Installation and Operating Instructions

Model 375 Series
Submersible Level Transmitter
AMETEK Drexelbrook makes no warranty of any kind with regard to the material contained in this manual, including, but not limited to, implied warranties or fitness for a particular purpose. Drexelbrook shall not be liable for errors contained herein or for incidental or consequential damages in connection with the performance or use of material.

Copyright © AMETEK Drexelbrook
Model 375 Series
Submersible Level Transmitter

205 Keith Valley Road, Horsham, PA 19044
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: drexelbrook.info@ametek.com
Website: www.drexelbrook.com
Contents

Section 1: Introduction .................................................................................................................... 1
  1.1 System Description ........................................................................................................... 1
  1.2 Model Number ................................................................................................................... 2

Section 2: Installation .................................................................................................................. 3
  2.1 Safety Information .......................................................................................................... 3
  2.2 Unpacking & Inspection ................................................................................................. 3
  2.3 Operational Checkout ..................................................................................................... 3
  2.3 Operational Checkout (continued) .................................................................................... 4
  2.4 Mounting ......................................................................................................................... 4
  2.5 Wiring ................................................................................................................................ 6
  2.6 Cable Termination .......................................................................................................... 8

Section 3: Accessories ................................................................................................................ 10
  3.1 Parts & Accessories ....................................................................................................... 10
  3.2 Ordering Parts & Accessories ....................................................................................... 10

Section 4: Troubleshooting ....................................................................................................... 11
  4.1 Problem/Cause/Checks .................................................................................................. 11
  4.2 Factory Assistance ......................................................................................................... 11
  4.3 Field Service ................................................................................................................. 12
  4.4 Equipment Return ......................................................................................................... 13

Section 5: Specifications ............................................................................................................. 14
  5.1 Model 375 Series Transmitter ....................................................................................... 14
Section 1: Introduction

1.1 System Description

The Model 375 is specifically designed for slurry and highly viscous applications where clogging of the sensor area is common. The Model 375 uses a 3.5” flush diaphragm to prevent unwanted clogging of the sensing area. This submersible level device is made of 316 SS which offers outstanding environmental protection and is available in depths up to 138 feet of water.

The non-fouling flush diaphragm is designed to eliminate unwanted buildup of debris, fats, oils, greases, and other bio-solids by removing any potential gaps on the measurement area. The high integrity seal’s heavy construction eliminates the effects of turbulence on the sensor.

The 375 Series Transmitters indicate the level of liquid by continuously measuring hydrostatic pressure via its sensing element, an ion implanted silicon semiconductor chip with integral Wheatstone Bridge circuit. Once the sensor measures the pressure, the data is transmitted by a 4 to 20 mA output signal. This design provides for excellent reliability in remote and inaccessible locations.

The Model 375 is approved for intrinsically safe operation in hazardous locations as designated by Class I, Div 1, Groups A, B, C & D and Class II, Groups E, F & G. when used with an approved barrier.

All Model 375 transmitters are equipped with a sealed cable termination area and moisture absorbing desiccant. The purpose is to restrict moisture from entering the transmitter through the cable vent.

Features
- Oversized 3.5” flush diaphragm to prevent clogging
- 0.25% Full Scale Accuracy
- Intrinsically Safe for Class 1 Division 1 Applications
- Custom Pressure Ranges and Cable Lengths
- Extremely rugged 316L SS construction
- Two-wire, 4-20 mA standard output
- Reverse polarity and surge protection

Applications
- Lift Stations
- Sewage Levels
- Slurries
- Storm Runoffs
- Pump Control
# Model 375 Series Submersible Level Transmitter

## 1.2 Model Number

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>375</td>
<td>Submersible Level Transmitter</td>
</tr>
<tr>
<td>375</td>
<td>Submersible pressure transducer</td>
</tr>
</tbody>
</table>

### Sensing Port
- **S**: Delrin snubnose
- **N**: No snubnose, 1/4 - 18 NPT Male

### Input/Output
- **B**: 11 to 30 VDC / 4 to 20 mA

### Pressure range
- **XXXX**: Pressure range in psi
- **BXXX**: Pressure range in bar

### Electrical Connection
- **N**: 22 AWG Polyurethane vented cable (K515072)/nut
- **R**: 22 AWG Polyurethane vented cable (K515072)/nut/cable support bracket
- **C**: 22 AWG Polyurethane vented cable (K515072)/conduit adapter
  - Consult Factory for Other Cable Options

### Diaphragm Material
- **L**: 316L stainless steel

### Fill Fluid
- **S**: Silicon oil

### Cable Seal
- **V**: VITON®
- **N**: Neoprene

### Cable Length
- Must be specified in feet

---

**Model Number Format:**

```
375 X X XXXX X L S X (XXX)
```
Section 2: Installation

To install the Model 375 Transmitter, connect the surface end of the cable to the Ametek Model CDM Meter Controller or other power source and indicator. Suspend the transmitter into a well or tank supported only by its attached shielded electronic cable. Insure that the opening in the well or tank cover is large enough for possible future removal of the transmitter.

2.1 Safety Information

The overall system is designed to prevent accidental shock to the operator when properly used. No design, however, can insure the safety of an instrument improperly installed or used negligently. Read this manual carefully and completely before operating the instrument. Failure to read this manual in its entirety could result in damage to the instrument or injury to the operator.

To avoid possible shock hazard install in a grounded enclosure, prevent live parts being touched and ground the sensor sheath and housing. Follow wiring diagrams and local regulations. Installations where failure of this equipment may cause personal injury, property loss, equipment damage or financial loss, backup failsafe protection must be used.

2.2 Unpacking & Inspection

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.

When this transmitter is used with the AMETEK Drexelbrook CDM Controller, the transmitter Model Number is identified on the nameplate of the CDM in the section labeled “USED WITH.” This is because the CDM is calibrated with, and should be used only with a specific Submersible Transmitter. Look for a correlation between the two instruments.

2.3 Operational Checkout

Before installing the 375 Series Transmitter, make sure the system is operating by doing a bench check.

**WARNING:**

Do not connect any wires while Power is applied.

For temporary connections, refer to diagrams in Wiring Section 2.5 of this manual. Connect AC power to the controller and/or with which it is to be used. Apply power and allow a five-minute warm-up.

With no pressure applied to the transmitter, the meter should display zero (or for “drawdown” the reading corresponding to the depth below ground level that the transmitter will be when installed.)
2.3 Operational Checkout (continued)

**CAUTION:** Do not simulate an increase in pressure by applying mechanical force to the sensing diaphragm of the transmitter. Excessive force will result in damage to or destruction of the transmitter.

When pressure is applied to the transmitter, the display should increase, and then return to the original reading when pressure is removed. The Transmitter can be pressurized by lowering it into water or by applying air pressure from a calibration device.

2.4 Mounting

2.4.1 Dimensions

![Figure 2-1](image)

**Figure 2-1**
Mounting Dimensions

2.4.2 Placement

**Caution:** The Model 375 Transmitter must be supported by a stainless steel relief cable that is attached to the tabs on the transmitter. The relief cable can be customer supplied. Figure 2-2 shows common installation recommendations. Ametek provides this relief cable as an option. Reference model number K554164 when ordering. Supporting the transmitter only by its attached electrical cable voids the warranty.

**Caution:** Do not allow transmitter to remain in liquid when it freezes solid. This will apply mechanical force to the sending diaphragm of the transmitter. Excessive force will result in transmitter damage or destruction.
2.4.3 Model 375 Series Transmitter

CAUTION: The cable grommet is specially installed by factory-trained personnel to assure that it remains watertight. Any adjustment or removal of the grommet may destroy the watertight feature thus exposing the transmitter to water seepage, causing an electrical short and transmitter failure. Any adjustment or removal of the cable grommet voids the warranty.

CAUTION: The diaphragm seal assembly is installed by factory trained personnel and should not be modified in the field. Any adjustment or removal of the diaphragm seal assembly voids the warranty.

CAUTION: The waterproof cable should not be kinked or nicked, which will allow water to seep into the cable and short out the transmitter.

2.4.4 Provide Signal Noise Isolation

The transmitter should not be mounted close to high current switching relays or in an enclosure containing such relays. Low voltage wiring (transmitter signal wires and analog output wires) should be separated from high voltage wiring (115, 230 & 440 Vac) and should be shielded.
2.5  Wiring

**WARNING:**
Do not connect any wires while AC Power input is applied.

<table>
<thead>
<tr>
<th>Color Polyurethane</th>
<th>Current (4-20mA) Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>+Vin</td>
</tr>
<tr>
<td>Black</td>
<td>-Vin</td>
</tr>
<tr>
<td>Green</td>
<td>Case Ground</td>
</tr>
</tbody>
</table>

![Transmitter Wiring Identification](image)

**2.5.1 Surge Protection**

Surge protectors are available as an option item (see Parts & Accessories in Section 3 of this manual). It is strongly recommended to protect from secondary surges and lightning on outdoor installations. Install in accordance with the applicable drawing that is supplied with the surge protector and the following instructions:

1. Lightning protection devices should be placed as close to the meter or transmitter as possible and wired in accordance with Local Electrical Codes in an approved watertight enclosure.

2. If the distance between the meter and transmitter, or meter and recorder is less than 100 ft., only one protector per line is needed.

3. Use No. 8 AWG ground wire or better from protector.

4. Keep ground wire less than one foot long and tie to a suitable ground rod or metal frame ground. Surge capability is only as good as the grounding method. **All ground connections must be installed.**

5. Install protectors in weather-tight enclosures.

6. Run signal lines shielded and away from power lines.

7. Mount the fused switch panel as close to the meter as possible. Wire according to the Local Electrical Code.

8. Lead lines for 110 Vac and 220 Vdc protectors should be cut as short as practical.
2.5.1 Surge Protection (Continued)

CAUTION: This or any installation can not protect against a direct lightning strike, or secondary strikes of sufficient magnitude. AMETEK Drexelbrook cannot accept liability for damage due to lightning or secondary surges.

2.5.2 Lightning Protection Wiring

Here is a typical wiring arrangement to a typical controller/ meter. Shown here are connectors to the AMETEK Drexelbrook CDM Controller.
Model 375 Series Submersible Level Transmitter

2.5.3 Lightning Protection Installation Concept

1. Lightning protection devices should be placed as close to the instrument as possible.

2. If the distance between the meter and transmitter, or the meter and recorder is less than 100 ft., only 1 protector per line may be used.

3. This or any installation cannot protect against a direct lightning strike, or secondary strikes of sufficient magnitude. AMETEK Drexelbrook cannot accept responsibility for damage due to lightning or secondary surges.

4. Proper installation including grounding require detailed installation drawing. Consult factory.

Figure 2-6
Lightning Protection Concept

2.6 Cable Termination

Instructions to installing the Ametek Submersible Transmitter using the supplied desiccant canister:

Remove Power Source During Installation.

This Ametek submersible transmitter is equipped with a sealed termination area and moisture absorbing desiccant canister. The purpose is to restrict moisture from entering the transmitter from the cable termination. It is important that the cable termination not be altered. Both potting and
2.6 Cable Termination (Continued)

solder blockers are used to restrict the moisture path. If a shorter length of cable is required, it is highly recommended that the cable be coiled instead of being cut.

The assembly is shipped complete to prevent moisture from entering during shipment and storage and to show the user how it will ultimately be connected.

To install the cable termination, it is recommended that a NEMA box (such as the AMETEK CDM Meter) be employed. The submersible cable enters the box through a included strain relief (cable is a 0.24” diameter). The red wire is the V+ lead and the black is the V- lead in a 4/20 mA loop. The green wire is a safety ground and should be tied to earth ground. The shield wire connection to earth ground is optional depending on EMI conditions in the area. The shield wire is terminated to the case internally.

The tubing should be connected to the desiccant though the use of the included fittings. There is one fitting at the cable end and another at the canister inlet. The tubing is removable from the fittings for ease of connection and replacement of the canister. Remove the yellow plug from the canister outlet prior to use.

The desiccant has a blue color when installed. Entering moisture becomes trapped within the desiccant. If moisture is absorbed inside in sufficient amounts, the color changed to pink. At that point the desiccant should be replaced. Use Ametek part #SJB-002. The fitting at the desiccant inlet can be removed using a small wrench and reused with the replacement part.
Section 3: Accessories

3.1 Parts & Accessories

K554164
Stainless Steel Support Cable

LMA912
30Vdc Lightning and surge protector for excitation and signal lines to the milliampere transmitter or meter analog output lines to other instruments

LMA918
Lightning & surge protector for 115Vac input line to a controller /meter

LMA919
Lightning & surge protector for 230Vac input line to a controller/meter

SJB-002
Moisture Absorbing Desiccant

CDM Meter
Controller and Housing

3.2 Ordering Parts & Accessories

When ordering replacement parts, supply the following information:
1. Part description and part number.
2. Quantity of each item required.
3. Shipping instructions and address.

Contact:

Contact your local AMETEK Drexelbrook representative, or Mail, Telephone or Fax Orders to:
AMETEK Drexelbrook
205 Keith Valley Road
Horsham, PA 19044-1499
215-674-1234; FAX: (215) 674-2731
Section 4: Troubleshooting

**WARNING:**
If the Level Measurement System 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 the electrical codes for the specific location and hazard level.

4.1 Problem/Cause/Checks

**Controller/meter Display Drifting:**
May be water in cable causing short circuit; look for kink or damaged cable; check for broken wires, loose or corroded connections, or obvious short circuits;

With transmitter wires disconnected, resistance between red or black lead and shield should not exceed 15 megohms.

**Controller/meter Display Incorrect:**
May be wrong transmitter connections; check wiring.
May be defective transmitter; check as above, replace transmitter.
May also be controller/meter problems, such as calibration.

4.2 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
4.2 Factory Assistance (Continued)

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

4.3 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.

1-800-527-6297 (US and Canada) or
+ 215-674-1234 (International)
4.4 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

5.1 Model 375 Series Transmitter

Pressure Range:
- 0-6 psi to 0-300 psi

Accuracy at 25°C Including Linearity (BFSL), Hysteresis, Repeatability:
- ±1% FS MAX

1 Yr. Stability:
- < 0.25% FS

Load Limitation:
- 600 OHM MAX (4-20MA)

Operating Temperature *:
- Pressure Ranges up to 150 PSI
  - -25 to 60°C (-13 to 140°F)
  - Pressure Ranges Above 150 PSI
  - -25 to 25°C (-13 to 77°F)

Compensated Temperature:
- Pressure Ranges up to 150 PSI
  - 0 to 50°C (32 to 122°F)
- Pressure Ranges Above 150 PSI
  - 0 to 25°C (32 TO 77°F)

Zero Offset: ±1% FS

Temperature Effects within Compensated Range:
- 6 PSI: ±2% FS
- All Other Ranges: ±1.25% FS

Burst Pressure:
- 3X FS or 450 PSI whichever is less

Vibration: 10G, 55 – 2000 HZ

Shock: 30G

Wetted Materials:
- 316L Stainless Steel, Polyurethane Cable,
- Viton / Neoprene Seal, Delrin

Process Connection:
- ¼ -18 NPT Male with Delrin Snubnose

Electrical Connection:
- #22AWG Cable, Options N, R, C
  - Include Desiccant Canister.

Pressure Code:
- 0006  0-6PSI (0-0.4BAR), 13.8 ft Water (4.2 m)
- 0015  0-15PSI (0-1BAR), 34.6 ft Water (10.5 m)
- 0030  0-30PSI (0-2BAR), 69.2 ft Water (21.1 m)
- 0060  0-60PSI (0-4BAR), 138.4 ft Water (42.2 m)
- 0100  0-100PSI (0-7BAR), 230.7 ft Water (70.3 m)
- 0150  0-150PSI (0-10BAR), 346.1 ft Water (105.5 m)
- 0300  0-300PSI (0-21BAR), 692 ft Water (211m)

Other Ranges Are Available. Consult Factory.

* Do Not Subject Unit To Freezing Water, Or Damage May Result.

For Unspecified Pressure Ranges, Errors Are Based On Turndown Of The Next Higher Range.

Affected Specifications Include 1 Yr Stability & Total Error Band. Example: 9 PSI Range is (15 PSI Sensor ÷ 9 PSI Range) X 1% = 1.67% Total Error Band
G. 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, insurance, duties, fees, taxes, storage, and handling costs, including all applicable duties and taxes, insurance, storage, transaction, 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.

D. Remedies: Seller reserves the right to make delivery in instalments which shall be separately invoiced and paid for when due, without regard to subsequent deliveries. Delay in delivery of any instalment shall not release 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 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: Seller provides no other warranties 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 representations or warranties, 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 shall promptly notify, 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; (2) The repair or replacement shall 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 defect 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. Reuseable/Non-Reusable: The buyer shall be responsible for return of warranty goods which Seller has repaired or reconditioned. Seller warrants for a period of sixty (60) days from date of invoice only new components replaced by most recent revision. Seller reserves the right to refuse repair of any item for which a repair charge is not paid within sixty (60) days of receipt of goods.

P. 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 costs of shipping, insurance, taxes, or related expenses associated with returned goods. In the event that credit for returned goods is granted, it shall be at the lesser of the then current purchase price or the original purchase price. Claims for shortage or incorrect material shall 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 AN IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE ARE EXCLUDED.