

connecting the world
of machinery

Our promise: Make connectivity
between machinery and
software easy, secure and
seamless – to help customers
exploit added value from data.

universal machine technology interface

Connectivity is key for all machinery in the 21st century. It means getting data in and out of devices and software systems – preferably via open, standardized interfaces.

umati is the global initiative for the promotion of open communication interface standards for machinery and production equipment.

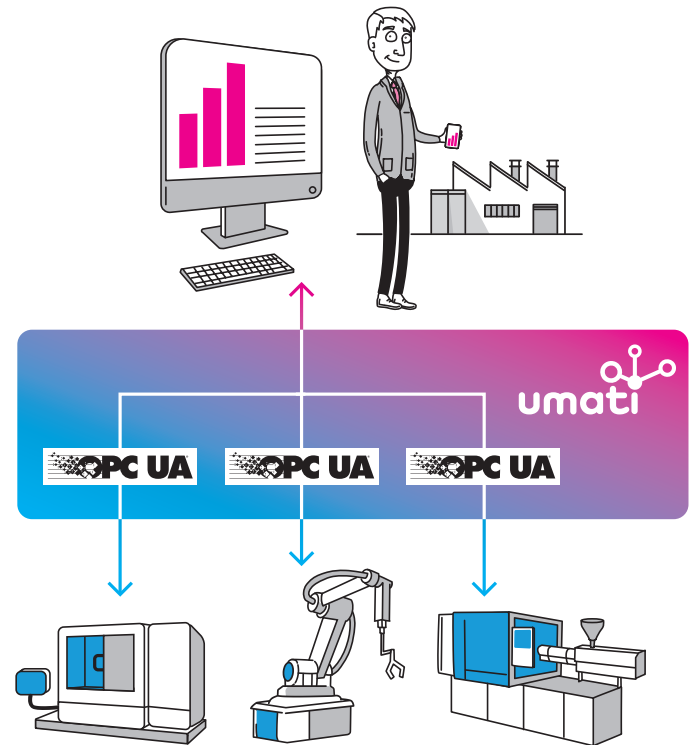
Our mission is to provide true plug and play functionality in the field of machinery, making it easier for users to participate in a data driven economy.

umati supports users and machine builders by building a strong international community; raising market awareness through joint marketing; ensuring identical implementation of the endorsed OPC UA Specifications; and proving the power of an open, standardized data exchange ecosystem through live demonstrations.

umati relies on **OPC UA as the global interoperability standard**. Standardization work takes place in multiple Joint Working Groups with various sectors of the machine building industries and the OPC Foundation. This guarantees that the individual needs of different technologies are taken into consideration and ensures maximum transparency and the support of a strong global community.

OPC UA and the OPC Foundation:

- provide a **framework for standardized communication** (**HOW** to communicate)
- **support standardization** of specific needs for various technologies (**WHAT** is to be communicated)
- make the standards **available worldwide with no license fee**.



How umati works: several machines with OPC UA servers using Companion Specifications endorsed by umati, implemented according to umati guidelines, are connected to one IT system with an OPC UA client.

umati provides resources on the uniform implementation of a range of OPC UA specifications at umati.org/dev



Network of strong partners

Our partners support the dissemination of OPC UA standards with uniform implementation in the machinery industries.

umati partners:

- advertize the connectivity of their products through the **umati logo**
- have **easier access to their customers**
- benefit from **market stimulation** through strong marketing with high visibility
- demonstrate the **plug and play** user experience e.g. by taking part in demonstrations at trade fairs
- are part of a **global community** – for the industry by the industry
- have access to **exclusive** information and tools

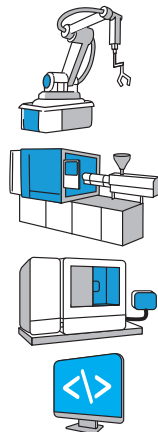
The number of umati partners is growing continuously.

To see who has already endorsed umati, visit

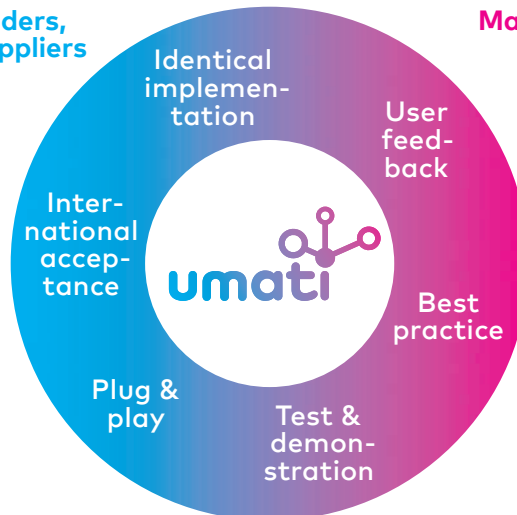
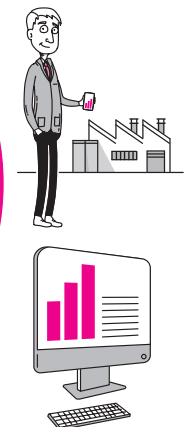
<https://umati.org/partners>

umati brings together machine builders, software producers and users in a strong community. They share their experience to benefit from identical implementation of OPC UA standards.

Machine builders,
Software suppliers



Manufacturers,
Users



Data flow as a user experience

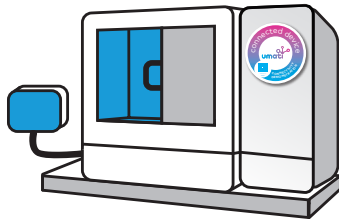
The umati live demonstration proves that connectivity across different machine technologies is a promise come true.

The umati live demonstration:

- provides a **user experience** for data flow
- has an **open, common interface** to which participants can connect
- realizes **criss-cross connectivity** between machinery and multiple software applications, even under trade show conditions

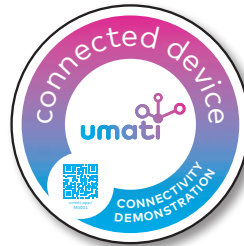
The umati community benefits from:

-  a common infrastructure for **secure connection** during a trade show and beyond
-  a vendor-independent **dashboard** to display data for a machine status monitoring use case
-  **guidelines** on getting connected – also applicable for testing and plug fests
-  comprehensive **marketing** (including design and templates) for all partners to increase market impact for customers and suppliers



How the umati live demonstration works:

1. Connected machines feature a umati sticker.



2. Scan the QR code or type the shortcut link to access the umati dashboard and see the live data stream from the machine.



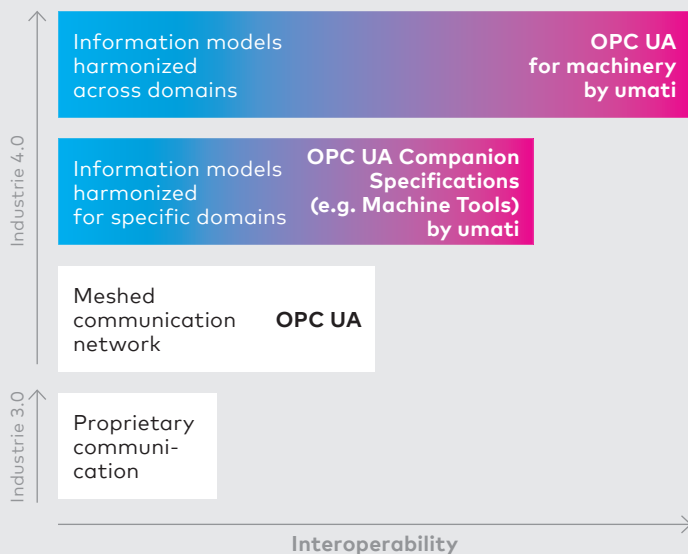
3. Get an overview of all the connected machines at <https://umati.app>

OPC UA 40001 for Machinery

OPC 40001 is applicable for the entire machine building industry.

It contains various building blocks for machinery that allow use cases across different types of machines and machine components. These building blocks can either be used in other Companion Specifications or directly in an information model.

The first version was published in 09/2020 and was one of the first OPC UA Companion Specifications to be fully endorsed by the umati community. Recently, the version was updated to address additional use cases and will continue to be updated in the future.



The highest level of interoperability is achieved through cross-domain information models. One such information model is the OPC UA Companion Specification OPC UA for Machinery.

Building blocks covered:



Machine Identification and Nameplate



Finding all **Machines in a Server** (OPC 40001-1)



Component Identification and Nameplate (OPC 40001-1)



Finding all **Components of a Machine** (OPC 40001-1)



Machinery State (OPC 40001-1)



Counters (OPC 40001-1)



Process Values (OPC 40001-2)



Job Management (OPC 40001-3)



Result Transfer (OPC 40001-101)

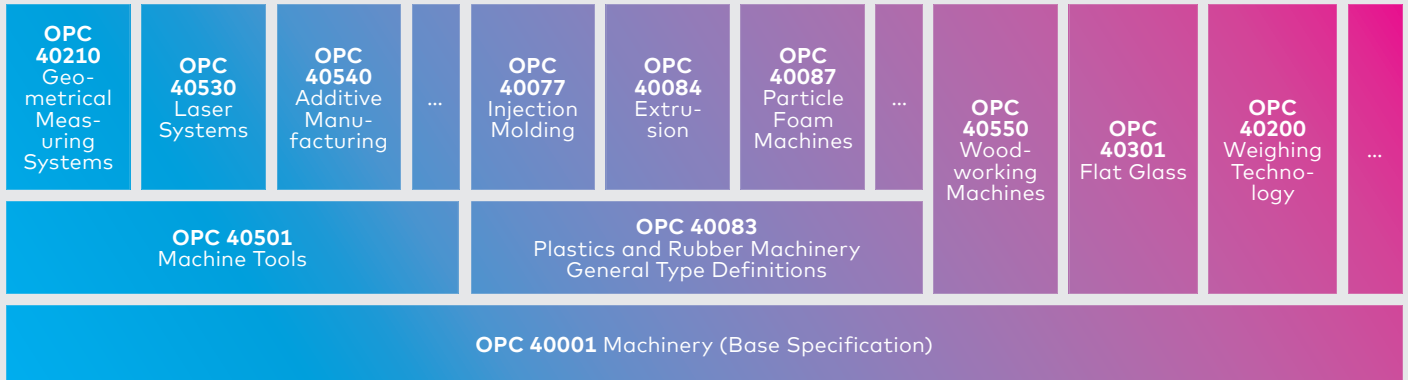


Energy Management (OPC 40001-4)

Identification

Machine and component identification is the foundation of the plug and work concept. Assets from a wide range of industries can be identified in the same way, enabling recognition between different participants, regardless of the machine and manufacturer.

Harmonized Interfaces based on OPC UA for Machinery



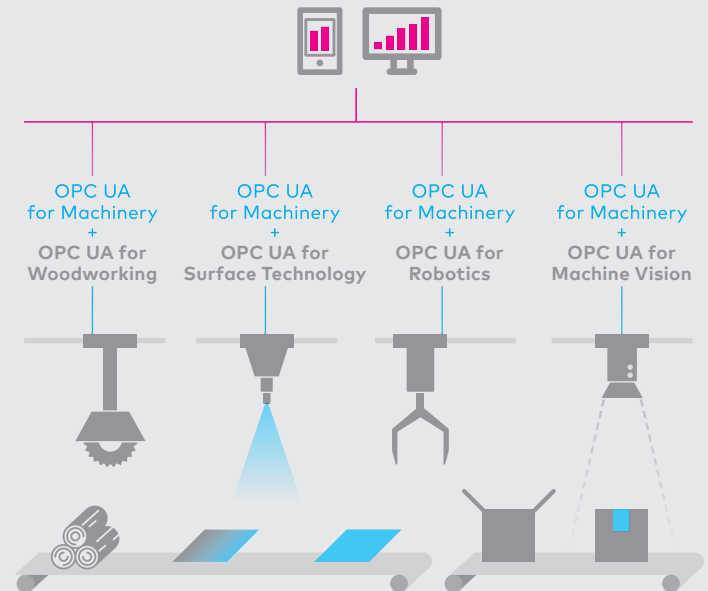
Machinery State

The Machinery State module paves the way for various use cases like Machine Monitoring and KPI Calculations. Machine availability can easily be determined, resulting in high added value – especially in production processes where machines from different industries are used.

The definition of states enables the basic status of the machine to be expressed in a uniform way across all the different domains in mechanical process engineering. Examples of those states are: currently executing an activity, waiting to start or resume an activity, or out of service.

Job Management

The Job Management information model defined in OPC UA for Machinery builds on the ISA 95 Job Control specification. In addition, all job parameters are aligned with the terminology from ISO 22400. Thus, it is a highly harmonized information model with a wide range of



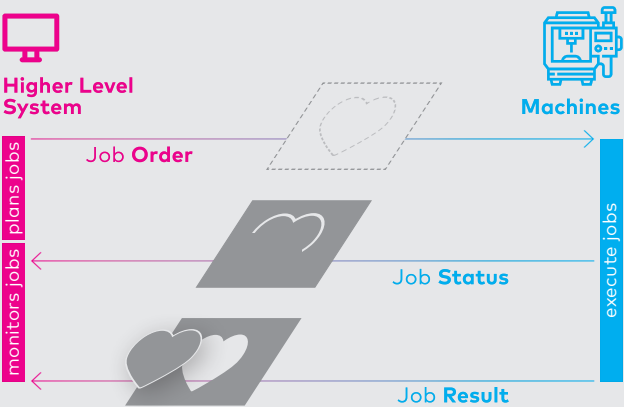
OPC UA for Machinery can be used across the entire landscape of production machinery, either standalone or in combination with domain-specific specifications.

usable job parameters. These include the job name, a start time, an end time, a job result, and information about the current status of the job. With the help of the Job Management model, use cases such as traceability and quality assurance can be supported in addition to the obvious use cases such as monitoring and controlling of jobs.

Energy Management

Energy management in industrial environments is increasingly critical for optimizing operations and meeting sustainability goals. The OPC UA for Machinery Energy Management is based on the generic specification OPC 34100 – Energy Consumption Management, a collaborative development by ODVA, OPC Foundation, PI, and VDMA.

The OPC UA for Machinery Energy Management provides a standardized approach to accessing energy consumption data from machines and their components. By defining a consistent set of typical, market-relevant energy information, it enables seamless integration across diverse systems and vendors. The structured energy data made available through this specification supports a wide range of use cases. These include Load Management, Product Carbon Footprint and Predictive Maintenance – all of which benefit from transparent and interoperable energy metrics directly from the machine level.



The Job Management model enables a user to issue job orders from a higher-level system to a machine. The user can also update and manage the job orders and get information on them during and after their execution.

Driven by the industry

OPC 40001 was developed under the umbrella of VDMA, the Mechanical Engineering Industry Association, in a Joint Working Group with the OPC Foundation. It followed an initiative by a number of technology-specific first-mover standardization groups from different sectors of the machine building industries. All domain-specific working groups support OPC UA for Machinery as the basis for interoperability.

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The specification is available free of charge from umati.org/ua4m

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OPC UA 40010 for Robotics

OPC 40010 provides standardized OPC UA information models for industrial robots.

The VDMA OPC Robotics Initiative was established in 2017 to bring together robot manufacturers with the aim of discussing and developing a common, usable, future-proof interface for industrial robots. OPC UA was identified as the obvious choice for the creation of such a standard since it provides feature-rich standardized mechanisms to describe vendor-independent interfaces supported by a strong information model.

As a Joint Working Group, the initiative is organized by VDMA Robotics + Automation and supported by the OPC Foundation. Over the last years, the core working group of this initiative, a group of experts from 14 companies, have developed Part 1 of the VDMA OPC Robotics Companion Specification. Part 1 is the first step in the gradual design-in towards a fully connected Industrial Internet of Things (IIoT). It enables vertical provisioning of information from the lower (Sensor/ Actuator) to the higher (Control, SCADA, MES, Cloud) levels of the automation pyramid.

The **OPC Robotics Information Model** can be used to describe all current and future robotics systems:

- **industrial robots**
- **mobile robots**
- **additional axes**
- **control units**
- **peripheral devices** which do not have their own OPC UA server

Part 1 covers these use cases:

- **Structuring of an integrated robot system** into its constituent components
- **Vendor-independent access** to asset information of all integrated robot systems and their components
- **Representation of motion devices** containing one or more axes
- **Representation of controllers** including their software and task controls
- **Representation of common safety states** of a motion device system
- **Common condition monitoring parameters** of the components of an integrated robot system
- **Identification of anomalies** based on the condition monitoring parameters
- AddIns for **remote operation** i.e. loading, unloading, starting, stopping programs
- A **dialog mechanism** to handle system notifications that need to be accepted by the operator

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The specification is available free of charge
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OPC UA 40020 for Cranes and Hoists

OPC 40020 provides standardized OPC UA information models for cranes and hoists.

The VDMA OPC Cranes and Hoists Working Group was established in 2018 with the aim of developing a common, usable, future-proof interface for cranes and hoists with a focus on industrial applications. OPC UA was developed based on OPC 40010 Robotics.

The Joint Working Group is organized by VDMA Materials Handling and Intralogistics with support from the OPC Foundation. Over the last years, the core working group of this initiative, a group of experts from 15 companies, have developed Part 1 of the VDMA OPC Cranes and Hoists Companion Specification.

Part 1 covers these use cases:

- **Supervision:** With the data provided, the crane or hoist system can be supervised and monitored. Functional analysis of individual crane systems within the factory is possible.
- **Condition monitoring** offers the possibility to determine the condition of machinery while in operation. This is a major component of predictive maintenance.
- **Asset management:** The specification provides detailed information of the main electrical and mechanical parts.
- **Limitation by external system:** The Companion Specification for cranes provides an interface for requesting limitations to the operation of the crane, making the crane operating area safer.

The OPC Cranes and Hoists information model can be used to describe all current and future crane and hoist systems, such as: Bridge cranes, gantry cranes, light crane systems, several control units and load attachments or other peripheral devices which do not have their own OPC UA server.

Ongoing work for Part 2 and extension of Part 1:

- **Inclusion of KPIs** (e.g. total number of cycles, average load moved during the cycles, cumulative displacement, based on ISO 12482, ISO 4301)
- **Geometric Measurement System**
- **Energy Consumption**
- **Accuracy Domain**

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OPC UA 40077 and OPC UA 40079 for Injection Molding Machines

OPC 40077 and **OPC 40079** provide standardized OPC UA information models for vertical and horizontal communication of injection molding machines.

OPC 40077

OPC 40077 focuses on data exchange between injection molding machines (IMM) and a higher-level manufacturing execution system (MES). The aim is to provide a vendor-independent interface for easier quality assurance, order and data set management.

The following functionalities are covered:

- **General information** about the IMM (manufacturer, model, serial number etc.), current configuration and status of the IMM
- **Job management:** Information on the jobs running on the machine and the parameters of the production cycles and methods to send and start jobs from the MES to the IMM
- **Dataset management:** Allows datasets to be transferred between the IMM and MES in order to create a central repository of datasets. These include information on nominal process parameters related to the IMM but also to installed handling systems.

OPC 40079

The interface for data exchange between injection molding machines and robots is described in OPC 40079. The target of OPC 40079 is to provide a unique interface for IMM and robots independent of manufacturer to ensure compatibility.

The following functionalities are covered:

- **Realtime exchange of signals** via PubSub to prevent mechanical collisions
- **Position signals** from the IMM: 1 mold, 2 ejectors, 10 cores and 1 additional axis
- **Enabling signals from the robot** to the IMM to enable/disable movements of the IMM depending on the robot position
- **Multiple pub sub connections**
- **Part tracking**
- **Signals from the IMM** representing the availability of parts in each mold
- **Signals from the robot** on inserting and removing parts
- **Exchange of production and quality datasets** between machine and robot

The next versions are going to add further facets which will cover unlimited equipment and other topics for higher level of integration on the production floor.

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The specifications are available free of charge from umati.org/ua4pr77 and umati.org/ua4pr79



OPC UA 40082 for Plastics Rubber – Peripheral devices

OPC 40082 defines standardized OPC UA interfaces for peripheral devices used in plastics and rubber machinery.

These interfaces enable seamless communication both between peripheral devices and production machines (e.g., injection molding machines, extruders) and with higher-level systems such as MES or SCADA.

The specification is structured into multiple parts, each addressing a specific device category:

- **Part 1:** Temperature Control Devices
- **Part 2:** Hot Runner Devices
- **Part 3:** Liquid Silicone and Rubber Dosing Systems
- **Part 4:** Dosing Systems
- **Part 5:** Molds
- **Part 6:** Granulate Drying Devices

Each part supports core functionalities such as:

- **Identification and status monitoring**
- **Information and configuration exchange**
- **Process value communication and control**

The overarching goal is to enable a smart, OPC UA-based workcell where all components interact in a standardized, interoperable way – regardless of manufacturer.

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The specifications are available free of charge from umati.org/ua4pr82-1, umati.org/ua4pr82-2 and umati.org/ua4pr82-3



OPC UA 40083 for **Plastics and Rubber Machinery**

OPC 40083 provides stand-
ardized OPC UA information
models for the plastics and
rubber machinery industry.

This collection of specifications is jointly developed with the OPC Foundation and the European umbrella association of the plastics and rubber machinery industry called EUROMAP. The initiative was launched in May 2014 and aims to define OPC UA information models for various plastics and rubber machines. The Companion Specifications for plastics and rubber machines are published in identical form as both OPC UA Companion Specification and EUROMAP Technical Recommendation.



EUROMAP provides technical recommendations for plastics and rubber machines. In addition to standards for machine descriptions, dimensions and energy measurement, interfaces between machines feature prominently.

The primary goal of this initiative is to increase the quality and efficiency of the production process, which is only possible with standardized interfaces. Plastics and rubber machines are usually integrated in a production line and/or connected to superordinate systems like Manufacturing Execution Systems (MES). Therefore, the Joint Working Group OPC UA Plastics and Rubber Machinery develops Companion Specifications for both horizontal and vertical communication.

OPC 40083 is a Companion Specification for general information related to plastics and rubber machinery. The idea is that object types used for different machines and applications are defined once only in OPC 40083. There are specific Companion Specifications for the concrete applications (**OPC 40077, 40079, 40082, 40084, 40086, 40087, 40091, 40092**). Their generally valid results are then summarized in OPC 40083.

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OPC UA 40084 for Extrusion Lines

OPC 40084 provides standardized OPC UA information models for whole extrusion lines and individual components.

The working group on OPC 40084 develops information models for rubber and plastics extrusion. The intention is to ensure interoperability between the different machines in an extrusion line. In particular, the monitoring of the overall production and the management of production orders are possible use cases.

OPC 40084-1 provides general types that are used for extrusion. Together with OPC 40083, which defines general type definitions for the complete sector of plastics and rubber machinery, it is the basis for all other parts of OPC 40084.

OPC 40084-2 describes the interface between extrusion lines and manufacturing execution systems (MES) for data exchange. MES are used for collecting the information generated by extrusion lines at a central point for easier quality assurance and job and dataset management. The target of OPC 40084-2 is to provide a unique interface for extrusion lines and MES from different manufacturers to ensure compatibility.

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The following functionalities are covered:

- **General information** about the extrusion lines, current configuration and status of the extruder line.
- **Job management**
- **Recipe management** including temperatures, dosing volumes etc.

OPC 40084-3 describes the interface between extruders in an extrusion line and the MES for data exchange. The target of OPC 40084-3 is to provide a unique interface for extruders and MES from different manufacturers to ensure compatibility.

The following functionalities are covered:

- **General information** about the extruder (manufacturer, model, serial number etc.), current configuration and status of the extruder.
- **Recipe management:** Extruders store their configurations in so-called recipes. These include information on nominal process parameters (temperatures, dosing volumes etc.).

OPC 40084-4 to **OPC 40084-12** describe the data exchange interface for various components of an extrusion line. The components include:

- | | |
|-----------------------------|------------------------------|
| • Part 4: Haul-off | • Part 9: Cutter |
| • Part 5: Melt pump | • Part 10: Calibrator |
| • Part 6: Filter | • Part 11: Corrugator |
| • Part 7: Die | • Part 12: Calender |
| • Part 8: Pelletizer | |

The interfaces are used by

- **MES** for collecting the information generated by extrusion lines at a central point for easier quality assurance and job and dataset management.
- **Line controllers** to monitor and set process parameters.

OPC UA 40086 for Material Supply Systems

OPC 40086 defines standardized OPC UA interfaces for material supply systems (MSS).

OPC 40086 defines information models for material supply systems in the plastics sector. The entire path of the material from silo to the processing machine is covered. The specification deals with the handling of granules, powder or liquids in a material supply system and addresses systems of varying complexity. Furthermore, all process data generated during the process in the material supply system should be recorded and made available to other systems.

OPC 40086 covers the following functionalities:

- **General information** about the Material Supply System and its materials: e.g. filling level, temperature etc. Each of the devices has a material input (incl. condition) and a material output.
- **Job management:** The delivery of material by the MSS is organized by jobs. For each job, a target machine is prescribed, and the MES orders material according to a defined recipe which is provided at a specified transfer point.
- **Traceability:** An event is generated for each batch part that leaves the MSS. This contains a unique identifier, which can later be used to determine the history of the supplied materials.

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The specification is available free of charge
from umatl.org/ua4pr86-1



OPC UA 40087 for Particle Foam Machines

OPC 40087 defines standardized OPC UA interfaces for particle foam machines used in the production of molded foam parts.

These machines process materials such as expanded polystyrene (EPS), expanded polypropylene (EPP) or similar bead foams to manufacture products like protective packaging, insulation panels and automotive components.

The specification enables seamless communication between the particle foam machine and higher-level systems such as MES or SCADA. It covers the following functionalities:

- **Identification** of the machine and its components
- **Configuration** of machine parameters and production settings
- **Status monitoring** for operational transparency
- **Process value exchange and control**, including temperature, pressure, and cycle times

By standardizing these interfaces, OPC 40087 supports efficient integration into smart production environments and enables real-time monitoring and optimization of the foaming process.

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The specification is available free of charge
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OPC UA 40091 for Winders

OPC 40091 defines OPC UA interfaces for winders and unwinders used in continuous production processes.

These machines are essential in handling material webs such as plastic films, paper, textiles, or laminates. The specification supports both horizontal and vertical communication and is applicable across multiple industries, including plastics & rubber as well as printing & paper machinery.

It includes:

- **Identification** of the winder system and its components
- **Configuration** of winding parameters such as tension, speed, and direction
- **Status and condition monitoring**
- **Control and monitoring** of process values relevant to the winding process

A unique feature of OPC 40091 is the modeling of the web path based on process values, enabling precise tracking and control of the material flow. This facilitates advanced use cases such as predictive maintenance, quality assurance, and energy optimization.

OPC UA 40092-1 for Foam Cutting Machines

OPC 40092-1 is the first part of a specification series for the flexible polyurethane (PUR) foam industry.

Part 1 covers foam cutting machines, which are used to shape foam blocks into final products for applications such as furniture, bedding, automotive interiors, and packaging.

The specification enables standardized communication between foam cutting machines and higher-level systems. It covers:

- **Identification** of the machine and its components
- **Configuration** of cutting parameters and job settings
- **Status monitoring** for operational insights
- **Monitoring of process values** such as cutting speed, blade position, and material feed

OPC 40092 is designed to cover the entire process chain of flexible PUR foam production. Future parts will address upstream and downstream equipment such as tank farms, pre-foamers, and bonding stations. This modular approach ensures scalability and interoperability across the full production line.

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OPC UA 40100 for Machine Vision

OPC 40100 provides standardized OPC UA information models for Machine Vision systems.

The VDMA OPC Machine Vision Initiative, launched in January 2016, released Part 1 of the OPC Machine Vision Companion Specification in 2019, and Part 2 was released in 2024. As a Joint Working Group, the initiative is organized by VDMA Robotics + Automation and supported by the OPC Foundation.

The core working group that is developing the specification consists of 17 experts from 10 companies. Due to the enormous variations in machine vision systems all over the world, it is very hard to generalize vision system data. Therefore Part 1 focuses on data management methods without restricting the content of the same. Behavior control and observation of a vision system are the key objectives addressed in Part 1. The generic state machine approach introduced in Part 1 of the specification enables monitoring and control of system behavior.

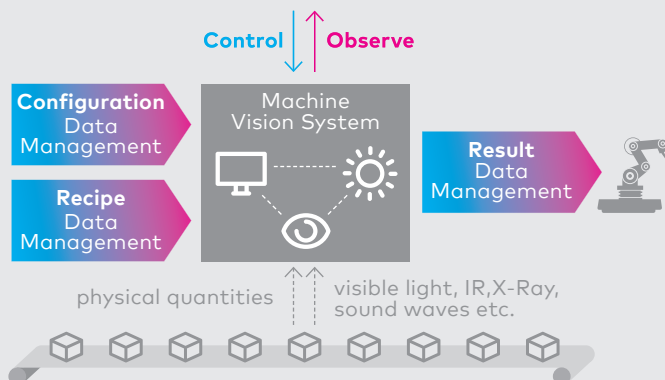
The initiative is currently concluding the development of Part 2 of the specification which aims to define a generic structure and the components of a machine vision system. It describes the relationship between the components and their condition monitoring parameters.

Part 1 describes the **functionality of a machine vision system** and covers these use cases:

- **Configuration Management**
- **Recipe Management**
- **Result Management**
- **Safety State Management**
- **Machine vision system state with state machines**

Part 2 describes **the structure of a machine vision system**, its components and the relationships between them and covers these use cases:

- **Identification of the system and its components**
- **Condition Monitoring**
- **Relationship between components**
- **Future-proof information model** to allow integration of future detailed Companion Specifications for the components of a machine vision system



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OPC UA 40200 for Weighing Technology

OPC 40200 provides relevant data and configuration parameters for different types of scales for weighing technology.

Scales and balances are used in a wide range of applications to verify and count parts, analyze products, mix recipes and optimize processes, including assuring compliance with legal requirements. This standardization for weighing equipment facilitates easy data exchange by using harmonized formats between equipment from different vendors, technologies, IT-systems, companies and industries.

The OPC 40200 includes the following **tasks and use cases**:

- Simple weighing scales
- Laboratory balances
- Catchweighing and checkweighing scales
- Vehicle scales
- Continuous conveyor scales
- Differential weighing feeders
- Automatic filling scales
- Piece counting scales
- Formulation and recipe scales
- Totalizing and hopper scales
- Automatic price labeling scales

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OPC UA 40210 for Geometrical Measuring Systems

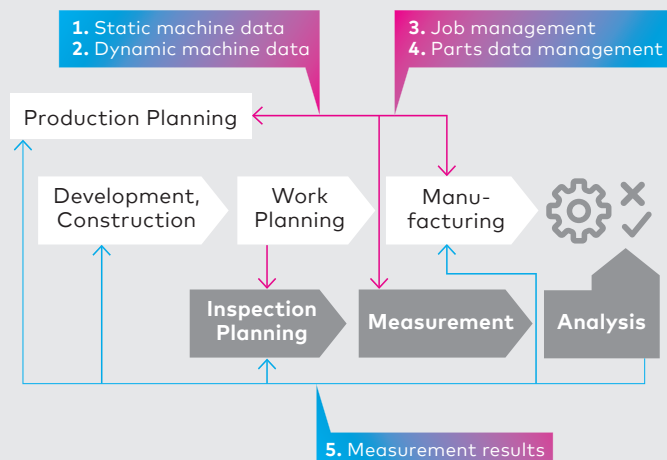
OPC 40210 provides information for data transfer to and from geometrical measuring systems.

For geometrical measuring systems (GMS), such as coordinate measuring systems, form and surface measuring machines as well as multi-point measuring machines, a VDMA working group is defining OPC 40210 UA for Geometrical Measuring Systems in coordination with the OPC Foundation. The aim is to provide information for data transfer to and from geometrical measuring systems via a uniform interface that can be used by digital data processing systems such as MES systems.

For geometrical measurement technology, as the "information supplier" on the quality of production, digitalization has a special significance in the interaction with other production systems. This interaction, which is also referred to as interoperability of machines and systems, enables companies to participate in new digital structures and is a basic prerequisite for new digital business models. Through interoperable interfaces, machines from different manufacturers can be efficiently integrated into existing and new production landscapes.

The Companion Specification covers the following use cases:

- 1. Static machine data** (identification of the GMS)
- 2. Dynamic machine data** (current state/status of the GMS)
- 3. Job management** (monitoring of measurement routines)
- 4. Parts data management** (identification of parts and related information)
- 5. Measurement results** (management of the provision of measurement results)



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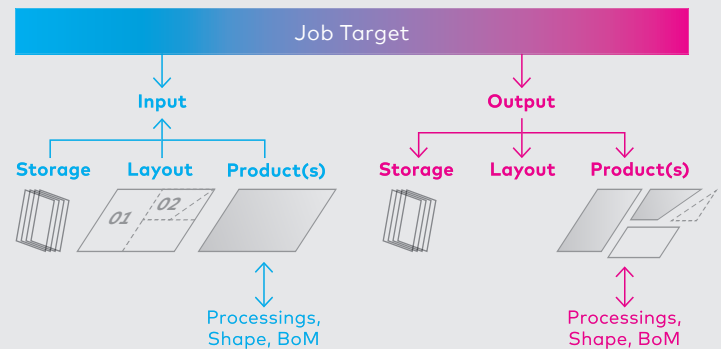
The specification is available free of charge
from umati.org/ua4gms



OPC UA 40301 for Flat Glass Processing

OPC 40301 standardizes communication and **VDMA 24124** standardizes job description. Together they enable future-ready glass manufacturing.

Founded in April 2019, the Flat Glass Initiative Joint Working Group published its 2nd release in 2024. The **new version of OPC 40301 introduces several technical improvements** over the 2022 version: it replaces the Job Management model with the newly developed OPC UA Machinery Job Management (OPC 40001-3), adds standardized Object Types like Machinery Item State and Operation Counters, introduces a File System entry point using OPC UA Part 20 and restructures Glass Machine Type to align with Machinery Building Blocks. Redundant or obsolete types were removed to streamline the model.



VDMA 24124 defines standardized job and status descriptions for machines in flat glass processing. It provides a uniform structure for job transmission and machine feedback, including job IDs, processing parameters, and result reporting. It also defines data structures for job orders, job responses, and machine status to improve interoperability and automation efficiency. The specification supports integration into MES and ERP systems and ensures consistent communication across different machine types.

Information models
harmonized across domains

OPC UA for machinery
by umati

OPC 40301 for Flat Glass Processing
• Machine Integration • Job Management

Interoperability →

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The specification is available free of charge
from umati.org/ua4flat-glass



OPC UA 40444 for Textile Testing Devices

OPC 40444 presents an OPC UA Information Model designed to seamlessly integrate a diverse range of textile testing devices into Manufacturing Execution Systems (MES) and other IT systems.

Specifically tailored to textile testing instruments utilized in applications such as the spinning industry, research institutes, quality control laboratories, and industrial production control, this Companion Specification streamlines the transfer of information to and from these devices.

By offering a standardized interface, manufacturers of textile testing devices can ensure compatibility and interoperability across various systems. It is important to note that online testing devices are not covered in the scope.

The specification encompasses a comprehensive set of functionalities for textile testing devices, including:

- **General device information**, encompassing identification parameters
- **Real-time** configuration and device status
- **Efficient recipe management**, facilitating the exchange of test conditions and instructions
- **Seamless result management**, allowing the transfer of generated test results to MES and IT systems
- **Job management**, providing insights into ongoing tasks on the device and offering interactive capabilities
- **Key Performance Indicator** (KPI) tracking and statistical analysis
- **Comprehensive logbook** of pertinent machine changes
- **Robust maintenance support**, event tracking and notifications for user interactions and error handling on the testing device.

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OPC UA 40450/40451 for Industrial Joining Technologies

OPC 40450 is the base specification for creating a common OPC UA interface for various joining technologies.

OPC 40451 is the first Companion Specification for Tightening – a specific joining technology.

The VDMA Industrial Joining Technologies (IJT) initiative, launched in May 2019, aims to standardize communication interfaces for various joining technologies such as Tightening, Gluing, Riveting, Pressing, etc. In October 2021, the initiative released OPC 40451 1.00.0 Tightening System Companion Specification, which focused specifically on tightening applications.

Building on this foundation, **Release 2** was published in March 2024, expanding the scope to cover a broader range of use cases through two specifications: OPC 40450 version 1.00.0 Joining System Base Companion

Specification, and an updated version of OPC 40451 version 2.00.0 Tightening System Companion Specification. Together, these specifications address the most common requirements across various joining technologies.

The IJT initiative is a Joint Working Group organized by VDMA Automated Solutions and supported by the OPC Foundation. The aim of the initiative is to create standard interfaces for joining technologies such as Tightening, Riveting, Gluing, Pressing etc. The first release of the initiative was to cover the specific Tightening use cases. The core working group that is developing the specification consists of 15+ experts from 13+ companies.

The following **use cases** are covered:

Asset Management and Condition Monitoring

- Overview and identification, monitoring of an asset
 - Set of methods to manage an asset
- Example: Enable Asset, Disconnect Asset, etc.

Result Management

- Standard definition of the Result including Steps, Traces, Errors
- Standard access to Result using Events, Methods and AddressSpace

Event Management

- Standard event and condition payload from a joining system
- Standard set of condition classes to categorize or filter various types of events from a joining system

Joining Process Management

- Set of methods and data types to manage a joining process. Example: Select Process, etc.

Joint Management

- Set of methods and data types to manage a joint
- Example: Send Joint, Select Joint, etc.

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The specification is available free of charge from umati.org/ua4ijt

OPC UA 40501 for Machine Tools

OPC 40501 series addresses use cases and parameters specifically for machine tools.

The aim is to create a common interface among machine tools of different technologies, manufacturers and model series.

The first part of the OPC UA for Machine Tools Companion Specification series provides the basics for such an interface. This allows for monitoring of the machine tool and includes a job monitoring and management interface. This information is provided in a way that is not specific to a particular technology. The OPC UA for Machine Tools interface facilitates the exchange of information between a machine tool and software systems like MES, SCADA, ERP or data analytics systems.

The Machine Tool Companion Specification provides the harmonized uses cases and information defined by OPC UA for Machinery, especially the machine states. They serve as the basis for the extended KPI Monitoring facets to enable calculations based on ISO 22400 KPI definitions. With the update to version 1.02 the crucial new Machinery use case for Job Management was added. This now enables the bidirectional exchange of information and files like job data, NC programs and tool management data to and from a connected machine tool.

Part 1 covers these use cases:

	Identify machines of different manufacturers
	Overview of whether production is running
	Overview of parts in a job
	Overview of runtimes for a job
	Overview of machine tool state
	Overview of upcoming manual activities
	Overview of errors and warnings
	Providing information for KPI calculations
	Providing an overview of tool data
	Providing OPC UA for Machinery use cases • Machinery State (OPC 40001-1) • Job Management (OPC 40001-3)

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The specification is available free of charge
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OPC UA 40503 for Metal Forming

OPC 40503 extends the technology-agnostic OPC UA for Machine Tools for metal forming-related use cases.

The aim of this specification series is to cover all metal forming machines and define all relevant process values for metal forming.

Part 1 of this specification contains various building blocks for metal forming that enable use cases to be formulated for different types of metal forming machines by taking building blocks from related Companion Specifications.

The specifications address the three main categories of metal forming: bulk forming, sheet forming, and powder forming and their underlying processes.

OPC 40503-1 development was initiated by Schuler Group, hosted and sponsored by the VDW, the German Machine Tool Builders' Association. It was created by a Joint Working Group between the VDW and the OPC Foundation.

Metal Forming			
Bulk Forming	Sheet Forming		Powder Forming
Forging	Deep Drawing	Shearing	Forging
Drawing	Blanking	Cutting	Drawing
Straightening	Punching	Stamping	
Sizing	Bending	Clinching & Pressing	
	Piercing	Pressing	

The Companion Specification covers the following **use cases**:

- Providing OPC UA for Machine Tools Use Cases - using the Machine Tools Facets
- Providing access to repetitive forming data and cyclic monitoring
- Providing access to characteristic forming positions and cyclic monitoring
- Providing information for metal forming tool-specific parameters
- Providing process values from functional working units related to the forming process
- Cyclic Monitoring of specific job parameters
- Cyclic Monitoring for forming part-specific information
- Notification if specific metal forming conditions appear during processing

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OPC UA 40505 for Wireless Machine Tool Peripherals

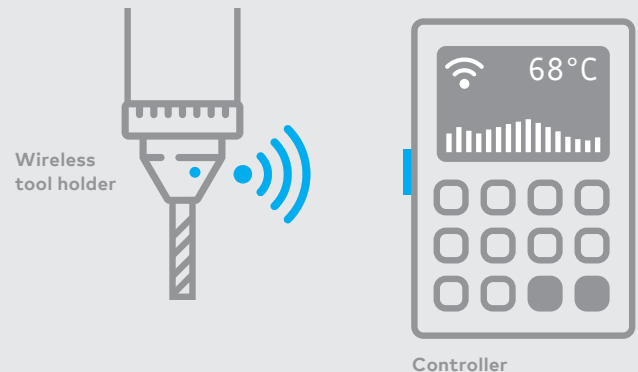
OPC 40505 Companion Specification defines a standardized OPC UA information model for wireless machine tool peripherals with integrated electronics and sensor technology.

A working group of international companies in the field of smart workholding devices and tool holders from the industry developed the specification to ensure interoperable communication between wireless peripherals and software systems, such as machine tool control systems, manufacturing execution systems and standalone mobile devices. The information model covers essential parameters such as forces, temperature, rotational speed, operating hours, position, and more. By providing a common semantic description, OPC 40505 enables consistent monitoring and evaluation of data across different machines and devices.

The specification aligns with the semantics defined in the Bluetooth Low Energy Industrial Measurement Device Service (IMDS) standard.

This IMDS standard governs wireless communication between peripheral devices and controllers. It enables plug and play connectivity for wireless tool holders and other movable components—such as work holding devices—within the machining area of a machine tool. Communication is established via a machine-integrated gateway, ensuring seamless integration between peripheral devices and the machine tool's control system.

The final specification was released in Q4 2025 and is jointly published as a VDMA Specification and by the OPC Foundation. It is freely available to all companies.



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The specification is available free of charge
from umati.org/ua4wmtp



OPC UA 40530 for Laser Systems

OPC 40530 specifies an OPC UA information model for laser systems.

A laser system is considered a self-contained unit, including the laser source and all required subsystems, such as the control system for the laser source, optics, cooling aggregates and others. Hence, one or several laser systems may be a subcomponent of a larger machine. The goal of this Companion Specification is to provide a standardized and extendable interface for the integration of laser systems into an OPC UA environment.

This interface shall then provide laser system operators with easy and robust access to information, based on which they can optimize their individual processes and derive additional value. One example would be the enabling of fast and target-oriented maintenance measures or the on-demand stock part management of service life parts. This is primarily achieved by providing data regarding the laser system type, identity, and past and current states/conditions.

The document was created by a Joint Working Group of the OPC Foundation and the VDMA, which involved 40 experts from North America, Asia, and Europe.

The following are the **use cases** covered in Version 1.0, published in February 2024:

- **Laser System Running or Not Running**
- **Errors and Warnings**
- **Information about the Next Maintenance**
- **Uniform Identification of Laser Systems**
- **Recipe Settings and Overview**
- **Activity Logging Information**
- **Condition Data Monitoring**
- **Consumption Data**

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The specification is available free of charge
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OPC UA 40540 for Additive Manufacturing

OPC 40540 was developed to facilitate the exchange of information between AM machines and software systems such as MES, SCADA, ERP or data analysis systems.

The OPC 40540 for Additive Manufacturing is based on the OPC UA for Machine Tools interface and takes AM-specific features into account.

This allows additive manufacturing machines from different manufacturers to be efficiently integrated into existing and new production landscapes. The different AM technologies are taken into account in the specification and specific features such as just-in-time, on-site and high flexibility in production networks are thus supported. The spread and successful use of additive manufacturing in industry are promoted in this way. The specification covers a similar spectrum of use cases to those of OPC 40501 for Machine Tools. Other AM-specific parameters such as job and component properties, material and consumable properties, and the material cycle are made available at the systems' interfaces.

In addition to the use cases adopted from UA4MT OPC 40501-1, some are directly addressed in UA4AM OPC 40540:

- **Identify an AM machine**
Add-on for machine tool identification
- **Monitor machine health, maintenance indicators and production operability**
Base for quality reports and machine operator alerts
- **Track usage of production materials and consumables**
Material identification and consumption
- **Track usage of production materials and consumables**
Monitor the availability and left-over quantities of materials and consumables

OPC 40540 and VDMA 40540 were initiated by a sub-working group of the VDMA Additive Manufacturing Working Group with more than 200 participating companies. The first version of UA4AM initially only deals with the interfaces of the printing systems. The VDMA Additive Manufacturing Working Group covers the entire process chain, thus also generating potential for corresponding expansion of the specification.

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The specification is available free of charge from umati.org/ua4am

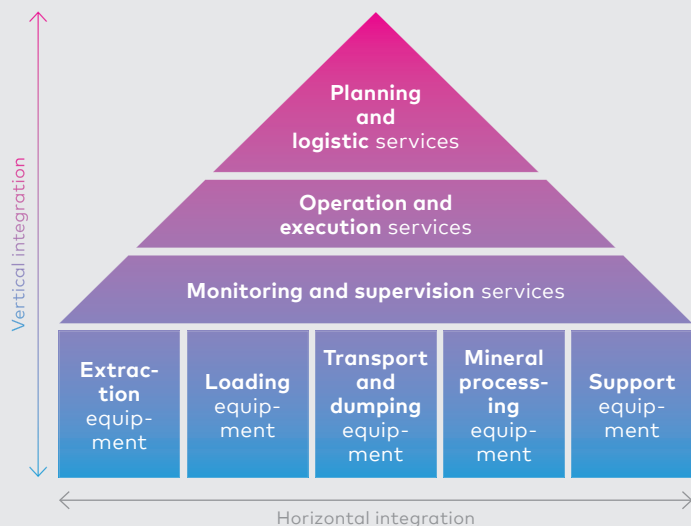


OPC UA 40560-40569 for Mining

OPC 40560 provides standardized OPC UA information models for mining.

Established in 2017, the VDMA OPC UA Mining Initiative has united machine manufacturers, software providers, and mine operators to develop a future-proof, vendor-independent interface using OPC UA. This standard supports rich information models for seamless data exchange.

Organized by VDMA Mining & Minerals and supported by the OPC Foundation, the initiative has developed parts of the OPC UA Mining Companion Specification. These enable vertical data flow from sensors to cloud systems, forming a common language for mining automation.



The OPC UA Mining information model applies to all mining systems – extraction, transport, processing, planning, and more. Due to the broad scope of mining, initial efforts focused on mobile machines and longwall mining, emphasizing ease of implementation and relevance.

Ongoing work includes:

- **Specialist Group Conveying:** defines use cases for conveyor systems, focusing on safe, efficient communication between components and SCADA systems. Covered functions include startup/shutdown, load sharing, condition monitoring, and asset management.
- **First release use cases:** startup/shutdown, brake control, belt monitoring and cleaning, asset management.
- **Next release:** conveying KPIs, advanced condition monitoring.
- **Specialist Group Processing:** involves experts from mobile and stationary processing systems. They reviewed existing specs, identified machine-specific data, and are developing new use cases and data exchange models. Collaboration with SENAI in Brazil supports this effort.

VDMA/SENAI cooperation in Brazil

A joint group develops use cases for conveyor and processing systems with manufacturers and operators in Brazil.

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The specification is available free of charge from umati.org/ua4mining



OPC UA for Surface Technology

The VDMA OPC Surface Technology Initiative develops common OPC UA interfaces for surface technology machinery.

4 Core Working Groups (CWG) are involved in creating common OPC UA interfaces for:

- organic coating technology
- shot blasting technology
- plasma surface technology
- cleaning and pretreatment technology

OPC 40001 UA for Machinery provides the basis for the information models for surface technology machinery.

OPC 40700 specifies **General Types** for machine types that typically are part of a production unit in which several interacting machine types are organized. The specified hierarchy of Component, System, Controller and Orchestrator provides a communication concept for interacting machine types in surface technology. The Companion Specifications for **Cleaning and Pretreatment Technology**, and **Organic Coating Technology** are based on these General Types. As of 2025-08, the available Companion Specifications are:

- **OPC 40700** UA for Surface Technology – General Types
- **OPC 40701** UA for Surface Technology – Cleaning and Pretreatment Technology
- **OPC 40702** UA for Surface Technology – Material Supply Systems

Further Companion Specifications for other machine types of Organic Coating Technology (application equipment, application booth, dip coating machinery, dryers, etc.) will be developed.

The OCP UA information models for the machine types of **Shot Blasting Technology** and **Plasma Surface Technology** have been developed on an individual basis. As of 2025-08, the available Companion Specifications are

- **OPC 40718** UA for Surface Technology – Shot Blasting Technology
- **OPC 40719** UA for Surface Technology – Plasma Surface Technology

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The specification is available free of charge from umati.org/ua4st

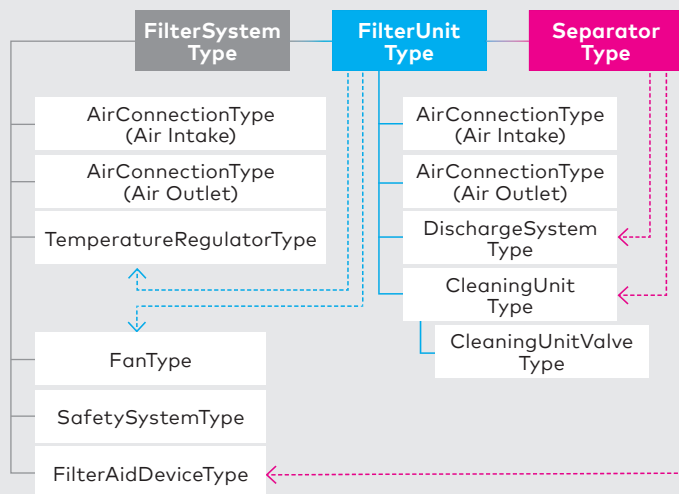


OPC UA 40740 for Process Air Extraction and Filtration Systems (PAEFS)

OPC 40740 provides a standardized OPC UA information model for data transfer to and from Process Air Extraction and Filtration Systems (PAEFS).

The VDMA OPC for PAEFS initiative, launched in July 2019, released OPC 40740 in October 2023 and subsequently published release 1.0.1 in March 2025. As a Joint Working Group, the initiative is organized by VDMA Air Pollution Control and supported by the OPC Foundation.

PAEFS modelling examples: Modelling solutions for air filtration systems with redundant cartridge filters or with several separators and for electrostatic separators with three filter stages are presented using three examples.



The Companion Specification defines essential data structures, parameters, and methods for communication between process air extraction and filtration systems, related machinery, supporting systems (e.g. ventilation, conveyors), and higher-level manufacturing systems (e.g. MES), enabling diagnostics and parameter settings.

A fundamental task of PAEFS in industrial process air technology is the fulfilment of the **basic functions**:

- **to supply a process** with the air required,
 - **to maintain the quality** of the air during the operation of the process, and
 - **to eliminate released substances** from the process.
- PAEFS are essential systems used in the process and manufacturing industry.

Ongoing work: Practical implementation of the Companion Specification in preparation (test and real time applications).

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The specification is available free of charge from umati.org/ua4paefs



VDMA User Groups for OPC UA

To accelerate the adoption of OPC UA and Companion Specifications, VDMA has launched dedicated user groups for the **automotive** and **software** sectors.

These platforms bring together leading companies and interoperability experts to align industry-specific requirements, share best practices, and drive standardization forward.

Whether it is enabling seamless machine communication in highly automated automotive environments or supporting software vendors in integrating OPC UA-based data flows – the user groups foster collaboration, knowledge exchange, and practical implementation across industries.

Automotive User Group

For the specific needs of the automotive industry, VDMA has set up the Automotive User Group. It brings together automotive companies and key interoperability stakeholders to exchange experiences and define common requirements.

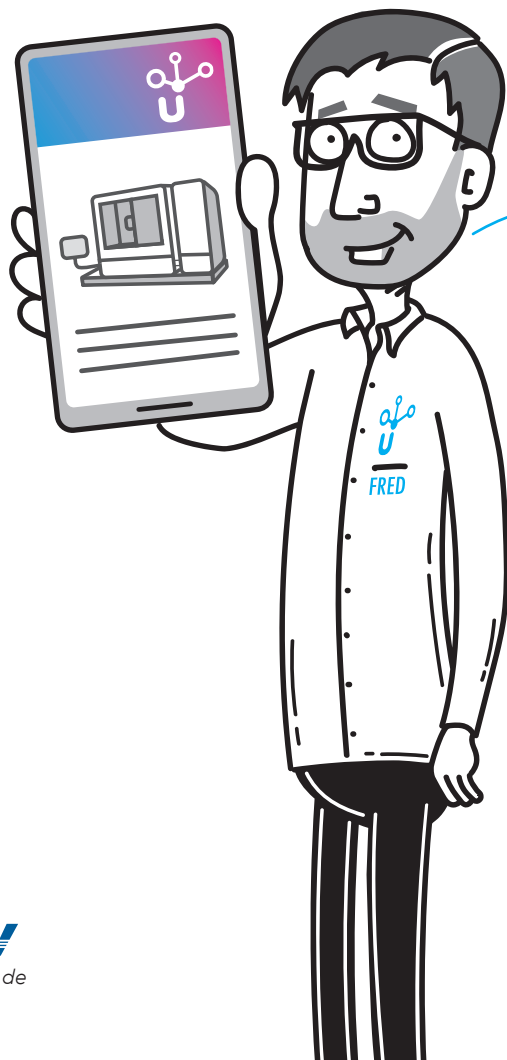
The group's main goal is to **promote the practical use of OPC UA in highly automated automotive environments** and to address challenges in machine communication and system integration. Regular meetings offer a platform to share insights, find areas of improvement, and stay informed about ongoing standardization efforts and upcoming initiatives.

Software Vendors User Group

To support software companies in implementing and using OPC UA and Companion Specifications, VDMA has set up the Software Vendors User Group. It targets companies that access and process production data via OPC UA, develop related software tools, or seek best practices for integration.

The group's goal is to **provide a platform for regular exchange, clarify relevant use cases, and gather requirements for software-side implementation**. Both experienced providers and newcomers receive help from shared insights, discussions on certification, and updates on standardization efforts.

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