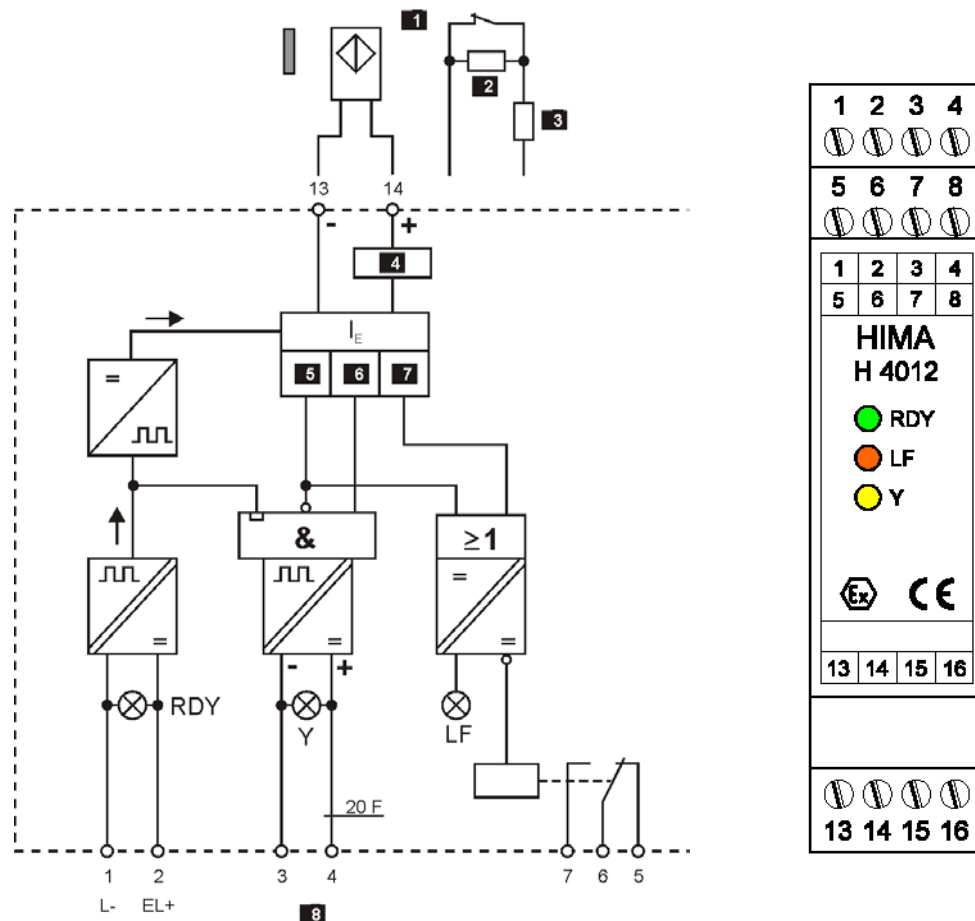




## H 4012: (Ex)i Switching Amplifier, Safety-Related

- With galvanic separation.
- For proximity switches in accordance with DIN EN 60947-5-6 (NAMUR) and mechanical contacts.
- With short-circuit and open-circuit monitoring.

The module is TÜV-tested for SIL 3 in accordance with IEC 61508.



- |   |                                      |
|---|--------------------------------------|
| <b>1</b> Proximity switch or mechanical contact | <b>5</b> > 5.1 mA                    |
| <b>2</b> 12 kΩ                                  | <b>6</b> > 2.9 mA                    |
| <b>3</b> 1 kΩ                                   | <b>7</b> < 0.2 mA                    |
| <b>4</b> approx. 8.2 V                          | <b>8</b> Output, short-circuit-proof |

Figure 1: Block Diagram and Front View of H 4012

The module is tested in accordance with:

- IEC 61508, Part 1 - 7:2010
- IEC 61511:2016
- EN 50156-1:2015
- EN 60664-1:2007
- EN 50178:1997 VDE 0160
- EN 298:2012
- NFPA 85:2015
- NFPA 86:2015

The device may be used in environments meeting the requirements of the following standards:

- EN 61000-6-2:2005
- EN 61000-6-7:2015
- EN 61326-3-1:2008
- EN 61326-3-2:2008

The module evaluates the signal from a safety-related proximity switch. In the event of a short-circuit, the output is de-energized. If a mechanical contact is used instead of a proximity switch, the mechanical contact must be connected on site with the specified resistor.

The following applies for applications in accordance with EN 298 and EN 61326-3-1:

If the H 4012 device module is located in a control cabinet and is fed with an external 24 VDC power supply from a DC network, the H 7013 filter must be installed directly near the power distributor and connected.

## Specifications

Specifications of H 4012	
Type of protection	[EEx ia] IIC or [EEx ia] IIB Proximity switch in accordance with DIN EN 60947-5-6 safety-tested such as: P+F (...SN), or mechanical contact with resistor combination 1 k $\Omega$ / 12 k $\Omega$ (0.25 W) or 1 k $\Omega$ / 10 k $\Omega$ (0.25 W)
Operating voltage	24 VDC, -15 ... +20 %, $r_p \leq 5\%$
Current consumption	40 mA (idle)
Switching time Y	Approx. 1 ms
Reset time Y	Approx. 3 ms
Switching time LF	Approx. 5 ms
Reset time LF	Approx. 10 ms
Output	Voltage: $\leq 33$ V Current: $\leq 40$ mA
Contact circuit	Voltage: $\leq 30$ V Current: $\leq 1$ A
Ambient temperature	-25...+60 °C
Degree of protection	IP20
Power dissipation	0.9...2.5 W

Table 1: Specifications

The switching amplifier features protective separation of the inputs, outputs and supply voltage in accordance with DIN EN 50178. The air and creepage distances are designed for overvoltage category II up to 300 V.

The module is associated electrical equipment, which must be installed outside the area with explosive atmosphere. The sensor for energizing the module may be mounted in the area with explosive atmosphere.

### Intended Use in Ex Zones



Use of H 4012 as associated equipment	
Group, category, type of protection	 II (1)G [EEx ia] IIC
EC Type Test Certificate	EX5 99 07 19183 029 X
Installation in Ex Zone 2	
Group, category, type of protection	 II 3G Ex nA nC IIC T4 Gc
Type Test Certificate	TÜV 14 ATEX 7558 X
IECEx Certificate of Conformity	IECEx TUR 14.0037 X

Table 2: Intended Use in Ex Zones


Marking	Description
	Explosion protection marking complying with the relevant directive.
II	Equipment group, for all areas with explosive atmosphere, other than underground mines.
(1)G	Equipment category, for use outside the area with explosive atmosphere, with impact up to zone 0.
(2)G	Equipment category, for use outside the area with explosive atmosphere, with impact up to zone 1.
3G	Equipment category, for use in areas in which explosive gas atmosphere is unlikely to occur or, if it does occur, will persist for a short period only.
Ex	Explosion protection complying with the relevant standard.
ia, ib	Type of protection intrinsic safety.
nA	Type of protection for non-sparking equipment.
nC	Type of protection for sparking, sealed equipment.
IIB	Gas group for explosive gas atmospheres, typical gas is ethylene.
IIC	Gas group for explosive gas atmospheres, typical gas is hydrogen.
T4	Temperature class T4, with a maximum surface temperature of 135 °C.
Gc	Equipment protection level, it corresponds to ATEX equipment category 3G.

Table 3: Ex Marking Description

Function Table

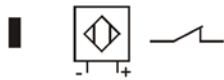





Input 13, 14	Output resistor R <sub>A</sub> Input current I <sub>E</sub>	Output Y	Contact 6, 7	LED LF
	R <sub>A</sub> = 1.8...0.9 kΩ I <sub>E</sub> = 2.9...4.3 mA	LED on		LED off
	R <sub>A</sub> ≥ 23 ... 2.9 kΩ I <sub>E</sub> ≤ 0.35 ... 2.1 mA	LED off		LED off
	R <sub>A</sub> < 600 Ω I <sub>E</sub> > 5.1 mA	LED off		LED on
	R <sub>A</sub> > 40 kΩ I <sub>E</sub> < 0.2 mA	LED off		LED on

Table 4:    Function Table

The current values, I<sub>E</sub>, refer to the rated 8.2 V open-circuit voltage.

The Y output is safety-related, the relay output for line faults (LF) is not safety-related.

The RDY LED (RDY = Ready) indicates the applied operating voltage.

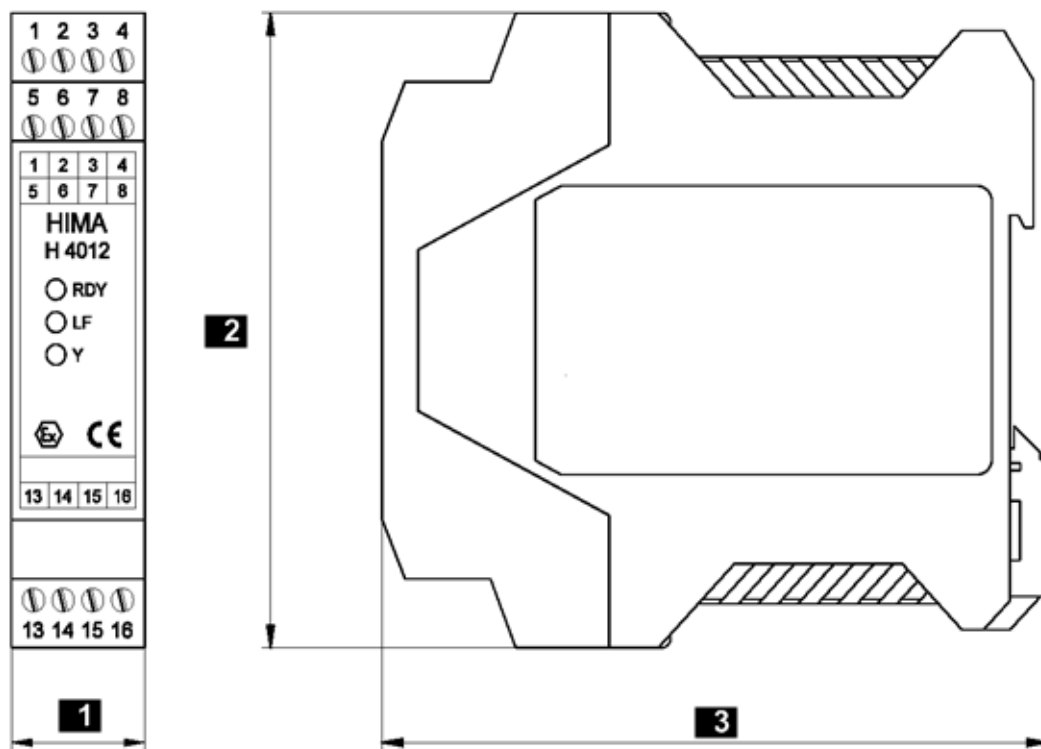
Relay Data

Switching voltage	≥ 10 mV ≤ 30 VDC / VAC
Switching current	≥ 10 μA ≤ 1 A
Switching capacity AC	≤ 30 VA, cos j > 0.5
Switching capacity DC	≤ 30 W
Remark: With inductive loads, suitable measures such as the use of free-wheeling diodes must be implemented to prevent induction voltages when de-energizing the relay.	
Lifetime	
mechanical	> 1 x 10 <sup>8</sup> switching operations
electrical	> 5 x 10 <sup>5</sup> switching operations

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- If safety tested proximity switches are used, the manufacturer's specifications and notices must be observed.
- Functionally and in terms of safety, the signal from a proximity switch may not be switched on the inputs of two modules.
- Proximity switches in accordance with DIN EN 60947-5-6 with 390 Ω (0.25 W) series resistor may be used for non-safety-related applications.

## Mechanical Design and Dimensions



**1** Width: 22.5 mm

**2** Height: 99 mm

**3** Depth: 114.5 mm

Figure 2: Mechanical Design and Dimensions

Terminal cross-section	0.25...2.5 mm <sup>2</sup>
Tightening torque	0.5...0.6 Nm
Stripping length	7 mm
Type of mounting	On 35 mm DIN rail (DIN)
Mounting Position	Horizontal or vertical
Mounting distance	Not required

# 1 Operating Instructions

## 1.1 Use

The device is suitable for supplying and evaluating proximity switches in accordance with DIN EN 60947-5-6 (NAMUR) or mechanical contacts with resistor circuit. The proximity switches or mechanical contacts may be installed in areas with explosive atmosphere as of zone 1.

## 1.2 Electrical Data Concerning Intrinsic Safety

The intrinsically safe input circuit is safely separated from the other circuits up to a 375 V peak value.

Description	Value
Input circuit	
Voltage for each input circuit, $U_o$	Up to 9 VDC
Current for each input circuit, $I_o$	Up to 11 mA DC
Power for each input circuit, $P_o$	Up to 25 mW
Effective internal capacitance for each input circuit, $L_i$	Negligible
Effective internal inductance for each input circuit, $L_i$	Negligible
EEx ia IIC	
Maximum connectable inductance for an input circuit	$L_o = 300 \text{ mH}$
Maximum connectable capacitance for an input circuit	$C_o = 8 \text{ }\mu\text{F}$
Maximum connectable inductance for two input circuits connected in parallel	$L_o = 70 \text{ mH}$
Maximum connectable capacitance for two input circuits connected in parallel	$C_o = 8 \text{ }\mu\text{F}$
EEx ia IIB	
Maximum connectable inductance for an input circuit	$L_o = 1 \text{ H}$
Maximum connectable capacitance for an input circuit	$C_o = 80 \text{ }\mu\text{F}$
Maximum connectable inductance for two input circuits connected in parallel	$L_o = 280 \text{ mH}$
Maximum connectable capacitance for two input circuits connected in parallel	$C_o = 80 \text{ }\mu\text{F}$

Table 5: Electrical Specifications Concerning Intrinsic Safety

Results when inputs 13 and 14 of two devices are connected in parallel:

$$I_o = 2 \times 11 \text{ mA} = 22 \text{ mA}$$

$$P_o = 2 \times 25 \text{ mW} = 50 \text{ mW}$$

## 1.3 Mounting

The following points must be taken into account when mounting the module:

- The device must be mounted outside the area with explosive atmosphere.
- If compliance with the special conditions is ensured, the device may be mounted in zone 2.

## 1.4 Installation

Observe the following points:

- The electrical device (as associated equipment), including its connected components, must be installed to ensure compliance with the requirements for degree of protection IP20 or higher in accordance with EN 60529:1991 + A1:2000.
- Two input circuits of two H 4012 devices may be connected in parallel. In such cases, the reduced maximum values must be observed (see EC Type Test Certificate, EX5 99 07 19183 029 X).
- A distance of  $\geq 50$  mm (arcing distance) must be ensured between intrinsically safe and non-intrinsically safe terminals, in particular between adjacent devices.
- A distance of  $\geq 6$  mm (arcing distance) must be ensured between terminals of adjacent, intrinsically safe circuits.
- Intrinsically safe and non-intrinsically safe lines must be separated, or the intrinsically safe lines must be additionally insulated.
- Intrinsically safe lines must be marked, e.g., using a light blue color (RAL 5015) for the insulation.
- The wiring must be mechanically protected to guarantee that the minimum distance between intrinsically safe and non-intrinsically safe connection (DIN EN 50020, Table 4) is not violated due to accidental disconnection.

The wires in use must comply with the following insulation test voltages:

- Intrinsically safe wires  $\geq 1000$  VAC
- Non-intrinsically safe wires  $\geq 1500$  VAC
- If fine wires are used, suitable measures must be implemented to prevent the wire ends from fanning out. The terminals must be suitable for fastening the cross-sections of the wires in use.

**Adequate knowledge of the relevant standards for installation in zone 2 is required.**

The relevant standards must be observed, in particular:

EN 60079-0:2012 (DIN EN 60079-0 VDE 0170-1:2014-06)	General requirements, gas and dust
EN 60079-15: 2010 (DIN EN 60079-15 VDE 0170-16:2011-02)	Zone 2, type of protection "n"
EN 60079-14: 2014 (DIN EN 60079-14 VDE 0165-1:2014-10)	Standard for operators, gas and dust

### 1.4.1 Special Conditions for Installation in Zone 2

The following additional points must be observed for installing the device in zone 2:

- To ensure compliance with category 3G, the device must be installed in an enclosure that fulfils the requirements of the EN/IEC 60079-15 with degree of protection IP54 or better.
- The enclosure must be able to safely handle the maximum power dissipation.
- Work is only permitted in the de-energized state. Exception: If a potentially explosive atmosphere has been precluded, work can also be performed when the device is under voltage.

**1.5 Proof Test**

The user must ensure that SIL 3 applications in accordance with IEC 61508 are subject to a functional test (proof test) in intervals of no longer than 10 years (proof test interval).

The required proof test can be performed on site without removing the device.

**1.6 Repair**

Components may only be repaired or replaced by the manufacturer in accordance with the valid standards and the TÜV requirements.

**1.7 Certificate and Declaration of Conformity**

The certificate and declaration of conformity are available on the HIMA website, at [www.hima.com](http://www.hima.com).