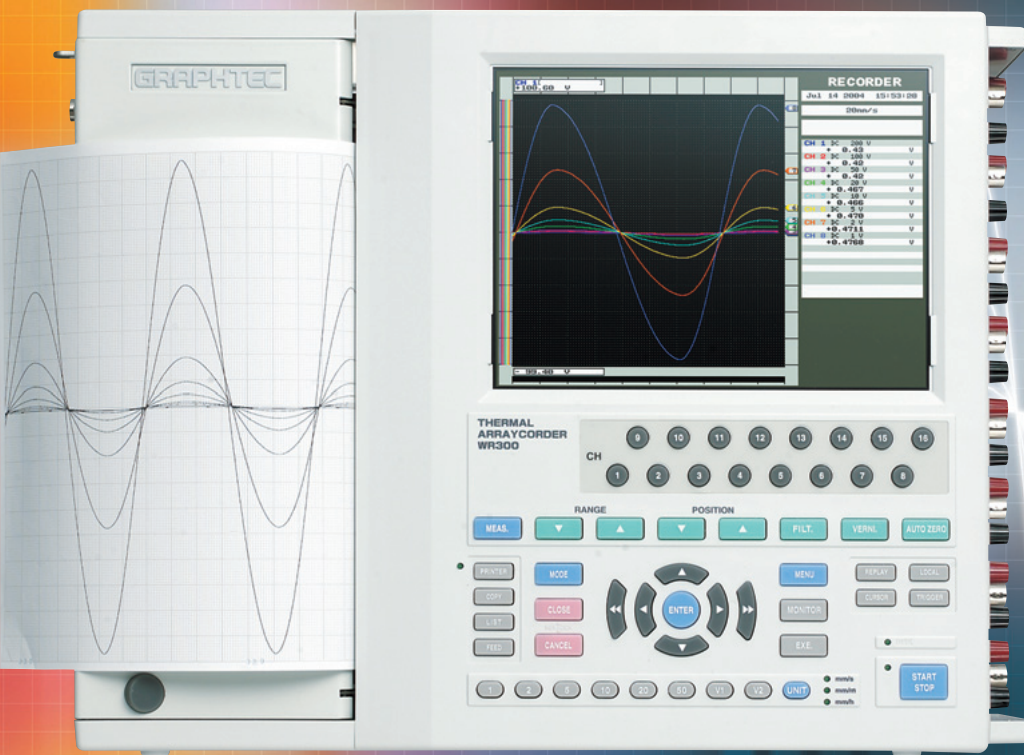


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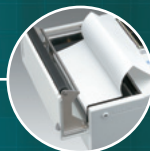
Thermal Arraycorders **WR300** SERIES



*State of the art recorder!
Accurate Data capture and recording.
This machine has it all.*

Direct Recording

Chart, Internal Memory, 40GB HDD



Multi-Function

Voltage / Temperature / Strain / Frequency



Direct Operation

Range, Position, Chart speed



Easy PC Connection

USB, LAN, PCMCIA



WR310: High-end model with long-term analog data recording and large capacity data capture capabilities

Ideal for use in all kinds of research and development, as well as for control applications at production and manufacturing sites, quality control, and more

- Up to 1 MS/s sample rate on all channels
- Bandwidth (frequency response): DC to 200 kHz (using the WR3-V amplifier)

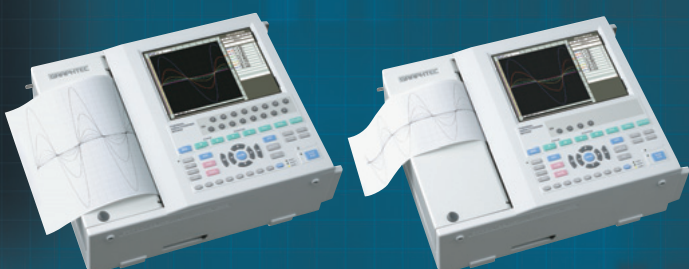


WR310-8/310-16

Thermal Arraycorders **WR300** NEW SERIES

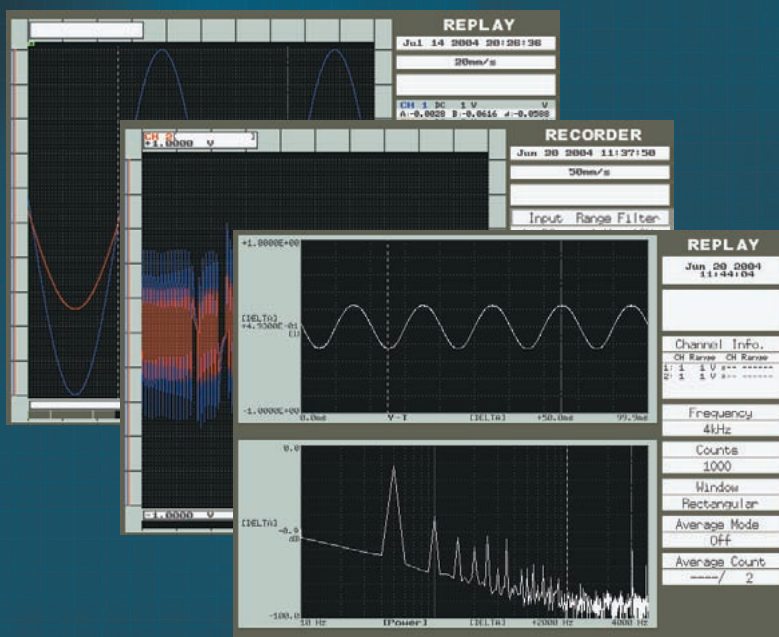
WR300: Recorder designed specifically for long-term waveform recording

- Selection of models with 4, 8, or 16 input channels
- 50 mm/s chart speed
- 100 mm recording width for 4-ch models;
200 mm recording width for 8-ch and 16-ch models



WR300-8/-16

WR300-4



Data Capture (Large capacity) — 40 GB HDD / PCMCIA card

Long-term data capture is possible with WR300 series at high speed. WR310 enables continuous measurement for 200 minutes at 10kS/s for 8-ch. 1 Mword/ch internal memory is standard.

Measurement data capture times <small>(when measuring on 8 channels)</small>								
	1 μ s	10 μ s	100 μ s	1 ms	5 ms	10 ms	100 ms	1 s
1 Mword/ch memory	1 s	10 s	1.6 min	16.6 min	1.4 h	2.8 h	28 h	11 days
HDD (1 file = 2 GB)*	2.08 min	20.8 min	3.4 h	1.4 days	7.2 days	14 days	144 days	1446 days
PCMCIA card (256 MB)					22 h	1.8 days	18.5 days	185 days

*One data capture operation is up to 2 GB

Recording (Thermal recording) — Various chart types/sizes are supported

Built-in 200 mm (8") wide thermal array printer in the 8- and 16-ch models; 100 mm wide printer in the 4-ch model.



Multi-function input — Plug-in amplifiers

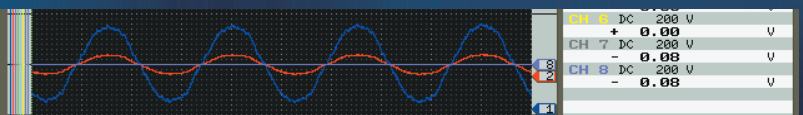
Models available with 4, 8 or 16 input channels. Plug-in 2-channel WR300 series amplifiers adapt the system to a wide variety of input types and sensors.



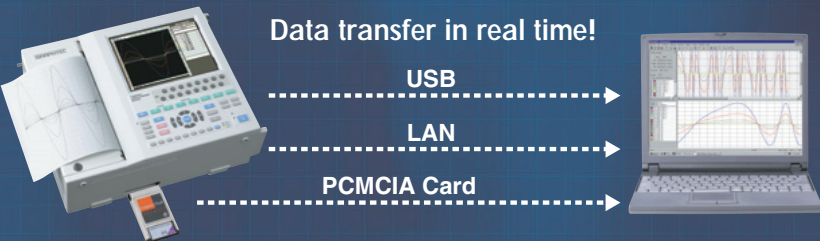
Performance, reliability and ease of use.

Display (8.4" color LCD monitor) — Easy operation and highly visible display

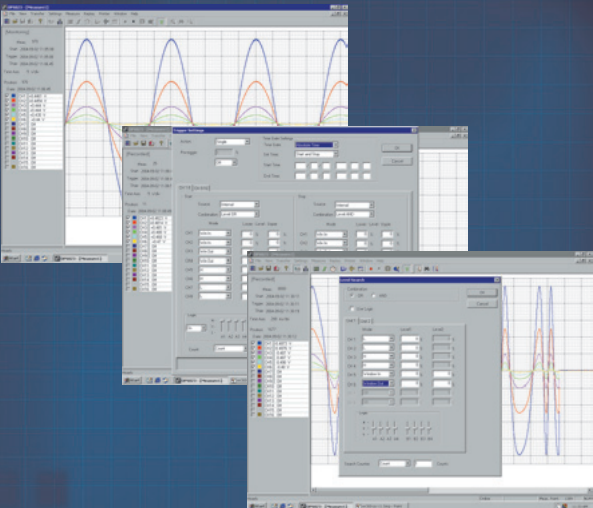
8.4" color LCD monitor for data display and graphical user interface.



PC connection & remote interface



Includes Windows™ software for setup, control, data transfer



Remote Functions

Name	Function	Remarks
START/STOP (Level operation)	Measurement START/STOP Pulse width: At least 1 s , Repeat cycle: At least 1 s	Input: CMOS type (0/+5V)
START/STOP (Edge operation)	Measurement START/STOP Measurement starts and stops repeatedly whenever the L level is reached. Pulse width: At least 1 s , Repeat cycle: At least 1 s	
EXT. FEED	Chart feed Amount fed per pulse: 0.03125 mm , Max. high frequency: 660 pps (20 mm/s)	
EXT. TRIGGER	Trigger activation L level pulse width: At least 10 ms	Output: CMOS type (0/+5V)
EXT. SAMPLE	Data capture cycle Pulse width: At least 500 ns , Repeat cycle: At least 10 μ s	
TRIGGER Output	Trigger output A CMOS type "L" pulse signal is output whenever a trigger is activated. Output pulse: At least 10 ms	

WR300 Series Model Configuration Chart

	WR300			WR310	
	4	8	16	8	16
No. of channels	Yes	No	No	No	No
100 mm roll paper	Yes	No	No	No	No
100 mm Z-fold paper (for internal use)	Opt.	No	No	No	No
100 mm internal Z-fold unit	Opt.	No	No	No	No.
200 mm roll paper	No	Yes	Yes	Yes	Yes
200 mm Z-fold paper (for internal use)	No	Opt.	Opt.	Opt.	Opt.
200 mm internal Z-fold unit	No	Opt.	Opt.	Opt.	Opt.
200 mm Z-fold paper (long-length)	No	Opt.	Opt.	Opt.	Opt.
Long length 200 mm Z-fold unit	No	Opt.	Opt.	Opt.	Opt.
Logic amp	4-ch	8-ch	16-ch	8-ch	16-ch
IRIG	No	No	No	Yes	Yes
40 GB hard disk	No	No	No	Yes	Yes

Basic Specifications

Main Unit Specifications

Item	Details
Analog input	4-ch model: 2 slots, 8-ch model: 4 slots, 16-ch model: 8 slots (amplifiers can be mixed in any combination)
Logic input	4-ch model: 4 channels, 8-ch model: 8 channels, 16-ch model: 16 channels
PC interface	Ethernet, USB 1.1
Memory capacity	1 Mword per channel
Internal memory	40 GB 2.5 inch hard disk*1, PCMCIA slot (Type II)
Isolation voltage	Between the AC power supply and casing: 1 minute at 1,500 V AC
Insulation resistance	Between the AC power supply and casing: 20 MΩ at 500 V DC
Backup functions	Setting conditions: EEPROM, Clock: Lithium batteries
Operating environment	0°C to 40°C, 30% to 80% RH (5°C to 35°C when using hard disk or printer)
Operating noise levels	Standby: 60 dBA max.
Rated power supply	100 to 120 V AC/200 to 240 V AC, 50/60 Hz (automatically selected for the voltage being used)
Power consumption	4-channel model: approx. 100 VA, 8-ch model: approx. 120 VA, 16-channel model: approx. 140 VA (when the print density is 50% and the printer is being used)
External dimensions (approximate)	380 mm (W) x 296 mm (D) x 125 mm (H), (excluding rubber feet and protrusions) [15W x 11.6D x 4.9H inches]
Weight (approximate)	4-ch model: 5.6 kg (including 2 amplifiers, less options) [12.32 lb.] 8-ch model: 6.1 kg (including 4 amplifiers, less options) [13.4 lb.] 16-ch model: 6.8 kg (including 8 amplifiers, less options) [15 lb.]

*1: WR310 only

Monitor and Printer Specifications

Item	Details
Display screen	8.4inch (diag.) color TFT LCD
Display details	Setting windows, mode measurement values
Thermal printer	4-ch model: 100 mm wide, 8 dots per mm 8-ch/16-ch models: 200 mm wide, 8 dots per mm
Measurement mode	Recorder mode, FFT mode
Recorder mode	Display format
	Display direction: Horizontal scroll
	No. of display zones: Zone specification, fixed format
	Digital display
	Digital display of measured values for up to 8 channels on right-hand side of screen
	Display method
	Scroll, Fixed
	Print details
	Waveforms and screen copy
	Chart speed
FFT mode	1, 2, 2.5, 5, 10, 20, 25, 50 mm/s
	1, 2, 2.5, 5, 10, 20, 25, 50, 100 mm/min, mm/h
	Printing accuracy
	Y: ±0.3% ±1 dot, T: ±2% ±0.5 mm
	Annotation printing
	System annotation: (System, User, System & User, OFF)
	Channel annotation: (Amp, User, Amp & User, Value, OFF)
	No. of annotation characters
	10 to 32 characters
	Annotation printing interval
Recorder mode	10 cm to 100 cm in 10 cm steps
	Captured data replay
	Waveform display/scroll, Waveform zoom-in/zoom-out, Cursor function, Calculation function, Data search function
	Waveform expansion/
	Time axis fixed zoom-in/zoom-out: x 10 to x 1/1000 (data between specified cursors)
	Compression functions
	Time axis variable zoom-in/zoom-out: data between specified cursors
	Voltage axis variable zoom-in/zoom-out: data between specified cursors
	Cursor functions
	Cursor readout function/Scroll function/Zoom function
FFT mode	Calculation functions
	Arithmetic operations/Moving average/Log/Index mean/Absolute value/Differential and integral (two types of integral)/Second differential (two types of second integral)/Sine/Cosine/Tangent/Arcsine/Arccosine /Arc tangent/Pi (π)
	Data search
	Date/Time: Data search from specified time/date
	Level: Data search above (below) specified level
	Analysis functions
	Auto-correlation: Linear spectrum, power spectrum, power spectrum density, RMS spectrum
	Cross-correlation: Cross spectrum, transfer function, coherence function
	Analysis frequencies
	400 kHz, 200 kHz, 100 kHz, 80 kHz, 40 kHz, 20 kHz, 10 kHz, 8 kHz, 5 kHz, 4 kHz, 2 kHz, 1 kHz, 800 Hz, 500 Hz, 400 Hz, 200 Hz, 100 Hz, 80 Hz, 40 Hz, 20 Hz, 10 Hz, 8 Hz, 5 Hz, 4 Hz, 2 Hz, 1 Hz, 0.8 Hz, 0.5 Hz, 0.4 Hz, 0.2 Hz, 0.1 Hz, 0.08 Hz
Recorder mode	Number of analysis channels
	4 ch
	Window functions
	Hanning & rectangular windows
	Number of sampling points
	1,000 points, 2,000 points
FFT mode	Averaging
	Summation, exponential, peak hold
	Display format
	1 Division, 2 Divisions, 4 Divisions, Nyquist
Recorder mode	Print details
	Screen copy

Data Capture Function Specifications

Function	Item	Details
Internal capture	Captured data	Measurement conditions, measurement data
	Capture capacity	Memory
		1 Mword per channel
		PCMCIA card
		Depends on usage conditions
		Hard disk*1
		40 GB (1 file: 2 GB max.)
	Sampling interval	Memory
Network capture		Depends on amplifier
		PCMCIA card
		Max. 5 ms
		Hard disk*1
		8 ch data capture : Max. 1 μs, 16 ch data capture: Max. 2 μs
		Note: 10 μs for temperature ranges
	Memory banks (Block) *2	1, 2, 4, 8, 16, 32, 64, 128
	Capture start specification	After a trigger, capture starts simultaneously with waveform recording (selectable On/Off)
Network capture	Captured data	Measurement conditions, measurement data
	Capture capacity	Depends on PC connected
	Sampling interval	Depends on amplifier
	Transfer data details	During measurement
		Min/Max values transferred in real-time
		After measurement
		Data captured to memory/hard disk
	Data backup*2	Memory, PCM-CIA card, hard disk (data capture capacity and sampling interval are the same as for Internal capture).
Network capture	Capture start specification	After a trigger, capture starts simultaneously with waveform recording (can be set On/Off)

*1: WR310 only *2: When using memory

Trigger Specifications

Item	Details
Time gate	OFF, Relative time, Absolute time
Action	Single, Repeat
[Start condition] source	OFF: Start trigger via pressing the START key Internal: Start trigger via AND/OR combination of measured signals Manual: Start trigger via pressing the TRIGGER key External: Start trigger via TRIGGER IN signal on remote connector
[Stop condition] source	OFF: Stop trigger via pressing the STOP key Internal: Stop trigger via a combination of measured signals Manual: Stop trigger via pressing the TRIGGER key External: Stop trigger via TRIGGER IN signal on remote connector Time: Stops measurement at preset time
Combination	Level OR, Level AND, Edge OR, Edge AND
Judgment mode	Edge: Rise time (↑), Fall time (↓) Level: H (High), L (Low) Window: IN, OUT, OFF
Level	−100% to +100% of setting range in 1% steps
Trigger Counter (when the Combination setting is Level)	Number of times: 1 to 255 Filter: Product of the Sampling Interval and the Number of Times settings (can only be set when the Function setting is Memory).
Pretrigger	Internal memory: 0% to 100% in 1% steps PCMCIA card, HDD: On/Off
Logic trigger	Pattern: H (High), L (Low), X (Don't care) Judgment mode: When the pattern is matched

Software Specifications

Item	Details
Compatible operating system	Windows 2000/XP
Functions	Measurement conditions setting, data measurement, file conversion, report creation (option)
Measurement condition settings	WR300/310 control, communication conditions setting
Measurement function	Recorder mode
Display format	Y-T
Display direction	Horizontal scroll
No. of display zones	Zone specification
Digital display	Digital display of measured values for up to 8 channels on left side of screen
Display method	Scroll, fixed
Captured data replay	Waveform display/scroll/waveform expansion/compression
Cursor functions	Cursor readout, data search
File conversion	TEXT, CSV, DADISP, GBD
Report creation (option)	Report creation mode or waveform screen copy and paste

Standard Accessories

Thermal paper (4ch PR230 100mm , 8ch-16ch PR231A 200mm)	1 roll
Roll paper bobbins	2
REMOTE connector	1
LCD Protector	1
User Guide CD-ROM with OPS023 Application Software , USB Driver	1
Quick Guide	2
AC cable (RSC-110)	1

Plug-in Amplifier Specifications

WR3-V Amplifier (for voltage measurement)

Item	Details
No. of channels	2 channels per module
Input configuration	Independent, unbalanced input for each channel (floating ground)
Input resistance	1 MΩ ±1%
Input coupling	AC, DC, GND, CAL, (1/2 F.S.), OFF
Measurement range	50, 100, 200, 500 mV/F.S. 1, 2, 5, 10, 20, 50, 100, 200 V/F.S.
Input filters	Line: 1.5 Hz (−3 dB) at −6 dB/oct Low-pass : 5 Hz, 10 Hz, 50 Hz, 500 Hz, 5 kHz, 50 kHz (−3 dB) at −6 dB/oct
Accuracy (23±3°C)	±0.25% of F.S.
Temperature coefficients	Zero point: 0.02% of F.S./°C Gain: 0.02% of F.S./°C
Insulation resistance	100 MΩ (at 500 V DC)
Isolation voltage	Between input terminal and casing: 1 minute at 1000 VAC
Permissible signal source resistance	Max. 1 kΩ
A/D converter	Sampling interval: 1 μs A/D resolution: 12-bit
Common mode rejection ratio	80 dB (typ.) (50/60 Hz, Signal source resistance: max. 500Ω)
Signal/noise ratio	−46 dB (typ.) 200(Vp-p at 50 mV range (with +/− shorted)
Frequency response	DC coupling: DC to 200 kHz (+/−3 dB Typ.) AC coupling: 10 Hz to 200 kHz (+/−4.5 dB Typ.)
Max permissible input voltage	Between +/− terminals: 5 V to 200 V range : 200 V DC (DC + AC _{p-p}) 50 mV to 2 V range: 30 V DC (DC + AC _{p-p}) Between input terminals and GND: 33 V AC rms
Input terminal type	BNC

WR3-M Amplifier (for voltage/temperature measurement)

Item	Details
No. of channels	2 channels per module
Input configuration	Independent, unbalanced input for each channel (floating ground)
Input resistance	1 MΩ ±1% constant
Input coupling	AC, DC, TEMP., GND, CAL (1/2 F.S.), OFF
Measurement range	[Voltage] 20, 50, 100, 200, 500 mV 1, 2, 5, 10, 20, 50, 100, 200, 500 V Auto [Temperature] TC-K: −200 to 1300 °C TC-J: −200 to 1100 °C TC-T: −200 to 400 °C TC-R: 0 to 1600 °C TC-E: −200 to 800 °C TC-B: 600 to 1700 °C
Input filters	[Line] 1.5 Hz (−3 dB) at −6 dB/oct. [Low-pass] 5, 10, 30, 50, 500Hz, 5 kHz (−3 dB) at −6 dB/oct.
Accuracy (23°C ±3 °C) (Temperature accuracy includes reference contact compensation accuracy)	[Voltage] ±0.25% of F.S. [Temperature] < TC-K, J, E > −200 °C to 0 °C: ± (1% of rdg + 3.5 °C) Other: ± (0.2% of rdg + 3.5 °C) < TC-T > −200 °C to 0 °C: ± (0.8% of rdg + 3 °C) Other: ± (0.2% of rdg + 3 °C) < TC-R > 0 °C to 200 °C: ± 9.5 °C 200 °C to 800 °C: ± 6.5 °C Other: ±(0.2% of rdg + 4.5 °C) < TC-B > 600 °C to 700 °C: ± 9.5 °C Other: ± (0.2% of rdg + 5.5 °C)
Temperature coefficient	Zero point: 0.01% of F.S./°C Gain: 0.02% of F.S./°C
Insulation resistance	100 MΩ (at 500 V DC)
Isolation voltage	Between input terminal and casing: 1 minute at 1,000 V AC
Permissible signal source resistance	Max. 1 kΩ
Input bias current	2nA (typ.)
A/D converter	Sampling interval: 10 μs A/D resolution: 16 bits (out of which 14 are internally acknowledged)
Common mode rejection ratio	100 dB typ (120 dB with Line Filter on)
Signal/noise ratio	−46 dB (typ) 100 μV-P at 20 mV range (with +/− shorted)
Frequency response	DC coupling: DC to 20 kHz (+/− 3 dB Typ.) AC coupling: 10 Hz to 20 kHz (+/− 4.5 dB Typ.)
Max permissible input voltage	Between +/− terminals: 2 V to 500 V range : 500 V DC (DC + AC _{p-p}) 20 mV to 1 V range: 100 V DC (DC + AC _{p-p}) Between input terminals and GND: 33 V AC rms
Input terminal type	Banana connector (two connectors)

WR3-DCB Amplifier (for strain measurement)

Item	Details
No. of channels	2 channels per module
Input terminals/format	Independent balanced input for each channel (NDIS strain input connectors)
Input coupling	DC, CAL+, CAL−, ZERO, OFF
Measurement range	Voltage: 1000 to 20,000 x 10 ^{−6} strain FS (1/2/5 steps)
Max permissible input	Differential input Sync voltage
	10 VDC (DC+ACp-p) 100 VACrms
Insulation resistance	Min. 100 MΩ (at 500 V DC)
Isolation voltage	Between input terminal and casing: 1 minute at 1,000 V AC
A/D converter	Sampling interval: 10 μs Resolution: 16-bit (14-bit effectively)
Common mode rejection ratio	80 dB typ (50/60 Hz)
Signal/noise ratio	Max. 50 x 10 ^{−6} strain (2 V DC, 350 Ω)
Input resistance	Approx. 10 MΩ (5 M + 5 M)
Accuracy (23 °C ±3 °C)	±(0.3% of F.S. +1.2 x 10 ^{−6} strain)
Frequency bandwidth	DC to 20 kHz (+/−3 dB)
Stability	Zero point Gain
	±1.2 x 10 ^{−6} strain/°C ±10 x 10 ^{−6} strain/8 h ±10 x 10 ^{−6} strain/0.5 h (initial drift / from 10 s after power on) ±0.02% of F.S./°C 0.10% of F.S./8h
Filters	Line L.P.F
	1.5 Hz (+/−3 dB) at −6 dB/Q (octave) 10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz (−3dB) at −12 dB/oct
Gage ratio	2.0 fixed
Gage resistance	120 to 1000 Ω
Bridge voltage	Voltage Accuracy Stability
	DC 2 V ±0.2% ±0.01%/°C
Balance adjustment	Method Accuracy Range
	Auto balance adjustment method ±10 x 10 ^{−6} strain (° = microstrain) Resistance ±2% (10,000 x 10 ^{−6} strain)

WR3-FV Amplifier (for frequency measurement)

Item	Details
Input terminals/format	Independent unbalanced input for each channel (floating ground)
Input coupling	DC (0 V reference), OC (+2.5 V reference), OFF
Measurement range	200 Hz to 40 kHz F.S. (1/2/4/5 steps)
Max permissible input	Between +/− terminals Between floating terminals
	DC 60 V (DC+ACp-p) 30 VACrms
A/D converter	Sampling interval: 4 μs (250 kHz) Resolution : 12 bits (out of which 14 are internally acknowledged)
Input resistance	DC: Approx. 100 k Ω OC: Approx. 10 k Ω
Accuracy	±0.5% of F.S.
Max. input frequency	40 kHz
Min pulse width	Min. 2.5 μs
Min. voltage	Min. ±1 V relative to the reference value
Low-pass filters	100 Hz, 1 kHz, 10 kHz (−3 dB) at −6 dB/oct

Logic Amplifier (for measurement of logic signals)

Item	Details
No. of channels	4-ch model: (4 channels/logic input terminal x 1) 8-ch model: (8 channels/logic input terminal x 2) 16-ch model: (16 channels/logic input terminal x 4)
Input voltage range	0 to 25 V max. (single ground input)
Threshold level	TTL (+1.4 V), CMOS (+2.5 V), Contact (+5.0 V)
Sampling interval	1 μs max. (regardless of which analog amplifiers are installed)
Trigger setting	8-channel pattern trigger
Display/Recording	On/Off switchable for each group (1 group: 4 channels)
Display/Record position specification	Display/Recording position can be specified for each group in each zone

IRIG (Time Code) (WR310 only)

Item	Details
Input signal type	Modulated, demodulated
Output signal type	Demodulated
Input signal format	IRIG-B, IRIG-E
Print record	System annotation printing
Display	Asterisk mark [*] displayed when time code received When a time code has not been received, the recorder's internal time is displayed The year displayed is the internal function clock
Input connector	BNC

Options/Accessories/Supplies Charts

Units

Unit	Model No.	Details
Voltage measurement amplifier	WR3-V AMP	Can be added later
Voltage/temperature measurement amplifier	WR3-M AMP	Can be added later
DC strain measurement amplifier	WR3-DCB AMP	Can be added later
Frequency measurement amplifier	WR3-FV AMP	Can be added later
200 mm long-length Z-fold unit	B-522	Can be added later
100 mm internal Z-fold unit	B-523	Can be added later
200 mm internal Z-fold unit	B-524	Can be added later

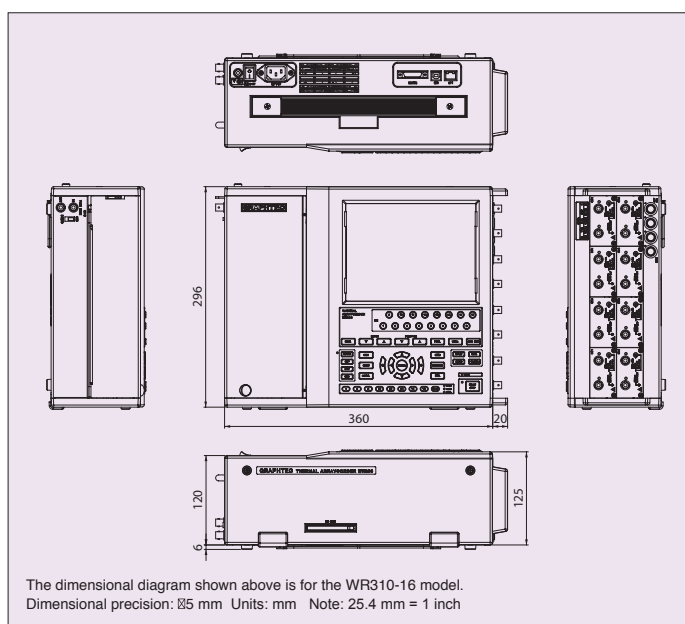
Accessories

Accessories	Model No.	Details
Input cable (8-cable set)	B-331	2-pin cable (banana terminal) bare tips
Input cable (16-cable set)	B-335	2-pin cable (banana terminal) bare tips
Clamp adapter (1200 A)	CM-102	
Digital clamp meter	CM-111	
Logic amplifier probe	RIC-07	
Alligator clip cable	RIC-08	
IC clip cable	RIC-09	
Probe set (Set RIC-07 to 09)	RIC-10	
Floating voltage input probe	CM-105	
Voltage conversion probe	CM-106	
Clamp meter temperature probe	RIC-110	
Line separator	CM-108	
Safety adapter	SMA-102	High-voltage BNC-to-banana conversion adapter

Supplies

Supplies	Model No.	Min. Qty.	Details
Roll paper (thermal recording paper)	PR230	5 rolls	100 mm wide, 40 m length
Z-fold paper (thermal recording paper)	PZ230	5 packs	100 mm wide, 40 m length
Roll paper (thermal recording paper)	PR231A	10 rolls	200 mm wide, 40 m length
Z-fold paper (thermal recording paper)	PZ233	5 packs	200 mm wide, 40 m length
Z-fold paper (thermal recording paper)	PZ231A	5 packs	200 mm wide, 100 m length
Head cleaner	B-368	1 set	For cleaning the thermal recording head

External Dimensions



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