ACT20X-(2)SAI-(2)HAO
HART transparent current output isolator

Safety Manual

Weidmüller

1.1 Revision history

Version	Date	Change
00	04/2014	First Edition
01	11/2017	Products added

1.2 Validity

This manual is valid for the following products:

Device version	Type	Order number
2	ACT20X-SAI-HAO-S	8965450000
2	ACT20X-2SAI-2HAO-S	8965460000
2	ACT20X-SAI-HAO-P	2456160000
2	ACT20X-2SAI-2HAO-P	2456170000

1.3 Contact address

Weidmüller Interface GmbH & Co. KG
Klingenbergstraße 16
32758 Detmold
Germany

T +49 5231 14-0
F +49 5231 14-292083
www.weidmueller.com

Table of contents

2. Observed standards

Standard	Description
IEC 61508	Functional safety of electrical / electronic / programmable electronic safety-related systems
IEC 61508-2:2000	Part 2: Requirements for electrical / electronic / programmable electronic safety-related systems

3. Acronyms and abbreviations

Acronym / Abbreviation	Designation	Description
Element		Term defined by IEC 61508 as “part of a subsystem comprising a single component or any group of components that performs one or more element safety functions”.
PFD	Probability of Failure on Demand	This is the likelihood of dangerous safety function failures occurring on demand.
PFH	Probability of dangerous Failure per Hour	The term “Probability” is misleading, as IEC 61508 defines a rate.
SFF	Safe Failure Fraction	Safe Failure Fraction summarizes the fraction of failures which lead to a safe state and the fraction of failures which will be detected by diagnostic measures and lead to a defined safety action.
SIF	Safety Integrity Function	Function that provides fault detection (to ensure the necessary safety integrity for the safety functions).
SIL	Safety Integrity Level	The international standard IEC 61508 specifies four discrete safety integrity levels (SIL 1 to SIL 4). Each level corresponds to a specific probability range regarding the failure of a safety function.

4. Purpose of the product

The ACT20X-SAI-HAO is an one channel, the ACT20X-2SAI-2HAO is a two channel HART transparent, galvanic isolator of 4...20 mA current signals between hazardous areas and non-classified areas.

The device can be mounted in the safe areas and in Zone 2 / Division 2 and drive a 4...20 mA current signal into Zone 0, 1, 2, 20, 21, 22 and mines or Class I/II/III, Division 1, Group A-G. Error events, including cable breakage, are monitored and signaled via the individual status relay.

The FDT/DTM software can be used to show the actual process value and alter the set point for high and low limit. The ACT20X-(2)SAI-(2)HAO has been designed, developed and certified for use in SIL 2 applications according to the requirements of IEC 61508.

5. Assumptions and restrictions for use of the product

5.1 Basic safety specifications

Operational temperature range:	-20...+60 °C
Storage temperature range:	-20...+85 °C
Power supply type:	Double or reinforced
Supply voltage:	19.2...31.2 V DC
Mounting area:	Zone 2 & Class I, Division 2 or safe area
Mounting environment:	Pollution degree 2 or better, Overvoltage category II

5.2 Safety accuracy

The analogue output corresponds to the applied input within the safety accuracy.

Safety accuracy:	±2 %

5.3 Analogue output

The connected safety valve or other, shall be able to detect and handle the fault indications from the analogue output of the ACT20X-(2)SAI-(2)HAO driver by having a NAMUR NE43-compliant input circuit.

5.4 Failure rates

The basic failure rates from the Siemens standard SN 29500 are used as the failure rate database. Failure rates are constant; wear-out mechanisms are not included. External power supply failure rates are also not included.

5.5 Installation in hazardous areas

The IECEx installation drawing, ATEX installation drawing and FM installation drawing shall be followed, if the products are installed in or connected to hazardous areas.

6. Functional specification of the safety functions

Galvanic isolation of 4...20 mA current signals, between hazardous areas and non-classified areas or Zone 2, Division 2, within the specified accuracy.

7. Functional specification of the non-safety functions

The status relay (terminal 53 and 54) and LED outputs are not suitable for use in any Safety Instrumented Function. The displayed value in the FDT/DTM software and any possible parameterization by the FDT/DTM software does not affect the safety function of the ACT20X-(2)SAI-(2)HAO. Also the HART transparency of the device is not a safety function.

8. Safety parameters

Safety parameter	Ex output SIL2
Proof-test interval (T_{proof}), (10 % of loop PFD)	5 years
Safe Failure Fraction (SFF)	85 %
Demand mode	High
Demand rate	(see note 1)
Mean Time To Repair (MTTR)	24 h
Hardware Fault Tolerance (HFT)	0
Component type	A (see note 2)
SIL capability	SIL 2
Description of the “safe state”	Output ≤ 3.6 mA or output ≥ 21 mA

Note 1: Depends on detection time in external controller. If detection time is xx seconds, the demand rate shall be 100 times xx seconds.

Note 2: Simple device (type A) where microprocessors and software have no effect on safety output.

PFD_{AVG}			PFH (see note 1)
T_{proof} = 1 year	T_{proof} = 2 years	T_{proof} = 5 years	
2.29×10^{-4}	4.37×10^{-4}	1.06×10^{-4}	$4.8 \times 10^{-8}\ h^{-1}$

PFD_{AVG} = Average Probability of Failure on Demand

PFH = Probability of dangerous Failure per Hour

Note 1: The ACT20X-(2)SAI-(2)HAO contains no lifetime limiting components, therefore the PFH figures are valid for up to 12 years, according to IEC 61508.

9. Failure category SIL 2

Failure rates according to IEC 61508	
Total failure rate for dangerous detected failures (λ_{DD})	127 FIT
Total failure rate for dangerous undetected failures (λ_{DU})	48 FIT
Total failure rate for all safe failures (λ_{Safe})	164 FIT

FIT = 10^{-9} h^{-1} (Failure in time)

10. Hardware and software configuration

All configurations of software and hardware versions are fixed from factory and cannot be changed by end-user or reseller.

This manual only covers products labeled with the product version (or range of versions) specified on the front page.

11. Periodic proof test procedure

Step	Action
1	Bypass the safety PLC or take other appropriate action to avoid a false trip.
2	Connect a simulator identical to the input setup.
3	Apply input value corresponding to 0/100 % output range to each channel.
4	Observe whether the output channel acts as expected.
5	Restore the input terminals to full operation.
6	Remove the bypass from the safety PLC or otherwise restore normal operation.

This test will detect approximately 95 % of possible “DU” (dangerous undetected) failures in the pulse isolator. The proof test is equivalent to the functional test.

12. Procedures to repair or replace the product

Any failures that are detected and that compromise functional safety should be reported to the sales department at Weidmüller Interface GmbH & Co. KG.

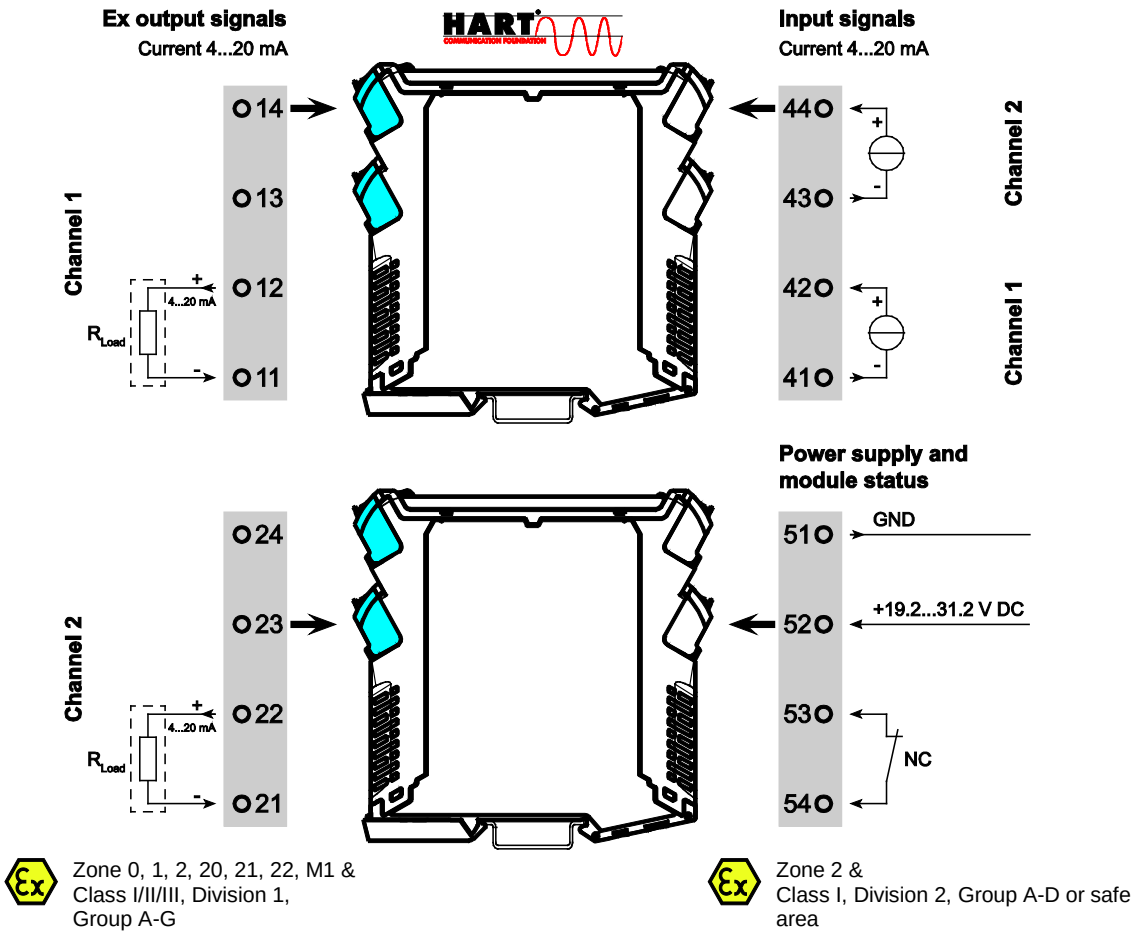
Repair of the device and replacement of circuit breakers must be done by Weidmüller Interface GmbH & Co. KG only.

13. Maintenance

No maintenance required.

14. Connection diagram

14.1 Application



14.2 Electrical connections

Terminal	Function		Connector
11	Out –		Ex output channel 1
12	Out +		
13			
14			
21	Out –		Ex output channel 2
22	Out +		
23			
24			
41	In –		input channel 1
42	In +		
43	In –		input channel 2
44	In +		
51	19.2…31.2 V ⎓ 3 W	GND	power supply
52		+	
53	NC		status relay
54	COM		

www.weidmueller.com

Weidmüller Interface GmbH & Co. KG
Klingenbergstraße 16
32758 Detmold
Germany
T +49 5231 14-0
F +49 5231 14-292083
www.weidmueller.com

Order Number:
1482850000/01/11.2017