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APPROVAL REPORT

MODEL 210 TU FLOW METERS FOR HAZARDOUS LOCATIONS

Prepared for:

**Intek Inc.
751 Intek Way
Westerville, OH 43082**

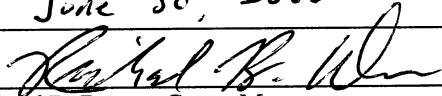
Project ID: 3024509

Class: 3615-FMCUS

Date of Approval:

June 30, 2006

Authorized by:


Richard B. Dunne, Group Manager

FM Approvals
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**MODEL 210 TU FLOW METERS
FOR USE IN
HAZARDOUS LOCATIONS
Prepared for**

**Intek Inc.
751 Intek Way
Westerville, OH 43082**

I INTRODUCTION

Intek Inc (manufacturer) has requested that FM Approvals perform examination and testing for FM Approval in the United States and Canada. The Model 210 TU Style Flow Meters was examined and tested for use in Explosionproof Class I, Division 1, Groups B, C and D, Class II/ III, Division 1, Groups E, F, and G, T6 Ta=60°C; and suitable for use in Class I, Zone 1, IIB + H₂, T6 Ta=60°C Hazardous (Classified) Locations; with an indoor/outdoor rating of Type 4X according to US requirements and Explosionproof Class I, Division 1, Groups B, C and D, Class II/ III, Division 1, Groups E, F, and G, T6 Ta=60°C Hazardous Locations; with an indoor/outdoor rating of Type 4X according to Canadian requirements.

1.2 This Report may be reproduced only in its entirety and without modification.

1.3 **Standards for US:**

Title	Number	Date
Electrical Apparatus for Use in Hazardous (Classified) Locations - General Requirements	FM Approvals Class 3600	1998
Explosionproof Electrical Equipment - General Requirements	FM Approvals Class 3615	2006
Electrical and Electronic Test, Measuring, and Process Control Equipment	FM Approvals Class 3810	2005
Enclosures for Electrical Equipment	ANSI/NEMA-250	1991

1.4 **Standards for Canada:**

Title	Number	Date
Bonding and Grounding of Electrical Equipment	CSA-C22.2 No. 0.4	1982
Threaded Conduit Entries	CSA-C22.2 No. 0.5	1982
Enclosures for Use in Class II Groups E, F, and G Hazardous Locations	CSA-C22.2 No. 25	1966
Explosion-Proof Enclosures For Use In Class I Hazardous Locations	CSA-C22.2 No. 30	1988
Special Purpose Enclosures	CSA-C22.2 No. 94	1991
Process Control Equipment	CSA-C22.2 No. 142	1990

- 1.5 Listing:** The specific models described by this report will be shown in Chapter 2 of the Electrical Section of the FM Approval Guide, a publication of FM Approvals, as follows:

210abcdefgh Flow Meter

XP/ I/ 1/ BCD/ T6 Ta=60°C; XP/ I/ 1/ IIB + H₂/ T6 Ta=60°C; DIP/ II, III/ EFG/ T6 Ta=60°C;

Type 4X.

a= Enclosure and Display Selections: X, XD, XT, or XDT.

b= Sensor Type/Size: NPT/2I, BF/2I, TU 1/16-1/4, or TUL 1/16-1/4.

c= Sensor Materials/Options: Stainless Steel, Hastelloy C-276, or Alloy20.

d= Stream Temperature: 0-150°F, 151-350°F, 351-500°F, or above 500°F.

e= End Fittings (for TU transducers): MNPT, 316SS 150LB Flange, 316SS 300LB Flange.

f= Operating Pressure: TU or TUL= 6000psi, 4500psi, 3250psi, 2500psi, or 2250psi.
Insertion Probe= 1500psi.

g= Output Options: 4/20, 0/5, 0/10.

h= Additional Options: SWn, ER, HPC, or FM.

Electrical Ratings: Rated Voltage 24 VDC.

- 1.6 Listing for Canada:** The specific models described by this report will be shown in the Canadian part of Chapter 2 of the Electrical Section of the FM Approval Guide, a publication of FM Approvals, as follows:

210abcdefgh Flow Meter

XP/ I/ 1/ BCD/ T6 Ta=60°C; DIP/ II, III/ EFG/ T6 Ta=60°C; Type 4X.

a= Enclosure and Display Selections: X, XD, XT, or XDT.

b= Sensor Type/Size: NPT/2I, BF/2I, TU 1/16-1/4, or TUL 1/16-1/4.

c= Sensor Materials/Options: Stainless Steel, Hastelloy C-276, or Alloy20.

d= Stream Temperature: 0-150°F, 151-350°F, 351-500°F, or above 500°F.

e= End Fittings (for TU transducers): MNPT, 316SS 150LB Flange, 316SS 300LB Flange.

f= Operating Pressure: TU or TUL= 6000psi, 4500psi, 3250psi, 2500psi, or 2250psi.
Insertion Probe= 1500psi.

g= Output Options: 4/20, 0/5, 0/10.

h= Additional Options: SWn, ER, HPC, or FM.

Electrical Ratings: Rated Voltage 24 VDC.

II DESCRIPTION

- 2.1** The Model 210 Flow Meter uses a thermal sensing technique to measure liquids and gas. The 210 Flow Meter has the ability to communicate with a handheld control device (not included in the scope of this project) and also offers infrared controls on the local display. Both handheld and infrared controls allow users to change readings and calibrate the instrument without compromising the explosionproof rating. The flow meter consists of two elements, a sensor and a transmitter. The sensors come in two basic designs, non-intrusive (TU and TUL style) and intrusive (insertion probe) sensors. Both sensors utilize the same thermal sensing technology. The thermal sensing technology uses two temperature sensors, one is in thermal equilibrium with fluid and provides a fluid temperature reference, while the second temperature sensor is located near a heater so that its temperature is slightly above that of the fluid. The rate at which heat is removed from the heated sensor by the process stream is related to fluid velocity. The measured temperature differential between the

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reference sensor and heated sensor is a function of flow rate. Both sensor configurations are designed with the same electronics. The electronics are housed in an Adalet enclosure model number XDHMFGCX.

- 2.2** Non-intrusive (TU and TUL) style sensor: The non-intrusive TU and TUL styles sensors are mounted inline with the process flow. The all welded 316 stainless steel sensors are threaded to the Adalet enclosure using the 1/2in FNPT connection in the enclosure. The sensor internal volume is separated from the enclosure internal volume by Stycast 2651 with Catalyst 9M Cement compound. The seven conductor sensor cable passes through the cement and is terminated inside the electronics housing. The sensor is connected inline to the process flow line by either a 1/2in MNPT connection or by other weldable fittings complying with tube size pressure ratings, or by forged flanges per ANSI B16.5. The non-intrusive sensors are a cylindrical tube ranging in diameter from 3in to 4.5in, with lengths of 5.8in to 7.0in. The process flow is connected to the sensor by an internal stainless steel tube measuring in diameters from .063in to .250in. The difference between the TU style and the TUL style sensor is the configuration of the internal sensing tube. For the TU style sensor the internal tube is a straight tube, for the TUL style sensor the internal tube is configured in a loop. The cylindrical tube is filled with Polyurethane Insulation Foam. For this program the TU and TUL style sensors were examined without the Polyurethane Insulation Foam, and inclusive of the potting cement in the threaded connection.
- 2.3** Intrusive (insertion) style probe sensor: The intrusive insertion probe is mounted (inserted) into the process pipe and mounted by either a threaded fitting or a flanged fitting. The probe comes in varying lengths up to a maximum length of 3ft. The all welded 316 stainless steel sensors are threaded to the Adalet enclosure using the 1/2in FNPT connection in the enclosure. The sensor internal volume is separated from the enclosure internal volume by Stycast 2651 with Catalyst 9M Cement compound. The seven conductor sensor cable passes through the cement and is terminated inside the electronics housing. For this program the Intrusive (insertion) style probe sensor sample as examined included the cement with sensor wires passing through.
- 2.4** The Adalet XDHM Series Instrument Housing was previously satisfactorily examined and tested under FM Approvals Project ID's 3016299 and 2B9A4.AE as Explosionproof for Class I, Division 1, Groups B, C and D, Class I, Zone 1, IIB +H₂; Class II, III, Division 1, Groups E, F, and G hazardous (classified) locations; with an indoor/outdoor rating of Type 4X/ IP66. FM Approvals satisfactorily examined and tested Adalet XDHL Series Instrument Housing against the Canadian standards under Project ID 0B5Q3.AE for a rating of Class I, Division 1, Groups B, C and D, Class II, III, Division 1, Groups E, F, and G hazardous locations; with an indoor/outdoor rating of Type 4X. The test results were submitted to CSA International for Canadian certification. The Adalet XDHL enclosures are certified under CSA International Certificate Number LR27991-73. The Adalet model XDHM and XDHL are identical in construction with the exception of free internal volume. The XDHL series enclosure has a larger free internal volume than the client chosen XDHM enclosure. During ignition testing conducted under FM Approvals Project ID OB5Q3.AE the highest recorded pressure for US Group B gas mixtures was 181psi, and the highest recorded pressure for the Canadian Group B gas mixtures was also 181psi. During ignition testing conducted under FM Approvals project ID 2B9A4.AE the highest ignition pressure recorded for US Group B gas mixtures was 125psi. This is considered acceptable for Canada. The Adalet XDHM Series Instrument Housings consist of a cast aluminum base and two of six optional covers to form a two compartment solid wall enclosure with options for a 1/2 inch through hole in the dividing wall or no dividing wall. The covers are flat or dome either solid or window and have a neoprene O-ring seal between the cover and the base to prevent the ingress of dust and water. The enclosures are available with two window cover designs, a cemented assembly or a non-cemented jointed window cover. The two window cover designs both include a glass lens and retaining ring assembly. The widow covers use ADACO XSC cement material. The base has options for two 3/4in NPT or 1/2in NPT openings for connection of conduit, or end instrument

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assemblies. There is also a rectangular flat on the housing base with an entry for connection of conduit, or end instrument assemblies. The entry in the flat can be ½in or 3/4in NPT threads. All but one conduit opening is supplied with a conduit plug which is suitable for hazardous locations. The covers and bases are constructed of aluminum alloy 357 or the optional material 316 Stainless Steel.

- 2.5 Refer to the attached Model 210 Flow Meter Sales Literature for further description and specifications.

III EXAMINATIONS AND TESTS

- 3.1 Samples of the Model 210 Flow Meters non-intrusive (TU and TUL styles) and intrusive (insertion probe) sensors as detailed in the following paragraphs, considered to be representative of the Model 210 Flow Meters were examined, tested, and compared to the manufacturer's drawings. All test data is on file at FM Approvals along with other documents and correspondence applicable to this program. Based on the enclosure testing conducted under FM Approvals Project ID's 3016299 and 2B9A4.AE and the applicable test data from FM Approvals Project ID 0B5Q3.AE the following testing was required to meet the intent of the standards;

- FM Group B Ignition testing (US Divisions and Zones).
- Canadian Group B Ignitions.
- Hydrostatic Testing.
- Dielectric Testing.
- Power Consumption Test.
- Temperature Testing (T-code).
- Process Pressure Testing.

The following test samples were received at FM Approvals for examination and testing:

- Non-intrusive TU Flow Meter Model Number 210-XDT-TUL-1/4-4/20-FM (RDM-1A)
- Non-intrusive TU Flow Meter Model Number 210-XDT-TUL-1/4-4/20-FM (RDM-2A)
- Non-intrusive TU Flow Meter Model Number 210-XDT-NPT/21-4/20-FM (RDM-6A)
- Intrusive 3ft Insertion Probe, Serial number T05016-4 (RDM-8A)

- 3.2 **Explosionproof Evaluation (US)** – The non-intrusive (TU and TUL styles) and intrusive (insertion probe) Model 210 Flow Meters both utilizes the same Adalet enclosure. The Adalet enclosures were previously examined and satisfactorily tested under FM Approvals Project ID's 3016299 and 2B9A4.AE.AE as Explosionproof for Class I, Division 1, Groups B, C and D, Class II, III, Division 1, Groups E, F, and G hazardous (classified) locations. Since the probes are separated from the enclosure and do not increase the enclosure free internal volume, all testing conducted on the Adalet enclosures under FM Approvals Project ID's 3016299 and 2B9A4.AE are considered applicable to this project, and only the probes are the subject of the explosionproof examination and testing.

- 3.3 **Explosionproof Evaluation - (Canada)** - The non-intrusive (TU and TUL styles) and intrusive (insertion probe) Model 210 Flow Meters both utilizes the same Adalet enclosure. The Adalet enclosures were previously examined and satisfactorily tested under FM Approvals Project ID's 3016299 and 2B9A4.AE as Explosionproof for Class I, Division 1, Groups B, C and D, Class II, III, Division 1, Groups E, F, and G hazardous (classified) locations. Additionally, the test data obtained under FM Approvals Project ID 0B5Q3.AE on the Adalet XDHL Series Instrument Housing is considered applicable to the XDHM enclosure for a rating of Explosionproof for Class I, Division 1, Groups B, C and D, Class II, III, Division 1, Groups E, F, and G hazardous locations per the Canadian standards. Since the probes are separated from the enclosure and do not increase the enclosure free internal volume, all testing conducted on the Adalet enclosures under FM Approvals Project ID's

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3016299 and 2B9A4.AE are considered applicable to this project, and only the probes are the subject of the explosionproof evaluation

- 3.3.1 Joint Analysis** – The Adalet XDHM Series Instrument Housings NPT openings for conduit, or end instrument assemblies, and threaded cover joint analysis conducted under FM Approvals Project ID's 3016299 and 2B9A4.AE are applicable and no further examination of the enclosure threaded joints is required.
- 3.3.2 Threaded Intrusive Probe to Housing: Cement Joint** - The sensors are separated from the enclosure opening which is potted with Stycast 2850FT Catalyst 9M Cement, the design joint length is 10mm, this is satisfactory as it meets the minimum design length of 10mm.
- 3.3.3 Threaded Non-intrusive (TU and TUL style) sensors to Housing: Cement Joint** - The sensors are separated from the enclosure opening which is potted with Stycast 2850FT Catalyst 9M Cement, the design joint length is 10mm, this is satisfactory as it meets the minimum design length of 10mm.
- 3.3.4 Explosionproof Tests**
- 3.3.4.1 Ignition Pressure Reference Test – Intrusive Probe**– The intrusive probe is manufactured with a maximum length of 3ft. For testing purposes the 3ft probe design was examined and tested. Two series of tests were conducted on the probe sample. The first series consisted of ten ignition tests. The test gas used was Hydrogen, representative of Group B, ranging in concentration from 22.6% to 38.2%, by volume, in air. The gas in connection was located at the top of the probe just below the potted threaded connection. The gas out connection was located at the bottom of the probe approximately 1in to 2in from the bottom. Two transducers were connected to the probe on opposite sides of the gas in and gas out connections. Ignition was initiated by a spark plug located at the bottom of the 3ftlong probe. No visible permanent deformation of the probe was observed. The highest ignition pressure recorded was 77psi (530kPa) at a gas concentration of 35% by volume, in air. The second series of tests consisted of 5 ignitions per the Canadian Group B requirements. The test gas used was Hydrogen, representative of Group B, with concentrations of 32%, by volume, in air. Ignition was initiated by a spark plug located at the bottom of the 3ft long probe. The highest ignition pressure recorded was 42psi (290kPa) No visible permanent deformation of the probe was observed.
- 3.3.4.2 Ignition Pressure Reference Test – Non-intrusive TU and TUL style sensors**– The non-intrusive sensors are manufactured in lengths of 5in, 5.8in and 7in long. Two series of tests were conducted on the TUL sensor sample. The first series consisted of ten ignition tests. The test gas used was Hydrogen, representative of Group B, ranging in concentration from 22.6% to 38.2%, by volume, in air. The gas in connection was located on the right hand flat side of the cylindrical tube while the gas out connection was located on the left hand flat side of the cylindrical tube. One transducer was mounted 90 degrees from the gas in connection on the round portion of the cylindrical sensor tube. Ignition was initiated by a spark plug located at the right hand side of the TUL sensor. No visible permanent deformation of the probe was observed. The highest ignition pressure recorded was 114psi (790kPa) at a gas concentration of 38% by volume, in air. The second series of tests consisted of 5 ignitions per the Canadian Group B requirements. The test gas used was Hydrogen, representative of Group B, with concentrations of 32%, by volume, in air. Ignition was initiated by a spark plug located at the right hand side of the TUL sensor. The highest ignition pressure recorded was 108psi (740kPa). No visible permanent deformation of the probe was observed.
- 3.3.4.3 Hydrostatic Test - Intrusive (Insertion) Probe**– A hydrostatic test was conducted on the Intrusive probe sample at a pressure equal to 400% of the maximum explosion pressure recorded (77psi). The pressure was increased at a rate of at least 100 psi (690 kPa) per minute and then held at the test

pressure of 310 psi (2130 kPa) for at least 10 seconds. At the conclusion of the test, the probe sample showed no visible signs of permanent deformation. This is satisfactory.

- 3.3.4.4 Hydrostatic Test - Non-intrusive TU and TUL style sensors**— A hydrostatic test was conducted on the TUL style sensor sample at a pressure equal to 400% of the maximum explosion pressure recorded (114psi). The pressure was increased at a rate of at least 100 psi (690 kPa) per minute and then held at the test pressure of 460 psi (3170 kPa) for at least 10 seconds. At the conclusion of the test, the TUL style sensor sample showed no visible signs of permanent deformation. This is satisfactory.
- 3.3.4.5 Surface Temperature Test** - The non-intrusive (TU and TUL styles) and intrusive (insertion probe) Model 210 Flow Meters both use the same electronics. The flow meter operates at input voltages of 24Vdc and a maximum rated current of 0.5 amps. The sample was tested in its normal operating position with +10% of its rated voltage (26.4Vdc) which is considered to generate the largest current draw, which was measured to be 3 watts of internal power. The surface temperature was measured until the temperature stabilized. The maximum temperature rise was less than 1 °C with an ambient of 24°C. After correcting to a 60°C ambient and adding a 5K measurement uncertainty factor, the maximum surface temperature is determined to be 66°C. The T6 (85°C) temperature code marking for a 60°C maximum ambient temperature rating, as marked on the product label, is satisfactory.
- 3.3.5 Process Pressure Test – Intrusive (Insertion) Probe** - The Intrusive (Insertion) Probe is rated for a Maximum Working Pressure of 1500 psi (17,240 kPa). The test sample was subjected to a pressure of at least 3000 psi for 1 minute. No visible leakage was observed in the unit. The Intrusive (Insertion) Probe sample was then subjected to a pressure of at least 4500psi for 1 minute. No rupture or failure which resulted in flying fragments outside of the equipment was detected nor was there any leakage to the electronics housing compartment. This is satisfactory.
- 3.3.5.1 Process Pressure Test – Non-intrusive TU and TUL style sensors** - The non-intrusive (TU and TUL) style sensors are available in a variety of Maximum Working Pressure ranges depending upon the tube wall thickness. The Maximum Working Pressure ranges are 6000psi for the TU 1/16 style with a tube wall thickness 0.010in, 4500psi for the TU 1/16 {1/4E} style with a tube wall thickness 0.010in, 2500psi for the TU 1/8 style with a tube wall thickness 0.010in, 2500psi for the TU 1/8 {1/4E} style with a tube wall thickness 0.010, 3250psi for the TU 3/16 style with a tube wall thickness 0.020, and 3250psi for the TU 1/4 style with a tube wall thickness 0.020. For testing purposes the TU 1/16 style (6000psi rating) and the TU 3/16 style (3250psi) samples were evaluated, as they represent the highest pressure ratings for tubes with a wall thickness of 0.010in and 0.020in. The TU 1/16 style test sample was subjected to a pressure of at least 12,000psi for 1 minute. No visible leakage was observed in the unit. The TU 1/16 style sample was then subjected to a pressure of at least 18,000psi for 1 minute. No rupture or failure which resulted in flying fragments outside of the equipment was detected nor was there any leakage to the electronics housing compartment. This is satisfactory. The TU 3/16 style test sample was subjected to a pressure of at least 6,500psi for 1 minute. No visible leakage was observed in the unit. The TU 3/16 style sample was then subjected to a pressure of at least 9,750psi for 1 minute. No rupture or failure which resulted in flying fragments outside of the equipment was detected nor was there any leakage to the electronics housing compartment. This is satisfactory.
- 3.4 Protection against Electric Shock** - The following testing was conducted to verify the protection afforded by the product against electrical shock hazardous. Evaluation of the Model 210 Flow Meter electronics was based on Pollution Degree 2, Installation Category I with a Comparative Tracking Index (CTI) greater than 175.

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- 3.4.1 Dielectric Strength Test** - The test was conducted per the requirements of CSA standard C22.2 No. 142 for equipment rated 250V or less, which is more severe than the requirements of ANSI/ISA 61010-1. A dielectric test was conducted between the main line input power terminals (shorted together) and ground. The test was conducted at a test potential of 1000 Vrms for one minute duration with no arcing or dielectric breakdown occurring, the results were satisfactory.
- 3.4.2 Protective Grounding** – Two protective grounding terminals using dedicated #10-32, stainless steel screws with captive washers are located inside and outside of the enclosure. One external protective grounding terminal is located at the side of the housing base on the enclosure. The other protective grounding terminal is located inside the enclosure. It has been verified by measurement that all accessible conductive components of the enclosures that could otherwise become energized in the event of a fault are bonded to this point with a resistance less than 0.1 ohms. This is satisfactory.
- 3.4.3 Protection from Accessible Live Parts** - The Model 210 Flow Meter contains no hazardous live voltages.
- 3.4.4 Spacings and Field Wiring Terminals** - The Model 210 Flow Meter contains no hazardous live voltages.
- 3.4.5 Protection Against Mechanical Hazards** - Testing for protection against mechanical hazards was waived for the Model 210 Flow Meter 1) has no moving parts accessible to the operator when installed per the manufacturers installation instructions; 2) is for fixed installation; 3) has no provisions for lifting or carrying; and 4) has no parts likely to be expelled.
- 3.5 Mechanical Resistance to Shock and Impact**
- 3.5.1 Impact Test** – The impact test was waived as the enclosure and window cover were previously examined and satisfactorily tested under FM Approvals Project ID's 3016299 and 2B9A4.AE
- 3.5.2 Drop Test** - This test is not applicable as the Model 210 Flow Meter is neither hand-held nor bench-top equipment.
- 3.6 Class II/III Tests** - The Class II,III tests were waived as the probes are all welded construction and the enclosure was satisfactorily examined and tested under FM Approvals Project ID's 3016299 and 2B9A4.AE as suitability for use in Class II/III, Division 1, Groups E, F and G hazardous (classified) locations.
- 3.7 Environmental Protection** – The Environmental testing was waived as the enclosure was previously examined and satisfactorily tested for a rating of Type 4X.

IV MARKING

Marking information was reviewed and found to meet standard requirements. The manufacturer's vinyl adhesive label was previously examined and satisfactorily tested under FM Approvals Project ID 3W0A2.AX. The label is adhesively attached to the exterior of the enclosure. Label drawing 05014-220 is included as an attachment to this report

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The following information appears on the apparatus identified in Section 1.5 and 1.6 and meets the Standard requirements:

- Manufacturer's name and manufacturing location.
- Hazardous Location Information
- Environmental Ratings
- Temperature Code Rating
- Warning Information
- Caution Information
- Model Number
- The FM Approval Mark for the US and Canada
- Electrical Rating

V REMARKS

- 5.1** Installation shall be in accordance with the National Electrical Code®, ANSI/NFPA 70 or the Canadian Electrical Code C22.1, as applicable.
- 5.2** Installation shall be in accordance with the current issue of the manufacturer's instructions.

VI FACILITIES AND PROCEDURES AUDIT

Intek, Inc. design and manufacturing facilities in Westerville, OH are subject to follow up audit inspections. The facilities and the quality control procedures in place have been found satisfactory to manufacture product identical to that tested and Approved.

VII MANUFACTURERS RESPONSIBILITIES

- 7.1** Documentation considered critical to this Approval is on file at FM Approvals and listed in the Documentation File, Section VIII of this report. No changes of any nature shall be implemented unless notice of the proposed change has been given and written authorization obtained from FM Approvals. The Approved Product Revision Report, Form 797, shall be forwarded to FM Approvals as notice of proposed changes.
- 7.2** The manufacturer shall provide the appropriate Installation / Operation / Maintenance Instructions with the Model 210 Flow Meters
- 7.3** Due to the welded construction of the non-intrusive (TU and TUL style) and intrusive (insertion probe) sensors and per the Canadian requirements, on 100% of production, the manufacturer shall conduct a routine hydrostatic test on the non-intrusive (TU and TUL style) and intrusive (insertion probe) sensors to verify suitability of the welded construction. The routine testing on the intrusive (insertion probe) sensors shall be at 126psi which is 3 times the maximum recorded ignition pressure of 42psi. The routine testing on the non-intrusive (TU and TUL style) sensors shall be at 324psi which is 3 times the maximum recorded ignition pressure of 108psi.
- 7.4** On 100% of production, the manufacturer shall subject the Model 210 Flow Meter to a test voltage of 840 Vrms or 1,200 VDC between the mains TERMINALS connected together on the one side, and all ACCESSIBLE conductive parts connected together on the other. For this test, the conductors of any output TERMINAL intended to be connected to circuits of other equipment, which are not HAZARDOUS LIVE, are considered to be ACCESSIBLE conductive parts. The test voltage is raised

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to its specified voltage within 2 seconds and maintained for at least 2 seconds. No breakdown or repeated flashover shall occur. Corona effects and similar phenomena are disregarded.

WARNING: The dielectric test required may present a hazard of injury to personnel and/or property and should only be performed under controlled conditions, and by persons knowledgeable of the potential hazards of such testing to minimize the likelihood of shock and/or fire.

7.5 On 100% of production, the manufacturer shall verify presence of the protective ground screws.

VIII DOCUMENTATION

The following drawings describe the complete Model 210 Flow Meter and are filed under blueprint folder 3024509.

Drawing No.	Drawing Title	Revision
A2100606	MODEL 210 FLOW METER MANUAL	B
04006-101	MODEL 210 FLOW METER POWER SUPPLY SCHEMATICS	11/17/04
04006-102	MODEL 210 FLOW METER TOP ASSEMBLY	11/08/04
04006-103	MODEL 210 FLOW METER USER INTERFACE W/ DISPLAY SCHEMATIC	11/23/04
05014-100	MODEL 210 EXPLOSIONPROOF ELECTRONICS	05/12/06
05014-200-1	MODEL 210 EXPLOSIONPROOF TU ASSEMBLY	05/12/06
05014-200-2	MODEL 210 EXPLOSIONPROOF PROBE ASSEMBLY	05/12/06
05014-202-1	MODEL 210 EXPLOSIONPROOF TU SENSOR DETAIL	06/12/06
05014-202-2	MODEL 210 EXPLOSIONPROOF PROBE SENSOR DETAIL	06/12/06
05014-220	MODEL 210 EXPLOSIONPROOF FLOW METER SPECIAL MARKINGS	06/21/06

IX CONCLUSION


The apparatus identified in 1.5 meets FM Approval requirements in accordance with the standards identified in 1.3. The apparatus identified in 1.6 meets FM Approval requirements for Canada in accordance with the standards identified in 1.4. Since a duly signed Master Agreement is on file for this manufacturer, FM Approval and FM Approval for Canada are effective the date of this report.

TESTS AND EXAMINATION BY: - Richard DiMaria
- Raymond Lawrence

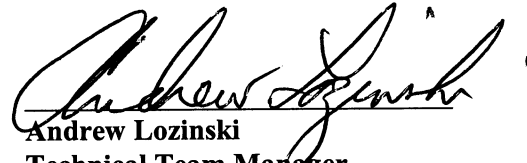
ATTACHMENTS: - Label drawing 05014-220
- Sales Literature Model 210

ORIGINAL DATA: -Project Data Record 3024509

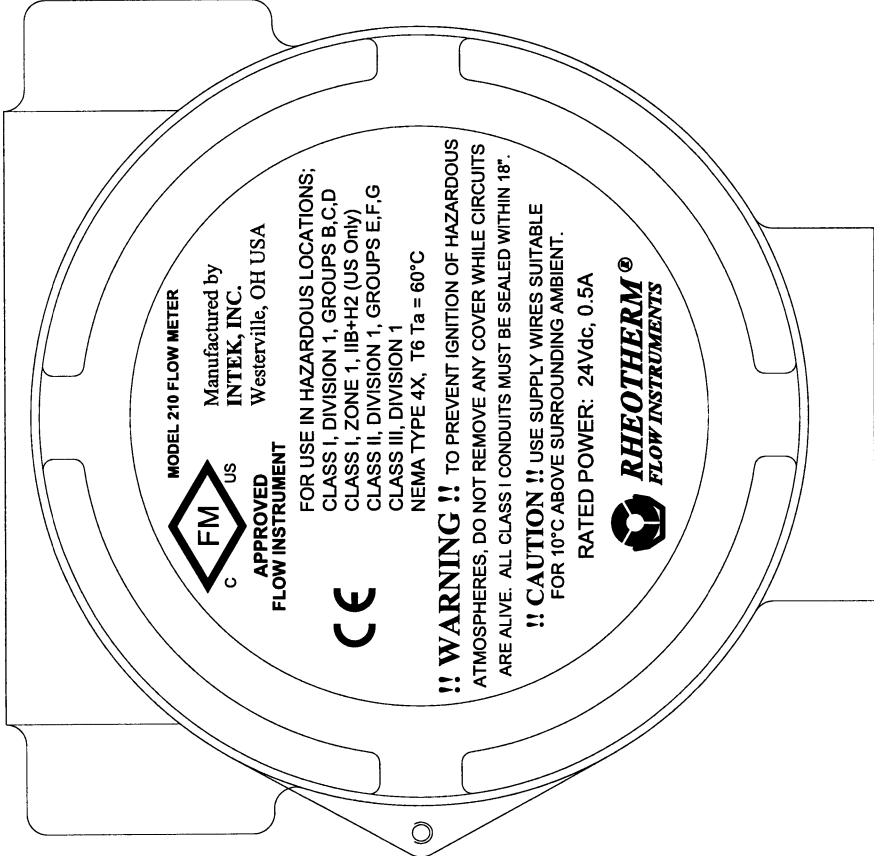
REPORT BY:


Richard DiMaria
Engineer
Hazardous Locations

REPORT REVIEWED BY:


Andrew Lozinski
Technical Team Manager
Hazardous Locations

REVISIONS		
REV	DESCRIPTION	DATE



NOTES:

- 1 REVISION REQUIRES FMRC APPROVAL
- 2 Label Material: Vinyl

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ON: FRACTIONS = ± N/A DECIMALS .X = ±N/A .XX = ±N/A .XXX = ±N/A ANGLES = ± N/A	DATE	06/21/06
	DRAWN	RAM
	CHKD	
	APVD	
PROGRAM:	SIZE	A
	CAGE CODE	59936
FILE	05014-220	CONTR
SCALE		N/A
SHEET		1 OF 1
MUL. No.		

Intek, Inc.
751 Intek Way
Westerville, Ohio 43082

Model 210 Explosionproof
Flow Meter Special Markings

DRAWING No. 05014-220

Model 210

The World Leader in Precision Thermal Flow Metering

- Unobstructed flow path
- No moving parts
- High precision
- Little to no maintenance
- Usually zero pressure drop
- Chemical compatibility
- Amazingly low flow rates
- Class 1, Div 1 Grps B,C,D Rated

The Model 210 flow meter uses Intek's patented thermal sensing technique to precisely measure most any liquid or gas. The Model 210 flow meter can measure liquid flow rates down to 1gal/yr (3.5 l/yr) and gas flow rates as low as 0.0009 SCFM with 1% of reading accuracy. With its standard straight through design users have little to worry about when it comes to maintenance or pressure drop. This has made Rheotherm flow meters the meter of choice in several aerospace applications for NASA and the International Space Station.

The Model 210 has the ability to communicate with a hand held control device. It also has infrared controls on the local display. Both the hand held device and infrared controls allows users to change readings and calibrate the instrument without compromising the explosion proof rating.



RHEOTHERM[®]
FLOW INSTRUMENTS

As with all Rheotherm flow meters virtually any gas or liquid can be measured by simply choosing the flow tube material that best fits the application. The Model 210 flow meter boasts the following features:

- CE certification
- One piece design
- Multiple fluid calibrations
- Temperature compensated
- Custom construction and calibration
- No moving parts, can not be over-ranged
- High temperature range, can be steam cleaned
- Remote analog outputs and/or local digital display
- Variety of fittings and cleaning options make it suitable for hospital, food, pharmaceutical uses
- Has a standard reading range of 10:1; 100:1, or greater can be easily met.

Technology Leader

The product described on this sheet is but one of many solutions we have developed to solve your unique flow measurement challenge. From high pressure to low vacuum we should have a solution for you. Please call with any flow measurement or switching requirement to find out what we can do for you.

Models Offered

114 - Standard linear flow meter calibrated for 10:1 standard, up to 100:1 with extended range.

200 - Microprocessor based flow meter with standard display and switch points; calibrated for 10:1 standard, up to 100:1 with extended range.

RheoVac DR - Multi sensor instrument for flow measurements under vacuum conditions

100 - Non-linear output. Low cost solution to low flow requirements. Calibrated for 10:1 standard, up to 100:1 with extended range.

100CS - Single point field adjustable flow switch.

500 - Single point field adjustable flow switch for OEM applications, UL rated.

400 - Dual point switch and/or non-linear flow meter.

Specifications

Output:

4-20 mA linear
2x20 character LCD (opt)
0-10 Vdc (opt)

Enclosure:

Cast aluminum (NEMA 4)
Explosion Proof (opt)

Power supply:

24 Vdc

Response time:

1 second

Time constant:

4 to 6 seconds for 63% of change
Faster optional

Pressure drop:

Depends on flow tube size

Temperature Range:

Electronics: -40-140°F
Fluid (TU): -40-250°F
Fluid (probe): -40-400°F

Accuracy:

1% of reading (10:1 turndown)

Repeatability:

0.5% of reading

Flow rate turndown ratio:

10:1 standard
100:1 optional



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