

VDMA

OPC UA Companion Specifications are the key for success



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The VDMA



- » Most important industrial association in Europe.
- » The VDMA represents over 3,200 member companies in the engineering industry
- » The VDMA is structured in
 - 38 trade associations,
 - 6 regional subsidiaries,
 - Berlin, Brussels and foreign subsidiaries (Brazil, China, India, Japan, Russia, Austria)
 - Working groups and forums,
 - Departments and competence centers and
 - Companies and foundations.
- » The VDMA is host of several European and global sector committees

The VDMA represents the broad machine building / manufacturing industry.



Need of standardized interfaces



OPC UA is the favorite interface standard

» Open Platform Communication Unified Architecture

The requirements of mechanical engineering are met

- » Communication on an open platform
- » Security by design
- » Support of different Protocols
- » Semantical machine description

Benefits for mechanical engineering

- » Manufacturer independent communication
- » Reduction of Interfaces and supported protocols
- » Plug & Work, Condition monitoring and predictive maintenance
- » Optimization of production



Modelling in OPC UA





OPC UA Companion Specifications

VDMA

Built-in Information Models

OPC UA Meta Model

OPC Foundation

Overview of OPC UA in the VDMA organizations

- » Agricultural Machinery
- » Air Conditioning & Ventilation
- » Air Pollution Control
- » Automated Guided Vehicles
- » Battery Production
- » Building Control and Management
- » Building Materials
- » Ceramic Machinery
- » Cleaning Systems
- » Compressors, Compressed Air and Vacuum Technology
- » Construction Equipment
- » Continuous Conveyors
- » Cranes
- » Die & Mould
- » Drying Technology
- » Electrical Automation
- » Electronics, Micro & Nano Technologies

- » Engines
- » Engines & Systems
- » Fire Fighting Equipment
- » Fluid Power
- Food Processing and Packaging Machinery
 Foundry Machinery
 Glass Machinery
- » Hydro Power Plants
- » Industrial Trucks
- Integrated Assembly Solutions
- Intralogistic Systems
- » Length Measurement Technology
- » Lifts & Escalators
- Machine Tools and Manufacturing Systems
- » Machine Vision
- Metallurgical Plants and Rolling Mills

- » Micro Technologies
- » Mining
- » Photovoltaic Equipment
- Plastics & Rubber Machinery
- » Power Transmission
- Engineering
- » Precision Tools
- Printing & Paper Technology
- » Process Plant & Equipment
- Productronic
- » Pumps & Systems
- » Refrigeration & Heat Pump Technology
- Robotics
- » Security Systems
- » Software & Digitalization
- » Surface Technology
- » Testing Technology
- » Textile Care, Fabric and Leather Technology

Textile Machinery

- » Thermal Power Plants
- » Thermo Process Technology
- Valves
- » Waste Treatment & Recycling
- » Weighing Technology
- » Welding & Pressure Gas Equipment
- » Wind Power Plants
- » Woodworking Machinery

OPC UA CS released
Release Candidate
Joint Working Group with OPC Foundation
OPC UA CS in work
Aware of OPC UA

Overview of OPC UA in the VDMA organizations

» Agricultural Machinery	» Engines	» Micro Technologies	» Textile Machinery
» Air Conditioning & Ventila			hermal Power Plants
» Air Pollution Control			hermo Process Technology
» Automated Guided Vehic			alves
» Battery Production	Rapid increas	se of new OPC UA CS working	Vaste Treatment & Recycling
» Building Control and	groups		Veighing Technology
Management » Building Materials	» More than 16	VDMA sector branches under	Velding & Pressure Gas Equipment
» Ceramic Machinery	discussion		Vind Power Plants
» Cleaning Systems	» Over 17 VDM	A sector branches in active	Voodworking Machinery
» Compressors, Compress and Vacuum Technology	(international)	implementation	
» Construction Equipment	» About 26 OPC	C UA CS working groups existing	
» Continuous Conveyors	» Over 450 com	noanies are involved	Voaso Candidato
» Cranes			
» Die & Mould	» ME, ET, I	T, Automotive,	th OPC Foundation
» Drying Technology			PC UA CS in work
» Electrical Automation			vare of OPC UA
» Electronics, Micro & Nan		ally Tautile Care Fabric and	

Rolling Mills

Technologies

Phases of the development of an OPC UA CS





Consistency

- Development of a generalizing architecture
- Interaction of the industry-specific CS



Internationalization

- Activities to reduce market barriers
- International trade fair activities and B2B events

1. Preliminary work





- » Kick-off in February 2017 workshop for identifying the requirements
- » Approximately 35 companies in the total working group
- » Members of the core working group are vendors and users
- » Organized as a joint working group between the VDMA and the OPC-Foundation

Joint working group





Robotics + Automation

Core working group members



2. Content work





Goal

» the creation of an OPC UA Robotics Information Model which enables access to standardized data structures of robot systems of any kind

- scalable and extensible
- independent of robotic type characteristics
- semantically self-describing with unified terms for data including attributes

Description of an information model to cover all current and future robotic systems

- » industrial robots
- » mobile robots
- » several control units
- » peripheral devices, which do not have their own OPC UA server

2. Content work





A so-called motion device system can consist

of several manipulators and controls

» a robot on a linear unit working with two turntables

- controlled by one control unit
- » a mobile platform with to robot arms

Agreement to proceed stepwise

- » part 1: vertical information provisioning for higher-level controls, SCADA systems, MES and cloud
- condition monitoring and asset management
- » subsequent parts :
 - methods and state machine(s) to initiate actions at the robotic system
 - alarms and events for messaging and conditions
 - possibility to store customer specific information inside the server e.g. ERP data, cost center



VDMA OPC Robotics Initiative



3. Design in OPC UA



4. Publication

VDMA OPC UA



https://opcua.vdma.org **Companion Specifications** About us OPC UA working groups STATE PREFIX TITLE NUMBER DATE OF ISSUE OPC UA Companion Specification for VDMA Robotics (OPC Robotics) 40010-1:2019 2019-07 - Part 1: Vertical integration /DMA-Einheitsblatt 40 000 Drive Technology EUROMAP 77 - OPC UA interfaces for plastics and rubber machinery -VDMA 2019-11 40077:2019 Data exchange between injection moulding machines and MES EUROMAP 82 - OPC UA interfaces for plastics Woodworking Machines and rubber machinery -Food and packaging \checkmark VDMA 40082-1:2019 2019-11 machines Peripheral devices - Part Open Platform Communications Unified Architecture (OPC UA) 1: Temperature control OPC UA is an open interface standard that defines the mechanisms of cooperation in the industrial environment. It enable devices its products and its production by information and communications technologies (ICT). Machines and plants can be redesi & work - irrespective of which manufacturers the machines and components originate. The VDMA develops with its memb EUROMAP 83 - OPC UA interfaces for plastics VDMA 40083:2019 2019-11 and rubber machinery -General Type definitions News OPC Robotics OPC UA for Machine Vision (OPC Machine OPC UA Survey among Industrie 4.0 interested members of the VDMA ... Vision) - Part 1: Control, 90 members answered our questions about OPC UA. Half of the member companie... 40100-1:2019 VDMA 2019-09 configuration management, recipe management, result VDMA OPC Robotics initiative: making industrial robots ready for the di... management Ar · Part 1 of the OPC UA Robotics Companion Specification - Released. · Standardization of the interface for Industrial Robots enables seamless communi OPC UA for Management Computerized VDMA 40502:2019 2019-11

Machine tools

Weighing Technology

Numerical Control

(CNC) Systems



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OPC UA

Companion Specifications.

OPC Machine Vision Companion Specification Part 1 - Released! OPC UA for Machine Vision (OPC Machine Vision) - Part 1: Control, configuration ma...

5. Use in industry







Phases of the development of an OPC UA CS





Consistency

- Development of a generalizing architecture
- Interaction of the industry-specific CS



Internationalization

- Activities to reduce market barriers
- International trade fair activities and B2B events



The VDMA defines the "world language of production"



The VDMA will define OPC UA Companion Specifications for the general manufacturing industry

- » Central coordination of the OPC UA working groups
- » Harmonization between OPC UA Companion Specifications

Consolidation of domain competences of the industry by the VDMA

- » Organization of standardization work
- » Support of information model design

Phases of the development of an OPC UA CS





Consistency

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Internationalization

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International Collaboration

World wide connected!





Machine Vision system

Introduction and definition



A system for Machine Vision is

- » any complex machine vision system,
- » any smart camera,
- » any vision sensor or
- » any other component

which, in the production context, is capable of extracting information from electro-magnetic waves in accordance with a given image processing task.

Machine Vision system

Example of production context





VDMA OPC Machine Vision CS

Focus on functionality

Vision system data very hard to generalize \rightarrow focus on:

- Data management methods, not content
- Behaviour control and observation



Result data management Result data black box

VDMA OPC Vision Initiative Data management

We want to achieve..

- a standard description of MV-System information by:
 - ConfigurationManagement Object is mandatory!
 - RecipeManagement Object is mandatory!
 - ResultManagement Object is mandatory!
 - SafetyStateManagement Object is mandatory!
 - DiagnosticLevel Variable is mandatory!
 - SystemState Variable is mandatory!



VDMA OPC Vision Initiative Mandatory standardized top level state machine

For common overall behavior of standard compliant systems





Plastics and rubber machines



Status of work



EUROMAP 83 (released)

» Higher-level information model with general type definitions for reuse in the various application-specific interfaces.

EUROMAP 77 (released)

» Interface between injection moulding machines and master computer/MES

EUROMAP 82.1 (released)

» Interface for Temperature control devices

EUROMAP 82.2 release candidate)

» Interface for Hot runner

EUROMAP 82.3 release candidate)

» Interface for LSR Dosing

EUROMAP 79 (release candidate)

» Interface between injection moulding machines and robots

Status of work



EUROMAP EUROMAP 84.x (release candidate)

- » Interface between extrusion line/extruder
- EUROMAP 84.1 General Type Definitions
- EUROMAP 84.2 Extrusion line
- EUROMAP 84.3 Extruder
- EUROMAP 84.4 Haul-Off
- EUROMAP 84.5 Melt Pump

EUROMAP 86 (release candidate)

» Interface for material handling systems

- EUROMAP 84.6 Filter
- EUROMAP 84.7 Die
- EUROMAP 84.8 Pelletizer
- EUROMAP 84.9 Cutter
- EUROMAP 84.10 Calibrator
- EUROMAP 84.11 Corrugator

VDMA OPC Workgroups involve different stakeholders

- Workgroup Plastics and Rubber Machinery EUROMAP 77

MES suppliers:

- » ARBURG GmbH + Co KG
- » bfa solutions ltd
- » BMS byba
- » INCLUDIS GmbH
- » inray Industriesoftware GmbH
- » MPDV Mikrolab GmbH
- » ProSeS BDE
- » RJG Germany
- » Steinberger Software
- » Stöckeler Software Services e.U.
- » TIG Technische Informationssysteme Ges.m.b.H.

Controller manufacturers:

- » B&R Industrial Automation GmbH
- » Beckhoff Automation GmbH & Co. KG

User:

» LEGO Systems A/S

Injection moulding machine manufacturers:

- » ARBURG GmbH + Co KG
- » ENGEL AUSTRIA GmbH
- » FANUC Germany/EUROPE
- » Ferromatik Milacron GmbH
- » KraussMaffei Technologies GmbH
- » NEGRI BOSSI S.p.a.
- » Netstal-Maschinen AG
- » Sumitomo (SHI) Demag Plastics Machinery GmbH
- » Wittmann Battenfeld GmbH



EUROMAP 77 Use-Cases



Basic machine information

» Static Information

Machine status

» operating state

Job management and status

» order management

Monitoring of process data

» Dynamic process values

Management of production datasets

» Information, reading and writing of machine configurations/programs





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