

DFE DOVER FLEXP ELECTRONICS, INC.
ISO 9001 CERTIFIED

TENSION ROLL[®] TRANSDUCERS



5 YEAR WARRANTY

TENSION ROLL® TRANSDUCER

The TR Tension Roll® Transducer accurately measures tension in any continuous web of paper, film, foil, textile or other material. It consists of a dead-shaft idler roll with tension sensors built into each end. This integrated construction makes installation of the Tension Roll® quick and easy on any dual-frame web press or machine.

Choose from three available frame sizes: 0, 1, or 2, depending on your application requirements and machine geometry. The size 0 TR has a 2.25-inch diameter roll and a

1-inch diameter shaft. The size 1 TR has a 3 inch diameter roll and a 1 inch diameter shaft. The size 2 TR can have a 4, 5, or 6 inch diameter roll and a 1.125-inch diameter shaft.

To allow measurement of an extremely wide tension range in a single location without the addition of an extra idler roll, the Tension Roll Transducer can be mounted in a pair of Model C dead-shaft tension transducers during installation.

BENEFITS/FEATURES

- Tension transducers and idler roll are combined in one integral package. No assembly required.
- Faster and easier to install than separate roll and transducers. Requires no more space than an ordinary idler roll.
- Costs less than separate transducers and idler roll.
- Only one transducer cable. No cable needs to cross the machine.
- High overload capacity provided by time-proven "through-shaft" design.
- Can be mounted in DFE dead shaft transducers to allow measurement of extremely wide tension range in one location without the need of an extra idler roll.
- Minimal transducer deflection does not affect the web.
- Measures actual web tension. Allows accurate and consistent display and control of tension.
- Installed the same as any dead shaft idler roll.

OPTIONS

- **Counterbore, Drill, and Tap (CDT).** Shaft ends are counterbored, drilled and tapped.
- **Drill and Tap (D&T).** Drill and tap ends of shaft. **Sizes 0 and 1:** 5/16-18 (8mm), **Size 2:** 1/2-13 (12mm).
- **Extended Range Output (XR).** Extra sensitive at low tensions. Electronics must also have extended range.
- **Milled Flats (MF).** Shaft with milled flats and a through hole at each end.
- **Non-standard Shaft Extensions (NSE).** Shaft extends longer or shorter or unequal lengths from ends of roll. Specify lengths.
- **Oiled Bearings (OB).** Oil instead of grease for lubrication.
- **Reduced Diameter (RD3).** Diameter of shaft is reduced to 3/4". Used on TR0 and TR1 which have 1" shafts.
- **Steel Roll (SR), or Stainless Steel (SSR)** instead of standard aluminum roll.

SPECIFICATIONS:

Excitation: 5 Vdc, regulated, 10Vdc with XR option

Output: 500mVdc, nominal, 1 Vdc with XR option.

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% per F° typical
(0.036% per C°)

Mating Electrical Connector: DFE Part No. 106-0050 for all sizes

Electrical Connector Position: 6 o'clock

Connector Pin Assignment: **A** = output; far end, **B** = 5V+, **C** = 5V-, **D** = output; connector end, **E** = 5V-, **F** = 5V+

Overload Capacity: Size 0 & 1 = 880 lbs. (3914 N),
Size 2 = 3000 lbs. (13,300 N)

Deflection of Sensor Beam: Sizes 0 and 1 = 0.018 in. max. (0.46 mm), Size 2 - 0.008 in. max. (0.2 mm)

Roll - Material: 6061 Aluminum; 304 Stainless Steel (option); 1020 Series Steel (option)

TIR: 0.002 in. (0.05mm)

Balance: Quality Grade G2.5 per ISO 1940 and ANSI S2-19-75

Finish: 32μ inch

Shaft: Stainless Steel, plain ends

Load Ratings: Size 0 = 12, 25, 50, 100 lbs.
(55, 110, 225, 450 N)

Size 1 = 12, 25, 50, 100, 150 lbs.
(55, 110, 225, 450, 670 N)

Size 2 = 12, 25, 50, 100, 200, 400 lbs.
(55, 110, 225, 450, 900, 1800 N)

ACCESSORIES

- Shaft Hangers for Sizes 0 and 1, PN# 601-3118.
- Shaft Hangers for Size 2: PN# 601-1179

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).

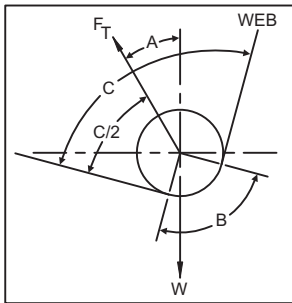
In some cases, the load rating, may be less than the computed Net Force. This is acceptable because the Net Force formula contains an oversizing factor of 2, which means that the actual force exerted on the transducer will not exceed its load rating.

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:

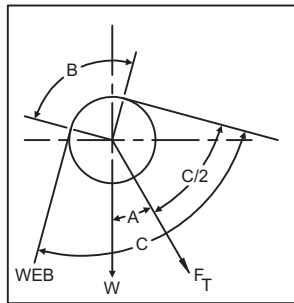
1. Reduce the transducer roll weight
2. Increase angle (A)
3. Use the next higher load rating (This is the least desirable choice because it reduces transducer signal output).

WRAP 1
Tension Force F_T above horizontal



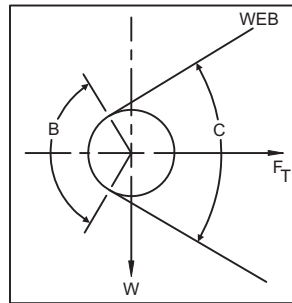
$$\text{LOAD RATING} = \frac{4T \sin\left(\frac{B}{2}\right) - W \cos(A)}{2}$$

WRAP 2
Tension Force F_T below horizontal



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

WRAP 3
Tension Force F_T is horizontal



$$\text{LOAD RATING} = \frac{4T \sin\left(\frac{B}{2}\right)}{2}$$

W = idler roll weight, T = Maximum web tension, B = Wrap angle = $180^\circ - C^\circ$, A = Angle between Tension Force F_T and vertical

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

MAXIMUM ALLOWABLE ROLL WIDTH inches (mm), see Note 1.

SIZE 0	ALUMINUM	STEEL	STAINLESS STEEL
LOAD RATING lb. (N)	Roll Diameter inch (mm)	Roll Diameter inch (mm)	Roll Diameter inch (mm)
12 (55)	2.25 (57)	2.25 (57)	2.25 (57)
25 (110)	40 (1016)	40 (1016)	40 (1016)
50 (225)	40 (1016)	40 (1016)	40 (1016)
100 (450)	40 (1016)	40 (1016)	40 (1016)
Roll Weight lb/in (kg/cm)	0.16 (0.03)	0.45 (0.08)	0.45 (0.08)

Weight of Bearing Assemblies is 0.3 lbs. (0.136 kg.) total. Minimum width of roll is 6 inches (152 mm).

SIZE 1	ALUMINUM	STEEL	STAINLESS STEEL
LOAD RATING lb. (N)	Roll Diameter inch (mm)	Roll Diameter inch (mm)	Roll Diameter inch (mm)
12 (55)	3 (76)	3 (76)	3 (76)
25 (110)	50 (1270)	50 (1270)	50 (1270)
50 (225)	50 (1270)	50 (1270)	50 (1270)
100 (450)	50 (1270)	50 (1270)	50 (1270)
150 (670)	44 (1118)	50 (1270)	50 (1270)
Roll Weight lb/in (kg/cm)	0.30 (0.054)	0.88 (0.157)	0.88 (0.157)

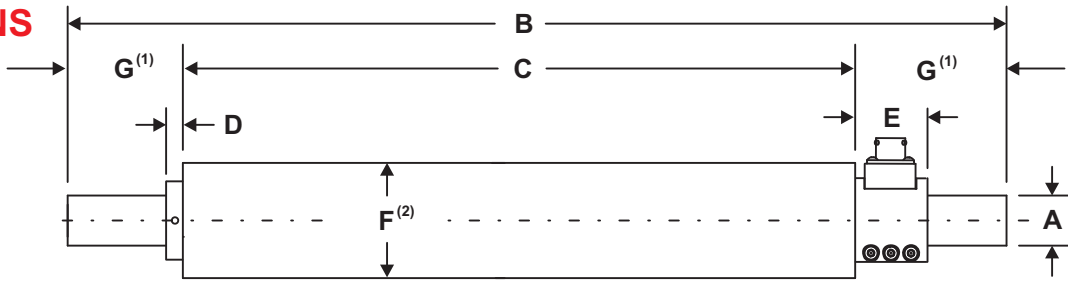
Weight of Bearing Assemblies is 1.4 lbs. (0.63 kg.) total. Minimum width of roll is 6 inches (152 mm).

SIZE 2	ALUMINUM			STEEL or STAINLESS STEEL		
LOAD RATING lb. (N)	Roll Diameter inch (mm)			Roll Diameter inch (mm)		
	4 (102)	5 (127)	6 (152)	4 (102)	5 (127)	6 (152)
12 (55)	112 (2845)	120 (3048)	120 (3048)	120 (3048)	120 (3048)	120 (3048)
25 (110)	112 (2845)	120 (3048)	120 (3048)	120 (3048)	120 (3048)	120 (3048)
50 (225)	100 (2450)	120 (3048)	120 (3048)	120 (3048)	120 (3048)	120 (3048)
100 (450)	84 (2134)	120 (3048)	120 (3048)	120 (3048)	120 (3048)	120 (3048)
200 (900)	69 (1753)	95 (2413)	120 (3048)	96 (2438)	120 (3048)	120 (3048)
400 (1800)	51 (1295)	73 (1854)	95 (2413)	79 (2007)	100 (2540)	120 (3048)
Roll Weight lb/in (kg/cm)	0.54 (0.096)	0.69 (0.124)	0.85 (0.152)	1.56 (0.279)	2.00 (0.357)	2.44 (0.437)

Weight of Bearing Assemblies is 4.3 lbs. (1.9 kg.) total. Minimum width of roll is 7 inches (178 mm).

1. Roll may be too heavy for the load rating. Be sure to check the sizing criteria and formulas
2. Use the std. sizing formulas to determine the correct load rating. In the formulas, "W" is equal to the roll weight plus the weight of the bearing assemblies.
3. Standard maximum roll width is 120 inches. Wider rolls are available on special order at an additional cost. Consult factory. Shorter widths limit roll deflection.

DIMENSIONS
inches (mm)

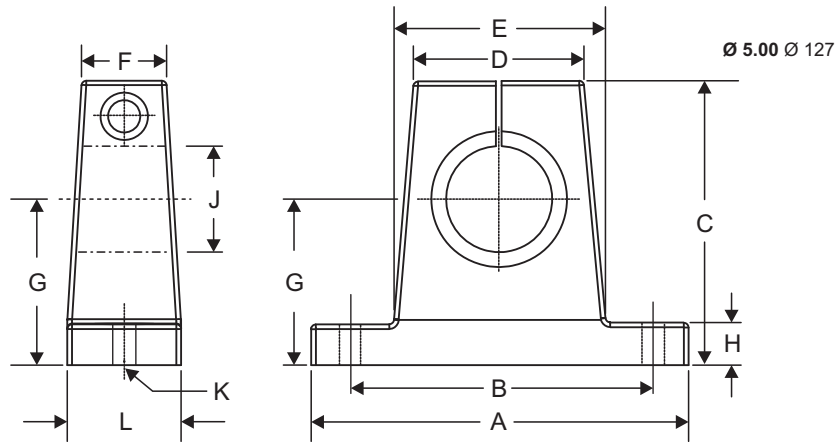


TENSION ROLL® TRANSDUCER

		A	B	C	D	E	F ⁽²⁾	G
SIZE 0	in.	Ø 1.00	*	*	0.31	1.30	Ø 2.25	3.00
	mm	Ø 25.4	*	*	7.9	33	Ø 57.1	76.2
SIZE 1	in.	Ø 1.00	*	*	0.31	1.26	Ø 3.00	3.00
	mm	Ø 25.4	*	*	7.9	32	Ø 76.2	76.2
SIZE 2	in.	Ø 1.125	*	*	0.31	1.26	Ø 4.00	4.00
	mm	Ø 28.58	*	*	7.9	32	Ø 101.6	101.6

* Specified at time of order

Notes: ⁽¹⁾Can be changed upon request. ⁽²⁾Size 2 is available with Ø 4.00" standard roll or optional Ø 5.00" (Ø 127) or Ø 6.00" (Ø 152.4) roll.



SHAFT HANGERS FOR TRANSDUCERS

		A	B	C	D	E	F	G	H	J	K	L
SIZE 0 (#601-3118)	in.	4.00	3.00	3.00	1.84	2.20	0.80	1.75	0.43	Ø 1.00	Ø 0.34	1.18
	mm	101.6	76.2	76.2	46.7	56	20.3	44.45	10.9	Ø 25.4	Ø 8.6	29.9
SIZE 1 (#601-3118)	in.	4.00	3.00	3.00	1.84	2.20	0.80	1.75	0.43	Ø 1.00	Ø 0.34	1.18
	mm	101.6	76.2	76.2	46.7	56	20.3	44.45	10.9	Ø 25.4	Ø 8.6	29.9
SIZE 2 (#601-1179)	in.	4.00	3.00	3.00	1.84	2.20	0.80	1.75	0.43	Ø 1.125	Ø 0.34	1.18
	mm	101.6	76.2	76.2	46.7	56	20.3	44.45	10.9	Ø 28.58	Ø 8.6	29.9

PRODUCT CODE

You may order by description or by specifying the code below by matching each labeled digit with your choice. Please specify Roll Length and Shaft Length (in inches).

Example: TR2-4-100-6-SR, D&T Roll Length = 32.5", Shaft Length = 42.5"

TRX - X - XXX - X - X,X,X

NOTES:

- Size 1 only
- Size 2 only
- Load direction is assumed at 6 o'clock.
- XR option requires that electronics have XRE option.

SIZE	ROLL DIAMETER	LOAD RATING	CONNECTOR POSITION	OPTIONS (Separated by commas)
0	2.25 (std Sz 0 only)	12 lb.	6:00 (Std)	CDT = Counterbore, Drill and Tap
1	3 (std Sz 1 only)	25 lb.	12:00	D&T = Drill & Tap
2	4 (std Sz 2)	50 lb.		MF = Milled Flats
	5 (opt Sz 2 only)	100 lb.		NSE = Non-std Shaft Extensions
	6 (opt Sz 2 only)	150 lb. ¹		OB = Oiled Bearings
	OTHER (Specify)	200 lb. ²		RD3 = Reduced Diameter of Shaft to 3/4"
		400 lb. ²		SR = Steel Roll
				SSR = Stainless Steel Roll
				XR = Extended Range ⁴
				Z = Special (SPR)

DFE 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@dfec.com Internet: www.dfec.com