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Installation and Operating Instructions

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Auto Calibration or Manual Calibration Selectable

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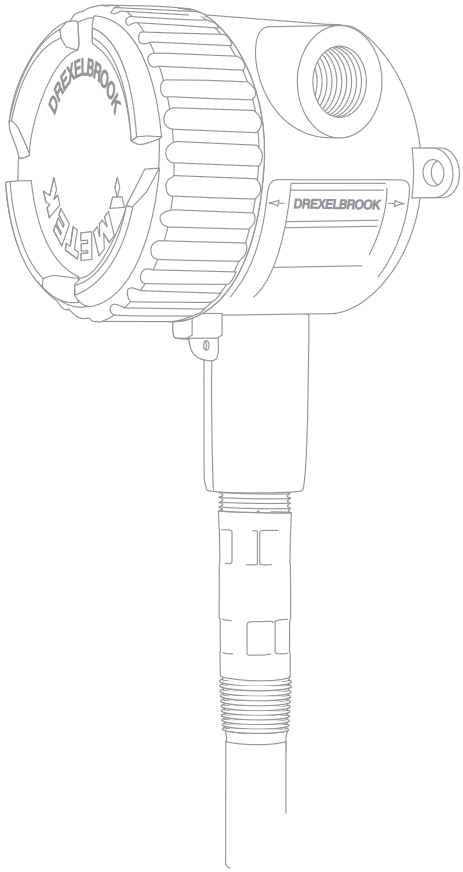

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Shortening or Lengthening Sensing Element A1

CE Installation Supplement A2

Section 1

Section 1: Introduction

1.1 System Description

The AMETEK Drexelbrook ThePoint™ Series uses No-Cal™ technology to detect the presence or absence of material without calibration or initiation via setpoint adjustments, push-buttons or magnets.

NOTICE

Material to be measured must be below sensor when power is applied.

Installation is simple and easy. Simply apply power and ThePoint system is ready to detect the presence or absence of material. Since ThePoint instrument does not require calibration or setpoint adjustments, it is capable of operating in non-dedicated tanks regardless of the material being measured.

1.2 Technology

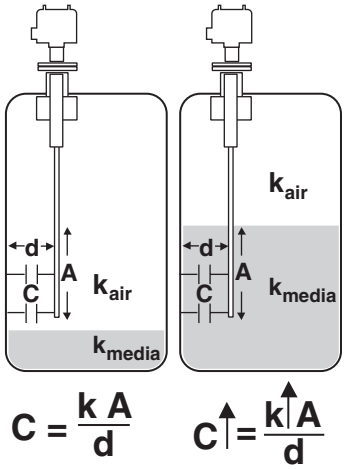


Figure 1-1 Simple Capacitance Probe (Insulating Media)

In a simple capacitance probe type sensing element, when the level rises and material covers the probe, the capacitance within the circuit between the probe and the media (conductive applications) or the probe and the vessel wall (insulating applications) increases. This is due to the dielectric constant (k) of the material, which causes a bridge imbalance. The signal is demodulated (rectified), amplified and the output is increased. There are drawbacks, however, especially when there is coating of the probe.

An RF Admittance level transmitter is the next generation. Although similar to the capacitance concept, ThePoint employs a radio frequency signal and adds the Cote-Shield™ circuitry within the Electronics Unit.

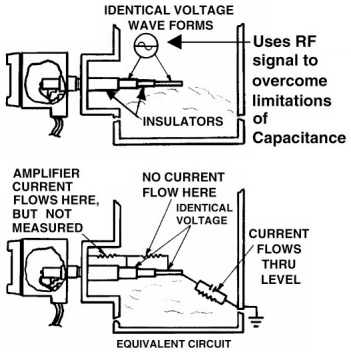


Figure 1-2 RF Admittance Probe with Cote-Shield

This patented Cote-Shield™ circuitry is designed into ThePoint series and enables the instrument to ignore the effect of buildup or material coating on the sensing element. The sensing element is mounted in the vessel and provides a change in RF admittance indicating presence or absence of material. The Cote-ShieldTM element of the sensor prevents the transmission of RF current through the coating on the sensing element. The only path to ground available for the RF current is through the material being measured.

The result is an accurate measurement regardless of the amount of coating on the probe, making it by far the most versatile technology, good for very wide range conditions from cryogenics to high temperature, from vacuum to 10,000 psi pressure, and works with all types of materials.

1.3 Model Number

Technology

P RF Admittance

Measurement Type

N	Std Auto Cal	**H**	Hi Sense .5 pF Auto Cal
L	Std 2 pF Fixed	**P**	Hi Sense .5 pF Fixed
T	10 pF Auto Cal	**G**	Hi Sense Manual
V	10 pF Fixed	**M**	Std Sense Manual

NOTICE

All Calibration modes are built into the standard unit. Modes can be changed in the field as required (See Section 2.9.9)

Input

L Universal Power Supply 19-250 VAC, 18-200 VDC

Output

1 One DPDT Relay, dry contacts, 5A, 120VAC (Min 100 mA / 12 VDC)

2 One DPDT Relay, gold plated contacts (Max 200 mA / 12 VDC)

Housing

0 No Approvals(Remote), NEMA 4X/IP66, M20 X 1.5 conduit entries

1 No Approvals, NEMA 4X/IP66, ¾" conduit entries

2 ATEX / IECEx (IECEx Remote only), NEMA 4X/IP66, M20 X 1.5 conduit entries

3 FM / FMc approved, NEMA 4X/IP66, ¾" conduit entries

5 No Approvals, NEMA 4X/IP66, M20 conduit entries, Dual Seal, Perm-a-Seal Sensors – only

6 FM / FMc approved (Integral), No Approvals (Remote), NEMA 4X/IP66, ¾" conduit entries, Dual Seal, Perm-a-Seal Sensors – only

7 FM / FMc approved (Remote), NEMA 4X/IP66, ¾" conduit entries, Dual Seal, Perm-a-Seal Sensors – only

8 No Approvals (Integral), NEMA 4X/IP66, ¾" conduit entries, Dual Seal, Perm-a-Seal Sensors – only

9 FM / FMc approved (Integral), No Approvals (Remote), NEMA 4X/IP66, M20 conduit entries, Dual Seal, Perm-a-Seal Sensors – only

A No Approvals (Remote), NEMA 4X/IP66, ¾" conduit entries, Dual Seal,Perm-a-Seal Sensors – only

B FM / FMc approved (Remote), NEMA 4X/IP66, ¾" conduit entries, Dual Seal, Perm-a-Seal Sensors – only

Electronics

0	Integral	**7**	Rmt. w/ (25 ft.) Tri-Ax Cable	**E**	Rmt. w/ (75 ft.) 1st 10ft Hi-Temp. Cbl.
1	Remote, no cable	**8**	Rmt. w/ (50 ft.) Tri-Ax Cable	**F**	Rmt. w/ (5 ft.) G.P. Cable
2	Rmt. w/ 3 m (10 ft.) G.P. cable	**9**	Rmt. w/ (75 ft.) Tri-Ax Cable	**G**	Rmt. w/ (5 ft.) Tri-Ax Cable
3	Rmt. w/ 7.6 m (25 ft.) G.P. cable	**A**	Rmt. w/ (10 ft.) Hi-Temp. Cable	**H**	Rmt. w/ (10 ft.) Tri-Ax Cable
4	Rmt. w/ 10.6 m (35 ft.) G.P. cable	**B**	Rmt. w/ (25 ft.) 1st 10ft Hi-Temp. Cbl.	**J**	Rmt. w/ (35 ft.) Tri-Ax Cable
5	Rmt. w/ 15.2 m (50 ft.) G.P. cable	**C**	Rmt. w/ (35 ft.) 1st 10ft Hi-Temp. Cbl.	**K**	Rmt. w/ (5 ft.) Hi-Temp. Cable
6	Rmt. w/ 23 m (75 ft.) G.P. cable	**D**	Rmt. w/ (50 ft.) 1st 10ft Hi-Temp. Cbl.		

Sensing Element

	Application	Sensing Element	Pressure/Temperature	Wetted Parts
00	General purpose	700-1202-001 remote 700-1202-021 integral	13.8 bar @ 232°C (200 PSI @ 450°F)	316SS and PEEK
01	Floating roof with cable attachment and brass bottom weight	700-1202-012 remote 700-1202-022 integral	13.8 bar @ 232°C (200 PSI @ 450°F)	316SS, Brass, and PEEK
02	General purpose, longer insertion lengths with cable attachment and 316SS bottom weight	700-1202-014 remote 700-1202-024 integral	13.8 bar @ 232°C (200 PSI @ 450°F)	316SS and PEEK
03	Proximity	700-1202-018 remote 700-1202-028 integral	13.8 bar @ 232°C (200 PSI @ 450°F)	316SS and PEEK with 76 mm (3) 316SS proximity plate
04	General purpose, high temperature and pressure	700-1202-041 remote 700-1202-042 integral	69 bar @ 121°C (1000 PSI @ 250°F) 20.7 bar @ 232°C (300 PSI @ 450°F)	316SS and PEEK
06	General purpose with FDA approved materials of construction	700-1202-031 remote 700-1202-032 integral	13.8 bar @ 232°C (200 PSI @ 450°F)	316SS and FDA grade PEEK
07	General purpose Granular materials	700-1202-010 remote 700-1202-020 integral	13.8 bar @ 232°C (200 PSI @ 450°F)	316SS and PEEK with 7/8 inch dia. 316SS collar
09	General purpose Granular materials with FDA approved materials of construction	700-1202-033 remote 700-1202-034 integral	13.8 bar @ 232°C (200 PSI @ 450°F)	316SS and FDA grade PEEK with 7/8 inch dia. 316SS collar
10	Corrosive liquids (2)(4)(9)	700-0001-018 remote	3.4 bar @ 149°C (50 PSI @ 300°F)	PFA
11	General purpose, TFE compatibility required	700-0201-005 int/rem	69 bar @ 38°C (1000 PSI @ 100°F) 34.5 bar @ 149°C (500psi @ 300°F)	316SS and TFE
12	Corrosive material, higher pressure	700-0201-005 int/rem Hastelloy C	69 bar @ 38°C (1000 PSI @ 100°F) 34.5 bar @ 149°C (500psi @ 300°F)	Hastelloy C and TFE
14	General Purpose, low pressure	700-0202-002 int/rem	3.4 bar @ 149°C (50 PSI @ 300°F)	316SS and TFE
15	Heavy duty, agitated tanks or material with high bulk density (1)	700-0202-043 remote	69 bar @ 38°C (1000 PSI @ 100°F) 34.5 bar @ 149°C (500psi @ 300°F)	316SS and TFE
16	High Integrity Seal for Hazardous Materials	700-0002-360 int/rem	34.5 bar @ 149°C (500 PSI @ 300°F)	PFA
18	Corrosive material, higher pressure with waterlike viscosity (4)	700-0001-022 int/rem	69 bar @ 38°C (1000 PSI @ 100°F) 34.5 bar @ 149°C (500 PSI @ 300°F)	TFE
19	Interface Measurement	700-0002-023 int/rem	69 bar @ 38°C (1000 PSI @ 100°F) 34.5 bar @ 149°C (500 PSI @ 300°F)	316SS and TFE
20	Miniature Pilot Plant Sensor (1)(7)	700-0209-002 remote	6.9 bar @ 121°C (100 PSI @ 250°F) 0 bar @ 232°C (0 PSI @ 450°F)	316 SS and TFE

Continued on Next Page

1.3 Model Number (continued)

Continued from Previous Page

Fly Ash Precipitators, Baghouse, and Economizers (1) (6)

	Application	Sensing Element	Pressure/Temperature	Wetted Parts
31	No hopper Installation	700-0029-001 remote	0.1 bar @ 260°C (2 PSI @ 500°F)	316SS and TFE
32	Hopper Installation up to 200mm (8 inches)	700-0029-002 remote	0.1 bar @ 260°C (2 PSI @ 500°F)	316SS and TFE
33	Hopper Installation up to 406mm (16 inches)	700-0029-003 remote	0.1 bar @ 260°C (2 PSI @ 500°F)	316SS and TFE
34	Hopper Instalation up to 521mm (20.5 inches)	700-0029-004 remote	0.1 bar @ 260°C (2 PSI @ 500°F)	316SS and TFE
35	Hopper Installation up to 635mm (25 inches)	700-0029-005 remote	0.1 bar @ 260°C (2 PSI @ 500°F)	316SS and TFE

Plugged Chute Detection (1) (5)

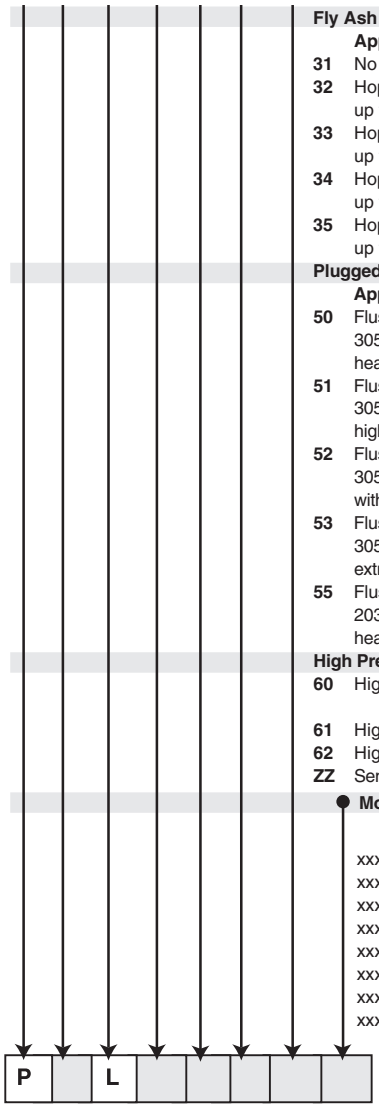
	Application	Sensing Element	Pressure/Temperature	Wetted Parts
50	Flush Mount Sensor 305mm^2 (12 inches^2) heavy duty	700-0207-001 remote	0.1 bar @ 82°C (1 PSI @ 180°F)	304 SS and Polyurethane
51	Flush Mount Sensor 305mm^2 (12 inches^2) higher temperature	700-0207-002 remote	0.1 bar @ 149°C (1 PSI @ 300°F)	304 SS and TFE
52	Flush Mount Sensor 305mm^2 (12 inches^2) with curved radius 153, 229, 305 mm (6, 9, or 12 inches)	700-0207-003 remote	0.1 bar @ 82°C (1 PSI @ 180°F)	304 SS and Neoprene
53	Flush Mount Sensor 305mm^2 (12 inches^2) extra heavy duty	700-0207-004 remote	0.1 bar @ 82°C (1 PSI @ 180°F)	410 SS and UHMW Polyethylene
55	Flush Mount Sensor 203mm^2 (8 inches^2) heavy duty	700-0207-006 remote	0.1 bar @ 82°C (1 PSI @ 180°F)	304 SS and Polyurethane

High Pressure / High Temperature

60	High Pressure & Temp.	700-0204-038 remote	137.9 bar @ 93°C (2000 PSI @ 200°F) 68.9 bar @ 260°C (1000 PSI @ 500°F)	316SS and Ceramic
61	High Temperature	700-0204-002 remote	0 bar @ 816°C (0 PSI @ 1500°F)	316SS and Ceramic
62	High Pressure & Temp.	700-0204-048 remote	275.8 bar @316°C (4000 PSI @ 600°F)	316SS
ZZ	Sensing Element **Not Listed**			

Mounting Type (See separate Mounting Chart for first three digits)

	IL	CSL		IL	CSL
xxx1	457 mm (18")	152 mm (6")	xxxG	457 mm (18")	0 mm (0")
xxx2	305 mm (12")	152 mm (6")	xxxH	914 mm (36")	254 mm (10")
xxxA	152 mm (6")	51 mm (2")	xxxJ	914 mm (36")	0 mm (0")
xxxB	305 mm (12")	51 mm (2")	xxxK	1219 mm (48")	254 mm (10")
xxxC	305 mm (12")	89 mm (3.5")	xxxL	1524 mm (60")	254 mm (10")
xxxD	457 mm (18")	51 mm (2")	P00X	IL/CSL Other	
xxxE	457 mm (18")	89 mm (3.5")	A1BX	IL/CSL factory set for Fly Ash	
xxxF	457 mm (18")	254 mm (10")	xxxZ	Other	



Not all mounting options available with all sensing elements

Notes: CSL (Cote-Shield Length) should extend through Nozzle + Typical "Wall Buildup" + 2 Inches

(1) Available with remote electronics only
(2) Use A1P mounting option
(3) Choose only sanitary mounting options
(4) Available with 0-inch CSL only
(5) Use P00X mounting option
(6) Use A1B mounting option
(7) Use A8B mounting option (¼-inch NPT)
(8) Choose from flange mounting only
(9) FM approved with remote electronics only

NPT Threads

A1B	¾"NPT	316SS		**A2B**	1"NPT	316SS	
A1C	¾"NPT	Hastelloy C		**A2C**	1"NPT	Hastelloy C	
A1P	¾"NPT	PFA					

DIN Flanges

E01	25 mm	16 bar	RF 316/316L SS		**E02**	25 mm	16 bar	RF CS
EP1	25 mm	40 bar	RF 316/316L SS		**EP2**	25 mm	40 bar	RF CS
EQ1	50 mm	16 bar	RF 316/316L SS		**EQ2**	50 mm	16 bar	RF CS
ER1	50 mm	40 bar	RF 316/316L SS		**ER2**	50 mm	40 bar	RF CS
ES1	80 mm	16 bar	RF 316/316L SS		**ES2**	80 mm	16 bar	RF CS
ET1	80 mm	40 bar	RF 316/316L SS		**ET2**	80 mm	40 bar	RF CS
EU1	100 mm	16 bar	RF 316/316L SS		**EU2**	100 mm	16 bar	RF CS
EV1	100 mm	40 bar	RF 316/316L SS		**EV2**	100 mm	40 bar	RF CS
EW1	150 mm	16 bar	RF 316/316L SS		**EW2**	150 mm	16 bar	RF CS
EX1	150 mm	40 bar	RF 316/316L SS		**EX2**	150 mm	40 bar	RF CS

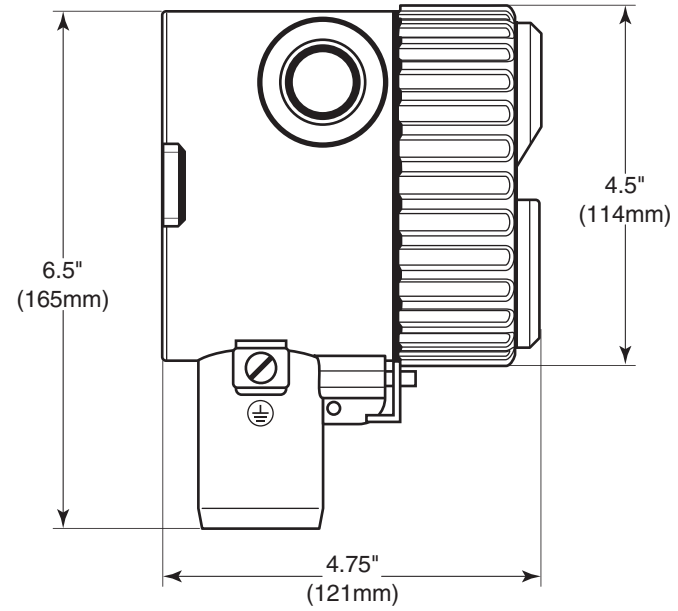
Sanitary TriClamps

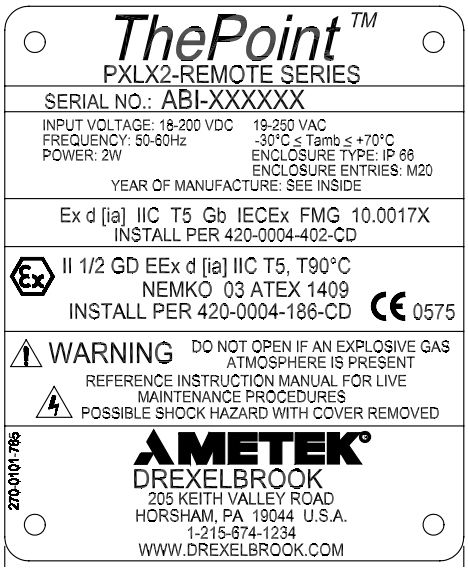
C2B	1"TriClamp	316SS		**C4B**	2"TriClamp	316SS
C3B	1½"TriClamp	316SS				

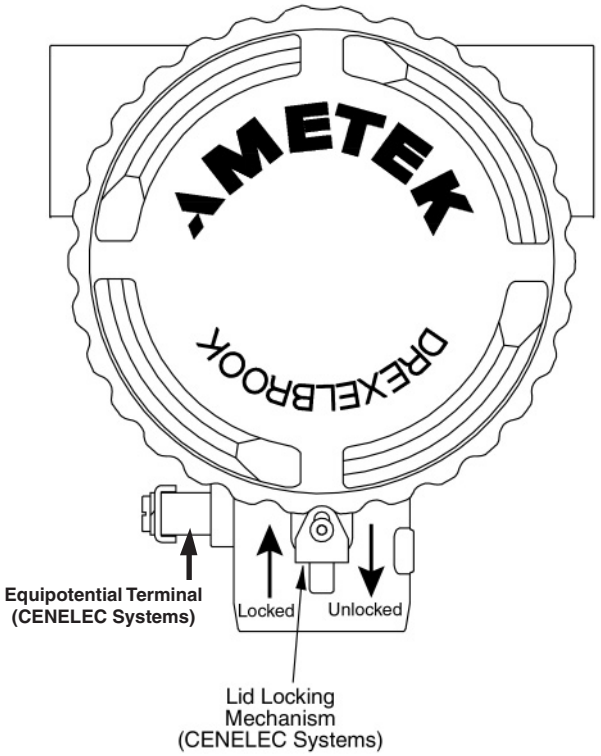
ANSI Flanges

DA1	1"	150#	RF 316/316L SS		**DA2**	1"	150#	RF CS
DB1	1½"	150#	RF 316/316L SS		**DB2**	1½"	150#	RF CS
DC1	2"	150#	RF 316/316L SS		**DC2**	2"	150#	RF CS
DD1	2½"	150#	RF 316/316L SS		**DD2**	2½"	150#	RF CS
DE1	1"	300#	RF 316/316L SS		**DE2**	1"	300#	RF CS
DF1	1½"	300#	RF 316/316L SS		**DF2**	1½"	300#	RF CS
DG1	2"	300#	RF 316/316L SS		**DG2**	2"	300#	RF CS
DH1	2½"	300#	RF 316/316L SS		**DH2**	2½"	300#	RF CS
DI1	3"	150#	RF 316/316L SS		**DI2**	3"	150#	RF CS
DJ1	3"	300#	RF 316/316L SS		**DJ2**	3"	300#	RF CS
DK1	4"	150#	RF 316/316L SS		**DK2**	4"	150#	RF CS
DL1	4"	300#	RF 316/316L SS		**DL2**	4"	300#	RF CS
DM1	6"	150#	RF 316/316L SS		**DM2**	6"	150#	RF CS
DN1	6"	300#	RF 316/316L SS		**DN2**	6"	300#	RF CS

1.4 Housing Dimensions







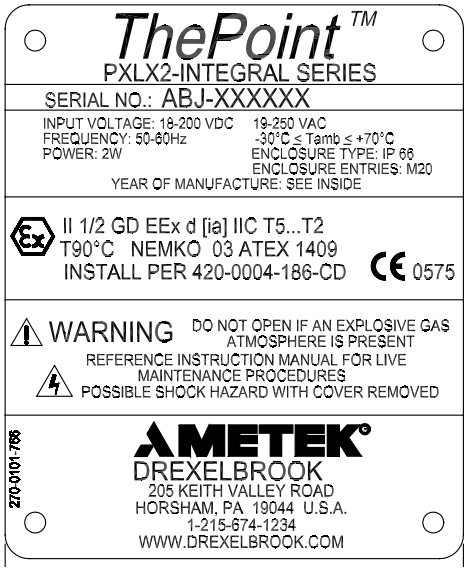


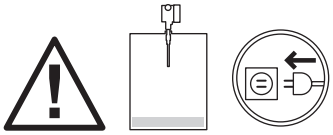
Figure 1-3
Compartment Housing Detail

Section 2: Installation

2.1 Unpacking

Carefully remove the contents of the shipping carton and check each item against the packing list before destroying any packing material. If there is any shortage or damage, immediately report it to the factory at 1-800-527-6297 (US and Canada or + 215-674-1234 (International).

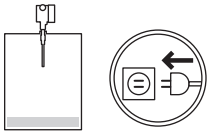
2.2 Mounting and Installation Guidelines



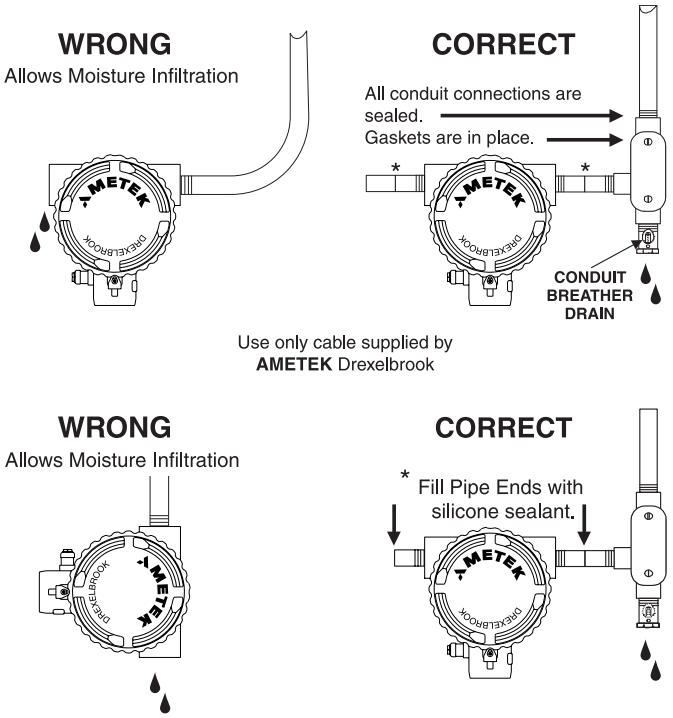
CAUTION:
ThePoint instrument must not be powered before it is installed in the application with material below the sensing element.

ThePoint instrument can be mounted vertically or horizontally or at an angle. Mounting location should be as free as possible from vibration, corrosive atmospheres, and any possibility of mechanical damage. Ambient temperatures at electronics should be between -30 to 70º C (-22 to 158º F).

NOTE:
To reduce possibility of damage caused by water in conduit, install drip loop and breather drain in conduit to purge any accumulating moisture as shown in Figure 2-1.



After system is installed and level is below sensing element, apply power. ThePoint series instrument does not require any calibration or setpoint adjustments and is ready to detect change in level.



If properly installed, the green LED will light when power is applied. Neither the green nor red LED should be flashing. If either of the LEDs are flashing, refer to, ***Section 4, Troubleshooting.***

Cable fittings supplied are weather-resistant. They are NOT certified as explosion proof (XP) or flameproof (d) unless they are specifically marked.

Figure 2-1
Recommended Conduit Connection

2.2 Mounting and Installation Guidelines (continued)

WARNING:
ThePoint equipment is rated explosion proof. When installing in explosion hazardous areas [rated "potentially hazardous" (EU) or "hazardous classified" (USA)] observe all national and local regulations as well as specifications in the certificate.

Mount sensing element using the following installation guidelines. ***Refer to Figure 2-2.***

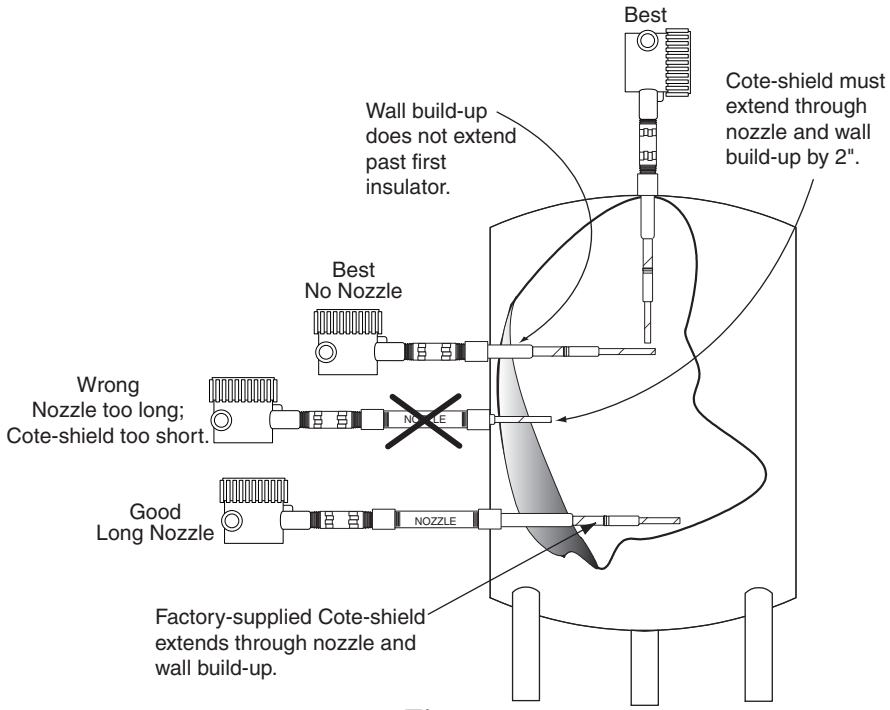


Figure 2-2
Installation Considerations

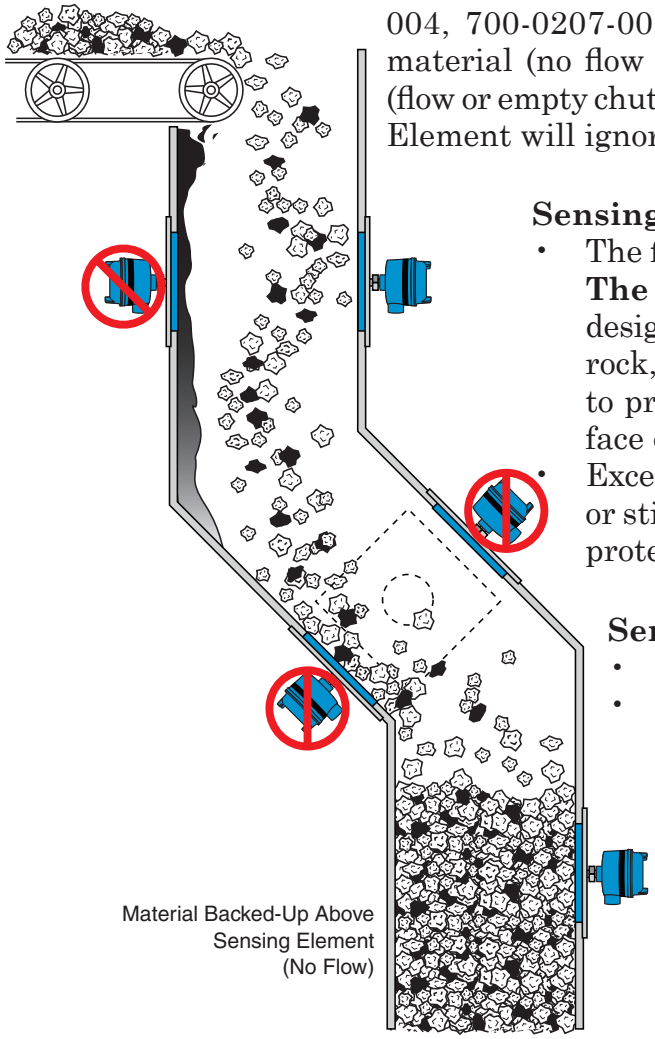
- When installing ThePoint instrument, ambient temperature at electronics must not exceed 70°C (158°F).
- When installing flange-mounted sensing elements, keep mating surfaces and bolts free of paint and corrosion to ensure proper electrical contact with vessel. Avoid using excessive amounts of Teflon™ tape when installing threaded sensing elements.
- Install systems with threaded NPT connection via wrench flats on the process connection ONLY.
- Locate sensing element to avoid enhancing electrostatic discharge from process medium, as is good practice with any thermowell, displacer, or sampler. This includes correct bonding to tank or silo wall.
- If installation area is rated explosion proof and requires conduit seal fittings, they should be used in accordance with company standards and local codes.

2.2 Mounting and Installation Guidelines (continued)

- Do not mount a Cote-Shield sensing element through a nozzle that exceeds length of first insulator.
- Ensure that there are no obstructions or agitator blades to interfere with sensing element.
- Rigid sensing elements can be mounted at any angle.

2.3 Installation of Flush-Mounted Sensing Elements

These instructions apply to all flush on/off sensing elements, models 700-0207-001, 700-0207-002, 700-0207-003, 700-0207-004, 700-0207-006. These systems will sense presence of material (no flow or plugged chute) and absence of material (flow or empty chute) at the sensing element. The Flush Sensing Element will ignore free falling material.



Sensing Element at the Top of a Chute.

- The flush sensing element should be mounted **In The Flow Stream**. These sensing elements are designed and built to withstand the impact of coal, rock, wood, chips, etc. This location is important to prevent excessive build up of material on the face of the sensing element.
- Excessive build up, typically consisting of wet and/or sticky fines, can occur if the sensing element is protected from falling material.

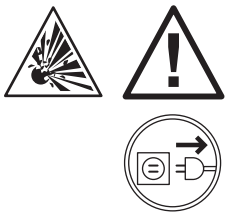
Sensing Element in an angle chute.

- Do not mount on the top or bottom.
- Best mounted on either side

Sensing Element at the Bottom

- Mount on any side.
- Low-Level sensors can be used to detect a plug or to insure that a seal is present (chute is full at this point).

2.4 Input Wiring



WARNING:
If ThePoint instrument is located in a hazardous environment, do not open enclosure cover or make/break any electrical connections without first disconnecting electrical power at the source. Ensure that wiring, electrical fittings and conduit connections conform to electrical codes for the specific location and hazard level.

ThePoint instrument uses a universal power supply and can be operated from any source between 19 to 250 VAC or 18 to 200 VDC. The universal power supply automatically detects input voltage regardless of polarity and does not require jumper changes. ***See Figure 2-3.***

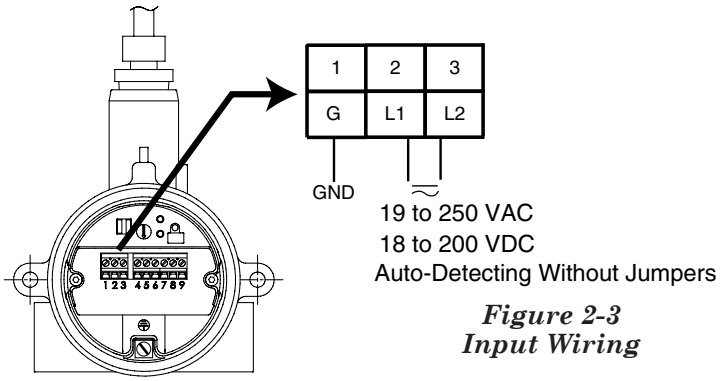


Figure 2-3
Input Wiring

IMPORTANT
Ground Must be Provided for Proper Operation and Safety.

2.5 Output Wiring – Relay Version

ThePoint series instrument is supplied with two sets of contacts using one 5A DPDT alarm relay. ***See Figure 2-4.***

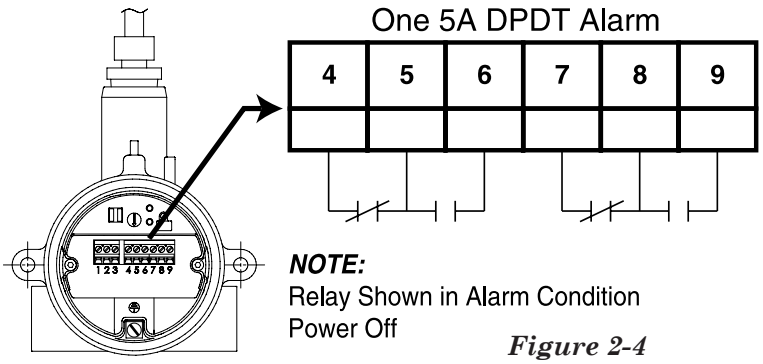


Figure 2-4
Relay Wiring

2.6 Output and LED Status

There are two status LEDs located on top of Electronic Unit. The green LED is used to indicate that unit has power. The red LED is used to indicate condition of the relay. ***See Figure 2-6.***

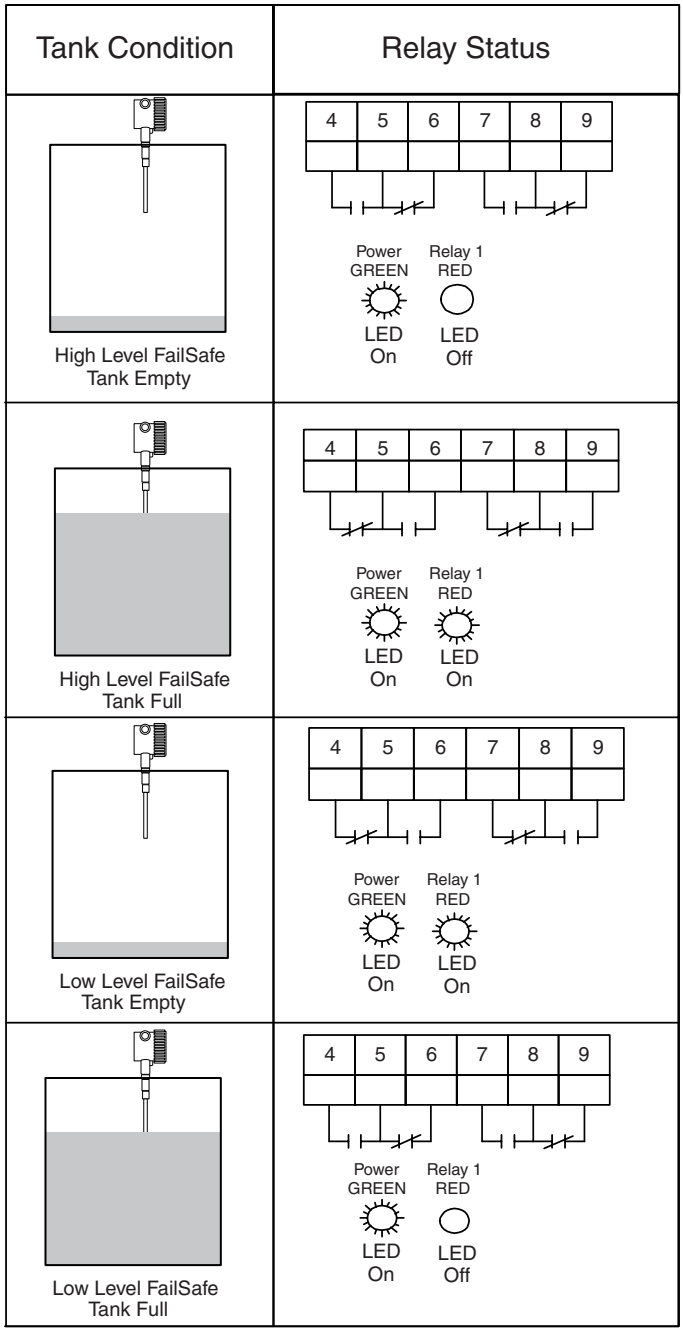


Figure 2-5
Output and LED Status
Note: Relays Shown as Powered State

2.7 Electronic Unit

Remove housing lid to access status LEDs, time delay adjustment, and configuration jumpers. ***See Figure 2-6.***

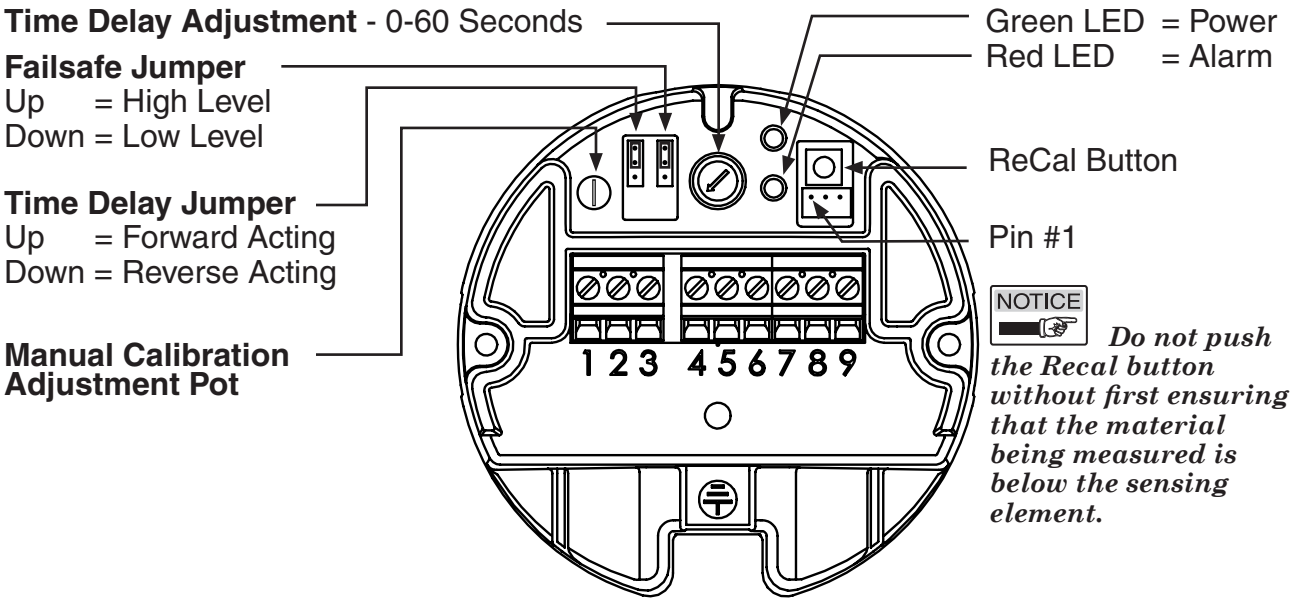


Figure 2-6
Electronic Unit Adjustments

2.7.1 Time Delay

TIME DELAY adjustment is used to avoid an oscillating relay output due to agitation or waves in the vessel. The time delay adjustment can be field adjusted from 0 to 60 seconds. Unit is shipped with time delay setting at zero seconds.

NOTICE

The Time Delay adjustment is a 270-Degree turn pot and is at zero seconds when in the full counter-clockwise position. Do not force the pot past the stop or damage will occur.

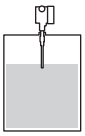
2.7.2 Time Delay Action

TIME DELAY ACTION describes whether the relay contacts are delayed from going into the alarm state or recovering from an alarm state.

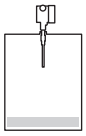
- **FWD:** delays system from coming out of alarm.
- **REV:** delays system from going into alarm.
- The instrument is supplied with time delay action set in forward mode (**FWD**) position.
- Time delay action is field-selectable using the Time Delay Jumper located on top of Electronic Unit. ***See Figure 2-6.***

2.7.3 Failsafe

FAILSAFE describes the level condition that causes the output relay to de-energize, and also the state of the relay upon loss of power.



- **High Level Failsafe (HLFS).** The relay will de-energize when level is high, indicating high level upon loss of power. (N.O. contacts open and N.C. contacts closed)



- **Low Level Failsafe (LLFS).** The relay will de-energize when level is low, indicating low level upon loss of power. (N.O. contacts open and N.C. contacts closed)

- Instrument is supplied with failsafe jumper set in high level (**HLFS**) position.

- Failsafe is field-selectable using the Failsafe Jumper located on top of Electronic Unit. ***See Figure 2-6.***

2.7.4 ReCal Button, Memory Reset

If power has been applied to ThePoint prior to installation (on a test bench) or, if ThePoint is moved from one vessel to another, **RECAL** is necessary. RECAL allows the system's software to capture the air capacitance generated by the sensing element in tank.

Merely press and hold the RECAL button (shown in Figure 2-6) for five (5) seconds. After five seconds, ThePoint's two LED's flash for sixty seconds before the recalibration occurs. (Removing power from the system while the LED's are flashing will reset the memory immediately upon next power up).

Do not push the Recal button without first ensuring that the material being measured is below the sensing element.

The system is now ready for installation.

2.8 Spark Protection

Applications involving insulating granulars and insulating liquids may produce a static discharge that can damage the electronics. The RF series instrument is supplied with integral heavy-duty spark protection to prevent static discharges from damaging the electronic circuits.

2.9 Sensing Element Connection

Sensing element connects to the rear side of the circuit board and is factory-installed.

NOTICE

The sensing element is sealed to the housing and cannot be removed without permanent damage.

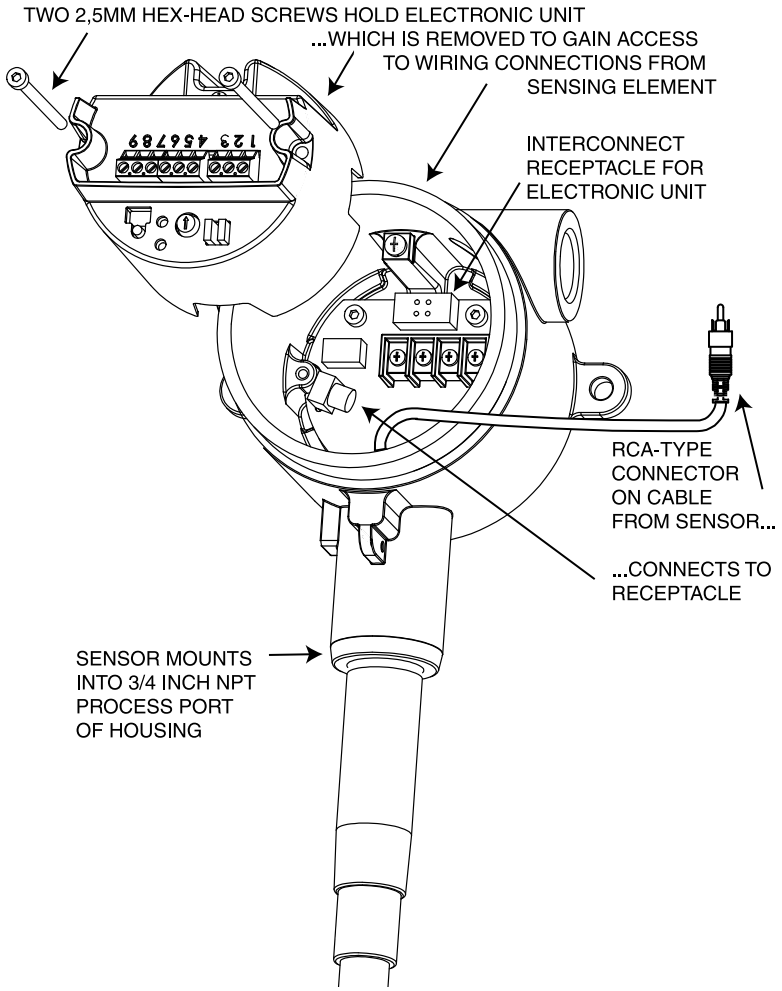


Figure 2-7
Sensing Element Connection
(Integral Housing)

2.9 Sensing Element Connection (continued)

For ThePoint instruments mounted remotely from sensing element, cable connections from sensing element to Electronic Unit are made to terminals beneath the Electronic Unit. ***See Figure 2-8.***

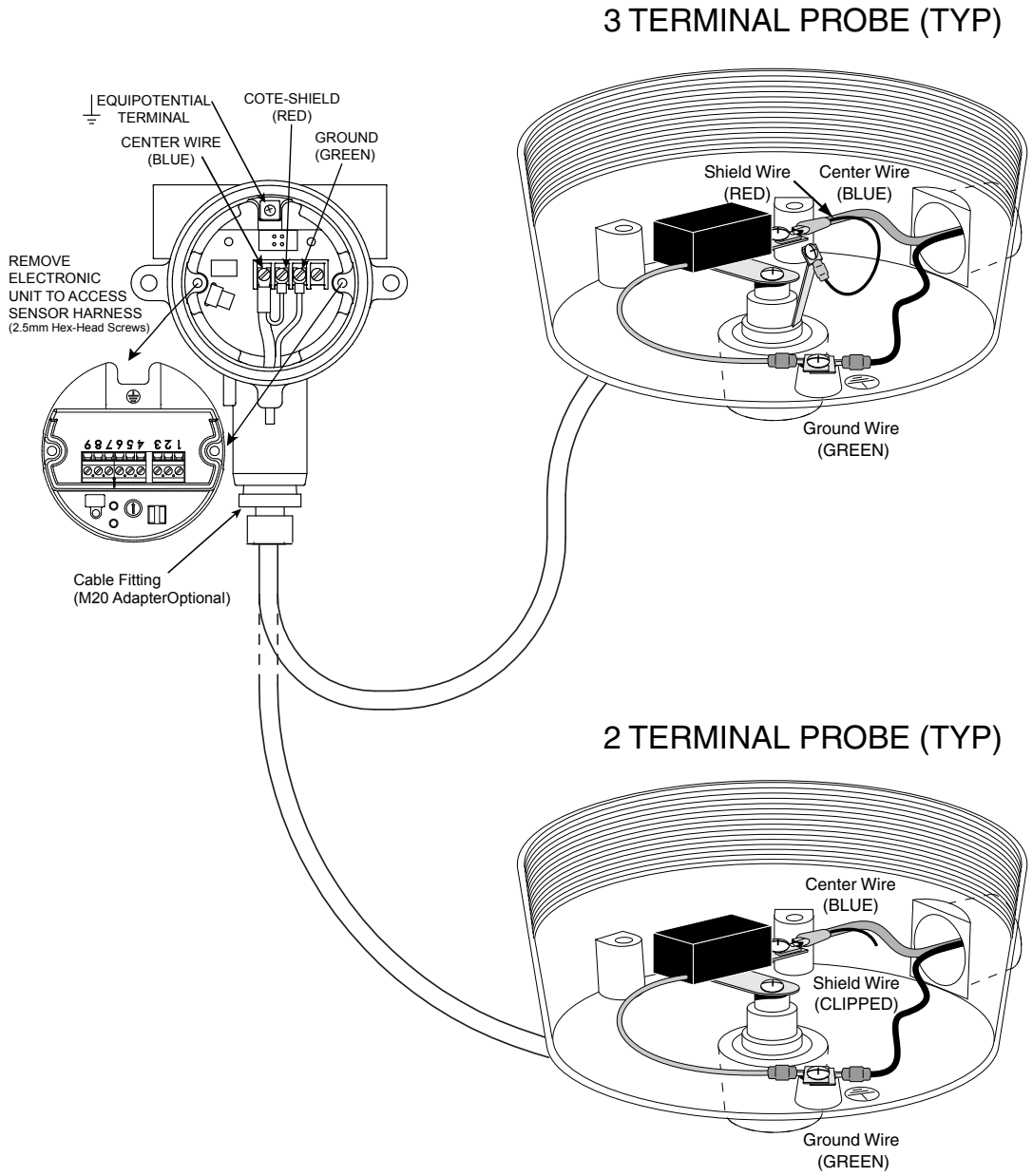


Figure 2-8
Sensing Element Connection
(Remote Housing)

2.10 Calibration

ThePoint™ level measurement switch features both Auto-Cal and manual calibration. The standard Auto-Calibration mode is applicable to most liquid and slurry point level measurements. If preferred, the manual calibration can be used and is recommended for some application. ThePoint electronic unit has auto and manual calibration modes built into the standard unit and can be accessed through a simple routine (see section 2.10.4). The inclusion of these calibration modes allows the Drexelbrook RF Point Level Products application flexibility that is far greater then any other point level product on the market. This RF Point Level switch can be used in Liquids, Solids, Slurries, and Interface applications.

2.10.1 Selecting the Calibration Mode for your application.

The following table is a list of measurement types and the recommended calibration mode for each of these applications. ThePoint has eight calibration modes however; only four are used on the majority of applications.

ThePoint will be shipped in the standard Auto-Cal mode #2 unless pre-ordered in a specific mode. To determine if the ThePoint has been shipped in a mode other than #2, look at the label on the inside of the unit housing. The model number will start with P**X**L1. The "**X**" indicates the pre-set mode typically an "L" for mode #2.

Common Calibration Modes

Mode 2 = L - Fixed Cal 2pF: 2pF differential, set point locked 2pF above starting capacitance

Mode 6 = P - Fixed Cal 0.5pF: 0.5pF differential, set point locked 0.5pF above starting capacitance

Mode 7 = M - Manual calibration standard sensitivity – pots adjusts from 0 to 65pF

Mode 8 = G - Manual calibration High sensitivity – pot adjusts from 0 to 27 pF

Additional calibration modes for specialty applications (consult factory)

Mode # 1 = N	Auto Mode 2pF
Mode # 3 = T	Auto Mode 10pF
Mode # 4 = V	Auto Mode 10pF
Mode # 5 = H	Auto Mode 0.5pF

For explanation of mode See Section 2.10.4

2.10.1 Selecting the Calibration Mode for your application (Continued)

Application Guide
(For instructions on how to access alternate modes see 2.10.4)

Application	Calibration Mode
Liquids and Slurries	Auto-Cal Mode #2
Granular /Solids with Bulk Density greater than 20#'s per cubic foot	Manual Cal Mode #7
Granular/Solids with Bulk Density Under 20#'s per cubic foot	Manual Cal Mode #8 (high sensitivity)
Interface Measurement	Manual calibration Mode #7
Plugged Chute Indication for Solids (Bulk density greater than 20 #'s per cubic foot)	Manual calibration Mode #7
Plugged Chute Indication for Solids (Bulk density under 20 #'s per cubic foot)	Manual calibration Mode #8 (high sensitivity)

2.10.2 Using ThePoint with Auto-Calibration mode #2

After ThePoint is installed in the vessel, simply apply power. ThePoint electronic unit will auto calibrate.

Caution
The material being measured must be below the sensing element when power is applied (Sensing element uncovered).

Note:
If power has been applied to ThePoint prior to installation (on a test bench) or, if ThePoint is moved from one vessel to another, **RECAL** is necessary. RECAL allows the system's software to capture the air capacitance generated by the sensing element in tank.

Merely press and hold the RECAL button (shown in Figure 2-6) for five (5) seconds. After five seconds, ThePoint's two LED's flash for sixty seconds before the recalibration occurs. (Removing power from the system while the LED's are flashing will reset the memory immediately upon next power up).

Calibration is complete.

2.10.3 Using ThePoint with Manual Calibration modes #7, and 8

Warning!
Before removing the explosion-proof housing cover in a potentially hazardous area, make certain that the area is safe. When calibration is complete, the cover must be replaced.

Make sure that ThePoint is set to either mode #7 (standard Sensitivity) or mode #8 (high sensitivity).
See section 2.10.4 for mode selection procedure.
Locate the manual calibration pot on the top of ThePoint electronic unit (see figure 2-6).

The adjustment pot located on the top of the unit controls the point at which the relay operates. A red LED indicates that the relay is de-energized.

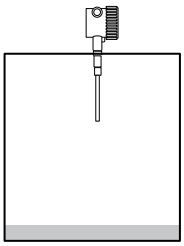
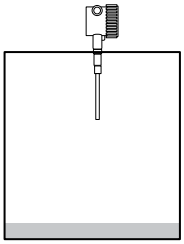
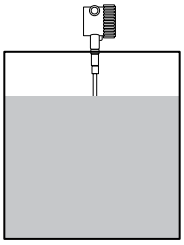
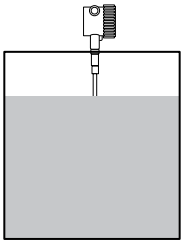
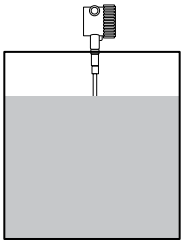
Full range of the pot is 25 turns. Each rotation of the pot changes the operating point by 4pF (Mode #7 standard Sensitivity) or 1pF (mode #8 high sensitivity).

Turning adjustment clockwise will raise level at which relay operates. Turning the adjustment counterclockwise will lower the level at which the relay operates.

Calibration Procedures
For water-based conducting applications using bare metal sensing elements, turn the adjustment point full clockwise. No other adjustment is required.

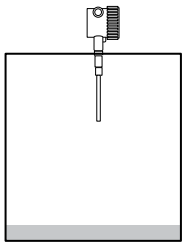
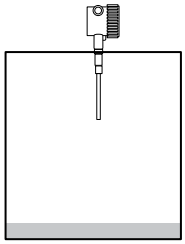
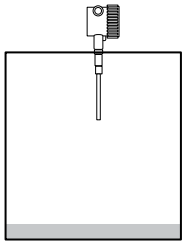
2.10.3 Manual Calibration modes #7, and 8 (Continued)

Manual Calibration
When material level **can** be moved
Make certain that ThePoint is in manual calibration mode #7 or 8 See Section 2.10.4

Configuration Settings	Adjustment Potentiometer	RED LED	Notes	
Fail Safe = High Level Time delay set to zero (full counter clockwise – DO NOT FORCE PAST STOP) Time delay action = either	Turn counter clockwise until RED LED is ON	RED LED ON	Material being measured must be below sensor at least twelve inches	
	Turn clockwise until RED LED just goes OFF	RED LED OFF		
		RED LED will come ON	Raise material level in vessel until sensor is covered	
	Turn clockwise counting the number of turns until the RED LED goes OFF (or 25 turns whichever comes first)	RED LED OFF (Or 25 turns whichever comes first) If red LED is not off, skip next step		
	Turn counter clockwise one half the number of turns counted	RED LED will come ON		
	Calibration is Complete			

2.10.3 Manual Calibration modes #7, and 8 (Continued)

Manual Calibration
When material level **can not** be moved
Make certain that ThePoint is in manual calibration mode #7 or 8 See Section 2.10.4

Configuration Settings	Adjustment Potentiometer	RED LED	Notes	
Fail Safe = High Level Time delay set to zero (full counter clockwise – DO NOT FORCE PAST STOP) Time delay action = either	Turn counter clockwise until RED LED is ON 	RED LED ON 	Material being measured must be below sensor at least twelve inches	
	Turn clockwise until RED LED just goes OFF 	RED LED OFF 		
Turn Adjustment Potentiometer Clockwise the number of turns indicated in the table below for your material type		RED LED OFF 		

Material Being Measured	Mode #7 (Standard Sensitivity)	Mode # 8 (High Sensitivity)
Conductive Materials (Water-Based) see note #1	15 Turns(Note 2)	20 Turns
Insulating Liquids, Organics, Oil, Plastics	1/2 Turn	2 Turns
Granular/Solid materials above 50#/ft3	1/2 Turn	2 Turns
Granular/Solid materials 25-50#/ft3	1/2 Turn	1 Turn
Granular/Solid materials less than 20#/ ft3	Use High Sensitivity Mode #8	3/4 Turn
Moist Granular Plugged Chute Applications using flush mount 700-0207 series sensing element (See Note 3)	1 turn	4 turns
Dry Granular Plugged Chute Applications using flush mount 700-0207 series sensing element	Use High Sensitivity Mode #8	½ turn

Calibration is Complete

2.10.3 Manual Calibration modes #7, and 8 (Continued)

Note 1: Most water based materials can be considered conductive, such as acids, bases, salt solutions, water based slurries, and very wet granular materials. Carbon black and powdered metals conduct even without water.

Note 2: With conducting materials, if heavy build up is anticipated, calibration adjustment can be turned to its clockwise limit.

Note 3: Some Wet Granular materials can be extremely conductive and may require special calibration or different electronic units. If the standard calibration in the table does not provide satisfactory results, please contact the field service department at 1-800-527-6297 (North America) or 215-674-1234 (outside North America)

Nonvolatile Memory

ThePoint has Nonvolatile memory which allows the unit to re-start after power outages without recalibrating.

When ThePoint is powered for the first time the internal microprocessor records and stores the "Air" value. This is the uncovered capacitance value of the sensor mounted in the vessel. ThePoint will also store the last covered value and the last uncovered value.

Whenever ThePoint is powered it uses these values as a reference point to determine its current condition (normal or alarm).

2.10.4 Accessing the Calibration Modes

1. On the top side of ThePoint, temporarily remove the shunt from the "Time Delay Selection Jumper" (see Fig. 2) and place it on pins 1 & 2 of the 3-pin connector. The green LED will go out and the red LED will begin to flash. The number of flashes indicates which mode the unit is in (1 through 8).

2. To switch modes, press and hold the ReCal button next to the 3-pin connector. The unit will cycle through the modes.

   First it will flash the current mode setting, then progress through all of the settings.

   For Example:
   The red LED will flash once indicating mode 1. Then it will flash twice-indicating mode 2. Then mode 3, etc.

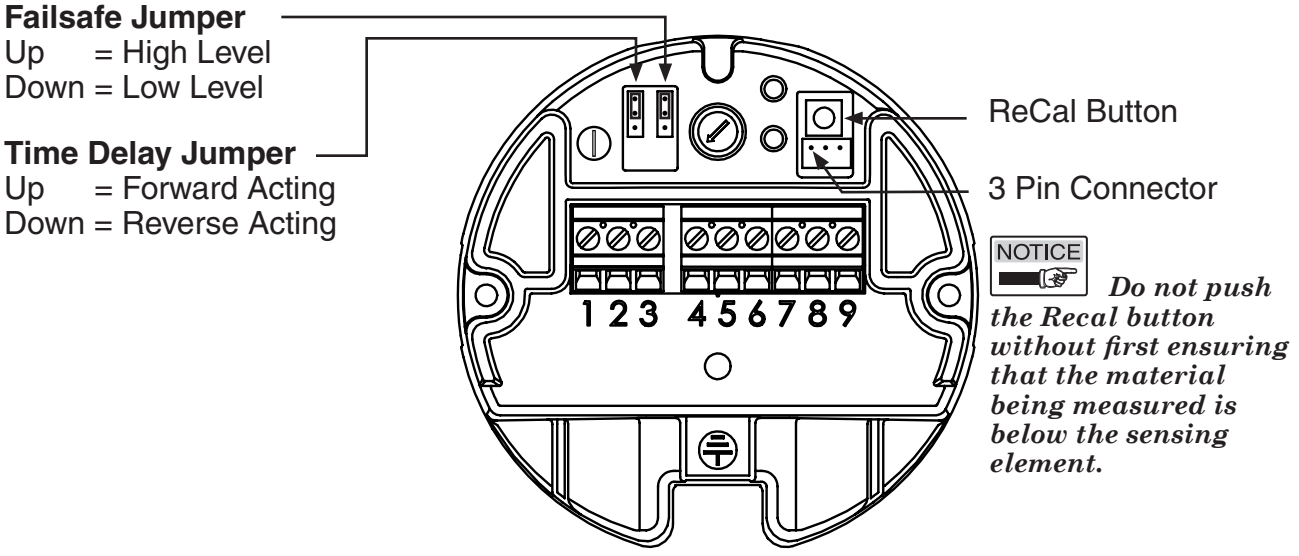
   Release the button when it reaches the desired mode. The red LED will now flash indicating which mode the unit is in.

NOTICE

3. Remove the shunt from pins 1 & 2 on the 3-pin connector and replace the shunt on the "Time Delay Selection Jumper". The unit will remain in the selected mode.

   Write the new mode # on the inside of the lid label for future reference

4. After setting the mode follow procedure in section 2.10.2 for mode 2. For modes 7 and 8, follow the appropriate manual calibration procedure as described in section 2.10.3.



Electronic Unit Adjustments

2.10.4 Accessing the Calibration Modes (Continued)

Code Designation - Definition of Modes

L **Mode 2:** Fixed Cal 2pF: 2pF differential, set point locked 2pF above starting capacitance

M **Mode 7:** Manual calibration standard sensitivity – pots adjusts from 0 to 65pF

G **Mode 8:** Manual calibration High sensitivity – pot adjusts from 0 to 27 pF

P **Mode 6:** Fixed Cal 0.5pF: 0.5pF differential, set point locked 0.5pF above starting capacitance

Code Designation - Other Calibration Modes

N **Mode 1:** Auto-Cal 2pF: 2pF differential, set point varies depending on material

T **Mode 3:** Auto-Cal 10pF: 10pF differential, set point varies depending on material

V **Mode 4:** Fixed Cal 10pF: 10pF differential, set point locked 10pF above starting capacitance

H **Mode 5:** Auto-Cal 0.5pF: 0.5pF differential, set point varies depending on material

Determining the Current Calibration Mode

ThePoint will be shipped in the Auto-Cal mode #2 unless pre-ordered in a specific mode. To determine if the ThePoint has been shipped in a mode other than #2, look at the label on the blue electronic unit. The model number will be 385-0051-012-0X. The "X" indicates the pre-set mode typically a "2" for mode #2

If the Mode has been changed after receiving the unit, the person changing the mode should have made a note of the new mode on the label inside the lid of the housing.

If there is no note on the lid or if there is a question as to what the current mode is, the following procedure can be used:
On the topside of ThePoint, temporarily remove the shunt from the "Time Delay Selection Jumper" (see Fig. 2) and place it on pins 1 & 2 of the 3-pin connector. The green LED will go out and the red LED will begin to flash. The number of flashes indicates which mode the unit is in (1 through 8).

After determining the current mode, replace the shunt on the "Time Delay Selection Jumper".

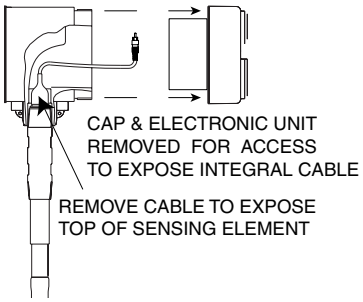
Section 3

Section 3: Troubleshooting

WARNING
If ThePoint instrument is located in a hazardous environment, do not open enclosure cover or make/break any electrical connections without first disconnecting electrical power at the source. Ensure that wiring, electrical fittings and conduit connections conform to electrical codes for the specific location and hazard level.

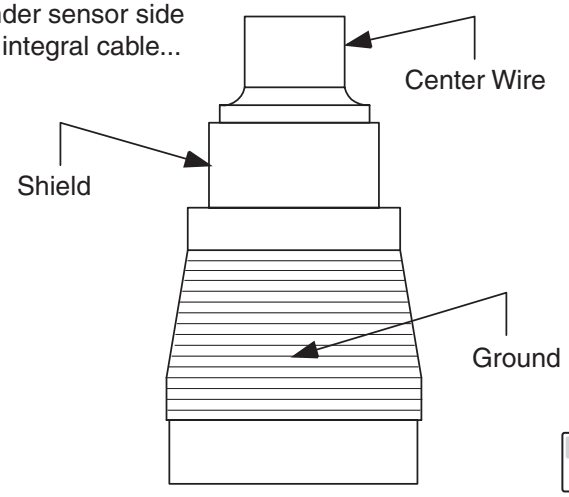
3.1 Testing Sensing Element

To test the sensing element, disconnect the integral cable as discussed in Section 2.9. See Figure 3-1.



Expect the following measurements:

For Three-terminal Probes:
under sensor side
of integral cable...

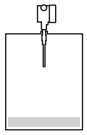


Measured Resistance (Sensor dry and clean):

Center Wire - Ground	∞ Ohms
Center Wire - Shield	∞ Ohms
Shield - Ground	∞ Ohms

Resistance readings must be taken using an analog ohmeter set to Rx1000 scale.

When tank level is known to be below the sensor, minimum acceptable values are:



Center Wire - Ground	1000 Ohms.
Center Wire - Shield	600 Ohms.
Shield - Ground	300 Ohms.

If the readings are less than the minimum acceptable values:

1. **Check** to see if tank is full, or if a severe coating is present.
2. **Clean sensor** and re-measure the sensor resistances.

Note:
NOTICE
Low resistance readings are acceptable if the sensor is covered with a conductive liquid. Also, low resistance readings can be the result of material lodging in a long mounting nozzle. Refer to Figure 2-2.

Note:
NOTICE
A reading of zero (0) Ohms usually indicates a metal-to-metal short circuit. Check for contact with tank wall, mounting nozzle, or other tank structure.

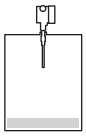
Figure 3-1
Testing Sensing Element

3.2 Testing Electronic Unit

Use the following steps to test the electronic unit:

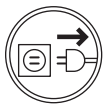
1. Be sure environment is safe before removing lid from housing.

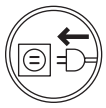
2. Observe **FAILSAFE** jumper on circuit board on top of electronic unit (shown in Figure 2-6). Move jumper from current setting to alternate setting [**HLFS** to **LLFS** or vice versa]. Alarm & relay should change state.



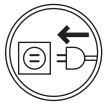
3. If possible to access sensing element with material below sensor, or remove ThePoint from vessel, touch tip of sensor with your finger, while holding any bare metal portion of instrument housing with other hand. Alarm & relay should change state.

4. If ThePoint changes state while moving jumper, but not while touching sensing element, in most cases, integral cable is faulty. ***See Section - 3.6, Testing Integral Cable.***





5. If ThePoint is stuck in one state:
A. Remove power.
B. Disconnect coax cable that joins sensing element to electronic unit. ***See Section - 2.9, Sensing Element Connection.***
C. Apply power.
D. Repeat step 2.
E. If ThePoint changes state with sensing element disconnected, in most cases, sensing element is faulty. ***See Section - 3.1, Testing Sensing Element.***



6. If there was no Change of state in either step 2 or step 3 and unit appears dead:
A. Remove and then reapply power.
B. Press **RESET** (shown in Figure 2-6).
C. Observe the two LEDs flashing for about 60 seconds.
D. Green LED should be lit after 60 seconds.
E. Touch sensing element with your finger.
F. Alarm & relay should change state. If so, circuit board is working properly.
G. Reinstall instrument and press **RESET**.

7. If ThePoint fails all of above tests, in most cases instrument is faulty. Use replacement electronic unit to determine the fault. Consult factory.

3.3 Testing Relay Circuits

Use the following steps to check out the relay circuits:

1. Relay connections consist of a double-pole double-throw (DPDT) relay.

2. The relay contacts are brought out to terminal strips for external switching. ***See Figure 3-2.***

3. Relay operation may generally be heard as an audible click when background noise is not too high. Connect ohmmeter to relay contacts to determine if they are switching.

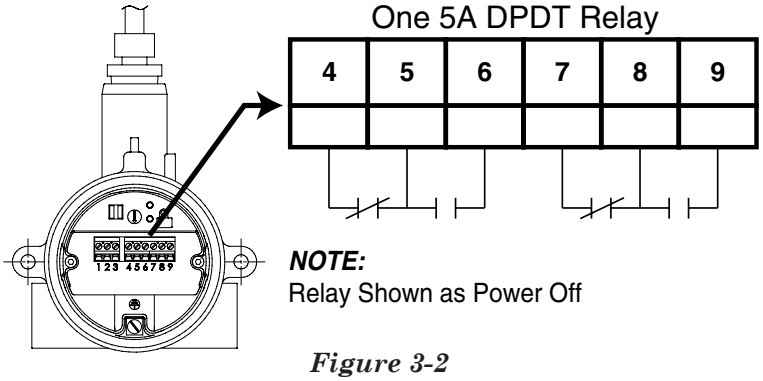


Figure 3-2
Relay Circuit Operation

3.4 Over Range

If the GREEN LED is flashing, the instrument has detected the uncovered sensing element capacitance exceeds the limits of the transmitter. ***Consult factory instructions.***

3.5 Under Range

If the RED LED is flashing, the instrument has detected the sensing element capacitance is too small. ***Consult factory for sensing element capacitor values.***

3.6 Testing Integral Cable

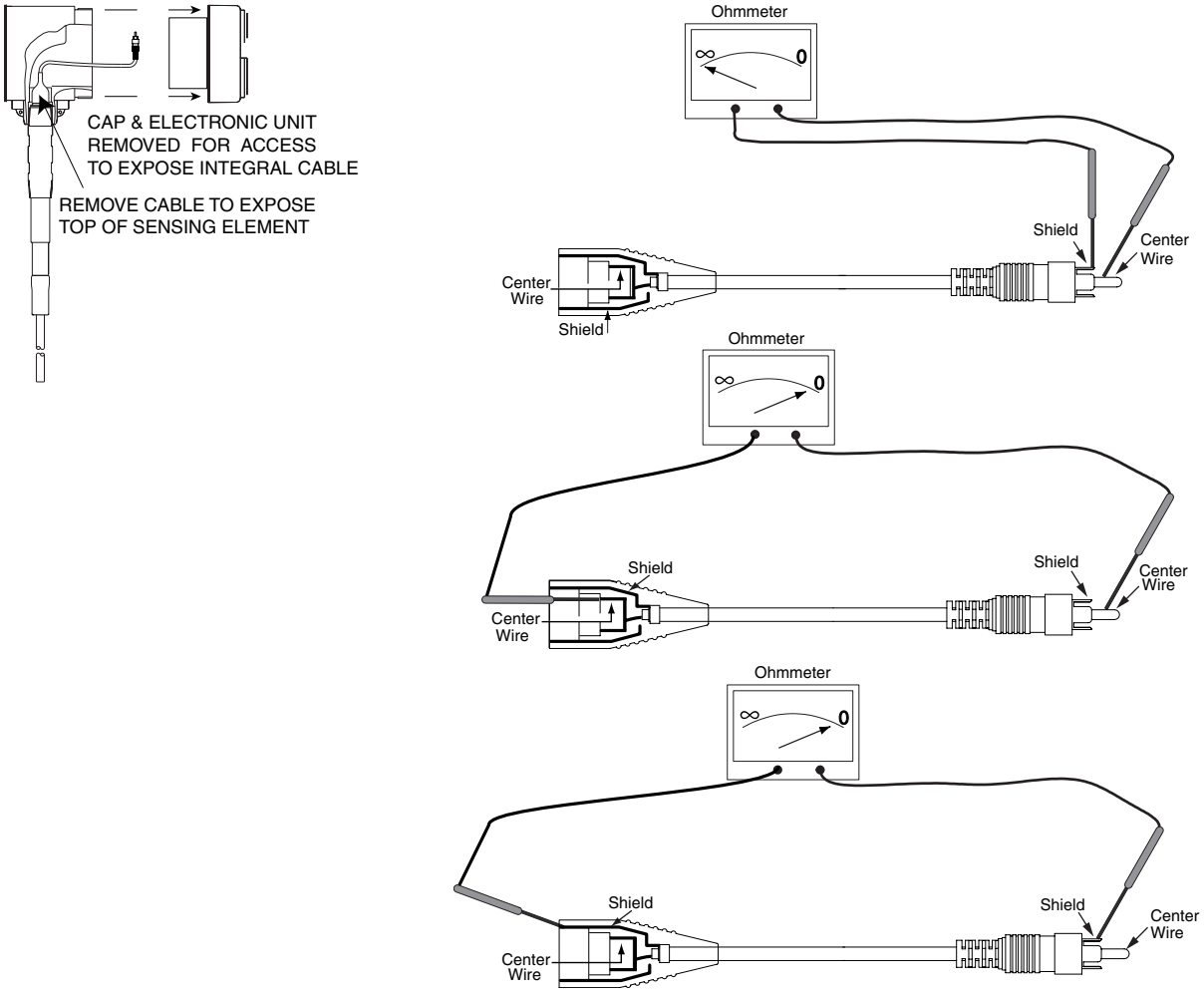


Figure 3-3
Testing Integral Cable

3.7 Testing Remote Cable

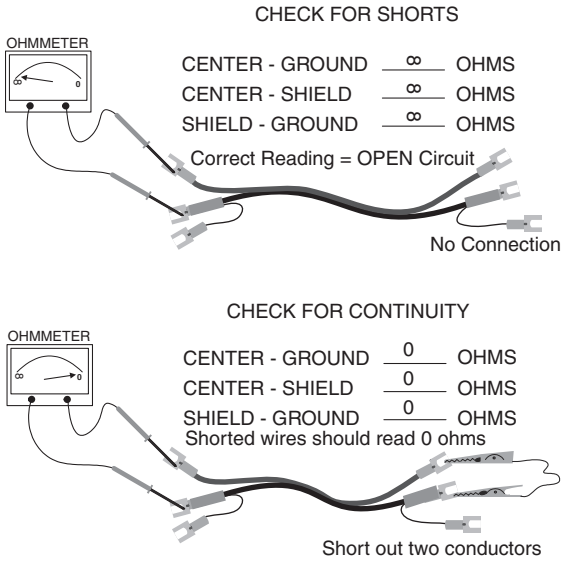


Figure 3-4
Testing Remote Cable

3.8 Factory Assistance

AMETEK Drexelbrook can answer any questions about ThePoint series instrument. Call Customer Service at 1-800-553-9092 (US and Canada) or +1 215 674-1234 (International).

If you require assistance and attempts to locate the problem have failed:

Contact your local Drexelbrook representative,

Telephone the Service department toll-free:
- 1-800-527-6297 (US and Canada)
- +1 215 674-1234 (International)

FAX: Service Department + 215-443-5117
E-mail: drexelbrook.service@ametek.com

Please provide the following information:

- Instrument Model Number
- Sensing Element Model Number and Length
- Original Purchase Order Number
- Material being measured
- Temperature
- Pressure
- Agitation
- Brief description of the problem
- Checkout procedures that have failed

3.9 Field Service

Trained field servicemen are available on a time-plus-expense basis to assist in start-ups, diagnosing difficult application problems, or in-plant training of personnel. Contact the service department for further details.

3.10 Customer Training

Periodically, AMETEK Drexelbrook instrument training seminars for customers are held at the factory. These sessions are guided by Drexelbrook engineers and specialists, and provide detailed information on all aspects of level measurement, including theory and practice of instrument operation. For more information write to:
AMETEK Drexelbrook, Communications/ Training Group or call 215-674-1234.

3.11 Equipment Return

In order to provide the best service, any equipment being returned for repair or credit must be pre-approved by the factory.

In many applications, sensing elements are exposed to hazardous materials.

- **OSHA mandates** that our employees be informed and protected from hazardous chemicals.

- **Material Safety Data Sheets (MSDS)** listing the hazardous materials to which the sensing element has been exposed MUST accompany any repair.

- It is your responsibility to fully disclose all chemicals and **decontaminate** the sensing element.

To obtain a return authorization (RA#), contact the Service department at 1-800-527-6297 (US and Canada) or + 215-674-1234 (International).

Please provide the following information:

- Model Number of Return Equipment
- Serial Number
- Original Purchase Order Number
- Process Materials to which the equipment has been exposed.
- MSDS sheets for any hazardous materials
- Billing Address
- Shipping Address
- Purchase Order Number for Repairs
- Please include a purchase order even if the repair is under warranty. If repair is covered under warranty, you will not be charged.

Ship equipment freight prepaid to:
AMETEK DREXELBROOK
205 KEITH VALLEY ROAD
HORSHAM, PA 19044-1499
COD shipments will not be accepted.

3.12 RF Point Level Troubleshooting Guide

Symptom	Possible Cause	Solution	See Section
Switch is in alarm and will not clear	Sensor is coated by a conductive material and the Cote-Shield™ element does not extend far enough into the vessel	Need a sensor with a longer Cote-Shield element. Rule of thumb is nozzle length + expected wall coating + 2 inches.	Section 2.2
	Fail Safe switch is set to the wrong setting	Check to make sure the fail safe switch is in the correct position	Section 2.6.3
	Active section of sensor is touching an internal structure or material is bridging active to ground.	May be able to shorten sensor (consult factory) or relocate sensor.	Appendix A
	Connection cable or harness between unit and sensor is damaged	Check connection cable for shorts, opens, or damage and proper termination	Section 3.6
	Flexible sensor is swaying and active is touching vessel or structure	Add 1 or 2 seconds of reverse acting time delay.	Section 2.6.1
Switch stays in alarm for extended period after level falls below sensor	Material bridging from active to tank structure	May be able to shorten sensor (consult factory) or relocate sensor.	Appendix A
	Time delay may be active	Make sure time delay pot is full counterclockwise.	Section 2.6.1
Switch does not respond to material	There may not be enough active to “see” an insulating material	Try changing to high sensitivity or adding active length to sensor	Section 2.9.5 Appendix A
	Switch was calibrated with sensor covered by material	Make sure material level is below sensor and re-calibrate	Section 2.9
	Granular material – Active section is not getting enough coverage due to angle of repose	Relocate sensor to get more coverage or lengthen active. Changing to high sensitivity may also help.	Section 2.9.5 Appendix A
	Connection cable or harness between unit and sensor is damaged	Check connection cable for shorts, opens, or damage and proper termination	Section 3.6
Switch delays in responding to material	Reverse acting time delay may be active	Check time delay settings to make sure they are correct	Section 2.6.1
LED’s are Flashing	Flashing LED’s indicate one of two things. Over Range / Under Range	Consult instruction manual to determine which of the three symptoms are experienced.	Section 3.4 Section 3.5
Over Range indicates that the standing capacitance of the sensing element in the vessel is to large to allow calibration	A long sensing element may generate too much standing capacitance to calibrate out	Padding is required – consult factory	Section 3.4
	The sensor could be touching an internal tank structure	May be able to shorten sensor (consult factory) or relocate sensor.	Appendix A
	Switch was calibrated with sensor covered by material	Make sure material level is below sensor and re-calibrate	Section 2.9
	Improper wiring connection (Remote Switches)	Check remote cable connections to confirm they are correct.	Section 3.6
Under Range indicates that the electronic unit is not seeing enough capacitance.	ThePoint ™ - Electronic unit is not attached to back board	Remove electronic unit and make certain that connection pins are not damaged. Re inset electronic unit making sure it is connected to back board.	Section 3.5
	Unit is damaged	Consult factory	Section 3.8
Green Power LED is out	Electronic unit is not getting power	Check power source to make sure proper power is supplied and connections are correct	Section 2.3
	Electronic unit is damaged	Consult factory	Section 3.8
Unit does not respond when pressing the Calibration Button	Cal button only operates when switch is set to Auto-Cal mode	Check to make sure switch is in Auto-Cal	Section 2.9.5
	Electronic Unit is damaged	Consult Factory	Section 3.8

Section 4

Section 4: Specifications

Technology:	RF/ Capacitance
Calibration:	None
Modes of Operation:	High and Low level
Repeatability:	2 mm (0.08 inch) conductive liquids
Response Time:	less than 1 second
Time Delay:	0 to 60 seconds forward and reverse acting
Ambient Electronics:	40 to 70°C (-40 to 158°F)
Storage Temperature:	-40 to 85° C (-40 to 185° F)
Indicators:	LEDs: Green Power, Red relay
Power supply:	Universal Supply 19 to 250 Vac 18 to 200 Vdc auto-detecting without jumper changes
Power consumption:	2 watts maximum
Relay Contacts:	(one) DPDT
Maximum Contact Load:	5A / 30 Vdc 5A / 250 Vac
Maximum Switching Capacity:	2000 VA / 150 Watt
Minimum Contact Load (DC):	100 mA / 12 Vdc 0 to 200 mA / 12 VDC (Optional)
Housing (electronics):	Powder-coated aluminum with two cable entries
Cable entry:	M20 x 1.5 or ¾-inch NPT
Ingress Protection:	IP66 NEMA 4X
Approvals:	ATEX, FM / FMc, IECEx

4.1 Approvals Available

Remote:
Explosion-proof for Class I, Division 1, Groups A, B, C, and D; Dust-Ignition proof for Class II, III, Division 1, Groups E, F, and G; Non-incendiary for Class I, Division 2, Groups A, B, C, & D; Suitable for Class II, III, Division 2, Groups F & G hazardous outdoor Type 4, 4X, IP66 (classified) locations with Intrinsically Safe connections to Class I, II, III, Division 1, Groups A, B, C, D, E, F, and G hazardous (classified) locations in accordance with Control Drawing 420-0004-181-CD.

Integral:
[Same, but Group A does not apply]

0575 See Installation Supplement on Page A-2

II 1/2 G EEx d [ia] IIC T2..T5, Ta = -30°C to +70°C
II 1/2 D

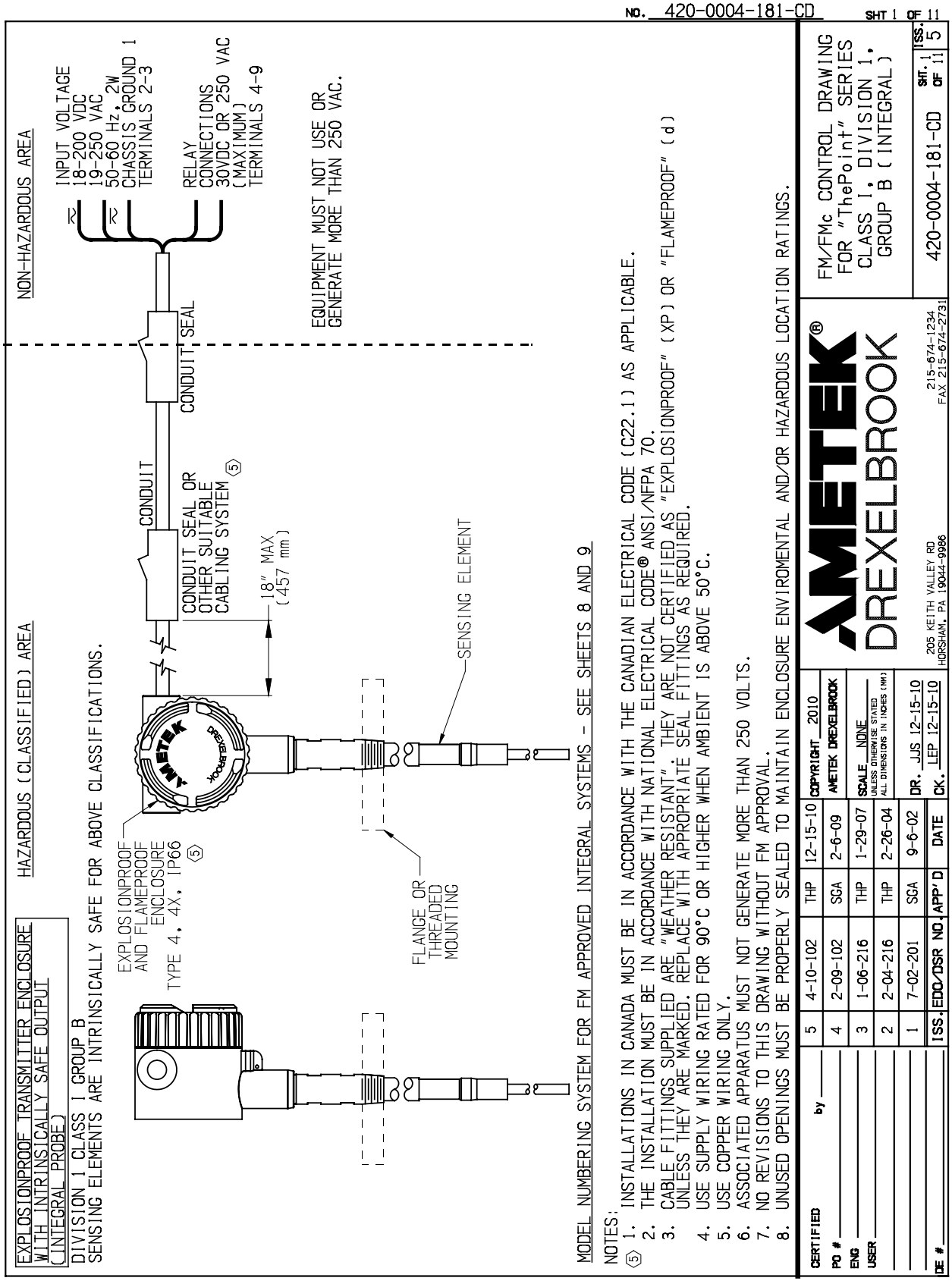
IECEx (For Remote Electronics)

Electronics Ex d[ia] Gb IIC T5; -30ºC <_ Ta <_ +70ºC; IP66
FMG 10.0017X
IEC 60079-0-General Requirements 2007-05
IEC 60079-1-Flameproof 2007-06
IEC 60079-11-Intrinsic Safety 2006-05
Install per 420-0004-402-CD

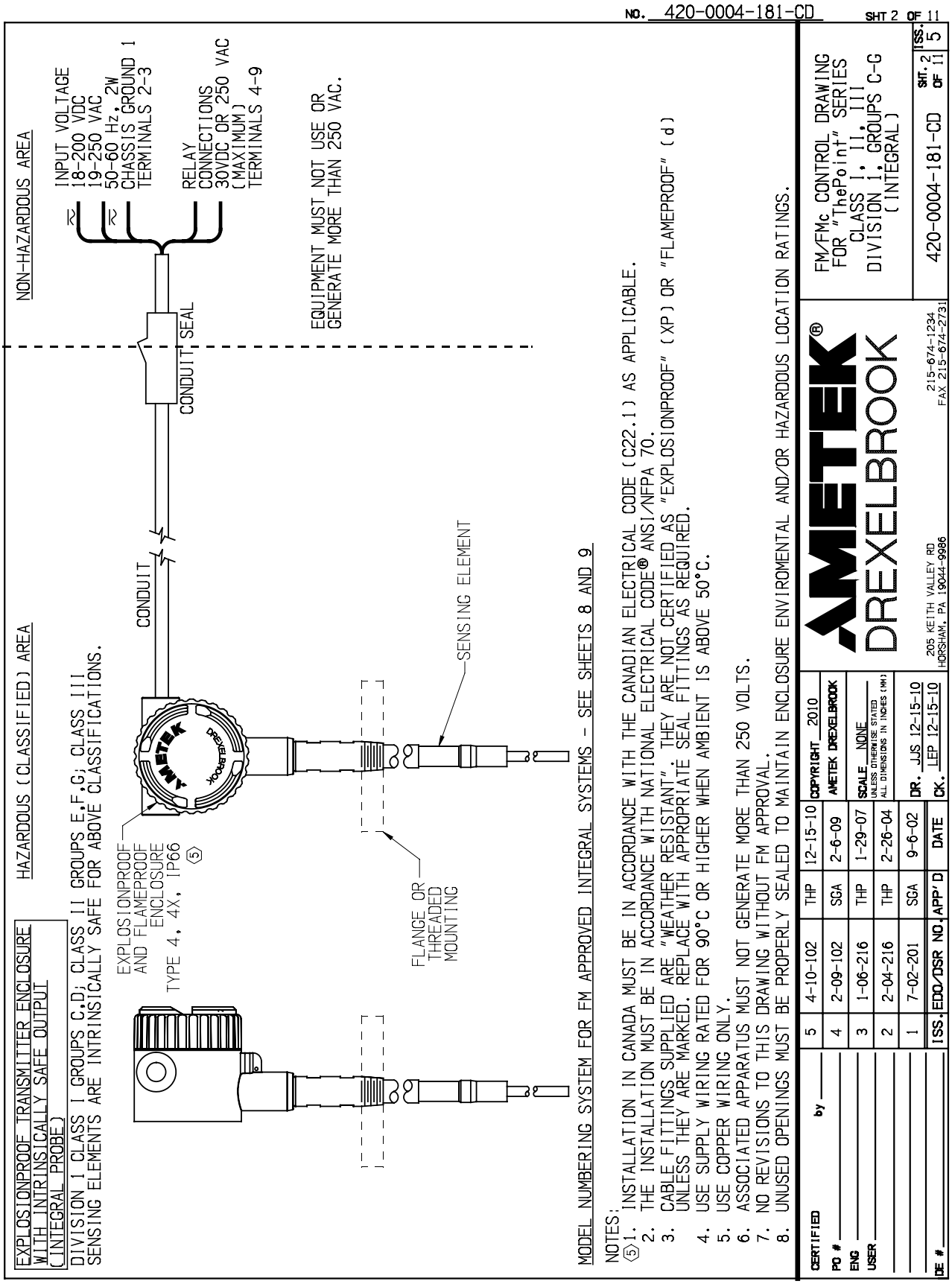
Sensing Element Ex ia Ga IIC T2...T5;
-30˚C ≤ Tamb ≤ +70˚C; IP66

Section 5: Control Drawings

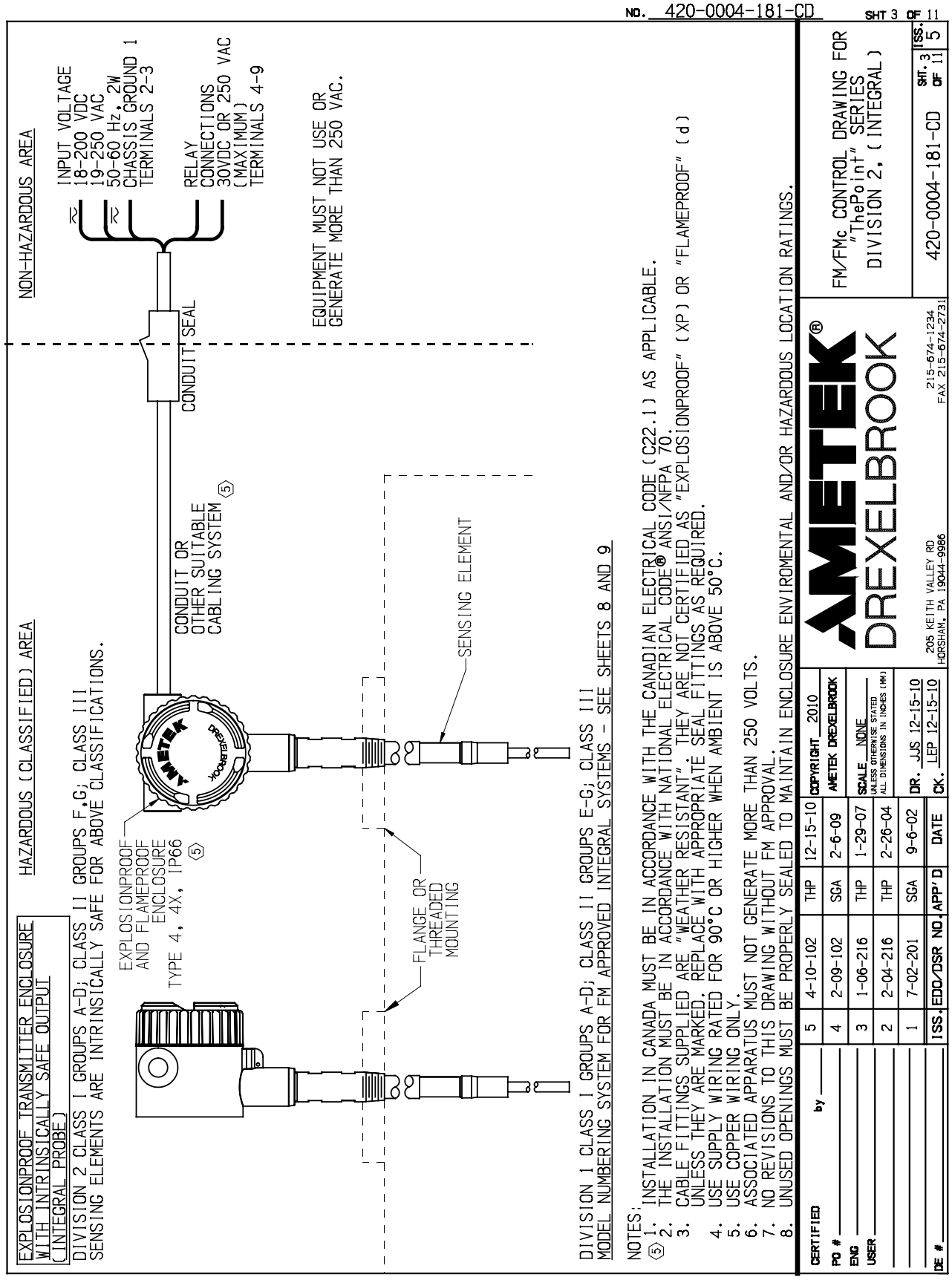
5.1 FM / FMc Control Drawings



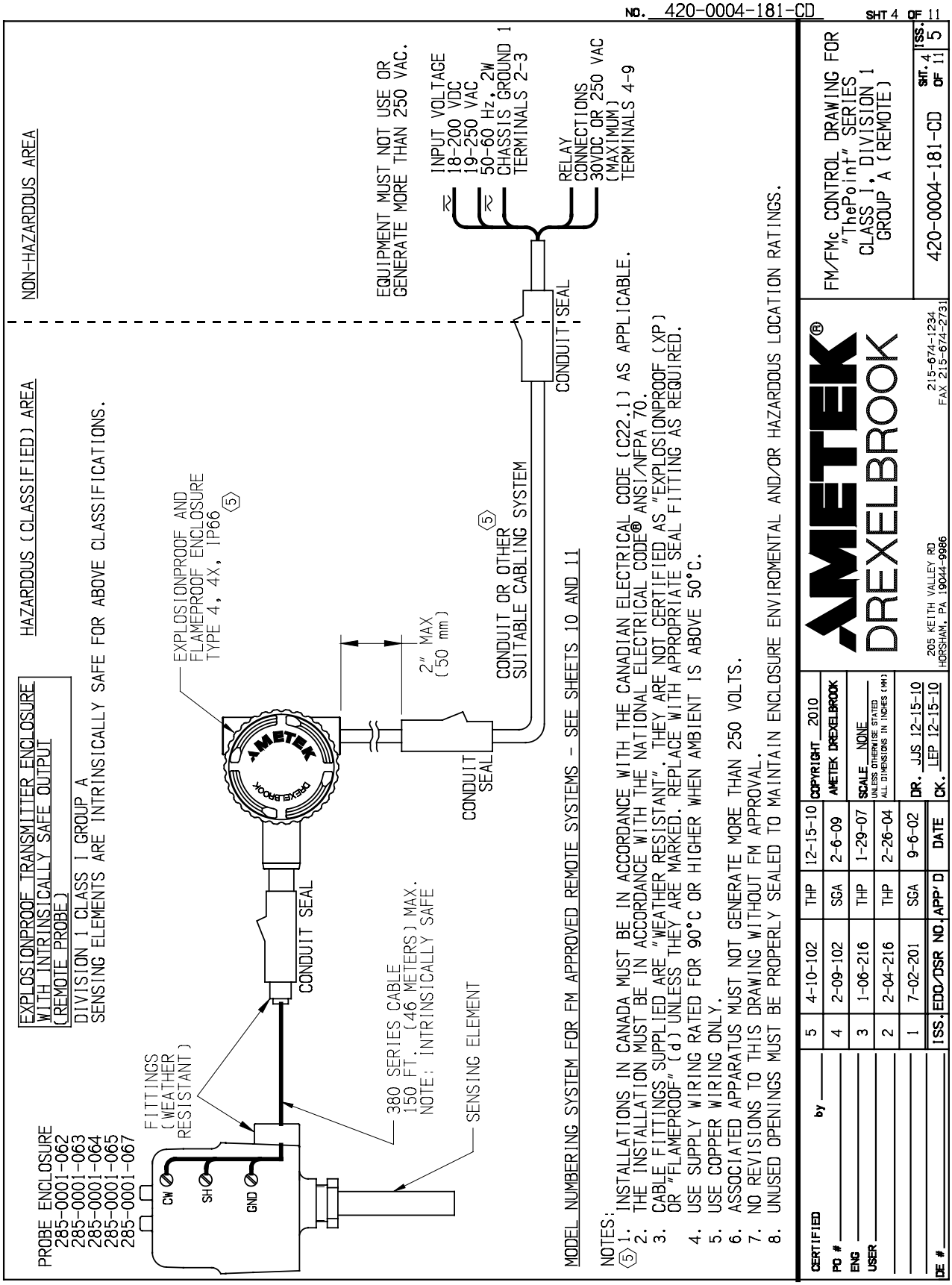
5.1 FM / FMc Control Drawings (Continued)



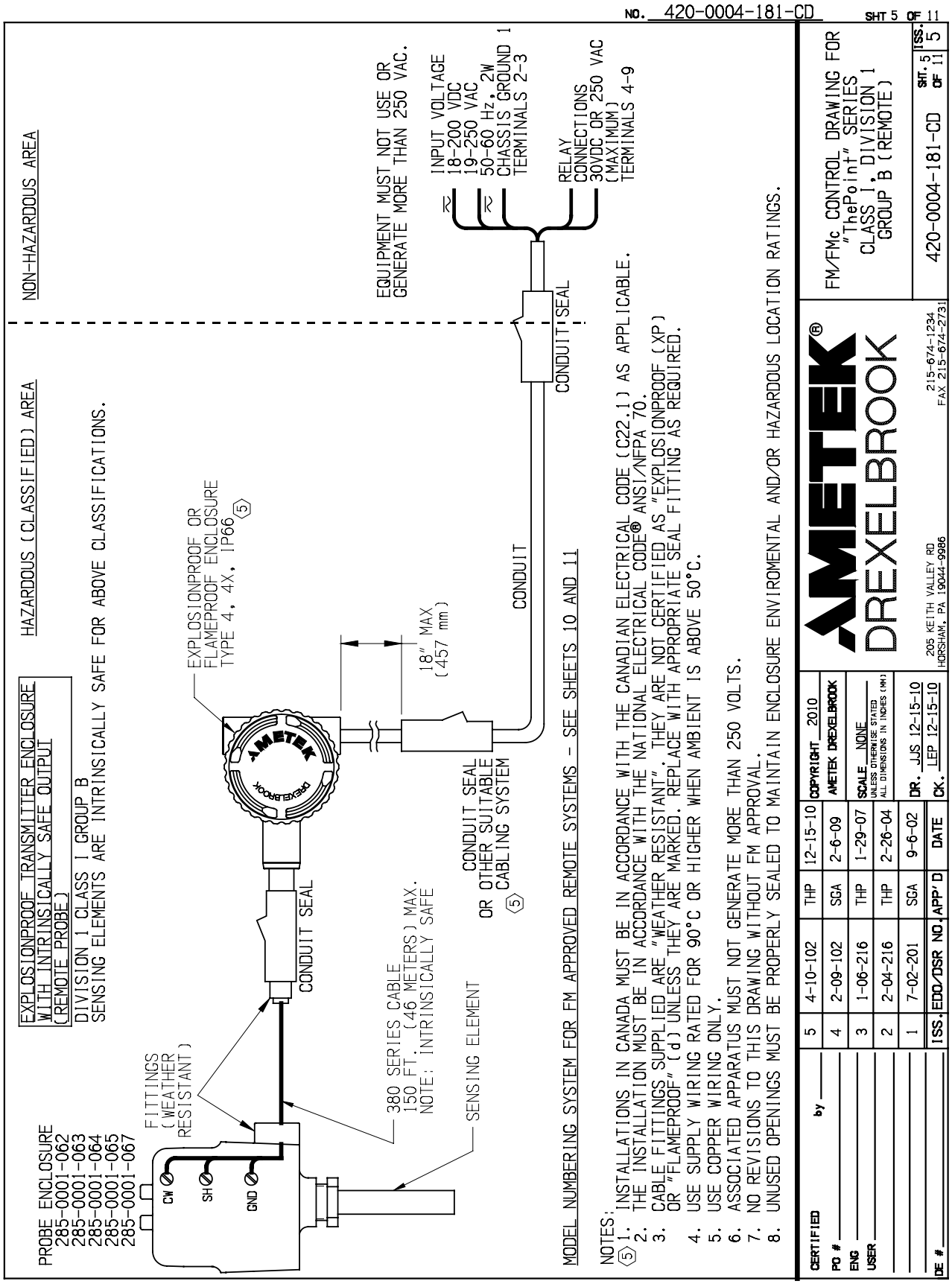
5.1 FM / FMc Control Drawings (Continued)



5.1 FM / FMc Control Drawings (Continued)



5.1 FM / FMc Control Drawings (Continued)



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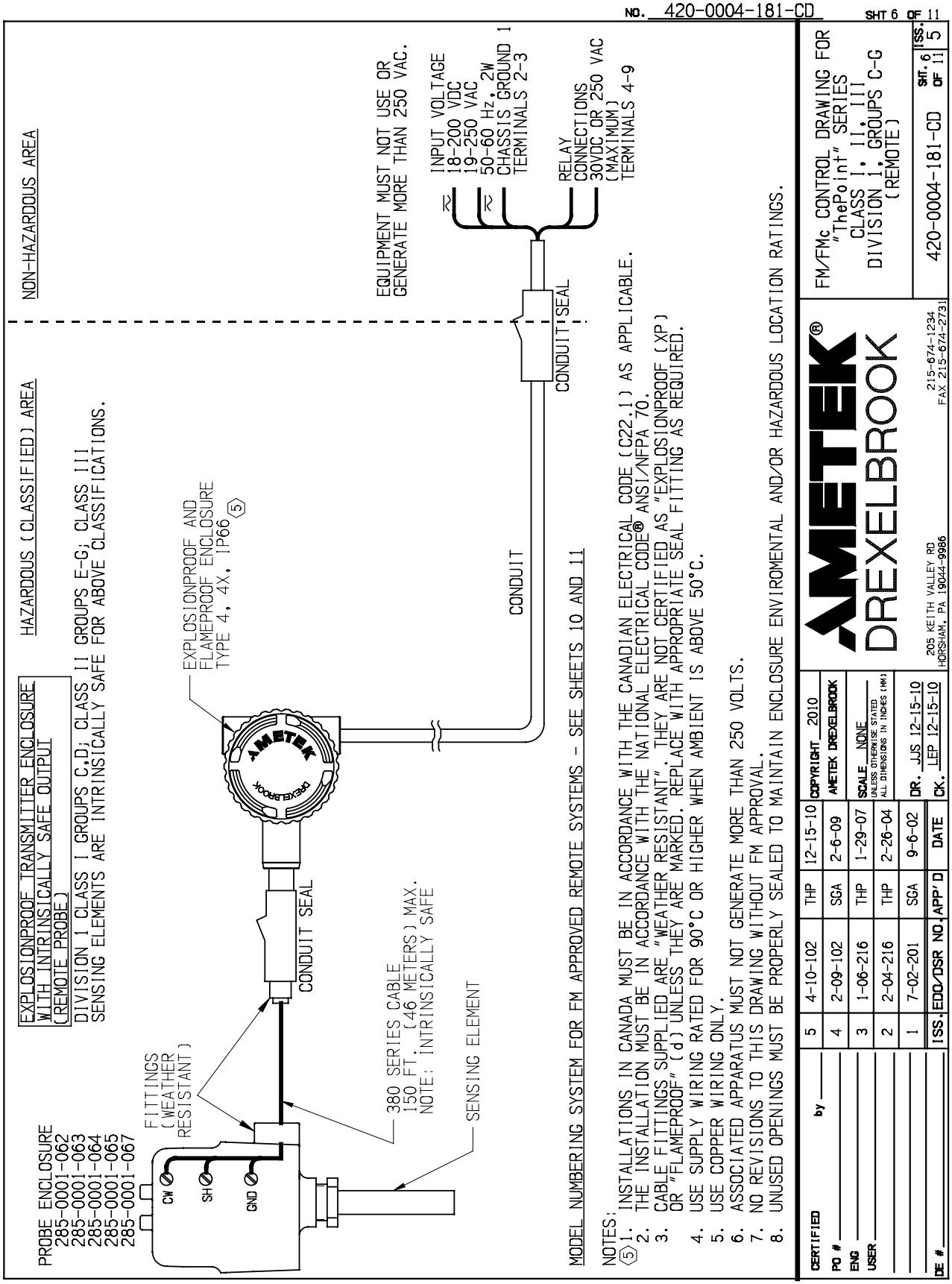
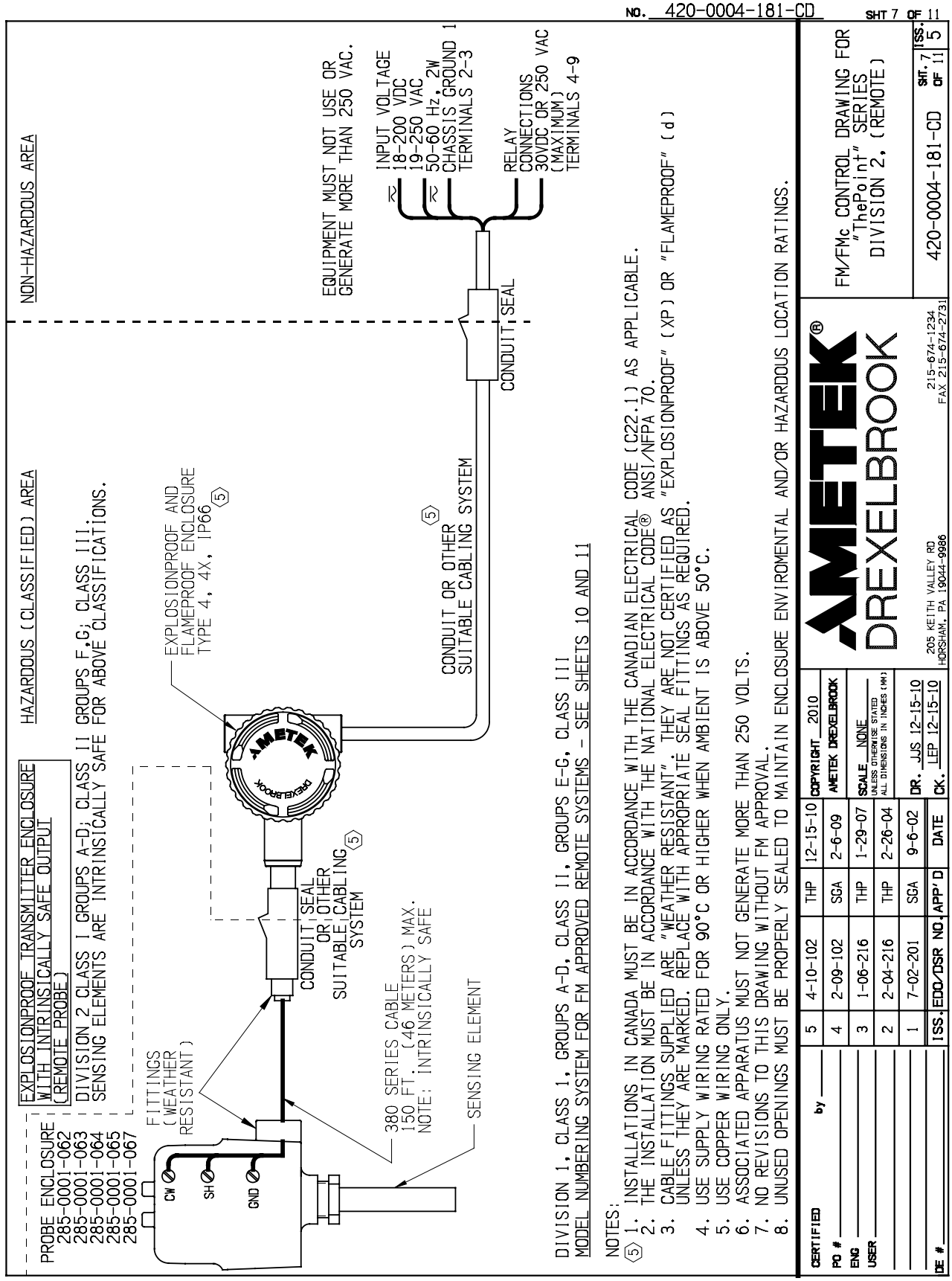


5.1 FM / FMc Control Drawings (Continued)



5.1 FM / FMc Control Drawings (Continued)

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P	a	L	b	c	0	d	d	*	*	*	*	
	a											a = MODE N = STD AUTO CAL
												L = STD 2pF FIXED
												T = 10pF AUTO CAL
												V = 10pF FIXED
												H = HI SENSE .5pF AUTO CAL
												P = HI SENSE .5pF FIXED
												G = HI SENSE MANUAL
												M = STD SENSE MANUAL
			b									b = OUTPUT 1 = 1 DPDT RELAY 2 = 1 GOLD DPDT RELAY
				c								c = 3 = STD MTG 6,9 = DUAL SEAL MTG
						d						d = SENSING ELEMENTS
							d					d = SENSING ELEMENTS
												SENSING ELEMENTS
						Z	Z					SPECIAL.....SEE LIST OF APPROVED SENSORS ON SHEET 9
						0	0					700-1202-021
							1					700-1202-022
							2					700-1202-024
							3					700-1202-028
							4					700-1202-042
							7					700-1202-020
						1	1					700-0201-005
							2					700-0201-005...HAST-C
							3					700-0201-036
							4					700-0202-002 ⟨5⟩
							6					700-0002-360
							7					700-0202-036
							8					700-0001-022

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5.1 FM / FMc Control Drawings (Continued)

700-0001-001	700-0002-053	700-0018-124
700-0001-002	700-0002-054	700-0018-126
700-0001-004	700-0002-055	700-0018-134
700-0001-005	700-0002-056	700-0018-144
700-0001-007	700-0002-057	700-0018-222
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700-0001-013	700-0002-060	700-0018-234
700-0001-014	700-0002-061	700-0018-242
700-0001-016	700-0002-062	700-0018-243
700-0001-022	700-0002-063	700-0018-245
700-0001-023	700-0002-064	700-0018-246
700-0001-024	700-0002-321	700-0018-262
700-0001-026	700-0002-360	700-0021-001
700-0001-029	700-0003-009	700-0021-002
700-0001-034	700-0004-038	700-0021-003
700-0001-035	700-0004-045	700-0021-007
700-0001-038	700-0004-050	700-0021-008
700-0001-039	700-0005-012	700-0201-005
700-0001-042	700-0005-014	700-0201-008
700-0001-044	700-0005-018	700-0201-009
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700-0002-012	700-0005-354	700-0201-118
700-0002-018	700-0008-122	700-0201-135
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700-0002-052	700-0018-122	700-1202-041
	700-0018-123	700-1202-042

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SHT 9 OF 11

5.1 FM / FMc Control Drawings (Continued)

								COLUMNS 9 AND UP DO NOT AFFECT SAFETY
1	2	3	4	5	6	7	8	9 10 11 12
P	a	L	b	c	d	e	e	* * * *
	a							a = MODE N = STD AUTO CAL
								L = STD 2pF FIXED
								T = 10pF AUTO CAL
								V = 10pF FIXED
								H = HI SENSE .5pF AUTO CAL
								P = HI SENSE .5pF FIXED
								G = HI SENSE MANUAL
								M = STD SENSE MANUAL
			b					b = OUTPUT 1 = 1 DPDT RELAY 2 = 1 GOLD DPDT RELAY
				c				c = 3 = STD MTG 7,B = DUAL SEAL MTG
					d			d = CABLE LENGTHS 1-9, A-K
								SENSING ELEMENTS
						e		e = SENSING ELEMENTS
							e	e = SENSING ELEMENTS
						Z	Z	SEE SHEET 11 FOR ADDITIONAL APPROVED SENSING ELEMENTS
						0	0	700-1202-001
							1	700-1202-012
							2	700-1202-014
							3	700-1202-018
							4	700-1202-041
							6	700-1202-031
							7	700-1202-010
							9	700-1202-033
						1	0	700-0001-018
							1	700-0201-005
							2	700-0201-005...HAST-C
							3	700-0201-036
							4	700-0202-002
							5	700-0202-043
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							7	700-0202-036
							8	700-0001-022
							9	700-0002-023
						2	0	700-0209-022
						3	1	700-0029-001
							2	700-0029-002
							3	700-0029-003
							4	700-0029-004
							5	700-0029-005
						5	0	700-0207-001
							1	700-0207-002
							2	700-0207-003
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SENSING ELEMENTS

420-0004-181-CD SHT. 10 OF 11 ISS. 5

NO. 420-0004-181-CD SHT 10 OF 11

5.1 FM / FMc Control Drawings (Continued)

MODEL NUMBERS OF APPROVED REMOTE SENSING ELEMENTS

701-mnop-qrs-t LEVEL PROBE

l = FAMILY NO. 0, 4
m = FAMILY NO. 0 THROUGH 9, BLANK
n = FAMILY NO. 0 THROUGH 9, BLANK
o = 0 THROUGH 9, BLANK
p = 0 THROUGH 9
q = FAMILY NO. 0 THROUGH 9, BLANK
r = FAMILY NO. 0 THROUGH 9, BLANK
s = FAMILY NO. 0 THROUGH 9
t = 14 CHARACTER EXPANDED NUMBERING SYSTEM, DOES NOT AFFECT SAFETY

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SENSING ELEMENTS

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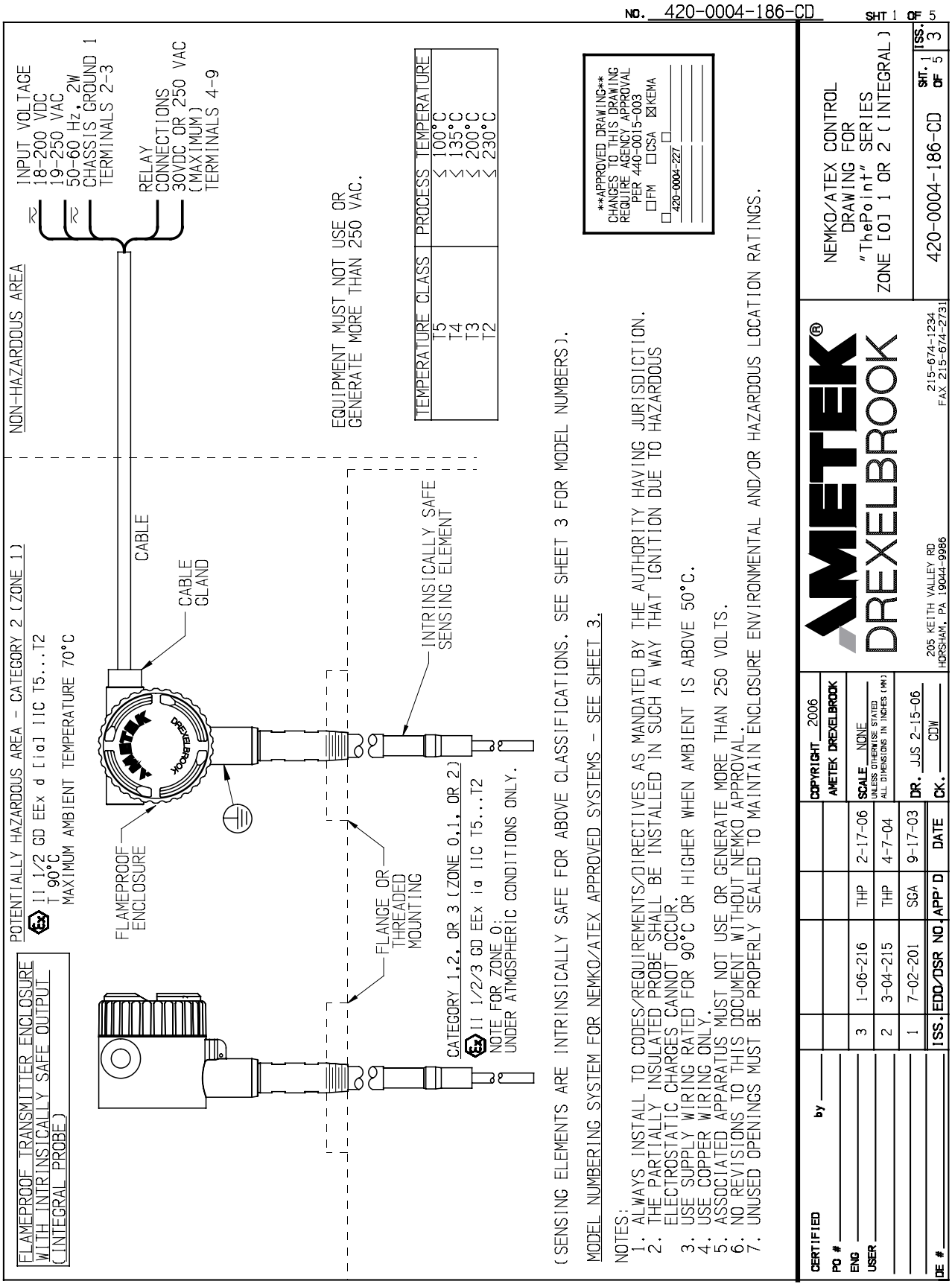
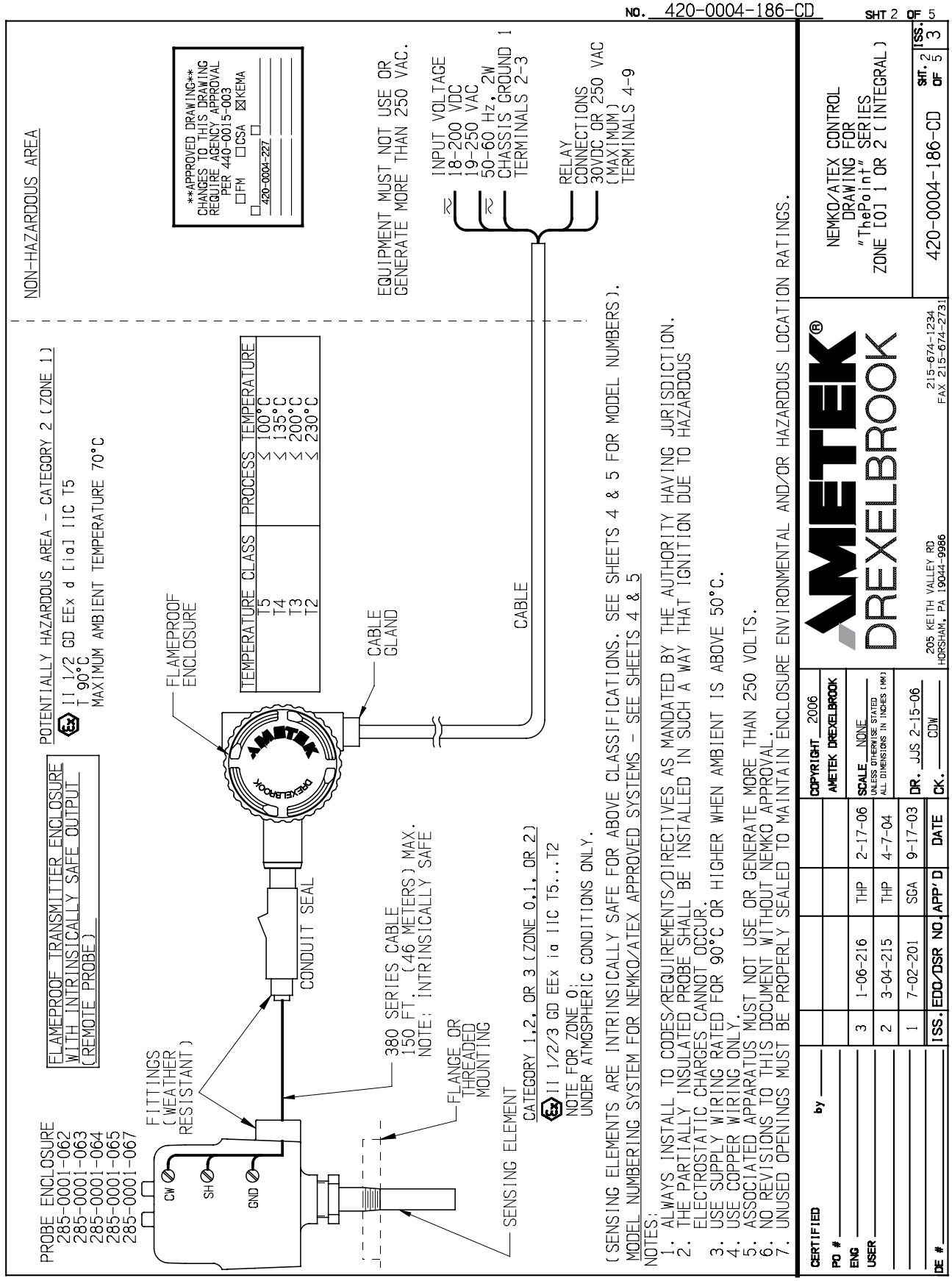
SHT 11 OF 11

5.2 ATEX Control Drawings



5.2 ATEX Control Drawings (Continued)



5.2 ATEX Control Drawings (Continued)

1	2	3	4	5	6	7	8	9	10	11	12	COLUMNS 9 AND UP DO NOT AFFECT SAFETY
P	a	L	b	2	0	0	c	*	*	*	*	
	a											a = MODE N = STD AUTO CAL
												L = STD 2pF FIXED
												T = 10pF AUTO CAL
												V = 10pF FIXED CAL
												H = HI SENSE .5pF AUTO CAL
												P = HI SENSE .5pF FIXED
												G = HI SENSE MANUAL
												M = STD SENSE MANUAL
			b									b = OUTPUT 1 = 1 DPDT RELAY 2 = 1 GOLD DPDT RELAY
				2								M20 KEMA/CENELEC SYSTEMS
							c					c = 0-3
												SENSING ELEMENTS
							0					700-1202-021 KEMA NO. Ex-00.E.2144 U
							1					700-1202-022 KEMA NO. Ex-00.E.2144 U
							2					700-1202-024 KEMA NO. Ex-00.E.2144 U
							3					700-1202-028 KEMA NO. Ex-00.E.2144 U

DO. 420-0004-186-CD

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2	3-04-215	THP	4-7-04
1	7-02-201	SGA	9-17-03

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420-0004-186-CD SHT. 3 OF 5 ISS. 3

SHT 3 OF 5

5.2 ATEX Control Drawings (Continued)

								COLUMNS 9 AND UP DO NOT AFFECT SAFETY				
1	2	3	4	5	6	7	8	9	10	11	12	
P	a	L	b	2	c	d	e	*	*	*	*	
	a											a = MODE N = STD AUTO CAL
												L = STD 2pF FIXED
												T = 10pF AUTO CAL
												V = 10 pF FIXED CAL
												H = HI SENSE .5pF AUTO CAL
												P = HI SENSE .5pF FIXED
												G = HI SENSE MANUAL
												M = STD SENSE MANUAL
			b									b = OUTPUT 1 = 1 DPDT RELAY 2 = 1 GOLD DPDT RELAY
					c							c = 1-9, A-K - CABLE OPTIONS (REMOTE) ③
						d						d = 0-3, 5, 6, OR Z SENSING ELEMENTS
							e					e = 0-9, OR Z SENSING ELEMENTS
												SENSING ELEMENTS
						0	0					700-1202-001
							1					700-1202-012
							2					700-1202-014
							3					700-1202-018
							4					700-1202-041
							6					700-1202-031
							7					700-1202-010
							9					700-1202-033
						1	0					700-0001-018
							1					700-0201-005
							2					700-0201-005...HAST C
							3					700-0201-036
							4					700-0202-002
							5					700-0202-043
							6					700-0002-360
							7					700-0202-036
							8					700-0001-022
							9					700-0002-023 ③
						2	0					700-0209-022
						3	1					700-0029-001
							2					700-0029-002
							3					700-0029-003
							4					700-0029-004
							5					700-0029-005
						5	0					700-0207-001
							1					700-0207-002
							2					700-0207-003
							3					700-0207-004
							5					700-0207-066
						6	0					700-0204-038
							1					700-0204-002 ③
							2					700-0204-048 ③
						Z	Z					SEE SHEET 5 FOR ADDITIONAL APPROVED SENSING ELEMENTS
												③

SCALE NONE
UNLESS OTHERWISE STATED
ALL DIMENSIONS IN INCHES (MM)

DR. JJS 2-15-06
CK. CDW

CERTIFIED by
PO #
ENG
USER
DE #

ISS.	EDO/DSR NO.	APP'D	DATE
3	1-06-216	THP	2-17-06
2	3-04-215	THP	4-7-04
1	7-02-201	SGA	9-17-03

AMETEK®
DREXELBROOK

205 KEITH VALLEY RD
HORSHAM, PA 19044-9986
215-674-1234
FAX 215-674-2731

NEMKO/ATEX APPROVED
"ThePoint"
MODEL NUMBERING SYSTEM
(REMOTE)

420-0004-186-CD SHT. 4 OF 5 ISS. 3

NO. 420-0004-186-CD

SHT 4 OF 5

5.2 ATEX Control Drawings (Continued)

MODEL NUMBERS OF APPROVED INTRINSICALLY SAFE SENSING ELEMENTS

700-mnop-qrs-† LEVEL PROBE

m = FAMILY NO. 0 THROUGH 9, BLANK
n = FAMILY NO. 0 THROUGH 9, BLANK
o = 0 THROUGH 9, BLANK
p = 0 THROUGH 9
q = FAMILY NO. 0 THROUGH 9, BLANK
r = FAMILY NO. 0 THROUGH 9, BLANK
s = FAMILY NO. 0 THROUGH 9
† = 14 CHARACTER EXPANDED NUMBERING SYSTEM, DOES NOT AFFECT SAFETY

SCALE NONE
UNLESS OTHERWISE STATED
ALL DIMENSIONS IN INCHES (MM)

DR. JJS 2-15-06
CK. CDW

CERTIFIED by
PO #
ENG
USER
DE #

NO. 420-0004-186-CD

ISS.	EDO/DSR NO.	APP'D	DATE
3	1-06-216	THP	2-17-06
2	3-04-215	THP	4-7-04
1	7-02-201	SGA	9-17-03

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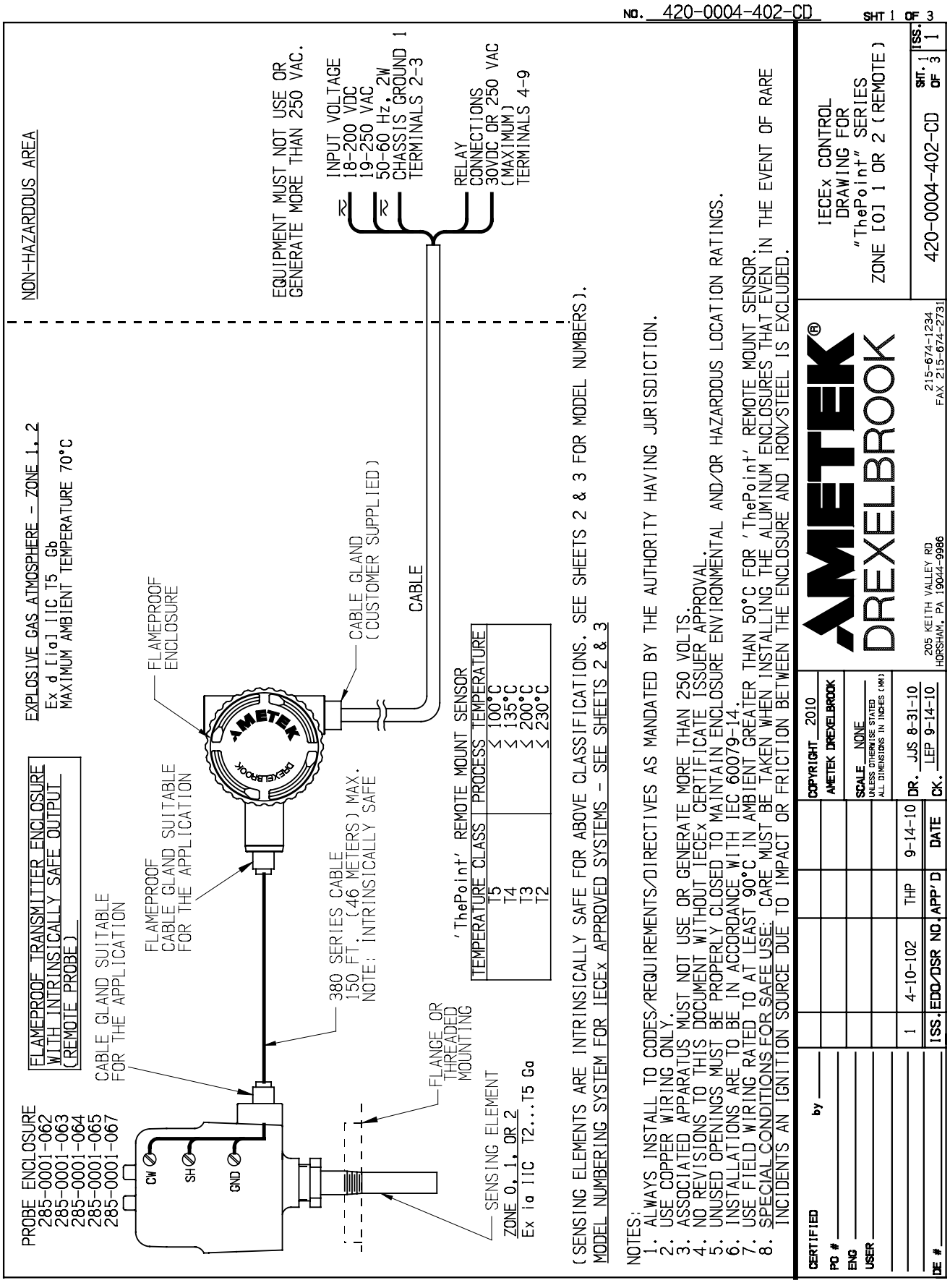
NEMKO/ATEX APPROVED
ADDITIONAL INTRINSICALLY
SAFE SENSING ELEMENTS
(REMOTE)

420-0004-186-CD SHT. 5 OF 5 ISS. 3

SHT 5 OF 5

5.3 IECEx Control Drawings



5.3 IECEx Control Drawings (Continued)

								COLUMNS 9 AND UP DO NOT AFFECT SAFETY
1	2	3	4	5	6	7	8	9 10 11 12
P	a	L	b	c	d	e	f	* * * *
	a							a = MODE N = STD AUTO CAL
								L = STD 2pf FIXED
								T = 10pf AUTO CAL
								V = 10pf FIXED
								H = HI SENSE .5pf AUTO CAL
								P = HI SENSE .5pf FIXED
								G = HI SENSE MANUAL
								M = STD SENSE MANUAL
			b					b = OUTPUT 1 = 1 DPDT RELAY 2 = 1 GOLD DPDT RELAY
				c				c = ENCLOSURE...2 = M20 ENTRIES
					d			d = 1-9 - CABLE OPTIONS (REMOTE)
						e		e = 0-3, 5, 6, OR Z SENSING ELEMENTS
							f	f = 0-9, OR Z SENSING ELEMENTS
								SENSING ELEMENTS
						Z	Z	SEE SHEET 3 FOR ADDITIONAL APPROVED SENSING ELEMENTS
						0	0	700-1202-001
							1	700-1202-012
							2	700-1202-014
							3	700-1202-018
							4	700-1202-041
							6	700-1202-031
							7	700-1202-010
							9	700-1202-033
						1	0	700-0001-018
							1	700-0201-005
							2	700-0201-005...HAST C
							3	700-0201-036
							4	700-0202-002
							5	700-0202-043
							6	700-0002-360
							7	700-0202-036
							8	700-0001-022
						2	0	700-0209-022
						3	1	700-0029-001
							2	700-0029-002
							3	700-0029-003
							4	700-0029-004
							5	700-0029-005
						5	0	700-0207-001
							1	700-0207-002
							2	700-0207-003
							3	700-0207-004
							5	700-0207-066
						6	0	700-0204-038

SCALE NONE
UNLESS OTHERWISE STATED
ALL DIMENSIONS IN INCHES (MM)

DR. JJS 8-31-10
CK. LEP 9-14-10

CERTIFIED by
PO #
ENG
USER
DE #

ISS.	EDO/DSR NO.	APP'D	DATE
1	4-10-102	THP	9-14-10

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FAX 215-674-2731

IECEx APPROVED
"ThePoint"
MODEL NUMBERING SYSTEM
(REMOTE)

420-0004-402-CD

SHT. 2 OF 3 | ISS. 1

NO. 420-0004-402-CD

SHT 2 OF 3

5.3 IECEx Control Drawings (Continued)

MODEL NUMBERS OF APPROVED INTRINSICALLY SAFE SENSING ELEMENTS

700-mnop-qrs-† LEVEL PROBE

m = FAMILY NO. 0 THROUGH 9, BLANK
n = FAMILY NO. 0 THROUGH 9, BLANK
o = 0 THROUGH 9, BLANK
p = 0 THROUGH 9
q = FAMILY NO. 0 THROUGH 9, BLANK
r = FAMILY NO. 0 THROUGH 9, BLANK
s = FAMILY NO. 0 THROUGH 9
† = 14 CHARACTER EXPANDED NUMBERING SYSTEM, DOES NOT AFFECT SAFETY

SCALE NONE
UNLESS OTHERWISE STATED
ALL DIMENSIONS IN INCHES (MM)

DR. JJS 8-31-10
CK. LEP 9-14-10

CERTIFIED by
PO #
ENG
USER
DE #

NO. 420-0004-402-CD

ISS.	EDO/DSR NO.	APP'D	DATE
1	4-10-102	THP	9-14-10

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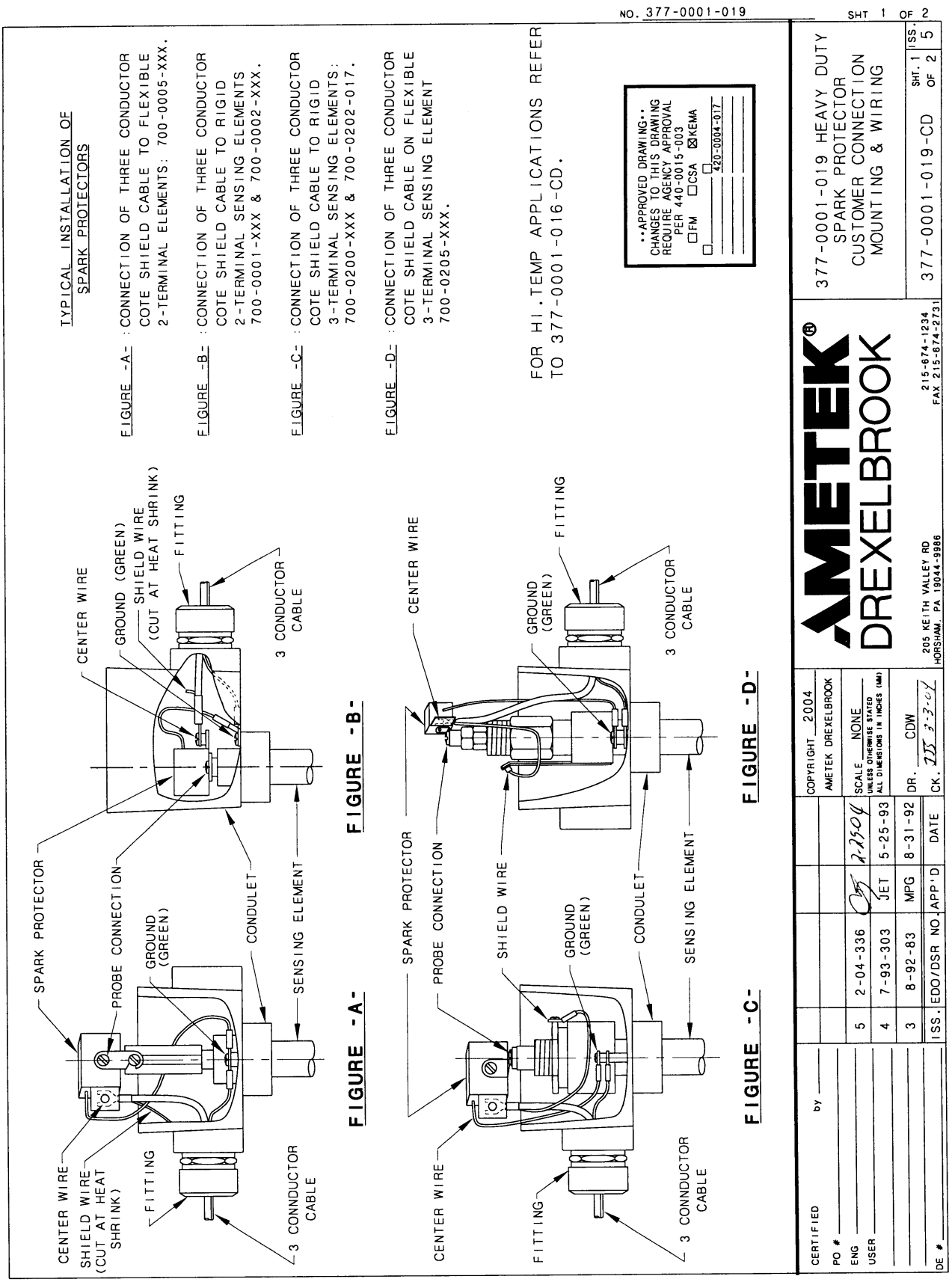
FAX 215-674-2731

IECEx APPROVED
ADDITIONAL INTRINSICALLY
SAFE SENSING ELEMENTS
(REMOTE)

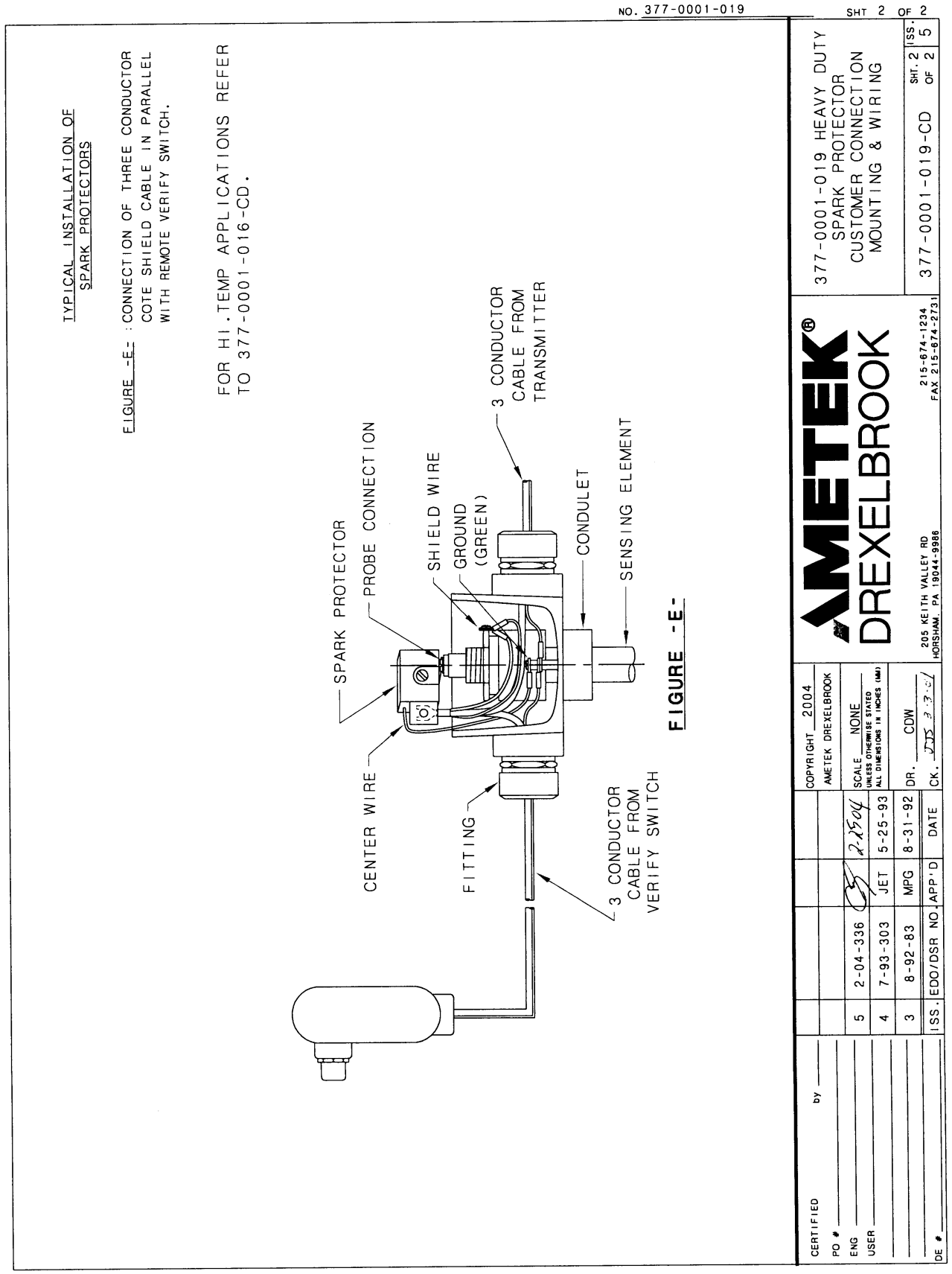
420-0004-402-CD SHT. 3 OF 3 ISS. 1

SHT 3 OF 3

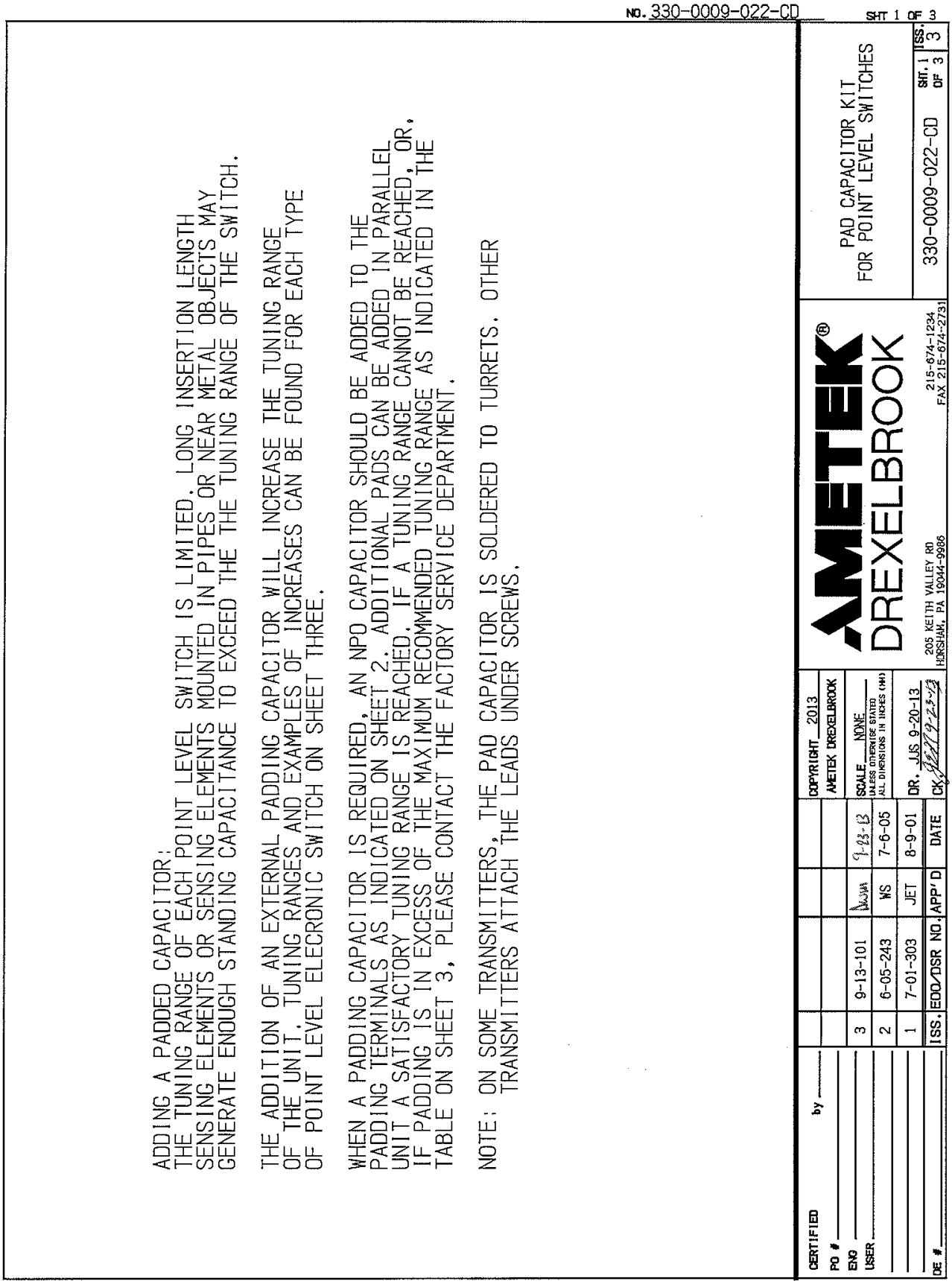
5.4 Heavy Duty Spark Protection



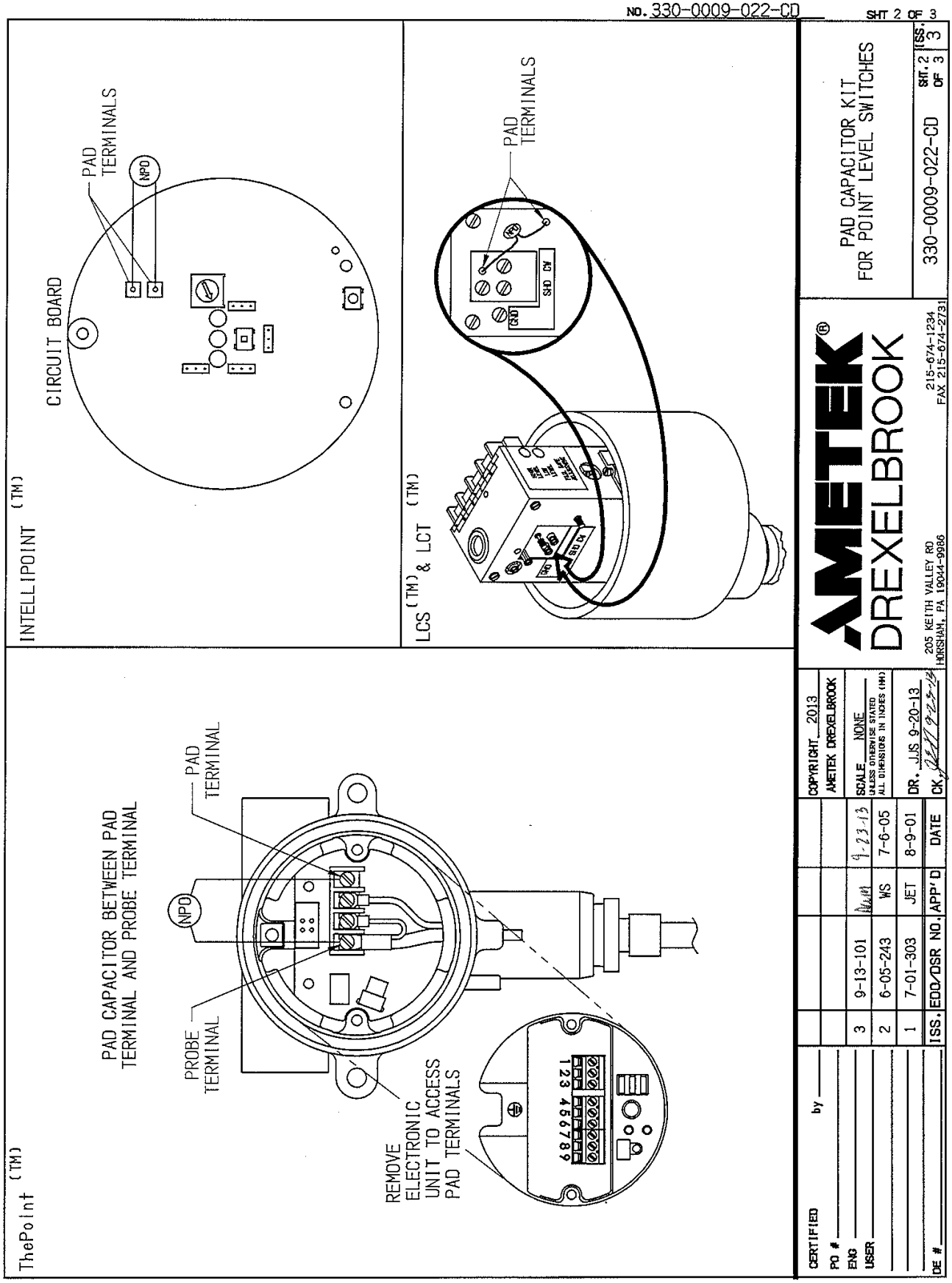
5.4 Heavy Duty Spark Protection (Continued)



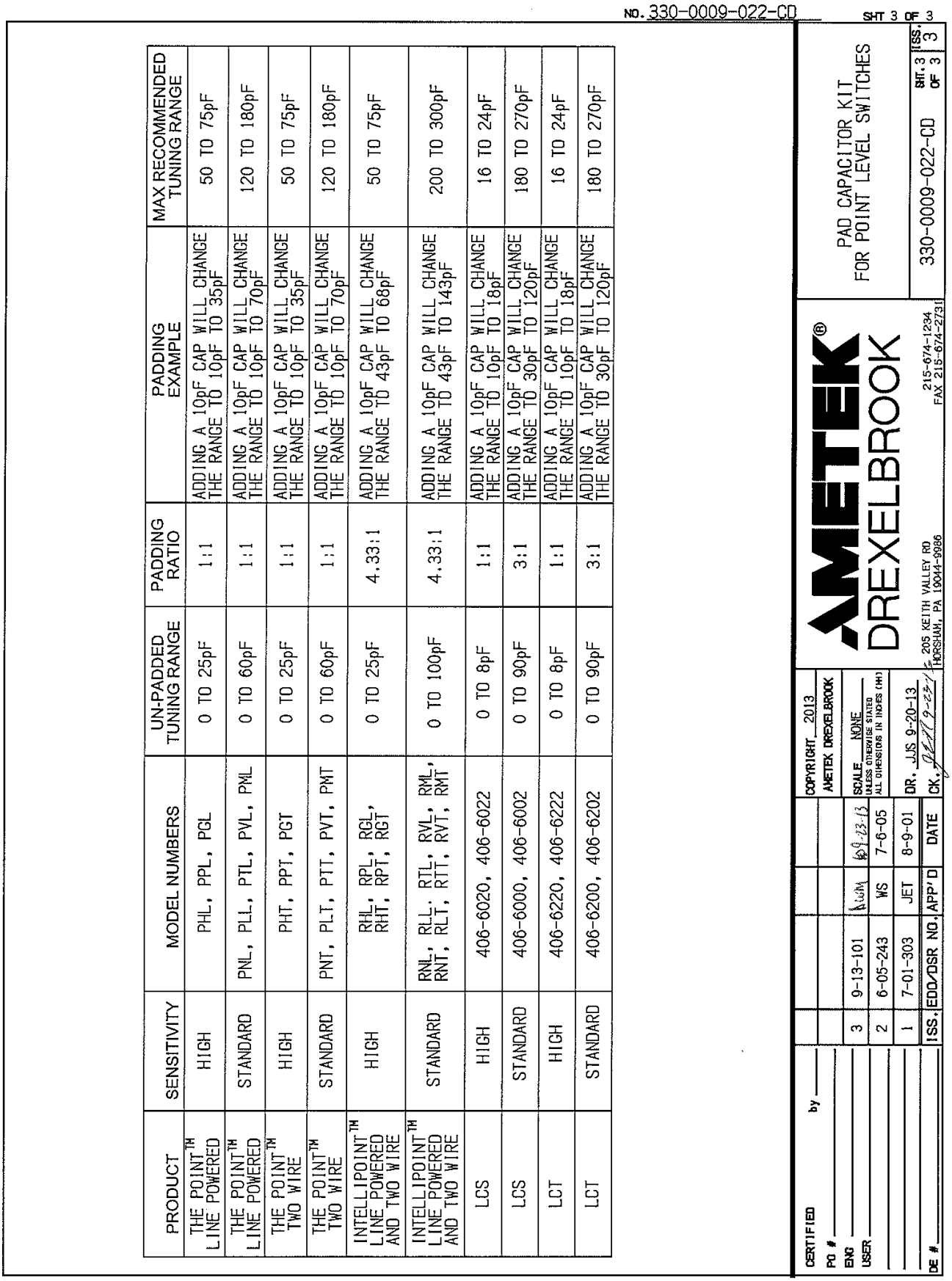
5.5 Adding a Padded Capacitor



5.5 Adding a Padded Capacitor (Continued)

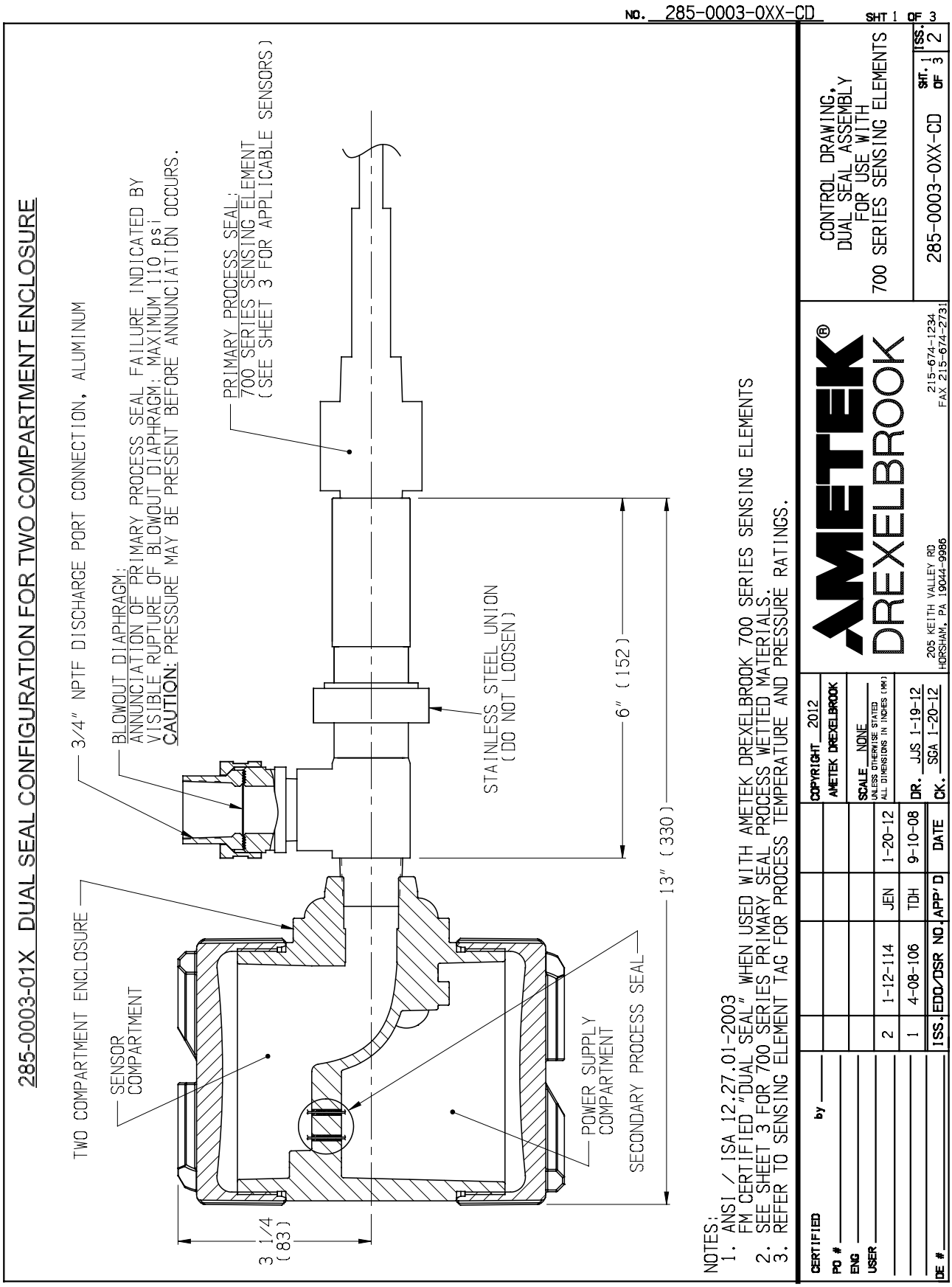


5.5 Adding a Padded Capacitor (Continued)

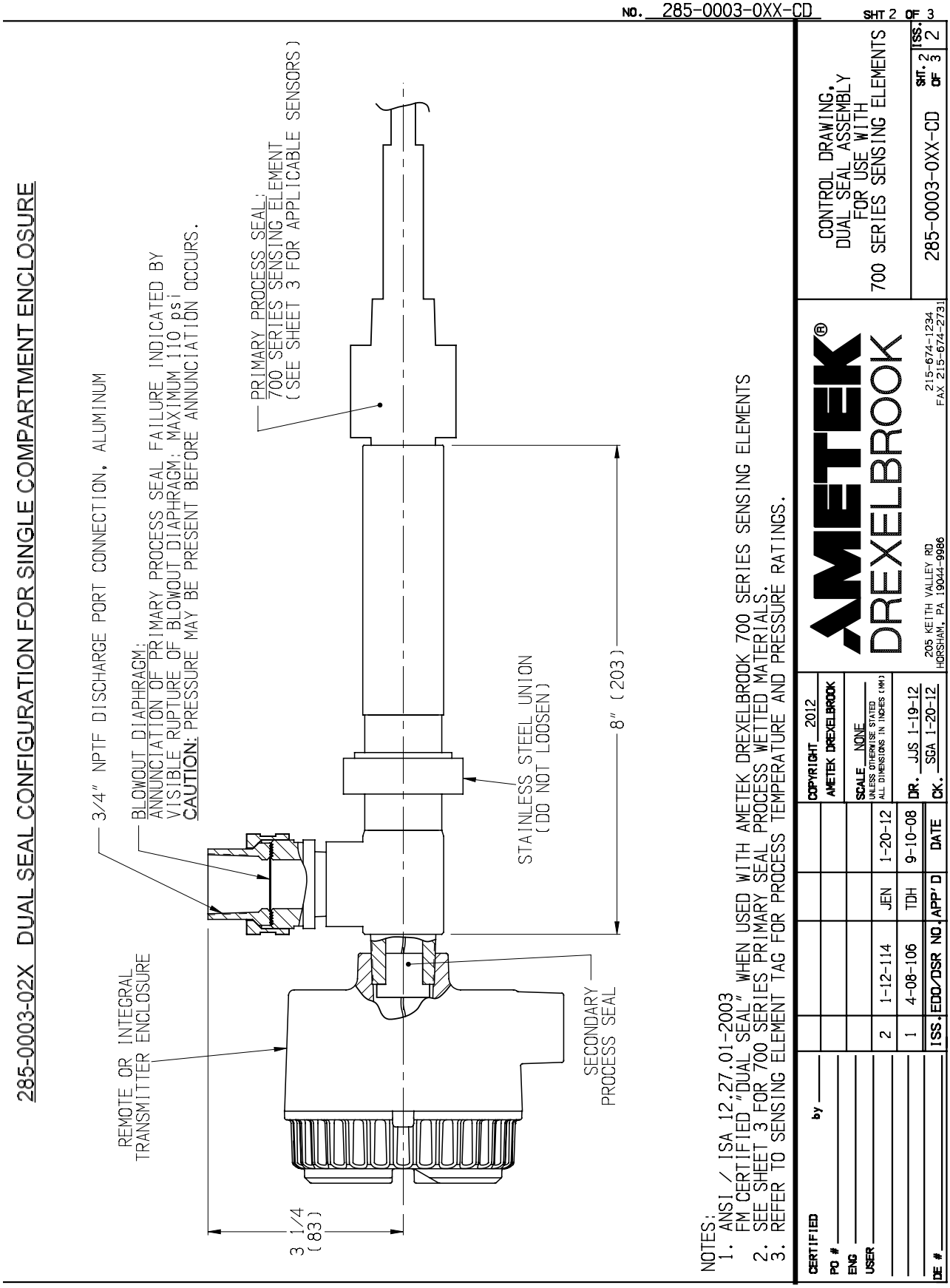


PRODUCT	SENSITIVITY	MODEL NUMBERS	UN-PADDED TUNING RANGE	PADDING RATIO	PADDING EXAMPLE	MAX RECOMMENDED TUNING RANGE
THE POINT™ LINE POWERED	HIGH	PHL, PPL, PGL	0 TO 25pF	1:1	ADDING A 10pF CAP WILL CHANGE THE RANGE TO 10pF TO 35pF	50 TO 75pF
THE POINT™ LINE POWERED	STANDARD	PNL, PLL, PTL, PVL, PML	0 TO 60pF	1:1	ADDING A 10pF CAP WILL CHANGE THE RANGE TO 10pF TO 70pF	120 TO 180pF
THE POINT™ TWO WIRE	HIGH	PHT, PPT, PGT	0 TO 25pF	1:1	ADDING A 10pF CAP WILL CHANGE THE RANGE TO 10pF TO 35pF	50 TO 75pF
THE POINT™ TWO WIRE	STANDARD	PNT, PLT, PTT, PVT, PMT	0 TO 60pF	1:1	ADDING A 10pF CAP WILL CHANGE THE RANGE TO 10pF TO 70pF	120 TO 180pF
INTELLIPOINT™ LINE POWERED AND TWO WIRE	HIGH	RHL, RPL, RGL, RHT, RPT, RGT	0 TO 25pF	4.33:1	ADDING A 10pF CAP WILL CHANGE THE RANGE TO 43pF TO 68pF	50 TO 75pF
INTELLIPOINT™ LINE POWERED AND TWO WIRE	STANDARD	RNL, RLL, RTL, RVL, RML, RNT, RLT, RTT, RVT, RMT	0 TO 100pF	4.33:1	ADDING A 10pF CAP WILL CHANGE THE RANGE TO 43pF TO 143pF	200 TO 300pF
LCS	HIGH	406-6020, 406-6022	0 TO 8pF	1:1	ADDING A 10pF CAP WILL CHANGE THE RANGE TO 10pF TO 18pF	16 TO 24pF
LCS	STANDARD	406-6000, 406-6002	0 TO 90pF	3:1	ADDING A 10pF CAP WILL CHANGE THE RANGE TO 30pF TO 120pF	180 TO 270pF
LCT	HIGH	406-6220, 406-6222	0 TO 8pF	1:1	ADDING A 10pF CAP WILL CHANGE THE RANGE TO 10pF TO 18pF	16 TO 24pF
LCT	STANDARD	406-6200, 406-6202	0 TO 90pF	3:1	ADDING A 10pF CAP WILL CHANGE THE RANGE TO 30pF TO 120pF	180 TO 270pF

5.6 Dual Seal Assembly for 700 Series Sensing Elements



5.6 Dual Seal Assembly (Continued)



SENSING ELEMENTS AVAILABLE

SENSOR MODEL #	PRIMARY SEAL WETTED MATERIALS
700-0001-022	TFE/316SS
700-0001-024	TFE/316SS
700-0001-026	TFE/316SS
700-0001-034	TFE/CS
700-0001-040	POLYETHYLENE/316SS
700-0001-044	PFA/316SS
700-0001-054	TFE/316SS
700-0001-064	TFE/316SS
700-0001-074	TFE/316SS
700-0001-344	PFA/316SS
700-0002-023	TFE/316SS
700-0002-024	TFE/316SS
700-0002-027	FEP/TFE/316SS
700-0002-028	TFE/316SS
700-0002-033	TFE/316SS
700-0002-037	PVDF/TFE/316SS
700-0002-040	UHMW PE/SILICONE/316SS
700-0002-044	PVDF/TFE/316SS

SENSOR MODEL #	PRIMARY SEAL WETTED MATERIALS
700-0002-054	FEP/TFE/316SS
700-0002-057	PVDF/TFE/316SS
700-0002-064	PVDF/TFE/316SS
700-0002-224	TFE/316SS
700-0002-321	FEP/TFE/316SS
700-0002-360	PFA/TFE/316SS
700-0005-054	PFA/TFE/316SS
700-0201-005	TFE/316SS
700-0201-025	TFE/316SS
700-0201-026	TFE/316SS
700-0201-027	TFE/316SS
700-0201-028	TFE/316SS
700-0201-035	TFE/316SS
700-0201-051	TFE/316SS
700-0201-052	TFE/316SS
700-0201-058	TFE/316SS
700-0201-059	TFE/316SS
700-0202-002	TFE/316SS

SENSOR MODEL #	PRIMARY SEAL WETTED MATERIALS
700-0202-053	TFE/316SS
700-0202-054	TFE/316SS
700-0202-056	TFE/316SS
700-1202-001	PEEK/316SS
700-1202-010	PEEK/316SS
700-1202-014	PEEK/316SS
700-1202-015	PEEK/316SS
700-1202-018	PEEK/316SS
700-1202-031	PEEK/316SS
700-1202-033	PEEK/316SS
700-1202-041	PEEK/316SS
700-1202-045	PEEK/316SS
700-1202-051	PEEK/316SS
700-1202-055	PEEK/316SS
700-1202-061	PEEK/316SS
700-1202-081	PEEK/316SS
700-9100-403	PEEK/316SS
700-9100-404	PEEK/316SS

CERTIFIED by _____
PO # _____
ENG _____
USER _____
E # _____

ISS.	EDO/DSR NO.	APP'D	DATE
2	1-12-114	JEN	1-20-12
1	4-08-106	TDH	9-10-08

SCALE NONE
UNLESS OTHERWISE STATED ALL DIMENSIONS IN INCHES (MM)

DR. JJS 1-19-12
CK. SGA 1-20-12

AMETEK®
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205 KEITH VALLEY RD
HORSHAM, PA 19044-9986
215-674-1234
FAX 215-674-2731

CONTROL DRAWING,
DUAL SEAL ASSEMBLY
FOR USE WITH
700 SERIES SENSING ELEMENTS

285-0003-0XX-CD SHT. 3 OF 3 ISS. 2

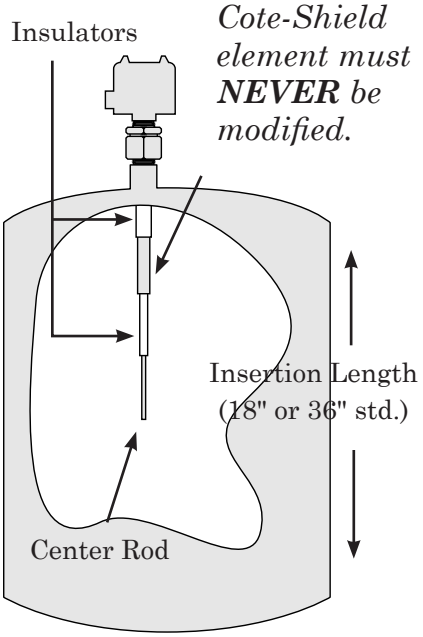
NO. 285-0003-0XX-CD SHT 3 OF 3

Appendix A

Shortening or Lengthening Sensing Element

CAUTION:
The insulation length of either ***Flush Sensing Elements*** *or* ***Insulated Sensing Elements*** *can* ***NOT*** *be changed.* ***Cable Sensing Elements*** *can only be shortened. Instructions are included with each unit.*

NOTE:
Cote-Shield element must ***NEVER*** *be modified.*



Note:
Any changes to probe length after calibration requires recalibration to ensure proper operation.

The Need

Sometimes your application calls for probe lengths other than the standard 18-inch or longer insertion lengths supplied. Shortening the sensing element is quite simple and can be done in the field. Lengthening the sensing element, however, is more difficult because the metal rod, typically 304 SS or 316 SS, must be welded.

Before making any Adjustments:

1) Read the following instructions thoroughly.
2) Remove power.
3) Disconnect the electronics.
4) Protect electronics from any static discharge.
5) Protect electronics from any heat.

Shortening

The bare metal center rod of the sensing element can be shortened with a hacksaw. Be careful not to cut either of the two insulators. See Figure on this page.

In applications using conductive or water-based materials, shortening is not a problem. Leave a minimum bare metal center rod length of two (2) inches.

For dry granular materials, such as powder, sand, corn, clinker, etc., you must leave a minimum bare metal center rod length of eight (8) inches. Consult the factory before shortening beyond this point.

Lengthening

To lengthen the sensing element, an extension rod can be welded onto the end of the bare metal center rod. Make sure that the extension rod is the same metal as the sensing element.

An alternate option is to add a pipe coupling and a section of metal pipe after threading the tip of the sensing element. In this case, the metal pipe need not be identical to the metal of the sensing element.

CE Installation Supplement

A. **Purpose:** To provide additional information that is required to be in compliance with the CE mark of conformity and EMC Directive requirements for systems as defined in EN50082-2 1995.

B. **Definitions:**

1. I/O Sensor/Measurement/Control Port -- Any port which provides level measurement, control, and/or DC power.
2. I/O AC Power -- Any port which provides AC main power to the instrument.
3. Housing -- Any enclosure where the sensor and transmitter can be located.
4. Non-metallic applications -- any application where the sensor is not surrounded by a metallic surface.

C. **Installation Specifics:**

1. **I/O Sensor/Measurement/Control Ports**

   – Wiring must be twisted pair and run in conduit or an equivalent shielded environment (i.e. shielded braid, cable, etc.).

   – The shield terminations must be grounded at the source and destination ports.

   – Wiring must be run separate from AC main power and/or any signal exceeding 75 volts DC or 50 volts AC.

2. **I/O AC Power Port**

   – Wiring must be run either in conduit or an equivalent shielded environment (i.e. shielded braid, cable, etc.).

   – The shield terminations must be grounded at the source and destination ports.

CE Installation Supplement

3. **Remote Installations**

– Sensor port must be connected to the transmitter port by one of the following means:

- 401-16-2 Probe Filter
- Coaxial cable run in conduit.
- Triaxial cable.

4. **Housings**

– All installations require the sensor and transmitter to be located in a closed shielded/metal housing (i.e. typically explosion-proof or weatherproof housings meet this requirement)

5. **Sensor Type/Mounting**

– In all non-metallic applications the sensor must have a full concentric shield (i.e. needs to be considered when ordering).

–The sensor/sensor condulet must be grounded locally either to a metal support structure or an equivalent earth ground.

D. **Comments:**

– Any deviation from these installation requirements should be reviewed with factory, prior to implementation

– These instructions are essential to insure conformity with specified EC directives.

Form 440-0001-001 3/1/2006

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AMETEK DREXELBROOK

GENERAL: ***ALL ORDERS ARE SUBJECT TO THE FOLLOWING TERMS AND CONDITIONS. ANY ACCEPTANCE OF ANY OFFER OF BUYER FOR ANY GOODS OR SERVICES IS CONDITIONED UPON THESE TERMS AND CONDITIONS, AND SELLER OBJECTS TO ANY ADDITIONAL OR DIFFERENT TERMS PROPOSED BY BUYER IN ANY DOCUMENT, WHICH SHALL NOT BE BINDING UPON SELLER.*** No salesman or other party is authorized to bind the AMETEK DREXELBROOK Division of AMETEK, Inc. (hereinafter "Seller") by any agreement, warranty, statement, promise, or understanding not herein expressed, and no modifications shall be binding on Seller unless the same are in writing and signed by an executive officer of Seller or his or her duly authorized representative. Verbal orders shall not be executed until written notification has been received and acknowledged by Seller.

QUOTATIONS: Written quotations are valid for thirty (30) days unless otherwise stated. Verbal quotations expire the same day they are made.

PRICES: All prices and terms are subject to change without notice. Buyer-requested changes to its order ("Orders"), including those affecting the identity, scope and delivery of the goods or services, must be documented in writing and are subject to Seller's prior approval and adjustments in price, schedule and other affected terms and conditions. Orders requiring certified test data in excess of commercial requirements, are subject to a special charge.

ORDER ACCEPTANCE: All Orders are subject to final approval and acceptance by Seller at its office located at 205 Keith Valley Road, Horsham, Pennsylvania 19044.

TERMS OF PAYMENT: Seller's standard terms of payment for Buyers who qualify for credit are net thirty (30) days from date of invoice. All invoices must be paid in United States dollars.

CREDIT: Seller reserves the right at any time to revoke any credit extended to Buyer or otherwise modify terms of payment if Buyer fails to pay for any shipments when due or if in Seller's opinion there is a material adverse change in Buyer's financial condition. Seller may, at its option, cancel any accepted Order if Buyer fails to pay any invoices when due.

DELIVERY: Shipments are F.O.B place of manufacture ("Shipping Point") and the Buyer shall pay all freight, transportation, shipping, duties, fees, handling, insurance, storage, demurrage, or similar charges from Shipping Point. Delivery of goods to common carrier shall constitute delivery and passing of title to the Buyer, and all risk of loss or damage in transit shall be borne by Buyer. Any claims or losses for damage or destruction after such delivery shall be the responsibility of Buyer.

Seller reserves the right to make delivery in installments which shall be separately invoiced and paid for when due, without regard to subsequent deliveries. Delay in delivery of any installment shall not relieve Buyer of its obligation to accept remaining deliveries.

Acknowledged shipping dates are approximate only and based on prompt receipt of all necessary information from Buyer and Buyer's compliance with terms of payment.

TAXES: All sales, excise and similar taxes which Seller may be required to pay or collect with respect to the goods and/or services covered by any Order, shall be for the account of the Buyer except as otherwise provided by law or unless specifically stated otherwise by Seller in writing.

TERMINATION AND HOLD ORDERS: No Order may be terminated by Buyer except upon written request by Buyer and approval by Seller, and if said request is approved by Seller, under the following conditions: (1) Buyer agrees to accept delivery of all of the units completed by Seller through the workday on which Seller receives the written termination request; (2) Buyer agrees to pay to Seller all direct costs and expenses applicable to the portion of the Order that is incomplete.

WARRANTY:

A. Hardware: Seller warrants its goods against defects in materials and workmanship under normal use and service for one (1) year from the date of invoice.

B. Software and Firmware: Unless otherwise specified, Seller warrants for a period of one (1) year from date of invoice that standard software or firmware, when used with Seller specified hardware, shall perform in accordance with Seller's published specifications. Seller makes no representation or warranty, expressed or implied, that the operation of the software or firmware shall be uninterrupted or error-free, or that functions contained therein shall meet or satisfy the Buyer's intended use or requirements.

C. Services: Seller warrants that services, including engineering and custom application, whether provided on a fixed cost or time and material basis, shall be performed in accordance with generally accepted industry practices.

D. Remedies: Seller's liability under this section is restricted to replacing, repairing, or issuing credit (at Seller's option) for any returned goods and only under the following conditions: (1) Seller must be promptly notified, in writing, as soon as possible after the defects have been noted by the Buyer, but not later than (1) year from date of invoice from Seller; (2) The defective goods are to be returned to the place of manufacture, shipping charges prepaid by the Buyer; (3) Seller's inspection shall disclose to its satisfaction that the goods were defective in materials or workmanship at the time of shipment; (4) Any warranty service (consisting of time, travel and expenses related to such services) performed other than at Seller's factory, shall be at Buyer's expense.

E. Repaired/Reconditioned Goods: As to out-of-warranty goods which Seller has repaired or reconditioned, Seller warrants for a period of sixty (60) days from date of its invoice only new components replaced in the most recent repair/reconditioning.

F. Returns and Adjustments: No goods may be returned unless authorized in advance by Seller and then only upon such conditions to which Seller may agree. Buyer must obtain an RMA (Return Material Authorization) number from Seller prior to any return shipment and such RMA number must appear on the shipping label and packing slip. Buyer shall be responsible for the returned goods until such time as Seller receives the same at its plant and for all charges for packing, inspection, shipping, transportation, or insurance associated with returned goods. In the event that credit for returned goods is granted, it shall be at the lesser of the then current prices or the original purchase price. Claims for shortage or incorrect material must be made within five (5) days after receipt of shipment.

ALL OTHER WARRANTIES, FOR ANY OF SELLER'S GOODS OR SERVICES, WHETHER ORAL, WRITTEN, EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE ARE EXCLUDED.

INTELLECTUAL PROPERTY: Seller's sale of goods or provision of related documentation or other materials to Buyer shall not transfer any intellectual property rights to Buyer unless Seller specifically agrees to do so in writing. Seller shall retain ownership of all applicable patents, trademarks, copyrights and other intellectual property rights. Buyer shall not use, copy or transfer any such items in violation of Seller's intellectual property rights or applicable law, or for any purposes other than that for which the items were furnished.

Seller shall defend any lawsuit brought against the Buyer based on a claim that the design or construction of the goods sold hereunder by Seller infringe any United States or Canadian Patent, Copyright or Mask Work Registration, provided that Buyer promptly notifies Seller of such claim in writing and further provided that, at Seller's expense, (1) Buyer gives Seller the sole right to defend or control the defense of the suit or proceeding, including settlement, and (2) Buyer provides all necessary information and assistance for that defense. In the event of a charge of infringement, Seller's obligation under the agreement shall be fulfilled if Seller, at its option and expense, either (i) settles such claim; (ii) procures for Buyer the right to continue using such goods; (iii) replaces or modifies goods to avoid infringement; or (iv) accepts the return of any infringing goods and refunds their purchase price; or (iv) defends against such claim.

If Buyer furnishes specifications or designs to Seller, the obligations of Seller set forth above shall not apply to goods made by Seller using such specifications or designs, and Buyer shall defend, indemnify and hold Seller harmless against any third party claims for infringement which arise out of Seller's use of specifications or designs furnished by Buyer.

SOFTWARE LICENSE: If goods purchased hereunder include software ("Software"), Buyer may use the Software only as part of the goods. Buyer may not use, copy, or transfer any of the Software except as may be permitted under the applicable License Agreement provided with the goods. Buyer's right to use, copy or transfer the Software shall terminate upon termination of Buyer's right to use the goods.

PACKAGING/WEIGHTS AND DIMENSIONS: Buyer specified packing or marking may be subject to additional charges not otherwise included in the price of the goods. Published weights and dimensions are estimates or approximate only and are not warranted.

FORCE MAJEURE: Seller shall not be responsible for delays in delivery or any failure to deliver due to causes beyond Seller's control, including but not limited to the following items: acts of God, war, terrorism, mobilization, civil commotion, riots, embargoes, domestic or foreign governmental regulations or orders, governmental priorities, port congestion, acts of the Buyer, its agents or employees, fires, floods, strikes, lockouts and other labor difficulties, shortages of or inability to obtain shipping space or transportation, inability to secure fuel, supplies or power at current prices or on account of shortages thereof, or due to limitations imposed by the extent of availability of Seller's normal manufacturing facilities.

If a delay excused per the above extends for more than ninety (90) days and the parties have not agreed upon a revised basis for continuing providing the goods or services at the end of the delay, including adjustment of the price, then Buyer, upon thirty (30) days' prior written notice to Seller may terminate the Order with respect to the unexecuted portion of the goods or services, whereupon Buyer shall promptly pay Seller its reasonable termination charges upon submission of Seller's invoices thereof.

LIMITATION OF LIABILITY: Seller's liability for any claim of any kind, except infringement of intellectual property rights, shall not exceed the purchase price of any goods or services which give rise to the claim. ***SELLER SHALL IN NO EVENT BE LIABLE FOR BUYER'S MANUFACTURING COSTS, LOST PROFITS, LOSS OF USE OF THE GOODS OR SERVICES, COST OF CAPITAL, COST OF SUBSTITUTE GOODS, FACILITIES, SERVICES OR REPLACEMENT POWER, DOWNTIME COSTS, CLAIMS OF BUYER'S CUSTOMERS FOR DAMAGES, OR OTHER SPECIAL, PROXIMATE, INCIDENTAL, INDIRECT, EXEMPLARY OR CONSEQUENTIAL DAMAGES.*** Any action against Seller must be brought within eighteen (18) months after the cause of action accrues. These disclaimers and limitations of liability shall apply regardless of the form of action, whether in contract, tort or otherwise, and further shall extend to the benefit of Seller's vendors, appointed distributors and other authorized resellers as third-party beneficiaries.

PROHIBITION FOR HAZARDOUS USE: Goods sold hereunder generally are not intended for application in and shall not be used by Buyer in the construction or operation of a nuclear installation or in connection with the use or handling of nuclear material, or for any hazardous activity or critical application, where failure of a single component could cause substantial harm to persons or property, unless the goods have been specifically approved for such a use or application. Seller disclaims all liability for any loss or damage resulting from such unauthorized use and Buyer shall defend, indemnify and hold harmless the Seller against any such liability, whether as a result of breach of contract, warranty, tort (regardless of the degree of fault or negligence), strict liability or otherwise.

EXPORT CONTROL: Buyer shall comply with all export control laws and regulations of the United States, and all sales hereunder are subject to those laws and regulations. Seller shall not be named as shipper or exporter of record for any goods sold hereunder unless specifically agreed to in writing by Seller. At Seller's request, Buyer shall furnish Seller with end-use and end-user information to determine export license applicability. Buyer warrants, in accordance with U.S. Export Law, that goods sold hereunder shall not be destined for facilities or activities involving nuclear, chemical or biological weapons, or related missile delivery systems in named prohibited regions or countries.

GOVERNING LAW: Seller intends to comply with all laws applicable to its performance under any order. All matters relating to interpretation and effect of these terms and any authorized changes, modifications or amendments thereto shall be governed by the laws of the Commonwealth of Pennsylvania. No government contract regulations or clauses shall apply to the goods or services, this agreement, or act to bind Seller unless specifically agreed to by Seller in writing.

NON-WAIVER BY SELLER: Waiver by Seller of a breach of any of these terms and conditions shall not be construed as a waiver of any other breach.

SEVERABILITY AND ENTIRE AGREEMENT: If any provision of these terms and conditions is unenforceable, the remaining terms shall nonetheless continue in full force and effect. This writing, together with any other terms and conditions Seller specifically agrees to in writing, constitutes the entire terms and conditions of sale between Buyer and Seller and supercedes any and all prior discussions, and negotiations on its subject matter.

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