

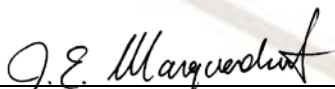
CERTIFICATE OF CONFORMITY

1. **HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT PER US REQUIREMENTS**
2. **Certificate No:** FM17US0108X
3. **Equipment:** PULSAR R86-5abc-def 26 GHz Radar Level Transmitter
(Type Reference and Name) Level Transmitter
4. **Name of Listing Company:** Magnetrol International Inc.
5. **Address of Listing Company:** 705 Enterprise St
Aurora IL 60504
United States
6. The examination and test results are recorded in confidential report number:

3059033 dated 9th July 2017
7. FM Approvals LLC, certifies that the equipment described has been found to comply with the following Approval standards and other documents:

FM Class 3600:2018, FM Class 3610:2015, FM Class 3611: 2016, FM Class 3615:2018,
FM Class 3616:2011, FM Class 3810:2005, ANSI/ISA 60079-0:2013, ANSI/UL 60079-1:2015,
ANSI/UL 60079-11:2014, ANSI/UL 60079-15:2013, ANSI/UL 60079-26:2017, ANSI/NEMA 250:2014,
ANSI/IEC 60529:2004
8. If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to specific conditions of use specified in the schedule to this certificate.
9. This certificate relates to the design, examination and testing of the products specified herein. The FM Approvals surveillance audit program has further determined that the manufacturing processes and quality control procedures in place are satisfactory to manufacture the product as examined, tested and Approved.

Certificate issued by:



J.E. Marquedant
VP, Manager, Electrical Systems

23 October 2018

Date

To verify the availability of the Approved product, please refer to www.approvalguide.com

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US Certificate Of Conformity No: FM17US0108X

10. Equipment Ratings:

PULSAR R86-5abc-def – RBx-xxxx-x0g-xx-000 26 GHz Radar Level Transmitter

Intrinsically Safe for use in Class I, II, and III Division 1, Groups A, B, C, D, E, F, and G; hazardous (classified) locations in accordance with installation drawing 099-5077. T-Class = T4...T1 Ta = -40°C to +70°C; Type 4X, IP67;
Explosionproof and Intrinsically Safe apparatus for use in in Class I, Division 1, Groups B, C and D; hazardous (classified) locations, indoor and outdoor in accordance with installation drawing 099-5077. T-Class = T4...T1 Ta = -40°C to +70°C; Type 4X, IP67
Dust-ignitionproof for use in Class II, Division 1, Groups E, F and G; Class III, Division 1 T-Class = T4...T1 Ta = -15°C to +70°C; Type 4X, IP67
Nonincendive Electrical Apparatus suitable for use in Class I, II and III, Division 2 Groups A, B, C, D E, F, and G; hazardous (classified) locations indoors and outdoors; T-Class = T4...T1 Ta = -40°C to +70°C; Type 4X, IP67
Intrinsically Safe for use in Class I, Zone 0, AEx ia IIC T4 Ga hazardous (classified) locations, in accordance with installation drawing 099-5077. T-Class = T4...T1 Ta = -40°C to +70°C; Type 4X, IP67;
Intrinsically Safe and Flameproof Apparatus for use in Class I, Zone 0/1, AEx ia/db IIB+H2 T4...T1 Ga/Gb hazardous (classified) locations, indoors and outdoors in accordance with installation drawing 099-5077. T-Class = T4...T1 Ta = -40°C to +70°C; Type 4X, IP67
Class I Zone 2 AEx nA Group IIC hazardous (classified) locations indoors and outdoors; T-Class = T4...T1 Ta = -15°C to +70°C; Type 4X, IP67

PULSAR R86-5abc-def – RBx-xxxx-x08-xx-000 26 GHz Radar Level Transmitter

Intrinsically Safe for use in Class I, II, and III Division 1, Groups A, B, C, D, E, F, and G; hazardous (classified) locations in accordance with installation drawing 099-5077. T-Class = T4...T2 Ta = -40°C to +70°C; Type 4X, IP67;
Explosionproof and Intrinsically Safe apparatus for use in in Class I, Division 1, Groups B, C and D; hazardous (classified) locations, indoor and outdoor in accordance with installation drawing 099-5077. T-Class = T4...T2 Ta = -40°C to +70°C; Type 4X, IP67
Dust-ignitionproof for use in Class II, Division 1, Groups E, F and G; Class III, Division 1 T-Class = T4...T2 Ta = -15°C to +70°C; Type 4X, IP67
Nonincendive Electrical Apparatus suitable for use in Class I, II and III, Division 2 Groups A, B, C, D E, F, and G; hazardous (classified) locations indoors and outdoors; T-Class = T4...T2 Ta = -40°C to +70°C; Type 4X, IP67
Intrinsically Safe for use in Class I, Zone 0, AEx ia IIC T4 Ga hazardous (classified) locations, in accordance with installation drawing 099-5077. T-Class = T4...T2 Ta = -40°C to +70°C; Type 4X, IP67;
Intrinsically Safe and Flameproof Apparatus for use in Class I, Zone 0/1, AEx ia/db IIB+H2 T4...T2 Ga/Gb hazardous (classified) locations, indoors and outdoors in accordance with installation drawing 099-5077. T-Class = T4...T2 Ta = -7°C to +70°C; Type 4X, IP67
Class I Zone 2 AEx nA Group IIC hazardous (classified) locations indoors and outdoors; T-Class = T4...T2 Ta = -15°C to +70°C; Type 4X, IP67

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PULSAR R86-5abc-def – RBx-xxxx-x02-xx-000 26 GHz Radar Level Transmitter

Intrinsically Safe for use in Class I, II, and III Division 1, Groups A, B, C, D, E, F, and G; hazardous (classified) locations in accordance with installation drawing 099-5077. T-Class = T4...T3 Ta = -40°C to +70°C; Type 4X, IP67;
Explosionproof and Intrinsically Safe apparatus for use in in Class I, Division 1, Groups B, C and D; hazardous (classified) locations, indoor and outdoor in accordance with installation drawing 099-5077. T-Class = T4...T3 Ta = -40°C to +70°C; Type 4X, IP67
Dust-ignitionproof for use in Class II, Division 1, Groups E, F and G; Class III, Division 1 T-Class = T4...T3 Ta = -15°C to +70°C; Type 4X, IP67
Nonincendive Electrical Apparatus suitable for use in Class I, II and III, Division 2 Groups A, B, C, D E, F, and G; hazardous (classified) locations indoors and outdoors; T-Class = T4...T3 Ta = -40°C to +70°C; Type 4X, IP67
Intrinsically Safe for use in Class I, Zone 0, AEx ia IIC T4 Ga hazardous (classified) locations, in accordance with installation drawing 099-5077. T-Class = T4...T3 Ta = -40°C to +70°C; Type 4X, IP67;
Intrinsically Safe and Flameproof Apparatus for use in Class I, Zone 1, AEx db ia IIB+H2 T4...T3 Gb hazardous (classified) locations, indoors and outdoors in accordance with installation drawing 099-5077. T-Class = T4...T3 Ta = -40°C to +70°C; Type 4X, IP67
Class I Zone 2 AEx nA Group IIC hazardous (classified) locations indoors and outdoors; T-Class = T4...T3 Ta = -15°C to +70°C; Type 4X, IP67

PULSAR R86-5abc-def – RBx-xxxx-x0A-xx-000 26 GHz Radar Level Transmitter

Intrinsically Safe for use in Class I, II, and III Division 1, Groups A, B, C, D, E, F, and G; hazardous (classified) locations in accordance with installation drawing 099-5077. T-Class = T4...T3 Ta = -40°C to +70°C; Type 4X, IP67;
Explosionproof and Intrinsically Safe apparatus for use in in Class I, Division 1, Groups B, C and D; hazardous (classified) locations, indoor and outdoor in accordance with installation drawing 099-5077. T-Class = T4...T3 Ta = -40°C to +70°C; Type 4X, IP67
Dust-ignitionproof for use in Class II, Division 1, Groups E, F and G; Class III, Division 1 T-Class = T4...T3 Ta = -15°C to +70°C; Type 4X, IP67
Nonincendive Electrical Apparatus suitable for use in Class I, II and III, Division 2 Groups A, B, C, D E, F, and G; hazardous (classified) locations indoors and outdoors; T-Class = T4...T3 Ta = -40°C to +70°C; Type 4X, IP67
Intrinsically Safe for use in Class I, Zone 0, AEx ia IIC T4 Ga hazardous (classified) locations, in accordance with installation drawing 099-5077. T-Class = T4...T3 Ta = -40°C to +70°C; Type 4X, IP67;
Intrinsically Safe and Flameproof Apparatus for use in Class I, Zone 1, AEx db ia IIB+H2 T4...T3 Gb hazardous (classified) locations, indoors and outdoors in accordance with installation drawing 099-5077. T-Class = T4...T3 Ta = -40°C to +70°C; Type 4X, IP67
Class I Zone 2 AEx nA Group IIC hazardous (classified) locations indoors and outdoors; T-Class = T4...T3 Ta = -15°C to +70°C; Type 4X, IP67

11. The marking of the equipment shall include:

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US Certificate Of Conformity No: FM17US0108X

PULSAR R86-5abc-def – RBx-xxxx-x0g-xx-000 26 GHz Radar Level Transmitter

Class I, II, III Division 1, Groups A, B, C, D, E, F G; T4...T1 Ta = -40°C to +70°C; Type 4X, IP67

Class I Division 1, Groups B, C, D; T4...T1 Ta = -40°C to +70°C; Type 4X, IP67

Class II, Division 1, Groups E, F, G, Class III, Division 1; T4...T1 Ta = -15°C to +70°C; Type 4X, IP67

Class I, II, III Division 2, Groups A, B, C, D, E, F G; T4...T1 Ta = -40°C to +70°C; Type 4X, IP67

Class I, Zone 0, AEx ia IIC T4...T1 Ga Ta = -40°C to +70°C, Type 4X, IP67

Class I, Zone 0/1, AEx ia/db IIB+H2 T4...T1 Ga/Gb Ta = -40°C to +70°C, Type 4X, IP67

Class I, Zone 2, AEx nA IIC T4...T1 Ta = -15°C to +70°C, Type 4X, IP67

PULSAR R86-5abc-def – RBx-xxxx-x08-xx-000 26 GHz Radar Level Transmitter

Class I, II, III Division 1, Groups A, B, C, D, E, F G; T4...T2 Ta = -40°C to +70°C; Type 4X, IP67

Class I Division 1, Groups B, C, D; T4...T2 Ta = -40°C to +70°C; Type 4X, IP67

Class II, Division 1, Groups E, F, G, Class III, Division 1; T4...T2 Ta = -15°C to +70°C; Type 4X, IP67

Class I, II, III Division 2, Groups A, B, C, D, E, F G; T4...T2 Ta = -40°C to +70°C; Type 4X, IP67

Class I, Zone 0, AEx ia IIC T4...T2 Ga Ta = -40°C to +70°C, Type 4X, IP67

Class I, Zone 0/1, AEx ia/db IIB+H2 T4...T2 Ga/Gb Ta = -7°C to +70°C, Type 4X, IP67

Class I, Zone 2, AEx nA IIC T4...T2 Ta = -15°C to +70°C, Type 4X, IP67

PULSAR R86-5abc-def – RBx-xxxx-x02-xx-000 26 GHz Radar Level Transmitter

Class I, II, III Division 1, Groups A, B, C, D, E, F G; T4...T3 Ta = -40°C to +70°C; Type 4X, IP67

Class I Division 1, Groups B, C, D; T4...T3 Ta = -40°C to +70°C; Type 4X, IP67

Class II, Division 1, Groups E, F, G, Class III, Division 1; T4...T3 Ta = -15°C to +70°C; Type 4X, IP67

Class I, II, III Division 2, Groups A, B, C, D, E, F G; T4...T3 Ta = -40°C to +70°C; Type 4X, IP67

Class I, Zone 0, AEx ia IIC T4...T3 Ga Ta = -40°C to +70°C, Type 4X, IP67

Class I, Zone 1, AEx db ia IIB+H2 T4...T3 Gb Ta = -40°C to +70°C, Type 4X, IP67

Class I, Zone 2, AEx nA IIC T4...T3 Ta = -15°C to +70°C, Type 4X, IP67

PULSAR R86-5abc-def – RBx-xxxx-x0A-xx-000 26 GHz Radar Level Transmitter

Class I, II, III Division 1, Groups A, B, C, D, E, F G; T4...T3 Ta = -40°C to +70°C; Type 4X, IP67

Class I Division 1, Groups B, C, D; T4...T3 Ta = -40°C to +70°C; Type 4X, IP67

Class II, Division 1, Groups E, F, G, Class III, Division 1; T4...T3 Ta = -15°C to +70°C; Type 4X, IP67

Class I, II, III Division 2, Groups A, B, C, D, E, F G; T4...T3 Ta = -40°C to +70°C; Type 4X, IP67

Class I, Zone 0, AEx ia IIC T4...T3 Ga Ta = -40°C to +70°C, Type 4X, IP67

Class I, Zone 1, AEx db ia IIB+H2 T4...T3 Gb Ta = -40°C to +70°C, Type 4X, IP67

Class I, Zone 2, AEx nA IIC T4...T3 Ta = -15°C to +70°C, Type 4X, IP67

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US Certificate Of Conformity No: FM17US0108X

12. Description of Equipment:

General - The Pulsar Model R86 26 GHz Radar Level Transmitters are, non-contact radar level transmitters utilizing the engineering principle of pulse burst radar technology. The primary components are the antenna, an RF (radio frequency) Board assembly, and a potted electronics assembly containing other PC Boards. A digital display and keypad are optional.

Short bursts of 26GHz microwave energy are emitted and subsequently reflected from the liquid level surface. Distance is calculated by the equation $D = \text{Transit time (round trip)} / 2$. Liquid level is then calculated based on transmitter configuration..

Construction - The Pulsar Model R86 is housed in a dual compartment (die-cast aluminum or investment cast 316SS) enclosure with separate wiring and electronics compartments. The wiring compartment at the top of the transmitter isolates the power/signal conductors from the electronics compartment beneath it by way of an environmentally sealed feed-through. A quick connect coupling eases installation and allows antennas to be installed without concern for their orientation to the transmitter head. The enclosure is provided with two (2) ½ inch NPT openings.

Ratings - The ambient operating temperature range is -40°C to 70°C with a listed range of -15°C to +70°C for the models that carry the Zone 2 Approval and for Class II/III, Division 1 dust atmospheres. The transmitter antenna are rated for use in a process temperature range of -40°C to +400°C.

Intrinsically Safe Model Options:

Entity Parameters : $U_i = 28.6V$, $I_i = 140mA$, $P_i = 1W$, $C_i = 4.4nF$, $L_i = 2.7\mu H$

Intrinsically Safe/ FISCO Model Options:

FISCO Parameters: $U_i = 17.5V$, $I_i = 380mA$, $P_i = 5.32W$, $C_i = 440pF$, $L_i = 2.7\mu H$

Division 2, Zone 2, and Explosionproof / Intrinsically Safe Model Options:

24Vdc 1Watt ($U_m = 36Vdc$)

PULSAR R86-5abc-def – RBx-xxxx-x0g-xx-000 26 GHz Radar Level Transmitter

Entity Parameters:

$U_i = 28.6V$, $I_i = 140mA$, $P_i = 1W$, $C_i = 4.4nF$, $L_i = 2.7\mu H$

FISCO Parameters:

$U_i = 17.5V$, $I_i = 380mA$, $P_i = 5.32W$, $C_i = 440pF$, $L_i = 2.7\mu H$

a = Signal Output = 1 (HART), 2 (Fieldbus), or 3 (Profibus)

b = Safety Options: 0, 1, A, or B.

c = Accessories/Mounting 0, or A.

d = Classification: 1, 3, A, B, C or D.

e = Housing 1 or 2

f = Conduit Connection 0, 1, 2 or 3

x = Non-FM Controlled Options

0 = None

g = Seal Options 0 or N

PULSAR R86-5abc-def – RBx-xxxx-x08-xx-000 26 GHz Radar Level Transmitter

Entity Parameters:

$U_i = 28.6V$, $I_i = 140mA$, $P_i = 1W$, $C_i = 4.4nF$, $L_i = 2.7\mu H$

FISCO Parameters:

$U_i = 17.5V$, $I_i = 380mA$, $P_i = 5.32W$, $C_i = 440pF$, $L_i = 2.7\mu H$

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US Certificate Of Conformity No: FM17US0108X

a = Signal Output = 1 (HART), 2 (Fieldbus), or 3 (Profibus)
b = Safety Options: 0, 1, A, or B.
c = Accessories/Mounting 0, or A.
d = Classification: 1, 3, A, B, C or D.
e = Housing 1 or 2
f = Conduit Connection 0, 1, 2 or 3
x = Non-FM Controlled Options
0 = None

PULSAR R86-5abc-def – RBx-xxxx-x02-xx-000 26 GHz Radar Level Transmitter

Entity Parameters:

U_i = 28.6V, I_i = 140mA, P_i = 1W, C_i = 4.4nF, L_i = 2.7μH

FISCO Parameters:

U_i = 17.5V, I_i = 380mA, P_i = 5.32W, C_i = 440pF, L_i = 2.7μH

a = Signal Output = 1 (HART), 2 (Fieldbus), or 3 (Profibus)
b = Safety Options: 0, 1, A, or B.
c = Accessories/Mounting 0, or A.
d = Classification: 1, 3, A, B, C or D.
e = Housing 1 or 2
f = Conduit Connection 0, 1, 2 or 3
x = Non-FM Controlled Options
0 = None

PULSAR R86-5abc-def – RBx-xxxx-x0A-xx-000 26 GHz Radar Level Transmitter

Entity Parameters:

U_i = 28.6V, I_i = 140mA, P_i = 1W, C_i = 4.4nF, L_i = 2.7μH

FISCO Parameters:

U_i = 17.5V, I_i = 380mA, P_i = 5.32W, C_i = 440pF, L_i = 2.7μH

a = Signal Output = 1 (HART), 2 (Fieldbus), or 3 (Profibus)
b = Safety Options: 0, 1, A, or B.
c = Accessories/Mounting 0, or A.
d = Classification: 1, 3, A, B, C or D.
e = Housing 1 or 2
f = Conduit Connection 0, 1, 2 or 3
x = Non-FM Controlled Options
0 = None

13. **Specific Conditions of Use:**

PULSAR R86-5abc-def – RBx-xxxx-x0g-xx-000 26 GHz Radar Level Transmitter

1. The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.
2. Provisions shall be made to provide transient overvoltage protection to a level not to exceed 119Vdc.
3. To maintain the T4 temperature code care shall be taken to ensure the enclosure temperature does not exceed 70°C.
4. For Installation with ambient temperature of 60°C, refer to the manufacturer's instructions for guidance on proper selection of conductors.
5. The risk of electrostatic discharge shall be minimized at installation, following the direction given in the

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instruction manual.

- The Pulsar R86 includes flamepath joints, consult Magnetrol if repair of the flamepath joints is necessary.
- Temperature class for the process temperature ranges is defined by the following table when "g" (seal option) is "N":

Process temperature range	Temperature Code
From 0°C to 130°C	T4
From 130°C to 195°C	T3
From 195°C to 295°C	T2
From 295°C to 400°C	T1

- Temperature class for the process temperature ranges is defined by the following table when "g" (seal option) is "0":

Process temperature range	Temperature Code
From 0°C to 130°C	T4
From 130°C to 180°C	T3

- Process temperature range for the seal options is defined by the following table:

Seal Option g	Process Temperature Range
0	-40°C to +180°C
N	-40°C to +400°C

PULSAR R86-5abc-def – RBx-xxxx-x08-xx-000 26 GHz Radar Level Transmitter

- The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.
- Provisions shall be made to provide transient overvoltage protection to a level not to exceed 119Vdc.
- To maintain the T4 temperature code care shall be taken to ensure the enclosure temperature does not exceed 70°C.
- For Installation with ambient temperature of 60°C, refer to the manufacturer's instructions for guidance on proper selection of conductors.
- The risk of electrostatic discharge shall be minimized at installation, following the direction given in the instruction manual.
- The Pulsar R86 includes flamepath joints, consult Magnetrol if repair of the flamepath joints is necessary.
- Temperature class for the process temperature ranges is defined by the following table:

Process temperature range	Temperature Code
From 0°C to 130°C	T4
From 130°C to 195°C	T3
From 195°C to 200°C	T2

- The seal is limited for use where process temperature range is from -7 to + 200 °C

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PULSAR R86-5abc-def – RBx-xxxx-x02-xx-000 26 GHz Radar Level Transmitter

1. The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.
2. Provisions shall be made to provide transient overvoltage protection to a level not to exceed 119Vdc.
3. To maintain the T4 temperature code care shall be taken to ensure the enclosure temperature does not exceed 70°C.
4. For Installation with ambient temperature of 60°C, refer to the manufacturer's instructions for guidance on proper selection of conductors.
5. The risk of electrostatic discharge shall be minimized at installation, following the direction given in the instruction manual.
6. The Pulsar R86 includes flamepath joints, consult Magnetrol if repair of the flamepath joints is necessary.
7. Temperature class for the process temperature ranges is defined by the following table:

Process temperature range	Temperature Code
From 0°C to 130°C	T4
From 130°C to 195°C	T3
From 195°C to 200°C	T2

8. The seals are limited for use where process temperature range is -7 to + 200 °C.

PULSAR R86-5abc-def – RBx-xxxx-x0A-xx-000 26 GHz Radar Level Transmitter

1. The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.
2. Provisions shall be made to provide transient overvoltage protection to a level not to exceed 119Vdc.
3. To maintain the T4 temperature code care shall be taken to ensure the enclosure temperature does not exceed 70°C.
4. For Installation with ambient temperature of 60°C, refer to the manufacturer's instructions for guidance on proper selection of conductors.
5. The risk of electrostatic discharge shall be minimized at installation, following the direction given in the instruction manual.
6. The Pulsar R86 includes flamepath joints, consult Magnetrol if repair of the flamepath joints is necessary.
7. Temperature class for the process temperature ranges is defined by the following table:

Process temperature range	Temperature Code
From 0°C to 130°C	T4
From 130°C to 195°C	T3
From 195°C to 200°C	T2

8. The seals are limited for use where process temperature range is -7 to + 200 °C.

14. Test and Assessment Procedure and Conditions:

This Certificate has been issued in accordance with FM Approvals US Certification Requirements.

15. Schedule Drawings

A copy of the technical documentation has been kept by FM Approvals.

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US Certificate Of Conformity No: FM17US0108X

16. Certificate History

Details of the supplements to this certificate are described below:

Date	Description
9 th July 2017	Original Issue.
29 th May 2018	<u>Supplement 1:</u> Report Reference: PR449910 dated 29 th May 2018 Description of the Change: Addition of safety options A and B. Modified PCB layout for programming reasons and RoHS, RF Board 002 part added for out of the tank testing requirements for FCC.
23 rd October 2018	<u>Supplement 2:</u> Report Reference: 3064009 dated 23 rd October 2018 Description of the Change: 1) Addition of PTFE and PEEK seal options. 2) Updating ANSI/ISA 60079-26:2011 standard to ANSI/UL 60079-26:2017.

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