VDMA 40001-4

ICS 27.010, 35.240.50

Comments by 2025-08-01

OPC UA for Machinery – Part 4: Energy Management

OPC UA for Machinery – Teil 4: Energie Management

VDMA 40001-4:2025-06 is identical with OPC 40001-4 (Release Candidate 1.00)

Application Warning Notice

This draft with date of issue 2025-04-25 is being submitted to the public for review and comment.

Because the final VDMA Specification may differ from this version, the application of this draft is subject to special agreement.

Comments are requested

– preferably as a file by e-mail to heiko.herden@vdma.org

– or in paper form to VDMA e.V. ,
Lyoner Straße 18, 60528 Frankfurt.

Document comprises 24 pages

VDMA

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The Link to the issue tracking project for this document is here:

https://mantis.opcfoundation.org/set_project.php?project_id=142&make_default=no

Forewords

Compared with the previous versions, the following changes have been made:

Version	Changes
OPC 40001-4 1.00 (identical with VDMA 40001-4:2025-06)	Initial release

OPC UA is a machine to machine communication technology to transmit characteristics of products (e.g. manufacturer name, device type or components) and process data (e.g. temperatures, pressures or feed rates). To enable vendor unspecific interoperability the description of product characteristics and process data has to be standardized utilizing technical specifications, the OPC UA companion specifications.

This specification was created by a joint working group of the OPC Foundation and VDMA.

OPC Foundation

OPC is the interoperability standard for the secure and reliable exchange of data and information in the industrial automation space and in other industries. It is platform independent and ensures the seamless flow of information among devices from multiple vendors. The OPC Foundation is responsible for the development and maintenance of this standard.

OPC UA is a platform independent service-oriented architecture that integrates all the functionality of the individual OPC Classic specifications into one extensible framework. This multi-layered approach accomplishes the original design specification goals of:

– Platform independence: from an embedded microcontroller to cloud-based infrastructure

– Secure: encryption, authentication, authorization and auditing

– Extensible: ability to add new features including transports without affecting existing applications

– Comprehensive information modelling capabilities: for defining any model from simple to complex

VDMA

The VDMA is Europe’s largest industry association with over 3300 member companies of the mechanical engineering industry. These companies integrate the latest technologies in products and processes. VDMA was founded in November 1892 and is the most important voice for the mechanical engineering industry today. With the headquarters located in Frankfurt, it represents the issues of the mechanical and plant engineering sector in Germany and Europe. The standard OPC UA has established itself in this industry sector. The VDMA defines OPC UA Companion Specifications for various sectors of the mechanical engineering industry, with more than 450 companies involved. Consequently, one of the main tasks is to harmonise and create consistency.

OPC UA FOR MACHINERY –

Part 4: Energy Management

1 Scope

The OPC UA for Machinery specification contains various building blocks for Machinery that allow to address use cases across different types of machines and components of machines defined in various companion specifications.

For the general scope of the OPC UA for Machinery specification see OPC 40001-1.

This part contains a building block for

- Energy Management

It uses OPC 34100 as base to add energy related information to a *MachineryItem*.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments and errata) applies.

OPC 10000-1, *OPC Unified Architecture - Part 1: Overview and Concepts*

http://www.opcfoundation.org/documents/10000-1/

OPC 10000-2, *OPC Unified Architecture - Part 2: Security Model*

http://www.opcfoundation.org/documents/10000-2/

OPC 10000-3, *OPC Unified Architecture - Part 3: Address Space Model*

http://www.opcfoundation.org/documents/10000-3/

OPC 10000-4, *OPC Unified Architecture - Part 4: Services*

http://www.opcfoundation.org/documents/10000-4/

OPC 10000-5, *OPC Unified Architecture - Part 5: Information Model*

http://www.opcfoundation.org/documents/10000-5/

OPC 10000-6, *OPC Unified Architecture - Part 6: Mappings*

http://www.opcfoundation.org/documents/10000-6/

OPC 10000-7, *OPC Unified Architecture - Part 7: Profiles*

http://www.opcfoundation.org/documents/10000-7/

OPC 10000-200, *OPC Unified Architecture - Part 200: Industrial Automation*

http://www.opcfoundation.org/documents/10000-200/

OPC 40001-1, *OPC UA for Machinery - Part 1: Basic Building Blocks*

http://www.opcfoundation.org/documents/40001-1/

OPC 34100, OPC UA for Energy Consumption Management

http://www.opcfoundation.org/documents/34100/

3 Terms, definitions and conventions

3.1 Overview

It is assumed that basic concepts of OPC UA information modelling are understood in this specification. This specification will use these concepts to describe the OPC UA for Machinery Energy Management Information Model. For the purposes of this document, the terms and definitions given in OPC 10000-1, OPC 10000-3, OPC 10000-4, OPC 10000-5, OPC 10000-7, OPC 40001-1 and OPC 34100 as well as the following apply.

Note that OPC UA terms and terms defined in this specification are *italicized* in the specification.

3.2 OPC UA for Machinery Energy Management terms

No additional terms are defined in this specification.

3.3 Abbreviated terms

e.g.	for example
	(OL: exempli gratia)
i.e.	that is to say
	(OL: id est)
OL	Original Language
OPC UA	Open Platform Communications Unified Architecture
URI	Uniform Resource Identifier
VDMA	German Mechanical Engineering Industry Association
	(OL: Verband Deutscher Maschinen- und Anlagenbau)
XML	Extensible Markup Language

3.4 Conventions used in this document

For conventions used in this document see OPC 40001-1.

4 General information to Machinery and OPC UA

For general information to Machinery and OPC UA see OPC 40001-1.

5 Use cases

5.1 Provide Energy Consumption Information for machines and its components according to OPC 34100

The general use cases on energy consumption information are already described in OPC 34100. This specification adds:

The user would like to easily access energy consumption information for machines and their components (see sections 6.1, 6.2 and 6.3).

The user would like to get a standard set of typical, market relevant energy information (see sections 6.4 and 6.5).

6 Machinery – Energy Management Information Model overview

6.1 General

This specification defines a Machinery building block to provide energy related information. The concept of machinery building blocks is defined in OPC 40001-1. This specification integrates into the existing building block Monitoring and therefore does not need to be referenced from the *MachineryBuildingBlocks Object* defined in OPC 40001-1. In Figure 1, the Monitoring building block is shown in an example, including where the information defined in this specification is added. The X:MyMachine *Object* of a vendor-specific X:MyMachineType provides the *2:Monitoring Object*. This contains already a *2:Consumption Object* intended to provide information on energy. In the example, it provides information on *Electricity*, *CompressedAir*, and *Steam_Superheated*. The *BrowseNames* of those *Objects* are defined in this specification (see 6.3), representing different resources. Details, on what information is provided in those *Objects* are described in 6.2. In addition, the X:MyMachine contains two components, X:MyComponent1 and X:MyComponent2 according to OPC 40001-1. Components may also have energy related information, as in Figure 1, where both provide information on *Electricity.*

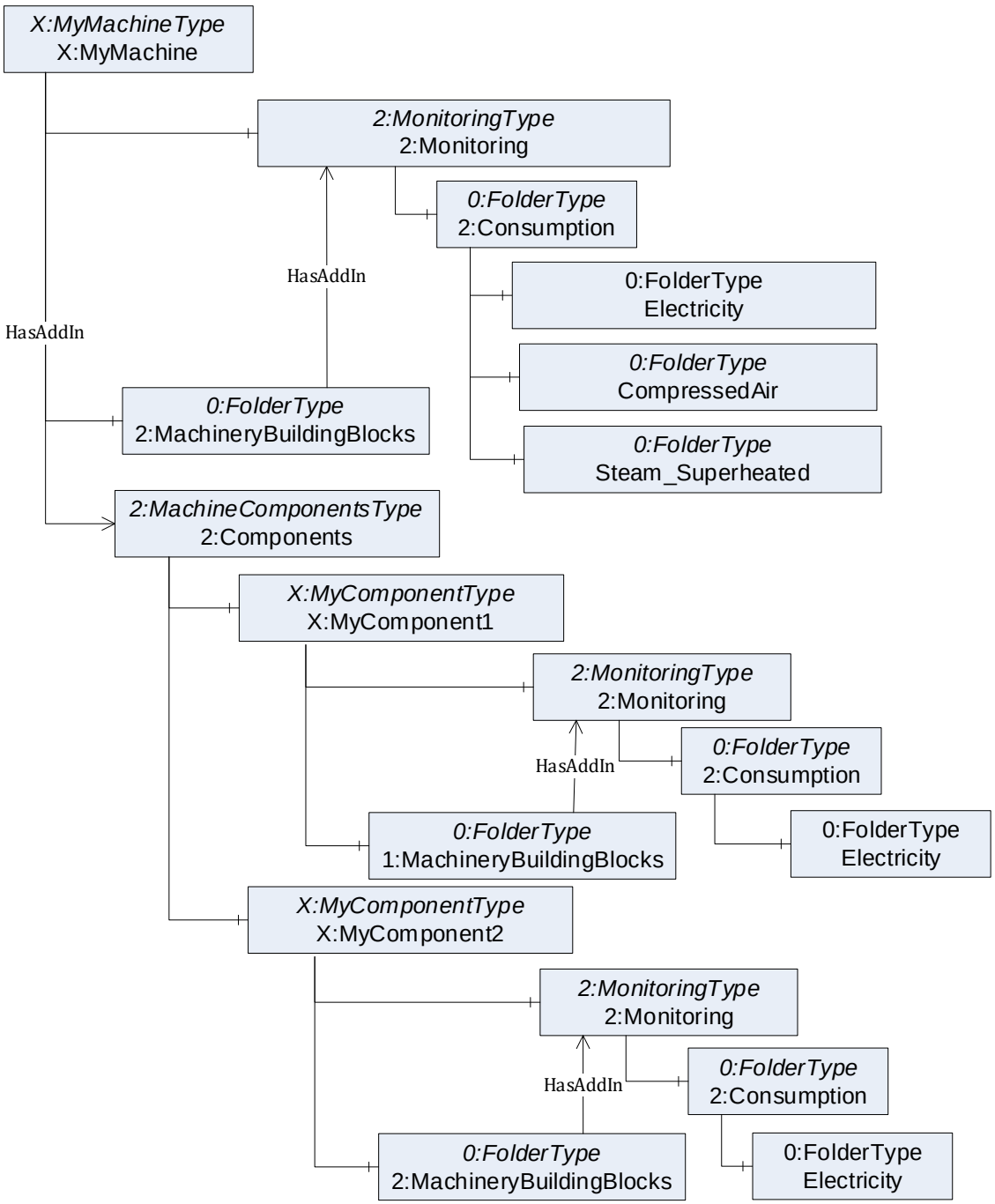

Figure 1 – Integration in Monitoring Building Block

6.2 Energy Information based on OPC 34100

OPC 34100 defines a common infrastructure for providing energy related measurements by defining the *3:EnergyMeasurementType*. An *Object* of that type represents a metering point that can measure several measurement values of *3:EnergyMeasurementValueType*. In addition, OPC 34100 defines common measurement values by defining a predefined *BrowseName*, *MeasurementID*, *EngineeringUnits*, etc. for *Variables* of *3:EnergyMeasurementValueType*.

This specification uses the OPC 34100 as base to add energy related information to a *MachineryItem*. Under each *Object* representing a resource, there may be several *Objects* of the 3:*EnergyMeasurementType*, each representing one metering point. The main metering point should use the *BrowseName Main* defined in this specification (see 6.3). In Figure 2, an example is given. The *Main Object* provides several *Variables* defined in OPC 34100. The *MachineryItem* provides two additional metering points, X:Submeasurement1 and

X:Submeasurement2. The first one is referenced with a *Contains Reference* indicating that the measured energy is contained in the *Main* values, whereas the second one is not referenced and therefore independent of the *Main* values.

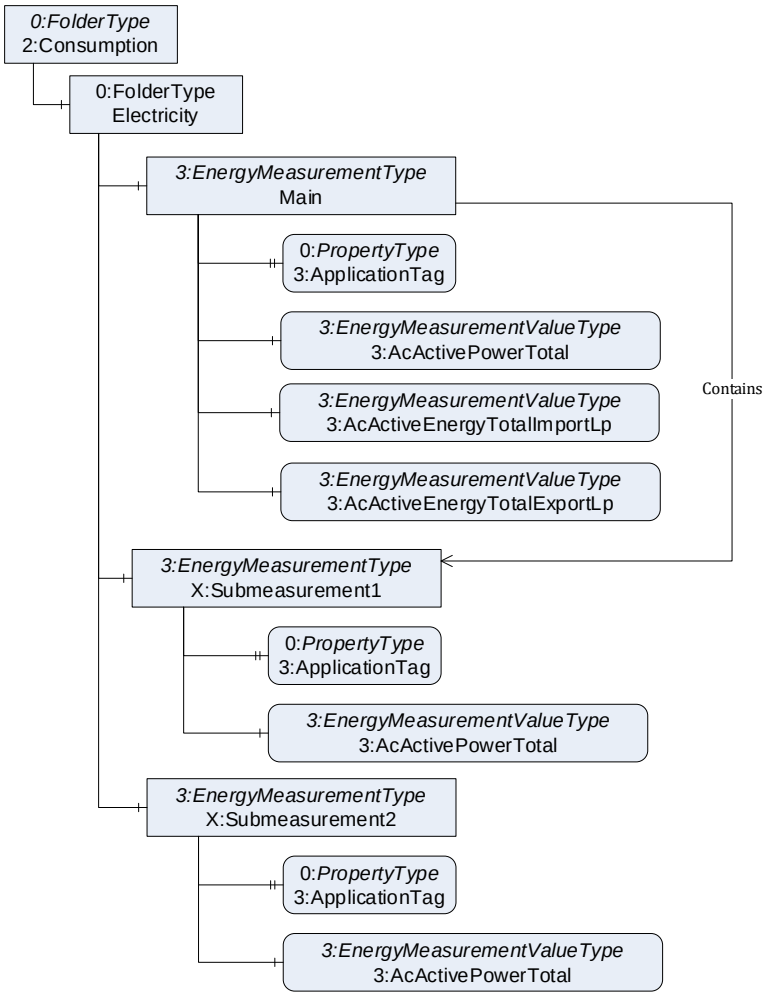

Figure 2 – Example of Measurements

In Figure 3, a more comprehensive example is given. In this case, also the components of the *MachineryItem* provide metering points. The metering points of the components may also be referenced by *Contains Reference*. This can be either done directly, as for X:MyComponent1, or indirectly via a proxy *Object* as in X:MyComponent2. Providing a proxy *Object* allows to provide anybody browsing more direct context and avoids potentially duplicated names, as many *Main Objects* of different components may be referenced.

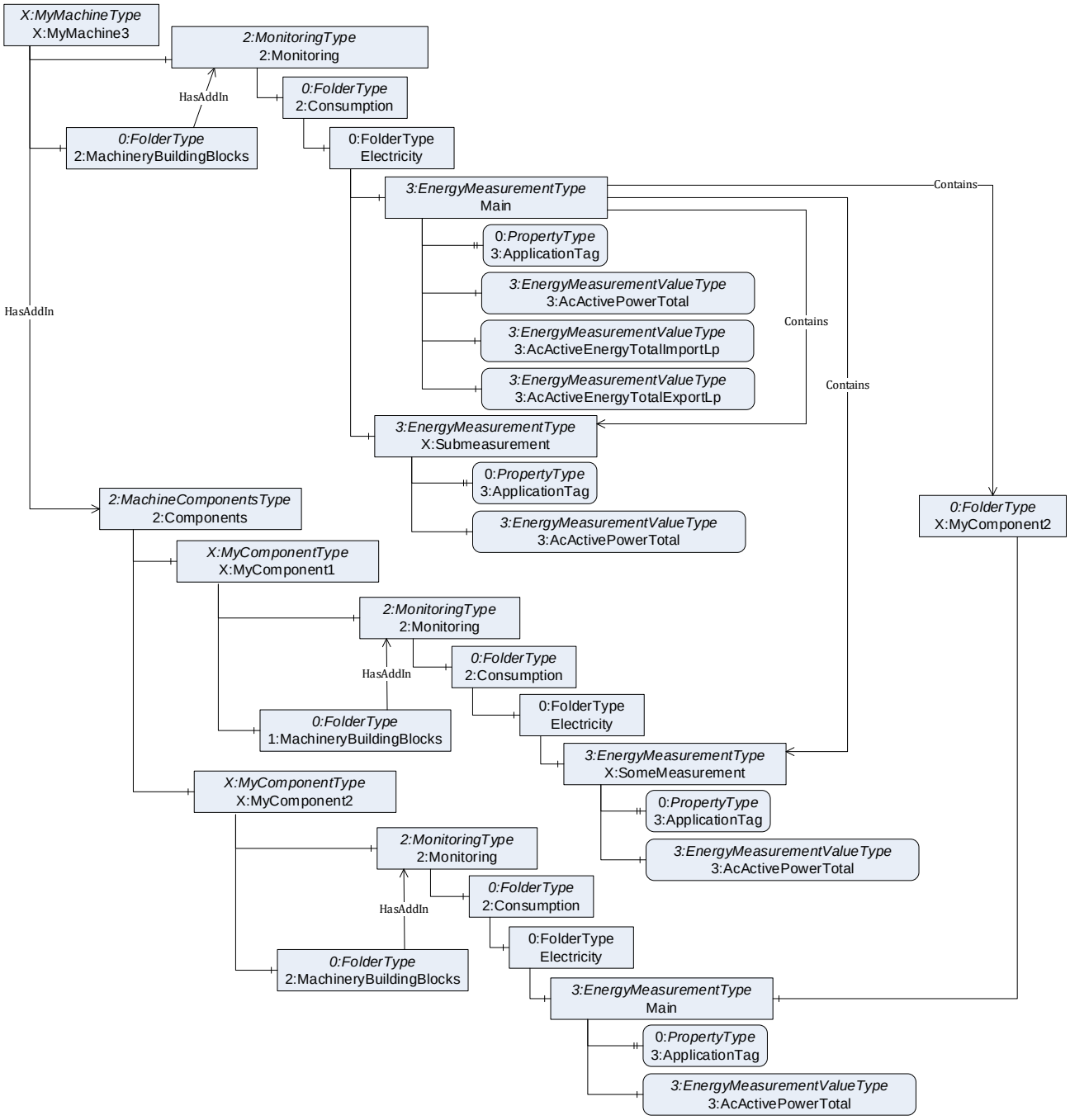

Figure 3 – Extended Example of Measurements

6.3 Standardized BrowseNames to group energy measurements based on resources

This specification defines standardized *BrowseNames* as entry points to energy metering points of specific resources. They are defined in 9.1.

In addition, a standardized *BrowseName* is defined for the main energy metering point of a *MachineryItem*. This can be used for each specific resource. It is defined in 9.2.

6.4 Standardized grouping of related measurements in Interfaces

OPC 34100 already defines OPC UA *Interfaces* to group specific energy measurement variables for electricity. This specification defines additional OPC UA *Interfaces* for non-electrical energy in 7.1, 7.2 7.3, and 7.4. In Figure 4, an example is given on how to use those *Interfaces*. The X:MyMachine provides energy measurements

for cooling lubricant, and the *Main* metering point, according to the recommendations in 6.5, implements the *Interfaces INonElectricalEnergyType* and *IVolumeFlowType*. By implementing the *Interfaces*, it provides the measurement variables as defined by the *Interfaces*.

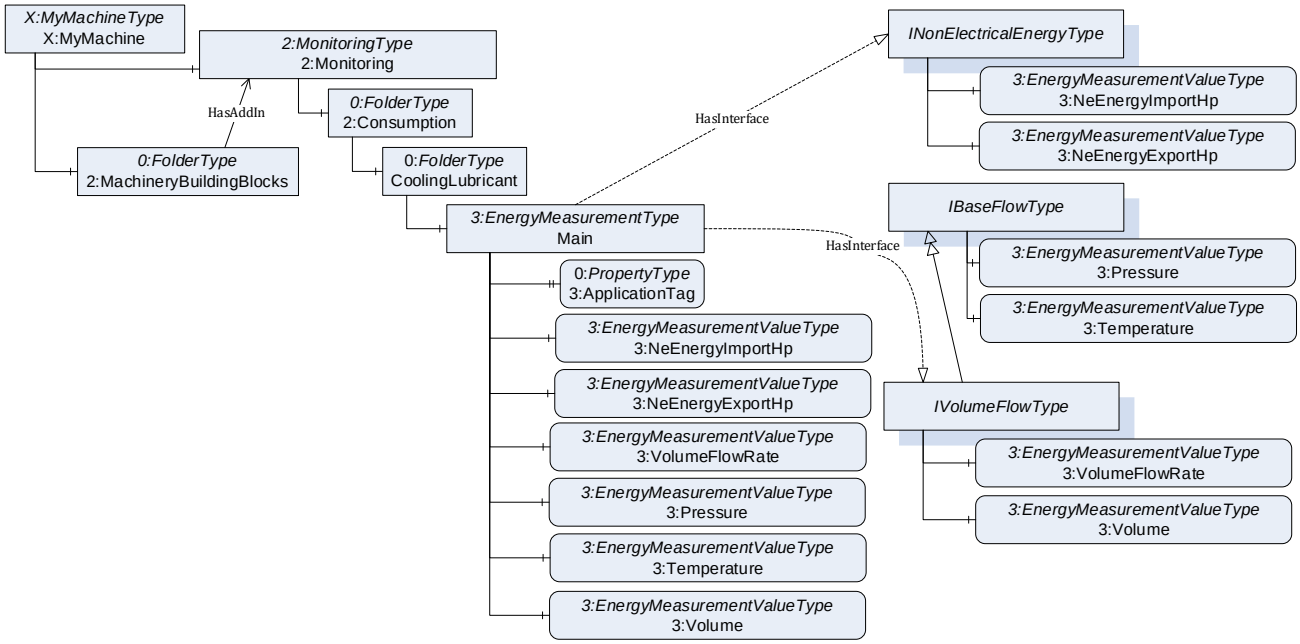

Figure 4 – Example of using Interfaces for standardized measurements

6.5 Recommended Interfaces for different resources

This specification defines a recommended mapping of resources to *Interfaces*, *Objects* of the 3:*EnergyMeasurementType* should implement. In this version of the specification, not all resources defined in OPC 34100 are considered, but only a part of it.

Table 1 – Recommended Interfaces for different resources

Resource	Interfaces
Electricity	Various Interfaces as defined in OPC 34100
Compressed Air	INonElectricalEnergyType IMassFlowType IVolumeFlowType
Cooling Lubricant	INonElectricalEnergyType IVolumeFlowType
Natural Gas	IMassFlowType IVolumeFlowType
Steam, Saturated	IMassFlowType IVolumeFlowType
Steam, Superheated	IMassFlowType IVolumeFlowType
Chilled Water	IVolumeFlowType
Hot Water	IVolumeFlowType
Hot Hot Water	IVolumeFlowType
Crude Oil	IMassFlowType IVolumeFlowType
Fuel Oil #2	IMassFlowType IVolumeFlowType
Fuel Oil #5	IMassFlowType IVolumeFlowType
Fuel Oil #6	IMassFlowType IVolumeFlowType
Diesel Oil	IMassFlowType IVolumeFlowType
Gasoline	IMassFlowType IVolumeFlowType
Propane	IMassFlowType IVolumeFlowType
Biogas	IMassFlowType IVolumeFlowType

Note: As some *Interfaces* only define optional *Variables*, it is in the responsibility of the implementer of the *Interface* to provide enough information to allow the calculation of energy data.

7 OPC UA ObjectTypes

7.1 INonElectricalEnergyType ObjectType Definition

The *INonElectricalEnergyType* provides general information on the consumed and produced non-electrical energy. It is formally defined in Table 2.

Table 2 – INonElectricalEnergyType Definition

Attribute	**Value**				
BrowseName	INonElectricalEnergyType				
IsAbstract	True				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Other**
Subtype of the 0:BaseInterfaceType					
4:HasStatisticComponent	Variable	3:NeEnergyImportHp	0:Double	3:EnergyMeasurementValueType	M
4:HasStatisticComponent	Variable	3:NeEnergyExportHp	0:Double	3:EnergyMeasurementValueType	M
Conformance Units					
Machinery Energy Non Electrical Base					

3:NeEnergyImportHp and *3:NeEnergyExportHp* provide the information on the consumed and produced non-electrical energy and shall be used according to OPC 34100.

The component *Variables* of the *INonElectricalEnergyType* have additional *Attributes* defined in Table 3.

Table 3 – INonElectricalEnergyType Attribute values for child nodes

BrowsePath	Value Attribute
3:NeEnergyImportHp 0:EngineeringUnits	NamespaceUri: http://www.opcfoundation.org/UA/units/un/cefact UnitId: 5720146 DisplayName: W·h Description: watt hour
3:NeEnergyImportHp 3:MeasurementID	2002
3:NeEnergyExportHp 0:EngineeringUnits	NamespaceUri: http://www.opcfoundation.org/UA/units/un/cefact UnitId: 5720146 DisplayName: W·h Description: watt hour
3:NeEnergyExportHp 3:MeasurementID	2005

7.2 IBaseFlowType ObjectType Definition

The *IBaseFlowType* provides base information on flow resources and is formally defined in Table 4.

Table 4 – IBaseFlowType Definition

Attribute	Value				
BrowseName	IBaseFlowType				
IsAbstract	True				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Other**
Subtype of the 0:BaseInterfaceType					
0:HasComponent	Variable	3:Pressure	0:Float	3:EnergyMeasurementValueType	O
0:HasComponent	Variable	3:Temperature	0:Float	3:EnergyMeasurementValueType	O
Conformance Units					
Machinery Energy Non Electrical Mass Flow					
Machinery Energy Non Electrical Volume Flow					

3:Pressure and 3:Temperature provide information on flow resources and shall be used according to OPC 34100.

The component *Variables* of the *IBaseFlowType* have additional *Attributes* defined in Table 5.

Table 5 – IBaseFlowType Attribute values for child nodes

BrowsePath	Value Attribute
3:Pressure 0:EngineeringUnits	NamespaceUri: http://www.opcfoundation.org/UA/units/un/cefact UnitId: 5259596 DisplayName: Pa Description: pascal
3:Pressure 3:MeasurementID	28684
3:Temperature 0:EngineeringUnits	NamespaceUri: http://www.opcfoundation.org/UA/units/un/cefact UnitId: 4932940 DisplayName: K Description: kelvin
3:Temperature 3:MeasurementID	28684

7.3 IVolumeFlowType ObjectType Definition

The *IVolumeFlowType* provides information on flowing resources based on volume. It is formally defined in Table 6.

Table 6 – IVolumeFlowType Definition

Attribute	**Value**				
BrowseName	IVolumeFlowType				
IsAbstract	True				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Other**
Subtype of the IBaseFlowType					
0:HasComponent	Variable	3:VolumeFlowRate	0:Float	3:EnergyMeasurementValueType	O
0:HasComponent	Variable	3:Volume	0:Float	3:EnergyMeasurementValueType	O
Conformance Units					
Machinery Energy Non Electrical Volume Flow					

This *Interface* is derived from *IBaseFlowType.* The *InstanceDeclarations* shall be used according to that *Interface* definition.

3:VolumeFlowRate and *3Volume* provide information on flow resources and shall be used according to OPC 34100.

The component *Variables* of the *IVolumeFlowType* have additional *Attributes* defined in Table 7.

Table 7 – IVolumeFlowType Attribute values for child nodes

BrowsePath	**Value Attribute**
3:VolumeFlowRate 0:EngineeringUnits	NamespaceUri: http://www.opcfoundation.org/UA/units/un/cefact UnitId: 5067091 DisplayName: m³/s Description: cubic metre per second
3:VolumeFlowRate 3:MeasurementID	2100
3:Volume 0:EngineeringUnits	NamespaceUri: http://www.opcfoundation.org/UA/units/un/cefact UnitId: 5067857 DisplayName: m³ Description: cubic metre
3:Volume 3:MeasurementID	28686

7.4 IMassFlowType ObjectType Definition

The *IMassFlowType* provides information on flowing resources based on volume and mass. It is formally defined in Table 8.

Table 8 – IMassFlowType Definition

Attribute	**Value**				
BrowseName	IMassFlowType				
IsAbstract	True				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Other**
Subtype of the IBaseFlowType					
0:HasComponent	Variable	3:MassFlowRate	0:Float	3:EnergyMeasurementValueType	O
0:HasComponent	Variable	3:Mass	0:Float	3:EnergyMeasurementValueType	O
Conformance Units					
Machinery Energy Non Electrical Mass Flow					

This *Interface* is derived from *IBaseFlowType.* The *InstanceDeclarations* shall be used according to that *Interface* definition.

3:MassFlowRate and *3:Weight* add information based on mass and shall be used according to OPC 34100.

The component *Variables* of the *IMassFlowType* have additional *Attributes* defined in Table 9.

Table 9 – IMassFlowType Attribute values for child nodes

BrowsePath	**Value Attribute**
3:MassFlowRate 0:EngineeringUnits	NamespaceUri: http://www.opcfoundation.org/UA/units/un/cefact UnitId: 4933459 DisplayName: kg/s Description: kilogram per second
3:MassFlowRate 3:MeasurementID	2101
3:Mass 0:EngineeringUnits	NamespaceUri: http://www.opcfoundation.org/UA/units/un/cefact UnitId: 4933453 DisplayName: kg Description: kilogram
3:Mass 3:MeasurementID	28685

8 OPC UA ReferenceTypes

8.1 Contains

Contains is a concrete *ReferenceType* and can be used directly. It is a subtype of *HierarchicalReferences*.

The semantic of this *ReferenceType* is to reference from a main energy measurement point to another one, which measurements are included in the main energy measurement point.

The *SourceNode* of *References* of this *ReferenceType* shall be an *Object* of *3:EnergyMeaurementType* or an *ObjectType* being a subtype of *3:EnergyMeaurementType.*

The *TargetNode* of *References* of this *ReferenceType* shall be an *Object* of *3:EnergyMeaurementType.*

Contains is formally defined in Table 10.

Table 10 – Contains definition

Attributes	Value		
BrowseName	Contains		
InverseName	ContainedIn		
Symmetric	False		
IsAbstract	False		
References	**NodeClass**	**BrowseName**	**Comment**
Subtype of 0:HierarchicalReferences			
Conformance Units			
Machinery Energy Contains			

9 Well-Known BrowseNames

9.1 Well-Known 0:FolderType BrowseNames

The *0:FolderType BrowseNames* are formally defined in Table 11.

Table 11 – Well-Known 0:FolderType BrowseNames

BrowseName	Purpose
Electricity	Entry point for energy measurements of the resource Electricity
CompressedAir	Entry point for energy measurements of the resource Compressed Air
CoolingLubricant	Entry point for energy measurements of the resource Cooling Lubricant
NaturalGas	Entry point for energy measurements of the resource Natural Gas
Steam_Saturated	Entry point for energy measurements of the resource Steam, Saturated
Steam_Superheated	Entry point for energy measurements of the resource Steam, Superheated
ChilledWater	Entry point for energy measurements of the resource Chilled Water
HotWater	Entry point for energy measurements of the resource Hot Water
HotHotWater	Entry point for energy measurements of the resource Hot Hot Water
CrudeOil	Entry point for energy measurements of the resource Crude Oil
FuelOil_2	Entry point for energy measurements of the resource Fuel Oil #2
FuelOil_5	Entry point for energy measurements of the resource Fuel Oil #5
FuelOil_6	Entry point for energy measurements of the resource Fuel Oil #6
DieselOil	Entry point for energy measurements of the resource Diesel Oil
Gasoline	Entry point for energy measurements of the resource Gasoline
Propane	Entry point for energy measurements of the resource Propane
Biogas	Entry point for energy measurements of the resource Biogas
HydraulicOil	Entry point for energy measurements of the resource Hydraulic Oil

9.2 Well-Known 3:EnergyMeasurementType BrowseNames

The *3:EnergyMeasurementTyp BrowseNames* are formally defined in Table 12.

Table 12 – Well-Known 3:EnergyMeasurementType BrowseNames

BrowseName	Purpose
Main	Main metering point of a MachineryItem

10 Profiles and ConformanceUnits

10.1 Conformance Units

This chapter defines the corresponding *Conformance Units* for the OPC UA Information Model for Machinery – Energy Management.

Table 13 – Conformance Units for Machinery – Energy Management

Category	Title	Description
Server	Machinery Energy Base Structure	Supports at least one MachineryItem supporting the Consumption Object having at least one sub-folder following the predefined BrowseNames of this specification.
Server	Machinery Energy Main grouping	Each MachineryItem supporting the Consumption Object with a sub-folder according to this specification provides a Main Object of EnergyMeasurementType for each of those sub-folders.
Server	Machinery Energy Non Electrical Base	Supports InonElectricalEnergyType and at least one instance of EnergyMeasurementType implementing the interface.
Server	Machinery Energy Non Electrical Mass Flow	Supports IBaseFlowType, IMassFlowType and at least one instance of EnergyMeasurementType implementing IMassFlowType.
Server	Machinery Energy Non Electrical Volume Flow	Supports IBaseFlowType, IVolumeFlowType and at least one instance of EnergyMeasurementType implementing IVolumeFlowType.
Server	Machinery Energy Contains	Supports the Contains ReferenceType and at least one instance using the ReferenceType.

10.2 Profiles

10.2.1 Profile list

Table 14 lists all Profiles defined in this document and defines their URIs.

Table 14 – Profile URIs for OPC UA for Machinery – Energy Management

Profile	URI
Machinery Energy Base Server Facet	http://opcfoundation.org/UA-Profile/Machinery/Energy/Server/Base

10.2.2 Server Facets

10.2.2.1 Overview

The following sections specify the *Facets* available for *Servers* that implement the OPC UA for Machinery – Energy Management companion specification. Each section defines and describes a *Facet* or *Profile*.

10.2.2.2 Machinery Energy Base Server Facet

Table 15 defines a *Profile* that describes the base functionality to provide energy consumption information of a MachineryItem.

Table 15 – Machinery Energy Base Server Facet

Group	Conformance Unit / Profile Title	Mandatory / Optional
Profile	Machinery Monitoring Server Facet	
ECM	ECM Energy Measurement	M
ECM	ECM EnergyProfile E0	O
ECM	ECM EnergyProfile E1	O
ECM	ECM EnergyProfile E2	O
ECM	ECM EnergyProfile E3	O
ECM	ECM EnergyProfile D0	O
ECM	ECM EnergyProfile D1	O
ECM	ECM Energy Measurement Common DataTypes	O
ECM	ECM Accuracy Domain Percent full scale	O
ECM	ECM Accuracy Domain Percent actual reading	O
ECM	ECM Accuracy Domain IEC	O
ECM	ECM Accuracy Domain EN	O
Machinery Energy	Machinery Energy Base Structure	M
Machinery Energy	Machinery Energy Main grouping	O
Machinery Energy	Machinery Energy Non Electrical Base	O
Machinery Energy	Machinery Energy Non Electrical Mass Flow	O
Machinery Energy	Machinery Energy Non Electrical Volume Flow	O
Machinery Energy	Machinery Energy Contains	O

10.2.3 Client Facets

This specification does not define client facets.

11 Namespaces

11.1 Namespace Metadata

Table 16 defines the namespace metadata for this document. The *Object* is used to provide version information for the namespace and an indication about static *Nodes*. Static *Nodes* are identical for all *Attributes* in all *Servers*, including the *Value Attribute*. See OPC 10000-5 for more details.

The information is provided as *Object* of type *NamespaceMetadataType*. This *Object* is a component of the *Namespaces Object* that is part of the *Server Object*. The *NamespaceMetadataType ObjectType* and its *Properties* are defined in OPC 10000-5.

The version information is also provided as part of the ModelTableEntry in the UANodeSet XML file. The UANodeSet XML schema is defined in OPC 10000-6.

Table 16 – NamespaceMetadata Object for this Document

Attribute	**Value**	
BrowseName	http://opcfoundation.org/UA/Machinery/Energy/	
Property	**DataType**	**Value**
NamespaceUri	String	http://opcfoundation.org/UA/Machinery/Energy/
NamespaceVersion	String	1.00
NamespacePublicationDate	DateTime	2025-06-01
IsNamespaceSubset	Boolean	False
StaticNodeIdTypes	IdType []	0
StaticNumericNodeIdRange	NumericRange []	
StaticStringNodeIdPattern	String	

Note: The *IsNamespaceSubset Property* is set to False as the UaNodeSet XML file contains the complete Namespace. *Servers* only exposing a subset of the Namespace need to change the value to True.

11.2 Handling of OPC UA Namespaces

Namespaces are used by OPC UA to create unique identifiers across different naming authorities. The *Attributes NodeId* and *BrowseName* are identifiers. A *Node* in the UA *AddressSpace* is unambiguously identified using a *NodeId*. Unlike *NodeIds*, the *BrowseName* cannot be used to unambiguously identify a *Node*. Different *Nodes* may have the same *BrowseName*. They are used to build a browse path between two *Nodes* or to define a standard *Property*.

Servers may often choose to use the same namespace for the *NodeId* and the *BrowseName*. However, if they want to provide a standard *Property*, its *BrowseName* shall have the namespace of the standards body although the namespace of the *NodeId* reflects something else, for example the *EngineeringUnits Property*. All *NodeIds* of *Nodes* not defined in this document shall not use the standard namespaces.

Table 17 provides a list of mandatory and optional namespaces used in an OPC UA for Machinery *Server*.

Table 17 – Namespaces used in an OPC UA for Machinery Server

NamespaceURI	Description
http://opcfoundation.org/UA/	Namespace for *NodeIds* and *BrowseNames* defined in the OPC UA specification. This namespace shall have namespace index 0.
Local Server URI	Namespace for nodes defined in the local server. This namespace shall have namespace index 1.
http://opcfoundation.org/UA/Machinery/	Namespace for *NodeIds* and *BrowseNames* defined in OPC 40001-1. The namespace index is *Server* specific.
http://opcfoundation.org/UA/IA/	Namespace for *NodeIds* and *BrowseNames* defined in OPC 10000-200. The namespace index is *Server* specific.
http://opcfoundation.org/UA/ECM/	Namespace for *NodeIds* and *BrowseNames* defined in OPC 34100. The namespace index is *Server* specific.
http://opcfoundation.org/UA/Machinery/Energy/	Namespace for *NodeIds* and *BrowseNames* defined in this document. The namespace index is *Server* specific.
Vendor specific types	A *Server* may provide vendor-specific types like types derived from *ObjectTypes* defined in this document in a vendor-specific namespace.
Vendor specific instances	A *Server* provides vendor-specific instances of the standard types or vendor-specific instances of vendor-specific types in a vendor-specific namespace. It is recommended to separate vendor specific types and vendor specific instances into two or more namespaces.

Table 18 provides a list of namespaces and their indices used for *BrowseNames* in this document. The default namespace of this document is not listed since all *BrowseNames* without prefix use this default namespace.

Table 18 – Namespaces used in this document

NamespaceURI	Namespace Index	Example
http://opcfoundation.org/UA/	0	0:EngineeringUnits
http://opcfoundation.org/UA/Machinery/	2	2:Monitoring
http://opcfoundation.org/UA/ECM/	3	3:Volume
http://opcfoundation.org/UA/IA/	4	4 HasStatisticComponent

Annex A
(normative)

OPC UA for Machinery Namespace and mappings

A.1 NodeSet and supplementary files for OPC UA for Machinery Information Model

The OPC UA for Machinery *Information Model* is identified by the following URI:

http://opcfoundation.org/UA/Machinery/Energy/

Documentation for the NamespaceUri can be found here.

The *NodeSet* associated with this version of specification can be found here:

https://reference.opcfoundation.org/nodesets/?u=http://opcfoundation.org/UA/Machinery/Energy/&v=1.00&i=1

The *NodeSet* associated with the latest version of the specification can be found here:

https://reference.opcfoundation.org/nodesets/?u=http://opcfoundation.org/UA/Machinery/Energy/&i=1

Supplementary files for the OPC UA for Machinery *Information Model* can be found here:

https://reference.opcfoundation.org/nodesets/?u=http://opcfoundation.org/UA/Machinery/Energy/&v=1.00&i=2

The files associated with the latest version of the specification can be found here:

https://reference.opcfoundation.org/nodesets/?u=http://opcfoundation.org/UA/Machinery/Energy/&i=2

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