

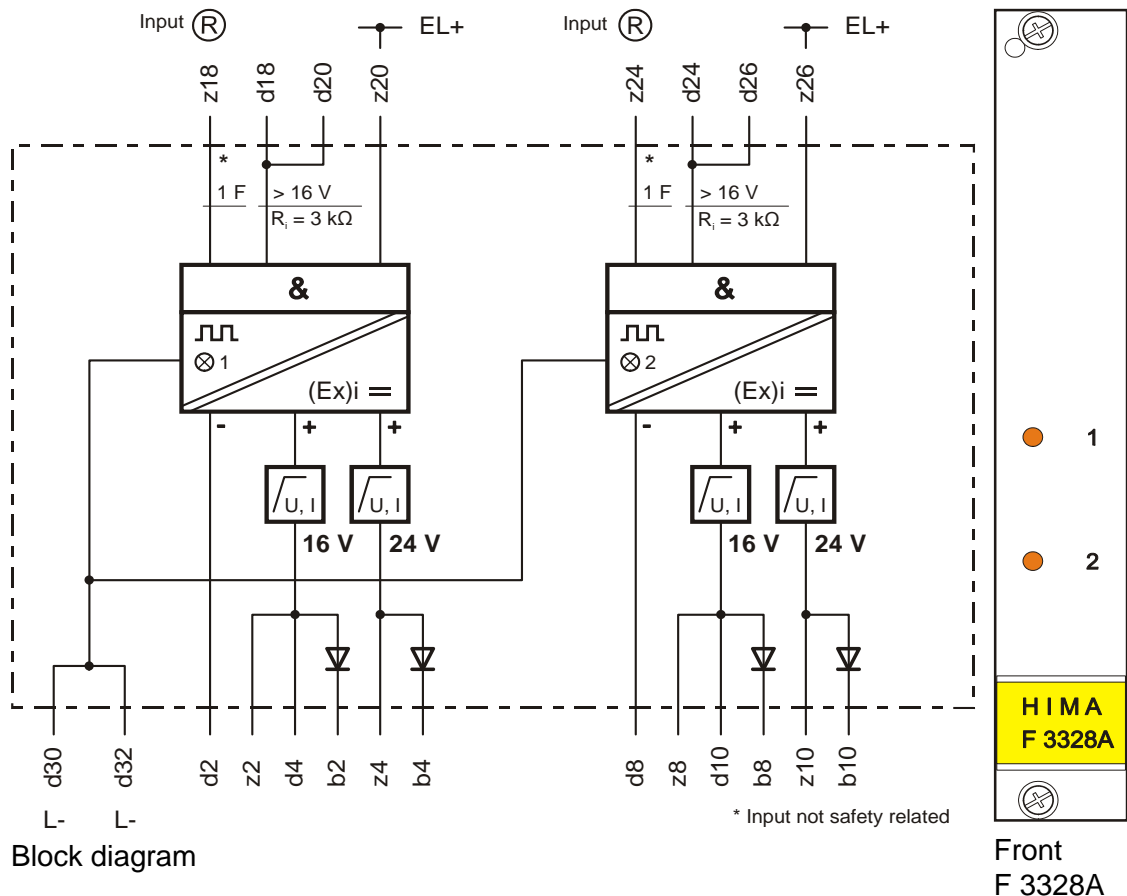
Electronic System **Planar-System F**

Data Sheet/Operating Instructions
for Module
F 3328A



**F 3328A****F 3328A: 2-channel safety related (Ex)i switching amplifier**

- For exciting intrinsically safe valves and for the supply of intrinsically safe transmitters
- For applications of functional safety, the module is
 - TÜV certified according to IEC 61508 up to SIL 3,
 - acc. to DIN V 19250 and DIN V 19251 up to AK 6,
 - acc. to IEC 954-1 to categorie 4,
 - acc. to DIN VDE 0116,
 - and acc. to EN 298
- EC Type Examination Certificate: EX5 03 06 19183 041 (ATEX)
- EC Certificate of Conformity: EX8 03 06 19183 040 X (zone 2 and zone 22)

**Caution:**

The inputs z18 and z24 are non-interacting. Nevertheless they must not be used for safety-related control of the outputs.

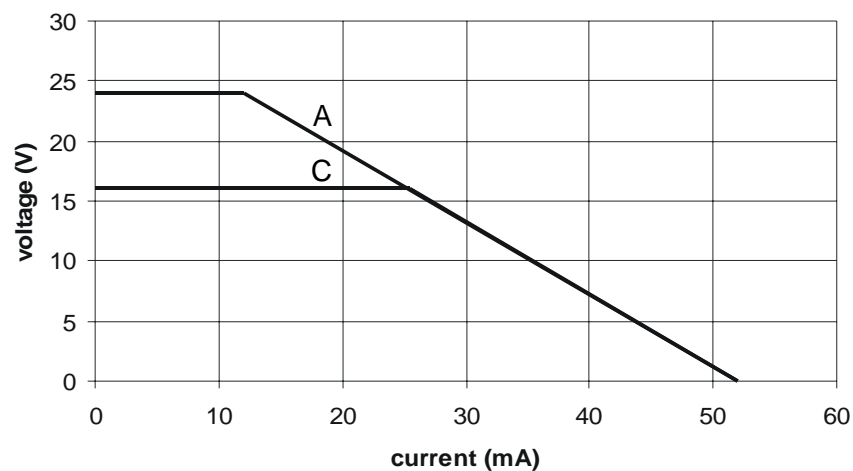
Note:

The standard load factor has the designation F (FAN).
 1 F = 2 mA @ 24 V ($R_i = 12 \text{ k}\Omega$) according to DIN 19238.

Technical Data:	
No-load voltage	24 V and 16 V
Short-circuit current	52 mA (short circuit proof)
Vertex of characteristic A	24 V @ 12 mA
Vertex of characteristic C	16 V @ 25 mA
Output characteristic	See diagram on page 4.
Switching time	z18 (z24) approx. 2 ms
	d18/d20 (d24/d26) approx. 2 ms
	z20 (z26) approx. 10 ms
Reset time (depending on load)	z18, d18/d20 (z24, d24/d26) 30 ... 300 ms
	z20 (z26) 50 ... 350 ms
Operating data per channel (z20 or z26)	24 VDC, -15% / +20%, $w_{ss} < 15\%$ 40 ... 100 mA (depending on load)
Power dissipation per channel	0,9 ... 2,5 W (depending on load)
Ambient temperature	-25 ... +70 °C
Ex category	II (2) G D [EEx ib] IIC
Zone 2 / Zone 22	II 3 GD EEx nA II T4 X
System of protection	IP 20
Space required	4 TE x 3 HE

The safe isolation from the intrinsically safe output circuit to the supply and input circuit is guaranteed for a nominal voltage of up to 375 V peak.

Output characteristic of the F 3328A module



Typical characteristics

Characteristic A: Output z4-d2 (z10-d8)

Characteristic B: Output z2-d2 (z8-d8)
with link z4/d4 (z10/d10)

The electrical characteristics of valves must be below the output characteristic of the F 3328A module.

Note: The maximum admissible cable length between the output of the amplifier and the actuator must not be exceeded. The cable length is determined by the inductance, capacity and resistance of the cable and actuator used. The lowest of these three calculated values limits the cable length. Detailed information on permissible external inductances and capacities is shown in the appendix of the EC Type Examination Certificate.

Driving the switching amplifier generates electrically isolated voltages of 16 VDC or 24 VDC at the outputs. These voltages can be used to excite intrinsically safe valves.

To increase the availability, the use of decoupled outputs connected in parallel is also possible in the protection class [EEx]i. In this case separate modules should be used to achieve continuous operation when replacing one module.


For (Ex)i applications a special female connector (with coding pin on d6) is required: Part no. 99.0000123

Operating Instructions

Application

The module can be used to control (Ex)i valves and (Ex)i measuring transmitters (0/4 to 20 mA). Valves or transmitters can be installed in hazardous areas from Zone 1 on.

Caution: Devices, which are installed in the zone 0, must **not** be driven by the F 3328A.

 The F 3328A output channels must **not** be exposed to external voltage. Modules, which were operated in general electrical systems, must **not** be used in Ex-plants thereafter.

In addition, **only** the applications described below are admissible.

Electrical specifications concerning intrinsic safety

For these specifications please refer to the EC Type Examination Certificate enclosed.

The maximum voltage U_m is 40 V.

Assembly

The module is mounted in a 19" subrack. It must be plugged in vertically. The design of the subrack must allow heat dissipation.

System start-up

Prior to the first system start-up, an Ex-expert has to check the correct installation of the system, especially the supply voltage connections and the connections for the intrinsically safe circuits.

Note: For further information on assembly and installation see page 10 to 11 and the HIMA catalogue "Planar-Sytem F".

Application examples

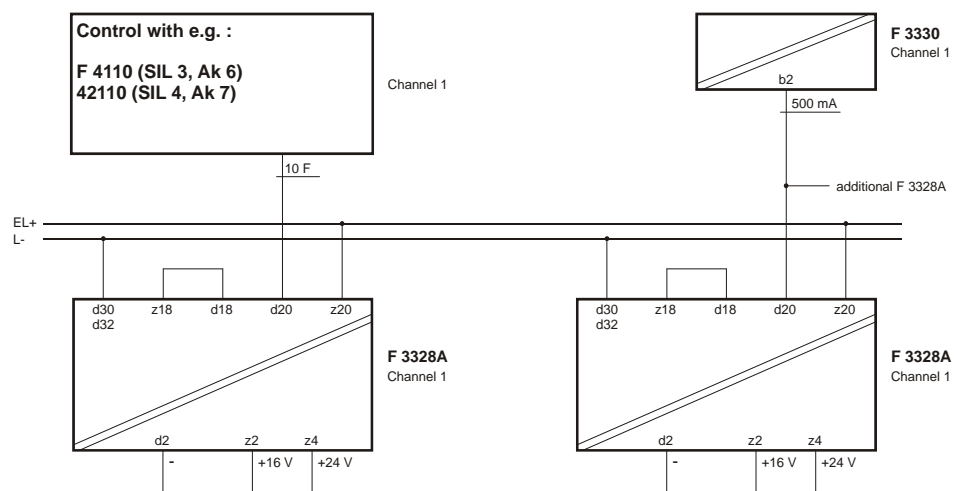
Safety-related application up to SIL 3 (AK 6)

The input d20 of the F 3328A is driven by

- a signal output of a safety related module (e.g. F 4110A). The output must be capable of driving a load of ≥ 10 F.
- a power output of a testable module (e.g. F 3330).

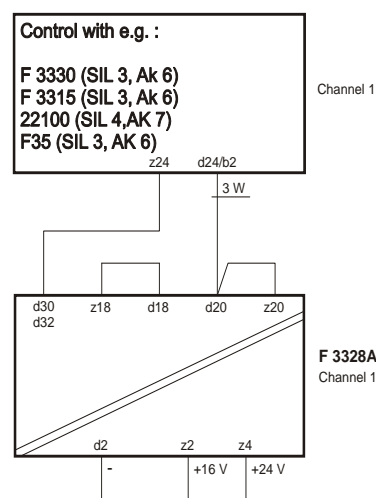
A testable module (e.g. F 3330) can drive up to twelve channels of the F 3328A.

The pins d30/d32 and z20 are connected to the operating voltage.



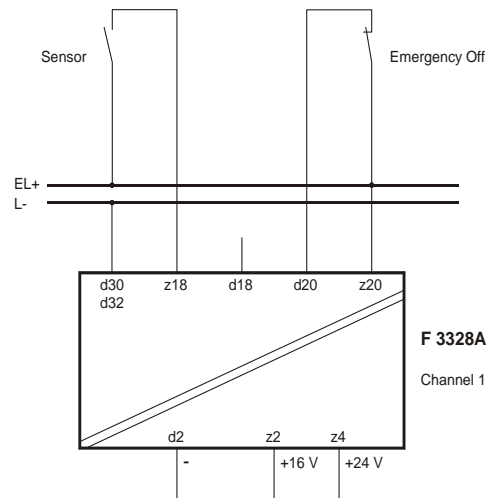
Safety-related application up to SIL 3 (AK 6)

The amplifier is driven by the power output of a safety-related module (e.g. F 3315) or by the power output of a testable module (e.g. F 3330).

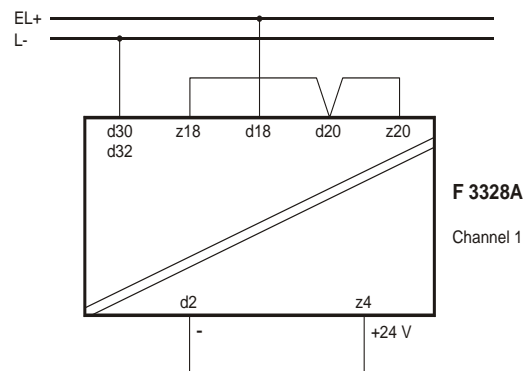


(Ex)i application (not safety-related)

The amplifier is driven via the control input z18. The pins d30/d32 and z20 are connected to the supply voltage. In this application, an additional Emergency-Off is controlled via the safety-related input d20.

**(Ex)i supply for transmitters**


The pins d30/d32, z18, d18 and z20 are connected to the operating voltage. The transmitter is connected to the output pins d2 and z4 (24 V).



Note: The proof test intervall is determined to 20 years!

List of usable (Ex)i single solenoid valves

This list does not claim to be complete. All data listed are without guarantee. The manufacturers' data sheets are authoritative.

Caution:	In case of parallel connection of two outputs, the following valves must not be driven:
	<p>Fa. Bürkert: 0590, 5470, 6516, 6517, 6518, 6519, 8640 und 6106</p> <p>Fa. Norgren Herion: LPV (E/P-Wandler) 2080, 2081, 2082, 2083 und 2084</p>

For output 24 V

Manufacturer	Type ¹⁾	Minimum operating voltage U_{an}	I_{an}
Safety-related (Ex)i solenoid valves (up to RC 7 according to DIN V 19251)			
Norgren Herion	2001, 2002 (With Booster Electronic)	22 V 5 V ²⁾	40 mA ²⁾
(Ex)i solenoid valves			
ASCO Joucomatic	IMXX (ISSC, WPIS) (With Booster Electronic)	21,6 V 11 V ²⁾	28 mA ²⁾
Norgren Herion	2038	15,9 V	19 mA
Parker Lucifer	VZ11 (482660) VZ12 (483330.01) (With Booster Electronic)	21,6 V 6 V ²⁾	40 mA ²⁾
Samson	E/P-binary converter 3964, 3776, 3766 and 3767	18 V	1,57 mA

¹⁾ Occasionally not the valve types themselves, but only the numbers of the solenoid coils are indicated.

²⁾ Retaining values

For output 16 V and 24 V

Manufacturer	Type ¹⁾	Minimum operate voltage U _{an}	I _{an}
Safety-related (Ex)i solenoid valves (up to RC 7 according to DIN V 19251)			
Eugen Seitz	11 G 52 121.11.01 121.11.02 121.11.03	13 V 15 V 14 V	16 mA 12 mA 16 mA
(Ex)i solenoid valves			
Bürkert	0590 5470 6516/6517 6518/6519 8640 6106	10,4 V 10,8 V	29 mA 30 mA
Norgren Herion	2032 2033 2034 2035 2036 2037	8,2 V 9,0 V 10,0 V 11,5 V 13,0 V 14,4 V	34 mA 30 mA 27 mA 25 mA 23 mA 21 mA
	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	VZ95 (482160.01) VZ23 (482870.01)	10,7	29 mA
	VZ91 (492965.01) VZ92 (492965.02) (With Booster Electronic)	13 V 10 V ²⁾	20 mA ²⁾
Samson	E/P-binary converter 3701, 3962, 3963,	9,6 V	1,52 mA
Telektron	V525011L00	12 V	8 mA

¹⁾ Occasionally not the valve types themselves, but only the numbers of the solenoid coils are indicated.

²⁾ Retaining values

Installation

- The module must be installed outside of explosion hazardous areas.
- Considering the special conditions X, the F 3328A may be installed in zone 2 or zone 22.
The special conditions X are to be taken from the appendix of the EC Type Examination Certificate.
- Good knowledge of the relevant standards for the installation in zone 2 and zone 22 is necessary.
- The electronic module including its connections has to be installed in a way that at least the system of protection IP 20 according to EN 60529: 1991 + A1: 2000 is achieved.
- The output channels of two F 3328A can be wired in parallel. The reduced maximum values have to be complied with (see EC Type Examination Certificate).
- The separation between intrinsically safe and not intrinsically safe terminals must be ≥ 50 mm.
- The separation between adjacent intrinsically safe terminals must be ≥ 6 mm.
- Intrinsically safe and not intrinsically safe lines must be installed separately, or the intrinsically safe lines must be provided with additional insulation.
- Intrinsically safe lines must be identifiable, e.g. by a light blue colour (RAL 5015) of the insulation.
- The wiring has to be secured mechanically in a way which ensures that in the event of an accidental disconnection, the distance (EN 50 020/ Part 7, Table 4) between the intrinsically safe and not intrinsically safe connections does not fall below the required minimum (e.g. by bundling).

The lines used must comply with the following insulation test voltages:

- Intrinsically safe lines ≥ 1000 VAC
- Not intrinsically safe lines ≥ 1500 VAC
- For stranded wires, the line ends must be provided with wire end ferrules. The terminals must be suitable for clamping the wire cross section.

The applicable regulations and standards have to be complied with, especially

- EN 50014: 1997 + Corrigendum: 1998 + A1: 1999 + A2: 1999
(VDE 0170/0171, Part 1: 2000, DIN EN 50014: 2000-02)
- EN 50020: 1994
(VDE 0170/0171, Part 7: 1996, DIN EN 50020: 1996-04)
- EN 50039: 1980
(VDE 0170/0171, Teil 10: 1982, DIN EN 50039: 1982-04)
- EN 50281-1-1: 1998 + EN 50281-1-1/A1: 2002
(VDE 0170/0171 Part 15-1-1, DIN EN 50281-1-1: 1999-10
+VDE 0170/0171 Part 15-1-1/A1, DIN EN 50281-1-1/A1: 2002-11)
- EN 50021: 1999
(VDE 0170/0171 Part 16, DIN EN 50021: 2000-02)
- EN 60079-14: 1997
(VDE 0165 Part 1, DIN EN 60079-14: 1998-08)
- EN 50281-1-2: 1998 + EN 50281-1-2/A1: 2002
(VDE 0165 Part 2, DIN EN 50281-1-2: 1999-11
+ A1, DIN EN 50281-1-2/A1: 2002-11)

Maintenance

In case of a failure, the defective module must be replaced with the same, or with another approved type.

Caution:

Any repair work must only be carried out by the manufacturer.

EC Type Examination Certificate

No.: EX5 03 06 19183 041



in accordance with Annex III of Council Directive No. 94/9/EC for equipment and protective systems intended for use in potentially explosive atmospheres (ATEX) for

HIMA Paul Hildebrandt GmbH + Co KG
Albert-Bassermann-Straße 28

D-68782 Brühl

Product: Electrical apparatus type of protection intrinsically safety i (EX-RL)

Model: Automation device, safety-related
F3328A

Parameters: see appendix (4 pages)

The above mentioned product meets the provisions of the Directive.

This certificate is issued on the basis of the product provided for testing and certification and on its technical documentation. The detailed results of the test and the provided technical documentation are listed in

Test report no.: 70023116

This certificate pertains only to the sample product submitted to TÜV PRODUCT SERVICE for testing. Therefore this certificate has no specified period of validity.

Released with the above mentioned certificate number by the Certification Body of TÜV PRODUCT SERVICE.

A handwritten signature in black ink, appearing to be 'J. Blum', written over a faint, circular, textured background.

Department: TA-ES/MUC-IQSE / jb
Date: 26.06.2003



TÜV PRODUCT SERVICE GMBH is a Notified Body in accordance with Council Directive 94/9/EC for equipment and protective systems intended for use in potentially explosive atmospheres with the identification number 0123.

Appendix to EC Type Examination Certificate

No.: EX5 03 06 19183 041



1 Description

The module F3328A is an isolation amplifier with two channels. As an associated electrical apparatus it must be installed only outside an atmosphere capable of explosion.

The module consists of one PCB-board which is placed in a module rack. The terminals b4, z4 – d2 and d4, z2, b2, - d2 respectively. b10, z10 – d8 and d10, z8, b8, - d8 provide an intrinsically safe electric circuit in order to supply certificated loads.

The ambient temperature averages $-25^{\circ}\text{C} \leq T_{\text{amb}} \leq 70^{\circ}\text{C}$.

From the manual of instruction you will see the general information for safe use.

2 Electrical data

2.1 Intrinsically safe output circuits

One voltage of 25V for the supply of certificated loads is provided. These is intrinsically safe and safety separated up to a peak value of 375V against the control resp. power supply circuit.

Connection	Output	Function
d2, d8	A-	Voltage output -
z4, z10	A+	Voltage output +
b4, b10	AR1+	Redundant voltage output +

The second output circuit provides a voltage of 17 V. This circuit is also separated up to a peak value of 375V against the control resp. power supply circuit.

Connection	Output	Function
d2, d8	A-	Voltage output -
z2, z8, d4, d10	A+	Voltage output +
b2, b8	AR1+	Redundant voltage output +

Appendix to EC Type Examination Certificate

No.: EX5 03 06 19183 041



2.1.1 Output circuit F3328 b4(b10), z4(z10) – d2(d8)

Voltage per output circuit, U_o	crest value DC 25 V
Amperage per output circuit, I_o	crest value DC 68 mA
Amperage for parallel connection of two output circuits	crest value DC 136 mA
Power per output circuit, P_o	crest value 565 mW
Power for parallel connection of two output circuits	crest value 1130 mW
Characteristic curve	trapeze
internal capacitor per output circuit, C_i	negligible
internal inductance per output circuit, L_i	negligible

2.1.1.1 EEx ib IIC

Max. connectable inductance for one output circuit	$L_o = 8 \text{ mH}$
Max. connectable capacitance for one output circuit	$C_o = 110 \text{ nF}$
Max. connectable inductance for parallel connection of two output circuits	$L_o = 1,9 \text{ mH}$
Max. connectable capacitance for parallel connection of two output circuits	$C_o = 110 \text{ nF}$

2.1.1.2 EEx ib IIB

Max. connectable inductance for one output circuit	$L_o = 30 \text{ mH}$
Max. connectable capacitance per output circuit	$C_o = 840 \text{ nF}$
Max. connectable inductance for parallel connection of two output circuits	$L_o = 8 \text{ mH}$
Max. connectable capacitance for parallel connection of two output circuits	$C_o = 840 \text{ nF}$

Appendix to EC Type Examination Certificate

No.: EX5 03 06 19183 041



2.1.2 Output circuit F3328A d4(d10), z2(z8), b2(b8) – d2(d8)

Voltage per output circuit, U_o	crest value DC 17 V
Amperage per output circuit, I_o	crest value DC 68 mA
Amperage for parallel connection of two output circuits	crest value DC 136 mA
Power per output circuit, P_o	crest value 565 mW
Power for parallel connection of two output circuits	crest value 1130 mW
Characteristic curve	trapeze
internal capacitor per output circuit, C_i	negligible
internal inductance per output circuit, L_i	negligible

2.1.2.1 EEx ib IIC

Max. connectable inductance for one output circuit	$L_o = 8 \text{ mH}$
Max. connectable capacitance for one output circuit	$C_o = 375 \text{ nF}$
Max. connectable inductance for parallel connection of two output circuits	$L_o = 1,9 \text{ mH}$
Max. connectable capacitance for parallel connection of two output circuits	$C_o = 375 \text{ nF}$

2.1.2.2 EEx ib IIB

Max. connectable inductance for one output circuit	$L_o = 30 \text{ mH}$
Max. connectable capacitance per output circuit	$C_o = 2,2 \text{ }\mu\text{F}$
Max. connectable inductance for parallel connection of two output circuits	$L_o = 8 \text{ mH}$
Max. connectable capacitance for parallel connection of two output circuits	$C_o = 2,2 \text{ }\mu\text{F}$

Appendix to EC Type Examination Certificate

No.: EX5 03 06 19183 041



2.1.3 Power supply circuit (non-intrinsically safe)

Power supply circuit connector z20(z26) – d30, d32

Nominal voltage, U_B	24 V DC
Voltage, $U_{B_{max}}$	≤ 30 V DC
Power, P	≤ 6 W
Absolute maximum voltage without affecting the intrinsic safety, U_m	≤ 40 V DC


2.1.4 Control circuits (non-intrinsically safe)

Control circuits connectors z18, d18/20 (z24, d24/26)

Control voltage, $U_{S_{max}}$	≤ 33 V DC
Control amperage, $I_{S_{max}}$	≤ 14 mA DC
Absolute maximum voltage without affecting the intrinsic safety, U_m	≤ 40 V DC

Appendix to EC Type Examination Certificate**No.: EX5 03 06 19183 041****3 Identifying marking**

The legible and durable marking must include the following option list:

- Name and address of the manufacturer
- Year of construction
- the identifier  II (2)GD [EEx ib] IIC

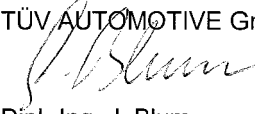
4 Production quality assurance

The manufacturer shall operate an approved quality system for production, final equipment inspection and testing according Annex IV Directive 94/9/EC.

Munich, June 26th 2003

TÜV AUTOMOTIVE GmbH

TA-ES/MUC


Dipl.-Ing. J. Blum

EC Certificate of Conformity

No.: EX8 03 06 19183 040 X



on the basis of a voluntary test in accordance with Annex VIII of Council Directive 94/9/EC for equipment and protective systems intended for use in potentially explosive atmospheres for

HIMA Paul Hildebrand GmbH + Co. KG
Albert-Bassermann-Straße 28

D-68782 Brühl

Product: Electrical apparatus type of protection n (EX-RL)

Model: Automation device, safety related
F3328A

Parameters: see appendix (2 pages)

The above mentioned product fulfills the basic requirements of the Directive.

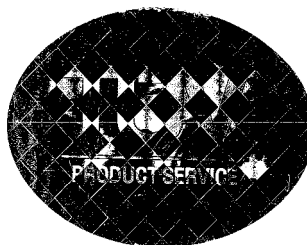
This certificate is issued on the basis of the product provided for testing and certification and on its technical documentation. The detailed results of the test and the technical documentation are listed in

Test report no.: 70023116

This certificate pertains only to the sample product submitted to TÜV PRODUCT SERVICE for testing. Therefore, this certificate has no specified period of validity.

Released with the above mentioned certificate number by the Certification Body of TÜV PRODUCT SERVICE.

A handwritten signature in black ink, appearing to read 'J. Blum', located to the left of the circular stamp.



Department: TA-ES/MUC-IQSE / jb
Date: 26.06.2003

Appendix to EC-Type examination conformity

Nr.: EX8 03 06 19183 040 X

1 Particular conditions X

1.1 Protection category

The module (electrical apparatus) F3328A has to be assembled in a cabinet, which corresponds at least to protection category **IP54** (EN 60529). In the case of conductible dust, the protection category **IP6X** is essential.

1.2 Adhesive label

This cabinet has to be provided with the adhesive label

„Service only in zero potential state“.

Exception:

There exists no explosive atmosphere resp. explosive dust.

1.3 Power dissipation

The applied cabinet must discharge the arising power dissipation assuredly.

1.4 Standards

Furthermore, the following norms must be considered:

EN 50281-1-1:1998 + EN 50281-1-1/A1:2002

(VDE 0170/0171 part 15-1-1, DIN EN 50281-1-1:1999-10
+ VDE 0170/0171 part 15-1-1/A1, DIN EN 50281-1-1/A1:2002-11)

EN 50021:1999

(VDE 0170/0171 part 16, DIN EN 50021:2000-02)

EN 60079-14:1997

(VDE 0165 Part 1, DIN EN 60079-14:1998-08)

EN 50281-1-2:1998 + EN 50281-1-2/A1:2002

(VDE 0165 part 2, DIN EN 50281-1-2:1999-11
+ A1, DIN EN 50281-1-2/A1:2002-11)

Appendix to EC-Type examination conformity

Nr.: EX8 03 06 19183 040 X

2 Identifying marking

The legible and durable marking must include the following option list:


- Name and address of the manufacturer
- Year of construction
- the identifier Ex II 3 GD EEx nA T4
- ambient temperature limit: $-25\text{ °C} \leq T_a \leq +70\text{ °C}$
- Note: particular conditions X shall be considered!

3 Production quality assurance

The manufacturer shall operate an approved quality system for production, final equipment, inspection and testing according Annex IV Directive 94/9/EG.

Munich, June 26th 2003

TÜV Automotive GmbH TA-ES/MUC


Dipl.-Ing. J. Blum

Certificate

No.: Z10 03 07 19183 042

TÜV
SÜDDEUTSCHLAND

HIMA Paul Hildebrandt GmbH + Co KG
Albert-Bassermann-Strasse 28

D-68782 Brühl

with the production facility(ies)
19183



is authorized to label the following product with the

“TÜV Mark“

in accordance with the attachment to this certificate. See also notes overleaf.

Product: Automation device, safety related

Model: F3328A

Parameters: Power supply: 24 VDC
Structure: 1oo1 (AK1-6, SIL 1-3)

hints: wording of TÜV Mark segment: „Functional Safety“

The compliance of the above-mentioned product with the essential requirements of the following directive(s) and/or other relevant safety requirements was tested on a voluntary basis:

- IEC 61508-2:2000; SIL 3
- EN 298:1994
- EN 61000-6-4:2001
- EN 954-1:1996; Kat. 4
- EN 61131-2/A12:2000
- EN 61000-6-2:2001
- DIN V 19250:1994
- DIN V 19251:1995
- VDE 0116:1989

Report No.: HB 63133

Released with the above certificate number by the
Certification Body of TÜV PRODUCT SERVICE GMBH.

Department: TA-IQSE / Beer
Date: 06.07.2003





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