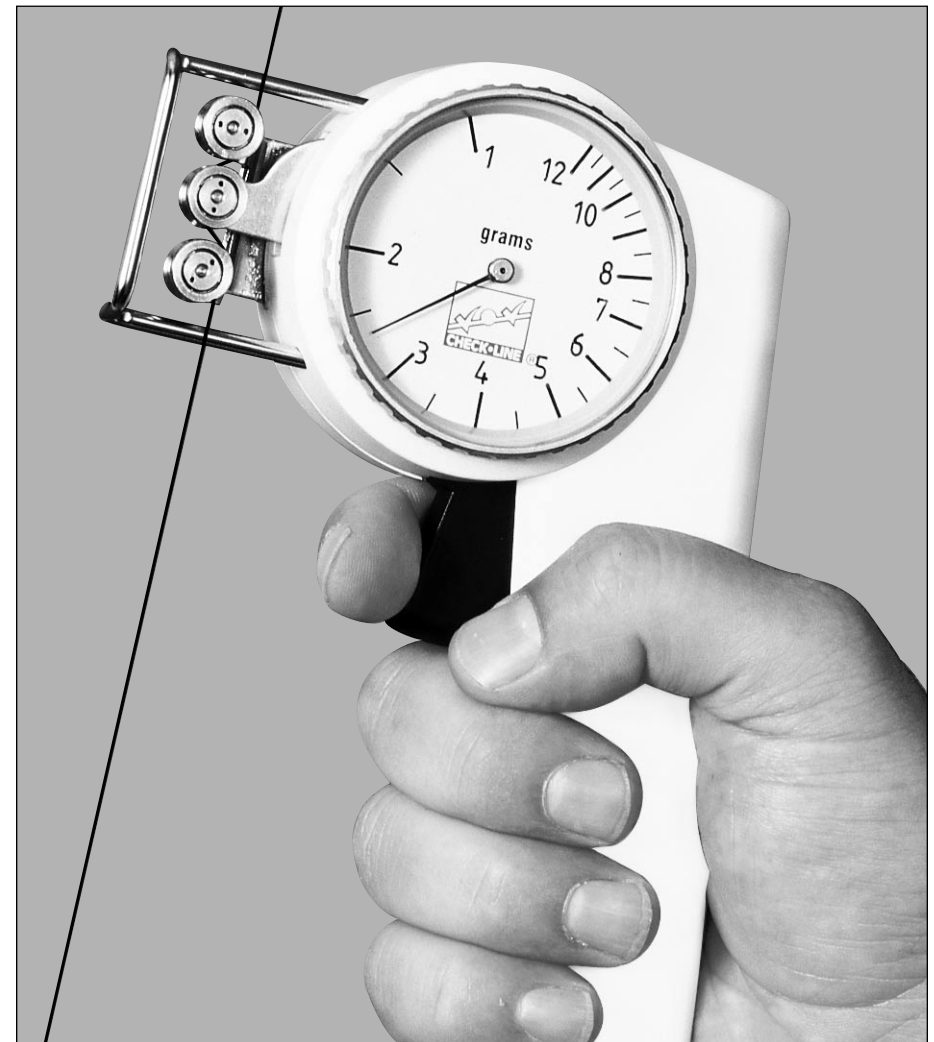


ZD2/ZF2

OPERATING INSTRUCTIONS



ELECTROMATIC
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NOTES

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1.0 OVERVIEW & OPERATING PRINCIPLE

ZD2 and ZF2 Tension Meters are hand-held, mechanical instruments which accurately measure the running as well as static tensions of a wide variety of process materials including yarns, fibers, wires and optical fibers. They employ the 3-roller principle for tension measurement where the outer two reference guide rollers remain fixed during measurement to establish a wrap angle over the middle sensing roller. The middle roller, acting against an internal calibrating spring, is displaced relative to the running line tension. This displacement is converted to a rotary motion to turn a pointer on a scale to give a reading in grams tension.

7.0 LIMITED WARRANTY

ELECTROMATIC Equipment Co., Inc. (ELECTROMATIC) warrants to the original purchaser that this product is of merchantable quality and conforms 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 products shall be remedied by repair or replacement of such product, at ELECTROMATIC's option, except where unauthorized repair, disassembly, tampering, abuse or misapplications have 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 repackaging 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.

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, notwithstanding, this warranty, in the absence of such limitations, shall extend for one year from the date of invoice.

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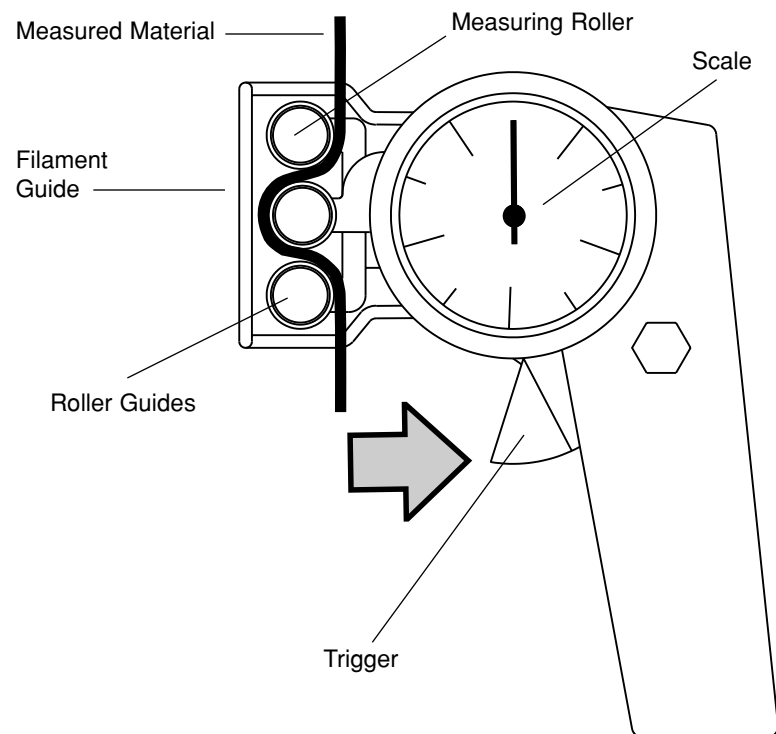
6.0 MODEL DATA & SPECIFICATIONS

Accuracy**	± 1% of full scale or ± 1 graduation mark on scale
Outer roller distance, c:c	
ZF2	22 mm (0.87")
ZD2	33 mm (1.5")
Diameter of Dial	54 mm (2.13")
Dimensions	150 x 120 x 30 mm (25.9" x 4.7" x 1.2")
Weight	210 g (7.5 oz.)
Maximum Speed	
ZF2 (standard)	900 m/min
ZF2 (optional)	2,000 m/min (K)
ZD2 (standard)	2,000 m/min
ZD2 (optional)	3,500 m/min (K)
ZD2 (optional)	5,000 m/min (HS)
Other Options	Calibration for horizontal material path (rollers pointing down)

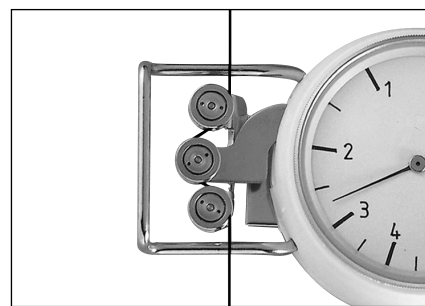
** Using factory standard materials and procedures. Special calibration using customer sample is available.

Specifications subject to change without notice.

2.0 OPERATING ELEMENTS

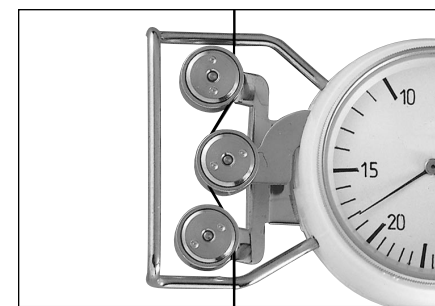


ZF2 Models



Miniaturized rollers make these models ideal for delicate fibers, low tensions or when access space is limited.

ZD2 Models



Recommended for all applications where miniaturized rollers are not needed.

3.0 QUICK START INSTRUCTIONS

1. Prior to engaging the material under test, part the 3-roller system by pressing and holding the Trigger.
2. Keeping the outer rollers extended, bring the instrument behind or under the filament and move it so that the Filament Guide bars contact the process material.
3. Slowly release pressure on the Trigger until the outer rollers return to their original position. This will automatically direct the material into the guide roller grooves.
4. The scale pointer will show line tension directly in grams or kilograms.
5. To remove the instrument from the process material, push the Trigger forward again to open the 3-roller system. With the outer rollers extended, move the instrument away from the material.
6. Remove the instrument and SLOWLY release pressure on the Trigger, allowing the outer rollers to return to their original position.

CAUTION. *Do not let the Trigger snap back as this may affect calibration and also damage the instrument.*

5.0 OPTIONS

5.1 High-Speed Guide Rollers

ZF2 guide roller assemblies are rated for 900 m/min., maximum. High-speed roller assemblies are optionally available:

“K” Roller Assembly : 2,000m/min., maximum

ZD2 guide roller assemblies are rated for 2,000 m/min., maximum. High-speed roller assemblies are optionally available:

“K” Roller Assembly : 3,500 meters/min., maximum

“HS”Assembly : 5,000 meters/min., maximum

All high speed roller assemblies must be initially installed by the factory or an authorized service facility.

5.2 Guide Roller Materials

ZF2 Tension Meters are supplied with hardcoated aluminum guide rollers standard. Plastic and nickel plated steel are optionally available with a maximum rated speed of 450 meters/min.

ZD2 Tension Meters are supplied with hardcoated aluminum guide rollers standard. Hardened steel and ceramic are optionally available with a maximum rated speed of 1,000 meters/min.

determination is best made by the user's Quality Assurance Department based on the user's experience. However, a quick calibration check near the anticipated process tension levels should be done to confirm the integrity of the instrument, as follows:

1. At the beginning of each work session
2. Every time a unit is dropped
3. Whenever process readings seem to be out of tolerance for no apparent reason

The quick check can be made with a simple load stand, as shown in 4.0, using a sample of the process material and weights that are close to the tensions encountered in the process. Be sure to move the tension meter up and down slowly to simulate the motion of the running process material. This will check the condition of the guide roller ball bearings and remove any inertia effect of the movement. Readings that change with this motion reversal may indicate the possibility of a guide roller ball bearing problem.

In the case of wire, which might be slightly deformed by the action of the 3-roller system during static measurement, always move to a fresh portion of the wire each time a measurement is made. (In production, the instrument always "sees" a fresh portion.)

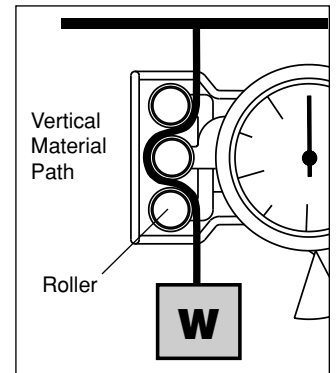
4.0 CALIBRATION NOTES

The calibration process involves hanging laboratory weights from a fixed point, engaging the vertical line material which holds the weights with the tension meter 3-roller system, marking a blank dial face where the scale pointer comes to rest for each weight used, dividing the spaces between load "reading" marks and finish marking and numbering to show calibration marks and "readings" on the dial face.

The procedure requires specialized skills and the following material:

1. A load stand to simulate the setup shown here.
2. A set of precision laboratory weights to cover the tension range of the instrument.
3. Factory "standard" nylon monofilaments as shown in the Table on page 6.
4. A Special Calibration Fixture and Metric Wrench.

A full, detailed calibration procedure is available upon request.



4.1 Calibration with Factory Standard Filaments

All ZF2 and ZD2 Tension Meters are calibrated with laboratory weights suspended from factory Standard nylon monofilament sizes, as noted in the table below. Any difference in process material size and rigidity from the Standard materials may result in some error. For over 95% of applications, the error is not significant and can be ignored since readings are generally treated as production setup values or are used for comparative purposes. In those cases where highest accuracy is required, a correction chart showing Readings vs. Actual Load should be made up by the user or “Special” calibration should be specified when an order is placed.

Standard Calibration Monofilament Sizes

Model	Range (g)	Monofilament Diam. (mm)
ZF2-5	1-5.0	0.12
ZF2-10	1-10	0.12
ZF2-12	1-12	0.12
ZF2-20	2-20	0.12
ZF2-30	3-30	0.15
ZF2-50	5-50	0.15
ZF2-100	10-100	0.15
ZD2-30	3-30	0.15
ZD2-50	5-50	0.15
ZD2-100	10-100	0.15
ZD2-150	20-150	0.15
ZD2-200	20-200	0.15
ZD2-300	20-300	0.15

4.2 Special Calibration

Special Calibration is available when measuring on a horizontal material path with the rollers pointing down. Please request a “down” calibration.

Special Calibration is also available for a specific material type and size so long as the material fits the mechanical limits and range of the instrument. The customer must supply a 10-ft sample (3 meters) of the material.

Note: Special calibration is available for a single sample only.

4.3 NIST Calibration

While all ZD2 and ZF2 instruments are furnished with a Calibration Certificate which certifies that they have been calibrated in accordance with factory procedures and were found to meet all published accuracy specifications, such calibrations do not fulfill ISO-9000 requirements since no record of measured values are kept or are submitted. Where ISO-9000 requirements are to be met, NIST calibration is optionally available but must be specified at time of order placement or after repair.

4.4 Calibration Verification Schedule

Frequency of calibration accuracy verification depends on many factors. These include frequency and extent of tension overloads, operating speeds, length of operating times, environment, care in handling, etc, Such