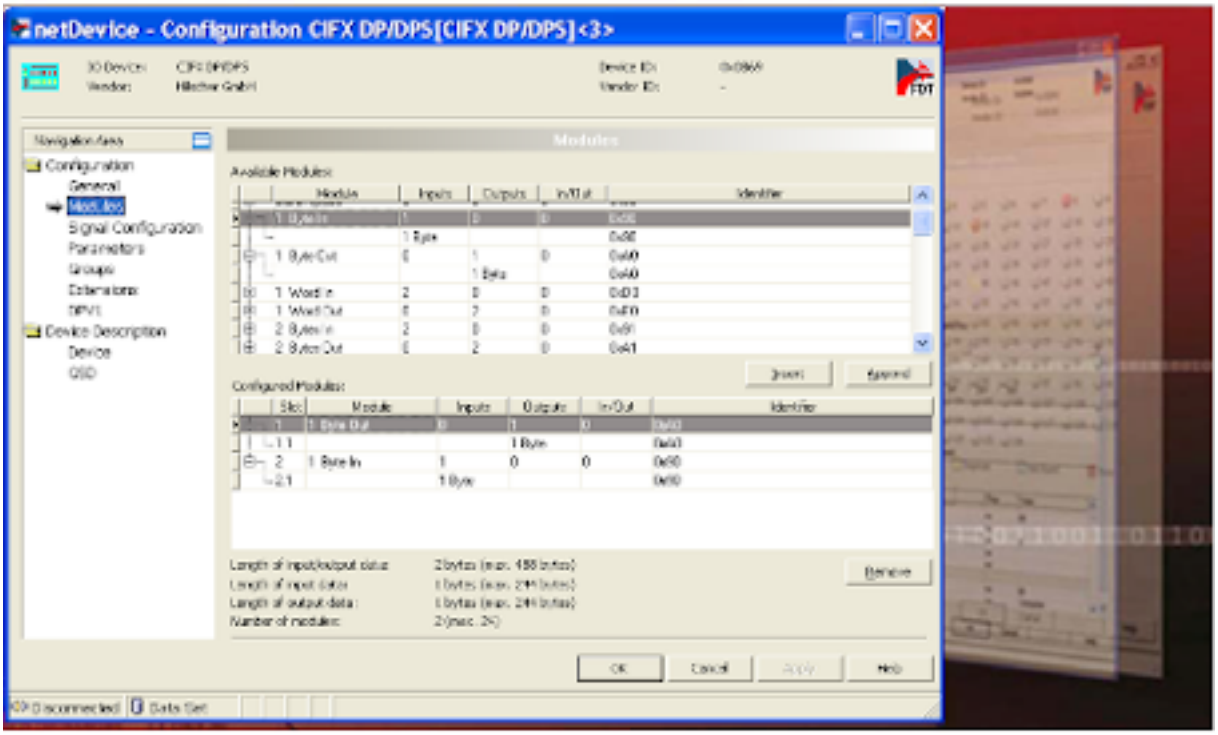
Operating instruction manual

Generic DTM for PROFIBUS DP Slave devices

Configuration of PROFIBUS DP Slave devices

V2.11000



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1 Introduction

1.1 About this manual

This manual provides information on how to set up PROFIBUS DP Slave devices (PROFIBUS DPV0, PROFIBUS DPV1 or PROFIBUS DPV2) described with GSD files. These devices can be configured by use of the generic PROFIBUS DP Slave DTM within an FDT Framework.

1.1.1 Online help

The generic PROFIBUS DP Slave DTM contains an integrated online help.

➢ To open the online help, click on **Help** or press **F1**.

1.1.2 List of revisions

Index	Date	Version	Component	Changes
21	2023-02-27	2.11000	PBGenSlaveDTM.dll	Document revised.
		2.11000	PBGenSlaveGUI.ocx	

Table 1: List of revisions

1.2 Overview use cases

In the table below you find an overview of the applicable use cases.

Use case	Description	Chapter, section
Device start up	• Creating project configuration	*Create project configuration* [▶ page 12]
Configuring device parameters	• Set station address • Configure slave modules • Signal configuration • Set module parameters • Assign slave to a group • Set extension parameters • Configure DPV1 functions • Configure DPV2 functions • Redundancy configuration	*General* [▶ page 15] *Modules* [▶ page 17] *Signal configuration* [▶ page 21] *Parameters* [▶ page 25] *Groups* [▶ page 26] *Extensions* [▶ page 26] *DPV1* [▶ page 28] *DPV2* [▶ page 30] *Redundancy* [▶ page 31]
Device description	• Device information • GSD viewer	*Device info* [▶ page 40] *GSD* [▶ page 40]
Connecting/disconnecting device	Establishing online connection	Connecting/disconnecting device
Upload	Upload device configuration and generate module configuration.	*Upload* [▶ page 34]
Diagnosis	• Diagnosis • Extended diagnosis • Process Image Monitor	*Diagnosis* [▶ page 42] *Extended Diagnosis* [▶ page 44] *Process image monitor* [▶ page 45]
User rights	Definition of access rights	*User rights* [▶ page 58]

Table 2: Overview use cases

1.3 System requirements

- PC with 1 GHz processor or higher
- Windows® XP SP3,
  Windows® Vista (32-bit) SP2,
  Windows® 7 (32-bit and 64-bit) SP1,
  Windows® 8 (32-bit and 64-bit),
  Windows® 8.1 (32-bit and 64-bit),
  Windows® 10 (32-bit and 64-bit)
- Administrator privilege required for installation
- Internet Explorer 5.5 or higher
- RAM: min. 512 Mbyte, recommended 1024 Mbyte
- Graphic resolution: min. 1024 x 768 pixels
- Keyboard and mouse
- Restriction: Touch screen is not supported.

Note:
If the project file is used on a further PC,
- this PC must also comply with the above system requirements,
- the device description files of the devices used in the project must be imported into the configuration software SYCON.net on the new PC,
- and the DTMs of the devices used in the project must also be installed on that further PC.

1.4 About the generic PROFIBUS DP Slave DTM

Using the generic PROFIBUS DP Slave DTM you can:

- configure slave device within an FDT frame application whose settings are defined via GSD files;
- store the information required for configuring the slave device in the master and thus configure the master device.

1.5 Requirements generic PROFIBUS DP Slave DTM

The following requirements apply when working with a generic PROFIBUS DP Slave DTM:

- Installed FDT/DTM frame application (V1.2 compliant)
- Installed PROFIBUS DP Master DTM
- GSD files of the devices to be configured
- The DTM must be loaded into the device catalog.
- Loading GSD files

To add devices to the netDevice device catalog, the GSD files of the used devices must be imported via **Network** > **Import device descriptions** .... into the folder `C:\ProgramData\ SYCONnet\[`*protocol name*`]\GSD` and the device catalog must be reloaded.

1.6 DTM dialog structure

The graphical user interface of the DTM is composed of different areas and elements listed hereafter:

1. A header area containing the **General device information**,
2. the **Navigation area** (area on the left side),
3. The **Dialog pane** (main area on the right side),
4. **OK**, **Cancel**, **Apply**, **Help**,
5. The **Status line** containing information e. g. the online-state of the DTM.

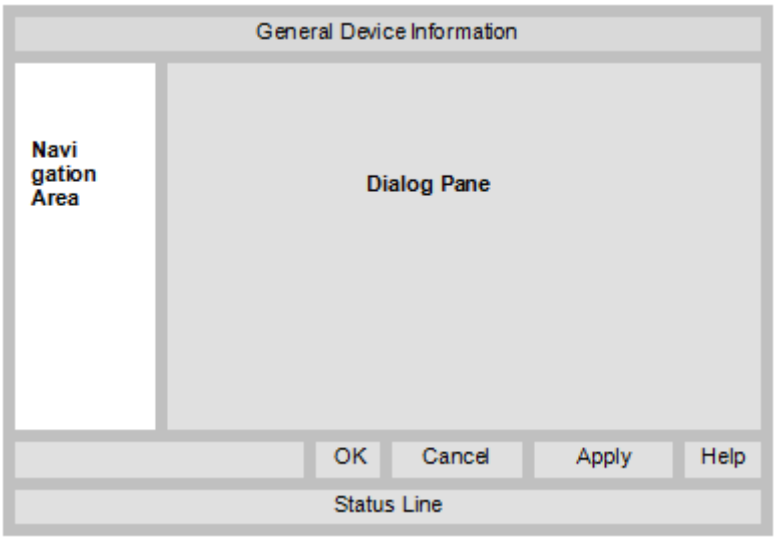


Figure 1: Dialog structure of the Device Type Manager

1.6.1 General device information

Parameter	Description
IO device	Device name
Vendor	Vendor name of he device
Device ID	Identification number of the device
Vendor ID	Identification number of the vendor

Table 3: General device information

1.6.2 Navigation area

In the navigation area, you can select the individual dialog panes via the folder structure of the DTM.

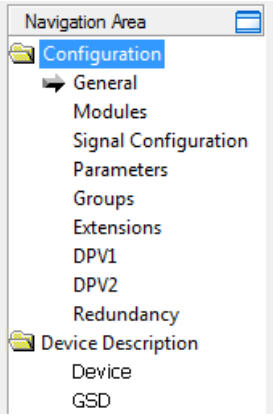


Figure 2: Navigation area

➢ Select the required folder and subfolder.

⇨ The corresponding dialog pane appears.

➢ Click , to hide or to open the navigation area.

1.6.3 Dialog pane

In the dialog pane area, the different windows of the DTM appear only with displayed information or for required setting steps. You call up the respective windows via the associated folder in the navigation area.

1.6.4 OK, Cancel, Apply, Help,

In the configuration software SYCON.net the following is valid:

	Description
OK	To confirm your latest settings, click **OK**. All changed values will be applied on the frame application database. The dialog then closes.
Cancel	To cancel your latest changes, click **Cancel**. Answer to the safety query "Configuration data has been changed. Do you want to save the data?" by **Yes**, **No** or **Cancel**. • **Yes**: The changes are saved or the changed values are applied on the frame application database. The dialog then closes. • **No**: The changes are *not* saved or the changed values are *not* applied on the frame application database. The dialog then closes. • **Cancel**: Back to the DTM.
Apply	To confirm your latest settings, click **Apply**. All changed values will be applied on the frame application database. The dialog remains opened.
Help	To open the DTM online help, click **Help**.

Table 4: OK, Cancel, Apply, Help

1.6.5 Status bar

In the status bar, graphical icons display the current DTM state (e. g., connection status, or other activities).

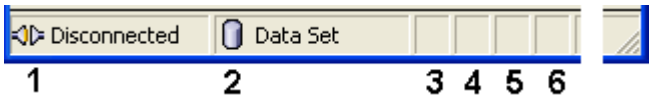


Figure 3: Status bar – status fields 1 to 6

Status field	Icon / description	
1	**DTM connection states**	
		**Connected**: Icon closed = Device is online
		**Disconnected**: Icon opened = Device is offline
2	**Data source states**	
		**Data set**: The displayed data is read out from the instance data set (database).
		**Device**: The displayed data is read out from the device.
3	**States of the instance date set**	
		**Valid Modified**: Parameter is changed (not equal to data source).

Table 5: Status bar icons [1]

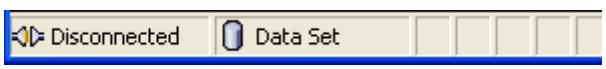
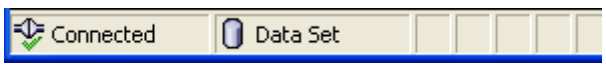
Offline state	
Online state	

Table 6: Status bar, display examples

2 Safety

2.1 General note

The documentation in the form of a user manual, an operating instruction manual or other manual types, as well as the accompanying texts, have been created for the use of the products by qualified personnel. When using the products, all Safety Messages, Integrated Safety Messages, Property Damage Messages and all valid legal regulations must be obeyed. Technical knowledge is presumed. The user has to assure that all legal regulations are obeyed.

2.2 Intended use

The generic PROFIBUS DP Slave DTM serves for configuration of PROFIBUS DP Slave devices.

2.3 Personnel qualification

Personnel responsible for the application of the network system shall be aware of the system behavior and shall be trained in using the system.

3 Device start up

3.1 Configuration steps

The following overview provides to you the step sequence on how to configure a PROFIBUS DP Slave device with a generic PROFIBUS DP Slave DTM as it is typical for many cases. It is assumed at this point that the installation of the PROFIBUS DP Master DTM has been completed.

Step	Brief description	Further information
Add PROFIBUS DP Slave in the device catalog	- Open configuration software SYCON.net. - **Network** > **Import device descriptions**. - Import the device description.	Section *Create project configuration* [page 12], or operating instruction manual “SYCON.net” and operating instruction manual “netDevice and netProject”
Load device catalog	- Select **Network > Device catalog**, - **Reload catalog**.	
Create / open project	- Select **File > New** or **File > Open**.	
Insert the master device and the slave device and into configuration	- In the **Device catalog**, select the master device and insert the device via drag & drop **to the line** in the network view. - In the **Device catalog**, select the slave device, and insert it via drag and drop **to the master bus line** in the network view.	
Configure slave	- Select **Configuration** > **General**. - Set the watchdog control and interval. - Select **Modules**. - Configure the slave modules. - Select **Signal configuration**. - Set the signal configuration. - Select **Parameters**. - Set the module parameters. - Select **Groups**. - Assign the slave to a group. - Select **Extensions**. - Set the extension parameters. - Select **DPV1**. - Configure the DPV1 functions. - Select **DPV1**. - Configure the DPV1 functions. - Select **Redundancy**. - Perform the redundancy configuration. - Close the dialog via **OK**.	*General* [page 15] *Modules* [page 17] *Signal configuration* [page 21] *Parameters* [page 25] *Groups* [page 26] *Extensions* [page 26] *DPV1* [page 28] *DPV2* [page 30] *Redundancy* [page 31]
Configure master device	Configure the master device via the PROFIBUS DP Master DTM netX.	Operating instruction manual of the DTM
Save project	- Select **File** > **Save**.	Operating instruction manual “SYCON.net”

Table 7: Getting started – Configuration steps

3.2 Create project configuration

1. Complete the slave device in the device catalog.
   - ➢ Select **Network** > **Import device descriptions**.
   - ➢ Import the device description file.
2. Load device catalog
   - ➢ Select **Network** > **Device catalog**.
   - ➢ Select **Reload catalog**.
3. Create or open a project.
   - ➢ Create new project / open existing project:
   - ➢ Select **File** > **New** or **File** > **Open**.
4. Insert slave device to the configuration.
   - ➢ In the device catalog, select the master device, and insert it via drag and drop **to the line** in the network view.
   - ➢ In the device catalog, under **Slave**, select the slave device.
   - ➢ Insert the slave device via drag and drop **to the master bus line**.

Notes

Note:
In order to select the desired device in the device catalog, note the details about the DTM and the device at the bottom of the device catalog window. When sorting by fieldbus, several devices with the same name from different vendors can be displayed.

For further information, see operating instruction manual "SYCON.net" or "netDevice and netProject".

4 Configuration

4.1 Overview configure device parameters

Under "Configuration" you configure your PROFIBUS DP Slave device.

- The **General** dialog pane shows the current name of station of the slave device.
- In the **Modules** dialog pane, you configure the slave modules.
- In the **Signal configuration** dialog, you define the data structure of the input and output data of your device and assign suitable data types, names or signal names.
- In the **Parameters** dialog, you configure the module parameters.
- In the **Groups** dialog, you assign your slave device to a group.
- In the **Extensions** dialog, you set the extension parameters.
- In the **DPV1** dialog, you configure the DPV1 functions.
- In the **DPV2** dialog, you configure the DPV2 functions.
- In the **Redundancy** dialog, you make settings for redundancy.

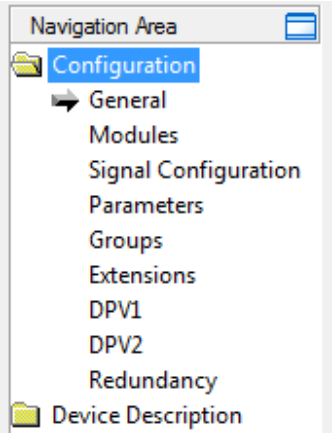


Figure 4: Navigation area – configuration

Note:
To edit the dialog panes under **Configuration**, you need the user rights for "Maintenance".

For further information about configuration, see the sections:

- *General* [▷ page 15],
- *Modules* [▷ page 17],
- *Signal configuration* [▷ page 21],
- *Parameters* [▷ page 25],
- *Groups* [▷ page 26],
- *Extensions* [▷ page 26],
- *DPV1* [▷ page 28],
- *DPV2* [▷ page 30],
- and *Redundancy* [▷ page 31].

Information on configuration download or diagnosis you find in the DTM for PROFIBUS DP Master devices operating instruction manual.

4.2 General

At the **General** pane, the used station address of the slave device is displayed.

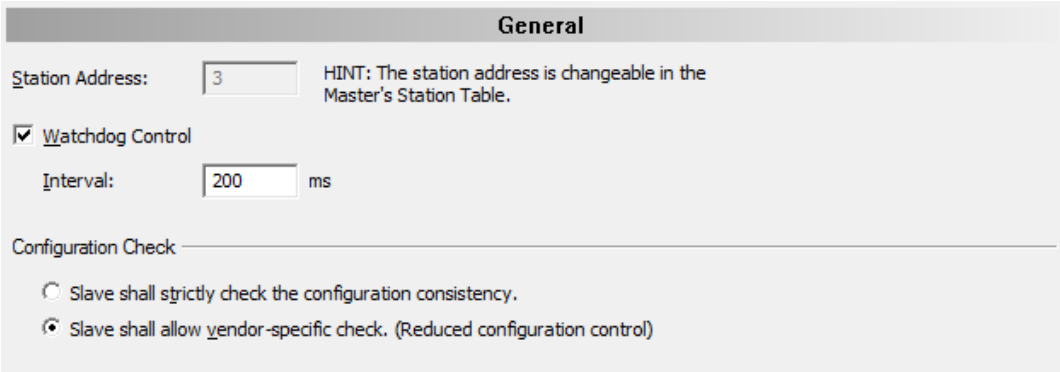


Figure 5: Configuration > General

You can set the station address of the PROFIBUS DP Slave device in the configuration of the PROFIBUS DP Master device.

The **Watchdog control** setting activates or deactivates in the PROFIBUS DP Slave the monitoring of communication errors to the assigned PROFIBUS DP Master device. E. g. if the PROFIBUS DP Slave device detects an interruption of an already operational communication, defined by the Watchdog time, then the PROFIBUS DP Slave device sets the outputs into the secure condition.

Note:
If the monitoring by means of the Watchdog control has been deactivated, there is the possibility, that the PROFIBUS DP Slave device does not set its outputs into a safe state, even though the communication has been interrupted.

In the **Interval** field, you can set the monitoring time of the selected PROFIBUS DP Slave device.

Note:
If the monitoring time chosen is too short for a low baud rate, there is the possibility, that the PROFIBUS DP Slave device will set its outputs into the safe state.

If the monitoring time chosen is too long for a low baud rate, there is the possibility, that if an interruption occurs, the PROFIBUS DP Slave device will take a long time to set its outputs into the safe state.

Configuration check

- The slave device checks the configuration data, which the master sends to the slave device during startup. The slave device accepts the configuration data or refuses incorrect configuration data by reporting a configuration fault. This behaviour corresponds to the setting **Slave shall strictly check the configuration consistency** (Default) and means “Startup when expected configuration matches actual configuration”.
- Some slave device can startup, even when the expected configuration differs from the actual configuration. This is for example when the expected configuration contains a module, but is not plugged in the slave device. This behaviour is vendor-specific and corresponds to the setting **Slave shall allow vendor-specific check. (Reduced configuration control)**. This setting is usable only when the slave device supports it.

4.3 Modules

At the **Modules** pane, modules can be selected or assigned and configured.

The following figure shows an example of a simple slave:

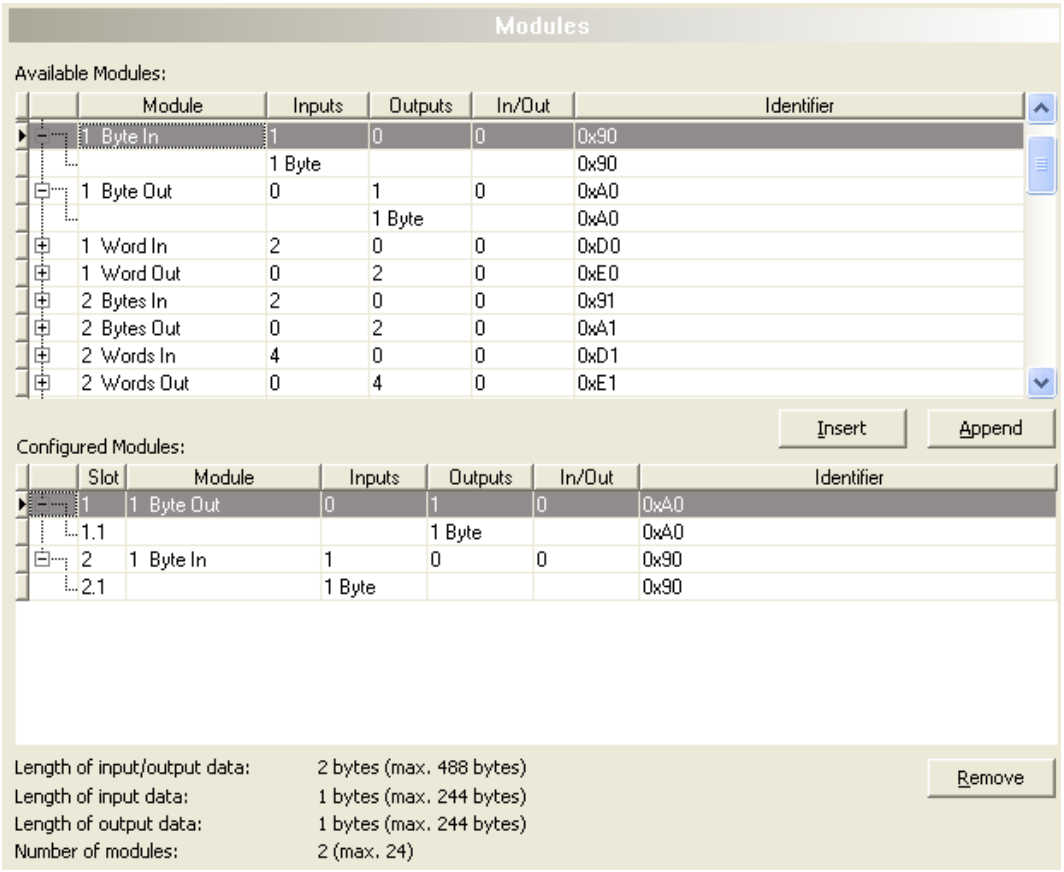


Figure 6: Configuration > Modules

There are two kinds of slaves (slave devices). A simple slave has a fixed data length. The data length of a complex and modular slave is configurable. The selection list **Available Modules** shows all possible modules of the slave.

- **Module configuration of a simple slave**

In the case of a simple slave, one module is shown and it is copied automatically into the **Configured modules** list.

For simple slaves in the **Module** column a module name is displayed. This one indicates the number of inputs, outputs or inputs/outputs of that module. In the line with the module name in the columns **Inputs**, **Outputs** and **In/Out** the number of inputs, the number of outputs or the number of inputs/outputs of the module will be displayed in bytes. In the line below the module name, the number and the data type (byte or word) of the inputs, outputs or inputs/outputs of this module are displayed.

- **Module configuration of a complex modular slave**

In case of a complex modular slave, the user has to select the required modules manually.

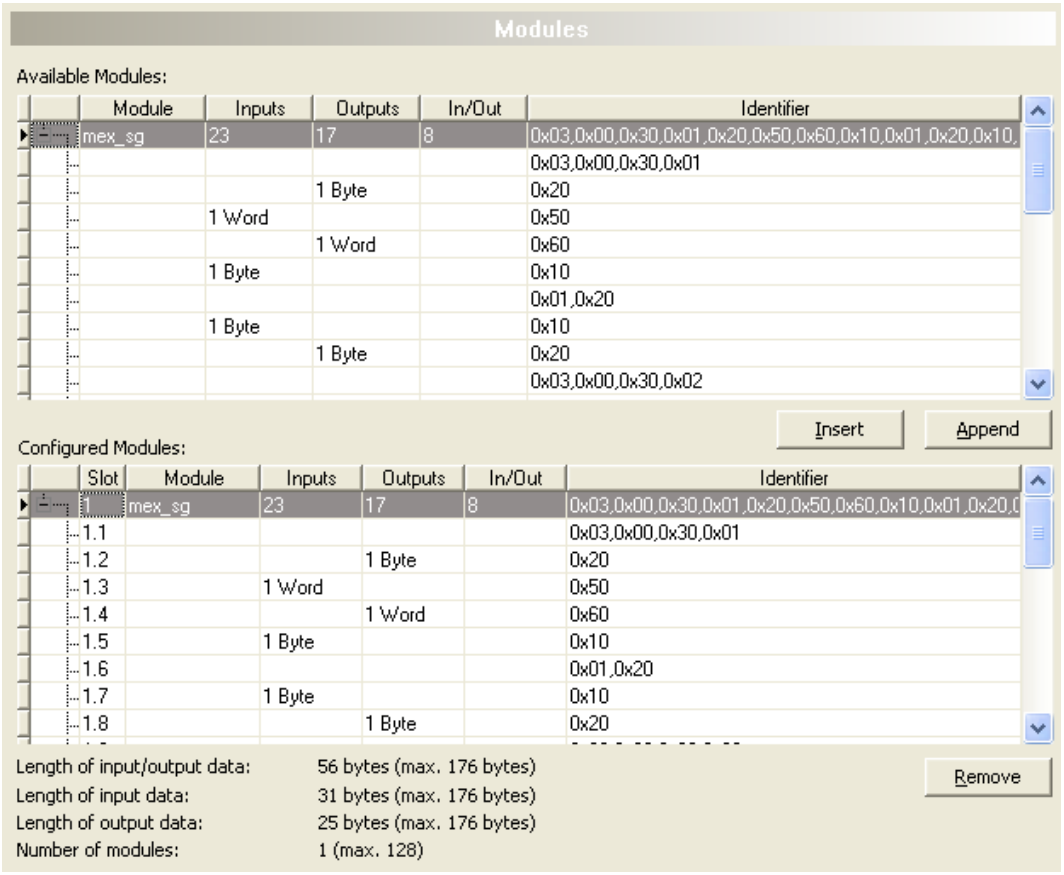


Figure 7: Configuration > Modules (XN-mex_sg, Example of a complex modulare slave)

For modules consisting from several submodules, in the **Module** column the module name is displayed. In the line with the module name in the columns **Inputs**, **Outputs** and **In/Out** the number of inputs, the number of outputs or the number of inputs/outputs of the module will be displayed in bytes. In the line below the module name, the number and the data type (byte or word) of the inputs, outputs or inputs/outputs of this module are displayed. In the columns Inputs, Outputs and In/Out for each submodule the number and the data type (byte or word) of the inputs, outputs or inputs/outputs are displayed.

In the **Identifier** column all identifier of the sub modules are displayed in the same line. A description of the Module configuration identifier you find in section *Identifier bytes* [▷ page 53].

The **Slot** column shows a sequential number for the modules or a sequential subnumber for the submodules of a module.

4.3.1 Configuration of the modules of a slave

For configuration of the modules of a slave (selection of the modules), proceed as follows:

1. Add all the required modules from the **Available modules** selection list to the **Configured modules** list. To know how to append or to insert the modules refer to section *Appending or inserting available modules* [page 19].

The sequence of the modules in the **Configured modules** list is important and must match with the sequence, which exists in the slave. Typically, the sequence is the actual physical sequence. There are slaves to which this rule does not apply and where for example first analogue modules and then digital modules must be entered, independent of their actual sequence.

For further information about the modules of the used slave see the manual of the device manufacturer.

Note:
If the slave device has only one module, this module is taken over automatically in the table **Configured modules** and can not be deleted.

2. Click on **OK** to confirm your selection. If the selection should not be taken over, click **Cancel**.

4.3.2 Appending or inserting available modules

You can append or insert one or several modules to the list **Configured modules**.

Note:
A multi-selection is possible. Therefore, click in the list **Available modules** on several modules while holding the **SHIFT** key.

1. Appending modules
   - ➢ Under **Available modules** click on one or several modules and click on **Append**.
   - ➢ Alternatively, double click on these modules.
   - ⇨ The modules appear at the lower end of the list **Configured modules**.
2. Inserting modules
   - ➢ Under **Available modules**, click on one or several modules.
   - ➢ Under **Configured modules**, click to the module before which the additional modules shall be inserted.
   - ➢ Click **Insert**.
   - ⇨ The modules appear in the list **Configured modules** before the selected module.

4.3.3 Remove configured modules

From the **Configured modules** list you can remove single modules.

- ➢ Therefore, click under **Configured modules** to the module, you wish to remove from the list.
- ➢ Click **Remove**.
- ⇨ The module is removed from the **Configured modules** list.

4.4 Signal configuration

With the PROFIBUS DP Slave, modules are defined at fieldbus level to configure the process data to be transmitted via the bus, with the amount of data transmitted.

The application requires the information on the meaning and data type of the input and output data specified via the signals.

Important:
First, configure the modules for the input and output data in the “Modules” dialog pane. Each module contains information about length and direction (In / Out). Only carry out the steps for signal configuration afterwards.

In the “Signal configuration” dialog you can define the data structure of the input or output data of your device and define the I/O data for your application

- assign data types,
- assign names or signal names, and
- define data structures.

The aim is to create a suitable signal configuration, which subsequently enables easy identification of the transmitted input and output data. This requires a structuring of the input and output data according to signals and the configuration of signal names or data types suitable for the individual application cases.

Signal names

The names assigned by default by the configuration software for the signals distinguish between input and output signals. You can replace these general names with suitable designations, such as "Setpoint" or "Status".

Merging or splitting signals

You can merge or split signals or data types by configuring the data type and the number of signals.

For example, you can specify that 4 bytes of input data together match with 1 input signal of the data type `UNSIGNED32`.

4 Byte (input) = 1 `UNSIGNED32` **(input)**

The GSD file for your device includes the definition of the identifier bytes specified by the PROFIBUS DP standard and contains the data types `BYTE` and `WORD`, which are displayed in the signal configuration. For the shown example 4 `BYTE` input data correspond to 1 signal of the data type `UNSIGNED32`. That is to say, on the lower level the transmitted bytes are set, whereas on the level above it is set how the data are used and interpreted.

To identify split data types, the configuration software assigns appropriate suffixes to the signal names, which depend on the selected new data type, for example `_Byte_0`, `_Byte_4` ... or `_Bit_1`, `_Bit_2` ...

Note:
The data types specified in the GSD file under `Data_Area` represent the default value for the data type. Data types that are not supported by the configuration software will not be built in the signal configuration. For these data types, you must build the module configuration by creating signals from the provided data types.

4.4.1 Signal configuration pane

➢ Select **Configuration > Signal configuration** in the navigation area.

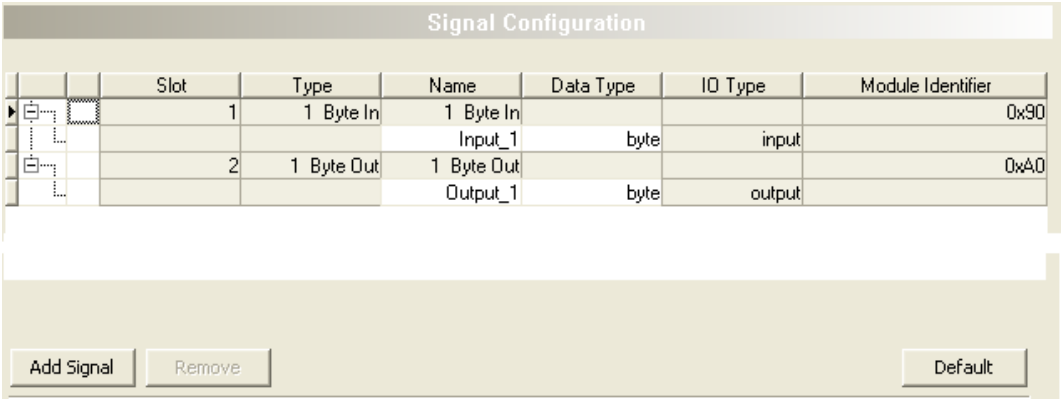


Figure 8: Configuration > Signal configuration

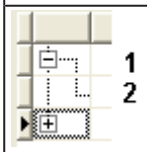
Parameter	Description	Range of value/ value
▶	The arrow symbol shows the current line in the table. This line is the reference for **Add signal** and **Remove**.	
	The tree shows the structure of the modules (1) with its configured signals (2).	
!	The modified signal configuration is incorrect. For example, if a duplicate name is used or if the length of the signal exceeds the configured length for the data transferred on the bus.	
Slot	Slot shows a sequential number for the modules or a sequential subnumber for the submodules of a module.	
Type	Not editable names of the modules with the input or output signals.	Byte In, Byte Out
Name	Not editable names of the modules Editable name for the input or output signals, as for example Input_1, Input_2, Output_1 or Output_2	Modules: Byte In, Byte Out
Data Type	Data type of the single input or output signals. Depending by the used device profile the user can select the data type from a list.	BYTE, SIGNED8/16/32, UNSIGNED8/16/32
IO Type	Input signal or output signal	input, output
Module Identifier	Hexadecimal module identifier for every single module A description of the Module Configuration Identifier you find in section *Identifier bytes* [▶ page 53].	
Add Signal	Using Add Signal you can insert additional signals to a module.	
Remove	Using Remove you can remove the current signal line from a signal configuration table.	
Default	Using Default you can reset the signal configuration to the configuration defined in the Modules pane.	

Table 8: Explanations signal configuration pane

4.4.2 Configuration steps

1. Open Signal configuration dialog
   - ➢ Select **Configuration** > **Signal configuration** in the navigation area.
   - ↬ The Signal configuration dialog pane is displayed.

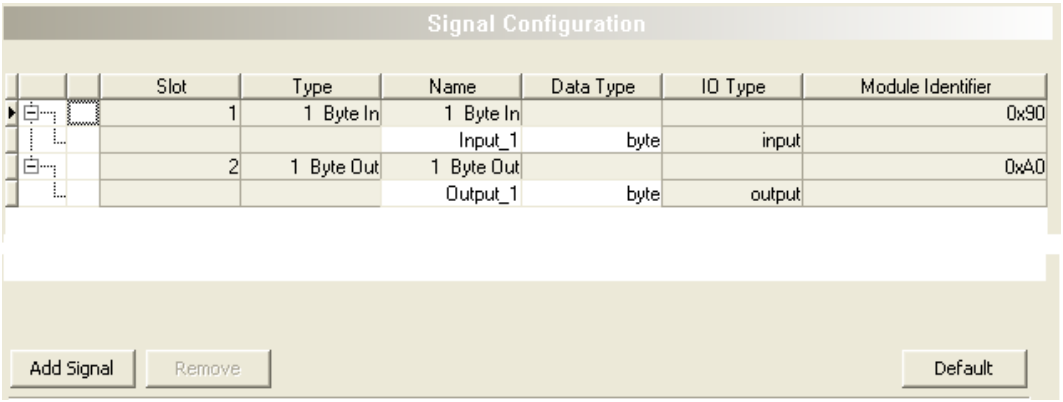


Figure 9: Configuration > Signal configuration - Example

2. Adjust signal names
   - ➢ In the **Name** column, adjust the names for the signals.
3. Define data types.
   - ➢ In the **Data type** column, define the data types for the signals.

Note:
For data types that are not supported by the configuration software you must build the module configuration by creating signals from the provided data types.

4. Add signal
   - ➢ Click on the line of the module, to which you intend to add a new signal.
   - ➢ Click **Add signal**.
   - ↬ At the lower end of the signal list of that module a new line for a new signal is inserted.
   - ↬ The signals of the type `Input` are sequentially assigned to the input data.
   - ↬ The signals of the type `Output` are sequentially assigned to the output data.

Note:
As a maximum you can insert as many signals as input or output data are configured.

If you insert more input signals, than input data are configured or if you insert more output signals, than output data are configured, the information appears: "Info - The total data length of signals exceeded module limit!"

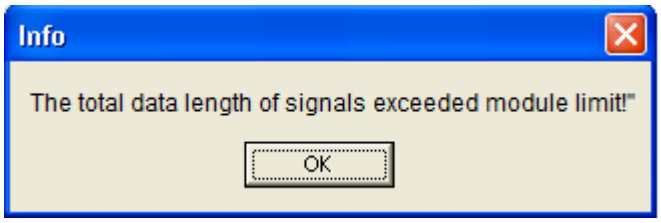


Figure 10: Info – Signal Length too large

If you afterwards click to “Apply” or “OK” , the message appears: „Error – Signal Configura¬tion is invalid "

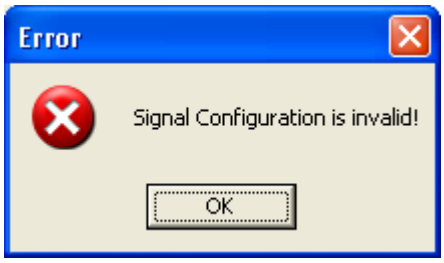


Figure 11: Error – Signal configuration is invalid

5. Remove signals
   - ➢ If the configured signal length has been exceeded, remove signals from the configuration.
   - ➢ Click to the line of the signal to be removed.
   - ➢ Click **Remove**.
   - ⇘ The marked signal is removed from the configuration.
6. Save configuration
   - ➢ Save your configuration using **Apply** or **OK**.

4.4.3 Default

Important:
First save your signal configuration before resetting the signal configuration to the default settings made in the Modules pane. Using **Default** all manually inserted signals and names get lost.

- ➢ Save your signal configuration using **Apply** or **OK**.
- ➢ Or save the entire project.
- ➢ Click **Default**.
- ⇨ The signal configuration is reset to the configuration made in the **Modules** pane.

4.5 Parameters

The **Parameters** pane allows it to change the parameter settings of the modules.

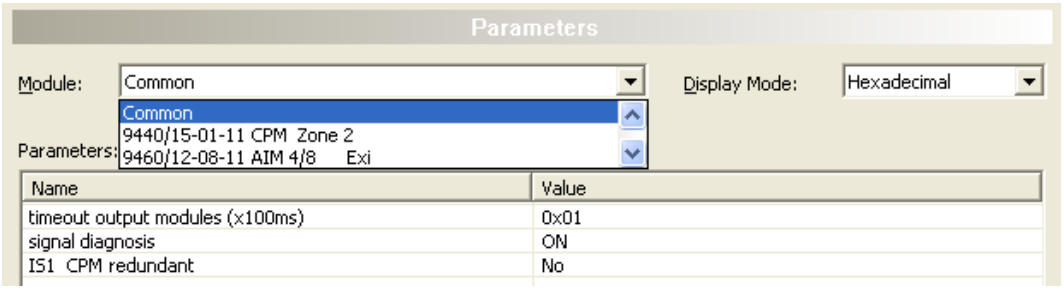


Figure 12: Configuration > Parameters

If default parameters are available in the GSD file of the slave, they are automatically inserted.

Some of the PROFIBUS DP Slave devices require further parameter data, for instance in order to change a measuring limit or a value range. This type of data is manufacturer and slave specific. The meaning of the parameters is determined by the device manufacturer. The explanations can be taken from the manufacturers' manual.

- **Module**

In the **Module** field, the module, which should be displayed, has to be selected. The modules have to be assigned in the configuration before (see section *Modules* [page 17]).

- **Parameter and value**

The Values of the parameters can be changed by making a double click on the parameter.

The meaning of the single parameters can be found in the manual of the device manufacturer.

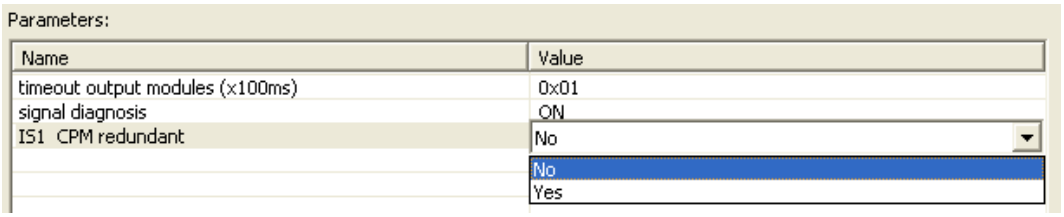


Figure 13: Change parameter values

The representation of the parameter values is by default in hexadecimal. If under **Display mode** the entry 'Decimal' is selected, the representation of the values changes into the decimal representation.

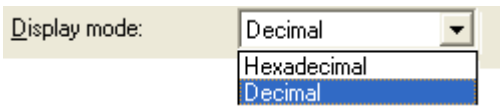


Figure 14: Hexadecimal and decimal representation of the parameter values

4.6 Groups

After a master was arranged, the single slaves devices can be assigned to up to eight different groups.

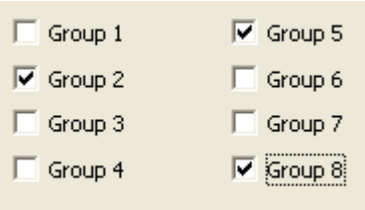


Figure 15: Configuration > Groups

The assignment of the actual slave device to one or more groups takes place by enabling the group respectively groups with the desired characteristics.

The selected group membership is transferred to the slave device during its start-up sequence. The group membership acts as a filter for the Sync and Freeze global commands. These are output as Broadcast telegrams in order to synchronize the input and output data of several slaves. Only the slaves in whose group these commands have been assigned react on it.

4.7 Extensions

The **Extensions** pane contains adjustment possibilities for the extension parameters: Auto clear, Fail safe behavior, Configuration data convention, Error on cyclic data exchange and Diagnosis update delay.

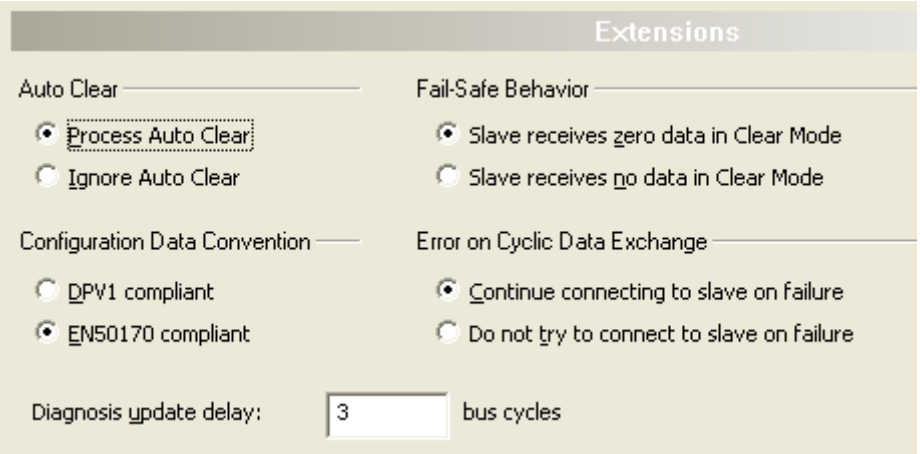


Figure 16: Configuration > Extensions

Setting	Description	Range of Value/ Value
Auto clear	The setting **Auto clear** activates or respectively deactivated the Auto clear function of the actual slave. This function can only be used if the global Auto clear is activated in the master. The setting of the global Auto clear typically is configured in the bus parameters of the master. If no data exchange occurs to at least one slave (process auto clear) or an existing data exchange takes place after the expiration of a monitoring time, then the master leaves the data exchange and sets the outputs of all assigned PROFIBUS DP Slaves into a secure condition. If the setting **Ignore auto clear** is selected, the master tries to stay in the data exchange with the other slaves.	Process auto clear, Ignore auto clear, Default: Process auto clear

Setting	Description	Range of Value/ Value
Fail safe behavior	The setting for fail safe behavior is read from the GSD file and is a fixed setting. The user can select between both options only if the slave supports them. Depending by which pre-settings are contained in the GSD file, the **Fail safe behavior** mode can get the following settings: 1. **Slave receives zero data in clear mode** (fixed setting) 2. **Slave receives no data in clear mode** (fixed setting) 3. The user can select between - **Slave receives zero data in clear mode** - **Slave receives no data in clear mode** (Default). The **Fail safe behavior** mode indicates to the master that the affected slave is working in a so-called `Fail_safe` mode. If the fail safe behavior mode is activated (setting “Slave receives zero data in clear mode”), in the `CLEAR` state the slave will receive output data of the length zero instead of the zero output data. Based on this method (setting “Slave receives zero data in clear mode”), the slave immediately recognizes that the master is in the `CLEAR` condition even if a previous `CLEAR` command had been destroyed on the bus.	Slave receives zero data in clear mode, Slave receives no data in clear mode, Default: The setting for fail safe behavior is read from the GSD file. (‘Slave receives no data in clear mode’ = default if the slave supports both functions.)
Configuration data convention	The **Configuration data convention** determines whether the configuration data is interpreted according to EN 50170 (supported) or additional configuration data according to PROFIBUS DPV1 extension is used (not supported).	DPV1 compliant, EN 50170 compliant, Default: EN 50170 compliant
Error on cyclic data exchange	If **Continue connecting to slave on failure** is selected, the master remains in the state `DATA_EXCHANGE` and holds the connection to the slave, although the slave does not respond and the master does not receive the response from the slave. If **Do not try to connect to slave on failure** is selected, the master does not remain in the `DATA_EXCHANGE` condition for the affected slave if the slave has been recognized as incorrect, but breaks off the connection to the slave.	Continue connecting to slave on failure, Do not try to connect to slave on failure, Default: ‘Do not try to connect to slave on failure’
Diagnosis update delay	Some slave devices which are newer require more time for the consistency testing for the processing of the `SET_PRM` parameter zing telegrams. In this case the standard diagnosis cycle is not sufficient after the parameterizing phase, to detect the disposition of the slave for the `DATA_EXCHANGE`. With the diagnosis delay, the number of diagnosis cycles is advanced after the parameterizing phase, which is the maximum that the master waits for this disposition, before it starts a new parameterizing.	3 bus cycles The value range is 0...255.

Table 9: Configuration > Extensions

4.8 DPV1

DPV1 serves for an acyclic data exchange and supports the functions read write and alarm handling.

Note:
DPV1 functions can only be used and configured if the used PROFIBUS DP Slave and the used PROFIBUS DP Master support DPV1 functions.

Enable DPV1

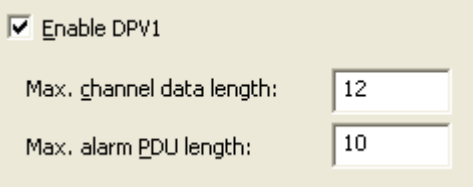


Figure 17: Configuration > DPV1 > Enable DPV1

The option **Enable DPV1** must be enabled, to activate DPV1. All setting possibilities concerning DPV1 are grayed out before activating.

Note:
In case of slave devices, which do not support DPV1, the **Enable DPV1** field is grayed out and cannot be selected for this slaves.

The **Max. channel data length** determines the maximum length of the DPV1 Alarm telegrams. The slave will arrange its buffer size for the concerning number of data.

The **Max. alarm PDU length** determines the maximum quantity of active alarms.

Alarms

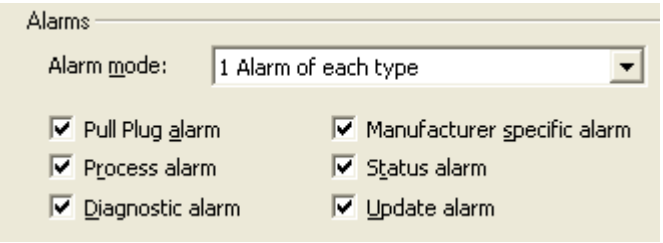


Figure 18: Configuration > DPV1 > Alarms

The **Alarm mode** defines the maximum number of possible active alarms: 1 alarm of each type respectively 2, 4, 8, 12, 16, 24 or 32 alarms in total.

The following alarms can be activated or deactivated by selecting it or not.

- Pull Plug alarm (module pulled),
- Process alarm,
- Diagnosis alarm,
- Manufacturer specific alarm,
- Status alarm and
- Update alarm.

Extra alarm SAP

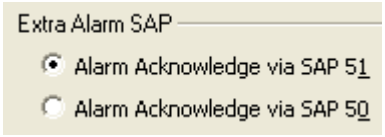


Figure 19: Configuration > DPV1 > Extra alarm SAP

Under **Extra alarm SAP**, you set whether the PROFIBUS DPV1 Master acknowledges an alarm to the PROFIBUS DPV1 Salve via SAP 51 or SAP 50.

Setting	Description	Range of Value/ Value
Extra alarm SAP	**SAP 5**1: The PROFIBUS DPV1 Master acknowledges alarms via SAP 51. With the setting "Alarm acknowledge via SAP 51", the master uses SAP 51 for DPV1 read/write and to acknowledge alarms for this slave. **SAP 50**: The PROFIBUS DPV1 Master acknowledges alarms via SAP 50. With the setting "Alarm acknowledge via SAP 50", the master uses SAP 50 to acknowledge alarms for this slave. However, the master still uses SAP 51 for DPV1 read/write. The setting "Alarm acknowledge via SAP 50" may result in a higher performance, because SAP 50 is exclusively used for alarm acknowledgement and cannot be delayed by a running DPV1 read/write service. The function "Alarm acknowledge via SAP 50" can only be used if the slave supports this function. This specification is included in the GSD file. The setting Alarm acknowledge via SAP 51 is used if the GSD file does not provide a default SAP. Otherwise the default SAP value is read from the GSD file: • If the GSD file provides SAP-50, this value is used. • If the GSD file provides SAP-51, this value is used.	Alarm acknowledge via SAP 51 (default if GSD does not contain a default SAP), Alarm acknowledge via SAP 50

Table 10: Configuration > DPV1 > Extra alarm SAP

4.9 DPV2

The **DPV2** pane contains adjustment possibilities for the Time sync configuration for the slave.

Activate time sync, Clock sync interval

For Time sync configuration, the settings **Activate time sync** and **Clock sync interval** must be used.

Figure 20: Configuration > DPV2 > Activate time sync, Clock sync interval

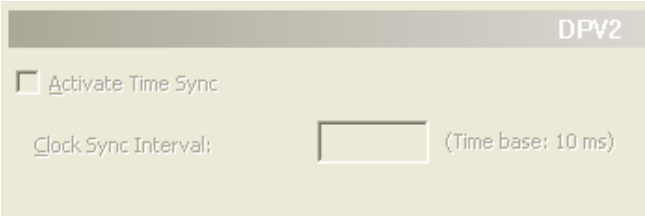


Figure 21: Configuration > DPV2 > Activate time sync, Clock sync interval - grayed out as Time Sync is not supported by the slave (GSD)

Parameters	Description	Range of Value / Value
Activate time sync	**Activate time sync** is enabled (checked), if Time Sync is supported by the slave (GSD). Otherwise the field is grayed out and can not be checked for this slave.	checked, unchecked, Default: unchecked (`Time_Sync_supp` is set to true in GSD)
Clock sync interval (Time base 10 ms)	**Clock sync interval** of the Out signal in 10ms steps. Time base 10 ms: e.g. the value 1000 results as 10ms*1000=10s Clock sync interval	1 … 2^{16} – 1, Default: 1000

Table 11: Activate time sync, Clock sync interval

➢ Respectively adjust **Clock sync interval**.

4.10 Redundancy

The **Redundancy** pane contains adjustment possibilities for the redundancy configuration for the slave.

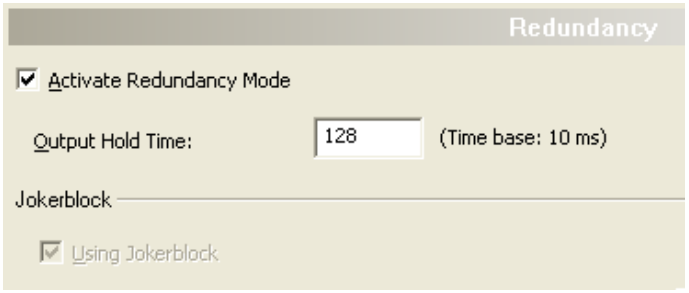


Figure 22: Configuration > Redundancy

Activate redundancy mode, Output hold time

For redundancy configuration of the slave the settings **Activate redundancy mode**, and **Output hold time** must be used.

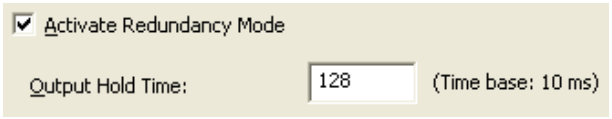


Figure 23: Configuration > Redundancy > Activate redundancy mode, Output hold time

Parameter	Description	Range of value/value
Activate redundancy mode	**Activate redundancy mode** is enabled (checked), if redundancy is supported by the slave (GSD). Otherwise, the field is grayed out and cannot be checked for this slave. **Note**: When redundancy mode is activated, station address offset will be set to 0 always.	checked, unchecked, Default: unchecked (`Slave_Redundancy_supp` and `PrmCmd_supp` are set to true in GSD)
Output hold time (Time base 10 ms)	**Hold time of the out signal** in 10ms steps. Time base 10 ms: e.g. the value 128 (0x0080) results as 10ms*128=1280ms=1,28s hold time	0 … 2^{16} – 1, Default: `Slave_Max_Switch_Over_Time+1` (if specified in GSD), otherwise:128

Table 12: Activate redundancy mode, Output hold time

➢ Set **Output hold time**.

Using Jokerblock

Figure 24: Configuration > Redundancy > Using Jokerblock (enabled)

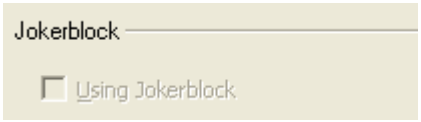


Figure 25: Configuration > Redundancy > Using Jokerblock (disabled)

Parameter	Description	Range of value/value
Using Jokerblock	The field is grayed out and cannot be checked/unchecked by the user. **Using Jokerblock** is enabled (checked) if GSD for the slave specifies `Jokerblock_supp = 1 & Jokerblock_Location = 0 or 1 & Jokerblock_Type=129` Otherwise this option is disabled (unchecked) for this slave. **Note:** Ext-Prm-Telegram is not supported!	checked, unchecked, Default: checked (`Jokerblock_supp = 1 & Jokerblock_Location = 0 or 1 & Jokerblock_Type=129` are set to true in GSD)

Table 13: Using Jokerblock

4.11 Connect/disconnect device

Note:
To access to the diagnosis panes and to use the diagnosis requires an online connection from the generic PROFIBUS DP Slave DTM to the PROFIBUS DP Master DTM. This online connection can only be build up if a driver is assigned to the PROFIBUS DP Master device.

For information on how to select a driver, to scan for a device and to select it in the master DTM dialog, refer to the operating instruction manual of the DTM for the PROFIBUS DP Master devicee

Connecting device

The following steps are needed to establish an online connection from the generic PROFIBUS DP Slave DTM to the PROFIBUS DP Master DTM:

- ➢ In the master DTM dialog verify that the default driver is checked and respectively check another or multiple drivers.
- ➢ Configure the driver, scan for the device, select it, and select and download the firmware.
- ➢ Close the user dialog of the PROFIBUS DP Master DTM via the **OK**.
- ➢ Right-click on the device icon of the generic PROFIBUS DP Slave device.
- ➢ Select **Connect** from the context menu.
- ⇨ The generic PROFIBUS DP Slave DTM now is connected to the PROFIBUS DP Master DTM via an online connection. In the network view, the device description at the device icon is displayed with a green colored background.

Disconnecting device

The following steps are needed to disconnect an online connection from the generic PROFIBUS DP Slave DTM to the PROFIBUS DP Master DTM:

- ➢ Right-click on the device icon of the generic PROFIBUS DP Slave device.
- ➢ Select **Disconnect** from the context menu.
- ⇨ The online connection from the generic PROFIBUS DP Slave DTM to the PROFIBUS DP Master DTM is disconnected.

4.12 Upload

Using the Upload function of the PROFIBUS DP Slave DTM, you can upload the configuration of a PROFIBUS DP Slave device via the PROFIBUS DP Master device and the PROFIBUS DP Master DTM to the PROFIBUS DP Slave DTM and then generate the module configuration. Then you must download the changed configuration of the PROFIBUS DP Slave device via Download to the PROFIBUS DP Master device.

Steps for upload and download

1. Upload the PROFIBUS DP Slave device configuration and generate the module configuration.
   - ➢ In netDevice: right-click on the device symbol of the PROFIBUS DP Slave DTM.
   - ➢ Select **Upload** from the context menu.

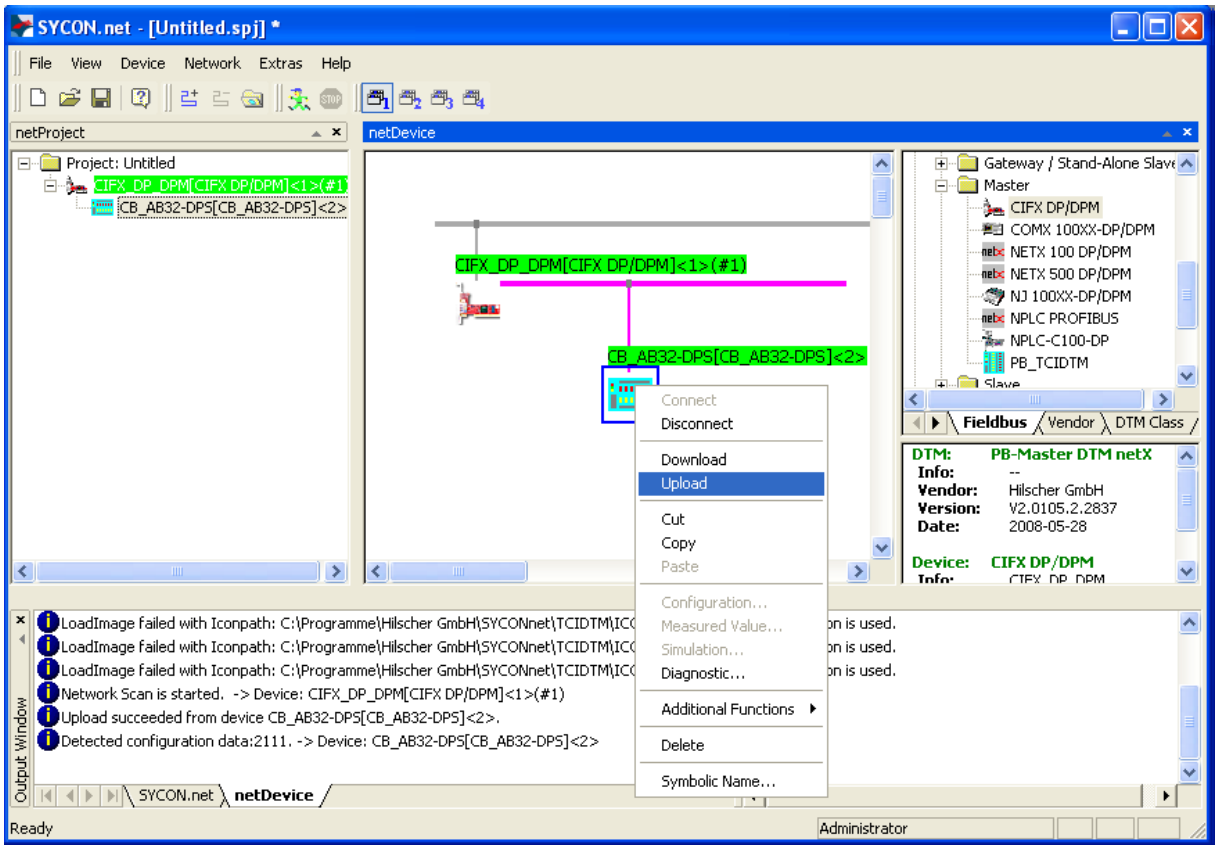


Figure 26: ‚Upload' - Configuration of a slave device (example ‚CB_AB32-DPS')

- ➢ If in the PROFIBUS DP Slave DTM already a module configuration is present, the dialog **Question – Upload function will overwrite any existing module configuration. Do you wish to proceed?** is displayed.
- ➢ To proceed the upload, select **Yes**.
- ➢ The dialog **Devices** *Symbolic Name of the Device [Device Description] <Device Address>* **Starting Upload …** appears. The dialog shows the progress of the upload process. (Depending on the manufacturer of the respective device, also a dialog with some slight deviations from this one may be displayed.)

➧ Additionally you are asked whether the module configuration of the PROFIBUS DP Slave device should be generated.

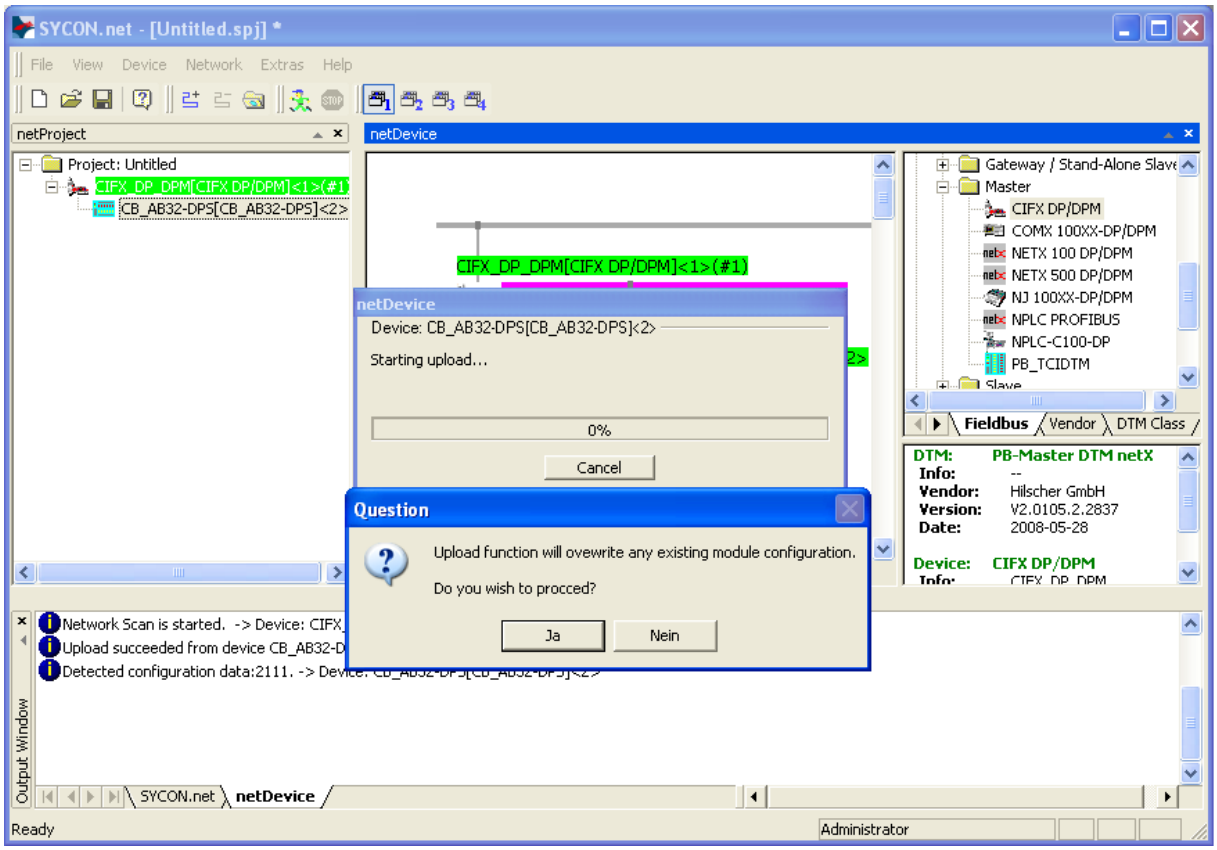


Figure 27: Upload succeeded (example ‚CB_AB32-DPS')

➢ Answer the query by **Yes**.

➧ The current configuration of the PROFIBUS DP Slave device is uploaded via the PROFIBUS DP Master device and the PROFIBUS DP Master DTM to the PROFIBUS DP Slave DTM.

➧ The success of the upload procedure is reported in the output window.

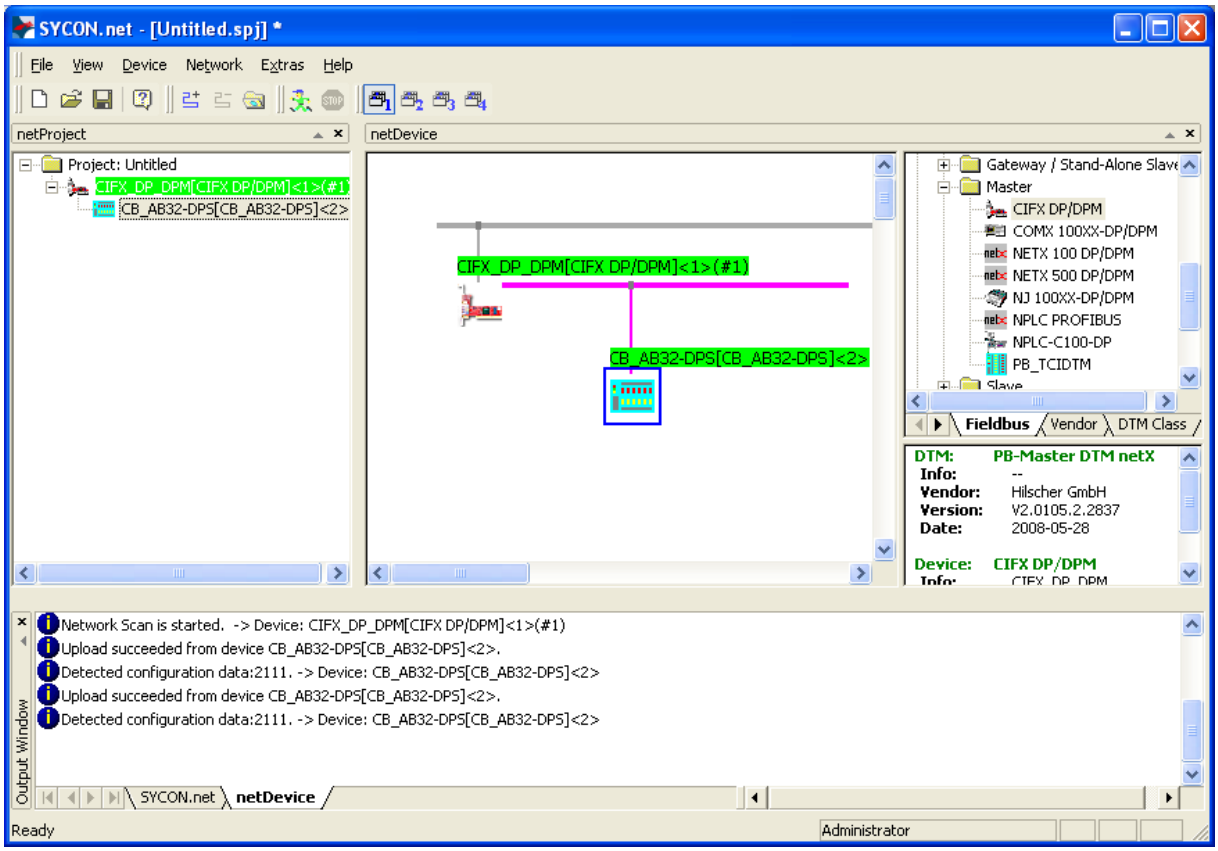


Figure 28: Upload succeeded (example ‚CB_AB32-DPS')

Note:
If a module identifier conflict occurs when scanning the module configuration, the Upload dialog appears, where occurred conflicts are displayed in red. For information to resolve identified module identifier conflicts, refer to section *Resolving module identifier conflicts* [page 37].

2. Download the current configuration of the PROFIBUS DP Slave device to the PROFIBUS DP Master device.
   - In netDevice: right-click on the device symbol of the PROFIBUS DP Master DTM.
   - Select **Download** from the context menu.

4.12.1 Resolving module identifier conflicts

4.12.1.1 Upload dialog

The Upload pane will be displayed only if modules are detected, which show a module identifier conflict, i. e., modules which have the same module identifier and not a unique one each. These modules then are listed under **Configured modules** marked in red.

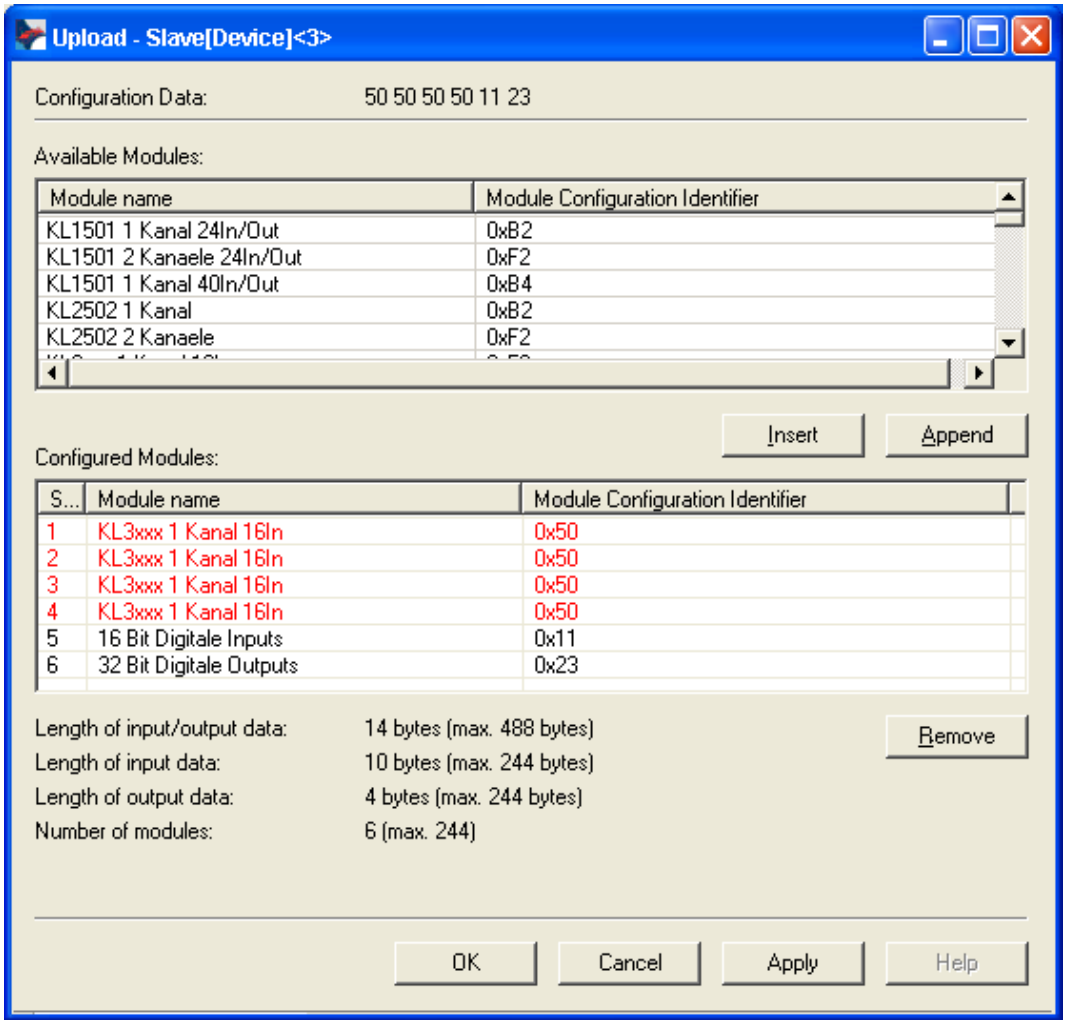


Figure 29: Upload

Column	Description
Configuration Data	Shows the scanned module configuration (sequence of the module configuration identifier).
Available Modules	Shows all possible modules of the slave. A simple slave has a fixed data length. The data length of a modular slave is configurable.
Configured Modules	In the case of a simple slave, one module is displayed here. In case of a modular slave, the scanned module configuration is displayed here.
Module name	Shows the name of the available respectively of the configured modules.
Module Configuration Identifier	Shows all identifier of the sub modules in the same row. For more information, refer to the Operating Instruction Manual of the slave DTM.
Slot	Shows a sequential number for modules.

Table 14: Upload

4.12.1.2 Module identifier conflicts

Module identifier conflicts detected during the upload are displayed in the **Upload** dialog (as text in red). This allows the user to clarify whether the scanned module configuration of a slave corresponds to the actual physical module sequence in the slave device or not. The user must replace scanned modules indicating a conflict using **Remove**, **Insert** or **Append**.

4.12.1.3 Resolving module identifier conflicts

If the module configuration of a slave device is indicated with a conflict, you must check and manually adapt this scanned module configuration.

Note:
The sequence of the modules in the Configured modules list is important and must match with the sequence, which exists in the slave. Typically, the sequence is the actual physical sequence. There are slaves to which this rule does not apply and where for example first analogue modules and then digital modules must be entered, independent of their actual sequence.

If the slave device has only one module, this module is taken over automatically in the table Configured Modules and cannot be deleted.

For further information about the modules of the used slave, see the manual of the device manufacturer.

1. Check module sequence
   - ➢ Check if the scanned module configuration of a slave corresponds to the actual physical module sequence in the slave device or not.
2. Remove, insert or append modules
   - ➢ Replace scanned modules, which do not correspond to the physical module sequence using **Remove**, **Insert** or **Append.**
   - ➢ Delete these scanned modules from the Configured modules list using via **Remove**.
   - ➢ Then Insert the required modules from the selection list Available modules into the list Configured modules.
   - ➢ You can append or insert one or several modules to the Configured modules list.

Note:
A multi-selection is possible. Therefore, click in the Available modules list on several modules while holding the SHIFT key.

Appending modules

- ➢ Under Available modules click on one or several modules and click on **Append**.
- ➢ Alternatively, double click on these modules.
- ➢ The modules appear at the lower end of the Configured modules list.

Inserting modules

- ➢ Under Available modules click on one or several modules.
- ➢ Under Configured modules click to the module before which the additional modules shall be inserted.
- ➢ Click **Insert**.
- ➪ The modules appear in the Configured modules list before the selected module.
- ➢ Click on **OK** to confirm your selection, otherwise click **Cancel**.
- ➢ Then download the configuration to the master device.

5 Device description

5.1 Overview device description

- The **Device info** dialog contains manufacturer information about the device, which is defined in the GSD file.
- The **GSD viewer** displays the contents of the GSD file of the device in text format.

Figure 30: Navigation area - Descriptions

5.2 Device info

The **Device Info** dialog contains manufacturer information about the device, which is defined in the GSD file. The following information is indicated:

Parameter	Description
Vendor name	Vendor name of the device
Product name	Name of the device
Ident. number	Identification number of the device
Revision	Hardware reference

Table 15: General device information

5.3 GSD

The **GSD viewer** shows the content of the GSD file in a text view.

Under **Filename** the file directory path and the file name of the displayed GSD file is displayed. **Find what** offers a search feature to search for text contents within the text of the GSD file.

In the GSD Viewer window on the left side, the line number is displayed for simple overview, the further entries show the GSD file in text format.

Parameter	Description
Filename	File directory path and the file name of the displayed GSD file.
Find what	Search feature to search for text contents within the text of the GSD file.
Match case	Search option
Match whole word	Search option

Table 16: Device description – GSD viewer

6 Diagnosis

6.1 Overview diagnosis

The dialog Diagnosis serves to diagnose the device behavior and communication errors. For diagnosis, the device must be in online state.

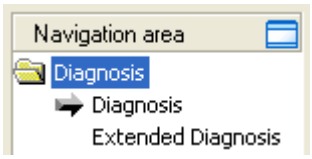


Figure 31: Navigation area - Diagnosis

Online connection to the device

Note:
Accessing the **Diagnosis** panes of the PROFIBUS DP Slave DTM requires an online connection from the PROFIBUS DP Slave DTM to the PROFIBUS DP Master DTM. For further information, refer to section *Connect/disconnect device* [page 33].

How to proceed

- In the diagnosis dialog, check whether the station status is OK: **Diagnosis** > **Diagnosis** – “Station status” > “Slave device” must be green!
- Otherwise, use **Diagnosis** and **Extended diagnosis** for troubleshooting.

The extended diagnosis helps to find bus and configuration errors. The extended diagnosis is only activated if the slave device supports it.

6.2 Diagnosis

The diagnosis information of a PROFIBUS DP Slave can be 6 to 244 bytes. The first 6 bytes are standard diagnosis information (specification). The meaning of these 6 bytes is according to the PROFIBUS DP specification and contains the **Station status**, the **Assigned master address** and the **Device-internal ident number** of the slave.

The extended device diagnosis starts at the 7th Byte. It is manufacturer specific and can contain, station related diagnosis, module related diagnosis and/or channel related diagnosis.

The range of the displayed diagnosis bytes can be restricted by the used PROFIBUS DP Master. The following figure shows the analysis of the first 6 byte of the standard diagnosis.

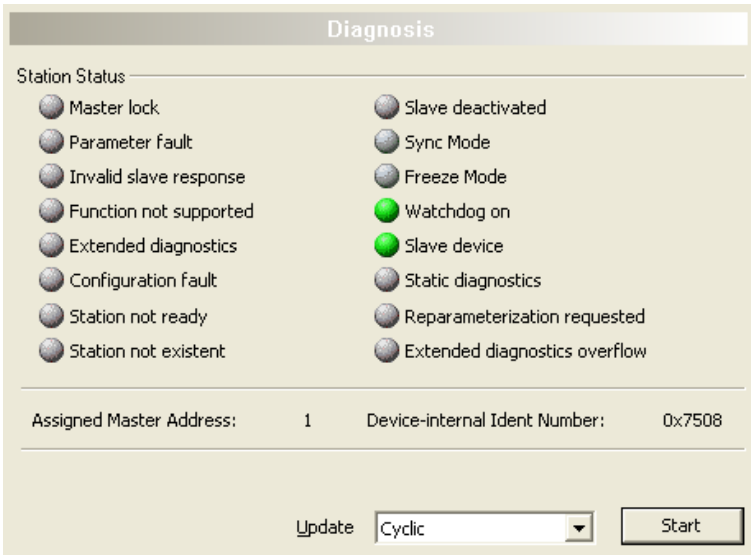


Figure 32: Diagnosis

Diagnosis	Description
Station status	The **Station status** 1, 2 and 3 in detail are described in section *Station status of the slave diagnosis* [page 47].
Assigned master address	At **Assigned master address** the address of the master is shown, that has parameterized and configured this slave. The value 255 displays, that the slave is not parameterized or configured yet or that the received parameter information and configuration information are rejected because of an error.
Device internal ident number	In the field **Device internal ident number** the (real) ident number of the used slave is displayed. If the Device internal Number shows the value 0000, then the master has no connection to the PROFIBUS DP Slave via PROFIBUS yet.
Update	Actualizes the displayed diagnosis states.

Table 17: Descriptions „Diagnosis“ pane

Note:

The **Device-internal ident number** has to agree with the **Ident number of the GSD file** (see section *General device information* [page 8]). When they are different, the reason could be that the wrong GSD file is used or the wrong PROFIBUS DP Slave device was connected to the PROFIBUS network.

Detailed information about the diagnosis of a PROFIBUS DP Slave device you find in section *PROFIBUS DP Slave diagnosis* [page 46].

6.2.1 Update

The diagnosis information can be updated “cyclic” or “one-time”.

Figure 33: Diagnosis - Update

1. Updating the diagnosis information “cyclic”:
   - ➢ Under **Update** click `Cyclic`.
   - ➢ Click **Start**.
   - ➪ The diagnosis information is updated cyclically.
   - ➢ To stop the cyclic update, click **Stop**.
2. Updating the diagnosis information “one-time”:
   - ➢ Under **Update** click `one-time`.
   - ➢ Click **Start**.
   - ⇨ The diagnosis information is updated one-time.

6.3 Extended Diagnosis

The “Extended diagnosis” helps to find bus and configuration errors. The “Extended diagnosis” is only enabled if the slave device supports this.

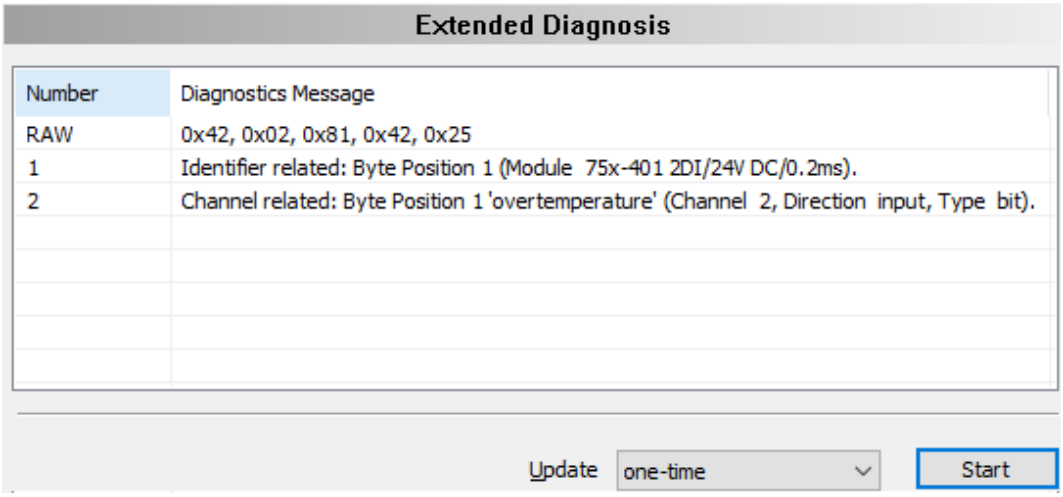


Figure 34: Extended diagnosis

The “Extended diagnosis” dialog pane shows a list of extended diagnosis messages. Three categories of messages could appear:

- The “Device-related diagnosis” contains manufacturer specific information about the status of the device.
- The “Identifier-related diagnosis” indicates in which module a diagnosis is present. The **Byte position** gives the relevant Module Configuration Identifier and the name of the associated module.
- The “Channel-related diagnosis” gives information about diagnosed channels and diagnosis causes. The **Byte position** gives the relevant Module Configuration Identifier and the channel type.

A detailed description about the device related, identifier related and channel related diagnosis can be found in the annex of this document in the section *PROFIBUS DP Slave diagnosis* [page 46].

RAW

The first entry in this list, characterized with “RAW” contains the undecoded extended diagnosis data (`Ext_Diag_Data`) of the used slave.

➢ To view for “RAW” the “Diagnostic message” column completely, double click to the right border of the column head. Move to the left or the right column side using the scroll bar.

Update

For updating diagnosis information, see section *Update* [page 43].

Requirements

Note:
The extended device diagnostics can only be evaluated if the device manufacturer has provided texts for evaluation in the GSD.

6.4 Process image monitor

The **Process image monitor** pane lists the configured modules or input or output signals of the devices. This makes the fieldbus structure and the data structure of the device's input and output data transmitted at the bus visible. Furthermore the values of the signal data provided to the OPC server are displayed here.

➢ Open **Diagnosis** > **Process image monitor**.

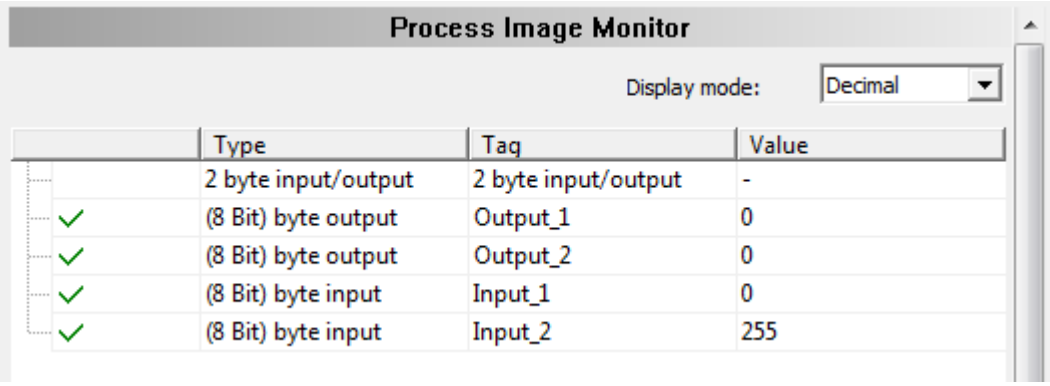


Figure 35: "Process image monitor" pane

Parameter	Description	Range of value/ value
Display mode	Display of the values in the column **Value** in decimal or hexadecimal mode.	Decimal (Default), Hexadecimal
?	Display when the input and output data is not completely read and analyzed.	
!	Display when the input and output data is not valid.	
✓	Display when the input and output data is valid.	
Type	Device labeling provided by the hardware: Also description of the modules or input or output signals configured to the device.	
TAG	Device name provided by the hardware (not changeable in the FDT container) or symbolic name for the modules configured to the device or for the input or output signals.	
Value	Display of the valid input and output data values.	

Table 18: Notes to the "Process image monitor" pane

7 Appendix

7.1 PROFIBUS DP Slave diagnosis

A PROFIBUS DP Master can read out diagnosis information of a PROFIBUS DP Slave. The diagnosis telegram contains standard diagnostics and, if necessary, extended diagnosis.

Length	Description
6 bytes	Standard diagnosis
0 … N bytes	Extended diagnosis (if available) with one or several blocks.

Table 19: PROFIBUS DP Slave diagnosis

The **Standard diagnosis** of the first 6 Byte for PROFIBUS DP Slave devices is described in section *Station status of the slave diagnosis* [page 47].

If an **Extended diagnosis** is available for this device, you find a description in section *Extended slave device diagnosis* [page 50].

7.1.1 Station status of the slave diagnosis

7.1.1.1 Station status 1

Station status 1	Set by	Description	Remedy
Master lock (Bit 7)	Master	The slave has already been parameterized by another master and is locked in its access.	This is security mechanism of PROFIBUS DP. First, clarify which master should have access to this slave. Then add this slave to the configuration of the master that should have access to this slave and remove this slave from the configuration of the other master.
Parameter fault (Bit 6)	Slave	This bit is set by the slave automatically, when the parameters sent by the master are containing wrong or insufficient data. On every received parameter telegram, the slave executes a check routine on the whole parameter telegram. If the slave detects a faulty parameter value or illegal data during its check, it will report the Parameter fault. During the check routine the slave compares its ident number with the one sent by master.	So if the slave reports this error, first compare the Device internal Number with the **GSD Ident Number**. If they are different, either a wrong GSD file is used or a wrong device was connected to the bus. If this two Ident numbers are the same, check the parameter data.
Invalid slave response (Bit 5)	Master	This bit is set by the master, when the master receives an invalid answer from the slave. Therefore, the physical contact to the slave works principally, but the logical answer was not understood.	An error at the physical transmission line could have appeared like twisted cable, missing bus termination or missing shield connection. Use standardized PROFIBUS DP Slave. This also can happen, for example if a PROFIBUS FMS Slave is connected to the PROFIBUS DP Master instead of a PROFIBUS DP Slave. So the slave does not understand the PROFIBUS DP telegram and rejects it. It is handled as 'Invalid slave Response'.
Function not supported (Bit 4)	Slave	This bit is set by the slave, when a function should be performed which is not supported. Newer releases of slave stations normally support the Sync and Freeze mode for I/O data. This is fixed in the GSD file, read out by SyCon, and sent to the slave in the parameter telegram.	If this error occurs the GSD file declares at least one of these commands as supported, but the slave does not. In this case, contact the manufacturer of the slave device for the right GSD file for the used slave.
Extended Diagnosis (Bit 3)	Slave	This bit is set by the slave, if extended diagnosis data are a read out. Extended diagnosis data is optionally and normally used by a slave to hand out manufacturer specific diagnosis information.	Click on Extended diagnosis to get a Hex-dump of the diagnosis data and read about their meaning in the manual of the manufacturer. If the GSD file contains information about the Extended device diagnosis it can be analyzed with the DTM.
Configuration fault (Bit 2)	Slave	During the PROFIBUS DP startup, procedure the slave compares its internal I/O configuration with the configuration of the master. If the slave detects differences, it will report a configuration error. That means that the master has another I/O module constellation as the slave.	So first compare visually all configured I/O modules in the configuration data of SyCon for this slave with its real physical constellation. Note that the order of the module has to agree. Some slaves need virtual I/O modules to be configured first or empty slot modules to get an even number of modules to run. This slave specific I/O module behavior has to be written down in the slave documentation because it cannot be read out from the GSD file. Read the configuration notes of the manufacturer.

Station status 1	Set by	Description	Remedy
Station not ready (Bit 1)	Slave	The PROFIBUS DP Slave is still not ready for the data exchange.	When or at which event the slave sets this bit is not defined in the specification. That means it can have several slave specific reasons. Usually the bit is set in combination with one the other fault bits. Check especially the parameter and the configuration. Often the report Station not ready results in case of parameter fault or configuration faults. It is possible that the supply voltage at the slave was just first switched on. Wait until the device is initialized.
Station not existent (Bit 0)	Master	This bit is set by the master automatically, if this slave does not answer or is not reachable on the bus.	Check your PROFIBUS cable. Both signal wires need to be connected correctly between all devices. In addition, the connectors at the end of the cable need to be provided with termination resistors. Check that the device is connected to the bus cable. Check the power supply at the slave device. Compare the station address at the slave with the configuration of the master. Check, if the slave supports the configured baud rate. Some slaves only work with up to 1.5 MBaud or need to be set for a PROFIBUS DP conform behavior. Check the intermediated LWL (optical) connector’s converters and repeaters.

Table 20: PROFIBUS DP diagnosis station status 1

7.1.1.2 Station status 2

Station status 2	Set by	Description
Slave deactivated (Bit 7)	Master	This bit is set by the master, if the slave in its parameter set is marked as inactive, so that it is taken out from the cyclic I/O exchange.
Reserved (Bit 6)	-	-
Sync mode (Bit 5)	Slave	This bit is set by the slave, when it has received the Sync control command.
Freeze mode (Bit 4)	Slave	This bit is set by the slave, when it has received the Freeze control command.
Watchdog on (Bit 3)	Slave	This bit is set by the PROFIBUS DP Slave, when its Watchdog control is active to supervise its corresponding master connection.
Slave device (Bit 2)	Slave	This bit is always set by the slave.
Static diagnosis (Bit 1)	Slave	The slave sets this bit to indicate the master to be not operative because of a general error. Typically, the PROFIBUS DP Slave is not ready for an I/O data transfer. In a case of a set Static diagnosis bit, the master has to collect diagnosis information as long as this bit is active. On which events or at what time this bit can be set by a slave device, is not defined in the norm description and cannot be mentioned here.
Parameteri-zation request (Bit 0)	Slave	The slave sets this bit to force the master system to do a new parameterization. This bit is set as long as new parameterization must be performed. In case of this error, you should compare firstly the **Device internal ident number** with the **GSD ident number** in this window. This numbers need to be the same. Furthermore, you have to check the parameter data.

Table 21: PROFIBUS DP diagnosis station status 2

7.1.1.3 Station status 3

Station status 3	Set by	Description
Extended diagnosis overflow (Bit 7)	Master Slave	This bit is set, if there is more extended diagnosis information to report to the master than can be given to the master in one diagnosis telegram. The PROFIBUS DP Slave sets this bit for example if there is more diagnosis channel information than the slave can hold down in its diagnosis buffer.
Reserved (Bit 6 to 0)	-	-

Table 22: PROFIBUS DP diagnosis station status 3

7.1.1.4 Master address

This byte of the standard diagnosis shows the address of the PROFIBUS DP Master which has parameterized the PROFIBUS DP Slave and which has read and write access to the PROFIBUS DP Slave. The value 255 (FFH) displays that the PROFIBUS DP Slave was not parameterized or faulty parameterized by the PROFIBUS DP Master.

7.1.1.5 Ident number

The “Ident number” is the manufacturer code of the PROFIBUS DP Slave device.

7.1.2 Extended slave device diagnosis

7.1.2.1 Device-related diagnosis

This extended diagnosis refers to the device. The length of the device related diagnosis has at least 2 and up to 63 bytes.

Length	Byte	Description
2 … 63 Bytes	1	Header byte (always present)
	2	Manufacturer-specific meaning (always present)
	…	Manufacturer-specific meaning (optional)
	63	Manufacturer-specific meaning (optional)

Table 23: Device-related diagnosis

The following table describes the meaning of the header byte.

Bit	Description
0 … 5	Block length in bytes including header byte.
6 … 7	Always 00 = device-related diagnosis

Table 24: Device-related diagnosis (Header byte)

The meaning of the 1 to max. 62 diagnosis bytes following the header byte is specified by the device manufacturer. For further analysis, the device description file or the device description of the manufacturer can be used.

7.1.2.2 Identifier/module-related diagnosis

This extended diagnosis refers to the module (identifier byte). The length of the identifier-related diagnosis has at least 2 an up to 63 bytes.

Length	Byte	Description
2 … 63 Bytes	1	Header byte (always present)
	2	Module 7 … 0 (always present)
	3	Module 15 … 8 (optional)
	4	Module 23 … 16 (optional)
	5	Module 31 … 24 (optional)
	…	Module N … N-7 (optional)

Table 25: Identifier/module-related diagnosis (structure)

One bit is reserved for each used identifier byte in the configuration. It is padded to byte limit. Unused bits are set to zero. A set bit means there is diagnosis for this module (identifier byte).

Header byte

Bit	Description
0 … 5	Block length in bytes including header byte.
6 … 7	Always 01 = identifier/module-related Diagnosis

Table 26: Identifier/module-related diagnosis (Header byte)

Bit structure for identifier-related diagnosis

Bit	Description
0	Identifier byte / module 0 has diagnostic
1	Identifier byte / module 1 has diagnostic
…	
7	Identifier byte / module 7 has diagnostic

Table 27: Identifier/module-related diagnosis (Bit structure)

7.1.2.3 Channel related diagnosis

This extended diagnosis refers to a channel and has a length of 3 bytes.

Byte	Description
Byte 1	Identifier number
Byte 2	Channel number
Byte 3	Type of diagnosis

Table 28: Channel-related diagnosis

In a block the diagnosed channels and the diagnosis reason are present. Several blocks with channel-related diagnosis can appear.

Byte 1: Identifier number

Bit	Description
0 … 5	Identifier number / module 0 to 63
6 … 7	Always 10 = channel-related dignostic

Table 29: Channel-related diagnosis Byte 1: Identifier number

Byte 2: Channel number

Bit	Description
0 … 5	Channel number 0 to 63 in the module
6 … 7	Input/Output 00 reserved 01 Input 10 Output 11 Input/Output

Table 30: Channel-related diagnosis Byte 2: Channel number

Byte 3: Type of diagnosis

Bit	Description
0 … 4	Error type 00000 reserved 00001 short circuit 00010 under voltage 00011 over voltage 00100 overload 00101 over temperature 00110 line break 00111 upper limit value exceeded 01000 lower limit value exceeded 01001 Error 01010 … 01111 reserved 10000 … 11111 manufacturer-specific
5 … 7	Channel type 000 reserved 001 bit 010 two bits 011 four bits 100 byte 101 word 110 two words 111 reserved

Table 31: Channel-related diagnosis Byte 3: Type of diagnosis

7.2 Identifier bytes

In the configuration telegram identifier bytes are used. The meaning of them is specified in the PROFIBUS specification.

The following table is an overview.

	Value	Description				
AKF/ SKF	0x00	00	Free place			
SKF	0x01-0x0F	01-15	see SKF			
AKF	0x10-0x1F	16-31	1-16	Byte	Input	Consistency over Byte
AKF	0x20-0x2F	32-47	1-16	Byte	Output	Consistency over Byte
AKF	0x30-0x3F	48-63	1-16	Byte	Input/ Output	Consistency over Byte
SKF	0x40-0x4F	64-79	see SKF			
AKF	0x50-0x5F	80-95	1-16	Word	Input	Consistency over Word
AKF	0x60-0x6F	96-111	1-16	Word	Output	Consistency over Word
AKF	0x70-0x7F	112-127	1-16	Word	Input/ Output	Consistency over Word
SKF	0x80-0x8F	128-143	see SKF			
AKF	0x90-0x9F	144-159	1-16	Byte	Input	Consistency over whole length
AKF	0xA0-0xAF	160-175	1-16	Byte	Output	Consistency over whole length
AKF	0xB0-0xBF	176-191	1-16	Byte	Input/ Output	Consistency over whole length
SKF	0xC0-0xCF	192-207	see SKF			
AKF	0xD0-0xDF	208-223	1-16	Word	Input	Consistency over whole length
AKF	0xE0-0xEF	224-239	1-16	Word	Output	Consistency over whole length
AKF	0xF0-0xFF	240-255	1-16	Word	Input/ Output	Consistency over whole length

Table 32: Identifier bytes (overview)

7.2.1 Identifier bytes (General Identifier Byte Format GIF)

For the identifier bytes, in general identifier format the following table shows the meaning.

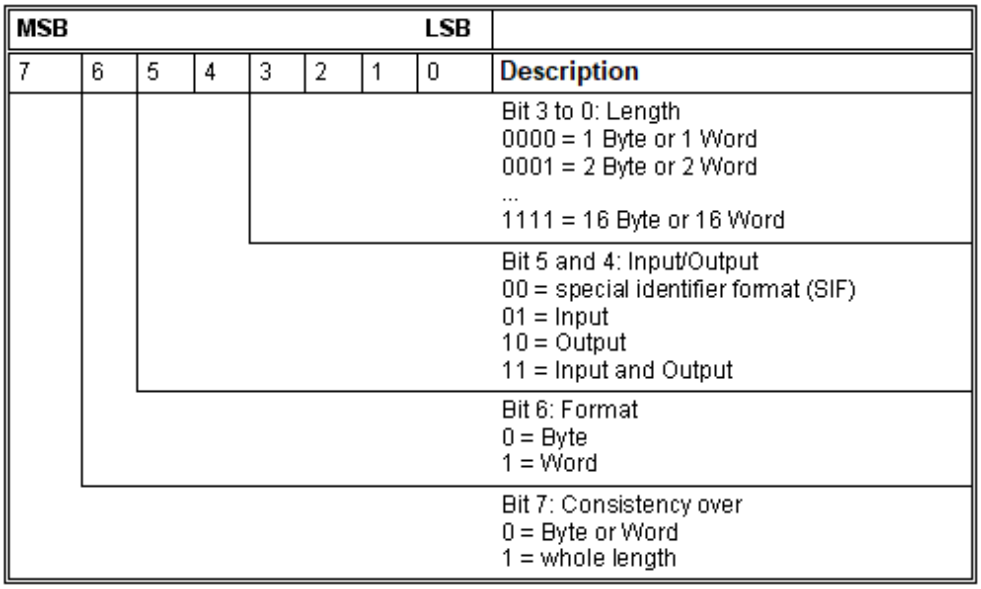


Figure 36: Identifier bytes (General Identifier Byte Format GIF)

	Value	Description				
AKF/ SKF	0x00	00	Free place			
SKF	0x01 – 0x0F		see SKF			
AKF	0x10	16	1	Byte	Input	Consistency over Byte
AKF	0x11	17	2	Byte	Input	Consistency over Byte
AKF	...	...	...	Byte	Input	Consistency over Byte
AKF	0x1F	31	16	Byte	Input	Consistency over Byte
AKF	0x20	32	1	Byte	Output	Consistency over Byte
AKF	0x21	33	2	Byte	Output	Consistency over Byte
AKF	...	...	...	Byte	Output	Consistency over Byte
AKF	0x2F	47	16	Byte	Output	Consistency over Byte
AKF	0x30	48	1	Byte	Input/Output	Consistency over Byte
AKF	0x31	49	2	Byte	Input/Output	Consistency over Byte
AKF	...	...	...	Byte	Input/Output	Consistency over Byte
AKF	0x3F	63	16	Byte	Input/Output	Consistency over Byte
SKF	0x40 – 0x4F		see SKF			
AKF	0x50	80	1	Word	Input	Consistency over Word
AKF	0x51	81	2	Word	Input	Consistency over Word
AKF	...	...	...	Word	Input	Consistency over Word
AKF	0x5F	95	16	Word	Input	Consistency over Word
AKF	0x60	96	1	Word	Output	Consistency over Word
AKF	0x61	97	2	Word	Output	Consistency over Word
AKF	...	...	...	Word	Output	Consistency over Word
AKF	0x6F	111	16	Word	Output	Consistency over Word
AKF	0x70	112	1	Word	Input/Output	Consistency over Word
AKF	0x71	113	2	Word	Input/Output	Consistency over Word
AKF	...	...	...	Word	Input/Output	Consistency over Word
AKF	0x7F	127	16	Word	Input/Output	Consistency over Word
SKF	0x80 – 0x8F		see SKF			
AKF	0x90	144	1	Byte	Input	Consistency over whole length
AKF	0x91	145	2	Byte	Input	Consistency over whole length
AKF	...	...	...	Byte	Input	Consistency over whole length
AKF	0x9F	159	16	Byte	Input	Consistency over whole length

Table 33: Identifier Bytes 0x10 .. 0x3F, 0x50 .. 0x7F, 0x90 .. 0x9F (AKF)

	Value	Description				
AKF	0xA0	160	1	Byte	Output	Consistency over whole length
AKF	0xA1	161	2	Byte	Output	Consistency over whole length
AKF	...	...	...	Byte	Output	Consistency over whole length
AKF	0xAF	175	16	Byte	Output	Consistency over whole length
AKF	0xB0	176	1	Byte	Input/Output	Consistency over whole length
AKF	0xB1	177	2	Byte	Input/Output	Consistency over whole length
AKF	...	...	...	Byte	Input/Output	Consistency over whole length
AKF	0xBF	191	16	Byte	Input/Output	Consistency over whole length
SKF	0xC0 – 0xCF	see SKF				
AKF	0xD0	208	1	Word	Input	Consistency over whole length
AKF	0xD1	209	2	Word	Input	Consistency over whole length
AKF	...	...	...	Word	Input	Consistency over whole length
AKF	0xDF	223	16	Word	Input	Consistency over whole length
AKF	0xE0	224	1	Word	Output	Consistency over whole length
AKF	0xE1	225	2	Word	Output	Consistency over whole length
AKF	...	...	...	Word	Output	Consistency over whole length
AKF	0xEF	239	16	Word	Output	Consistency over whole length
AKF	0xF0	240	1	Word	Input/Output	Consistency over whole length
AKF	0xF1	241	2	Word	Input/Output	Consistency over whole length
AKF	...	...	...	Word	Input/Output	Consistency over whole length
AKF	0xFF	255	16	Word	Input/Output	Consistency over whole length

Table 34: Identifier Bytes 0xA0 .. 0xBF, 0xD0 .. 0xFF (AKF)

7.2.2 Special Identifier Format (SIF)

The special identifier byte format (SIF) is an extension of the general identifier byte format and offers more flexibility. Also manufacturer specific information can be used with it.

MSB							LSB	Description
7	6	5	4	3	2	1	0	
								Bit 0 to 3: Length of manufacturer specific data according to the length byte for In- and/or Output In case of DDLM_Chk_Cfg: 0000 = no manufacturer specific data follow 0001 = 1 manufacturer specific data follow ... 1110 = 14 manufacturer specific data follow 1111 = no manufacturer specific data follow In case of DDLM_Get_Cfg: 0000 = no manufacturer specific data follow 0001 = 1 manufacturer specific data follow ... 1110 = 14 manufacturer specific data follow 1111= not allowed
								Bit 5 and 4: solid 00 = solid
								Bit 7 and 6: Input/Output 00 = free place 01 = a length byte for Input follows 10 = a length byte for Output follows 11 = a length byte for Input and Output follows

Figure 37: Special Identifier Format (SIF)

Length Byte

MSB							LSB	Description
7	6	5	4	3	2	1	0	
								Bit 0 to 5: Length 000000 = 1 Byte or 1 Word 000001 = 2 Byte or 2 Word ... 111111 = 64 Byte or 64 Word
								Bit 6: Format 0 = Byte 1 = Word
								Bit 7: Consistency over 0 = Byte or Word (element) 1 = whole length

Figure 38: Length Byte of the SIF

	Value	Description	
AKF/ SKF	0x00	00	free place
SKF	0x01 – 0x0E	01 – 14	free place and 1-14 manufacturer specific data
SKF	0x0F	15	free place and no manufacturer specific data
SKF	0x40	64	1 length byte Input
SKF	0x41 – 0x4E	65 – 78	1 length byte Input and 1-14 manufacturer specific data
SKF	0x4F	79	1 length byte Input and no manufacturer specific data
SKF	0x80	128	1 length byte Output
SKF	0x81 – 0x8E	129 – 142	1 length byte Output 1 and 1-14 manufacturer specific data
SKF	0x8F	143	1 length byte Output 1 and no manufacturer specific data
SKF	0xC0	192	1 length byte Output and 1 length byte Input
SKF	0xC1 – 0xCE	193 – 206	1 length byte Output, 1 length Input byte and 1-14 manufacturer specific data
SKF	0xCF	207	1 length byte Output, 1 length Input byte and no manufacturer specific data

Table 35: Special Identifier bytes 0x01 .. 0x0F, 0x40 .. 0x4F, 0x80 .. 0x8F, 0xC0 .. 0xCF (SKF)

Length Byte

Value		Description		
0x00 – 0x3F	00-63	1-64	Byte	Consistency over Byte
0x40 – 0x7F	64-127	1-64	Word	Consistency over Word
0x80 – 0xBF	129-191	1-64	Byte	Consistency over whole length
0xC0 – 0xFF	193-255	1-64	Word	Consistency over whole length

Table 36: Length byte of the special identifiers (SIF)

7.3 References

[1] FDT Joint Interest Group (www.fdt-jig.org, FDT-JIG Working Group): Device Type Manager (DTM) Style Guide, Version 1.0; FDT-JIG - Order No. <0001-0008-000>, English, 2005.

[2] EtherCAT Technology Group: EtherCAT communication specification, August 2007.

[3] Hilscher Gesellschaft für Systemautomation mbH: Protocol API, PROFIBUS DP Salve, V 5.2.0, Protocol API Manual, Revision 2, DOC191004API02EN, English, 2022-02.

7.4 User rights

User-rights are set within the FDT-container. Depending on the level, the configuration is accessible by the user or read-only.

To access the **Settings**, **Configuration** and **Diagnosis** panes of the generic PROFIBUS DP Slave DTM you do not need special user rights. Also all users can select the decimal or hexadecimal Display mode or sort table entries.

Note:
To edit, set or configure the parameters of the **Settings** and **Configuration** panes, you need user rights for "Maintenance", for "Planning Engineer" or for "Administrator".

The following tables give an overview of the user right groups and which user rights you need to configure the single parameters.

7.4.1 Configuration

	Observer	Operator	Maintenance	Planning engineer	Administrator
General [▶ page 15]	D	D	X	X	X
Modules [▶ page 17]	D	D	X	X	X
Signal configuration [▶ page 21]	D	D	X	X	X
Parameters [▶ page 25]	D	D	X	X	X
Groups [▶ page 26]	D	D	X	X	X
Extensions [▶ page 26]	D	D	X	X	X
DPV1 [▶ page 28]	D	D	X	X	X
DPV2 [▶ page 30]	D	D	X	X	X
Redundancy [▶ page 31]	D	D	X	X	X

Table 37: User rights configuration (D = displaying, X = editing, configuring)

7.5 Conventions in this manual

Instructions

1. Operation purpose
2. Operation purpose
   ➢ Instruction

Results

Intermediate result

Final result

Signs

Sign	Note
	General note
	Important note that must be followed to prevent malfunctions.
	Reference to further information

Table 38: Signs

7.6 Legal notes

Copyright

Important notes

Utmost care was/is given in the preparation of the documentation at hand consisting of a user's manual, operating manual and any other document type and accompanying texts. However, errors cannot be ruled out. Therefore, we cannot assume any guarantee or legal responsibility for erroneous information or liability of any kind. You are hereby made aware that descriptions found in the user's manual, the accompanying texts and the documentation neither represent a guarantee nor any indication on proper use as stipulated in the agreement or a promised attribute. It cannot be ruled out that the user's manual, the accompanying texts and the documentation do not completely match the described attributes, standards or any other data for the delivered product. A warranty or guarantee with respect to the correctness or accuracy of the information is not assumed.

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- Flight control systems in aviation and aerospace;
- Nuclear fission processes in nuclear power plants;
- Medical devices used for life support and
- Vehicle control systems used in passenger transport

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- For military purposes or in weaponry;
- For designing, engineering, maintaining or operating nuclear systems;
- In flight safety systems, aviation and flight telecommunications systems;
- In life-support systems;
- In systems in which any malfunction in the hardware and/or software may result in physical injuries or fatalities.

You are hereby made aware that the hardware and/or software was not created for use in hazardous environments, which require fail-safe control mechanisms. Use of the hardware and/or software in this kind of environment shall be at your own risk; any liability for damage or loss due to impermissible use shall be excluded.

Warranty

Hilscher Gesellschaft für Systemautomation mbH hereby guarantees that the software shall run without errors in accordance with the requirements listed in the specifications and that there were no defects on the date of acceptance. The warranty period shall be 12 months commencing as of the date of acceptance or purchase (with express declaration or implied, by customer's conclusive behavior, e.g. putting into operation permanently).

The warranty obligation for equipment (hardware) we produce is 36 months, calculated as of the date of delivery ex works. The aforementioned provisions shall not apply if longer warranty periods are mandatory by law pursuant to Section 438 (1.2) BGB, Section 479 (1) BGB and Section 634a (1) BGB [Bürgerliches Gesetzbuch; German Civil Code] If, despite of all due care taken, the delivered product should have a defect, which already

existed at the time of the transfer of risk, it shall be at our discretion to either repair the product or to deliver a replacement product, subject to timely notification of defect.

The warranty obligation shall not apply if the notification of defect is not asserted promptly, if the purchaser or third party has tampered with the products, if the defect is the result of natural wear, was caused by unfavorable operating conditions or is due to violations against our operating regulations or against rules of good electrical engineering practice, or if our request to return the defective object is not promptly complied with.

Costs of support, maintenance, customization and product care

Please be advised that any subsequent improvement shall only be free of charge if a defect is found. Any form of technical support, maintenance and customization is not a warranty service, but instead shall be charged extra.

Additional guarantees

Although the hardware and software was developed and tested in-depth with greatest care, Hilscher Gesellschaft für Systemautomation mbH shall not assume any guarantee for the suitability thereof for any purpose that was not confirmed in writing. No guarantee can be granted whereby the hardware and software satisfies your requirements, or the use of the hardware and/or software is uninterruptable or the hardware and/or software is fault-free.

It cannot be guaranteed that patents and/or ownership privileges have not been infringed upon or violated or that the products are free from third-party influence. No additional guarantees or promises shall be made as to whether the product is market current, free from deficiency in title, or can be integrated or is usable for specific purposes, unless such guarantees or promises are required under existing law and cannot be restricted.

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The parties hereby agree to one another that the information that each party receives from the other party respectively is and shall remain the intellectual property of said other party, unless provided for otherwise in a contractual agreement.

The customer must not allow any third party to become knowledgeable of this expertise and shall only provide knowledge thereof to authorized users as appropriate and necessary. Companies associated with the customer shall not be deemed third parties. The customer must obligate authorized

users to confidentiality. The customer should only use the confidential information in connection with the performances specified in this agreement.

The customer must not use this confidential information to his own advantage or for his own purposes or rather to the advantage or for the purpose of a third party, nor must it be used for commercial purposes and this confidential information must only be used to the extent provided for in this agreement or otherwise to the extent as expressly authorized by the disclosing party in written form. The customer has the right, subject to the obligation to confidentiality, to disclose the terms and conditions of this agreement directly to his legal and financial consultants as would be required for the customer's normal business operation.

Export provisions

The delivered product (including technical data) is subject to the legal export and/or import laws as well as any associated regulations of various countries, especially such laws applicable in Germany and in the United States. The products / hardware / software must not be exported into such countries for which export is prohibited under US American export control laws and its supplementary provisions. You hereby agree to strictly follow the regulations and to yourself be responsible for observing them. You are hereby made aware that you may be required to obtain governmental approval to export, reexport or import the product.

7.7 Registered trademarks

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Glossary

DPV0	PROFIBUS DP with cyclic communication
DPV1	PROFIBUS DP with acyclic communication
DPV2	PROFIBUS DP with cyclic and acyclic communication and time-sync configuration for the slave
DTM	Device Type Manager: Software module with graphical user interface for the configuration and/or for diagnosis of devices
FDT	Field Device Tool: FDT specifies an interface, in order to be able to use DTM (Device Type Manager) in different applications of different manufacturers
Freeze	After receiving the control command FREEZE, the DP-Slave freezes the actual state of the Inputs and transmits them cyclically to the DP-Master. After each new control command FREEZE, the Slave freezes the state of the Inputs again. The actual Input data are not transmitted cyclically from the DP-Slave to the DP-Master until the DP-Master sends the control command UNFREEZE. The DP-Slave has to be assigned to a group for the control command FREEZE in the configuration.
GSD	General Station Description: A special kind of device description file used by PROFIBUS, which describes the characteristics of a device type in a stipulated format. The GSD are created individually for each device type. And they are allocated in form of a GSD file for the user by the manufacturer of the device. The project system can read in and consider the GSD for any PROFIBUS DP device automatically because of the pegged file format during the configuration of the bus system.
netDevice	FDT container of the Hilscher configuration software SYCON.net
PROFIBUS DP	PROFIBUS Decentralized Peripherals
PROFIBUS DP Slave	Peripheral device, such as a IO device or a drive respectively passive participant without bus access authorization, which may only acknowledge received messages or requested by a master, may transmit messages to this one
Slave	Type of device that is configured by the master and which then performs the communication
Sync	With the control command SYNC the DP-Master arranges the DP-Slave, that the DP-Slave freezes the states of the Outputs on the actual value. During the following telegrams the DP-Slave saves the Output data in each case, which it has save as Output data. The Outputs are first updated cyclically until the DP-Master sends the control command UNSYNC. The DP-Slave has to be assigned to a group for the control command SYNC in the configuration.

Contacts

HEADQUARTER

Germany

Hilscher Gesellschaft für
Systemautomation mbH
Rheinstraße 15
65795 Hattersheim
Phone: +49 (0) 6190 9907-0
Fax: +49 (0) 6190 9907-50
E-mail: info@hilscher.com

Support

Phone: +49 (0) 6190 9907-990
E-mail: hotline@hilscher.com

SUBSIDIARIES

China

Hilscher Systemautomation (Shanghai) Co. Ltd.
200010 Shanghai
Phone: +86 (0) 21-6355-5161
E-mail: info@hilscher.cn

Support

Phone: +86 (0) 21-6355-5161
E-mail: cn.support@hilscher.com

France

Hilscher France S.a.r.l.
69800 Saint Priest
Phone: +33 (0) 4 72 37 98 40
E-mail: info@hilscher.fr

Support

Phone: +33 (0) 4 72 37 98 40
E-mail: fr.support@hilscher.com

India

Hilscher India Pvt. Ltd.
Pune, Delhi, Mumbai, Bangalore
Phone: +91 8888 750 777
E-mail: info@hilscher.in

Support

Phone: +91 8108884011
E-mail: info@hilscher.in

Italy

Hilscher Italia S.r.l.
20090 Vimodrone (MI)
Phone: +39 02 25007068
E-mail: info@hilscher.it

Support

Phone: +39 02 25007068
E-mail: it.support@hilscher.com

Japan

Hilscher Japan KK
Tokyo, 160-0022
Phone: +81 (0) 3-5362-0521
E-mail: info@hilscher.jp

Support

Phone: +81 (0) 3-5362-0521
E-mail: jp.support@hilscher.com

Republic of Korea

Hilscher Korea Inc.
13494, Seongnam, Gyeonggi
Phone: +82 (0) 31-739-8361
E-mail: info@hilscher.kr

Support

Phone: +82 (0) 31-739-8363
E-mail: kr.support@hilscher.com

Austria

Hilscher Austria GmbH
4020 Linz
Phone: +43 732 931 675-0
E-mail: sales.at@hilscher.com

Support

Phone: +43 732 931 675-0
E-mail: at.support@hilscher.com

Switzerland

Hilscher Swiss GmbH
4500 Solothurn
Phone: +41 (0) 32 623 6633
E-mail: info@hilscher.ch

Support

Phone: +41 (0) 32 623 6633
E-mail: support.swiss@hilscher.com

USA

Hilscher North America, Inc.
Lisle, IL 60532
Phone: +1 630-505-5301
E-mail: info@hilscher.us

Support

Phone: +1 630-505-5301
E-mail: us.support@hilscher.com