ZVEI|RECOMMENDATION 2020.01

THE DIGITAL NAMEPLATE
CONSISTENT, SUSTAINABLE, FUTURE-PROOF, NETWORKED

ZVEI:
Die Elektroindustrie

Contents

1. SUMMARY

Products have a human-readable, analogue nameplate. The nameplate identifies the product manufacturer uniquely and has the function of a "product passport", providing important information on the product's use and classification.

These nameplates, which often take the form of adhesive labels, metal plates or printing on the product itself, are limited in the information they are able to display by the available space on the product or by the size of the product and the font size that can be used. The challenge facing manufacturers is that of conveying the growing volume of essential information concerning the product to the customer in a way that is user-friendly and compliant with the legislation, taking account of the labelling requirements for global markets and the information and languages required for safe use.

As products become smaller and smaller, the essential information can often no longer be displayed on them. Manufacturers are obliged to limit the information displayed to a minimum and provide comprehensive supplementary documentation in paper form. This information is supplied with the product and gives rise to redundancy and an additional disposal overhead when multiple products of the same type, sharing the same documentation, are purchased. During the product's use, the documentation must be updated by the user, and passed to the operator following installation of the product in machines and systems. Considerable overhead and costs are incurred when documentation is provided on an analogue nameplate with supplementary paper documentation.

This is the background behind use of the digital nameplate:

The concept of a "digital nameplate" demonstrates how information can be provided directly at the product. The digital nameplate is capable of providing far more information than that displayed on an analogue nameplate with accompanying documentation, as at present. The digital nameplate encompasses all the information and labelling required by law for the distribution, transport and safe use of the product, in a standardized, digital form. Furthermore, it fulfils this function through all phases of the product's life cycle, from commissioning, through operation, maintenance and service, to decommissioning. The manufacturer thus has the means to provide all the information, services and support necessary for use of the product directly and in an accessible form. This information is available to the user of the product in human and machine-readable form and in multilingual form, and is at all times up to date.

Access to the digital nameplate is provided by means of digital identifiers (for example employing a QR code, Data Matrix code or RFID tag) which are applied to the product and can be read out at any time directly and locally by any smartphone or tablet PC.

Summary of the benefits

Source: ZVEI
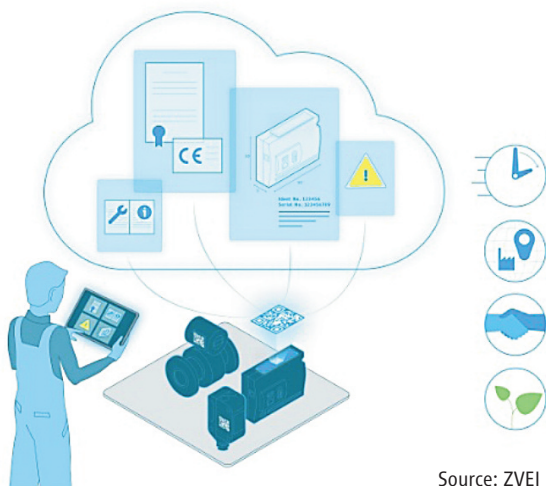
- Time and cost savings owing to instant digital access to up-to-date, multilingual documents, certificates and safety information

- High availability and acceptance owing to non-proprietary standards

- Sustainability owing to the elimination of paper documentation

Application and definitions

The digital nameplate is a further cornerstone of the digital transformation of industry and product use worldwide.

The QR code is a medium for two different forms of access to information through the digital nameplate:

In its function as a product identifier, the digital nameplate provides full product documentation via the Internet, with automated access for manufacturers and users to all information and services relating to the product and its use through its full life cycle. To deliver this, the QR code contains a globally unique URI (uniform resource identifier) with device-specific identification. This URI:

a) enables the web page with information on the product to be accessed directly from any smartphone or tablet PC through the manufacturer's website

b) permits direct access to a user's information page through a customer-specific app, enabling information and services specific to the installation to be called up for the purposes of operational management or asset management of the equipment

c) permits automated data access, by which seamless communication is possible between manufacturer and customer processes

The DIN SPEC 91406 industry standard describes the definitions and processes required for this purpose and thereby enables the products equipped with this feature to operate within Industry 4.0 systems.

The use of QR codes and implementation of a "product passport" in fully digital form are currently limited by legal provisions. The standards described above already enable manufacturers and users alike to apply product labelling reliably and inseparably to the product and to implement their process chains and the handling of information in consideration of future circumstances.

In its function as a "product passport", the digital nameplate contains the legal and normative product identifiers in digital form within the QR code. This information can be accessed through the QR code and displayed to the user on a smartphone or tablet PC, directly and without the need for a network connection. The scope of the information is defined in the VDE V 0170-100 industry standard.

We advise manufacturers to apply the digital nameplate with the function of a product identifier to their products and thereby offer their customers an automated means of obtaining information. This standardized solution is already being discussed with regulators throughout the world with a view to enabling existing processes for product design and use to be migrated to full digitalization.

2. THE DIGITAL NAMEPLATE: STRUCTURE, CONTENT, IMPLEMENTATION

A nameplate has the purpose of identifying a product uniquely. The operator/user, the manufacturer and the authorities must all be able to identify the product uniquely throughout its entire life cycle. For this purpose, the nameplate should preferably be affixed to the product such that it is clearly visible and inseparable from the product. Should it not be possible for a nameplate to be affixed to the product owing to the latter's dimensions or other constraints, it may be possible to provide it on the packaging or in the accompanying documents.

The digital nameplate enables a user to obtain information on a product by digital means. However, it is also a form of machine-readable identification which can be used, by the equipment manufacturer, as early as the production process for automated control of the material flow – a function already often implemented by the use of a barcode. It could be used by customs authorities, for example to check the product electronically when it is exported. At the operator's premises, it enables the product to be identified uniquely at receipt, and during operation, a service technician or public authority can check the product and its permissible scope of use electronically. The data from the machine-readable nameplate can be transferred directly to an ERP (enterprise resource planning) system for error-free inventory control. The digital nameplate makes all device data available to the operator in digital form. Its benefits are therefore numerous.

Unique product identification and safe use of the product require the following minimum information:

- Manufacturer's name and address

- Product name and type

- Serial or batch number

- Country of manufacture

- Year of manufacture

- Instructions for safe use, for example concerning the resistance to temperature and pressure, electrostatic charge, high voltage, radioactivity, etc.

For international goods traffic and compliance with national regulations, conformity marks and symbols must be visible on the nameplate, e.g.:

- CE marking (Europe)

- EAC mark (Eurasian Economic Union)

- Ex hexagon, IECEx logo for explosion-proof equipment

- Calibration or metrology (M) marking for meters

- Crossed-out wheeled bin (EU Waste Electrical and Electronic Equipment Directive)

Where products are exported, the marks applicable in the country of destination must appear on the nameplate.

The following additional information must be stated for electrical devices in Germany:

- Supply voltage range, frequency range, power or input current

- Connection facilities (e.g. connector type, cable gland, earth or protective conductor terminal)

- Where applicable, special information concerning the power supply (e.g. Ex i, protection class)

The current EU directives and regulations require equipment markings to be permanent and human-readable.

A purely digital nameplate does not satisfy these requirements. Hybrid solutions are therefore necessary, at least for the immediate future. These comprise:

- A conventional nameplate displaying a minimum of information

- A unique digital product identifier (URI) which is firmly affixed to the product (a QR code, Data Matrix code or RFID tag is suitable for this purpose; other technologies are however also conceivable)

2.1.   Digital nameplate serving as the product identifier:

The QR code contains a globally unique product identifier in the form of a reference (URI). In the simplest case, this points to a product-specific page on the manufacturer's website. The user can access all information provided by the manufacturer on this page.

The table on the next page compares the two variants of the digital nameplate and the conventional physical nameplate.

Feature	Conventional nameplate	Digital nameplate with QR code/ Data Matrix code RFID in the form of a "product passport"	Digital nameplate with QR code/ Data Matrix code RFID in the form of a product ID
Number of characters, information provided	Limited by nameplate dimensions	Limited by size and readability of the QR or Data Matrix code or the memory of the RFID Chip	Unlimited
Reader required	No	Yes, e.g. smartphone or tablet PC	Yes, e.g. smartphone or tablet PC
Internet connection required	No	No	Yes
Updating possible	No	No	Yes
Data loss possible	No	No	Yes**

**e.g. as a result of the website not being up to date, or insolvency of the manufacturer.

The technical implementation of a digital nameplate should be defined in standards independently of any particular technology, to enable consideration to be given to rapid technological advances in information technology.

Where QR codes/Data Matrix codes/RFID tags are used for product labelling, the stored data can be read out with standard devices such as smartphones.

Products equipped with a digital communication port, such as sensors, actuators or controllers, are also able store the content of the digital nameplate in their firmware and make it available through the communication port (e.g. over a field bus system, WLAN or Bluetooth).

The digital nameplate represents the "admission ticket" of a product to digitalized value-adding processes, also termed "Industry 4.0" processes. It enables information to be associated clearly with the product through its entire life cycle, the product to be identified during operation, and information from it be used to control processes, for example during production or for diagnostics and maintenance purposes.

With respect to the organization of products in digital value chains, the Industry 4.0 platform has specified the concept of the asset administration shell (AAS). The AAS provides access to

information associated with a product (or more generally an "asset"). With its AAS, a product becomes an "Industry 4.0 component". In the simplest scenario, the AAS contains all information associated with a product, i.e. primarily information from the manufacturer, but also information from the operator, service provider, etc.; when authorized, this information can be read out and used by access to the AAS. The AAS may be connected to the product either directly or remotely, e.g. in a cloud.

The AAS is organized in submodels. Each submodel describes one aspect of the product. Different submodels may be relevant for different use cases. The digital nameplate forms a central part of the AAS of the product concerned, namely in the first instance the "Nameplate" submodel. Suitable digital measures can be taken to prevent the data being falsified. Other submodels of the AAS contain further information associated with the product. Examples are the "Identification" submodel (in which the manufacturer can state further information on the identity of the product over and beyond what is required on the conventional nameplate, e.g. the product family, date of manufacture or batch number), and the "Document" submodel, in which all certificates of conformity and other certificates are stored, together with other information.

The following picture shows a possible realisation of the access to the AAS of a product via the digital nameplate:
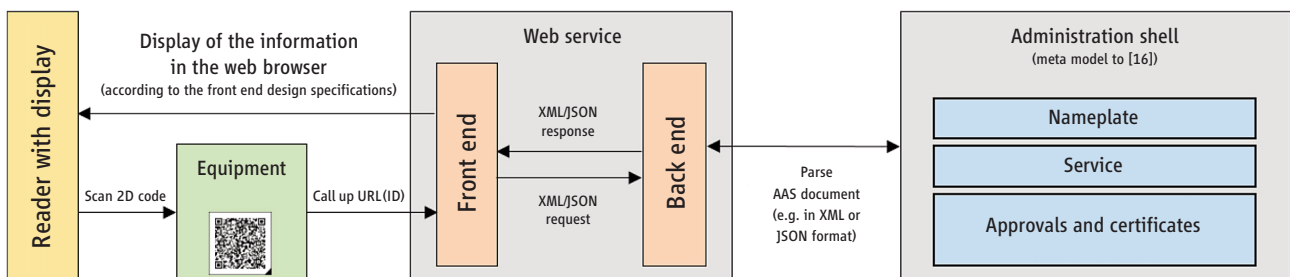
Source: ZVEI

2.2. The identifier:

The ID (= identifier) satisfies the minimum requirements of DIN SPEC 91406. For a product to be identified automatically, the only requirement is a globally unique, machine-readable ID affixed to the product. The manufacturer is responsible for ensuring that this ID is not reused, even after expiry of a product's maximum lifetime. In the event of bankruptcy of the manufacturer or takeover by other manufacturers, it must be ensured that this ID and the AAS are retained. The format of the ID is specified in DIN SPEC 91406 and includes the structure, syntax and permitted characters.

For the digital nameplate, the URI location function is necessary to provide access to the full breadth of the information and functions of a digital nameplate.

2.3.   Further information:

- Examples of products and their AAS with the "Nameplate", "Identification" and "Document" submodels at: http://www.i40-aas.de

- Specification of the "submodel templates of the asset administration shell ›Digital nameplate‹" (published via the Industry 4.0 platform and ZVEI, as of December 2020).

ZVEI recommendations are technical descriptions that are efficiently developed within a working group of companies.

The working groups are open to all members. The ZVEI recommendations are publicly available.

ZVEI Recommendations have a pre-normative character and take into account the rapid dynamic development of technology by describing a topic and then being worked on in the standardisation process in the relevant organisations DKE, DIN, CEN, CENELEC, IEC, ISO or ETSI.

When drawing up the ZVEI recommendation, the applicable antitrust aspects must be observed at all times.