laboratory tests include:

- Assessment of descriptive parameters including weight, dimensions, and composition
- Performance assessment after various treatments.

After a successful laboratory test, the ICAR approval is granted and the product is listed on the ICAR homepage (www.icar.org/pages/approved_eartags.htm)

Testing and approval of RFID devices (transponders and transceivers) are standardized in cooperation of ICAR and ISO. Testing of RFID can be subdivided into two main categories:

- Conformance test
- Performance test

Conformance test is required if the use of particular identification devices is specified in any kind of official regulation or scheme. In general, the submission of identification devices to conformance testing is obligatory before they can be used in the official identification of animals.

Conformance test is described in standards:

- ISO 24631-1: Radio frequency identification of animals - test procedures - part 1, Evaluation of conformance of RFID transponders with ISO 11784 and ISO 11785, which includes granting and use of a manufacturer code.
- ISO 24631-2: Radio frequency identification of animals - test procedures - part 2, Evaluation of conformance of RFID transceivers with ISO 11784 and ISO 11785.

The aim of the tests and registrations is to have on the market only approved and registered products without any modification. For this reason, there are three types of tests for RFID transponders (ISO 24631-1).

A **full test** is mandatory in the following cases:

- When a manufacturer not registered by ICAR applies for a test.
- When an ICAR registered manufacturer uses a new silicon (Integrated Circuit) or a new technology, such as HDX or FDX-B, in the transponder.
- When an ICAR registered manufacturer changes the coil technology, for example ferrite coils vs. air coils.

A **limited test** is applicable in the following cases:

- When an ICAR registered manufacturer inserts previously ICAR certified transponder hardware (silicon + coil) into a different primary transponder packaging material.
- When an ICAR registered manufacturer uses the silicon of an ICAR certified transponder with different coil dimensions.
- When an ICAR registered manufacturer inserts an ICAR certified transponder with its original primary packaging in a different secondary packaging; for example, a glass transponder into a bolus or a glass transponder into an eartag.

Testing and approval of radio frequency identification devices

A **listing update** is applicable when an ICAR registered manufacturer uses an ICAR certified transponder without any modification. In this case, the applicant has to deliver a copy of the original test report and a written confirmation from the ICAR registered manufacturer who originally submitted the transponder under question for certification by ICAR.

Successful conformance test confirms the compliance of the transponder with the code structure and the technical concepts given in ISO 11784 and ISO 11785.

There are two kind of code structures available according to ISO 11784:

- Country code transponders.
- Manufacturer code transponders.

Country code used in transponders is ISO 3166 numeric three digit country code, and according to the ISO 24631-1 Annex E (Conditions of use of manufacturer codes) 'A manufacturer is not permitted to use a country code unless authorized by the specific official competent authority in the country'.

Manufacturer code used in transponders is a code granted by ICAR if the manufacturer has already participated successfully in a full test. The manufacturer code might be shared manufacturer code or unshared manufacturer code. The shared manufacturer code is '900' for all manufacturers having shared manufacturer code, but ICAR has allocated a restricted set of identification codes for exclusive use together with the shared manufacturer code. Unshared manufacturer codes are from 901 to 998 and the unique code might be used only by a specific manufacturer. ICAR has approved 346 products from 114 manufacturers. All registered manufacturers and the manufacturers codes granted by ICAR are published on ICAR homepage (www.service-icar.com/manufacturer_complete.php).

Performance testing is an option for determining the operation of identification devices in practical applications. The objective of this kind of testing is to provide widespread information concerning the special characteristics of identification devices to the end-user.

Table 1. ICAR approved products (at 20 Nov. 2011).

Conventional tags	3		
Conformance tested	Total	FDX	HDX
Bolus	62	43	19
Eartag	176	123	53
Injectable	93	84	9
Leg tag	4	4	0
Tag attachment	11	10	1
Total	346	264	82
Performance tested			
Bolus	27	23	4
Eartag	48	38	10
Injectable	3	3	
Total	78	64	14

Performance test is described in standards:

- ISO 24631-3: Radio frequency identification of animals - test procedures - part 3, Evaluation of performance of RFID of ISO 11784 and ISO 11785 transponders.
- ISO 24631-4: Radio frequency identification of animals - test procedures - part 4, Evaluation of performance of RFID of ISO 11784 and ISO 11785 transceivers.

The objective of the performance test is to furnish qualitative and quantitative data for the comparison of the FDX and HDX transponders conforming to the technologies described in the standards ISO 11784 and ISO 11785 in order to contribute to market transparency. The test includes the following parameters:

- Transponder minimal activating magnetic field strength.
The measurement will define the minimal value of the magnetic field strength to get the full activity stage of the transponder. This value will be comparable for all transponders on the market, and in addition, the obtained value can be used for the system analyses for comparison of transceivers-transponder performance matching.
- Transponder dipole moment.
The transponder dipole moment is the ability of the transponder to send the information to the transceiver station. This value can be used for the system analyses when comparing the transceivers-transponder matching.
- Stability.
The stability of the return signal is especially important when reading in difficult environments. The obtained value can be used for the transceivers-transponder performance analysis.

ICAR does not publish the results of the performance tests, but if a product is tested the date is published and the manufacturer can provide the test report if requested.

As a result of international cooperation, we have standards for identification of animals and testing of identification devices that are accessible to all interested persons. Besides these standards, there is information regarding the products approved by ICAR on ICAR homepage.

To have good quality products on the market, we need to have good cooperation between ICAR and national competent authorities by exchanging information and findings related to products not compliant with international standards.

ICAR 2010, A Synthesis of ICAR Guidelines on Animal Identification.

ICAR Guidelines, 2011, International agreement of recording practices. Guidelines approved by the General Assembly held in Riga, Latvia on June 2010.

ICAR homepage: www.icar.org

ISO 11784, 1996, Radio-frequency identification of animals - Code structure.

Conclusion

List of references

ISO 24631-1, 2009, Radio frequency identification of animals -- Part 1:
Evaluation of conformance of RFID transponders with ISO 11784 and ISO 11785
(including granting and use of a manufacturer code).

ISO 24631-3, 2009, Radio frequency identification of animals -- Part 3:
Evaluation of performance of RFID transponders conforming with ISO 11784 and
ISO 11785.