



A Leader in  
Level Measurement

For Assistance Call 1-800-527-6297  
Outside North America + 215-674-1234

# Installation and Operating Instructions

## **TF-100™ Series**

Vibrating Level Switch  
with

TF-L-Relay Output

TF-P-Transistor Output

U.S. and Canada:	1-800-553-9092
24-Hour Service:	1-800-527-6297
International:	+1 215-674-1234
Fax:	+1 215-674-2731
E-mail:	<a href="mailto:drexelbrook.service@ametek.com">drexelbrook.service@ametek.com</a>
Website:	<a href="http://www.drexelbrook.com">www.drexelbrook.com</a>

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EDO# 7-11-104  
TF-L-LM  
Issue #5

**TF-100™ Series**  
Vibrating Level Switch  
with  
TF-L-Relay Output  
TF-P-Transistor Output



**AMETEK®**  
**DREXELBROOK**  
*An ISO 9001 Certified Company*

205 Keith Valley Road, Horsham, PA 19044  
U.S. and Canada: 1-800-553-9092  
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Website: [www.drexelbrook.com](http://www.drexelbrook.com)

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## **Section 1**

## Section 1: Introduction

These instructions are for the AMETEK Drexelbrook TF-100™ series tuning fork.

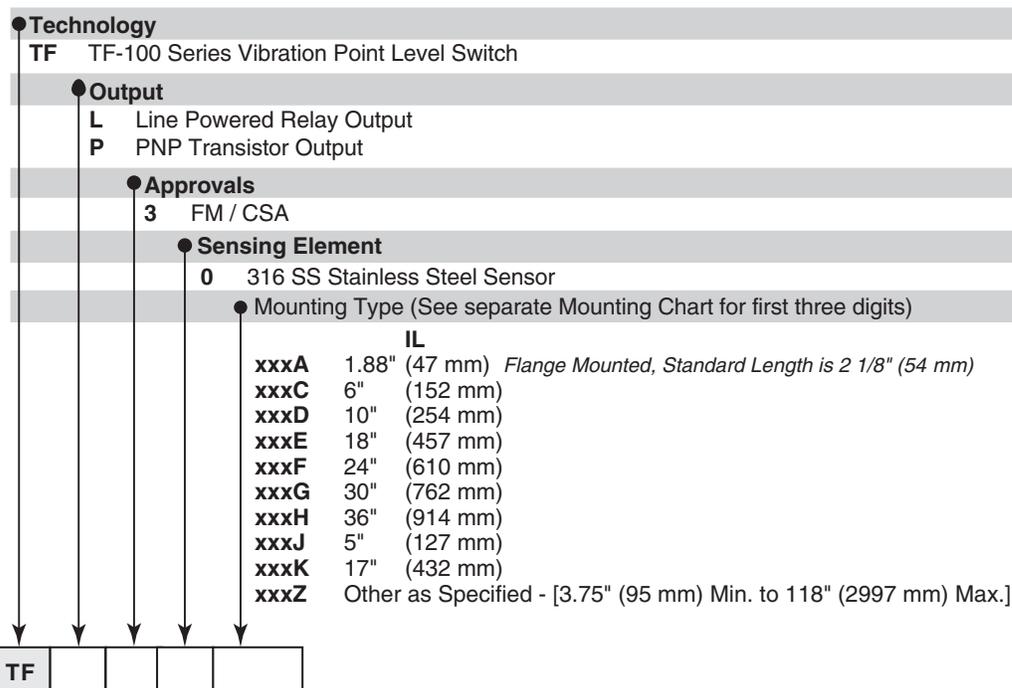
### 1.1 System Description

The TF-100 vibrating level switch is used for point level detection of liquids.

The TF-100 tuning fork is piezoelectrically energized and vibrates at a frequency of approximately 1200hZ. When the fork is covered in material, the frequency shifts. The frequency shift is detected by the internal oscillator and converted into a switching command.

### 1.2 Model Number

#### TF -100 Series



#### Mounting Chart

<b>A1B</b>	3/4" (19 mm)	NPT		
<b>DA1</b>	1" (25 mm)	150# RF 316 / 316LSS	<b>DG1</b>	2" (51 mm) 300# RF 316 / 316LSS
<b>DB1</b>	1 1/2" (38 mm)	150# RF 316 / 316LSS	<b>DJ1</b>	3" (76 mm) 300# RF 316 / 316LSS
<b>DC1</b>	2" (51 mm)	150# RF 316 / 316LSS	<b>DL1</b>	4" (102 mm) 300# RF 316 / 316LSS
<b>DI1</b>	3" (76 mm)	150# RF 316 / 316LSS	<b>C2B</b>	1" (25 mm) Tri-Clamp 3A Sanitary
<b>DK1</b>	4" (102 mm)	150# RF 316 / 316LSS	<b>C3B</b>	1 1/2" (38 mm) Tri-Clamp 3A Sanitary
<b>DE1</b>	1" (25 mm)	300# RF 316 / 316LSS	<b>C4B</b>	2" (51 mm) Tri-Clamp 3A Sanitary
<b>DF1</b>	1 1/2" (38 mm)	300# RF 316 / 316LSS	<b>C6B</b>	3" (76 mm) Tri-Clamp 3A Sanitary

## **Section 2**

## 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 materials. If there is any shortage or damage report it to the factory at: 1-800-527-6297 (US and Canada) or + 215-674-1234 (International).



**Do not hold the TF-100 by the fork.** Be careful to keep the fork covered with protective shipping tube to prevent impact damage. Only remove shipping tube just prior to mounting.

Never test the switch by holding the forks as this can damage the sensor. Always dip the sensor in a liquid for testing.

### 2.2 Mounting

The TF-100 level switch can be mounted vertically or horizontal.

Note - Be careful not to damage the fork while installing through the mounting opening.

The tuning fork has lateral markings (notches) that indicate the switching point for use when the sensor is mounted vertically. The marks indicate where a liquid with the density of water would cause the unit to switch. This switch point is approximately 1/2 inch (13mm) from the end of the fork.

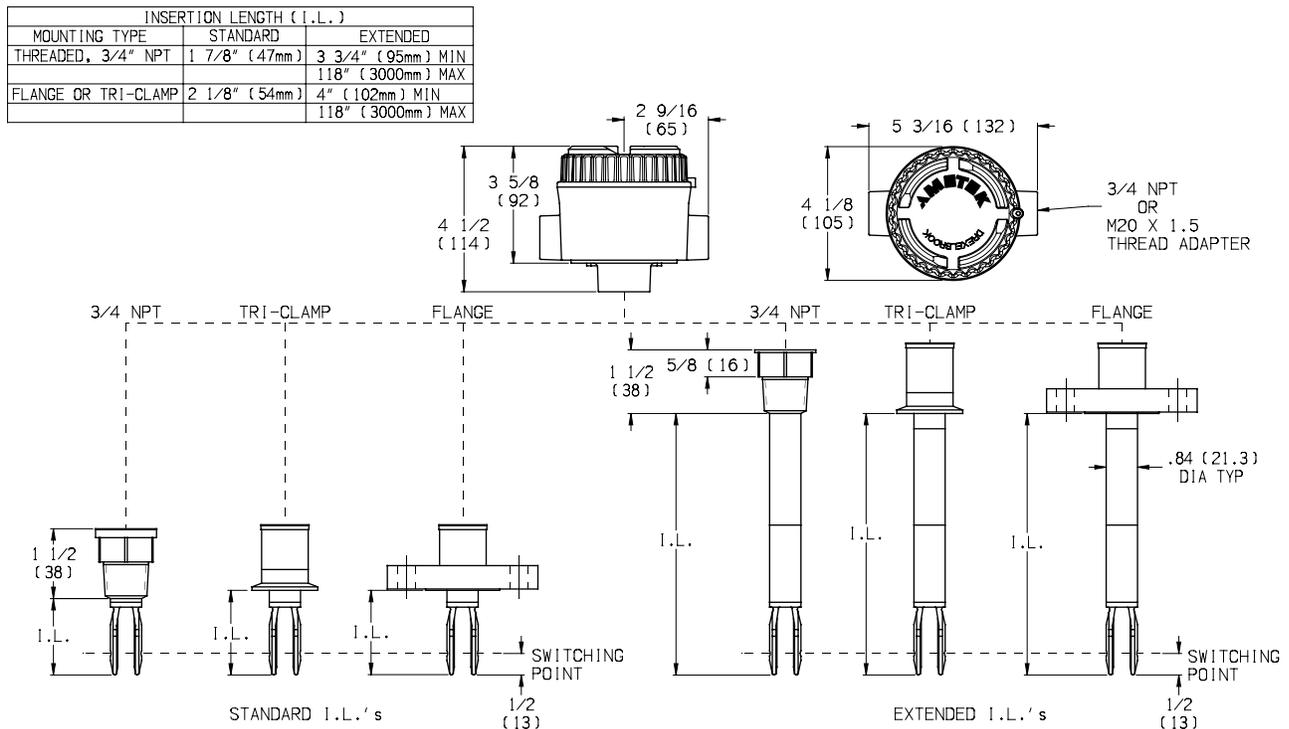


Figure 2-1: Mounting Dimensions

### 2.2.1 Adhesive / Viscous Materials

When using the TF-100 in adhesives or viscous materials where the sensor is to be mounted horizontally, make certain that the forks are vertical to ensure that material drains freely.

The fork should protrude into the vessel to avoid build up. That is, the forks should not be positioned inside a nozzle where material could build up and cause false alarms.

### 2.2.2 Inflowing Material

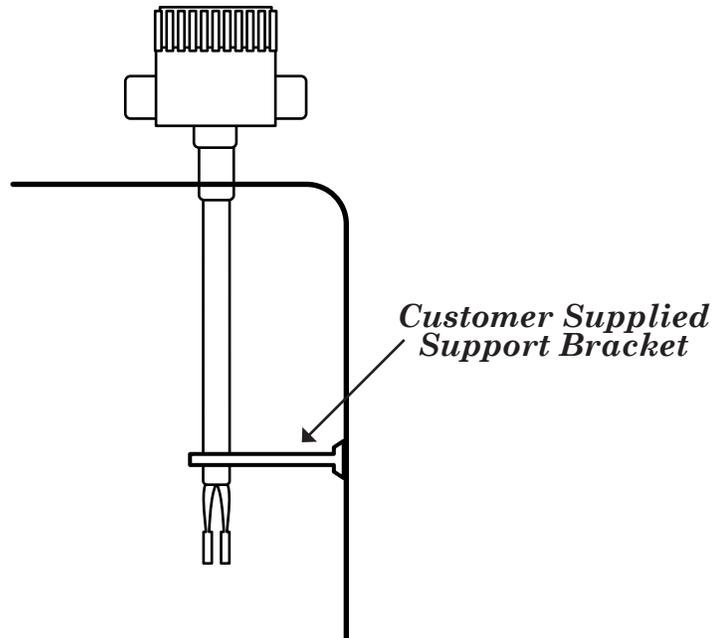
Do not mount the TF-100 so that the fork is located in a fill stream. Mount the TF-100 in a location that is free from splashing material.

In strong product flow, the forks should be mounted so that they are parallel to the direction of the flow to minimize stress on the fork.

### 2.2.3 Agitators

When specifying the TF-100 for agitated vessels it is best to use a short sensor and mount horizontally. Long vertical sensors in agitated vessels can experience heavy lateral force that can damage the sensor.

If a long vertical sensor is the only practical mounting, a support can be fashioned and located above the fork (See Figure 2-2)



*Figure 2-2: Support Bracket*

## 2.3 Power Wiring



### Caution

Do not open enclosure cover or make/break any electrical connections without first disconnecting electrical power at the source. Ensure that the area is non-hazardous. Ensure that wiring, electrical fittings and conduit connections conform to electrical codes for the specific location and hazard level.



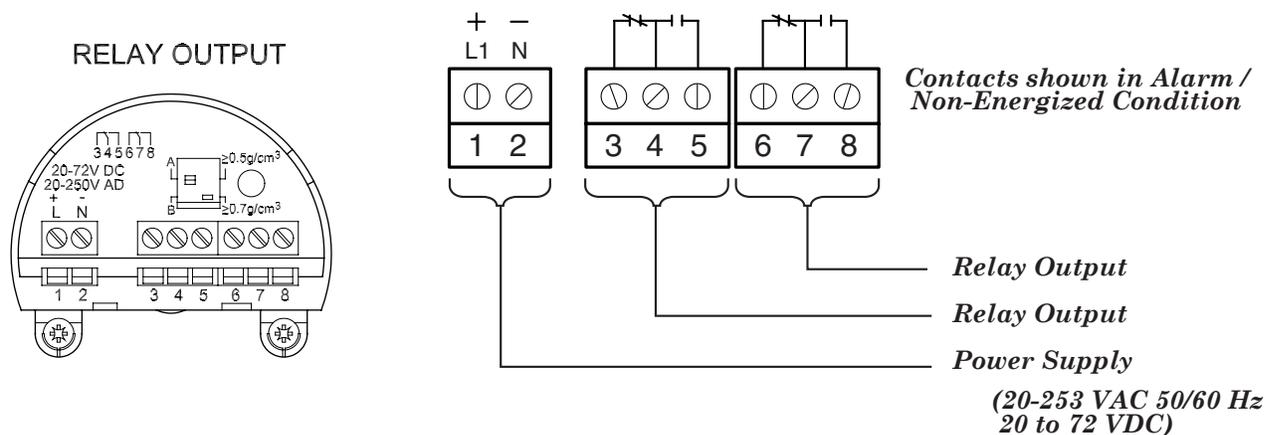
Refer to Figure 2-3 for power wiring and output connections

Review checklist

- Wiring Correct
- Input voltage matches instrument label.
- Proper output connections

Replace the cover prior to restoring power if in a hazardous location.

### Wiring Relay Output Model TF-LXX-XXXX



### Wiring Transistor Output Model TF-PXX-XXXX

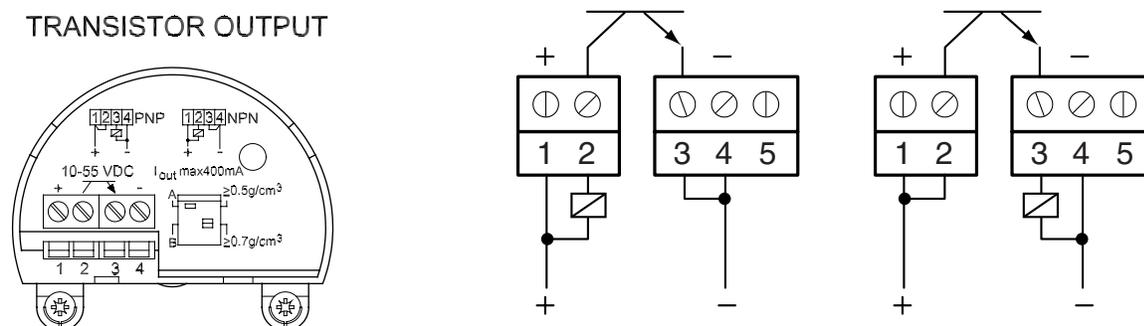
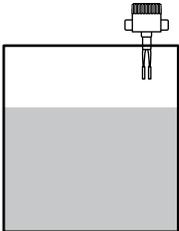
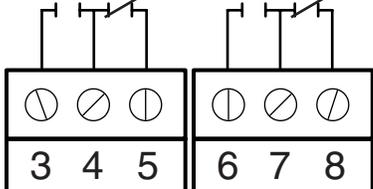
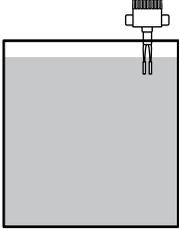
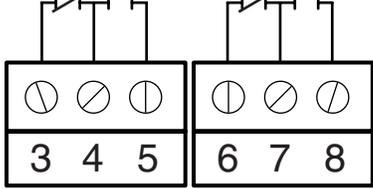
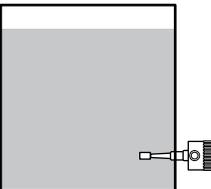
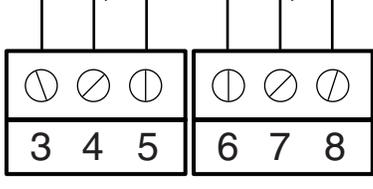
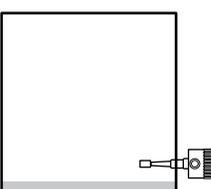
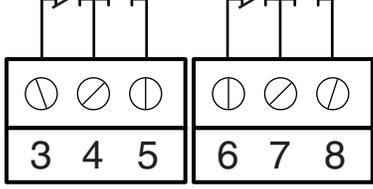
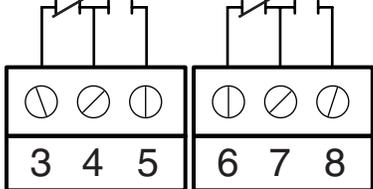
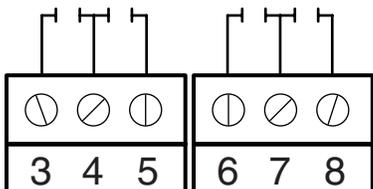
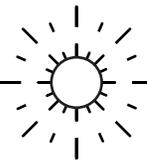


Figure 2-3: Output Wiring

2.4 Function Chart

	Level	TFL Series Relay Output	TFP Series Transistor Output	LED Status
<b>Mode A High Level</b>		 <p>Relay Energized</p>	Transistor Conducts	 Green
		 <p>Relay De-Energized</p>	Transistor Blocks	 Red
<b>Mode B Low Level</b>		 <p>Relay Energized</p>	Transistor Conducts	 Green
		 <p>Relay De-Energized</p>	Transistor Blocks	 Red
<b>Failure of Supply Voltage</b>	Any	 <p>Relay De-Energized</p>	Transistor Blocks	 Out
<b>Electronic Unit or Fork Failure</b>	Any	 <p>Relay De-Energized</p>	Transistor Blocks	 Flashes Red

## **2.5 LED Display**

Green = Normal  
Red = Alarm  
Red flashing = Fault

## **2.6 Fault Monitoring**

The oscillator of the TF-100 continuously monitors the switch. If the sensor stops vibrating or if the sensor corrodes or is damaged, the switch will go to a fault condition. In case of a fault, the red LED flashes and the relays go to the alarm condition.

## **Section 3**

## Section 3: Set up

### 3.1 A/B Mode Setting

The TF-100 can be set up to alarm when material touches the sensor or when material is absent from the sensor.

**Mode A** – switch will alarm when material reaches sensor  
(High Level, stop fill, overflow prevention)

**Mode B** – Switch will alarm when material uncovers sensor  
(Stop empty, run dry protection)

See Figure 3-1 for A/B switch location.

### 3.2 Sensitivity Adjustment

The standard as shipped setting of the TF-100 will operate in liquids with a density greater than 0.7g/cm<sup>3</sup>. For material with Density from 0.5 g/cm<sup>3</sup> to 0.7g/cm<sup>3</sup> move the sensitivity selection switch to >0.5.

### 3.3 Maintenance

When used as directed in this instruction manual, the TF-100 series level switch requires no routine maintenance.

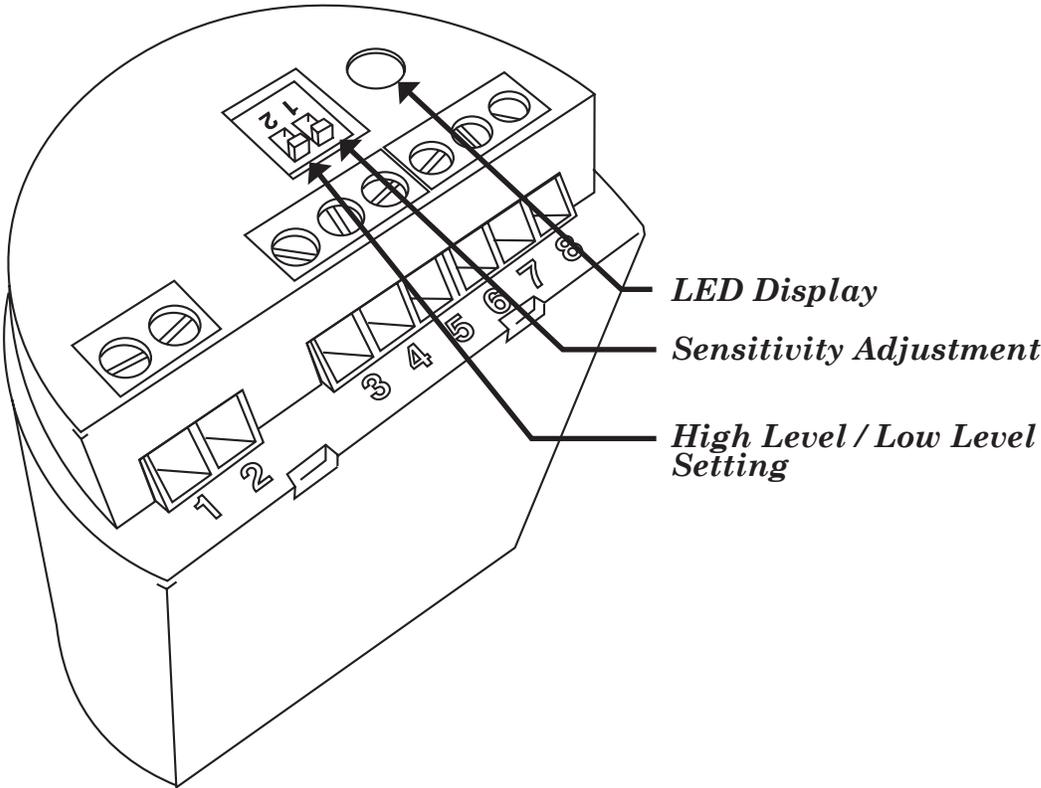


Figure 3-1: Electronic Unit

## **Section 4**

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**Section 4:     Trouble Shooting****4.1   Troubleshooting Guide**

<b>Symptom</b>	<b>Action</b>	<b>Corrective Action</b>
TF-100 fails to “see” material	Check power supply voltage	Correct power supply to meet minimum requirement
TF-100 fails to “see” material	Change from mode A to Mode B – output should change states	If unit does not change state it is defective – contact the factory to replace unit.
TF-100 is in normal state when it should be in alarm and in alarm when it should be normal	Check to see if A/B mode selection is set correctly	Change A/B mode selector
LED Flashes RED	Electronics have detected a sensor failure	Contact the factory to for replacement.
LED Flashes alternately Red/Green	Electronics are defective	Contact the factory to replace unit.

## 4.2 Telephone Assistance



If you have questions about your AMETEK Drexelbrook equipment:

- Contact your local Drexelbrook representative
- Call the Drexelbrook Service department toll-free at:  
1-800-527-6297 (US and Canada) or  
215-674-1234 (Outside North America)
- Fax the following information to the Service department at:  
215-443-5117.

To expedite assistance, please provide the following information:

Instrument Model Number: \_\_\_\_\_

Original Purchase order number: \_\_\_\_\_

Material being measured: \_\_\_\_\_

Temperature: \_\_\_\_\_

Pressure: \_\_\_\_\_

Agitation: \_\_\_\_\_

Brief description of the problem: \_\_\_\_\_

\_\_\_\_\_

Checkout procedures that have failed: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## 4.3 Field Service

Trained field service personnel are available on a time-plus-expense basis to assist in start-ups, diagnosing difficult application or equipment problems, or in-plant training of personnel. Preventive Maintenance and Calibration Certification service contracts are also available to maintain plant efficiency. Contact the Service department for further information.

4.4 Equipment Return

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

In many applications, the equipment is exposed to hazardous materials.

- OSHA mandates that our employees be informed and protected from hazardous materials.
- Material Safety Data Sheets (MSDS) listing the hazardous material that the system has been exposed to must accompany any return.
- It is your responsibility to fully disclose all chemicals and decontaminate the returned items.



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

Please provide the following information:

Model Number of Returned Equipment: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Original Purchase Order Number: \_\_\_\_\_

Process Material that the equipment has been exposed: \_\_\_\_\_

MSDS for any hazardous materials

Billing Address: \_\_\_\_\_

Shipping Address: \_\_\_\_\_

Purchase Order Number for Repairs: \_\_\_\_\_

Please include a purchase order number 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

COD shipments will not be accepted.

## **Section 5**

## Section 5: Specifications

### 5.1 TF-L Series Relay Output

**Power Requirement** = 20 to 253 VAC, 50/60hZ or 20 to 72 VDC

**Power consumption** = 1 to 8 volts VA (AC) approx. 1.3 W (DC)

**Function** = High or Low Level Indication

**Density Sensitivity Setting** = 0.7 to 2.5g/cm<sup>3</sup> or 0.5 to 0.7g/cm<sup>3</sup>

**Output** = DPDT Relay

**Switching Current** = Min 10micro Amps  
Max 5 amps AC/1 amp DC

**Turn on Voltage** = Min 10 mV

**Ambient Temperature** = - 40° to 60°C (- 40° to 140°F)  
- 40° to 50°C (- 40° to 122°F) for process  
temperature above 75°C

### 5.2 TF-P Transistor Output

**Power Requirement** = 10 to 55 VDC

**Power consumption** = Max 0.5W

**Function** = High or Low Level indication

**Density**

**Sensitivity Setting** = 0.7 to 2.5g/cm<sup>3</sup> or 0.5 to 0.7g/cm<sup>3</sup>

**Output** = Floating Transistor Output  
Overload and Permanently Short Circuit Resistors

**Load Current** = 400 mA

**Voltage Loss** = Max 1V

**Turn on voltage** = Max 55 VDC

**Blocking Current** = < 10 Micro Amps

**Ambient Temperature** = - 40° to 60°C (- 40° to 140°F)  
- 40° to 50°C (- 40° to 122°F) for process  
temperature above 75°C

### 5.3 Sensing Element

**Material** = 316 L Stainless Steel

**Mounting** = ¾ inch NPT standard  
(optional flanges and tri-clamp mountings available)

**Process Temperature** = -58° to 302° F (-50° to 150° C)

**Pressure** = max 928 psi (64 Bar)

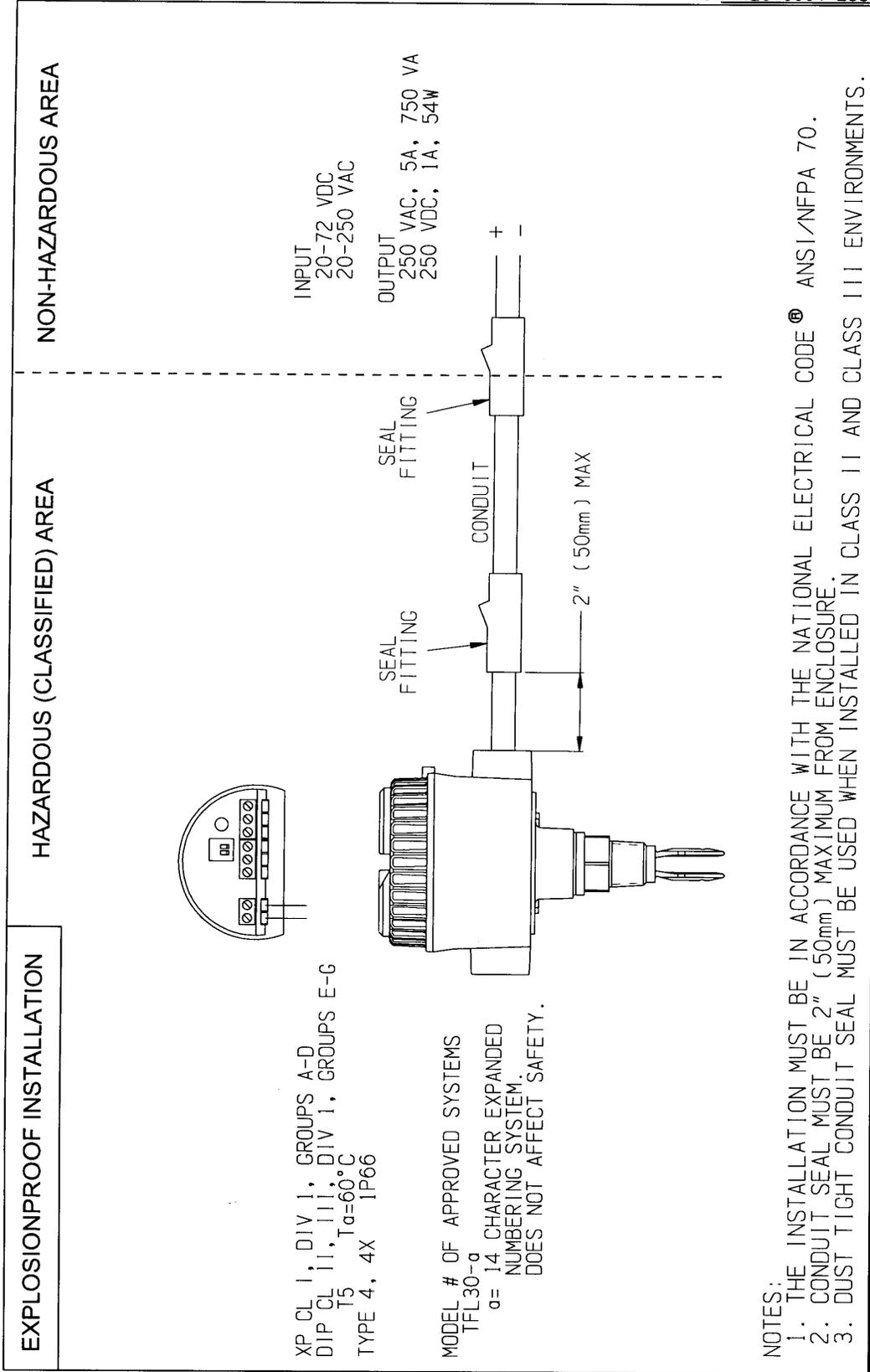
**Viscosity** = 0.1 to 10,000 Centipoise

**Density** = 0.7 to 2.5g/cm<sup>3</sup> (Standard)  
0.5 to 0.7g/cm<sup>3</sup> (By switch selection)

Section 6: Control Drawings

6.1 FM Control Drawings

NO. 420-0004-283-CD SHT 1 OF 7

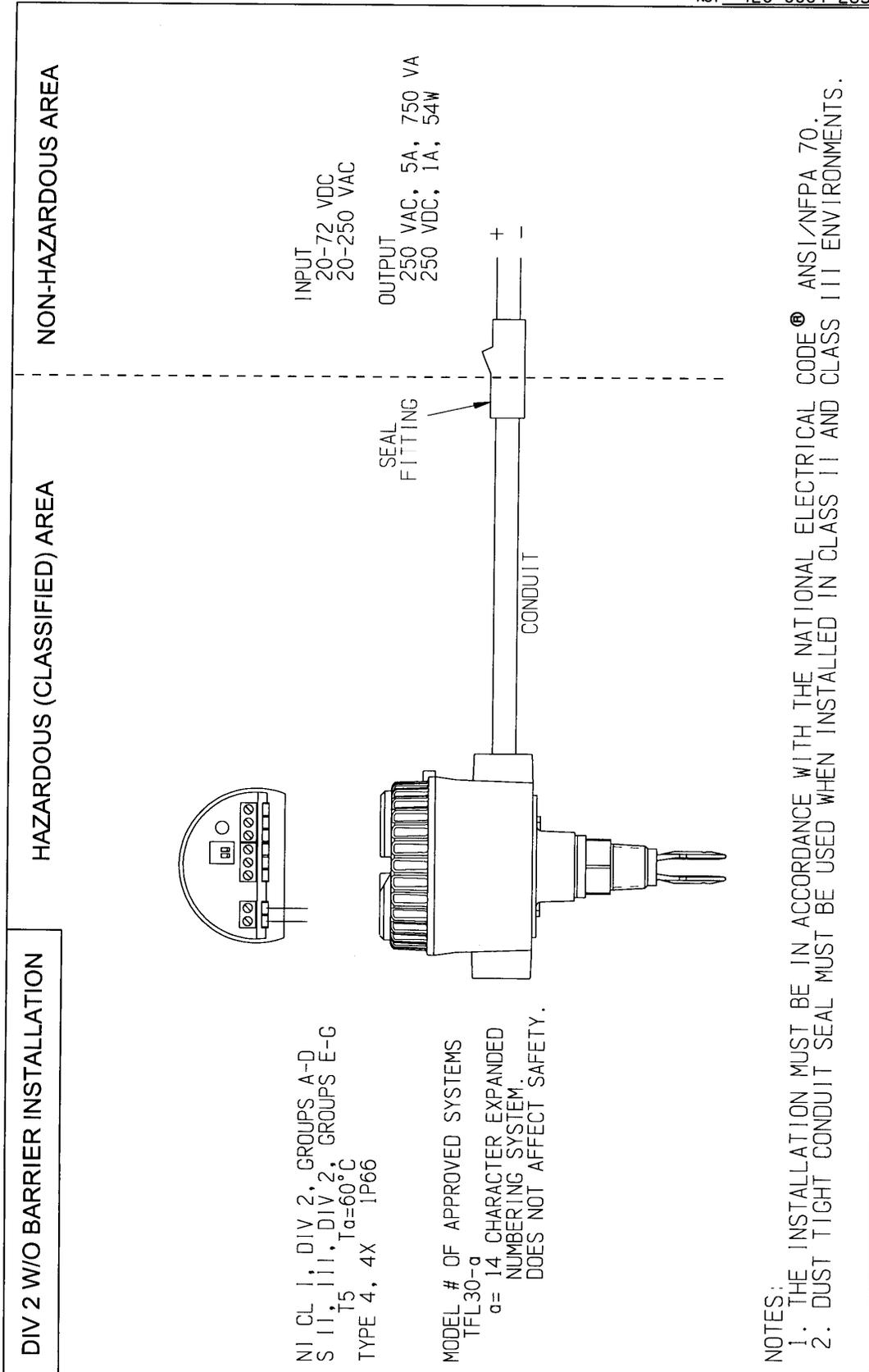


CERTIFIED		COPYRIGHT 2006		TF100 SERIES	
PO #	by	AMETEK DREXELBROOK		FM CONTROL DRAWING	
ENG		SCALE NONE		TFL30 EXPLOSIONPROOF	
USER		ALL DIMENSIONS IN INCHES (MM)		INSTALLATIONS	
		2	6-06-215	54	6-15-06
		1	11-04-333	SGA	3-14-05
DE #		ISS: EDD/DSR NO	APP: D	DATE	DR. JJS 6-13-06
				CK. <i>[Signature]</i>	
				205 KEITH VALLEY RD HORSHAM, PA 19044-9886	
				215-674-1294 FAX 215-674-2731	
				420-0004-283-CD	
				SHT. 1	OF 7
				ISS.	2

6.1 FM Control Drawings (Continued)

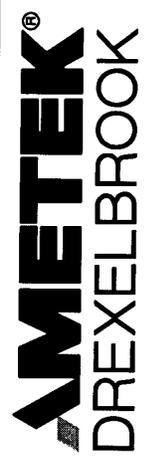
NO. 420-0004-283-CD

SHT 2 OF 7



NOTES:  
 1. THE INSTALLATION MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE® ANSI/NFPA 70.  
 2. DUST TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.

CERTIFIED		by _____		COPYRIGHT 2006		AMETEK DREXELBROOK		TF100 SERIES FM CONTROL DRAWING TFL30 DIV 2 WITHOUT BARRIER INSTALLATIONS	
PO #									420-0004-283-CD
ENG									SHT. 2 OF 7
USER									ISS
	2	6-06-215	SGA	3-14-05	DR.	JUS	6-13-06		
	1	11-04-333	SGA	3-14-05	DR.	JUS	6-13-06		
DE #					ISS	EDO/DSR NO.	APP'D	DATE	



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

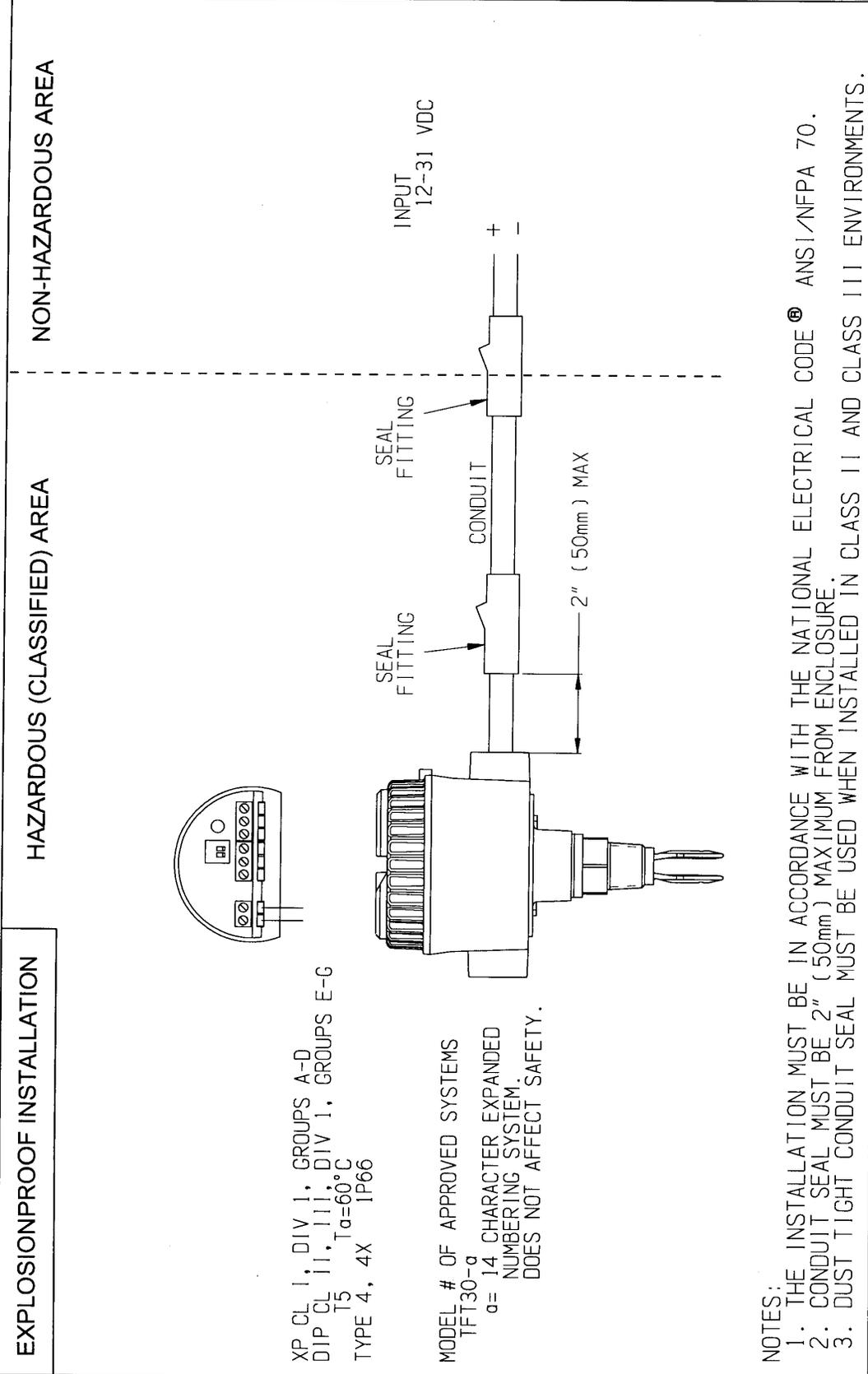




6.1 FM Control Drawings (Continued)

NO. 420-0004-283-CD

SHT 5 OF 7



XP CL I, DIV 1, GROUPS A-D  
 DIP CL II, III; DIV 1, GROUPS E-G  
 T5  
 Ta=60°C  
 TYPE 4, 4X IP66

MODEL # OF APPROVED SYSTEMS  
 TFT30-a  
 a= 14 CHARACTER EXPANDED  
 NUMBERING SYSTEM.  
 DOES NOT AFFECT SAFETY.

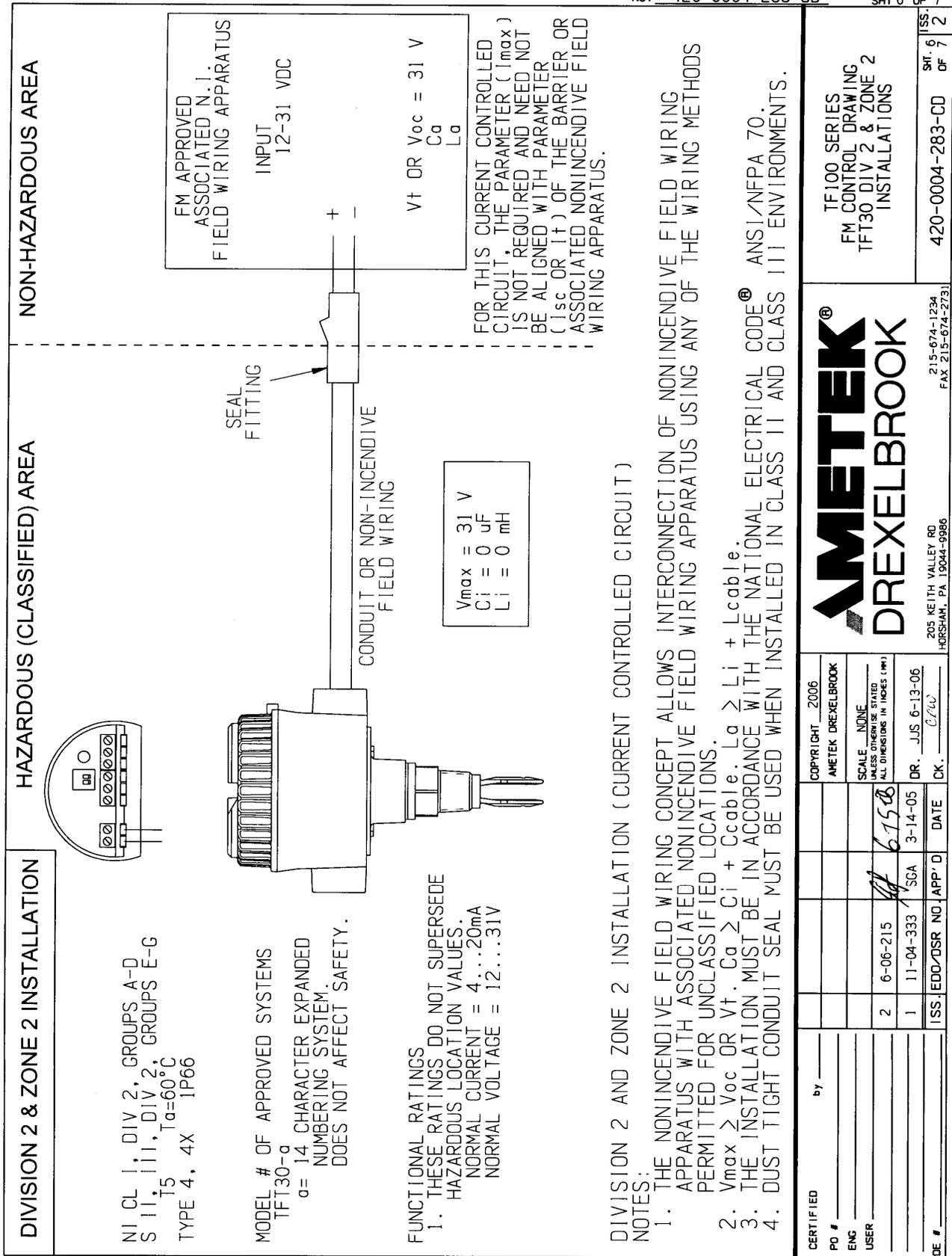
- NOTES:
1. THE INSTALLATION MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE® ANSI/NFPA 70.
  2. CONDUIT SEAL MUST BE 2" (50mm) MAXIMUM FROM ENCLOSURE.
  3. DUST TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.

EXPLOSIONPROOF INSTALLATION		HAZARDOUS (CLASSIFIED) AREA		NON-HAZARDOUS AREA	
CERTIFIED	by	COPYRIGHT 2006	AMETEK DREXELBROOK		
PO #		SCALE	NONE		
ENG		UNLESS OTHERWISE STATED			
USER		2	6-06-215	6/15/06	
		1	11-04-333	3-14-05	
ISS/EDD/DSR NO	APP'D	DATE	DR.	JUS 6-13-06	
DE #		CK.	CALC		
			205 KEITH VALLEY RD HORSHAM, PA 19044-9986 215-674-1234 FAX 215-674-2731		
			TF100 SERIES FM CONTROL DRAWING TFT30 EXPLOSIONPROOF INSTALLATIONS		
			420-0004-283-CD SHT. 5 OF 7 ISS. 5 OF 7		

6.1 FM Control Drawings (Continued)

NO. 420-0004-283-CD

SHT 6 OF 7



**DIVISION 2 & ZONE 2 INSTALLATION**

NI CL I, DIV 2, GROUPS A-D  
 S II, III, DIV 2, GROUPS E-G  
 T5  
 Ta=60°C  
 TYPE 4, 4X IP66

MODEL # OF APPROVED SYSTEMS  
 TFT30-a  
 a= 14 CHARACTER EXPANDED  
 NUMBERING SYSTEM.  
 DOES NOT AFFECT SAFETY.

FUNCTIONAL RATINGS  
 1. THESE RATINGS DO NOT SUPERSEDE  
 HAZARDOUS LOCATION VALUES.  
 NORMAL CURRENT = 4...20mA  
 NORMAL VOLTAGE = 12...31V

**DIVISION 2 AND ZONE 2 INSTALLATION (CURRENT CONTROLLED CIRCUIT)**

- NOTES:
1. THE NONINCENDIVE FIELD WIRING CONCEPT ALLOWS INTERCONNECTION OF NONINCENDIVE FIELD WIRING APPARATUS WITH ASSOCIATED NONINCENDIVE FIELD WIRING APPARATUS USING ANY OF THE WIRING METHODS PERMITTED FOR UNCLASSIFIED LOCATIONS.
  2.  $V_{max} > V_{oc}$  OR  $V_t$ .  $C_a \geq C_i + C_{cable}$ .  $L_a \geq L_i + L_{cable}$ .
  3. THE INSTALLATION MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE® ANSI/NFPA 70.
  4. DUST TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.

CERTIFIED		COPYRIGHT 2006	
PO #	by	AMETEK DREXELBROOK	
ENG		SCALE NONE	
USER		UNLESS OTHERWISE STATED	
		ALL DIMENSIONS IN INCHES (IN)	
2	6-06-215	SGA	DR. JJS 6-13-06
1	11-04-333		DATE 3-14-05
ISS. EDO/DSR NO.	APP'D	OK.	DATE
ISS. OF		OK.	DATE

**AMETEK®**  
**DREXELBROOK**

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

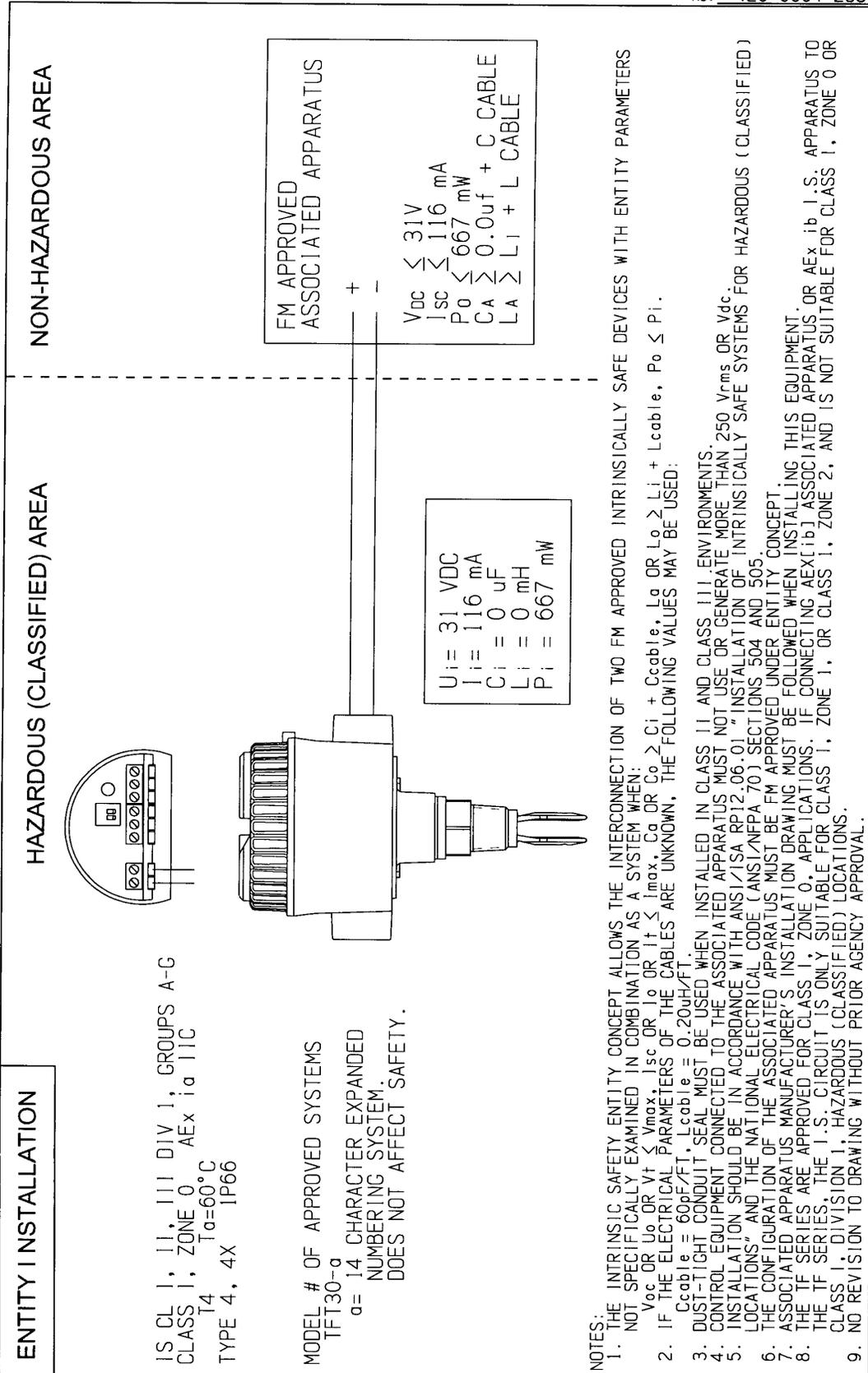
TF100 SERIES  
 FM CONTROL DRAWING  
 TFT30 DIV 2 & ZONE 2  
 INSTALLATIONS

420-0004-283-CD

SHT. 6 OF 7

6.1 FM Control Drawings (Continued)

NO. 420-0004-283-CD SHT 7 OF 7



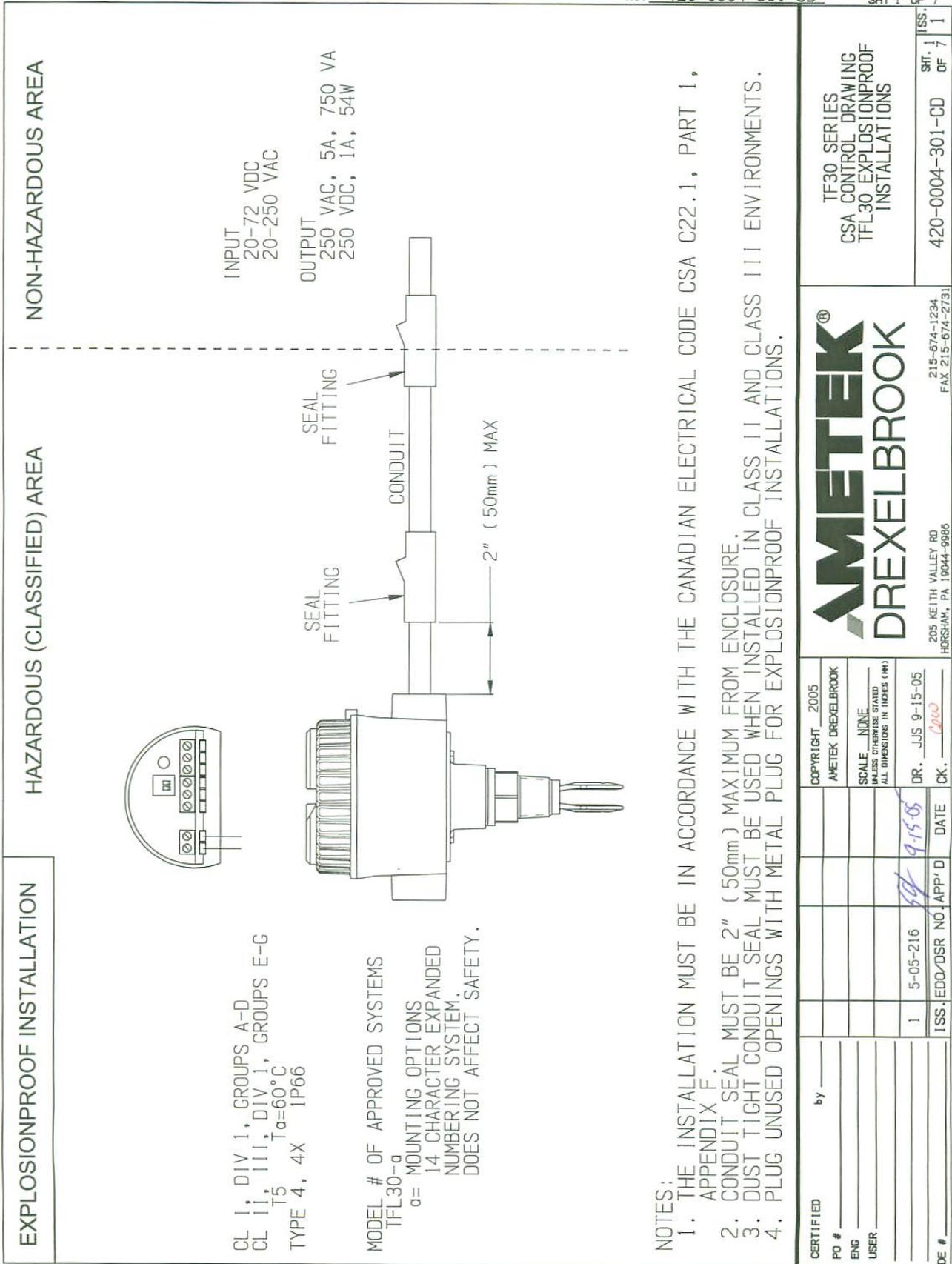
- NOTES:
1. THE INTRINSIC SAFETY ENTITY CONCEPT ALLOWS THE INTERCONNECTION OF TWO FM APPROVED INTRINSICALLY SAFE DEVICES WITH ENTITY PARAMETERS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM WHEN:  
 $V_{oc} OR U_o OR V_t \leq V_{max}, I_{sc} OR I_o OR I_t \leq I_{max}, C_a OR C_o > C_i + C_{cable}, L_a OR L_o > L_i + L_{cable}, P_o \leq P_i.$
  2. IF THE ELECTRICAL PARAMETERS OF THE CABLES ARE UNKNOWN, THE FOLLOWING VALUES MAY BE USED:  
 $C_{cable} = 60pF/FT, L_{cable} = 0.20\mu H/FT.$
  3. DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.
  4. CONTROL EQUIPMENT CONNECTED TO THE ASSOCIATED APPARATUS MUST NOT USE OR GENERATE MORE THAN 250 V<sub>rms</sub> OR V<sub>dc</sub>.
  5. INSTALLATION SHOULD BE IN ACCORDANCE WITH ANSI/ISA RP12.06.01 "INSTALLATION OF INTRINSICALLY SAFE SYSTEMS FOR HAZARDOUS (CLASSIFIED) LOCATIONS" AND THE NATIONAL ELECTRICAL CODE (ANSI/NFPA 70) SECTIONS 504 AND 505.
  6. THE CONFIGURATION OF THE ASSOCIATED APPARATUS MUST BE FM APPROVED UNDER ENTITY CONCEPT.
  7. ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.
  8. THE IF SERIES ARE APPROVED FOR CLASS I, ZONE 0, APPLICATIONS. IF CONNECTING AEXIib) ASSOCIATED APPARATUS OR AEXIib I.S. APPARATUS TO CLASS I, DIVISION 1, HAZARDOUS (CLASSIFIED) LOCATIONS.
  9. NO REVISION TO DRAWING WITHOUT PRIOR AGENCY APPROVAL.

CERTIFIED	by _____	COPYRIGHT 2006	AMETEK DREXELBROOK	TF100 SERIES FM CONTROL DRAWING TF130 ENTITY INSTALLATIONS	ISS. 7 OF 7
PO #		SCALE NONE	ALL DIMENSIONS IN INCHES (IN.)		
ENG		DR. JJS 6-13-06	DR. JJS 6-13-06		
USER		DATE	DATE		
ISS. EDD/DSR NO.	APP'D	DATE	DATE		
DE #		DATE	DATE		
			<p><b>AMETEK®</b> <b>DREXELBROOK</b></p> <p>205 KEITH VALLEY RD HORSHAM, PA 19044-9986 215-674-1234 FAX 215-674-2731</p>		
			<p>420-0004-283-CD</p>		

6.2 CSA Control Drawings

NO. 420-0004-301-CD

SHT. 1 OF 7



NON-HAZARDOUS AREA

HAZARDOUS (CLASSIFIED) AREA

EXPLOSIONPROOF INSTALLATION

INPUT  
20-72 VDC  
20-250 VAC

OUTPUT  
250 VAC, 5A, 750 VA  
250 VDC, 1A, 54W

SEAL FITTING

CONDUIT

2" (50mm) MAX

CL I, DIV 1, GROUPS A-D  
CL II, III, DIV 1, GROUPS E-G  
T<sub>5</sub> T<sub>a</sub>=60°C  
TYPE 4, 4X IP66

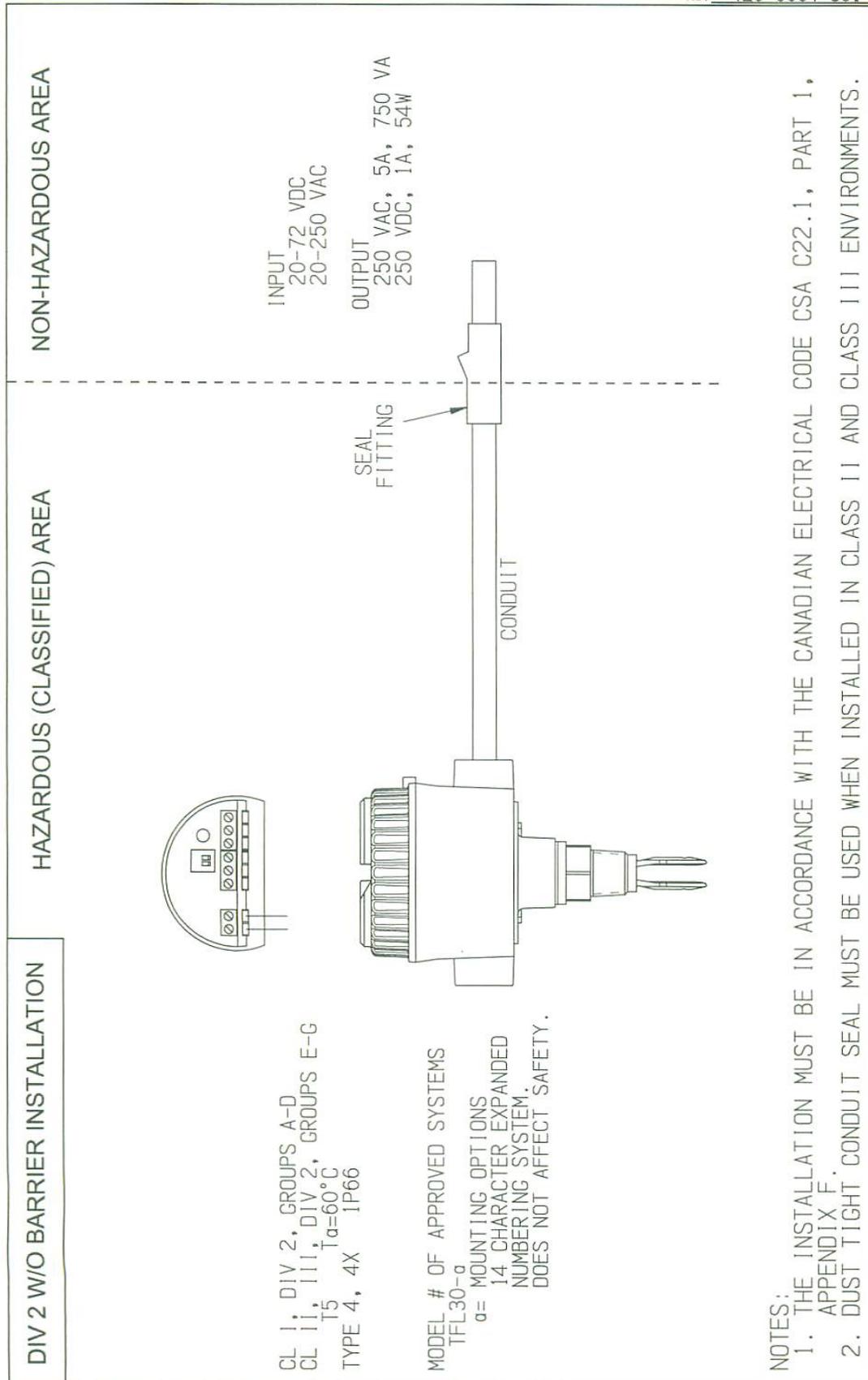
MODEL # OF APPROVED SYSTEMS  
TFL30-g  
α= MOUNTING OPTIONS  
14 CHARACTER EXPANDED  
NUMBERING SYSTEM.  
DOES NOT AFFECT SAFETY.

- NOTES:
1. THE INSTALLATION MUST BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE CSA C22.1, PART 1, APPENDIX F.
  2. CONDUIT SEAL MUST BE 2" (50mm) MAXIMUM FROM ENCLOSURE.
  3. DUST TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.
  4. PLUG UNUSED OPENINGS WITH METAL PLUG FOR EXPLOSIONPROOF INSTALLATIONS.

CERTIFIED		by _____		COPYRIGHT 2005		TF30 SERIES CSA CONTROL DRAWING TFL30 EXPLOSIONPROOF INSTALLATIONS	
PO #	_____	AMETEK DREXELBROOK		SCALE NONE		420-0004-301-CD	
ENG	_____	SCALE NONE		UNLESS OTHERWISE STATED		SHT. 1 OF 7	
USER	_____	ALL DIMENSIONS IN INCHES (MM)		DR. JUS 9-15-05		ISS.	
ISS.	1	5-05-216	DATE	9-15-05	DATE	420-0004-301-CD	
EDD/DSR NO.	_____	APP'D	_____	CK.	_____	SHT. 1 OF 7	
DE #	_____	205 KEITH VALLEY RD HORSHAM, PA 19044-9966		215-674-1234 FAX 215-674-2731		ISS.	

6.2 CSA Control Drawings (Continued)

NO. 420-0004-301-CD SHT 2 OF 7



NOTES:  
 1. THE INSTALLATION MUST BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE CSA C22.1, PART 1, APPENDIX F.  
 2. DUST TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.

CERTIFIED		by _____		COPYRIGHT 2005		METTEK DREXELBROOK		TF30 SERIES CSA CONTROL DRAWING TFL30 DIV 2 WITHOUT BARRIER INSTALLATIONS		SHT. 2 OF 7		ISS. OF 1		
PD #	ENG	USER	DR.	DATE	ISS. EDO/DSR NO.	APP'D	DATE	SCALE	215-674-1234 FAX 215-674-2731		420-0004-301-CD		ISS. OF 1	
			9-15-05		1			NONE	205 KEITH VALLEY RD HORSHAM, PA 19044-9966					
								UNLESS OTHERWISE STATED, ALL DIMENSIONS IN INCHES (IN)						
DE #														

6.2 CSA Control Drawings (Continued)

NO. 420-0004-301-CD SHT 3 OF 7

<p><b>EXPLOSIONPROOF INSTALLATION</b></p>	<p><b>HAZARDOUS (CLASSIFIED) AREA</b></p>	<p><b>NON-HAZARDOUS AREA</b></p>
<p>CL I, DIV 1, GROUPS A-D                  CL II, III, DIV 1, GROUPS E-G                  T5                  Ta=60°C                  TYPE 4, 4X IP66</p> <p>MODEL # OF APPROVED SYSTEMS                  TFP30-a                  a= MOUNTING OPTIONS                  14 CHARACTER EXPANDED                  NUMBERING SYSTEM.                  DOES NOT AFFECT SAFETY.</p>		<p>INPUT                  10-55 VDC                  OUTPUT                  55 VDC MAX, 400 mA MAX</p>
<p>NOTES:</p> <ol style="list-style-type: none"> <li>1. THE INSTALLATION MUST BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE CSA C22.1, PART 1, APPENDIX F.</li> <li>2. CONDUIT SEAL MUST BE 2" (50mm) MAXIMUM FROM ENCLOSURE.</li> <li>3. DUST TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.</li> <li>4. PLUG UNUSED OPENINGS WITH METAL PLUG FOR EXPLOSIONPROOF INSTALLATIONS.</li> </ol>		
<p>CERTIFIED                  PD # _____                  ENG _____                  USER _____</p>	<p>by _____</p> <p>ISS/EDO/DSR NO. APP'D</p> <p>1 5-05-216 SA 9-15-05</p>	<p>DATE 9-15-05</p> <p>DR. J.S 9-15-05</p> <p>CK. <i>[Signature]</i></p>
<p><b>AMETEK®</b>  <b>DREXELBROOK</b></p> <p>205 KEITH VALLEY RD                  HORSHAM, PA 19044-9986                  215-674-1234                  FAX 215-674-2731</p>		
<p>TF30 SERIES                  CSA CONTROL DRAWING                  TFP30 EXPLOSIONPROOF                  INSTALLATIONS</p>		
<p>420-0004-301-CD SHT. 3 OF 7</p>		

6.2 CSA Control Drawings (Continued)

NO. 420-0004-301-CD SHT 4 OF 7

<p><b>DIV 2 W/O NON-INCENDIVE FIELD WIRING INSTALLATION</b></p>	<p><b>HAZARDOUS (CLASSIFIED) AREA</b></p>	<p><b>NON-HAZARDOUS AREA</b></p>
<p>CL 1, DIV 2, GROUPS A-D CL 11, 111, DIV 2, GROUPS E-G T5 T<sub>a</sub>=60°C TYPE 4, 4X 1P66</p> <p>MODEL # OF APPROVED SYSTEMS TFP30-g a= MOUNTING OPTIONS 14 CHARACTER EXPANDED NUMBERING SYSTEM. DOES NOT AFFECT SAFETY.</p>		
<p>NOTES:</p> <ol style="list-style-type: none"> <li>1. THE INSTALLATION MUST BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE CSA C22.1, PART 1, APPENDIX F.</li> <li>2. DUST TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS 11 AND CLASS 111 ENVIRONMENTS.</li> <li>3. TTC, PLTC OR TC NON-METALLIC WIRING MAY BE USED IN LIEU OF CONDUIT SEAL.</li> </ol>		
<p>CERTIFIED _____ by _____</p> <p>PO # _____</p> <p>ENG _____</p> <p>USER _____</p> <p>DE # _____</p>	<p>COPYRIGHT 2005 AMETEK DREXELBROOK</p> <p>SCALE NONE UNLESS OTHERWISE STATED ALL DIMENSIONS IN INCHES (MM)</p> <p>DR. JUS 9-15-05 DATE 9-15-05</p> <p>ISS. EDO/DSR NO. 544 APP'D _____</p>	<p>TF30 SERIES CSA CONTROL DRAWING TFP30 DIV 2 WITHOUT NON-INCENDIVE FIELD WIRING INSTALLATIONS</p> <p>420-0004-301-CD</p> <p>ISS. SHT. 4 OF 7 OF 1</p>

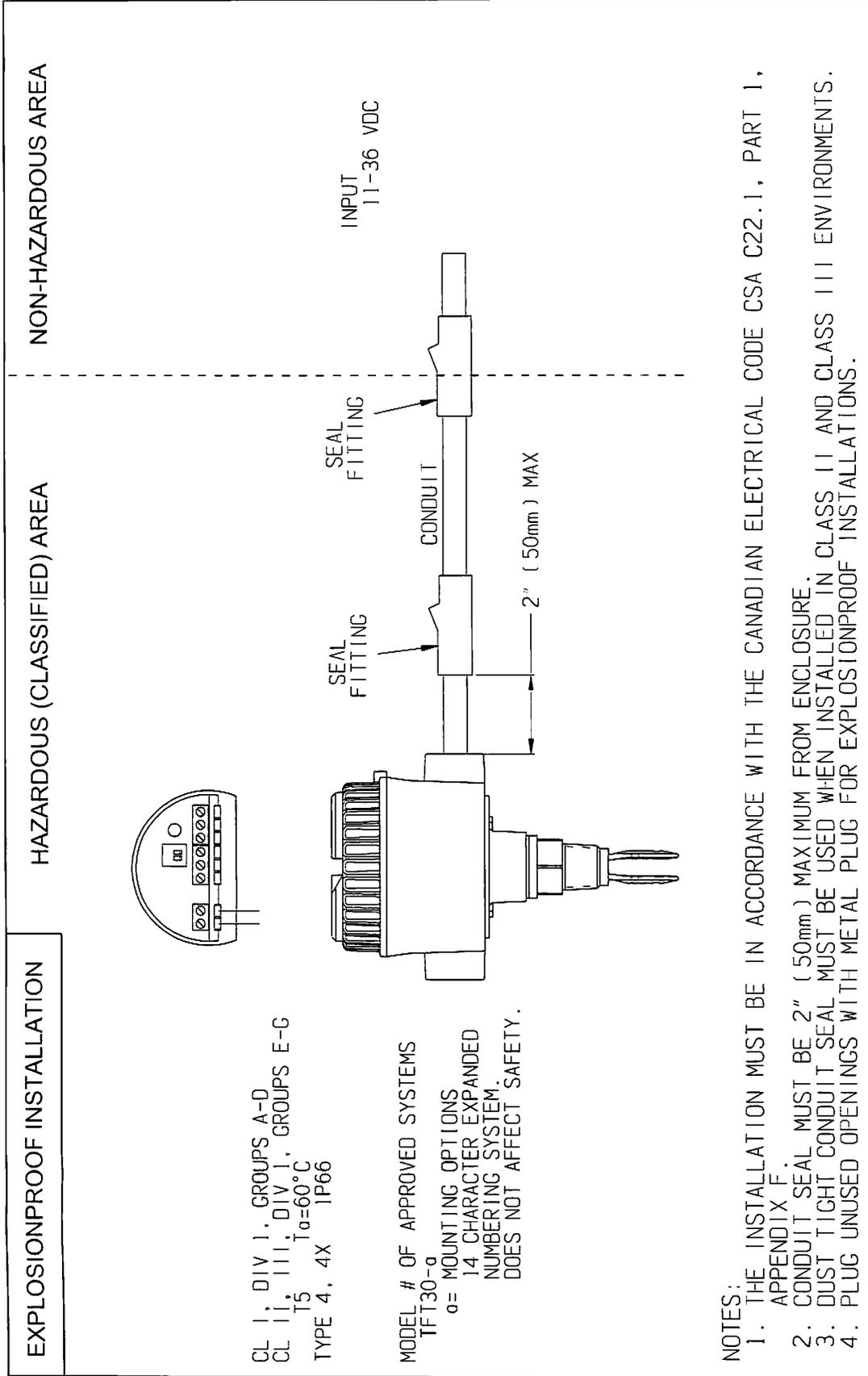


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6.2 CSA Control Drawings (Continued)

NO. 420-0004-301-CD

SHT 5 OF 7

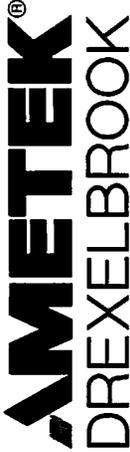


CL I, DIV 1, GROUPS A-D  
 CL II, III, DIV 1, GROUPS E-G  
 T5 Ta=60°C  
 TYPE 4, 4X IP66

MODEL # OF APPROVED SYSTEMS  
 TFT30-a  
 a= MOUNTING OPTIONS  
 14 CHARACTER EXPANDED  
 NUMBERING SYSTEM.  
 DOES NOT AFFECT SAFETY.

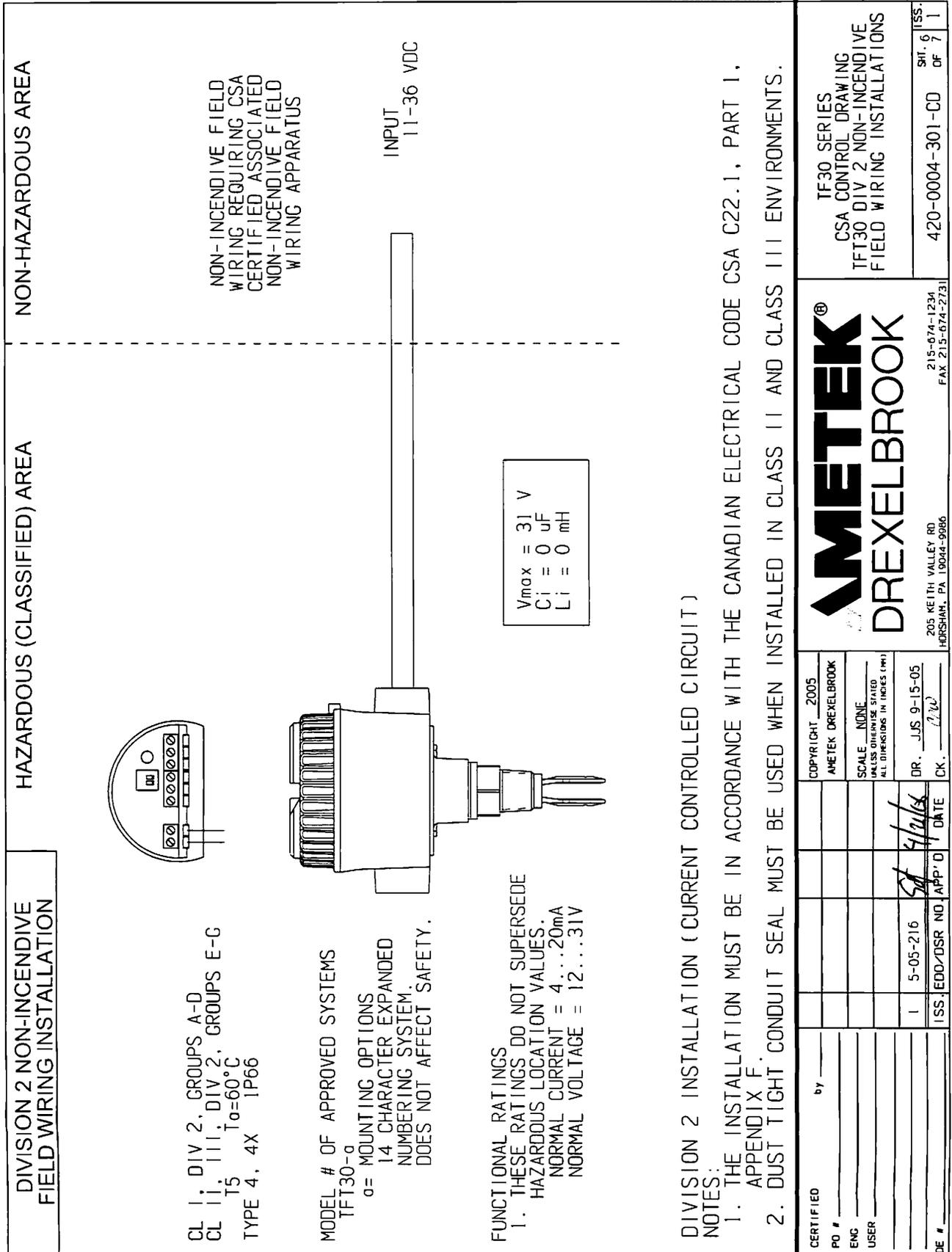
- NOTES:
1. THE INSTALLATION MUST BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE CSA C22.1, PART 1, APPENDIX F.
  2. CONDUIT SEAL MUST BE 2" (50mm) MAXIMUM FROM ENCLOSURE.
  3. DUST TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.
  4. PLUG UNUSED OPENINGS WITH METAL PLUG FOR EXPLOSIONPROOF INSTALLATIONS.

EXPLOSIONPROOF INSTALLATION		HAZARDOUS (CLASSIFIED) AREA		NON-HAZARDOUS AREA	
CERTIFIED	by	COPYRIGHT 2005 AMETEK DREXELBROOK		TF30 SERIES CSA CONTROL DRAWING TFT30 EXPLOSIONPROOF INSTALLATIONS	
PO #		SCALE NONE UNLESS OTHERWISE STATED ALL DIMENSIONS IN INCHES (MM)		SH. 5 OF 7 ISS. 1	
ENG		DR. JJS 9-15-05		420-0004-301-CD	
USER		CK. <i>[Signature]</i>			
DE #		ISS. EDO/DSR NO. 1	5-05-216	205 KEITH VALLEY RD HORSHAM, PA 19044-9986	215-674-1234 FAX 215-674-2731
		APP'D	DATE		



6.2 CSA Control Drawings (Continued)

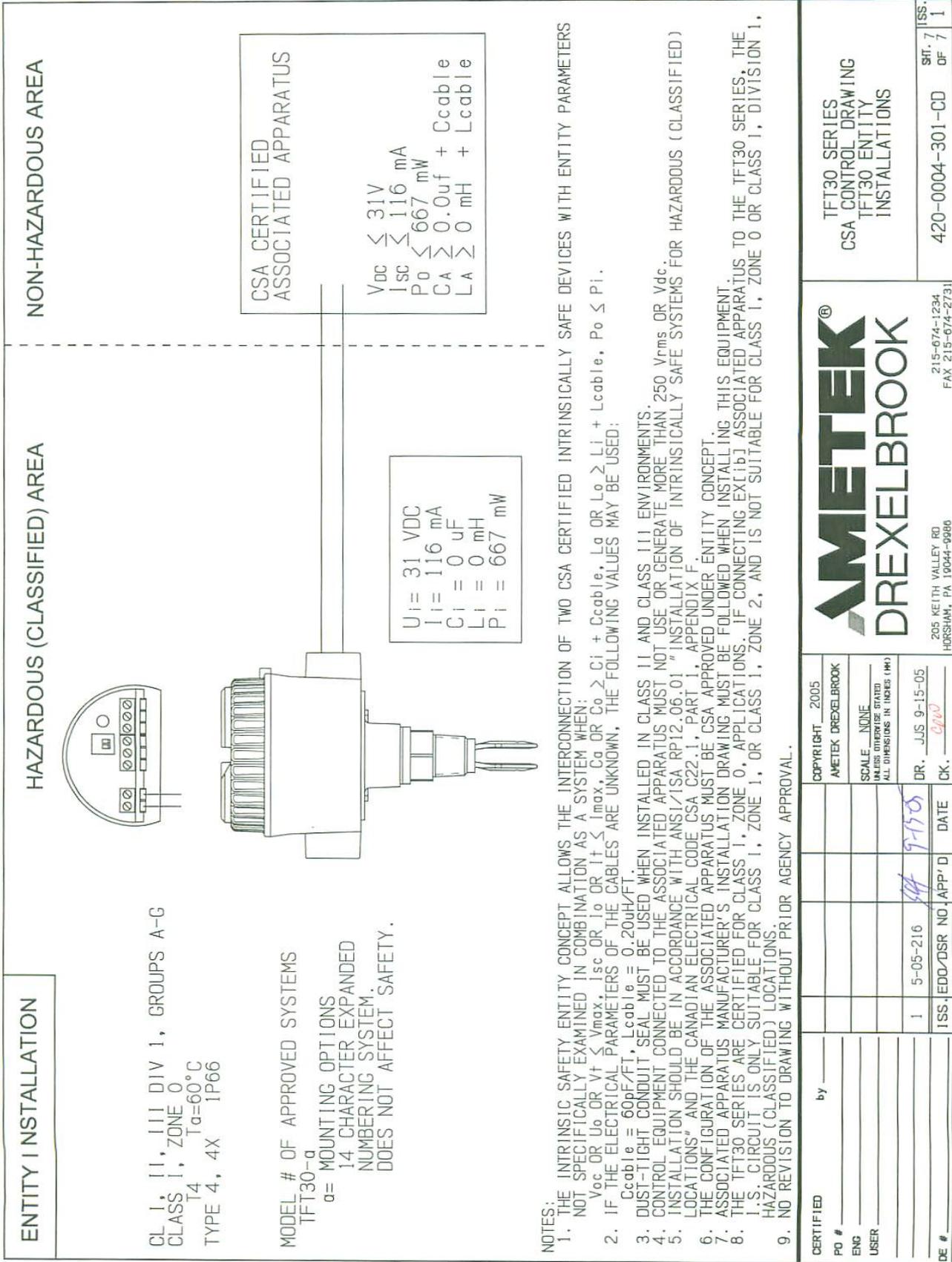
NO. 420-0004-301-CD SHEET 6 OF 7



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6.2 CSA Control Drawings (Continued)

NO. 420-0004-301-CD SHT 7 OF 7



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SCALE NONE UNLESS OTHERWISE STATED ALL DIMENSIONS IN INCHES (MM)	DR. JJS 9-15-05 9-15-05	420-0004-301-CD	SHT. 7 OF 7
ISS, EDD/DSR NO., APP'D	DATE	ISS.	OF
1 5-05-216	9-15-05	420-0004-301-CD	7 1
AMETEK® DREXELBROOK		215-674-1234 FAX 215-674-2731	
205 KEITH VALLEY RD HORSHAM, PA 19044-9986			



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**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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