



# IECEX Certificate of Conformity

## INTERNATIONAL ELECTROTECHNICAL COMMISSION IEC Certification Scheme for Explosive Atmospheres

for rules and details of the IECEx Scheme visit [www.iecex.com](http://www.iecex.com)

Certificate No.: IECEx BVS 08.0057X issue No.:2

Status: **Current**

Certificate history:

Issue No. 2 (2011-3-18)  
Issue No. 1 (2010-3-22)  
Issue No. 0 (2009-1-8)

Date of Issue: **2011-03-18** Page 1 of 6

Applicant: **R. STAHL Schaltgeräte GmbH**  
Am Bahnhof 30  
74638 Waldenburg  
**Germany**

Electrical Apparatus: **Field Device Coupler type 9411/21-2\*\*-\*1 and type 9411/24-3\*\*-\*1**  
*Optional accessory:*

Type of Protection: **Increased safety 'e'; Encapsulation 'm'; Intrinsic safety 'i', Protection by enclosure 'tD',  
Intrinsic safety 'iD', Type of protection 'n'**

Marking: **Type 9411/21-2\*0-\*1:  
Ex mb e ib [ia Ga] IIC T4 Gb or Ex mb eb ib [ia] IIC T4  
[Ex ia Da] IIIC or [Ex ia] IIIC**  
**Type 9411/21-2\*a-\*1, with a = 1, 2:  
Ex mb e ib [ia Ga] IIC T4 Gb or Ex mb eb ib [ia] IIC T4 and Ex tD A21 IP 6X T80C [ia D]**  
**Type 9411/24-3\*0-\*1:  
Ex nA [ia Ga] IIC T4 Gc or Ex nAc [ia] IIC T4  
[Ex ia Da] IIIC or [Ex ia] IIIC**  
**Type 9411/24-3\*a-\*1, with a = 1, 2:  
Ex nA [ia Ga] IIC T4 Gc or Ex nAc [ia] IIC T4 and  
Ex tD A21 IP 6X T80C [ia D]**  
**FISCO Power Supply**

*Approved for issue on behalf of the IECEx  
Certification Body:*

H.-Ch. Simanski

*Position:*

Head of Certification Body

*Signature:  
(for printed version)*

*Date:*

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting the [Official IECEx Website](http://www.iecex.com).

Certificate issued by:

**DEKRA EXAM GmbH**  
Dinnendahlstrasse 9  
44809 Bochum  
Germany

 **DEKRA**  
DEKRA EXAM GmbH



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Manufacturer: **R. STAHL Schaltgeräte GmbH**  
Am Bahnhof 30  
74638 Waldenburg  
Germany

Manufacturing location(s):

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.

#### STANDARDS:

The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

<b>IEC 60079-0 : 2007-10</b> Edition: 5	Explosive atmospheres - Part 0: Equipment - General requirements
<b>IEC 60079-11 : 2006</b> Edition: 5	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"
<b>IEC 60079-15 : 2010</b> Edition: 4	Explosive atmospheres - Part 15: Equipment protection by type of protection "n"
<b>IEC 60079-18 : 2009</b> Edition: 3	Explosive atmospheres Part 18: Equipment protection by encapsulation "m"
<b>IEC 60079-26 : 2006</b> Edition: 2	Explosive atmospheres - Part 26: Equipment with equipment protection level (EPL) Ga
<b>IEC 60079-27 : 2008</b> Edition: 2.0	Explosive atmospheres - Part 27: Fieldbus intrinsically safe concept (FISCO)
<b>IEC 60079-7 : 2006-07</b> Edition: 4	Explosive atmospheres - Part 7: Equipment protection by increased safety "e"
<b>IEC 61241-0 : 2004</b> Edition: 1	Electrical apparatus for use in the presence of combustible dust - Part 0: General requirements
<b>IEC 61241-1 : 2004</b> Edition: 1	Electrical apparatus for use in the presence of combustible dust - Part 1: Protection by enclosures "tD"
<b>IEC 61241-11 : 2005</b> Edition: 1	Electrical apparatus for use in the presence of combustible dusts - Part 11: Protection by intrinsic safety 'iD'

*This Certificate **does not** indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.*

#### TEST & ASSESSMENT REPORTS:

*A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in*

Test Report:

[DE/BVS/ExTR09.0003/02](#)

Quality Assessment Report:

[DE/BVS/QAR10.0002/01](#)



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## Schedule

### EQUIPMENT:

*Equipment and systems covered by this certificate are as follows:*

#### Description (for issue 0 to 2)

The field device coupler (FDC) Type 9411/21 (Ex e - Ex i) is an explosion protected apparatus for installation in hazardous areas Zone 1 or Zone 21. The non-intrinsically safe circuits are connected via terminals with type of protection increased safety. The non-intrinsically safe parts of the circuit are encapsulated with a compound providing type of protection Ex mb.

The field device coupler (FDC) Type 9411/24 (Ex nA - Ex i) is an explosion protected apparatus for installation in hazardous areas Zone 2 / Zone 22 (with an additional enclosure) or Zone 21.

The intrinsically safe output circuits are designed with type of protection Ex ia for the connection into hazardous areas of Zone 0 and Zone 20. The output circuits are electrically interconnected but are electrically isolated from the non-intrinsically safe fieldbus and ground.

The FDC is used for intrinsically safe connection of field devices to a corresponding fieldbus. The fieldbus main cable is referred to below as "TRUNK" and the intrinsically safe stub lines to the field devices are referred to as "SPURs".

The 4 or 8 output circuits comply with the FISCO Model for connection of field devices with Foundation Fieldbus H1 or Profibus PA interface with IEC 61158-2 topology. The devices are powered from the incoming, non-intrinsically safe fieldbus.

The device is connected to the TRUNK with 2-wire cabling, consequently also tapping the required power from the fieldbus, besides the communication signals.

A jumper at the device terminals can be used to connect a bus termination if required. The fuse serves the purpose of explosion protection and limits the maximum power to the device under fault conditions. The pole-reversal protection protects the electronic circuitry in the case of unintentional incorrect polarity.

A specially designed power management system ensures that undesirable feedback effects on the bus are avoided. Besides monitoring for undervoltage, the power management system is also responsible for the required limiting of the switch-on current and limiting of the rate of current change when switching on. Suitable filters are used to protect the bus against high-frequency electrical interference.

The power tapped from the bus is transferred, electrically isolated, with a DC/DC converter. The communication signals are transferred, electrically isolated, with the aid of a signal transformer and superimposed on the supply voltage at the secondary side. A limiting function limits the voltage to the maximum voltage of all intrinsically safe SPURs.

A variable current limiter serves to protect each SPUR against short circuit so that the short circuit of a SPUR has no retroactive effects.

The most important fault states can be diagnosed with LEDs.

### CONDITIONS OF CERTIFICATION: YES as shown below:

(for issue 0 to 2)

For use in Zone 1 the field device coupler (FDC) with type nomenclature 9411/21-2\*0-\*1 has to be assembled into an enclosure with the protection increased safety "e".

For use in Zone 2 the field device coupler (FDC) with type nomenclature 9411/24-3\*0-\*1 has to be assembled into an enclosure which is in acc. with IEC 60079-15.

For use in Zone 22 the field device coupler (FDC) with type nomenclature 9411/21-2\*0-\*1 or 9411/24-3\*0-\*1 has to be assembled into an enclosure which is in acc. with IEC 60079-31 or IEC 61241-1.



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## EQUIPMENT(continued):

### Description (continued)

Power management of the SPURs is performed with the aid of a logic circuit and a microcontroller. The individual SPURs are connected staggered timewise when the bus is switched on so that the switch-on current peaks of connected field devices are not added up. Shorted SPURs are disconnected from the power supply until the short circuit is remedied. This results in a substantial reduction in maximum current consumption and power loss. In addition, the response threshold for short circuit protection of the SPURs is variable, consequently allowing the required power demand to be reduced still further if necessary.

Finally, there is a resistive limiter, limiting to the intrinsically safe maximum current of the SPURs. The terminal connections of the cable's shields both for TRUNK and for SPURs are connected capacitively to the device earth connection (PA). As an alternative, direct earthing with the shield busbar provided can be performed if necessary.

### Type designation

See Annex

### Electrical data (for issue 0 to 2)

#### **Fieldbus input**

(Terminals: TRUNK IN and TRUNK OUT, terminals: +, -, S)

Nominal cross section: 2.5 mm<sup>2</sup>

Nominal voltage:  $U_{nom} = 24 \text{ V DC (16 ... 32 V DC)}$

Rated current:  $I_{rated} = 2 \text{ A}$

Nominal current, Type 9411/2\*-\*\*\*-31; 4 outputs:  $I_{nom} = 130 \text{ mA (in the case of } 4 * I_{SPUR} = 40 \text{ mA)}$

Nominal current, Type 9411/2\*-\*\*\*-41; 8 outputs:  $I_{nom} = 160 \text{ mA (in the case } 8 * I_{SPUR} = 40 \text{ mA)}$

Maximum Safety voltage:  $U_m \leq 253 \text{ V AC}$

Shield connector:  
(terminals: S) For connection of the cable shield  
the shield connector is connected to the device earth  
connector via a  $\leq 2.6 \text{ nF}$  capacitor.

Earth connector:  
and For connection of the equipotential bonding conductor and  
(terminals at the shield busbar) for direct connection of the cable shields to earth (PA)

Shorting jumper:  
shorting The internal terminating resistor is activated if the  
(terminals TERM 1, 2) jumper is fitted. The bus is not terminated if there is no  
jumper fitted.



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## DETAILS OF CERTIFICATE CHANGES (for issues 1 and above):

The Field Device Couplers have been modified slightly.  
Marking can be carried out with EPL's or with alternate marking.  
Electrical parameters keep unchanged.

A new type has been added:

Type 941 1/2\*-\*3\*-\*1



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## Additional information:

### Output circuits with type of protection Ex ia

(Terminals: SPUR 1 ... 4 or 1 ... 8; in each case: +, -)

The output circuits are safely electrically isolated from the non-intrinsically safe fieldbus input up to a peak nominal voltage of 375 V. However, they are electrically interconnected between each other.

Nominal voltage:  $U_{nom} = 13.5 \text{ V DC}$

Nominal current:  $I_{nom} = 40 \text{ mA}$

$U_o = 15.7 \text{ V}$

$I_o = 245 \text{ mA}$

Safe maximum values per circuit:  $P_o = 960 \text{ mW}$  (linear characteristic)

$C_i = 1.1 \text{ nF}$   $L_i \approx 0 \text{ mH}$

The maximum permitted values for the external inductance and capacitance are specified in the table below (internal capacitance already taken into account)

	IIB	IIC
$L_o$ [mH]	2.9	0.58
$C_o$ [nF]	2878	476
$L_o/R_o$ [ $\mu\text{H}/\Omega$ ]	148	37

The following maximum values apply if concentrated inductances or capacitances are connected (internal capacitance already taken into account)

	IIB				IIC
$L_o$ [mH]	0.5	1.0	2.0	2.9	0.50
$C_o$ [nF]	2698	2198	1598	1198	368

As values for the external inductance and capacitance for dust applications the values of Group IIB are valid.

The output circuits are suitable for connection to fieldbus systems on the basis of the Foundation Fieldbus ENTITY Model.

The output circuits represent a FISCO power supply for connection to fieldbus systems on the basis of FISCO Model pursuant to IEC 60079-27.

The parameter per unit length of the cable used for the fieldbus must comply with the specifications of IEC 60079-27:

$R' = 15 \dots 150 \text{ /km}$  (loop resistance)

$L' = 0.4 \dots 1 \text{ mH/km}$

$C' = 45 \dots 200 \text{ nF/km}$

where any cable shield present must be allowed for as follows:

$C' = C'_{\text{wire/wire}} + 0.5 * C'_{\text{wire/shield}}$   
(in the case of floating field device circuit)

$C' = C'_{\text{wire/wire}} + C'_{\text{wire/shield}}$   
(if the shield is connected to one pole of the output circuit)

With these limitations the safe allowable connectable maximum line length is 1000 m.

Outgoing stub lines from the line are limited to a length of 60 m.

Shield connector:

For connection of the cable shield

(Terminals: S)

The shield connector is connected to the device ground connector (PA) via a  $\leq 5.2 \text{ nF}$  capacitor.

(Terminals at the shield busbar)

For direct connection of the cable shields to ground (PA).



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**Annex**  
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Type designation:

Field device coupler	Type	9411 / 2 * - * * * - * 1
Type of protection, output circuits (SPUR): Ex i	2	
Type of protection, input circuits (TRUNK): Ex e	1	
Type of protection Ex nA	4	
Device Zone 1	2	
Device Zone 2	3	
Design: Screw	1	
Cage clamp	2	
Exi terminals detachable	3	
No Enclosure	0	
Plastic enclosure	1	
Metal enclosure	2	
Number of channels (SPURs):	4 3	
	8 4	
Electrical isolation (input-output):	U <sub>m</sub> =253 V	1