

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 ±0,05ppm/°C, thus all specs are valid in the wide temperature range of 23°C±5°C. Therefore the 6048 is also well suited for the use outside the calibration lab.

Because of its outstanding accuracy and stability (0.5ppm/24h) 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 prooved as a 8½ 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 ±0,05ppm/°C, so daß alle Spezifikationen in dem weiten Umgebungstemperaturbereich von 23°C±5°C gelten. Das Gerät kann somit auch außerhalb eines Kalibrierlabors bestens zum Einsatz kommen.

Wegen seiner hervorragenden Genauigkeit und Stabilität (0,5ppm/24h) wird das DMM 6048 in vielen **DKD-Kalibrierstellen** als Referenzgerät verwendet und hat sich auch im Zusammenhang mit dem **Josephson-Spannungsnormal** der PTB als 8½-stelliges Gerät bestens bewährt.

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

- Supplement of data sheet DMM 6048 / Ergänzung zum Datenblatt DMM 6048 -

MEASURING CURRENT about 100 µA

-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)

SWITCHING MODE..... CHANNELS.....

SWITCHING DEVICES THERMOELECTRIC EMF less than 1 µV after 1,5 h warm-up time

GUARD SHIELD MAX. VOLTAGE BETWEEN 2 CONTACTS

OF A CHANNEL..... MAX. SWITCHED CURRENT

TIME BETWEEN 2 SWITCHING CYCLES..... MAX. CONTINUOUS SWITCHING FREQUENCY......

MAX. LEAD RESISTANCE..... CONTACT LIFE INSULATION RESISTANCE BETWEEN 2 CONTACTS ...

INSULATION RESISTANCE TO CASE

CAPACITANCE BETWEEN THE CONTACTS

1) Only for DMM 6047

20

isolated mechanical switches (monostable)

125 V peak, max. 10⁶ V · Hz ¹) 2 Adc or 3 A peak less than 100 ms

2 Hz less than 0.4 Ω per wire

more than 2 x 100 Million switching cycles (0.1 A, 10 Vdc)

3 G Ω when relative humidity less than 60 % 3 G Ω when relative humidity less than 60 %

less than 100 pF

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-UPTIME 20 minutes for 1 year accuracy, 1 h for full accuracy

RELATIVE HUMIDITY up to 25 °C up to 75% relative humidity

above 25 °C up to 65% relative humidity

100V,120V,220V,240V, switch-selected

LINE VOLTAGE POWER CONSUMPT, about 20 VA

FREQUENCY 50 Hz or 60 Hz

CABINET 19" aluminium flat cabinet

Height without/with feet 88 mm/105 mm Width 444 mm

Depth without/with handles 356 mm/396 mm

WEIGHT 5.2 kg (2.4 lbs)

ORDERING INFORMATION MODEL

6047/6048 Digital Multimeter

OPTIONS AND ACCESSORIES Scanner option2) 6047/01 6047/02

6048/05 Ratio input at the rear1) Adapter card for scanner input2) TYPE 5020 G Accessories for rack mounting

TYPE 5023 K Interface cable for IEEE 488 bus, length 2 m Mating plug vor scanner input2) Precision Lead set, very low thermoelectrical emf's Input plugs at the rear1) TYPE 3015

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

6047/03

6047/04



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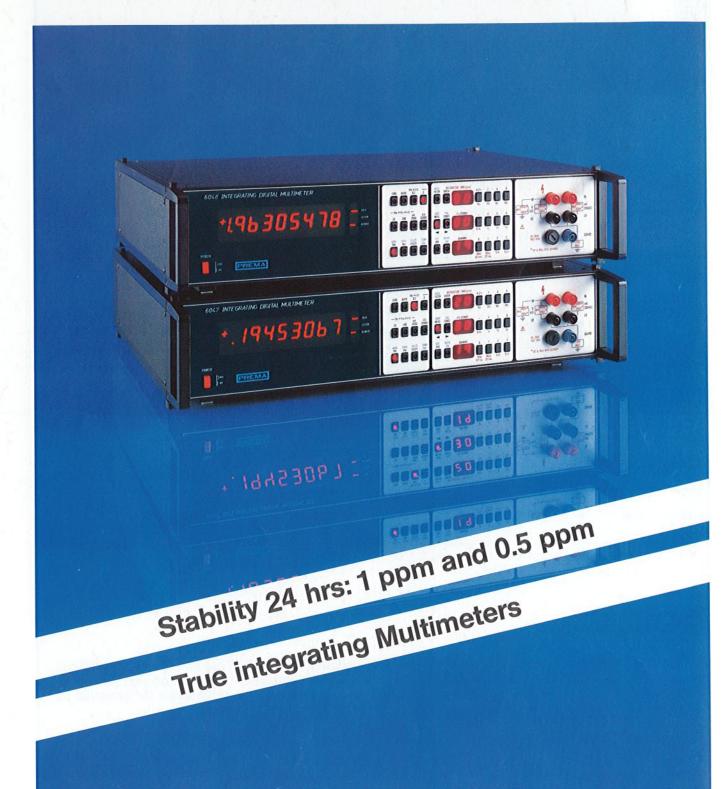
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INSTRUMENTS



DIGITAL MULTIMETER 6047 and 6048



CURRENT 6047

	mA =	mA~
RANGE	// 2000 mA/	// 2000 mA/
MEASURING TIMES (sec.)	/ 0.02 - 80 sec/	//
MAX. READING	//	//
RESOLUTION	/1μΑ/	/1μΑ/
ACCURACY (1 year, 23 ± 5 °C) 1)2)		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°C to 18°C and 28°C to 40°C)	// 0.0003 + 0.001/	//
DROP VOLTAGE		
2000 mA	/ le	ess than 600 mV/
OVERLOAD LIMITS	/ max. 3 A pea	ak (fuse rating 3.15 A/250V)/
CREST-FACTOR	**	/
SETTLING TIME	/	_ 1 s for 0.1 %/

RESISTANCE 6047

MEASURING METHOD

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

		MEASURING TIMES (sec.)	MAX. READING	RESOLUTION
RANGES	$200\Omega/2 k\Omega/20 k\Omega/200 k\Omega/2 M\Omega$	0.02 + 0.04	19.999	10 m Ω
	$20~\mathrm{M}\Omega$	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)]

	24 h, 23	°C ± 1°C	90 days,	23 °C \pm 5 °C	1 year, 23	1 year, 23 $^{\circ}$ C \pm 5 $^{\circ}$ C	
Range	% 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	0.001	0.0001	
20 kΩ		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	0.001	0.0003	0.0012	0.0003	0.002	0.0003	
20 MΩ		0.001	0.009	0.001	0.015	0.002	

TEMPERATURE COEFFICIENTS (10 °C - 18 °C, 28 °C - 40 °C) CURRENT THROUGH MEASURED RESISTOR

Range	±% read	ing/°C	Range	
200 Ω	0.0001	0.00015	200 Ω , 2k Ω	1 m
2 kΩ			20 kΩ	100 μ
20 kΩ			200 kΩ	10 μ
200 kΩ			2 M Ω	1 μ
2 ΜΩ			20 M Ω	0.1μ

20 MΩ 0.0008 OVERLOAD LIMIT ± 250 V peak 1)

Ran								
200	Ω , 2	2k	5	2			٠	1 mA
20	$k \Omega$,						100 μΑ
200	$k \Omega$							10 μΑ
2	$M\Omega$							1 μΑ
20	$M\Omega$							0.1 μΑ

VOLTAGE AT OPEN CIRCUIT TERMINALS

5 V max.

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

SUPPORTED FUNCTIONS Handshake source function

Handshake sink function AH1 T5 Talker function

Listener function L3 RL1 Remote control

DC₁ Reset function DT1 Trigger function

Service request function (SRQ) SR1

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

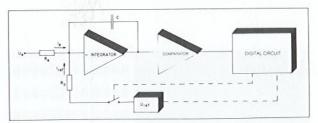
24-pole Amphenol Nr. 57-40240

COMPATIBILITY

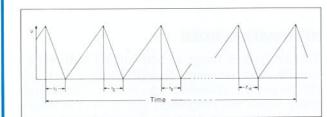
IEEE-Standard-488

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 continously 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

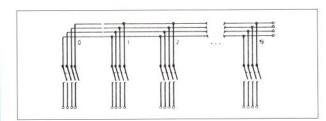


Integrator output voltage waveform

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 preselected 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

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

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

DIRECT VOLTAGE 6047

RANGES	$\pm 0.2 \text{ V/} \pm 2 \text{ V/} \pm 20 \text{ V/} \pm 200 \text{ V/} \pm 1000 \text{V}$	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)])

24 h, 23 °	C ± 1°C	90 days,	23 °C ± 5 °C	1 year, 23	3 °C ± 5 °C	
% read	% range	% read	% range	% read	% range	
0.0001	0.0001	0.0005	0.0001	0.0008	0.00015	
0.0001	0.00005	0.0005	0.00005	0.0007	0.0001	
0.0001	0.00005	0.0004	0.00005	0.0007	0.0001	
0.0001	0.0001	0.0008	0.0001	0.001	0.00015	
0.0003	0.0001	0.001	0.00015	0.0014	0.00015	
	% read 0.0001 0.0001 0.0001 0.0001	0.0001 0.0001 0.0001 0.00005 0.0001 0.00005 0.0001 0.0001	% read % range % read 0.0001 0.0001 0.0005 0.0001 0.0005 0.0005 0.0001 0.00005 0.0004 0.0001 0.0001 0.0008	% read % range % read % range 0.0001 0.0005 0.0001 0.0001 0.0005 0.0005 0.0001 0.0005 0.0004 0.0001 0.0001 0.0008 0.0001 0.0001 0.0008	% read % range % read % range % read 0.0001 0.0001 0.0005 0.0001 0.0008 0.0001 0.00005 0.00005 0.00005 0.0007 0.0001 0.00005 0.0004 0.00005 0.0007 0.0001 0.0001 0.0008 0.0001 0.001	% read % range % read % range % read % range 0.0001 0.0001 0.0005 0.0001 0.0008 0.00015 0.0001 0.00005 0.0005 0.00005 0.0007 0.0001 0.0001 0.0005 0.0004 0.00005 0.0007 0.0001 0.0001 0.0001 0.0008 0.0001 0.001 0.00015

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

Range	± % Az./°C
±0,2 V	0.00015
±2 V	
±20 V	
±200 V1)	0.0002
± 1000 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

30 HZ	Detter triair	100 00
46 Hz to 56 Hz	better than	50 dB
Common mode rejection (shield	connected o	n low resistance
path to one of the two input socl	kets, with 1 k	Ω in series with
one of the two input leads).		

Direct voltage 160 dB 50 Hz 160 dB

INPUT RESISTANCE

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

ZERO POINT

Temperature coefficient better than 0.3 μV/°C Long-term stability better than 1 uV 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: $\pm 0.2 \text{ V}, \pm 2 \text{ V}, \pm 20 \text{ V}$ range:	
for 60 seconds	
continuous	\pm 700 V ¹)
\pm 200 V, \pm 1000 V range:	
continuous	$\pm 1000 V^1$)

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

better than 100 dR

ALTERNATING VOLTAGE 6047/48

TVDE	OF	CON	VERSION	

MEAS. TIMES (sec.) MAX. READING RESOLUTION 199.999 0.1 - 0.41 µV True rms value. Can be switched to pure alternative voltage 1.999.999 100 nV measurement or to measurement of the sum of direct and alternating voltage components.

RANGE SELECTION manual, automatic or by remote control.

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

Range										1 MHz
0.2 V	0.1 + 0.01	/ 0.03	3 + 0.01	/	-0.03 + 0.02	2/_	$_{-}$ 3 + 0.1	/_		
2 V										
20 V										
200 V ²)	0.1 + 0.01	/ 0.0	2 + 0.007	/_	0.02 + 0.01	/_	0.1 + 0.1	/	2 + 1	/
700 V ²)	0.1 + 0.01	/ 0.0	4 + 0.007	/_	•					

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

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

ILMI LIMIONE COLITIO	
kHz [% readi	ing + % range]/°C
0-20 0.001	0.0005
20-3000.005	0.001
INPUT IMPEDANCE	$1 M\Omega // < 60 pF$
SETTLING TIME	1 s to 0.1%

OVERLOAD LIMITS

Input V $\pm\,1000\,V$ peak or 700 V rms with the restriction of 107 V·Hz2)

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 10⁶ V·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

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

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

CONSTANT QUALITY CONTROL

Precision Digital Multimeters, expecially 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.

Calibration for the 6047 and 6048 precision meters is carried out normally and is traceable to the standards of the Physics-Technical Federal Institute in Braunschweig (PTB). Additionally, NBS certification is available as required. Before release, these digital multimeters receive a comprehensive 90 day stability test during which the specifics of PREMA such as stability and preciseness are carefully tested.

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

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 Multi	meter	6047		604	48
	Working Temperature 23°C "	± 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 $\mu\Omega$	-	10 μΩ	-
Alternating Voltage	24 hours stability	-	50 ppm	-	50 ppm
	1 year accuracy	200 ppm	-	200 ppm	- 1 k
	Resolution	100 nV	-	100 nV	* - \\
Input Resistance		10 GΩ		10 GΩ	
Resolution		19 999 999)	199 999 99	9

^{*)} technical data specified for \pm 5 °C are also valid for \pm 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 $\pm 0.05~\text{ppm/}^{\circ}\text{C}$ is achieved. This guarantees the outstanding technical data of the meter in the expanded temperature

range of 23 °C \pm 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.

			CURRE	NT 6048			
		mA=					mA~
RANGE				A/			
MEASURING TIMES	(sec.)			sec/			c/
MAX. READING		THE RESERVE OF THE PERSON NAMED IN		9/		1.999.999	
RESOLUTION		. /	1 µA _			1 μΑ	
ACCURACY (1 year, 2					30 Hz	1 kHz	
2000 mA up to 2000		/ (0.003 +	0.001/	/ 0.04 +	0.04/	0.2 + 0.07/
TEMPERATURE COE							
(10 °C to 18 °C and 28	3°C to 40°C)	/ 0.	0003 + 0	.001/	/	0.004 + 0.00)2/
DROP VOLTAGE				les diminished			197
2000 mA		/	america.	less	than 600 my		
OVERLOAD LIMITS.			- Fried	_ max. 3 A peak	(fuse rating 3.	15 A/250V)	
CREST-FACTOR				100	/	7 : 1°) _	
SETTLING TIME		/		1	s for 0.1% _		
1) ± (% of reading + % of ra 2) Guard connected to "VOI 3) Peak value smaller than 3	hm-LO" input sock		eater than 5	% of maximum readin	g (10000 digit)	or equity to	M .
	_	RI	ESISTAI	NCE 6048			
4-wire circuit or 2-wire		rtahla via kauhaa	rd or IEE	= hus			
wire Circuit Or Z-Wil	o on ount, sere	otable via keyboa	I OF IEE		MEG () **	AV DEADING	DESCULITION
RANGES	2000/240/	20 kΩ / 200 kΩ /	2 MO	MEASURING TI 0.02 + 0.04	MES (sec.) M		RESOLUTION 10 m Ω
NANGES	20 MΩ / 200 I		2 17132	0.02 + 0.04 0.1 + 0.2 + 0.4		199.999	1 mΩ
RANGE SELECTION			e control			1.999.999	$100 \mu\Omega$
			TOURSTHAND TO T	4 + 10	i i	19.999.999	10 $\mu\Omega$
				20 + 40 + 80	19	99.999.999	10 $\mu\Omega$
stability (24 h) / AC in each case ± [% o			num readi	ng (% range)]			
NORMAL MEASURIN	IG CURRENT						
	24 h, 23 °C ±	5°C 9	0 days, 2	23 °C ± 5 °C	1 year, 23	°C ± 5 °C	
Range			% read	% range	% read	% range	
200 Ω			0.0005	0.0001	0.0008	0.0001	
2 kΩ			0.0004	0.0001	0.0007	0.0001	
20 kΩ			0.0004 0.0005	0.0001 0.0001	0.0007 0.0007	0.0001 0.0001	
2 MΩ			0.0003	0.0001	0.0007	0.0001	
20 MΩ			0.0009	0.0003	0.0015	0.0003	
200 MΩ			0.007	0.001	0.009	0.002	
LOW MEASURING C	URRENT						
_	24 h, 23 °C ±			23 °C ± 5 °C		°C ± 5 °C	
Range			% read	% range	% read	% range	
200 Ω 2 kΩ			0.0007 0.0006	0.0001	0.0012 0.0010	0.0001 0.0001	
20 kΩ			0.0006	0.0001	0.0010	0.0001	
200 kΩ			0.0009	0.0002	0.0015	0.0002	
2 MΩ			0.0012	0.0003	0.0020	0.0003	
20 M Ω	0.0040 0.0	0010	0.009	0.001	0.015	0.002	
TEMPERATURE COE	FFICIENTS (1		C – 40°C)	CURRENT TH	HROUGH ME	ASURED RESIS	STOR
nange		rrent		200 Ω , 2k Ω		mA 1 mA	
	±% reading/			20 kΩ		mA 100 μA	
200 Ω		0001			100		
2 kΩ		0001		2 M Ω	10	μ A 1 μ A	
20 kΩ		0001		20 MΩ	1	μ A 0.1 μ A	
200 kΩ		00015		200 M Ω	0.1	μ A	
2 ΜΩ		0002		VOLTAGE AT	OPEN CIRCL	JIT TERMINAL	3
20 MΩ		8000				max. 5 V m	
200 IVIS2	0.0000			OVERLOAD	LIMIT ± 250 V	/ peak 1)	
				C. Elleond	200 v	F-2011 /	
1) restricted to 125 V peak v	when the scanner i	s incorporated					

2

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.



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.



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.



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

TRIGGERING

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





Trigger plug

Calibration Switch

DIRECT VOLTAGE 6048

			DIRECTVO	LIAGE 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 0.02 + 0.04 19.999 0.1 + 0.2 + 0.4 199.999			RESOLUTION 10 μV 1 μV	
RANGE SELECTION	manual a	utomatic or rem	otely controlled			1.999.999	100 nV	
	manadi, d	atomatio or rom	otory controlled	4+10+20+4	0 + 80	19.999.999	10 nV	
				20 + 40 + 80		199.999.999	10 nV	
STABILITY (24 h) / A0 in each case \pm [% of	reading (% read) + % of r	maximum readi	ng (% range)])				
	24 h, 23 °			$23 ^{\circ}\text{C} \pm 5 ^{\circ}\text{C}$		3 °C ± 5 °C		
Range	% read	% range	% read	% range	% read	% range		
±0.2 V		0.0001	0.0004	0.0001	0.0006	0.00015		
±2 V	0.00005	0.00005	0.0003	0.00005	0.0005	0.0001		
±20 V		0.00005	0.0003	0.00005	0.0005	0.0001		
±200 V ¹)	0.0001	0.0001	0.0004	0.0001	0.0007	0.00015		
$\pm 1000 V^1$)	0.0002	0.0001	0.0005	0.00015	0.0008	0.00015		
TEMPERATURE COE Range ±0.2 V	± % Az./° 0.00005 0.00005		28°C - 40°C)		20 V	10 GΩ 10 MΩ		
±20 V	0.0001			ZERO POIN Temperature Long-term st	coefficient l	petter than 0.3 μ 0 petter than 1 μ V o		
MEASURING METHO	OD					•		
Continuously integra (German Patent No. 2				POLARITY C Automatic, m		100 ms		
INTERFERENCE SU (Measured by increa ence signal until a re 400 ms measuring tir	PPRESSIC sing the pe	ON eak amplitude o or of 1 digit is p	of the interfer-		t on selection time longer		orogram involving ring time, and or	
Series mode rejectio	n		10 dP	OVERLOAD LIMITS Between "+"- and "-"-input: ±0.2 V, ±2 V, ±20 V Bereich: tor 60 exception +1000 V()				
50 Hz								
46 Hz to 56 Hz								
Common mode reject				for 60 seconds				
path to one of the two		kets, with 1 kΩ	in series with	continuous ± 700 V¹) ±200 V, ±1000 V range: continuous ±1000 V¹)				
one of the two input		100 10						
Direct voltage				continuous .		± 1000 \	()	
1) restricted to 125 V dc wh 2) valid for a constant input				0 ms after signal char	nge			

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

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:

for U_{Ref} from 5 V to 8 V:

Accuracy of the selected range

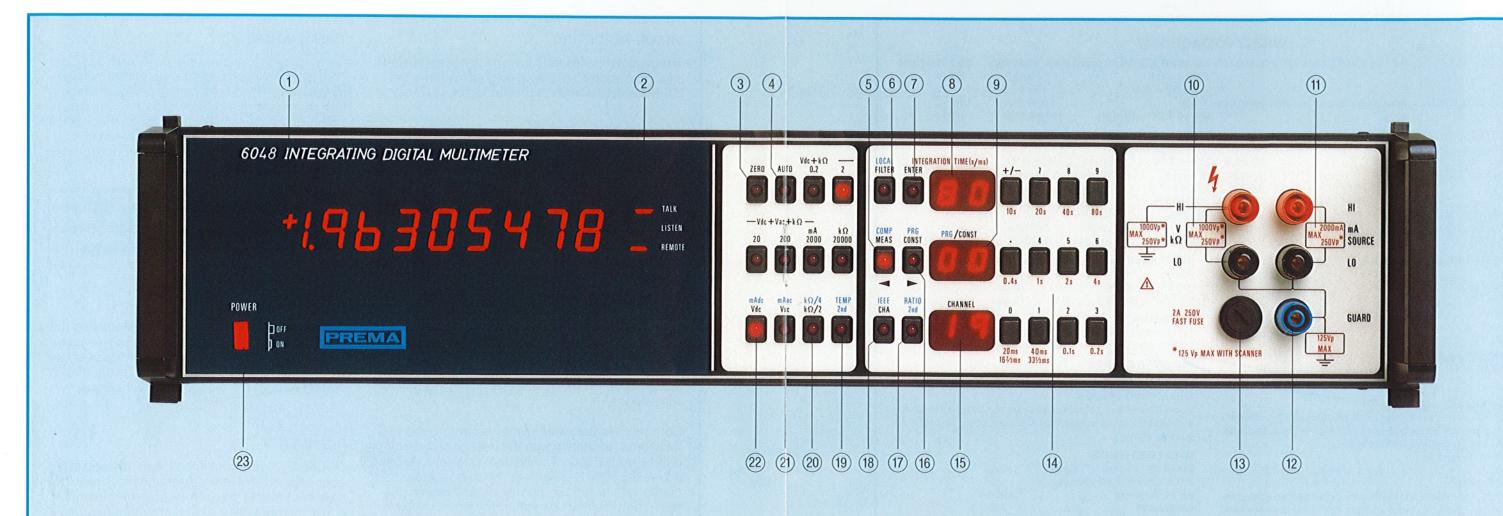
Accuracy of the selected range multiplied by a

factor of [(20V) / (Ref V)]

OVERLOAD LIMITS

between "+" and "-"

reference input...... 200 V peak



MATHEMATICA	I DE	COGRA	MS SET
WAIDEWAIL	4L PC	IUGNA	IVIO SEI

Prog	ram No.	Mathematical Function	Expression	Program No.	Mathematical Funct	ion Expression
01		Linear functions Offset	$R = X - C_0$	15	Minimum measured valu	e R = Xmin
02		Multiplication	$R = X \cdot C_5$	16	Range of measured valu	es R = Xmax - Xmin
03		Ratio	$R = \frac{X}{C4}$			
04		Power	$R = \frac{X^2}{C_4}$	17	Statistical functions Average value	$R = \frac{1}{i} \cdot \sum_{k=1}^{i} X_k = X$
05		Percentage deviation	$R = 100 \cdot \frac{X \cdot C_4}{C_4}$	18	Variance	$R = \frac{1}{i-1} \cdot \sum_{k=1}^{i} (X_k - X)^2$
06		Polynomial Polynomial	$\begin{aligned} R &= Co + C_1 \cdot x + \ldots + C_8 \cdot x^8 \\ \text{with } x &= \underline{X} \end{aligned}$	19	Standard deviation	$R = \sqrt{\frac{1}{1-1}} \cdot \sum_{k=1}^{1} (x_k - x)^2$
		Non-linear functions	C ₉	20	Root mean square (rms)	$R = \sqrt{\frac{1}{i} : \sum_{k=1}^{i} x_k^2}$
07		Logarithm	$R = C_5 \cdot \log \frac{X}{C_4}$	30	Program combination	$K = 1$ $C_9 = .xxyyzz$
08		Square root	$R = C_5 \cdot \sqrt{\frac{X}{C_4}}$	¥		
09		Tangent	$R = C_5 \cdot \tan \frac{X}{C_4}$			
			200		Scanner programming	
10		Arc tangent	$R = C_5 \cdot \arctan \frac{X}{C_4}$	50	Interval time	TI
		Limitualua	U 4	51	Delay time	TD
11		Limit values Limit	C7>X>C6	52	Duration of switch-on	то
10,04		semmen	-1	53	Channel preselection	Channel 00 to 19
12		Limit greater than	X < C7	. 54	Automatic scan	Start/Stop
13		Limit less than	x>c ₆		Sancial accommun	
				98	Special programms Selftest	
14		Maximum measured value	R = Xmax	99	Calibration	

- 1 INDICATOR: 7 1/2 to 8 1/2 digit measurement values.
- 2 CONDITION INDICATOR: IEEE Bus operation.
- 3 ZERO: Enter an offset value.
- 4 AUTO: Automatic ranging.
- MEAS: Normal measuring mode. COMP: The multimeter is in the calculating mode. In the start operation the key is used as a trigger.
- 6 FILTER: Switchable digital filter for rejection of further 20 dBs of disturbance averaging last 10 measurements. LOCAL: Switches to the keyboard in the IEEE-Bus operation
- ② ENTER: Confirms the entries of constants, programs, channels, etc.
- 8 INTEGRATION TIME: The remaining measuring time is counted down by seconds for integrations of 4 seconds or more.
- PRG: The selected mathematics program number is displayed.
 CONST: The entered constant is displayed.
- 10 V/k Ω INPUT: Very high ohm input resistance of over 10 G Ω
- mA/SOURCE INPUT: Serves as current measurement and as current source in the 4-pole resistance measurement.
- (2) SHIELDING: Important for a very good series mode repression in difficult measuring conditions.
- 13 FUSE: Protection for current overloads.

- NUMERICAL KEYBOARD: Serves to input the integration times and the constants for the mathematics programs.
- (5) CHANNEL: Shows the selected channel for the optional scanner.
- (6) PRG: Runs the mathematics programs. CONST: Enters constants required for the programs.
- (17) RATIO: Measurement mode proportion measurement. 2nd: The blue lettered functions of the right keyboard are selectable using this key.
- (8) CHA: Channel selection for the optional scanner (6047).
- (9) TEMP: Temperature measurement with a 4-wire programmed connected PT-100 temperature sensor. Displayed in °C, °F and K.
 2nd: Selecting the blue lettered measuring functions of
 - 2nd: Selecting the blue lettered measuring functions of the left functions and field keyboard.
- Ω k Ω /2: 2-wire resistance measurement. k Ω /4: 4-wire resistance measurement
- VAC: Alternating voltage measurement without the direct voltage portion. In order to also measure the direct voltage portion, the Vdc key must be depressed at the same time. mAac: Alternating current measurement.
- Vdc: Direct voltage measurement. mAdc: Direct current measurement.
- 23 Line Switch: The meter is switched on and off with this 2-pole switch.

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