

Functional Safety Manual

RIA45



Panel meter

Application

1- to 2-channel transmitter power supply with intrinsically safe current inputs, temperature inputs, limit value monitoring with 2 changeover contacts, maths functions and 1 to 2 analog outputs that have to meet the particular requirements for safety-related systems in accordance with IEC 61508:2010 (Edition 2.0) and IEC 61511.

The measuring unit fulfils the requirements concerning

- Functional safety according to IEC 61508:2010 (Edition 2.0) and IEC 61511
- Explosion protection (depending on version)
- Electromagnetic compatibility in accordance with EN 61326 and NAMUR recommendation NE 21
- Electrical safety in accordance with IEC/EN 61010-1

Your benefits

- Used in a safety-related protection function up to SIL 2, independently assessed by Exida in accordance with IEC 61508:2010 (Edition 2.0).

Table of Contents

SIL Declaration of Conformity	3
General information	5
Measuring system design	5
System components	5
Description of the application as a safety-instrumented system .	5
Permitted device types	5
Further applicable device documentation	6
Description of safety requirements and boundary conditions	6
Safety function	6
Safety-related signal	9
Restrictions for use in safety-related applications	9
Functional safety parameters	10
Proof-test interval	11
Behavior of device when in operation or in the event of a fault .	11
Installation	11
Orientation	11
Operation	11
Maintenance	13
Proof tests	14
Procedure for proof test	14
Repair	14
Repair	14
Appendix	15
Commissioning or proof-test protocol	15
Declaration of Hazardous Material and De-Contamination	16

SIL Declaration of Conformity

SIL_00155_01.17

Endress+Hauser 
People for Process Automation

SIL-Konformitätserklärung

Funktionale Sicherheit nach IEC 61508:2010 Beiblatt 1

SIL Declaration of Conformity

Functional Safety according to IEC 61508:2010 Supplement 1

Endress+Hauser Wetzlar GmbH+Co. KG, Obere Wank 1, 87484 Nesselwang

erklärt als Hersteller, dass das Gerät
declares as manufacturer, that the device

RIA45

für den Einsatz in sicherheitsrelevanten Anwendungen bis SIL2 nach IEC61508:2010 geeignet ist. In sicherheitsrelevanten Anwendungen gemäß IEC 61508 und DIN EN 61511-1 2005 sind die Angaben des Handbuchs zur Funktionalen Sicherheit zu beachten. is suitable for the use in safety-instrumented systems up to SIL2 according to IEC61508:2010. In safety instrumented systems according IEC 61508 and DIN EN 61511-1 2005, the instructions of the Safety Manual have to be followed.

Allgemein / General			
Sicherheitsbezogenes Ausgangssignal Safety related output signal	Strom / Current 4...20mA	Spannung / Voltage 2...10V	Relais / Relay
Fehlersignal fault signal	3,5mA oder / or 22mA	0V oder / or 11V	Relais stromlos / Relay de-energized
Bewertetes Eingangssignal / Funktion Input signal / function	Strom, Spannung, Temperatur, Widerstand current, voltage, temperature, resistance		
Gerätetyp gem. IEC 61508-2 Device type acc. to IEC 61508-2	<input type="checkbox"/> Typ A	<input checked="" type="checkbox"/> Typ B	
Betriebsart Operating mode	<input checked="" type="checkbox"/> Low Demand Mode	<input type="checkbox"/> High Demand	<input type="checkbox"/> Continuous Mode
Gültige Hardware-Version valid hardware version	01.00.zz oder höher/ or higher		
Gültige Firmware-Version valid firmware version	01.03.03 oder höher / or higher		
Handbuch zur Funktionalen Sicherheit/ Functional safety manual	SD00014R/09		
Art der Bewertung Type of evaluation	<input type="checkbox"/>	Vollständige entwicklungsbegleitende HW/SW Bewertung inkl. FMEDA und Änderungsprozess nach IEC 61508-2, 3 Complete HW/SW evaluation parallel to development incl. FMEDA and change request acc. to IEC 61508-2, 3	
	<input checked="" type="checkbox"/>	Bewertung über Nachweis der Betriebsbewährung HW/SW inkl. FMEDA und Änderungsprozess nach IEC 61508-2, 3 Evaluation of "Proven-in-use" performance for HW/SW incl. FMEDA and change request acc. to IEC 61508-2, 3	
	<input checked="" type="checkbox"/>	Auswertung von Felddaten HW/SW zum Nachweis "Frühere Verwendung" gem. DIN EN 61511-1 2005 Evaluation of HW/SW field data to verify „prior use“ acc. to DIN EN 61511-1 2005	
	<input type="checkbox"/>	Bewertung durch FMEDA gem. IEC 61508-2 für Geräte ohne Software Evaluation by FMEDA acc. to IEC61508-2 for devices w/o software	
Prüfungsunterlagen Test documents	Entwicklungsdokumente, Testberichte, Datenblätter development documents, test reports, data sheets		

SIL_00155_01.17

Endress+Hauser 
People for Process Automation

SIL – Integrität / SIL Integrity						
Hardware Sicherheitsintegrität Hardware safety integrity	Einkanaliger Einsatz / Single channel use		<input checked="" type="checkbox"/> SIL 2 fähig / capable		<input type="checkbox"/> SIL 3 fähig / capable	
FMEDA						
Empfohlenes Intervall für Wiederholungsprüfungen / recommended proof test interval	T ₁ = 1 Jahr / year					
Sicherheitsbezogenes Ausgangssignal Safety related output signal	Strom / Current 4...20mA		Spannung / Voltage 2...10V		Relais / Relay	
Anzahl Eingänge / number of inputs	1	2	1	2	1	2
MTBF _{tot} ³⁾ / Jahre / years	95	58	89	60	80	57
SFF	84,4 %	84,9 %	84,6 %	82,4 %	73,9 %	75,0 %
λ _{SD} ^{2) 4)}	0 FIT	0 FIT	0 FIT	0 FIT	0 FIT	0 FIT
λ _{SU} ^{2) 4)}	0 FIT	0 FIT	0 FIT	0 FIT	453 FIT	604 FIT
λ _{DD} ^{2) 4)}	559 FIT	841 FIT	584 FIT	751 FIT	106 FIT	125 FIT
λ _{DU} ^{2) 4)}	103 FIT	149 FIT	106 FIT	160 FIT	197 FIT	242 FIT
PFD _{avg} ^{1) 4)} T ₁ = 1 Jahr / year	4,51 x10 ⁻⁴	6,53 x10 ⁻⁴	4,64 x10 ⁻⁴	7,01 x 10 ⁻⁴	8,63 x10 ⁻⁴	1,06 x10 ⁻³
Fehlerreaktionszeit Fault reaction time ⁵⁾	0,4 sec 5 sec	0,4 sec 5 sec	0,4 sec 5 sec	0,4 sec 5 sec	0,4 sec 5 sec	0,4 sec 5 sec

- Die Werte entsprechen SIL 2 nach ISA S84.01. PFD-Werte für andere T1-Werte siehe Handbuch zur Funktionalen Sicherheit. / The values comply with SIL 2 according to ISA S84.01. PFD values for other T1-values see Functional Safety Manual.
- Gemäß Exida Bericht Nr. E+H 08/02-49 / According to Exida report no. E+H 08/02-49
- Gemäß Siemens SN29500, einschließlich Fehlern, die außerhalb der Sicherheitsfunktion liegen. / According to Siemens SN29500, including faults outside the safety function.
- Gültig für gemittelte Umgebungstemperaturen bis zu +40 °C (+104 °F) Bei einer durchschnittlichen Dauereinsatztemperatur nahe +50 °C sollte ein Faktor von 1,3 berücksichtigt werden. / Valid for average ambient temperature up to +40 °C (+104 °F) For continuous operation at ambient temperature close to +50 °C (+122 °F), a factor of 1,3 should be applied
- Zeit zwischen Fehlererkennung und Fehlerreaktion. Die Zeit beträgt maximal 0,4 Sekunden. Bei Verwendung von RTD oder Thermoelement als Eingangssignal beträgt die Zeit zur Erkennung eines Leitungsbruches maximal 5 Sekunden / Maximum time between error recognition and error response. The maximum time is 0,4 sec. If a RTD or a thermocouple input signal is used the fault reaction time is up to 5 sec for cable open recognition.

Nesselwang, 16.02.2017
Endress+Hauser Wetzler GmbH+Co. KG

Endress + Hauser
Wetzler GmbH + Co. KG
Obere Wank 1
D - 87484 NESSELWANG
Telefon (0 83 61) 308 - 0

ppa. Rainer Kühnel
Director Operations



i.V. Robert Zeller
Head of department FEC

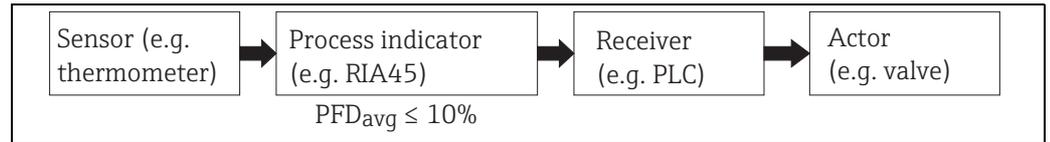
General information

General information on functional safety (SIL) is available at: www.de.endress.com/SIL (German) or www.endress.com/SIL (English) and in the Competence Brochure CP01008Z11EN "Functional Safety – SIL Safety Instrumented Systems in the Process Industry".

Measuring system design

System components

The diagram below displays a measuring system with exemplary devices.



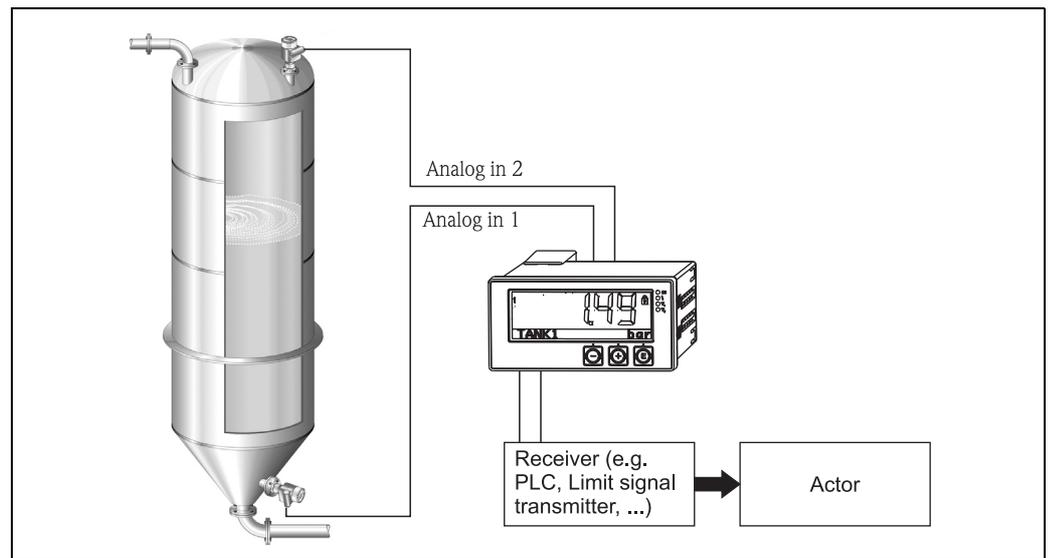
Part of the panel meter at the "average probability of failure on demand of a safety-related system" (PFDAVG)



This document treats the RIA45 as part of a safety function.

Together, the sensor, panel meter, logic unit and actuator form a safety-related system, which carries out a safety function. The "average probability of failure on demand of the entire safety-related system" (PFDavg) is divided among the sensor, panel meter, logic unit and actuator sub-systems.

Description of the application as a safety-instrumented system



Example for "differential pressure" application

Powered by panel meter RIA45, the sensors generate an analog signal (4 to 20 mA) that is proportional to the measured value. Maths functions enable the generation of a new process variable. The panel meter sends the analog signals that are proportional to the new process variable to a downstream logic unit, e.g. a PLC. Limit values can also be monitored directly with the RIA45 via 2 changeover contacts.

Permitted device types

The functional safety assessment described in this manual applies to the device versions listed below and is valid from the stated software and hardware versions.

Valid hardware version (electronics): **from 01.00.zz**

Valid firmware software version: **from 01.03.03 or higher**

In the event of device modifications, a modification process compliant with IEC 61508 is applied.

Unless otherwise indicated, all subsequent versions can also be used for safety-instrumented systems.

Device versions valid for use in safety-related applications:

Feature	Designation	Version
010	Approval	All
020	Input, output	All
030	Housing	1
500	Additional option	All
510	Additional approval	B1
520	Accessory	All

Further applicable device documentation

Documentation	Contents	Comment
Technical Information TI00141R/09 (RIA45 panel meter)	<ul style="list-style-type: none"> ▪ Technical data ▪ Information on accessories 	
Operating Instructions BA00272R/09 (RIA45 panel meter)	<ul style="list-style-type: none"> ▪ Identification ▪ Installation ▪ Wiring ▪ Operation ▪ Commissioning ▪ Maintenance ▪ Accessories ▪ Troubleshooting ▪ Technical data ▪ Appendix: menu diagram 	
Safety instructions depending on the selected version "Certificate"	<ul style="list-style-type: none"> ▪ 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 safety requirements and boundary conditions

Safety function

Description of the safety function performed by the device as part of a safety-instrumented system. An analog output or a limit relay can be used when the device is part of a safety function. More than one independent safety function can be implemented with one device. All inputs and outputs which are not part of a safety function can be used as before. The use of inputs and outputs which are not safety-related is interference free with regard to the safety function. The following table shows which settings are permitted or not when the RIA45 is used in a safety-related application:

RIA45 with current or voltage output:

Setup menu Analog Out 1* Analog Out 2*	Setting options (Signal type*)	Setting for safety function
Assignment of analog output (Assignment*) Analog 1* Analog 2*	4 to 20 mA	Permitted
	0 to 20 mA	Not permitted
	0 to 10 V	Not permitted
	2 to 10 V	Permitted
	0 to 5 V	Not permitted
	1 to 5 V	Not permitted
	± 1 V	Not permitted

Setup menu Analog Out 1* Analog Out 2*	Setting options (Signal type*)	Setting for safety function
	± 10 V	Not permitted
	± 30 V	Not permitted
	± 100 mV	Not permitted
	30 to 3000 Ohm	Not permitted
Response in the event of an error	hold	Not permitted
	min	Permitted
	max	Permitted
Expert menu Output**	Setting of response to error event (Failure mode**)	Setting for safety function
Analog Out 1** Analog Out 2**	Fixed value	Not permitted
	Min	Permitted
	Max	Permitted

RIA45 with relay for limit value monitoring:

Setup menu Relay 1* Relay 2*	Setting options (Function*)	Setting for safety function
Assignment of value to be monitored by relay (Assignment*) Analog input 1* Analog input 2*	Off	Not permitted
	Min	Permitted
	Max	Permitted
	Gradient	Permitted
	OutBand	Permitted
	InBand	Permitted

*) Display in the Setup menu of the device software

**) Display in the Expert menu of the device software

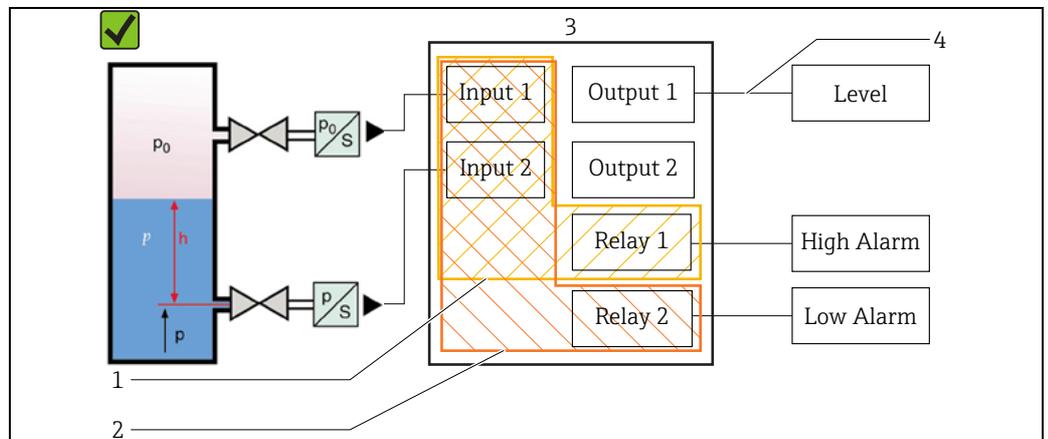
For further information, refer to the Operating Instructions BA00272R/09.

Safety function

Example 1: Level monitoring with difference pressure measurement

Safety function 1
 Safety function 2
 Process value:
 (no safety function)

Input1, Input2 -> Relay 1 max. level (overflow protection)
 Input1, Input2 -> Relay 2 min. level (protection against dry running)
 Output 1 (level)



- 1: Safety function 1
- 2: Safety function 2
- 3: Panel meter
- 4: Output 1 - Process value, not part of the safety function. Output 2 not used

Example 2: Level monitoring of two tanks

Safety function 1

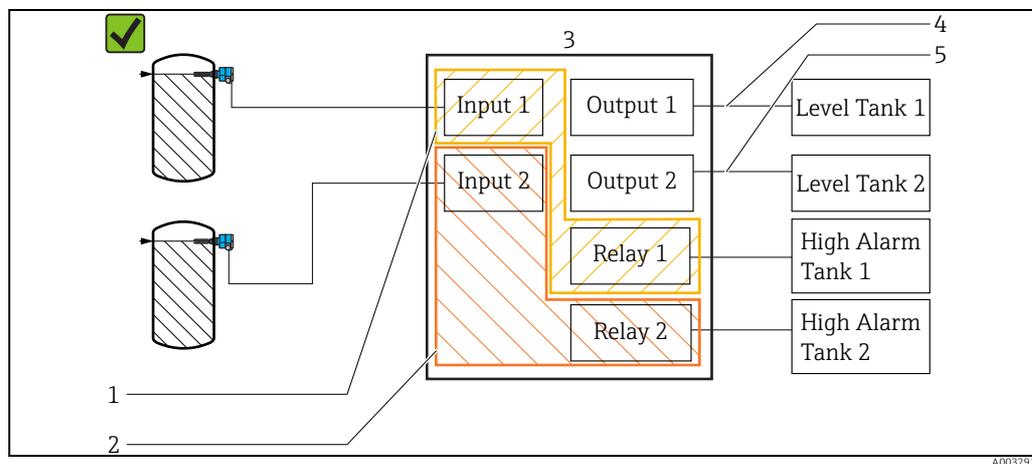
Input1, Input2 -> Relay 1 max. level tank 1

Safety function 2

Input1, Input2 -> Relay 2 max. level tank 2

Process value:
(no safety function)

Output 1 (level tank 1), Output 2 (level tank 2)



1: Safety function 1

2: Safety function 2

3: Panel meter

4: Output 1 - process value, not part of the safety function.

5: Output 2 - process value, not part of the safety function.

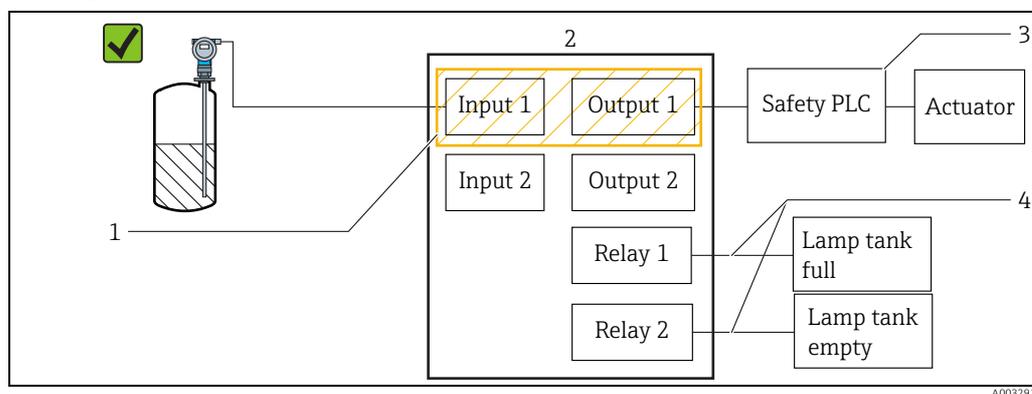
Example 3: continuous level monitoring of one tank

Safety function 1

Input1 -> Output 1 continuous level value tank 1 to safety PLC with actuator

Process value:
(no safety function)

Relay 1 (lamp for full tank), Relay 2 (lamp for empty tank)



1: Safety function 1

2: Panel meter

3: Input1 -> Output 1 continuous level value tank 1 to safety PLC with actuator

4: Relay 1 (lamp for full tank), Relay 2 (lamp for empty tank)

Example 4: Level monitoring of one tank with two channels (NOT PERMITTED!)

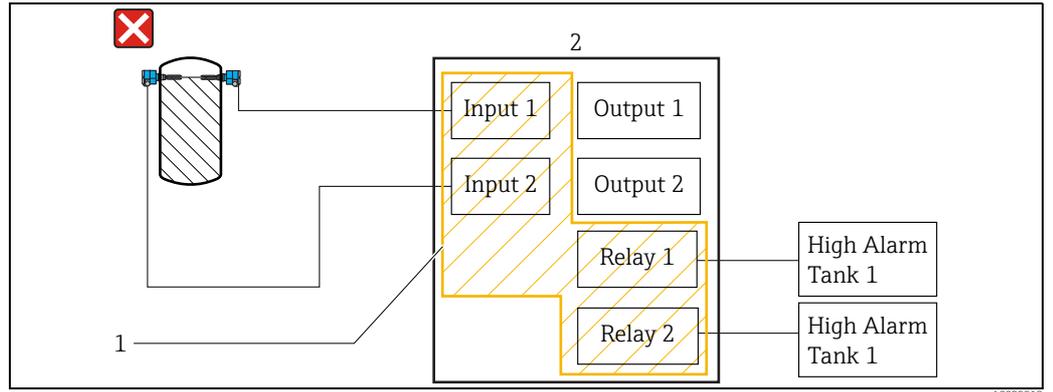
Safety function 1 (2 channels as
homogenous redundancy):

Input1 -> Relay 1 max. level tank 1

Input2 -> Relay 2 max. level tank 1

Process value:
(no safety function)

Relay 1 (lamp for full tank), Relay 2 (lamp for empty tank)



1: Safety function 1

2: Panel meter

A0032918

Safety-related signal

The safety-related signal is the 4 to 20 mA or 2-10 V analog output signal or the limit relay. All safety functions solely refer to these output signals.

The safety-related output signal or the limit relays are sent to a downstream logic unit, e.g. a programmable logic controller or a limit signal transmitter, and monitored there to establish if:

- A specified limit has been overshoot
- A fault has occurred, e.g. error current in accordance with Namur recommendation 43 ($\leq 3.6 \text{ mA}$, $\geq 21.0 \text{ mA}$, signal cable disconnection or short-circuit).

Restrictions for use in safety-related applications

- The measuring system must be used correctly taking into consideration the ambient conditions.
- Information on critical process situations and installation conditions from the Operating Instructions (cf. section 3.2) must be observed.
- Application-specific limits must be complied with.
- Specifications from the Operating Instructions must not be exceeded. The accuracy of the safety-related output signal 4 to 20 mA is $\pm 1\%$ of the measuring range.
- Device start-up time: The safety functions are available after an initialization period of 20 seconds following device start-up.
- The device must be locked after configuration.
- A complete function test of the safety-related functions must be carried out during commissioning.
- Only vertical orientation is permitted.

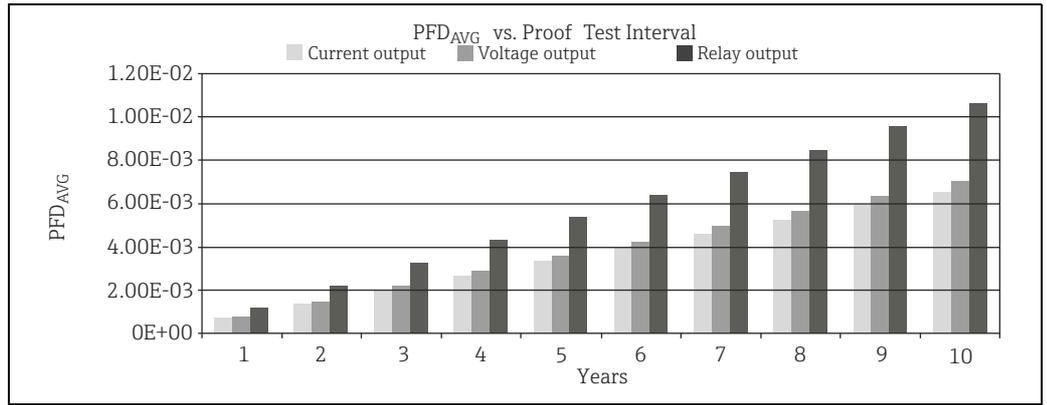
Functional safety parameters The table shows specific parameters relating to functional safety:

Parameter as per IEC 61508	Value, version 1	Value, version 2	Value, version 3
Protection function	Current output 1 input	Current output 2 inputs	Voltage output 1 input
SIL	2	2	2
HFT	0	0	0
Device type	B	B	B
Operating mode	Low demand mode	Low demand mode	Low demand mode
MTTR	24 hours	24 hours	24 hours
Recommended proof-test interval T_1	1 year	1 year	1 year
SFF	84.4 %	84.9 %	84.6 %
λ_{SD}	0 FIT	0 FIT	0 FIT
λ_{SU}	0 FIT	0 FIT	0 FIT
λ_{DD}	559 FIT	841 FIT	584 FIT
λ_{DU}	103 FIT	149 FIT	106 FIT
λ_{Total}^{*1}	662 FIT	990 FIT	690 FIT
$PF_{D_{avg}}$ (for $T_1 = 1$ year) *2	4.51×10^{-4}	6.53×10^{-4}	4.64×10^{-4}
MTBF *1	95 years	58 years	89 years
Fault reaction time *3	0.4 s / 5 s (RTD)	0.4 s / 5 s (RTD)	0.4 s / 5 s (RTD)

Parameter as per IEC 61508	Value, version 4	Value, version 5	Value, version 6
Protection function	Voltage output 2 inputs	Limit relay 1 input	Limit relay 2 inputs
SIL	2	2	2
HFT	0	0	0
Device type	B	B	B
Operating mode	Low demand mode	Low demand mode	Low demand mode
MTTR	24 hours	24 hours	24 hours
Recommended proof-test interval T_1	1 year	1 year	1 year
SFF	82.4 %	73.9 %	75.08 %
λ_{SD}	0 FIT	0 FIT	0 FIT
λ_{SU}	0 FIT	453 FIT	604 FIT
λ_{DD}	751 FIT	106 FIT	125 FIT
λ_{DU}	160 FIT	197 FIT	242 FIT
λ_{Total}^{*1}	911 FIT	756 FIT	971 FIT
$PF_{D_{avg}}$ (for $T_1 = 1$ year) *2	7.01×10^{-4}	8.63×10^{-4}	1.06×10^{-3}
MTBF *1	60 years	80 years	57 years
Fault reaction time *3	0.4 s / 5 s (RTD)	0.4 s / 5 s (RTD)	0.4 s / 5 s (RTD)

*1	This value takes into account all failure types. Failure rates of electronics components in accordance with Siemens SN29500. (see "Management summary - optional")
*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. For further information, see "Management summary - optional".
*3	Time between fault detection and fault reaction. The time is max. 0.4 seconds. When RTD is used as the input signal the time to detect an open circuit is max. 5 seconds

Proof-test interval



Proof-test interval depending on the PFD_{avg}

Dangerous undetected failures in this scenario

An incorrect output signal that deviates from the actual measured value by more than 1%, whereby the output signal is still within the range of 4 to 20 mA, is considered to be a dangerous undetected failure.

Operating life of electrical components

The underlying failure rates of electrical components apply within the usable operating life in accordance with IEC 61508-2:2010, Section 7.4.7.4, Note 3.

The operating life span of the device is mainly determined by the electrolytic capacitors and the ambient temperature. Due to the use of high-class capacitors the life span is 20 years assuming an average ambient temperature of 40 °C. With higher ambient temperatures the life span is shorter.

Behavior of device when in operation or in the event of a fault

The behavior during operation and in the event of a fault is described in the Operating Instructions BA00272R/09.

Installation

Installation, wiring and commissioning of the device are described in the Operating Instructions BA00272R/09.

All relay outputs which are used in a safety function must be protected by a 2 A fuse in order to prevent the contacts from being damaged. As an alternative a circuit breaker with thermal-magnetic curve or electronic limiting or a circuit breaker with trigger characteristic "Z" can be used.

Orientation

The permitted orientation of the device is described in Operating Instructions BA00272R/09.

Operation

Device behavior when switched on

The device runs through a diagnostic phase of maximum 20 seconds after it is switched on. During this time, the current output is set to error current ≤ 3.6 mA, the voltage output to 0 V and the limit relays are de-energized.

Communication via the PC interface is not possible during this diagnostic phase.

The output signal can only be viewed as safe on successful completion of the diagnostic function.

Behavior of device in the event of alarms or warnings

Analog output:

A fault exists at the output when the assigned input or maths channel delivers an error status. Failsafe mode of the output can be configured. The following options can be configured:

Setting	Current output	Voltage output
Min	< 3.6 mA (3.5 mA) ¹⁾	0 V
Max	> 21 mA (22 mA) ¹⁾	11 V

1) actual output value

Limit relay:

A fault exists when the assigned input or maths channel delivers an error status. The limit relays are de-energized in the event of a fault.

Alarm and warning messages:

The alarm and warning messages output in the form of error codes are additional information and are not part of the safety function.

The following table shows the connection between the error code and input current / voltage:

Error code*	Meaning	Input current	Input voltage
F041	Sensor/cable open circuit	$\leq 2 \text{ mA}$	
F045	Sensor error	$2 < x \leq 3.6 \text{ mA}$ $\geq 21 \text{ mA}$	
F101	Range undershoot	$\geq 2 \text{ mA}$ $> 3.6 \text{ mA} \leq 3.8 \text{ mA}$ (as per Namur)	$< 1 \text{ V}$
F102	Range overshoot	$> 20.5 \text{ mA} < 21 \text{ mA}$ (as per Namur) $\geq 21 \text{ mA}$ (as per Namur)	$> 11 \text{ V}$

*) The error codes are listed in the Operating Instructions BA00272R/09, Section 9.2.1 Device malfunction.

Device setup

When the device is used in a PLT safety functions the device setup must meet the following requirements:

1. Confirmation concept:
Proven independent checking of set safety-related parameters
2. Locking concept:
Device locking after finished device setup (as demanded by IEC 61511-1 §11.6.4 and NE 79 §3)

Device setup procedure

Device setup is described in the Operating Instructions BA00272R/09

Permissible parameter settings

For some parameters only certain settings are permitted. If one of these parameters is set to an impermissible setting, safe operation of the device cannot be guaranteed.

Function group (menu mapping)	Parameter and setting
Expert → Input → Analog In 1/2 → Failure mode	Invalid
Expert → Application → Calc value 1/2 → Failure mode	Invalid
Expert → Output → Analog output 1/2 → Failure mode	Min Max
Expert → Input → Analog In 1/2 → Namur	On
Expert → Output → Relay 1/2 → Operating mode	norm closed (relay opens when the set point is violated; default setting)
Expert → Output → Relay 1/2 → Failure mode	norm closed (relay opens in the event of a fault; default setting)
Expert → Diagnostics → Simulation → Simulation AO1/ 2	Off
Expert → Diagnostics → Simulation → Simu relay 1/2	Off

Check

NOTICE

Check of the complete safety function is required

- ▶ When all parameters have been set, the safety function must be checked before locking the device! E.g. using the parameter "Simulation" (→ Operating Instructions BA00272R/09 "Simulation").
- ▶ When the device is used as part of a safety function, the complete safety function must be checked when the device has been changed, e.g. altered parameter setting.

Locking

CAUTION

Setup of the device must be locked

- ▶ When all parameters have been set and the safety function been checked, the device must be locked since changing the measurement system or parameters could be impaired. (→ Section 6.4.6 Operating Instructions BA00272R/09 "Access protection").

Locking the device has to be realized in the following way:

- The device has to be protected from unauthorized changes:
User Code protects the set parameters (as in Step 6, → p. 30 in BA00272R/09): Enter 4-digit code: Choose digit with '+' or '-' and confirm the individual digits with 'E'; when the digit has been confirmed, the cursor jumps to the next digit or, after the fourth digit, back to the menu item 'System'.
The lock symbol is displayed.
- Setup → System → Overfill protect: Select German WHG.



Parameter setup using FieldCare PC software via CDI interface requires changing the device status, i.e. WHG must be deactivated in order to change parameters.

Maintenance

No special maintenance work is required on the device.

Proof tests

Safety functions must be tested at appropriate intervals to ensure that they are functioning correctly and are safe.

The intervals must be specified by the operator.

The "Proof-test interval depending on the PFDavg" graphic (→  11) can be used for this purpose.

The device proof test can be performed as follows:

Procedure for proof test

1. Bypass the logic unit or take other suitable measures to prevent an unwanted reaction in the process.
2. Simulate several defined limit values across the entire range and verify that the output or the limit relays go to a safe state.
3. Restore the complete operational capability of the loop.
4. Disable bypassing of the logic unit or restore normal operation in some other way. This test detects approx. 99% of all possible " λ_{DU} " (dangerous undetected) failures of the RIA45 panel meter.



The device may no longer be used as part of a safety-instrumented system if one of the criteria of the test procedures described above is not fulfilled.

The proof test is used to detect random device failures. It does not cover the influence of systematic faults on the safety function, which must be checked separately. Operating conditions or corrosion, for example, can cause systematic faults.

Repair

Repair

All repairs to the device must be carried out by Endress+Hauser only.

Please read the information in the Section "Return" of the appropriate Operating Instructions.



In the event of failure of a SIL-labeled E+H device, which has been used in a safety-instrumented system, the "Declaration of Hazardous Material and De-contamination", with the corresponding note "Used as SIL device in a Safety Instrumented System", must be enclosed when the defective device is returned.

You will find the "Declaration of Hazardous Material and De-contamination" in the Appendix at the end of this functional safety manual.

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	
Password (if device-specific)	
Signature	

Device-specific commissioning parameters		
Empty value		
Full value		
Proof test protocol		
Test stage	Analog output / Limit relay	
	Set point	Actual value
Jumper current input	Current: <3,6 mA or > 21 mA Voltage: 0.0 V or 11.0 V Relay: de-energized	
Connect multimeter (accuracy class 1) to current/voltage output		
Impress a current value of x mA on current input		
Read the current/voltage value at the output and record it (set point e.g. x mA +/- 0.1 mA)		

Declaration of Hazardous Material and De-Contamination

Endress+Hauser 

People for Process Automation

Declaration of Hazardous Material and De-Contamination *Erklärung zur Kontamination und Reinigung*

RA No.

Please reference the Return Authorization Number (RA#), obtained from Endress+Hauser, on all paperwork and mark the RA# clearly on the outside of the box. If this procedure is not followed, it may result in the refusal of the package at our facility.

Bitte geben Sie die von E+H mitgeteilte Rücklieferungsnummer (RA#) auf allen Lieferpapieren an und vermerken Sie diese auch außen auf der Verpackung. Nichtbeachtung dieser Anweisung führt zur Ablehnung ihrer Lieferung.

Because of legal regulations and for the safety of our employees and operating equipment, we need the "Declaration of Hazardous Material and De-Contamination", with your signature, before your order can be handled. Please make absolutely sure to attach it to the outside of the packaging.

Aufgrund der gesetzlichen Vorschriften und zum Schutz unserer Mitarbeiter und Betriebseinrichtungen, benötigen wir die unterschriebene "Erklärung zur Kontamination und Reinigung", bevor Ihr Auftrag bearbeitet werden kann. Bringen Sie diese unbedingt außen an der Verpackung an.

Type of instrument / sensor
Geräte-/Sensortyp _____

Serial number
Seriennummer _____

Used as SIL device in a Safety Instrumented System / *Einsatz als SIL Gerät in Schutzeinrichtungen*

Process data/ *Prozessdaten* Temperature / *Temperatur* _____ [°C]

Pressure / *Druck* _____ [Pa]

Conductivity / *Leitfähigkeit* _____ [S]

Viscosity / *Viskosität* _____ [mm²/s]

www.addresses.endress.com

Endress+Hauser 

People for Process Automation