DOVER FLEXO ELECTRONICS, INC.
ISO 9001 CERTIFIED

TENSION TRANSDUCERS
Models FH and FV

5 YEAR WARRANTY

MODEL F TENSION TRANSDUCERS

The F transducer is a heavy-duty, flat transducer designed to accurately measure web tension in machines having live-shaft idler rolls. One F transducer mounts under the pillow block bearing at each end of the roll shaft. Designed for use in demanding tension measurement environments, the F transducer shell has a single-piece aluminum base with a removable stainless steel top plate. A rubber seal between the base and top plate prevents water intrusion or other contamination. The transducer's electrical connector is located at the end of a short cable for simpler access during installation.

The F transducer is available in a V (vertical) configuration for use when the applied force is roughly perpendicular to the top plate of the transducer. It is also available in an H (horizontal) configuration for use when the applied force is oriented more parallel to the transducer top plate. The F transducer mounts on a stable machine frame surface using one bolt (size 2), or two bolts (size 3) on each end.

The F transducer is available in two sizes. Load ratings range to 1200 lbs in the size 2 and 5000 lbs. in the size 3.

BENEFITS

- Low-maintenance design.
- Entire length of top plate is clear for pillow block installation.
- Can be installed in any orientation.
- Mechanical stop provides protection from overloads.
- Splash resistant.
- Use with live-shaft or dead-shaft idler rolls.

FEATURES

- Corrosion-resistant stainless steel and aluminum construction.
- Attached cable with amphenol connector.
- Tethered top plate safety feature prevents separation from transducer in the unlikely event of beam breakage.
- Robust overload protection. Load stops limit beam deflection to 125% of rated output.
- Designed to meet CE mark requirements for Measurement & Control equipment: EN61326 for EMI.
- Designed to meet the IP 65 standard for ingress protection.

OPTIONS

- **Drill and Tap (D&T).** Drill and tap the top plate.
- **Extended Range output (XR).** Produces twice the output signal for a given load rating. Must be used with electronics having extended range option.
- **Oversize Top Plate (OTP).** For mounting of oversized pillow block bearing
- **Permanently Attached Cable with Tinned Leads (PT).** Instead of cable connector.

SPECIFICATIONS

Excitation Voltage: 5 Volts dc (10V with XR option)
Full Scale Output: 250 mVdc nominal (500mVdc with XR)
Strain Gage Resistance: 100 ohms nominal (200 ohms XR)
Non-Repeatability: ± 1/4% full span (FS)
Non-Linearity and Hysteresis Combined: ± 1/2% FS
Temperature Range: -10°F to +200°F (-23°C to +93°C)
Mating Electrical Connector:
Amphenol MS3106A-10SL-3S
Materials: 303/304 stainless steel and aluminum

Load Ratings:
Size 2: 100, 200, 400, 800, 1200 lbs.
(225, 450, 900, 1800, 600, 5350 N)
Size 3: 1000, 2500, 5000 lbs. (4450, 11,125, 22,250 N)
Static Overload Capacity: 5 times load rating, minimum
Weight: Size 2: 7 lbs. (3 Kg)
Size 3: 42 lbs. (19 Kg.)

PRODUCT CODE

You may order by description or by indicating your feature choices in place of the X's in the product code shown below.
Example: F2V-200-XR,PT

F X X - X - OPTIONS (Separated by commas)

SIZE	TENSION FORCE DIRECTION	LOAD RATING (lbs)	OPTIONS
2 3	V = Vertical H = Horizontal	100 (Size 2 only) 200 (Size 2 only) 400 (Size 2 only) 800 (Size 2 only) 1000 (Size 3 only) 1200 (Size 2 only) 2500 (Size 3 only) 5000 (Size 3 only)	D&T = Drill & Tap OTP = Oversize Top Plate PT = Permanent Cable with tinned leads. XR = Extended Range(1)

Notes: 1. Electronics must have XRE option

SELECTION OF LOAD RATING FOR MODEL F TYPE H TRANSDUCER

The Model FH Transducer is available in several standard load ratings, ranging from 100 lbs. (450 N) to 5000 lbs. (22250 N). The correct rating for any particular application depends on web tension, transducer roll weight, wrap angle and the direction of the tension force. Select the appropriate wrap configuration from the sketches below and apply the formula below the sketch.

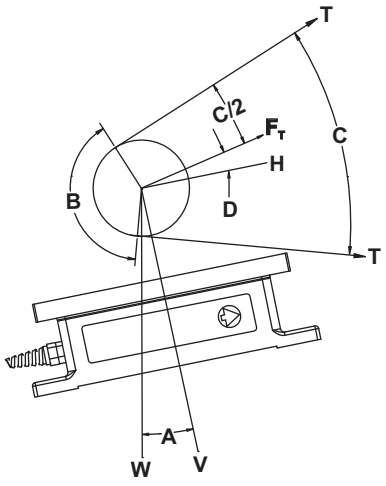
- The Model FH transducer is sensitive to forces **parallel** to its top plate.
- Angle "D" should be as small as possible. Output will rapidly drop as D gets larger. Do not exceed 30°.
- If A = 0, idler weight will not produce any output signal.

Use the chart at bottom of page to select the correct load rating. In some cases, the load rating may be LESS than the calculated value. Sometimes the weight of a transducer roll 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. If the effective roll weight, represented by the "Wsin(A)" term in the formulas below, 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 Wsin(A).

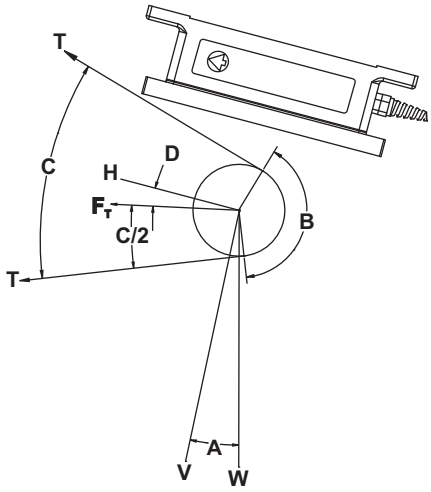
A. Reduce the transducer roll weight.
B. Decrease angle (A).
C. Use the next higher load rating. (This is the least desirable choice because it reduces the transducer output signal).

Recommended Roll Weight Maximums:
100 lbs. load rating: 400 lbs. max. roll weight
200 to 400 lbs. load rating: 1000 lbs. max. roll weight
800 to 1200 lbs. load rating: 2500 lbs. max. roll weight
2500 lbs. load rating: 5100 lbs max. roll weight
5000 lbs. load rating: 11000 lbs. max. roll weight

WRAP A

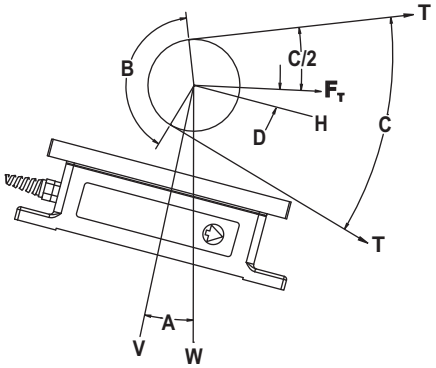


WRAP B

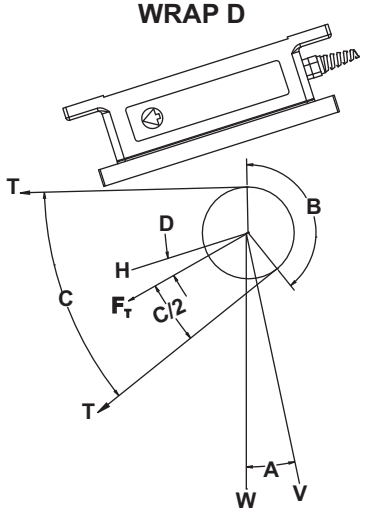


$$\text{Load Rating} = \frac{4T \sin\left(\frac{B}{2}\right) \cos(D) - W \sin(A)}{2}$$

WRAP C



WRAP D



$$\text{Load Rating} = \frac{4T \sin\left(\frac{B}{2}\right) \cos(D) + W \sin(A)}{2}$$

T = total maximum tension
C = angle between entering and exiting web
F_T = resultant force due to tension
W = idler Roll weight
B = wrap angle = 180° - C
A = angle between line "V" and vertical direction
D = angle between top plate and direction of force. Do not exceed 30° for best accuracy.
"H" is a line parallel to top plate
"V" is a line perpendicular to top plate

TABLE 1

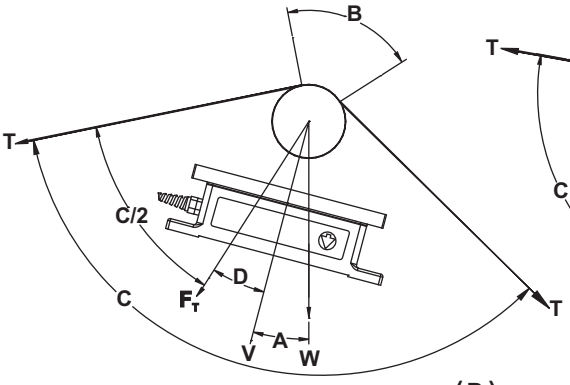
ANGLE	SINE	COSINE
0°	0.000	1.000
5°	0.087	0.996
10°	0.174	0.985
15°	0.259	0.966
20°	0.342	0.940
25°	0.423	0.906
30°	0.500	0.866
35°	0.574	0.819
40°	0.643	0.766
45°	0.707	0.707
50°	0.766	0.643
55°	0.819	0.574
60°	0.866	0.500
65°	0.906	0.423
70°	0.940	0.342
75°	0.966	0.259
80°	0.985	0.174
85°	0.996	0.087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

Size	Calculated Load Rating (lb.)	Recommended Load Rating
2	up to 120	100 lbs (450 N)
	121 - 240	200 lbs (900 N)
	241 - 480	400 lbs (1800 N)
	481 - 960	800 lbs (3500 N)
	721 - 1440	1200 lbs (5350 N)
3	up to - 1200	1000 lbs (4450 N)
	1201 - 3000	2500 lbs (11125 N)
	3001 - 6000	5000 lbs (22250 N)

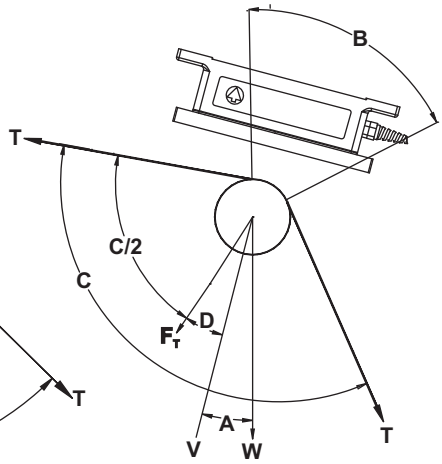
SELECTION OF LOAD RATING FOR MODEL F TYPE V TRANSDUCER

The Model FV transducer is sensitive to forces **perpendicular** to its top plate. It is also available in several standard load ratings, ranging from 100 lbs. (450 N) to 5000 lbs. (22250 N). The correct rating for any particular application depends on web tension, transducer roll weight, wrap angle and the direction of the tension force. Select the appropriate wrap configuration from the sketches below and apply the formula below the sketch. Use the chart at bottom of page to select the correct load rating.

WRAP 1

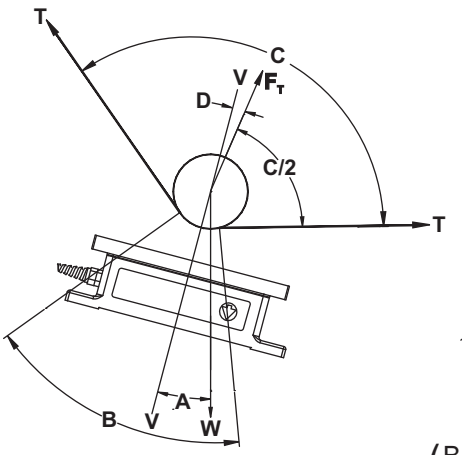


WRAP 2

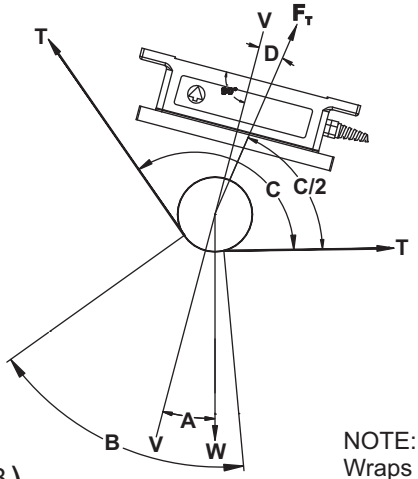


$$\text{Load Rating} = \frac{4.5T \sin\left(\frac{B}{2}\right) \cos(D) + W \cos(A)}{2}$$

WRAP 3



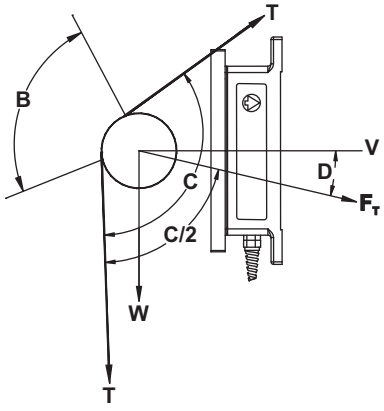
WRAP 4



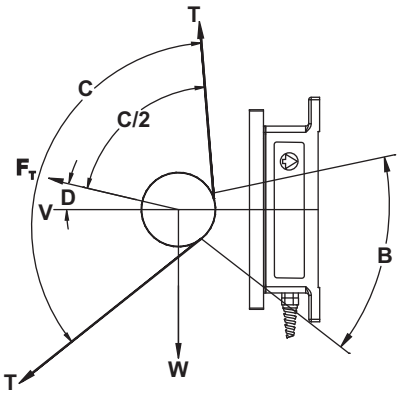
$$\text{Load Rating} = \frac{4.5T \sin\left(\frac{B}{2}\right) \cos(D) - W \cos(A)}{2}$$

NOTE:
Wraps 2, 3, & 6 will produce a negative output. See Note 2 above.

WRAP 5



WRAP 6



$$\text{Load Rating} = \frac{4.5T \sin\left(\frac{B}{2}\right) \cos(D)}{2}$$

Notes:

1. Angle "D" should not exceed 30° for best accuracy.
2. Wraps 2, 3, and 6 will produce an output signal which is opposite in polarity from normal. The transducer signal leads must be reversed at the controller or indicator terminal strip so the tension meter will read up-scale. DO NOT REVERSE THE METER CONNECTIONS.
3. If the W COS (A) term in equations for wraps 1, 2, 3, & 4 exceed 95% of the transducer load rating, use the next larger size transducer.

T = total maximum tension
C = angle between entering and exiting web
F_T = resultant force due to tension
W = idler Roll weight
B = wrap angle = 180° - C
A = angle between line "V" and vertical direction
D = angle between top plate and direction of force. Do not exceed 30° for best accuracy.
"V" is a line perpendicular to top plate

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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

Size	Calculated Load Rating (lb.)	Recommended Load Rating
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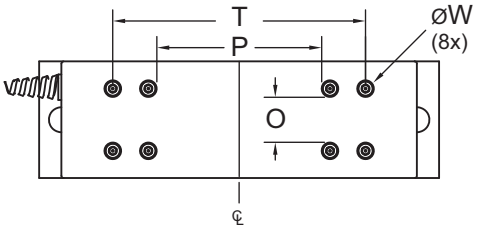
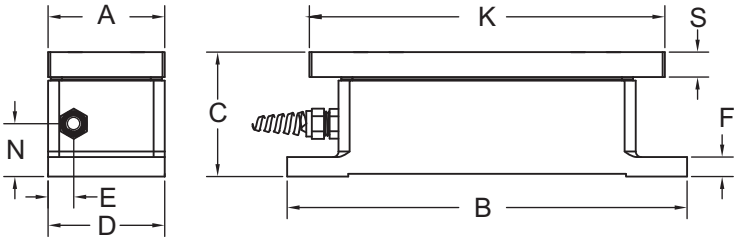
DIMENSIONS:

SIZE		A	B	C	D	E	F	H	J	K	L	M	N	O	P	R	S	T	W
2	in	**2.63**	**9.00**	**2.81**	**2.63**	**0.58**	**0.44**	**8.00**	**9.75**	**8.00**	---	**0.56**	**1.19**	**1.03**	**3.71**	**1.31**	**0.56**	**5.69**	**0.37**
	mm	66.8	228.6	71.4	66.8	14.7	11.2	203.2	247.7	203.2	---	14.2	30.2	26.2	94.2	33.3	14.2	144.5	9.4
3	in	**4.50**	**13.50**	**4.89**	**4.50**	**2.25**	**0.94**	**12.25**	**14.00**	**11.00**	**2.75**	**0.53**	**2.19**	**2.24**	**5.86**	**0.88**	**0.94**	**8.72**	**0.56**
	mm	114.3	342.9	124.2	114.3	57.2	23.9	311.2	355.6	279.4	69.9	13.5	55.6	56.9	148.8	22.4	23.9	221.5	14.2

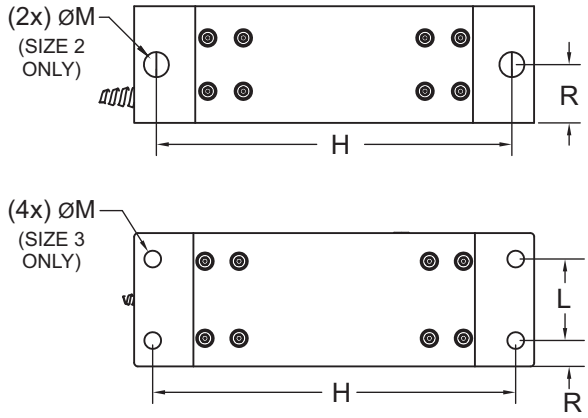
STANDARD



TOP VIEW

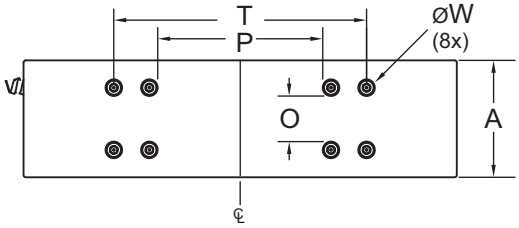


SIDE VIEW

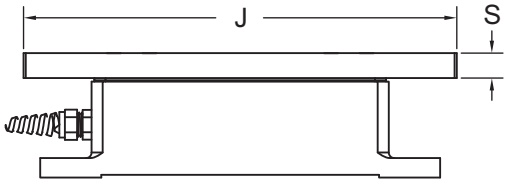


BOTTOM VIEW

WITH (OTP) OPTION



TOP VIEW



SIDE VIEW

BEARING RECOMMENDATION:

The F transducer will perform best if the proper bearings are used. First, the bearings should have self-aligning capability. This will eliminate stresses on the top plate caused by roll deflection, misalignment and uneven mounting surfaces. Second, one of the bearings should be able to "float" (move axially a small amount) to compensate for roll/shaft expansion caused by heat. The other bearing should not float.

DOVER'S TENSION TRANSDUCERS

Dover tension transducers are the direct-sensing devices that output an accurate tension measurement signal from a roller in the web path to the transducer inputs on your amplifier, indicator, or controller.

Dover Flexo produces tension transducers for almost any web press or process machinery application to measure actual tension in moving web or filament.

All Dover transducers are built with superior overload protection and have rugged stainless steel and aluminum construction for reliability and corrosion resistance.

Shown here are just a few of the different styles of tension transducers available from DFE. If you don't see a transducer that fits your needs exactly, please call or e-mail us. We manufacture custom transducers to fit almost any tension measurement application.

Items shown with the CE mark have been tested, and have met the requirements of the Low Voltage Directive (73/23/EEC) and the EMC Directive (89/336/EEC) established by the member states of the European Union.

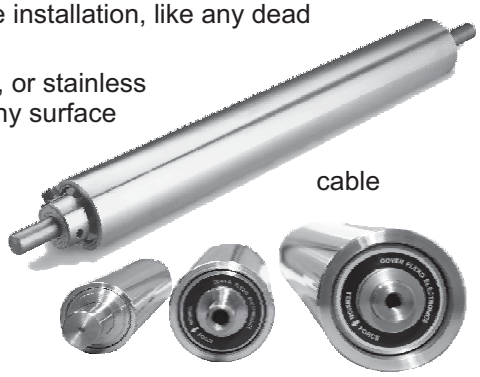
Please refer to your DFE catalog binder or ask for data sheets on the individual tension transducer products shown here.

MODEL C TENSION TRANSDUCERS CE

- Dead shaft and live shaft models
- Five mounting styles
- Dual cantilevered sensing-beam for high accuracy
- Load ratings from 10 to 800 lbs. (45 to 3560N; 4.5 to 364 Kg)

TENSION ROLL® TRANSDUCERS CE

- Transducers and idler roll in one, easy-to-install unit
- Fast, hassle-free installation, like any dead shaft idler roll
- Aluminum, steel, or stainless steel rolls in many surface finishes
- One electrical cable
- Small, medium, and large roll diameters



NARROW WEB TRANSDUCERS CE

- For narrow web machines with single-side frame
- Transducers and idler roll combined into one unit
- Load ratings from 12 to 100 lbs. (55 to 450N; 25 to 45 Kg) with wide operating range
- Optional tension display on roll end
- Three roll diameters

RIBBON FILAMENT TRANSDUCERS CE

- Measure tension of narrow ribbon or filament
- Small, versatile, and easy-to-install
- Special wheels are available
- Load ratings from 10 to 150 lbs. (45 to 665N; 4.5 to 68 Kg) with wide operating range

THE TENSION CONTROL SPECIALISTS
DOVER FLEXO ELECTRONICS, INC.
217 PICKERING ROAD, ROCHESTER, NH 03867 USA • 603-332-6150 • FAX 603-332-3758
E-Mail: info@dfe.com • Internet: www.dfe.com • ISO 9001 Certified

DOC 802-2225 R1
PRINTED IN USA