

Special Documentation

Micropilot FMR60B, FMR62B, FMR63B, FMR66B, FMR67B

Application package
Heartbeat Verification + Monitoring
HART



1 About this document

1.1 Document function

This manual is a Special Documentation and does not replace the Operating Instructions included in the scope of supply. It is a 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

DANGER

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

WARNING

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

CAUTION

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

NOTICE

This symbol alerts you to a potentially harmful situation. Failure to avoid this situation can result in damage to the product or something in its vicinity.

1.3.2 Symbols for certain types of information and graphics

Tip

Indicates additional information

1, 2, 3 Series of steps

1, 2, 3, ...

Item numbers

Bluetooth® wireless technology

Wireless data transmission between devices over a short distance via radio technology.

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.

1.5 Registered trademarks

HART®

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

Bluetooth®

The *Bluetooth*® word mark and logos are registered trademarks owned by the Bluetooth SIG, Inc. and any use of such marks by Endress+Hauser is under license. Other trademarks and trade names are those of their respective owners.

2 Product features and availability

2.1 Product features

The Heartbeat Verification + Monitoring application package 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 devices in the application.

The test scope achieved using these diagnostic and verification tests is expressed as the **total test coverage** (TTC). The TTC 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 undetected dangerous 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 confirms that the device is functioning within the specified measuring tolerance with a defined TTC.

The TTC is at least:

- 98 % for the current output
- 95 % for HART communication



The current value for the TTC depends on the configuration and integration of the measuring device. It is determined under the following basic conditions:

- Integration of the measuring device for the output of measured values via the 4 to 20 mA HART output
- **Simulation** parameter **Off** option
- **Failure behavior current output** parameter set to **Min.** option or **Max.** option and evaluation unit detects both alarms
- Settings for diagnostic behavior correspond to factory settings

2.2 Availability

The Heartbeat Verification + Monitoring application package can be ordered together with the device or subsequently enabled using an activation code. Detailed information on the order code is available from the website www.endress.com or from an Endress+Hauser sales organization.

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: enter the serial number from the nameplate and check whether the order code is displayed
- In the operating menu: here you can see if the application package is enabled.

Navigation: System → Software configuration → Software option overview

2.2.1 Activation code

If ordered at a later date, a conversion kit will be supplied. This includes a tag with modified device data and an activation code.

Enter the activation code in the operating menu:

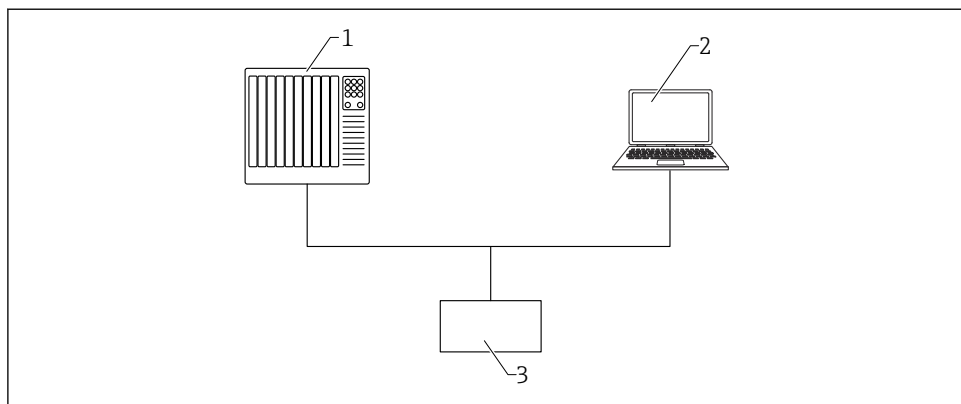
Navigation: System → Software configuration → Activate SW option

2.2.2 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.

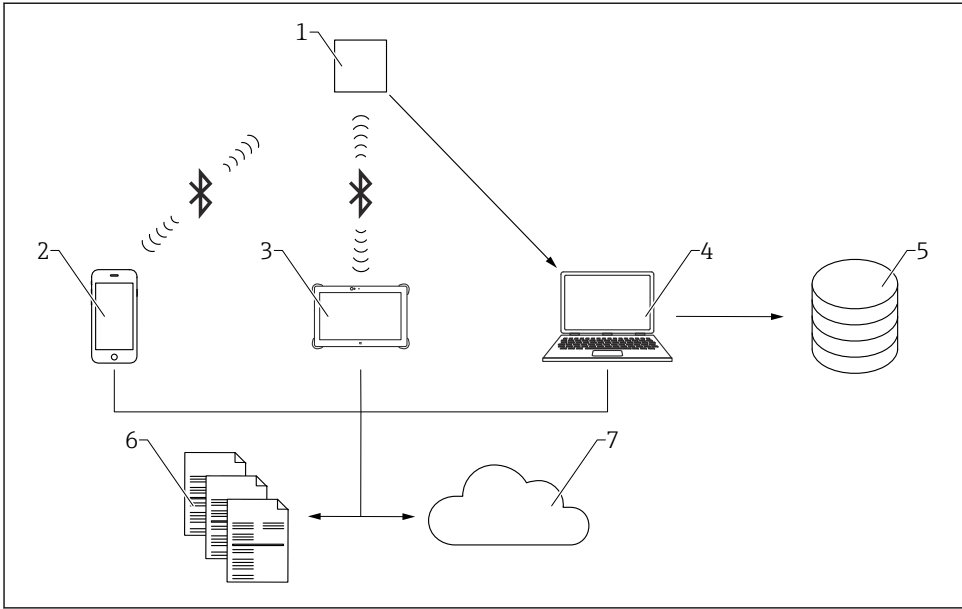
3 System integration

The functions of Heartbeat Technology are available via the digital interfaces. They can be used both via an asset management system and via the automation infrastructure (e.g. PLC).



A0040019

- 1 PLC
- 2 Asset management system
- 3 Measuring device



A0047321

- 1 Device with local display
- 2 Mobile terminals with SmartBlue app
- 3 FieldXpert
- 4 DTM-based tools, e.g. FieldCare, DeviceCare ...
- 5 Data archive
- 6 Verification report
- 7 Netilion Library

Run Heartbeat Verification via one of the following interfaces:

- System integration interface of a higher-level system
- Service interface (CDI = Endress+Hauser Common Data Interface)
- Local 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** option or **Failed** option). 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 result is saved in the device.

Verification reports can be created using the plant asset management software FieldCare, DeviceCare or the SmartBlue app and FieldXpert.

3.1 Data exchange performed by the user (asset management system)

Heartbeat Verification

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

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 operating menu.

3.2 Data management

The result of a verification is saved as a non-volatile parameter set in the measuring device memory. Previous data are overwritten by new Verification results; only the last result is saved.

3.2.1 Verification report

Printing the Verification report

The Verification report is output 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

Verification via the Heartbeat Verification module is performed on demand and supplements continuous self-monitoring with additional checks. During verification, the system checks whether the device components comply with the factory specifications. Both the sensor and the electronics modules are included in the tests.

Heartbeat Verification confirms the device function within the specified measuring tolerance on demand with a total test coverage TTC (Total Test Coverage) as a percentage.

The Heartbeat Verification test result **Passed** confirms that, for example, the level accuracy is ± 1 mm (0.04 in) under reference operating conditions within the measuring range of 3 300 mm (130 in) with a specified total test coverage of > 95 %.

Heartbeat Verification meets the requirements for metrological traceability in accordance with ISO 9001 (ISO 9001:2015 Section 7.1.5.2).

The result of the verification is either Passed or Failed. The verification data are stored in the device using the FIFO method (First In – First Out) and optionally archived using the asset management software FieldCare on a PC or in the Netilion Library. Based on this data, a verification report is generated automatically to ensure that traceable documentation of the verification results is available.

It is possible to manually record reference data relating to the operator and the location. These reference data appear on the verification report.

4.1 Device behavior and interpretation

- Result: **Passed**
All test results are within the specification.
- Result: **Failed**
One or more test results are **Out of specification (S)**.



Recommendations in the event of a verification with the verification result: Failed

If a verification returns the result **Failed**, repeat the verification. In doing so, follow the measures below:

- Create defined and stable process conditions in order to rule out process-specific influences as much as possible.
- Compare current process conditions with those of the previous verification to identify possible deviations.
- Take remedial measures based on the diagnostic information of the device.

The cause of the error can be narrowed down by identifying the test group that has a **Failed** verification.



Operation continues during the entire Heartbeat Verification.

4.2 Verification

Perform verification:

1. Navigation: Guidance → Heartbeat Technology → Heartbeat Verification
2. Select the **Start verification** option.

Show status:

- Navigation: Diagnostics → Heartbeat Technology → Heartbeat Verification → Status

Show result:

1. Navigation: Guidance → Heartbeat Technology → Heartbeat Verification
2. Select the **Show results** option.

4.3 Verification results

Access to the verification results via:

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

4.3.1 Classification of verification results

Individual result:

-  **Failed**
At least one individual test in the test group was **Out of specification (S)**.
-  **Passed**
All individual tests in the test group complied with the specifications.
The result is **Passed** even if the result of an individual test is **Not done** and the result of all other tests is **Passed**.
-  **Not done**
No test has been performed for this test group. For example, because this parameter is not available or activated in the current device configuration.

Overall result:

-  **Failed**
At least one test group has **Failed**.
-  **Passed**
All verified test groups were within the specification.
The overall result is **Passed** even if the result of individual test groups is **Not done** and the result of all other tests is **Passed**.



Heartbeat Verification confirms on demand that the device is functioning within the specified measuring tolerance with a total test coverage (TTC) specified as a percentage.

4.4 Verification report

The results of the verification can be documented via DTM-based tools, the SmartBlue app or FieldXpert in a Verification report. Since the Verification results are automatically and uniquely identified with the Operating time, they are suitable for the traceable documentation of the verification of devices.

The following information is provided on each report page/section for unique identification:

- Serial number
- Device tag
- Operating time (Verification)

4.4.1 Verification report, section 1

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

- **Device information**

(Information on place of installation, Device tag, Device name, Order code, Firmware version, Hardware version)

- **Calibration / Configuration**

(Information on device configuration such as Empty calibration, Full calibration, Medium type, CRC device configuration)

- **Verification information**

(Operating time (Verification), Date/time Heartbeat Verification and verification ID used to uniquely assign the verification results for the traceable documentation of the verification)

- **Verification result**

(The Overall result of the verification is **Passed** if all individual results are **Passed**)

4.4.2 Verification report, section 2

Details on the individual results for the following test groups:

- Verification pre-condition
- Mainboard module
- Sensor module

4.4.3 Verification report, section 3

Details with values for the individual tests from section 2.

4.4.4 Verification report, section 4

Additional data and information that can influence the assessment of the measurement results or the appraisal of the process conditions:

- Process condition (at the time of verification)
- Device history
- Sensor history

4.5 Verification criteria for the test objects

4.5.1 Verification pre-condition

System status

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".

4.5.2 Mainboard module

- **Terminal voltage**

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.

Terminal voltage value:

The Terminal voltage currently applied is measured and compared with the limit values (Minimum terminal voltage and Maximum terminal voltage).

Limit values: 12 to 30 V

- **Output current**

Checks whether read-back current at the output matches the current set by the device.

Output current deviation

The output current is measured and compared with the limit values.

Limit values: -0.5 to +0.5 mA

- **Software integrity**

Checks whether the function blocks of the software are executed in the correct order.

Checks whether certain events are currently present e.g. incrementing of the sequence counter in the mainboard is checked with each new measured value in the sensor module. If this is not the case, **Failed** is displayed.

- **RAM check**

Checks the correct function of the RAM (Random Access Memory). If a RAM cell is defective, this is detected by the value read back from the RAM cell and **Failed** is output.

- **ROM check**

Checks the correct function of the ROM memory (Read-Only-Memory). If the checksum of the tested program code range does not match, **Failed** is output.

- **Loop diagnostics**

Only visible if the Heartbeat Monitoring functionality Loop diagnostics was enabled via the wizard.

Checks whether the voltage/current values are within range or the voltage/current baseline defined with wizard. "Failed" can indicate faulty power supply or grounding / wiring.

- **Terminal voltage value:**

The voltage is monitored to check if it falls within the characteristic band defined by the **Clamping voltage lower threshold** parameter and **Clamping voltage upper threshold** parameter.

- **Timestamp Baseline**

Time stamp when the baseline was recorded (current-voltage curve). At this time, the upper terminal voltage (U1) was determined at 4 mA and the lower terminal voltage (U2) was determined at 20 mA.

- **Resistance Baseline**

Displays the resistance value of the baseline (slope of the current-voltage curve).

- **Supply voltage Baseline**

Displays the point from which the baseline is built (voltage at the point where the current-voltage curve is generated).

- **Timestamp previous Baseline**

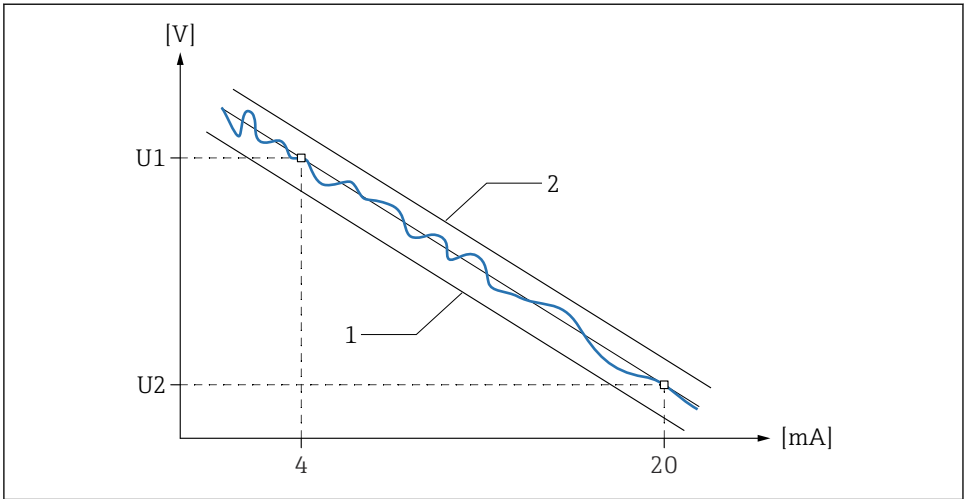
Time stamp when the previous baseline was recorded (current-voltage curve). At this time, the upper terminal voltage (U1) was determined at 4 mA and the lower terminal voltage (U2) was determined at 20 mA.

- **Resistance previous Baseline**

Displays the resistance value of the previous baseline (slope of the previous current-voltage curve).

- **Supply voltage previous Baseline**

Displays the point from which the previous baseline is built (voltage at the point where the previous current-voltage curve was generated).



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1 Current/voltage baseline

1 Clamping voltage lower threshold

2 Clamping voltage upper threshold

4.5.3 Sensor module

■ Signal quality

The Relative echo amplitude is used for evaluation purposes.

■ Signal quality

Shows the quality of the evaluated level signal.

Strong (>10 dB)

Medium (≤ 10 dB)

Weak (≤ 5 dB)

No signal (0 dB)

■ Relative echo amplitude

Shows the relative amplitude (i.e. the distance to the evaluation curve) of the evaluated level signal.

■ Radar Accuracy Index (RAI)

The Radar Accuracy Index (RAI) evaluates the reference accuracy of the device. The test method to determine the RAI is based on the generation of a test signal via the high-frequency oscillator and the measurement of the signal using the sample oscillator.

Radar accuracy index deviation

The Radar Accuracy Index (RAI) [ppm] is output as the relative deviation between two RAI measurements:

- Traceable measurement which was performed during production as part of device calibration.

- Measurement which is performed in the application as part of Heartbeat Verification.

The **Failed** option is output if the relative RAI deviation exceeds or drops below the limit values.

Limit values: -200 to $+200$ ppm

■ Clock and analog path

To ensure correct measurement, a test signal is generated and evaluated via the normal measuring path (frequency and amplitude).

■ Reference echo frequency

The frequency of the test signal is evaluated and compared with the limit values.

Limit values: 990 000 to 1 010 000 Hz

■ Reference echo amplitude

The amplitude of the test signal is evaluated and compared with the limit values.

Limit values: device-specific

- **IF signal**

The check of the intermediate frequency signal (IF signal) ensures the sensor electronics and the associated signal path are functioning correctly. The permitted range is defined by limit values for the amplitude and amplitude swing.

- **Maximum value of the IF amplitude**

Measured maximum value of the IF amplitude

Limit values: max. 65 525 digits

- **Minimum value of the IF amplitude**

Measured minimum value of the IF amplitude

Limit values: min. 10 digits

- **IF amplitude span**

Amplitude swing; difference between the maximum value for the IF amplitude and the minimum value for the IF amplitude

Limit values: min. 10 digits

- **Sensor integrity**

Checks the function of the sensor (no event active).

- **Energy boundaries**

Checks whether the energy states are within the limits.

- **Energy monitoring**

Checks the energy balance on the sensor.

- **Energy storage capacity**

Checks if the measuring capacitors are within the valid range.

Limit value: 500 to 3 000 μF

- **Radar signal input strength**

Checks the input power in the sensor module.

Limit value: >8 mW

- **Energy consumption of the measurement**

Checks whether the energy consumption of the sensor module is in the valid range.

Limit value: 1 to 20 mWs

- **Sensor module voltage**

Checks the supply voltages.

- **Value for power supply 1.8 V**

Supply voltage for the logic part of the sensor module (processor, memory)

Limit value: 1.71 to 1.95 V

- **Value for power supply DCS**

Supply voltage transmitted by the mainboard to the sensor module

Limit value: 6 to 20 V

- **RAM check**

Checks the correct function of the RAM (Random Access Memory). If a RAM cell is defective, this is detected by the value read back from the RAM cell and **Failed** is output.

■ ROM check

Checks the correct function of the ROM memory (Read-Only-Memory). If the checksum of the tested program code range does not match, **Failed** is output.

■ Buildup detection

Checks if build up is present (Precondition: functionality is activated).

Buildup index

Build-up index 0% means: no build-up. Build-up index 100% means: maximum detectable build-up.

Limit value: customer-specific setting

■ Foam detection

Checks if foam is present (Precondition: functionality is activated).

Foam index

Foam index 0% means: no foam. Foam index 100% means: maximum detectable foam.

Limit value: customer-specific setting

4.6 Further Verification information



The following parameters are information values only and do not include an evaluation with respect to **Passed/Failed**.

4.6.1 Process conditions at the time of verification

HART signal quality

Possible reasons for poor signal quality include:

- EMC interference
- Defective device on the same bus
- Poor contacts
- Incorrectly dimensioned resistor

Level linearized

Displays the linearized level.

"Absolute echo amplitude" parameter

Shows the absolute amplitude of the evaluated level signal.

"Relative echo amplitude" parameter

Shows the relative amplitude (i.e. the distance to the evaluation curve) of the evaluated level signal.

"Sensor temperature" parameter

Current Sensor temperature and permitted Minimum/maximum values

Electronics temperature

Current Electronics temperature and permitted Minimum/maximum values

4.6.2 Device history

Terminal voltage value

Shows the current terminal voltage that is applied at the output. Including the Minimum/maximum values achieved since the last reset.

Electronics temperature

Displays the current temperature of the main electronics. Including the Minimum/maximum values achieved since the last reset.

"Sensor temperature" parameter

Displays the current temperature of the sensor electronics. Including the Minimum/maximum values achieved since the last reset.

"Time min. sensor temperature" parameter

Time of the operating time counter at which the Minimum sensor temperature was achieved.

"Time max. sensor temperature" parameter

Time of the operating time counter at which the Maximum sensor temperature was achieved.

4.6.3 Sensor history**Max. filling speed**

Shows the maximum Filling speed achieved since the last reset; used to detect possible measurement peaks.

Max. draining speed

Shows the maximum Draining speed achieved since the last reset; used to detect possible measurement peaks.

Level linearized

Displays the linearized level. Including the Minimum/maximum values achieved since the last reset.

Time max. level

Time of the operating time counter at which the Max. level value was reached. Helps assign the recorded measurement peak to the process sequence.

Time min. level

Time of the operating time counter at which the Min. level value was reached. Helps assign the recorded measurement peak to the process sequence.

Counter underfilling

Number of level undershoots less than 0%.

Counter overfilling

Number of level overshoots greater than 100%.

Counter for switch-on procedures

Number of power-up cycles of the device.

4.7 "Safety mode" wizard

The device can be write-protected via the software using this wizard. The safety-related parameters must be confirmed in the wizard.



The parameters for the configuration of Current output 2 and Switch output are not contained in the **Safety mode** wizard.

1. In 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. The **CRC device configuration** parameter is unique and is based on the current safety-related parameter settings.

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.

4.8 Heartbeat Technology in safety instrumented systems

Verification via the Heartbeat Verification module enables the documentation of the current device diagnostic or device status as a proof of testing.

- This supports the documentation of proof tests in accordance with IEC 61511-1, Section 16.3.3, "Documentation of proof tests and inspection".
- The verification is based on automatically executed device-specific test sequences. For safety reasons, verification cannot replace the proof-testing of a sensor since random faults are usually not detected.
- Verification can be used as a partial test to detect systematic faults among other things, e.g. buildup at the antenna.
- The verification report should be regarded as a supplement to the proof-test report.

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 Monitoring parameters

The following monitoring parameters can be assigned to the various outputs of the device for continuous transmission to a Condition Monitoring system.

- **Level linearized**
Displays the linearized level.
- **Distance**
Distance from process connection to product surface
- **Terminal voltage 1**
Shows the current terminal voltage that is applied at the output
- **Electronics temperature**
Temperature measured in the main electronics
- **Sensor temperature**
Temperature measured in the sensor electronics
- **Absolute echo amplitude**
Shows the absolute amplitude of the evaluated level signal.
- **Relative echo amplitude**
Shows the relative amplitude (i.e. the distance to the evaluation curve) of the evaluated level signal.

- **Area of incoupling**
Ringing integral within the detection area. Shows the area under the echo curve in the range up to 1 m (3.28 ft) in order to determine the buildup quantity on the antenna.
- **Buildup index**
Visibility depends on order options or device settings
Build-up index 0% means: no build-up. Build-up index 100% means: maximum detectable build-up.
- **168 Build-up detected**
Visibility depends on order options or device settings. Shows whether the customer-specific threshold for buildup detection has been exceeded.
- **Foam index**
Visibility depends on order options or device settings
Foam index 0% means: no foam. Foam index 100% means: maximum detectable foam.
- **952 Foam detected**
Visibility depends on order options or device settings
Shows whether the customer-specific threshold for foam detection has been exceeded.
- **Percent of range**
Measured variable of the first dynamic variables (PV) as a percentage.
- **Loop current**
The loop current is the current at the output which is determined by the analyzed level signal.
- **Terminal current**
The terminal current is the current that is read back at the terminal block.
- **Loop diagnostics**
Visibility depends on order options or device settings
Detects installation anomalies such as leak currents caused by corrosion of the terminals or a drop in the power supply.

Defining monitoring parameters as HART SV/TV/QV:

1. Navigation: Application → HART output → HART output
2. Select SV/TV/QV assignment.
3. Select monitoring parameters.

Selecting the measured value that is shown on the local display:

1. Navigation: System → Display
2. Select the measured value.

5.2 "Loop diagnostics" wizard

Using this wizard, changes in the current-voltage loop characteristics (baseline) can be used to detect unwanted installation anomalies such as creep currents caused by terminal corrosion or a deteriorating power supply that can lead to an incorrect 4-20 mA measured value.



Loop diagnostics can be linked with an additional current or switch output (optional).

5.2.1 Areas of application

- Detection of changes in the measuring circuit resistance due to anomalies
Examples: Contact resistance or leakage currents in wiring, terminals or grounding due to corrosion and/or moisture
- Detection of faulty power supply

5.2.2 Loop diagnostics initialization



Activate the loop diagnostics during device commissioning.

Navigation: Guidance → Heartbeat Technology → Loop diagnostics

Programming the current-voltage baseline

Typically, the voltage at the terminal changes in a linear manner as a function of the analog output current. Following the initial installation, the current-voltage baseline of the measuring circuit is recorded via an active current simulation of 4 or 20 mA.

CAUTION

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

- ▶ Take appropriate measures.
- ▶ Bridge the PLC if necessary.
- ▶ The baseline cannot be programmed on a write-protected device.

The bandwidth around this characteristic curve (Factory settings 1.5 V) determines when an event is reported.

The current and last baseline of the current-voltage baseline are saved in the device. Reprogram the baseline if changes have been made in the measuring circuit.

Alarm delay

Period of time for which the alarm status must be active before an event report is issued. Necessary to exclude short-term signal interference. Factory settings: 1 s

Diagnostic behavior

In addition to the NE107 category (default setting: **Maintenance required (M)** option), the diagnostic behavior defines how the detected event **Loop diagnostics** diagnostic message is to be communicated:

- **Warning** option: Current output remains unchanged; message is output digitally (Factory settings)
- **Logbook entry only** option: No digital or analog transmission of the report

The warning is no longer active in the device once the permissible conditions are met again.

Disable/Enable

Specify whether the Loop diagnostics function should be enabled. If the **Disable** option is selected, no analysis and therefore no event reporting take place.



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.

5.3 "Foam detection" wizard

This wizard configures the automatic foam detection.

Foam detection can be linked to an output variable or status information e.g. to control a sprinkler used to dissolve the foam. It is also possible to monitor the foam increase in a so called foam index. The foam index can also be linked to an output variable and can be shown on the display.

Preparation:

The Foam monitoring initialization should only be done without or less foam.



Foam detection can be linked to an additional current or switch output (optional).

5.3.1 Areas of application

- Measurement in liquids
- Reliable detection of foam on the medium

5.3.2 Foam detection initialization

The **Foam detection** wizard is only available for Medium type = Liquid.

Navigation: Guidance → Heartbeat Technology → Foam detection



Foam detection should only be initialized with little or no foam.

- ▶ Follow the instructions provided by the wizard.
 - ↳ The wizard guides you through the entire configuration of Foam detection.

"952 Diagnostic behavior" parameter

Determines how the detected Foam detection event is to be communicated:

- **Alarm** option: Current output adopts the configured alarm current
- **Warning** option: Current output remains unchanged; message is output digitally (Factory settings)
- **Logbook entry only** option: No digital or analog transmission of the report

5.4 "Buildup detection" wizard

This wizard configures the build-up detection.

Basic idea:

The build-up detection can, for example, be linked to a compressed-air system to clean the antenna.

With the build-up monitoring the maintenance cycles can be optimized.

Preparation:

The build-up monitoring initialization should only be done without or less build-up.



The Buildup index can be linked to an output variable and shown on the display.

Buildup detection can be linked to an additional current or switch output (optional).

5.4.1 Areas of application

- Reliable measurement in liquids and solids
- Detection of buildup on the antenna, enables optimization of maintenance cycles

5.4.2 Buildup detection initialization

Navigation: Guidance → Heartbeat Technology → Buildup detection



Buildup detection should only be initialized with little or no buildup.

- Follow the instructions provided by the wizard.
 - ↳ The wizard guides you through the entire configuration of Buildup detection.

"168 Diagnostic behavior" parameter

Determines how the detected Buildup detection event is to be communicated:

- **Alarm** option: Current output adopts the configured alarm current
- **Warning** option: Current output remains unchanged; message is output digitally (Factory settings)
- **Logbook entry only** option: No digital or analog transmission of the report



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