



SAFETY
NONSTOP



H 4007: (Ex)i Switching Amplifier in Terminal Housing

For controlling intrinsically safe valves and supplying intrinsically safe transmitters.

The module is suitable for passively connecting safety-related outputs (SIL 1 to SIL 4) without impairing their safety class.

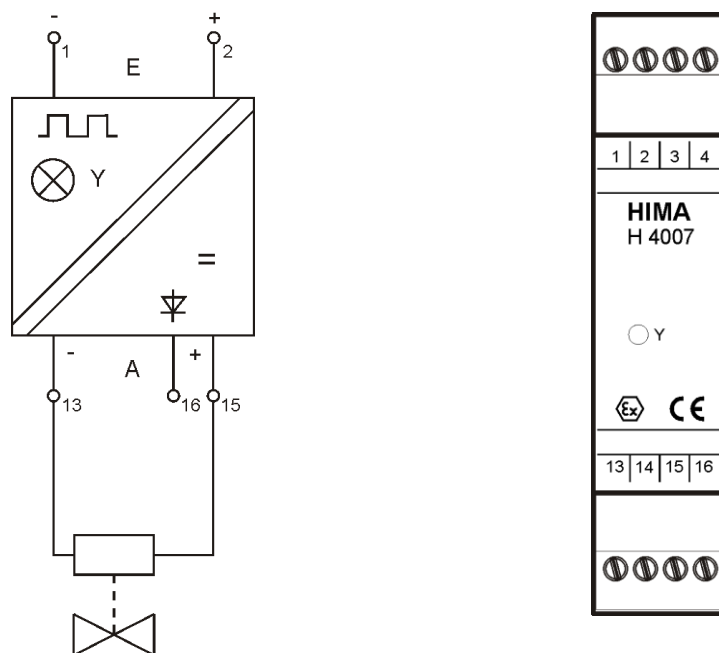


Figure 1: Block Diagram and Front View of H 4007

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

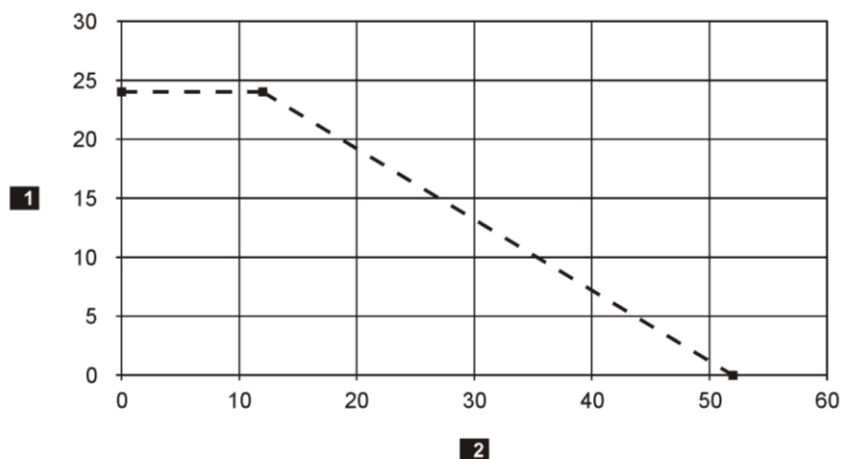
Specifications

Specifications of H 4007	
Operating voltage	24 VDC, -15...+20 %
Current consumption	40...110 mA (load-dependent)
Output	Voltage outputs 24 V, current limited (short-circuit-proof)
Open-circuit voltage	24 V
Short-circuit current	52 mA (short-circuit-proof)
Vertex	24 V at 12 mA
Rated output voltage	19 V at 20 mA
Output voltage curve	See diagram Output Characteristic Curve of the H 4007 Module
Switching time	approx. 15 ms
Reset time	35...270 ms (load-dependent)
Ambient temperature	-25...+50 °C
Degree of protection	IP20
Power dissipation	0.7...2.1 W (load-dependent)

Table 1: Specifications

The switching amplifier features safe separation between input and output in accordance with EN 50178. The air and creepage distances are designed for overvoltage class II up to 300 V.

Output Characteristic Curve of the H 4007 Module



1 Voltage in Volt

2 Current in mA

Figure 2: Output Characteristic Curve of the H 4007 Module

The electrical characteristics of the valves must be below the characteristic curve of the H 4007 module.

Intended Use in Ex Zones

Use of H 4007 as associated equipment	
Group, category, type of protection	Ex II (2)GD [EEx ib] IIC
EC Type Test Certificate	EX5 02 11 19183 038
Installation in Ex Zone 2	
Group, category, type of protection	Ex II 3G Ex nA IIC T4 Gc
Type Test Certificate	TÜV 14 ATEX 7558 X
IECEx Certificate of Conformity	IECEx TUR 14.0037 X

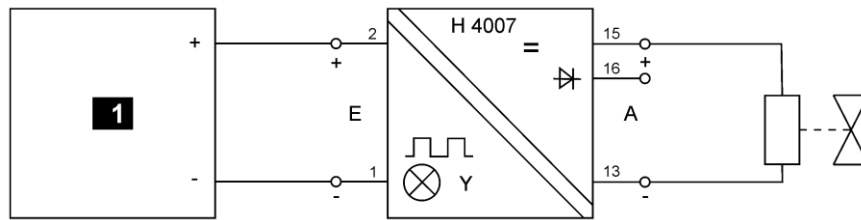
Table 2: Intended Use in Ex Zones

Marking	Description
Ex	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

Wiring Variants for the H 4007 Module

- Standard wiring (valve control)

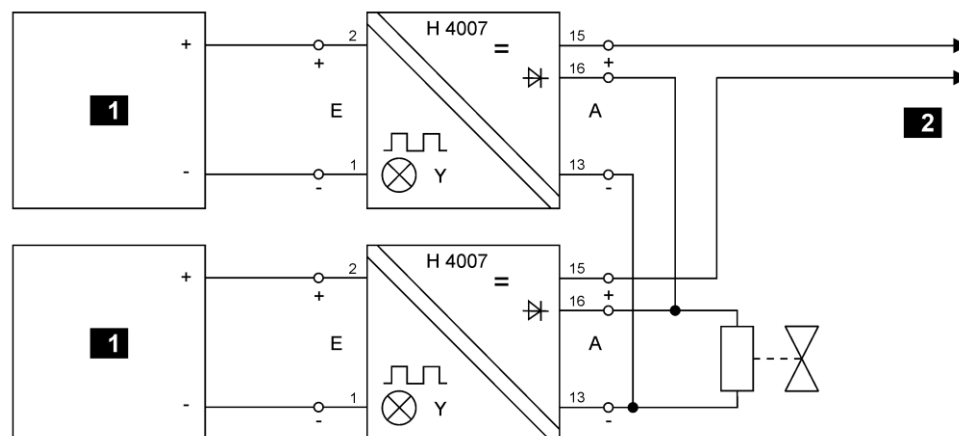


1 Control, e.g., with:

- F 3330 (SIL 3)
- 22 100 (SIL 4)
- F35 (SIL 3)

Figure 3: Standard Wiring (Valve Control)

- Redundant wiring (valve control)



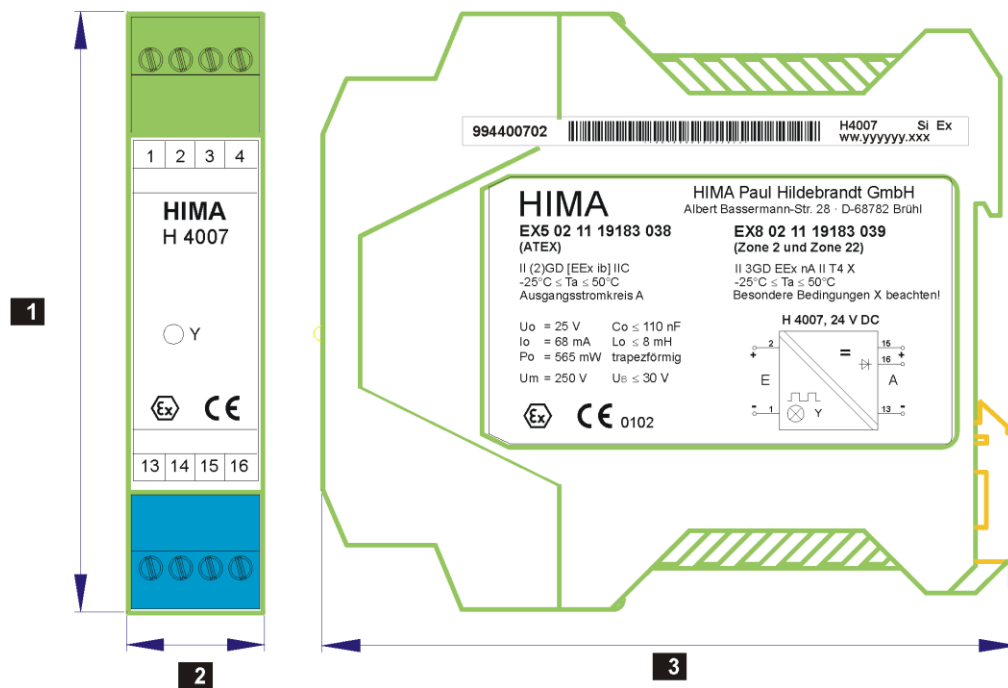
1 Control, e.g., with:

- F 3330 (SIL 3)
- 22 100 (SIL 4)
- F35 (SIL 3)

2 To redundancy evaluation

Figure 4: Redundant Wiring (Valve Control)

Mechanical Design and Dimensions



1 Height: 99 mm

2 Width: 22.5 mm

3 Depth: 114.5 mm

Figure 5: Mechanical Design and Dimensions

Terminal cross-section	0.25...2.5 mm ² (with wire end ferrule)
Tightening torque	0.5...0.6 Nm
Stripping length	7 mm

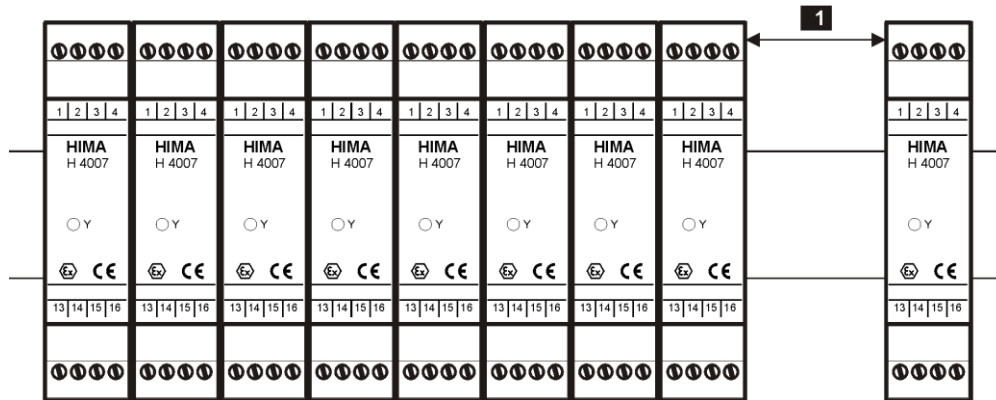
Mounting the H 4007 Module

The H 4007 module is mounted on a 35 mm DIN rail. The module may be installed horizontally or vertically.

The horizontal mounting position should be preferred for thermal reasons. A mounting distance is mandatory (see Figure 6).

Mounting on Horizontal DIN Rail

In groups of eight, with 20 mm distance between each group.

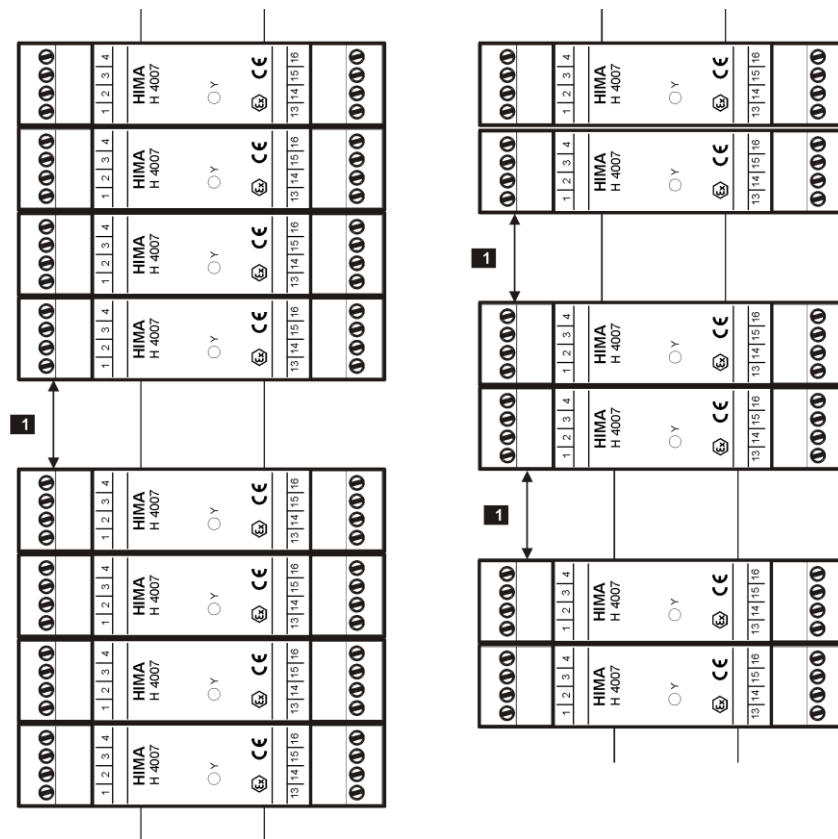


1 Mounting distance: 20 mm

Figure 6: Mounting on Horizontal DIN Rail

Mounting on Vertical DIN Rail

- In groups of four, with 20 mm distance between each group.
- With an output current of $I_a > 35 \text{ mA}$ ($R_{\text{Load}} < 300 \Omega$), in groups of two with 20 mm distance between each group.



1 Mounting distance: 20 mm

Figure 7: Mounting on Vertical DIN Rail

1 List of Suitable (Ex)i Solenoid Valves

The list does not claim to be complete. All specifications are without guarantee; the data sheets provided by the relevant manufacturer are mandatory.

1.1 Safety-Related (Ex)i Solenoid Valves

(Up to SIL 4 in accordance with IEC 61508)

Manufacturer	Type	Minimum torque values	
		U _{on}	I _{on}
Eugen Seitz (pilot valves)	11 G 52		
	121.11.01	13 V	16 mA
	121.11.02	15 V	12 mA
	121.11.03	14 V	16 mA
	121.113.23	14 V	16 mA
	PV 12F73 Ci oH		
	133.288.00	14 V	2.2 mA
	PV 12F73 Xi oH		
	127.991.00	6.4 V	1.5 mA
Norgren Herion (direct operated valves)	PV 12F73 Xi oH-2		
	128.319.00	7 V	4.4 mA
	2001, 2002	22 V 5 V ¹⁾	40 mA ¹⁾
¹⁾ Non-reset values			

Table 4: Safety-Related (Ex)i Solenoid Valves

1.2 (Ex)i Solenoid Valves

Manufacturer	Type	Minimum torque values	
		U _{on}	I _{on}
ASCO Joucomatic (direct operated valves)	IMXX (ISSC, WPIS)	21.6 V 11 V ¹⁾	28 mA ¹⁾
Bürkert (pilot valves)	0590 5470 6516/6517 6518/6519 8640	10.4 V	29 mA
	6106	10.8 V	30 mA
Norgren Herion (pilot valves)	2032	8.2 V	34 mA
	2033	9.0 V	30 mA
	2034	10.0 V	27 mA
	2035	11.5 V	25 mA
	2036	13.0 V	23 mA
	2037	14.4 V	21 mA
	2038	15.9 V	19 mA
Norgren Herion (pilot valves)	LPV (E/P converter)		
	2080, 2082	5 V	1 mA
	2081, 2083	10 V	2.7 mA
	2084	4 V	1.6 mA
Parker Lucifer (pilot valves)	482160 482870	10.7 V	29 mA
Parker Lucifer (direct operated valves)	492965	13 V 10 V ¹⁾	20 mA ¹⁾
Samson (pilot valves)	E/P binary converter 3701, 3962, 3963, 3964, 3776, 3766 and 3767	9.4 V 18 V	1.43 mA
Telektron (pilot valve)	V525011L00	12 V	8 mA
¹⁾ Non-reset values			

Table 5: (Ex)i Solenoid Valves

2 Operating Instructions

2.1 Use

The module is suitable for controlling Ex valves and supplying Ex measuring transmitter (0/4...20 mA). These valves or transmitters may be installed in areas with explosive atmosphere (zone 1 and higher).

NOTICE



Devices installed in zone 0 may **not** be energized.

The outputs must **not** be supplied with external voltage. The module may **not** be used as associated equipment if it has been previously operated in a general electrical plant.

Additionally, all applications other than those described in this document are **not** allowed.

2.2 Electrical Data Concerning Intrinsic Safety

Safe separation of the intrinsically safe output circuit from the supply and input circuit is ensured for a nominal voltage with a maximum 375 V peak value.

Description	Value
Output circuit	
Voltage for each output circuit, U_O	Up to 25 VDC
Current for each output circuit, I_O	Up to 68 mADC
Power for each output circuit, P_O	Up to 565 mW
Characteristic curve	Trapezoidal
Effective internal capacitance for each output circuit, C_i	Negligible
Effective internal inductance for each output circuit, L_i	Negligible
EEx ib IIC	
Max. connectable inductance for an output circuit	$L_O = 8 \text{ mH}$
Max. connectable capacitance for an output circuit	$C_O = 110 \text{ nF}$
Maximum connectable inductance for two output circuits connected in parallel	$L_O = 1.9 \text{ mH}$
Maximum connectable capacitance for two output circuits connected in parallel	$C_O = 110 \text{ nF}$
EEx ib IIB	
Max. connectable inductance for an output circuit	$L_O = 30 \text{ mH}$
Max. connectable capacitance for an output circuit	$C_O = 840 \text{ nF}$
Maximum connectable inductance for two output circuits connected in parallel	$L_O = 8 \text{ mH}$
Maximum connectable capacitance for two output circuits connected in parallel	$C_O = 840 \text{ nF}$

Table 6: Electrical Data Concerning Intrinsic Safety

Results when two outputs are connected in parallel:

$$I_O = 2 \times 68 \text{ mA} = 136 \text{ mA}$$

$$P_O = 2 \times 565 \text{ mW} = 1.13 \text{ W}$$

2.3 Mounting

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

- The module must be mounted outside the area with explosive atmosphere.
- If compliance with the special conditions is ensured, the module may be mounted in zone 2 and zone 22.

2.4 Installation

Observe the following points:

- The electrical module (as associated equipment), including its connected components, must be installed to ensure compliance with the requirements for degree of protection IP20 or better in accordance with EN 60529:1991 + A1:2000.
- Two output circuits of two H 4007 modules may be connected in parallel. In such cases, the reduced maximum values must be observed (see EC Type Test Certificate, EX5 02 11 19183 038).
- A distance of ≥ 50 mm (arcing distance) must be ensured between intrinsically safe and non-intrinsically safe terminals, in particular between adjacent modules.
- A distance of ≥ 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 ≥ 1000 VAC
- Non-intrinsically safe wires ≥ 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 cables in use.

Adequate knowledge of the relevant standards for installation in zone 2 and zone 22 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 60079-11: 2012 (DIN EN 60079-11 VDE 0170-7: 2012-06)	Intrinsic safety "i"
EN 60079-15: 2010 (DIN EN 60079-15 VDE 0170-16: 2011-02)	Zone 2, type of protection "n"
EN 60079-31: 2010/2014 (DIN EN 60079-31 VDE 0170 15-1: 2014-12)	Zone 2x, dust ignition protection "t"
EN 60079-14: 2014 (DIN EN 60079-14 VDE 0165-1: 2014-10)	Standard for operators, gas and dust

2.4.1 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 in use 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.

2.4.2 Special Conditions for Installation in Zone 22

The following additional points must be observed for installing the device in zone 22:

- The device may only be operated in zones with explosive dust if the device is installed in a suitable enclosure.
- See, e.g., EN 60079-31.
- This enclosure requires degree of protection IP54 or, in case of moist, conductive dust, IP6X. The operator must perform the necessary measurements and tests in accordance with EN 60079-31.

2.5 Start-Up

Proper installation, in particular the connections of the intrinsically safe circuits, must be tested by an explosion protection expert prior to starting up the module for the first time.

2.6 Maintenance

If failures occur, the defective module must be replaced with a module of the same type or with an approved replacement model.

To replace the module, just remove the plugs. Detaching the wires from the plugs is not necessary.

i

To prevent mistakes, remove the plugs from only one module at the same time.

2.7 Repair

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

2.8 Certificates and Declarations of Conformity

The certificates and declarations of conformity are available on the HIMA website, at www.hima.de and www.hima.com.

