

FLUKE®

Fluke 750 Series

**Documenting Process Calibrators:
*Work smarter. Work faster.***



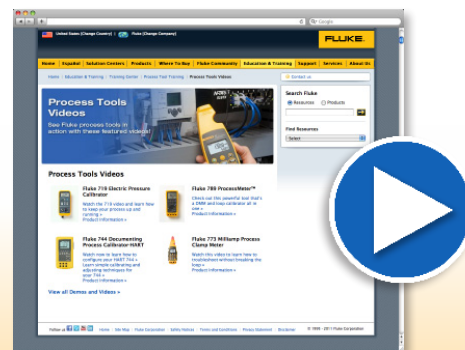
HART 
COMMUNICATION PROTOCOL

Fluke 750 Series Documenting Process Calibrators: Work smarter. Work faster.

Whether you're calibrating instruments, troubleshooting a problem or running routine maintenance, Fluke 750 Series process calibrators can help you get the job done faster. It does so many different tasks, so quickly and so well, it's the only process calibrator you need to carry.

- **Multifunctional.** Calibrate temperature, pressure, voltage, current, resistance, and frequency. Since it both measures and sources, you can troubleshoot and calibrate all with one rugged tool.
- **Powerful, yet easy to use.** The easy-to-follow, menu-driven display guides you through any task. Programmable calibration routines enable you to create and run automated as-found/as-left procedures to ensure fast, consistent, calibrations.
- **Records and documents results.** To support your ISO-9000 or regulatory standards, the Fluke 753, and 754 capture your calibration results, eliminating the need to juggle a pen and pad in the field. The USB interface in the Fluke 753 and 754 lets you transfer the results to a PC, thus saving the time of having to manually transcribe them when you return to the shop.
- **Supports popular instrumentation management software.** The 753 and 754 work with the Fluke DPC/TRACK™ software, and with popular programs from Honeywell Meridium, Emerson, Cornerstone, Yokogawa, Prime Technologies, Intergraph and others. It allows you to create procedures, instructions, and action lists to deliver fast, easy documentation.
- **Truly hand-held.** Small enough to fit easily into a tool bag and to use in tight spaces. Runs an entire shift on a rechargeable Li-ion battery pack.
- **Rugged and reliable.** Overmolded urethane case stands up to rough handling in industrial environments. Calibrators offer one- or two-year calibration cycles and three-year warranty.
- **Bright white display** lets you read your results in any kind of light. Backlight has three (3) settings.
- **Soft keys** provide one-touch access to enhanced functions such as task lists, automated procedures, scaling, min/max, stepping and ramping, and review memory.
- **Three operating modes** Measure, Source, or simultaneous Measure/Source, —enable technicians to troubleshoot, calibrate, or maintain instrumentation with just one tool.
- **Integrated HART communication capability** lets you program and control HART instrumentation (754 only).
- **Use it immediately.** If you've used the Fluke 74X Documenting Process Calibrator you'll be able to pick up the 75X and start using it immediately, without a learning curve.

- **Multi-lingual interface** displays instructions in English, French, German, Spanish, and Italian.
- **AutoStep** allows technicians to set the calibrator for a delayed start and a specific sequence of steps, so it can run unattended as a continuously varying test source.
- **User entered values** enable users to capture readings measured or sourced by other devices.
- **Custom units** allow readings to be scaled and displayed in any user-defined units.
- **Switch calibration procedures** perform fast, automated calibration of one- and two-point switches for voltage, current, temperature, and pressure.
- **Differential pressure flow instrument calibration** routines use a square root function to directly calibrate DP flow instruments.
- **Built-in algebraic calculator** with four functions — plus square root — stores, recalls, and performs calculations required for setting up instruments or evaluating data in the field. Use it to set the source function to a calculated value. There's no need to carry a pencil and paper or a separate calculator.
- **Programmable measurement delay** inside automated procedures permits calibrating instruments that respond slowly.



Get the knowledge straight from the product expert in these process tools videos:

- 719 Electric Pressure Calibrator
- 789 ProcessMeter™
- 773 Milliamper Process Clamp Meter
- 754 Video Series

Online now at www.fluke.com/ptoolsvideos

Bonus feature available with product registration:

- **Transmitter mode: simulate a transmitter while you get a replacement.**

Fluke 750 Series Documenting Process Calibrators: Calibrators as versatile as you are.

The Fluke 750 Calibrators, offered in two models, let you choose the right set of capabilities for your needs.

- The **Fluke 753** offers simultaneous source and measure capabilities for all common process parameters. Create and execute automated procedures and automatically capture the results results. The USB interface enables two-way communication with popular PC-based instrumentation management applications.
- The **Fluke 754** offers all of the capabilities of the 753, plus the ability to maintain and calibrate selected HART transmitters without a second tool.

| Capability | 753 | 754 |
|---------------------------------|-----|-----|
| Source /measure | • | • |
| Automated procedures | • | • |
| Results capture | • | • |
| Uses all Fluke pressure modules | • | • |
| Transmitter mode | • | • |
| Serial interface | • | • |
| Data logging | • | • |
| HART communications | | • |
| Pulsed RTD simulation to 1 ms | • | • |
| Li-ion battery with "Gas Gauge" | • | • |

Fluke 754 HART Documenting Process Calibrator: Get HART-ability.

Process plants have taken advantage of smart transmitters, the need for a new generation of calibrators has emerged—calibrators that can communicate via industry standard digital protocols. The 754 combines HART communication capability in a documenting process calibrator to deliver an integrated communicating calibrator. This rugged, reliable tool is ideal for calibrating, maintaining, and troubleshooting HART instrumentation. The 754 offers:

- Integrated HART communication functions, permitting you to monitor, control, and calibrate HART instrumentation.
- Handling of fast pulsed RTD transmitters and PLCs, with pulses as short as 1 mS.
- Li-ion battery with 4400 mA hour life and gas gauge.



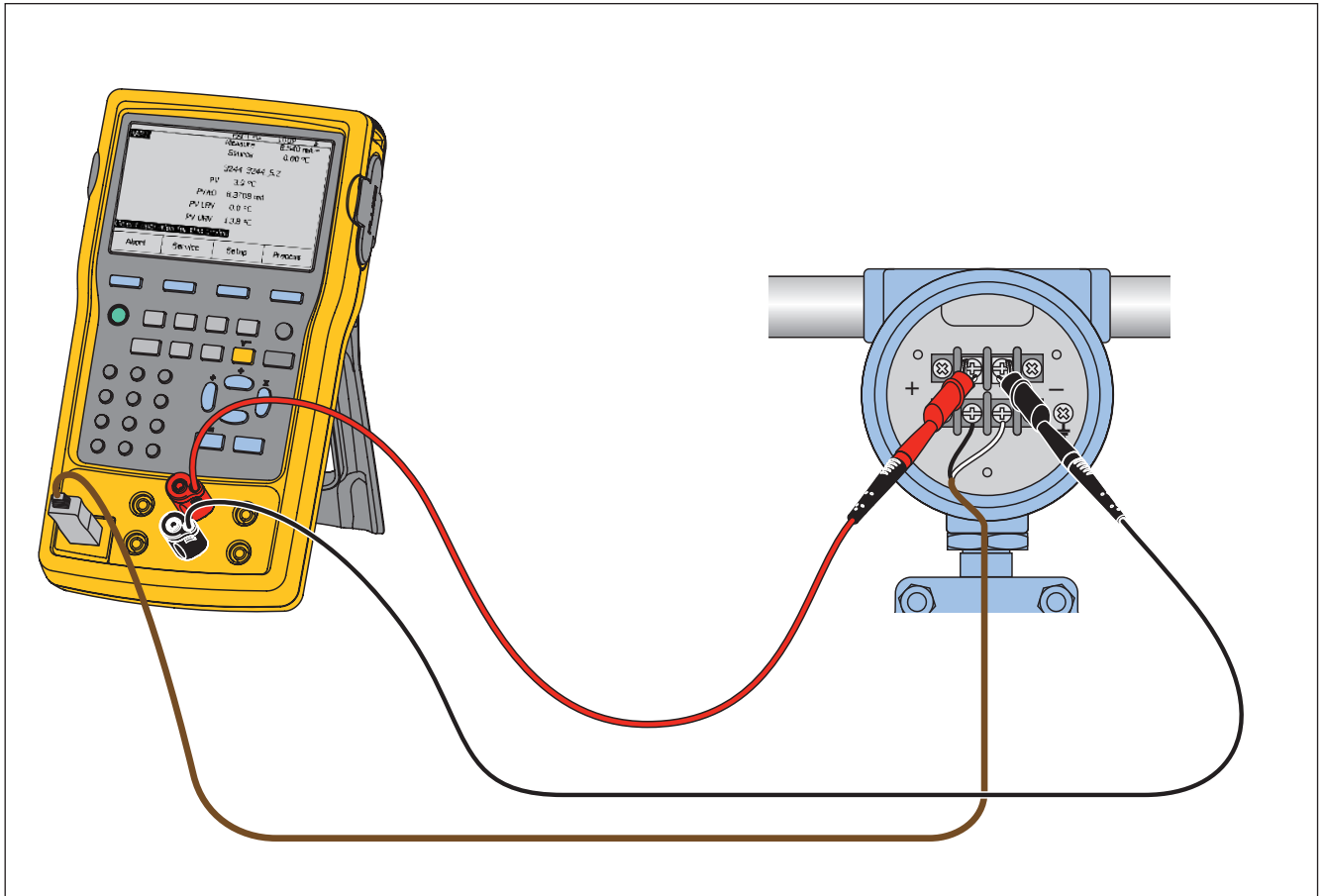
The field calibrator for HART instruments that's both powerful and easy to use.

The 754 offers the most complete HART implementation of any process calibrator. The 754:

- Requires no external box or second tool for everyday HART calibration and maintenance.
- Offers fast HART communication.
- Supports popular models of HART transmitters with device-specific command support.
- Fully complies with the Data Link Layer of the HART protocol, including multiple masters, burst mode, and multi-drop configurations.
- Is easy to update as additional instruments are added and new HART versions are released.
- Is based on the 740 series calibrators, the most rugged, reliable multifunction field calibrators ever made.
- Is backed by the service and support of the Fluke organization, a member of the HART Communications Foundation.

The 754 is designed to take on nearly all the day-to-day tasks you now perform with a separate communicator. In fact, it offers many of the communication capabilities of the 475 HART communicator except for the DD interpreter, which can read command set libraries from any HART supplier. This is not necessary for daily HART maintenance.

It's easy to calibrate and maintain HART instrumentation with one powerful tool.



With the 754 DPC, you can:

- Generate precision electrical, temperature, or pressure signals for **analog stimulus** or sensor simulation.
- Simultaneously **measure** electrical, temperature, or pressure signals from **transmitter output**.
- Determine type, manufacturer, model, tag ID by interrogating HART devices.
- **Read HART PV** function and smart transmitter **digital output** while measuring **analog mA output**.
- **Read and write HART configuration functions** to make field adjustments to PV range points, damping, and other top-level configuration settings.
- **Change sensor configuration** on supported temperature transmitters.
- **Re-label smart transmitters** by reading and writing HART tag and message fields.
- **Clone additional transmitters** by reading and storing basic HART configurations.
- Perform **automated HART sensor trim** and output trim for selected devices in conjunction with As Found/As Left tests.
- Perform **loop test** with simultaneous analog and digital mA readout.
- Address new, fast, pulsed-excitation smart transmitters and PLCs.
- Control Hart Scientific Dry Block Calibrator.

HART applications

Fluke 754: The HART calibrator that is easy to use.



Versatile HART protocol support

The 754 supports the commands contained in HART protocol version 5.7. The 754 supports a substantial set of HART instructions:

- **Universal commands**—provide functions that are implemented in **all field devices**, for example, read manufacturer and device type, read primary variable (PV), or read current output and percent of span

- **Common practice commands**—provide functions that are common to **many but not all field devices**, for example read multiple variables, set damping time, or perform loop test
- **Device-specific commands**—provide functions that are **unique to a particular field device**, for example sensor trim. The 754 supports these devices:

Today's 754 supports device-specific instructions for a variety of popular instruments. Additional support may be added periodically with a simple software update available on diskette or via download for a modest upgrade fee.

HART operating modes supported

- For **Point to Point operation**, the most commonly used mode, connects the 754 to a single HART device in a 4–20 mA loop.
- In **Multi-Drop** mode, several HART instruments can be bussed together. The 754 searches for each, identifies addresses in use, and allows you to select the instrument for calibration and related operations.
- In **Burst Mode**, the HART instrument transmits bursts of data without waiting to be interrogated by a master unit. The 754 can take transmitters out of burst mode during test or calibration, then later restore them to burst mode.

| Manufacturer | Pressure instruments | Temperature instruments | Coriolis instruments |
|----------------------|--|---|---|
| ABB/Kent-Taylor | 600T | 658T ¹ | |
| ABB/Hartmann & Braun | Contrans P ¹ AS 800 Series | | |
| Endress & Hauser | CERABAR S, CERABAR M, DELTABAR S | TMT 122 ¹ , TMT 182 ¹ , TMT 162 ¹ | |
| Foxboro Eckardt | | TI/RTT20 ¹ | |
| Foxboro/Invensys | I/A Pressure | | |
| Fuji | FCX FCXAZ | FRC | |
| Honeywell | ST3000 | STT25T ¹ , STT25H ¹ | |
| Micro Motion | | | 2000 2000 IS 9701 9712 9739 |
| Moore Products | | 344 ¹ | |
| Rosemount | 1151 2088 3001C 3051, 3051S | 3044C 644 3144 3244, 3144P | |
| Siemens | SITRANS P DS SITRANS P ES | | |
| SMAR | LD301 | TT301 ¹ | |
| Viatran | I/A Pressure | | |
| Wika | UNITRANS | T32H ¹ | |
| Yokogawa | EJA | YTA 110, 310 and 320 | |

¹Sensor Trim not supported

Fluke 789 ProcessMeter™



Why use “smart” instrumentation?

Like most process plants, your organization is probably facing the dual challenges of maximizing productivity while minimizing maintenance costs. “Smart” digital transmitters offer superior performance and reliability, while saving time and effort in maintenance and calibration. Manufacturers of field instruments have helped accelerate the changeover by offering smart transmitters at prices nearly as low as analog units. As digital instruments using the HART protocol quickly become the standard, communicators and calibrators are becoming essential everyday tools.

What is HART?

HART, the **H**ighway **A**ddressable **R**emote **T**ransducer protocol, uses a 1200 baud Frequency Shift Keying (FSK) signal to superimpose digital information on the conventional 4–20 mA analog signal.

Why use the HART protocol?

HART is an industry standard developed to define the communications protocol between intelligent field devices and a control system. HART is the most widely used digital communication protocol in the process industry. More than five million HART field instruments are installed in more than 100,000 plants worldwide.

The HART protocol:

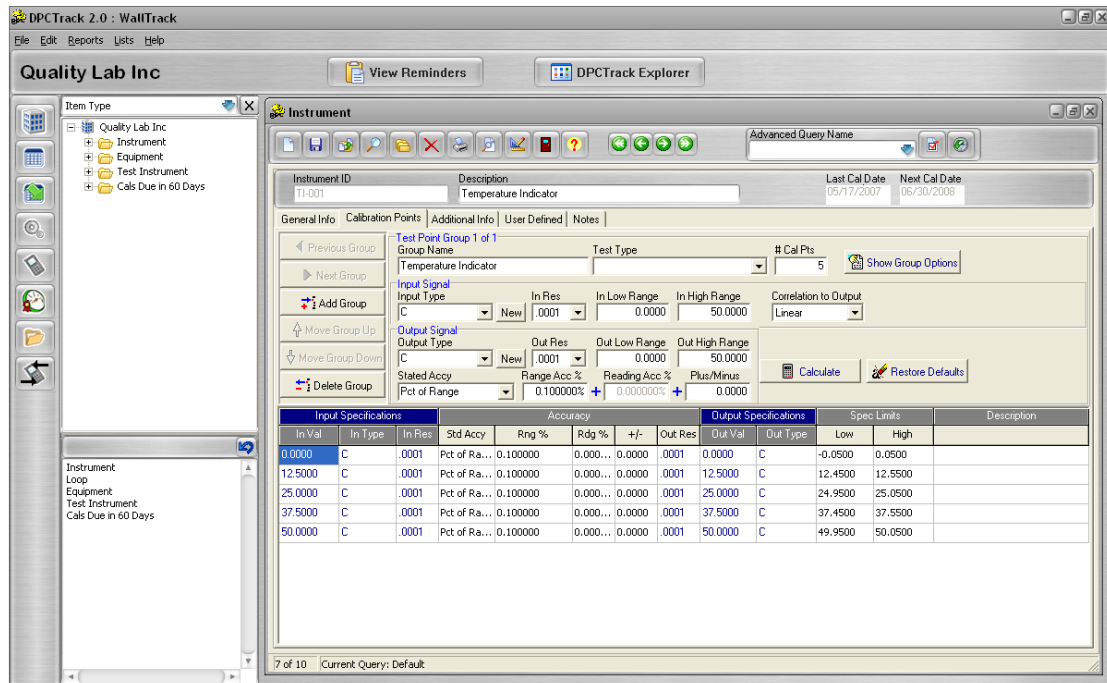
- Is supported by all of the major suppliers of process field instruments supported by the HART Communication Foundation, an industry-wide non-profit organization. See the <http://www.hartcomm.org> for information on the HART standard.
- Preserves present control strategies.
- Allows traditional 4–20 mA signals and digital communication to share the same two-wire loops.
- Provides important information for installation and maintenance: Tag IDs, measured values, range and span data, product information and diagnostics.
- Reduces operation costs by making it easier to manage and fully utilize “smart” instrument networks.

The Fluke-789 doubles your power giving you a multimeter and a loop calibrator in one tool.

Key 789 features:

- 24 V loop power supply
- HART mode setting with loop power (adds 250 ohm resistor)
- 200 % larger dual display
- mA drive up to 1,200 ohms
- Enhanced backlight with (2) brightness settings
- Improved battery power with (4) AA batteries
- 0 % to 100 % mA *Span Check* buttons to toggle from 4 mA to 20 mA
- Infrared I/O serial port compatible with FlukeView Software
- 5 V measurement capability on the 4 V range for precise 1 V to 5 V measurements
- DMM designed to meet 1000 V IEC 1010 CAT III standards
- Precision 1000 V, 400 mA digital multimeter Measure ac and dc volts, ac and dc current, resistance, continuity and frequency
- True-rms ac voltage measurement
- Frequency measurement to 20 kHz
- 20 mA dc current source/loop calibrator/simulator Manual Step (100 %, 25 %, Coarse, Fine) plus Auto Step and Auto Ramp
- Externally accessible battery for easy battery changes
- V overload protection on V, ohms, frequency, mA (backed up by 440 mA 1000 V fuse)

Automatically record and document your work



Fluke 750SW DPC/TRACK 2 software includes an instrumentation data-base that makes it easy to manage your instrumentation, create and schedule tests, load and unload the 753 or 754, print a variety of standard reports, and manage calibration data.

Print standard reports automatically. The software assembles pre-formatted reports from your database files, saving time and reducing errors. Reports include calibration certificates, instruments due for calibration, inventory characteristics, calibration histories, calibration procedures, and traceability to instruments touched.

Documentation of results

The scheduling of calibrations, creation of procedures and documentation of your calibration results are facilitated by a number of instrumentation management software packages:

Fluke DPC/TRACK™



AMS from Emerson Process Management, (formerly Fisher-Rosemount).



PRM (Plant Resource Manager) from Yokogawa Electric Corporation.



On Time Support Process/Track

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To see the Fluke 750 Series calibrators in action, call 1 800 44 FLUKE (U.S.), 31 40 2 675 200 (Europe), 1 425 446 5500 (other countries), or your local Fluke representative for a demo. Visit our Web site: www.fluke.com/Processtools



The Fluke-C799 Field soft case is included with every 750 series documenting process calibrator. This unique case has many useful features that allow the calibrator to be operated inside the case:

- Clear window protects from the elements but allows access of 75X keyboard
- Input/output slot; bring test leads from inside the case to connect to what you are testing.
- Open the side pockets to connect a pressure module
- Ample storage for a pressure module, hand pumps all test leads and interconnect cables.

Measurement function specifications

Confidence Interval: $k=3$

DC voltage measurement

| Range (full scale) | Accuracy (% of reading + floor) | |
|--------------------|---------------------------------|--------------------|
| | 1 year | 2 years |
| 100.000 mV | 0.02 % + 0.005 mV | 0.03 % + 0.005 mV |
| 3.00000 V | 0.02 % + 0.00005 V | 0.03 % + 0.00005 V |
| 30.0000 V | 0.02 % + 0.0005 V | 0.03 % + 0.0005 V |
| 300.00 V | 0.05 % + 0.05 V | 0.07 % + 0.05 V |

Temperature coefficient: (0.001 % reading + 0.0002 % range)/°C from -10 °C to 18 °C and 28 °C to 50 °C, 100.000 mV range: 0.001 % of reading + 0.001 % of range
Input impedance: >4 MΩ
Maximum input voltage: 300 V rms
Normal mode rejection: >100 dB at 50 Hz or 60 Hz nominal
Specifications are valid to 110 % of range (except for 300 V range)

AC voltage measurement

| Range 40 Hz to 500 Hz | Resolution | % of reading + floor | |
|--------------------------|------------|----------------------|-----------------|
| | | 1 year | 2 year |
| 3.000 V | 0.001 V | .5 % + 0.002 V | 1.0 % + 0.004 V |
| 30.00 V | 0.01 V | 0.5 % + 0.02 V | 1.0 % + 0.04 V |
| 300.0 V | 0.1 V | 0.5 % + 0.2 V | 1.0 % + 0.2 V |

Input impedance: >4 M Ω and <100 pF
Input coupling: AC
Maximum input voltage: 300 V, IEC 61010 300V CAT II
Temperature coefficient: 5 % of specified accuracy / °C (<18 °C or >28 °C)
Specifications apply for 9 % to 100 % of voltage range.

DC current measurement

| Range (full scale) | Accuracy (% of reading + floor) | |
|--------------------|---------------------------------|-----------------|
| | 1 year | 2 years |
| 30.000 mA | 0.01 % + 5 uA | 0.015 % + 7 uA |
| 110.00 mA | 0.01 % + 20 uA | 0.015 % + 30 uA |

Temperature coefficient: (3 % of specified accuracy)/°C from -10 °C to 18 °C and 28 °C to 50 °C
Normal mode rejection: 90 dB at 50 or 60 Hz nominal and 60 dB at 1200 Hz and 2200 Hz (HART signals)

Resistance measurement

| Range (full scale) | Accuracy (% of reading + ohms) | |
|--------------------|--------------------------------|----------------|
| | 1 year | 2 years |
| 10.000 Ω | 0.05 % + 50 mΩ | 0.07 % + 70 mΩ |
| 100.00 Ω | 0.05 % + 50 mΩ | 0.07 % + 70 mΩ |
| 1.0000 kΩ | 0.05 % + 0.5 Ω | 0.07 % + 0.5 Ω |
| 10.000 kΩ | 0.1 % + 10 Ω | 0.15 % + 15 Ω |

Temperature coefficient: (3 % of specified accuracy)/°C from -10 °C to 18 °C and 28 °C to 50 °C
Maximum input voltage: 50 V dc
Continuity: Continuous tone < 25 Ω, No tone > 400 Ω
Specifications are valid to 110 % of range

Frequency measurement

| Range | Resolution | Accuracy |
|-----------------------------------|------------|-----------|
| | | 2 years |
| 1.00 Hz to 110.00 Hz ¹ | 0.01 Hz | 0.05 Hz |
| 110.1 Hz to 1100.0 Hz | 0.1 Hz | 0.5 Hz |
| 1.101 kHz to 11.000 kHz | 0.001 kHz | 0.005 kHz |
| 11.01 kHz to 50.00 kHz | 0.01 kHz | 0.05 kHz |

¹For frequencies < 109.99 Hz, specification applies for signals with slew rates > 5 V/ms
Minimum amplitude for Hz measurement: (Squarewaves) 1 Hz to 1 kHz, 300 mV p-p; 1 kHz to 30 kHz, 1.4 V p-p; > 30 kHz, 2.8 V p-p
Maximum input: 1 Hz to 1 kHz, 300 V rms; > 1 kHz, 30 V rms
Input impedance: 4 MΩ

Sourcing (simulation) function specifications

Confidence Interval: $k=3$

DC voltage output

| Range (full scale) | Accuracy (% of output + floor) | |
|--------------------|--------------------------------|--------------------|
| | 1 year | 2 years |
| 100.000 mV | 0.01 % + 0.005 mV | 0.015 % + 0.005 mV |
| 1.00000 V | 0.01 % + 0.00005 V | 0.015 % + 0.0005 V |
| 15.0000 V | 0.01 % + 0.0005 V | 0.015 % + 0.0005 V |

Temperature coefficient: (0.001 % output + 0.001 % f.s.)/°C from -10 °C to 18 °C and 28 °C to 50 °C
Maximum output current: 10 mA
Specifications are valid to 110 % of range, 100 mV and 1 V ranges

DC current output

| Range (full scale) | Accuracy (% of output + floor) | |
|-------------------------------------|--------------------------------|-------------------|
| | 1 year | 2 years |
| 22.000 mA | 0.01 % + 0.003 mA | 0.02 % + 0.003 mA |
| Current sink (simulate transmitter) | 0.02 % + 0.007 mA | 0.04 % + 0.007 mA |

Specification applies from 0.1 mA to 22 mA; below 2 mA typical accuracy is 0.15 % of full scale
Maximum burden voltage: 18 V
Temperature coefficient: 3 % of specified accuracy/°C from -10 °C to 18 °C and 28 °C to 50 °C

Resistance sourcing

| Range | Accuracy (% of output + ohms) | |
|-----------|-------------------------------|-----------------|
| | 1 year | 2 years |
| 10.000 Ω | 0.01 % + 10 mΩ | 0.015 % + 15 mΩ |
| 100.00 Ω | 0.01 % + 20 mΩ | 0.015 % + 30 mΩ |
| 1.0000 kΩ | 0.02 % + 0.2 Ω | 0.03 % + 0.3 Ω |
| 10.000 kΩ | 0.02 % + 3 Ω | 0.03 % + 5 Ω |

Temperature coefficient: 0.01 % f.s./°C from -10 °C to 18 °C and 28 °C to 50 °C
Maximum and minimum current through source resistance:

| | Maximum | Minimum |
|---------------|----------|------------|
| 10 Ω range: | 10 mA dc | 0.1 mA dc |
| 100 Ω range: | 10 mA dc | 0.1 mA dc |
| 1.0 kΩ range: | 1 mA dc | 0.01 mA dc |
| 10 kΩ range: | 1 mA dc | 0.01 mA dc |

Specifications valid to 110 % of range

Frequency sourcing

| Range | Specification |
|--|---------------|
| | 2 years |
| Sinewave: 0.1 Hz to 10.99 Hz | 0.01 Hz |
| Squarewave: 0.01 Hz to 10.99 Hz | 0.01 Hz |
| Sine and square 11.00 Hz to 109.99 Hz | 0.1 Hz |
| Sine and square 110.0 Hz to 1099.9 Hz | 0.1 Hz |
| Sine and square 1.100 kHz to 21.999 kHz | 0.002 kHz |
| Sine and square 22.000 kHz to 50.000 kHz | 0.005 kHz |

Waveform choices: Zero-symmetric sine wave or positive 50 % duty-cycle square wave
Square wave amplitude: 0.1 V to 15 V p-p
Square wave amplitude accuracy:
 0.01 kHz to 1 kHz: 1 % p-p output + 75 mV,
 1 kHz to 50 kHz: 10 % p-p output + 75 mV
Sine wave amplitude: 0.1 V to 30 V p-p
Sine wave amplitude accuracy, 0.1 Hz to 50 kHz: 3 % p-p output + 75 mV
Maximum input voltage: ± 30 V dc

Temperature measurement and simulation specifications

Confidence Interval: $k=3$

Temperature, Resistance Temperature Detectors

| Type (α) | Range °C | Degrees or % of reading | | | | Allowable current 3 | |
|-----------------|-------------|-------------------------|------------------|----------------|--------------------|---------------------|-----------------|
| | | Measure °C 2 | | Source current | Source °C | | |
| | | 1 year | 2 years | | 1 year | | 2 years |
| 100 Ω Pt (385) | -200 to 100 | 0.07 °C | 0.14 °C | 1 mA | 0.05 °C | 0.10 °C | 0.1 mA to 10 mA |
| | 100 to 800 | 0.02 % + 0.05 °C | 0.04 % + 0.10 °C | | 0.0125 % + 0.04 °C | 0.025 % + 0.08 °C | |
| 200 Ω Pt (385) | -200 to 100 | 0.07 °C | 0.14 °C | 500 μA | 0.06 °C | 0.12 °C | 0.1 mA to 1 mA |
| | 100 to 630 | 0.02 % + 0.05 °C | 0.04 % + 0.10 °C | | 0.017 % + 0.05 °C | 0.034 % + 0.10 °C | |
| 500 Ω Pt (385) | -200 to 100 | 0.07 °C | 0.14 °C | 250 μA | 0.06 °C | 0.12 °C | 0.1 mA to 1 mA |
| | 100 to 630 | 0.02 % + 0.05 °C | 0.04 % + 0.10 °C | | 0.017% + 0.05 °C | 0.034 % + 0.10 °C | |
| 1000 Ω Pt (385) | -200 to 100 | 0.07 °C | 0.14 °C | 150 μA | 0.06 °C | 0.12 °C | 0.1 mA to 1 mA |
| | 100 to 630 | 0.02 % + 0.05 °C | 0.04% + 0.10 °C | | 0.017 % + 0.05 °C | 0.034 % + 0.10 °C | |
| 100 Ω Pt (3916) | -200 to 100 | 0.07 °C | 0.14 °C | 1 mA | 0.05 °C | 0.10 °C | 0.1 mA to 10 mA |
| | 100 to 630 | 0.02 % +0.05 °C | 0.04 % +0.10 °C | | 0.0125 % + 0.04 °C | 0.025 % + 0.08 °C | |
| 100 Ω Pt (3926) | -200 to 100 | 0.08 °C | 0.16 °C | 1 mA | 0.05 °C | 0.10 °C | 0.1 mA to 10 mA |
| | 100 to 630 | 0.02 % +0.06 °C | 0.04 % +0.12 °C | | 0.0125 % + 0.04 °C | 0.025 % + 0.08 °C | |
| 10 Ω Cu (427) | -100 to 260 | 0.2 °C | 0.4 °C | 3 mA | 0.2 °C | 0.4 °C | 1 mA to 10 mA |
| 120 Ω Ni (672) | -80 to 260 | 0.1 °C | 0.2 °C | 1 mA | 0.04 °C | 0.08 °C | 0.1 mA to 10 mA |

¹Specifications are valid to $k=3$

²Sensor inaccuracies not included

³For two and three-wire RTD measurements, add 0.4°C to the specifications.

Resolution: 0.01 °C except 0.1 °C for 10 Ω Cu (427)

Temperature coefficient: 0.02 °C/°C source, (< 18°C or > 28°C), 0.01 °C/C for measure

Maximum input voltage: 30 V

³Supports pulsed transmitters and PLCs with pulse times as short as 1 ms

RTD reference: Pt(385): IEC 60751, 2008; (3916): JIS C 1604, 1981; Pt(3926), Cu(427), Ni(672): Minco Application Aid #18

Temperature, Thermocouples

| Type | Source °C | Measure °C | | Source °C | |
|------|--------------|------------|---------|-----------|---------|
| | | 1 year | 2 years | 1 year | 2 years |
| E | -250 to -200 | 1.3 | 2.0 | 0.6 | 0.9 |
| | -200 to -100 | 0.5 | 0.8 | 0.3 | 0.4 |
| | -100 to 600 | 0.3 | 0.4 | 0.3 | 0.4 |
| | 600 to 1000 | 0.4 | 0.6 | 0.2 | 0.3 |
| N | -200 to -100 | 1.0 | 1.5 | 0.6 | 0.9 |
| | -100 to 900 | 0.5 | 0.8 | 0.5 | 0.8 |
| | 900 to 1300 | 0.6 | 0.9 | 0.3 | 0.4 |
| J | -210 to -100 | 0.6 | 0.9 | 0.3 | 0.4 |
| | -100 to 800 | 0.3 | 0.4 | 0.2 | 0.3 |
| | 800 to 1200 | 0.5 | 0.8 | 0.3 | 0.3 |
| K | -200 to -100 | 0.7 | 1.0 | 0.4 | 0.6 |
| | -100 to 400 | 0.3 | 0.4 | 0.3 | 0.4 |
| | 400 to 1200 | 0.5 | 0.8 | 0.3 | 0.4 |
| | 1200 to 1372 | 0.7 | 1.0 | 0.3 | 0.4 |
| T | -250 to -200 | 1.7 | 2.5 | 0.9 | 1.4 |
| | -200 to 0 | 0.6 | 0.9 | 0.4 | 0.6 |
| | 0 to 400 | 0.3 | 0.4 | 0.3 | 0.4 |
| B | 600 to 800 | 1.3 | 2.0 | 1.0 | 1.5 |
| | 800 to 1000 | 1.0 | 1.5 | 0.8 | 1.2 |
| | 1000 to 1820 | 0.9 | 1.3 | 0.8 | 1.2 |
| R | -20 to 0 | 2.3 | 2.8 | 1.2 | 1.8 |
| | 0 to 100 | 1.5 | 2.2 | 1.1 | 1.7 |
| | 100 to 1767 | 1.0 | 1.5 | 0.9 | 1.4 |
| S | -20 to 0 | 2.3 | 2.8 | 1.2 | 1.8 |
| | 0 to 200 | 1.5 | 2.1 | 1.1 | 1.7 |
| | 200 to 1400 | 0.9 | 1.4 | 0.9 | 1.4 |
| | 1400 to 1767 | 1.1 | 1.7 | 1.0 | 1.5 |
| C | 0 to 800 | 0.6 | 0.9 | 0.6 | 0.9 |
| | 800 to 1200 | 0.8 | 1.2 | 0.7 | 1.0 |
| | 1200 to 1800 | 1.1 | 1.6 | 0.9 | 1.4 |
| | 1800 to 2316 | 2.0 | 3.0 | 1.3 | 2.0 |
| L | -200 to -100 | 0.6 | 0.9 | 0.3 | 0.4 |
| | -100 to 800 | 0.3 | 0.4 | 0.2 | 0.3 |
| | 800 to 900 | 0.5 | 0.8 | 0.2 | 0.3 |
| U | -200 to 0 | 0.6 | 0.9 | 0.4 | 0.6 |
| | 0 to 600 | 0.3 | 0.4 | 0.3 | 0.4 |

| Type | Source °C | Measure °C | | Source °C | |
|------|--------------|------------|---------|-----------|---------|
| | | 1 year | 2 years | 1 year | 2 years |
| BP | 0 to 1000 | 1.0 | 1.5 | 0.4 | 0.6 |
| | 1000 to 2000 | 1.6 | 2.4 | 0.6 | 0.9 |
| | 2000 to 2500 | 2.0 | 3.0 | 0.8 | 1.2 |
| XK | -200 to 300 | 0.2 | 0.3 | 0.2 | 0.5 |
| | 300 to 800 | 0.4 | 0.6 | 0.3 | 0.6 |

Sensor inaccuracies not included.

Accuracy with external cold junction; for internal junction add 0.2 °C

Resolution: 0.1 °C

Temperature scale: ITS-90 or IPTS-68, selectable (90 is default)

Compensation: ITS-90 per NIST Monograph 175 for B,R,S,E,J,K,N,T; IPTS-68

per IEC 584-1 for B,R,S,E,J,K,T; IPTS-68 per DIN 43710 for L,U. GOST P 8.585-

2001 for BP and XK, ASTM E988-96 for C (W5Re/W26Re)

Temperature coefficient: 0.05°C/°C (< 18°C or > 28°C)

0.07°C/°C for C type > 1800°C and for BP type > 2000°C

Instrument operating temperature: 0 °C to 50 °C for C and BP type

thermocouples / -10 °C to 50°C for all other types

Normal mode rejection: 65 dB at 50 Hz or 60 Hz nominal

Why you can depend on Fluke calibrator specifications

Specifications must be carefully considered when comparing calibrators from different vendors.

For example, Fluke specifications use a 3-sigma confidence interval ($k = 3$). This means that 99.7 % of measurements will remain in specification over the stated period of time. Other manufacturers use a 2-sigma confidence interval ($k = 2$). This means that 95.4 % of measurements will remain in specification over the stated period of time so one in 20 instruments are statistically likely to fail to perform to their specifications.

The most important components of a process calibrator specification are:

- **Reference uncertainty.** Performance of a calibrator at 23 °C ± 3 °C at the time it is verified by the manufacturer. This specification does not include the effects of time and temperature, two of the largest components of calibrator error.
- **Time.** Fluke 750 Series calibrators are delivered with both one-year and two-year specs, to limit your calibration support costs. You choose your cal interval based upon the performance you need.
- **Temperature.** Fluke process calibrator specs reflect performance from 18 °C to 28 °C. Compensation factors are provided to permit specified use of the calibrators over a wide -10 °C to 50 °C range.
- **Allowance for traceability.** Fluke specs are not relative specs, but total specs, including an allowance for uncertainty of standards that provide traceability to national standards.

For more information, view our interpreting specifications webinar or refer to the application note "Understanding Specifications For Process Calibrators."

Pressure specifications

The Fluke family of 29 pressure modules:

Covers virtually any pressure application including gage, differential, dual (compound), absolute, and vacuum.

- Display pressure readings in any of ten different pressure units you specify in the calibrator setup.
- Rugged urethane molded cases protect the modules from rough handling and harsh conditions.
- Features internal temperature compensation from 0 °C to 50 °C for full-accuracy performance.
- Includes NIST-traceable calibration certificate.
- Modules can be calibrated locally, helping to control costs.



Pressure module specifications (all specifications in % of full span. Specifications reflect a confidence interval of 95 %.)

| Model | Range/Resolution | Range (approx)/Resolution | Reference uncertainty (23 ± 3 °C) | Stability (1 year) | Temperature (0 to 50 °C) | Total ¹ uncertainty | High ² side media | Low ² side media | Fitting material | Max over-pressure (x nominal) |
|--|------------------------------|---------------------------|-----------------------------------|--------------------|--------------------------|--------------------------------|------------------------------|-----------------------------|------------------|-------------------------------|
| Differential | | | | | | | | | | |
| FLUKE-700P00 | 1 in. H ₂ O/0.001 | 0.25 kPa/0.0002 | 0.300 | 0.025 | 0.025 | 0.350 | Dry | Dry | 316 SS | 30x |
| FLUKE-700P01 | 10 in. H ₂ O/0.01 | 2.5 kPa/0.002 | 0.200 | 0.050 | 0.050 | 0.300 | Dry | Dry | 316 SS | 3x |
| FLUKE-700P02 | 1 psi/0.0001 | 6900 Pa/0.7 | 0.150 | 0.070 | 0.080 | 0.300 | Dry | Dry | 316 SS | 3x |
| FLUKE-700P22 | 1 psi/0.0001 | 6900 Pa/0.7 | 0.100 | 0.020 | 0.030 | 0.150 | 316 SS | Dry | 316 SS | 3x |
| FLUKE-700P03 | 5 psi/0.0001 | 34 kPa/0.001 | 0.050 | 0.020 | 0.030 | 0.100 | Dry | Dry | 316 SS | 3x |
| FLUKE-700P23 | 5 psi/0.0001 | 34 kPa/0.001 | 0.025 | 0.010 | 0.015 | 0.050 | 316 SS | Dry | 316 SS | 3x |
| FLUKE-700P04 | 15 psi/0.001 | 103 kPa/0.01 | 0.025 | 0.010 | 0.015 | 0.050 | Dry | Dry | 316 SS | 3x |
| FLUKE-700P24 | 15 psi/0.001 | 103 kPa/0.01 | 0.025 | 0.010 | 0.015 | 0.050 | 316 SS | Dry | 316 SS | 3x |
| Gage | | | | | | | | | | |
| FLUKE-700P05 | 30 psi/0.001 | 207 kPa/0.01 | 0.025 | 0.010 | 0.015 | 0.050 | 316 SS | N/A | 316 SS | 3x |
| FLUKE-700P06 | 100 psi/0.01 | 690 kPa/0.07 | 0.025 | 0.010 | 0.015 | 0.050 | 316 SS | N/A | 316 SS | 3x |
| FLUKE-700P27 | 300 psi / 0.01 | 2070 kPa / 0.1 | 0.025 | 0.010 | 0.015 | 0.050 | 316 SS | N/A | 316 SS | 3x |
| FLUKE-700P07 | 500 psi/0.01 | 3400 kPa/0.1 | 0.025 | 0.010 | 0.015 | 0.050 | 316 SS | N/A | 316 SS | 3x |
| FLUKE-700P08 | 1000 psi/0.1 | 6900 kPa/0.7 | 0.025 | 0.010 | 0.015 | 0.050 | 316 SS | N/A | 316 SS | 3x |
| FLUKE-700P09 | 1500 psi/0.1 | 10 MPa/0.001 | 0.025 | 0.010 | 0.015 | 0.050 | 316 SS | N/A | 316 SS | 2x |
| Absolute (not compatible with Fluke 701 or 702) | | | | | | | | | | |
| FLUKE-700PA3 | 5 psi/0.0001 | 34 kPa/0.001 | 0.050 | 0.010 | 0.010 | 0.070 | 316 SS | N/A | 316 SS | 3x |
| FLUKE-700PA4 | 15 psi/0.001 | 103 kPa/0.01 | 0.050 | 0.010 | 0.010 | 0.070 | 316 SS | N/A | 316 SS | 3x |
| FLUKE-700PA5 | 30 psi/0.001 | 207 kPa/0.01 | 0.050 | 0.010 | 0.010 | 0.070 | 316 SS | N/A | 316 SS | 3x |
| FLUKE-700PA6 | 100 psi/0.01 | 690 kPa/0.07 | 0.050 | 0.010 | 0.010 | 0.070 | 316 SS | N/A | 316 SS | 3x |
| Vacuum (not compatible with Fluke 701 or 702) | | | | | | | | | | |
| FLUKE-700PV3 | -5 psi/0.0001 | -34 kPa/0.001 | 0.040 | 0.015 | 0.015 | 0.070 | 316 SS | Dry | 316 SS | 3x |
| FLUKE-700PV4 | -15 psi/0.001 | -103 kPa/0.01 | 0.040 | 0.015 | 0.015 | 0.070 | 316 SS | Dry | 316 SS | 3x |
| Dual | | | | | | | | | | |
| FLUKE-700PD2 | ±1 psi/0.0001 | ±6900 Pa/0.7 | 0.150 | 0.025 | 0.025 | 0.200 | 316 SS | Dry | 316 SS | 3x |
| FLUKE-700PD3 | ±5 psi/0.0001 | ±34 kPa/0.001 | 0.040 | 0.015 | 0.015 | 0.070 | 316 SS | Dry | 316 SS | 3x |
| FLUKE-700PD4 | ±15 psi/0.001 | ±103 kPa/0.01 | 0.025 | 0.010 | 0.015 | 0.050 | 316 SS | Dry | 316 SS | 3x |
| FLUKE-700PD5 | -15/30 psi/0.001 | -100/207 kPa/0.01 | 0.025 | 0.010 | 0.015 | 0.050 | 316 SS | N/A | 316 SS | 3x |
| FLUKE-700PD6 | -15/100 psi/0.01 | -100/690 kPa/0.07 | 0.025 | 0.010 | 0.015 | 0.050 | 316 SS | N/A | 316 SS | 3x |
| FLUKE-700PD7 | -15/200 psi/0.01 | -100/1380 kPa/0.1 | 0.040 | 0.015 | 0.015 | 0.070 | 316 SS | N/A | 316 SS | 3x |
| High | | | | | | | | | | |
| FLUKE-700P29 | 3000 psi/0.1 | 20.7 M Pa/0.001 | 0.050 | 0.010 | 0.020 | 0.080 | C276 | N/A | C276 | 2x |
| FLUKE-700P30 | 5000 psi/0.1 | 34 M Pa/0.001 | 0.050 | 0.010 | 0.020 | 0.080 | C276 | N/A | C276 | 2x |
| FLUKE-700P31 | 10000 psi/1 | 69 M Pa/0.007 | 0.050 | 0.010 | 0.020 | 0.080 | C276 | N/A | C276 | 1.5x |

¹ Total uncertainty, one year for temperature range 0 °C to +50 °C. Total uncertainty, 1.0% of full span for temperature range -10 °C to 0 °C. For P00 module only, compensated temperature range is 15 ° to 35 °C.

² "Dry" indicates dry air or non-corrosive gas as compatible media. "316 SS" indicates media compatible with Type 316 Stainless Steel. "C276" indicates media compatible with Hastelloy C276.

Use of pressure zero is required prior to measurement or source. Maximum overpressure specification includes common mode pressure. Modules are CC rated. Metric adapter(s): 1/4" NPT female to male BSP/ISO 1/4-19, tapered thread, included with all modules except P29, P30, and P31. Effective October 1996, all modules include a NIST traceable certificate and test data.

General specifications

Data log function

Measure functions: Voltage, current, resistance, frequency, temperature, pressure

Reading rate: 1, 2, 5, 10, 20, 30, or 60 readings per minute

Maximum record length: 8000 readings (7980 for 30 or 60 readings per minute)

Ramp function

Source functions: Voltage, current, resistance, frequency, temperature

Rate: 4 steps/second

Trip detect: Continuity* or voltage

**Continuity detection not available when sourcing current*

Loop power function

Voltage: 26 V

Accuracy: 10 %, 18 V minimum at 22 mA

Maximum current: 25 mA, short-circuit protected

Maximum input voltage: 50 V dc

Note: 250 Ω series resistance is automatically supplied whenever loop power is enabled on 754.

HART modem interface (754 only)

Maximum input voltage: 30 V dc

Environmental specifications

All calibrator specifications apply from +18 °C to +28 °C unless stated otherwise.

Operating temperature: -10 °C to 50 °C

Storage temperature: -20 °C to 60 °C

Operating altitude: 3000 m above mean sea level (9842 ft)

90-day specifications: The standard specification intervals for the 750 Series are 1 and 2 years.

Typical 90-day measurement and source accuracy can be estimated by dividing the one year “% of reading” or “% of output” specifications by 2. Floor specifications, expressed as “% of f.s.” or “counts” or “ohms” remain constant.

Ingress protection: IP-52

Power: Internal battery pack li-ion, 7.2 V, 4400 mAh, 30 Wh

Battery life: Typical usage, >8 hours

Dimensions: 136mm x 245mm x 63 mm (5.4 in x 9.6 in x 2.5 in)

Weight: 1.2 kg (2.7 lb)

Side port connections:

- Pressure module connector
- USB connector to interface to your PC
- Digital instrument (HART) connector
- Connection for optional battery charger/eliminator

Safety: Complies with CAN/CSA C22.2 No 1010.1-92, ANSI/ISA S82.01-1994, UL3111, and EN610-1:1993.

Data storage capacity:

1 week of calibration procedures and results

Ordering information

FLUKE-753 Documenting Process Calibrator

FLUKE-754 Documenting Process Calibrator-HART

Standard accessories include: Three sets of stackable test leads, three sets of TP220 test probes with three sets of “extended tooth” alligator clips, two sets AC280 hook clips, BP7240 Li-ion battery pack, BC7240 battery charger, C799 field soft case, USB communication cable, getting started guide, instruction manual on CDROM, NIST traceable certificate of calibration, DPC/TRACK 2 sample software that enables upload and printing of calibration records. Model Fluke-754 includes HART communication cable. Includes C799 Field Soft Case. Includes three year warranty.

FLUKE-750SW DPC/TRACK 2 Software

Included with DPC/TRACK software: Software media, Instruction Manual, USB Cable.

FLUKE-700 Pxx Pressure Modules

Included with each Fluke Pressure Module: BP-ISO Adapter(s) (except with P29 - P31), Instruction Sheet, NIST traceable calibration report and data, one-year warranty.

Accessories

Fluke-700PMP Pressure Pump; 100 psi/7 bar

Fluke-700LTP-1 Low Pressure Test Pump

Fluke-700PTP-1 Pneumatic Test Pump;

400 psi/40 bar

Fluke-700HTP-1 Hydraulic Test Pump;

10,000 psi/700 bar

Fluke-700HTH-1 Hydraulic Test Hose

Fluke-700PRV-1 Pressure Relief Valve Kit for HTP

Fluke-700-IV Current Shunt (for mA/mA applications)

Fluke-700PCK Pressure Calibration Kit

Fluke-700BCW Bar Code Wand

Fluke-700TC1 TC Mini-Plug Kit, 9 types

Fluke-700TC2 TC Mini-Plug Kit, JKTERS

Fluke-700TLK Process Test lead kit

754HCC Smart instrument

communication cable

BC7240 Battery Charger

BP7240 Li-ion Battery Pack

C700 Hard Carrying Case

C781 Soft Carrying Case

C799 Soft Field Case



Fluke. Keeping your world up and running.®

Fluke Corporation
PO Box 9090,
Everett, WA 98206 U.S.A.

Fluke Europe B.V.
PO Box 1186, 5602 BD
Eindhoven, The Netherlands

For more information call:

In the U.S.A. (800) 443-5853 or Fax (425) 446-5116
In Europe/M-East/Africa +31 (0) 40 2675 200 or Fax +31 (0) 40 2675 222
In Canada (800)-36-FLUKE or Fax (905) 890-6866
From other countries +1 (425) 446-5500 or Fax +1 (425) 446-5116
Web access: <http://www.fluke.com>

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