

SECTION 7 SPECIFICATIONS

General

SAFETY

The 1061, 1061A and 1071 have been designed to meet BSI 4743, IEC 348, and UL 1244 specifications.

MAXIMUM INPUTS

See Tables 2.1 to 2.3

CLIMATIC CONDITIONS

Operating Temperature : 0°C to +50°C (except where specified)

Storage Temperature^[1] : -40°C to +70°C

Maximum Relative Humidity : 75% @ 40°C

Warm-up Time : Two hours to meet all specifications

POWER SUPPLY

Voltage : 205-255 or 105-127 Volts

Line Frequency : 50Hz ± 2%, 60Hz ± 2%, or 400Hz ± 2%.

Consumption : Approximately 30VA

Fuses : 160mA or 500mA anti-surge (depends on voltage)

MECHANICAL

Dimensions : Height = 89mm, Width = 455mm, Depth = 420mm

Weight : 10 kg.

OPERATING INDICATIONS

Scale length : 1071 7½ digits maximum, i.e. 19,999,999
1061 5½ digits i.e. 199,999
1061A 6½ digits maximum i.e. 1,999,999

Overload : Error 0L displayed

Indication : Symbols lit on display and illuminated keys

AUTORANGE

Range Up : 200% of nominal range

Range Down : 18.8% of nominal range

DIGITAL ERROR

Computation : ± 1 digit (assumes no error in stored value)

Spec read-out : < 1% of displayed error

ANALOG OUTPUT (0 to ±2 Volts)

1 Volt output for full range signal input

Accuracy : ± 1% of Reading ± 2mV

Output Resistance : Approximately 200Ω

RATIO

Type : Computational, same function (True 4-wire and auto-ranging).
(AC:DC voltage and current ratios [DC coupled AC])

Accuracy :

$$\pm E_R \pm E_S \pm \infty \left(\left| \frac{\text{Ref. range}}{\text{Ref. reading}} \right| + \left| \frac{\text{Sig range}}{\text{Sig reading}} \right| \right)$$

Where E_R = Net error of reference
 E_S = Net error of signal
 ∞ = 0.000 002 (1071, DCV, kΩ)
= 0.000 02 (1071 remaining functions)
= 0.000 02 (1061 same range all functions)
= 0.000 06 (1061 all functions and 1071 AC: after a range change)

Read rate, with full scale input:

	Function	Filter	Max. Read Rate
1071	DCV or kΩ	out	1 per 5 seconds
		in	1 per 40 seconds
	DCI, ACV } or ACI }	out	1 per second
		in	1 per 2 seconds
1061 } 1061A }	DCV or kΩ	out	7 per second
		in	1 per second
	DCI, ACV } or ACI }	out	1 per second
		in	1 per 2 seconds

[1] Excessive temperature stress may affect calibration stability.

1071 Specifications

DC VOLTAGE

Full Range Count (FR) : $\pm 1,000,000$
 Full Scale Count (FS) : $\pm 1,999,999$ on all ranges
 except 1000V range
 Average Modes Full Scale Count : $\pm 19,999,999$ on
 all ranges except 1000V range

ACCURACY (Valid up to 24 hours after 'Input Zero' correction).
 24 HOURS (23°C \pm 1°C) Relative to calibration standards and at
 internal read rate

*0.1V range:	± 4 ppm of reading	± 4 digits (40)
1 and 10V range:	± 3 ppm of reading	± 2 digits (20)
100 and 1000V range:	± 4 ppm of reading	± 2 digits (20)

90 DAYS (23°C \pm 5°C)

*0.1V range:	± 20 ppm of reading	± 5 digits (50)
1 and 10V range:	± 15 ppm of reading	± 3 digits (30)
100 and 1000V range:	± 20 ppm of reading	± 3 digits (30)

1 YEAR (23°C \pm 5°C)

*0.1V range:	± 30 ppm of reading	± 6 digits (60)
1 and 10V range:	± 20 ppm of reading	± 4 digits (40)
100 and 1000V range:	± 30 ppm of reading	± 4 digits (40)

*Rolling-Average Mode typically twice as good as Normal mode.
 Specification applies on illumination of last digit following
 selection of Input filter after application of input signal
 (approximately 8 seconds).*

TEMPERATURE COEFFICIENT: (10°C to 35°C)
 1/10th of 90 DAY specification $\pm 0.3\mu\text{V}/^\circ\text{C}$.

READ RATE (with full scale input)
 Normal Mode: 2/second
 'Input Filter': Updates every 8 seconds (due to digital filtering)
 'Continuous' Average Mode: Updates average value at the same
 rate as Normal mode.
 'Block' Average Mode: Measurement rate ≥ 2 /second, displays
 block average until next block completed.

SETTLING TIME (to 10ppm of step size) [1]
 Filter out: $< 50\text{ms}$
 Filter in: < 1 sec

SERIES MODE REJECTION
 Filter out: 66dB @ 50Hz (60Hz) $\pm 0.15\%$
 Filter in: add 54dB @ 50Hz increasing at 18dB/octave

COMMON MODE REJECTION
 (1k Ω source unbalance)
 $> 140\text{dB}$ at DC
 $> 80\text{dB} + \text{series mode}$ at 1Hz to 60Hz

AUTORANGE SPEED (No filter)
 Typically 300ms per range between top and bottom
 ranges.

INPUT RESISTANCE
 0.1 to 10 Volt ranges (< 20 volts): $> 10,000\text{M}\Omega$.
 100 and 1000 Volt ranges: $10\text{M}\Omega \pm 0.1\%$.

INPUT CURRENT (1 year)
 $< 50\text{pA}$ drifting at $< 2\text{pA}/^\circ\text{C}$.

RESISTANCE

Full Range Count : 1,000,000
 Full Scale Count : 1,999,999
 Average Modes Full Scale Count : 19,999,999

ACCURACY (Valid up to 24 hours after 'Input Zero' correction).
 24 HOURS (23°C \pm 1°C) Relative to calibration standards and at
 internal read rate

*10 Ω range:	± 10 ppm of reading	± 8 digits (80)
0.1k Ω , 1k Ω , 10k Ω ranges:	± 5 ppm of reading	± 2 digits (20)
100k Ω range:	± 10 ppm of reading	± 2 digits (20)
1000k Ω range:	± 20 ppm of reading	± 2 digits (20)
10M Ω range:	± 100 ppm of reading	± 2 digits (20)

90 DAYS (23°C \pm 5°C)

*10 Ω range:	± 30 ppm of reading	± 8 digits (80)
0.1k Ω , 1k Ω , 10k Ω ranges:	± 20 ppm of reading	± 4 digits (40)
100k Ω range:	± 30 ppm of reading	± 4 digits (40)
1000k Ω range:	± 80 ppm of reading	± 4 digits (40)
10M Ω range:	± 240 ppm of reading	± 4 digits (40)

1 YEAR (23°C \pm 5°C)

*10 Ω range:	± 40 ppm of reading	± 10 digits (100)
0.1k Ω , 1k Ω , 10k Ω ranges:	± 30 ppm of reading	± 6 digits (60)
100k Ω range:	± 40 ppm of reading	± 6 digits (60)
1000k Ω range:	± 120 ppm of reading	± 6 digits (60)
10M Ω range:	± 360 ppm of reading	± 6 digits (60)

*Rolling-Average Mode typically twice as good as Normal mode.
 Specification applies on illumination of last digit following
 selection of Input filter after application of input signal
 (approximately 8 seconds).*

TEMPERATURE COEFFICIENT (10°C to 35°C)
 1/10th of 90 DAY specification $\pm 100\mu\Omega/^\circ\text{C}$

READ RATE : As DC Volts

TYPE
 True 4-wire with active guard (can be switched to 2-wire on
 the front panel).
 Measurement technique is independent of the internal
 reference voltage.

OPEN CIRCUIT VOLTAGE
 < 10 volts on all ranges

LEAD RESISTANCE
 Up to 100 Ω may be tolerated in any or all the leads on any
 range. (Rejection of lead resistance is 100dB on any range).

RESPONSE TIME
 Depends on external capacitance and guarding/shielding
 techniques used.
 Generally up to 10k Ω response as DC Volts. Higher resist-
 ances take longer to settle. OHMS GUARD may be used to
 guard out stray capacitance.

CURRENT THROUGH UNKNOWN ($\pm 0.2\%$)
 10 Ω , 0.1k Ω ranges: 10mA
 1k Ω range: 1mA
 10k Ω range: 100 μA
 100k Ω range: 10 μA
 1000k Ω range: 1 μA
 10M Ω range: 100nA

OHMS GUARD
 Drive Capability: I+ or I- to OHMS GUARD,
 250 Ω minimum (up to 10 Ω lead resistance)
 Guarding Accuracy: See Section 2 - 'Resistance measurement'

*Within 15 minutes of 'Input Zero' correction and 'Input Filter' selected or add 5 μV per year

[1] or < 30 digits or 1ppm of step size (whichever is greater) following a range change

[5] Accuracy figures in brackets refer to 1071 in 'Filter' or 'Av' Mode (7 $\frac{1}{2}$ digits)

1071 Specifications (cont.)

AC VOLTAGE (TRUE RMS – OPTION 10)

Full Range Count : 100,000
Full Scale Count : 199,999 on all ranges except 1000V range

ACCURACY (Signals $< 2 \times 10^7$ Volt Hz, $> 0.25\%$ Full Scale).

	DC + 45Hz ^[2] to 5kHz	DC + 5kHz to 100kHz
24 HOURS (23°C ± 1°C) Relative to calibration standards.		
0.1V and 1000V ranges:	± 0.04% of reading ± 40 digits	± 0.1% of reading ± 100 digits
1 to 100V ranges:	± 0.02% of reading ± 20 digits	± 0.05% of reading ± 50 digits
90 DAYS (23°C ± 5°C)		
0.1V and 1000V ranges:	± 0.08% of reading ± 40 digits	± 0.2% of reading ± 100 digits
1 to 100V ranges:	± 0.04% of reading ± 20 digits	± 0.1% of reading ± 50 digits
1 YEAR (23°C ± 5°C)		
0.1V and 1000V ranges:	± 0.12% of reading ± 40 digits	± 0.3% of reading ± 100 digits
1 to 100V ranges:	± 0.06% of reading ± 20 digits	± 0.15% of reading ± 50 digits

HF ACCURACY^[3] (1 and 10V ranges)

Option 10: 100kHz to 1MHz ± 2% of reading ± 2000 digits (typical)

INPUT IMPEDANCE

1MΩ shunted by 150pF

LF ACCURACY

Filter out, at line frequency add: ± 0.6% of reading
Filter in, 10Hz: ± 2.0% of reading

CONVERSION TYPE

True RMS AC coupled (measures AC component with up to 1000V DC bias on any range, subject to the constraints of Section 2, Table 2.1).

or

True RMS DC coupled (measures $\sqrt{AC^2 + DC^2}$)

CREST FACTOR

7 : 1 typically, at full range

TEMPERATURE COEFFICIENT

$< 1/10$ th of 90 DAY specification/°C

SETTLING TIME (DC coupled)

(i) To 0.1% of step size

COMMON MODE REJECTION

1kΩ unbalance > 90 dB @ DC – 60Hz

Filter out < 150 ms
Filter in < 500 ms

READ RATE (with full scale input) : 2 readings/second.

Continuous and Block Average modes : As DC Volts.
No digital filtering on 'Input filter'.

(ii) From DC bias input (AC coupled) or severe overload:
Depends on change of DC bias
(CR time constant 0.22 seconds)

DC CURRENT

(applicable only if Option 12 is not fitted)

Full Range Count : ± 100,000
Full Scale Count : ± 199,999

ACCURACY

24 HOURS (23°C ± 1°C) Relative to calibration standards.

0.1 to 100mA ranges: ± 50ppm of reading ± 4 digits
1000mA range: ± 100ppm of reading ± 4 digits

90 DAYS (23°C ± 5°C)

0.1 to 100mA ranges: ± 100ppm of reading ± 4 digits
1000mA range: ± 200ppm of reading ± 4 digits

1 YEAR (23°C ± 5°C)

0.1 to 100mA ranges: ± 150ppm of reading ± 4 digits
1000mA range: ± 300ppm of reading ± 4 digits

TEMPERATURE COEFFICIENT

1/10th of 90 DAY specification/°C

READ RATE : As DC Volts

SETTLING TIME : As DC Volts

SHUNT RESISTANCE

0.1mA range : 1kΩ
1mA range : 100Ω
10mA range : 10Ω
100mA range : 1Ω
1000mA range : 0.1Ω

Internal lead resistance: $< 20\%$ of shunt resistance + 1Ω.

INPUT PROTECTION

Overloads : < 2 A, internally clamped
 ≥ 2 A, rear panel fuse

AC CURRENT (TRUE RMS)

(in conjunction with option 10 only)

Full Range Count: 100,000
Full Scale Count : 199,999

ACCURACY DC + 45Hz^[2] to 5kHz

(Signals $> 0.1\%$ Full Scale).

24 HOURS (23°C ± 1°C) Relative to calibration standards

0.1 to 1000mA ranges: ± 0.1%^[4] of reading ± 100 digits
90 DAYS (23°C ± 5°C)

0.1 to 1000mA ranges: ± 0.2%^[4] of reading ± 100 digits
1 YEAR (23°C ± 5°C)

0.1 to 1000mA ranges: ± 0.3%^[4] of reading ± 100 digits

CREST FACTOR

3 : 1 typically, at full range

TEMPERATURE COEFFICIENT

$< 1/10$ th of 90 DAY specification/°C

READ RATE : As AC volts

SETTLING TIME : As AC volts

SHUNT RESISTANCE : As DC current

CONVERSION TYPE

True r.m.s. AC coupled or DC coupled

INPUT PROTECTION

As DC Current but large DC bias may cause protection to operate as the AC coupling is provided after current shunts.

[2] Read 360Hz instead of 45Hz if 'Input Filter' not selected.

[3] Spec read-out invalid above 100kHz.

[4] Typical above 1kHz.