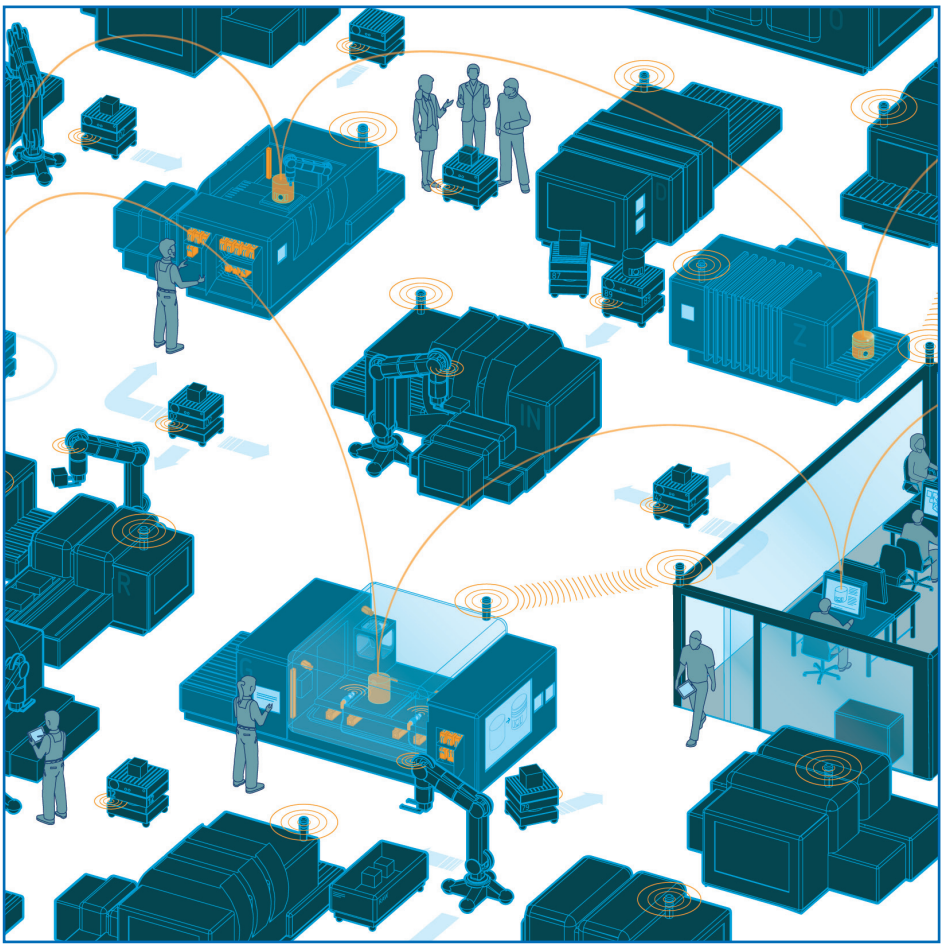
ZVEI:
Die Elektroindustrie

Guideline

What Criteria do Industrie 4.0 Products Need to Fulfil?



April 2017

German Electrical and Electronic Manufacturers' Association

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April 2017

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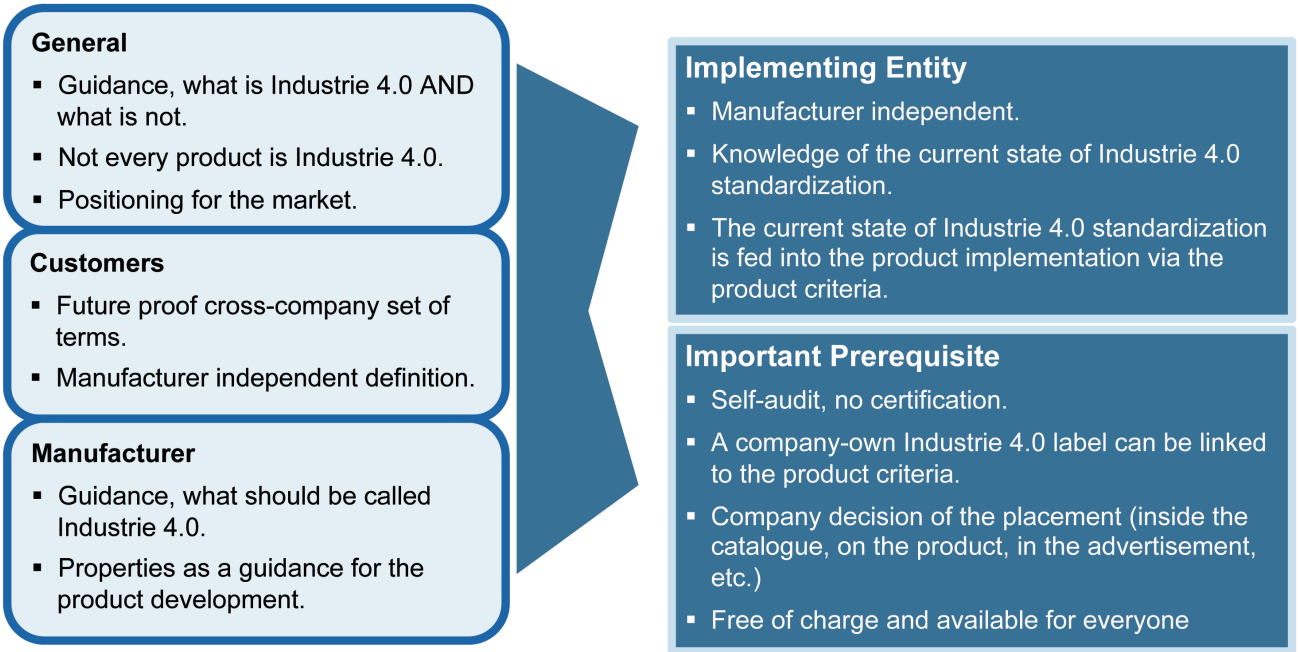
1. Introduction

The fully digitised and networked production method of the future, Industrie 4.0, is relentlessly moving into factories. Terms like "IoT ready" "RAMI 4.0-compliant" and "Industry 4.0 seal" seem almost to be overused. Moreover, consulting companies are offering to test products and even entire companies for their Industrie 4.0-capability. Too frequently the service offers behind this have entirely different definitions of Industrie 4.0 and cause more confusion than clarity. How can we clear this jungle of terms and offers? What does the customer gain from this and what is behind the various terms and consulting solutions? ZVEI has developed general, manufacturer-independent criteria for Industrie 4.0 products, which are described in this guide.

These criteria help providers on the market to decide which products can already be labelled as Industrie 4.0-capable. In addition, companies can use these criteria as a guide for product development. For customers, the ZVEI definition provides clarity regarding the services and features that Industrie 4.0 products[1] should provide. This results in more transparency and security for the market as a whole. Indirectly, it also clarifies what is not Industrie 4.0-compliant.

Figure 1: Why criteria for Industrie 4.0 are important: an initial manufacturer-independent orientation for customers and manufacturers



Source: ZVEI, Martin Hankel (Bosch Rexroth)

[1] This guide deals with criteria for products, whereby the term "product" could refer to devices, systems, machines or software. Criteria for Industrie 4.0 complete solutions (hardware, software, service, application, etc. as a complete package) are not described. Industrie 4.0 complete solutions should contain at least one Industrie 4.0 product that complies with the criteria for Industrie 4.0 products and thus the minimum product properties.

2. Principles for Defining Criteria for Industrie 4.0 Products

The aim is for the criteria for Industrie 4.0 products to become established quickly and easily. The following prerequisites were defined for this purpose.

2.1 Self-examination

Every company or organisation checks for itself based on the criteria for Industrie 4.0 products whether its own products correspond to the characteristics. The companies are also responsible for developing solutions for any characteristics that their products lack.

Certification is explicitly not necessary for the self-examination.

2.2 Simplicity

The criteria for Industrie 4.0 products and their product properties are to be presented as simply as possible so that any company or organisation can apply them independently without the aid of third parties.

2.3 Own identifier instead of a general label

No general label is associated with the criteria for Industrie 4.0 products and the necessary product properties. Every company or organisation can use its own label to reference the criteria and refer customers to the criteria.

Vice versa, customers can also actively query whether a company label meets the criteria for Industrie 4.0 products.

2.4 Free usage

Every company and organisation is free to decide whether to use the criteria for Industrie 4.0 products in a public manner, for example for product catalogues, at trade fairs or in advertisements.

Public use is expressly requested – after all, it always contributes to spreading the criteria for Industrie 4.0 products.

2.5 Free of charge and for everyone

Companies and organisations can use the criteria for Industrie 4.0 products and their product properties free of charge. Anybody can use them for their products.

2.6 Implementing entity

A manufacturer-independent entity defines the criteria for Industrie 4.0 products in a fixed, transparent process and publishes them.

Specifically, the criteria are developed by the committees "ZVEI-SG Modelle & Standards" (models and standards) and "Plattform Industrie 4.0 Norms and Standards". Both committees are staffed with cross-manufacturer representatives from the IT industry, automation engineering and machine and plant engineering. The two committees have appropriate knowledge of the ongoing standardisation activities regarding a reference architecture for Industrie 4.0.

This ensures that the criteria for Industrie 4.0 products are generally valid and that the right and necessary technical product properties are used.

The specified criteria for Industrie 4.0 products can only be changed via these committees.

The aim is for the criteria and required product properties to be used in a standardisation process in the future.

3. Product Properties 2017

The "product properties 2017" describe minimum properties that a product currently available must have to comply with the criteria for Industrie 4.0 products. This also includes products with features that can subsequently be loaded and updates for future requirements.

The properties primarily target customers and show which products can already be procured for an Industrie 4.0 network. These properties describe the minimum requirements regarding norms and standards in order for a product to participate in an Industrie 4.0 network. Of course, products can also have properties that exceed these minimum requirements.

The criteria for Industrie 4.0 products and the product properties are checked and adjusted annually.

3.1 Migration

The description and specification of the minimum properties for the individual criteria are checked once per calendar year. Changes are made if necessary, thus ensuring that the properties of the criteria for Industrie 4.0 products are adjusted in line with technical progress. New norms and standards can be added in the future and the properties can be drawn up increasingly specifically.

3.2 Product labelling

The criteria for Industrie 4.0 products and their product properties 2017 should be used as a basis for labelling products. ZVEI recommends adding the label "I4.0" or "Industrie 4.0", for example, to the products and the manufacturers' catalogues. Products with this label meet the current minimum requirement for properties, and migration to comply with future properties is ensured.

4. Selecting the Criteria

As part of the standardisation activities for Industrie 4.0, the reference architecture model for Industrie 4.0 (RAMI 4.0) was created. This represents the entire scope of solutions for Industrie 4.0.

Technical standards from the three axes "Architecture Layer", "Lifecycle & Value Stream" and "Functional Hierarchy" can be found in RAMI 4.0. The various Industrie 4.0 committees are currently working on activities in this area.

The second reference model is "Industrie 4.0 components", which has also already been published. This describes how an Industrie 4.0 product is integrated into an Industrie 4.0 network. An administration shell with the required Industrie 4.0 communication is required here.

This means that an Industrie 4.0 product is always an Industrie 4.0 component consisting of the "asset" (i.e. the object) and the "administration shell".

Both reference models set requirements and are the starting point for deriving the criteria for Industrie 4.0 products.

The criteria selected were those that involve major changes or are an essential requirement for Industrie 4.0.

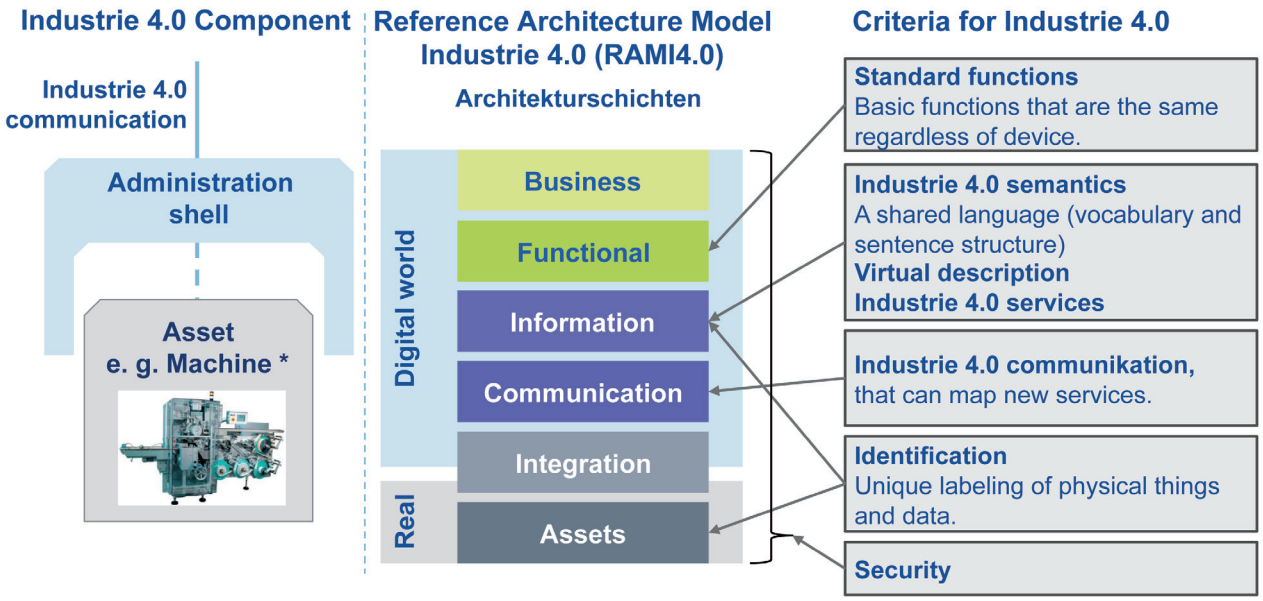
Each criteria is divided into its product properties, degree of fulfilment and the phases of its lifecycle.

The minimum required product properties for each criteria are described below and must be complied with cumulatively.

The degree of fulfilment specifies which properties are mandatory and which are optional (use case-dependent).
The lifecycle is split into two rough phases – type (development) and instance (production, service). The product properties for the criteria can differ depending on the lifecycle phase and must then be fulfilled cumulatively (both criteria) to achieve the product property.

Figure 2: Deriving criteria for Industrie 4.0 products

* Also relates to individual components, such as sensors, actors, controllers or software, etc.



Source: ZVEI, Martin Hankel (Bosch Rexroth)

4.1 Identification

A necessary prerequisite for Industrie 4.0 is globally unique identification of all products, i.e. assets and administration shells, in the Industrie 4.0 network. For this purpose, each product must have an identifier that can be used to clearly identify it worldwide.

The same applies to data, standard functions, administration shells, etc. that belong to the product. You also require a globally unique identifier so that the relationship between the data and functions can be established on a cross-manufacturer basis.

The two preferred schemas for identifiers (in accordance with ISO 29002-5 or as a URI, see: "Structure of the Administration Shell" by Plattform Industrie 4.0, 2016) were specified in part two of the description of the Industrie 4.0 components.

The identification is required in RAMI 4.0 in the asset, information and functional architecture layers.

4.2 Industrie 4.0 communication

Industrie 4.0 follows a service-oriented architecture in which services can be performed and data exchanged. Requirements for message transfer between two Industrie 4.0 components, known as Industrie 4.0 communication, have been formulated for this.

The specifications for Industrie 4.0 communication are currently being defined. For this, the best standards are being filtered out from those standards that already exist and are currently being developed to find those that are best suited for Industrie 4.0 communication.

In RAMI 4.0, Industrie 4.0 communication is mapped with the communication layer. All other communication types as well as protocols are located in the integration layer.

4.3 Industrie 4.0 semantics

So that components, machines, plants and IT systems can understand one another regardless of their manufacturers, they need a common language. This involves shared vocabulary in the form of data and functions, as well as a common syntax that creates the right context for the data.

Some initial good candidates for Industrie 4.0 semantics are already being discussed in the ZVEI and Plattform Industrie 4.0 standardisation committees. As well as candidates such as eCl@ss or IEC 61360 with IEC CCD, other options that are being discussed for potential sorting of the syntax include Automation ML. The first standardised data and file formats will be added to the criteria as necessary product properties.

In RAMI 4.0, the Industrie 4.0 semantics are in the information layer. Here, all data and functions that are not standardised in accordance with I4.0 are located in the integration layer.

4.4 Virtual description

The virtual description reflects the entire content of the digital product description.

There is a compilation in digital form of key Industrie 4.0 semantics data as well as other information; for example, product descriptions, catalogue sheets, images, technical features, data sheets, security features, simulation models and so on.

This information results in a digital description of the product. Customers can also access parts of this. This information can be accessed for the product, be made freely available on the Internet, linked to the product or be accessible online with a user ID.

4.5 Industrie 4.0 services and conditions

Components, systems and machines should be able to find each other in an Industrie 4.0 network and be able to perform an initial negotiation by communicating between themselves. This also includes exchanging information regarding the available data, functions and capabilities. Once they have reached an agreement in these negotiations, the first data can be exchanged. Some basic services are required for these processes, and both communication partners must be able to operate these.

These Industrie 4.0 services must be described and implemented manufacturer-independent so that an Industrie 4.0 network can function. These Industrie 4.0 services must be open, standardised (preferably normed) and accessible to all, and must also not be dependent on a single provider. They are essential basic services that every Industrie 4.0 product must support and provide – staggered from initial implementation to full expansion. This also includes, for example, a general interface for all loadable services and messages regarding the statuses of Industrie 4.0 products.

4.6 Standard functions

For machine builders and end customers, it is extremely helpful if certain functions are standardised for all components or systems. A good example are PLCopen functions, which are standardised regardless of manufacturer. Simple condition monitoring functions are also suitable for this; if the initial values are standardised across all manufacturers, it is much easier to implement cross-manufacturer condition monitoring in a machine. Such functions, which will then be located in the functional layer of RAMI 4.0, are currently being standardised/normed and will also be a good criteria for Industrie 4.0 products in the future.

4.7 Security

Security is one of the central topics for Industrie 4.0 and must be ensured throughout the entire lifecycle in all architectural layers and hierarchy levels. In a similar manner to a building that is reinforced with steel, security thus ensures the stability of RAMI 4.0 and provides protection against possible attacks.

Initial security capabilities should already be in place today. A threat analysis should typically reveal which capabilities these are, and this should already be clearly documented. Furthermore, an appropriately secure identity should already be available, at least for the product instance. In the future, the partial security model will describe the necessary capabilities (authentication of

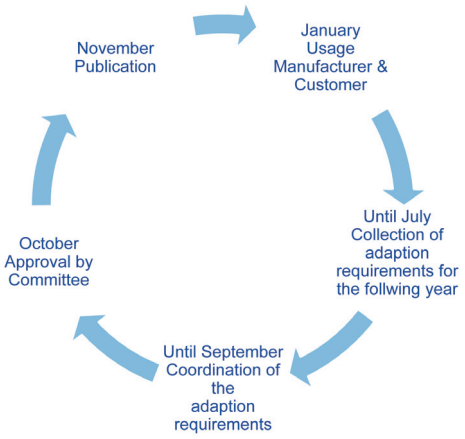
the identifiers, user and role management, secure communication, logging of security-related events) and optional capabilities of an Industrie 4.0 component that need to be taken into account for Industrie 4.0 products. It will be possible to look up the inherent security capabilities online. IEC 62443 will play a key role here.

In the long term (ten years), the security capabilities of a product property will have to be evaluated with a measurable quality based on a scale that has yet to be determined. In addition, the security capabilities[2] alongside the safety capabilities, privacy capabilities, resilience and reliability will have to be the characteristic properties of a trustworthy Industrie 4.0 component. A multi-level scale for trustworthiness will then allow estimates of an Industrie 4.0 component's usability in an overall system and it will be possible to determine the level of trustworthiness of a value-creation network automatically based on the current networking of the participants in the value-creation network. When components are integrated into a machine, the resulting level of trustworthiness must arise from the composition of the components.

5. Procedure for Criteria and Product Properties

Initially, the criteria for Industrie 4.0 products and their product properties will be defined and specified in the ZVEI-SG models and standards and then released in the "Plattform Industrie 4.0 AG1 Reference Architecture and Standards". The remainder of the process for criteria and product properties will be designed openly and, in the future, could also be implemented by means of a DINSPEC that performs an annual check and, if necessary, makes changes to the criteria and their product properties.

Figure 3: Generic yearly cycle for checking the criteria for Industrie 4.0 products incl. product properties



Source: ZVEI, Martin Hankel (Bosch Rexroth)

5.1 Milestone plan

The annual process will be roughly as follows: The criteria for Industrie 4.0 products and their product properties are published in November of each year. Manufacturers and customers will then be able to work using these specifications in the following year. By the middle of the following year, the incoming adjustment requests will have been collected and will then be discussed in the committees until September. The decisions taken by the committees will be released in October so that the adjustments for the following year can again be published in November.

[2] This goes in a similar direction to the "Trustworthiness" proposed by the IIC

6. Criteria for Industrie 4.0 Products and their Product Properties 2017

Products that are capable of communicating directly can meet most of the product properties 2017. In future, the product quantity will be substantially increased.

Table 1: Product properties 2017 for the criteria for Industrie 4.0 products

	Criteria	Requirements	L	C	Product properties 2017
1.	Identification	Cross-manufacturer identification with unique identifier (ID) attached to the product, electronically readable. Identification in: 1) Development 2) Goods transport (logistics), production 3) Sales, service, marketing 4) Network	T	M	For 1) material number[1] (electronic) in accordance with ISO 29002-5[2] or URI
			I	M	For 2) serial number or unique ID For 3) manufacturer + serial number or unique ID With 2) and 3) electronically readable, physical products via 2D code or RFID For 4) participant identification via IP network
2.	Industrie 4.0 communication	Transfer of product data and data files for interpretation or simulation, for example; product data in standardised form The product can be addressed via the network, supplies and accepts data, Plug & Produce via Industrie 4.0-compliant services	T	M	Manufacturer makes data that is relevant for the customer available/accessible online with the aid of identification, e.g. PDF via http(s)
			I	M	Product addressable online via TCP/UDP&IP with at least the information model from OPC-UA
3.	Industrie 4.0 semantics	Standardised data with manufacturer-independent unique identification in the form of characteristics with a syntax for, e.g.: 1) Commercial data 2) Catalogue data 3) Technical data: mechanics, electronics, functionality, location, performance 4) Dynamic data 5) Data regarding the lifecycle of the product instance	T	M	Catalogue data can be accessed online
			I	M	Catalogue data and data regarding the lifecycle of the product instance can be accessed online
4.	Virtual description	Virtual representation in Industrie 4.0-compliant semantics Virtual representation across the entire lifecycle. Characteristic attributes of the actual component, information regarding relationships between the attributes, production and production process-relevant relationships between Industrie 4.0 components, formal description of relevant functions of the actual component and its processes	T	M	Relevant information for customers can be accessed digitally based on the type identification (product description, catalogue, image, technical features, data sheet, security properties, etc.)
			I	M	Digital contact to service and information for product support incl. spare part information possible from in the field
5.	Industrie 4.0 services and conditions	Definition still open (service system) General interface for loadable services and messages regarding statuses Essential basic services that an Industrie 4.0 product must support and provide	T	O	Description of the device interface available digitally
			I	O	Information such as statuses, error messages, warnings, etc. available via OPC-UA information model in accordance with an industry standard
6.	Standard functions	Basic standardised functions that run on various products regardless of manufacturer and provide the same data in the same functions. These serve as the foundation for the functionality, on which all manufacturers can build their own enhancements.	T	N	Not defined
			I	N	Not defined
7.	Security	Minimum requirements to guarantee the security functionality.	T	M	A threat analysis has been performed. Appropriate security capabilities have been considered and publicly documented.
			I	M	The existing security capabilities are documented. Appropriately secure identities are available.

L: Lifecycle with T: Type and I: Instance, C: Coverage with M: Mandatory, O: Optional, use-case dependent, may be mandatory, and N: Not relevant

[1] Material number is used here as an umbrella term for the type designation, manufacturer part number, order number, product classification, etc.

[2] Generally, a manufacturer-specific identification should be required for the directly connected assets discussed above. As it currently stands, ISO29002-5 does not provide this.

7. Further Development of the Criteria for Industrie 4.0 Products

Industrie 4.0 is not fully described at present. The first specifications were included in the criteria for Industrie 4.0 products. Which implementations and standards for Industrie 4.0 will become relevant in the future? A timeframe is relevant for manufacturers and customers, as well as for checking the product criteria and product properties. With regard to the classification, the outlook has been divided into medium-term and long-term.

7.1 Probable criteria and product properties – medium term

The medium-term outlook describes which additional product properties are already being discussed today and could be implemented in the various products over the next few years.

It is directed particularly at manufacturers and shows the minimum product properties regarding the criteria for Industrie 4.0 products that will have to be developed and implemented over the next few years. The time horizon here is up to five years.

7.2 Outlook for criteria and product properties – long-term

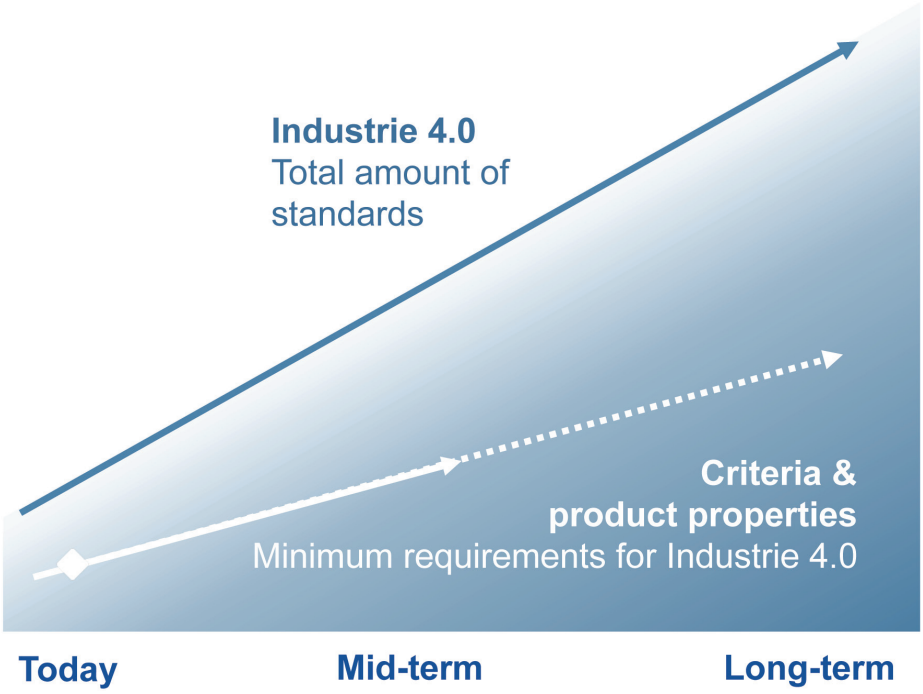
The long-term outlook describes the entire Industrie 4.0 spectrum with all its norms and specifications. Many of these topics have not yet been conclusively defined and cannot yet be recorded in full. This will provide enhancements that could be Industrie 4.0 product properties in the future.

The description is directed in particular at norming and standardisation bodies and highlights the fields in which norms need to be added. Research requirements can also be derived from this.

Whether and when these descriptions will become minimum product properties and be part of the criteria for Industrie 4.0 products is currently entirely unknown. Potential candidates will first be transferred to the medium-term product properties as part of the annual checks.

The time horizon here is much longer than five years until a more detailed description and definition is available.

Figure 4: Further development of the criteria and product properties incl. migration path



Source: ZVEI, Martin Hankel (Bosch Rexroth)

Table 2: Outlook of criteria and product properties

	Criteria	Requirements	L	C	Medium term ≤ 5 years[3]	C	Long-term ≤ 10 years[3]
1.	Identification	Cross-manufacturer identification with unique identifier (ID) attached to the product, electronically readable. Identification in: 1) Development 2) Goods transport (logistics), production 3) Sales, service, marketing 4) Network	T	M	As in 2017	M	As in 2017
			I	M	As in 2017, but further wireless identification (e.g. NFC) also possible More detailed identification data and de-referencing of further identifiers (e.g. GS1) possible	M	As for medium-term, but indoor and outdoor localisation and others possible
2.	Industrie 4.0 communication	Transfer of product data and data files for interpretation or simulation, for example; product data in standardised form The product can be addressed via the network, supplies and accepts data, Plug & Produce via Industrie 4.0-compliant services	T	M	As in 2017, but the administration shell and its data can communicate digitally	M	As for medium-term
			I	M	As in 2017, but additional basic services implemented for Industrie 4.0	O	As for medium-term, but communication can use advanced communications standards (e.g. OPC-UA, DDS, MQTT, TSN, 5G, Bluetooth, etc.) Flexible network topologies
3.	Industrie 4.0 semantics	Standardised data with manufacturer-independent unique identifier in the form of characteristics with a syntax for, e.g.: 1) Commercial data 2) Catalogue data 3) Technical data: mechanics, electronics, functionality, location, performance 4) Dynamic data 5) Data regarding the lifecycle of the product instance	T	M	As in 2017, but with I4.0-compliant self description. 1–3) ecl@ss / IEC CDD / W3C-compliant data	M	As for medium-term 1–3) ecl@ss / IEC CDD / W3C-compliant data + other candidates + data in public catalogues
			T	M	As in 2017 3–5) ecl@ss / IEC CDD / W3C-compliant data	M	3–5) ecl@ss / IEC CDD / W3C-compliant data + other candidates + data in public databases
4.	Virtual description	Virtual representation in Industrie 4.0-compliant semantics Virtual representation across the entire lifecycle. Characteristic features of the actual components, information regarding relationships between the features, production and production process-relevant relationships between Industrie 4.0 components, formal description of relevant functions of the actual components and their processes	T	M	As in 2017, but further customer-relevant data is available in I4.0-compliant formats. Data regarding product types can also be transferred to public or private clouds (administration shell via a type).	M	All data and descriptions are available in digital form in Industrie 4.0 semantics for cross-manufacturer exchange
			I	M	Representation of all production and service documents as well as data present and available internally in a transparent manner	M	All data and descriptions are available in digital form in Industrie 4.0 semantics for cross-manufacturer exchange
5.	Industrie 4.0 services and conditions	Definition still open (service system) General interface for loadable services and messages regarding states Essential basic services that an Industrie 4.0 product must support and provide	T	M	As in 2017, but additional initial services can be loaded online	M	All Industrie 4.0 services required in the development process, such as simulation models, are available online.
			I	M	As in 2017, but additional basic services implemented for Industrie 4.0 (e.g. self-description, etc.)	M	As for medium-term, but all Industrie 4.0 services are additionally available for Plug&Produce
6.	Standard functions	Basic standardised functions that run on various products regardless of manufacturer and provide the same data in the same functions. These serve as the foundation for the functionality, on which all manufacturers can build their own enhancements.	T	O	Simulation model available, for example	M	All defined development functions are available
			I	O	For example, PLCopen for Motion, IEC61131-3 basic functions, Condition monitoring standard functions in accordance with VDMA 24582, …	M	All defined standard functions are available and can be implemented and executed

	Criteria	Requirements	L	C	Medium term ≤ 5 years[3]	C	Long-term ≤ 10 years[3]
7.	Security	Minimum requirements to guarantee the security functionality.	T	M	Security by design Security capabilities are described at the respective level (Authentication of the identifiers, user and role management, secure communication, logging of security-relevant changes)	M	Security by design Additional (level of trustworthiness) Abilities of the planned trustworthiness level are described
			I	M	Security capabilities can be accessed digitally at the intended level (Authentication of the identifiers, user and role management, secure communication, logging of security-relevant changes)	M	Can additionally be accessed digitally (level of trustworthiness) Abilities of the planned trustworthiness level are implemented

L: Lifecycle with T: Type and I: Instance, C: Coverage with M: Mandatory, O: Optional, use-case dependent but may in fact be mandatory, and N: Not relevant

[3] The criteria for future developments should not yet be viewed as binding. They are only examples and represent the current status of discussions.

8 Product Examples

Below, we discuss a few specific product examples with the aim of illustrating the application of criteria for Industrie 4.0 products and their properties in practice.

Overview of examples:

8.1 Industrial Nexo cordless wifi nutrunner
8.2 Energy efficiency module
8.3 FDI-based software for device management

8.1 Industrial Nexo cordless wifi nutrunner

The nutrunner works fully self-sufficiently. The controls are entirely integrated into the nutrunner and are accessible via open interfaces using WLAN. The parameters are configured using a web browser. Numerous sensors are integrated. Functions can be subsequently loaded and all the nutrunner's data can be retrieved via an open interface using WLAN. Condition monitoring and diagnostic functions are already integrated into the nutrunner. Software can be used to adjust the communication to all common protocols.

Figure 5: Nexo cordless wifi nutrunner

Source: Bosch Rexroth

Table 3: Properties of the Nexo cordless wifi nutrunner

	Criterion	Requirements	L	C	Product properties 2017	Nexo nutrunner
1.	Identification	Cross-manufacturer identification with unique identifier (ID) attached to the product, electronically readable. Identification in: 1) Development 2) Goods transport (logistics), production 3) Sales, service, marketing 4) Network	T	M	For 1) material number[1] (electronic) in accordance with ISO 29002-5[2] or URI	1) Material number (electronic)
			I	M	For 2) serial number or unique ID For 3) manufacturer + serial number or unique ID With 2) and 3) electronically readable, physical products via 2D code or RFID For 4) participant identification via IP network	2) QR code 3) QR code 4) Participant identification via TCP/UDP and IP network
2.	Industrie 4.0 communication	Transfer of product data and data files for interpretation or simulation, for example; product data in standardised form The product can be addressed via the network, supplies and accepts data, Plug & Produce via Industrie 4.0-compliant services	T	M	Manufacturer makes data that is relevant for the customer available/accessible online with the aid of identification, e.g. PDF via http(s)	Step files, CAD drawings, etc.
			I	M	Product addressable online via TCP/UDP&IP with at least the information model from OPC-UA	Yes, torque, rotary angle, tightening curve, etc. can be read online
3.	Industrie 4.0 semantics	Standardised data with manufacturer-independent unique identifier in the form of characteristics with a syntax for, e.g.: 1) Commercial data 2) Catalogue data 3) Technical data: mechanics, electronics, functionality, location, performance 4) Dynamic data 5) Data regarding the lifecycle of the product instance	T	M	Catalogue data can be accessed online	Yes, via QR code
			I	M	Catalogue data and data regarding the lifecycle of the product instance can be accessed online	Yes, via QR code
4.	Virtual description	Virtual representation in Industrie 4.0-compliant semantics Virtual representation across the entire lifecycle. Characteristic attributes of the actual component, information regarding relationships between the attributes, production and production process-relevant relationships between Industrie 4.0 components, formal description of relevant functions of the actual component and its processes	T	M	Relevant information for customers can be accessed digitally based on the type identification (product description, catalogue, image, technical features, data sheet, security properties, etc.)	The product description, catalogue, image, technical features, data sheet, etc. can be downloaded
			I	M	Digital contact to service and information for product support incl. spare part information possible from in the field	QR Code leads directly to service and provides information regarding spare parts
5.	Industrie 4.0 services and conditions	Definition still open (service system) General interface for loadable services and messages regarding states Essential basic services that an Industrie 4.0 product must support and provide	T	O	Description of the device interface available digitally	Interfaces are described openly
			I	O	Information such as statuses, error messages, warnings, etc. available via OPC-UA information model in accordance with an industry standard	Data at the interface for all statuses is disclosed and can be downloaded
6.	Standard functions	Basic standardised functions that run on various products regardless of manufacturer and provide the same data in the same functions. These serve as the foundation for the functionality, on which all manufacturers can build their own enhancements.	T	N	Not defined	Not defined
			I	N	Not defined	Initial diagnosis and condition monitoring functions, additional monitoring of the process with diagnostic output
7.	Security	Minimum requirements to guarantee the security functionality.	T	M	A threat analysis has been performed. Appropriate security capabilities have been considered and publicly documented.	Is discussed and documented for customer projects
			I	M	The existing security capabilities are documented. Appropriately secure identities are available.	Is discussed and documented for customer projects

L: Lifecycle with T: Type and I: Instance, C: Coverage with M: Mandatory, O: Optional, use-case dependent but may in fact be mandatory, and N: Not relevant

Conclusion: The Nexo cordless wifi nutrunner thus meets all the specified product properties 2017.

The manufacturer has therefore given it the "Industrie 4.0 logo" available in this area.

Source: Bosch Rexroth

8.2 Energy efficiency module

The energy efficiency module combines pressure and flow sensors, self-sufficient data processing, a 2/2 way shut-off valve and an Ethernet communication interface. The communication parameters of the interface (usual field buses, OPC-UA, Modbus/TCP) are open. Functions can be subsequently loaded through integration of CODESYS controls. The module continuously monitors the air consumption of the downstream system and, thanks to machine learning, can distinguish between resting state, operating state and abnormal states. Fixed limits can also be set for the individual states. The shut-off valve allows an auto-stop function, which automatically blocks the compressed air supply after a configurable amount of time in a resting state to prevent leaks. The sensor data, operating states and shut-off valve behaviour can all be accessed via the communication interface.

Figure 6: Energy efficiency module

Source: Festo

Table 4: Properties of the energy efficiency module

	Criteria	L	C	Product properties 2017	Energy efficiency module
1.	Identification	T	M	For 1) material number[1] (electronic) in accordance with ISO 29002-5[2] or URI	1) Manufacturer's part number and product keys can be read (electronically)
		I	M	For 2) serial number or unique ID For 3) manufacturer + serial number or unique ID With 2) and 3) electronically readable, physical products via 2D code or RFID For 4) participant identification via IP network	2) Manufacturer's DM code 3) Manufacturer's DM code 4) Participant identification via TCP/UDP and IP network
2.	Industrie 4.0-compliant communication	T	M	Manufacturer makes data that is relevant for the customer available/accessible online with the aid of identification, e.g. PDF via http(s)	CAD drawings, EPLAN macros, instructions, device description, etc.
		I	M	Product addressable online via TCP/UDP&IP with at least the information model from OPC-UA	Yes, sensors and states can be read. Valve can be controlled. A control module with an OPC UA application is attached for this.
3.	Industrie 4.0-compliant semantics	T	M	Catalogue data can be accessed online	Yes, via DM code link
		I	M	Catalogue data and data regarding the lifecycle of the product instance can be accessed online	Yes, via DM code link

4.	Virtual description	T	M	Relevant information for customers can be accessed digitally based on the type identification (product description, catalogue, image, technical features, data sheet, security properties, etc.)	The product description, catalogue, image, technical features, data sheet, CAD drawings, EPLAN macros, instructions, device descriptions, etc. can be downloaded
		I	M	Digital contact to service and information for product support incl. spare part information possible from in the field	DM code leads directly to service and provides information regarding spare parts
5.	Industrie 4.0-compliant services and status	T	O	Description of the device interface available digitally	Interfaces are described openly
		I	O	Information such as statuses, error messages, warnings, etc. available via OPC-UA information model in accordance with an industry standard	Data at the interface for all statuses is disclosed and can be downloaded
6.	Standard functions	T	N	Not defined	Initial diagnosis and condition monitoring functions
		I	N	Not defined	Additional monitoring of the process with diagnostic output
7.	Security	T	M	A threat analysis has been performed. Appropriate security capabilities have been considered and publicly documented.	Documentation shows that the product has no security capabilities
		I	M	The existing security capabilities are documented. Appropriately secure identities are available.	Documentation shows that the product has no security capabilities

L: Lifecycle with T: Type and I: Instance, C: Coverage with M: Mandatory, O: Optional, use-case dependent but may in fact be mandatory, and N: Not relevant at this level

Conclusion: The energy efficiency module thus meets all the specified product properties 2017. The manufacturer has not given it a special Industrie 4.0 logo.

8.3 FDI-based software for device management

Fig. 7: Field Information Manager with HART modem and field device

Source: ABB

The Field Information Manager (FIM) is a software solution for field-device configuration and diagnostics on handheld devices. FIM provides easy access to standardised device parameters and helps people to work securely with different device types. It is based on FDI technology (http://www.field-commgroup.org). The DeviceWindow edition of the FIM enables online parameter configuration for HART devices. The handheld edition allows offline device configuration, the use of templates and document generation. The Field Information Manager can be downloaded from: www.abb.com/fieldinfo

Table 5: Properties of the Field Information Manager

	Criteria	L	C	Product properties 2017	Field Information Manager
1.	Identification	T	M	For 1) material number[1] (electronic) in accordance with ISO 29002-5[2] or URI	www.abb.com/fieldinfo
		I	M	For 2) serial number or unique ID For 3) manufacturer + serial number or unique ID With 2) and 3) electronically readable, physical products via 2D code or RFID For 4) participant identification via IP network	Every installed version of the FIM has a unique "machine ID".
2.	Industrie 4.0-compliant communication	T	M	Manufacturer makes data that is relevant for the customer available/accessible online with the aid of identification, e.g. PDF via http(s)	Product data can be accessed online
		I	M	Product addressable online via TCP/UDP&IP with at least the information model from OPC-UA	Device data can be called with OPC UA clients (planned)
3.	Industrie 4.0-compliant semantics	T	M	Catalogue data can be accessed online	Product guide can be accessed online
		I	M	Catalogue data and data regarding the lifecycle of the product instance can be accessed online	Version number can be retrieved in the software
4.	Virtual description	T	M	Relevant information for customers can be accessed digitally based on the type identification (product description, catalogue, image, technical features, data sheet, security properties, etc.)	Manual can be accessed online
		I	M	Digital contact to service and information for product support incl. spare part information possible from in the field	Service queries can be placed online. ABB Knowledge Store available to contact other end customers and ABB experts from within the software
5.	Industrie 4.0-compliant services and status	T	O	Description of the device interface available digitally	Follows FDI standard
		I	O	Information such as statuses, error messages, warnings, etc. available via OPC-UA information model in accordance with an industry standard	Device parameters could be read via OPC-UA (planned). Statuses in accordance with NE 107
6.	Standard functions	T	N	Not defined	
		I	N	Not defined	
7.	Security	T	M	A threat analysis has been performed. Appropriate security capabilities have been considered and publicly documented.	Security capablities are documented in the manual.
		I	M	The existing security capabilities are documented. Appropriately secure identities are available.	Access to OPC-UA server only following appropriate user authentication

L: Lifecycle with T: Type and I: Instance, C: Coverage with M: Mandatory, O: Optional, use-case dependent but may in fact be mandatory, and N: Not relevant at this level

Conclusion:

The Field Information Manager will comply with the product properties 2017 in the near future.

The manufacturer will issue the logo "IoTSP-enabled" (Internet of Things, Service and People) for this product.

Source: ABB

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