FLUKE®

792A AC/DC Transfer Standard

Technical Data

Support for your most demanding ac measurement requirements

- 10 ppm total uncertainty
- Traceable to national standards
- Voltage range 2 mV to 1000V
- Frequency range: 10 Hz to 1 MHz
- Fast and easy to use

The Fluke 792A is an ultra-high accuracy AC/DC Thermal Transfer Standard, designed to meet the most demanding ac measurement requirements. Using the patented Fluke RMS sensor and thin film range resistors, the 792A offers an extraordinary transfer accuracy, with total uncertainties of as low as ± 10 ppm (± 5 ppm from the National Institute of Standards and Technology — NIST). The 792A also provides a wide voltage range of 2 mV to 1000V, and a wide frequency range of 10 Hz to 1 MHz.

The Fluke solid-state RMS sensor also provides the 792A with remarkable temperature stability and fast settling time. Now you can be ready to make measurements in 30 seconds instead of 30 minutes. To simplify the transfer process, the 792A's 2V output permits you to use a high resolution digital multimeter rather than a null meter.

The Fluke 792A is designed to support the calibration of the most accurate ac instruments in your standards lab workload, including calibrators like the Fluke 5700A, voltmeters like the Fluke 8506A and ac measurement standards like the Fluke 5790A.

Accurate, fast and easy to use

At the heart of the Fluke 792A is the patented Solid-State Thermal RMS sensor, which has been proven in a variety of Fluke products since 1979. Its output voltage is 2V, compared to the 7 to 10 mV output of traditional thermocouples. That means the 792A exhibits excellent signal-to-noise characteristics and minimal reversal errors as low as 10 ppm relative to input voltage. The 2V output also permits you to make measurements with high resolution, so you can use a digital voltmeter rather than a null meter to make transfers. Not only are measurements easier to make, they are more precise as well. And, because it is small, the RMS Sensor has very low thermal mass, so the 792A stabilizes in as little as 30 seconds and can be used over a wide temperature range of 11°C to 35°C.

The RMS Sensor is designed to be rugged and reliable. Each is built to exacting standards by the Fluke Microelectronics Operation to maintain quality and consistency, part after part.

Fully traceable performance

Each 792A is shipped from Fluke with documented traceability to the US National Institute of Standards and Technology (NIST). Included is a table of correction factors and uncertainties for measured ac/dc differences.

To support the traceability requirements for an instrument as accurate as the 792A, the Fluke Metrology Department developed a unique system to transfer NIST values to the 792A production environment. This system is based on proven techniques developed to maintain a 732A direct voltage standard to within a few parts in 100 million.

Statistical treatment of data resulting from successive intercomparisons of virtually identical 792As is used to minimize transfer uncertainties. To achieve even higher performance, you can have the transfer uncertainties of your 792A assigned directly by NIST, or other national standards organizations. For more information, request the application note titled *Establishing Traceability for a High Performance AC/DC Transfer Standard*.

Periodic calibration and recertification is available from Fluke. This service repeats the original calibration procedure. A new table of correction factors and undertainties for measured ac/dc differences is returned with your instrument. Order 792A-000.

The 792A consists of four main components: The Transfer Unit, Power Pack, 1000V Range Resistor and Transfer Switch.

Each 792A includes a table of correction factors and uncertainties for measured ac/dc differences.

Description

The 792A consists of four units. The Transfer Unit is the main analog component of the 792A for the 20 mV to 220V ranges. Stainless Steel Type-N connectors assure low signal loss and high measurement repeatability. The separate Power Pack unit permits the Transfer Unit and 1000V Range Resistor to be shipped independently for calibration. The 1000V Range Resistor isolates the heat generated at high voltages outside the main Transfer Unit. The Range Resistor has a low temperature coefficient, stabilizes quickly and exhibits small ac/dc differences. The Transfer Switch provides for switching between the ac and dc inputs.

Each 792A is shipped from the factory traceable to NIST standards. Each 792A also includes a table of correction factors and uncertainties for measured ac/dc differences.

Performance specifications

There are three tables of uncertainties included for the 792A. The first two are absolute and traceable to the National Institute of Standards and Technology (NIST). Absolute uncertainty includes time stability, temperature, line and load regulation, and the traceability provided by NIST (see Fluke application note B0205A, Establishing Traceability for a High Performance AC/DC Transfer Standard). The third table, Relative Uncertainty, includes time stability, temperature, line and load regulation, but not the traceability to national or external standards.

These uncertainties apply when the calibration report, provided with the 792A, is used to correct the response of the transfer standard.

Corrected absolute ac/dc uncertainty

1 year, T_{CAL} ±5°C

AC/DC uncertainty ±ppm input														
Voltage		Frequency												
Voltage Range	Voltage Input	10 Hz	20 Hz	40 Hz	100 Hz	1 kHz	10 kHz	20 kHz	50 kHz	100 kHz	300 kHz	500 kHz	800 kHz	1 MHz
22 mV	2 mV	2200	1600	1600	1600	1600	1600	1600	1600	1900	2500	4500	5000	5000
	6 mV	500	400	350	350	350	350	350	500	1000	1500	1800	1800	1800
	10 mV	320	280	280	280	280	280	280	300	500	700	1200	1500	1500
	20 mV	280	180	140	125	125	125	125	200	450	650	1000	1000	1000
220 mV	20 mV	350	230	190	190	190	190	190	220	450	650	1000	1100	1100
	60 mV	230	120	80	60	60	60	60	120	250	500	600	600	600
	100 mV	210	90	50	50	50	50	50	65	150	270	300	350	350
	200 mV	200	80	40	30	30	30	30	65	150	220	250	300	300
700 mV	200 mV	220	80	50	50	50	50	50	75	150	220	250	300	300
	600 mV	200	70	30	22	22	22	22	45	60	130	140	140	140
2.2V	600 mV	200	65	30	25	25	25	25	45	60	120	140	140	140
	1V	190	60	30	15	15	15	15	40	50	115	125	125	125
	2V	190	60	25	10	10	10	10	40	50	115	125	125	125
7V	2V	190	65	30	22	22	22	22	45	55	120	140	140	140
	6V	190	60	25	10	10	10	10	40	50	120	125	125	125
22V	6V	190	65	30	22	22	22	22	45	55	120	125	140	140
	10V	190	60	30	15	15	15	15	40	50	120	125	125	125
	20V	190	60	25	15	15	15	15	40	50	120	125	125	125
70V	20V	190	65	30	25	25	25	25	55	70	130	140	140	140
	60V	190	60	25	20	20	20	20	50	65	130			
220V	60V	190	65	33	33	33	33	33	65	70	130			
	100V	190	65	30	20	20	20	20	60	70				
	200V	190	60	27	18	18	18	18	60	70				
1000V	200V	190	90	40	33	33	33	33	65	70				
	600V	190	90	35	27	27	30	30	60	70				
	1000V	190	90	27	25	25	27	27	60	70				

Volt-hertz product: $1x10^8$ @ 100 kHz, $2.2x10^7$ @1 MHz
Waveform requirements: Sinusoidal, distortion less than 1%

Corrected absolute ac/dc uncertainty

1 year, T_{CAL} ± 12°C

AC/DC uncertainty ±ppm input														
Voltage		Frequency												
Voltage Range	Voltage Input	10 Hz	20 Hz	40 Hz	100 Hz	1 kHz	10 kHz	20 kHz	50 kHz	100 kHz	300 kHz	500 kHz	800 kHz	1 MHz
22 mV	2 mV 6 mV 10 mV 20 mV	2300 780 500 400	1700 430 300 200	1700 380 300 200	1700 380 300 180	1700 380 300 180	1700 380 300 180	1700 380 300 180	1700 500 300 250	2000 1200 600 600	2700 1700 800 800	5000 2100 1400 1200	5600 2400 2000 1300	5600 2400 2000 1300
220 mV	20 mv 60 mV 100 mV 200 mV	450 260 240 220	250 130 100 90	220 90 55 45	220 70 55 34	220 70 55 34	220 70 55 34	220 70 55 34	280 130 72 72	700 270 160 160	900 560 300 240	1400 660 330 270	1200 650 380 330	1200 650 380 330
700 mV	200 mV 600 mV	230 210	90 75	55 35	55 26	55 26	55 26	55 26	83 50	160 65	240 130	270 150	330 170	330 170
2.2V	600 mV 1V 2V	210 200 200	65 60 60	30 30 25	25 15 10	25 15 10	25 15 10	25 15 10	45 40 40	60 50 50	120 120 120	140 130 130	140 130 130	140 130 130
7V	2V 6V	200 200	65 60	30 25	22 10	22 10	22 10	22 10	45 40	55 50	120 120	140 130	160 140	160 140
22V	6V 10V 20V	200 200 200	65 60 60	30 30 25	22 15 15	22 15 15	22 15 15	22 15 15	45 40 40	55 50 50	120 120 120	130 130 130	170 150 150	170 150 150
70V	20V 60V	200 200	70 65	30 25	25 20	25 20	25 20	25 20	55 50	70 65	130 130	150	150	150
220V	60V 100V 200V	200 200 200	70 70 65	33 30 30	33 20 18	33 20 18	33 20 18	33 20 18	65 60 60	70 70 70	130			
1000V	200V 600V 1000V	200 200 200	95 95 95	40 39 30	33 27 25	33 27 25	33 30 27	33 30 27	65 60 60	70 70 70				

Volt-hertz product: $1x10^8$ @ 100 kHz, $2.2x10^7$ @ 1 MHz
Waveform requirements: Sinusoidal, distortion less than 1%

Corrected ac/dc uncertainties relative to calibration standards

1 year, T_{CAL} ± 5°C

AC/DC uncertainty ±ppm input														
Voltage		Frequency												
Voltage Range	Voltage Input	10 Hz	20 Hz	40 Hz	100 Hz	1 kHz	10 kHz	20 kHz	50 kHz	100 kHz	300 kHz	500 kHz	800 kHz	1 MHz
22 mV	2 mV 6 mV 10 mV 20 mV	1300 400 300 250	1200 325 260 150	1100 275 225 125	1100 275 225 125	1100 275 225 125	1100 275 225 125	1100 275 225 125	1300 400 250 175	1500 750 400 350	2000 1000 650 500	3000 1300 900 650	4000 1500 1000 700	4000 1500 1000 700
220 mV	20 mV 60 mV 100 mV 200 mV	300 200 150 80	160 50 50 50	150 25 12 10	130 25 12 10	130 25 12 10	130 25 12 10	130 25 12 10	180 50 50 50	400 250 150 50	550 450 200 200	700 450 250 200	800 500 300 275	800 500 300 275
700 mV	200 mV 600 mV	70 70	50 19	25 7	25 7	25 7	25 7	25 7	50 30	50 35	200 70	200 125	275 130	275 130
2.2V	600 mV 1V 2V	70 70 70	19 19 19	10 7 7	10 7 6	10 7 6	10 7 7	10 7 7	30 30 30	35 35 35	70 70 70	125 100 10	130 100 100	130 100 100
7V	2V 6V	70 70	19 19	15 7	15 6	15 6	15 7	15 7	30 30	35 35	70 70	125 100	130 100	130 100
22V	6V 10V 20V	70 70 70	19 19 19	15 7 7	15 7 7	15 7 7	15 7 7	15 7 7	30 30 30	35 35 35	70 70 70	125 100 100	130 100 100	130 100 100
70V	20V 60V	70 70	19 19	15 7	15 7	15 7	15 7	15 7	30 30	35 35	70 70	115	115	115
220V	60V 100V 200V	70 70 70	19 19 19	15 7 7	15 7 7	15 7 7	15 7 7	15 7 7	30 30 30	35 50 50	100			
1000V	200V 600V 1000V	70 100 100	19 35 35	17 17 10	16 16 10	16 16 10	18 18 10	18 18 10	30 30 30	50 50 50				

Volt-hertz product: 1 x 10^8 @ 100 kHz, 2.2 x 10^7 @ 1 MHz
Waveform requirements: Sinusoidal, distortion less than 1%.

Settling time

Voltage Range	Settling Time
22 mV	60 sec
220 mV	60 sec
700 mV	60 sec
2.2V	30 sec
7V	30 sec
22V	30 sec
70V	30 sec
220V	30 sec
1000V	30 sec

Note: For amplitude changes of less than 10%, settling times are typically 20% of those indicated in the table above.

Ouput characteristics

Impedance: <30 milliohms.
Current: up to 20 mA drive capability
Protection: Protected against damage due to high voltage up to 200 volts, provided the peak current does not exceed 50 mA. May be shorted indefinitely without damage to the instrument.
Tolerance: The output voltage is approximately 2 volts at full scale of any range with the following tolerances:

Voltage Range	Tolerance
22 mV	5% + 5.3 mV
220 mV	5% + 760 μV
700 mV	5% + 500 μV
2.2V	10% + 300 μV
7V	10% + 300 μV
22V	10% + 300 μV
70V	10% + 300 μV
220V	10% + 300 μV
1000V	10% + 300 μV

Battery characteristics

The following characteristics are typical and apply at 23°C. Four, 6 volt lead-acid, sealed, gelled electrolyte batteries are used.
Battery life: 22 mV to 700 mV ranges, 24 hours; 2.2V to 1000V ranges, 72 hours
Battery charge time: 16 hours to full charge
Low battery life: 22 mV to 700 mV ranges, 30 minutes; 2.2V to 1000V ranges, 60 minutes

DC reversal error

The following table of errors is relative to the input voltage and applies over each entire range.

Voltage Range	Input Voltage	Maximum Reversal Error
22 mV	2.2–22 mV	90 μV
220 mV	22–220 mV	90 μV
700 mV	220–700 mV	90 μV
2.2V	0.7–2.2V	10 ppm
7V	2.2V–7V	10 ppm
22V	7–22V	10 ppm
70V	22–70V	10 ppm
220V	70–220V	10 ppm
1000V	220–1000V	10 ppm

Input impedance

	Input Impedance	
Voltage Range	Resistance	Shunt Capacitance
22 mV	10 MΩ	<40 pF
220 mV	10 MΩ	<40 pF
700 mV	10 MΩ	<40 pF
2.2V	420Ω	<20 pF
7V	1.2 kΩ	<20 pF
22V	4.0 kΩ	<20 pF
70V	12 kΩ	<20 pF
220V	40 kΩ	<20 pF
1000V	200.4 kΩ	<20 pF

Maximum input voltage

The following table lists both the maximum operational and the non-destructive rms voltages.

	Maximum Input Voltage	
Voltage Range	Operational	Non-Destructive
22 mV	22 mV	3V
220 mV	220 mV	3V
700 mV	700 mV	3V
2.2V	2.2V	50V
7V	7V	50V
22V	22V	50V
70V	70V	130V
220V	220V	250V
1000V	1000V	1000V

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General specifications

Temperature stabilization: Allow 12 hours stabilization time in the environment of use.
Warm-up time: 15 minutes with power on, after stabilization time

Temperature performance
Operating: 11°C to 35°C
Calibration: 18°C to 28°C
Storage: –40°C to 50°C

Relative humidity
Operating: <75% to 30°C, <70% to 35°C
Storage: <95%, non-condensing

Altitude
Operating: to 3,050m (10,000 ft)
Non-operating: to 12,200m (40,000 ft)

Safety: Designed to comply with UL1244(1987); IEC 348-1978; IEC 66E(CO)4; and SCA556B
Input low isolation: 20V to chassis
Guard isolation: 10V to input LO or chassis
EMI/RFI: Designed to comply with FCC Rules Part 15, Subpart J, Class B; VDE 0871, Class B; VDE 0875, Class K

Reliability: {MIL-STD-28800D, para 3.13.3}
Line power: 50 to 60 Hz ± 5% allowed about selectable nominal line voltages: 100V, 120V, 220V, 240V ± 10%
Maximum power: 45 VA

Size
Transfer unit:
Height 17.8 cm (7 in), plus 1.5 cm (0.6 in) for feet;
Width 21.6 cm (8.5 in);
Depth 30.5 cm (12 in)

Power pack:
Height 17.8 cm (7 in), plus 1.5 cm (0.6 in) for feet;
Width 21.6 cm (8.5 in);
Depth 30.5 cm (12 in)

1000V range resistor:
Height 7.6 cm (3 in);
Width 8.9 cm (3.5 in);
Depth 14.0 cm (5.5 in)

Transfer switch:
Height 7.6 cm (3 in);
Width 8.9 cm (3.5 in);
Depth 14.0 cm (5.5 in)

Weight
Transfer unit: 8.4 kg (18.5 lbs)
Power pack: 8.9 kg (19.5 lbs)
1000V range resistor: 1.6 kg (3.5 lbs)
Transfer switch: 1.6 kg (3.5 lbs)

Ordering Information

Model

792A	AC/DC Transfer Standard, Includes Transfer Unit, Power Pack, 1000V Range Resistor, Transfer Switch and a Report of Calibration that provides traceability to the National Institute of Standards and Technology

Accessories

792A-7001	Power Pack
792A-7002	100V Range Resistor
792A-7003	Transfer Switch
792A-7004	A40 Current Shunt Adapter

Calibration

792A-000	Calibration to original specifications

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