

Special Documentation

Cerabar PMC71B, PMP71B

Deltabar PMD75B, PMD78B

HART

Application package
Heartbeat Verification + Monitoring



1 About this document

1.1 Document function

This manual is Special Documentation and does not replace the Operating Instructions included in the scope of supply. It forms part of the Operating Instructions and serves as a reference for using the Heartbeat Technology function integrated in the measuring device.

1.2 Content and scope

This document contains descriptions of the additional parameters and technical data of the application package and detailed explanations regarding:

- Application-specific parameters
- Advanced technical specifications

1.3 Symbols

1.3.1 Safety symbols

CAUTION

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.

DANGER

This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

NOTICE

This symbol contains information on procedures and other facts which do not result in personal injury.

WARNING

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

1.3.2 Symbols for certain types of information and graphics



Warning of radioactive substances or ionizing radiation sources



Permitted

Procedures, processes or actions that are permitted



Preferred

Procedures, processes or actions that are preferred



Forbidden

Procedures, processes or actions that are forbidden



Tip

Indicates additional information



Reference to documentation



Reference to page



Reference to graphic



Notice or individual step to be observed

1., 2., 3.

Series of steps



Result of a step



Operation via local display



Operation via operating tool



Write-protected parameter

1, 2, 3, ...

Item numbers

A, B, C, ...

Views



Safety instructions

Observe the safety instructions contained in the associated Operating Instructions

1.4 Documentation



For an overview of the scope of the associated Technical Documentation, refer to the following:

- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

This documentation is not a substitute for the Operating Instructions supplied with the device.

Detailed information: Operating Instructions, additional documentation, Device Viewer.

This documentation is an integral part of the Operating Instructions for the device.

1.5 Registered trademarks

HART®

Registered trademark of the FieldComm Group, Austin, Texas, USA

2 Product features and availability

2.1 Product features

Heartbeat Technology offers diagnostic functionality through continuous self-monitoring, the transmission of additional measured variables to an external Condition Monitoring system and the in situ verification of measuring devices in the application.

The test scope achieved using these diagnostic and verification tests is expressed as the **total test coverage** (TTC). The total test coverage is calculated using the following formula for random errors (calculation based on FMEDA as per IEC 61508):

$$TTC = (\lambda_{TOT} - \lambda_{du}) / \lambda_{TOT}$$

λ_{TOT} : Rate of all theoretically possible failures

λ_{du} : Rate of dangerous undetected failures

The undetected dangerous failures are not diagnosed by the device diagnostics. If these failures occur, they can falsify the measured value that is displayed or interrupt the output of measured values.

Heartbeat Technology checks the device function with a defined TTC.

TTC > 99 % for output of measured values via 4 to 20 mA output

- Simulation operation not active
- Error behavior, current output set to Minimum alarm or Maximum alarm and evaluation unit recognizes both alarms
- Settings for diagnostic behavior correspond to factory settings

TTC > 95 % for output of measured values via HART output

- Simulation operation not active
- Error behavior, HART bus configured according to "HART Communication Protocol" and evaluation unit recognizes alarms (e.g. device errors)
- Settings for diagnostic behavior correspond to factory settings

2.2 Availability

The application package can be ordered together with the device or can be activated subsequently with an activation code. Detailed information on the order code is available via the Endress+Hauser website www.endress.com or from your local Endress+Hauser Sales Center.

2.2.1 Order code

If ordering directly with the device or subsequently as a retrofit kit:

Order code 540 "Application package", option EH "Heartbeat Verification + Monitoring"

The availability of the application package can be checked as follows:

- Order code with breakdown of the device features on the delivery note
- On the Web using the Device Viewer (www.endress.com/deviceviewer): Enter the serial number from the nameplate and check whether the order code is displayed.
- In the operating menu: The menu indicates whether the application package is activated.

2.2.2 Activation

A retrofit kit is supplied if the application package is ordered subsequently. This kit includes a tag plate with device data and an activation code.

Menu path for entering the activation code

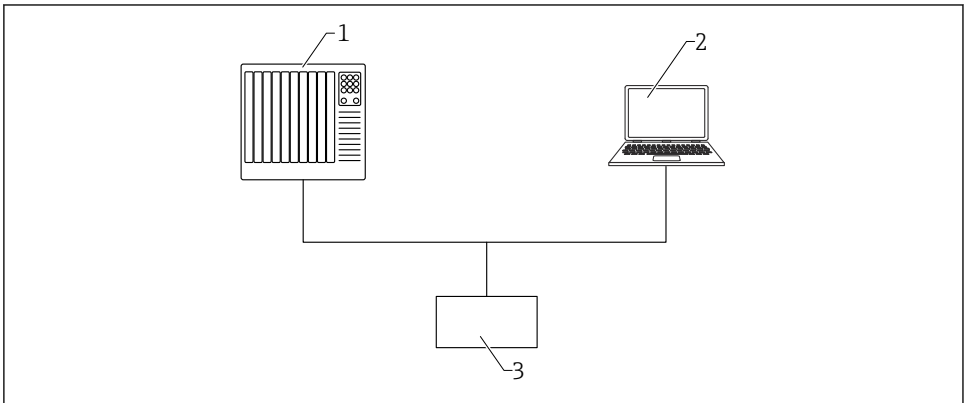
System → Software configuration → Activate SW option

2.2.3 Access

Heartbeat Technology is compatible with all the system integration options. Interfaces with digital communication are required to access the data saved in the device. The speed of data transmission depends on the type of communication interface used.

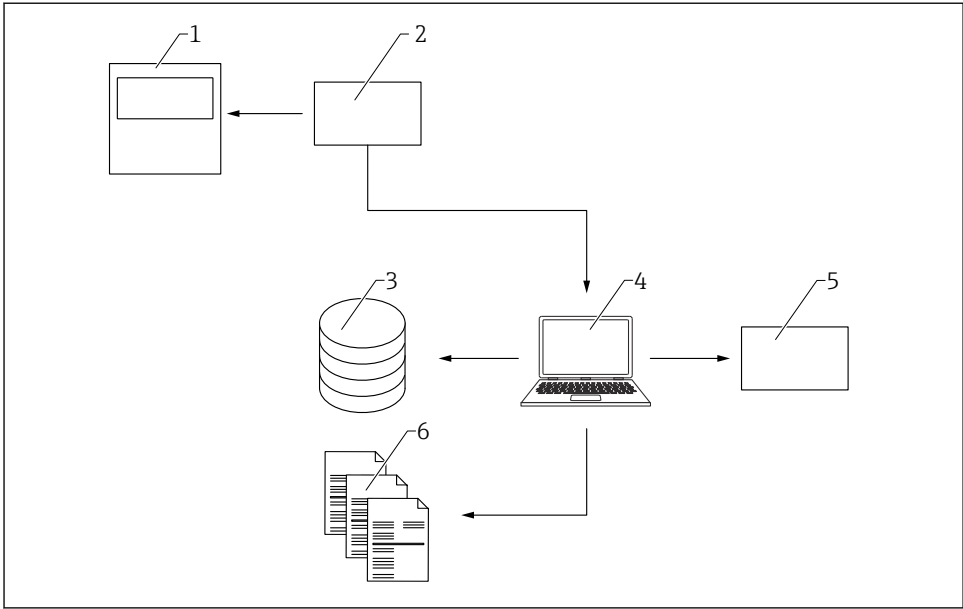
3 System integration

The **Heartbeat Technology** features are available via the digital interfaces. The features can be used via an asset management system and also via the automation infrastructure (e.g. PLC).



A0040019

- 1 PLC
- 2 Asset Management System
- 3 Measuring device



A0040020

- 1 Local display
- 2 Measuring device
- 3 Data archive
- 4 FieldCare
- 5 Netilion Library
- 6 Verification report

Run **Heartbeat Verification** via one of the following interfaces:

- System integration interface of a higher-level system
- Common Data Interface (CDI)
- Display (optional)
- Bluetooth (optional)

The device must be accessed externally from a higher-level system via the system integration interface in order to start a verification and signal the verification result (Passed or Failed). It is not possible to start the verification via an external status signal and relay the results to a higher-level system via the status output.

The detailed results of the verification are saved in the device and provided in the form of a verification report. The last verification report is saved in the device.

Verification reports can be created using Endress+Hauser's FieldCare plant asset management software.

3.1 Data exchange by the user

3.1.1 Heartbeat Verification

- Start of verification
- Upload, archive and document the verification results including detailed results

Prerequisites include HART-7-compatible IO cards and the use of manufacturer-specific HART commands.

3.1.2 Heartbeat Monitoring

- Configuration of the monitoring function: specify which monitoring parameters are output continuously via the system integration interface.
- The user can read the monitoring measured variables in the verification report or in the operating menu.
- Heartbeat Monitoring data can be transmitted to higher-level systems and used for predictive maintenance and process optimization.
- Heartbeat Monitoring data via the cyclic HART signal are only available with the "Heartbeat Verification + Monitoring" option.

3.1.3 Monitoring data in the cyclic HART signal

Data to detect blocked impulse lines/process KPIs

The following data is always transmitted as a HART signal as long as the "Activation code" software option is enabled. The following data is transmitted as a cyclic HART signal:

- Median of pressure signal
- Current Baseline noise
- Signal noise detected

Loop integrity data

- Terminal voltage
- Terminal current

Temperature profiling/heat tracer data

- Process Temperature
- Electronics temperature

3.1.4 Acyclic monitoring data via HART command

Mechanical stress data

- Counter limit underruns sensor Pmin
- Counter limit overruns sensor Pmax
- Counter underruns of user limit Pmin
- Counter overruns of user limit Pmax
- Pressure min
- Pressure max

Thermal stress data

- Counter limit underruns sensor Tmin
- Counter limit overruns sensor Tmax
- Counter underruns of user limit Tmin
- Counter overruns of user limit Tmax

- Minimum sensor temperature
- Maximum sensor temperature
- Minimum electronics temperature
- Maximum electronics temperature

Electrical stress data

- Minimum terminal voltage
- Maximum terminal voltage

3.2 Data management

The result of a **Heartbeat Verification** is saved as a non-volatile parameter set in the measuring device memory:

New verification results overwrite old data following the FIFO ¹⁾ principle.

3.2.1 Verification result

A verification report is created in PDF format.



Prerequisite: A verification has already been performed.

3.2.2 File management

Netilion Library

Heartbeat verification reports can be saved in Netilion with the Netilion Library (www.netilion.endress.com). They can be uploaded by notebook, smartphone or a Field Xpert tablet.

The verification reports are then:


- online
- automatically assigned to their digital twin
- easier to find
- always readily available

4 Heartbeat Verification

Heartbeat Verification uses the self-monitoring function of the measuring devices to check the measuring device functionality. During the verification process, the system checks whether the measuring device components comply with the factory specifications. Both the sensor and the electronics modules are included in the tests.

Heartbeat Verification checks the device function on demand with the total test coverage (TTC) specified in Section 2.1. The result of the verification is "Passed" or "Failed". The verification data is saved in the device and optionally archived on a PC with the FieldCare asset management software. Based on this data, a verification report is generated automatically to ensure that traceable documentation of the verification results is available.

1) First in First out

Heartbeat Verification meets the requirements for measurement traceability in accordance with ISO 9001 (ISO9001:2015 Section 7.1.5.2). See →  13. It is possible to record reference data for Plant operator and Location manually. These reference data appear on the verification report.



- The current output remains unchanged during Heartbeat Verification.
- The safety function is not guaranteed during Heartbeat Verification.

4.1 Performance characteristics

Heartbeat Verification is performed on demand and supplements permanent self-monitoring with additional checks .

4.2 Operation

4.2.1 Device behavior and interpretation

Result is "Passed"

All the test results are within the specifications whose limits are indicated in the verification report.

Result is "Failed"

One or more test results are outside the specifications.

The cause of the error can be narrowed down if the test group whose result is **Failed** is identified.

4.2.2 Verification

Perform verification via tooling (SmartBlue and DTM-based tools like FieldCare/ DeviceCare)

Guidance → Heartbeat Technology → Heartbeat Verification

Select the "START" option here

Displaying the verification status and result

The result of the verification is displayed in the **Verification result** parameter.




4.2.3 Verification results

Access to the verification results via:

- SmartBlue
- DTM-based tools (e.g. FieldCare or DeviceCare)

Classification of results

Individual results:

-  **Failed**
At least one individual test in the test group was outside the specifications.
-  **Passed**
All individual tests in the test group complied with the specifications. The result is also "Passed option" if the result of an individual test is "Not done option" and the result of all other tests is "Passed option".
-  **Not done**
No test has been performed for this test group. For example, because this parameter is not possible or not enabled in the current device configuration.

Overall results:

- **Failed**
At least one test group was outside the specifications.
- **Passed**
All verified test groups complied with the specifications (result: "Passed option").

4.2.4 Verification report

The results of the verification can be documented in the form of a verification report via the FieldCare, Device Care or SmartBlue operating tool. The verification report is created on the basis of the data records saved in the measuring device after verification. As the verification results are automatically and uniquely identified with the operating time, they are suitable for the traceable documentation of the verification of measuring devices.

Verification report, Section 1

Measuring point identification, identification of the verification result and confirmation of completion:

- Plant operator
Customer reference
- Device information
 - Information on the place of operation
 - Device name
 - Management of the information in the device
 - Firmware and hardware version
- Calibration/configuration
 - Setting: **Zero adjustment offset** parameter, **Lower range value** parameter, **Upper range value** parameter, **Checksum** parameter **CRC device configuration**, information on loop diagnostics (if enabled): Timestamp Baseline, Resistance Baseline, Supply voltage Baseline
 - This section also shows whether the sensor used is traceable.

- Verification information
 - Operating time for the clear assignment of the results. This aids the traceable documentation of the verification.
 - The system time is indicated in addition to the current operating time in the measuring device
- Verification ID
 - Displays consecutive numbering of the verification results in the measuring device.
- Verification result
 - The overall result of the verification is "passed" if all of the individual results are "passed".

Verification result, Section 2

Details on the individual results for all test groups:

- Device and verification information
- Test groups
 - Verification pre-condition
 - Mainboard module
 - Sensor module

Verification result - values, Section 3

Details with values for the individual tests from section 2

Verification result, Section 4

Additional data that can influence the assessment of the measurement results or appraisal of the process conditions Information regarding:

- Process condition
 - HART signal
 - HART signal quality
 - Sensor pressure
 - Zero adjustment offset
 - Sensor temperature
 - Electronics temperature
 - System status
- Historical values of the measuring device
 - Pressure min
 - Pressure max
 - Minimum sensor temperature
 - Maximum sensor temperature
 - Minimum electronics temperature
 - Maximum electronics temperature
 - Minimum terminal voltage
 - Maximum terminal voltage
- Sensor history
 - Counter limit underruns sensor Tmin
 - Counter limit overruns sensor Tmax
 - Counter limit underruns sensor Pmin
 - Counter limit overruns sensor Pmax
 - Counter limit underruns sensor Pmin
 - Counter limit overruns sensor Pmax
 - Counter underruns of user limit Pmin
 - Counter overruns of user limit Pmax
 - Counter underruns of user limit Pmin
 - Counter overruns of user limit Pmax
 - Counter for power-on
 - Counter Baseline creation SSD

4.2.5 Test criteria for the test objects

Verification pre-condition

Test: **System status** parameter

Function: Checks active measurement device errors at diagnostical behavior 'alarm'. If an active error is detected, then verification will be performed but the overall result will always be 'Failed'.

Mainboard module

- Test: **Terminal voltage** parameter
Function: Checks whether the voltage at the supply terminals is within the specified limits. Exceeding the maximum terminal voltage can damage the device. If the supply voltage is permanently in the maximum range, the useful life of the device can be reduced. If the terminal voltage falls below the minimum, the device can fail.
If the maximum terminal voltage is exceeded, this can damage the device. If the supply voltage is constantly in the maximum range, this can reduce the operating life of the device. A device failure can occur if the terminal voltage drops below the minimum terminal voltage level.
- Test: **Output current** parameter
Function: Checks whether read-back current at the output matches the current set by the device.
- Test: **Software integrity** parameter
Function: Checks whether the function blocks of the software are executed in the correct order.
- Test: **RAM check** parameter
Function: Checks the correct function of the RAM (Random Access Memory).
- Test: **ROM check** parameter
Function: Checks the correct function of the ROM memory (Read-Only-Memory).
- Test: Loop diagnostics
Function: Checks whether the voltage/current is within the built current/baseline Only visible if enabled.

Sensor module

- Test: **Integrity of the analog path**
Function: Performs a traceable check on whether the current measurement path properties of the production state are within the permissible tolerance range This test can only be carried out reliably at a sensor temperature between -10 to +40 °C (14 to 104 °F). If the result is **Failed**, recalibration or sensor replacement is recommended. If the result is **Not done**, either the sensor temperature is not within the permitted range at the time of verification or the sensor used is not traceable at that time.
- Test: **Sensor integrity** parameter/**Membrane integrity** parameter²⁾.
Function: Checks the integrity of the sensor. The scope of the check depends on the type of sensor.
- Test: **Statistical Sensor Diagnostics** parameter
Function: Checks whether the current measured values are within the built signal/signal noise limit values Only visible if enabled.

2) The membrane integrity cannot be checked on all sensors

4.2.6 Additional verification information

Process conditions at the time of verification

- Display **Sensor temperature** parameter
Function: Current temperature as well as permitted min/max range. For traceable testing according to ISO9001, the sensor temperature must be between -10 to +40 °C (14 to 104 °F).
- HART signal quality indicator
Function: Share of defective data frames in relation to the total number of data frames received.
Possible reasons for poor signal quality include:
 - EMC influence
 - A defective device on the same bus
 - Poor contacts
 - A resistor of the wrong size

Device history

Information on whether the device was operated within its specifications Current value and min/max values for:

- Electronics temperature
- Sensor temperature
- Sensor pressure
- Terminal voltage

Sensor history

- Counter for **Sensor temperature** parameter, **Sensor pressure**
Function: number of times the specified limits are overshoot or undershot
- Counter for **Sensor temperature** parameter, **Sensor pressure**: user-defined limit values
Function: number of times the defined limits are overshoot or undershot
- Counter for power-on
Function: number of device reboots
- Counter Baseline creation SSD
Function: number of built baselines

4.3 Proof Testing Wizard

Proof testing Wizards are provided for devices with the SIL option and the "Heartbeat Verification + Monitoring" application package. See the Functional Safety Manual.

4.4 Safety Mode Wizard



This Wizard can be used to write-protect the device via software. The safety-related parameters must be confirmed in the Wizard.

1. On the preparation screen, enter the locking code "7452".
2. Go through the Wizard step by step.
3. Enter "7452" as the locking code.

The current **CRC device configuration** parameter is saved at the end of the Wizard and the device is locked. If a device is unlocked and locked again, the current **CRC device**

configuration parameter is compared with the **Stored CRC device configuration** parameter. If there is no difference in the configuration, the device is locked immediately. If there is a difference in the configuration, the safety-related parameter settings must be confirmed again.

5 Heartbeat Monitoring

Several Heartbeat Monitoring Wizards are available. Furthermore, additional monitoring parameters can be displayed and used for predictive maintenance or application optimization.

5.1 "SSD: Statistical Sensor Diagnostics" Wizard

A statistical analysis of the raw pressure signal (SSD) can detect a variety of unwanted process anomalies.

5.1.1 Areas of application

All process anomalies that deviate from the programmed (built) standard operation and affect the signal noise. Typical applications include blocked piping, incorrect valve position following maintenance, or air pockets in water-based media.

A number of conditions must be met for successful detection in the application:

- Signal noise should always be present, e.g. flow applications.
- There should be an adequate ratio of signal noise to actual pressure. This is usually the case in differential pressure applications with Deltabar, but rare in high-pressure applications with Cerabar
- Process dynamics should be at a minimum so a usable baseline can be created.

A number of prerequisites are checked during baseline creation or commissioning to ensure correct operation.

5.1.2 Commissioning

As the Wizard does not interfere with the 4-20 mA signal circuit, the SSD configuration can be performed during operation.

The settings must be adapted to the process conditions to ensure the device functions in line with user needs. Build the **Current Baseline signal** and **Current Baseline noise** parameters under recurrent process conditions. The diagnostic function is only active if the current process conditions are within the signal baseline bandwidth that is to be defined. If the current process conditions are outside the built process conditions, e.g. at the weekend or during system start-up, statistical analysis does not take place. Unwanted messages are avoided in this way.

The following parameters must be configured:

Current Baseline signal

Arithmetic average of the pressure signal (25 measured values). Perform under recurrent process conditions. This measured variable is analyzed in order to characterize the process

conditions in the normal state. If process conditions are outside the defined limits, the function is set to "Idle".

Baseline Signal Lower Control Line and Baseline Signal Upper Control Line

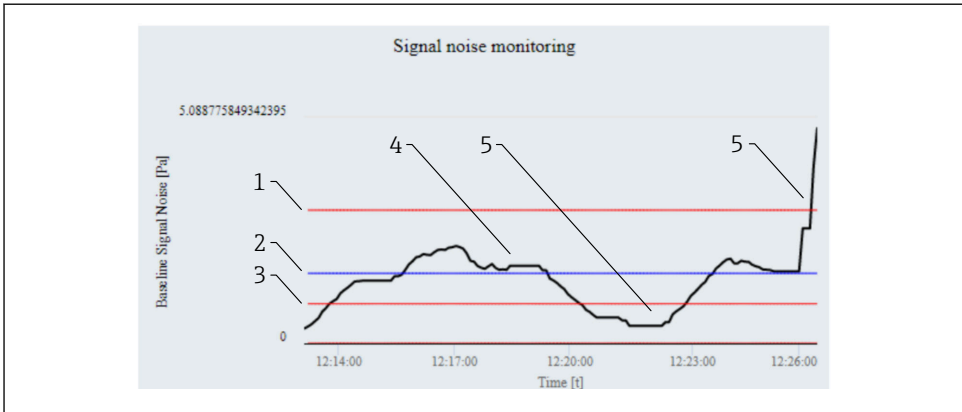
Defines the bandwidth above (UCL) or below (LCL) the baseline in which statistical analysis or anomaly detection is "Active" option.

Perform under recurrent process conditions. The recorder function and/or the min/max values in the Wizard can be used to specify as narrow a bandwidth as possible. The value must be > 0 .

Current Baseline noise

The signal noise is determined with this process value.

The interquartile range indicates the width of the interval that contains the middle 50 % of the measuring points. This measured variable is analyzed in order to detect process anomalies.



A0044430

- 1 Upper threshold
- 2 Baseline
- 3 Lower threshold
- 4 Current signal noise
- 5 Anomaly

Baseline Signal Noise Lower Control Line and Baseline Signal Noise Upper Control Line

Ideally, these limit values are defined by actively simulating the process anomaly that is to be detected. For example, the valve to the differential pressure transmitter can be closed to simulate blocked piping. It is possible to define the limit value at precisely this point using the recorder function. If this is not possible, the user can define the LCL and UCL values that were produced when the signal baseline was built. Deviations and process anomalies can be identified on the basis of this "normal" state.

Signal Noise Baseline Min

For differential pressure if the two impulse lines are blocked.

"Sample rate" parameter

Specifies the scan rate depending on the process conditions (frequency of transmission of measurement data points for analysis).

- **Fast** option: homogeneous, stable process (factory setting)
One measured value every 200 milliseconds
- **Medium** option: dynamic process
One measured value every second
- **Slow** option: extremely dynamic, variable process
One measured value every 2 seconds.

The time required to build the baseline depends on the scan rate and can take between 3 minutes (**Fast** setting) and up to several minutes (**Slow** setting). The factory setting is **Fast**. Only choose different settings if it is not possible to build a baseline with the **Fast** setting.

Status information

Different status parameters are displayed in order to assess the current process conditions and the monitoring function:

- System status
- Signal noise status
- Signal median status

"SSD Monitoring Delay Time" parameter

Time during which the "Out of range" status must apply before an event message is displayed
Required if conditions are present for a short time Example: pump start-up phase which the user wants to ignore in order to avoid unwanted event messages.

"Diagnostic behavior" parameter

In addition to the NE107 category (factory setting: "M" maintenance required), the event level specifies how the recognized "Process anomaly" event is to be communicated:

- Logbook entry: no digital or analog communication of the message
- Warning: Current output is not changed.
Message is output digitally (factory setting).
- Alarm: not allowed
- Off: No logbook entry or digital communication of the message is output.

The message is always shown on the display. If a process anomaly event (out of range, signal noise) is recognized and the measurement returns to the permitted range afterwards due to the process conditions, the warning is no longer active in the device.

Enable/Disable

Specify whether the SSD function should be activated. If **"Disable"** is selected, an analysis is not performed and no event message is displayed.

5.2 "Process window" Wizard

Using user-defined limit values, undesired installation and application anomalies can be detected with this Wizard. Pressure shocks < 20 ms are detected here. Therefore it is possible to quantify thermal or mechanical stress on the device or in the process.

5.2.1 Areas of application

- **Temperature:**
Defective trace heating system or insulation, frozen process connections or empty condensate pipes.
- **Pressure:**
Pressure shocks from valves closing quickly, pulsating flow, other unwanted process events that generate dynamic pressure peaks.

5.2.2 Commissioning

The following parameters must be configured.

Temperature min/max. limit value

Specify the range. An event is generated if this limit value is exceeded or undershot. Factory setting: limit values as specified in the Technical Information. There is no hysteresis here.

Pressure min/max. limit value

Specify the range. An event is generated if this limit value is exceeded or undershot. Factory setting: LRL/URL. There is no hysteresis here.

Scaled variable min/max

Specify the range. An event is generated if this limit value is exceeded or undershot. This only appears when scaled variable is selected.

Event level

In addition to the NE107 category (factory setting: "M" maintenance required), the event level specifies how the recognized "Process anomaly" event is to be communicated:

- **Logbook entry:** no digital or analog communication of the message
- **Warning:** Current output is not changed.
Message is output digitally (factory setting).
- **Alarm:** Current output adopts the configured alarm current.
- **Off:** No logbook entry or digital communication of the message is output. The counter function is retained.

The message is always shown on the display. If a process anomaly event (out of range, temperature) is recognized and the measurement returns to the permitted range afterwards due to the process conditions, the warning is no longer active in the device. Up to 100 events are saved in the logbook.

Enable/disable

Specify whether the function should be activated. If "Disable" is selected, an analysis is not performed and no event message is displayed.

5.2.3 Analysis

The number of times values were over/under range can be used to quantify the mechanical or thermal stress of the measuring point. This information is available in the menu **"Diagnostics menu → Minimum/maximum values submenu"** and can be read out acyclically.

5.3 "Loop diagnostics" Wizard

Undesired electrical installation anomalies can be detected with this Wizard using a built current/voltage characteristic (baseline). Such installation anomalies can result in an incorrect 4 to 20 mA measured value.

5.3.1 Areas of application

Detection of changes in the circuit resistance as a result of anomalies.

Examples:

- Leak currents in the wiring, terminals or grounding caused by corrosion and/or moisture
- Detection of incorrect power supply

5.3.2 Commissioning

The following parameters must be configured.

Building the current/voltage characteristic (baseline)

The voltage at the terminal typically changes in a linear manner depending on the analog output. After initial installation, the current/voltage baseline characteristic is recorded by the measuring circuit via an active current simulation of 4 or 20 mA. The current/voltage characteristic is defined by the slope, i.e. the measuring circuit resistance, and the supply voltage point.

The bandwidth around this characteristic (factory setting 1.5 V) determines when an event is reported.

CAUTION: the current output is simulated. If necessary, bridge the PLC or take other appropriate measures to prevent the inadvertent triggering of alarm messages or changes in the behavior of the control circuit. The baseline cannot be built on a write-protected device.

The current and last baseline of the current/voltage characteristic are saved in the device. Rebuild the baseline if scheduled changes have been implemented in the measuring circuit.

Suggestion:

NOTICE

The current output is simulated. Alarms can be triggered by mistake. The behavior in the control loop can change.

- ▶ Take suitable measures:
- ▶ Bridge the PLC if necessary.
- ▶ Do not build the baseline on a write-protected device.

Delay time

Time during which the "Out of range" status must apply before an event message is displayed. Required if conditions are present for a short time. Factory setting: (in preparation) seconds.

Event level

In addition to the NE107 category (factory setting: "M" maintenance required), the event level specifies how the recognized "Measuring circuit anomaly" event is to be communicated:

- Logbook entry: no digital or analog communication of the message
- Warning: current output is not changed
Message is output digitally (factory setting)
- Alarm: not allowed

The message is always shown on the display.

Enable/disable

Specify whether the function should be activated. If "Disable" is selected, an analysis is not performed and no event message is displayed. In some cases, changes in the measuring circuit resistance can only be detected at high output currents. By rebuilding the baseline, characteristic values can be compared and changes detected.

5.4 Monitoring data

Additional data is available with the Heartbeat Verification + Monitoring application package (see 3.1). These parameters can be defined as a HART output if the software option is enabled.



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