AIDC Standards Report 2017

Automatic Identification & Data Capture

Report on the cross-industry and transnational standardization of the application of Barcode, RFID & related data communication for automatic identification and traceability up to the "Internet of Things"

Fig. 1) The participants of the Stockholm meetings have been delegated from all over the world.

Flags of member Nations of ISO/IEC/JTC 1/SC 31 (partial selection)

Australia	Austria	Belgium	China	Canada	Switzerland	Germany	Finland	France
Japan	Singapore	S. Africa	S.Korea	Sweden	NL	Russia	UK	USA

.. and contributing organizations like

AIM	**CEN TC225**	**NATO**	**EDC**	**ETSI**	**GS1**	**IATA**	**HIBC**	**ISO TC122**	**ISO SC17**	**ITU**	**UPU**

and other contributors and liaisons such as JTC1/SWG10, IEEE, etc.

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chair DIN NIA 043-01-31 AIDC
in cooperation with AIM, DIN, EDIFICE, EHIBCC and liaisons

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AIDC Standards Report 2017

This report is intended to supply information on further developments of AIDC technologies and applications. The report is focusing on the 23nd ISO/IEC JTC 1/ SC 31 plenary meeting in Stockholm (Sweden), but will include highlights of AIDC activities as subject of other standardization efforts and actual application developments in industries, e.g. Healthcare, Rail, Automotive, etc.

Note: Page number in parentheses (..)

Liaisons of industries and healthcare:

AIM DACH – AIM Germany, Austria, Switzerland, www.AIM-d.de
DIN NA 043-01-31 – Normalization Institute Germany, www.din.de
EDIFICE – Electronic Industries, Europe, USA, Asia, www.edifice.org
EHIBCC – European Health Industry Business Communication Council, www.ehibcc.com
E.D.C. - Eurodata Council Stichting, The Netherlands, www.EurodataCouncil.org
IFA – IFA-Informationsstelle für Arzneimittel, http://www.ifaffm.de/de/ifa-coding-system
JTCH AIDC – Joined Technical Committee Healthcare, www.hibc.de, www.vddi.de

Logos of cooperation partners and contributors for the standardization activities:

Fig. 2) ISO emblem, source www.iso.org/home.html

AIDC - Automatic Identification and Data Capture standards development

Already in the 70th it was experienced that computing is fine, but if data are to be captured from material and processes manual entry causes errors spoiling the data and database contents. But Barcode would have solved this problem. David C. Allais developed Code 39 (3 of 9) 1974 for encoding alphanumeric data but it took a time to establish the methods of automatic data capture techniques on a global basis. One reason was the absence of internationally accepted standards. The consortium of manufacturers of AutoID equipment "AIM" took the initiative in the 80th to issue "Uniform Symbol Descriptions (USD), e.g. USD-1 for the Barcode Interleaved Two of Five (I 2/5) and USD-3 for Code 39 in 1981. Specific user communities as Automotive industries implemented Barcode specs in own area like AIAG-Symbol Specification B1 for Code 39, the "Uniform Product Code Council-UCC" adopted UPC in 1984, the later EAN Code . National Standardization Institutes like ANSI took over the specifications for symbols like Code 39 but also for data syntax with Data Identifiers like ANSI/FACT-1 in 1991. But the international link was still missing. The European Standardization Institute CEN took the initiative 1992 to bring best practices in European shape in order to publish European standards as references valid according to European law. E.g. Code 39 became European Norm EN 800 and Data Identifiers became EN 1571. This indicated an enormous increase of interest in AutoID surely due to increase of international trade. Many organizations supported the internationalization of AIDC standards like EDIFICE (Electronic Industries, the EAN Community (now GS1), ODETTE (Automotive), EHIBCC (Healthcare) and many others. But only European companies would refer to ENs and it became obvious that international trade would require international standardization. Consequently a AIDC committee was established under the umbrella of ISO/IEC/ JTC 1 responsible for it. ISO/IEC JTC 1/SC 31 was established for international standardization of AIDC in 1996. After migration of the EN standards with ANSI and others on the ISO level the CEN TC 225 members recognized the advantages of the decisions being done, AIDC standards became available world wide. Consequently the work was concentrated to the ISO level reducing the European work to projects with European relevance only. E.g. the European Union was asking for a European Norm for the RFID Emblem in conjunction with the RFID & Privacy regulations. For this purpose CEN TC 225 converted the ISO/IEC Emblem into EN to supply a European reference and available in 3 European languages. Regularly AIDC standards intended for experts can remain as ISO standard printed in English only. Now 2017 ISO/IEC SC 31 is supplying all necessary standards for AIDC media like Barcode, OCR and RFID, Quality test specifications for it as for data syntax and structures. After having celebrated the 20 years anniversary of SC31 at the 2016 Plenary meeting in Sapporo, the committee still shows development (see: https://jtc1historyblog.wordpress.com/sc-31/). At the Stockholm meeting 2017 a new working group "AIDC Applications" has been established. This committee has been set up to deliver capacity for servicing all user areas seeking for support of development of AIDC Application standards for their specific area. For them SC 31 can supply the expertise for Automatic Identification and Data Capture techniques because SC 31 supplied the modules for it already. The next SC 31 Plenary meeting will take place June 2018 in Chicago. Dan Kimball is retiring 2017 and the new Chair of SC 31 will be Henri Barthel as successor of Dan Kimball, nominated and announced at the JTC 1 meeting in Wladiwostok Oct. 2017.

AIDC as a strategic module

In 1992, 25 years ago, Pieter de Meijer and Lucas Schouten wrote the book titled "NO Barcode, NO BUSINESS". In fact this becomes even more true nowadays. No parcel without Barcode, no food or non food product, no electronic component and in future no medical device without. Even the marketing and advertisement departments discovered that QR Code is good for the business. Ministries recognized that AIDC is indispensable for tracking and tracing products, e.g. in the health care supply chain. Manufactures will be out of business, if they would not fulfill the requirements to supply automatic readable data with the products. In 2017 the European Parliament decided that any manufacturer of medical devices and In-Vitro-Diagnostica has to apply a unique Barcode and RFID as an option to any product for traceability reasons where ever it has been produced. The US Parliament did this 3 years before: No Barcode no Business according to law.

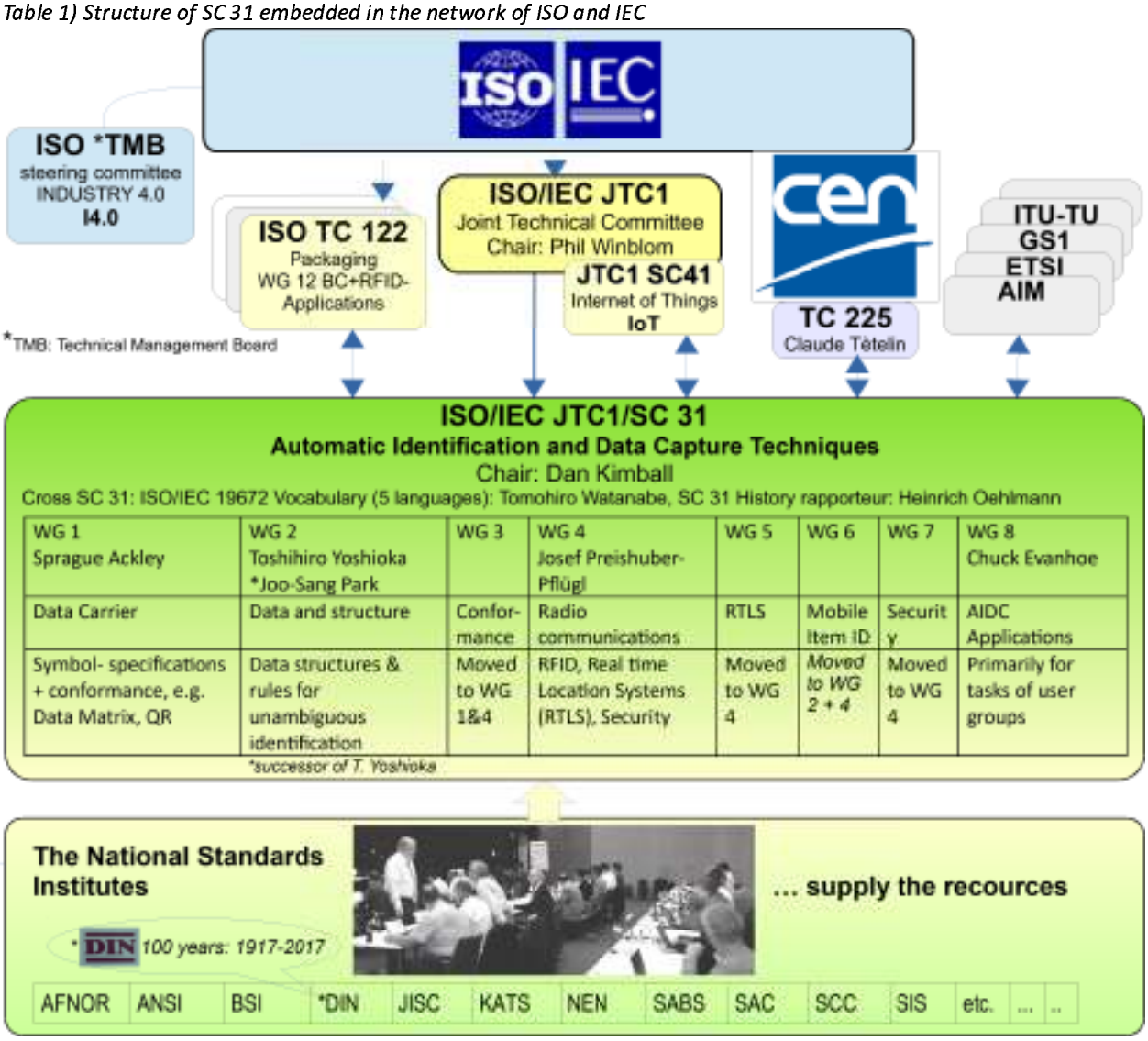
The technology and the tools for it are delivered by ISO/IEC JTC 1/SC 31 like the basic tool for unique identification "ISO/IEC 15459" setting the hierarchical structure for unique item codes. Not everywhere legal requirements dictate Barcode or RFID but without it companies missing any AIDC strategy yet get difficulties to compete with other companies that have and use such a strategy. It is a fact, that consequent application of AIDC will avoid errors, ease quality control, enhance processing time and servicing the whole supply chain. Of course implementation of AIDC in the different segments of production lines, supply chains and even at the point of use of the coded products require specific expertise, and reading of all the different AIDC standards is not really something for the management. Guidance can be found from

specific organizations. E.g. DIN just completed a guideline "AIDC supported Traceability (DIN SPEC 16599). It includes future aspects for realization today, the link from a product code to the Internet of Things (IoT). Where regular Barcode according to base standards becomes a prerequisite for entering in continuing existence in certain markets, innovative and strategic oriented ideas for extended use of AIDC are increasing competitiveness. Examples are the integration of the mentioned product link to IoT or DataMatrix on delivery notes called "PaperEDI" offering capture of shipment content data by "one scan only" at the point of goods entry. Implementing security for item codes and its authentication is one more strategic aspect how to use AIDC for more than one purpose, e.g. by help of ISO/IEC 20248 Digital Signature. The Author and team will be more than happy for any question of strategic use of AIDC in specific areas.

The structure of ISO/IEC JTC 1/SC 31 - National, European and International Standards connect the world

The National Standardization Institutes built International Working Groups for the different areas of interest. ISO/IEC JTC 1/SC 31 was set up to cover AIDC. SC 31 is bound to the structure of the Joint Technical Committee of ISO and IEC. Table 1 illustrates how SC 31 is embedded within the network of standardization efforts.

Table 1) Structure of SC 31 embedded in the network of ISO and IEC



The power of the work of the ISO/IEC JTC 1/Sub Committee 31 is the expertise and experience of the National Standardization Institutes supplying the resources. E.g. the **National Institute DIN celebrates the 100 years anniversary** this year (1922 - DIN paper format standards, today - hightech). SC 31 has got the responsibility for AIDC by the ISO/IEC Joint Technical Committee JTC1. SC 31 has to process new work items (NWI) on request of the members and is responsible for the maintenance of the published standards. Any task, any new work item is to be agreed by the National Institutes by voting first prior to start the standardization process. For the procedures the general ISO rules apply. Approval of the new work item now requires a 2/3 majority of P-members instead of simple majority before 2017. Agreed new work items will be handed over to the appropriate working group. The work passes different stages where any stage gets an indicator: Proposal stage (10), Preparatory stage (20), Committee stage (30), Enquiry stage (40) for the "Draft International Standard (DIS), Approval stage (50) and finally the Publication stage (60).

The results of the work have to pass voting with majority of 2/3 of the P-members in stage 40/50. The SC 31 cooperates with other committees for sharing interest and expertise and to avoid duplication of work. Table 1) illustrates some links to other organizations such as AIM, CEN TC 225, ETSI, GS1, ISO TC 122, SC 41, etc.
This year, CEN TC 225 and the ISO/IEC JTC 1/SC 31 and WG meetings have been hosted at the Swedish Standards Institute (SIS) in Stockholm City and by ERICSSON AB in Kista, north of Stockholm.


Fig. 3) SIS-Elg as key

CEN TC 225 Plenary meeting at SIS in Cooperation with ISO/IEC JTC 1/SC 31
The CEN TC 225 Plenary showed a maximum of cooperation with the liaison partner SC 31. The TC 225 chairman Claude Tètelin had invited the SC 31 members to join the CEN meeting taking place for this purpose in Stockholm as well and hosted by the Swedish Standards Institute SIS.


Fig. 4) CEN TC 225 experts meet SC 31 experts at SIS in Stockholm

One issue of cooperation between CEN TC 225 and SC 31 was to coordinate the work item **"EN°17071 Electronic Identification Plate**" with the new work item proposal (NWIP) for the SC 31/WG 8 for a **Standard for Electronic Labeling** (NP-ISO/IEC 22603). Both projects include similarities concerning the AIDC parts and it was discussed that the most efficient way of getting non-conflicting specifications would be, if the editor of the EN 17071 Rainer Schrundner (Ident-One) would become Co-Editor of the potential SC 31 project editor Gary Schrempp (see chapter "New SC31 working group for AIDC applications"). This principle was welcomed by both sides. EN 17071 already includes item identification for assets and IoT capability. Link from equipment to information in the Web is a requirement for the NP Electronic labeling as well like access to related compliance markings and documentation.
Other projects specific to Europe only have been presented like the projects "Fish Box Labels" and "RFID for RAIL"

Fig. 5) Label for Fish & Seafood Boxes

The **project for Fish Boxes** is titled "EN WI 225083 Fish and fish products - requirements for labelling of distribution units and pallets in the trade of seafood products". This standard specifies design requirements for labels to be used on distribution units and pallets for seafood products, ensuring a uniform label design that will facilitate the flow of information on the products and on their production along the value chain, including traceability information using text and machine readable codes in the form of bar codes. The intention of the initiators under the lead of Norway is it to deliver a common base for fulfilling the European regulations EU 404 for enabling traceability of Seafood. May be this is to prevent strict regulations for the use of AIDC by the EC like shown with the Medical Device Regulation (MDR). CEN TC 225/WG 4 under the lead of Rainer Schrundner took the responsibility to deliver the adequate European Norm (see also box "New ASC Data Identifiers).

Fig. 6) RFID emblem

EN-Project "RFID for Rail"

The demand for a "RFID for Rail" standard has been raised by Railway operators to get a common solution for identifying rail assets uniquely within Europe. This will help for proactive maintenance, e.g. when ball bearings run hot or wheels are out of round, and help to trace and find vehicles lost somewhere in Europe. The project **CEN TC 225 WI°2250825 RFID for RAIL** is targeting to use RFID Tags compatible to ISO/IEC 18000-63 UHF and ISO/IEC 15418 (EN 1571) ASC Data Identifiers and GS1 Application Identifiers. The convener of CEN TC225 WG4 Rainer Schrundner has applied for a specific "Application Family Identifier (AFI)", which got assigned for RFID in Rail applications to differentiate between other RFID applications like Road Vehicle ID. In agreement the AFI maintenance committee of ISO/IEC JTC1/WG 4 reserved the AFI for RFID in Rail at June 2, 2017 for registration within the timeline of the EN.

Note: The application family identifier (AFI) is used as a mechanism to preselect tags across the air interface, minimizing the extent of communication transaction time with tags that do not carry the relevant AFI code, e.g. to filter products packages, containers, vehicles, etc. from each other. RFID Application Identifiers (AFI) are listed in ISO/IEC 15961 DATA CONSTRUCTS REGISTER (Part 2: Registration of RFID data constructs, Part 3: RFID data constructs). The responsibility for the registration will be handed over from the WG 4 RFID Data Constructs Steering committee to AIM-Global as soon the administrative settlement has been finalized by the ISO Secretariat in Geneva.

Fig. 7) ISO flag, source ISO Geneva

ISO/IEC JTC 1/SC 31 WG meetings and Plenary

The SC 31 Working Group (WG) meetings for WG2, WG 4, WG 8 and SC 31 Plenary took place between June 13 to June 16, 2017. Between the meetings there was time for discussions and exchanges on AIDC matters but also for general communication between the delegates for better understanding different positions for finding consensus. Not anything can be discussed by a phone conference as effective like at a face to face meeting sitting together closely.

Fig. 8) Toshihiro Yoshioka and Kazuo Kobashi

The WG 2 meeting on AIDC data structures
was chaired by the convener Toshihiro Yoshioka (Yoshioka-san) assisted by Kazuo Kobashi.

It was the last last meeting of "Yoshioka-san" prior to retirement. His successor will be Joo-Sang Park (Korea). "Yoshioka-san" looks back to a successful leadership of WG2 responsible for the data structure part of AIDC. Key standards are dedicated to WG 2 like ISO/IEC 15459 Unique Identification setting the base for unambiguous identification (see Annex 2), ISO/IEC 15434 Syntax for High Capacity Media and ISO/IEC 29161 Unique identification for the Internet of Things. Where security features for RFID are dedicated to WG 4 general security aspects for data are subject of WG 2, like ISO/IEC 20248.

The editor of the project **ISO/IEC 20248 Digital Signature Meta structure (DigSig)** Bertus Pretorius (Australia) was able to report on the finalization of the "Draft Internatioal Standard (DIS)" status ready for voting. He was able to manage the development in the set time frame with support from many other AIDC experts being interested in it. Implementing security for AIDC media gets more and more interest in application areas where protection mechanism are an issue like in case of links between a code to IoT or in fully automated M2M applications. For purposes of preventing criminal misuses DigSig allows code and data verification via App and/or Internet (see Annex 1).
Note: Voting closed 2017-07-05 with 100% approval.

ISO/IEC 15434 Syntax for High Capacity Media discussion how to ease AIDC implementation
by formatting AIDC syntax for **keyboard compatibility.**
AIDC data structures are special, shall be secure but should also have options for easy implementation. A proposal was brought into "WG 2 Data & Structure" for a simplified syntax of ISO/IEC 15434 by the DIN representative Rainer Schrundner to enable high capacity symbol scans to pass keyboard interfaces. The presentation led to controversial

discussions about interfacing scanners to a system and how to simplify data transmission from scanners through keyboard interfaces. ISO/IEC 15434 defines the structure in which data are encoded in high capacity media using a unique Start/Stop sequence and Format Indicators, like "04" for structured data using UN/EDIFACT Segments, Format Indicator "06" for ASC DI structure, "09" for Binary data, etc. The issue is that ISO/IEC 15434 syntax includes control characters not being available as keys on keyboards therefore they don't pass such interfaces. Such control characters are e.g. the "Group Separator" <gs> and the "End of Text" character <eot>. Originated by CEN TC 225 in 1995 the structure was set for computer interfaces processing full ASCII data streams but not expecting that keyboard interfaces will ever be used for high volume data streams. But times change and hardware too. Today standard scanners can be connected to high speed keyboard interfaces like through "Universal Serial Bus (USB)". Unfortunately for transmission of ISO/IEC 15434 data streams some specific set up or scanner programming is necessary for passing the message through such keyboard interfaces. Specifically for the most used format "06" of the syntax, e.g. in conjunction with ISO/IEC 16022 Data Matrix, the DIN 66403 based proposal would enable data transmission through any keyboard interface without any special scanner configuration. The idea seems easy to substitute the start sequence which includes control characters like <rs> and <gs> by a "." (dot) and the data element separator <gs> by a "^"(circumflex). In the year 2006 DIN adopted the French solution already to define the "." as System Identifier (SI) for the ASC DI system. The good acceptance and field experience (true sample see Annex 4) "Method to ease AIDC applications") led to the rising demand for a solution where anybody could benefit from. This caused DIN to put the idea on the ISO level. The DIN committee completed the solution by adding the simple character <^> for the function as separator. After a thorough discussion it was concluded that ISO/IEC 15434 would not be the right host for such a simplification because of the fear that any exception from the given formats would confuse the scope of the standard. But the fruitful discussion opened ideas in synergy how to manage the intention of a keyboard compatible syntax. A present member of the Data Identifier Maintenance Committee (DIMC) suggested to develop a new standard document for such a proposed "Keyboard compatible syntax". In this case it could be referenced by "System Identifier" within ISO/IEC 15418, part ANSI MH 10.8.2 like system identifiers listed already in the DI column as Data Identifiers like "+" for HIBC, "&" or "=" for ISBT 128 and "FNC 1" for the GS1 system. Already the "dot" has been defined as system identifier by DIN 66403:2006. The WG members supplied valuable input for options as a global solution where ever codes shall be set for keyboard compatibility in a unique way (see chapter "Method to ease AIDC applications").

NEW ISO/IEC 15418 ASC Data Identifiers (DIs)

ISO/IEC 15418 ASC Data Identifier Maintenance Committee (DIMC) under lead of chairman Bill Hoffman, HOFFMAN SYSTEMS for the responsible Material Handling Institute (MHI) has got a number of applications for registering new ASC Data Identiefers required for expanding the usage of ASC DIs. Some of the ASC DIs having be add to the list:

30B Packaging Item Number for the packaging material
31B Global Unique Packaging Number.
30B and 31B is for identifying the packaging item used when packing products and packages
25D Best before date: (YYYYMMDD), e.g.25D20170202
12E Packing material and 13E Moister Sensitivity Level
5I Unique production vehicle identifier
52P Color of an item
27Q to 31Q for monetary values, discounts tax
5R Data in the format and symantic of a responsible party identified by a ISO/IEC 15459 CIN
6R Digital-Signature for AIDC according ISO/IEC 20248
23V Government-assigned Value Added Tax identification number identifying supplier, starting with an ISO 3166-1 alpha-2 country code, followed by the government-assigned VAT number
24V same as 23V but number identifying customer

and on CEN TC225 request
a number of seafood branch related ASC DIs, like fishing area codes, aquatic species codes, Vessel/farm ID, harvest dates, production method, etc.

The complete set of DIs is listed in the document ANS MH10.8.2 ASC Data Identifiers and GS1 Application Identifiers", hosted by the Material Handling Institute (MHI) Charlotte, NC, USA The link to the list is:
http://www.mhi.org/standards/di

The 43rd WG 4 meeting on RFID

where about 50 delegates attended has been chaired by the convener Josef Preishuber-Pflügl. Obviously RFID is still an emerging technology for item and supply chain management. A Market analysis from the AIM Global associate "RAIN RFID Alliance" shows that the UHF Tag IC market grew from 5.8B chips in 2015 to 10.3B chips in 2016. Surely WG 4 contributed to it by the RFID standards enabling the growth.
The ambitious agenda of WG 4 included 25 RFID work items and 17 systematic reviews of RFID standards to be discussed. The 16 editors of the individual RFID standards have been asked to report on the success of the ongoing work. Where Barcode standards are established since a long time, RFID has to catch up specifically in terms of interoperability and hybrid solutions for backing up one technology with the other.

Fig. 9) Meetings can be hard work

Application standards like the Electronic Name Plate and RFID in Rail but also the guidelines of user groups as Automotive industries take the developments of the WG 4 as the common base. Security for RFID by means of cryptographic methods gets increasing interest to protect the RFID data stream. This is visible by the increasing numbers of work items. ISO/IEC 29167, Part 1 is setting the base for different security features for RFID. The standard defines the architecture for security services for the ISO/IEC 18000 RFID air interfaces standards defining various security features called Crypto Suites as security mechanism that can be implemented by a tag depending on the application. Each Crypto Suite is getting an

individual ISO/IEC 29167-x part. Today the WG 4 is processing Crypto Suite "RAMON" as part -19, Crypto Suite "Algebraic Eraser" as part 20, Crypto Suite "SIMON" as part 21 and part 22 Crypto Suite SPECK. A RFID tag may support one or a selection of application related Crypto Suites. The names of the suites reference to the algorithm used for the encryption telling the experts what it is about. We have to trust the experts for recommendations which mechanism to implement for the application demanding security. For public information some Standing Documents (SD-x) are under work to bring more transparency into the area: SD-1 „New Work Item Proposal Crypto Suite Evaluation Criteria", SD-2 „Crypto Suite Framework ", SD-3 „Template for new ISO/IEC 29167 cryto suites", SD-4 "Information technology —Conformance test methods for security service crypto suites —Part 1: General requirements".
Some more spots of the meeting below shall give impression about the detailed experts work on completion and maintenance RFID standards where the technological development will continue fulfilling expectations to RFID features inclusively localization by Real Time Location Systems (RTLS).

Update RFID Tag ID (TID)

Occasionally of the update of the standard for the RFID TagID, in short "TID", might be mentioned here. The TID is not in the foreground of the RFID features but it is fulfilling core functionalities of RFID Tags. The TID is a unique number burned in the RFID chip by the chip manufacturer. Where a "Unique Item Identifier (UII)" for an RFID tagged item can be changed, a Tag ID cannot. The standard for the RFID Tag ID ISO/IEC 15963 Unique identification for RF tags is currently subject to update by adding a part 2 "Unique identification of RFID tags – Registration procedures. According to the rules of part 2 chip manufactures get an assigned "IC manufacturer registration number" registered in a public registry. The Tag ID contains this registered number plus the serial number of the chip assigned by the chip manufacturer.
The TID has a key functionality for RFID Tags and can be used

- for the traceability of the integrated circuit itself for quality control in its manufacturing process,
- for the traceability of the RF tag during its manufacturing process and along its lifetime,
- for the completion of the reading in a multi-antenna configuration,
- for the anti-collision mechanism
- for authentication reference
- and optionally for the traceability of the Item to which the RF tag is attached if no UII is used.

AIM Global has applied to become the Registration Authority for the RFID chip manufacturer.

The WG4 **RFID data constructs steering committee** reported about moving the maintenance for the RFID Application Family Identifiers (AFI) to AIM Global (see note under "RFID for Rail") and confirmed the assignment of the latest AFI for RFID for Rail applications.
Further meeting spots for mentioning among the detailed work on bits and bytes:
Not every project passes as quickly as expected. Specifically the delegates of China urged to accelerate processing the update of ISO/IEC FDIS 18000-4 RFID Air Interface 2.4GHz where administrative obstacles are to be handled. The ball was taken by finding the reason by a "Future Use" reference for a class allocation of TIDs in ISO/IEC 15963 where the class should be used for ISO/IEC 18000-4. A solution for speeding up the process was found by resolution for a quick technical corrigendum.
ISO/IEC FDIS 15961- RFID for item management: Data protocol --Part 2: Registration of RFID data constructs and Part 3 RFID data constructs are still pending due to the assignation process for AIM Global as Registration Authority (RA) for it.

New SC31 working group for AIDC application standards The SC 31 technology based cross application AIDC platform was not set to be the host for development of specific application related projects yet. But application standards with SC 31 modules have been processed by other ISO TCs like by ISO TC 122 Packaging. Under their scope of Standardization in the field of packaging and with regards of marking packages TC 122 produced the standards for AIDC application across all logistical levels *(see Fig. 9 Layer 0 to 4: ISO 15394, 22742, 28219 for Barcode, ISO 1736x for RFID)*. SC 31 resolution 19 - Consideration of a new work group related to the application of AIDC standards (ISO/IEC JTC 1/SC 31/WG 8) of the Sapporo Plenary 2016 initiated preparation of the new WG already. In Stockholm the kick-off meeting took place supported by more than 20 interested experts and establishment of

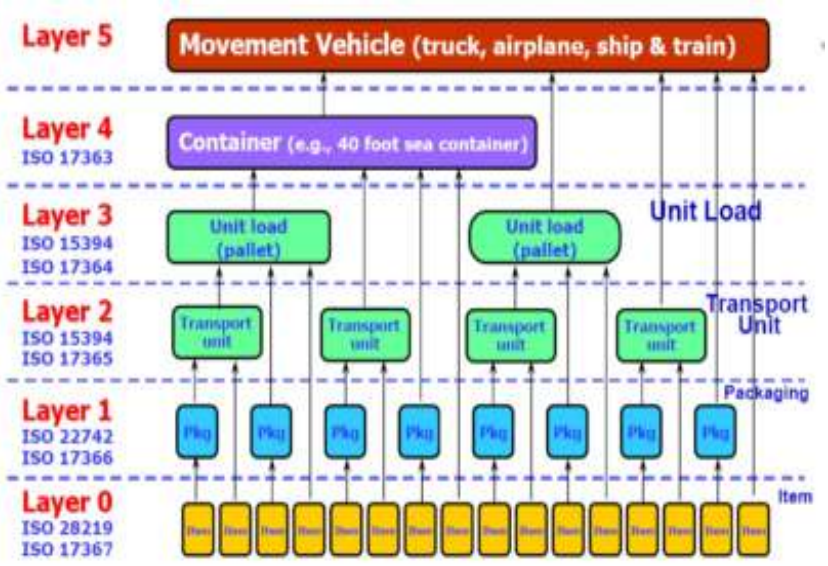


Fig. 10) ISO standards AIDC for the logistical levels of supply chains

the new group as WG°8. Due to the fact that most members of TC 122 WG for AIDC applications are members of SC 31 as well, the group is highly interested in getting transferred the responsibility for maintenance of the standards shown in Fig. 9). This would ease updating those standards in line with the updates of the base standards of SC 31.
Meanwhile user groups from other fields are asking for sharing the expertise with SC 31 for their purposes like the representative from the Computer Association CASCO, Gary Schrempp (DELL), did recently by request through the national body ANSI. DELL is using the term "Quick Resource Locator (QRL)" for a solution how to use QR-Code to access equipment information from the DELL portal intending to extend the solution for the purpose of access to compliance information. DELL is looking for a common solution jointly with colleges of the electronic industries. The kick off for the WG8 was successful, Chuck Evanhoe has been named as the convener for WG 8 to be confirmed by the plenary meeting (which happened). The request from DELL through CASCO/ANSII became the first work item **NP ISO/IEC 22603 Standard for Electronic Labeling.** The purpose of the Electronic System is to provide electronic access to product's conformity assessment marks and statements as an alternative to having such information on the product using traditional methods such as via nameplate or product label. Since AIDC elements and Internet access is contained in preEN 17071 Electronic Identification Plate already (see chapter CEN TC 225) cooperation with TC 225 was agreed as appropriate.
The editor of the EN Rainer Schrundner declared prepared to act as a co-editor for the nominated project editor Gary Schrempp as the link to the work of the preEN 17071. Best case the AIDC features of the EN will complete the "e-label" requirements of the ISO/IEC NP. Where the new work item proposal is just including an URL in a QR Code the preEN includes a Unique Item code and an optional URL already. To get a complete picture of marking electronic equipment it also will be worthwhile to take a look to IEC 62090:2017 Product package labels for electronic components using bar code and two-dimensional symbologies. It contains item identification and an annex "URL" as well but intended for packages. A look to ISO 28219 Labelling and direct product marking with linear bar code and two-dimensional symbols will be appropriate as well. By help of the expertise of the experts involved, the WG 8 will have the chance to produce a standard for electronic labeling by taking use of existing AIDC modules considering compatibility and interoperability with given labeling practices and avoiding overlapping. Since the standard is for optimizing labeling by avoiding an overload of conformance compliance signets on an equipment label the optimum would be to minimize to one 2D symbol also featuring both unique identification and access to the compliance signets for electronic display in one. A module how to achieve it might be the "Pointer to Process (P2P)" Data Identifier used for the Electronic Identification Plate (see chapter: Quick link to IoT for items by "P2P").

Fig. 11) QRL-Quick Resource Locator linking to DELL infos

Developments of Data Carrier under responsibility of convener Sprague Ackley, WG 1
The convenor of WG1 Data Carrier reported on the recently published standards ISO/IEC 30116:2017 OCR-B print quality and ISO/IEC 15416 Linear bar code quality, edition 2 and on highlights of the current work. He mentioned progress of the initiative of China, the Han Xin Code (ISO/IEC 20830), the conversion of DPM quality guideline from the Technical Report (ISO/IEC TR 29158) to a regular standard and on the progress of DMRE (ISO/IEC 21471) in process. The last WG 1 meeting has been hosted by REA ELECTRONIC, Germany in March, the next meeting will take place Oct. 2017 hosted by Honeywell, Seattle. One topic is the completion of the rectangular formats of DMRE by additional formats supporting wide spread applications. Table 2) will show an excerpt of available DMRE formats.

Rectangular Data Matrix Extension "DMRE" becoming ISO/IEC 21471.
DMRE will give DataMatrix applications more capacity to carry more data on smaller or rounded items and flexibility of designing codes fitting to given surfaces. Meanwhile the solution attracted even more user groups than expected and WG 1 will propose additional rectangular formats as originally foreseen.
Table 2) Four of the Rectangular Data Matrix Extension formats and its size/capacity relation

	Size Capacity n/an	mm x mm X=10mil/ 0,25mm	Sample content generic
1	8x48 36/25	2 x 12mm	123456789012345678901234567890123456
2	8X64 48/34	2 x 16mm	1234567890123456789012345678901234567890123456789012345678
3	12 x 64 86/63	3 x 16mm	1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456
4	16 x 64 124/91	4 x 16mm	1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234
			For more formats see: http://www.eurodatacouncil.org/de/dmre

Fig 12) DMRE on a small metal device carrying tracking data (source: ELMICRON)

Fig 13) DMRE on a medical device carrying UDI-Health Industry Bar Code – HIBC (source: Sprague Ackley, Honeywell)

The new rectangular formats will help to solve many marking problems where in the past the size of a symbol did not fit

to the surface like to medical devices. The final set of sizes and its capacities will be defined at the WG1 October meeting. Until DMRE will be published as ISO/IEC 21471 DMRE can be explored by help of the given standards AIM-Symbol Specification DMRE and DIN 16587 DMRE which have been published already. Printing tools are available "open source" downloadable from the E.D.C. page (click the DMRE sample Fig 11, 12). Any application can take use of DMRE to solve small surface marking problems in industry and healthcare like for medical instruments marking to meet the requirements for traceability.

Other developments not having been submitted to WG 1 yet but with potential for the future work are the two 3-dimensional codes Ultracode, developed by Clive Hohberger with AIM-Global and JAB-Code (Just Another Barcode), developed by the Federal Office for Information Security, Bonn, Germany for high data volume security applications. Both use color as the 3rd dimension increasing the capacity of a code reasonably. It will be interesting to get pictures from practical applications for comparing the relation between size and data volume. Fig. 13) just shows samples how the codes look like.

Fig. 14) From black and white to color: Data Matrix, Ultracode and JAB-Code (Click the symbols for more information)

Internet of Things

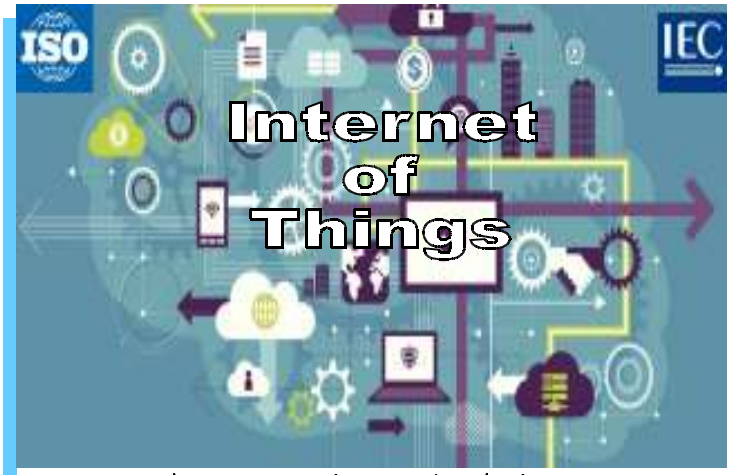


Fig. 15) Coverpage IoT charts Sangkeun/Tenhagen, SC 41

has got a new home under ISO/IEC JTC 1

IoT has been defined by ISO/IEC CD 20924 "- *an infrastructure of interconnected objects, people, systems and information resources together with intelligent services to allow them to process information of the physical and the virtual world and react.*" In fact work on this would require much more expertise then AIDC. IoT was handled by different groups in the past but JTC 1 found the time ripe to coordinate the work by one group. This was the birth of ISO/IEC JTC 1/SC 41 Internet of Things and related technologies. The Secretariat has got the KATS - Korean Agency for Technology and Standards, secretary is Ms. Jooran Lee, elected Chairperson is Dr. François Coallier, ETS, Montreal, Canada. Professor Coallier has been active with the JTC 1 working group on Smart Cities already and is the vice-chair of the Canadian committee on international IT standardization. Under his lead the scope has been described short but precise: **SCOPE of SC 41** - *Standardization in the area of Internet of Things and related technologies Serve as the focus and proponent for JTC 1's standardization programme on the Internet of Things and related technologies, including Sensor Networks and Wearables technologies. Provide guidance to JTC 1, IEC, ISO and other entities developing Internet of Things related applications.*

The scope would include IoT for consumers, smart home solution as industrial applications. As synonyms for industrial IoT terms are used like Industry 4.0, Machine to Machine communication (M2M) and Smart Factory already.

The first Plenary meeting of SC 41 took place 2017-05-28 to 2017- 06-02 in Seoul, Republic of Korea. By resolution the 3 WG started the activities on IoT Arcitecture, IoT Interoperability and IoT Applications.

Many other groups will communicate with SC 41 by liaison. SC 31 will supply the modules for automatic identification but also security modules appropriate for automated cross system and "cross responsibility" processes. Such SC 31 modules are ISO/IEC 15459 Unique Identification and specifically ISO/IEC 29161 Unique identification for IoT, but also the standards for the data carriers Barcode and RFID. IoT surely requires to include security features, one module to supply it is ISO/IEC 20249 Digital Signature Meta Structure (see Annex 1) DigSig). IoT can be extremely complex but one AIDC module will enable immediate "Item to Internet" communication very easy by using the freely available "Pointer to Process (P2P)" Data Identifier solution (Fig. 15) .

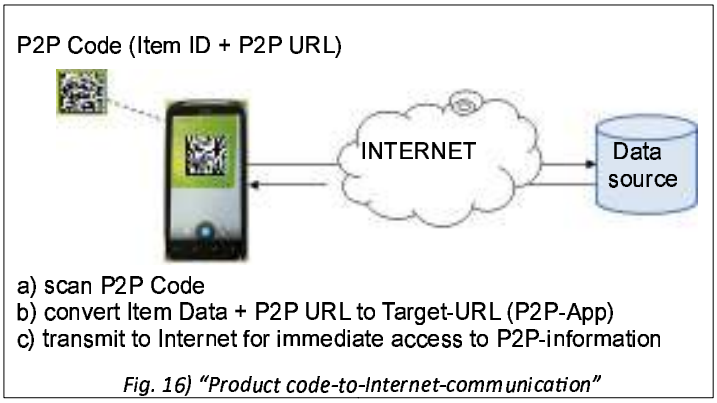


Fig. 16) "Product code-to-Internet-communication"

Quick link to IoT for items by "P2P"

Internet connection with Smart Phone by QR-Code is common practice. The fast growth of the application shows how easy it is to get access to information stored somewhere in the net just by scanning a code. But an Internet link in a QR does not allow unique identification nor tracking & tracing nor secured functionality. The Joint AIDC Experts Group of Industries and Healthcare took the initiative to develop a "light IoT" system not by replacing a unique item code by a URL (as done in regular QR) but by combining item data with a portal URL. That URL will allow "pointing to a process" for immediate internet response dedicated to a specific item. (Fig. 15) The response can enable automatic access to Material Safety Data Sheets (MSDS) to maintenance instructions and it could even link to a dialog for a specific process like maintenance.

On request the ASC DI Maintenance Committee (DIMC) registered two ISO/IEC 15418 ASC DIs for this purpose, the URL DI "33L" just for adding a URL to an **Unique Item code (UID)** and as second the **Pointer to Process (P2P) D**I "34L". DI "34L" includes a process after scanning for generating a "Target URL" out of the item data and the connected P2P URL. The after scan generated URL will point to the intended process e. g. linking straight to information e. g. dedicated to a specific serial number of a product. This precisely dedicated URL can open a specific dialog or simply can open access to specific documents. Already the P2P solution has been adopted by DIN 66277 Electronic Name Plate completing the 2d + RFID hybrid solution with a link to Internet sources for object relevant information, maintenance docs., etc. IEC TC 91 adopted it with IEC 62090, Edition 2.0. for access to product related documents.

For more comprehensive information to *DIN SPEC 16589 see:*
http://www.din.de/de/mitwirken/normenausschuesse/nia/projekte/wdc-proj:din21:246254368

What happens in specific areas of AIDC applications

e.g. in Healthcare

Fig. 17) UDI-Code in ISO/IEC 16022 Data Matrix

European Regulation following US by requirement for marking Medical Devices and In-vitro-Diagnostica mandatory by UDI.

UDI stands for Unique Device Identifier, a unique Barcode and optional RFID on the product and/or package and its mirrored master data accessible by Internet publicly. In fact this looks like and innovative move fitting nicely in the scope of IoT.

Since the development of the Healthcare Bar Code (HIBC) in 1984 sets a milestone of product traceability it took a while until Barcode became general means in that area like in many other areas of industries and distribution where data had to be captured quick and safely. In fact, specifically for Healthcare the regulators discovered that AIDC will increase patient safety and logistical accuracy and acted accordingly under the pressure of the parliaments. Accordingly the International Medical Device Regulators Forum (IMDRF) with members like Food and Drug Administration (FDA) of the US, the European Commission of the EU and many other national members around the globe started the global project UNIQUE DEVICE IDENTIFICATION (UDI). UDI includes AIDC for unique product marking/labeling and of corresponding data in central data bases. UDI was put to law in the US in 2013 already where FDA became the executive arm for controlling it. Any Medical Device entering in the US market is subject of the legal requirements to mark medical devices with Barcode. Compliance dates began Sept. 24, 2014 for Medical Devices of category Class III *(for more information see www.fda.gov/UDI or www.hibc.de/de/udi.html).*

The project passed the European Parliament April 2017 and the European Commission is preparing the implementation in detail right now. The compliance dates begin 2020 with UDI for Class III Devices 2021. UDI becomes mandatory for any other Medical Device an In-vitro-Diagnostica according the compliance schedule of the MDR and IvDR.

The change from previous practices is, that unique marking/labeling by AIDC is not a voluntary matter anymore but became a legal requirement (see also Annex 5 "UDI Book").

The European regulation for medicinal products moved a step further, it requires serialized ISO/IEC 16022 Data Matrix and data bases for it.

Fig. 18) Pharma Product Number (PPN) carried by DIN 16587 DMRE

The regulation for medicinal products has been processed slightly faster than the European UDI project. The COMMISSION DELEGATED REGULATION (EU) 2016/161 was released October 2. 2015. It includes the marking of product packages uniquely by serialized ISO/IEC 16022 Data Matrix but also a system for linking Pharmacies to a database automatically for verification check of the Serial Number (SN). In addition it includes safety features for recognizing opening the package (tamper proof). This are means against counterfeiting but serialization is also a means for improving logistics and handling the medicinal products in pharmacies as well as in hospitals. Nationally recognized support organizations adjust their systems according to the new regulations like the German national system has been adjusted from the previous "PZN" to the "Pharma Product Number-PPN" (see Fig. 17 PPN encoded in DMRE). The unique "IFA-Coding-System" is providing capacity for any other national drug identification system in the world inviting other nations to join *(see* http://www.ifaffm.de/en/ifa-codingsystem.html*).*

ANNEX 1) Application example ISO/IEC 20248 Digital Signature for Item Management

"Verification of item data values by associated DigSig"

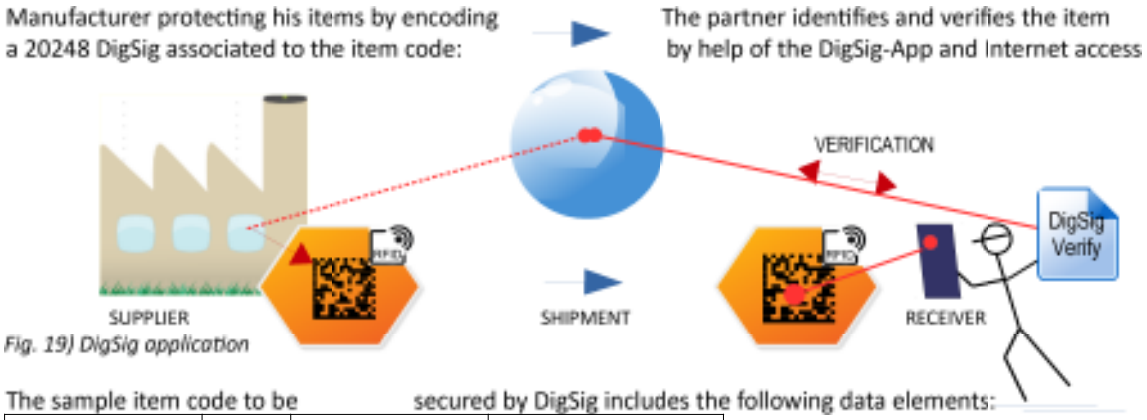


Fig. 19) DigSig application

The sample item code to be secured by DigSig includes the following data elements:

Data	*ASC DI*	*Item data value*	*ASC data element*
Unique SN (UID)	25S	QCTRUE123456	25SQCTRUE123456
Product reference	1P	MOT25X	1PMOT25X
production date	16D	2017-07-20	16D20170720

→ For securing the item data above the DigSig for it will be generated by the labeler and applied with the ASC Data Identifier "6R -ISO/IEC 20248 digital signature data construct":

ASC DI and DigSig	6R	*https://v1.20248.info/?wJgJlkAByOEAEZiABcUOiUS-CcR7en-awDzEaTiV4-kxodnqQZvEdjBZbwRV*

The "DigSig data element" will be add to the item data for building the protected code. The data will effectively encoded in a 2d-symbol like Data Matrix or RFID using ISO/IEC 15434 Syntax for High Capacity Media. The the start sequence is [)><$^{R}_{S}$>06<$^{G}_{S}$>, the separator is <$^{G}_{S}$> and the stop sequence is <$^{R}_{S}$><^{E}o $_{T}$>

Encoded in Data Matrix the Item Code + DigSig will result in a code size of 40x40modules / X0,25mm=10x10mm

[)><$^{R}_{S}$>06<$^{G}_{S}$>25SQCTRUE123456<$^{G}_{S}$>1PMOT25X<$^{G}_{S}$>16D20170720<$^{G}_{S}$>
6Rhttps://v1.20248.info/?wJgJlkAByOEAEZiABcUOiUS-CcR7en-awDzEaTiV4-kxodnqQZvEdjBZbwRV<$^{R}_{S}$><^{E}o $_{T}$>
Note: The Start/Stop sequence is substituted by a single Data Matrix control character <Macro 06> and RFID offers a compact feature as well.

Fig. 20) ISO/IEC 16022 with DigSig protected Item Code

Scanning the symbol the scanner will supply an equal data string.

→ For transmission the data to the DigSig Verifier in the Internet the string will be converted slightly by moving the "6R DigSig" to the front voiding the ASC DI "6R", without 15434 syntax and separator <$^{G}_{S}$> substituted by the character "~" (tilde). Having done this, the string is ready to be transmitted for verification:
https://v1.20248.info/?wJgJlkAByOEAEZiABcUOiUS-CcR7en-awDzEaTiV4-kxodnqQZvEdjBZbwRV~25SQCTRUE123456~1PMOT25X~16D20170720

Alternatively Internet compatibility can be achieved by translating <$^{G}_{S}$> into RFC 1738 sequence <%1D>:
https://v1.20248.info/?wJgJlkAByOEAEZiABcUOiUS-CcR7en-awDzEaTiV4-kxodnqQZvEdjBZbwRV%1D25SQCTRUE123456%1D1PMOT25X%1D16D20170720

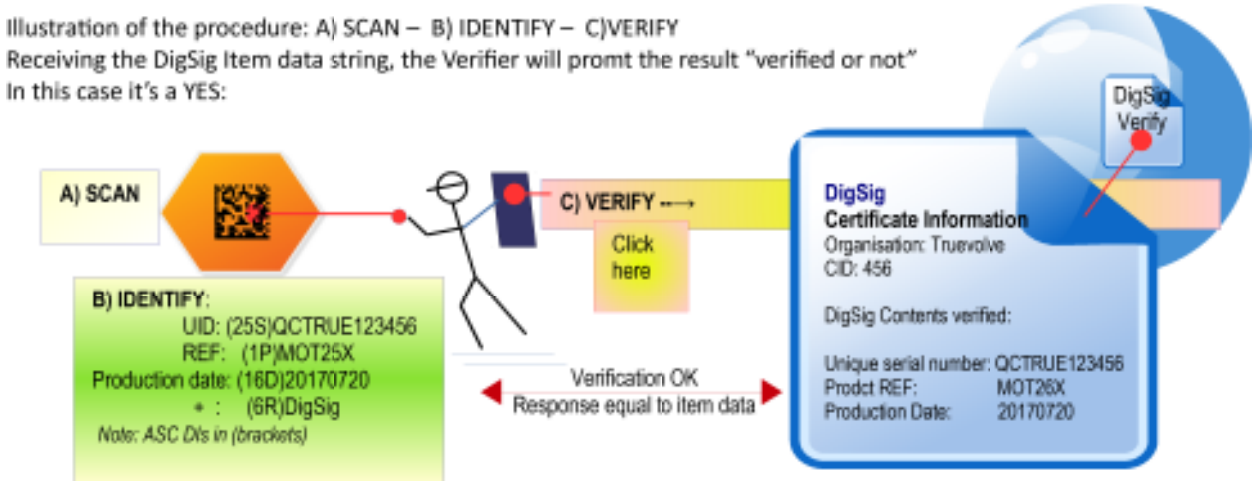


Fig. 21) Scanning and response from the DigSig Verifier

Note:
Application example by Steyn Geldenhuis, TrueVolve Technologies, SA; Bertus Pretorius, Solutions Architect, Heinrich Oehlmann, E.D.C..

Annex 2) Quick guide: Global unambiguity for items
The hierarchical A,B,C, D structure

ISO/IEC 15459 sets the commonly agreed hierarchy for generating unambiguous codes under the lead of WG 2 Data Structures (chart see Fig. 22). The hierarchy originally was adopted by ISO from CEN EN 1572 and extended for validity not only for transport units but for all levels of items. The rules are rather simple: ISO (A) accredits a Registration Authority (B) for assigning Issuing Agency Codes to interested institutions B) assigning unique Company Identification Codes (C) to users/companies (D) on request. Companies (D) having got a CIN are in the position to mark any item globally unambiguously like products, packages, transport units, containers, but also for papers, equipment, locations and even persons identified by unique wrist bands or ID Cards. What is the data element about tells the Identifier to the computer, who is responsible for the content tells the code of the Issuing Agency (IAC) plus Company ID (CIN).

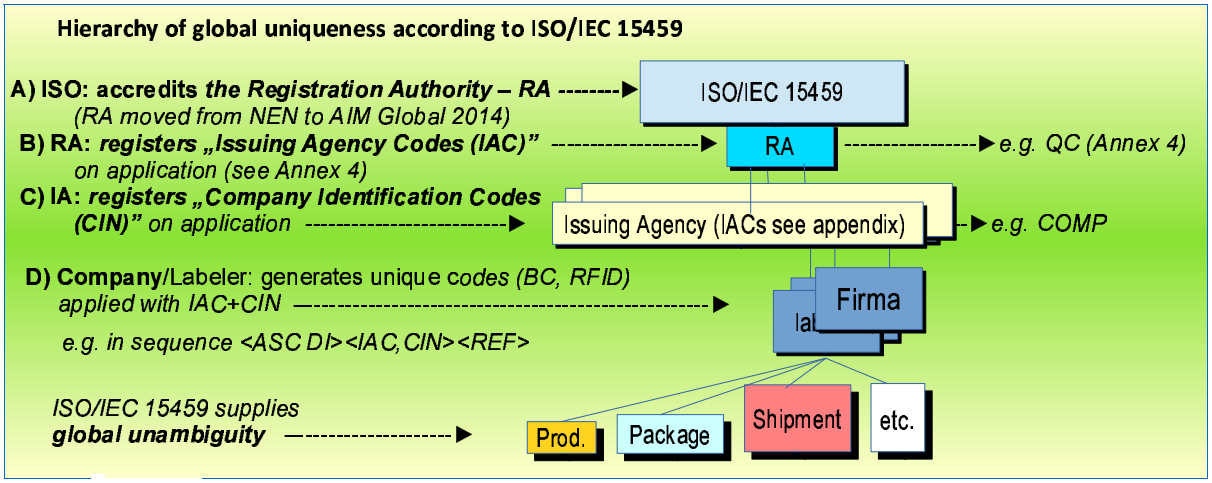


Fig. 22) Shared responsibilities for unique marking and identification

How to get to globally unambiguous product codes

The prerequisite for labeling an item unambiguously is the availability of a registered CIN from one of the Issuing Agencies. As next the characteristic of the item number to be encoded uniquely determines the syntax to be used. E. g. the ISO/IEC 15418 ASC DIs are for alphanumeric product reference used on average for 10 characters or up to 20 where the ISO/IEC 15418 GS1 Application Identifiers define a product reference as a Global Trade Item Number (GTIN) with typical 3, 4, or 5 digits max. and country related. The Health Care Bar Code system sets a max. of 18 alpha numeric characters.

Quick guide for labelers how to get a globally unique product code

e.g. for the product REF **M4215R73**:

I) Check the format of your product number (e.g. for **M4215R73**) for choosing one of the ISO/IEC 15418 formats as syntax for the code

→ a) if numeric 5 digit max – go for ISO/IEC 15418 ASC Data Identifiers or GS1 Application Identifiers or HIBC (depending of the customer areas)

→ b) if more than 5 digits or alphanumeric – go for ASC Data Identifiers including HIBC, IFA-PPN

II) Decide for the most convenient format, e.g. ASC Data Identifiers for REF **M4215R73**:

III) Decide for an Issuing Agency supporting to encode **M4215R73** by ASC DI, then

→ a) apply for a CIN, e. g. "COMP" from E.D.C. (IAC "QC")

→ b) chose the appropriate DI "25P" for the unique sequence <DI><IAC><CIN><REF>

→ c) build a sample sequence for your product reference **M4215R73**:
<25P><QC><COMP><**M4215R73**> for encoding as: 25PQCCOMP**M4215R73**

→ d) in case of a serialized product add SN 1234567 headed by DI "S": <S><1234567>
for encoding as: 25PQCCOMP**M4215R73**+S**1234567**

→ e) if required add other data elements like LOT (DI "1T", Expiry Date "D", etc) and use Syntax ISO/IEC 15434 (not illustrated with Fig. 23) for 2D symbols or RFID

IV) chose a symbology depending on data volume, available size and customer area, e.g. Code 128 (if enough place) or Data Matrix or go for RFID (Fig 23).

That's it --► 

a unique product code

Fig. 23) Uniquely serialized product code in Data Matrix and RFID

Annex 3)
Issuing Agencies support different data formats for codes

Issuing Agencies (IA) for unique Company Identification Codes (CIN) have got a key role for achieving uniquenss, they take care for that a registered Company Identification Code cannot appear twice in the world. A labeler cannot do it by himself, he has to apply for his individual CIN by one of the IA (see Annex 2). The responsible Registration Authority (RA) is listing 39 Issuing agencies in the registry version 2016-08-10, see
http://www.aimglobal.org/resource/resmgr/registration_authority/Register-IAC-Def_2016.pdf

ISO/IEC 15459-2 accredited and registered Issuing Agencies do supply not only a unique Company Identification Code (CIN) but they determine the AIDC data structure where the CIN is used as well which has effect to data elements specifically for product and transport unit codes. In consequence the choice of an Issuing Agency it is also a choice for the structure of key codes.
Table 2) shows a selection of typical Issuing Agencies of industry and healthcare areas supporting the data structures for either alpha numeric or numeric only product codes and transport codes.

Table 2) Selection of 8 of 39 Issuing Agencies, their AC's and supported data structures and data capacity

Excerpt of the ISO/IEC 15459 registry of Issuing Agencies for Company ID's (CIN) ▼	**IAC** ▼	**Length of a CIN** ▼	**Typically issued CIN, e.g.** ▼	**Support for data structure & code capacity for product and transport codes**		
				Data structure ▼	**Product code 2-20an ▼ (max. 50)**	**Transport code 2-20an ▼ (max. 35)**
Eurodata Council	QC	4an	CPRO	ASC	YES	YES
DUN Dun & Bradstreet	UN	9n	123456789	ASC	YES	YES
GS1 and EPC Global	0-9	3-7	1212345	GS1 (EPC)	3-5n	9n
EDIFICE European Electronic Industries Association	LE	3an	IBM	ASC	YES	YES
EHIBCC European Health Industries Assoc.	LH	4an	ELMI	ASC, HIBC	18	YES
ODETTE European Automotive Industry	OD	4an	A2B3	ASC	YES	YES
TELECORDIA Telecom. Equipment	LB	4an	CSCO	ASC	YES	YES
UPU Universal Postal Union, etc.	J	6an	D00001	ASC	YES	YES
..... can be completed						

The Table 2) illustrates the relation between the choice of the Issuing Agency for the Company ID and determing the data structure for alpha numeric codes for products and transport units by help of ASC DIs oer GS1AIs whereas only the Agency GS1 determines numeric reference codes for it. The table illustrates the technical selection criteria for one or the other Issuing Agency. The complete list of IACs is publicly available under the link to AIM Global above.

Note: The complete list of registered Issuing Agencies can be found at the home page of AIM Global http://www.aimglobal.org/?Reg_Authority15459

Note 2: Some regulations may accredit specific Issuing Agencies only as a choice for generating unique codes, e. g. the FDA US accredited the Issuing Agencies GS1, HIBC and ICCBBA for the Unique Device Identifier (UDI) system. In this case the code structures of that agencies apply for the application.

Annex 4)
Under scope of experts: Method to ease AIDC applications

by solving problems of data not passing Keyboard interfaces.
(explanation to WG 2 discussion page how to ease AIDC implementation.

Keyboards interfaces filter data or misinterpret data if they receive data different from the character set of the keys itself. But keyboard connection for scanners are common and state of the art. Interfacing Barcode scanners to Laptops and Computers enables high speed and high volume data transfer through USB keyboard connection. Unfortunately the syntax for high capacity media ISO/IEC 15434 has been designed for any full ASCII interface but not for interfaces with a limiting keyboard character set like keyboards. The simple reason is that at the time of the development of the syntax the keyboard interfaces have been slow according to the speed of manual key entry of a telex with e.g. 100 Bit/sec. Today USB is allowing up to Gigabits/sec. and exactly this is very attractive as an universal port to transmit data directly in fields of application windows. But not any character will pass this port properly.
Illustration of the problem:

Control characters of ISO/IEC 15434 like <$^{R}_{S}$>, <$^{G}_{S}$>, <^{E}o$_{T}$> will not pass a keyboard interface. This causes that the syntax cannot be identified properly and the data elements loosing the separator cannot be separated from each other anymore (Fig 24).

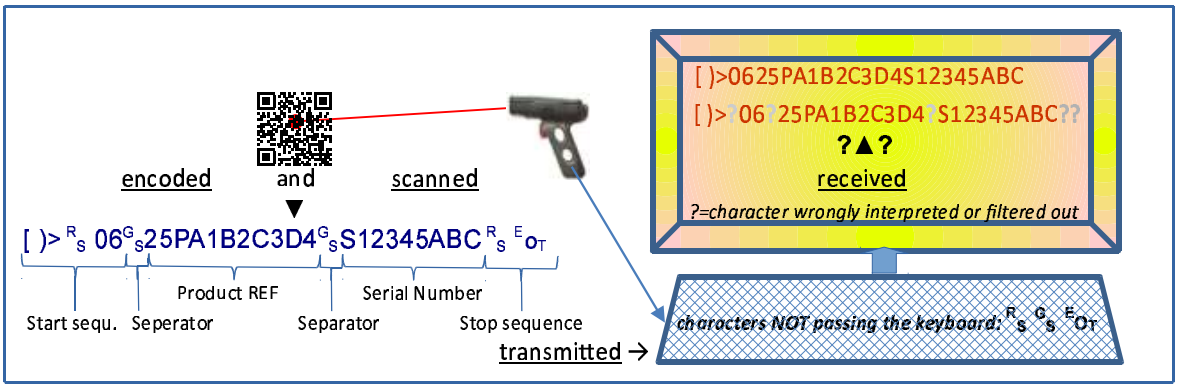


Fig. 24) Illustration ISO/IEC 15434 Format "06" unique product code data cannnot pass keyboard interfaces correctly

Assistance for the complex handling of control characters
Interface experts help by converting control characters not passing the keyboard interfaces by configuration of scanners and/or by programming interfaces or application software. But any expert has it's own method and it needs specific know how and efforts to do it properly and to repeat it while changing scanners. Configuration may differ between different scanners.

Reported experience of a smart but simple solution:
If keyboard characters are used for encoding – then any data will pass any keybord port.

This simple but smart solution is practiced already since years based on national standards with potential to become international: It is the solution based on DIN 66401:2006 System Identifier "."(dot) as start of a code string of ASC Data Identifiers. The lesson learned was that voiding special characters gets the keyboard compatibility required for "plug-in" solutions. How it works today will be shown by help of a simple sample of a patient wrist band (Fig. 25) in a hospital.

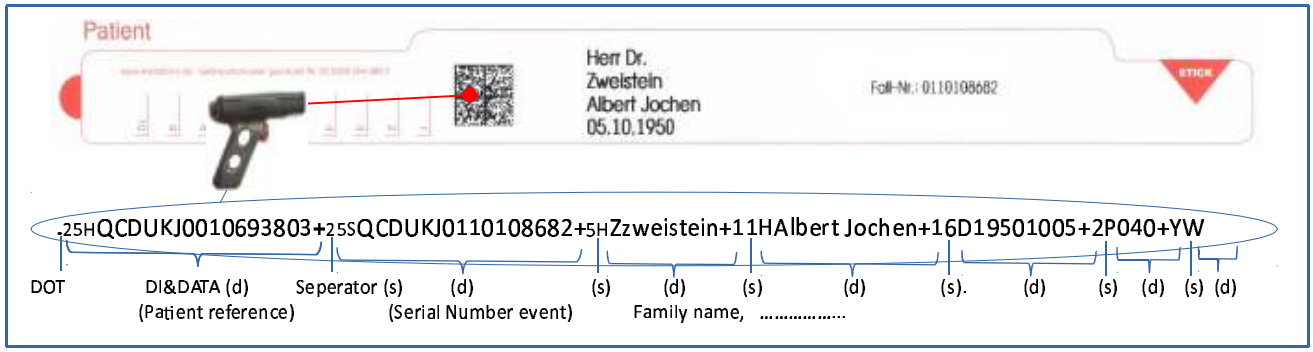


Fig. 25 Example Wrist Band uniquely coded by keyboard compatibly System ID (DOT) and Separator (PLUS).

The example Wrist Band Fig 25) is showing a true sample of a patient wrist band of the University Hospital Jena. It is using the DIN 66403 System Identifier "." (DOT)for ASC Data Identifier Syntax. As Separator the "+" (PLUS) is used. Any code generated from the system is structured accordingly, like containers for sterilization, locations codes, etc..

Concerning the "+" as separator ISO/IEC 15418-ANS MH10.8.2 is stating that the "+" is being used as separator between data elements and a "+" can appear inside specific data elements. Such data elements cannot be concatenated by using the "+" as separator. It also lists the "+" as System Identifier for the HIBC-Code (ANSI HIBC 2.6).
For optimization and avoiding conflict with data elements using a data element internal Plus "+" several proposals have been made in order to harmonize a simplified ASC DI syntax passing keyboard interfaces:
A) DOT "." as System Identifier for ASC DI syntax, as defined by DIN 66403 System Identifiers and successfully practiced. In fact an option of a two character System flag (e.g. ".^" was suggested at the WG 2 meeting in Stockholm but on the other hand single character SIs work fine like the SI "+" for the HIBC system since more then 20 years. Even for the single SI "=" for the world wide used ISBT system no problem has been reported ever.
B) Circum flex "^" as separator, a character not commonly used as text character. Another character has got the function as separator, the tilde "~" is used separating ASC DI fields within the ISO/IEC 20248 DigSig to be verified via the Internet (see chapter DigSig).
In comparison to the complex situation illustrated by Fig. 24) the solution with the "Keyboard compatible ASC DI Syntax" would care for a one to one (1:1) reception of encoded equal to transmitted data avoiding interfacing and configuration problems, see illustration by Fig. 26).

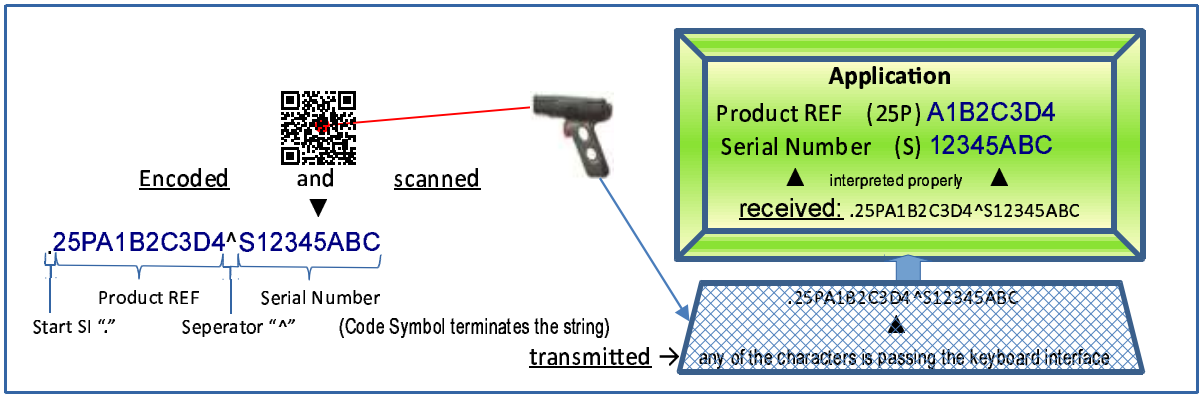


Fig. 26) Illustration how a unique product code with simplified syntax passes the keyboard interface easily

The editors of the report would be happy to get additional input to the "Keyboard compatible ASC DI Syntax". Applications would honor simplifications like suggested where off the shelf scanners can be used but expensive manpower, configurations or programming avoided. This option has the potential to reduce "generic codes" toward to "unique codes" only even for internal applications but it is not for replacing ISO/IEC 15434 Syntax for high capacity media.

Annex 5) UDI Book

Fig. 28) UDI Book, cover

Due to the importance of the healthcare projects and its relevance to the whole supply chain the DIN publishing house "BEUTH" published May 16, 2017 the book titled UNIQUE DEVICE Identification.
The date fits nicely to the publication of the Medical Device Regulation (MDR) where UDI is included. The book covers guidance for the labeler but includes guidance for the hospitals as well and having the chance to benefit from UDI to a high degree. The chance is to come to 100% Barcode for Medical Devices if UDI is implemented to 100% according to the time frame of the regulators. But UDI will surely stimulate the users to implement automatic data capture in all areas where data entry is required for error free quality controlled handling and traceability. The first edition of the UDI Book has been written in German but the original text of the regulation, the MDR dated 5th of April 2017, is available in any of the European languages accessible under the URL:
http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32017R0745

Annex 6) Selection of AIDC Standards

ISO/IEC 19762 Harmonized Vocabulary, 5 languages (+ Japanese under work))

Documents of ISO/IEC JTC 1/SC 31/WG 1 Data Carrier (ORM)

ISO/IEC 15417 Code 128
ISO/IEC 15438 PDF 417
ISO/IEC 16022 Data Matrix
ISO/IEC 18004 QR Code
ISO/IEC 15415 Bar code symbol print quality test specification-Two-dimensional symbols
ISO/IEC 15416 Bar code symbol print quality test specification-Linear symbols
ISO/IEC 16480 Reading and display of ORM by mobile devices
ISO/IEC 30116 OCR Quality Testing
ISO/IEC 21471 Extended Rectangular Data Matrix DMRE

Documents of ISO/IEC JTC 1/SC 31/WG 2 Data Structure"

ISO/IEC 15418 GS1 Application Identifiers and ASC Data Identifiers
ISO/IEC 15434 Syntax for High-Capacity ADC Media
ISO/IEC 15459 Unique Identification, Part 1 to 6
ISO/IEC 29162 Guidelines for using ADC Media (Bar code & RFID)
ISO/IEC 29161 Unique Identification for IoT
ISO/IEC FDIS 20248 Digital Signature meta structure

Documents of ISO/IEC JTC 1/SC 31/WG 4 RFID for Item Management

ISO/IEC 18000-1 REV 1 (including Battery Assistants, Sensor functions)
ISO/IEC 18000-2 AMD 1 (including Battery Assistants, Sensor functions)
ISO/IEC 18000-6, part 61 to 64, rev. 2 (incl. Battery Assistants, Sensor functions)
ISO/IEC 18000-7 REV 1 (including Battery Assistants, Sensor functions)
ISO/IEC 15963 Tag ID: applied with the list of IC manufacturer ID's
ISO/IEC 29160 RFID Emblem
ISO/IEC 24791-Part 1 to 6 Software System Infrastructure (SSI)
ISO/IEC 24753: RFID & Sensors with reference to IEEE 1451.7
ISO/IEC 15961, 15962: RFID Data protocol – Update
ISO/IEC 15961-4: Sensor commands (NP)
ISO/IEC 29172-19179 Mobile item identification and management
ISO/IEC 29143 Air Interface Specification for Mobile Interrogators

Documents of ISO/IEC JTC 1/SC 31WG 4 Security on Item Management

ISO/IEC 29167 Air Interface for file management and security services for RFID
ISO/IEC 29167 part 10-19 crypto suites with ISO/IEC 19823-X Conformance test methods

Documents of the Liaison ISO TC122/WG 10 for BC&RFID applications

ISO 22742 Linear bar code and two-dimensional symbols for product packaging
ISO 28219 Labeling and direct product marking with linear bar code and 2d- symbols
ISO 15394 Bar code and 2d- symbols for shipping, transport and receiving labels
ISO 17363 Supply chain applications of RFID – Freight containers
ISO 17364 Supply chain applications of RFID – Returnable transport items
ISO 17365 Supply chain applications of RFID – Transport units
ISO 17366 Supply chain applications of RFID – Product packaging
ISO 17367 Supply chain applications of RFID – Product tagging

DIN standards

DIN 66401 Unique Identification Mark – UIM
DIN 66403 System Identifiers
DIN 66277 Identification plate with RFID tag and/or 2D bar code
DIN 16587 DMRE - Data Matrix Rectangular Extension
DIN Spec 16589 Product to Internet communication - Pointer to Process

Other application related standards

EN 1573 Multi Industry Transport Label, http://standards.globalspec.com/std/9972808/cen-en-1573
IEC 62090 Product Package Labels for Electronic Components using Bar Code & 2-d symbologies
Global Transport Label V3, www.odette.org
Global Guideline for Returnable Transport Item Identification, www.aiag.org
GS1 Global Specifications, www.gs1.com
HIBC Health Industry Bar Code, www.hibc.de
PaperEDI Standard, www.eurodatacouncil.org
Set Label Standard, www.edifice.org (June 2011)

Note: ISO, CEN and DIN standards are available directly or via national bodies, e.g. www.din.d