HAMEG Instruments

3GHz Programmable Counter
HM8123

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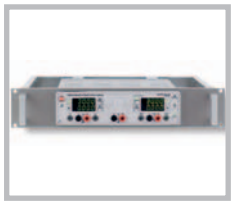
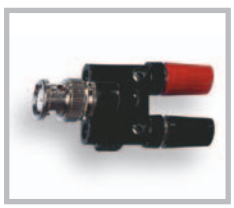
USB | RS-232 | optional IEEE-488

HZ33, HZ34
Test cable BNC/BNC

HZ42 19" Rackmount kit 2 RU



HZ20 Connector
BNC to 4 mm socket



- ☑ Measurement range 0Hz...3GHz
- ☑ 2 measurement inputs DC...200MHz,
  1 measurement input 100MHz...3GHz
- ☑ Input A/B: Input impedance 1MΩ/50Ω (switchable),
  sensitivity 25mV$_{rms}$
- ☑ Input C: Input impedance 50Ω, sensitivity 30mV$_{rms}$
- ☑ 400MHz time base with 0.5ppm stability
- ☑ 9-digit resolution at 1s gate time
- ☑ 9 measurement functions, external gate and arming
- ☑ Input for external time base (10MHz)
- ☑ Display modes: numeric, histograms or trend plots
- ☑ Standard: TCXO (temperature stability: ±0.5x10^{-6})
  Optional: OCXO (temperature stability: ±1x10^{-8})
- ☑ Intuitive one-pushbutton operation each function directly addressable
- ☑ Galvanically isolated USB/RS-232 Interface, optional IEEE-488

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All data valid at 23 °C after 30 minute warm-up

Input characteristics (Input A and B)

Connection:	BNC socket	
Frequency range:		
0...200 MHz	(DC-coupled)	
10 Hz...200 MHz	(1 MΩ, AC-coupled)	
500 kHz...200 MHz	(50 Ω, AC-coupled)	
Input impedance:	1 MΩ II 30 pF or 50 Ω (switchable)	
Attenuation:	1:1, 1:10, 1:100 (selectable)	
Sensitivity: (normal triggering)		
0...80 MHz	25 mV_{rms} (sine wave), 80 mV_{pp} (pulse)	
80 MHz...200 MHz	65 mV_{rms} (sine wave)	
20 Hz...80 MHz	50 mV_{rms} (sine wave, auto trigger)	
Trigger (programmable via encoder or software)		
Attenuation:	**Trigger level:**	**Resolution:**
1:1	0...± 2 V	1 mV
1:10	0...± 20 V	10 mV
1:100	0...± 200 V	100 mV
Max. input voltage:		
Input 1 MΩ:	250 V (DC + AC_{peak}) from 0...440 Hz decreasing to 8 V_{rms} at 1 MHz	
Input 50 Ω:	5 V_{rms}	
Minimum pulse duration:	‹5 ns for single pulse	
Input noise:	(typ.) 100 µV	
Auto trigger (AC coupling):	trigger point: 50 % of peak-to-peak value	
Trigger slope:	Raising or falling	
Filter:	100 kHz low-pass filter (switchable)	

Input characteristics (Input C)

Connection:	SMA socket	
Frequency range:	100 MHz...3 GHz	
Input sensitivity:	up to 1 GHz:	30 mV_{rms} (typ. 20 mV_{rms})
	1 GHz...3 GHz:	100 mV_{rms} (typ. 80 mV_{rms})
Input impedance:	50 Ω nominal	
Max. input voltage:	5 V (DC + AC_{peak})	

Input characteristics

	External Reset	Reference	Gate/Arming
Input impedance:	5 kΩ	500 Ω	5 kΩ
Max. input voltage:	± 30 V	± 20 V	± 30 V
Input sensitivity:	-	typ. 2 V_{pp}	-
High level:	› 2 V	-	› 2 V
Low level:	‹ 0.5 V	-	‹ 0.5 V
Min. pulse duration:	200 ns	-	50 ns
Input frequency:	-	10 MHz	-
Min. eff. gate time:	-	-	20 µs

Measurement functions

Frequency A/B/C; period duration A; width A; totalize A; RPM A; frequency ratio A:B; time interval A:B; time interval A:B (average); phase A to B; Duty cycle A; burst measurements

Frequency measurement (Inputs A, B, C)

Frequency range:	0...200 MHz (3 GHz)
LSD:	(1.25 x 10^{-8}s x frequency) / measurement time
Resolution:	± 1 or 2 LSD
Accuracy:	± (resolution / frequency ± time inaccuracy ± trigger error[2] / measurement time)

Period duration measurement

Range:	10,000 s....5 ns
LSD:	(1.25 x 10^{-8}s x period) / measurement time
Resolution:	1 or 2 LSD
Accuracy:	± resolution / period ± (trigger error[2] B / measurement time)

Totalization A

	(manual control)	(external control)
Range:	0...200 MHz	0...200 MHz
Min. pulse duration:	10 ns	10 ns
LSD:	1 count	± 1 count
Resolution:	LSD	LSD
Accuracy:	(resolution ± ext. gate time error x frequency A)/total	
Pulse resolution:	10 ns	10 ns
Ext. gate error:	-	100 ns

Time interval / Average time interval

(Input A = start; input B = stop)

LSD:	10 ns (10 ns...1 ps in "average" mode)	
Resolution:	1 LSD (1 or 2 in "average" mode)	
Accuracy:	± (resolution + trigger error[2] + system error) / time interval ± time basis uncertainty (system error: ≤ 4 ns)	
Number of average:	N = 1...25	LSD = 10 ns
	N = 26...2,500	LSD = 1 ns
	N = 2,501...250,000	LSD = 100 ps
	N = 250,001...25,000,000	LSD = 10 ps
	N = › 25,000,000	LSD = 1 ps

RPM measurement

NPR[1] presetting:	1...65,535 pulses per revolution
Gate time:	330 ms fixed
LSD:	7.5 x 10^{-8} revolution speed
Resolution:	1 or 2 LSD
Accuracy:	± (trigger error[2] / 0.33) ± time basis error

Offset

Range: Covers the entire measurement range

Resolution: Same resolution as in normal measurement.
If the gate time is changed in the offset mode, the offset resolution is the reference value resolution or the current reading resolution (whichever is less precise).

Gate time

Range:	1 ms...65 s
Resolution:	1 ms
External gate time:	min. 20 µs

Time base

Frequency:	400 MHz clock rate; 10 MHz crystal	
Temperature stability (0...50 °C):	TCXO (standard): ± 0,5 x 10^{-6}	
	OCXO (type HM8123X): ± 1 x 10^{-8}	
Aging	**TCXO:**	‹ 0.27 ppm per month, 0.05 ppm per day
	OCXO:	≤ ±1x10^{-9}/day
External Reference:	10 MHz ± 20 ppm	

Miscellaneous

Interface:	USB/RS-232 (serial), IEEE-488 (optional)
Safety class:	Safety Class I (EN61010-1)
Display:	LCD display (83 x 21 mm)
Power supply:	115/230 V ± 10 %, 45/60 Hz, CAT II
Power consumption:	approx. 20 Watt
Operating temperature:	+5°C...+40°C
Storage temperature:	-20°C...+70°C
Max. rel. humidity:	5%...80% (non condensing)
Dimensions (W x H x D)**:**	285 x 75 x 365 mm
Weight:	approx. 4 kg

[1] NPR=number of pulses per revolution
[2] Trigger error= ± noise input (V_{pp}) / slew rate of the input signal

Accessories supplied: Operator's Manual and power cable
Optional accessories:
HZ42 19" Rackmount kit 2RU
HZ33/34 Test cable 50 Ω (BNC-BNC)
HZ24 Attenuators 50 Ω
HZ20 Adapter plug
HO880 IEEE-488 (GPIB) Interface
OCXO (Installation only ex factory, Type HM8123X)

HAMEG Instruments GmbH · Industriestr. 6 · D-63533 Mainhausen · Tel +49 (0) 6182 800 0 · Fax +49 (0) 6182 800 100 · www.hameg.com · info@hameg.com