

# Full Function Handy DMMs for Lab and Field Services!

Full  $\mu\text{A}/\text{mA}/10\text{A}$  Ranges, Audible + Visible BeepLit™ Continuity, AutoV + Ghost Voltage Buster, VFD V & Hz Fundamentals, Hi & Lo EF-Detection, Records Min/Max/Average, Relative Zero, BeepJack™ Warning!

## BM230 SERIES

Practical Multimeter



www.brymen.com





BM235



BM233



BM231

235	233	231	FUNCTIONS & FEATURES
•			AutoV LoZ Feature. Automatic DC & AC 600V Selection With Low Initial Impedance To Drain Ghost Voltages
•			Type-K Temperature Readings -40°C To 400°C or -40°F To 752°F
•	•		Cx Ranges 20.00nF to 10.00mF For Start & Run Motor Capacitors
•	•		Line Level Frequency Ranges 99.99Hz To 50.00kHz
•	•	•	3-5/6 Digits 6,000 Counts Large Easy To Read LCD Display
•	•	•	Fast Measurements, 5/Sec; Fully Auto-Ranging
•	•	•	Intelligent Auto Power Off
•	•	•	True RMS AC Conversion
•	•	•	Data Hold
•	•	•	Records Max/Min Readings & Calculates Avg Readings Over Time
•	•	•	VFD V & Hz Fundamental Readings Of Most Variable-Frequency-Drives
•	•	•	White Back-Lighted LCD Display
•	•	•	BeepLit™ Continuity; Features Audible Beep & Visible Backlight Effects
•	•	•	Relative Zero Mode
•	•	•	Non-Contact EF-Detection (NCV) With Hi/Lo Selectable Sensitivities
•	•	•	Probe-Contact EF-Detection For More Precise Indication Of Live
•	•	•	DC/AC V Ranges 600.0mV To 600.0V
•	•	•	Ohms Ranges 600.0Ω To 60.00MΩ
•	•	•	DC/AC μA, mA & A Ranges 600.0μA To 10.00A (20A for 30s / 5 mins cool down)
•	•	•	Beep-Jack™ Input Warning Against Improper μAmA/A-Terminals Plug In
•	•	•	Diode Tester
•	•	•	Rugged Fire Retarded Housing
•	•	•	Replaceable Protective Holster With Probe-Holders & Tilt-Stand
•	•	•	Optional Purchase Magnetic Hanger
•	•	•	Batteries And Fuses Access Door
•	•	•	Transient Protection Up To 6kV 1.2/50μs Lightning Surge
•	•	•	LVD: EN61010-1/-2-033 CAT-III 600V & CAT-IV 300V
•	•	•	EMC: EN61326-1

# Compact Yet Optimized For Your Daily Service!

Full  $\mu\text{A}/10\text{A}$  Ranges, BeepLit™ Continuity, Hi/Lo EF-Detection, LoZ AutoV, VFD V/Hz, °C/°F, Min/Max/Avg, BeepJack™ Warning

## True RMS Measurements

For Non-sinusoidal Waveforms  
Of AC Voltages & AC Currents

## Large 6000 Counts LCD Display

5/sec Fast Nominal Update Rate

## Auto & Manual-ranging

Auto-ranging With  
Manual-ranging Override

## White Display Backlight

For Easy Viewing In The Dark

## Hz Of Line Level Voltage

Measures Noisy High Voltage  
ACV Frequencies

## Function Selection

Toggle Conveniently Between  
Primary & Secondary Functions

## VFD V & Hz Feature

Measures Fundamental  
Voltage & Frequency Of Most  
Variable-Frequency-Drives

## AutoV LoZ Feature

Automatic Selection Of  
LoZ DCV And LoZ ACV

## Ghost-voltage-buster

AutoV LoZ Drains Ghost/ Stray Voltages  
Leaving Only Hard Signals  
On Meter Readings

## Beep-jack™ Audible Warning

Beeps Against Improper A-terminal  
Plug In. Decreases Risks Of Damage

## High Impedance Voltage

600VAC/DC Measuring Capabilities;  
High Input Impedance For  
Load Sensitive Circuits

## Protective Holster

With Holders For Probe Storage  
And "third Hand" Feature,  
Replaceable & Washable

## EMC

Meets EN61326-1



## Max Min Avg Record

Record Max/Min And  
Calculates Average  
Readings Over Time

## Relative Zero Mode

For Convenient Readings  
Comparison & Offset

## Data Hold

Freezes The Displaying  
Reading For Later View

## Hi/Lo Senses EF-Detection

Both Non-contact (NCV) &  
Single-probe Voltage Detection  
For Identifying Live Lines

## Full $\mu\text{A}$ , mA & A Ranges

6 Full Current Ranges With  
1000V HBC Fuses Protected

## BeepLit™ Continuity

Quick Open-short Tests.  
Beep and Backlight Effects  
For Noisy Environments

## Type-k Temperature

Selectable °C & °F Readings

## Intelligent Auto-power-off

To Extend Battery Life

## Transient Protection

Up To 6kV 1.2/50 $\mu\text{s}$  Lightning Surge;  
Superb Protection For Serious Users

## LVD Safety

Meets EN61010-1/61010-2-033  
CAT III 600V & CAT IV 300V

## ELECTRICAL SPECIFICATIONS

Accuracy is given as  $\pm$ (% of reading digits + number of digits) or otherwise specified @ 23°C  $\pm$  5°C ACV & ACA accuracies are specified from 1% to 100% of range or otherwise specified. Maximum Crest Factor <2:1 at full scale & <4:1 at half scale, and with frequency components fall within the meter specified frequency bandwidth for non-sinusoidal waveforms

### AC Voltage

RANGE	Accuracy
50Hz ~ 60Hz	
6.000V <sup>1)</sup> , 60.00V, 600.0V	0.7% + 3d
45Hz ~ 440Hz	
6.000V <sup>1)</sup> , 60.00V, 600.0V	2.0% + 3d

Input Impedance: 10M $\Omega$ , 54pF nominal

Overload protection: 1100Vrms for AC & 660V for DC

<sup>1)</sup><5d non-zero residue may appear when backlight is on, which will not affect the specified measuring range and accuracy

### DC Current

RANGE	Accuracy	Burden Voltage
600.0 $\mu$ A, 6000 $\mu$ A	1.0% + 3d	0.1mV/ $\mu$ A
60.00mA, 600.0mA	0.7% + 3d	1.9mV/mA
6.000A, 10.00A <sup>1)</sup>		0.04V/A

<sup>1)</sup>10A continuous, >10A to 20A for 30 seconds max with 5 minutes cool down interval

### BeepLit™ Continuity Tester

Continuity Threshold: Between 30 $\Omega$  and 480 $\Omega$

Continuity ON Response Time: <15ms

Audible Indication: Beep sound

Visible Indication: LCD Backlight

## GENERAL SPECIFICATIONS

Display: 3-5/6 digits 6,000 counts

Update Rate: 5 per second nominal

Operating Temperature: -10°C to 45°C

Relative Humidity: Maximum relative humidity 80% for temperature up to 31°C decreasing linearly to 50% relative humidity at 45°C

Altitude: Operating below 2000m

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

Temperature Coefficient: Nominal 0.15 x (specified accuracy)/°C @ -10°C ~ 18°C or 28°C ~ 45°C, or otherwise specified

Sensing: True RMS sensing

Ingress Protection: IP40

Pollution Degree: 2

Safety: Certified per IEC/UL/EN61010-1 Ed. 3.1, IEC/UL/EN61010-2-033 Ed. 2.0, IEC/UL/EN61010-031 Ed. 2.0 and the corresponding CAN/CSA-C22.2 regulations to Measurement Categories:

CAT III 600V and CAT IV 300V AC & DC

Transient Protection: 6.0kV (1.2/50 $\mu$ s surge)

E.M.C.: Meets EN61326-1

In an RF field of 3V/m:

Temperature function is not specified

Ohm function:

Total Accuracy = Specified Accuracy + 15 digits

Other functions:

Total Accuracy = Specified Accuracy

Performance above 3V/m is not specified

Overload Protection:

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

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

V & AutoV: 660Vdc / 1100Vac rms

mV, Ohm & others: 600Vdc/Vac rms

Low Battery: Below approx. 2.5V

Power Supply: 1.5V AAA Size battery X 2

Power Consumption (typical): 3.2mA

APO Consumption (typical): 10 $\mu$ A

APO Timing: Idle for 30 minutes

Dimension: 161\*80\*50mm L\*W\*H (With Holster)

Weight: Approx. 334 gm (With Holster)

Special Features: AutoV (LoZ) (Model 235 only); VFD; BeepLit™ Continuity;

Auto-ranging MAX/MIN/AVG Record; Backlighted LCD; Auto-ranging Relative

Zero mode; Display Hold; EF-Detection (NCV); BeepJack™ on  $\mu$ Am/A/A

terminals

Accessories: Test lead pair; Batteries installed; User's manual; BKP60

banana plug type-K thermocouple (Model 235 only)

Optional Purchase Accessories: BK832 banana plug to type-K socket plug

adaptor (Model 235 only); BMH-01 magnetic hanger; BMP-25x soft carrying

pouch



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### ACmV

RANGE	Accuracy
10Hz ~ 500Hz	
60.00mV <sup>1)2)</sup> , 600.0mV <sup>3)</sup>	1.0% + 3d
500Hz ~ 800Hz	
60.00mV <sup>1)2)</sup> , 600.0mV <sup>3)</sup>	2.0% + 3d

Overload protection: 600Vrms AC/DC

Input Impedance: 10M $\Omega$ , 54pF nominal

<sup>1)</sup><5d non-zero residue may appear when backlight is on, which will not affect the specified measuring range and accuracy

<sup>2)</sup>Signal peak absolute values, including DC bias, less than 130mV<sub>peak</sub>

<sup>3)</sup>Signal peak absolute values, including DC bias, less than 1300mV<sub>peak</sub>

### VFD ACV (with Low Pass Filter)

RANGE	Accuracy <sup>1)</sup>
10Hz ~ 100Hz (fundamental)	
600.0V	1.0% + 3d
100Hz ~ 400Hz (fundamental)	
600.0V	10% + 3d <sup>2)</sup>

Overload protection: 1100Vrms for AC & 660V for DC

<sup>1)</sup>Not specified for fundamental frequency > 400Hz

<sup>2)</sup>Accuracy linearly decreases from 1% + 3d @100Hz to 10% + 3d @400Hz

### AutoV ACV (Model 235 only)

RANGE	Accuracy <sup>1)</sup>
45Hz ~ 440Hz	
600.0V	2.0% + 3d

Overload protection: 1100Vrms for AC & 660V for DC

<sup>1)</sup>Not specified at <1VAC

Threshold: > 1VAC nominal

Approximate input impedance (//164pF) for reference:

At direct input  $\leq$ 50Vac (typical) from quiescence:

>8M $\Omega$ @ < 5.6Vac

22k $\Omega$ @ 7Vac

12k $\Omega$ @ 8Vac

2.6k $\Omega$ @ 50Vac

At direct input >>50V (typical) from quiescence:

Initial impedance is approximately 2.1k $\Omega$ .

Impedance increases abruptly within a fraction of a second as

display voltage (hard signal) is much higher than 50V (typical).

End-up impedances vs display voltages typically are:

12k $\Omega$ @100V

100k $\Omega$ @300V

240k $\Omega$ @600V

### DC Voltage

RANGE	Accuracy
60.00mV <sup>1)</sup> , 600.0mV <sup>1)</sup> , 6.000V <sup>2)</sup>	0.3% + 2d
60.00V <sup>2)</sup>	0.4% + 2d
600.0V <sup>2)</sup>	0.2% + 2d

Input Impedance: 10M $\Omega$ , 54pF nominal

<sup>1)</sup>Overload protection: 600Vrms AC/DC

<sup>2)</sup>Overload protection: 1100Vrms for AC & 660V for DC

### Capacitance (Models 233 & 235 only)

RANGE	Accuracy
20.00nF, 200.0nF	1.5% + 8d
2000nF, 20.00 $\mu$ F, 200.0 $\mu$ F, 2000 $\mu$ F	1.5% + 2d
10.00mF	4.5% + 10d

Accuracies with film capacitor or better

### Diode Tester

RANGE	Accuracy
3.000V	0.9% + 2d

Test Current: 0.3mA typical

Open Circuit Voltage: < 3.2VDC typical

### Ohm

RANGE <sup>1)</sup>	Accuracy
600.0 $\Omega$ , 6.000k $\Omega$	0.3% + 3d
60.00k $\Omega$ , 600.0k $\Omega$	0.5% + 3d
6.000M $\Omega$ <sup>2)</sup> , 60.00M $\Omega$ <sup>3)</sup>	0.9% + 2d <sup>4)</sup>

<sup>1)</sup>Open Circuit Voltage: 1.6VDC typical

<sup>2)</sup>Constant Test Current: 0.2 $\mu$ A Typical

<sup>3)</sup>Constant Test Current: 0.02 $\mu$ A Typical

<sup>4)</sup>5%+20d @ >30M $\Omega$

### AutoV DCV (Model 235 only)

RANGE	Accuracy <sup>1)</sup>
600.0V	2.0% + 3d

Overload protection: 1100Vrms for AC & 660V for DC

<sup>1)</sup>Not specified at <1VDC

Threshold: > +1.0VDC or < -1.0VDC nominal

Approximate input impedance (//164pF) for reference:

At direct input  $\leq$ 50Vdc (typical) from quiescence:

>8M $\Omega$ @ < 8Vdc (Protection clamping threshold)

25k $\Omega$ @ 9Vdc

13k $\Omega$ @ 10Vdc

2.6k $\Omega$ @ 50Vdc

At direct input >>50V (typical) from quiescence:

Initial impedance is approximately 2.1k $\Omega$ .

Impedance increases abruptly within a fraction of a second as

display voltage (hard signal) is much higher than 50V (typical).

End-up impedances vs display voltages typically are:

12k $\Omega$ @100V

100k $\Omega$ @300V

240k $\Omega$ @600V

### AC Current

RANGE	Accuracy	Burden Voltage
50HZ ~ 400HZ		
600.0 $\mu$ A, 6000 $\mu$ A	1.5% + 3d	0.1mV/ $\mu$ A
60.00mA, 600.0mA	1.0% + 3d	1.9mV/mA
6.000A <sup>1)</sup> , 10.00A <sup>2)</sup>		0.04V/A

<sup>1)</sup><5d non-zero residue may appear when backlight is on, which will not affect the specified measuring range and accuracy

<sup>2)</sup>10A continuous, >10A to 20A for 30 seconds max with 5

minutes cool down interval

### Temperature (Model 235 only)

RANGE	Accuracy <sup>1)2)</sup>
-40.0°C ~ 99.9°C	1% + 1°C
100°C ~ 400°C	
-40.0°F ~ 99.9°F	1% + 2°F
100°F ~ 752°F	

<sup>1)</sup>Accuracies assume meter interior and the ambient have reached the same temperature (isothermal stage) for a correct junction voltage compensation. Allow enough settling time 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

### Line Frequency (Models 233 & 235 only)

Function	Sensitivity (Sine RMS)	Range
60mV, 600mV	50mV	10Hz - 50kHz
6V	5V	10Hz - 50kHz
60V	10V	10Hz - 50kHz
600V	50V	10Hz - 1kHz
1000V	500V	10Hz - 1kHz
VFD 600V	50V	10Hz - 1kHz
VFD 1000V	500V	10Hz - 1kHz
600 $\mu$ A, 6000 $\mu$ A	500 $\mu$ A	10Hz - 5kHz
60mA, 600mA	50mA	10Hz - 5kHz
6A, 10A	8A	50Hz - 1kHz

Accuracy: 0.03% + 2d

### Line Frequency (Models 233 & 235 only)

Bar-Graph Indication	EF-H (Hi Sensitivity)	EF-L (Lo Sensitivity)
	Typical Voltage (Tolerance)	
-	10V (3V ~ 19V)	40V (16V ~ 71V)
--	20V (10V ~ 38V)	80V (32V ~ 142V)
---	40V (21V ~ 79V)	160V (63V ~ 285V)
----	80V (40V ~ 156V)	300V (105V ~ 608V)
-----	160V (>80V)	500V (>300V)

Indication: Bar-graph segments & audible beep tones proportional to the field strength

Detection Frequency: 50/60Hz

Detection Antenna: Top-left end of the meter

Probe-Contact EF-Detection: For more precise

indication of live wires, such as distinguishing between live and

ground connections, use direct contact testing with one single test-

probe via the input terminal COM or V. The COM terminal (Black)

has the best sensitivity.