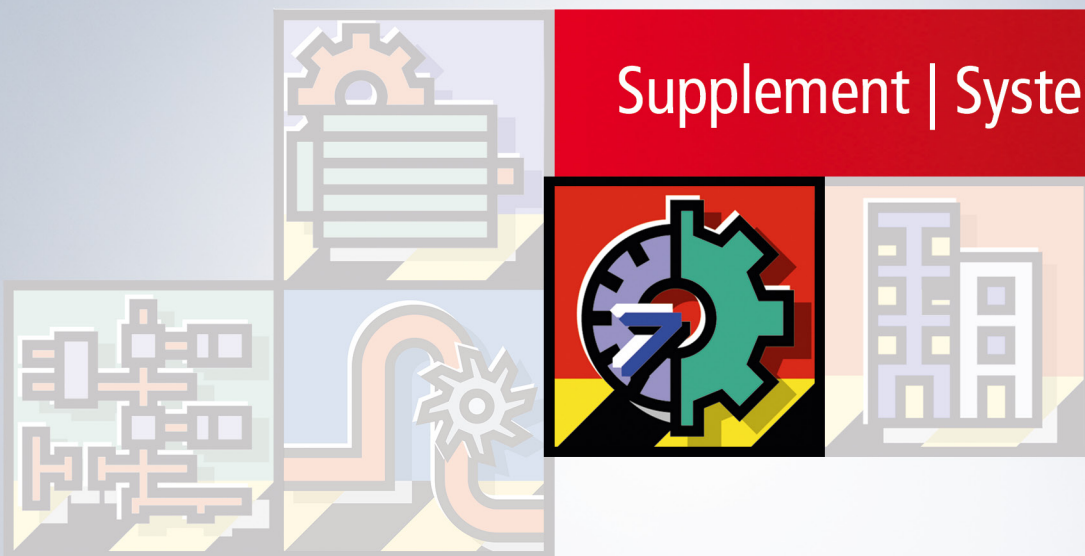


Manual | EN

# TS1120

TwinCAT 2 | ECAD Import

Supplement | System





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# 1 Foreword

## 1.1 Notes on the documentation

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with applicable national standards.

It is essential that the documentation and the following notes and explanations are followed when installing and commissioning the components.

It is the duty of the technical personnel to use the documentation published at the respective time of each installation and commissioning.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

### Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development.

We reserve the right to revise and change the documentation at any time and without prior announcement. No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

### Trademarks

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The EtherCAT Technology is covered, including but not limited to the following patent applications and patents:

EP1590927, EP1789857, EP1456722, EP2137893, DE102015105702  
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## 1.2 Safety instructions

### Safety regulations

Please note the following safety instructions and explanations!  
Product-specific safety instructions can be found on following pages or in the areas mounting, wiring, commissioning etc.

### Exclusion of liability

All the components are supplied in particular hardware and software configurations appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH & Co. KG.

### Personnel qualification

This description is only intended for trained specialists in control, automation and drive engineering who are familiar with the applicable national standards.

### Description of symbols

In this documentation the following symbols are used with an accompanying safety instruction or note. The safety instructions must be read carefully and followed without fail!

#### **DANGER**

##### **Serious risk of injury!**

Failure to follow the safety instructions associated with this symbol directly endangers the life and health of persons.

#### **WARNING**

##### **Risk of injury!**

Failure to follow the safety instructions associated with this symbol endangers the life and health of persons.

#### **CAUTION**

##### **Personal injuries!**

Failure to follow the safety instructions associated with this symbol can lead to injuries to persons.

#### **NOTE**

##### **Damage to the environment or devices**

Failure to follow the instructions associated with this symbol can lead to damage to the environment or equipment.



##### **Tip or pointer**

This symbol indicates information that contributes to better understanding.

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In addition, the recommendations from Beckhoff regarding appropriate protective measures should be observed. Further information regarding information security and industrial security can be found in our <https://www.beckhoff.com/secguide>.

Beckhoff products and solutions undergo continuous further development. This also applies to security functions. In light of this continuous further development, Beckhoff expressly recommends that the products are kept up to date at all times and that updates are installed for the products once they have been made available. Using outdated or unsupported product versions can increase the risk of cyber threats.

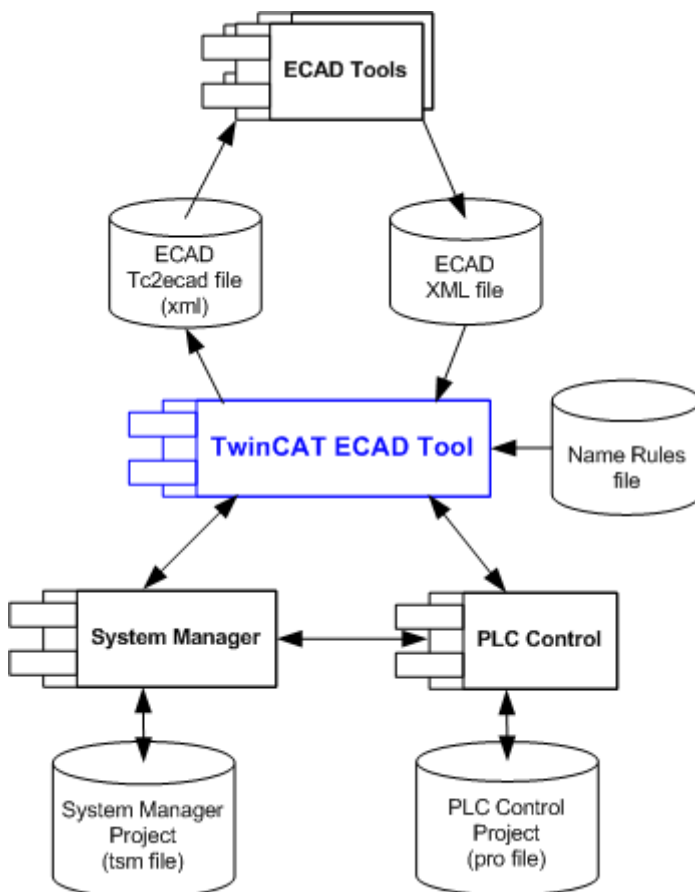
To stay informed about information security for Beckhoff products, subscribe to the RSS feed at <https://www.beckhoff.com/secinfo>.

## 2 Overview

The TwinCAT ECAD Import Tool completes the engineering chain: Everything happens automatically without user intervention, from electrical design to PLC projects. The achievable reduction in input and transmission errors ultimately also reduces costs. From an ECAD program, the required information about the structure of the I/Os and the linkage to PLC variables is exported via XML. Beckhoff uses an XML schema for specifying the structure of the XML file. The TwinCAT ECAD Tool reads the XML file and generates a TwinCAT System Manager configuration with all I/O devices, Bus Terminals and Fieldbus Box modules, and a basic PLC program with the I/O variables used.

A software device hierarchy can be created by importing a further XML file. An NC device with tasks, axes and, obviously, I/O variables can be created automatically. For this too, links with PLC variables can be generated automatically. Corrections in the ECAD construction drawings can be implemented at any time. Any changes that may be required in the System Manager or the PLC program are carried out automatically, as far as possible.

In another direction, the TwinCAT ECAD Tool can produce the specified XML file from an existing TwinCAT System Manager configuration file. This provides an ECAD program an opportunity to get the information of I/Os configuration and then generate or modify the ECAD construction drawings.



The concept of TwinCAT ECAD Tool

### 2.1 Release Note

*TcEcadImport Version 2.0.1.9*

User interface is modified. New properties are added to Teip project.

[IoGroup \[P 28\]](#) is extended for the Variables of EtherCAT devices in ECAD2TwinCAT.xsd.

[Link \[P 37\]](#) is extended in Box and Terminal for the linked Nc/CNC Axis, Encoder or Drive.



*TcEcadImport Version 2.0.0.0*

New user interface.

Connection [▶ 35] is extended for EtherCAT devices in ECAD2TwinCAT.xsd.

## **3 Installation**

System requirements:

1) Windows NT\2000\XP.

2) TwinCAT version 2.9 (Build 1030) or higher.

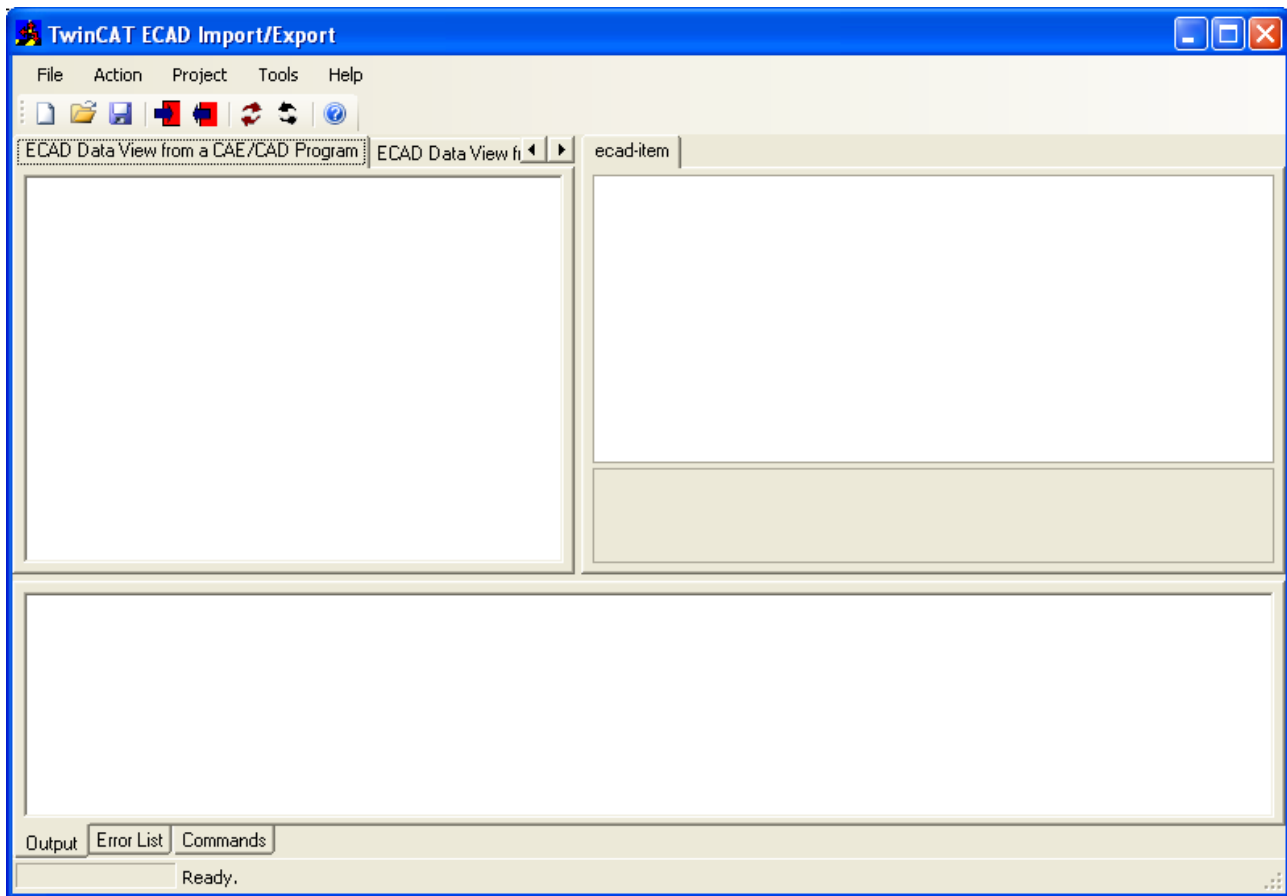
\* If EtherCAT is desired, TwinCAT version 2.11 have to be installed.

3) .Net Framework 3.5 SP1.


## 4 User Interface

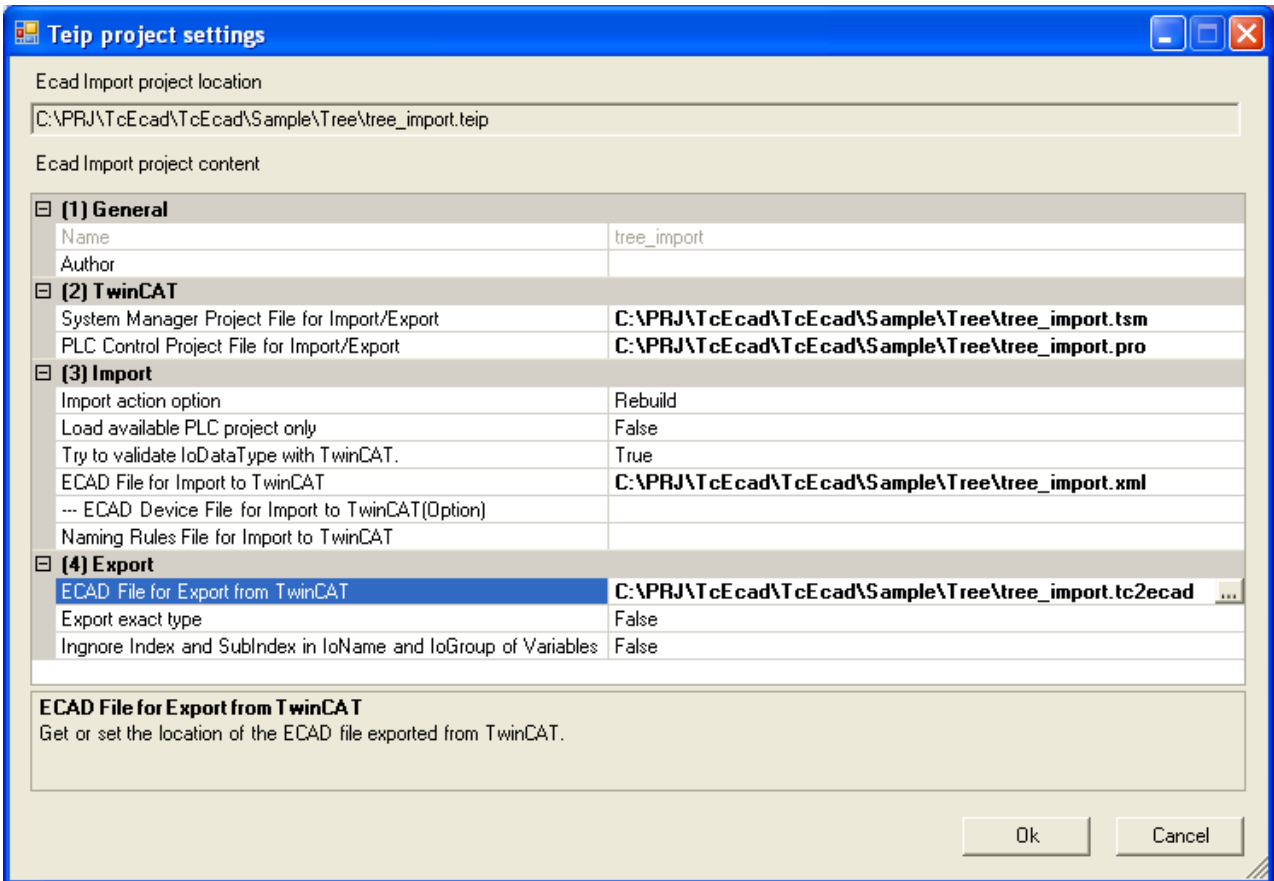
✓ After installation, TwinCAT ECAD Import can be found under TwinCAT System in "All programs" of the Windows "start" menu.

1. A dialog as below will show up after the program started.



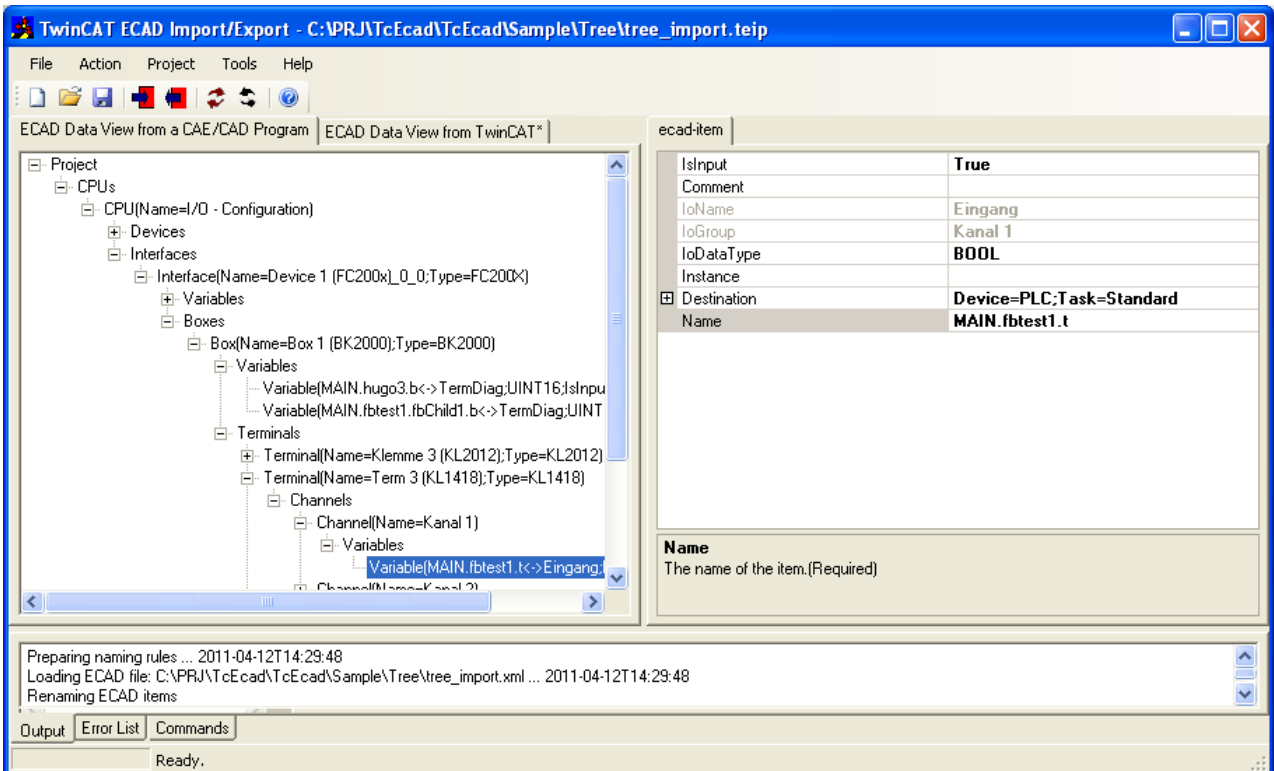
Main dialog


2. Make a new Project via either the menu "File/New/Project" or  in the toolbar. Give a filename for the Project. The content for a TwinCAT ECAD Import Project (**Teip**) will be shown in the following dialog.



TwinCAT ECAD Import Project (Teip) Dialog

- Click "OK" to continue, if the required settings are done. The ECAD files will be loaded or prepared. The results will be shown in the Data View. The property view on the right side will show the details of the selected ECAD item.



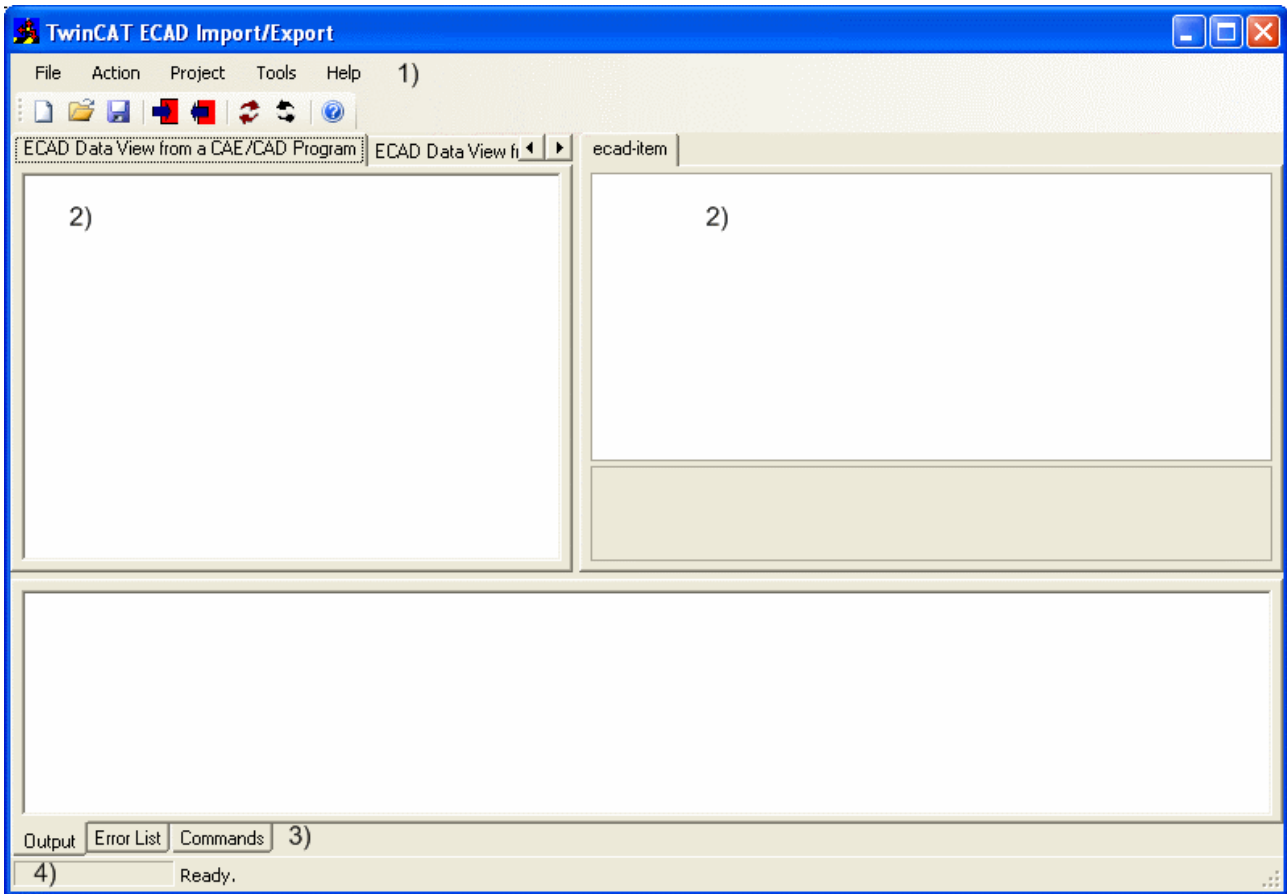
4. Click menu "Action/Import ECAD to TwinCAT" or  in the tool bar. The TwinCAT System Manger and PLC Control Project files will be generated or updated. A message will be shown after the action is excuted. The generated/updated TwinCAT project files can be opened via the menu "Tools/View tsm" or "Tools/View pro".

## 4.1 Dialogs

### 4.1.1 Main dialog

The main dialog contains the following parts:

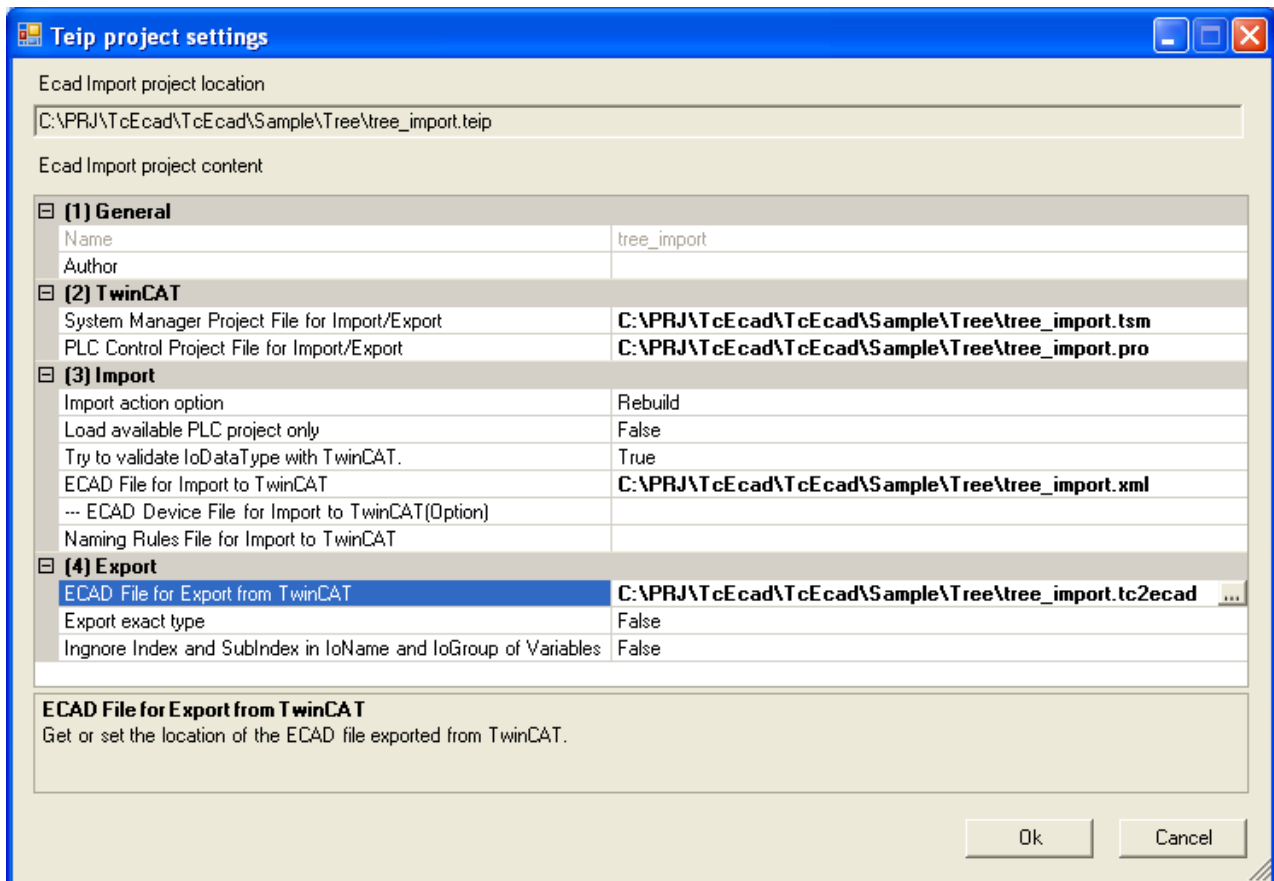
- 1) Menu and toolbar part.
- 2) ECAD Data View and the property window
- 3) Output, Error List and Commands windows.
- 4) Processbar and status info label.



Main dialog

### 4.1.2 TwinCAT ECAD Import Project (Teip)

The following dialog will be shown if [File/New/Project \[▶ 16\]](#) or [Project/Properties \[▶ 17\]](#) is clicked. It decides which ECAD import/export Files and TwinCAT Project files are included in the project.



Teip dialog

The inputs are grouped in 4 Categories:

### 1) General

*Name* shows the name of the Teip.

*Author* is an option.

### 2) TwinCAT

*System Manager Project File* for Import/Export is **obligatory** for a Teip. The file will be generated/updated via importing an ECAD file. Or an ECAD exporting file will be generated/updated via exporting the TwinCAT files.

*PLC Control Project File* for Import/Export is **obligatory** for a Teip. The file will be generated/updated via importing an ECAD file. Or an ECAD exporting file will be generated/updated via exporting the TwinCAT files.

### 3) Import

*Import action option* decides if the TwinCAT Projects will be rebuild or refreshed.

if *Load available PLC projects* is true, the PLC project will not be generated, but only be loaded for mapping variables.

if *Try to validate IoDataType with TwinCAT* is true, the given DataType in ECAD xml file will be validated with System Manager IO Variable data types.

*ECAD File for Import to TwinCAT* is **obligatory** for a Teip. This file is available from the ECAD Construction Drawings Program, which exports such files following the schema "ECAD2TWINCAT.xsd".

--- *ECAD Device File for Import to TwinCAT (Option)* is a separate ECAD file, which only contains the "[Devices \[► 23\]](#)" Information.

*Naming Rules File for Import to TwinCAT* is an option, if there are any rules for replacing the special characters reading from the ECAD file, e.g. "ue" replacing "ü".

**4) Export**

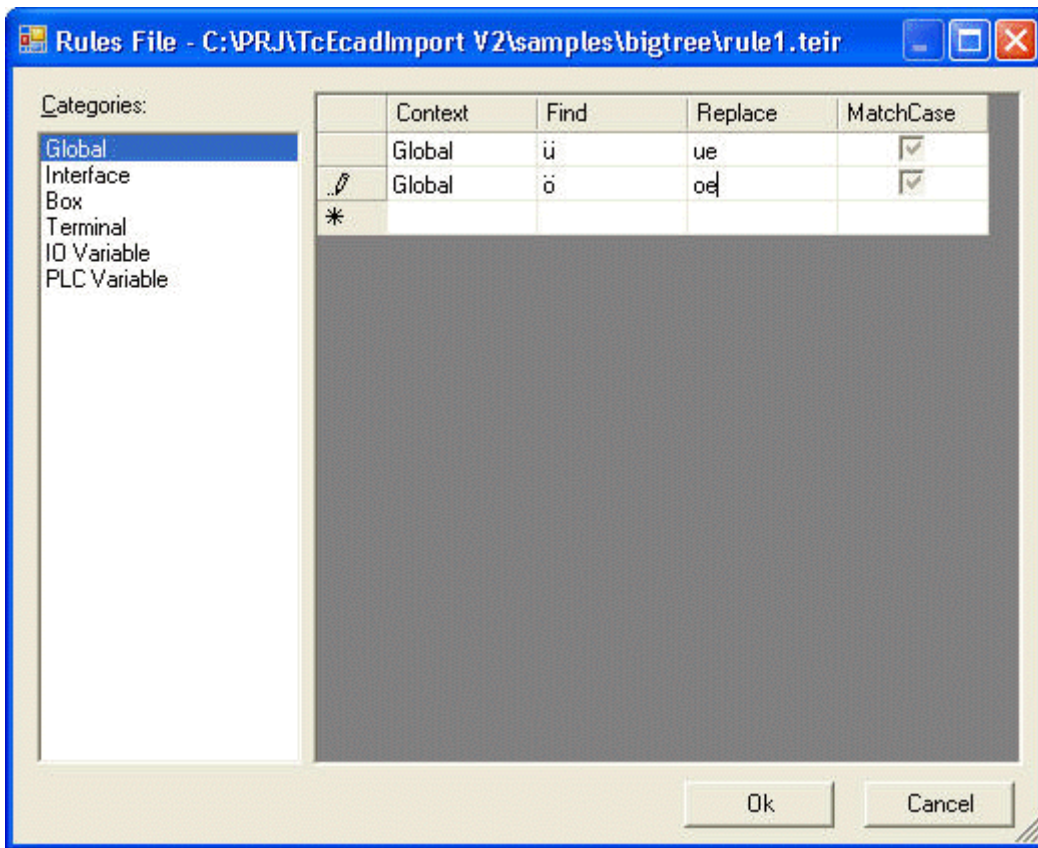
*ECAD File for Export from TwinCAT* has to be decided, if TwinCAT System Manager and/or PLC Control Project files are existing and you want to export an ECAD file via TwinCAT ECAD Import Tool.

*Export exact type* indicates if an exact Product-Revision type for EtherCAT devices will be obtained or not.

*Ignore Index and SubIndex in IoName and IoGroup of Variables* should always be False, the exact variable information will be exported.

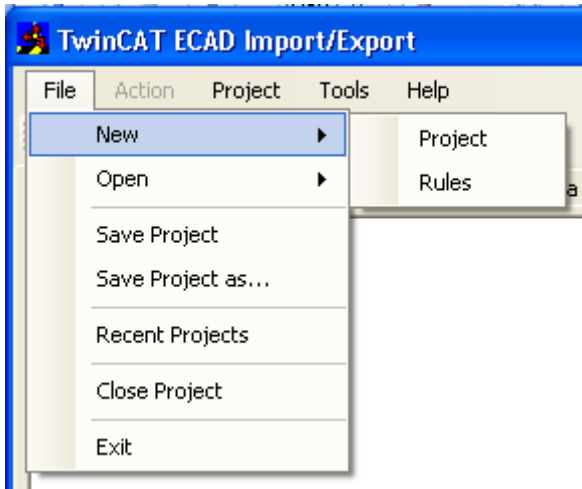
**4.1.3 Rules file**

The following dialog will be shown if *File/New/Rules* or *File/Open/Rules* [▶ 16] is clicked. It defines the rules, which characters in the Names of the Interface, Box, Terminal, IO Variable or PLC Variable are replaced with other characters, without changing the content of an ECAD file. This Naming Rules file then can be included in the Teip.



## 4.2 Menu and toolbar

### 4.2.1 File



The File menu


File menu includes the following menu items:

**New/Project:** Create a new TwinCAT ECAD Import Project (Teip), same as toolbar button 

**New Rules:** Create a new Naming Rules file. The [Rules File Dialog \[▶ 15\]](#) will be shown.

**Open/Project:** Open an existing Teip file, same as toolbar button .

**Open/Rules:** Open an existing Naming Rules file. The [Rules File Dialog \[▶ 15\]](#) will be shown.

**Save Project:** Save the current opening Teip file, same as toolbar button .

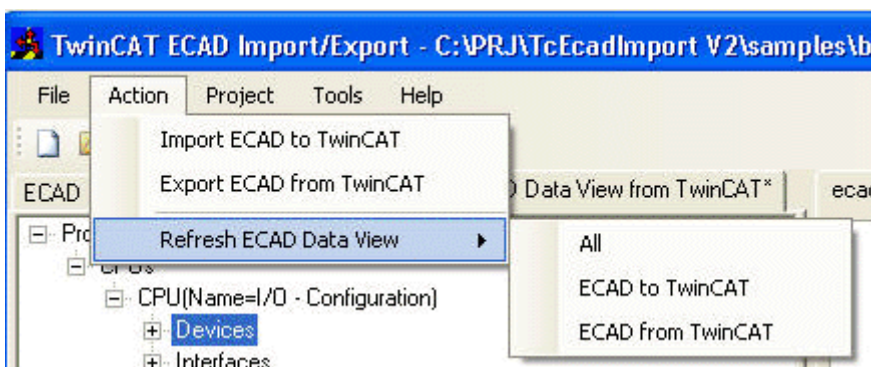
**Save Project as...:** Save the current opening Teip file with another filename.

**Recent Projects:** Shows a list of recent opened Teip files.

**Close Project.** Close the current openend Teip project.

**Exit:** Closes TwinCAT ECAD Import.

### 4.2.2 Action







The Action menu

Action menu includes the following menu items:

**Import ECAD to TwinCAT:** Generate/update the TwinCAT System Manager and PLC Control Projects file

via importing an ECAD file, same as toolbar button .

**Export ECAD from TwinCAT:** Generate/update an ECAD file following the "ECAD2TWINCAT.xsd" schema

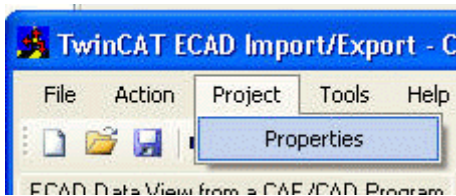
with ".tc2ecad" extension, same as toolbar button .

**Refresh ECAD Data View/All:** Reload ECAD import file and reconstruct ECAD export data from the TwinCAT projects.

**Refresh ECAD Data View/ECAD to TwinCAT:** Only reload ECAD import file.

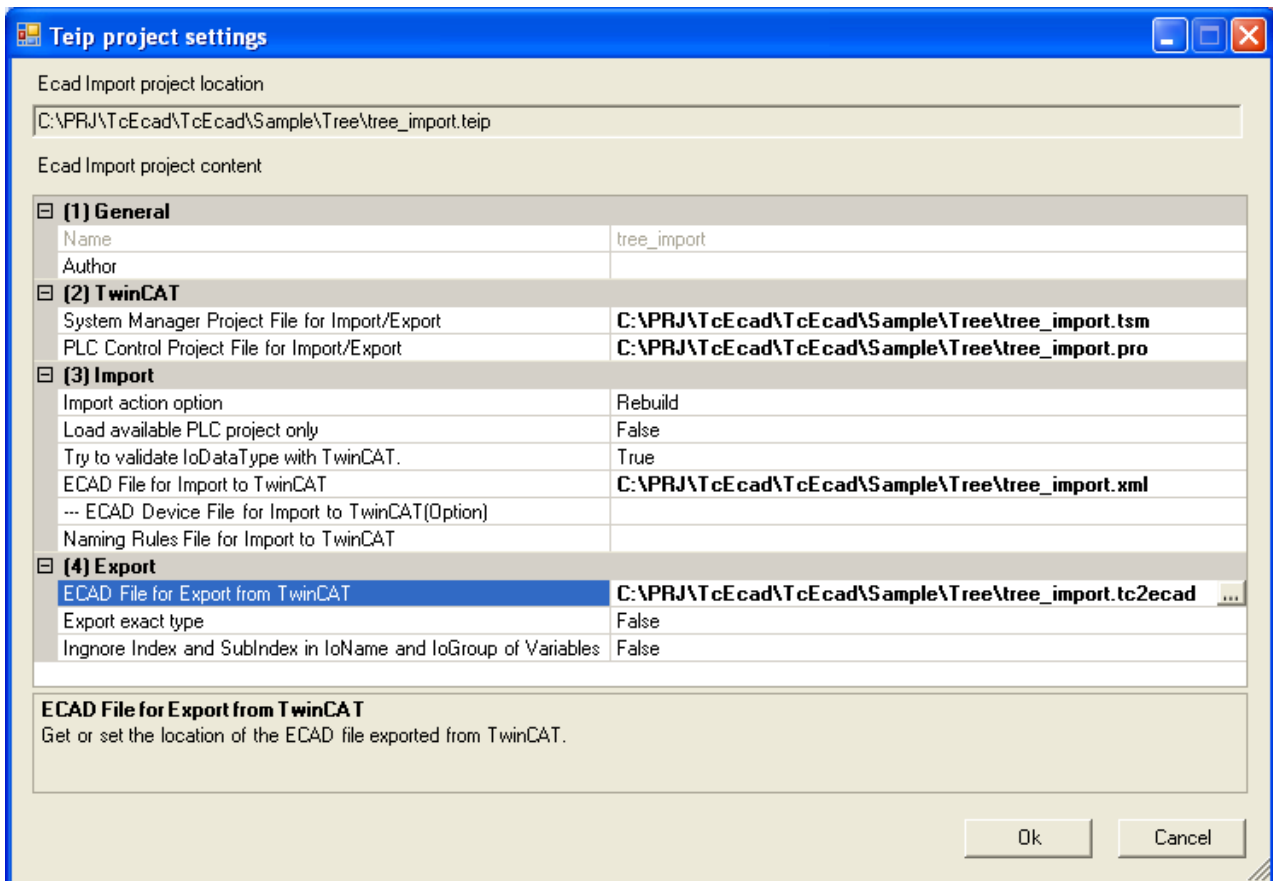
**Refresh ECAD Data View/ECAD from TwinCAT:** Only reconstruct ECAD export data from the TwinCAT projects.

### 4.2.3 Project

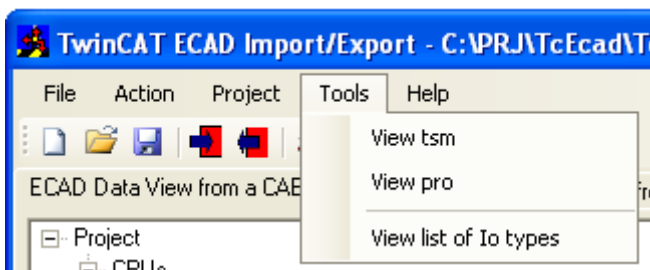


The Project menu

**Project/Properties:** Opens the Properties dialog as below for the current opened Teip file. If the properties are changed, the ECAD Data will be updated.



## 4.2.4 Tools

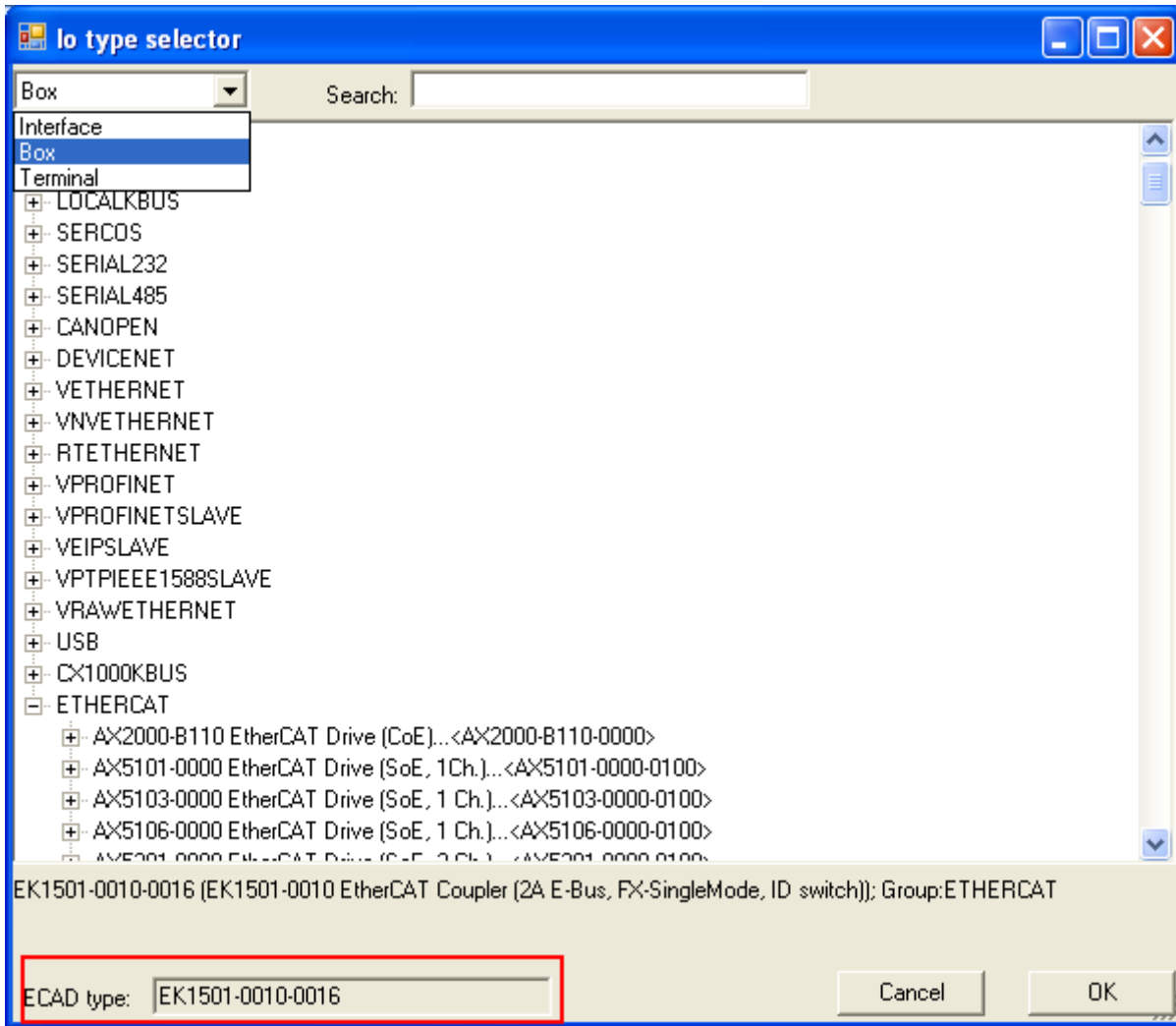


The Tools menu

**Tools/View tsm:** Opens the TwinCAT System Manager Project file, which is included in the current opened Teip file.

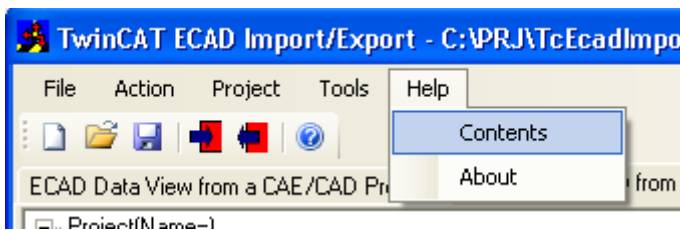
**Tools/View pro:** Opens the PLC Control Project file, which is included in the current opened Teip file.

**Tools/View list of io types:** Shows a list of System Manager IO types. The corresponding ECAD types can be checked.



IO type selector dialog

### 4.2.5 Help



The help menu

**Help/Contents:** Opens this document.

**Help/About:** Shows the about dialog as below.



## 5 Appendix

### 5.1 ECAD export XML file

ECAD export XML file is required in Import dialog to generate a TwinCAT System Manager configuration and its corresponding PLC program. It contains the required information about the structure of the I/Os and the linkage to PLC variables. Beckhoff uses an XML schema for specifying the structure of the XML file. This schema file named ECAD2TwinCAT.xsd and its related TcBaseTypes.xsd can be found under the installed TcEcad folder.

Here is a simple example of ECAD export XML file.

```
<?xml version="1.0" encoding="UTF-8"?>
<Project>
  <Name><![CDATA[SOMENAME XML]]></Name>
  <Author><![CDATA[UNKOWN]]></Author>
  <Version>1.0</Version>
  <Description><![CDATA[SOMEDESCRIPTION]]></Description>
  <ChangeDate>2003-10-14T13:18:44</ChangeDate>
  <CPUs>
    <CPU>
      <Name><![CDATA[CPU1]]></Name>
      <Interfaces>
        <Interface>
          <Name><![CDATA[FB1]]></Name>
          <Comment><![CDATA[Interfacekommentar]]></Comment>
          <Type><![CDATA[FC2002]]></Type>
          <ChannelNo>1</ChannelNo>
          <Boxes>
            <Box>
              <Name><![CDATA[LBF1]]></Name>
              <Comment><![CDATA[BK2000]]></Comment>
              <Type><![CDATA[BK2000]]></Type>
              <BoxNo>1</BoxNo>
              <Variables>
                <Variable>
                  <Name><![CDATA[byAF1Status]]></Name>
                  <IsInput>1</IsInput>
                  <Comment><![CDATA[LWL-BUS-Koppler Klemmstelle 1 Festseite]]></Comment>
                  <IoName><![CDATA[State]]></IoName>
                  <IoDataType>BYTE</IoDataType>
                </Variable>
              </Variables>
            </Box>
          </Boxes>
          <Terminals>
            <Terminal>
              <Name><![CDATA[Q01]]></Name>
              <Comment><![CDATA[Terminalkommentar]]></Comment>
              <Type><![CDATA[KL2032]]></Type>
              <Channels>
                <Channel>
                  <Name><![CDATA[A01]]></Name>
                  <Comment><![CDATA[]]></Comment>
                  <Variables>
                    <Variable>
                      <Name><![CDATA[bQHF1FormatbYSchnellMinus]]></Name>
                      <IsInput>0</IsInput>
                      <Comment><![CDATA[Formatbearbeitung Y-Achse schnell minus]]></Comment>
                      <IoDataType>Bool</IoDataType>
                    </Variable>
                  </Variables>
                </Channel>
                <Channel>
                  <Name><![CDATA[A02]]></Name>
                  <Comment><![CDATA[]]></Comment>
                  <Variables>
                    <Variable>
                      <Name><![CDATA[bQHF1FormatbYLangsMinus]]></Name>
                      <IsInput>0</IsInput>
                      <Comment><![CDATA[Formatbearbeitung Y-Achse langsam minus]]></Comment>
                      <IoDataType>Bool</IoDataType>
                    </Variable>
                  </Variables>
                </Channel>
              </Channels>
            </Terminal>
          </Terminals>
        </Interface>
      </Interfaces>
    </CPU>
  </CPUs>
</Project>
```

```

    </Terminal>
  </Terminals>
</Box>
</Boxes>
</Interface>
<Interface>
  <Name><![CDATA[FB1]]></Name>
  <Comment><![CDATA[Interfacekommentar]]></Comment>
  <Type><![CDATA[FC2002]]></Type>
  <ChannelNo>2</ChannelNo>
</Interface>
</Interfaces>
</CPU>
</CPUs>
</Project>

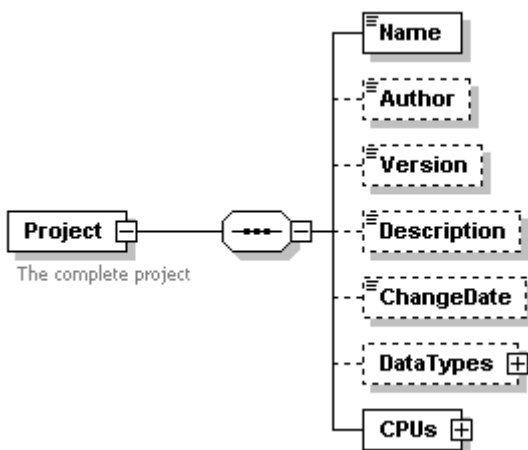
```

## 5.2 ECAT2TwinCAT.xsd

This XML schema file defines the structure of the ECAD export XML file. The definitions of each xml element in **ECAD2TwinCAT.xsd** are briefly summarized as below. In following graphics, the elements with solid line means must-be, e.g. all **Name** elements. Meanwhile, the elements with dashed-line mean that they are optional, e.g. all **Comment** elements.

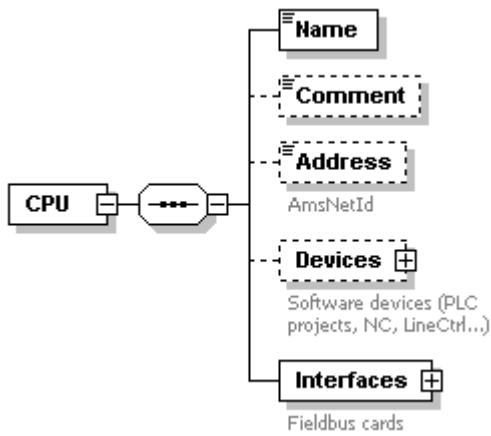
### 5.2.1 Project

**Project** is the root element. In **Name**, **Author**, **Description** should be written in <![CDATA[]]>. **DataTypes** defines the data types used in PLC program. It could be ignored in an ECAD exported XML file, as the same as in sample "AT002V2.xml".



### 5.2.2 CPU

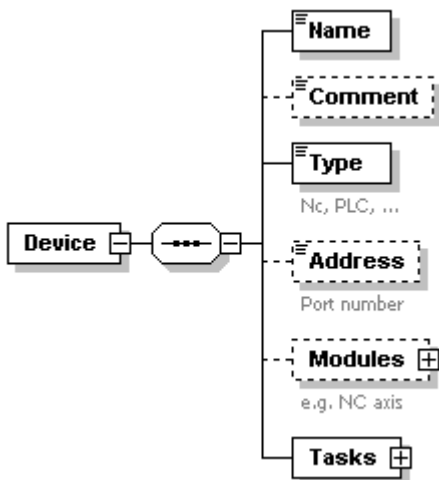
**CPUs** includes at this moment only one element **CPU**. This CPU corresponds to one System Manager Project.



## 5.2.3 Devices

### 5.2.3.1 Device

**Device** defines different configurations in System Manager, e.g. a PLC project.



For instance, the below is a case of a PLC project.

```
<Device>
<Name><![CDATA[AT002]]></Name>
<Comment/>
<Type>PLC</Type>
<Address>801</Address>
<Modules/>
<Tasks>
  <Task>
    <Name><![CDATA[Standard]]></Name>
    <Comment><![CDATA[Taskdes IEC61131 Projekts "AT002"]]></Comment>
    <Type>PLC</Type>
    <Calls>
      <ProgramCall>Main()</ProgramCall>
    </Calls>
    <Priority>0</Priority>
    <CycleTime>10000</CycleTime>
  </Task>
</Tasks>
</Device>
```

in a case of Nc:

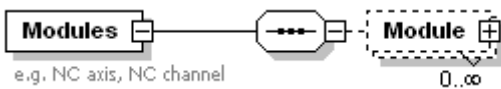
```
<Device>
<Name><![CDATA[NC - Configuration]]></Name>
<Comment/>
```

```

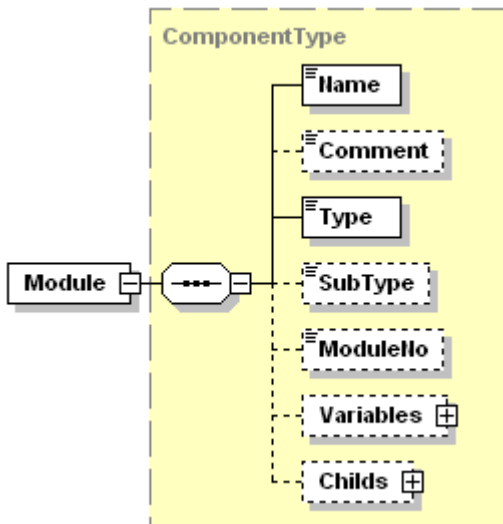
<Type>NC</Type>
<Address>500</Address>
<Modules>
  <Module>
    <Name><![CDATA[Achse 1 (Oberdruck)]]></Name>
    <Comment/>
    <Type>NCAXIS</Type>
    <SubType>2</SubType>
    <ModuleNo>1</ModuleNo>
    <Childs>
      <Child>
        <Name><![CDATA[Achse 1 (Oberdruck)_Enc]]></Name>
        <Comment/>
        <Type>NCENCODER</Type>
        <SubType>4</SubType>
        <ModuleNo>1</ModuleNo>
        <Variables>
          <Variable>
            <Name><![CDATA[Achse 1 (Oberdruck)_Enc_In^nInData1^nInData1[0]]></Name>
            <Comment/>
            <DataType>UINT16</DataType>
            <IsInput>true</IsInput>
            <LinkedWith>
              <Name><![CDATA[Counter]]></Name>
              <DataType>UINT16</DataType>
              <IsInput>true</IsInput>
              <Device>IO</Device>
            </LinkedWith>
            ....
          </Variable>
        </Variables>
      </Child>
    </Childs>
  </Module>
</Modules>
<Tasks>
  <Task>
    <Name><![CDATA[NC-Task 1 SAF]]></Name>
    <Comment/>
    <Type>NC SAF</Type>
    <Priority>0</Priority>
    <CycleTime>4000</CycleTime>
  </Task>
  <Task>
    <Name><![CDATA[NC-Task 1 SVB]]></Name>
    <Comment/>
    <Type>NC SVB</Type>
    <Priority>1</Priority>
    <CycleTime>10000</CycleTime>
  </Task>
</Tasks>
</Device>

```

### 5.2.3.2 Modules (Device)







**Modules** are a collection of NC axes, NC channels in TwinCAT System Manager.

The **Type** for a NC axis should be "NCAXIS" and "NCCHANNEL" for NC channel.

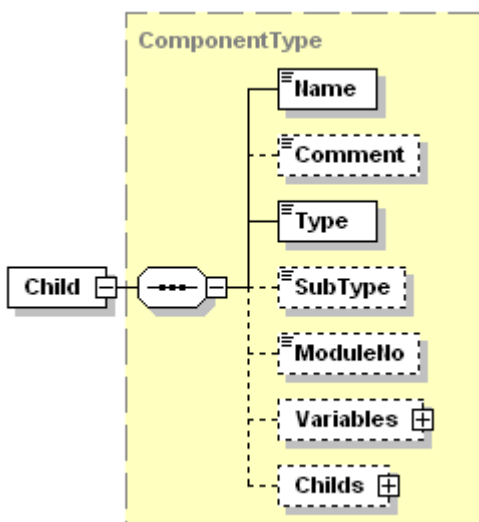
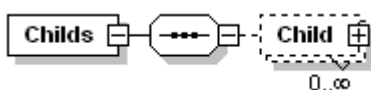
For a NC axis, the **SubType** can be:

- 1, for **Continuous Axis**;
- 2, for **Discrete Axis (two speed)**;
- 3, for **Low Cost Stepper Axis (dig. I/O)**;
- 5, for **Encoder Axis (virtual axis)**...

The **Variables** can be found directly under a LineMotion module. (*under construction*).

**Childs** are the same ComponentType in schema file. They present the members and a NC axis, for example.

### 5.2.3.3 Childs

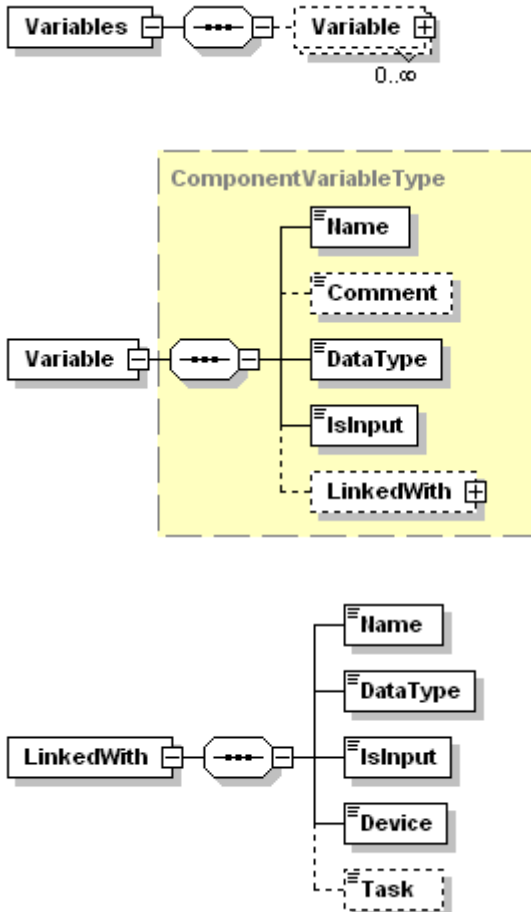


**Childs** are the same *ComponentType* in schema file. They present the members and a NC axis, for example.

The **Type** should be "NCENCODER" for a Axis encoder; "NCDRIVE" for a Axis drive; "NCCONTROLLER" for a Axis controller.

The SubType should be "1" for Simulations-Encoder, for example.

#### 5.2.3.4 Variables



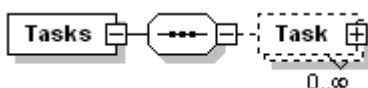
**Variables** is a collection of the *ComponentType*. They present the members of a NC axis, for example.

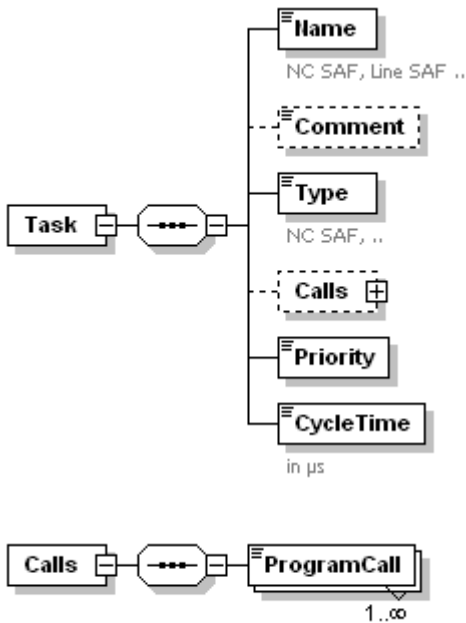
The **Type** should be "NCENCODER" for a Axis encoder, "NCDRIVE" for a Axis drive and "NCCONTROLLER" for a Axis controller.

The SubType should be "1" for Simulations-Encoder, for example.

**LinkedWith** defines the variable which is linked with this variable. The **Linkedwith** variable can be in PLC, NC or IO configurations. Thus, "PLC1", "PLC2", "PLC3", "PLC4", "PLC" as default of "PLC1, or "NC", "LM", "IO" has to be included in **Device** tag.

#### 5.2.3.5 Tasks





**Tasks** is a collection of Task under a PLC, NC, LineMotion and so on.

The **Name** is the name of taks, e.g "T1\_Slow".

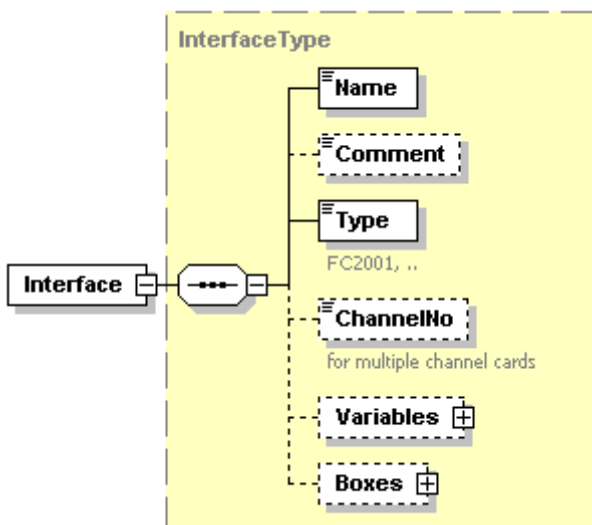
The **Type** should be "PLC" for Plc tasks; "NC SAF" for NC SAF task; "NC SVB" for NC SVB task.

Calls are the programs, which the task calls, e.g.

```
<Calls>
  <ProgramCall>Main()</ProgramCall>
</Calls>
```

## 5.2.4 Interfaces

### 5.2.4.1 Interface



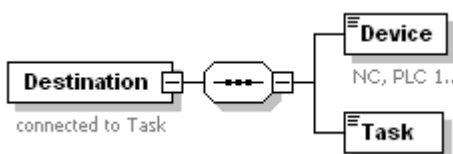
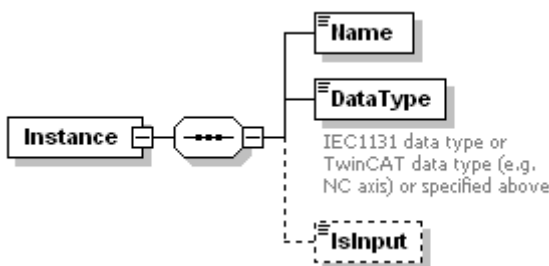
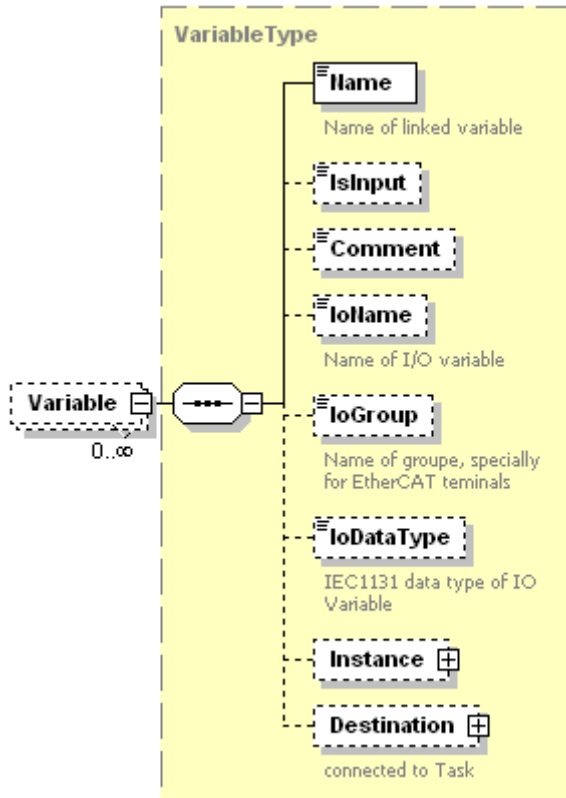
**Interfaces** defines the Fieldbus cards under IO-Devices of IO configuration in System Manager.

A Fieldbus card can have more than one channel, e.g 2xLight Bus in one card. These 2 channels will be treated as 2 cards in System Manager. In this case, the **Name** of the Fieldbus can be the same, but the **ChannelNo** has to be different. As the XML file is imported to generate a System Manager, 2 cards with the name of *Name\_ChannelNo* will be created in System Manager. For Instance, an interface **Name= FB, ChannelNo=1** in a XML file, will correspond an IO-Device called "FB\_1".

As observed in System Manager, the Inputs/Outputs of a Fieldbus card can directly linked with PLC variables. The information can be also included in the XML file, as described in the next section.

**Boxes** defines the Bus couplers, which are connected with a Fieldbus card.

### 5.2.4.2 Variables



**Variable** can be found in different places: **Interfaces**, **Boxes** and **Channels**.

**Name** is the linked PLC or NC variable name.

**IoName** is the name of an IO variable shown in System Manager. In case of **Variable** under **Interface** and **Box**, the **IoName** must be the same as the one in System Manager.

**IoDataType** is the IEC data type of the PLC variable.

**IsInput** is used for variable definition in TwinCAT PLC Control. For example, in PLC project,

```
myInVar AT%I* : BOOL;
myOutVar AT%Q* : BOOL;
```

%I indicates input, %Q indicates output.

**Instance** is used to link a variable in a Device like NC or PLC. In case of NC, the **Name** should be the parent module name, like "Axis1" or "Axis1^Axis\_Enc". In case of PLC, in future it would be also used to link non-globe PLC variable, e.g. a Function Block's variable (under construction)

**Destination** defines in which Device and Task the Variable should be linked.

An example of Variable is like,

```
<Variable>
  <Name><![CDATA[nInData1[0]]]></Name>
  <IsInput>true</IsInput>
  <IoName>Counter</IoName>
  <IoDataType>UINT16</IoDataType>
  <Instance>
    <Name><![CDATA[Achse 1 (Oberdruck)^Achse 1 (Oberdruck)_Enc]]></Name>
    <DataType>UINT16ARR2</DataType>
    <IsInput>true</IsInput>
  </Instance>
  <Destination>
    <Device>NC</Device>
    <Task>NC-Task 1 SAF</Task>
  </Destination>
</Variable>
```

And the linked variable in the device has to be,

```
<Variable>
  <Name><![CDATA[Achse 1 (Oberdruck)_Enc_In^nInData1^nInData1[0]]]></Name>
  <DataType>UINT16</DataType>
  <IsInput>true</IsInput>
  <LinkedWith>
    <Name><![CDATA[Counter]]></Name>
    <DataType>UINT16</DataType>
    <IsInput>true</IsInput>
    <Device>IO</Device>
  </LinkedWith>
</Variable>
Info:
```

#### Info:

The **Variable** under a **Channel** is somehow different from the one under **Interface** or **Box**. There is generally only one (e.g. in case of a Digital Terminal) or only one interesting variable under a channel. In this case, the **IoName** could be named as desired, and **IsInput** could be omitted. However if another non-default IO variable under a Channel is requested to link with a PLC variable, **IoName** has to be the same as the one in System Manager.

*New:* since the version 2.0.1.9, the following extension specially for the EtherCAT slaves is added:

**IoGroup** is obligatory for an EtherCAT Slave's Variables. It is the name of the variable group as shown in the following figure. **IoGroup** can have the **Index** attribute, which should be the same as the Index of the PDO item's Index.

**IoName** can now have the optional Attributes **Index**, **SubIndex** and **IndexInArray**, which should be the same as the ones of the Entries in Process Data of an EtherCAT slave. **IndexInArray** is necessary if the Variable is an element of an array.

The screenshot shows the System Manager interface with the following data:

**Tree View:** BKS1\_Q02, BKS1\_Q03, Channel 1, Output, Channel 2, Channel 3, Channel 4, Channel 5, Channel 6, Channel 7, Channel 8, WcState, InfoData, BKS1\_Q04, BKS1\_QN01\_24V, BKS1\_QN02, BKS1\_Q501\_24V, BKS1\_Q502, BKS1\_QN20, BKS1\_QN21, Analog ein, BKS1\_XEND2, BKT1.

**Sync Manager:**

SM	Size	Type	Flags
0	1	Outputs	

**PDO List:**

Index	Size	Name	Flags	SM	SU
0x1600	0.1	Channel 1	MF	0	0
0x1601	0.1	Channel 2	MF	0	0
0x1602	0.1	Channel 3	MF	0	0
0x1603	0.1	Channel 4	MF	0	0
0x1604	0.1	Channel 5	MF	0	0
0x1605	0.1	Channel 6	MF	0	0
0x1606	0.1	Channel 7	MF	0	0
0x1607	0.1	Channel 8	MF	0	0

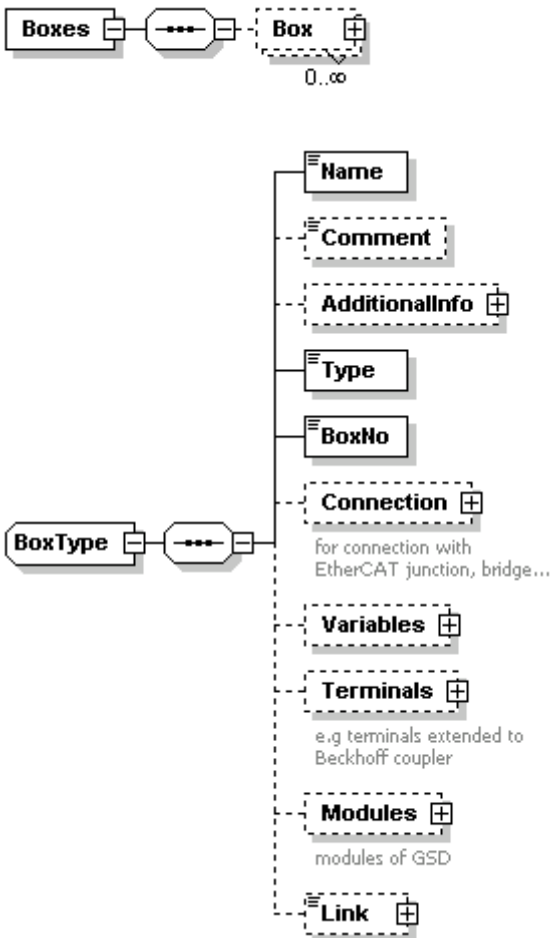
**PDO Assignment (0x1C10):**

<input checked="" type="checkbox"/>	0x1600
<input checked="" type="checkbox"/>	0x1601
<input checked="" type="checkbox"/>	0x1602
<input checked="" type="checkbox"/>	0x1603
<input checked="" type="checkbox"/>	0x1604
<input checked="" type="checkbox"/>	0x1605
<input checked="" type="checkbox"/>	0x1606

**PDO Content (0x1600):**

Index	Size	Offs	Name	Type	Default (hex)
0x7000:01	0.1	0.0	Output	BOOL	
		0.1			

### 5.2.4.3 Boxes



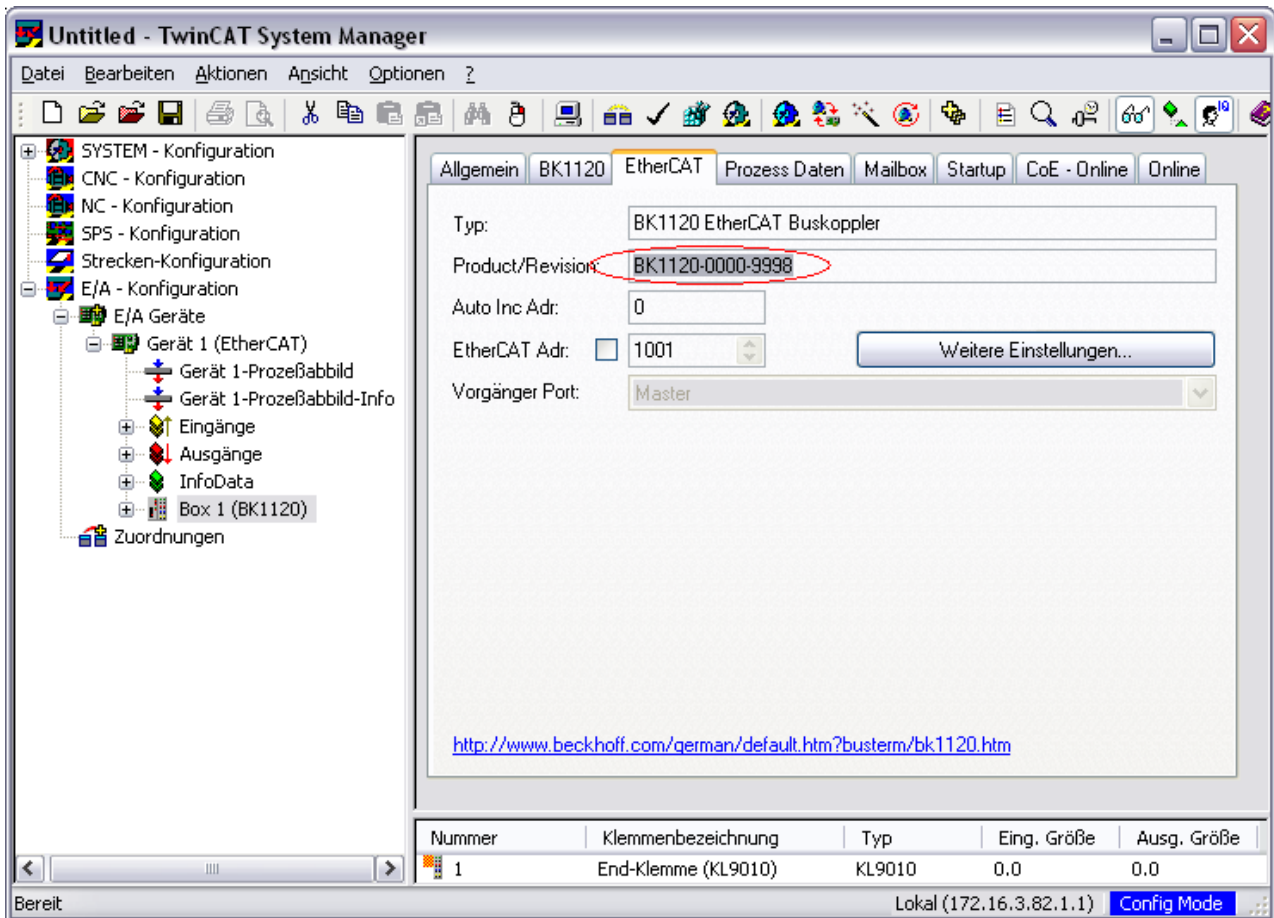
**Boxes** describes the Boxes in the System Manager, e.g. Fieldbus coupler. From the version 2.0.0.0, all EtherCAT members are treated as Box type.

**Name** and **Comment** have the same content as in System Manager. **Type** should be the abbreviate name which could be found in TcTerminals.xml.

**Type** is necessary for System Manager to append the correct Box. Normally it is just the short name of the type shown in System Manager, e.g. BK2000.

There are two cases, which have to be treated specially.

1) For *EtherCAT* boxes, the Interface of the boxes has to be "ETHERCAT" Type . The Type of a EtherCAT box can be given in an exact or short format. For instance, "BK1120-0000-9998" is the exact Type for a BK1120, which can be found on the *EtherCAT* tab of an EtherCAT Box property settings. If the short format of "BK1120" is given, the latest Revision (e.g. "BK1120-0000-0000" ) will be imported.



It will be included in the Ecad Xml File, as

```
<Interfaces>
<Interface>
  <Name><![CDATA[FB1_1]]></Name>
  <Comment/>
  <Type>ETHERCAT</Type>
  <Boxes>
    <Box>
      <Name><![CDATA[BKF33]]></Name>
      <Comment/>
      <Type>BK1120-0000-9998</Type>
      <BoxNo>5</BoxNo>
      <Terminals>
        ...
      </Terminals>
    </Box>
  </Boxes>
</Interface>
</Interfaces>
```

Or in general, especially for the third party products, the code should be given in format "V%8X\_P%8X\_R%8X\_S%8X", e.g.

V00000002\_P04602C22\_R270E0000

V: Vendor code, e.g. it is 2 for Beckhoff products.

P: Product code.

R: Revision number, optional.

S: Serial number, optional.

%8X: a number in hex format and 8 length.

## 2) For Profibus boxes:

If the Profibus box is a Beckhoff Product, "**BK3XXX**" should be given in <Type> tag. Otherwise it should be "**PBDP\_GSD**".

To give the exact Type information, the Production Name or Module Name in GSD file must be included in <ProductName> tag in <AdditionalInfo> tag, e.g. IL230x-B310, which is listed in Beckhoff Catalog.

```
<Interfaces>
<Interface>
  <Name><![CDATA[Pos.650 Sorter201 (FC310x)]]></Name>
  <Comment/>
  <Type>FC3100</Type>
  <Boxes>
    <Box>
      <Name><![CDATA[Coupler box IL230x-Bxxx]]></Name>
      <Comment/>
      <AdditionalInfo>
        <ProductName>IL2302-B310</ProductName>
      </AdditionalInfo>
      <Type>BK3XXX</Type>
      <BoxNo>5</BoxNo>
      <Terminals>
        ...
      </Terminals>
    </Box>
  </Boxes>
</Interface>
...
</Interfaces>
```

See the next section "AdditionalInfo" to get more detail information.

**BoxNo** is the physical topography of the box, identical with the number of "Id:" in System Manager.



The topography for LightBus is very important, but not for Profibus.

[Connection \[▶ 35\]](#) is a special Element for giving connectivity information of EtherCAT box. It is especially useful for such EtherCAT boxes with more than 1 EtherNet port, like EtherCAT junction EK1122.

[Variables \[▶ 28\]](#) defines the linked I/O variables of a Box and PLC variables, as given in the last section.

[Terminals \[▶ 35\]](#) represents the I/O terminal cards extended to a Box.

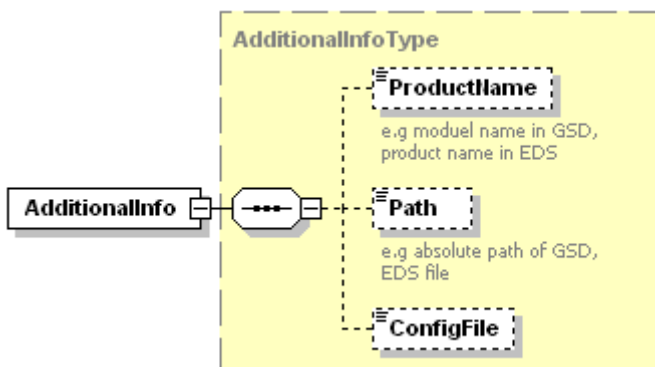
[AdditionalInfo \[▶ 32\]](#) and [Modules \[▶ 36\]](#) are used optionally for such as Profibus and DeviceNet.

[AdditionalInfo \[▶ 32\]](#) provides the possibility especially for third-party products to include the additional information.

[Modules \[▶ 36\]](#) give the information of Profibus modules.

[Link \[▶ 37\]](#) provides information of linked NC/CNC Axis, Encoder or Drive of the Box.

### 5.2.4.4 AdditionalInfo



In general, **ProductName** has to be the same name as Model\_Name in a GSD file, or ProdName in an EDS file. If it is a Beckhoff Product, the Product Name listed in Beckhoff Catalog can be used.



The detail information can be given in two ways: either the absolute **Path** of the file name, or integrated the whole file in **ConfigFile** section, a sample shown as below

```
<Interface>
  <Name><![CDATA[Device 1 (CX1500-M310)]]></Name>
  <Type>CX1500_M310</Type>
  <ChannelNo>1</ChannelNo>
  <Boxes>
    <Box>
      <Name><![CDATA[Bosch-VII1 (GSD Box) (RMVDP/F)]]></Name>
      <Comment><![CDATA[Vendor: Robert Bosch GmbH, 64701 Erbach Revision: 1.0]]></Comment>
      <AdditionalInfo>
        <ProductName>RMVDP/F</ProductName>
        <Path>C:\GSDBox\Rb010118.gsd</Path>
        <ConfigFile><![CDATA[
;*****
;*** **any commons...
;*****
;*****
;
#Profibus_DP
;
;*****
; Allgemeine Daten
;*****
;
; Versionskennung des GSD-Dateiformats
GSD_Revision = 2
;
; Herstellername
Vendor_Name = "Robert Bosch GmbH, 64701 Erbach"
;
; Geraetebezeichnung
Model_Name = "RMVDP/F"
;
; Ausgabestand des DP-Geraetes
Revision = "1.0"
;
; Typnummer
Ident_Number = 0x0118
;
; Protokollkennung
Protocol_Ident = 0
;
; DP-Geraetetyp
Station_Type = 0
;
; Hardware-Ausgabestand
Hardware_Release = "V1.0"
;
; Software-Ausgabestand
Software_Release = "----"
;
; Unterstuetzte Baudraten
9.6_supp = 1
19.2_supp = 1
93.75_supp = 1
187.5_supp = 1
500_supp = 1
1.5M_supp = 1
3M_supp = 1
6M_supp = 1
12M_supp = 1
;
; Maximale Protokoll-Bearbeitungszeit
MaxTsdr_9.6 = 60
MaxTsdr_19.2 = 60
MaxTsdr_93.75 = 60
MaxTsdr_187.5 = 60
MaxTsdr_500 = 100
MaxTsdr_1.5M = 150
MaxTsdr_3M = 250
MaxTsdr_6M = 450
MaxTsdr_12M = 800
;
; Geraeteunterstuetzung redundanter Uebertragungstechnik
Redundancy = 0
;
; Pegel des Repeater-Steuersignals CNTR-P
Repeater_Ctrl_Sig = 0
```

```

;
; Bitmap-Datei
Bitmap_Device = "RBxxRM_M"
;
; Realisierungs-Typ LSPM2 Version B
Implementation_Type = "LSPM2-B"
;
;*****
; spezifische Daten des Busteilnehmers
;*****
;
; DP-Geraet unterstuetzt den Freeze-Mode
Freeze_Mode_supp = 1
;
; DP-Geraet unterstuetzt den Sync-Mode
Sync_Mode_supp = 1
;
; Automatische Baudratenerkennung
Auto_Baud_supp = 1
;
; Unterstuetzung der Busteilnehmer-Adressierung
Set_Slave_Add_supp = 0
;
; Hoechstlaenge des herstellerspezifischen Feldes
User_Prm_Data_Len = 0x05
;
; Herstellerspezifisches Feld
User_Prm_Data = 0x00,0x00,0x00,0x00,0x00
;
; Minimaler Abstand zwischen zwei Zugriffen auf den Busteilnehmer
Min_Slave_Intervall = 1
;
; Busteilnehmertyp
Modular_Station = 1
;
; Hoechstanzahl der Module einer modularen Station
Max_Module = 1
;
; Hoechstlaenge der Eingangsdaten einer modularen Station in Bytes
Max_Input_Len = 0
;
; Hoechstlaenge der Ausgangsdaten einer modularen Station in Bytes
Max_Output_Len = 4
;
; Groesste Summe der Laengen der Ein- und Ausgangsdaten einer modularen Station
Max_Data_Len = 4
;
; Geraetespezifische Diagnosemeldungen
Unit_Diag_Bit(0) = "Kurzschluss Ventile"
Unit_Diag_Bit(1) = "Unterspannung UQ1"
Unit_Diag_Bit(2) = "Unterspannung UQ2"
Unit_Diag_Bit(3) = "UQ1 nicht vorhanden"
Unit_Diag_Bit(4) = "UQ2 nicht vorhanden"
;
; Hoechstlaenge der Diagnoseinformation (Diag_Data)
Max_Diag_Data_Len = 13
;
; Funktionsklasse: I/O
Slave_Family = 3@Bosch
;
; Modulkennung
;-----
;
Module = "Ventile 1-16" 0x23, 0x00
0
EndModule
Module = "KT-Ventile 1-12" 0x22, 0x00
1
EndModule
;
;***** Ende der Geraetestammdatendatei *****
]]>
</ConfigFile>
</AdditionalInfo>
<Type>PBBDP_GSD</Type>
<BoxNo>1</BoxNo>
<Modules>
<Module>
<Name><![CDATA[Ventile 1-16]]></Name>

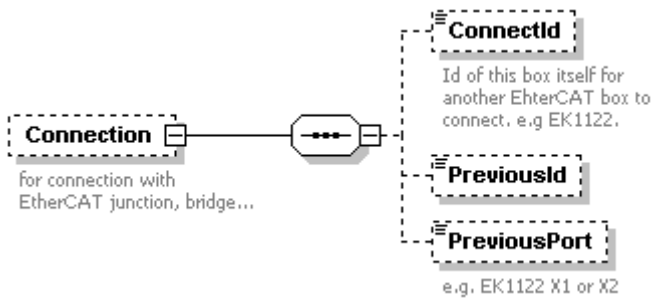
```

```

<Comment/>
<Type>0</Type>
<Variables>
  <Variable>
    <Name><![CDATA[]]></Name>
    <IsInput>>false</IsInput>
    <Comment/>
    <IoName>Ventile 1-16_1_0</IoName>
    <IoDataType>BYTE_ARRAY_0_3</IoDataType>
  </Variable>
  .....

```

### 5.2.4.5 Connection



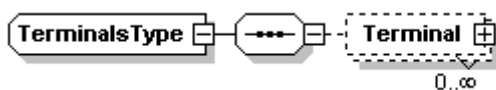
This element is only required if there is an EtherCAT member, which has two or more ethernet ports. For instance, the EtherCAT junction "EK1122" has two ports, labeled with "X1" and "X2". Individual devices or complete EtherCAT strands can be connected at the junction ports. The TwinCAT ECAD Import then needs to know which devices are connected at which junction port. Therefore in the ECAD file a unique ConnectId for EK1122 has to be given. And the PreviousId and PreviousPort have to be given for the sidelined device. An example is shown as below:

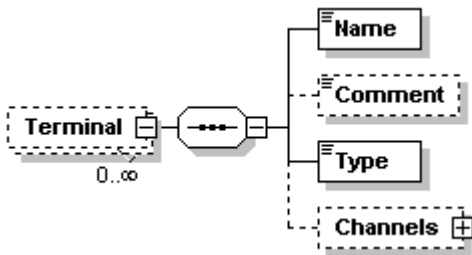
```

<Interface>
  <Name><![CDATA[Device 1 (EtherCAT)]]></Name>
  <Type>ETHERCAT</Type>
  <ChannelNo>1</ChannelNo>
  <Boxes>
    ...
    <Box>
      <Name><![CDATA[Term 12 (EK1122)]]></Name>
      <Type>EK1122-0000-0016</Type>
      <BoxNo>1012</BoxNo>
      <Connection>
        <ConnectId>1012</ConnectId>
      </Connection>
      ....
    </Box>
    <Box>
      <Name><![CDATA[Term 40 (EK1100)]]></Name>
      <Type>EK1100-0000-0001</Type>
      <BoxNo>1040</BoxNo>
      <Connection>
        <PreviousId>1012</ConnectId>
        <PreviousPort>X1</ConnectId>
      </Connection>
      ....
    </Box>

```

### 5.2.4.6 Terminals





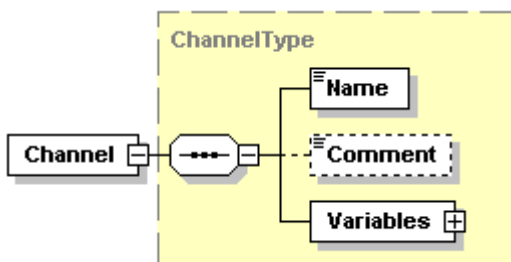
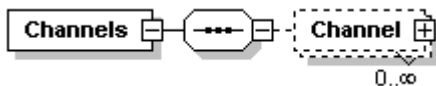
**Terminals** contains the list of Bus terminals.

**Type** is the terminal type. The type number, which System Manager uses for appending, is just the number from the terminal symbol (KL2004->2004). There is an exception, if the terminal has subtypes. Some terminals have compact (fewer variables) and complex with additional variables for status and diagnosis. Then a compact terminal has a subtype, which is identified like "KL3001-1".

**Channels** [▶ 36] contains the channels of the terminal.

**Link** [▶ 37] contains information of the linked NC/CNC Axis, Encoder or Drive of the Terminal.

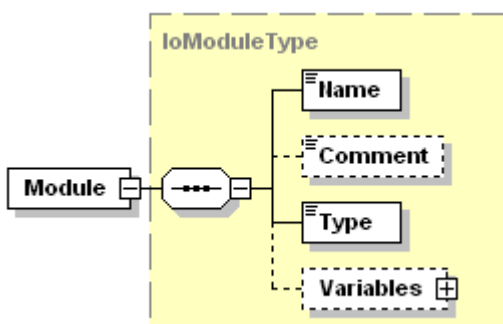
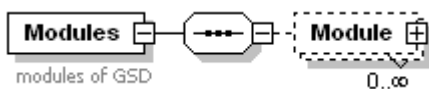
### 5.2.4.7 Channels



The **Channels** represent the channels of a terminal in a System Manager file. **Name** and **Comment** will taken as they are.

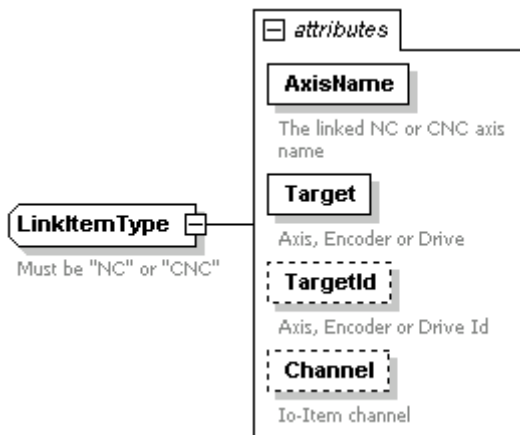
One Channel can have one or more variables, depending on the terminal types.

### 5.2.4.8 Modules (Box)



**Modules** under a **Box** are similar as **Terminals** but without channels, the variables are found directly under a Module. They are used specially in the case of GSD file.

### 5.2.4.9 Link in Box and Terminal



**Link** contains information of the linked NC or CNC Axis, Encoder or Drive of a Box resp. Terminal. e.g.

```
<Box>
  <Name><![CDATA[BKF21_I20 (OF1-Einzug Messrad)]]></Name>
  <Comment><![CDATA[]]></Comment>
  <Type>EL5151</Type>
  <BoxNo>8</BoxNo>
  <Connection>
    <ConnectId>1007</ConnectId>
    <PreviousId>1006</PreviousId>
  </Connection>
  <Link AxisName="Achse 7 Servokanteneinzug T3 (OF1)" Target="Encoder" TargetId="2">NC</Link>
</Box>
```

## 5.3 Example: Using EPLAN P8 Data in TwinCAT

The following application provides a solution to reuse EPLAN P8 data in TwinCAT. This reuse is based on a XML-file defined by Beckhoff. The TwinCAT ECAD import tool uses this XML file to create a TwinCAT configuration.

The example contains an EPLAN P8 project, the exported XML file from EPLAN and the TwinCAT configuration. So the example shows the complete workflow of the TwinCAT EPLAN interface.

<https://infosys.beckhoff.com/content/1033/tcecadimport/Resources/11276618507/.zip>



More Information:  
[www.beckhoff.com/ts1120](http://www.beckhoff.com/ts1120)

Beckhoff Automation GmbH & Co. KG  
Hülshorstweg 20  
33415 Verl  
Germany  
Phone: +49 5246 9630  
[info@beckhoff.com](mailto:info@beckhoff.com)  
[www.beckhoff.com](http://www.beckhoff.com)

