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# APPROVAL REPORT

**THERMAL GAS FLOWMETER  
TYPE FMT500-iG (SENSYFLOW iG EX)  
FOR HAZARDOUS (CLASSIFIED) LOCATIONS**

**Prepared for:**

**ABB Automation Products GmbH  
Borsigstrasse 2,  
Alzenau D-63755, Germany**

**Project ID: 3028403**

**Class: 3615**

**Date of Approval:**

*March 7, 2008*

**Authorized by:**

  
Richard B. Dunne - Group Manager

FM Approvals  
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Norwood, MA 02062

**THERMAL GAS FLOWMETER  
TYPE FMT500-iG (SENSYFLOW iG EX)  
FOR HAZARDOUS (CLASSIFIED) LOCATIONS**

**from**

**ABB Automation Products GmbH  
Borsigstrasse 2,  
Alzenau D-63755, Germany**

**I INTRODUCTION**

- 1.1 ABB Automation Products GmbH (manufacturer) requested FM Approval of their Thermal Gas Flowmeter Type FMT500-iG in two versions:

Compact Version - Explosionproof for Class I, Division 1, Groups A, B, C and D; and for Class I, Zone 1 Group IIB with intrinsically-safe circuits for Class I, Division 1, Groups B, C and D; Class I, Zone 0 AEx ia IIB; dust-ignitionproof for Class II, III, Division 1, Groups E, F and G; and non-incendive for Class I, Division 2, Groups A, B, C, D, F and G; Class I, Zone 2 Group IIC; and intrinsically-safe sensor for Class I, Division 1, Groups A, B, C and D; Class I, Zone 0 AEx ia IIC hazardous (classified) locations, indoors and outdoors (IP67 / NEMA 4X).

Remote Version - Non-incendive for Class I, Division 2, Groups A, B, C, D; Class I, Zone 2 Group IIC; and dust-ignitionproof for Class II, III, Division 1 and 2, Groups E, F and G; with intrinsically-safe circuits for Class I, Division 1, Groups A, B, C and D; Class I, Zone 0 AEx ia IIC hazardous (classified) locations, indoors and outdoors (IP67 / NEMA 4X).

KEMA performed the examination and testing for possible FM Approvals based on the inter-laboratory agreement between FM Approval and KEMA.

- 1.2 This report is supplemented by FM Approval Report 3015261 which describe the original examination and testing of the of the same explosionproof housing.
- 1.3 This Report may be reproduced only in its entirety and without modification.

1.4 **Standards:**

Title	Class Number	Date
Electrical Equipment for Use in Hazardous (Classified) Locations, General Requirements	FM 3600	1998
Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II and III, Division 1, Hazardous (Classified) Locations	FM 3610	1999
Electrical Equipment for use in Class I, Division 2 Class II, Division 2 and Class III, Division 1 and 2	FM 3611	2004
Explosionproof Electrical Equipment General Requirements	FM 3615	2006
Electrical and Electronic Test, Measuring and Process Control Equipment	FM 3810	2005
Electrical Apparatus for Use in Class I, Zones 0 & 1 Hazardous (Classified) Locations General Requirements	ANSI/ISA-60079-0	2005
Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection - Flameproof "d"	ANSI/ISA-60079-1	2003
Electrical Apparatus for Use in Class I, Zones 0, 1, & 2 Hazardous (Classified) Locations - Intrinsic Safety	ANSI/ISA-60079-11	2002
Electrical Apparatus for Use in Class I, Zone 2 Hazardous (Classified) Locations - Type of Protection	ANSI/ISA-60079-15	2005
Degrees of protection provided by enclosures (IP Code)	ANSI/IEC 60529	2004
Enclosures for Electrical Equipment	ANSI/NEMA 250	1991

1.5 **Listings:** The product will appear in the FM Approval Guide, a publication of FM Approvals, as follows:

***V14224-abcdefghijkl. Sensyflow FMT500- iG***

XP-IS / I / 1 / ABCD / T4 Ta = 50°C; I / 1 / AEx d [ia][ib] IIC T4 Ta = 50°C; DIP / II, III / 1 / EFG / T4 Ta = 50°C – V14224-7; Entity; Type 4X, IP67.

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RTD Sensor: IS / I / 1 / ABCD / T4 Ta = 100°C, T2 Ta = 200°C, T1 Ta = 300°C; I / 0 / AEx ia IIC T4 Ta = 100°C, T2 Ta = 200°C, T1 Ta = 300°C; DIP / II, III / 1 / EFG / T4 Ta = 100°C, T2 Ta = 200°C, T1 Ta = 300°C – V14224-7; Entity; Type 4X, IP67.

Remote Sensor when option f = 2: IS / I / 1 / ABCD / T4 Ta = 85°C; I / 0 / AEx ia IIC T4 Ta = 85°C or I / 1 / AEx ia IIC T4 Ta = 100°C, T2 Ta = 200°C, T1 Ta = 300°C ; DIP / II, III / 1 / EFG / T4 Ta = 85°C – V14224-7; Entity; Type 4X, IP66.

Remote Housing when option f = 2 (without IS barrier): NI / I / 2 / ABCD / T4 Ta = 50°C; I / 2 / AEx nL IIC T4 Ta = 85°C; DIP / II, III / 1 / EFG / T4 Ta = 50°C – V14224-7; Type 4X, IP66.

Entity Parameters:

When g = 1, intrinsically safe circuit connection

Analog output connection terminals 31 and 32 of connector:

$U_i = 30V$ ,  $I_i = 100mA$ ,  $C_i = 2.5nF$ ,  $L_i = 250\mu H$

$U_o = 17.2V$ ,  $I_o = 78.3mA$ ,  $P_o = 337 mW$ ,  $C_o = 353nF$   $L_o = 4 mH$

Digital output Connection terminals 33 and 34, 35 and 36:

$U_i = 15V$ ,  $I_i = 30mA$ ,  $P_i = 115 mW$ ,  $C_i = 2.5nF$ ,  $L_i = 250\mu H$

Digital input Connection terminals 37 and 38, 39 and 40:

$U_i = 30V$ ,  $I_i = 250mA$ ,  $P_i = 1.1W$ ,  $C_i = 2.5nF$ ,  $L_i = 250\mu H$

Accordinging control drawing:

V14224-6...1212.../V14224-6...2212...IS ( Remote HART )

V14224-7...1112.../V14224-7...2112...IS (Compact HART )

or alternatively connected with non-intrinsically safe field circuit

Analog output terminals 31 and 32 of connector:

$U \leq 30V$ ,  $I \leq 30mA$ ,  $U_m = 90 V$

Digital output Connection terminals 33 and 34, 35 and 36:

$U \leq 30V$ ,  $I \leq 100mA$ ,  $U_m = 90 V$

Digital input Connection terminals 37 and 38, 39 and 40:

$U \leq 30V$ ,  $I \leq 100mA$ ,  $U_m = 90 V$

Accordinging control drawing:

V14224-6...1212.../V14224-6...2212... ( Remote HART )

V14224-7...1112.../V14224-7...2112... (Compact HART )

A combination of intrinsically safe and non-intrinsically safe circuit is not allowed.

When g = 2 or 3, connection terminals X2 and X3, PIN A and B:

$U_i = \pm 4.2V$ ,  $I_i = \pm 2.66A$ ,  $C_i = 0 nF$ ,  $L_i = 0 \mu H$

$U_o = \pm 3.72V$ ,  $I_o = \pm 155 mA$ ,  $P_o = 144.2 mW$ ,

Accordinging control drawing:

V14224-6...1222.../V14224-6...2222... ( Remote Profibus DP )

V14224-7...1122.../V14224-7...2122... (Compact Profibus DP )

a = Sensor design options 6 or 7

b = Medium options A, B, C or D

c = Sensor unit option 1

d = Mounting length options 1, 2 or 3

e = Power supply options 1 or 2

f = Design options 0, 1 or 2

g = Communication options 1, 2 or 3

h = Cable gland options 1 or 2

i = Number of characteristics 1, 2, 3 or 4  
j = Calibration certificate options 0 or 1  
k = Material certificate options 0 or 1

- 1.6 As described in this report, the construction of the Thermal Gas Flowmeter Type FMT500-iG provides the degree of protection against electrical shock, fire, and injury required for hazardous (classified) locations.

## **II DESCRIPTION**

The description of the Thermal Gas Mass Flowmeter type FMT500-iG (Sensyflow iG EX) can be found in Section 3 of the attached KEMA Report No. 2025750.51.

## **III EXAMINATIONS AND TESTS**

The attached KEMA Assessment Report 2025750.51 describes the examination and testing that KEMA performed towards FM Approval of the Thermal Gas Mass Flowmeter type FMT500-iG (Sensyflow iG EX). A review of the KEMA report found the examination and testing of the FMT500-iG to be satisfactory for FM Approval per Section 1.1 and 1.5. All documents and correspondence applicable to this program are on file at FM Approvals.

## **IV MARKING**

The manufacturer's nameplates are shown on Drawing Number FMT500-iG CLASS 1 DIV 1 and FMT500-iG CLASS 1 DIV 2 which is included as an attachment to this report.

## **V REMARKS**

Installation shall be in accordance with the National Electrical Code ANSI/NFPA- 70 and the Installation shall be in accordance with the manufacturer's instructions.

## **VI FACILITIES AND PROCEDURES AUDIT**

The manufacturer's design and manufacturing facilities in Alzenau, Germany, are subject to follow-up audit inspections by FM Approvals. The facilities and quality control procedures in place have been found to be satisfactory to manufacture the product identical to that tested and Approved.

## **VII MANUFACTURERS RESPONSIBILITIES**

- 7.1 Documentation considered critical to this Approval is on file at FM Approvals and listed in the Documentation File, Section VIII of this report. No changes of any nature shall be implemented unless notice of the proposed change has been given and written authorization obtained from FM Approvals. The Approved Product Revision Report, Form 797, shall be forwarded to FM Approvals as notice of proposed changes.

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7.2 On 100% of production, the Thermal Gas Mass Flowmeter type FMT500-iG (Sensyflow iG EX) shall be dielectric tested. The input power connections shall withstand, for two seconds, with no insulation breakdown, the application of 1390 Vac with respect to the protective ground terminal for the AC powered models.

WARNING: The dielectric tests required may present a hazard of injury to personnel and/or property and should only be performed under controlled conditions, and by persons knowledgeable of the potential hazards of such testing to minimize the likelihood of shock and/or fire.

7.3 On 100% of production, the manufacturer shall inspect the protective grounding system.

### VIII DOCUMENTATION

The following drawings describe the Thermal Gas Mass Flowmeter type FMT500-iG (Sensyflow iG EX) and are filed under 3028403.

<u>Drawing No.</u>	<u>Revision Label</u>	<u>Title</u>
13201850_00	00	EXPLODED VIEW PROFIBUS
13201997_00	00	EXPLODED VIEW HART
13202002_00	00	EXPLODED VIEW PROFIBUS-EX
13202003_00	00	EXPLODED VIEW HART-EX
13202005_00	00	COMPARISON PROFIBUS-HART
13202012_00	00	SENSYFLOW iG REMOTE EX PROFIBUS EPL VIEW
13202013_00	00	SENSYFLOW iG REMOTE EX HART EPL VIEW
13202014	00	CERAMIC SENSOR UNIT
13202015	00	HEATER AND GAS TEMPERATURE SENSOR
13202016	00	SENSOR STRUCTURE AND DIM IN SANDWICH
13202017_00	00	ASSEMBLY iG PROTECTION TUBE
13202018	00	ASSEMBLY iG REMOTE PROTECTION TUBE
13202039_00	00	EEx d REMOTE SENSOR UNIT
AEKOM	1.03	AEKOM PARTS LIST
NET24V EX	1.00	PARTS LIST Power Supply 24V NV
NET230V EX	1.03	PARTS LIST Power Supply 230V HV
MT EX	1.00	SCHEMATIC
MT_EX	1.01	PARTS LIST/ARTWORK
ABGKOMI EX	1.00	SCHEMATIC
ABGKOMI_EX	1.01	PARTS LIST/ARTWORK
ABGKOMII EX	1.00	SCHEMATIC
ABGKOMII_EX	1.00	PARTS LIST/ARTWORK
FMT500-iG Odering Code	1.00	FLOWMETER FMT500iG ORDERING INSTRUCTIONS
FM/CSA Typeplate Class1 DIV 1	1.0	Type plate FMT500-iG FM/CSA Class 1 Div 2
FM/CSA Typeplate Class1 DIV 1	1.0	Type plate FMT500-iG FM/CSA Class 1 Div 1
KOMI_EX	1.03	HART PART LIST
KOMI_EX	1.03	HART Schematic
KOMII_EX	1.01	Profibus PARTS LIST
KOMII_EX	1.00	Profibus SCHEMATIC
M_0003A	11/02/00	SCHEMATIC Power Supply 24V LV
M_0004A	11/02/00	SCHEMATIC Power Supply 230V HV
AEKOM SCH RESA13	1.01	AEKOM-MODUL SCHEMATIC

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TR100_NT230V	1.01	BUILDING SPECIFICATION TRANSFORMER 230V HV
TR100_NT24V	1.00	BUILDING SPECIFICATION TRANSFORMER 24 V LV
V14224-	1.00	FMT500_iG EX PARTS LIST
V14224-7...1112...	1.01	FMT500-IG HART CONTROL DRAWING Compact
V14224-7...1112...IS	1.01	FMT500-IG HART CONTROL DRAWING Compact
V14224-7...1122...	1.01	FMT500-IG PROFIBUS CONTROL DRAWING
V14224-6...1212...	1.01	FMT500-IG REMOTE HART CONTROL DRAWING
V14224-6...1212...IS	1.01	FMT500-IG REMOTE HART CONTROL DRAWING
V14224-6...1222...	1.00	FMT500-IG REMOTE PROFIBUS CONTROL DRAWING
V14224B	1.00	FMT500_iG EX PARTS LIST
V14224C	1.00	FMT500_iG EX PARTS LIST
V14224D	1.00	FMT500_iG EX PARTS LIST

**IX CONCLUSION**

The apparatus identified in 1.5 meets FM Approvals requirements. Since a duly signed Master Agreement is on file for this manufacturer, Approval is effective the date of this report.


**EXAMINATION AND TESTING BY: KEMA – Erwin ter Haar**

**EXAMINATION BY: FM Approvals - E. W. LaLiberte**

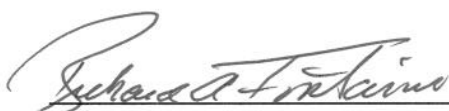
**ATTACHMENTS:**

KEMA Assessment Report 2025751-02, dated February 6, 2006  
KEMA CB Test Certificate NL-6710, dated 2003-06-02  
Nameplate Drawings: FMT500-iG CLASS 1 DIV 1  
FMT500-iG CLASS 1 DIV 2

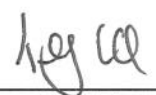
**REPORT BY:**

  
Edmond W. LaLiberte  
Senior Engineer  
Electrical Section

**REPORT REVIEWED BY:**

  
Richard A. Fontaine  
Senior Engineer  
Electrical Section

**REPORT REVIEWED BY:**

  
Timothy Adam  
Technical Team Manager  
Electrical Section

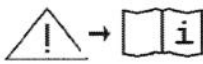

FMT500-IG TYPE PLATE


FMT500-iG FM /CSA Class 1 Div 2 Remote Version


Remote Electronic:

**ABB** Automation Products GmbH FMT500  
 Alzenau Germany 2007

FMT500-IG (Sensyflow iG), S/N: XXX5NNNN  
 O-Code : V14224-6A111212100 8323455772  
 Voltage: 110...230V DC/AC +/-10%, 48..62Hz  
 Power: max. 20 VA HW. Rev. 1.01  
 Typ - Nr.: xxxx  
 Tamb.= -20...+50°C IP 67, NEMA 4X

 NI CLASS I DIV2 Group: A,B,C,D , CLASS I Zone 2 AEx nA IIC T4..T1  
 DIP CLASS II,III DIV1 and 2 Group: E,F,G  
 IS Circuits for CLASS I DIV1 Group: A,B,C,D , CLASS I Zone 0 AEx ia IIC

 CLASS I DIV2, Group: A,B,C,D CLASS I Zone 2 Ex nA II T4..T1  
 CLASS II,III DIV1 and 2 Group: E,F,G  
 Associated Equipment [Ex ia] CLASS I DIV1 Group: A,B,C,D [Ex ia] IIC

when connected per drawing V14224-6...12x2,V14224-6...22x2  
 Tamb. = -20 ... +50°C

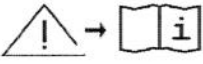

Description:


x = 1 HART Version SAP Option Communication 1  
 x = 2 Profibus Version SAP Option Communication 2  
 O-Code : Example incl. SAP Order- No.  
 XXX5NNNN = ABB Serial No.  
 Voltage = 110..230V DC/AC +/-10%, 48..62Hz or 24V DC/AC +/-20%,  
 48..62Hz  
 xxxx = ABB Type No.


Remote Sensor:

**ABB** Automation Products GmbH FMT500  
 Alzenau Germany 2007

FMT500-IG (Sensyflow iG), S/N: XXX5NNNN  
 O-Code : V14224-6A111212100 8323455772  
 Typ - Nr.: xxxx  
 Tamb.= -20...+80°C IP 66, NEMA 4X

 IS CLASS I DIV1 Group: A,B,C,D , CLASS I Zone 0 AEx ia Group IIC T4..T1  
 DIP CLASS II,III DIV1 and 2 Group: E,F,G  
 NI CLASS I,II,III DIV2, Group: A,B,C,D CLASS I Zone 2 Group: IIC T4..T1  
 Intrinsically safe Exia CLASS I DIV1 Group: A,B,C,D Ex ia IIC T4..T1

 CLASS II,III DIV1 and 2 Group: E,F,G  
 CLASS I DIV2, Group: A,B,C,D Ex nA II T4..T1  
 when connected per drawing V14224-6...12x2,V14224-6...22x2

T4/T3 Tmed. = -20..100°C; T2 Tmed. = -20..200°C; T1 Tmed. = -20..300°C; Tmax. med. = 150°C






Material: Metal type plate

				2007	Date	Name	Title :
				Prep.	24.01.08	Müller	FMT500-iG FM/CSA Type Plate Class 1 DIV 2
				Approved			
				Resp.dept.			Product no.: V14224-6...1212..., 2212... V14224-6...1222..., 2222...
				<b>ABB</b> Automation Products			Document no.:
							<b>FM/CSA Typeplate Class 1 DIV 2</b>
1.0	----	21.12.07	Müller	No. of sheets : 1	Sheet : 1		
Rev.	Modification	Date	Name				

FMT500-IG TYPE PLATE

FMT500-iG FM /CSA Class 1 Div 1 Compact Version

Compact Electronic:

	Automation Products GmbH Alzenau Germany 2007	<b>FMT500</b>
FMT500-IG (Sensyflow iG), S/N: XXX5NNNN O-Code : V14224-6A111111100 8323455772		 → 
Voltage: 110...230V DC/AC +/-10%, 48..62Hz Power: max. 20 VA HW. Rev. 1.01		
Typ - Nr.: xxxx Tamb.= -20...+50°C		
IP 67, NEMA 4X		
	XP CLASS I DIV1 Group: B,C,D CLASS I , Zone 1 Group II B T4..T1 IS Circuits for CLASS I DIV1 Group: B,C,D , CLASS I Zone 0 AEx ia IIC DIP CLASS II,III DIV1 and 2 Group: E,F,G NI CLASS I,II,III DIV2, Group: A,B,C,D,F,G CLASS I Zone 2 Group: IIC T4..T1	
	CLASS I DIV1 Group: B,C,D,F,G CLASS I , Zone 1 II B T4..T1 CLASS I Zone 1 / 0 Ex d [ia] [ib] IIC T4...T1 or Ex d [ia] IIC T4..T1 CLASS II,III DIV1 and 2 Group: E,F,G CLASS I,II,III DIV2, Group: A,B,C,D,F,G CLASS I Zone 2 Ex nA II T4..T1 when connected per drawing V14224-7...12x2,V14224-7...22x2	
T4/T3 Tmed. = -20..100°C; T2 Tmed. = -20..200°C; T1 Tmed. = -20..300°C; Tmax. med. = 150°C		

Description:

x = 1 HART Version SAP Option Communication 1  
x = 2 Profibus Version SAP Option Communication 2  
O-Code : Example incl. SAP Order- No.  
XXX5NNNN = ABB Serial No.  
Voltage = 110..230V DC/AC +/-10%, 48..62Hz or 24V DC/AC +/-20%,  
48..62Hz  
xxxx = ABB Type No.

Material: Metal type plate

				2007	Date	Name	Title :
				Prep.	24.01.08	Müller	FMT500-iG FM/CSA Type Plate Class 1 DIV 1
				Approved			
				Resp.dept.			Product no.: V14224-7...1112..., 2112... V14224-7...1122..., 2122...
				<b>ABB</b> Automation Products			Document no.:
							<b>FM/CSA Typeplate Class 1 DIV 1</b>
1.0	----	21.12.07	Müller				
Rev.	Modification	Date	Name	No. of sheets : 1	Sheet : 1		