nexen | **WEB CONTROL** PRODUCTS

LOAD CELL TENSION SYSTEM APPLICATION DATA SHEET

NAME: _____ **TITLE:** _____ **DATE:** _____

COMPANY: _____

ADDRESS: _____ **PHONE NO. ( )** _____ **EXT.** _____

CITY: _____ **STATE:** _____ **ZIP** _____

Load Cell Data from MB Sensor Brochure:

Load Range per Sensor _____ lb **FR**

Tare per Sensor _____ lb **TR**

Maximum Tension (T)

Total Tension (Customer Supplied)

_____ lbs. **T**

Paper or Board Calculation (From Chart on page 4)

_____ **PLI** x _____ **W**= _____ lbs. **T**

Film/Foil Calculation (From Chart on page 4)

_____ **W** x _____ **M** x _____ lbs/mil/inch = _____ lbs **T**

Wrap Angles (Check appropriate boxes.)

Angle **a** = 90°

Angle ☐ **X** or ☐ **X'** = _____ °

Angle ☐ **Y** or ☐ **Y'** = _____ °

Angle **X** - **Y**; or **X'** - **Y'** = △°

_____ ° - _____ ° = ± _____ △°

(If △° is > 25° see inside; Asymetrical Wrap Calculations.)

Applied Force F or F'

F = (**T** x cos **X**) + (**T** x cos **Y**)

F' = (**T** x cos **X'**) + (**T** x cos **Y'**)

(_____ x _____)+ (_____ x _____) = _____ lbs **F** or **F'**

F or **F'** ¸ 2 = Force per Sensor **F/S**

_____ ¸ 2 = _____ lbs **F/S**

Tare Weight (tw)

_____ **RW** + _____ **BW** = _____ lbs **tw**

Tare Weight **tw** ¸ 2 = lbs **t/s**

_____ ¸ 2 = _____ lbs **t/s**

Data Required from Application:

Maximum Web Width _____ inches **W**

Paper Basis Weight _____ Lbs/3000 ft²

Sensing Roll Weight _____ lb. **RW**

Sensing Roll Bearing Weight _____ lb. **BW**

Paper Board Thickness _____ point **Pt**

Film/Foil Thickness _____ mils **M**

Material Description: _____

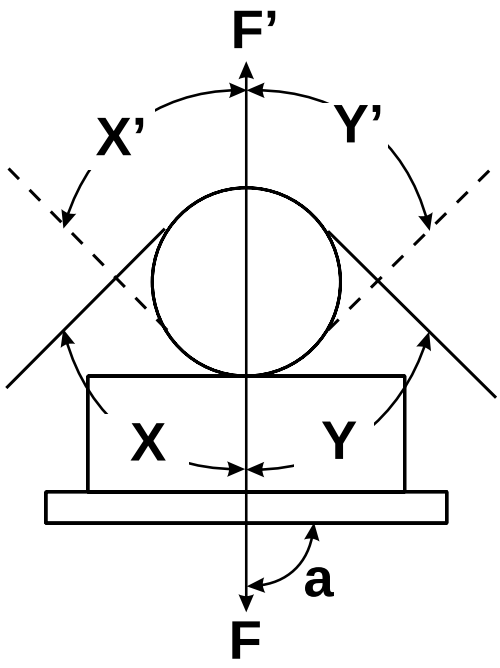


FIGURE 1

Load Cell Sizing

F/s < FR _____ **<** _____

t/s < TR _____ **<** _____

Load Cell Selected _____ **Prod. No.** _____

Read out Sizing (Analog Meter Face or Digital Range)

Maximum Readout > **T** _____

ASYMETRICAL LOAD CELL WRAP FORCE CALCULATIONS

A. TENSION INDUCED FORCES.

Data Required

From Application

Bearing Center Line Height _____ in **H** (Figure 2)
Web Angle _____ ^{o} **A** (Figure 3)
Offset Angle _____ ^{o} **C** (Figure 3)
Maximum Web Tension_____lb **T** (From Page 1)

From Load Cell Data

Pivot Point to Top Plate _____in **d** (Figure 2)
Pivot Point to Vertical _____ in **L** (Figure 2)
Load Range per Sensor _____lb **FR** (Figure 2)

FIGURE 2

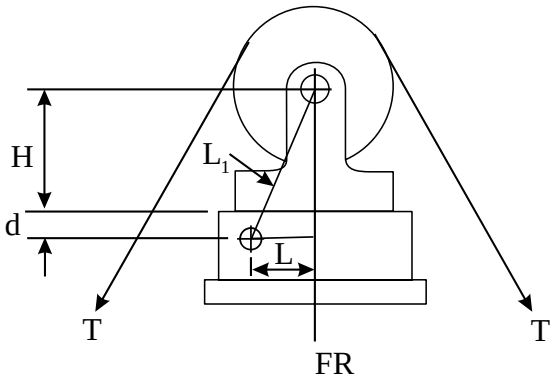


FIGURE 3

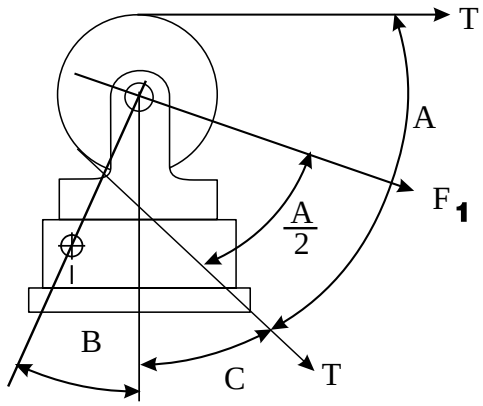


FIGURE 4

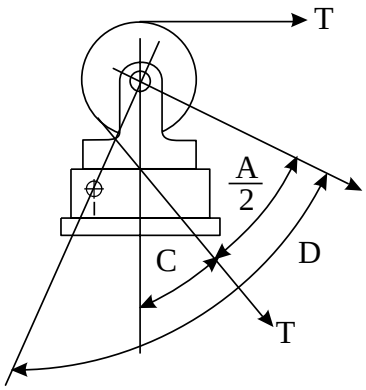
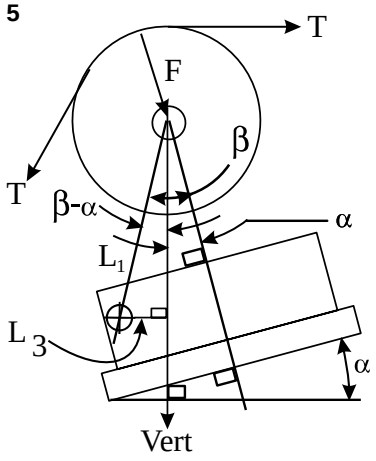


FIGURE 5



1. Determine Allowable Force Induced Moment (Figure 2)
FR x **L** = Maximum Force Induced Moment
_____ **lb x** _____ **in =** _____ **lb in**

2. Calculate Pivot Point to Roll Center Distance $\mathbf{L_1}$ (Figure 2)
$\mathbf{L^2 + (H + d)^2 = (L_1)^2}$
_____ ^{2} **in + (** _____ **in +** _____ **in)** ^{2} **=** _____ $\mathbf{L_1^2}$**; therefore,** $\mathbf{L_1}$ **=** _____ **in**

3. Calculate Angle of $\mathbf{L_1}$ to Vertical **B** (Figure 3)
(H + d) ¸ $\mathbf{L_1 = \cos B}$

(_____ **in +** _____ **in) ¸** _____ **in =** _____ **cos B; therefore, B =** _____ ^{o}

4. Calculate Tension Induced Resultant Force $\mathbf{F_1}$ (Figure 3)
$\mathbf{2 \times T \times \cos \frac{A}{2} = F_1}$
2 x _____ **lb x** _____ **=** _____ **lb** $\mathbf{F_1}$

5. Calculate Resultant Force Angle **D** (Figure 4)

B + C + $\frac{A}{2}$ = D

_____ **°** + _____ **°** + _____ **°** = _____ **°**

6. Calculate the Moment of F_1

F_1 x L_1 x sin D = Moment of F_1

_____ **lb x** _____ **in x** _____ **=** _____ **lb in**

7. Calculate the Moment per Load Cell

F_1 Moment ¸ number of Load Cells = Moment per Load Cell

_____ **in lb ¸** _____ **=** _____ **lb in**

8 Compare Moments

Moment per Load Cell (From Step 7**) ≤ Maximum Force Induced Moment (**From Step 1)

_____ **in lb ≤** _____ **in lb**

B. TARE INDUCED FORCES

Additional Data Required

From Application

Sensing Roll and Bearing Weight___ **lb tw** (From Page 1)

Mounting Angle (Figure 5)_____ **° a**

From Load Cell Data

Tare Rating _____ **lb TR**

9. Determine Allowable Tare Induced Moment (Figure 2)

TR x L = Maximum Tare Induced Moment

_____ **lb x** _____ **in =** _____ **lb in**

10. Calculate Leverage Arm of Tare Moment L_3 (Figure 5)

L_1 x sin (b-a) = L_3

_____**in x sin (** _____**° -** _____**°) =** _____ **in**

11. Calculate Tare Induced Moment

tw x L_3 (From Step 10) **= Tare Moment**

_____ **lb x** _____ **in =** _____ **lb in Tare Moment**

12. Calculate Tare Moment per Load Cell

Tare Moment ¸ number of Load Cells = Tare Moment per Load Cell

_____ **lb in ¸** _____ **=** _____ **lb in**

13. Compare Moments

Tare Moment per Load Cell (From Step 12) ≤ **Allowable Tare Moment** (From Step 9)

_____ **lb in ≤** _____ **lb in**

C. CONCLUSION

14. Load Cell must satisfy both steps **8** and **13**. If both of these steps are not satisfied, recalculate using a Load Cell with greater force and tare capacities.

15. Load Cell Selected _____ Product No. _____

Suggested Tension Levels
Paper Products (Based upon 3000 ft² ream)

Wind Up	
BW	PLI
15	0.5
20	0.75
30	1
40	1.5
50	2
60	2.5
80	3
100	4
120	5
150	6
180	8
200	10

Unwind	
BW	PLI
15	0.25
20	0.50
30	0.75
40	1
50	1.25
60	1.75
80	2
100	3
120	3.5
150	4
180	6
200	7

Paper Board (Measured as Point = 0.001 inch)

Wind Up	
PT	PLI
8	3
12	4
15	5
20	7
25	9
30	11

Unwind	
PT	PLI
8	2
12	2.75
15	3.25
20	4.75
25	6
30	7.25

Films & Foils
(Tension Defined as Pounds/Mil/ Inch)

MATERIAL	TENSION
Acetate	0.5
Alum. Foil	1
Cellophane	0.75
Cellulose	0.5
Cryovac	0.1
Glassine	1.5
Polyester	0.75
Nylon	0.25
Polyethylene	0.25
Polystyene	1
Pliofilm	1
Saran	0.1
Vinyl	0.1
Polypropylene	0.25

For Laminates, use the sum of tension levels for each substrate.

Wire

AWG	TOTAL TENSION (Lbs)
8	30
10	20
12	12
14	9
16	6
20	5
24	4.5
30	1.25
36	0.25
40	0.1

Copper	Use Chart value
Aluminium	Use Chart value x 0.6
Multi-strand	Use tension per strand x number of strands

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Nexen Group, Inc.
560 Oak Grove Parkway
Vadnais Heights, MN
55127

800.843.7445
Fax: 651.286.1099
www.nexengroup.com

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