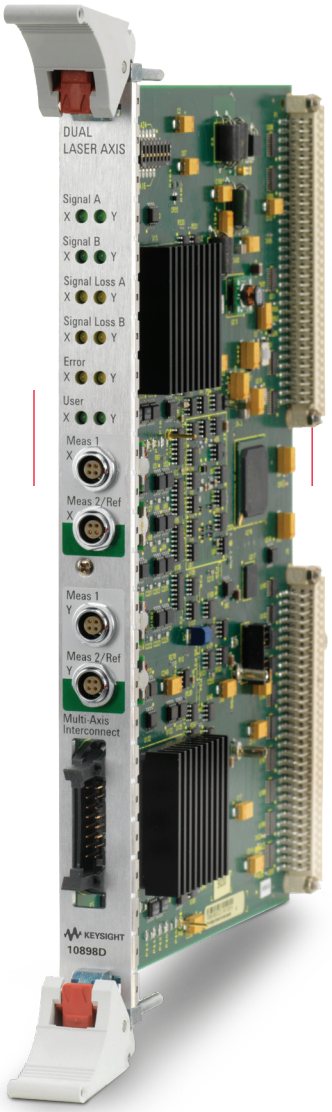
Keysight Technologies
10898D High Resolution Dual Laser Axis Board



Data Sheet

KEYSIGHT
TECHNOLOGIES

Introduction

The new 10898D High Resolution Dual Laser Axis Board offers the outstanding performance for which Keysight Technologies, Inc. is known. The Keysight 10898D dual axis board combines the same excellent resolution of the 10897D board together with increased slew rates and even better noise performance to provide the ultimate in repeatable and accurate positioning for advanced applications such as IC fabrication.

The 10898D offers very high data rates to provide exceptional bandwidth and high-performance closed-loop positioning for critical applications. The 10898D's standard VMEbus interface speeds system integration, saving valuable time and money. To further simplify and speed system layout, the 10898D also offers programmable signal routing. Like all VMEbus laser electronics from Keysight, the 10898D has a three-year warranty.

Keysight 10898D High Resolution Dual Laser Axis Board

High Performance for Advanced Applications

The Keysight 10898D High Resolution Dual Laser Axis Board offers outstanding position resolution and low noise, resulting in unsurpassed positioning repeatability and accuracy compared to previous laser systems. The Keysight 10898D provides measurement resolution up to I/2048, or 0.3 nm (3 Å) with the high resolution plane mirror interferometer. The Keysight 10898D is tested at frequencies equivalent to 2700 mm/s plane mirror slew rates.

Systems generally can compensate for data age, the constant time lag between triggering a measurement and receiving the data, but not for variable data age, the portion that changes and translates directly into stage position error. For example, a stage moving at 500 mm/s with 800 ps of variable data age has a minimum 0.4 nm position error due to variable data age.

The unique Keysight 10898D design has improved dynamic positioning accuracy by reducing the variable data age to less than 1 nanosecond for most applications. This results in unsurpassed positioning accuracy when compensating moving systems for the delay between the position measurement and the time the position information is available. Dynamic accuracy is especially important for E- beam machines and step and scan IC fabrication tools.

The 10898D contains an onboard, lowpass filter which may be enabled to provide more stable operation in low signal- to-noise conditions. This filter is programmable to provide the most stable positioning for your specific application.

The 10898D is a register- programmed position axis board that provides a 36- bit position word in fractional wavelengths. The position word is readable over the VMEbus and is also available from a real- time hardware output on the A and C rows of the P2 connector.

Flexible VMEbus Electronics Speed System Integration

The Keysight 10898D is a 6U- size board that complies electrically and mechanically with Revision C.1 of the VMEbus specifications. The heart of the 10898D is a proprietary interpolator specifically designed for this application. Surface mount technology is used to provide a compact, reliable design.

To further simplify and speed system layout, the 10898D offers programmable signal routing. Cable routing is flexible; the reference and measurement signals can come from either the front panel connectors or the multiaxis interconnect cable.

The 10898D uses Keysight 10880A/B/C or N1250A/B/E Receiver Cables, and 10881A/B/C/D/E/F Laser Head Cables. Contact your Keysight representative for more information about cable options.

Keysight Technologies 10898D High Resolution Dual Laser Axis Board

General System Specifications	
Number of measurement channels	Two channels
Maximum number of boards in system	Seven boards (for larger board groups, consult your Keysight representative)

Measurement resolution	
	Linear Optics 1.2 nm (λ/512) Plane Mirror Optics 0.6 nm (λ/1024) High Resolution Optics 0.3 nm (λ/2048)
Velocity range (using plane mirror)	±1.100 m/s with Keysight 5517GL laser head ±1.000 m/s with Keysight 5517FL laser head ±0.790 m/s with Keysight 5517EL laser head ±0.670 m/s with Keysight 5517DL laser head ±0.500 m/s with Keysight 5517D laser head ±0.356 m/s with Keysight 5517C laser head ±0.254 m/s with Keysight 5517B laser head ±0.203 m/s with Keysight 5517A laser head (Consult your Keysight representative for help in selecting the correct receiver that corresponds to the velocity for your laser head.)
Working range with plane mirror optics	±10.6 m

General VME Characteristics	
VME Compliance	Complies with VME Specification Rev. C.1 6U size, VME64X A16 Data Transfer Cycles D16 Data Transfer Cycles A24 Data Transfer Cycles D32 Data Transfer Cycles D08 (O) Interrupt Acknowledge Cycles

Power Requirements	
Power requirements	5 Vdc +0.25 V/–0.125 V at less than 4.5 A +12 V ±0.5 V at less than 0.2 A

Environmental Requirements	
Operating temperature range	0 to 40°C
Airflow requirements	19 linear meters (60 linear feet) per minute minimum

Physical Characteristics	
Weight	0.45 kg (1 lb)

Keysight Technologies 10898D High Resolution Dual Laser Axis Board

VMEbus Position Output	
Data format	Units: fractions of a wavelength 2's Complement: choose any 32 of 35 bits to read Positive Logic Least Significant Bit (or one count) equals resolution
Data rate over backplane	>100 kHz VMEbus cycle rate
Sample data age and delay (typical)	Fixed With respect to the rising edge of the 10 MHz P2 clock pin immediately after assertion of one of the asynchronous sample pins of P2, the value in the position register will reflect the actual position that occurred approximately N ns before. There are two user-selectable values of N: 262 ns and 762 ns. Variable <800 ps over the full power supply voltage specification, and <40 ps/°C Delay When N=262 ns is selected, the position data is available to be read on the VMEbus 600 ns after the sampling operation. For N=762 ns, position data is available on the VMEbus 100 ns after the sampling operation.

P2 Connector Hardware Position Output	
Data format	Units: fractions of a wavelength *either* 2's Complement: 36 parallel binary *or* signed magnitude (bit 35 is sign bit) Positive Logic Least Significant Bit (or one count) equals resolution
Data update rate	10 MHz using a single channel 5 MHz using both channels (hardware included to synchronize to slower clocks)
Data age (typical)	Fixed There is a time lag of approximately 1.1 µs between the actual position and the position at the hardware output lines (located on rows A and C of P2 connector). Variable <800 ps over the full power supply voltage specification, and <40 ps/°C

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