AVO® ADVANCED ANALOGUE/DIGITAL MULTIMETERS

M3004, M3005 & M3006

226 361 / 226 385

A series of hand-held multimeters featuring unique Safety Zone terminals linked to the Range Selector.

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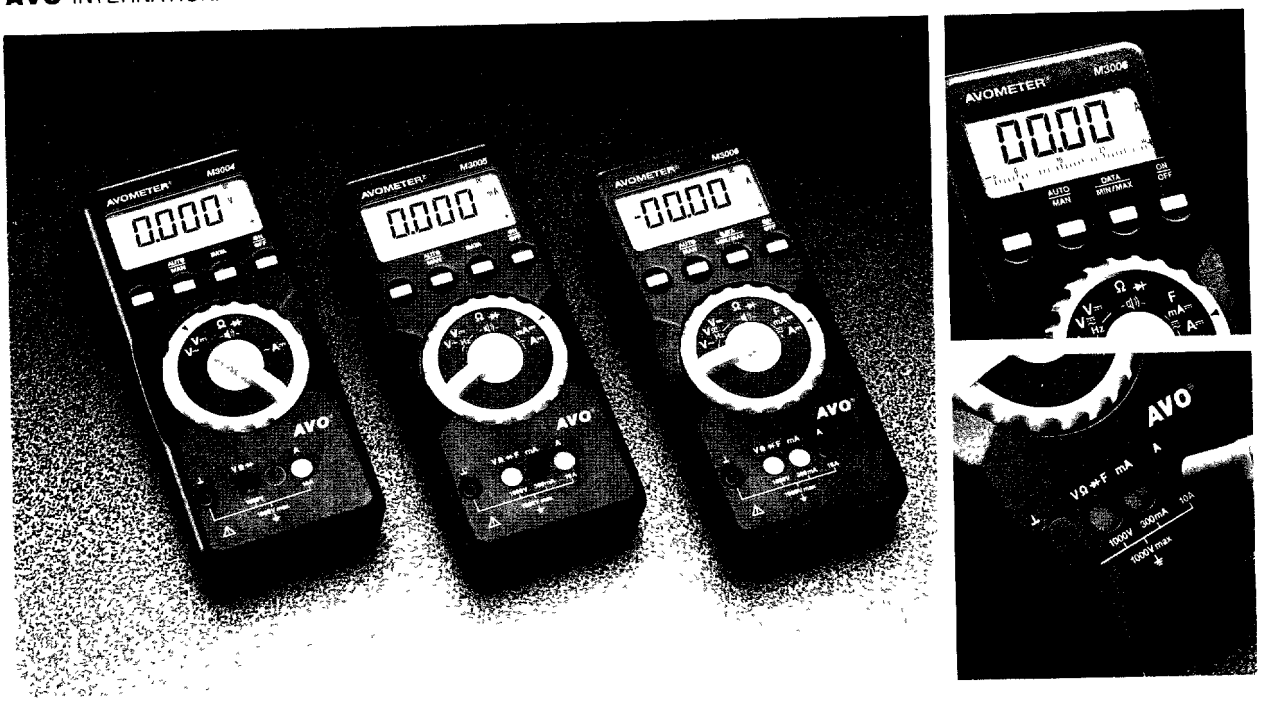

Safety Zone terminals for user protection.

Combined analogue and digital liquid crystal display with large, easy to read digits.

35 division analogue scale with dynamic pointer; digital display $3^3/_4$ digit.

All current ranges fused.

Capacitance, frequency and duty cycle on M3005 and M3006.

Basic accuracy from ±0,5% to ±0,1%.

True r.m.s. a.c. + d.c. measurement on M3006.

Data hold function — detects when a new test point is probed.

Automatic switch-off, over-ride facility.

Continuity buzzer/diode tests.

The M3004, M3005 and M3006 are hand-held instruments from the AVO® M3000 series of analogue/digital multimeters whose characteristics include wide ranges and a high accuracy of measurement They are designed in general compliance with the BS 4743 and IEC 1010-1 safety specifications A precise digital reading and a high resolution analogue scale combine to give accurate measurement of a value and clear indication of its variations

Display

The liquid crystal display has $3^3/_4$ digits with 15 mm high characters and a high resolution analogue scale with a dynamic pointer and 35 calibrated divisions A negative portion of the scale is visible for d c voltage and current measurements so that fluctuations around zero can be studied The display also shows all that the user needs to know about the measurement and instrument settings, with annunciators to indicate the units of measurement, the measuring range in operation, range, data or min/max hold as appropriate, over-range violations, battery status etc Having a solid state pointer, the display has no parallax problems and is highly resistant to impacts

Case Design

The instrument case design has distinctive features It is rugged and hard wearing with the advantage of easy disassembly, to change fuses and battery The Safety Zone terminals provide operator protection for the user as well as ease of operation Direct coupling from the rotary function switch ensures that, automatically, two out of three terminals are always 'safety blocked'

Functions

Although the instruments are autoranging (except for the 300 mV range), any current, voltage, resistance, capacitance, frequency or duty cycle measuring range can be selected and held When 'Data Hold' is selected the measured reading will be retained on the display when the test prods are removed The display will automatically update as a new test point is probed When 'Min/Max' is selected on the M3006 the minimum and the maximum measured reading can be displayed Min/Max does not influence the analogue indication The actual measured value can still be read The M3006 measures the true r m s values of a c and d c quantities, the other instruments in the group have average responding a c and d c ranges (corrected to r m s for sine waves) All instruments are able to test diodes and have buzzers for audible continuity testing

Controls

There is a rotary switch fitted to the front panel for function selection Push-buttons operate the manual/autorange, data hold and min/max hold facilities

Supply and Protection

The power supply for each instrument is provided by a replaceable 9 V IEC 6F 22 battery For all models the current ranges of the instruments are protected by two fuses in series with the input terminals, one for the 10 A range only and the other for all other current ranges In addition to this, overload protection extends to 1200 V on voltage ranges and 500 V on other ranges

Applications

The M3000 series are uniquely flexible instruments, ideal for use in the workshop and in the field, but also suitable for the laboratory The precision of the digital reading combined with the ability to follow trends and changes on the analogue scale, ensures that the technician or engineer is fully equipped for all testing requirements with just one instrument

In the laboratory, high accuracy, a good frequency response and the analogue display on the M3006 allow accurate measurement on a wide range of input signal types For the electrician the M3004 will have the most suitable measuring ranges The higher resolution for current measurements, additional frequency, capacitance and duty cycle facilities and a basic accuracy of 0,25% on the M3005 will prove very beneficial to an engineer

In the field the mechanical features of the instrument prove their real worth, giving the operator full freedom in using the instrument in the most convenient manner

When measuring or detecting voltage in situations where a high energy level is present, the advice given in the Health and Safety Executive Guidance Note GS 38 must be followed, particularly in regard to the use of test leads with fused prods

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ANALOGUE/DIGITAL MULTIMETERS

SPECIFICATION

Ranges

Voltage d c — 300,0 mV 3,000 V 30,00 V 300,0 V 1000 V, autoranging (except on 300 mV range) Max. resolution 0,1 mV

Voltage a c — 3,000 V 30,00 V 300,0 V 1000 V, autoranging Max resolution 1 mV True r m.s for (a c + d c) on M3006

Current d c and a c. — M3004 10,00 A; M3005 3,000 mA 300,0 mA 10,00 A; M3006 30,00 mA 300,0 mA 10,00 A True r m s for (a c. + d c) Max resolution 0,1 μA (M3005 and M3006) and 10 mA (M3004)

Resistance — 300,0 Ω 3,000 kΩ 30,00 kΩ 300,0 kΩ 3,000 MΩ 30,00 MΩ Max resolution 0,1 Ω

Diode Test — 2,000 V d c max resolution 0,001 V

Capacitance — 30 nF, 300 nF, 3 μF, 30 μF Max resolution 10 pF (M3005 and M3006)

Frequency — 300 Hz 3 kHz 30 kHz 100 kHz Max resolution 0,1 Hz (M3005 and M3006)

Duty Cycle — 2% to 98% Max resolution 0,1% (M3005 and M3006)

Accuracy (of digital reading under reference conditions)

Voltage Ranges d c — M3004 ±0,5% of reading ±1 digit (1000 V range is ±0,6% of reading ± 1 digit) M3005 ±0,25% of reading ±1 digit (1000 V range is ±0,35% of reading ± 1 digit) M3006 ±0,1% of reading ±1 digit

Voltage Ranges a c — M3004 ±1,0% of reading ±2 digits M3005 ±0,75% of reading ±2 digits M3006 ±0,75% of reading ±3 digits

Current Ranges d c — M3004 ±1,5% of reading ±1 digit M3005 ±1,0% of reading ±1 digit M3006 ±0,75% of reading ±1 digit (10 A range is ±1,0% of reading ±1 digit)

Current Ranges a c — M3004 ±1,5% of reading ±2 digits M3005 ±1,5% of reading ±2 digits M3006 ±1,5% of reading ±4 digits (10 A range is ±1,75% of reading ±4 digits)

Resistance Ranges — M3004 ±0,7% of reading ±1 digit (300 Ω range is ±0,7% of reading ±3 digits, 30 MΩ range is ±3,0% of reading ±1 digit) M3005 ±0,4% of reading ±1 digit (300 Ω range is 0,5% of reading ±3 digits, 30 MΩ range is ±3,0% of reading ±1 digit) M3006 ±0,2% of reading ±1 digit (300 Ω range is ±0,4% of reading ±3 digits, 3 MΩ range is ±0,4% of reading ±1 digit, 30 MΩ range is ±3,0% of reading ±1 digit)

Diode Test Range — M3004 ±0,5% of reading ±1 digit M3005 ±0,25% of reading ±1 digit M3006 ±0 1% of reading ±1 digit

Capacitance — M3005 and M3006 ±1,0% of reading ±3 digits (30 nF range is ±1,0% of reading ±3 digits with zero adjuster, without zero adjuster ±1% of reading ±35 digits 30 μF range is ±3,0% of reading ±3 digits)

Frequency — M3005 and M3006 ±0,5% of reading ±1 digit Range 3 V ≃ V_E = 1,5 V rms — 100 V rms 30 V ≃ V_E = 15 V rms — 300 V rms 300 V ≃ V_E = 150 V rms — 1000 V rms

Duty Cycle — M3005 and M3006 1 Hz — 1 kHz ±0,5% 1 kHz — 10 kHz ±0,5%/kHz On the range 3 V–, square-wave signal positive on one side 5 – 15 V, f = const , not 163, 84 Hz or integral multiple

Reference Conditions

Ambient Temperature	+23 °C ±2 °C
Humidity	45% to 55% RH
Frequency	45 Hz to 65 Hz
Waveform	Sinusoidal
Battery Voltage	8 V ±0,1 V

Input Impedance
Voltage Ranges — 10 MΩ/40 pF (3 V range is 11 MΩ//40 pF and 300 mV range is >10 GΩ//<40 pF)

Voltage Drop
Current Ranges

3 mA range	150 mV
30 mA range	160 mV
300 mA range	1 V
10 A range	270 mV

Open Circuit Voltage
Resistance Ranges — 1,25 V except for 300 Ω range which is 3,2 V
Diode Test — 3,2 V

Overload Protection
(0 °C to +40 °C)
Voltage Ranges — 1200 V d c /a c rms (continuously)

Current Ranges — 3 mA, 30 mA, 300 mA ranges. 0,36 A continuous 10 A range, 12 A for 5 min, 16 A for 30s

Resistance Diode and Capitance Test Ranges — 500 V d c /a c rms for 10 min

Frequency and Duty Cycle Test Ranges — ≤3 kHz 1200 V; ≤30 kHz 300 V; ≤100 kHz 30 V — continuously

Common Mode Disturbance Voltage — 1000 V max

Frequency Influence on Accuracy (error data are referred to a display from 300 digits on)

Voltage Ranges a c — 3 V to 300 V ranges 15 Hz to <30 Hz (M3006) ±1% of reading ±3 digits 30 Hz to <45 Hz (M3006) ±0,5% of reading ±3 digits >65 Hz to 400 Hz ±0,5% of reading ±3 digits (M3006) (M3004 and M3005 is 2% of reading ±3 digits) >400 Hz to 1 kHz ±1% of reading ±3 digits (M3006) (M3004 and M3005 is 2% of reading ±3 digits) >1 kHz to 20 kHz (M3006) ±2% of reading ±3 digits 1000 V range M3006 15 Hz to <30 Hz ±1% of reading ±3 digits 30 Hz to <45 Hz ±0,5% of reading ±3 digits >65 Hz to 1 kHz ±2% of reading ±3 digits

Current Ranges a c — 15 Hz to <30 Hz ±1% of reading ±3 digits M3006 30 Hz to <45 Hz ±0,5% of reading ±3 digits M3006 >65 Hz to 1 kHz ±3% of reading ±3 digits M3006 >65 Hz to 1 kHz ±2% of reading ±3 digits M3004 and M3005

Data Hold Influence on Accuracy — ±1 digit

Min/Max Hold Influence on Accuracy — ±1 digit

Display

Analogue — 55 mm (max), 35 division l c d scale with pointer Automatic scale calibration and polarity Over-range indication by triangle Sampling rate approx 20 readings/s

Digital — 7 segment numerals, 15 mm high, 3¾ digits up to ±3100 digits Over-range indication "OL" is displayed Automatic polarity indication Sampling rate approx 2 readings/s

Temperature Range
Operating — 0 °C to +50 °C
Storage — −25 °C to +70 °C (batteries excepted)

Humidity Range — 75% RH max

Fuses — 1,6 A/500 V FF ceramic HBC; 16 A/600 V ceramic HBC (10 A range only)

Safety — The instruments will meet, in general, the requirements of the BS 4743 (1979), IEC 1010-1 (1990) Safety Class II, Installation Category II Flash Test 6 kV a c

Power Supply — 9 V battery IEC 6F 22 or IEC 6LR 61 or suitable Ni Cd storage battery Battery life approx 750 hours with alkaline-manganese battery on d c (200 hours on a c) Low battery warning appears when voltage is less than approx 7 V

Dimensions — 84 mm x 195 mm x 35 mm (3¼ in x 7¾ in x 1¼ in approx)

Weight — 350 g (¾ lb approx)

Functions	M3004	M3005	M3006
Range Hold	•	•	•
Data Hold	•	•	•
Min/Max			•
Continuity Buzzer/ Diode Test	•	•	•

Accessories
Supplied with the instrument — Test lead set (with prods)

Supplied as an optional extra

Carrying case	part no 6420-056
Pair of crocodile clips	part no 6220-447
FPK4 set of test leads with fused prods Comply with Health and Safety Executive Guidance Note GS 38	part no 6110-920
Protective holster	part no 8110-869

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Test with total confidence

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