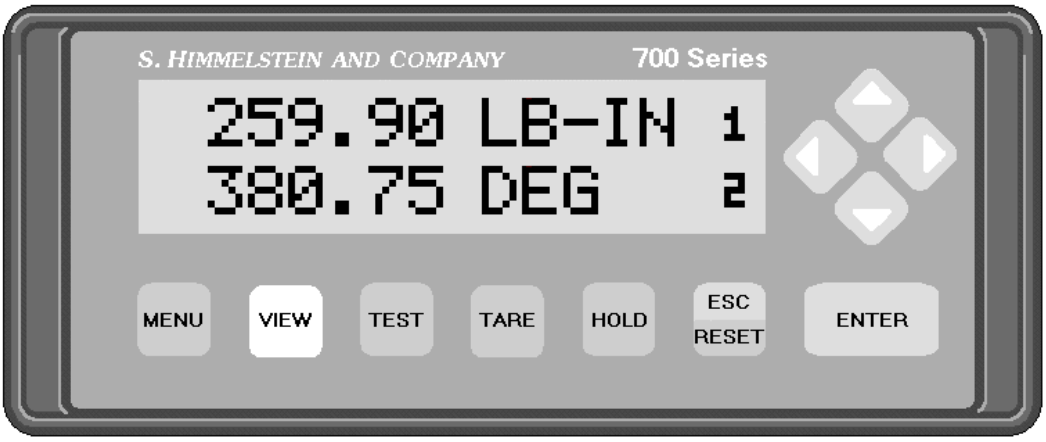
# Model 751

BULLETIN 381A

# Torque/Angle & Force/Displacement Instrument

## Use With a mV/V Strain Gage Sensor and a Quadrature Encoder




Superb instrument for strain gage torque, force, and pressure sensors, and rotary and linear quadratic encoders.

- ***reads, displays, processes and outputs***
  - ***shaft torque, angular rotation and torsional stiffness***
  - ***force, linear displacement and spring rate***
- ***fast, rock solid readings with high noise immunity***
  - ***2000 samples/sec. for torque, or force input***
  - ***0.5 millisecond encoder response with 400kHz bandwidth***
- ***6 digit engineering unit display with legends and 0.01% resolution***
- ***RS232/RS422/RS485 serial communication***
- ***auto-scaled ±5V and/or ±10V analog outputs***
- ***no pots, batteries, fans, maintenance, or external power supplies***

These advanced instruments provide engineering unit display of a mV/V output strain gage sensor and a rotary or linear position encoder. They also compute their ratio and perform 21 functions including limits, tare, hold, and max/min capture. You needn't write code or add hardware to be up-and-running a productive test.

The alphanumeric readout can display measured and computed data, units of measure and test status. During setup, it guides you with English language prompts. There are no *manual adjustments.* To calibrate, enter the full scale value in engineering units and the instrument provides 0.01% resolution and ±5V and/or ±10V analog outputs at full scale. The keyboard accesses measured data, held data, max/min data, data spread, limit status, and/or I/O status *without test disruption*. Password protection may be used, if needed.

The mV/V conditioner has the advantages of ac carriers with the operating simplicity of dc. Microprocessors provide true ac null balance without manual adjustments. As a result, the instrument *has superior noise immunity, is unaffected thermal and galvanic voltages and offers high sensitivity.* The encoder conditioner accepts quadrature TTL signals. It has an input bandwidth of 400 kHz, software selected data filter and a 48 bit internal counter. The counter may be reset from the keyboard, logic I/O or hard wired. Inputs are protected to 130 Volts. *Excitation power is furnished for both the strain gage and position encoder; there is no need for external power supplies.*

Select either RS232, RS422, or RS485 serial communications to remotely control instrument modes, settings and measurements. Input actions (28) and output events (30) are controlled by user configurable logic I/O's – 4 inputs, 6 outputs. These can be combined (OR'd and/or AND'd) *to create virtually any imaginable test without the need for special software or hardware*. Instruments are shipped with software that allows the user to setup and control all functions from a Windows-based PC. That software also has the ability to display, plot and save real time data.


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# Model 751 Specification

**Strain Gage Input** ..... Any 80Ω to 2kΩ transducer, directly wired or transformer coupled. 4, 6, or 7 wire circuits are accommodated.
- **Transducer Excitation** ..... 3Vrms, 3030Hz ± 0.01% sine wave. Regulated, and short circuit protected.
- **Sensitivity** ..... 0.5 to 5mV/V with 50% overrange; automatically scaled.
- **Input Impedance** ..... 100MΩ in parallel with 33pF.
- **Automatic Null** ..... In Phase: ±10% of F.S. (with 50% overrange), ±60% of F.S. (with 0% overrange). Quadrature: ±1mV/V.
- **Auto Calibration** ..... Dual polarity shunt calibration with provision for CAL resistor feedback.
- **Spurious Signal Rejection** ..... 60Hz: 120dB common mode, 100dB normal mode. Carrier quadrature: 60dB.
- **Antialias Filter** ..... 7 pole Bessel response filter.
- **Low Pass Filtering** ..... 4 pole Bessel response digital filter with 11 cutoff frequencies from 0.1 to 200Hz in 1-2-5 steps.
- **Signal-to-Noise Ratio**[1] ..... with 1/10/100/200Hz filters 86/76/66/62dB @ 1mV/V F.S. and 86/80/72/66dB @ 5mV/V F.S.
- **Display Resolution** ..... 0.01% of F.S.
- **Overall Accuracy** (at 77ºF/25ºC) ..... 0.02% of F.S., worst case.
- **Temperature Effects** ..... Zero: ±0.001% of F.S./ºF (max); Span: ±0.001% of F.S./ºF (max).

**Position Encoder Input** ..... Rotary and linear quadrature encoders, or TTL events.
- **Excitation Supplies** ..... +12V@125mA[2] or +5V@250mA[2]. Short circuit (current limit) and overvoltage (fuses: 375mA for 12V, 1A for 5V) protected.
- **Inputs** ..... Signal A, Signal B, Reset, Reset Arm.
  - Type ..... Single ended, TTL.
  - Impedance ..... 50kΩ.
  - Maximum Voltage ..... 130VDC or 130Vrms.
  - Bandwidth ..... 400kHz.
- **Operating Modes**
  - Quadrature Encoder Mode ..... Counts input cycles once or doubles (2X) or quadruples (4X) the number of input pulses. Choose *A leads B* or *B leads A* for incrementing direction of counter.
  - Totalizer Mode ..... Counts edges of Signal A. Choose *Rising Edge* or *Falling Edge*.
- **Counter Reset** ..... Via the RESET key, the Logic I/O or, the transducer connector.
  - Reset Via The Transducer Connector: ..... Choose *TTL Low*, *TTL High*, or *Ignore*.
    - Reset Mode ..... Choose *Level*, *Leading Edge*, */A AND /B*, */A AND B*, *A AND /B*, or *A AND B*.
    - Reset Arm Signal ..... Enables Reset signal (choose *TTL Low*, *TTL High*, or *Ignore)*.
- **Internal Counter** ..... 48 bits.
- **Display Range and Resolution** ..... Displays 0 to 999,900 units of measure with legend; resolution is 0.01% of Full Scale.
- **Response Time** ..... 0.5ms.
- **Data Filter** ..... Unfiltered or 4 pole Bessel response low pass digital filter. 10 cutoff frequencies from 0.1 to 100Hz (in 1-2-5 steps).
- **Maximum Transducer Cable Length** ..... 500ft.

**System Display** ..... 2 line by 16 alphanumeric characters, each 0.2" wide by 0.3" high. Backlit LCD with adjustable contrast.
- **Views** ..... Select either 2 Channels, 1 Channel with Limit Status, or 1 Channel with I/O Status.
- **Data Displayed** ..... Select from Current, Max, Min, Spread, Held data and Tare value.
- **Data Format** ..... Engineering units with 6 digits (1-2-5 format) and 5 character, upper/lower case, user-entered legend/descriptor.

**System Response (per channel)**
- **Data Sampling & Max/Min Update Rates** ..... 2000Hz (hardware channels), 50Hz (CH3 calculation).
- **Limit Checking Rate** ..... 1000Hz (hardware channels), 50Hz (CH3 calculation).
- **Logic I/O Response Time** ..... 1ms (hardware channels), 20ms (CH3 calculation).
- **Update Rate for Each Analog Output** ..... 1000Hz.

**System Control** ..... All I/O functions can be OR'd in any combination. The *pattern* function adds ANDing capabilities.
- **Input Actions/Channel** ..... Logic inputs, outputs, and internal Matrix signals control following actions. Tare, Clear Tare, Hold, Clear Hold, Reset Max/Min, Clear Latched Limits, Check Limits, Do Max/Mins, Apply +CAL, Apply -CAL.
- **Output Events/Channel** ..... The following events drive Logic outputs and internal Matrix signals. HI Limit, NOT HI Limit, IN Limit, NOT IN Limit, LO Limit, NOT LO Limit, At Max, NOT At Max, At Min, NOT At Min.
- **Three User-defined Patterns** ..... Patterns of Logic inputs, outputs and Matrix signals drive Logic outputs and internal Matrix signals.

**Limit Checking** ..... Each channel has a HI and LO limit which may be latched or unlatched, absolute or signed, and with or without hysteresis. Select either Current, Max, Min, Spread or Held data for limit checking. Limit violations on any or all channels can be set to trigger backlight flashing in any of the display view modes.

**Four Logic Inputs** ..... Each with programmable destination, protected to ±130VDC or 130Vrms.
- **Type** ..... TTL compatible, Schmitt Trigger, low-true with 47kΩ pull-up. Input current is -100µA @ 0V.

**Six Logic Outputs** ..... Each with programmable source, short circuit (current and thermal limits) and overvoltage (fuse) protected.
- **Type** ..... Open collector, low-true. Operating @ 24V (max) and 0.3A max sink current.

**External +5VDC Power** (on I/O connector) ..... 250mA, short circuit (current limit) and overvoltage (fuse) protected.

**Serial Communication Port** (selectable as RS232, RS422, or RS485. Supports 32 devices on RS485 port and 1 device on RS232/422)
- **BAUD Rate** ..... 300 to 38400. Maximum Cable Length: 4000ft (RS422/RS485), 50ft (RS232).
- **120Ω Termination Resistors** (RS485) ..... user selectable for RXD and TXD.
- **RS422/485 Transceivers** ..... Slew-rate limited, short circuit protected (current & thermal limits).
- **RS232 Drivers** ..... Short circuit protected (current limit).
- **Serial I/O's** ..... Use a 9 pin D connector. They are ±15kV ESD protected and float (100kΩ) with respect to Earth Ground.
- **Commands** ..... Control of all modes, settings, and measurements.

**Non-Volatile Memory Storage for System Settings** ..... EEPROM, batteries are not used.

**Dual Analog Outputs** ..... Each assignable to any of the 3 channels are short circuit (current limit) and overvoltage (fuse) protected.
- **Output Impedance/Minimum Load Resistance** ..... <1Ω/10kΩ.
- **Full Scale** ..... ±5V or ±10V (user selectable). Resolution is 2mV @ ±5V F.S. or 4mV @ ±10V F.S.
- **Overrange** ..... ±8.2V @ ±5V F.S. or ±13.5V @ ±10V F.S.
- **Non-linearity** ..... ±2mV @ ±5V F.S. or ±4mV @ ±10V F.S.
- **Overall Error** (worst case, including temperature effects) ..... ±5mV @ ±5V F.S. or ±10mV @ ±10V F.S.
- **Filter** ..... 100Hz, 5 pole Bessel response low pass filter.

**Size and Weight** ..... 6.5" wide, 2.9" high, 8.7" deep. Weight is 3 pounds.

**Operating Temperature** ..... +41ºF to +122ºF (+5ºC to +50ºC).

**Input Power** ..... 90VAC to 250VAC, 50/60Hz @ 25VA, max. Two 2A/250V fuses, line filter, and rear power switch. Option 12D1, converts from AC line power to 10 to 15VDC operation @ 15 Watts, max. It includes a rear power switch, fuse & filter.

Notes:
1. The ratio expressed in decibels (dB), of full scale (F.S.) signal to noise spread. Measurements are made for a 1 minute interval using a 100Ω source impedance.
2. Both excitation voltages can be used simultaneously with the following restrictions:
   A) 4.8 x (12V current) +(5V current) ≤ 700mA  B) 12V current ≤ 125mA  C) 5V current ≤ 250mA
   Examples of acceptable loads: 12V @ 125mA and 5V @ 100mA and 12V@90mA and 5V@250mA
3. Specifications are subject to change without notice.