

Operator's Manual

RPM Series Float Level Sensors

Rev. D6, 10/09 Doc. 9002103



Automation Products Group, Inc.

APG...Providing tailored solutions for measurement applications

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· Warranty and Warranty Restrictions

APG warrants its products to be free from defects of material and workmanship and will, without charge, replace or repair any equipment found defective upon inspection at its factory, provided the equipment has been returned, transportation prepaid, within 24 months from date of shipment from factory.

THE FOREGOING WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES NOT EXPRESSLY SET FORTH HEREIN, WHETHER EXPRESSED OR IMPLIED BY OPERATION OF LAW OR OTHERWISE INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

No representation or warranty, express or implied, made by any sales representative, distributor, or other agent or representative of APG which is not specifically set forth herein shall be binding upon APG. APG shall not be liable for any incidental or consequential damages, losses or expenses directly or indirectly arising from the sale, handling, improper application or use of the goods or from any other cause relating thereto and APG's liability hereunder, in any case, is expressly limited to the repair or replacement (at APG's option) of goods.

Warranty is specifically at the factory. Any on site service will be provided at the sole expense of the Purchaser at standard field service rates.

All associated equipment must be protected by properly rated electronic/ electrical protection devices. APG shall not be liable for any damage due to improper engineering or installation by the purchaser or third parties. Proper installation, operation and maintenance of the product becomes the responsibility of the user upon receipt of the product.

Returns and allowances must be authorized by APG in advance. APG will assign a Return Material Authorization (RMA) number which must appear on all related papers and the outside of the shipping carton. All returns are subject to the final review by APG. Returns are subject to restocking charges as determined by APG's "Credit Return Policy".

Description

The RPM utilizes reed switches in the instrument's stem and a permanent magnet in the float. As the float rises or falls with the level of the liquid, the magnet inside the float acts on the reed switches inside the stem and provides a resistive-chain output. The RPM is also available with optional electronics that convert the resistance output into a 4-20mA signal.

Handling of the Intrinsically Safe RPM Series

Electrical ratings; 12 to 24 Volts DC, 4 - 20 ma

Exia Class I Division 1; Groups C, D T3C (Max. Temp. 85°C) Vmax = 30VDC, Imax = 130ma, Ci = 3nF, Li = 0uH



🖾 II 1 G EEx ia IIB T3 -40° C \leq Ta \leq +85 $^{\circ}$ C

 $Ui \le 30 \text{ V}, \text{ Ii} \le 130 \text{ mA}, \text{ Pi} \le 1 \text{ W}, \text{ Ci} \le 3 \text{ nF}, \text{ Li} \le 0 \text{ mH}$

All repairs and adjustments of the RPM must be made by the factory. To modify, disassemble, or alter the RPM on site is strictly prohibited. Do not loosen any joints, with the exception of the housing cover for electrical connection.

Handling of the Explosion-Proof RPM Series

Electrical ratings; 5 to 15 Volts DC, 100 ma

Class I Division 1 Groups C & D (Max. Temp. 40°C.)



Class I Division 2; Groups C & D (Max. Temp 85°C.

Probe may be wired as a Non-Incendive device in Class I Division 2 Groups C & D areas. All repairs and adjustments of the RPM must be made by the factory. To modify, disassemble, or alter the RPM on site is strictly prohibited. Do not loosen any joints, with the exception of the housing cover for electrical connection.

• Handling of the Explosion-Proof RPM Series

Installation

- Unpacking -

When unpacking the instrument, exercise care not to subject the instrument to mechanical shock. After unpacking, visually inspect the instrument for damage.

- Environment -

The RPM series intruments should be installed in an areas indoors or outdoors which meets the following conditions:

1. The ambient temperature does not exceed -40 $^{\circ}$ C to 85 $^{\circ}$ C (-40 $^{\circ}$ F to +185 $^{\circ}$ F) for Class I Divison 2 or -40 $^{\circ}$ C to 40 $^{\circ}$ C (-40 $^{\circ}$ F to +104 $^{\circ}$ F) for Class I Divison 1.

NOTE: It is recommended that a sun shield be installed over the housing if exposed to direct sunlight.

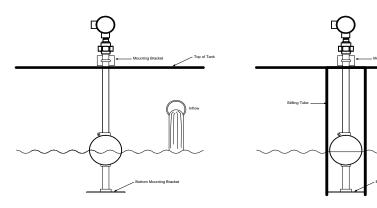
- 2. The medium temperature does not exceed -40°C to 85°C (-40°F to $+185^{\circ}\text{F}$) for Class I Divison 2 or -40°C to 40°C (-40°F to $+104^{\circ}\text{F}$) for Class I Divison 1.
- 3. Relative humidity up to 100%
- 4. Pollution Degree 2
- 5. Measurment Category II
- 6. Altitude 2000 m or less.
- 7. Locate the sensor away from strong magnetic fields such as those produced by motors, transformers, solenoid valves, etc.
- 8. The medium is free from metallic substances and other foreign matter.
- 9. No corrosive gases such as NH₂, SO₂, Cl₂, etc.
- 10. No excessive vibration
- 11. Ample space for maintenance and inspection.

Installation

- Location -

Do not locate the RPM sensor near inlets/outlets.

If there is surface wave action, then it may be advisable to use a stilling tube. If a stilling tube is used, drill vent holes in the tube and use a spacer bottom mounting bracket to assure the probe is centered in the tube and the can move without interference.



Wave action will cause signal bounce.

Use a stilling tube to provide a smooth output signal.

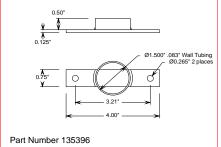
- Mounting -

The RPM probe must be secured top and bottom. The bottom of the probe can be secured using stainless steel bottom mounting bracket (p/n 135396) or similar stainless steel mounting method. This bracket is fixed to the bottom of

the vessel and the

probe stem seats inside of it.

Mounting in this way will prevent any lateral movement and prevent the float from coming off of stem during use.



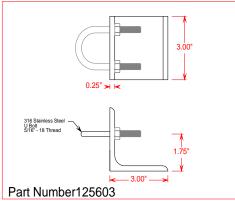
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1. Clamp Mounting

The most common method of mounting the top of the RPM probe is by clamping it into place. Top stainless steel mounting bracket part number 125603 or similar can be used. The U-bolt is tightened around the 1.25" stainless steel stem just below the union. The bracket is permanently mounted to the top of the tan. It is important to keep mounting hardware clear of float travel.



2. Flange Mounting

Provide the compatible mating flange on the tank and install using a suitable gasket.

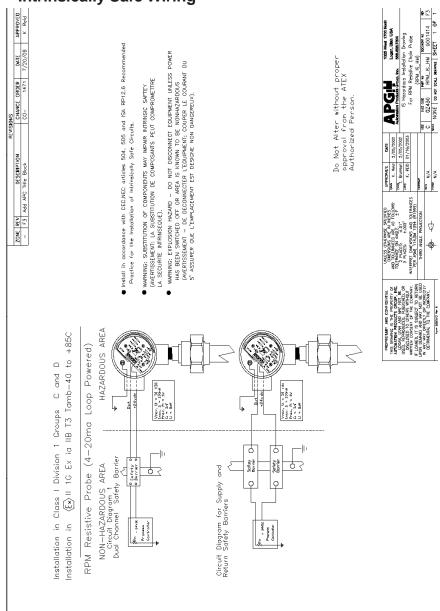
3. Plug Mounting

Provide the compatible female boss on the tank and install the RPM with a suitable gasket, O-ring, or thread tape.

Note: Assure that all metal parts are earthed. It must be assured that the sensor tube is connected to the potential equalizing system and is not isolated from it due to, for instance, tightening means.

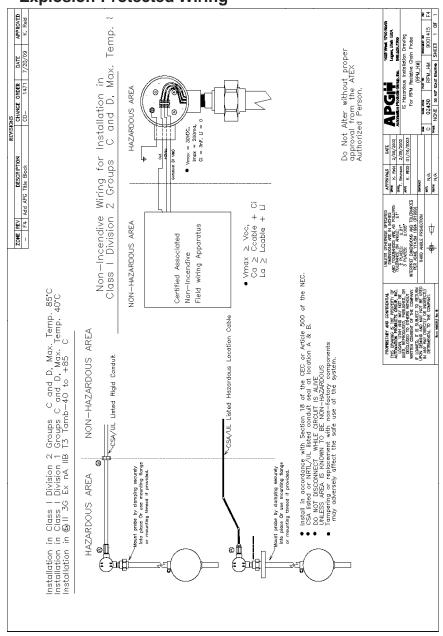
Warning: Because the enclosure of the electronics/terminals of the Float Level Sensor is made of aluminium, if it is mounted in an area where the use of category 1 G apparatus is required, it must be installed such, that even in the event of rare incidents, ignition sources due to impact and friction sparks are excluded. Nonconductive surface of the float may be charged by nonconductive media.

• Intrinsically Safe Wiring

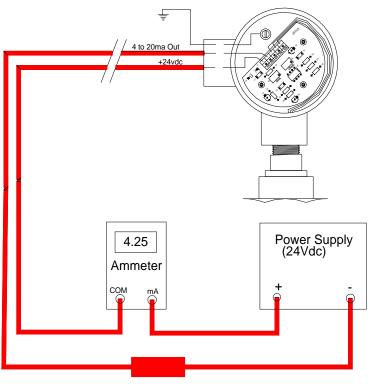


Note: Insure that all metal parts are earthed.

• Explosion-Protected Wiring



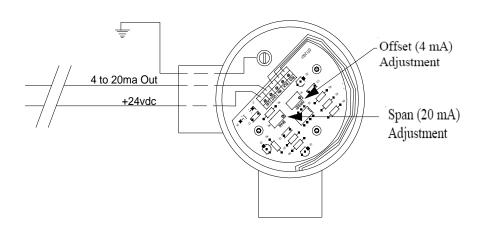
Analog Calibration Procedure (for models equipped with 4-20 mA conversion board)



Choose Loop Resistance to match application

- 1. Set DC power supply voltage at 24VDC.
- 2. Connect Ammeter in series with loop.
- 3. Move float to the bottom position
- 4. Adjust the Offset potentiometer until meter reads 4ma
- 5. Move float to top position
- 6. Adjust the Span potentiometer until the meter reads 20ma.
- 7. Repeat steps 3-6 for final adjustment.

Analog Calibration Procedure (for models equipped with 4-20 mA conversion board)

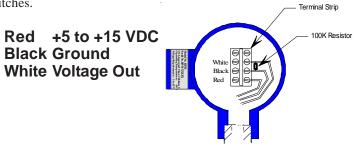


Analog Board is Encapsulated



Wiring for Voltage Operation

Red and Black connect to each end of a resistive chain. The white wire is the voltage output that is connected to different points on the resistive chain by reed switches.



• Inspection and Maintenance

Periodic inspection is necessary to keep your RPM unit in good working order.

CAUTION! Do not remove the housing cover until the atmosphere is determined to be safe, and the power supplied to the unit is turned off.

Keep the sensor clean.

If sediment or other foreign matter is trapped between the stem and the float, detection errors may be caused.

Inspect probe shaft and bottom weld for any possible holes or leaks. If possible leak is detected remove probe from service and send to factory for repair.

Inspect O-ring on cover to make sure that it is in good condition. Never leave the housing cover off. If the cover becomes damaged or is misplaced, replace immediately.

• RPM Specifications

Resolution +/- 0.39 in. (+/- 10mm.)

Maximum Length 288 in. (7.3M)

Maximum Process Temperature -40°C to 85°C (-40°F to

185°F)

Probe Material 316 L SS.

Float Material Polyurethane Foam

Housing Material Aluminium

Modified 359 Alloy

 Silicon (Si)
 8.5 - 9.5 %

 Magnesium (Mg)
 68 - .85%

 Copper (Cu)
 .30% max (3/10 of 1%)

 Iron (Fe)
 .30% max (3/10 of 1%)

Housing Rating NEMA 4

Hazardous Ratings: Intrinsically Safe

Electrical ratings; 12 to 24 Volts DC, 4 - 20 ma

Exia Class I Division 1; Groups C, D T3C (Max. Temp. 85° C) Vmax = 30VDC, Imax = 130ma, Ci = 3nF, Li = 0uH

ATEX Directive: (6 0334 KEMA 05 ATEX 1207 X

 \bigcirc II 1 G EEx ia IIB T3 -40°C \leq Ta \leq +85 °C

 $Ui \le 30 \text{ V}, \text{ } Ii \le 130 \text{ mA}, \text{ } Pi \le 1 \text{ W}, \text{ } Ci \le 3 \text{ nF}, \text{ } Li \le 0 \text{ mH}$

Explosion-Proof

Electrical ratings; 5 to 24 Volts DC, 100 ma



Class I Division 1 Groups C & D (Max. Temp. 40° C.)



Class I Division 2; Groups C & D (Max. Temp 85° C).

Non-Incendive

Electrical ratings; 5 to 24 Volts DC, 100 ma



Class I Division 2; Groups C & D (Max. Temp 85°C).

Vmax = 30 VDC, Imax = 200 ma, Ci = 3nF, Li = 0



Certificate of Compliance

Certificate: 2167400 Master Contract: 237484

2167400 2009/11/16 Project: Date Issued:

Issued to: Automation Products Group Inc

> 1025 West 1700 North Logan, UT 84321 USA Attention: Karl Reid

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.



Issued by: Frank Gessner

Authorized Patricia Pasemko, Operations

PRODUCTS
CLASS 2252 05 - PROCESS CONTROL EQUIPMENT

CLASS 2252 85 - PROCESS CONTROL EQUIPMENT - Certified to US Standards

Float Level Sensors, permanently connected, indoor and outdoor use, max. operating ambient 85°C:

• Models FLXx and FLRx, rated 220 V, 0.5 A;

• Models RPMx, RPXx and RPEx, rated 5 - 15 Vdc, 100 mA, or 12 to 24 Vdc, 4-20mA;

• Model RPAx, rated 12 to 24 Vdc, 4-20mA;

• Model CTR-0100 (P/Ns 110101 and 110101-0001), Loop Powered 4-20mA Module, rated 4-20mA output is

Note: The above models are Pollution Degree 2, Measurement Category II.

Notes for Models FLXx, FLRx, RPMx, RPAx, RPXx, RPEx:

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- The "x" in the Model designations may be any alpha-numeric character, to denote minor mechanical
 options, not affecting safety. Refer to Illustration 28 for Model designator and suffix details.
- 2. The equipment is intended to be installed as required by the applicable electrical code (CEC, NEC) and as specified by the manufacturer's Installation Instructions.
- 3. The circuit board P/N STF-CTR-01** from the Model RPMx Probe may be supplied as a component part where the suitability of the final installation will be inspected by the authority with jurisdiction in the area where installed.
- 4. The installation will be inspected by the authority with jurisdiction in the area where installed.

CLASS 2258 02 - PROCESS CONTROL EQUIPMENT - FOR HAZARDOUS LOCATIONS

CLASS 2258 82 - PROCESS CONTROL EQUIPMENT - FOR HAZARDOUS LOCATIONS, U.S. Requirements

Class I, Division 1, Groups C, and D

• Float Level Sensors, model FLXx, rated 220 V, 0.5 A, max., and model RPMx and RPXx, rated 5 - 15 Vdc, 100mA or 12 to 24 Vdc, 4-20mA; operating ambient 40°C.

Notes for Models FLXx, RPMx, RPXx:

- 1. The "x" in the Model designations may be any alpha-numeric character, to denote minor mechanical options, not affecting safety
- 2. The equipment is intended to be installed as required by the applicable electrical code (CEC, NEC) and as specified by the manufacturers Installation Instructions.
- 3. The installation will be inspected by the authority with jurisdiction in the area where installed.

Class I, Division 2, Groups C, and D

 Float Level Sensor model FLXx, rated 220 V, 0.5 A, model RPMx and RPXx, rated 5 - 15 Vdc, 100mA, or rated 12 to 24 Vdc, 4-20mA, and model RPAx, rated 12 to 24 Vdc, 4-20mA; max; operating ambient 85°C.

Notes for Models FLXx, RPMx, RPAx, RPXx:

- 1. The "x" in the Model designations may be any alpha-numeric character, to denote minor mechanical options, not affecting safety
- 2. The equipment is intended to be installed as required by the applicable electrical code (CEC, NEC) and as specified by the manufacturers Installation Instructions.
- 3. The installation will be inspected by the authority with jurisdiction in the area where installed

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CLASS 2258 03 - PROCESS CONTROL EQUIPMENT - INTRINSICALLY SAFE AND NON INCENDIVE SYSTEMS - FOR HAZARDOUS LOCATIONS

CLASS 2258 83 - PROCESS CONTROL EQUIPMENT - INTRINSICALLY SAFE AND NON INCENDIVE SYSTEMS - FOR HAZARDOUS LOCATIONS, CERTIFIED TO U.S. STANDARDS

Class I, Division 2, Groups C, and D

 Float Level Sensor model RPMx and RPXx, rated 5 - 15 Vdc, 100mA, or rated 12 to 24 Vdc, 4-20mA, and model RPAx, rated 12 to 24 Vdc, 4-20mA; max; operating ambient 85°C. Field wiring is non-incendive when installed per drawings 9001415, 9001932 and 9002023 respectively.

Notes for Models RPMx, RPAx, RPXx:

- 1. The "x" in the Model designations may be any alpha-numeric character, to denote minor mechanical options, not affecting safety.
- 2. The equipment is intended to be installed as required by the applicable electrical code (CEC, NEC) and as specified by the manufacturers Installation Instructions.
- 3. The installation will be inspected by the authority with jurisdiction in the area where installed.

 ${\tt CLASS~2258~04}$ - PROCESS CONTROL EQUIPMENT - INTRINSICALLY SAFE, ENTITY - FOR HAZARDOUS LOCATIONS

CLASS 2258 84 - PROCESS CONTROL EQUIPMENT - INTRINSICALLY SAFE, ENTITY - FOR HAZARDOUS LOCATIONS, U.S. Requirements

Class I, Division 1, Groups C, and D

• Float Level Sensors, model RPMx, RPAx, RPXx and model CTRx loop powered 24Vdc, 4-20mA converter module, max. operating ambient 85°C; Temperature Code rating T3C; Intrinsically Safe when connected as per drawing 9001414, 9001423 and 9001930 with the following Entity Parameters: Vmax = 30V, Imax = 130mA, Ci = 3nF, Li = 0uH.

Notes for Models RPMx, RPAx and RPXx:

- The "x" in the Model designations may be any alpha-numeric character, to denote minor mechanical
 options, not affecting safety.
- 2. The equipment is intended to be installed as required by the applicable electrical code (CEC, NEC) and as specified by the manufacturers Installation Instructions.
- 3. The installation will be inspected by the authority with jurisdiction in the area where installed.

APPLICABLE REQUIREMENTS

CSA Standards C22.2 No. 0-M91 - General Requirements - Canadian Electrical Code, Part II

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Project: 2167400 Date Issued: 2009/11/16

CSA Standards C22.2 No. 30-M1987 - Explosion-Proof Enclosures for Use in Class I Hazardous Locations

 $CAN/CSA\ C22.2\ No.\ 61010\cdot 1\cdot 04\ - Safety\ Requirements\ for\ Electrical\ Equipment\ for\ Measurement,\ Control,\ and\ Laboratory\ Use,\ Part\ 1:\ General\ Requirements$

CSA Standards C22.2 No. 157-M1992 - Intrinsically Safe and Non-Incendive Equipment for Use in Hazardous Locations

CSA Standards C22.2 No. 213-M1987 - Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations

 $\label{eq:UL-61010-1} \ensuremath{\text{UL-61010-1}}\xspace (Control, and Laboratory Use - Part 1: General Requirements)$

UL 913, Sixth Edition - Intrinsically Safe Apparatus and Associated Apparatus for use in Class I, II, III, Division 1, Hazardous (Classified) Locations

 ${\tt UL1203, Third \, Edition \, - Explosion-Proof \, and \, Dust-Ignition-Proof \, Electrical \, Equipment \, for \, Use \, in \, Hazardous \, (Classified) \, Locations}$

FM~3611, December~2004~- Nonincendive~Electrical~Equipment~for~Use~in~Class~I~and~II,~Divisions~1~and~2~Hazardous~(Classified)~Locations

 $TIL\ E-11\ - Enclosures\ of\ Welded\ Construction\ for\ Class\ I,\ Division\ 1,\ Hazardous\ Locations\ appended\ to\ the\ applicable\ requirements$

DQD 507 Rev. 2009-09-01

Rev. D5, 12/08 RPM Series

Notes



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