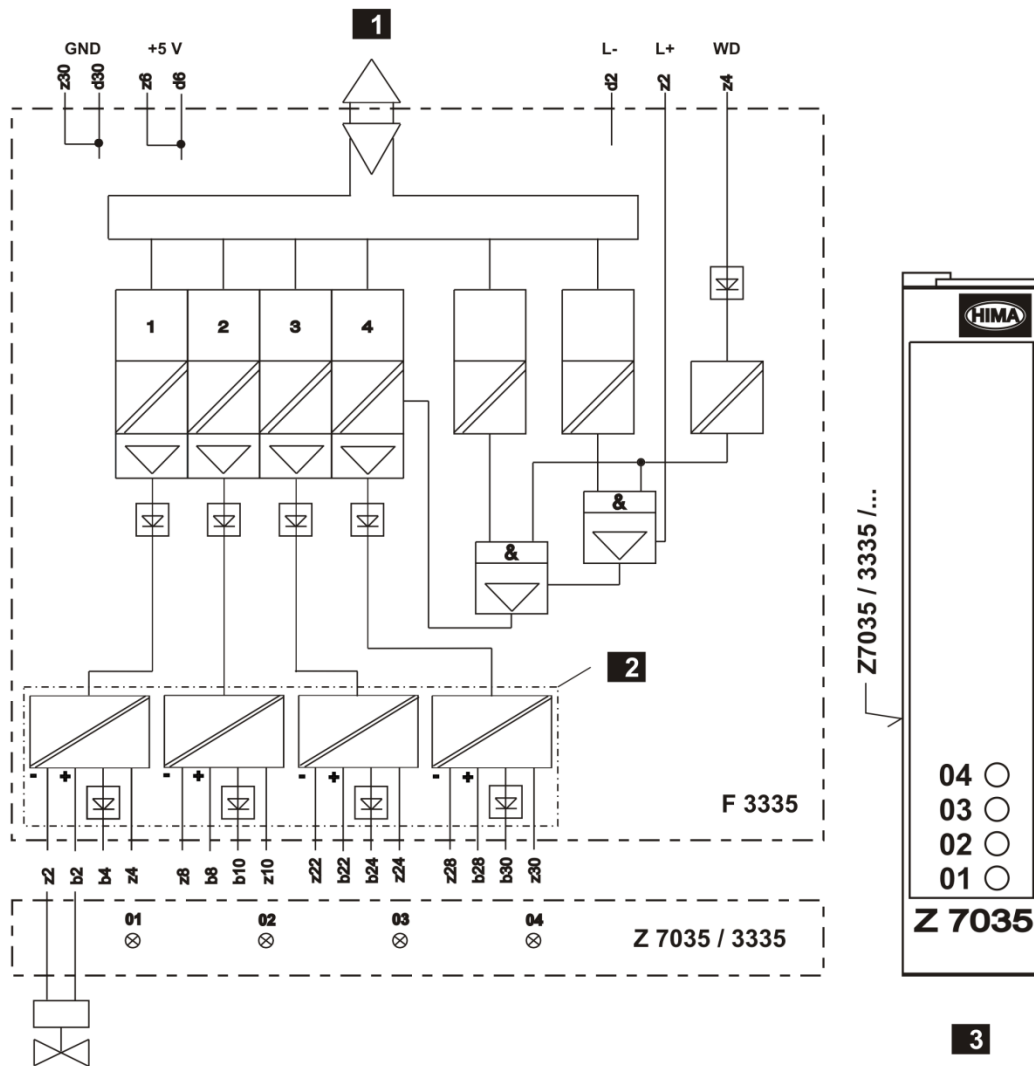




## F 3335: Output Module (Ex)i

**Safety-related**, TÜV-tested in accordance with IEC 61508 for applications up to SIL 3

- 4 channels for controlling intrinsically safe valves and supplying intrinsically safe transmitters.
- 4 voltage outputs 24 V, current limited.
- EU Type Test Certificate: TÜV 18 ATEX 8172.
- For HIQuad X (SILworX) and HIQuad (ELOP II).



**1** I/O bus

**2** Ex separation

**3** Cable plug, front view

Figure 1: Module Block Diagram and Cable Plug Front View

## Specifications

Ex category	II (2) GD [Ex ib Gb] IIC, [Ex ib Db] IIIC
Nominal output voltage	19 V at 20 mA load current
Open-circuit voltage	24 V
Short-circuit current	52 mA (short-circuit-proof)
Vertex	24 V / 12 mA
Switching time	Approx. 15 ms
Reset time	35...270 ms (load-dependent)
Space requirements	4 HP
Current consumption	60 mA at 5 VDC (via backplane) 270...500 mA at 24 VDC (load-dependent) (via backplane)

### i

The module may only be operated with forced cooling through fans K 9203A or K 9212. Systems without forced cooling must be retrofitted with fans as soon as an F 3335 is used.

## Wiring

Refer to the corresponding tables for the wire color coding of the following cable plugs:

- Cable plug Z 7035/3335/Ex/Cx with blue cable (Table 1)
- Redundant cable plug Z 7035/3335/Ex/Cx/Rx with blue cable (Table 2)

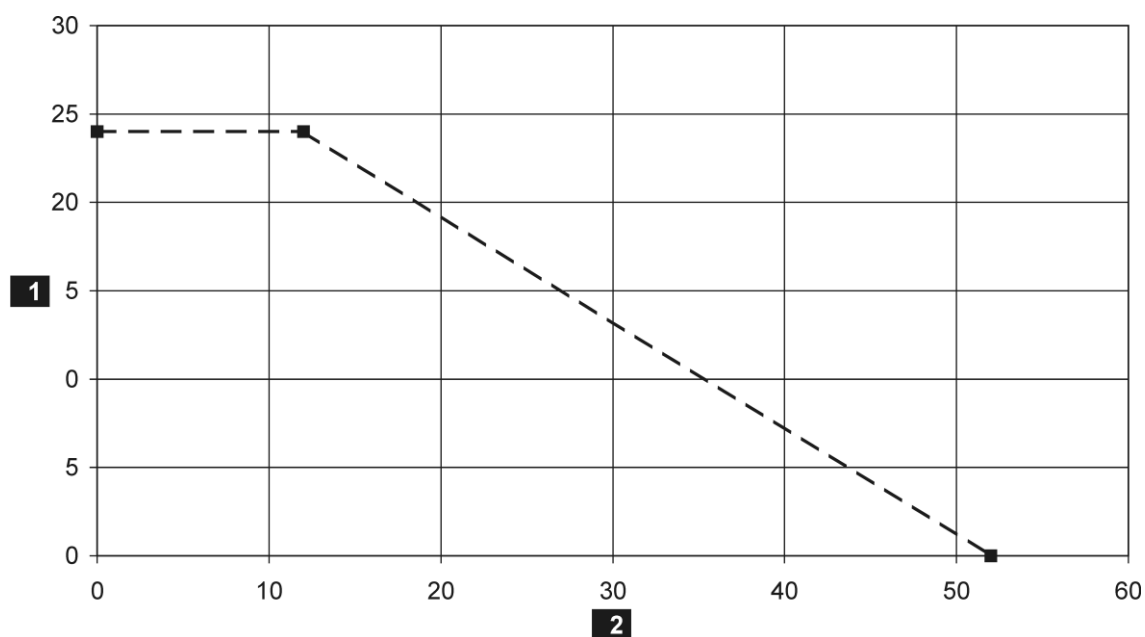
Channel	Pin	Color	Connection
O1-	z2	WH	Cable: LiYY 8 x 0.5 mm <sup>2</sup>
O1+	b2	BN	
O2-	z8	GN	
O2+	b8	YE	
O3-	z22	GY	
O3+	b22	PK	
O4-	z28	BU	
O4+	b28	RD	

Table 1: Wire Color Coding of the Cable Plug Z 7035/3335/Ex/Cx

Channel	Pin	Color	Connection
O1-	z2	WH	Cable: LiYY 8 x 0.5 mm <sup>2</sup>
OR1+	b4	BN	
O2-	z8	GN	
OR2+	b10	YE	
O3-	z22	GY	
OR3+	b24	PK	
O4-	z28	BU	
OR4+	b30	RD	

Table 2: Wire Color Coding of the Cable Plug Z 7035/3335/Ex/Cx/Rx

## Output Characteristic Curve of the F 3335 Module



**1** Voltage in Volt

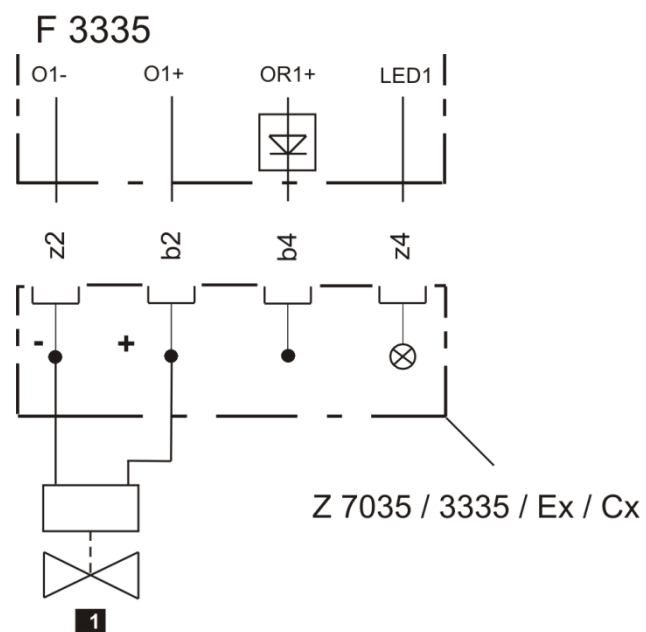
**2** Current in mA

Figure 2: Output Characteristic Curve of the F 3335 Module, 12 mA Vertex

The electrical characteristics of the solenoid valves must always be below the characteristic curve of the F 3335 module.

## One-Channel Wiring of the Module (Valve Control)

Cable plug Z 7035/3335/Ex/Cx must be used for 1-channel operation on the outputs.



**1** Module 1, Channel 1

Figure 3: One-Channel Wiring of the Module (Valve Control)

## Redundant Wiring of the Module (Valve Control)

For redundant operation, cable plug Z 7035/3335/Ex/Cx/R must be used on the outputs.

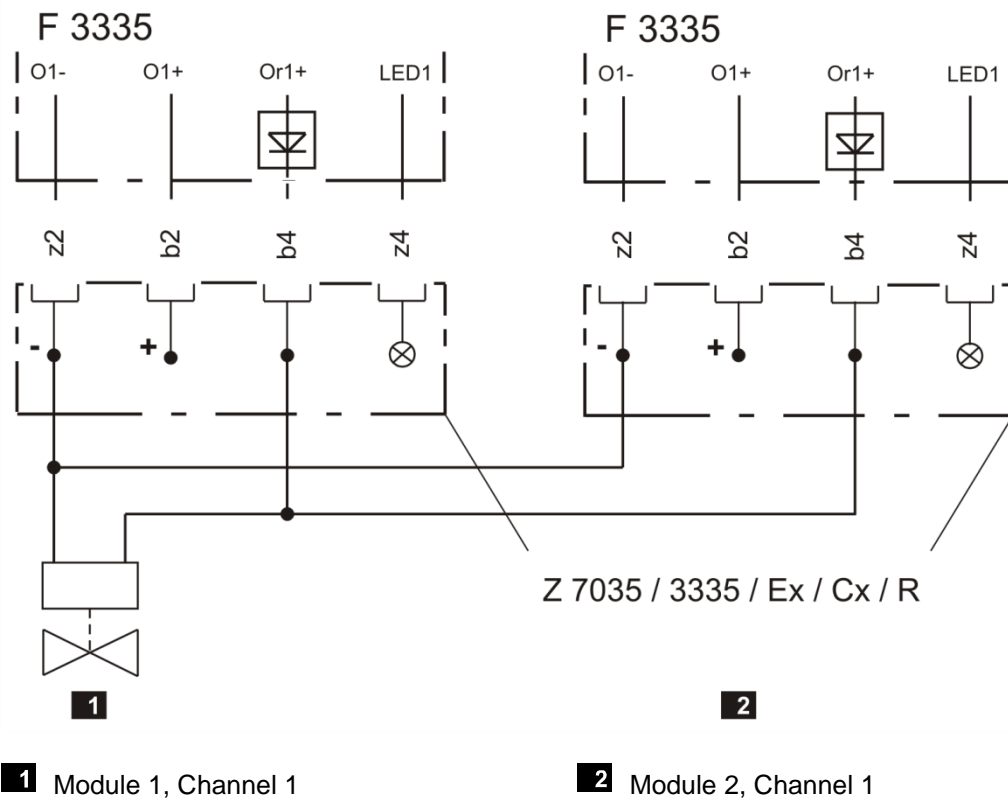


Figure 4: Redundant Wiring (Valve Control)

# 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 <sub>on</sub>	I <sub>on</sub>
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 <sup>1)</sup>	40 mA <sup>1)</sup>
<sup>1)</sup> Non-reset value			

Table 3: Safety-Related (Ex)i Solenoid Valves (up to SIL°4 in Accordance with IEC°61508)

## 1.2 (Ex)i Solenoid Valves

Manufacturer	Type	Minimum torque values	
		U <sub>on</sub>	I <sub>on</sub>
ASCO Joucomatic (direct operated valves)	IMXX (ISSC, WPIS)	21.6 V 11 V <sup>1)</sup>	28 mA <sup>1)</sup>
Bürkert (pilot valves)	0590 5470 6516/6517 6518/6519 8640  6106	10.4 V     10.8 V	29 mA     30 mA
Norgren Herion (pilot valves)	2032 2033 2034 2035 2036 2037 2038	8.2 V 9.0 V 10.0 V 11.5 V 13.0 V 14.4 V 15.9 V	34 mA 30 mA 27 mA 25 mA 23 mA 21 mA 19 mA
Norgren Herion (pilot valves)	LPV (E/P converter) 2080, 2082 2081, 2083 2084	5 V 10 V 4 V	1 mA 2.7 mA 1.6 mA
Parker Lucifer (pilot valves)	482160 482870	10.7 V	29 mA
Parker Lucifer (direct operated valve)	492965	13 V 10 V <sup>1)</sup>	20 mA <sup>1)</sup>
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
<sup>1)</sup> Non-reset value			

Table 4: (Ex)i Solenoid Valves

## 2 Configuration in SILworX

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

Observe the following points when configuring the module:

- 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 2.1.
- If redundancy groups are created, their configuration is defined in the associated tabs. The redundancy group tabs differ from those of the individual modules, see the following tables.

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.

### 2.1 The Module Tab

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

System parameters	Data type	S <sup>1)</sup>	R/W	Description
Name	---	---	W	Module name.
Noise Blanking	BOOL	Y	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	Y	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	Y	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	Y	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	Y	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	Y	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>



System parameters	Data type	S <sup>1)</sup>	R/W	Description				
Restart on Error Suppressed	BOOL	Y	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).				
				<table><tr><td>TRUE</td><td>No automatic restart after a module or channel fault.</td></tr><tr><td>FALSE</td><td>Automatic restart after a module or channel fault.</td></tr></table>	TRUE	No automatic restart after a module or channel fault.	FALSE	Automatic restart after a module or channel fault.
				TRUE	No automatic restart after a module or channel fault.			
FALSE	Automatic restart after a module or channel fault.							
Default setting: FALSE								

<sup>1)</sup> The operating system handles the system parameter in a safety-related manner, yes (Y) or no (N).

Table 5: The **Module** Tab in the Hardware Editor

## 2.2 The F 3335\_1: Channels Tab

The **F 3335\_1: Channels** tab contains the following system parameters for each channel:

System parameters	Data type	S <sup>1)</sup>	R/W	Description	
Channel no.	---	---	R	Channel number, preset and cannot be changed.	
Channel Value [BOOL] ->	BOOL	Y	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	Y	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	Y	R	TRUE	Fault-free channel. Valid channel value.
				FALSE	<ul style="list-style-type: none"><li>Faulty channel.</li><li>Module in the STOP state.</li><li>Connection loss.</li></ul>
Redund.	BOOL	Y	R	Requirement: A redundant module must exist.	
				TRUE	Redundancy for this channel active.
				FALSE	Redundancy for this channel not active.
Default setting: TRUE					

<sup>1)</sup> The operating system handles the system parameter in a safety-related manner, yes (Y) or no (N).

Table 6: Tab **F 3335\_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.

## 2.3 Description of Diagnostic Entry

The module is completely and automatically tested for safety-related errors during operation. The diagnostic entry is not 0 if one or more errors were detected in the module.

Defective modules must be replaced with a faultless module of the same type or with an approved replacement model.

Bit	Coding <sup>1)</sup>	Description
0	0x00000001	Hardware module fault..
1	0x00000002	The module in the slot was not deleted. The slot is either empty or equipped with incorrect module type.
2	0x00000004	Module defective (the error code is for internal purposes only).
...	...	
31	0x80000000	
<sup>1)</sup> The status may consist of several codings, e.g.: Module status = 0x80000001 (0x00000001 + 0x80000000).		

Table 7: Diagnostic Entry Coding

### 2.3.1 Channel Status

The channel status byte in the diagnostic entry shows the following status:

Bit	Coding <sup>1)</sup>	Description
0	0x01	Hardware channel fault. F-IOP indicator: Continuous light of the channel LED.
6	0x40	Hardware channel fault. (The error code is for internal purposes only). F-IOP indicator: Continuous light of the channel LED.
7	0x80	
1) The status may consist of several codings, e.g.: Channel status = 0x81 (0x01 + 0x80).		

Table 8: Channel Status the F 3335

## 3 Operating Instructions

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

### 3.1 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).

#### **WARNING**



**The outputs 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 operated in a general electrical plant.**

**All applications other than those described in the F 3335 data sheet are not allowed!**

### 3.2 Electrical Data Concerning Intrinsic Safety

For these specifications, refer to the Annex to the EU type test certificate TÜV 18 ATEX 8172.

### 3.3 Configuration Notes

If used in intrinsically safe circuits (Ex)i, adjacent F 3335 slots may be equipped with any type of module.

### 3.4 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 7035.

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

### 3.5 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 output circuits within a module may be connected in parallel, or an intrinsically safe output circuit within an F 3335 to an intrinsically safe input circuit within another F 3335. 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

### 3.6 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.

### 3.7 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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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 8172**

Issue: 00

- (4) Equipment: **HIQuad Module F 3335**
- (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/Ex8172.00/18
- (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 (2) GD [Ex ib Gb] IIC  
[Ex ib Db] 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  
Tel. +49 (0) 221 806-0 Fax. + 49 (0) 221 806 114

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(13) Annex

(14) **EU Type Examination Certificate**  
**TÜV 18 ATEX 8172** Issue: 00

(15) Description of equipment

## 15.1 Equipment and type:

HIQuad Module F 3335

## 15.2 Description / Details of Change

## General product information

The module F 3335 is an associated apparatus and can be used to control Ex valves and Ex measuring transmitters (0/4 to 20 mA). These valves or transmitters can be installed in potentially explosive atmospheres from Zone 1 on.

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

## Supply circuit UB1:

 $U_n = 24 \text{ V DC } (-15\%, +20\%) \text{ (max. 30VDC)}$  $U_m = 40\text{V}$ 

(terminal X1 z2(L+), d2(L-))

## Supply circuit UB2:

 $U_n = 5 \text{ V DC } (\pm 10\%) \text{ (max. 6VDC)}$  $U_m = 40\text{V}$ 

(terminal X1 z6/d6(+), z30/d30(-))

Intrinsically safe values for the control circuits,

type of protection

[Ex ib Gb] IIC/IIB

or

[Ex ib Db] IIIC/IIIB

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single circuit:	parallel circuit:
U <sub>o</sub> : 25.0 V	U <sub>o</sub> : 25.0 V
I <sub>o</sub> : 70 mA	I <sub>o</sub> : 140mA
P <sub>o</sub> : 581 mW	P <sub>o</sub> : 1162 mW
Trapezoidal (R = 474.3Ω)	

Maximum allowed external capacitance **or** inductance:

Ex ib	single circuit		parallel circuit	
	IIC	IIB/IIIC/IIIB	IIC	IIB/IIIC/IIIB
L <sub>o</sub>	7 mH	25 mH	-	7 mH
C <sub>o</sub>	110 nF	840 nF	-	840 nF

(16) Test-Report No. 557/Ex8172.00/18

(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

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