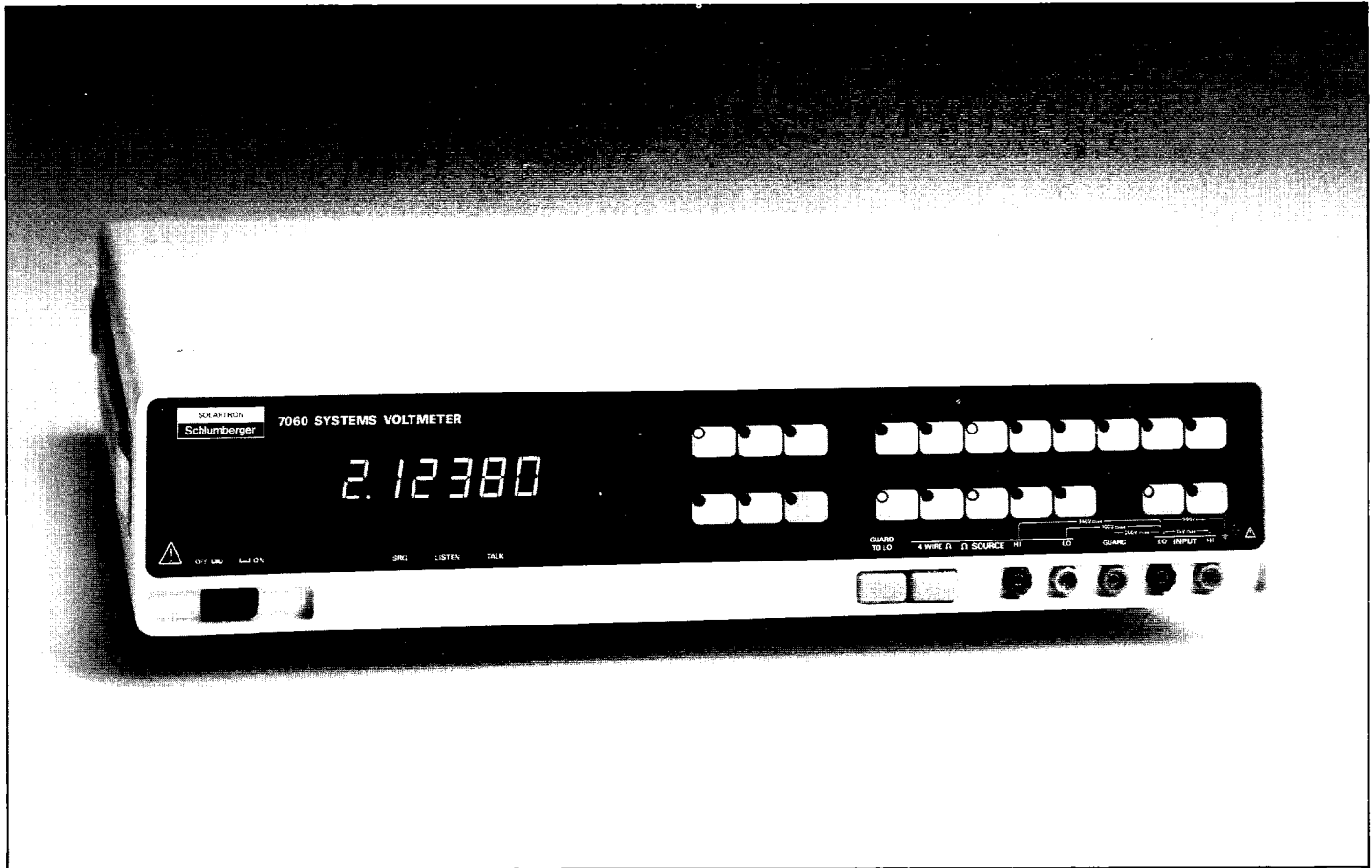


# SYSTEM MULTIMETERS 7060 SERIES



## ■ 6½ to 3½ digits

## ■ 20ppm accuracy dc volts

When you buy a voltmeter for use in a system how do you choose the right one for the application? With the 7060 the design is modular so the problem is simplified considerably. Decide which functions you require and order the appropriate model. Not a set of individual modules but a factory assembled and tested instrument. All models are equipped with IEEE488 interface as standard.

### DC Voltage

Measurement of dc voltage is included in all 7060 models. It is highly linear (better than 3ppm) with a speed of up to 266 readings per second.

### AC Voltage

Three versions of ac voltage measurement are offered allowing performance to be matched to user requirements; mean sensing, rms or high performance rms. The latter, in 7060E, employs a special gain control within the rms converter to give excellent linearity down to 0.1% of full scale.

### Ratio

This function provides ratiometric measurements of any input to a dc voltage reference.

## ■ 3 levels of ac volts performance

## ■ Version with only dc volts

### Resistance

Measurements may be made 2- or 4-wire. An ohms-guard enables in-circuit measurements to be performed.

### Null

All models offer a Null facility for automatic compensation of offsets.

### GPIB Programming

Commands for function selection consist of merely a single alpha character followed by a single integer. The command set covers the full functions available at the front panel, plus additional facilities such as bus control and interrogation of instrument status.

### Scanner Interface

The addition of an interface (70603M) for the 7010 Minate Scanner provides a cost-effective solution for multi-channel measurements such as are needed in automatic test. The combination of 7060 with 7010 allows full computer control via the GPIB through the voltmeter itself. The computer need address only the 7060 to make measurements on all channels.

## ■ IEEE488 included

## ■ Ratio facilities

### 7060A: dc volts

An extremely cost-effective system solution for dedicated dc voltage applications.

### 7060C: dc volts, ac (mean) volts, resistance, ac and dc current, ratio.

A full multimeter configuration with mean ac volts and ratio (VAC/VDC, Ω/VDC, IAC/VDC, IDC/VDC).

### 7060E: dc volts, high performance rms ac, resistance and ratio.

This version provides the best ac volts performance of the 7060 range plus dc volts and resistance. Ratio provides (VAC/VDC, Ω/VDC).

### 7060G: dc volts, ac (rms), resistance, ac and dc current, ratio.

A full multimeter configuration as in the 7060C but includes the rms version of ac volts facility.

# SPECIFICATIONS

## CALIBRATION TEMPERATURE 20°C (23°C in USA)

### DC VOLTAGE 7060A, 7060C, 7060G, 7060E

6½ digits, filter in, full scale 1999999

Range and Sensitivity	Limits of Error ± [% rdg + digits]					
	24 hrs ± 1°C		6 mnth ± 5°C		1 yr ± 5°C	
100mV 1μV	0.002	6	0.006	6	0.008	6
1V 1μV	0.002	6	0.006	6	0.008	6
10V 10μV	0.002	6	0.006	6	0.008	5
100V 100μV	0.002	6	0.006	6	0.008	6
1000V 1mV	0.002	6	0.006	6	0.008	6

**Analogue settling time:** <2.5ms

#### Overload protection

Autorange & Commanded 100V, 1000V: 1.2kV dc/peak ac

Commanded 100mV, 1V, 10V ranges: 350 dc/peak ac

Instantaneous application of input voltage on Autorange must not exceed: 500V dc

**Null Range:** ±25μV min.

**Input Current:** <100pA

**Input Resistance:** 100mV, 1V, 10V ranges: >1GΩ

100V, 1000V: 10MΩ ± 1%

**Temperature Coeff** Need be applied only when operating beyond the temperature limits quoted under Limits of Error.

**All ranges:** <±0.001% rdg/°C

**Zero offset:** <±0.2μV

**Temperature Coeff** Need be applied only when operating beyond the temperature limits quoted under Limits of Error.

**All ranges:** <±0.001% rdg/°C

**Zero offset:** <±0.2μV

Scale Digits	Integ Time	Filter Out			Filter in	
		Add digits	Speed rdg/s	Noise digits	Integ Time	Noise digits
3½	0.3ms	1	>250	<3	20ms	<1
4½	2.5ms	1	145	<3 ± 15μV	20ms	<1
5½	20ms	—	39	<3	160ms	<1
6½	320ms	10	3	<3	1.28s	<1

### DC CURRENT 7060C, 7060G 5½ digits, full scale 199999

Range	Sensitivity	Limits of Error ± [% rdg + digits]			
		1 yr (± 5°C)		Burden	
100μA	1nA	0.04	10	<0.3V	
1mA	10nA	0.04	10	<0.3V	
10mA	100nA	0.04	10	<0.5V	
100mA	1μA	0.04	10	<0.3V	
1A	10μA	0.1	10	<0.9V	

**Temperature Coeff** Need be applied only when operating beyond the temperature limits quoted under Limits of Error.

**All Ranges:** <±.003% rdg/°C

**Measurement speeds:** As for DC Voltage

**Null Range:** ±25nA min.

**Overload Protection:** 2A fuse

### RESISTANCE 7060C, 7060G, 7060E

6½ digits, filter in, 4-wire measurement. Full scale 1999999.

Range and Sensitivity	Limits of Error ± [% rdg + digits]					
	24 hrs ± 1°C		6 mnth ± 5°C		1 yr ± 5°C	
1kΩ 1mΩ	0.002	10	0.01	10	0.013	10
10kΩ 10mΩ	0.002	6	0.01	6	0.013	6
100kΩ 100mΩ	0.002	6	0.01	6	0.013	6
1MΩ 1Ω	0.002	6	0.02	9	0.02	9
10MΩ 10Ω	0.01	20	0.035	20	0.04	20
100MΩ 100Ω	0.05	25	0.01	25	0.1	25

#### Measurement Speeds

Ranges to 100kΩ, measurement time is 2×integration time + 2.2ms

(settling time) + 1.5ms (software time). At 1MΩ, settling time =

20ms; at 10MΩ and 100MΩ, settling time = 225ms.

**Overload protection:** 350V dc/pk ac

**Noise:** As for DC voltage measurement ± 1 digit

**Open circuit voltage** 1kΩ to 100kΩ ranges: <7V

1MΩ to 1000MΩ ranges: <30V

**Temperature Coeff** Need be applied only when operating beyond the temperature limits quoted under Limits of Error.

**Range:** 1k to 1MΩ: <±0.002% rdg/°C

10MΩ <±0.0025% rdg/°C

100MΩ <±0.01% rdg/°C

**Null Range:** ±250mΩ min.

**Temperature Coeff** Need be applied only when operating beyond the temperature limits quoted under Limits of Error.

**Range:** 1k to 1MΩ: <±0.002% rdg/°C

10MΩ <±0.0025% rdg/°C

100MΩ <±0.01% rdg/°C

**Null Range:** ±250mΩ min.

**Temperature Coeff** Need be applied only when operating beyond the temperature limits quoted under Limits of Error.

**Range:** 1k to 1MΩ: <±0.002% rdg/°C

10MΩ <±0.0025% rdg/°C

100MΩ <±0.01% rdg/°C

**Null Range:** ±250mΩ min.

**Temperature Coeff** Need be applied only when operating beyond the temperature limits quoted under Limits of Error.

**Range:** 1k to 1MΩ: <±0.002% rdg/°C

10MΩ <±0.0025% rdg/°C

100MΩ <±0.01% rdg/°C

**Null Range:** ±250mΩ min.

**Temperature Coeff** Need be applied only when operating beyond the temperature limits quoted under Limits of Error.

**All Ranges:** 7060C: <±0.006% rdg/°C

7060G: <±(0.015% rdg + 0.005% f.s.)/°C

**Measurement speeds:** 7060C: as for AC Volts (mean)

7060G: as for AC Volts (rms)

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7060G: as for AC Volts (rms)

**AC VOLTAGE (MEAN) 7060C**

5½ digits, filter in. Limits of Error ± [%rdg + digits]. Input &gt; 2% fs.

Range	Sensitivity	Full Scale	24 hrs at 20°C ± 1°C				1 year at 20°C ± 5°C			
			40Hz to 10kHz		10Hz to 50kHz		40Hz to 10kHz		10Hz to 50kHz	
100mV	1μV	0.199999V	0.03	20	0.1	20	0.07	20	0.2	30
1V	10μV	1.99999V	0.03	20	0.1	20	0.07	20	0.2	30
10V	100μV	19.9999V	0.06	20	0.2	20	0.1	20	0.3	30
100V	1mV	199.999V	0.06	20	0.2	20	0.1	20	0.3	30
1000V	10mV	1000.00V	0.06	20	0.2	20	0.1	20	0.3	30

100mV and 1V ranges up to 100kHz: <0.05dB  
up to 1MHz: <1.5dB

**Reduced Scale Lengths**

Digital Filter selected. Filter must be used for full accuracy below 300Hz.

Specification as above except the digits change to those given below for all ranges.

Scale	50Hz to 10kHz	10kHz to 50kHz
4½	3 digits	3 digits
3½	3 digits	2 digits

**Temperature Coeff** Need be applied only when operating beyond the temperature limits quoted.

**Range** 100mV and 1V: <0.005% rdg/°C  
10V, 100V, 1000V: <0.01% rdg/°C

**Maximum Reading Rates** With filter: 1/s  
Without filter: 8/s

**Overload protection** Autorange: 1.2kV pk  
Command ranges, 100mV and 1V: 350V\* pk  
10V, 100V, 1000V: 1.2kV pk

\*Subject to a V-Hz limit of  $5 \times 10^5$

**Maximum Input Voltage:** Below 20kHz: 750V rms  
Above 20kHz: V-Hz limit of  $1.5 \times 10^7$

DC: 400V

**Input Impedance:** 1MΩ//<150pF

**Response Time** First reading will be within 0.1% of step size, assuming no dc component.

**AC VOLTAGE (RMS) 7060G**

5½ digits, filter in. Limits of Error ± [%rdg + dig]

Range	Sensitivity	Full Scale	24 hrs at 20°C ± 1°C						1 year at 20°C ± 5°C					
			10Hz to 40kHz		40Hz to 10kHz		10kHz to 100kHz		10Hz to 40kHz		40Hz to 10kHz		10kHz to 100kHz	
100mV	1μV	0.199999V	0.5	0	0.05	50	0.25	250	0.5	0	0.1	75	0.35	300
1V	10μV	1.99999V	0.5	0	0.05	50	0.2	200	0.5	0	0.1	75	0.3	250
					10kHz to 50kHz						10kHz to 50kHz			
10V	100μV	19.9999V	0.5	0	0.08	50	0.35	250	0.5	0	0.15	75	0.45	300
100V	1mV	199.999V	0.5	0	0.08	50	0.35	250	0.5	0	0.15	75	0.45	300
1000V	10mV	750.00V	0.5	0	0.08	50	0.35	250	0.5	0	0.15	75	0.45	300

1V range, up to 1MHz: <1dB

**Reduced Scale Lengths**

Filter selected. Filter must be used for full accuracy below 300Hz. Specification as above except the digits change to those given below for all ranges.

Scale	40Hz to 10kHz	10kHz to 50kHz
4½	10 digits	30 digits
3½	2 digits	3 digits

**Maximum reading rates:** With filter: 1/s  
Without filter: 12/s

**Temperature Coeff** Need be applied only when operating beyond the temperature limits quoted.

**Range** ±[% rdg + %fs]/°C  
100mV and 1V: <0.01 + 5  
10V, 100V, 1000V: <0.015 + 5

**Limits of error:** apply for substantially sinusoidal inputs above 10% f.s., relative to calibration standard.

Crest factor: at f.s. 5:1 max  
for <0.2% error: 7:1 max

**AC VOLTAGE (RMS) 7060E**

5½ digits, filter in. Limits of Error ± [%rdg + digits]. Input >0.1% fs.

Range	Sensitivity	Full Scale	24 hrs at 20°C ± 1°C				1 year at 20°C ± 5°C			
			100Hz to 10kHz		40Hz to 50kHz		100Hz to 10kHz		40Hz to 50kHz	
100mV	1µV	0.199999V	0.03	20	0.1	40	0.07	40	0.20	60
1V	10µV	1.99999V	0.03	20	0.1	40	0.07	40	0.20	60
10V	100µV	19.9999V	0.06	20	0.2	40	0.09	40	0.30	60
100V	1mV	199.999V	0.06	20	0.2	40	0.09	40	0.30	60
1000V	10mV	750.00V	0.06	20	0.2	40	0.09	40	0.30	60

Measurement time: Filter Selected 1.28s  
 Filter out 320ms  
 Measurement delay: 3s  
 Crest factor, at f.s. 4:1  
 maximum for <0.1% error 7:1

**Overload Protection, Maximum Input Voltage, Input Impedance** as for 7060C

**Temperature Coeff** Need be applied only when operating beyond the temperature limits quoted.

**Range** ±[% rdg + %fs]/°C  
 100mV and 1V: <0.01 + 0.002  
 10V, 100V, 1000V: <0.15 + 0.002

**Other Scale Lengths**  
 Add ± 1 digit to the Limits of Error quoted above.

**RATIO 7060C, 7060G, 7060E**

**Reference Voltage:** ±10mV to ±8V dc (relative to input Low)  
**Instrument range for Reference input:** 10V  
**Reference Input Resistance:** >1GΩ

**Reference Voltage Overload Protection**  
 ±100V peak either terminal relative to input Low.

**Measurement Input:** V====, I====, V~, I~, R

**Instrument range for input parameter**  
 Full autorange/manual/command range facilities.

**Limits of Error:** ±[Limits of Error for dc reference + Limits of Error for other parameter + 2 digits].

**Measurement Time**  
 [Time to measure unknown + time to measure reference + time for calculation].

**INTERFERENCE REJECTION All 7060 models**

Ratio of peak interference to 1 digit reading error:

**Series Mode**

Peak input voltage: Autorange: 1.1kV pk  
 Command Range: 1.1×V fs

**DC Measurement:** Rejection of 50 (60) (400) Hz ±0.1%

Scale Digits	Without Filter		With Filter	
	Integ Time	Rejection	Integ Time	Rejection
6½	320ms	>60dB	1.28s	>60dB
5½	20ms	>60dB	160ms	>60dB
4½	2.5ms	—	20ms	>60dB
3½	0.3ms	—	20ms	>60dB

**Effective Common Mode**

Measured with 1kΩ imbalance in Lo lead.

Maximum Common Mode: 500V dc or peak ac

DC Measurement: Rejection of dc >140dB  
 Rejection of 50 (60) Hz ±0.1% >130dB

AC Measurement: Rejection of dc >130dB  
 Rejection of 50 (60) Hz ±0.1% > 60dB

**GENERAL SPECIFICATION All 7060 models**

**Environment** Working Temperature: 0 to +50°C  
 Storage Temperature: -30°C to +70°C  
 Maximum Humidity: 70% at +40°C

**Power Supply** Voltage: 100V/120V/220V/240V (±10%)  
 Frequency: 50, 60 or 400Hz (±3%)  
 Consumption: 40VA  
 Fuse: 200mA (120V); 400mA (240V)

**Safety**

This instrument conforms to the recommendations of IEC 348, Class 1.

**Dimensions** Width: 432mm (17 ins.)  
 Height: 88mm (3.5 ins.)  
 Depth: 419mm (16.5 ins.)  
 (462.5mm including bezel)  
 Weight: 7kg (15 lbs.)