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SIL IntelliPoint RF Series
Two-Wire, Point Level Safety Switch

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Two-Wire, Point Level, Safety, Switch

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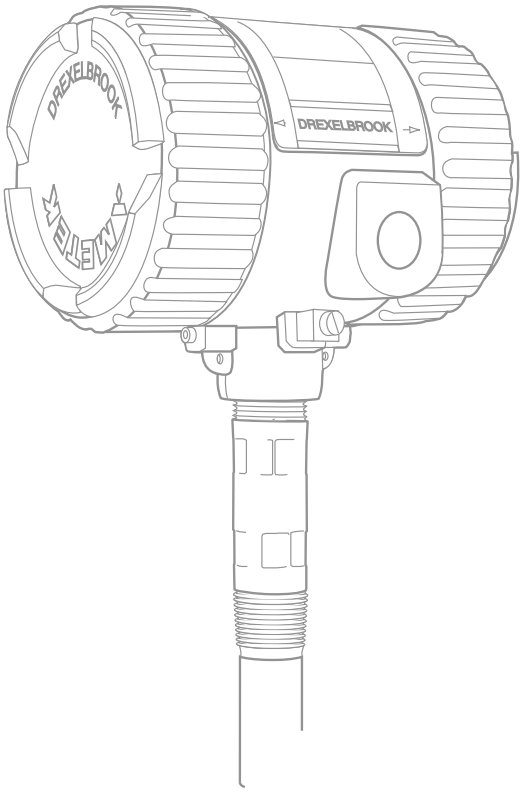

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Contents

Management summary

This report summarizes the results of the Failure Modes, Effects, and Diagnostic Analysis (FMEDA) of the Safety IntelliPoint RF™ Series Point Level Switch. A Failure Modes, Effects, and Diagnostic Analysis is one of the steps to be taken to achieve functional safety certification per IEC 61508 of a device. From the FMEDA, failure rates and Safe Failure Fraction are determined. The FMEDA that is described in this report concerns only the hardware of the Safety IntelliPoint RF™ Series Point Level Switch, electronic and mechanical, including the probe assembly. For full functional safety certification purposes all requirements of IEC 61508 must be considered.

The Safety IntelliPoint RF™ Series Point Level Switch is a two-wire, 4 – 20 mA smart device with discrete output levels. It contains self-diagnostics and is programmed to send it's output a specified state upon internal detection of a failure. For safety instrumented systems usage it is assumed that the 4 – 20 mA output is used as the primary safety variable. All other possible output variants are not covered by this report. The different devices can be equipped with or without display.

The Safety IntelliPoint RF™ Series Point Level Switch is classified as a Type B[1] device according to IEC61508, having a hardware fault tolerance of 0. The analysis shows that the device has a safe failure fraction between 90 and 99% (assuming that the logic solver is programmed to detect any currents outside the discrete output levels boundaries, see section 4.4) and therefore may be used up to SIL 2 as a single device.

The FMEDA analysis was performed for the High Level Fail Safe setting of the switch (HLFS). Table 1 lists the failure rates for the Safety IntelliPoint RF™ Series Point Level Switch according to IEC 61508, assuming that the logic solver is set to detect any currents outside a 1mA range around the three output levels.

Table 1: Failure rates according to IEC 61508

Safety IntelliPoint RF™ Series Point Level Switch	λ^{sd}	λ^{su2}	λ^{dd}	λ^{du}	SFF
High Level Fail Safe application	0 FIT	300 FIT	686 FIT	73 FIT	93.2%

These failure rates are valid for the useful lifetime of the product, see Appendix A.

A user of the Safety IntelliPoint RF™ Series Point Level Switch can utilize these failure rates in a probabilistic model of a safety instrumented function (SIF) to determine suitability in part for safety instrumented system (SIS) usage in a particular safety integrity level (SIL). A full set of failure rates is presented in section 4.5 along with all assumptions.

[1] Type B component: "Complex" component (using micro controllers or programmable logic); for details see 7.4.3.1.3 of IEC 61508-2.

[2] It is important to realize that the No Effect failures and Annunciation Undetected failures are included in the "safe" failure category according to IEC 61508. Note that these failures will not affect system reliability or safety and should not be included in spurious trip calculations

Section 1: Introduction

1.1 System Description

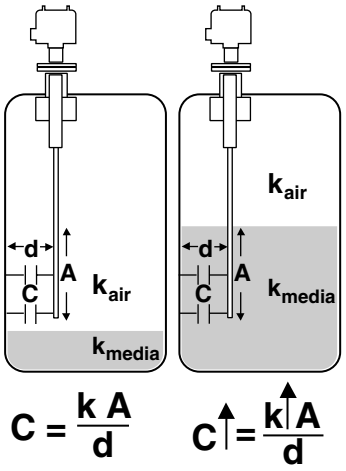

Figure 1-1
Simple Capacitance Probe (Insulating Media Shown)

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

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

Notice: Material to be Measured Must Be Below Sensor when Power is Applied.

The **AutoVerify™** self-testing function continuously monitors the entire system to ensure proper operation. **Manual Certify™** changes the outputs in order to test the loop current and ensure proper operation of the control systems.

1.2 Technology

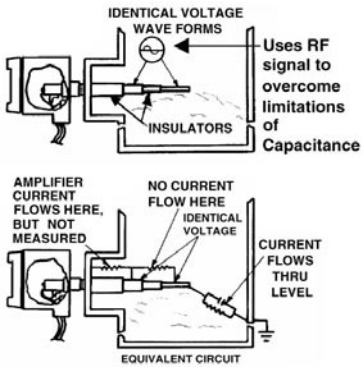

Figure 1-2
RF Admittance Probe with Cote-Shield

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 mis-balance. 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, IntelliPoint employs a radio frequency signal and adds the Cote-Shield™ circuitry within the Electronics Unit.

This patented Cote-Shield™ circuitry is designed into the IntelliPoint 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-Shield 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 10,000psi pressure, and works with all types of materials.

1.3 Model Number

Safety Switch
S

SIL
1 SIL1
2 SIL2

Technology
R RF Admittance

Measurement Type
N No Calibration, 2 pf Preload
L No Calibration, Fixed / Locked 2 pf Preload

Input
T Two Wire Power Supply 13-30 VDC

Housing
0 No Approvals, Dual Compartment NEMA 4X/IP66, M20 x 1.5 conduit entries
1 No Approvals, Dual Compartment NEMA 4X/IP66 ¾" NPT conduit entries
2 CENELEC/ATEX Approved, Dual Compartment NEMA 4X/IP66 M20x1.5 conduit entries
3 FM Approved, Dual Compartment NEMA 4X/IP66 ¾" NPT conduit entries
4 CSA Approved, Dual Compartment NEMA 4X/IP66 ¾" NPT conduit entries

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.		

Output
0 8-16mA Output

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 @ 177˚C (200 PSI @ 350˚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 @ 177˚C (200 PSI @ 350˚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, 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 in 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 in dia. 316SS collar
10	Corrosive liquids (2)(4)(9)	700-0001-018	3.4 bar @ 149˚C (50 PSI @ 300˚F)	PFA
11	General purpose, higher pressure TFE compatibility required	700-0201-005	69 bar @ 38˚C (1000 PSI @ 100˚F) 13.8 bar @ 232˚C (200 PSI @ 450˚F)	316SS and TFE
12	Corrosive material, higher pressure	700-0201-005 Hastelloy C	69 bar @ 38˚C (1000 PSI @ 100˚F) 13.8 bar @ 232˚C (200 PSI @ 450˚F)	Hastelloy C and TFE
13	Sanitary (3)	700-0201-036	69 bar @ 38˚C (1000 PSI @ 100˚F) 13.8 bar @ 232˚C (200 PSI @ 450˚F)	316/316L SS and TFE
14	General Purpose, low pressure	700-0202-002	3.4 bar @ 149˚C (50 PSI @ 300˚F) 1.4 bar @ 232˚C (20 PSI @ 450˚F)	316SS and TFE
15	Heavy duty, agitated tanks or material with high bulk density (1)	700-0202-043	69 bar @ 38˚C (1000 PSI @ 100˚F) 13.8 bar @ 232˚C (200 PSI @ 450˚F)	316SS and TFE
16	High integrity seal for hazardous material (8)	700-0002-360 (Seal Tyte™)	34.5 bar @ 149˚C (500 PSI @ 300˚F)	PFA (flange mounting only)
17	Sanitary (3) low pressure	700-0202-036	3.4 bar @ 149˚C (50 PSI @ 300˚F) 1.4 bar @ 232˚C (20 PSI @ 450˚F)	316SS and TFE
18	Corrosive material, higher pressure with waterlike viscosity (4)	700-0001-022	69 bar @ 38˚C (1000 PSI @ 100˚F) 34.5 bar @ 149˚C (500 PSI @ 300˚F)	TFE
20	Miniature Pilot Plant Sensor (1)(7)	700-0209-002	6.9 bar @ 121˚C (100 PSI @ 250˚F) 0 bar @ 232˚C (0 PSI @ 450˚F)	316 SS and TFE
60	Highest pressure and temperature (1)	700-0204-038	138 bar @ 93˚C (2000 PSI @ 200˚F) 69 bar @ 260˚C (1000 PSI @ 500˚F)	316SS and Ceramic
61	High temperature	700-0204-002	0.1 bar @ 371˚C (1 PSI @ 700˚F)	316SS and Ceramic
62	High pressure and temperature	700-0204-048	275 bar @ 316˚C (4000 PSI @ 600˚F)	316SS and Ceramic

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1.3 Model Number (Continued)

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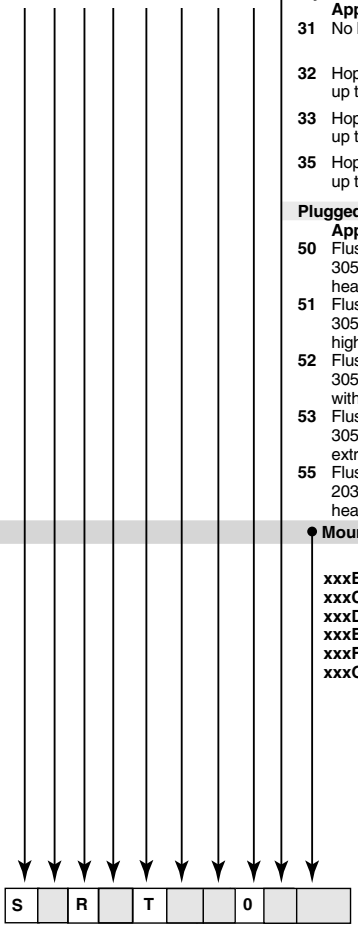


Fly Ash Precipitators, Baghouse, and Economizers (1) (6)

	Application	Sensing Element	Pressure/Temperature	Wetted Parts
31	No hopper installation	700-0029-001	0.1 bar @ 260˚C (2 PSI @ 500˚F)	316SS and TFE (CS Inactive)
32	Hopper installation up to 200mm (8 inches)	700-0029-002	0.1 bar @ 260˚C (2 PSI @ 500˚F)	316SS and TFE (CS Inactive)
33	Hopper installation up to 250mm (10 inches)	700-0029-003	0.1 bar @ 260˚C (2 PSI @ 500˚F)	316SS and TFE (CS Inactive)
35	Hopper installation up to 400mm (16 inches)	700-0029-005	0.1 bar @ 260˚C (2 PSI @ 500˚F)	316SS and TFE (CS Inactive)

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	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	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	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	0.1 bar @ 82˚C (1 PSI @ 180˚F)	410 SS and UHMW Polyurethane
55	Flush Mount Sensor 203mm^2 (8 inches^2) heavy duty	700-0207-006	0.1 bar @ 82˚C (1 PSI @ 180˚F)	304 SS and Polyurethane

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

	IL	CSL
xxxB	305 mm (12")	51 mm (2")
xxxC	305 mm (12")	89 mm (3.5")
xxxD	457 mm (18")	51 mm (2")
xxxE	457 mm (18")	89 mm (3.5")
xxxF	457 mm (18")	254 mm (10")
xxxG	457 mm (18")	0 mm (0")

	IL	CSL
xxxH	914 mm (36")	254 mm (10")
xxxJ	914 mm (36")	0 mm (0")
xxxK	1219 mm (48")	254 mm (10")
xxxL	1524 mm (60")	254 mm (10")
P00X	IL/CSL factory set for Plugged Chute	
A1BX	IL/CSL factory set for Fly Ash	
xxxZ	Other	

Notes:
(1) Available with remote electronics only
(2) Use A1P mounting option
(3) Choose from sanitary mounting options only
(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

Not all mounting options available with all sensing elements

IMPORTANT:
Minimum Active Length for SIL Compliance is 8" (203mm).
Consult Factory for Shorter Lengths

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

Sanitary TriClamps		
C2B	1" TriClamp	316SS
C3B	1½" TriClamp	316SS
C4B	2" TriClamp	316SS

DIN Flanges			
E01	25 mm	16bar	RF 316/316L SS
EP1	25 mm	40 bar	RF 316/316L SS
EQ1	50 mm	16 bar	RF 316/316L SS
ER1	50 mm	40 bar	RF 316/316L SS
ES1	80 mm	16 bar	RF 316/316L SS
ET1	80 mm	40 bar	RF 316/316L SS
EU1	100 mm	16 bar	RF 316/316L SS
EV1	100 mm	40 bar	RF 316/316L SS
EW1	150 mm	16 bar	RF 316/316L SS
EX1	150 mm	40 bar	RF 316/316L SS

DIN Flanges (cont.)			
E02	25 mm	16 bar	RF Carbon Steel
EP2	25 mm	40 bar	RF Carbon Steel
EQ2	50 mm	16 bar	RF Carbon Steel
ER2	50 mm	40 bar	RF Carbon Steel
ES2	80 mm	16 bar	RF Carbon Steel
ET2	80 mm	40 bar	RF Carbon Steel
EU2	100 mm	16 bar	RF Carbon Steel
EV2	100 mm	40 bar	RF Carbon Steel
EW2	150 mm	16 bar	RF Carbon Steel
EX2	150 mm	40 bar	RF Carbon Steel

ANSI Flanges			
DA1	1"	150#	RF 316/316L SS
DB1	1½"	150#	RF 316/316L SS
DC1	2"	150#	RF 316/316L SS
DD1	2½"	150#	RF 316/316L SS
DE1	1"	300#	RF 316/316L SS
DF1	1½"	300#	RF 316/316L SS
DG1	2"	300#	RF 316/316L SS
DH1	2½"	300#	RF 316/316L SS
DI1	3"	150#	RF 316/316L SS

ANSI Flanges (cont.)			
DJ1	3"	300#	RF 316/316L SS
DK1	4"	150#	RF 316/316L SS
DL1	4"	300#	RF 316/316L SS
DM1	6"	150#	RF 316/316L SS
DN1	6"	300#	RF 316/316L SS
DA2	1"	150#	RF Carbon Steel
DB2	1½"	150#	RF Carbon Steel
DC2	2"	150#	RF Carbon Steel
DD2	2½"	150#	RF Carbon Steel
DE2	1"	300#	RF Carbon Steel
DF2	1½"	300#	RF Carbon Steel
DG2	2"	300#	RF Carbon Steel
DH2	2½"	300#	RF Carbon Steel
DI2	3"	150#	RF Carbon Steel
DJ2	3"	300#	RF Carbon Steel
DK2	4"	150#	RF Carbon Steel
DL2	4"	300#	RF Carbon Steel
DM2	6"	150#	RF Carbon Steel
DN2	6"	300#	RF Carbon Steel

1.4 Dual Compartment Housing Detail

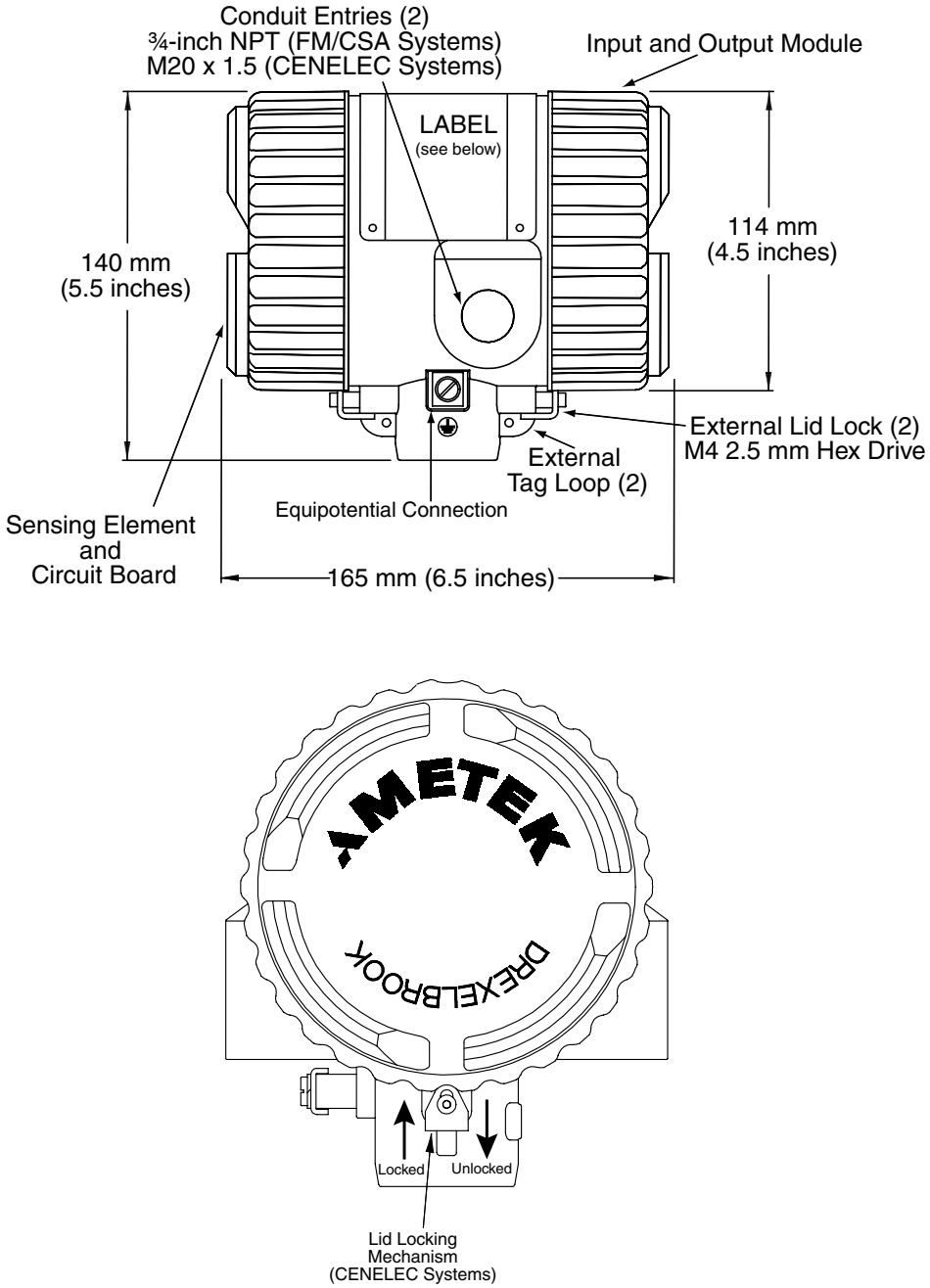


Figure 1-3
Dual Compartment Housing Detail

NOTICE

The Input/Output Module (IOM) is located on Customer Connection side; sensing element/circuit board are on opposite side.

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, report it to the factory immediately.

2.2 Mounting and Installation Guidelines

CAUTION:
The IntelliPoint RF instrument must be powered AFTER it is installed in the application and with material BELOW the sensing element.

The IntelliPoint RF instrument can be mounted vertically or horizontally at any angle. The 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°C to 70°C (-22°F to 158°F).

The IntelliPoint RF instrument uses a dual compartment housing and a completely encapsulated input/output module to reduce the possibility that damage may occur from water migrating into the housing through the conduit. To further reduce the possibility of damage caused by water in the conduit, install a drip loop and breather drain to purge any accumulating moisture. ***See to Figure 2-1***.

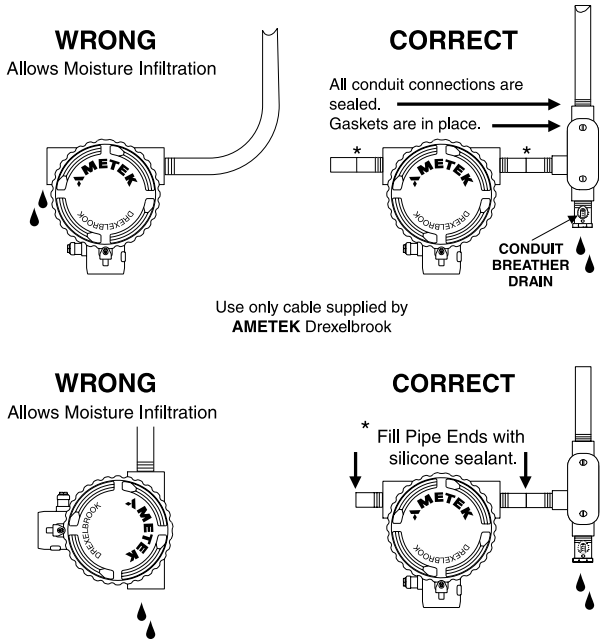


Figure 2-1
Recommended Conduit Connection

2.2 Mounting and Installation Guidelines (Continued)

After system is installed and level is **below** sensing element, apply power. The RF Series instrument does not require any calibration or setpoint adjustments and is ready to detect change in level. If properly installed, the green LED lights when power is applied. The Red LED should not be flashing. If the Red LED is flashing, refer to ***Section 4: Troubleshooting.***

NOTICE

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

The IntelliPoint RF instrument is rated Intrinsically Safe (I.S.) when power is provided from an I.S. supply.

WARNING:

IntelliPoint RF 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. ***See Figure 2-2.***

When installing IntelliPoint RF 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.

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 the 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)

Mounting sensing element inside a pipe is not recommended.

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 either vertically or horizontally.

NOTICE

Do Not Shorten the sensing element without checking with the factory. 1-800-527-6297 or 215-674-1234

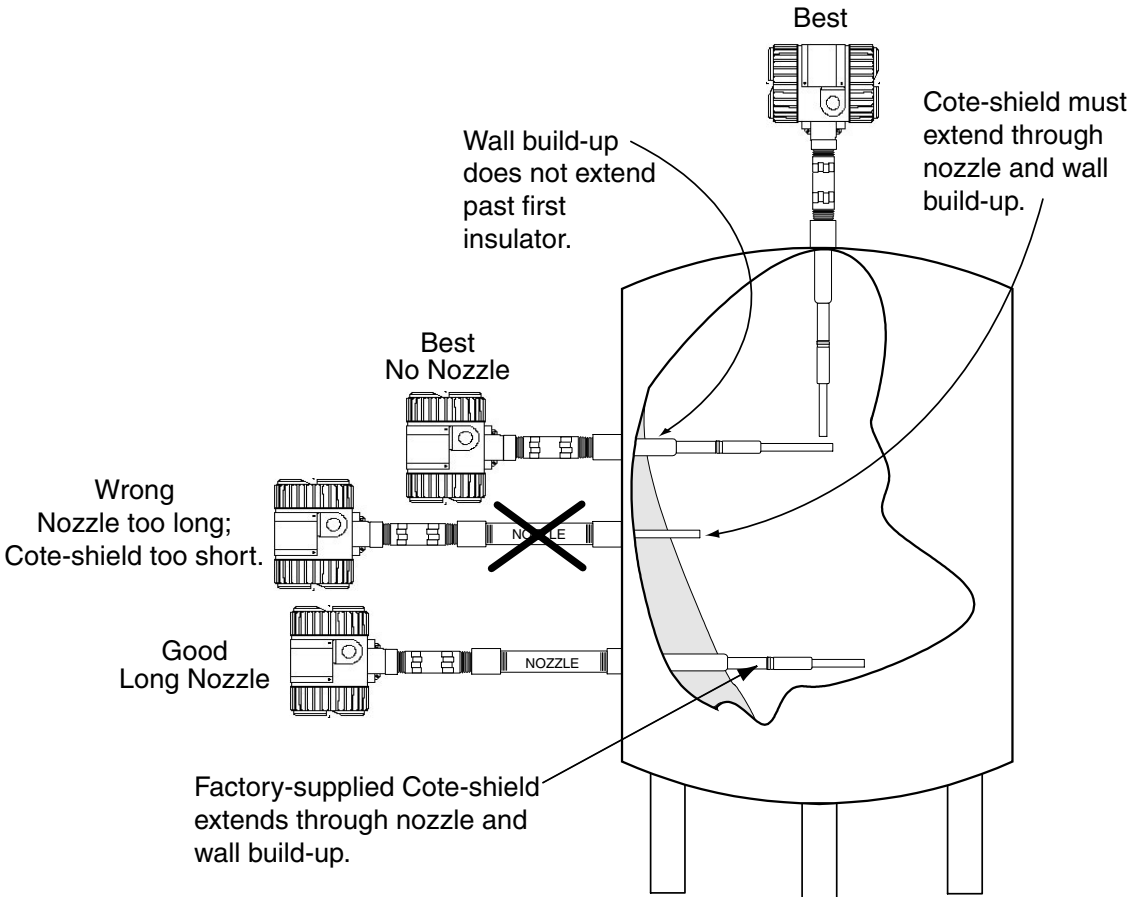


Figure 2-2
Installation Considerations

2.3 Input Wiring

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

The IntelliPoint RF instrument requires a 13-30 Vdc supply to operate. To access, remove the housing lid on the customer connections side to reveal the Input/Output Module **(IOM)**. The IOM is an encapsulated assembly that contains the power supply, outputs and eight wiring terminals. IOM is held in place with three screws. ***See Figure 2-3***.

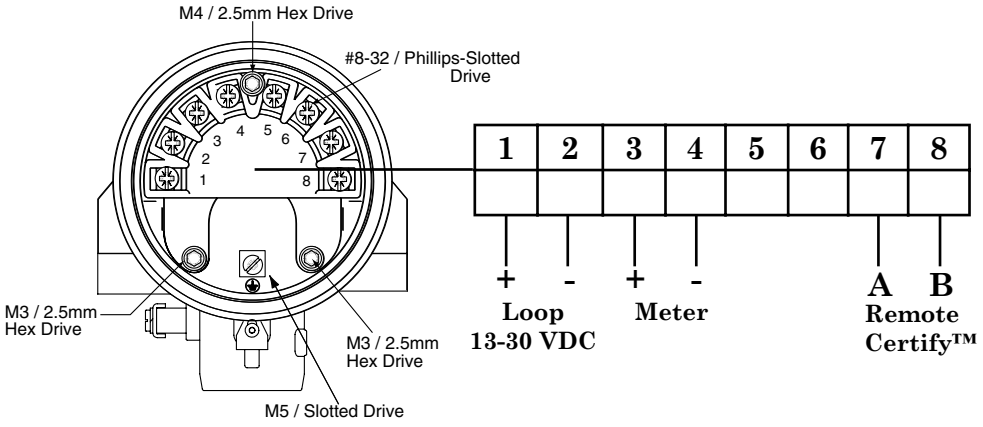


Figure 2-3
Input Wiring

2.4 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.

2.5 Circuit Board

The circuit board is located on the sensing element/circuit side of the housing (marked on label). Remove the housing lid to access the status LEDs, time delay adjustment, and configuration jumpers. ***See Figure 2-4***.

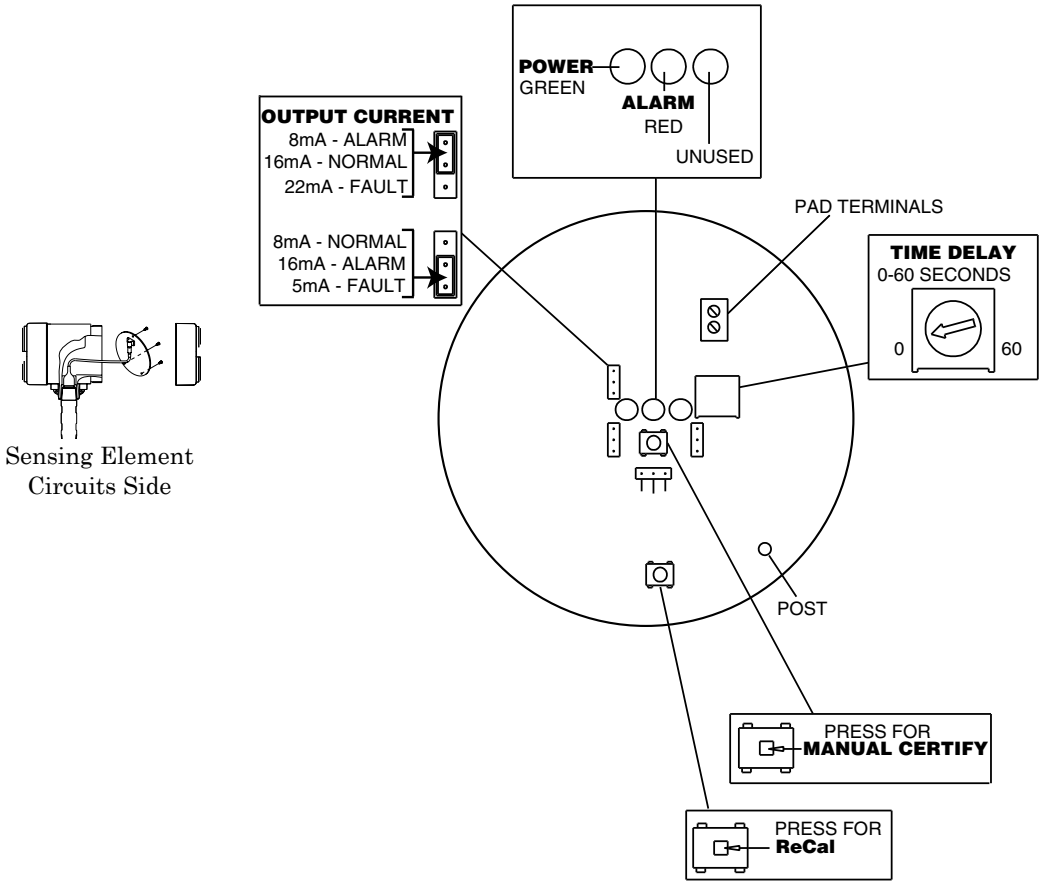


Figure 2-4
Circuit Board

NOTICE

Do **NOT** push the ReCal button without first ensuring the material being measured is below the sensing element

2.5.1 Time Delay

The "Time Delay" adjustment is located on the sensing element/ circuit board side of the housing (marked on label). It is used to help stop an oscillating current output due to agitation or waves in the vessel. The time delay adjustment can be field adjusted from 0 to 60 seconds. The unit is shipped with the Time Delay set to zero (0) seconds.

Safety Switches are set to Forward Acting Time Delay only.
ie: When material first touches the sensing element, the switch enters into the alarm condition and stays in the alarm condition for the duration of the delay setting.

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.

2.5.2 Failsafe

"Failsafe" describes the level condition that causes the transmitter to go into alarm.

Safety Switches are only applicable to High Level Fail Safe (**HLFS**) applications. Fail Safe is factory pre-set, through software, to **HLFS**.

2.5.3 Current Output Assignment

The Output Current can be configured using the jumpers as follows:

- Jumper on pin #1 and #2 creates:
  8mA - Alarm, 16mA - Normal, 22mA - Fault
- Jumper on pin #2 and #3 creates:
  8mA - Normal, 16mA - Alarm, 5mA - Fault

2.5.4 Manual / Remote Certify™

The "Certify" test feature performs a confidence test of the system by duplicating the same signal as a high-level alarm condition without requiring the system to be removed from the tank. Simulating a high level with the Manual/Remote Certify feature:

- Checks the AutoVerify™ and system circuits to ensure proper operation.

2.5.5 Manual / Remote Certify™ (Continued)

- Checks the integrity and continuity of the wiring connections.
- Verifies that the sensing element is working properly.

The "**Manual Certify**" test is initiated with the press of the Manual Certify Button located on the sensing element / circuit side of the housing.

The "**Remote Certify**" test is initiated by creating a momentary short between contacts 7 and 8 located on the power supply side of the housing. This can be done with a push button or relay closure.

After initializing the Certify test, the green LED flashes for 5 seconds and the red LED will illuminate. The current moves to the alarm condition for 2 seconds. If the red LED does not turn on, and the current does not move to the alarm condition, the Certify has detected a fault.
Consult Section 4: Troubleshooting.

2.5.5 AutoVerify™

"AutoVerify" is a self-testing function that continuously checks the system for proper operation when the unit is in the High Level Failsafe (**HLFS**) mode and in normal condition.

- The Safety IntelliPoint switch is shipped with AutoVerify Enabled, through software.
  AutoVerify Can Not be Disabled on the Safety IntelliPoint.

- If a fault is detected during the AutoVerify cycle, both LEDs will flash alternately, and the current will go to the fault output of 5mA or 22mA. ***See Section 2.5.4***

2.5.6 Periodic Testing Requirement

The intent of periodic testing is to ensure the SIS continues to function according to design requirements. Periodic testing intervals should be calculated during the SIF design verification. this time interval must be made part of the maintenance procedure for this process.

2.5.7 Re-Calibration

Do not push the "ReCal" Button without first ensuring the material being measured is below the sensing element.

If system is powered on the bench prior to installation, or moved from one tank to another, Re-Calibration is necessary to allow software to capture the air capacitance generated by sensing element in the tank.

Merely press and hold the "ReCal" Button for 5 seconds (***Shown in Figure 2-4***). Green LED flashes for 60 seconds before reset occurs.
[*Remove power from the system while the green LED is flashing and reset will occur immediately*].

The system is now ready for installation.

Nonvolatile Memory

The IntelliPoint has nonvolatile memory which allows the unit to re-start after power outages without recalibrating.

When The IntelliPoint is powered for the first time the internal microprocessor records and stores the “Air” value.
This is the uncovered value of the sensor mounted in the vessel. The IntelliPoint will also store the last covered value and the last uncovered value.

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

The IntelliPoint has nonvolatile memory which retains the recorded values even if power is lost for months. When The IntelliPoint regains power after a power outage, the microprocessor compares the stored values to the current measured value. It will then determine its current status based on this.

Example:
Air value is 10pF
covered value is 20pF
Uncovered value is 11pF
Setpoint = Alarm or recovery value.

3.3.4 Recalibration (Continued)

For alarm this would typically be 2pF above the last uncovered value (13pF in this case). For recovery this would be halfway between the uncovered and covered value (15.5pF in this case). The setpoint is stored in memory to indicate the last status of the switch.

So, when the unit regains power the microprocessor reads the current value of the sensor and determines the status based on the stored values. It will only re-calibrate if the re-call button is pressed.

2.6 Output & Status LEDs

There are two status LEDs located on the sensing element/ circuit board side of the housing. One is used to indicate that the unit has power. The second LED is used to indicate the status of the unit: **Normal** or **Alarm**. ***See Figure 2-5***.

NOTICE

Second Red LED is not used on the two wire transmitter.

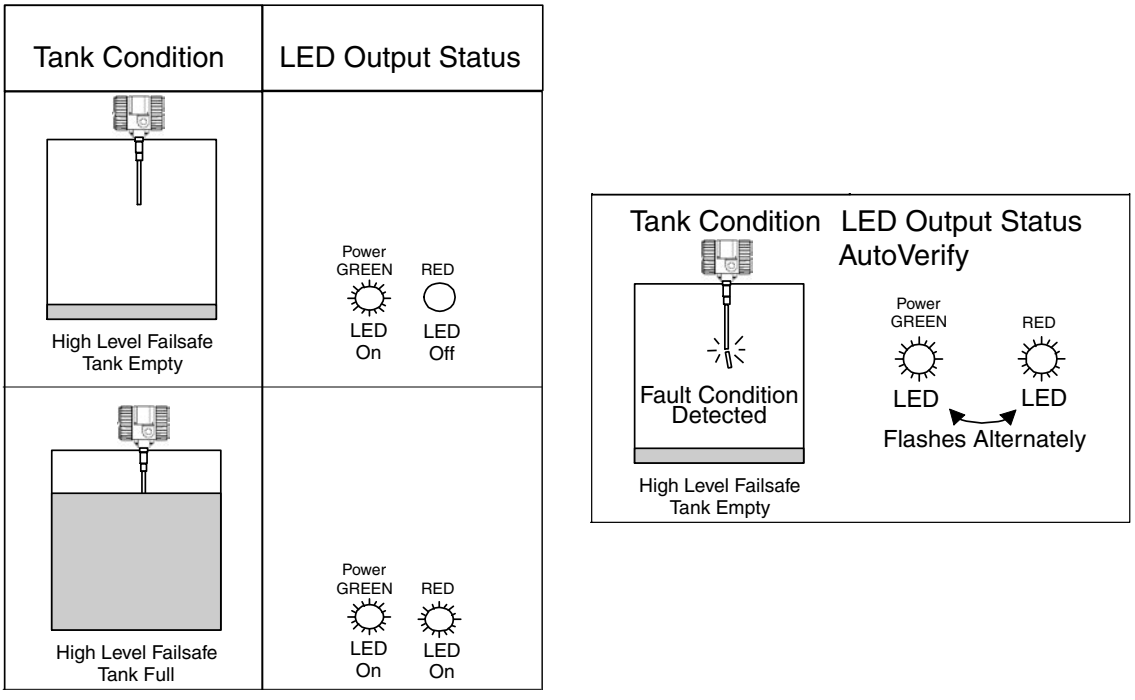


Figure 2-5
Output and LED Status

2.7 Sensing Element Connection

NOTICE

Disconnecting sensing element from integrally mounted transmitter is not usually necessary.

Sensing element connects to rear side of circuit board and is factory-installed. If sensing element must be removed from housing due to mounting requirements during installation, or because a different insertion length is discovered to be needed, use these following steps:

To remove sensing element:

- Remove power from system.
- Remove lid from sensing element/circuit side of housing.
- Remove three retaining screws that hold the board in place.
- Remove circuit board by gently pulling the post located at the lower right edge of the board. ***See Figure 2-4***.
- Disconnect wire harness from rear side of circuit board.
- Remove sensing element by rotating it counter clockwise.

To reinstall the sensing element:

- Insert wire harness into housing through bottom process entry.
- Apply thread sealant to ¾-inch NPT threads on sensing element.
- Install sensing element by threading it clock wise into housing.
- Connect wire harness to rear of circuit board.
- Carefully align the six feed through pins and place circuit board in housing.
- Install the three retaining screws.
- Install lid on sensing element/circuit side of housing.
- Apply power.

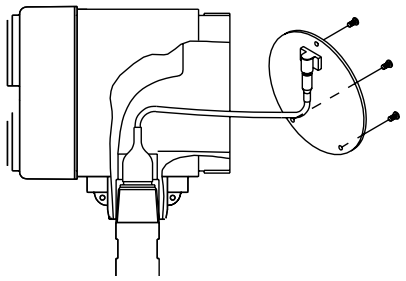
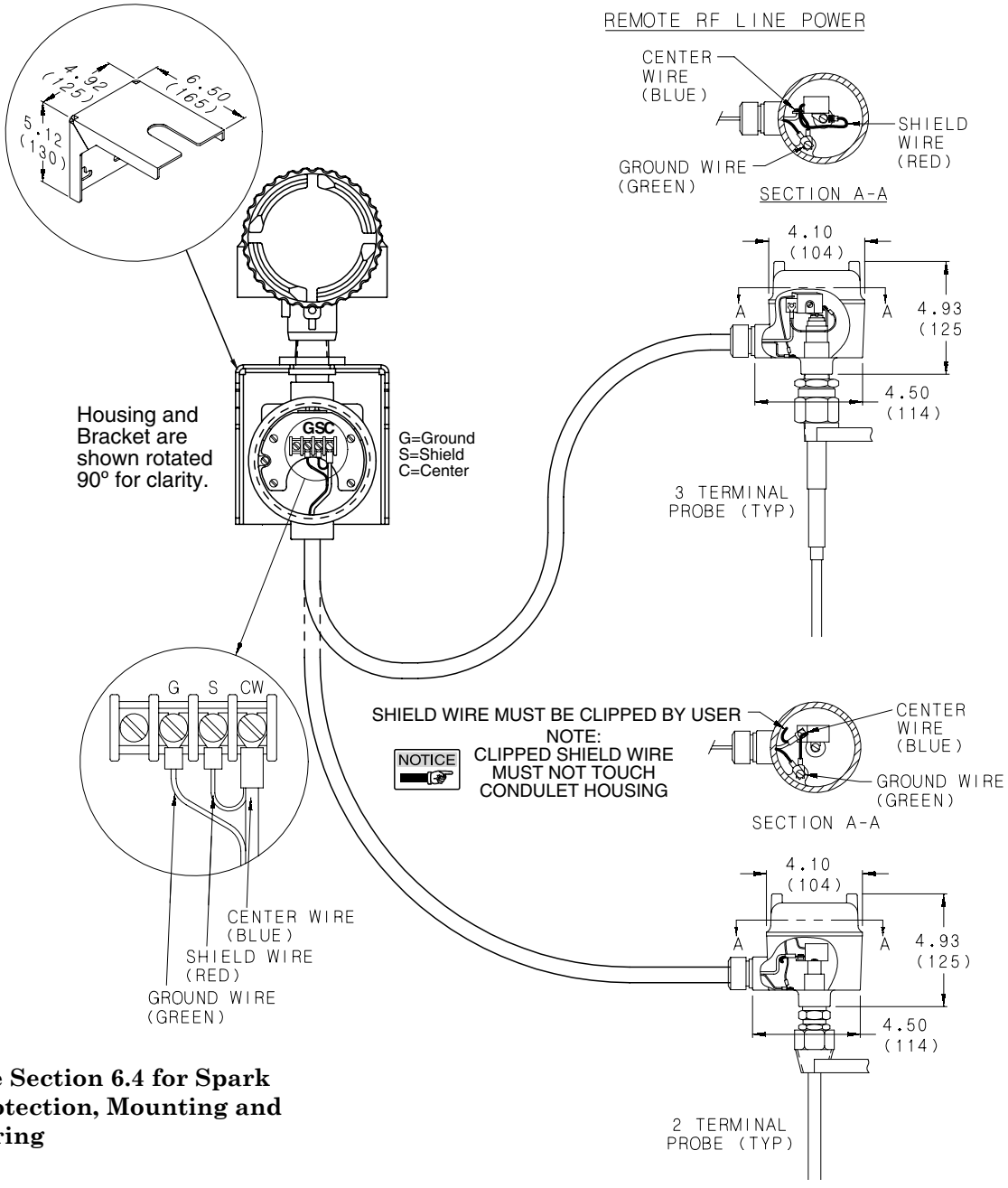


Figure 2-6
Sensing Element Connection (Integral Mounting)

2.7 Sensing Element Connection (Continued)

For IntelliPoint RF instruments that are mounted remotely from the sensing element, the cable connections from the sensing element to the electronic unit are made to the terminals on the sensing element side of the housing (marked on label). ***See Figure 2-7***. Connect Green (Ground) wire to Green screw, Red (Shield) wire to red screw, and Blue (Center) wire to blue screw.



NOTICE **See Section 6.4 for Spark Protection, Mounting and Wiring**

Figure 2-7
Sensing Element Connection (Remote Mounting)

Section 3: Spare Parts List

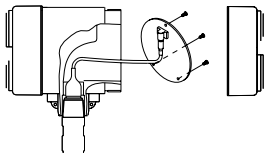
O-ring	250-1-75
Housing ¾-inch NPT Conduit Entry	260-2-540
Housing M20 Conduit Entry	260-2-542
Input/Output Module	385-48-15
Circuit Board	385-48-3-S

Section 4: Troubleshooting

WARNING:
If IntelliPoint 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.

4.1 Testing Sensing Element

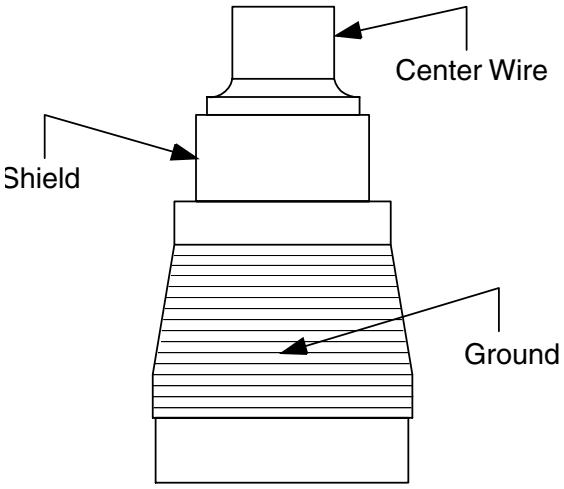
To test the sensing element, disconnect the integral cable. ***See Figure 4.1.***



Sensing Element Circuits Side

Expect the following measurements:

Three Terminal Probes without Shield Tab



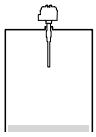
Measured Resistance (Sensor dry and clean):

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

CW-G 1000 ohms.
CW-S 600 ohms.
S-G 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.

NOTICE

Note: 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.

NOTICE

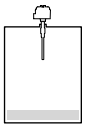
Note: A reading of zero ohms usually indicates a metal-to-metal short circuit. Check for contact with tank wall, mounting nozzle, or other tank structure.

Figure 4.1
Testing Sensing Element

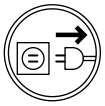
4.2 Testing Electronic Unit

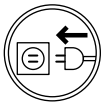
Use the following steps to test the electronic unit:

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



2. If possible to access sensing element with material below sensor, or remove the IntelliPoint from vessel, use your finger to touch upper pad terminal (***Shown in Figure 2-4***) while holding any bare metal portion of instrument housing with other hand. Alarm & relay should change state.
3. Again with no material touching sensor element, touch tip of sensing element with your finger, while holding any bare metal portion of instrument housing with other hand. Alarm & relay should change state.
4. If IntelliPoint changes state while touching test point, but not when touching tip of sensor, in most cases, integral cable is faulty. ***See Section 4.5: Testing Integral Cable***.





5. If IntelliPoint is stuck in one state:
   A. Remove power.
   B. Disconnect coax cable that joins sensing element to electronic unit.
   C. Apply power.
   D. Repeat steps 3 and 4.
   E. If IntelliPoint changes state with sensing element disconnected, in most cases, sensing element is faulty. ***See Section 4.1: Testing Sensing Element.***
6. If there was no action in any of steps 2, 3, or 4 and unit appears dead:
   A. Remove and then reapply power.
   B. Press **ReCal** Button (***Shown in Figure 2-4***).
   C. Observe that green LED flashes for about 60 seconds.
   D. Green LED should be lit after 60 seconds.
   E. Touch test point (***Shown in Figure 2-4***) with your finger.
   F. Alarm & Relay should change state. If so, circuit board is working properly.
   G. Reinstall instrument and press **ReCal** Button.
7. If IntelliPoint fails all of above tests, in most cases instrument is faulty. Use a replacement Input/Output Module (**IOM**) or circuit board to determine fault. ***Consult factory***.

4.3 Over Range

If Red LED is flashing quickly (4 times/second), IntelliPoint has detected that uncovered sensing element capacitance exceeds limits of transmitter. Consult factory for pad capacitor values and instructions.

4.4 Under Range

If Red LED is flashing slowly (once per second), IntelliPoint has detected that pad capacitor value is too large. Consult factory for pad capacitor values.

4.5 Testing Integral Cable

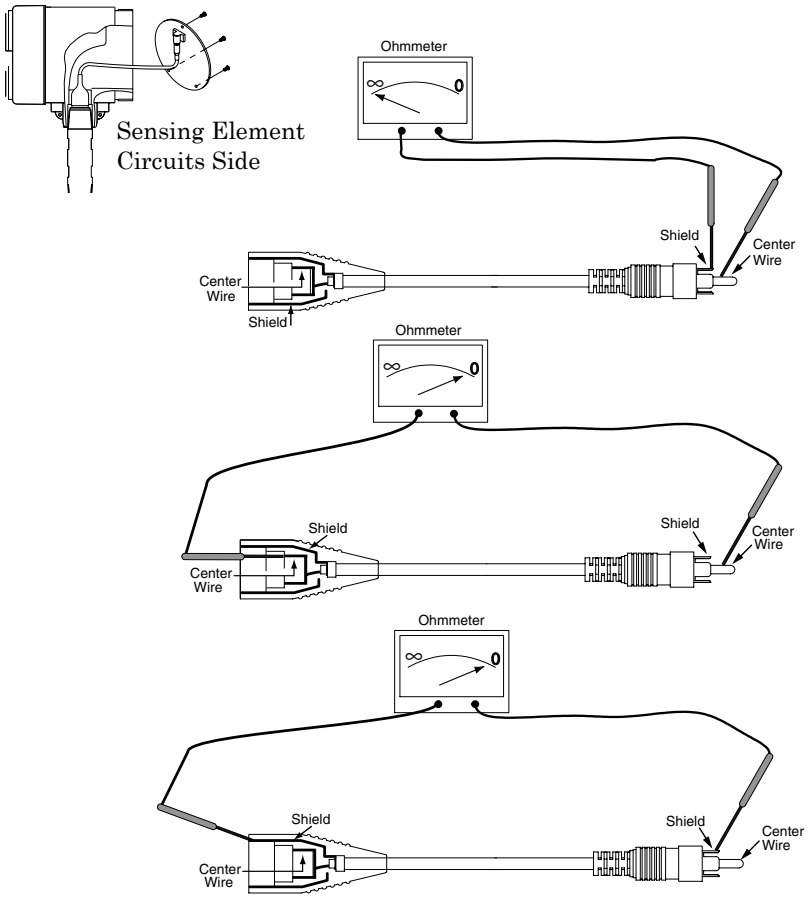


Figure 4-2
Testing Integral Cable

4.6 Testing Remote Cable

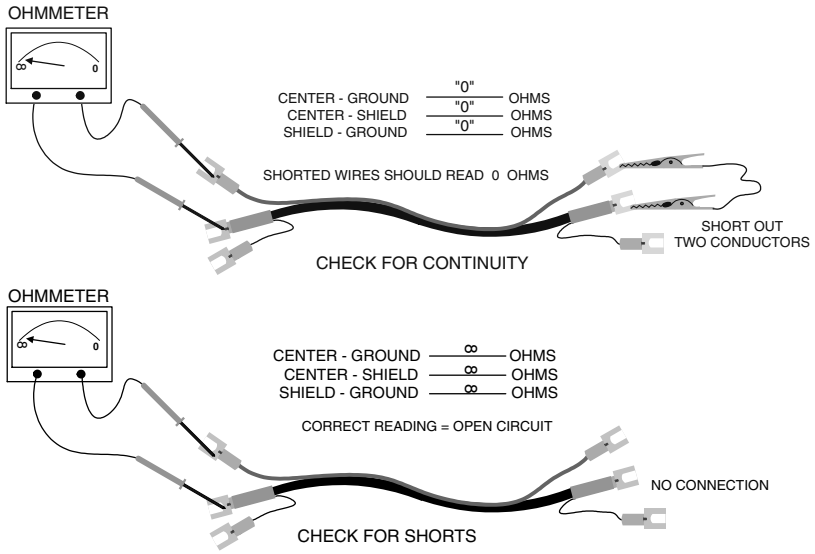


Figure 4-3
Testing Remote Cable

4.7 Testing Power Supply

Power supply can be tested separately as follows:

1. Remove power from electronic unit.
2. Remove three screws holding circuit board into housing.
3. Disconnect sensing element connection. ***See to Section 2.7 Sensing Element Connection***.
4. Reapply power.
5. Using a DC voltmeter, measure voltage from -5 to Common and +5 to Common. Correct readings are -5 to -6 and +5 to +6 Vdc. ***See Figure 4-4***.

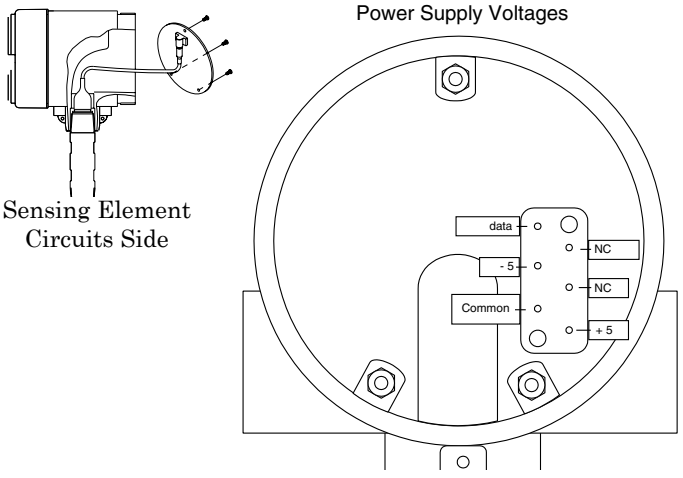


Figure 4-4
Testing Power Supply

4.8 Factory Assistance

AMETEK Drexelbrook can answer any questions about this, or any Drexelbrook 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

4.9 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.

4.10 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.

4.11 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

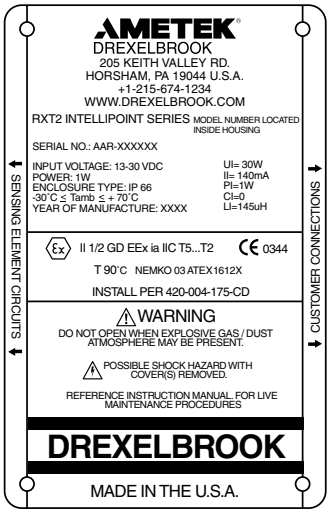
Section 5: Specifications

Technology:	RF/Capacitance
Safety:	SIL 2, FMEDA, IEC61508-2, 7.4.3.1 1999 (Exida)
Calibration:	None
Modes of Operation:	High level
Repeatability:	2mm (0.08 inch) conductive liquids
Response Time:	Less than 1 second
Time Delay:	0 to 60 seconds forward acting
Ambient Electronics:	-30 to 70°C (-28 to 158°F) KEMA -40 to 70°C (-40 to 158°F) FM (CSA pending)
Storage Temperature:	-40 to 85°C (-40 to 185°F)
Indicators:	LEDs: Green Power, Red Alarm Status
Self-Check:	Continuous AutoVerify and Manual Certify
Power Supply:	13 to 30 Vdc *Note: The minimum supply voltage at the transmitter terminal is:* 13 Volts at 22mA (Fault) 18 Volts at 5mA (Fault)
Power Consumption:	1 watt maximum
Output:	8 mA - Alarm 16 mA - Normal 22 mA - Fault (or field-selectable) 8 mA - Normal 16 mA - Alarm 5 mA - Fault
Housing (Electronics):	Dual Compartment, powder-coated aluminum with two cable entries
Cable Entry:	M20 x 1.5 CENELEC ¾-inch NPT FM/CSA
Ingress Protection:	IP66 NEMA 4X

5.1 Approvals

Explosion-proof for use in Class I, Division 1, Groups A, B, C, and D, Dust-Ignition proof for use in Class II and III, Division 1, Groups E, F, and G; Non-incendiary for use in Class I, Division 2, Groups A, B, C, and D; Suitable for use in Class II and III, Division 2, Groups F and G Hazardous (Classified) Indoor and Outdoor (Type 4, 4X, IP66) Locations with Intrinsically Safe connections to Class I, II, and III, Division 1, Groups A, B, C, D, E, F, and G Hazardous (Classified) locations in accordance with control drawing 420-0004-173-CD; Intrinsically Safe for use in Class I, II, and III, Division 1, Groups A, B, C, D, E, F, and G hazardous (Classified) locations in accordance with entity requirements and control drawing 420-0004-173-CD.

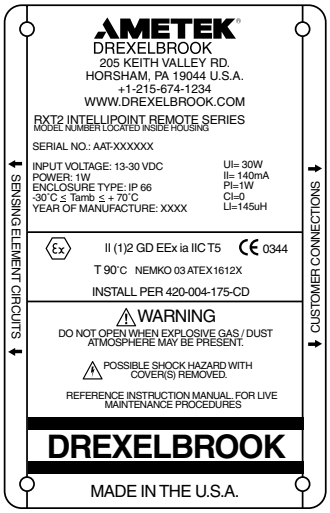
ATEX



Integral

II 1/2 GD EEX ia IIC T5...T2
T 90°C KEMA 01 ATEX 2187X CE 0344

Temperature Class	Process Temperature
T5	100°C
T4	135°C
T3	200°C
T2	230°C



Remote

II (1)2 GD EEX ia IICT5
T90°C KEMA 01 ATEX 2187X CE 0344

5.1 Approvals (Continued)

Class I, Groups A,B,C, and D with Intrinsically Safe Probe; ClassII, Groups E, F, and G; Class III

IntelliPoint RF Point Level System RXL4 Series; Rated supply: 18...200Vdc or 85...250Vac max.; 400Hz, 2W Relay: 250V, 5A with or without optional remote sensing element connection box; Temperature Code T5; Maximum Ambient Temperature +70C; CSA Enclosure Type 4X.

IntelliPoint RF Two-Wire Point Level System RXT4 Series; Rated 30Vdc max., 140mA max. with or without optional remote sensing element connection box; Temperature Code T4; Maximum Ambient Temperature +70C; CSA Enclosure Type 4X.

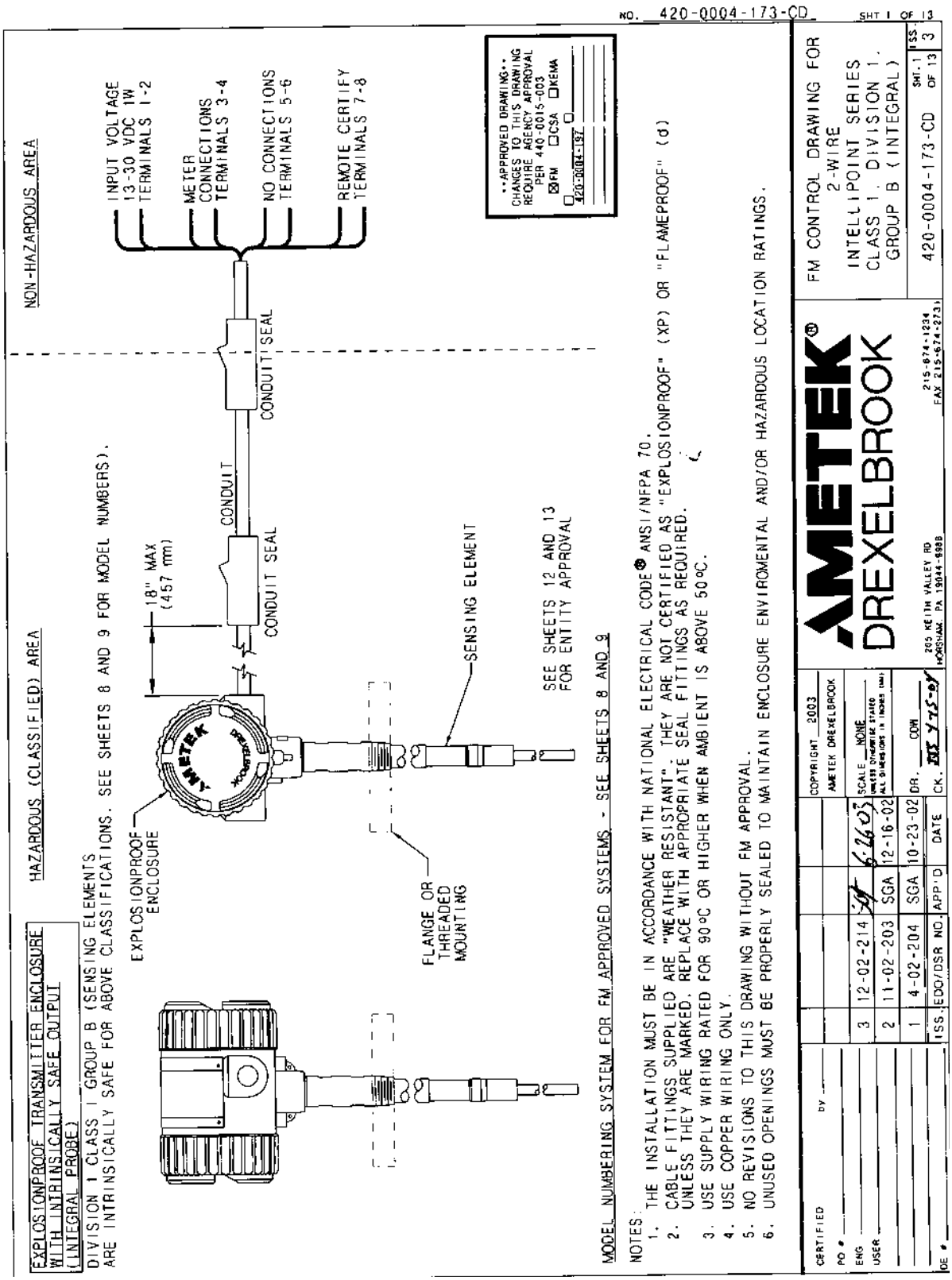
Note: The Intrinsically Safe Circuits remain internal to the device.

Class I,m Div 2, Groups A, B, C, and D; Class II, Groups E, F, and G; Class III

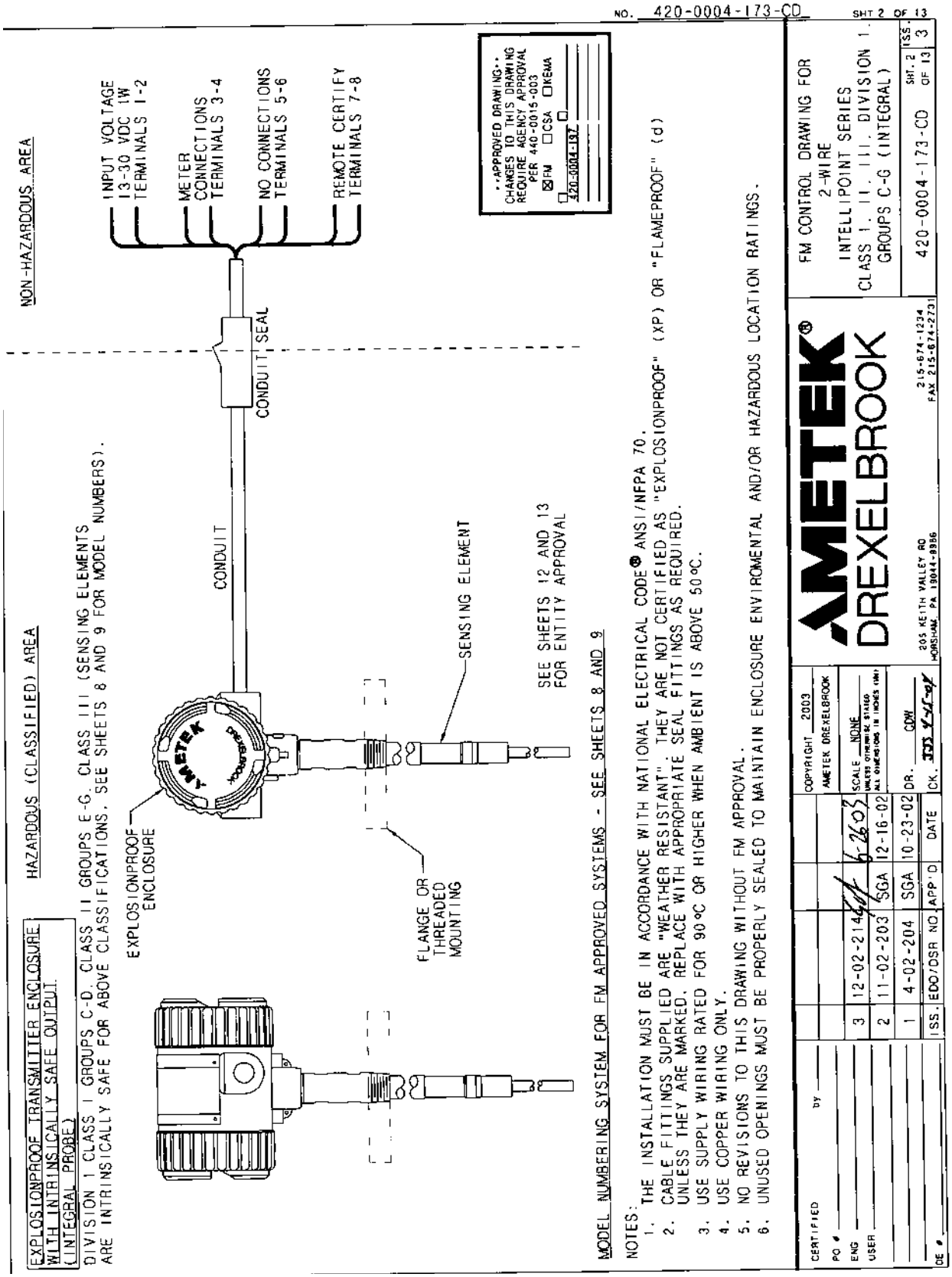
IntelliPoint RF Two-Wire Point Level System RXT4 Series; Rated 30Vdc max., 140mA max.; Temperature Code T4; Maximum Ambient Temperature +70C; CSA Enclosure Type 4X.

Section 6: Control Drawings

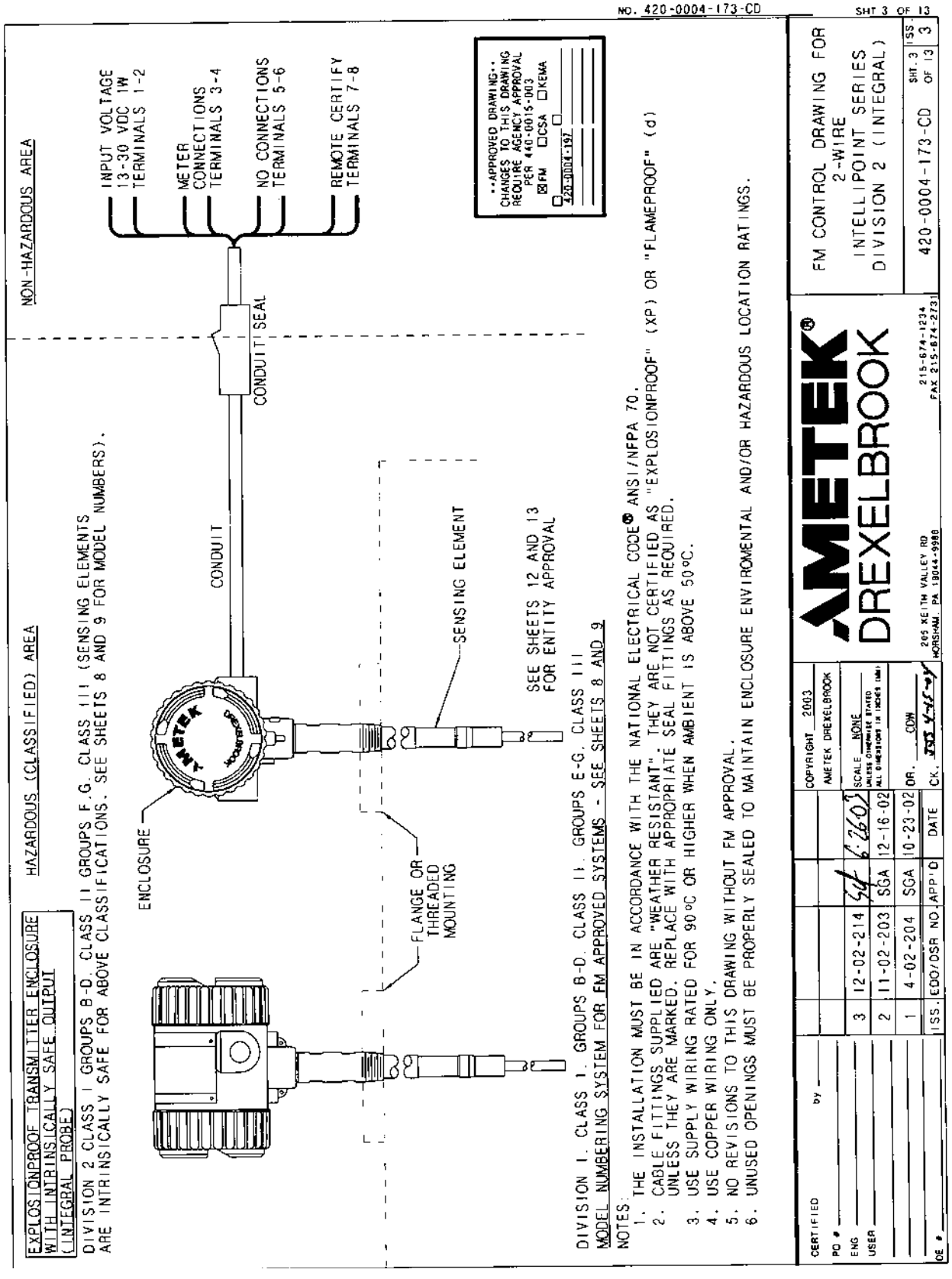
6.1 FM Control Drawings



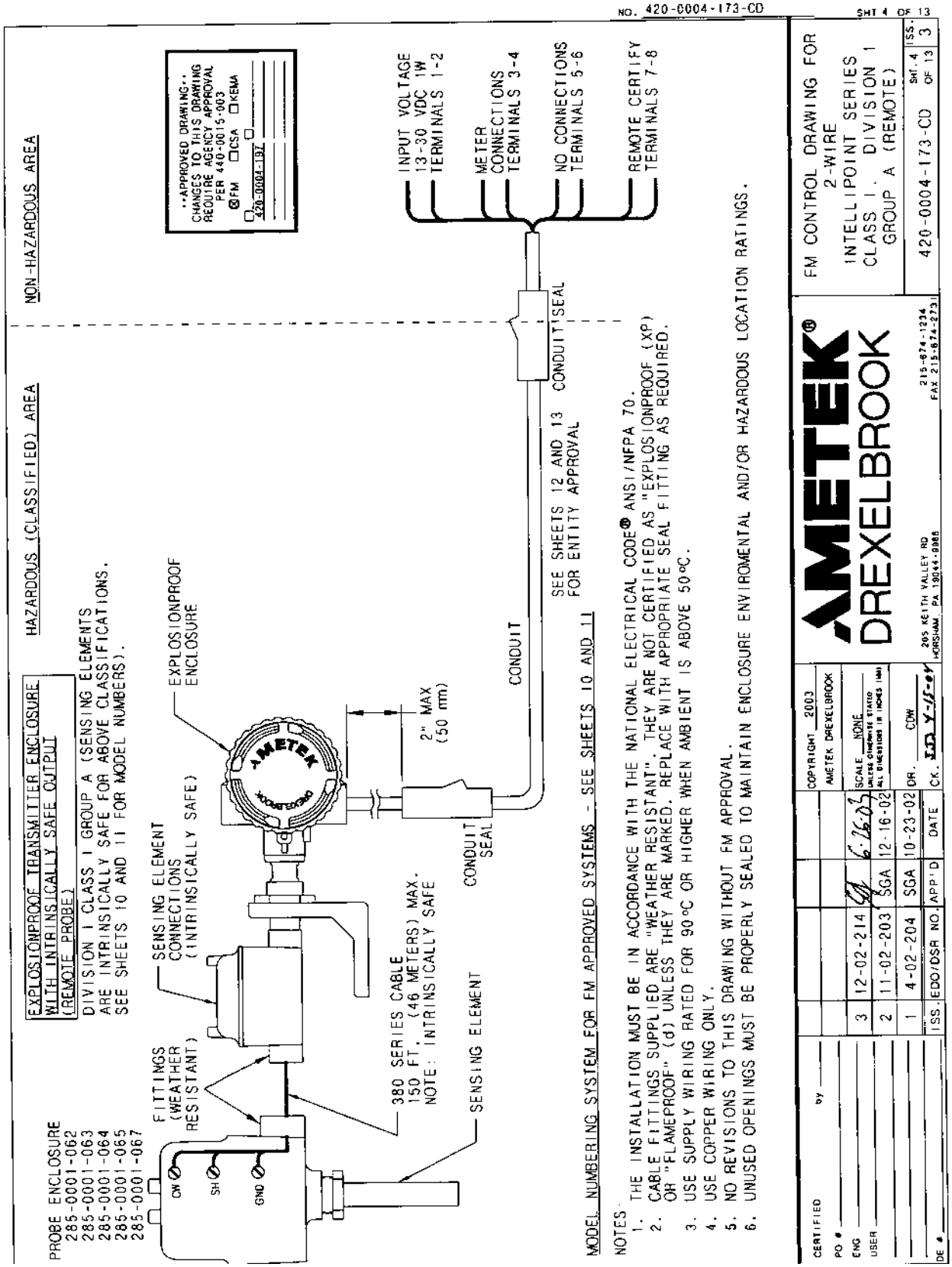
6.1 FM Control Drawings (Continued)



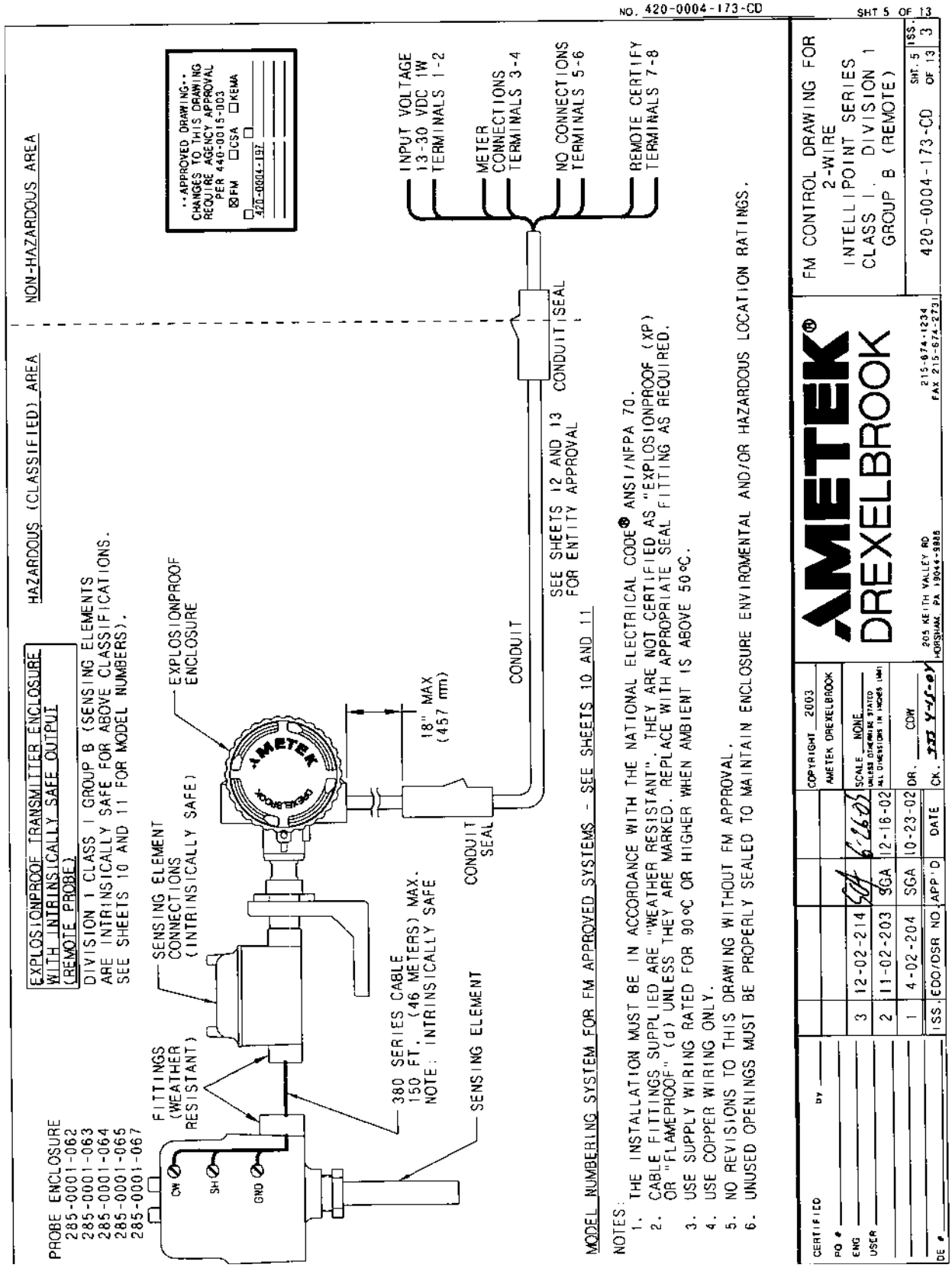
6.1 FM Control Drawings (Continued)



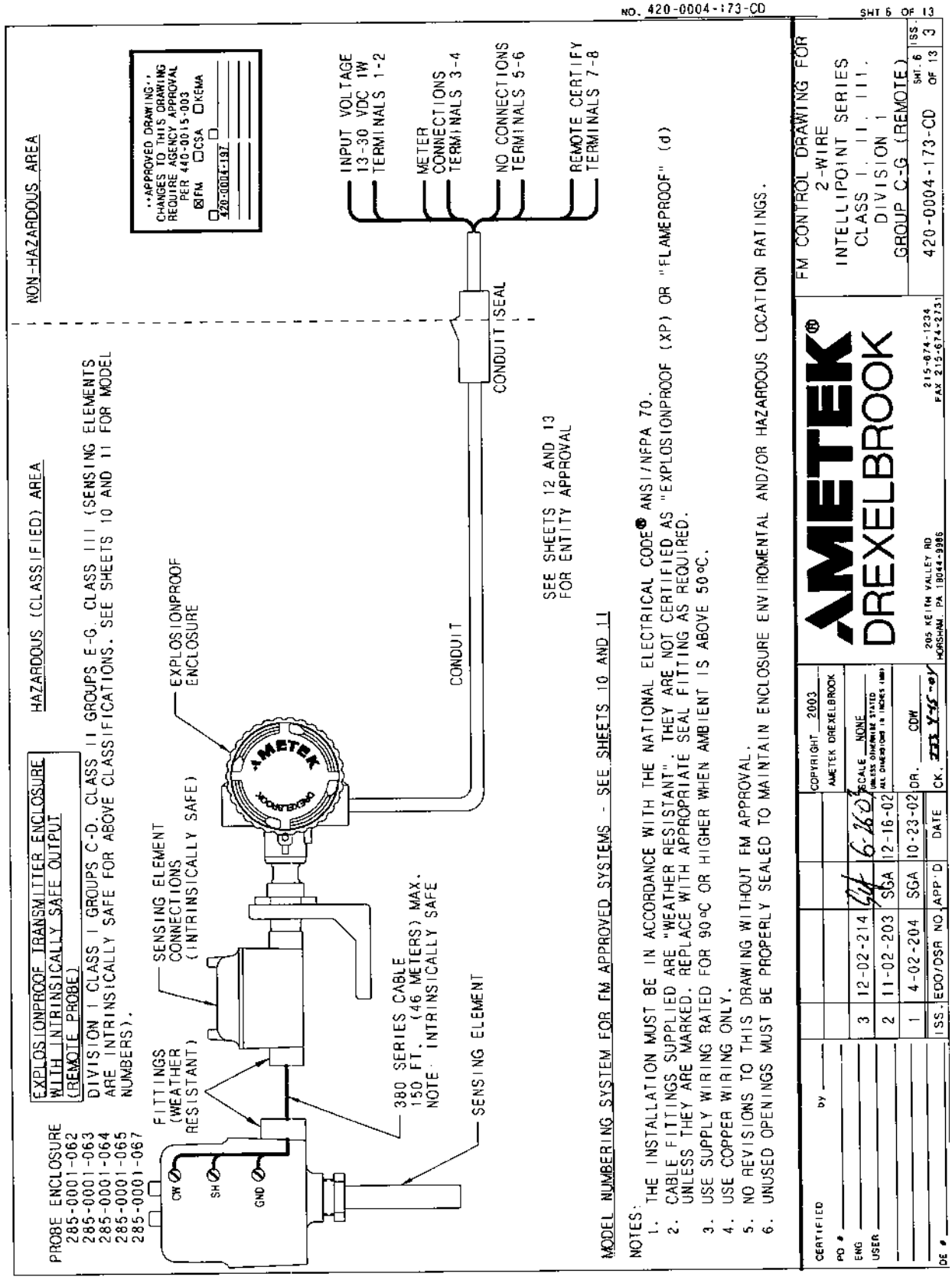
6.1 FM Control Drawings (Continued)



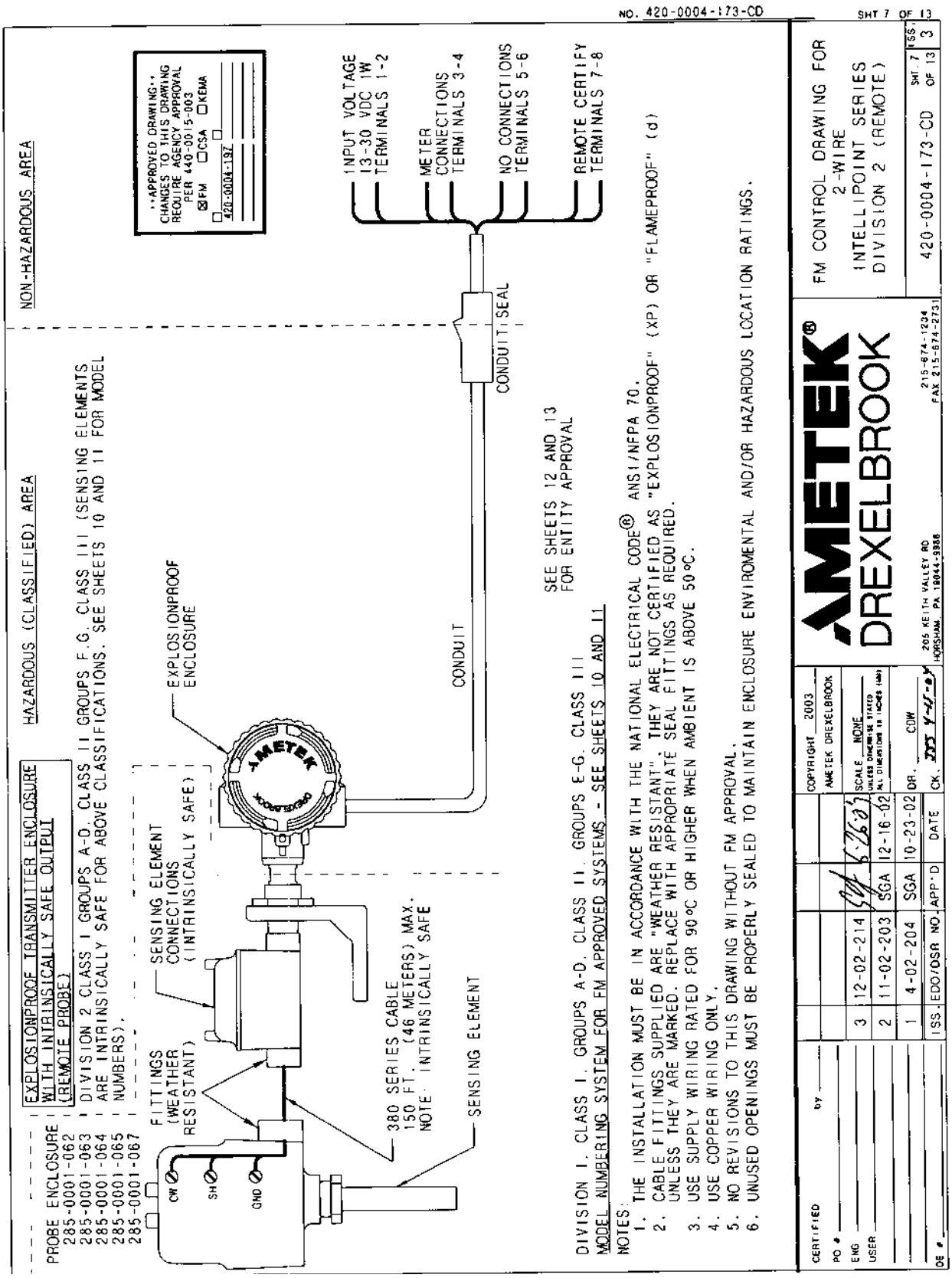
6.1 FM Control Drawings (Continued)



6.1 FM Control Drawings (Continued)



6.1 FM Control Drawings (Continued)



6.1 FM Control Drawings (Continued)

								COLUMNS 9 AND UP DO NOT AFFECT SAFETY				
1	2	3	4	5	6	7	8	9	10	11	12	
R	a	T	3	0	0	b	c	*	*	*	d	a = OPTIONS
	a											N = NO-CAL (STD)
												M = MANUAL SET POINT ADJUSTMENT
												H = HI SENSITIVITY
												G = HI SENSITIVITY MANUAL SET POINT ADJUSTMENT
						b						b = 0, 1 OR Z SENSING ELEMENTS
							c					c = 0-4, 6 & 8, Z SENSING ELEMENTS
												SENSING ELEMENTS
						0	0					700-1202-021
							1					700-1202-022
							2					700-1202-024
							3					700-1202-028
							4					700-1202-042
						1	1					700-0201-005
							2					700-0201-005 HAST C
							3					700-0201-036
							6					700-0002-360
							8					700-0001-022
						Z	Z					SEE SHEET 9 FOR A LIST OF OTHER APPROVED INTEGRAL SENSING ELEMENTS
											d	c = A-F, H, K, L OR Z
												INSERTION LENGTH/COTE SHIELD LENGTH
											A	6"/2" & 152.4mm/50.8mm
											B	12"/2" & 304.8mm/50.8mm
											C	12"/3.5" & 304.8mm/88.9mm
											D	18"/2" & 457.2mm/50.8mm
											E	18"/3.5" & 457.2mm/88.9mm
											F	18"/10" & 457.2mm/254mm
											H	36"/10" & 914.4mm/254mm
											K	48"/10" & 1219.2mm/254mm
											L	60"/10" & 1524mm/254mm
											Z	OTHER

NO. 420-0004-173-CD

SCALE NONE
UNLESS OTHERWISE STATED ALL DIMENSIONS IN INCHES (MM)
DR. CDW
CK. JJS 4-15-04

CERTIFIED by
PO #
ENG
USER
DE #

ISS.	EDO/DSR NO.	APP'D	DATE
3	12-02-214		6-26-03
2	11-02-203	SGA	11-13-02
1	4-02-204	SGA	10-23-02

AMETEK®
DREXELBROOK
205 KEITH VALLEY RD
HORSHAM, PA 19044-8986
215-674-1234
FAX 215-674-2731

FM APPROVED INTEGRAL
2-WIRE INTELLIPOINT
MODEL NUMBERING SYSTEM

420-0004-173-CD SHT. 8 OF 13 ISS. 3

SHT 8 OF 13

6.1 FM 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
700-0001-012	700-0002-059	700-0018-226
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
700-0001-045	700-0005-028	700-0201-010
700-0001-051	700-0005-035	700-0201-015
700-0001-052	700-0005-038	700-0201-016
700-0001-053	700-0005-045	700-0201-018
700-0001-054	700-0005-048	700-0201-025
700-0001-061	700-0005-054	700-0201-026
700-0001-062	700-0005-114	700-0201-035
700-0001-063	700-0005-148	700-0201-036
700-0001-064	700-0005-214	700-0201-105
700-0001-324	700-0005-314	700-0201-108
700-0001-344	700-0005-348	700-0201-109
700-0002-012	700-0005-354	700-0201-118
700-0002-018	700-0008-122	700-0201-135
700-0002-021	700-0008-123	700-0202-002
700-0002-022	700-0008-124	700-0202-004
700-0002-023	700-0008-126	700-0202-019
700-0002-024	700-0008-134	700-0202-023
700-0002-025	700-0008-144	700-0202-024
700-0002-027	700-0008-222	700-0202-033
700-0002-028	700-0008-226	700-0202-036
700-0002-029	700-0008-234	700-0202-043
700-0002-033	700-0008-242	700-0202-102
700-0002-035	700-0008-243	700-0204-038
700-0002-036	700-0008-245	700-0204-045
700-0002-037	700-0008-246	700-0204-048
700-0002-039	700-0008-262	700-0221-002
700-0002-041	700-0009-002	700-1202-001
700-0002-042	700-0009-024	700-1202-018
700-0002-043	700-0011-001	700-1202-021
700-0002-044	700-0011-003	700-1202-022
700-0002-047	700-0011-004	700-1202-024
700-0002-051	700-0011-015	700-1202-028
700-0002-052	700-0018-122	700-1202-041
	700-0018-123	700-1202-042

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

DR. CDW
CK. [illegible]

CERTIFIED by
PO #
ENG
USER
DE #

ISS.	EDO/DSR NO.	APP'D	DATE
3	12-02-214	SGA	6-26-03
2	11-02-203	SGA	11-13-02
1	4-02-204	SGA	10-23-02

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HORSHAM, PA 19044-5985
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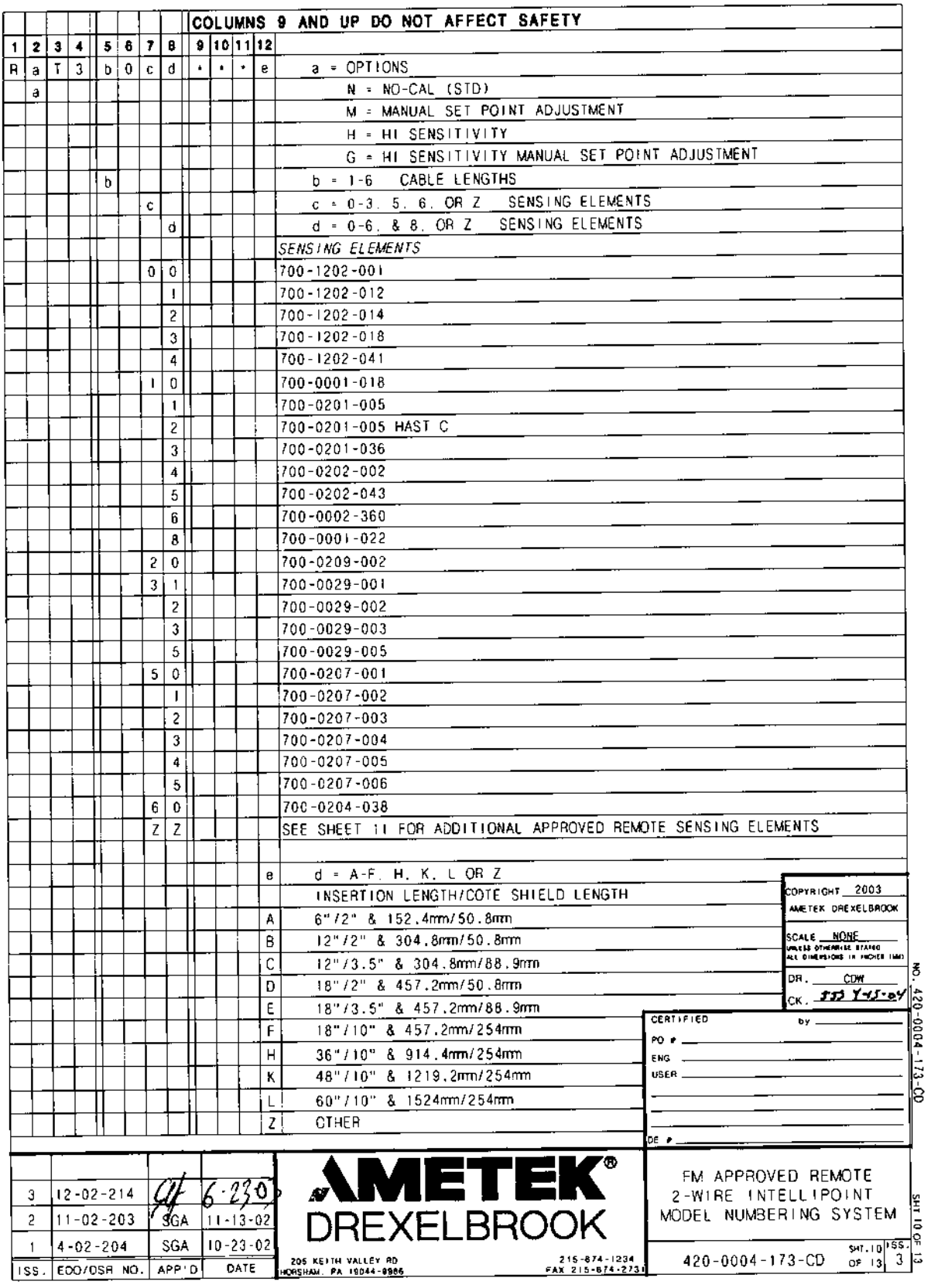
FAX 215-674-2731

FM APPROVED
ADDITIONAL INTEGRAL
SENSING ELEMENTS

420-0004-173-CD SHT. 9 OF 13 ISS. 3

6.1 FM Control Drawings (Continued)



COLUMNS 9 AND UP DO NOT AFFECT SAFETY											
1	2	3	4	5	6	7	8	9	10	11	12
R	a	T	3	b	0	c	d	*	*	*	e

a = OPTIONS
- N = NO-CAL (STD)
- M = MANUAL SET POINT ADJUSTMENT
- H = HI SENSITIVITY
- G = HI SENSITIVITY MANUAL SET POINT ADJUSTMENT

b = 1-6 CABLE LENGTHS

c = 0-3, 5, 6, OR Z SENSING ELEMENTS

d = 0-6, & 8, OR Z SENSING ELEMENTS

SENSING ELEMENTS

c	d	
0	0	700-1202-001
	1	700-1202-012
	2	700-1202-014
	3	700-1202-018
	4	700-1202-041
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
	8	700-0001-022
2	0	700-0209-002
3	1	700-0029-001
	2	700-0029-002
	3	700-0029-003
	5	700-0029-005
5	0	700-0207-001
	1	700-0207-002
	2	700-0207-003
	3	700-0207-004
	4	700-0207-005
	5	700-0207-006
6	0	700-0204-038
Z	Z	SEE SHEET 11 FOR ADDITIONAL APPROVED REMOTE SENSING ELEMENTS

e = d = A-F, H, K, L OR Z INSERTION LENGTH/COTE SHIELD LENGTH

A	6"/2" & 152.4mm/50.8mm
B	12"/2" & 304.8mm/50.8mm
C	12"/3.5" & 304.8mm/88.9mm
D	18"/2" & 457.2mm/50.8mm
E	18"/3.5" & 457.2mm/88.9mm
F	18"/10" & 457.2mm/254mm
H	36"/10" & 914.4mm/254mm
K	48"/10" & 1219.2mm/254mm
L	60"/10" & 1524mm/254mm
Z	OTHER

6.1 FM 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

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

DR. CDW
CK. TTS 7-15-03

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PO #
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ISS.	EDO/DSR NO.	APP'D	DATE
3	12-02-214		6-6-03
2	11-02-203	SGA	11-13-02
1	4-02-204	SGA	10-23-02

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HORSHAM, PA 19044-9885
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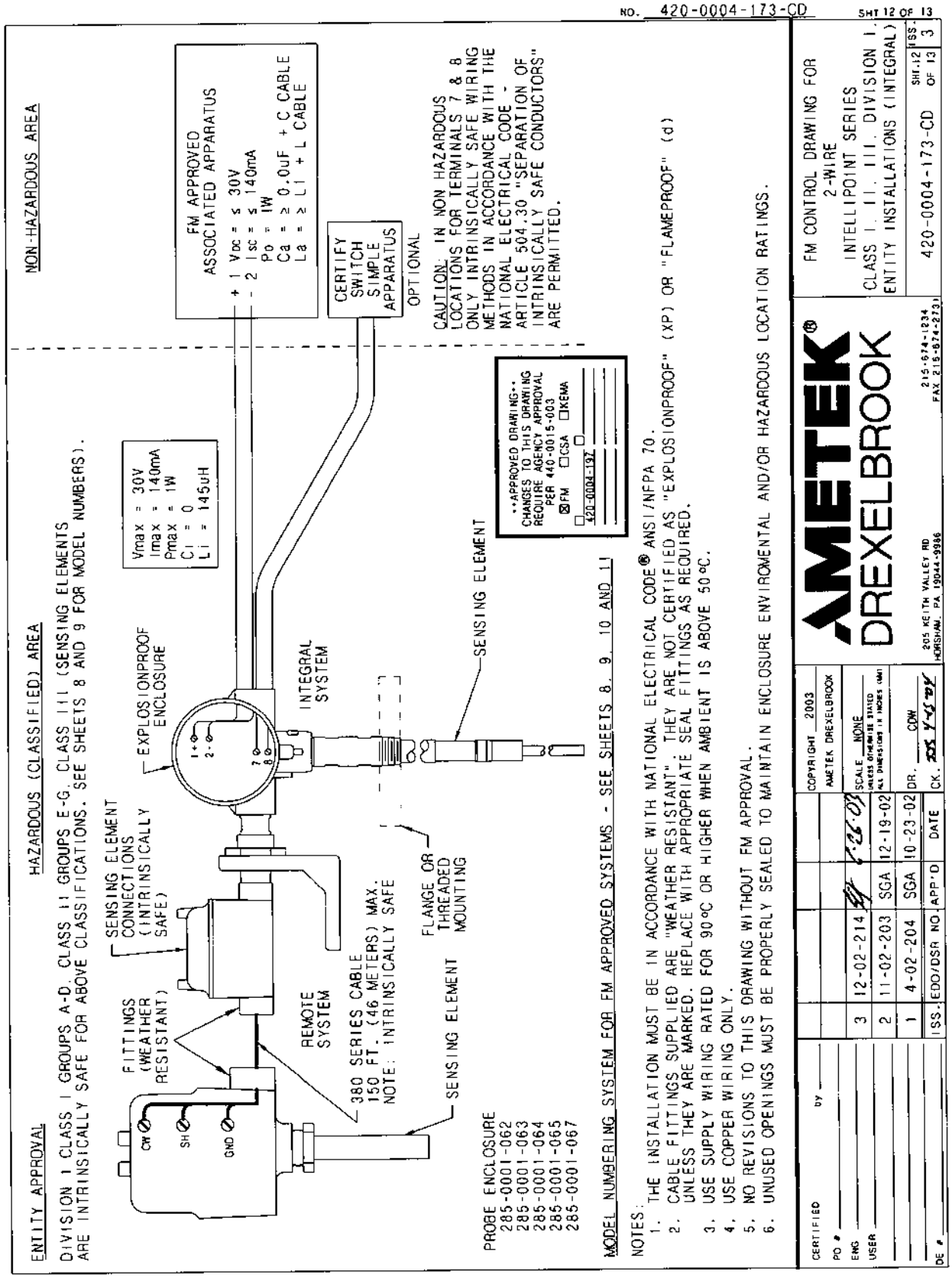
FM APPROVED
ADDITIONAL REMOTE
SENSING ELEMENTS

420-0004-173-CD SHT. 11 OF 13 ISS. 3

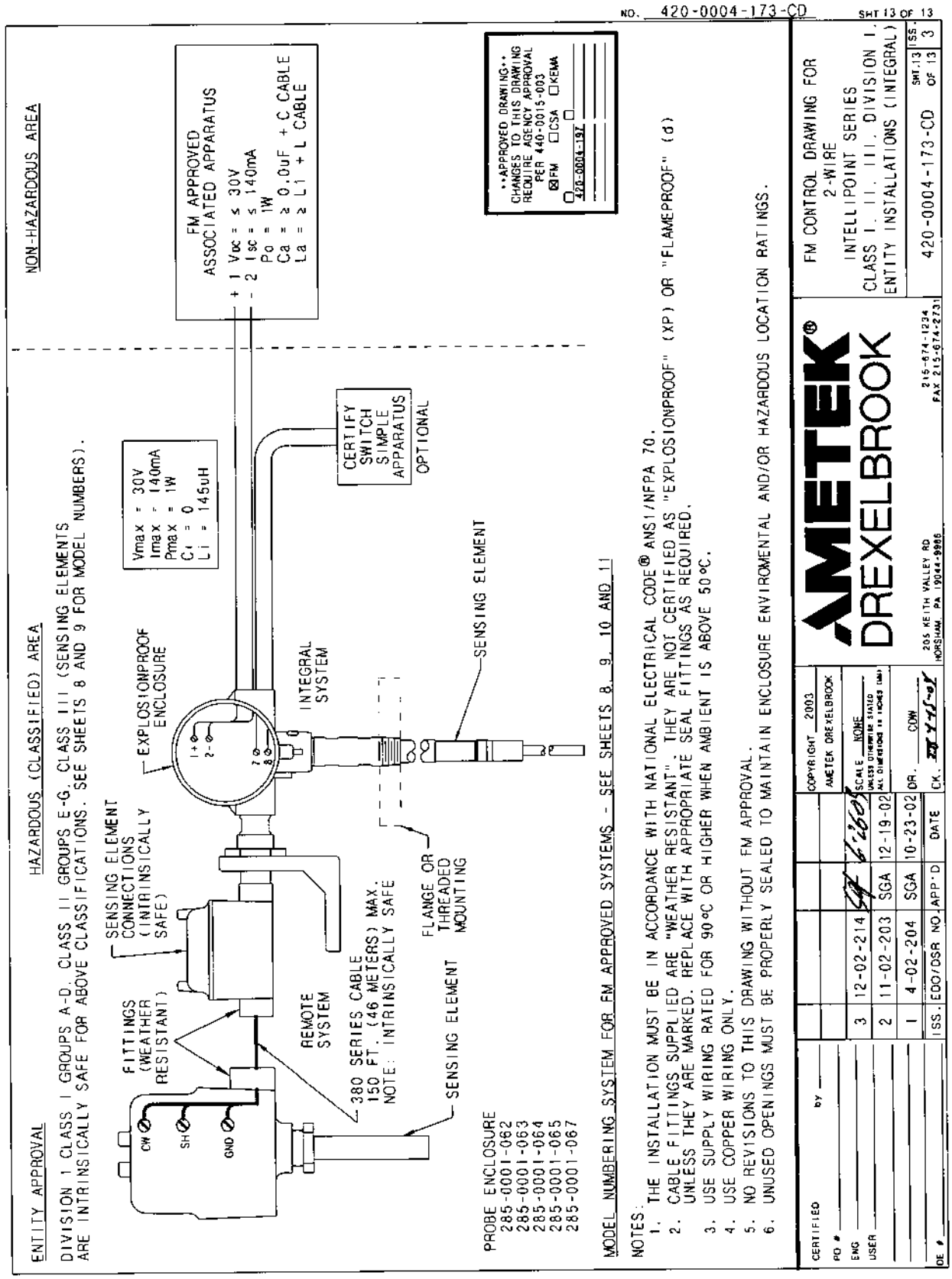
NO. 420-0004-173-CD

SHT 11 OF 13

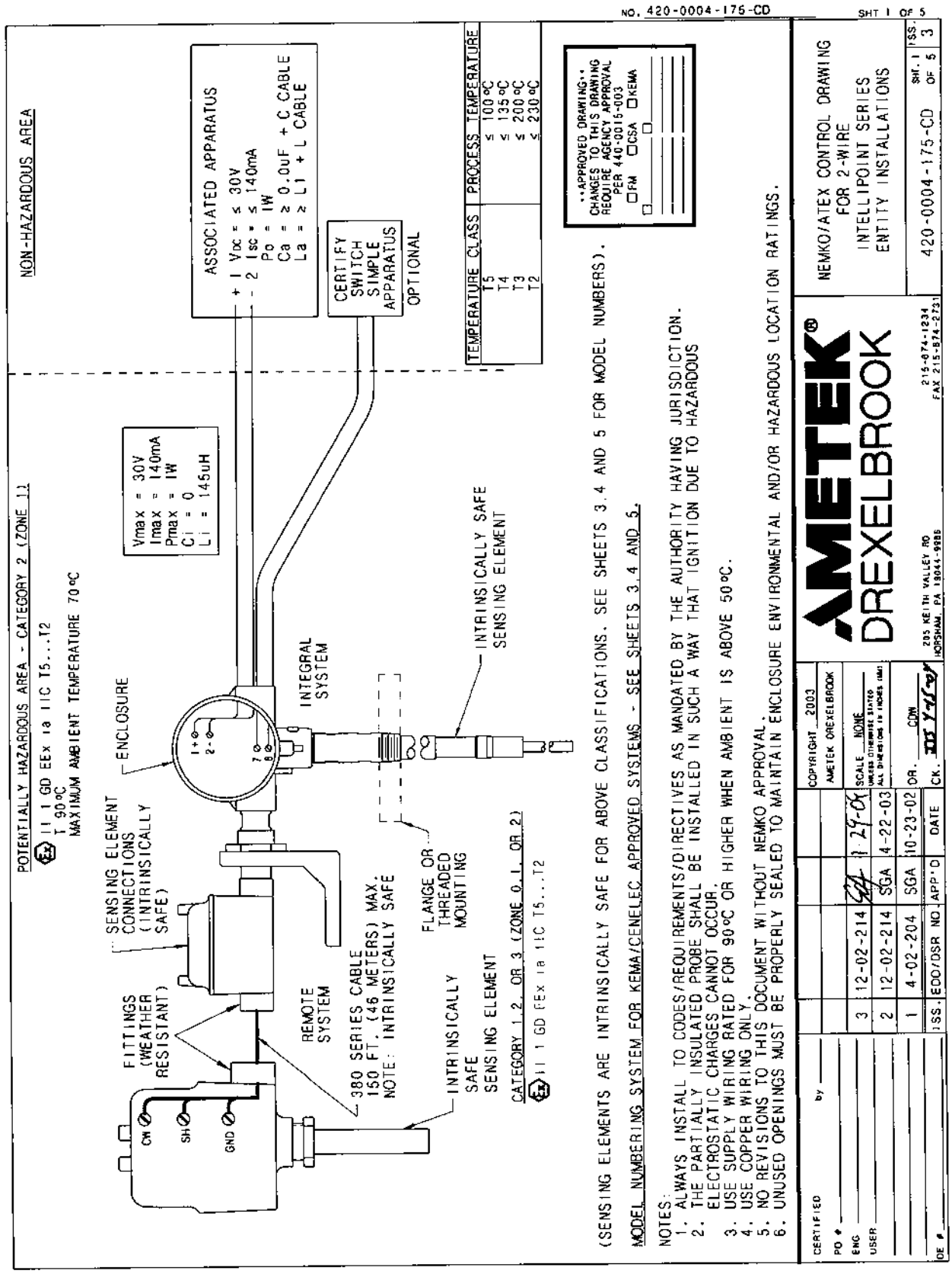
6.1 FM Control Drawings (Continued)



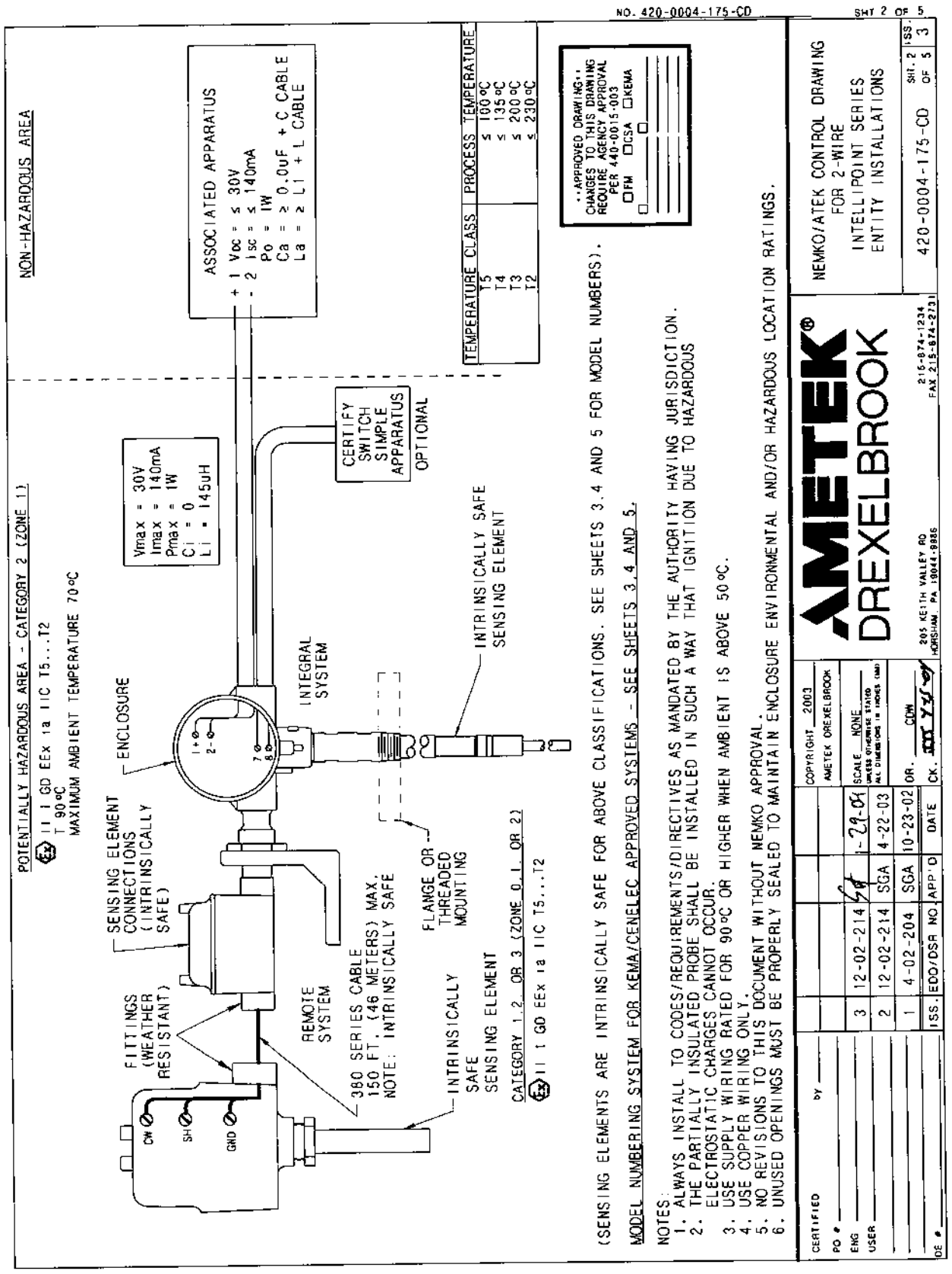
6.1 FM Control Drawings (Continued)



6.2 KEMA / CENELEC Control Drawings



6.2 KEMA / CENELEC Control Drawings (Continued)



6.2 KEMA / CENELEC Control Drawings (Continued)

1	2	3	4	5	6	7	8	9	10	11	12	
R	a	T	b	0	1	0	c	*	*	*	d	
	a											a = CALIBRATION
												N = NO CALIBRATION POINT LEVEL, M = MANUAL SET POINT,
												H = HI SENSITIVITY, G = MANUAL SET POINT HI SENSITIVITY
			b									b = 2
			2									M20 KEMA/CENELEC SYSTEMS
							c					c = 0-4
												SENSING ELEMENTS
						0	0					700-1202-001
							1					700-1202-012
							2					700-1202-014
							3					700-1202-018
							4					700-1202-041
						1	0					700-0001-018 INTRINSICALLY SAFE SENSING ELEMENT
							1					700-0201-005 INTRINSICALLY SAFE SENSING ELEMENT
							2					700-0201-005 HAST C INTRINSICALLY SAFE SENSING ELEMENT
							3					700-0201-036 INTRINSICALLY SAFE SENSING ELEMENT
							4					700-0202-002 INTRINSICALLY SAFE SENSING ELEMENT
							5					700-0202-043 INTRINSICALLY SAFE SENSING ELEMENT
							6					700-0002-360 INTRINSICALLY SAFE SENSING ELEMENT
							8					700-0001-022 INTRINSICALLY SAFE SENSING ELEMENT
						2	0					700-0209-002 INTRINSICALLY SAFE SENSING ELEMENT
						3	1					700-0029-001 INTRINSICALLY SAFE SENSING ELEMENT
							2					700-0029-002 INTRINSICALLY SAFE SENSING ELEMENT
							3					700-0029-003 INTRINSICALLY SAFE SENSING ELEMENT
							5					700-0029-005 INTRINSICALLY SAFE SENSING ELEMENT
						5	0					700-0207-001 INTRINSICALLY SAFE SENSING ELEMENT
							1					700-0207-002 INTRINSICALLY SAFE SENSING ELEMENT
							2					700-0207-003 INTRINSICALLY SAFE SENSING ELEMENT
							3					700-0207-004 INTRINSICALLY SAFE SENSING ELEMENT
							4					700-0207-005 INTRINSICALLY SAFE SENSING ELEMENT
							5					700-0207-006 INTRINSICALLY SAFE SENSING ELEMENT
						6	0					700-0204-038 INTRINSICALLY SAFE SENSING ELEMENT
						6	1					700-0204-002
						6	2					700-0204-048
						Z	Z					SEE SHEET 5 FOR ADDITIONAL APPROVED INTRINSICALLY SAFE SENSING ELEMENTS
									*	*	*	SEE MOUNTING CHART
											d	d = A-F, H, K, L OR Z
												INSERTION LENGTH/COTE SHIELD LENGTH
											A	6"/2" & 152.4mm/50.8mm
											B	12"/2" & 304.8mm/50.8mm
											C	12"/3.5" & 304.8mm/88.9mm
											D	18"/2" & 457.2mm/50.8mm
											E	18"/3.5" & 457.2mm/88.9mm
											F	18"/10" & 457.2mm/254mm
											H	36"/10" & 914.4mm/254mm
											K	48"/10" & 1219.2mm/254mm
											L	60"/10" & 1524mm/254mm
											Z	OTHER

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

DR. CON

CERTIFIED

PO #

ENG

USER

DE #

ISS.	EDO/DSR NO.	APP'D	DATE
3	12-02-214	SGA	1-29-04
2	12-02-214	SGA	4-22-03
1	4-02-204	SGA	10-23-02

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FAX 215-674-2731

KEMA/CENELEC APPROVED
2-WIRE INTELLIPOINT
MODEL NUMBERING SYSTEM
(INTEGRAL)

420-0004-175-CD SHT. 3 OF 5 ISS. 3

NO. 420-0004-175-CD

SHT 3 OF 5

6.2 KEMA / CENELEC Control Drawings (Continued)

1	2	3	4	5	6	7	8	9	10	11	12	
								COLUMNS 9 AND UP DO NOT AFFECT SAFETY				
R	a	T	2	b	1	c	d	*	*	*	e	
	a											a = CALIBRATION N = NO CALIBRATION POINT LEVEL, M = MANUAL SET POINT
												H = HI SENSITIVITY, G = MANUAL SET POINT HI SENSITIVITY
				b								b = 1-9, A-E CABLE OPTIONS (REMOTE)
						c						c = 0-3, 5, 6, OR Z SENSING ELEMENTS
							d					d = 0-6, & 8, 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
						1	0					700-0001-018 INTRINSICALLY SAFE SENSING ELEMENT
							1					700-0201-005 INTRINSICALLY SAFE SENSING ELEMENT
							2					700-0201-005 HAST C INTRINSICALLY SAFE SENSING ELEMENT
							3					700-0201-036 INTRINSICALLY SAFE SENSING ELEMENT
							4					700-0202-002 INTRINSICALLY SAFE SENSING ELEMENT
							5					700-0202-043 INTRINSICALLY SAFE SENSING ELEMENT
							6					700-0002-360 INTRINSICALLY SAFE SENSING ELEMENT
							8					700-0001-022 INTRINSICALLY SAFE SENSING ELEMENT
						2	0					700-0209-002 INTRINSICALLY SAFE SENSING ELEMENT
						3	1					700-0029-001 INTRINSICALLY SAFE SENSING ELEMENT
							2					700-0029-002 INTRINSICALLY SAFE SENSING ELEMENT
							3					700-0029-003 INTRINSICALLY SAFE SENSING ELEMENT
							5					700-0029-005 INTRINSICALLY SAFE SENSING ELEMENT
						5	0					700-0207-001 INTRINSICALLY SAFE SENSING ELEMENT
							1					700-0207-002 INTRINSICALLY SAFE SENSING ELEMENT
							2					700-0207-003 INTRINSICALLY SAFE SENSING ELEMENT
							3					700-0207-004 INTRINSICALLY SAFE SENSING ELEMENT
							4					700-0207-005 INTRINSICALLY SAFE SENSING ELEMENT
							5					700-0207-006 INTRINSICALLY SAFE SENSING ELEMENT
						6	0					700-0204-038 INTRINSICALLY SAFE SENSING ELEMENT
						6	1					700-0204-002
						6	2					700-0204-048
						Z	Z					SEE SHEET 5 FOR ADDITIONAL APPROVED INTRINSICALLY SAFE SENSING ELEMENTS
											e	e = A-F, H, K, L OR Z
												INSERTION LENGTH/COTE SHIELD LENGTH
											A	6"/2" & 152.4mm/50.8mm
											B	12"/2" & 304.8mm/50.8mm
											C	12"/3.5" & 304.8mm/88.9mm
											D	18"/2" & 457.2mm/50.8mm
											E	18"/3.5" & 457.2mm/88.9mm
											F	18"/10" & 457.2mm/254mm
											H	36"/10" & 914.4mm/254mm
											K	48"/10" & 1219.2mm/254mm
											L	60"/10" & 1524mm/254mm
											Z	OTHER

SCALE NONE
UNLESS OTHERWISE STATED ALL DIMENSIONS IN INCHES (MM)
DR. COW
CK. [illegible]

CERTIFIED by
PO #
ENG
USER
DE #

ISS.	EDO/DSR NO.	APP'D	DATE
3	12-02-214	[illegible]	1-29-04
2	12-02-214	SGA	4-16-03
1	4-02-204	SGA	10-23-02

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FAX 215-674-2731

KEMA APPROVED
2-WIRE INTELLIPOINT
MODEL NUMBERING SYSTEM
(REMOTE)

420-0004-175-CD SHT. 4 OF 5 ISS. 3

NO. 420-0004-175-CD

SHT 4 OF 5

6.2 KEMA / CENELEC Control Drawings (Continued)

MODEL NUMBERS OF APPROVED INTRINSICALLY SAFE SENSING ELEMENTS

700-mnop-qrs-t 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
t = 14 CHARACTER EXPANDED NUMBERING SYSTEM, DOES NOT AFFECT SAFETY

SCALE NONE
UNLESS OTHERWISE STATED ALL DIMENSIONS IN INCHES (MM)
DR. CDW
CK. [illegible] 7-11-03

CERTIFIED by
PO #
ENG
USER
DE #

NO. 420-0004-175-CD

ISS.	EDO/DSR NO.	APP'D	DATE
3	12-02-214	[illegible]	4-29-04
2	12-02-214	SGA	4-22-03
1	4-02-204	SGA	10-23-02

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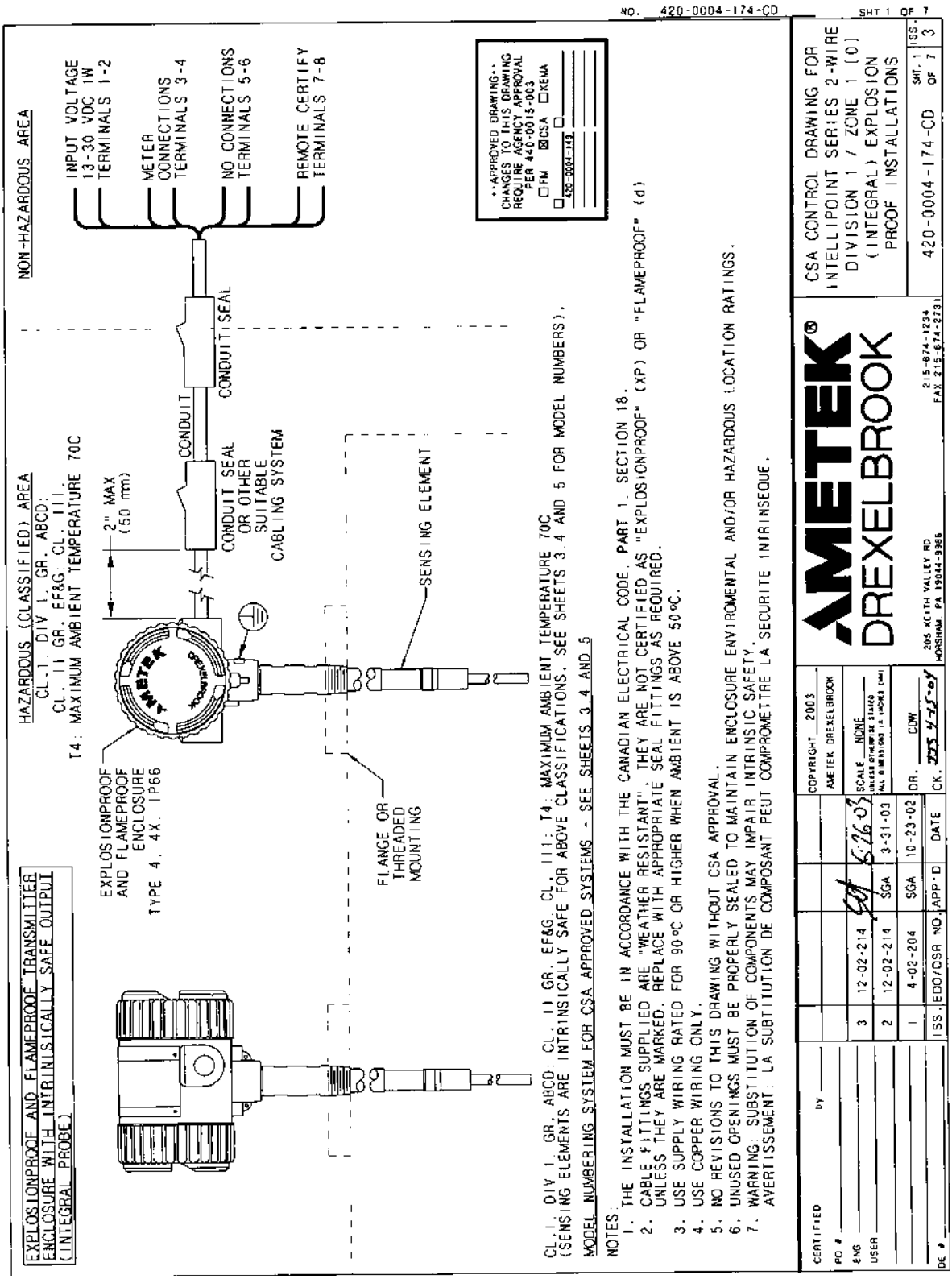
KEMA APPROVED
ADDITIONAL INTRINSICALLY
SAFE SENSING ELEMENTS
(REMOTE)

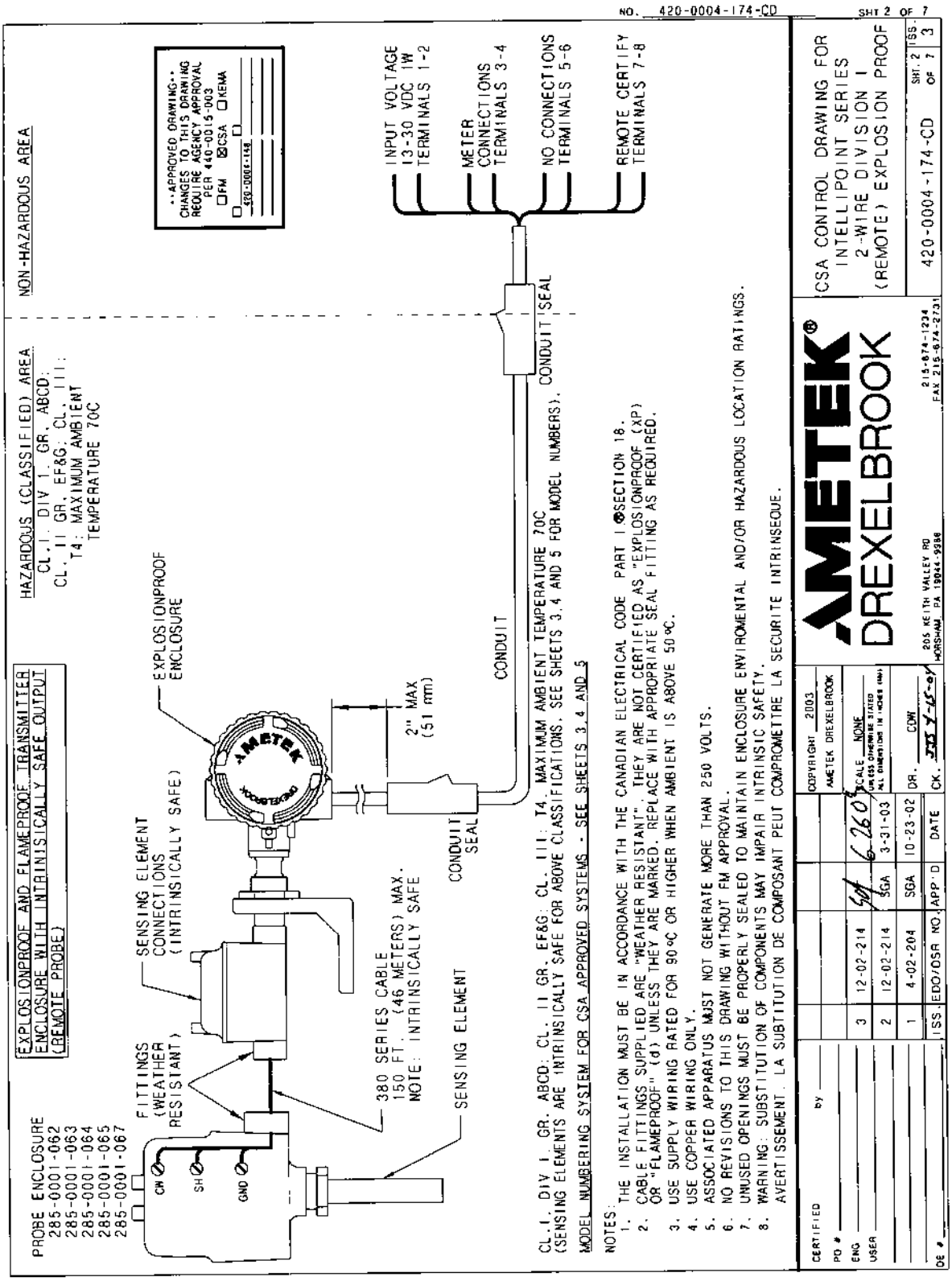
420-0004-175-CD SHT. 5 OF 5 ISS. 3

SHT 5 OF 5

6.3 CSA Control Drawings



6.3 CSA Control Drawings (Continued)



6.3 CSA Control Drawings (Continued)

1	2	3	4	5	6	7	8	9	10	11	12	
R	a	T	3	0	0	0	b	*	*	*	c	
	a											a = CALIBRATION
	N											N = NO CALIBRATION POINT LEVEL
			4									3/4" NPT CSA SYSTEMS
							b					b = 0-3
												SENSING ELEMENTS
							0					700-1202-021
							1					700-1202-022
							2					700-1202-024
							3					700-1202-028
								*	*	*		SEE MOUNTING CHART
											c	c = A-F, H, K, L OR Z
												INSERTION LENGTH/COTE SHIELD LENGTH
											A	6"/2" & 152.4mm/50.8mm
											B	12"/2" & 304.8mm/50.8mm
											C	12"/3.5" & 304.8mm/88.9mm
											D	18"/2" & 457.2mm/50.8mm
											E	18"/3.5" & 457.2mm/88.9mm
											F	18"/10" & 457.2mm/254mm
											H	36"/10" & 914.4mm/254mm
											K	48"/10" & 1219.2mm/254mm
											L	60"/10" & 1524mm/254mm
											Z	OTHER

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

DR. CDW
CK. TJS 4-15-04

CERTIFIED by
PO #
ENG
USER
QE #

NO. 420-0004-174-CD

ISS.	EDO/DSR NO.	APP'D	DATE
3	12-02-214	SGA	6-26-03
2	12-02-214	SGA	3-31-03
1	4-02-204	SGA	10-23-02

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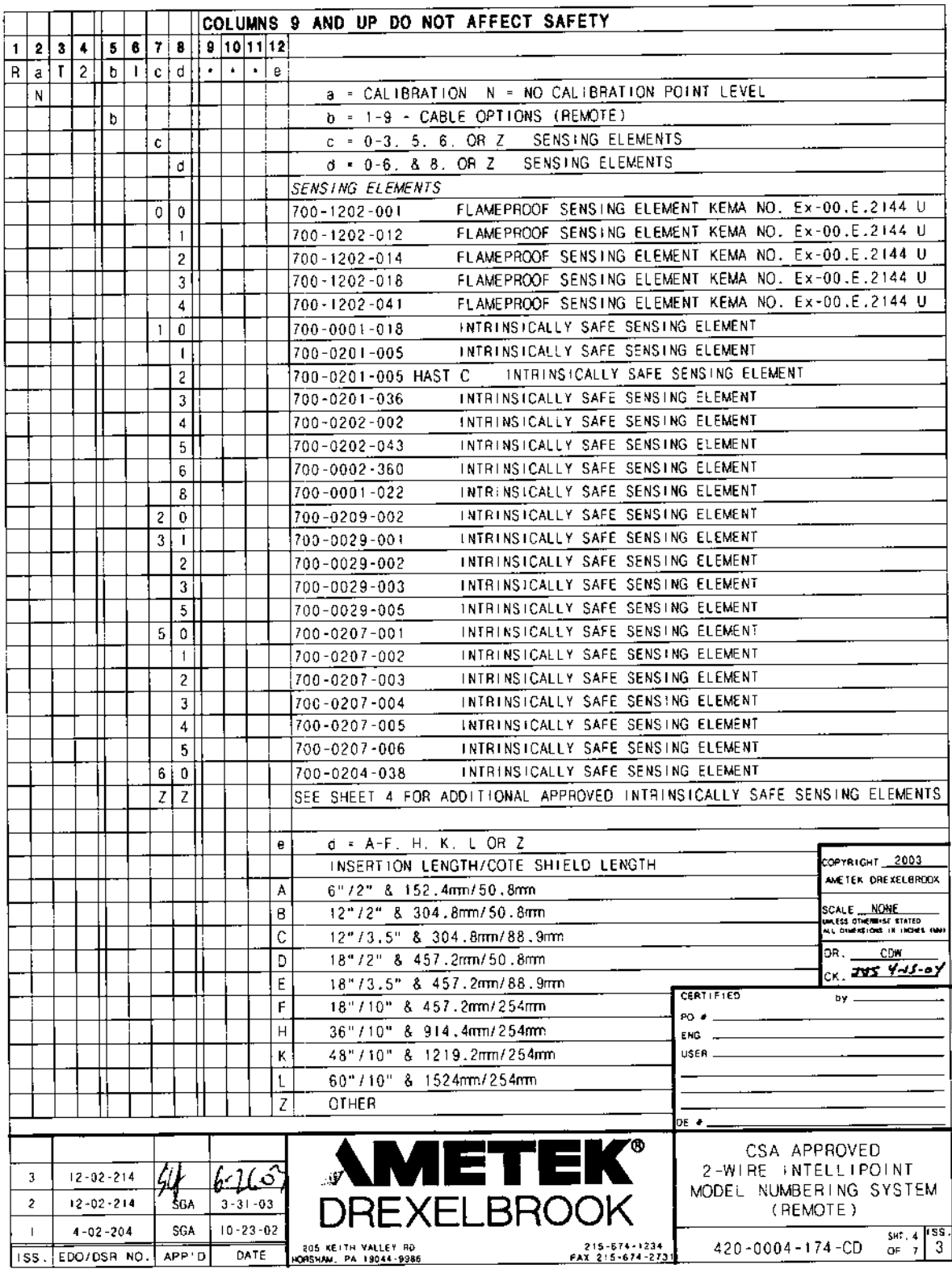
215-674-1234
FAX 215-674-2731

CSA APPROVED
INTELLIPOINT 2-WIRE
MODEL NUMBERING SYSTEM
INTEGRAL SYSTEMS

420-0004-174-CD SHT. 3 OF 7 ISS. 3

SHT 3 OF 7

6.3 CSA Control Drawings (Continued)



COLUMNS 9 AND UP DO NOT AFFECT SAFETY												
1	2	3	4	5	6	7	8	9	10	11	12	
R	a	T	2	b	I	c	d	*	*	*	e	
	N											a = CALIBRATION N = NO CALIBRATION POINT LEVEL
				b								b = 1-9 - CABLE OPTIONS (REMOTE)
						c						c = 0-3, 5, 6, OR Z SENSING ELEMENTS
							d					d = 0-6, & 8, OR Z SENSING ELEMENTS
												SENSING ELEMENTS
						0	0					700-1202-001 FLAMEPROOF SENSING ELEMENT KEMA NO. Ex-00.E.2144 U
							1					700-1202-012 FLAMEPROOF SENSING ELEMENT KEMA NO. Ex-00.E.2144 U
							2					700-1202-014 FLAMEPROOF SENSING ELEMENT KEMA NO. Ex-00.E.2144 U
							3					700-1202-018 FLAMEPROOF SENSING ELEMENT KEMA NO. Ex-00.E.2144 U
							4					700-1202-041 FLAMEPROOF SENSING ELEMENT KEMA NO. Ex-00.E.2144 U
						1	0					700-0001-018 INTRINSICALLY SAFE SENSING ELEMENT
							1					700-0201-005 INTRINSICALLY SAFE SENSING ELEMENT
							2					700-0201-005 HAST C INTRINSICALLY SAFE SENSING ELEMENT
							3					700-0201-036 INTRINSICALLY SAFE SENSING ELEMENT
							4					700-0202-002 INTRINSICALLY SAFE SENSING ELEMENT
							5					700-0202-043 INTRINSICALLY SAFE SENSING ELEMENT
							6					700-0002-360 INTRINSICALLY SAFE SENSING ELEMENT
							8					700-0001-022 INTRINSICALLY SAFE SENSING ELEMENT
						2	0					700-0209-002 INTRINSICALLY SAFE SENSING ELEMENT
						3	1					700-0029-001 INTRINSICALLY SAFE SENSING ELEMENT
							2					700-0029-002 INTRINSICALLY SAFE SENSING ELEMENT
							3					700-0029-003 INTRINSICALLY SAFE SENSING ELEMENT
							5					700-0029-005 INTRINSICALLY SAFE SENSING ELEMENT
						5	0					700-0207-001 INTRINSICALLY SAFE SENSING ELEMENT
							1					700-0207-002 INTRINSICALLY SAFE SENSING ELEMENT
							2					700-0207-003 INTRINSICALLY SAFE SENSING ELEMENT
							3					700-0207-004 INTRINSICALLY SAFE SENSING ELEMENT
							4					700-0207-005 INTRINSICALLY SAFE SENSING ELEMENT
							5					700-0207-006 INTRINSICALLY SAFE SENSING ELEMENT
						6	0					700-0204-038 INTRINSICALLY SAFE SENSING ELEMENT
						Z	Z					SEE SHEET 4 FOR ADDITIONAL APPROVED INTRINSICALLY SAFE SENSING ELEMENTS

e	d = A-F, H, K, L OR Z
	INSERTION LENGTH/COTE SHIELD LENGTH
A	6"/2" & 152.4mm/50.8mm
B	12"/2" & 304.8mm/50.8mm
C	12"/3.5" & 304.8mm/88.9mm
D	18"/2" & 457.2mm/50.8mm
E	18"/3.5" & 457.2mm/88.9mm
F	18"/10" & 457.2mm/254mm
H	36"/10" & 914.4mm/254mm
K	48"/10" & 1219.2mm/254mm
L	60"/10" & 1524mm/254mm
Z	OTHER

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

DR. CDW
CK. JHS 4-15-04

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ENG
USER
DE #

NO. 420-0004-174-CD

ISS.	EDO/DSR NO.	APP'D	DATE
3	12-02-214	SGA	6-26-03
2	12-02-214	SGA	3-31-03
1	4-02-204	SGA	10-23-02

AMETEK®
DREXELBROOK
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HORSHAM, PA 19044-9986
215-674-1234
FAX 215-674-2731

CSA APPROVED
2-WIRE INTELLIPOINT
MODEL NUMBERING SYSTEM
(REMOTE)

420-0004-174-CD SHT. 4 OF 7 ISS. 3

SHT 4 OF 7

6.3 CSA Control Drawings (Continued)

MODEL NUMBERS OF APPROVED INTRINSICALLY SAFE SENSING ELEMENTS

700-mnop-qrs-t 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
t = 14 CHARACTER EXPANDED NUMBERING SYSTEM. DOES NOT AFFECT SAFETY

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

DR. CDW
CK. 205.7-15-04

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DE #

ISS.	EDO/DSR NO.	APP'D	DATE
3	12-02-214	SGA	6-26-03
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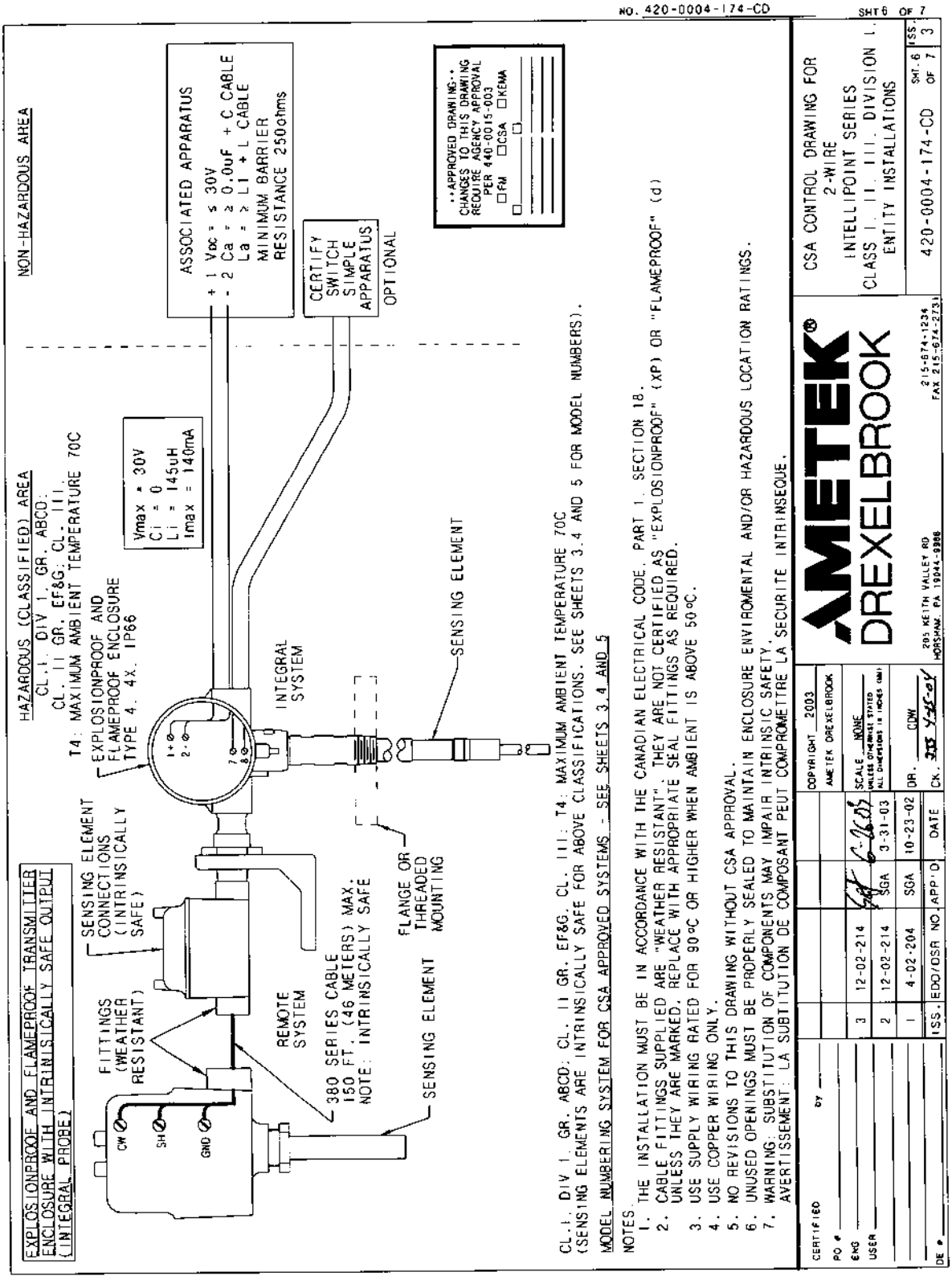
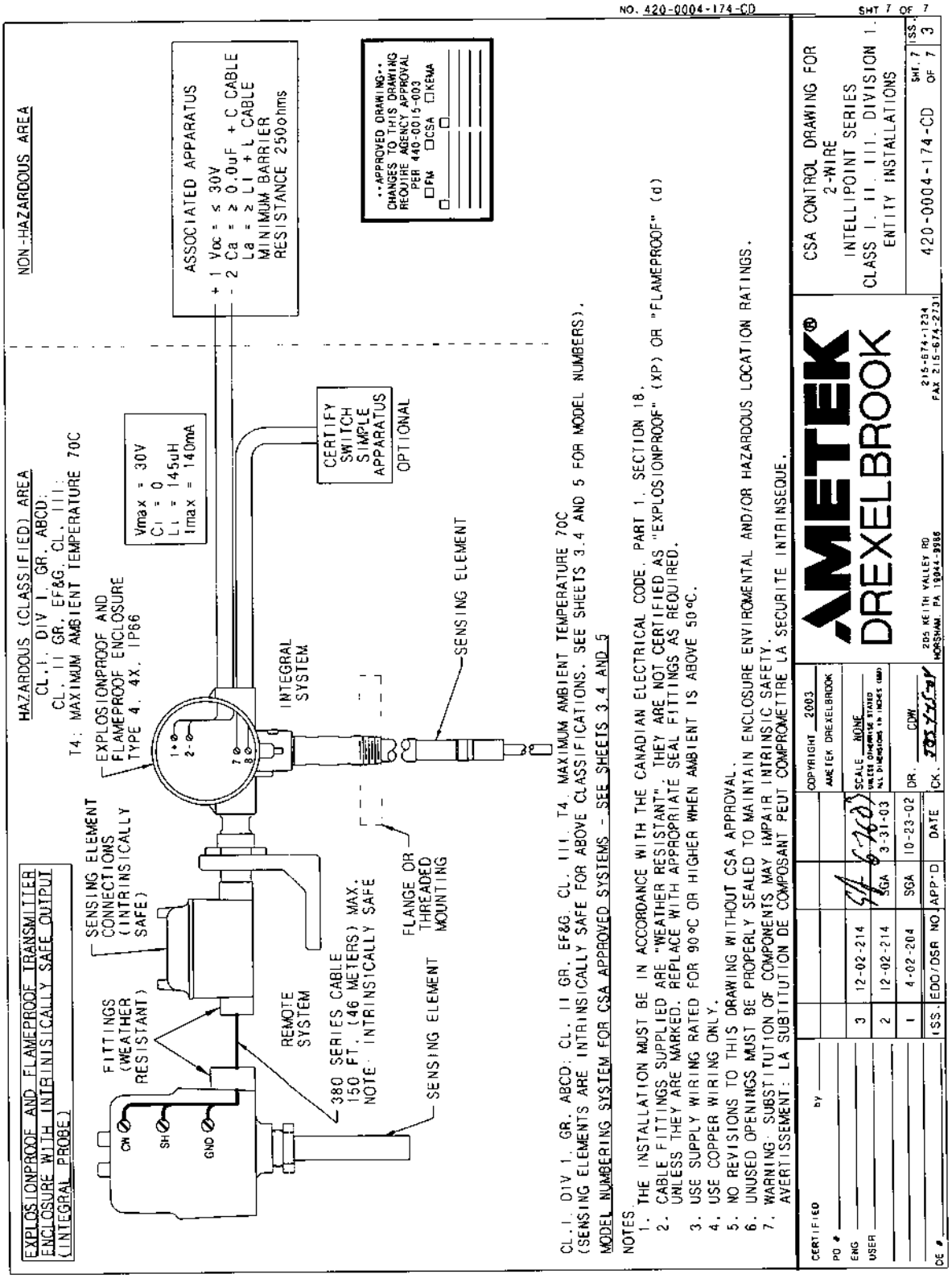
CSA APPROVED
ADDITIONAL INTRINSICALLY
SAFE SENSING ELEMENTS
(REMOTE)

420-0004-174-CD
SHT. 5 OF 7
ISS. 3

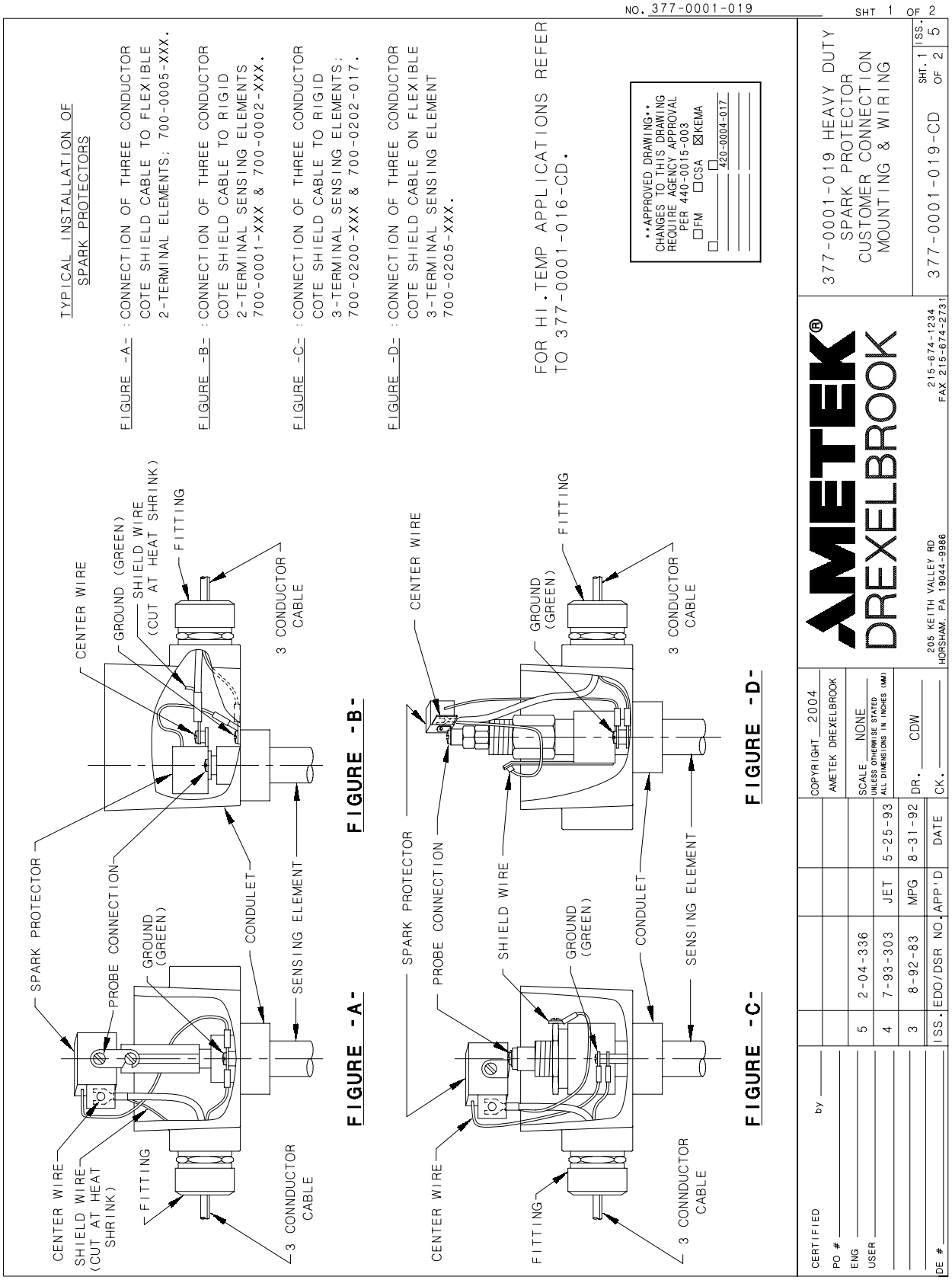
6.3 CSA Control Drawings (Continued)



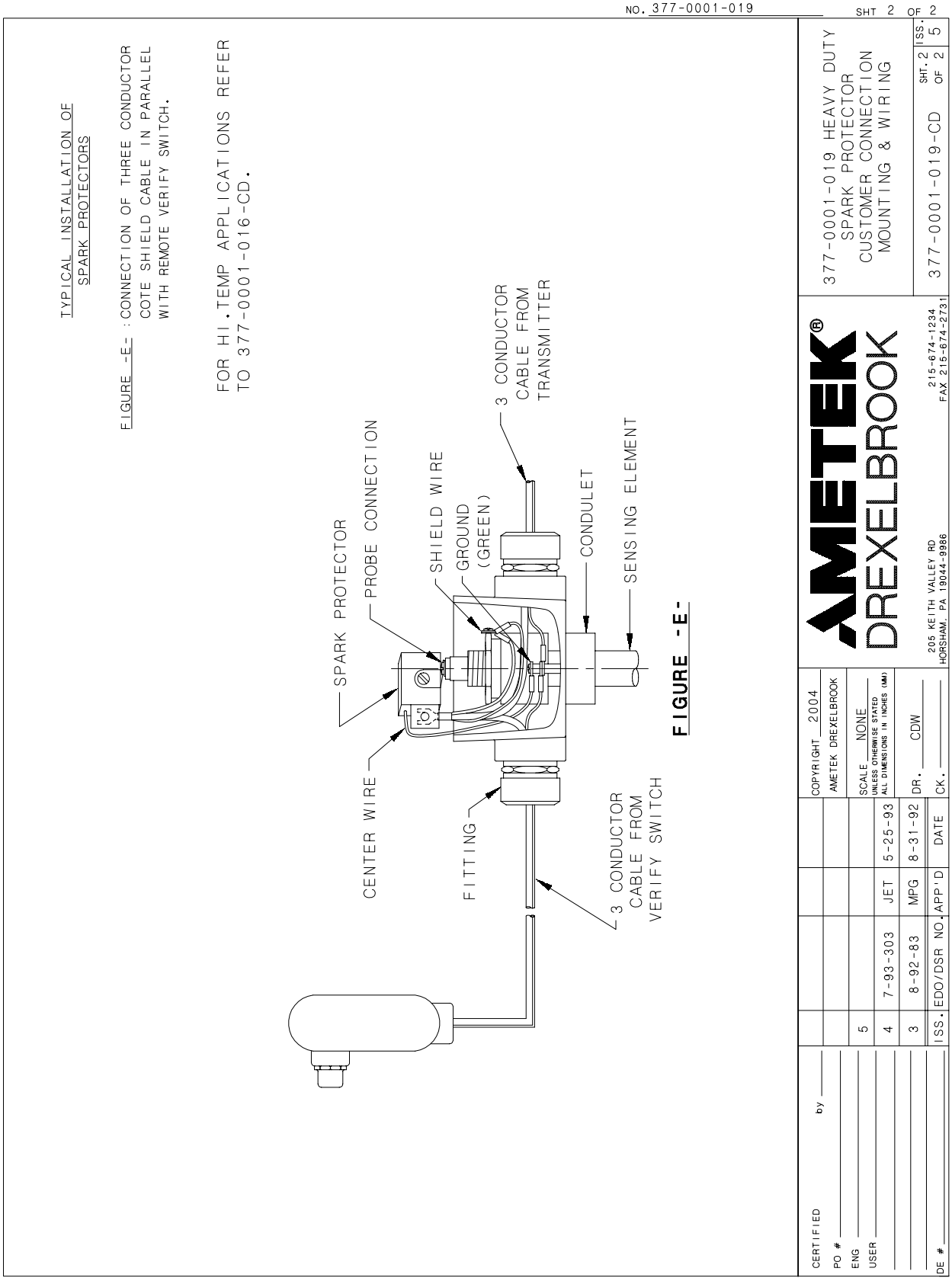
6.3 CSA Control Drawings (Continued)



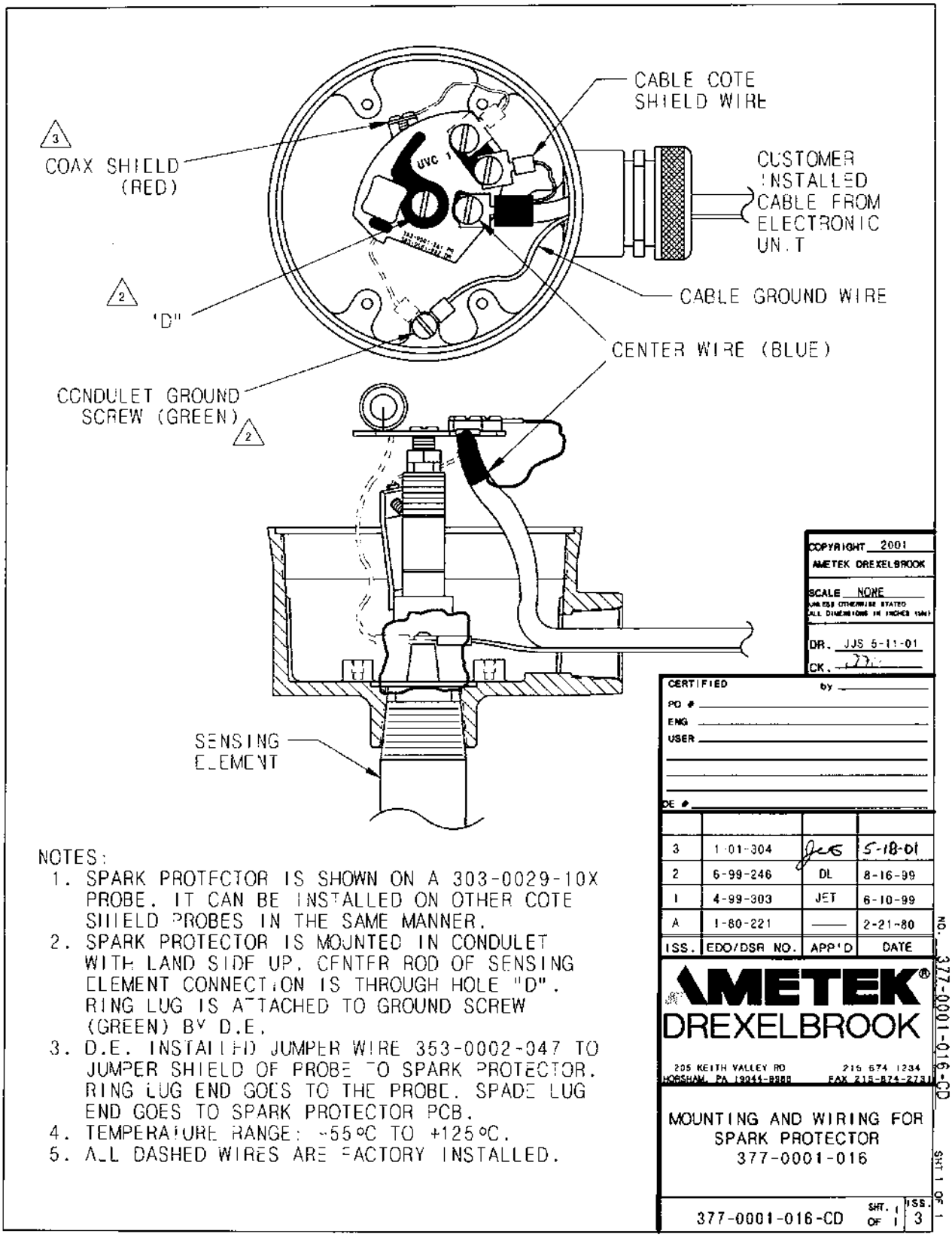
6.4 Mounting and Wiring for Spark Protector Drawings



6.4 Mounting and Wiring for Spark Protector (Continued)



6.4 Mounting and Wiring for Spark Protector (Continued)



Appendix A: SIL Declaration of Conformity

AMETEK Drexelbrook

AMETEK

SIL Declaration of Conformity

Functional safety of level measuring device according to IEC 61508-2 1999

AMETEK Drexelbrook
205 Keith Valley Rd. Horsham Pennsylvania 19044

declares as manufacturer, that the level measuring device

Intellipoint RXTX Series

Is suitable for the use in a safety instrumented system for **SIL 1**(overfill protection) according to standard IEC61508-2, Sec. 7.4.3.1 1999, if the safety instructions are observed.
The data in this declaration provides the required hardware failure data and does not contain any software assessment required for the full functional safety requirements of IEC 61508

The third party FMEDA with analysis of the safety critical and dangerous faults provides, under the assumption of an annual functional test cycle the following parameters:

exida.com

SIL (Safety Integrity level)	:	1
HFT (Hardware Fault tolerance)	:	0
SFF (Safe failure fraction)	:	88.7
PFD_{avg} (Fail to Danger)	:	5.0×10^{-4}
λ_{du} (failure rate dangerous undetected faults)	:	116 FIT
λ_{dd} (failure rate dangerous detected faults)	:	605 FIT
λ_{su} (failure rate safe undetected faults)	:	287 FIT
λ_{sd} (failure rate safe detected faults)	:	17 FIT

Steven G. Arnold
AMETEK Drexelbrook
Quality Assurance & Product Safety Manager

July 7, 2004
Date

420-0004-255		Sht. 1 of 1	APP'D BY SGA
ISSUE	EDO NO.	APP'D	DATE
1	5-04-213	SGA	5/27/04
2	7-04-215	SGA	7/29/04

Appendix A: SIL Declaration of Conformity (Continued)

AMETEK Drexelbrook

AMETEK

SIL Declaration of Conformity

Functional safety of level measuring device according to IEC 61508-2 1999

AMETEK Drexelbrook
205 Keith Valley Rd. Horsham Pennsylvania 19044

declares as manufacturer, that the level measuring device

Intellipoint RXTX Series

Is suitable for the use in a safety instrumented system for **SIL 2** (overfill protection) according to standard IEC61508-2, Sec. 7.4.3.1 1999, if the safety instructions are observed.
The data in this declaration provides the required hardware failure data and does not contain any software assessment required for the full functional safety requirements of IEC 61508

The third party FMEDA with analysis of the safety critical and dangerous faults provides, under the assumption of an annual functional test cycle the following parameters:

exida.com®

SIL (Safety Integrity level)	:	2
HFT (Hardware Fault tolerance)	:	0
SFF (Safe failure fraction)	:	93.2%
PFD_{avg} (Fail to Danger)	:	3.2×10^{-4}
λ_{du} (failure rate dangerous undetected faults)	:	73 FIT
λ_{dd} (failure rate dangerous detected faults)	:	686 FIT
λ_{su} (failure rate safe undetected faults)	:	300 FIT
λ_{sd} (failure rate safe detected faults)	:	0 FIT

Steven G. Arnold
AMETEK Drexelbrook
Quality Assurance & Product Safety Manager

July 27, 2004
Date

420-0004-267		Sht. 1 of 1	APP'D BY SGA
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1	7-04-215	SA	7/29/04

Appendix B: CE Mark Declaration of Conformity

420-0004-250		Sht. 1 of 1	APP'D BY SGA
ISSUE	EDO NO	APP'D	DATE
1	4-04-216	SGA	5/4/04

Declaration of Conformity

AMETEK DREXELBROOK
205 KEITH VALLEY ROAD
HORSHAM, PENNSYLVANIA
USA 19044

declare under our sole responsibility that the product 2-Wire IntelliPoint Point Level Measuring System Model Number RXT2 Series, to which this declaration relates is in conformity with the following standards and entitled to carry the CE Mark:

Product Type: **Generic Heavy Industrial**

Conforms to the emissions requirements of:

EN 55011:1998	Class A, Conducted Emissions 150 kHz to 30 MHz
EN 55011:1998	Class B, Radiated Emissions, 30MHz to 1GHz

Conforms to the immunity requirements of EN 61000-6-2:1999:

EN 61000-4-2:1995	Electrostatic Discharge
EN 61000-4-3:1997	Radiated Immunity
ENV 50204:1994	Radiated Immunity, Pulsed
EN 61000-4-4:1995	EFT/Burst, Power and I/O Leads
EN 61000-4-5:1995	Surge Immunity, Power Leads
EN 61000-4-6:1996	Conducted Immunity, Power and I/O Leads
EN 61000-4-8:1994	Power Frequency Magnetic Fields (10 A(rms)/meter)
EN 61000-4-11:1994	Voltage Dips and Interrupts

Following the provisions of 94/9/EC Directive,

Conforms to the requirements of:

EN 50014:1997+A1:1999+A21999
EN50018:2000 EN 50020:2002 EN 50281-1-1:1998 EN 50284:1999
EC-Type Examination Certificate Number NEMKO 03ATEX1312X
NEMKO, PO Box 73, Blindern, N-0314, Oslo, Norway
Notified Body number 0470

Steven G. Arnold
Quality Assurance & Product Safety Manager
Issue Date 4/29/2004

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