PART I - DESCRIPTION

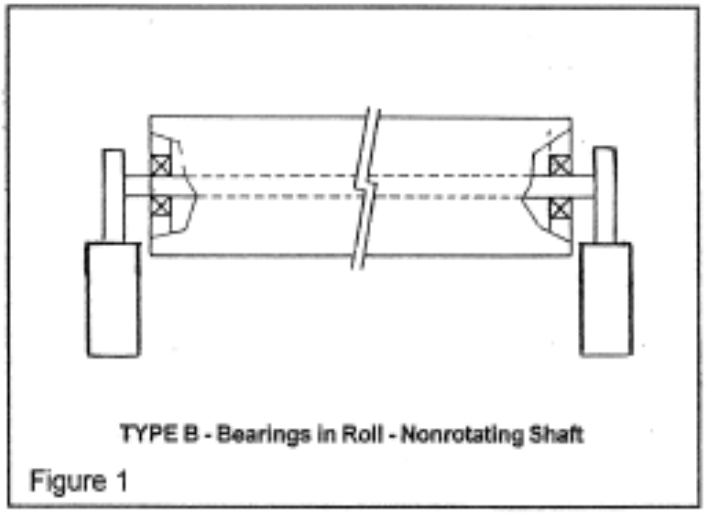
I-A GENERAL INFORMATION

Comptrol Series 20 Type “B” and “C” Tensioncells are force transducers especially designed to measure and control web tension on continuous web processing lines. They are normally installed in matched pairs at each end of a measuring roll. (See Figure 1 & 2)

A Tensioncell consists of a unique combination of two integral systems (one mechanical, the other electrical) for converting the mechanical force of web tension into an electrical signal which is directly proportional to the web tension.

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 when the Tensioncells are bolted to the frame of the machine. Type “B” cells are supplied in matched pairs, one to be mounted at each end of the measuring roll.



TYPE B - Bearings in Roll - Nonrotating Shaft

Figure 1

Table of Contents

General Information.....1
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Adjustments.....5
Troubleshooting.....6
Recalibration.....7
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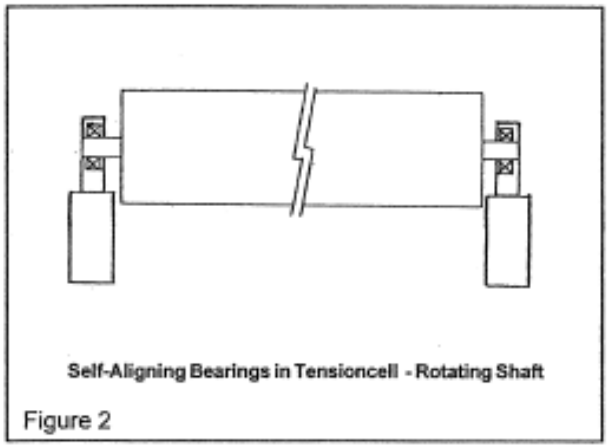
How To Order.....10
Application Review.....11



Self-Aligning Bearings in Tensioncell - Rotating Shaft

Figure 2

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.

For Type “B” & “C” note that the cell marked “W2” is a mirror image of “W1”. The "W2" cell allows for thermal expansion of the roll shaft. (See Figure 2.)

(Continued on Page 2)

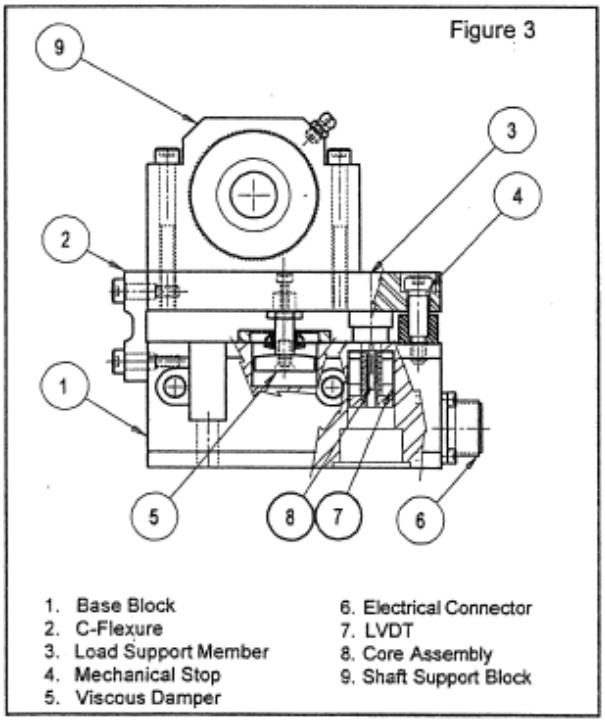


Figure 3

1. Base Block
2. C-Flexure
3. Load Support Member
4. Mechanical Stop
5. Viscous Damper
6. Electrical Connector
7. LVDT
8. Core Assembly
9. Shaft Support Block

I-B THE MECHANICAL SYSTEM

The mechanical system consists of a Patented "C-Flexure Pivot Assembly" which incorporates a mounting Base Block, frictionless elastic pivot (or hinge), and Load Plate. (See Figure 3) 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 toward the Base Block 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 Tensioncells response to rapid changes in apparent tension loads. (See Figure 3)

I-C THE ELECTRICAL SYSTEM

The electrical system consists of a Linear Variable Differential Transformer (LVDT) which converts the mechanical deflection of the Load Plate into a useful electrical output signal. (See Figure 4) The core of the LVDT is mechanically coupled to the Load Plate. (See Figure 3) This adjustment is factory set and is not accessible.

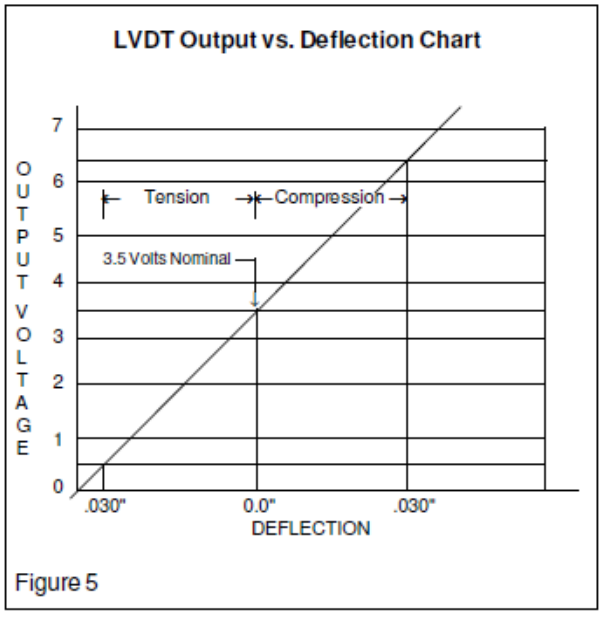


Figure 5

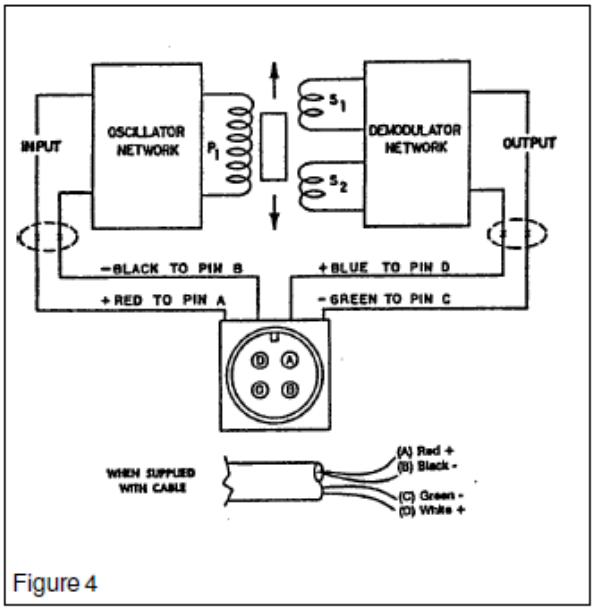


Figure 4

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 Coil (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.

Comptrol Tension Indicators provide the 24-volt DC power supply and the necessary circuitry to integrate and sum the output signals. Adjustments are also provided for offset and tare, as well as balance and gain. (See Indicator Manual for more information)

I-E DESCRIPTION OF OPERATION

The total resultant load per cell (JT) is calculated by resolving web force vectors acting upon the Tensioncells, with respect to the Loading Line (OX). (JT) is the resultant of both TENSION and TARE loads, PER CELL! (See Figure 6)

The intrinsic design of Comptrol Tensioncells allows the location of the Resultant Load of Web Tension (H) on any angle with respect to the Load Line (OX). Note, however, that the Total Force vector (JT) must always be calculated on the line (OX).

Any force vector falling on the line (OR) (through the pivot point of the C-Flexure) will produce no deflection, and thus no change in electrical output.

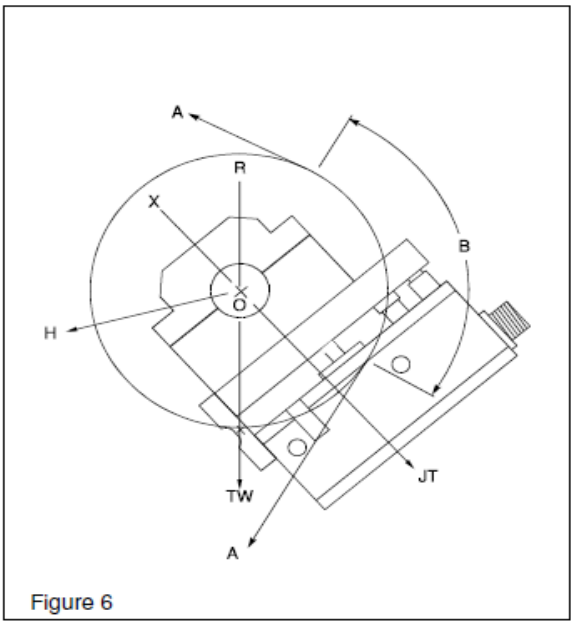


Figure 6

Changing the mounting angle of the Tensioncell changes the effects of the force vectors on the cell. The mounting angle selected for a specific application is selected to maximize the Tensioncell output signal.

Figures 7 & 8 below show the Tensioncell used in the tension and compression modes. In both examples, the Tensioncell is mounted so that the resultant tare force vector (TW) is through the pivot. In these cases, the Tensioncell is measuring only the Resultant Load of Web Tension.

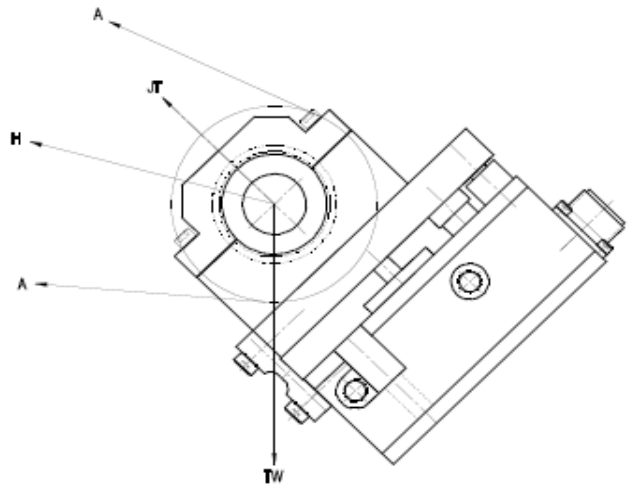


Figure 7 Tension Mode

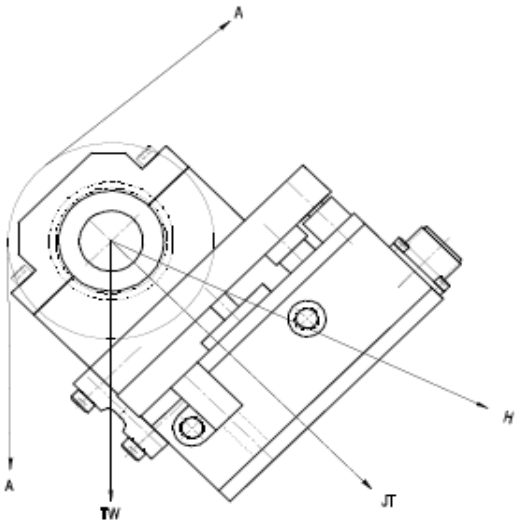


Figure 8 Compression Mode

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.

2. Check the contents against the packing list.

3. Promptly report any damage or shortage to both the carrier and Comptrol.

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 20 Tensioncells can be either wall or base mounted. Refer to the dimensional drawing on Page 8 of this manual for detailed identification of all parts.

2. Check calibration sheet for proper mounting orientation of Tensioncell. Refer to the machine design drawing, layout, and calibration sheet for mounting angle and orientation. The stands or base structures to which the Tensioncells are mounted must be flat (within .002 inch T.I.R.).

3. Drill and tap the holes in the stand or base mounting structure to accept mounting bolts.

a. Base Mount: 11/32 (.344) diameter hole to receive 5/16 diameter socket head cap screw, two required for base mount.

b. Wall Mount: "Q" (.332) diameter hole with C' Bore for recessed head to receive 5/16 diameter socket head cap screw, two required for wall mount hole, also tapped for alternate reverse wall mount to receive 3/8-24 UNF Bolt, two required.

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 measuring roll to avoid any mechanical binding or friction. The measuring roll must be level and perpendicular to the path of the web 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 from the LVDTs 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 10)

4. Connect the positive (+) output lead to Pin D and the negative (-) output lead to Pin C. (See Figure 10.)

5. Repeat Steps 1 through 4 of the electrical wiring procedure for the Tensioncells mounted on the other end of the measuring roll.

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.

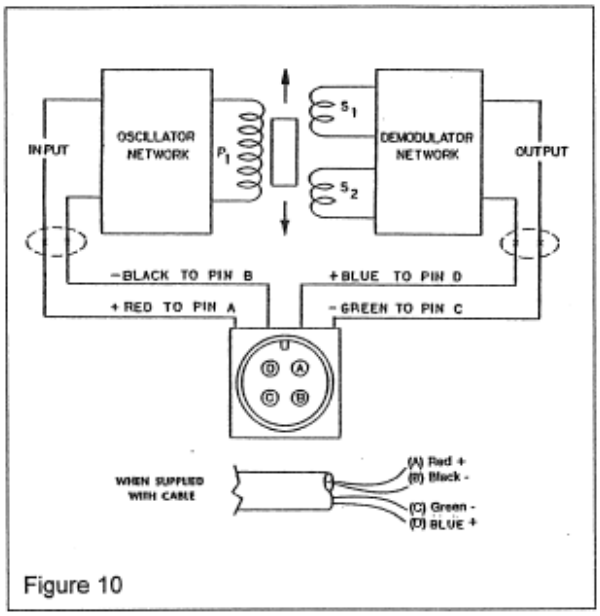


Figure 10

6. Disengage web from the measuring roll so that no tension force is applied to the Tensioncell.

7. Connect a voltmeter to Pins C and D (See Figure 10)

8. Apply 24-volt DC electrical power to the Tensioncell observing the correct polarity. [Plus (+) to Pin A and minus (-) to Pin B.] Do not exceed the maximum rated input voltage.

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

9. Check 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 for the applied tare load should be between 0.5 and 6.5 volts.

II-G ELECTRICAL ZERO ADJUSTMENT

The tare weight voltage cannot be mechanically or electrically zeroed out at the Tensioncell.

Refer to the appropriate tension indicator or control documentation for zeroing out the tare weight voltage.

II-H FULL LOAD ADJUSTMENT

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

1. Run a non-stretchable rope over the center of the tension roll simulating the web path. (NOTE: the rolls should be free to turn)

2. With one end of the rope secured, hang a known weight, so that the total tension is equal to the maximum web tension specified on the calibration sheet. (See Figure 11)

3. With a voltmeter connected to Pins C and D of the connector, an output voltage will be observed.

4. Repeat Step 3 for the Tensioncell mounted on the opposite end of the measuring roll.

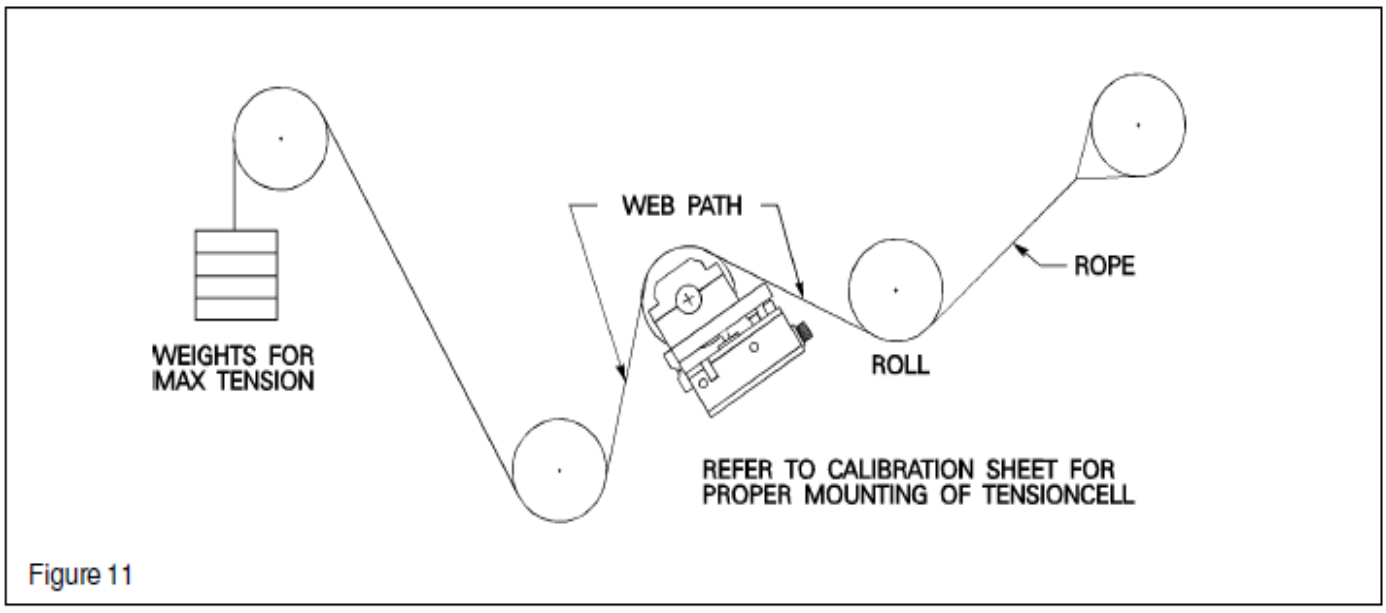


Figure 11

(Continued on Page 6)

Comptrol Tensioncells 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 web 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

1. Has the tension measuring system been changed?

a. An increase or decrease in web tension (Refer to A on the calibration sheet for specified web tension)

b. 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.

2. Are the Tensioncells mounted securely?

3. Is the tension measuring roll in proper alignment and does it turn freely?

4. Are bearings and seals free of all binding and stickiness? Are they worn?

III-B ELECTRICAL

1. Are LVDTs receiving correct input voltage?

   Check line voltage, fuses or circuit breakers, and power switches. Check power supply output and voltage to LVDTs.

2. Are all connections secure?

   Check for continuity. Retighten all connections. Recheck operation.

3. 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 12)

a. Pin A to Pin B (Primary Coil) should be in excess of 2 megohms.

b. 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.

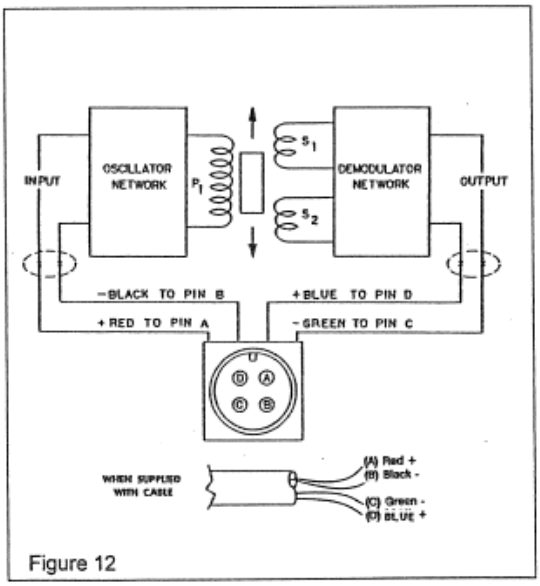


Figure 12

PART IV - RECALIBRATION PROCEDURES

All Comptrol Tensioncells are factory calibrated before shipment as specified in the purchase order. However, if any of the following parameters vary from the original design specifications, recalibration will become necessary.

1. Web Tension (Refer to A on the calibration sheet for the specified strip tension)

2. Wrap Angle (Refer to B on the calibration sheet for the specified wrap angle)

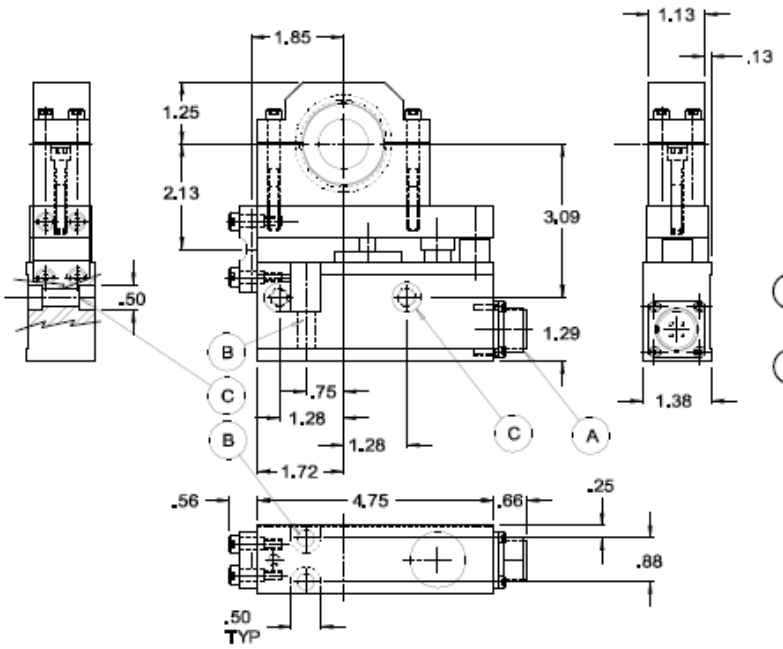
3. Inclination of the Passline (Refer to C on the calibration sheet for the specified Passline)

4. Mounting Angle (Refer to N on calibration sheet for the specified mounting angle)

IV-A RECALIBRATION AFTER INSTALLATION

Comptrol Tensioncells cannot be recalibrated in the field. It will be necessary to return the Tensioncells to the factory for new flexures and a new nominal rating.

SERIES 20 - TYPE B - DIMENSION



OPTIONS

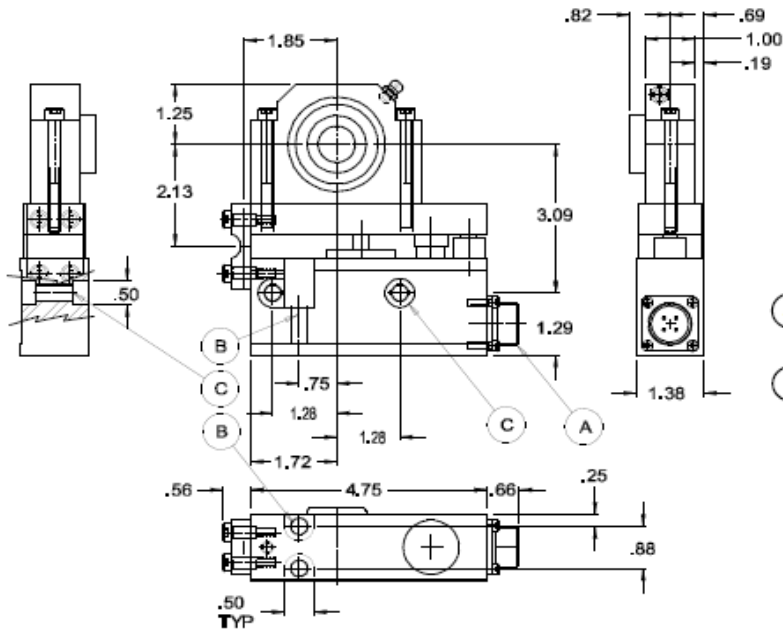
- Purge
- Cable
- Mating Connector

(A) Four Pin Electrical Connector

(B) (C) Details (See Page 9)

Specifications and dimensions subject to change without notice.

SERIES 20 - TYPE C - DIMENSION



OPTIONS

- Purge
- Cable
- Mating Connector
- Oil Ball Bearing

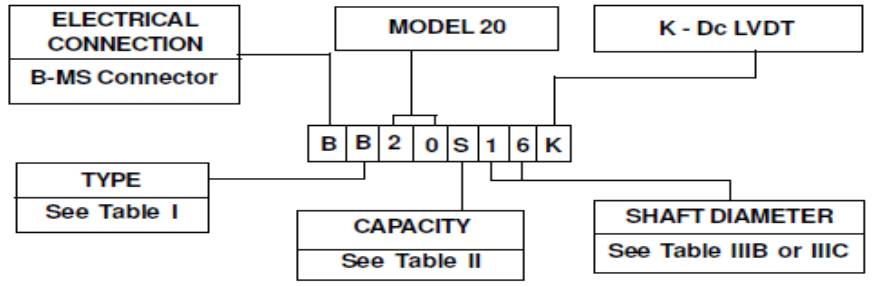
(A) Four Pin Electrical Connector

(B) (C) Details (See Page 9)

Series 20 Tensioncell is an economical unit for Wall & Base mounting.

TABLE I	TABLE II				TABLE III B				TABLE III C			
TYPE	CAPACITY RANGE				NON - ROTATING SHAFT DIAMETER 1/16" increments				ROTATING SHAFT DIAMETER 1/16" increments			
B-NON ROTATING SHAFT	Code	Lbs.	Code	Lbs.	Dim.	Code	Dim.	Code	Dim.	Code	Dim.	Code
C-ROTATING SHAFT	L	4	P	20	0.50	8	1.00	16	0.50	8	0.75	12
	M	8	S	30	0.63	10	1.13	18	0.56	9	0 88	14
	N	13	T	50	0.75	12	1.25	20	0.63	10	0.94	15
			U	90	0.88	14	1.38	22	0.69	11	1.00	16

SERIES 20 MODEL NUMBER DESIGNATION



Example shown:
BB20S16K
MS Electrical Connector
Non-Rotating Shaft
Model B20
0-30 lbs. Capacity
1" Diameter Shaft
K Type Dc LVDT

MECHANICAL MOUNTING DETAILS (B) & (C)

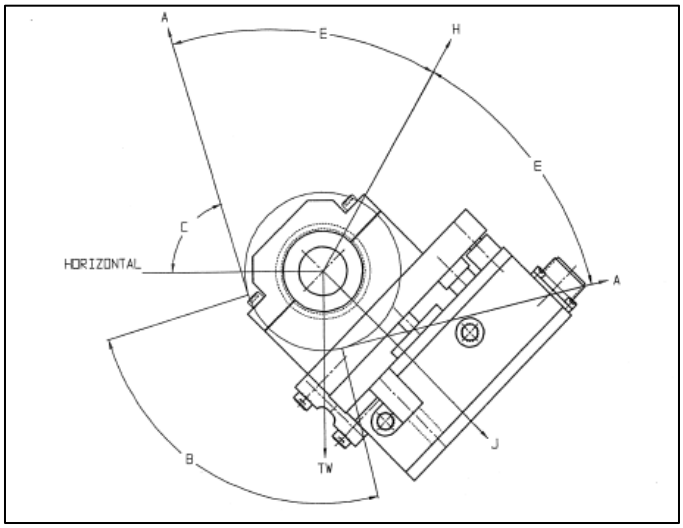
(B) Base Mount
11/32 (.344) diameter hole to receive 5/16 diameter socket head cap screw. Two (2) required.

(C) Wall Mount
Q (.322) diameter hole with counterbore for recessed head to receive 5/16 diameter socket head cap screw. Two (2) required for Wall Mount. Hole also tapped for Alternate Reverse Wall Mount to receive 3/8-24 UNF bolt. Two (2) required.

HOW TO ORDER TENSIONCELLS 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.)

. Maximum Web, or Strand Tension (A)
. Total Wrap Angle (B)
. Inclination of the Passline with respect to horizontal (C)
. Total Weight of the roll and bearings (or sheave and bearing) (TW)
. Shaft Diameter
. Rotating or Non-Rotating Shaft
. Measuring Roll Diameter (in inches)
. Maximum Machine Speed (FPM)



Include the Model Number of the Tensioncell Control Required.

When placing your order, please include instructions as to how the equipment and/or shipping containers are to be marked.

Tensioncells 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.

Use the “Application Review” sheet on the following page to send or request information.

Comptrol maintains complete files and documentation on all Tensioncell 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. _____

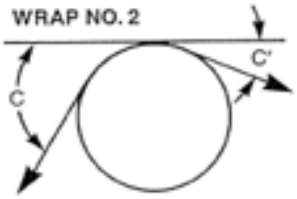
Roll and bearing weight: _____ lbs. Shaft diameter: _____ in.

Controller: ◯ Analog ◯ Digital Installation: ◯ New ◯ Existing

COMPTROL STRIP TENSION TRANSDUCER DATA

WRAP NO. 1

WRAP NO. 2



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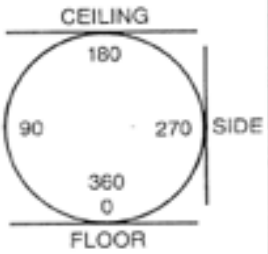
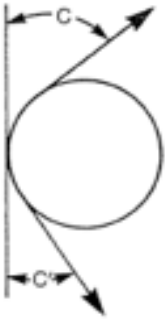
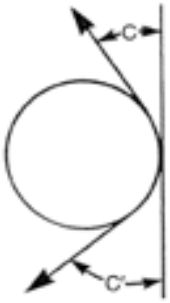


(Attach separate page for this example.)

WRAP NO. 4



WRAP NO. 5



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

The information contained in this document is subject to change without notice. Comptrol has made effort to ensure the accuracy and completeness of the descriptions and procedures discussed in this document. Failure to comply with these procedures may result in personal injury, or damage to the Comptrol product or the equipment used in conjunction with it.

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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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