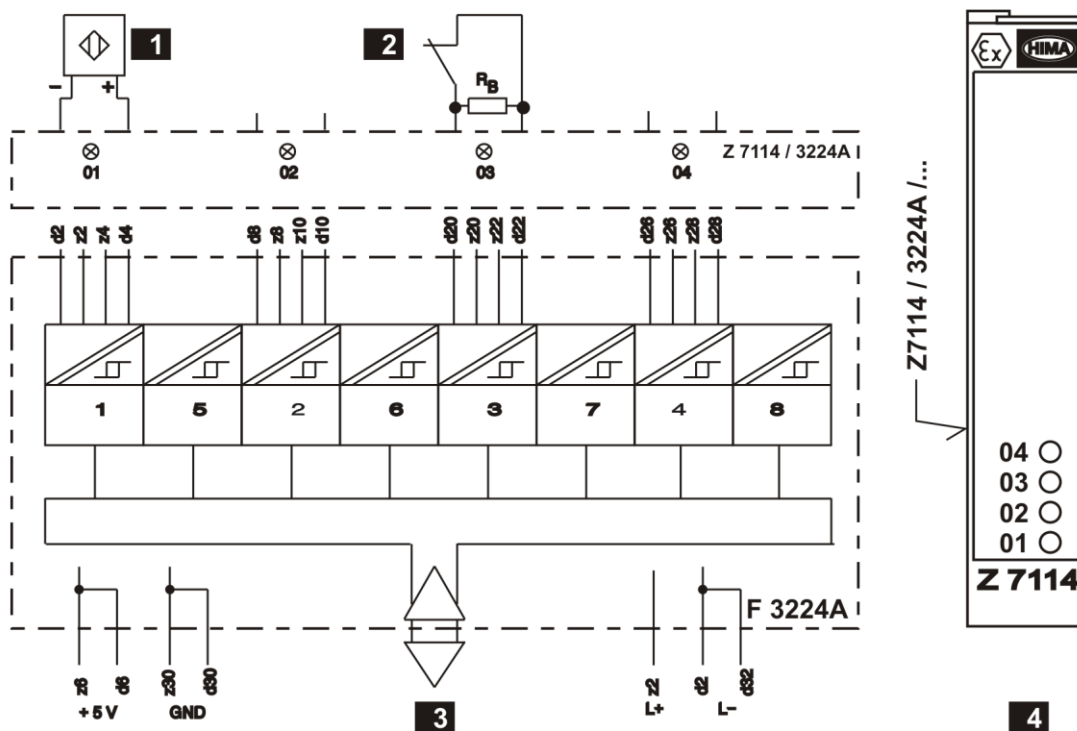




## F 3224A: Input Module (Ex)i

- 4 channels for intrinsically safe circuits (Ex)i, with protective separation.
- Connection of proximity switches in accordance with EN 60947-5-6 (NAMUR) or wired mechanical contacts.
- Open-circuit monitoring (OC).
- EU Type Test Certificate: TÜV 18 ATEX 8168.
- For HIQuad X (SILworX) and HIQuad (ELOP II).



- |                                   |                                 |
|-----------------------------------|---------------------------------|
| <b>1</b> Proximity switch         | <b>3</b> I/O bus                |
| <b>2</b> Wired mechanical contact | <b>4</b> Cable plug, front view |

Figure 1: Module Block Diagram and Cable Plug Front View

## Specifications

Ex category	II (1) GD [Ex ia Ga] IIC, [Ex ia Da] IIIC
Switching point	1.65 mA $\pm$ 0.2 mA (at 8.2 V)
Switching current difference	Approx. 0.2 mA
Switching time	Approx. 10 ms
Proximity switch supply	7.7 ... 9 V
Resistor R <sub>B</sub>	8.2...15 k $\Omega$
Space requirement	4 HP
Current consumption	5 mA at 5 VDC (via backplane) 90 mA at 24 VDC (via backplane)

## Wiring

Refer to Table 1 for the wire color coding of the following cable plugs:

- Cable plug Z 7114/3224/Cx with gray cable.
- Cable plug Z 7114/3224/Ex/Cx with blue cable for intrinsically safe circuits (Ex)i.

Channel	Pin	Color	Connection
1	d2	WH	Cable: LiYY 8 x 0.5 mm <sup>2</sup>
	d4	BN	
2	d8	GN	
	d10	YE	
3	d20	GY	
	d22	PK	
4	d26	BU	
	d28	RD	

Table 1: Wire Color Coding of the Cable Plug Z 7114/3224/...

## Function Table

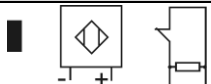
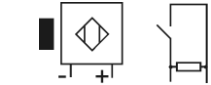
Input state	Input current I <sub>E</sub> in mA	LED	Channel	Open-circuit monitoring
	> 2.1	On	1-signal	1-signal
	< 1.2	Off	0-signal	1-signal
Open-circuit monitoring activation range	0.05 ... 0.35	Off	0-signal	0-signal

Table 2: Function Table

### Open-Circuit Monitoring in ELOP II

With the ELOP II programming tool, channels 5...8 can be configured with variables of type BOOL. Using these variables, open-circuits on the corresponding channels 1...4 can be evaluated in the user program. If an open-circuit occurs, the variable value changes from TRUE to FALSE.

Input channel	Corresponding channel for open-circuit monitoring
1	5
2	6
3	7
4	8

Table 3: Channel Assignment for Open-Circuit Monitoring

## 1 Configuration in SILworX

The module is configured in the Hardware Editor of the SILworX programming tool.

In addition to the measuring values, the system parameters can be evaluated in the user program to diagnose the module or channels. For more information on the statuses and parameters, refer to the tables starting with Chapter 1.1.

To evaluate the system parameters in the user program, they must be assigned to global variables. The necessary steps are to be performed in the detail view of the Hardware Editor.

The following tables present the system parameters for the module in the same order as in the SILworX Hardware Editor.

## 1.1 The Module Tab

The **Module** tab contains the following system parameters:

System parameters	Data type	R/W	Description	
Name	---	W	Module name.	
Noise Blanking	BOOL	W	Noise blanking performed by the system module allowed (activated/deactivated). After a transient fault, the system delays the fault response until the safety time. The user program retains its last valid process value. Default setting: Activated. Refer to the system manual (HI 803 211 E) for more details on noise blanking.	
The following statuses and parameters can be assigned global variables and used in the user program.				
Explicitly Triggered Restart Required	BOOL	R	TRUE	The module must be explicitly required to restart.
			FALSE	<ul style="list-style-type: none"><li>Restart is necessary and the module performs it automatically.</li><li>Module in the STOP state.</li><li>Connection loss.</li></ul>
Background Test Noise Blanking Active	BOOL	R	TRUE	Error detected by a background test.
			FALSE	<ul style="list-style-type: none"><li>No errors detected by the background tests.</li><li>Module in the STOP state.</li><li>Connection loss.</li></ul>
Initialization Active	BOOL	R	TRUE	The module is performing initial tests.
			FALSE	<ul style="list-style-type: none"><li>The initial tests are complete.</li><li>Module in the STOP state.</li><li>Connection loss.</li></ul>
Module OK	BOOL	R	TRUE	No internal fault detected by the system.
			FALSE	<ul style="list-style-type: none"><li>Internal fault detected by the system.</li><li>Module in the STOP state.</li><li>Connection loss.</li></ul>
Module Process Value OK	BOOL	R	TRUE	No channel fault detected by the system.
			FALSE	<ul style="list-style-type: none"><li>At least one channel fault detected by the system.</li><li>Module in the STOP state.</li><li>Connection loss.</li></ul>
Restart on Error Suppressed	BOOL	W	Automatic restart after errors can be suppressed by the user. To cause the automatic restart to be performed after an error, the system parameter must have been set to FALSE for longer than the F-CPU safety time (does not apply to field faults).	
			TRUE	No automatic restart after a module or channel fault.
			FALSE	Automatic restart after a module or channel fault.
Default setting: FALSE				

Table 4: The **Module** Tab in the Hardware Editor

## 1.2 The F 3224A\_1: Channels Tab

The **F 3224\_1: Channels** tab contains the following system parameters for each channel:

System parameters	Data type	R/W	Description	
Channel no.	---	R	Channel number, preset and cannot be changed.	
Channel Value [BOOL] ->	BOOL	R	Binary value in accordance with the switching level LOW (dig) and HIGH (dig).	
			TRUE	Channel energized.
			FALSE	Channel de-energized.
-> Process Value OK [BOOL]	BOOL	R	TRUE	Fault-free channel. No internal fault nor fault on the field side detected. Module initialization successfully completed.
			FALSE	<ul style="list-style-type: none"><li>Faulty channel. Internal fault or fault on the field side detected.</li><li>The initial test has not been completely performed.</li><li>Module in the STOP state.</li><li>Connection loss.</li></ul>
-> Channel OK [BOOL]	BOOL	R	TRUE	Fault-free channel. The channel value is valid.
			FALSE	<ul style="list-style-type: none"><li>Faulty channel.</li><li>Module in the STOP state.</li><li>Connection loss.</li></ul>
Perform Line Diagnosis	[BOOL]	R	Short-circuit monitoring activated or deactivated. Default setting: Activated.	
-> OC [BOOL]	[BOOL]	R	TRUE	Open-circuit.
			FALSE	<ul style="list-style-type: none"><li>No open-circuit.</li><li>Module fault.</li><li>Module in the STOP state.</li><li>Connection loss.</li></ul>

Table 5: Tab **F 3224A\_1: Channels** in the Hardware Editor

Global variables can be assigned to the system parameters with -> and used in the user program. The values of the system parameters without -> must be directly defined.

## 2 Operating Instructions

This chapter describes important aspects when using the module in the HIQuad X and HIQuad system.

### 2.1 Use

The module evaluates proximity switches (in accordance with NAMUR) or wired mechanical contacts in intrinsically safe circuits (Ex)i.

The proximity switches or wired mechanical contacts may be installed in areas with explosive atmosphere in zone 0, 1 or 2.

The connection of a mechanical contact requires a parallel resistor (8.2...15 k $\Omega$ ) directly at the mechanical contact to avoid an open-circuit signal when the contact is open.

#### WARNING



**The inputs must not be supplied with external voltage.**

**The module may no longer be used in (Ex)i applications as associated equipment if it has been previously used in a general electrical plant.**

**All applications other than those described in this document are not allowed!**

### 2.2 Electrical Data Concerning Intrinsic Safety

For these specifications, refer to the Annex to the EU type test certificate TÜV 18 ATEX 8168.

### 2.3 Configuration Notes

If used with intrinsically safe circuits (Ex)i, adjacent F 3224A slots may be equipped with any type of module.

### 2.4 Mounting

The module is mounted in a 19-inch rack. A mounting distance is not mandatory. The rack must be designed to allow dissipation of the generated power.

The module is connected to the intrinsically safe field circuits through cable plug Z 7114.

For further installation instructions, refer to the HIQuad X system manual (HI 803 211 E) or the HIQuad catalog (HI 800 263 E).

## 2.5 Installation

- The module as associated equipment, included its connected components, must be installed to ensure achievement of degree of protection IP20 or better in accordance with EN 60529/IEC 60529.
- Either two intrinsically safe input circuits within a module may be connected in parallel, or an intrinsically safe input circuit within an F 3224A to an intrinsically safe input circuit within another F 3224A. The reduced maximum values (C0, L0) resulting from this wiring must be taken into account (see the EU type examination certificate).
- A distance of  $\geq 50$  mm (arcing distance) must be ensured between external, intrinsically safe and non-intrinsically safe terminals.
- A distance of  $\geq 6$  mm (arcing distance) must be ensured between the external 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 sheath.
- The wiring must be mechanically protected to guarantee that the minimum distance between intrinsically safe and non-intrinsically safe connection (EN 60079-11/IEC 60079-11) 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 finely stranded wires are used, the wire ends must be provided with wire end ferrules. The terminals must be suitable for fastening the cross-sections of the cables in use.

Additionally, the applicable regulations and standards must be observed. In particular, these include:

- EN 60079-14:2014 / IEC 60079-14:2013
- EN 60079-0:2012 + A11:2013 / IEC 60079-0:2011, Revised + Cor.:2012 + Cor.: 2013
- EN 60079-11:2012 / IEC 60079-11:2011 + Cor.:2012
- EN 60947-5-6:2000 / IEC 60947-5-6:1999

## 2.6 Start-Up

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

## 2.7 Maintenance

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

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**i**

Only the manufacturer may repair the modules.

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(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 18 ATEX 8168**

Issue: 00

- (4) Equipment: **HIQuad Module F 3224A**
- (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 26<sup>th</sup> 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/Ex8168.00/18
- (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) GD [Ex ia Ga] IIC  
[Ex ia Da] IIIC**

TÜV Rheinland Zertifizierungsstelle für Explosionsschutz

Cologne, 2018-09-03

Dipl.-Ing. Andreas Maschke

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TÜV Rheinland Industrie Service GmbH TÜV Rheinland Group Am Grauen Stein 51105 Köln  
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www.tuv.com





(13) Annex

(14) **EU Type Examination Certificate**  
**TÜV 18 ATEX 8168** Issue: 00

(15) Description of equipment

## 15.1 Equipment and type:

HIQuad Module F 3224A

## 15.2 Description / Details of Change

## General product information

The module F 3224A is a 4 channel input module for intrinsically safe passive circuits (Ex) i. The module is used as an associated apparatus to evaluate proximity switches (according to NAMUR) or contacts in intrinsically safe circuits (Ex)i. The proximity switches or contacts can be installed in hazardous areas from zone 0 on.

Technical DataAmbient temperature:  $T_a = 0^\circ\text{C} \dots + 60^\circ\text{C}$ 

## Supply circuit UB1:

 $U_n = 20 \dots 30\text{VDC}$  $U_m = 40\text{V}$ 

(terminal z2(L+), d2, d32(L-))

## Supply circuit UB2:

 $U_n = 4.5 \dots 5.5\text{VDC}$  (max. 6VDC) $U_m = 40\text{V}$ (terminal z6, d6(V<sub>DD</sub>), z30, d30(GND))

## Intrinsically safe values for the control circuits,

type of protection

[Ex ia Ga] IIC/IIIB

or

[Ex ia Da] IIIC/IIIB

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circuit 1 (d2, d4), circuit 2 (d8, d10), circuit 3 (d20, d22), circuit 4 (d26, d28)

single circuit:	parallel circuit:
U <sub>o</sub> : 9 V	U <sub>o</sub> : 9 V
I <sub>o</sub> : 10 mA	I <sub>o</sub> : 20 mA
P <sub>o</sub> : 23 mW	P <sub>o</sub> : 46 mW

Maximum allowed external capacitance **or** inductance:

Ex ia / Ex ib	single circuit		parallel circuit	
	IIC	IIB/IIIC/IIIB	IIC	IIB/IIIC/IIIB
L <sub>o</sub>	355 mH	1000 mH	88 mH	355 mH
C <sub>o</sub>	4.9 µF	40 µF	4.9 µF	40 µF

Maximum allowed external capacitance **and** inductance (mixed consideration):

Ex ia / Ex ib	single circuit		parallel circuit	
	IIC	IIB/IIIC/IIIB	IIC	IIB/IIIC/IIIB
L <sub>o</sub>	5 mH	5 mH	5 mH	5 mH
C <sub>o</sub>	940 nF	4.9 µF	900 nF	4.8 µF

(16) Test-Report No. 557/Ex8168.00/18

(17) Special Conditions for safe use

None

(18) Basic Safety and Health Requirements

Covered by afore mentioned standard

TÜV Rheinland Zertifizierungsstelle für Explosionsschutz

Cologne, 2018-09-03

Dipl.-Ing. Andreas Maschke



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