



(1) **EC-Type Examination Certificate**

(2) Equipment or Protective Systems intended for use in potentially hazardous atmospheres - **Directive 94/9/EC**



(3) **TÜV 99 ATEX 1443 X**

(4) Equipment: Mass Flowmeter TRIO MASS Type MC27.. and TRU MASS Type MI27..

(5) Manufacturer: ABB Automation Products GmbH

(6) Address: D-37079 Göttingen, Dransfelder Straße 2, GERMANY

(7) The equipment and any acceptable variations thereto are specified in the schedule to this certificate and documents therein referred to.

(8) The TÜV Hannover/Sachsen Anhalt e.V., TÜV Certification Body No. 0032 in accordance with the Article 9 of the European Community Council Directive 94/9/EC of 23 March 1994 certifies that this equipment or protective system has been found to comply with the Essential Safety and Health Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II of the Directive.

The examination and test results are recorded in the confidential report No. 99/PX12190.

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

EN 50 014:1997
EN 50 018:1995

EN 50 019:1994
EN 50 020:1994

EN 50 028:1987
EN 50 284:1997, Par. 4.2.5

(10) If the sign "X" is placed after the certification number, it indicates that the equipment or protective system is subject to the special conditions for safe use specified in the schedule to this certificate.

(11) This EC-TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified equipment or protective system. If applicable, further requirements of this Directive apply to the manufacture and supply of this equipment or protective system.

(12) The markings for the equipment or protective system shall include the following:

 **II 1/2 G EEx emd [ib] IIC T6 or II 2 G EEx emd [ib] IIC T6**

TÜV Hannover/Sachsen-Anhalt e.V.
TÜV CERT-Certification Authority
Am TÜV 1
D-30519 Hannover, Germany

Hannover, 13.08.1999

Stürwold

Head of the Certification Body

(13)

SCHEDULE(14) **EC-Type Examination Certificate No. TÜV 99 ATEX 1443 X**

(15) Description of the Equipment

The Mass Flowmeters TRIO MASS Type MC27.. and TRU MASS Type MI27.. are utilized to meter the flowrate of liquids or gases and their operation is based on the Coriolis-Principle and they may be installed in explosion hazardous areas defined as Category 2 (Zone 1). The internal volume of the metering tube in the Mass Flowmeter Primary TRIO MASS Type MC27.. in meter sizes DN50 to DN150 [2" to 6"] corresponds to Category 1 (Zone 0). The internal volume of the metering tube in the TRIO MASS in meter sizes \leq DN40 [1-1/2"] corresponds only to Category 2 (Zone 1). The Temperature Classes, as a function of the flowmeter size, fluid temperature and ambient temperature, are listed in the following table:

Flowmeter Size	MC27 DN6..15 [1/4"-1/2"] MI27 DN3 [1/8"]			MC27 DN20..150 [3/4"-6"] MI27 DN6..40 [1/4"-1-1/4"]		
	Ambient Temperature	40°C	50°C	60°C	40°C	50°C
Temperature Class						
T2	150°C	---	---	180°C	---	---
T3	140°C	140°C	80°C	165°C	140°C	---
T4	75°C	75°C	75°C	100°C	100°C	80°C
T5	40°C	40°C	40°C	65°C	65°C	65°C
T6	25°C	25°C	25°C	50°C	50°C	50°C

These values are also applicable to insulated Mass Flowmeter Primary installations.

Electrical Specifications

Supply Power Circuit
(Terminals 1+ / 2-)
(Terminals L / N)

Function of the Design
 $U_m = 60$ V AC or DC
 $U_m = 265$ V AC or DC

The output current circuit can be selected for connection to Intrinsically Safe or Non-Intrinsically Safe circuits. The maximum allowable values are listed in the following tables:

Output Current Circuit	For Ignition Class Intrinsically Safe EEx ib IIC/IIB						Connections for Increased Safety, $U_m = 60$ V
Current Output active Terminals 31/32 Terminal 32 is to be connected to PA	$U_0 = 20$ V						Operating Values: $U = 30$ V $I = 30$ mA
	I_0 [mA]	P_0 [mW]	EEx ib IIC		EEx ib IIB		
			C_0 [nF]	L_0 [mH]	C_0 [nF]	L_0 [mH]	
	100	500	217	3.8	1400	14.8	
80	400	217	5.8	1400	21.8		
60	300	217	9.8	1400	39.8		
Characteristic: linear Effective internal capacitance $C_i = 2.4$ nF Effective internal inductance $L_i = 0.17$ mH For connection to passive, Intrinsically Safe circuits or Intrinsically Safe circuits with maximum values of: $U_i = 60$ V							

Schedule to EC-Text Examination Certificate NO.: TÜV 99 ATEX 1443 X

Current Output Circuit	For Ignition Class Intrinsically Safe EEx ib IIC/IIB		Connection for Increased Safety, $U_m = 60 \text{ V}$
Current Output passive Terminals 33/34 Terminal 34 is to be connected to PA	$U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 760 \text{ mW}$	$C_i = 2.4 \text{ nF}$ $L_i = 0.17 \text{ mH}$	Operating Values: $U = 30 \text{ V}$ $I = 30 \text{ mA}$
Contact Output Terminals 41/42 Pulse Output Terminals 51/52	$U_i = 15 \text{ V}$ $I_i = 30 \text{ mA}$ $P_i = 115 \text{ mW}$	$C_i = 2.4 \text{ nF}$ $L_i = 0.17 \text{ mH}$	Operating Values: $U = 30 \text{ V}$ $I = 220 \text{ mA}$
Contact Input passive Terminals 81/82	$U_i = 30 \text{ V}$ $I_i = 250 \text{ mA}$ $P_i = 1.1 \text{ W}$	$C_i = 2.4 \text{ nF}$ $L_i = 0.17 \text{ mH}$	Operating Values: $U = 30 \text{ V}$ $I = 10 \text{ mA}$

Piece Tests

The housing, within the framework of the piece tests, must be subjected to a gage pressure of 14.1 bar according to DIN EN 50018, Paragraph 15.1.3.1.

- (16) Test documentation are listed in Test Report No.: 99/PX12190.
- (17) Special Conditions

The output current circuits listed in the tables may only be operated as Intrinsically Safe or as Non-Intrinsically Safe. A combination is not permissible. For Intrinsically Safe circuits Potential Equalization must be maintained along the entire length of the current output cabling.

- (18) Basic Safety and Health requirements

None additionally

1st SUPPLEMENT
to
EC-Type Examination Certificate No. TÜV 99 ATEX 1443 X

of : ABB Automation Products GmbH
 Dransfelder Strasse 2
 D-37079 Göttingen

The TRIO MASS, type MC27..., and TRU MASS, type MI27..., mass flowmeters may in future also be manufactured according to the documents listed in the test certificate. This type range is complemented by the MC26, MI26, MC28 and MI28 types. The mass flowmeters are used to measure liquids or gases using the Coriolis principle. In their compact version all types may be set up in category 2 (zone 1) hazardous locations. The remote version of the ME28 type measuring transducer, enclosed in a flameproof housing, is identified with II 2 G EEx ed IIC T6 or EEx ed [ib] IIC T6 and may be operated in category 2 (zone 1) hazardous locations in combination with the MC28/MI28 flowmeter.

The inside of the meter tubes of all DN50 up to DN150 nominal diameter pick-ups may correspond to category 1 (zone 0), and that of \leq DN40 nominal diameters only to category 2 (zone 1). The temperature classification dependent on the nominal diameter, the maximum permissible measured medium temperature and the ambient temperature is shown in the table:

Nominal Diameter	MC2. DN6..15 MI2. DN3			MC2. DN20..150 MI2. DN6..40		
	Ambient Temperature Range	Ambient Temperature Range	Ambient Temperature Range	Ambient Temperature Range	Ambient Temperature Range	Ambient Temperature Range
Ambient Temperature Range	-40..+40°C	-40..+50°C	-40..+60°C	-40..+40°C	-40..+50°C	-40..+60°C
Temperature Classification						
T2	150°C	---	---	180°C	---	---
T3	140°C	140°C	80°C	165°C	140°C	---
T4	75°C	75°C	75°C	100°C	100°C	80°C
T5	40°C	40°C	40°C	65°C	65°C	65°C
T6	25°C	25°C	25°C	50°C	50°C	50°C

For all types it is permissible for the lowest measured medium temperature to be -40°C .

The values also apply to isolated mass flowmeters.

Electrical Data

Auxiliary current circuit (terminals 1+ / 2-) (terminals L / N)	depending on the type $U_m = 60 \text{ V AC or DC, or}$ $U_m = 265 \text{ V AC or DC}$
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The output current circuits can alternatively be connected to intrinsically protected or non-intrinsically protected circuits. The max. permissible values are shown in the following table:

Enclosure to 1st Supplement of EC-Type Examination Certificate No. TÜV 99 ATEX 1443 X

Output current circuit	In Intrinsically Protected Protection Type, EEx ib IIC/IIB						Connection in Increased Protection, $U_m = 60 \text{ V}$
Current output active terminals 31/32 terminal 32 is connected with PA	$U_0 = 20 \text{ V}$						Ratings: $U = 30 \text{ V}$ $I = 30 \text{ mA}$
	I_0 [mA]	P_0 [mW]	EEx ib IIC		EEx ib IIB		
			C_0 [nF]	L_0 [mH]	C_0 [nF]	L_0 [mH]	
	100	500	217	3,8	1400	14.8	
	80	400	217	5,8	1400	21.8	
60	300	217	9,8	1400	39.8		
Characteristic curve: linear Effective internal capacitance $C_i = 2.4 \text{ nF}$ Effective internal inductance $L_i = 0.17 \text{ mH}$ For connection to passive, intrinsically protected circuits or intrinsically protected circuits for a maximum of: $U_i = 60 \text{ V}$							
Output current circuit	In Intrinsically Protected Protection Type, EEx ib IIC/IIB						Connection in Increased Protection, $U_m = 60 \text{ V}$
Current output passive terminals 33/34 terminal 34 is connected with PA	$U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 760 \text{ mW}$		$C_i = 2.4 \text{ nF}$ $L_i = 0.17 \text{ mH}$		Ratings: $U = 30 \text{ V}$ $I = 30 \text{ mA}$		
Switch output terminals 41/42 Pulse output terminals 51/52	$U_i = 15 \text{ V}$ $I_i = 30 \text{ mA}$ $P_i = 115 \text{ mW}$		$C_i = 2. \text{ nF}$ $L_i = 0.17 \text{ mH}$		Ratings: $U = 30 \text{ V}$ $I = 220 \text{ mA}$		
Switch input passive terminals 81/82	$U_i = 30 \text{ V}$ $I_i = 250 \text{ mA}$ $P_i = 1,1 \text{ W}$		$C_i = 2,4 \text{ nF}$ $L_i = 0,17 \text{ mH}$		Ratings: $U = 30 \text{ V}$ $I = 10 \text{ mA}$		

Routine Check Test

According to DIN EN 50018, section 15.1.3.1, in the course of their routine check test housings for ambient temperatures below -20°C must be subjected to a vacuum test with 18.5 bar.

(16) Test documentation are listed in Test Report No. 0 1 PX 10110.

(17) Special conditions

The output current circuits specified in the tables may be operated only as intrinsically protected or non-intrinsically protected circuits. A combination is not permissible. Equipotential bonding is to be incorporated along the line of the current outputs.

Enclosure to 1st Supplement of EC-Type Examination Certificate No. TÜV 99 ATEX 1443 X

(18) Basic Safety and Health requirements:

No supplements

**TÜV Hannover/Sachsen-Anhalt e.V.
TÜV CERT-Zertifizierungsstelle
Am TÜV 1
D-30519 Hanover**

Hanover, 10.05.2001

Director

Translated from German Original

2nd SUPPLEMENT
to
EC-Type Examination Certificate No. TÜV 99 ATEX 1443 X

Manufacturer: ABB Automation Products GmbH
Dransfelder Straße 2
D-37079 Göttingen, Germany

The flowmeters TRIO MASS and TRU MASS Types M_26, M_27 and M_28 may now also be manufactured in accordance with the test documents listed in this test report. The revisions affect the protection circuits (for sensor coils and Pt100) in Ignition Types Potted Encapsulation „m“ and Increased Safety „e“, the intrinsically safe circuits for the power supply and „Front-End“, the mechanical design and the use of the flowmeter in explosion hazardous areas with combustible dust and the markings.

The identification of the flowmeters will now be as follows:

Flowmeters FCM2000 Types M_26, M_27 and M_28.

The allowable ambient temperature range for use of the flowmeter in explosion hazardous areas containing combustible dust is -20°C ... + 60°C.

For use of the flowmeter in explosion hazardous areas containing combustible dust, connections to

- intrinsically safe circuits in accordance with the electrical specifications in EC-Type Examination Certificate TÜV 99 ATEX 1443 X or
- non-intrinsically safe circuits with $U_m = 60 \text{ V}$ (output circuits) as well as
- non-intrinsically safe circuits with $U_m = 60 \text{ V} / 265 \text{ V}$ (supply power circuit)


are allowed.

All the remaining specifications remain unchanged.

2. Identifications of the Test Object:

Use in explosion hazardous areas with combustible dust

Flowmeter TRIO MASS and TRU MASS Types M_26 and M_27 or
Flowmeter FCM2000 Types M_26 and M_27:


 II 2 D T115°C ... T_{Medium} IP67


only converter Type ME28:

 II 2 D T115°C IP67


Use in explosion hazardous areas with gases, steam or vapors

Flowmeter TRIO MASS Types MC26 and MC28 or
Flowmeter FCM2000 Types MC26 and MC28:

 II 1/2 G EEx em [ib] IIC T6 (nominal diameter ≥ DN50 [2"])

 II 2 G EEx em [ib] IIC T6 (nominal diameter ≤ DN40 [1-1/2"])

Flowmeter TRU MASS Types MI26 and MI28 or
Flowmeter FCM2000 Types MI26 and MI28:

 II 2 G EEx em [ib] IIC T6 (nominal diameter ≤ DN40 [1-1/2"])

The remaining identifications remain unchanged

Special Requirements:

1. The output circuits listed in the Tables may only be operated as intrinsically safe or non-intrinsically safe. A combination is not permitted.
2. For intrinsically safe circuits, potential equalization is to be maintained along the entire connection path.
3. When protection earth (PE) is connected in the connection box of the flowmeter primary, assure that no dangerous potential difference can exist between the protection earth (PE) and the potential equalization in the explosion hazardous area.

The test documents are listed in Test Report No. 03YEX550545.

TÜV NORD CERT GmbH & Co. KG
TÜV CERT-Certification Body
Am TÜV 1
D-30519 Hannover, Germany
Tel.: 0511 986-1470
Fax: 0511 986-2555

Hannover, 27 January 2004

The Director