



Transducer Instruction Manual

Range: Advance

Type: ACDF – 3

Revision: V1.0



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1. Principle of Transducer Operation

ACDF web tension transducers are annular force transducers supplied with double row self-aligning ball bearing cartridges for rotating shaft applications. Normally a pair of transducers would be used, supporting the ends of the tension sensing roller shaft. The tension force applied to the sensing roller must pass freely through to the transducer, which converts this force into an electrical signal.

This signal is a combination of tension force and sensing roller dead weight. The dead weight 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.

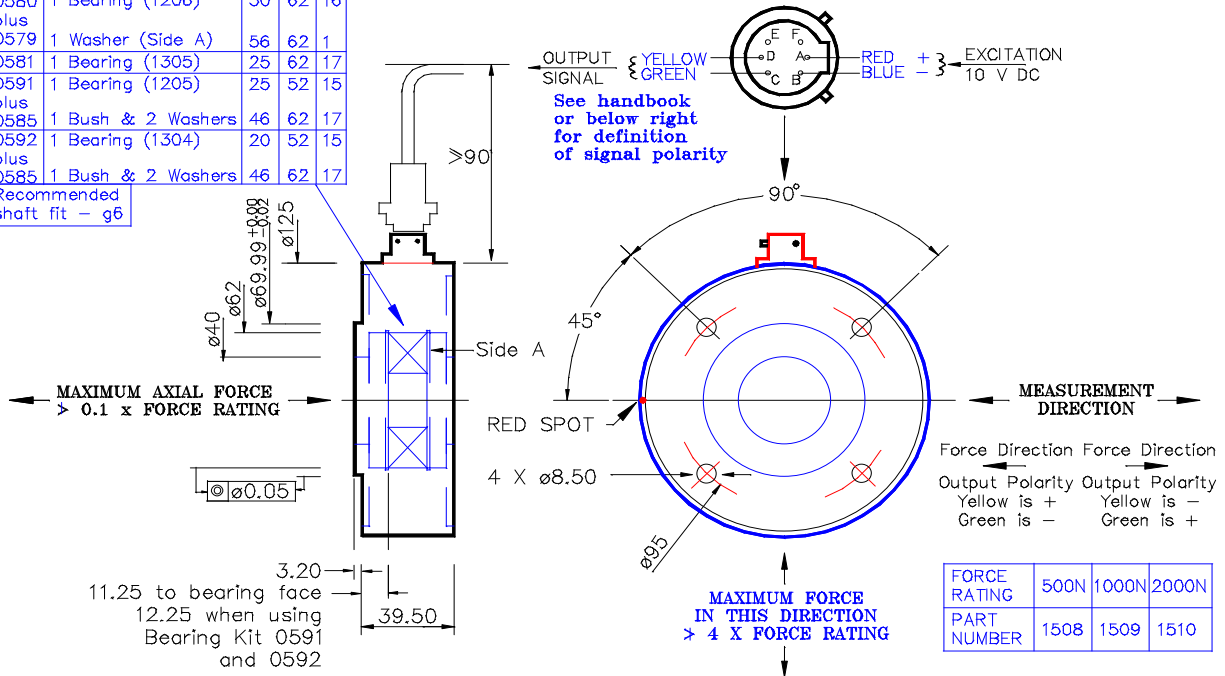
2. Installation

2.1 Selection of Transducer Mounting Location

The transducer must be mounted in a clean, dry location, see below for hazardous area installation. When selecting a transducer 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 transducer as a change in tension, and indicated as such on the tension meter or display.

BEARING KIT (Self Aligning Bearing)					
Part Number	Qty	Item	I/D	O/D	W
0580	1	Bearing (1206)	30	62	16
plus					
0579	1	Washer (Side A)	56	62	1
0581	1	Bearing (1305)	25	62	17
0591	1	Bearing (1205)	25	52	15
plus					
0585	1	Bush & 2 Washers	46	62	17
0592	1	Bearing (1304)	20	52	15
plus					
0585	1	Bush & 2 Washers	46	62	17
Recommended shaft fit – g6					

Bearing is supplied with preservative only. Lubrication is required before use.



ALL DIMENSIONS IN MM UNLESS STATED OTHERWISE. NOT TO SCALE.

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 transducer **BEFORE** installing the tension sensing roller.

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

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

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

2.3 Mounting Surface Preparation

Precision machined surfaces are necessary as the transducer is located in the machine frame by the close tolerance mounting spigot. The close concentricity of this mounting spigot to the bearing diameter allows parallel path rollers and thus avoids web tracking problems. No appreciable force should be transmitted through the four fixing bolts. See the Transducer Dimensions drawing for full details.

2.4 Bearing Lubrication

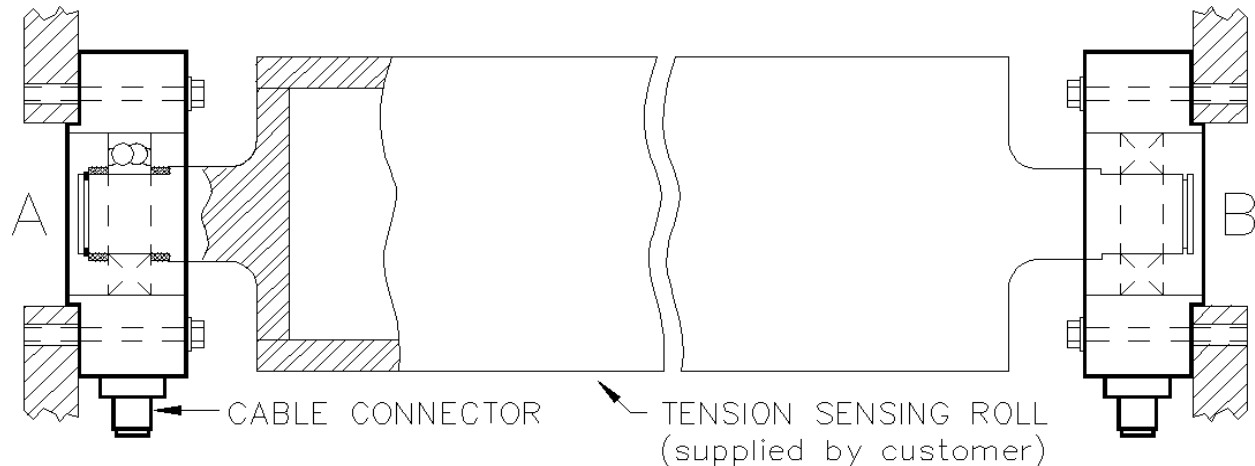
The bearing normally fitted by CMC Controls is without seals and has only the bearing manufacturers preservative. The bearing will require lubrication by the user prior to use according to the service and environment. When the transducer is for use in vacuum the bearing will need to be removed from the transducer, degreased and suitably lubricated by the user before refitting into the transducer. To lubricate the bearing remove side plate "A" only. Periodic inspection of the lubricant is advised in all cases.

2.5 Sensing Roller Balance

The tension sensing roller should be dynamically balanced when the roller speed exceeds 300 RPM as excessive vibration can damage the transducer. Any out of balance force should not exceed 10% of the maximum working force (**MWF**) of the transducer. The sensing roller must not be driven or have any force applied to it except by the web. Even with a balanced roller, a vibration can be set up at the critical roller speed. To ensure that this problem is avoided, the critical roller speed should be at least 20% above that attained at maximum web speed. Consult the roller manufacturer for advice.

2.6 Transducer and Sensing Roller Installation

The transducer should be mounted so that the **Measurement Direction** is in the direction of the resultant tension force. The cable connector is at right angles to the **Measurement Direction**.



One end of the sensing roller should be held in the bearing of one transducer, as at 'A' above; the other end of the roller must be free to move or "float" axially in the other transducer bearing, as at 'B' above.

This float must allow the overall distance between transducers to be reduced by at least 8mm to permit the transducers and roller assembly to fit inside the machine frames for installation. The transducers may also be fitted on the outside faces of the frames to allow full use of the machine width. Alternatively provision must be made to fit the complete transducers and roller as an assembly into the machine axially. The bearing is retained in the transducer by circlips. It is recommended that only the plain side plate "A" of the transducer be removed for bearing access, see the Transducer Dimension drawing for details.

2.7 Temperature Compensation and Shaft Expansion

The transducer is supplied with a temperature compensation network which is in series with Pin D, the output signal lead. The compensation circuit will operate correctly only when used with a tension indicator or controller supplied by CMC Controls. The transducer can accommodate sensing roller shaft expansion due to normal temperature changes. The transducer, sensing roller and machine structure should all therefore be at normal room temperature during installation

2.8 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.

2.9 Single Transducer Operation

Most web tension installations require two transducers, each supporting one end of the sensing roller shaft and the transducer output signals are summed to give a measurement of Total tension. For those installations where only one transducer is required a Dummy Transducer, Part Number 4431, may be needed to complete the full Wheatstone bridge. For single transducer installations the MWF calculation, see below, should be derated by a factor of 1.5, consult CMC Controls for more information.

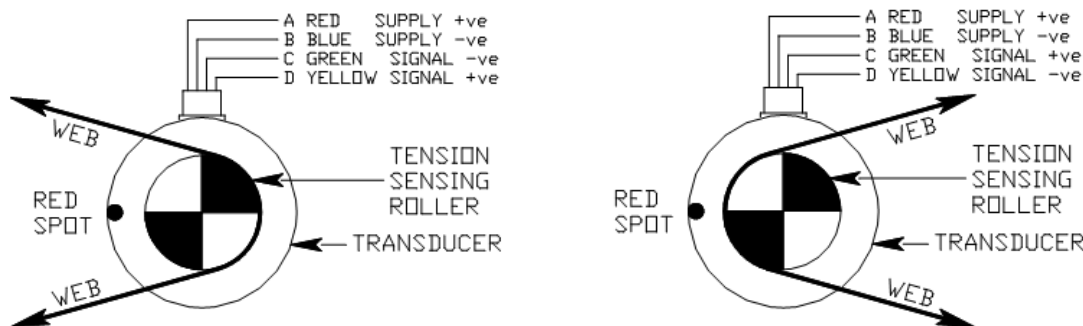
2.10 Transducer Electrical Connections

The signal wiring between the transducer and the indicator or controller must be by screened cable routed well away from any power wiring or other sources of interference.

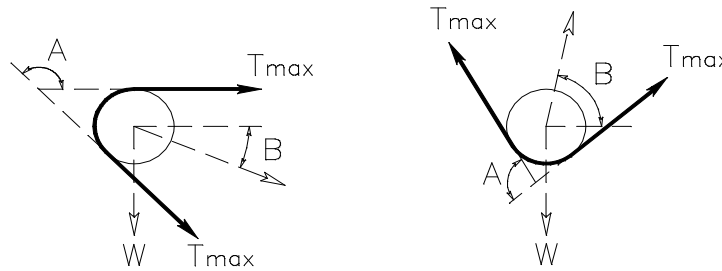
The **RED SPOT** on the transducer specifies the output signal polarity in relation to the applied load direction. Depending on the installation the transducer output signal can be positive or negative for increasing load. Ensure the yellow and green output leads are connected to the indicator or controller terminals correctly, so that they add to, rather than cancel each other. In most installations, one transducer will give a positive signal the other a negative signal.

To confirm the connections to the indicator, switch on, unplug any one of the transducer connectors, adjust the indicator zero control until the meter or display reads approximately zero. Apply a load to the tension sensing roller in the same direction as the resultant web tension, the display should move positive. If the display decreases or moves negative, reverse the appropriate yellow and green transducer leads at the indicator terminals. Repeat for the other transducer.

When completed, reconnect both transducers.



3. Transducer Force (MWF) Calculation



The formula for calculation of the transducer 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

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

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 transducer. Tampering or damage caused during installation will invalidate the warranty.

The signal output from the transducer with the recommended 5.6V DC excitation is 250mV (nominal) when the transducer is loaded to its maximum working force - MWF.

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

4.2 *Low Output Signal With Maximum Tension*

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

4.3 *Wrong Polarity of Output Signal*

- [1] Check that the web path is correct.
- [2] The transducer may be incorrectly orientated, rotate 180° to correct this. If rotation is not possible, interchange the transducer excitation supply or output signal 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 transducer mounting and that the mounting hole diameter in the machine frame is correct.
- [2] Check that the four fixing bolts are secure.
- [3] Check that the bearing is completely free to rotate and align.
- [4] Check that one end of the tension sensing roller is free to float axially in the transducer bearing.

4.5 *Transducer Strain Gauge Resistance*

The transducer has four foil strain gauges in a Wheatstone bridge. The nominal resistance is 350 ohms.