



# VDMA supports developing OPC UA CS



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VDMA | Forum Industry 4.0 | Andeas Faath

## Content



**The VDMA** 

**Relationship between VDMA and OPC Foundation** 

**Overview about some VDMA OPC UA activities** 



# 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.



# VDMA represents the broad manufacturing industry The trade associations and sector groups

- » Agricultural Machinery
- » Air Conditioning and Ventilation
- » Air Pollution Control
- » Air-handling Technology
- » Building Control and Management
- » Cleaning Systems
- » Compressors, Compressed Air and Vacuum Technology
- » Construction Equipment and Building Material Machines
- » Drying Technology
- » Electrical Automation
- » Electronics, Micro and Nano Technologies
- » Engine Systems for Power and Heat Generation
- » Engines and Systems

- » Fire Fighting Equipment
- » Fluid Power
- » Food Processing Machinery and Packaging Machinery
- » Foundry Machinery
- » Gas Welding
- » Hydro Power
- Integrated Assembly Solutions
- » Large Industrial Plant Manufacturing
- » Lifts and Escalators
- » Machine Tools and Manufacturing Systems
- » Machine Vision
- » Materials Handling and Intralogistics
- » Measuring and Testing Technology

- » Metallurgical Plants and Rolling Mills
- » Metallurgy
- » Micro Technologies
- » Mining
- » Plastics and Rubber Machinery
- » Power Systems
- » Power Transmission Engineering
- » Precision Tools
- » Printing and Paper Technology
- » Process Plant and Equipment
- » Productronic
- » Pumps + Systems
- » Refrigeration and Heat Pump Technology
- » Robotics

- » Robotics + Automation
- » Security Systems
- » Software
- » Surface Treatment Technology
- » Textile Care, Fabric and Leather Technology
- » Textile Machinery
- Thermal Turbines and Power Plants
- » Thermo Process Technology
- » Valves
- » Waste Treatment and Recycling
- » Wind Energy
- » Woodworking Machinery



with OPC UA + VDMA



Goal

- » Integration of components, machines and plants
- » Interoperability in the factory



# Need

- » Replacing manuals and data sheets by information models
- » Standardized <u>information</u> about components and machines vendor-independently

![](_page_4_Figure_10.jpeg)

## Benefit

- » Reduces integration efforts
- » Saves money and time
- » Enables new business models

## Content

![](_page_5_Picture_1.jpeg)

**The VDMA** 

**Relationship between VDMA and OPC Foundation** 

**Overview about some VDMA OPC UA activities** 

# **Delimitation between VDMA and OPC Foundation**

![](_page_6_Picture_1.jpeg)

![](_page_6_Figure_2.jpeg)

# **Cooperation between VDMA and OPC Foundation**

![](_page_7_Picture_1.jpeg)

![](_page_7_Figure_2.jpeg)

# The VDMA is Doing International Standards – get informed, participate in and use them

![](_page_8_Picture_1.jpeg)

- VDMA India
- VDMA China
- VDMA Japan
- VDMA Russia

Designed by Layerace / Freepik

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**VDMA Brazil** 

**VDMA Germany** 

**VDMA European Office** 

# Content

![](_page_9_Picture_1.jpeg)

The VDMA Relationship between VDMA and OPC Foundation **Overview about some VDMA OPC UA activities** 

# **OPC UA as an holistic approach inside the VDMA**

![](_page_10_Picture_1.jpeg)

![](_page_10_Figure_2.jpeg)

# Video on

![](_page_11_Picture_1.jpeg)

# opcua.vdma.org

industrie40.vdma.org

![](_page_12_Picture_0.jpeg)

#### Meeting of the OPC UA Working Groups of the VDMA promotes exchange of ...

On November 2nd the first "Meeting of the OPC UA Working Groups in the VDMA" took place. Presentations by experts from the OPC community inform the working group participants about the most important activities and innovations concerning OPC UA. In moderated parallel...

![](_page_12_Picture_3.jpeg)

![](_page_12_Picture_4.jpeg)

![](_page_12_Picture_5.jpeg)

OPC UA Drive Technology

![](_page_12_Picture_7.jpeg)

OPC Robotics

![](_page_12_Picture_9.jpeg)

![](_page_12_Picture_10.jpeg)

**OPC** Vision

![](_page_12_Picture_11.jpeg)

OPC UA for machine tools

![](_page_12_Picture_13.jpeg)

OPC UA Working Group IAS

VDMA OPC Weighing Technology Initiative

![](_page_12_Picture_15.jpeg)

OPC UA for food and packaging machines

![](_page_12_Picture_17.jpeg)

Woodworking Machines

![](_page_12_Picture_19.jpeg)

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#### Asset Publisher Standardization Cauncil 140 Labs Network 140 **OPC** Foundation

Forum Industrie 4.0

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![](_page_12_Picture_21.jpeg)

## **New OPC UA VDMA Homepage:**

## opcua.vdma.org

### **Provides information on**

- **New OPC UA Activities** 
  - **OPC UA CS Working groups**
- **Companion Specifications Download**

# VDMA represents the broad manufacturer industry VDMA has more than 3200 member companies

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» Fire Fighting Equipment

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Robotics

» Robotics + Automation

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- » Valves
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- » Wind Energy
- » Woodworking Machinery

OPC UA CS Release (Candidate)

OPC UA CS under development

Awareness existent

# **Plastics and Rubber Machinery**

Finished	EUROMAP 83: Basis of all other EUROMAP OPC UA CS »General Type definitions
	EUROMAP 77: »Injection moulding machines and central computers/MES
Release Candidate	EUROMAP 82.1:
	»Injection moulding machines and temperature control devices
Under Development	EUROMAP 79: »Injection moulding machines and robots
	EUROMAP 84: »Extruders and MES
Planned	EUROMAP 82.x: »Interface between injection moulding machines and other peripheral devices
	EUROMAP 85: »Blow moulding machines and MES

# EUROMAP 77 working group

- developed from the industry for the industry

#### 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

#### **Controller manufacturers:**

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

#### **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.

#### User:

LEGO Systems A/S

![](_page_16_Figure_0.jpeg)

![](_page_17_Figure_0.jpeg)

# **OPC UA CS for machine tools and manufacturing systems**

### Scope

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![](_page_18_Picture_3.jpeg)

- » Development of an OPC UA information model for the communication machine tools and manufacturing systems
- » Communication between machine tools and the higher-level systems on or outside of the shopfloor
- » Universal, manufacturer-independent interface based on OPC UA
- » Manufacturer specific extensions foreseen

#### **Use Case**

- » Basic description of the machine tools
- » Status/OEE monitoring, job and next interaction vertically into higher level manufacturing systems (MES, etc.)
- » Further use cases like tool management, automation system interaction, order management foreseen

#### Draft specification in preparation, based on VDW working group

### JWG Kick Off December 2018/January 2019

VDW OPC UA CS for machine tools - umati

# **OPC UA CS for machine tools and** manufacturing systems

![](_page_19_Picture_1.jpeg)

![](_page_19_Picture_2.jpeg)

DMG MORI

umati is an initiative of VDW, the German Machine Tool Builders' Association umati was created in the belief that

- exploiting data creates an added value for customers, thus leading to new, trendsetting business models for the sector open interfaces are the basic requirement to ex the specification of open interfaces must be un cover the specific needs of its customers
  - this is no field for competition, neither results it collaboration to use resources more efficiently

models for the sector		FANUC	+GF+
<ul> <li>open interfaces are the basic requirement to exchange data between machines and IT systems</li> </ul>			
<ul> <li>the specification of open interfaces must be undertaken by the machine tool industry itself, to cover the specific needs of its customers</li> </ul>			
<ul> <li>this is no field for competition, neither results it in any advantage in the market, but requires collaboration to use resources more efficiently</li> </ul>			
Up to now	LIEBHERR	<b>C</b> Pfiffner	A Bosch Company
10 machine tools manufacturers joined to create the standard			
5 controller suppliers support implementation and realization		TRUMPF	
1 research institute supports the activities	SIEWIENS		GRINDING
The initiative is open for interested participants from all over the world!		Supported by	

BECKHOFF

chirnn

# **VDMA OPC Vision Initiative**

Joint working group of

![](_page_20_Picture_2.jpeg)

![](_page_20_Picture_3.jpeg)

**Robotics + Automation** 

Total Working Group of approx. 60 stakeholder companies

Core Working Group kick-off 03/2017

19 days of face-to-face meetings and several online meetings

![](_page_20_Picture_8.jpeg)

## **Core Working Group of 10 companies**

![](_page_20_Figure_10.jpeg)

**VDMA OPC Vision Initiative** 

![](_page_21_Picture_1.jpeg)

# "The camera is not working!"

![](_page_22_Figure_0.jpeg)

# A wonderful range of mind

![](_page_23_Picture_1.jpeg)

### **Broad system range**

- Vastly different system types
- Wide variations in performance and flexibility

![](_page_23_Picture_5.jpeg)

## **Enormous application variety**

- Different configurations
- Different results
- Different time behavior
- •

![](_page_23_Picture_11.jpeg)

# **OPC UA Vision, part 1 focus on functionality**

![](_page_24_Picture_1.jpeg)

## Machine vision system data very hard to generalize $\rightarrow$ initial focus on:

- 1. Standardized data management model, not content
- 2. Standardized behaviour model to control and observe

![](_page_24_Figure_5.jpeg)

# VDMA OPC Vision Initiative Standardized top level state machine

## We want to achieve

- Common behavior for all standard compliant systems for
  - Startup,
  - Shutdown,
  - Error handling,
  - Automatic in-line operation
- Extensibility for future standard or vendor-specific modes of operation

Top level VisionStateMachineType is mandatory!

![](_page_25_Figure_10.jpeg)

![](_page_25_Picture_11.jpeg)

# **The VDMA OPC Robotics Initiative**

## **Some characteristics**

- » Kick-off in February 2017
- » approximately 35 companies in the total working group
- » members of the core working group are vendors and users
- » organized as a joint working group by
- » 9 face-to-face two-days core working group meetings, clarifications and preparations in sub groups in between and several online conferences

## Proud to present at the automatica 2018

- » OPC UA Robotics, part 1 (Draft)
- » fair demonstrator with 8 vendors providing data by one information model

## **Core working group members**

![](_page_26_Picture_11.jpeg)

# Joint working group

![](_page_26_Picture_13.jpeg)

![](_page_26_Picture_14.jpeg)

Robotics + Automation

# **Definition of Robotics for the Companion Specification**

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# The OPC UA Robotics CS describes an information model which aims 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

# 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

![](_page_27_Picture_11.jpeg)

# **Component-oriented modelling approach**

![](_page_28_Picture_1.jpeg)

## **1 MotionDeviceSystem includes:**

- » 1...n MotionDevices (kincematics)
  - 1...n Axis
- » 1...n Controller (control units)
  - 1....n Software
  - -0...n TaskControls
- » 1...n SafetyStates

![](_page_28_Picture_9.jpeg)

## Agreement to proceed stepwise

![](_page_29_Picture_1.jpeg)

### **OPC UA Robotics, part 1**

- » Asset management
- » Condition monitoring
- » Preventive Maintenance
- » Vertical integration for
  - higher-level controls,
  - SCADA systems,
  - MES and
  - cloud

## **OPC UA Robotics, 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

# Robotics condition monitoring dashboard demonstrates vendor-independence

![](_page_30_Picture_1.jpeg)

![](_page_30_Picture_2.jpeg)

Access any of your robots, of any robot brand, at any time, anywhere in the world!

# Impressions VDMA OPC UA Demonstrator booth at automatica 2018 trade show

![](_page_31_Picture_1.jpeg)

![](_page_31_Picture_2.jpeg)

![](_page_31_Picture_3.jpeg)

![](_page_31_Picture_4.jpeg)

![](_page_31_Picture_5.jpeg)

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# Conclusion

**VDMA and OPC Foundation work closely together** 

More than 50% of the industries represented by VDMA have at least an awareness of OPC UA

**Rising demand of OPC UA activities show that the** ongoing activities in VDMA are the tip of the iceberg

Standards developed by the industry should be used internationally

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![](_page_33_Picture_1.jpeg)

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