

**BROOKFIELD MODEL FAST-10X
IN-LINE TRANSMITTER SENSOR**

Installation, Operation and Maintenance Instructions

Manual No. M14-5907-D0925

**Critical Document:
No changes allowed
without agency approval.**



11 Commerce Boulevard, Middleboro, MA 02302 USA
Tel: 508-946-6200 or 800-628-8139 (USA excluding MA)
Fax: 508-946-6262 Internet <http://www.brookfieldengineering.com>

Table of Contents

Section 1 - In-Line Viscometer System Description	7
Introduction.....	7
Features and Benefits	7
Theory of Operation.....	8
Specifications	10
Component Certification: see Appendix C	10
Component Identification.....	10
Section 2 - Installation	11
Unpacking and Inspection.....	11
Installation Requirements	11
Cleaning	13
Section 3 - Operation	18
Section 4 - Maintenance	19
Cleaning in Place	19
Section 5 - Service	20
Introduction.....	20
Instrument Repair Procedure and Guidelines	20
Procedure:	21
Appendix A - Customer Support	23
Appendix B - Warranty Information	24
Appendix C - Certification	25

The information in this document is believed to be accurate and reliable. However, AMETEK Brookfield cannot accept any financial or other responsibilities that may result from the use of this information. No warranties are granted or extended by this document.

Brookfield reserves the right to change any or all information contained herein without prior written notice. Revisions may be issued at the time of such changes and/or deletions.

Any duplication of this manual or any of its parts without expressed written permission from Brookfield is strictly prohibited.

Any correspondence regarding this document should be forwarded to:

AMETEK Brookfield
11 Commerce Boulevard
Middleboro, Massachusetts 02346
U.S.A.
Telephone: (508) 946-6200
FAX: (508) 946-6262
Internet: <http://www.brookfieldengineering.com>

Section I - In-Line Viscometer System Description

Introduction

The Brookfield Model FAST-10X In-Line Viscometer is a highly sensitive, versatile instrument that measures process fluid viscosity in a fully flooded product stream under pressure or vacuum.

The FAST-10X In-Line Viscometer is a vibratory style sensor that generates a digital signal that is proportional to viscosity. This digital signal remains stable even under severe process conditions.

The System shown in Figure 1-1 can be used in a variety of industrial applications where the viscosity of chemicals, coatings, inks, and many other process fluids must be monitored.

Features and Benefits

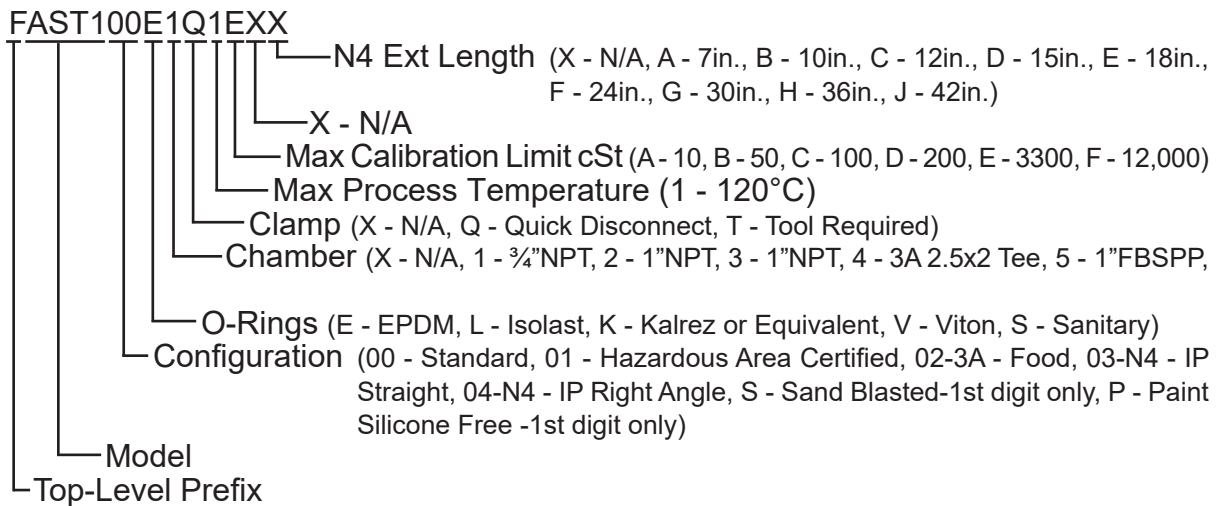
The FAST-10X In-Line Viscometer incorporates the following features:

- Easy startup and operation
- Instantaneous response
- Wide viscosity range
- Multiple output signal options
- Versatile and easy-to-use
- EEPROM with calibration data integrated into sensor

The FAST-10X In-Line Viscometer incorporates the following benefits:

- No rotating parts, therefore, the only seals are static o-ring seals.
- Sensor is cleaned-in-place as part of the system cleaning procedure, thereby, minimizing downtime.
- Repeatable and stable — optimizes product consistency and quality.
- Provides a permanent record for quality control when used with a data recorder or computer system.
- Operates continuously and quickly responds to changes in viscosity.
- Minimal pressure drop across the sensor housing.
- Linear output signals are compatible with most industrial process control equipment.
- Installs directly in-line or in a by-pass line.

AST Model Number Naming Convention



Theory of Operation

The product stream flows through the inlet into the viscosity sensor-measuring chamber, as shown in Figure 1-1, where it is exposed to the sensing probe which is vibrating in a torsional mode. The viscometer has been calibrated and correlates the viscous damping effect of the fluid on the probe to viscosity. The fluid temperature is measured using an RTD (Pt100) located next to the probe. The system (MXT) has 4-20 mA, RS485, RS232 and CAN outputs.

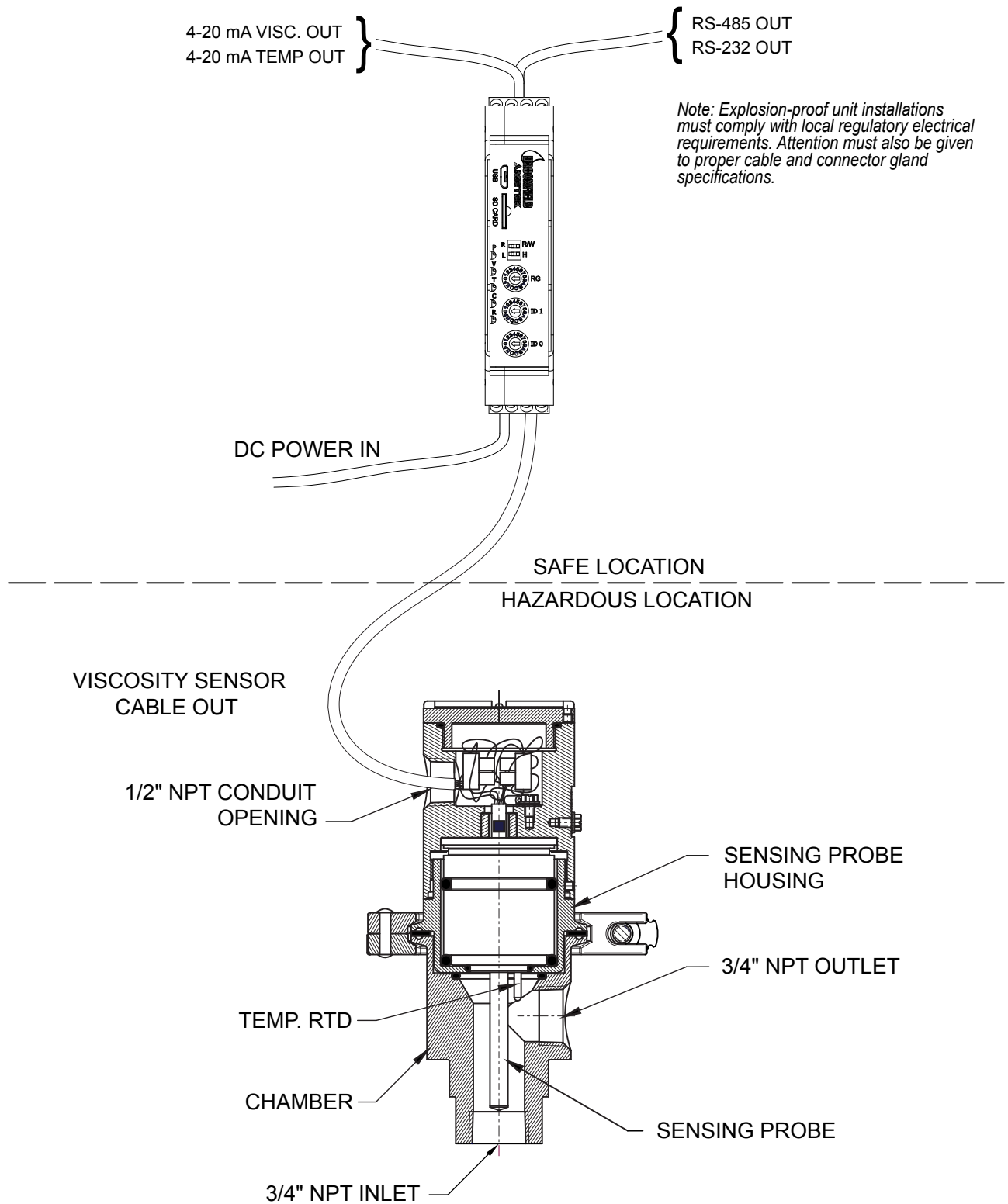


Figure 1-1: Typical FAST-10X System

Specifications

Table 1-1: Model FAST-10X In-Line Viscometer Specifications

Viscometer Specifications	
Viscosity Range	2 to 3,300 cSt Standard 2 to 12,000 cSt Optional
Process Fluid Temp Range	-4°F to 248°F (-20°C to 120°C)
Process Fluid Pressure Range	0 to 200 psig (14 bar)
Sensor Chamber Connections	¾ inch Female NPT 1 inch NPT 1 inch FBSP
Repeatability/Stability	+/- 1% of Reading
Weight	6.5 lbs (2.9 kg)
Explosion-Proof Classification (Model AST101 only)	See Appendix C

Viscometer Materials of Construction	
Wetted Surfaces	316L Stainless Steel
Probe O-Ring Material	Isolast
Chamber O-Ring Material	EPDM Isolast Kalrez or Equivalent Viton

Component Certification: see Appendix C

Component Identification

The following paragraphs provide a brief description of each component within the Viscometer. Refer to Figure 1-1 for the component location within the system.

Sensing Probe

The Sensing Probe is the 5/16 diameter rod that is immersed in the fluid. This rod senses the viscous damping of the material and that signal is taken back to the electronic enclosure for processing.

Sensing Probe Chamber

This chamber is the component that is plumbed into the process line. Its main function is to house and protect the sensor. The chamber is provided with multiple connection options.

Section 2 - Installation

Unpacking and Inspection

NOTE: Upon receipt, inspect the shipping carton and viscometer components for shipping damage. Report any damage to the shipping company immediately.

NOTE: Throughout this procedure take precautions not to allow the sensing probe to come in contact with any hard surface. Damage to the probe could result.

The shipping carton should contain the following components:

- Viscosity Sensor in its Chamber
- MXT Electronics Enclosure
- Cabling
- Instruction Manual
- Optional Equipment

Installation Requirements



The explosion-proof AST, Model AST101, must be installed to comply with the relevant requirements of the National Electrical Code (ANSI/NFPA 70) for US installations, the Canadian Electrical Code (CSA C22.1) for Canadian installations and in accordance with IEC 60079-14 for ATEX approved installations.

NOTE: Only the Viscosity Sensor is approved for use in a hazardous area. See Appendix C for approval information.

The viscosity sensor must be installed in a manner that will optimize its performance. The installation requirements are:

- Provide a continuous product stream to the viscometer with a minimum time lag between the viscometer location and point of changes.
- The AST Sensor Cable should not be installed through the same conduit as AC line voltage. Use separate conduit. Do not run cable past line voltage terminals.

NOTE: Sensor must be rinsed clean after use. This is accomplished as part of the system cleaning. If material is allowed to dry out on the sensor, it may affect the proper operation of the unit.

- Install the viscometer so that it is always full of fluid. Mounting is recommended as shown in Figure 2-1. Avoid pipe configurations that allow air or solids to collect in the Sensor Chamber, as the viscometer only measures the viscosity of fluid located around the probe sensor.
- To avoid damage to the viscosity sensor, it should be installed after a filtering device or screen.
-  For ATEX Installations, enclosure must be sealed at the conduit opening with a suitably rated Ex db IIB, Ex tb IIIC cable gland.
-  Flamepaths are not to be modified or repaired. If flamepaths are damaged, remove equipment from service and contact Brookfield.

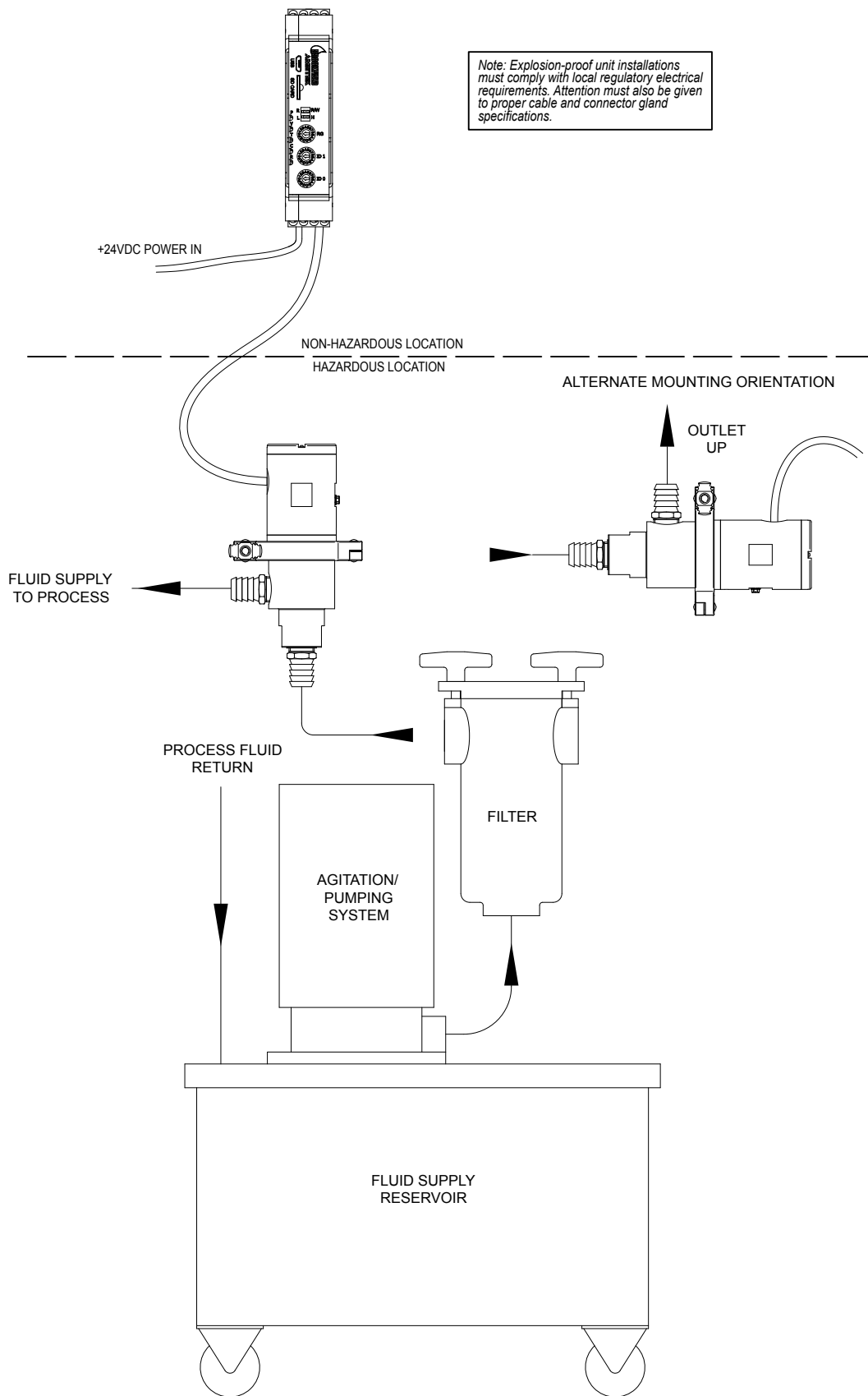




Figure 2-1: Typical FAST-10X System


Installation

Cleaning

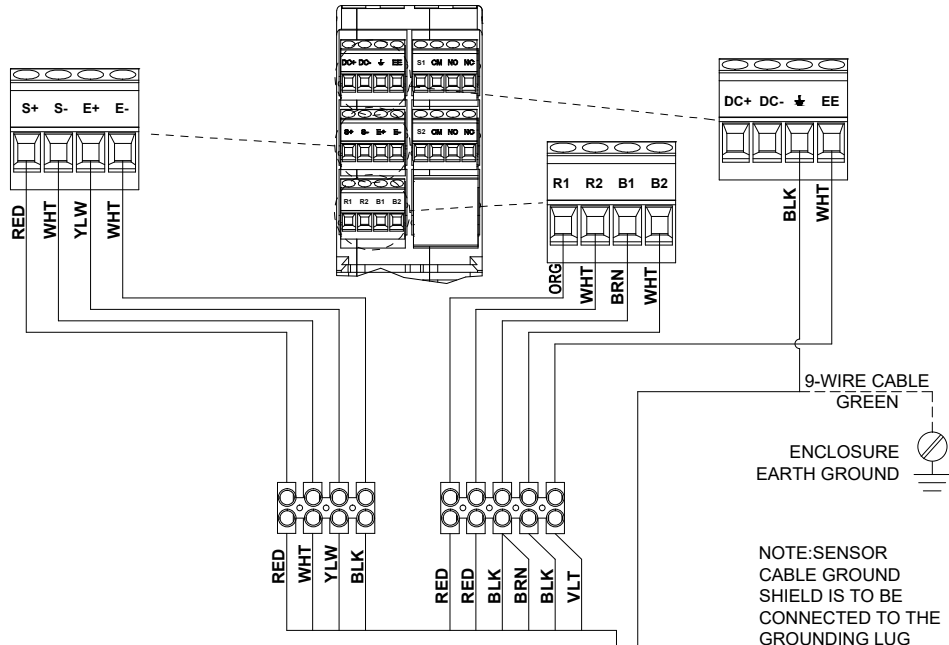
To ensure proper operation of the viscometer, it is important to flush clean the sensor once the operation has been shut down. Do not allow material to dry out on the sensor or it may not work properly. If the sensor is flushed clean as part of the system cleaning procedure, it will continue to operate accurately.

 **CAUTION:** The user should ensure that the substances placed under test do not release poisonous, toxic or flammable gases at the temperatures which they are subjected to during the tests.

 **CAUTION:** Do not exceed the Temperature or Pressure ratings of the system during cleaning. Care should be taken to ensure that all cleaning materials are compatible with the elastomeric o-rings in the probe housing.

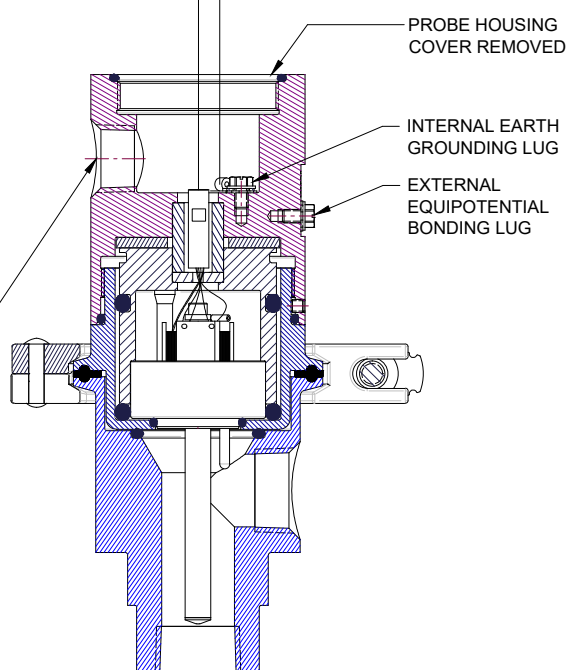
 **CAUTION:** If this instrument is used in a manner not specified by the manufacturer, the protection provided by the instrument may be impaired.

TERMINAL CONNECTIONS
ON BOTTOM OF
ELECTRONICS ENCLOSURE



PROBE	VPV1-105x 9-WIRE CABLE	AST-395x 10-WIRE CABLE	ELECTRONICS ENCLOSURE
VISCOSITY	RED	RED (PAIR 3)	S+
	WHITE	WHITE (PAIR 3)	S-
	YELLOW	YELLOW (PAIR 5)	E+
	BLACK	WHITE (PAIR 5)	E-
TEMPERATURE	PURPLE	ORANGE (PAIR 4)	R1
	RED	WHITE (PAIR 4)	R2
	BLACK/BROWN	BROWN (PAIR 2)	B1
	BLACK	WHITE (PAIR 2)	B2
EEPROM	N/A	WHITE (PAIR 1)	EE
GROUND	GREEN	BLACK (PAIR 1)	⏚

MUST BE SEALED
WITHIN 18" (46 cm)
1/2-14 NPT
(FOR ATEX, CONDUIT MUST
BE SEALED AT ENCLOSURE,
WITH Ex db IIb, Ex tb IIIC
CABLE GLAND.)



NOTE: Installation must comply with local regulatory electrical requirements. Attention must also be given to proper cable and connection/gland specifications.

Note: Negative terminal is earth grounded and max. impedance is 1000 Ω.

Figure 2-2: Terminal Connection

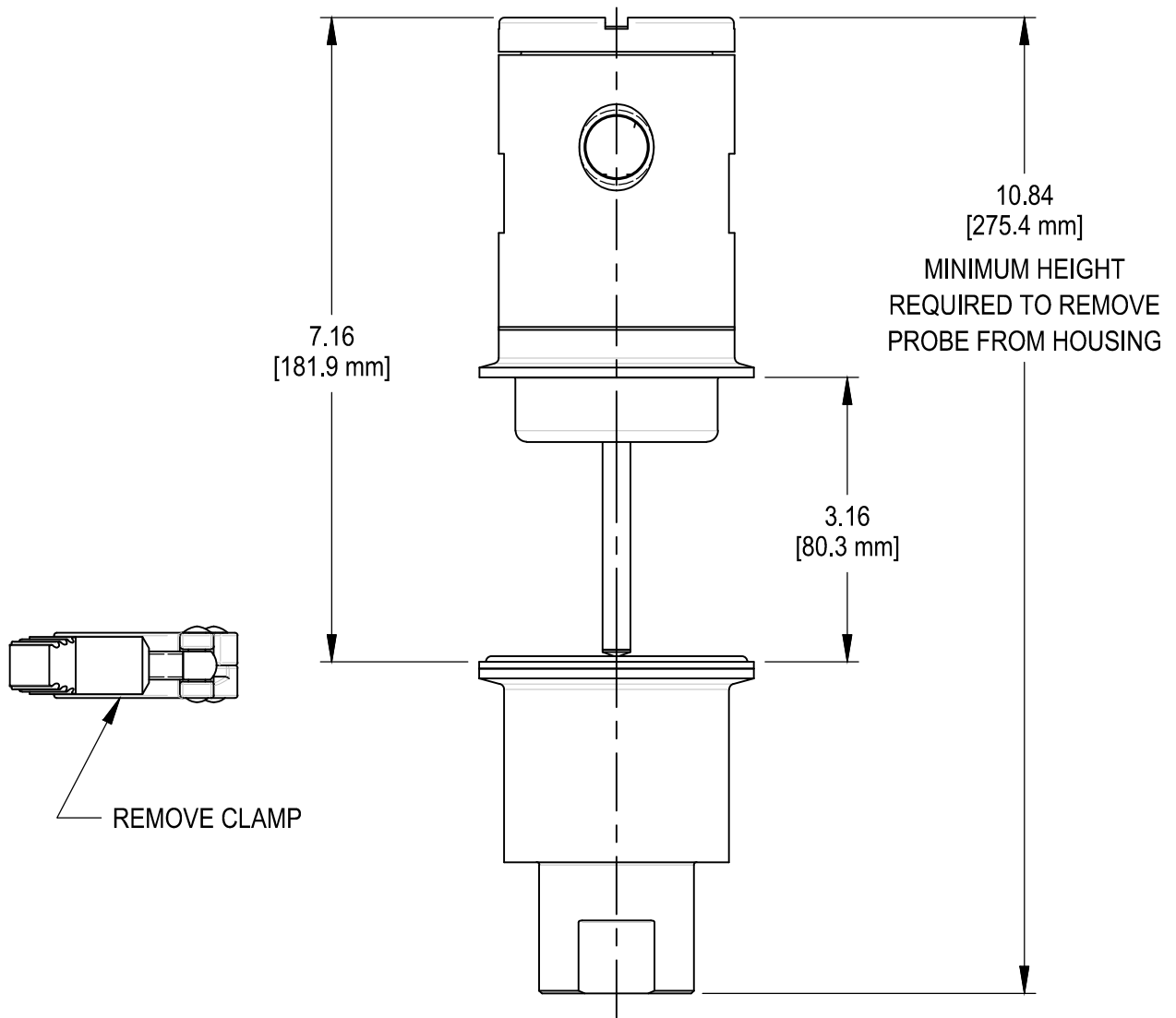


Figure 2-3: FAST-10X Installation Clearance

NOTE: Take precaution not to allow the sensing probe to come in contact with any hard surface. Damage to the probe could result.

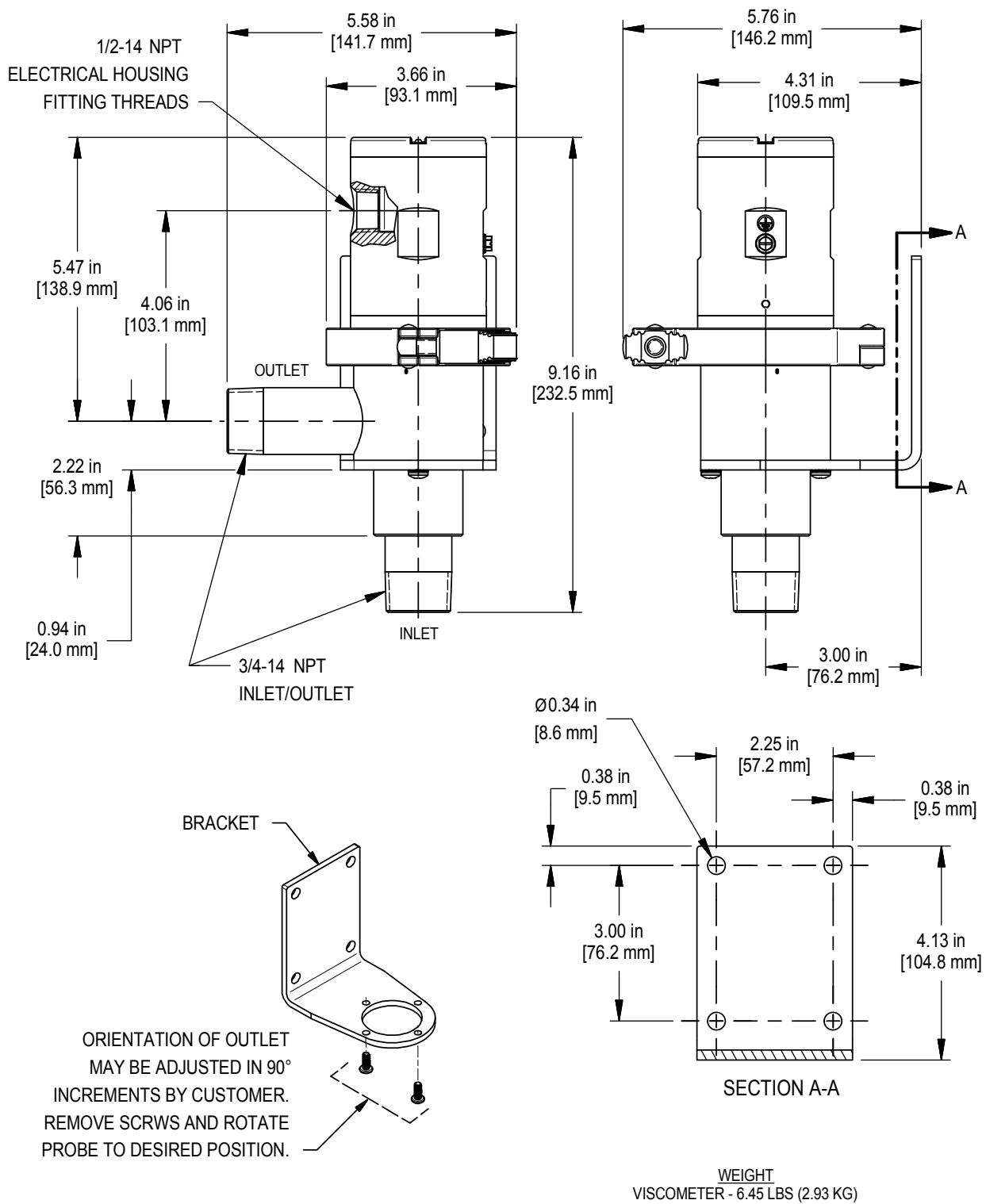


Figure 2-4: FAST-10X (Male Chamber) Bracket Mounting and Clearance

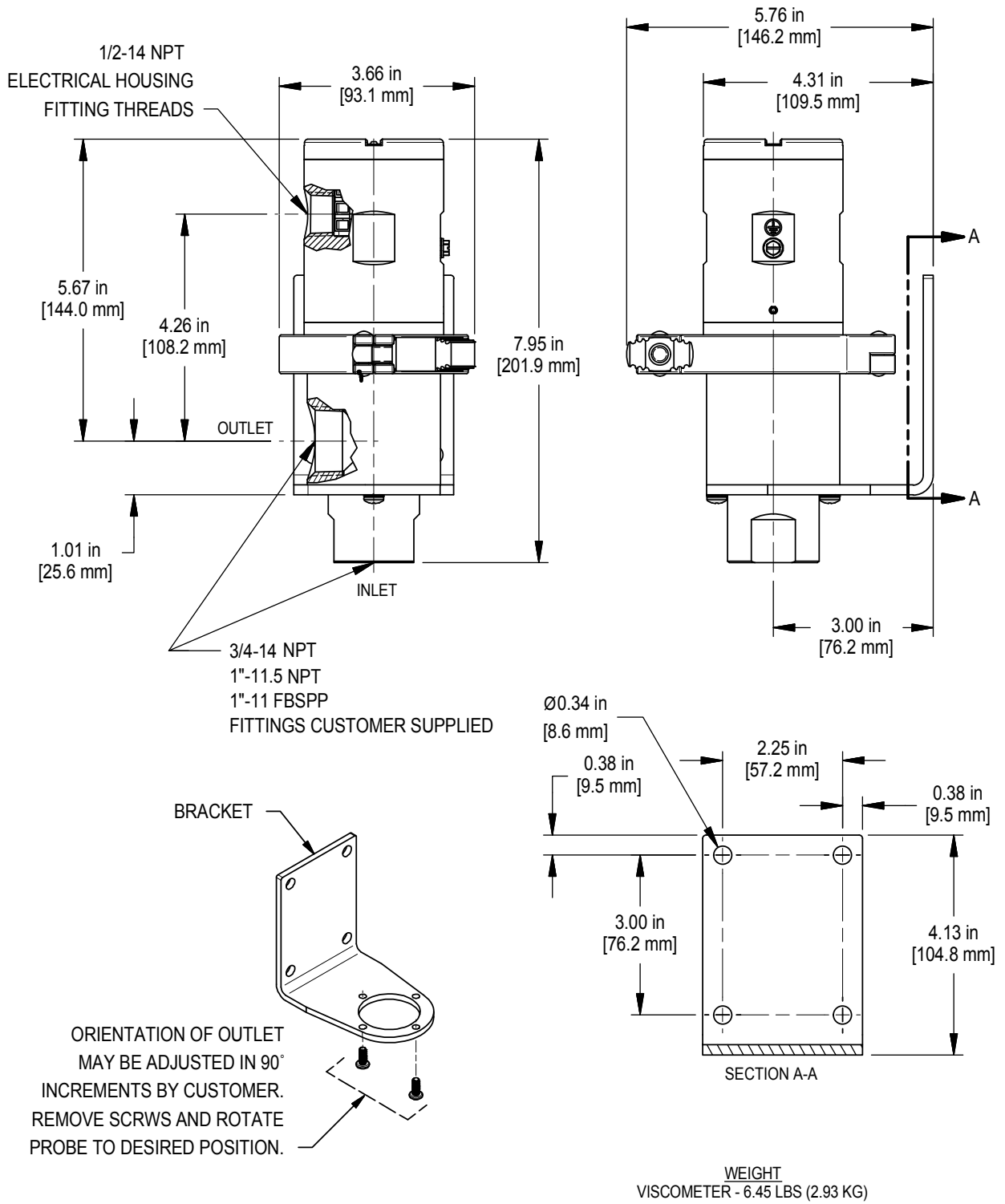


Figure 2-5: FAST-10X (Female Chamber) Bracket Mounting and Clearance

Section 3 - Operation

Operation

Once installation is completed, applying power to the FAST-10X will automatically transfer the probe data from the FAST-10X EEPROM to MXT memory. Once this operation is complete, the system will automatically begin measuring the viscosity of the sample.

The viscosity will be displayed on the User's Display Meter, PLC or similar device. There are no user adjustments required for normal operation. Should it be necessary to adjust the 4-20mA output range, refer to the MXT Manual (M16-5909).

Section 4 - Maintenance

Cleaning in Place

The solvent used for cleaning the viscometer is dependent upon the process fluid being measured. It may be preferable to isolate the section of pipe in which the viscometer is installed from the main process system.

1. Drain the process fluid from the system or isolated section of pipe in which the viscometer is installed.
2. Fill the system, or isolated section of pipe in which the viscometer is installed, with cleaning fluid.
3. The instrument should flush clean along with normal process piping.
4. The instrument should be flushed clean prior to any extended downtime to avoid product buildup.

NOTE: Cleaning duration varies by the amount of process fluid build-up and its cleaning characteristics.

5. Drain the cleaning fluid from the system or isolated section of pipe in which the viscometer is installed
6. Refer to *Section 3 - Operation* and perform the Start-up procedure.

NOTE: In addition to these instructions, ATEX approved installations must be maintained in accordance to IEC 60079-19.


NOTE: Throughout this procedure take precautions not to allow the sensing probe to come in contact with any hard surfaces. Damage to probe could result.

Section 5 - Service

Introduction

The Viscosity Sensor is a highly reliable and rugged unit that requires little maintenance. This section provides information on component replacement.

To order replacement parts, refer to Appendix A and contact Brookfield. When ordering replacement assemblies, make sure that all associated components (gaskets, O-rings, etc.) have been ordered to ensure the new assemblies can be properly installed.

 **CAUTION:** The internal components of the viscometer must be empty of process fluid, clean, and free of obstructions before it can be serviced. Refer to Section 4 - Maintenance and perform the cleaning procedure for the process fluid application.

NOTE: In addition to these instructions, ATEX approved installations must be maintained in accordance to IEC 60079-19.

 **CAUTION:** This instrument is approved for Hazardous Locations.

- **Flamepaths are not repairable.** Please contact Brookfield for all damage that may effect safety.

Instrument Repair Procedure and Guidelines

In the event that your Process Viscometer should require factory maintenance, Brookfield has provided the following guidelines and recommendations to follow to ensure a prompt turn around time for all repaired items.

Before returning any Brookfield Process Viscometer, please contact our Process Service/Sales Department or go online to obtain a Return Authorization Number. This will ensure that your instrument is routed to the proper Repair Department when received. Unnecessary delays may result when “unannounced” repairs arrive at our facility and have to be sorted and routed outside standard procedures. To contact the Process Service/Sales Department, please call 508-946-6200 or 800-628-8139 (USA Only); or you may prefer to email us at MA-MID.sales@ametech.com.

Please be sure to follow these guidelines when returning your instrument:

1. The Process Return Form received from us is completely filled out with the correct information.
2. Ensure that the SDS section of the Process Return Form is completed and any applicable SDS sheets are also included with your instrument to be repaired. Failure to comply with SDS regulations may result in repair delays.
3. Our method of return shipment is via FedEx. Should you prefer a different method or wish to charge to your carrier account number, be sure to include this information.

FAST-10X Performance Verification Test Using AST-111 Reference Fluid

The AST instrument requires no field calibration. On an annual or as needed basis, you may verify the AST to the Certificate of Test provided with the instrument.

The “Certificate of Test” will include the following:

- Certificate Number
- Model #
- Serial #
- Test Fluid
- Test Temperature
- Fluid Viscosity Uncertainty
- Test Value (cSt)

This Performance Verification Test requires that you use the same test media, namely Brookfield test fluid AST-111 held at the Test Temperature listed on the “Certificate of Test” for the duration of the test. If you are able to test the product under the above conditions and the viscosity is within +/- 3% of the Test Value the instrument is working properly.

The following describes the procedure for completing a performance verification test on any AST using AST-111 reference fluid.

NOTE: Please protect the probe at all times to prevent damage.

Procedure:

1. Remove instrument from service.
2. Check the measuring probe for damage and ensure there is no product contamination on the probe. Clean as necessary with appropriate material and prevent scratches and damage to the probe.
3. Use a container wide & deep enough to submerge the Sensing Probe without contacting the sides of the container.
4. Open the AST-111 container and mark it with the date of first use as it has a life expectancy of one year after being opened.
5. Pour an appropriate amount of the AST-111 Fluid into the container and bring it to the “Test Temperature”.
6. Submerge the Sensing Probe fully in the AST-111 Fluid, ensuring that the RTD probe is fully submerged.
7. Allow the temperature of the AST-111 Fluid & the Sensing Probe to equalize in temperature at the “Test Temperature”, which may take time if the probe came from a hot or cold environment.

8. Record the Measured Value, either from the output signals available from the transmitter, or the controller if purchased.
9. The instrument is functioning properly if the recorded value is within +/- 3% of the "Test Value" as noted on the "Certificate of Test".
10. If the value is outside the range, please contact Brookfield or go online for a repair authorization number and return for service.
11. If found acceptable, remove the Sensing Probe from the test container, clean excess fluid from the Probe and Probe Housing to prepare it for re-assembly into the process.
12. The AST-111 fluid can then be returned to the AST-111 container for future use. Please mark the date of first use on the container as the shelf life is one year after first use.

Appendix A - Customer Support

Introduction

Use the following information to contact Brookfield for technical assistance or service:

AMETEK Brookfield.
11 Commerce Boulevard
Middleboro, Massachusetts 02346 U.S.A.
TEL: 508-946-6200 800-628-8139 (USA only)
FAX: 508-946-6262
EMAIL: MA-MID.sales@ametek.com

Please have the following information available when calling so that we may assist you:

- Product Part Number
- Product Serial Number
- Product Application
- Specific Problem Area
- Hours of Operation
- Equipment Type

Appendix B - Warranty Information



We hereby warranty this Brookfield Viscometer to be free from defects in workmanship and materials. If found to be defective in workmanship or materials upon being returned, within one year from the date of purchase to our factory, it will be repaired or replaced at the factory without charges. Transportation charges shall be at the owner's expense.

However, if upon being so returned and after inspection, we determine that the instrument has been subjected to tampering, careless handling, improper or faulty application or installation, the above guarantee shall not be applicable and we shall have the right in any such case to make a charge to cover the cost of repairs or servicing. Brookfield assumes and shall have no liability for consequential damages resulting from the use or misuse of the instrument.

The foregoing warranty is in lieu of all other guarantees or warranties, expressed or implied, and of all other obligations or liabilities, contractual or otherwise, either to the original purchaser of said instrument or to any other person whomsoever.

Appendix C - Certification

Table D-1: Approvals for Model FAST-10X

Approval	Protection Concept
CLASS I, DIV 1, GROUPS C & D	Explosion Proof (US & CA)
CLASS II, DIV 1, GROUPS E, F, G	Dust-Ignition proof (US & CA)
CLASS III, DIV 1	Fiber & Flying Protection (US & CA)
Ex db IIB  II 2 G	Flameproof (EU - ATEX 2014/35/EU) Certificate #: ETL25ATEX0592X
Ex tb IIIC  II 2 D	Protection by Enclosure (EU - ATEX 2014/35/EU)
NEMA 4X & IP66	Environmental Protection
T6/T85°C for Ta = 50°C / Process of -20°C to 50°C T4/T135°C for TA = 50°C / Process of -20°C to 120°C	
Hazardous Location Standards	
Conforms to UL Stds 61010-1, 50 & 50E, FM Stds 3600, 3615 & 3616 Certified to CSA Std C22.2 Nos. 61010-1, 25, 30, 94.1 & 94.2	



Intertek
4010399

