

# hydra-wave Tote & Drum Ultrasonic Level Transmitter



◆ CAUTION

It is essential that all instructions in this manual be followed precisely to ensure proper operation of the equipment.

## Instruction Manual

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# NOTICE

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## SAFETY PRECAUTIONS

### ◆ **User's Responsibility for Safety:**

It is the user's responsibility to select a technology that is appropriate for the application, install it properly, perform tests of the installed system, and maintain all components. The failure to do so could result in property damage or serious injury.

### ◆ **Proper Installation and Handling:**

Because this is an electrically operated device, only properly-trained staff should install and/or repair this product. *Note: Always install the 3/4" Viton gasket with the transmitter. The G threaded version of the Tote & Drum will not seal unless the gasket is installed properly.* Use a proper sealant with all installations. Never overtighten the transmitter within the fitting. Always check for leaks prior to system start-up.

### ◆ **Wiring and Electrical:**

A supply voltage of 12-36 VDC is used to power the transmitter. The sensor systems should never exceed a maximum of 36 VDC. Electrical wiring of the sensor should be performed in accordance with all applicable national, state, and local codes.

### ◆ **Temperature and Pressure:**

This sensor is designed for use in application temperatures from  $-40^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$ ) to  $140^{\circ}\text{F}$  ( $60^{\circ}\text{C}$ ), and for use at pressures up to 30 psi (2 bar) @ ( $25^{\circ}\text{C}$ )  $77^{\circ}\text{F}$ , derated @ 1.667 psi (.113 bar) per degree above ( $25^{\circ}\text{C}$ )  $77^{\circ}\text{F}$ .

### ◆ **Material Compatibility:**

The continuous ultrasonic level transmitter is made of two materials. The enclosure is of Polypropylene (PP) and the transducer is made of Polyvinylidene (PVDF). Make sure that these materials are chemically compatible with the application liquids and vapors. While the transmitter housing is liquid-resistant when installed properly, it is not designed to be immersed. It should be mounted in such a way that it does not normally come into contact with fluid.

### ◆ **Flammable, Explosive, and Hazardous Applications:**

This sensor is NOT rated for use in flammable or explosive applications.

### ◆ **Make a Fail-Safe System:**

Design a fail-safe system that accommodates the possibility of transmitter or power failure. In critical applications, it is recommended to use redundant backup systems and alarms in addition to the primary system.

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# Introduction

*This chapter describes the organization, manual conventions, and provides contact and technical service information.*

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## Description

An ultrasonic sound wave is pulsed two times per second from the base of the transducer. The sound wave reflects against the process medium below and returns to the transducer. The microprocessor based electronics measure the time of flight between the sound generation and receipt, and translates this figure into the distance between the transmitter and process medium below.

This manual describes the installation of the Tote and Drum Ultrasonic Level Transmitter (Tote & Drum ULT). It includes instructions for installation, product specifications, and maintenance notes.

Contact Kistler-Morse (KM) at 1-800-426-9010 if you have any questions regarding the installation. For outside USA & Canada, call 425-486-6600.

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## About this manual

The chapters are organized in the following way:

Chapter 1:       Pre-Installation of the Tote & Drum ULT  
Chapter 2:       Installation of the Tote & Drum ULT  
Chapter 3:       Calibration of the Tote & Drum ULT

Appendix A and B include specifications and maintenance.

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## Manual Conventions

Three kinds of special explanations appear throughout the manual — *Warning*, *Caution* and *Note*. The format and significance of each is defined below:

 **WARNING**

Possible danger to people. Injury may result if this information is ignored.

 **CAUTION**

Possible risk to the product. The ULT or other equipment may be damaged if this information is ignored.

 **Note**

Contains additional information about a step or feature critical to the installation or operation of the ULT.

## Contact Information



You may reach Kistler-Morse corporate headquarters at the following:

Mail: Kistler-Morse  
19021 120th NE Ave Suite 101  
Bothell, Washington USA 98011-9505

Telephone: 1-800-426-9010  
(425) 486-6600

Fax: (425) 402-1500

E-mail: [sales@kistlermorse.com](mailto:sales@kistlermorse.com)

Website: <http://www.kistlermorse.com>

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## Technical Service

A complete, unabridged copy of our product warranty is available upon request from KM. A summary of the warranty, *subject to the terms and conditions listed fully in the warranty*, follows:

KM warrants the equipment to be free from defects in material and workmanship for two years from date of shipment to original user. KM will replace or repair, at our option, any part found to be defective. Buyer must return any part claimed defective to KM, transportation prepaid.

KM maintains a fully trained staff of field service personnel who are capable of providing you with complete product assistance. Our field service staff is based in Bothell, Washington USA (corporate headquarters).

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### Phone Consultation

Our Customer Service staff provides the following services by telephone, via our regular and toll free number (toll free in U.S.A. and Canada only):

- Technical, application, and troubleshooting assistance
  - Spare parts assistance
  - Warranty (replacement) assistance
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### On-Site Consultation

KM's Field Service staff can provide additional services at your request. Contact KM for rate and scheduling information for the following services:

- Technical, application, startup, and troubleshooting assistance on-site
- Training on-site or at our corporate office
- Service calls
- Equipment updates to our latest configuration

General descriptions of some of these standard services follow. Of course, if your service needs vary from those described, we are available to discuss them with you.

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### Installation, Startup Assistance, and On-Site Training

The system will be powered up and checked for proper electrical operation. Recommendations for the optimal performance of the system will be provided.

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### Troubleshooting

KM will troubleshoot systems for mechanical, electrical, calibration, and wiring errors. Normal component repairs will be made and wiring errors will be corrected, including replacement of non-repairable printed circuit boards.

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### Service Calls

KM will perform on-site repair/replacement services.

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### Return Material Authorization

If a part needs to be sent to the factory for repair, contact KM's corporate office and request a Return Material Authorization (RMA) number. The RMA number identifies the part and the owner and must be included with the part when it is shipped to the factory.

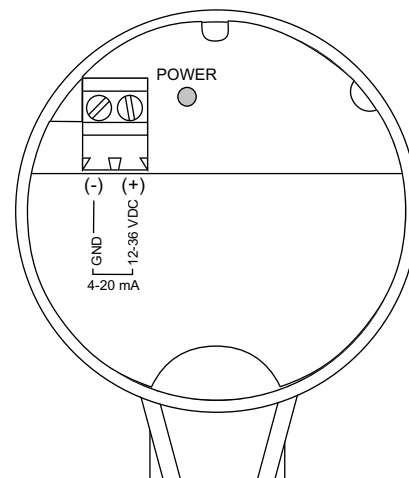
# Chapter 1: Pre-Installation of the Tote & Drum U.L.T.

*This chapter describes the pre-installation wiring for the Tote & Drum ULT.*

## Wiring to the Terminal

The Tote & Drum ULT arrives from the factory pre-calibrated and pre-assembled. Use the following instructions for wiring to the Tote & Drum ULT.

1. Remove the cap of the transmitter.

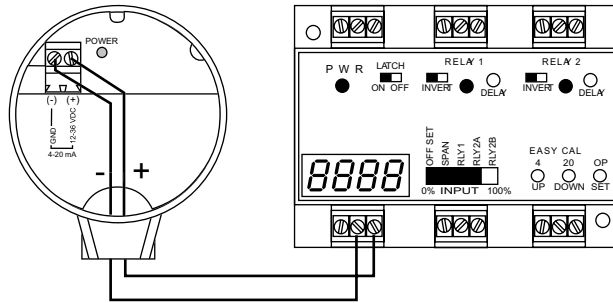


2. Look for the terminal block with two terminals.
3. Remove the terminal block to wire the Tote & Drum ULT. The Terminal on the right is positive, and the terminal on the left is negative.
4. When finished attaching the wires, assemble the Tote & Drum ULT using steps 1- 3 in reverse.

## Wiring to other devices

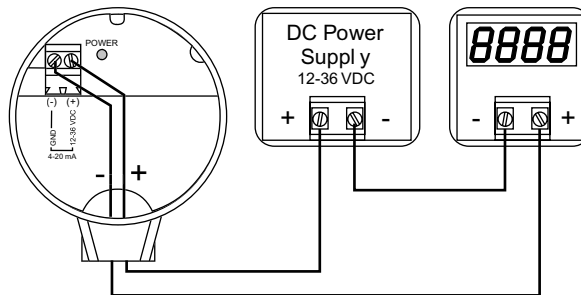
### 1. Wiring to a hydra-wave Continuous Relay Controller:

Connect the (+) terminal to the positive 24 VDC, 25 mA terminal on the Controller. Connect the (-) terminal to the GND terminal on the Controller (See below). Check the Controller Instruction Manual to set for loop powered operation.



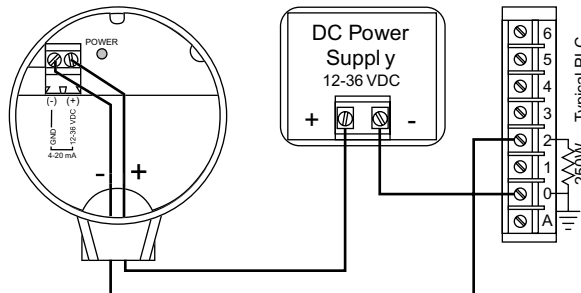
### 2. Wiring to a Two-Wire Loop Powered Indicator:

The Tote & Drum ULT requires 12-36 VDC power and an indicator which receives a 4-20mA current input. Connect the (+) terminal of the Tote & Drum ULT to the positive VDC terminal on the power supply. Connect the (-) terminal on the Tote & Drum ULT to the (+) terminal on the loop indicator. Connect the (-) of the loop indicator to the (-) of the power supply (see illustration below).



### 3. Wiring to a Typical PLC:

The Tote & Drum ULT requires a PLC which provides a 12-36 VDC excitation and receives a 4-20mA current input. Connect the (+) terminal of the Tote & Drum ULT to the positive VDC power terminal. Connect the (-) terminal on the Tote & Drum ULT to the (+) channel of the PLC. Connect the (-) of the PLC to the (-) of the power terminal (see illustration below).



# Chapter 2: Installation of the Tote & Drum U.L.T.

*This chapter describes the installation procedures including mounting.*

**Mounting:**

The Tote & Drum U.L.T. may be installed through the top wall of a tank. Installation requires a 3/4" NPT fitting or blind flange.

1. Install the appropriate 3/4" fitting in the top wall of the tank. Prior to installation, make sure that the fitting has been installed properly and checked for leaks. Use a proper sealant at the time of installation to ensure a liquid-tight seal. Secondly, make sure that the fitting's threads are not damaged or worn.
2. Insert the transmitter into the fitting and tighten to hand tight.
3. Always check for leaks prior to system start-up. To ensure proper installation, a complete leak test and simulation of actual process conditions should be performed.

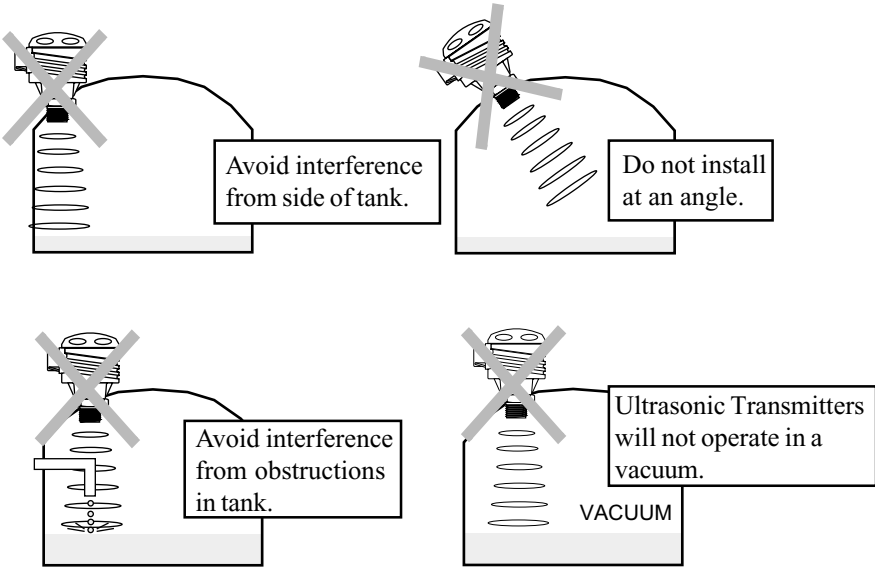
**Warning**

Do not install the Tote & Drum ULT in pressurized applications above 30 psi.

Always install the 3/4" Viton gasket with all versions of the hydra-wave Tote & Drum. The G threaded version of the Tote & Drum ULT will not seal unless the gasket is installed properly and checked for leaks.

Use a proper sealant at the time of installation to ensure a liquid-tight seal. Secondly, make sure that the fitting's threads are not damaged or worn.

**Positioning:**



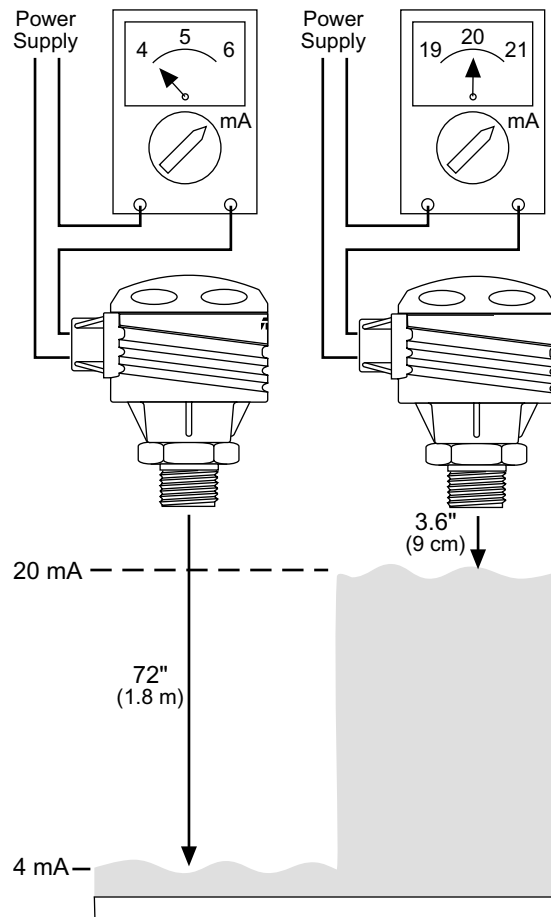
# Chapter 3: Calibration of the Tote & Drum U.L.T.

*This chapter describes the procedure for calibrating the Tote & Drum ULT. Verify that the current output, and distance between the ULT and the liquid, are inversely related.*

## Calibration Procedures

The Tote & Drum ULT is factory calibrated with a fixed measurement span of 72 inches. The 4 mA position is located 72 inches from the transducer face of the transmitter. The 20 mA position is located 3.6 inches from the transducer face. Refer to the current to distance and distance to current conversion charts on page 3-3 for reading the current output.

1. Connect a multimeter in series to read the current output.
2. Verify that as the distance from the liquid to the Tote & Drum ULT increases, the current signal decreases.
3. Verify that as the distance from the liquid to the Tote & Drum ULT decreases, the current signal increases.

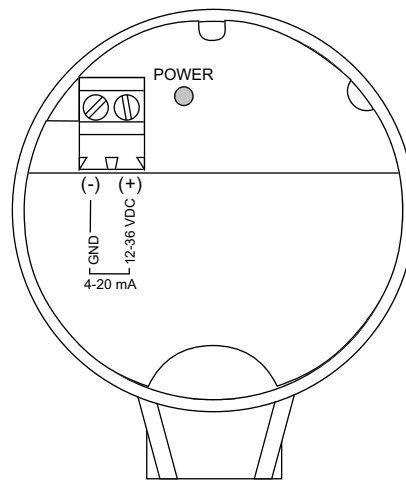


### LED Indication

The Tote & Drum ULT features a single LED indicator which is used for power and fail-safe indication. During normal operation, the LED will be ON continuously to indicate that the transmitter has power and a strong echo signal return strength.

Should the LED begin to FLASH, it indicates that the transmitter has no signal return strength and the device has gone into a fail-safe condition. During the fail-safe condition, the current will increase up to 22 mA and hold until the acoustic signal is re-acquired.

Once re-acquired, the LED will turn back ON continuously and the current will indicate the appropriate measured value.

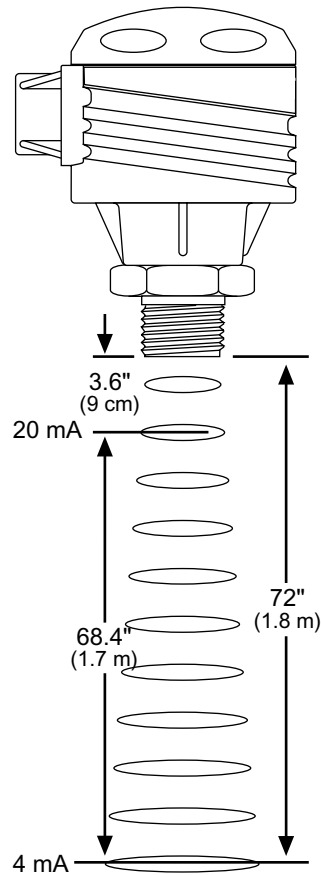


### Current to Distance Conversion Chart (Nominal)

Current mA	Distance inches	Current mA	Distance inches	Current mA	Distance inches
20	03.6	14	29.2	08	54.9
19	07.9	13	33.5	07	59.2
18	12.1	12	37.8	06	63.5
17	16.4	11	42.1	05	67.7
16	20.7	10	46.3	04	72.0
15	25.0	09	50.6		

### Distance to Current Conversion Chart (Nominal)

Distance inches	Current mA	Distance inches	Current mA	Distance inches	Current mA
3.6	20.0	30	13.8	60	06.8
06	19.4	36	12.4	66	05.4
12	18.0	42	11.0	72	04.0
18	16.6	48	09.6		
24	15.2	54	08.2		



# Appendix A: Product Specifications

**Accuracy:**

Range: 3.6 to 6 feet (9 cm to 1.8 m)  
 Accuracy: ± 0.25% of span (air)  
 Resolution: 0.125" (3 mm)

**Rate:**

Frequency: 83 kHz  
 Pulse rate: 2 pulses per second

**Beam:**

Beam width: 8° conical  
 Dead band: 3.6" (9 cm)

**Electrical:**

Supply voltage: 12-36 VDC  
 Max Loop Resistance: 600 ohms @ 36 VDC  
 Signal output: 4-20 mA, 12-36 VDC  
**Fail-safe diagnostics:** Reverts to 22 mA, LED Flashing

**Temperature:**

Temperature rating: F: -40° to 140°  
 C: -40° to 60°  
 Temp. compensation: Automatic over entire range

**Pressure:**

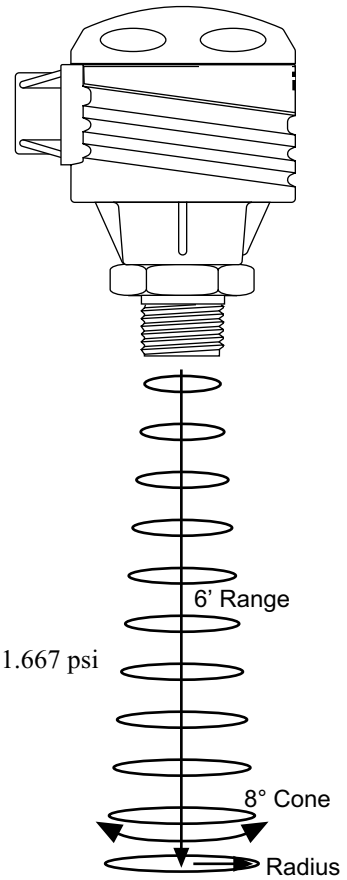
Pressure rating: 30 psi (2 bar) @ 25 °C (77°F), derated @ 1.667 psi (.113 bar) per degree above 25 °C (77°F).

**Physical:**

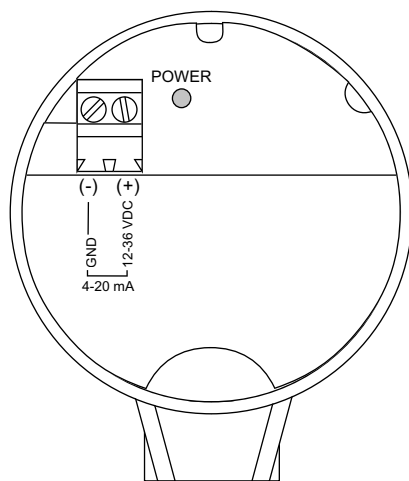
Enclosure rating: NEMA 4X (IP65)  
 Enclosure material: Polypropylene, U.L. 94VO  
 Transducer material: Polyvinylidene Fluoride  
 Mounting threads: 3/4" NPT (3/4" G)  
 Mounting gasket: Viton (3/4"G) metric only  
 Conduit connection: 1/2" NPT

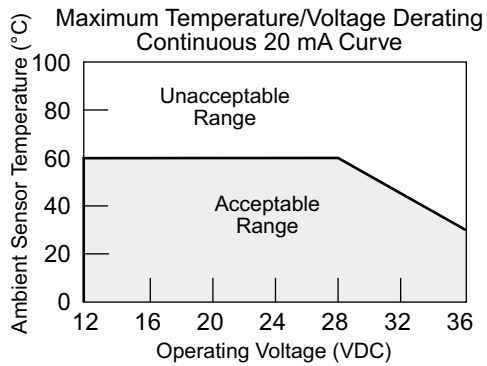
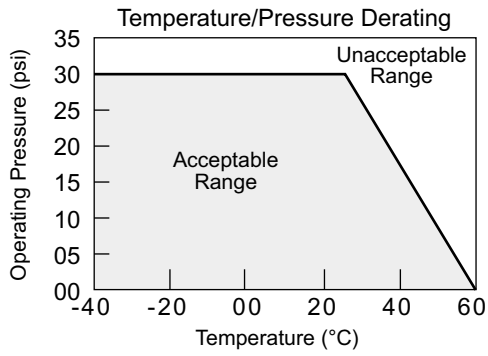
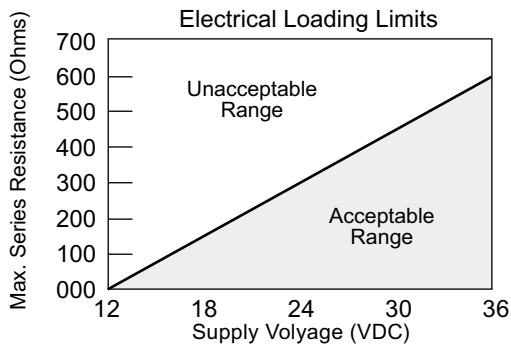
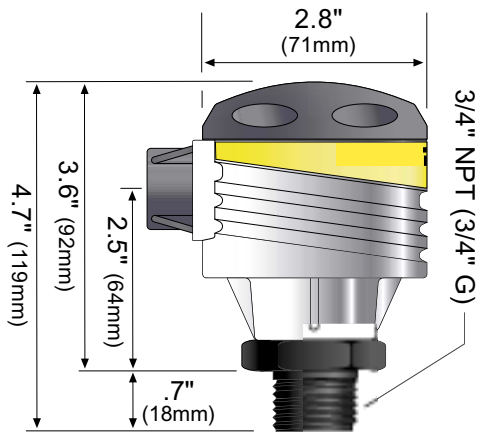
**CE compliance:**

EN 50082-2 immunity  
 EN 55011 emission



Range Feet	Radius Inches	Radius cm
1	1.2	3.1
2	2.1	5.2
3	2.9	7.3
4	3.7	9.5
5	4.9	11.6
6	5.4	13.7





# Appendix B: Maintenance

*This section includes maintenance notes for the Tote & Drum ULT.*

## General:

The Tote & Drum ULT itself requires no periodic maintenance except cleaning as required. It is the responsibility of the user to determine the appropriate maintenance schedule, based on the specific characteristics of the application liquids.

## Cleaning Procedure:

 **Warning!**

*Unit may be controlling other equipment. Make sure it is safe to disconnect power.*

1. Power: Make sure that all power to the ULT, controller and/or power supply is completely disconnected.
2. ULT Removal: In all through-wall installations, make sure that the tank is drained well below the ULT prior to removal. Carefully remove the ULT from the installation.
3. Cleaning the ULT: Using a soft bristle brush and mild detergent, carefully wash the ULT. Do not use harsh abrasives such as steel wool or sandpaper, which might damage the surface sensor. Do not use incompatible solvents which may damage the Polypropylene or PVDF body.
4. ULT installation: Follow the appropriate steps of installation as outlined in the installation section of this manual.