DIGSI 4

DIGSI is talking XML

Manual

Edition: 23.04.08

E50417-F1176-C404-A2

Information for Your Safety

This manual does not represent a complete listing of all the safety measures required to operate the equipment (module, device) since specific operating conditions may make further measures necessary. However, it contains information which you have to observe in order to ensure your personal safety and in order to avoid property damage. The information is highlighted by a warning triangle and, depending on the degree of danger, is shown as follows:

Warning

indicates that death, severe personal injury or substantial property damage can result if proper precautions are not taken.

Caution

indicates that minor personal injury or property damage can result if proper precautions are not taken**.**

Qualified personnel

Commissioning and operation of equipment (module, device) described in this manual may only be carried out by qualified personnel. Qualified personnel in the sense of the safety instructions in this manual are persons who are entitled to commission, enable, earth and identify devices, systems and circuits in accordance with the standards of safety technology.

Use as prescribed

The equipment (device, module) may only be used for the applications described in the catalogue and the technical specifications and only in combination with third party equipment recommended or approved by Siemens.

The successful and safe operation of this device is dependent on proper handling, storage, installation, operation, and maintenance.

Hazardous voltages are present in parts of this electrical equipment during operation. Severe personal injury or property damage can result if the device is not handled properly

- The device is to be earthed to the protective-earth terminal before any other connections are made.
- Hazardous voltages can arise in all the circuit parts connected to the power supply.
- Hazardous voltages can be present in the equipment even after the power supply voltage has been removed, i.e. capacitors can still be charged.
- Equipment with current transformer circuits may not be operated openly.

The limits specified in this manual or in the operating instructions respectively may not be exceeded. This point must also observed during testing and commissioning.

Disclaimer of Liability
We have checked the text of this manual for conformity with the hardware and software described. However, since deviations cannot be ruled out entirely, we do not accept liability for complete conformity or for any errors or omissions.
The information in this manual is checked periodically, and necessary corrections will be included in future editions. We appreciate any suggestions for improvement.

We reserve the right to make technical improvements.
Document version 1.01.00

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What Awaits You 1

A hearty welcome and a good Tag. Tag? Yes, you read correctly. Of course, we also wish you a good day, but Tags, more exactly XML Tags, will accompany us through this entire book. And, if in the end, we should have convinced you that DIGSI XML makes your life easier, then they may even accompany you through your entire life. But in order to get there we have to start small, as usual, with an overview of that which awaits you.

XML is XXL

With the import and export interface based on XML (extensible markup language) new, cost-saving opportunities open up for you with DIGSI as of Version 4.8: via the import interface, you can read data into DIGSI 4 from other applications and in this manner parameterize devices from outside. Vice versa, you transfer the setting data into other applications in order to further process them there. With the XML interface you open up a multitude of new applications. And you use the potential of familiar applications much better since you can now integrate them optimally in your workflow. You could also put it this way: With DIGSI XML your benefits are XXL:

- reduced error frequency,
- complete security,
- marginal learning time,
- increased productivity
- and practically no costs!

Ambitious

The data output of most other setting programs is limited to simple ASCII text or in some cases uses the CSV database format. Siemens, on the other hand, has pursued the strategy right from the beginning of offering a universal, platform-independent and future-oriented format for DIGSI 4 that is based on the standardized descriptive language XML.

In DIGSI XML, standard-conform XML tags are offered that on the one hand reflect the structure of the parameter set and on the other the meaning of the parameters. Only what is visible in the DIGSI 4 user interface or is found in the appendix of any device manual goes into the XML file. Thus, the DIGSI XML format has decisive benefits from your viewpoint: It is easy to read and to understand, is structured with only a few levels and you can learn it quickly.

Chapters of their own

If you already have some knowledge of XML it definitely means that you are a bit ahead of the others. But this knowledge isn’t absolutely necessary in order to understand DIGSI XML. In Chapter 2 **Little XML Science**, we will provide you with a basis, in the form of several basic terms, that is more than sufficient to understand and be able to apply DIGSI XML.

We will get right down to the business of our actual topic in Chapter 3 **Exporting and Importing with DIGSI 4**. There we will use the opportunity to give you an overview of all possible DIGSI 4 import and export formats. Then, we will describe the procedures for exporting and importing data in XML.

In Chapter 4 **The DIGSI XML Code under the Microscope**, we will unpack our microscopic tools and perform an autopsy of the structure and contents of a DIGSI XML file. It will be a completely bloodless procedure since we don’t have to do any cutting: the code is open to all right from the beginning.

The knowledge that we’ve gathered by then will be used in Chapter 5 **Targeted Editing of Data** for the practical application. After studying these pages you will be able - just like the great cooking masters, to get more flavor through reduction. Clearly put: We will show you how you can shrink the code in the best case to only a few lines.

The parameter set is sacred, that much is clear. Chapter 6 **Safety Concept for the XML Import** therefore shows you to what lengths DIGSI 4 goes so that nothing goes wrong when importing XML data.

Many users manage setting data with the help of Microsoft’s Excel and often use its capabilities to calculate values with all sorts of formulas. Reason enough for Siemens to develop one macro and one add-in that organize the data exchange between Excel and DIGSI 4 considerably more effectively. Everything you need to know on this, you’ll find in Chapter 7 **Excel as Data Source**.

One topic that is of great importance for many is surely the exchanging of data with other applications that are at home in the power distribution area. Programs for line calculation or protection testing are examples of this. Nevertheless, we will only go into it very briefly in this manual. The reason being that you don’t need any special knowledge for this as far as DIGSI 4 is concerned. You export the data in XML or XRIO and you’re already at your goal. In Chapter 8 **Exchanging Data with Applications from the Power Distribution Area** you’ll only find a short fundamental overview.

Our **What Else You Should Know** - chapter with the Number 9 once again forms the conclusion of the book. There you will find a tabular overview of information numbers this time. What this is all about, you’ll find out in one of the next chapters.

Call me

If you have additional questions on this topic, our Hotline would be more than happy to help you:

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Fax: 01 80 - 5 24 24 71
e-mail: support.energy@siemens.com

Training

You can obtain the individual course offerings from our Training Center. There, Siemens offers you extensive courses on working with DIGSI 4.

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Beyond the horizon there´s more

If you're interesting in more information, here are two order numbers on the topic of DIGSI 4 and SIPROTEC.

- **DIGSI 4 Start Up** manual
  C50417-G1176-C152-A4
- **SIPROTEC 4 Tutorial** DVD
  E50001-U310-D21-X-7100

And now, have fun!

Little XML Science 2

Based on William Tunnicliffe's concept of Generic Coding, the separation of contents and form, you can no longer do without XML today. It stretches through practically all areas of the software world and enables connections that were not thought to be possible previously or at least could only be implemented with a great deal of effort.

Simple, not trivial

Even if the basic idea of XML is the simplification of handling, it doesn't mean that an XML document must therefore be necessarily trivial. To be sure, there are XML characteristics that can be called sophisticated. Luckily, our developers have managed to depict the data from a SIPROTEC 4 device in an easy to understand XML structure. You will become familiar with the special structure in Chapter 4. Here and now we will inform you of the basic terms and the best way to do that is with an example:

```
<Author Name="Gerald Gutwin" Job="Heavy laborer">

   <Characteristics>
         <Performance>maximum</Performance>
         <Wages>minimum</Wages>
   </Characteristics>

   <Charity Account="02 346 829" BLZ="01010101" />

</Author>
```

A code says more than a thousand words: Insights into XML and the life of the author.

Elementary parts

An XML code consists of elements. **Author** and **Characteristics** are such elements, but also **Performance**, **Wages** and **Charity Account**. Each element can have attributes and contents - but it doesn't have to. The element **Author**, for example, has the two attributes **Name** and **Job**. Each attribute has its value that is attached to the attribute name in the form of **="Value"**.

The content of an element can be a further element, such as is the case for **Author** and **Characteristics**. The elements **Performance** and **Wages**, on the other hand, simply have text as the content, namely **maximum** and **minimum.**

You can choose almost anything as the element names. You must, however, avoid some special characters.

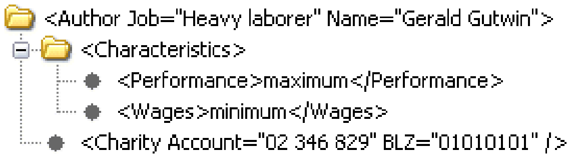
Tic Tag Toe

Elements, either with or without attributes, are always enclosed in two V-shaped brackets. Constructions such as **<Characteristics>** are called Tags. In this case, it is an opening Tag, in other words, the beginning of the following content. The end of this content must also be marked. For this, a slash is added and there you have a closing Tag: **</Characteristics>**. The name of the element, in this case **Characteristics**, can also be called Tag Name. By the way, only the element in an opening Tag can have attributes.

If an element only has attributes but no content, you may deviate from the described structure and get by with only one single Tag: <Charity Account="02 346 829" BLZ="01010101" />.

Sounding out nodes

Nodes are often talked about in conjunction with XML. For that it is helpful to picture the code as a tree structure. Our example from the previous page would then look like the following:



```
<Author Job="Heavy laborer" Name="Gerald Gutwin">
    <Characteristics>
        <Performance>maximum</Performance>
        <Wages>minimum</Wages>
    <Charity Account="02 346 829" BLZ="01010101" />
```

What all passes as nodes nowadays: The XML code as tree structure.

Each folder and every point that you see in the figure corresponds to a node. The nodes **Characteristics** and **Charity Account** lie on the same structure level. On this level and on the subordinate levels as well, you can arrange as many other nodes as you like. Only on the upper-most level can only one single node be located, the so-called root element. In our example, this is the element **Author**.

Now that’s enough

With that, you have really already learned all the basic terms needed in order to enter into the one and only DIGSI XML Code.

Exporting and Importing with DIGSI 4 3

You could already export and import data with DIGSI 4 right from the beginning. In the course of the various versions, formats were always added so as to fulfill the ever-changing requirements of the user. That is why we want to use this chapter, among other things, to explain all the possible import and export formats of DIGSI 4 in a brief overview. After that, we will show you how easy it is to export data into the XML format and then reimport it into DIGSI 4.

A Comparison of the Various Formats

The exporting and importing of data in the different formats is always connected to the current work situation. That is why you can trigger appropriate actions in the DIGSI Manager (export and import) as well as in the DIGSI Device Editor (only export). On the next pages we have summarized which formats are possible from where, whether it only functions in one or in both directions and which menu commands you need for it.

- **DEX**
  Direction: Export/Import
  Contents: All device data
  Program level: DIGSI Manager
  Commands: Edit → Export device, Edit → Import device

  DEX is the format that you choose to get a complete data image of a device in one single file. You use this bidirectional format to archive device data completely or even to exchange it between different projects. You can only use the DEX format within DIGSI 4 and you cannot edit it.

- **XML (for protective data)**
  Direction: Export/Import
  Contents: Protective data
  Program level: DIGSI Manager
  Commands: Edit → Export device, Edit → Import device

  XML for protective data or simply DIGSI XML is the format that it’s all about on these roughly 60 pages.

  The DIGSI XML format has the decided advantage that, on the one hand, it enables data exchange with other applications and on the other that it also permits the targeted changing of individual parameter values. This becomes possible through its readable and manually editable format. However, only protective parameter settings and routings can be exported, edited and reimported.

Settings for CFC and the device display have to stay on the outside. Also process data such as indications and measured values (with the exception of extended measured values) don´t flow into the XML file.

- **XRIO**
  Direction: Export
  Contents: Protective data
  Program levels: DIGSI Manager, DIGSI Device Editor
  Commands: Edit → Export device (DIGSI Manager), File → Export → Configuration & Protection parameters (DIGSI Device Editor)

  The XRIO format was developed by the OMICRON Company based on the RIO format in order to be able to pass data from a protective configuration system, in our case DIGSI 4, to their test systems. You can open files in the XRIO format without further ado using an XML editor; after all, it is also a matter of XML code. However, identifiers, contents and structure differ clearly from the DIGSI XML code.

- **XML (for system interface)**
  Direction: Export
  Contents: System interface data
  Program level: DIGSI Device Editor
  Command: File → Export → System interface (XML)

  With the help of this export format, a station control system can read in all information that is routed in DIGSI 4 on an IEC 60870-5-103 system interface. But watch out: This XML export has nothing to do with what we are dealing with extensively in this book. Of course, the structure of the exported code conforms in principle to the XML conventions. But the contents of the export file is limited *exclusively* to the mentioned interface data.

- **DBF**
  Direction: Export
  Contents: System interface data
  Program level: DIGSI Device Editor
  Command: File → Export → System interface (dBase)

  The dBase format DBF was developed at the beginning of the 1990s and is still a commonly used alternative to XML for connecting to instrumentation and control systems. Here, as well, DIGSI 4 exports exclusively data of the IEC 60870-103 system interface.

- **ELC (ASCII for ELCAD)**
  Direction: Export
  Contents: Protective data
  Program level: DIGSI Device Editor
  Command: File → Export → Configuration & Protection parameters

  In the ELCAD format, the parameter values and routings are stored in a file distributed on individual pages. This file can only be opened by current ELCAD program versions. Older program versions are not capable of importing several pages from one file.

- **CSV**
  Direction: Export
  Contents: Protective data
  Program level: DIGSI Device Editor
  File → Export → Configuration & Protection parameters

  In the CSV format (Comma Separated Values), the data is stored in a file line-by-line and separated by semicolons. Such files can be opened by many spread-sheet programs, even Excel. Disadvantages vis-a-vis DIGSI-XML: After importing in Excel, the data is presented in a rather uninviting layout. There is also no way back to DIGSI 4.

- **PDF**
  Direction: Export
  Contents: System interface data
  Program level: DIGSI Device Editor
  Command: File → Export → IEC 61850 system interface for documentation (PDF)

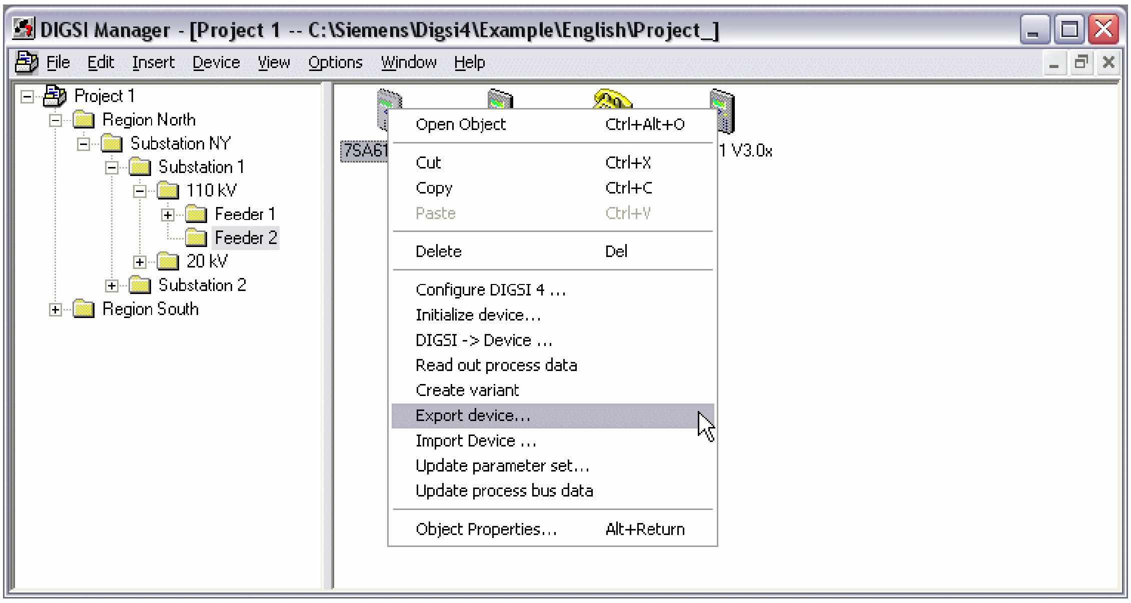
  The data of an IEC 61850-system interface can be exported in the PDF format for purely documentation purposes. The IEC 61850 Standard refers to this type of export as MICS (Model Implementation Conformance Statement). It is the readable form of the data contained in the device description file (ICD).

Conclusion

XML is THE format if you require a flexible and easy parameterization of protective settings, that also enables you to further use data already existing in Excel without having to type it all again. Whoever has to archive all device data, though, for example also settings for CFC and the device display continues to use the DEX format.

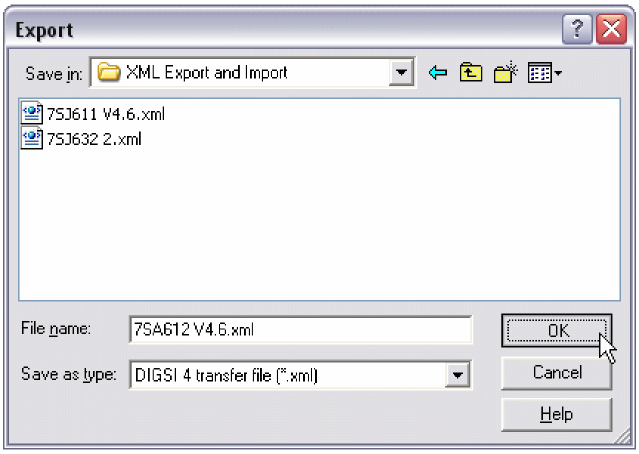
Exporting Device Data in XML

In order to get DIGSI 4 to export the data of a device into XML, you proceed in principle just as you always have when you exported it in the DEX format. Clearly put: You right-click on the symbol of the device concerned and select the command **Export device** from the pop-up menu.



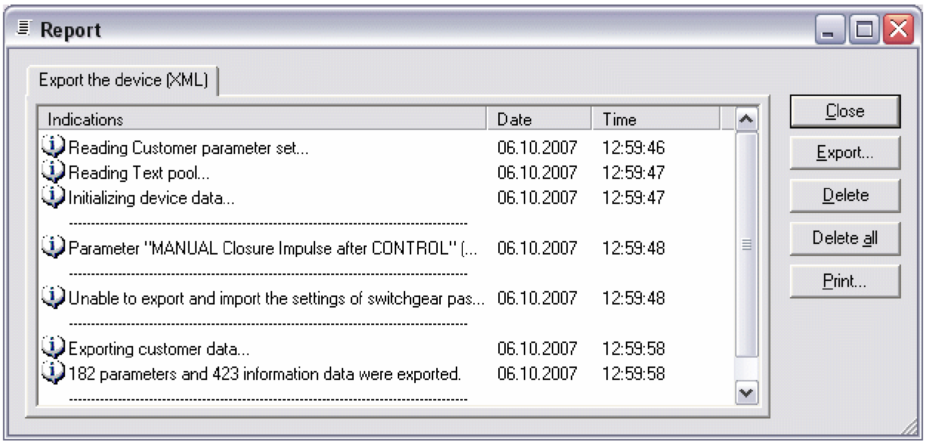
Business as usual: The command for exporting is the same as for exporting in the DEX format.

But wait! One prerequisite must be fulfilled so that DIGSI 4 starts with the data export. The device, whose data is to be converted into the XML format, must have been opened at least once with the DIGSI Device Editor. Should you have forgotten that, nothing earthshattering will happen. DIGSI 4 will simply make you aware of it and you can quickly correct it. Now let’s continue!


Export
Save in: XML Export and Import
7SJ611 V4.6.xml
7SJ632 2.xml
File name: 7SA612 V4.6.xml
Save as type: DIGSI 4 transfer file (*.xml)
OK
Cancel
Help

Accept suggestion or improve on it: Select Name and Directory

DIGSI 4 opens the Export dialog and you choose **XML** as the export format. If you don’t like the file name suggested by DIGSI 4, you can, of course, change it and then you can also define a destination directory. One click on **OK** starts the export, the progress and result of which you can follow in the Report window. It should look something like the following picture.



Indications	Date	Time
Reading Customer parameter set...	06.10.2007	12:59:46
Reading Text pool...	06.10.2007	12:59:47
Initializing device data...	06.10.2007	12:59:47
--		
Parameter "MANUAL Closure Impulse after CONTROL" (...	06.10.2007	12:59:48
--		
Unable to export and import the settings of switchgear pas...	06.10.2007	12:59:48
--		
Exporting customer data...	06.10.2007	12:59:58
182 parameters and 423 information data were exported.	06.10.2007	12:59:58
--		

Everything looks good: The Report shows only positive messages.

Log book

The Report window shows you warnings and success messages and with that a compressed overview. You get all the details by looking into the Log files that DIGSI 4 writes during the export (and also import). To find the path to these files, open the **Object Properties** dialog of the device concerned and click on the **DIGSI Manager** tab. The dialog then shows you a path that you follow up in the Explorer. When you get to the specified destination directory you then switch to the subdirectory **Para** and there you will find the two files **XmlExport.log** and **XmlImport.log**, both of which are very normal text files. By the way: With each import or export, the content of the respective file is overwritten.

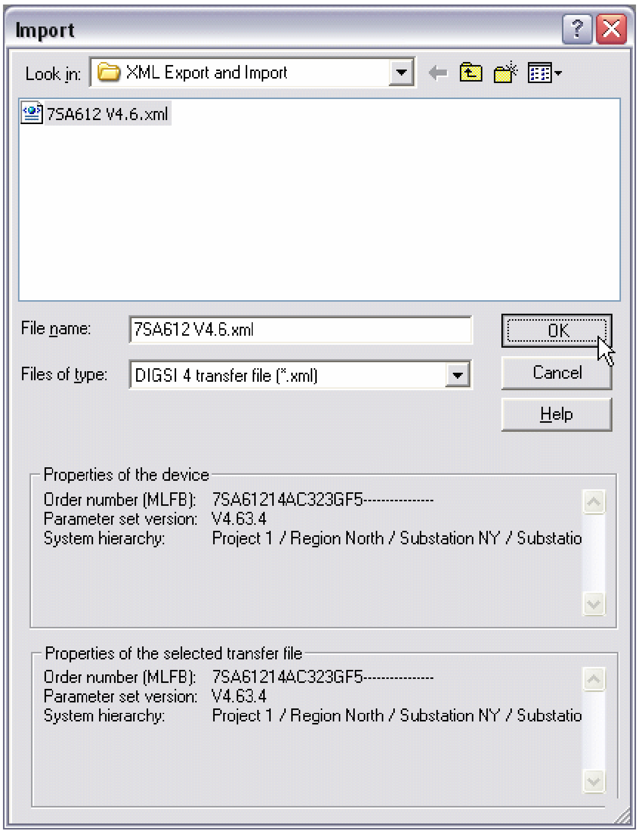
Importing Device Data in XML

To import the device data in the XML format into a device, right-click on it in the DIGSI Manager. From the pop-up menu, select **Import device** and that way open the Import dialog (see next page).

By comparison

In the lower half it shows you several characteristic data of the chosen device. This serves as orientation help in the selection of data to be imported. As soon as you have marked the name of the import file in the selection field, DIGSI 4 also shows some key data on the device that is hidden behind this XML code. Possibly at least. Since you could be dealing with a greatly reduced XML file, that doesn’t necessarily have to contain any information on a particular device, the information displayed could be quite skimpy.

From that we can also derive that DIGSI 4 shows itself to be far less rebuffing in this first step of the import as it is in the import of data in the DEX format. Only after you have clicked **OK**, does DIGSI 4 become really critical and of course makes sure that no damage is caused to the parameter set of the device. You'll find out more on this in Chapter 6.



Look in: XML Export and Import

7SA612 V4.6.xml

File name: 7SA612 V4.6.xml

Files of type: DIGSI 4 transfer file (*.xml)

Properties of the device

Order number (MLFB): 7SA61214AC323GF5---------------
Parameter set version: V4.63.4
System hierarchy: Project 1 / Region North / Substation NY / Substatio

Properties of the selected transfer file

Order number (MLFB): 7SA61214AC323GF5---------------
Parameter set version: V4.63.4
System hierarchy: Project 1 / Region North / Substation NY / Substatio

The comparison falls short: The XML file does not imperatively supply general device information.

Take it easy

For the first import try, we will make it easy and fall back on the file that we had previously exported for the same device. The displays for destination and source should therefore be complete and identical and nothing stands in the way of a click on **OK**. DIGSI 4 once again opens the Report window and keeps you informed about the import and, above all, the result. In our case, it should turn out to be positive.

As soon as the process has been successfully completed, transfer the data directly from the DIGSI Manager into the real device concerned. From the device symbols pop-up menu, select the command **DIGSI > Device**. In the dialog that then appears, select the connection type that corresponds to the actual physical connection between the PC and the device and click **OK**. DIGSI takes over the rest.

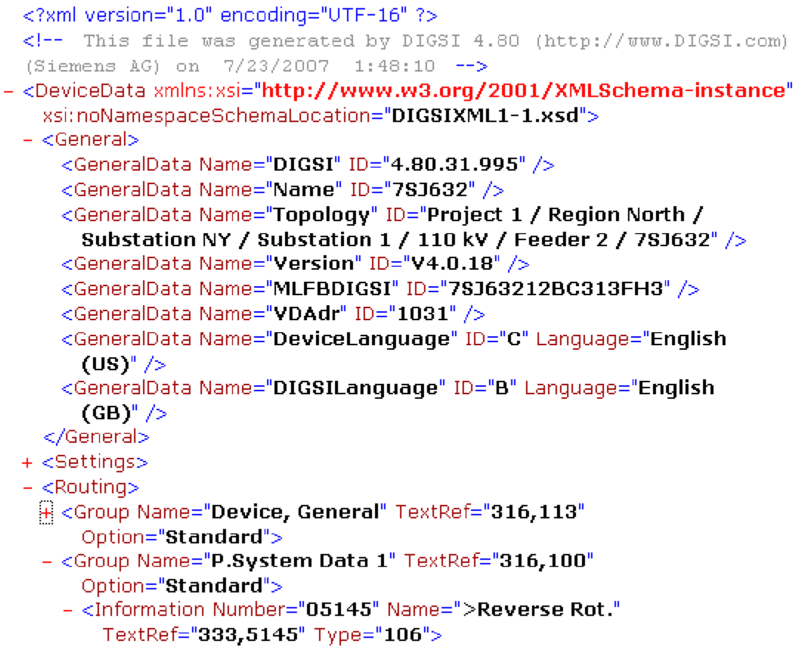
The DIGSI XML Code under the Microscope 4

In this chapter, we would like to take a closer look at the XML code exported by DIGSI 4. You will see that it is neither a question of witchcraft nor complex information that is only accessible to a few experts. On the contrary, you will quickly arrive at the conclusion that DIGSI 4 structures the required information for you well and presents it to you in appetizing morsels. And, with only a little exercise, you will quickly advance to professional and doing the applications presented in the next chapters will be a piece of cake for you.

Opening the XML Code in the Editor

Plain simple

To be able to examine the exported XML code, you basically require nothing more than that which your operating system already supplies, namely the Internet Explorer. Provided that you have not uninstalled it for ideological reasons, a double-click on the file name of the XML export file is all you need. And there you have it in all its glory. Here, nevertheless, only an excerpt.



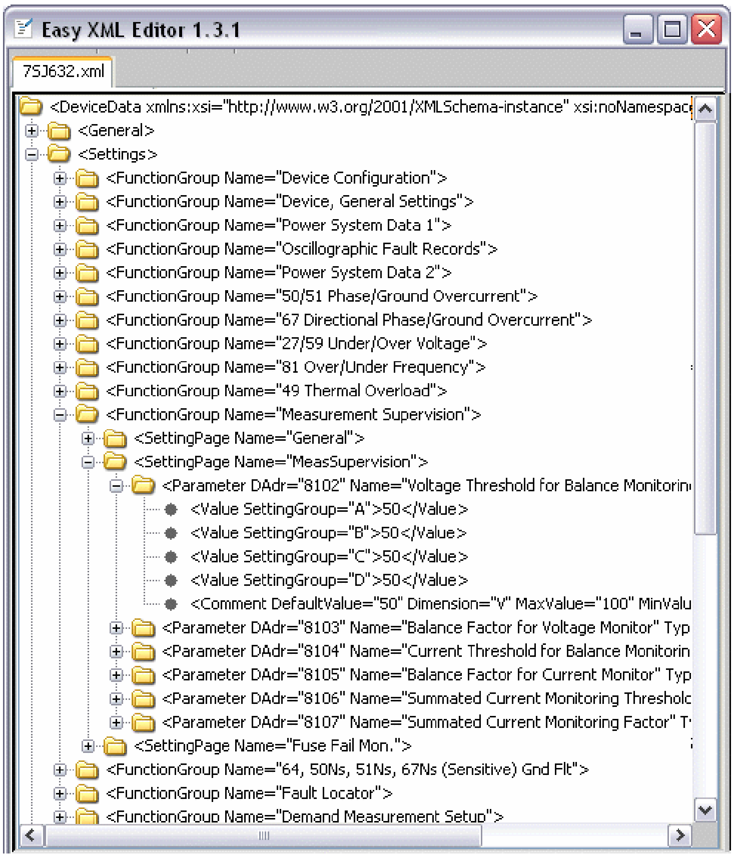
```
  <?xml version="1.0" encoding="UTF-16" ?>
  <!--  This file was generated by DIGSI 4.80 (http://www.DIGSI.com)
  (Siemens AG) on  7/23/2007  1:48:10  -->
- <DeviceData xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:noNamespaceSchemaLocation="DIGSIXML1-1.xsd">
  - <General>
      <GeneralData Name="DIGSI" ID="4.80.31.995" />
      <GeneralData Name="Name" ID="7SJ632" />
      <GeneralData Name="Topology" ID="Project 1 / Region North /
        Substation NY / Substation 1 / 110 kV / Feeder 2 / 7SJ632" />
      <GeneralData Name="Version" ID="V4.0.18" />
      <GeneralData Name="MLFBDIGSI" ID="7SJ63212BC313FH3" />
      <GeneralData Name="VDAdr" ID="1031" />
      <GeneralData Name="DeviceLanguage" ID="C" Language="English
        (US)" />
      <GeneralData Name="DIGSILanguage" ID="B" Language="English
        (GB)" />
    </General>
  + <Settings>
  - <Routing>
    + <Group Name="Device, General" TextRef="316,113"
        Option="Standard">
    - <Group Name="P.System Data 1" TextRef="316,100"
        Option="Standard">
      - <Information Number="05145" Name=">Reverse Rot."
          TextRef="333,5145" Type="106">
```

Not an excerpt from Shakespeare, but the excerpt from an XML export file.

The code is structured in different levels that are differently indented and thus can easily be distinguished from one another. Little minus and plus signs allow you to hide or once again display the contents of individual levels and nodes using a mouse-click. You lose this comfort feature, however, as soon as you wish to edit the code using standard tools. Because, after choosing **View → Source text**, Windows opens the code in Notepad and this doesn't allow you to even indent individual lines with the tabulator key.

Exotic food

A special XML Editor is therefore recommended, especially since they are available on mass and often are quite inexpensive. A little Google-ing gets you quickly to your goal. Here is an example for the representation of the code in an Editor that displays the XML structures in the form of folders.



```
<DeviceData xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespac
  <General>
  <Settings>
    <FunctionGroup Name="Device Configuration">
    <FunctionGroup Name="Device, General Settings">
    <FunctionGroup Name="Power System Data 1">
    <FunctionGroup Name="Oscillographic Fault Records">
    <FunctionGroup Name="Power System Data 2">
    <FunctionGroup Name="50/51 Phase/Ground Overcurrent">
    <FunctionGroup Name="67 Directional Phase/Ground Overcurrent">
    <FunctionGroup Name="27/59 Under/Over Voltage">
    <FunctionGroup Name="81 Over/Under Frequency">
    <FunctionGroup Name="49 Thermal Overload">
    <FunctionGroup Name="Measurement Supervision">
      <SettingPage Name="General">
      <SettingPage Name="MeasSupervision">
        <Parameter DAdr="8102" Name="Voltage Threshold for Balance Monitorin
          <Value SettingGroup="A">50</Value>
          <Value SettingGroup="B">50</Value>
          <Value SettingGroup="C">50</Value>
          <Value SettingGroup="D">50</Value>
          <Comment DefaultValue="50" Dimension="V" MaxValue="100" MinValu
        <Parameter DAdr="8103" Name="Balance Factor for Voltage Monitor" Typ
        <Parameter DAdr="8104" Name="Current Threshold for Balance Monitorin
        <Parameter DAdr="8105" Name="Balance Factor for Current Monitor" Typ
        <Parameter DAdr="8106" Name="Summated Current Monitoring Threshold
        <Parameter DAdr="8107" Name="Summated Current Monitoring Factor" T
      <SettingPage Name="Fuse Fail Mon.">
    <FunctionGroup Name="64, 50Ns, 51Ns, 67Ns (Sensitive) Gnd Flt">
    <FunctionGroup Name="Fault Locator">
    <FunctionGroup Name="Demand Measurement Setup">
```

Very orderly: XML Code can also be represented in a folder structure.

Notes in the margin: The Freeware XML Editor **XML Notepad 2007** is available from Microsoft, with which you can view the data in a structured manner and you can also modify this.

Keep in mind that you don't need any full-blown editor monsters for the work with DIGSI XML. The exported code does have some bulk but you will see as we go on that you will usually get by with just a few lines of code and that for the data exchange with other applications you really don't have to show any interest for the code itself.

Direct Assignment between Code and DIGSI 4

If the volume of the XML code exported by DIGSI 4 gives you a feeling of uneasiness at first glance, we can put your mind to rest: As far as the contents are concerned you basically don’t see anything new other than that which you otherwise also get to see within the framework of the DIGSI Device Editor. You only see the contents in another format.

Without any doubts

To make sure that you don’t have any more doubts, we would like to bolster this statement by means of a small code excerpt, before we devote ourselves to the complete structure of the code. (The code excerpt in reality also contains the data on the rest of the three parameters of the dialog register; we have left them out of the figure to make it easier to understand.)

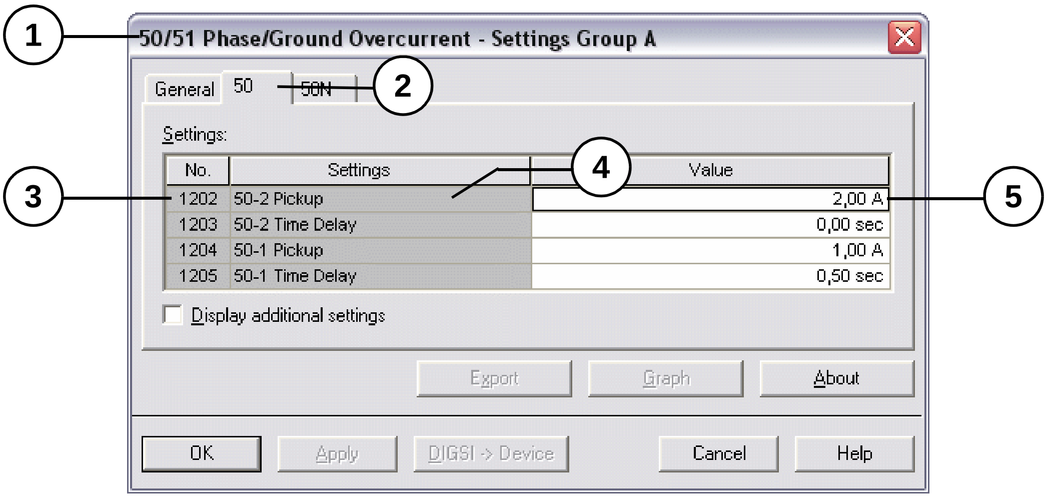
```
<FunctionGroup Name="50/51 Phase/Ground Overcurrent">

   <SettingPage Name="50">

      <Parameter DAdr="1202" Name="50-2 Pickup" Type="Dec">
         <Value>2.00</Value>

         <Comment Dimension="A" MinValue="0.10" MaxValue="35.00"/>
         <Comment AdditionalValidValues="oo" DefaultValue="2.00"/>
      </Parameter>

   </SettingPage>
</FunctionGroup>
```



50/51 Phase/Ground Overcurrent - Settings Group A

No.	Settings	Value
1202	50-2 Pickup	2,00 A
1203	50-2 Time Delay	0,00 sec
1204	50-1 Pickup	1,00 A
1205	50-1 Time Delay	0,50 sec

XML code and DIGSI 4: Always in dialog with one another.

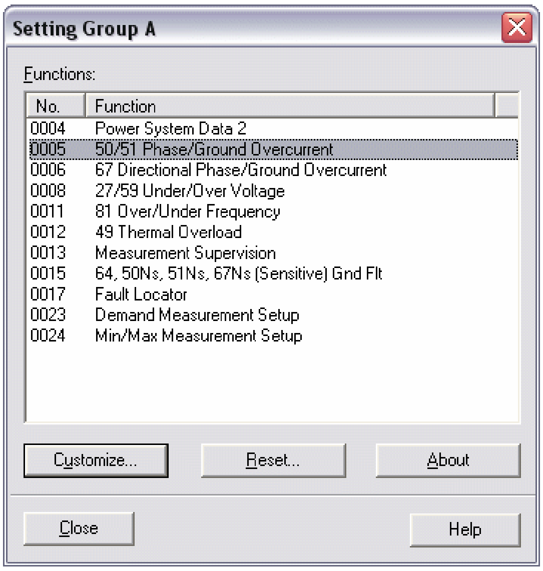
Numbered

The excerpt shows you parts of the function **50/51 Phase/Ground Overcurrent**. Directly underneath, you can see the matching dialog from the DIGSI Device Editor. We have given each of the corresponding elements the same numbers.

The excerpt shows that the DIGSI XML code contains XML tags conforming to standard that, on the one hand, reproduce the structure of the parameter set and, on the other, the meaning of the parameter. We have even gone one step further in the conversion: only that which is visible in the DIGSI 4 user interface or, if necessary, is listed in the appendix of any device manual goes into the XML file. But let’s not beat about the bush.

XML Connections

The previously shown excerpt from a DIGSI XML file begins with the tag **<FunctionGroup Name="50/51 Phase/Ground Overcurrent“>**. The element **FunctionGroup** leads us to the following DIGSI 4 dialog:



No.	Function
0004	Power System Data 2
0005	50/51 Phase/Ground Overcurrent
0006	67 Directional Phase/Ground Overcurrent
0008	27/59 Under/Over Voltage
0011	81 Over/Under Frequency
0012	49 Thermal Overload
0013	Measurement Supervision
0015	64, 50Ns, 51Ns, 67Ns (Sensitive) Gnd Flt
0017	Fault Locator
0023	Demand Measurement Setup
0024	Min/Max Measurement Setup

Group structure: All Function groups find themselves in this dialog again.

This dialog gives you in DIGSI 4 an overview of the configured functions and at the same time the opportunity to open these for editing. One of these functions is the Overcurrent time protection. In the tag shown, **50/51 Phase/Ground Overcurrent** is the value of the attribute **Name**. In this way, the connection between the selection dialog and also the dialog for editing the function is established, for you will find **50/51 Phase/Ground Overcurrent** in the title bar of this again.

The parameters for the overcurrent time protection are classified by topic into several dialog tabs to make them more transparent. These are also called **Setting pages**. The tag **<SettingPage Name="50">** gives you information, by means of the attribute value, in which dialog register in DIGSI 4 you would find the parameters that follow in the code.

In our case it is the tab **50**. It contains four parameters and in the code, as well, you find the description of four parameters between the opening tag **<SettingPage Name="50">** and the closing tag **</SettingPage>**.

Even if you can't see it: the style of the representation is the same in all cases. The tag reveals through its name **Parameter** what it's all about. The three attributes **DAdr**, **Name** and **Type** uniquely identify the parameter. DAdr stands for the Direct address, in the example 1202. The value of the attribute **Name** is nothing more than the identifier of the parameter, here **50-2 Pickup**. And with the attribute **Type** you get the information of whether it is, as in this case, a Decimal parameter or a Text selection parameter.

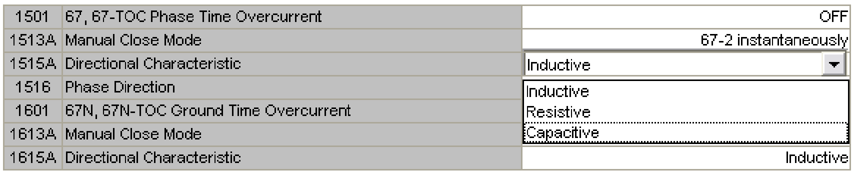
Commentary of value

You will find the value of the parameter one level lower, framed by two tags, in the form **<Value>2.00</Value>**. On this level, the code more or less also presents comment tags. The quantity of these tags depends on the respective parameter for these tags contain parameter-specific information. For decimal parameters these are, for example, the physical unit or the validity range within which values are permitted. The counterpart to this comment line is a Tooltip in DIGSI 4 that appears as soon as you position the mouse pointer on the input field in the dialog. This tooltip then also shows you the permitted value limits.

There are also comment lines for text selection parameters. These give you information about all the possible settings for this parameter. The counterpart in the DIGSI 4 dialog is a Selection list that also gives you an overview of the permitted values.

```
<Parameter DAdr="1515A" Name="Directional Characteristic" Type="Txt">
  <Value>25001</Value>
  <Comment Number="25001" Name="Inductive" />
  <Comment Number="25002" Name="Resistive" />
  <Comment Number="25003" Name="Capacitive" />
  <Comment DefaultValue="25001" />
</Parameter>
```

Fits like the lid to a pot: The possible values of a text parameter as comment lines ...



1501	67, 67-TOC Phase Time Overcurrent	OFF
1513A	Manual Close Mode	67-2 instantaneously
1515A	Directional Characteristic	Inductive
1516	Phase Direction	
1601	67N, 67N-TOC Ground Time Overcurrent	
1613A	Manual Close Mode	
1615A	Directional Characteristic	Inductive

... and as Selection list in DIGSI 4.

As you can see, it is not the text itself that is stated as the value in the XML code, but a numeric sequence that DIGSI 4 uniquely assigns for every possible selection text.

Speechless

Just a few words on the linguistics within the code. The individual elements are always presented with English terms. Contents such as parameter identifiers and textual parameter values, on the other hand, are exported by DIGSI 4 in the respective national language preset in the parameter set. What appears as a supposed irregularity at first glance gives you the advantage that you can directly read the contents of the exported code. However, DIGSI 4 ignores these national language elements during import of parameter values. You can therefore also leave these out in this case and, as you will see, reduce the code, depending on the application, to a few lines that then no longer contains any national language elements.

Basic Structure of DIGSI XML

A DIGSI XML file is well-formed. Please don’t associate anything incorrectly with this. Well-formed here means that all XML rules are followed. And the first one is that there is only one root element and/or on the highest level there is only one opening and one closing tag. In the DIGSI XML file, this element is called **DeviceData**; the associated tags are consequently **<DeviceData>** and **</DeviceData>**. Framed by these two tags, all information of the XML file is divided into three sections that are identified by the elements **General**, **Settings** and **Routing**.

```
<DeviceData>
   <General>
   <Settings>
   <Routing>
</DeviceData>
```

Practical: All data can be shrunk into three sections

All three elements are located on the same level depth. The effective section of an element is once again marked by one opening and one closing tag each.

General information

The section between the tags **<General>** and **</General>** provides information that identifies the device itself from which the further data was exported. It is therefore, in the figurative sense, the licence plate and the chassis number.

The next figure shows you the exact information. The DIGSI 4 version that generates the code belongs to it just as does, for example, the location of the device within the project.

```
<General>
  <GeneralData Name="DIGSI" ID="4.80.31.995" />
  <GeneralData Name="Name" ID="7SJ632" />
  <GeneralData Name="Topology" ID="Project 1 / Region North / Substat ..." />
  <GeneralData Name="Version" ID="V4.0.18" />
  <GeneralData Name="MLFBDIGSI" ID="7SJ63212BC313FH3" />
  <GeneralData Name="VDAdr" ID="1031" />
  <GeneralData Name="DeviceLanguage" ID="C" Language="English (US)" />
  <GeneralData Name="DIGSILanguage" ID="C" Language="English (US)" />
</General>
```

In general, nothing to say against it: The node General provides the key data of the device.

House sharing

If we go one house further, we bump into the element **Settings** with its renters, the **Parameters**, whom you met briefly in the last section. These live there in various cohabitations that are called **FunctionGroups**. More or fewer parameters have to share a room in the form of **SettingPages**. The following basic XML structure reveals a look at this peaceful co-existence.

```
<Settings>

  <FunctionGroup Name="27/59 Under/Over Voltage">

    <SettingPage Name="General">

      <Parameter DAdr="5101" Name="27 Undervoltage Protection" Type="Txt">

        <Value SettingGroup="A">23</Value>
        <Value SettingGroup="B">22</Value>
        <Value SettingGroup="C">23</Value>
        <Value SettingGroup="D">12700</Value>

        <Comment Number="23" Name="OFF" />
        <Comment Number="22" Name="ON" />
        <Comment Number="12700" Name="Alarm Only" />
        <Comment DefaultValue="23" />

      </Parameter>

    </SettingPage>

  </FunctionGroup>

</Settings>
```

Little room for individuality: The structures in the Settings area are principally always the same.

Notes in the margin:
The size of the values divulges it immediately: DIGSI 4 always exports secondary values - and also expects such during import.

What we had still withheld in the preceding section, but you can now well recognize, is the influence of the setting group on the code. During export, DIGSI 4 supplements the element **Value** with the attribute **SettingGroup** that can have the values A, B, C or D. In that way differently set parameter values can also be brought into the setting groups in the XML code. By the way, DIGSI 4 always exports parameters that are part of a setting group in the manner shown, even if you have deactivated the setting group configuration and have never set different parameter values. In this case, one identical parameter value is displayed for all four setting groups.

The route-thing

The third element **Routing** encompasses with its two tags the largest of the three sections of the XML code. This is also understandable if you take a look at a completely displayed matrix and keep in mind that DIGSI 4 exports each single routing. This doesn't have to make us uneasy for this data is clearly structured as well.

```
<Routing>

   <Group Name="Device, General" TextRef="316,113" Option="Standard">

      <Information Number="00003" Name=">Time Synch" TextRef="333,3" Type="105">

         <Properties>
         <Source>
         <Destination>
         <SysInterface Type="IEC60870-5-103">

      </Information>

      <Information Number="00005" Name=">Reset LED" TextRef="333,5" Type="106">

      ...

   </Group>

</Routing>
```

For routings as well: Always following the same pattern.

The information is, similar to the matrix, also summarized in groups in the XML code. The element **Group**, whose tags identify the individual groups, has three attributes. The value of the attribute **Name** is identical to the identifier of the button that is used in the matrix to show and hide the information group. The attribute **TextRef** is a reference to the long text of the information that is stored in the device textpool. The attribute **Option** occupies a special position. You won't find any counterpart to this in the matrix or elsewhere in the parameter set of the device. This attribute is completed during the export.

Depending on the value set, it only unfolds its effect once it is reimported into the device. Put briefly, this attribute is important as soon as you want to manipulate individual groups and information. Since this is the topic of the next chapter, we ask for your patience.

Dividing

All data that is in touch with one single piece of information is subdivided into four sections. The element **Properties** identifies the section that summarizes all properties of an information and its values. The sections that are assigned to the nodes **Source** and **Destination** contain the routings of the information to sources and destinations. And even though the system interface in the matrix is in each case part of the sections **Source** and **Destination**, it is represented in the code by its own element. The reason for this: The system interface is not only source or destination for routings, it also has its own properties that are stored here in the code.

Depth psychology

Let’s now drop down a level in the direction of the actual information and have a look at it with all of its detail.

```
<Information Number="00003" Name=">Time Synch" TextRef="333,3" Type="105">

  <Properties>
    <Value Name="Select Message In Fault Record">false</Value>
    <Value Name="Software Filter Time">0</Value>
    <Value Name="Retrigger Filter">false</Value>
  </Properties>

  <Source>
    <Value Name="Binary Input" />
    <Value Name="CFC">false</Value>
  </Source>

  <Destination>
    <Value Name="Binary Output" />
    <Value Name="LEDs">L5,U7</Value>
    <Value Name="Operational Indication Buffer">K</Value>
    <Value Name="Sensitive Ground Fault Indication Buffer" />
    <Value Name="CFC">false</Value>
    <Value Name="Default Display">false</Value>
  </Destination>

  <SysInterface Type="IEC60870-5-103">
    <Value Name="Source">false</Value>
    <Value Name="Destination">true</Value>
    <Value Name="Function Type (Destination)">135</Value>
    <Value Name="Information Number (Destination)">48</Value>
  </SysInterface>

</Information>
```

Information and more information: The XML code is in no way inferior to the matrix (for that reason slightly abridged here).

The code excerpt shows that even the element **Information** has a series of attributes. This also corresponds to the representation in the matrix where a piece of information is also further described by several details. In the sequence from left to right, this is first of all the information number and the display text, represented in the tag with the attribute **Name**. The long text is once again referenced with the value of **TextRef**. And the attribute **Type** contains a code number as a value that stands for a specific information type, for example, **External double message**. In Chapter 9, you will find a tabular overview that shows you all info types each with an associated code number.

Between the two tags **<Properties>** and **</Properties>**, DIGSI 4 places, during export, the properties of an information including the associated values. In the matrix, you get at this by right-clicking on the info number, for example, to open the pop-up menu and selecting **Properties**.

Writing styles

The writing styles in the code are comparable to the ones in the parameter settings with the difference that the attribute **Name** has been placed at the side of the element **Value**.

<Value Name="Software Filter Time">3</Value> therefore means that the property **Software Filter Time** has the value **3**.

<Value Name="Retrigger Filter">false</Value> means nothing more than that the option **Retrigger Filter** has not been selected (= false).

Let’s look a little further to the section between the two source tags. There, the message **<Value Name="Binary Input">L3</Value>** proclaims that the information with the option **L** (active without voltage) is routed as source on the binary input **3**.

Compared to that, the tag **<Value Name="Binary Output" />** in the destination section tells us that the message is not routed to any of the binary outputs. In this case, the usual construction is not necessary in which the opening and closing tag takes the element value between them. For elements without content, one single tag in the writing style shown is also possible.

You can now easily interpret the rest of the code excerpt entries by yourself based on what has already been said.

By the way: The property names in the Properties nodes are always English regardless of which language the device used from which the code was exported. The abbreviations of the routing options such as **L** for **Latched** or **U** for **Unlatched** on the other hand depend on the selected DIGSI language, not however on the device language.

Targeted Editing of Data 5

The XML code exported by DIGSI 4 not only contains the pure data on settings and routings. It is enriched with a multitude of directly readable information that makes sure that you can understand the code right off the bat. In reality though, DIGSI 4 puts up with far less during the import of the XML code into a device than you would like to assume when you first glance at the code. In the minimum case, it is merely 5 lines of code! How you can make use of this DIGSI 4 import feature is the topic of this chapter. Whoever then would frequently like to change individual parameters specifically for test purposes, transfer function settings from one device to another or would like to undertake routings using XML, should by all means read on.

Reducing the Code

To make it clear right up front: There is nothing wrong with working with the complete XML file if you would only like to change one single parameter value in a device. But it's even better, if you don't do it.

Argumentation help

First argument: Clarity. Five lines of code are simply clearer and easier to grasp than several hundred. Second argument: Re-usability. You write a code segment once and import it in as many devices as you like. These can definitely be different as long as they belong to the same type family (such as, 7SJ62 >> 7SJ64). This is not only true for code segments with which you only want to change exactly one parameter value or one routing. Even when you change several settings in a file, the benefit is on your side.

Everything that a DIGSI 4 needs

How drastically you can evaporate the code not only depends on the number of changes that this is to affect. Crucial as well is whether you are dealing with parameter values or routings. The handling of routings is a little more complex than that of parameter values. This of course lies in the nature of things. You change a parameter value. That's it. You can neither delete the associated parameter nor can you re-generate a parameter. All of this, however, is possible with routings. You remove routings of individual information or you re-route these to sources and destinations. You generate new, user-defined information and information groups and you delete existing ones - all with XML!

Rules

Regardless of whether you want to change parameter values, routings or both with your homemade knitted XML file, the following rules are true:

Notes in the margin:
If you want to import the XML code in a new device, like it is possible with the DEX format, you have to leave the General section in the XML file. Based on this data, DIGSI 4 then generates a new device with the standard values and then adapts these to the values specified in the XML file.

1. The code must begin with the tag **<DeviceData>** and end with the tag **</DeviceData>**.
2. On the same upper-most level where these two tags are located, no other code may bustle about. The exception is comment lines in the form like this, for example:
   <!-- This file was written by Gerald Gutwin-->.
3. You can leave out the tags **<General>** and **</General>** with everything that lies between them. You do however provoke a warning during data import with this, but you may simply ignore it.

Changing Individual Parameter Values

Let's have a look at the code segment that DIGSI 4 would generate if it could export one single parameter. The parameter **27 Undervoltage Protection** would appear as follows:

```
<DeviceData>
   <Settings>
      <FunctionGroup Name="27/59 Under/Over Voltage">
         <SettingPage Name="General">
            <Parameter DAdr="5101" Name="27 Undervoltage Protection" Type="Txt">
               <Value SettingGroup="A">23</Value>
               <Value SettingGroup="B">23</Value>
               <Value SettingGroup="C">23</Value>
               <Value SettingGroup="D">23</Value>
               <Comment Number="23" Name="OFF" />
               <Comment Number="22" Name="ON" />
               <Comment Number="12700" Name="Alarm Only" />
               <Comment DefaultValue="23" />
            </Parameter>
         </SettingPage>
      </FunctionGroup>
   </Settings>
</DeviceData>
```

Purely hypothetical: DIGSI 4 would export this code for one single parameter.

Throwing off ballast

Quite a lot of stuff for one parameter. But from the point of view of DIGSI 4 just enough so that you can correctly classify the parameter and receive all the information you need in order to know which values it can accept. In your minimum XML file you don't necessarily need exactly this information and DIGSI 4 knows anyway which values a parameter may accept. So, the first thing to go is the comment lines.

Likewise, the SettingGroup attributes are not necessary if the value is to be the same in all parameter groups, so get rid of these as well.

Now, a decisive system benefit of DIGSI 4 and SIPROTEC 4 comes into play: Each parameter has a unique numbering, the so-called direct address **DAdr**.

That means that simply by way of this direct address, a parameter can already be uniquely identified. The name and the type of the parameter is also information that doesn’t play a role for the importation. The only correct consequence: Leave it out! The same goes for the elements **SettingPage** and **FunctionGroup**. It’s all information that results from the direct address of the parameter and, for that reason, no longer needs to be explicitly mentioned.

Finally, the Setting tag is also dispensed with because it goes without saying that parameters are only found in the section **Setting**. The minimum code segment to change the value of a single parameter looks much more promising after this radical diet:

```
<DeviceData>
   <Parameter DAdr="5101">
        <Value>23</Value>
   </Parameter>
</DeviceData>
```

Greatly reduced: These five lines are enough to change a parameter value using XML.

Variety

If you would still like to place different values for the parameter in the individual parameter groups, you simply expand this mini script by further value tags including SettingGroup attributes. But even then, the code segment remains easy to handle.

```
<DeviceData>
   <Parameter DAdr="5101">
     <Value SettingGroup="A">23</Value>
     <Value SettingGroup="B">22</Value>
     <Value SettingGroup="C">22</Value>
     <Value SettingGroup="D">22</Value>
   </Parameter>
</DeviceData>
```

Put on a little bit again: With these expansions, you serve the parameter groups with different values.

Importing an XML Segment

So that this whole thing doesn't become too dry, we'll make proof of the matter right away. We'll generate a 7SJ645, open it once and close it again so that it is ready for the XML import.

Software switch

For every device inserted new in a project, the setting group change option is deactivated. We want to change this with a small code segment and set it to **existing**. For that we need the following XML script:

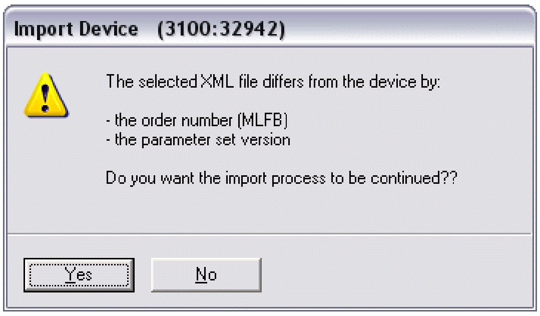
```
<DeviceData>
   <Parameter DAdr="0103">
         <Value>8</Value>
   </Parameter>
</DeviceData>
```

With this easy-edit script you activate the setting group change option.

The direct address 0103 belongs to the parameter **Setting Group Change Option** that you find in every device in the dialog for functional scope. The value 8 corresponds with the setting **existing**.

You can write the code with any standard text editor and give the file any name you like, for example, **Activate Change Group Option**. While the name plays a subordinate role, it is however extremely important that you use **.xml** as the file extension.

In the DIGSI Manager, you now select the device with a right mouse-click and from the pop-up menu choose **Import device**. With the Import dialog you look for your XML file and click on **OK**. DIGSI 4 will now give you a warning in the following form:



Import Device (3100:32942)

The selected XML file differs from the device by:

- the order number (MLFB)
- the parameter set version

Do you want the import process to be continued??

Identity unclear: DIGSI 4 sends a reminder that order number and parameter set version are missing.

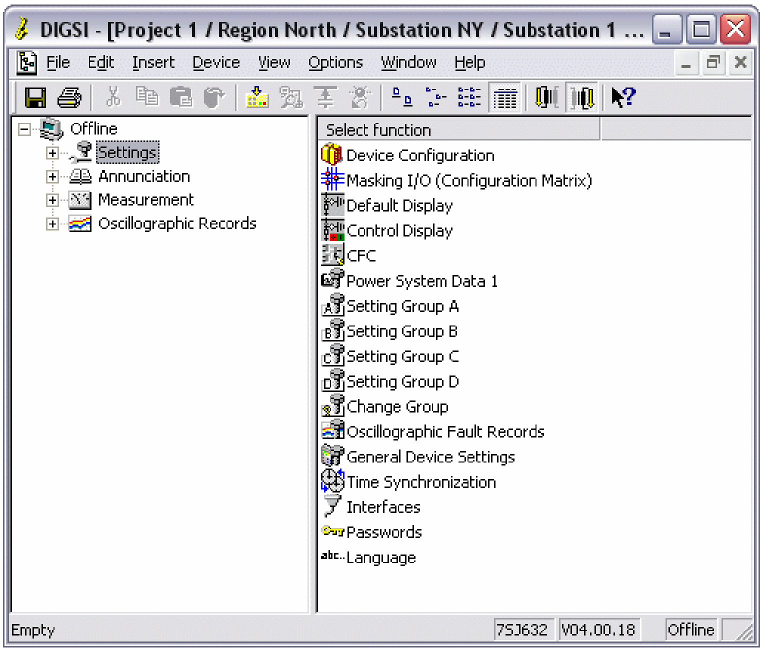
This is nothing critical because it is a completely natural reaction of DIGSI 4. It is missing the information for the unique identification of the device.

That is why it is making you aware that the data could also belong to another device and therefore might not fit to the selected destination device. You acknowledge this warning with a click on **Yes** for, after all, you know that the data is compatible with each other.

Convinced

DIGSI 4 begins with the import, the progress of which you can once again follow in the Report window. If the import of the data was successful, which we can predict with 100 percent accuracy for our sample task, you still have to explicitly okay that the updated parameter set is really to be stored. This is your last opportunity to prevent the changes. In the current case, you click on **Yes** without giving it a thought.

You can easily check whether the XML script has shown the desired effect by opening the device for editing. As soon as you have brought forward the function settings by double-clicking on **Parameter**, you will see it right away: The entries for all four parameter groups are visible. The XML code worked.



Made it: The parameter groups switchover was activated without using the help of the DIGSI device editing.

Copying Complete Function Settings

Changing individual parameter values probably has its reasons for test purposes. In the every-day parameterization world, you will more than likely be confronted with the demand to change several parameter values simultaneously with an XML file.

Nothing to argue about. A plausible application would, for example, be to cover all settings of a function with one XML file. In the next figure you see the code for the Time Overcurrent function.

```
<DeviceData>

   <!--  Time overcurrent function -->

   <Parameter DAdr="1202">
      <Value>2.00</Value>
   </Parameter>

   <Parameter DAdr="1203">
      <Value>0.00</Value>
   </Parameter>

   <Parameter DAdr="1204">
      <Value>1.00</Value>
   </Parameter>

   <Parameter DAdr="1205">
      <Value>0.5</Value>
   </Parameter>

</DeviceData>
```

Globetrotter: This code segment feels at home almost everywhere.

The great thing about it: You can import the XML code shown within a device family (such as, 7SA) in devices of different types; the destination device just has to have this function. In principle, you proceed as follows:

1. You export the device data from a specific type in XML.
2. From the export file, you copy the code section that describes the function settings into a new file.
3. You complete the code segment with the tags **<DeviceData>** at the beginning and **</DeviceData>** at the end.
4. Optionally, you remove comment lines and other information that is not relevant for the import.
5. You import the file into other device types of a device family.

By the way, it doesn’t matter which national language is set on the destination device. Because as you can see from the code, except for the English language tag names and a comment line, which you could also leave out, it is independent of a specific national language.

Basically, with a script skeleton, you can also copy settings between different device families. Then all you have to do, if its necessary, is change the direct addresses since these don’t necessarily correspond.

Changing Routings and Properties of Existing Information

The highly tooted language independence in setting parameter values is not necessarily given when changing routings and properties of information. That is because not all information in the matrix has a unique identifier that is comparable to the direct address of a parameter. Beyond that, properties of information must fit completely when it has to do with the unique identification based on an address or something similar.

What must be, must be

Let’s first of all have a look at the minimally-invasive script that is necessary to change one single routing.

```
<DeviceData>
   <Routing>
      <Group Name="System Data 2">
         <Information Number="04601" Type="106">
            <Source>
               <Value Name="Binary Input">H2</Value>
            </Source>
         </Information>
      </Group>
   </Routing>
</DeviceData>
```

Less is not possible: With this mini script, you change a routing.

With the code segment shown, you route the information with Number 04601 to the binary input 2 and use Option H (active with voltage) for that. A brief listing summarizes the special features of this script:

- All actions that affect the routing matrix must be completely enclosed by the two Routing tags.
- Information that is edited must always be subordinate to its groups.
- The Information tag must always contain the type attribute including a value.
- The actual values must be assigned to one of the three sections **Properties**, **Source** or **Destination**.

Declaration of independance

The Name attribute with the value **System data 2** makes the script above dependent on a particular national language. For that reason, DIGSI 4 cannot import this error-free into a device with a differently set national language. To avoid this conflict, you could instead use the attribute **TextRef**. Since it is a question of a language-independent reference to a list with text, the importing then functions.

In the following code segment, we have, as an example, resorted to the TextRef attribute and at the same time incorporated a property whose value we want to change to **true**.

```
<DeviceData>
   <Routing>
      <Group TextRef="316,9">
         <Information TextRef="333,4601" Type="106">
            <Properties>
               <Value Name="Select Message In Fault Record">true</Value>
            </Properties>
            <Source>
               <Value Name="Binary Input">H2</Value>
            </Source>
         </Information>
      </Group>
   </Routing>
</DeviceData>
```

Multitasking: With this script, you influence several data at the same time.

There are, however, several downers to this: Firstly, you can, in all probability, hardly imagine what information is meant by TextRef **232, 66**. Here it is surely helpful to leave or to incorporate the affected comment line of the XML export file, which gives you the meaning of a particular text reference, in the code. Secondly, you cannot use the TextRef in conjunction with user-defined groups and information. In this case, you will have to fall back on the Name attribute. And thirdly, the routing options like **L** for **Latched** or **U** for **Unlatched** depend on the selected DIGSI language (we already mentioned this in the preceding chapter). Our tip: When you make changes to routings, decide on a uniform language-dependent version and insert a reduced General section with unique language information at the beginning of the XML code. Better safe than sorry!

Generating and Deleting User-defined Information and Groups

Even if you work with XML, you shouldn’t limit your own creativity. For that reason, don’t only build on what’s existing, you can also produce something new. Let’s begin by enriching the matrix with a new information group.

Group dynamics

What you would normally do with pop-up menu and the command **Insert Group**, is taken over in the XML world by the following rhyme-free five-liner.

```
<DeviceData>
   <Routing>
      <Group Name="New Group" />
   </Routing>
</DeviceData>
```

With only five lines to success: This script doesn’t cause any damage to the matrix, but a new group.

As you can see, the code has been kept extremely simple. In addition to the obligatory DeviceDate and Routing tags, there is only need for one further tag, that is self-enclosed, that contains as an attribute the name of the new group. In the practical life of parameterization, please forgive us for the farthest-reaching senseless term **New Group**, but it simply brings it right to the point at this moment. Since we don’t do anything half-baked, we will expand the code segment so that in addition to the new group, and directly in it, we will insert a new information. And now guess what we will call it.

```
<DeviceData>
   <Routing>
      <Group Name="New Group">
         <Information Name="New Info" Type="131" />
      </Group>
   </Routing>
</DeviceData>
```

For all that, consistent: A new information is inserted in the new group.

In the interpretation of this modern lyric, DIGSI 4 first of all checks whether it is possibly a question of a plagiarism, that a group of the same name already exists. If no, DIGSI 4 generates such a group and then inserts the just as new information in this new group. Should, however, a group already exist that has the desired name, DIGSI 4 simply adds the new information to this group. What is important is that along with a name, you also send the new information on its way with a valid type.

Delete it

Apropos way: The reverse way, that is, the deleting of user-defined information and groups is also possible with XML. For that, two new attributes come into the game. The attribute **Option** for the element **Group** as well as the attribute **Delete** for the element **Information**.

DIGSI 4 already adds these attributes to the XML code during export and fills them with standard values that cannot do any damage during re-entry into the DIGSI 4 atmosphere. The attribute **Option** contains the value **Standard**, the attribute **Delete** the value **no**.

If you want to use the export file to delete some information and groups, you only have to change the values of the attributes concerned. Or, you once again use individual code segments as we will show and describe in the following.

Version 1

You want to specifically delete individual information within a group. For that, you add the attribute **Delete** with the value **yes** to the information that is to be deleted.

```
<DeviceData>
   <Routing>
      <Group Name="New Group">
         <Information Name="New Info" Type="131" Delete="yes"/>
      </Group>
   </Routing>
</DeviceData>
```

Individual extinguisher: With this script, you remove specific individual information.

Version 2

You want to delete a group with all the information contained in it. For that, you add the attribute **Option** with the value **DeleteGroup** to the group that is to be deleted.

```
<DeviceData>
   <Routing>
      <Group Name="New Group" Option="DeleteGroup" />
   </Routing>
</DeviceData>
```

Group extinguisher: With this script, you remove entire groups.

Version 3:

You want to specify exactly what the contents of a group are to look like in order to send one or several devices on their way with a kind of basic equipment. For that, you complete the group concerned with the attribute **Option** with the value **Complete**. Then, between the Group tags, you list all the information that is to remain of the existing ones or that is to be added.

```
<DeviceData>
   <Routing>
      <Group Name="New Group" Option="Complete">
         <Information Name="New Info" Type="131" />
         <Information Name="Another Info" Type="105" />
         <Information Name="Existing Info" Type="124" />
      </Group>
   </Routing>
</DeviceData>
```

You do the determining: With this script, you specify the result concretely.

Safety Concept for the XML Import 6

In the last chapter you already noticed that DIGSI 4 doesn’t accept what it gets placed before it during the import of XML data without checking it. It immediately recognized and criticized the lack of device-specific features such as the MLFB. In this case, it left the decision to continue with the import with you anyway. First of all, there is no direct danger for the parameter set because of the lack of general device information. And secondly, a rigid attitude by DIGSI 4 at this point would make it impossible to write XML scripts that are to be used by different devices. But as soon as there is danger ahead, DIGSI 4 intervenes uncompromisingly - for the safety of the parameter set.

Threefold is just better

The safety concept for the importing of data in the XML format is three-stage: After a device validation, there follows a syntax check and then a plausibility control of all parameters, routings and values.

Device Validation

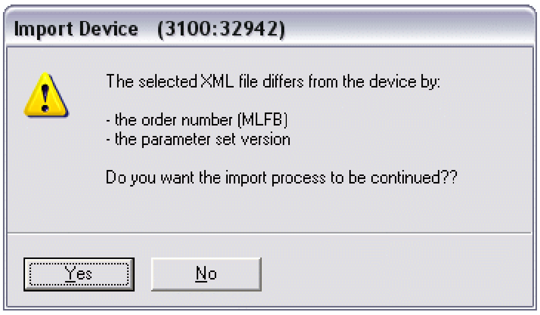
In the first step, DIGSI 4 compares the information on the device that it finds under the XML node **General** with that in the parameter set. Let’s bring back to mind which general device data DIGSI 4 inserts in the XML file during export.

```
<General>
  <GeneralData Name="DIGSI" ID="4.80.31.995" />
  <GeneralData Name="Name" ID="7SJ632" />
  <GeneralData Name="Topology" ID="Project 1 / Region North / Substat ..." />
  <GeneralData Name="Version" ID="V4.0.18" />
  <GeneralData Name="MLFBDIGSI" ID="7SJ63212BC313FH3" />
  <GeneralData Name="VDAdr" ID="1031" />
  <GeneralData Name="DeviceLanguage" ID="C" Language="English (US)" />
  <GeneralData Name="DIGSILanguage" ID="C" Language="English (US)" />
</General>
```

Program repetition: Here once more the general device data.

Opinion poll

If this information is now different or the node doesn't even exist, you will get at least one or even several warnings. The first of these you already know:



Import Device (3100:32942)

The selected XML file differs from the device by:

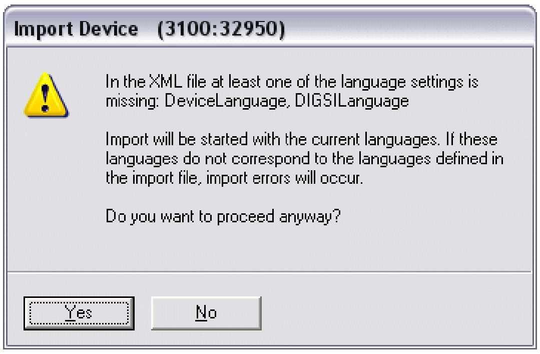
- the order number (MLFB)
- the parameter set version

Do you want the import process to be continued??

Already known: The identity of the device cannot be clarified.

If you acknowledge this warning with a click on **Yes**, DIGSI 4 will probably show you a second warning and then always when the following two prerequisites are fulfilled at the same time:

- Both attributes **DeviceLanguage** and **DIGSILanguage** are missing and with that the reference to a specific national language.
- The XML file contains changes to the routing.



Import Device (3100:32950)

In the XML file at least one of the language settings is missing: DeviceLanguage, DIGSILanguage

Import will be started with the current languages. If these languages do not correspond to the languages defined in the import file, import errors will occur.

Do you want to proceed anyway?

Your opinion is asked for once more.

Conclusions

The two prerequisites mentioned above mean that this message will never appear as long as you only want to influence parameter values with the XML file. This is because language-dependent additions of a parameter like its name are always ignored during import; after all, the direct address is sufficient for identification.

With routings it is different. Information and groups can to a certain extent also be language-independently recognized by means of the attribute **TextRef**. In many cases, though, a language-dependent identification is necessary, such as for user-defined groups and information or the abbreviations of routing options. For that reason, DIGSI 4 always draws your attention to possible incompatibilities.

Your responses to this warning should therefore be as follows. If there are no language-dependent identifiers in your XML file, ignore the message and click on **Yes**. If this is not so, you should first of all check whether the language set in the device is the same as that used for the names in the XML file.

If for some reason you don't make the right decision at some point in time and you still click on **Yes**, nothing earth-shattering is going to happen. DIGSI 4 will generate a message in the Report window for every incompatibility and will not adopt the data in the parameter set. If the import is then completed, you still have the opportunity to forego a definitive saving of the temporarily changed parameter set.

Wishful thinking

Just a word on the specification of the language. DIGSI 4 analyzes exclusively the two IDs and ignores the value of the attribute **Language**. The wish for dialects like in the following script will hence remain a wish.

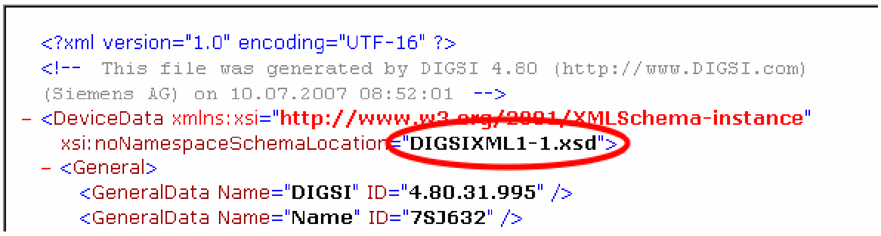
```
<General>
   <GeneralData Name="DeviceLanguage" ID="C" Language="Southern Drawl" />
   <GeneralData Name="DIGSILanguage" ID="C" Language="Texas Twang" />
</General>
```

Unfortunately stands way down on the list of features still to be implemented.

Syntax Check

Provided that DIGSI 4 had no reason for concern during the device validation or you confirmed all occurring warnings with **Yes**, we now enter the second phase of the import.

The syntax check is to find out whether all nodes are syntax-correct, that is, that they can also be analyzed in the next step. For that, DIGSI 4 scrutinizes the XML file with an existing scheme. This scheme is also an XML file that lays down the fundamental structure as well as tag name(s) and permissible attributes. You will find the name of this Schema file (scheme) at the very top of the exported XML file.



```
  <?xml version="1.0" encoding="UTF-16" ?>
  <!--  This file was generated by DIGSI 4.80 (http://www.DIGSI.com)
  (Siemens AG) on 10.07.2007 08:52:01  -->
- <DeviceData xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:noNamespaceSchemaLocation="DIGSIXML1-1.xsd">
  - <General>
      <GeneralData Name="DIGSI" ID="4.80.31.995" />
      <GeneralData Name="Name" ID="7SJ632" />
```

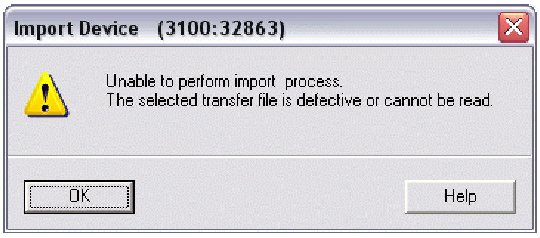
Fundamental scheme: DIGSIXML1-1.xsd

By means of several error scenarios, we want to show you the reactions of DIGSI 4 in this test phase.

Scenario 1

The file to be imported does have the extension **.xml**, but in truth it isn’t even an XML file.

Result: DIGSI 4 reacts immediately.



Import Device (3100:32863)

Unable to perform import process.
The selected transfer file is defective or cannot be read.

Nothing doing!: DIGSI 4 categorically rejects non-XML files.

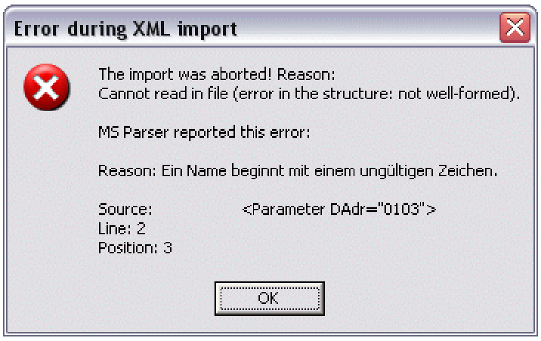
Scenario 2

The structure of the code is no longer completely consistent since a character is missing. In the following code segment it is the closing bracket of the DeviceData tag.

```
<DeviceData
   <Parameter DAdr="5101">
         <Value>23</Value>
   </Parameter>
</DeviceData>
```

Where is the closing bracket?

Result: DIGSI 4 aborts the import process with a message.



Error during XML import

The import was aborted! Reason:
Cannot read in file (error in the structure: not well-formed).

MS Parser reported this error:

Reason: Ein Name beginnt mit einem ungültigen Zeichen.

Source: <Parameter DAdr="0103">
Line: 2
Position: 3

Here there is danger ahead: DIGSI 4 resorts to drastic measures.

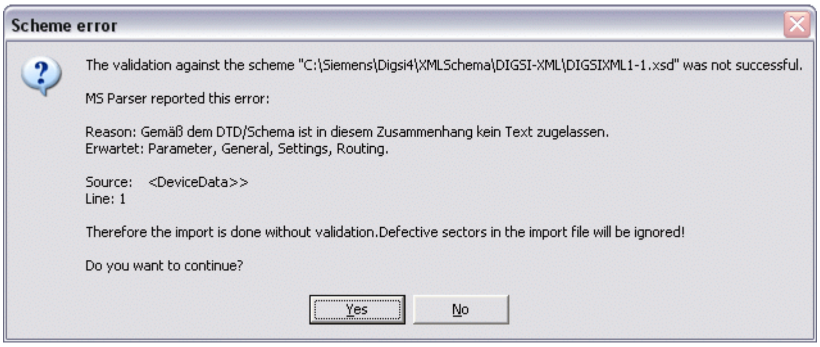
Scenario 3

A tag name was written incorrectly, as is easily recognized in the following code segment.

```
<DeviceData>
   <ParaCentimeter DAdr="5101">
         <Value>23</Value>
   </Parameter>
</DeviceData>
```

Well what do you know: Measuring unit instead of made to measure.

Since this type of error does not destroy the structure of the XML code, but merely makes one individual node unusable, DIGSI 4 sends you a message but leaves the decision to abort or continue with you.



Scheme error

The validation against the scheme "C:\Siemens\Digsi4\XMLSchema\DIGSI-XML\DIGSIXML1-1.xsd" was not successful.

MS Parser reported this error:

Reason: Gemäß dem DTD/Schema ist in diesem Zusammenhang kein Text zugelassen.
Erwartet: Parameter, General, Settings, Routing.

Source: <DeviceData>>
Line: 1

Therefore the import is done without validation.Defective sectors in the import file will be ignored!

Do you want to continue?

Listen to your inner voice and don’t take any risks.

Our tip: Even if the parameter set isn’t damaged later on since DIGSI 4 simply ignores such nodes, you should abort the import and eliminate the error in the XML file.

Scenario 4

You swap individual nodes in the sequence.

Result: As long as you don’t damage the fundamental XML structure in the process, DIGSI 4 has no objections.

Plausibility Control

With the plausibility control, we reach the third and last step of the integrity test. In this phase, DIGSI 4 assigns the values from the XML file node for node to the corresponding parameters in the parameter set. However, DIGSI 4 only does this when the values lie within the validity range.

It ignores all invalid values and generates concrete messages in the Report window for them. For the plausibility check as well, we will once again supply you with some thoroughly realistic error scenarios.

Scenario 1

To save work, you copy a complete parameter node. You edit the value but forget to change the direct address. This is now found twice in the code.

Result: Different than in real life, Number 2 wins here. That means, DIGSI 4 first of all imports the value that lies in the first position in the sequence for the parameter concerned and then overwrites it with the value in the second position. In this case, you don’t get an error message.

Scenario 2

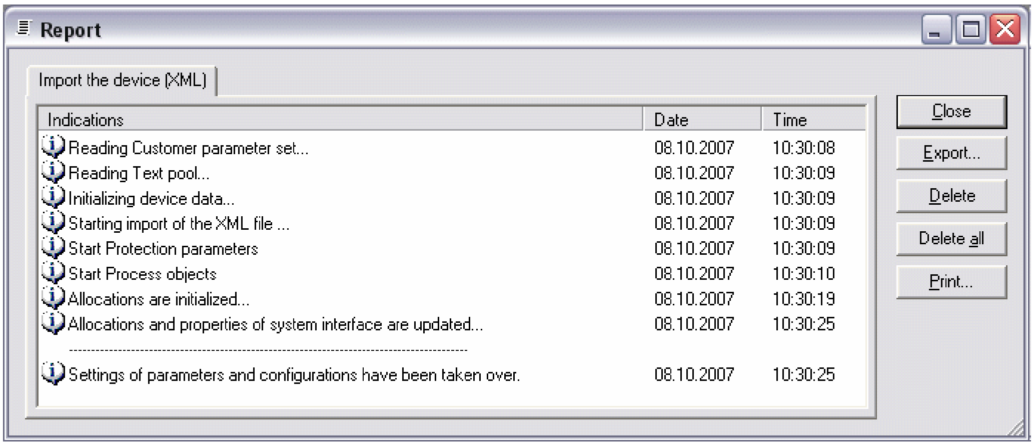
You change the direct address of a parameter, but you don’t get the result you want.

Result: Here we have to differentiate between two cases. In the first case, a direct address that doesn’t exist results from an incorrect entry. DIGSI 4 simply ignores this without further warnings. In the second case, a direct address emerges that in fact already exists for another parameter. Since DIGSI 4 cannot know that you have specified the correct address incorrectly, it imports the associated value in so far as it lies within the validity range.

Scenario 3

The value entered by you does not lie within the permitted value range.

Result: DIGSI 4 checks every value to see if it violates the validity limits. If this is so, DIGSI 4 foregoes the import and displays an appropriate message in the Report window. Based on this, you can find out exactly what is wrong.

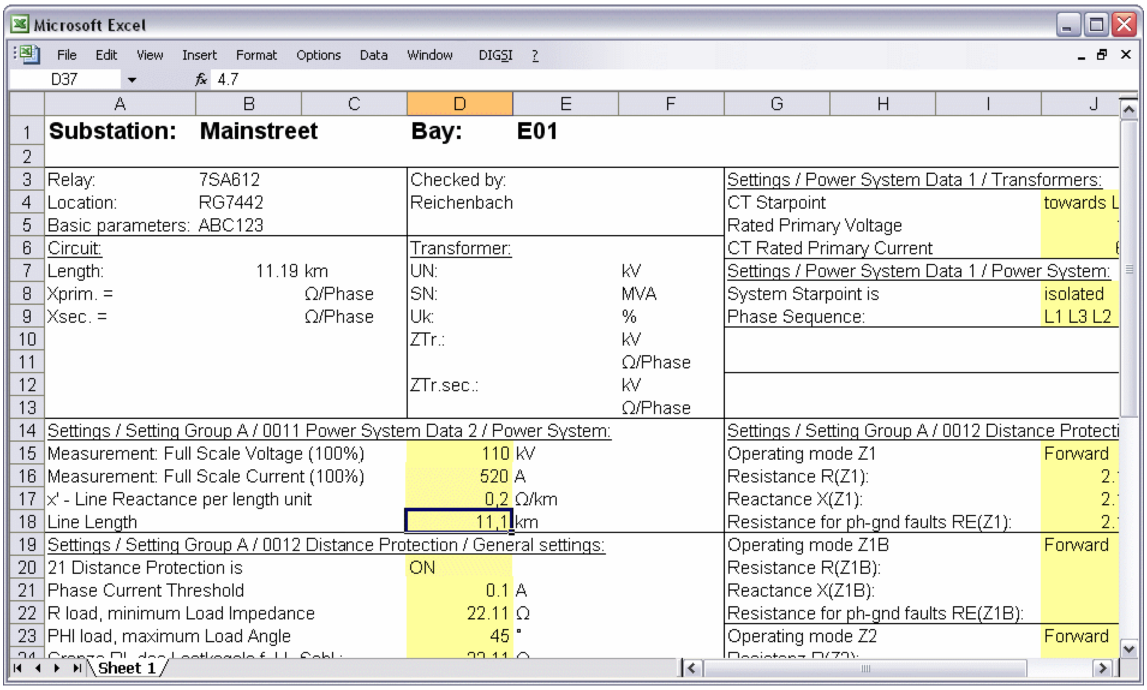


Indications	Date	Time
Reading Customer parameter set...	08.10.2007	10:30:08
Reading Text pool...	08.10.2007	10:30:09
Initializing device data...	08.10.2007	10:30:09
Starting import of the XML file ...	08.10.2007	10:30:09
Start Protection parameters	08.10.2007	10:30:09
Start Process objects	08.10.2007	10:30:10
Allocations are initialized...	08.10.2007	10:30:19
Allocations and properties of system interface are updated...	08.10.2007	10:30:25
--		
Settings of parameters and configurations have been taken over.	08.10.2007	10:30:25

Informative: In the Report window, you can read exactly where you have to make improvements.

7 Excel as Data Source

Experience shows that often several protecting devices are fed with the same or at least almost the same parameter values. It is therefore absolutely worthwhile and even economically justifiable to clearly prepare the individual setting values before the actual parameterization. That way the individual values can be reviewed in their entirety and also be controlled for plausibility more easily.



	A	B	C	D	E	F	G	H	I	J
1	**Substation:**	**Mainstreet**		**Bay:**	**E01**					
2										
3	Relay:	7SA612		Checked by:			Settings / Power System Data 1 / Transformers:			
4	Location:	RG7442		Reichenbach			CT Starpoint			towards L
5	Basic parameters:	ABC123					Rated Primary Voltage			1
6	Circuit:			Transformer:			CT Rated Primary Current			6
7	Length:	11.19	km	UN:		kV	Settings / Power System Data 1 / Power System:			
8	Xprim. =		Ω/Phase	SN:		MVA	System Starpoint is			isolated
9	Xsec. =		Ω/Phase	Uk:		%	Phase Sequence:			L1 L3 L2
10				ZTr.:		kV				
11						Ω/Phase				
12				ZTr.sec.:		kV				
13						Ω/Phase				
14	Settings / Setting Group A / 0011 Power System Data 2 / Power System:						Settings / Setting Group A / 0012 Distance Protecti			
15	Measurement: Full Scale Voltage (100%)			110	kV		Operating mode Z1			Forward
16	Measurement: Full Scale Current (100%)			520	A		Resistance R(Z1):			2.
17	x' - Line Reactance per length unit			0,2	Ω/km		Reactance X(Z1):			2.
18	Line Length			11,1	km		Resistance for ph-gnd faults RE(Z1):			2.
19	Settings / Setting Group A / 0012 Distance Protection / General settings:						Operating mode Z1B			Forward
20	21 Distance Protection is			ON			Resistance R(Z1B):			
21	Phase Current Threshold			0.1	A		Reactance X(Z1B):			
22	R load, minimum Load Impedance			22.11	Ω		Resistance for ph-gnd faults RE(Z1B):			
23	PHI load, maximum Load Angle			45	°		Operating mode Z2			Forward
24	Grenze RL des Lastkegels f. LL-Schl.:			22.11	Ω		Resistanz R(Z2):			

Manual labor: An example of a self-created setting sheet.

Calculating

For many users, and possibly even you, a spread-sheet calculation program is the software that is suitable for this. With the usually numerous formatting possibilities, so-called setting sheets can be custom-designed. There are hardly any limits on creativity here. Whereby, the design alone, however, is not the deciding factor. After all, many setting values don't just appear out of the blue, but are the result of often elaborate calculations. Spread-sheets already have their advantage anchored in the name, namely that they can carry out calculations and, that they already bring the necessary tools for this with them.

Such setting sheets could then not only contain the pure setting data but also, for example, the complete distance protection calculations for it. In additional tables, you store line section and relay data that you need for the calculations and you derive new parameter values from existing ones using suitable formulas. Additional notes then complete the whole thing to make it an informative and valuable setting portfolio.

The advantage is obvious but up until now there was also a big disadvantage: In order to get the values gathered in the setting sheets into the protective setting program there was practically only one solution up until now: to type it! That is not only time-consuming but also prone to errors.

But typing is now a thing of the past for all users of DIGSI as of Version 4.8, at least if their spread-sheet answers to the name of Excel. For this, Siemens provides you with a free add-in that takes this work off your hands in a few seconds using XML Export and that actively supports you in the creation of new and the adapting of existing setting sheets.

Installing the Add-In

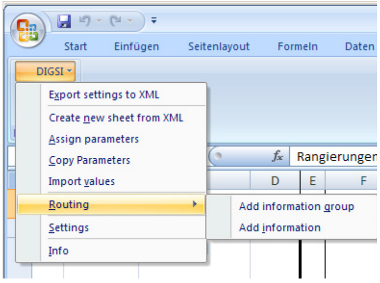
You will find the add-in as of Version 4.81 on the DIGSI 4 installation CD. If you can't call this your own, then simply get the Excel addition via the Internet. In the SIPROTEC Download Area, that you reach with the URL www.siprotec.de, you will find it under the link **Programs** → **DIGSI 4**.

Drop landing

The add-in lands on your hard drive in the form of a self-extracting ZIP archive, that is, as EXE file. A double-click on the file name unzips the add-in along with two text files, one each for German and English. Copy the add-in file **DIGSI XML Interface.xla** in the add-in directory of your Windows installation. This is usually **C:\Documents and Settings\User\Application Data\Microsoft\AddIns.**

Start Excel. In the menubar you should now find the additional new entry **DIGSI**. If not, the reason may be your Excel version. In Excel 2003, then open the Add-In Manager with **Options** → **Add-Ins**. Activate the control field next to the entry **DIGSI XML Interface**. After a click on **OK** and a short pause, Excel should display the new menu name. With Excel 2007, first of all open the setup window using the Office menu > **Excel Options**, then call up the Add-In page via "Add-Ins" in the menu on the left. Select the "Excel Add-Ins" from the "Manage" drop-down and "Go". With the Add-In Manager you can of course deactivate the add-in at any time in the reverse manner.

The first menu entry right away shows the essence and purpose of the add-in: with **Export settings to XML** it converts the settings from the opened EXCEL table into DIGSI XML code and thus saves you a lot of typing. For this, however, the table must fulfill several requirements.



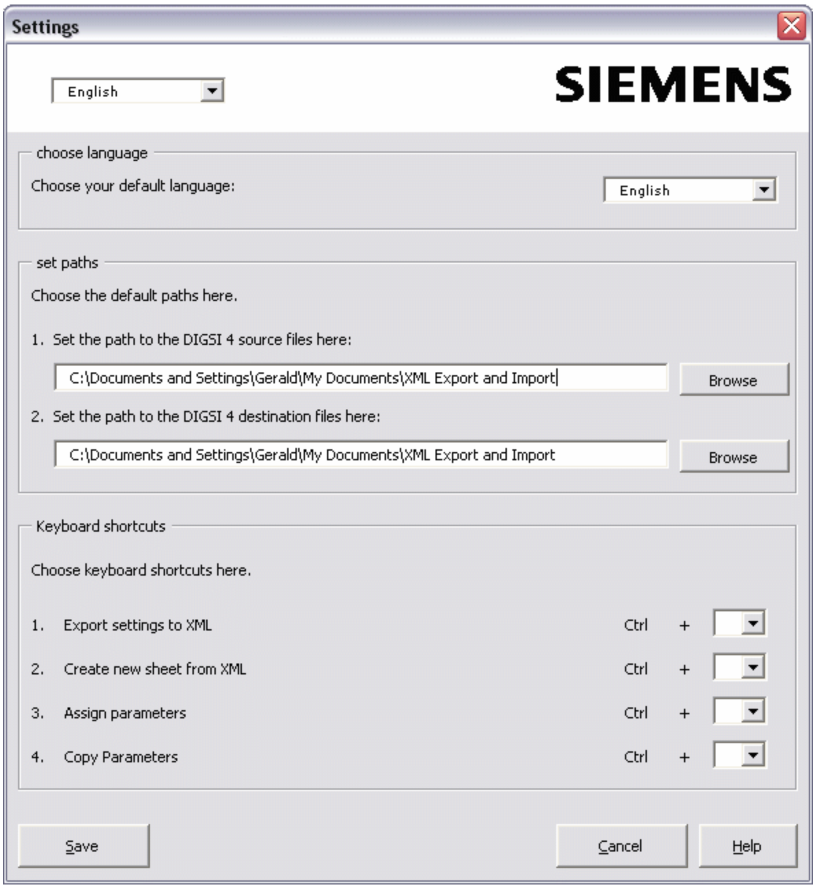
3-course menu: Create, adapt and export.

A table generated with the command **Create new sheet from XML** automatically brings these requirements with it. You adapt existing setting sheets that you have designed yourself and have already filled with values to the necessary requirements using **Assign Parameters**.

The ability to copy parameters saves you work when you want to manage several devices with identical parameter configurations in one setting sheet. We will explain all these procedures to you as we go on.

A matter of settings

Before that though, please click on **Settings**.



Settings

English

choose language

Choose your default language: English

set paths

Choose the default paths here.

1. Set the path to the DIGSI 4 source files here: C:\Documents and Settings\Gerald\My Documents\XML Export and Import
2. Set the path to the DIGSI 4 destination files here: C:\Documents and Settings\Gerald\My Documents\XML Export and Import

Keyboard shortcuts

Choose keyboard shortcuts here.

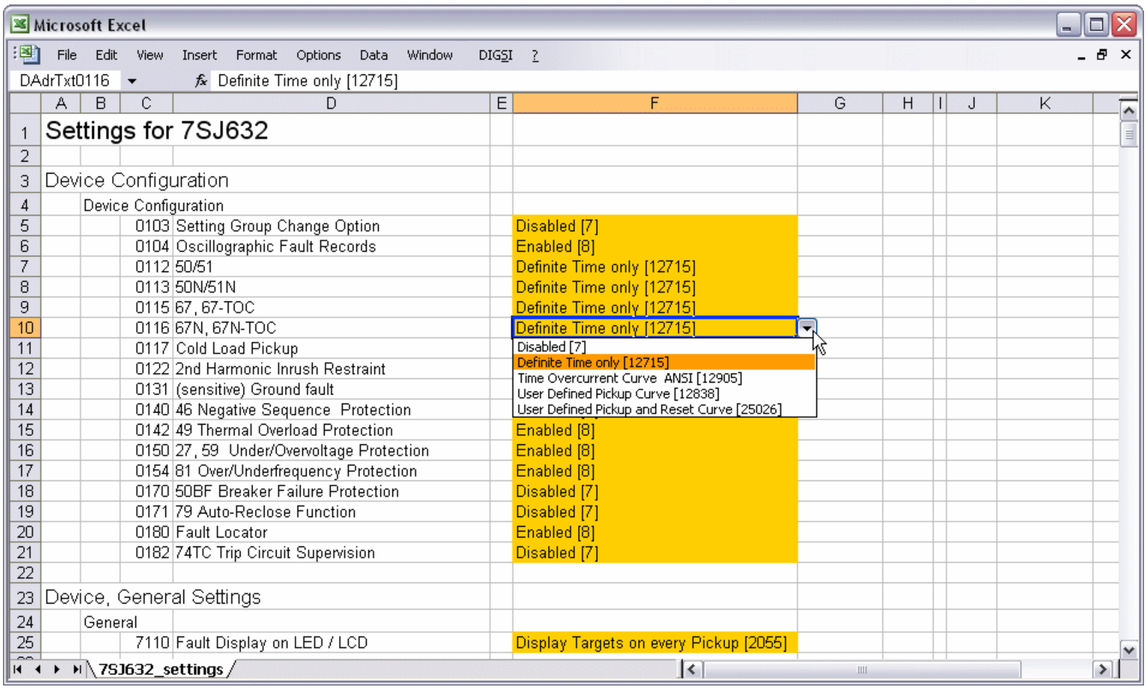
1. Export settings to XML Ctrl +
2. Create new sheet from XML Ctrl +
3. Assign parameters Ctrl +
4. Copy Parameters Ctrl +

Starting with the correct settings: You undertake individual adjustments here.

The dialog of the same name offers you several possibilities to adapt the add-in to your requirements. First on the list is, of course, the operating language for which you can choose between German and English. Should you always keep exported and imported XML files in the same directories respectively then it pays off to enter these in the input fields as standard directories. The constant climbing through all sorts of folders is not required that way. If you are more of a key presser than a mouse pusher, you can decide to establish individual keyboard shortcuts for the individual menu commands.

Creating and Editing a New Setting Sheet

Let’s first of all assume that you haven’t as yet created any of your own setting sheets but would like to have one generated by the add-in. No problem! With a few mouse-clicks you’ll get one. And before we explain to you which mouse-clicks are involved let’s have a look at the result.



DAdrTxt0116 | Definite Time only [12715]

	A	B	C	D	E	F
1	Settings for 7SJ632					
2						
3	Device Configuration					
4		Device Configuration				
5			0103	Setting Group Change Option		Disabled [7]
6			0104	Oscillographic Fault Records		Enabled [8]
7			0112	50/51		Definite Time only [12715]
8			0113	50N/51N		Definite Time only [12715]
9			0115	67, 67-TOC		Definite Time only [12715]
10			0116	67N, 67N-TOC		Definite Time only [12715]
11			0117	Cold Load Pickup		
12			0122	2nd Harmonic Inrush Restraint		
13			0131	(sensitive) Ground fault		
14			0140	46 Negative Sequence Protection		
15			0142	49 Thermal Overload Protection		Enabled [8]
16			0150	27, 59 Under/Overvoltage Protection		Enabled [8]
17			0154	81 Over/Underfrequency Protection		Enabled [8]
18			0170	50BF Breaker Failure Protection		Disabled [7]
19			0171	79 Auto-Reclose Function		Disabled [7]
20			0180	Fault Locator		Enabled [8]
21			0182	74TC Trip Circuit Supervision		Disabled [7]
22						
23	Device, General Settings					
24		General				
25			7110	Fault Display on LED / LCD		Display Targets on every Pickup [2055]

Disabled [7]
Definite Time only [12715]
Time Overcurrent Curve ANSI [12905]
User Defined Pickup Curve [12838]
User Defined Pickup and Reset Curve [25026]

Well done: The setting sheet generated by the Excel add-in contains all possible settings.

Old acquaintances

After a brief look you will quickly notice that what you see looks familiar to you. After all, it is a question of parameter names that you already know from the work with the DIGSI Device Editor. These are structured according to the entries in the operator tree as well as according to the names of the dialogs and the dialog tabs that you also know. And even the comfort doesn’t break down. Selection parameters that, in the DIGSI dialog, bring all of your permissible settings to light as a list with the press of a button also do this in the setting sheet. With input parameters, however, information to the right of the input area shows you the permitted value limits. The add-in also checks after a value has been entered whether you have taken these limits into account and criticizes, with a message, if you are off the mark.

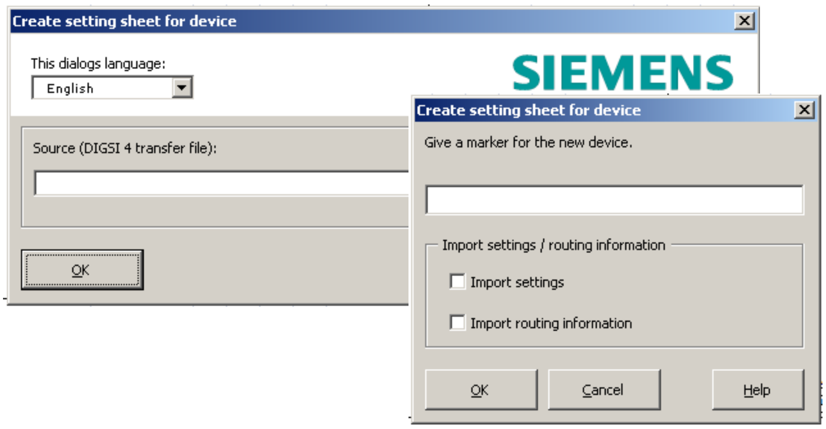
That the add-in still accepts a value that is outside of the validity range is, by the way, no error but has been consciously planned. After all, you should stay flexible and also be able use parts of the setting sheet for other devices for which the validity ranges could very well be different.

A question of type

From the header area of the table you can see that it has to do with settings for a certain device type. You determine which one it is and in which scope its parameters appear in the table. The fundamental sequence is simple: In DIGSI 4, you create a device of the type concerned, set a specific functional scope for it and then export this device into XML. This XML file then uses the add-in as reference in order to be able to create a setting sheet.

In setting the functional scope you should proceed generously. We recommend that you set the maximum possible device scope. Then you have an excellent master setting sheet in Excel. You copy this as often as you like and adjust the copies to the respective devices by simply deleting the parameters that are not required.

But first, you must import the device data that you exported into DIGSI XML into Excel, and this is how it goes: From the Add-in menu select the command **Create new sheet from XML**. This brings the dialog **Create setting sheet for device** to light. Tick or untick the check box to select whether you want to use the setting sheet for the parameter values and the information of the configruation matrix. Just try out both variants.


Create setting sheet for device
This dialogs language:
English
SIEMENS
Source (DIGSI 4 transfer file):
OK
Create setting sheet for device
Give a marker for the new device.
Import settings / routing information
□ Import settings
□ Import routing information
OK
Cancel
Help

Search for the code: With this dialog, you select a reference file.

You can use the **Import parameter values** menu to update existing setting sheets later on. For example, new parameter values are loaded and new configuration values are added in Excel.

Best references

The only purpose of this dialog is to define the appropriate XML file for the setting sheet. After a click on **Search**, you make your way through the folder jungle to find it. Or, you land directly in the correct directory if you have defined it as a standard in **DIGSI** → **Settings**.

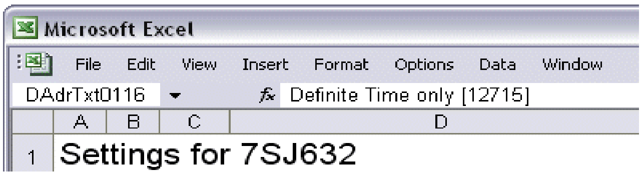
As soon as the correct XML file has been determined and is entered in the input field of the dialog, you close it with a click on **OK**. A further dialog now prompts you to enter a so-called identifier. We will explain later what you need this for because you could also do without it. As proof of this, click on **OK** without doing anything further and a short time later Excel presents you with a new setting sheet, just as you already know it from the figure on the preceding page.

Should the setting sheet generated by the add-in not meet your demands, you can of course edit it any way you like. You may add and delete cells, format, complete additional sheets and make links from their cells to those of the setting sheet.

After that, you copy this work portfolio in order to adapt it in detail for various devices, manually change the setting values or have it calculated using a formula and then export the data back into XML. Only the identifiers of the value cells of parameters must remain untouched!

Address trade

The reason for this becomes quickly clear as soon as you have selected the value cell of any parameter. You then see an identifier in the form of **DAdrDec0204** or **DAdrTxt0170**. The value of a parameter is linked via the cell identifier with its direct address.



DAdrTxt0116 Definite Time only [12715]

Settings for 7SJ632

Reliably addressed: Direct address and type of a parameter are components of its name in Excel.

As you have already learned in the preceding chapters, direct address and value of a parameter are the essential information that is required in the importing of an XML file in DIGSI 4. And even the Excel add-in requires exactly these two pieces of information in order to be able to correctly export the data. For that reason, it is absolutely crucial that these identifiers remain unchanged.

Identifying

Let us now come back to the identifier whose entry we had dispensed with in the creation of a new setting sheet. This is all right as long as you create a separate setting sheet for each device. The add-in also makes it possible for you to manage several devices on one setting sheet. This presents itself, for example, when you have several devices with similar or even identical functional scopes that are only different in their settings. Or you use this opportunity to be able to access all devices of a system section at a glance. Whatever your reasons, whenever you have more than one device on a setting sheet, each of the devices must have its own identifier so that the add-in doesn’t lose track during exporting. You assign the identifiers yourself. The rule is: Only digits and letters, no spaces and other special characters.

Copying Parameters

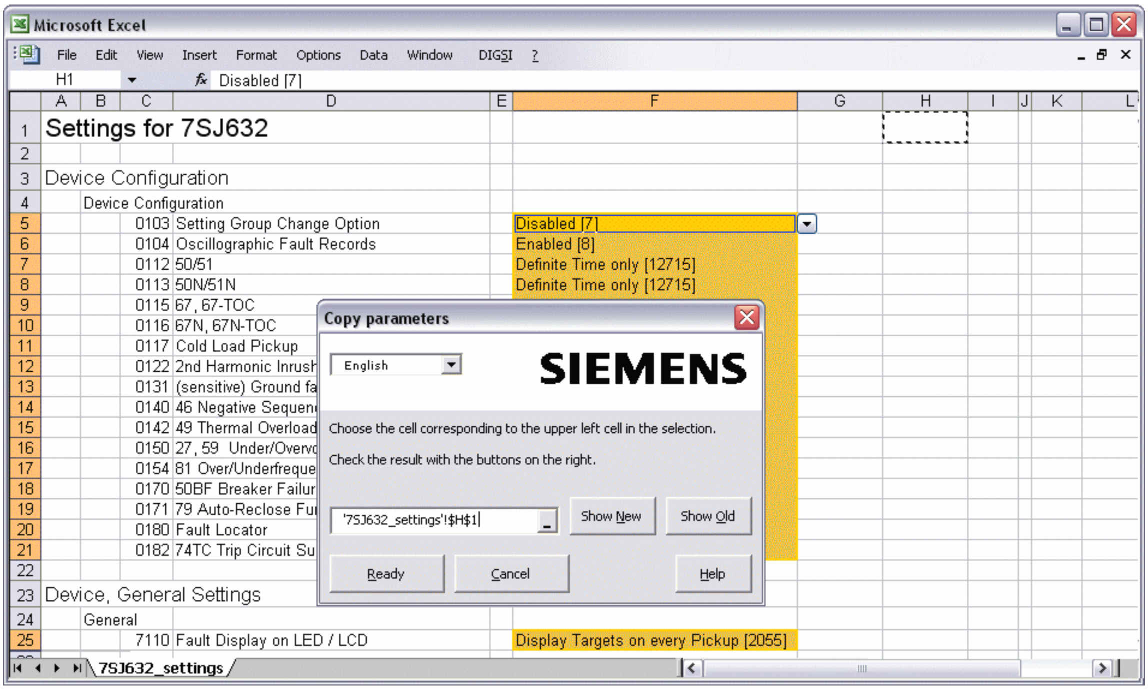
Now the only thing that has to be clarified is how you get the data of several devices onto one common setting sheet. For that, you first of all create a new setting sheet once again, (almost) like we described it further above. In the query for an identifier, you don't simply click on this time, instead you enter a valid character combination. We have done this as well and selected **E01** as the identifier.

At first glance, the new setting sheet appears no different that its predecessor. If, however, you look at the name of a value cell, you will see that the previous character sequence has been supplemented by the identifier assigned by you or us. This now looks like this, for example: **DAdrDec_E01_0204**.

Intermediate course

To complete the existing setting sheet with the data of another device, copy the data of the already existing device to another place in the table. However, please don't use the usual copy/paste procedure. With that you would certainly copy the contents, however all cell identifiers would collapse. (You would have the soup without the bowl and how would you ever be able to spoon it out?) Reach for the DIGSI menu instead. For between the three courses Create - Adapt - Export there was still room for an intermediate course with the name **Copy Parameter.** We will show how you deal with it using an example.

First of all, you expand the newly generated setting sheet by an additional column which you place between the information on physical units and validity ranges. After that, you select all value cells in the column F and then choose the command **Copy Parameters**.



H1 Disabled [7]

	A	B	C	D	E	F
1	Settings for 7SJ632					
2						
3	Device Configuration					
4		Device Configuration				
5			0103	Setting Group Change Option		Disabled [7]
6			0104	Oscillographic Fault Records		Enabled [8]
7			0112	50/51		Definite Time only [12715]
8			0113	50N/51N		Definite Time only [12715]
9			0115	67, 67-TOC		
10			0116	67N, 67N-TOC		
11			0117	Cold Load Pickup		
12			0122	2nd Harmonic Inrush		
13			0131	(sensitive) Ground fa		
14			0140	46 Negative Sequen		
15			0142	49 Thermal Overload		
16			0150	27, 59 Under/Overvo		
17			0154	81 Over/Underfreque		
18			0170	50BF Breaker Failur		
19			0171	79 Auto-Reclose Fu		
20			0180	Fault Locator		
21			0182	74TC Trip Circuit Su		
22						
23	Device, General Settings					
24		General				
25			7110	Fault Display on LED / LCD		Display Targets on every Pickup [2055]

7SJ632_settings

English

Choose the cell corresponding to the upper left cell in the selection.

Check the result with the buttons on the right.

'7SJ632_settings'!$H$1

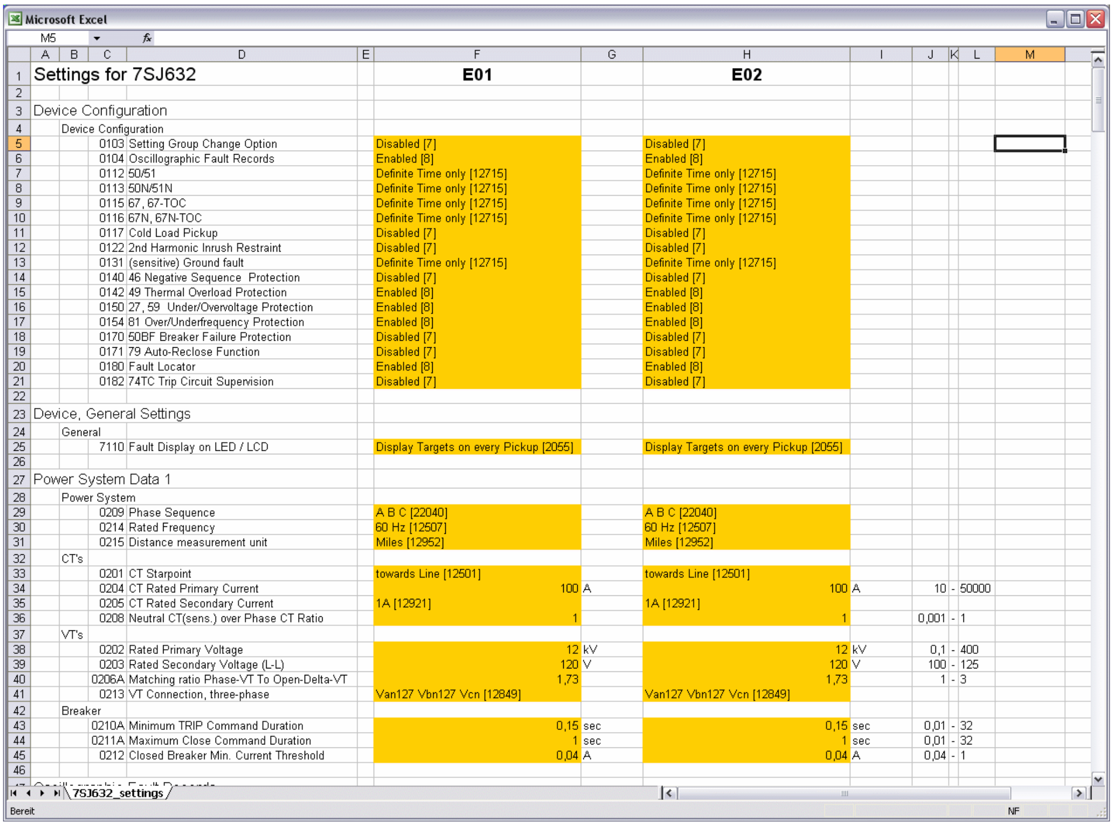
Good copy: Always use the add-in function **Copy Parameters**.

In the dialog **Copy Parameters** you define the destination area of the data. To do so, you merely select the upper-most cell of the destination area in the setting sheet. In our case, it is the cell in the newly inserted column that is located at the same height as the first value cell. With alternating clicks on **Show new** and **Show old** you ascertain that you really chose the correct starting cell. Only then are the selected areas located parallel to one another. If everything is in order here, click **Ready**.

In the next dialog box, that you now are already familiar with, you enter the identifier for the second device, for example E02. As you can see, the input field is a list at the same time. You can therefore also add data to a device after the fact and then select the associated identifier from this list. Then click on **OK**. The add-in inserts the copied data into the area defined for this. Crucial nevertheless is that the names of the value cells now contain the identifier E02 guaranteeing the possibility of differentiating between the two devices.

Cosmetic surgery

So that the clarity is also retained, you should give the new column the optimum width and highlight the individual cells in color. It is also recommended that you copy the column with the physical units. You can see the complete result in the following figure.

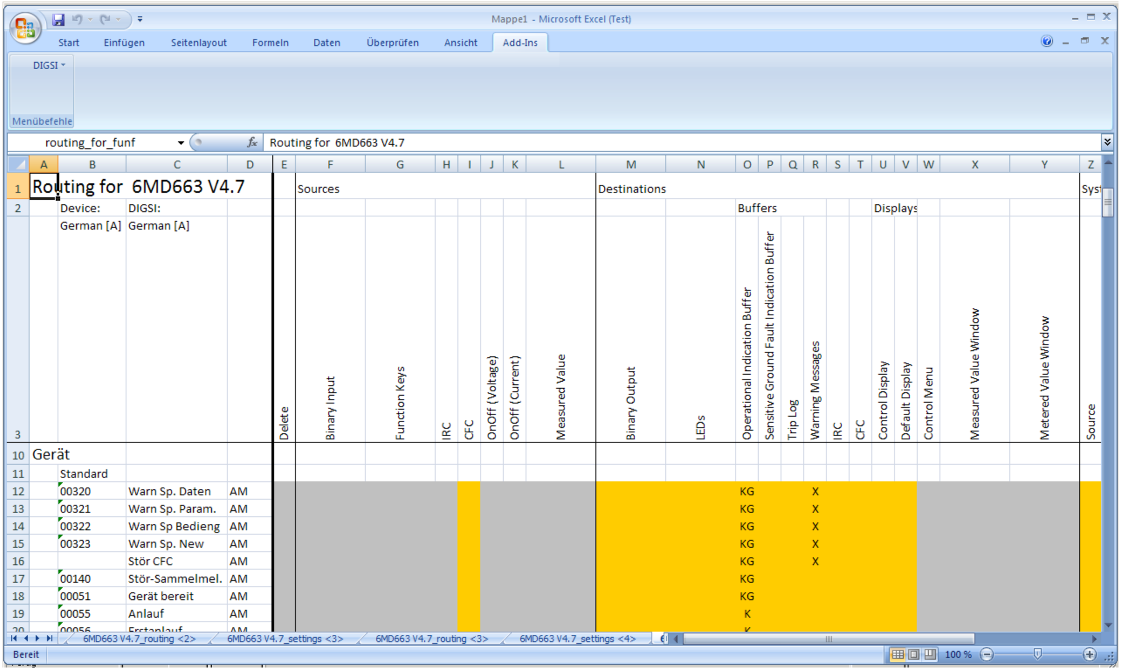


	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Settings for 7SJ632					E01		E02					
2													
3	Device Configuration												
4		Device Configuration											
5			0103	Setting Group Change Option		Disabled [7]		Disabled [7]					
6			0104	Oscillographic Fault Records		Enabled [8]		Enabled [8]					
7			0112	50/51		Definite Time only [12715]		Definite Time only [12715]					
8			0113	50N/51N		Definite Time only [12715]		Definite Time only [12715]					
9			0115	67, 67-TOC		Definite Time only [12715]		Definite Time only [12715]					
10			0116	67N, 67N-TOC		Definite Time only [12715]		Definite Time only [12715]					
11			0117	Cold Load Pickup		Disabled [7]		Disabled [7]					
12			0122	2nd Harmonic Inrush Restraint		Disabled [7]		Disabled [7]					
13			0131	(sensitive) Ground fault		Definite Time only [12715]		Definite Time only [12715]					
14			0140	46 Negative Sequence Protection		Disabled [7]		Disabled [7]					
15			0142	49 Thermal Overload Protection		Enabled [8]		Enabled [8]					
16			0150	27, 59 Under/Overvoltage Protection		Enabled [8]		Enabled [8]					
17			0154	81 Over/Underfrequency Protection		Enabled [8]		Enabled [8]					
18			0170	50BF Breaker Failure Protection		Disabled [7]		Disabled [7]					
19			0171	79 Auto-Reclose Function		Disabled [7]		Disabled [7]					
20			0180	Fault Locator		Enabled [8]		Enabled [8]					
21			0182	74TC Trip Circuit Supervision		Disabled [7]		Disabled [7]					
22													
23	Device, General Settings												
24		General											
25			7110	Fault Display on LED / LCD		Display Targets on every Pickup [2055]		Display Targets on every Pickup [2055]					
26													
27	Power System Data 1												
28		Power System											
29			0209	Phase Sequence		A B C [22040]		A B C [22040]					
30			0214	Rated Frequency		60 Hz [12507]		60 Hz [12507]					
31			0215	Distance measurement unit		Miles [12952]		Miles [12952]					
32		CT's											
33			0201	CT Starpoint		towards Line [12501]		towards Line [12501]					
34			0204	CT Rated Primary Current		100	A	100	A	10	-	50000	
35			0205	CT Rated Secondary Current		1A [12921]		1A [12921]					
36			0208	Neutral CT(sens.) over Phase CT Ratio		1		1		0,001	-	1	
37		VT's											
38			0202	Rated Primary Voltage		12	kV	12	kV	0,1	-	400	
39			0203	Rated Secondary Voltage (L-L)		120	V	120	V	100	-	125	
40			0206A	Matching ratio Phase-VT To Open-Delta-VT		1,73		1,73		1	-	3	
41			0213	VT Connection, three-phase		Van127 Vbn127 Vcn [12849]		Van127 Vbn127 Vcn [12849]					
42		Breaker											
43			0210A	Minimum TRIP Command Duration		0,15	sec	0,15	sec	0,01	-	32	
44			0211A	Maximum Close Command Duration		1	sec	1	sec	0,01	-	32	
45			0212	Closed Breaker Min. Current Threshold		0,04	A	0,04	A	0,04	-	1	
46													
47	Oscillographic Fault Records												

No problem for the add-in: To manage the data of two or more devices in one setting sheet.

Routing

You have certainly imported the configurations when you created the new setting sheet. It is not recommended to include information on parameters and configurations in the same Excel sheet. It is therefore better to go to the “Routing“ sheet. The overall result can be seen in the figure below.



Routing for 6MD663 V4.7

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	Routing for 6MD663 V4.7					Sources							Destinations													Syst
2		Device:	DIGSI:												Buffers						Displays					
3		German [A]	German [A]		Delete	Binary Input	Function Keys	IRC	CFC	OnOff (Voltage)	OnOff (Current)	Measured Value	Binary Output	LEDs	Operational Indication Buffer	Sensitive Ground Fault Indication Buffer	Trip Log	Warning Messages	IRC	CFC	Control Display	Default Display	Control Menu	Measured Value Window	Metered Value Window	Source
10	Gerät																									
11		Standard																								
12		00320	Warn Sp. Daten	AM											KG			X								
13		00321	Warn Sp. Param.	AM											KG			X								
14		00322	Warn Sp Bedieng	AM											KG			X								
15		00323	Warn Sp. New	AM											KG			X								
16			Stör CFC	AM											KG			X								
17		00140	Stör-Sammelmel.	AM											KG											
18		00051	Gerät bereit	AM											KG											
19		00055	Anlauf	AM											K											
20		00056	Erstanlauf	AM											K											

Routings in a different way.

This is the complete Routingmatrix. The table with the Routingmatrix may appear very familiar to you. In fact, it is very similar to the short view in DIGSI. However, this means for you that you are not allowed to make any structural changes in the table. The essential difference to the DIGSI matrix is that there is only one matrix for commands and measured values. The colour of the cells indicates where entries are possible and where not. Possible values are displayed in selection boxes. The **Routing** submenu offers functions for adding new groups and indications to the configuration matrix. These are similar to those you may know from DIGSI. Just try it out.

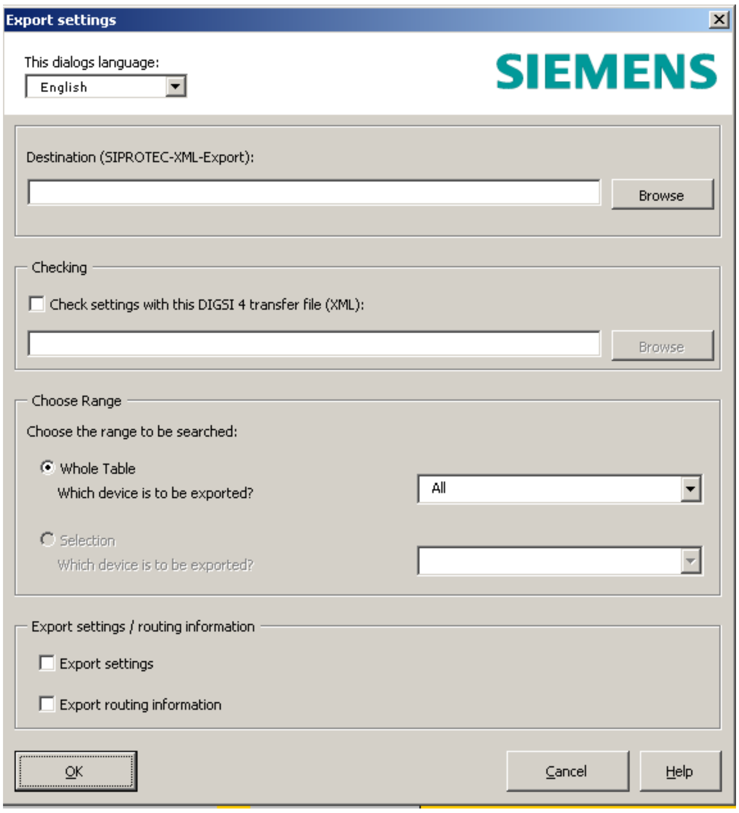
Exporting the Setting Data in XML Code and Importing It in DIGSI

The exporting of data is just as easy as the importing, but it offers a number of additional possibilities to influence the scope of the exported data. First of all, you have the choice of earmarking the complete table for the export, or to make a preselection.

For the second variant, you select an area that is intended for the export. Such an area consists of only one parameter in the simplest case.

Out of here

With **DIGSI** → **Export settings to XML** now open the export dialog of the add-in. You can also tick or untick the check boxes to select whether you want to export the information of the parameter values and the configuration matrix. In the bottom half of this dialog you now have further possibilities to have an influence on the data scope. If you previously selected a table area, the option **Selection** is active and also selected. You can, however, still decide differently and choose the option **Whole table**.



Export settings

This dialogs language: English

Destination (SIPROTEC-XML-Export):

Checking

☐ Check settings with this DIGSI 4 transfer file (XML):

Choose Range

Choose the range to be searched:

● Whole Table

Which device is to be exported? All

○ Selection

Which device is to be exported?

Export settings / routing information

☐ Export settings

☐ Export routing information

Now it goes out: The export dialog of the add-in.

If you manage the settings of several devices on one setting sheet and have properly differentiated them with identifiers, you can further restrict the scope of the exported data.

For that, you choose the identifier of a device from the respective list if the add-in is only to export its data. Or, you select the setting **All** and in that way make sure that the add-in generates a separate XML file for every device.

Before that, however, probably the most important input is missing, namely the destination and the name of the export file. Here it is just like importing: One click on **Search** leads you directly to the desired directory if everything is optimally prepared or, in the worst case, lets you roam about in the folder nirvana.

No risk

If you want to be on the safe side that all your settings are within the permitted ranges, then make use of the comparison function of the XML export. For that, the add-in requires a reference file, that is, an XML file of the same device type exported from DIGSI 4. For each parameter, the add-in individually compares its setting with the permissible settings that are stored in the comment lines of the respective parameter in the reference file. As soon as the add-in determines a discrepancy, it interrupts the export, opens a text file in which the difference is explained and asks you whether you want to continue with the export or whether it should be ended.

To use the comparison function, first of all select the control field in the section **Checking**. Then, choose the reference file. If possible, use the file on whose basis you have already created the setting sheet.

But now ...

Now finally, click on **OK** to close the dialog and to start the export. It gets into gear quickly and usually only takes one, two seconds. And there you have the file(s) ready to access in the destination directory so that they can be imported into the DIGSI Manager in one or more devices. You already learned how this works in Chapter 3.

Just one more note on the import mechanisms of DIGSI 4: Should there be errors in the exported XML code, either because of the lack of an activated comparison function or because you have knowingly accepted it, DIGSI 4 stubbornly strikes back. DIGSI 4 mercilessly sorts out parameters or values that are not compatible, for only in that way is the data consistency of a parameter set ensured.

Experimental time killing

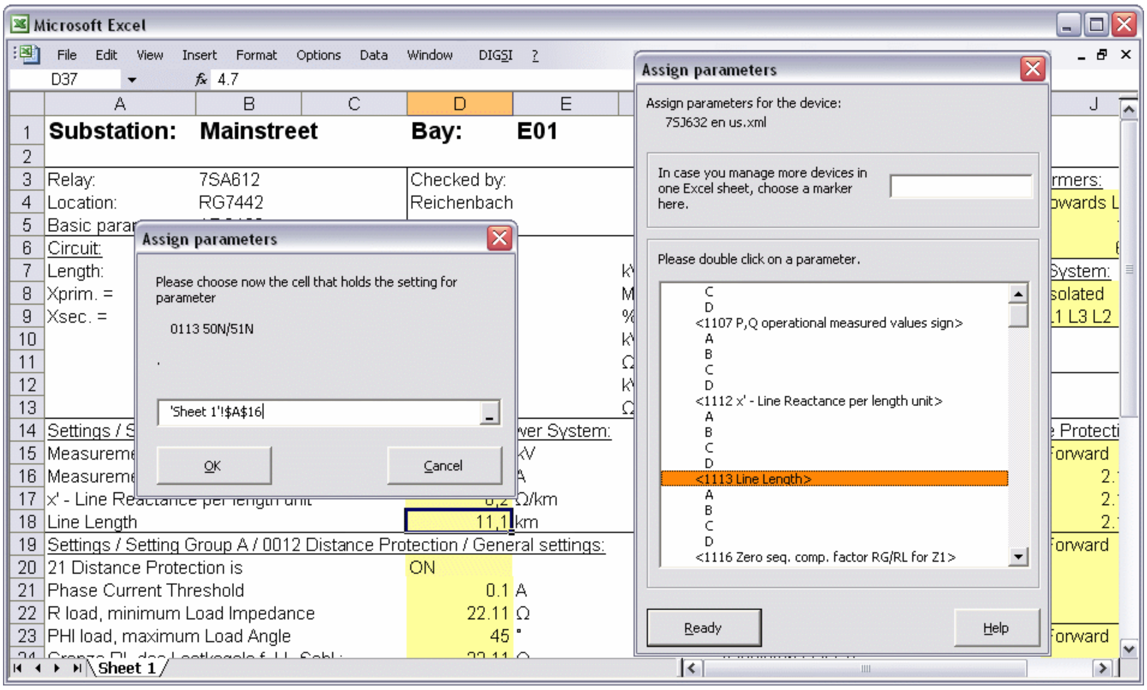
By the way, the fact that a difference exists between what goes in the front and what comes out the back, even if you haven’t knowingly changed anything along the way, can be illustrated by the following little experiment: Import the data of an XML file in Excel and then export it again immediately without doing anything in between. From the file sizes alone you will notice the file exported out of Excel is a lot slimmer than the original XML file. One glance at the insides will then divulge why this is so. The add-in only exports that which is absolutely necessary for the import into DIGSI 4. And that is simply the direct address and the value of each individual parameter.

The rest of the information on the parameter such as its type or name have disappeared, just as the comment lines with the possible settings as well as the division according to functional aspects.

All information on routings was already thrown overboard during the import into Excel since this is not relevant to the setting sheet. This is how an XML code reduced to the essentials comes into being.

Preparing an Existing Setting Sheet for the XML Export

Many of you have already recognized the advantage of working with Excel and have already created your own setting sheets. You can, of course, continue to use them and still get the benefit of the XML interface. The trick is to name each cell, that contains parameter values, with the direct address of the associated parameter according to the already described pattern. In principle, you could take care of this manually for each cell by typing it. Or you use the add-in function **Assign parameters**. This is easier and safer and with selection parameters also gives you all possible settings in the form of a dropdown list to boot.



D37 4.7

	A	B	C	D	E		J
1	**Substation:**	**Mainstreet**		**Bay:**	**E01**		
2							
3	Relay:	7SA612		Checked by:			rmers:
4	Location:	RG7442		Reichenbach			owards L
5	Basic parar						
6	Circuit:						
7	Length:					k	System:
8	Xprim. =					M	solated
9	Xsec. =					%	L1 L3 L2
10						k	
11						Ω	
12						k	
13						Ω	
14	Settings / S				ver System:		Protecti
15	Measureme				kV		Forward
16	Measureme				A		2.
17	x' - Line Reactance per length unit			0,2	Ω/km		2.
18	Line Length			11,1	km		2.
19	Settings / Setting Group A / 0012 Distance Protection / General settings:						Forward
20	21 Distance Protection is			ON			
21	Phase Current Threshold			0.1	A		
22	R load, minimum Load Impedance			22.11	Ω		
23	PHI load, maximum Load Angle			45	°		Forward

Please choose now the cell that holds the setting for parameter

0113 50N/51N

.

'Sheet 1'!$A$16

Assign parameters for the device:
7SJ632 en us.xml

In case you manage more devices in one Excel sheet, choose a marker here.

Please double click on a parameter.

```
    C
    D
<1107 P,Q operational measured values sign>
    A
    B
    C
    D
<1112 x' - Line Reactance per length unit>
    A
    B
    C
    D
<1113 Line Length>
    A
    B
    C
    D
<1116 Zero seq. comp. factor RG/RL for Z1>
```

Re-usable at any time: With the add-in, you prepare existing setting sheets for the XML export.

The start is the same as when creating a new setting sheet. You first of all export the data of the device type, for which you have designed a setting sheet, as a reference file in XML. In Excel you then select the command **Assign parameters** in the DIGSI menu.

With the dialog that follows you now choose the previously exported XML file. After clicking on **OK,** the add-in opens a selection dialog that shows you the names and direct addresses of all existing parameters.

The assignment now works quite simply: You double-click on a parameter and enter the cell coordinates in a second dialog box. This is done either manually or - much easier - by selecting the associated cell in your setting sheet using a mouse-click. A click on **OK** and the assignment for the first parameter is perfect. You proceed similarly for the other parameters. It's no problem here, as well, if you manage several devices with one setting sheet.

To make the devices distinguishable for the export, enter identifiers for the individual devices in the upper-right of the input field. An identifier that you've entered remains valid until you enter a new identifier.

Special Case: Adopting Settings from Analog Siemens Protective Gear

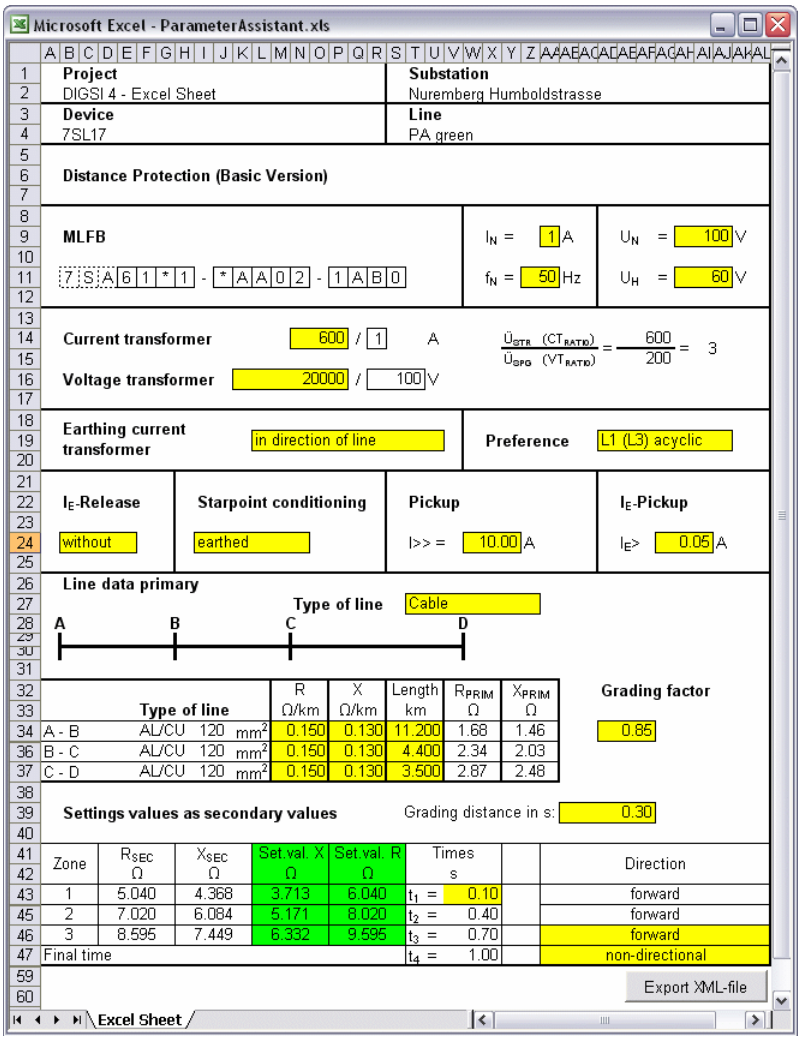
Let's assume you would like to replace an older, still electromechanical SIPROTEC device from analog times with a current digital one. You have documented the protection settings of the older device and want to transfer this into the new device with the least amount of effort. Even this task doesn't present a problem because you solve it in a few steps using a macro developed for this and the associated setting sheet. In it, you enter the existing protection settings, let them be exported to XML using an integrated macro and then import them into a current DIGSI 4 project.

Two pairs of boots

The following explanations have nothing more to do with the Excel add-in, by the way, and are therefore identified in the title as a special case. Setting sheet and macro are installed with DIGSI 4. You open it directly via the Start menu of Windows. There you will find in the folder **Siemens Energy → DIGSI** the entry **Import analog device settings**. With this you start Excel and the setting sheet. Before this appears though, a dialog box first appears. Here you choose the type of the prevailing analog device. If necessary, you select one of the two other options if they apply to the functional scope of the device. In the lower part of the dialog, you can then already see the almost complete MLFB of the future device. As soon as you click on **Next**, Excel displays the worksheet with already preassigned values (see next page).

You now have to adapt all values in the yellow hi-lighted fields to the prevailing protections settings. Here as well, you have dropdown lists to select a setting for the selection parameters for which only very particular values are permitted. When you've done everything, click on **Export XML File** and then as usual define the destination and the name for the export file.

In DIGSI 4, you now open a project and in it you insert a device with the applicable MLFB. Select this device and from the pop-up menu choose the command **Import device**. In the dialog that appears, select XML as the import format and then the previously exported file with protection settings. DIGSI 4 now adopts the protection settings in the SIPROTEC 4 device. That's it!



Microsoft Excel - ParameterAssistant.xls

Project
DIGSI 4 - Excel Sheet

Substation
Nuremberg Humboldstrasse

Device
7SL17

Line
PA green

Distance Protection (Basic Version)

MLFB

7 S A 6 1 * 1 - * A A 0 2 - 1 A B 0

I_N = 1 A

f_N = 50 Hz

U_N = 100 V

U_H = 60 V

Current transformer 600 / 1 A

Voltage transformer 20000 / 100 V

$\frac{Ü_{STR} \ (CT_{RATIO})}{Ü_{SPG} \ (VT_{RATIO})} = \frac{600}{200} = 3$

Earthing current transformer in direction of line

Preference L1 (L3) acyclic

I_E-Release
without

Starpoint conditioning
earthed

Pickup
I>> = 10.00 A

I_E-Pickup
I_E> 0.05 A

Line data primary

Type of line Cable

	Type of line			R Ω/km	X Ω/km	Length km	R_{PRIM} Ω	X_{PRIM} Ω
A - B	AL/CU	120	mm^2	0.150	0.130	11.200	1.68	1.46
B - C	AL/CU	120	mm^2	0.150	0.130	4.400	2.34	2.03
C - D	AL/CU	120	mm^2	0.150	0.130	3.500	2.87	2.48

Grading factor
0.85

Settings values as secondary values

Grading distance in s: 0.30

Zone	R_{SEC} Ω	X_{SEC} Ω	Set.val. X Ω	Set.val. R Ω	Times s			Direction
1	5.040	4.368	3.713	6.040	t_1 =	0.10		forward
2	7.020	6.084	5.171	8.020	t_2 =	0.40		forward
3	8.595	7.449	6.332	9.595	t_3 =	0.70		forward
Final time					t_4 =	1.00		non-directional

From old make new: You transfer settings using a prepared setting sheet.

Exchanging Data with Applications from the Power Distribution Area 8

With Excel, you exchange data actually only within your own four walls. But as soon as you leave these, you see a series of other interesting applications:

- Line calculation
- Protection test
- Line and protective data management.

Most of these have been around for awhile, now with DIGSI XML you also have a smooth data exchange free-of-charge as well.

In the development and optimization of the DIGSI XML interface, Siemens worked very closely with the suppliers of the applications described: OMICRON, IPS, DIgSILENT and Electrocon are only some of them. All profit from this cooperation, most of all you. For where you previously had to exchange the data manually by typing it, you now do it with XML.

Here now a really brief overview. You can find out detailed information on the individual products as well as the cooperation between Siemens and the individual manufacturers directly from them.

Line Calculation

With line calculation programs, users simulate different fault situations and based on the results determine the necessary setting data for the protective device. Professional programs such as SINCAL and SIGRADE from Siemens, PowerFactor from DIgSILENT or CAPE from Electrocon automatically supply setting recommendations.

Up until now you had to print these out in order to then retype them in DIGSI 4. All programs mentioned now offer an interface compatible to DIGSI XML. For you it means: You export this data into an XML file and import the data of this file into DIGSI 4.

Protection Test

The OMICRON Company has further developed its RIO format to the XML-based XRIO format. This format that OMICRON has introduced with the Test-universe 2.0, now separates parameters from the actual functional implementation.

Even DIGSI as of Version 4.8 masters this format. With that, Siemens is the first manufacturer that actively supports the new XRIO format. And you can now export the protective settings of each SIPROTEC 4 device in the XRIO format.

OMICRON provides free-of-charge XRIO converters for the Testuniverse 2.0, with which you can very easily import the setting values and thus efficiently create the test program.

Line and Protective Data Management

Already one single Siemens protective device contains a large number of parameters with the associated settings. So as not to lose the overview with the diversity of devices within a system, you’re best bet is a program for line and protective data management. You transfer the data there using XML and so receive a common data collection for all devices. As an additional benefit, it enables you to optimize and analyze data. Examples of such programs are TestBase from OMICRON, IPS-Energy RELEX from IPS and StationWare from DIgSILENT.

What Else You Should Know 9

The following tables show you the assignment of the Info numbers to the individual information.

Indications	Info number
Single Point	
Event (SP_Ev)	105
ON/OFF (SP)	106
Open/Close (SP)	107
external Single Point ON/OFF (ExSP)	134
external Single Point Open/Close (ExSP)	135
Single Point FAST	
Protection Single Point Fast ON/OFF	129
Protection Single Point Fast Open/Close	130
Double Point	
0= not valid (DP)	108
0= intermediate (DP_I)	109
external double indication (ExDI)	151
external double indication (ExDI_S)	150
Output SLOW	
Event (Out_Ev)	123
ON/OFF (Out)	124
Open/Close (Out)	125
Value Indication (VI)	156
Output FAST	
Protection ON/OFF (Out)	131
Protection Open/Close (Out)	132

Tagging	
Internal Event (IntSP_Ev)	110
Internal ON/OFF (IntSP)	111
Internal Open/Close (IntSP)	112
Internal 0= not valid (IntDP)	113
nternal 0= intermediate (IntDP_I)	114
Transformer Tap Changer	
Transformer Tap Changer (TxTap)	133
Bit pattern	
Bit pattern 2...8 Bit (BP8)	152
Bit pattern 9...16 Bit (BP16)	153
Bit pattern 17...32 Bit (BP32)	154
external Bit pattern, 8 Bit (ExBP8)	136
Counter	
external Counter (ExMV)	137

Control without feedBack	Info number
Single Control (SC)	
ON/OFF (C_S)	49
Open/Close (C_S)	50
external Single Com. without FB (ExCF_S)	141
Open/Close (C_S2)	164
Double Command (DC)	
external Double Com. without FB (ExCF_D)	143
Double Control (DC) 1Trip 1Close	
ON/OFF (C_D2)	52
Open/Close (C_D2)	53
Transformer Tap changer (C_D2)	54

Double Control (DC) 1Trip 1Close 1Com	
ON/OFF (C_D3)	55
Open/Close (C_D3)	56
Transformer Tap changer (C_D3)	57
Double Control (DC) 2Trip 2Close	
ON/OFF (C_D4)	58
Open/Close (C_D4)	59
Transformer Tap changer (C_D4)	60
Open/Close (C_D22)	166
Double Control (DC) 1Trip 2Close	
ON/OFF (C_D12)	61
Open/Close (C_D12)	62
Transformer Tap changer (C_D12)	63
Open/Close (C_D21)	165
Double Control (DC) xTrip xClose	
Open/Close (C_D31)	167
Open/Close (C_D33)	168
Open/Close (C_D44)	169
Double Control (DC) negated	
ON/OFF (C_D2N)	64
Open/Close (C_D2N)	65
Transformer Tap changer (C_D2N)	66
Single Control (negated)	
ON/OFF (C_SN)	46
Open/Close (C_SN)	47

Control with feedBack	Info number
Single Control	
Single Point ON/OFF (CF_S)	69
Single Point Open/Close (CF_S)	70
Double Point; 0= not valid (CF_S)	71
Double Point; 0= intermediate (CF_S)	72
external Single Command with FB (ExCF_S)	140
Single Point Open/Close (CF_S2)	158
Double Command (DF)	
external Double Command with FB (ExCF_D)	142
Double Control (DF) 1Trip 1Close	
Single Point ON/OFF (CF_D2)	79
Single Point Open/Close (CF_D2)	80
Double Point; 0= not valid (CF_D2)	81
Double Point; 0= intermediate (CF_D2)	82
Transformer Tap changer (CF_D2)	83
Double Control (DF) 1Trip 1Close 1Com	
Single Point ON/OFF (CF_D3)	84
Single Point Open/Close (CF_D3)	85
Double Point; 0= not valid (CF_D3)	86
Double Point; 0= intermediate (CF_D3)	87
Transformer Tap changer (CF_D3)	88
Double Control (DF) 2Trip 2Close	
Single Point ON/OFF (CF_D4)	89
Single Point Open/Close (CF_D4)	90
Double Point; 0= not valid (CF_D4)	91
Double Point; 0= intermediate (CF_D4)	92
Transformer Tap changer (CF_D4)	93
Double Point; 0= not valid (CF_D22)	160

Double Control (DF) 1Trip 2Close	
Single Point ON/OFF (CF_D12)	94
Single Point Open/Close (CF_D12)	95
Double Point; 0= not valid (CF_D12)	96
Double Point; 0= intermediate (CF_D12)	97
Transformer Tap changer (CF_D12)	98
Double Point; 0= not valid (CF_D21)	159
Double Control (DF) xTrip xClose	
Double Point; 0= not valid (CF_D31)	161
Double Point; 0= not valid (CF_D33)	162
Double Point; 0= not valid (CF_D44)	163
Double Control (DF) 1Trip 1Close negated	
Single Point ON/OFF (CF_D2N)	99
Single Point Open/Close (CF_D2N)	100
Double Point; 0= not valid (CF_D2N)	101
Double Point; 0= intermediate (CF_D2N)	102
Transformer Tap changer (CF_D2N)	103

Measurement	Info number
Operating value	
Measurement (MVU)	37
external operating value (MVU)	139
Set points	
Set point (LVU)	39

PowerMeter	Info number
PowerMeter	
PowerMeter (MVMV)	44
Pulse	
Pulse (PMV)	42

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