

Reference DMM with Drift Compensation *Referenz-DMM mit Driftkompensation*

The **Digital Multimeter 6048** presents itself with the grey case in a new design now.

The **Temperature Drift Compensation** in Voltage and Resistance Measurement offers a typical Temperature Coefficient of $\pm 0,05\text{ppm}/^\circ\text{C}$, thus all specs are valid in the wide temperature range of $23^\circ\text{C}\pm 5^\circ\text{C}$. Therefore the 6048 is also well suited for the use outside the calibration lab.

Because of its outstanding accuracy and stability ($0,5\text{ppm}/24\text{h}$) the DMM 6048 is used as a reference DMM in a lot of secondary national calibration laboratories, like the German DKD labs. It is also well proved as a $8\frac{1}{2}$ digit DMM in the application with the **Josephson Voltage Standard** of the PTB in Braunschweig, Germany.

The DMM 6047, still shown in the data sheet, will be no longer available.

Das **Digitalmultimeter 6048** präsentiert sich mit neuem Design nun im grauen Gehäuse.

Mit der **Temperatur-Driftkompensation** bei Spannungs- und Widerstandsmessung ergibt sich ein typischer Temperaturkoeffizient von $\pm 0,05\text{ppm}/^\circ\text{C}$, so daß alle Spezifikationen in dem weiten Umgebungstemperaturbereich von $23^\circ\text{C}\pm 5^\circ\text{C}$ gelten. Das Gerät kann somit auch außerhalb eines Kalibrierlabors bestens zum Einsatz kommen.

Wegen seiner hervorragenden Genauigkeit und Stabilität ($0,5\text{ppm}/24\text{h}$) wird das DMM 6048 in vielen **DKD-Kalibrierstellen** als Referenzgerät verwendet und hat sich auch im Zusammenhang mit dem **Josephson-Spannungsnorm** der PTB als $8\frac{1}{2}$ -stelliges Gerät bestens bewährt.

Das im Datenblatt mit aufgeführte DMM 6047 befindet sich nicht mehr im aktuellen Lieferprogramm.

TEMPERATURE 6047/48		
MEASURING METHOD	Four-wire resistance measurement with linearization for PT-100 sensor conforming to DIN IEC 751	MEASURING CURRENT about 100 μ A
RANGE	-200 °C to + 850 °C	
RESOLUTION	0.01 °C	
TOLERANCE	\pm 0.05 °C for 1 year, 23 °C \pm 5 °C (without sensor tolerance)	
TEMPERATURE COEFFICIENT	10 °C - 18 °C, 28 °C - 40 °C	0.001 °C/°C
SENSOR ALIGNMENT	possible at any temperature in the range from -200 °C to + 850 °C	
READOUT DISPLAY	measured value in °C, °F or K	

SCANNER/CHANNEL SWITCH (OPTION 6047/01)¹⁾

SWITCHING MODE	4 TIMES 1 of 20
CHANNELS	20
CONTACTS PER CHANNEL	4
SWITCHING DEVICES	isolated mechanical switches (monostable)
THERMOELECTRIC EMF	less than 1 μ V after 1,5 h warm-up time exists
GUARD SHIELD	exists
MAX. VOLTAGE BETWEEN 2 CONTACTS OF A CHANNEL	125 V peak, max. 10^6 V · Hz ¹⁾
MAX. SWITCHED CURRENT	2 A dc or 3 A peak
TIME BETWEEN 2 SWITCHING CYCLES	less than 100 ms
MAX. CONTINUOUS SWITCHING FREQUENCY	2 Hz
MAX. LEAD RESISTANCE	less than 0.4 Ω per wire
CONTACT LIFE	more than 2 x 100 Million switching cycles (0.1 A, 10 Vdc)
INSULATION RESISTANCE BETWEEN 2 CONTACTS	3 G Ω when relative humidity less than 60 %
INSULATION RESISTANCE TO CASE	3 G Ω when relative humidity less than 60 %
CAPACITANCE BETWEEN THE CONTACTS	less than 100 pF

1) Only for DMM 6047

ADAPTER CARD (OPTION 6047/02)

The adapter card is plugged externally onto the 50-pole subminiature type D socket strip connector of the scanner to permit connection of the measuring lines to screw terminals. 10 channels can be connected via one such card. Dimensions 100 mm x 70 mm. Maximum voltage 40 V. Maximum current 2 A.

GENERAL SPECIFICATIONS

WARM-UP TIME	20 minutes for 1 year accuracy, 1 h for full accuracy	CABINET	19" aluminium flat cabinet
RELATIVE HUMIDITY	up to 25 °C up to 75% relative humidity above 25 °C up to 65% relative humidity	Height without/with feet	88 mm/105 mm
LINE VOLTAGE	100V, 120V, 220V, 240V, switch-selected	Width	444 mm
POWER CONSUMPT.	about 20 VA	Depth without/with handles	356 mm/396 mm
FREQUENCY	50 Hz or 60 Hz	WEIGHT	5.2 kg (2.4 lbs)

ORDERING INFORMATION

MODEL	6047/6048	Digital Multimeter
OPTIONS AND ACCESSORIES	6047/01	Scanner option ²⁾
	6047/02	Adapter card for scanner input ²⁾
	6047/03	Mating plug vor scanner input ²⁾
	6047/04	Input plugs at the rear ¹⁾
	6048/05	Ratio input at the rear ¹⁾
	TYPE 5020 G	Accessories for rack mounting
	TYPE 5023 K	Interface cable for IEEE 488 bus, length 2 m
	TYPE 3015	Precision Lead set, very low thermoelectrical emf's

¹⁾ Option 6047/04 and 6048/05 available only for instruments without scanner (Option 6047/01)
²⁾ Only for DMM 6047



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INSTRUMENTS

PREMA®

DIGITAL MULTIMETER 6047 and 6048



CURRENT 6047

	mA=	mA~
RANGE	/ 2000 mA /	/ 2000 mA /
MEASURING TIMES (sec.)	/ 0.02 - 80 sec /	/ 0.1 - 20 sec /
MAX. READING	/ 1.999.999 /	/ 1.999.999 /
RESOLUTION	/ 1 μ A /	/ 1 μ A /
ACCURACY (1 year, 23 \pm 5 $^{\circ}$ C) ¹⁾		30 Hz 1 kHz 5 kHz
2000 mA up to 2000 mA	/ 0.003 + 0.001 /	/ 0.04 + 0.04 / 0.2 + 0.07 /
TEMPERATURE COEFFICIENT ¹⁾		
(10 $^{\circ}$ C to 18 $^{\circ}$ C and 28 $^{\circ}$ C to 40 $^{\circ}$ C)	/ 0.0003 + 0.001 /	/ 0.004 + 0.002 /
DROP VOLTAGE		
2000 mA	/ less than 600 mV /	
OVERLOAD LIMITS		
CREST-FACTOR	/ max. 3 A peak (fuse rating 3.15 A/250 V) /	
SETTLING TIME	/ 1 s for 0.1 % /	

1) \pm (% of reading + % of range)

2) Guard connected to "VOhm-LO" input socket; sinusoidal signal greater than 5% of maximum reading (10000 digit)

3) Peak value smaller than 3.5 x measuring range end value

RESISTANCE 6047

MEASURING METHOD

4-wire circuit or 2-wire circuit, selectable via keyboard or IEEE bus

RANGES	MEASURING TIMES (sec.)	MAX. READING	RESOLUTION
200 Ω / 2 k Ω / 20 k Ω / 200 k Ω / 2 M Ω	0.02 + 0.04	19.999	10 m Ω
20 M Ω	0.1 + 0.2 + 0.4	199.999	1 m Ω
RANGE SELECTION manual, automatic or by remote control	1 + 2	1.999.999	100 $\mu\Omega$
	4 + 10 + 20 + 40 + 80	19.999.999	10 $\mu\Omega$

STABILITY (24 h) / ACCURACY (90 days, 1 year)

in each case \pm [% of reading (% read) + % of maximum reading (% range)]

Range	24 h, 23 $^{\circ}$ C \pm 1 $^{\circ}$ C		90 days, 23 $^{\circ}$ C \pm 5 $^{\circ}$ C		1 year, 23 $^{\circ}$ C \pm 5 $^{\circ}$ C	
	% read	% range	% read	% range	% read	% range
200 Ω	0.0002	0.0001	0.0007	0.0001	0.0012	0.0001
2 k Ω	0.0002	0.0001	0.0006	0.0001	0.001	0.0001
20 k Ω	0.0001	0.0001	0.0006	0.0001	0.0009	0.0001
200 k Ω	0.0004	0.0002	0.0009	0.0002	0.0015	0.0002
2 M Ω	0.001	0.0003	0.0012	0.0003	0.002	0.0003
20 M Ω	0.004	0.001	0.009	0.001	0.015	0.002

TEMPERATURE COEFFICIENTS (10 $^{\circ}$ C - 18 $^{\circ}$ C, 28 $^{\circ}$ C - 40 $^{\circ}$ C)

Range	\pm % reading/ $^{\circ}$ C	
200 Ω	0.0001	0.00015
2 k Ω	0.0001	0.0001
20 k Ω	0.0001	0.0001
200 k Ω	0.00015	0.00015
2 M Ω	0.0002	
20 M Ω	0.0008	

CURRENT THROUGH MEASURED RESISTOR

Range	Current
200 Ω , 2k Ω	1 mA
20 k Ω	100 μ A
200 k Ω	10 μ A
2 M Ω	1 μ A
20 M Ω	0.1 μ A

VOLTAGE AT OPEN CIRCUIT TERMINALS

5 V max.

OVERLOAD LIMIT \pm 250 V peak ¹⁾

¹⁾ restricted to 125 V peak when the scanner is incorporated

IEEE BUS INTERFACE 6047 / 48

OUTPUT INFORMATION

Numerical data for measurement result, calculation result and constants, function, range filter, measuring time, program number and keyboard-code

INPUT INFORMATION

Function, range, measuring time, start command, filter, program number and values for constants

ADDRESS

Selectable from 0 to 30, via keyboard

KEYBOARD

can be switched off with REN and on via GTL

END-CHARACTER

EOI/9 END-character select. via keyboard

ISOLATION FROM INPUT

Electrically isolated from the input stage

BUS PLUG CONNECTOR

24-pole Amphenol Nr. 57-40240

COMPATIBILITY

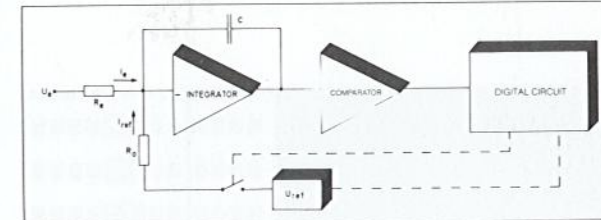
IEEE-Standard-488

SUPPORTED FUNCTIONS

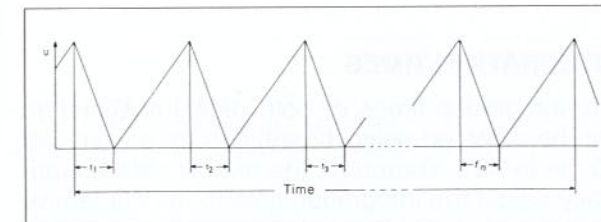
SH1	Handshake source function
AH1	Handshake sink function
T5	Talker function
L3	Listener function
RL1	Remote control
DC1	Reset function
DT1	Trigger function
SR1	Service request function (SRQ)

MEASURING PRINCIPLE

The PREMA multiple ramp integration method is used for the analog to digital conversion. This method results in outstanding linearity and high rejection of unwanted series mode voltages. The integration takes place continuously without disturbing pauses. The capacitor C is charged continuously by a current which is proportional to the input voltage and discharged periodically by a constant current. The total of the discharge times is proportional to the integral of the input voltage.



Simplified functional circuit diagram

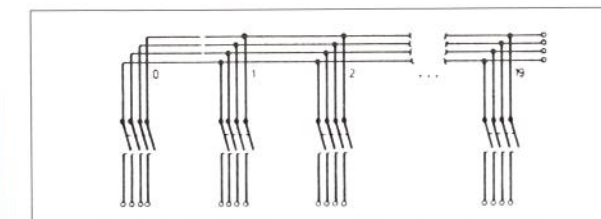


Integrator output voltage waveform

MULTIPOINT MEASURING SYSTEMS

The range of possible measuring circuits is extended up to 20 four-pole measuring inputs when the optional 20 channel scanner is installed. All channels can be switched in any desired sequence for measuring voltage, current or resistance values. All channels operate with floating switch contacts.

In the automatic channel switching mode, the pre-selected channels are scanned cyclically according to the user selected switching times. The measured values can be processed in the unit or sent via the IEEE bus interface to a computer or directly to a printer.



Scanner circuit diagram

INPUT RESISTANCE

The input resistance of these models is 10 Gohms. This is important in attaining very accurate voltage readings for sources with high internal resistances.

SERIES MODE REJECTION

The 6047 and 6048 have excellent series mode rejection of over 100 dB. This is achieved by the phase locked loop circuit (line synchronization) and advanced shielding techniques.

SELFTEST

Every time the 6047 and 6048 are switched on, a comprehensive selftesting program is executed automatically. This routine checks the analog section and microprocessor system including all memory locations for proper function and data retention. The self-testing routine can also be performed at any desired time during meter operation.



IEEE BUS

The IEEE bus interface is incorporated as a standard feature. It permits readout of measurement results and all instrument settings, full remote control and monitoring of all functions for the 6047 and 6048. The status of the IEEE bus is displayed on the front panel.



IEEE Status Indication

IEEE Plug Connector

DIRECT VOLTAGE 6047

RANGES	$\pm 0.2 \text{ V} / \pm 2 \text{ V} / \pm 20 \text{ V} / \pm 200 \text{ V} / \pm 1000 \text{ V}^1$	MEASURING TIMES (sec.)	MAX. READING	RESOLUTION
		0.02 + 0.04	19.999	10 μV
		0.1 + 0.2 + 0.4	199.999	1 μV
RANGE SELECTION	manual, automatic or remotely controlled	1 + 2	1.999.999	100 nV
		4 + 10 + 20 + 40 + 80	19.999.999	10 nV

STABILITY (24 h) / ACCURACY (90 days, 1 year)

in each case \pm [% of reading (% read) + % of maximum reading (% range)]

Range	24 h, 23 °C ± 1 °C		90 days, 23 °C ± 5 °C		1 year, 23 °C ± 5 °C	
	% read	% range	% read	% range	% read	% range
$\pm 0.2 \text{ V}$	0.0001	0.0001	0.0005	0.0001	0.0008	0.00015
$\pm 2 \text{ V}$	0.0001	0.00005	0.0005	0.00005	0.0007	0.0001
$\pm 20 \text{ V}$	0.0001	0.00005	0.0004	0.00005	0.0007	0.0001
$\pm 200 \text{ V}^1$	0.0001	0.0001	0.0008	0.0001	0.001	0.00015
$\pm 1000 \text{ V}^1$	0.0003	0.0001	0.001	0.00015	0.0014	0.00015

TEMPERATURE COEFFICIENTS (10 °C - 18 °C, 28 °C - 40 °C)

Range	\pm % Az./°C
$\pm 0.2 \text{ V}$	0.00015
$\pm 2 \text{ V}$	0.0001
$\pm 20 \text{ V}$	0.0001
$\pm 200 \text{ V}^1$	0.0002
$\pm 1000 \text{ V}^1$	0.0002

MEASURING METHOD

Continuously integrating PREMA multi-ramp principle (German Patent No. 2114141, US-Patent No. 3765012)

INTERFERENCE SUPPRESSION

(Measured by increasing the peak amplitude of the interference signal until a readout error of 1 digit is produced with 400 ms measuring time without filter.)

Series mode rejection

50 Hz	better than 100 dB
46 Hz to 56 Hz	better than 50 dB

Common mode rejection (shield connected on low resistance path to one of the two input sockets, with 1 k Ω in series with one of the two input leads).

Direct voltage	160 dB
50 Hz	160 dB

1) restricted to 125 V dc when the scanner (Option 6047/01) is incorporated
2) valid for a constant input signal; +/- 0.0005% range must be added during 100 ms after signal change

ALTERNATING VOLTAGE 6047/48

TYPE OF CONVERSION	MEAS. TIMES (sec.)	MAX. READING	RESOLUTION
True rms value. Can be switched to pure alternative voltage measurement or to measurement of the sum of direct and alternating voltage components.	0.1 - 0.4	199.999	1 μV
	1 - 20	1.999.999	100 nV

RANGE SELECTION manual, automatic or by remote control.

ACCURACY \pm [% of reading (% read) + % of maximum reading (% range)]¹, 1 year, 23 °C ± 5 °C

Range	20 Hz to 40 Hz	to 1 kHz	to 10 kHz	to 100 kHz	to 1 MHz
0.2 V	0.1 + 0.01	0.03 + 0.01	0.03 + 0.02	3 + 0.1	
2 V	0.1 + 0.01	0.02 + 0.007	0.03 + 0.01	0.1 + 0.1	2 + 1
20 V	0.1 + 0.01	0.02 + 0.007	0.02 + 0.01	0.1 + 0.1	2 + 1
200 V ²	0.1 + 0.01	0.02 + 0.007	0.02 + 0.01	0.1 + 0.1	2 + 1
700 V ²	0.1 + 0.01	0.04 + 0.007			

Direct voltage \pm (0.1% reading + 0.05% range)
(23 °C ± 5 °C)

TEMPERATURE COEFFICIENT (10 °C - 18 °C, 28 °C - 40 °C)

kHz	[% reading + % range]/°C
0-20	0.001
20-300	0.005

INPUT IMPEDANCE 1 M Ω // < 60 pF
SETTLING TIME 1 s to 0,1%

OVERLOAD LIMITS

Input V

$\pm 1000 \text{ V}$ peak or 700 V rms with the restriction of $10^7 \text{ V} \cdot \text{Hz}^2$

CREST-FACTOR 7:1

The peak value must not exceed 3.5 times the nominal value of the measuring range or 1000 V²

1) Shield connected to "V/Ohm-LO" input socket, sinusoidal signal greater than 5% of full scale
2) Restricted to 125 V peak with a maximum of $10^6 \text{ V} \cdot \text{Hz}$ when the scanner (Option 6047/01) is incorporated

ERROR REPORTING

The multimeters issue 10 error messages covering situations such as overflow, manual control errors, IEEE bus errors and calibration factor checks.



FUNCTION CHANGE

The functions can be changed on the front keyboard or via the IEEE bus. The currently chosen function appears on the front LED display.

RESISTANCE MEASUREMENT

Measurements can be made in either two or four wire modes.

Both models use very low currents through the measured resistance with the voltage at open circuit being 5 V max. The Normal Current function allows the 6048 to also make resistance measurements with a higher, normal measurement current. The resulting voltage on the open circuit is about 25 V. This function allows a smaller margin of error especially with high resistances yet also makes possible a 200 M Ω -range on the 6048.

REAL TIME RATIO MEASUREMENT

The real time ratio measurement is available as an option for the models 6047 and 6048. The ratio of two direct voltages can be determined in real time.

This type of ratio measurement has proven itself in applications such as in bridge measurements, because oscillations of the bridge voltage are strongly suppressed.

CONSTANT QUALITY CONTROL

Precision Digital Multimeters, especially with the high resolution and accuracy of the PREMA 6047 and 6048, demand the highest of quality design and control standards. PREMA, a world class leader, holds key patents and has almost two decades of experience in the precision measurement industry. These meters are assembled and tested at their facility in Mainz, West Germany. Components are tested for stability for 1000 hours, with certain key rectifiers and resistors receiving additional testing.

TEMPERATURE

As a standard feature, the 6048 and 6047 are equipped for direct reading temperature measurements with a PT 100 platinum resistance temperature sensor with a resolution of 0.01 °C. The linearization of the temperature results in accordance with DIN IEC 751. Readings are displayed in °C, °F and K. Temperature range extends from -200 °C to + 850 °C.

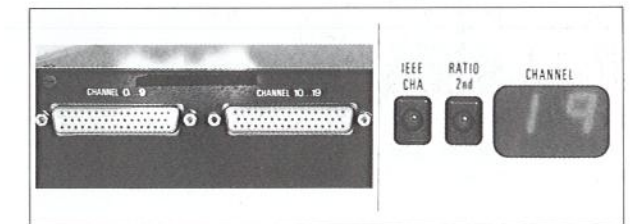


TRUE RMS MEASUREMENT

True rms values are determined for alternating voltage and current. In addition, during the measurement of alternating current or voltage it is possible to determine the true rms value of the alternating portion without the respective direct portion.

SCANNER

The 6047 digital multimeter can be equipped optionally with a 4-pole 20-channel scanner. The switch contacts have very low thermoelectric emf's, low ohms (< 0.4) and are rated for up to 2 amps of current. The maximum permitted input voltage for the 6047 and 6048 is 125 V peak when the scanner is incorporated.



Scanner Input channel 00 to 19 Channel Selection

HIGHEST ACCURACY AND RESOLUTION FROM PREMA

Both the 7 1/2- and 8 1/2 digit PREMA digital multimeter are introduced as full performance, highest resolution multimeters.

Features incorporated in these models including standard IEEE-488-bus, trigger input and mathematical functions programs are valued aids in their operation. The most important characteristics of these DMMs is certainly the outstanding technical data:

Digital Multimeter

6047 6048

		Working Temperature 23°C ¹⁾		± 5°C	± 1°C	± 5°C	± 1°C
Direct Voltage	24 hours stability	-	1 ppm	0.5 ppm	-		
	1 year accuracy	7 ppm	-	5 ppm	-		
	Resolution	10 nV	-	10 nV	-		
Resistance	24 hours stability	-	1 ppm	1 ppm	-		
	1 year accuracy	9 ppm	-	7 ppm	-		
	Resolution	10 μΩ	-	10 μΩ	-		
Alternating Voltage	24 hours stability	-	50 ppm	-	50 ppm		
	1 year accuracy	200 ppm	-	200 ppm	-		
	Resolution	100 nV	-	100 nV	-		
Input Resistance		10 GΩ		10 GΩ			
Resolution		19 999 999		199 999 999			

¹⁾ technical data specified for ± 5°C are also valid for ± 1°C.

DRIFT COMPENSATION

A crucial performance feature of the DMM 6048 is being equipped with internal, automatic compensation for temperature drifts, whereby a typical temperature coefficient of ±0.05 ppm/°C is achieved. This guarantees the outstanding technical data of the meter in the expanded temperature

range of 23 °C ± 5 °C, so that even under difficult external conditions it can still measure very accurately. This meter is thus suited for industrial as well as metrology applications.

CURRENT 6048

	mA=	mA~
RANGE	/ 2000 mA /	/ 2000 mA /
MEASURING TIMES (sec.)	/ 0.02 - 80 sec /	/ 0.1 - 20 sec /
MAX. READING	/ 1.999.999 /	/ 1.999.999 /
RESOLUTION	/ 1 μA /	/ 1 μA /
ACCURACY (1 year, 23 ± 5 °C) ¹⁾ 2000 mA up to 2000 mA.....	/ 0.003 + 0.001 /	30 Hz 1 kHz 5 kHz / 0.04 + 0.04 / / 0.2 + 0.07 /
TEMPERATURE COEFFICIENT ¹⁾ (10 °C to 18 °C and 28 °C to 40 °C).....	/ 0.0003 + 0.001 /	/ 0.004 + 0.002 /
DROP VOLTAGE 2000 mA.....	/ less than 600 mV /	
OVERLOAD LIMITS	/ max. 3 A peak (fuse rating 3.15 A/250V) /	
CREST-FACTOR	/ 7 : 1 ³⁾ /	
SETTLING TIME	/ 1 s for 0.1% /	

1) ± (% of reading + % of range)
2) Guard connected to "VOhm-LO" input socket; sinusoidal signal greater than 5% of maximum reading (10000 digit)
3) Peak value smaller than 3.5 x measuring range end value

RESISTANCE 6048

MEASURING METHOD			
4-wire circuit or 2-wire circuit, selectable via keyboard or IEEE bus			
RANGES	MEASURING TIMES (sec.)	MAX. READING	RESOLUTION
200 Ω / 2 kΩ / 20 kΩ / 200 kΩ / 2 MΩ	0.02 + 0.04	19.999	10 mΩ
20 MΩ / 200 MΩ	0.1 + 0.2 + 0.4	199.999	1 mΩ
RANGE SELECTION manual, automatic or by remote control	1 + 2	1.999.999	100 μΩ
	4 + 10	19.999.999	10 μΩ
	20 + 40 + 80	199.999.999	10 μΩ

STABILITY (24 h) / **ACCURACY** (90 days, 1 year)
in each case ± [% of reading (% read) + % of maximum reading (% range)]

NORMAL MEASURING CURRENT						
Range	24 h, 23 °C ± 5 °C		90 days, 23 °C ± 5 °C		1 year, 23 °C ± 5 °C	
	% read	% range	% read	% range	% read	% range
200 Ω.....	0.0002	0.0001	0.0005	0.0001	0.0008	0.0001
2 kΩ.....	0.0002	0.0001	0.0004	0.0001	0.0007	0.0001
20 kΩ.....	0.0001	0.0001	0.0004	0.0001	0.0007	0.0001
200 kΩ.....	0.0002	0.0001	0.0005	0.0001	0.0007	0.0001
2 MΩ.....	0.0004	0.0002	0.0007	0.0002	0.0009	0.0002
20 MΩ.....	0.0007	0.0003	0.0009	0.0003	0.0015	0.0003
200 MΩ.....	0.004	0.001	0.007	0.001	0.009	0.002

LOW MEASURING CURRENT						
Range	24 h, 23 °C ± 1 °C		90 days, 23 °C ± 5 °C		1 year, 23 °C ± 5 °C	
	% read	% range	% read	% range	% read	% range
200 Ω.....	0.0002	0.0001	0.0007	0.0001	0.0012	0.0001
2 kΩ.....	0.0002	0.0001	0.0006	0.0001	0.0010	0.0001
20 kΩ.....	0.0001	0.0001	0.0006	0.0001	0.0009	0.0001
200 kΩ.....	0.0004	0.0002	0.0009	0.0002	0.0015	0.0002
2 MΩ.....	0.0010	0.0003	0.0012	0.0003	0.0020	0.0003
20 MΩ.....	0.0040	0.0010	0.009	0.001	0.015	0.002

TEMPERATURE COEFFICIENTS (10 °C - 18 °C, 28 °C - 40 °C)

Range	normal	
	current	current
± % reading/°C		
200 Ω.....	0.0001	0.0001
2 kΩ.....	0.0001	0.0001
20 kΩ.....	0.0001	0.0001
200 kΩ.....	0.0001	0.00015
2 MΩ.....	0.0002	0.0002
20 MΩ.....	0.0002	0.0008
200 MΩ.....	0.0008	

CURRENT THROUGH MEASURED RESISTOR

Range	normal	
	low	low
200 Ω, 2kΩ.....	1 mA	1 mA
20 kΩ.....	1 mA	100 μA
200 kΩ.....	100 μA	10 μA
2 MΩ.....	10 μA	1 μA
20 MΩ.....	1 μA	0.1 μA
200 MΩ.....	0.1 μA	

VOLTAGE AT OPEN CIRCUIT TERMINALS

25 V max. 5 V max.

OVERLOAD LIMIT ± 250 V peak¹⁾

1) restricted to 125 V peak when the scanner is incorporated

DIGITAL CALIBRATION

Each range of each measuring function can be calibrated individually, via either the keyboard or the IEEE bus. This data can be retained in a battery buffered RAM. Also, the original working calibration may be recalled at any time from an EPROM. A small safety switch on the back of the meter assures a hardware-like protection of the calibration data in RAM.



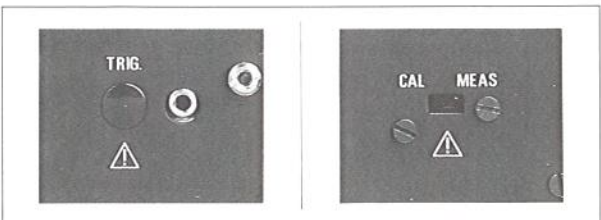
DIGITAL OFFSET CORRECTION

Offset corrections for constants such as the resistance of the connecting leads can be entered for one or every range and each function with the press of a button.



TRIGGERING

In the trigger mode, measurements can be started on command via the IEEE bus or the trigger signal output.



Trigger plug

Calibration Switch

MATHEMATICAL FUNCTIONS PROGRAM SET

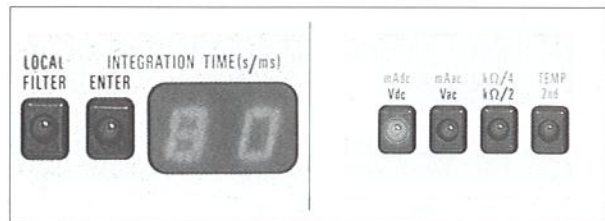
The PREMA 6047 and 6048 offer a wide library of internal programs that utilize measured values to input mathematics functions calculating and displaying the result. Up to four programs can be cascaded in any desired sequence to give a new compound program. For example, use the polynomial function to eliminate the non-linearity of a measurement value with the computed result being displayed. Additional programs are also available to the user for statistical analysis of the measurement data.



INTEGRATION TIMES

The integration times of both digital multimeters can be selected using 12 settings from values of 20 ms to 80 s. Therefore, the user is able to optimally adjust the integration time to his respective measurement requirement, either faster measurements with smaller resolution or slower precise measurements with higher accuracy and resolution.

The longer integration times are especially advantageous since disturbances are strongly repressed. Therefore, a distortion of the measurement result does not occur.



Integration time

Selection of Measuring Functions

DIRECT VOLTAGE 6048

RANGES	$\pm 0.2 \text{ V} / \pm 2 \text{ V} / \pm 20 \text{ V} / \pm 200 \text{ V} / \pm 1000 \text{ V}^{(1)}$	MEASURING TIMES (sec.)	MAX. READING	RESOLUTION
		0.02 + 0.04	19.999	10 μV
		0.1 + 0.2 + 0.4	199.999	1 μV
RANGE SELECTION	manual, automatic or remotely controlled	1 + 2	1.999.999	100 nV
		4 + 10 + 20 + 40 + 80	19.999.999	10 nV
		20 + 40 + 80	199.999.999	10 nV

STABILITY (24 h) / ACCURACY (90 days, 1 year)

in each case \pm [% of reading (% read) + % of maximum reading (% range)]

Range	24 h, 23 °C \pm 5 °C		90 days, 23 °C \pm 5 °C		1 year, 23 °C \pm 5 °C	
	% read	% range	% read	% range	% read	% range
$\pm 0.2 \text{ V}$	0.0001	0.0001	0.0004	0.0001	0.0006	0.00015
$\pm 2 \text{ V}$	0.00005	0.00005	0.0003	0.00005	0.0005	0.0001
$\pm 20 \text{ V}$	0.00005	0.00005	0.0003	0.00005	0.0005	0.0001
$\pm 200 \text{ V}^{(1)}$	0.0001	0.0001	0.0004	0.0001	0.0007	0.00015
$\pm 1000 \text{ V}^{(1)}$	0.0002	0.0001	0.0005	0.00015	0.0008	0.00015

TEMPERATURE COEFFICIENTS (10 °C - 18 °C, 28 °C - 40 °C)

Range	\pm % Az./°C
$\pm 0.2 \text{ V}$	0.00005
$\pm 2 \text{ V}$	0.00005
$\pm 20 \text{ V}$	0.00005
$\pm 200 \text{ V}^{(1)}$	0.0001
$\pm 1000 \text{ V}^{(1)}$	0.0001

INPUT RESISTANCE

Range	
$\pm 0.2 \text{ V}$ to $\pm 20 \text{ V}$	10 G Ω
$\pm 200 \text{ V}$, $\pm 1000 \text{ V}^{(1)}$	10 M Ω

ZERO POINT

Temperature coefficient better than 0.3 $\mu\text{V}/^\circ\text{C}$
Long-term stability better than 1 μV over 90 days

POLARITY CHANGE

Automatic, max. 100 ms

MEASURING PAUSES

None, except on selection of a calculation program involving a calculation time longer than the measuring time, and on polarity change.

OVERLOAD LIMITS

Between "+" and "-" input:
 $\pm 0.2 \text{ V}$, $\pm 2 \text{ V}$, $\pm 20 \text{ V}$ Bereich:
for 60 seconds $\pm 1000 \text{ V}^{(1)}$
continuous $\pm 700 \text{ V}^{(1)}$
 $\pm 200 \text{ V}$, $\pm 1000 \text{ V}$ range:
continuous $\pm 1000 \text{ V}^{(1)}$

MEASURING METHOD

Continuously integrating PREMA multi-ramp principle
(German Patent No. 2114141, US-Patent No. 3765012)

INTERFERENCE SUPPRESSION

(Measured by increasing the peak amplitude of the interference signal until a readout error of 1 digit is produced with 400 ms measuring time without filter.)

Series mode rejection

50 Hz better than 100 dB
46 Hz to 56 Hz better than 50 dB

Common mode rejection (shield connected on low resistance path to one of the two input sockets, with 1 k Ω in series with one of the two input leads).

Direct voltage 160 dB
50 Hz 160 dB

1) restricted to 125 V dc when the scanner (Option 6047/01) is incorporated

2) valid for a constant input signal; +/- 0.0005% range must be added during 100 ms after signal change

REAL TIME RATIO MEASUREMENT 6047/48

(Option 6047/05)

MEASURING METHOD

The ratio measurement application for DMM 6047 and 6048 is performed in real time. The input voltage of the ratio source is effectively used as an internal reference in comparison to the measured source with the proportion being directly developed. Using this technique, an outstanding noise suppression is achieved.

RATIO-(REFERENCE-)INPUT 5 Vdc to 20 Vdc

INPUT RESISTANCE > 10 G Ω

MAX. SIGNAL VOLTAGE 2 x reference voltage

DISPLAY
Input voltage
Reference voltage x 10

COMMON MODE RANGE

(referenced to "-" signal input)

"+" reference input -05 Vdc to + 20.5 Vdc
"-" reference input -9.8 Vdc to + 9.8 Vdc

Accuracy (1 year)

for U_{Ref} from 8 V to 20 V: Accuracy of the selected range

for U_{Ref} from 5 V to 8 V: Accuracy of the selected range multiplied by a factor of [(20V) / (Ref V)]

OVERLOAD LIMITS

between "+" and "-"
reference input 200 V peak

