PART I - DESCRIPTION

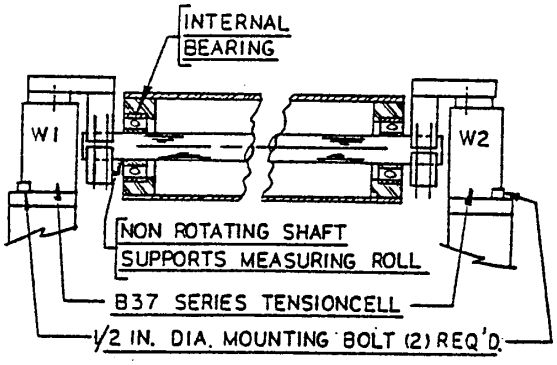
I-A GENERAL INFORMATION

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

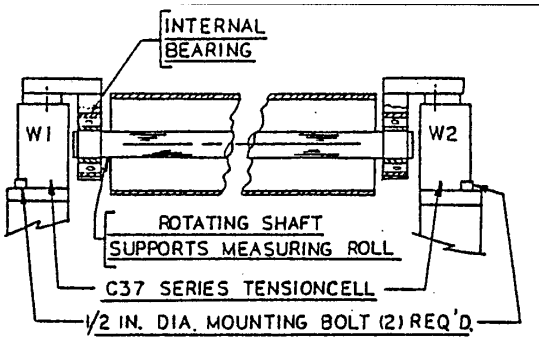
Type "B" Tensioncells are designed for use in NON-ROTATING shaft installations. A self-aligning shaft clamp assures proper alignment of the measuring roll when the Tensioncells are bolted to the frame of the machine. Type "B" cells are supplied in matched pairs, one to be mounted at each end of the measuring roll.



TYPE B - Bearings in Roll - Nonrotating Shaft

Figure 1

Table of Contents



Self-Aligning Bearings in Tensioncell - Rotating Shaft

Figure 2

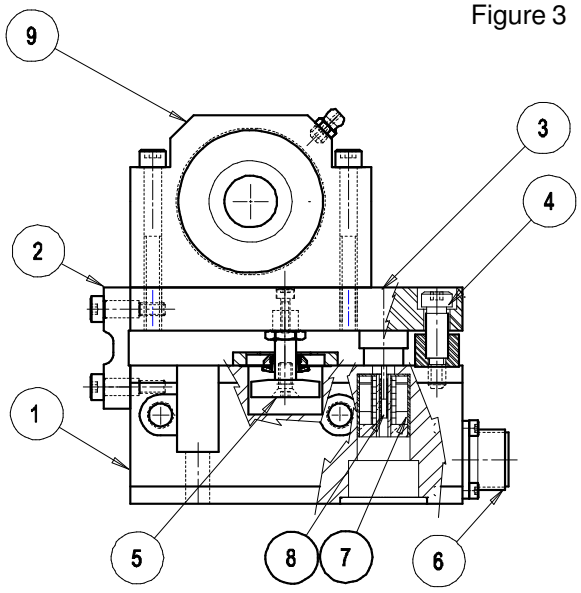
Type C

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 Tensioncell 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.

I-D TYPE "K" DcLVDT

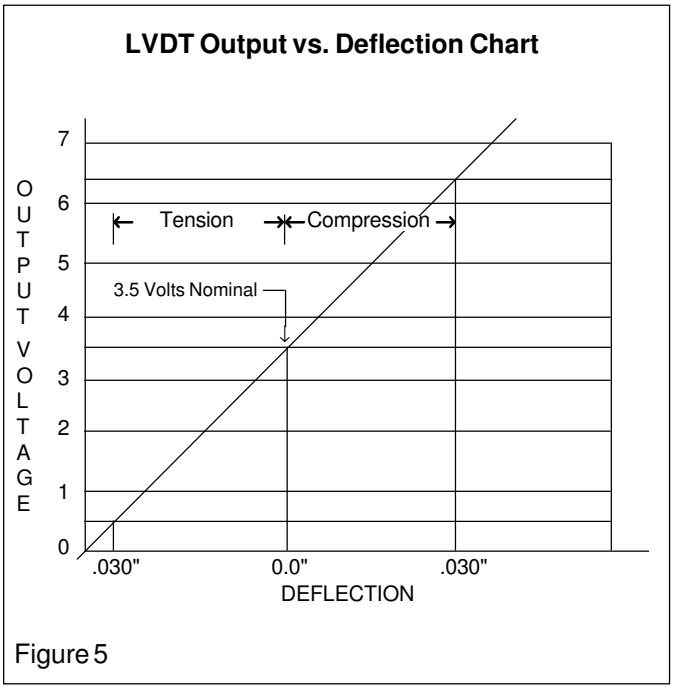


Figure 5

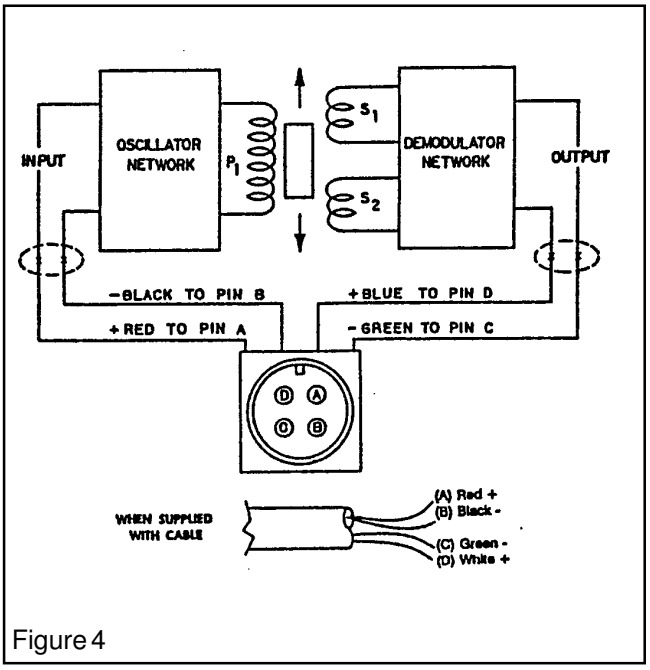


Figure 4

As illustrated in Figure 4, a DcLVDT 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 Tensioncell. 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 straingage 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 acccurate and repeatable tension measurement.

Comptrol Tension Indicators and Controls 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 Control Manual for more information.)

PART II - INSTALLATION AND OPERATION

I-E DESCRIPTION OF OPERATION

The total resultant load per cell (JT) is calculated by resolving web force vectors acting upon the Tensioncell, 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.

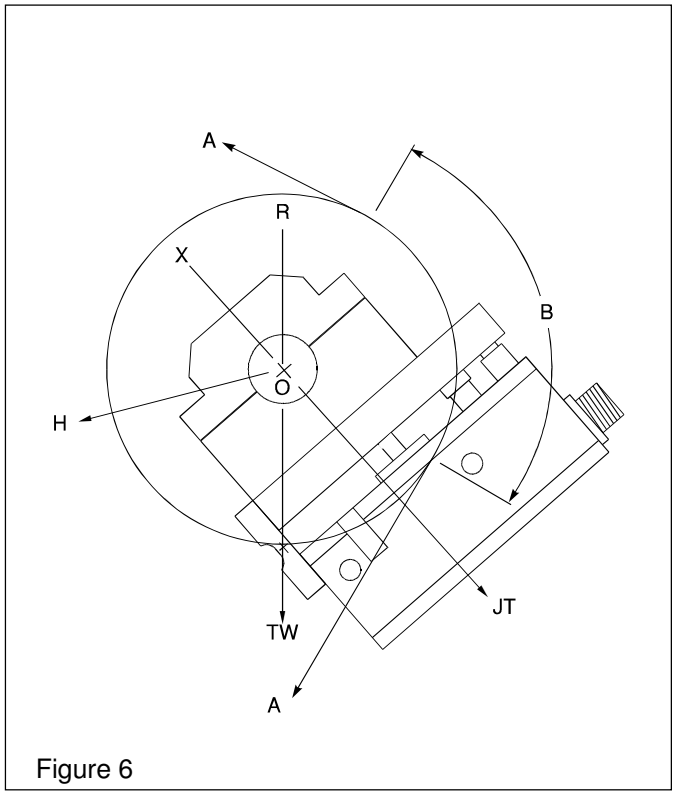


Figure 6

Changing the mounting angle of the Tensioncell changes the affects 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.

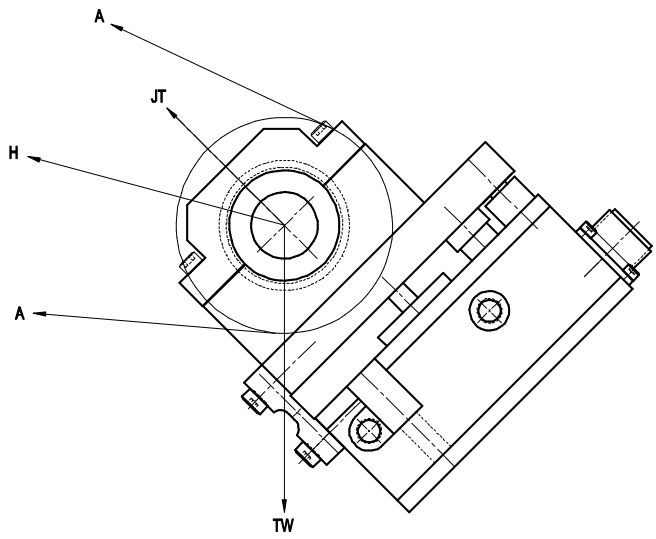


Figure 7 Tension Mode

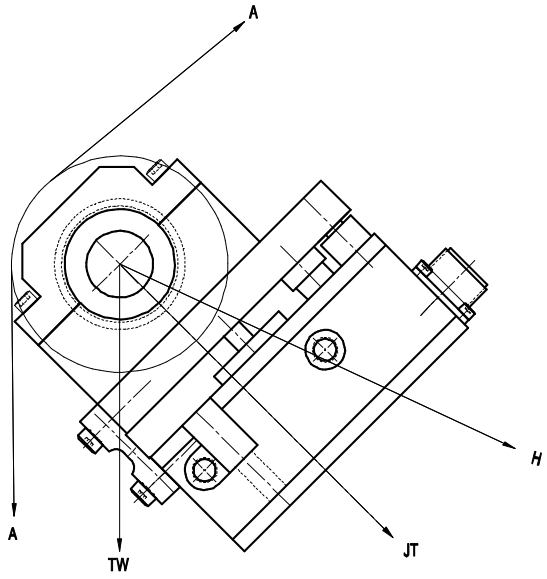


Figure 8 Compression Mode

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 Incorporated.

II-B HANDLING

Tensioncells can be handled manually.

II-C LONG TERM STORAGE

While Comptrol Tensioncells 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 DcLVDT Specifications

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

Note: Comptrol Tensioncells 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.

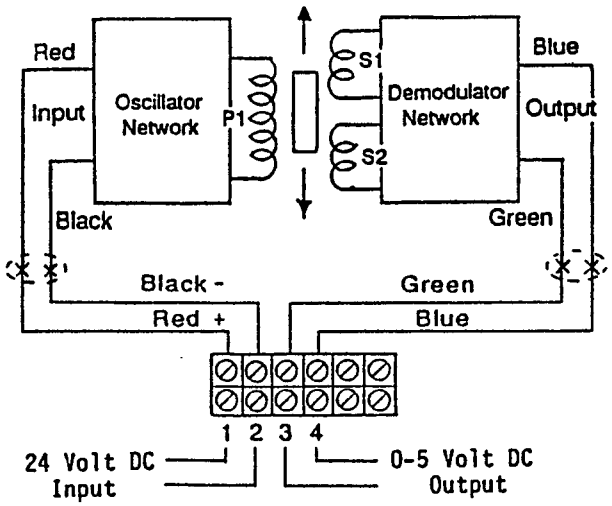


Figure 10

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.

(continued on Page 6)

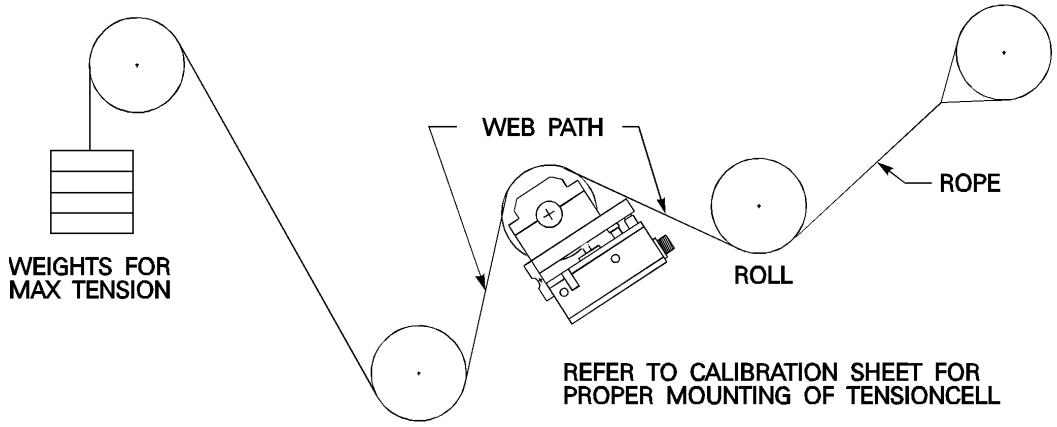


Figure 11

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.

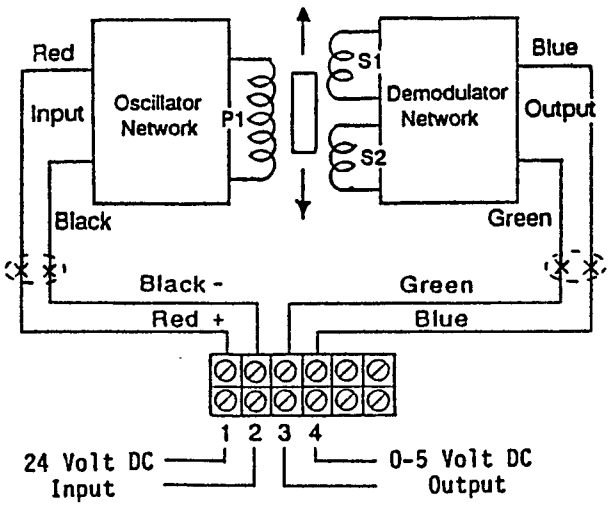


Figure 12

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.)

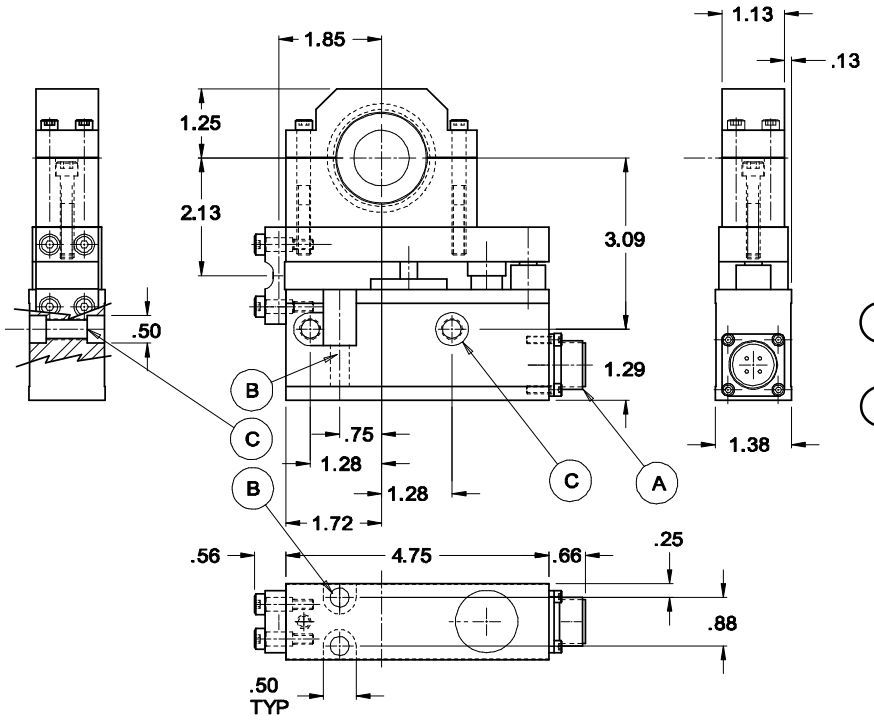
3. Inclination of the Passline (Refer to C on the calibration sheet for the specified passline.)

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

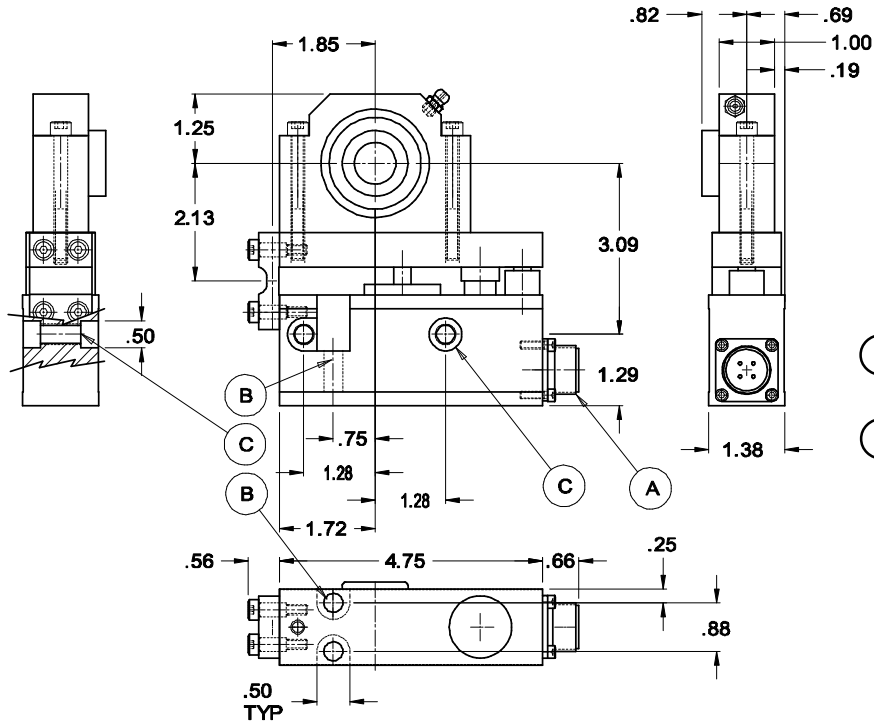
- Purge
- Cable
- Mating Connector

(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

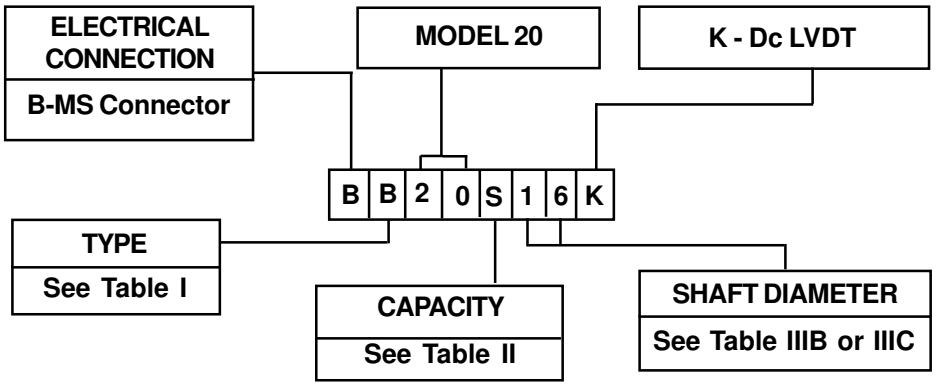
(A) Four Pin Electrical Connector

(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 below.)

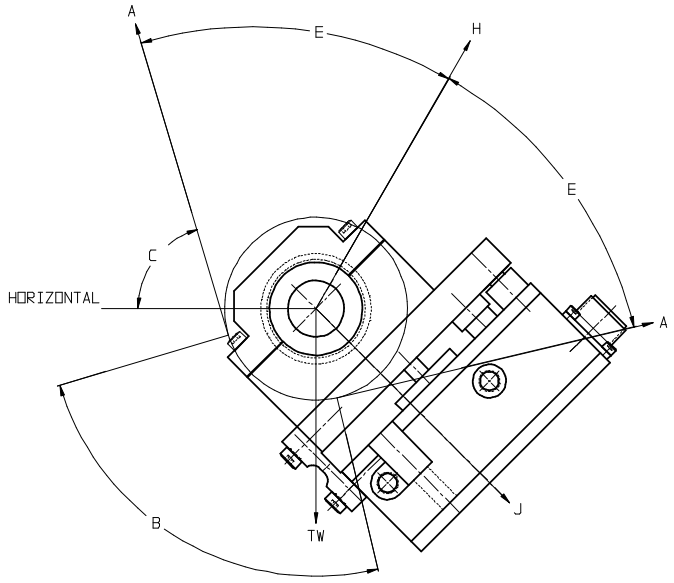
- Maximum Web, or Strand Tension (A)
- Total Wrap Angle (B)
- Inclination of the Passline with respect to horizontal (C)
- Total Weight of the roll and bearings (or sheave and bearing) (TW)
- Shaft Diameter
- Rotating or Non-Rotating Shaft
- Measuring Roll Diameter (in inches)
- Maximum Machine Speed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

Use the Faxalog on the following page to send or request information.



FAXALOG DATA REQUEST

PHOTOCOPY AND FAX TO:

COMPTROL INCORPORATED
U.S.A. & CANADA FAX: (800) 544-2268
INTERNATIONAL FAX: (216) 587-5210

SENDER

COMPANY: _____ DATE: _____

ADDRESS: _____ NUMBER OF PAGES TRANSMITTED (Including cover page): _____

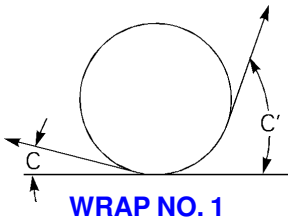
_____

INDIVIDUAL: _____

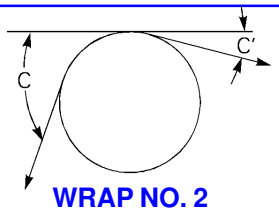
REFERENCE _____ FAX: _____

_____ PHONE: _____

COMPTROL WEB TENSION TRANSDUCER DATA



WRAP NO. 1



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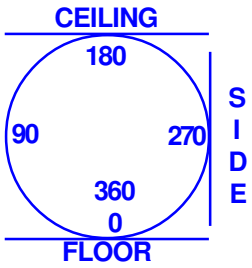

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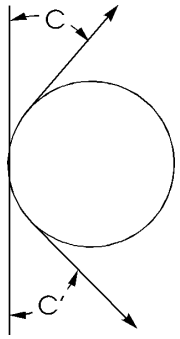
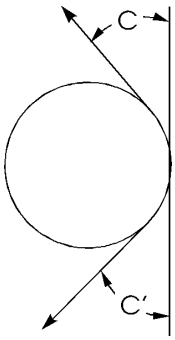


WRAP NO. 4



WRAP NO. 5

BASIC APPLICATION DATA

Wrap No. _____ C = _____° C' = _____°

Web Tension:

Max. _____lbs. Min. _____lbs.

Line Speed:

Max. _____fpm Min. _____fpm

Roll Diameter ____in. Total Roll Weight ____lbs.

Shaft Diameter ____in.

Mounting: ☐ Base ☐ Wall

Total Number of Units Required _____

Electronic Display: ☐ Analog ☐ Digital

Installation: ☐ New ☐ Existing

REQUEST

☐ Send Data per Basic Application Data.

☐ Send Complete Tension Monitoring Catalog

Comments:_____

_____

_____

_____

_____

_____

COMPTROL INCORPORATED

9505 Midwest Avenue
Cleveland, Ohio 44125
Phone: (216) 587-5200

1801-K Cross Beam Drive
Charlotte, NC 28217
Phone: (704) 357-9110

COMPTROL MANUFACTURED PRODUCTS

BALLSCREW PRODUCTS

- Inch and metric rolled thread ballscrews
- Precision ground ballscrews
- Single and preloaded ballnuts for base, flange, cut-off flange, or trunnion mounting
- Base, flange, or cut-off flange mounted end bearing supports
- Custom and modified units also available

COMPLETE BALLSCREW PACKAGES

Comptrol complete ballscrew packages feature standard pre-engineered Comptrol products to provide ready-to-install ballscrew "package" consisting of the ballscrew, ballnut, and end mounting bearing supports. Custom and modified standard assemblies are also available.

HIGH SPEED LINEAR POSITIONERS

Comptrol industrial linear positioners for applications requiring stroke lengths up to 36 inches, load capacities up to 5,000 pounds, and speeds up to 50 inches per second.

QUALITY VERIFICATION SYSTEMS

Comptrol Rod and Piston Systems

An industry standard for over 20 years in reciprocating engine plants around the world, Comptrol Connecting Rod and Piston Balancing Systems provide an accurate, high speed method of weighing and balancing connecting rods and pistons on automatic engine transfer lines.

Comptrol Weighcells Systems

Ideal for automatic assembly and packaging systems, Comptrol weighcells provide a high speed, continuous method of monitoring of process quality. These systems can detect weight deviations within 0.1 gram of the ideal weight in 0.8 seconds.

TENSION MONITORING SYSTEMS

Comptrol tension monitoring systems are designed to measure and control strip or web tension of continuous process lines. Available in over 30 models with capacity ranges from 4 to 20,000 pounds, these units are ideal for new, replacement and retrofit applications.

COMPTROL TECHNICAL SUPPORT

ENGINEERING

- Application Assistance
- Mechanical Design
- Electrical Design
- Software Design

CUSTOMER SUPPORT

- Field Service Support
- Project Planning
- Installation Supervision and Assistance
- Installation Inspection
- Documentation

MANUFACTURING

- Electrical and Mechanical Assembly
- In-house Machining

COMPTROL INCORPORATED
9505 MIDWEST AVENUE CLEVELAND, OH 44125 U.S.A.
TELEPHONE: (216)587-5200 FAX:(800)544-2268