

## **ATEX & IECEx supplement**

Supplementary Instructions

9500A / 9700A + IMT31A 4 / IMT31A N

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**Foxboro**<sup>®</sup>

**by Schneider** Electric

1	Introduction	3
1.1	Scope of the document	3
1.2	Safety instructions for the operator	3
1.3	Approvals	4
1.4	9500A & 9700A	6
1.4.1	Field versions	6
1.4.2	Compact versions	7
1.4.3	Signal converter IMT31A N	7
1.5	Marking labels (examples)	8
2	Temperature limits	9
2.1	9500A and 9700A	9
2.1.1	Field versions	9
2.1.2	Compact versions	11
2.1.3	IMT31A N	11
3	Electrical connections	12
3.1	Signal cable A	12
3.2	Equipotential bonding	13
3.3	Signal cable connections	13
3.4	Installation instructions	14
3.5	Connection of IMT31A N and 9500A / 9700A + IMT31A 4	16
4	Maintenance and service	19
4.1	Maintenance and service	19

## 1.1 Scope of the document

These instructions are applicable only to the explosion-protection version of the:

- 9500A + IMT31A 4
- 9700A + IMT31A 4
- 9500A
- 9700A
- IMT31A N



**INFORMATION!**

*For all other data, use the Quick Start and Handbook. If you do not have these documents, please download them from the manufacturer's website.*

## 1.2 Safety instructions for the operator



**WARNING!**

- *Do not change the device. Unauthorised changes affect the explosion safety of the devices.*
- *The prescriptions and regulations as well as the electrical data described in the EC type examination certificate must be obeyed.*
- *Beside the instructions for electrical installations in non-hazardous locations according to the applicable national standard (equivalent to HD 384 or IEC 60364, e.g. VDE 0100), especially the regulations in EN/IEC 60079-14 "Electrical installations in hazardous locations", equivalent national standard (e.g. DIN VDE 0165 Part 1).*
- *Installation, establishment, utilisation and maintenance are only allowed to be executed by personnel with an education in explosion safety!*

## 1.3 Approvals

The flowmeters consists of a flow sensor and a signal converter. The approval numbers are:

**Compact versions:**

9500A + IMT31A 4

9700A + IMT31A 4

**FTZU 16 ATEX 0037X and IECEx FTZU 16.0010X**

The flowmeters are approved to following standards:

- EN IEC 60079-0 : 2012 / 2011
- EN IEC 60079-1 : 2007 / 2007
- EN IEC 60079-5 : 2007 / 2007
- EN IEC 60079-7 : 2007 / 2006
- EN IEC 60079-11 : 2012 / 2011
- EN IEC 60079-18 : 2009 / 2009
- EN IEC 60079-31 : 2009 / 2008

**Field versions:**

IMT31A N

**FTZU 16 ATEX 0034X and IECEx FTZU 16.0007X**

Approved to following standards:

- EN IEC 60079-0 : 2012 / 2011
- EN IEC 60079-7 : 2007 / 2006
- EN IEC 60079-11 : 2012 / 2011
- EN IEC 60079-18 : 2009 / 2009
- EN IEC 60079-31 : 2009 / 2008

9500A and 9700A

**FTZU 16 ATEX 0036X and IECEx FTZU 16.0009X**

Approved to following standards:

- EN IEC 60079-0 : 2012 / 2011
- EN IEC 60079-1 : 2007 / 2007
- EN IEC 60079-5 : 2007 / 2007
- EN IEC 60079-7 : 2007 / 2006
- EN IEC 60079-11 : 2012 / 2011
- EN IEC 60079-18 : 2009 / 2009
- EN IEC 60079-31 : 2009 / 2008



**INFORMATION!**

*For more information of the certification and related EN/IEC standards with date of compliances see the relevant certificates delivered with your flow meter or available on the manufacturer website.*



**INFORMATION!**

*EN and IEC issue dates are separated by a backslash, EN issue date precedes the IEC issue date.*



**INFORMATION!**

*All ATEX EC-type examination certificates and IECEx certificates of conformity can be downloaded from the website.*

## 1.4 9500A & 9700A

### 1.4.1 Field versions

The 9500A and 9700A versions are suitable for installation in gas hazardous areas zone 1 or zone 2, group IIC, temperature class T6...T3 or T5...T3. The flow meters are also suitable for installation in dust hazardous areas zone 21 or 22, group IIIC, surface temperature 180°C.

Field current circuit, in type of protection "Increased safety" (Ex e), terminals 7, 8 and 9:  
 $U < 40$  V (switched DC voltage, alternately +40 and -40 V)

$I = 125$  mA (injected square wave current)

Electrode circuits, in type of protection "Intrinsic safety" (Ex ia), terminals 1, 2, 3 and 4:  
 $U_i = 20$  V,  $I_i = 175$  mA,  $C_i = 0$  nF,  $L_i = 0$  mH.

The before mentioned intrinsically safe circuits shall, from safety point of view, be considered to be connected to ground. The cable gland for the electrode circuit is - as an intrinsically safe circuit - marked with a blue o-ring.

#### Ex Marking 9500A and 9700A

Nominal diameter	Ex marking	
DN2,5...15 ("mb")	II 2G	Ex e ia mb IIC T6...T3 Gb
DN10...20 ("mb")	II 2G	Ex e ia mb IIC T6...T3 Gb
DN25...150 ("d")	II 2G	Ex d e ia IIC T6...T3 Gb
DN200...300 ("q")	II 2G	Ex e ia q IIC T6...T3 Gb
DN350...3000 ("e")	II 2G	Ex e ia IIC T6...T3 Gb
<b>Optional:</b>		
DN25...150 ("q")	II 2G	Ex e ia q IIC T5...T3 Gb
Additionally:		
All diameters	II 2D	Ex tb IIIC T180°C Db



#### **INFORMATION!**

*Equipment group (II) and equipment category (2G or 2D) only included in marking for ATEX*

### 1.4.2 Compact versions

The 9500A/9700A + IMT31A 4 compact versions are suitable for installation in gas hazardous areas zone 1 or zone 2, group IIC, temperature class T4 (or T3), and dust hazardous areas zone 21 or 22, group IIIC, surface temperature 120 °C.

The connection compartment contains terminals for Power, Status / Pulse / Current, and others, in type of protection Ex e or Ex ia depending on the ordered IMT31A version. For electrical data of these terminals, refer to section 3.5.

#### Ex Marking 9500A / 9700A + IMT31A 4, non-Ex ia I/O.

Nominal diameter	Ex marking	
2,5...15 ("mb")	II 2(1)G	Ex e (ia Ga) mb IIC T4 Gb
10...20 ("mb")	II 2(1)G	Ex e (ia Ga) mb IIC T4 Gb
25...150 ("d")	II 2(1)G	Ex d e (ia Ga) mb IIC T4 Gb
200...300 ("q")	II 2(1)G	Ex e (ia Ga) mb q IIC T4..T3 Gb
350...3000 ("e")	II 2(1)G	Ex e (ia Ga) mb q IIC T4 Gb
<b>Optional:</b>		
25...150 ("q")	II 2(1)G	Ex e (ia Ga) mb q IIC T4...T3 Gb
<b>Additionally:</b>		
All diameters	II 2(1)D	Ex tb (ia Da) IIIC T120

### 1.4.3 Signal converter IMT31A N

The IMT31A N is suitable for installation in gas hazardous areas zone 1 or zone 2, group IIC temperature class T4 and dust hazardous areas, zone 21 or zone 22 , group IIIC, surface temperature T135°C

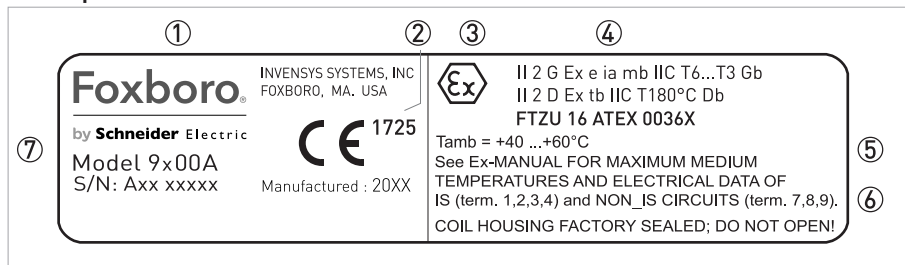
The connection compartment contains terminals for:  
Power, status / pulse / current and others, in type of protection Ex e or Ex ia depending on the IMT31A N version ordered. It contains also the terminals for the sensor coils( in type of protection Ex e) and the sensor signal (in type of protection Ex ia) .

Ex marking	
II 2(1)G	Ex e [ia Ga] mb IIC T4 Gb
II 2(1)D	Ex tb (ia Da) IIIC T135°C Db

## 1.5 Marking labels (examples)

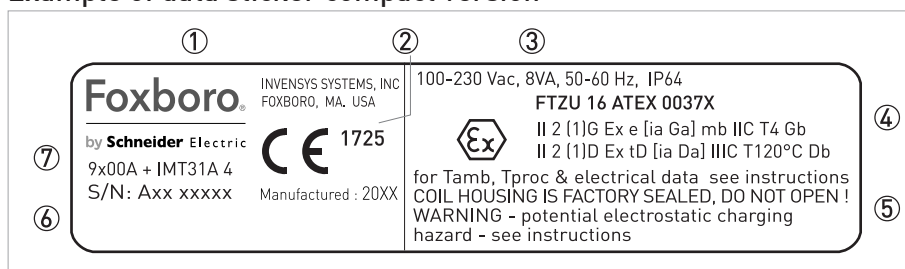
The ATEX/IECEX data stickers on the flowmeter and / or converter typically contains the following information:

### Example of data sticker on the sensor (remote version)



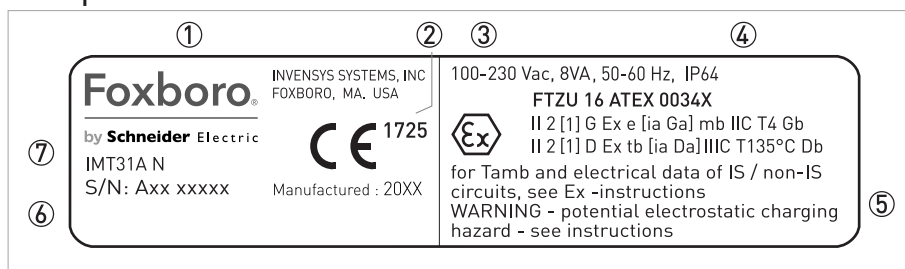
- ① Name and address of the manufacturer
- ② CE mark with number of notified body (ATEX only)
- ③ Ex marking for explosion safety (ATEX only)
- ④ Symbols and code letters for explosion safety and certificate number
- ⑤ Explosion safety notes and warnings
- ⑥ Other specific data and warnings
- ⑦ Type designation of flow meter

### Example of data sticker compact version



- ① Name and address of the manufacturer
- ② CE mark with number of notified body (ATEX only)
- ③ Electric data of mains circuit
- ④ Ex marking with certificate number and symbols and code letters for explosion safety
- ⑤ Ambient temperature and explosion safety notes and warnings
- ⑥ Other specific data and warnings (non-ex)
- ⑦ Type designation of the flowmeter

### Example of data sticker on the converter



- ① Name and address of the manufacturer
- ② Type designation of flow meter
- ③ non-Ex specific data
- ④ Explosion safety notes and warnings
- ⑤ Symbols and code letters for explosion safety
- ⑥ Electrical data mains circuit
- ⑦ Ex marking for explosion safety (ATEX only)
- ⑧ CE mark with number of notified body (ATEX only)



The temperature limits apply under the following conditions:

- The instrument is installed and operated in accordance with the installation directions given in the installation and operating instructions.
- The instrument is not heated up by any additional heat radiation (direct solar radiation, heat from adjacent plant parts) so causing it to operate above the permissible ambient temperature range.
- Insulation is not hindering free ventilation of the signal converter housing.

## 2.1 9500A and 9700A

### 2.1.1 Field versions

- The 9500A & 9700A flow sensors are suitable for an ambient temperature of  $-40...+60^{\circ}\text{C}$ .
- For dust hazardous areas, the maximum surface temperature is  $180^{\circ}\text{C}$ .
- The minimum process temperature for all DN sizes is  $-40^{\circ}\text{C}$ .
- The maximum process temperature  $T_p$  is dependent on the required temperature class T6...T3 (or T5...T3), the diameter and the maximum ambient temperature  $T_a$
- The process temperature range is often limited further by the liner type used (refer to the Quick Start).
- The continuous operating temperature of heat resistant cables must be at least  $85^{\circ}\text{C}$  (see in following tables note ①)

#### DN2,5...15 ("mb")

Temperature class	Max. process temperature $T_p$ [ $^{\circ}\text{C}$ ]		
	$T_a \leq 40^{\circ}\text{C}$	$40 < T_a \leq 50^{\circ}\text{C}$	$50 < T_a \leq 60^{\circ}\text{C}$
T6	70	70	70
T5	85	85	85
T4	120	120	120
T3	180	180	165
Use heat resistant cables for; $T_p$ above	N.A.	N.A.	N.A.

#### DN10...20 ("mb")

Temperature class	Max. process temperature $T_p$ [ $^{\circ}\text{C}$ ]		
	$T_a \leq 40^{\circ}\text{C}$	$40 < T_a \leq 50^{\circ}\text{C}$	$50 < T_a \leq 60^{\circ}\text{C}$
T6	75	70	70
T5	95	90	75
T4	130	115	75
T3	150	130	75
Use heat resistant cables for; $T_p$ above ①	N.A.	N.A.	N.A.

## DN25...150 ("d")

Temperature class	Max. process temperature $T_p$ [°C]		
	$T_a \leq 40^\circ\text{C}$	$40 < T_a \leq 50^\circ\text{C}$	$50 < T_a \leq 60^\circ\text{C}$
T6	70	70	70
T5	85	85	85
T4	120	120	120
T3	180	180	180
Use heat resistant cables for; $T_p$ above ①	N.A.	155	105

## DN25...150 ("q" - optional)

Temperature class	Max. process temperature $T_p$ [°C]		
	$T_a \leq 40^\circ\text{C}$	$40 < T_a \leq 50^\circ\text{C}$	$50 < T_a \leq 60^\circ\text{C}$
T5	60	55	---
T4	110	105	100
T3	180	180	180
Use heat resistant cables for; $T_p$ above ①	N.A.	155	105

## DN200...300 ("q")

Temperature class	Max. process temperature $T_p$ [°C]		
	$T_a \leq 40^\circ\text{C}$	$40 < T_a \leq 50^\circ\text{C}$	$50 < T_a \leq 60^\circ\text{C}$
T6	75	70	70
T5	95	90	75
T4	130	115	75
T3	160	130	75
Use heat resistant cables for; $T_p$ above ①	N.A.	145	110

## DN350...3000 ("e")

Temperature class	Max. process temperature $T_p$ [°C]		
	$T_a \leq 40^\circ\text{C}$	$40 < T_a \leq 50^\circ\text{C}$	$50 < T_a \leq 60^\circ\text{C}$
T6	80	75	70
T5	95	95	95
T4	130	130	130
T3	160	160	160
Use heat resistant cables for; $T_p$ above ①	N.A.	N.A.	145

### 2.1.2 Compact versions

- The 9500A / 9700A + IMT31A 4 is suitable for an ambient temperature of -20...+40°C or -(with a limited maximum process temperature) 20...+55°C.
- For dust hazardous areas, the maximum surface temperature is 120°C.
- The minimum process temperature for all DN sizes is -20°C.
- For  $T_a \leq 40^\circ\text{C}$  the maximum process temperature is determined by the temperature class T4 of the gas hazardous area of concern
- The process temperature range is often limited further by the liner type used (refer to the Quick Start).

DN10...20 ("mb"), DN25...150 ("d"), DN200...300 ("q") and DN350...3000 ("e")

Temperature class	Max. process temperature $T_p$ [°C]	
	$T_a \leq 40^\circ\text{C}$	$40 < T_a \leq 55^\circ\text{C}$
T4	120	55

DN25...150 ("q", optional)

Temperature class	Max. process temperature $T_p$ [°C]	
	$T_a \leq 40^\circ\text{C}$	$40 < T_a \leq 55^\circ\text{C}$
T4	100	55
T3	120	55

### 2.1.3 IMT31A N

The IMT31A N signal converter is suitable for an ambient temperature of:

-40°C...+55°C

In the case of field versions, the electrical connection between the sensor and the signal converter is established via a signal cable and a field current cable.

The **field current cable** is no part of the supply and must be supplied by the user. It must be according EN/IEC 60079-14 clause 9.3 and 11.2 (Increased safety).

The **signal cable** is part of the supply.

### 3.1 Signal cable A

The signal cable A is a double screen shielding cable, according to EN IEC 60079-14 clause 12.2.2 (Intrinsic safety).

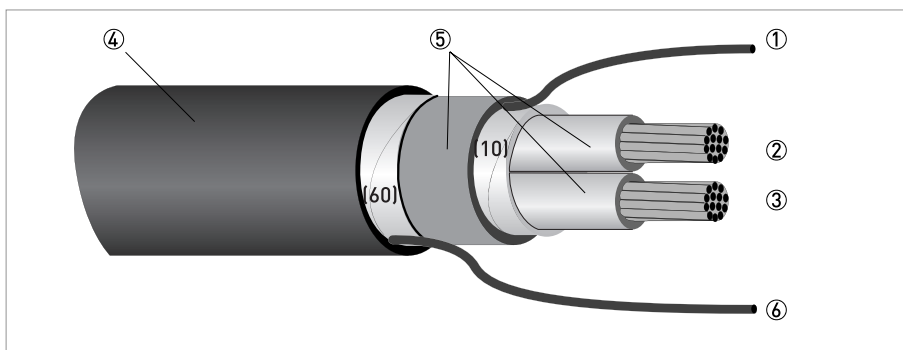


Figure 3-1: Construction of signal cable A

- ① Stranded drain wire (1) for the inner shield (10), 1.0 mm<sup>2</sup> Cu / AWG 17 (not insulated, bare)
- ② Insulated wire (2), 0.5 mm<sup>2</sup> Cu / AWG 20
- ③ Insulated wire (3), 0.5 mm<sup>2</sup> Cu / AWG 20
- ④ Outer sheath
- ⑤ Insulation layers
- ⑥ Stranded drain wire (6) for the outer shield (60)

### 3.2 Equipotential bonding

- As the Ex ia electrode circuits of the flow sensors are effectively earthed through the conductive liquid in the measuring tube, an equipotential bonding system must exist over the whole area in which the electrode circuits, including their wiring, are installed, conform EN IEC 60 079-14 clause 12.2.4.
- The flowmeters 9500A & 9700A, the electrode cable and the IMT31A N signal converter must all be included in the equipotential bonding system of the hazardous area. If a single separate conductor is used for equipotential bonding, than this conductor must have a cross section of at least 4 mm<sup>2</sup> copper.
- The separate equipotential bonding conductor between flowmeter and converter can be left out, if by other means (e.g. over bonding conductors over the metal piping system) a high level of assurance that potential equalization exists between flowmeter and converter is reached.

### 3.3 Signal cable connections

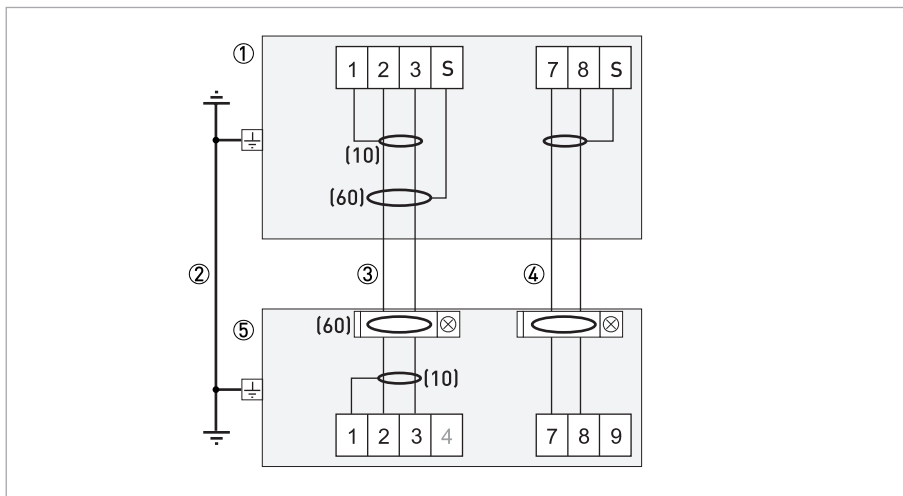


Figure 3-2: Connecting cables Field version

- ① Electrical terminal compartment in housing of the signal converter for signal and field current cable
- ② Equipotential bonding, conductor  $\geq 4 \text{ mm}^2$
- ③ Signal cable acc. EN/IEC 60079-14 clause 12.2 (intrinsic safety)
- ④ Field current cable acc. EN/IEC 60079-14 clause 9.3 and 11.2 (increased safety)
- ⑤ Flow sensor outlet box

### 3.4 Installation instructions

For IMT31A N and 9500A / 9700A + IMT31A 4



**WARNING!**

*To avoid the risk of ignition as a result of electrostatic charging, it is not allowed to use the flow meter in locations such as:*

- *High discharge generating processes*
- *Mechanical friction and separation processes*
- *Processes where electron emission occur (e.g. near electrostatic coating equipment).*

The cable glands and blanking elements must be in type of protection increased safety "e", suitable for the conditions of use and correctly installed. The device must provide a degree of protection of at least IP64 according to IEC 60 529.

**Additionally for 9500A / 9700A compact and field version:**

The field coils in type of explosion protection "q" and "m" must be protected by a 160 mA fuse. The breaking capacity of the fuse must be in accordance with the prospective short circuit current of the supply. This concerns:

9500A / 9700A field versions	DN10...20 ("mb")
	DN200...300 ("q")
	DN25...150 ("q") (optional)

**INFORMATION!****General notes for all flowmeters:**

- *The internal field coil fuses of the IMT31A N signal converter fulfill the above mentioned requirements with respect to rated current and breaking capacity.*
- *The IMT31A N signal converter is delivered with four Ex e certified M20x1.5 cable glands, clamping range Ø 6...12 mm.*
- *The 9500A / 9700A versions flow sensors and the IMT31A 4 + 9500A / 9700A compact flowmeters are normally delivered with two Ex e certified M20x1.5 cable glands, The clamping range of the Ex e cable glands is Ø 6...12 mm.*
- *Unused cable glands must be replaced by suitable Ex e certified M20x1,5 stopping plugs. The plastic yellow caps which are provided with the cable glands are not to be used in hazardous areas and are only used during transport and storage !*
- *To avoid the risk of ignition as a result of electrostatic charging, all flowmeters and signal converters can not be used in location as follows:*
  - *at high discharge generating processes*
  - *at mechanical friction and separation processes*
  - *when electron emission occurs (e.g. near electrostatic coating equipment)*

## 3.5 Connection of IMT31A N and 9500A / 9700A + IMT31A 4

Terminals	Circuit	Type of protection
L, N, PE	Power 100...230 V AC, +10%/-15%, 8 VA, $U_m = 253$ V  or 24 V AC/DC, for connection to a PELV circuit, $U_m = 253$ V, AC: +10%/-15%, 8 VA DC: +30%/-25%, 4 W	Ex e
The terminals for inputs/outputs are dependant on the IMT31A version ordered Each IMT31A version can be identified by it's Modelnumber ( where the last 3 digits define the specific version). The terminals used for the different versions are listed in the table below		
Terminals	Basic I/O	Type of protection
C, C- D, D- S A, A-, A+	Status / Control Pulse / Status Screen (frame) Current + HART (active /passive)  All circuits $U_n \leq 32$ V, $I_n \leq 50$ mA, $U_m = 253$ V for connection to a PELV circuit	Ex e
Terminals	Ex i I/O	Type of protection
D, D-, S C, C-	Pulse / Status Screen (frame) Current + HART (passive) See Ex ia IIC data in table below	Ex ia IIC Ex ib IIC
Terminals	Profibus PA	Type of protection
D, D-, S, C, C-	FISCO Field device See Ex ia IIC data in table below	Ex ia IIC Ex ib IIC
Terminals	Foundation Field bus	Type of protection
D, D-, S, C, C-	FISCO Field device See Ex ia IIC data in table below	Ex ia IIC Ex ib IIC
Terminals	Profibus RS-485 (DP)	Type of protection
D, D-, S, C, C-	Profibus RS-485 interface, up to 12 MBaud, $U_m = 253$ V	Ex e
Terminals	Modbus	Type of protection
D, D-, S, C, C- B, B-	Modbus RS-485 interface, up to 115,2 KBaud, $U_m = 253$ V	Ex e

**INFORMATION!**

More information regarding the connection of the inputs and outputs can be found in the converter manual. Specific information concerning FF, Profibus PA/DP and Modbus is available on the website.



**Ex ia IIC / Ex ib IIC data for IMT31A versions:**  
**Ex i I/O, Profibus PA and Foundation Fieldbus**

Terminals	Circuit	Type of protection
Terminals	Ex I/O	Type of protection
D, D-  C, C- S (screen) ①	Pulse / Status Only for connection to a certified intrinsically safe circuit, Current + HART (passive) Maximum values: $U_i = 30V$ , $I_i = 130\text{ mA}$ , $P_i = 1\text{ W}$ $C_i = 10\text{ nF}$ , $L_i = \text{negligible low}$	Ex ia IIC Ex ib IIC
Note: The intrinsically safe Pulse / Status and current output are electrically safe isolated from each other and from all other intrinsically safe circuits, up to a peak value of the nominal voltage of 60 V Both circuits are electrically safe isolated from all non-intrinsically safe circuits, up to a peak value of the nominal voltage of 375 V		
Terminals	Profibus PA	Type of protection
D, D-, C, C- S (screen) ①	FISCO Field device Maximum values: $U_i = 24V$ , $I_i = 380\text{ mA}$ , $P_i = 5,32\text{ W}$ $C_i$ and $L_i = \text{negligible low}$	Ex ia IIC Ex ib IIC
Terminals	Foundation Field bus	Type of protection
D, D-, C, C- S (screen) ①	FISCO Field device Maximum values: $U_i = 24V$ , $I_i = 380\text{ mA}$ , $P_i = 5,32\text{ W}$ $C_i$ and $L_i = \text{negligible low}$	Ex ia IIC Ex ib IIC
Note: The intrinsically safe fieldbus circuits output (Profibus PA / Foundation Filedbus) is electrically safe isolated from each other and from all other intrinsically safe circuits, up to a peak value of the nominal voltage of 60 V The fieldbus circuits are electrically safe isolated from all non-intrinsically safe circuits, up to a peak value of the nominal voltage of 375 V ① Only for connection to a certified intrinsically safe circuit		

**Additional information for IMT31A only:**

Terminals	Circuit	Type of protection
7, 8, S	Sensor coils Screen (frame) Switched DC current; $U_n \leq 20\text{ V}$ , $I_n \leq 160\text{ mA}$ prospective short circuit current $< 35\text{ A}$ , for connection to a PELV circuit	Ex e
1, 2, 3, S	Sensor signal (electrodes) Screen (frame) $U_o = 19.7\text{ V}$ , $I_o = 8\text{ mA}$ , $P_o = 40\text{ mW}$ , $C_o = 180\text{ nF}$ , $L_o = 20\text{ mH}$ Lineair characteristic	Ex ia IIC

**For IMT31A N versions:**

The intrinsically safe sensor signal (electrodes) circuit and the non-intrinsically safe sensor coils circuit are galvanically connected with each other. Both circuits are securely galvanically isolated from all other non-intrinsically safe circuits up to a peak voltage of 375 V. The sensor coils circuit shall be connected to a passive load only. For further details about the electrical connection, see the converter manual.

**For 9500A / 9700A + IMT31A 4 only:**

The housing must be connected to the equipotential bonding system of the hazardous area. See EN/IEC 60 079-14 clause 6.3. For this purpose the internal or external connection facility (PE clamp) can be used.

## 4.1 Maintenance and service

The Foxboro flowmeters are maintenance free with respect to the flow metering properties. Within the scope of periodic inspections required for electrical equipment installed in hazardous areas it is recommended to check the flow meter and converter housing for signs of the corrosion. This is especially important for the flameproof Ex d flowmeter or coil housing, sizes DN25...150. of the **9500A / 9700A compact and remote version** .

Specific notes for the above mentioned types:

### Specific notes for Ex d flowmeters, sizes DN25...150:

- In case of replacement of one (or more) of the four M6 hexagon socket head cap screws which connect the IMT31A converter housing or the connection box with the 9500A / 9700A compact or remote flowmeter, equivalent types must be used, that are M6x16 hexagon socket head cap screws to ISO 4762, steel quality A2-70 or A4-70.

### Specific notes for Ex q flowmeters, sizes DN25...150 and DN200...300:

- The coil housing is factory sealed. After opening of the seal the flowmeter must be returned to the manufacturer to re-fill the compact or remote flowmeter with the Ex q approved powder filling material.

If needed, contact the manufacturer for information on the dimensions of the flameproof joints.

## ISSUE DATES

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**Foxboro**<sup>®</sup>

by **Schneider** Electric

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