# PROFIBUS-Diagnostic package

# for SIMATIC S7 and WinCC

A package is available for Profibus diagnosis that consists of the following components:

- **S7 diagnostic block FB125 and FB126** for the analysis and supply of the diagnostic information of a PROFIBUS DP system.

- **WinCC diagnostic pictures** for the display of the diagnostic information on the visualization system. The diagnostic pictures access the information of the S7 diagnostic block and bring them to the display.
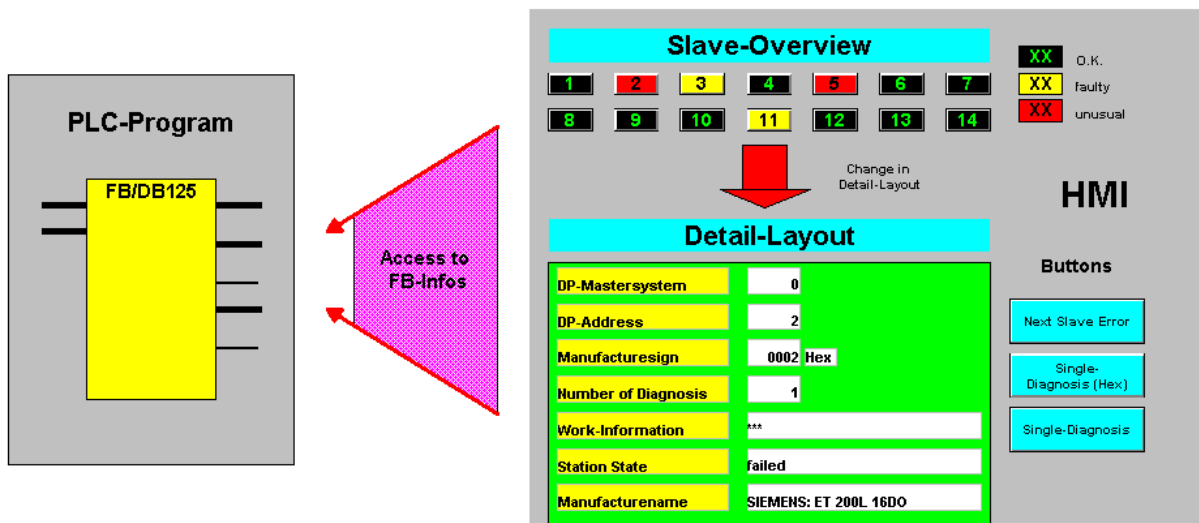


Figure 1: Principle of functioning of the diagnostic package

# 1.    Diagnostic block FB125

The FB125 is a interrupt-driven function for detection of failed and faulty DP slaves. In the case of faulty slaves, detailed diagnostics information concerning the cause of the fault is displayed (slot or module number, module status, channel number, channel fault). The diagnostics information of any DP slaves can be read and interpreted via individual diagnostics. Overview diagnostics give information on configured, existing, failed and faulty DP slaves. The FB125 diagnostic block also offers information of subordinate ASI bus systems, when a DP/ASI-Link is used as a DP slave. All interrupts are delayed during execution of the FB.

The specification and meaning of the parameters of the S7 diagnostic block are to be found in the separate documentation to the FB125 (DP_Diag41).

## 1.1    Application area of FB125

FB125 can be used in the following integral and external DP interfaces:

- CPU 315-2 DP (from 6ES7 315-2AF**02**-0AB0)
- CPU 315-2 DP (only 6ES7 315-2AF**01**-0AB0):
    - ➔ FB125 without detection of faulty slaves by Start/RESET
- CPU 316-2 DP
- CPU 318-2 DP
- C7-626 DP (from 6ES7 626-2AG01-0AE3)
- C7-633 DP and C7-634 DP
- SINUMERIK 840D with integrated CPU315-2 DP (6ES7 315-2AF**01**-0AB0):
    - ➔ FB125 without detection of faulty slaves by Start/RESET
- SINUMERIK 840DI with integrated CPU315-2 DP (6ES7 315-2AF**03**-0AB0)
- CPU 41x-2/3/4 DP
- CP 443-5
- IM 467 and IM 467 FO
- WIN AC
- WIN LC
- **Not** for CP 342-5

## 1.2    Calling the FB125 in the S7 user program

The DP diagnostic block is called via the following statement in the user program:

**CALL  FB125, DBxy**                    (xy represents any instance data block number)

The parameter list then appears automatically with the formal operands which should not be parameterized. The controlling of the building block function is made by the WinCC diagnostic pictures.

<div align="center">

| OB1 / OB82 / OB86 |
|---|

</div>

```
CALL FB125, DB125
    DP_MASTERSYSTEM           :=
    EXTERNAL_DP_INTERFACE     :=
    MANUAL_MODE               :=
    SINGLE_STEP_SLAVE         :=
    SINGLE_STEP_ERROR         :=
    RESET                     :=
    SINGLE_DIAG               :=
    SINGLE_DIAG_ADR           :=
    ALL_DP_SLAVES_OK          :=
    SUM_SLAVES_DIAG           :=
    SLAVE_ADR                 :=
    SLAVE_STATE               :=
    SLAVE_IDENT_NO            :=
    ERROR_NO                  :=
    ERROR_TYPE                :=
    MODULE_NO                 :=
    MODULE_STATE              :=
    CHANNEL_NO                :=
    CHANNEL_TYPE              :=
    CHANNEL_ERROR_CODE        :=
    CHANNEL_ERROR_INFO_1      :=
    CHANNEL_ERROR_INFO_2      :=
    DIAG_COUNTER              :=
    DIAG_OVERFLOW             :=
    BUSY                      :=
```

<div align="center">Picture 2: Call of FB125</div>

This call (including the same instance data block number and the same user actual operand) must be made in the three execution levels **OB1, OB82 and OB86**. A nested FB125 call in the three execution levels is possible (e.g.: OB82 → FC120 → FB125). The order and the contents of the 20 bytes of temporary local data of the organization blocks OB1, OB82 and OB86 must not be changed but can be extended at any time.

The following SFCs are used internally in the FB125: SFC13 and SFC51 with SZL 0C91 (in the case of an internal DP interface to the master CPU) or SZL 4C91 (in the case of an external DP interface to the CP/IM). It is **not** permissible to call SFC13 and/or SFC51 with SZL 0C91/4C91 in OB1 in addition to the FB125 call.

Evaluation of the information at the block output parameters only makes sense in the cyclic program section (OB1).

The block FB125 will be processed orderly, if the BIE-Bit is set as "1". And The BIE-Bit will be removed, if the processing of FB125 was error.

## 1.3   Technical specifications of FB125

Runtime without pending diagnostics message: depend on the DP master

> e.g. CPU 315-2 DP as DP master: approx. 4ms

Runtime with pending diagnostics message:   depend on the DP master and the slave diagnostics length
e.g. CPU 315-2 DP as DP master: approx. 11ms

Memory used in the CPU:                      5,8 Kbytes

## 2.   S7-user block FB126

In user block FB126, the system calls diagnostic block FB 125. FB126 manages the FB125 input parameters that are to be controlled. FB126 does not itself have any parameters. It must be called on sequence levels **OB1, OB82 and OB86:**

**CALL  FB126, DB126**

## 3.   Integration the blocks in the S7 user project

The S7 blocks FB125 and FB126 are offered in an archived STEP7 project. Double-clicking allows you to unpack the project to any folder you like:
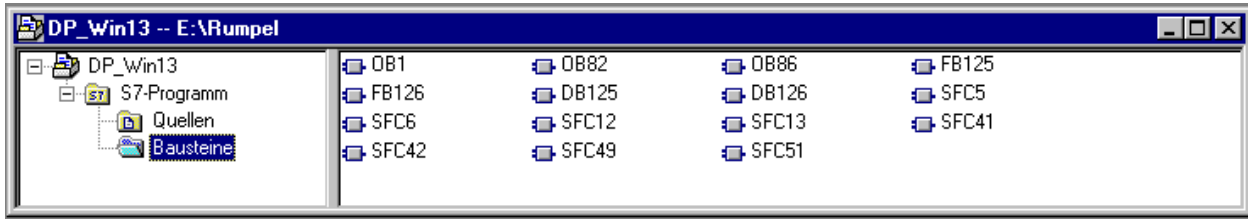
Figure 2: S7 project after unpacking

The unpacked S7 project contains all the necessary S7 blocks including the organization blocks (OB1, OB82, OB86) and the calls of diagnostic blocks FB125 and FB126.

Simply Copy and Paste to place the S7 blocks from the STEP7 project in the respective user project.

FB126 must be called via "Call FB126, DB126" in organization blocks OB1, OB82 and OB86. In FB126, the system must implicitly call FB 125.

# 4. The WinCC sample project

The SIMATIC S7 project and WinCC project are integrated in the download (DP_WIN13.exe). After unpacking, the data storage has the following structure:
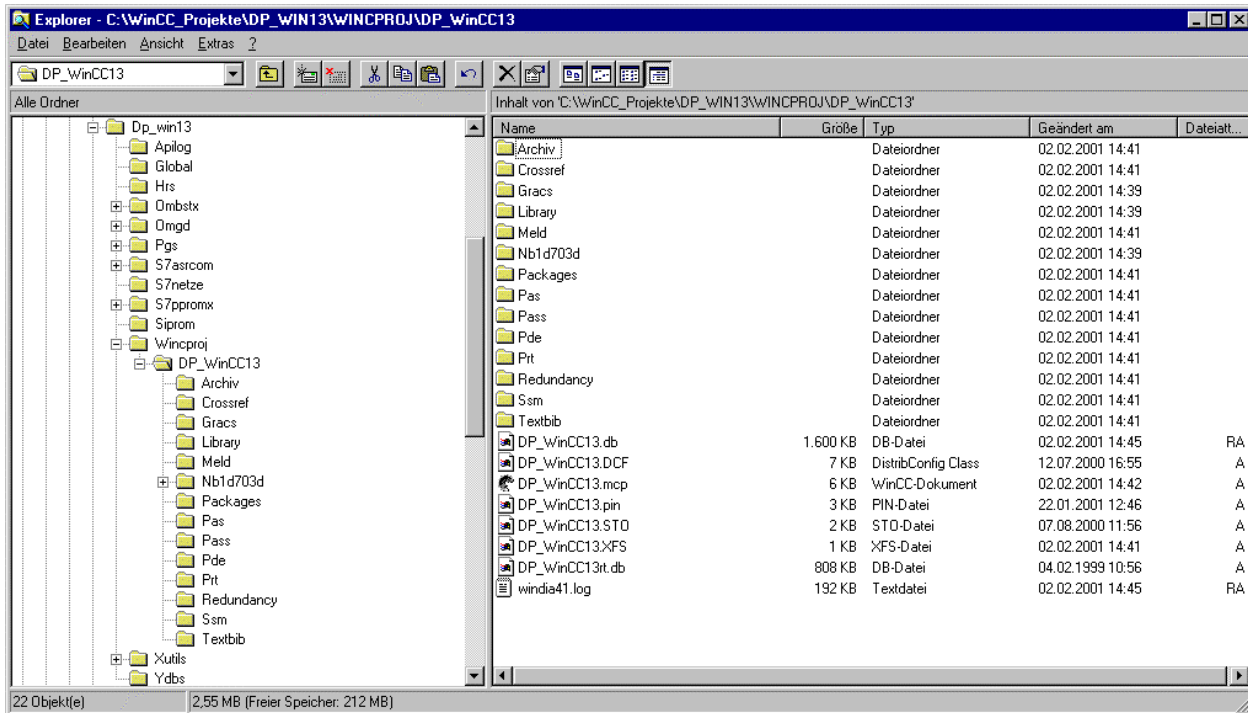


Figure 4: Unpacked sample project

The WinCC project is in folder **DP_Win13/Winccproj/DP_WinCC13**.

# 4.1   Used tags

To be able to use all the functions of the Profibus diagnostic package, you need 119 process tags. The description of the tags is as follows:

| Name | Bedeutung | Steuerungs-Zugriff |
|------|-----------|--------------------|
| Address_In | Slave address input | DB125.DBB3 |
| Address_Out | Slave address output | DB125.DBB6 |
| Asi0_7 | ASI-Slaves | DB125.DBB18 |
| Asi8_15 | ASI-Slaves | DB125.DBB19 |
| Asi16_23 | ASI-Slaves | DB125.DBB20 |
| Asi24_31 | ASI-Slaves | DB125.DBB21 |
| Cfg_Error | Configuration error | DB125.DBX932.2 |
| Channel_No | Channel number | DB125.DBB14 |
| Channel_Typ | Channel type section | DB125.DBB15 |
| Count_Diag | Number of diagnoses per slave | DB125.DBB26 |
| Count_Slaves | Number of affected slaves | DB125.DBB5 |
| Diag_Dat_B1 | Slave diagnostic data | DB125.DBB932 |
| Diag_Dat_B2 | | DB125.DBB933 |
| Diag_Dat_B3 | | DB125.DBB934 |
| Diag_Dat_B4 | | DB125.DBB935 |
| Diag_Dat_D1 | | DB125.DBD938 |
| Diag_Dat_D2 | | DB125.DBD942 |
| Diag_Dat_D3 | | DB125.DBD946 |
| Diag_Dat_D4 | | DB125.DBD950 |
| Diag_Dat_D5 | | DB125.DBD954 |
| Diag_Dat_D6 | | DB125.DBD958 |
| Diag_Dat_D7 | | DB125.DBD962 |
| Diag_Dat_D8 | | DB125.DBD966 |
| Diag_Dat_D9 | | DB125.DBD970 |
| Diag_Dat_D10 | | DB125.DBD974 |
| Diag_Dat_D10_1 | | DB125.DBD978 |
| Diag_Dat_D10_2 | | DB125.DBD982 |
| to | | |
| Diag_Dat_D10_49 | | DB125.DBD1170 |
| Diag_Dat_D10_50 | | DB125.DBW1174 |
| Diag_Dat_W5 | | DB125.DBW936 |
| Diag_Deactivated | Slave deactivated | DB125.DBX933.7 |
| Diag_Ext_Diag | Slave-specific diagnostic data | DB125.DBX932.3 |
| Diag_Freeze_Mode | Freeze mode | DB125.DBX933.4 |
| Diag_Invalid_Slave_Respond | Invalid slave response | DB125.DBX932.5 |
| Diag_Master_Lock | Slave parameterized by another master | DB125.DBX932.7 |

| Name | Bedeutung | Steuerungs-Zugriff |
|---|---|---|
| Diag_Non_Exist | Slave cannot be reached | DB125.DBX932.0 |
| Diag_Stat_Diag | Static diagnosis | DB125.DBX933.1 |
| Diag_Station_Not_Ready | Slave not ready for data exchange | DB125.DBX932.1 |
| Diag_Sync_Mode | Sync mode | DB125.DBX933.5 |
| Diag_WD_On | Control monitoring activated | DB125.DBX933.3 |
| DP_Interface | DP interface type | DB125.DBX2.0 |
| DP_Master | DP master system | DB125.DBW0 |
| Effected_Stored_1 | Pending and pended disturbances | DB125.DBD1256 |
| Effected_Stored_2 | | DB125.DBD1260 |
| Effected_Stored_3 | | DB125.DBD1264 |
| Effected_Stored_4 | | DB125.DBD1268 |
| Error_Code | Error code | DB125.DBW16 |
| Error_No | Error number | DB125.DBB10 |
| Error_Type | Error type | DB125.DBB11 |
| Existing_1 | Existing slaves | DB125.DBD1192 |
| Existing_2 | | DB125.DBD1196 |
| Existing_3 | | DB125.DBD1200 |
| Existing_4 | | DB125.DBD1204 |
| Failed_1 | Failed slaves | DB125.DBD1208 |
| Failed_2 | | DB125.DBD1212 |
| Failed_3 | | DB125.DBD1216 |
| Failed_4 | | DB125.DBD1220 |
| Faulty_1 | Disturbed slaves | DB125.DBD1224 |
| Faulty_2 | | DB125.DBD1228 |
| Faulty_3 | | DB125.DBD1232 |
| Faulty_4 | | DB125.DBD1236 |
| Global_Info | Global info | DB125.DBX4.0 |
| Hand_Auto | Manual/automatic operation | DB125.DBX2.1 |
| Module_No | Module number | DB125.DBB12 |
| Module_State | Module status | DB125.DBB13 |
| Next_Error | Switch to next error on the slave | DB125.DBX2.3 |
| Next_Slave | Switch to the next affected slave | DB125.DBX2.2 |
| Prm_Error | Parameterization error | DB125.DBX932.6 |
| Reset | Reset evaluation, apply inputs | DB125.DBX2.4 |
| Single_Diag | Activate single diagnosis | DB125.DBX2.5 |
| Slave_Ident | Manufacturer identifier | DB125.DBW8 |
| Status | Slave status | DB125.DBB7 |
| Support_Error | Slave does not support function | DB125.DBX932.4 |

# 4.2  WinCC-Diagnostic pictures

PROFIBUS diagnostic pictures are made available for SIEMENS's WinCC visualization system. The tags of the pictures are assigned to data of the FB125 instance data block.

The pictures were created using **WinCC V5.0 + Service Pack 1.**

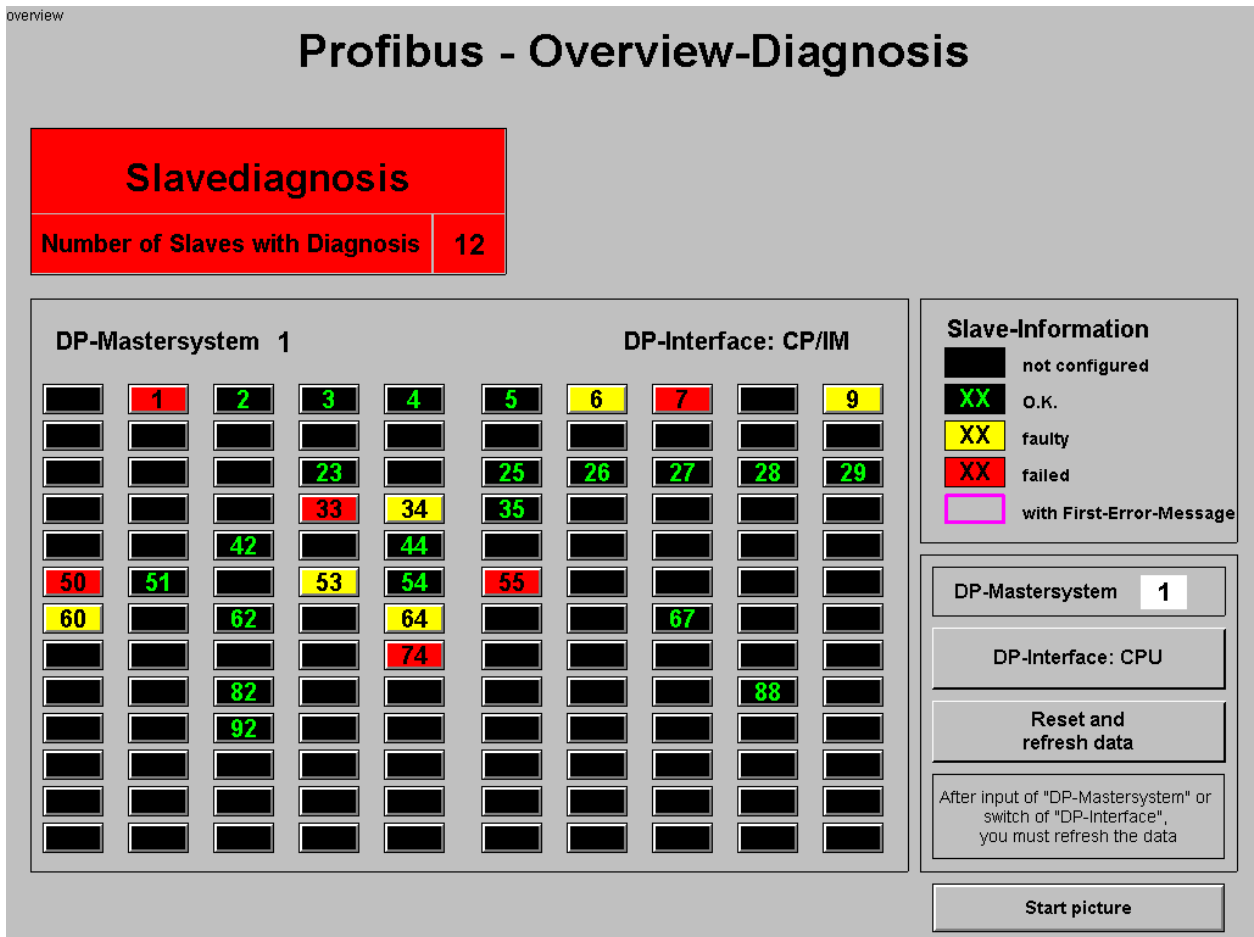| Name | Meaning |
|------|---------|
| Start | Start picture |
| Overview | Overview diagnosis |
| DetailDiag_d (German)<br>or<br>DetailDiag_e (English) | Detailed diagnosis |
| DetailDiag_hex_d (German)<br>or<br>DetailDiag_hex_e (English) | Detailed diagnosis with output of information in hex code. |

# 4.2.1 Picture „Overview"



Figure 5: Overview diagnosis

**Slavediagnosis**

**Number of Slaves with Diagnosis** | **12**

Overview message whether all Slaves operates trouble free.
Number of Slaves with diagnosis.

**DP-Mastersystem: 1**

Specification of the DP master system to be diagnosed.

**DP-Interface: CP/IM**

Specification of the DP interface type. If the master's DP interface in question is an integrated one (CPU) or a plug-in DP interface (CP/IM ). Clicking on the pushbutton switches between the two interface types.

**Reset and
refresh data**

Applies the specified number of the DP master system and the DP interface type. The system then initializes DP evaluation and restarts it. The system reacquires the entire DP master system, i.e. it determines automatically in an initialization routine all the configured, available, failed and disturbed DP slaves.

**7**

In the overview diagnosis, a pushbutton represents all the slaves of the specified master system. Each slave's status is visualized by the pushbuttons color codes.

**Slave-Information**

| | |
|---|---|
| ⬛ | not configured |
| XX | O.K. |
| XX | faulty |
| XX | failed |
| ▭ | with First-Error-Message |

When you click on the colored pushbutton to choose a slave, the system switches to the diagnostics detailed picture.

# 4.2.2 Picture „DetailDiag_e"

DetailDiag_e

## Profibus Single-Diagnosis

### Station-Diagnosis

| | | | |
|---|---|---|---|
| DP-Mastersystem | 1 | | |
| DP-Address | 7 | Station status | faulty |
| Vendor ID | 801D Hex | Vendor name | SIEMENS: ET200M (IM153-1) |
| Diagnostic counter | 3 | | |
| Location designation | *** | | |

Error number 2

### Module-Diagnosis

Module number 4

### Channel-Diagnosis

| | | | |
|---|---|---|---|
| Channel number | 3 | Channel type | Analog-Output |
| Channel error | M short-circuit | | |

| Refresh Diagnosis | Next Slave Error | Single-Diagnosis (Hex) | Back to Overview |
|---|---|---|---|

Figure 10: Detailed diagnosis

In the diagnostic detailed picture, the system displays in plain text all the diagnostic information of the slave.

⚑ **Vendor ID**

The system displays in hex format the manufacturer identifier that is assigned to the slave. In our example, this is the 801D (an ET200M).

⚑ **Vendor Name**

Based on the identifier, the system displays here the device designation. The manufacturer designation is a text list object. If you have hex codes from third-party manufacturers or from new Siemens devices, convert them to a decimal number and add the new designation to the text list object.

▲ **Location Information**

In this text list object, you can enter the information of your plant configuration. For example, the ET 200 shown above is in "Machine room 3.Fl. 5.1".

▲ **Module diagnosis**

Displays information on errors in the module.

▲ **Channel diagnosis**

Displays information on errors in the channel.

| Refresh Diagnosis |

The system updates the diagnostic data of the displayed slave. After eliminating a disturbance click on this pushbutton.

| Next Slave Error |

If several errors are pending on a slave, clicking on this pushbutton switches between the individual errors. You differentiate between the errors by means of the error number field.

| Single-Diagnosis (Hex) |

Clicking on this pushbutton chooses another diagnostics detailed picture that displays further diagnostics information on the slave in hex format.

# 4.3  Integrating the pictures in the WinCC user project

▲ Copy the diagnostic pictures from the sample project (folder GraCS) to the GraCS folder of your user project.

▲ Copy the tags from the sample project into your project to the existing tags:
  - Using the VAR_EXIM.EXE tool on WinCC CD for exporting/importing tags
  - or by simply dragging and dropping: Open the sample project ➔ Highlight all the tags ➔ Right click and choose Copy in the context menu to copy all the tags ➔ Close the sample project ➔ Open your project and paste the tags in your WinCC controller connection.

## 4.4 What must I do observe with German/English language switching!

In our Profibus example, we created different (diagnostic detailed) pictures for English and German. This is due to the use of text list objects.

With list objects, you can activate or deactivate Language Switching in the Miscellaneous property. With "Yes", the system stores the texts in the text library and with "No" in the picture. To retain the assigned texts in the picture, we deactivated language switching on the list objects in the sample project, i.e. the texts are stored in the picture.