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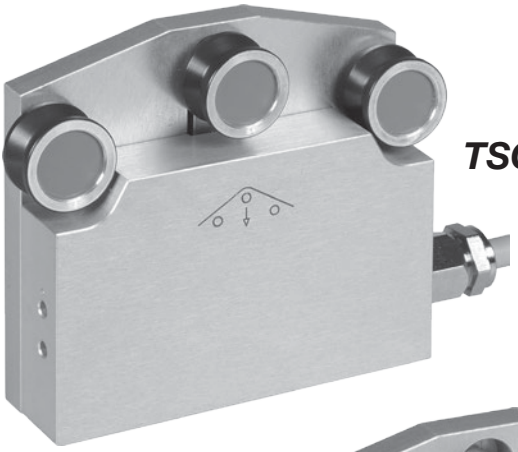
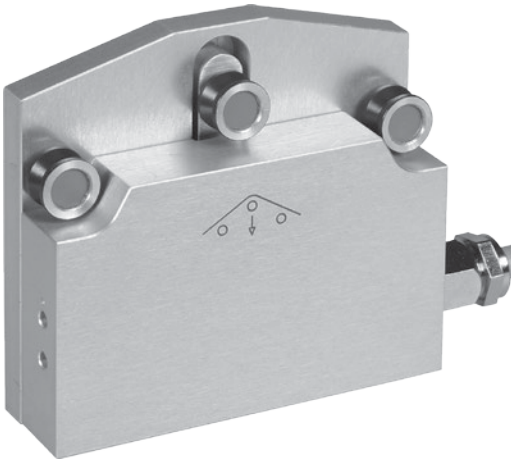
# Tension Sensors

# TSC Series



*TSC-ZD Series*

*TSC-ZF Series*



## Operating Manual



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**WARNING**

The device must not be operated in potential explosive areas and must not come into contact with aggressive substances.

## 1.0 INTRODUCTION

The new TSC Series is a purpose-built online tension sensor for continuous measurement of running line tensions of yarns, fibers, thin wires and similar process materials. The precision-machined housing is constructed allowing for installation of several sensors in close-proximity to one another when end-to-end spacing of the process material is limited. Multiple sensors can be mounted adjacent to another for fixed to a single rail for quick and easy mounting.. Built-in signal conditioning with ZERO and SPAN pots provide a high-level, analog output to minimize the chance for signal interference.

It can be using for process diagnostics, for continuously monitoring and recording of online tensions. The TS2 Tension Sensor can also be used as part of a closed-loop control system with 3rd-Party controller.

**Mounting possibilities**

The sensor can be mounted on a flat plate using the supplied thru holes on the underside of the housing body or fixed on the optional rail allowing for quick, easy installation and allows for multiple sensors mounted adjacent to one another with minimal spacing.

**Custom Modifications**

The individual models of the ZSC Series are also available with the following modificaions

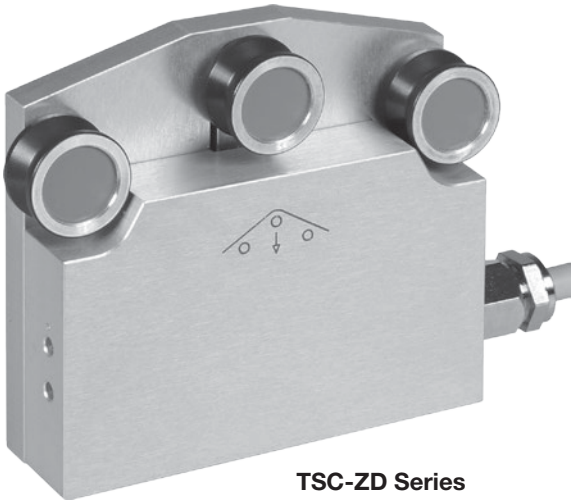
- Customized roller dimensions and materials
- Special calibration using customer supplied materials

**Optional Accessories**

- Code A2: Analog output 0 - 10 V DC
- Code A10: Analog DMS output mV / without amplifier

**Unpacking**

Unpack the instrument and inspect it for any shipping damage. Notices of defect must be filed immediately, in writing, at the latest within 10 days of receipt of the goods.



**TSC-ZD Series**

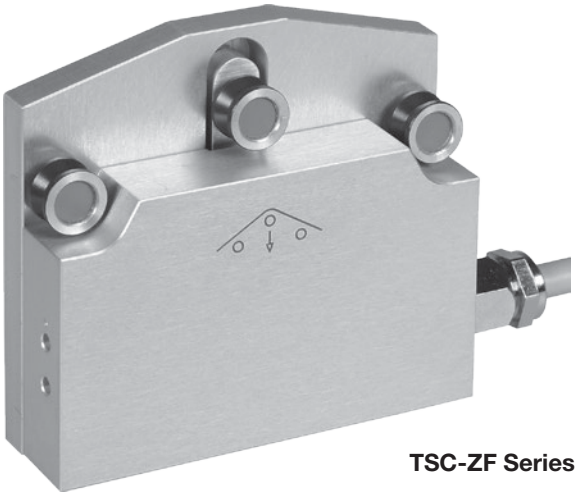
## 1.1 TSCA-ZD, TSCB-ZD Models

| Model | Model | Tension Ranges [cN] | *Measuring Head Width [mm] | **Electromatic Calibration Material |
|---|---|---|---|---|
| TSCA-ZD-100 | TSCB-ZD-100 | 0 - 100 | 78 | PA: 0.20 mm Ø |
| TSCA-ZD-200 | TSCB-ZD-200 | 0 - 200 | 78 | PA: 0.20 mm Ø |
| TSCA-ZD-500 | TSCB-ZD-500 | 0 - 500 | 78 | PA: 0.20 mm Ø |

* Outside dimensions of the housing.
** Suitable for 95% of applications. PA = Polyamide Monofilament
International unit of tensile force: 1 cN = 1.02 g = 0.01 N

### ZSCA-ZD, TSCB-ZD Guide Rollers

| V-Groove | Line Speed [m/min ... max.] | Roller Material |
|---|---|---|
| Standard | 2000 | Hard-coated aluminium |
| Code K | 3500 | Hard-coated aluminium |



**TSC-ZF Series**

## 1.2 TSCA-ZF, TSCB-ZF Models

| Model | Model | Tension Ranges [cN] | *Measuring Head Width [mm] | **Electromatic Calibration Material |
|---|---|---|---|---|
| TSCA-ZF-100 | TSCB-ZF-100 | 0 - 100 | 70 | PA: 0.12 mm Ø |
| TSCA-ZF-200 | TSCB-ZF-200 | 0 - 200 | 70 | PA: 0.12 mm Ø |
| TSCA-ZF-500 | TSCB-ZF-500 | 0 - 500 | 70 | PA: 0.20 mm Ø |

* Outside dimensions of the housing.
** Suitable for 95% of applications. PA = Polyamide Monofilament
International unit of tensile force: 1 cN = 1.02 g = 0.01 N

### ZSCAZF, TSCB-ZF Guide Rollers

| V-Groove | Line Speed [m/min ... max.] | Roller Material |
|---|---|---|
| Standard | 900 | Hard-coated aluminium |
| Code K | 2000 | Hard-coated aluminium |

## 1.3 Model Numbering Guide

| Model with tension range | | Code for guide rollers (if not standard) | | Complete Model No. |
|---|---|---|---|---|
| TSCA-ZD-500 | + | K | = | TSCA-ZD-500-K |

The model number, serial nume ahd the calibration label (option) are provided on the rear side of the sensor

## 2.0 OPERATING PROCEDURES

### 2.1 Installing the Sensor

1. Install the sensor at the desired measuring location. The sensor can be mounted with the three boreholes (M3-10 mm deep), which are located on the bottom side of the unit (fig. 2.1a) or can be snaped in at a mounting rail with the optional available adapter (fig.2.1b), that is mounted ex works at the sensor. The material incoming and outgoing angle of models TSCA-ZD and TSCA-ZF must be 35° (fig. 2.1c).

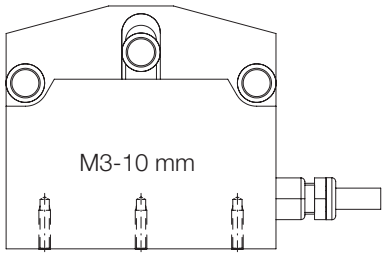



fig. 2.1a

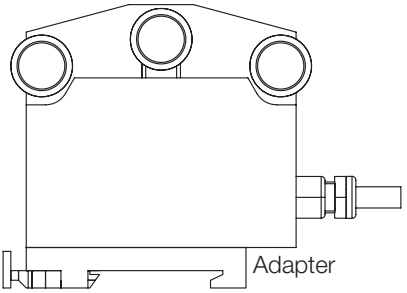



fig. 2.1b

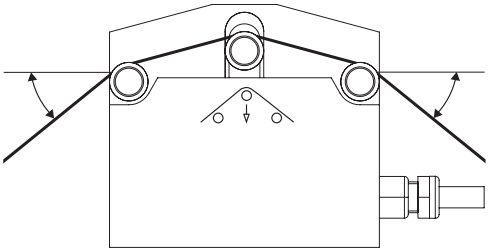


fig. 2.1c

### 2.2 Connecting the Sensor

1. Connect the sensor to the supplied or existing display unit.
2. If the material path is other than vertical or if the process material deviates significantly from the Electromatic calibration material, you need to carry out zero adjustment and gain adjustment as described in Chapters 3.1 and 3.2. before starting measurement.
3. Allow approx. 10 minutes for thermal stabilization of the sensor.
4. Thread the process material through the measuring and guide rollers, following the material path symbol on the front of the sensor.

**WARNING**

Tensions that exceed the tension range of the instrument by more than 100% may cause permanent damage to the measuring spring and must be avoided under any circumstances.

## 2.3 Internal Adjustment of the Sensors

**General Information**

If the sensor has been delivered with a display unit, the ZERO and GAIN adjustments should only be carried out with the supplied display unit.

All tension meters are calibrated with standard materials—such as polyamide monofilament (PA)—according to the Electromatic factory procedure; the material path is vertical. Any difference in process material size and rigidity from the standard material may cause a deviation of the accuracy.

In 95% of all industrial applications the Electromatic calibration has been proven to provide the best results and is used for comparative purposes.

If required you can also operate the sensors with a material path other than vertical. Should the process material differ significantly from the Electromatic calibration material in size, rigidity or shape, we recommend special calibration using customer supplied material. If the material path is other than vertical or if the process material deviates significantly from the Electromatic calibration material, you need to carry out static **ZERO** and **GAIN** adjustment as described in Section 3.

## 3.0 ZERO AND GAIN ADJUSTMENTS

### 3.1 ZERO Adjustment

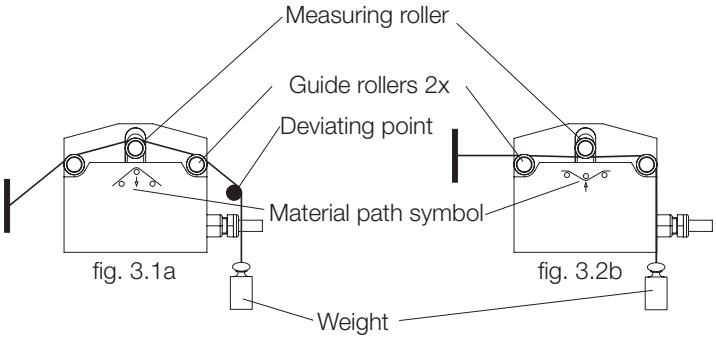



fig. 3.1a fig. 3.2b

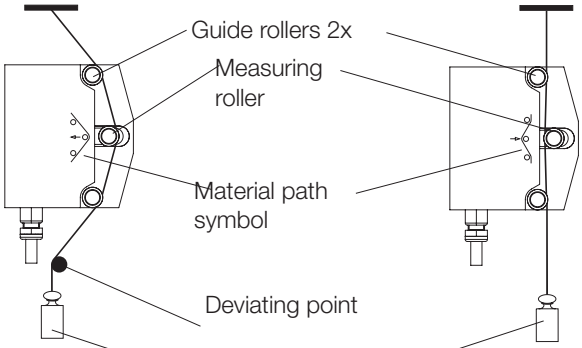



fig. 3.2.1c fig. 3.2.1d

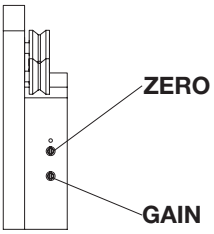



fig. 3.2.1e

1. Install the sensor in the desired position at the measuring location (chapter 3.1).
2. Allow approx. 10 minutes for thermal stabilization of the sensor.
3. Thread the process material through the measuring and guide rollers, following the material path symbol on the front of the sensor.
4. Hang on a weight that corresponds to e.g. 10% of the tension range from the process material.
5. Connect a volt meter to the yellow and green lead of the connecting cable.
6. Adjust the potentiometer, which you can reach through the ZERO hole in the housing, with a screwdriver (with a point width of max. 1.9 mm) until the display of the connected volt meter reads,

**For example:**

Sensor model TSCA-ZF - 200:
Weight 20 cN = Display 0.100 V for the TSCA-ZF standard version
or
Weight 20 cN = Display 1.00 V for the TSCA-ZF version with 10 V output signal.

**WARNING**

When threading the process material through the rollers, follow the material path symbol on the front of the sensor. If a force is applied to the middle sensor roller in the incorrect direction, damage could result.To get the needed incoming and outgoing angle of 35° with the models TSCA-ZD and TSCA-ZF, a deviating point must be mounted at the test preparation.

**WARNING**

Do not insert the screwdriver at an angle as this may damage the potentiometer. This warning applies to be ZERO and GAIN adjustments.

## 3.2 GAIN Adjustment

**Requirement:** ZERO adjustment carried out.

1. Thread the process material through the measuring and guide rollers, following the material path symbol on the front of the sensor.
2. Hang a weight that corresponds to e.g. 100 % of the tension range from the process material.
3. Adjust the potentiometer, which you can reach through the GAIN hole in the housing, with a screwdriver (with a point width of max. 1.9 mm) until the display of the connected volt meter reads,

   **For example:**
   Sensor model TSCA-ZF - 200:
   Weight 200 cN = Display 1.000 V for TSCA-ZF standard version
   or
   Weight 200 cN = Display 10.00 V for TSCA-ZF version with 10 V output signal.
4. Check the adjustments by using a new filament of the process material and repeat the procedure, if required, as described in Chapters 3.2.1 and 3.2.2.

**NOTE:** Since ZERO and GAIN adjustments are always performed statically, the readings may differ under dynamic load.

## 4.0 SPECIFICATIONS

### 4.1 Specifications

| | |
|---|---|
| **Calibration** | According to Electromatic factory procedure |
| **Accuracy** | ± 2% FS* ad ±1 digit |
| | Other calibration material: ±3% FS* or better |
| **Overload Protection** | 100% of range |
| **Measuring Principle** | Strain gauge bridge |
| **Meas. Roller Deflection** | 0.5 mm, max. |
| **Natural Frequency of** | |
| **Measuring Spring** | Approx. 500 Hz, depending on tension range |
| **Signal Processing** | Analog |
| **Output Signal** | 0 to 1 V DC, impedance: > 5 kOhm (standard) |
| *Option Code DC* | 0 to 10 V DC |
| *Option Code A10* | Analog DMS output mV / without amplifier |
| **Damping (fg)** | Standard: approx. 30 Hz (other values on request) |
| **Temperature Coefficient** | Zero point: less than ± 0.05% FS* / °C |
| **Temperature Range** | 50 to 113 °F *(10 to 45 °C)* |
| **Air Humidity** | 85% RH, max. |
| **Power Supply** | 15 ... 24 V DC, 21 mA (regulated) |
| | max. 21 mA for other output signals as standard |
| **Housing** | Aluminum |
| **Dimensions** (L x W x H) | 2.7 x 2.4 x 0.66 in. *(70 x 63 x 17mm)* |
| **Weight, net \| gross** | With cable approx. 0.46 lbs *(210 g)* \| 0.66 lbs. *(300 g)* |

**Full Scale*

### 4.2 Assignment of the Connector

**Cable Wire Assignment**

***Analog Output***

| | |
|---|---|
| **Yellow** | Output signal (+) |
| **Green** | Output Ground (–) |

***Power Supply***

| | |
|---|---|
| **Brown** | Excitation (–) |
| **White** | Excitation (+) |

(Note: Power required is 15 to 24V DC, regulated)

## 5.0 SERVICE, MAINTENANCE AND VERIFICATION INTERVALS

### 5.1 Service and Maintenance

The tension meter is easy to maintain. Depending on operating time and load, the instrument should be checked according to the locally valid regulations and conditions (as described in Chapter 3.3). The use of other test methods than the procedure described in Chapter 3.3 may cause deviating measuring results.

**Rollers:** You should regularly inspect the rollers to assure that they are running easily and smoothly. You can replace the rollers yourself, as necessary. Please indicate the tension meter model and the serial number in your spare-parts order.

**WARNING**

For cleaning, do not use AGGRESSIVE SOLVENTS such as trichloroethylene or similar chemicals. No warranty or liability shall be accepted for damage resulting from improper cleaning.

### 5.2 Verification Interval

The question of finding the right frequency of calibration accuracy verification depends on several different factors:

- Operating time and load of the Electromatic tension meter
- Tolerance band defined by the customer
- Changes to the tolerance band compared to previous calibrations

Therefore, the interval between verifications of calibration must be determined by the user‘s Quality Assurance Department, based on the user‘s experience.

Assuming normal operating time and load as well as careful handling of the tension meter, we recommend a verification interval of one year.

## 6.0 WARRANTY

ELECTROMATIC Equipment Co., Inc. (ELECTROMATIC) warrants to the original purchaser that this product is of merchantable quality and confirms in kind and quality with the descriptions and specifications thereof. Product failure or malfunction arising out of any defect in workmanship or material in the product existing at the time of delivery thereof which manifests itself within one year from the sale of such product, shall be remedied by repair or replacement of such product, at ELECTROMATIC's option, except where unauthorized repair, disassembly, tampering, abuse or misapplication has taken place, as determined by ELECTROMATIC. All returns for warranty or non-warranty repairs and/or replacement must be authorized by ELECTROMATIC, in advance, with all repacking and shipping expenses to the address below to be borne by the purchaser.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, THE WARRANTY OF MERCHANTABILITY AND FITNESS FOR ANY PARTICULAR PURPOSE OR APPLICATION. ELECTROMATIC SHALL NOT BE RESPONSIBLE NOR LIABLE FOR ANY CONSEQUENTIAL DAMAGE, OF ANY KIND OR NATURE, RESULTING FROM THE USE OF SUPPLIED EQUIPMENT, WHETHER SUCH DAMAGE OCCURS OR IS DISCOVERED BEFORE, UPON OR AFTER REPLACEMENT OR REPAIR, AND WHETHER OR NOT SUCH DAMAGE IS CAUSED BY MANUFACTURER'S OR SUPPLIER'S NEGLIGENCE WITHIN ONE YEAR FROM INVOICE DATE.

Some State jurisdictions or States do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you. The duration of any implied warranty, including, without limitation, fitness for any particular purpose and merchantability with respect to this product, is limited to the duration of the foregoing warranty. Some states do not allow limitations on how long an implied warranty lasts but, not withstanding, this warranty, in the absence of such limitations, shall extend for one year from the date of invoice.