

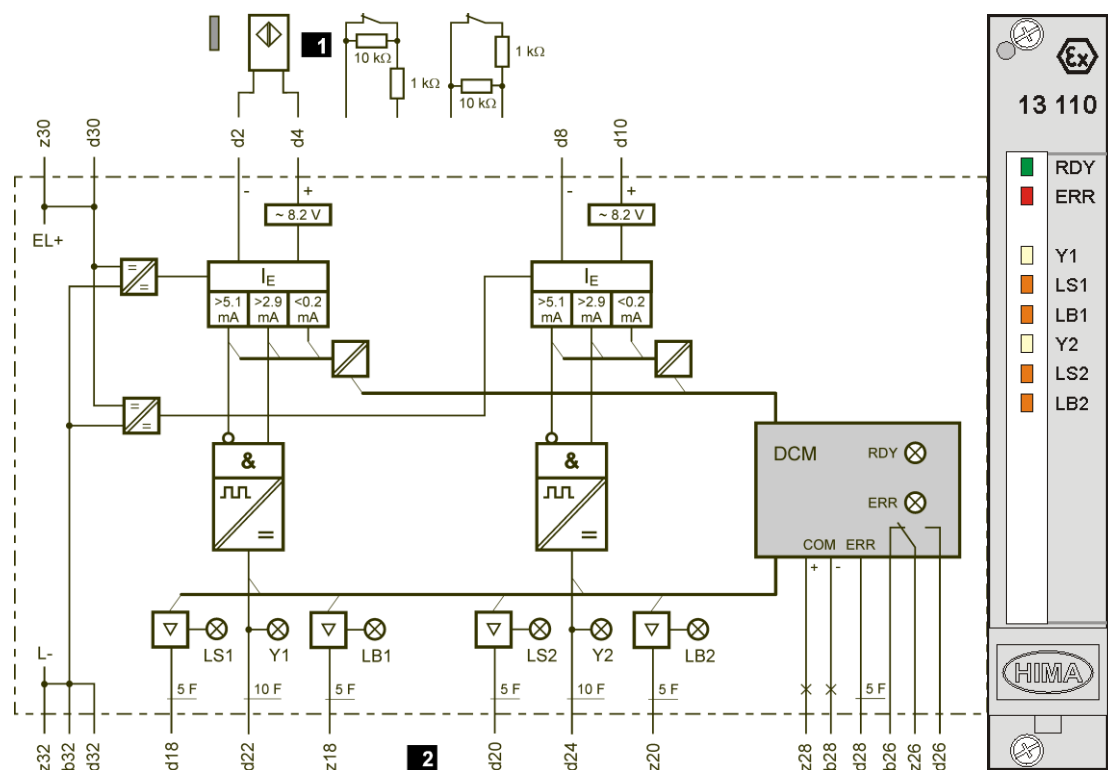


13 110: Input Module (Ex)i

- **Safety-related**
- With galvanic separation
- 2 channels, with short-circuits and open-circuits monitoring

The module is TÜV-tested for SIL 4 in accordance with IEC 61508.

EU Type Test Certificate TÜV 16 ATEX 7865 X.



Proximity switch or mechanical contacts
with resistors (see inputs)

Outputs are short-circuit-proof

Figure 1: Block Diagram

The module evaluates the signal from a safety-tested proximity switch and reports open-circuits and short-circuits. If a mechanical contact is used instead of a proximity switch, the mechanical contact must be connected on site with the specified resistors.

Outputs Y1...Y2 are safety-related. The outputs for short-circuits (LS1...LS2) and open-circuits (LB1...LB2) are not safety-related, but they can be grouped to a collective message on a signal bar.

Inputs	Proximity switches in accordance with DIN EN 60947-5-6 (VDE 0660-212), Safety-tested, and designed for: <ul style="list-style-type: none"> ▪ P+F proximity switches with safety function (...SN), ▪ Proximity switches with no safety function (i.e., not SN), with external wiring. ▪ Proximity switches with resistors 1 kΩ / 10 kΩ (0.25 W). ▪ BARTEC resistive coupling element 1 kΩ / 10 kΩ (type 17-9Z62-0002).
Switching time Y1, Y2	Approx. 2 ms
Reset time Y1, Y2	Approx. 4 ms
Operating data	24 VDC / 75 mA
Space requirement	3 RU, 4 HP

The switching amplifier features **protective separation** of the inputs or supply voltage from the outputs in accordance with EN 50178 (VDE 0160). The air and creepage distances are designed for overvoltage category II up to 300 V.

For (Ex)i use, a coding pin on connector d6 must be used for the subrack's female connector. 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.

Function Table

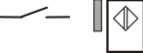

Inputs		Outputs		
		Y1, Y2	LS1, LS2	OC1, OC2
$R_A = 23.0 \dots 2.9 \text{ k}\Omega$ $I_E = 0.35 \dots 2.1 \text{ mA}$		⊗	⊗	⊗
$R_A = 1.8 \dots 0.9 \text{ k}\Omega$ $I_E = 2.9 \dots 4.3 \text{ mA}$		●	⊗	⊗
$R_A < 600 \Omega$, $I_E > 5.1 \text{ mA}$ (LS)		⊗	●	⊗
$R_A > 40 \text{ k}\Omega$, $I_E < 0.2 \text{ mA}$ (LB)		⊗	⊗	●
The current values, I_E , refer to the rated 8.2 V open-circuit voltage. ⊗ LED off ● LED on				

Table 1: Function Table

All the module functions are monitored by a microcontroller.

If a malfunction occurs, the ERR LED is lit, output d28 is on 1-signal and relay contact z26-d26 opens.

Output z28-b28 is intended for connecting to the communication module, e.g., for transferring data to a distributed control system (DCS).

RDY (Ready) indicates the applied voltage ($\geq 20 \text{ V}$).

Notice

Functionally and in terms of safety, the signal from a proximity switch may not be switched on two inputs.

Use of Proximity Switches with No Safety Function

The safety-related Planar4 input modules are designed for connecting to safety-tested P+F proximity switches (SN).

This results in values for switching point and detection of short-circuits that differ from those of the DIN EN 60947-5-6. If proximity switches with no safety function (i.e., not SN) are used, these differences may cause an unintended behavior.

The planner is responsible for properly matching proximity switches with no safety function. To this end, the instructions and specifications of the manufacturer and the DIN EN 60947-5-6 standard must be observed.

Unintended Behavior in Connection with Short-Circuit Detection

When a proximity switch with no safety function is switched on, the flowing current is sufficient to cause the safety-related Planar4 input modules to detect a short-circuit. As a workaround, an adjustable resistor must be connected in series (e.g., 390 Ω , 0.25 W).

The responsible planner must calculate and test this serial adjustable resistor specifically for the corresponding proximity switch family.

Unintended Behavior in Connection with Switching Point On

When a proximity switch with no safety function is switched on, it does not provide the current required to switch on the safety-related Planar4 input modules (2.9 mA). As a workaround, an adjustable resistor must be directly connected in parallel to the proximity switch with no safety function.

The responsible planner must calculate and test this parallel adjustable resistor specifically for the corresponding proximity switch family.

Example

Increasing the NAMUR output to safely switch on the Planar4 inputs.

When a NAMUR output of a proximity switch is switch on, it provides 2.6 mA, but the Planar4 input module need 2.9 mA. Direct connection of a coiled 8.2 k Ω (1 % / 0.25 W) metal film resistor in parallel to the NAMUR output increases the flowing current to 2.9 mA.

The connected adjustable resistor does not impair functional safety.

Communication via Modbus

Reading of Variables

Type BOOL: Function code 1

Type WORD: Function code 3

Events: Function codes 65, 66, 67

Relative address	Data type	Value	Description	Relative event no.
0	WORD	12 H	Module type 13 110	
1	BOOL	0	None	
2	BOOL	1	Module removed	
3	BOOL	1	Communication with module not ok	
4	BOOL	1	Module in slot, communication ok	
5	BOOL	1	Operating voltage too low, no RDY	
6	BOOL	1	Module fault, ERR	
7	BOOL	1	Current in input circuits not ok, LS, LB	
8...40	BOOL	0	None	
41	BOOL	1	1-signal at output d22 Y1	24
42	BOOL	1	1-signal at output d24 Y2	25
43...48	BOOL	0	None	

Table 2: Module Status via Modbus

Value: 0 always has the opposite meaning
H: Hexadecimal value

Absolute address: $A = p * 256 + \text{relative address}$

Absolute event no.: $E = (p - 1) * 32 + \text{relative event no.}$
p = Slot no. in the subrack

Reading of All Variables

Function code 3, 84 WORDS

Starting with address 2000 H, 3000 H or 4000 H

	WORD 0 (16-bit)		WORD 1 (16-bit)		WORD 2 (16-bit)		WORD 3 (16-bit)	
Relative address	0	8...1	24...17	16...9	40...33	32...25		48...41
Data	Module type	Module status	None	None	None	None	None	Outputs

For error-free data transfer, all 84 WORDS must be read. This ensures that the variables of all the modules within a subrack are transferred. 0 is transferred for unused module slots.

Communication via PROFIBUS DP

Reading of Variables

Relative addresses of WORD and BYTE type

WORD	Bit	BYTE	Bit	Value	Description
0	0...7	0	0...7	12 H	Module type 13 110
	8	1	0	0	None
	9		1	1	Module removed
	10		2	1	Communication with module not ok
	11		3	1	Module in slot, communication ok
	12		4	1	Operating voltage too low, no RDY
	13		5	1	Module fault, ERR
	14		6	1	Current in input circuits not ok, LS, LB
	15		7	0	None
1...2		2...5		0	None
3	0	6	0	1	1-signal at output d22 Y1
	1		1	1	1-signal at output d24 Y2
	2...7	7	2...7	0	None
	8...15		0...7	0	None

Table 3: Module Status via PROFIBUS DP

Value: 0 always has the opposite meaning
H: Hexadecimal value

Absolute address WORD: $W = 4 * (p - 1) + \text{relative address}$

Absolute address BYTE: $B = 8 * (p - 1) + \text{relative address}$

p = Slot no. in the subrack

(1) **EU-TYPE EXAMINATION CERTIFICATE**

- (2) Equipment and Protective Systems intended for use in Potentially Explosive Atmosphere - **Directive 2014/34/EU**
- (3) EU-Type Examination Certificate Number

TÜV 16 ATEX 7865 X


Issue: 00

- (4) Equipment: **Planar 4, Module 13 110**
- (5) Manufacturer: **HIMA Paul Hildebrandt GmbH**
- (6) Address: **Albert-Bassermann-Str. 28
68782 Brühl, Germany**
- (7) This product and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.
- (8) The TÜV Rheinland Zertifizierungsstelle für Explosionsschutz of TÜV Rheinland Industrie Service GmbH, Notified Body No. 0035 in accordance with Article 21 of the Council Directive 2014/34/EU of 26th February 2014, certifies this product which has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmosphere, given in Annex II to the Directive.
- The examination and test results are recorded in the confidential report 557/Ex7865.00/16
- (9) Compliance with the Essential Health and Safety Requirements, with the exception of those listed in the schedule of this certificate, has been assessed by reference to:
- EN 60079-0: 2012+A11:2013 EN 60079-11: 2012**
- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.
- (11) This EU-Type Examination Certificate relates only to the design and specification for construction of the equipment or protective system. It does not cover the process for actual manufacture or supply of the equipment or protective system, for which further requirements of the directive are applicable.
- (12) The marking of the equipment shall include the following:

**II (1) G [Ex ia Ga] IIC**

TÜV Rheinland, Zertifizierungsstelle für Explosionsschutz

Cologne, 2017-04-21



Dipl.-Ing. Andreas Maschke

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(13)

Annex

(14)

EU Type Examination Certificate

TÜV 16 ATEX 7865 X

Issue: 00

(15) Description of equipment

15.1 Equipment and type:

Planar 4, Module 13 110

15.2 Description / Details of Change

General product information

The electronic module of type 13 110 is a 2-channel isolation amplifier for the transmission of control signals from the intrinsically safe circuit, type of protection "Ex ia", to the non-intrinsically safe output circuits. The module was assessed to meet the requirements of an associated apparatus [Ex ia Ga].

The permissible range of ambient temperature is -25°C up to +70°C.

Accessories: Subrack 90 901 and 90 911

Technical Data

Power supply: 24V DC (-15%, +20%) $U_m = 40V$
(Terminals +: z30, d30; -: z32, b32, d32)

Control circuits: [Ex ia Ga] IIC
(Terminals d2 and d4, d8 and d10)
 $U_o = 9V$
 $I_o = 11mA$
 $P_o = 25mW$

The maximum permissible values of the external capacitance and inductance of a single control circuit as well as of two circuits connected in parallel are shown in the following table:

Ex	single circuit		parallel connection	
	IIC	IIB	IIC	IIB
C_o	4.9 μF	40 μF	4.9 μF	40 μF
L_o	300 mH	1000 mH	80 mH	290 mH

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Output circuits: 16....33V DC, 20mA per circuit $U_m = 40V$
(Terminals d18, d22, z18, d20, d24, z20, d28, all outputs refer to -)

Communication circuits:
Terminals z28, b28
 $U_m = 40V$

Relay outputs:
Terminals b26, d26, z26: $U \leq 30V$ (DC/AC), $I \leq 1A$; $P \leq 30W$, $U_m = 40V$

(16) Test-Report No. 557/Ex7865.00/16

(17) Special Conditions for safe use

1. The module 13110 is an associated apparatus and shall be mounted into an enclosure with ingress protection of at least IP 20 according to EN 60529.
2. Each of the two circuits of one or two electronic modules s may be connected in parallel:
One module: terminal d4 connected to d10
terminal d2 connected to d8
Two modules: terminal d4 connected to d4
terminal d2 connected to d2
3. If the Planar 4 system is intended to be placed in a hazardous area of zone 2, the certificate TÜV 14 ATEX 7554 X and its special conditions shall be considered.
4. The installation instructions of the manual shall be considered.
5. The permissible range of ambient temperature is $-25^{\circ}C$ up to $+70^{\circ}C$.

(18) Basic Safety and Health Requirements

Covered by afore mentioned standard

TÜV Rheinland Zertifizierungsstelle für Explosionsschutz

 Dipl.-Ing. Andreas Maschke

Cologne, 2017-04-21

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