

**Installation Instructions**

P/N MMI-20011707, Rev. AA

July 2009

# **ATEX Installation Instructions for Micro Motion<sup>®</sup> Model 3500 Transmitters**



Note: For hazardous installations in Europe, refer to standard EN 60079-14 if national standards do not apply.

Information affixed to equipment that complies with the Pressure Equipment Directive can be found on the internet at [www.micromotion.com/library](http://www.micromotion.com/library).

If you require the information given in this manual in a different language, please contact Micro Motion Customer Service.

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# Model 3500 Transmitters

## ATEX Installation Instructions and Drawings

- For installing the following Micro Motion transmitters:
  - Model 3500 with 4-wire connection to a core processor
  - Model 3500 with 9-wire connection to a junction box
  - Model 3500 with a remote core processor and remote sensor with a junction box

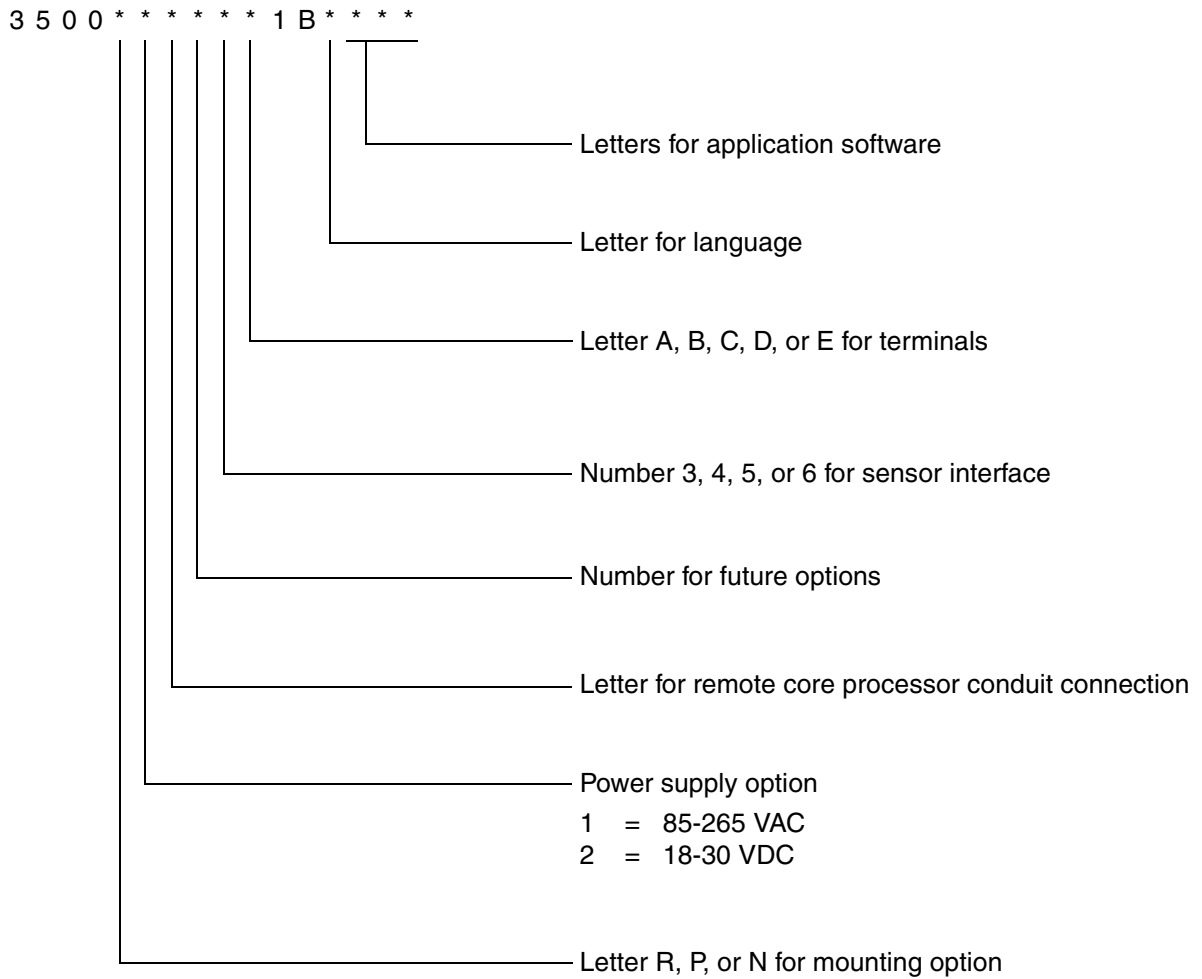


Subject:	Equipment type	<b>Transmitter type 3500*****1B****</b>
Manufactured and submitted for examination		<b>Micro Motion, Inc.</b>
Address		<b>Boulder, Co. 80301, USA</b>
Standard basis	EN 60079-0:2006	General requirements
	EN 60079-11:2007	Intrinsic safety 'i'
Code for type of protection	<b>II (2) G [Ex ib] IIB/IIC</b>	
EC Type Examination Certificate	<b>DMT 02 ATEX E 242 X</b>	

1) **Subject and type**

Transmitter type 3500\*\*\*\*\*1B\*\*\*\*

Instead of the \*\*\* letters and numerals will be inserted which characterize the following modifications:



**2) Description**

The transmitter is, in combination with a sensor, used for mass flow measurement and for indicating as well as entering of parameters.

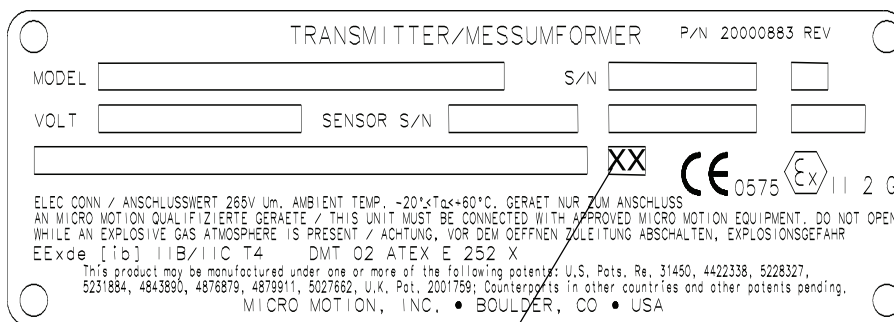
The electrical components of the transmitters are securely fixed in a light metal housing which is mounted outside the hazardous area. The transmitter can be purchased with one of three mounting options. The 3500R\*\*\*\*1B\*\*\*\* is suitable for rack mount installation. The 3500P\*\*\*\*1B\*\*\*\* is suitable for panel mount installation. The 3500N\*\*\*\*1B\*\*\*\* comes with an optional fiberglass enclosure.

The 3500\*\*\*\*1B\*\*\*\* transmitter comes with different sensor interface boards. The 3500\*\*\*\*3\*1B\*\*\*\* is for 9 wire installation to a sensor with junction box. The 3500\*\*\*\*4\*1B\*\*\*\* has DSP (digital signal processing) in the sensor interface board to be compatible with T\*\*\*\*\*Z\*\*\*\*\* sensors (DMT 01 ATEX E 083 X). The 3500\*\*\*\*5\*1B\*\*\*\* is for 4 wire installation to a sensor with integral core processor (Model 700 or Model 800). The 3500\*\*\*\*6\*1B\*\*\*\* is for connection to the remote mount core (DMT 02 ATEX E 002, Model 700C).

The 3500\*\*\*\*1B\*\*\*\* is available with two terminal options. Model 3500\*\*\*\*A1B\*\*\*\* uses solder pins for the terminal connections. Model 3500\*\*\*\*B1B\*\*\*\* uses screw terminals for the connections.

Model 3500\*\*\*\*(C, D or E) 1B\*\*\*\* uses I/O cables with three different lengths for the connections, only in combination with mounting option code P.

Amendment 4 to the ATEX Certificate DMT 02 ATEX E242X changes the marking from EEx to Ex in compliance with the new standards and covers the revised internal printed circuit boards. This version is identified with Construction Identification Code CIC A2.



Construction Identification Code (CIC)  
(Approximate location)

**3) Parameters**

**3.1) Mains circuit**

For type 3500\*1\*\*\*\*1B\*\*\*\* (terminals J3-1 and J3-3, Power Board)

Voltage	AC	85–265	V
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For type 3500\*2\*\*\*\*1B\*\*\*\* (terminals J3-1 and J3-3, Power Board)

Voltage	DC	18–30	V
Max voltage	Um	AC/DC	265

3.2) Intrinsically safe sensor circuits for 3500\*\*\*\*3\*1B\*\*\*\*

		Drive circuit terminals J2-A12/C12	Pick-off circuits terminals J-A8/C8 and J2-A10/C10	Temperature circuit terminals J2-C6/A6/C4			
Voltage	Uo	11,4 Vdc	15,6 Vdc	15,6 Vdc			
Current	Io	1,14 A	10 mA	10 mA			
Limited by a fuse with a rated current of		250 mA					
Power	Po	1,2 W	40 mW	40 mW			
<b>Group</b>							
		<b>IIC</b>	<b>IIB</b>	<b>IIC</b>	<b>IIB</b>	<b>IIC</b>	<b>IIB</b>
Max. external inductance	Lo	27,4 μH	109 μH	355 mH	1,4 H	355 mH	1,4 H
Max. external capacitance	Co	1,7 μF	11,7 μF	500 nF	3,03 μF	500 nF	3,03 μF
Max. inductance/resistance ratio	Lo/Ro	10,9 μH/Ω	43,7 μH/Ω				

For drive circuit terminals, the maximum external inductance L (sensor coil) can be calculated with the following term:

$$L = 2 \times E \times \left( \frac{Ri + Ro}{1,5 \times Uo} \right)^2$$

Where:

E = 40 μJ for group IIC and E = 160 μJ for group IIB

Ro = Total resistance (coil resistance + series resistance)

3.3) Intrinsically safe sensor circuits for 3500\*\*\*\*4\*1B\*\*\*\*

		Drive circuit terminals J2-A12/C12	Pick-off circuits terminals J-A8/C8 and J2-A10/C10	Temperature circuit terminals J2-C6/A6/C4			
Voltage	Uo	11,4 Vdc	21,13 Vdc	21,13 Vdc			
Current	Io	1,14 A	8,45 mA	17 mA			
Limited by a fuse with a rated current of		250 mA					
Power	Po	1,2 W	45 mW	90 mW			
<b>Group</b>							
		<b>IIC</b>	<b>IIB</b>	<b>IIC</b>	<b>IIB</b>	<b>IIC</b>	<b>IIB</b>
Max. external inductance	Lo	27,4 μH	109 μH	490 mH	1,9 H	122 mH	490 mH
Max. external capacitance	Co	1,7 μF	11,7 μF	180 nF	1,24 μF	180 nF	1,24 μF
Max. inductance/resistance ratio	Lo/Ro	10,9 μH/Ω	43,7 μH/Ω				

For drive circuit terminals, the maximum external inductance L (sensor coil) can be calculated with the following term:

$$L = 2 \times E \times \left( \frac{Ri + Ro}{1,5 \times Uo} \right)^2$$

Where:

E = 40 μJ for group IIC and E = 160 μJ for group IIB

Ro = Total resistance (coil resistance + series resistance)

3.4) For type 3500\*\*\*\*5\*1B\*\*\*\* and 3500\*\*\*\*6\*1B\*\*\*\* (terminals J2-A4/C4 and J2-A6/C6) 4-wire board

Voltage	Uo	17,22 Vdc	
Current	Io	0,484 A	
Power	Po	2,05 W	
<b>Type of protection</b>		<b>Ex ib IIC</b>	<b>Ex ib IIB</b>
Max. external inductance	Lo	151,7 µH	607 µH
Max. external capacitance	Co	0,333 µF	2,04 µF
Max. inductance/resistance ratio	Lo/Ro	17,06 µH/Ω	68,2 µH/Ω

3.4.1) Ambient temperature range                      Ta                      -20 °C to +60 °C

**4) Marking**

 II (2) G [Ex ib] IIB/IIC

-20 °C ≤ Ta ≤ +60 °C

<b>- type</b>	<b>- type of protection</b>
3500****1B****	II (2) G [Ex ib] IIB/IIC

**5) Special conditions for safe use / Installation instructions**

- 5.1) The transmitter has to be installed outside the hazardous area into a housing which shall at least have a degree of protection of IP 20 according to EN 60529.
- 5.2) The installation of the transmitter shall be such that the clearances between bare parts of intrinsically safe circuits and metallic housing parts will be at least 3 mm and between bare parts of intrinsically safe circuits and bare parts of the non-intrinsically safe circuits be at least 6 mm.
- 5.3) For type 3500\*\*\*\*A1B\*\*\*\* the terminals for connection of external intrinsically safe circuits shall be so arranged that the distance between those terminals and terminals or bare conductors of non-intrinsically safe circuits will be at least 50 mm or that they are separated by a barrier according to EN 60079-11 clause 6.2.1.

# Model 3500 installation drawings

**Figure 1: Model 3500 transmitter to remote core processor**

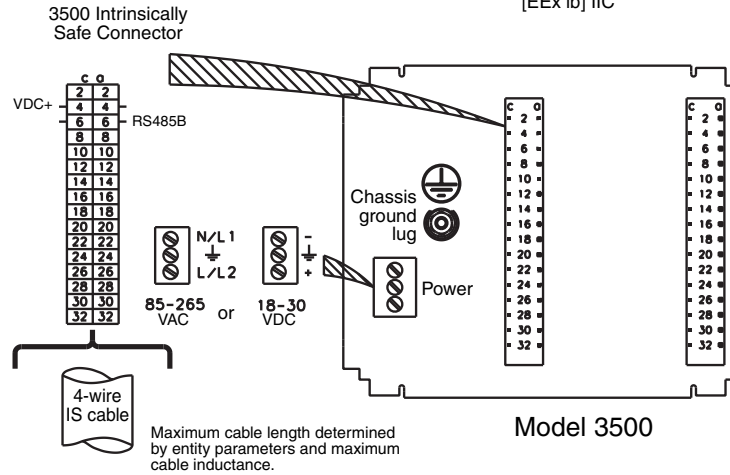
COMBINE THIS DRAWING WITH ONE OF FIGURE 2, 3, 4, OR 5

Special conditions for safe use:

1. The transmitter has to be installed outside the hazardous area into a housing which shall at least have a degree of protection of IP 20 according to IEC Publication 529.
2. The installation of the transmitter shall be such that the clearances between bare parts of intrinsically safe circuits and metallic housing parts will be at least 3 mm and between bare parts of intrinsically safe circuits and bare parts of the non-intrinsically safe circuits be at least 6 mm.
3. For type 3500\*\*\*\*A1B\*\*\*\* the terminals for connection of external intrinsically safe circuits shall be so arranged that the distance between those terminals and terminals of unisolated conductors of non-intrinsically safe circuits will be at least 50 mm or that they are separated by a barrier according to EN 50020 clause 6.4.1.

Safe Area  
[EEx ib] IIB  
or  
[EEx ib] IIC

I.S. 3500 outputs to core processor entity parameters	
Uo	17,22 Vdc
Io	484 mA
Po	2,05W
Co	IIC 0,333 μF
	IIB 2,04 μF
Lo	IIC 15,7 μH
	IIB 607 μH
Lo/Ro	IIC 17,06 μH/Ohm
	IIB 68,2 μH/Ohm



Installation notes:

Associated apparatus parameter limits	
Voc	<= Vmax
Isc	<= Imax
(Voc x Isc) / 4	<= Pmax
Co	>= Ccable + Ci1 + Ci2 + ... + Cin
Lo	>= Lcable + Li1 + Li2 + ... + Lin

- \* The total Ci is equal to the sum of all Ci values of all devices on the network. Ccable is the total capacitance of all cable on the network.
- \* The total Li is equal to the sum of all Li values of all devices on the network. Lcable is the total inductance of all cable on the network.

If the electrical parameters of the cable are unknown, then the following values may be used:  
 Cable Capacitance = 197 pF/m  
 Cable Inductance = 0,66 μH/m

This device must not be connected to any associated apparatus which uses or generates more than 250Vrms with respect to earth ground.

Micro Motion mass flowmeter system connection for intrinsically safe operation.

Reference no. EB-20003016 Rev. A

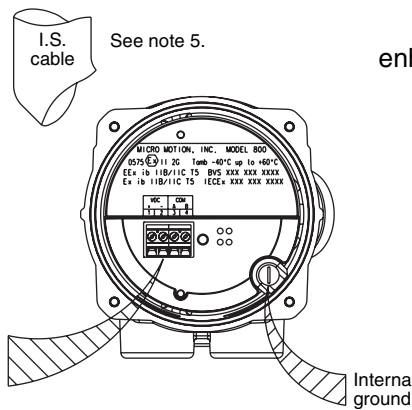


**Figure 2: Sensor with enhanced core processor**

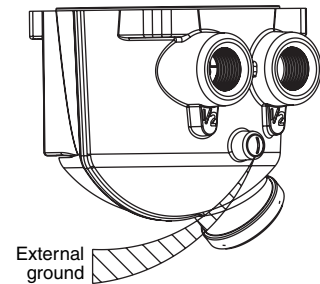
COMBINE THIS DRAWING WITH FIGURE 1

Hazardous Area  
Ex ib IIC / IIB  
Refer to sensor tag for complete hazardous area classification.

4-wire I.S. and non-incendive core processor entity parameters	
U <sub>i</sub>	17,3 Vdc
I <sub>i</sub>	484 mA
P <sub>i</sub>	2,1W
C <sub>i</sub>	2200pF
L <sub>i</sub>	30μH



Sensor mounted enhanced core processor



5. Maximum cable length determined by entity parameters and maximum cable inductance.

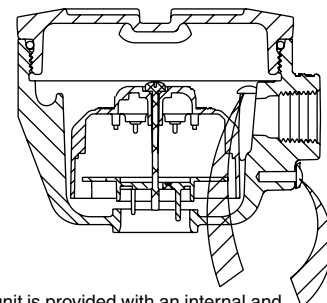
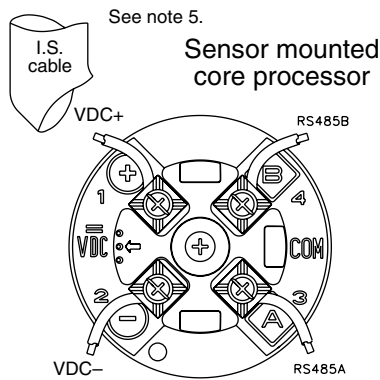
Reference no. EB-20003016 Rev. A

**Figure 3: CMF, D (except D600), DL, F, H, R, CNG and T sensors with core processor**

COMBINE THIS DRAWING WITH FIGURE 1

Hazardous Area  
EEx ib IIC / IIB  
Refer to sensor tag for complete hazardous area classification.

4-wire I.S. and non-incendive core processor entity parameters	
U <sub>i</sub>	17,3 Vdc
I <sub>i</sub>	484 mA
P <sub>i</sub>	2,1W
C <sub>i</sub>	2200pF
L <sub>i</sub>	30μH



This unit is provided with an internal and external terminal for supplementary bonding connection. This terminal is for use where local codes or authorities permit or require such connection.

5. Maximum cable length determined by entity parameters and maximum cable inductance.

Reference no. EB-20000251 Rev. C

**Figure 4: D600 with core processor**

COMBINE THIS DRAWING WITH FIGURE 1

Hazardous Area  
EEx de [ib] IIB T4

Refer to sensor and booster amplifier tags for complete hazardous area classification.

4-wire I.S. and non-incendive core processor entity parameters	
U <sub>i</sub>	17,3 Vdc
I <sub>i</sub>	484 mA
P <sub>i</sub>	2,1W
C <sub>i</sub>	2200pF
L <sub>i</sub>	30μH

Installation method	Fitting required	Per EN60079-14
Conduit	EEx d IIB Conduit Seal	
Cable	EEx d IIB Cable Gland	
Conduit or Cable Increased Safety	EEx e	

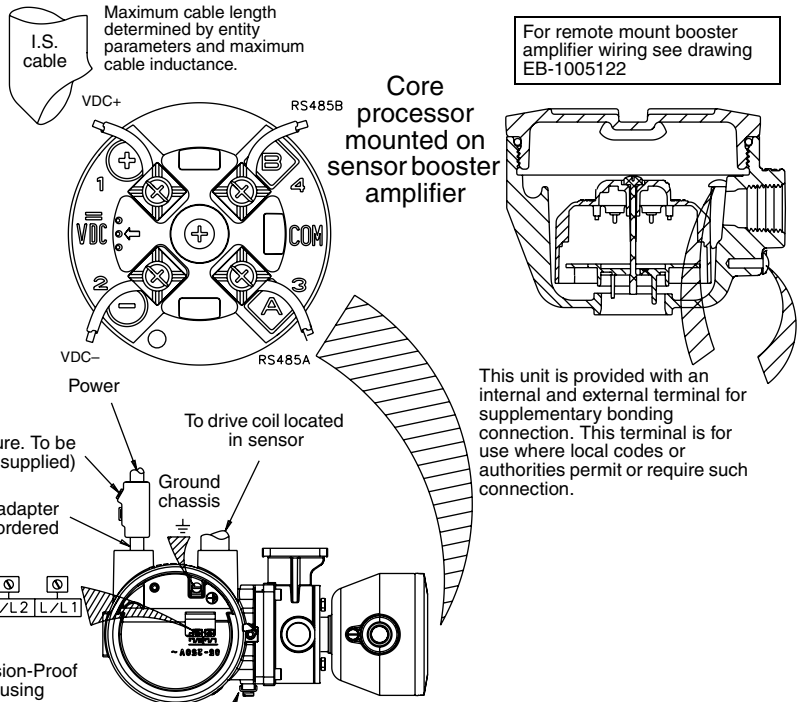
Conduit Seal Required within 18" of enclosure. To be sealed after wiring. (customer supplied)

1/2"-14 NPT or M20 x 1,5 adapter supplied as ordered

85-265 VAC N/L2 L/L1  
50-60 HZ

Explosion-Proof housing

To achieve potential equalization the ground terminal must be connected to the appropriate ground terminal within the hazardous area using a potential equalizing line.



Reference no. EB-20000248 Rev. C

**Figure 5: Remote core processor with remote transmitter**

COMBINE THIS DRAWING WITH FIGURE 1 AND ALSO WITH ONE OF FIGURE 7, 8, OR 9

Maximum cable length determined by entity parameters and maximum cable inductance.

Hazardous Area EEx ib IIB / IIC

Refer to remote core processor tag for complete hazardous area classification.

4-wire and non-incendive core processor entity parameters	
U <sub>i</sub>	17,3 Vdc
I <sub>i</sub>	484 mA
P <sub>i</sub>	2,1W
C <sub>i</sub>	2200pF
L <sub>i</sub>	30μH

Ground screw

Black

Brown

Violet

Yellow

Red

Green

White

Ground screw

Blue

Gray

Orange

9-wire IS cable

20 m. maximum cable length

Remote core processor

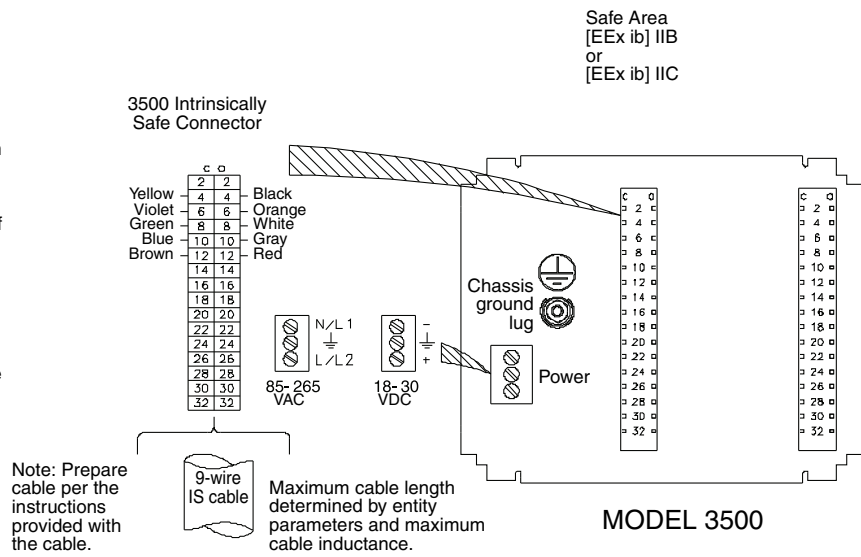
Reference no. EB-20001041 Rev. E

**Figure 6: Model 3500 transmitter to remote junction box**

COMBINE THIS DRAWING WITH ONE OF FIGURE 7, 8, OR 9

Special conditions for safe use:

1. The transmitter has to be installed outside the hazardous area into a housing which shall at least have a degree of protection of IP 20 according to IEC Publication 529.
2. The installation of the transmitter shall be such that the clearances between bare parts of intrinsically safe circuits and metallic housing parts will be at least 3 mm and between bare parts of intrinsically safe circuits and bare parts of the non-intrinsically safe circuits be at least 6 mm.
3. For type 3500\*\*\*\*\*A1B\*\*\*\* the terminals for connection of external intrinsically safe circuits shall be so arranged that the distance between those terminals and terminals of unisolated conductors of non-intrinsically safe circuits will be at least 50 mm or that they are separated by a barrier according to EN 50020 clause 6.4.1.



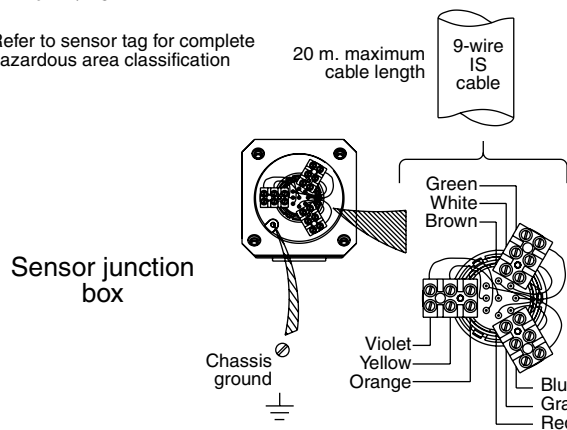
Reference no. EB-20001042 Rev. E

**Figure 7: CMF, D (except D600), DL, F, H, and T sensor with junction box**

COMBINE THIS DRAWING WITH FIGURE 5 OR 6

Hazardous Area  
EEx ib IIB / IIC

Refer to sensor tag for complete hazardous area classification

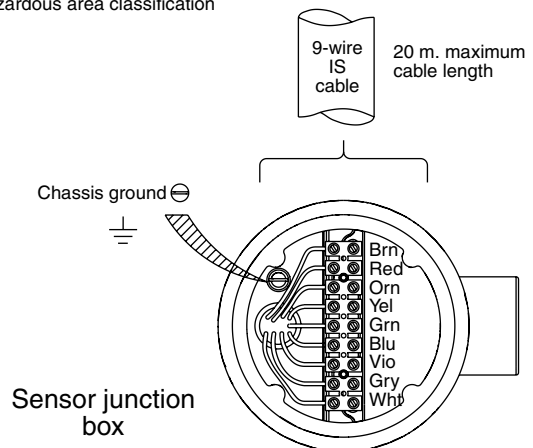


Model			
CMF	T	F	H

Supplied as intrinsically safe

Hazardous Area  
EEx ib IIB / IIC

Refer to sensor tag for complete hazardous area classification



Model
D, DL (EXCEPT D600)

Supplied as intrinsically safe

Reference no. EB-20001042 Rev. E

**Figure 8: D600 with junction box**

COMBINE THIS DRAWING WITH FIGURE 5 OR 6

Hazardous Area  
EExde [ib] IIB

For remote mount booster amplifier wiring refer to EB-3007062.

**CAUTION:**  
To maintain intrinsic safety, the intrinsically safe wiring must be installed according to EN 60079-14. Transmitter and sensor must be properly grounded.

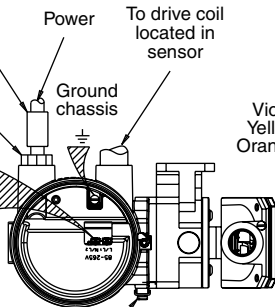
Installation method	Fitting required	Per EN60079-14
Conduit	EEx d IIB conduit seal	
Cable	EEx d IIB cable gland	

Cable O.D. must be suitably sized to gland.

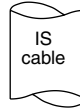
Conduit seal required within 18" of enclosure. To be sealed after wiring (customer supplied).

1/2"-14 NPT or M20 x 1.5 adapter supplied as ordered

85-265 VAC | N/L2 | L/L1  
50-60 HZ



20 m maximum cable length



Intrinsically safe terminals

Micro Motion mass flowmeter system connection for intrinsically safe operation

To achieve potential equalization the ground terminal must be connected to the appropriate ground terminal within the hazardous area using a potential equalizing line.

Reference no. EB-20000277 Rev. B

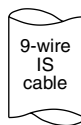
**Figure 9: DT with junction box**

COMBINE THIS DRAWING WITH FIGURE 1 OR FIGURE 5

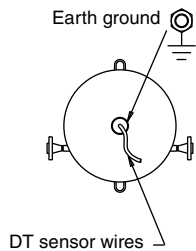
Hazardous Area  
EEx ib IIB

Special conditions for safe use:  
For the sensor types DT065, DT100, and DT150 the following applies: The minimum medium temperature is +32 °C.

20 m maximum cable length



DT sensor wires must be connected to IS cable using customer supplied terminal block and junction box.



DT sensor wire terminations to IS cable	
DT sensor wire #	IS cable color
1	Brown
2	Red
3	Orange
4	Yellow
5	Green
6	Blue
7	Violet
8	Gray
9	White

Micro Motion mass flowmeter system connection for intrinsically safe operation

Models: DT65, DT100, DT150

Reference no. EB-20000280 Rev. A



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