# INSTRUCTION MANUAL
(MAN-70254)

# CLEVELAND-KIDDER ®
## ULTRA SERIES UNDER PILLOW BLOCK TRANSDUCER

## MODELS: UPB1 & UPB2

Cleveland Motion Controls
An IMC Company

REVISION
AA

Industrial Products Division

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## *REVISION HISTORY*

| Rev | ECO | Author | Date | Description of Change |
|---|---|---|---|---|
| AA | XXX | RDL | 01/31/2005 | As Released |

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## WARRANTY

Cleveland Motion Controls warrants the goods against defects in design, materials and workmanship for the period of 12 months from the date of delivery on the terms detailed in the Cleveland Motion Controls, Inc. Terms and Conditions of Sale, document number AO-90131

Cleveland Motion Controls, Inc. reserves the right to change the content and product specification without notice.


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## INTENDED USERS

This Instruction Manual is to be made available to all persons who are required to configure, install or service the equipment described in this manual or any other related activity.

## ADDITIONAL INFORMATION

**ATTENTION**: The following information is provided merely as a guide for proper installation. Cleveland Motion Controls cannot assume responsibility for the compliance (or failure to comply) to any code (national, local or other) that prescribes the proper installation of this electro-mechanical device or associated equipment. A hazard of personal injury and/or property damage can exist if applicable codes are not adhered to.

## CE EMC RESPONSIBILITY

The Cleveland-Kidder Ultra Transducer may be used by a manufacturer as a component of a larger system, along with other components, which may or may not bear the CE mark. The system assembler is responsible for the compliance of the system as a whole with the EMC Directive.

Before installing the Transducer you must clearly understand who is legally responsible for conformance with the EMC Directive. Misappropriation of the CE mark is a criminal offense.

# 1 IMPORTANT INFORMATION

## 1.1 ORDER NUMBERS

Use the following example and Tables A to determine order numbers for:

- Ultra Series Under Pillow Block Transducers
- With or without mounting Plate

**Figure 1 – Example for Determining Transducer Order Numbers**

| If you needed to Purchase a Transducer corresponding to following description: | Then, you would use Catalog Numbers: |
|---|---|
| • Size 1 Under Pillow Block Transducer.<br>• With Blank mounting plate.<br>• Maximum Working Force (MWF) of 100 lbs. | Ultra Series Transducer = M846-13523-100 (Refer to Table A) |

Having the following information at hand will help you to easily determine which of the Ultra Series Under Pillow Block Transducers is right for your application:

- The size of the pillow block bearing used
- Pillow block mounting plate requirements
- Maximum working force

Use Table A to determine the catalog number for the proper Under Pillow Block Transducer.

**Table A – Determining a Catalog Number for the Ultra Under Pillow Block Transducer with Stainless Steel mounting plate.**

| Size | Base Part Number | Order Code Suffix, M.W.F. | | | | | |
|---|---|---|---|---|---|---|---|
| | | -000 | -100 | -200 | -300 | -400 | -500 |
| UPB1 | M846-13523 | 25 lb. | 50 lb. | 100 lb. | 250 lb. | 500 lb. | 1000 lb. |
| UPB2 | M846-13510 | 1000 lb. | 2500 lb. | 5000 lb. | 10000 lb. | 20000 lb. | |

For units without the blank Stainless Steel mounting plate, change the last digit of the ending suffix from a zero “0” to a “1”. Example: use M846-13523-001 instead of M846-13523-000

## 1.2 CONTACT INFORMATION AND SERVICE ASSISTANCE

For service assistance, have the following information available:

- Type of Transducer you are using
- Maximum working force
- Purchase order number

You can contact Cleveland Motion Controls at:

**Phone:** 216.524.8800
**Fax:** 216.642.5155

For the latest product information, technical literature etc., visit our website at www.cmccontrols.com

*Disassembly by improperly trained personnel may result in additional damage to these units. Should repairs be required or for warranty repairs, contact the Customer Service Department for a return authorization number before returning the units.*

## 1.3 RECEIVING AND UNPACKING

After receiving the Ultra Under Pillow Block Transducer you should:

- Carefully, unpack and inspect the equipment
- Compare the received shipment with the packing list
- Report any damage to the carrier and your CMC representative
- Store equipment that will not be used in a clean, dry location
- Take appropriate precautions to prevent moisture, dust and dirt from accumulating in storage and installation areas

## 1.4 PRE-INSTALLATION PRECAUTIONS

### 1.4.1 SHIPPING

Shock and the vibration transmitted to the transducers by the sensing roll during transportation can damage the transducers. It is essential that you remove the sensing roll when the machine is shipped with the transducers mounted.

### 1.4.2 ROLL BALANCE

The sensing roll should be adequately balanced. Understand that the balance of the sensing roll will be more demanding than that typically needed in general rotating machinery. The goal goes beyond just limiting the force to which bearings will be subjected, but rather to minimize the generation of an unintended noise component in the transducer tension signal. The centrifugal force caused by imbalance can be estimated using the following formula:

$$F = (1.77 \times 10^{-6}) \times W \times R \times (RPM)^2$$

Where:

*F = centrifugal force (in units of lb-f)*
*W = weight imbalance (in units of ounces)*
*R = radius of displacement, distance of imbalance weight from roll axis of rotation (in inches)*
*RPM = Revolution per minute*

The force increase is equal to the square of the RPM, or in other words, doubling the RPM causes four times the imbalance force. Because rolls tend to have a high length-to-diameter ratio, two-plane (dynamic) balancing is recommended. Balancing is particularly needed where higher RPMs and lower web forces are involved.

To illustrate how much imbalance induced "noise" could be generated, the following table shows the force disturbance for various ISO balance grades for an illustrative case of a 20 pound roll (4" diameter x 36" long, aluminum ) rotating at 1500 RPM.

| Balance Grade (ISO 1940/1) | Residual Imbalance | Resultant Force due to Residual Imbalance |
|---|---|---|
| G16 | 1.25 oz-in | +/- 5 lb-f at 25 Hz |
| G6.3 | 0.5 oz-in | +/- 2 lb-f at 25 Hz |
| G2.5 | 0.2 oz-in | +/- 0.8 lb-f at 25 Hz |
| G1 | 0.08 oz-in | +/- 0.3 lb-f at 25 Hz |

### 1.4.3 CRITICAL ROLL SPEED

Even with a balanced roll, a vibration can be set up in a stationary shaft. If this vibration (in cycles per minute) occurs at the harmonic frequency of the shaft, the transducers can be damaged. To determine critical roll speed, use the following formula:

$$\text{Critical roll speed in RPM} = \frac{4.8 \times 106 \times \text{Shaft O.D.}}{(\text{Shaft Length})^2}$$

(Dimensions are in inches)

To assure that this issue is avoided, the critical roll speed should be at least 20% above the roll speed attained at maximum web speed.

### 1.4.4 AVOIDING DAMAGE TO THE ROLL

To avoid damaging the transducer, refrain from repetitive overloading above the maximum working force or severe overloading.

### 1.4.5 EXCITATION VOLTAGE

*Maximum Excitation Voltage for the Ultra Series Under Pillow Block transducers must be limited to 5.6 VDC or 5.6 VRMS.* ***Do not use*** *10 Volt excitation or possible damage to the semiconductor strain gage elements can occur. Before applying power to the amplifier, verify that the amplifier excitation voltage has been set to 5.0 VDC.*

# 2 SPECIFICATIONS

| Item: | Specification: |
|---|---|
| Transducer Weight | **UPB1** **UPB2**<br>1.5 lbs. 12 lb.<br>0.68 kg. 5.4 kg |
| Mounting Plate with screws | **UPB1** **UPB2**<br>2.2 lbs. 10 lb.<br>1 kg. 5 kg |
| Material | Strain Sensing beam – UPB1: 6061Aluminum<br>UPB2: 410 Stainless steel<br><br>Mounting Plate – 304 Stainless steel |
| Finish Material | UPB1 only: Anodized Aluminum |
| Mounting Surface Flatness | 0.002 inches from one side of transducer to the other. |
| Bridge Resistance | Steel Transducer: 135-147 Ohms @ 20 $^{o}$C<br>Aluminum Transducer: 122-134 Ohms @ 20 $^{o}$ |
| Gage Type | Semi-conductor strain gage, gage factor equals 95 (nominal) |
| Connector Type | M12 Quick-disconnect, 4 conductor, DC keyed |
| Excitation Voltage | 5.6 VDC or VAC (RMS) maximum<br>(Excess voltage can cause permanent damage) |
| Nominal Output Signal at Rated MWF | +/- 120 mV per Transducer (with 5.0 VDC or VAC rms excitation voltage) |
| Output Impedance | Steel Transducer: Approximately 64 Ohms per Bridge leg<br>Aluminum Transducer: Approximately 60 Ohms per Bridge leg |
| Ultimate Overload | 500% MWF (typ) for units rated 10,000 M.W.F or less<br>250% MWF (typ) for units rated at 20,000 M.W.F or more |
| Maximum Voltage, Gage to Beam or Base (Ground) | 50 Volts peak |
| Operating Temperature Range | 0$^{o}$ F to +200 $^{o}$ F |

## 2.1 FORCE RATINGS

Refer to Table A in this document for Transducer Maximum Working Force Ratings.

## 2.2 BEFORE INSTALLING THE TRANSDUCER

Before installing the Transducer, perform the following steps:

1. Review the Installation Precautions (Section 2.2.1 on page 9).
2. Review the Safety Considerations (Section 2.2.2 on page 9)
3. Review the Mounting Configurations (Section 2.2.3 on page 10)
4. Assemble the Mounting Hardware and review the Fastener and Torque information (Section 2.2.4 on page 11).
5. Reference the Mounting Dimensions (Section 2.2.5 on page 12).

### 2.2.1 INSTALLATION PRECAUTIONS

To ensure proper installation and operation of the system, keep the following points in mind:

- Exercise care to avoid overstressing the transducer when handling partially mounted rolls. Even relatively short rolls can afford an impressive mechanical advantage over the transducer.
- Bolting the transducer to a non-flat surface can cause deformation of the transducer body and degrade the quality of the tension signal.

*Failure to follow precautions can result in serious damage to the Ultra Series Transducer and possibly void the warranty!*

### 2.2.2 SAFETY CONSIDERATIONS

*Safety practices should not be an afterthought. Before installing, servicing or calibrating review and follow applicable policies and procedures to ensure worker safety. Machinery must be in a safe state and be aware of any additional hazards that can arise when installing and calibrating higher force transducers.*

The following points are also important to remember:

- Check that all hardware is mounted with appropriate fasteners (thread size and pitch, fastener grade, length of thread engagement).
- When “dead-weights” are used to produce calibration forces, always wear steel-toed shoes.
- When manually handling calibration weights and rolls, use safe lifting practices to avoid injury.
- Size cordage or straps with ample safety factors to reduce the chances of failure and falling weights.
- Consider where the cords and weights will travel to should a failure occur.

### 2.2.3 MOUNTING CONFIGURATIONS

Ultra Series Under Pillow Block Transducers are designed for use with shafts that are mounted in Pillow Block Bearings. See Figure 1. When choosing a mounting configuration, evaluate your options by taking the following points into consideration:

- Model type
- Safety
- Machine Frame orientation
- Ease of Assembly

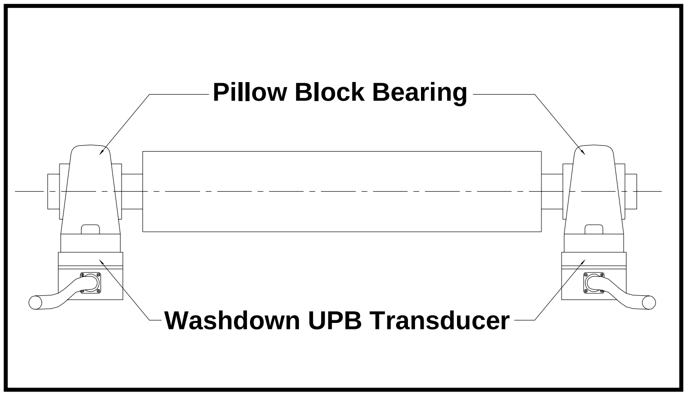


**Figure 1 –Mounting Configuration**

The tension-sensing roll *must not* be mounted where the web wrap angle can vary, or the transducer will not interpret the tension properly. If a variance in the wrap angle occurs, it is sensed by the transducer as a tension change and the change is indicated on the tension indicator. In cases where it is impossible to mount the transducer where the wrap angle does not vary, the change in indicated tension that results should be calculated and if small, can be disregarded.

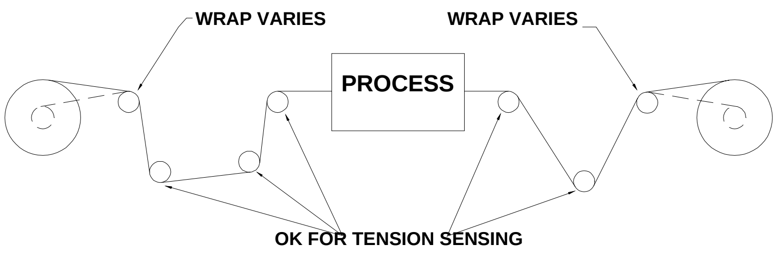


**Figure 2 - Example of Varying Wrap Angles**

### 2.2.4 MOUNTING HARDWARE AND FASTENER TORQUE RECOMMENDATIONS

The Table B provides you with guidelines to refer to when determining torque values for clean and dry fasteners. Keep in mind, however, that several variables can influence the "optimum" torque to be used in a given situation, and Table B should be used only as a general reference. If you are unsure of the proper torque values to use, consult the machine manufacturer for specific recommendations.

- Use quality alloy steel fasteners (SAE Grade 8, ISO property grade 10.9).
- If the fastener threads are lubricated, reduce the torque amount. Use a torque value that is 70 percent of that listed in Table B. For example, if you are using a lubricated 1/2-13NC base stud on a UPB2 transducer, reduce the torque amount of 45 ft-lb to 31 ft-lb.
- It is recommended that an assembly lubricant be used with Stainless Steel fasteners to prevent galling and the fastener from seizing in the threads.
- Transducers operated at lower forces may not require the higher clamping forces obtained at the cited torque values.

**Table B – Torque Value Guideline Tables**

| Transducer Models: | Fastener Type: | Fastener Thread (SAE): | Torque: |
|---|---|---|---|
| UPB1 | Base Bolt | 5/16-18 NC | 12 lb-ft |
| | Mounting Plate Bolt | 5/16-18 NC | 12 lb-ft |
| UPB2 | Base Bolt | 1/2-13 NC | 45 lb-ft |
| | Mounting Plate Bolt | 1/2-13 NC | 45 lb-ft |
| **Transducer Models:** | **Fastener Type:** | **Fastener Thread (Metric):** | **Torque:** |
| UPB1 | Base Bolt | M8-1.25 | 8 N-m |
| | Mounting Plate Bolt | M8-1.25 | 8 N-m |
| UPB2 | Base Bolt | M12-1.75 | 35 N-m |
| | Mounting Plate Bolt | M12-1.75 | 35 N-m |

Mechanisms used for industrial automation can tax even the best threaded fasteners. You can improve the likelihood that bolts and shafts remain secure by using suitable anaerobic "thread lockers" during the final assembly.

### 2.2.5 MOUNTING DIMENSIONS

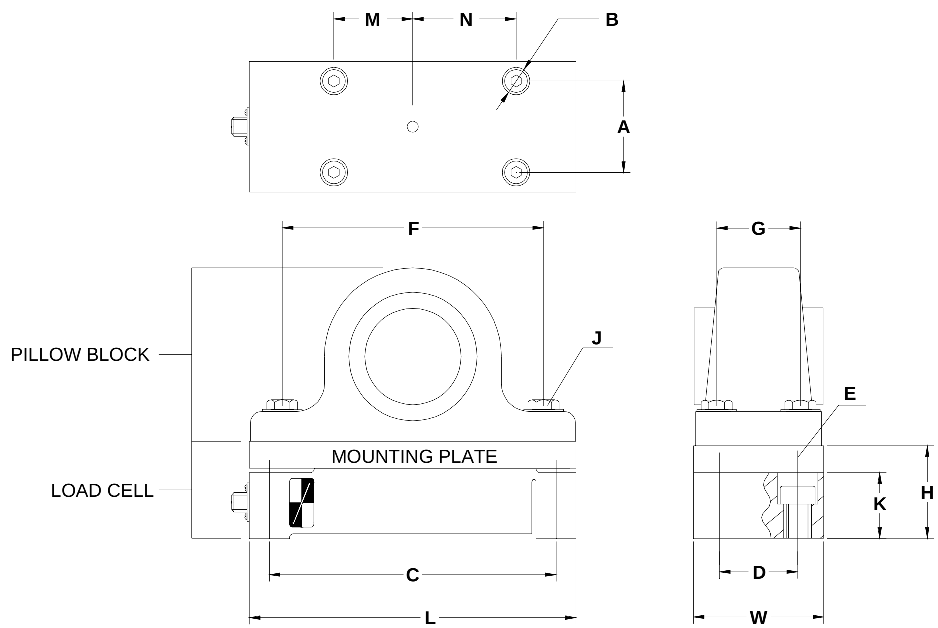


**Figure 3 – Mounting Dimensions**

**Mounting dimensions in Inches**:

| Designator: | UPB1 | UPB2 |
|---|---|---|
| A | 1.5 | 3 |
| B | 0.55 | 0.80 |
| C | 5.8 | 10.0 |
| D | 1.5 | 3.0 |
| E | 5/16 (4) | 1/2 (4) |
| F | 5.8 (Max.) | 10.0 (Max.) |
| G | 1.6 | 3.0 |
| H | 1.95 | 2.5 |
| I | - | - |
| J | 1/2 (Max.) (2) | 3/4 (Max.) (4) |
| K | 1.40 | 1.71 |
| L | 6.5 | 11.0 |
| M | 1.3 | 3.3 |
| N | 2.2 | 3.95 |
| O | - | - |
| P | - | - |
| Q | - | - |
| R | - | - |
| S | - | - |
| T | - | - |
| U | - | - |
| V | - | - |
| W | 2.2 | 4.0 |
| X | - | - |
| Y | - | - |
| Z | - | - |

**Mounting dimensions in Millimeters**:

| Designator: | UPB1 | UPB2 |
|---|---|---|
| A | 38 | 76 |
| B | 14 | 20 |
| C | 147.5 | 254 |
| D | 38 | 76 |
| E | M8 (4) | M12 (4) |
| F | 147 (Max.) | 254 (Max.) |
| G | 40.5 | 76 |
| H | 49.5 | 63.5 |
| I | - | - |
| J | M12 (Max.) (2) | M20 (Max.) (4) |
| K | 35.5 | 43.5 |
| L | 165 | 279.5 |
| M | 33 | 84 |
| N | 56 | 100 |
| O | - | - |
| P | - | - |
| Q | - | - |
| R | - | - |
| S | - | - |
| T | - | - |
| U | - | - |
| V | - | - |
| W | 56 | 101.5 |
| X | - | - |
| Y | - | - |
| Z | - | - |

# 3 INSTALLING THE UNDER PILLOW BLOCK TRANSDUCER

The following sections provide you with detailed information and steps to correctly install the Ultra Series Under Pillow Block Transducer.

## 3.1 ORIENTING THE UNDER PILLOW BLOCK TRANSDUCER

The Under Pillow Block transducer must be oriented so that the resultant tension force direction (bisector of the wrap angle) is in the same quadrant as the load direction arrow on the side of the UPB. See Figure 4.

Ensure that the mounting location takes the transducer orientation into consideration.

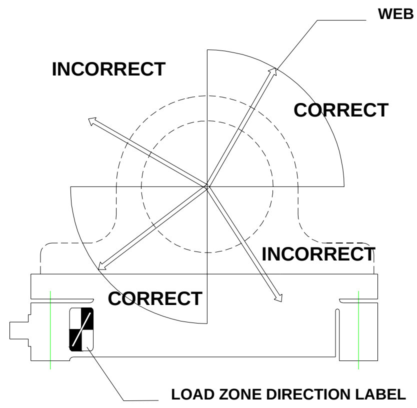


**Figure 4 –Transducer load direction Diagram.**

The orientation is very important to ensure that the Transducer works as it was intended to. Incorrect orientation will result in very little or no signal being produced from the transducer.

## 3.2 MOUNTING SURFACE PREPARATION

Remove any loose paint, rust or scale from the machine frame before mounting. The mounting surfaces for the transducer should be flat to within 0.002 inches from one end of the transducer to the other. This generally requires a machined surface upon which to mount the transducer.

## 3.3 MOUNTING THE TRANSDUCER TO THE MACHINE FRAME

Remove the pillow block mounting plate (it is held in place by four stainless steel corner bolts) in order to gain access to the four load cell mounting holes (Refer to Figure 5). For the mounting hole spacing pattern and proper bolt size refer to Figure 3 in section 2.2.5. Drill and tap the machine frame to match the load cell mounting holes. The UPB load cell is designed so that either imperial or metric mounting bolts can be used when mounting the load cell to the machine frame (Refer to section 2.2.5). Orient the UPB load cell properly to obtain a good tension measurement (See Figure 4 for details) and bolt the load cell in place. For proper fastener torque specifications Refer to Section 2.2.4

The mounting surface must be flat to within 0.002 inches from one end of transducer to the other or the transducer will produce an error signal due to the sensing beams flexing.

When tightening the mounting bolts use a criss-cross pattern and don't fully tighten all the bolts until each bolt has been lightly tightened down first.

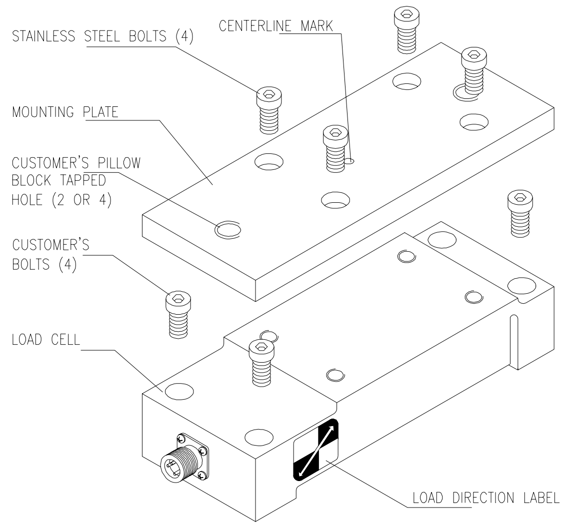


**Figure 5 – Mounting the Under Pillow Block Transducer**

### 3.4 MOUNTING THE PILLOW BLOCK BEARING TO THE LOAD CELL

Note: The UPB is normally shipped with a pillow block mounting plate but is occasionally ordered without one if the customer chooses to make their own.

Mounting the pillow block bearing to the UPB is simple and convenient. The mounting plate is held in place by four stainless steel corner bolts. If the mounting plate has not already been removed from the transducer then remove the mounting plate, then drill and tap it to match the pillow block mounting dimensions. A centerline mark is provided on the mounting plate. The plate is to be drilled and tapped by utilizing this centerline mark to insure that the pillow block bearing is centered on the plate. Remount the plate and bolt the pillow block bearing to it. The mounting plate is 304 Stainless Steel, which is amenable to drilling but offers corrosive and chemical resistance. Refer to "J" in the table in section 2.2.5 above for the maximum bolt diameter recommended for bolting the pillow block bearing to the mounting plate.

### 3.5 EXTREMELY SEVERE APPLICATIONS

For applications that can create major build-ups of material (paint, glue…), it is recommended to close the exposed gaps of the transducer. A good way to do this is to use Electrical Tape all around the side of the UPB Transducer.

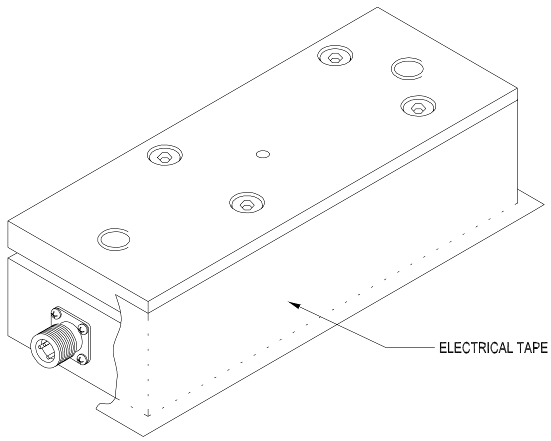


**Figure 6 – Mounting the Under Pillow Block Transducer**

### 3.6 SHAFT EXPANSION

If the roller is subjected to higher temperatures after installation, thermal shaft expansion may damage the transducers. To prevent damage to the transducers, an expansion type pillow block bearing should be used.

### 3.7 MOUNTING THE SENSING ROLL

The following steps take into consideration the risk and difficulty of handling large rolls and help to minimize the number of failed attempts at mounting the roll.

1. Before mounting the sensing roll, confirm that the transducer body is securely mounted.
2. The pillow block bearings used must be a expansion type to allow for thermal shaft expansion.
3. Follow the pillow block manufactures directions for installation.
4. The pillow block must be mounted flat to the UPB transducer mounting plate and the transducer must be mounted flat to the machine surface. Refer to flatness specification in Section 3.2. The pair of transducers must be parallel to each other in all directions. This should be accomplished by machining the surfaces before mounting the transducers. Do not insert any shims under the pillow block bearing or the UPB transducer to accomplish this. Inserting shims will induce twisting moments that create erroneous tension measurements.

### 3.8 CHECKING THE TRANSDUCER MOUNTING

Before preparing to apply force to the transducer and calibrating the amplifier, inspect the load cell to confirm that it is oriented and mounted in accordance to the installation instructions. Common problems include:

- Failure to mount transducer on flat (machined) surface.
- Shaft length or roll weight that exceeds allowable limits.
- Fastener torque either excessive or insufficient.
- Transducer mis-oriented so that the axis of sensing is not true to the applied force vector (bisector of the wrap angle).
- The transducer is positioned in the web path so that the wrap angle is not constant.

### 3.9 ELECTRICAL CONNECTIONS AND WIRING

Refer to the installation wiring diagrams supplied with the Cleveland-Kidder tension indicator or controller for making the transducer to amplifier connections. Make certain that:

- The cables do not interfere with the web path, and that they are away from gearing or other moving parts.
- You exercise care when routing the cables to avoid pick-up from noise-radiating power cabling (motor armature leads, AC main wiring, etc).
- In environments with severe electromagnetic noise, it may be necessary to route the cables inside metallic conduit.
- Polarity changes are accommodated by reversing the orientation of the transducer or by interchanging the black and white output wires.

Figure 7 illustrates a typical full bridge transducer configuration.

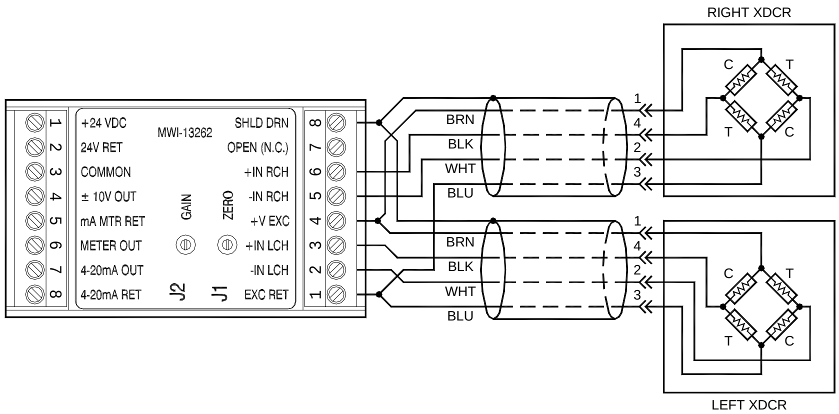


**Figure 7 – Full Bridge Transducer Wiring**

## 3.10 MATING CONNECTORS

The M12 connector used on the Ultra Series Under Pillow Block transducer is a four-pin, DC keyed, male connector that mates directly with the molded corsets offered by Cleveland Motion Controls. The following table lists the pin numbers and cable colors that apply:

| Pin Number | Wire Color | Signal |
|---|---|---|
| 1 | brown | Excitation Voltage |
| 2 | white | Output - (low going) |
| 3 | blue | Excitation Return |
| 4 | black | Output + (high going) |

If you choose to make your own cables or need to repair damaged connectors, you can purchase a separate mating connector from Cleveland Motion Controls. To order, use CMC part number, X44-34338.

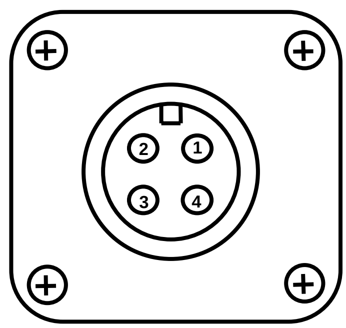


**Figure 8 - Front View of M12 Connector**

When mating the connector, align the keying mechanism and pins so that they enter the socket without you having to apply excessive force. Use your fingers to sufficiently tighten the coupling nut enough to ensure an adequate seal and to discourage accidental loosening.

## 3.11 CALIBRATION

For the proper calibration procedure, refer to the Instruction Manual that accompanied your amplifier or tension controller.

# 4 TROUBLE SHOOTING

*Safety should not be an afterthought. Before installing, servicing or calibrating review and follow applicable policies and procedures to ensure worker safety. Machinery must be in a safe state and be aware of any additional hazards that can arise when installing and calibrating higher force transducers.*

The following table provides you with a list of typical issues that you may encounter and possible solutions:

| If you are having this issue: | Then: |
|---|---|
| Low Output Signal | The transducer may have too large a maximum working force (MWF) in relation to the force to be sensed, or the wrap angle may be insufficient and is not able to generate an optimum resultant force on the transducer.<br>Or<br>The transducer may be improperly orientated such that the transducer's axis of sensitivity is not aligned with the bisector of the wrap angle.<br>Or,<br>Check the amplifier to confirm that the signals from each transducer will combine additively. Otherwise, the two signals will work against each other, and only minute differences between signals appear. |
| Wrong Polarity of Output Signal | Transducer may have been incorrectly oriented. Refer to Section 3.1 for proper load direction. Alternately, change the signal sense by interchanging the white and black transducer leads into the amplifier. |
| No Output Signal | Check to be sure that all connections have been made completely and properly.<br><br>Inspect the connecting cables for crimps or cuts.<br><br>Verify that the appropriate excitation voltage is being issued by the amplifier with the load cells connected.<br><br>Disconnect the transducer output wires from the amplifier's input terminals (to eliminate any potential for accidental loading) and check the output signal using a voltage meter.<br><br>Check the transducer (refer to Section 4.1 - DC Resistance Check in this document). |
| Excessive Output Signal with Minimal or No Load | The sensing guide roll assembly may be excessively heavy. The sensing guide roll should not weigh more than ½ the maximum working force of the transducers in most cases.<br>Or<br>The transducer may have too small a maximum working force for the application. Replace with a higher maximum working force transducer or decrease the web wrap angle.<br>Also,<br>Check cables and connectors for intended connections using an ohm-meter or continuity checker. Inspect not only for continuity where expected, but also disconnect pluggable connectors and check for unintended resistances (shorts) between conductors. |
| Poor Linearity | Check for mechanical reasons such as rubbing or binding that interferes with the force being properly transmitted to the load cell.<br>Or<br>Your calibration efforts may have been conducted while either the transducer or the amplifier was in a non-linear mode (i.e. under the effects clipping or saturation). Try and recalibrate the amplifier using a lower force.<br>To determine whether the clipping is being caused by the transducer or the amplifier, apply a series of intermediate forces and record the unamplified tension signal. If the data demonstrates that the transducer is linear then, investigate the amplifier. |

## 4.1 DC RESISTANCE CHECK

If you have attempted to resolve your issue using the table above and have been unsuccessful, use the following checks to determine the viability of the transducer.

The following nominal DC resistances table indicates a normal load cell, with no load applied at room temperature. The resistances are cited using both the wire color and the M12 connector pin numbers (Figure ). Often, it is best to begin by measuring the resistances at the amplifier end of the cable. Then, if a problem is indicated, un-mate the transducer end of the connector and check the resistances. Following this procedure, allows you to readily and initially check the resistances without disturbing the transducer or M12 connections and inadvertently disturbing the interconnect condition.

| Measurements taken between the following wires: | Corresponding M12 Connector Pins: | Target Resistance UPB1 | Target Resistance UPB2 |
|---|---|---|---|
| WHT - BRN | 1-2 | 88 Ohm | 88 Ohm |
| BLK - BRN | 1-4 | 88 Ohm | 88 Ohm |
| WHT - BLK | 2-4 | 118 Ohm | 118 Ohm |
| WHT - BLU | 2-3 | 104 Ohm (Varies slightly based on load cell temperature) | 112 Ohm (Varies slightly based on load cell temperature) |
| WHT - BLU | 2-3 | 104 Ohm (Varies slightly based on load cell temperature) | 112 Ohm (Varies slightly based on load cell temperature) |
| BRN - BLU | 1-3 | 133 Ohm (Varies slightly based on load cell temperature) | 141 Ohm (Varies slightly based on load cell temperature) |

Resistance should **NOT** be indicated (> 10 M-ohm) between any of the transducer connections and the metal body of the transducer when the M12 transducer connector is un-mated. A low resistance indicates a possible breakdown of an insulation component, and could be caused by excessive voltage between the body and electrical connections of the transducer.

## 4.2 DC VOLTAGE AND CURRENT CHECKS

When 5VDC excitation is applied to a correctly wired transducer, the output to ground voltage for each of the bridge outputs should be approximately 2.8 VDC. The difference in voltage between the two output leads (BLK and WHT) is the un-amplified tension signal. It should be only tens of millivolts with little applied force, increasing to approximately 100 mV at the transducers MWF.

The current flow through the bridge Excitation connections (into BRN and out the BLU wire) should be approximately 35 mA and equal in each wire. Non-equal currents indicate that the current is being diverted, indicating a potential wiring error, short circuit, or ground loop.