

***KEMKRAFT* ENGINEERING, INC.**
MODEL KEI-234 STEERING WHEEL TORQUE/INCLINOMETER TESTER

KEMKRAFT
ENGINEERING, INC.

INSTRUCTION MANUAL

**STEERING WHEEL TORQUE/
INCLINOMETER SYSTEM
MODEL KEI-234
W / INTERNAL BARCODE SCANNER**

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MODEL KEI-234 STEERING WHEEL TORQUE/INCLINOMETER TESTER

GENERAL DESCRIPTION

The KEMKRAFT Model KEI-234 Steering Wheel Torque/Inclinometer Data Acquisition System is a precision test instrument which will display and record "Straight ahead steering torque and angle" during vehicle drive testing. Setup requires a Calibration stand for the Inclinometer. Raw data is stored in the Steering Wheel Torque/Inclinometer Tester for up to 60 seconds for a 1 run test or 2 run test or 4 run test. The runs are programmable from 1 to 60 seconds and the sample rate is 3 samples/sec. Torque is determined by inputting the steering wheel radius. Multiple tests can be run and each test is identified with a run # and time/date stamp. After a test is performed, the Mean is displayed for both torque and angle on the LCD display. Raw data, Stored into memory, can, at any time, be dumped to a PC for SPC purposes.

INSTALLATION

NOTE: Fully charge the unit before use (w/ the power off) over night for 14 hours. Also make sure both the Inclinometer and force gauges are calibrated before use.

1. The KEI-234 Steering Wheel Torque/Inclinometer Tester box.
2. Review figure 1 below for the KEI-234 Steering Wheel Torque/Inclinometer Tester. Make sure the Rollers on both sides of the steering wheel are firmly seated into place. Clamp the unit into place by tightening the thumbscrew on top of the tool. (do not overtighten)

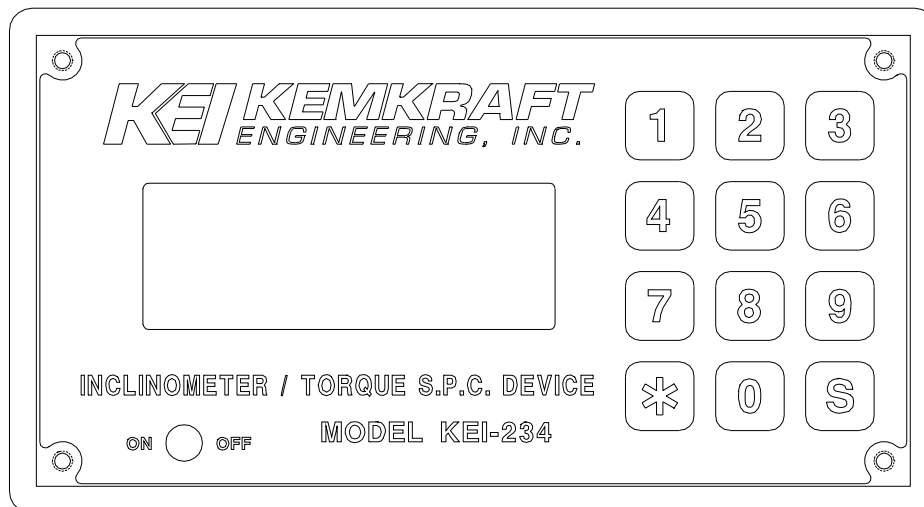


Fig. 1

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1. Turn the Steering Wheel Torque/Inclinometer Tester on. The Main menu will be displayed.

MAIN MENU

0 = Run
1 = Setup
2 = Download
3 = Calibrate

2. Make sure the test parameters, for the test to be run, (e.g. S.W. radius, Test Timeout, 1,2 or 4 run test) are set properly. Their setup is listed in the next section under setup.

The installation is now complete.

SYSTEM SETUP

Certain system parameters must be modified when changing to a new vehicle or adjustment is required. The Steering Wheel radius from *center of wheel* to the *center of the driving knob* must be changed when switching to a new vehicle. (See figure 1) The clock should be checked for accuracy and reset for daylight savings time.

To change or enter setup parameters:

1. Turn on the Steering Wheel Torque/Inclinometer Tester.
2. Press the 1 key to enter the System Setup Menu.

SYSTEM SETUP MENU

1 = Test Timeout
2 = 1,2,4 Run Select
3 = S. W. Radius L/R
4 = Misc. Parameters

To enter a new Test Timeout:

1. Test Setup Menu: Press the 1 key to change the Test Timeout.

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2. The Test Timeout Menu will be displayed.

Set New Test Timeout 10sec Timeout = 10sec 60s MAX = All Tests * = to Abort
--

3. Press * to abort.

To enter a 1, 2, or 4 Run Test:

1. Test Setup Menu: press the 2 key to change the 1,2,4 Run Test Select.
2. The 1,2,4 Run Test Menu will be displayed.

1 Run Currently Selected 1 = ONE Run Test 2 = TWO Run Test 4 = FOUR Run Test

3. Select the 1 or 2 or 4 key for the test required and press * to abort.

To enter a new Steering Wheel Radius:

1. When in the Test Setup Menu: press the 3 key to change the Steering Wheel Radius. The S. W. radius should be less than 1000.0 mm
2. The Steering Wheel Radius Menu will be displayed.

Right S.W. RADIUS: xxxx.x mm xxxx.x mm Enter New RAD or (*)
--

3. Enter the new Torque Radius and press * to abort.
Torque Radius = Center of S.W. to Center of Torque Knob in mm.

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To Change or Enter Misc. Parameters

1. Test Setup Menu: Press 4 to enter Misc. Parameters Menu

1 = Run Delay 2 = Set Time & Date 3 = Backlight T.O. 4 = Select Options
--

To change the Test Run Delay:

1. Misc. Parameter Menu: Press 1 to enter Run Delay.

Set New Run Delay 1.0sec Delay = 1.0sec Range = (0 – 9.9) sec * = to Abort

2. The Run Delay is how long the unit will wait before taking samples in RUN Mode.
3. Press * to Abort.

To enter a new time and date:

1. Misc. Parameter Menu: Press the 2 key to change the Date/Time.
2. The display will show the current time and date.
3. Enter the new time, in 24 hr format (1:00 PM = 13:00:00), on the keypad.
4. Enter the new date on the keypad example: 01/01/1999
5. Press the * key to return to the System Setup and main menus.

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To change the Backlight T.O.:

1. Misc. Parameter Menu: Press 3 to enter Backlight T.O. Menu.

Backlight Timeout
Current Time = 60 sec
New Timeout = 60 sec
* = to Abort

2. The Backlight T.O. is how long the Display backlight will stay on after the last keypad entry.
3. Press * to Abort.

To Enter an Inclinometer, Torque or both test:

1. Misc. Parameter Menu: Press 4 to enter the Select Options.

Options Menu
1 = Incl./Torque Sel
2 = Barcode Scanner
* = to Abort

2. Press 1 for Inclinometer / Torque Tool Menu.

Incl./Torque Sel:3
1 = Inclinometer
2 = Torque Tool
3 = Both Tools

3. Press 1, 2, or 3 for the test required or press * Abort.

To Enable or Disable Barcode Scanner:

4. Press 2 for Barcode Scanner Menu.

Barcode Scanner: OFF
1 = ON
2 = OFF
* = to Abort

5. Press 1 or 2 to enable or disable the scanner option.

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OPERATION

NOTE: THE TOOL IS BALANCED AT 0.0 DEGREES, THEREFORE THE TORQUE DISPLAYED WILL BE 0.00. SINCE THERE IS INTERNAL COMPENSATION FOR THE WEIGHT OFFSET OF THE TOOL, WHEN THE TOOL IS ROTATED LEFT AND RIGHT ON THE STEERING WHEEL THE TORQUE NUMBER WILL CHANGE.

1. Be sure all setup is complete as detailed in the Installation and System Setup sections. Turn on the Steering Wheel Torque/Inclinometer Tester power switch. **Verify that steering wheel radius has been entered correctly for the current vehicle steering.**
2. Press the **0** key to select RUN TEST.
3. If the internal Barcode Scanner is enabled the screen will display the following. If the internal Barcode Scanner is disabled skip to step 7.

Press ' 9 ' to Scan
The Barcode Label or
Press ' * ' to Abort

4. Press ' 9 ' to trigger the Barcode Scanner. The Scan will stay active for 3 seconds.
5. When the Barcode Scanner has a good read the following screen will be displayed.

XXXXXXXXXX
Save this VIN ?
* = NO S = Yes
Press ' * ' to Abort

6. Press S to save the VIN or * to abort.
7. The Test screen will display Torque data & Test Timeout during testing.

XX.XX Nm TORQUE
X.X Deg. Angle
0=Zro XDCCR S=Sample
10s T.O. 2 Run Test

8. The current Torque value (NM) is displayed in Newton Meters.

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9. The test is started by pressing the S Key, the unit will start taking Torque and Angle samples. The tests can either A.) Timeout on its own pre-programmed Timeout Value or, B.) Be stopped by depressing the S Key a second time.

10. When the test is finished, the unit will display the Torque Mean & the Angle Mean. These values are not stored in memory and therefore need to be written down if needed for future use. These values can be calculated again later by dumping the raw data to a PC, importing the data into a spreadsheet, and running the proper math formulas.

11. Press the * key to return to the Main menu. If data collection is in progress, when the * key is pressed, the data collection will be lost.

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TRANSDUCER CALIBRATION

Periodic re-calibration of the system is necessary. This calibration should be performed with the Calibration Stand.

To calibrate the Force Transducer:

1. Mount the KEI-234 Steering Wheel Torque/Inclinometer Tester to the steering wheel.
2. Turn on the Steering Wheel Torque/Inclinometer Tester.
3. **Press the 3 key** to enter the Calibration mode.

- Calibration Menu - 1 = Inclinometer 2 = Load Cell * = to Abort

4. **Press the 2 key** to calibrate the Load Cell.
5. The first calibration screen will be displayed:

ZERO FORCE TRANSDUCR With gauge mounted On Stand XXXX Press "0" on Keypad

6. With the Calibration Stand adjusted for 0 degrees, and nothing touching the force knob, **Press the 0 key** to zero the force transducer.
7. The second calibration screen will be displayed:

Gauge Calib Constant 123.45 N xxx.xx N Cnstnt on Gage or *

8. The unit will display the current Calibration Constant. The Calibration Constant number is located on a label on the side of the Force Transducer. **Input this Calibration Constant** number into the keypad now if it is different than the value listed on the display. If the numbers are the same, press * key to continue.

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TRANSDUCER CALIBRATION (CONTINUED)

9. The third calibration screen will be displayed:

Applying Cal. Shunt
DO NOT TOUCH LD CELL
XXXX
<<<PLEASE WAIT>>>

10. The KEI-234 will apply the Calibration Shunt during this period.
DO NOT TOUCH LOAD CELL this will cause the Calibration to be incorrect.

11. The load cell calibration can be verified or Press ‘ * ‘ to abort.

Load Cell Calibration
=====

Press ‘ 9 ‘ to Verify
or ‘ * ‘ to Abort

12. Press 9 to verify calibration.

POSITION AUDIT TOOL
At +30.0 Degrees
On Cal. Stand
Press ‘ 0 ‘ on Keypad

13. Press 0 to continue.

HANG A CERTIFIED
WEIGHT TO VERIFY
X.XX lbs. Force
Press ‘ * ‘ to Abort

14. Press ‘ * ‘ to Abort.

15. The calibration is complete and the display will go back to the Main.

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INCLINOMETER CALIBRATION

Periodic re-calibration of the system is necessary. This inclinometer calibration should be performed with the Calibration Stand.

To calibrate the Inclinometer:

1. Mount the KEI-234 Steering Wheel Torque/Inclinometer Tester to a Calibration Stand
2. Turn on the Steering Wheel Torque/Inclinometer Tester.
3. **Press the 3 key** to enter the Calibration mode.

- Calibration Menu -
1 = Inclinometer
2 = Load Cell
* = to Abort

4. **Press the 1 key** to calibrate the Inclinometer.

ZERO ANGLE TRANSDUCR
With Gauge Mounted
on Cal. Stand XXXX
Press "0" on Keypad

5. Verify that the Calibration Stand is Level and on 0.0 Degrees. **Press the 0 key** to zero the Inclinometer.
6. The second calibration screen will be displayed:

SET ANGLE TRANSDUCR
To **-10.0 Degrees**
on Cal. Stand XXXX
Press "0" on Keypad

7. Adjust the Calibration Stand to -10 Degrees, then **Press the 0 key** to record the Inclinometer negative limit.

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8. The third calibration screen will be displayed:

SET ANGLE TRANSDUCR To +10.0 Degrees on Cal. Stand XXXX Press "0" on Keypad

9. Adjust the Calibration Stand to +10 Degrees, then **Press the 0 key** to record the Inclinator positive limit.

10. The calibration is complete (if the receiver was receiving the proper signal) and the display will go back to the Main.

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DOWNLOADING DATA

The KEI-234 Steering Wheel Torque/Inclinometer Tester can store data for download to a computer and further analysis. The Kemload program and the Download menu are used for this purpose. After downloading the data, the memory can be reset using the same menu.

To download data: (Using KEMLOAD for Dos)

1. Connect the KEI-234 Steering Wheel Torque/Inclinometer Tester RS-232 port to a PC COM1 port. A Null modem cable is required (female DE-9 to female DE-9). Connect power to & turn on the Steering Wheel Torque/Inclinometer Tester.
2. From the KEMLOAD directory, type KEMLOAD <CR> on the computer to start the Kemload program. Press F4 to change the data file name if desired.
3. From the main menu **press the 2 key**. The Download Data Menu will be displayed.

----- Download ----- 2 = Download 9 = to Reset Mem * = Abort

4. **Press the 2 key** to start the data download.
5. If the Download Error message is displayed, check the cable and be sure the last line of the Kemload Computer screen reads "Waiting to receive data".
6. The data will display on the computer screen as it is being received by the computer. When the download is complete, both the computer and Steering Wheel Torque/Inclinometer Tester will indicate this.
7. The KEMLOAD program allows the data to be edited before being saved. Press F3 to edit the file. If the data is to be saved on disk, press the F2 key to save. Data is not permanently stored on disk until F2 is pressed.
8. The data remains in the KEI-234 Steering Wheel Torque/Inclinometer Tester memory and can be download as many times as desired. To clear the memory and reset the pointer to the beginning of memory, select the Download menu and press the 9 key to reset memory. ****NOTE:**** Be sure no important data remains in the Steering Wheel Torque/Inclinometer Tester memory before clearing or resetting it as all data is irretrievably lost.
9. Press F10 to exit the KEMLOAD program. Press the Steering Wheel Torque/Inclinometer Tester * key to exit the download menu.

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To download data: (Using KEMLOAD32 for Windows)

1. Connect the KEI-234 Steering Wheel Torque/Inclinometer Tester RS-232 port to a PC COM1 port. A Null modem cable is required (female DE-9 to female DE-9). Connect power to & turn on the Steering Wheel Torque/Inclinometer Tester.
2. From the KEMLOAD Program directory, Double Click Windows KEMLOAD32 Icon on the computer to start the Kemload program.
3. Set COM Port to 9600 Baud under OPTIONS Menu.
4. From the main menu **press the 2 key**. The Download Data Menu will be displayed.

----- Download ----- 2 = Download 9 = to Reset Mem * = Abort

5. **Press the 2 key** to start the data download.
6. The data will display on the computer screen as it is being received.
7. The KEMLOAD32 program will save the downloaded data to an ASCII file named Month/YearSL.TXT. This file will be appended every time data is downloaded to the computer until the next month, then the program will create a new file for that month.
8. The data can also be saved to a separate file by selecting under the File Menu Save as ...
9. The data remains in the KEI-234 memory and can be download as many times as desired. To clear the memory, select the Download menu and press the 9 key to reset memory.

****NOTE:**** Be sure no important data remains in the Portable Caster Gauge memory before clearing or resetting it, as all data is irretrievably lost.

10. From the File Menu Select EXIT to quit.

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STANDARD EQUIPMENT

1. KEI-234 STEERING WHEEL TORQUE/INCLINOMETER TESTER
2. AC POWER TRANSFORMER (12V DC 500MA)
3. MANUAL - KEI-234 STEERING WHEEL TORQUE/INCLINOMETER.
4. KEMLOAD32 SOFTWARE 3 1/2" DISKS
5. KEI-234 DOWNLOAD CABLE