

3GHz Programmable Counter HM8123 | HM8123-X



HM8123



HZ33, HZ34
Test Cable BNC/BNC



HZ42
19" Rackmount Kit 2RU



HZ20 Connector BNC to
4mm Socket



- ✓ Measurement range: DC to 3GHz
Input A/B (BNC): DC to 200MHz
Input C (SMA): 100MHz to 3GHz
- ✓ Input impedance A/B: 50Ω or 1MΩ (switchable), sensitivity 25mV
Input impedance C: 50Ω, sensitivity 30mV
- ✓ 10-digit resolution (at 10s gate time)
- ✓ 9 measurement functions, external GATE and ARMING connectors (BNC)
- ✓ External Ref.-Input/Output (10MHz) via BNC-connector
- ✓ HM8123: TCXO (temperature stability: $\pm 0.5 \times 10^{-6}$)
HM8123-X: OCXO (temperature stability: $\pm 1.0 \times 10^{-8}$)
- ✓ RS-232/USB dual interface, IEEE-488 (GPIB) optional
- ✓ Fanless design

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

Input characteristics (Input A and B)

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

Input characteristics (Input C)

Connection:	SMA socket
Frequency range:	100 MHz to 3 GHz
Input sensitivity:	up to 1 GHz: 30 mV _{rms} (typ. 20 mV _{rms}) 1 to 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 k Ω	500 Ω	5 k Ω
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 μ s

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 to 200 MHz (3 GHz)
LSD:	(1.25 x 10 ⁻⁸ s x frequency)/measurement time
Resolution:	1 LSD
Accuracy:	$\pm$ (resolution/frequency $\pm$ time inaccuracy $\pm$ trigger error ²⁾ /measurement time)

Period duration measurement

Range:	5 ns to 10,000 s
LSD:	(1.25 x 10 ⁻⁸ s x period)/measurement time
Resolution:	1 LSD
Accuracy:	$\pm$ resolution/period $\pm$ (trigger error ²⁾ /measurement time)

Totalization A

	(manual control)	(external control)
Range:	0 to 200 MHz	0 to 200 MHz
Min. pulse duration:	10 ns	10 ns
LSD:	1 count	± 1 count
Resolution:	LSD	LSD
Accuracy:	(resolution $\pm$ 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 (0.1 ps to 10 ns in 'average' mode)
Resolution:	1 LSD
Accuracy:	$\pm$ (resolution + trigger error ²⁾ +system error)/time interval $\pm$ time base uncertainty (system error: ≤ 4 ns)
Number of average:	N = 1 to 25 LSD = 10 ns N = 26 to 2,500 LSD = 1 ns N = 2,501 to 250,000 LSD = 100 ps N = 250,001 to 25,000,000 LSD = 10 ps N = >25,000,000 LSD = 0.1 ps

RPM measurement

NPR ¹⁾ presetting:	1 to 65,535 pulses per revolution
Gate time:	330 ms fixed
LSD:	7.5 x 10 ⁻⁸ x revolution speed
Resolution:	1 LSD
Accuracy:	$\pm$ (trigger error ²⁾ /0.33) $\pm$ time base 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 to 65 s
Resolution:	1 ms
External gate time:	min. 20 μ s

Time base

Frequency:	400 MHz clock rate; 10 MHz crystal
Temperature stability	HM8123 (TCXO): ± 0.5 x 10 ⁻⁶ (0 to 50 °C): HM8123-X (OCXO): ± 1.0 x 10 ⁻⁸
Aging	HM8123 (TCXO): <0.27 x 10 ⁻⁶ per month, 0.05 x 10 ⁻⁶ per day HM8123-X (OCXO): ≤ 1.0 x 10 ⁻⁷ /day
External Reference:	10 MHz ± 20 x 10 ⁻⁶

Miscellaneous

Interface:	Dual-Interface USB/RS-232 (H0820), IEEE-488 (GPIB) (optional)
Safety class:	Safety Class I (EN61010-1)
Display:	LCD display (83 x 21 mm)
Power supply:	115/230 V ± 10 %, 45 to 60 Hz, CAT II
Power consumption:	approx. 20 W
Operating temperature:	+5 to +40 °C
Storage temperature:	-20 to +70 °C
Rel. humidity:	5 to 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= $\pm$ noise input (V_{pp})/slew rate of the input signal

Accessories supplied: Line cord, printed Operating manual, CD

Recommended accessories:

H0880	Interface IEEE-488 (GPIB), galvanically isolated
HZ13	Interface cable (USB) 1.8 m
HZ14	Interface cable (serial) 1:1
HZ20	Adapter, BNC to 4 mm banana
HZ24	Attenuators 50 Ω (3/6/10/20 dB)
HZ33	Test cable 50 Ω , BNC/BNC, 0.5 m
HZ34	Test cable 50 Ω , BNC/BNC, 1.0 m
HZ42	19" Rackmount kit 2RU
HZ72	GPIB-Cable 2 m