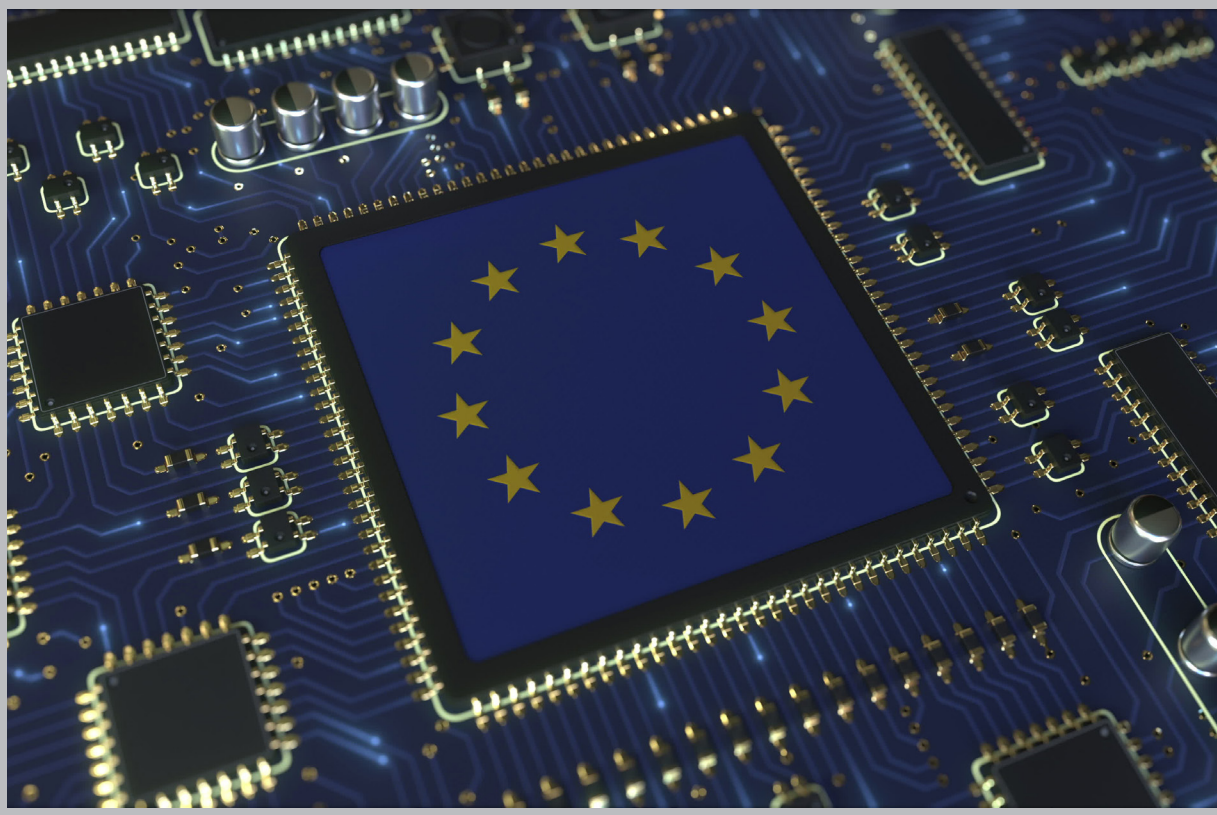
Quick Guide



Interoperability Interface Standards for Applying the EU Data Act Successfully

In cooperation with

Machine Information Interoperability Legal Informatics

VDMA

umati universal machine technology interface

Editorial

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The guidelines are intended as a non-binding reference and merely offer an overview for evaluating certain challenges relating to the EU Data Act; the recommended actions and suggestions for implementation described within are non-binding and merely provide orientation in applying the EU Data Act. They do not claim to be comprehensive, nor do they constitute legal advice. They must not replace examination of the relevant directives, laws and regulations. Furthermore, the special characteristics of the respective products and their various possible applications must be taken into account. Many further scenarios are therefore possible in addition to the evaluations and procedures mentioned in the guidelines. Please note that, according to the EU Data Act, the European Commission can commission one or more European standardisation organisations to draft harmonised standards or, under certain conditions, adopt common specifications (Art. 33 et seq. EU Data Act) by means of implementing acts that may under certain circumstances differ from the descriptions in these guidelines and the standards mentioned within. Any future measures and effects in the context of Art. 33 et seq. EU Data Act are not yet foreseeable at the time of writing.

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Foreword

Hartmut Rauen

The mechanical and plant engineering industry plays an active role in shaping change. Intelligently connected production is crucial to companies in the global marketplace. As well as being an essential prerequisite for successful digitalisation, data is the result of digitalisation processes and therefore forms the basis of new business models. The European data spaces that are now emerging allow the potential of the European data economy to be utilised quickly. Initiatives such as Manufacturing-X are creating a federal data ecosystem that not only enables data-driven value-added services and encourages sustainable production, but also contributes to and is promoted by the goals of the EU Data Act.

The EU Data Act provides a new framework for regulating the flow of data between companies. This act has far-reaching consequences for businesses and is both an opportunity and a risk. Wherever data is accessed and used, this gives rise to questions regarding transparency, data protection, data exchange and interoperability. Companies will need to evaluate and classify their data in a targeted way in order to participate in data exchange. Because the act is so complex, companies urgently need to examine the regulations intensively.

With this Quick Guide on the EU Data Act, we want to remove inhibitions and provide a broad and, where possible, interdisciplinary overview of this topic. We will take a look at the data economy and explain what the EU Data Act is all about from the perspective of the mechanical and plant engineering industry. There is also a range of tips for technical implementation and an example application.

It's time to get stuck in and seize the opportunities the act offers!

Hartmut Rauen
Member of the VDMA Executive Board

1. Management summary

The EU Data Act is part of the EU data strategy and aims to ensure fair access to and use of data. It entered into force on 11 January 2024 and puts mechanical and plant engineering companies under pressure to ensure compliance with the new regulation and prevent infringements. Alongside other participants in the value chain, it primarily focuses on users of connected products and related services, giving them access rights to and decision-making powers over the data created while these products and services are used or provided.

VDMA offers a variety of publications and services to support the mechanical and plant engineering industry in implementing the new regulation and with regard to legal, technical and business model-related aspects.

This Quick Guide focuses on meeting the technical prerequisites, and thus allowing companies to apply the act successfully. Interoperability interface standards play a key role here. Companies that wish to do so can implement the Open Platform Communications Unified Architecture (OPC UA) specified in IEC 62541 together with companion specifications. This has significant advantages in relation to the EU Data Act:

- Global acceptance and standardised interfaces: more than 700 companies have already participated in the development of OPC UA companion specifications. More than 60 OPC UA companion specifications are ready for implementation; these contain industry-specific information models that have already been standardised and can be viewed and enacted efficiently. The result is a comprehensive overview of the data generated when operating the product, virtually eliminating the need to structure data individually in order to define product data. This also makes it easier to meet information obligations.
- Integrated security: basic functions enable secure and reliable communication between different systems in an industrial environment and allow access permissions and information encryption to be managed.
- Scalability and availability of the standard: access to the standard is open and free of charge.
- OPC UA and the associated interface standards can be applied to a wide variety of products ranging from production to IT and cloud environments (component level, machine and device level, plant level, distributed control system level, cloud level and across different companies).

Based on a specific use case, this Quick Guide illustrates how companies can put the non-binding implementation suggestion into action. The industry must be proactive in laying the groundwork for compliance with the EU Data Act; after all, this is the only way that companies can benefit from the opportunities of the data economy.

2. Introduction and objective

Adopted in 2020, the European Union (EU) data strategy aims to create a single market for data. The objective is to make it easier to exchange data across countries and industries in order to guarantee Europe's global competitiveness and data sovereignty both now and in the future. It regards data as a key resource for economic growth, competitiveness, innovation, job creation and the progress of society in general. This should also benefit countries such as Germany, which do not have significant natural resources, so that the current level of prosperity can be maintained for future generations even working age demographic falls. The EU data strategy sets out the following four main priorities: creating a cross-sector governance framework, encouraging investment in data infrastructures, strengthening individual control over data, and developing common European data spaces in various sectors. The strategy is being implemented in collaboration with the member states and stakeholders from business, and involves a series of legislative processes. [European Commission, 2024]

The EU Data Act[1] is a key element of this legislative process and aims to ensure fair access to and use of data. It defines new rights and obligations for providers and users of connected products and related services, as well as data recipients. Essentially, users of a product or service gain access to and decision-making power over the data generated while using the connected products or related services. Easier access to data drives the development of data ecosystems and spaces and offers a series of opportunities relating to a data economy.

At the same time, however, the new obligations also pose a risk to companies. Firstly, regulatory infringements carry the threat of civil law disputes or sanctions. Secondly, companies are worried that implementing the regulation will result in them losing the specific expertise, knowledge or competitive advantages they have built up to their market rivals. The pressure to act resulting from the legislation means that companies face a large number of challenges concerning legal and technical aspects, as well as in relation to their own business models.

This Quick Guide focuses on the technical prerequisites for the successful implementation of the EU Data Act. It begins by illustrating the opportunities and challenges of the data economy and providing a concise overview of the EU Data Act. It then explains the significance of the act for the mechanical and plant engineering industry and demonstrates why interoperability interface standards play a key role in putting the technical prerequisites in place. Based on the Open Platform Communications Unified Architecture (OPC UA) specified in IEC 62541 with companion specifications, the guide presents a non-binding recommendation for implementing interoperability interface standards and highlights the benefits of implementation with regard to the EU Data Act. A use case shows a specific example of how mechanical and plant engineering companies can put the implementation recommendation into action.

1 Regulation (EU) 2023/2854 of the European Parliament and of the Council of 13 December 2023 on harmonised rules on fair access to and use of data and amending Regulation (EU) 2017/2394 and Directive (EU) 2020/1828 (Data Act), available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AL_202302854

VDMA offers plenty of assistance and support for further challenges perceived by mechanical and plant engineering companies regarding the EU Data Act. Figure 1 shows VDMA publications and initiatives in relation to:

- Answers to frequently asked questions on the EU Data Act with a focus on legal aspects[2]
- Industrie 4.0 Communication Guideline Based on OPC UA – Guidance for German small and medium sized companies[3]
- Industrie 4.0 Interoperabilität durch OPC UA Companion Specifications – Mehrwerte für Stakeholder des Maschinen- und Anlagenbaus [Industrie 4.0 Interoperability through OPC UA Companion Specifications – Added Value for Stakeholders from the Mechanical and Plant Engineering Industry; only available in German][4]
- A list of and access to available VDMA OPC UA companion specifications[5]
- Support in implementing OPC UA companion specifications through the umati implementation initiative – the umati reference implementation represents the first interoperable data space for machines[6]
- Studies on the challenges and potential of the EU Data Act with recommendations for action for the mechanical and plant engineering industry[7]
- Manufacturing-X Data Space Study[8]
- A white paper on monetising platform-based products and services[9]

2 Available at: https://www.vdma.org/viewer/-/v2article/render/82842914

3 Available at: https://www.vdma.org/documents/34570/77803117/Industrie+4.0+Communication+Guideline.pdf/a1fcf2a7-7476-b56f-667f-bd0f469da3a1

4 Available at: https://www.vdma.org/documents/34570/77803117/VDMA_Leitfaden_Mehrwerte_DE.pdf

5 Available at: https://www.vdma.org/catalogs

6 Available at: https://umati.org/

7 Available at: https://vdma.org/documents/34570/51307093/2023_10_05+Study+Data+Act_ENG.pdf/5718b16c-6d79-531a-4706-acac3e665a72?t=1698847345873

8 Available at: https://www.vdma.org/documents/34570/4802302/159705_Brosch_Manufacturing-X_engl_FINAL.pdf/b93b300d-dd61-0e22-561b-f7c9d45744ec?t=1690971432686

9 Available at: https://www.vdma.org/viewer/-/v2article/render/75356586

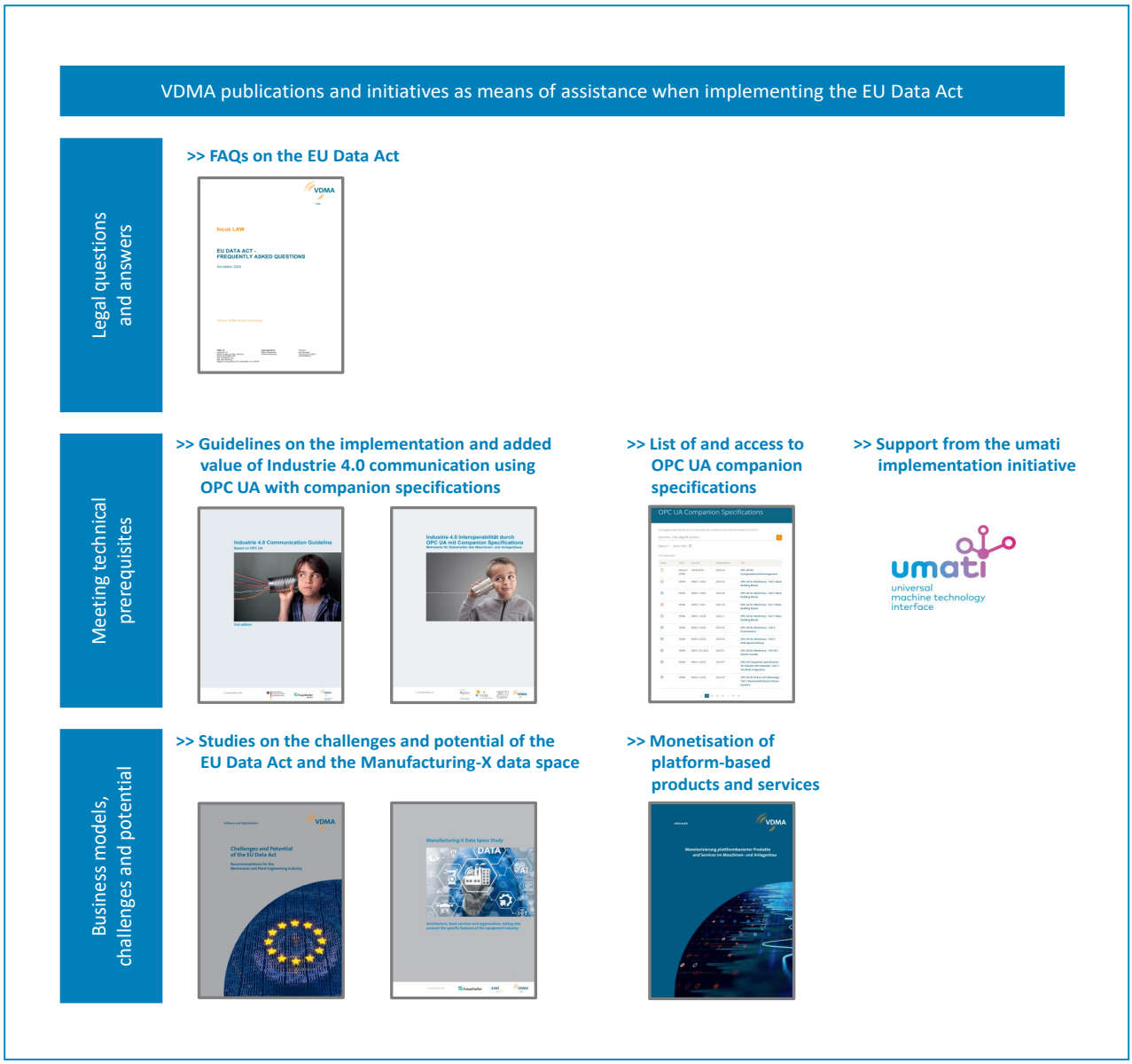

Figure 1: VDMA publications and initiatives as means of assistance when implementing the EU Data Act

3. Opportunities and challenges of the data economy

Data is a crucial resource for the digital transformation. As digital technologies become increasingly widespread, the quantity of available data is growing – presenting enormous opportunities for business. The Federation of German Industries (BDI) estimates that the value creation potential of the data economy in Germany alone will total up to €425 billion by 2025, while a figure of €1.25 trillion is forecast for the whole of Europe.

Opportunities:

- Correct use of data can bring about **new business models** and improve existing ones, potentially resulting in additional economic growth.
- Data allows companies to develop **innovative products and services** that cater to customers' needs ever more effectively.
- Data analysis can help companies optimise their processes and products, utilise resources **more efficiently** and reduce costs.
- By analysing data, companies can offer **more individual products and services** that are tailored to their customers' needs and preferences.

To put this into practice, companies need to make data available within their value creation network.

Challenges:

- The **cultural change** involved in greater awareness of the importance of data and sharing data, which comes about by increasingly viewing data as a valuable resource and using targeted strategies to acquire, analyse, share and monetise data.
- Handling large quantities of data carries risks with regard to **data protection and data security,** which can lead to concerns about the abuse of data and privacy breaches.
- The data economy requires specialised staff with knowledge of areas such as data analysis, artificial intelligence and machine learning. A **lack of qualified staff** can make it more difficult to implement data-based projects.
- **Data economy regulations** are complex and can differ depending on the region and industry. Companies have to deal with a vast number of rules and regulations, which can lead to an additional administrative burden.
- An **uneven distribution of data and the access to it** can amplify existing inequalities in society if certain groups or regions are excluded from the benefits of the data economy.

A VDMA study based on expert interviews on the challenges and potential of the EU Data Act revealed that data-based and digital business models often already work today. Products and services can be designed such that customers accept them and data protection is not a hindrance to the implementation of data-driven and digital business models. Examples show that customers either retain their data sovereignty or consent to the use of their data, as they know that it cannot be used to draw conclusions about the raw data. [VDMA, 2023a]

4. A concise overview of the EU Data Act

What is the fundamental motivation and objective of the EU Data Act?

The EU Data Act essentially pursues the goal of fair access to data and the fair use of data for participants in the data economy by means of harmonised regulations. Through this, the EU aims to become a pioneer in the data-driven society; it believes that this holds enormous economic potential and would contribute towards a European single market for data. [Council of the European Union, 2023]

What it is about in a nutshell?

The EU Data Act specifies that connected products and related services must be designed in such a way that connected product data and related service data is by default accessible to the user easily, securely, free of charge and in a comprehensive, structured, commonly used and machine-readable format. Accordingly, product manufacturers and service providers are always obligated to provide users of their connected products or related services access to data generated by the connected products or related services, and to enable them to use this data. [EU Data Act, 2023]

When does the EU Data Act enter into force (timeline)?

The EU Data Act was passed by the Council of the European Union on 27 November 2023 and entered into force following publication in the Official Journal of the European Union on 11 January 2024. A legal transition period of 20 months applies from the day on which the act entered into force; accordingly, the basic regulations of the act will be applicable from 12 September 2025. The requirements specified in Art. 3 (1) of the EU Data Act regarding the design and manufacture of connected products and the design and provision of related services apply to connected products and services related to them that enter the market after 12 September 2026. Further transition periods are specified in Art. 50 of the EU Data Act. The EU Data Act specifies the execution of a comprehensive assessment of various aspects by the European Commission no later than 56 months after the act enters into force; this assessment will take the form of

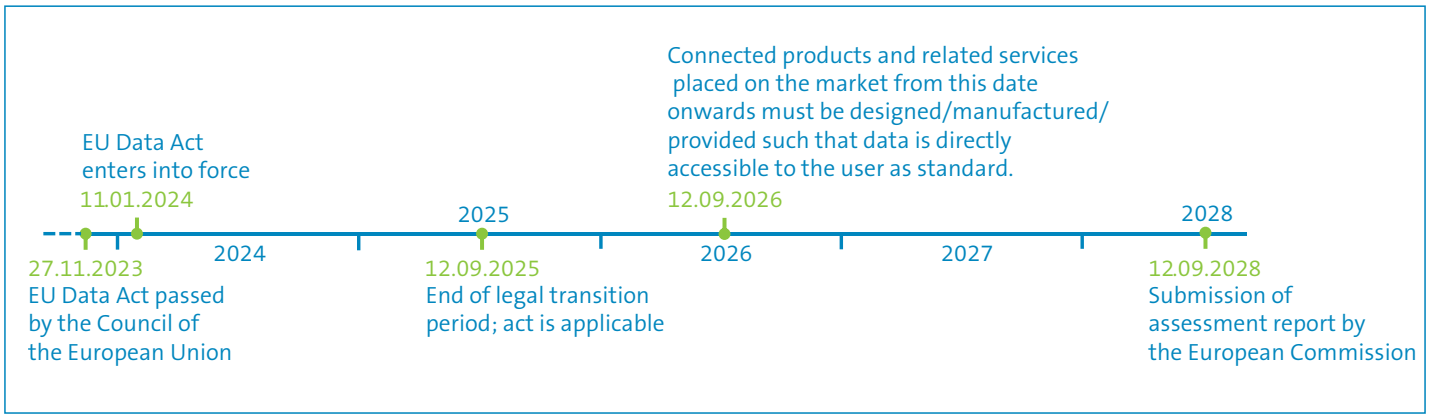

Figure 2: Timeline with important information on the EU Data Act

a report that will be presented to the European Parliament, the Council of the European Union and the European Economic and Social Committee. On the basis of this report, the European Commission can introduce legislative proposals to amend the act where necessary. [EU Data Act, 2023]

Where does the EU Data Act apply and which fundamental rights and obligations apply to the respective roles?

All parts of the act are binding and apply directly in every EU member state, although a differentiation is made depending on whether the "connected products" or "related services" are placed on or provided in the EU single market. The EU Data Act defines certain roles to which, in turn, the resulting rights and obligations are assigned. The following section presents the various roles defined in the act and summarises the rights and obligations arising from it.

Data holder (irrespective of their place of establishment): a natural or legal person that has the right or obligation, in accordance with the EU Data Act, applicable European Union law or national legal provisions for the implementation of European Union law, to use and make available data, including, where contractually agreed, product data or related service data generated during the operation of their connected product (which was placed on the market in the EU) or retrieved/generated during the provision of a related service (provision in the EU). [Art. 2 (13) EU Data Act, 2023]

Among other things, data holders are obligated to:

- make the data of their connected products – which is generated during operation or retrieved/generated during the provision of related services – accessible to the user easily, securely and free of charge, without undue delay and in the same quality as is available to the data holder.
- provide certain data, including the required metadata, continuously in a comprehensive, commonly used and machine-readable format.
- provide data to data recipients only in accordance with the requirements of the user. The compensation agreed between data holders and data recipients for making data available in business-to-business relations must be reasonable and non-discriminatory and may include a margin.
- use non-personal data solely according to a contract with the user. Such data must not be used to gain insights into the economic situation of the user.
- make non-personal product data available to third parties solely for the purpose of fulfilling their contract with the user.

Data holders have the right to:

- restrict access to data for security reasons if it is possible that the health or safety of natural persons is seriously threatened.
- declare trade secrets and refuse access to special data when severe economic damage is probable as a result of disclosing trade secrets.
- apply technical protection measures, such as smart contracts and encryption, in order to prevent unauthorised access to data..

User (in the EU): a natural or legal person that owns a connected product or to whom temporary rights to use that connected product have been contractually transferred, or that receives related services. [Art. 2 (12) EU Data Act, 2023]

Users have the right to:

- easy, free-of-charge access to their data which is generated during the operation of their connected products or retrieved/generated during the use of related services.
- pass on their data to third parties.

The disclosure of data is subject to certain conditions. Users shall not use received data to develop, manufacture or sell competing connected products, passing on data to third parties with this intention, or using the data to gain insights into the economic situation, assets and production methods of the manufacturer or, if applicable, the data holder. They shall not use inappropriate means to access data.

Data recipient (in the EU, to whom data is provided): a natural or legal person acting for purposes related to their trade, business, craft or profession, other than the user of a connected product or related service, to whom the data holder makes data available, including a third party following a request by the user to the data holder or in accordance with a legal obligation under a different European Union law or national legal provisions adopted in accordance with EU law. [Art. 2 (14) EU Data Act, 2023]

Data recipients are obligated to:

- adhere to agreements with the user.
- erase data of the user or data provided by the data holder after processing it.
- use data solely in accordance with agreements with the user and in compliance with data protection laws.

Data recipients shall not:

- using received data to develop connected products that compete with the connected product or related service from which the data originates, or to gain insights into the economic situation of the data holder.
- obstructing the exercise of rights of the user.
- using data for profiling without consent.
- passing data on to third parties, unless this has been contractually agreed with the user.
- preventing users from making the received data available to other parties.

Manufacturer of connected products (irrespective of their place of establishment): a natural or legal person that places connected products on the market in the EU. They shall design the connected products in such a way that data generated through the use of a connected product can be accessed by a user, data holder or a third party – including the manufacturer themselves if necessary – via an electronic communications service, a physical connection or on-device access. Their design choices (and, where applicable, EU or national legislation addressing sector-specific needs and objectives or the relevant decisions of competition authorities) should determine which data will be retrievable by a connected product. [Art. 1 (3a), Art. 2 (15), whereas clause 14, EU Data Act, 2023]

Before concluding a purchase, rental or lease agreement for a connected product, the seller, renter or lessor – or possibly also the manufacturer – provides the user with the following information as a minimum in a clear and understandable manner:

- The type, format and estimated scope of product data that can be generated by the connected product.
- Whether the connected product is capable of generating data continuously and in real time.
- Whether the connected product is capable of saving data on a device or a remote server, including, where applicable, the intended storage duration.
- How the user can access, retrieve or, where necessary, erase the data, including the technical means required for this and the relevant terms of use and quality of service.

Provider of data processing services (irrespective of their place of establishment): an organisation or company that provides such services relating to data processing to customers in the EU. These are generally companies that offer IT infrastructure, storage space, software applications or other services that enable their customers to store, process or access data without using their own physical resources. A data processing service is defined as a digital service that is provided to a customer. This service enables ubiquitous and on-demand network access to a shared pool of configurable, scalable and elastic computing resources in a centralised, distributed or highly distributed manner. It can be rapidly provisioned and released with minimal administrative effort or interaction by the service provider. [Art. 1 (3f), Art. 2 (8) EU Data Act, 2023]

The act obligates these service providers to:

- support their customers when switching to another provider of data processing services.
- ensure that such a switch is completed successfully, effectively and securely.
- ensure that any obstructions to the switch are eliminated and that no new obstructions are created, even if customers wish to switch to a different information and communications technology infrastructure.
- guarantee a high level of security throughout the entire process of the switch and to extend the security level to all technical arrangements for which they are responsible during the switching process.
- provide their customers with all the required information to support the switching process. This includes procedures for the switch, data export formats and the estimated time necessary to complete the switching process.
- promote collaboration between the involved parties in order to guarantee an effective switch and ensure continuity of service.

Figure 3 shows the territory covered by the EU Data Act and the scenarios in which the act is binding for the various roles. [See Art. 1 (3a–d) EU Data Act, 2023]

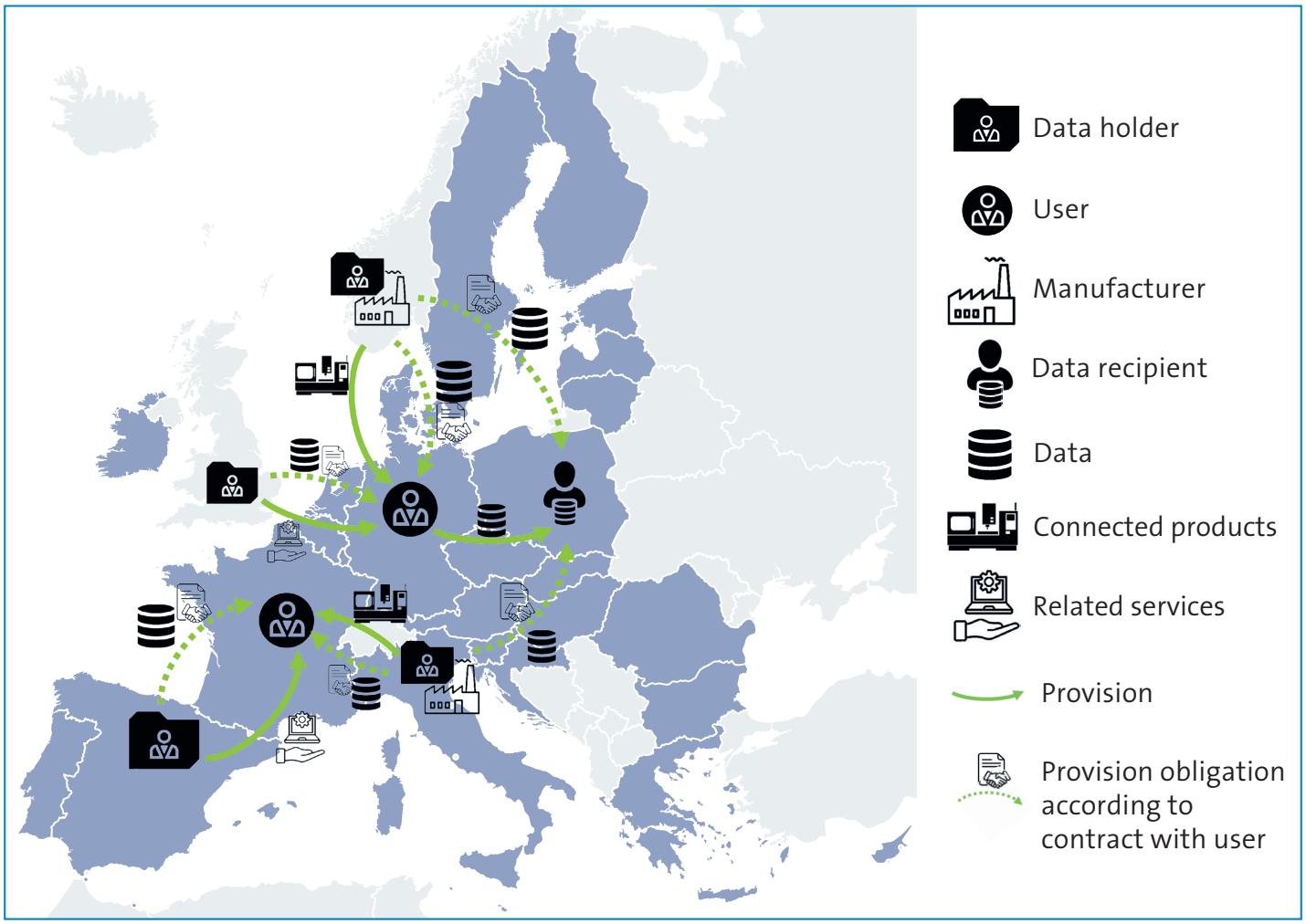

Figure 3: Illustration of the territory covered by the act with roles and example connections

5. Recommended actions for implementation in the mechanical and plant engineering industry

What does the EU Data Act mean for the mechanical and plant engineering industry?

From a formal perspective, the EU Data Act initially means that mechanical and plant engineering companies need to check whether the new requirements contained within are relevant for connected products that they manufacture or sell or for their own related service offerings, and assess how the requirements can be adhered to. In terms of risk management, they should also review the relevant risk portfolio and, if necessary, update it with a view to possible sanctions, civil law consequences and economic implications.

Violations of the EU Data Act can lead to civil law disputes when, for example, claims are asserted in relation to the provision of data or the invalidity of contractual arrangements. This can also result in warnings and cease and desist orders from persons with legal standing and demands for damages. These consequences are similar to those found in other legal scenarios. Regular legal recourse is available in the event of civil law disputes. Article 10 of the EU Data Act also allows access to a dispute settlement body. In addition to the civil law consequences, Article 40 of the EU Data Act states that violations of these can also lead to fines imposed by public authorities. The act does not specify the level of the fines.

The EU member states must create the statutory regulations required for this. However, the EU Data Act describes certain factors that should be taken into account when setting the fines, such as the infringing company's turnover in the EU during the previous financial year.

The act will severely impact existing business models, but will also provide the basis for new and economically lucrative business models. One challenge will be in finding a way to implement business models in an open data economy while also safeguarding interests such as the protection of intellectual property and trade and business secrets. The scope of consequences for companies from the mechanical and plant engineering industry varies, as it depends on a range of key factors including the following:

- Does the company offer connected products and/or related services?
- How much technical and organisational progress has the company made towards Industrie 4.0 in its digital transformation?
- Does the company already have digital business models and, if so, are its functional mechanisms compliant with the new regulations of the EU Data Act?

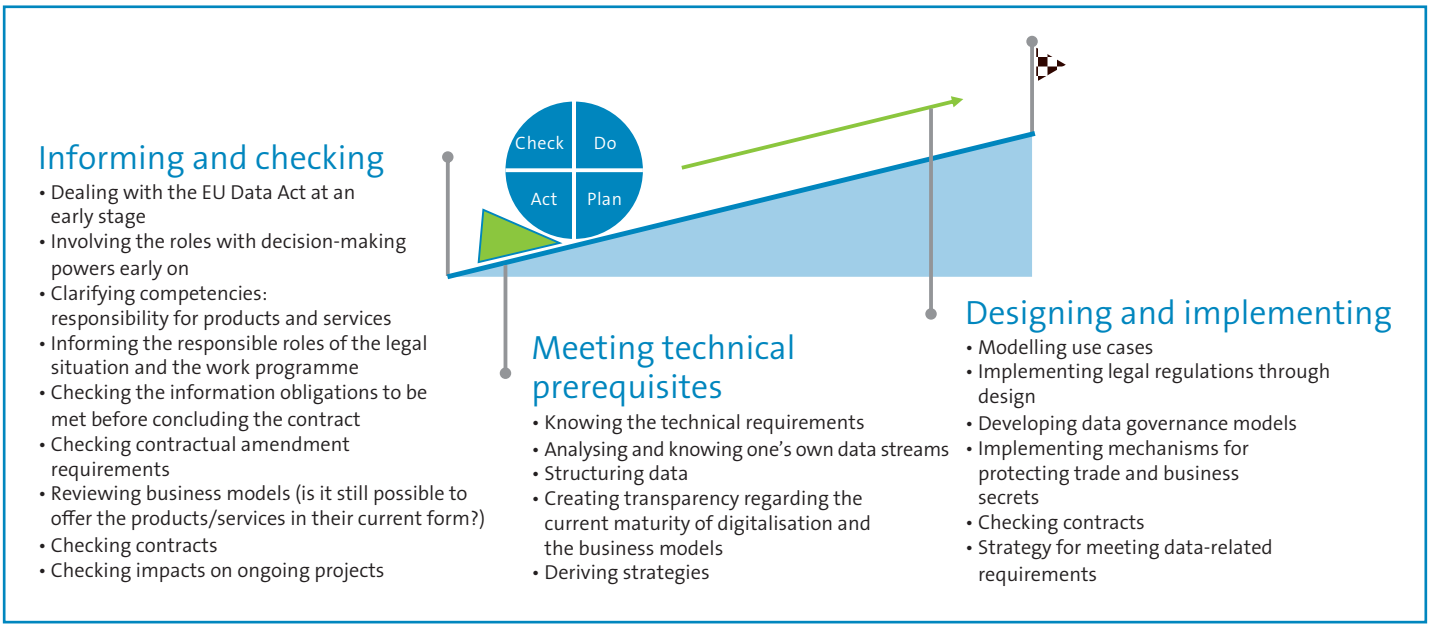

Figure 4: Recommended actions for implementation of the EU Data Act

Overall, the EU Data Act will have a decisive impact on the competitiveness of companies in the mechanical and plant engineering industry and will open up many new opportunities. To implement the act successfully, the non-binding actions outlined in Figure 4 are generally recommended. The starting point is to inform and review, i.e. ensuring that all affected and responsible roles are familiar with the act and checking existing business models, contracts and projects for conformity. Putting the technical prerequisites in place is an essential and unavoidable step for complying with the requirements specified in the act and making data available in the manner required. On this basis, design and implementation projects are possible with the aim of adapting business models, products or services to the act or redesigning them. Another important step is to develop a data governance model. This is a framework or structure that defines how data is managed, organised, stored and used within an organisation. To support business goals and adhere to legal requirements, rules, guidelines, processes and responsibilities are defined to ensure that the data is used effectively and protected.

What do companies always need to consider when putting the technical prerequisites in place?

Companies from the mechanical and plant engineering industry need to ensure that their practices and systems are always in compliance with the provisions of the EU Data Act. When putting the technical prerequisites in place, the following aspects need to be observed in particular:

Collecting and structuring data: companies must ensure that the product data of a connected product and the related services can be collected and retrieved in a comprehensive, structured and machine-readable format. This requires an initial analysis and, where necessary, adaptation of the existing data collection and storage practices.

Implementing security measures: data security is an important aspect of the EU Data Act. Companies should implement appropriate security measures to ensure that the data is protected against unauthorised access and manipulation. This can entail the implementation of encryption technologies, access control concepts and other security protocols, as well as user and role management.

Ensuring accessibility: connected products and related services must be designed such that the user can access the relevant data easily, securely and free of charge as standard. Companies should ensure that the data is easily accessible for the user and that access to the data is technically feasible.

Promoting interoperability: the data should be available in a commonly used format in order to promote interoperability in terms of transport and information between different systems.

6. Non-binding recommendation for technical implementation

The OPC UA with companion specifications for Industrie 4.0 communication is already established in the mechanical and plant engineering industry. It provides an open, secure and scalable communication architecture for vendor-neutral connection. This standard has two decisive features. Firstly, it allows data to be exchanged between different devices or systems in industrial environments securely and reliably; secondly, it enables data structuring and the semantic description and modelling of information. VDMA coordinates the activities of more than 40 working groups. Within these, it works with more than 700 companies to develop OPC UA interface standards, more than 60 of which are already available. [VDMA, 2024b] The introduction of Industrie 4.0 communication based on OPC UA is described in detail in the VDMA guidelines referred to above. [VDMA, 2023b] The structure and implementation of the standards is summarised in the following.

What is the basic structure of the OPC UA standard?

The OPC UA standard essentially consists of **basic functions** and the information level. The basic functions comprise **transport mechanisms, protocols and security,**[10] as well as the configuration for **access to information** and the rules regarding the **object-oriented provision of information.** The information level contains the structure and definition of the information to be exchanged.

Three categories of information model can be specified:

- **OPC UA for Machinery** (OPC 40001) is the **basic specification** for the entire mechanical and plant engineering industry. The information within can be used in various sectors equally, i.e. across multiple domains. The content is based on use cases and is therefore divided into individual elements that can be used as required.
- Domain or **industry-specific companion specifications** comprise the integration of standard information, data types, objects and methods specified in a certain domain or industry, and thus describe the information through a standardised domain-specific information model.
- **Manufacturer-specific extensions** are information models extended in a manufacturer-specific manner on the basis of functions that go beyond the standard and are based on the experience or protected knowledge of individual manufacturers. They solely contain information that a manufacturer expressly wishes to offer and can be protected against unauthorised access.

10 The German Federal Office for Information Security (BSI) confirms that IT-secure Industrie 4.0 communication can be implemented with OPC UA. [German Federal Office for Information Security (BSI), 2022]

How is the OPC UA standard implemented?

VDMA recommends the following procedure for implementing the OPC UA standard in the mechanical and plant engineering industry (see Figure 5).

The open OPC UA standard can always be used free of charge. Specifications and implementation examples are available in various languages. Commercial support for implementation is also offered, e.g. in the form of training courses, workshops, consulting services and professionally maintained tool kits tested for maturity. The latter make it easier for users to start using the technology and summarise functions via simple interfaces. However, using development and tool kits may be subject to licensing costs. The umati initiative offers an ideal, free, global, trust-based space with more than 300 members in which the implementation of the OPC UA companion specifications can be tested and demonstrated pre-competition. For example, the umati initiative is a space to exchange best practices and lessons learned as a way for the mechanical and plant engineering industry to collaboratively promote the implementation of the OPC UA companion specifications.[11]

The first step of implementing OPC UA is to implement and configure an OPC UA server and utilise OPC UA as a standardised communication interface for accessing information using the **basic functions**; as a result, variables made available by plant and machinery can be found and subscribed to manually.

The next step focuses on structuring **information** and implementing information models. When doing so, it should first be checked whether an **industry-specific companion specification** is already available. If so, it can be implemented accordingly. It must also be checked whether the basic specification OPC UA for Machinery is

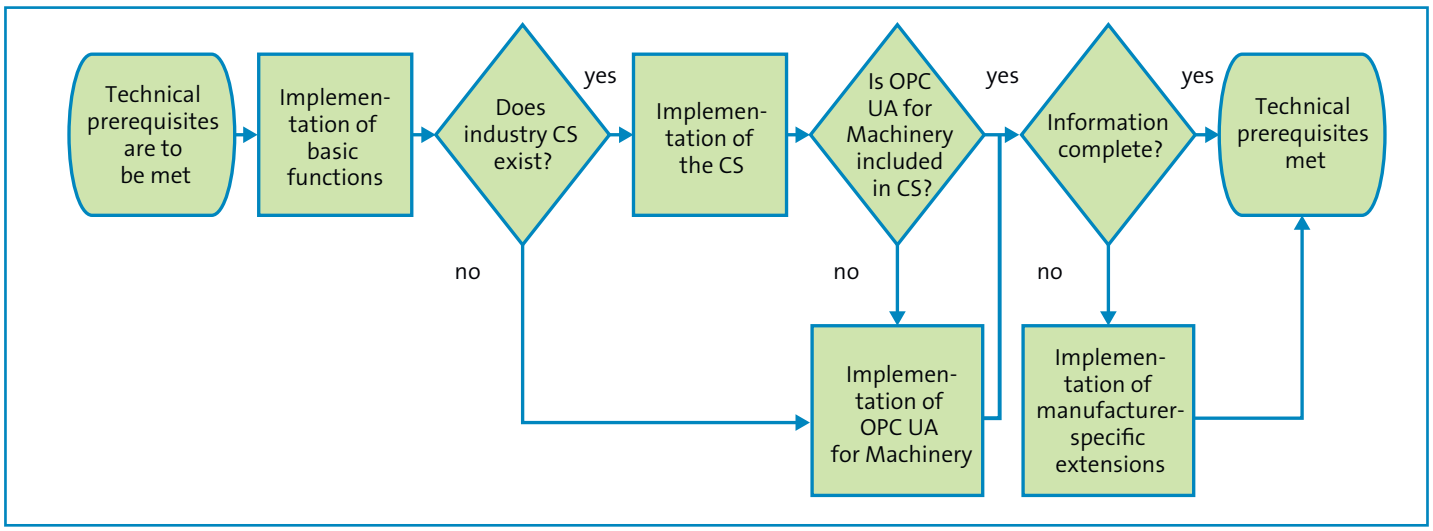

Figure 5: Procedure for implementing the OPC UA standard with companion specifications (CS) for the mechanical and plant engineering industry

11 More information on the umati initiative is available at: https://umati.org/

inherent to the companion specification. If the **OPC UA for Machinery basic specification** is not inherent to the companion specification or if no industry-specific companion specification exists, the OPC UA for Machinery basic specification can be implemented.

If further information is then to be expressly offered by the manufacturer, **manufacturer-specific extensions** or information models can be added.

How will using the OPC UA standard help me in relation to the requirements of the EU Data Act?

The EU Data Act specifies a large number of requirements that need to be met in order to comply with the act. The non-binding recommended implementation of the OPC UA with its companion specifications described in this Quick Guide allows data to be exchanged securely and reliably between different devices or systems in industrial environments, as well as enabling data structuring and the semantic description and modelling of information.

The added value of using the OPC UA standard with its companion specifications is highlighted below with regard to certain (both implicit and explicit) requirements of the EU Data Act.

1. **General added value of OPC UA with companion specifications in relation to the EU Data Act:**

- The openness and transparency of the standard and its global acceptance establishes trust – on the part of both the data holder and the user.
- Applicable to a broad range of products due to the standard's scalability – the OPC UA standard can be applied at the component level (e.g. sensors and actuators), the machine and device level, the plant level, the distributed control system level, the cloud level and across different companies.
- Applicable to a broad range of products due to the large number of existing specifications with information models.

2. **Meeting the technical prerequisites (implicit requirement for implementation of the EU Data Act):**

- Firstly, using the OPC UA standard allows data to be exchanged securely and reliably between different devices or systems in industrial environments;
- secondly, it enables data structuring and semantic information modelling.

3. **Defining product data (in the meaning of Art. 2 (15) EU Data Act), related service data (Art. 2 (16) EU Data Act) and metadata (as per Art. 2 (2) EU Data Act) within the scope of the company's own services for standard provision for the user in accordance with Art. 3 (1) EU Data Act:**

- Essential assistance in defining "product data" and "metadata" by structuring data into the specified information models.

4. **In accordance with recital 57 of the EU Data Act, data holders can apply appropriate technical protection measures to prevent the unlawful disclosure of or access to data:**

- The integrated security mechanisms enable secure and reliable exchange of data, thereby protecting the data holder and their knowledge by enabling them to manage access permissions via authentication using certificates, encrypt information, integrate signatures, assign user roles and track them by logging activities and access.
- Protection of own knowledge and experiences – information can be explicitly protected against unauthorised access in an OPC UA information model, and extended manufacturer-specific information models only contain the information that the manufacturer explicitly wishes to provide.

5. **With regard to the information obligations specified in Art. 3 (2) EU Data Act, the user must be informed of the type, format and estimated scope of product data that the connected product can generate:**

- By structuring the data into the specified information models, the OPC UA standard provides the data holder with vital assistance in meeting information obligations as the data holder has already provided and implemented a complete overview of the data generated during operation of the product – accordingly, they have full knowledge of the data streams and the corresponding formats relevant to the product and can thus provide meaningful information on the scope of the product data. The data holder therefore saves both time and money, as they do not have to provide individual information on the format and context of the data.

6. **With regard to the information obligations specified in Art. 3 (2) EU Data Act, the user must be informed how they can access, retrieve or, where necessary, erase the data, including the technical means required for this and the relevant terms of use and quality of service.**

- As an open standard, the OPC UA specifications are publicly available.
- By structuring the data into the specified information models, the OPC UA standard helps the data holder as they already have a complete overview of the data generated during operation of the product – accordingly, the data holder has full knowledge of the data streams and the corresponding formats relevant to the product and can thus provide meaningful information on accessing and retrieving the product data.

7. **In accordance with Art. 3 (1) EU Data Act, connected products must be designed and manufactured, and related services designed and provided, in such a manner that product data and related service data – including the relevant "metadata" necessary for interpreting and using this data – are, as standard, accessible to the user easily, securely, free of charge and in a comprehensive, structured, commonly used and machine-readable format, and, where relevant and technically feasible, can be accessed directly.**

- Using the OPC UA standard allows data to be exchanged securely and reliably between different devices or systems in industrial environments, meets the agreements made on data provision and thereby assures the user that the data will be accessible.
- Using the OPC UA standard allows the structuring of data and the semantic modelling of information in standardised and globally widespread information models. This guarantees that the user has access to the product data in a comprehensive, structured, commonly used and machine-readable format.
- Because it is an open standard, it is also feasible for the data holder to provide the data free of charge.

Moreover, using the OPC UA standard with its companion specifications offers stakeholders from the mechanical and plant engineering industry many sources of added value, which are described in detail in the VDMA guidelines referred to in chapter 3. (VDMA, 2023c)

7. Use case

On the basis of an example scenario, this chapter explains the roles (in the meaning of the EU Data Act) that mechanical and plant engineering companies can take. It then uses the use case to describe how companies from the industry can efficiently put in place the technical prerequisites for meeting the EU Data Act successfully through the non-binding use of the OPC UA standard with its companion specifications.

Initial situation in the example scenario

In simple terms, the example scenario is about a connected production cell in the discrete manufacturing facility in fully automated and flexible operation. The operator of the production cell is a fictitious manufacturing company from the mechanical and plant engineering industry based in the EU – Precision Parts GmbH. This company makes high-precision milled parts and supplies them to its customers, which include OEMs.

The connected production cell consists of a machine tool, an industrial robot and a coordinate measuring machine. Because these need to interact with one another in the production process chain, data exchange and connection on the shop floor are required. The connected products are also integrated into the network in order to manage production via a manufacturing execution system.

To optimise manufacturing, process data is transferred to an external IoT platform of the fictitious company Digital Services AG, which is also based in the EU and performs various services for digital process optimisation. In the fictitious production process, the industrial robot loads a workpiece into the machine tool. A job is then started on the machine tool. As soon as the job is complete, the industrial robot removes the machined part from the machine tool and places it on the coordinate measuring machine, where it is measured for the subsequent quality assessment. While the measurement is taking place, the industrial robot loads a new workpiece into the machine tool.

Once the measurement is finished, the quality of the machined part is checked. If the workpiece does not comply with the specified tolerances, the industrial robot removes it from the coordinate measuring machine and places it on a pallet for reworking or rejection. If the specified tolerances are adhered to, the industrial robot places the machined part on a pallet for good parts.

At the same time, Precision Parts GmbH is a customer of the also fictitious European-based machine tool manufacturer HighDyn GmbH & Co. KG, the fictitious industrial robot manufacturer AllRobo AG based in the EU, and the fictitious coordinate measuring machine manufacturer CMM Ltd., which does not have an establishment in the EU.

In the example scenario, Precision Parts GmbH takes the role of the user as it is a legal entity and the owner of the machine tool, industrial robot and coordinate measuring machine, which are all connected products. It therefore has the right to easy and free access to the data generated during the operation of the three aforementioned connected products. It must not use the data it receives to develop, manufacture or sell products that compete with the machines that generate the data. However, it does have the right to transfer the aforementioned data to third parties, which in turn may have to pay a fee to the data holder.

In the example scenario, HighDyn GmbH & Co. KG, AllRobo AG and CMM Ltd. each take the role of **data holder** regardless of their place of establishment, as they have placed their products in the European market and are legal entities.

HighDyn GmbH & Co. KG, AllRobo AG and CMM Ltd. also play the role of the **manufacturer** of connected products in the example scenario: through their design decisions, they specify which data can be provided by their connected product. Because they sell their connected products to Precision Parts GmbH, they must meet their information obligations towards this

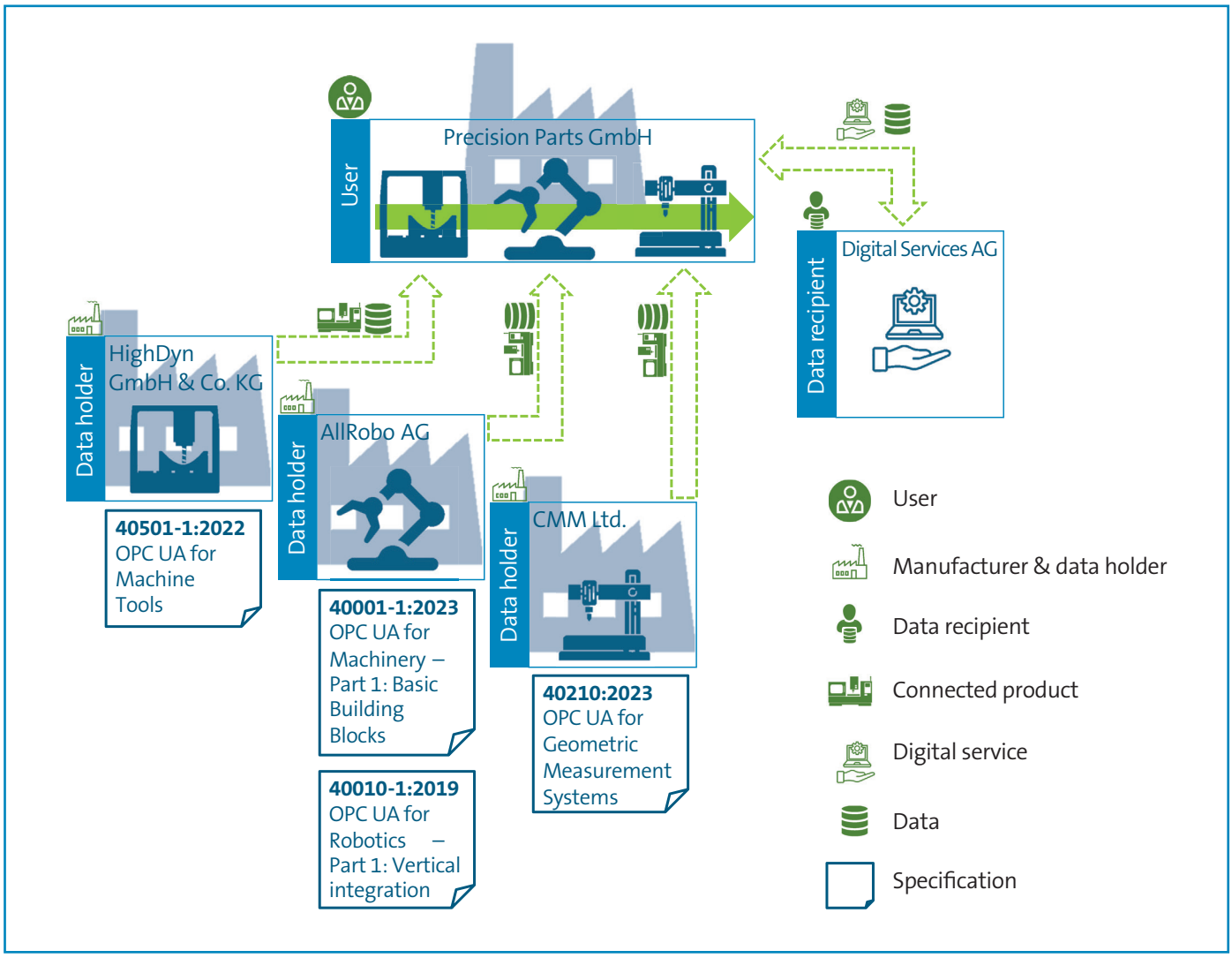

Figure 6: Roles and relationships based on the EU Data Act in this example application

company prior to concluding a purchase contract (see chapter 5, information obligations for the "manufacturer" role) and provide this information to Precision Parts GmbH in a clear and understandable manner.

Digital Services AG takes the role of **data recipient**, as it is based in the EU, it is not a user of the connected products and its data is provided by the user for the purpose of providing a service.

Meeting the technical prerequisites by implementing the recommended implementation in the example scenario

HighDyn GmbH & Co. KG, AllRobo AG and CMM Ltd., which are the manufacturer and data holder of their connected products, have the option of implementing the OPC UA standard with selected companion specifications in accordance with the recommended implementation described above. They all initially implement the basic functions on the control system or IPC of their machines. They then check whether an industry-specific companion specification exists for their products. However, the following steps then differ for the various companies:

HighDyn GmbH & Co. KG implements the companion specification 40501-1:2022: OPC UA for Machine Tools – Part 1: Machine Monitoring and Job Overview.[12] In this case, the basic specification OPC UA for Machinery does not need to be implemented separately, as it is inherent to OPC UA for Machine Tools.

CMM Ltd. implements the companion specification 40210:2023 OPC UA for Geometric Measuring Systems.[13] The basic specification OPC UA for Machinery does not need to be implemented separately in this case either, as it is inherent to OPC UA for Geometric Measuring Systems.

AllRobo AG implements the companion specification 40010 40010:2019 OPC UA Companion Specification for Robotics – Part 1: Vertical Integration.[14] As the basic specification is not inherent to this, AllRobo AG implements 40001-1:2023 OPC UA for Machinery – Part 1: Basic Building Blocks[15] separately (note: in each companion specification, the namespace table in the last chapter "Annex" states whether OPC UA for Machinery is inherent).

Because the OPC UA for Machinery specification has been implemented at all three data creators, cross-sector interoperability is present in this case and the information can be analysed in the same manner. This can be information for identification, status monitoring and job management.

The respective industry-specific companion specification supplements this with information about motor temperatures, current load conditions, positions, or error and warning messages, for example.

A full overview of information available with a companion specification can be found in the corresponding specification. Manufacturer-specific extensions are not dealt with in this example application, but can be implemented where required.

With the implementation described above, HighDyn GmbH & Co. KG, AllRobo AG and CMM Ltd. have met the technical prerequisites for satisfying their obligations as manufacturers and data holders. The working group of the respective domain has already defined which data from the companies' connected products can prudently be provided during their use when drafting the respective companion specification. By structuring the data in the specified information models, companion specifications provide a comprehensive overview of the data created when operating the connected product and the corresponding formats, enabling HighDyn GmbH & Co. KG, AllRobo AG and CMM Ltd. to make meaningful and informed statements about access to and

12 OPC UA for Machine Tools, available at: https://www.vdma.org/catalog-detail/-/catalog/8482

13 OPC UA for Geometric Measuring Systems, available at: https://www.vdma.org/catalog-detail/-/catalog/7527

14 OPC UA for Robotics, available at: https://www.vdma.org/catalog-detail/-/catalog/1720

15 OPC UA for Machinery – Part 1, available at: https://www.vdma.org/catalog-detail/-/catalog/10174

retrieval of product data. When handing over the machinery, they give Precision Parts GmbH access information for the data in the OPC UA server, thereby granting it access to the data. When operating the connected products, Precision Parts GmbH must manage the certificates and access permissions and can therefore determine who has access to which data. If the manufacturers HighDyn GmbH & Co. KG, AllRobo AG and CMM Ltd. wish to access the data themselves, they need to obtain the consent of the operator and should specify this as part of a contract. In accordance with the provisions of the EU Data Act, Precision Parts GmbH can also forward this data to third parties, e.g. in order to take advantage of further digital services.

The use case illustrates that the use of OPC UA standards with companion specifications is an efficient option for putting in place the technical prerequisites for successfully applying the EU Data Act. This enables design and implementation projects aimed at adapting business models, products or services in line with the EU Data Act or developing them and benefiting from the opportunities held by the data economy in years to come.

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