Kirchner und Tochter
Durchflussmesstechnik seit 1951

Supplementary Installation and Operating Instructions

Flap-type Flow Meters
KFS ... Ex / Exd

A. Kirchner & Tochter GmbH Dieselstraße 17 · D-47228 Duisburg
Fon: +49 2065 9609-0 · Fax: +49 2065 9609-22 Internet: www.kt-flow.de · e-mail: info@kt-flow.de

Version 1.8

Contents

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1 General safety directions

These Supplementary Installation and Operating Instructions apply to the explosion protected versions of flap-type flow meter KFS ... Ex. The explosion protection applies solely to devices made of steel and stainless steel designed for installation between flanges.

They are additional and supplementary to the Installation and Operating Instructions for the non-explosion protected versions.

The directions given in these supplementary Instructions contain only the data relevant to explosion protection. The technical details given in the Installation and Operating Instructions for the non-explosion protected versions apply unchanged unless excluded or superseded by these Instructions.

The KFS ... Ex/ Exd series flow meter are in conformity with the European Directive 2014/34/EU have been tested for use in hazardous areas under **TÜV 15 ATEX 7085 X** by TÜV Rheinland (Rhineland Technical Inspectorate).

These approvals together with their boundary conditions must be observed without fail (see also Annex sect. 10 “EU type examination certificate”).

ATTENTION!

Assembly, installation, start-up and maintenance of explosion-protected equipment may only be carried out by qualified personnel!

2 Main safety-relevant characteristics

2.1 EPL and device group / Zone

The flap-type flow meter is designed for use in EPL Gb (former Category 2) (use in Zone 1). The measuring part may also be filled with flammable fluids, provided that a potentially explosive atmosphere (Zone 0) is not present continuously or for a long duration in the measuring part.

2.2 Types of protection

The circuits of the electrical signal outputs (transmitters) and contacts (slot initiators) are designed in Intrinsic Safety type of protection of Category “ia”. The measuring part is designed in Category “c” type of protection.

The housing is optionally also available as a flameproof encapsulated version “db”.

2.3 Temperature classes

Depending on temperature class and ambient temperature, flap-type flow meters of Type KFS ... Ex are approved for the process temperatures listed in Table 1 (see sect. 11.2): the Table includes the following parameters for determination of the allowable temperature class:

- Ambient temperature T_{amb}
- Process temperature T_m
- Meter size DN
- Heat resistance of the cables

Where several built-in intrinsically safe devices are used, the user shall take the data of the least favourable device as basis.

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2.4 Static discharge

Surfaces can be electrostatically, combustibly charged during cleaning (e.g. viewing window). These surfaces may only be cleaned with a damp, lint-free cloth.

In addition, caution should be taken not to rub against these surfaces with clothing, since static charge can occur at any time.

Dust deposits on the housing of the variable area flow meter are also to be removed with a damp cloth.

The deposits must not exceed a thickness of 3 mm.

3 Type code KFS ... Ex devices

Standard indicator part:

KFS Ex	Standard indicator part
KFS-IK1 Ex	1x inductive limit value switch (NG 100 I-12[Si2-K08-Y1])
KFS-IK2 Ex	2x inductive limit value switch (NG 100 I-12[Si2-K08-Y1])

M40 indicator part

KFS-M40 Ex	M40 local mechanical indicator without modules
KFS-M40-IK1 Ex	1x inductive limit value switch module (SC3,5-N0-Y / I7S23,5N / SJ3,5-SN / SJ3,5-S1N)
KFS-M40-IK2 Ex	2x inductive limit value switch module (SC3,5-N0-Y / I7S23,5N / SJ3,5-SN / SJ3,5-S1N)
KFS-EM Ex	4-20 mA output (ESK4)
KFS-EM-IK1 Ex	4-20 mA output (ESK4) + 1x inductive limit value switch (SC3,5-N0-Y / I7S23,5N / SJ3,5-SN / SJ3,5-S1N)
KFS-EM-IK2 Ex	4-20 mA output (ESK4) + 2x inductive limit value switch (SC3,5-N0-Y / I7S23,5N / SJ3,5-SN / SJ3,5-S1N)
KFS-EMZ Ex	4-20 mA output (ESK4) + totalizer, I/O module and LC-Display (ESK I/O) → ESK4-T

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MH40 Display unit (ignition protection type db; flameproof enclosure):

KFS-MH40 Exd	MH40 local mechanical indicator without modules
KFS-MH40-IK1Exd	1x inductive limit value switch module
KFS-MH40-IK2 Exd	2x inductive limit value switch module
KFS-MH40-IKS1 Exd	1x Elektronik-Grenzwertkontakt Modul
KFS-MH40-IKS2 Exd	2x Elektronik-Grenzwertkontakt Modul
KFS-EM Exd	4-20 mA output (ESK4)
KFS-EM-IK1 Exd	4-20 mA output (ESK4) + 1x inductive limit value switch
KFS-EM-IK2 Exd	4-20 mA output (ESK4) + 2x inductive limit value switch
KFS-EM-IKS1 Exd	4-20 mA Ausgang (ESK4) + 1x electronic limit value switch
KFS-EM-IKS2 Exd	4-20 mA Ausgang (ESK4) + 2x electronic limit value switch
KFS-EMZ Exd	4-20 mA output (ESK4) + totalizer, I/O module and LC-Display (ESK I/O) → ESK4-T

4 Identifying marking

The complete device is marked on the indicator part with the rating plate reproduced below:

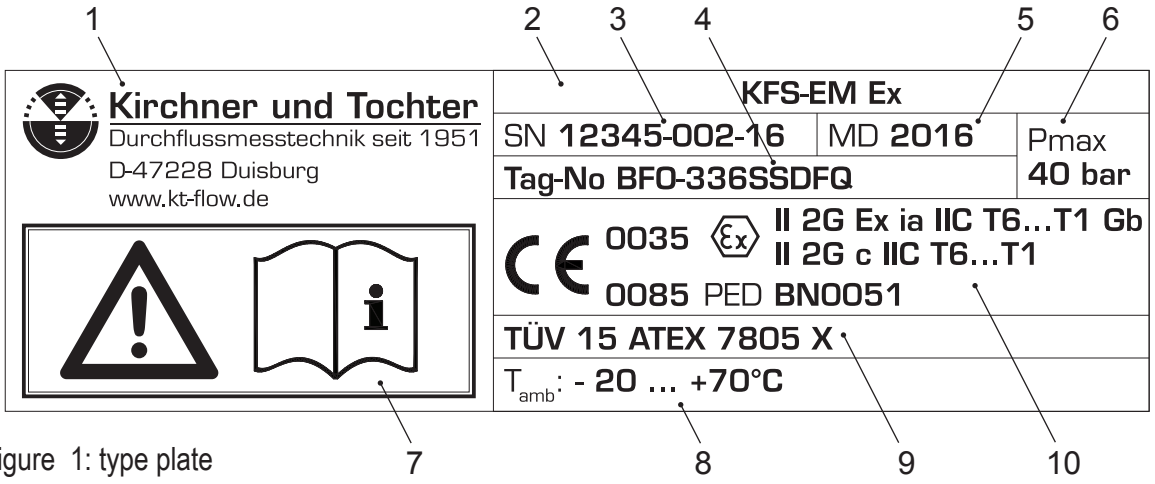

Figure 1: type plate

1. Kirchner und Tochter logo with address details
2. Device name
3. Serial number
   Composition: nnnnn – mmm - jj
   Example: 12345-002-16 — year of manufacture **2016**
   — device No. **002** of order
   — order number **12345**
4. Tag Number (provided by the customer)
5. Year of manufacture
6. Max. allowable operating pressure
7. Note icon: Note installation and operating instructions!
8. Ambient temperature range
9. Ex marking
10. CE marking
    superscript: Notified Body regarding explosion protection directive. Ex symbol, no. of examination certificate
    subscript: Notified Body regarding the Pressure Equipment Directive. Abbreviation for “Pressure equipment directive”, reg. No.

All devices in hazardous areas with contacts and/or 4 ... 20 mA output shall be marked by using appropriate installation material.

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5 Special conditions for safe use

1. The flap flowmeter must be integrated in the local equipotential bonding.
2. The temperature class of the flap flowmeter depends on the selected ambient temperature and medium temperature (see section 2.3 & 11.2).
3. To avoid static electricity on the display, clean the plastic surface with a damp cloth only (see section 2.4).

Additionally with type of protection „Flameproof enclosure“:

1. Cable glands of simple design (PG cable gland) and sealing plugs of simple design must not be used.
2. Unused openings must be closed in accordance with EN 60079-1 Section 11.9.
3. The connecting cable must be fixed and laid in such a way that it is adequately protected against damage.
4. If the temperature at the inlet parts exceeds 70°C, temperature-resistant connecting cables must be used.

6 Assembly and installation

All assembly and installation work shall be carried out in accordance with applicable installation standards for hazardous areas (e.g. EN 60079-14) by specialist personnel who have received training in explosion protection.

The directions and information given in the Installation and Operating Instructions, in the Supplementary Installation and Operating Instructions (Ex) as well as in the EC type examination certificate (see Annex 8.1) shall be observed without fail.

Special attention is drawn to the following points for installation and assembly:

The indicator part must be earthed. This is carried out e.g. by way of a wire jumper between the flange on the indicator part and a pipe flange on the main pipeline with cable lugs appropriate to the bolted connection (not included with the flow meter!).

6.1 Electrical connection

The certified intrinsically safe equipment for the flap-type flowmeter KFS-EM Ex may only be connected to separated, intrinsically safe circuits with the following maximum values:

Identification data					
Module	Ui [V]	Ii [mA]	Pi [mW]	Ci [nF]	Li [µH]
EM / EMZ	≤ 30	≤ 130	≤ 1000	≈ 0	≤ 10
I/O (LCD)	≤ 30	≤ 130	≤ 1000	≤ 10	≈ 0

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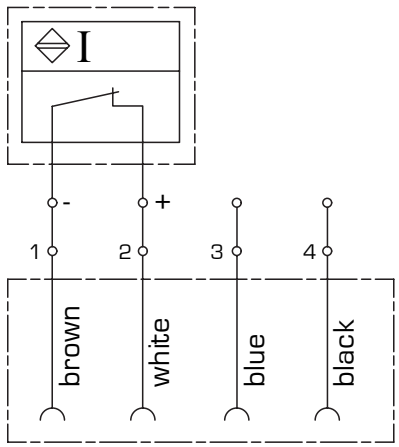
6.2 Terminal assignment

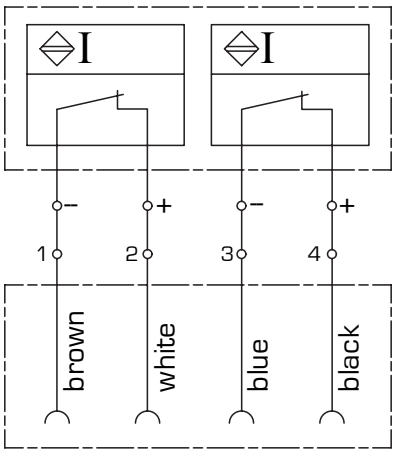
6.2.1 KFS-IK ... Ex

Series IK built-in electrical signal transmitters are non-contacting, inductive make and break contacts which operate when a control vane moved by the setpoint pointer dips into and out of the slot initiator. The change in signal is used for driving a control device via an isolation switching amplifier.

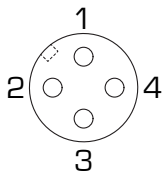
Terminal assignment
Contact IK-1



Terminal assignment
Contact IK-2



Terminal assignment
at right angle plug

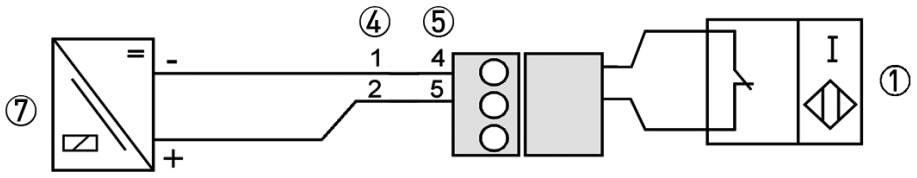


6.2.2 KFS-M40-IK ... Ex

To connect the limit switch board the housing cover of the display part is to be removed. The terminals ⑤ are pluggable and can be removed to connect the lines.

SC3,5-N0-Y ... / I7S23,5-N limit contact in 2-wire technology, normally closed
SJ3,5-SN limit contact in 2-wire technology, normally closed
SJ3,5-S1N limit contact in 2-wire, normally open

Maximum value					
Typ	Ui [V]	Ii [mA]	Pi [mW]	Li [µH]	Ci [nF]
SC3,5-N0-Y...	16	25	64	150	150
I7S23,5-N	16	52	169	150	150
SJ3,5-SN	16	25	64	100	30
SJ3,5-S1N	16	52	169	100	30



① Limit switch NAMUR 2-wire
④ Terminal connection MIN Contact
⑤ Terminal connection MAX Contact
⑦ NAMUR isolating amplifier

Limit switch (connector color)	MIN (black)			MAX (gray)		
Labeling	1	2	3	4	5	6
Polarity	–	+		–	+	

6.2.3 KFS-MH40-IK ... Exd

Same as 6.2.2 but different:

U_N = 5 ... 25 V

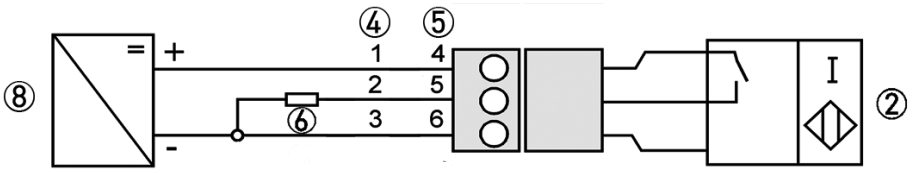
I_N = ≤ 1 / ≥ 3 mA (depending on switching position)

6.2.4 KFS-MH40-IKS ... Exd

U_N = 10 ... 30 V

I_N = ≤ 100 mA (depending on switching position)

SB3,5-E2 Limit value contact in 3-wire technology, normally open



② Limit value switch3-wire
④ Terminal connection MIN contact
⑤ Terminal connection MAX Contact
⑥ Load 3-wire
⑦ Power supply 3-wire

contact	MIN			MAX		
plug colour	black			black		
label	1	2	3	4	5	6
polarity	+	⎍	-	+	⎍	-

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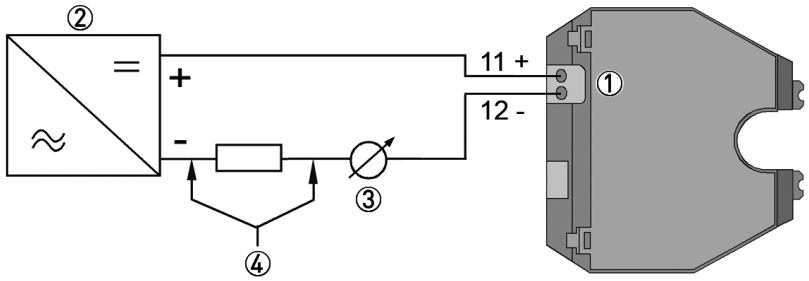
6.2.5 KFS-EM Ex / Exd

The plug-in type connection terminals of the ESK4 module in the M40 indicator part can be removed to connect the cables.

Terminal connection	pluggable; < 2,5 mm²
Type of connection	2 wire current sink - polarity reversal protection only for connection to extra-low voltage according to SELV or PELV

① Current output ESK4 /ESK4A
② Power supply 14...30 VDC
③ Measuring signal 4...20 mA
④ External load, HART® communication



Wiring must be planned with great care when it comes to connecting other devices such as evaluation units or process control. Internal connections in these devices (e.g. GND with PE, mass loops) may lead to non-permitted voltage potentials which could negatively affect the function of the converter itself or that of a device connected to it. In such cases a protected extra-low voltage (PELV) is recommended.

6.3 Connecting cables

The connecting cables for the intrinsically safe circuits must be selected in line with the valid installation standard (e.g. EN 60079-14). Summation current between different intrinsically safe circuits of the flap-type flow meter shall be ruled out.

6.4 Assembly of screwed cable gland

Before inserting the cable for the contacts into the indicator-device, the screwed cable glands have to be assembled.

6.4.1 Data of the screwed cable gland

(included in delivery)

For devices with type of protection “intrinsically safe” (Ex ia):

Size	M20x1,5
Degree of protection	IP68, acc. to EN 60529
Clamping- and sealing range	8 – 13 mm
Torque M	4 Nm
Colour sealing gasket	grey
Temperature range	-20°C to +80°C

For devices with type of protection “Flameproof enclosure” (Ex db):

Size	M20x1,5
degree of protection	IP68, acc. EN 60529
Clamping and sealing area	10 – 14 mm
torque	4 Nm
material	Nickel-plated brass
temperature range	-60°C to +105°C

Please observe the temperature specifications in section 11.2.

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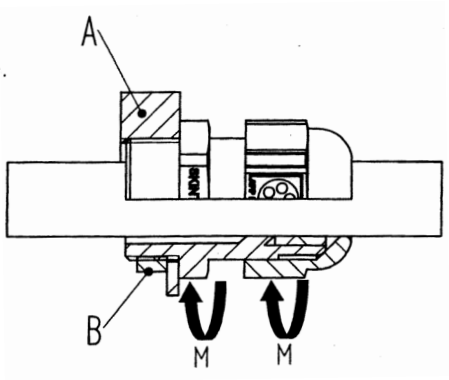
6.4.2 Assembly

To assemble the screwed cable gland perform these activities:

For devices with type of protection “intrinsically safe” (Ex ia):

1. Screw screwed cable gland into the housing (A) – Torque M: 4 Nm.
2. Put cable through screwed cable gland into the indicator device.
3. Tighten nutcap (B) – Torque M: 4 Nm.



For devices with type of protection “Flameproof enclosure” (Ex db):

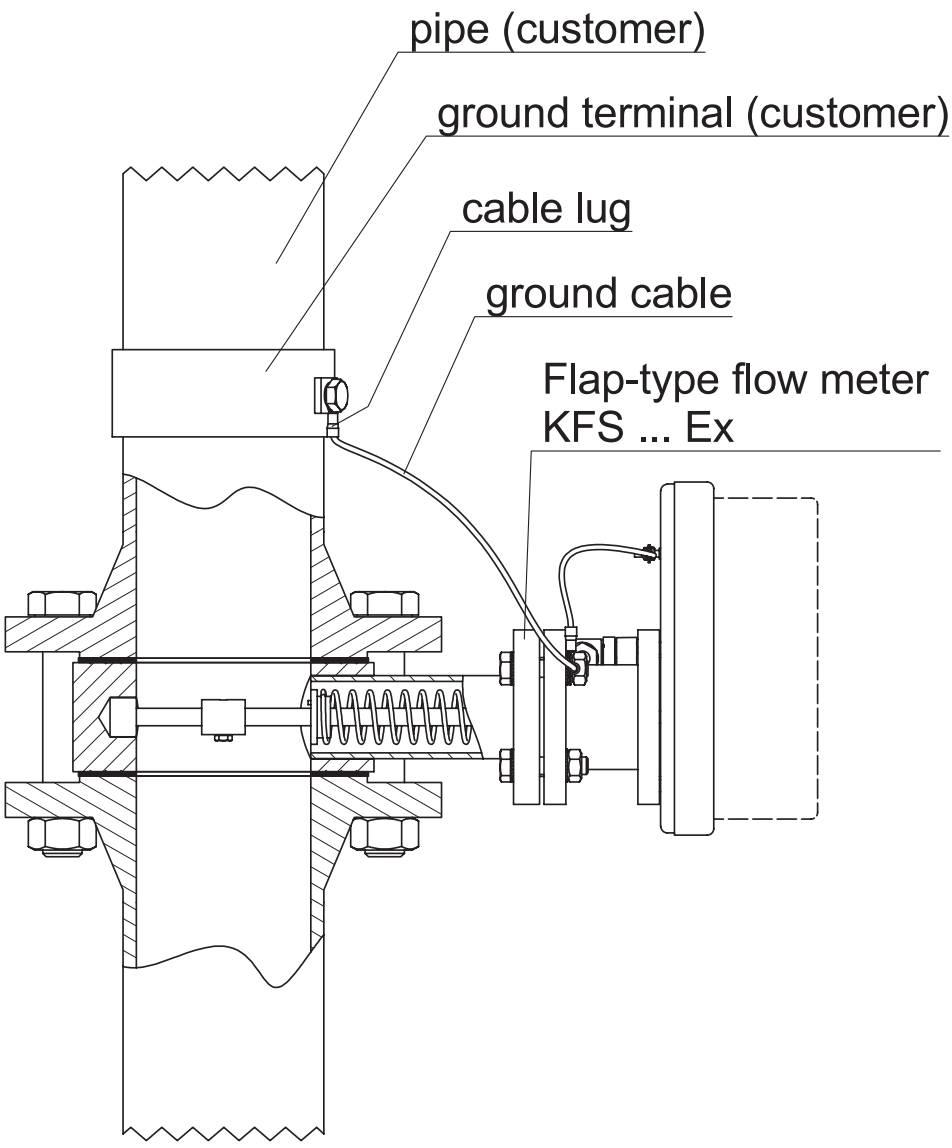
1. Screw the cable gland into the housing (A). - Torque 10 Nm.
2. Insert the cable through the screw connection into the display unit.
3. Tighten the cap nut (B). - Torque 10 Nm.

Use only tightly wired cables and wires to be introduced. The operator must ensure the relief for the wires. The maximum thermal load of introduced cables and wires must be observed.

6.5 Ground connector

Danger!
Danger of explosion can result from incorrect connection. The operating company is responsible for installing error free grounding of the process line.

The following illustration shows a principle sketch of the connection of the ground cable with the process line.
This ground cable must be connected with the process line before starting up the flow meters of type **KFS ... Ex**.



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7 Start-up

Before starting up the device, carry out the following checks and inspections:

1. Suitability of the materials used for the measuring part and the gasket materials used for adequate resistance to corrosion from the process product.
2. Correct connection of the built-in electrical equipment.

8 Maintenance

8.1 Indicator

The indicator part is maintenance-free under normal operating conditions and when used for the intended purpose.
Within the scope of checks required to be carried out in hazardous areas to maintain systems in proper working order, the following visual inspections should be carried out at regular intervals:

1. Inspection of the casing, cable entry glands and the incoming lines for signs of corrosion or damage,
2. Check of the measuring part for leaks,
3. Inclusion of the flow meter in the periodic pressure testing of the process pipe.

8.2 Cleaning of the Indicator

If you wand to clean the indicator, please note the following.

To prevent electrostatic charge by cleaning the indicator screen, it is important to use only a moist cloth.

8.3 Measuring part

The measuring part is maintenance-free under normal operating conditions and when used for the intended purpose. A visual inspection of the damper mechanism for visible wear (at least every 2 years) is necessary for safe operation.

Depending on the application, however, the measuring function may in unfavourable cases become impaired by soiling of the flap.

The measuring part should be cleaned as described in the Installation and Operating Instructions for the non-hazardous-duty versions. The measuring part must be dismantled before it can be cleaned. In this connection, follow the directions for replacement of the complete device (see Section Maintenance in the Installation and Operating Instructions for the flap-type flow meter).

9 Dismantling

9.1 Replacement of the indicator part

Due to the modular construction of the flap type flow meters, the indicator and, if necessary, the electrical equipment built into the indicator can be replaced with identical replacement parts satisfying safety requirements (CAUTION: possible loss of measuring accuracy!)

The measuring part can remain in the pipeline. This also applies to pressurized pipes. Replacement and dismantling should if possible be carried out when the device is not in a powered state. If that is not possible, be sure to observe the boundary conditions for Intrinsic Safety (e.g. no earthing or interconnection of different intrinsically safe circuits) during dismantling. When replacing the indicator of a pressurized device, pay special attention to the disconnection point (see Installation and Operating Instructions): detach the indicator part from the two brackets located on the outside of the indicator casing.

9.2 Replacement of complete device

The same requirements as described in Section Maintenance in the Installation and Operating Instructions for the flap-type flow meter are applicable to the indicator.

NOTE!

Pressurized pipes to be depressurized before dismantling the measuring part.

Avoid uncontrolled discharge of residual liquid from the measuring part. In the case of environmentally critical process products, carefully decontaminate the wetted parts of the device after dismantling.

Dismantling and installation are the responsibility of the Operator.

10 Maintenance

Maintenance work of a safety-relevant nature within the meaning of explosion protection may only be carried out by the manufacturer, his authorized representative or under the supervision of authorized inspectors.

11 Annex

11.1 Type examination certificate

(1) **EU BAUMUSTERPRÜFBESCHEINIGUNG**

(2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - **Richtlinie 14/34/EU**

(3) EU-Baumusterprüfbescheinigung

TÜV 15 ATEX 7805 X Ergänzung: 00

(4) Gerät : **Klappendurchflussmessgerät Typ KFS-***-*** Ex**

(5) Hersteller : **A. Kirchner & Tochter GmbH**
(6) Anschrift : **Dieselstrasse 17**
D-47228 Duisburg

(7) Die Bauart dieses Produkts sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung und den Referenzdokumenten festgelegt.

(8) Die Zertifizierungsstelle für Explosionsschutzprodukte der TÜV Rheinland Industrie Service GmbH bescheinigt als benannte Stelle Nr. 0035 nach Artikel 21 der Richtlinie des Rates vom 26. Februar 2014 (14/34/EU), dass die Komponente die grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie erfüllt.
Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht Nr.557/Ex7805.00/15 dokumentiert.
Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden mit Ausnahme der Anforderungen, die in der Anlage gelistet sind, erfüllt durch Übereinstimmung mit:

EN 60079-0:2012+A11:2013 **EN 60079-11:2012** **EN 1127-1:2011**
EN 13463-1:2009 **EN 13463-5:2011**

(10) Das Zeichen "X" hinter einer Bescheinigungsnummer gibt an, dass dieses Gerät besonderen Bedingungen zur sicheren Anwendung unterliegt welche im Anhang dieser Bescheinigung spezifiziert sind.

(11) Diese Baumusterprüfbescheinigung bezieht sich nur auf Konzeption und Spezifikationen zum Bau des Geräts oder Schutzsystems. Für die Herstellung und das Inverkehrbringen diese Komponente gelten weitere Anforderungen dieser Richtlinie. Diese Anforderungen werden durch diese Bescheinigung nicht abgedeckt.

II 2G Ex ia IIC T6...T1 Gb
II 2G c IIC T6...T1
II 2G c IIC T6...T1 (nur für Typ KFS Ex)

TÜV Rheinland ExNB für Explosionsschutzprodukte Köln, den 13.07.2016

Dipl.-Ing. Klauspeter Gräfi

Diese EU-Baumusterprüfbescheinigung hat ohne Unterschrift und Stempel keine Gültigkeit
Diese EG-Baumusterprüfbescheinigung darf nur unverändert verbreitet werden. Auszüge und Änderungen bedürfen der Genehmigung der TÜV Rheinland Industrie Service GmbH TÜV Rheinland Group Am Grauen Stein 51105 Köln
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(1) **EU Type Examination Certificate**

(2) Equipment and protective systems intended for use in potentially explosive atmospheres - **Directive 2014/34/EU**

(3) EC Type Examination Certificate Number

TÜV 15 ATEX 7805 X Issue: 01

(4) Equipment : **Flap type flow meter, type KFS-***-*** Ex***

(5) Manufacturer : **A. Kirchner & Tochter GmbH**
(6) Address : **Dieselstrasse 17**
D-47228 Duisburg, Germany

(7) The type of this product as well as the different permitted versions are specified in the appendix to this EC Type Examination Certificate and the reference documents.

(8) The certification body for explosion protection at TÜV Rheinland Industrie Service GmbH, as Notified Body No. 0035 in accordance with Article 21 of the Council Directive of 26 February 2014 (2014/34/EU), certifies that the basic health and safety requirements for the design and production of equipment and protective systems intended for use in potentially explosive atmospheres are met in accordance with Annex II of the Directive.

The results of the test are specified in the confidential test report No. 557/Ex7805.01/15.

(9) The basic health and safety requirements, with the exception of the requirements listed in the appendix, are fulfilled by compliance with:

EN 60079-0:2012+A11:2013	**EN 60079-1:2014**	**EN 60079-11:2012**
EN 1127-1:2011	**EN 13463-1:2009**	**EN 13463-5:2011**

(10) The sign "X" after a certificate number indicates that this equipment is subject to special conditions for safe use, which are specified in the appendix to this certificate.

(11) This EU Type Examination Certificate relates only to the design and specifications for the construction of the equipment or protection system. Other requirements of this Directive apply to the manufacture and placing on the market of this product. These requirements are not covered by this certificate.

(12) The marking of the equipment must contain the following information:

II 2G Ex ia IIC T6-T1 Gb or II 2G Ex db IIC T6-T1 Gb and II 2G c IIC T6-T1

II 2G c IIC T6-T1 (only for type KFS Ex)

TÜV Rheinland Certification Body for Explosion Protection — Cologne, 13/08/2018

Dipl.-Ing. Andreas Maschke

0035

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This EU Type Examination Certificate may only be circulated unchanged. Excerpts and changes require permission from TÜV Rheinland Industrie Service GmbH Rheinland Group Am Grauen Stein 51105 Cologne, Germany
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11.2 Classes of temperatures

Maximum allowable process and ambient temperatures KFS-EM Ex

Note:

The maximum allowable process temperatures listed in the Table apply under the following conditions:

- that the flap-type flow meter is operated in the mounting position intended
- that insulations are confined to the pipeline only. Unobstructed ventilation of the indicator part must be ensured.

Temperature class acc. EN 60079-0			T6	T5	T4	T3		T2, T1	
Max. ambient temperature T_{amb} [°C]	≤40	≤60	≤40	≤60	≤60	≤40	≤60	≤40	≤60
	Heat resistant cables required for T_m [°C] and higher *								
Max. process temperature T_m [°C]	–	145	80	95	130	195	195	200	200

* heat-resistant cable required (continuous operating temperature: 100°C) if measuring part has not been thermally insulated!

For instruments with type of protection "Flameproof enclosure" (Ex db):

Medium temperature (depending on instrument version) -25 °C to T_m
Reference point temperature (external PA connection on display) -25 °C to T_{Ref}
Ambient temperature (depending on the device version) -25 °C to +65 °C

Maximum medium temperature T_M [°C]					
temperature class	T6	T5	T4	T3	T2, T1
T_{amb} [°C]	≤ 60 °C	≤ 65 °C	≤ 65 °C	≤ 65 °C	≤ 65 °C
T_m	80	95	130	195	200

	Maximum reference point temperature T_{Ref} [°C]		
temperature class	T6 ... T1	T6	T5 ... T1
$T_{connecting\ lead}$ [°C]	Standard [70°C]	Heat resistant [90°C]	
T_M	64	74	84

Notes

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Notes

The devices from **Kirchner und Tochter** have been tested in compliance with applicable EC/EU CE-regulations of the European Community.

The respective declaration of conformity is available on request. Subject to change without notice. The current valid version of our documents can be found at www.kt-flow.de.

The **Kirchner und Tochter** QM-System is certified in accordance with DIN EN ISO 9001:2015. The quality is systematically adapted to the continuously increasing demands.

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