

## 9782 Specific Ion Analyzer/Controller

## Specification

### Overview

The 9782 Specific Ion Analyzer/Controller is a microprocessor-based instrument for analysis of ion concentrations in industrial processes. It is used with Honeywell electrode mountings and a variety of electrodes for the measurement of monovalent and divalent cations and anions.

### Description

The 9782 Specific Ion Analyzer along with the appropriate electrode is designed to provide

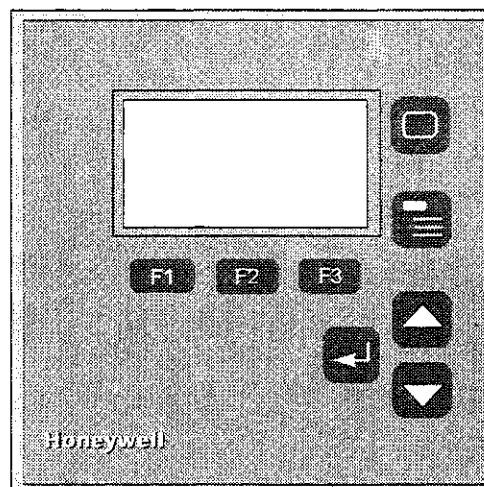
continuous measurement and control of chloride, sodium or fluoride ions in industrial processes. The analyzer's NEMA4X (IP55) enclosure is suitable for outdoor locations and is available in panel, wall, or pipe mounting. The unit's interior is specially coated to provide effective shielding from RFI / EMI interference. An easy to open front panel provides safe access to power and I/O terminals. The front panel provides five easily identified membrane-type keys for configuration, maintenance and calibration functions. Three additional function keys dynamically change for specialized capability while in menus or displays. The 9782 multi-parameter display is backlit for improved process visibility even in dimly lit areas.

The 9782 simultaneously displays an ion concentration and a compensated temperature measurement. All configuration, calibration, and maintenance

functions can be accessed from the main menu. Additionally, the calibration menu can be accessed with a single keystroke from the front panel. Alarms and diagnostics appear prominently in text format on the front display for quick problem assessment. A user configurable alphanumeric tagname appears at the top of the display for the purpose of instrument identification. A 24-hour clock is available for use with the analyzer's automatic functions.

The 9782 provides one 4 – 20 mA signal to output the ion concentration to a recorder, controller, or other data acquisition system. This same 4 – 20 mA signal can be used for proportional only control. Four relays are standard and can be used for configuration of alarms or control outputs. Additional relay functions include automatic calibration, cleaning, and stream switching. Automatic stream switching allows

measurement of two separate sample points with one analyzer. While the 9782 is designed for use with Honeywell electrodes it is also compatible with any standard 12mm electrode.



### Features

- Wide calibration capability is compatible with virtually all ion-selective electrodes within response ranges.
- Honeywell specific ion electrodes include fluoride, chloride, and sodium. Display formats are in ppm, ppb, or millivolts.
- Digital readout capability from ppb levels to 19,900 ppm with auto-ranging.
- Compatible with Honeywell specific ion electrode mountings and preamps. Standard 12 mm specific ion electrodes from other manufacturers can also be used.

- Automatic clean and/or calibration features are enabled by internal clock and relay contacts.
- Two-stream sampling can be controlled automatically by internal clock and relays with addition of external solenoid valves.
- Four SPDT internal relays are field-selectable for concentration, mV, temperature and/or diagnostic alarming.
- Adjustable alarm deadband and delay eliminates excess alarm action and false alarms.
- On/off control includes adjustable cycle timers.
- Proportional-only control with three field-selectable output types:  
CAT—current Adjusting  
PFT—pulse frequency  
DAT—duration adjusting
- Security password prevents changing settings
- Nonvolatile memory (no batteries) retains settings on power loss.
- Isolated output signals 0-1 V, 0-10 V, and 4-20 mA can represent any range within display limits of concentration, mV, or temperature.
- Output scaling is selectable as 2-, 3-, or 4-decade logarithmic, linear, or bilinear.

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### Measurements/ Applications/Limitations

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Honeywell offers specific ion electrodes for the following measurements:

**Sodium ion** is monitored in high purity water treatment, low sodium food and beverage preparation, chemical processing, and boiler water and steam monitoring. Sodium electrodes experience an interference from hydrogen ions if both the sodium concentration and the pH are low enough.

The proprietary Honeywell sodium electrode has the highest available selectivity for sodium over hydrogen, but in some cases

sample conditioning is still required. To eliminate hydrogen ion interference, base reagent is introduced to raise the sample pH. For ppb range measurements, the Honeywell 7972-1 Sodium Ion Analyzer provides pH adjustment where necessary and a facility for convenient calibration, protected from contamination.

For ppm concentration of sodium at moderate pH, no sample conditioning is required and the normal accessory preamplifier electrode system is sufficient. Fig. 1 shows the conditions under which direct measurement can be made without sample pH adjustment.

**Chloride ion** concentration is restricted in plant effluent by environmental regulations and is controlled in processes to minimize corrosion. The monitoring of these concentrations can usually be handled by the chloride ion-selective electrode. The lower limit of detection is approximately 2 ppm, which precludes direct measurement in boiler waters at ppb levels. (Note also that a chloride ion electrode does not measure chlorine or residual chlorine as used in potable water and swimming pools.)

In ppm ranges, the measurement is relatively free of interferences except from bromide, iodide, and cyanide ions. Also, samples containing sulfides, mercury, and strong reducing agents are not suitable. Chloride electrode life is shortened by prolonged measurement in concentrations greater than 1000 ppm chloride.

**Fluoride ion** is monitored in plant effluent, especially from microelectronics manufacturing, glass etching, etc. and in potable water to verify the level of fluoridation.

Fluoride ion is complexed with hydrogen ion below 5 pH and by

aluminum, silica, or iron (+3), into forms not detected by the electrode; however, samples containing constant levels of complexing agents can yield an electrode signal proportional to total concentration. Custom calibration standards that include the background level of complexing agents may provide the means for direct readout. Hydroxide ion is an increasing interference above 8.5 pH when fluoride is near 1 ppm.

**Other ion measurements** must be prequalified based on electrode documentation from other suppliers. Many electrodes, such as the liquid ion exchange and gas sensing membrane types would have short life in continuous service and are therefore not suitable for process measurements. It should be noted that the glass and solid state-type electrodes identified above can have shortened life under adverse conditions.

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### Equipment

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Over two decades of experience in ion-selective electrode measurements have enabled Honeywell to provide a reliable high-performance analyzer. System components consist of a monitor and electrode assembly.

**The 9782 Specific Ion Analyzer** offers a wide selection of state-of-the-art features in a reliable compact design. The user friendly front panel incorporates a menu-driven display with word messages for alarms and diagnostics and a clearly labeled keypad with tactile feedback. Human engineering extends into the basic functioning of the analyzer, beginning with on-screen options being available only when specific hardware options are selected. The analyzer's configuration is intuitive. Prompts and feedback given upon completion of calibration make calibrating an electrode easy.

Input is from the electrode, which includes both ion concentration and temperature signals. Temperature compensation is provided by calculations onboard the analyzer.

The 0-1 V, 0-10 V, and 4-20 mA output signals are isolated to assure compatibility with any recorder, computer, data acquisition system, etc. They all have the same scaling that is field-selectable as logarithmic (2, 3, or 4 decades), linear or bilinear, to match virtually any recording/data acquisition requirement. Linear output scaling can also provide x10 and x100 autoranging. For example, it can normally be scaled for 0-10 ppm but switch automatically to 0-100 and 0-1000 ppm during overrange upset conditions. At each scaling change, an SPDT relay changes state either for event indication at the recorder, or to switch the output signal to different recorder points for clear range identification.

Four built-in alarms and relays have complete flexibility in assignment as high or low, for concentration, temperature and/or diagnostics. Setpoints are set digitally for maximum resolution and have adjustable deadband and time delay.

**Automatic 2-stream sample switching** allows alternate measurement of two different samples with a single measuring system. It is provided by two SPDT relays and timers internal to the analyzer. One relay controls 3-way solenoid valves S1 and S2 (supplied by user) to make the stream selection, while the other relay switches the output signal between points of a multipoint recorder for clear stream identification. (Figure 2.)

**Automatic electrode cleaning** uses an internal clock to schedule the timing and duration of cleaning solution flow to the electrodes by actuating valve. Outputs, control

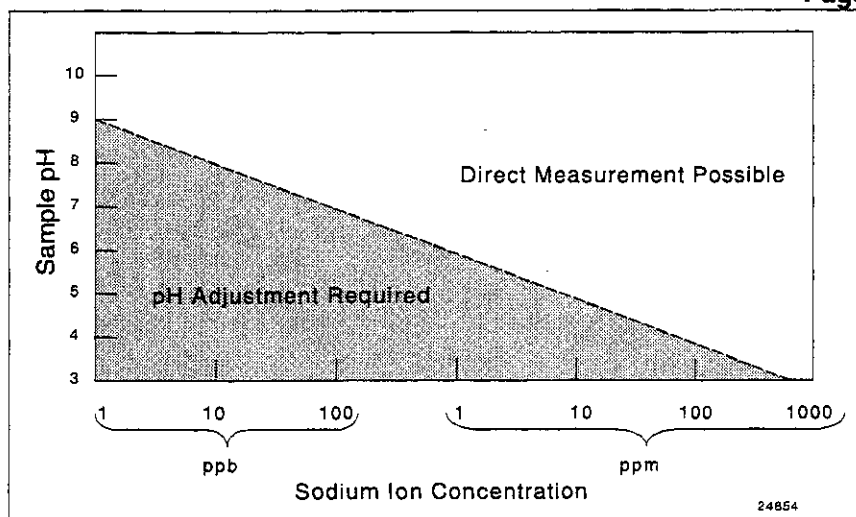


Figure 1

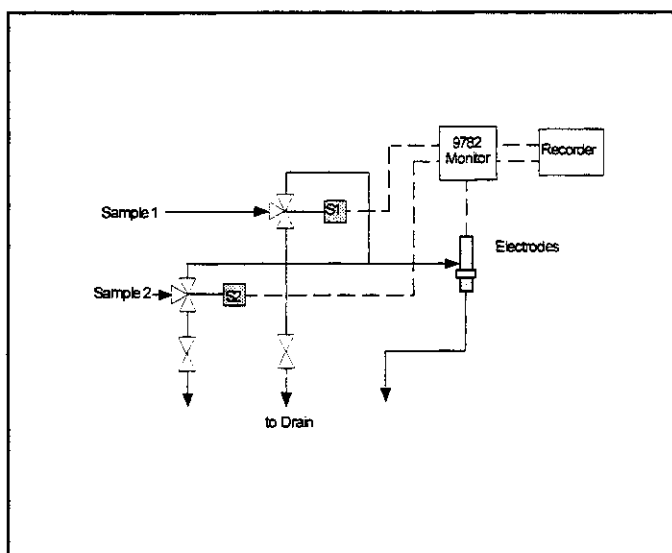


Figure 2 Two Stream Sampling

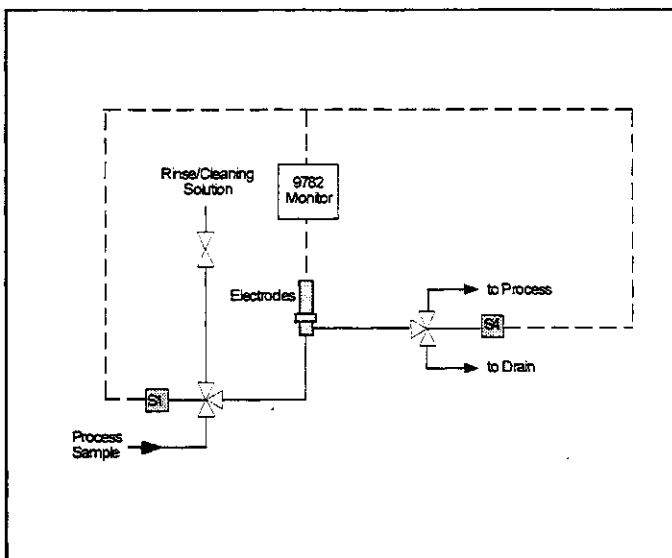


Figure 3 Electrode Cleaning Configuration

action, and alarms are 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. (Figure 3.)

**Automatic calibration** is enabled by an internal clock to set the standardization schedule, rinse time, buffer time, slope calibration interval, and "resume measurement" time for 1- and 2-point calibrations. Internal relays can activate external, user-supplied solenoid valves to direct appropriate streams to the analyzer as shown in Figures 4 and 5. Because 2-stream sample switching, described above, uses some of the same clock settings, it cannot be used simultaneously with the automatic cal and clean features.

### Specific Ion Measurement Notes

The validity of the specific ion measurement is completely dependent on the particular ion-selective electrode used and on the ionization and interference effects of the sample being measured. Ion-selective electrodes respond only to free ionic concentration. A careful assessment must be made by the user to determine if the electrode's limit of detection, selectivity, process interferences, and possibilities of ion complexing will yield a meaningful electrode signal under the specific application conditions. Electrode documentation provides the most detail on measurement precautions and limitations; however there is no substitute for direct laboratory experience with the particular electrode measuring a

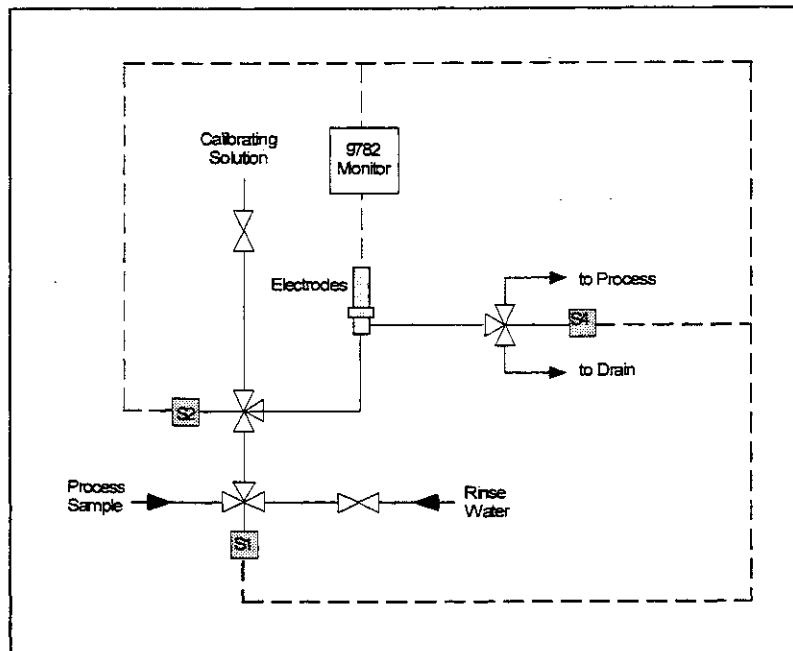


Figure 4 Automatic Calibration of Electrodes Configuration

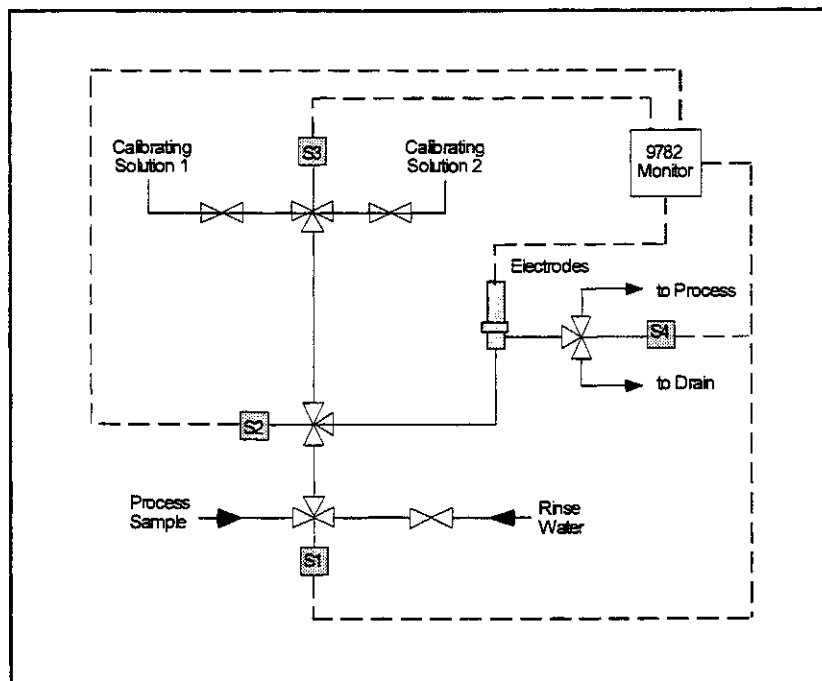


Figure 5 Automatic 2-Point Calibration Configuration

representative sample. This should be obtained through a consulting water-testing laboratory if not

available in-house, before on-line equipment is specified. Electrode life in continuous service is also a consideration.

## Specifications

Displays	LCD dot matrix display, 128 by 64 dpi. Backlit display: solid state LCD. Displays ion concentration/mV, temperature, time, alarm conditions, alarm setpoints, calibration, output limits and diagnostics.
Display Ranges	<b>Ion concentration:</b> .001 to 19990 ppm or ppb; resolution 1 count. <b>mV:</b> -1999 to 1999 mV; resolution 1 mV. <b>Temperature:</b> -10 to +140 °C; resolution 1 °C.
Keypad	Monoplanar front panel with eight keys. Pushbutton entry with tactile feedback.
Auto Buffer Recognition	Retains two calibration solution values in memory.
AutoCal™ Automatic Calibration and AutoClean™ Electrode Washing Schedule Settings	<i>Clock Cycle:</i> 28 days with day, hour, minute resolution. <i>Rinse Time:</i> 1-1999 seconds. <i>Maximum Buffer Times:</i> 1-1999 seconds. <i>Resume Process Time Delay:</i> 1-1999 seconds. <i>Calibration Interval:</i> Adjustable, number of rinse cycles between one-point calibrations; or number of one-point calibrations between two-point calibrations.
Performance (Under reference operating conditions)	<i>Accuracy:</i> $\pm 3$ ppm or ppb for ion concentration, or $\pm 2$ mV (display). <i>Drift:</i> Negligible. <i>Repeatability:</i> $\pm 0.1\%$ of span $\pm 1$ count. <i>Reference Operating Conditions:</i> $25 \pm 1$ °C; 10-40% RH; 120 Vac
Operating Influences (Under normal operating conditions)	<i>Effect on accuracy (% of span):</i> Temperature: 0.05% per °C; RH: <1%; Line Voltage: <0.1% per volt; <i>Power Loss:</i> memory retention by EEPROM (no batteries).
Operating Conditions	<i>Ambient Temperature:</i> Normal 0 to 60 °C (32 to 140 °F), extreme -10 to +60 °C (+14 to 140 °F); storage -30 to +70°C (-22 to 158 °F). <i>Line Voltage:</i> 120 $\pm$ 10% Vac, 47 to 63 Hz, 15 VA. 240 $\pm$ 10% Vac, 47 to 63 Hz, 15 VA..  <i>RH:</i> 90% maximum non-condensing @ 40°C (104 °F) max.
Output Range	Adjustable to any ion concentration/mV/TEMP range within the display range.
Output Signals	4 to 20 mA dc; adjustable to within 0.01 mA, repeatable to within $\pm 0.1\%$ of span; 600 ohm maximum load resistance.
Alarm/Control Relays	Four relays. Two SPDT Form C general purpose relays rated 0.6 amps at 120/240 Vac, 0.6 amps at 110 Vdc, 2 amps at 30 Vdc. Maximum switching power for ac, 125 VA resistive; for dc, 60W resistive. Two hermetically sealed Form C, rated at 3 amps at 120 Vac or 28 Vdc.
Analog Output	One output. Use as isolated 4-20 mA or 0-10 V.
Two Stream Switching Settings	Sample Time 1, Sample Time 2, Output Hold 1, Output Hold 2: 0-1999 seconds each.
Control Settings	On/off period: 1 to 1000 seconds On/off percent "on" time: 0 to 100%, 1% resolution. Alarm/discrete control setpoint and proportional band limit, and alarm deadband: 0.001 to 19990 ion concentration, 1 to 1999 mV, -10 to 140 °C. 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.

**Specifications (continued)**

Power Requirements	120 $\pm$ 10% Vac, 47 to 63 Hz, 15 VA. 240 $\pm$ 10% Vac, 47 to 63 Hz, 15 VA. Memory retained by EEPROM when power is off.
Fuse Rating	120V operation : 0.25 amp/250V 240V operation: 0.125 amp/250V
Standards Compliance	CE Mark on specified models signifies compliance to the EMC Directive 89/336/EEC.
Year 2000	Compliant to Year 2000
Case	Gray Noryl plastic, NEMA 4X/IP55 Rainproof and Outdoor. Interior conductive coating to provide effective RFI/EMI shielding.
Case Dimensions	156 x 156 x 178 mm (6 1/8 x 6 1/8 x 7 in.); panel cutout 141 x 141 mm (5.53 x 5.53 in.).
Weight	1.8 kg (4 lbs.)
Mounting	Panel mounting hardware supplied. Surface and 1" to 2" pipe mounting kit available as option. (Pipe mounting is not recommended if pipe is subject to severe vibration.)



Distributor :

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