



## Microchip FAQ's

All you wanted to know about microchips but were afraid to ask!

### **International Committee for Animal Recording (ICAR)**

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### 1. WHAT is a Radio Frequency Identity Device (RFID) AND HOW DOES IT WORK?

RFID is a method of identification which uses a signal transmitted between an electronic device, such as a "tag", "transponder" or "microchip" and a reading device or "scanner". The information provided by the transmitted signal can be used to identify the transponder and, by reference to stored data, on a "database" or "registry", can identify whatever is carrying that transponder.

RFID can be used to identify almost anything, be it car, animal, fish, bird, box, industrial sub-assembly or waste container. There is a range of RFID systems, and the nature of the thing to be identified and the circumstances under which the signal is transmitted determine the type of system used.

In situations where long distance identification is needed a battery operated device is preferred, as in tracking wild animals from a helicopter etc. This article does not deal with these "active" devices.

The RFID devices most widely used in animals are passive in nature. They have no battery or source of power of their own, but pick up the energy they require from the scanner. Devices of this type are called transponders, and small transponders are commonly called microchips. This method of energising the transponder severely limits the effective operating distance between the scanner and the transponder.

The scanner creates an energy field when it is turned on, and the transponder picks up energy when its antenna enters this energy field. The transponder uses the energy to power an integrated circuit attached to its antenna. The integrated circuit (the actual microchip) creates a signal of specific characteristics including the transponder's identification data and transmits it using the same antenna.

The signal is then received by the scanner, either by the same antenna that created the energy field or by a separate receiving antenna. The scanner interprets the signal, converting it from binary data to decimal or other format, and then sends it to a display, a computer, or other device. In some cases transponder data alone is sufficient to identify whatever is carrying the transponder. However, in many other situations, and in particular the identification of domestic animals, it is necessary to refer to information stored in a database registry to effect identification.

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## 2. The ISO Standards

The International Standards Organisation (ISO) is an international association of national standards bodies. ISO has no regulatory authority, regulations are the responsibility of National and International regulators. ISO provides standards, guidelines, procedures and policies on a wide range of issues and applications. These international standards provide a template for the member bodies, the National Standards organisations, to publish National standards. The result is standards that are internationally compatible, consistent and clear.

When countries, regulators or users specify that products or services must conform to an ISO standard, these organisations give their legal authority to the ISO standard and become responsible for enforcing the use of the standard.

The ISO system provides for some degree of quality assurance. ISO appoints and forms official Liaisons with other "Internationally recognised" organisations to assess products and or services and to certify that they comply with ISO standards.

### 2.1 What are the ISO RFID standards for animal identification?

#### ( i ) ISO 11784

This international standard describes the structure and the information content of the radio-frequency identification code for animals. It sets the length of the 132-bit binary message sent by the transponder to the scanner and the meaning of every bit in it. The message is split into several sections with specific meanings, including indicating whether the transponder is for animal use, manufacturer and/or country code and the fixed transponder identification code. There is also an error detection section to ensure the message is read correctly by the scanner, and some sections that are reserved for future use.

ISO 11784 states that it is a national responsibility to ensure that transponders carry a unique number within that country, and says that ideally every country should maintain databases of information about all issued codes and the associated animals. Number uniqueness is supported by the use of a country code (based on another ISO standard) and/or a manufacturer code assigned by ICAR, an organisation appointed by ISO.

#### (ii) ISO 11785

This international standard defines the technical aspects of communication between transponder and scanner.

It sets the frequencies of activation and response, the encoding format, and the precise interaction between the scanner and the transponder. This standard permits either one-way at a time signal transmission (Half Duplex) or simultaneous two-way signal transmission (Full Duplex). The standard was designed to facilitate the combination integrating the two systems, HDX and FDX into one scanner.

ISO 11785 also discusses the problem presented by large numbers of animals having already been identified by various non ISO transponders (ones which do not conform to ISO 11784), and shows how these technologies can be incorporated into a scanner in accordance with ISO 11785.

### 3.1 Are all ISO Transponders the Same?

No. There is a range of transponder size, type and intended use. Within each type there will be

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variations in terms of performance. Importantly, they will all transmit the same format of message at the same frequency, though they could be either FDX or HDX.

All transponders contain an integrated circuit (microchip) but these can differ widely in complexity and performance. They are made to specification in a specialised factory (a wafer fabricator) which makes chips for many other applications. These microchips are then assembled into transponders including an antenna of some type and packaged in the format required: glass rod, plastic ear tag, rumen bolus etc.

Variations in the construction of the transponders and readers produce variations in performance characteristics such as read speed and distance - see 5. These variations make particular types of devices more suitable for use in some applications rather than others.

### 3.2 Are All ISO Readers the Same?

No. An ISO reader must read both HDX and FDX transponders according to the ISO communication protocols.

Differences will occur if a reader also reads other types of transponder., Each additional technology to be read reduces the overall efficiency of reader operation (speed, range etc.)

For any transponder, scanner read distance will vary depending on antenna size and transponder orientation. Since the size and features of scanners vary greatly, from the hand held to the fixed installation, so does their cost.

### 3.3 Do the ISO Standards Guarantee Number Uniqueness?

ISO does not guarantee or regulate anything. The ISO standards and associated protocols provide a mechanism whereby countries and regulatory organisations, such as ICAR, can guarantee number uniqueness using a combination of country and manufacturer codes and database management.

The country codes used, are defined in a separate ISO standard, ISO 3166 ; Codes for the Representation of Countries.

### 4.1 ISO standard RFID compliance testing and manufacturer registration

ISO have appointed the International Committee for Animal Recording (ICAR) to issue manufacturer codes to manufacturers, who wish through ICAR testing and submission for ICAR procedural approval, to demonstrate that their transponders comply with the standards.

ICAR will also be conducting laboratory tests for ISO standard compliance and to ensure that performance and procedures are within agreed standards. ICAR RFID test approvals will be issued for devices which meet the performance standards specified in the ICAR RFID test approvals specification.

ICAR will check on any complaints, and will randomly inspect transponders sold by any ICAR approved manufacturer. ICAR approval is subject to the manufacturer agreeing to guarantee that all transponders supplied by them will have the ISO defined unalterable and unique code numbers.

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Where there is no National agreement or regulation on the use of RFIDs in a particular application in a country, the manufacturer code must be used in the place of the country code.

#### 4.2. Performance

ICAR, has member organisations in over 50 countries, currently recording over 50 million animals. ICAR member organisations agree that once devices have ICAR test approval, the devices can be used in "official animal recording schemes".

There are obvious differences in performance due to differing types of transponders. For example, small transponders such as 12 mm glass rods cannot be read at as great a distance as those with large antennas such as plastic ear tags.

However, for transponders of each particular type there will also be variations in performance due to differing design. The most important variable is the antenna size and configuration, which determines the amount of energy captured by the transponder to operate the microchip. This in turn affects the strength of their signal transmission and hence the read distance..

ICAR will also test the field performance of ISO compliant transponders and scanners for which manufacturer numbers have been issued. The organisation conducting the ICAR FRID field test will depend on the application for which approval is being sought. For example, for companion animal device testing, FECAVA (The European companion animal veterinary association) will play a leading role. When the testing process is complete and a device has an ICAR application test approval, users can be confident that devices will be suitable for use in the applications for which they have been approved.

#### 4.3 Animal Details databases and Registries

The database provides the information required to link the RFID number to records of the animal. ICAR member organisations, companion animal organisations and others are already operating substantial databases.

Uniqueness of transponder numbering is guaranteed for those devices and manufacturers that are ICAR approved.

#### 4.4 Authentication

Some consumers have expressed concerns as to whether manufacturer's claims of ISO compliance are valid. ICAR will examine products submitted by manufacturers to ensure that they comply with ISO 11784 and 11785. Products that comply will be issued with an ICAR "application test approval" certificate. The Codes are allocated to manufacturers to enable them to produce devices and readers which can be submitted for approval testing. The allocation of a manufacturers code does not mean that a device has an ICAR "approval".

#### 4.5 Why Use ISO Compliant and ICAR tested Products?

The ISO standards and ICAR tests will provide assurance that animals identified with an "approved transponder" will be recognised by an "approved" scanner, anywhere, anytime.

There are obvious implications for, companion animal recovery, international livestock trade, commerce, residue management and disease control. Regulators will insist that only "approved devices and readers" can be used for "officially identification schemes".

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#### 4.6 What Effect will Standardisation Have on Technological Developments?

Manufacturers now face a real challenge. As an increasing number of users insist on ISO products, manufacturers lose their ability to keep their existing markets closed. They now have to compete with other manufacturers on performance and price. This in turn, within the confines of the standards encourages developments which give competitive advantage through superior performance, reduced cost or some other feature attractive to users.

#### 4.7 Will Standardisation Mean Lower Costs?

Standardisation and approvals will lead to more RFIDs being used. This will reduce costs, and competition for market share in the standardised markets will reduce prices.

#### 4.8 Advanced Transponders

This is the area of major new technological development. The extra space in the message in ISO 11784 was designed to enable the development of a virtually limitless number of new types of transponders with an enormous range of potential applications. A new standard which builds on ISO 11784 & 111785 is now under discussion to facilitate this progress.

The new types of transponder will be able to carry extra pages of information and may link to other bio sensors. In future the devices may have additional pages of records, such as name and address or owner, enabling a preliminary identification without the need to access a database.

#### 4.9 Is the World Changing to ISO?

Yes. There seems no doubt that ISO is coming, but while most countries are committed to the adoption of ISO some are taking their time to make the transition.

Companion animals dominate the RFID market in most countries and so are the first animals to face the need to convert. Commonly expressed concerns are lack of ISO reader network and non-conforming installed bases. There are few instances of compulsory RFID, but even amongst those countries that have formally endorsed ISO, only a few are implanting ISO transponders en masse at the present time. The stimulus for widespread implantation in Europe is the implementation of the policy for free movement of animals within the EU and the need for ID for rabies control. In Europe, the sale of non-ISO transponders for companion animals has effectively stopped and there are EU wide plans to require companion animals crossing EU internal and external borders to be ISO compliant RFID device identified.

In the livestock industries at present there is less "official" use of RFID. A lot of testing and trialing is being done much of it under EU grant aided trials. While an early start to "official ISO compliant RFID application" has been made in Australia, there is not likely be massive usage of ISO product in the EU until the completion of current field trials.

#### ICAR Identity Device update

Table 1 below shows the manufacturer codes allocated by the ICAR identification working group to date.

#### **Manufacturer Code Product code Technology Usage Description**

Destron 985001 FDX-B Inject cylindrical, glass encapsulated 2.1\*12.5mm

Destron 985002 FDX-B Tag disk like shape with shaft, black, 28.5\*1.7\*10.5mm

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Destron 985003 FDX-B Inject cylindric glass encapsulated 3.1\*20.6mm  
Destron 985004 FDX-B Tag rectangular shape with shaft, yellow 38.0\*31.5\*1.3mm

Nedap 984001 FDX-B Tag conical shape, red, 22\*12mm

Texas Instruments 983001 HDX Tag button like shape, 29\*13mm  
Texas Instruments 983002 HDX Injec cylindric glass encapsulated, 3.9\*31.5mm

Allflex 982001 HDX Tag button like shape, 29\*13mm  
Allflex 982002 FDX-B Inject cylindric glass encapsulated, 2.1\*11.1mm

Datamars 981001 FDX-B Inject cylindric, glass encapsulated 2.1\*13.3mm

Diehl-Ident 980001 FDX-B Tag attachment disk like shape, center hole, black, 30\*1.6mm

Earlsmere I.D. 979 979001 FDX-B Tag attachment disk like shape, dark blue, 30\*2.0mm

Ordicam 978 978001 FDX-B Tag attachment disk like shape, white, 28 (50) \*1.7mm

Avid 977001 FDX-B Bolus cylindric, ceramic, white, 20\*74mm cylindric glass encapsulated,  
Avid 977002 FDX-B Inject 2.1\*15mm

Gemplus 976 976001 FDX-B Tag disk like shape with tab, yellow, 38\*6mm, 61mm including tab

Sokymat 975 975001 FDX-B Inject cylindric, glass encapsulated 2.1\*13.5mm

Impro 974 974001 FDX-B Bolus cylindric, plastic, grey, 25\*104mm

Fugihira 973 973001 FDX-B Tag plastic tag, yellow, 2.5\*60, 80mm including tab

Planet ID 972 972001 FDX-B Inject cylindric, glass encapsulated, 2.2\*12.5mm

Note. The allocation of a manufacturers code does not indicate the RFID device is ICAR approved.

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#### Request

Please let me know - as soon as possible - what you would like to be covered in future issues of the Newsletter and also the names and addresses of other people who you feel should receive it.

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