Transducer Instruction Manual

Range: Classic

Type: TN Series

Revision: V1.0

Contents

1. Principle of Tensiometer Operation

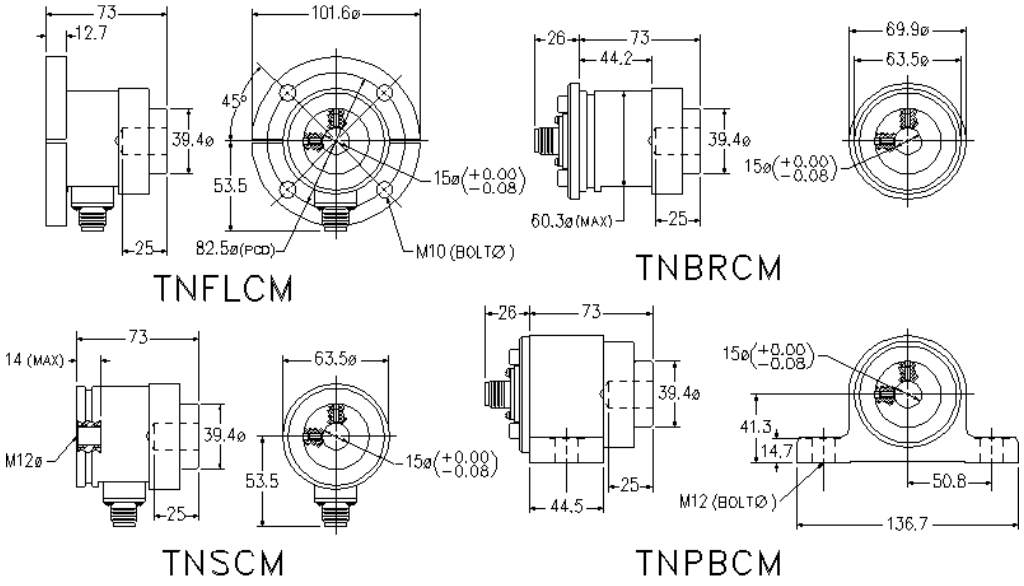
Cleveland Kidder tensiometers utilise a sensing beam to which semi-conductor strain gauges are bonded and they are used to measure tension in wire, filament or narrow web applications. The tension force applied to the tension sensing roller or guide pulley must pass freely through to the tensiometer, which converts this force into an electrical signal.

This signal is a combination of tension force and sensing roller dead weight. The dead weight of the roller is zeroed out electrically in the indicator or controller leaving the tension force signal only to be amplified to give a true display of measured tension.

2. Installation

2.1 Selection of Tensiometer Mounting Location

The tensiometer must be mounted in a clean, dry location, see below for hazardous area installation. When selecting a tensiometer mounting location, please remember that the tension sensing roller must **NOT** be mounted where the web wrap angle can vary. Any change in the wrap angle will be sensed by the tensiometer as a change in tension, and indicated as such on the tension meter or display.



ALLOW 75mm CLEARANCE FOR CONNECTOR

2.2 Installation Precautions

To ensure proper installation and operation of the tension system, the following steps should be performed in sequence - always install, orientate and firmly bolt down the tensiometer **BEFORE** installing the tension sensing roller.

Welding. Unplug the cable connector from the tensiometer before any electric welding is undertaken on the machine.

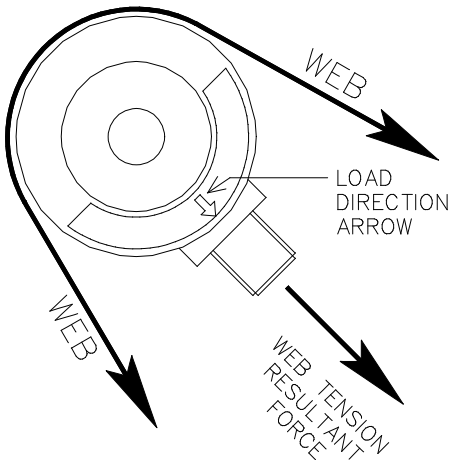
Transport. It is recommended that the tension sensing roller is removed from the tensiometer before the machine is transported to prevent excessive shock being transmitted through to the tensiometer.

Failure to carry out these precautions could seriously damage the tensiometer and invalidate the warranty.

2.3 Mounting Surface Preparation

The mounting surface for the tensiometer should be rigid, flat and clean. Prepare the machine frame or mounting surface by removing any loose paint, rust, scale, burrs etc.

2.4 TNSCM Tensiometer Installation



Rotate the tensiometer until the **"LOAD IN THIS DIRECTION"** arrow is pointing in the direction of the web tension resultant force, then **SECURELY** tighten the mounting bolt.

The cable connector should bisect the web wrap angle.

The mounting bolt must not bottom in the tensiometer, the depth of the M12 mounting hole in the TNSCM tensiometer is 14mm. Check that there is clearance between the mounting bolt and the bottom of the tensiometer mounting hole. M12 fixings are available from CMC Controls if they have not been supplied with the order, request Part Number 0594.

2.5 TNFLCM Tensiometer Installation

Four M10 mounting holes should be drilled in the machine frame to accept the split flange. Loosen, but do not remove the two clamping bolts for the split flange. Rotate the tensiometer in the split flange until the **"LOAD IN THIS DIRECTION"** arrow is pointing in the direction of the web tension resultant force.

The cable connector should bisect the web wrap angle.

Tighten the two clamping bolts for the split flange

Secure the tensiometer firmly to the machine frame with four M10 mounting bolts.

2.6 TNPBCM Tensiometer Installation

Mount the tensiometer and fix firmly to the machine frame with two M12 fixing bolts. Loosen, but do not remove, the four socket head screws retaining the lockplate on to the rear of the tensiometer. Rotate the tensiometer body until the **"LOAD IN THIS DIRECTION"** arrow is pointing in the direction of the web tension resultant force. Tighten the lockplate retaining screws.

2.7 TNBRCM Tensiometer Installation

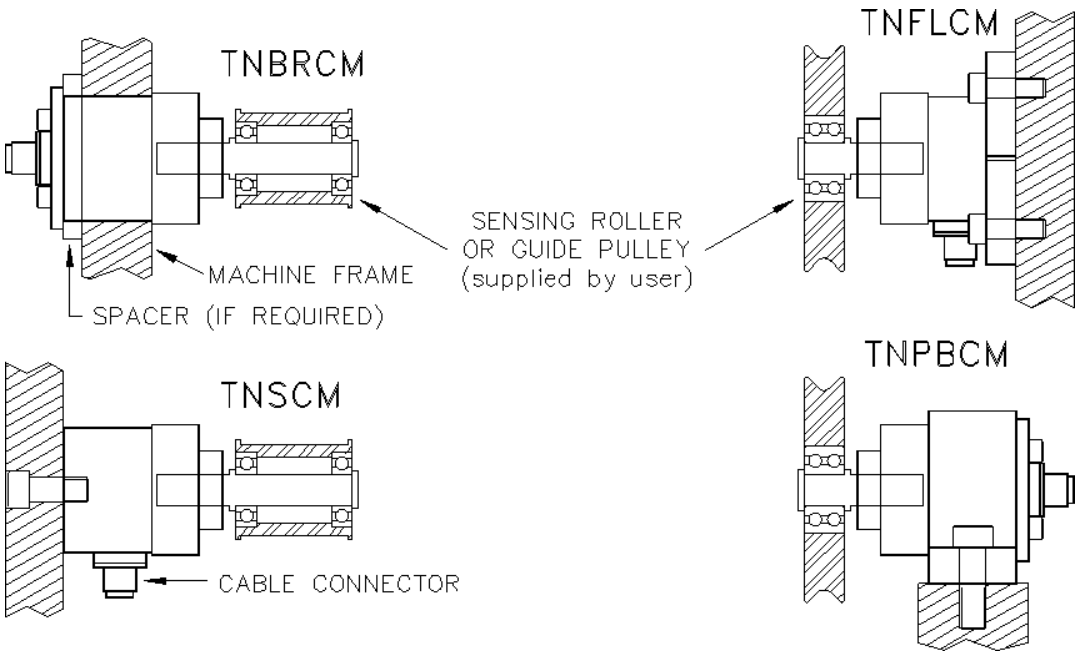
Remove the four socket head retaining screws and the lockplate on the rear of the tensiometer. Insert the tensiometer into the hole bored in the machine frame. Rotate the tensiometer in the machine frame until the **"LOAD IN THIS DIRECTION"** arrow is pointing in the direction of the web tension resultant force.

Secure the tensiometer firmly in the machine frame using the lockplate. A spacer over the tensiometer body may be used if required.

2.8 Single Tensiometer Operation

For most installations a Dummy Tensiometer, Part Number 4431, will be needed to complete the full Wheatstone bridge.

2.9 Sensing Roller Installation



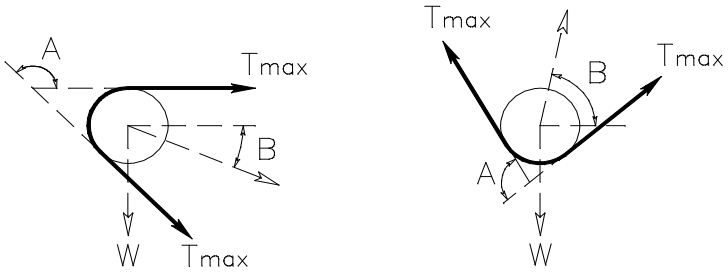
The tensiometer has a 15mm diameter hole, 25mm deep, to accept a shaft to which a tension sensing roller or guide pulley can be mounted as shown below. Two set screws at 90E are used to hold the shaft in place. The tension sensing roller or guide pulley should be dynamically balanced when the roller speed exceeds 300 RPM as excessive vibration can damage the tensiometer. Any out of balance force should not exceed 10% of the maximum working force (**MWF**) of the tensiometer.

2.10 Hazardous Area Installation - Intrinsic Safety

CMC Controls tension transducers can be located in a hazardous area to provide an Intrinsically Safe installation to EN 50039 when a proprietary Zener Barrier module, Part Number 4503, is used. Tension transducers are passive components and are classified as simple apparatus by EN 50014. Strain gauge transducers (load cells) will be damaged if subjected to the 500 volt insulation test required by EN 50020. To comply with Intrinsic Safety regulations the body of the transducer must be bonded to the IS earth using 4 square millimetre green/yellow insulated cable. Consult CMC Controls for more information.

NOTE It is the responsibility of the user to ensure that all relevant safety regulations are complied with. The integrity of all connections particularly the earth should form part of any maintenance procedure.

3. Tensiometer Force (MWF) Calculation



The formula for calculation of the tensiometer maximum working force (**MWF**) or force rating allows a 100% overload for tension transients or a tight edge to the web.

Remember to use the correct units.

To convert W in Kg to Newtons - N multiply by 10, the exact factor is 9.81

$$MWF = 4\ T_{max}\ \sin(A/2) + W \sin(B) \qquad MWF = 4\ T_{max}\ \sin(A/2) - W \sin(B)$$

MWF MUST BE GREATER THAN SENSING ROLLER WEIGHT W
ANGLE 'A' IS 30 DEGREES MINIMUM

4. Troubleshooting

There are no user replaceable or serviceable parts in the tensiometer. Tampering or damage caused during installation will invalidate the warranty.

The signal output from the tensiometer with the recommended 5A6V DC excitation is 250mV (nominal) when the tensiometer is loaded to its maximum working force - MWF.

The tensiometer has built in mechanical overload stops which operate at approximately 125% of the MWF. Forces above 150% of MWF particularly transients or tension snatches may cause permanent damage.
The ultimate overload capability before breakage is 300%, bearing damage may occur before this.

4.1 High Output Signal With No Tension

[1] Check for correct wiring to the tensiometer.
[2] Check cables and connectors for good continuity with an ohm meter, do **NOT** use a 'megger'.
[3] The tensiometer may have too low a MWF, replace with a higher MWF tensiometer or reduce the web wrap angle.
[4] The tensiometer excitation voltage may be too high - this will cause permanent damage and may invalidate the warranty.
[5] The sensing roller weight may be too heavy, this should not exceed the MWF of the tensiometer.

4.2 Low Output Signal With Maximum Tension

[1] Check for correct wiring to the tensiometer.
[2] Check cables and connectors for good continuity with an ohm meter, do **NOT** use a 'megger'.
[3] The tensiometer may have too high a MWF, replace with a lower MWF tensiometer or increase the web wrap angle.
[4] The tensiometer excitation voltage may be too low.

4.3 Wrong Polarity of Output Signal

[1] Check that the web path is correct.
[2] The tensiometer may be incorrectly orientated, rotate 180° to correct this. If rotation is not possible, interchange the tensiometer excitation supply leads at the indicator or controller terminals.

4.4 Output Signal Not Linear, Zero Shifts During Operation

[1] Check that there is no dirt or foreign matter interfering with the tensiometer mounting.
[2] Check that the shaft clamp screws and tensiometer mounting bolts are secure.

4.5 Tensiometer Strain Gauge Resistance

The tensiometer has two semiconductor strain gauges in a half bridge configuration. The temperature compensation network is in series with the output signal lead Pin A. The gauge resistances, measured at room temperature with no load, are shown in the table below.

Measurement	**Resistance – Ohms Ω**
Pin B to Pin C	240 +/- 35 Ω
Pin A to Pin B	120 +/- 18 Ω
Pin A to Pin C	Pin A to Pin B +/- 5 Ω
Pins A, B or C to body	> 20 M Ω