Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

(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 06 ATEX 2036 X

(4)	Equipment:	Measuring sensors, type series OPTIMASS 1000, 1010C, 3000, 3010C, 7000, 7010C, 8000, 8010C, 9000 and 9010C type series OPTIGAS 5000 and 5010C
(5)	Manufacturer:	KROHNE Ltd.
(6)	Address:	Rutherford Drive, Park Farm South Ind. Est. Wellingborough, Northants NN8 6AE, Great Britain

(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 06-26151.

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

IEC 60079-0:2004 Ed.4 **EN 50020:2002** **IEC 61241-11:2005 Ed.1**

(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:

Ex II 2 G Ex ib IIC T6...T1 or Ex II 2 D Ex ibD 21 T °C

Zertifizierungsstelle Explosionsschutz
By order:

Braunschweig, September 21, 2006

Dr.-Ing. U. Johannsmeyer
Direktor und Professor

PHYSIKALISCH-TECHNISCHE BUNDESANSTALT 24

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.
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(13) # SCHEDULE

(14) ## EC-TYPE-EXAMINATION CERTIFICATE PTB 06 ATEX 2036 X

(15) Description of equipment

The measuring sensors of type series OPTIMASS 1000, 1010C, 3000, 3010C, 7000, 7010C, 8000, 8010C, 9000 and 9010C as well as type series OPTIGAS 5000 and 5010C are used as part of a flow measuring system to determine the mass flow rate of flammable and non-flammable liquids and gases. The measuring sensors are equipped with the separately certified on-site electronics Frontend & Backplane-FE as well as the p.c.b. Junction Box and they are operated using the measuring transducer, type MFC 300 which is also certified separately.

For relationship between maximum permissible ambient temperature, maximum medium temperature, maximum surface temperature and temperature class for the individual types of sensors, reference is made to the following tables.

OPTIMASS 1000 / 1010C

ambient temperature, up to T_{amb}	temperature class	max. medium temperature, up to T_M	max. surface temperature
65 °C	T4	89 °C	T130°C
	T3 – T1	130 °C (*)	T175°C

(*) heat-resistant connecting cable ≥ 80 °C required

OPTIMASS 3000 / 3010C und 7000 / 7010C, non-insulated designs

ambient temperature, up to T_{amb}	temperature class	max. medium temperature, up to T_M	max. surface temperature
40 °C	T6	70 °C	T80°C
	T5	90 °C	T95°C
	T4	130 °C (*)	T130°C
	T3 – T1	150 °C (*)	T150°C
50 °C	T6	70 °C	T80°C
	T5	85 °C	T95°C
	T4	130 °C (*)	T130°C
	T3 – T1	150 °C (*)	T150°C
65 °C	T5	85 °C	T95°C
	T4	125 °C (*)	T130°C
	T3 – T1	150 °C (*)	T150°C

(*) heat-resistant connecting cable ≥ 80 °C required

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OPTIMASS 3000 / 3010C und 7000 / 7010C, insulated / heated designs

ambient temperature, up to T_{amb}	temperature class	max. medium temperature, up to T_M	max. surface temperature
40 °C	T6	65 °C	T80°C
	T5	80 °C	T95°C
	T4	115 °C (*)	T130°C
	T3 – T1	150 °C (*)	T165°C
65 °C	T5	80 °C	T95°C
	T4	115 °C (*)	T130°C
	T3 – T1	150 °C (*)	T165°C

(*) heat-resistant connecting cable ≥ 90 °C required

OPTIMASS 8000 / 8010C

ambient temperature, up to T_{amb}	temperature class	max. medium temperature, up to T_M	max. surface temperature
65 °C	T4	80 °C	T130°C
	T3	145 °C	T195°C
	T2 – T1	230 °C (*)	T280°C

(*) heat-resistant connecting cable ≥ 80 °C required

OPTIMASS 9000 / 9010C

ambient temperature, up to T_{amb}	temperature class	max. medium temperature, up to T_M	max. surface temperature
65 °C	T4	95 °C	T130°C
	T3	160 °C	T195°C
	T2	255 °C (*)	T290°C
	T1	350 °C (*)	T385°C

(*) heat-resistant connecting cable ≥ 80 °C required

OPTIGAS 5000 / 5010C

ambient temperature, up to T_{amb}	temperature class	max. medium temperature, up to T_M
65 °C	T4	70 °C
	T4	80 °C (*)
	T3 – T1	95 °C (*)

(*) heat-resistant connecting cable ≥ 80/90 °C required

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Electrical data

Supply circuit	type of protection Intrinsic Safety EEx ib IIC
terminals +, - (on p.c.b. Sensor Junction Box)	only for connection to a certified intrinsically safe circuit
	Maximum values:
	U_i = 16.5 V Ii = 340 mA P_i = 1.3 W C_i = 35 nF L_i = 10 µH

Data circuit	type of protection Intrinsic Safety EEx ib IIC
terminals A, B (on p.c.b. Sensor Junction Box)	only for connection to a certified intrinsically safe circuit
	Maximum values:
	U_i = 11.8 V Ii = 40 mA P_i = 120 mW C_i = 35 nF L_i = 10 µH

The supply circuit and the data circuit are electrically interconnected.

(16) Test report PTB Ex 06-26151

(17) Special conditions for safe use

1. The measuring sensors of type series OPTIMASS 1010C, 3010C, 7010C, 8010C and 9010C as well as OPTIGAS 5010C shall be included in the equipotential bonding system of the hazardous area.

2. For relationship between maximum permissible ambient temperature, maximum medium temperature, maximum surface temperature and temperature class for the individual types of sensors, reference is made to the tables given in the operating instructions or the tables given above respectively.

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(18) Essential health and safety requirements

met by compliance with the standards mentioned above

Zertifizierungsstelle Explosionsschutz
By order:

Braunschweig, September 21, 2006

Dr.-Ing. U. Johannsmeyer
Direktor und Professor

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Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

1. SUPPLEMENT

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

to EC-TYPE-EXAMINATION CERTIFICATE PTB 06 ATEX 2036 X

(Translation)

Equipment: Measuring sensors, type series OPTIMASS 1000, 1010C, 3000, 3010C, 7000, 7010C, 8000, 8010C, 9000 and 9010C type series OPTIGAS 5000 and 5010C

Marking: **⟨Ex⟩ II 2 G Ex ib IIC T6...T1 or ⟨Ex⟩ II 2 D Ex ibD 21 T** °C

Manufacturer: KROHNE Ltd.

Address: Rutherford Drive, Park Farm South Ind. Est.
Wellingborough, Northants NN8 6AE, Great Britain

Description of supplements and modifications

In the future the measuring sensors of type series OPTIMASS and OPTIGAS may also be manufactured and operated according to the test documents listed in the test report. The modifications comprise the introduction of the new type series OPTIMASS 2000 and 2010C, two additional variants of configuring and wiring of strain gauges for the measuring sensors OPTIMASS 2000 as well as the extension of the temperature classes to a T6-option for the measuring sensors OPTIMASS 1000 and 1010C.

Thus the temperature specifications and the electrical data change as follows:

OPTIMASS 2000 / 2010C

For relationship between maximum permissible ambient temperature, maximum medium temperature, maximum surface temperature and temperature class, reference is made to the following table.

ambient temperature, up to T_{amb}	temperature class	max. medium temperature, up to T_M	max. surface temperature
40 °C	T6	60 °C	T80 °C
	T5	75 °C	T95 °C
	T4	110 °C	T130 °C
	T3 – T1	130 °C	T150 °C
65 °C	T5	75 °C	T95 °C
	T4	110 °C (*)	T130 °C
	T3 – T1	130 °C (*)	T150 °C

(*) heat-resistant connecting cable ≥ 80 °C required

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1. SUPPLEMENT TO EC-TYPE-EXAMINATION CERTIFICATE PTB 06 ATEX 2036 X

Electrical data

Supply circuit

terminals +, -
(on p.c.b. Sensor Junction Box)

type of protection Intrinsic Safety Ex ib IIC

only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 16.5 V
Ii = 340 mA
P_i = 1.3 W
C_i = 35 nF
L_i = 10 µH

Data circuit

terminals A, B
(on p.c.b. Sensor Junction Box)

type of protection Intrinsic Safety Ex ib IIC

only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 11.8 V
Ii = 40 mA
P_i = 120 mW
C_i = 35 nF
L_i = 10 µH

The supply circuit and the data circuit are electrically interconnected.

OPTIMASS 1000 / 1010C with T6-option

For relationship between maximum permissible ambient temperature, maximum medium temperature, maximum surface temperature and temperature class, reference is made to the following table.

ambient temperature, up to T_{amb}	temperature class	max. medium temperature, up to T_M	max. surface temperature
40 °C	T6	45 °C	T80 °C
	T5	60 °C	T95 °C
	T4	95 °C (*)	T130 °C
	T3 – T1	130 °C (*)	T165 °C
50 °C	T5	60 °C	T95 °C
	T4	95 °C (*)	T130 °C
	T3 – T1	130 °C (*)	T165 °C
65 °C	T4	95 °C (*)	T130 °C
	T3 – T1	130 °C (*)	T165 °C

(*) heat-resistant connecting cable ≥ 80 °C required

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Braunschweig und Berlin

1. SUPPLEMENT TO EC-TYPE-EXAMINATION CERTIFICATE PTB 06 ATEX 2036 X

Electrical data

Supply circuit

terminals +, -
(on p.c.b. Sensor Junction Box)

type of protection Intrinsic Safety Ex ib IIC

only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 16.5 V
Ii = 265 mA
P_i = 1.1 W
C_i = 35 nF
L_i = 10 µH

Data circuit

terminals A, B
(on p.c.b. Sensor Junction Box)

type of protection Intrinsic Safety Ex ib IIC

only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 11.8 V
Ii = 40 mA
P_i = 120 mW
C_i = 35 nF
L_i = 10 µH

The supply circuit and the data circuit are electrically interconnected.

The "Special Condition" No. 1 of the EC-type examination certificate is extended as follows:

1. The measuring sensors of type series OPTIMASS 1010C, 1010C-T6, 2010C, 3010C, 7010C, 8010C and 9010C as well as OPTIGAS 5010C shall be included in the equipotential bonding system of the hazardous area.

All further specifications and electrical data of the EC-type examination certificate as well as the "Special Conditions" apply without changes also to this 1st supplement.

Applied standards

EN 60079-0:2006	**EN 60079-11:2007**
EN 61241-0:2006	**EN 61241-11:2006**

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1. SUPPLEMENT TO EC-TYPE-EXAMINATION CERTIFICATE PTB 06 ATEX 2036 X

Test report: PTB Ex 08-28027

Zertifizierungsstelle Explosionsschutz
By order:

Dr.-Ing. U. Johannsmeyer
Direktor und Professor

Braunschweig, June 9, 2008

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.
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Braunschweig und Berlin

2. SUPPLEMENT

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

to EC-TYPE-EXAMINATION CERTIFICATE PTB 06 ATEX 2036 X

(Translation)

Equipment: Measuring sensors, type series OPTIMASS 1000, 1000 T6, 1010C, 1010C T6, 2000, 2010C, 3000, 3010C, 7000, 7010C, 8000, 8010C, 9000 and 9010C as well as type series OPTIGAS 5000 and 5010C

Marking: ⟨Ex⟩ **II 2 G Ex ib IIC T6...T1 bzw.** ⟨Ex⟩ **II 2 D Ex ibD 21 T** °C

Manufacturer: KROHNE Ltd.

Address: Rutherford Drive, Park Farm South Ind. Est.
Wellingborough, Northants NN8 6AE, Great Britain

Description of supplements and modifications

In the future the measuring sensors of type series OPTIMASS and OPTIGAS may also be manufactured and operated according to the test documents listed in the test report. The modifications concern the introduction of the new type series OPTIMASS 4000, 4010C, 8000k, 8010kC as well as OPTIGAS 4000 and 4010C, the adaption to the current state of the standards, the introduction of a design with lacquered enclosure surfaces for specific type series and the specifications of the maximum permissible ambient and medium temperatures. Furthermore, specific type series can in future be applied as separating unit to isolate areas from each other where equipment of category 1 or category 2 is required respectively. For this application purpose the marking has been adapted correspondingly.

For relationship between maximum permissible ambient temperature, maximum medium temperature, maximum surface temperature and temperature class for the newly introduced type series, reference is made to the following tables.

OPTIMASS 8000k / 8010kC with or without heating jacket / insulation			
permissible range of the ambient temperature T_{amb}	temperature class	permissible range of the medium temperature T_M	max. surface temperature
-40 °C ... +65 °C	T4	-40 °C ... +80 °C	T130 °C
	T3	-40 °C ... +140 °C *)	T195 °C
	T2 – T1	-40 °C ... +230 °C *)	T280 °C

*) heat-resistant connecting cable ≥ 80 °C required

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2. SUPPLEMENT TO EC-TYPE-EXAMINATION CERTIFICATE PTB 06 ATEX 2036 X

OPTIMASS 8000k / 8010kC with or without heating jacket / insulation cyrogenic applications			
permissible range of the ambient temperature T_{amb}	temperature class	permissible range of the medium temperature T_M	max. surface temperature
-20 °C ... +65 °C	T4 – T1	-195 °C ... +80 °C	T130 °C

OPTIMASS / OPTIGAS 4000 / 4010C without heating jacket / insulation			
permissible range of the ambient temperature T_{amb}	temperature class	permissible range of the medium temperature T_M	max. surface temperature
-40 °C ... +65 °C	T4	-40 °C ... +80 °C	T130 °C
	T3	-40 °C ... +145 °C *)	T195 °C
	T2 – T1	-40 °C ... +160 °C *)	T210 °C

*) heat-resistant connecting cable ≥ 80 °C required

Electrical data

OPTIMASS 8000k / 8010kC and OPTIGAS 4000 / 4010C

Supply circuit

terminals +, -
(on p.c.b. Sensor Junction Box)

type of protection Intrinsic Safety Ex ib IIC

only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 16.5 V
Ii = 340 mA
P_i = 1.3 W
C_i = 35 nF
L_i = 10 µH

Data circuit

terminals A, B
(on p.c.b. Sensor Junction Box)

type of protection Intrinsic Safety Ex ib IIC

only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 11.8 V
Ii = 40 mA
P_i = 120 mW
C_i = 35 nF
L_i = 10 µH

The supply circuit and the data circuit are electrically interconnected.

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2. SUPPLEMENT TO EC-TYPE-EXAMINATION CERTIFICATE PTB 06 ATEX 2036 X

The maximum permissible ambient and medium temperatures for type series OPTIMASS 1000, 1000 T6, 1010C, 1010C T6, 2000, 2010C, 3000, 3010C, 4000, 4010C, 7000, 7010C, 8000k, 8010kC, as well as OPTIGAS 4000 and 4010C of lacquered designs are:

T_{amb} = 40 °C T_{medium} = 110 °C

The marking of type series OPTIMASS 1000, 1000 T6, 1010C, 1010C T6, 2000, 2010C, 4000, 4010C, 7000, 7010C, 8000k, 8010kC as well as OPTIGAS 4000 and 4010C for the application as separating unit reads:

II 1/2 G Ex ib IIC T6...T1 Ga/Gb

The marking of all type series for the application in hazardous areas due to combustible dusts changes to:

II 2 D Ex ib IIIC T °C Db**

The "Special Condition" No. 1 of the EC-type examination certificate is extended as follows:

1. The measuring sensors of type series OPTIMASS 1010C, 1010C-T6, 2010C, 3010C, 4010C, 7010C, 8010C, 8010kC and 9010C as well as OPTIGAS 4010C and 5010C shall be included in the equipotential bonding system of the hazardous area.

All further "Special Conditions" and specifications of the EC-type examination certificate and the 1st supplement apply without changes also to this 2nd supplement.

Applied standards

EN 60079-0:2009	**EN 60079-11:2007**
EN 60079-26:2007	**EN 61241-11:2006**

Assessment and test report: PTB Ex 10-20136

Zertifizierungssektor Explosionsschutz
On behalf of PTB:

Braunschweig, October 21, 2010

Dr.-Ing. U. Gerlach
Oberregierungsrat

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Braunschweig und Berlin

3. SUPPLEMENT

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

to EC-TYPE-EXAMINATION CERTIFICATE PTB 06 ATEX 2036 X

(Translation)

Equipment: Measuring sensors, type series OPTIMASS 1000, 1000 T6, 1010C, 1010C T6, 2000, 2010C, 3000, 3010C, 4000, 4010C, 7000, 7010C, 8000, 8010C, 8000k, 8010kC, 9000 and 9010C as well as
type series OPTIGAS 4000, 4010C, 5000 and 5010C

Marking: **II 1/2 G Ex ib IIC T6...T1 Ga/Gb or**
II 2 D Ex ib IIIC T* °C Db**

Manufacturer: KROHNE Ltd.

Address: Rutherford Drive, Park Farm South Ind. Est.
Wellingborough, Northants NN8 6AE, United Kingdom

Description of supplements and modifications

In the future the measuring sensors of type series OPTIMASS and OPTIGAS may also be manufactured and operated according to the test documents listed in the test report. The resistance of the drive coils of the variant OPTIMASS 2000/2010C is reduced by reducing the number of windings. Based on a reconsideration of the utilisation of the protection diodes D3 and D4 the limiting diodes D1, D2 and D3-opt., previously used in addition, are no longer required.

The maximum permissible medium temperatures for the variant OPTIGAS 4000/4010C are reduced. Hence the limiting resistor R1 may be dispensed with. The junction box is replaced by a blanking plate and a smaller PCB.

Furthermore, this supplement includes the adaption to the current state of the standards.

For relationship between maximum permissible ambient temperature, maximum medium temperature, maximum surface temperature and temperature class for type series OPTIGAS 4000/4010C, reference is made to the following table.

OPTIGAS 4000/4010C without heating jacket / insulation			
permissible range of the ambient temperature T_{amb}	temperature class	permissible range of the medium temperature T_M	max. surface temperature
-40 °C ... +65 °C	T4	-40 °C ... +60 °C	T130 °C
	T3	-40 °C ... +125 °C *)	T195 °C
	T2 – T1	-40 °C ... +140 °C *)	T210 °C

*) heat-resistant connecting cable ≥ 80 °C required

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3. SUPPLEMENT TO EC-TYPE-EXAMINATION CERTIFICATE PTB 06 ATEX 2036 X

All further specifications and the "Special Conditions" of the EC-type examination certificate as well as the 1st and 2nd supplement apply without changes also to this 3rd supplement.

Applied standards

EN 60079-0:2012 **EN 60079-11:2012** **EN 60079-26:2007**

Test report: PTB Ex 14-24163

Konformitätsbewertungsstelle, Sektor Explosionsschutz
On behalf of PTB:

Braunschweig, November 3, 2014

Dr.-Ing. U. Johannsmeyer
Direktor und Professor

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