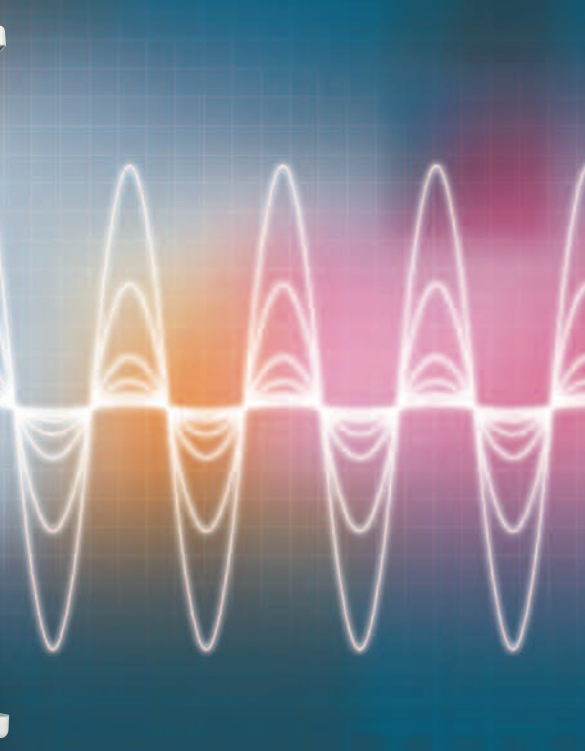
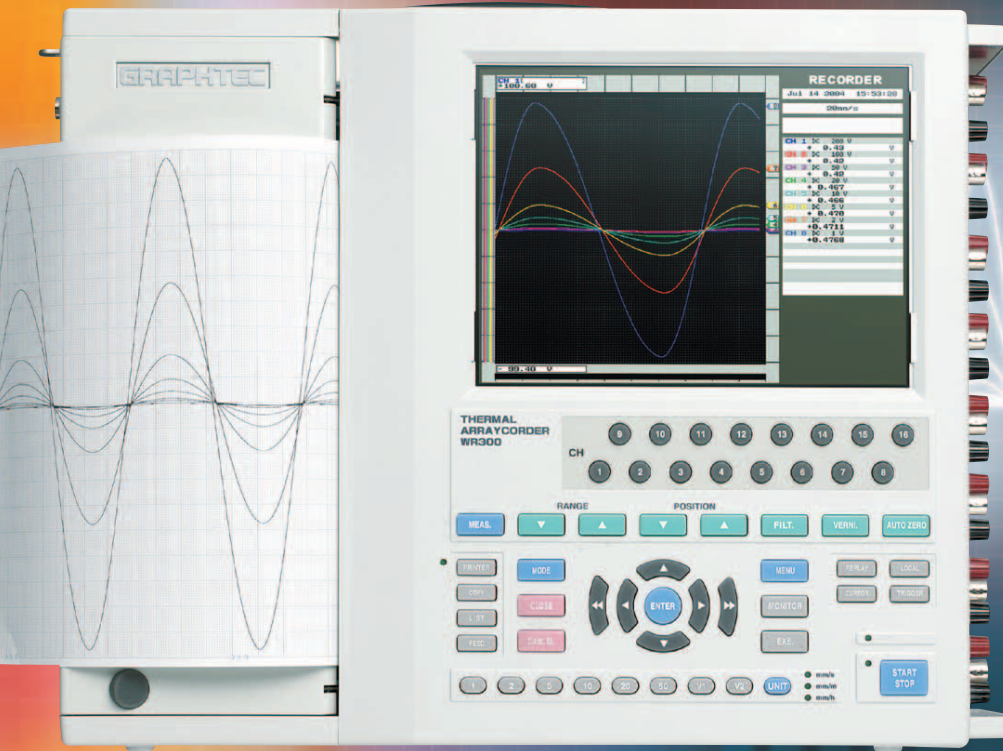
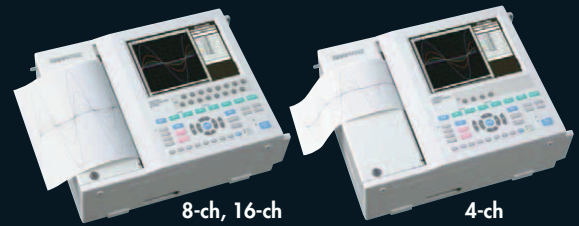


GRAPHTEC

Thermal Arraycorders **WR300** ^{NEW} SERIES



Direct Recording

Chart, Internal Memory, HDD



Multi-function

Voltage/Temperature/Strain



Direct Operation

Range, Position, Chart speed



Thermal Array recorders WR300 SERIES



- Models available with 4, 8 or 16 input channels.
- 8.4" color LCD monitor for data display and the graphics
- Plug-in 2-channel DM3 series amplifiers adapt the system
- Up to 1 MS/s sampling rate on all channels.
- Bandwidth (frequency response): DC to 50 kHz.
- 1 MSample internal memory is standard.
- Built-in 200mm (8") wide thermal array printer in the
- Interfaces: Ethernet, USB, and PCMCIA port .
- Performance, reliability and ease of use.

Basic Specifications

Main Unit Specifications

Item	Details
Analog input	4-ch model: 2 slots, 8-ch model: 4 slots, 16-ch model: 8 slots (amplifier units can be intermixed)
Logic input	4-ch model: 4 channels, 8-ch model: 8 channels, 16-ch model: 16 channels
PC interface	LAN, USB
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)
Weight (approximate)	4-ch model: 5.6 kg (including 2 amplifiers, excluding options) 8-ch model: 6.1 kg (including 4 amplifiers, excluding options) 16-ch model: 6.8 kg (including 8 amplifiers, excluding options)

*1: WR310 only

Monitor and Printer Specifications

Item	Details
Display screen	8.4-inch 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
Display format	Display format: Y-T 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	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: $\pm 0.3\%$ ± 1 dot, T: $\pm 2\%$ ± 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	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
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 /Arctangent/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
Number of analysis channels	4 ch
Window functions	Hanning window, rectangular window
Number of sampling points	1,000 points, 2,000 points
Averaging	Summation, exponential, peak hold
Display format	1 Division, 2 Divisions, 4 Divisions, Nyquist
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 Depends on amplifier PCMCIA card Max. 5 ms Hard disk*1 8-ch data capture : Max. 1μs, 16-ch data capture: Max. 2μs Note: 10μs 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 (can be set 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, PCMCIA card, hard disk (data capture capacity and sampling interval are the same as for Internal 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 triggered by pressing the START key Internal: Start triggered by a combination of measured signals Manual: Start triggered by pressing the TRIGGER key External: Start triggered by a TRIGGER IN signal from the remote connector
[Stop condition] source	OFF: Stop triggered by pressing the STOP key Internal: Stop triggered by a combination of measured signals Manual: Stop triggered by pressing the TRIGGER key External: Stop triggered by a TRIGGER IN signal from the 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-hand 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 PR230A 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

al user interface.

em to a wide variety of input types and sensors.

e 8- and 16-ch models; 100 mm wide printer in the 4-ch model.

WR300 Series Model Configuration Chart

No. of channels	WR300			WR310	
	4	8	16	8	16
100-mm roll paper	Yes	No	No	No	No
100-mm Z-fold paper (for internal use)	Opt.	No	No	No	No
Internal 100-m 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.
Internal 200-m 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
DC drive	Opt.	Opt.	Opt.	Opt.	Opt.

Plug-in Amplifier Specifications

WR3-V Amplifier (for voltage measurement) Specifications

Item	Details
No. of channels	2 channels per unit
Input configuration	Independent unbalanced input for each channel (floating ground)
Input resistance	1 M Ω \pm 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 \pm 3 $^{\circ}$ C)	\pm 0.25% of F.S.
Temperature coefficients	Zero point: 0.02% of F.S. / $^{\circ}$ C Gain: 0.02% of F.S. / $^{\circ}$ C
Insulation resistance	100 M Ω (at 500 V DC)
Isolation voltage	Between input terminal and casing: 1 minute at 1,000 V AC
Permissible signal source resistance	Max. 1 k Ω
A/D converter	Sampling interval: 1 μ s A/D resolution: 12 bits
Common mode rejection ratio	80 dB (typ) (50/60 Hz, Signal source resistance: max. 500 Ω)
Signal/noise ratio	-46 dB (typ) 200(Vp-p at 50 mV range (with \pm shorted)
Frequency response	DC coupling: DC to 200 kHz (\pm 3 dB Typ.) AC coupling: 10 Hz to 200 kHz (\pm 1/ -4.5 dB Typ.)
Max permissible input voltage	Between \pm 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) Specifications

Item	Details
No. of channels	2 channels per unit
Input configuration	Independent unbalanced input for each channel (floating ground)
Input resistance	1 M Ω \pm 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 $^{\circ}$ C TC-J: -200 to 1100 $^{\circ}$ C TC-T: -200 to 400 $^{\circ}$ C TC-R: 0 to 1600 $^{\circ}$ C TC-E: -200 to 800 $^{\circ}$ C TC-B: 600 to 1700 $^{\circ}$ 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 $^{\circ}$ C \pm 3 $^{\circ}$ C) (Temperature accuracy includes reference contact compensation accuracy)	[Voltage] \pm 0.25% of F.S. [Temperature] < TC-K, J, E > -200 $^{\circ}$ C to 0 $^{\circ}$ C: \pm (1% of rdg + 3.5 $^{\circ}$ C) Other: \pm (0.2% of rdg + 3.5 $^{\circ}$ C) < TC-T > -200 $^{\circ}$ C to 0 $^{\circ}$ C : \pm (0.8% of rdg + 3 $^{\circ}$ C) Other: \pm (0.2% of rdg + 3 $^{\circ}$ C) < TC-R > 0 $^{\circ}$ C to 200 $^{\circ}$ C : \pm 9.5 $^{\circ}$ C 200 $^{\circ}$ C to 800 $^{\circ}$ C: \pm 6.5 $^{\circ}$ C Other: \pm (0.2% of rdg + 4.5 $^{\circ}$ C) < TC-B > 600 $^{\circ}$ C to 700 $^{\circ}$ C : \pm 9.5 $^{\circ}$ C Other: \pm (0.2% of rdg + 5.5 $^{\circ}$ C)
Temperature coefficient	Zero point: 0.01% of F.S./ $^{\circ}$ C Gain: 0.02% of F.S./ $^{\circ}$ C
Insulation resistance	100 M Ω (at 500 V DC)
Isolation voltage	Between input terminal and casing: 1 minute at 1,000 V AC
Permissible signal source resistance	Max. 1 k Ω
Input bias current	2nA (typ.)
A/D converter	Sampling interval: 10 μ s 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 μ V-P at 20 mV range (with \pm shorted)
Frequency response	DC coupling: DC to 20 kHz (\pm 1/ -3 dB Typ.) AC coupling: 10 Hz to 20 kHz (\pm 1/ -4.5 dB Typ.)
Max permissible input voltage	Between \pm 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) Specifications

Item	Details
No. of channels	2 channels per unit
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)
Insulation resistance	Min. 100 M Ω (at 500 V DC)
Isolation voltage	Between input terminal and casing: 1 minute at 1,000 V AC
A/D converter	Sampling interval: 10 μ s Resolution: 16 bits (out of which 14 are internally acknowledged)
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 M Ω (5 M + 5 M)
Accuracy (23 $^{\circ}$ C \pm 3 $^{\circ}$ C)	\pm (0.3% of F.S. + 1.2 x 10 $^{-6}$ strain)
Frequency bandwidth	DC to 20 kHz (\pm 1/ -3 dB)
Stability	Zero point \pm 1.2 x 10 $^{-6}$ strain/ $^{\circ}$ C \pm 10 x 10 $^{-6}$ strain/8 h \pm 10 x 10 $^{-6}$ strain/0.5 h (initial drift / from 10 s after power on)
	Gain \pm 0.02% of F.S./ $^{\circ}$ C 0.10% of F.S./8h
Filters	Line 1.5 Hz (\pm 1/ -3 dB) at -6 dB/oct L.P.F 10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz (-3 dB) at -12 dB/oct
Gauge ratio	2.0 fixed
Gauge resistance	120 to 1000 Ω
Bridge voltage	Voltage DC 2 V Accuracy \pm 0.2% Stability \pm 0.01%/ $^{\circ}$ C
Balance adjustment	Method Auto balance adjustment method Accuracy \pm 10 x 10 $^{-6}$ strain Range Resistance \pm 2% (10,000 x 10 $^{-6}$ strain)

WR3-FV Amplifier (for frequency measurement) Specifications

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 \pm terminals DC 60 V (DC+ACp-p) Between floating terminals 30 VACrms
A/D converter	Sampling interval: 4 μ s (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	\pm 0.5% of F.S.
Max. input frequency	40 kHz
Min pulse width	Min. 2.5 μ s
Min. voltage	Min. \pm 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) Specifications

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 μ s max. (irrespective of analog amplifiers 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) Specifications (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

12 V DC Drive Specifications

Item	Details
Input voltage range	10 V to 16 V DC
Isolation voltage	Between input/output terminals: 500 V DC Between input/output terminals and casing: 500 V DC
Insulation resistance	Min. 100 MΩ
Power consumption	Approx. 150 VA (Max.)

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
12 V DC power supply	B-525	Can be added later

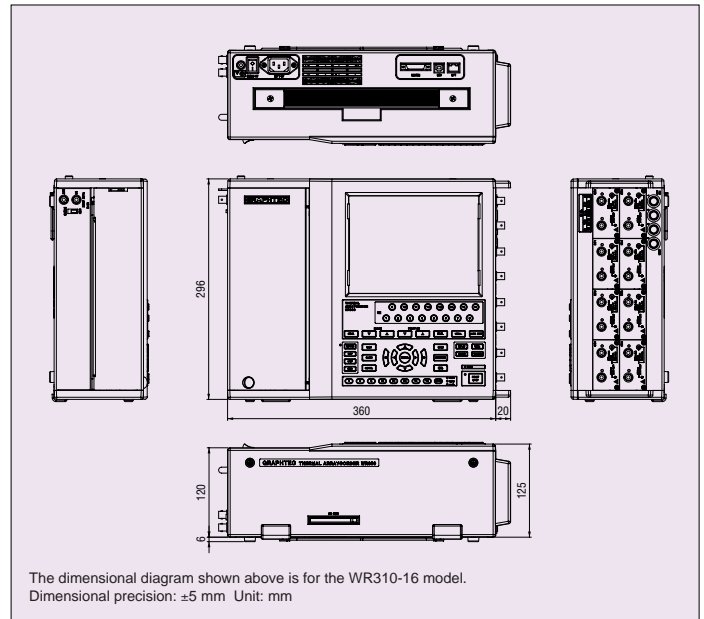
Accessories

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
Power cable (DC)	RIC-140	10-pin round connector cable (2 m) x 1
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



- Brand names and product names are the trademarks or registered trademarks of their respective owners.
- Specifications are subject to change without notice.



To ensure correct and safe use of your recorder:

- Read your User's Manual before using the recorder, and operate it correctly in accordance with the procedures described.
- To prevent malfunctions or electrical shock due to current leakage, ensure that the recorder has a good protective ground, and ensure that the supply voltage conforms to the recorder's power rating.

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