MB Series Tension Sensors

The MB Series of load cells uses an LVDT type sensor to convert tension into a proportional electrical signal. The LVDT system provides precise, accurate tension measurement while the mechanical design allows for extremely high overloads without damage to the unit.

Function

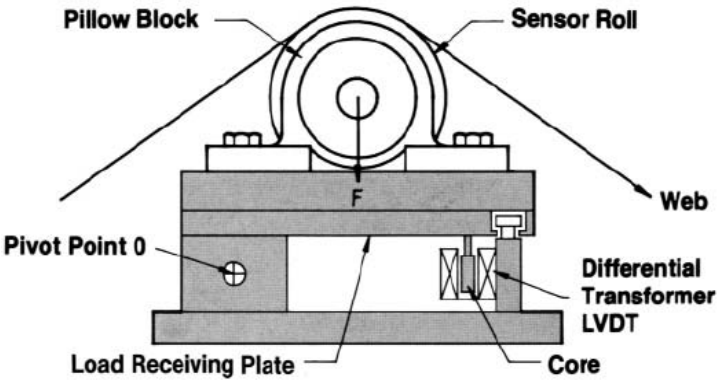
As web tension increases, the resultant force F (see Figure 1) also increases. This causes the load plate to rotate minutely around the pivot point. This pivot point is a torsion bar which resists the force F. Due to leverage advantage, actual sensing roll movement is quite small. Movement of the core in the LVDT is proportionately larger, as the core moves within the LVDT coil, the output of the coil varies directly with the core movement, which varies directly with the force F. The output is thus proportional to F. The mechanical structure of the torsion bar and the mechanical limit stops on the load plate allow the MB Sensors to survive 100-to-1 overloads without structural failure or variance in calibration.

The LVDT housing also contains a high-frequency oscillator circuit which guarantees excellent linearity and a thermal compensating circuit which ensures zero thermal drift when used within the stated temperature range.

Cables

Standard cable (16 ft/5m) provided with each sensor. Optional cables listed below, purchased separately.

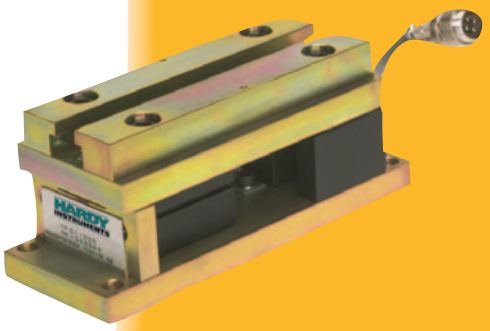
Part Number	Length
HI 17167	18" Extension
HI 17168	48" Extension
HI 2138	16′ (5m) Standard
HI 8365	30′ (10m)
HI 9428	50′ (16m)
HI 9429	75′ (25m)
HI 9430	100′ (33m)



Specifications

Model Number	Part Number	Load range per sensor LB / Kg	Tare per sensor LB / Kg	Accuracy	Weight LB / Kg	Electrical Data	Temp. Range
MB05B	HI 912609	22 / 10	11 / 5	±1%	3.3 / 1,5	6 VDC Excitation; 0-400 mV return	+14°to +140°F (-10°to +60°C)
MB05A	HI 912610	44 / 20	22 / 10	±1%	3.3 / 1,5		
MB11B	HI 911991	22 / 10	11 / 5	±1%	1.8 / 0,8		
MB11A	HI 911995	44 / 20	22 / 10	±1%	1.8 / 0,8		
MB25B	HI 911996	110 / 50	55 / 25	±1.5%	7.5 / 3,4		
MB25A	HI 911999	220 / 100	110 / 50	±1.5%	7.5 / 3,4		
MB33B	HI 911889	660 / 300	330 / 150	±1.75%	35 / 16		
MB33A	HI 912000	1100 / 500	385 / 175	±1.75%	35 / 16		
MB41	HI 911998	2200 / 1000	770 / 350	±1.75%	53 / 24		

Tension Control Accessories

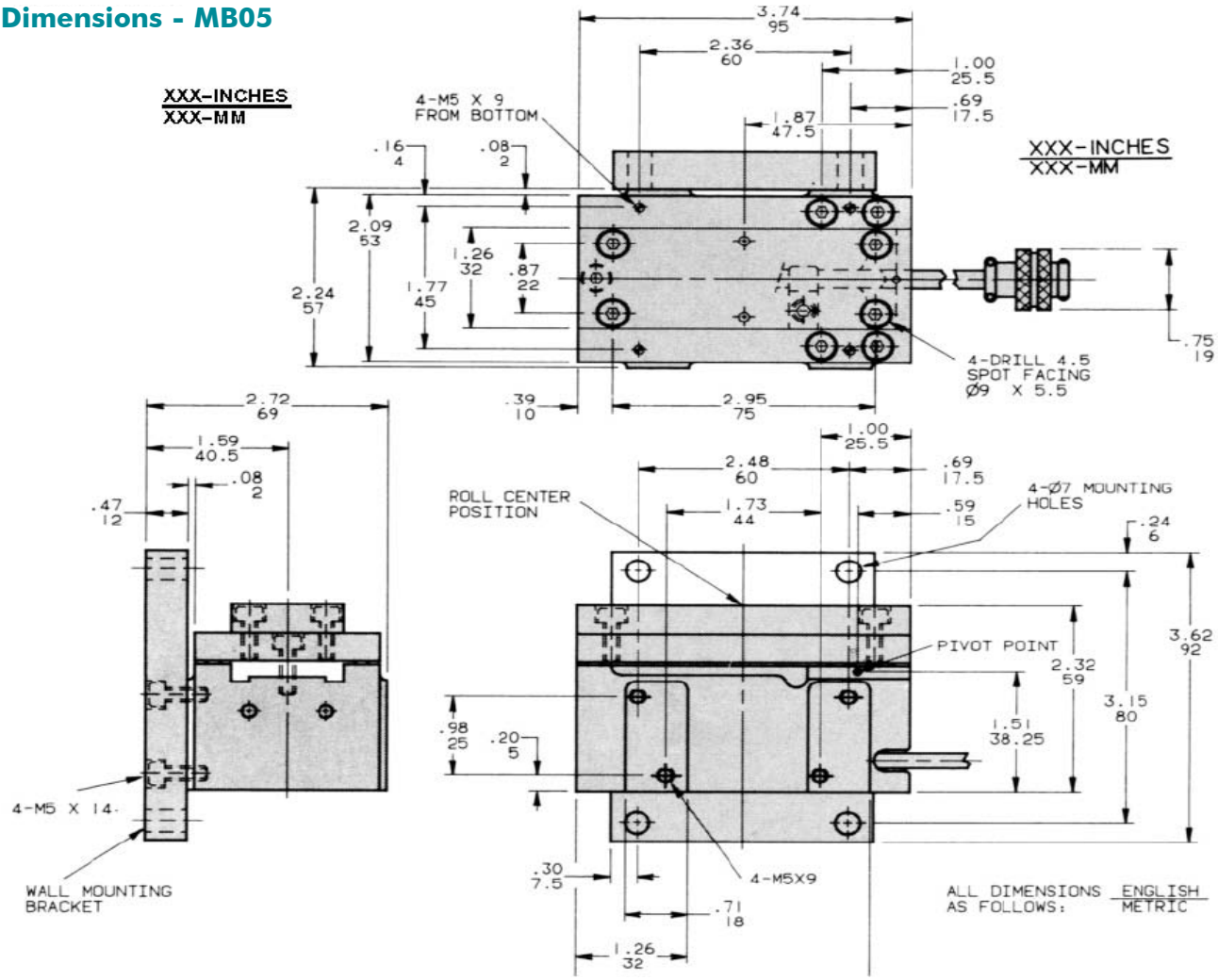


Features

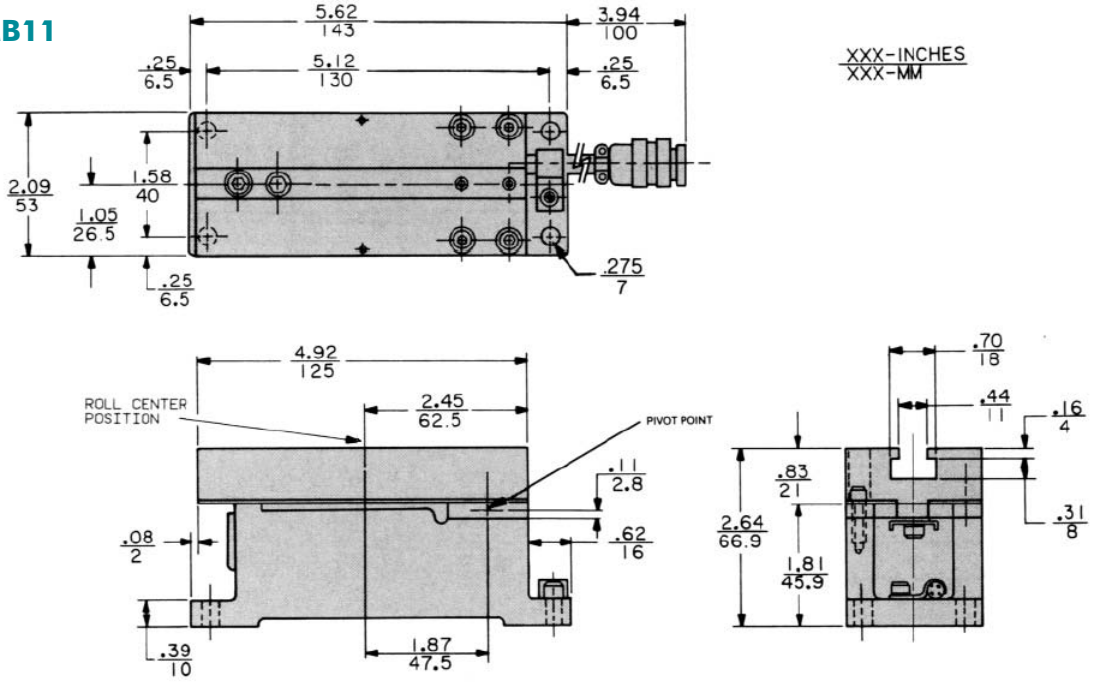
- Extremely accurate LVDT type sensor
- Mountable at any angle
- Suitable for either symmetrical or asymmetrical web path angles
- Capable of taking extreme overloads without structural damage or loss of calibration
- Simplified mechanical structure
- No calibration or maintenance required

HARDY INSTRUMENTS

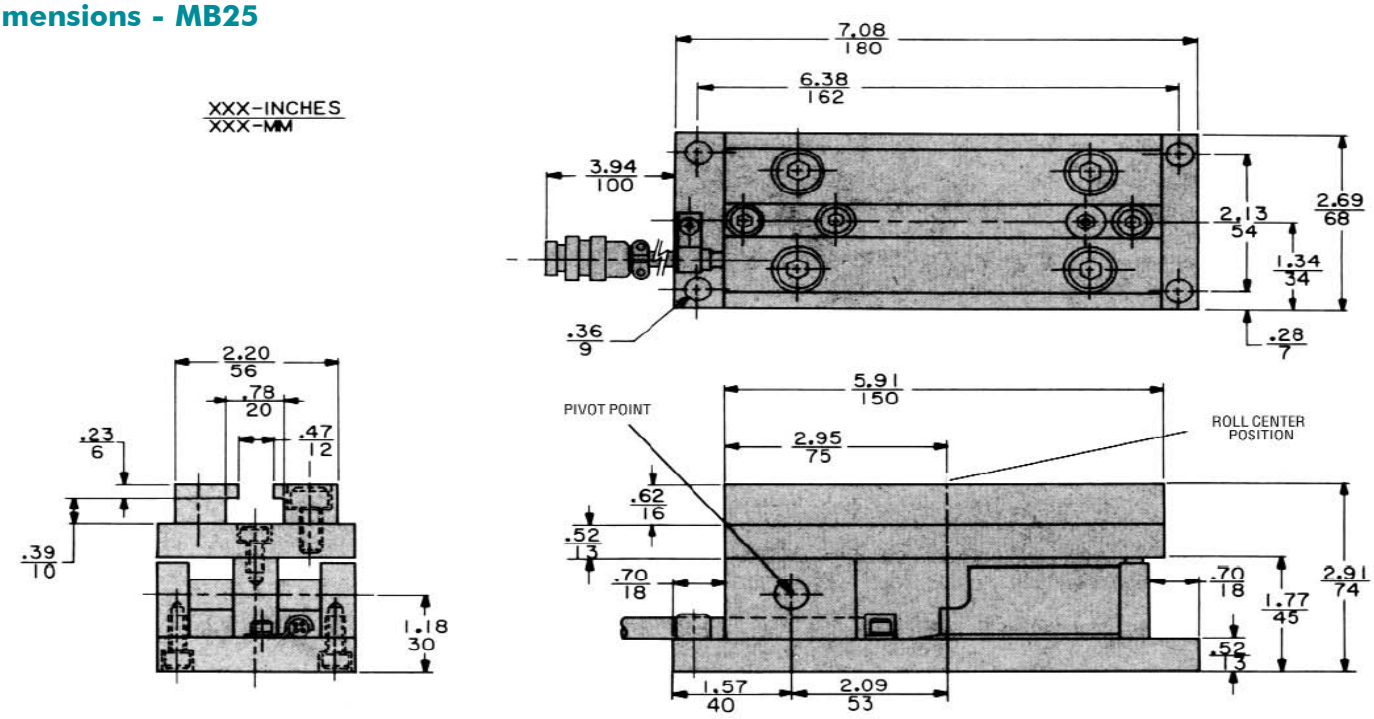
Dimensions - MB05



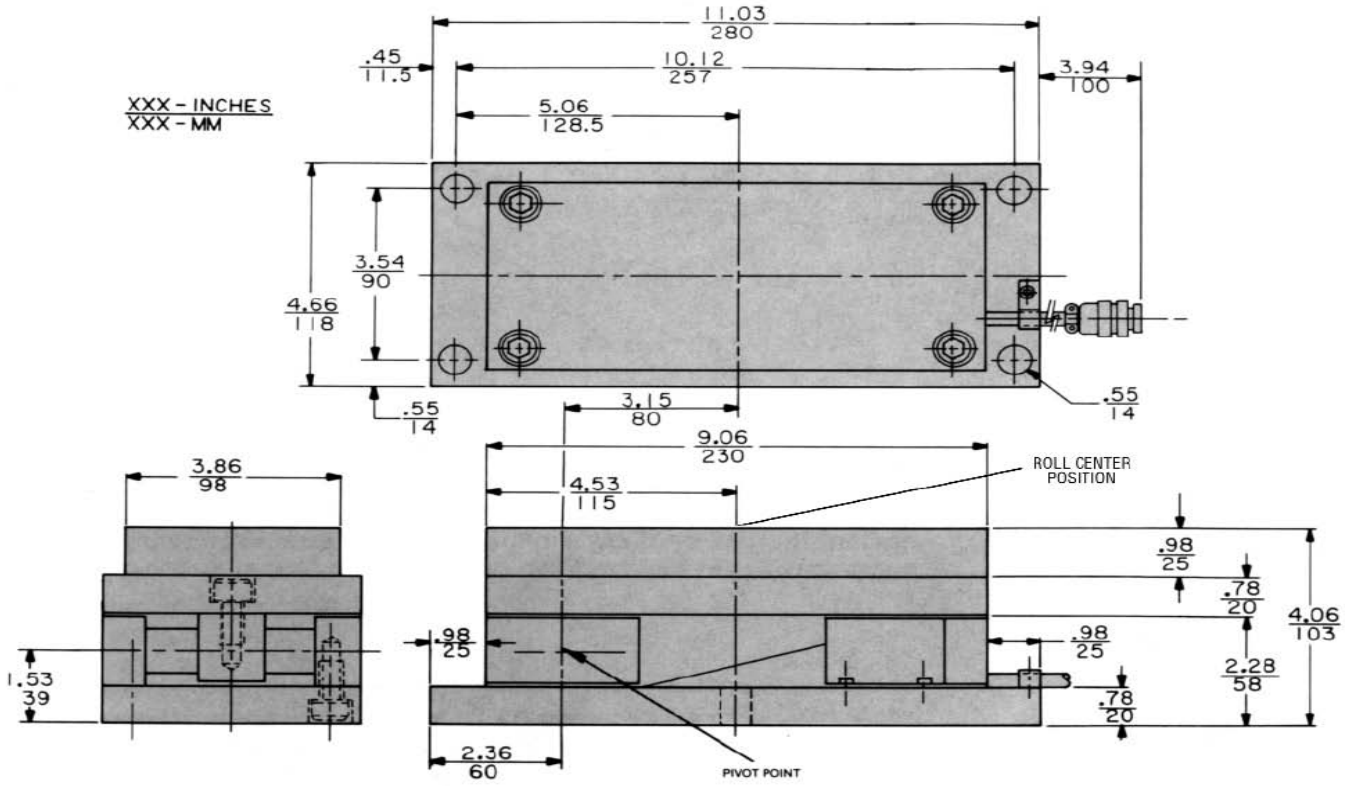
Dimensions - MB11



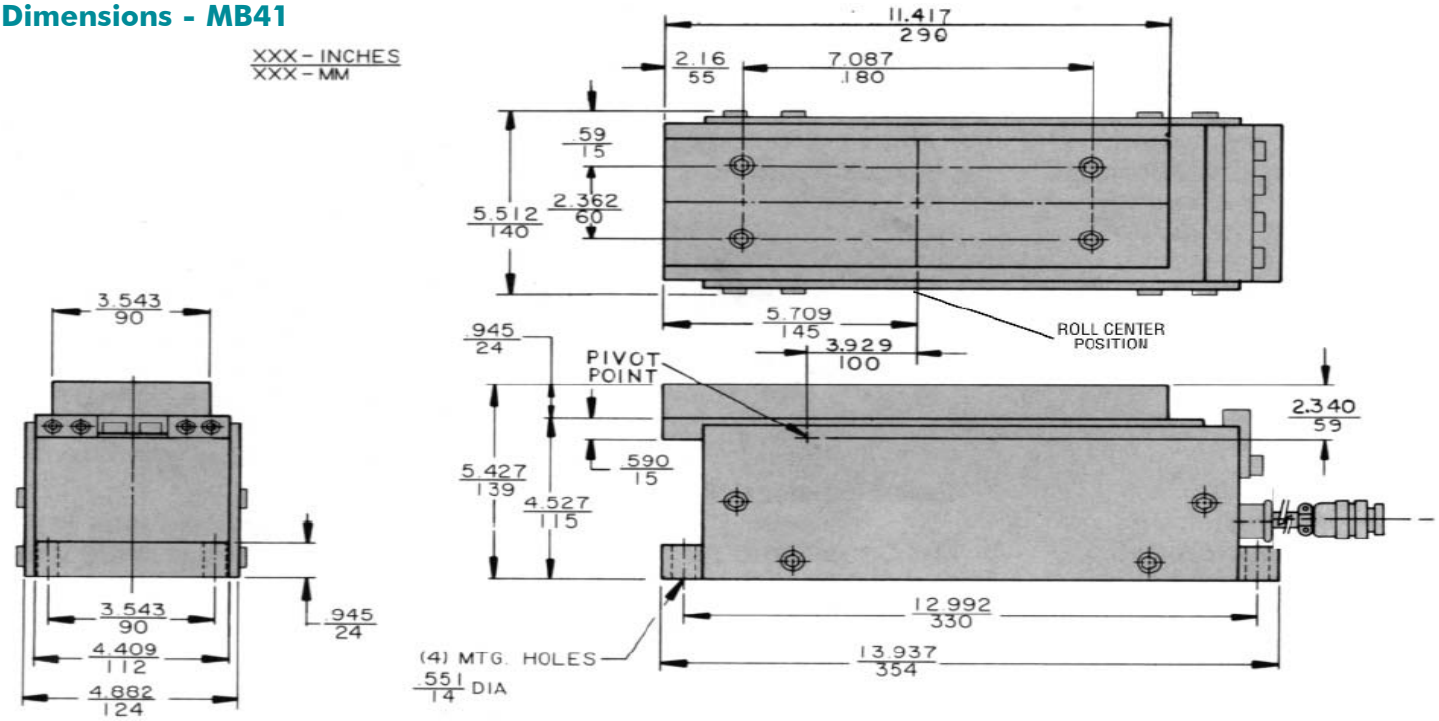
Dimensions - MB25



Dimensions - MB33



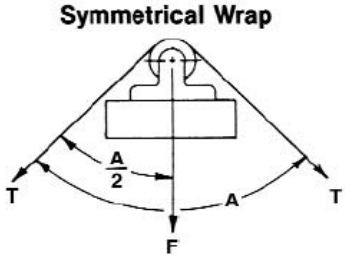
Dimensions - MB41

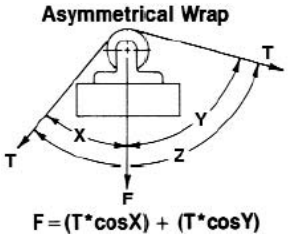


Sizing

Two factors affect Sensor Sizing. The sensor must be able to measure the Force (F) created by the Web Tension (T) wrapping the roll at given angle. The sensor must also support the tare weight of the sensing roll and bearings. These two factors are independent of one another and must be calculated separately.

Force Calculation





Load range per sensor (see spec. chart next page) is F divided by the number of points supporting the load, i.e. two support points in bilateral, Unilateral or Cantilevered configuration, or one support point in Narrow Web or Wire and Filament configuration. Tare per sensor (see spec. chart next page) is calculated the same way. The tare per sensor is the total weight of the sensor roll and the bearings divided by the number of support points.

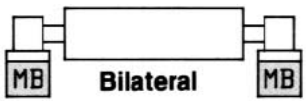
Warning

Tare capacity can decrease by up to 50% when sensors are mounted vertically or at an angle (see items B and D under "Sensor Mounting" next page). Reduce tare per Sensor rating in spec. chart by 50% or contact the factory.

Contact Hardy Instruments or your Hardy Representative if you have any question about sensor sizing.

Installation

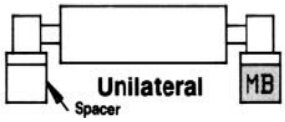
Sensor Configuration



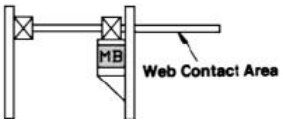
Bilateral - Standard arrangement used on most machines. Sensing tension on both ends provides maximum sensitivity and eliminates sensing errors due to tension variation from edge to edge.

Narrow Web - Useful on narrow web machines. Should not be used where roll face exceeds six inches.

Wire or Filament
- Similar to narrow web style. For tension in excess of 2 lbs. (0,09 kg).



Unilateral - More economical sensing method. Not recommended for webs over 14 inches (355,6mm) wide or on machines where the web is run off center.



Cantilevered Rolls - MB Sensor mounted on support bracket to machine frame. For tensions less than two pounds multiply the force with leverage. F=2T(Y/X)

Sensor Mounting

Mounting dimensions for the five frame sizes are given on previous pages. Sensors may be mounted at any angle (see Figures A-D).

All sensors include a 16 ft. (5M) cable which may be extended with 18 AWG 4 conductor shielded cable to as long as 500 ft. (152M). Presized, Extension Cables are also available. All sensors must be mounted according to the following guidelines:

1. Flatness must be 0.002" (0.05 mm) over the length of the sensor. This can be achieved by milling of the mounting surface.
   NOTE: Any shimming required for sensor roll leveling must be done between sensor and pillow block. Never shim between sensor and sensor mounting surface.

2. Sensor roll span must equal sensor span. This is achieved by securing the sensor to the mounting surface, then the pillow block bearings to the sensors, and finally the bearings to the sensor roll shaft (see Fig. E).

3. When sensors are mounted to a base of material different than that of the sensor roll, i.e. aluminum roll, steel mounting base; secure only one pillow block bearing to the roll shaft. This will allow for different rates of thermal expansion (see Fig. E).

4. Mounting surfaces must be parallel. Self centering pillow block bearings are required to take up any variations in parallelism (see Fig. F).
   NOTE: Noncompliance with these conditions will induce heavy side loads within the sensor. This will cause hysteresis, and the sensor will measure mechanical resistance rather than tension load.

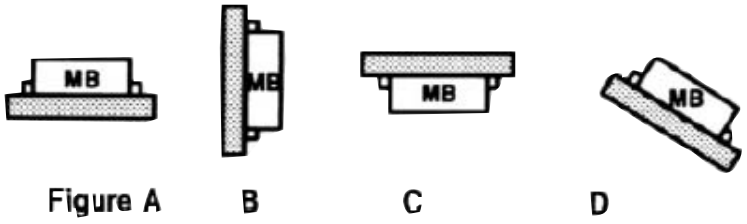


Figure A B C D

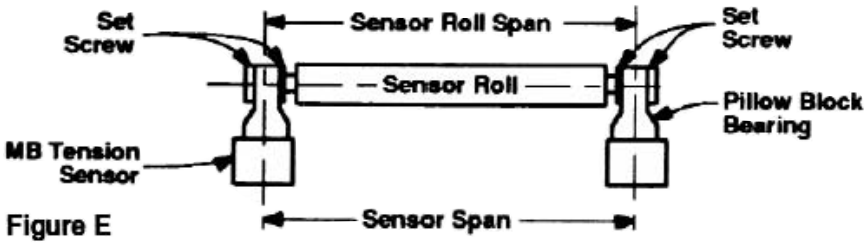


Figure E

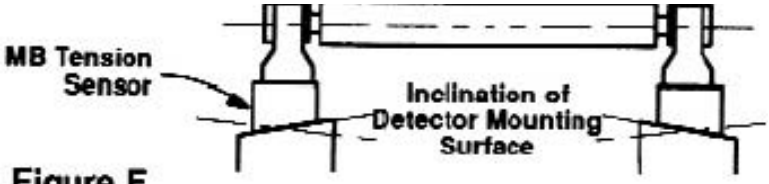


Figure F

MB 05, MB II and MB 25 only

MB05 is normally mounted using the side mounting plate and cap screws provided with the unit. MB II and MB 25 may be mounted on customer supplied wall mounting brackets. (See figures G & H).

All three sizes may be mounted for either normal or reverse web wrap. The tension induced force (F) is calculated the same in both cases and the allowable load range per sensor (see chart page 3) does not change.

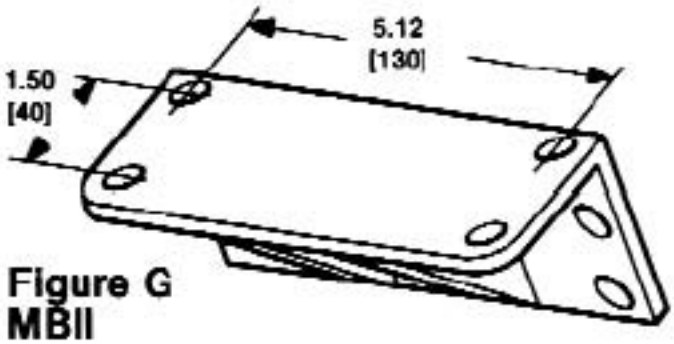


Figure G
MBII

MB 33 and MB 41

Due to the high forces generated by webs needing MB 33 and 41 load cells, reverse wrap is not recommended. Due to the high forces generated, side wall mounting is not recommended.

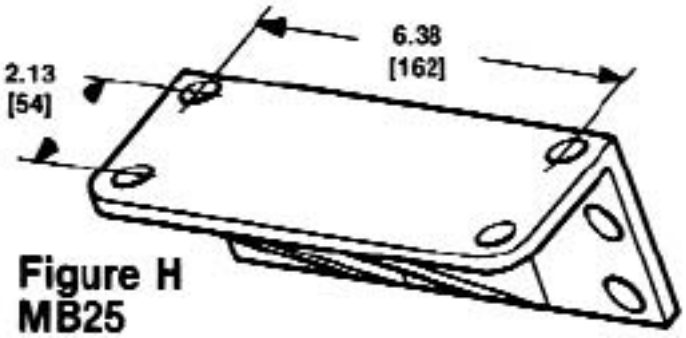


Figure H
MB25

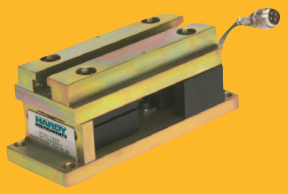
COMPONENTS TO COMPLETE YOUR HARDY INSTRUMENTS SYSTEM

Hardy provides the all the components you need to complete your tension control system

Tension Controller

Load Cells / Tension Sensors

Hardy offers strain gage and LVDT load cells in various mounting versions and in a wide range of capacities.



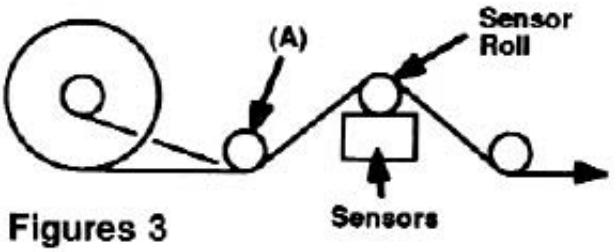
Pneumatic Brakes

Hardy supplies Air Brakes of all capacities for use on unwinding applications. Hardy also provides I/P (electrical to pneumatic) converters and air filters.

HARDY INSTRUMENTS

Installation

Sensor Location



Figures 3

Figure (3) illustrates correct sensor location for winding or unwinding control. One transport roll (A) located between the sensors and roll stand serves to fix the web angle over the sensor roll.

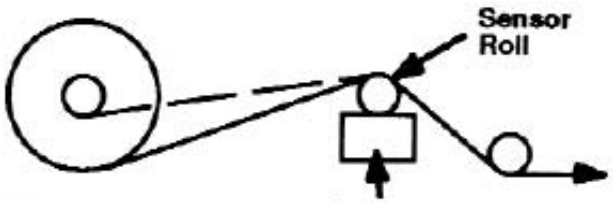


Figure 4

Figure (4) illustrates angular changes as the roll changes diameter during processing. These angular changes will cause incorrect readings from the Tension sensors and must be avoided by use of roll (A) (see Fig. 3).

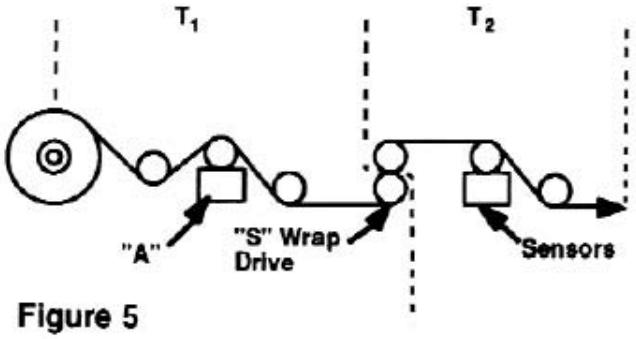


Figure 5

Figure (5) illustrates a common mistake in sensor mounting. In this configuration, the "S" wrap drive will effectively isolate tension into two zones, T1 and T2. A nip roll at the same position would provide the same isolation. The roll stand brake or clutch can only control tension in T1 zone. Since the sensors are mounted in the T2 zone, they can not sense any tension changes caused by the roll stand and can not be used for closed loop control. The sensors must be moved to position "A" for proper control of the roll stand and T1 tension.

To learn more about the Tension Controller Line, or to download data sheets, drawings, or manuals, visit our website at:
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