

# 60,000 Counts, 100kHz TRMS and CAT-III 1kV Now Over-molded Ergonomic!

AutoHold Real-Read™, BeepLit™ Continuity, BeepLit™ Diode Alert, LoZ AutoV  
Hi-Lo EF Detection, VFD V & Hz, nS Measurements, T1-T2 Type-K, dBm  
Crest Peaks, Speedy MaxMinAvg, Relative Zero, BeepJack™

## BM780 SERIES

Professional  
Multimeters



www.brymen.com



Bright People's Choice

CE

UK  
CA





BM789



BM785

789	785	FUNCTIONS & FEATURES
•	7kHz	ACV Bandwidth up to 100kHz
•		dBm Readings with Selectable Reference Impedance Values
•		AutoV LoZ Ghost-Voltage-Buster Feature; Automatic Selection of ACV and DCV
•		T1-T2 Dual Input Type-K Temperature -200.0°C to 1090°C; Selectable °F Readings
•		%4~20mA Readings to Test Process Control Loop Currents
•		nS Range 99.99nS to Extend Resistance Measurements
•	•	4-5/6 Digits 60,000 Counts Max Large Easy-to-Read LCD Display
•	•	Nominal 5/Sec Fast Measurements; Fully Auto-Ranging
•	•	31 Segment Analog Bar-graph Updates 50/Sec
•	•	Best Basic DCV Accuracy up to 0.03%+2d
•	•	Warm White Back-Lighted LCD Display
•	•	DC+AC, AC True RMS Conversion
•	•	Intelligent Auto Power Off
•	•	Data Hold
•	•	Relative Zero Mode
•	•	Crest (Peak Hold) Captures MaxMin Changes > 0.25ms in Durations
•	•	AutoHold Real-Read™ Shows Real-time Readings to Avoid Blind Measurements
•	•	Speedy Record MaxMinAvg Readings; Updates 10/sec Nominal on DC Measurements
•	•	VFD-V & VFD-Hz Measures Fundamental V & Hz of Most Variable Frequency Drives
•	•	DC, AC, DC+AC Voltage Ranges 600.00mV to 1000.0V
•	•	DC, AC, DC+AC $\mu$ A, mA & A Ranges 600.00 $\mu$ A to 10.000A
•	•	Ohms Ranges 600.00 $\Omega$ to 60.000M $\Omega$
•	•	Capacitance Ranges 10.00nF to 10.00mF
•	•	Line Frequency Ranges 99.999Hz to 50.000kHz
•	•	Logic Frequency Ranges 99.999Hz to 1.0000MHz
•	•	BeepLit™ Continuity Tester. Features Audible Beep & Visible Backlight Effects
•	•	BeepLit™ Diode Tester. Short-Beep-Alert and Voltage-threshold Continuity
•	•	BeepJack™ Input Warning Against Improper Plug into $\mu$ AmA/A Terminals
•	•	Rugged Fire Retarded Casing with Battery Compartment Cartridge
•	•	Over-molded Protective Holster with Probe-Holders & Tilt-Stand
•	•	Optional Purchase Magnetic Hanger Strap
•	•	HBC 1kV Fuses Protected on $\mu$ AmA/A Terminals
•	•	Transient Protection up to 8kV 1.2/50 $\mu$ s Lightning Surge
•	•	SAFETY Meets EN/BSEN 61010-1/-2-030/-2-033 to Measurement CAT III 1000V & CAT IV 600V
•	•	EMC Meets EN/BSEN 61326-1:2013



# Ergonomic and Handy + Professional Performance

Superb Resolution, Accuracy, Speed, Bandwidth, Safety, & Quality!

## DC+AC & AC 100kHz TRUE RMS

For Non-sinusoidal & Complex Waveforms of Volts & Amps.  
100kHz High Bandwidth for ACV

## LINE LEVEL Hz

Measures Noisy Line Level Voltage Frequencies

## INNOVATIVE BeepLit™ CONTINUITY

Quick Open-short Tests on Switches and Wires; Beep + Backlight Effects for Noisy Environments

## FULLY AUTO-RANGING

Shortens the Time to Measure and Increases the Ease of Use

## LOGIC LEVEL Hz AND %

Measures Digital Logic Level Frequencies and Duty Cycles

## BACKLIGHTED LCD DISPLAY

For Easy Viewing in The Dark; 16 mins Auto-Off to Save Battery Power

## 0.03% BASIC DCV ACCURACY

Measures DCV up to 1000Vdc

## REC MAX MIN AVG READINGS

Speedy Records Max, Min and Calculates Average Readings Over Time; Automatic APO Disable

## dBm READINGS

Features 20 Selectable Reference Impedance Values

## AutoV

Automatic Selection of ACV or DCV

## LPF ACV & Hz FOR VFDs

Measures Voltage & Frequency of Most Variable Frequency Drives and Noisy Electrical Signals up to 1000Vac

## LoZ GHOST-VOLTAGE-BUSTER

Low Ramp-up Input Impedance to Drain Ghost Voltages Leaving Only Hard Signal Meter Readings

## BEEPJACK™ MIS-INPUT WARNING

Guards Against Improper Amps Terminals Plug-in for Voltage Measurements

## RUGGED & DURABLE

Robust Enclosure; Precise & Reliable Rotary Switch; Premium Plating & Low Leakage PCB

## INTELLIGENT AUTO-POWER-OFF (APO)

Stays ON While in Measurements; Intelligently Turns OFF to Extend Battery Life; Disable option

## EMC

Superior Immunity to Interferences; Reliable Operations and Readings; Meets EN61326-1



## ERGONOMIC & STREAMLINE BODY

Over-molded Holster Fits Nicely in One Hand; Reduced Size for Easy Carrying

## RELATIVE ZERO

REL for Convenient Readings Comparison

## DUAL SENSITIVITIES EF-DETECTION

Features Non-Contact (NCV) & Single-Pole Contact Voltage Detections; Selectable Hi/Lo Dual Sensitivities

## LARGE 60,000 COUNTS LCD DISPLAY

5-5/6 Digits High Resolution; 5/Sec Fast Nominal Update Rate

## DATA HOLD

Freezes the Displaying Reading for Later View

## FAST ANALOG BAR-GRAPH

50/Sec Fast Nominal Update Rate

## AUTOHOLD REAL-READ™

Shows Real-time Readings and automatically latches the last stable reading for later display

## CREST MAX MIN PEAKS

Fast Captures +/- Peak Extremes at Durations as Short as 0.25ms; Automatic APO Disable

## %4~20mA READINGS

Monitors and Verifies Process Control Loop Currents

## TYPE-K TEMPERATURE

T1, T2 Dual Inputs; Selectable °C and °F Readings

## INNOVATIVE BeepLit™ DIODE TEST

Short-Beep Alert on Forward Voltages <0.85V; Continuous Beep & Backlight Effects for Shorted Diode Continuities

## CAPACITANCE

Up to 10mF for Measuring Motor Capacitors

## LVD CAT III 1000V & CAT IV 600V

Certified EN61010-2-033, EN61010-1 & Relevant Standards on CAT III 1kV & CAT IV 600V

## nS CONDUCTANCE

nS=1/GΩ virtually extends Resistance measurements to the order of GΩ

## TRANSIENT PROTECTION

Up To 8kV 1.2/50µs Lightning Surge; Fully Certified by Independent Test Lab; Years of Credibility for Serious Users

## RESISTANCE

Best Resolution 0.01Ω At 600Ω Range; 6 Auto-ranges Up To 60MΩ

# ELECTRICAL SPECIFICATIONS

Accuracy is  $\pm$ (% reading digits + number of digits) or otherwise specified, at 23°C  $\pm$  5°C & less than 75% relative humidity. Maximum Crest Factor <1.6:1 at full scale & < 3:2.1 at half scale, and with frequency components fall within the specified frequency bandwidth for non-sinusoidal waveforms.

## DC Voltage

RANGE	Model 789	Model 785
600.00mV, 6.0000V	0.03% + 2d	0.03% + 2d
600.00V	0.05% + 5d	0.05% + 5d
1000.0V	0.15% + 5d	0.15% + 5d

Input Impedance: 10M $\Omega$ , 75pF nominal (280pF nominal for 600mV range)

## VFD AC Voltage

RANGE	Accuracy <sup>1)</sup>
10Hz ~ 200Hz	
600.00V, 1000.0V	4% + 50d
200Hz ~ 440Hz	
600.00V, 1000.0V	10% + 50d <sup>2)</sup>

<sup>1)</sup>Signal fundamental frequency > 440Hz is unspecified

<sup>2)</sup>Accuracy linearly decreases from 2% + 50d @ 200Hz to 10% + 50d @ 440Hz

## dBm (Model 789 only)

Range and accuracy are subject to ACmV, ACV and reference impedance selected.

Typical 600 $\Omega$  reference impedance ranges:

In ACmV: -42.22 dBm to -2.22 dBm

In ACV: -17.78 dBm to 62.22 dBm

Input Impedance: 10M $\Omega$ , 140pF nominal

Selectable reference impedance of 4, 8, 16, 32, 50, 75, 93, 110, 125, 135, 150, 200, 250, 300, 500, 600, 800, 900, 1000 and 1200 $\Omega$

## CREST mode (Instantaneous Peak Hold)

Accuracy: Specified accuracy  $\pm$  100 digits for changes > 0.35ms in duration

Availability: Voltage and Current functions

Resolution: 6000 counts

## AutoHold Real-Read™

Accuracy: Specified accuracy  $\pm$  50 digits

Availability: Resistance, Continuity, LoZ AutoV, VFD Volts, Voltage and Current functions

## DC Loop Current %4-20mA (Model 789 only)

4mA = 0% (zero)

20mA = 100% (span)

Resolution: 0.01%

Accuracy:  $\pm$  25d

# GENERAL SPECIFICATIONS

Display: 4-5/6 digits 60,000 counts.

Polarity: Automatic

Update Rate:

4-5/6 digits: Max 5 per second nominal

31 Segment Bar-graph: 50 per second max

Operating Temperature: -20°C to 55°C continuous operating (except on A function, see Electrical Specifications below for more details)

Relative Humidity: Maximum relative humidity 80% for temperature up to 31°C decreasing linearly to 50% relative humidity at 55°C

Pollution degree: 2

Storage Temperature: -20°C to 60°C, < 80% R.H. (with battery removed)

Altitude: Operating below 2000m

Temperature Coefficient: nominal 0.10 x (specified accuracy) / °C @ (-20°C ~ 18°C or 28°C ~ 55°C), or otherwise specified

Sensing: AC and AC+DC True RMS

Safety: Double insulation per IEC/UL/EN 61010-1 Ed. 3.0, IEC/UL/EN 61010-2 -030 Ed. 1.0, IEC/UL/EN 61010-2-033 Ed. 1.0, IEC/UL/EN 61010-031 Ed. 2.0 and the corresponding CAN/CSA-C22.2 regulations to Measurement Categories III 1000V AC & DC and Category IV 600V AC & DC

Overload Protections:

$\mu$ A & mA: 0.4A/1000V DC/AC, IR 30kA or better, F fuse

A: 11A/1000V DC/AC, IR 20kA or better, F fuse

V: 1100V DC/AC rms

mV,  $\Omega$  & Others: 1000 V DC/AC rms

Transient protection: 8kV (1.2/50 $\mu$ s surge)

E.M.C.: Meets EN61326-1:2013

Power Supply: 1.5V AAA Alkaline battery x 3

Power Consumption: 10mA typical for AC & AC+DC Voltage/Current functions; 8mA typical for other functions

Low Battery: Below approx. 3.7V

APO Timing: Idle for 15 minutes

APO Consumption: 15 $\mu$ A typical.

Dimension: L193mm X W89mm X H51mm

Weight: 635 gm

Accessories: Test lead pair, User's manual, Bkp60 banana plug K-type thermocouple x 1 (Model 789 only)

Optional Accessories: BKB32 banana plug to type-K socket plug adaptor (Model 789 only), BMH-02 magnetic hanger strap

Special Features: AutoHold; VFD; BeepLit™ Continuity; Record MAX, MIN, & AVG readings; Crest (Instantaneous Peak hold) MAX & MIN readings; Relative Zero mode; Data Hold; Backlight LCD display; BeepJack™ audible & visible input warning; %4-20mA loop current readings (Model 789 only); T1-T2 differential temperature readings (Model 789 only); dBm readings (Model 789 only)

## AC Voltage

RANGE	Model 789 <sup>1)</sup>	Model 785
Accuracy		
50Hz ~ 60Hz		
600.00mV <sup>2)</sup> , 6.0000V, 60.000V, 600.00V, 1000.0V	0.5% + 30d	0.5% + 30d
40Hz ~ 1kHz		
600.00mV <sup>2)</sup> , 6.0000V, 60.000V, 600.00V, 1000.0V	0.9% + 30d	1.2%+30d
1kHz ~ 7kHz		
600.00mV <sup>2)</sup> , 6.0000V, 60.000V, 600.00V	1.8% + 40d	2.0%+40d <sup>3)</sup>
1000.0V	Unspec'd	Unspec'd
7kHz ~ 20kHz		
600.00mV <sup>2)</sup> , 6.0000V, 60.000V, 600.00V <sup>4)</sup>	2.0%+60d	Unspec'd
1000.0V	Unspec'd	Unspec'd
20kHz ~ 100kHz		
600.00mV <sup>2)</sup> , 6.0000V <sup>5)</sup> , 60.000V <sup>5)</sup>	4.0%+60d	Unspec'd
600.00V, 1000.0V	Unspec'd	Unspec'd

<sup>1)</sup>Accuracy specified from 10% to 100% of range

<sup>2)</sup>Signal peak absolute values, including DC bias, less than 1000mV<sub>peak</sub>

<sup>3)</sup>Accuracy adds 1% @ >5kHz ~ 7kHz

<sup>4)</sup>Bandwidth specified to 10kHz only for 600V range

<sup>5)</sup>Accuracy specified from 30% to 100% of range

Input Impedance: 10M $\Omega$ , 75pF nominal (140pF nominal for 600mV range)

Residual reading less than 50 digits with test leads shorted

## AC+DC Voltage

RANGE	Model 789 <sup>1)</sup>	Model 785
Accuracy		
50Hz ~ 60Hz		
600.00mV <sup>2)</sup> , 6.0000V, 60.000V, 600.00V, 1000.0V	0.7% + 40d	0.7% + 40d
0Hz, 40Hz ~ 1kHz		
600.00mV <sup>2)</sup> , 6.0000V, 60.000V, 600.00V, 1000.0V	1.2% + 40d	1.4%+40d
1kHz ~ 7kHz		
600.00mV <sup>2)</sup> , 6.0000V, 60.000V, 600.00V	2.0% + 50d	2.2%+50d <sup>3)</sup>
1000.0V	Unspec'd	Unspec'd
7kHz ~ 20kHz		
600.00mV <sup>2)</sup> , 6.0000V, 60.000V, 600.00V <sup>4)</sup>	2.5%+70d	Unspec'd
1000.0V	Unspec'd	Unspec'd

<sup>1)</sup>Accuracy specified from 10% to 100% of range

<sup>2)</sup>Signal peak absolute values, including DC bias, less than 1000mV<sub>peak</sub>

<sup>3)</sup>Accuracy adds 1% @ >5kHz ~ 7kHz

<sup>4)</sup>Bandwidth specified to 10kHz only for 600V range

Input Impedance: 10M $\Omega$ , 75pF nominal (140pF nominal for 600mV range)

Residual reading less than 50 digits with test leads shorted.

## LoZ Auto-DCV (Model 789 only)

RANGE	Accuracy
6.0000V, 60.000V, 600.00V, 1000.0V	0.5%+30d

LoZ Auto-DCV Threshold: > +1.0VDC or < -1.0VDC nominal

LoZ Auto-DCV Input Impedance:

Initially approx. 2.1k $\Omega$ , 140pF nominal; Impedance increases abruptly

within a fraction of a second as display voltage is above 50V (typical).

Ended up impedances vs display voltages typically are:

12k $\Omega$  @ 100V

90k $\Omega$  @ 300V

300k $\Omega$  @ 600V

670k $\Omega$  @ 1000V

## LoZ Auto-ACV (Model 789 only)

RANGE	Accuracy <sup>1)</sup>
50Hz ~ 60Hz	
6.0000V, 60.000V, 600.00V, 1000.0V	1.0%+40d

<sup>1)</sup>Accuracy specified from 10% to 100% of range

LoZ Auto-ACV Threshold: > 1.0VAC (50/60Hz) nominal

LoZ Auto-ACV Input Impedance:

Initially approx. 2.1k $\Omega$ , 140pF nominal; Impedance increases abruptly within

a fraction of a second as display voltage is above 50V (typical). Ended up

impedances vs display voltages typically are:

12k $\Omega$  @ 100V

90k $\Omega$  @ 300V

300k $\Omega$  @ 600V

670k $\Omega$  @ 1000V

## Ohms

RANGE	Accuracy <sup>1)</sup>
600.00 $\Omega$	0.085%+10d
6.0000k $\Omega$ , 60.000k $\Omega$	0.085%+4d
600.00k $\Omega$	0.15%+4d
6.0000M $\Omega$ <sup>2)</sup>	1.5%+5d
60.000M $\Omega$ <sup>3)</sup>	2.0%+5d
99.99nS <sup>5)</sup>	1.0%+10d

Open Circuit Voltage: < 1.3VDC (< 1.5VDC for 600 $\Omega$  range)

<sup>1)</sup>Temperature Coefficient: 0.20 x (specified accuracy) / °C @ (-20°C ~ 18°C or 28°C ~ 55°C)

<sup>2)</sup>Constant Test Current: 0.1 $\mu$ A Typical

<sup>3)</sup>Constant Test Current: 0.01 $\mu$ A Typical

<sup>4)</sup>Specified accuracy adds 0.5% @ >50M $\Omega$

<sup>5)</sup>For Model 789 only; Specified accuracy adds 30d @ <10nS

## BeepLit™ Diode Tester

RANGE	Accuracy	Test Current (Typical)	Open Circuit Voltage
3.0000V	1%+20d	0.35mA	< 3.1 VDC

Short-Beep-Alert Threshold: Drop Across 0.850V

BeepLit™ continuous ON Threshold: < 0.100V

Audible Indication: Beep Sound

Visible Indication: LCD Backlight

## DC Current

RANGE	Accuracy	Burden Voltage
600.00 $\mu$ A <sup>1)</sup>	0.075%+20d	0.2mV/ $\mu$ A
6000.0 $\mu$ A	0.075%+20d	0.2mV/ $\mu$ A
60.000mA <sup>2)</sup>	0.075%+20d	2.0mV/mA
600.00mA	0.15%+20d	2.0mV/mA
6.0000A	0.3%+20d	30mV/A
10.000A <sup>3)</sup>	0.3%+30d	30mV/A

<sup>1)</sup>Specified with Open-circuit-voltage (OCV) of Current-loop-under-test at > 100 $\mu$ V.

<sup>2)</sup>The meter shows a few negative residue counts when the input is short-circuited, with OCV at zero volt. It is the nature of the internal protection circuitry design, and will not affect measurement readings at nominal OCVs greater than 100 $\mu$ V in significant measurements.

<sup>3)</sup>10A continuous up to ambient 40°C only, and is <3 mins on per >15 mins off @ 40°C ~ 55°C; >10A to 20A for <30 seconds on per >15 mins off

## BeepLit™ Continuity Tester

Audible threshold: between 100 $\Omega$  and 420 $\Omega$

Response time < 100 $\mu$ s

Audible Indication: Beep Sound

Visible Response: LCD Backlight

## Capacitance

RANGE	Accuracy <sup>1)</sup>
10.00nF	1.0% + 10d
100.0nF ~ 1000nF	1.0% + 2d
10.00 $\mu$ F ~ 1.000mF	1.8% + 4d
10.00mF	2.0% + 4d

<sup>1)</sup>Accuracies with film capacitor or better

<sup>2)</sup>Temperature Coefficient: 0.20 x (specified accuracy) / °C @ (-20°C ~ 18°C or 28°C ~ 55°C)

## AC Current

RANGE	Model 789 <sup>1)</sup>	Model 785	Burden Voltage
Accuracy			
40Hz ~ 3kHz			
600.00 $\mu$ A, 6000.0 $\mu$ A	0.9%+20d	0.9%+20d	0.2mV/ $\mu$ A
60.000mA, 600.00mA			2.0mV/mA
6.0000A, 10.000A <sup>2)</sup>	1.0%+30d	1.0%+30d	30mV/A

<sup>1)</sup>Accuracy unspecified @ <10% of range

<sup>2)</sup>10A continuous up to ambient 40°C only, and is <3 mins on per >15 mins off @ 40°C ~ 55°C; >10A to 20A for <30 seconds on per >15 mins off

## AC+DC Current

RANGE	Model 789 <sup>1)</sup>	Model 785	Burden Voltage
Accuracy			
0Hz, 40Hz ~ 3kHz			
600.00 $\mu$ A, 6000.0 $\mu$ A	1.0%+30d	1.0%+30d	0.2mV/ $\mu$ A
60.000mA, 600.00mA			2.0mV/mA
6.0000A, 10.000A <sup>2)</sup>	1.2%+40d	1.2%+40d	30mV/A

<sup>1)</sup>Accuracy unspecified @ <10% of range

<sup>2)</sup>10A continuous up to ambient 40°C only, and is <3 mins on per >15 mins off @ 40°C ~ 55°C; >10A to 20A for <30 seconds on per >15 mins off

## Temperature (Model 789 only)

RANGE	Accuracy <sup>1)</sup>
-200.0°C to 1090°C	1.0%+1.0°C
-328.0°F to 1994°F	1.0%+1.8°F

<sup>1)</sup>Accuracies assume meter interior has the same temperature (isothermal stage) of the ambient for a correct junction voltage compensation. Allow the meter and the type-K probe set to reach isothermal stage for a significant change of ambient temperature. It can take up to an hour for changes > 5°C.

<sup>2)</sup>Type-K thermocouple range & accuracy not included

## Hz Logic Level Frequency

RANGE	Accuracy <sup>1)</sup>
5.000Hz ~ 1.0000MHz	0.002%+4d

<sup>1)</sup>Sensitivity: >3.0Vp square wave

<sup>2)</sup>Specified with Pulse Width > 0.5 $\mu$ s

## %Duty Cycle

5V Logic Frequency	RANGE Specified	Accuracy
5Hz ~ 1kHz	0.10% ~ 99.99%	
1kHz ~ 10kHz	1.00% ~ 99.00%	3d/kHz+2d
10kHz ~ 500kHz	20.00% ~ 80.00%	

Sensitivity: >3.0Vp square wave