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1 Introduction

1.1 Scope and Application

Our Opc Ua Server describes the interface between an isel cnc machine (ICM) and manufacturing execution systems (MES) for data exchange. MES are used for collecting the information generated by the ICM at a central point for easier quality assurance and job and dataset management. The target is to provide a interface for ICM and MES to ensure compatibility.

The following functionalities are covered:

- General information about the ICM (manufacturer, model, serial number...), current configuration and status of the ICM.
- Job management: Information on the jobs running on the machine and methods to send jobs from MES to the ICM.
- Information about the cnc system from the ICM (axis status, input/output, spindles, tool and cnc channel information)
- Direct control of machine movements by the MES via program calls

The following function are not included:

- related signals like emergency stop

1.2 References

Short name	**Titel**
OPC 10000-1	OPC Unified Architecture - Part 1: Overview and Concept
OPC 10000-2	OPC Unified Architecture - Part 2: Security Model
OPC 10000-3	OPC Unified Architecture - Part 3: Address Space Model
OPC 10000-4	OPC Unified Architecture - Part 4: Services
OPC 10000-5	OPC Unified Architecture - Part 5: Information Model
OPC 10000-6	OPC Unified Architecture - Part 6: Mappings
OPC 10000-7	OPC Unified Architecture - Part 7: Profiles
OPC 10000-8	OPC Unified Architecture - Part 8: Data Access
OPC 10000-9	OPC Unified Architecture - Part 9: Alarms and Conditions
OPC 10000-11	OPC Unified Architecture - Part 11: Historical Access
OPC 10000-12	OPC Unified Architecture - Part 12: Discovery
OPC 10001-7	OPC Unified Architecture V1.04 - Amendment 7: Interfaces and AddIns
OPC 10000-100	OPC Unified Architecture - Part 100: OPC UA for Devices
OPC 10000-200	OPC Unified Architecture - Part 200: Industrial Automation
EUROMAP 77	OPC UA interfaces for plastics and rubber machinery - Data exchange between injection moulding machines and MES
EUROMAP 83	OPC UA interfaces for plastics and rubber machinery - General Type definitions
Machinery	OPC 40001-1 - UA CS for Machinery Part 1 - Basic Building Blocks
MachineTool	OPC 40501-1 - UA CS for Machine Tools Part 1 - Monitoring and Job

Table 1: References

2 Basic security requirements

2.1 Application Security

For the communication between ICM and MES the OPC UA application authentication via X509 certificates shall be used. OPC UA provides unctionalities for using self-signed certificates that have to be manually added to a “trust list” as well as for certificates issued by a certificate authority (CA). NOTE:

It is not fixed by this specification if the certificate includes a fixed IP address and/or the host name. However, if the certificate includes a host name, a DNS server is expected to resolve the host name. An OPC UA GDS (Global Discovery Server) can be used to manage the connections and certificates.

2.2 User security/Access control

NOTE: OPC UA also allow an anonymous-token (e.g. for testing)

3 OPC UA Conformance Units and Profiles

This chapter defines the corresponding profiles and conformance units for the OPC UA Information Model. Profiles are named groupings of conformance units. Facets are profiles that will be combined with other Profiles to define the complete functionality of an OPC UA Server or Client. The following tables specify the facets available for Servers that implement the information Model companion specification.

NOTE: The names of the supported profiles are available in the Server Object under ServerCapabilities.ServerProfileArray

4 Namespaces

4.1 Namespace and identifiers for the Information Model

This clause defines the numeric identifiers for all of the numeric NodeIds defined in this specification. The identifiers are specified in a CSV file with the following syntax

```
<SymbolName>, <Identifier>, <NodeClass>
```

where the SymbolName is either the BrowseName of a Type Node or the BrowsePath for an Instance Node that appears in the specification and the Identifier is the numeric value for the NodeId.

The BrowsePath for an Instance Node is constructed by appending the BrowseName of the instance Node to the BrowseName for the containing instance or type. An underscore character is used to separate each BrowseName in the path. Lets take for example, the MachineInformationType.

ObjectType Node which has the ControllerName Property. The **Name** for the ControllerName InstanceDeclaration within the MachineInformationType declaration is: MachineInformationType_ControllerName.

4.2 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 Address Space 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. All NodeIds of nodes not defined in this specification shall not use the standard namespaces.

5 IMM_MES_InterfaceType

The IMM_MES_InterfaceType is defined in EUROMAP 77.

Since our Opc Ua server is based on CNC machines and not on injection moulding machines, we can only use selected types from IMM_MES_InterfaceType. These are in this case the types JobsType, MachineConfigurationType, MachineInformationType and MachineStatusType. Also, not all objects and variables of these types could be used. The following is a listing of the objects and variables used from the above types.

5.1 JobsType

The JobsType is defined in EUROMAP 83.

Table 2: JobsType Definition

Attribute	**Value**				
BrowseName	JobsType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of DeviceType defined in OPC UA Part 5					
HasComponent	Object	JobInformationType		JobInformationType	M
HasComponent	Object	ActiveJobValuesType		ActiveJobValuesType	M
HasComponent	Method	SendJobList			O

SendJobList

The SendJobList method allows you to send up to 10 jobs to the server. All jobs need a name. The name can always be the same, but it is not advisable to do so. All jobs are sorted according to the FIFO principle. If you send a JobPriority as a number, the internal JobList is sorted in descending order by JobPriority. Higher number means higher priority. As long as no job has been started, the list will sort again and again. In addition, the ProductionDatasetName is required, here you must specify the local path of the file to be processed. If you create a file (via OpcUa, FTP or similar) in one of the following folders on the control PC, this file is recognized by the OpcUa server and created as a node under Isel_Machine_Interface. FileHandling is in the folder, witch is setup in ProNC.

- FileHandlingFolder\NCP
- FileHandlingFolder\ISO
- FileHandlingFolder\PAL
- FileHandlingFolder\Script
- FileHandlingFolder\OpcUaImport

In the folder NCP, ISO, PAL and Script the server offers only reading rights. Here, the client only has the option to open the file and read. In the folder OpcUaImport exist for the client read and write rights. Here you can also create, write and delete files from the client.

With the help of this node you can query the location of the local file. This information is in the description of the node.

This location can be used as ProductionDatasetName.

5.1.1 JobInformationType

Table 3: JobInformationType Definition

Attribute	**Value**				
BrowseName	JobInformationType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasProperty	Variable	JobName	String	PropertyType	M, R
HasProperty	Variable	JobDescription	String	PropertyType	M, R
HasProperty	Variable	CustomerName	String	PropertyType	M, R
HasProperty	Variable	ProductionDataset-Name	String	PropertyType	M, R
HasProperty	Variable	ProductionDataset-Description	String	PropertyType	M, R
HasProperty	Variable	Material	String[]	PropertyType	M, R
HasProperty	Variable	ProductName	String[]	PropertyType	M, R
HasProperty	Variable	ProductDescription	String[]	PropertyType	M, R

5.1.2 ActiveJobValuesType

Table 4: ActiveJobValuesType Definition

Attribute	**Value**				
BrowseName	ActiveJobValuesType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasProperty	Variable	JobStatus	JobStatus-Enumeration	PropertyType	M, R
HasComponent	Method	StartJob			M
HasComponent	Method	InterruptJob			M
HasComponent	Method	FinishJob			M

JobStatus

The JobStatus Property represents the current status of the job.

Table 5: JobStatusEnumeration Definition

Value	Description
OTHER_0	This state is used if none of the other states below apply. Set by operator.
TRANSFERRED_ASSIGNED_1	The job has been transferred to the machine and assigned as current job.
SET_UP_ACTIVE_2	The operator prepares the machine for the job.
SET_UP_INTERRUPTED_3	The operator has interrupted but not finished the preparation of the machine for the job.
SET_UP_FINISHED_4	The operator has finished the preparation of the machine for the job.
START_UP_ACTIVE_5	The operator is setting the machine in the start-up phase.
JOB_IN_PRODUCTION_6	The machine is producing parts/products for the job.
JOB_INTERRUPTED_7	The job is interrupted. The nominal output is not reached.
JOB_FINISHED_8	Nominal output reached.
TEAR_DOWN_ACTIVE_9	The operator tears the machine down.
TEAR_DOWN_INTERRUPTED_10	Tear-down is interrupted but not finished.
TEAR_DOWN_FINISHED_11	Tear-down is finished.

er

5.2 MachineConfigurationType

The MachineConfigurationType is defined in EUROMAP 83.

Table 6: MachineConfigurationType Definition

Attribute	Value				
BrowseName	MachineConfigurationType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of DeviceType defined in OPC UA Part 5					
HasProperty	Variable	LocationName	String	PropertyType	M, RW
HasProperty	Variable	TimeZoneOffset	TimeZoneDataType	PropertyType	M, RW
HasProperty	Variable	UserMachineName	String	PropertyType	M, RW
HasComponent	Method	SetMachineTime			M

5.3 MachineInformationType

The MachineInformationType is defined in EUROMAP 83.

Table 7: MachineInformationType Definition

Attribute	**Value**				
BrowseName	MachineInformationType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of DeviceType defined in OPC UA for Devices (DI)					
HasProperty	Variable	DeviceClass	String	PropertyType	M, R
HasProperty	Variable	ControllerName	String	PropertyType	M, R
HasProperty	Variable	SupportedLogbook-Events	LogbookEventsEnu-meration[]	PropertyType	M, R
HasProperty	Variable	Manufacturer	LocalizedText	PropertyType	M, R
HasProperty	Variable	DeviceManual	String	PropertyType	M, R
HasProperty	Variable	Model	LocalizedText	PropertyType	M, R
HasProperty	Variable	SoftwareRevision	String	PropertyType	M, R
HasProperty	Variable	SerialNumber	String	PropertyType	M, R
HasProperty	Variable	DeviceRevision	String	PropertyType	M, R
HasProperty	Variable	SerialNumber	String	PropertyType	M, R
HasProperty	Variable	HardwareRevision	String	PropertyType	M, R
HasProperty	Variable	RevisionCounter	Int32	PropertyType	M, R

5.4 MachineStatusType

The MachineStatusType is defined in EUROMAP 83.

Table 8: MachineStatusType Definition

Attribute	**Value**				
BrowseName	MachineStatusType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of DeviceType defined in OPC UA Part 5					
HasProperty	Variable	IsPresent	Boolean	PropertyType	M, R
HasProperty	Variable	MachineMode	MachineMode-Enumeration	PropertyType	M, R
HasComponent	Method	ActivateSleepMode			M
HasComponent	Method	DeactivateSleepMode			M

MachineMode

The MachineMode Property represents the current status of the machine.

Table 9: MachineModeEnumeration Definition

Value	**Description**
OTHER_0	This state is used
AUTOMATIC_1	This state is used
SEMI_AUTOMATIC_2	This state is used
MANUAL_3	This state is not supported by the machine.
SETUP_4	This state is used
SLEEP_5	This state is used

6 Machine_InterfaceType

Table 10: Machine_InterfaceType Definition

Attribute	Value				
BrowseName	Machine_InterfaceType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Object	FileHandling		FileHandlingType	M
HasComponent	Object	JobHandling		Machine_JobHandling-Type	M
HasComponent	Object	ArrayHandling		Machine_Array-HandlingType	M
HasComponent	Object	Machine_CncInterface		Machine_CncInterface-Type	M
HasProperty	Variable	SleepModeActivate	Boolean	PropertyType	M
HasProperty	Variable	SleepModeDeactivate	Boolean	PropertyType	M
HasProperty	Variable	SleepModeStatus	UInt32	PropertyType	M
HasProperty	Variable	MachineMode	UInt16	PropertyType	M

SleepModeActivate

With this Variable the client (e.g. MES) requests the machine to activate the SleepMode. It is similar to the ActivateSleepMode Method from Euromap 83.

SleepModeDeactivate

With this Variable the client (e.g. MES) requests the machine to deactivate the SleepMode. It is similar to the DeactivateSleepMode Method from Euromap 83.

SleepModeStatus

The server responds the client (e.g. MES) the current status from the SleepMode request.

MachineMode

The server send the current status from the MachineMode to the client (e.g. MES). It is similar to the MachineMode Variable from Euromap 83.

6.1 FileHandlingType

Table 11: FileHandlingType Definition

Attribute	Value				
BrowseName	FileHandlingType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Object	FileDirectory		FileDirectoryType	M
HasComponent	Object	ISO		FolderType	M
HasComponent	Object	NCP		FolderType	M
HasComponent	Object	OpcUaImport		FolderType	M
HasComponent	Object	PAL		FolderType	M
HasComponent	Object	Script		FolderType	M

Table 12: ISO, NCP, OpcUaImport, PAL, Script Definition

Attribute	Value				
BrowseName	ISO, NCP, OpcUaImport, PAL, Script				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Object	"FolderName"		FolderType	O
HasComponent	Object	"FileName"."Exten-tion"		FileType	O

6.2 Machine_JobHandlingType

This Machine_JobHandlingType is a container Variablen to control the jobs from Euromap 83 without any functions.

Table 13: Machine_JobHandlingType Definition

Attribute	Value				
BrowseName	Machine_JobHandlingType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Object	JobsList		Machine_JobValuesList-Type	M
HasProperty	Variable	AddJob	Boolean	PropertyType	M
HasProperty	Variable	OpenJob	Boolean	PropertyType	M
HasProperty	Variable	FileName	String	PropertyType	M
HasProperty	Variable	FinishJob	Boolean	PropertyType	M
HasProperty	Variable	InterruptJob	Boolean	PropertyType	M
HasProperty	Variable	JobHandlingStatus	UInt32	PropertyType	M, R
HasProperty	Variable	NumOfJobs	UInt32	PropertyType	M, R
HasProperty	Variable	StartJob	Boolean	PropertyType	M
HasProperty	Variable	StartJob_Option	UInt32	PropertyType	M

AddJob

This Variable is used to send a job from the client to the server. The server supports 10 jobs. It is similar to SendJobList Method from Euromap 83.

OpenJob

This Variable is used to open (display) a job on the server.

FileName

This Variable is used to define the filename of the job. It is similar to ProductionDatasetName from JobListElementType from Euromap 83.

FinishJob

With this Variable the client (e.g. MES) requests the machine to change the JobStatus to JOB_FINISHED_8. It is similar to the FinishJob Method from Euromap 83.

InterruptJob

With this Variable the client (e.g. MES) requests the machine to change the JobStatus to JOB_INTERRUPTED_7. It is similar to the InterruptJob Method from Euromap 83.

JobHandlingStatus

The JobHandlingStatus Property represents the current status of the AddJob, FinishJob or InterruptJob flags.

NumOfJobs

The NumOfJobs Property represents the current number of jobs on the server.

StartJob

With this Variable the client (e.g. MES) request the machine to change the JobStatus to JOB_IN_PRODUCTION_6. It is similar to the StartJob Method from Euromap 83.

StartJob_Option

With this Variable client (e.g. MES) request the machine to start the job without any error check at the beginning of the job.

Bit 0: Starts the programm without error check
Bit 1: Starts the programm in invisible-mode

6.2.1 Machine_JobValuesListType

Table 14: Machine_JobValuesListType Definition

Attribute	**Value**				
BrowseName	Machine_JobValuesListType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Object	J0		JobInformationType	M
HasComponent	Object	J1		JobInformationType	M
HasComponent	Object	J2		JobInformationType	M
HasComponent	Object	J3		JobInformationType	M
HasComponent	Object	J4		JobInformationType	M
HasComponent	Object	J5		JobInformationType	M
HasComponent	Object	J6		JobInformationType	M
HasComponent	Object	J7		JobInformationType	M
HasComponent	Object	J8		JobInformationType	M
HasComponent	Object	J9		JobInformationType	M

6.3 Machine_ArrayHandlingType

Table 15: Machine_ArrayHandlingType Definition

Attribute	**Value**				
BrowseName	Machine_ArrayHandlingType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasProperty	Variable	AI_Value	UInt32	PropertyType	O
HasProperty	Variable	AO_Value	UInt32	PropertyType	O
HasProperty	Variable	ArrayStatus	UInt32	PropertyType	M
HasProperty	Variable	DI_Value	Byte	PropertyType	O
HasProperty	Variable	DO_Value	Byte	PropertyType	O
HasProperty	Variable	Global_I_Var_Value	Int32	PropertyType	M
HasProperty	Variable	Global_R_Var_Value	Double	PropertyType	M
HasProperty	Variable	Global_Str_Var_Value	String	PropertyType	M
HasProperty	Variable	I_Var_Value	Int32	PropertyType	M
HasProperty	Variable	AxisIdx	UInt16	PropertyType	O
HasProperty	Variable	Index	UInt16	PropertyType	M
HasProperty	Variable	PWMI_Value	UInt32	PropertyType	O
HasProperty	Variable	PWMO_Value	UInt32	PropertyType	O
HasProperty	Variable	R_Var_Value	Double	PropertyType	M
HasProperty	Variable	DestPos_Value	Double	PropertyType	O
HasProperty	Variable	Velocity_Value	Double	PropertyType	O
HasProperty	Variable	Read_AI	Boolean	PropertyType	O
HasProperty	Variable	Read_AO	Boolean	PropertyType	O
HasProperty	Variable	Read_DI	Boolean	PropertyType	O
HasProperty	Variable	Read_DO	Boolean	PropertyType	O
HasProperty	Variable	Read_Global_I_Var	Boolean	PropertyType	M
HasProperty	Variable	Read_Global_R_Var	Boolean	PropertyType	M
HasProperty	Variable	Read_Global_Str_Var	Boolean	PropertyType	M
HasProperty	Variable	Read_I_Var	Boolean	PropertyType	M
HasProperty	Variable	Read_PWMI	Boolean	PropertyType	O
HasProperty	Variable	Read_PWMO	Boolean	PropertyType	O
HasProperty	Variable	Read_R_Var	Boolean	PropertyType	M
HasProperty	Variable	Read_Str_Var	Boolean	PropertyType	M
HasProperty	Variable	Str_Var_Value	String	PropertyType	M
HasProperty	Variable	Write_AO	Boolean	PropertyType	O
HasProperty	Variable	Write_DO	Boolean	PropertyType	O
HasProperty	Variable	Write_Global_I_Var	Boolean	PropertyType	M
HasProperty	Variable	Write_Global_R_Var	Boolean	PropertyType	M
HasProperty	Variable	Write_Global_Str_Var	Boolean	PropertyType	M
HasProperty	Variable	Write_I_Var	Boolean	PropertyType	M
HasProperty	Variable	Write_PWMO	Boolean	PropertyType	O
HasProperty	Variable	Write_R_Var	Boolean	PropertyType	M
HasProperty	Variable	Write_Str_Var	Boolean	PropertyType	M
HasProperty	Variable	Write_DestPos	Boolean	PropertyType	O

Example

This short example is to show how the ArrayHandlingType-Structure is used to read out the information offered, such as digital outputs, instead of the methods.

```
1  // reset the command first to clear the ArrayStatus
2  DO_Read = 0;
3  // select the index of the required value
4  Index = 0;
5  // enable the command to start the processing
6  DO_Read = 1;
7  // the status of the command in the ArrayStatus and returns "0" with no error
8  IF ArrayStatus == 0 THEN
9    value[0] = DO_Value;
10 ELSE
11   error = ArrayStatus;
12 END_IF
```

Listing 1: Machine_ArrayHandlingType

AI_Value

This Variable contains the current read value or the value to write from the selected index of the analog input.

AO_Value

This Variable contains the current read value or the value to write from the selected index of the analog output.

ArrayStatus

This Variable contains the current status from the last read or write operation. You have to disable all read and write operations to clear the status.

DI_Value

This Variable contains the current read value or the value to write from the selected index of the digital input.

DO_Value

This Variable contains the current read value or the value to write from the selected index of the digital output.

Global_I_Var_Value

This Variable contains the current read value or the value to write from the selected index of the global I-Variable.

Global_R_Var_Value

This Variable contains the current read value or the value to write from the selected index of the global R-Variable.

Global_Str_Var_Value

This Variable contains the current read value or the value to write from the selected index of the global R-Variable.

I_Var_Value

This Variable contains the current read value or the value to write from the selected index of the I-Variable.

Index

This Variable contains the index for the next read or write operation.

AxisIdx

This Variable contains the axis index for the next write operation.

PWMI_Value

This Variable contains the current read value or the value to write from the selected index of the pwm input.

PWMO_Value

This Variable contains the current read value or the value to write from the selected index of the pwm output.

R_Var_Value

This Variable contains the current read value or the value to write from the selected index of the R-Variable.

DestPos_Value

This Variable contains the current write value from the selected axis index of the destination positon.

Velocity_Value

This Variable contains the current write value from the selected axis index of the velocity.

Read_AI

This Variable starts the read operation for the selected index of the analog input.

Read_AO

This Variable starts the read operation for the selected index of the analog output.

Read_DI

This Variable starts the read operation for the selected index of the digital input.

Read_DO

This Variable starts the read operation for the selected index of the digital output.

Read_Global_I_Var

This Variable starts the read operation for the selected index of the global I-Variable.

Read_Global_R_Var

This Variable starts the read operation for the selected index of the global R-Variable.

Read_Global_Str_Var

This Variable starts the read operation for the selected index of the global Str-Variable.

Read_I_Var

This Variable starts the read operation for the selected index of the I-Variable.

Read_PWMI

This Variable starts the read operation for the selected index of the pwm input.

Read_PWMO

This Variable starts the read operation for the selected index of the pwm output.

Read_R_Var

This Variable starts the read operation for the selected index of the R-Variable.

Read_Str_Var

This Variable starts the read operation for the selected index of the Str-Variable.

Str_Var_Value

This Variable contains the current read value or the value to write from the selected index of the Str-Variable.

Write_AO

This Variable starts the write operation for the selected index of the analog output.

Write_DO

This Variable starts the write operation for the selected index of the digital output.

Write_Global_I_Var

This Variable starts the write operation for the selected index of the global I-Variable.

Write_Global_R_Var

This Variable starts the write operation for the selected index of the global R-Variable.

Write_Global_Str_Var

This Variable starts the write operation for the selected index of the global Str-Variable.

Write_I_Var

This Variable starts the write operation for the selected index of the I-Variable.

Write_PWMO

This Variable starts the write operation for the selected index of the pwm output.

Write_R_Var

This Variable starts the write operation for the selected index of the R-Variable.

Write_Str_Var

This Variable starts the write operation for the selected index of the Str-Variable.

Write_DestPos

This Variable starts the write operation for the selected axis index of the destination position.

6.4 Machine_CncInterfaceType

Table 16: Machine_CncInterfaceType Definition

Attribute	**Value**				
BrowseName	Machine_CncInterfaceType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Object	CncAxisList		Machine_CncAxis-ListType	M
HasComponent	Object	CncChannelList		Machine_CncChannel-ListType	M
HasComponent	Object	CncCounterList		Machine_CncCounter-ListType	M
HasComponent	Object	CncIoList		Machine_CncIoList-Type	M
HasComponent	Object	CncSpindleList		Machine_CncSpindle-ListType	M
HasComponent	Object	CncStatus		Machine_CncStatus-ListType	M
HasComponent	Object	CncTimerList		Machine_CncTimer-ListType	M
HasComponent	Object	CncToolList		Machine_CncToolList-Type	M
HasComponent	Object	ErrorStatus		Machine_ErrorStatus-Type	M
HasComponent	Object	FaultMemory		Machine_FaultMemory-Type	M

6.4.1 Machine_CncAxisListType

This Machine_CncAxisListType is a container for the axis.

Table 17: Machine_CncAxisListType Definition

Attribute	Value				
BrowseName	Machine_CncAxisListType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Object	A		Machine_CncAxisType	O
HasComponent	Object	A2		Machine_CncAxisType	O
HasComponent	Object	Ax1		Machine_CncAxisType	O
HasComponent	Object	Ax2		Machine_CncAxisType	O
HasComponent	Object	Ax3		Machine_CncAxisType	O
HasComponent	Object	Ax4		Machine_CncAxisType	O
HasComponent	Object	Ax5		Machine_CncAxisType	O
HasComponent	Object	Ax6		Machine_CncAxisType	O
HasComponent	Object	B		Machine_CncAxisType	O
HasComponent	Object	B2		Machine_CncAxisType	O
HasComponent	Object	C		Machine_CncAxisType	O
HasComponent	Object	C2		Machine_CncAxisType	O
HasComponent	Object	U		Machine_CncAxisType	O
HasComponent	Object	U2		Machine_CncAxisType	O
HasComponent	Object	V		Machine_CncAxisType	O
HasComponent	Object	V2		Machine_CncAxisType	O
HasComponent	Object	W		Machine_CncAxisType	O
HasComponent	Object	W2		Machine_CncAxisType	O

6.4.1.1 Machine_CncAxisType

This Machine_CncAxisType is a container for one axis.

Table 18: Machine_CncAxisType Definition

Attribute	Value				
BrowseName	Machine_CncAxisType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasProperty	Variable	InVelocity	Boolean	PropertyType	O
HasProperty	Variable	IsHomed	Boolean	PropertyType	O
HasProperty	Variable	MoveActive	Boolean	PropertyType	O
HasProperty	Variable	Position	Double	PropertyType	M, R
HasProperty	Variable	PowerOn	Boolean	PropertyType	O
HasProperty	Variable	StatusID	UInt32	PropertyType	O
HasProperty	Variable	Stopped	Boolean	PropertyType	O
HasProperty	Variable	Velocity	Double	PropertyType	O
HasProperty	Variable	DestPosition	Double	PropertyType	M, R
HasProperty	Variable	DistanceToGo	Double	PropertyType	M, R
HasComponent	Method	SetDestPosition			M, R

InVelocity

The InVelocity Property provides the state that the axis runs at a defined speed.

IsHomed

The IsHomed Property provides the information that the axis is referenced.

MoveActive

The MoveActive Property provides the information that the axis is in movement.

Position

The Position Property provides the actual position of the axis.

PowerOn

The PowerOn Property provides the information that the axis is power on.

StatusID

The StatusID Property provides the status information of the axis.

Stopped

The Stopped Property provides the information that the axis is stopped.

Velocity

The Velocity Property provides the actual velocity of the axis.

DestPosition

The DestPosition Property provides the destination position of the axis.

DistanceToGo

The DistancToGo Property provides the distance between actual position and destination position of the axis.

SetDestPosition

The SetDestPosition Method allows to set the destination position of an axis.

Signature

```
SetDestPosition (
   [in]   DestPosition Double
   [in]   Velocity     Double);
```

Attribute	Value
DestPosition	Double
Velocity	Double

Attribute	Value				
BrowseName	SetDestPosition				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

6.4.2 Machine_CncChannelListType

Table 19: Machine_CncChannelListType Definition

Attribute	Value				
BrowseName	Machine_CncChannelListType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Object	Channel1		Machine_CncChannel-Type	M
HasProperty	Variable	Global_I_Var	Int32[]	PropertyType	M, R
HasProperty	Variable	Global_I_Var_999	Int32	PropertyType	M, R
HasProperty	Variable	Global_R_Var	Double[]	PropertyType	M, R
HasProperty	Variable	Global_Str_Var	String[]	PropertyType	M, R
HasComponent	Method	Set_Global_I_Var		PropertyType	M
HasComponent	Method	Set_Global_R_Var		PropertyType	M
HasComponent	Method	Set_Global_Str_Var		PropertyType	M

Global_I_Var

The Global_I_Var Property provides the value of all (1000) global I-variables.

Global_I_Var_999

The Global_I_Var_999 Property provides the value of the 999th global I-variables. This Property can be used to trigger an application (e.g. OPC Router) without using arrays.

Global_R_Var

The Global_R_Var Property provides the value of all (1000) global R-variables.

Global_Str_Var

The Global_Str_Var Property provides the value of all (500) global Str-variables.

Set_Global_I_Var

The Set_Global_I_Var Method allows to set all (1000) global I-variables.

Signature

```
Set_Global_I_Var (
   [in]   StartIndex   UInt32
   [in]   EndIndex     UInt32
   [in]   Values       Int32[]);
```

Attribute	Value
StartIndex	UInt32
EndIndex	UInt32
Values	Int32[]

Attribute	Value				
BrowseName	Set_Global_I_Var				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

Set_Global_R_Var

The Set_Global_R_Var Method allows to set all (1000) global I-variables.

Signature

```
Set_Global_R_Var (
   [in]   StartIndex   UInt32
   [in]   EndIndex     UInt32
   [in]   Values       Double[]);
```

Attribute	Value
StartIndex	UInt32
EndIndex	UInt32
Values	Double[]

Attribute	Value				
BrowseName	Set_Global_R_Var				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

Set_Global_Str_Var

The Set_Global_Str_Var Method allows to set all (500) global I-variables.

Signature

```
Set_Global_R_Var (
   [in]   StartIndex   UInt32
   [in]   EndIndex     UInt32
   [in]   Values       String[]);
```

Attribute	Value
StartIndex	UInt32
EndIndex	UInt32
Values	String[]

Attribute	Value				
BrowseName	Set_Global_Str_Var				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

6.4.2.1 Machine_CncChannelType

Table 20: Machine_CncChannelType Definition

Attribute	Value				
BrowseName	Machine_CncChannelType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Object	ProgramInfo		Machine_CncChannel-ProgramType	M
HasProperty	Variable	MoveActive	Boolean	PropertyType	M, R
HasProperty	Variable	MoveDone	Boolean	PropertyType	M, R
HasProperty	Variable	MoveStopped	Boolean	PropertyType	M, R

MoveActive

The MoveActive Property provides the state that the channel is in movement.

MoveDone

The MoveDone Property provides the state that the movement of the channel is done.

MoveStopped

The MoveDone Property provides the state that the movement of the channel is stopped.

6.4.2.1.1 Machine_CncChannelProgramType

This Machine_CncChannelProgramType is a container for the axis.

Table 21: Machine_CncChannelProgramType Definition

Attribute	Value				
BrowseName	Machine_CncChannelProgramType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Object	BlockNumber		Machine_Cnc-ChannelProgram-BlockType	M, R
HasProperty	Variable	Name	String	PropertyType	M, R
HasProperty	Variable	Progress	Double	PropertyType	M, R
HasProperty	Variable	Runtime	Double	PropertyType	M, R
HasProperty	Variable	R_Var	Double[]	PropertyType	M, R
HasProperty	Variable	I_Var	Int32[]	PropertyType	M, R
HasProperty	Variable	Str_Var	String[]	PropertyType	M, R
HasComponent	Method	Set_R_Var			M
HasComponent	Method	Set_I_Var			M
HasComponent	Method	Set_Str_Var			M

Name

The Name Property provides the name of the current program.

Progress

The Progress Property provides the progress of the current program.

Runtime

The Runtime Property provides the runtime of the current program.

R_Var

The R_Var Property provides the value of all (1000) R-variables of the current program.

I_Var

The I_Var Property provides the value of all (1000) I-variables of the current program.

Str_Var

The Str_Var Property provides the value of all (500) Str-variables of the current program.

Set_R_Var

The Set_R_Var Method allows to set all (1000) I-variables.

Signature

```
Set_R_Var (
   [in]   StartIndex   UInt32
   [in]   EndIndex     UInt32
   [in]   Values       Double[]);
```

Attribute	Value
StartIndex	UInt32
EndIndex	UInt32
Values	Double[]

Attribute	Value				
BrowseName	Set_R_Var				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

Set_I_Var

The Set_I_Var Method allows to set all (1000) I-variables.

Signature

```
Set_I_Var (
   [in]   StartIndex   UInt32
   [in]   EndIndex     UInt32
   [in]   Values       Int32[]);
```

Attribute	Value
StartIndex	UInt32
EndIndex	UInt32
Values	Int32[]

Attribute	Value				
BrowseName	Set_I_Var				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

Set_Str_Var

The Set_Str_Var Method allows to set all (500) I-variables.

Signature

```
Set_R_Var (
   [in]   StartIndex   UInt32
   [in]   EndIndex     UInt32
   [in]   Values       String[]);
```

Attribute	Value
StartIndex	UInt32
EndIndex	UInt32
Values	String[]

Attribute	Value				
BrowseName	Set_Str_Var				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

6.4.2.1.1.1 Machine_CncChannelProgramBlockType

This Machine_CncChannelProgramBlockType is a container for the axis.

Table 22: Machine_CncChannelProgramBlockType Definition

Attribute	Value				
BrowseName	Machine_CncChannelProgramBlockType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasProperty	Variable	BlockNumber	UInt32	PropertyType	M, R
HasProperty	Variable	Length	Double	PropertyType	M, R
HasProperty	Variable	LineActual	String	PropertyType	M, R
HasProperty	Variable	LineLast1	String	PropertyType	M, R
HasProperty	Variable	LineLast2	String	PropertyType	M, R
HasProperty	Variable	LineNext1	String	PropertyType	M, R
HasProperty	Variable	LineNext2	String	PropertyType	M, R
HasProperty	Variable	LineNumber	Int32	PropertyType	M, R
HasProperty	Variable	RemainingDistance	Double	PropertyType	M, R

BlockNumber

The BlockNumber Property provides the current block number of the current program.

Length

The Length Property provides length of the current movement.

LineActual

The LineActual Property provides the content of the current line of the current program.

LineLast1

The LineLast1 Property provides the content of the current line - 1 of the current program.

LineLast2

The LineLast2 Property provides the content of the current line - 2 of the current program.

LineNext1

The LineNext1 Property provides the content of the current line + 1 of the current program.

LineNext2

The LineNext2 Property provides the content of the current line + 2 of the current program.

LineNumber

The Number Property provides the number of the current line of the current program.

RemainingDistance

The RemainingDistance Property provides the remaining distance of the current movement.

6.4.3 Machine_CncCounterListType

Table 23: Machine_CncCounterListType Definition

Attribute	**Value**				
BrowseName	Machine_CncCounterListType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasProperty	Variable	CounterValue	Double[]	PropertyType	O, R
HasComponent	Method	ExecCounter			O
HasComponent	Method	ResetCounter			O
HasComponent	Method	SetCounterValue			O

CounterValue

The CounterValue Property provides the value of all (32) counters.

ExecCounter

The ExecCounter Method allows to increment or decrement all (32) counters.

Signature

```
ExecCounter (
   [in]    Index    UInt32);
```

Attribute	**Value**
Index	UInt32

Attribute	**Value**				
BrowseName	ExecCounter				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

ResetCounter

The ResetCounter Method allows to reset all (32) counters.

Signature

```
ResetCounter (
   [in]   Index   UInt32);
```

Attribute	Value
Index	UInt32

Attribute	Value				
BrowseName	ResetCounter				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

SetCounterValue

The SetCounterValue Method allows to set the value of all (32) counters.

Signature

```
SetCounterValue (
   [in]   Index   UInt32
   [in]   Values  UInt32[]);
```

Attribute	Value
Index	UInt32
Values	UInt32[]

Attribute	Value				
BrowseName	SetCounterValue				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

6.4.4 Machine_CncIoListType

Table 24: Machine_CncIoListType Definition

Attribute	Value				
BrowseName	Machine_CncIoListType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasProperty	Variable	AI	UInt32[]	PropertyType	O, R
HasProperty	Variable	AO	UInt32[]	PropertyType	O, R
HasProperty	Variable	DI	Byte[]	PropertyType	O, R
HasProperty	Variable	DO	Byte[]	PropertyType	O, R
HasProperty	Variable	PWMI	UInt32[]	PropertyType	O, R
HasProperty	Variable	PWMO	UInt32[]	PropertyType	O, R
HasComponent	Method	SetAO			O
HasComponent	Method	SetDO			O
HasComponent	Method	SetPWMO			O

AI

The AI Property provides the value of all (64) analog inputs.

AO

The AO Property provides the value of all (64) analog outputs.

DI

The DI Property provides the value of all (64) digital inputs.

DO

The DO Property provides the value of all (64) digital outputs.

PWMI

The PWMI Property provides the value of all (32) pwm inputs.

PWMO

The PWMO Property provides the value of all (32) pwm outputs.

SetAO

The SetAO Method allows to set all (64) analog outputs.

Signature

```
SetAO (
   [in]    StartIndex    UInt32
   [in]    EndIndex      UInt32
   [in]    Values        UInt32[]);
```

Attribute	Value
StartIndex	UInt32
EndIndex	UInt32
Values	UInt32[]

Attribute	Value				
BrowseName	SetAO				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

SetDO

The SetDO Method allows to set all (64) digital outputs.

Signature

```
SetDO (
   [in]   StartIndex   UInt32
   [in]   EndIndex     UInt32
   [in]   Values       BYte[]);
```

Attribute	Value
StartIndex	UInt32
EndIndex	UInt32
Values	Byte[]

Attribute	Value				
BrowseName	SetDO				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

SetPWMO

The SetPWMO Method allows to set all (32) pwm outputs.

Signature

```
SetPWMO (
   [in]   StartIndex   UInt32
   [in]   EndIndex     UInt32
   [in]   Values       UInt32[]);
```

Attribute	Value
StartIndex	UInt32
EndIndex	UInt32
Values	UInt32[]

Attribute	Value				
BrowseName	SetPWMO				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

6.4.5 Machine_CncSpindleListType

Table 25: Machine_CncSpindleListType Definition

Attribute	Value				
BrowseName	Machine_CncSpindleListType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Object	Q		Machine_CncSpindle-Type	O
HasComponent	Object	Q2		Machine_CncSpindle-Type	O
HasComponent	Object	Q3		Machine_CncSpindle-Type	O
HasComponent	Object	Q4		Machine_CncSpindle-Type	O

6.4.5.1 Machine_CncSpindleType

Table 26: Machine_CncSpindleType Definition

Attribute	Value				
BrowseName	Machine_CncSpindleType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasProperty	Variable	DesiredVelocity	Int32	PropertyType	M, R
HasProperty	Variable	Direction	Int32	PropertyType	M, R
HasProperty	Variable	Override	Int32	PropertyType	M, R
HasProperty	Variable	SwitchState	Int32	PropertyType	M, R
HasProperty	Variable	Velocity	Int32	PropertyType	M, R

DesiredVelocity

The DesiredVelocity Property provides the desired velocity of the spindle.

Direction

The Direction Property provides the direction of the spindle.

Override

The Override Property provides the override of the spindle.

SwitchState

The SwitchState Property provides the switch state of the spindle.

Velocity

The Velocity Property provides the velocity of the spindle.

6.4.6 Machine_CncStatusListType

Table 27: Machine_CncStatusListType Definition

Attribute	**Value**				
BrowseName	Machine_CncStatusListType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Object	CncMctlStatus		Machine_CncMctl-StatusType	M
HasComponent	Object	CncSecCStatus		Machine_CncSecC-StatusType	M

6.4.6.1 Machine_CncMctlStatusType

Table 28: Machine_CncMctlStatusType Definition

Attribute	Value				
BrowseName	Machine_CncMctlStatusType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasProperty	Variable	dwCommon	UInt32	PropertyType	M, R
HasProperty	Variable	dwExtended	UInt32	PropertyType	M, R
HasProperty	Variable	dwHWLSNeg	UInt32	PropertyType	M, R
HasProperty	Variable	dwHWLSPos	UInt32	PropertyType	M, R
HasProperty	Variable	dwSWLSNeg	UInt32	PropertyType	M, R
HasProperty	Variable	dwSWLSPos	UInt32	PropertyType	M, R
HasProperty	Variable	fInMotion	Boolean	PropertyType	M, R
HasProperty	Variable	fInStopMode	Boolean	PropertyType	M, R
HasProperty	Variable	fInTeachMode	Boolean	PropertyType	M, R
HasProperty	Variable	fInTestMode	Boolean	PropertyType	M, R
HasProperty	Variable	fCurrentOff	Boolean	PropertyType	M, R
HasProperty	Variable	fInPathMotion	Boolean	PropertyType	M, R
HasProperty	Variable	fIsMoving	Boolean	PropertyType	M, R
HasProperty	Variable	fNeedReferenceRun	Boolean	PropertyType	M, R
HasProperty	Variable	fBreakError	Boolean	PropertyType	M, R
HasProperty	Variable	fHWLSActive	Boolean	PropertyType	M, R
HasProperty	Variable	fSWLSActive	Boolean	PropertyType	M, R
HasProperty	Variable	fHWLSDuringMotion	Boolean	PropertyType	M, R
HasProperty	Variable	fPosLagError	Boolean	PropertyType	M, R
HasProperty	Variable	fPowerFail	Boolean	PropertyType	M, R
HasProperty	Variable	fSCFail	Boolean	PropertyType	M, R
HasProperty	Variable	fIsBusy	Boolean	PropertyType	M, R
HasProperty	Variable	fIsInitialized	Boolean	PropertyType	M, R
HasProperty	Variable	fDisabled	Boolean	PropertyType	M, R
HasProperty	Variable	fHardwareFail	Boolean	PropertyType	M, R
HasProperty	Variable	fCommunicationFail	Boolean	PropertyType	M, R
HasProperty	Variable	fDrillCycleActive	Boolean	PropertyType	M, R
HasProperty	Variable	fCtrlSpecError	Boolean	PropertyType	M, R
HasProperty	Variable	fPathStarted	Boolean	PropertyType	M, R

dwCommon

Common status information.

Value	Description
0x00000001	At least one axis is in motion.
0x00000002	At least one axis is in Stop Mode.
0x00000004	Teach mode activated.
0x00000008	Test mode activated.
0x00000010	Amplifier current is switched off.
0x00000020	A path segment is processed at the moment.
0x00000040	At least one axis is really moving.
0x00000080	Path operation was started by user.

0x00000100	StopOnInput mode activated.
0x00000200	StopOnInput configured input mode activated.
0x00000400	Handwheel mode activated.
0x00000800	not in use.
0x00001000	not in use.
0x00002000	not in use.
0x00004000	not in use.
0x00008000	VPO mode activated.
0x00010000	A reference run is required.
0x00020000	break was executed, reset required.
0x00040000	At least one hardware limit switch is activated.
0x00080000	At least one software limit switch is activated.
0x00100000	A hardware limit switch was activated during a motion.
0x00200000	An position lag error occured during movement.
0x00400000	Load path data error is active.
0x00800000	Key switch error is active.
0x01000000	Key switch occured during motion.
0x02000000	The power supply is switched off.
0x04000000	Motion control is blocked by security module.
0x08000000	Hardware error was signaled.
0x10000000	Communication error between DLL and control.
0x20000000	not in use.
0x40000000	not in use.
0x80000000	not in use.

dwHWLSNeg

Hardware limit switch status, negative.

Value	Description
0x00000001	Negative hardware limit switch on axis X is active.
0x00000002	Negative hardware limit switch on axis Y is active.
0x00000004	Negative hardware limit switch on axis Z is active.
0x00000008	Negative hardware limit switch on axis A is active.
0x00000010	Negative hardware limit switch on axis B is active.
0x00000020	Negative hardware limit switch on axis C is active.
0x00000040	Negative hardware limit switch on axis U is active.
0x00000080	Negative hardware limit switch on axis V is active.
0x00000100	Negative hardware limit switch on axis W is active.

dwHWLSPos

Hardware limit switch status, positive.

Value	Description
0x00000001	Positive hardware limit switch on axis X is active.
0x00000002	Positive hardware limit switch on axis Y is active.
0x00000004	Positive hardware limit switch on axis Z is active.
0x00000008	Positive hardware limit switch on axis A is active.
0x00000010	Positive hardware limit switch on axis B is active.
0x00000020	Positive hardware limit switch on axis C is active.
0x00000040	Positive hardware limit switch on axis U is active.
0x00000080	Positive hardware limit switch on axis V is active.
0x00000100	Positive hardware limit switch on axis W is active.

dwSWLSNeg

Software limit switch status, negative.

Value	Description
0x00000001	Negative software limit switch on axis X is active.
0x00000002	Negative software limit switch on axis Y is active.
0x00000004	Negative software limit switch on axis Z is active.
0x00000008	Negative software limit switch on axis A is active.
0x00000010	Negative software limit switch on axis B is active.
0x00000020	Negative software limit switch on axis C is active.
0x00000040	Negative software limit switch on axis U is active.
0x00000080	Negative software limit switch on axis V is active.
0x00000100	Negative software limit switch on axis W is active.

dwSWLSPos

Software limit switch status, positive.

Value	Description
0x00000001	Positive software limit switch on axis X is active.
0x00000002	Positive software limit switch on axis Y is active.
0x00000004	Positive software limit switch on axis Z is active.
0x00000008	Positive software limit switch on axis A is active.
0x00000010	Positive software limit switch on axis B is active.
0x00000020	Positive software limit switch on axis C is active.
0x00000040	Positive software limit switch on axis U is active.
0x00000080	Positive software limit switch on axis V is active.
0x00000100	Positive software limit switch on axis W is active.

dwExtended

Extended status information.

Value	Description
0x00000001	The motion control is busy at the moment.
0x00000002	Motion control is disabled.
0x00000004	Motion control is initialized.
0x00000008	Motion control is ready.
0x00000010	A drill cycle is currently performed.
0x00000020	A control specific error occured.
0x00000040	A dynamic power fail occured.
0x00000080	not in use.

fInMotion

At least one axis is in motion.

fInStopMode

At least one axis is in Stop Mode.

fInTeachMode

Teach mode activated.

fInTestMode

Test mode activated.

fCurrentOff

Amplifier current is switched off.

fInPathMotion

A path segment is processed at the moment.

fIsMoving

At least one axis is really moving.

fNeedReferenceRun

A reference run is required.

fBreakError

A break was executed, reset required.

fHWLSActive

At least one hardware limit switch is activated.

fSWLSActive

At least one software limit switch is activated.

fHWLSDuringMotion

A hardware limit sw was activated during a motion.

fPosLagError

An position lag error occured during movement.

fPowerFail

The power supply is switched off.

fSCFail

Motion control is blocked by security module.

fIsBusy

The motion control is busy at the moment.

fIsInitialized

Motion control is initialized.

fDisabled

Motion control is disabled.

fHardwareFail

Hardware error was signaled.

fCommunicationFail

Communication error between DLL and control.

fDrillCycleActive

A drill cycle is currently performed.

fCtrlSpecError

A control specific error occured.

fPathStarted

Path operation was started by user.

6.4.6.2 Machine_CncSecCStatusType

Table 29: Machine_CncSecCStatusType Definition

Attribute	Value				
BrowseName	Machine_CncSecCStatusType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasProperty	Variable	dwCommon	UInt32	PropertyType	M, R
HasProperty	Variable	dwCover	UInt32	PropertyType	M, R
HasProperty	Variable	dwExtended	UInt32	PropertyType	M, R
HasProperty	Variable	dwHardwareLock	UInt32	PropertyType	M, R
HasProperty	Variable	fAtHomePos	Boolean	PropertyType	M, R
HasProperty	Variable	fControlFail	Boolean	PropertyType	M, R
HasProperty	Variable	fCoverLocked	Boolean	PropertyType	M, R
HasProperty	Variable	fCoverOpen	Boolean	PropertyType	M, R
HasProperty	Variable	fDisabled	Boolean	PropertyType	M, R
HasProperty	Variable	fEmergencySwitch	Boolean	PropertyType	M, R
HasProperty	Variable	fHardwareFail	Boolean	PropertyType	M, R
HasProperty	Variable	fIsBusy	Boolean	PropertyType	M, R
HasProperty	Variable	fIsInitialized	Boolean	PropertyType	M, R
HasProperty	Variable	fLimitSwitch	Boolean	PropertyType	M, R
HasProperty	Variable	fLocked	Boolean	PropertyType	M, R
HasProperty	Variable	fOEM1	Boolean	PropertyType	M, R
HasProperty	Variable	fOEM2	Boolean	PropertyType	M, R
HasProperty	Variable	fPowerFail	Boolean	PropertyType	M, R
HasProperty	Variable	fReserved2	Boolean	PropertyType	M, R
HasProperty	Variable	fSetupMode	Boolean	PropertyType	M, R
HasProperty	Variable	fSpindleTurns	Boolean	PropertyType	M, R

dwCommon

Common status information.

Value	Description
0x00000001	Emergency switch activated.
0x00000002	Setup mode is activated.
0x00000004	All axes are at home pos.
0x00000008	Spindle is still turning, not halted.
0x00000010	At least 1 cover is opened.
0x00000020	At least 1 limit switch is activated.
0x00000040	Not in use.
0x00000080	Not in use.

0x00000100	A user control input (#1) is active.
0x00000200	A user control input (#2) is active.
0x00000400	Not in use.
0x00000800	Not in use.
0x00001000	Not in use.
0x00002000	Not in use.
0x00004000	Not in use.
0x00008000	Not in use.
0x00010000	Security module power fail.
0x00020000	Security module communication fail.
0x00040000	Hardware check failed.
0x00080000	Control self test failed.
0x00100000	Module status is "locked".
0x00200000	Cover status is "locked".
0x00400000	Not in use.
0x00800000	Not in use.
0x01000000	Flashlight is on.
0x02000000	Not in use.
0x04000000	Not in use.
0x08000000	Not in use.
0x10000000	Not in use.
0x20000000	Not in use.
0x40000000	Not in use.
0x80000000	Not in use.

dwCover

Hardware limit switch status, negative.

Value	Description
0x00000001	Cover 1 is opened.
0x00000002	Cover 1 is opened.
0x00000004	Cover 1 is opened.
0x00000008	Cover 1 is opened.
0x00000010	Not in use.
0x00000020	Not in use.
0x00000040	Not in use.
0x00000080	Not in use.

dwExtended

Hardware limit switch status, positive.

Value	Description
0x00000001	Module is busy with an operation.
0x00000002	Security module is disabled.
0x00000004	Security module is initialized.
0x00000008	Not in use.
0x00000010	Not in use.
0x00000020	Not in use.
0x00000040	Not in use.
0x00000080	Not in use.

dwHardwareLock

Software limit switch status, negative.

Value	Description
0x00000001	Axes are disabled.
0x00000002	Spindle drives are disabled.
0x00000004	Toolchange system is disabled.
0x00000008	IO system is disabled.
0x00000010	Cover lock is activated.
0x00000020	Not in use.
0x00000040	Not in use.
0x00000080	Not in use.

0x00000100	Not in use.
0x00000200	Not in use.
0x00000400	Not in use.
0x00000800	Not in use.
0x00001000	Additional HW provided by user is disabled.
0x00002000	Additional HW provided by user is disabled.
0x00004000	Not in use.
0x00008000	Not in use.

fEmergencySwitch

Emergency switch is activated.

fSetupMode

Setup mode is activated.

fAtHomePos

Home position Switch is activated.

fSpindleTurns

Spindle is turning.

fCoverOpen

At least one cover is still open.

fLimitSwitch

Limit switch is activated.

fOEM1

OEM input 1 is active.

fOEM2

OEM input 2 is active.

fPowerFail

Status Rueckfuehrkreis Schuetze.

fHardwareFail

SecModule hardware check failed.

fControlFail

Interner Logikfehler in Prozessor 1 oder 2.

fLocked

SecModule status is "locked".

fCoverLocked

Cover status is "locked".

fReserved2

Alert Flashlight is on.

fIsBusy

Flag SecModule is busy.

fDisabled

Flag SecModule is disabled.

fIsInitialized

Flag SecModule is initialized.

6.4.6.3 Machine_CncTimerListType

Table 30: Machine_CncTimerListType Definition

Attribute	Value				
BrowseName	Machine_CncTimerListType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasProperty	Variable	TimerValue	Double[]	PropertyType	O, R
HasProperty	Variable	Interval1	Double[]	PropertyType	O, R
HasProperty	Variable	Interval2	Double[]	PropertyType	O, R
HasProperty	Variable	Interval3	Double[]	PropertyType	O, R
HasProperty	Variable	Interval4	Double[]	PropertyType	O, R
HasProperty	Variable	Interval5	Double[]	PropertyType	O, R
HasProperty	Variable	Interval6	Double[]	PropertyType	O, R
HasProperty	Variable	Interval7	Double[]	PropertyType	O, R
HasComponent	Method	ResetTimer			O
HasComponent	Method	StartTimer			O
HasComponent	Method	StopTimer			O
HasComponent	Method	SetTimerValue			O

TimerValue

The TimerValue property provides the value of all (8) timers.

Interval1

The Interval1 property provides the value of all (8) timers interval 1.

Interval2

The Interval2 property provides the value of all (8) timers interval 2.

Interval3

The Interval3 property provides the value of all (8) timers interval 3.

Interval4

The Interval4 property provides the value of all (8) timers interval 4.

Interval5

The Interval5 property provides the value of all (8) timers interval 5.

Interval6

The Interval6 property provides the value of all (8) timers interval 6.

Interval7

The Interval7 property provides the value of all (8) timers interval 7.

StartTimer

The StartTimer Method allows to start all (8) timers with mode.
Mode = 0 -> increment
Mode = 1 -> decrement

Signature

```
StartTimer (
        [in]    Index   UInt32
        [in]    Mode    UInt32);
```

Attribute	Value
Index	UInt32
Mode	UInt32

Attribute	Value				
BrowseName	StartTimer				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

StopTimer

The StopTimer Method allows to stop all (8) timers.

Signature

```
StopTimer (
   [in]    Index    UInt32);
```

Attribute	Value
Index	UInt32

Attribute	Value				
BrowseName	StopTimer				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

ResetTimer

The ResetTimer Method allows to reset all (8) timers.

Signature

```
ResetTimer (
   [in]    Index    UInt32);
```

Attribute	Value
Index	UInt32

Attribute	Value				
BrowseName	ResetTimer				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

SetTimerValue

The SetTimerValue Method allows to set all (8) timers.

Signature

```
SetTimerValue (
   [in]   Index   UInt32
   [in]   Values  UInt32[]);
```

Attribute	Value
Index	UInt32
Values	UInt32[]

Attribute	Value				
BrowseName	SetTimerValue				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

6.4.7 Machine_CncToolListType

This Machine_CncToolListType is a container for the tools.

Table 31: Machine_CncToolListType Definition

Attribute	Value				
BrowseName	Machine_CncToolListType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Object	Tn (0..x)		Machine_CncToolType	O

6.4.7.1 Machine_CncToolType

This Machine_CncToolType is a container for one tool.

Table 32: Machine_CncToolType Definition

Attribute	Value				
BrowseName	Machine_CncToolType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasProperty	Variable	CommonStatus	UInt32	PropertyType	M, R
HasProperty	Variable	CuttingTime	UInt32	PropertyType	M, R
HasProperty	Variable	ErrStatus	UInt32	PropertyType	M, R
HasProperty	Variable	ExtendetStatus	UInt32	PropertyType	M, R
HasProperty	Variable	MaxCuttingTime	UInt32	PropertyType	M, R
HasProperty	Variable	MaxLength	UInt32	PropertyType	M, R
HasProperty	Variable	MaxRunTime	UInt32	PropertyType	M, R
HasProperty	Variable	MaxSpeed	UInt32	PropertyType	M, R
HasProperty	Variable	RefPosZ	Int32	PropertyType	M, R
HasProperty	Variable	RunTime	UInt32	PropertyType	M, R
HasProperty	Variable	TimeStampRefPosZ	UInt32	PropertyType	M, R
HasProperty	Variable	ToolDesc	String	PropertyType	M, R
HasProperty	Variable	ToolNr	UInt32	PropertyType	M, R
HasProperty	Variable	Type	UInt32	PropertyType	M, R
HasProperty	Variable	TypicalLength	UInt32	PropertyType	M, R

CommonStatus

The CommonStatus Property provides the common status of the tool.

CuttingTime

The CuttingTime Property provides the information about the cutting time of the tool.

ErrStatus

The ErrStatus Property provides the error status of the tool.

ExtendetStatus

The ExtendetStatus Property provides extendet status of the tool.

MaxCuttingTime

The MaxCuttingTime Property provides the information about the maximum cutting time of the tool.

MaxLength

The MaxLength Property provides the status information about the maximum length of the tool.

MaxRunTime

The MaxRunTime Property provides the information about the maximum run time of the tool.

MaxSpeed

The MaxSpeed Property provides the information about the maximum speed of the tool.

RefPosZ

The RefPosZ Property provides the information about the trigger position Z on the measuring probe.

RunTime

The RunTime Property provides the information about the run time of the tool.

TimeStampRefPosZ

The TimeStampRefPosZ Property provides the timestamp of the last measuring of the tool.

ToolDesc

The ToolDesc Property provides the description of the tool.

ToolNr

The ToolNr Property provides the information about the tool number.

Type

The Type Property provides the type information of the tool.

TypicalLength

The TypicalLength Property provides the typical length of the tool.

6.4.8 Machine_ErrorStatusType

Table 33: Machine_ErrorStatusType Definition

Attribute	**Value**				
BrowseName	Machine_ErrorStatusType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasProperty	Variable	ErrorActive	Boolean	PropertyType	M, R
HasProperty	Variable	ErrorCode	UInt32	PropertyType	M, R
HasProperty	Variable	ErrorMessage	LocalizedText	PropertyType	M, R
HasProperty	Variable	ErrorType	MachineErrorType-Enumeration	PropertyType	M, R
HasProperty	Variable	NumberOfErrors	UInt32	PropertyType	M, R
HasComponent	Method	ClearLastError			M

MachineErrorTypeEnumeration

Value	**Description**
SUCCESS_0	no information, warning or error detacted
INFORMATION_1	information detacted
WARNING_2	warning detacted
ERROR_3	error detacted

ErrorActive

The ErrorActive Property provides the state error is active.

ErrorCode

The ErrorCode Property provides the code of the last error.

ErrorMessage

The ErrorMessage Property provides the message of the last error.

ErrorType

The ErrorType Property provides the type of the last error.

NumberOfErrors

The NumberOfErrors Property provides the number of errors.

ClearLastError

The ClearLastError Method allows to clear the last error.

Signature

```
ClearLastError();
```

Attribute	Value				
BrowseName	ClearLastError				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

6.4.9 Machine_FaultMemoryType

Table 34: Machine_FaultMemoryType Definition

Attribute	Value				
BrowseName	Machine_FaultMemoryType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasProperty	Variable	ClearAllError_2	Boolean	PropertyType	M
HasProperty	Variable	ErrorCode	UInt32	PropertyType	M, R
HasProperty	Variable	ErrorMessage	LocalizedText	PropertyType	M, R
HasProperty	Variable	ErrorType	MachineErrorType-Enumeration	PropertyType	M, R
HasProperty	Variable	FaultMemoryStatus	UInt32	PropertyType	M, R
HasProperty	Variable	GetLastError_2	Boolean	PropertyType	M
HasProperty	Variable	NumberOfErrors	UInt32	PropertyType	M, R
HasComponent	Method	GetLastError			M
HasComponent	Method	ClearAllError			M

MachineErrorTypeEnumeration

Value	Description
SUCCESS_0	no information, warning or error detacted
INFORMATION_1	information detacted
WARNING_2	warning detacted
ERROR_3	error detacted

FaultMemoryStatus

The ErrorCode Property provides the code of the last error.

ClearAllError_2

The ClearAllError_2 Property provides to call ClearAllError-Method.

GetLastError_2

The GetLastError_2 Property provides to call GetLastError-Method.

ErrorCode

The ErrorCode Property provides the code of the last error.

ErrorMessage

The ErrorMessage Property provides the message of the last error.

ErrorType

The ErrorType Property provides the type of the last error.

NumberOfErrors

The NumberOfErrors Property provides the number of errors.

GetLastError

The GetLastError Method shows the last error from the fault memory. The error is automatically deleted from the fault memory list.

Signature

```
GetLastError();
```

Attribute	Value				
BrowseName	GetLastError				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

ClearAllError

The ClearAllError Method deletes all errors from the fault memory list.

Signature

```
ClearAllError();
```

Attribute	Value				
BrowseName	ClearAllError				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
HasProperty	Variable	InputArguments	Argument[]	PropertyType	M

7 MachineToolType

The MachineToolType is defined in OPC 40501-1 OPC UA for Machine Tools.

7.1 MachineTool_IdentificationType

Table 35: MachineTool_IdentificationType Definition

Attribute	**Value**				
BrowseName	MachineTool_IdentificationType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasProperty	Variable	DeviceClass	String	PropertyType	M, R
HasProperty	Variable	Manufacturer	String	PropertyType	M, R
HasProperty	Variable	ProductInstanceUri	String	PropertyType	M, R
HasProperty	Variable	SerialNumber	String	PropertyType	M, R

DeviceClass

For the DeviceClass inherited from the MachineIdentificationType, the values in Table 11 shall be used. The most appropriate value, based on the main machine tool technology shall be chosen. Detailed definitions can be found at Rotebuch

Manufacturer

Manufacturer refers to the manufacturer/producer of the software.

ProductInstanceUri

A globally unique resource identifier provided by the manufacturer of the machine.

SerialNumber

A string containing a unique production number of the manufacturer of the MachineryItem. The global uniqueness of the serial number is only given in the context of the manufacturer, and potentially the model. The value shall not change during the life-cycle of the MachineryItem.

7.2 MachineTool_MonitoringType

Table 36: MachineTool_MonitoringType Definition

Attribute	**Value**				
BrowseName	MachineTool_MonitoringType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Object	MachineTool		MachineOperation-MonitoringType	M, R

7.2.1 MachineOperationMonitoringType

Table 37: MachineOperationMonitoringType Definition

Attribute	Value				
BrowseName	MachineOperationMonitoringType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Variable	OperationMode		MachineOperationMode	M, R

OperationMode

OperationMode contains a MachineOperationMode value as defined in 12.5. The values of the MachineOperationMode enum are derived from the MO modes of machinery functional safety standards. For a machine tool adhering to such a standard, the OperationMode shall show the respective mode. For a machine tool not adhering to such a standard, the OperationMode shall be filled with the appropriate mode available from the MachineOperationMode Enum. The OperationMode is only a representation of the machine tool mode, it shall not be used in a safety relevant manner.

7.3 ProductionType

Table 38: ProductionType Definition

Attribute	Value				
BrowseName	ProductionType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Object	ActiveProgram		ProductionActive-ProgramType	M, R

7.3.1 ProductionActiveProgramType

Table 39: ProductionActiveProgramType Definition

Attribute	Value				
BrowseName	ProductionActiveProgramType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Object	State		ProductionActiveState-ProgramType	M, R
HasComponent	Variable	Name	String	PropertyType	M, R
HasComponent	Variable	NumberInList	UInt16	PropertyType	M, R

Name

The Name is used to distinguish and identify programs on a machine tool.

NumberInList

NumberInList is used to enumerate ProductionProgramType instances used as list elements. This index shall be 0 for the first list element and increase by one for each subsequent list element. If nodes are deleted from the list or inserted into the list, the NumberInList has to be adjusted for all following nodes in the list, such that the NumberInList elements always form a sequential series of numbers.

7.3.1.1 ProductionActiveStateProgramType

Table 40: ProductionActiveStateProgramType Definition

Attribute	**Value**				
BrowseName	ProductionActiveStateProgramType				
IsAbstract	False				
References	**Node Class**	**BrowseName**	**DataType**	**TypeDefinition**	**Modelling Rule**
Subtype of BaseObjectType defined in OPC UA Part 5					
HasComponent	Object	CurrentState		FiniteSteteVariableType	M, R

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