

## 3GHz Programmable Counter HM8123



HM8123



HZ33, HZ34  
Test Cable BNC/BNC



HZ42  
19" Rackmount Kit 2RU



HZ20 Connector BNC to  
4mm Socket



- ✓ Measurement Range 0Hz...3GHz
- ✓ 2 Measurement Inputs DC...200MHz,  
1 Measurement Input 100MHz...3GHz
- ✓ Input Impedance A/B: 1MΩ/50Ω (switchable), Sensitivity 25mV<sub>rms</sub>
- ✓ Input Impedance C: 50Ω, Sensitivity 30mV<sub>rms</sub>
- ✓ 400MHz Time Base with 0.5ppm Stability
- ✓ 10-Digit Resolution at 10s Gate Time
- ✓ 9 Measurement Functions, external Gate and Arming
- ✓ Input for external Time Base (10MHz)
- ✓ Standard: TCXO (Temperature Stability:  $\pm 0.5 \times 10^{-6}$ )  
Optional: OCXO (Temperature Stability:  $\pm 1 \times 10^{-8}$ )
- ✓ Intuitive One-Pushbutton Operation, each Function directly selectable
- ✓ Galvanically isolated USB/RS-232 Dual-Interface, optional IEEE-488 (GPIB)

## 3 GHz Programmable Counter HM8123

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

### Input characteristics (Input A and B)

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

### Input characteristics (Input C)

<b>Connection:</b>	SMA socket	
<b>Frequency range:</b>	100 MHz...3 GHz	
<b>Input sensitivity:</b>	up to 1 GHz: 30 mV <sub>rms</sub> (typ. 20 mV <sub>rms</sub> )	
	1...3 GHz: 100 mV <sub>rms</sub> (typ. 80 mV <sub>rms</sub> )	
<b>Input impedance:</b>	50 Ω nominal	
<b>Max. input voltage:</b>	5V (DC + AC <sub>peak</sub> )	

### Input characteristics

	External Reset	Reference	Gate/Arming
<b>Input impedance:</b>	5 kΩ	500 Ω	5 kΩ
<b>Max. input voltage:</b>	±30V	±20V	±30V
<b>Input sensitivity:</b>	-	typ. 2V <sub>pp</sub>	-
<b>High level:</b>	>2V	-	>2V
<b>Low level:</b>	<0.5V	-	<0.5V
<b>Min. pulse duration:</b>	200 ns	-	50 ns
<b>Input frequency:</b>	-	10 MHz	-
<b>Min. eff. gate time:</b>	-	-	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)

<b>Frequency range:</b>	0...200 MHz (3 GHz)
<b>LSD:</b>	(1.25 x 10 <sup>-8</sup> s x frequency)/measurement time
<b>Resolution:</b>	1 LSD
<b>Accuracy:</b>	±(resolution/frequency ±time inaccuracy ±trigger error <sup>2)</sup> /measurement time)

### Period duration measurement

<b>Range:</b>	5 ns...10,000 s
<b>LSD:</b>	(1.25 x 10 <sup>-8</sup> s x period)/measurement time
<b>Resolution:</b>	1 LSD
<b>Accuracy:</b>	±resolution/period ±(trigger error <sup>2)</sup> /measurement time)

### Totalization A

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

### Time interval/Average time interval

(Input A = start; input B = stop)		
<b>LSD:</b>	10 ns (0,1 ps...10 ns in 'average' mode)	
<b>Resolution:</b>	1 LSD	
<b>Accuracy:</b>	±(resolution + trigger error <sup>2)</sup> +system error)/time interval ±time base uncertainty (system error: ≤4 ns)	
<b>Number of average:</b>	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 = 0.1 ps

### RPM measurement

<b>NPR<sup>1)</sup> presetting:</b>	1...65,535 pulses per revolution
<b>Gate time:</b>	330 ms fixed
<b>LSD:</b>	7.5 x 10 <sup>-8</sup> x revolution speed
<b>Resolution:</b>	1 LSD
<b>Accuracy:</b>	±(trigger error <sup>2)</sup> /0.33) ±time base error

### Offset

<b>Range:</b>	Covers the entire measurement range
<b>Resolution:</b>	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

<b>Range:</b>	1 ms...65 s
<b>Resolution:</b>	1 ms
<b>External gate time:</b>	min. 20 μs

### Time base

<b>Frequency:</b>	400 MHz clock rate; 10 MHz crystal
<b>Temperature stability</b>	TCXO (standard): ±0,5 x 10 <sup>-6</sup>
(0...50 °C):	OCXO (H085): ±1 x 10 <sup>-8</sup>
<b>Aging TCXO:</b>	<0.27 ppm per month, 0.05 ppm per day
<b>OCXO:</b>	≤±1 x 10 <sup>-9</sup> /day
<b>External Reference:</b>	10 MHz ±20 ppm

### Miscellaneous

<b>Interface:</b>	Dual-Interface USB/RS-232 (H0820), IEEE-488 (GPIB) (optional)
<b>Safety class:</b>	Safety Class I (EN61010-1)
<b>Display:</b>	LCD display (83 x 21 mm)
<b>Power supply:</b>	115...230V ±10%, 45...60 Hz, CAT II
<b>Power consumption:</b>	approx. 20W
<b>Operating temperature:</b>	+5...+40 °C
<b>Storage temperature:</b>	-20...+70 °C
<b>Rel. humidity:</b>	5...80% (non condensing)
<b>Dimensions (W x H x D):</b>	285 x 75 x 365 mm
<b>Weight:</b>	approx. 4 kg

<sup>1)</sup> NPR=number of pulses per revolution

<sup>2)</sup> Trigger error= ±noise input (V<sub>pp</sub>)/slew rate of the input signal

**Accessories supplied:** Line cord, Operating manual, CD

#### Recommended accessories:

H085	OCXO, temperature stability ±1 x 10 <sup>-8</sup> (Installation only ex factory)
H0880	Interface IEEE-488 (GPIB), galvanically isolated
HZ13	Interface cable (USB) 1.8 m
HZ14	Interface cable (serial) 1:1
HZ20	Adapter, BNC to 4mm 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