

**Generic HART DTM  
for FDT 1.2 and FDT 1.2.1  
compliant frame applications  
Release 6.0**

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### Generic HART DTM

Device Type Manager for parameterization of field devices with HART capability. The Generic HART DTM executes in PACTware which has been implemented in compliance with the Field Device Tool Specification Release 1.2 or Release 2.0.

The Generic HART DTM executes with Windows XP, Vista, Windows7 and Windows8.

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## 1. Introduction

The Generic HART Device Type Manager (DTM) is used to parameterize field devices with HART capability. The universal and common practice commands of the HART protocol Release 5, 6 and 7 are supported, which are processed by most HART devices.

### Note

Only a Microflex HART modem is allowed for hardware communication with a HART device.

### Note

Software communication takes place via the HART Communication Device Type Manager (CommDTM) for the PACTware parameterization software from the member companies of the PACTware Consortium e.V. Only frame application PACTware is supported by Microflex Generic HART DTM.

Both the Generic HART DTM and the HART CommDTM must be implemented in accordance with the Field Device Tool (FDT) Specification Release 1.2 Addendum (see /1/) to allow them to be used in frame applications compliant with FDT 1.2. The Generic HART DTM additionally supports all FDT 1.2.1 functions.

Generic HART DTM Release 6 will be installed in parallel with previous releases of this DTM. All versions can therefore be used in one project at the same time. During topology scan in a plant only one release of the DTM should be enabled in the device catalog.

If the Generic HART DTM is used in the PACTware frame application Release 4.0 or higher, the device status according to NAMUR (see /3/) can be recorded and logged using the Device State Manager.

Since the Field Device Tool Specification is being continuously developed further, the component which processes the interfaces to the frame applications is also being continuously updated. This component is part of the DTM master concept which was developed by ICS GmbH and is being used in the DTMs of numerous device manufacturers.

The Generic HART DTM comprises several forms with which the functions of a DTM are processed. These include:

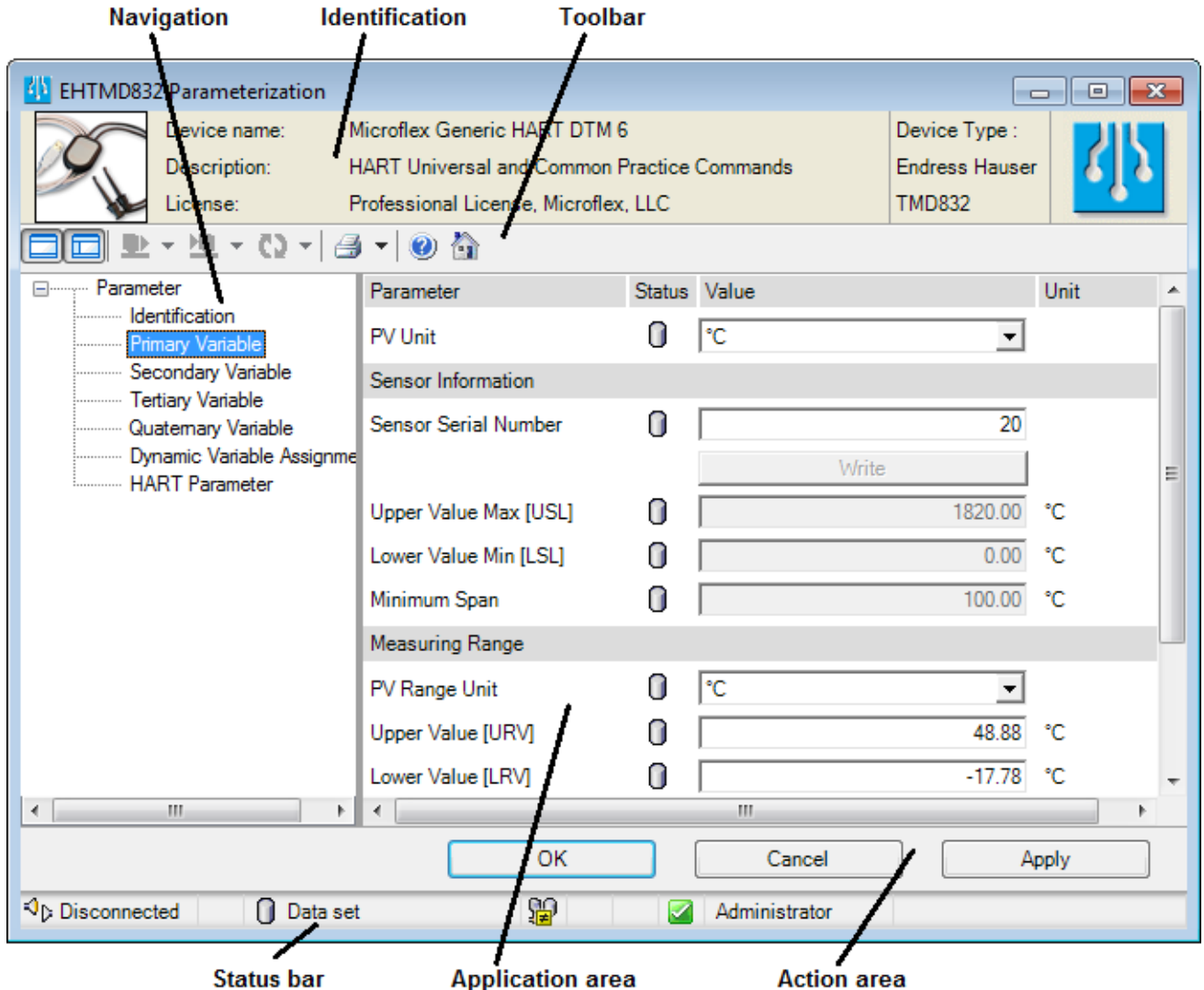
- Identification
- Parameterization
- Diagnostics
- Measured-value display
- Trend with archive function
- Calibration of sensor and current signal
- Printing of parameter values, diagnosis and configuration

**Caution: All configuration data of the DTM are protected by a signature. If these data are changed, the DTM can no longer be used. It has to be reinstalled again.**

Following installation of the Microflex Generic HART DTM, all functions can be used without limitation.

## 2. General layout of the user interfaces

In accordance with the specifications of the DTM Style Guide (see /2/), every user interface (UI) of the DTM comprises several areas which contain general and specific data. These serve to control the display and also communication with the field device.



### Identification

The description of the DTM as well as the license are displayed next to the HART logo.

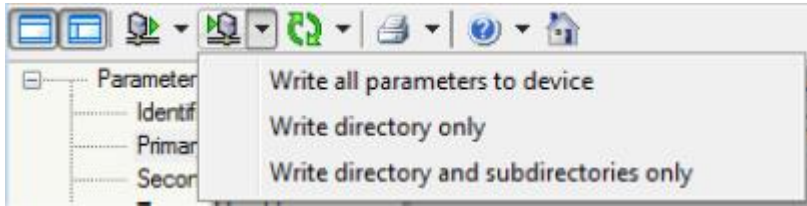
Two additional columns show manufacturer and device type of the field device that is currently connected to the DTM. Values of parameters PV, SV and TV are also shown. These values are refreshed when parameters are read from the device. If the window size is reduced to the identification area a very compact display of measurement values can thus be obtained.

The company logo of Microflex, LLC is displayed on the right. The website of Microflex, LLC can be accessed by clicking on the company logo provided an Internet connection is present on the workstation.

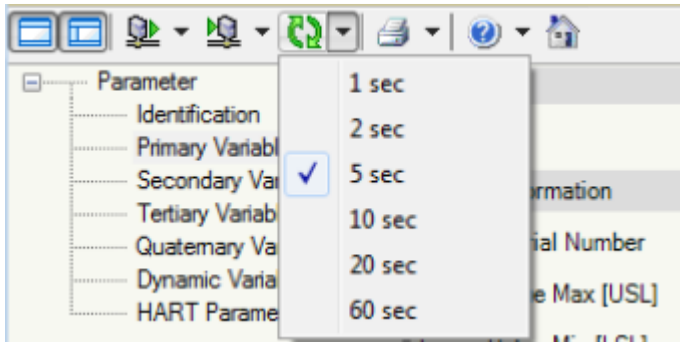
### Toolbar

From left to right, the toolbar contains buttons for displaying/hiding the navigation and identification of the DTM, for reading parameters from the field device or writing parameters to it, for starting cyclic updating of the parameters, for printing parameter lists, and for opening the online documentation.

When reading, writing and printing the parameters, a menu can be used to select the quantity of processed parameters in order to save transmission time or to provide a compact print preview. The respective directory or subdirectory refers to the selected nodes in the navigation tree of the window.

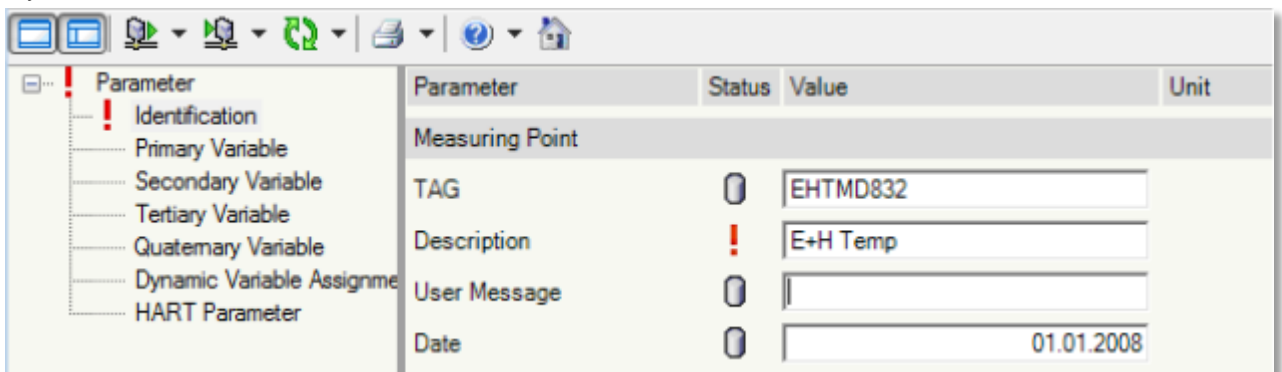


The cyclic updating rate is also set using a menu. Only parameter values displayed in the current directory are refreshed.



### Navigation

A navigation tree for selecting the parameter directories of the DTM data record is shown on the left next to the application area. Switching between the directories is possible using the mouse or the cursor keys on the keyboard.



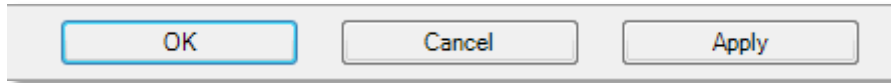
If parameters have been changed in a directory, also incorrectly, this is indicated by an icon in front of the directory. The display of incorrect changes has priority.

### Application area

The application area displays the respective group of parameters which has been selected via the context menu of the DTM in the frame application (e.g. PACTware) or via a node in the navigation tree. In addition, or alternatively, help information or special functions such as a wizard (see Section 8) can be displayed.

**Action area**

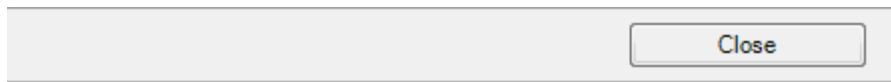
The following 3 buttons are displayed in the action area if the application area contains parameters which can be changed:



The changes are imported into the local data record using the **OK** button, and the window is closed. **Cancel** is used to reject the changes, and the window is closed. **Apply** is used to import the changes into the local data record, and the window remains open.

Modified parameters are only sent to the field device by clicking on the **Write parameters to device** symbol. In order to write parameters into the data record of a project, the corresponding function of the frame application must be used.










If no parameters can be changed in the application area, the action area only contains one button:












**Status bar**

In this part of the GUI, the status of the DTM is displayed summarized in 8 fields. A tooltip in the language of the frame application is displayed for each field, and explains the meaning and current status.

The fields from left to right are explained in the following table:

Field 1	Connection status between DTM and field device
 Separated	No communication possible between DTM and field device
 Standby	Connection between DTM and field device can be made
 Validate	Field device type being checked
 Connected	Communication possible between DTM and field device
 Disturbed	Communication interrupted between DTM and field device
Field 2	Communications status
Empty	No communication
	Communication running
Field 3	Data source
 Data set	Data record of DTM
 Device	Data from the field device
 Device/data set	Data from the field device and the data record of the DTM



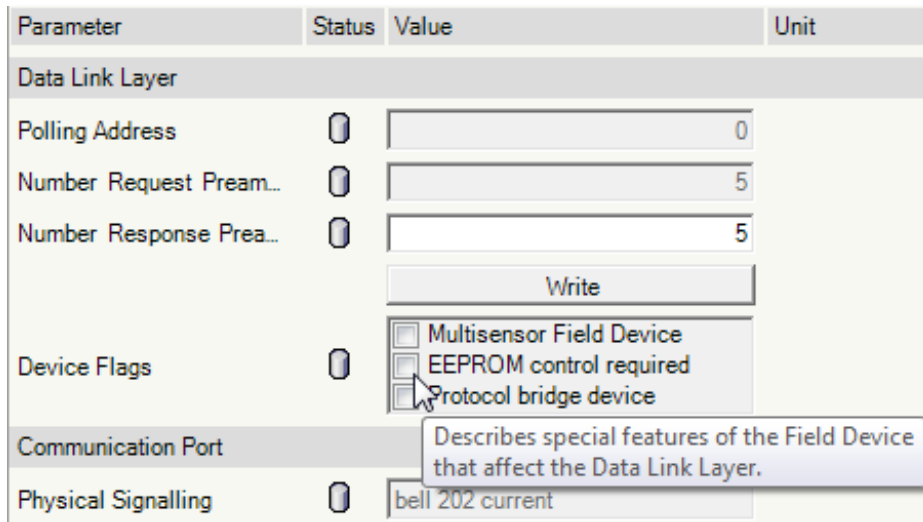
<b>Field 4</b>	<b>Status of the data record</b>
empty	Data records of DTM and field device are identical
	Data records of DTM and field device are different
<b>Field 5</b>	<b>Common status of parameters</b>
	At least one parameter is faulty
	At least one parameter has been changed
<b>Field 6</b>	<b>empty</b>
<b>Field 7</b>	<b>NAMUR status of field device</b>
	Diagnostics passive
	Device error
	Maintenance required
	Outside the specification
	Diagnostics active, device OK
	Device undergoing maintenance
<b>Field 8</b>	<b>User role</b>

A progress bar is displayed temporarily during data transmission between the DTM and field device.

### 3. Parameter display

Display and processing of parameter values are available corresponding to the DTM Style Guide (see /2/).

The components of the parameter display are output in the list of parameters in the application area. Help text for each parameter is displayed as a tooltip as well as in a window by using the F1 button








#### Parameter

The parameter name is displayed in the currently set language.

#### Status

The status of a parameter can assume the following values:

	Invalid input or error when writing the parameter to the field device or reading it from the field device. Is described in more detail in the tooltip.
	Parameter was changed correctly
	Parameter is being cyclically updated
	Parameter from the data record of the DTMs
	Parameter has been read from the field device

#### Value

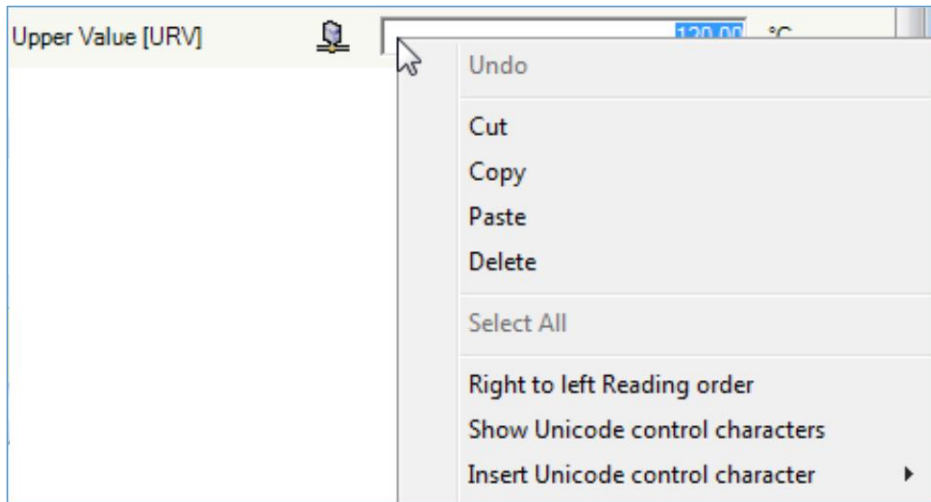
The value is displayed differently depending on the data type. The display is in compliance with the Windows Style Guide

#### Unit

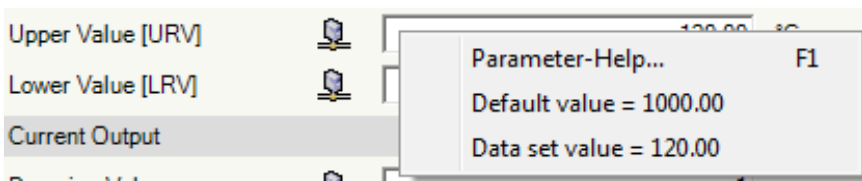
The unit is obtained from the list of HART units (see XMLUnitTables.xml).

Two pop-up menus are offered in addition.

The standard menu corresponding to the type of displayed value is opened in the pop-up menu of the parameter value following selection of the field. Various menus may appear here in the language of the operating system depending on the configuration of this system.



Depending on the type of parameter, a number of preset values for it as well as the option for calling help text appear in the pop-up menu which is accessed using the parameter name.



## 4. Identification

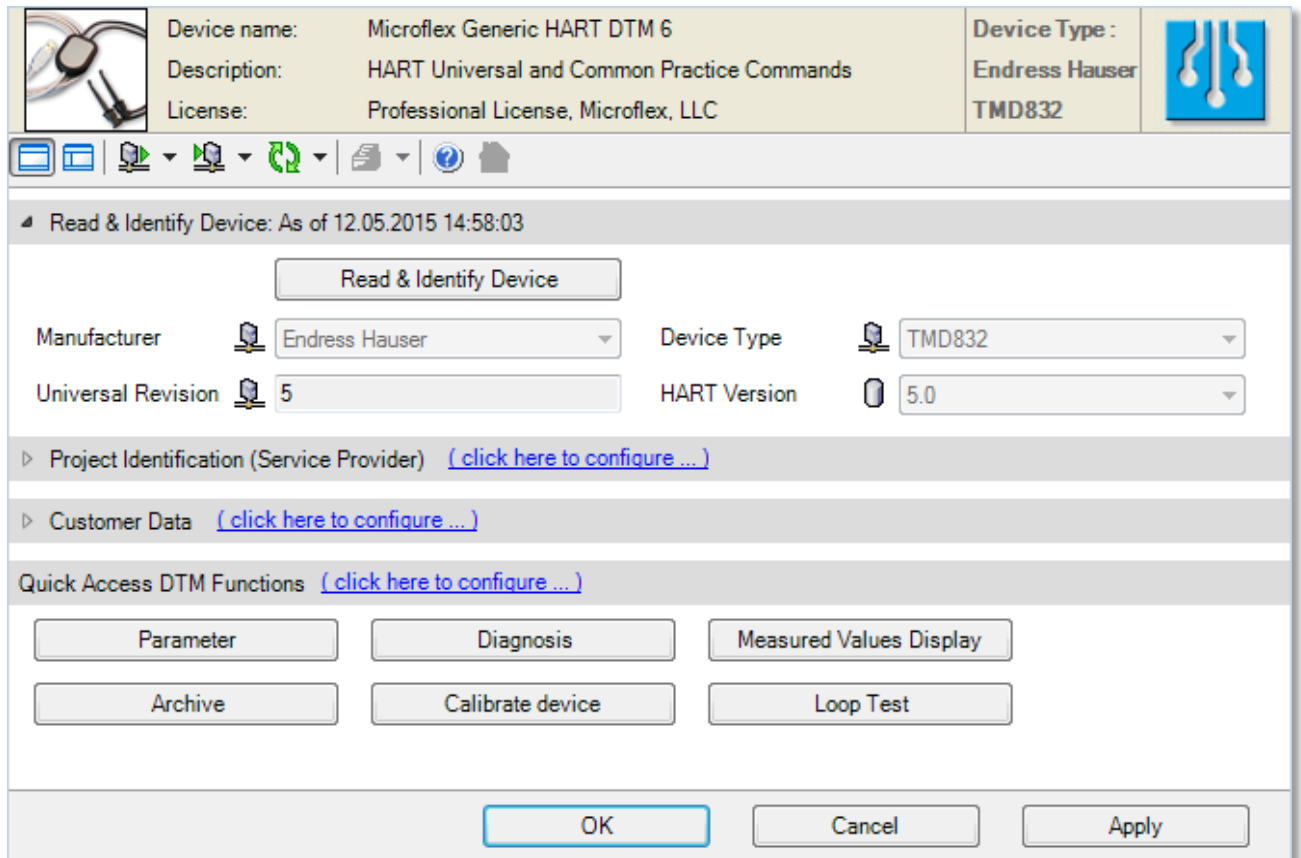
Function **Identification** of a DTM is called per default by double click on the DTM within the project tree of a frame application. In case the default function was defined different using Configuration, the **Identification** can be found in the submenu **Additional functions** of the device menu.



Working with a device can be started using this function.

The window shows three areas:



- Manufacturer and type of the device and version of HART protocol supported by the device
- Project data for documentation of the work with the field device
- Buttons for direct call of DTM functions



For saving space the first and second area can be minimized.



	Device name: Microflex Generic HART DTM 6	Device Type: Endress Hauser TMD832	
	Description: HART Universal and Common Practice Commands		
	License: Professional License, Microflex, LLC		

Read & Identify Device: As of 12.05.2015 14:58:03

Manufacturer  Endress Hauser Device Type  TMD832

Universal Revision  5 HART Version  5.0

Project Identification (Service Provider) [\(click here to configure ...\)](#)

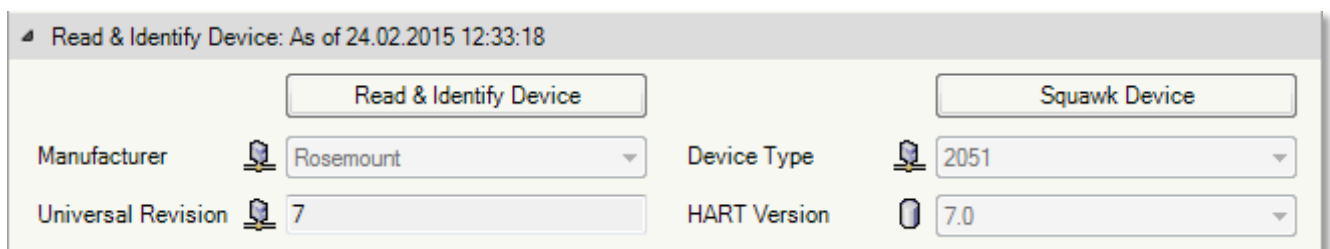
Customer Data [\(click here to configure ...\)](#)

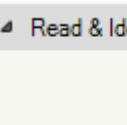

Quick Access DTM Functions [\(click here to configure ...\)](#)

### Identify device



Pressing the button **Read&Identify Device** all device data are read out from the device. If available manufacturer and device type are displayed. If these data are not provided by the device because e.g. the device is not listed by the HART Foundation, the fields are left empty.



If the connected device supports HART 7 protocol an additional button may be displayed that can be used for identifying the device in the plant by a prompt in its display.



	Device name: Rosemount	Device Type: 2051	
	Description: HART Universal and Common Practice Commands		
	License: Professional License, Microflex, LLC		

Read & Identify Device: As of 24.02.2015 12:33:18

Manufacturer  Rosemount Device Type  2051

Universal Revision  7 HART Version  7.0

### Project data

Commissioning of new field devices in a plant is often executed by external service providers. For documentation of work documents can be printed using the Generic HART DTM that contain data of the project and the service provider.

Project data are defined using the function **Configuration** and are displayed in this table.

Project Identification (Service Provider) <a href="#">(click here to configure ...)</a>			
Project	<input type="text" value="Test Genhart6"/>	Order-No	<input type="text" value="12345"/>
Company	<input type="text" value="ICS"/>	Department	<input type="text" value="Commissioning"/>
Service Person	<input type="text" value="Walter"/>	Address	<input type="text" value="Pforzheimer Str. 202C"/>
City	<input type="text" value="Ettlingen"/>	Country	<input type="text" value="Germany"/>

### Customer Data

All data for localization of a field device are collected in this table in order to get a clear assignment of all documents that are printed by the DTM.

Customer data are defined using the function **Configuration** and are displayed in this table.

Customer Data <a href="#">(click here to configure ...)</a>			
Company	<input type="text" value="ICS"/>	Site	<input type="text" value="Ettlingen"/>
Unit	<input type="text" value="Spinnerei"/>	Sub Unit	<input type="text" value="2nd Floor"/>
Address	<input type="text" value="Pforzheimer Str. 202C"/>	City	<input type="text" value="Ettlingen"/>
Country	<input type="text" value="Germany"/>		

### User defined DTM functions

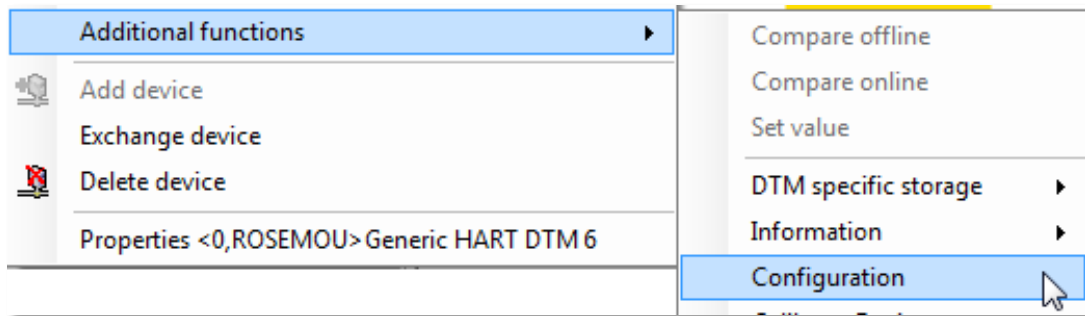
Up to 8 DTM functions can be assigned to buttons for immediate call of often used functions.

Buttons are defined using the function **Configuration** and are displayed in this table.

Quick Access DTM Functions <a href="#">(click here to configure ...)</a>		
<input type="button" value="Parameter"/>	<input type="button" value="Diagnosis"/>	<input type="button" value="Measured Values Display"/>
<input type="button" value="Archive"/>	<input type="button" value="Calibrate device"/>	<input type="button" value="Loop Test"/>

## 5. Configuration

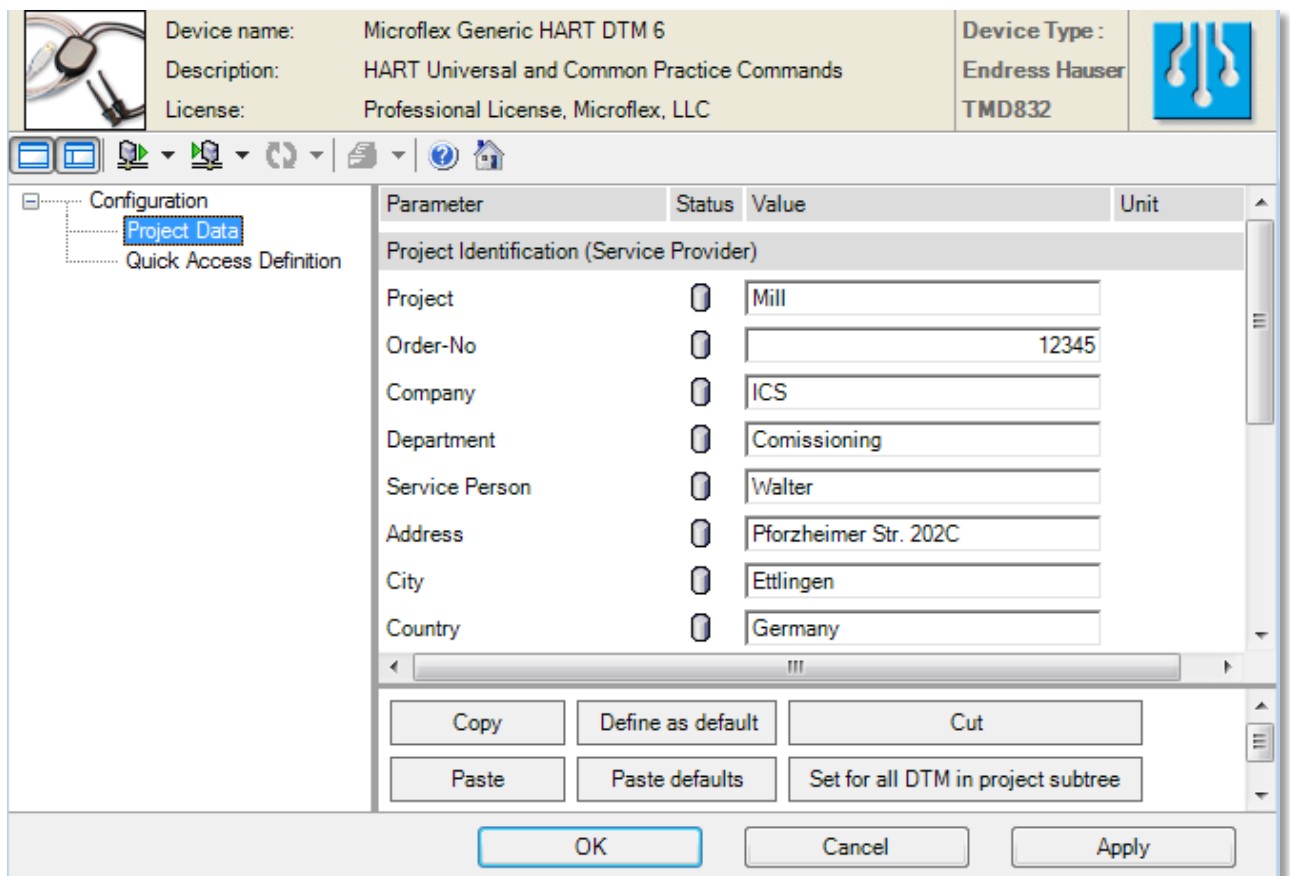
Configuration is called by DTM context menu entry **Additional functions** in the project tree.



Three groups of DTM functions and data can be configured:

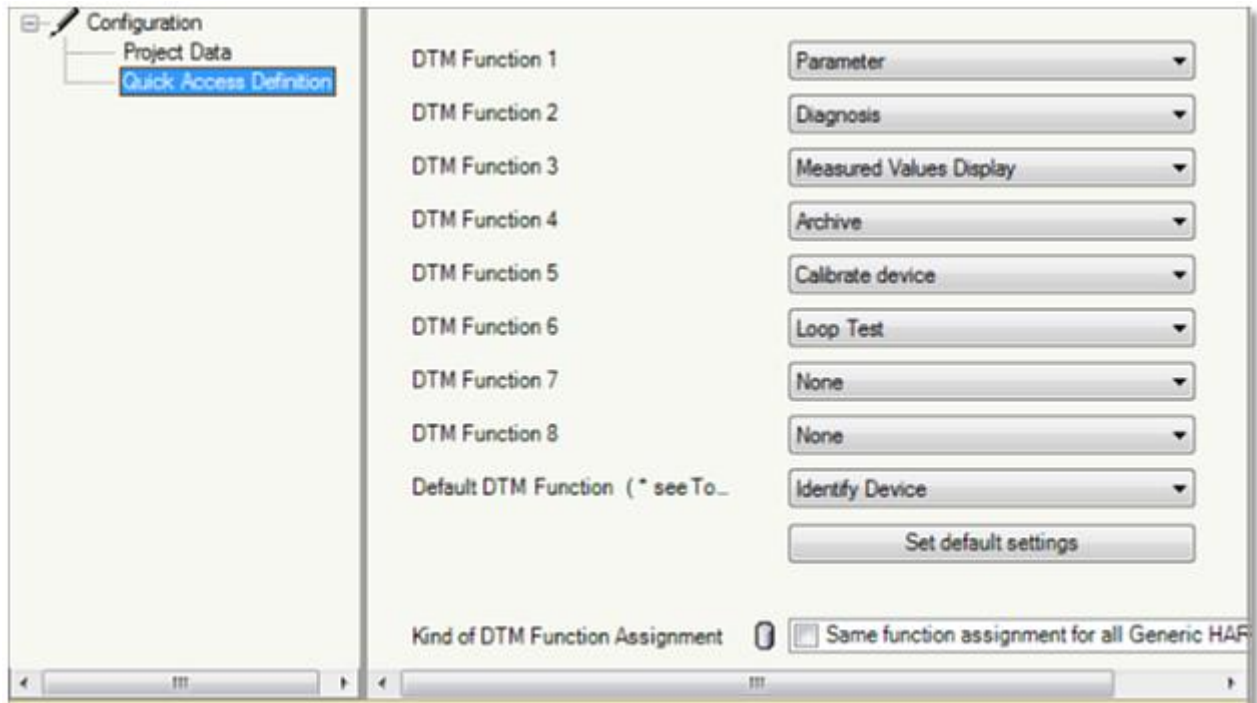
- Project and customer data
- Buttons in the window of the Identification function
- Options for function declaration

Project and customer data are text values that are valid for one or all DTM instances within a project. They are added to the printout of the parameter list and are stored with the DTM data.



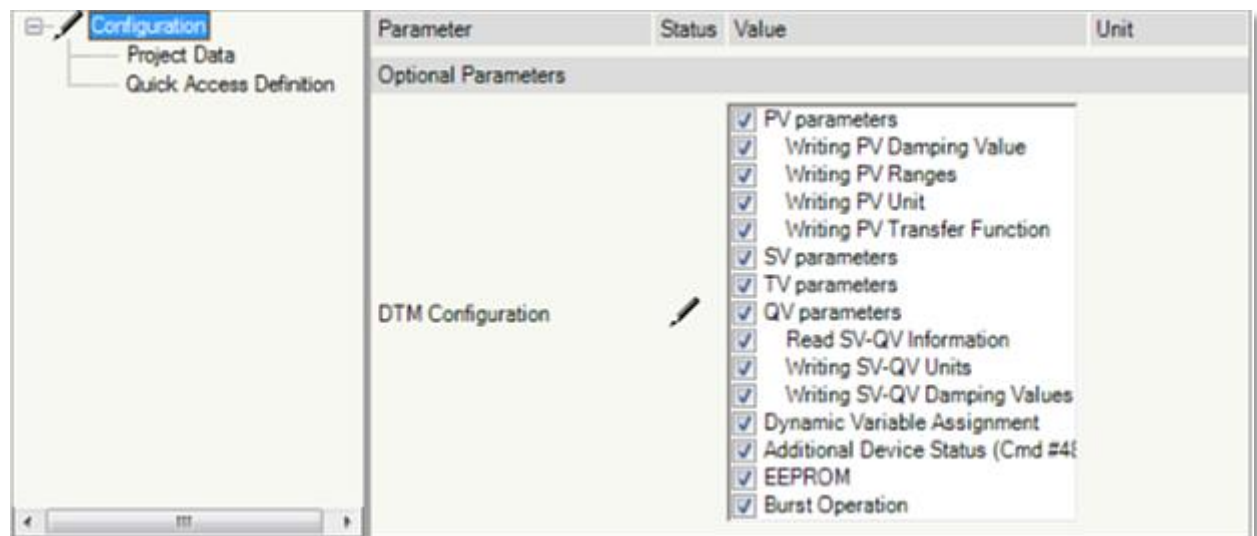
Using **Copy** and **Paste** buttons copies project and customer data from one DTM to another. A data set can be defined as default and used for some DTMs. **Set for all DTM in a project subtree** copies the project and customer data set to all DTMs in the referenced project structure.

From 4 to 8 function buttons can be configured. All DTM functions are allowed for assignment. Functions (e.g. calibration) that can only be executed when DTM and device are connected with each other can only be called in the **Identification** window if the device is connected.



In addition a DTM function can be set to default that is called by double click on the DTM in the project. It can be declared whether the default function is valid for one DTM instance only or for all DTMs within a project.

Within the list of optional parameters on the **Configuration** page only those parameters are checked that shall be displayed and therefore can be edited in the **Parameter** function windows.

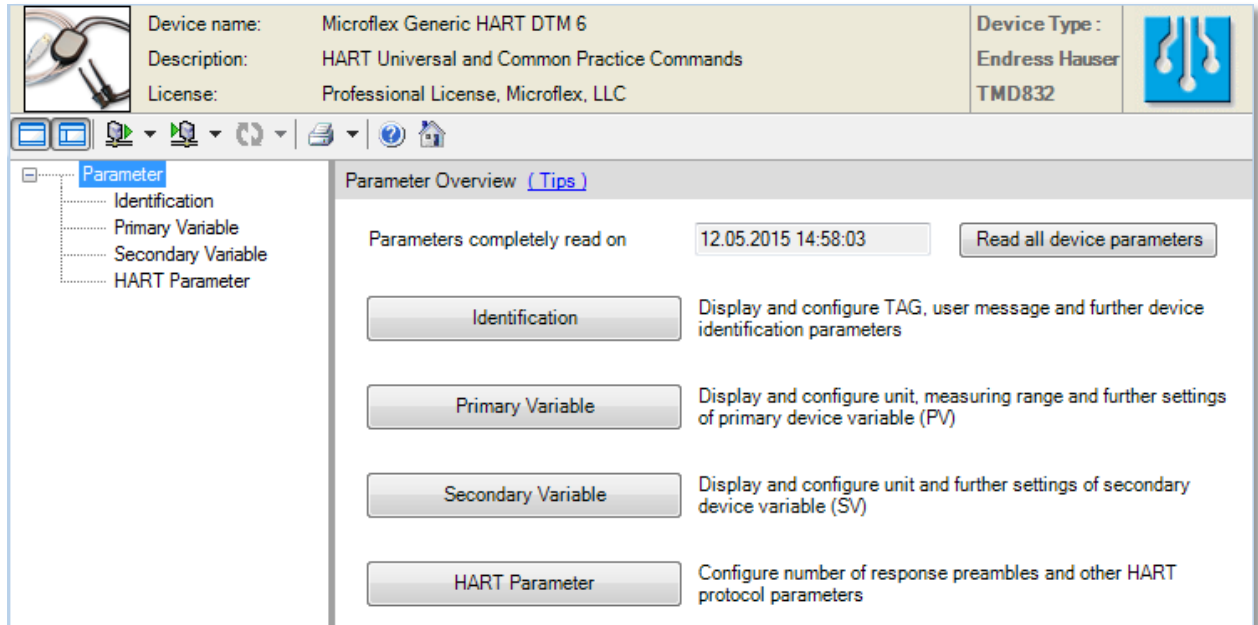




## 6. Parameterization

The **Parameter** function allows the display and modification of all parameters of the field device which can be processed using the Generic HART DTM.

According to the HART protocol version and the options defined by function **Configuration** a different number of pages are provided.

For a HART 5 device only 4 pages are shown,



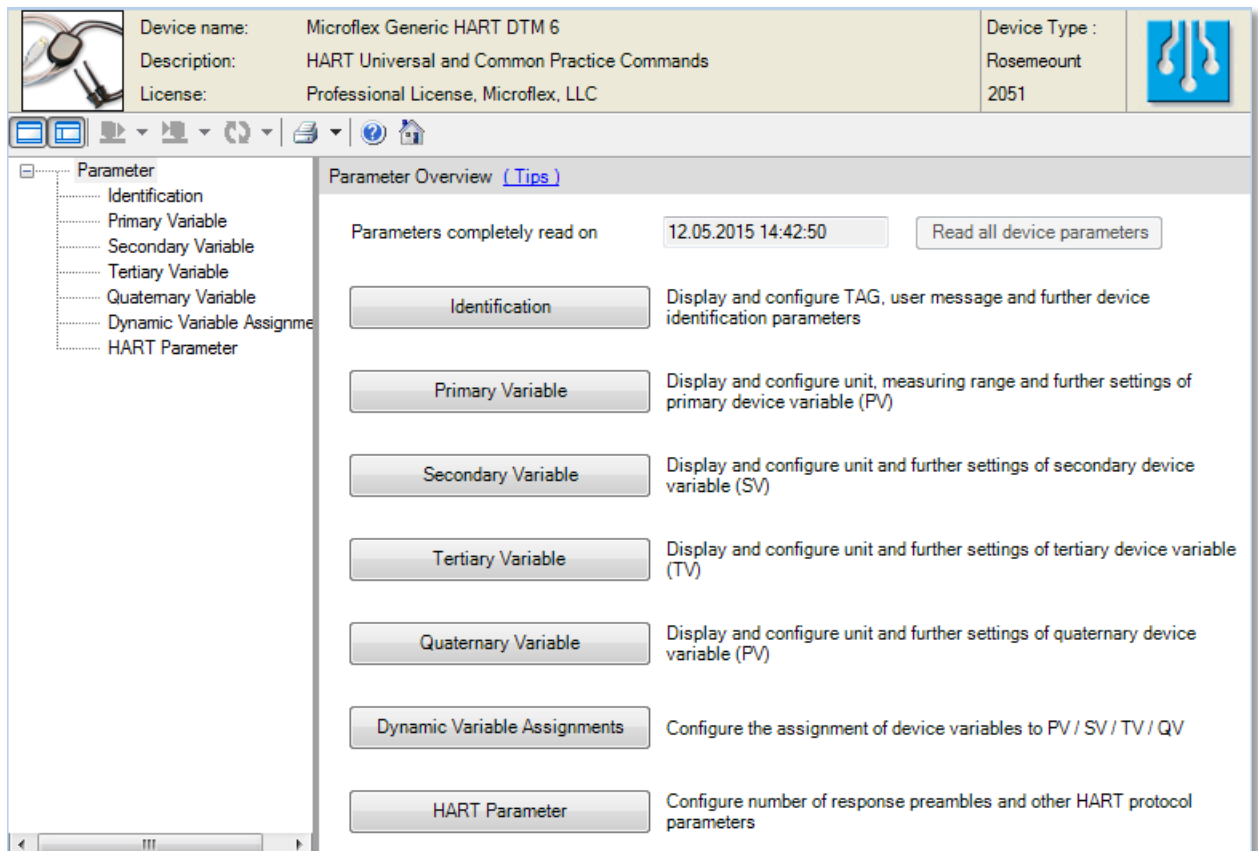
	Device name: Microflex Generic HART DTM 6 Description: HART Universal and Common Practice Commands License: Professional License, Microflex, LLC	Device Type : Endress Hauser TMD832	
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**Parameter Overview** [\(Tips\)](#)

Parameters completely read on: 12.05.2015 14:58:03 Read all device parameters

<input type="button" value="Identification"/>	Display and configure TAG, user message and further device identification parameters
<input type="button" value="Primary Variable"/>	Display and configure unit, measuring range and further settings of primary device variable (PV)
<input type="button" value="Secondary Variable"/>	Display and configure unit and further settings of secondary device variable (SV)
<input type="button" value="HART Parameter"/>	Configure number of response preambles and other HART protocol parameters

whereas up to 7 pages are displayed for a HART 7 capable device.



	Device name: Microflex Generic HART DTM 6 Description: HART Universal and Common Practice Commands License: Professional License, Microflex, LLC	Device Type : Rosemount 2051	
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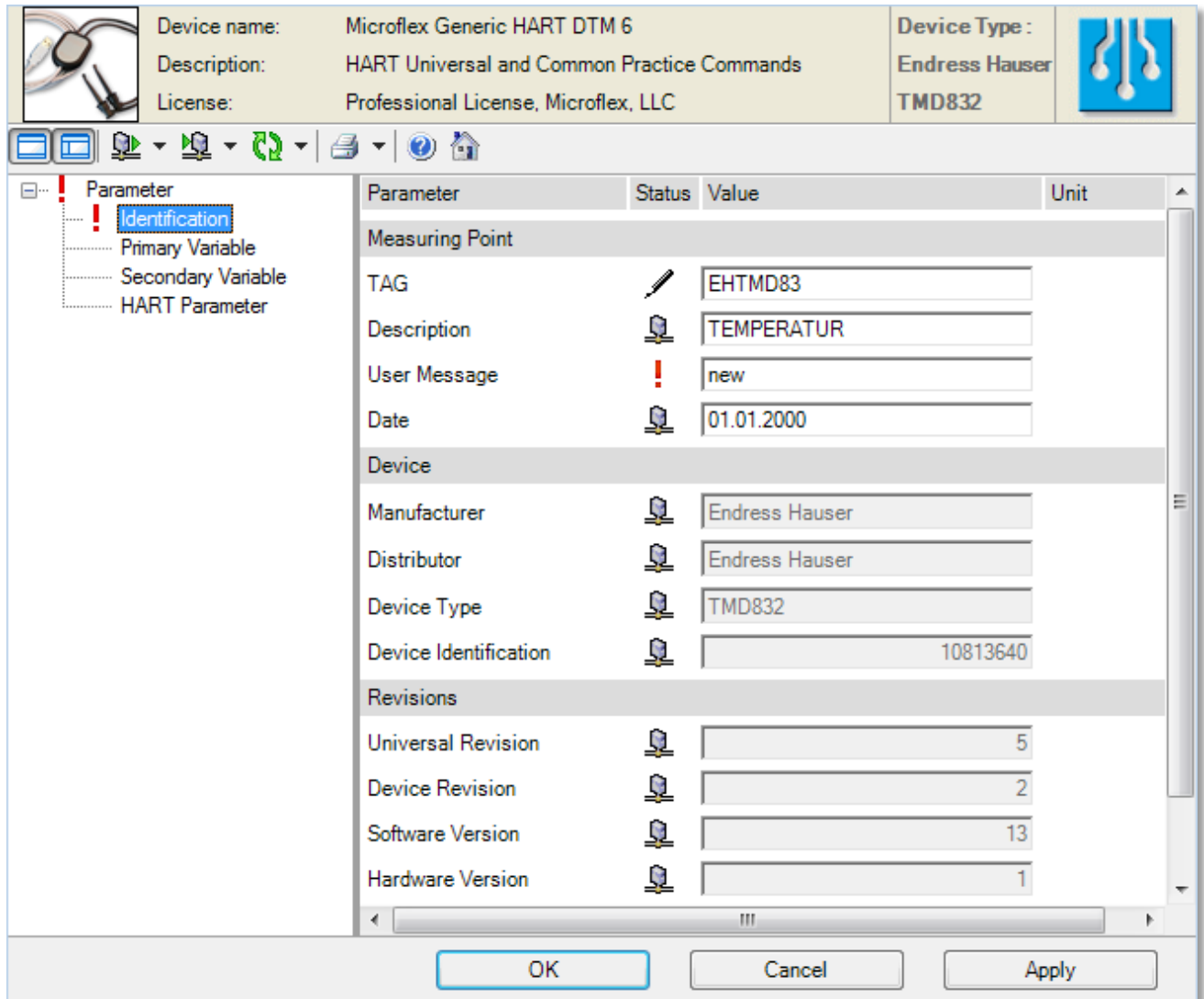
**Parameter Overview** [\(Tips\)](#)

Parameters completely read on: 12.05.2015 14:42:50 Read all device parameters

<input type="button" value="Identification"/>	Display and configure TAG, user message and further device identification parameters
<input type="button" value="Primary Variable"/>	Display and configure unit, measuring range and further settings of primary device variable (PV)
<input type="button" value="Secondary Variable"/>	Display and configure unit and further settings of secondary device variable (SV)
<input type="button" value="Tertiary Variable"/>	Display and configure unit and further settings of tertiary device variable (TV)
<input type="button" value="Quaternary Variable"/>	Display and configure unit and further settings of quaternary device variable (QV)
<input type="button" value="Dynamic Variable Assignments"/>	Configure the assignment of device variables to PV / SV / TV / QV
<input type="button" value="HART Parameter"/>	Configure number of response preambles and other HART protocol parameters



The first directory shows the device identification:



Device name: Microflex Generic HART DTM 6  
 Description: HART Universal and Common Practice Commands  
 License: Professional License, Microflex, LLC  
 Device Type: Endress Hauser TMD832

Parameter	Status	Value	Unit
<b>Measuring Point</b>			
TAG		EHTMD83	
Description		TEMPERATUR	
User Message		new	
Date		01.01.2000	
<b>Device</b>			
Manufacturer		Endress Hauser	
Distributor		Endress Hauser	
Device Type		TMD832	
Device Identification		10813640	
<b>Revisions</b>			
Universal Revision			5
Device Revision			2
Software Version			13
Hardware Version			1

Buttons: OK, Cancel, Apply

The parameters status is identified by means of different icons (see example):

- The description has been changed
- The user message contains an incorrect character (only upper-case and special characters are permissible, see tooltip)

All other parameters have been – according to the HART protocol version used - read out of the device. The navigation area and the status bar indicate that an error is present in the data record of the DTM.

Parameters of the Primary variable are displayed in the second page of the function Parameter. Some of the parameters can be protected against editing by function Configuration. The directory can be hidden too.

Parameter	Status	Value	Unit
PV Unit		mbar	
<b>Sensor Information</b>			
Sensor Serial Number		13075528	
		<input type="button" value="Write"/>	
Upper Value Max [USL]		621.60	mbar
Lower Value Min [LSL]		-621.60	mbar
Minimum Span		2.49	mbar
<b>Variable Information</b>			
Damping Value		1	s
Classification		Pressure	
Device family		Not Used	
<b>Measuring Range</b>			
PV Range Unit		mbar	
Upper Value [URV]		622.72	mbar
Lower Value [LRV]		-0.01	mbar
<b>Current Output</b>			
Damping Value		1	s
Current Alarm		High	
Transfer Function		linear	
Classification		Pressure	

Whereas the sensor limits are defined by the device and therefore cannot be changed, the measuring range limits can be defined by the user.

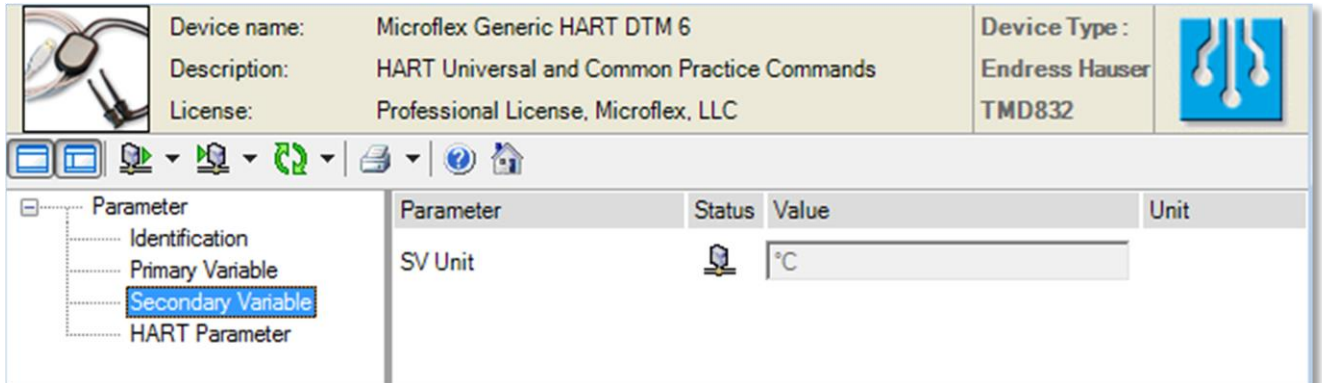
The unit for the measured value can be selected from the list of HART units. The selected unit is used for all limits and the span. It also appears in the measured-value display and in the trend.

The Sensor Serial Number can be changed if permitted by the device.

Damping value, Current alarm and transfer function can be defined for the current output of the device.

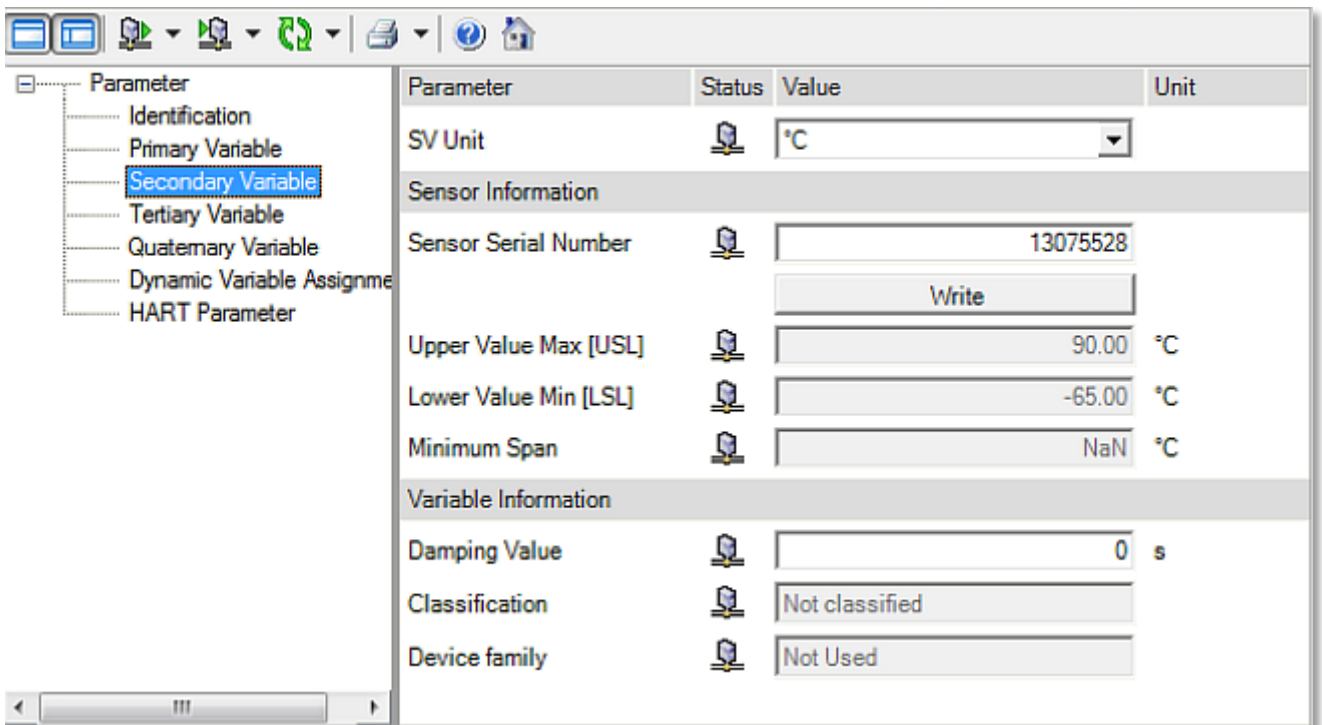
Depending of the properties of a device a second, third and fourth variable can be parameterized.

A HART 5 device provides a second variable only,



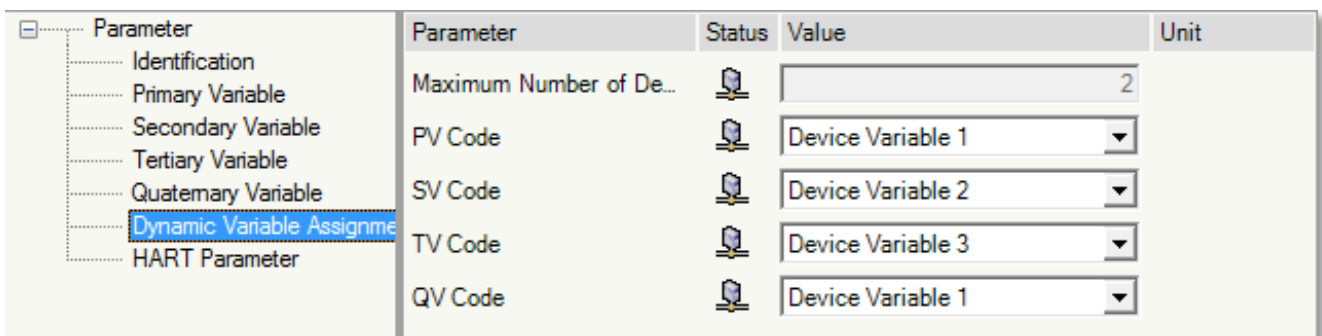
Parameter	Status	Value	Unit
SV Unit		°C	

whereas a HART 7 device provides 4 variables.



Parameter	Status	Value	Unit
SV Unit		°C	
<b>Sensor Information</b>			
Sensor Serial Number		13075528	
Upper Value Max [USL]		90.00	°C
Lower Value Min [LSL]		-65.00	°C
Minimum Span		NaN	°C
<b>Variable Information</b>			
Damping Value		0	s
Classification		Not classified	
Device family		Not Used	

If a device provides more than 4 variables, an assignment of device variables can be defined for the four standard variables PV to QV.



Parameter	Status	Value	Unit
Maximum Number of De...		2	
PV Code		Device Variable 1	
SV Code		Device Variable 2	
TV Code		Device Variable 3	
QV Code		Device Variable 1	

The protocol parameters of the HART interface are configured in the last directory. The polling address is written with the HART CommDTM. Some parameters are not stored in the field device.

Parameter	Status	Value	Unit
<b>Data Link Layer</b>			
Polling Address		<input type="text" value="0"/>	
Number Request Prea...		<input type="text" value="5"/>	
Number Response Pre...		<input type="text" value="5"/>	
<input type="button" value="Write"/>			
Device Flags		<input checked="" type="checkbox"/> Multisensor Field Device <input type="checkbox"/> EEPROM control required <input type="checkbox"/> Protocol bridge device <input type="checkbox"/> IEEE 802.15.4, 2.4 GHz DSSS <input type="checkbox"/> C8psk Capable Field Device <input type="checkbox"/> C8psk In Multi-Drop Only	
<b>Communication Port</b>			
Physical Signalling		<input type="text" value="bell 202 current"/>	

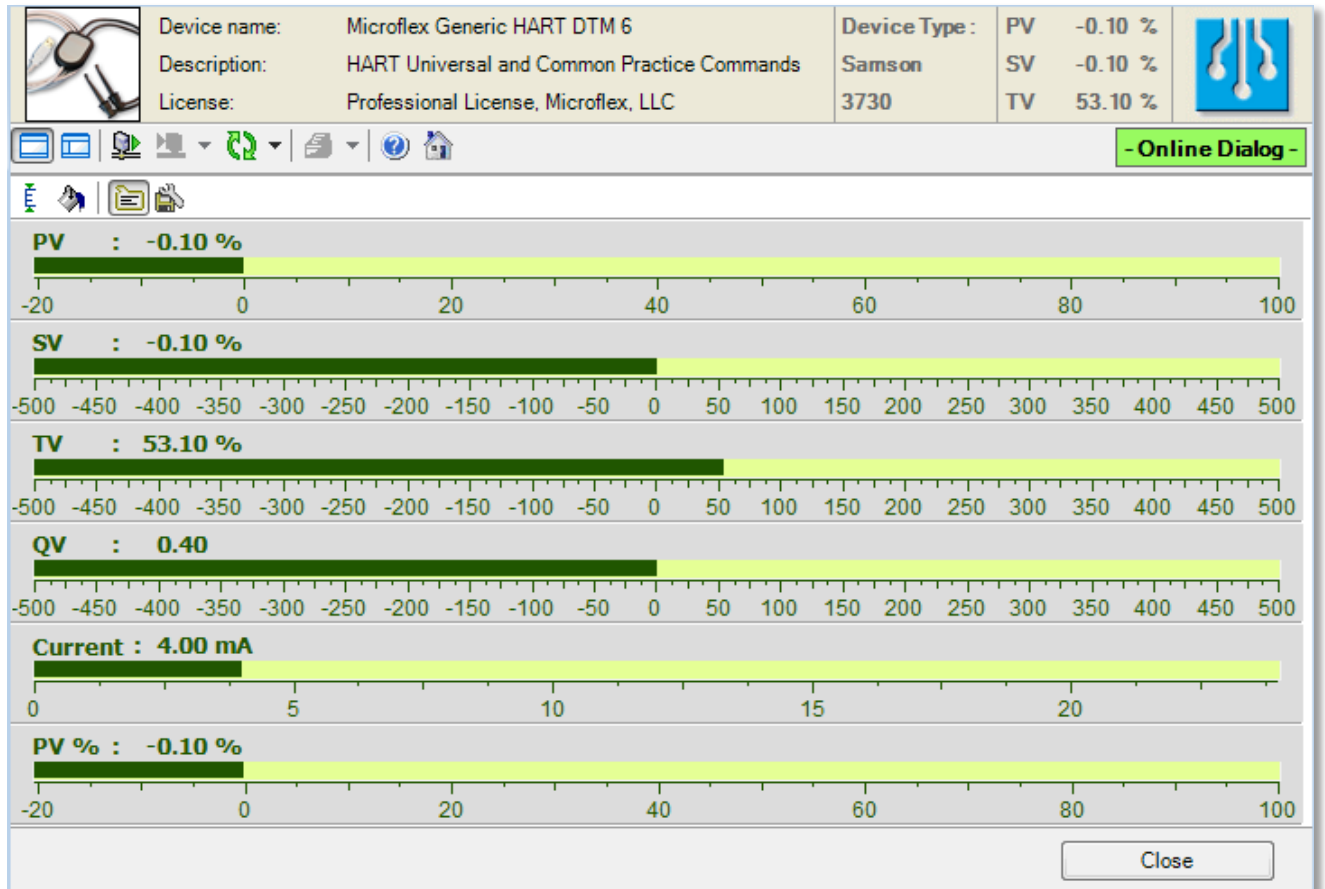
Some HART 7 device may provide a function for identifying the device in the plant by a noise or message in the display.

Parameter	Status	Value	Unit
<b>Data Link Layer</b>			
Polling Address		<input type="text" value="0"/>	
Number Request Pre...		<input type="text" value="5"/>	
Number Response Pr...		<input type="text" value="5"/>	
<input type="button" value="Write"/>			
Device Flags		<input type="checkbox"/> Multisensor Field Device <input type="checkbox"/> EEPROM control required <input type="checkbox"/> Protocol bridge device <input type="checkbox"/> IEEE 802.15.4, 2.4 GHz DS <input type="checkbox"/> C8psk Capable Field Devic <input type="checkbox"/> C8psk In Multi-Drop Only	
Squawk		<input type="button" value="Execute"/>	
<b>Communication Port</b>			
Physical Signalling		<input type="text" value="bell 202 current"/>	

Some field devices have an EEPROM for parameter backup to ensure that the values are still present following a power failure.

## 7. Measured-value display

Four variables and the current output value are displayed together in a bar diagram. The primary variable is additionally displayed as a percentage.

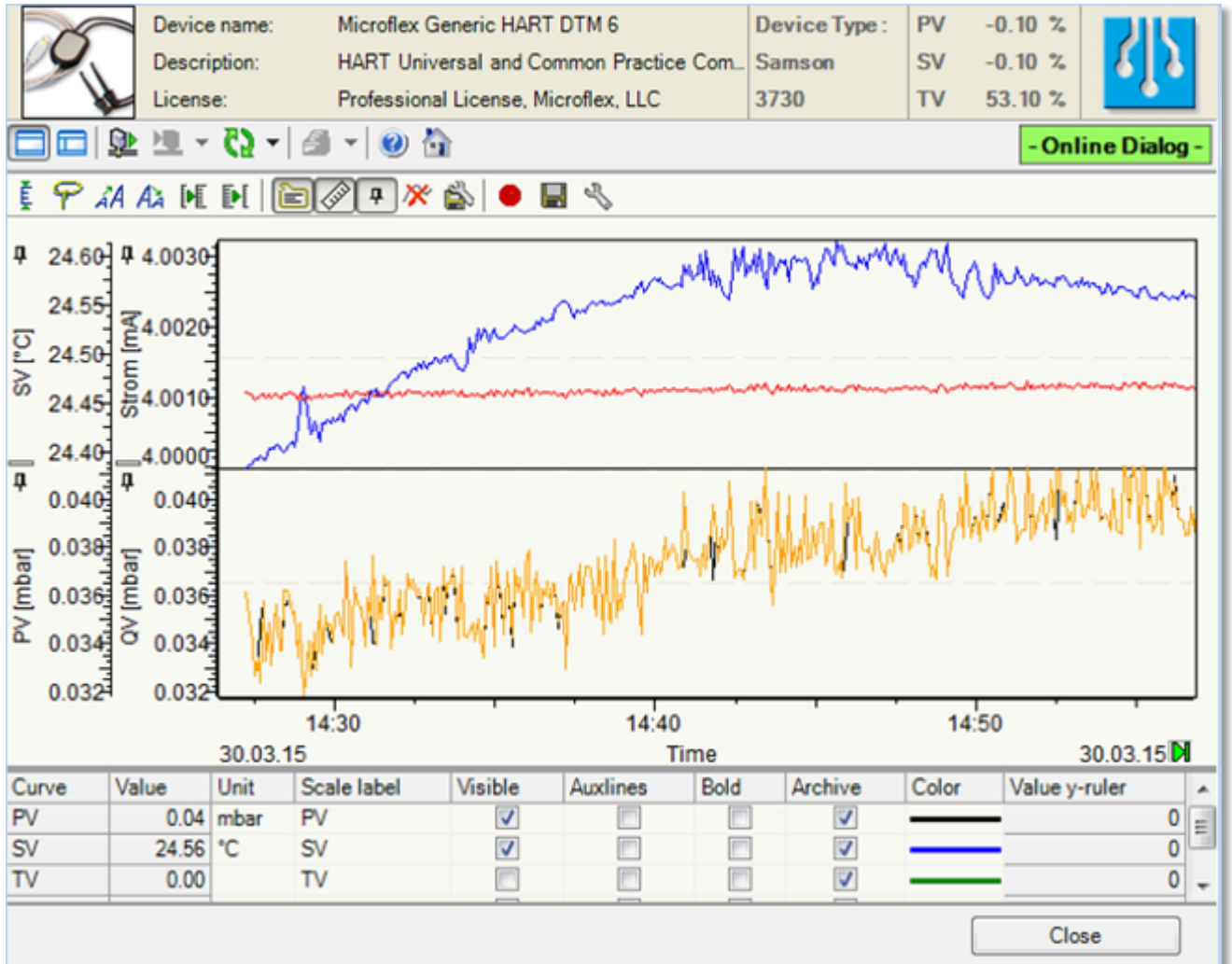


Using the keys in the toolbar of the measured-value display it is possible to capture the measuring range, to set the font size and colors for the bars, and to save these. The tooltip for the scales can be switched off.

The measured-value display can be updated once or cyclically. The cycle time can be set from 1 to 60 seconds.

## 8. Trend with archive function

The current output value and the four dynamic variables can be recorded cyclically in a diagram and saved in a csv file or Microsoft ACCESS database.



Three tool groups are present in the toolbar of the archive function.



These contain the following tools from left to right:

### 1. Display of trend chart



Measuring limits and units are read from the device



The curves are captured and displayed optimally. Scales are adapted accordingly.



The font size for the scale inscriptions can be changed.



The distance between the scale and the inscription can be adjusted.

## 2. Functions of the trend chart



Switch tooltip for scales and curves on/off.



Switch ruler on/off. With the ruler switched on, the measured values are displayed at the current position of the ruler in the **Value** column in the table.



Switch scale arranging on/off. The positions of the scales can be changed when this function is switched on.



Curves in the trend chart are deleted.



The settings of the trend chart are saved.

## 3. Curve archiving

As long as the cycle is switched on, measured data are recorded and displayed in the trend chart.



If curves from the previous recording are still present in the trend chart, they are deleted. The recorded measured data are archived directly in a csv file or a database. This mode is recommended if archiving of the measured data takes place without supervision.



The recorded curves can be saved. This function can be used as an alternative to direct archiving.

The display of the curves and the inscription of the scales can be changed in the table positioned underneath the trend chart. If the Unit of a measured curve is changed, the scale in the trend chart is adapted accordingly.

As soon as recording of curves is started or continued, the units read from the device are applied again.

If a new archive file is created, the format of the recorded data can be set using the following form:

CSV File

CSV File

User defined formats:

Date format:

Time format:

Date time e.g.:

CSV separator:

Decimal symbol:

Number e.g.:

Data Field	Name	Unit
Time stamp	Time stamp	
PV	PV	kg/h
State PV	State PV	
SV	SV	t
State SV	State SV	

Attach unit to data field

The setting of the appropriate list delimiter is particularly important for the further processing of archived data from files with csv format. The time, data format and decimal delimiters are defined by the respectively used Windows version. The measured data can also be saved in Microsoft ACCESS databases.

The **Archive data record buffer** tool can be used to write the data collected in the trend chart into the specified file.

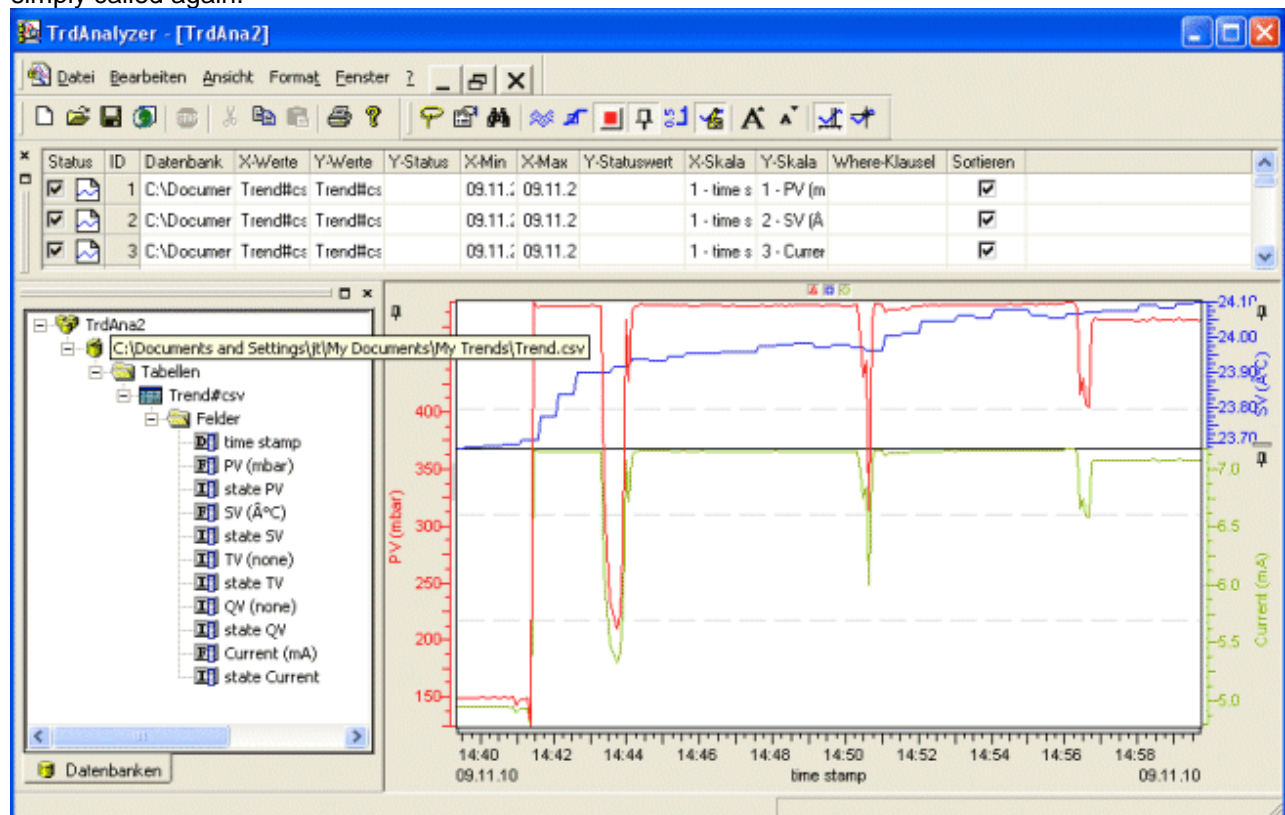
The archive has the following contents, for example:

	A	B	C	D	E	F	G	H	I	J	K
1	Zeitstempel	PV [°C]	Status PV	SV [°C]	Status SV	TV [Undefiniert]	Status TV	QV [Undefiniert]	Status QV	Current [mA]	Status Current
2	25.11.2014 10:00:21	9999	0	24,7282	0	0	0	0	0	3,799999952	0
3	25.11.2014 10:04:03	9999	0	24,5682	0	0	0	0	0	3,799999952	0
4	25.11.2014 10:04:21	9999	0	24,7282	0	0	0	0	0	3,799999952	0
5	25.11.2014 10:04:34	9999	0	24,7282	0	0	0	0	0	3,799999952	0
6	25.11.2014 10:04:49	9999	0	24,5682	0	0	0	0	0	3,799999952	0
7	25.11.2014 10:05:01	9999	0	24,7282	0	0	0	0	0	3,799999952	0
8	25.11.2014 10:05:14	9999	0	24,5682	0	0	0	0	0	3,799999952	0
9	25.11.2014 10:05:29	9999	0	25,0482	0	0	0	0	0	3,799999952	0
10	25.11.2014 10:05:40	9999	0	25,0482	0	0	0	0	0	3,799999952	0
11	25.11.2014 10:05:53	9999	0	24,5682	0	0	0	0	0	3,799999952	0
12	25.11.2014 10:06:10	9999	0	24,5682	0	0	0	0	0	3,799999952	0
13	25.11.2014 10:06:26	9999	0	24,7282	0	0	0	0	0	3,799999952	0
14	25.11.2014 10:06:37	9999	0	24,8882	0	0	0	0	0	3,799999952	0

The **TrendAnalyzer** software tool is particularly suitable for analyzing or documenting archived curves. For example, if measured curves are to be repeatedly recorded and documented

- during the development of field devices,
- during production processes or for quality assurance, or
- in the case of guarantee claims,

either the archive is transferred to the TrendAnalyzer by drag and drop or the corresponding project file is simply called again.



Further information on the TrendAnalyzer is available at [www.trendanalyzer.de](http://www.trendanalyzer.de).

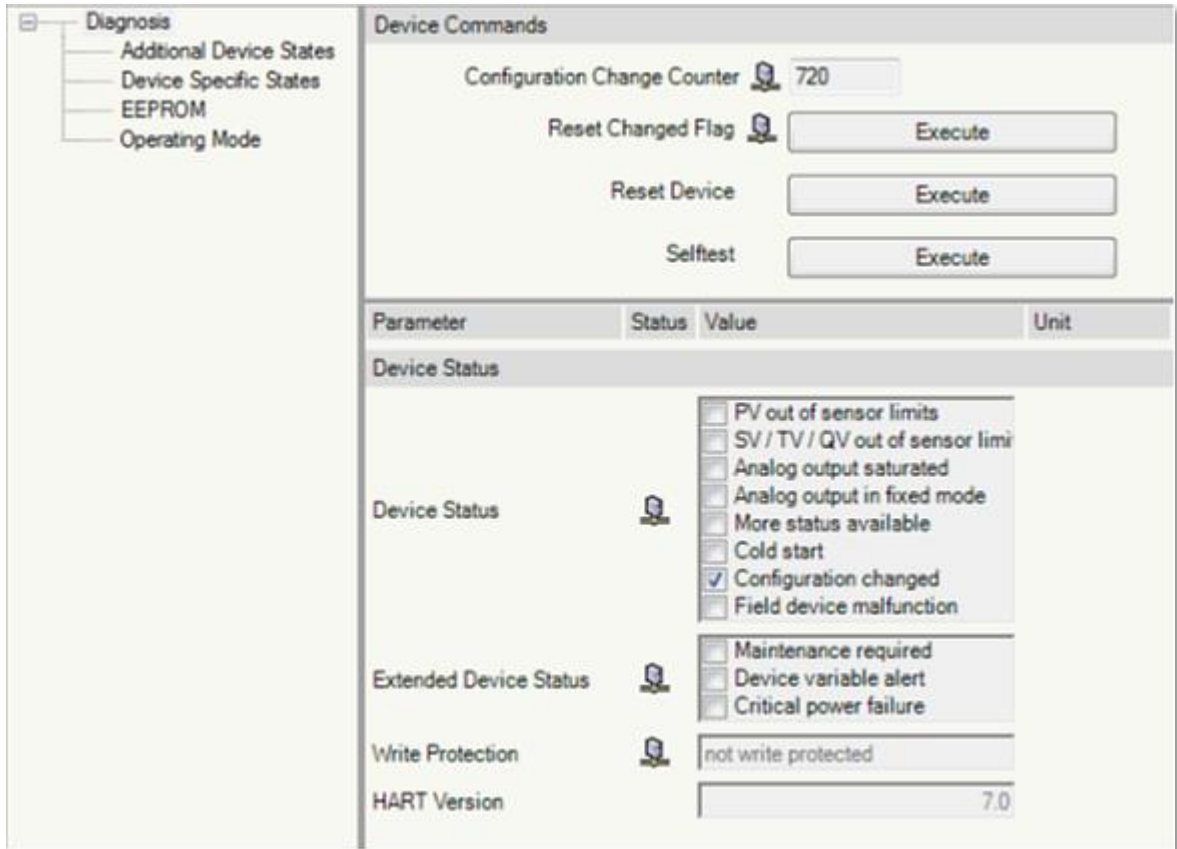


## 9. Diagnostics

The diagnostics function indicates the status of the field device. The maximum possible scope of status information is read, even if not supported by every HART field device.

Status information can be read once or cyclically.

This application additionally offers commands with which the field device can be reset or tested.

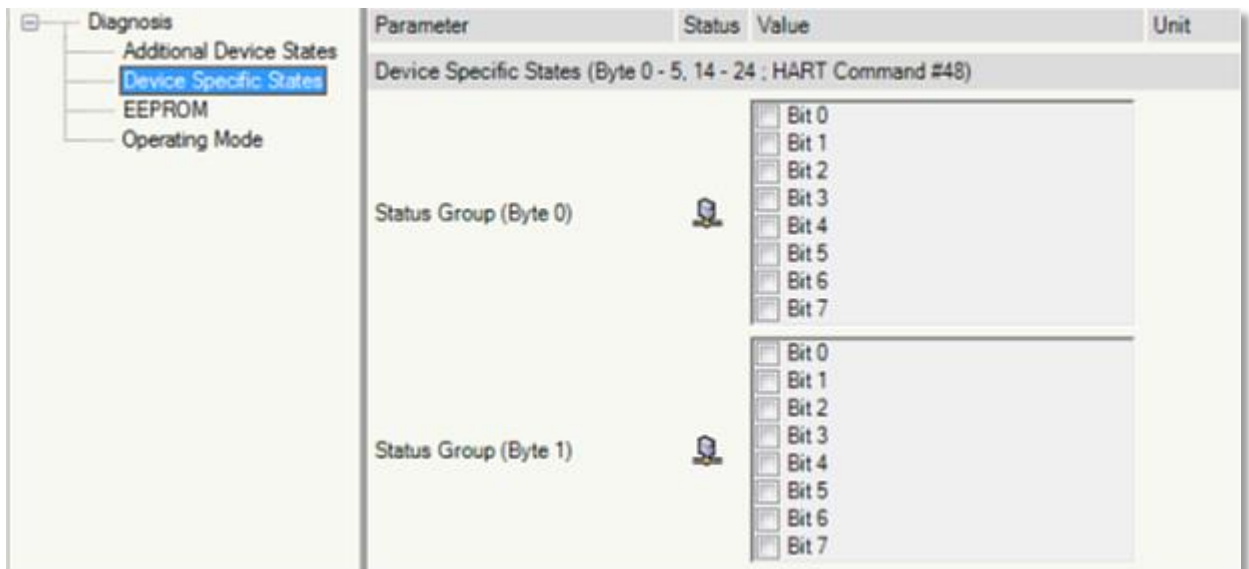


The screenshot shows a software interface for device diagnostics. On the left is a tree view with 'Diagnosis' expanded, showing sub-items: 'Additional Device States', 'Device Specific States', 'EEPROM', and 'Operating Mode'. The main area is divided into two sections:

- Device Commands:** Contains four controls:
  - 'Configuration Change Counter' with a value of 720.
  - 'Reset Changed Flag' with an 'Execute' button.
  - 'Reset Device' with an 'Execute' button.
  - 'Selftest' with an 'Execute' button.
- Device Status:** A table with columns 'Parameter', 'Status', 'Value', and 'Unit'.
 

Parameter	Status	Value	Unit
Device Status		<input type="checkbox"/> PV out of sensor limits <input type="checkbox"/> SV / TV / QV out of sensor limit <input type="checkbox"/> Analog output saturated <input type="checkbox"/> Analog output in fixed mode <input type="checkbox"/> More status available <input type="checkbox"/> Cold start <input checked="" type="checkbox"/> Configuration changed <input type="checkbox"/> Field device malfunction	
Extended Device Status		<input type="checkbox"/> Maintenance required <input type="checkbox"/> Device variable alert <input type="checkbox"/> Critical power failure	
Write Protection		not write protected	
HART Version			7.0

The following page shows status bits from 16 status groups with 8 bits each. The meanings of the bits are different for each field device, and must therefore be obtained from the device descriptions.



This screenshot shows the 'Device Specific States' section of the diagnostics interface. The tree view on the left has 'Device Specific States' highlighted. The main area displays a table with columns 'Parameter', 'Status', 'Value', and 'Unit'.

Parameter	Status	Value	Unit
Device Specific States (Byte 0 - 5, 14 - 24 ; HART Command #48)			
Status Group (Byte 0)		<input type="checkbox"/> Bit 0 <input type="checkbox"/> Bit 1 <input type="checkbox"/> Bit 2 <input type="checkbox"/> Bit 3 <input type="checkbox"/> Bit 4 <input type="checkbox"/> Bit 5 <input type="checkbox"/> Bit 6 <input type="checkbox"/> Bit 7	
Status Group (Byte 1)		<input type="checkbox"/> Bit 0 <input type="checkbox"/> Bit 1 <input type="checkbox"/> Bit 2 <input type="checkbox"/> Bit 3 <input type="checkbox"/> Bit 4 <input type="checkbox"/> Bit 5 <input type="checkbox"/> Bit 6 <input type="checkbox"/> Bit 7	

More status information according to device type may be displayed, provided that a device delivers those data.

Parameter	Status	Value	Unit
<b>Additional Device Status</b>			
Operating mode		#NDEF#	
Analog output saturated (...)		<input type="checkbox"/> AO1 out of range	
		<input checked="" type="checkbox"/> AO2 out of range	
		<input type="checkbox"/> AO3 out of range	
		<input type="checkbox"/> AO4 out of range	
		<input checked="" type="checkbox"/> AO5 out of range	
		<input type="checkbox"/> AO6 out of range	
		<input type="checkbox"/> AO7 out of range	
		<input type="checkbox"/> AO8 out of range	
Analog output fixed (Byte...)		<input type="checkbox"/> AO1 in fixed mode	
		<input checked="" type="checkbox"/> AO2 in fixed mode	
		<input type="checkbox"/> AO3 in fixed mode	
		<input checked="" type="checkbox"/> AO4 in fixed mode	
		<input checked="" type="checkbox"/> AO5 in fixed mode	
		<input checked="" type="checkbox"/> AO6 in fixed mode	
		<input checked="" type="checkbox"/> AO7 in fixed mode	
		<input checked="" type="checkbox"/> AO8 in fixed mode	

On the last two pages EEPROM control and operating mode are displayed and can be executed.

Parameter	Status	Value	Unit
<b>EEPROM</b>			
EEPROM control		burn EEPROM	
Execute			

Parameter	Status	Value	Unit
<b>Burst Operation</b>			
Burst Command		1	
Burst Mode		off	
Execute			

## 10. Calibration

The calibration is called e.g. using the context menu of the DTM in the frame application by means of the entry Additional functions -> Calibrate device.

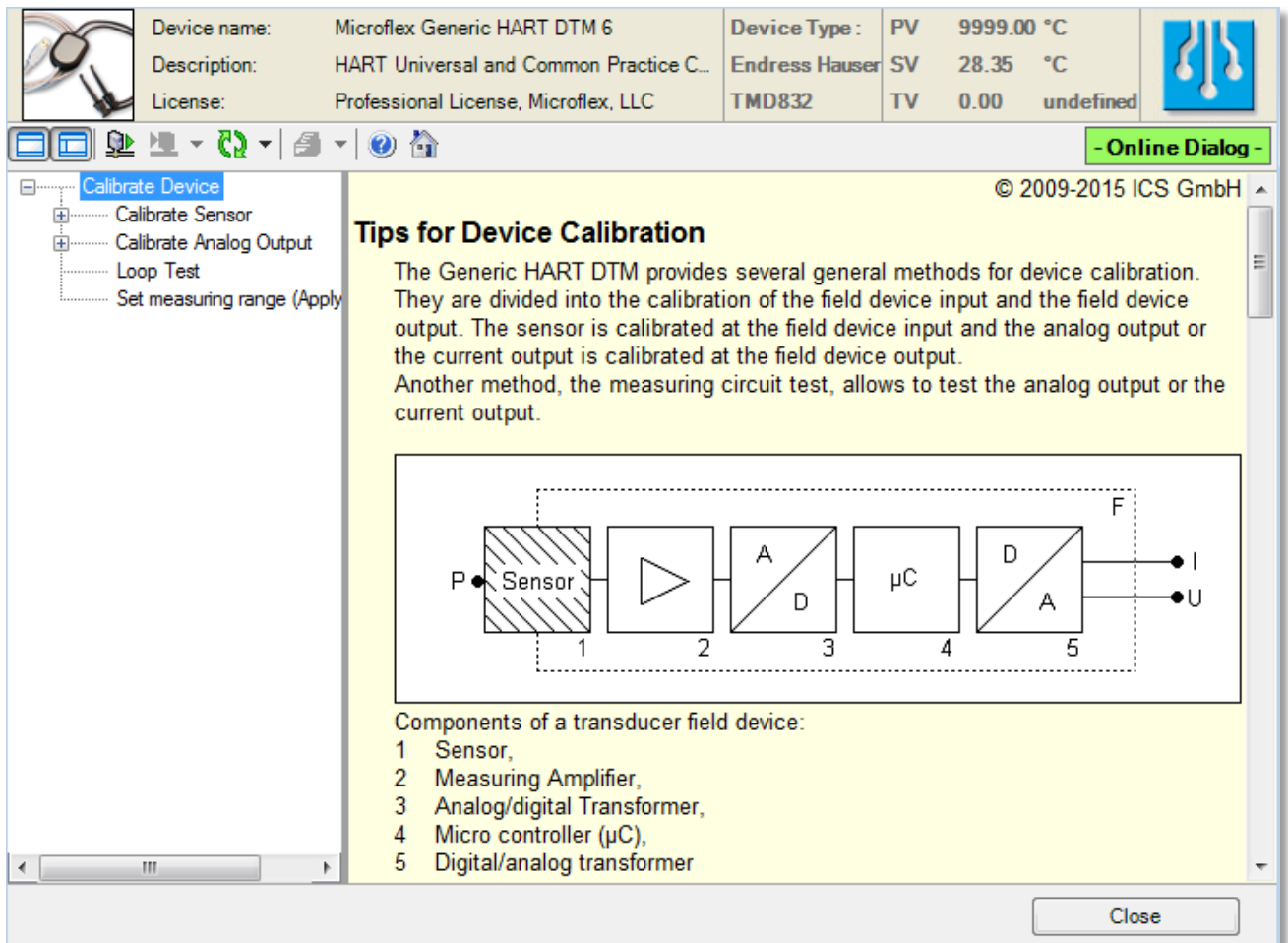
The calibration can only be started if a connection exists to the field device. Furthermore, a



Professional license is required after the test period (30 days). The DTM offers 5 calibration methods:

- 2 sensor calibrations (sensor adjustment, zero adjustment)
- 2 calibrations of the analog output (digital/analog adjustment and scaled digital/analog adjustment)
- Measuring circuit test

The calibration methods are initially explained in an overview. The individual methods are described in detailed documentation which guides the user through preparation and implementation of the calibration steps.

A wizard is provided for each calibration with which the required steps can be carried out similar to with a Device Description on the handheld:



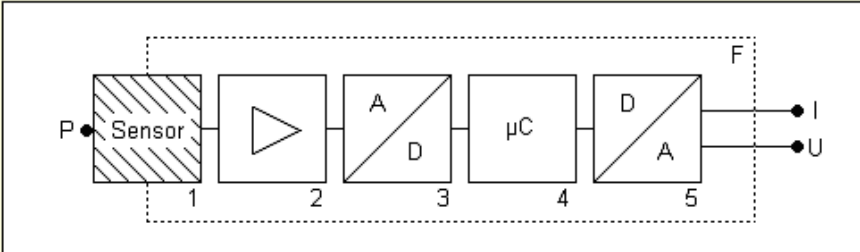
	Device name: Microflex Generic HART DTM 6	Device Type: PV	9999.00 °C		
	Description: HART Universal and Common Practice C...	Endress Hauser	SV		28.35 °C
	License: Professional License, Microflex, LLC	TMD832	TV		0.00 undefined

**Calibrate Device**

- Calibrate Sensor
- Calibrate Analog Output
- Loop Test
- Set measuring range (Apply)

**Tips for Device Calibration**

The Generic HART DTM provides several general methods for device calibration. They are divided into the calibration of the field device input and the field device output. The sensor is calibrated at the field device input and the analog output or the current output is calibrated at the field device output. Another method, the measuring circuit test, allows to test the analog output or the current output.



Components of a transducer field device:

- 1 Sensor,
- 2 Measuring Amplifier,
- 3 Analog/digital Transformer,
- 4 Micro controller ( $\mu\text{C}$ ),
- 5 Digital/analog transformer

Close

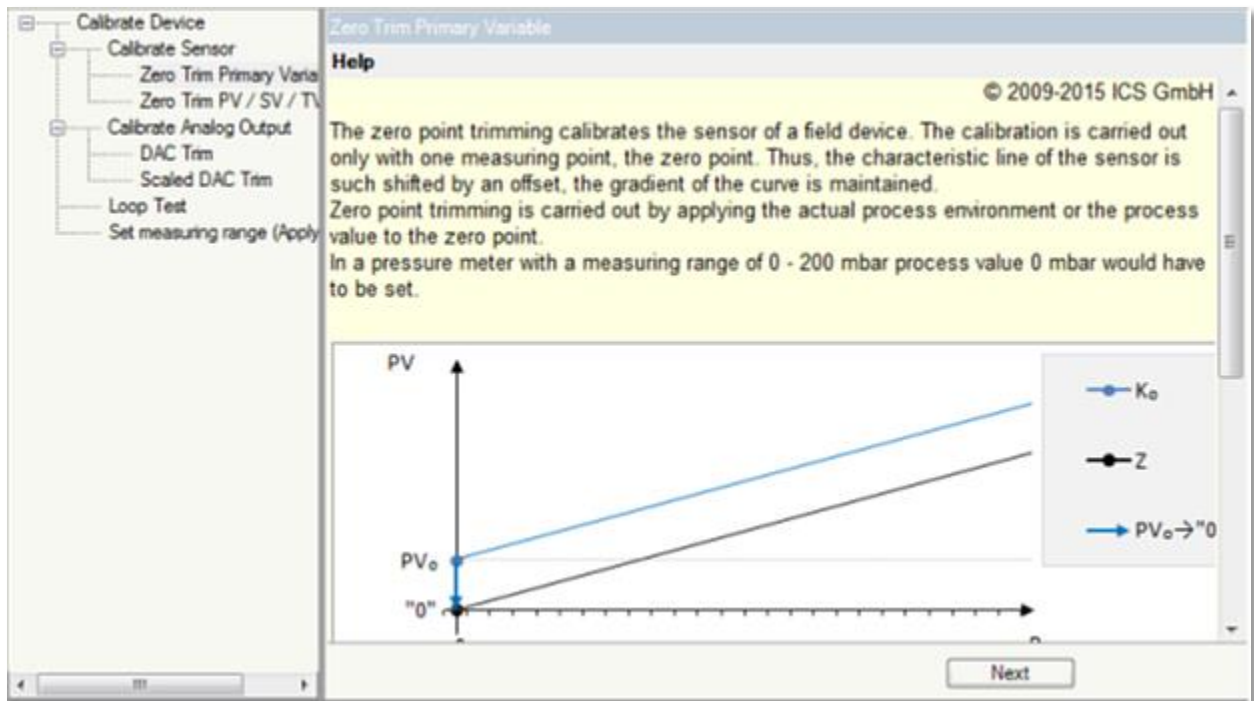
Each calibration can be repeated several times in succession.

If a calibration is aborted, a note appears which guarantees correct termination of the calibration.

An error message appears if one or more calibration methods are not supported by a field device.

## 10.1. Zero adjustment

The characteristic line of a sensor is shifted by an offset.



**Zero Trim Primary Variable**

**Help**

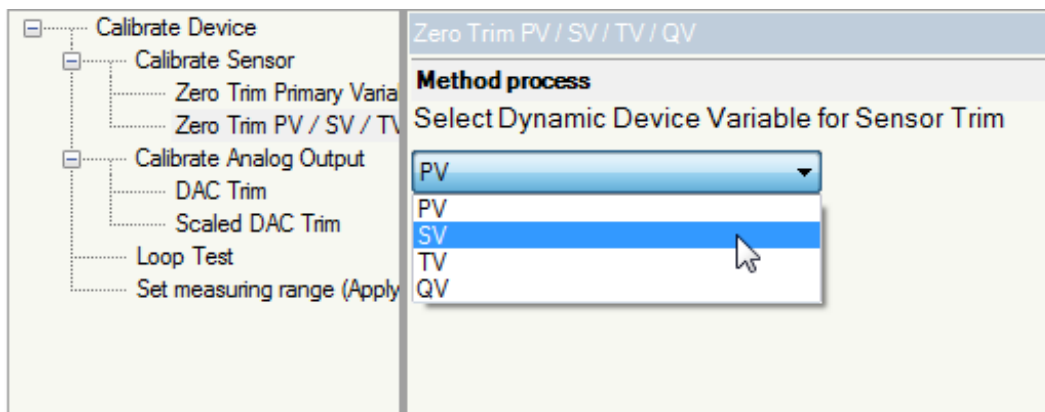
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The zero point trimming calibrates the sensor of a field device. The calibration is carried out only with one measuring point, the zero point. Thus, the characteristic line of the sensor is such shifted by an offset, the gradient of the curve is maintained. Zero point trimming is carried out by applying the actual process environment or the process value to the zero point. In a pressure meter with a measuring range of 0 - 200 mbar process value 0 mbar would have to be set.

**Graph:** The graph shows a vertical axis labeled 'PV' and a horizontal axis. Two parallel lines are plotted. The upper line is labeled 'K<sub>0</sub>' and the lower line is labeled 'Z'. A horizontal arrow labeled 'PV<sub>0</sub> → 0' indicates the shift of the zero point.

**Next**

If another variable of the device is selected...



**Zero Trim PV / SV / TV / QV**

**Method process**

Select Dynamic Device Variable for Sensor Trim

PV  
PV  
SV  
TV  
QV

... an error message may occur in case the variable cannot be calibrated.



**Zero Trim PV / SV / TV / QV**

**Help**



**Method process**

By the last data exchange, the field device returned a response code:

**2 - Invalid selection**

## 10.2. Digital/analog adjustment

The analog output of the field device is calibrated by means of the following two sequences.

	Device name:	Microflex Generic HART DTM 6	Device Type :	PV	9999.00 °C	
	Description:	HART Universal and Common Practice C...	Endress Hauser	SV	28.35 °C	
	License:	Professional License, Microflex, LLC	TMD832	TV	0.00 undefined	

**- Online Dialog -**

- Calibrate Device
  - Calibrate Sensor
  - Calibrate Analog Output
    - DAC Trim**
    - Scaled DAC Trim
  - Loop Test
  - Set measuring range (Apply)

### DAC Trim

**Help**

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The digital/analog trimming is a calibration of the field device output. The field device output is a current output, which is calibrated at the two points 4 and 20 mA. For exact calibration of the two points the use of a reference ampere meter is required.

**Steps of the digital/analog trim**

1. Deactivate automatic control.
2. Connect reference display (ampere meter).
3. The field device output is set to 4 mA.
4. Input of the mA-value of the reference display (ampere meter).
  - 4.1. Confirm whether the displayed value of the field device output (at 4 mA) matches the reference display (ampere meter).
5. The field device output is now set to 20 mA.
6. Input of the mA-value of the reference display (ampere meter).
  - 6.1. Confirm whether the displayed value of the field device output (at 20 mA) matches the reference display (ampere meter).
7. Optionally reactivate automatic control.
8. The operation is completed.

### 10.3. Scaled Digital/Analog adjustment

The analog output of the field device is calibrated to range limits other than the standard values of 4 and 20 mA.

	Device name:	Microflex Generic HART DTM 6	Device Type :	PV	9999.00 °C	
	Description:	HART Universal and Common Practice C...	Endress Hauser	SV	28.35 °C	
	License:	Professional License, Microflex, LLC	TMD832	TV	0.00 undefined	

**- Online Dialog -**

- Calibrate Device
  - Calibrate Sensor
  - Calibrate Analog Output
    - DAC Trim
    - Scaled DAC Trim**
  - Loop Test
  - Set measuring range (Apply)

#### Scaled DAC Trim

**Help**

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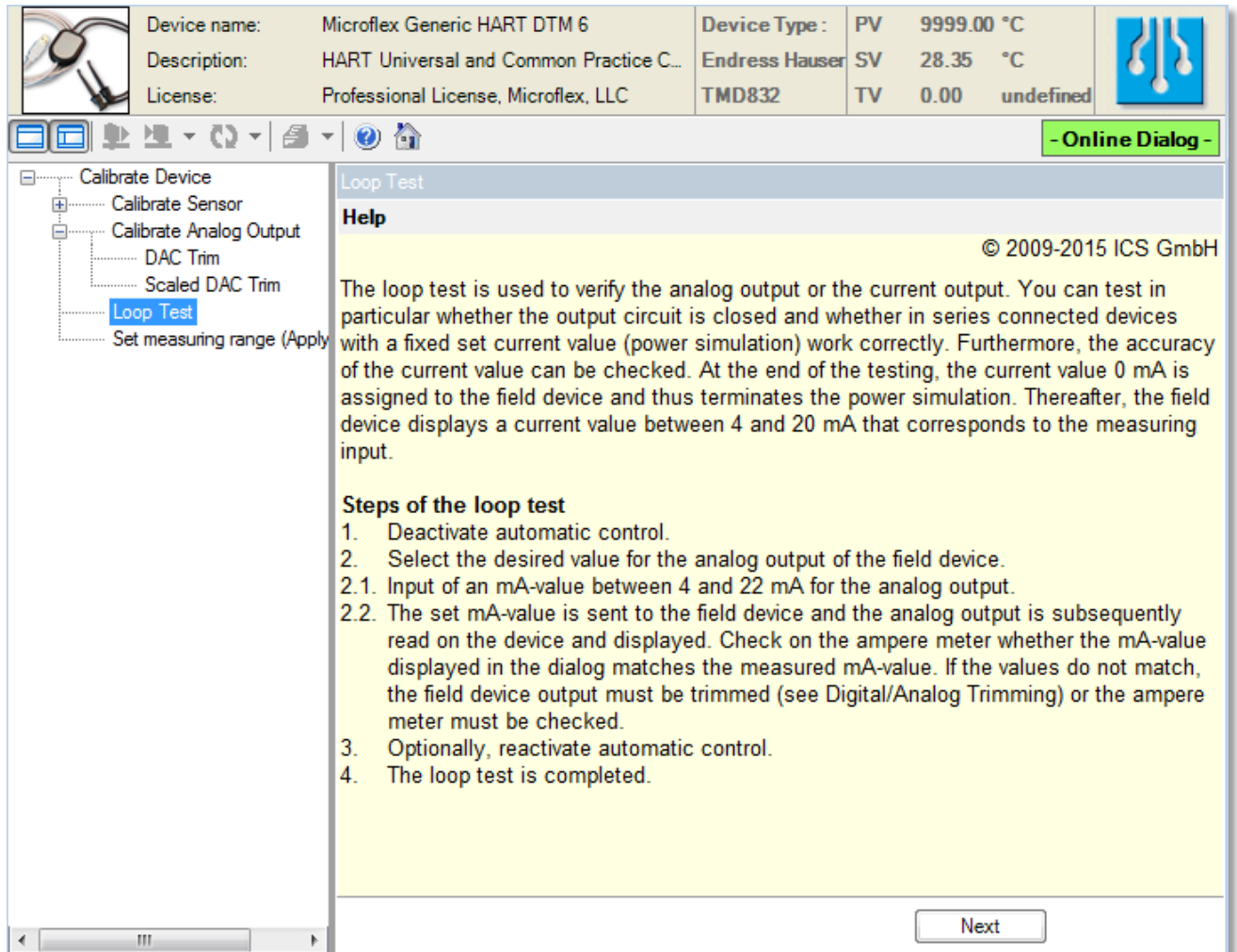
The scaled digital/analog trim is a calibration of the field device output. The field device output is a current output, which is calibrated at two adjustable points between 4 and 20 mA. For precise calibration of the two points the use of a reference ampere meter is required.



**Steps of the scaled digital/analog trim**

1. Deactivate automatic control.
  - 1.1. Confirm whether you want to perform a trimming of the displayed values.
  - 1.2. Input of the mA-value for the lower trim point.
  - 1.3. Input of the mA-value for the upper trim point.
2. Connect reference display (ampere meter).
3. At the beginning of the scaling of the lower trim point the field device output is set to 4 mA.
4. Input of the mA-value of the reference display (ampere meter).
  - 4.1. Confirm whether the displayed lower trim value of the field device output matches the reference display (ampere meter).
5. At the beginning of the scaling of the upper trim point set the field device output to 20 mA.
6. Input of the mA-value of the reference display (ampere meter).
  - 6.1. Confirm whether the displayed upper trim value of the field device output matches the reference display (ampere meter).
7. Optionally reactivate the automatic control.
8. The procedure is completed.

## 10.4. Loop test

The loop test checks whether the output circuit is closed and whether the accuracy of the current values is sufficient.



	Device name: Microflex Generic HART DTM 6	Device Type : PV 9999.00 °C	
	Description: HART Universal and Common Practice C...	Endress Hauser SV 28.35 °C	
	License: Professional License, Microflex, LLC	TMD832 TV 0.00 undefined	

- Online Dialog -

- Calibrate Device
  - Calibrate Sensor
  - Calibrate Analog Output
    - DAC Trim
    - Scaled DAC Trim
    - Loop Test**
    - Set measuring range (Apply)

Loop Test

**Help**

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The loop test is used to verify the analog output or the current output. You can test in particular whether the output circuit is closed and whether in series connected devices with a fixed set current value (power simulation) work correctly. Furthermore, the accuracy of the current value can be checked. At the end of the testing, the current value 0 mA is assigned to the field device and thus terminates the power simulation. Thereafter, the field device displays a current value between 4 and 20 mA that corresponds to the measuring input.

**Steps of the loop test**

1. Deactivate automatic control.
2. Select the desired value for the analog output of the field device.
  - 2.1. Input of an mA-value between 4 and 22 mA for the analog output.
  - 2.2. The set mA-value is sent to the field device and the analog output is subsequently read on the device and displayed. Check on the ampere meter whether the mA-value displayed in the dialog matches the measured mA-value. If the values do not match, the field device output must be trimmed (see Digital/Analog Trimming) or the ampere meter must be checked.
3. Optionally, reactivate automatic control.
4. The loop test is completed.

Next

## 11. Save/load parameter data record

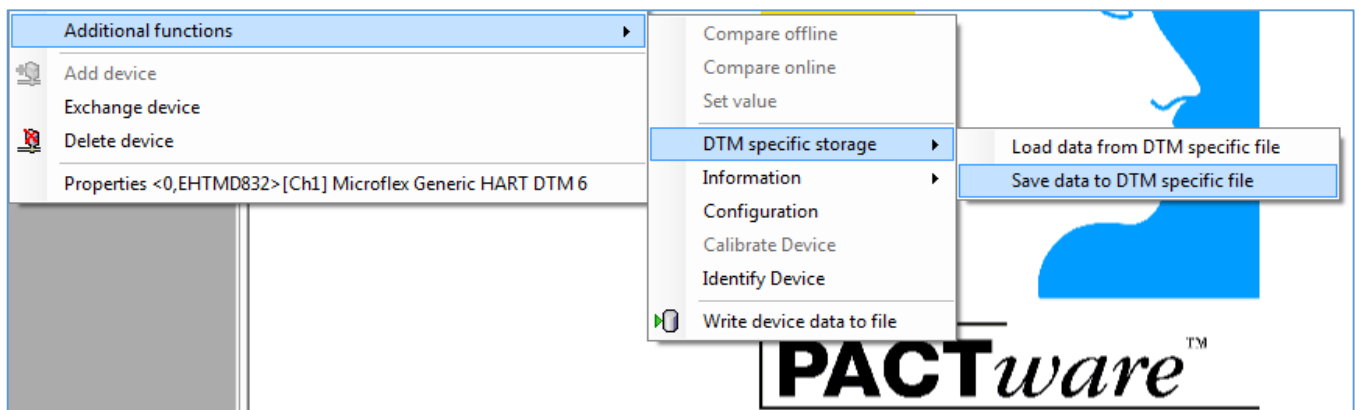
The parameter data record of a field device which is processed using the Generic HART DTM can be saved as a file.

**Caution:** If a field device possesses parameters which cannot be processed using the general HART commands, these are then missing in the saved data record.

The following applications are thus supported:

- Save the parameter data record of a field device in a different field device
- Archive and document the parameter data record of a field device
- Transfer the parameter data record of a field device from one frame application to another

The function is called e.g. using the context menu of the DTM in the frame application by means of the entry **Additional functions -> DTM-specific storage**.

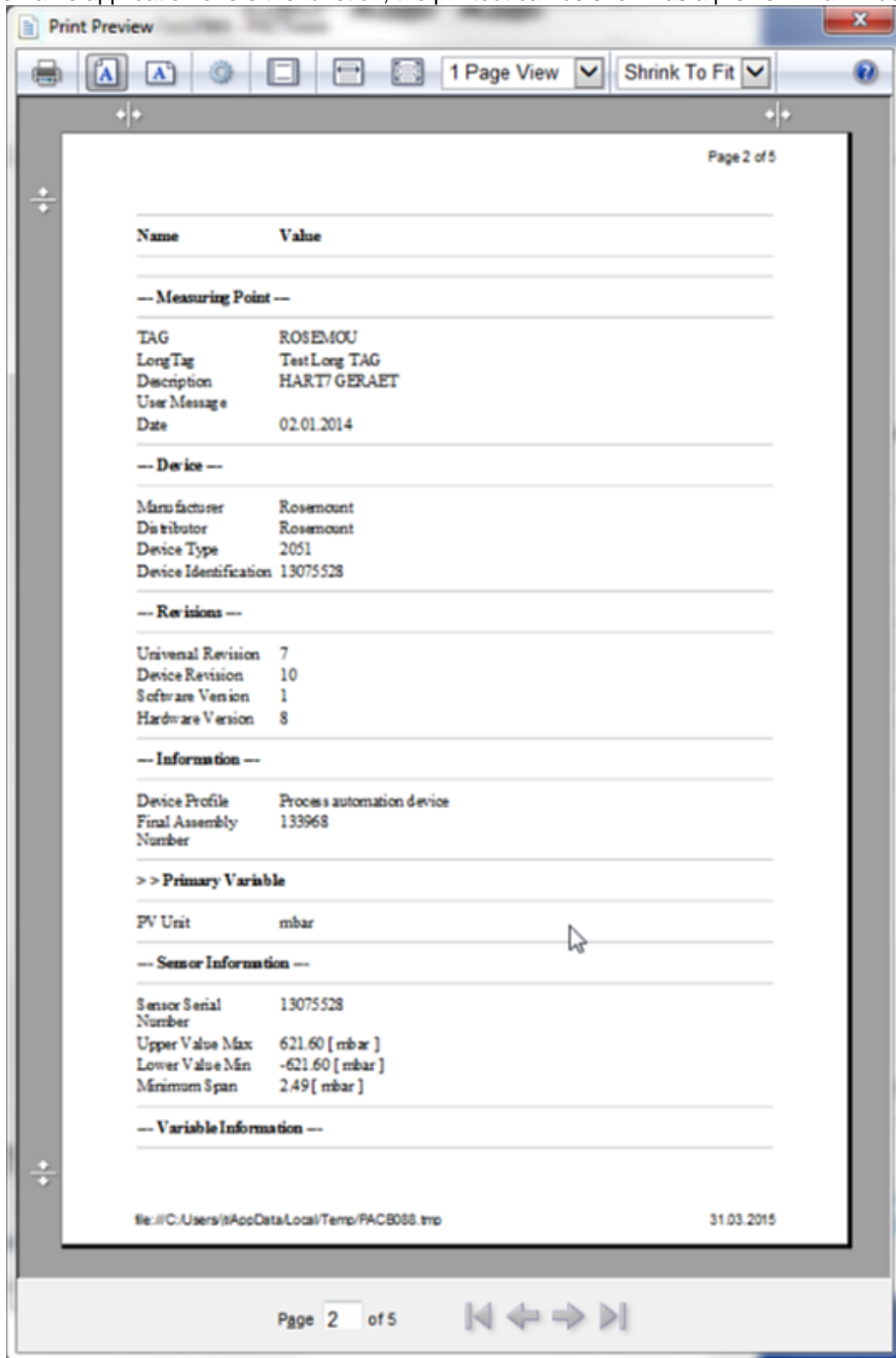


The data are saved in binary form and can only be read in again using the Generic HART DTM.



## 12. Printing of parameters

All parameters or a subset of the parameters can be printed together with the name, value, description, and status. If the frame application offers the function, the printout can be shown as a preview in a window.



To allow the preview, Microsoft Internet Explorer Version 5.0 or later must be installed on the PC.

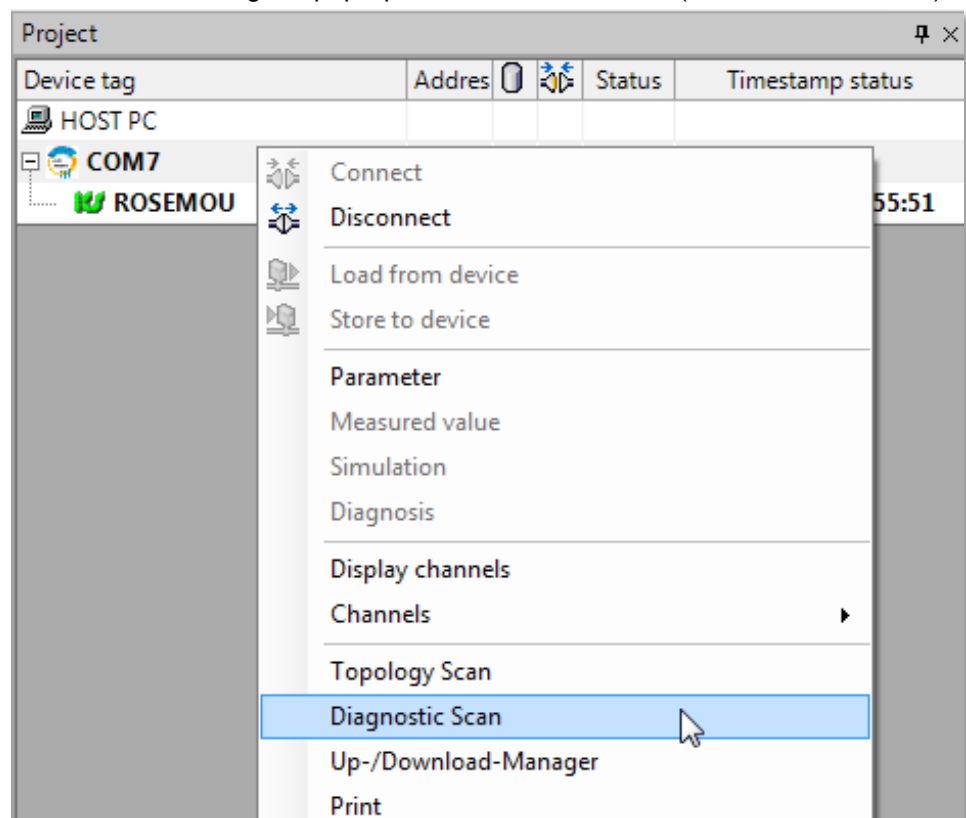
### 13. Display and log NAMUR device status

The current status of the field device - in other words, the last read status - is displayed in the seventh field of the status bar.

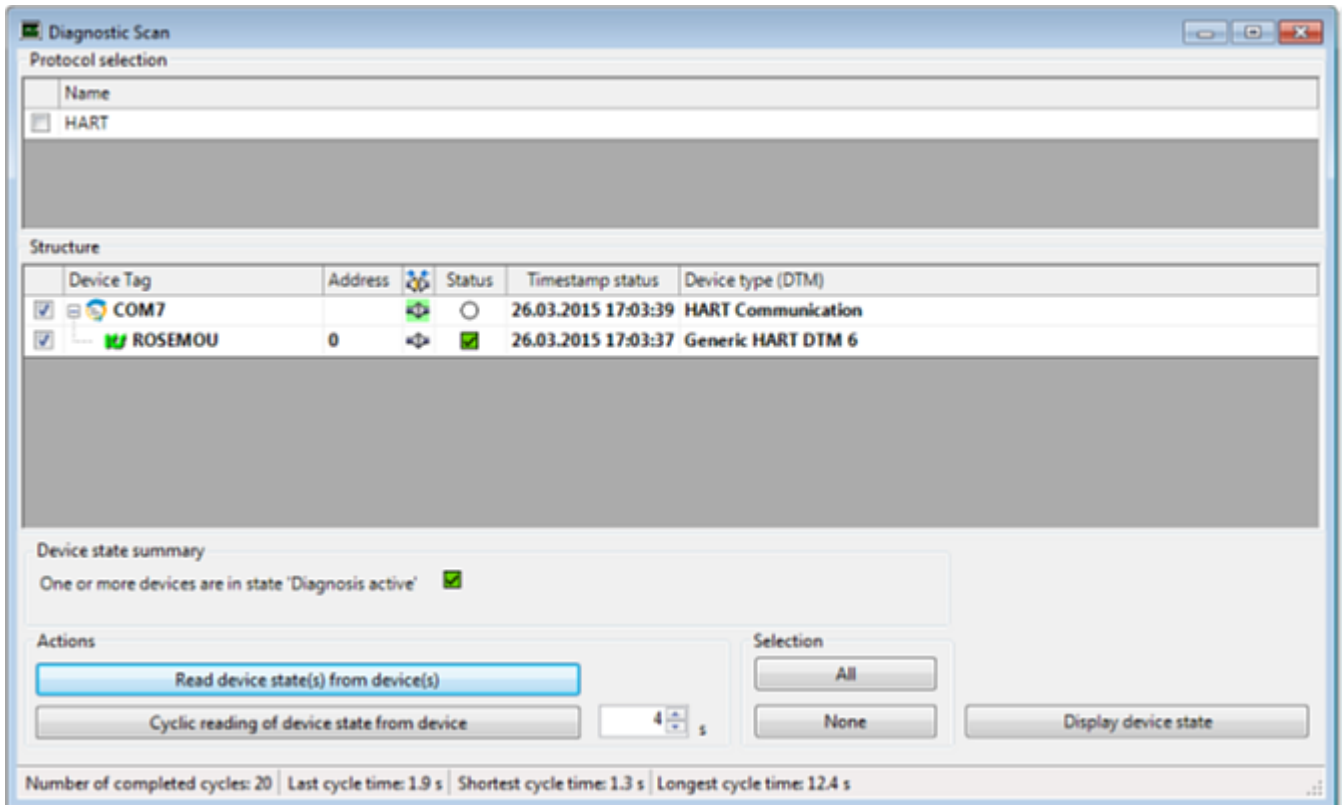
The PACTware frame application additionally allows direct reading out of the device status in the Addin project with display of a time stamp in accordance with the NAMUR directive.

Device tag	Address		Status	Timestamp status
HOST PC				
COM7				
ROSEMOU	0			26.03.2015 16:55:51

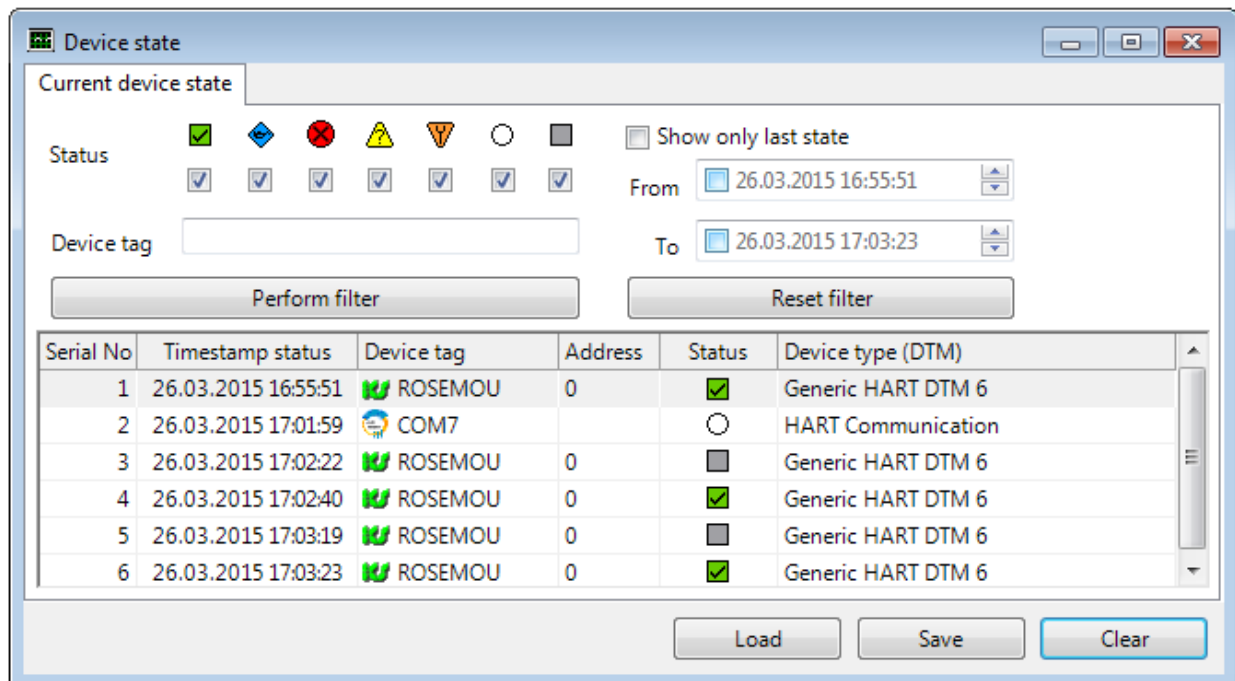
The Diagnostic Scan Addin is called using the pop-up menu of a CommDTM (communication DTM).



By means of the window which is thus open, the NAMUR device status is read out, displayed and logged once or cyclically for all DTMs connected to the PC via the CommDTM.



The log lists the changes in status for all scanned field devices. The log can be saved for documentation of the system status.



## 14. References

- /1/ FDT Group: FDT Interface Specification Version 1.2 Order No. 0001-0001-001, see also [www.fdt-group.org](http://www.fdt-group.org)
- /2/ FDT Group AISBL Guideline: Device Type Manager Style Guide Version 1.1; FDT Group - Document No. 0001-0008-001
- /3/ NAMUR Worksheet Status Signals of Field Instruments, NE107, Version 12.6.2006