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16117 Covello Street
Van Nuys, CA 91406
Printed in USA

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1. Overview

170E-PH / ORP is a monitor and controller. 170E-PH monitors and controls pH. 170E-ORP monitors and controls ORP.

The unit has four built-in relays, which can be used for high and low alarms and high and low process control.

The unit sends out a 4-20mA signal for either recording or proportional process control.

2. Operation Function

**pH**
- **High Alarm**: turns on above HH
- **Acid Pump**: turns on above H
- **Low Alarm**: turns on below LL

**ORP**
- **High Alarm**: turns on above HH
- **Oxidation pump**: turns on below L
- **Low alarm**: turns on below LL

Fig. 1 pH and ORP Control Concept

pH has four set points: low alarm, base chemical injection control (not available), acid chemical injection control, and high alarm. ORP also has four set points: low alarm, oxidizer injection control, reduction chemical injection control (not available), and high alarm.
3. Specifications

<table>
<thead>
<tr>
<th>Spec</th>
<th>Details</th>
</tr>
</thead>
</table>
| **Range**                 | pH: 0.00 to 14.00 pH  
               ORP: -1400 to 1400 mV  
               Temperature: -9.9 - +99.9 °C                                      |
| **Resolution**            | pH: 0.01 pH  
               ORP: 1 mV  
               Temperature: 0.1 °C                                               |
| **Accuracy**              | pH: ± 0.02 pH (± 1 digit)  
               ORP: ± 0.1 % (± 1 digit)                                           |
| **Control Function**      | Operation: ON / OFF  
               Mode: CH1: LL, CH2: L, CH3: H, CH4: HH  
               pH Dead Band: 0.1 to 2.0pH  
               ORP Dead Band: ±1 to 200 mV                                      |
| **Relays**                | 4 Relays  
               Capacity: 250VAC; 3A (Load Resistance)                             |
| **Output**                | 4-20 mA Output, Isolated  
               Max. Load Resistance: 500Ω  
               Linearity: 0.5%                                                   |
| **Output Range**          | pH: 0 to 14 pH  
               ORP: ±700 mV, ±1400 mV                                            |
| **Calibration Function**  | pH: 2-point automatic calibration or manual calibration  
               ORP: 1-point manual calibration                                       |
| **Temperature Compensation** | Pt100, 0 to 100°C                |
| **Ambient Temperature**   | -5 to 40 °C below 85 %RH                                                |
| **Power Supply**          | 110 VAC / 220 VAC; 50 / 60 Hz 10 W                                      |
| **Mounting Style**        | Panel                                                                   |
| **Cutout Dimension**      | 96(W) x 96(H) x 85(D)                                                   |
| **Weights**               | Approx.: 600 gram                                                       |
4. Instrument Layout

**Fig. 3 Instrument layout**

4.1 Operation key

<table>
<thead>
<tr>
<th>Key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTO</td>
<td>Press this key to go back to measuring mode if you are in configuration mode. Press this key to go back to the beginning of the parameters.</td>
</tr>
<tr>
<td>CAL</td>
<td>Press and hold this key until the Measurement Display starts flashing to start calibration.</td>
</tr>
<tr>
<td>MODE</td>
<td>Press this key to select one of parameters on the Parameter Display. Press this key repeatedly until the desired parameter is on Parameter Display. Press and hold this key until the Parameter Display starts flash to change a particular parameter.</td>
</tr>
<tr>
<td>▲, ▼</td>
<td>Press and hold the MODE key until the Parameter Display starts flash to change a particular parameter. Use the UP or DOWN arrow key to change the value of the selected parameter.</td>
</tr>
<tr>
<td>ENT</td>
<td>Press this key to save the change.</td>
</tr>
</tbody>
</table>

4.2 Indicators

These indicators are located below the Parameter Display.

<table>
<thead>
<tr>
<th>Key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTO</td>
<td>Normal operation, measuring mode</td>
</tr>
<tr>
<td>CAL</td>
<td>Calibration mode. During calibration this indicator will be ON. Press and hold the CAL key until the Measurement Display starts flashing to start calibration. To clear the calibration, push the AUTO key and the AUTO indicator will turn ON.</td>
</tr>
<tr>
<td>SEL LL, L, H, HH</td>
<td>Selected Set point. Press the MODE key to select the SEL, LL, L, H, HH parameter.</td>
</tr>
</tbody>
</table>
5. Installation

5.1. Environment Conditions
Mount the meter by following the following conditions.
- A well ventilated area
- Ambient temperature (-5 to 40 °C)
- Low humidity (less than 85 % RH)
- Low mechanical vibration
- Avoid corrosive area
- Low electrical interference

5.2 Mounting and Installation

This is a panel mount instrument. Place the mounting bracket on the left and right side of the meter (see Fig. 2) using a flat head screwdriver. Tighten the mounting bracket on the swing out plate clockwise.
5.3 Wiring Connection

The power requirement for this meter is 110 VAC or 220 VAC, 50/60Hz. This meter does not have a power switch.

**Caution:** Contact capacity is AC 250V, 3A. Do not exceed capacity.
Be sure to ground the instrument properly

The meter has 4 relays. See section 2 for operation functions of the 4 relays.

In case of not using of automatic temperature sensor, please attach this fixed resistance T(11) and T(12).

Fig. 4 Mounting

Fig. 6 Electrode Connection
**Terminal Description**

1. **LL:** Low Alarm relay (110V / 220V)
2. **LOW:** Low set point for control, such as pump (110V / 220V)
3. **HIGH:** High set point for control, such as pump (110V / 220V)
4. **HH:** High Alarm relay (110V / 220V)
5. **COM:** Common for the relays (110V / 220V)
6. **AC 220V:** Power for the meter, Hot
7. **AC 110V:** Power for the meter, Hot
8. **0V:** Power for the meter, Neutral
9. **GND:** Power for the meter, Ground
10. **G(M):** Sensor input, BNC
11. **T:** Temperature compensation
12. **T:** Temperature compensation
13. **+:** + 4-20mA output
14. **-:** - 4-20mA output
6. Calibration

6.1 pH Calibration
1. Connect the pH electrode to the instrument.
2. Place the electrode tip in pH 7.00 buffer.
3. Push CAL button and hold for 3 seconds. Small red LED light above CAL turns ON and (4-7) displays on the bottom display momentarily and the top display starts blinking. When a stable reading is recognized, it will stop blinking and 7.00 will appear. Bottom display will read (-7)
4. Rinse the electrode tip with fresh water.
5. Place the electrode tip in pH 4 buffer and press ENT.
6. Top display starts blinking when a stable reading is reached and the bottom display reads (4-7).
7. Press ENT for final acceptance and a stable 4.00 reading is displayed.
8. CAL LED light turns off and LED light above AUTO turns ON indicating normal mode.

6.2 ORP Calibration
1. Connect the ORP electrode to the instrument.
2. Place the electrode tip in a known ORP value solution.
3. Push CAL button and hold for 3 seconds. Small red LED light above CAL turns ON and (SCAL) displays on the bottom display and the top display starts blinking.
4. Press ENT and the lower display starts blinking.
5. Use the arrows to adjust the lower display value to match the value of the solution used.
6. Press ENT for final acceptance and a stable calibrated reading is displayed on the top display.
7. CAL LED light turns off and LED light above AUTO turns ON indicating normal mode.

7. Set Point Configuration
1. Lower green digit display indicates the value of the selected set point, which is indicated by the corresponding small green indicator light.
2. MODE: Choose the desired set point by pressing MODE. Pressing again moves to the dead band (hysteresis) selection, and pressing MODE again moves to the next set point selection. Hold the MODE button down for 3 seconds to change the selected set point or dead-band value individually for each point.
3. When the display starts blinking, use the Up/Down arrows to select the desired value. Once the correct value is displayed, press ENT to accept and confirm the new value.
4. The lower green digit display blinks 4 times rapidly and displays the new set point value.
8. Parameters

- ALM-LL Control value (SEL-LL LAMP BLINK)
- ALM-LL DB (SEL-LL LAMP BLINK)
- ALM-L Control value (SEL-L LAMP BLINK)
- ALM-L DB (SEL-L LAMP BLINK)
- ALM-H Control value (SEL-H LAMP BLINK)
- ALM-H DB (SEL-H LAMP BLINK)
- ALM-HH Control value (SEL-HH LAMP BLINK)
- ALM-HH DB (SEL-HH LAMP BLINK)

※ Display of Temperature value

※ Temperature Electrode Type

※ CAL Method

PH/ORP meter TYPE

& Selecting of 4~20mA out transmission range

4mA CAL

20mA CAL

※ Not used in ORP meter.
POWER ON

Selecting the temperature sensor

Calibrating method

Displaying the temperature
8.1 Displaying the current temperature
If you want to know the current temperature, set the current temperature measurement mode. Check the current temperature by pressing the MODE KEY. The available range of temperature is –9.9 °C to +99.9 °C.

8.2 Calibration method
Select the calibrating method when you use it as pH meter.

Automatic calibration:  

Manual calibration:
8.3 Output Range Selection

1. 0~14pH Range — Use as pH meter
2. ±700mV Range
3. ±1400mV Range — Use as ORP meter
4. 0~1000mV Range

The 4-20 mA output corresponds to the input range.
## 9. Error Message

The controller’s error messages are displayed on the second screen of the controller.

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Explanation</th>
<th>Solution</th>
</tr>
</thead>
</table>
| E-oF | pH / ORP value is over the high limit. pH value is higher than 15.0 pH. ORP value is higher than 1501 mV. | • Check electrode connection and cable.  
• Check the solution. |
| E-uF | pH / ORP value is below the low limit. pH value is lower than –1.0 pH. ORP value is lower than -1501 mV. | • Check electrode connection and cable.  
• Check the solution. |
| E-C1 | Electrode needs cleaning. Old standard calibration solution. | • Clean the electrode.  
• Change calibration solution.  
• Change electrode. |
| E-C2 | Big difference between the displayed value and the standard calibration solution value. | • Clean the electrode.  
• Change calibration solution.  
• Change electrode. |
| E-C3 | Wrong standard calibration solution. | • Change calibration solution.  
Make sure the calibration solution is pH 4, 7, or 10. |
| E-t1 | No temperature compensation. | • Temperature sensor or resistor is missing on controller terminal 11 and 12.  
• Replace resistor or electrode. |
| E-t2 | No temperature compensation. There is a short circuit. | • Temperature sensor or resistor is short circuit on controller terminal 11 and 12.  
• Replace resistor or electrode. |
| E-t3 | Temperature is over the high limit. Temperature is higher than 110°C. | • Temperature sensor or resistor connection on controller terminal 11 and 12.  
• Do not use electrode over the temperature limit. |
| E-t4 | Temperature is below the low limit. Temperature is lower than -10°C. | • Temperature sensor or resistor connection on controller terminal 11 and 12.  
• Do not use electrode over the temperature limit. |
| E-S1 | Controller system error. Loss of memory. | • Contact the factory. |
| E-S2 | Controller system error. Defective A/D converter. | • Contact the factory. |