

Technical Information

DR4300 Circular Chart Recorder

Specification, June 2023

Function

The DR4300 Circular Chart Recorder provides one of the most cost-effective solutions for dependable pen drawn analog traces on a 10-inch (250 mm) chart.

It is easy to set up and configure to match a wide range of applications such as food processing, environmental monitoring, machine monitoring, flow, water, and waste monitoring, for use on furnaces and ovens, packaging machines, and numerous other processes.

The DR4300 Recorder gives you the flexibility to tailor the recorder to match any application, from basic recording to actually doing the process control, by choosing the options that are required to accomplish your application needs.

Both one- and two-pen models accept inputs from any one of a variety of sensors or transmitters within the configurable range limits.

The DR4300 can be specified with a variety of options such as one or two digital controllers, a vacuum fluorescent display for viewing the process variable or configuration using English language prompts.

You can also select Modbus™ communications or choose a number of software options such as a timer function, setpoint programming, or advanced fuzzy tuning/PID control.

™Modbus is a trademark of Schneider Electric

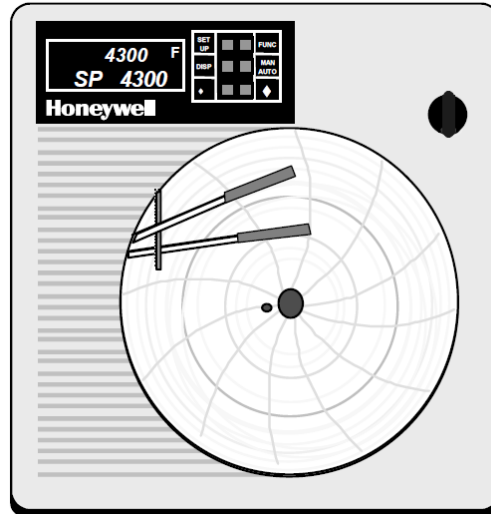


Figure 1—DR4300 Recorder provides clear analog trace and digital indication of process variable value.

Features

Charts—Over 200 preprinted charts available to meet specific recording needs.

Ink Cartridge—Disposable fiber-tip ink cartridge for dependable recording with minimum maintenance.

Universal Power—Eliminates the concern with matching the local power requirements.

Universal Inputs—Accepts 10 thermocouple types, RTDs, mA, mV or voltage inputs through simple configuration.

Thermocouple Failsafe—Configurable upscale or down-scale burnout.

Features, continued

Manual/Automatic Modes—Bumpless, balanceless transfer between control modes on advanced recorders.

User Configurable—Allows you to set up or alter operating parameters to fit your requirements. Easily set DIP switch configuration on basic recorder.

A Vacuum Fluorescent Display/ Keypad with English language prompts is available for more advanced recorder set up and monitoring.

Optional Outputs—Choose from Alarm, On-Off Control, Limit Control, or versatile PID digital controller.

Features, continued

Accutune II™—Provides a new, truly plug and play tuning algorithm, which will, at the touch of a button or through a digital input, accurately identify and tune any process including those with deadtime and integrating processes. This speeds up and simplifies start-up plus allows retuning at any setpoint.

Fuzzy Logic—This new feature uses fuzzy logic to suppress process variable overshoot due to SP changes or externally induced process disturbances. It operates independently from Accutune tuning. It does not change the PID constants, but temporarily modifies the internal controller response to suppress overshoot. This allows more aggressive tuning to co-exist with smooth PV response. It can be enabled or disabled depending on the application or the control criteria.

Individual Pen Options—Include Totalization, a Timer function, Digital Inputs, Auxiliary Output, and Setpoint Programming allowing the most flexibility to meet the application need.

Quality/Support—The DR4300 is backed up by a toll-free phone number for technical assistance.

CE Mark—Conformity with 73/23/EEC, Low Voltage Directive and 89/336/EEC, the EMC Directive.

Options

Control Outputs—One or two control outputs, PID-A, ON-OFF, or PD with Manual Reset.

Options, continued

Auxiliary Output—There is also a 4 mA to 20 mA current output available. If not used for control, it can be used to retransmit a process variable.

Alarm Selection—None, one, or two relays to activate external equipment when preset high/low setpoints are reached.

Totalizer—Totalizes a variable, such as a flow signal, on one or both pens. Provides a 6-digit digital display indication of the totalized value with reset capability. Totalizer allows the units of the totalized value to be different than the input units. A low value cutoff value can also be programmed for the totalizer.

Options, continued

Transmitter Power—24 Vdc transmitter output to power up to two transmitters.

Door— Standard gray with acrylic window.

Approvals—UL, CSA, or combined UL/CSA.

Digital Controller

The DR4300 Recorder is available with an integral microprocessor-based single-loop PID controller for each pen.

A variety of output types—current, time proportional simplex or duplex control, with electromechanical relays, solid state relays, or open collector outputs are available.

Depending on the output type, users can configure the control action as ON-OFF, PID-A, or PD with Manual reset.

The recorder's display and keypad allow the user to quickly view what is happening with the process and to easily make changes, and with the door keypad these changes can be made without opening the recorder door.

Outputs

The following output types are available per the model selection guide:

- Electromechanical Relay
- Open Collector Output

Output Algorithms

The DR4300 is available with the following output algorithms:

Relay Simplex—Provides On-Off or Time Proportional (relay) output. Electromechanical, solid-state or open collector outputs are standard; 2 amp or 10 amp externally mounted solid-state relay outputs are optional. One output available for alarm.

Relay Duplex (Heat/Cool)— Depending on which control algorithm you select; this duplex output type can provide on-off duplex or time proportional duplex. The time proportional duplex output provides independent PID tuning constants and two-time proportional outputs: one for heat zone above the 50 % output, and one for cool zone below 50 % output. Alarming is not available

Current Simplex—Supplies proportional direct current output for final control elements that require a 4 mA to 20 mA signal. Both relay outputs are available for alarm.

Current/Relay Duplex (Relay = Heat)—Type of output using one relay for time proportional output for Heat control if PV is greater than SP and one 4 mA to 20 mA signal for cooling control if PV is less than SP.

Relay/Current Duplex (Relay = Cool)— Type of output using one 4 mA to 20 mA signal for Heat control if PV is greater than SP and one relay for time proportional output for cooling control if PV is less than SP.

Control Algorithm

Depending on the output algorithm you select, the recorder can be configured for the following control algorithms:

On-Off—Whenever the controlled variable deviates a predetermined amount from the setpoint, the recorder moves the final control element to either of two extreme positions. Hysteresis: 0 % to 100 %

PID-A—The recorder gives full response to Setpoint and Process Variable (PV) changes involving Gain (Proportional), Reset (Integral), and Rate (Derivative) effects. There is a fixed relationship between the value of the controlled variable and the position of the final control element. The adjustable Gain, Rate, and Reset Time tuning constants let you tailor the recorder's response to your process requirements.

PD with Manual Reset—The action is similar to the PID-A algorithm except the reset (Integral) value is entered as Manual Reset tuning constant instead of Reset Time. The manual reset value eliminates offset by shifting the PD calculated output upscale or downscale to return the recorder variable to the setpoint.

Microprocessor Controlled Recording

Both the chart and the pen are driven by stepper motors controlled by the microprocessor for precise operation. This allows for configurable chart speeds without the need to change motors or gears. The microprocessor uses the configured range selection and input data to determine the proper pen position and then accurately positions the pen to the correct chart position without the need for slidewire feedback or drive cables. This provides for accurate and reliable data recording.

Operator Interface/ Configuration

Since microprocessor control replaces the previous electro-mechanical recording mechanisms, the configuration of the recorder is determined primarily by its software.

For the basic recorder the configuration is easily set up by selecting the pre-configured range, actuation, and chart speed.

An optional display, using English language prompts, provides additional flexibility to select other chart ranges, input actuation, control or alarm parameters, chart speeds, plus other software features.

An upper and lower display allows the user to view the process variable (PV) and, by key selection, the control setpoint, control output, deviation from setpoint, totalizer, Setpoint Programming operation information, time remaining or elapsed time on the timer and the status of Accutune, as desired.

In the Setup mode, digital displays are preempted by prompts and values for entering the configuration data.

Indicators light to show which input channel PV is being displayed, which output relay is active, the selected temperature unit, and the recorder's mode of operation.

The configuration data and display actions are selected using an integral keypad.

The display can also be set to toggle between Input 1 and Input 2. The display can also be set to blank (turn off) if the operator does not want to see a displayed value.

Input Processing

The input can be one of any standard low-level electrical signals which can be selected by the user.

Ranges are either pre-configured or, by using the display/keypad, expanded, and compressed within the range limits to meet the specific measurement needs.

Users can select upscale or downscale break protection for most actuations. Input samples are taken at a rate of once every 0.33 seconds. Each input is isolated from the other to ensure that the signals do not affect the other inputs.

A digital filter value of 1 second on the basic recorder provides input signal smoothing or with the display, this can be changed from 0 seconds to 120 seconds of filtering to match the application need.

The basic recorder provides a wide selection of linear and non-linear inputs for the user to select which one best meets the need. By adding the display, a full range of selections is available to the user. The non-linear inputs can be set so the microprocessor linearizes the input, thus allowing mixed input actuations for two pen models to record the process variable on a linear chart. This can be bypassed by recording on a non-linear chart.

Control Modes

The recorder can operate in the following modes:

Manual Mode—when switched to manual mode, the recorder holds its output at the last value used during automatic operation and stops adjusting the output for changes in process variable.

Local Automatic Mode—The recorder uses the local setpoint and automatically adjusts the output to maintain the setpoint at the desired value.

Diagnostics

Each DR4300 has built-in diagnostics that check critical recorder operations and provide error detection or messages to alert the user of potential faults. This self-test is run each time the recorder is powered up. In addition to this, a built-in step pattern test can be run on demand to ensure proper pen and chart drive motor operation; this draws a special test pattern on the chart thus providing a record of the recorder's proper operation.

Construction

All DR4300 recorders are manufactured with a rugged, durable, molded case designed to withstand most industrial environments. This case and the standard NEMA 3 door are designed to protect the internal electrical components from harsh industrial environments. The recorder comes standard with an acrylic window. Knockouts in the side and bottom of the case accept conduit connections for convenient wire entry of power, inputs, and outputs. Individual boards for each input allow the user to easily service each input separately, add an additional input to a single pen recorder and avoid problems with the isolation of each signal. The removable connectors also allow for easier servicing without having to disconnect the field wiring.

Specifications

Performance							
Number of Inputs	<i>One pen model:</i> One input <i>Two pen model:</i> Two inputs						
TYPICAL ACCURACY							
Types of Input Actuators	Range		Reference Accuracy* with Field Calibration		Reference Accuracy* with Factory Calibration		Temp Stability ± Degrees Error Per 1 Degree ΔT
	°F	°C	± °F	± °C	± °F	± °C	
Thermocouples B	105 to 3300	41 to 1816					
	150 to 500	66 to 260	56.0	32.0			4.00
	500 to 1000 1000 to 3300	260 to 538 538 to 1815	12.0 6.0	6.6 3.4	37 18	21 10	1.00 0.40
E	-454 to 1832	-270 to 1000					
	-454 to -202 -202 to 1832	-270 to -130 -130 to 1000	72.0 4.0	40.0 2.2	79 14	44 8	1.40 0.70
E (low)	-200 to 1100	-129 to 593	2.0	1.2	11	6	0.40
J	0 to 1600	-18 to 871	3.2	1.8	7	4	0.15
J (low)	20 to 770	-7 to 410	1.6	1.0	6	3	0.08
K	-320 to 2500	-196 to 1371	4.8	2.8	9	5	0.15
K (low)	-20 to 1000`	-29 to 538	2.0	1.2	7	4	0.10
Ni-Ni Moly	32 to 2500	0 to 1317					
	32 to 500 500 to 2500	0 to 260 260 to 1371	3.0 2.0	1.6 1.2	12 9	7 5	0.21 0.14
Nicrosil-Nisil	0 to 2372	-18 to 1200	4.2	2.4	11	6	0.20
R	0 to 3100	-18 to 1704					
	0 to 500 500 to 3100	-18 to 260 260 to 1704	8.0 4.0	4.4 2.2	26 13	14 7	0.50 0.21
S	0 to 3100	-18 to 1704					
	0 to 500 500 to 3100	-18 to 260 260 to 1704	8.0 4.0	4.4 2.2	23 13	13 7	0.50 0.21
T	-420 to 700	-251 to 371	3.2	1.8	13	7	0.15
T (low)	-200 to 600	-129 to 316	1.6	1.0	7	4	0.15
W5W26	0 to 4200	-18 to 2316					
	0 to 600 600 to 3600 3600 to 4200	-18 to 316 316 to 1982 1982 to 2316	5.6 5.2 6.4	3.2 3.0 3.6	19 13 27	11 7 15	1.00 0.50 0.20
RTD Platinum							
100 ohms**	-300 to 900	-184 to 482	1.6	1.0	4	2	0.15
100 ohms(low)**	-130 to 392	-90 to 200	1.2	0.6	3	2	0.15
100 ohms(T)***	-238 to 482	-150 to 250	1.2	0.6	3	2	0.15

*Includes reference junction calibration of ± 0.01 degrees using the standard "ice bath" method of calibration. Factory calibration at reference ± 1.2 °F. Note that factory calibration may have typical variations of ± 150 microvolts or ± 0.6 ohms for RTDs which means recalibration may be required to achieve stated accuracy.

**IEC Alpha = 0.00385

***Alpha = 0.00391

NOTE: Field Calibration requires a model with the display.

Specifications, continued

Performance, continued				
REFERENCE ACCURACY				
Types of Input Actuations	Range	Reference Accuracy* with Field Calibration	Reference Accuracy* with Factory Calibration	Temp Stability ± Degrees Error Per 1 Degree ΔT
Linear Milliamperes dc	0 to 20	40 μA	80 μA	0.011 %/°F
	4 to 20	32 μA	80 μA	0.011 %/°F
Millivolts dc	0 to 10	20 μV	50 μA	0.011 %/°F
	0 to 100	200 μV	500 μA	0.011 %/°F
	0 to 200	400 μV	1.0 mV	0.011 %/°F
Volts dc	0 to 1	2 mV	5 mV	0.011 %/°F
	0 to 2	4 mV	10 mV	0.011 %/°F
	0 to 5	10 mV	25 mV	0.011 %/°F
	1 to 5	8 mV	20 mV	0.011 %/°F
	0 to 10	20 mV	50 mV	0.011 %/°F
Design				
Minimum Input Span	Range is fully configurable within span limitation of the sensing element.			
Input Impedance	mA dc: 250 ohms Vdc: 200 K ohms RTD: 13.3 K ohms All Others: 10 Megohms			
Span Step Response Time	7 seconds maximum			
Reproducibility	0.1 percent of span			
Sampling Rate	Input sampled every 1/3 seconds			
Input Filter	Without Display: Analog with time constant of 3 seconds and digital with time constant of 1 second. With Display: Analog with time constant of 3 seconds and digital adjustable 0 seconds to 120 seconds.			
Digital Displays (Optional)	Vacuum fluorescent, alphanumeric An upper four-digit display dedicated to the process variable or setpoint. Alternate information displayed during configuration. A six-digit lower display shows key selected operating parameters. Also provides guidance during configuration.			
Modes of Operation	Manual Automatic with local set point			

*Includes reference junction calibration of ± 0.01 degrees using the standard "ice bath" method of calibration. Factory calibration at reference ± 1.2 °F. Note that factory calibration may have typical variations of ± 150 microvolts or ± 0.6 ohms for RTDs which means recalibration may be required to achieve stated accuracy.

Specifications, continued

Design, continued	
Indicators	Channel PV display (INP 1 or 2) Controller output (OUT 1 or 2) Temperature unit (F or C) Controller's mode (A or M) Active Setpoint [L = SP1 active; R = SP2(S2) active]
Controller Output	<p>On-Off or Time Proportional One SPDT electromechanical relay. Control action can be set for direct or reverse. <i>For Limit Controller:</i> SPDT electromechanical output. <i>Electromechanical Relay Contact Ratings:</i> Resistive Load: 5 A @ 120 Vac, 2.5 A @ 240 Vac Inductive Load: 50 VA @ 120 Vac or 240 Vac <i>Solid State Relay Contact Rating:</i> 0.8 A @ 120 Vac Open <i>Collector Output Contact Rating:</i> 12 mA @ 24 Vdc Time <i>Proportional Relay Resolution:</i> 3.33 mSec. <i>Cycle Time:</i> 1 second to 120 seconds</p> <p>Current Proportional 21 mA dc maximum into a negative or positive grounded or non-grounded load of 0 ohms to 600 ohms. Output range can be set between 4 mA and 20 mA, and as direct or reverse action. Resolution: 11 bits Accuracy: 0.5 % Full Scale</p> <p>Time Proportional Duplex Variation of time proportional for Heat/Cool applications. Uses two relay contacts with adjustable deadband that is split at 50 % controller output.</p> <p>Current Duplex and Time/Current Duplex Variation of time proportional duplex for Heat/Cool applications. Time proportional output (heat or cool) is a SPST relay. Current proportional output (heat or cool) is a 4 mA to 20 mA signal that can be fed into a negative or positive grounded load of 0 ohms to 600 ohms and is operational over 50 % of range or the entire range. Time Proportional Relay Resolution: 3.33 mSec. Relay Contact Ratings: Resistive Load: 5 A @ 120 Vac, 2.5 A @ 240 Vac Inductive Load: 50 VA @ 120 Vac or 240 Vac Cycle Time: 1 second to 120 seconds Current Proportional: Resolution: 11 bits Accuracy: 0.5 % full scale</p> <p>Action Direct or Reverse</p> <p>Output Limits 0 % to 100 % Relay Output -5 % to 105 % Current</p> <p>Deadband -5 % to 25 % Time Relay 0 % to 25 % On-Off Duplex</p> <p>Hysteresis 0 % to 100 % of PV span</p>
Case	Molded, foamed-Noryl* with gasketed door to meet NEMA 3 enclosure requirements.

*Registered Trademark – General Electric Co.

Specifications, continued

Design, continued	
Pen	Disposable fiber-tip ink cartridge, line length per cartridge more than 1000 ft (305 m) <i>One Pen:</i> Purple <i>Two Pen:</i> Purple (pen one) and red (pen two) NOTE: Only pen 1 (purple) is referenced to the chart timeline.
Chart	10.24-inch (260 mm) diameter chart with standard preprinted markings and a calibrated width of 4 inches (100 mm).
Wiring Connections	Two-piece wiring connectors inside case.
Color	<i>Case:</i> Black <i>Door:</i> Gray (standard). <i>Window:</i> Acrylic
Approval Bodies	CE Mark, UL, CSA.
Dimensions	See Figure 2.
Weight	12 lb. (5.4 kg)
Mounting	Panel, surface, or 2-inch pipe mounting
CE Conformity (Europe) (Optional)	This product is in conformity with the protection requirements of the following European Council Directives: 73/23/EEC , the Low Voltage Directive, and 89/336/EEC , the EMC Directive. Conformity of this product with any other “CE Mark” Directive(s) shall not be assumed.
<i>Product</i>	Class I: Permanently Connected, Panel Mounted Industrial Control Equipment with protective earthing (grounding). (EN 61010-1)
<i>Classification:</i>	Panel Mounted Equipment, IP 00, this recorder must be panel mounted. Terminals must be enclosed within the panel. Front panel IP 65 (IEC 529)
<i>Enclosure Rating:</i>	Category II: Energy-consuming equipment supplied from the fixed installation. Local level appliances, and Industrial Control Equipment. (EN 61010-1)
<i>Installation Category (Over-voltage Category)</i>	Pollution Degree 2: Normally non-conductive pollution with occasional conductivity caused by condensation. (Ref. IEC 664-1)
<i>Pollution Degree:</i>	Group 1, Class A, ISM Equipment (EN 55011, emissions), Industrial Equipment (EN 50082-2, immunity)
<i>EMC Classification</i>	Technical File (TF)
<i>Method of EMC Assessment</i>	51197639-000
<i>Declaration of Conformity</i>	

Specifications, continued

Options	
Alarm Output	Two SPDT electromechanical relays, or open collector outputs for an alarm. <i>Relay Contact Ratings:</i> <i>Resistive Load:</i> 5 A @ 120 Vac or 2.5 A @ 240 Vac <i>Inductive Load:</i> 50 VA @ 120 Vac or 240 Vac
Tuning	PID tuning parameters of Gain or PB, Rate, Reset.
Chart	For Basic Recorder chart speeds set as part of configuration for 8 hours, 12 hours, 24 hours or 7 days; with Display/Keypad speeds selectable from 1 hour to 744 hours.
Input	Display can be set for 0, 1 (XXX.X) or 2 (XX.XX) decimal position with Display/Keypad, °F or °C units. Input range can be scaled from -999 to 9999 and bias of -999 to 9999.
Sensor Burnout	Selectable for None, Up, or Down.
Totalizer (Optional)	Totalizers (1 per pen); 6 digits displayed; resettable with Keypad or remote (digital) input; rate can be set for seconds, minutes, hours, days, or millions per day, scale factor by 10's from 1 to 1×10^8 ; programmable low flow cutoff value.
Alarms	<i>Type:</i> Based on PV or deviation, high or low state <i>Hysteresis:</i> 0 % to 100 % of input span
Transmitter Power	24 Vdc with adjustment of ± 6 % (22.6 to 25.4) 100 mA maximum output.

Environmental and Operation Conditions

Parameter	Reference	Rated	Extreme	Transport and Storage
Ambient Temperature	67 °F to 77 °F 19 °C to 25 °C	58 °F to 131 °F 15 °C to 55 °C**	32 °F to 131 °F 0 °C to 55 °C**	-40 °F to 151 °F -40 °C to 66 °C
Relative Humidity (% RH)	50 \pm 3*	10 to 90*	5 to 90*	5 to 95*
Vibration				
Frequency (Hz)	0	0 to 70	0 to 200	0 to 200
Acceleration (g)	0	0.1	0.5	0.5
Mechanical Shock				
Acceleration (g) Duration (ms)	0	1	5	5
Duration (ms)	0	30	30	30
Mounting Position from Vertical				
Tilted Forward	5°	5°	5°	Any
Tilted Backward	5°	30°	90°	Any
Tilted to Side (\pm)	5°	10°	20°	Any
Power Requirements				
Voltage (VRMS)	120 \pm 1 or 240 \pm 1	100 to 240	90 to 264	N/A
Frequency (Hz)	60 \pm 0.21 or 50 \pm 0.21	60 \pm 1 or 50 \pm 1	48 to 62	N/A N/A
Power Consumption	20 watts maximum			

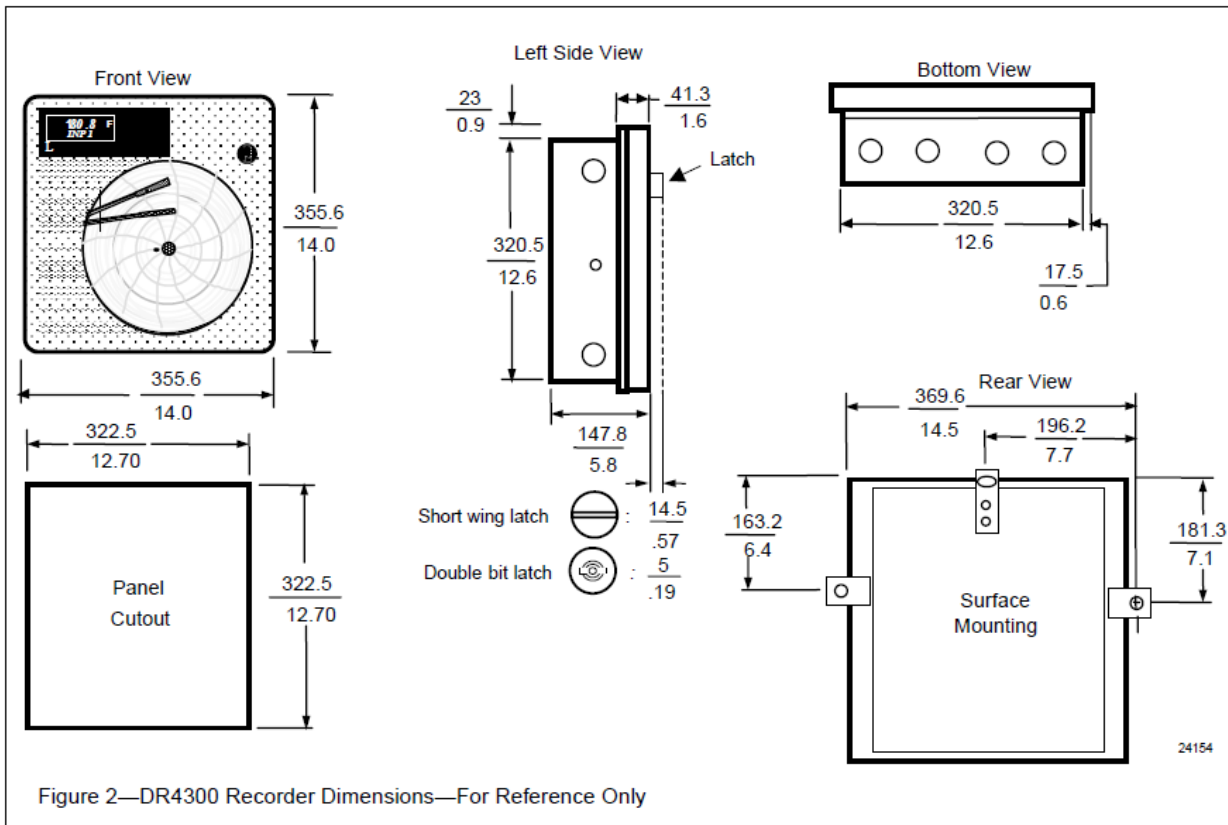
*The maximum rating only applies up to 104 °F (40 °C). For higher temperatures, the RH specification is derated to maintain constant moisture content.

**122 °F (50 °C) is maximum temperature for recorder with UL Listing.

General Reference Data

Stray Rejection	<p><i>Common Mode Rejection Ratio:</i> 120 dB or 1 LSB (whichever is greater) at 60 Hz with maximum source impedance of 100 ohms.</p> <p><i>Normal Mode Rejection Ratio:</i> 60 dB with 100 % span peak to peak maximum at 60 Hz.</p>
Static Charge Effects	Exposed panel surface capable of withstanding a discharge from a 250-pf capacitor charged to 10 KV through 100 ohms.
RFI Susceptibility	Capable of withstanding an EMI-field generated from a 5-watt transmitter being held at 1 meter and operating at 151.685 and 450 MHz.
Line Noise Effects	Field terminals for connecting power line to recorder can withstand the IEEE Surge Withstanding Capability Test to level of 2.5 KV.
Technical Assistance	Toll-free 800 number puts technical assistance only a phone call away.

Dimensions



Ordering Information

For complete ordering information, see Model Selection Guide 44-01-16-04 for DR4300 Circular Chart Recorder.

Warranty/ Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and **is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.** Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

While we provide application assistance personally, through our literature and the Honeywell website, it is up to the customer to determine the suitability of the product in the application.

Specifications are subject to change without notice.

For more information

To learn more about Honeywell's products or solutions, visit our website www.process.honeywell.com or contact your Honeywell account manager.

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