



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

(2) Equipment or Protective Systems Intended for Use in
Potentially Explosive Atmospheres - **Directive 2014/34/EU**

(3) EU-Type Examination Certificate Number:

PTB 12 ATEX 2013 X

Issue: 1

(4) Product: Mass Flow Sensors, type series OPTIMASS
1000F VE***, 2000F VE***, 3000F VE***, 6000F VE***, 7000F VE***

(5) Manufacturer: Krohne Ltd.

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

(7) This product and any acceptable variation thereto is 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 17 of the Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential Test Report PTB Ex 17-27037.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
EN 60079-0:2012 + A11:2013 EN 60079-11:2012 EN 60079-26:2015

(10) If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Specific Conditions of Use specified in the schedule to this certificate.

(11) This EU-Type Examination Certificate relates only to the design and construction of the specified product in accordance to the Directive 2014/34/EU. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

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



II 1 G Ex ia IIC T6...T1 Ga or II 1 D Ex ia IIIC Txxx°C Da

Konformitätsbewertungsstelle, Sektor Explosionsschutz
On behalf of PTB:

Braunschweig, May 9, 2017

Dr.-Ing. F. Lienesch
Regierungsdirektor



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EU-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.

(13)

SCHEDULE

(14) **EU-Type Examination Certificate Number PTB 12 ATEX 2013 X, Issue: 1**

(15) Description of Product

The Mass Flow Sensors of type series OPTIMASS 1000F VE***, 2000F VE***, 3000F VE***, 6000F VE***, 7000F VE*** are used as part of a mass flow measuring system to determine the mass flow rate of flammable and non-flammable liquids and gases. The sensor units are operated either as a separately certified compact device where the converter is bolted directly onto the sensor housing or as a remote unit for connection to the separately certified MFC400F converter. The remote versions are provided with a Remote Junction Box which includes the terminals for connection to the converter and a protective circuitry to limit the voltage generated from the driver coils in the event of a remote cable break (back EMF). Therefore, an infallible connection between Remote Junction Box and MFC400F converter is not required.

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 1000F

Permissible range of the ambient temperature T_{amb} [°C]	Maximum medium temperature T_m [°C]	Temperature class	Maximum surface temperature [°C]
- 40 ... + 40	45	T6-T1	T80°C
	60	T5-T1	T95°C
	95	T4-T1	T130°C
	130	T3-T1	T165°C
	150	T3-T1	T185°C
- 40 ... + 50	60	T5-T1	T95°C
	95	T4-T1	T130°C
	130	T3-T1	T165°C
	150	T3-T1	T185°C
- 40 ... + 65	95	T4-T1	T130°C
	130	T3-T1	T165°C
	150	T3-T1	T185°C

Table 1: OPTIMASS 1000F with Remote Junction Box made of aluminum or stainless steel, with or without heating jacket or insulation
 Minimum process temperature: - 50 °C

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OPTIMASS 2000F including VE90... (4-tube-option)

Permissible range of the ambient temperature T_{amb} [°C]	Maximum medium temperature T_m [°C]	Temperature class	Maximum surface temperature [°C]
- 40 ... + 40	40	T6-T1	T70°C
	55	T5-T1	T85°C
	90	T4-T1	T120°C
	130	T3-T1	T160°C
- 40 ... + 50	55	T5-T1	T85°C
	90	T4-T1	T120°C
	130	T3-T1	T160°C
- 40 ... + 65	65	T5-T1	T95°C
	90	T4-T1	T120°C
	130	T3-T1	T160°C

Table 2: OPTIMASS 2000F (incl. VE90...) with Remote Junction Box made of aluminum or stainless steel, with or without heating jacket or insulation
Minimum process temperature: - 50 °C

OPTIMASS 3000F

Permissible range of the ambient temperature T_{amb} [°C]	Maximum medium temperature T_m [°C]	Temperature class	Maximum surface temperature [°C]
- 40 ... + 40	65	T6-T1	T80°C
	80	T5-T1	T95°C
	115	T4-T1	T130°C
	150	T3-T1	T165°C
- 40 ... + 50	65	T6-T1	T80°C
	80	T5-T1	T95°C
	115	T4-T1	T130°C
	150	T3-T1	T165°C
- 40 ... + 65	65	T6-T1	T80°C
	80	T5-T1	T95°C
	115	T4-T1	T130°C
	130	T3-T1	T145°C

Table 3: OPTIMASS 3000F with Remote Junction Box made of aluminum or stainless steel, with or without heating jacket AND insulation
Minimum process temperature: - 50 °C

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OPTIMASS 6000F

Permissible range of the ambient temperature T_{amb} [°C]	Maximum medium temperature T_m [°C]	Temperature class	Maximum surface temperature [°C]
- 40 ... + 40	40	T6-T1	T80°C
	55	T5-T1	T95°C
	90	T4-T1	T130°C
	150	T3-T1	T190°C
	230	T2-T1	T270°C
- 40 ... + 50	40	T6-T1	T80°C
	55	T5-T1	T95°C
	90	T4-T1	T130°C
	150	T3-T1	T190°C
	230	T2-T1	T270°C
- 40 ... + 65	40	T6-T1	T80°C
	55	T5-T1	T95°C
	90	T4-T1	T130°C
	150	T3-T1	T190°C
	230	T2-T1	T270°C

Table 4: OPTIMASS 6000F with Remote Junction Box made of aluminum or stainless steel, with heating jacket AND insulation or without heating jacket and with or without insulation

Minimum process temperature: - 50 °C

OPTIMASS 6000F, cryogenic applications

Permissible range of the ambient temperature T_{amb} [°C]	Permissible range of the medium temperature T_m [°C]	Temperature class	Maximum surface temperature [°C]
- 25 ... + 65	- 140 ... + 40	T6-T1	T80°C
- 25 ... + 65	- 160 ... + 40	T6-T1	T80°C
- 20 ... + 65	- 180 ... + 40	T6-T1	T80°C
- 20 ... + 65	- 200 ... + 40	T6-T1	T80°C

Table 5: OPTIMASS 6000F with Remote Junction Box made of aluminum or stainless steel, with heating jacket AND insulation or without heating jacket and with or without insulation

Minimum process temperature: < - 50 °C

Minimum medium temperature: - 20 °C or - 25 °C

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OPTIMASS 6000F VE...0... (short stem option)

Permissible range of the ambient temperature T_{amb} [°C]	Maximum medium temperature T_m [°C]	Temperature class	Maximum surface temperature [°C]
- 40 ... + 40	40	T6-T1	T80°C
	55	T5-T1	T95°C
	90	T4-T1	T130°C
	150	T3-T1	T190°C
- 40 ... + 50	40	T6-T1	T80°C
	55	T5-T1	T95°C
	90	T4-T1	T130°C
	150	T3-T1	T190°C
- 40 ... + 65	40	T6-T1	T80°C
	55	T5-T1	T95°C
	90	T4-T1	T130°C
	135	T3-T1	T175°C

Table 6: OPTIMASS 6000F VE...0... with Remote Junction Box made of aluminum or stainless steel, with heating jacket AND insulation or without heating jacket and with or without insulation

Minimum process temperature: - 50 °C

OPTIMASS 6000F VE...0... (short stem option), cryogenic applications

Permissible range of the ambient temperature T_{amb} [°C]	Permissible range of the medium temperature T_m [°C]	Temperature class	Maximum surface temperature [°C]
+ 10 ... + 65	- 140 ... + 40	T6-T1	T80°C
+ 20 ... + 65	- 160 ... + 40	T6-T1	T80°C
+ 30 ... + 65	- 180 ... + 40	T6-T1	T80°C
+ 40 ... + 65	- 200 ... + 40	T6-T1	T80°C

Table 7: OPTIMASS 6000F VE...0... with Remote Junction Box made of aluminum or stainless steel, with heating jacket AND insulation or without heating jacket and with or without insulation

Minimum process temperature: < - 50 °C

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OPTIMASS 6000F VE ...T... (high-temperature applications)

Permissible range of the ambient temperature T_{amb} [°C]	Maximum medium temperature T_m [°C]	Temperature class	Maximum surface temperature [°C]
- 40 ... + 40	40	T6-T1	T80°C
	55	T5-T1	T95°C
	90	T4-T1	T130°C
	150	T3-T1	T190°C
	230	T2-T1	T270°C
	400	T1	T440°C
- 40 ... + 55	40	T6-T1	T80°C
	55	T5-T1	T95°C
	90	T4-T1	T130°C
	150	T3-T1	T190°C
	230	T2-T1	T270°C
	400	T1	T440°C
- 40 ... + 60	40	T6-T1	T80°C
	55	T5-T1	T95°C
	90	T4-T1	T130°C
	150	T3-T1	T190°C
	230	T2-T1	T270°C
	400	T1	T440°C
- 40 ... + 65	350	T1	T390°C

Table 8: OPTIMASS 6000F VE...T... with Remote Junction Box made of aluminum or stainless steel, with heating jacket AND insulation

Minimum process temperature: - 50 °C

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OPTIMASS 6000F VE ...T... (high-temperature applications)

Permissible range of the ambient temperature T_{amb} [°C]	Maximum medium temperature T_m [°C]	Temperature class	Maximum surface temperature [°C]
- 40 ... + 40	40	T6-T1	T80°C
	55	T5-T1	T95°C
	90	T4-T1	T130°C
	150	T3-T1	T190°C
	230	T2-T1	T270°C
	400	T1	T440°C
- 40 ... + 50	40	T6-T1	T80°C
	55	T5-T1	T95°C
	90	T4-T1	T130°C
	150	T3-T1	T190°C
	230	T2-T1	T270°C
	400	T1	T440°C
- 40 ... + 55	40	T6-T1	T80°C
	55	T5-T1	T95°C
	90	T4-T1	T130°C
	150	T3-T1	T190°C
	230	T2-T1	T270°C
	400	T1	T440°C
- 40 ... + 60	350	T1	T390°C

Table 9: OPTIMASS 6000F VE...T... with Remote Junction Box made of stainless steel, with heating jacket AND insulation

Minimum process temperature: - 50 °C

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OPTIMASS 6000F VE ...T... (high-temperature applications)

Permissible range of the ambient temperature T_{amb} [°C]	Maximum medium temperature T_m [°C]	Temperature class	Maximum surface temperature [°C]
- 40 ... + 40	40	T6-T1	T80°C
	55	T5-T1	T95°C
	90	T4-T1	T130°C
	150	T3-T1	T190°C
	230	T2-T1	T270°C
	400	T1	T440°C
- 40 ... + 55	40	T6-T1	T80°C
	55	T5-T1	T95°C
	90	T4-T1	T130°C
	150	T3-T1	T190°C
	230	T2-T1	T270°C
	400	T1	T440°C
- 40 ... + 65	40	T6-T1	T80°C
	55	T5-T1	T95°C
	90	T4-T1	T130°C
	150	T3-T1	T190°C
	230	T2-T1	T270°C
	400	T1	T440°C

Table 10: OPTIMASS 6000F VE...T... with Remote Junction Box made of aluminum or stainless steel, without heating jacket AND with insulation

Minimum process temperature: - 50 °C

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OPTIMASS 7000F

Permissible range of the ambient temperature T_{amb} [°C]	Maximum medium temperature T_m [°C]	Temperature class	Maximum surface temperature [°C]
- 40 ... + 40	65	T6-T1	T80°C
	80	T5-T1	T95°C
	100	T4-T1	T115°C
	115	T4-T1	T130°C
	150	T3-T1	T165°C
- 40 ... + 50	80	T5-T1	T95°C
	100	T4-T1	T115°C
	115	T4-T1	T130°C
	150	T3-T1	T165°C
- 40 ... + 65	100	T4-T1	T115°C
	115	T4-T1	T130°C
	130	T3-T1	T145°C

Table 11: OPTIMASS 7000F with Remote Junction Box made of aluminum or stainless steel, with or without heating jacket AND insulation
 Minimum process temperature: - 50 °C

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Electrical data:

Connection to converter, type MFC400F VE53...

Driver circuit

(terminals, P.C.B. Board
DR+, DR-)

type of protection Intrinsic Safety Ex ia IIC
or Ex ib IIC

only for connection to the certified measuring
converter, type MFC400F VE53,
PTB 12 ATEX 2015 X

Maximum values:

$$\begin{aligned}U_i &= 11.8 \text{ V} \\I_i &= 1325 \text{ mA} \\P_i &= 530 \text{ mW}\end{aligned}$$

$$\begin{aligned}C_i &= 500 \text{ nF} \\L_i &= 36 \text{ }\mu\text{H}\end{aligned}$$

ineffective when connected infallibly

and

Sensor circuit

(terminals, P.C.B. Board
SA+ SA-, SB+, SB-)

type of protection Intrinsic Safety Ex ia IIC
or Ex ib IIC

only for connection to the certified measuring
converter, type MFC400F VE53,
PTB 12 ATEX 2015 X

Maximum values:

$$\begin{aligned}U_i &= 11.8 \text{ V} \\I_i &= 13 \text{ mA} \\P_i &= 39 \text{ mW}\end{aligned}$$

$$\begin{aligned}C_i &= 90 \text{ nF} \\L_i &= 100 \text{ mH}\end{aligned}$$

and

RTD / DMS-circuit

(terminals, P.C.B. Board
T1, T2, T3, T4)

type of protection Intrinsic Safety Ex ia IIC
or Ex ib IIC

only for connection to the certified measuring
converter, type MFC400F VE53,
PTB 12 ATEX 2015 X

Maximum values:

$$\begin{aligned}U_i &= 11.8 \text{ V} \\I_i &= 9 \text{ mA} \\P_i &= 27 \text{ mW}\end{aligned}$$

$$\begin{aligned}C_i &= 310 \text{ nF} \\L_i &= 1 \text{ mH}\end{aligned}$$

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Connection to converter, type MFC400F VE54...

Driver circuit

(terminals, P.C.B. Board
DR+, DR-)

type of protection Intrinsic Safety Ex ia IIC
or Ex ib IIC

only for connection to the certified measuring
converter, type MFC400F VE54,
PTB 12 ATEX 2015 X

Maximum values:

$$\begin{aligned}
 U_i &= 11.8 \text{ V} \\
 I_i &= 1325 \text{ mA} \\
 P_i &= 530 \text{ mW}
 \end{aligned}$$

$$\begin{aligned}
 C_i &= 1000 \text{ nF} \\
 L_i &= 36 \text{ } \mu\text{H}
 \end{aligned}$$

ineffective when connected infallibly

and

Sensor circuit

(terminals, P.C.B. Board
SA+ SA-, SB+, SB-)

type of protection Intrinsic Safety Ex ia IIC
or Ex ib IIC

only for connection to the certified measuring
converter, type MFC400F VE54,
PTB 12 ATEX 2015 X

Maximum values:

$$\begin{aligned}
 U_i &= 11.8 \text{ V} \\
 I_i &= 13 \text{ mA} \\
 P_i &= 39 \text{ mW}
 \end{aligned}$$

$$\begin{aligned}
 C_i &= 90 \text{ nF} \\
 L_i &= 100 \text{ mH}
 \end{aligned}$$

and

RTD / DMS-circuit

(terminals, P.C.B. Board
T1, T2, T3, T4)

type of protection Intrinsic Safety Ex ia IIC
or Ex ib IIC

only for connection to the certified measuring
converter, type MFC400F VE54,
PTB 12 ATEX 2015 X

Maximum values:

$$\begin{aligned}
 U_i &= 11.8 \text{ V} \\
 I_i &= 10.5 \text{ mA} \\
 P_i &= 31 \text{ mW}
 \end{aligned}$$

$$\begin{aligned}
 C_i &= 340 \text{ nF} \\
 L_i &= 100 \text{ mH}
 \end{aligned}$$

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Note:

The interconnection of the Mass Flow Sensors, type series OPTIMASS 1000F VE***, 2000F VE***, 3000F VE***, 6000F VE***, 7000F VE*** and the separately certified measuring converter, type MFC400F (PTB 12 ATEX 2015 X) can be considered intrinsically safe without additional evaluation if the following parameters of the connecting cable are not exceeded:

Maximum length: 20 m
Maximum total capacitance: 90 nF
Maximum total inductance: 36 μ H

Changes with respect to previous issues:

Compilation of the specifications from the initial certificate and the 1st and 2nd supplement as well as the specifications resulting from the following changes:

1. In addition to flammable and non-flammable liquids also gases are specified in the description as measuring medium.
2. Introduction of a revised CF-stem and a new CF-bush between sensor unit and Remote Junction Box as an additional option
3. Introduction of a modified wiring option for the sensor, type OPTIMASS 3000F
4. Revision of the sensor coil for the sensors, types OPTIMASS 1000F and OPTIMASS 2000F
5. Increase of the inductance of the sensor coil for the sensor, type OPTIMASS 6000F
6. Revision of electrical data, correction of the connection specifications, specification of data for operation with converter variants VE53 and VE54, remove driver circuit A data
7. Introduction of a clarifying note respecting the interconnection of the OPTIMASS x000F-sensors and the associated measuring converter, type MFC400F
8. Update of the state of standards
9. Revision of the operating instructions manual

(16) Test Report PTB Ex 17-27037

(17) Specific conditions of use

1. The Mass Flow Sensors of type series OPTIMASS 1000F VE***, 2000F VE***, 3000F VE***, 6000F VE***, 7000F VE*** 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 tables given in the operating instructions manual or the tables given above respectively.

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(18) Essential health and safety requirements

Met by compliance with the aforementioned standards.

According to Article 41 of Directive 2014/34/EU, EC-type examination certificates which have been issued according to Directive 94/9/EC prior to the date of coming into force of Directive 2014/34/EU (April 20, 2016) may be considered as if they were issued already in compliance with Directive 2014/34/EU. By permission of the European Commission supplements to such EC-type examination certificates and new issues of such certificates may continue to hold the original certificate number issued before April 20, 2016.

Konformitätsbewertungsstelle, Sektor Explosionsschutz
On behalf of PTB:

Braunschweig, May 9, 2017


Dr.-Ing. F. Lienesch
Regierungsdirektor

