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Snap-on Technologies, Inc.
420 Barclay Boulevard
Lincolnshire, IL 60069

Consolidated Devices, Inc. (CDI)
19220 San Jose Avenue
City of Industry, CA 91748
Using this Manual

This manual contains instructions for use and setup of the TFC series Force Testing Kits. A table of contents and table of illustrations are provided to make this manual easy to use.

Some of the information shown in text or illustrations is obtained using optional equipment. A CDI sales representative can determine optional equipment availability.

Conventions
This section contains a list of conventions used in text.

Check Note
A check note provides additional information about the subject in the preceding paragraph.

Example:
✓ System capabilities include, data storage, retrieval, statistical analysis and automatic downloading to a printer or computer.

Chapter References
Additional information in text is reference by chapter number and section name.

Example:
✓ For testing procedures refer to Chapter 4 – Using the TFC 2000.

Equipment Damage
The possibility of damage to equipment is introduced by a signal word indicating this condition.

Example:

IMPORTANT The connector on single transducer cables contain the EEPROM calibration memory chip. Never attempt to remove the connector from the transducer.
Using this Manual

Safety Messages

Safety messages are provided to help prevent personal injury and equipment damage. All safety messages are introduced by a signal word indicating the hazard level. The types of safety messages are:

⚠️ **DANGER** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury to the operator or to bystanders.

⚠️ **WARNING** Indicates a potential hazard which, if not avoided, could result in death or serious injury to the operator or to bystanders.

⚠️ **CAUTION** Indicates a potential hazard which, if not avoided, may result in minor or moderate injury to the operator or to bystanders.

The three-part message, used with safety messages, uses three different type styles to further define the potential hazard:
- Normal type states the hazard,
- Bold type states how to avoid the hazard, and
- *Italic* type states the possible consequences of not avoiding the hazard.

Some safety messages contain pictorials with signal words, pictorials showing the potential hazard, and pictorials describing how to avoid the potential hazard.

*Example:*

⚠️ **WARNING**

*Flying particles can discharge when applying torque.*
*Users and bystanders must wear safety goggles.*
*Always wear safety goggles when applying torque.*

*Flying particles can cause injury*
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<tr>
<td>Figure 5-1: Force (Compression) Gage Testing Kit</td>
<td>5-1</td>
</tr>
</tbody>
</table>
Important Safety Instructions

This manual contains important safety and operating instructions for CDI's TFC series Force Testing Kits. Refer to the information in this manual often for safe operation.

Read All Instructions

Read, understand and follow all safety messages and instructions in this manual and on the test equipment. Safety messages in this section of the manual contain a signal word, a three-part message, and, in some instances, pictorials.

The signal word indicates the level of hazard in a situation:

⚠️ DANGER
Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury to the operator or to bystanders.

⚠️ WARNING
Indicates a potential hazard which, if not avoided, could result in death or serious injury to the operator or to bystanders.

⚠️ CAUTION
Indicates a potential hazard which, if not avoided, may result in minor or moderate injury to the operator or to bystanders.

The three-part message, used with safety messages, uses three different type styles to further define the potential hazard:
- Normal type states the hazard,
- Bold type states how to avoid the hazard, and
- Italic type states the possible consequences of not avoiding the hazard.

Save These Instructions
Safety Information

Some safety messages contain pictorials with signal words, pictorials showing the potential hazard, and pictorials describing how to avoid the potential hazard.

**WARNING**
- Flying particles can discharge when applying torque. Users and bystanders must wear safety goggles. Always wear safety goggles when applying torque. Flying particles can cause injury

**WARNING**
- Improper use can cause breakage. Read instructions before operating. Follow manufacturer’s instructions, safety precautions, and specifications when operating tools. Broken equipment can cause injury

**WARNING**
- Improper or out of specification equipment can cause breakage. Make sure all components, including adaptors are rated to match or exceed the torque or load being applied. Do not use the Force Testing Kit if it has loose parts or shows any other sign of damage. Have repairs performed at an Authorized Service Center before use. Do not remove any labels. Replace and damaged labels. Broken equipment can cause injury
Introduction

Force testing kits enhance the versatility of your TFC series loader, indicator, and transducers when configured properly can deliver cable tension loads for testing cable tensiometers, compression and tension gauges. The indicator provides measurement, display, storage, and statistical analysis of FORCE inputs. The accuracy of the total system when using force testing kits may be slightly less than the specified accuracy of your TFC series equipment that does take into account the force testing kits.

A one foot force arm attaches to a transducer and the torque measurement is mathematically equivalent to the force measurement for ft-lb torque units. The indicator will automatically convert to the selected units of force (e.g. N, dN, kp, gf, lbf, oz). For example, a 250 ft-lb transducer translates into 250 lbf (pound force). The transducer is installed by lining up the red locator mark with the FORCE marker on the loader. Only single transducers ranging above 400 in-lb can be used to measure force.

The force arm attaches to a transducer and a cable connects to the force arm and a fixture that is secured to the loader. Depending on which test kit is used while under load the cable is in tension for testing cable tensiometers, or the cable pulls a tension gauge, or the cable pulls a compression block for testing compression gauges.

The information in this manual is general. Operational features, procedures, and specifications may change without notice. CDI makes no claims as to the suitability of this information for diverse user applications.
Force Arm Kit

The Force Arm Kit contains force arms for drive type and flange type transducers. A force arm is required for all force measurements. Only single transducers ranging 400 in-lb and above can be used to measure force.

Figure 2-1: Force Arm Kit
Drive Mount Force Arm & Components for testing force to 250 lb maximum

A₁ – Drive Mount Force Arm Cable Adaptor
The drive mount force arm cable adaptor is required when connecting cables whose eyelets are larger than 3/16 inch. Refer to Figure 2-3 for exploded views of the drive mount force arm cable connection.

B₁ – Square Drive Adaptor
The square drive adaptor is required when connecting the drive mount force arm to a 3/8 inch drive transducer. The square drive adaptor converts a 3/8 inch external square drive to a 1/2 inch external square drive.

IMPORTANT The square drive adaptor is designed specifically for use with the drive mount force arm. Never attempt to use the square drive adaptor in other applications.

C₁ – Quick release pin
A 3/16 inch diameter quick release pin is provided for use with the drive mount force arm cable adaptor.

D₁ – Drive Mount Force Arm
The drive mount force arm has an internal 1/2 inch square drive that attaches to a drive type transducer. To minimize side loading on the transducer, the arm has a counter weight for balance. The counter weight has been factory set and secured using a screw. The screw should not be loosened or removed, doing so will change the factory setting. Only single transducers ranging above 400 in-lb can be used to measure force. Refer to Figure 2-2 for an exploded view of the drive mount force arm and transducer mounting.
A2 – Transducer Mounting

The transducer must be installed into the loader by lining up the red mark with the “FORCE” label on the loader and securing it using two quick release pins that are provided with the loader. Refer to the instructions for the loader for proper transducer mounting.

IMPORTANT

The connector on single transducer cables contains the EEPROM calibration memory chip. Never attempt to remove the cable from the transducer.

B2 – Transducer

The recommended drive type transducers available for the drive mount force arm are shown below:
### TFC Force Arm Kit

<table>
<thead>
<tr>
<th>Transducer</th>
<th>Drive Size</th>
<th>Range</th>
<th>Force Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-7-02</td>
<td>3/8 inch</td>
<td>30-400 in lb</td>
<td>2.5-33 lb</td>
</tr>
<tr>
<td>2000-8-02</td>
<td>3/8 inch</td>
<td>80-1000 in lb</td>
<td>6.6-83 lb</td>
</tr>
<tr>
<td>2000-10-02</td>
<td>1/2 inch</td>
<td>10-125 ft lb</td>
<td>10-125 lb</td>
</tr>
<tr>
<td>2000-11-02</td>
<td>1/2 inch</td>
<td>20-250 ft lb</td>
<td>20-250 lb</td>
</tr>
</tbody>
</table>

© square drive adaptor required.

### C2 – Cable Connection

Connecting cables to the drive mount force arm require the use of a 3/16 inch quick release pin. When connecting cables whose eyelets are larger than 3/16 inch the drive mount force arm cable adaptor is required. Quick release pins for cable attachment are available in 2000-260-0 Tensiometer Testing Kit, 2000-261-0 Force (Tension) Gage Kit, or 2000-262-0 Force (Compression) Gage Kit. Refer to Figure 2-3 for exploded views of the drive mount force arm cable connection.
**E₁ - Mounting Screws**

5 screws [1/2-13 x 1-3/4 inch] are provided to secure the flange mount force arm to the transducer. Only single transducers ranging 400 in-lb and above can be used to measure force. Refer to Figure 2-4 for an exploded view of the flange mount force arm and transducer mounting.

**Flange Mount Force Arm & components from 100 – 2500 lb**
**F₁ — Quick Release Pin**

A 3/16 inch diameter quick release pin is provided for use with the flange mount force arm cable adaptors.

**G₁ — Flange Mount Force Arm Cable Adaptors**

Flange mount force arm cable adaptors are needed when connecting the tension cables to the flange mount force arm. Connecting the force arm requires the appropriate adaptor, a 3/16 inch diameter quick release pin, the appropriate tension cable, and appropriate quick release pin. Make sure the proper flange mount force arm adaptor, tension cable, pin holes, and quick release pins are used.

**H₁ — Flange Mount Force Arm**

The flange mount force arm has a flange that mates with the flange on the transducer. Provided screws secure the force arm to the transducer. Only single transducers ranging above 400 in-lb can be used to measure force. Refer to Figure 2-4 for an exploded view of the flange mount force arm and transducer mounting.

![Figure 2-4: Exploded view of flange type force arm mounting](image-url)
A3 – Transducer Mounting
The transducer must be installed into the loader by lining up the red mark with the "FORCE" label on the loader and securing it using two quick release pins that are provided with the loader. Refer to the instructions for the loader for proper transducer mounting.

B3 – Transducer
Remove the internal drive adaptor flange that is factory installed on the transducer by removing the screws. Attach the force arm to the transducer using the provided screws [1/2-13 x 1-3/4 inch]. The recommended flange type transducers available for the flange mount force arm are shown below:

<table>
<thead>
<tr>
<th>Transducer</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-13-02</td>
<td>100–1000 ft lb</td>
</tr>
<tr>
<td>2000-14-02</td>
<td>200–2000 ft lb</td>
</tr>
</tbody>
</table>

C3 – Cable Connection
Connecting cables to the flange mount force arm requires the use of a flange mount force arm cable adaptor, a 3/16 inch quick release pin, and an appropriate quick release pin for the eyelet of the cable being connected that is in 2000-260-0 Tensiometer Testing Kit 2000-261-0 Force (Tension) Gage Kit, or 2000-262-0 Force (Compression) Gage Kit. Refer to Figure 2-5 for typical exploded view of the flange mount force arm cable connection.
Figure 2-5: Exploded view of flange type force arm cable connection
**Tensiometer Testing Kit**

The Tensiometer Testing Kit contains tension cables, quick release pins, and a universal reaction cable adaptor.

**Force Tensiometer Testing Kit**

![Diagram of tension cables](image)

*Figure 3-1: TTC2600 Tensiometer Testing Kit*

- **A₁** - Tension Cables
  - The following tension cables are provided in the Tensiometer Testing Kit
### TTC2630 Tensiometer Testing Kit

<table>
<thead>
<tr>
<th>Flange mount force arm cable adaptor</th>
<th>Cable diameter</th>
<th>Quick release pin diameter</th>
<th>Maximum Allowable Working Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/16 inch</td>
<td>3/16 inch</td>
<td>100 lbs</td>
<td></td>
</tr>
<tr>
<td>3/32 inch</td>
<td>3/16 inch</td>
<td>185 lbs</td>
<td></td>
</tr>
<tr>
<td>1/8 inch</td>
<td>3/16 inch</td>
<td>350 lbs</td>
<td></td>
</tr>
<tr>
<td>5/32 inch</td>
<td>1/4 inch</td>
<td>580 lbs</td>
<td></td>
</tr>
<tr>
<td>3/16 inch</td>
<td>5/16 inch</td>
<td>740 lbs</td>
<td></td>
</tr>
<tr>
<td>7/32 inch</td>
<td>5/16 inch</td>
<td>1000 lbs</td>
<td></td>
</tr>
<tr>
<td>1/4 inch</td>
<td>3/8 inch</td>
<td>1280 lbs</td>
<td></td>
</tr>
<tr>
<td>9/32 inch</td>
<td>7/16 inch</td>
<td>1580 lbs</td>
<td></td>
</tr>
<tr>
<td>5/16 inch</td>
<td>7/16 inch</td>
<td>1800 lbs</td>
<td></td>
</tr>
<tr>
<td>3/8 inch</td>
<td>1/2 inch</td>
<td>2000 lbs</td>
<td></td>
</tr>
</tbody>
</table>

---

**WARNING**

- Exceeding the maximum allowable working load can cause breakage.

Follow manufacturer's safe allowable working load limit.

*Broken equipment can cause injury*

---

**B₁ – Universal Reaction Cable Adaptor**

The universal reaction cable adaptor has six holes to accommodate the different tension cable hole diameters. The universal reaction cable adaptor slides into the center hole on the end side rail of the loader. Attach the eyelet of the desired cable diameter to the appropriate hole of the universal reaction cable adaptor using the appropriate quick release pins.

---

**C₁ – Quick Release Pins**

The following quick release pins are provided in the Tensiometer Testing Kit:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Quick release pin diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3/16 inch</td>
</tr>
<tr>
<td>2</td>
<td>1/4 inch</td>
</tr>
</tbody>
</table>
TTC2630 Tensiometer Testing Kit

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>5/16 inch</td>
</tr>
<tr>
<td>2</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>2</td>
<td>7/16 inch</td>
</tr>
<tr>
<td>2</td>
<td>1/2 inch</td>
</tr>
</tbody>
</table>

! WARNING
- Undersized quick release pin can cause breakage.
- Follow manufacturer's recommendation for quick release pin selection.
- Broken equipment can cause injury

Setup

Selecting and mounting a transducer
When selecting a transducer, choose a single transducer that covers the low to high end capacity of the tensiometer being tested.

- Never attempt to use the 4-in-1 transducer for force measurements
- Only single transducers of 400 in-lb and higher range are recognized by the Indicator unit when in FORCE mode.

Install the transducer by lining up the red mark with the "FORCE" label on the loader. For additional information on installing a transducer refer to your loader documentation.

Selecting, mounting a force arm and a connecting tension cable
Use the drive mount force arm with external square drive transducers and use the flange mount force arm with internal square drive flange transducer.

Connecting tension cables to the force arm are different depending on which force arm is used and whether cable adaptors are needed.

- For connecting cables to the force arm refer to Chapter 2 – TTC2630 Force Arm Kit.

Test Procedure for Testing Tensiometers
Force (Tension) Gage Testing Kit

The Force (Tension) Testing Kit contains a gage support, quick release pins, tension cables, and a reaction pin.

Force (Tension) Testing Kit

![Diagram of force testing kit components]

Figure 4-1: TTC2610 Force (Tension) Testing Kit

A₁ – Gage Support
The gage support mounts onto the reaction pin and rests on the end side rail of the loader. Several pre-drilled mounting holes that match many force gages on the market are used to attach the force gage to the gage support. If the force gage you are testing does not align with the mounting holes, please ask your Snap-on sales representative for assistance.

B₁ – Quick Release Pins
The following quick release pins are provided in the Force (Tension) Testing Kit:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Quick release pin diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3/16 inch</td>
</tr>
<tr>
<td>1</td>
<td>1/4 inch</td>
</tr>
<tr>
<td>1</td>
<td>5/16 inch</td>
</tr>
</tbody>
</table>
Force (Tension) Gage Testing Kit

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Quick release pin diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3/8 inch</td>
</tr>
</tbody>
</table>

⚠️ WARNING
- Undersized quick release pin can cause breakage.
Follow manufacturer's recommendation for quick release pin selection.
Broken equipment can cause injury

C₁ – Tension Cables
The following tension cables are provided in the Force (Tension) Testing Kit:

<table>
<thead>
<tr>
<th>Cable diameter</th>
<th>Quick release pin diameter</th>
<th>Maximum allowable working load</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8 inch</td>
<td>3/16 inch</td>
<td>500 lbs</td>
</tr>
<tr>
<td>5/32 inch</td>
<td>1/4 inch</td>
<td>1,000 lbs</td>
</tr>
<tr>
<td>7/32 inch</td>
<td>5/16 inch</td>
<td>1,000 lbs</td>
</tr>
<tr>
<td>1/4 inch</td>
<td>3/8 inch</td>
<td>2,000 lbs</td>
</tr>
</tbody>
</table>

① cable adaptor required when attaching to the flange mount force arm.
② cable adaptor required when attaching to the drive mount force arm.

⚠️ WARNING
- Exceeding the maximum allowable working load can cause breakage.
Follow manufacturer's safe allowable working load limit.
Broken equipment can cause injury

D₁ – Reaction Pin
The reaction pin has a reduced diameter at one end with a ball-type retention device that fits into the center hole on the end side rail of the loader. Using the appropriate hole in the gage support, slide it over the reaction pin. The gage support should rest on the side rail of the loader.
Setup

Selecting and mounting a transducer
When selecting a transducer, choose a single transducer that covers the low to high end capacity of the force gage being tested.

✓ Never attempt to use the 4-in-1 transducer for force measurements

✓ Only single transducers of 400 in-lb and higher range are recognized by the Indicator unit when in FORCE mode.

Install the transducer by lining up the red mark with the "FORCE" label on the loader. For additional information on installing a transducer refer to your loader documentation.

Selecting, mounting a force arm, and connecting tension cable
Use the drive mount force arm with external square drive transducers and use the flange mount force arm with internal square drive flange transducers.

Connecting tension cables to the force arm are different depending on which force arm is used and whether cable adaptors are need.

✓ For connecting cables to the force arm refer to Chapter 2 – Force Arm Kit.
Force (Compression) Gage Testing Kit

The Force (Compression) Testing Kit contains a compression block gage support, quick release pins, tension cables, and a reaction pin.

**A₁ – Compression Block Gage Support**

The compression block gage support mounts onto the reaction pin and rests on the end side rail of the loader. Several pre-drilled mounting holes that match many compression gages on the market are used to attach the compression gage to the compression block. If the compression gage you are testing does not align with the mounting holes, please ask your CDI sales representative for assistance.
B₁ – Quick Release Pins

The following quick release pins are provided in Force (Compression) Gage Testing Kit:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Quick release pin diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3/16 inch</td>
</tr>
<tr>
<td>1</td>
<td>1/4 inch</td>
</tr>
<tr>
<td>1</td>
<td>5/16 inch</td>
</tr>
<tr>
<td>1</td>
<td>3/8 inch</td>
</tr>
</tbody>
</table>

![WARNING]

- Undersized quick release pin can cause breakage. Follow manufacturer's recommendation for quick release pin selection. *Broken equipment can cause injury*

C₁ – Tension Cables

The following tension cables are provided in the Force (Compression) Gage Testing Kit:

<table>
<thead>
<tr>
<th>Cable diameter</th>
<th>Quick release pin diameter</th>
<th>Maximum allowable working load</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8 inch</td>
<td>3/16 inch</td>
<td>500 lbs</td>
</tr>
<tr>
<td>5/32 inch</td>
<td>1/4 inch †</td>
<td>1,000 lbs</td>
</tr>
<tr>
<td>7/32 inch</td>
<td>5/16 inch †</td>
<td>1,000 lbs</td>
</tr>
<tr>
<td>1/4 inch</td>
<td>3/8 inch †</td>
<td>2,000 lbs</td>
</tr>
</tbody>
</table>

† cable adaptor required when attaching to the flange mount force arm.

‡ cable adaptor required when attaching to the drive mount force arm.

![WARNING]

- Exceeding the maximum allowable working load can cause breakage. Follow manufacturer's safe allowable working load limit. *Broken equipment can cause injury*

D₁ – Reaction pin

The reaction pin has a reduced diameter at one end with a ball-type retention device that fits into the center hole on the end side rail of the loader. Using the appropriate hole in compression block gage support, slide it over the reaction pin.
The compression block gage support should rest on the side rail of the loader.

Setup

Selecting and mounting a transducer
When selecting a transducer, choose a single transducer that covers the low to high end capacity of the compression gage being tested.

✓ Never attempt to use the 4-in-1 transducer for force measurements

✓ Only single transducers of 400 in-lb and higher range are recognized by the Indicator unit when in FORCE mode.

Install the transducer by lining up the red mark with the "FORCE" label on the loader. For additional information on installing a transducer refer to your loader documentation.

Selecting, mounting a force arm, and connecting tension cable
Use the drive mount force arm with external square drive transducers and use the flange mount force arm with internal square drive flange transducers.

Connecting tension cables to the force arm are different depending on which force arm is used and whether cable adaptors are needed.

✓ For connecting cables to the force arm refer to Chapter 2 – Force Arm Kit.