



(1) **EC-TYPE-EXAMINATION CERTIFICATE**
(Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 94/9/EC**



(3) EC-type-examination Certificate Number:

PTB 02 ATEX 2029

(4) Equipment: Analog output type AO4H-Ex and type AO4-Ex

(5) Manufacturer: ABB Automation Products GmbH

(6) Address: Borsigstraße 2, 63754 Alzenau, Germany

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment 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 atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential report PTB Ex 02-21495.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50014:1997 + A1 + A2

EN 50020:1994

(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 EC-type-examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

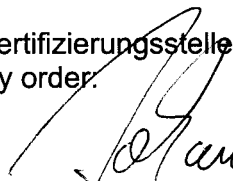
(12) The marking of the equipment shall include the following:



II 2(1)G EEx ib [ia] IIC T4

Zertifizierungsstelle Explosionsschutz

By order:


Dr.-Ing. U. Johannsmeyer
Regierungsdirektor



Braunschweig, April, 26 2002

SCHEDULE

(13)

(14) **EC-TYPE-EXAMINATION CERTIFICATE PTB 02 ATEX 2029**

(15) Description of equipment

The 4-channel analog output, type AO4H-Ex and AO4-Ex, is part of the S-900 system. The termination unit, type TU **R-Ex is used as assembly / module rack as specified in PTB 00 ATEX 2156 U. In conjunction with this type of termination unit, the 4-channel analog output may only be operated within the S-900 system.

The AO 930S version of the analog output modules of type AO4H-Ex are designed for HART communication. They are used to control actuators in a process engineering environment with digital HART communication.

The AO 910S version of the analog output modules of type AO4-Ex are also used to control actuators in a process engineering environment, however without HART communication.

All modules are used to safely electrically isolate intrinsically safe field circuits of category "ia" from intrinsically safe bus and supply circuits of category "ib".

The field circuits are electrically isolated from the supply circuit and the CAN bus.

The ambient temperature range is $-20^{\circ}\text{C} \dots +70^{\circ}\text{C}$.

Electrical data

I) Supply circuit

Plug connector X101, connecting pins 15, 16
Only for connection to the certified intrinsically safe circuit as specified in PTB 00 ATEX 2156 U, designed to type of protection Intrinsic Safety EEx ib IIC with the following maximum values:

$$U_{\max} = 20 \text{ V AC (amplitude)}$$

$$f = 307 \text{ kHz} \pm 5 \text{ KHz}$$

$$P \approx 2.5 \text{ W (power consumption)}$$

The intrinsically safe AC supply circuit is electrically isolated from the intrinsically safe field circuits and the CAN signal circuits of the module, as shown in table 4, EN 50020.

II) Signal circuit (CAN bus) (internal circuit only; no external connections)

III) Address coding circuit (internal circuit only; no external connections)

IV) Field circuit for types AO 910S and AO 930S for passive actuators

Terminals on the system module rack

type of protection Intrinsic Safety
EEx ia IIC / IIB or EEx ib IIC / IIB
Maximum values for each channel:

Channel 1: terminals 11, 12
Channel 2: terminals 21, 22
Channel 3: terminals 31, 32
Channel 4: terminals 41, 42

$U_o = 22.1 \text{ V}$
 $I_o = 93 \text{ mA}$
 $P_o = 403 \text{ mW}$

Output characteristic: trapezoidal with
 $U_Q = 27.54 \text{ V}$
 $R = 300 \Omega$

effective internal capacitance: $C_i \leq 1.1 \text{ nF}$
effective internal inductance: $L_i \leq 0.22 \text{ mH}$

For the external capacitance C_o and the external inductance L_o , the following maximum permissible values apply, the effective internal values having already been considered:

| Type of protection | EEx ia and EEx ib | |
|--------------------|-------------------|---------|
| | IIC | IIB |
| L_o | 1.78 mH | 1.78 mH |
| C_o | 100 nF | 500 nF |

All the channels of the field circuits are electrically interconnected via earth. The channels of the four intrinsically safe field circuits are safely isolated from one another up to a voltage of 30 V, as specified in table 4, EN 50020. This means that the above tabulated values apply to each channel.

- (16) Test report PTB Ex 02-21495
- (17) Special conditions for safe use
None
- (18) Essential health and safety requirements
covered by standards

Zertifizierungsstelle Explosionsschutz
By order:

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor



Braunschweig, April 26, 2002


1st SUPPLEMENT

according to Directive 94/9/EC Annex III.6

to EC-TYPE-EXAMINATION CERTIFICATE PTB 02 ATEX 2029

(Translation)

Equipment: Analog output, types AO4H-Ex and AO4-Ex

Marking:  II 2(1) G EEx (ia) ib IIC T4

Manufacturer: ABB Automation Products GmbH

Address: Borsigstraße 2, D-63755 Alzenau, Germany

Description of supplements and modifications

The 4-channel analog output modules, types AO4H-Ex and AO4-Ex, of the S 900 system may in future be manufactured in compliance with the test documents listed in the test report.

The modifications concern the revised documentation as well as the output power of the field circuits.

All other details remain unaffected by the modifications.

Electrical data

IV) Field circuits for types AO 910S and AO 930S for passive transducers

Terminals at the
system module rack

Channel 1: terminals 11, 12

Channel 2: terminals 21, 22

Channel 3: terminals 31, 32

Channel 4: terminals 41, 42

type of protection Intrinsic Safety

EEx ia IIC / IIB or EEx ib IIC / IIB

Maximum values per channel:

$$U_o = 22.1 \text{ V}$$

$$I_o = 93 \text{ mA}$$

$$P_o = 640 \text{ mW}$$

Output characteristic: trapezoidal, with

$$U_Q = 27.54 \text{ V}$$

$$R = 298 \text{ } \Omega$$

Effective internal capacitance: $C_i \leq 1.1 \text{ nF}$

Effective internal inductance: $L_i \leq 0.22 \text{ mH}$

Sheet 1/2

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

The maximum values of the external capacitance C_o and the external inductance L_o are shown in the table below. They already consider the effective internal values.

| Type of protection | EEx ia and EEx ib | |
|--------------------|-------------------|---------|
| Group | IIC | IIB |
| L_o | 1.78 mH | 1.78 mH |
| C_o | 100 nF | 500 nF |

All the channels of the field circuits are electrically interconnected via ground. The channels of the four intrinsically safe field circuits are safely electrically isolated from each other up to a voltage of 30 V as shown in EN 50020, table 4. The values specified in the table above thus apply to each channel.

Test report: PTB Ex 03-23311

Zertifizierungsstelle Explosionsschutz
By order:


Dr.-Ing. U. Johannsmeyer
Regierungsdirektor



Braunschweig, November 12, 2003


2. SUPPLEMENT

according to Directive 94/9/EC Annex III.6

to EC-TYPE-EXAMINATION CERTIFICATE PTB 02 ATEX 2029

(Translation)

Equipment: Analog output, type AO4H-Ex, AO4-Ex

Marking:  II 2 (1G/D) G EEx [ia] ib IIC T4

Manufacturer: ABB Automation GmbH

Address: Schillerstraße 72, 32425 Minden, Germany

Description of supplements and modifications

Safety-relevant components have been modified in the analog output, type AO4H-Ex and AO4-Ex.

Furthermore the marking is extended for application in hazardous areas due to combustible dust as follows:

 II 2 (1G/D) G EEx [ia] ib IIC T4

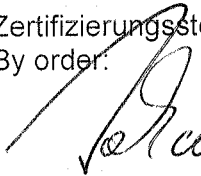
The name and the address of the applicant have changed.
All other specifications apply without changes also for this 2nd supplement.

Applied standards

EN 50014:1997 + A1 + A2 EN 50020:2002

Test report: PTB Ex 07-27065

Zertifizierungsstelle Explosionschutz
By order:


Dr.-Ing. U. Johannsmeyer
Direktor und Professor



Braunschweig, February 14, 2007

3. SUPPLEMENT

according to Directive 94/9/EC Annex III.6

to EC-TYPE-EXAMINATION CERTIFICATE PTB 02 ATEX 2029

(Translation)

Equipment: Analog output, type AO4H-Ex and AO4-Ex

Marking:  II 2 (1G/D) G Ex [ia] ib IIC T4

Manufacturer: ABB Automation GmbH
formerly: ABB Automation Products GmbH

Address: Schillerstraße 72, 32425 Minden, Germany
formerly: Borsigstraße 2, 63754 Alzenau, Germany

Description of supplements and modifications

In the future the analog output, type AO4H-Ex and AO4-Ex may also be manufactured according to the test documents listed in the assessment and test report.

The modifications concern the internal and external design.

All other specifications of the EC-type examination certificate and its supplements apply without changes.

Electrical data

I) **Supply circuit**
(terminals X101, 15/16)

type of protection Intrinsic Safety Ex ib IIC
Only for connection to the certified intrinsically safe circuit according to PTB 00 ATEX 2156 U

Maximum values:

U_{\max} = 20 V AC (amplitude)
 f = 307 kHz \pm 5 KHz
 P \approx 2.5 W (power consumption)
 P \approx 1.5 W (power dissipation in the module)

The intrinsically safe AC supply circuit is electrically isolated from the intrinsically safe field circuits and the CAN signal circuits of the module in compliance with EN 60079-11, table 5.

II) Signal circuit (CAN-Bus).....internal circuit designed to type of protection
(terminals CAN-Bus A: X101, 9/10Intrinsic Safety Ex ia IIC
terminals CAN-Bus B: X101, 11/12)without external connection facilities

3. SUPPLEMENT TO EC-TYPE-EXAMINATION CERTIFICATE PTB 02 ATEX 2029

The signal circuit (CAN supply) is safely electrically isolated from all other intrinsically safe circuits up to a voltage of 30 V (EN 60079-11, table 5).

The signal circuit (Bus-line A) is safely electrically isolated from the signal circuit (Bus- line B) up to a voltage of 30 V according to EN 60079-11, table 5. They are, however, electrically interconnected (only) inside the module.

III) Address coding circuit

internal circuit designed to type of protection
Intrinsic Safety Ex ia IIC
without external connection facilities

- IV) Field circuitstype of protection Intrinsic Safety Ex ia IIC/IIB
(connector X102, or Ex ib IIC/IIB
channel 1: +19/-21, terminals +11/-12
channel 2: +13/-15, terminals +21/-22
channel 3: +7/-9, terminals +31/-32
channel 4: +1/-3, terminals +41/-42)

Maximum values per channel
(corresponding to PTB 00 ATEX 2058 X):

$$U_o = 22.1 \text{ V}$$

$$I_o = 93 \text{ mA}$$

$$P_o = 640 \text{ mW}$$

trapezoidal output characteristic with

$$U_Q = 27.54 \text{ V}$$

$$R = 298 \text{ } \Omega$$

$$C_i = 1.1 \text{ nF}$$

$$L_i = 0.22 \text{ mH}$$

For relationship between level of protection and external reactances, reference is made to the table. The effective internal values have already been considered.

(Basis: Ignition curve diagrams from PTB-report ThEx-10)

| | Ex ia | or | Ex ib |
|-------|--------|----|--------|
| L_o | 0.5 mH | | 2 mH |
| C_o | 65 nF | | 270 nF |

All the channels of the field circuits are electrically interconnected via internal ground inside the module. The channels of the four intrinsically safe field circuits are safely isolated from each another on the output side up to a voltage of 30 V, as specified in table 5, EN 60079-11. Therefore, the values tabulated above apply to each channel (no interconnection).

Applied standards

EN 60079-0:2006

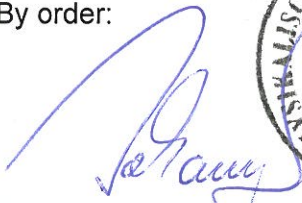
EN 60079-11:2007

Assessment and test report:

PTB Ex 10-29185

Zertifizierungssektor Explosionsschutz
By order:

Braunschweig, June 10, 2010



Dr.-Ing. U. Johannsmeyer
Direktor und Professor