Safety instructions
VEGAMET 841, 842, 861, 862

Installation in Division 2
with output intrinsic safety "i"

Document ID: 66308

Contents

Supplementary documentation:

- Operating instructions VEGAMET 841, 842, 861, 862
- Certificate of Compliance cULus E505919 (Document ID: 66309)

Editing status: 2021-07-20

66308-EN-210910

1 Area of applicability

These safety instructions apply to the devices:

- VEGAMET 841
- VEGAMET 842
- VEGAMET 861
- VEGAMET 862

In accordance with the Certificate of Compliance cULus E505919, as associated equipment for installation in Div 2 (certificate number on type plate) and for all devices with safety instruction 66308.

The classification as well as the respective standards are stated in the above certificates:

Type of protection marking:

- USL - Associated Apparatus, Class I, Division 2, Groups A, B, C and D T4, Hazardous Locations [AEx ia Ga] IIC, [AEx ia Da] IIIC
- CNL - Associated Apparatus, Class I, Division 2, Groups A, B, C and D T4, Hazardous Locations [Ex ia Ga] IIC X, [Ex ia Da] IIIC X

Open type programmable controller model/Cat. Nos. VEGAMET 8; followed by 4 or 6; followed by 1 or 2, providing instrinsically safe circuits for use in Hazardous Locations Class I, Division 1, Groups A, B, C and D; Class II, Division 1, Groups E, F and G; Class III, Division 1; and Class I, Zone 0, Group IIC and Class II, Zone 20, Group IIIC when installed per control drawing 66308.

2 Device configuration/-properties

The detailed device configurations can be retrieved using the serial number search on our homepage.

Move to "www.vega.com" and enter in the search field the serial number of your instrument.

Alternatively, you can find all via your smartphone:

- Download the VEGA Tools app from the "*Apple App Store*", "*Google Play Store*" or "*Baidu Store*"
- Scan the DataMatrix code on the type label of the instrument or
- Enter the serial number manually in the app

3 General information

The single and double channel controllers VEGAMET 841, 842, 861, 862 are ideal for simple control tasks in all industrial areas for non-Ex or Ex applications for the connection of one or two 4 … 20 mA sensors.

They serve as a display for continuous sensors and can also be used as a (Ex)power supply unit for the connected sensors.

The setting can be easily done on site using manual operation or remotely using smartphone/tablet and PC/Laptop using Bluetooth Smart.

There are no further interfaces on the controllers. The devices can be used in the field (field mounting using tube/wall mounting).

The operating instructions as well as the installation regulations or standards that apply for explosion protection of electrical systems must generally be observed.

The installation of explosion-protected systems must always be carried out by qualified personnel.

4 Application area, use in gas and dust atmospheres (divisions)

Associated apparatus for non-hazardous locations
The controllers VEGAMET 841, 842, 861, 862 may be installed and operated outside of hazardous areas as associated equipment.

5 Special operating conditions

The following overview is listing all special properties of VEGAMET 841, 842, 861, 862, which make a labelling with the symbol "X" behind the certificate number necessary.

The installer must ensure that the rated ambient temperature range of the equipment is not exceeded when installed in an enclosure with other equipment and that sufficient separation is provided around the device.

Ambient temperature
You can find the details in chapter "*Thermal data*" of these safety instructions.

Electrostatic charging (ESD)
You can find the details in chapter "*Electrostatic charging (ESD)*" of these safety instructions.

6 Safe operating mode

General operating conditions
- Do not operate the instrument outside the electrical, thermal and mechanical specifications of the manufacturer

Connection conditions
- The connection cable of VEGAMET 841, 842, 861, 862 has to be wired fix and in such a way that damages can be excluded
- If the temperature at the inlet components exceeds 60 °C (USA and Canada), temperature-resistant connection cables must be used

7 Important information for mounting and maintenance

General instructions
The following requirements must be fulfilled for mounting, electrical installation, setup and maintenance of the instrument:

- The staff must be qualified according the respective tasks
- The staff must be trained in explosion protection
- The staff must be familiar with the respectively valid regulations, e.g. planning and installation acc. to ANSI/ISA RP12.06.01 „Installation of Intrinsically Safe Systems for Hazardous (Classifies) Locations“ and the National Electrical Code® (ANSI/NFPA 70) or Canadian Electrical Code
- Make sure when working on the instrument (mounting, installation, maintenance) that there is no explosive atmosphere present, the supply circuits should be voltage-free, if possible.
- The instrument has to be mounted according to the manufacturer specifications, the Certificate of Conformity and the valid regulations and standards
- Modifications on the instrument can influence the explosion protection and hence the safety, therefore repairs are not permitted to be conducted by the end user
- Modifications must only be carried out by employees authorized by VEGA company
- Use only approved spare parts
- Components for installation and connection not included in the approval documents are only permitted if these correspond technically to the latest standard mentioned on the cover sheet. They must be suitable for the application conditions and have a separate certificate. The special

conditions of the components must be noted and if necessary, the components must be integrated in the type test. This applies also to the components already mentioned in the technical description.

Mounting
Keep in mind for instrument mounting

- Mechanical damage on the instrument must be avoided
- Mechanical friction must be avoided

Maintenance
To ensure the functionality of the device, periodic visual inspection is recommended for:

- Secure mounting
- No mechanical damages or corrosion
- Worn or otherwise damaged cables
- No loose connections of the line connections, equipotential bonding connections
- Correct and clearly marked cable connections

Intrinsic safety "i"

- Observe the valid regulations for connection of intrinsically safe circuits, e.g. proof of intrinsic safety in accordance with ANSI/ISA RP12.06.01 „Installation of Intrinsically Safe Systems for Hazardous (Classifies) Locations“ and the National Electrical Code® (ANSI/NFPA 70) or Canadian Electrical Code.
- The instrument is only suitable for connection to certified, intrinsically safe instruments
- If the intrinsically safe circuit is led into dust-explosive areas of zone 20, 21 or Div 1, Div 2, please make sure that the instruments connected to these circuits meet the requirements of the device protection level (EPL) Da, Db or Div 1, Div 2 and are certified respectively

8 Electrostatic charging (ESD)

In case of instrument versions with electrostatically chargeable plastic parts, the danger of electrostatic charging and discharging must be taken into account!

The following parts can charge and discharge:

- Lacquered housing version or alternative special lacquering
- Plastic housing, plastic housing parts
- Metal housing with inspection window
- Plastic process fittings
- Plastic-coated process fittings and/or plastic-coated sensors
- Connection cable for separate versions
- Type label
- Isolated metallic labels (measuring point identification plate)

Take note in case of danger of electrostatic charges:

- Avoid friction on the surfaces
- Do not dry clean the surfaces

The instruments must be mounted/installed in such a way that the following can be ruled out:

- electrostatic charges during operation, maintenance and cleaning.
- process-related electrostatic charges, e.g. by measuring media flowing past

9 Electrical data

VEGAMET 841, 842

Non-intrinsically safe circuit

Supply circuit:	
Terminals 91[+, L], 92[-, N]	U = 24 … 65 V DC (-15 … +10 %) P = 4 W (VEGAMET 841), 5 W (VEGAMET 842) U = 100 … 230 V AC (-15 … +10 %), 50/60 Hz P = 13 VA (VEGAMET 841), 15 VA (VEGAMET 842) U_m = 253 V AC (only for Ex ia)

Relay output:	
Relay 1: terminals 61, 62, 63	1 A AC (cos phi > 0.9), 250 V AC, 250 VA
Relay 2: terminals 64, 65, 66	1 A DC, 60 V DC, 40 W
Relay 3: terminals 67, 68, 69	U_m = 253 V AC (only for Ex ia)

Current output circuit:	
I_{out} 1, terminals 41[+], 42[-] In addition only VEGAMET 842: I_{out} 2, terminals 43[+], 44[-]	I = 0/4 … 20 mA U ≤ 16 V DC Load ≤ 500 Ohm U_m = 253 V AC (only for Ex ia)

Intrinsically safe circuit

Supply and signal circuit:	
4 … 20 mA sensor 1: Terminals 1[+], 2[-] In addition only VEGAMET 842: 4 … 20 mA sensor 2: Terminals 4[+], 5[-]	In type of protection intrinsic safety Ex ia IIC, IIB/IIIC.
	For connection to a certified, intrinsically safe circuit. U_o/V_{oc} ≤ 23.3 V DC I_o/I_{sc} ≤ 109.8 mA P_o ≤ 639.6 mW
	Characteristics: linear
	C_i negligibly small L_i negligibly small
	The maximum values given in the table can be used as concentrated capacitances and concentrated inductances. The values for IIC and IIB are also permissible for dust explosive areas.

Ex ia	**IIC, Gp A, B**		**IIB, Gp C or IIIC, Gp E, F, G**		**IIA, Gp D**
Permissible external inductance L_o/L_a	0.2 mH	0.5 mH	0.5 mH	2 mH	10 mH
Permissible external capacitance C_o/C_a	120 nF	88 nF	580 nF	470 nF	770 nF

VEGAMET 861, 862

Non-intrinsically safe circuit

Supply circuit:	
Terminals 91[+, L], 92[-, N]	U = 24 … 65 V DC (-15 … +10 %) P = 6 W (VEGAMET 861), 7 W (VEGAMET 862) U = 100 … 230 V AC (-15 … +10 %), 50/60 Hz P = 17 VA (VEGAMET 861), 19 VA (VEGAMET 862) U_m = 253 V AC (only for Ex ia)

Relay output:	
Relay 1: terminals 61, 62, 63 Relay 2: terminals 64, 65, 66 Relay 3: terminals 67, 68, 69 Relay 4: terminals 70, 71, 72 In addition only VEGAMET 862: Relay 5: terminals 73, 74, 75 Relay 6: terminals 76, 77, 78	1 A AC (cos phi > 0.9), 250 V AC, 250 VA 1 A DC, 60 V DC, 40 W U_m = 253 V AC (only for Ex ia)

Current output circuit:	
I_{out} 1, terminals 41[+], 42[-] In addition only VEGAMET 862: I_{out} 2, terminals 43[+], 44[-] I_{out} 3, terminals 45[+], 46[-]	I = 0/4 … 20 mA U ≤ 16 V DC Load ≤ 500 Ohm U_m = 253 V AC (only for Ex ia)

Digital input circuit:	
Digital IN 1, terminals 21, 22, 23 Digital IN 2, terminals 24, 25, 26 In addition only VEGAMET 862: Digital IN 3, terminals 27, 28, 29 Digital IN 4, terminals 30, 31, 32	U_{max} 30 V DC I_{max} 30 mA

Intrinsically safe circuit

Supply and signal circuit:	
4 … 20 mA sensor 1: Terminals 1[+], 2[-] In addition only VEGAMET 862: 4 … 20 mA sensor 2: Terminals 4[+], 5[-]	In type of protection intrinsic safety Ex ia IIC, IIB/IIIC.
	For connection to a certified, intrinsically safe circuit. $U_o/V_{oc} \leq 23.3$ V DC $I_o/I_{sc} \leq 111.3$ mA $P_o \leq 648.4$ mW
	Characteristics: linear
	C_i negligibly small L_i negligibly small
	The maximum values given in the table can be used as concentrated capacitances and concentrated inductances. The values for IIC and IIB are also permissible for dust explosive areas.

Ex ia	**IIC, Gp A, B**		**IIB, Gp C or IIIC, Gp E, F, G**		**IIA, Gp D**
Permissible external inductance L_o/L_a	0.2 mH	0.5 mH	0.5 mH	2 mH	10 mH
Permissible external capacitance C_o/C_a	120 nF	88 nF	580 nF	470 nF	760 nF

The intrinsically safe circuits of VEGAMET 841, 842, 861, 862 are galvanically separated from ground.

The intrinsically safe circuits of the VEGAMET 841, 842, 861, 862 are reliably separated from the non-intrinsically safe circuit up to a peak value of 375 V.

The maximum voltage on the non-intrinsically safe circuits must not exceed 253 Vrms in the event of a fault.

10 Mechanical data

The following mechanical data are valid for all housing and electronics versions.

Mechanical data	
Protection (IEC/EN 60529)	TYPE 4X, IP66/IP67
Connection cross-section:	0.25 … 2.5 mm²
Overvoltage category	II
Pollution degree	4

11 Thermal data

Permissible ambient temperatures

Permissible ambient temperature at the installation location of an instrument	**Ambient temperature (Ta)**
Ambient temperature range	-40 … +50 °C (-40 … +122 °F)

12 Installation

The controllers VEGAMET 841, 842, 861, 862 as associated equipment for installation in Div 2 can be mounted and operated within hazardous areas of Div 2.

The device may then only be installed in locations that offer adequate protection against the ingress of solid foreign objects or liquids.

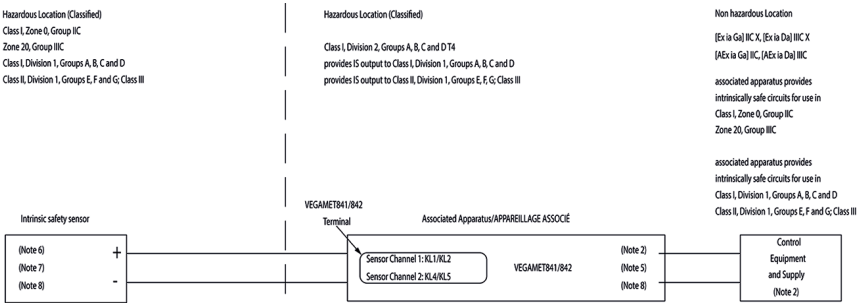
The suitability of the housing is subject to the approval of the local authorities responsible at the time of installation.

The housing used must be labelled with the following warning:

WARNING – EXPLOSION HAZARD: DO NOT CONNECT OR DISCONNECT WHEN ENERGIZED

If the intrinsically safe circuit is lead into dust-explosive areas of zone 20, 21 or Div 1, Div 2, please make sure that the instruments which are connected to these circuits meet the requirements of (EPL) Da, Db or Div 1, Div 2 and are certified respectively.

13 Control drawing VEGAMET 841, 842



Connection cross-section:	0.25 … 2.5 mm²
Ambient temperature range	-40 … +50 °C (-40 … +122 °F)

Non-intrinsically safe circuit

Supply circuit:	
Terminals 91[+, L], 92[-, N]	U = 24 … 65 V DC (-15 … +10 %) P = 4 W (VEGAMET 841), 5 W (VEGAMET 842) U = 100 … 230 V AC (-15 … +10 %), 50/60 Hz P = 13 VA (VEGAMET 841), 15 VA (VEGAMET 842) U_m = 253 V AC (only for Ex ia)

Relay output:	
Relay 1: terminals 61, 62, 63	1 A AC (cos phi > 0.9), 250 V AC, 250 VA
Relay 2: terminals 64, 65, 66	1 A DC, 60 V DC, 40 W
Relay 3: terminals 67, 68, 69	U_m = 253 V AC (only for Ex ia)

Current output circuit:	
I_{out} 1, terminals 41[+], 42[-] In addition only VEGAMET 842: I_{out} 2, terminals 43[+], 44[-]	I = 0/4 … 20 mA U ≤ 16 V DC Load ≤ 500 Ohm U_m = 253 V AC (only for Ex ia)

Intrinsically safe circuit

Supply and signal circuit:	
4 … 20 mA sensor 1: Terminals 1[+], 2[-] In addition only VEGAMET 842: 4 … 20 mA sensor 2: Terminals 4[+], 5[-]	In type of protection intrinsic safety Ex ia IIC, IIB/IIIC.
	For connection to a certified, intrinsically safe circuit. U_o/V_{oc} ≤ 23.3 V DC I_o/I_{sc} ≤ 109.8 mA P_o ≤ 639.6 mW
	Characteristics: linear
	C_i negligibly small L_i negligibly small
	The maximum values given in the table can be used as concentrated capacitances and concentrated inductances. The values for IIC and IIB are also permissible for dust explosive areas.

The maximum values of L_o/L_a, C_o/C_a from the table apply, when circuits are connected. With combined inductances and capacitances considered as concentrated reactances.

Ex ia	IIC, Gp A, B		IIB, Gp C or IIIC, Gp E, F, G		IIA, Gp D
Permissible external inductance L_o/L_a	0.2 mH	0.5 mH	0.5 mH	2 mH	10 mH
Permissible external capacitance C_o/C_a	120 nF	88 nF	580 nF	470 nF	770 nF

The values of the following table are the maximum values acc. UL 60079-11 Annex A and can be used up to the permissible limits as distributed reactances. For installations in which both the Ci and Li of the intrinsically safe apparatus exceeds 1 % of the Ca(or Co) and La(or Lo) parameters of the associated apparatus (excluding the cable), then 50 % of Ca(or Co) and La(or Lo) parameters are applicable and shall not be exceeded. The reduced capacitance shall not be greater than 1 µF for Groups C and/or D, and 600 nF for Groups A and B. Alternatively refer to the table for combined inductances and capacitances above.

Ex ia	IIC, Gp A, B	IIB, Gp C or IIIC, Gp E, F, G	IIA, Gp D
Max. permissible external inductance L_o/L_a	2.94 mH	11.76 mH	23.6 mH
Max. permissible external capacitance C_o/C_a	136 nF	1000 nF	3600 nF

Notes:

1. The Intrinsic Safety Entity concept allows the interconnection of two intrinsically safe devices, cULus certified with entity parameters, not specifically examined in combination as a system when: Uo or Voc or Vt ≤ Vmax; Io or Isc or It ≤ Imax; Po ≤ Pi; Ca or Co ≥ Ci + Ccable; La or L ≥ Li + Lcable

2. Control equipment connected to the Associated Apparatus shall not use or generate more than 250 Vrms or Vdc with respect to earth.

3. Installation shall be in accordance with ANSI/ISA-RP12.06.01 “Intrinsic Safety Wiring Methods for Hazardous (Classified) Locations Instrumentation” and the Canadian Electrical Code for Canada or the National Electrical Code for the US or other local codes, as applicable.

4. Capacitance and inductance of the field wiring from the intrinsically safe equipment to the barrier shall be calculated and has to be included in the system calculations. Cable capacitance (Ccable) plus intrinsically safe equipment capacitance (Ci) must be less than the marked capacitance (Ca) shown on any barrier used. The same applies for inductance (Lc, Li and La, respectively). Where the cable capacitance and inductance per foot are not known, the following values shall be used for two or three core cables: Ccable = 60 pF/ft, Lcable = 0.2 uH/ft.

5. Associated apparatus must be installed in an enclosure suitable for the application in accordance with the National Electrical Code (ANSI/NFPA 70) for installation in the US, the Canadian Electrical Code for installations in Canada, or other local codes, as applicable.

6. The configuration of Field device must be cULus/FM/CSA listed under Entity Concept

7. Field sensors/device manufacturer´s installation drawing shall be followed when installing this equipment.

8. No revision to drawing without prior Approval by UL.

9. The installer must ensure that the rated ambient temperature range of the equipment is not exceeded when installed in an enclosure with other equipment and that sufficient separation is provided around the device.

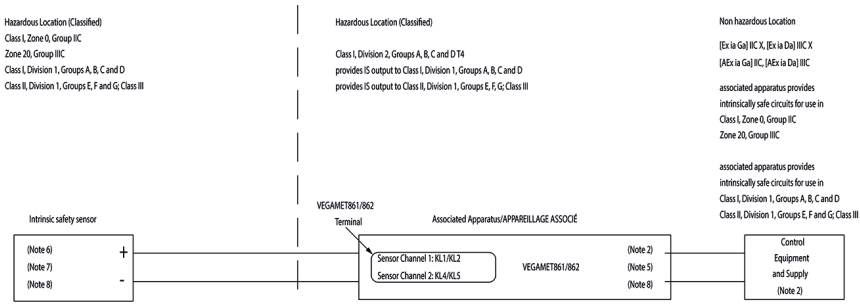
10. The installation orientation of the device must be in accordance with the instructions.

11. Live maintenance is not permitted.

12. The equipment must be installed in a tool secured final enclosure.

13. WARNING – EXPLOSION HAZARD: DO NOT CONNECT OR DISCONNECT WHEN ENERGIZED; AVERTISSEMENT – RISQUE D’ EXPLOSION NE PAS BRANCHER NI DEBRANCHER SOUS TENSION

14 Control drawing VEGAMET 861, 862



Connection cross-section:	0.25 … 2.5 mm²
Ambient temperature range	-40 … +50 °C (-40 … +122 °F)

Non-intrinsically safe circuit

Supply circuit:	
Terminals 91[+, L], 92[-, N]	U = 24 … 65 V DC (-15 … +10 %) P = 6 W (VEGAMET 861), 7 W (VEGAMET 862) U = 100 … 230 V AC (-15 … +10 %), 50/60 Hz P = 17 VA (VEGAMET 861), 19 VA (VEGAMET 862) U_m = 253 V AC (only for Ex ia)

Relay output:	
Relay 1: terminals 61, 62, 63 Relay 2: terminals 64, 65, 66 Relay 3: terminals 67, 68, 69 Relay 4: terminals 70, 71, 72 In addition only VEGAMET 862: Relay 5: terminals 73, 74, 75 Relay 6: terminals 76, 77, 78	1 A AC (cos phi > 0.9), 250 V AC, 250 VA 1 A DC, 60 V DC, 40 W U_m = 253 V AC (only for Ex ia)

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Digital IN 1, terminals 21, 22, 23 Digital IN 2, terminals 24, 25, 26 In addition only VEGAMET 862: Digital IN 3, terminals 27, 28, 29 Digital IN 4, terminals 30, 31, 32	U_{max} 30 V DC I_{max} 30 mA

Intrinsically safe circuit

Supply and signal circuit:	
4 … 20 mA sensor 1: Terminals 1[+], 2[-] In addition only VEGAMET 862: 4 … 20 mA sensor 2: Terminals 4[+], 5[-]	In type of protection intrinsic safety Ex ia IIC, IIB/IIIC.
	For connection to a certified, intrinsically safe circuit. U_o/V_{oc} ≤ 23.3 V DC I_o/I_{sc} ≤ 111.3 mA P_o ≤ 648.4 mW
	Characteristics: linear
	C_i negligibly small L_i negligibly small
	The maximum values given in the table can be used as concentrated capacitances and concentrated inductances. The values for IIC and IIB are also permissible for dust explosive areas.

The maximum values of L_o/L_a, C_o/C_a from the table apply, when circuits are connected. With combined inductances and capacitances considered as concentrated reactances.

Ex ia	**IIC, Gp A, B**		**IIB, Gp C or IIIC, Gp E, F, G**		**IIA, Gp D**
Permissible external inductance L_o/L_a	0.2 mH	0.5 mH	0.5 mH	2 mH	10 mH
Permissible external capacitance C_o/C_a	120 nF	88 nF	580 nF	470 nF	760 nF

The values of the following table are the maximum values acc. UL 60079-11 Annex A and can be used up to the permissible limits as distributed reactances. For installations in which both the Ci and Li of the intrinsically safe apparatus exceeds 1 % of the Ca(or Co) and La(or Lo) parameters of the associated apparatus (excluding the cable), then 50 % of Ca (or Co) and La (or Lo) parameters are applicable and shall not be exceeded. The reduced capacitance shall not be greater than 1 µF for Groups C and/or D, and 600 nF for Groups A and B. Alternatively refer to the table for combined inductances and capacitances above.

Ex ia	**IIC, Gp A, B**	**IIB, Gp C or IIIC, Gp E, F, G**	**IIA, Gp D**
Max. permissible external inductance L_o/L_a	2.87 mH	11.47 mH	22.95 mH
Max. permissible external capacitance C_o/C_a	136 nF	1000 nF	3600 nF

Notes:

1. The Intrinsic Safety Entity concept allows the interconnection of two intrinsically safe devices, cULus certified with entity parameters, not specifically examined in combination as a system when: Uo or Voc or Vt ≤ Vmax; Io or Isc or It ≤ Imax; Po ≤ Pi; Ca or Co ≥ Ci + Ccable; La or L ≥ Li + Lcable

2. Control equipment connected to the Associated Apparatus shall not use or generate more than 250 Vrms or Vdc with respect to earth.

3. Installation shall be in accordance with ANSI/ISA-RP12.06.01 “Intrinsic Safety Wiring Methods for Hazardous (Classified) Locations Instrumentation” and the Canadian Electrical Code for Canada or the National Electrical Code for the US or other local codes, as applicable.

4. Capacitance and inductance of the field wiring from the intrinsically safe equipment to the barrier shall be calculated and has to be included in the system calculations. Cable capacitance (Ccable) plus intrinsically safe equipment capacitance (Ci) must be less than the marked capacitance (Ca) shown on any barrier used. The same applies for inductance (Lc, Li and La, respectively). Where the cable capacitance and inductance per foot are not known, the following values shall be used for two or three core cables: Ccable = 60 pF/ft, Lcable = 0.2 uH/ft.

5. Associated apparatus must be installed in an enclosure suitable for the application in accordance with the National Electrical Code (ANSI/NFPA 70) for installation in the US, the Canadian Electrical Code for installations in Canada, or other local codes, as applicable.

6. The configuration of Field device must be cULus/FM/CSA listed under Entity Concept

7. Field sensors/device manufacturer´s installation drawing shall be followed when installing this equipment.

8. No revision to drawing without prior Approval by UL.

9. The installer must ensure that the rated ambient temperature range of the equipment is not exceeded when installed in an enclosure with other equipment and that sufficient separation is provided around the device.

10. The installation orientation of the device must be in accordance with the instructions.

11. Live maintenance is not permitted.

12. The equipment must be installed in a tool secured final enclosure.

13. WARNING – EXPLOSION HAZARD: DO NOT CONNECT OR DISCONNECT WHEN ENERGIZED; AVERTISSEMENT – RISQUE D' EXPLOSION NE PAS BRANCHER NI DEBRANCHER SOUS TENSION

Printing date:

66308-EN-210910

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