

Specification for Digital Multimeter PM 2525/.2.

(Terms used in these specifications are based on definitions layed down in IEC 458).

General

Manufacturer : Philips HIG I&E
 Type number : PM 2525/.2.
 Designation : Digital Multimeter
 Measured functions : Vdc, Vac, Vac+dc, Vpeak,
 Adc, Aac
 Ohm 2W, Ohm 4W, \rightarrow , cont, F, °C,
 Hz, s.

General notes:

1. Specification points, marked with * apply only on the /52. and /62. versions.
2. This specification describes the overlapping specification points of the versions /02., /22., /52., /62. and /72. .

Measurement performanceDC voltage measurement

(VALID 1 HOUR AFTER POWER ON)

Ranges : 200 mV - 2000V (max.input voltage 1000V)
 Resolution : *High speed mode: 100uV in 200mV range
 Normal mode: 10uV in 200mV range
 High resolution mode: 1uV in 200mV range
 Number of representations units. : *High speed mode:2100
 Normal mode:21000
 High resolution mode:210000
 Accuracy at reference conditions speed 1+2 : $\pm(0.02\%$ of reading+0.01% of range)
 speed 3 : $\pm(0.15\%$ of reading+0.1% of range)
 Temperature coefficient : $\pm 0.002\%$ of reading/°C
 Input impedance : 200mV - 2V 20 M Ω // 50pF
 20 V 11 M Ω // 80pF
 200 V - 2000 V 10 M Ω // 90pF
 Offset current in input SMRR : < 20 pA
 : >80 dB for AC signals 50 Hz $\pm 0.1\%$
 >60 dB for AC signals 50 Hz $\pm 1.0\%$
 Maximum SM signal CMRR : 2x range except 2000 V range
 : >120 dB for DC signals
 >120 dB for signals 50 Hz $\pm 0.1\%$
 Max. CM-voltage : 250 V RMS
 350 V peak
 Response time : 0.2 /0.8 /5 s (without ranging)
 depending on speed.
 : 1 /1.5 /6 s (with ranging)
 depending on speed.

Maximum input voltage : Hi and Lo 1000 V RMS
 Hi and earth 1000 V RMS
 Lo and earth 250 V RMS

Max. V - Hz product of input signal : 10^7

Zeroing : automatically

Zero point drift : 0 - 35°C 2uV/°C
 35°- 45°C 10uV/°C

dB Measurement in DC ranges

Range : -77...+62.2 dB (reference resistor 600Ω)
 Measured values less than 0.1 mV is displayed as - UL. Measured value > 1000V is displayed as OL.

0 dB reference : 1 mV in reference resistor or when selecting the zero function with push button "zero" on/off.

Reference resistor : programmable between 0.0001 Ω and 9999 Ω

Resolution : 0.1 dB for signals > 1 mV
 1.0 dB for signals < 1 mV

Number of representation units : 999 for signals > 1 mV
 : 99 for signals < 1 mV

Accuracy
 signals > 5 mV;
 (speed 1+2) : ± 0.1 dB
 signals > 0.5 mV; < 5mV
 (speed 1+2) : ± 1.0 dB
 signals > 5 mV;
 (speed 3) : ± 0.4 dB

Temperature coefficient
 signals > 5 mV : ± 0.02 dB/°C
 signals < 5 mV : ± 0.2 dB/°C

Input impedance for signals between : 0 1.8 V 20 M // 50 pF
 1.8 V.. 18 V 11 M // 80 pF
 18 V .. 600 V 10 M // 90 pF

CMRR : > 120 dB for DC signals
 > 120 dB for AC signals 50 Hz
 ± 0.1%

Response time : 1.5 s

AC voltage measurement

Possible measuring modes : AC voltages excl. DC component
 AC voltages incl. DC component

Ranges : 200 mV - 2000 mV
 (max. input voltage 750 V RMS)

Resolution : *High speed mode: 100uV on 200 mV range.
 Normal mode 10 uV on 200 mV range
 Measured value under < 1% of range displayed as 0000

Number of representation units : *High speed mode: 2100
Normal mode: 21000

Function Vac

Accuracy at reference conditions over 3% - 100% of range.

All ranges (2000V only 20 Hz ... 70Hz)

20 Hz - 40 Hz	: ±(0.6% of reading+0.2% of range)
40 Hz - 100 Hz	: ±(0.2% of reading+0.1% of range)
100 Hz - 20 kHz	: ±(0.8% of reading+0.2% of range)
20 kHz - 50 kHz	: ±(2.5% of reading+0.5% of range)
50 kHz - 100 kHz	: ±(4.0% of reading+0.5% of range)

Function Vac/dc

Accuracy at reference conditions	: same as Vac : Additional for DC component: ±(0.2% of reading+0.1% of range)
Temperature coefficient	: ±(0.025% of reading+0.005% of range)/°C
Input impedance	: 200 mV - 2V 20 M // 50 pF 20 V 11 M // 80 pF 200 V - 2000 V 10 M // 90 pF
CMRR	: >120 dB for DC signals > 60 dB for AC signals 50 Hz
Freq. range	: 20 Hz ... 100 kHz, incl. or excl. DC component, switchable on front.
DC voltage on Vac for no additional error	: 25x range
Response time	: 1.5 s (without ranging) 3.0 s (with ranging)
AC detector	: True RMS
Crest factor	: 2 at full scale, increasing down scale via 2 x full scale/ranging
Maximum input voltage	: Hi and Lo 750 V RMS Hi and earth 750 V RMS Lo and earth 250 V RMS
Maximum V - Hz product	: 10 ⁷

dB measurements in AC ranges

Possible measuring modes : AC voltage excl. DC component (Vac)
AC voltage incl. DC component (Vac/dc)

Range : - 51.7 + 59.7 dB (reference resistor 600 Ω)
Measured value less than 2 mV is displayed as UL.

0 dB reference : 1 mW in reference resistor or when selecting the zero function with pushbutton zero "on/off".

Reference resistor : Programmable between 0.0001 Ω and 9999 Ω

Resolution : 0.1 dB

Number of representation units. : 999

Function Vac

Accuracy at reference conditions for signals

- 42.2 dB - 32.6 dB : 20 Hz ... 20 kHz \pm 0.8 dB
- 32.6 dB + 48.2 dB : 20 Hz ... 20 kHz \pm 0.4 dB
- 32.6 dB + 48.2 dB : 20 kHz ... 100 kHz \pm 1 dB

Function Vac/dc

Accuracy at reference conditions : same as Vac
additional for the DC component : \pm 0.2 dB

Temperature coefficient within specified range : \pm 0.02 dB/ $^{\circ}$ C

Input impedance for signals between : 0 .. 1.8 V 20 M // 50 pF
1.8 V .. 18 V 11 M // 80 pF
>18 V .. 10 M // 90 pF

CMRR : >120 dB for DC signals
> 60 dB for AC signals 50 Hz \pm 1%

Freq. range : 20 Hz ... 100 kHz, incl. or excl. DC component, switchable on front.

Response time : 3 s

AC detector : True RMS

Crest factor : 2

Maximum input voltage : Hi and Lo 750 V RMS
Hi and earth 750 V RMS
Lo and earth 250 V RMS

Maximum V - Hz product : 10^7

Vpeak

Possible measuring modes : V peak-peak; V peak pos;
Vpeak neg

Ranges : 2 V ... 2000 V
(max. input voltage 850 Vpeak)

Response time : 0.8 s (without ranging)
 2.5 s (with ranging)
 Protected up to : 250 V RMS ranges 1 uA - 100 mA
 Ranges 1 A ... 10 A not protected
 Max. CM - voltage : 250 V RMS, 350 V peak
 Max. input - voltage : Hi and Lo 250 V RMS
 Hi and earth 250 V RMS
 Lo and earth 250 V RMS

AC current measurements

Ranges : 1 uA...10 A
 Resolution : *High speed mode: 1 nA on 1 uA range
 Normal mode: 0.1 nA on 1 uA range
 measured value under 2% of range
 is displayed as 0000
 Number of representation units : *High speed mode: 1100
 Normal mode: 11000
 Accuracy (valid between 5% and 100% of range)
 Range 1 uA - 100 mA
 20 Hz - 40 Hz : $\pm(0.6\% \text{ of reading} + 0.2\% \text{ of range})$
 40 Hz - 200 Hz : $\pm(0.4\% \text{ of reading} + 0.15\% \text{ of range})$
 200 Hz - 500 Hz : $\pm(0.6\% \text{ of reading} + 0.2\% \text{ of range})$
 Range 1 A - 10 A
 20 Hz - 40 Hz : $\pm(0.6\% \text{ of reading} + 0.2\% \text{ of range})$
 40 Hz - 200 Hz : $\pm(0.4\% \text{ of reading} + 0.15\% \text{ of range})$
 200 Hz - 500 Hz : $\pm(3.0\% \text{ of reading} + 1.0\% \text{ of range})$
 Temperature coefficient : $\pm(0.04\% \text{ of reading} + 0.015\% \text{ of range})/^{\circ}\text{C}$
 Freq. range : 20 Hz ... 500 Hz
 Voltage drop : ranges 1 uA ... 1 mA < 2.5 mV
 ranges 10 mA and 1 A < 40 mV
 ranges 100 mA and 10 A < 400 mV
 AC detector : RMS convertor, AC coupled
 Crest factor : 4 at full scale
 Responce time : 1.5 s (without ranging)
 3 s (with ranging)
 Protected up to : 250 V RMS ranges 1 uA...100 mA
 Ranges 1 A... 10 A not protected
 Max. CM Voltage : 250 V RMS, 350 V peak
 Max. input voltage : Hi and Lo 250 V RMS
 Hi and earth 250 V RMS
 Lo and earth 250 V RMS

Resistance measurement

Possible measuring modes : two-wire configuration
 via Ω - 0 terminals.
 four-wire configuration
 via PROBE terminal selectable
 with switch on front

Ranges two-wire	: 200 Ω 200 M Ω
Ranges four-wire	: 200 Ω 2 M Ω
Maximum lead resistance on four wire configuration	: 2 Ω
Resolution	: *High speed mode: 100 m Ω on 200 Ω range Normal mode: 10 m Ω on 200 Ω range
Number of representation units	
200 Ω ... 20 M Ω	: *High speed mode: 2100 Normal mode: 21000
200 M Ω	: *High speed mode: 210 Normal mode: 2100
Accuracy	
200 Ω - 200 k Ω ; speed 2	: $\pm(0.1\%$ of reading+0.05% of range)
200 Ω - 200 k Ω ; speed 3	: $\pm(0.15\%$ of reading+0.15% of range)
2 M Ω - 20 M Ω ; speed 2	: $\pm(0.5\%$ of reading+0.05% of range)
2 M Ω - 20 M Ω ; speed 3	: $\pm(0.5\%$ of reading+0.15% of range)
200 M Ω	: $\pm(3\%$ of reading+ 1% of range)
Temperature coefficient	
200 Ω - 200 k Ω	: $\pm(0.01\%$ of reading+0.005% of range)/ $^{\circ}$ C
2 M Ω - 20 M Ω	: $\pm(0.05\%$ of reading+0.01% of range)/ $^{\circ}$ C
200 M Ω	: $\pm(0.5\%$ of reading+0.1% of range)/ $^{\circ}$ C
Measuring current	: 1 mA, 1 mA, 100 μ A, 10 μ A, 1 μ A, 100 nA, 10nA at the separate ranges
Maximum volt at open input	: 4 V
Polarity of input socket at two-wire	: - on Hi + on Lo
Response time	
200 Ω - 200 k Ω	: 0.8 s (without ranging) 2.5 s (with ranging)
2 M Ω - 20 M Ω	: 2 s (without ranging) 3.5 s (with ranging)
200 M Ω	: 9 s (without ranging) 10 s (with ranging)
Protected up to	: 250 V RMS
Maximum input voltage	: Hi and Lo 250 V RMS Hi and earth 250 V RMS Lo and earth 250 V RMS

Diode measurements

Driving current	: 1 mA
Range	: 2000.0 mV
Resolution	: 0.1 mV
Number of representation units	: 20000
Polarity input sockets	: - on Hi + on Lo

Response time : 0.8 s
 Maximum input voltage : Hi and Lo 250 V RMS
 Hi and earth 250 V RMS
 Lo and earth 250 V RMS

Continuity

Driving current : 1 mA
 Short circuit : Audible tone from 0 ... 10 Ω
 Isolation : Resistance > 10 Ω , no tone
 Response time : < 0.15 sec.

Capacity measurement

Ranges : 20 nF ... 2000 uF
 Resolution : *High speed mode: 10 pF in 20 nF range
 Normal mode: 1 pF in 20 nF range

Number of representation units : *High speed mode: 2100
 Normal mode: 21000
 (20 nF .. 200 uF range)
 2100
 (2000 uF range)

Accuracy
 20 nF .. 200 uF range : $\pm(1\%$ of reading+0.1% of range)
 2000 uF range : $\pm(10\%$ of reading+0.1% of range)
 Temperature coefficient:
 20 nF .. 200 uF range : $\pm(0.1\%$ of reading+0.01% of range)/ $^{\circ}\text{C}$

2000 uF of range : $\pm(1\%$ of reading+0.1% of range)/ $^{\circ}\text{C}$
 Measuring current : 100 nA, 1 uA, 10 uA, 100uA, 1mA
 at the separate ranges

Maximum voltage at input : 2.5 V
 Polarity input socket : - on Hi
 + on Lo

Response time : 1 s (without ranging)
 1.5 s (with ranging)

Protected up to : 250 V RMS
 Maximum input voltage : Hi and Lo 250 V RMS
 Hi and earth 250 V RMS
 Lo and earth 250 V RMS

Temperature measurements

For temperature measurements additional needed : Pt 100 probe
 Range : - 100 $^{\circ}\text{C}$... + 850 $^{\circ}\text{C}$
 Resolution : * Normal mode: 1 $^{\circ}\text{C}$
 High resolution mode: 0.1 $^{\circ}\text{C}$

Number of representation units : * Normal mode: 850
 High resolution mode: 8500
 Accuracy(excl. probe) : $\pm(0.3\%$ of reading+0.3 $^{\circ}\text{C}$)
 Temperature coefficient : $\pm(0.03\%$ of reading+0.03 $^{\circ}\text{C}$)/ $^{\circ}\text{C}$

Measuring current : 1 mA
 Response time : 0.5 s (excl. probe)
 Linearisation : probe characteristics is linearised within limits stated in DIN 43760
 Max. voltage at probe tip : depending on probe

Frequency measurements.

Ranges : 10 kHz ... 20 MHz
 Resolution : Normal mode 1 Hz in 10 kHz range
 High resolution mode 0.1 Hz in 10 kHz range
 Number of representation units 10 kHz ... 10 MHz : Normal mode: 10000
 High resolution mode: 100000
 20 MHz : Normal mode: 2000
 High resolution mode: 20000
 Accuracy : $\pm(0.01\%$ of reading + 2 digits range)
 Temperature coefficient : $\pm 0.001\%$ of reading / °C
 Response time : Normal mode: 0.3 s (without ranging)
 0.5 s (with ranging)
 High resolution: 2.5 s (without ranging)
 3.0 s (with ranging)
 range 10 kHz : Normal mode: 1.5 s (without ranging)
 2.0 s (with ranging)
 High resolution 13.0 s (with ranging)
 Impedance : 10 M // 50 pF
 Coupling : AC
 For voltage > 5 V max. V-Hz product : 10^7
 Maximum input voltage : Hi and Lo 250 V RMS
 Hi and earth 250 V RMS
 Lo and earth 250 V RMS
 Sensitivity : 10 Hz ... 100 Hz : 1 V peak
 100 Hz ... 10 MHz : 250 mV peak
 10 MHz ... 20 MHz : 500 mV peak

Time measurements

Range : 1 ... 10^5 seconds
 Resolution : 10 us in 1 second range
 Number of representation units : 99999
 Accuracy for timer measurements : 0.01% of reading
 Temperature coefficient : $\pm 0.001\%$ of reading / °C

Hold of time : 30 us
 Start : By positive or negative slope passing the trigger level. Selectable by push button "s".
 Stop : By positive and negative slope passing the trigger level. Selectable by push button "s".
 Reset : By pushbutton on date hold probe if connected or stop pulse, if no data hold probe is connected.
 Trigger level : < 1 V
 Result representation : Old measurement are displayed at least 500 ms. Display is updated at the "stop-condition" moment. 10 seconds after a "start-condition" the display starts counting the time in seconds until the " stop condition". If measuring time > 10 seconds, the beeper will be activated by the "stop condition" for a moment. A moving baragraph indicates a measurement in progress.

External triggering (/52. and /62. version only)
 Response time (single trigger, without ranging):

Function	HSM(speed 3)	NM(speed 2)	HRM(speed 1)
Vdc	0.1	0.4	4
Vac	0.25	0.55	-
Vp+, Vp-	-	0.5	-
Vpp	-	1.0	-
Adc	0.1	0.4	-
Aac	0.25	0.55	-
Ω	0.1	0.4	-
Temp	-	0.5	4.5
Freq	-	0.3	1.2 (100 kHz-20 MHz range)
Freq	-	1.5	11 (10 kHz range)
Cont	0.1	-	-
Diode	0.1	0.5	-
Cap	0.2	0.5	-

Calculate functions

- a. Relative reference setting via push button "zero".
 Measured value is default reference value (Can be altered manually)
- b. Min/max.
 Highest and lowest measured values are stored and can be displayed afterwards.
- c. dB
 $Display = 20 \log \frac{X}{R}$ X = measured value
 R = reference value
 is function Vdc, Vac, Vac + Vdc

Conversion characteristics

Kind of conversion	: linear
Operating principle	: Delta modulation
Basic mode of operating	: repetitive triggered
Range setting	: Manual - with UP and DOWN pushbutton Automatic - Upranging at 100% of scale 2000/10.000/20.000/100.000/ 200.000 Down ranging at 9.5% of scale 190/900/1900/9000/19000
Polarity setting	: Automatic setting on Vdc, Adc, Vpeak, °C, dB, relative reference
Display	
Visual representation	
Number of digits	: 5½, 4½, 4, 3½ depending of function and range
Number of representation units	: 2100 depending of 11000 function and 21000 range 210000
Means of representation of output value	: liquid crystal display Reflective Additional analog representation function by means of bargraph in LCD
Means of polarity repre- sentation	: Automatic indication of + or - or blanked according to measuring function
Means of measuring mode representation	: High speed mode SPEED 3 Normal mode SPEED 2 High resolution mode SPEED 1
Note:	SPEED 3 available on Vdc and on versions /52. and /62. for Vdc, Vac, Ω, Cap, Adc, and Aac functions. SPEED 2 for temperature function available only on /52. and /62. versions.
Means of decimal point representation	: Automatic indication, depending on range
Means of functional representation	: selected function is indicated in LCD
Means of overload representation	: display indicates "OL"
Means of representation of exceeding crest factor	: † in display
Data hold	: By using data hold probe PM 9267
Range hold	: possible via Auto/Man switch

Operating conditions (according to IEC 359)

- a. Climatic conditions : Group I with extension of the temperature limits
- Temperature:
- Reference temperature : + 23 °C .. ± 5 °C
- Rated range of use : 0 °C ...+40 °C
- Adjustment temp. range : + 21 °C ...+25 °C (factory only)
- Limit range of operation : 0 °C ...+55 °C
- Limit range of storage and transport : - 40 °C ...+70 °C
- Humidity
- Reference rel.hum. : 20 ...80% excluding condensation
- Limit range of storage and transport : 5 - 95% RH
- Max. dew point : 26 °C
- b. Mechanical conditions : according UN-D 1639/03
class: portable equipment
subclass I
- c. EMC
Emmission : CISPR publ. 11 and 14
VDE 871-B, VDE 875-K
according Vfg. 1046/84

Line supply conditions

- Group : S2
- Reference value : 230 V ± 1%
- Rated range of use : 230 V + 12% - 15%

Note : Instruments can be altered for nominal mains voltage of 115 V

Mains supply frequency

- Reference value : 50 Hz ± 1%
- Rated range of use : 50 Hz ± 5%

Note 1 : Instruments can be altered for nominal frequency of 60 Hz

Note 2 : Mains frequency can influence Series Mode Rejection; see specification SMR to meet same spec. for 60 Hz as for 50 Hz signals, the settings of the PM 2525 must be altered in the check function.

