

Fluke 740 Series Documenting Process Calibrators: Ready for anything

Whether you're calibrating instruments, troubleshooting a problem or running routine maintenance, Fluke 740 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 741B, 743B, and 744 capture your calibration results, eliminating the need to juggle a pen and pad in the field. The RS-232 interface in the Fluke 743B and 744 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 743B and 744 work with the Fluke DPC/TRACK™ software, and with popular programs from Honeywell Loveland, Cornerstone, Yokogawa, Prime Tech-nologies, On-Time Support, 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 NiCd or NiMH 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.
- 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 (744 only).
- 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.
- Limit switch calibration procedures** perform fast, automated calibration of one- and two-point limit switches for voltage, current, temperature, and pressure.
- Differential pressure flow instrument calibration** routines use a square root function to directly calibrate DP flow instruments.

Technical Data



- 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.



Two bonus features available with product registration:

- Transmitter mode
- Bar code entry (except 741B)

740 Series

The Fluke 740 Calibrators, offered in three models, let you choose the right set of capabilities for your needs.

- The **Fluke 741B** offers simultaneous source and measure capabilities for all common process parameters. Create and execute automated procedures and automatically capture the results.
- The **Fluke 743B** offers all the capability of the 741B, plus adds a serial interface for two-way communication with popular PC-based instrumentation management applications.
- The **Fluke 744** offers all of the capabilities of the 743B, plus the ability to maintain and calibrate selected HART transmitters without a second tool.

Capability	741B	743B	744
Source / Measure	•	•	•
Automated procedures	•	•	•
Results capture	•	•	•
Uses all Fluke pressure modules	•	•	•
Transmitter mode	•	•	•
Bar code entry		•	•
Serial interface		•	•
Data logging		•	•
HART communications			•
Pulsed RTD simulation to 1 ms	•	•	•
NiMH battery with "Gas Gauge"			•

744 upgrades available

Fluke periodically releases new internal software for the Fluke 744. These upgrades include:

- New revisions of previously supported instruments.
- Device-specific command support for new instruments.
- New HART communication capability.

The upgrade can be easily loaded from a PC to a 744.

What's new in Version 2.5

- **Device-specific calibration support for new instruments:**
 - Micro Motion 2000, 2000 IS, 9701, 9712 and 9739 coriolis flow transmitters
 - Fuji FCX and FCXA2 pressure and FRC temperature transmitter
- **New features:**
 - Support for New Hart Scientific dry blocks: 7103, 9007, 9011, 9023, 9103, 9105, 9107, 9122, 9127, 9132, 9133 and 9150
 - Enhanced dry block delay setting for temperature switch testing
 - Switch test without reset

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

The 744 offers the most complete HART implementation of any process calibrator. The 744:

- Requires no external box or second tool for every-day HART calibration and maintenance.
- Offers fast HART communication.
- Supports popular models of HART transmitters, with more device-specific command support than any other HART field calibrator.
- 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 743B, the most rugged, reliable multifunction field calibrator available.
- Is backed by the service and support of the Fluke organization, a member of the HART Communications Foundation.

Manufacturer	Pressure Instruments	Temperature Instruments	Coriolis Instrument
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

Technical Specifications

Measurement Function

DC voltage measurement

Range (full scale)	Accuracy (% of reading + % of full scale)	
	1 year	2 years
110.000 mV	0.025% + 0.015%	0.05% + 0.015%
1.10000 V	0.025% + 0.005%	0.05% + 0.005%
11.0000 V	0.025% + 0.005%	0.05% + 0.005%
110.000 V	0.05% + 0.005%	0.1% + 0.005%
300.00 V	0.05% + 0.005%	0.1% + 0.005%

Temperature coefficient: (0.001% reading + 0.0015% f.s.)/°C from -10 °C to 18 °C and 28 °C to 50 °C

Input impedance: 5 MΩ

Common mode error: 0.008% f.s./(Common Mode Volt)

Maximum input voltage: 300 V rms

AC voltage measurement

Frequency range	Accuracy (% of reading + counts)	
	1 year	2 years
20 to 40 Hz	2% + 10	2% + 10
40 to 500 Hz	0.5% + 5	0.5% + 5
500 Hz to 1 kHz	2% + 10	2% + 10
1 to 5 kHz	10% + 20	10% + 20

Ranges: 1.1000, 11.000, 110.00, 300.0 V

Specifications apply for 10% to 100% of range

Input impedance: 5 MΩ and <100 pF

Input coupling: AC only

Temperature coefficient:

10% of spec/°C from -10 °C to 18 °C and 28 °C to 50 °C

Maximum input voltage: 300 V rms

Minimum input voltage: 0.5 V above 1 kHz

DC current measurement

Range (full scale)	Accuracy (% of reading + % of full scale)	
	1 year	2 years
30.000 mA	0.01% + 0.015%	0.02% + 0.015%
110.00 mA	0.01% + 0.015%	0.02% + 0.015%

Temperature coefficient: (0.001% reading + 0.002% f.s.)/°C

from -10 °C to 18 °C and 28 °C to 50 °C

Common mode error: 0.01% f.s./(Common Mode Volt)

Maximum input voltage: 30 V dc

Resistance measurement

Range (full scale)	Accuracy (% of reading + ohms)	
	1 year	2 years
11.000 Ω	0.05% + 50 mΩ	0.075% + 50 mΩ
110.00 Ω	0.05% + 50 mΩ	0.075% + 50 mΩ
1.1000 kΩ	0.05% + 0.5 Ω	0.075% + 0.5 Ω
11.000 kΩ	0.1% + 10 Ω	0.1% + 10 Ω

Temperature coefficient: (0.01% f.s. + 2 mΩ)/°C from -10 °C to 18 °C and 28 °C to 50 °C

Common mode error: 0.005% f.s./(Common Mode Volt)

Maximum input voltage: 30 V dc

Continuity: Continuous tone <25 Ω, No tone >400 Ω

Frequency measurement

Range	Accuracy	
	1 year	2 years
1.00 to 109.99 Hz	0.05 Hz	0.05 Hz
110.0 to 1099.9 Hz	0.5 Hz	0.5 Hz
1.100 to 10.999 kHz	0.005 kHz	0.005 kHz
11.00 to 50.00 kHz	0.05 kHz	0.05 kHz

For 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: 5 MΩ

Sourcing (Simulation) Function

DC voltage output

Range (full scale)	Accuracy (% of output + % of full scale)	
	1 year	2 years
110.000 mV	0.01% + 0.005%	0.015% + 0.005%
1.10000 V	0.01% + 0.005%	0.015% + 0.005%
15.0000 V	0.01% + 0.005%	0.015% + 0.005%

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

Loading: (0.001% f.s. + 1 μV)/mA

Common mode error: 0.008% f.s./(Common Mode Volt)

Maximum input voltage: 30 V dc

DC current output

Range (full scale)	Accuracy (% of output + % of full scale)	
	1 year	2 years
22.000 mA	0.01% + 0.015%	0.02% + 0.015%
Current sink (simulate transmitter)	0.02% + 0.03%	0.02% + 0.03%

Specification applies from 2 to 22 mA; below 2 mA typical accuracy is 0.15% of full scale

Maximum burden voltage: 24 V

Temperature coefficient: (0.003% output + 0.003% f.s.)/°C from -10 °C to 18 °C and 28 °C to 50 °C

Common mode error: 0.008% f.s./(Common Mode Volt)

Maximum input voltage: 30 V dc

Resistance sourcing

Range (full scale)	Accuracy (% of output + ohms)	
	1 year	2 years
11.000 Ω	0.01% + 20 mΩ	0.02% + 20 mΩ
110.00 Ω	0.01% + 40 mΩ	0.02% + 40 mΩ
1.1000 kΩ	0.02% + 0.5 Ω	0.03% + 0.5 Ω
11.000 kΩ	0.03% + 5 Ω	0.04% + 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
11 Ω range:	3 mA dc	0.1 mA dc
110 Ω range:	3 mA dc	0.1 mA dc
1.1 kΩ range:	3 mA dc	0.01 mA dc
11 kΩ range:	1 mA dc	0.01 mA dc

Common mode error: 0.008% f.s./(Common Mode Volt)

Maximum input voltage: 30 V dc

Frequency sourcing

Range	Accuracy	
	1 year	2 years
0.00 to 10.99 Hz	0.01 Hz	0.01 Hz
11.00 to 109.99 Hz	0.1 Hz	0.1 Hz
110.0 to 1099.9 Hz	0.1 Hz	0.1 Hz
1.100 to 21.999 kHz	0.002 kHz	0.002 kHz
22.000 to 50.000 kHz	0.005 kHz	0.005 kHz

Waveforms: Squarewave w/50% duty cycle, sinewave

Amplitude: 0.1 to 10 V p-p

Amplitude accuracy: 3% of output + 0.5% of f.s., 1 to 1099 Hz; 10% of output + 0.5% of f.s., 1.1 to 10.9 kHz; 30% of output + 0.5% f.s., 11 to 50 kHz

Maximum input voltage: 30 V dc

Temperature Measurement and Simulation

Temperature, RTDs

Type and range	Accuracy			
	Measure		Source	
	1 year	2 years	1 year	2 years
10 Ω Cu (427)				
-100 to 0 °C	2 °C	2 °C	1 °C	1 °C
0 to 260 °C	2 °C	2 °C	1 °C	1 °C
100 Ω Pt (3916)				
-200 to -190 °C	0.3 °C	0.4 °C	0.3 °C	0.4 °C
-190 to 0 °C	0.3 °C	0.4 °C	0.1 °C	0.2 °C
0 to 630 °C	0.5 °C	0.8 °C	0.2 °C	0.4 °C
100 Ω Pt (3926)				
-200 to 0 °C	0.3 °C	0.4 °C	0.1 °C	0.2 °C
0 to 630 °C	0.5 °C	0.8 °C	0.2 °C	0.4 °C
100 Ω Pt (385)				
-200 to 0 °C	0.3 °C	0.5 °C	0.1 °C	0.2 °C
0 to 400 °C	0.5 °C	0.8 °C	0.2 °C	0.4 °C
400 to 800 °C	0.8 °C	1.0 °C	0.4 °C	0.5 °C
200 Ω Pt (385)				
-200 to 0 °C	0.3 °C	0.5 °C	0.1 °C	0.2 °C
0 to 400 °C	0.5 °C	0.8 °C	0.2 °C	0.4 °C
400 to 630 °C	0.8 °C	1.0 °C	0.4 °C	0.5 °C
500 Ω Pt (385)				
-200 to 0 °C	0.3 °C	0.5 °C	0.1 °C	0.2 °C
0 to 400 °C	0.5 °C	0.8 °C	0.2 °C	0.4 °C
400 to 630 °C	0.8 °C	1.0 °C	0.4 °C	0.5 °C
1000 Ω Pt (385)				
-200 to 0 °C	0.3 °C	0.5 °C	0.1 °C	0.2 °C
0 to 400 °C	0.5 °C	0.8 °C	0.2 °C	0.4 °C
400 to 630 °C	0.8 °C	1.0 °C	0.4 °C	0.5 °C
120 Ω Ni (672)				
-80 to 260 °C	0.3 °C	0.4 °C	0.1 °C	0.2 °C

For 2-wire and 3-wire measurements add 0.4 °C

Sensor inaccuracies not included

Resolution: 0.1 °C, except 1 °C for 10 Ω Cu

Temperature coefficient: 0.02 °C/°C from -10 °C to 18 °C and 28 °C to 50 °C

Maximum input voltage: 30 V dc

Maximum input current for RTD Source function:

10 Ω RTD 8 mA dc
100, 120 Ω RTDs 8 mA dc*
200, 500, 1000 Ω RTDs 1 mA dc

741B*, 743B*, 744: Addresses pulsed transmitters and PLCs with pulses as short as 1 ms

* For 741B serial number 7935XXXX and greater.

For 743B serial number 7940XXXX and greater.

Otherwise, 3 mA and 100 ms.

Temperature, Thermocouples

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

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

Compensation: ITS-90 per NIST Monograph 175 for E, N, J, K, T, B, R, S thermocouples; IPTS-68 per IEC 584-1 for E, J, K, T, B, R, S thermocouples; IPTS-68 per DIN 43710 for L, U thermocouples

Temperature coefficient: 0.05 °C/°C from -10 °C to 18 °C and 28 °C to 50 °C

Common mode error: 0.01 °C/(Common Mode Volt)

Maximum input voltage: 30 V dc

Note: When simulating temperature in As Found/As Left procedures, steps may be either linear by temperature or linear by mV potential.

How to compare calibrators based on specifications.

Analyzing specifications can be complex. To get a true picture of calibrator performance, you should be aware of the key components of a specification and how to interpret them. Specifications must be carefully considered when comparing calibrators from different vendors. 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 740 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 ° to 28 °C. Compensation factors are provided to permit specified use of the calibrators over a wide -10 ° 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.
- Confidence level. Fluke uses a conservative 95% confidence level when setting specifications, increasing your confidence that your calibrator will remain in spec for its stated calibration interval.

For more information, refer to the application note "Understanding Specifications For Process Calibrators", downloadable from the Fluke website www.fluke.com (choose your region)