DOVER FLEXO ELECTRONICS, INC.

INSTRUCTION MANUAL

Tension Transducer

MODEL C CE

DOC 801-0647

5 YEAR WARRANTY

DOVER FLEXO ELECTRONICS, INC.

307 Pickering Road

Rochester, NH 03867 U.S.A.

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Telephone: (603) 332-6150

Fax: (603) 332-3758

E-Mail : info@dfe.com Internet: www.dfe.com

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PRODUCT DESCRIPTION

1.1 GENERAL DESCRIPTION

The Model C Tension Transducer is an electro-mechanical device that converts web tension into a dc voltage proportional to tension. The voltage is amplified in external electronic circuitry and displayed on an analog or digital meter which is calibrated to indicate actual web tension. The tension reading is expressed in pounds, ounces, grams, kilograms, newtons or any other desirable units. It can also be supplied to a regulator circuit to control tension automatically.

The information in this section will help give a clear understanding of the Model C Transducer, how it works and how it is used.

1.2 CONSTRUCTION AND MECHANICAL OPERATION (see Figures 1 & 2)

In a typical installation, a transducer is mounted on each end of a standard idler roll. The roll shaft may be stationary (non-rotating or dead) in which case the transducer is known as the dead-shaft, or D version. Or the roll shaft may be rotating (live) and the transducer is known as the live-shaft, or L version. The D version has a split coupling that clamps the shaft and allows removal of the idler roll from the transducers without removing the transducers from the machine. The L version has a special tapered shaft bushing and precision, self-centering coupling which eliminates shaft run-out.

The shaft coupling assembly contains a self-aligning bearing which allows the coupling to compensate for misalignment and deflection of the idler roll shaft. This compensation is extremely important because it prevents mechanical pre-loading of the transducer which causes inaccurate tension measurement and may damage the transducer. A small amount of axial movement is built into the shaft coupling to compensate for variations in shaft length caused by temperature fluctuations and shaft bending.

Inside the transducer is a dual cantilever beam with strain gages mounted on the top and bottom surfaces. The shaft coupling is attached to the free end of the beam. When web tension is applied the beam deflects a small amount, causing an electrical output from the strain gages.

A mechanical stop prevents damage from accidental overloads. The stop is functional through 360 degrees, so the overload condition may occur from any direction, not just the load direction. In all cases, the beam is prevented from deflecting far enough to cause any damage.

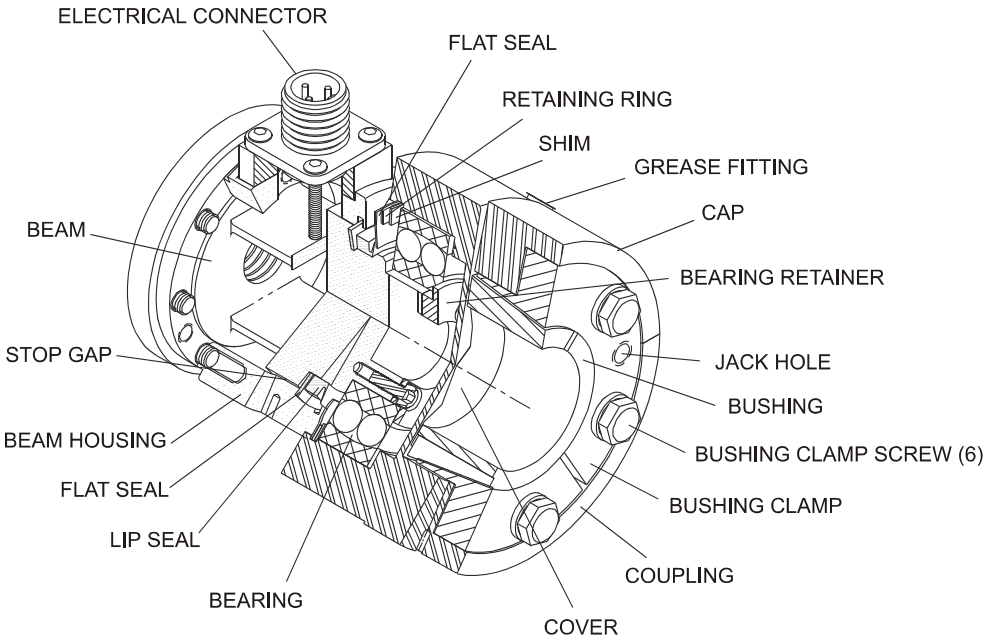


Figure 1 **- LIVE SHAFT VERSION CUT-AWAY VIEW**

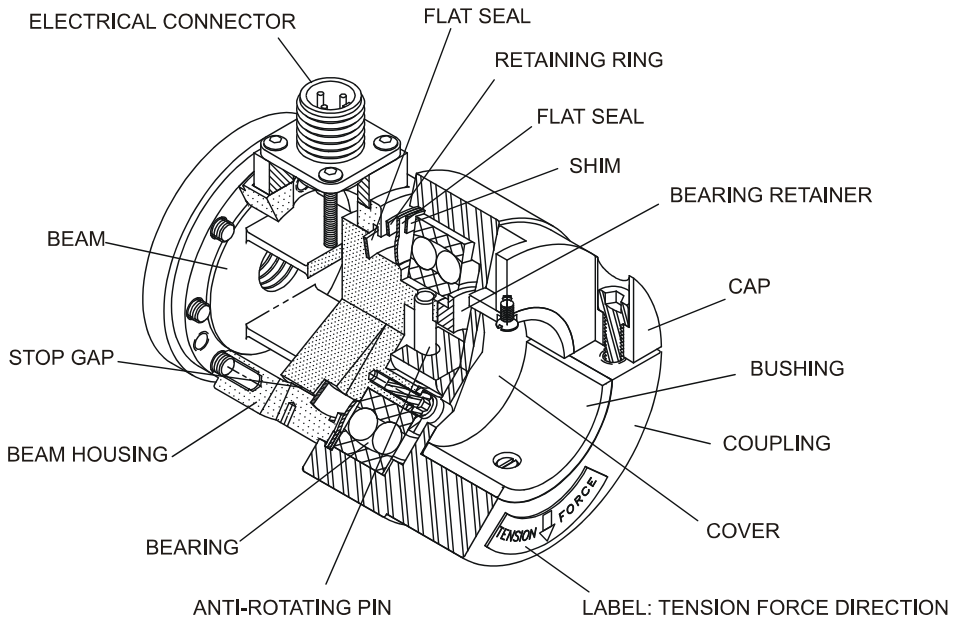


***Figure 2* - DEAD SHAFT VERSION CUT-AWAY VIEW**

1.3 SPECIFICATIONS

Excitation Voltage:		5 volts dc
Output:		250 mV, nominal, at 5V excitation
Strain Gages:		semiconductor, 120 ohms +/- 20 ohms resistance
Repeatability:		+/- 1/4% full span (FS)
Linearity and Hysteresis Combined		+/- 1/2% FS
Temperature Range		-10° F to +200° F (-23° C to +93° C)
Temperature Coefficient		0.02% per degree F, typical (0.01% per degree C, typical)
Material:		303 stainless steel and 7075-T6 aluminum
Minimum Overload Capacity		Size 0,1 - 1200 lbs. (5338 N), Size 2 - 2500 lbs. (11121 N)
Deflection:		0.005" typical (0,127 mm typical)
Mis-alignment Capacity (degrees)		2°
Mating Electrical Connector		Amphenol MS3106A-10SL-3S
Standard Connector Position		S and FL styles - 6 o'clock with reference to force direction,
		PB and BR - rear mount
Electrical Connections		pin A....white wire..output
		pin B....black wire.....+5V
		pin C....red wire.....-5V
Maximum Shaft Sizes:	Size 0,1	Live (L) = 1.00" (20 mm) Dead (D) = 1.500" (30 mm)
	Size 2	Live (L) = 1.500" (40 mm) Dead (D) = 1.750" (40 mm)
Shaft Size Tolerance:		nominal -0.002" (nominal -0,051 mm)
Load Ratings:	Size 0,1	10, 25, 50, 100, 150 lbs. (45, 110, 225, 450, 670 N)
	Size 2	25, 50, 100, 200, 400, 800 lbs. (110, 225, 450, 900, 1800, 3550 N)

Break-Away Torque:
(Typical with greased bearing, L version only)

Standard Seal:	Size 0,1	4.5 oz-in / unit (0.032 Nm / unit)
	Size 2	6.5 oz-in / unit (0.046 Nm / unit)
Labyrinth Seal	Size 0,1	0.3 oz-in / unit (0.002 Nm / unit)
	Size 2	0.6 oz-in / unit (0.004 Nm / unit)

1.4 STANDARD FEATURES

- **Dual Cantilever Beam**. Provides high strength and accuracy at low tension.
- **Grease Fitting**. Allows quick lubrication without disassembly or removal from machine (Live shaft only).
- **Stainless Steel and Aluminum construction**. Excellent corrosion resistance.

1.5 CONFIGURATION CHOICES

These are explanations of standard choices of various configurations that were specified for your application.

- **Size.** Sizes offered are 0, 1, and 2.
- **Coupling Style.** Live for rotating shafts, or Dead for stationary or non-rotating shafts.
- **Mounting Style.** Screw or Bolt mount (S) uses a single bolt to mount to machine frame. Pillow Block bracket (PB) uses a right-angle bracket to mount onto the machine frame. Flange mount (FL) uses a four bolt flange mounted onto the machine frame which can be rotated to any position for precise orientation. Through-Frame (TF, Size 2 only) style inserts a collar into the wall of the machine frame and is clamped with a flange outside the frame wall. Piloted Flange (PFL) fits directly in place of industry standard RFC style 3.0" piloted flange bearings.
- **Load Ratings.** Size 0,1: 10, 25, 50, 100, 150 lbs. (45, 110, 225, 450, 670 N)
  Size 2: 25, 50, 100, 200, 400, 800 lbs. (110, 225, 450, 900, 1800, 3550 N)
- **Bore/Shaft Size**. Choices are as follows:
  Size 0, & 1: 1/2, 5/8, 3/4, 1, 1 1/8*, 1 1/4* 1 1/2* inches, (20mm, 25mm, 30mm, 35mm*)
  Size 2: 3/4, 7/8, 1, 1 1/8, 1 3/16, 1 1/4, 1 1/2, 1 3/4* inches (25mm, 30mm, 32mm, 35mm, 40mm)
  Cannot exceed standard size listed in Specifications in section 1.3. *** Dead shaft version only.**
- **Force Direction.** Applies only to Pillow Block Bracket style. Choices are: 1:30, 3:00, 4:30, 6:00 (std.*), 7:30, 9:00, 10:30, 12:00 (*standard - toward mounting surface) using clock face numbers while looking at the coupling face.
  Note: Rotation of "PB" force can be adjusted more accurately at final installation, but must be known within 45° only for limitations in optional connector positions.
- **Connector Position**. Choices are as follows:
  S, FL , PFL: 1:30, 3:00, 4:30, 6:00 (std.), 7:30, 9:00, 10:30, 12 o'clock
  PB: 1:30, 3:00, 9:00, 10:30, 12 o'clock, and Rear (std.)
  TF: Rear Position only

1.6 OPTIONS

- **Drill and Tap (DT).** Non-standard drill and tap for S or FL mounting styles.
- **Environmental Connector (EC)**. Seals with mating cable electrical connector to protect against contact oxidation; especially useful in corrosive environments.
- **Extended Range (XR)**. Produces twice the output signal for a given load rating. Used in applications requiring a full scale tension force that is as low as 6% of the transducer rating.- 12% is standard. Must be used with electronics having extended range also.
- **Full Bridge (FB)**. Four strain gauges instead of two to form a Wheatstone Bridge connection. Applies only if one transducer is used.
- **Labyrinth Seal (LS)**. For very low break away torque. Used on Live shaft version only. Tolerances listed in Specifications in section 1.3.
- **Metric Mounting Stud. (MMS)** Metric mounting screw for S type transducers.
- **Vacuum Compensation (VAC).** Transducer has special screws and features for fast and complete air evacuation. Used for transducers installed in vacuum metalizers

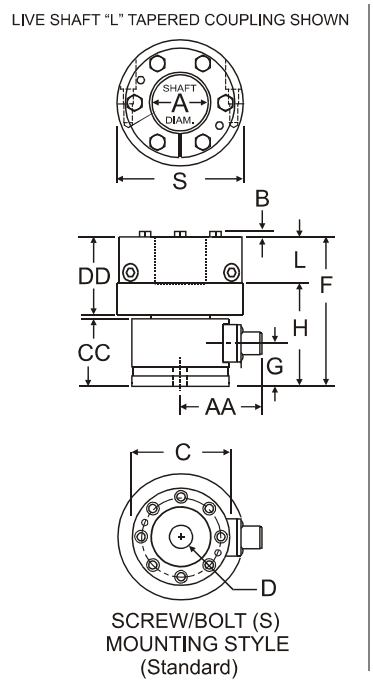
SECTION 2 INSTALLATION

2.1 DIMENSIONS

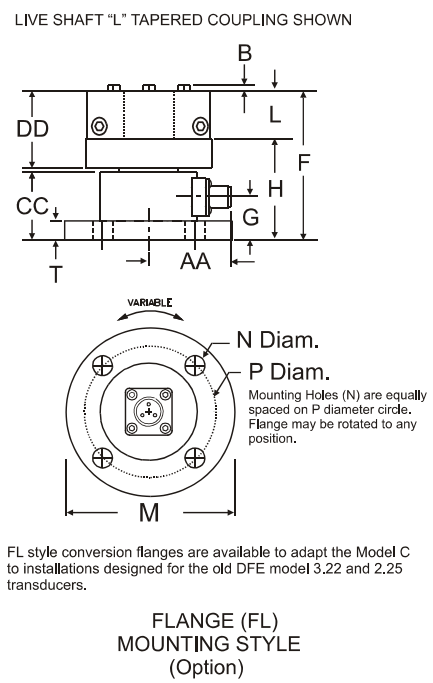
SIZE		A (D) [1]	A (L) [1]	B	C	D	E	F (max)	G	H (max)	J	K (max)	L	M	N	P
0	**in.**	**1.50**	**1.00**	**0.13**	**1.80**	**3/8 - 16**	**1.20**	**3.02**	**0.95**	**2.45**	**2.75**	**1.62**	**0.56**	**3.12**	**0.34**	**2.50**
	mm	30	25	3.3	45.7	M10 x 1.5	30.5	76.7	24.1	62.2	69.9	41.4	14.2	79.2	8.6	63.5
1	**in.**	**1.50**	**1.00**	**0.13**	**1.80**	**1/2 - 13**	**1.20**	**3.18**	**0.95**	**2.61**	**3.01**	**1.71**	**0.56**	**4.00**	**0.43**	**3.25**
	mm	30	25	3.3	45.7	M12 x 1.75	30.5	80.8	24.1	66.3	76.5	43.4	14.2	101.6	10.9	82.6
2	**in.**	**1.75**	**1.50**	**0.16**	**2.60**	**5/8 - 11**	**1.04**	**4.00**	**1.15**	**3.00**	**3.99**	**2.16**	**0.98**	**4.49**	**0.53**	**3.50**
	mm	40	40	4	66	M16 x 2	26.4	101.6	29.2	76.2	101.3	54.9	24.9	114	13.5	88.9

Notes: 1. Bushings are available for smaller shaft diameters. **D** = Dead Shaft, **L** = Live shaft.

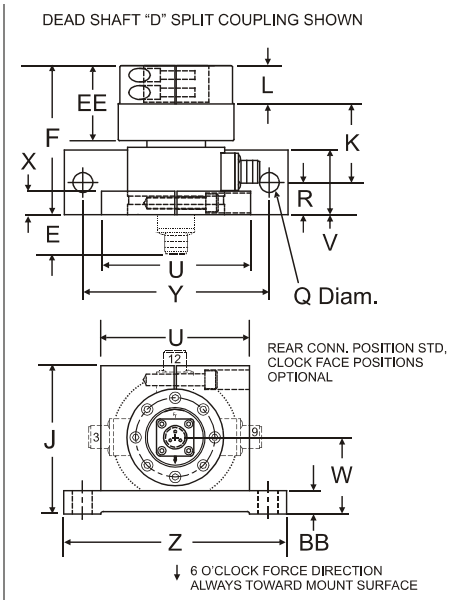
SIZE		Q	R	S (L)	S (D)	T	U	V	W	X	Y	Z	AA	BB	CC	DD (L)	EE (D)
0	**in.**	**0.43**	**0.81**	**2.26**	**2.26**	**0.375**	**2.50**	**1.37**	**1.37**	**0.38**	**3.25**	**4.25**	**1.60**	**0.38**	**1.50**	**1.33**	**1.43**
	mm	10.9	20.6	57.4	57.4	9.5	63.5	34.8	34.8	9.7	82.6	108	40.6	9.7	38.1	33.8	36.3
1	**in.**	**0.53**	**0.72**	**2.26**	**2.26**	**0.535**	**2.50**	**1.41**	**1.63**	**0.38**	**4.00**	**5.38**	**1.60**	**0.38**	**1.66**	**1.33**	**1.43**
	mm	13.5	18.3	57.4	57.4	13.6	63.5	35.8	41.4	9.7	101.6	136.7	40.6	9.7	42.2	33.8	36.3
2	**in.**	**0.53**	**0.87**	**3.38**	**3.11**	**0.375**	**4.00**	**1.74**	**2.06**	**0.63**	**5.00**	**6.00**	**2.49**	**0.63**	**1.81**	**2.04**	**2.09**
	mm	13.5	22.1	85.9	79	9.5	101.6	44.2	52.3	16	127	152	63.2	16	46	51.8	53.1



SCREW/BOLT (S) MOUNTING STYLE (Standard)

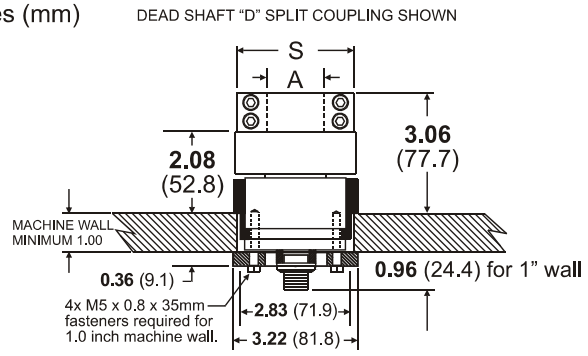


FLANGE (FL) MOUNTING STYLE (Option)

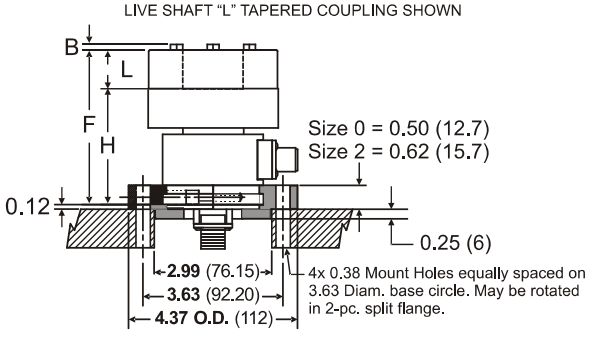


PILLOW BLOCK BRACKET (PB) MOUNTING STYLE (Option)

inches (mm)



THROUGH-FRAME (TF) MOUNTING STYLE (Option) Size 2 Only



PILOTED FLANGE (PFL) MOUNTING STYLE (Option)
SIZE 0 & 2 ONLY (Replaces industry standard RFC style bearings)

***Figure 3* - DIMENSIONS**

2.2 PRE-INSTALLATION REQUIREMENTS

A. TRANSDUCER ROLL

The Model C Transducers are used in pairs. One is mounted on each end of an idler roll shaft. The roll chosen is called the Transducer Roll.

1. **The Transducer Roll MUST be a true idler!** It can NOT be a driven roll! There can be NO brakes, clutches, belts, chains or gears attached to it or its shaft. It can not be a nip roll or be in contact with a nip roll. It can not be filled with water or have pipes or hoses attached to it. **Nothing must contact the roll or its shaft except the web!**
2. The Transducer Roll shaft may be non-rotating (use the D version transducer) or rotating (use the L version transducer). It must be designed and built for rotating service. Usually this means that it is straight, dynamically balanced and strong enough to resist bending from web tension forces.
3. The roll must be **Dynamically Balanced** if web speed is over 300 FPM! Refer to **Section 2.4** for specifications. An unbalanced roll will reduce the accuracy of the tension signal and may **DAMAGE** the transducers.

B. WRAP ANGLE

The web must always contact the transducer roll in exactly the same way. The wrap angle must not change as the unwind or rewind roll diameter changes. Therefore there must be at least one idler roll between the transducer roll and the unwind or rewind shaft. If the machine has more than one webbing path, be sure to choose a roll that is wrapped the same for each. Otherwise it will be necessary to install an additional pair of transducers, or dual calibration circuitry, or both. If the wrap angle is allowed to change, the transducer output will change with angle as well as tension, and accuracy will be reduced. Minimum wrap of 20° is required in most cases.

C. MOUNTING SURFACE.

The structure on which the transducers are mounted **MUST** be very stable and strong. Any movement of the structure may be sensed by the transducers and may cause inaccurate tension readings. The surfaces must also be smooth and flat so the transducers won't be crooked when they are installed.

The transducer is mounted on the machine frame by one of five methods; a single screw/bolt ("S", style), a four bolt flange ("FL"style), a pillow block bracket ("PB"), Through-frame ("TF"), and Piloted Flange ("PFL"). See below.

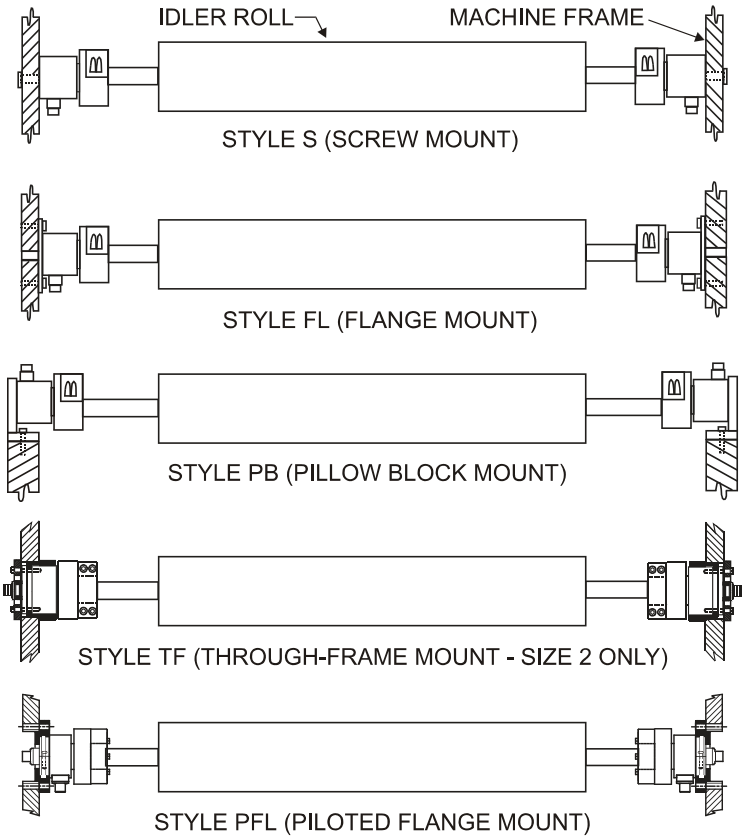


Figure 4 **- MODEL C MOUNTING STYLES**

D. TENSION ZONE.

The roll must be located in the tension zone which is to be monitored or controlled. The beginning or end of any tension zone is always at a nip (driven or braked), unwind shaft, rewind shaft or drag bar. Any element in the web path that can change web tension is at one end of a tension zone.

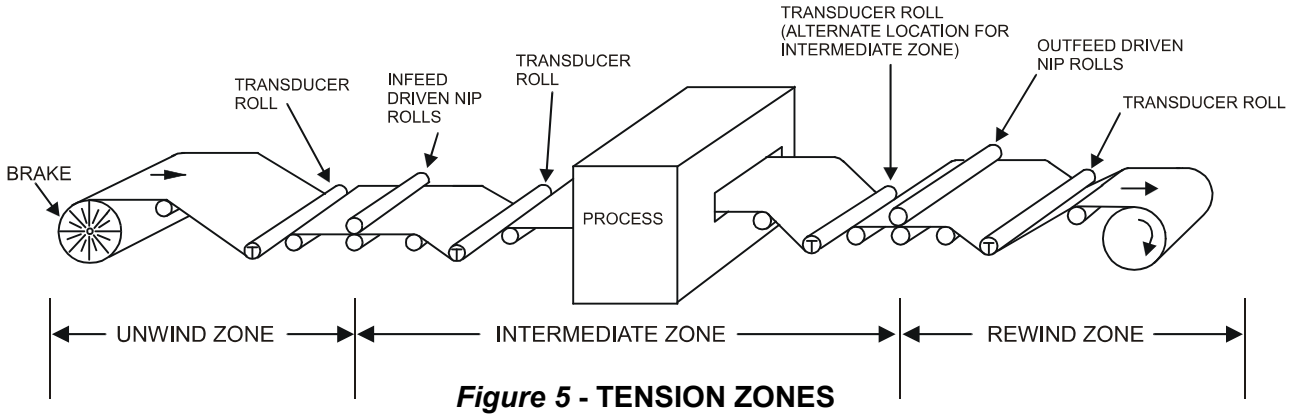


Figure 5 **- TENSION ZONES**

2.3 SELECTION OF LOAD RATING

1. LOAD RATINGS

The Model C Transducer is available in several standard load ratings, ranging from 10 lbs. to 800 lbs. The correct rating for any particular application depends on web tension, transducer roll weight, wrap angle, and the direction of the tension force on the transducer roll. Figure 6 below contains mathematical formulas which use these factors to determine the correct load rating.

2. SELECTION PROCEDURE

The correct load rating is found in four simple steps:

Step 1. OBTAIN DATA TO PLUG INTO THE SELECTION FORMULA

a. Weigh the transducer roll.

b. Estimate the maximum web tension. Use the Typical Tensions table in Appendix A as a guide if necessary.

c. Determine the wrap angle.

d. Determine the angle of the tension force, F_T, relative to the vertical. (**NOTE:** F_T bisects the wrap angle B)

Step 2. COMPUTE NET FORCE USING THE SELECTION FORMULA

Refer to Figure 6. Select the appropriate wrap configuration as determined by the direction of the tension force (above, below or on horizontal). Compute the Net Force, using the formula below the wrap diagram.

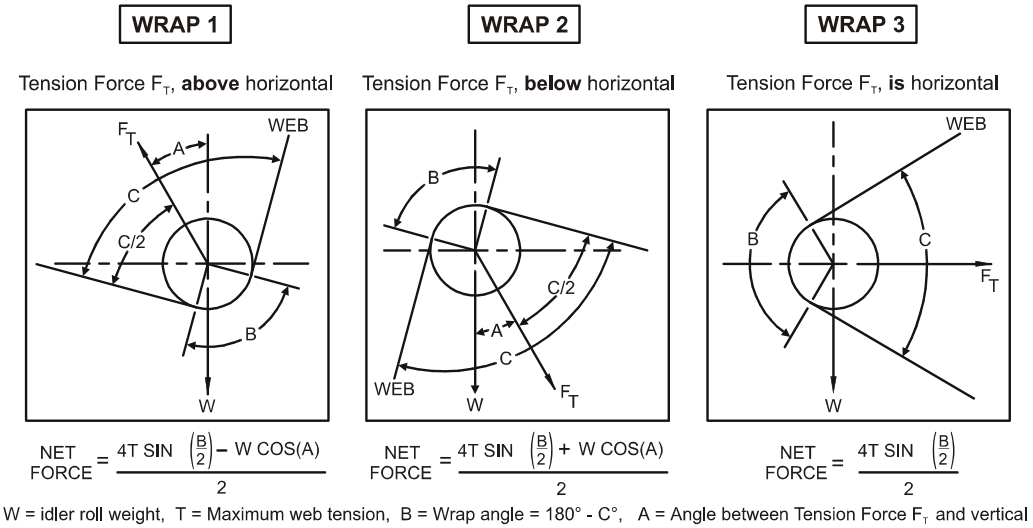


TABLE 1

Angle (Degrees)	SINE	COSINE
0	.000	1.000
5	.087	.996
10	.174	.985
15	.259	.966
20	.342	.940
25	.423	.906
30	.500	.866
35	.574	.819
40	.643	.766
45	.707	.707
50	.766	.643
55	.819	.574
60	.866	.500
65	.906	.423
70	.940	.342
75	.966	.259
80	.985	.174
85	.996	.087
90	1.000	.000

Figure 6 **- LOAD RATING SELECTION FORMULAS**

Step 3. SELECT THE LOAD RATING

Use chart below to select the correct load rating. In some cases, the load rating may be **LESS** than the computed Net Force. This is acceptable because the Net Force formula contains an oversizing factor of 2 for tension surges, which means that the actual force exerted on the transducer will not exceed its rating if the transducer is chosen according to the chart below. The actual force on the transducer will reach 125% of the load rating before hitting the safety stop gap.

LOAD RATING CHART	
NET FORCE (lb)	LOAD RATING (lb)
up to 13	10
14 - 32	25
33 - 63	50
64 - 125	100
126 - 187	150
126 - 250	200
251 - 500	400
501 - 1000	800

Step 4. COMPARE LOAD RATING WITH EFFECTIVE TRANSDUCER ROLL WEIGHT

Sometimes, a transducer roll is so heavy that its weight uses up most of the operating range of the transducers. When this happens, it may not be possible to adjust the tension indicating meter to read zero when tension is zero because the adjustment range of the electronic circuit has been exceeded. To find out if the roll is too heavy, compare the load rating with the effective weight of the roll as follows:

Refer back to the Net Force formula used in Section 2.3, Step 2, above. The effective roll weight on the pair of transducers is the "W Cos(A)" term in the formula. If W Cos(A) is more than 95% of the load rating chosen, the tension meter will probably not be adjustable to zero. If this is the case, one or more of the following changes must be made to reduce W Cos(A) to less than 95% of the load rating:

A. Reduce the transducer roll weight.

B. Increase angle (A). (See Figure 6).

C. Use the next higher load rating. (This is the least desirable choice because it reduces the transducer output signal).

2.4 INSTALLATION INSTRUCTIONS

Model C Transducers are very easy to install. For the Dead Shaft (D) version, both transducers are mounted on the machine and the roll is then installed in them. For the Live Shaft (S) version, the second transducer must be installed with the roll. Follow the simple steps below.

1. DETERMINE SHAFT LENGTH

Measure the distance between the machine frames (D)* where the transducers will be mounted. Use the appropriate formula below to determine the correct shaft length. The formulas allow approximately 1/16 inch (1.5mm) clearance at both shaft ends. This clearance is necessary for proper operation and for ease of installation and removal. **DO NOT ALLOW THE SHAFT TO CONTACT THE BOTTOM OF THE BORE.** (see Figure 7). ** for PB style, D is distance between PB bracket mounting hole centers*

SHAFT LENGTH CALCULATION			
SIZE	**STYLE S, FL**	**STYLE PB**	**STYLE BR**
0	L = D - 5 1/16 in (129 mm)	L = d - 3 7/16 in (87 mm)	N/A
1	L = D - 5 3/8 in (137 mm)	L = d - 3 9/16 in (90 mm)	N/A
2	L = D - 6 3/16 in (157 mm)	L = d - 4 3/8 in (111 mm)	L = d - 3 9/16 in (90 mm)
L = Shaft length in inches D = Distance between mounting surfaces in inches d = Distance between PB bracket mounting hole centers in inches			

2. BALANCE THE ROLL

The roll must be dynamically balanced if web speed is 300 FPM or more. Balance the roll to Quality Grade G-2.5 as described in ISO 1940 and ANSI S2.19-75 standards. If these standards are not available, please contact Dover Flexo Electronics and we will provide the appropriate data.

3. INSTALL THE ROLL AND TRANSDUCERS ON THE MACHINE

This part of the installation is different for the (D) and (L) versions. Use the procedure under letter A for the (D) version. Use the procedure under letter B for the (L) version. However, refer to Figure 7 for both versions for illustration of the shaft end clearance.

A. Installation Procedure for the D (dead shaft) Version:

1. Remove the cap from the shaft coupling by removing the coupling cap screws. Mount the transducers on the machine. If you are installing Mounting Style "S","FL", PFL, or "TF", leave the mounting bolts loose enough to allow the transducers to be turned easily by hand. If you are installing Mounting Style "PB", tighten the mounting bolts securely now.
2. Turn the couplings so that the roll shaft will rest in the bottom half of the coupling when installed. Lift and set the roll in place with the shaft ends resting in the bottom bushing halves of both transducer couplings.
3. Install the coupling caps (with the attached shaft bushings) but leave the screws loose.
4. Adjust the shaft depth to allow approximately 1/16 inch (1.5mm) end clearance in ONE transducer ONLY (see figure 7). Tighten the cap screws to clamp the shaft into the transducer coupling.

DO NOT TIGHTEN the cap screws on the other transducer yet! This must be done later in Section 2.4.5 - Tighten the Loose Transducer Coupling.

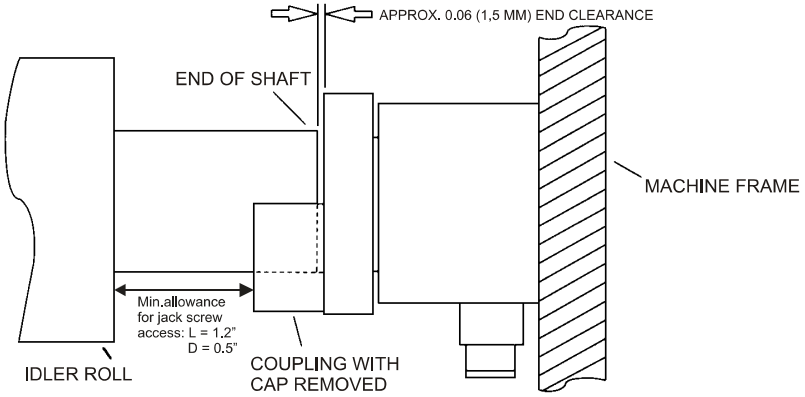


***Figure 7* - SHAFT END CLEARANCE**

B. Installation Procedure for the L (Live shaft) version:

IMPORTANT!! The coupling cap has been made removable to allow the roll shaft to be taken out without loosening the transducers from the machine frame. The cap **MUST NOT** be used to clamp the roll shaft! The cap must be tightened before the bushing clamp is tightened. If it isn't, severe shaft run-out will occur. Follow the procedure below.

1. Remove the coupling cap, bushing clamp, and shaft bushing from each transducer. Note: Each cap should be kept paired with the coupling from which it was removed to ensure bushing clamp alignment.
2. Slide the bushing clamps and then the shaft bushings onto each end of the idler roll shaft.
3. Position the idler shaft in the transducers to allow approximately 1/16 inch (1.5mm) end clearance in ONE transducer ONLY. (See Figure 7).
4. Slide the shaft bushing over the shaft and into the transducer coupling until the bushing touches the bottom of the bore. It may help to mark the exposed shaft at this time so the 1/16 inch end clearance is ensured.
5. Slide the bushing clamp over the bushing as far as it will go without forcing it. The bushing clamp helps position, but MUST NOT interfere with the cap installation.
6. Start the three bushing clamp screws into the coupling. Do not tighten them yet! This will be done later.
7. Place the coupling cap for this coupling over the bushing clamp and install the two cap screws that fasten the cap to the body. Tighten them securely.

PERFORM THE FOLLOWING STEPS ON ONE TRANSDUCER ONLY

8. Start the three bushing clamp screws that screw into the cap.
9. Tighten all six bushing clamp screws ALTERNATELY AND PROGRESSIVELY ½ turn at a time to lock the shaft into the transducer. For heavy transducer rolls it is helpful to rotate the shaft and coupling together while tightening the six clamp screws to assist in centering the weight in the tapered bushing and clamp. (Be sure the other end of the transducer roll is supported so that it will not fall as the coupling rotates.)

   DO NOT TIGHTEN the bushing clamp screws on the second transducer yet! This must be done later, in Section 2.4.5 - Tighten the Loose Transducer Coupling.

4. ORIENTATE THE TRANSDUCERS (see Figure 8)

The transducers must be turned so the Tension Force arrow (or the notch on the rear edge of the beam) points in the same direction as the Tension Force.

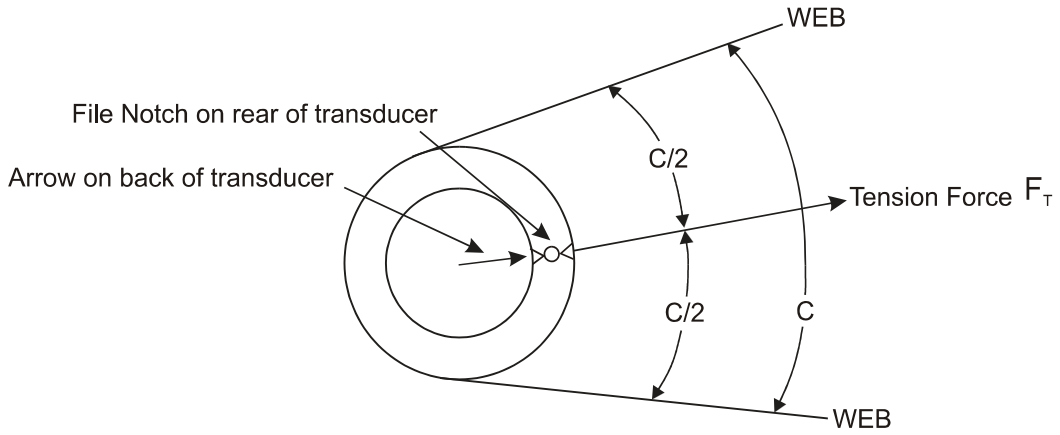


Figure 8 **- TENSION FORCE DIRECTION**

If you are installing "S", "FL","PFL", "TF" style transducers, turn both transducers by hand (do NOT use a wrench) so the arrow (or notch) bisects the wrap angle. Tighten all mounting bolts.

If you are installing "PB" bracket style transducers, the transducer is already assembled with the force direction orientation specified when purchased. It can be aligned more accurately by loosening the clamp bolt on top of the bracket and turning the transducers by hand. (Pry the top of the bracket open with a screwdriver if necessary) Re-tighten the clamp bolt.

5. TIGHTEN THE LOOSE TRANSDUCER COUPLING (follow the instructions below very carefully)

For any tension transducer to operate properly, there must be some axial (along the idler shaft) movement capability to allow for shaft deflection and length variations caused by temperature fluctuations. The Model C transducer is designed with approximately 0.040 inches (1.0mm) of axial compensation per transducer with a maximum of 0.080" (1.5mm) per pair. To preserve this capability, follow the instructions below. A normal installation will have about 0.040" (1.0 mm) of axial movement. The D version coupling should also have a small amount of rotational free play. See Figure 10.

A. Procedure for the D (dead shaft) version: Refer to Figure 9A. Remember, the left end transducer is tightly clamped to the shaft and the right end coupling cap is loose.

1. Pull the roll toward the loose coupling on the right end while pushing this coupling away from the roll.
2. Rotate the shaft and the loose coupling a small amount by hand in the same direction until they both stop.
3. Tighten the coupling cap screws alternately and progressively ½ turn at time to clamp the shaft into the transducer coupling.

B. Procedure for the L (live shaft) version:

1. Install the coupling cap securely tightened as in 2.4.3, B4-8. Loosely start the six bushing clamp screws. Tighten screws as in 2.4.3, B9 (they are pictured in Figure 11). Refer to Figure 9A. Remember, the left end transducer is tightly clamped to the shaft and the right clamp is loose.
2. Pull the roll toward the loose coupling on the right end while pushing this coupling away from the roll and tighten the six bushing clamp screws ALTERNATELY AND PROGRESSIVELY 1/2 turn at a time, to clamp the shaft into the transducer coupling.

C. **Special procedure for Hot Installations**: If the idler roll is exposed to high temperatures (from a hot web, for example), it may be advisable to maximize the axial play to allow the shaft length to expand more without danger of preloading the transducers. To increase axial play to the maximum; follow the procedures in 5A. or 5B, BUT push the loose coupling toward the roll instead of away from it. Refer to Figure 9B. This will double the available axial expansion capability as compared to the normal installation procedures.

If shaft length is correct and installation has been done correctly, you will be able to move the idler roll shaft axially at least 0.040 inch (1.0mm). **THE AXIAL MOVEMENT IS ESSENTIAL TO THE PROPER OPERATION OF THE TRANSDUCERS! VERIFY THE AXIAL MOVEMENT NOW.** Use a feeler gage placed in the gap between the shaft coupling and beam housing to measure the movement (see Figure 10). On PB style mounting there is some adjustment to this movement with the clearance holes of the mounting bolts. **NOTE:** If you used the special procedure for hot installations, you will not be able to measure any axial movement until the idler roll gets hot.

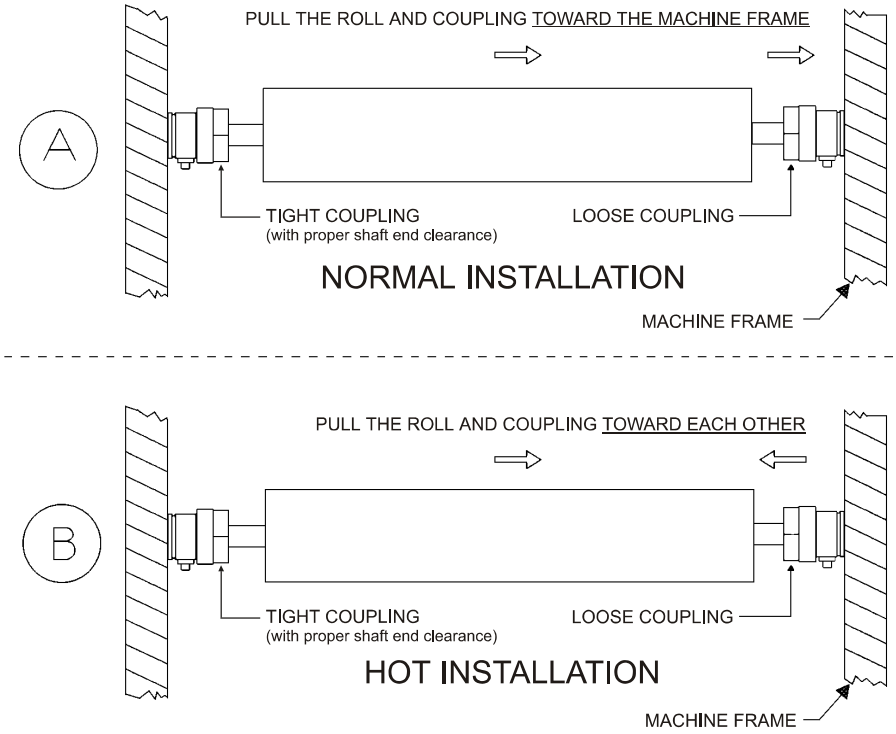


Figure 9 **- ADJUSTING FOR AXIAL PLAY**

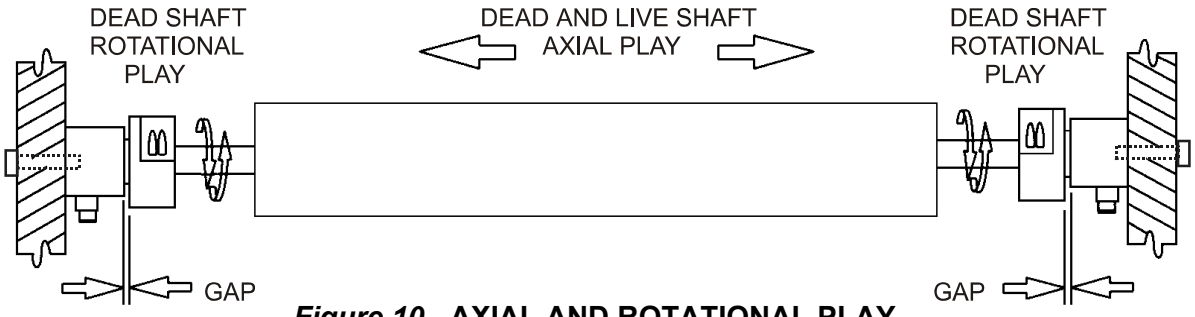


Figure 10 **- AXIAL AND ROTATIONAL PLAY**

If no movement can be detected, loosen one shaft coupling and repeat the installation procedures, Section 2.4.3, A or B.

Also verify the rotational free play (D version, only) at this time, see Figure 10. Not much is needed, only enough to be able to feel. If none is detected, loosen one shaft clamp and turn both the idler shaft and the loose coupling in the SAME direction. Then re-tighten the clamp.

The rotational and axial movements eliminate the possibility of mechanically pre-loading the transducers. Pre-loading causes non-Linearity, zero-drift, and loss of calibration.

NOTE: It is important for accuracy and safety that the cap screws on D version and bushing clamp screws on L version, be tightened firmly.

6. CHECK THE GAP FOR BEARING AXIS ALIGNMENT (see Figure 10)

Up to 2° of bearing axis alignment is acceptable in dead shaft applications. Bearing mis-alignment will cause premature failure in live shaft applications.

Measure the gap between the shaft coupling and the beam housing in at least four places equally spaced around the circumference of each transducer. A mis-alignment of 2° will measure 0.056 difference in clearance to the beam housing around the opposite side of circumference. Shim or reposition the transducers at the mount surface as necessary. If shims are installed, check the axial movement again. Refer to step 5 for the procedure. Be sure the correct axial movement is present.

2.5 REMOVAL OF ROLL AND/OR TRANSDUCERS

To remove the transducers, first support the idler roll so it won't fall. Then, follow the appropriate procedure below to remove the roll shaft from the transducers.

A. Procedure for the D (dead shaft) version:

1. Remove the four screws from the coupling cap on each transducer and lift off the cap.
2. Take the roll out of the transducers.

B. Procedure for the L (live shaft) version:

1. Remove the six bushing clamp screws from each transducer coupling.
2. Thread two of the screws into the jack holes in the bushing clamp (see Figure 11). Turn until finger-tight.

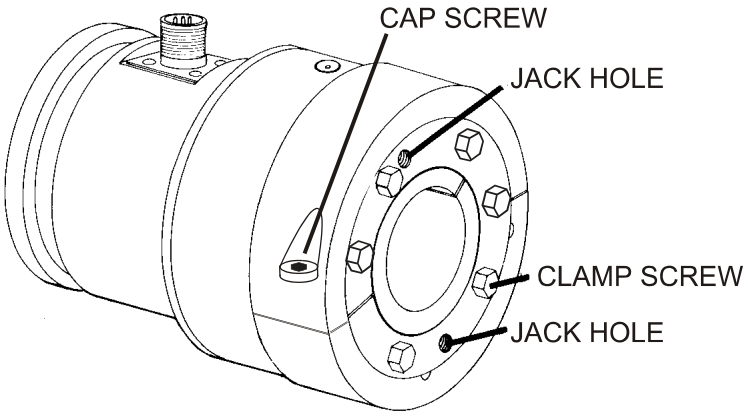


Figure 11 **- LOCATION OF COUPLING JACK HOLES**

5. Alternately tighten each screw a half turn at a time to back the bushing clamp out of the coupling until the cap, bushing and bushing clamp are loose.
6. Remove the two screws from the coupling cap on each transducer and lift off the cap.

   Note: The cap and coupling body are made as one piece and should be kept paired together.

2.6 ELECTRICAL OPERATION

The Model C Transducer is used in pairs, one on each end of an idler roll shaft. Web tension exerts a force on the roll which is transmitted to the cantilever beam by the shaft coupling. Two semiconductor strain gages are mounted on the beam, one on the top and one on the bottom. As force is applied and the beam deflects, the top gage is stretched and the bottom gage is compressed. This increases the electrical resistance of the top gage and decreases the resistance of the bottom gage. The gages in both transducers are electrically connected together in a Wheatstone bridge configuration. The output from the bridge is the sum of the output from the two transducers. Therefore, web position, width and loose or tight edges do not affect the accuracy of the tension signal.

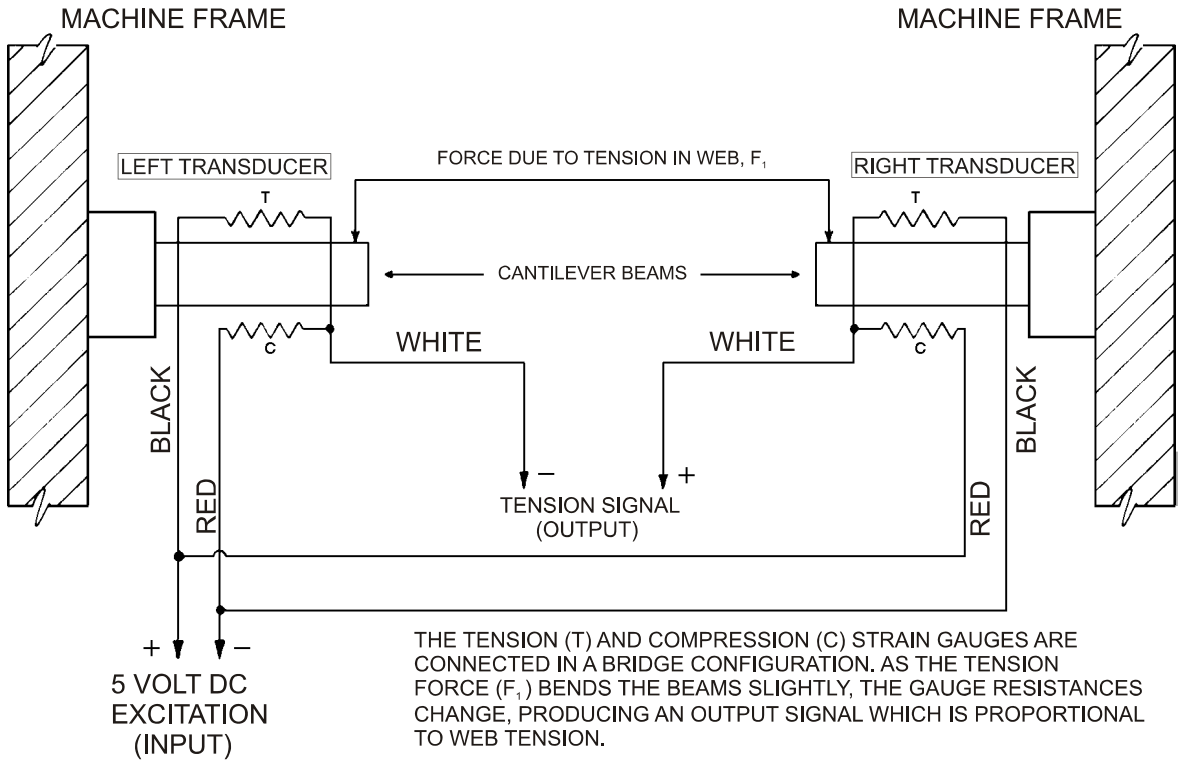


***Figure 12* - STRAIN GAGE CONNECTIONS**

The physical location of the strain gages, on opposite sides of the beam, ensures that each gage experiences the same temperature variations. This, and the Wheatstone bridge configuration, provides automatic temperature compensation and a stable output.

The strain gages are high output semiconductor devices which typically have an output sixteen times greater than the inexpensive foil gages used in some transducers. Therefore, the signal amplifier used with these Model C transducers is a very stable low-gain design. An added benefit of the high output is inherent immunity to electrical noise.

SECTION 3 CALIBRATION AND SETUP

3.1 INTRODUCTION

There are no calibration adjustments on the Model C Transducer itself. The instructions below are for the electronic device which the transducers are connected to. All of the terminology and procedures, following, assume that the transducers are connected to a **DOVER FLEXO ELECTRONICS** tension controller or tension indicator. If some other device is being used, you should follow the instructions furnished with it.

These are general instructions which are correct for most **DFE** controllers and indicators, and are placed here for your convenience. If you have any difficulty calibrating or if there is any discrepancy between these instructions and those in the Instruction Manual for the indicator or controller, you should disregard these instructions and follow the instructions in the Manual for the indicator or controller.

*The transducers must be properly installed and oriented as directed in **SECTION 2**, pages 7-10.*

3.2 ZERO THE TENSION METER

1. Turn the "POWER" switch off. If the meter does not read zero, turn the mechanical adjustment screw on the meter face so the needle indicates zero tension.
2. Find an object of some kind that weighs at least 25% of the maximum value on the tension meter scale. (Be sure you know the exact weight). Calculate the exact ratio of this calibration weight and the expected web tension.
3. Find a rope, tape, or wire that will support the weight in 2. above.
4. Verify that there is no web contacting the Transducer Roll. Turn the "POWER" switch on. Wait for about five minutes for the tension meter to settle. Turn the "CALIBRATE" pot. to approximately 75%. Then, turn the "ZERO" pot. so the tension meter reads zero tension.

3.3 CALIBRATE THE TENSION METER

See Figure 13. Pass the rope over the Transducer Roll in exactly the same path as the web follows. Tie the end in the machine at least one idler roll beyond the Transducer Roll. Pass the other end by at least one idler roll before the Transducer Roll. Be sure the rope does not pass over any driven rolls, braked rolls, or dead bars. (This will cause in-accurate calibration). Attach the weight to the free end of the rope and let it hang without touching anything. **Wait for the weight to stop swinging**. Turn the "CALIBRATE" pot. so the tension meter reads the same ratio of scale as the ratio of the calibration weight and maximum tension calculated in Section 3.2.. Remove the weight and rope. This concludes the calibration procedure.

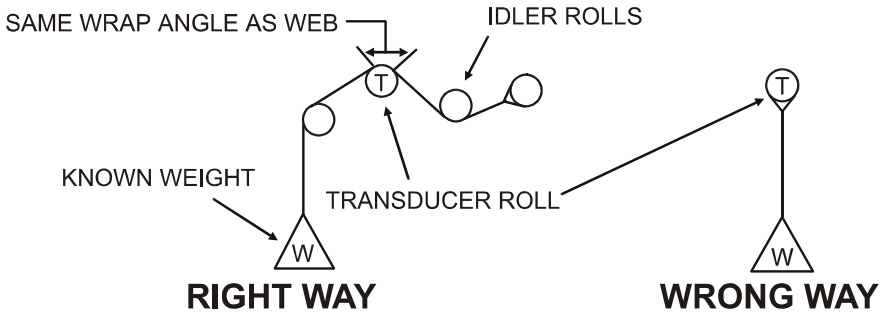


***Figure 13* - WEB PATH**

SECTION 4 CARE AND MAINTENANCE

Your Dover Flexo Model C Tension Transducers have been manufactured of quality materials. With proper application and installation your transducers will be relatively maintenance free and long lasting. Any changes in your application which affect the dynamics of your equipment such as web speed, net force, material, etc. could possibly require upgrading of load rating or roll change. Contact Dover for specific information and engineering approval.

4.1 BEARING LIFE

The coupling bearing in the L (live or rotating shaft) version of the Model C transducer will turn continuously in normal operation. It has been selected to give a long service life under typical operating conditions if properly maintained with lubrication.. Use the formulas below, or the nomogram on the next page, to find the L_{10} life, in hours, for your application.

To find the radial load (P) for your application, use the appropriate sizing formula in Figure 6 on page 6, substituting 2 for the 4 in the numerator to eliminate the oversizing factor.

RPM = 3.82 x web speed in feet per minute/diameter of transducer roll in inches.

(RPM = 318.3 x web speed in meters per minute/diameter of transducer roll in millimeters).

BEARING SPECIFICATIONS			
Size	**Bearing Type**	**Rated Load (C)**	**Maximum Speed (RPM)**
0	ball	1990 lbs (8840 N)	18,700
1	ball	1990 lbs (8840 N)	18,700
2	ball	3510 lbs (15600 N)	11,050

LIFE CALCULATION FORMULAS *(where P is radial load as described above)*

$L_{10} = (16667 / RPM) \times (C / P)^3$, for ball bearings

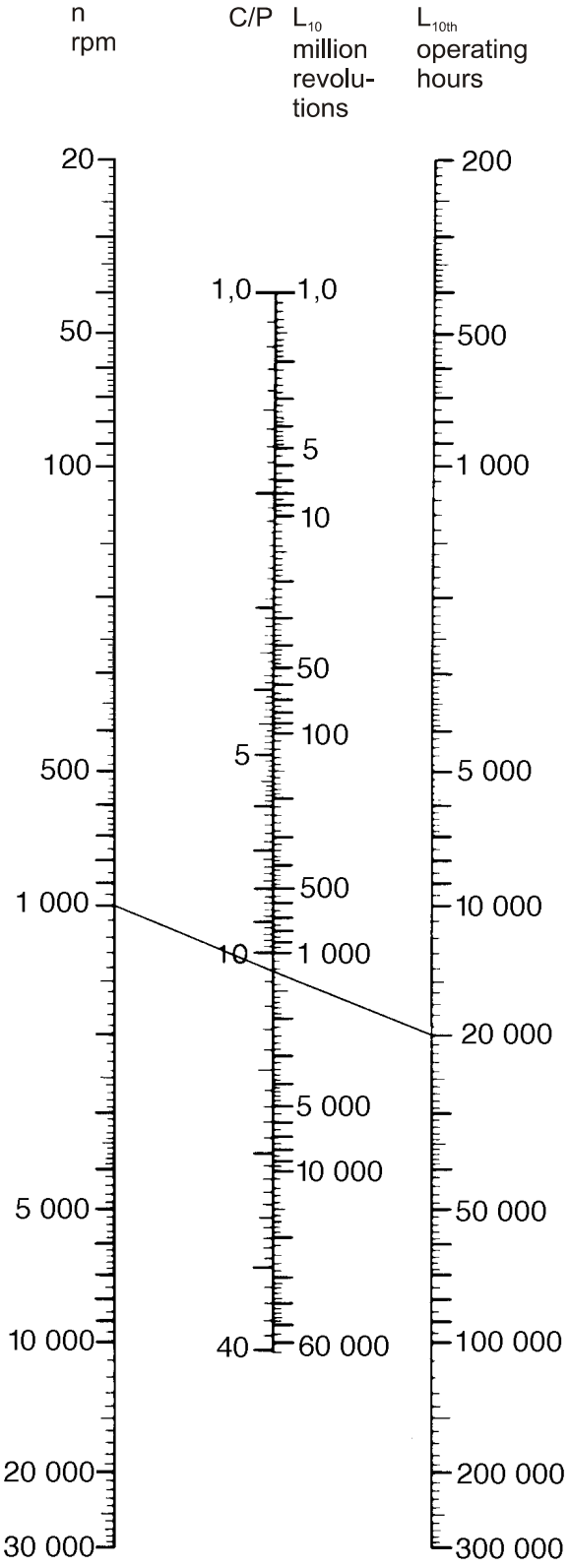
An L_{10} life of 20,000 to 30,000 hours is usually considered satisfactory for web process machinery such as printing presses, coaters, etc.

If preferred, the bearing life nomogram (Figure 14) on the next page can be used instead of the formulas. The result will be the same.

TO USE THE NOMOGRAM:

1. Use the left set of three scales for ball bearings, the right set for roller bearings.
2. Compute the speed of the bearing, in RPM.
3. Compute the ratio C/P.
4. Find the speed on the left scale. Mark it.
5. Find the value of C/P on the middle scale. Mark it on the left side of the middle scale.
6. Connect the two marks with a straight line extending to the right scale. Read the L_{10} life on the right scale where the line intersects it.

BEARING LIFE NOMOGRAM



This life is expected to be exceeded by 90% of the bearings.
The median life is approximately five times as long.

Figure 14 **- BEARING LIFE NOMOGRAM**

4.2 LUBRICATION

The coupling bearing is lubricated at the factory with a high quality light grease. For the D version only, this should be adequate for the life of the transducer.

1. PROCEDURE

The grease fitting is a flush-to-the surface type. (See Figure 15 for location). Use a hand operated push-type grease gun and fill the housing only 1/3 to ½ full (see chart below for housing capacity). Too much grease will increase friction, causing the transducer to turn hard. It also causes churning, resulting in separation of the grease components, breakdown in lubricating value and excessive temperature. Grease life is halved with every 25°F (14°C) increase in temperature and is doubled with every 25°F (14°C) reduction in temperature. Please read the CAUTION in 4. SEALS on next page.

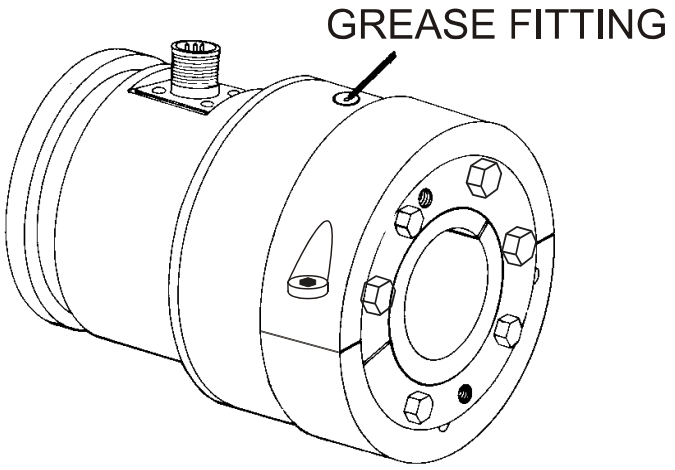


Figure 15 **- GREASE FITTING LOCATION**

GREASE CAPACITY CHART	
Size 0,1	0.21 oz. (6.2 cc)
Size 2	1.0 oz. (29.6 cc)

2. RECOMMENDED GREASE

The grease should be a non-fibrous NLGI No.2 grade. The thickener should be a lithium or lithium complex soap for resistance to water and high temperature. Greases with a polyurea thickener are also suitable. In any case, the maximum rated operating temperature of the grease should be at least 250°F (104°C). The following are some that meet these requirements:

MOBIL	Mobilith AW2
SHELL	Darina 2
KEYSTONE	81EP-2 and Zeniplex 2
TEXACO	Premium RB
LUBRIPLATE	630-2 and 1200-2
CHEVRON	SRI-2

(**DOVER FLEXO ELECTRONICS** uses Mobil Mobilith AW2)

3. LUBRICATION SCHEDULE

The bearing should be re-lubricated periodically. How often depends on the speed and operating temperature of the bearing. These are different for every application, so it is not possible to offer a single recommendation for every case. We recommend re-greasing every six months of single-shift per day operation. More often if speeds and temperatures are higher than usual. (Recall the effects of high temperature mentioned in Section 4.2.1, and the bearing life section 4.1 requires proper lubrication) If there is an established lubrication schedule for the other bearings on the machine it should be satisfactory for the transducer bearings as well.

4. SEALS (refer to Figure 1 on page 1)

The bearing cavity is closed except for the back which is covered by a seal. The standard seal is a rubber lip type which will allow pressure or excess grease to escape around its edge during re-lubrication.

The optional seal is a metal labyrinth type. **CAUTION!** IT MAY CLOSE TIGHTLY DURING RE-LUBRICATION AND PREVENT PRESSURE OR EXCESS GREASE FROM ESCAPING! Care should be taken to avoid over-pressurizing the bearing cavity! This could cause the seal to rupture or deform, causing friction. Use a hand operated push-type grease gun to prevent damage. If you feel resistance to the grease flow, reduce the force you are using and push more slowly. If this doesn't work, push the shaft coupling axially in one direction and try again. If it still doesn't work, try the other direction. Moving the coupling axially will open the seal and allow pressure or excess grease to escape. Remember, the housing should only be 1/3 to ½ full of grease. See previous page.

SECTION 5 TROUBLESHOOTING

This is a list of problems which could occur during initial start-up or afterwards. The probable causes are listed with the most likely one first and the least likely one last.

1. **TRANSDUCER ROLL SHAKES, VIBRATES, or BOUNCES**
   a. Roll is not balanced. See Section 2.4.2 page 8 and Section 2.2 page 5.
   b. Shaft is not clamped tightly in transducers. Coupling screws are loose or shaft diameter is undersize.
   c. Transducer mounting bolts are not tight.
   d. Shaft is too weak or there is too much shaft extension between the ends of the roll and the transducers.
   e. Shaft is bent or too weak.
   f. Roll is turning at its natural frequency. Call our **TECHNICAL SERVICE DEPARTMENT** for analysis of operating conditions and solution to problem.

2. **CAN NOT ADJUST TENSION METER TO READ ZERO WHEN WEB IS SLACK**
   a. Transducer roll is too heavy. See Section 2.3.2, Step 4 on page 7.
   b. Transducers are pre-loaded. See Section 2.4.1 page 7 and 2.4.5 page 9.

3. **TENSION METER READS BACKWARDS**
   a. Transducers are installed backwards with force arrow pointing in opposite direction. See Section 2.4.3 page 8.
   b. Transducer cables are connected wrong at controller/indicator terminal strip. Signal wires are reversed.

4. **TENSION METER NEEDLE PEGS HIGH OR LOW**
   a. Meter is not electrically adjusted to zero. See Section 3.2 page 13.
   b. Transducers are pre-loaded. See Section 2.4.1 page 7 and 2.4.5 page 9.
   c. Transducer cable has broken wire, poor connection or short circuit.
   d. A strain gage has failed. To verify: Unplug the transducer cable and use an ohm-meter to measure the resistance of the gages at the connector on the transducer. Measure between pins A,B, and A,C. In each case, the resistance should be about 100 ohms. Measure the resistance between any pin and the outside of the transducer. The meter should read infinite resistance. Apply a force to the roll by hand or by using a rope and a weight, in the direction of the tension force and maintain it while again measuring between pins A,B and A,C. The resistance should be only a few ohms different from before.
   e. Failure in the tension amplifier circuit of the controller/indicator.

5. **TENSION METER DOES NOT READ ZERO WHEN WEB IS SLACK AND READING DRIFTS WITH TIME.**
   a. Meter is not calibrated. See Section 3.3 page 13
   b. Transducers are pre-loaded. See Section 2.4.1 page 7 and 2.4.5 page 9.
   c. The structure the transducers are mounted on is weak. See Section 2.2 page 5.
   d. Transducer cable has a broken wire, poor connection or short circuit.
   e. A strain gage is cracked. Perform the test in 4d above.

6. **TENSION METER DOES NOT READ THE SAME EACH TIME THE SAME FORCE IS APPLIED** (poor repeatability)
   a. Transducers are pre-loaded. See Section 2.4.1 page 7 and 2.4.5 page 9.
   b. The structure the transducers are mounted on is weak. See Section 2.2 page 5.
   c. The shaft coupling cap screws are loose.

7. TENSION METER READING DOES NOT CHANGE WHEN FORCE IS APPLIED TO ROLL. METER READS ZERO.

a. Meter is not calibrated. See Section 3.3 page 13.
b. Gap between shaft coupling and beam housing is not even. See Section 2.4.6 page 11.
c. Transducer roll is too heavy. See Section 2.3.2, Step 4, page 7.
d. Transducer cable has broken wire, poor connection or short circuit.
e. Transducer cables connected incorrectly, or to wrong transducers.
f. Failure of tension amplifier circuit in controller/indicator. Unit not turned on.

8. TENSION METER NEEDLE BOUNCES

a. Web tension is fluctuating because of machine speed fluctuations, bent roll shafts, worn idler roll bearings, chattering unwind brake, flat spot in unwind or rewind roll, etc.
b. Shaft is loose in the transducers. Shaft coupling cap screws are loose or shaft diameter is under-size.
c. Transducer mounting bolts are loose.
d. Tension controller is not adjusted properly. See controller Instruction Manual for procedure.

SECTION 6

REPLACEMENT PARTS

(DFE P/N)

PART	SIZE 0, 1	SIZE 2
Electrical Connector	Amphenol Number MS3102A - 10SL - 3S (106-0070)	
Connector Screws	M3 x 16 Socket Button Head (123-0215)	
Bearing Retainer Screws	M2 x 8 (123-0389)	M3 x 10 (123-0210)
Seals:	BUNA - N VITON	BUNA - N VITON
Flat Housing L & D Type	(503-0001) (503-0159)	(503-0002) (503-0119)
Flat Coupling D Type only	(503-0213) -------	------ (503-0263)
Lip L & D Type	(117-0001) (117-0004)	(117-0002) (117-0003)
Teflon Disc L Type only	--- (501-0349) ---	--- (501-0349) ---
Shaft Bushing D & L Type	Specify bore	Specify bore
Coupling Cap Screws D & L Type	M5 x 10 (123-0081)	M6 x 20 (123-0214)
Bushing Clamp Screws (L type)	M4 x 12 hex head (123-0232)	M6 x 25 hex head (123-0391)

NOTE: All screws are steel socket head, metric, grade 12.9, coarse thread unless otherwise noted.

Call **Customer Service** for prices and for part numbers of items not listed. For help with service or repairs, call **Technical Service.**

DOVER FLEXO ELECTRONICS

Telephone: 603-332-6150

Fax: 603-332-3758

TOOLS NEEDED FOR DISASSEMBLY

The following metric socket screw keys are the only tools normally needed for assembly or disassembly of the Model C transducer.

Screw Size	Key Size (mm)	Transducer Size
M1.6 / M2	1.5	0, 1
M3 button head	2.0	0, 1, 2
M3	2.5	0, 1, 2
M4	3.0	0, 1
M5	4.0	0, 1, 2
M6	5.0	2

MODELS C, RS, AND F TRANSDUCERS

THE TENSION (T) AND COMPRESSION (C) STRAIN GAGES ARE CONNECTED IN A BRIDGE CONFIGURATION. AS THE BEAMS BEND SLIGHTLY UNDER WEB TENSION, THE GAGE RESISTANCES CHANGE PRODUCING AN OUTPUT SIGNAL WHICH IS DIRECTLY PROPORTIONAL TO THE WEB TENSION.

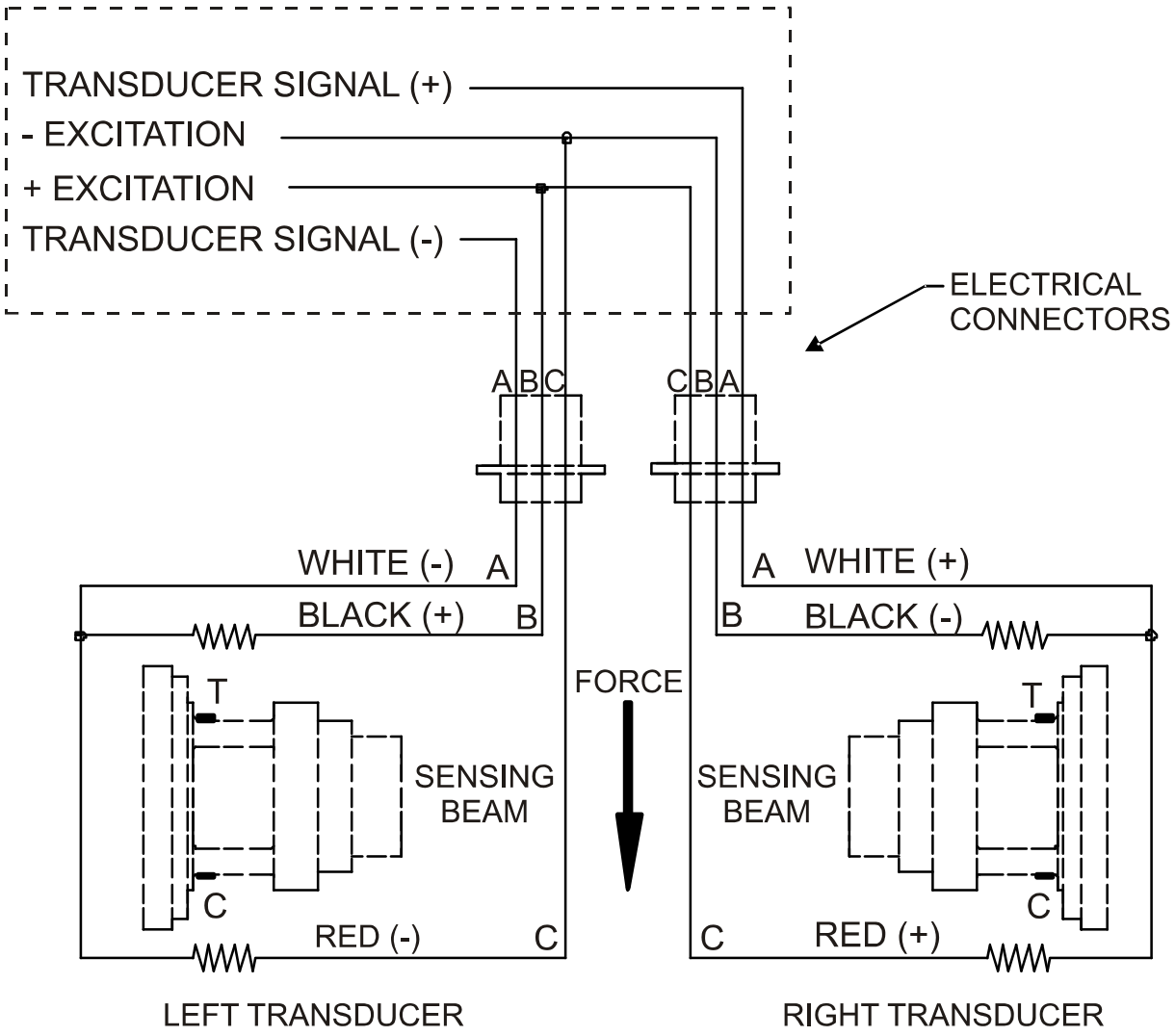


Figure 16 **- MODEL C TRANSDUCER WIRING**

Appendix B: Typical Tensions for Various Materials

TYPICAL TENSIONS FOR WEB MATERIALS

ACETATE		0.5 lb. per mil per inch of width
FOIL	Aluminum	0.5 lb. per mil per inch of width
	Copper	0.5 lb. "
CELLOPHANE		0.75 lb. per mil per inch of width
NYLON		0.25 lb. per mil per inch of width
PAPER	15 lb *	0.4 lb. per inch of width
	20 lb	0.5 lb. "
	30 lb	0.75 lb. "
	40 lb	1.25 lb. "
	60 lb	2.0 lb. "
	80 lb	3.0 lb. "
	100 lb	4.0 lb. "
* based on 3000 sq. ft. ream		
PAPERBOARD	8pt	3.0 lb. per inch of width
	12pt	4.0 lb. "
	15pt	4.5 lb. "
	20pt	5.5 lb. "
	25pt	6.5 lb. "
	30pt	8.0 lb. "
POLYETHYLENE		0.12 lb. per mil per inch of width
POLYESTER (Mylar)		0.75 lb. per mil per inch of width
POLYPROPYLENE		0.25 lb. per mil per inch of width
POLYSTYRENE		1.0 lb. per mil per inch of width

RUBBER	GAUGE	AT 25% STRETCH	AT 50% STRETCH
	10 mil	1.75	3.68
	12 mil	1.10	2.03
	16.5 mil	4.09	8.17
	26 mil	2.47	4.97
SARAN		.15 lb per mil per inch of width	

STEEL	GAUGE - INS	UNWIND-PSI	REWIND-PSI
	.001 -.005	1000	4000
	.006 -.025	850	3500
	.026 -.040	750	3000
	.041 -.055	650	2600
	.058 -.070	550	2200
	.071 -.090	450	1800
	.091 -.120	450	1400
	.121 -.140	400	1200
	.141 -.165	400	1000
	.166 -.200	400	900
	.201 -.275	400	800
	.276 -.380	300	700

VINYL	0.05 lb. per mil per inch of width

*** For laminated webs, sum the tension for the individual webs and add 0.1 lb per inch of width.

TERMS AND CONDITIONS OF SALE AND SHIPMENT

1. THE COMPANY
Dover Flexo Electronics, Inc. is hereinafter referred to as the Company.

2. CONFLICTING OR MODIFYING TERMS
No modification of, additions to or conflicting provisions to these terms and conditions of sale and shipment, whether oral or written, incorporated into Buyer's order or other communications are binding upon the Company unless specifically agreed to by the Company in writing and signed by an officer of the Company. Failure of the Company to object to such additions, conflicts or modifications shall not be construed as a waiver of these terms and conditions nor an acceptance of any such provisions.

3. GOVERNING LAW
This contract shall be governed by and construed according to the laws of the state of New Hampshire, U.S.A. The parties agree that any and all legal proceedings pursuant to this contract shall take place under the jurisdiction of the courts of the State of New Hampshire in the judicial district of Strafford County.

4. PENALTY CLAUSES
Penalty clauses of any kind contained in orders, agreements or any other type of communication are not binding on the Company unless agreed to by an officer of the Company in writing.

5. WARRANTY
Dover Flexo Electronics, Inc. warrants, to the original Buyer, its' products to be free of defects in material and workmanship for five years from date of original shipment. Repairs on products are warranted for 90 days from date of shipment. During the warranty period the Company will repair or replace defective products free of charge if such products are returned with all shipping charges prepaid and if, upon examination, the product is shown to be defective. This warranty shall not apply to products damaged by abuse, neglect, accident, modification, alteration or mis-use. Normal wear is not warranteed. All repairs and replacements under the provisions of this warranty shall be made at Dover Flexo Electronics or at an authorized repair facility. The Company shall not be liable for expenses incurred to repair or replace defective products at any other location or by unauthorized persons or agents. This warranty contains all of the obligations and warranties of the Company. There are no other warranties, either expressed or implied. No warranty is given regarding merchantability or suitability for any particular purpose. The Company shall not be liable in either equity or law for consequential damages, losses or expenses incurred by use of or inability to use its' products or for claims arising from same. No warranty is given for products of other manufacturers even though the Company may provide these products with its' own or by themselves. The provisions of this warranty can not be changed in any way by any agent or employee of the Company. Notice of defects must be received within the warranty period or the warranty is void. The warranty is void if the serial number tag is missing or not readable.

6. PAYMENTS
Standard terms of credit are net 30 days from date of shipment, providing satisfactory credit is established with the Company. Amounts past due are subject to a service charge of 1.5% per month or portion thereof or 18% per annum. The Company reserves the right to submit any unpaid late invoices to a third party for collection and Buyer shall pay all reasonable costs of such collection in addition to the invoice amount. All quoted prices and payments shall be in U.S. Dollars.

If the Company judges that the financial condition or payment practices of the Buyer does not justify shipment under the standard terms or the terms originally specified, the Company may require full or partial payment in advance or upon delivery. The Company reserves the right to make collection on any terms approved in writing by the Company's Finance Department. Each shipment shall be considered a separate and independent transaction and payment therefore shall be made accordingly. If the work covered by the purchase order is delayed by the Buyer, upon demand by Company payments shall be made on the purchase price based upon percentage of completion.

7. TAXES
Any tax, duty, custom, fee or any other charge of any nature whatsoever imposed by any governmental authority on or measured by any transaction between the Company and the Buyer shall be paid by the Buyer in addition to the prices quoted or invoiced.

8. RETURNS
Written authorization (MRA) must be obtained from the Company's factory before returning any material for which the original Buyer expects credit, exchange, or repairs. Material returned for credit must be unused, received back within 30 days of original ship date and shall be subject to a re-stocking charge of 15%. Special Product Requests (SPRs), product manufactured specially to customer specifications, and non-DFE product purchased on customer behalf shall not be returnable for any reason. All material returned, for whatever reason, shall be sent with all freight charges prepaid by the Buyer.

9. SHIPPING METHOD AND CHARGES
All prices quoted are EXW the Company's factory. The Company shall select the freight carrier, method and routing. Shipping charges are prepaid and added to the invoice of Buyers with approved credit, however the Company reserves the right to ship freight-collect if it prefers. Shipping charges will include a charge for packaging. Company will pay standard ground freight charges for items being returned to Buyer which are repaired or replaced under the Warranty. Claims of items missing from a shipment must be received, in writing, within 30 days of original shipment

10. CANCELLATION, CHANGES, RESCHEDULING
Special Product Requests (SPRs), product manufactured specially to customer specifications, and non-DFE product purchased on customer behalf shall not be returnable for any reason. Buyer will be subject to a 15% fee for any standard item on order with the Company which is cancelled by the Buyer. A one-time hold on any item ordered from the Company shall be allowed for a maximum of 30 days. After 30 days, or upon notice of a second hold, Company shall have the right to cancel the order and issue the appropriate cancellation charges which shall be paid by Buyer. Items held for the Buyer shall be at the risk and expense of the Buyer unless otherwise agreed upon in writing. Company reserves the right to dispose of cancelled material as it sees fit without any obligation to Buyer. If Buyer makes, or causes to make, any change to an order the Company reserves the right to change the price accordingly.

11. PRICES
Prices published in price lists, catalogs or elsewhere are subject to change without notice and without obligation. Written quoted prices are valid for thirty days only.

12. EXPORT SHIPMENTS
Payment for shipments to countries other than the U.S.A. and Canada or to authorized distributors shall be secured by cash in advance or an irrevocable credit instrument approved by an officer of the Company. An additional charge will apply to any letter of credit. There will also be an extra charge for packaging and documentation.

13. CONDITION OF EQUIPMENT
Buyer shall keep products in good repair and shall be responsible for same until the full purchase price has been paid.

14. OWNERSHIP
Products sold are to remain the property of the Company until full payment of the purchase price is made.

Rev.10 10/15/19

DECLARATION OF CONFORMITY

We,

Dover Flexo Electronics
217 Pickering Road
Rochester, NH 03867 USA
Tel: (603) 332-6150
Fax: (603) 332-3758

declare under our sole responsibility that the product:

Model C0/C1 Web Tension Transducer,

manufactured after the date 1 May 1997, and to which this declaration relates, is in conformity with the following standards or other normative documents:

EN 55011: Radiated and Conducted Emissions
EN 50082-2: Electromagnetic compatibility - Generic immunity standard,
Part 2. Industrial Environment, to include:
ENV 50140: Radio Frequency Immunity - AM
ENV 50141: Conducted Radio Frequency Interference
ENV 50204: Radio Frequency Immunity - Pulse Modulated
ENV 61000-4-2: Electrostatic Discharge
EN 61000-4-4: Electrical Fast Transient Bursts

following the provisions of Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the member states relating to electromagnetic compatibility (the "EMC Directive").

The Technical Construction File is maintained at:

Dover Flexo Electronics
217 Pickering Road
Rochester, NH 03867 USA

Per Annex II R of the Machinery Directive (89/392/EEC):
The machinery, product, assembly, or sub-assembly covered by this Declaration of Conformity must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the provisions of the applicable Directive(s).

Date of issue: 5 May, 1997
Place of issue: Rochester, NH USA

Signed: Alan H. Wysocki
Alan H. Wysocki, Engineering Manager

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DECLARATION OF CONFORMITY

We,

Dover Flexo Electronics
217 Pickering Road
Rochester, NH 03867 USA
Tel: (603) 332-6150
Fax: (603) 332-3758

declare under our sole responsibility that the product:

Model C2 Web Tension Transducer,

manufactured after the date 1 May 1997, and to which this declaration relates, is in conformity with the following standards or other normative documents:

EN 55011: Radiated and Conducted Emissions
EN 50082-2: Electromagnetic compatibility - Generic immunity standard,
Part 2. Industrial Environment, to include:
ENV 50140: Radio Frequency Immunity - AM
ENV 50141: Conducted Radio Frequency Interference
ENV 50204: Radio Frequency Immunity - Pulse Modulated
ENV 61000-4-2: Electrostatic Discharge
EN 61000-4-4: Electrical Fast Transient Bursts

following the provisions of Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the member states relating to electromagnetic compatibility (the "EMC Directive").

The Technical Construction File is maintained at:

Dover Flexo Electronics
217 Pickering Road
Rochester, NH 03867 USA

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Date of issue: 5 May, 1997
Place of issue: Rochester, NH USA

Signed: Alan H. Wysocki
Alan H. Wysocki, Engineering Manager

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NOTES

INDEX

DOVER FLEXO ELECTRONICS, INC.

307 PICKERING ROAD
ROCHESTER, NEW HAMPSHIRE 03867-4630 USA
TEL: 603-332-6150
FAX: 603-332-3758
E-mail: info@dfe.com Internet: www.dfe.com

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