

PART I - DESCRIPTION

I-A GENERAL INFORMATION

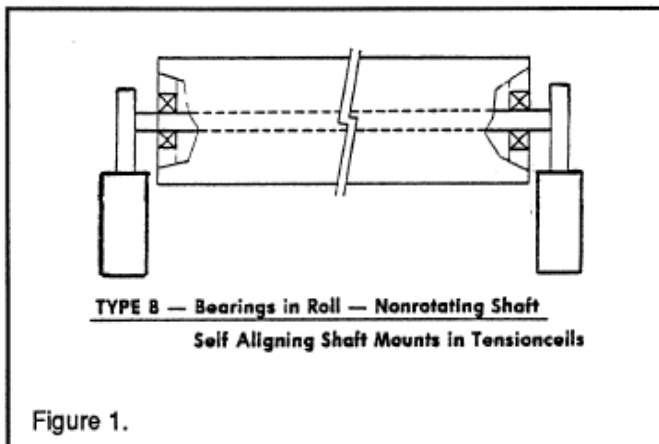
Comptrol Series 42 Type "B" and "C" Tensioncells are force transducers specially designed to measure and control web tension on continuous strip processing lines. Tensioncells convert the mechanical force of the strip tension into an electrical signal, which is directly proportional to the strip tension.

Tensioncells are normally installed in matched pairs at each end of a measuring roll. (See Figure 1)

Tensioncells consist of a unique combination of two integral systems, one mechanical, the other electrical.

TYPE "B"

Type "B" Tensioncells are designed for use in NON-ROTATING shaft installations. A self-aligning shaft clamp assures proper alignment of the measuring roll. Type "B" cells are supplied in matched pairs, one to be mounted at each end of the measuring roll. Note that the cell marked "W2" is a mirror image of "W1". "W2" allows for thermal expansion of the shaft. (See Figure 1.)



TYPE "C"

Type "C" Tensioncells are intended for ROTATING shaft installations. They are supplied with self-aligning ball bearings to assure positive alignment of the measuring roll. Type "C" Tensioncells are supplied in matched pairs, one to be mounted at each end of the tension measuring roll. Note that the cell marked "W2" is a mirror image of "W1". Remove Set Screw from "W2" cell to permit thermal expansion of the rotating shaft. (See Figure 2)

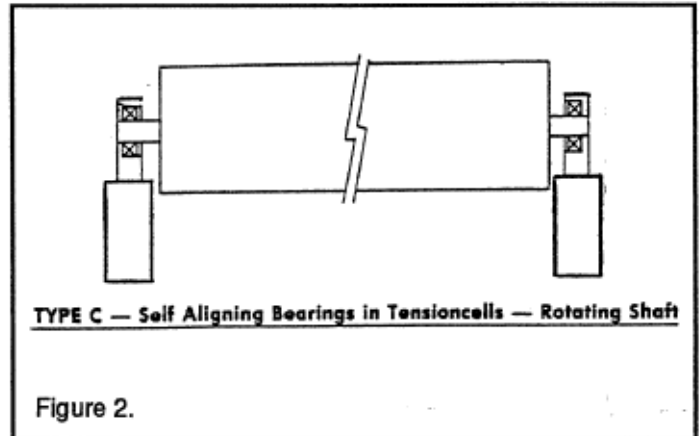


Figure 2.

I-B THE MECHANICAL SYSTEM

The mechanical system consists of a Patented "C-Flexure Pivot Assembly" which incorporates amounting Base Block, frictionless elastic pivot (or hinge), and Load Plate. When a mechanical force is applied to the Load Plate the pivot permits its deflection toward or away from the Base Block. .

For our discussion here, deflection of the Load Plate the Base Block (Figure 3) is defined as the "Compression Mode", while the opposite is defined as the "Tension Mode". Tensioncells are designed to operate equally well in either mode.

The Base Block contains an integral Mechanical Stop to limit the amount of deflection in either direction, and a Viscous Damper to allow control of the Tensioncell response to rapid changes in apparent tension loads.

This displacement creates an accurate voltage output from Linear Variable Differential Trans- former (LVDT). This extremely accurate high level output signal is directly proportional to the strip tension.

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I-C THE ELECTRICAL SYSTEM

The primary conversion element of the Tensioncell is a Linear Variable Differential Transformer (LVDT), (Figure 3) which converts the mechanical deflection of the load plate in to an electrical signal, which is directly proportional to the force applied. The cylindrical body of the LVDT is mechanically attached to the Base Block, while the movable core is attached to the Load Plate. By means of the core adjust assembly this adjustment is factory set and is not accessible.

I-D TYPE "K" DC LVDT

As illustrated in Figure 4, a DC LVDT consists of the following components:

- An oscillator network, which converts the DC input voltage into a high frequency alternating current for exciting the Primary Poil (P_1).
- A Primary Coil (P_1).
- A movable, permeable metallic core.
- Two Secondary Coils (S_1 and S_2).
- A demodulator and summing network to rectify and integrate the currents from the Secondary coils.

With Comptrol LVDTs, the input and output circuits are electrically isolated from each other and from the mechanical structure of the Tensioncells. Thus, they may be used in "floating ground" or "ground return" systems. This eliminates the need for extra circuit boards which are required for most strain gage loadcells.

Tensioncells 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 deflection then adds to or subtracts from the 3.5 volt offset. This results in an output voltage of 3.5 to 6.5 volts in the Compression Mode and 3.5 to 0.5 volts in the Tension Mode. (See Figure 5)

While acceptable performance may be obtained over an input voltage range of 6.0 to 30.0 volts DC, the output voltage will vary in direct proportion to the input voltage. Because of this, the use of a "well regulated" constant voltage power supply is essential for accurate and repeatable tension measurement.

In standard applications, where two Tensioncells are used, the inputs may be connected in parallel allowing the Tensioncells to be excited from the same power supply. The LVDT outputs are then summed to obtain a signal representing the strip tension and tare loads distributed across the roll

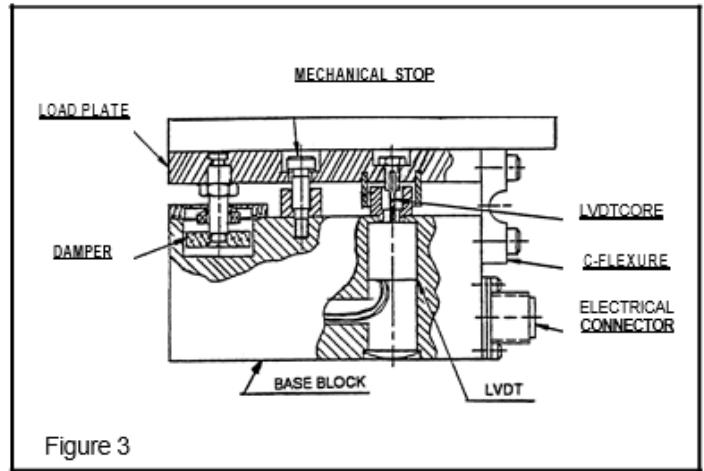


Figure 3

Comptrol Tensioncell Indicators supply 24-volt DC and integrate the output signals in a summing amplifier. This permits incorporation of additional circuitry for offset and tare adjustments, as well as adjustments for balance and gain.

PART II - INSTALLATION AND OPERATION

II-A INSPECTION UPON DELIVERY

Comptrol Tensioncells are carefully packaged in sturdy reinforced cartons or wooden boxes and are securely blocked or bolted in place.

1. Upon receipt, examine the exterior of the container for obvious damage or tampering.

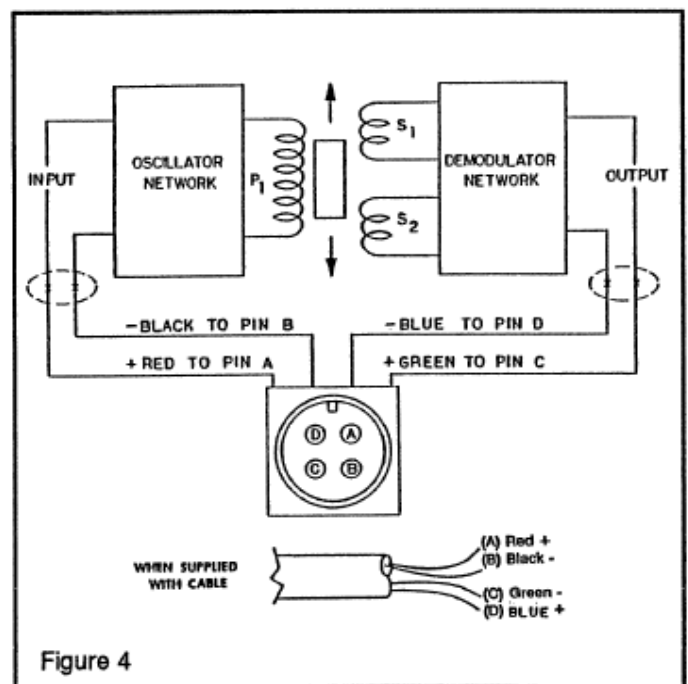


Figure 4

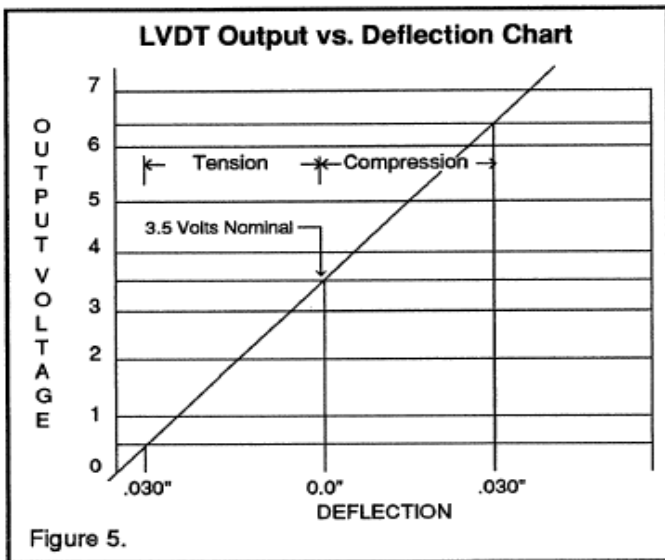
2. Check the contents against the packing list.
3. Promptly report any damage or shortage to both the carrier and Comptrol Incorporated.

II-B HANDLING

Tensioncells can be handled manually.

II-C LONG TERM STORAGE

While Comptrol loadcells are plated, exposure to weather, dirt, or moisture should be avoided when they are stored.



II-D MECHANICAL INSTALLATION

1. Model 42 Tensioncells are mounted with four 5/16-inch bolts. Refer to the dimensional drawing on Page 7 or 8 of this manual, for detailed identification of all parts.
2. Refer to the machine design drawing or layout. The stands or base structures to which the terminals are mounted must be within .002-inch T.I.R.
3. Drill and tap the holes in the stand or base mounting structure to accept the four 5/16-inch mounting bolts.
4. Assemble the Tensioncells to the stands or base mounting structures.
5. Assemble the measuring roll to the Tensioncell.

II-E MECHANICAL ALIGNMENT

Align the sectional measuring roll to avoid any mechanical binding or friction. The measuring roll must be level and perpendicular to the path of the strip material for accurate measurement.

The Mechanical Stops are fixed for the required travel of the Load Table.

II-F ELECTRICAL INSTALLATION

(Read the entire electrical wiring procedure before proceeding.)

1. Turn off all electrical power to the loadcell.
2. Use twisted four conductor signal cable, Belden 9402, or equivalent in grounded steel conduit to conduct wiring from the LVDT's to the control panel.
3. Observing correct polarity, connect the positive (+) input lead to Pin A and the negative (-) input lead to Pin B. (See Figure 4)
4. Connect the positive (+) output lead to Pin D and the negative (-) output lead to Pin C. (See Figure 4)
5. Repeat Steps 1 through 4 of the electrical wiring procedure for the Tensioncells mounted on the other end of the measuring roll.

II-G ELECTRICAL ZERO ADJUSTMENT

(Read the complete Electrical Zero Adjustment procedure before proceeding with the adjustment.)

1. Disengage strip from the measuring roll so that no tension force is applied to the loadcell.
2. Connect a voltmeter to Pins C and D (See Figure 4)
3. Apply 24-volt DC electrical power to the loadcell observing the correct polarity. [Plus (+) to Pin D and minus (-) to Pin C]. Do not exceed the maximum rated input voltage.

NOTE: Allow 20 minutes for the loadcell to warmup before taking first readings to insure accurate readings.

4. Measure the output voltage of the LVDT between the Green and Blue leads for each Tensioncell with a voltmeter with a sensitivity of at least 100,000 ohms per volt. The output voltage should be between 0.5 and 6.5 volts.

- Since Comptrol Tensioncells cannot be mechanically zeroed, refer to the Control Manual for zeroing out the tare weight voltage.

TYPE 'K' 24 VOLT DC LVDT SPECIFICATIONS

Input	6-30volts DC
Output	0.5 - 6.5 volts DC (nominal, open circuit)
Output impedance.....	2.5K ohms
Current Consumption.....	40mA
Recommended Load.....	100K ohms or greater
Maximum Temperature:	250°F

Note: Comptrol loadcells are calibrated for 24-volt DC input voltage to provide a 0.5 to 6.5 volts DC output signal. Output voltage will vary proportionally to input voltage.

II-H FULL LOAD ADJUSTMENT

After the loadcell has been zeroed, a pull test can be made to check the output voltage of the loadcell at full load. (See calibration sheet for voltage output.)

- Run a non-stretchable rope over the center of the tension roll simulating the web path. (NOTE: the rolls should be free to turn)
- With one end of the rope secured, hang a known weight, equally over the roll so that the total tension is equal to the maximum strip tension specified on the calibration sheet, at the other end. (See Figure 6)
- With a voltmeter connected to Pins C and D of the connector, an output voltage will be observed.
- Repeat Step 3 for the Tensioncell mounted on the opposite end of the measuring roll.

Comptrol loadcells instrumentation provides the required signal conditioning and a reliable high level output signal for use as feedback control of a tension drive system. The feedback signal is directly proportional to the strip tension applied. If a Comptrol control is used, refer to the control manual for further calibration.

Although the electrical output of Comptrol Tensioncells are sufficient to drive most electrical indicators, substantial signal conditioning is normally required for effective tension instrumentation system control. Refer to the documentation available from the instrumentation supplier for more information.

PART III - TROUBLE SHOOTING

When properly installed in accordance with the original design specifications, Comptrol Tensioncells should require little or no regular maintenance or service.

Certain conditions, however, can impair their inherently accurate and reliable performance. Therefore, if trouble should arise, the following conditions should be checked.

III-A MECHANICAL

- Has the tension measuring system been changed?
 - An increase or decrease in web tension. (Refer to A on the calibration sheet for specified web tension)
 - An increase or decrease in the wrap angle. (Refer to B on the calibration sheet for the specified wrap angle)

If the above parameters have been changed enough to prevent the unit from operating within the limits of the fixed Mechanical Stops, replacement of the Flexure will be required. For this modification, the Tensioncell should be returned to the factory with complete specifications.

- Are the loadcells mounted securely?
- Is tension measuring roll in proper alignment and does it turn freely?
- Are bearings and seals free of all binding and stickiness? Are they worn?

III-B ELECTRICAL

- Are LVDTs receiving correct input voltage?
Check line voltage, fuses or circuit breakers, and power switches. Check power supply output and voltage to LVDTs.
- Are all connections secure?
Check for continuity. Retighten all connections. Recheck operation.
- Are LVDTs open or shorted.
To check, turn off power and disconnect the input and output leads. Check coil continuity and resistance. (Refer to Figure 4)
 - Pin A to Pin B (Primary Coil) should be in excess of 2 megohms.
 - Pin A or Pin B to LVDT shell should be in excess of 5 megohms.

- c. Pin C to Pin D (Secondary Coil) should be approximately 20,000 ohms.
- d. Pin C or Pin D to LVDT shell should be in excess of 5 megohms.

If LVDT circuits are open or shorted, replace LVDT.
Contact Comptrol with Tensioncell model number and serial number.

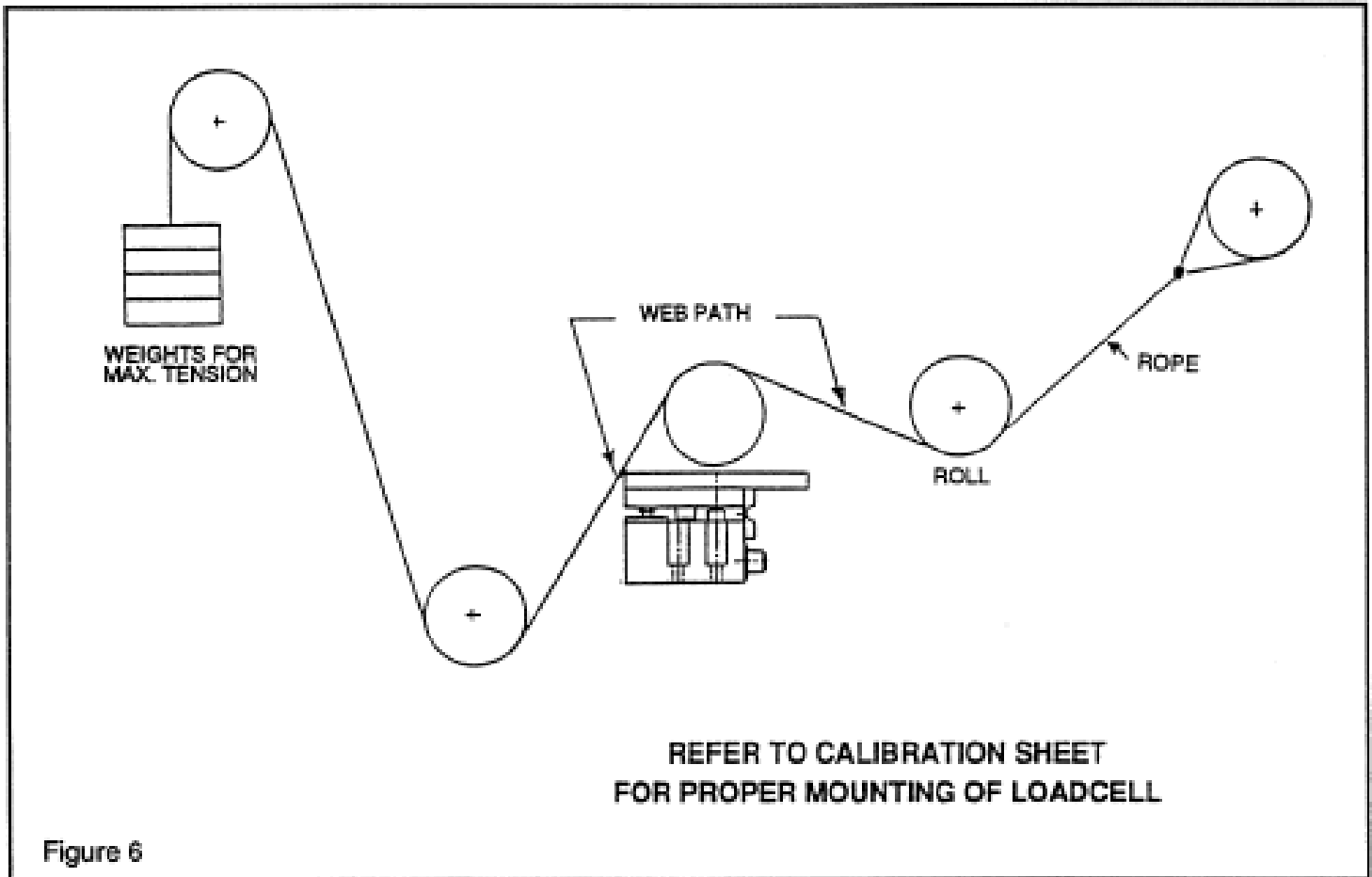


Figure 6

HIGH PROFILE - DEAD SHAFT MOUNTING - B42

TABLE II		CAPACITY RANGE									
MODEL	RANGES (POUNDS)										
B42	0 - 4	0 - 8	0 - 13	0 - 20	0 - 30	0 - 50	0 - 90	0 - 140	0 - 200	0 - 300	0 - 500
	L*	M*	N	P	S	T	U	W	X	Y	Z

* TENSIONCELLS IN THIS RANGE SUPPLIED FOR SHAFT SIZES UP TO MAX. 3/4 DIA., UNLESS APPROVED BY FACTORY.

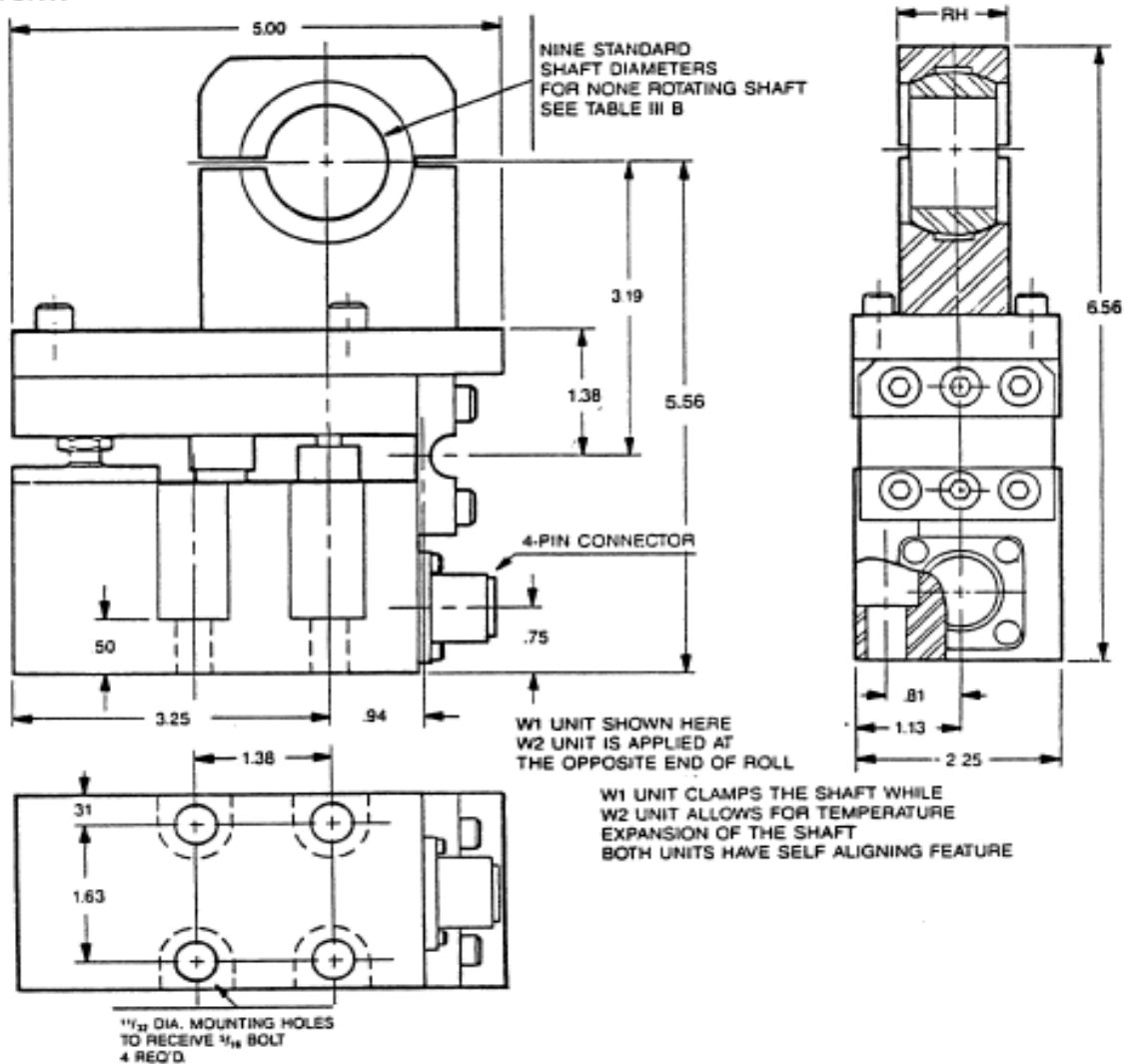


TABLE III-B	SHAFT SIZE									INCHES
INCHES	1/2	3/8	3/4	7/8	1.0	1-1/8	1-1/4	1-3/8	1-1/2	
CODE	08	10	12	14	16	18	20	22	24	
RH	1.00				1.13					

C42 - LOW PROFILE - ROTATING SHAFT MOUNTING

TABLE II		CAPACITY RANGE									
MODEL	RANGES (POUNDS)										
C42	0 - 4	0 - 8	0 - 13	0 - 20	0 - 30	0 - 50	0 - 90	0 - 140	0 - 200	0 - 300	0 - 500
	L*	M*	N	P	S	T	U	W	X	Y	Z

* Tensioncells in this range supplied for shaft sizes up to maximum 3/4 dia. unless approved by factory.

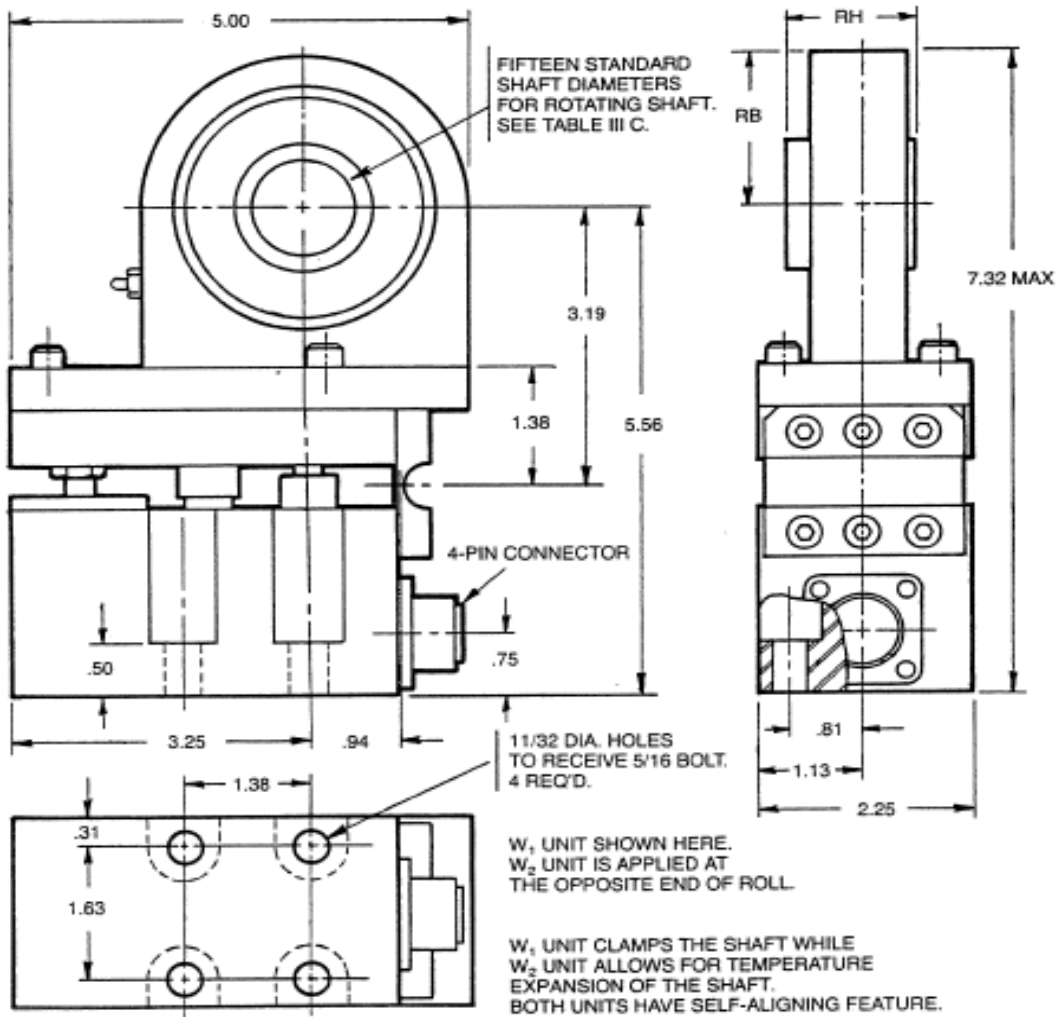


TABLE III-C		SHAFT DIAMETER - INCHES														
INCHES	1/2	9/16	5/8	11/16	3/4	7/8	15/16	1.0	1-1/16	1-1/8	1-3/16	1-1/4	1-5/16	1-3/8	1-7/16	
CODE	08	09	10	11	12	14	15	16	17	18	19	20	21	22	23	
RB	1.38						1.75									
RH	1.31			1.38			1.53			1.69						

HOW TO SPECIFY TENSIONCELLS

<p>ELECTRICAL CONNECTION B - MS Connector</p>	<p>MODEL H40</p> <p>B H 4 O Y K</p>	<p>J - AC LVDT K - DC LVDT</p>	<p>Example shown: BH40YK MS Electrical Connector Basic Base Mounting Model 40 0-300 lbs. Capacity K Type DC LVDT Dimensions: Page B5</p>									
<p>TYPE See Table I</p>	<p>CAPACITY See Table II</p>											
<p>ELECTRICAL CONNECTION B - MS Connector</p>	<p>MODELS B41 & B42</p> <p>B B 4 2 S 1 6 K</p>	<p>J - AC LVDT K - DC LVDT</p>	<p>Example shown: BB42S16K MS Electrical Connector Non-Rotating Shaft Model 42 0-30 lbs. Capacity 1" Diameter Shaft K Type DC LVDT Dimensions: Pages B6 & B7 (same as C41 & C42)</p>									
<p>TYPE See Table I</p>	<p>CAPACITY See Table II</p>	<p>NON-ROTATING SHAFT DIAMETER See Table III B</p>										
<p>ELECTRICAL CONNECTION B - MS Connector</p>	<p>MODELS C41 & C42</p> <p>B C 4 1 X 2 2 K</p>	<p>J - AC LVDT K - DC LVDT</p>	<p>Example shown: BC41X22K MS Electrical Connector Rotating Shaft Model 41 0-200 lbs. Capacity 1-3/8" Diameter Shaft K Type DC LVDT Dimensions: Pages B6 & B7</p>									
<p>TYPE See Table I</p>	<p>CAPACITY See Table II</p>	<p>ROTATING SHAFT DIAMETER See Table III C</p>										
<p>ELECTRICAL CONNECTION B - MS Connector</p>	<p>MODELS P43, Q43 & R43</p> <p>B P 4 3 T 1 2 K</p>	<p>J - AC LVDT K - DC LVDT</p>	<p>Example shown: BP43T12K MS Electrical Connector Pillow Block Rotating Shaft Model 43 0-50 lbs. Capacity 3/4" Diameter Shaft K Type DC LVDT Dimensions: Page B8</p>									
<p>TYPE See Table I</p>	<p>CAPACITY See Table II</p>	<p>ROTATING SHAFT DIAMETER See Table III C</p>										
TABLE I	TABLE II	TABLE III B	TABLE III C									
TYPE	NON-ROTATING SHAFT DIAMETER 1/16" increments		ROTATING SHAFT DIAMETER 1/16" increments									
	CAPACITY RANGE											
	Code	Lbs.	Code	Lbs.	Dim.	Code	Dim.	Code	Dim.	Code	Dim.	Code
<p>A - Pulley or Shaft B - Non-Rotating Shaft C - Rotating Shaft H - Basic Base P - Pillow Block Q - Pillow Block R - Pillow Block</p>	L	0-4	U	0-90	1/2	08	1-1/8	18	1/2	08	1- 3/16	19
	M	0-8	W	0-140	5/8	10	1-1/4	20	9/16	09	1- 1/4	20
	N	0-13	X	0-200	3/4	12	1-3/8	22	5/8	10	1- 5/16	21
	P	0-20	Y	0-300	7/8	14	1-1/2	24	11/16	11	1- 3/8	22
	S	0-30	Z	0-500	1.0	16			3/4	12	1- 7/16	23
	T	0-50							7/8	14	1- 1/2	24
									15/16	15	1- 9/16	25
									1.0	16	1- 5/8	26
									1-1/16	17	1-11/16	27
									1-1/8	18	1- 3/4	28

HOW TO ORDER SUPERLOADCELLS AND CONTROLS

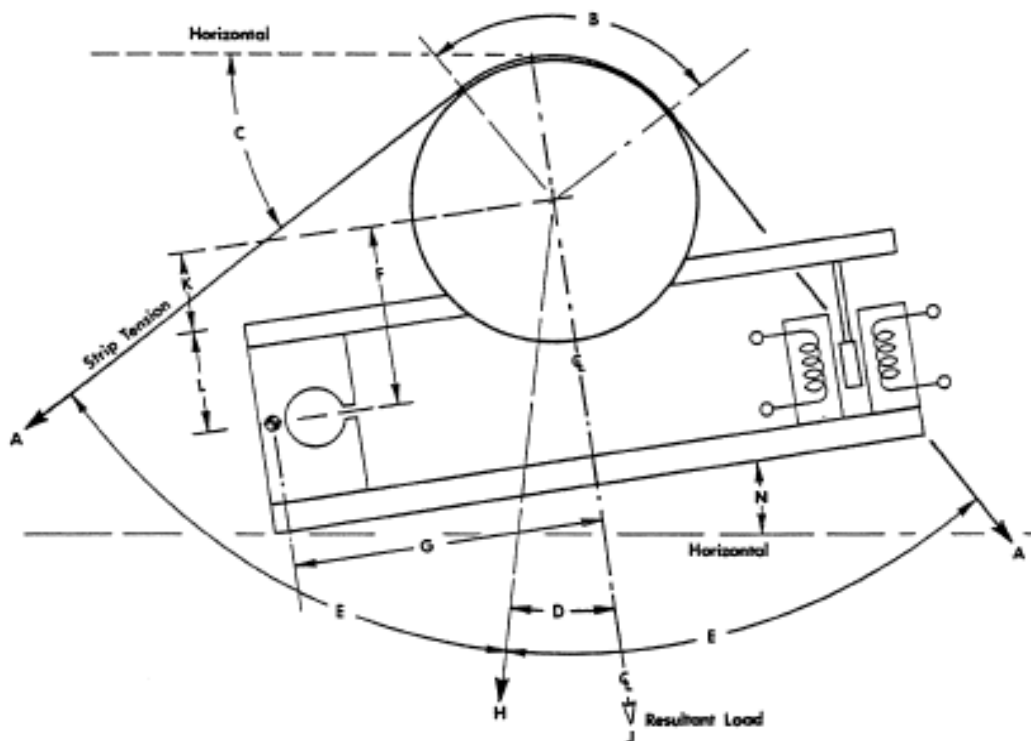
Our Application Engineering Department will make all calculations and offer installation suggestions as part of our formal quotation. To help us provide these services, we request that you furnish us with complete information about your requirements. If possible include a drawing or sketch of your application, noting the preferred position of the electrical conduit box. The information listed below is the MINIMUM we require: (Refer to illustration below.)

- Maximum Strip or Web Tension (A)
- Total Wrap Angle (B)
- Inclination of the Passline with respect to horizontal (C)
- Height of the Centerline of the Pillow Block Bearing (K). Please identify by Type, Model Number, and Manufacturer.
- Mounting Angle with respect to horizontal (N)
- Total Weight of the roll and bearings (or sheave and bearing) (TW)
- Measuring Roll Diameter (in inches)
- Maximum Machine Speed (FPM)

Include the Model Number of the Loadcell Control Required.

When placing your order, please include instructions as to how the equipment and/or shipping containers are to be marked. Loadcells are assembled from stock parts for fast delivery.

When ordering spare, or replacement parts, please reference the Model and Serial Number of the original equipment. Comptrol maintains complete files and documentation on all loadcell equipment.



APPLICATION REVIEW

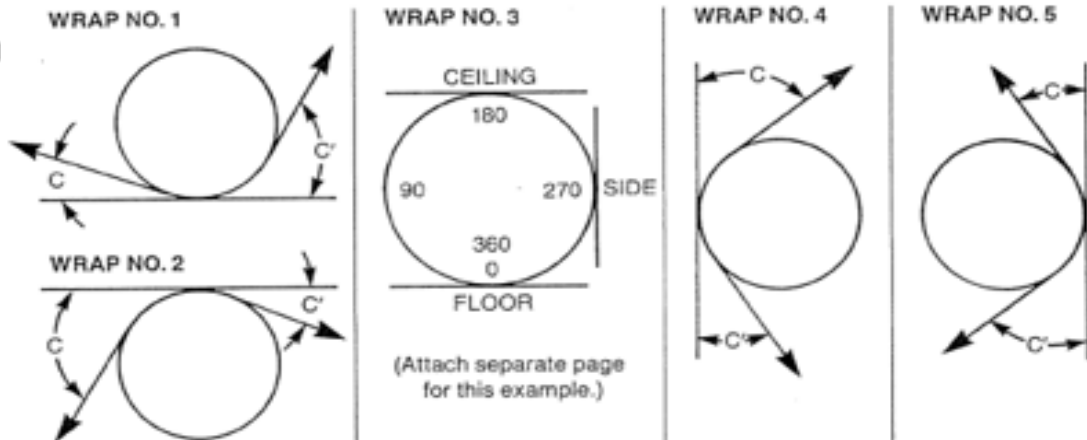
Company _____
 Address _____
 City _____ State _____ Zip _____
 Name _____
 Phone _____ Email _____

APPLICATION DATA

Wrap No. _____ C = _____ deg. C' = _____ deg.
 Strip Tension: Max _____ lbs. Min. _____ lbs.
 Line Speed: Max _____ fpm Min _____ fpm Roll Diameter _____ in.
 Mounting: Side Under Pillow Block Bearing (specify manufacturer & model)
 Bearing Mfr. _____ Model No. _____
 Roll and bearing weight: _____ lbs. Shaft diameter: _____ in.

Controller: Analog Digital Installation: New Existing

COMPTROL
STRIP TENSION
TRANSDUCER
DATA



Special Considerations (Environment, temperature, etc.): _____

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Note that protective covers or guarding may not be shown in some illustrations to provide a clearer view of specific components or assemblies. All protective covers and guarding must be installed before operating the unit.

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