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 2050 X

(4) Equipment: Vortex frequency flowmeter, type OPTISWIRL 4070 C

(5) Manufacturer: Krohne Messtechnik GmbH & Co. KG

(6) Address: Ludwig-Krohne Straße 5, 47058 Duisburg, 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 06-26248 .

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

EN 50014:1997 + A1 + A2 **EN 50018:2000** **EN 50020:2002**

(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 G EEx d ia [ia] IIC T6

Zertifizierungsstelle Explosionsschutz
By order:

Braunschweig, November 17, 2006

Dr.-Ing. U. Johannsmeyer
Direktor und Professor

(13) # SCHEDULE

(14) ## EC-TYPE-EXAMINATION CERTIFICATE PTB 06 ATEX 2050 X

(15) Description of equipment

The vortex frequency flowmeters of type series OPTISWIRL 4070 C are used for the measurement, count and display of the volumetric flow of liquids, gases and vapours in pipings. The apparatus consists of the assemblies measuring transducer OPTISWIRL VFC 070 and sensor unit OPTISWIRL 4000 which are mounted to each other to form a compact device. The Measuring transducer is assembled from the separately certified components enclosure, type MH 70, electronic assembly, type VFC 070 and crewed-in conductor bushings between electronic compartment and sensor or terminal compartment respectively.
Supply and signal evaluation are designed to type of protection Intrinsic Safety. The vortex frequency flowmeters are intended for application in the hazardous area.

For relationship between maximum permissible medium and ambient temperatures and the respective temperature classes and nominal diameters, reference is made to the following table 1:

Table 1: Maximum permissible medium and ambient temperatures OPTISWIRL 4070 C

[°C]	temperature class									
	T6	T5	T4		T3			T2 ... T1		
T_{amb}	60	60	50	60	40	50	60	40	50	60
nominal diameter										
DN15 ... 25	60	75	110	90	175	175 *)	125*)	235*)	180*)	125*)
DN40 ... 50	60	75	110	85	175	165	115	215	165	115
DN65 ... 100	60	75	110	85	175	155	110	200	155	110
DN150	60	75	110	95	175	175	130*)	240*)	190*)	130*)

*) long-term service temperature of the connecting line and the cable gland ≥ 80 °C.

The minimum ambient temperature is : -25 °C
The minimum medium temperature is: -40 °C

Electrical data

Signal outputs / auxiliary power

Current output 4-20 mA
(terminals A+, A)

type of protection Intrinsic Safety EEx ia IIC
only for connection to a certified intrinsically safe circuit

Maximum values:
U_i = 30 V
I_i = 100 mA
P_i = 1.0 W
C_i = 15 nF
Li = 600 µH

Pulse-/status output (terminals B+, B)	type of protection Intrinsic Safety EEx ia IIC only for connection to a certified intrinsically safe circuit Maximum values: U_i = 30 V I_i = 100 mA P_i = 1.0 W C_i = 15 nF Li = 600 µH
Sensor circuits	internal, type of protection Intrinsic Safety
Display circuit	internal, non-intrinsically safe Nominal values U = 10 V I = 1 mA

The current output 4-20 mA is safely electrically isolated from the pulse-/status output up to a peak value of the nominal voltage of 60 V. Both circuits are isolated from earth.

(16) Test report PTB Ex 06-26248

(17) Special conditions for safe use

1. The vortex frequency flowmeters of type series OPTISWIRL 4070 C shall be included in the equipotential bonding system of the hazardous area.
2. Opening the enclosure inside the hazardous area is only permissible in a de-energized state and with keeping a subsequent waiting time (warning label !)

   This waiting time is: 1 minute for temperature classes T6 and T5
   The waiting time may be omitted for temperature classes T4 ... T1.
3. For relationship between maximum permissible medium and ambient temperatures and the respective temperature classes and nominal diameters, reference is made to the table given in the operating instructions or to the table 1 stated above.
4. Attention shall be paid to the notes given in the operating instructions.

(18) Essential health and safety requirements

met by compliance with the standards mentioned above

Zertifizierungsstelle Explosionsschutz
By order:

Braunschweig, November 17, 2006

Dr.-Ing. U. Johannsmeyer
Direktor und Professor

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 2050 X

(Translation)

Equipment: Vortex frequency flowmeter, type OPTISWIRL 4070 C

Marking: Ⓔx **II 2 G Ex d ia [ia] IIC T6**

Manufacturer: Krohne Messtechnik GmbH & Co. KG

Address: Ludwig-Krohne Straße 5
47058 Duisburg, Germany

Description of supplements and modifications

The modifications concern the adaption to the standards of series EN 60079 without any technical modification of the equipment.

According to EN 60079-0 the marking changes as follows:

Marking: Ⓔx **II 2 G Ex d ia [ia] IIC T6**

The "Special conditions" apply without changes also to this first supplement.

Applied standards

EN 60079-0:2006 **EN 60079-1:2004** **EN 60079-11:2007**

Test report: PTB Ex 07-27212

Zertifizierungsstelle Explosionsschutz
By order:

Braunschweig, July 3, 2007

Dr.-Ing. U. Johannsmeyer
Direktor und Professor

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2. SUPPLEMENT

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

to EC-TYPE-EXAMINATION CERTIFICATE PTB 06 ATEX 2050 X

(Translation)

Equipment: Vortex frequency flowmeter, type OPTISWIRL 4070 C

Marking: ⟨Ex⟩ II **2 G Ex d ia [ia] IIC T6**

Manufacturer: Krohne Messtechnik GmbH & Co. KG

Address: Ludwig-Krohne Straße 5, 47058 Duisburg, Germany

Description of supplements and modifications

In the future the vortex frequency flowmeter, type OPTISWIRL 4070 C may also be manufactured and operated according to the test documents listed in the test report. The modifications concern the extension of the flow measuring ranges by the nominal diameters DN200, DN250 and DN300, the design of the sensors (Hastelloy, lacquered finish), the installation of different certified cable glands as well as the permissible lowest ambient temperature and the specification of the permissible medium and ambient temperatures for different mounting positions of the measuring transducer.

The permissible lowest ambient temperature will be in future -40 °C.

For relationship between the maximum permissible medium and ambient temperatures, the respective temperature classes and the nominal diameters for different mounting positions, reference is made to the following tables:

Table 1: Maximum permissible medium and ambient temperatures (Mounting position of the measuring transducer above the measuring unit)

[°C]	temperature class									
	T6	T5	T4		T3		T2 ... T1			
$T_{amb.}$	60	60	50	60	40	50	60	40	50	60
nominal diameter										
DN15 ... 25	60	75	110	110	175	175 *)	125*)	235*)	180*)	125*)
DN40 ... 50	60	75	110	110	175	165	115	215	165	115
DN65 ... 100	60	75	110	110	175	155	110	200	155	110
DN150... 300	60	75	110	110	175	175	130*)	240*)	190*)	130*)

*) long-term service temperature of the connecting line and the cable gland ≥ 80 °C.

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2. SUPPLEMENT TO EC-TYPE-EXAMINATION CERTIFICATE PTB 06 ATEX 2050 X

Table 2: Maximum permissible medium and ambient temperatures (Mounting position of the measuring transducer on the side of the measuring unit)

[°C]	temperature class									
	T6	T5	T4		T3			T2 ... T1		
T_{amb}	60	60	50	60	40	50	60	40	50	60
nominal diameter										
DN15 ... 25	60	75	110	110	175	175 *)	145*)	240*)	205*)	145*)
DN40 ... 50	60	75	110	110	175	175 *)	135*)	240*)	205*)	135*)
DN65 ... 100	60	75	110	110	175	175 *)	130*)	240*)	195*)	130*)
DN150... 300	60	75	110	110	175	175	150*)	240*)	235*)	150*)

*) long-term service temperature of the connecting line and the cable gland ≥ 80 °C.

Table 3: Maximum permissible medium and ambient temperatures (Measuring units of lacquered finish)

[°C]	temperature class		
	T6	T5	T4 ... T1
T_{amb}	60	60	60
nominal diameter			
DN15 ... 300	60	75	90

The "Electrical Data", the "Special Conditions" and all further specifications of the EC-type examination certificate including the 1. supplement apply without changes also for this 2. supplement.

Applied standards

EN 60079-0:2006 EN 60079-1:2004 EN 60079-11:2007

Test report: PTB Ex 08-27368

Zertifizierungsstelle Explosionsschutz
By order:

Dr.-Ing. U. Gerlach
Oberregierungsrat

Braunschweig, March 25, 2008

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

3. SUPPLEMENT

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

to EC-TYPE-EXAMINATION CERTIFICATE PTB 06 ATEX 2050 X

(Translation)

Equipment: Vortex frequency flowmeter, type OPTISWIRL 4070 C

Marking: Ⓔx **Ex d ia [ia] IIC T6**

Manufacturer: Krohne Messtechnik GmbH formerly Krohne Messtechnik GmbH & Co. KG

Address: Ludwig-Krohne Straße 5, 47058 Duisburg, Germany

Description of supplements and modifications

In the future the vortex frequency flowmeter, type OPTISWIRL 4070 C may also be manufactured and operated according to the test documents listed in the test report.

The modifications concern the introduction of a conically shaped pickup used for the nominal diameters DN15 and DN25, the reduction of the piezo-capacitance considered in the piezo/Pt1000-circuit, the manufacturing process of the sensors used for nominal diameters from DN150 to DN300 and the introduction of a Dual Version with two independent measuring systems and optional pressure sensor where the signal analysis is carried out by means of two separate measuring transducers. Furthermore, the Remote-System, type OPTISWIRL 4070F is introduced which consists of the measuring transducer, type VFC 070F with wall bracket and the separated sensor of type OPTISWIRL 4000. The interconnection is designed to type of protection Intrinsic Safety, category "ia" and realized by a cable having a maximum length of 30 m. The electrical data as well as the type code are extended correspondingly. In the future also equivalent connection cables of other manufacturers may be used in the pickup (piezo and temperature sensor).

Electrical data

Measuring transducer, type VFC 070F — **Marking: II 2 G Ex d ia [ia] IIC T6**

Signal outputs / auxiliary power

Current output 4-20 mA
(terminals A+, A)

type of protection Intrinsic Safety Ex ia IIC
only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 30 V
I_i = 100 mA
P_i = 1.0 W
C_i = 15 nF
Li = 600 µH

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3. SUPPLEMENT TO EC-TYPE-EXAMINATION CERTIFICATE PTB 06 ATEX 2050 X

Pulse-/status output
(terminals B+, B)

type of protection Intrinsic Safety Ex ia IIC
only for connection to a certified intrinsically safe circuit

Maximum values:
U_i = 30 V
I_i = 100 mA
P_i = 1.0 W
C_i = 15 nF
Li = 600 µH

Sensor circuits
Piezo / Pt1000
(connection Piezo: terminals 1, 2, 3
connection Temp: terminals 1, 2)

type of protection Intrinsic Safety Ex ia IIC
Maximum values:
U_o = 30 V
I_o = 62 mA
P_o = 460 mW
C_o = 22 nF
L_o = 0.35 mH

Pressure measuring circuit
(connection Pressure: terminals 1, 2, 3,4 ,5)

type of protection Intrinsic Safety Ex ia IIC
Maximum values:
U_o = 30 V
I_o = 100 mA
P_o = 509 mW
C_o = 44 nF
L_o = 0.4 mH

Display circuit

internal, non-intrinsically safe

Nominal values
U = 10 V
I = 1 mA

The current output 4-20 mA is safely electrically isolated from the pulse-/status output up to a peak value of the nominal voltage of 60 V. Both circuits are isolated from earth.

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3. SUPPLEMENT TO EC-TYPE-EXAMINATION CERTIFICATE PTB 06 ATEX 2050 X

Sensor, type OPTISWIRL 4000 **Marking: II 2 G Ex ia IIC T6**

(only for connection to the certified intrinsically safe measuring transducer, type VFC 070F)

Sensor circuits
Piezo / Pt1000
(connection Piezo: terminals 1, 2, 3
connection Temp: terminals 1, 2)

type of protection Intrinsic Safety Ex ia IIC
Maximum values:

U_i = 30 V
I_i = 62 mA
P_i = 460 mW
C_i = 8 nF
L_i = negligibly low

Pressure measuring circuit
(connection Pressure: terminals 1, 2, 3, 4 ,5)

type of protection Intrinsic Safety Ex ia IIC
Maximum values:

U_i = 30 V
I_i = 100 mA
P_i = 509 mW
C_i = negligibly low
L_i = negligibly low

Both intrinsically safe sensor circuits are safely electrically isolated in the sensor up to a peak value of the nominal voltage of 30 V and from earth.

Special Condition No. 1 is extended as follows:

Special conditions for safe use

1. The vortex frequency flowmeters of type series OPTISWIRL 4070 C as well as the Remote-System, type OPTISWIRL 4070F shall be included in the equipotential bonding system of the hazardous area.

All further electrical data, Special Conditions and specifications of the EC-type examination certificate including the 1st and 2nd supplement apply without changes also to this 3rd supplement.

Applied standards

EN 60079-0:2006 **EN 60079-1:2007** **EN 60079-11:2007**

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3. SUPPLEMENT TO EC-TYPE-EXAMINATION CERTIFICATE PTB 06 ATEX 2050 X

Assessment and test report: PTB Ex 10-29339

Zertifizierungssektor Explosionsschutz
By order:

Braunschweig, May 12, 2010

Dr.-Ing. U. Johannsmeyer
Direktor und Professor