

## Fluke 123 Industrial ScopeMeter® Specifications

### Technical Data

#### Introduction

##### Performance characteristics

Fluke guarantees the properties expressed in numerical values with the stated tolerance. Specified non-tolerance numerical values indicate those that could be nominally expected from the mean of a range of identical ScopeMeter test tools.

##### Environmental data

The environmental data mentioned in this technical data are based on the results of the manufacturer's verification procedures.

##### Safety characteristics

The ScopeMeter 123 test tool has been designed and tested in accordance with ANSI/ISA S82.01-1994, EN 61010.1 (1993) (IEC 1010-1), CAN/CSA-C22.2 No.1010.1-92, UL3111-1 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use.

Use of this equipment in a manner not specified by the manufacturer may impair protection provided by the equipment.

#### Specifications

##### Dual input oscilloscope

###### Vertical

###### Frequency response

DC coupled:

Excluding probes and test leads:

DC to 20 MHz (-3 dB)

With STL120 1:1 shielded test leads:

DC to 12.5 MHz (-3 dB)

DC to 20 MHz (-6 dB)

With PM 8918 10:1 probe (optional accessory): DC to 20 MHz (-3 dB)

###### AC coupled (LF roll off)

Excluding probes and test leads:

<10 Hz (-3 dB)

With STL120: <10 Hz (-3 dB)

With PM 8918: <1 Hz (-3 dB)

###### Rise time

Excluding probes and test leads:  
<17.5 ns

###### Input impedance

Excluding probes and test leads:

1 M $\Omega$ /12 pF

With BB120: 1 M $\Omega$ /20 pF

With STL120: 1 M $\Omega$ /225 pF

With PM 8918: 10 M $\Omega$ /15 pF

Sensitivity: 5 mV to 500V/div

Display modes: A, -A, B, -B

###### Max input voltage

A, B: 600V rms up to 200 kHz,  
derating to 6V rms @ 20 MHz

###### Max floating voltage

From any terminal to ground:  
600V rms up to 400 Hz

Resolution: 8 bit

Vertical accuracy:  $\pm 1\%$  of reading  
+ 0.05 range/div

Max vertical move:  $\pm 4$  divisions

##### Horizontal

###### Acquisition modes

Normal: Equivalent sampling: 20 ns  
to 500 ns/div; real time sampling:

1  $\mu$ s to 5s/div

Single (real time): 1  $\mu$ s to 5s/div

Roll (real time): 1s to 60s/div

Sampling rate (for both channels simultaneously): For repetitive signals (equivalent sampling) up to 1.25 GS/s; real time (normal and single): 1  $\mu$ s to 5 ms/div, 25 MS/s; 10 ms to 5s/div, 5 MS/s

###### Time base accuracy

Equivalent sampling:  $\pm 0.4\%$   
of reading +0.04 time/div

Real time sampling:  $\pm 0.1\%$   
of reading +0.04 time/div

Glitch detection:  $\geq 40$  ns

@ 20 ns to 5 ms/div;  $\geq 200$  ns

@ 10 ms to 5s/div

Glitch detection is always active

Horizontal move, 10 divisions.

Permits shifting of the display  
from 0 to 10 division of pre-trigger.  
Trigger point will always be visible.



### **Trigger**

**Mode:** Auto, Triggered, Single  
**Source:** A, B, EXT. EXTERNAL via optically isolated trigger probe ITP120 (optional accessory)

### **Sensitivity A and B**

@ DC to 5 MHz: 0.5 divisions or 5 mV  
@ 25 MHz: 1.5 divisions  
@ 40 MHz: 4 divisions  
**Slope:** Positive, Negative

### **Video A and B**

**Modes:** Lines, Line Select  
**Standards:** NTSC, PAL, PAL+, SECAM  
**Polarity:** Positive, Negative  
**Sensitivity:** 0.6 divisions sync

## **Advanced scope functions**

### **Display modes**

**Normal:** Captures up to 40 ns glitches and displays analog-like persistence waveform  
**Smooth:** Removes noise from a waveform  
**Envelope:** Records and displays the minimum and maximum of waveforms over time

### **Connect-and-View™**

Continuous fully automatic adjustment of amplitude, time base, trigger levels, trigger gap, hold-off, and position.  
Manual override: Manual adjustment of amplitude, time base, trigger level, or position.

### **Dual input autoranging meter**

The accuracy of all measurements is within  $\pm$  (%) of reading + number of counts) from 18°C to 28°C. Add 0.1x (specific accuracy) for each °C below 18°C or above 28°C. For voltage measurements with 10:1 probe, add probe uncertainty +1%. At least one waveform period must be visible on the screen.

### **Input A and Input B DC Voltage (VDC)**

**Ranges:** 500 mV, 5V, 50V, 500V, 1250V  
**Accuracy:**  $\pm$  (0.5% + 5 counts)  
**Normal mode rejection (SMR):** >60 dB @ 50 or 60 Hz  
**Common mode rejection (CMRR):** >100 dB @ dc; >60 dB @ 50, 60, or 400 Hz  
**Resolution:** 5000 counts

### **True-rms voltages (VAC and VAC+DC)**

**Ranges:** 500 mV, 5V, 50V, 500V, 1250V  
**Accuracy for 5% to 100% of range DC coupled:** DC to 60 Hz (VAC+DC)  $\pm$  (1% + 10 counts); 1 Hz to 60 Hz (VAC)  $\pm$  (1% + 10 counts)  
**AC or DC coupled:** 60 Hz to 20 kHz  $\pm$  (2.5% + 15 counts); 20 kHz to 1 MHz  $\pm$  (5% + 20 counts); 1 MHz to 5 MHz  $\pm$  (10% + 25 counts); 5 MHz to 20 MHz  $\pm$  (30% + 25 counts)  
**AC coupled with 1:1 (shielded) test leads:** 60 Hz (6 Hz with 10:1 probe) -1.5%; 50 Hz (5 Hz with 10:1 probe) -2%; 33 Hz (3.3 Hz with 10:1 probe) -5%; 10 Hz (1 Hz with 10:1 probe) -30%  
**Normal mode rejection (SMR):** >60 dB @ 50 or 60 Hz  $\pm$  1%  
**Common mode rejection (CMRR):** >100 dB @ dc; >60 dB @ 50, 60, or 400 Hz  
**Resolution:** 5000 counts  
**Crest factor:** Automatic ranging on crest factor overload

### **Peak**

**Modes:** Max peak, Min peak, or pk-to-pk  
**Ranges:** 50 mV, 500 mV, 5V, 50V, 500V, 1250V  
**Accuracy:** Max peak or Min peak, 5% of full scale; peak-to-peak, 10% of full scale  
**Resolution:** 500 counts

### **Frequency (Hz)**

**Ranges:** 1 Hz, 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz, 10 MHz, 40 MHz (1 Hz and 10 Hz in manual mode or Auto Set LF ranging only)  
**Accuracy:** @ dc to 1 MHz,  $\pm$  (0.5% + 2 counts); @ 1 MHz to 10 MHz  $\pm$  (1.0% + 2 counts); @ 10 MHz to 40 MHz  $\pm$  (2.5% + 2 counts)  
**Resolution:** 1000 counts

### **Duty Cycle (DUTY)**

**Range:** 2% to 98%  
**Accuracy:** Same as frequency  
**Resolution:** 0.1%

### **Pulse Width (PULSE)**

**Accuracy:** Same as frequency  
**Resolution:** 1000 counts

### **Amperes (AMP)**

With optional current probe  
**Ranges:** Same as VDC, VAC, VAC+DC, or peak  
**Scale factor:** 1 mV/A, 10 mV/A, 100 mV/A, and 1 V/A  
**Accuracy:** Same as VDC, VAC, VAC+DC, or peak (add current probe uncertainty)

### **Temperature (TEMP)**

With optional temperature probe  
**Range:** Same as VDC  
**Scale Factor:** 1 mV/°C and 1 mV/°F  
**Accuracy:** Same as VDC (add temperature probe uncertainty)

### **Decibel (dB)**

0 dBV: 1V  
0 dBm (600 $\Omega$ /50 $\Omega$ ): 1 mW referenced to 600 $\Omega$  or 50 $\Omega$  dB on VDC, VAC, or VAC+DC  
**Resolution:** 1000 counts

### **Crest Factor (CREST)**

**Range:** 1 to 10  
**Accuracy:**  $\pm$  (5% + 1 count)  
**Resolution:** 100 counts

### **Phase**

**Modes:** A to B, B to A  
**Range:** 0 to 359°  
**Accuracy:**  $\pm$  (1° + 1 count)  
**Resolution:** 1°

### **Input A**

#### **Ohm ( $\Omega$ )**

**Ranges:** 500 $\Omega$ , 5 k $\Omega$ , 50 k $\Omega$ , 500 k $\Omega$ , 5 M $\Omega$ , 30 M $\Omega$   
**Accuracy:**  $\pm$  (0.6% + 5 counts)  
**Resolution:** 5000 counts  
**Measurement current:** 0.5 mA to 50 nA (decreases with increasing ranges)  
**Open circuit voltage:** <4V

#### **Continuity (CONT)**

**Beep:** <(30 $\Omega$   $\pm$  5 $\Omega$ ) in 50 $\Omega$  range  
**Measurement current:** 0.5 mA  
**Detection of shorts of:**  $\geq$  1 ms

#### **Diode**

**Maximum voltage:** @ 0.5 mA 2.8V; @ open circuit 4V  
**Accuracy:**  $\pm$  (2% + 5 counts)  
**Measurement current:** 0.5 mA  
**Polarity:** + on input A, - on COM

#### **Capacitance (CAP)**

**Ranges:** 50 nF, 500 nF, 5  $\mu$ F, 50  $\mu$ F, 500  $\mu$ F  
**Accuracy:**  $\pm$  (2% + 10 counts)  
**Resolution:** 5000 counts  
**Measurement current:** 5  $\mu$ A to 0.5 mA (increases with increasing ranges)  
Dual slope integrating measurement with parasitic serial and parallel resistance cancellation.

## **Advanced meter functions**

### **Zero set**

Set actual value to reference

### **Fast/Normal/Smooth**

#### **Meter settling time**

Fast: 1s @ <10 ms/div  
Normal: 2s @ <10 ms/div  
Smooth: 10s @ <10 ms/div

## Touch Hold®

Captures and freezes a stable measurement result. Beeps when stable.

## TrendPlot

Graphs meter readings of the Min and Max values from 15s/div (120 seconds) to 2 days/div (16 days) with time and date stamp. Automatic vertical scaling and time compression. Displays the actual and Min, Max, or AVG reading.

## Fixed decimal point

Possible by using attenuation keys.

## Miscellaneous

### Display

**Size:** 72 x 72 mm (2.83 x 2.83 in)

**Resolution:** 240 x 240 pixels

**Vertical (scope mode):**

1 div = 20 pixels

**Horizontal (scope mode):**

1 div = 25 pixels

**Backlight:** Cold Cathode

Fluorescent (CCFL)

### Power

**External:**

Via PM 8907 Power Adapter

**Input voltage:** 10 to 21V dc

**Power:** 5W typical

**Input connector:** 5 mm jack

**Internal:**

**Battery power:** Rechargeable NiCd 4.8V

**Operating time:** 4 hours with bright backlight; 5 hours with dimmed backlight

**Charging time:** 4 hours with test tool off; 7 hours with test tool on; 12 hours with refresh cycle

**Allowable ambient temperature during charging:** 0°C to 45°C (32°F to 104°F)

## Memory

**Number of screens:** 2

**Number of user setups:** 10

## Mechanical

**Size:** 232 x 115 x 50 mm (9.1 x 4.5 x 2 in)

**Weight:** 1.1 kg (2.5 lb); includes battery pack

## Interface

RS-232, optically isolated.

To printer: Supports Epson FX, LQ, and HP Deskjet®, Laserjet®, and Postscript. Serial via PM 9080 (optically isolated RS-232 adapter/cable, optional). Parallel via PAC91 (optically isolated print adapter cable, optional).

To PC: Dump and load settings and data. Serial via PM 9080 (optically isolated RS-232 adapter/cable, optional).

## Environmental

**Environmental reference**

MIL 28800E, Type 3, Class 3, Style B

**Temperature**

**Operating:**

0°C to 50°C (32°F to 122°F)

**Storage:**

-20°C to 60°C (-4°F to 140°F)

**Humidity**

**Operating:** @0°C to 10°C (32°F to 50°F), non-condensing; @10°C to 30°C (50°F to 86°F) 95%; @30°C to 40°C (86°F to 104°F) 75%; @40°C to 50°C (104°F to 122°F) 45%

**Storage:** @-20°C to 60°C

(-4°F to 140°F), non-condensing

**Altitude**

**Operating:** Max input and floating voltage: 600V rms up to 2 km

**Storage:** 12 km (40,000 ft)

**Vibration:** Max 3g

**Shock:** Max 30g

**Electromagnetic Compatibility (EMC)**

**Emission:** EN 50081-1 (1992);

EN55022 and EN60555-2

**Immunity:** EN 50082-1(1992);

IEC1000-4-2, -3, -4, -5

**Enclosure Protection:** IP51

## Safety

**Ratings:** Designed for measurements on 600V rms Category III installations, Pollution Degree 2, per:

ANSI/ISA S82.01-1994

EN61010-1 (1993) (IEC1010-1)

CAN/CSA-C22.2 No.1010.1-92

UL3111-1

**Max input voltage input A and B:**

Direct on input or with leads 600V rms up to 200 kHz, derating to 6V rms @ 20 MHz

With Banana-to BNC Adapter

BB120: 300V rms up to 200 kHz, derating to 6V rms @ 20 MHz

**Max floating voltage:**

From any terminal to ground 600V rms up to 400 Hz

## CE marking

Conforms with the EEC directive 89/336. See additional information shown in Table 1 and Table 2.

## Warranty

Three years on parts and labor.

Quality system certified to ISO 9001.

## Accessories

Supplied complete with PM 8907

Line Adapter/Charger, STL120

Shielded Test Leads, AC120

Alligator Clips, HC120 Hook Clips,

one BB120 Shielded BNC Adapter,

BP120 Rechargeable Battery Pack,

and users manual.

Table 1. Trace disturbance with STL120

No visible disturbance	E = 3V/m	E = 10V/m
Frequency range 10 kHz to 27 MHz	50 mV/div to 500V/div	500 mV/div to 500V/div
Frequency range 27 MHz to 1 GHz	50 mV/div to 500V/div	50 mV/div to 500V/div

Indicated ranges are without visible disturbance.

Table 2.

Disturbance less than 10% of full scale	E = 3V/m	E = 10V/m
Frequency range 10 kHz to 27 MHz	10 mV/div to 20 mV/div	50 mV/div to 200 mV/div
Frequency range 27 MHz to 1 GHz	5 mV/div to 20 mV/div	—

Not indicated ranges (-) have no visible disturbance, indicated ranges show disturbance less than 10% of full scale.

Table 3. Multimeter disturbance (VDC, VAC, OHM, CAP) with TL120

Disturbance less than 1% of full scale	E = 1V/m	E = 3V/m
Frequency range 10 kHz to 27 MHz (with STL120)		
VDC, VAC, VAC+DC	500 mV to 1.25 kV	500 mV to 1.25 kV
OHM, CONT, DIODE	500Ω to 30 MΩ	500Ω to 30 MΩ
CAP	50 nF to 500 μF	50 nF to 500 μF
Frequency range 27 MHz to 1 GHz (with STL120)		
VDC, VAC, VAC+DC	500 mV to 1.25 kV	500 mV to 1.25 kV
OHM, CONT, DIODE	500Ω to 30 MΩ	500Ω to 30 MΩ
CAP	50 nF to 500 μF	50 nF to 500 μF

For conditions not specified in Tables 1 to 3, a susceptibility effect of more than 10% is possible.

# ScopeMeter® test tool Selection Guide

	Fluke 105B	Fluke 99B	Fluke 96B	Fluke 92B	Fluke 123
<b>Oscilloscope Features</b>					
Bandwidth	100 MHz	100 MHz	60 MHz	60 MHz	20 MHz
Maximum repetitive sample rate	5 GS/s	5 GS/s	2.5 GS/s	2.5 GS/s	1.25 GS/s
Number of channels	2 + Ext. Trig	2 + Ext. Trig	2 + Ext. Trig	2 + Ext. Trig	2
Rise time	<3.5 ns	<3.5 ns	<5.7 ns	<5.7 ns	<17.5 ns
Time/division	5 ns-60 sec	5 ns-60 sec	10 ns-60 sec	10 ns-60 sec	20 ns-60 sec
Volts/division	1 mV-100V	1 mV-100V	5 mV-100V	5 mV-100V	5 mV-500V
Record length (bytes)	512	512	512	512	512
ScopeRecord™ 30k memory	•	•	•		
Screen/waveform/set-up memories	10 / 20 / 40	10 / 20 / 40	5 / 10 / 20	- / - / -	2 / - / 10
Continuous AUTOSET	•	•	•	•	Connect-and-View™
Glitch capture down to 40 ns	•	•	•	•	•
Video triggering; interlaced, NTSC, PAL, SECAM (line and field selectable)	•	•	•	•	•
Video triggering; high resolution video, non-interlaced (line selectable)	•	•	•	•	
External triggering	•	•	•	•	+
Pre and post trigger adjustment in divisions	-20 to +640	-20 to +640	-20 to +640	-20 to +640	-10 to +10
Envelope Mode (Min/Max) and Waveform Smooth	•	•	•	•	•
Measure amps with optional current clamps	•	•	•	•	•
Cursor measurements	•	•	•		
Waveform math (integrate, +, -, filter)	•	•			
<b>Autoranging True-rms Multimeter Features</b>					
Number of DMM channels	1	1	1	1	2
Display readout (basic dc accuracy 0.5%)	3000 counts	3000 counts	3000 counts	3000 counts	5000 counts
Advanced measurements (temp., current, % duty, pulse width, dB, Hz, amps, and more)	•	•	•	•	•
Diode Test and Continuity Beeper	•	•	•	•	•
Min Max TrendPlot with time and date stamp	1 channel	1 channel	1 channel	1 channel	2 channel
DMM measurements with waveform	•	•	•	•	•
Capacitance					50 nF-500 µF
<b>General Features</b>					
High-contrast, gray scaled backlit display	•	•	•	•	•
Waveform and screen image transfers to a PC and remote operation	•	•	•		•
Screen image transfers to a PC	•	•	•	•	•
4 hour NiCad battery operation and charger	•	•	•	•	5 hours
Optically isolated RS-232C interface for printer and PC interface cable optional (included in 105B)	•	•	•	•	•
On-line help (information)	•	•	•	•	
EN61010-1 approved and UL listed for 600 volts rms, CSA certified	•	•	•	•	•
Automatic setup measurements	40	40	40	28	26
Signal generator/component tester output	•	•			
Size (HxWxD)	10.2 x 5.1 x 2.4 in 260x130x60 mm	10.2 x 5.1 x 2.4 in 260x130x60 mm	10.2 x 5.1 x 2.4 in 260x130x60 mm	10.2 x 5.1 x 2.4 in 260x130x60 mm	9.1 x 4.5 x 2.0 in 232x115x50 mm
Weight	4 lb/1.8 kg	4 lb/1.8 kg	4 lb/1.8 kg	4 lb/1.8 kg	2.5 lb/1.2 kg
PC software for Windows + PM 9080 cable	•	+	+		+
Hard carrying case	•	+	+	+	+

- = Standard feature
- + = Option

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