GUZIK Technical Enterprises
Performance Specification Summary

Supported Technologies

- Longitudinal and Perpendicular Recording
- GMR and TMR heads
- Flying Height Control
- Micro-Actuator (piezo on suspension)
- Head Gimbal Assembly testing (HGA)
- Head Stack Assembly testing (HSA)
- Media Scanning
- Commercial PRML Chip integration
- Reference Guzik PRML channel
- Commercial headamplifier IC integration
- Reference Guzik headamplifier

Read/ Write Analyzer (RWA-2004 Model)

No	Item	Guzik Spec	Reference / Comments
1	Data Rate	Up to 4 Gbit/s, bit precompensation	*Read-Write Analyzer 2000 Series User's Manual*, Guzik P/N 02-107220-01, page 19
2	Bit precompensation resolution for any transition	1psec	
3	Absolute position accuracy for any transition	5psec (typ) 10psec (max)	
4	Random pattern maximum length	up to 2Mbit	
5	Frequency Synthesizer	4 GHz better than 1 Hz resolution	
6	RWA Analog Channel Bandwidth	From 100kHz to 2GHz (-3dB)	*Read-Write Analyzer 2000 Series User's Manual*, Guzik P/N 02-107220-01, page 23
7	RWA Analog Channel Flatness	± 0.2dB up to 1GHz, ±0.5dB up to 1.8GHz	
8	RWA Analog Channel Group delay	±100psec up to 1GHz, ±200ps up to 1.8 GHz	
9	Analog Channel non-linear distortion (entire bandwidth, nominal level)	better than 1%	
10	Commercial PRML Chip Integration (several chips from multiple manufacturers are supported; new chips integrated upon request)	Up to 4 Gbit/s (chip dependent)	*PRML Chip Adapter 4000 Product Bulletin*, Guzik P/N 02-107288-03, page 1

Note: All specifications are subject to change.

Digital Signal Analyzer (Optional D5000 Analyzer, can be connected to RWA-2000 series)

No	Item	Guzik Spec	Reference / Comments
1	Sampling Rate	10 Gs/sec	*D5000 Signal Analyzer Hardware Description*, Guzik P/N 02-107344-02, page 13–15
2	ADC Resolution	8 bit	
3	Analog Bandwidth	5 GHz	
4	Memory Size	4 Gbyte	
5	Digital Test Time Improvement	25–35%	Digital channel performs typical Production sequence faster comparing to analog. This indicates the percentage of improvement.
6	Digital Tests	• Entire Spectrum of Parametric measurements • Fast Frequency Domain Measurements (FFT) • Jitter and Eye-Diagram Analysis • Media Scanning • Guzik PRML	

Spinstand (Guzik V2002 Model)

No	Item	Guzik Spec	Reference / Comments
1	NRRO (servo mode), 1 sigma	0.35–0.60 nm[1]	*Piezo-Actuator Cartridge For Guzik V2002 Spinstand Product Bulletin,* Guzik P/N 02-107400-01, page 1–3
2	Nano-positioning Accuracy (servo mode), 1sigma[2]	0.4 nm	*Servo Improvement Package Product Bulletin*, Guzik P/N 02-107380-01, page 3
3	Nano-positioning Resolution (servo mode)	0.02 nm	
4	1st nano-positioner (head loader actuator), linear stroke	19 μm (±9.5 μm)	
5	2nd nano-positioner (cartridge actuator), linear stroke	13 μm (±6.5 μm)	
6	XY Coarse Stage, resolution	1 nm	
7	Skew angle range (software programmable)	±25 degrees[3]	*Spinstand V2002 User's Manual*, Guzik P/N 02-107200-02, page 21
8	Spindle RPM range	100–20000 RPM 1 RPM step	
9	Acceleration (0–10.000 RPM, with 3.5 Inch disk)	2.4 seconds	

[1] With piezo-actuator cartridge (patent pending), results may be limited / depend on HGA capability.
[2] With Servo Improvement Package.
[3] Conditional, maximum positive skew angle is limited at the ID depending on particular cartridge design.

Read/ Write Analog Front-End (Guzik UP8 Preamplifier Board)

No	Item	Guzik Spec	Reference / Comments
1	Write Data Rate	Up to 4 Gbit/s	*Read-Write Analyzer 2000 Series User's Manual*, Guzik P/N 02-107220-01, page 31
2	Bandwidth	70 kHz – 1.8 GHz (at -3 dB)	
3	Typical non-linear distortion	Better than 1%	
4	Intergration with Commercial IC	**AVAILABLE**	

Read/ Write Analog Front-End (Guzik MR5L TMR Headamplifier)

No	Item	Guzik Spec	Reference / Comments
1	Bandwidth	DC to 2.0 GHz (at –3 dB)	*MR-5L Current-Sense Low-Impedance Read Amplifier For TMR Heads Product Bulletin*, Guzik P/N 02-107324-05, page 1
2	Input noise	1.0 $nV/\sqrt{Hz}$ (*typical*)	
3	Non linear distortion(1 GHz, 1 mV input level)	less than 1%	
4	Head MR-Impedance range	100–1000 Ohm	
5	TMR Read Bias voltage (programmable)	±400 mV in 0.1 mV steps	
6	Write Current (programmable)	0mA to 100 mA zero-to-peak, 0.025 mA step	
7	Write to read recovery time	100 nsec (typical)	
8	Input impedance	80 Ohm differential (typical)	
9	Flying Height Heater Control	0V to 9V[4]	
10	Micro-Actuator (piezo on suspension)	**SUPPORTED**	*Micro Actuator Tests For Guzik V2002 Spinstands Product Bulletin*, Guzik P/N 02-107304-02

[4] Typical, adjustable upon customer request

Read/ Write Analog Front-End (Guzik MR5 GMR Headamplifier)

No	Item	Guzik Spec	Reference / Comments
1	Bandwidth	1.5 GHz (at –3 dB)	*MR-5 Read/Write Amplifier For GMR Heads Product Bulletin*, Guzik P/N 02-105546-07, page 1
2	Input noise	0.6 $nV/\sqrt{Hz}$ (*typical*)	
3	Non linear distortion(1 GHz, 1 mV input level)	less than 1%	
4	Head MR-Impedance range	20–100 Ohm	
5	MR Read Bias (for Guzik MR5 GMR amplifier)	–5mA to +5 mA[5], 0.01 mA steps	
6	Write Current (programmable)	0mA to 100mA zero-to-peak, 0.025 mA step	
7	Write to read recovery time	100 nsec (typical)	
9	Flying Height Heater Control	0V to 7V[6]	
10	Micro-Actuator (piezo on suspension)	**SUPPORTED**	*Micro Actuator Tests For Guzik V2002 Spinstands Product Bulletin*, Guzik P/N 02-107304-02

[5] Limited in hardware to protect head GMR element. Some customers are using the ±20 mA modification.
[6] Typical, adjustable upon customer request.

Test and Measurement Accuracy

No	Item	Digital[7] (D5000)	Analog[8] (RWA-2004)
1	Amplitude (TAA)	± 0.04dB (down to 12 dB SNR)	±0.5 dB
2	Signal-to-noise Ratio (SNR)	± 0.2dB (down to 12 dB SNR)	±0.5 dB
3	Pulse width (PW) / Rise-Fall Time (T50)	± 1.0 % (down to 12 dB SNR)	± 3%
4	Minimum pulse width (PW) to be measured	170 psec	170 psec
5	Resolution	± 0.5 %	±3.5%
6	TAA Asymmetry	± 0.5 %	±0.5 %
7	Overwrite	± 0.2dB	±0.2 dB
8	Modulation	± 1.0 %	± 2%
9	Crest Factor[9]	± 1%	± 2%
10	MRW, MWW , W/R Offset	Typ. 0.5–0.8nm, 1 sigma[10]	
11	MR-Impedance	±0.5% typical (±0.2 Ohm for GMR 40 Ohm / ±1.5 Ohm for TMR 300 Ohm) ±1% maximum (±0.4 Ohm for GMR 40 Ohm / ±3.0 Ohm for TMR 300 Ohm)	

[7] *D5000 Signal Analyzer Hardware Description*, Guzik P/N 02-107344-02, page 17
[8] *Read-Write Analyzer 2000 Series User's Manual*, Guzik P/N 02-107220-01, page 20
[9] This is the peak amplitude of the erased signal normalized to the envelope amplitude of a previously written HF signal (in percentage).
[10] *Servo Improvement Package Product Bulletin*, Guzik P/N 02-107380-01, page 5

WITE32 SOFTWARE MODULES

Perpendicular Parametric Test Test Module [optional]

- Differentiator Optimization
- Roll-off
- Rise and Fall Time
- Saturation Asymmetry
- Amplitude Asymmetry

WATI – Adjacent Track Interference Test Module [optional]

- Adjacent Track Interference Test

WESA – Write Excited Sectored Amplitude Test Module [optional]

- Separate Amplitude Asymmetry Stability
- Triple Amplitude Asymmetry Stability
- Write Induced Instability
- Pole Erasure

Bit Error Rate (BER) Test Test Module [optional]

- BER 747A Test
- BER Linear Density Test
- BER Error Distribution Test
- BER Performance Test

Jitter Test Module [with D5000]

- Jitter Explorer Test
- Media Noise Test

Digital Parametric Test Module [with D5000]

- Digital Parametric Test
- Signal Profile

Guzik PRML Test Package [with D5000]

- Guzik PRML Channel Optimization
- PRML Explorer Test
- Sequenced Amplitude Margin Test

MSCAN – Media PRML Scanning Test Module [optional]

- Transition Shift Detection
- Extra Pulse Detection
- Missing Pulse Detection
- Thermal Asperity Detection

Micro-Actuator Test Module [optional]

- Stroke Test
- Mechanical Frequency Response Test
- Micro-Actuator Loop Setup Test
- Micro-Actuator Loop Frequency Response Test

Parametric Test Module

- TAA Test
- Overwrite Test
- Asymmetry Test
- Pulse Width Test
- Parametric Test
- Read-Only Parametric Test
- Signal-to-Noise Ratio Test
- Spectral Signal-to-Noise Test
- Spectral Integral Signal-to-Noise Test
- Amplitude Stability Test
- Sector Amplitude Stability Test
- Resolution Delta Test
- Pulse Width Stability Test

Composite Test Module

- Frequency Test
- Saturation Test
- Track Profile Test
- MR Saturation Test
- Pulse Profile Test
- Comparator Error Rate Test
- Off-Track Performance Test
- Set RPM Test
- Spectrum Analysis Test
- Triple Track Test

MR Test Module

- TAA Asymmetry Test
- Pulse Width Asymmetry Test
- Pulse Stability Test
- Write/Read Offset Test
- MR-Impedance Test
- WR-Impedance Test
- Head Polarity Test

Error Test Module

- Comparator Test
- Popcorn Test

Triple-Track Test Module [optional]

- Triple-Track Signal-to-Noise Test (with 747 option)

NLTS Test Module

- Pseudo-Random Sequences
- Alternative Spectral Elimination Test
- Third Harmonic Ratio Test
- MR Transfer Curve Test
- Alternate Overwrite Test
- NLTS vs. Write Current Test
- Signal/Noise Ratio Test

Spinstand Test Module

- Position Error Signal Analysis Test (PES Test)
- Off-track Modulation Test

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