

10. Specification

Uncertainties include long-term stability, temperature coefficient, linearity, line regulation and the traceability of factory and National calibration standards. Specified accuracy is valid after one hour warm up in temperature range 23 ± 10 °C. Specified accuracy is one year accuracy.

DC voltage

Summary range: 0 to 100 Vdc
Voltage resolution: 6½ digits

Range +/-	+/- (ppm of output + V)		Resolution	Max. current
300 mV	20	3 uV	100 nV	50 mA
3 V	20	20 uV	1 uV	50 mA
30 V	20	200 uV	10 uV	50 mA
100 V	20	1 mV	100 uV	25 mA

DC current

Summary range: 0 to 50 mAdc
Current resolution: 6 digits

Range +/-	+/- (ppm of output + A)		Resolution	Max. voltage
25 mA	50	1 µA	100 nA	100 V
50 mA	50	1 µA	100 nA	30 V

Frequency source

Summary range: 10 mHz to 15 kHz
Open collector: max. 30 V/50 mA
or internal pull up 100R to +5V

Range	+/- (ppm of output + Hz)		Resolution
200 mHz	50	0.0 Hz	100 nHz
2000 mHz	50	0.0 Hz	1 µHz
20 Hz	50	0.0 Hz	10 µHz
200 Hz	50	0.0 Hz	100 µHz
2000 Hz	50	0.0 Hz	10 mHz
4 kHz	100	0.0 Hz	100 mHz
10 kHz	600	0.0 Hz	1 Hz
15 kHz	1500	0.0 Hz	10 Hz

Frequency meter

Summary range: 10 mHz to 100 kHz
Frequency resolution: 5½ digits
Accuracy: +/- 50 ppm

TC

Resolution: 0.01 °C

Type	Range	+/- °C
R (EN60584-1/ITS90)	-50 ... -10 °C	0.8 °C
	-10 ... 100 °C	0.6 °C
	100 ... 400 °C	0.4 °C
	400 ... 1768 °C	0.3 °C
S (EN60584-1/ITS90)	-50 ... -20 °C	0.7 °C
	-20 ... 100 °C	0.6 °C
	100 ... 1768 °C	0.4 °C
B (EN60584-1/ITS90)	400 ... 500 °C	0.8 °C
	500 ... 800 °C	0.6 °C
	800 ... 1820 °C	0.4 °C
J (EN60584-1/ITS90)	-210 ... -180 °C	0.15 °C
	-180 ... 1200 °C	0.1 °C
T (EN60584-1/ITS90)	-200 ... -100 °C	0.2 °C
	-100 ... 400 °C	0.1 °C
E (EN60584-1/ITS90)	-250 ... -200 °C	0.25 °C
	-200 ... 1000 °C	0.1 °C
K (EN60584-1/ITS90)	-200 ... -100 °C	0.2 °C
	-100 ... 900 °C	0.1 °C
	900 ... 1372 °C	0.15 °C
N (EN60584-1/ITS90)	-200 ... 100 °C	0.3 °C
	-100 ... 100 °C	0.15 °C
	100 ... 900 °C	0.1 °C
	900 ... 1300 °C	0.15 °C

Pt100 meter for RJ

Summary range: -50 to 150 °C

Resolution: 0.01 °C

Range	+/- °C
-50 ... 150 °C	0.02 °C

Option 91

External reference junction for thermocouples.

RTD 4W (full version only)

Pt summary range: -200 °C to +850 °C

Ni summary range: -60 °C to +300 °C

Resolution: 0.01 °C

Type	Range	+/- °C
Pt100 ... Pt1000	-200 ... 0 °C	0.15 °C
Pt100 ... Pt1000	0 ... 850 °C	0.2 °C
Ni100 ... Ni1000	-60 ... 300 °C	0.1 °C

RTD 2W (full version only)

Pt summary range: -200 °C to +850 °C

Ni summary range: -60 °C to +300 °C

Resolution: 0.01 °C

Type	Range	+/- °C
Pt100 ... Pt1000	-200 ... 850 °C	0.2 °C
Ni100 ... Ni1000	-60 ... 300 °C	0.15 °C

Resistance 4W (full version only)

Summary range: 10 Ω to 300 kΩ

Short resistance: < 50 mΩ

Range	% of output + Ω		Resolution
20 Ω	0.05	15 mΩ	0.0001 Ω
200 Ω	0.05	15 mΩ	0.001 Ω
1000 Ω	0.02	0	0.01 Ω
3000 Ω	0.02	0	0.1 Ω
10000 Ω	0.02	0	1 Ω
30 kΩ	0.05	0	0.01 kΩ
100 kΩ	0.1	0	0.1 kΩ
300 kΩ	0.5	0	1 kΩ

Resistance 2W (full version only)

Terminals:	Hi, Li (adapter)
Summary range:	10 Ω to 300 k Ω
Specification:	add 10 m Ω to the 4W specification
Short resistance:	< 200 m Ω

RTD, Resistance

Maximum dissipation power:	0.3 W
Maximum current:	0.2 A
Maximum voltage:	50 Vpk

Interface	:	RS232 (optionally IEEE488, USB, Ethernet)
Power supply	:	115/230 Vac, 47...63 Hz
Maximal power consumption	:	60 VA
Reference temperature	:	+13 °C ... +33 °C (Voltage, Current, TC, Frequency)
	:	+20 °C ... +26 °C (RTD, Resistance)
Working temperature	:	+5 °C ... +45 °C
Storing temperature	:	-10 °C ... +55 °C
Housing	:	metal sheet
Dimensions	:	W 390 mm, H 128 mm, D 310 mm
Weight	:	5.5 kg
Protection fuses	:	T315mAL250 for 230 V T630mAL250 for 115 V

Notes:

Only data shown with tolerance or with band of limits are tested. All other values have informative character.

Temperature coefficient

Temperature coefficient outside of the reference temperature range is 10 % of the stated specification per °C (for example 2x specification for 43°C).

11. Ordering information – options

Bus

M160-V1xxx - RS232

M160-V2xxx - RS232, LAN, USB, IEEE488

Functions

M160i-Vxxxx - economy version (U, I, TC, Frequency)

M160-Vxxxx - full version (U, I, TC, Frequency, RTD, R)

Housing

M160-Vxx0x - table version

M160-Vxx1x - module 19“, 3HE

Example of order:

M160-V2010

- Precision DC calibrator

RS232, LAN, USB, IEEE488 / full version / 19“ rack

12. Accessories

M160 Basic accessories (included in delivery)

- Power line cord 1 pc
- User's manual 1 pc
- Test report 1 pc
- Spare fuse 1 pc
- RS232 cable 1 pc
- Option 14 – test lead (black) 1 pc
- Option 15 – test lead (red) 1 pc
- Option 160-60 frequency adapter (M160i) 1 pc
- Option 160-70 R/frequency adapter (M160) 1 pc

Options (extra ordered)

- Option 91 External Reference Junction for thermocouples

Manufacturer

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