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Portable Hybrid Recorder
DR 130



- Small, light-weight and portable
- Data can be saved to a floppy disk
- A wealth of PC-based application software
- Mutually isolated channels, and universal inputs
 - Large display, simple operation
 - DC power supply operation (optional)


Data Acquisition and Recording Windows

Light-weight and Flexible

Multi-function Portable Hybrid Recorder

DARWIN

A highly reliable, functional expert tool-ideal for data acquisition and recording

The DR130 portable hybrid recorder comes with a large VFD monitor, and has a wide range of functions including multi-point, high speed, precision measurement and recording, and the ability to save data to a floppy disk. It has excellent mobility, enabling it to be used anywhere at all.

The measurement data can be effectively utilized by a personal computer via a general purpose communication interface or a memory device (floppy disk). A wealth of application software provides powerful support for PC measurement.

The new DR130 hybrid recorder, which was developed to meet the demands of the downsizing era, is the latest addition to the DARWIN series.

- Number of input channels: 10 channels or 20 channels (specify when ordering)
- Measurement intervals: Max. 2 seconds
- Kinds of inputs: Universal inputs (DCV, TC, RTD, DI) or DCV/TC/DI dedicated inputs (specify when ordering), power monitor input options
- Effective recording width: 150 mm
- Memory devices: 3.5-inch floppy disk drive

Portable Hybrid Recorder

DR 130

Small, light-weight and portable

The DR130 is smaller and lighter (9.3 kg) than the popular HR1300, and is considerably more portable for mobile use.

Data can be saved to a floppy disk

You can transfer settings and measurement data to a personal computer or save them to a memory device (floppy disk). The saved measurement data can also be converted to the Excel or Lotus 1-2-3 format by means of DAQ32 (standard) software.

A wealth of PC-based application software

The DR130 comes with various drivers for commercially available software in addition to configuration and data logging software. This enables you to easily configure a personal computer-based data recording environment.

Mutually isolated channels, and universal inputs

The input section, in which each channel is isolated from the other, contains a signal conditioner function, permitting universal measurement of various inputs including voltage, thermocouple (TC), resistance temperature detector (RTD), and contact signals.

High environmental toughness and high reliability to withstand severe field environments

The DR130 uses high breakdown voltage solid state relays developed by Yokogawa and also conforms to world safety standards, ensuring high reliability.

The instrument comes with complete filter functions, resulting in greater immunity to field noise.

Comes with a large display, and is designed for ease of operation.

The DR130 has a large, 3-line VFD display for improved visual recognition of data. Also, various messages are displayed when you operate the instrument, thus making for improved operability.

AC/DC dual-mode power supply (optional)

Equipped with an AC/DC dual-mode power supply, the unit can be taken anywhere with ease and even installed in an automobile, delivering full performance from the field to the desk.

DARWIN's common concept is to provide the measurement world, in which there are increasing demands for networks and open systems, with data acquisition equipment that can evolve to meet diversifying needs.

In addition to the DR130, Yokogawa has a full lineup which includes the DA100 personal computer-based data acquisition unit and the DR230 desktop type hybrid recorder.

Panel-mounting DR240



Portable hybrid recorder DR130



Desk-top hybrid recorder DR230



PC-based data acquisition unit DA100

DARWIN

Application Versatility

Superior Mobility and High Reliability at a Reasonable Cost

The DR130 was designed for user economy and environmental toughness in the field. It is compact and light, making for improved portability, and also occupies little space. The cost of the converter has been reduced due to the wide range of inputs. In addition, high breakdown voltage solid state relays are employed, resulting in higher reliability and maintainability. This hybrid recorder has a wide range of functions including realtime computation and memory functions, enabling it to meet a variety of applications.

Portable and simple construction

The recorder proper contains the input/output section and also a wealth of functions. In addition, the instrument is smaller and lighter than the HR1300, making it easy to move about.



Excellent input functions

You can freely set a wide range of inputs including DC voltage, thermocouple, RTD, and contact signals, by a simple key operation. A lineup of high cost performance models designed exclusively for voltage, thermocouple and contact inputs is also available. In addition, you can select power monitor input options that enable you to measure RMS values of AC voltage and current, active power, apparent power, reactive power, frequency, power factor and phase angle (for both single phase and 3-phase applications).

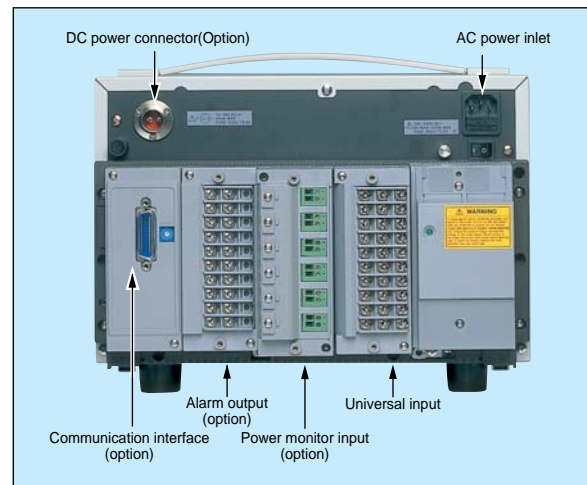
● Mutual channel isolation. Reliable high withstand voltage and noise immunity

Each channel of the input circuit is isolated from the others by high breakdown voltage solid state relays*¹. As a result, the common mode rejection voltage is 250 VAC*² rms, and the withstand voltage is 1,500 VAC*² (1 minute). Excellent noise rejection is ensured by the built-in power line noise rejection filter employing an integrating type A/D converter, low-pass filter, and moving average digital filter*³.

*¹: RTD inputs share a common line within the same module.

*²: Depends on input module types

*³: The shortest measurement interval varies depending upon the integration mode and the low-pass filter mode.



Rear view of the DR130

YOKOGAWA's elemental technology realizes high reliability

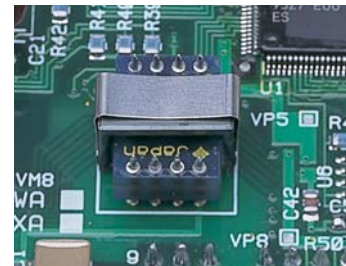
● High breakdown voltage solid state relays (SSR)

The input switching devices are high breakdown voltage solid state relays (SSR) developed independently by Yokogawa. Semiconductors take the place of the contacts and drive section of a mechanical relay, hence the relay device has long operational life, does not generate any sound, and consumes little power. These solid state relays have a high withstand voltage (1,500 VDC) enabling them to be used safely in the field. In addition, they produce very little leakage current (1 nA), permitting accurate measurement of minute voltage signals such as those output from a thermocouple.



● Planar transformer

A planar transformer is a revolutionary integrated circuit transformer which takes the place of the conventional wire-wound transformer, the most antiquated of all electronic components. This small, thin transformer consists of multi-layer precision thin film coils. This compact design means that the power supply unit occupies just 1/2 to 1/4 of the volume of conventional units. All of the transformers used in the main unit and also the sub-units and the input/output modules of the DR130 are planar transformers. This is an important factor in achieving the large degree of miniaturization and weight reduction of the DR130.



Computation functions (some are optional)

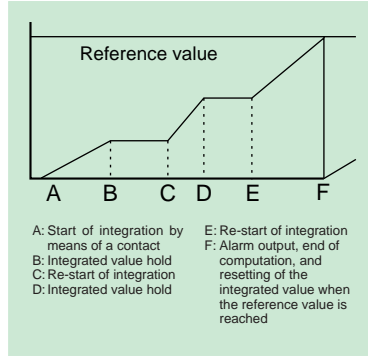
The DR130 can perform various computations such as the four arithmetic operations, measurement data integration processing, and detection of maximum and minimum values, in realtime. The results of computations are sent together with the measurement data to a PC, thus reducing the burden of analysis work and improving the measurement efficiency. The main computation functions of the DR130 are as follows.

- Standard computation functions:
 Linear scaling, moving average, differential computation
- Computation options:
 Four arithmetic operations, logic operations, related operations, computation of absolute and relative values, and statistical computations (maximum, minimum, mean, and integrated values)

● Moving average function

This function renews the measured value while computing the moving average, hence it is effective for monitoring the trend of a varying input signal over a long period. It can also be used as a digital filter when noise components are present on the input signal. You can set the number of moving average scans by selecting a value between 2 and 64.

● Batch integration



By using the DR130 in combination with the optional DI/DO module or alarm function, you can easily perform batch processing.

Memory function (specify when ordering)

You can select a floppy disk unit as an external memory device. You can save a number of set values and recall them whenever necessary, and in addition store the measurement data before and after an alarm, and also computed results. You can record the memorized data on a chart, or analyze it or make it into a report using a personal computer and commercially available spreadsheet software.



● If a floppy disk drive is installed, the measurement data is stored in a binary format in the 512 kB (SRAM) internal buffer memory. You can also copy measurement data from the internal buffer memory to a floppy disk while converting it into the ASCII format.

● By combining the memory function with a remote function, timer, key operation, etc., you can memorize data at fixed intervals (e.g. 1 hour), or save the results of statistical computations alone (integrated value or maximum and minimum values).

● The DR130 comes with standard data conversion software, enabling you to convert data into the ASCII, Excel, or Lotus 1-2-3 format.

Other standard functions

Function		Description	
Input	Integration mode selection	You can select the 50/60 Hz or 10 Hz integration mode. The 10 Hz integration mode is useful when power line noise containing both 50 Hz and 60 Hz components is superimposed on the signal. (When the 10 Hz integration mode is activated, the minimum measurement interval is 4 seconds.)	
	Low-pass filter	You can insert a low-pass filter in the path of a signal on which noise components are superimposed. (When the hard filter is ON, the measurement interval becomes at least 3 seconds.)	
	Scaling	The input signal is displayed and/or recorded as an industrial quantity or a physical quantity.	
	Burn-out	When the thermocouple input goes open circuit, the indicator moves to the 100% or 0% side.	
Recording	Differential computation	The difference between the reference channel and measured channel is measured.	
	Zone recording	The recording area can be set freely for each channel.	
	Partially compressed and expanded recording	Unimportant parts are compressed, and only necessary parts are expanded, thus enabling the recording resolution to be increased.	
	Group channel trend	Only channels that belong to a specified group are recorded. Switchover between groups can be done using a remote contact.	
Setting	Alarm generation channel trend	Trend recording takes place only for channels that emit an alarm.	
	Memory backup	The set data is protected by a lithium battery inside the unit.	
Alarm (Output is optional)	Security	The unit comes with a standard password lock function, preventing mis-operation and also protecting the set data.	
	Setting	You can set a 4-level alarm (upper and lower limits, difference between upper and lower limits, percentage change rising and falling limits) for each channel.	
	Re-breakdown re-alarm	The alarm output can be refreshed when an alarm is emitted.	
Option functions	Hold function	Once an alarm is emitted, the alarm indication and relay state are held until the operator acknowledges the alarm.	
	General purpose communication function (GP-IB, RS-232C) and alarm output relay (10 make contacts) DI/DO functions (recorder action control function, fail function, chart end function), etc.		
	Conformity to standards	CSA Obtained CSA22.2 No.1010.1, Installation category (Overvoltage category) : II, Degree of pollution : 2	
Conformity to standards	UL	Obtained UL3111-1 (CSA NRTL/C)	
	CE	EMC directive	EN61326 EN61000-3-2 EN61000-3-3 EN55011 Class A Group 1
		Low voltage directive	EN61010-1 Measurement category : II, Degree of pollution : 2
	C-Tick	AS/NZS 2064 Class A Group 1	

Wide Variety of Indications, and Ease of Operation

Monitoring/setting functions

The DR130 comes with a large 3-line VFD display, enabling you to recognize data easily, even from a distance. The instrument is operated using a dia-

log method with this VFD display. Various guidance messages are displayed to help you make settings.

Employing large VFD display, versatile display formats



The DR130 has a large VFD which can display a total of 102 characters (one line of 22 large characters, and two lines of 40 characters each). This ensures that the measurement results and alarm status are easy to read and can be transmitted ac-

curately. A wide range of display formats is available. These include 5-channel simultaneous digital measurement values, bar graphs, and alarm relay status displays.

Simple operations using a dialog method

You can make settings easily using a dialog method and the display which can display a total of 102 characters. The setting item is always displayed in large characters at the top of the display, and the guidance display (auxiliary information), such as the setting range, is displayed in detail at the bottom of the display. Also, items that are normally used frequently are grouped separately from items which, once set, are not changed frequently, thus simplifying routine operations.



Range setting screen



Chart speed setting screen

Replacing cassette type consumables



A removable cassette type ink ribbon is used, enabling the ink ribbon to be replaced easily. Also, the chart holder is a pull-out type enabling the chart to be replaced with ease. The ink ribbon and chart paper are completely interchangeable with the ribbon and paper used in Yokogawa's HR1300 hybrid recorder.

Removable input module



The input/output section is of modular construction (10-channel or 20-channel units), enabling you to remove it to carry out wiring work.

Clear and Advanced Recording

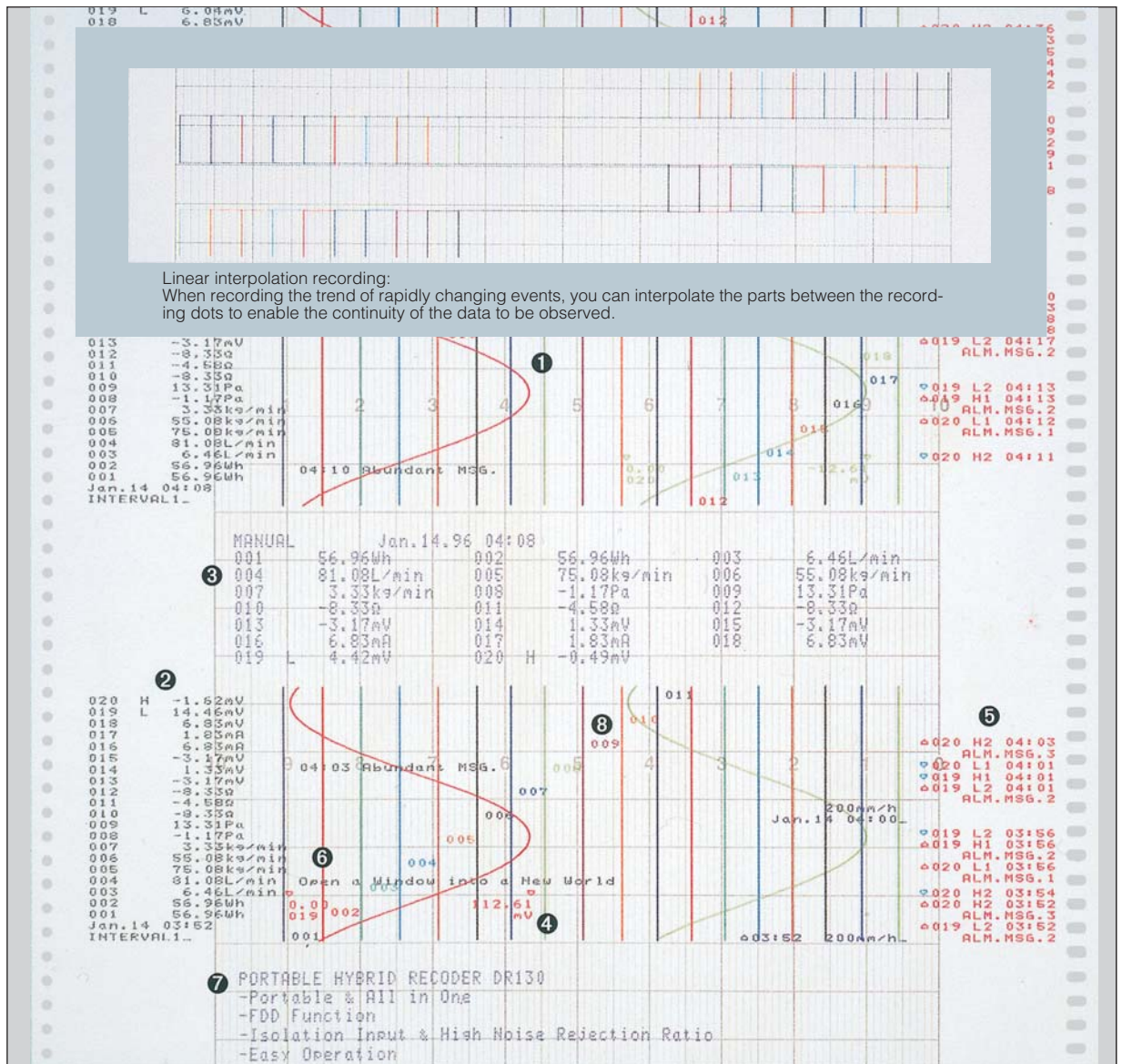
Hybrid Recording Functions

A recorder's performance is determined by the readability of the information on its printed chart. The DR130 can record clearly, in 10 colors, data from all measurement points, at 2-second intervals. It has a variety of recording functions including ana-

log trend recording over an effective recording width of 150 mm, recording of digital measured values, recording of various messages, zone recording, and partially compressed and expanded recording, thus enabling data to be read off at a glance.

- Clear, high speed 10-color recording at 2-second intervals
- A full range of auxiliary printing functions

- Many recording formats



1 Analog trends

Records clearly in 10 colors. You can assign a recording color to each channel.

2 Digital recording

Measured values are recorded digitally either at an interval based on the chart speed or at an interval that you specify. You can also start recording of data by a remote contact input.

3 Manual recording

By pressing a key, you can interrupt analog recording and digitally record one scan's worth of measured values.

4 Scale printout

The recording scale is printed out for each channel.

5 Alarm printout

A change of the alarm status (ON/OFF state and time, for each channel) is printed out.

6 Message printout

The contents of a preset message are printed out by pressing a key, when an input is received from a remote contact, or when an alarm is detected.

You can preset up to 20 messages of 16 characters each.

7 Header printout

Headers are printed as comments (five rows of 60 characters).

8 Printing channel No. and tag No.

The channel number or tag No. are printed periodically.

PC-Friendly

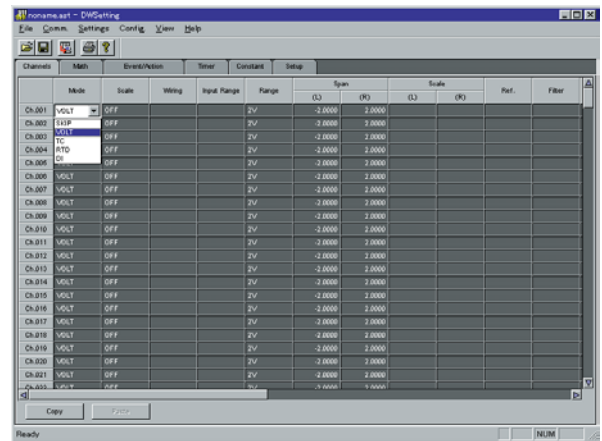
Data Acquisition Software is Designed to Run Under Windows 98 / Me / NT4.0 / 2000 / XP.

In addition to performing realtime recording and data saving to a medium, the DR130 functions as a high speed multiplexer A/D converter of 20 ch/2 seconds which contains a signal conditioner function. It also comes with a full range of application software and driver software.

By using this package software, you can configure the measurement conditions, create data acquisition programs and set up with ease a personal computer-based data recording environment.

DARWIN DAQ32 Software

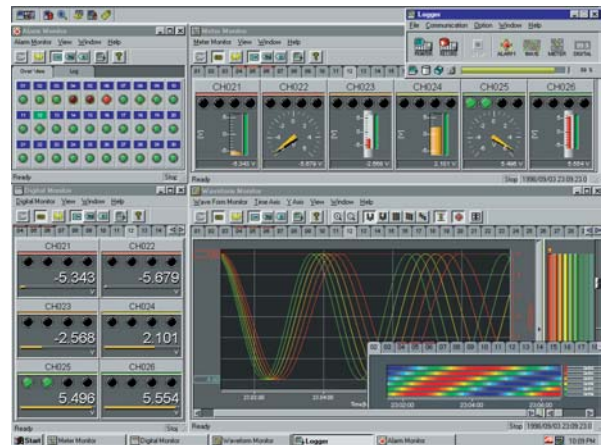
The data acquisition software 32 (DAQ32) is the standard software for common use with all the data gathering instruments in the DARWIN series. The software includes hardware setup, simplified data logging, simplified data viewing, data conversion (Excel, Lotus 1-2-3 or ASCII format), preference setting, system diagnosis and calibration functions, all in one package. All models of the DA100 data acquisition unit and DC100 data collector come standard with this software. For each model of the DR130, DR230 and DR240 hybrid data recorders, you can specify whether software is necessary or unnecessary when ordering. When you specify software as "necessary," DAQ32 software comes standard with the model.



Example of hardware setup display

Data Acquisition Software 32Plus

The data acquisition software 32Plus (DAQ32Plus) is the enhanced software for common use with all the data gathering instruments in the DARWIN series. Like the standard DAQ32, this software includes hardware setup, simplified data logging, simplified data viewing, data conversion (Excel, Lotus 1-2-3 or ASCII format), preference setting, system diagnosis, calibration, and tag number setting functions, all in one package. DAQ32Plus is far more powerful than DAQ32, however, in terms of the data monitoring and logging functions. It contains a number of additional functions not found in DAQ32. Additions include a display of up to 30 data groups each having a maximum of 32 channels' worth of data per window (as compared with the DAQ32's display of up to 2 data groups each having a maximum of 10 channels' worth of data per window); displays of various meters including level meters, analog meters and thermometers (not offered by DAQ32); alarm displays; as well as a DDE server, logger autostart, retry, password and tag setting function.



Example of data logging display



Example of data viewing display

Specifications

Input section

- Measurement interval
2, 3, 4, 5, 6, 10, 12, 15, 20, 30 and 60 seconds
Maximum of 2 seconds/20 channels
- A/D integration period
Manual selection: 20 ms (50 Hz), 16.7 ms (60 Hz) and 100 ms (10 Hz) or Automatic switchover between 50 and 60 Hz

Filter ON/ OFF Cutoff frequency	Low pass filter OFF		Low pass filter ON	
	20 ms (50 Hz) 16.7 ms (60 Hz)	100 ms (10 Hz)	20 ms (50 Hz) 16.7 ms (60 Hz)	100 ms (10 Hz)
Number of channels				
10	2 sec	4 sec	3 sec	12 sec
20	2 sec	5 sec	4 sec	15 sec

■ Measurement range

Kind of input	Range	Measurement range	Measurement (digital display and recording)	
			Measurement accuracy	Min. resolution
DC voltage	20 mV	-20.000 to 20.000 mV	±(0.05% of rdg + 5 digits)	1μV
	60 mV	-60.00 to 60.00 mV	±(0.05% of rdg + 2 digits)	10μV
	200 mV	-200.00 to 200.00 mV	±(0.05% of rdg + 2 digits)	10μV
	2 V	-2.0000 to 2.0000 V	±(0.05% of rdg + 2 digits)	100μV
	6 V	-6.000 to 6.000 V	±(0.05% of rdg + 2 digits)	1 mV
	20 V	-20.000 to 20.000 V	±(0.05% of rdg + 2 digits)	1 mV
	50 V	-50.00 to 50.00 V	±(0.05% of rdg + 2 digits)	10 mV
Thermocouple; (Does not include the reference junction compensation accuracy.)	R ¹	0.0 to 1760.0°C	±(0.05% of rdg + 1°C) However R, S: 0 to 100°C, ±3.7°C 100 to 300°C, ±1.5°C B: 400 to 600°C, ±2°C Accuracy less than 400°C is not specified	0.1°C
	S ¹	0.0 to 1760.0°C		
	B ¹	0.0 to 1820.0°C		
	K ¹	-200.0 to 1370.0°C	±(0.05% of rdg + 0.7°C) However, K attains an accuracy of ±(0.05% of rdg + 1°C) within the range between -200 and -100°C.	
	E ¹	-200.0 to 800.0°C	±(0.05% of rdg + 0.5°C)	
	J ¹	-200.0 to 1100.0°C	However, J and L attain an accuracy of ±(0.05% of rdg + 0.7°C) within the range between -200 and -100°C.	
	T ¹	-200.0 to 400.0°C		
	L ²	-200.0 to 900.0°C		
	U ²	-200.0 to 400.0°C		
	N ³	0.0 to 1300.0°C	±(0.05% of rdg + 0.7°C)	
	W ⁴	0.0 to 2315.0°C	±(0.05% of rdg + 1°C)	
	KPvsAu7Fe	0.0 to 300.0K	±(0.05% of rdg + 0.7K)	0.1K
	RTD	Pt100 (1 mA) ⁵	-200.0 to 600.0°C	±(0.05% of rdg + 0.3°C)
Pt100 (2 mA) ⁵		-200.0 to 250.0°C	±(0.05% of rdg + 0.3°C)	0.1°C
JPt100 (1 mA) ⁵		-200.0 to 550.0°C	±(0.05% of rdg + 0.3°C)	0.1°C
JPt100 (2 mA) ⁵		-200.0 to 250.0°C	±(0.05% of rdg + 0.3°C)	0.1°C
Pt50 (2 mA) ⁵		-200.0 to 550.0°C	±(0.05% of rdg + 0.3°C)	
Ni100 (1 mA) ⁶ SAMA		-200.0 to 250.0°C	±(0.05% of rdg + 0.3°C)	
Ni100 (1 mA)DIN ⁶		-60.0 to 180.0°C	±(0.05% of rdg + 0.3°C)	
Ni120 (1 mA) ⁷		-70.0 to 200.0°C		
J263*B		0.0 to 300.0K	±(0.05% of rdg + 0.3K)	0.1K
Cu10 GE		-200.0 to 300.0°C	±(0.2% of rdg + 0.7°C)	-84.4 to 170.0°C ⁸
Cu10 L&N				-75.0 to 150.0°C ⁸
Cu10 WEED				-20.0 to 250.0°C ⁸
Cu10 BAILEY				-20.0 to 250.0°C ⁸
High resolution RTD	Pt100 (1 mA) ⁵	-140.00 to 150.00°C	±(0.05% of rdg + 0.3°C)	0.01°C
	Pt100 (2 mA) ⁵	-70.00 to 70.00°C	±(0.05% of rdg + 0.3°C)	
	JPt100 (1 mA) ⁵	-140.00 to 150.00°C	±(0.05% of rdg + 0.3°C)	
	JPt100 (2 mA) ⁵	-70.00 to 70.00°C	±(0.05% of rdg + 0.3°C)	
Contact	Voltage input	Less than 2.4 V OFF, 2.4 or more ON detection (TTL)		
	Contact input	Contact ON/OFF		

*1 R, S, B, K, E, J, T: ANSI, IEC 584, DIN IEC 584, JIS C 1602-1981

*2 L: Fe-CuNi, DIN-43710, U: Cu-CuNi, DIN 43710

*3 N: Nicrosil-Nisil, IEC584, DIN IEC 584

*4 W: W.5%Re-w.26%Re (Hoskins Mfg.Co.)

■ Input method

floating unbalanced input, each channel mutually isolated(channel independent)

The RTD range has a common potential (terminal b).

■ A/D resolution

±20000

■ The standard operating conditions

23 ±2°C, 55 ±10% RH, warming-up time 30 minutes or more, vibration and others not affecting instrument operation

■ Compensation for the reference junction

Switchable internally or externally for each channel

■ Compensation accuracy for the reference junction

(measured at 0°C, used for a bundle line of thermocouple at Ø0.5 or less when the input terminals are balanced; Frontwards: 0° Backwards: 0° horizontal)

Type R, S, B, W: ±1°C

Type K, J, E, T, N, L, U: ±0.5°C

■ Maximum allowable input voltage

2V DC range or lower, thermocouple, RTD, DI (CONT): ±10 V DC

6V DC range or greater, DI (LEVEL): ±60 V DC

■ Normal mode voltage

voltage, thermocouple: 1.2 times or less (at peak value, including 50 or 60Hz signal component)

General specifications

■ External dimensions

Approx. 338 (W) × 221 (H) × 335 (D) mm

The DC power supply option adds 45 mm to the depth.

■ Weight

9.3 kg (when 20 input channels and an alarm output are installed)

The DC power supply option adds 1.5 kg(f) to the weight.

■ Materials

Steel plate, aluminum alloy, plastic moldings

■ Paint color

Display: Slate Gray light (equivalent to Munsell 0.1 PB 4.6/0.2)

Core: Ice White (equivalent to Munsell 6.6Y 7.9/0.5)

*5 P150: JIS C 1604-1981, JIS C 1606-1986 P1100: JIS C 1604-1989, JIS C 1606-1989, IEC 751, DIN IEC 751JP1100: JIS C 1604-1981, JIS C 1606-1989

*6 SAMA/DIN

*7 McGRAW EDISON *8 Accuracy guarantee range

RTD: 50 mV or lower (at peak value)

■ Normal mode rejection ratio

40 dB or greater (50/60 Hz ±0.1%)

■ Common mode noise voltage

250 V AC rms (50/60 Hz)

■ Common mode rejection ratio

120 dB or greater (50/60 Hz ±0.1%, 500 Ω unbalanced, between the negative measurement terminal and ground)

■ Maximum noise between channels

150 V AC rms (50/60 Hz) (except for RTD)

■ Noise rejection

rejection by integration type A/D, lowpass filter, or moving averaging

■ Lowpass filter

50/60/10 Hz

■ Input resistance

Min. 10 MΩ at 2 V DC or lower, thermocouple range

Approx. 1 MΩ at 6 V DC or higher (Power off: 10 MΩ or more)

■ Insulation resistance

Min. 20 MΩ at 500 V DC between the input terminal and ground

■ Input bias current

max.: 10 nA

- Dielectric strength
1,000 V AC (50/60 Hz) for 1 minute: between input terminals, (except for RTD)
1,500 V AC (50/60 Hz) for 1 minute: between an input terminal and ground
- Input source resistance
DCV, thermocouple: 2 kΩ or lower
RTD: 10 Ω or lower per line (Pt100 Ω)
5 Ω or lower per line (Pt50 Ω)
1 Ω or lower per line (Cu10 Ω)
the same resistance including 3-line
- Temperature coefficient
zero: 0.01% of range/°C
full span: 0.01% of range/°C (0.02% of span/°C for Cu10 Ω)
- Thermocouple burn out:
Detected in a thermocouple range (On/Off enabled), current of 4 μA, detectable pulse width of approx. 5 ms
2 kΩ or lower is considered to be 'Normal'.
100 kΩ or greater is considered to be 'Disconnected'.

Recording section

- Recording method
Raster scan method, 10-color wire dot recording
- Number of recording points
Measurement result: 20 points + AC 6 points* or 2 points*
Computation results: 30 points
* To be released later
- Recording paper
Effective recording width: 150 mm (for dot recording)
- Recording accuracy
Dot: ±(0.2% of recording span + measurement accuracy)
Digital value: Determined by the measurement accuracy.
- Maximum recording resolution
Dot: 0.1 mm
Digital value: Depends upon the measurement resolution.
- Recording colors
Analog trend mode
Dot recording: Purple, red, green, blue, brown, black, navy blue, yellow-green, red-purple, orange (Color can be specified separately for each channel.)
- Digital printout:
Alarm printout:
Logging mode
Logging recording: Purple
- Recording interval
Analog recording interval in analog trend mode
FIX: Recording takes place in synchronism with the measurement interval between 2 and 60 seconds.
AUTO: Recording takes place in synchronism with the measurement interval and the recording paper feed speed.
- Recording interval for digital printing in the analog trend mode
MULTIPLE: Specify from six kinds for each channel (1 minute to 24 hours, specify in 1-minute units).
SINGLE: Automatically determined from the paper feed speed, the number of recording channels whose numerical values are to be printed, and the number of rows.
- Digital value recording interval in the logging mode:
MULTIPLE: Specify from six kinds for each channel (1 minute to 24 hours, specify in 1-minute units).
SINGLE: Common to all points (between 1 minute and 24 hours, specify in 1-minute intervals)
- Recording interval switchover: 2 kinds
Switched over according to event/action function
- Recording paper feed
Paper feed speed: 1 to 1,500 mm/h
Recording paper speed change: 2 kinds
Switched over according to the event/action function
- Recording paper feed method: Pulse motor
Paper feed accuracy: ±0.1% of the feed distance (Does not include the elongation or contraction of the recording paper when continuous recording is performed over a distance of at least 1000 mm.)
- Recording mode
NORMAL: Starting and stopping recording by pressing a key
Alarm generation channel trend: TRIGGER ... Recording starts only for a channel in which an alarm is detected.
Stopping recording by pressing a key.
LEVEL ... Recording of only a channel in which an alarm is generated takes place.
(Recording starts when an alarm is detected, and stops when the alarm is canceled.)
- Group trend: The measurement channels are divided into groups, and recording takes place only for channels belonging to the specified group. The selection of the group to be recorded can be made using the event/action function.
- Auxiliary printing functions
Common: Printing takes place in the analog trend mode.
Chart speed (mm/h) × dot recording interval (s) must be no greater than 3000 (≤ 3000).
Hours, minutes
Time printing: Arbitrary setting within 6 characters
Unit printing (UNIT): Arbitrary setting between 7 and 16 characters
Channel No./TAG printing: Arbitrary setting between 7 and 16 characters
Alarm printing: Channel No., kind of alarm, ON/OFF time (hours, minutes)
- Scale printing: 0, 100%/0, 50, 100%/every 20%
Message printing: 20 kinds of messages (16 characters) and the time are printed. Periodic printing. Printed is started by a key operation or the event/action function.
- Others
Setting the recording time: The recording start/stop times can be set.
Manual printing: One scan's worth of data can be digitally printed by means of a key operation or the event/action function. Analog trend recording is interrupted.
- List printing: The set contents are printed (printing is started by a restart).
- Header printing: A character array consisting of 80 characters x 5 lines is printed (the measurement value recording is interrupted). Printing is started by a key operation or the event/action function.
- Recording zone: The recording width and the recording positions (0% and 100% positions) can be set in mm units for each channel.

- Partial compression: Can be set for each channel (Only one boundary value can be set).
- Event/action function: Alarm detection/remote control signal input/Chart end signal/Timer/Recording starts by means of a key operation/The chart speed can be changed, etc.

Memory function section

- Memory media
3.5" floppy disk drive
When measurement data is saved to a floppy disk, it is first stored in the buffer memory (512 KB, SRAM).
- Applicable data
Set values, measurement values, computed values (except /M3 report value)
- Data length
10 items of data/channel to 50 k items of data/channel
However, the total memory length must be within the capacity of the vacant memory.
- Memory format
Binary
However, when copying the data in the buffer memory to a floppy disk, it is possible to convert the data into ASCII (CSV) format.
- Sample rate
In synchronism with the measurement interval of the recorder, or 1/2/5/10 minutes, or when an event occurs

Display section

- Display section
Display: VFD display (5x7 dot matrix, 3 lines)
Number of characters: 22 characters (Large/1 line), 40 characters (2 lines)
- Display contents
Digital value display: The data for an arbitrary channel is displayed on one line (1 ch/1 line, max 5 ch).
CH No./TAG(7 characters), alarm search, measurement value, and unit are displayed with respect to time.
- Measurement value bar graph display: Values are displayed as 0 to 100%.
- Auxiliary information: Clock, alarm status, alarm relay status, recording format, recording ON/OFF, key lock ON/OFF, and recorder operation (print format)

Alarms

- Number of settings
Up to four alarm settings can be made for each channel.
- Kinds of alarms: Select from upper and lower limits, difference between upper and lower limits, and percentage change rising and falling limits.
Percentage change alarm time interval: Measurement interval ≠ 1 to 15 settings are possible (common to rising and falling limits).
- Output mode
AND/OR mode selection, and output hold/non-hold designation are possible.
Re-breakdown re-alarm output 6 contacts are available.
- Number of alarm output points
Max. 12 points (when /A4 or /R1 optional specifications are specified)
- Alarm information recording
Trend mode: Channel No., TAG, kind of alarm, and ON/OFF time (hours, minutes) are printed in the right margin.
- Logging mode: The kind of alarm and ON/OFF time (hours, minutes) are printed when the measurement values are recorded.
- Displaying alarm information
Alarm status display: Lights when an alarm is detected. A flashing display can also be set.
Alarm acknowledge display: The alarm point flashing display stops when a key is pressed.

Standard computation functions

- Kinds of computation
Difference between arbitrarily selected channels, linear scaling (scaling), moving average
- Linear scaling
Scaleable range: DC voltage, thermocouple, RTD, contact
Scaling range: -30,000 to +30,000
Decimal point: Arbitrarily set
Measurement accuracy during scaling: Measurement accuracy during scaling (digits) = Measurement accuracy (digits) × Scaling span (digits)/Measurement span (digits) + 2 digits (Digits below the decimal point are discarded.)
- Moving average
The moving average result for 2 to 64 scans is computed.

Power supply section

- AC power supply
Rated supply voltage: 100 to 240 VAC
Usable supply voltage range: 90 to 250 VAC
Rated supply frequency: 50/60 Hz
Power consumption: Approx. 130 VA max. (when 20 input channels are selected)
- DC power supply
Rated supply voltage: 12 to 28 VDC
Usable supply voltage: 10 to 32 VDC
Terminal: Dedicated connector
Power consumption: Max. 80 VA (when 20 input channels are selected)
Note: When both AC and DC power are connected to a DC power supply model, which of the power supplies is used depends on the voltage of the DC power supply connected as follows.

DC Power Supply Voltage	Power Supply Used
< 20 V	AC power supply
20 to 28 V	Indeterminate
28 to 32 V	DC power supply

Others	
Clock:	Comes with calendar function (Western calendar).
Clock accuracy:	±100 ppm. However, this does not include the delay when the power is switched ON/OFF once (no more than 1 second).
Fail:	Contact output (when the /R1 option is specified)
Key lock:	The set condition is locked with software.
Set value backup:	Lithium battery backup (approx. 10 years)
Insulation resistance:	Between the power supply terminal and ground, between each terminal and ground, and between input terminals
Withstand voltage:	At least 20 MΩ (measured with 500 VDC) Between power supply terminal and ground of DR130 ... 1.500 VAC (50/60 Hz) for 1 minute Between input terminal and ground of DR130 ... 1.500 VAC (50/60 Hz) for 1 minute Between output terminal and ground of DR130 ... 2.300 VAC (50/60 Hz) for 1 minute

Normal operating conditions									
Supply voltage:	90 to 250 VAC or 10 to 32 VDC								
Supply frequency:	50 Hz ±2%, 60 Hz ±2%								
Ambient temperature:	0 to 50°C (5 to 40°C when FDD is installed)								
Ambient humidity:	<table border="1"> <thead> <tr> <th>Ambient temperature</th> <th>Ambient humidity</th> </tr> </thead> <tbody> <tr> <td>0 to 40°C</td> <td>20 to 80% RH</td> </tr> <tr> <td>40 to 50°C</td> <td>10 to 50% RH</td> </tr> <tr> <td colspan="2">* Condensation is not allowed.</td> </tr> </tbody> </table>	Ambient temperature	Ambient humidity	0 to 40°C	20 to 80% RH	40 to 50°C	10 to 50% RH	* Condensation is not allowed.	
Ambient temperature	Ambient humidity								
0 to 40°C	20 to 80% RH								
40 to 50°C	10 to 50% RH								
* Condensation is not allowed.									
Vibration:	10 to 60 Hz 0.2 m/s ²								
Impact:	Not allowed								
Magnetic field:	400 A/m max. (50/60 Hz)								
Position:	The instrument must be installed left-right horizontally, or vertically.								

Optional specifications

Computation functions (/M1)

■ Kinds of computations
Four arithmetic operations, SQR (square root), ABS (absolute value), LOG (common logarithm), LN (natural logarithm), EXP (exponent, statistic computations, logic computations (AND/OR/NOT/XOR), relative computations, power, previous measurement value reference, hold, reset, remote RJC computations

Number of channels on which computations can be performed: Max. 30
Computation interval: Each measurement interval (However, if computation processing becomes difficult to perform during each measurement interval because of the kind of computation or the number of channels, a warning is output.)

Computation range: ±10³⁰⁸
Display range: -9,999,999 to +99,999,999 (Decimal point can be set to have 1 to 4 digits on the right of the decimal point.)

Communication input: The digital value (ASCII number row) input due to the communication interface is recorded as an analog trend.
Starting and stopping computation: Can be controlled by communication commands, function keys, the event/action function (key operation, remote control signal, time setting, alarm status, etc.).

Computation value hold: Computation can be temporarily interrupted or the computation result can be temporarily held by means of the event/action function (key operation, remote control signal, time specification, alarm status, etc.). Statistical computations restart from the hold point after computation is restarted.

■ Statistical computations

CLOG: Computation processing in groups specified at the same time (total, maximum, minimum, average, maximum - minimum)

TLOG: Computation processing of a time system concerning a certain channel (total, maximum, minimum, average, maximum - minimum)

Statistical computation interval: Interval setting by means of the event/action function

■ Remote RJC

Range: Thermocouple (TC)
Accuracy: (Standard thermocouple input measurement accuracy × 2) + (Difference in temperature between the terminal of the remote terminal and the remote terminal temperature measurement thermocouple)
Thermocouple burnout: Cannot be selected.

Report Function (/M3)

Instantaneous values of measured data, as well as maximum, minimum, average and total, for each hour, day or month are printed in tabular form on recording paper. Analog recording is interrupted while a report is being made.
Report calculation channels: Up to 30 channels.

Note: This function does not allow the results of the report and computing function to be saved on floppy disks. (Thus, to be able to transfer the results to a personal computer, the DP380 report software is needed. Note that the DP380 software cannot be run simultaneously with the DAQ32 or DAQ32Plus software package.)

Power monitor option (/N7 or /N8)

■ Outline specifications

Number of channels: For single phase: (voltage 1 channel, current 1 channel)
For 3 phase: (voltage 3 channels, current 3 channels)

Terminal shape: Clamp

Measurement interval: 2 s

Input method: Transformer-isolated input

Measurement items: Six items can be selected from the following: RMS value of AC voltage/current, active power, apparent power, reactive power, frequency, power factor and phase angle (There is a restriction in combining selected items.)

Measurement range (resolution):

Voltage: 250 V (0.1 Vrms), 25 V (0.01 Vrms)

Current: 5 A (0.001 Arms), 0.5 A (0.0001 Arms)
Measurement accuracy: ±(0.5% of span when RMS V or A is measured)
Measurement frequency: 45 to 65 Hz (Must be the same frequency for all channels.)
Crest factor: 3 max.
Power integration: Calculated by /M1 (computation functions) option. /M1 must be specified for the DR130.

GP-IB communication option (/C1)

■ Functions

Control of measurement value output, set value output, setting of measurement conditions, starting/stopping of measurement, etc.

■ Outline specifications

Electrical and mechanical specifications: Conform to IEEE Std 488-1978.

Code used: ISO (ASCII) code

Address: 0 to 15

RS-232C communication option (/C2)

■ Functions

Control of measurement value output, set value output, setting of measurement conditions, starting/stopping of measurement, etc.

■ Outline specifications

Electrical and mechanical specifications: Conform to EIA RS-232C.

Connection method: Point-to-point

Communication method: Half duplex

Synchronization method: Start-stop synchronization (synchronization by start/stop bit)

Baud rate: 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400 bps

Start bit: 1 bit fixed

Data length: 7 or 8 bits

Parity: EVEN, ODD or no parity

Stop bits: 1 or 2 bits

Transmission distance: Max. 15 m

Connector: D-sub 25-pin connector

Ethernet communication option (/C7)

■ Functions

Control of measurement value output, set value output, setting of measurement conditions, starting/stopping of measurement, etc.

■ Outline specifications

Network configuration: Ethernet (10Base-T)

10Base-T modular connector: 1

Baud rate: 10 Mbps

Communication protocol: TCP, UDP, IP, ARP or ICMP

Input data: ASCII

Output data: ASCII or binary

Alarm contact output option (/A4)

■ Outline specifications

Number of output points: 10 points

Contact mode: Make contact: Normally open - common terminal

Terminal shape: Screw

Can be switched between excited and non-excited.

Can be switched between hold and non-hold.

Max. 6 contacts can be specified.

Re-breakdown re-alarm: 250 VDC/0.1 A (resistive load)

Contact capacity: 250 VAC/2 A (resistive load)

30 VDC/2 A (resistive load)

Withstand voltage: 2300 VAC (50/60 Hz) for one minute between output terminal and ground

DI/DO interface option (/R1)

■ Alarm contact output

Number of output points: 2 points

Output refresh interval: Each measurement interval

Contact mode: SPDT (normally open - common - normally closed contacts)

Shape of terminal: Screw

Can be switched between excited and non-excited.

Can be switched between hold and non-hold.

Re-breakdown re-alarm can be specified.

250 VDC/0.1 A (resistive load)

250 VAC/2 A (resistive load)

30 VDC/2 A (resistive load)

Withstand voltage: 2300 VAC (50/60 Hz) for one minute between output terminal and ground

■ Recorder function remote control

Function outline: The following functions can be controlled by a contact input.

- Starting/stopping analog recording
 - Starting manual printing
 - Starting digital recording of measurement values
 - Starting message printing, and header printing
 - Changing the recording paper feed speed
 - Changing the digital recording interval
 - Resetting the digital recording interval
 - Starting and resetting statistical computations (when /M1 has been added)
 - Temporarily holding the results of statistical computations (when /M1 has been added)
 - Resetting the alarm contact hold function
 - Starting measurement data save (memory write)
 - No-voltage contact open collector (TTL or transistor)
- Input signal: 1 second min.
Withstand voltage: Between input terminal and ground 1500 VAC (50/60 Hz) 1 minute

■ Fail output

Outline of function: If a system abnormality is detected, the fail output terminal becomes non-excited.

Contact mode: SPDT (normally open - common - normally closed contacts)

Cannot be switched between excited and non-excited.

Contact capacity: 250 VDC/0.1 A (resistive load), 250 VAC/2 A (resistive load), 30 VDC/2 A (resistive load)

Withstand voltage: Between the output terminal and ground 2300 VAC (50/60 Hz) 1 minute

■ Chart end output

Outline of function: When the end of the recording paper is detected, the chart end output terminal is excited.

Contact mode: SPDT (normally open - common - normally closed contacts)

Cannot be switched between excited and non-excited.

Contact capacity: 250 VDC/0.1 A (resistive load), 250 VAC/2 A (resistive load), 30 VDC/2 A (resistive load)

Withstand voltage: Between the output terminal and ground 2300 VAC (50/60 Hz) 1 minute

Model and Suffix Codes DR130 portable hybrid recorder

Model	Suffix code	Description	
DR130		Portable hybrid recorder	
Memory	-0	No memory	
	-1	3.5-inch FD	
Software	0	No DAQ32 software	
	2	DAQ32 software included	
Input channel	-1	10channels	
	-2	20channels	
Input	1	Universal input, screw	
	2	Universal input, clamp	
	3	DCV/TC/DI input screw	
	4	DCV/TC/DI input clamp	
Power supply voltage	-1	100 to 240 VAC	
Power inlet, power cable	D	3-pin power inlet w/UL, CSA cable	
	F	3-pin power inlet w/VDE cable	
	H	3-pin power inlet w/CCC cable	
	R	3-pin power inlet w/SAA cable	
	S	3-pin power inlet w/BS cable	
Optional specifications	/M1	Computation functions (including RRJC)	
	/M3	Report function	
	/C1	GP-IB interface	
	/C2	RS232C interface	Must not coexist
	/C7	Ethernet interface	
	/N7	Power monitor for single phase	
	/N8	Power monitor for 3 phase	Must not coexist
	/A4	Alarm output module (A type 10 contacts)	
	/R1	2-point alarm output, remote control signal input, fail output, and chart end output	
	/D2	*F display	
/P6	DC power supply (AC power supply is also available.)		

Options

The maximum allowable number for the /N/C, /C/C, /A4 and /R1 options is determined according to the specified number of input channels, as shown below.
10 channels: Three kinds of options can be specified.
20 channels: Two kinds of options can be specified.

Standard accessories

One fold of recording paper, one ink ribbon, instruction manual

Consumables

Part No	Part name	Minimum ordering quantity
B9627AZ	10-color ribbon	1
B9855AY	Foldable recording paper (20 m)	10

Accessories

Model	Description
DV300-011	Shunt resistor 10 Ω, screw type
DV300-012	Shunt resistor 10 Ω, clamp type
DV300-101	Shunt resistor 100 Ω, screw type
DV300-102	Shunt resistor 100 Ω, clamp type
DV300-251	Shunt resistor 250 Ω, screw type
DV300-252	Shunt resistor 250 Ω, clamp type
DV400-015	Rack mounting kit, for DR130, conforms to ANSI/EIA standard.
DV400-025	Rack mounting kit, for DR130, conforms to JIS standard.

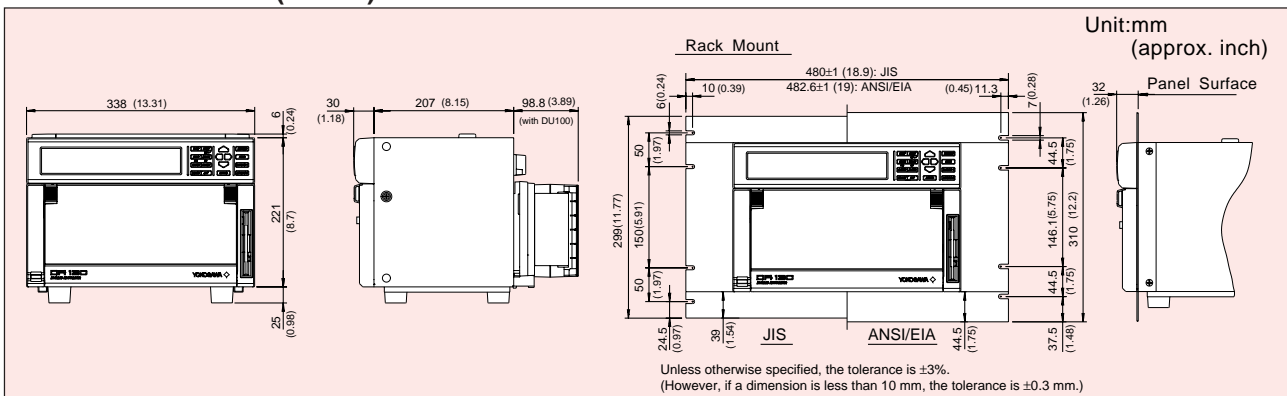
Software

Model Code	Description	Applicable Operating System
DP120-13	DARWIN DAQ32 software (Supports setup, simplified data logging and viewing, and diagnosis and calibration functions. One package of this software comes standard with the purchased DR130 recorder if you specify the model code specification for "software included.")	Windows 98 Windows Me Windows NT4.0 Windows 2000 Windows XP
WX102/CD1	DARWIN DAQ32Plus software. (Supports setup, data logging and viewing, diagnosis and calibration and tag setting functions.)	
WX101/CD1	DAQLOGGER DAQLOGGER supports a wide variety of models from among YOKOGAWA's family of data acquisition products.	

As for the overview of these software, refer to the catalog (Bull 04L00L00-00E) of "Data Acquisition Software Suite DAQWORX."

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External Dimensions (DR130)



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DRM-12E