

# 9782 pH/ORP Multifunction Analyzer/Controller

## Specification

### Overview

Honeywell 9782 analyzers measure pH, ORP, and temperature (simultaneously where needed) in all process, wastewater, water treatment and pure water applications. The user friendly, menu driven display and keypad simplifies configuration and calibration and reduces installation and wiring time. Relays and isolated output signals can be used for alarm, control, and data acquisition. Internal timers, in coordination with the relays, can be used to perform unattended cleaning and calibration.

### Description

Honeywell's 9782 pH/ORP Analyzer/Controller is based on of over seventy years of industrial pH experience. It offers the widest available selection of advanced features in a reliable and economical instrument.

Easy to find and use menus guide the user through instrument and electrode set-up, relay, alarm and output configuration, and advanced features, such as automatic cleaning and calibration. The 9782 set-up is fool-proof because the parameters that a user can configure and use are determined by the model number. The model number is configured into the unit at the factory, for new analyzers, or can be changed in the field using a factory supplied security password.

The 9782 offers a selection of single parameter displays or multiple parameters on a single

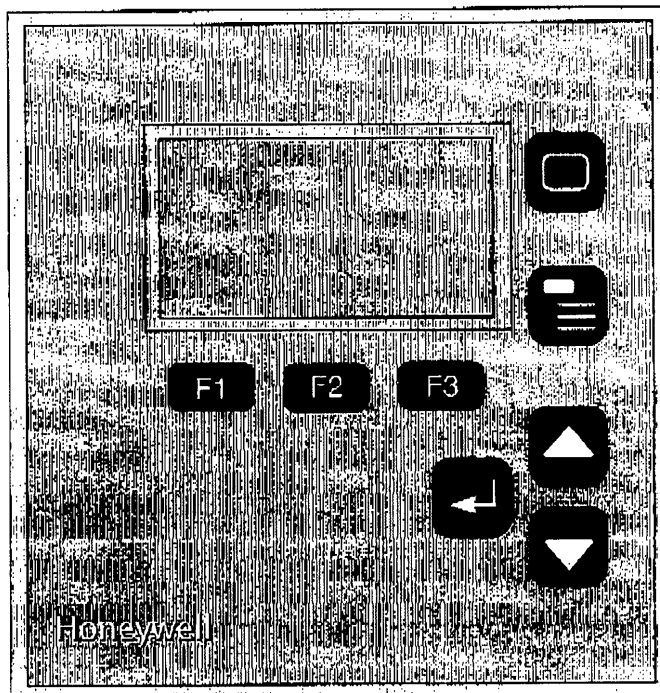
display. The front panel has a conveniently grouped keypad that adds to the unit's user friendliness. Alarms and diagnostic messages are displayed in text form on a reverse video line for easy reading.

Calibration options include buffer or sample calibration, auto-buffer recognition, and ORP calibration. Step-by-step instructions minimize the potential for calibration error. Instructional messages and feedback on the success or failure of the calibration are displayed in the procedure. Going directly to the Calibration menu is easy with the use of the Function Keys. Calibration diagnostics give the

user important information on the health of the electrode.

Special features in the 9782 include a user defined alpha-numeric tag that is displayed on the screen for easy loop identification, a wiring summary of relays and outputs that reduces installation time, and an option for a DE output for digital integration with a Honeywell DCS.

Input to the 9782 may be from a Honeywell glass, antimony or Durafet® II pH electrode/preamplifier system, or directly from any pH or ORP—oxidation reduction potential—electrodes. In chrome and cyanide waste treatment



systems requiring control of pH and ORP at the same location, a single 9782 can provide both measurements, greatly reducing system cost.

Outputs from the 9782 are isolated from ground. This assures compatibility with recorders, control systems, metering pumps, etc., with no possibility of ground loop problems. The output signals can be scaled to represent any pH, ORP, and temperature ranges. Relay outputs are described under alarm and control.

Alarms of pH, ORP, temperature, and/or diagnostics activate two 2 A general purpose and, optionally, two 3 A hermetically sealed or general purpose SPDT relays within the analyzer. Alarms can be assigned high and low to individual relays, or high and low alarms can be logically or'd to a single relay. Setpoints are digitally set with a resolution of 0.01 pH, 1 mV or 1°C. An adjustable alarm delay helps prevent false alarms caused by transient upsets from inadequate reagent mixing, bubbles at the electrodes, electrical noise pickup, etc. Individually adjustable deadbands are provided to eliminate excess alarm or control action.

AutoClean™ unattended automatic electrode wash uses an internal clock to schedule the timing and duration of cleaning solution flow to the electrodes. Outputs, control action, and alarms can be held during the sequence until the measurement has restabilized on the process sample. Solenoid valve S4 is used only if the sample is returned to the process and cleaning solution cannot be tolerated there. See Figure 1.

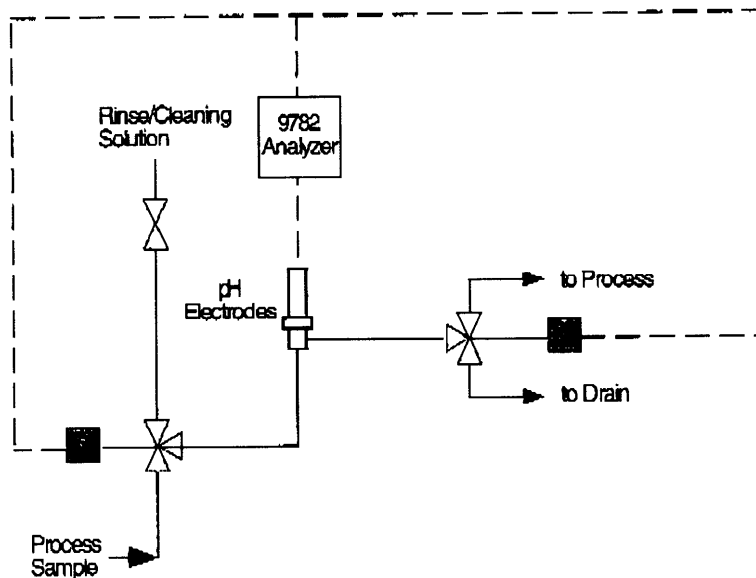


Figure 1 AutoClean Automatic Electrode Washing Configuration

Calibration uses a dedicated STD/SLOPE key to permit easy 1- or 2-point calibration. Microprocessor calculations eliminate any interaction between the two. Automatic buffer recognition identifies six commonly used buffer solutions along with their temperature variation to promote accurate calibration. It includes automatic stability checks to assure final response before storing calibration data. A Hold function maintains control and output level and holds alarm action to prevent an upset when electrodes are removed from the process for calibration in buffer solutions.

For "grab-sample" standardization, the displayed pH value is frozen at the time the sample is taken, for subsequent adjustment. The output and alarm/control action continues during a grab-sample calibration, unless Hold is activated. AutoCal™ unattended automatic calibration is enabled by

an internal clock to set the standardization schedule, rinse time, buffer time, slope calibration interval, and "resume control" time for 1- and 2-point calibrations. Internal relays activate external solenoid valves to direct appropriate streams to the electrodes. Functions can be combined so that the 1-point calibrations can be set to occur after any number of AutoClean™ washing cycles. A buffer-saving feature ends calibration as soon as the measurement of the buffer stabilizes. A resume control delay assures that the measurement has equilibrated to the process before alarms, output, and control are reactivated. Solenoid valve S4 is used only if the sample is returned to the process and buffer or cleaning solutions cannot be tolerated there. See Figs. 2 and 3.

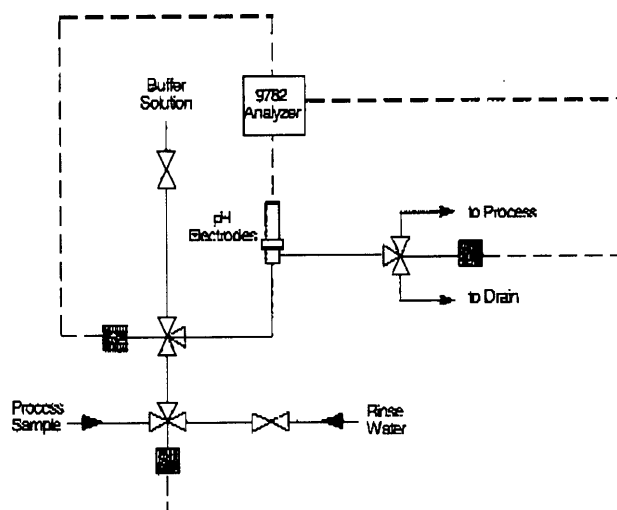


Figure 2 AutoCal Automatic 1-point Calibration Configuration

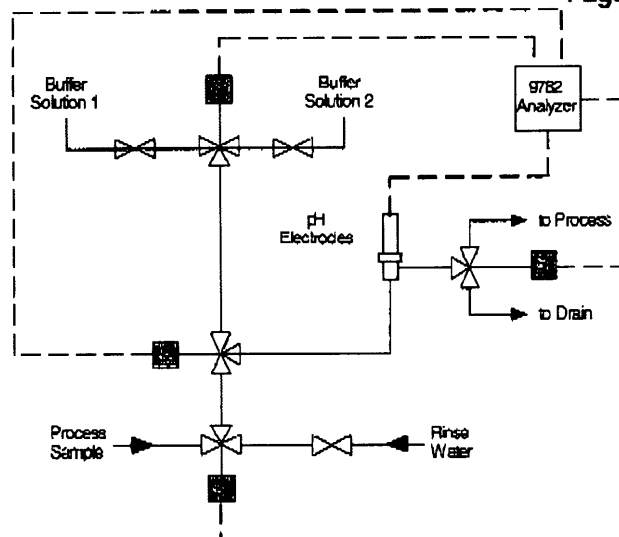


Figure 3 AutoCal Automatic 2-point Calibration Configuration

Temperature compensation capabilities include conventional automatic Nernst electrode temperature compensation for the changing response of pH electrodes. In addition, optional solution temperature compensation, a Honeywell innovation specifically for high-purity water, can be set to match the changing pH of the sample as shown in Figure 4. This special algorithm provides pH referenced to 25°C to satisfy steam power water chemistry specifications. (This effect is negligible in most potable, process, and waste waters, which is the reason for the omission of this function from virtually all other pH instruments.)

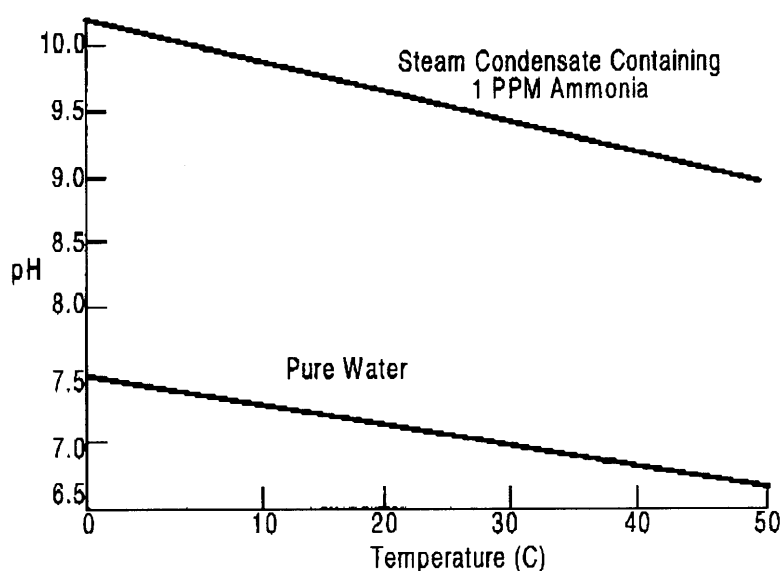


Figure 4 pH vs Temperature of Pure Water Samples

High-purity water has a number of properties that make pH more difficult to measure than in most other application. The 9782 analyzer and the HPW7000 HipHurity Water Measurement System provide the features necessary for reliable measurement. The analyzer provides solution temperature compensation, noted previously, that allows display, alarm, control, and recording of pH referenced to 25°C. The specially designed flow chamber, flowing reference electrode, and symmetrical

Meridian electrode design provides shielding to prevent interference from electrical noise and streaming potentials. The HPW7000 delivers unparalleled measurement stability in this difficult application.

DualCal™ for backup electrode calibration allows precalibration of an alternate electrode system for critical processes where measurement interruption cannot be tolerated. It enables continued operation by manually switching

the sample and measurement over to the backup electrodes that have been maintained in the process, in clean water or in storage solution, ready to go.

DualCal™ for 2-tank batch treatment systems allows a single analyzer/controller to manually select electrode/preamp systems in each tank. The system neutralizes one tank while the other is being filled. See Figures 5 and 6.

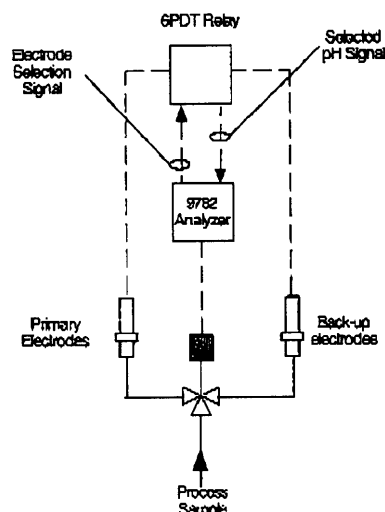


Figure 5 Backup Electrode Installation using DualCa Alternate Electrode Calibration

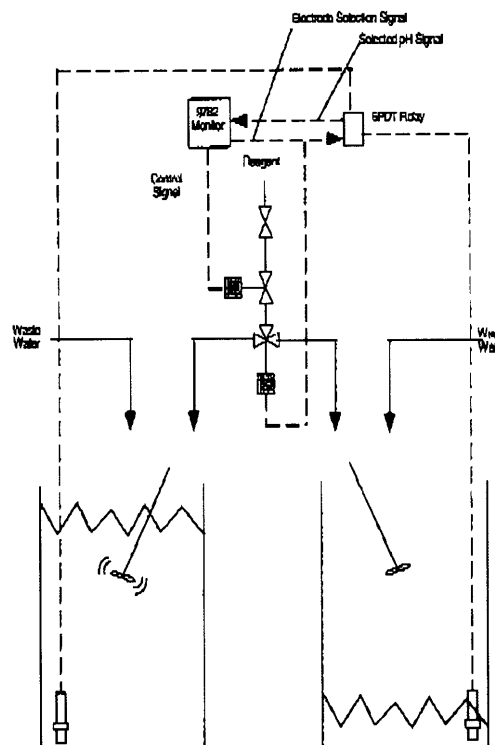


Figure 6 Two-tank Batch Treatment with DualCa Alternate Electrode Calibration

On/Off control can use built-in cycle timers with an adjustable period and individually adjustable "on" and "off" times. This allows convenient fine tuning of reagent feedrates even with oversized pumps, solenoid valves, etc.

Deadbands for each alarm/control point are individually adjustable to meet specific application requirements. Up to 4 setpoints can control multiple reagent feeders, each with progressively higher flowrate, to handle wider deviations from the desired control point. Setpoints may also be used to provide 2 control and 2 alarm points to warn of empty reagent tank or over-feed conditions.

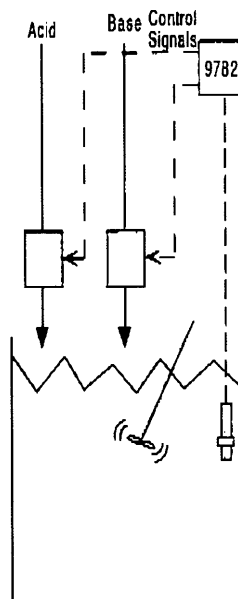


Figure 7 Recommended Control Arrangement- Control Signals may be on/off, proportional current, proportional pulse frequency or proportional "on" time.

Proportional-only control provides more rapid batch treatment without overshoot or provides efficient pretreatment in continuous neutralization systems. Acid and/or base may be controlled, with individual setpoints, to allow a deadband with no reagent feed between them. Proportional band limits are individually adjustable to match each reagent feeder to the process. Proportional control options use only 1 or 2 relays, leaving the balance for alarm purposes.

The three types of field-selectable proportional-only control outputs are illustrated for increasing control action:

CAT, 4-20 mA output, is proportional to the deviation from setpoint. It uses one SPDT relay to switch between two feeders when dual reagents are used with single parameter output models. With multiple output options, one signal controls each reagent and no relay is used.

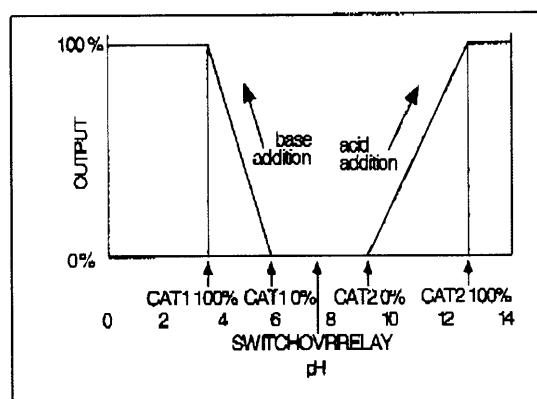


Figure 8 Dual Control, feeding acid and bases provides: 1) proportional-only action, 2) deadband with no reagent added between CAT1 0% and CAT2 0%, 3) individually adjustable proportional band limits CAT1 100% and CAT2 100%. Percent output represents CAT, PFT or DT control action.

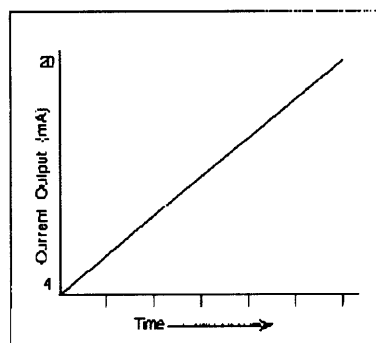


Figure 9 Current Adjusting Type Output Provides Increasing Current Level

PFT, pulse frequency output, pulses one or two relays at a frequency proportional to the deviation from the setpoint to activate electronic pulse-type metering pump(s). Maximum pulse frequency is adjustable to match the pump specifications. Metering pumps must have a remote pulse input capability to utilize PFT control.

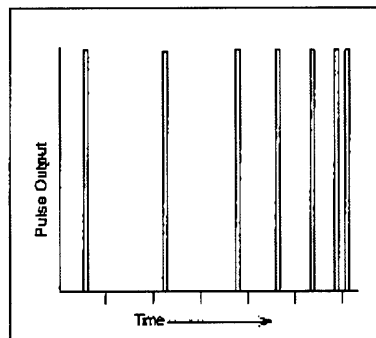


Figure 10 Pulse Frequency Type Output Provides Increasing Pulse Frequency

DAT, duration adjusting or time - proportioned output, cycles one or two relays at a set period, with the percent "on" time proportional to the deviation from setpoint. Where tank volume is sufficient to smooth the cycling, it provides true proportional-only action using low cost solenoid valves or metering pumps.

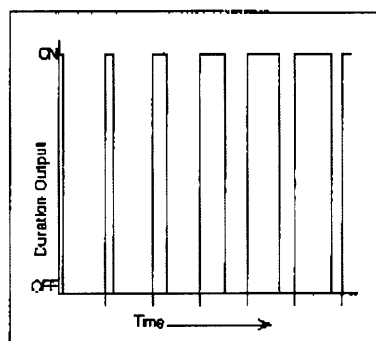


Figure 11 Duration Adjusting Type Output Provides Increasing 'on' Time

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**Features**


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**9782 HMI**

- Menu driven displays
- Intuitive prompts and instructional messages
- Text descriptions for diagnostics and alarms
- Single and multi-parameter display options
- Dynamic function keys
- Conveniently grouped keypad

**Measurement**

- pH, ORP and temperature can be measured simultaneously, with optional cycling display of pH, ORP, temperature, and time.
- Input can be from preamp or directly from glass, Durafet II\*, or antimony pH and/or ORP electrodes.
- Superior analog and digital design permits up to 3000 ft. separation of electrode preamp and analyzer.
- Solution temperature compensation is provided for high-purity water measurements, in addition to conventional electrode temperature compensation.
- AutoClean automatic unattended electrode washing is enabled by internal clock and relay contacts.

**Calibration**

- Automatic buffer recognition gives efficient, foolproof 1- or 2-point pH calibration.
- AutoCal™ automatic unattended electrode 1- or 2-point calibration is controlled by internal clock, timers, and relays to assure long-term measurement integrity.
- DualCal™ backup electrode system with preset alternate calibration can be selected for critical processes or for dual batch treatment tanks.
- Calibration diagnostics

**Control**

- On/off control includes adjustable cycle timers.
- Proportional-only control with one or two setpoints provides a gap "no feed" control deadband.
- Three single or dual-reagent proportional control output types are field-selectable:  
CAT—current adjusting  
PFT—pulse frequency  
DAT—duration adjusting

**Alarm**

- Up to four SPDT internal relays are field-selectable for pH, ORP, temperature, and/or diagnostic alarming.
- Alarm deadbands are individually adjustable.
- Adjustable alarm delay eliminates false alarms from transient upsets.
- Summary of selections for easy wiring

**I/O**

- Security lock prevents changing settings.
- All settings are retained on power loss with E<sup>2</sup>PROM (no batteries)
- Up to three fully isolated current outputs for pH, ORP, and temperature; voltage output also available.
- Compatible with future digital communications options.
- Step-by-step setup-up based on the model number
- DE communication option

**Case**

- Weatherproof, corrosion resistant case is RFI/EMI-shielded from walkie-talkie or other electrical noise.
- Panel, surface, and pipe mounting.
- 120/240 Vac or (4-wire) power.
- Easy open front panel for ease of wiring

**CE Compliance**

- Meets requirements of EMC and Low Voltage Directives
- \*Durafet II is the Honeywell tradename for ISFET (Ion-Sensitive Field Effect Transmitter) pH electrode.

## Specifications

9782 pH/ORP Multifunction Analyzer/Controller	
Displays	LCD Dot Matrix 128 x 64 dpi, solid state backlighting. Displays pH/ORP, temperature (requires separate temperature sensor with Durafet II electrodes), alarm conditions, alarm setpoints, calibration, output limits and diagnostics. Updates every 0.5 second, 1 second with simultaneous pH/ORP measurements.
Display Ranges	-2.00 to 14.00 pH or -1999 to 1999 mV (-1638 mV for absolute mV measurement) and -10 to 130°C Resolution 0.01 pH, 1 mV, 1°C.
Keypad	Monoplanar front panel with 8 keys. Pushbutton entry with tactile feedback.
Auto Buffer Recognition	For 4.01, 6.86, 7.00, 9.00, 9.18, 10.00 pH standard buffer solutions with temperature correction from 0 to 60°C.
AutoCal™ Automatic Calibration and AutoClean™ Electrode Washing Schedule Settings	<b>Settings</b> Clock cycle: 1 hour to 28 days with day, hour, minute resolution Rinse Time: 0-1999 seconds Maximum buffer times: 0-1999 seconds Resume process time delay: 0-1999 seconds Calibration interval: adjustable, number of rinse cycles between 1-point calibrations; or number of 1-point calibrations between 2-point calibrations.
Performances (Under reference operating conditions)	Display Accuracy: $\pm 0.02$ pH, $\pm 2$ mV Output Accuracy (as % of span, added to Display Accuracy): 4-20 mA, $\pm 0.1\%$ ; 0.1 V, $\pm 0.2\%$ ; 0-10 V, $\pm 0.4\%$ Drift: negligible Repeatability: $\pm 0.1\%$ of span, $\pm 1$ count Reference Operating Conditions: $25 \pm 1^\circ\text{C}$ ; 10-40% RH; 120 or 240 Vac, or 24 Vdc
Operating Influences (Under normal operating conditions)	Effect on accuracy (% of span) Temperature: 0.05%/C RH: <1% Line Voltage: <0.1%/volt Power Loss: memory retention by EPROM (no batteries)
Operating Conditions	Ambient Temperature: normal: 0 to 60°C, extreme: -20 to 60°C, storage: -30 to 70°C Line Voltage: normal 108 to 132, 216 to 264 Vac, extreme 100 to 132, 200 to 264 Vac, 47-63 Hz RH: 90% max. noncondensing at 40°C max.
Output Range	Adjustable to any pH/ORP/TEMP range within the display range. All output signals are scaled the same.
Output Signals	Proportional to user-set output range(s) of selected parameter(s), isolation rating 240 Vac (tested to 1500 V). 0-1 Vdc, 200 ohms min.; 0-10 Vdc, 2000 ohms min. and 4-20 mAdc, 600 ohms max., isolated from input and ground, not from each other, all on same parameter, scaled identically. One 4-20 mAdc, 600 ohms max., isolated from inputs and ground. Two 4-20 mAdc, 600 ohms max., isolated from inputs, ground, and each other, independently field-assignable to any parameters and ranges. Three 4-20 mAdc, 600 ohms max., isolated from inputs, ground, and each other, independently field-assignable to any parameters and ranges. DE-Digital integration to Honeywell TPS, TDC 3000 & 2000
Standard Alarm/Control Relays	AC-powered analyzers: two SPDT, Form C general purpose relays rated at 0.6 A at 120/240 Vac, 0.6 A at 110 Vdc, and 2 A at 30 Vdc
Optional Additional Alarm/Control Relays	Two SPDT, Form C, general purpose or hermetically sealed, rated 3 A, 120 Vac, 28 Vdc.

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Alarm/Control Settings	Alarm/on-off control delay: 0-100 seconds. Alarm/on-off control deadbands: individually set, from 1 count to full scale for pH, ORP, and temperature. On/off cycle period: 0 to 1000 seconds. On/off percent "on" time: 0 to 100%, 1% resolution. Setpoint and proportional band limit ranges: $\pm 19.99$ pH, $\pm 1999$ mV, -10 to 130°C, 1 count resolution. DAT cycle period: 1 to 1999 seconds. PFT maximum frequency: 1 to 200 pulses/minute. PFT pulse width: 50 ms, compatible with electronic pulse-type metering pumps.
Temperature Compensation	Conventional compensation for changing electrode output (Nernst response), plus selectable solution temperature compensation for high-purity water.
Power Requirements	108-132/216-264 Vac, 47-63 Hz, 15 VA. Memory retained by E <sup>2</sup> PROM when power is off.
Case	Gray Noryl plastic. Waterproof and corrosion resistant design. Interior conductive coating to provide effective RFI/EMI shielding.
Hazardous Location Approval	FM and CSA Approval for Class I, Div 2.
Standards Compliance	CE Mark on all models signifies compliance to EMC Directive 84/336/EEC.
Case Dimensions	156 mm x 156 mm x 178 mm (6 1/8" x 6 1/8" x 7"). Panel cutout: 141 mm x 141 mm (5.53" x 5.53").
Weight	1.8 kg (4 lb.).
Mounting	Panel mounting-hardware supplied. For surface and 1" to 2" pipe mounting. Select option appropriate in model selection number.

Distributor :

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Honeywell Control System Ltd., Honeywell House, Bracknell, UK-HG 12 1 EB, (44) 1344 826000

*In Japan:* Yamatake-Honeywell Co. Ltd., Nagai Int'l Bldg., 2 - 12 - 19 Shibuya-Ku, Tokyo 150 Japan, 81-3-3486-2051

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