DATA SHEET

THE TENSION CONTROL SPECIALISTS

MODEL C SERIES TENSION TRANSDUCER

Model C tension transducers are the industry standard in semiconductor strain gage web tension load cells. Available in five mounting styles: Screw, Flange, Pillow-Block, Pilot-ed-Flange and Through-Frame. These rugged and refined transducers can be configured to accommodate both live or dead shaft idler rolls and are available in three cartridge sizes that provide a wide range of load ratings from 10 to 800 lbs.

FEATURES & BENEFITS

- Highly accurate and reliable semiconductor strain gage technology.
- Eliminates guess work and allows for the measurement of precise tension in control and monitoring applications.
- Helps reduce or eliminate web breakage, stretching, registration and length problems.
- Sealed from dust and moisture; seals are recessed, blocking access from potential damage.
- Dual cantilever beam provides high strength and accuracy even at low tension.
- Temperature compensated for stable output.
- Stainless steel and aluminum construction for excellent corrosion resistance.
- All mounting styles can be rotated to any position for precise orientation.
- Coupling articulation accommodates changes in idler shaft angle and length caused by deflection and temperature variations.
- Idler shaft can be removed from transducer without removing transducer from machine on the live (L) split-cap and dead (D) shaft versions.
- CE marked – meets European low voltage (73/23/EEC) and EMC (89/336/EEC) directives.
- 5 year tension-free warranty.

INDUSTRY LEADING FIVE YEAR WARRANTY

IN-FRAME MOUNTING STYLES

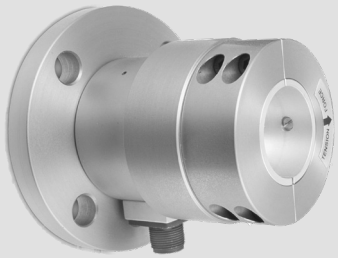
Piloted Flange (PFL) - Mounting Style in which transducer has a piloted mounting flange that fits directly in place of industry standard RFC style 3.0" piloted flange bearings. Size 0 and 2 only.

Through-Frame (TF) - Mounting style in which a Model C transducer with rear connector fits into a recessed 72mm hole in machine frame. Saves space, and allows longer idler roll shaft. Size 2 only.

AVAILABLE MOUNTING STYLES

C2LS
SCREW MOUNT

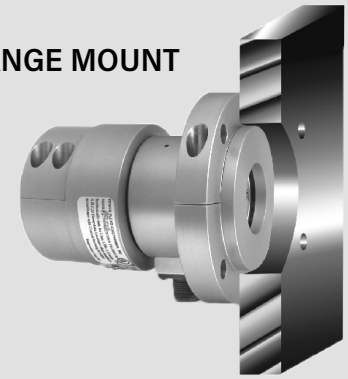
C2DFL
FLANGE MOUNT



C2LPB
PILLOW BLOCK MOUNT

C2DTF
THROUGH-FRAME MOUNT

C2DPFL
PILOTED FLANGE MOUNT



OPTIONS

Environmental Connector (EC) - Seals with mating cable electrical connector to protect against contact oxidation; especially useful in corrosive environments.

Extended Range Output (XR) - Extra sensitive to low tensions. XR produces twice the output signal for a given load rating. Electronics must also have extended range.

Full Bridge (FB) - Four strain gauges instead of two to form a full Wheatstone Bridge connection. See Note 6.

Labyrinth Seal (LS) - A non-contact seal used for minimal drag for very low break-away torque. Only available on Size 0 and Size 1 live shaft coupling. Break-away torque: 0.3 oz-in.

Metric Mounting Stud (MMS) - Metric mounting screw for S type transducers.

Vacuum Compensation (VAC) - Special features for fast and complete air evacuation. Used for transducers installed in vacuum metalizers. Consult factory.

PRODUCT CODE

You may order by description or by specifying the code matching each category with one of the choices below.

EXAMPLE: **C 1 D S - 10 - 1/2 - 12 - EC,XR**

SIZE | TYPE | MOUNTING STYLE | LOAD RATING | SHAFT BUSHING | CONNECTOR POSITION | OPTIONS

SIZE	TYPE	MOUNTING STYLE	LOAD RATING	SHAFT BUSHING				CONNECTOR POSITION [4]	OPTIONS
				SIZE 0, 1 Dead	SIZE 0, 1 Live	SIZE 2 Dead	SIZE 2 Live		
0 = Size 0 1 = Size 1 2 = Size 2	D = Dead L = Live	S = Screw / Bolt[3] PB = Pillow Block FL = Flange TF = Through-frame[2] PFL = Piloted Flange	10 lbs[1] 25 lbs 50 lbs 100 lbs 150 lbs[1] 200 lbs[2] 400 lbs[2] 800 lbs[2]	1/2 5/8 3/4 1 1 1/8 1 1/4 1 1/2 20mm 25mm 30mm 35mm	1/2 5/8 3/4 7/8 1 20mm 25mm	3/4 7/8 1 1 1/8 1 3/16 1 1/4 1 1/2 1 3/4 25mm 30mm 32mm 35mm 40mm	3/4 7/8 1 1 1/8 1 3/16 1 1/4 1 1/2 25mm 30mm 35mm 40mm	12 (12 :00) 1:30 3:00 4:30 6 (6:00) S, FL only 7:30 9:00 10:30 Rear (PB,TF[7], FL[8], PFL[8] only)	EC = Environmental Connector XR = Extended Range[5] FB = Full Bridge[6] LS = Labyrinth Seal[1] MMS = Metric Mounting Stud VAC = Vacuum Compensation Z = Special (SPR)

1. Available on Size 0, 1 only.
2. Available on Size 2 only.
3. Std mounting thread for S and FL styles is in inches. Available taps for the S style are: **Size 0:** 3/8-16 or M10, **Size 1:** 1/2-13 or M12, and **Size 2:** 5/8-11 or M16.
4. Connector position is figured relative to force direction for S and FL mounting styles and assumes force is at 6:00 o'clock. For PB mounting style, if the connector is not at rear, then the mount surface is considered the 6:00 o'clock position for force direction.
5. Requires that indicator/controller has XRE option.
6. Applies only if one transducer is used.
7. Must use rear connector position for TF style.
8. Rear connector position available if hole in frame is through. Not available on Size 0.

SPECIFICATIONS

ELECTRICAL

Excitation: 5 VDC, regulated (10 VDC with XR)
Output: 250 mVDC, nominal, at 5 V excitation (500 mVDC at 10 VDC excitation with XR)
Strain Gage Resistance: 100 ohms, nominal
Non-Repeatability: ±1/4% Full Span (FS)
Combined Non-Linearity and Hysteresis: ±1/2% (FS)
Temperature Range: -10°F to 200°F (-23°C to 93°C)
Temperature Coefficient: 0.02% FS per °F, typical (0.036% FS per °C)
Mating Electrical Connector:
Amphenol MS3106A-10SL-3S
Connector Pin Assignment:
A = Transducer Output
B = + 5V
C = - 5V

MECHANICAL

Overload Capacity: Size 0, 1: 1,200 lbs (5,338 N), Size 2: 2,500 lbs (11,121 N)
Deflection of Sensor Beam: 0.005 in. max. (.127 mm)
Material: 6061, 7075-T6 Aluminum; 303, 304 Stainless Steel
Connector Position (standard):
Screw, Flange, and Piloted Flange mount = 6 o'clock (connector points in tension force direction)
Pillow Block and Through Frame = center rear
Shaft Bushings (max.):
Size 0,1: Dead = 1.5" (35mm) Live = 1" (20mm)
Size 2: Dead = 1.75" (40mm) Live = 1.5" (40mm)
Basic Dynamic Load Rating of Bearings:
Size 0,1: 1,990 LBF (8,840 N)
Size 2: 3,510 LBF (15,600 N)

SELECTION OF LOAD RATING

The correct transducer load rating for your application is determined by maximum web tension, wrap angle, and roll weight. Choose the appropriate wrap configuration from the diagrams below. Then compute the Net Force using the formula below the diagram. (The direction of the tension force determines which diagram and formula to use).

The selected load rating, may be 20% less than the computed Net Force. The actual force on the transducer will read 125% of the load rating before hitting the stops. This is acceptable because the Net Force formula contains an oversizing factor of 2, which means that the actual force exerted on the transducer will not exceed its rating. Sometimes, a roll is so heavy that its weight uses up most of the operating range of the transducer. 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:

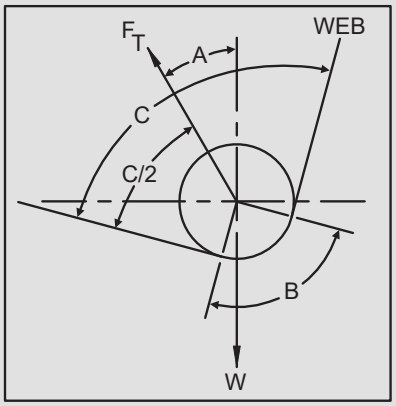
The effective roll weight is the "WCOS(A)" term in the formula. If WCOS(A) is more than 95% of the load rating chosen, the tension meter will probably not be adjustable to zero. If this is the case, one or more of the following changes must be made to reduce WCOS(A) to less than 95% of the load rating:

1. Reduce the transducer roll weight.
2. Increase angle (A).
3. Use the next higher load rating (this is the least desirable choice because it reduces transducer signal output)

TENSION FORCE DIRECTIONS

WRAP 1

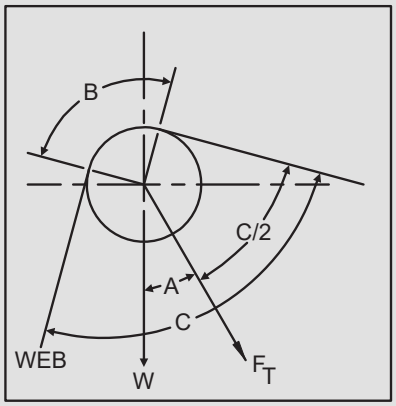
Tension Force (F_T) **above** horizontal



$$\text{NET FORCE} = \frac{4T \text{ SIN } \left(\frac{B}{2}\right) - W \text{ COS(A)}}{2}$$

WRAP 2

Tension Force (F_T) **below** horizontal



$$\text{NET FORCE} = \frac{4T \text{ SIN } \left(\frac{B}{2}\right) + W \text{ COS(A)}}{2}$$

TABLE 1

ANGLE	SINE	COSINE
0°	0.000	1.000
5°	0.087	0.996
10°	0.174	0.985
15°	0.259	0.966
20°	0.342	0.940
25°	0.423	0.906
30°	0.500	0.866
35°	0.574	0.819
40°	0.643	0.766
45°	0.707	0.707
50°	0.766	0.643
55°	0.819	0.574
60°	0.866	0.500
65°	0.906	0.423
70°	0.940	0.342
75°	0.966	0.259
80°	0.985	0.174
85°	0.996	0.087
90°	1.000	0.000

Note: These sizing formulas contain an oversizing factor of 2X tension for tension surges.

W = Idler roll weight
T = Maximum web tension
B = Wrap angle = 180° - C°
A = Angle between Tension Force F_T and vertical

DIMENSIONS

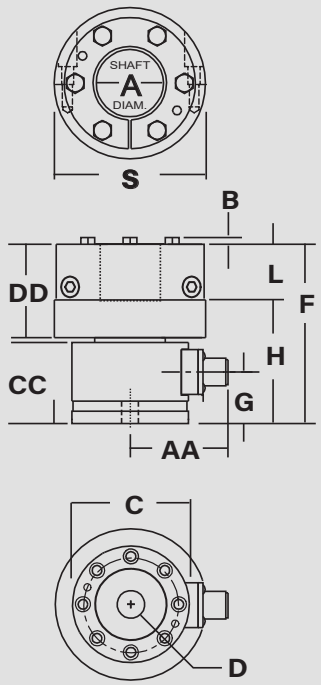
inches (mm)

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	35	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	35	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**	**1.57**	**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	4.0	66	M16 x 2	26.4	101.6	29.2	76.2	101.3	54.9	24.9	114	13.5	88.9

Note 1: Bushings are available for smaller shaft diameters. **D** is for Dead Shaft version, **L** is for Live Shaft version.

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**		**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		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**		**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		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

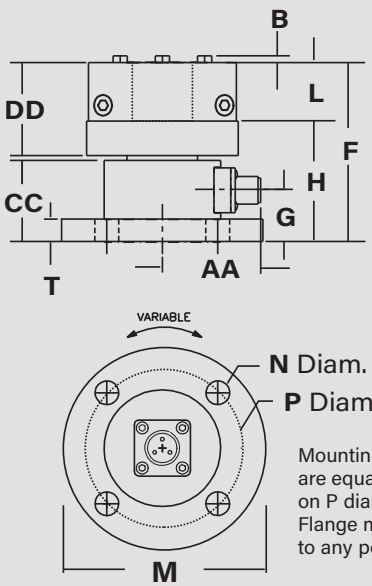
LIVE SHAFT "L"
TAPERED COUPLING SHOWN



Select MMS option if metric thread is required.

SCREW/BOLT (S)
MOUNTING STYLE

LIVE SHAFT "L"
TAPERED COUPLING SHOWN

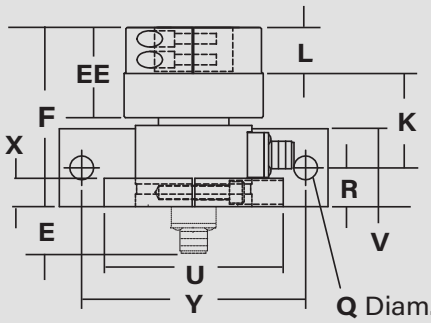


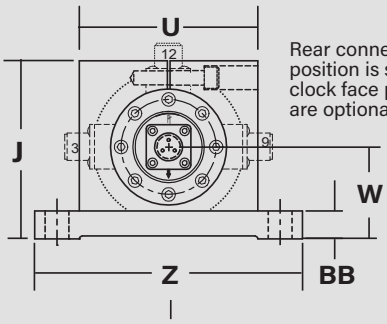
Mounting Holes (N) are equally spaced on P diameter circle. Flange may be rotated to any position.

FL style conversion flanges are available to adapt the Model C to installations designed for the old DFE model 3.22 and 2.25 transducers.

FLANGE (FL)
MOUNTING STYLE

DEAD SHAFT "D"
SPLIT COUPLING SHOWN





Rear connector position is standard, clock face positions are optional.

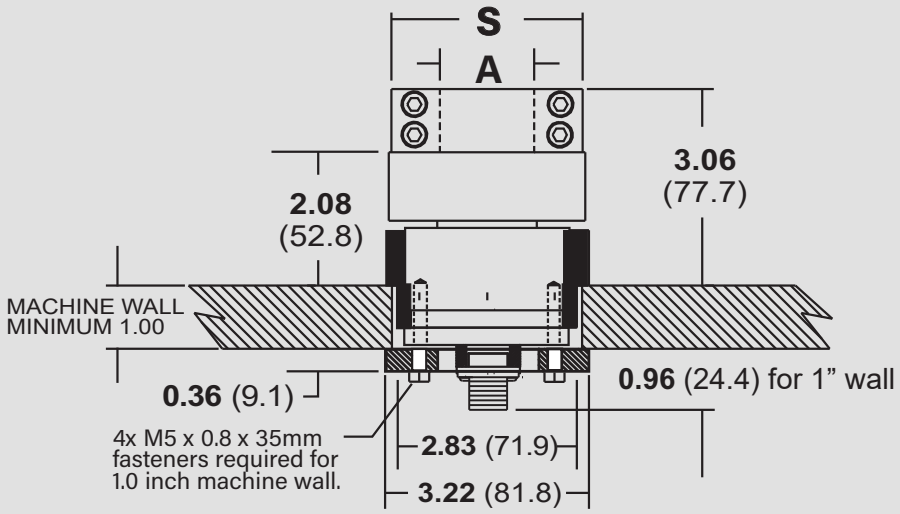
6 o'clock force direction always toward mount surface.

PILLOW BLOCK BRACKET (PB)
MOUNTING STYLE

DIMENSIONS

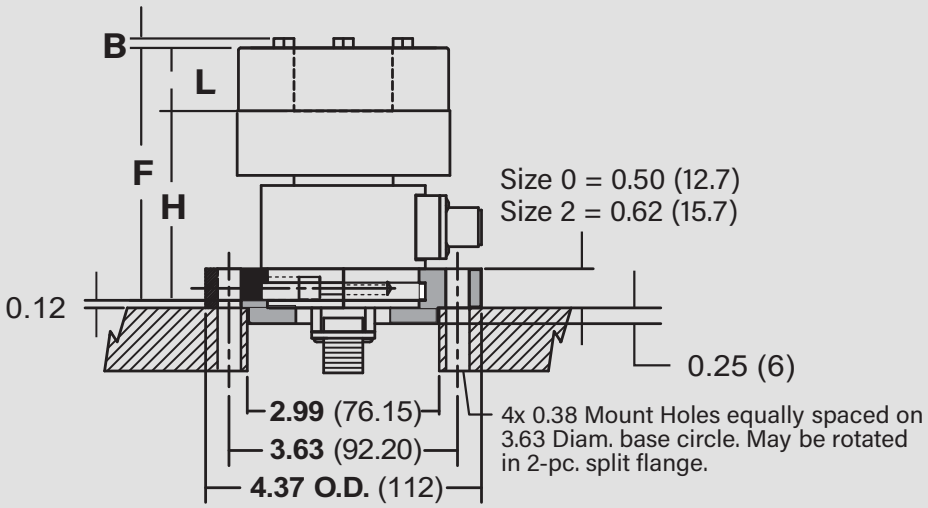
inches (mm)

DEAD SHAFT "D" SPLIT COUPLING SHOWN



THROUGH-FRAME (TF) MOUNTING STYLE
Size 2 Only

LIVE SHAFT "L" TAPERED COUPLING SHOWN



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

1109 Doc 802-0628 R9

307 Pickering Rd
Rochester
NH 03867 USA

Email: info@dfe.com
Website: www.dfe.com
Phone: (603) 332-6150
FAX: (603) 332-3758