

# 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 1000 V
- 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  $\pm 10$  ppm (or optionally up to  $\pm 5$  ppm from Fluke's Primary Standard's Lab). The 792A also provides a wide voltage range of 2 mV to 1000 V, 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 2 V 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.

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 2 V, compared to the 7 mV 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 2 V 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. 17025 accredited reports of calibration are optionally available as well.

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 inter-comparisons 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 uncertainties for measured ac/dc differences is returned with your instrument. Consult your Fluke representative for details on Fluke's calibration service alternatives.



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

FLUKE®		792A AC/DC TRANSFER STANDARD													
		TEST REPORT S/N 9578002 14-Mar-2008													
RANGE	INPUT	10Hz	20Hz	40Hz	100Hz	1kHz	10kHz	20kHz	50kHz	100kHz	300kHz	500kHz	800kHz	1MHz	
22mV	2mV	-362	138	124	105	190	126	215	359	439	872	896	692	765	
	6mV	-404	19	112	109	86	-3	3	193	373	701	736	504	511	
	10mV	-386	5	54	66	65	-14	7	151	345	677	666	488	528	
	20mV	-244	3	16	31	-6	-14	-9	122	307	632	626	406	386	
220mV	20mV	-178	64	42	-5	-40	-4	-1	65	92	-55	-62	8	254	
	60mV	-120	-12	-3	4	1	-1	-8	-5	-9	-57	-88	-42	269	
	100mV	-125	-7	12	4	7	-6	-12	-10	-10	-63	-97	-42	237	
	200mV	53	27	7	-6	-5	-6	-13	-5	-1	-34	-101	-191	-7	
700mV	200mV	-225	-30	7	12	12	-8	-1	16	31	65	97	234	484	
	600mV	-17	16	8	1	0	-15	-7	-2	3	1	-50	-76	16	
	2V	60mV	62	11	6	3	4	6	9	16	30	57	64	60	52
	1V	96	17	4	3	4	1	1	8	21	54	66	64	56	
7V	2V	274	56	8	-5	-8	-5	-3	6	20	49	56	48	36	
	7V	72	11	2	3	1	5	5	13	20	36	42	36	32	
	6V	303	74	19	5	3	5	7	12	17	25	24	22	15	
	22V	6V	66	12	1	3	2	2	8	13	15	22	22	16	12
70V	10V	114	27	8	6	3	6	8	12	17	18	18	14	7	
	20V	317	80	26	12	8	7	10	15	19	24	24	20	13	
	70V	78	16	5	6	2	4	9	14	21	73				
	60V	332	90	28	13	10	11	13	16	23	54				
220V	60V	72	17	6	4	1	2	5	7	7	33				
	100V	125	33	12	8	4	6	8	8	4					
	200V	332	91	31	14	11	10	12	10	5					
	1000V	200V	66	18	9	6	5	2	5	15	28				
1000V	600V	168	53	23	14	7	6	2	-6	-6					
	1000V	321	86	28	13	10	6	5	-8	7					

Note: All values of ac-dc difference are in ppm.  
A positive ac-dc difference indicates that more alternating than direct voltage is required to produce the same output.

Tested using reference 792A S/N 4990012  
Temperature of Calibration 22.71 °C

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 220 V ranges. Stainless Steel Type-N connectors assure low signal loss and high measurement repeatability. The separate Power Pack unit permits the Transfer Unit and 1000 V Range Resistor to be shipped independently for calibration. The 1000 V 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,

*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,  $T_{CAL} \pm 5^\circ C$

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
2.2 V	600 mV	200	65	30	25	25	25	25	45	60	120	140	140	140
	1 V	190	60	30	15	15	15	15	40	50	115	125	125	125
	2 V	190	60	25	10	10	10	10	40	50	115	125	125	125
7 V	2 V	190	65	30	22	22	22	22	45	55	120	140	140	140
	6 V	190	60	25	10	10	10	10	40	50	120	125	125	125
22 V	6 V	190	65	30	22	22	22	22	45	55	120	125	140	140
	10 V	190	60	30	15	15	15	15	40	50	120	125	125	125
	20 V	190	60	25	15	15	15	15	40	50	120	125	125	125
70 V	20 V	190	65	30	25	25	25	25	55	70	130	140	140	140
	60 V	190	60	25	20	20	20	20	50	65	130			
220 V	60 V	190	65	33	33	33	33	33	65	70	130			
	100 V	190	65	30	20	20	20	20	60	70				
	200 V	190	60	27	18	18	18	18	60	70				
1000 V	200 V	190	90	40	33	33	33	33	65	70				
	600 V	190	90	35	27	27	27	27	60	70				
	1000 V	190	90	27	25	25	27	27	60	70				

**Volt-hertz product:**  $1 \times 10^8$  @ 100 kHz,  $2.2 \times 10^7$  @ 1 MHz

**Waveform requirements:** Sinusoidal, distortion less than 1 %

## Corrected absolute ac/dc uncertainty

1 year,  $T_{CAL} \pm 12\text{ }^\circ\text{C}$

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

**Volt-hertz product:**  $1 \times 10^8$  @ 100 kHz,  $2.2 \times 10^7$  @ 1 MHz

**Waveform requirements:** Sinusoidal, distortion less than 1 %

## Corrected ac/dc uncertainties relative to calibration standards

1 year,  $T_{CAL} \pm 5\text{ }^\circ\text{C}$

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

**Volt-hertz product:**  $1 \times 10^8$  @ 100 kHz,  $2.2 \times 10^7$  @ 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
2.2 V	30 sec
7 V	30 sec
22 V	30 sec
70 V	30 sec
220 V	30 sec
1000 V	30 sec

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

## Output 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 $\mu$ V
700 mV	5 % + 500 $\mu$ V
2.2 V	10 % + 300 $\mu$ V
7 V	10 % + 300 $\mu$ V
22 V	10 % + 300 $\mu$ V
70 V	10 % + 300 $\mu$ V
220 V	10 % + 300 $\mu$ V
1000 V	10 % + 300 $\mu$ V

## 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; 2.2 V to 1000 V ranges, 72 hours

**Battery charge time:** 16 hours to full charge

**Low battery life:** 22 mV to 700 mV ranges, 30 minutes; 2.2 V to 1000 V 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 mV to 22 mV	90 $\mu$ V
220 mV	22 mV to 220 mV	90 $\mu$ V
700 mV	220 mV to 700 mV	90 $\mu$ V
2.2 V	0.7 V to 2.2 V	10 ppm
7 V	2.2 V to 7 V	10 ppm
22 V	7 V to 22 V	10 ppm
70 V	22 V to 70 V	10 ppm
220 V	70 V to 220 V	10 ppm
1000 V	220 V to 1000 V	10 ppm

## Input impedance

Voltage Range	Input Impedance	
	Resistance	Shunt Capacitance
22 mV	10 M $\Omega$	< 40 pF
220 mV	10 M $\Omega$	< 40 pF
700 mV	10 M $\Omega$	< 40 pF
2.2 V	420 $\Omega$	< 20 pF
7 V	1.2 k $\Omega$	< 20 pF
22 V	4.0 k $\Omega$	< 20 pF
70 V	12 k $\Omega$	< 20 pF
220 V	40 k $\Omega$	< 20 pF
1000 V	200.4 k $\Omega$	< 20 pF

## Maximum input voltage

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

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



## 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 3,050 m (10,000 ft)  
**Non-operating:** to 12,200 m (40,000 ft)  
**Input low isolation:** 20 V to chassis  
**Guard isolation:** 10 V 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 Hz to 60 Hz  $\pm$  5 % allowed about selectable nominal line voltages: 100 V, 120 V, 220 V, 240 V  $\pm$  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)  
**1000 V 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 lb)  
**Power pack:** 8.9 kg (19.5 lb)  
**1000V range resistor:** 1.6 kg (3.5 lb)  
**Transfer switch:** 1.6 kg (3.5 lb)

## Ordering Information

### Model

**792A** AC/DC Transfer Standard, Includes Transfer Unit, Power Pack, 1000 V 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** 100 V Range Resistor  
**792A-7003** Transfer Switch  
**792A-7004** A40 Current Shunt Adapter



## 绿测科技有限公司

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