Preventing systematic errors

More than 10 ways to ensure safe operations

Endress+Hauser
People for Process Automation

High level of safety and plant availability

The function of process control safety equipment is to minimize the risk of processes which pose a hazard for people, the environment and/or property.

Increasing the amount of process control safety equipment Over the last few years, the chemical industry has steadily increased the measurement technology used in process control safety equipment from 6% to 15%.

The trend in plant support is increasingly calling for simple and reliable process control safety equipment. The most important challenges here are as follows:

- Increase in safety requirements from standards, laws and regulations
- The basis for safety assessments is state-of-the-art (SIL)
- Increased decision making responsibilities for the operator: The amended German Ordinance on Industrial Safety and Health (Betriebssicherheitsverordnung) and the German Hazardous Incident Ordinance (Störfallverordnung), driven by the new European guidelines, results in greater responsibility for the operator with regard to the implementation of suitable protective measures in practice
- Complex and diverse technical solutions are increasing support costs
- Loss of resources and knowledge is leading to outsourcing of engineering, testing and maintenance tasks

Changes to the laws, standards and the new regulations are causing uncertainty. If plant safety is maintained at current state-of-the-art level, the uncertainty will result in continually rising costs.

Tried and tested concepts and experienced knowledgeable partners are required to handle the current process control safety equipment requirements.


K 3400
W 1310
W 1310

Simply safe: The new SIL device concept

Prevention of systematic errors

The Endress+Hauser SIL device concept, minimizes systematic errors and enables reliable and simple commissioning and repeat testing of measuring devices in process control safety equipment. In this brochure, you can read how to plan process control safety equipment efficiently and reliably, put it into operation, test it and repair it.

Diagnostics in accordance with NE107
Signal on alarm in the event of device defect, warning in the event of process conditions affecting the device
Page 12

Diagnostic coverage up to 98%
High level of safety due to extensive device and process diagnostics
Page 12

Heartbeat Technology™
Simple in-situ repeat testing at the touch of a button with clear testing documentation
Page 16

Tested and specified SIL firmware version
Avoids repeated „proven-in-use" assessments or driver updates
Page 8

Event logbook
Recording and traceability of all relevant device events
Page 12

HistoROM
Simple replacement of components without changing parameters or recalibration
Page 15

SIL developed in accordance with IEC 61508
Prevents systematic errors in the development process
„Proven-in-use“ phase shortened to half a year (NE130)
Page 7

SIL device selection and sizing
Selection and sizing of devices for safety equipment,
e.g. with Application Selection and Sizing Flow
Page 9

SIL documentation
Comprehensive manual on functional safety with
all information and characteristic values
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SIL 3 – Homogeneous redundancy
Problem-free sequence switching of
multiple devices
Page 10

SIL sequence
Simple, guided commissioning and automatic
testing of all setting parameters relevant to SIL
Page 11

SIL lock
Prevents access and provides identification
of the SIL mode
Page 10

SIL identification
On the nameplate
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Requirements for measuring devices in process control safety equipment

Prevention of systematic errors The requirements for process control safety equipment and the operation thereof is described in detail in the standards and recommendations on functional safety. The key aspect here is the prevention of systematic errors in order to minimize the potential residual risk.

Endress+Hauser has consistently integrated the requirements, e.g. IEC 61508, in its factory standards and implemented them in the device development process. Below, we will show you the most important elements of the new SIL concept from Endress+Hauser using the Promass as an example and present you with the large range of improvements for process controlled safety equipment in day-today operation which result from it.

The Endress+Hauser SIL device concept provides increased efficiency and safety in the planning, operation and maintenance of process control safety equipment.

Benefit:
- Fulfillment of statutory requirements and those specified in standards
- High level of plant safety
- Simple and reliable implementation of process control safety equipment for planning, commissioning, testing and maintenance

Common causes of systematic errors in process control safety equipment

Target group	Cause of systematic errors	Solution on page	IEC / EN 61508	IEC / EN 61511	VDI / VDE 2180	NAMUR NE79	NAMUR NE130
Planners	Incorrect device selection and sizing	9	✔	✔			
	Incorrect design, e.g. redundant SIL 3 measuring points	10	✔	✔			
	Impermissible process conditions: Inhomogeneous media, air pockets, etc.	9	✔				
	Operating status which is not allowed (e.g. calculated measured variables)	9	✔		✔	✔	
	Error in the software	7	✔		✔	✔	✔
Commissioning and operation	Incorrect installation	9	✔				
	Configuration error	11					✔
	Other commissioning error	10	✔	✔	✔	✔	
	Impermissible change of device parameters	10	✔	✔	✔		
Maintenance	Use of non-SIL-certified software	15		✔			
	Repeat testing	16		✔			

Fulfillment of requirements: Device development in accordance with IEC 61508

Tested safety The development of measuring devices in accordance with the standard on functional safety IEC 61508 defines processes and testing for the prevention of systematic errors. These are now used as the standard for development of Endress+Hauser products and represent quality and reliability. External qualification via an external inspection authority such as the TÜV (German Technical Testing Association) also contributes to this. The TÜV checks the implementation and certifies the characteristic values determined for the use of devices in SIL safety equipment.

Type testing and „proven-in-use“ assessment of devices NAMUR member companies (User Association of Autom tion Technology in Process Industries) test the devices as part of a device type test in their own testing laboratories. This also includes checking compliance with the requirements of device-relevant NAMUR recommendations. Currently, the following NAMUR recommendations are relevant for flowmeters: NE21, 32, 43, 53, 80, 95, 100, 105, 107, 130, 131, 132.

Shortened „proven-in-use“ phase Device testing in a test laboratory is followed by a one year „proven-in-use“ phase which is defined in NE130. In this „proven-in-use“ phase, the devices must be operated without any errors for a minimum of 100,000 operating hours in at least 10 relevant applications.

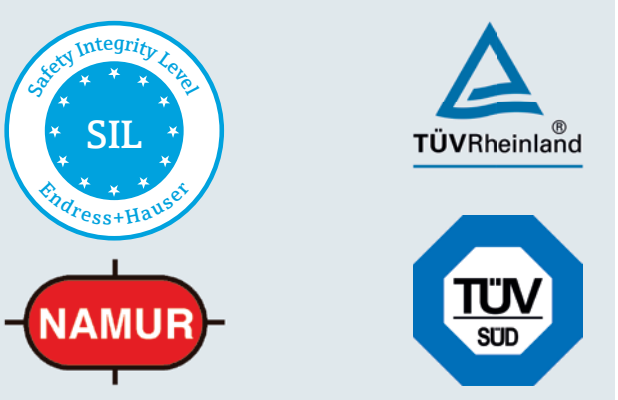
It is worthwhile using devices developed in accordance with IEC 61508. These devices have a sufficient shortened „proven-in-use“ phase of just half a year, in accordance with NE130.

Finally, the devices are integrated into the users‘ standard device lists. The member companies now accept the type tests carried out by other NAMUR member companies.

Software updates without carrying out another „proven-in-use“ phase For devices developed in accordance with IEC 61508, a detailed safety function test is performed after every software update. This means that, in accordance with NE130, these devices no longer need to go through another „proven-in-use“ phase lasting half a year or a whole year following a software update.

Benefits of devices developed in accordance with IEC 61508

- Extensive testing prevents systematic errors in th device and/or in development process
- „Proven-in-use“ phase shortened to half a year
- Software update process in accordance with IEC 61508 eliminates the need for another „proven-in-use“ phase



TÜVRheinland®

ZERTIFIKAT
CERTIFICATE

Nr./No.: 968/EZ 295.01/09

Prüfgegenstand Product tested	Durchflussmeßgerät für die sichere Messung von Massedurchfluss, Dichte und Volumendurchfluss Flow rate meter for the safe measurement of massflow rate, density and volumeflow rate	Zertifikatsinhaber Licence holder	Endress + Hauser Flowtec AG Kägenstrasse 7 4153 Reinach BL 1 Switzerland
Typbezeichnung Type designation	PROMASS 80/83	Hersteller Manufacturer	wie Zertifikatsinhaber same as licence holder
Prüfgrundlagen Codes and standards forming the basis of testing	IEC 61508, Part 1- 7:2000 DIN EN 61508, Teil 1-7:2002		
Bestimmungsgemäße Verwendung Intended application	Das Gerät ist in Anwendungen bis SIL 2 gemäß IEC 61508 (einkanalig) sowie bis SIL 3 (redundante Verschaltung) einsetzbar. The device can be used in applications up to SIL 2 acc. to IEC 61508 (single channel) or up to SIL 3 acc. to IEC 61508 (redundant use).		
Technische Daten Technical Data	Bei der Verwendung des Systems müssen das Anwenderhandbuch und das Sicherheitshandbuch berücksichtigt werden.		
Besondere Bedingungen Specific requirements	For the use of the system the Safety Manual and the User Manual have to be considered.		

Dieses Zertifikat ist gültig bis 09.11.2014.
This certificate is valid until 2014-11-09.

TÜVRheinland Functional Safety Type Approved FS

Der Prüfbericht-Nr.: 968/EZ 295.01/09 vom 09.11.2009 ist Bestandteil dieses Zertifikates.
Der Inhaber eines für den Prüfgegenstand gültigen Genehmigungs-Ausweises ist berechtigt, die mit dem Prüfgegenstand übereinstimmenden Erzeugnisse mit dem abgebildeten Prüfzeichen zu versehen.

The test report-no.: 968/EZ 295.01/09 dated 2009-11-09 is an integral part of this certificate.
The holder of a valid licence certificate for the product tested is authorized to affix the test mark shown opposite to products, which are identical with the product tested.

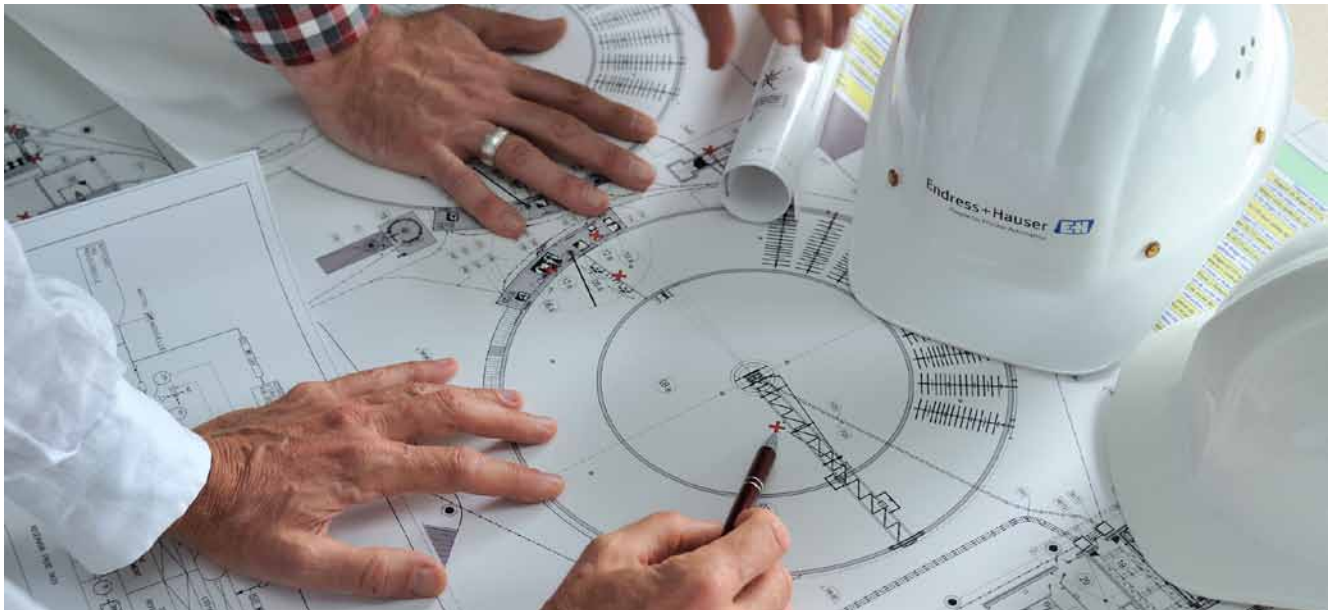
TÜV Rheinland Industrie Service GmbH
Geschäftsfeld ASI
Automation, Software und Informationstechnologie
Am Grauen Stein, 51105 Köln
Postfach 91 09 51, 51101 Köln

Köln, 09.11.2009

Zertifizierungsstelle bei der TÜV Rheinland Industrie Service GmbH

Dipl.-Ing. Heinz Gall

Planning of process control safety equipment



Suitable tools and intelligent concepts help to prevent systematic errors as early as the planning phase for process-control safety equipment.

The selection of suitable measurement technology and the correct device sizing and/or parameter setting at a later time are crucial to ensure the process control safety equipment works reliably and safely.

Over 100 SIL-certified devices Endress+Hauser has been providing measurement technology for industrial applications for more than 60 years. Drawing on experience of more than 10 million devices in safety-related applications, the product range has now grown to more than 100 SIL-certified device lines. We provide users with a large amount of standardized and type-tested measuring devices for use in virtually all safety equipment.

www.endress.com/SIL

Device identification with SIL logo SIL-assessed devices are identified as suitable for use in protective circuits by an SIL logo on the nameplate.

Tested and specified device firmware The new devices in the two-wire device concept enable device firmware to be specified via the product structure for the first time.

For example, for validated plants, this ensures the identical and most tested, firmware version of the device is used. This also prevents any surprises with regards to different device software versions when ordering spare parts. By specifying the firmware version in the order code, it can be ensured in the future that the identical device software is always supplied and used – throughout the entire life cycle of the plant.

Benefits:

- More than 100 TÜV-certified SIL devices make it possible to provide best-fit technology for all areas of use
- Clear SIL device identification prevents the use of devices which are not suitable
- Specified SIL firmware ensures availability and prevents driver conflicts and incompatibilities

Simple and reliable device selection and sizing
First, the technology and the measuring device which are suitable for the relevant measuring task must be determined.
Endress+Hauser offers the tried-and-tested „Applicator“ software tool, which enables you to reliably select and size devices. With this tool, in just a few clicks, the „Applicator Selection“ module provides you with the optimum

measuring device for virtually any application. Additional measuring point sizing can then be performed using the „Sizing Flow“ software module. More than 300 process media and its special characteristics that are stored in the Applicator ensure a detailed application test is performed with the specified process data. This ensures the optimum sizing of the relevant measuring device and documents this as a measuring point sheet. werden.

Comprehensive SIL documentation The device‘s compact and standardized SIL documentation specifies all relevant safety characteristic values and defines the devices relevant operating conditions in the safety equipment. This means that all relevant data on the instrumentation of safety equipment is ready to hand.

Specification in accordance with the manual – Impermissibleprocess conditions (e.g. cavitation) This contains, for example, a description of the process conditions that are not authorized which could impair the protective function. Gas pockets and cavitation in flowmeters, for example, should generally be avoided. Another example is the high temperatures in the measuring environment which could cause the electronics to overheat.

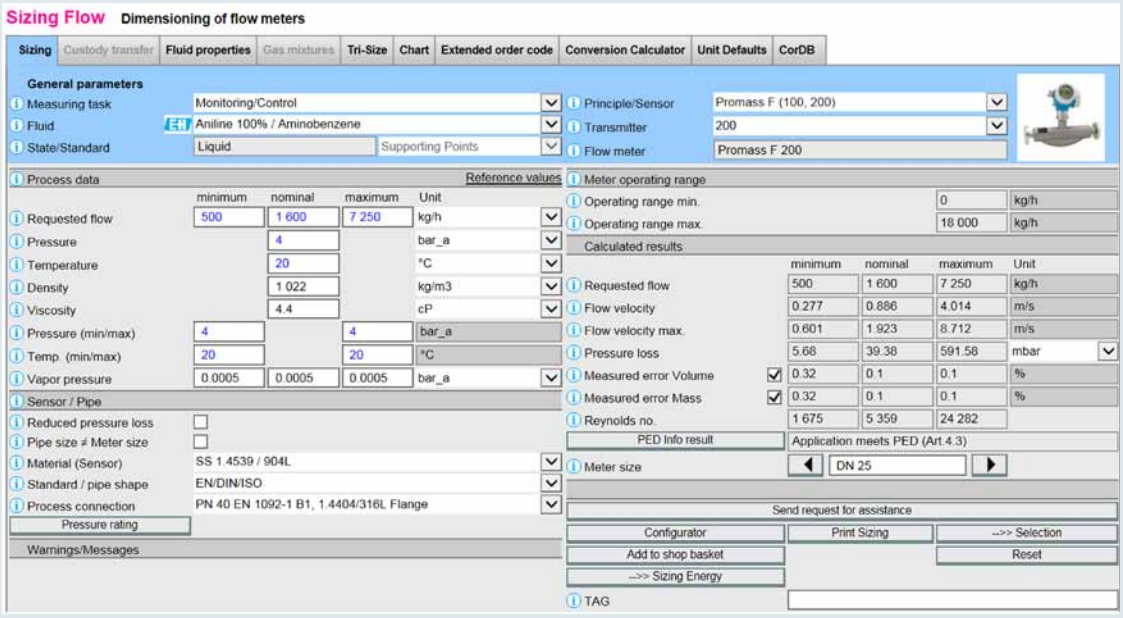
Specification in accordance with the manual – Impermissible or incorrect device configuration Today‘s high-performance devices are complex due to their capabilities. To provide reliable functionality in process control safety equipment, all function-relevant setting parameters must be known and set correctly for the applicable measuring task. For this reason, IEC 61508 requires a reduced range of setting parameters. In this case, in addition to the SIL documentation, the guided SIL sequence helps the operator to comply with the necessary settings as part of commissioning. The SIL documentation for all Endress+Hauser devices can be accessed from a central location – on the homepage at www.endress.com/SIL.

www.endress.com/SIL
www.endress.com/applicator

Benefit: Prevents systematic planning errors

- The Applicator enables simple and reliable measuring-point-specific device selection
- The comprehensive SIL documentation makes it easier to access the relevant SIL characteristic values and application information directly and prevents any incorrect use

The online Applicator



Implementation and commissioning of process control safety equipment

Implementation of redundant safety equipment
In practice, there is often a requirement to design process-control safety equipment so that it is redundant, e.g. for the implementation of SIL 3 measuring points or for the instrumentation of 2oo3 (2 out of 3) circuits.

For example, the devices within the Endress+Hauser two-wire device concept are developed for SIL 3 in accordance with IEC 61508 and thus enable the use of two devices with the same design in order to implement homogeneous redundant configuration and to represent SIL 3 safety equipment. However, practice shows that measuring devices can influence each other (cross-talk).

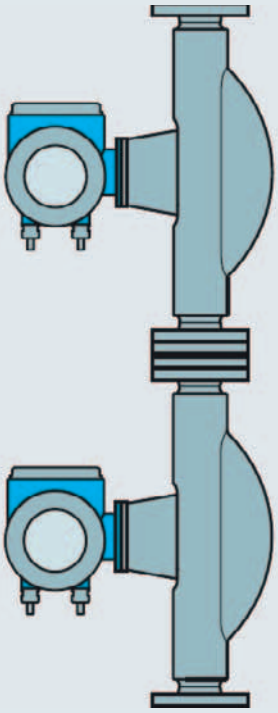
Redundant safety equipment with Promass
With Promass, Endress+Hauser offers a Coriolis mass flowmeter immune to cross-talk. This means devices can be installed directly flange to flange in order to save space. The absence of any intermediate pieces and compensation measures makes installation simple and cost-effective.

Redundant safety equipment with Prowirl The Prowirl 200 is the first vortex meter to be developed in accordance with IEC 61508. The dual sensor version in which two independent sensors and the electronics are brought together at one measuring point enables cost-effective and spacesaving SIL 3 installation in a homogeneous redundant design. The identical installation dimensions of the sensor compared with the simple SIL 2 device means that it is easy to ugrade to SIL 3 – without additional changes to pipes.

Commissioning and locking For SIL safety equipment and standard operating measurements, the same devices with identical hardware and software are used. In safety equipment, during commissioning, the SIL sequence is also activated in the device and the processes finish with the SIL lock.

It is also possible to protect the devices against unauthorized access using an individual customer code. In addition, the hardware write-protect switch blocks access to any operating or communication interfaces. This ensures the devices are configured correctly for operation in safety equipment and prevents any unauthorized access.

Redundant flow measurement



SIL lock

Error-free, simple operation The diversity and broad functionality of the devices often makes operation complex. For safety equipment in particular a reliable and well-guided operation is important for error-free configuration.

Through its standardized operating concept, Endress+Hauser enables simple and reliable parameter setting processes. The standardization ensures that the same parameters can always be set in exactly the same way. The standardization in the designations, the menu structure and in the guided sequences makes it much easier to operate the devices.

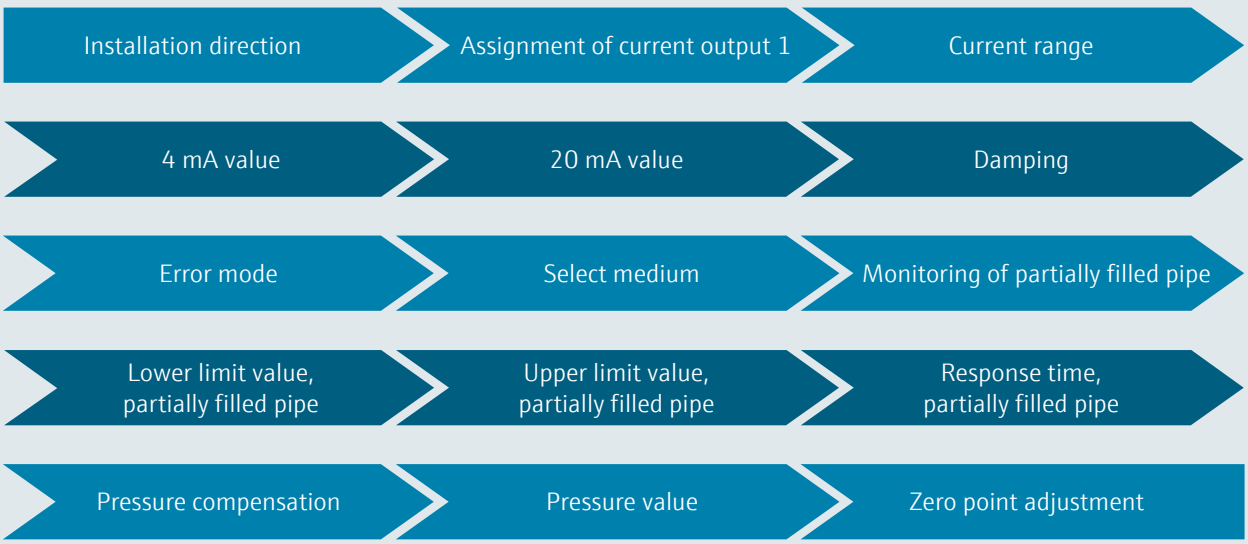
In the order configuration, all factory settings are preset according to the NAMUR requirements for SIL safety equipment. This aids understanding and reduces operating errors.

SIL sequence ensures the correct configuration The SIL sequence is specially designed for commissioning devices in process control safety equipment. When the SIL commissioning sequence is activated, all parameters are set to the correct initial settings for the safety equipment. When the sequence is ran, all settings are checked and confirmed by the person in charge of commissioning. The sequence finishes by activating the lock. The graphic below shows the individual parameters as well as the scope and flow of the SIL sequence using the example of Promass 200. At the start of the SIL sequence, a few SIL-relevant parameters are set to specified default values in order to prevent systematic errors during parameterization. This includes the following:

- Preventing too much damping of the measured value (slow response time)
- Intentional operation in simulation mode
- Preventing an offset on the measured value
- Preventing any alarms which have not been set in the event of a device defect
- Preventing early alarms in the event of process conditions affecting the device, and many more

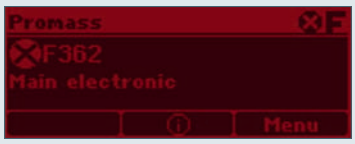
This guarantees error-free device configuration and that the safety equipment works reliably.

Example: SIL confirmation sequence for Promass 200 parameter check

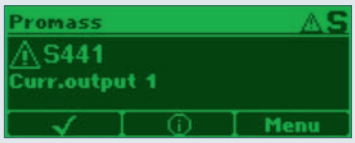


Simple and targeted maintenance

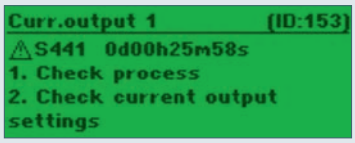
Diagnostics in accordance with NE107, diagnostics list and event logbook



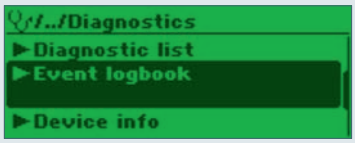
Error signaling
Clear error signaling using red flashing display (e.g.: Main electronics defective).



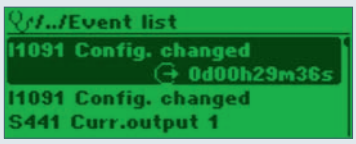
Clear error diagnostics
Diagnostics with error display in accordance with NE107 (e.g.: S441 = current output 1 passed over – outside the specification.



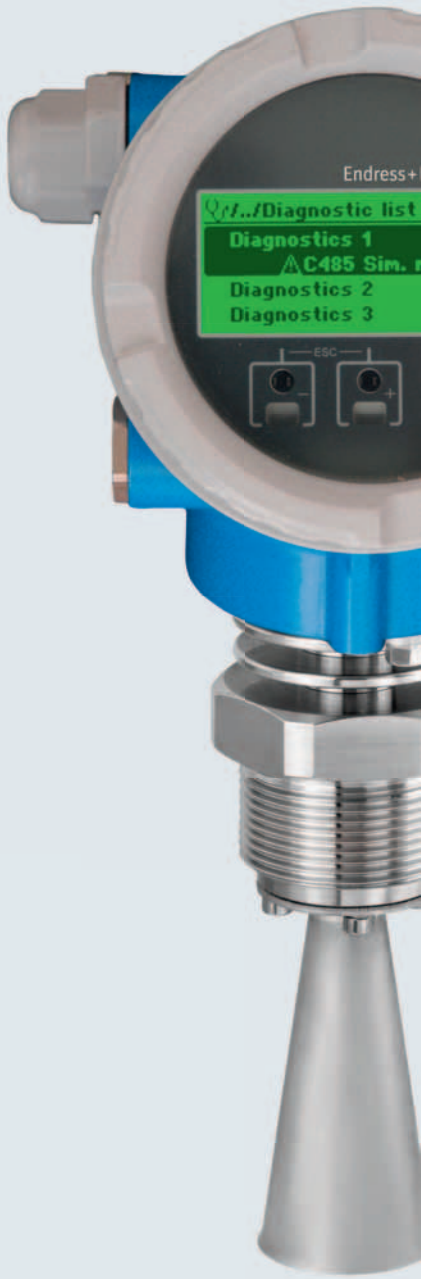
Remedial measure
Error display with operating hours/operating time and remedial measure. Additional ID for detailed error diagnostics.



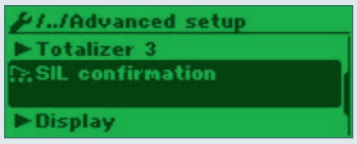
Diagnostics list and event logbook
Power failure-proof diagnostics list and event logbook for signaling all device messages in accordance NE107 and for the chronological display of all device events.



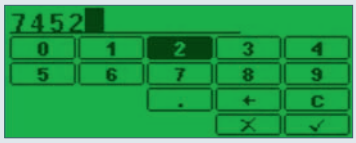
Chronological sequence in event logbook
Entry in events list of the event logbook with start and end of the event and time stamping with operating hours counter.



SIL sequence for safe commissioning



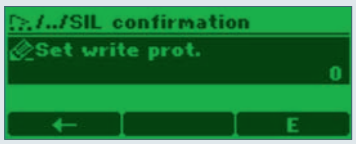
SIL sequence
Start of SIL commissioning sequence for checking all SIL-relevant setting parameters. ellparameter.



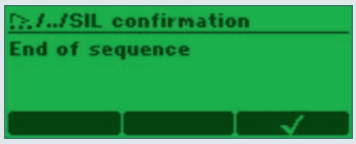
Start with standardized SIL lock code
Start of SIL sequence by entering the SIL lock code. Standardized code for all Endress+Hauser devices under the SIL concept.

Inspection of parameters
Automatic inspection of all SIL-relevant setting parameters and configuration of specified SIL default values.

Review and confirmation
Inspection and verification for confirming all SIL-relevant settings (e.g.: Promass 200, see Page 13).



Termination and locking
iTermination of the SIL sequence by entering the SIL lock code and locking to prevent unauthorized access.



Device in SIL mode
Termination of SIL commissioning.
All SIL-related parameters are set, verified, confirmed and protected against any changes.

Operation of process control safety equipment

Robust sensors with long-term stability These sensors, which have been optimized for more than 20 years and tried-and-tested in millions of applications, stand out due because of its long-term stability during operation.

They typically have a service life of more than 12 years based on the current IEC 61511.

Due to its many years of experience in applications out of specification, Endress+Hauser provides excellent long-term stability for all flow rate technologies.

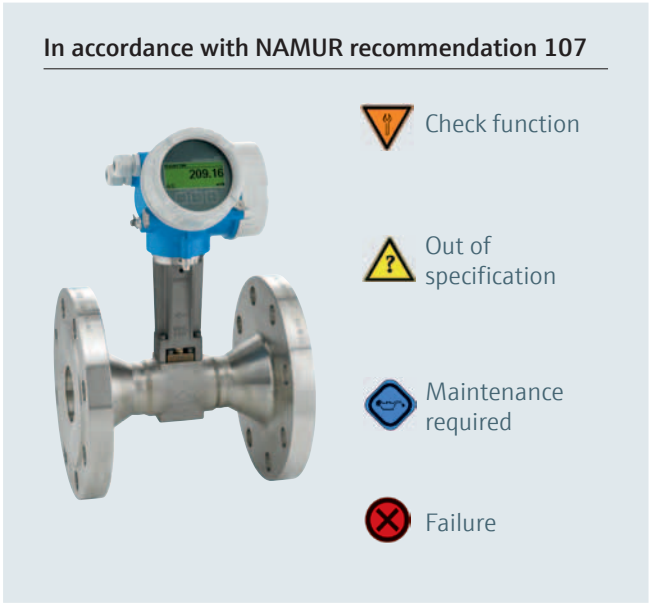
Overtime, electronics have significantly improved its behavior toward drifting. All deviations can now be clearly diagnosed using the specific testing tools such as Fieldcheck and Heartbeat Technology.

Clear device diagnosis in accordance with NE107 Using self-monitoring, field devices can supply information about its status. In general, for device diagnostics in process-control safety equipment, dangerous device errors which can lead to the failure of safety equipment can be reliably detected. Using the alarms generated, the plant is returned to a safe condition.

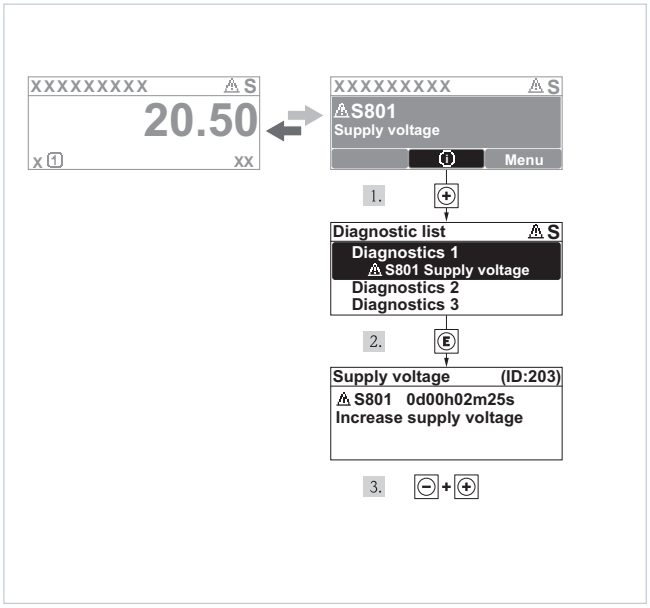
In process control safety equipment, in the event of an error, a clear and quick diagnosis is particularly important. Thanks to the development process in accordance with IEC 61508, systematic errors during device development are predominantly prevented. As a result, the devices are extremely reliable in operation. Innovative diagnostic functions such as Heartbeat Technology ensure a high and continuous error coverage (TTC: Total Test Coverage >95%). Dangerous, random device errors that could cause the safety equipment to fail are detected reliably and immediately as a result. The residual risk posed by dangerous, undetected errors is thus reduced to a level never previously achieved.

The device messages are thoroughly categorized in accordance with the NE107 requirements. In this process, a large number of additional diagnoses were implemented which are responsible for the current maximum level of device safety and error coverage. The clear error categorization, in accordance with NE107 and the full text troubleshooting, prevents and/or reduces the number of plant shutdowns. Furthermore, the event counter available offers maximum transparency and easy traceability of plant and device statuses.

The extensive error diagnostics, following the NE107, enables simple error containment, saves time and money by specifically responding to incidents in a timely manner.



Diagnostics according to NE107



Error display and remedial measure

Repair of process control safety equipment

Simple and reliable repair of safety equipment

Safety equipment is extremely important to ensure safety functionality and the production plant's availability. This is why it is particularly important failed safety equipment is repaired quickly and reliably.

- This includes the following:
- Clear containment of the cause of error
- Simple identification of the correct spare parts
- Smooth replacement of defective components
- Error-free transmission of measuring point parameters
- Simple commissioning and testing of the repaired measuring point

A clear understanding of the cause of error The extensive error diagnostics in accordance with NE107 and the full text troubleshooting function enables clear error containment.

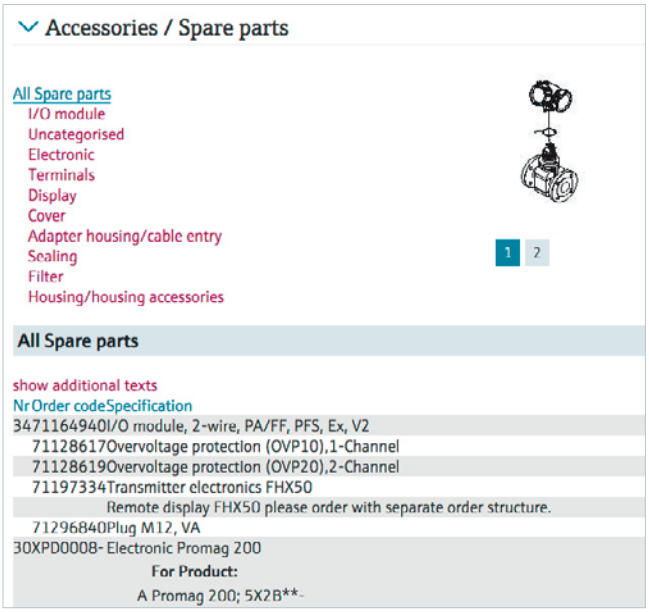
Clear identification of spare parts All spare parts required for a device can be seen on both the device cover (see Fig. below) and via the online search at www.endress.com/order-ident. Compatibility with the relevant hardware and software version is ensured when selecting the order. Even with devices in SIL safety equipment, a repair can be carried out easily using the approved identical spare parts without recalibration. This avoids having to remove the devices in the event of an incident and ensures high plant availability.

Problem-free replacement of components and error-free transmission of all measuring point parameters
For example, the modular two-wire device concept for flow rate reduces storage costs and increases the availability of the plant by means of the flexible interchangeability of subcomponents.

The HistoROM memory is permanently connected to the housing. For example, after replacing the electronics, the HistoROM automatically copies the entire device configuration to the new electronics. This enables the smooth replacement of components on-site and without recalibration.

Easy device commissioning and testing in safety equipment Thanks to the HistoROM, all measuring point specific device parameters are automatically and reliably transmitted. To commission the safety equipment, the SIL sequence is performed again to test all the relevant setting parameters and the device is locked.

Item	Spare part	Part no./structure
1	Sensor	5P2B25-BJXXXXAD5S0
2	Main electronic	XPD0008-A2
3	IO module	71108599
3.1	Overvolt.protection	Not ordered
4	Cover (front)	71110297
5	Cover (right)	71110301
6	Transmitter	5X2BXX-BJBECA+ ABEA
7	Display	71162152
8		



Taking the pulse of your measurement

You would like to increase your plant availability and reduce costs? With Heartbeat Technology Endress+Hauser offers the broadest range of devices with a trend-setting diagnosis and verification concept for this purpose.

Heartbeat Technology permits cost-effective and safe plant operation during the entire life cycle by combining diagnosis, verification and monitoring functions in an expedient manner.

Heartbeat Technology

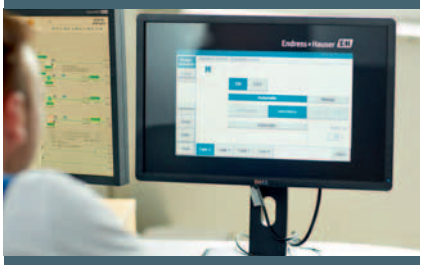
Instruments with Heartbeat Technology excel by permanent process diagnosis and extensive in-situ diagnosis functions. Verification occurs directly in the measuring point – without any dismantling or process interruption. In this way, you significantly reduce your verification efforts. The functionalities in the area of monitoring facilitate predictive maintenance thus optimizing your process and maintenance strategy.

Heartbeat Technology provides easier and better control of your measuring point. You may rest assured that your process runs reliably and safely and that verification efforts are significantly reduced. You save money and discover potential for further process optimization in trend recognition.

You are always taking the pulse of your measurement!

Heartbeat Technology: An even easier and better control of your measuring points

Heartbeat Technology

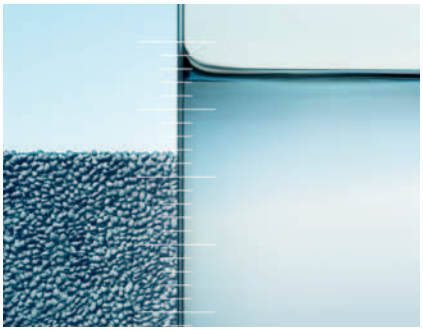
Heartbeat Diagnostics	Heartbeat Verification	Heartbeat Monitoring
		
Permanent process and device diagnostics	Documented in-situ verification	Information for predictive maintenance
Increased plant availability and ...		
... safe processes	... reduced verification effort	... optimization of process and maintenance strategy

- Unambiguous and standardized **diagnosis messages** with clear **instructions for action** facilitate economically efficient and state-oriented maintenance.
- **Permanent self-diagnosis** of the instrument facilitates safe plant operation with extended verification cycles.

- The measuring point may be **verified and documented in-situ** at any time.
- An easy, guided verification procedure always achieves **unambiguously documented verification results.**
- The automatically generated **verification protocol** supports the evidence required for regulations, laws and standards.

- The provision of **instrument and process data** facilitates trend recognition for **predictive maintenance.**
- The combination of instrument and process parameters facilitates the analysis for **targeted process optimization.**

Heartbeat Technology – High plant availability and reduced costs for measuring tasks in the area of flow, level and analysis.


Proof-testing in safety-instrumented systems

Heartbeat Technology: Extensive device and process diagnostics as well as on-site verification without interrupting the process.

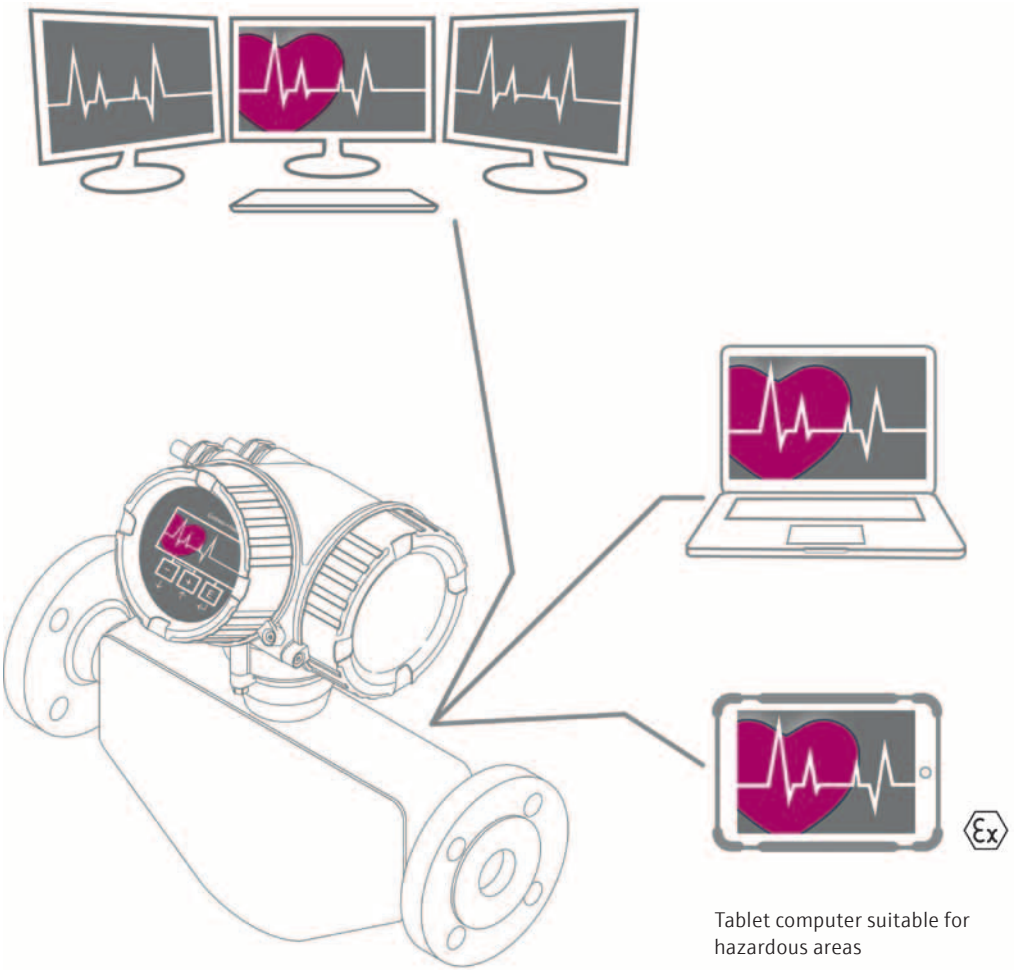
Equipment in safety-instrumented systems must be tested in accordance with IEC 61511 and VDI/VDE 2180 at regular intervals. Proof-testing is intended to ensure all components operate without errors. For flow measurements in particular, the time spent on proof-testing is particularly high. In this case, the devices generally need to be removed and tested on a calibration rig.

Endress+Hauser offers new appealing ways to extend intervals for recalibration complying with standards.

Heartbeat Diagnostics: maximum functional safety, 24/7 Best-in class diagnostic coverage of our new instruments provides greatly reduced probability of failure on demand. Dangerous-undetected errors have been minimized, so that the measuring instruments typically do not determine the frequency of proof-testing for the safety-instrumented systems. Other components in a safety loop will define the frequency of functional tests.

Heartbeat Verification: functional reliability documented at any given moment Whenever required by the operator of a contracted service provider, Heartbeat Verification initiates a complete series of functional tests. The entire signal chain, from the sensor to the transmitter and the outputs is tested on demand of the user. The result is documented in a clear and comprehensive verification report, which can be obtained on-site device, or remotely via the asset management system. A simple and guided procedure takes the operator through this functional test. Additional testing procedures providing enhanced proof-test coverage are available by specific DTM software for a diversity of instruments types. On our new Proline flowmeters, Heartbeat Verification complies with the requirements of a traceable verification according to DIN EN ISO 9001:20018 - Section 7.6 a). It confirms that the instrument functions within the limits specified for the application, with a Total Test Coverage of at least 95%.

Heartbeat Technology eliminates most of the cost and time associated with proof-testing In conclusions, Heartbeat Technology provides ideal support to plant operators in fulfilling their obligations to perform proof-tests on safety-instrumented systems, and to document that measuring equipment works as reliably as required.



Tablet computer suitable for hazardous areas

Heartbeat Technology is easy to understand and is always available: on the display on-site, on the PC, or remotely via asset management systems

www.addresses.endress.com

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Endress+Hauser

People for Process Automation