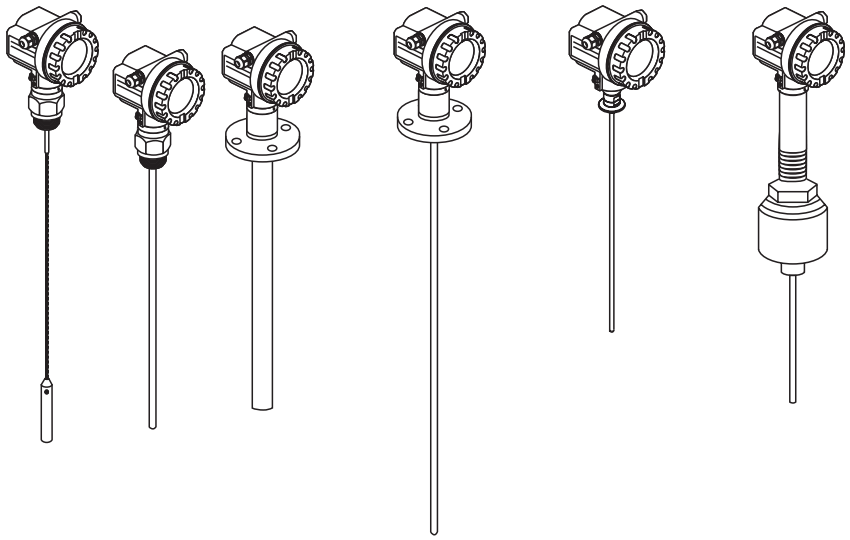
Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Functional Safety Manual

Levelflex M
FMP40, FMP41C, FMP43, FMP45

Guided Level-Radar for Liquids and Bulk Solids with 4 to 20 mA Output Signal



Application

Operating minimum (e.g. dry run protection), maximum (e.g. overfill protection) and range monitoring of liquids and bulk solids of all types in systems to satisfy particular safety systems requirements as per IEC 61508/ IEC 61511.

The measuring device fulfils the requirements concerning

- Functional safety as per IEC 61508/IEC 61511
- Explosion protection (depending on the version)
- Electromagnetic compatibility as per EN 61326 and NAMUR recommendation NE 21
- Electrical safety as per IEC/EN 61010-1

Your benefits

- Used for level monitoring (MIN, MAX, range) up to SIL 2
  - Independently assessed by TÜV Nord as per IEC 61508/IEC 61511
- Permanent self-monitoring
- Continuous measurement
- Measurement is virtually independent of product properties
- Measurement is possible even at strongly agitated surfaces and foam
- Easy commissioning
- Suitable for bulk solids as well

SD174F/00/EN/04.10
71116342

Endress+Hauser
People for Process Automation

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SIL Declaration of Conformity

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SIL-08006a/00/a2

SIL-Konformitätserklärung

Funktionale Sicherheit nach IEC 61508

SIL Declaration of Conformity

Functional safety according to IEC 61508

Endress+Hauser GmbH+Co. KG, Hauptstraße 1, 79689 Maulburg
erklärt als Hersteller, dass der Standaufnehmer (Seriennummer XXXXXXXXXX)
declares as manufacturer, that the level transmiter (Serial number XXXXXXXXXX)

Levelflex M FMP40, FMP41C, FMP43, FMP45 (4...20mA)

für den Einsatz in Schutzeinrichtungen entsprechend der IEC 61508 / IEC 61511 geeignet ist, wenn das Handbuch zur Funktionalen Sicherheit SD174F/00 und nachfolgende Kenngrößen beachtet werden:
is suitable for the use in safety-instrumented systems according to IEC 61508 / IEC 61511, if the functional safety manual SD174F/00 and following characteristics are observed:

Gerät / Product	2-Draht / 2-wire	4-Draht / 4-wire
Schutzfunktion/Safety function	Level MIN, Level MAX, Level Range	
SIL [4]	2	
HFT	0	
Gerätetyp/Device type	B	
SFF	72,4 %	85,3 %
PFD_{avg} [1] (T_1 = 1 Jahr/year)	$3{,}19 \times 10^{-3}$	$1{,}60 \times 10^{-3}$
Prüfintervall/Proof test interval	empfohlen/recommended: T_1 = 1 Jahre/year	
λ_{sd} [2]	684 FIT	75 FIT
λ_{su} [2]	242 FIT	918 FIT
λ_{dd} [2]	993 FIT	1133 FIT
λ_{du} [2]	729 FIT	366 FIT
$MTBF_{tot}$ [3]	41 Jahre/years	45 Jahre/years

[1] Die Werte entsprechen SIL 2 nach ISA S84.01. PFD_{avg}-Werte für andere T_1-Werte siehe Handbuch zur Funktionalen Sicherheit. / The values comply with SIL 2 according to ISA S 84.01. PFD_{avg}-values for other T_1-values see Functional Safety Manual.
[2] Gemäß Siemens SN29500 / according to Siemens SN29500
[3] Gemäß Siemens SN29500, einschließlich Fehlern, die außerhalb der Sicherheitsfunktion liegen / according to Siemens SN29500, including faults outside the safety function
[4] Betrachtung gemäß IEC 61511-1 Abschnitt 11.4.4 / consideration according to IEC 61511-1 clause 11.4.4

Das Gerät , einschließlich Software und Änderungsprozess , wurde auf Basis der Betriebsbewährung bewertet.
The device , including the software and the modification process , was assessed on the basis of proven-in-use.

Maulburg, 29.08.2008

Endress+Hauser GmbH+Co. KG

i.V. (Dr. Arno Götz)
Leitung Zertifizierung/Manager Certification

i.A. (Dr.H.Schroth)
Leitung Projekt / Project Manager

Endress+Hauser
People for Process Automation

SIL_08006a_en

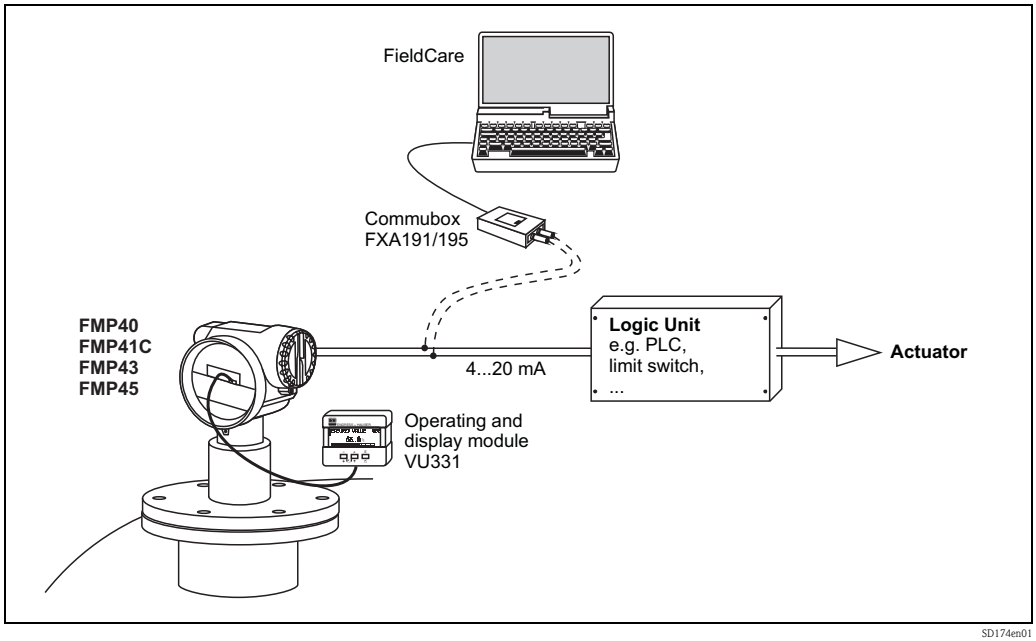
Introduction

Note!
General information on functional safety (SIL) is available at:
www.de.endress.com/SIL (German) or www.endress.com/SIL (English) and in Competence Brochure CP002Z "Functional Safety in the Process Industry – Risk Reduction with Safety Instrumented Systems".

Structure of the measuring system

System components

The measuring system's devices are displayed in the following diagram (example).

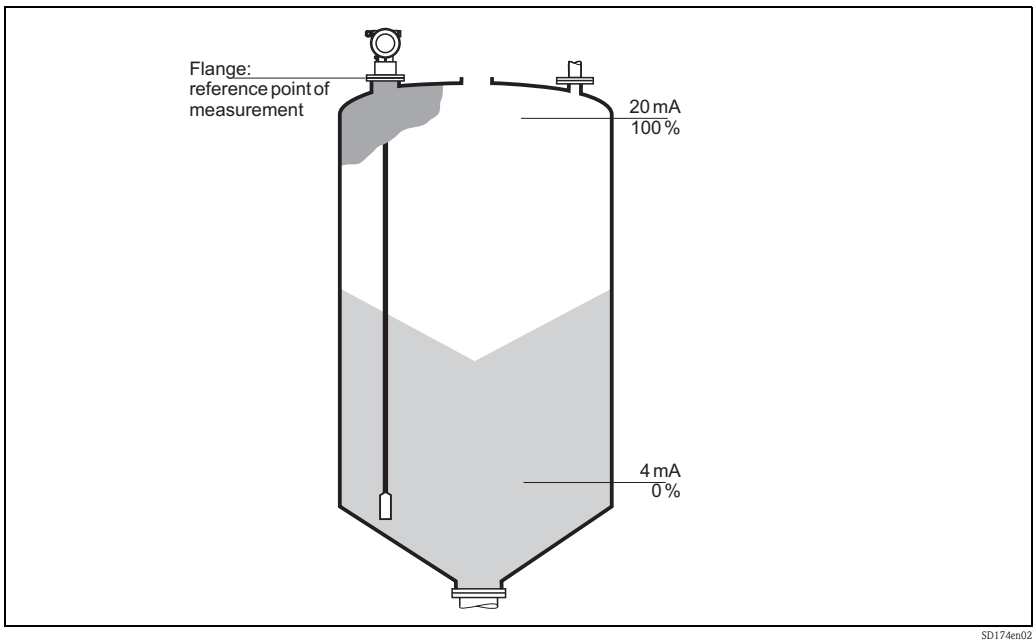


An analog signal (4 to 20 mA) in proportion to the level is generated in the transmitter. This is sent to a downstream logic unit (e.g. PLC, limit signal transmitter, etc.) where it is monitored to determine whether it is below or above a specified limit value.
For fault monitoring, the logic unit must recognize both HI-alarms (≥ 21.0 mA) and LO-alarms (≤ 3.6 mA (2-wire), ≤ 2.4 mA (4-wire)).

Description of use as a protective system

The Levelflex M is a "downward-looking" measuring system that functions according to the ToF method (ToF = Time of Flight). The distance from the reference point (process connection of the measuring device) to the product surface is measured. High-frequency pulses are injected to a probe and led along the probe. The pulses are reflected by the product surface, received by the electronic evaluation unit and converted into level information. This method is also known as TDR (time domain reflectometry).

Typical measuring arrangement:



The Levelflex M can be used in this arrangement in safety instrumented systems for MIN safety, MAX safety and range monitoring.

Note!
Correct installation is a prerequisite for safe operation of the device.

Permitted device types

The details pertaining to functional safety in this manual relate to the device versions listed below and are valid as of the specified software and hardware version. Unless otherwise specified, all subsequent versions can also be used for safety instrumented systems.
A modification process according to IEC 61508 is applied for device changes.

Valid device versions for safety-related use:

Levelflex M FMP40		
Feature	**Designation**	**Version**
010	Approval	All
020	Probe	All
030	Probe Length	All
040	O-ring Material; Temperature	All
050	Process Connection	All
060	Power Supply; Output	B, G, H
070	Operation	All
080	Type of Probe	All
090	Housing; Cable Entry	All
100	Additional Option	All

Valid software version: as of 01.02.02 (MAX), as of 01.04.02 (MIN, range)
Valid hardware version (electronics): as of delivery date September 2003

Levelflex M FMP41C		
Feature	**Designation**	**Version**
010	Approval	All
020	Probe	All
030	Process Connection	All
040	Power Supply; Output	B, G, H
050	Operation	All
060	Type of Probe	All
070	Housing	All
080	Cable Entry	All
090	Additional Option	All

Valid software version: as of 01.02.02 (MAX), as of 01.04.02 (MIN, range)
Valid hardware version (electronics): as of delivery date September 2003

Levelflex M FMP43		
Feature	**Designation**	**Version**
010	Approval	All
020	Probe	All
030	O-ring Material; Temperature	All
040	Process Connection	All
050	Power Supply; Output	B, G, H
060	Operation	All
070	Type of Probe	All
080	Housing	All
090	Cable Entry	All
100	Additional Option	All

Valid software version: as of 01.04.02 (MIN, MAX, range)
Valid hardware version (electronics): as of delivery date September 2003

Levelflex M FMP45		
Feature	**Designation**	**Version**
010	Approval	All
020	Process Temperature	All
030	Probe	All
040	Process Connection	All
050	Power Supply; Output	B, G, H
060	Operation	All
070	Type of Probe	All
080	Housing	All
090	Cable Entry	All
100	Additional Option	All

Valid software version: as of 01.02.02 (MAX), as of 01.04.02 (MIN, range)
Valid hardware version (electronics): as of delivery date September 2003

Supplementary device documentation

Documentation	**Contents**	**Comment**
Technical Information TI358F/00 (FMP40) TI386F/00 (FMP41C, FMP45) TI424F/00 (FMP43)	– Technical data – Instructions on accessories	– The documentation is available on the Internet. → www.endress.com.
Operating Instructions (HART) BA242F/00 (FMP40) BA276F/00 (FMP41C) BA279F/00 (FMP45) BA357F/00 (FMP43)	– Identification – Installation – Wiring – Operation – Commissioning – Maintenance – Accessories – Troubleshooting – Technical data – Appendix: menu diagram	– The documentation is supplied with the device. – The documentation is also available on the Internet. → www.endress.com.
Operating Instructions (Device Functions) BA245F/00	– Instructions on use – Levelflex M function menu – Function groups ... – ... – Envelope curve – Troubleshooting – Function menu index	– The documentation is available on the Internet. → www.endress.com.
Safety instructions depending on the selected version "Approval"	– Safety, installation and operating instructions for devices, which are suitable for use in potentially explosive atmospheres or as overfill protection (WHG, German Water Resources Act).	Additional safety instructions (XA, XB, XC, ZE, ZD) are supplied with certified device versions. Please refer to the nameplate for the relevant safety instructions.

Description of the safety requirements and boundary conditions

Safety function

The measuring system's safety functions are:

– Maximum level limit monitoring (overfill protection)
– Minimum level limit monitoring (dry run protection)
– Level range monitoring

Safety-related signal:

The Levelflex M's safety-related signal is the 4 to 20 mA analog output signal.
All safety measures refer to this signal exclusively.

The Levelflex M additionally communicates effectively via HART and contains all HART features with additional device information.

The safety-related output signal is fed to a downstream logic unit, e.g. a programmable logic controller or a limit signal transmitter where it is monitored for the following:

– Overshooting and/or undershooting a specified level limit.
– The occurrence of a fault, e.g. error current (≤ 3.6 mA (2-wire), ≤ 2.4 mA (4-wire), ≥ 21.0 mA, interruption or short-circuit of the signal line).

Restrictions for use in safety-related applications

The measuring system must be used correctly for the specific application, taking into account the medium properties and ambient conditions. Carefully follow instructions pertaining to critical process situations and installation conditions from the Operating Instructions.
The specifications from the Operating Instructions (→ 7, "Supplementary device documentation") must not be exceeded.

The following restriction also applies to safety-related use:

– The accuracy of the 4 to 20 mA safety-related output signal is ± 2%.

Functional safety indicators

The following tables show specific indicators for functional safety. The data is shown separately for the 2-wire and 4-wire version.

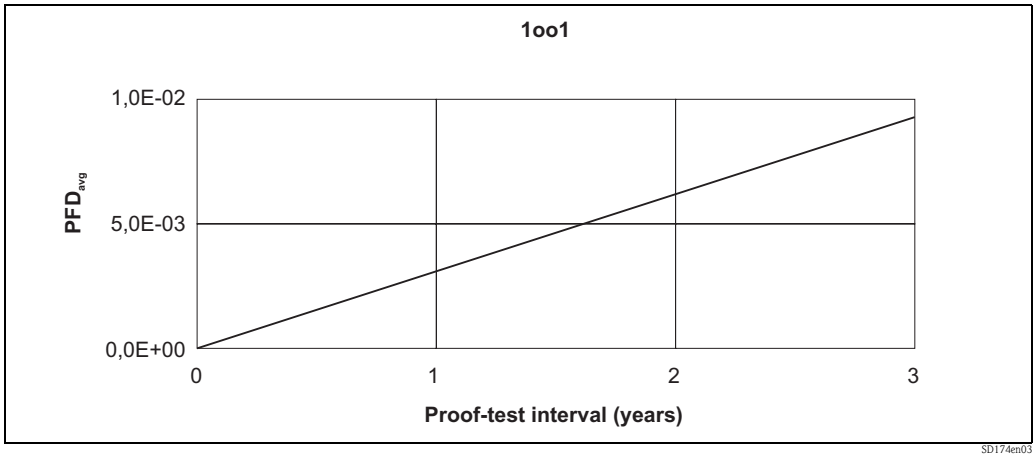
2- wire version

Characteristic as per IEC 61508	Levelflex M with 4 to 20 mA output, 2-wire
Safety functions	MIN, MAX, range
SIL	2
HFT	0
Device type	B
Mode of operation	Low demand mode
SFF	72.4 %
MTTR	8 h
Recommended time interval for proof-testing T_1	1 year
λ_{sd}	684 FIT
λ_{su}	242 FIT
λ_{dd}	993 FIT
λ_{du}	729 FIT
λ_{tot} *1	2763 FIT
PFD_{avg} for T_1 = 1 year *2	3.19×10^{-3}
MTBF *1	41 years
System reaction time *3	≤ 5 s

*1 This value takes into account all failure types. Failure rates of the electronic components as per Siemens SN29500.

*2 Where the average temperature when in continuous use is in the region of 50°C, a factor of 1.3 should be taken into account.

*3 Step response time as per DIN EN 61298-2.



Proof-test interval (2-wire version)

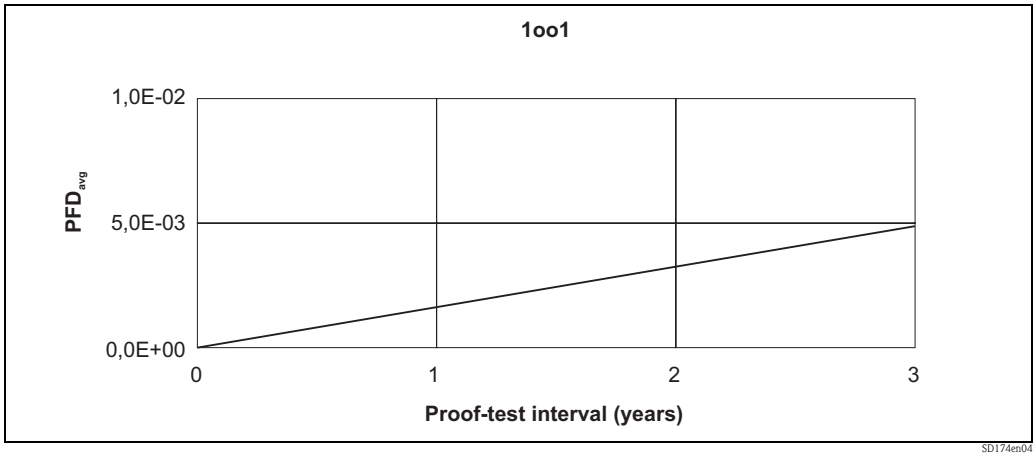
4-wire version

Characteristic as per IEC 61508	Levelflex M with 4 to 20 mA output, 4-wire
Safety functions	MIN, MAX, range
SIL	2
HFT	0
Device type	B
Mode of operation	Low demand mode
SFF	85.3 %
MTTR	8 h
Recommended time interval for proof-testing T_1	1 year
λ_{sd}	75 FIT
λ_{su}	918 FIT
λ_{dd}	1133 FIT
λ_{du}	366 FIT
λ_{tot} *1	2520 FIT
PFD_{avg} for T_1 = 1 year *2	1.60×10^{-3}
MTBF *1	45 years
System reaction time *3	≤ 5 s

*1 This value takes into account all failure types. Failure rates of the electronic components as per Siemens SN29500.

*2 Where the average temperature when in continuous use is in the region of 50°C, a factor of 1.3 should be taken into account.

*3 Step response time as per DIN EN 61298-2.



Proof-test interval (4-wire version)

Dangerous undetected failures in this scenario:

An incorrect output signal that deviates from the real measured value by more than 2%, but is still in the range of 4 to 20 mA, is considered a dangerous, undetected failure.

Useful lifetime of electrical components:

The established failure rates of electrical components apply within the useful lifetime as per IEC 61508-2, section 7.4.7.4. note 3.

Behavior of device during operation and in case of error

Behavior of device during power-up

The safe 4 to 20 mA output signal is available after 17 s (2-wire) or 12 s (4-wire) after the device is switched on or when the voltage returns.

Device response in the event of alarms or warnings

Error current

In the event of an alarm, the output current can be configured to a value of ≤ 3.6 mA (2-wire), ≤ 2.4 mA (4-wire) or ≥ 21 mA.

In some cases (e.g. failure of power supply, a cable open circuit and faults in the current output itself, where the error current ≥ 21 mA cannot be set), output currents ≤ 3.6 mA (2-wire) or ≤ 2.4 mA (4-wire) irrespective of the configured error current can occur.

For alarm monitoring, the logic unit must therefore be able to recognize both HI-alarms (≥ 21 mA) and LO-alarms (≤ 3.6 mA (2-wire), ≤ 2.4 mA (4-wire)).

Alarm and warning messages

Additional information is available in the form of fault codes on the alarm and warning messages output.

Installation

Installation and wiring

Installation and wiring of the device is described in the accompanying Operating Instructions (→ 🖹 7, "Supplementary device documentation").

Orientation

The permitted orientations of the device are described in the Operating Instructions.

Commissioning

Commissioning of the device is described in the accompanying Operating Instructions (→ 🖹 7, "Supplementary device documentation").

Caution!
The integrated broken probe detection function must be enabled!

If this function is switched off, it can be enabled as follows:

1. With the probe uncovered, perform a mapping ("Range of mapping" (052) and "Start mapping." (053)).
2. Activate the "Broken probe det" (019) function in the "Safety settings" (01) function group.

To ensure that the broken probe detection function works correctly, a mapping must have been performed in the tank beforehand.
The mapping must be at least 1 m in length since it has to cover the launch area.
If the device is installed in a nozzle, it must be ensured that the mapping is at least 0.5 m longer than the actual nozzle.

Operation

Calibration of the measuring point

Calibration of the measuring point is described in the Operating Instructions.

The method of device configuration

Note!
Altered settings (display/FieldCare) in the "extended calibr." function group (Pos. 05) such as "offset" or "curr.turn down" (Pos. 063) in the "output" function group have an effect on the output signal.
This must be taken into account when calculating the response height (→ relevant Operating Instructions).
We recommend that you check that the behavior of the current signal matches the expected behavior by means of level simulation (correctness of configuration).

Configuration schemata/basic calibration

FieldCare/Display - plain text display	**Display VU331 Position**
Tank properties	002
↓	
Medium property	003
↓	
Process properties	004
↓	
End of probe	030
↓	
Length adjustment	031
↓	
Empty calibration E	005
↓	
Full calibration F	006
↓	
Mapping	→ Operating Instructions
↓	
Further settings: function group 05	→ Operating Instructions
↓	
Overfill protection WHG (optional, → 🖹 13)	018
↓	
On-site locking: 3 keys on the VU331 display	Yes

The configuration is performed as follows depending on the application:

Without WHG

Option 1
- The parameters are safety-oriented with the "WHG" setting in 018 (→ information in the following table). Modifications are not possible as the settings are locked.

Option 2
- As an alternative to activating the "WHG" setting, it is also possible to make the safety-oriented setting manually. In doing so, please observe the information in the table below.

With WHG

- The parameters are safety-oriented with the "WHG" setting in 018 (→ information in the following table). Modifications are not possible as the settings are locked.

Note!
The parameters in *italics* are located on the service level, which can be opened with the code "300".

FieldCare/ Display - plain text display	**Value/parameter**	**Display VU331**	**Comment**
Safety settings			
output on ALARM	Max. 110 %, 22 mA	010	Parameter **must** be configured in this way
outp. echo loss	ALARM	012	Parameter **must** be configured in this way
delay time	1 s	014	→ Note 1
in safety distance	self holding	016	→ Note 3
Filtering/averaging/delay			
For software 01.02.zz:			
envelope statistics	0	*0D21*	→ Note 2
For software 01.04.zz:			
envelope statistics up	0	*0D23*	→ Note 2
envelope statistics down	0	*0D24*	→ Note 2
max. low pass	10 s	*0D14*	→ Note 2
delta at min.	0 mm	*0D15*	→ Note 2
General:			
MAM filt. length	5	*0D11*	→ Note 2
MAM filt. border	1	*0D12*	→ Note 2
output damping	0	058	→ Note 2
Echo detection			
For software 01.04.zz:			
detection window	Off	*0A7*	Parameter **must** be configured in this way
merging echoes	parable fit	*0D25*	Parameter **must** be configured in this way
General:			
threshold near	0.04*0D85, if **"Tank prop." (002)** = coax probe (4), 0.07*0D85, otherwise	*0D35*	→ Note 3
threshold attenuation constant	= 0D86	*0D36*	→ Note 3

FieldCare/ Display - plain text display	**Value/parameter**	**Display VU331**	**Comment**
threshold far	0.04*0D87, if **"Tank prop." (002)** = coax probe (4), 0.07*0D87, otherwise	*0D37*	→ Note 3
EOP evaluation	On	*0D61*	→ Note 3
EOP in upper area	echo preferred (factory setting)	*0D62*	Parameter **must** be configured in this way → also Note 4
First echo factor	6 dB	*0D51*	→ Note 3
Max. filling speed	0 mm/s (factory setting)	*0D15*	Parameter **must** be configured in this way
Max. drain speed	0 mm/s (factory setting)	*0D16*	Parameter **must** be configured in this way
Other			
hysterese width	0 mm (factory setting)	*0D14*	Parameter **must** be configured in this way
Communication address	0	060	Parameter **must** be configured in this way
Current output mode	**"Standard"** if previously **"fixed current"**	063	Parameter **must** be configured in this way
Simulation	Sim./OFF	065	Parameter **must** be configured in this way

✎ Note!

1. This parameter determines the reaction time of the device in the event of echo loss; a setting of less than 30 s is recommended.
2. This parameter determines the reaction time of the device; deviating settings are possible.
   In case of changes in **"process cond." (004)** it is automatically adjusted. The corresponding reaction time is indicated in the documentation BA245F.
3. This parameter can be selected differently, depending on the application.
4. In the **"Tank properties" (002) function** , **"aluminum tank"** may not be used!

A measuring condition (echo) which results in an ALARM in the "Safety distance SD" area can be reset or deleted by

– confirming the ALARM in Pos. 017 locally by means of the VU331 LCD display;
– confirming the alarm via the communication protocol (HART) (FieldCare: "ackn. alarm" under safety settings).

Locking

The device must be locked once the Levelflex M has been calibrated as per the Operating Instructions.
To do this, hardware locking (recommended) or software locking can be activated.

Type of locking	Code/action	Position/VU331 display
Hardware (recommended)	3 keys together "lock"	Locally via VU331 display (keys + and − and E)
	↓	
Software	100	0A4

Unlocking

The device is unlocked by firstly removing the hardware lock by locally pressing all the three keys together via the VU331 LCD display and then by setting the "Overfill protection" parameter (Position 018) to "Standard" if necessary.

Type of unlocking	Code/action	Position/VU331 display
Hardware; if locked	3 keys together "unlock"	Locally via VU331 display (keys + and − and E)
	↓	
Software	Standard	018

Maintenance

Please refer to the relevant Operating Instructions (→ 🖹 7, "Supplementary device documentation") for instructions on maintenance and recalibration.
Alternative monitoring measures must be taken to ensure process safety during configuration, proof-testing and maintenance work on the device.

Proof-test

Proof-test

Check the operativeness and safety of safety functions at appropriate intervals!
The operator must determine the time intervals.
You can refer to the diagram "Proof-test interval", → 🖹 9, → 🖹 10 for this purpose.

Proof-testing of the device can be performed as follows:
– Approaching the level (→ test sequence A).
– Removing and immersing in a medium with comparable properties (→ test sequence B).
– Simulation at the electronic insert (→ test sequence C; only for 2-wire).

You must also check that all cover seals and cable entries are sealing correctly.

Process for proof-testing

Test sequence A

Preparation

1. Connect suitable measuring device (recommended accuracy better ±0.1 mA) to the current output.
2. Determine the safety setting (level limit or range monitoring).

Procedure for level limit monitoring

1. Approach the level directly below (MAX monitoring) or directly above (MIN monitoring) the level limit to be monitored.
2. Read the output current, record it and assess for accuracy.
3. Approach the level directly above (MAX monitoring) or directly below (MIN monitoring) the level limit to be monitored.
4. Read the output current, record it and assess for accuracy.
5. The test is deemed successful if the current in step 2 does not result in activation of the safety function but the current in step 4 does.

Procedure for range monitoring

1. Approach five levels within the range to be monitored.
2. Read the output current at each level value, record it and assess for accuracy.
3. The test is deemed successful if the current values in step 2 are within the required level of accuracy.

Note!
The proof-test is deemed to have failed if the expected current value deviates for a specific level by > ±2%.
For troubleshooting, → Operating Instructions (→ 🖹 7, "Supplementary device documentation"), Section 9.
98% of dangerous, undetected failures are detected using this test.

Test sequence B

Preparation

1. Prepare the test tank with the medium (dielectric constant comparable to that of the medium to be measured).
   For installation instructions, → Operating Instructions (→ 🖹 7, "Supplementary device documentation"), Section 3.
2. Remove the device and mount it in the test tank.
3. Perform interference echo mapping if the shape and size of the test tank is different.
4. Connect suitable measuring device (recommended accuracy better than ±0.1 mA) to the current output.
5. Determine the safety setting (level limit or range monitoring).

Procedure for level limit monitoring
→ Test sequence A

Procedure for range monitoring
→ Test sequence A.

Note!
The proof-test is deemed to have failed if the expected current value deviates for a specific level by > ±2%.
For troubleshooting, → Operating Instructions (→ 🖹 7, "Supplementary device documentation"), Section 9.
98% of dangerous, undetected failures are detected using this test.

Caution!
If an interference echo mapping was performed in the test tank, a valid interference echo mapping must be performed after the device is mounted in the original tank.

Test sequence C
(for 2-wire only)

Preparation

1. Connect suitable measuring device (recommended accuracy better than ±0.1 mA) to the current output.
2. Determine the safety setting (level limit or range monitoring).

Procedure for level limit monitoring

1. Simulate the level directly below (MAX monitoring) or directly above (MIN monitoring) the level limit to be monitored. To do this, set the "Simulation" function (065) to "sim. level" in the "Output" function group and enter the value in the "simulation value" (066) function.
2. Read the output current, record it and assess for accuracy.
3. Simulate the level directly above (MAX monitoring) or directly below (MIN monitoring) the level limit to be monitored.
4. Read the output current, record it and assess for accuracy.
5. The test is deemed successful if the current in step 2 does not result in the activation of the safety function but the current in step 4 does.

Procedure for range monitoring

1. Simulate five levels within the range to be monitored.
2. Read the output current at each level value, record it and assess for accuracy.
3. The test is deemed successful if the current values in step 2 are within the required level of accuracy.

Note!
The proof-test is deemed to have failed if the expected current value deviates for a specific level by > ±2%.
For troubleshooting, → Operating Instructions (→ 🖹 7, "Supplementary device documentation"), Section 9.
70% of dangerous, undetected failures are detected using this test.
A number of sensor (probe) and sensor electronics (HF module) faults are not detected.

Note!
If one of the test criteria from the test sequences described above is not fulfilled, the device may no longer be used as part of a safety instrumented system.
The purpose of proof-testing is to detect random device failures. The impact of systematic faults on the safety function is not covered by this test and must be assessed separately.
Systematic faults can be caused, for example, by process material properties, operating conditions, buildup or corrosion.

Repairs

Repairs

Repairs on the devices must always be carried out by Endress+Hauser.
Safety functions cannot be guaranteed if repairs are carried out by anybody else.

Exception:
The following components can be replaced by the customer if the person responsible for doing so has been trained beforehand by Endress+Hauser:

- Sensor
- HF module
- Electronic insert
- Terminal module (2-wire)
- Power supply (4-wire)
- Probe rods and ropes

The replaced components must be sent to Endress+Hauser for the purpose of fault analysis.
Once the components have been replaced, a proof-test must be carried out as per test sequence A (→ 🖹 16) or test sequence B (→ 🖹 17).

In the event of failure of a SIL-labeled Endress+Hauser device, which has been operated in a protection function, the "Declaration of Contamination and Cleaning" with the corresponding note "Used as SIL device in protection system" must be enclosed when the defective device is returned.
Please refer to the Section "Return" in the Operating Instructions (→ 🖹 7, "Supplementary device documentation").

Appendix

Commissioning or proof test protocol

System-specific data		
Company		
Measuring points / TAG no.		
System		
Device type / Order code		
Serial number of device		
Name		
Date		
Signature		
Device-specific commissioning parameters		
Empty calibration		
Full calibration		
Proof-test protocol		
Test stage	Set point	Actual value
1. Current value 1		
2. Current value 2		
3. If necessary current value 3		
4. If necessary current value 4		
5. If necessary current value 5		

SD174en05

Certificate

TÜV NORD

Zertifikat

Certificate

Registrier-Nr.
Registration No.
44 799 362107-001

Zeichen des Auftraggebers *Customer's reference*	Auftragsdatum *Date of order*	Aktenzeichen *File reference*	Prüfbericht Nr. *Test report no.*
	16.07.2008	8000362107	08 7992107-001

Name und Anschrift des Auftraggebers
Customer's name and address

Endress+Hauser GmbH+Co. KG
Hauptstrasse 1
79689 Maulburg
Deutschland

Geprüft nach — *Tested in accordance with*

IEC 61508:1998

Funktionale Sicherheit sicherheitsbezogener elektrischer/elektronischer/ programmierbarer elektronischer Systeme Anforderungen an SIL 2

Teile der Hardware und die Software wurden auf Basis der Betriebsbewährung gemäß IEC 61508 / IEC 61511 bewertet. Der Software Änderungsprozess wurde gemäß IEC 61508-3 bewertet.
Parts of hardware and software were assessed on the basis of proven-in-use according to IEC 61508 / IEC 61511. The software modification process has been assessed according to IEC 61508-3.

Beschreibung des Produktes (Details siehe Anhang 1) — *Description of product (Details see Annex 1)*

Geführtes Füllstand-Radar
Guided Level Radar

Typenbezeichnung — *Type Description*

Levelflex M

Typen FMP40, FMP41C, FMP43, FMP45

Dieses Zertifikat bescheinigt das Ergebnis der Prüfung an dem vorgestellten Prüfgegenstand. Eine allgemein gültige Aussage über die Qualität der Produkte aus der laufenden Fertigung kann hieraus nicht abgeleitet werden.
This certifies the result of the examination of the product sample submitted by the manufacturer. A general statement concerning the quality of the products from the series manufacture cannot be derived there from.

TÜV NORD CERT GmbH
Zertifizierungsstelle für Produktsicherheit
Certification body for product safety

Gültig bis / *Valid to*: 04.11.2013

Ralf Laborenz

Hannover, 04.11.2008

Bitte beachten sie auch die umseitigen Hinweise
Please also pay attention to the information stated overleaf

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Anlage 1 zum Zertifikat Nr.:
Annex 1 to Certificate no.:

44 799 362107-001

TÜV NORD

Rev. 1

Aktenzeichen: 8000362107
File reference

Allgemeine Angaben *General information*	**Siehe Seite 1 des Zertifikates** *See also page 1 of the Certificate*
Typenbezeichnung *Type Description*	**Levelflex M FMP40, FMP41C, FMP43, FMP45**
Nennspannung: *Nominal Voltage*	**2-Draht/ 2 wire: 16 … 36V_{DC} (Standard), 16 … 30V_{DC} (Ex)** **4-Draht/4 wire: 10,5 … 32V_{DC} oder/or 90 … 253V_{AC}**
Schutzart *Protection Degree*	**IP20 für geöffnetes Gehäuse/for open housing** **IP66/NEMA 4X für geschlossenes Gehäuse/for closed housing** **IP68/NEMA 6P für geschlossenes Gehäuse/for closed housing**
Sicherheitsbezogenes Ausgangssignal: *Safety-related output signal*	**4…20 mA**
Fehlerstrom: *Error current*	**2-Draht/2 wire: ≤ 3,6 mA, ≥ 21,0 mA** **4-Draht/4 wire: ≤ 2,4 mA, ≥ 21.0mA**
Sicherheitsfunktionen: *Safety functions*	**MIN-Sicherheit (z. B. Trockenlaufschutz)** *MIN safety (e.g. dry run protection)* **MAX-Sicherheit (z. B. Überfüllsicherung)** *MAX safety (e.g. overspill protection)* **Füllstand-Bereichsüberwachung** *Level range control*
SIL (HW, SW): *Safety Integrity Level (hw/sw)*	**2**
Anmerkung: *Note*	**Bei Geräteänderungen wird für Hardware und Software ein Modifikationsprozess konform zu IEC 61508 angewendet.** *A modification process according to IEC 61508 is applied for device changes in hardware and software.*

TÜV NORD CERT GmbH
Zertifizierungsstelle für Produktsicherheit
Certification body for product safety

Gültig bis / *Valid to*: 04.11.2013

Ralf Laborenz

Hannover, 04.11.2008

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People for Process Automation

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FM+SGML 6.0

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