QUAD

Position Sensing Power & Energy Detectors

QUAD-4Track Module

FEATURES

1. **MEASURE, TRACK AND ALIGN**
   With µm resolution in real time!
2. **4-CHANNEL DETECTORS**
   Unique pyrolectric QUADrant detector technology handles high peak power without saturation
3. **FOR CW, PULSED AND HIGH REP RATE LASERS**
   - QUAD-E: Energy per pulse from µJ to mJ
   - QUAD-P: Powers from µW to mW
4. **FROM UV TO FIR AND THz**
   Broadband detectors cover the full spectrum, from UV to Sub-Millimeter wavelengths
5. **LARGE AREA SENSORS**
   9 mm and 20 mm square detectors
6. **FAST USB 2.0 CONNECTION**
   Ensures full speed tracking
7. **INCLUDES APPLICATION SOFTWARE**
   Complete LabView Application Software included, with many features

CONNECTIVITY

QUAD-9-MT-E
(9 x 9 mm-For Energy)

QUAD-20-MT-E
(20 x 20 mm-For Energy)

QUAD-9-MT-P
(9 x 9 mm-For Power)

QUAD-20-MT-P
(20 x 20 mm-For Power)

ACCESSORIES

Stand with Delrin Post
(Model Number: 200428)

Additional 9V Power Supply
(Model Number: 200960)

USB Cable
(Model Number: 202373)

SDC-500 Digital
Optical Chopper (for -P)

Pelican Carrying Case

SEE ALSO

TECHNICAL DRAWINGS **132**
LIST OF ALL ACCESSORIES **186**

APPLICATION NOTES
LASER POSITION SENSING DETECTORS AND MONITOR 201930

SDC-500 DIGITAL OPTICAL CHOPPER 202154

Watch the Introduction video available on our website at www.gentec-eo.com

QUAD

SPECIFICATIONS

	QUAD-9-MT-E / QUAD-9-MT-P		QUAD-20-MT-E / QUAD-20-MT-P	
MAX ENERGY / AVG POWER	20 mJ / 200 mW		20 mJ / 200 mW	
MAX POSITION RESOLUTION	1 µm / 10 µm		1 µm / 10 µm	
EFFECTIVE APERTURE	9 x 9 mm		20 x 20 mm	
MEASUREMENT CAPABILITY				
Spectral Range	0.1 - 3000 µm		0.1 - 3000 µm	
Min Beam Size [a]	≥ 4.5 mm Ø		≥ 10 mm Ø	
For -E (Energy sensors)				
Max Measurable Energy	20 mJ/Channel		20 mJ/Channel	
Noise Equivalent Energy	0.5 µJ		1.0 µJ	
Rise Time (0-100%)	150 µs		150 µs	
Max Repetition Rate	1000 Hz		1000 Hz	
Max Pulse Width	2.5 µsec		2.5 µsec	
Sensitivity	1000 V/J		1000 V/J	
For -P (Power sensors)				
Max Measurable Power	200 mW		200 mW	
Noise Equivalent Power	1 µW		2 µW	
Rise Time (0-100%)	< 0.02 s		< 0.02 s	
Max Chopping Frequency	50 Hz		50 Hz	
Sensitivity	2000 V/W		2000 V/W	
Calibration Uncertainty	± 4%		± 4%	
Minimum Position Resolution With QUAD-4Track Monitor	-E: 1 µm -P: 10 µm		-E: 1 µm -P: 10 µm	
DAMAGE THRESHOLDS				
Max Average Power Density (@ 1.064 µm)	100 mW/cm^2		100 mW/cm^2	
Max Energy Density (@ 1.064 µm 10 ns)	50 mJ/cm^2		50 mJ/cm^2	
PHYSICAL CHARACTERISTICS				
Effective Aperture	9 x 9 mm		20 x 20 mm	
Sensor	Pyroelectric		Pyroelectric	
Absorber	MT		MT	
Dimensions	63.5Ø X 40.6D mm		63.5Ø X 40.6D mm	
Weight	181 g		181 g	
ORDERING INFORMATION				
Product Name (Detectors)	QUAD-9-MT-E	QUAD-9-MT-P	QUAD-20-MT-E	QUAD-20-MT-P
Product Number	201774	201776	201775	201777
Product Name (Module)	QUAD-4Track			
Product Number	201517			

Specifications are subject to change without notice

a. For optimal performance.

** For details, contact your Gentec-EO representative*

QUAD

QUAD-4TRACK

The QUAD-4Track is a Laser Position Sensing system designed to support our unique Pyroelectric Quadrant Detectors, QUAD-P and QUAD-E. It is a 4-channel microprocessor-based system that measures the voltage output of each QUAD element and does the math necessary to provide a measurement of the X and Y displacement of a laser beam or image. It is fast and can be used to track, align and/or measure movement in real time, with a resolution of just a few microns!

QUAD-4Track
(Front View)

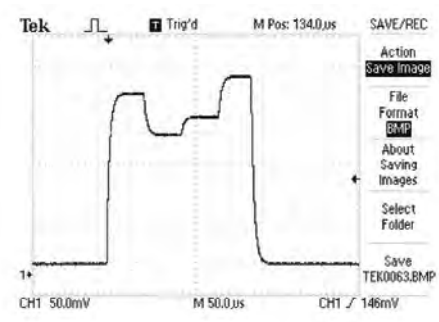
QUAD-4Track
(Rear View)

SPECIFICATIONS & FEATURES

QUAD-4TRACK	
Number of Channels	4
Full Scale Ranges (4 Decades) (E / P)	
Joulemeter Mode (with QUAD-E)	20 µJ to 20 mJ
Radiometer Mode (with QUAD-P)	200 µW to 200 mW
USB Connection to Computer	YES (USB 2.0 Full Speed)
Power Supply	9VDC
Power On Light	YES
Detector Input	DB-25 Connector
Detector Analog Output	BNC Connector (0-2 V)
Trigger Input (TTL)	BNC Connector with LED Indicator
Product Number	201517

QUAD DETECTORS

Our large area Pyroelectric Quadrant Detectors provide unique advantages over other position sensing detectors like Silicon quads or lateral effect photodiodes. They are fast, handle high peak power of pulsed lasers without saturation and respond to lasers across the spectrum, from UV to Far IR and even THz. The QUAD-E is intended for use with pulsed sources at up to 1000 Hz, while the QUAD-P is designed for CW and High Repetition Rate (Quasi CW) sources. Both types of detectors can also be used as standalone units, in an analog mode, for incorporation into your own system application. We can provide a Lemo pigtail cable for this purpose.

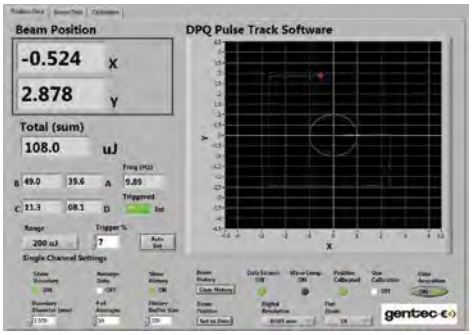


ANALOG OUTPUT

The analog output of the QUAD-4Track provides voltage that is directly proportional to the pulse energy or laser power irradiating each QUAD element. When the four voltage outputs are equal, the beam is centered on the QUAD detector. This provides a very useful tool when setting up our QUAD probes with your source for optical alignment.

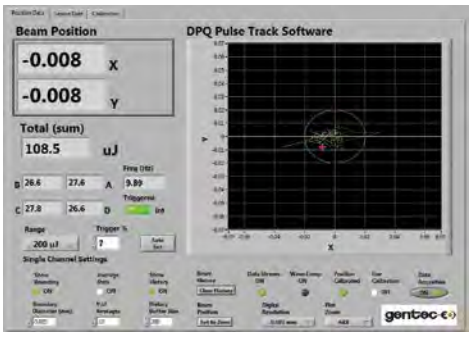
QUAD

MEASUREMENT SCREEN



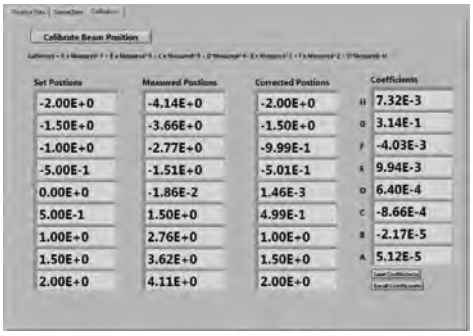
QUAD-4Track includes powerful, stand alone, LabView Software which is used to control the instrument, process the data, and display X and Y position. It also displays the energy or power of your source and repetition rate. The large graphic in this screen shows the position of the centroid of the beam and tracks its movement in real time. The software includes many handy features like: set boundary, zoom (2X to 128X), set resolution, data logging, and many more. The green line represents the tracking history.

TRACKING THE BEAM OVER TIME



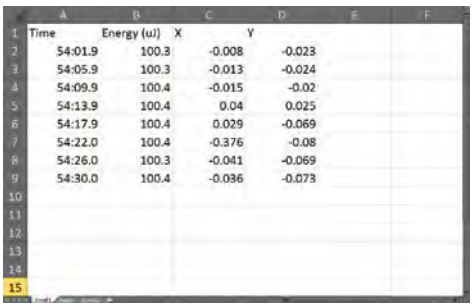
In the measurement screen shown on the left, we are tracking the beam stability of a pulsed Nd:YLF laser at 10 Hz. The resolution was set at 0.001 µm, the boundary is at 20 µm (red circle), and the zoom feature is at 64X. The total energy is 108.5 µJ, the final position of the laser is at -8 µm in X and -8 µm in Y. The green tracking line shows the movement of the laser about the zero position over a few hundred pulses.

POSITION CALIBRATION SCREEN



We've developed a unique position calibration routine which allows you to calibrate our QUAD-4Track system when working with a uniformly round laser beam. It requires the use of a micrometer-driven linear stage (1-axis only). As you can see from the calibration screen on the left, the procedure involves zeroing the instrument, moving the QUAD probe to nine discrete positions (+2.000 to – 2.000 mm) and then capturing the QUAD readings. It then determines correction coefficients (last column) and applies them to the raw data to arrive at "corrected positions". The QUAD probe is now calibrated!

DATA LOGGING



Time	Energy (uJ)	X	Y
54:01.9	100.3	-0.008	-0.023
54:05.9	100.3	-0.013	-0.024
54:09.9	100.4	-0.015	-0.02
54:13.9	100.4	0.04	0.025
54:17.9	100.4	0.029	-0.069
54:22.0	100.4	-0.376	-0.08
54:26.0	100.3	-0.041	-0.069
54:30.0	100.4	-0.036	-0.073

Another very handy feature is "data logging". This allows you to set up the QUAD-4Track to follow the displacement, energy and/or power of your laser over several minutes, hours or even days. Need to measure the "beam steering" of your laser as it warms up? This is how you do it! Need to measure the beam displacement vs laser repetition rate or energy level? Data logging will help you measure it!