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## TSD121C HAND DYNAMOMETER

The TSD121C is an isometric dynamometer that measures gripping (compression) or pulling (tension) forces associated with a wide variety of muscle groups. The isometric design improves experiment repeatability and accuracy. Forces are easily recorded in pounds, grams, kilograms force or in Newtons.

The TSD121C can be used for both compression (gripping) and tension (pulling) muscle strength studies under isometric constraint.

- For compression measurements, simply squeeze the handle of the transducer. This simple operation makes for very simple and quick hand strength measurements.
- For tension measurements, the attached sturdy metal eye loops can be threaded using rope or chain. In this configuration, arm curling, leg lifting, and digit activation forces can be measured. For these measurements, one loop is clamped securely, and the other loop is attached, via cabling, to the appropriate body location under test.

The TSD121C has a 3-meter cable terminated in a connector that interfaces with the DA100C general-purpose transducer amplifier. The ergonomic soft handle design and simple calibration procedure make this device very easy to use.

For in-depth studies of muscular activity, combine TSD121C force recordings with EMG recordings; see the EMG100C amplifier for more information.

## TSD121C CALIBRATION

With the proper equipment and correct scaling techniques described below, precise force measurements can be obtained.

## EQUIPMENT

TSD121C Hand Dynamometer

MP System and DA100C General Purpose Transducer Amplifier

SS25 Simple Sensor Hand Dynamometer

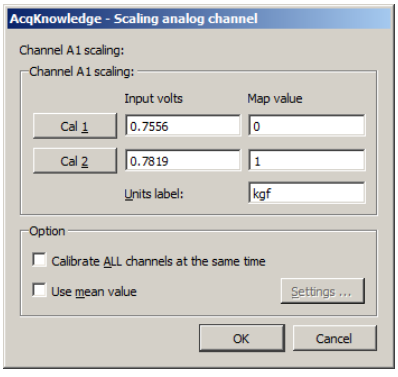
MP System and TEL100C Remote Monitoring Module Set

## HARDWARE SETUP

Connect the TSD121C to the DA100C, or the SS25 to the TEL100C. When using this type of transducer, proper hand placement is at the uppermost portion of the foam grip, directly below the dynagrip connections.

## SOFTWARE SETUP

1. Select **MP160/150** > **Set Up Data Acquisition > Channels** and enable one analog channel; make sure this channel matches the Analog Output Channel physically selected on the DA100C amplifier.)
2. Select **Setup** > **Scaling**. A dialog similar to the example shown at right will be generated.
3. In the **Map value** fields, enter the values 0 and 1 respectively. These represent 0 and 1 kilograms.
4. Enter “kgf” for the **Units label,** as shown.
5. Place the TSD121C on a flat surface and click the **Cal 1** button.
6. Note the value appearing in the **Cal 1** Input field.



7. Add 13.15 µV per volt of excitation ($V_{ex}$) to this value and enter the result in the **CAL 2** Input field.

The DA100C amplifier is factory set to a default 2 V (±1 V) of excitation. If the amplifier has been set to a different level of excitation, use the following equation wherein: V = volts of excitation per 1 kgf and G = gain setting on the DA100C or TEL100C module:

$$(13.15\ \mu V*G * V_{ex}) + \text{Cal 1} = \text{Cal 2}$$

To more precisely tune the **Cal 2** value for tension measurements, proceed to alternate Steps 6a and 7a:

6a. Hang a known weight from the eyelets of the TSD121C and enter that weight value in the **CAL 2** MAP value field.

7a. Click the **CAL 2** button.

If using the TSD121C dynamometer to record hand clench compression measurements, modify the **CAL 2** value to reflect ~80% of the **CAL 2** value resulting from the eyelet (tension) method of calibration. This 80% derating suggestion accounts for the shifting of the collective applied force vector - resulting from hand clench - closer to the pivot axis of the TSD121C (near bottom).

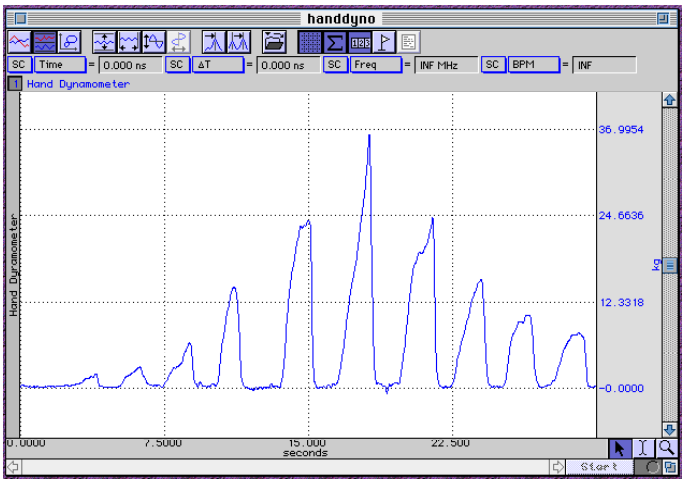
Another way to correct for handle derating is to create a calculation channel using the expression A1 * 1.466, where A1 is the analog channel receiving the signal from the TSD121C. This correction assumes that the user is gripping the unit right under the eyelets.

In Acq*Knowledge* 4.1 and higher, simply use **Set Up Data Acquisition** > **Channels** > **Add New Module**. Choose DA100C as the module type. Choose the correct physical channel switch position and select the TSD121C from the transducer list. Then follow the calibration prompts.

## TESTING CALIBRATION

To see if the calibration is correct for the MP System:

1. Start acquiring data.
2. Place the hand dynamometer on a flat surface.
3. Place a known weight on the uppermost portion of the grip.
4. Check the data — the weight should be reflected accurately in the data acquired.




***Sample Data***

See also: DA100C Calibration options.

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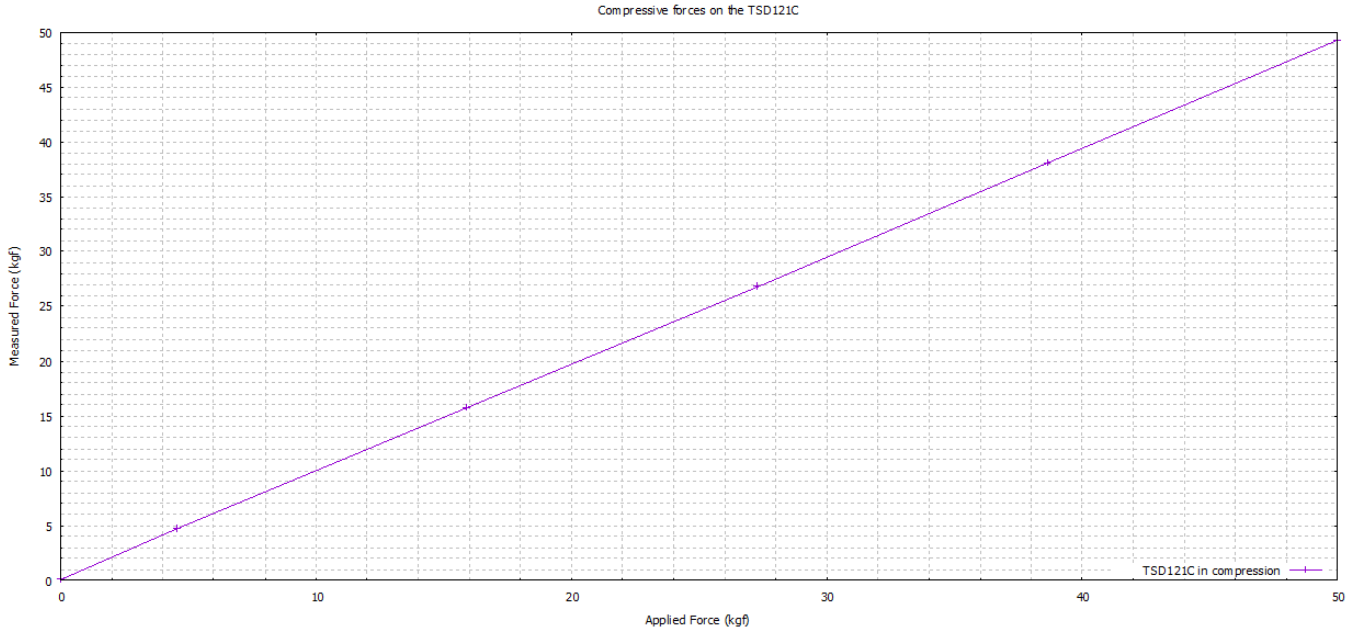
## TSD121C SPECIFICATIONS

| | |
|---|---|
| Isometric Range: | 0-100 kgf |
| Nominal Output: | 13.2 µV/kgf (normalized to 1 V excitation) |
| Nonlinearity: | < ±0.03% of rated output |
| Nonrepeatability: | < ±0.03% of rated output |
| Creep after 30 minutes: | < 0.05% of rated output |
| Hysteresis: | < ±0.03% of rated output (compression only or tension only) |
| Sensitivity: | 2.2 grams rms (5 V excitation, DC-10 Hz) |
| Weight: | 315 g |
| Dimensions: | 185 mm (long) x 42 mm (wide) x 30 mm (thick) |
| Cable Length: | 3 m |
| Interface: | DA100C |
| TEL100C compatibility: | SS25 |

## TSD121C COMPRESSIVE FORCE RESPONSE

The following chart depicts the compressive force curve of the TSD121C; (how the dynamometer behaves at different forces). Force was applied to the handle at a position 3.8 cm (1.5") from the eyelets, using the TSD121C Handle Preset.




*TSD121C Compressive Force Profile*

| Force Applied | TSD121C Compression |
|---|---|
| 0 | 0.049 |
| 4.545 | 4.734 |
| 15.909 | 15.764 |
| 27.272 | 26.821 |
| 38.636 | 38.105 |
| 50 | 49.314 |

*Tabular Data for TSD121C Compressive Force Profile*