

MILITARY COMMITTEE LAND STANDARDIZATION BOARD (MCLSB)

3 November 2010

NSA(ARMY)1155(2010)AST/2233

MCLSB

STANAG 2233 AST (EDITION 3) - NATO CONSIGNMENT AND ASSET TRACKING BY RADIO-FREQUENCY IDENTIFICATION

References:

- A. NSA(ARMY)0286(2007)AST/2233 dated 27 March 2007 (Edition 2)
- B. NSA(ARMY)1116(2009)AST/2233 dated 19 October 2009 (Edition 3) (Ratification Draft 1)

1. The enclosed NATO Standardization Agreement, which has been ratified by nations as reflected in the NATO Standardization Document Database (NSDD), is promulgated herewith.
2. The references listed above are to be destroyed in accordance with local document destruction procedures.

ACTION BY NATIONAL STAFFS

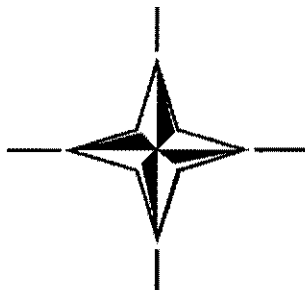
3. National staffs are requested to examine their ratification status of the STANAG and, if they have not already done so, advise the MCLSB NSA, through their national delegation as appropriate of their intention regarding its ratification and implementation.

Declassified for release to the public
in accordance with C-M(2002)60.
Reference of decision for release:
NSA(ARMY)0815(2010)1/AST
Dated 22 July 2010


Cihangir AKSIT, TUR Civ
Director, NATO Standardization Agency

Enclosure:
STANAG 2233 AST (Edition 3)

NORTH ATLANTIC TREATY ORGANIZATION
(NATO)



NATO STANDARDIZATION AGENCY
(NSA)

STANDARDIZATION AGREEMENT
(STANAG)

SUBJECT: NATO CONSIGNMENT AND ASSET TRACKING BY RADIO-FREQUENCY IDENTIFICATION

Promulgated on 3 November 2010

A handwritten signature in black ink, appearing to read 'Cihangir AKSIT'. The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Cihangir AKSIT, TUR Civ
Director, NATO Standardization Agency

RECORD OF AMENDMENTS

No.	Reference/date of amendment	Date entered	Signature

EXPLANATORY NOTES

AGREEMENT

1. This STANAG is promulgated by the Director NATO Standardization Agency under the authority vested in him by the NATO Standardization Organisation Charter.
2. No departure may be made from the agreement without informing the tasking authority in the form of a reservation. Nations may propose changes at any time to the tasking authority where they will be processed in the same manner as the original agreement.
3. Ratifying nations have agreed that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purposes of identification.

RATIFICATION, IMPLEMENTATION AND RESERVATIONS

4. Ratification, implementation and reservation details are available on request or through the NSA websites (internet <http://nsa.nato.int>; NATO Secure WAN <http://nsa.hq.nato.int>).

FEEDBACK

5. Any comments concerning this publication should be directed to NATO/NSA – Bvd Leopold III - 1110 Brussels - Belgium.

NATO STANDARDIZATION AGREEMENT
(STANAG)

NATO CONSIGNMENT AND ASSET TRACKING BY RADIO-FREQUENCY
IDENTIFICATION

- Annexes: A. RFID System Requirements
 B. Miscellaneous Considerations
 C. Listing of Tag Data Routing Codes for NATO and PfP Countries

Related Documents:

AAP-6	NATO Glossary of Terms and Definitions (English and French)
STANAG 1059	Letter Code for Geographical Entities
STANAG 2183	NATO Consignment Tracking Communication and Security Requirements
STANAG 2185	NATO ASSET TRACKING ELECTRONIC DATA INTERCHANGE (EDI)
STANAG 2494	NATO Asset Tracking Shipping Label and Associated Symbolologies
STANAG 2495	Data Formats for Asset Tracking Technology
STANAG 4281	NATO Standard Marking for Shipment and Storage
STANAG 2345	Evaluation and Control of Personnel Exposure to Radio Frequency Fields – 3kHz to 300GHz
ISO 9735	Electronic data interchange for administration, commerce and transport (EDIFACT) -- Application level syntax rules
ISO/IEC 15418	Information technology -- Automatic identification and data capture techniques -- GS1 Application Identifiers and ASC MH10 Data Identifiers and maintenance
ISO/IEC 15434	Information technology -- Automatic identification and data capture techniques -- Syntax for high-capacity ADC media
ISO/IEC 15961	Information technology -- Radio frequency identification (RFID) for item management -- Data protocol: application interface
ISO/IEC 15962	Information technology -- Radio frequency identification (RFID) for item management -- Data protocol: data encoding rules and logical memory functions
ISO/IEC 15963	Information technology -- Radio frequency identification for item management -- Unique identification for RF tags
ISO/IEC 19762	Information technology -- Automatic identification and data capture (AIDC) techniques -- Harmonized vocabulary
ISO/IEC 18000-3	Information technology -- Radio frequency identification for item management -- Part 3: Parameters for air interface communications at 13,56 MHz
ISO/IEC 18000-6C	Information technology -- Radio frequency identification for item management -- Part 6: Parameters for air interface communications at 860 MHz to 960 MHz
ISO/IEC 18000-7	Information technology -- Radio frequency identification for item

	management -- Part 7: Parameters for active air interface communications at 433 MHz
ISO/IEC TR 24729-1	Information technology -- Radio frequency identification for item management -- Implementation guidelines -- Part 1: RFID-enabled labels and packaging supporting ISO/IEC 18000-6C
ISO/IEC TR 24729-2	Information technology -- Radio frequency identification for item management -- Implementation guidelines -- Part 2: Recycling and RFID tags
ISO/IEC TR 24729-3	Information technology -- Radio frequency identification for item management -- Implementation guidelines -- Part 3: Implementation and operation of UHF RFID Interrogator systems in logistics applications
ISO 3166-1	Codes pour la représentation des noms de pays et de leurs subdivisions – Partie 1 : Codes de pays
Recommandation ERC/REC/70-03	relative à l'utilisation des appareils de faible portée (SRD)
ETSI EN 302 208	Electromagnetic compatibility and Radio spectrum Matters (ERM) - Radio Frequency Identification Equipment operating in the band 865 MHz to 868 MHz with power levels up to 2 W
ETSI EN 300 330-2	Electromagnetic compatibility and Radio spectrum Matters (ERM) - Short Range Devices (SRD) - Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz - Part 2: Harmonized EN covering the essential requirements under article 3.2 of the R&TTE Directive
ETSI EN 300 440	Electromagnetic compatibility and Radio spectrum Matters (ERM) - Short range devices - Radio equipment to be used in the 1 GHz to 40 GHz frequency range
ETSI EN 300 220	Electromagnetic compatibility and Radio spectrum Matters (ERM) - Short Range Devices (SRD) - Radio equipment to be used in the 25 MHz to 1000 MHz frequency range with power levels ranging up to 500 mW - Part 1: Technical characteristics and test methods
Directive 94/9/CE	Appareils et systèmes de protection destinés à être utilisés en atmosphère explosible
FCC Part 15	Federal Communications Commission Rules and Regulations

AIM

1. The purpose of this agreement is to achieve Radio-Frequency Identification (RFID) interoperability to support consignment and asset tracking within NATO.

SCOPE

2. The scope of this STANAG is limited to the use of RFID capabilities to support consignment and asset tracking and applies to NATO Operations. Nations (including NATO Agencies) are encouraged to utilize the provisions of this STANAG internally. This STANAG excludes radio frequency data communications and the application of Radio Frequency (RF) tracking using satellite tracking capabilities and Real Time Locating Systems. This STANAG is in addition to the requirements of STANAGs 2494 and 4281.

AGREEMENT

3. Participating nations agree to implement the procedures for passive and/or active RFID as described in this STANAG when introducing an RFID consignment and asset tracking system.

DEFINITIONS

4. Terms and definitions used for the purpose of this agreement are defined in AAP-6, and ISO/IEC 19762.

GENERAL PRINCIPLES

5. The principles followed in this STANAG and which will apply to subsequent amendments and supplements are as follows:

- a. Subject to overriding operational considerations, the RFID media should be the same in peacetime as in time of conflict.
- b. The RFID media should comply, insofar as practicable, with commercial requirements when it meets military needs.
- c. This STANAG deals with the unique identification of a consignment or asset using RFID.
- d. Each RFID tag shall have a Unique tag ID. This tag ID shall conform to ISO/IEC 15963. For active RFID Tags it shall be possible to identify the tag ownership from the Tag Data Routing Code (TDRC) found in the broadcast message response format (ISO/IEC 18000-7).
 - a. The format of the TDRC for active RFID tags shall be in the K plus a two alpha character code format as shown in Annex C, e.g. Kxx. Nations shall register their Kxx character codes with the Nederlands Normalisatie-Instituut (NEN). For registration procedures, see Annex C.
- e. Information systems receiving, storing or processing TDRCs should be capable of handling the varying length commercial TDRCs described in ISO/IEC 18000-7.
- f. Each active high capacity RFID tag shall contain the Serial Shipping Container Code (SSCC) of the consignment when available.
- g. Other transmission of data of distinct national interest is permitted insofar as it does not detract from the clarity of this minimum data.
- h. Data message protocols for exchange of information between nations shall conform to STANAG 2185.

- i. All active tag data shall be identified and structured in accordance with ANS MH10.8.2 and GS1 General Specifications (to which ISO/IEC 15418 refers) and ISO/IEC 15434. Passive tag data formats should conform to ISO/IEC 15961 and ISO/IEC 15962 and the specific implementing application of these standards (e.g. EPC Tag Data Standard Version 1.3 or later).
- j. The air interface protocols between the interrogators and tags shall be in accordance with ISO/IEC 18000 series for the specified operating frequency as shown in Table 1.
- k. RF transmission, power levels, duty cycles, channel width and separation (if applicable) will have to be approved by the host nation in which the equipment is to be used.
- l. In peacetime and whenever practical in times of conflict, users of active RFID devices shall ensure compliance with National and International air safety regulations, including Airworthiness Certifications, controlling or limiting radio transmission when air carriage is involved.

DETAILS OF THE AGREEMENT

- 6. Details of the agreement are described in the Annexes as follows:
 - a. Annex A describes the system attributes that NATO requires to satisfy the requirements of this STANAG.
 - b. Annex B describes those requirements and cautions not included in Annex A.

IMPLEMENTATION OF THE AGREEMENT

- 7. This STANAG is implemented when the necessary orders/instructions to adopt the methods described in this agreement have been issued to the forces concerned.

RFID SYSTEM REQUIREMENTS

GENERAL

1. This agreement is designed to be used in conjunction with STANAG 2495.
2. The mandatory qualifier standards and associated formats are as follows:
 - a. ASC MH10 Data Identifiers (DIs) and GS1 Application Identifiers (AIs) in accordance with STANAG 2495 and ISO/IEC 15418 shall be used in conjunction with data formats in the high capacity active RFID tags. The authoritative reference for DIs is ANS MH10.8.2. The authoritative reference for AIs is the GS1 General Specifications.
 - b. The message syntax in accordance with STANAG 2495 and ISO/IEC 15434 shall be used in conjunction with data formats and syntax in the high capacity active RFID tags. Message syntax for passive tags shall be in accordance with ISO/IEC 15962. ISO/IEC 15961 can be used to convert/translate the bit oriented data to and from traditional STANAG 2495 and ISO/IEC 15434 data format structures. Additionally, use of EPC Tag Data Standard Version 1.3 or later, simplifies the use of GS1 data structures found in STANAG 2495.
 - c. Air interface standards shall be in accordance with ISO/IEC 18000, Part 3 Mode 3 (Passive), ISO/IEC 18000, Part 6C (Passive) and ISO/IEC 18000, Part 7 (Active).
 - d. Frequency and RF power requirements shall be agreed upon between the user and the host nation(s) before installations are initiated. Properties such as bandwidth, data transmission rates, duty cycle and frequency deviation are examples of additional considerations. These requirements can be found in the host nation's radio regulations e.g. FCC Part 15, ETSI EN 300 220.
 - e. Asset tracking messages shall be in accordance with STANAG 2185.
 - f. RFID systems (tags and interrogators) shall conform to all safety and regulatory requirements of the host nation and operating nation. These include but are not limited to:
 - (1) The limits of human exposure as defined in NATO STANAG 2345.
 - (2) The limits for exposure to fuels and fuel vapours are as defined in EC 94/9.
 - (3) RFID tags and interrogators shall comply with ERC Rec. 70-03, ETSI EN 300 330-2 V1.1.1, EC 94/9; ETSI EN 302 208; ETSI EN 300 220 and ETSI EN 300 440 as appropriate.
3. Those implementing this agreement are encouraged to become familiar with the

following ISO Technical Reports:

- a. ISO/IEC TR 24729-1 Information technology - Radio frequency identification for item management - Implementation guidelines - Part 1: RFID -enabled labels and packaging supporting ISO/IEC 18000-66.
 - b. ISO/IEC TR 24729-2 Information technology - Radio frequency identification for item management - Implementation guidelines - Part 2: Recycling and RFID tags.
 - c. ISO/IEC TR 24729-3 Information technology - Radio frequency identification for item management - Implementation guidelines - Part 3: Implementation and operation of UHF RFID interrogator systems in logistics applications.
4. It is the intent that RFID should be used in harmony with other Automatic Identification Technology (AIT), specifically linear bar code and 2D symbols.
5. Considering the key NATO Asset Tracking applications, the ISO references are:
- a. In-transit container tracking – ISO/IEC 18000-7.
 - b. Shipping and receiving applications – ISO/IEC 18000-6 (Type C) for packages and boxes of product; ISO/IEC 18000-7 for freight containers. Either technology is applicable for returnable transport items.
 - c. Container park management – ISO/IEC 18000-7.
 - d. Individual high value asset tracking – ISO/IEC 18000-6 (Type C).
 - e. Individual asset tracking – ISO/IEC 18000-3 (Mode 3) or ISO/IEC 18000-6 (Type C).

Uses and applications of RFID technology are listed below in Table 1:

Table 1
Matching Application Requirements to Technology (Capability)

Application	Parameter	Value	RFID Technology
In-transit container tracking	Distance / Speed	$\geq 10 \text{ m} / \leq 20 \text{ kph}$	ISO/IEC 18000-7
Shipping and receiving (Packages, Parcels)	Distance / Tags in Field of View (FoV)	$\leq 5 \text{ m} / 100 \text{ tags}$	ISO/IEC 18000-6C
Shipping and receiving (Freight containers)	Distance / Tags in FoV	$\leq 5 \text{ m} / 100 \text{ tags}$	ISO/IEC 18000-7
Shipping and receiving (Returnable transport item)	Distance / Tags in FoV	$\leq 5 \text{ m} / 100 \text{ tags}$	ISO/IEC 18000-6C or ISO/IEC 18000-7
Container park management	Distance / Tags in FoV	$\leq 100 \text{ m} / 100 \text{ tags}$	ISO/IEC 18000-7
Asset Management – product tagging	Distance / Tags in FoV	$\leq 0.5 \text{ m} / 500 \text{ tags}$ $\leq 5 \text{ m} / 500 \text{ tags}$	18000-3 Mode 3 ISO/IEC 18000-6C

"Requirements for each system may or may not be identical and the values are for guidance only. The distances and number of tags in the field of view may vary by application."

MISCELLANEOUS CONSIDERATIONS

1. **RF SITE SURVEYS.** Site surveys for RF coverage by fixed interrogators may be required:

a. When the area to be covered is large:

Large areas are those areas that cannot be effectively covered by one omni-directional antenna. Large areas may not be able to be covered by a single interrogator. This may be due to the size or shape of the area. Examples of areas that may cause a problem because of shape would include “L”-shaped areas and long narrow piers.

b. When directional coverage is necessary:

Directional coverage is often desired in a choke point scenario where coverage is desired in only one direction and RF signals might be minimized in directions where containers may be stored or RF interference may occur. In some cases the RF power level of the interrogator is reduced so that only nearby containers will respond. In other cases, devices, such as proximity detectors, may be used to trigger the interrogators, thereby transmitting only when a container is in the field of view.

c. When materiel, terrain, or other obstacles interfere with the RF field:

A site survey should be accomplished if there is any possibility that buildings, equipment, or containers may affect tag readability in the field of view, i.e. blocked field of view. It should also be noted that the human body may affect readability if a person is standing in the immediate vicinity of the tag. Another scenario within this category is when tags of interest are inside a totally enclosed metal trailer. In such cases the tags may be unreadable from interrogators located alongside or over the roadway.

d. Where other RF devices may be present:

Other RF generation devices such as mobile radios, wireless local area networks, alarm systems, radio microphones, wireless audio, amateur broadcasting, radio location devices, sealing machines, and other machinery may emit RF signals that may unintentionally interfere with RFID devices. A site survey will enable potential users to identify the amount, type, and source of potentially interfering emissions.

e. Where explosive ordnance and or fuels may be present:

Installation of RFID equipment where fuel and or ordnance may be present must be subject to a site survey to ensure adherence to all relevant safety regulations.

2. **ACTIVE TAG MAINTENANCE AND RETURN POLICY.** The owner of active RFID tag is responsible for the inventory, maintenance and battery replacement of the tag. Active tags will be returned to the owner of the tags at the owner's expense as soon as possible following the completion of the shipment. To avoid unintended interrogations and extend battery life, the batteries of these tags shall be reversed or disabled in accordance with the manufacturer's instruction. Nations are encouraged to use external labels and or logos to assist in identifying ownership and return of tags.

TAG DATA ROUTING CODES FOR NATO AND PFP COUNTRIES

Country	K plus Two Code
Albania	KAL
Armenia	KAM
Austria	KAT
Azerbaijan	KAZ
Belarus	KBY
Belgium	KBE
Bosnia and Herzegovina	KBA
Bulgaria	KBG
Canada	KCA
Croatia	KHR
Czech Republic	KCZ
Denmark	KDK
Estonia	KEE
Finland	KFI
France	KFR
Georgia	KGE
Germany	KDE
Greece	KGR
Hungary	KHU
Iceland	KIS
Ireland	KIE
Italy	KIT
Kazakhstan	KKZ
Kyrgyzstan Republic	KKG
Latvia	KLK
Lithuania	KLT
Luxembourg	KLU
The Former Yugoslav Republic of Macedonia ¹	KFY
Malta	KMT
Moldavia	KMD
Montenegro	KME
Netherlands	KNL
Norway	KNO
Poland	KPL
Portugal	KPT
Romania	KRO
Russian Federation	KRU

¹ Turkey recognizes the Republic of Macedonia with its constitutional name.

Serbia	KRS
Slovakia	KSK
Slovenia	KSI
Spain	KES
Sweden	KSE
Switzerland	KCH
Tajikistan	KTJ
Turkey	KTR
Turkmenistan	KTM
Ukraine	KUA
United Kingdom	KGB
United States	KUS
Uzbekistan	KUZ
NATO	KXM

Registration procedures: Nations shall register their use of the Tag Data Routing Code with the ISO registration Authority NEN.

Registration forms are available from the NEN at:
Nederlands Normalisatie-Instituut
P.O. Box 5059
2600 GB, Delft
The Netherlands

and on the web at WWW.NEN.NL