
INSTRUCTION MANUAL . . . TYPE SLIM CELL TRANSDUCER



1.0 GENERAL INFORMATION

1.1 RECEIVING AND UNPACKING

Handle and unpack the equipment carefully. Immediately upon arrival, check the shipment against the packing list. Any damage should be reported immediately to the carrier and to the nearest CMC representative.

Equipment that will not be installed immediately should be stored in a clean, dry location. Precautions should be taken to prevent moisture, dust and dirt from accumulating in storage and installation areas

1.2 PRECAUTIONS

1.2.1 Shipping - It is recommended that the sensing roll be removed when the machine is shipped with the transducers mounted. The shock and vibration transmitted to the transducers by the sensing roll during transporting can damage them.

1.2.2 Roll Balance - The sensing roll should be balanced to prevent forces caused by imbalance. These forces cause a noise signal to be superimposed on the tension signal. The centrifugal force (F) caused by imbalance can be calculated using the equation below.

$$F = 28.6 \times 10^{-6} \times W \times R \times (\text{RPM})^2 \text{ Lbs.}$$

W = Weight of roll in pounds

R = Displacement of mass of roll from the axis of rotation in inches

RPM = Revolution per minute

It is recommended that the force (F) be less than 5% of the resultant web force at the maximum web speed for most applications.

1.2.3 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 the critical roll speed, use the following formula:


$$\text{Critical roll speed in RPM} = \frac{4.8 \times 10^6 \times \text{Shaft O.D.}}{(\text{Shaft Length})^2}$$

Dimensions are in inches.

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

1.2.4 Overloading - Repetitive overloading above the maximum working force or severe overloading should be avoided because it will damage the transducers.

1.3 SPECIFICATIONS

| | |
|---|--|
| Gage Resistance | - End to end resistance 440-480 Ohms |
| Gage Factor | - 100 nominal |
| Excitation Voltage | -10 VDC or VAC (RMS) maximum |
| Output Signal at Rated MWF | - 100 – 175 mV nominal per Transducer (with 10VDC or VAC rms excitation voltage) |
| Output Impedance | - Approximately 880 ohms per Transducer |
| Required Input Impedance of Tension Amplifier | - 5K ohms per Transducer (1/2 bridge) |
| Maximum Voltage, Gage to Beam or Base (Ground) | - 50 VDC |
| Operating Temperature Range | - 0 F to +200 F |
|  Compliant | |

1.4 DESCRIPTION

The Cleveland-Kidder SLIM CELL transducers utilize a sensing twin beam to which semiconductor strain gages are bonded. With these high output signal gages a very small force on the sensing beam will be shown as a change in the tension signal.

For many applications SLIM CELL transducers are for use with rotating (live) shaft rolls that are traditionally mounted in Pillow Block Bearings. See **Figure 1**. For mounting dimensions see **Figure 2**. But SLIM CELL transducers can also be used with stationary (dead) shaft rollers.

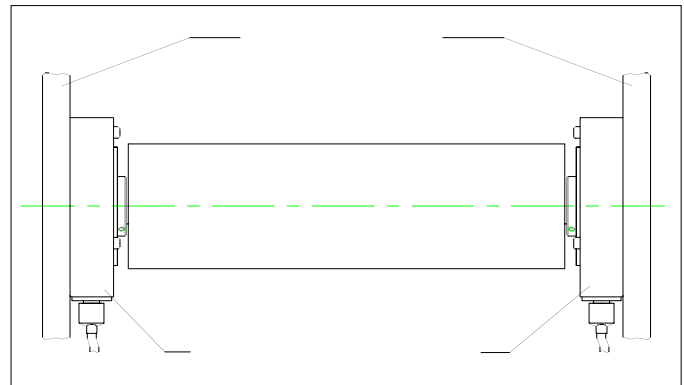
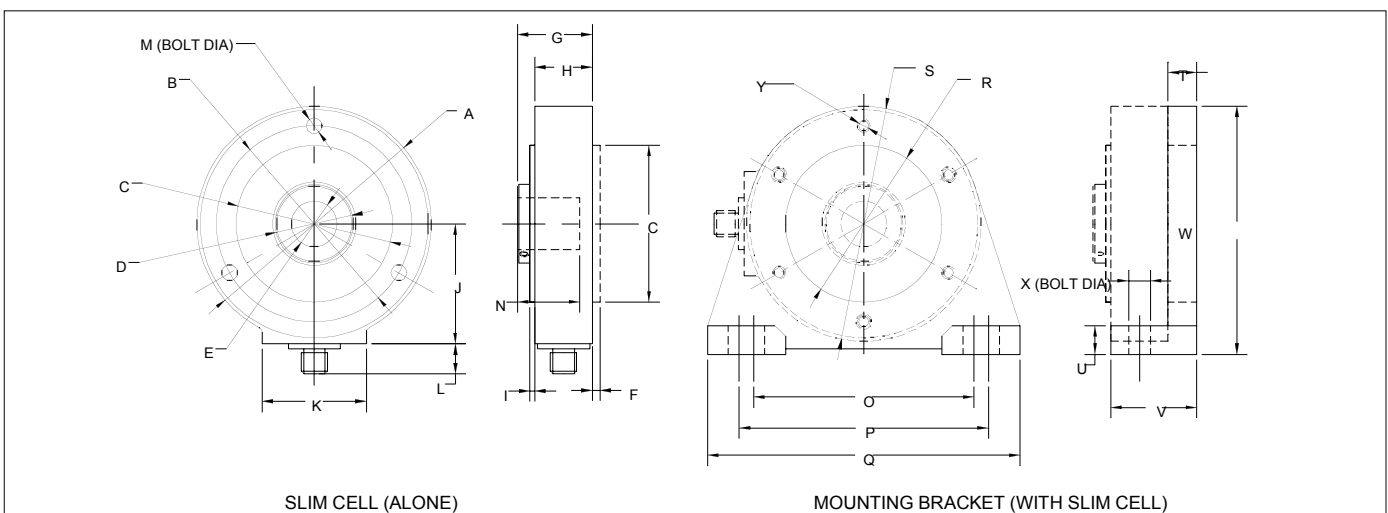


Figure 1



Dimensions in inches, allow 2.5 in clearance for Connector

| SIZE | A | B | C | D | E* | F | G | H | I | J | K | L | M |
|-------|------|------|-------------|------|----|------|------|------|------|------|------|------|---------|
| SLIM1 | 4.50 | 3.75 | 2.996-3.000 | 1.50 | - | 0.12 | 1.31 | 1.02 | 0.07 | 2.30 | 2.00 | 0.65 | (3) |
| SLIM2 | 5.80 | 4.75 | 4.196-4.200 | 2.46 | - | 0.14 | 1.70 | 1.32 | 0.10 | 3.05 | 2.50 | 0.65 | 3/8 (3) |

| N | O | P | Q | R | S | T | U | V | W | X | Y** |
|------|------|------|------|-------------|------|------|------|------|------|---------|---------|
| 1.02 | 4.22 | 4.78 | 6.00 | 3.000-3.006 | 4.50 | 0.55 | 0.55 | 1.60 | 4.75 | 3/8 (2) | (3) |
| 1.36 | 5.50 | 6.5 | 8.00 | 4.200-4.206 | 5.80 | 0.65 | 0.65 | 2.00 | 6.2 | (2) | 3/8 (3) |

* See Table 3 for permissible Shaft Diameter. Bore Diameter is typically between Nominal Diameter+0.0007 and +0.0017 inch.

** Bolts supplied with bracket

Dimensions in mm, allow 64 mm in clearance for Connector

| SIZE | A | B | C | D | E* | F | G | H | I | J | K | L | M |
|-------|-------|-------|---------------|------|----|-----|------|------|-----|------|------|------|---------|
| SLIM1 | 114.3 | 95.3 | 76.10-76.20 | 38.1 | - | 3.0 | 33.3 | 25.9 | 1.8 | 58.4 | 50.8 | 16.5 | 6mm (3) |
| SLIM2 | 174.3 | 120.7 | 106.58-106.68 | 62.5 | - | 3.6 | 43.2 | 33.5 | 2.5 | 77.5 | 63.5 | 16.5 | 8mm (3) |

| N | O | P | Q | R | S | T | U | V | W | X | Y** |
|------|-------|-------|-------|---------------|-------|------|------|------|-------|----------|---------|
| 25.9 | 107.2 | 121.4 | 152.4 | 76.20-76.35 | 114.3 | 14.0 | 14.0 | 40.6 | 120.6 | 10mm (2) | (3) |
| 34.5 | 139.7 | 165.1 | 203.2 | 106.68-106.83 | 174.3 | 16.5 | 16.5 | 50.8 | 157.5 | 12mm (2) | 3/8 (3) |

* See Table 3 for permissible Shaft Diameter. Bore Diameter is typically between Nominal Diameter+0.018 and +0.043 mm.

** Bolts supplied with bracket

Figure 2

2.0 INSTALLATION

2.1 SELECTION OF TRANSDUCER MOUNTING LOCATION

When selecting a transducer mounting location, keep in mind that the tension-sensing roll must NOT be mounted where the web wrap angle can vary. Any change in the wrap angle will be sensed by the transducers as a change in tension, and indicated as such on the tension indicator.

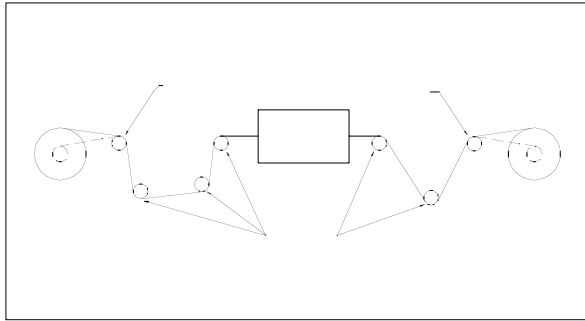


Figure 3

In some cases, it may be impossible to find a

location for the transducers where the wrap angle does not vary. The change in indicated tension that will result can be calculated and, if small, may not be significant.

2.2 MOUNTING SURFACE PREPARATION

The mounting surfaces for the transducers should be flat and parallel. Prepare the machine frames or mounting surfaces by removing any loose paint, rust, scale, etc.

2.3 MOUNTING STYLE

The SLIM CELL Transducer is very versatile and can be mounted in several mounting styles. If you have not decided which style to use, evaluate which is the most convenient, based on the machine frame, ease of assembly and protection. See **Figure 4**.

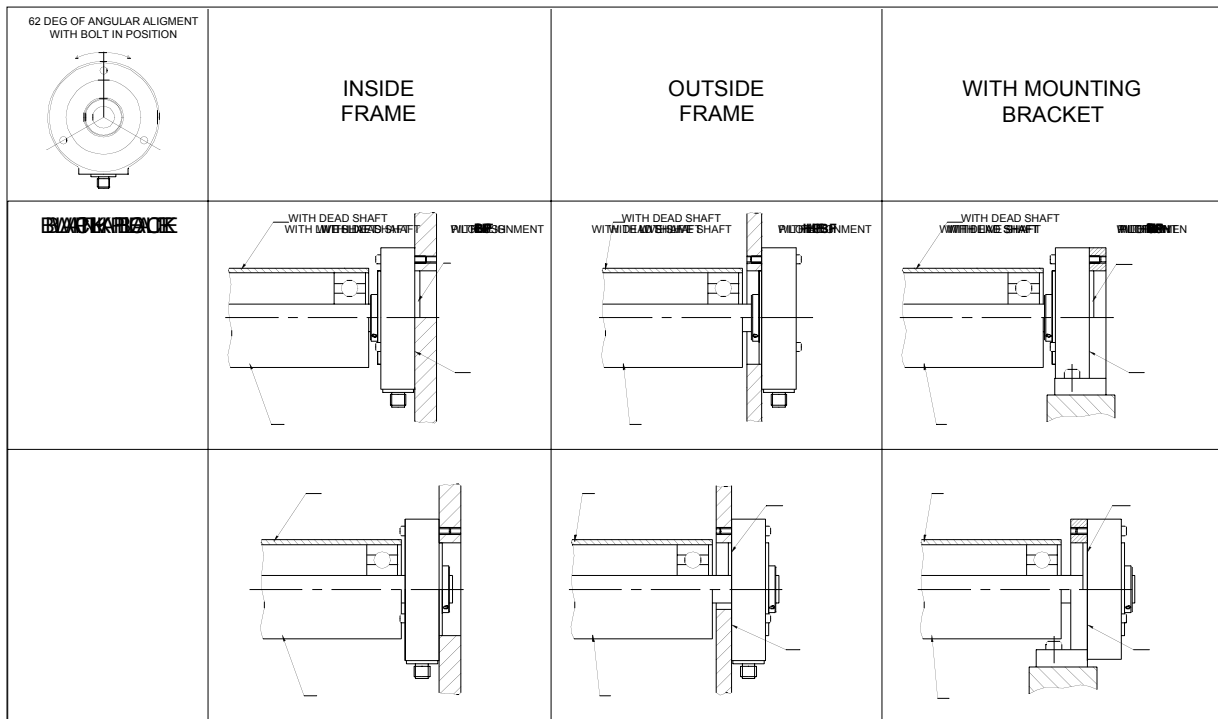


Figure 4

2.4 INSTALLATION OF THE TRANSDUCER

The Slim Cell can be mounted directly to the machine frame or to the optional mounting bracket.

Mounting the Slim Cell to the Machine Frame

Note that the Slim Cell can be mounted on either side of the machine frame (see **Figure 4**). Determine the arrangement that best suits your application. The load cell is mounted in place with 3 bolts. Before drilling and tapping the mounting holes in the machine frame read the instructions below. (**Orientation and Mounting of the Slim Cell**) to insure that the Slim Cell is properly aligned. The holes should be located so that load cell can be mounted to achieve proper alignment. Refer to dimension B and M in Figure 2 for the proper bolt hole centers and bolt size. The bolt hole centers are evenly spaced on a circle and are 120 degrees from each other.

Mounting the Bracket to the Machine Frame

Determine the correct position for the mounting bracket. Note that the Slim Cell can be mounted on either side of the bracket. Refer to Figure 4. Determine the arrangement that best suits your

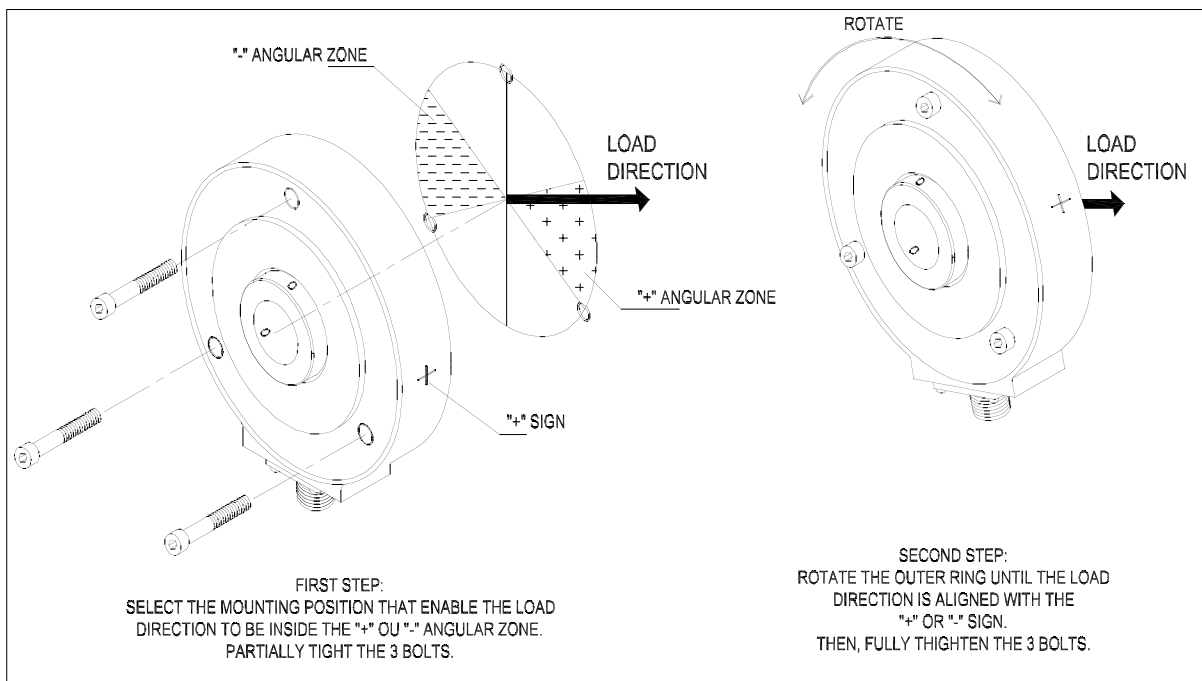
application.

Drill and tap two mounting holes in the machine frame for each bracket. Refer to dimension X in Figure 2 for the proper bolt diameter. The Slim Cell is mounted to the bracket with 3 bolts. Before mounting the load cell in place read the instructions below (**Orientation and Mounting of the Slim Cell**) to insure that it is properly aligned.

2.5 ORIENTATION AND MOUNTING OF THE LOAD CELL

Before bolting the load cell in place it must be positioned so that is aligned with the tension force (load direction). The Slim Cell is properly oriented when the load direction arrow (bisector of the wrap angle- see **Figure 7**) is pointing along a line connecting the “+” and “-” signs on the sides of the load cell.

Position the Slim Cell so that it can be bolted in place at the position that is the closest to the proper orientation. (see **Figure 5**). Insert the bolts and partially tighten. To achieve the exact orientation, rotate the Slim Cell outer ring as required so that the load direction is pointing through the “+/-” axis. The outer ring can be rotated 60 degrees. When the Slim Cell is properly aligned completely tighten the mounting bolts. If the force points to the “+”, the



output signal of the transducer is positive. If the force points to the “-“ the output is negative. This is importance to know when wiring the transducer to the amplifier, indicator, or controller terminals. Interchanging the B (black wire) and C (red wire) connections may be required in order to provide the proper signal polarity for the device. (see **Figure 6**).

2.6 INSTALLATION PRECAUTIONS

To insure proper installation and operation of the system, the following steps should be performed in sequence. Failure to do so could seriously damaged the Transducers and void the warranty:

- For SLIM CELLS that don't have a through hole, make sure that the shaft doesn't go too deep inside the Load Cell and touch the back plate (See **Figure 2** letter H).
- When mounting a roll with a shaft that comes through the back plate (see **Figure 4**), push the adapter to the inside of the SLIM CELL before you tighten the set screws to allow for shaft expansion.
- SLIM CELL installations having the roll and SLIM CELL mounted on the inside of a machine might require installing the roll and SLIM CELLS as a unit.

2.7 SHAFT EXPANSION

- The SLIM CELL is design to accommodate shaft expansion. The only precaution, as said in **2.6 INSTALLATION PRECAUTIONS**, is that in case of a shaft entering through the back plate of the Load Cell (The two back plates facing each other), you need to push the adapter toward the front of the SLIM SPIN before you tighten the set screws to allow for shaft expansion.

3.0 ELECTRICAL CONNECTION

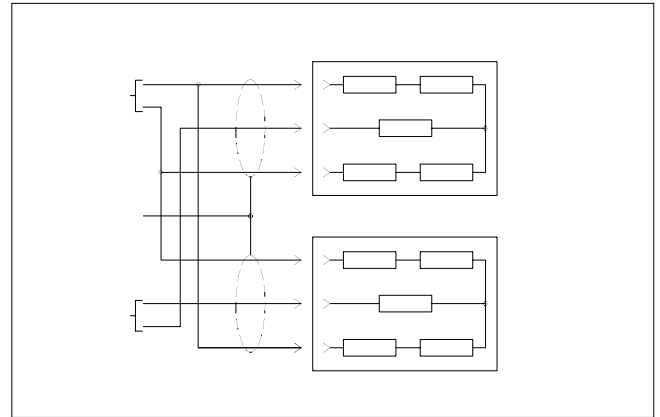


Figure 6

Refer to the installation wiring diagrams supplied with the Cleveland-Kidder tension indicator or controller for making the transducer connections. Make certain that the cables do not interfere with the web path and that they are away from gearing or other moving parts.

Figure 6 is for reference only for use with a full bridge transducer configuration. Many of the Cleveland-Kidder indicators and controllers use only half bridge transducer inputs and then sum the two transducers signals internally. See the applicable installation wiring diagrams for the tension indicator or controller.

3.1 MATING CONNECTORS FOR TRANSDUCERS

| | <u>CMC P/N</u> |
|--|----------------|
| Mating Straight Connector, Boot and Clamp Kit | MO-09854 |
| Mating 90 Angle Connector, Boot and Clamp Kit | MO-09855 |

3.2 INTRINSICALLY SAFE TRANSDUCERS

These transducers are intrinsically safe only when they are part of a complete intrinsically safe system using the TIX-1 tension indicator or wired per CMC control drawings.

Barrier block assemblies and/or the individual barrier blocks may be purchased from CMC. Please contact CMC for part numbers and pricing.

4.0 TEMPERATURE COMPENSATION

The transducers are supplied with a temperature compensation network (except size 1 that don't require it) which is in series with the output signal lead. The compensation circuit is designed to be used with a tension amplifier, which has an input impedance of 10K Ohms when a pair of transducers connected as a full bridge is used. If only one transducer is used, the tension amplifier impedance should be 5K Ohms. If other than the input impedances given above are used, drift will occur in the tension amplifier output when the transducer temperature changes.

5.0 SINGLE TRANSDUCER OPERATION

For those applications where only one transducer is required, a dummy circuit may or may not be required depending upon the input circuit of the tension amplifier. Consult the factory for this information. The dummy circuit consisting of two resistors is substituted in place of the second transducer. The resistors should have a resistance value between 100 and 150 Ohms and should be matched to within 1%. Dummy circuits are available from the factory for connecting to tension indicators or controllers.

6.0 TROUBLESHOOTING

6.1 EXCESSIVE OUTPUT SIGNAL WITH NO LOAD

There may be a high degree of misalignment of the transducers causing a severe pre-load.

Or

The sensing guide roll assembly may be excessively heavy. The sensing guide roll should not weigh more than the maximum working force of the transducers in most cases.

Or

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.

6.2 LOW OUTPUT SIGNAL

The transducer may have too large a maximum working force for the application. Replace with a lower maximum working force transducer or increase web wrap angle.

6.3 WRONG POLARITY OF OUTPUT SIGNAL

Transducers may have been incorrectly oriented. See **Section 2.4** for proper load direction. Alternately, change the transducer excitation voltage by interchanging the B and C connections.

6.4 OUTPUT SIGNAL NOT LINEAR, ZERO SHIFTS DURING OPERATION

Check transducer and tension roll mounting. All mounting bolts must be tight. Check that there is no dirt or foreign matter interfering with the transducer mounting. Check that mounting surface is flat and rigid.

6.5 NO OUTPUT SIGNAL

Check to see that all connections have been made completely. Check for places where the connecting cables might be crimped or cut.

6.6 VERY HIGH OUTPUT WITH NO LOAD

Check cables and connectors for good connections and check continuity of cables with an ohmmeter. Check for proper wiring to transducers. Check transducer gage resistance as given in the following chart at room temperature with no load applied.

TRANSDUCER GAGE RESISTANCE CHECK

| Resistance (ohms) | SLIM CELL 1 or 2 |
|-------------------|------------------|
| Pin C to B | 420±20 |
| Pin A to B | 900-1100 |
| Pin A to C | 900-1100 |

7.0 SERVICE ASSISTANCE AND REPAIR

For additional service assistance, please obtain the Type, MWF, and Purchase Order Number from the nameplate. Contact the Factory Service Department.

Phone: (216) 524-8800
Fax: (216) 642-5155

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.

8.0 PRODUCT LITTERATURE

A copy of the Specification Sheet SC-C&S-DS is included at the end of this manual.

LIMITED WARRANTY.

ALL GOODS ARE SOLD SUBJECT TO THE MUTUAL AGREEMENT THAT THEY ARE WARRANTED BY THE COMPANY TO BE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP FOR ONE YEAR FROM THE DATE OF SHIPMENT. THE COMPANY'S WARRANTY DOES NOT COVER, AND IT MAKES NO WARRANTY WITH RESPECT TO ANY DEFECT, FAILURE, DEFICIENCY OR ERROR WHICH IS:

- A) NOT REPORTED TO THE COMPANY WITHIN THE APPLICABLE WARRANTY PERIOD; OR
- B) DUE TO MISAPPLICATION, MODIFICATION, DISASSEMBLY, ABUSE, MISUSE, IMPROPER INSTALLATION, UNAUTHORIZED REPAIR, IMPROPER MAINTENANCE OR ABNORMAL CONDITIONS OF TEMPERATURE, DIRT OR CORROSIVE MATTER; OR
- C) DUE TO OPERATION, EITHER INTENTIONAL OR OTHERWISE, ABOVE RATED CAPACITIES OR IN AN OTHERWISE IMPROPER MANNER.

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