

# HM8150

## Function Generator

### Technical Data



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#### Key facts

- Frequency range: 10mHz to 12.5MHz
- Output voltage: 10mV<sub>pp</sub> to 10V<sub>pp</sub> (into 50Ω)
- Waveforms: Sine wave, square wave, triangle, pulse, sawtooth, arbitrary
- Rise and fall time <10ns
- Pulse width adjustment: 100ns to 80s
- Arbitrary waveform generator 40MSa/s
- Burst, gating, external triggering, sweep
- Free of charge software for remote control and for creation of arbitrary waveforms
- External amplitude modulation (bandwidth 20kHz)
- Intuitive operation with one touch of a button – quick change of signals
- Galvanically isolated USB/RS-232 dual-interface, optional IEEE-488 (GPIB)

# Technical Data

## 3 GHz Programmable Counter HM8123

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 $\Omega$ , AC coupled	
500 kHz to 200 MHz	50 $\Omega$ , AC coupled	
Input impedance	1 M $\Omega$    30 pF or 50 $\Omega$ (switchable)	
Attenuation	1:1, 1:10, 1:100 (selectable)	
Sensitivity (normal triggering)		
0 to 80 MHz	25 mV <sub>rms</sub> (sine wave), 80 mV <sub>SS</sub> (pulse)	
80 to 200 MHz	65 mV <sub>rms</sub> (sine wave)	
20 Hz to 80 MHz	50 mV <sub>rms</sub> (sine wave, auto trigger)	
Trigger (programmable via encoder or software)		
Attenuation:	Trigger level	Resolution
1:1	0 to $\pm 2$ V	1 mV
1:10	0 to $\pm 20$ V	10 mV
1:100	0 to $\pm 200$ V	100 mV
Max. input voltage		
Input 1 M $\Omega$	250V (DC + AC <sub>peak</sub> ) from 0 to 440 Hz decreasing to 8V <sub>rms</sub> at 1 MHz	
Input 50 $\Omega$	5V <sub>rms</sub>	
Minimum pulse duration	<5 ns for single pulse	
Input noise	(typ.) 100 $\mu$ 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	to 1 GHz:	30 mV <sub>rms</sub> (typ. 20 mV <sub>rms</sub> )	
	1 to 3 GHz:	100 mV <sub>rms</sub> (typ. 80 mV <sub>rms</sub> )	
Input impedance	50 $\Omega$ nominal		
Max. Input voltage	5V (DC + AC <sub>peak</sub> )		

### Input characteristics

	External Reset	Reference	Gate/Arming
Input impedance	5 k $\Omega$	500 $\Omega$	5 k $\Omega$
Max. Input voltage	$\pm 30$ V	$\pm 20$ V	$\pm 30$ V
Input sensitivity	-	typ. 2V <sub>pp</sub>	-
High level	>2V	-	>2V
Low level	<0,5V	-	<0,5V
Min. pulse duration	200 ns	-	50 ns
Input frequency	-	10 MHz	-
Min. eff. gate time	-	-	20 $\mu$ 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 <sup>-8</sup> s x frequency) / measurement time
Resolution	1 LSD

Accuracy	$\pm$ (resolution/frequency $\pm$ time inaccuracy $\pm$ trigger error <sup>2</sup> ) / measurement time)
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### Period duration measurement

Range	5 ns to 10.000 s
LSD	(1,25 x 10 <sup>-8</sup> s x period) / measurement time
Resolution	1 LSD
Accuracy	$\pm$ resolution / period $\pm$ (trigger error <sup>2</sup> ) / 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	$\pm 1$ 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 im 'average' mode)	
Resolution	1 LSD	
Accuracy	$\pm$ (resolution + trigger error <sup>2</sup> ) +system error) / time interval $\pm$ time base uncertainty (system error: $\leq 4$ ns)	
Number of average	N = 1 to 25 N = 26 to 2.500 N = 2.501 to 250.000 N = 250.001 to 25.000.000 N = >25.000.000	LSD = 10 ns LSD = 1 ns LSD = 100 ps LSD = 10 ps LSD = 0,1 ps

### Drehzahlmessung

NPR <sup>1)</sup> presetting	1 to 65,535 pulses per revolution
Gate time	330 ms fixed
LSD	7,5 x 10 <sup>-8</sup> x revolution speed
Resolution	1 LSD
Accuracy	$\pm$ (trigger error <sup>2</sup> ) / 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 $\mu$ s

### Time base

Frequency	400 MHz clock rate; 10 MHz Quarz
Temperature stability (0 to 50°C)	TCXO (standard): $\pm 0,5 \times 10^{-6}$ OCXO (HO85): $\pm 1,0 \times 10^{-8}$
Alterung TCXO	<0.27 ppm per month, 0.05 ppm per day
OCXO	$\leq \pm 1 \times 10^{-9}$ /day
External Reference	10 MHz $\pm 20$ ppm

### Miscellaneous

Interface	Dual-Interface USB/RS-232 (HO820), optional HO880 IEEE-488 (GPIB)
Safety class	Safety class I (EN61010-1)
Display	LCD display (83 x 21 mm)
Netzanschluss	115 to 230V $\pm 10\%$ , 45 to 60 Hz, CAT II

Power consumption	approx. 20W
Operating temperature	+5 to +40°C
Storage temperature	-20 to +70°C
Rel. humidity	5 to 80% (without condensation)
Dimensions (W x H x D)	285 x 75 x 365mm
Weight	approx. 4kg

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, Operating manual

#### **Recommended accessories:**

HO880 Interface IEEE-488 (GPIB), galvanically isolated

HZ20 Adapter, BNC to 4mm banana

HZ24 Attenuators 50  $\Omega$  (3/6/10/20 dB)

HZ42 19" Rackmount kit 2RU

HZ72 GPIB-Cable 2m