

# APT2000 Series 2-Wire Contacting Conductivity Transmitters

# Specification

## Overview

The Honeywell Analytical Process Transmitter (APT) 2000 Series transmitter is a two-wire 24-Volt device that continuously measures conductivity, resistivity and salinity in industrial processes within the power, chemical, pharmaceutical, pulp and paper, and water quality industries.

The APT2000's NEMA 4x and IP65 rated enclosure is specifically designed to meet the measurement needs of intrinsically safe, non-incendive and general-purpose areas. Honeywell conductivity cells or electrically compatible sensors can be used with the transmitter. For bi-directional remote monitoring/control of the process, the HART communications protocol is available as an option.

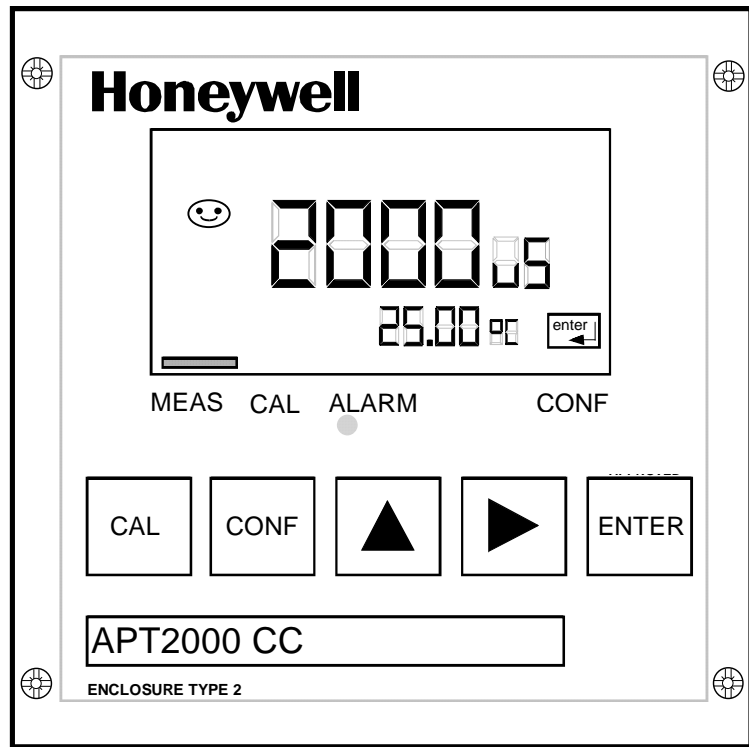


Figure 1 – APT2000 Transmitter

## Description

The Honeywell APT2000 series of transmitters offer the widest available selection of advanced features in a reliable and economical instrument.

### Reliability First

The advanced features of the APT2000 transmitter guarantee complete reliability. The APT2000 continuously monitors sensor and transmitter electronics and immediately displays diagnostic information at the onset of a problem. If an error or diagnostic is found, the transmitter will indicate the appropriate error code or pictograph (see Figure 2), blink a red LED and adjust the error current to 22 mA if desired. A manual loop-back check is available to test the integrity of the 4-20 mA output.

### Quick Problem Assessment

The APT2000 has a large front display for quick recognition of process parameters and diagnostics even at a distance. Only the APT2000 employs *visual feedback* to quicken setup and maintenance times and to minimize errors made during calibrations. Visual feedback refers to pictograph type characters that appear on the display both to prompt and respond to operator and process changes.

Pictograph type characters also appear during problem conditions to report diagnostics for easy troubleshooting. There is even a Sensoface<sup>®</sup> pictograph that provides

constant feedback to the operator on whether or not there is a problem with the cell. These easily learned and recognized symbols make the APT2000 an easy-to-use instrument in any language.

### Foolproof Calibrations

Each Honeywell conductivity cell comes supplied with one of four sensor factors (0.01, 0.1, 1.0, and 10). The lower cell constants are used for low conductivity water or resistivity measurements, while the higher ones are used for higher conductivity water or salinity measurements. Calibration of the cells is easy by either utilizing a factory-determined calibration factor or performing a simple one-point calibration.

**Works with a Variety of Cells**

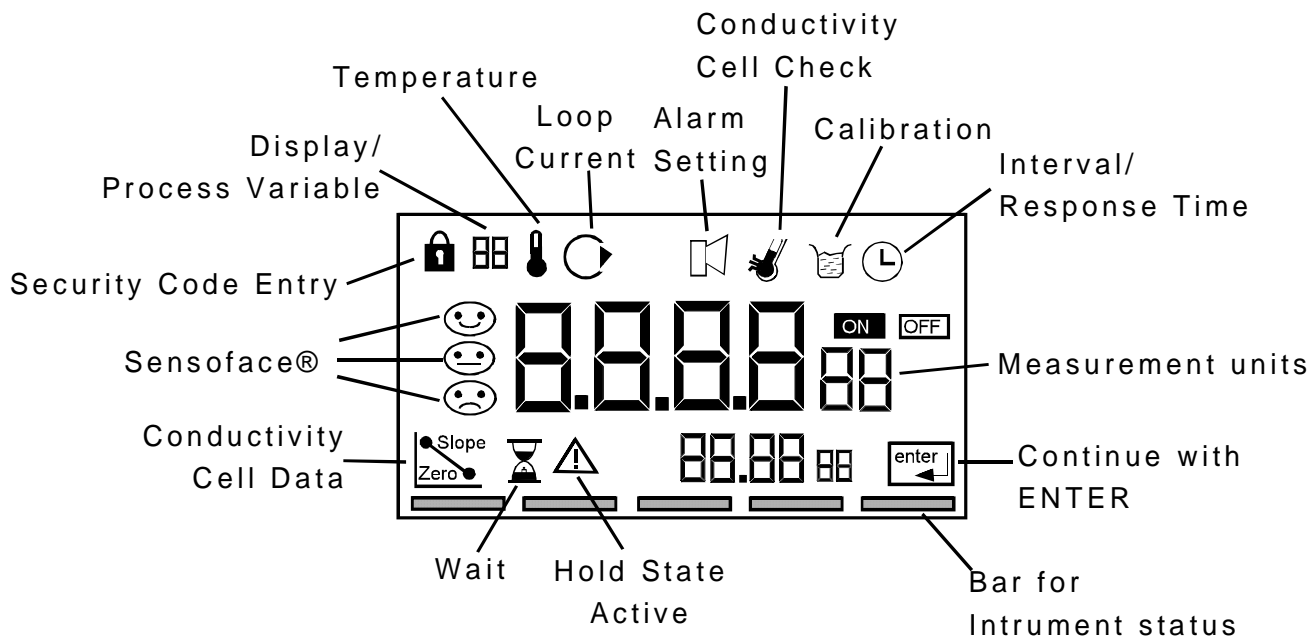
Inputs to the APT2000 Series include all Honeywell conductivity cell types with appropriate temperature compensator and cell constant. These include the 4973 pure water cells, 4974 sanitary cells, 4905 general-purpose cells, and the 4909 insertion/removal cells. In addition, a wide variety of other manufacturers' conductivity cells are compatible.

**Fully Certified**

Area certifications for the APT2000 include both intrinsically safe and non-incendive ratings from CENELEC. Each transmitter comes standard with CE.

**Easily Integrated**

The APT2000 Series transmitters can be continuously remote controlled via HART communications from a handheld terminal or the control room. This option enables additional visibility and control of the process.



**Figure 2 – APT2000CC Display Features**

**Features**

- Large display with easy-to-read 0.75 inch measured value
- Simple operator interface with basic pictographs
- Application in hazardous and safe areas
- HART bi-directional communications protocol
- Continuous diagnostics for monitoring calibration, cell health, and transmitter self-test
- Manual loopback check for integrity of 4-20 mA output

- Robust, tightly sealed plastic enclosure
- Wall, pipe or panel mounting
- Easy installation with pre-assembled empty enclosure and plug-in terminals
- Optical alarm signaling by blinking red LED
- Integrated current source for simple checking of peripheral devices
- Quick Response Time (less than five seconds per step change)

**Applications**

The APT2000CC transmitter is designed to meet the measurement needs of a number of industries, including:

- Power
- Chemical
- Pharmaceutical
- Pulp and Paper
- Water Quality
- Metals

## Specifications

| Conductivity Input               |  |
|----------------------------------|--|
| <b>Display Range</b>             | (0.2 $\mu\text{S/cm}$ * Cell Constant) to (1000 $\text{mS/cm}$ * Cell Constant)  |
| <b>Accuracy</b>                  | Less than 1 % of Measured Value or +/- (0.4 $\mu\text{S/cm}$ * Cell Constant), whichever is greater  |
| <b>Step Change Response Time</b> | Less than 5 seconds  |
| <b>Process Variable/Range</b>    | 0.000 to 9.999 $\mu\text{S/cm}$ , 00.00 to 99.99 $\mu\text{S/cm}$ , 000.0 to 999.9 $\mu\text{S/cm}$ , 0000 to 9999 $\mu\text{S/cm}$<br>0.000 to 9.999 $\text{mS/cm}$ , 00.00 to 99.99 $\text{mS/cm}$ , 000.0 to 999.9 $\text{mS/cm}$<br>0.000 to 9.999 $\text{M}\Omega\text{-cm}$ , 00.00 to 99.99 $\text{M}\Omega\text{-cm}$ , 000.0 to 999.9 $\text{M}\Omega\text{-cm}$  |
| <b>Salinity</b>                  | 0.0 % to 45.0 % (0 $^{\circ}\text{C}$ to 35 $^{\circ}\text{C}$ )   |
| Diagnostics                      |  |
| <b>Sensocheck</b>                | Polarization detection and monitoring of cable capacitance (can be switched off)   |
| <b>Sensor Standardization</b>    | - Entry of cell calibration factor with display of conductivity and temperature<br>- Temperature probe adjustment  |
| <b>Sensoface</b>                 | - Provides information on the electrode state via Sensocheck<br>- Monitors asymmetry potential, slope, and response time during calibration  |
| Temperature Input                |  |
| <b>Range</b>                     | <i>8550 <math>\Omega</math> Thermistor:</i> -10.0 $^{\circ}\text{C}$ to +130.0 $^{\circ}\text{C}$ / -14 $^{\circ}\text{F}$ to +266 $^{\circ}\text{F}$<br><i>Pt100/1000 <math>\Omega</math> RTD:</i> -20.0 $^{\circ}\text{C}$ to +150.0 $^{\circ}\text{C}$ / +4 $^{\circ}\text{F}$ to +302 $^{\circ}\text{F}$   |
| <b>Resolution</b>                | 0.1 $^{\circ}\text{C}$ or 1 $^{\circ}\text{F}$   |
| <b>Accuracy</b>                  | < 0.5 K  |
| <b>Temperature Compensation</b>  | Automatic Compensation using Pt 100 $\Omega$ or 1000 $\Omega$ RTD, 8550 $\Omega$ Thermistor or manual adjust   |
| <b>Display</b>                   | LCD display 76 mm x 48 mm dimensions (3" x 1 7/8"), 7-segment<br><br><i>Cond Value:</i> character height 17 mm (.66"), meas. symbol 10 mm (.4")<br><i>Temperature:</i> character height 10 mm (.4"), meas. symbol 7 mm (.33")<br>Sensoface with three states, 5 status bars, 16 pictographs / symbols, Red Alarm LED<br><br>Security protection with four-digit mode codes to access calibration and configuration options |

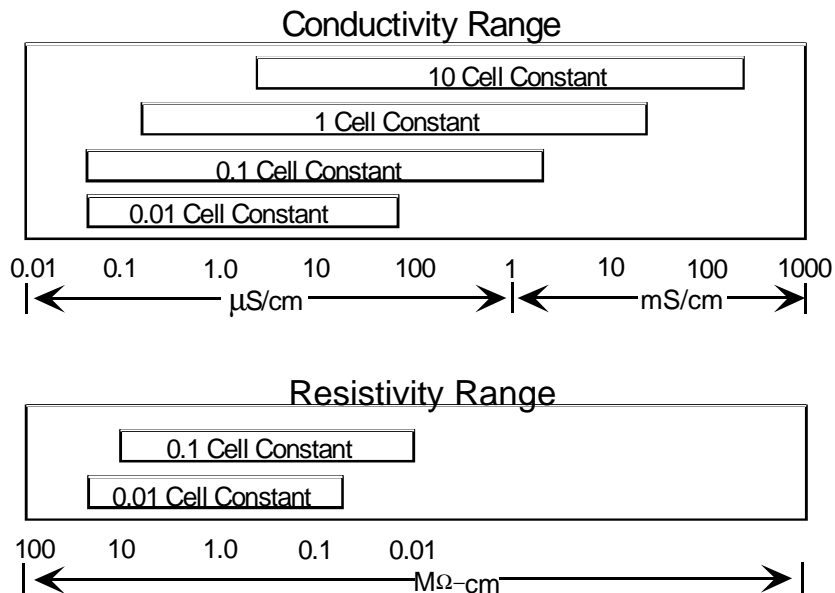
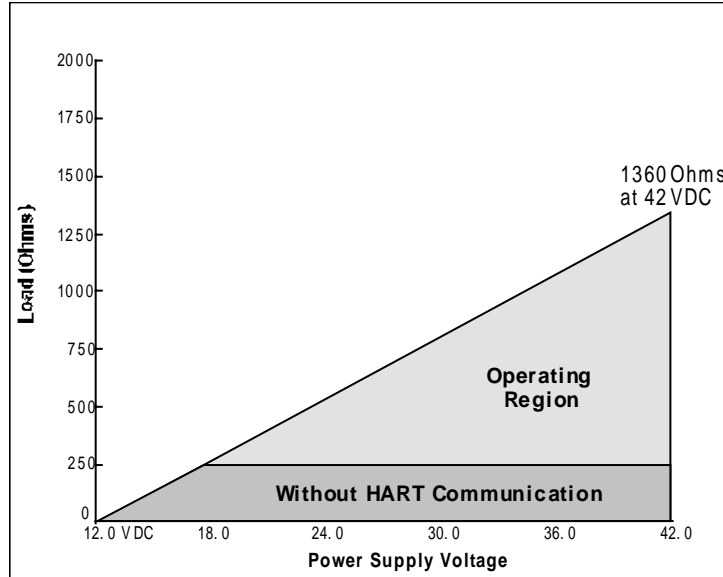


Figure 3 – Optimal Cell Constant for Conductivity or Resistivity Ranges

| Supply/Output         |   |
|-----------------------|---|
| <b>Output Current</b> | 4 mA to 20 mA (22 mA for error notification) current loop, floating (3.8 mA to 20.5 mA) |
| <b>Supply Voltage</b> | 12 V to 42 V; $I_{max} = 100 \text{ mA}$ ; $P_{max} = 0.8 \text{ W}$                    |
| <b>Overrange</b>      | 22 mA for error messages  |
| <b>Current Error</b>  | <0.3 % of current value +0.05 mA  |
| <b>Current Source</b> | 3.80 mA to 22.0 mA  |



**Figure 4 – Load/Power Supply Requirements**

| Communications       |   |
|----------------------|---|
| <b>HART Protocol</b> | <ul style="list-style-type: none"> <li>- Digital communication via FSK modulation of the loop current</li> <li>- Point-to-point connection</li> <li>- Reading of measured values, status, messages, and multidrop unit identification</li> <li>- Read and write parameters</li> </ul> |
| Physical             |   |
| <b>Enclosure</b>     | Plastic enclosure made of PBT (polybutylene terephthalate) bluish-gray RAL 7031   |
| <b>Mounting</b>      | Wall, Pipe, or Panel Mount  |
| <b>Dimensions</b>    | H 144 mm, W 144 mm, D 105 mm (H 5.67", W 5.67", D 4.13")  |
| <b>Protection</b>    | NEMA 4x, IP 65  |
| <b>Cable Glands</b>  | 3 breakthroughs for Pg 13.5<br>2 breakthroughs for NPT 1/2" or Rigid metallic conduit   |
| <b>Weight</b>        | Approx. 1 kg (2.2 lbs)  |

| Area Certifications / Compliances        |  |
|--|--|
| <b>General Purpose</b>                   | Zone 2 (USA)<br>FM: NI, Class I, Div 2, Groups A – D, T4   |
| <b>Intrinsically Safe</b>                | Zone 1 (USA)<br>FM: IS, Class I, Div 1, Groups A – D, T4<br><br>Zone 1 (Europe)<br>CENELEC: II 2G EEx ib [ia] IIC T6   |
| <b>Data Retention</b>                    | Parameters and calibration data > 10 years (EEPROM)  |
| <b>RFI Suppression / Immunity to ESD</b> | To EN 50 081-1 and EN 50 081-2   |
| <b>Ambient Conditions</b>                | <i>Operation/Environmental temperature:</i> (T4) -20 °C to +55 °C (4 °F to +131 °F)<br>(T6) -20 °C to +40 °C (-4 °F to +104 °F)<br><br><i>Transport and Storage temperature:</i> -20 °C to +70 °C (-4 °F to +158 °F) |

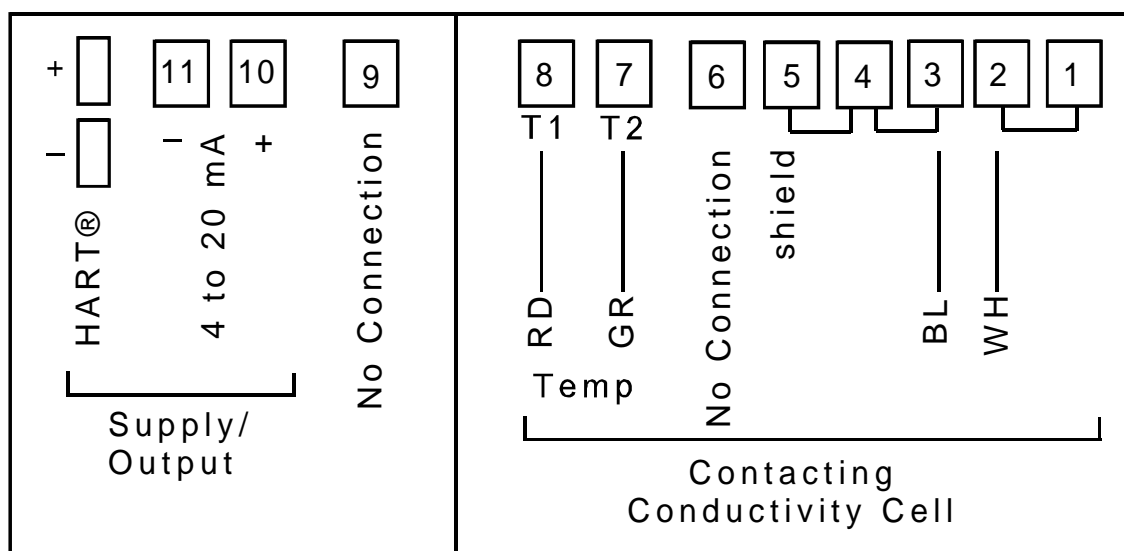


Figure 5 – APT2000CC Terminal Assignments

**Instructions**

- APT2000 Transmitter Offers:
  - Power Requirements - 2 Wire, 14 to 42 VDC
  - Standard - All models CE Compliant
  - Standard - NEMA 4X, IP65
  - Three mounting types: **(must be ordered separately)**
    1. Panel Mount Kit
    2. Pipe/Wall Mount Kit
    3. Protective Hood (requires Pipe/Wall Mount Kit)
  - Optional - HART communications
  - Approval Options:
    1. General Purpose; also FM Class I, Div 2, Groups A-D
    2. Intrinsically Safe: FFM Class I, Div 1, Groups A-D  
CENELEC EEx ib [ia] 11C T6/T4
- Select the desired key number. The arrow to the right marks the selection available.
- Make one selection from Tables using the column below the proper arrow.  
A dot (•) denotes unrestricted availability.

Key Number                      I                      II                      III  
 [-----] - [ - ] - [ - ] - [ - ]

| KEY NUMBER  | Selection                  | Availability |   |   |
|---|----------------------------|--------------|---|---|
| <b>Description of Measurement Type</b>  |                            |              |   |   |
| pH/ORP<br>Glass Electrodes: Internal pre-amp used<br>Durafet II Electrodes: Cap adapter is required | APT 2000 PH                | ↓            |   |   |
| Toroidal (Electrodeless) Conductivity<br>Contacting Conductivity                                    | APT 2000 TC<br>APT 2000 CC |              | ↓ | ↓ |

**TABLE I - Communications Protocol**

|                              |   |   |   |   |
|------------------------------|---|---|---|---|
| None (Analog 4 - 20 mA only) | 0 | • | • | • |
| HART Protocol                | H | • | • | • |

**TABLE II - Approvals**

|  |    |   |   |   |
|--|----|---|---|---|
| General Purpose; also FM Class I, Div 2, Groups A-D                                | 00 | • | • | • |
| Intrinsically Safe: FM Class I, Div 1, Groups A-D<br>CENELEC EEx ib [ia] IIC T6/T4 | IS | • |   | • |

**TABLE III - Optional Equipment**

|               |         |       |   |   |   |
|---------------|---------|-------|---|---|---|
| User's Manual | English | E _ _ | • | • | • |
| Future        |         | _ 0 _ | • | • | • |
| Future        |         | _ _ 0 | • | • | • |

**Accessory Parts**

|  | Part Number  |
|--|--------------|
| Mounting Kits:   |              |
| Panel Mounting Kit   | 51205990-001 |
| Pipe/Wall Mounting Kit                                     | 51205988-001 |
| Protective Hood (requires pipe/wall kit)                   | 51205989-001 |
| HART Test Socket   | 51205991-001 |
| Instruction Manual - pH                                    | 70-82-25-92  |
| Instruction Manual - Toroidal (Electrodeless) Conductivity | 70-82-25-96  |
| Instruction Manual - Contacting Conductivity               | 70-82-25-95  |

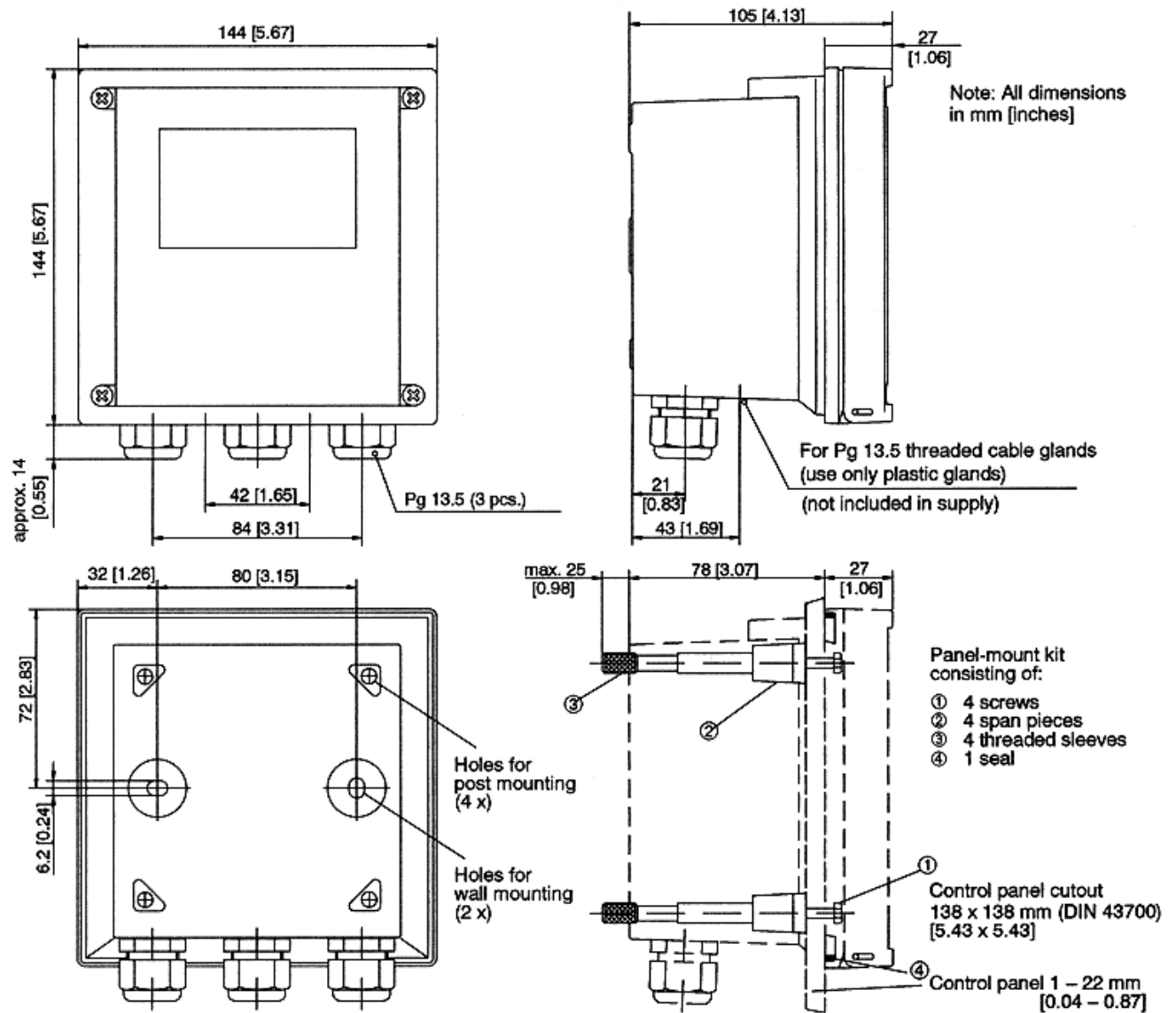


Figure 6 – Dimension Drawing for APT2000 and P/N 51205990-001 Panel Mounting Kit

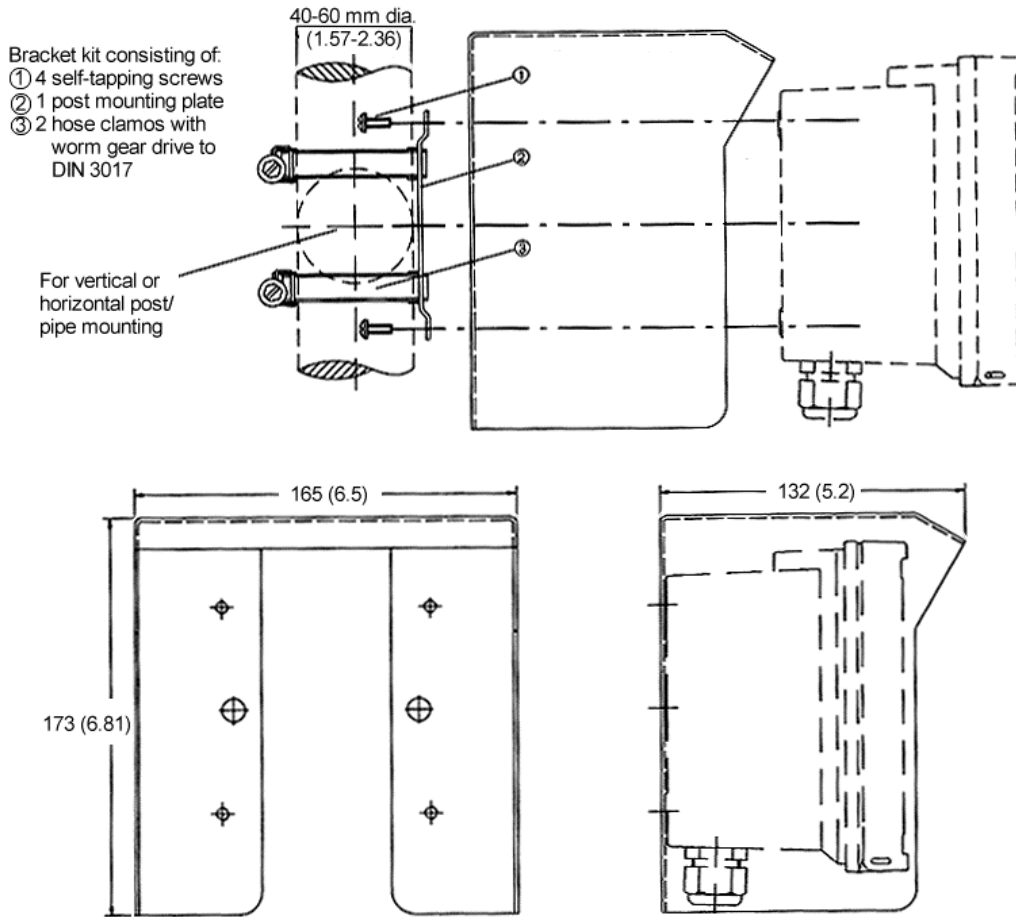


Figure 7 – Dimension Drawing for APT2000 with Wall or Pipe Mounting

**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 web site, it is up to the customer to determine the suitability of the product in the application.

For more information, contact Honeywell sales at (800) 343-0228.

**Honeywell**

Sensing and Control  
 Honeywell Inc.  
 11 West Spring Street  
 Freeport, IL 61032