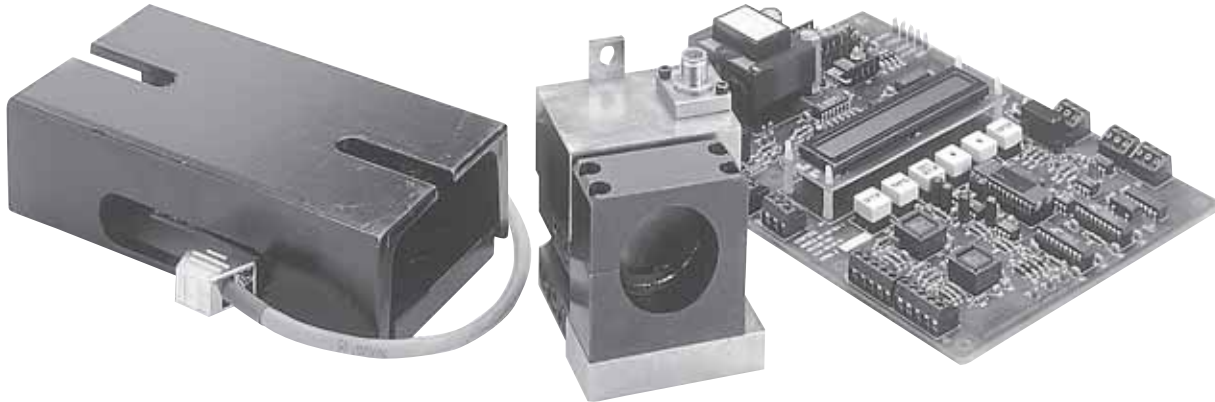


Tension Control Systems

Load Cell Sensors

Load Cell Sensors

INDUSTRIAL MAGZA MEX (55) 53 63 23 31 MTY (81) 83 54 10 18
DIST. AUTORIZADO QRO (442) 1 95 72 60 ventas@industrialmagza.com



Foot Mounted and End Shaft Mounted Series

FM Series Sensors

The foot mounted style load cells (used with pillow blocks) provide easy and convenient mounting to the roll that is being measured. It is a strain gauge style unit that is ideal for heavy tension applications.

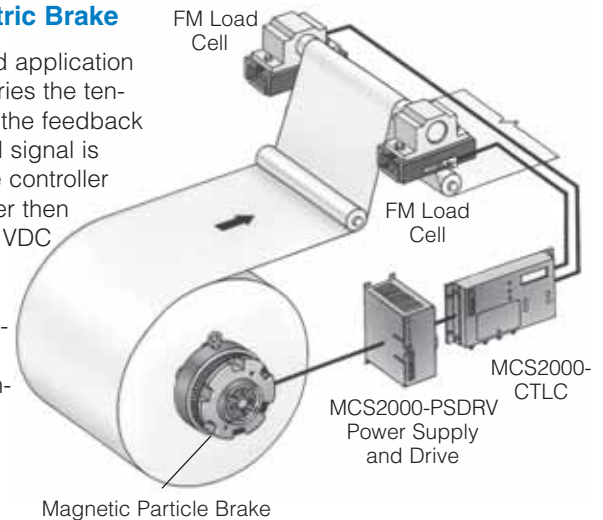
ES Series Sensors

The end shaft style load cells mount to the end of the roll that is being measured. It is a LVDT (Linear Variable Differential Transformer) style that can withstand overloads up to 10 times its rated load capacity. Several models are offered: dead shaft (no bearing), live shaft and cantilever where a single load cell can be used to measure the tension on the roll. Some units are powered with DC voltage and others are powered with AC. The AC units offer a price advantage over the DC.

Typical System Configuration Examples

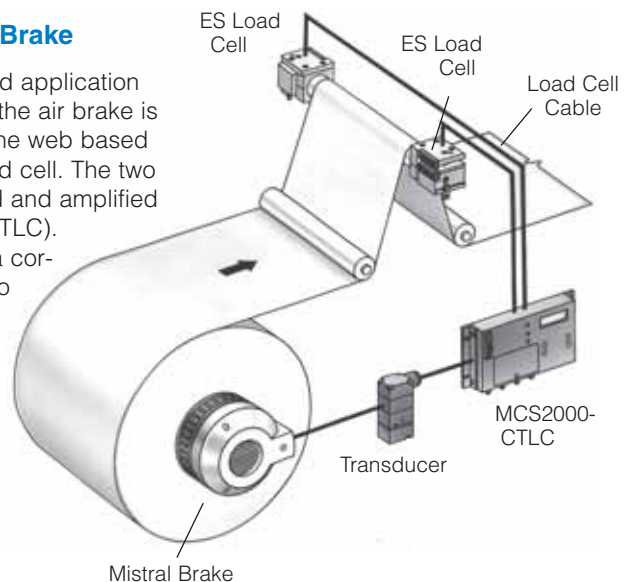
FM Load Cell with an Electric Brake

This is a single load cell unwind application example. The electric brake varies the tension on the web depending on the feedback from the load cell. The load cell signal is amplified and interpreted in the controller (MCS2000-CTLC). The controller then puts out a corresponding 0–10 VDC signal to the power supply and drive (MCS2000-PSDRV). The PSDRV then amplifies and interprets the signal from the controller and puts out a corresponding 0–24 VDC signal to the brake to apply either more or less braking.



ES Load Cell with a Pneumatically Operated Brake

This is a dual load cell unwind application example. In this application, the air brake is used to vary the tension on the web based on the feedback from the load cell. The two load cell signals are summed and amplified in the controller (MCS2000-CTLC). The controller then puts out a corresponding 0–20 mA signal to the transducer, which converts this signal from current to pressure to command the brake to apply either more or less braking.



Specifications

FM Series Foot Mounted Load Cells

Load Ratings	N	100	250	500	1,000	2,500	5,000	10K
	(lbs.)	(22)	(56)	(112)	(225)	(562)	(1,124)	(2,248)
Size		01	01	01	01	01	01	02
Input Power		±12 to ±15 VDC, ±5%						Deflection:
Output Signal		5 VDC factory setting at nominal load (can be rescaled for 25% load at +10 VDC output)						6mm at full load rating
Ambient Temperature		0–70°C (F)						
Temperature Drift		0.1% of rating per °C						
Non-Linearity & Repeatability		<0.5%						
Power Consumption		1 watt						
Cable		16 ft. provided with load cell.						



Load Cell Selection

The following information should be followed to determine the proper load cell size and style for your application.

1. Determine whether you will be using one or two load cells.

It is best for two sensing heads to be used, one at each end of the sensing roll. The two individual web tension inputs are averaged in the controller, which takes care of non-central alignment of the web over the sensing roll and slack edges from a non-uniform reel. The AC10 and C30 can only be used in dual load cell applications. The FM Series and A30 can be used in single load cell applications. The A30 is designed to be used with a single pulley or sheave mounting with a projection of 1 or 2 inches. An ES style cantilever unit is also available in lengths to 18". Consult the factory for more information.

2. Choose the load cell model that fits dimensionally.

The FM style is a foot mounted load cell (used with pillow blocks) that mounts perpendicular to the roll being measured. The ES style is an end shaft model where the mounting bolt centerline is on the axis of the measuring roll. There are two shaft mounting configurations with the ES style load cells. The "W1" cell clamps to the shaft while the "W2" cell allows for thermal expansion of the shaft. Both units have self aligning features. When using the dual load cell units (B30, C30 or AC10 series) one of each shaft mounting configuration must be used. It is recommended that a system be ordered in the AC10, B30 or C30 series (ex. AC10A12S) which will insure one "W1" load cell and one "W2" load cell is supplied as a matched pair.

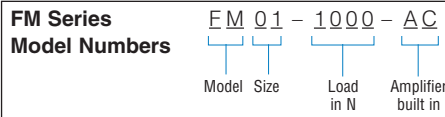
The AC10 is an AC version load cell that is economically priced when compared with the other ES models, even with the added power supply board that is required to power it.

Available sizes and dimensions are listed on pages 42 & 43 for the ES or FM style units. Choose the unit(s) that will best fit the machine construction.

ES Series End Shaft Mounted Load Cells

AC10 requires a power supply/amplifier

Load Ratings	60 lbs., 170 lbs., 500 lbs.	Deflection:	6mm at full load rating
Input Power	15 Vrms @ 5 KHz		
Output Signal	3.2 volts AC/inch displacement/volt excitation		
Output Impedance	780 ohms ±30%		
Ambient Temperature	–60° to +250°F (–50° to +620°C)		
Temperature Drift	0.02%		
Linearity & Repeatability	0.1% of full scale		
Overload Protection	10 times maximum rated load of unit		
Cable	Two 30 ft. cables provided with load cells.		

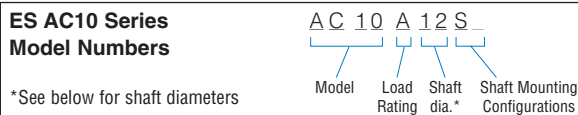


ES AC10 Series Load Ratings

- A** 60 lbs.
- B** 170 lbs.
- C** 500 lbs.

Shaft Mounting Configurations

- W1** = split bushing
- W2** = solid bushing
- S** = system which includes one W1 load cell, one W2 load cell, two 30 ft. cables and a power supply (PSAC10)



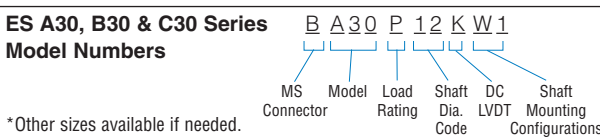
PSAC10 Power Supply/Amplifier

Input Power	115/230 VAC, 50–60 Hz
Output Signal	–10 to +10 VDC scaleable
Ambient Temperature	32°F to +160°F (0°C to +70°C)
Maximum cable distance between load cell and power supply board	100 feet
Part Number	PSAC10 (For a 10 x 8 x 4 Housing add –H)

*ES, A30, B30 & C30 Series

Load Ratings	A30 8 lbs., 20 lbs., 50 lbs., 90 lbs. B30 8 lbs., 20 lbs., 50 lbs., 90 lbs., 140 lbs., 200 lbs., 300 lbs., 500 lbs. C30 8 lbs., 20 lbs., 50 lbs., 90 lbs., 140 lbs., 200 lbs., 300 lbs., 500 lbs.	Deflection:	6mm at full load rating
Input Power	24 VDC at .040 amps (12 to 30 VDC acceptable, with LVDT output proportional)		
Output Signal	3 VDC/unit		
Ambient Temperature	–60° to +250°F (–50° to +120°C)		
Overload Protection	10 times rated load range		

Note: Tension cells are factory adjusted to provide an offset voltage with no load applied (no deflection). Using an input of 24 volts DC, the LVDT is set to provide an output of 3.5 volts into a resistive load of not less than 100,000 ohms. The voltage resulting from the maximum rated load then adds to or subtracts from the 3.5 volt offset. This results in an output of 6.5 volts in Compression.



Shaft diameter	inches ¾ 1 1¼ 1½
	code 12 16 20 23
	– Other diameters are available

Shaft Mounting Configurations
W1 = split bushing
W2 = solid bushing

ES A30 & C30 Series Load Ratings		
M* 8 lbs.	U 90 lbs.	Y 300 lbs.
P 20 lbs.	X 200 lbs.	Z 500 lbs.
T 50 lbs.	W 140 lbs.	*shaft size 70 3/4 only

Tension Control Systems

Load Cell Sensors

3. Load Cell Force Calculations

The FM style load cell can be mounted regardless of orientation, but has to work in compression. Only the perpendicular force (resultant) is measured by the load cell. The perpendicular force can be at a maximum permitted angle of $\pm 30^\circ$. The FM style is a strain gauge load cell and the maximum tension in the web used (T) should be the potential overload force.

The ES style load cells can be mounted at any angle around the axis of the measuring roll with any wrap angle. They work equally well in either tension or compression making it easy to adapt them to any new, retrofit, or replacement application. The mechanical structure and primary conversion element is designed to handle overloads at ten times the rated load range. Therefore, these units don't need to be oversized to provide adequate overload protection.

The following selection information is required to select a load cell:

T = maximum tension in the web (lbs.)

W = weight of the sensing roll (lbs.) acts vertically

X = wrap angle (degrees), 180° max.

Y = angle between resultant force of tension and vertical (degrees)

SF = Safety factor. Use 1 for ES style load cells and 2 for FM style load cells.

RF = Resulting force (lbs.)

4. Choose the load cell rating that is equal to or greater than the force calculation.

– Minimum rating of each cell should exceed 7% of maximum rating.

5. Choose accessories

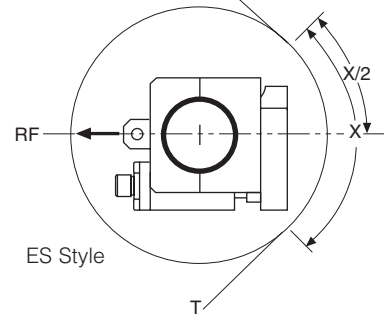
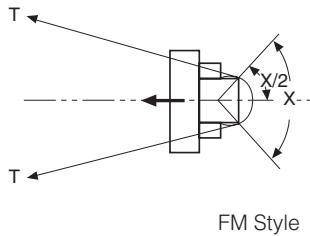
- For ES style load cells choose shaft diameter. Chart is on page 43.
- For the A30, B30 or C30 models choose cables L1A25 or L1A99 which are 25 or 99 ft. cables. Other lengths are available. A cable is needed for each load cell ordered.
- For the AC10 model the PSAC10 (power supply amplifier) is needed. Specify with or PSAC10-H with housing.

Sin/Cos Table

Degrees	Sin	Cos
0°	.0000	1.000
5°	.0872	.9962
10°	.1736	.9848
15°	.2588	.9659
20°	.3420	.9397
25°	.4226	.9063
30°	.5000	.8660

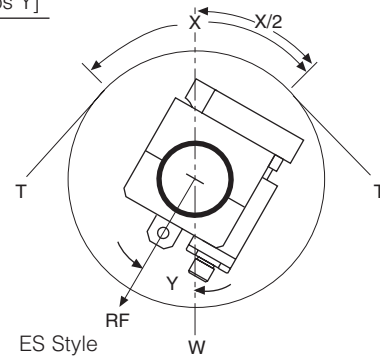
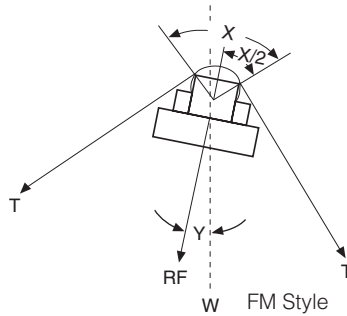
Case 1: Resultant force points horizontal

Load = $SF \times T(\text{lbs.}) \times \sin(X/2)$



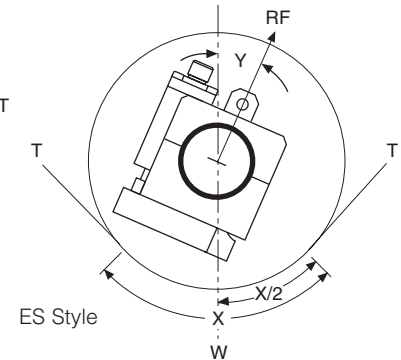
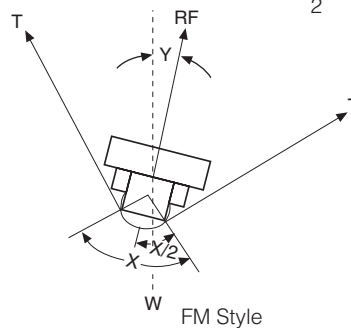
Case 2: Resultant force points down

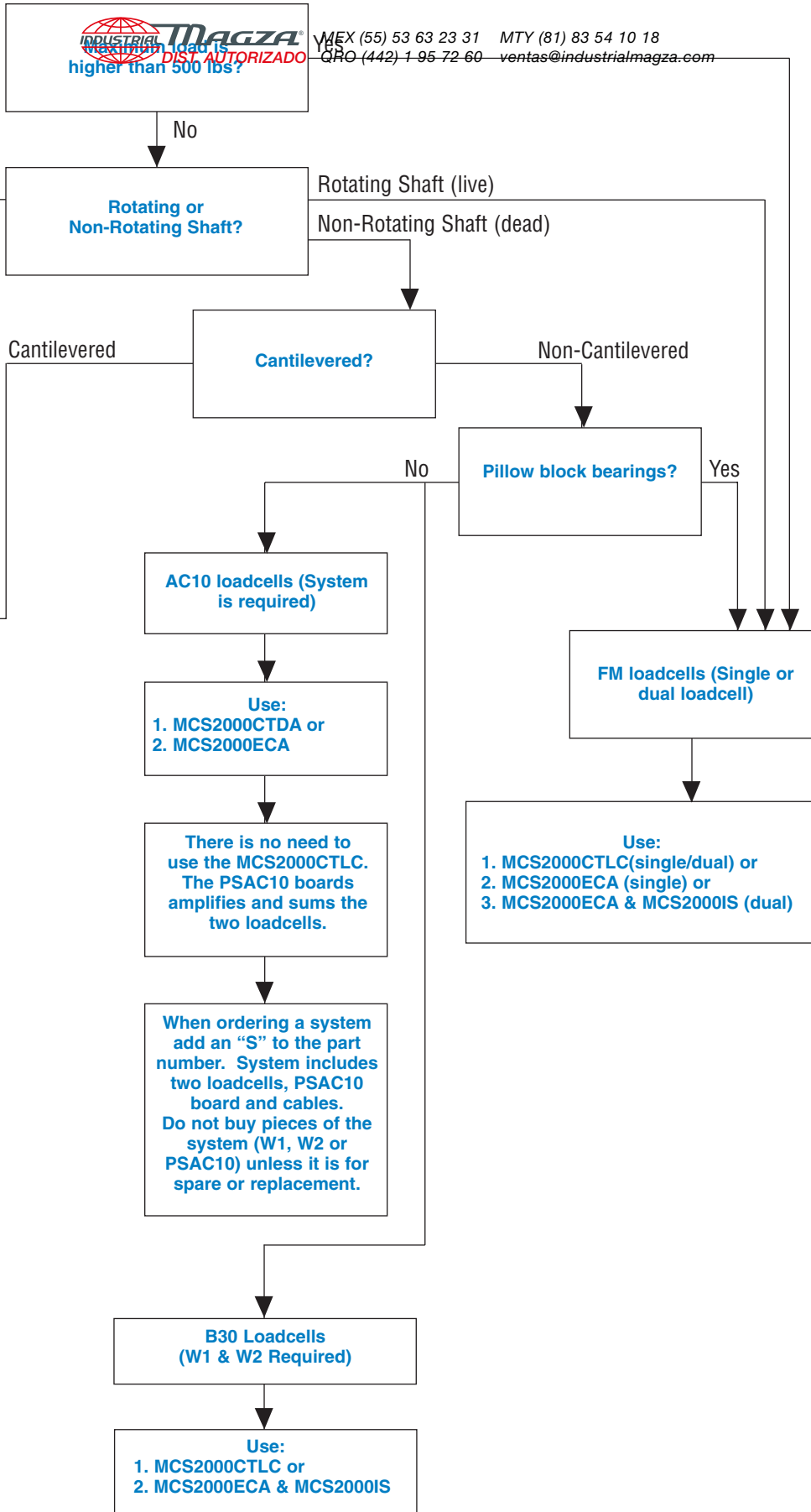
$$\text{Load} = [SF \times T(\text{lbs.}) \times \sin(X/2)] + \frac{[W(\text{lbs.}) \times \cos Y]}{2}$$



Case 3: Resultant force points upward

$$\text{Load} = [SF \times T(\text{lbs.}) \times \sin(X/2)] - \frac{[W(\text{lbs.}) \times \cos Y]}{2}$$





Note 1: B30, C30 and AC10 loadcells are calibrated as pairs of loadcells (W1 and W2). Do not use W1 from one pair with a W2 from another pair.

Note 2: Tension weight and roller weight must be known for proper selection of the loadcells.

Note 3: Other sizes available if needed. Please consult factory.

Consult factory for more details

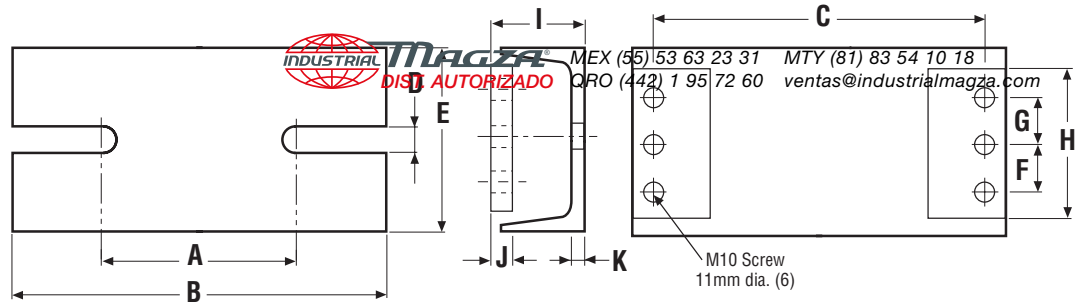
Tension Control Systems

Load Cell Sensors

Dimensions

FM Series

Foot mounted load cells



inches/(mm)

Size	Part Number	Load Ratings (lbs.)	A	B	C	D	E	F	G	H	I	J	K
1	6910-840-100	22											
	6910-840-102	56											
	6910-840-104	112	4.055	7.874	6.890	.512	4.016	.984	.984	3.150	2.047	.472	.236
	6910-840-106	225	(103)	(200)	(175)	(13)	(102)	(25)	(25)	(80)	(52)	(12)	(6)
	6910-840-108	562											
	6910-840-110	1124											
2	6910-840-112	2248	5.591	8.858	7.677	.669	5.00	.984	.984	3.937	2.165	.709	.236
			(142)	(225)	(195)	(17)	(127)	(25)	(25)	(100)	(55)	(18)	(6)
	6910-101-089	Cable Assembly 16 ft.											

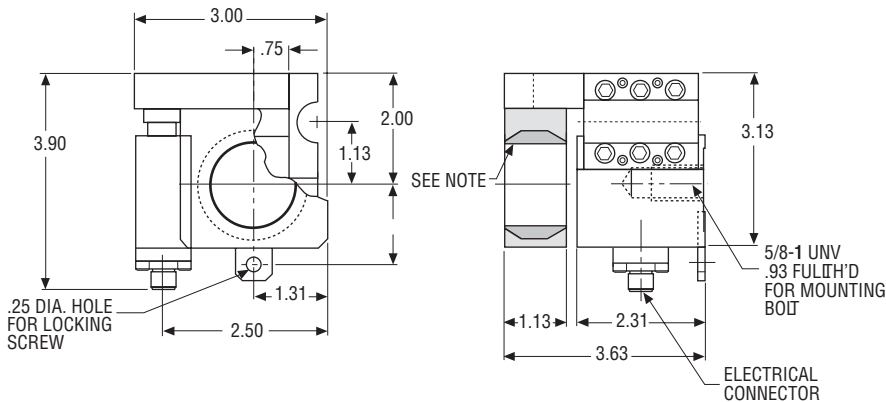
ES Series

End Shaft Mounted Load Cells

AC10

Dual Load Cell, Non-Rotating Shaft

Load ratings 60 lbs., 170 lbs., 500 lbs.



Cable Assembly

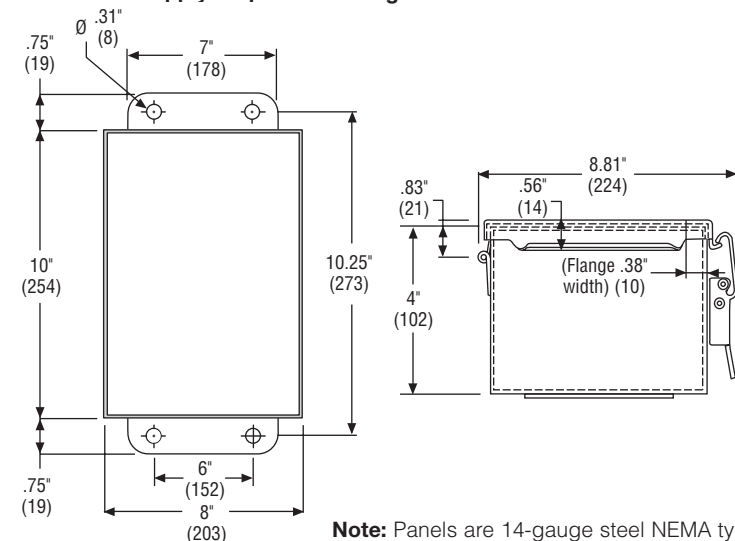
L1A30 30 ft. Cables

Note:

Stainless steel self-aligning bushing provided for shaft sizes 3/4", 1", 1-1/4" and 1-7/16" diameters. Other shaft diameters available on special order.

PSAC10-H

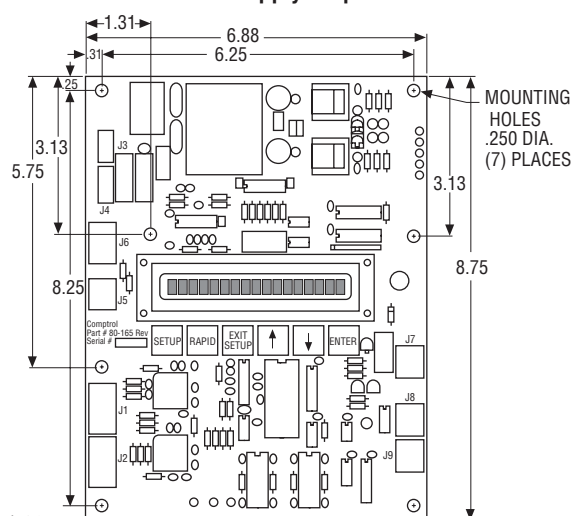
AC10 Power Supply/Amplifier Housing



Note: Panels are 14-gauge steel NEMA type 12 and 13.

PSAC10

AC10 Power Supply/Amplifier



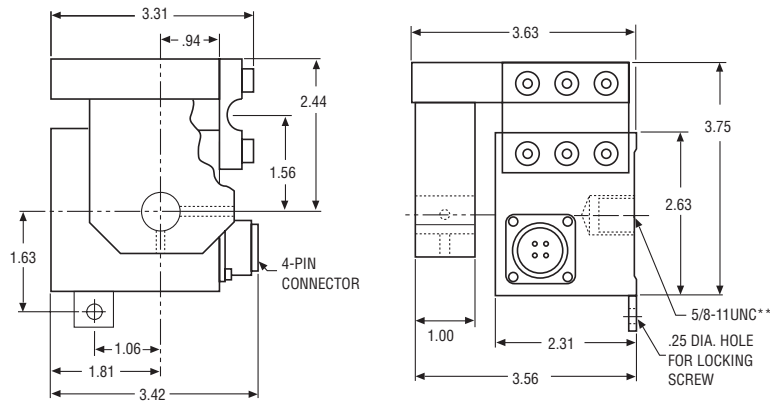
A30

Single Load Cell, Non-Rotating Shaft

Sheave or pulley mounting with projection of 1 or 2 inches.



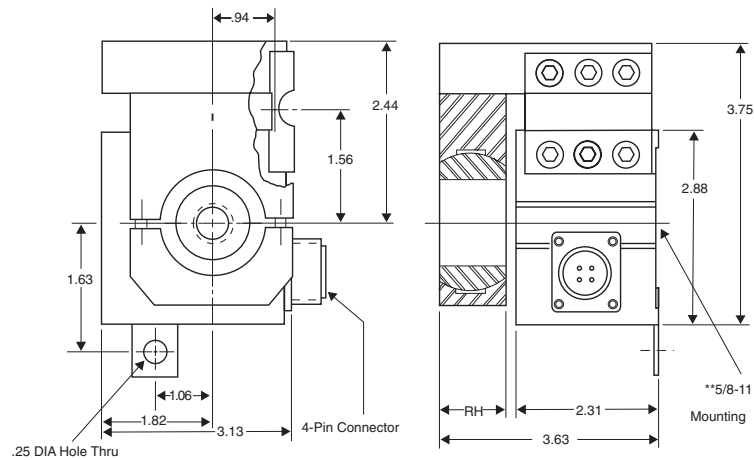
MEX (55) 53 63 23 31 MTY (81) 83 54 10 18
 QRO (442) 1 90 72 60 90 11 11 11 11 11 11 11 11
Cable Assemblies For All 30 Series
 L1A25 25 ft. with Connector
 L1A99 99 ft. with Connector



Load Ratings: 20 lbs., 50 lbs., 90 lbs.

Note: Other load ratings available - consult factory.

B30

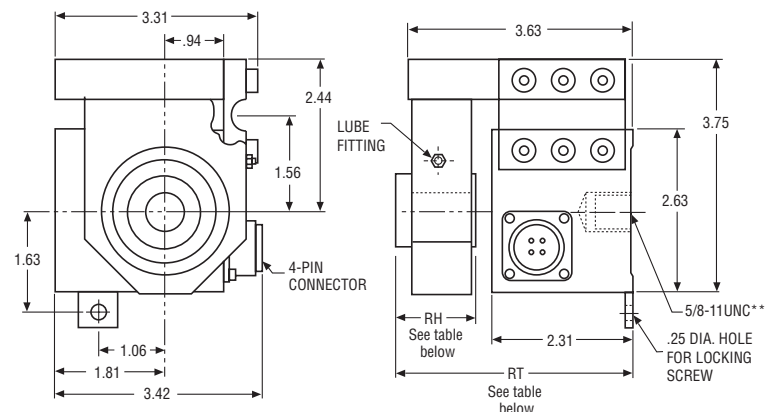


Load Ratings: 20 lbs., 50 lbs., 90 lbs., 200 lbs., 500 lbs.

Note: Other load ratings available - consult factory.

C30

Dual Load Cell, Rotating Shaft



Load Ratings: 20 lbs., 50 lbs., 90 lbs., 200 lbs., 500 lbs.

Note: Other load ratings available - consult factory.

RH and RT dimensions based on shaft diameter

Inches	3/4	1.0	1-1/4	1-7/16
Code	12	16	20	23
RH	1.31	1.38	1.69	
RT	3.88		4.13	

Standard Shaft Diameters	
Shaft Diameter	Standard
0.75"	3/4"
1.00"	1"
1.25"	1-1/4"
1.4375"	1-7/16"

Other shaft sizes available on special order - consult factory