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## АНАЛИТИЧЕСКИЕ ПРИБОРЫ

Технические характеристики  
на преобразователь  
АРТ2000ТС

# APT2000 Series 2-Wire Toroidal Conductivity Transmitters Specification

## Overview

The Honeywell Analytical Process Transmitter (APT) 2000 Series transmitter is a two-wire 24-Volt device that continuously measures conductivity, chemical concentration and salinity in industrial processes within the chemical, food & dairy, pulp & paper, refinery, metals, and other 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 toroidal 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.

## 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.

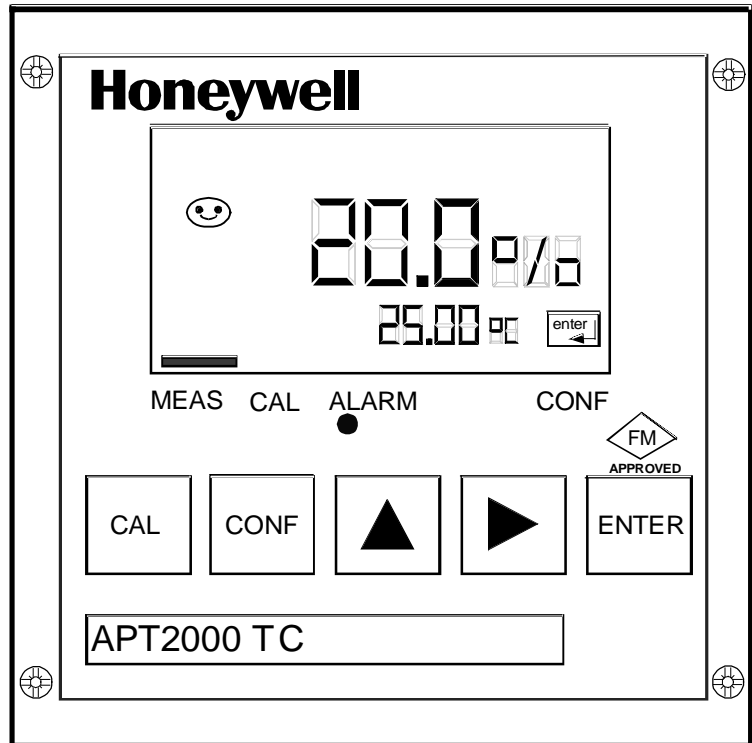


Figure 1 – APT2000TC Transmitter

### 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 has unique measuring characteristics when shipped from the factory. It is possible that these characteristics will vary slightly depending upon the installation as well. For optimum accuracy, a single-point calibration in a known conductivity solution should be performed when a new cell is installed. Further calibration adjustments are also available for enhanced accuracy in special applications.

**Works with a Variety of Cells**

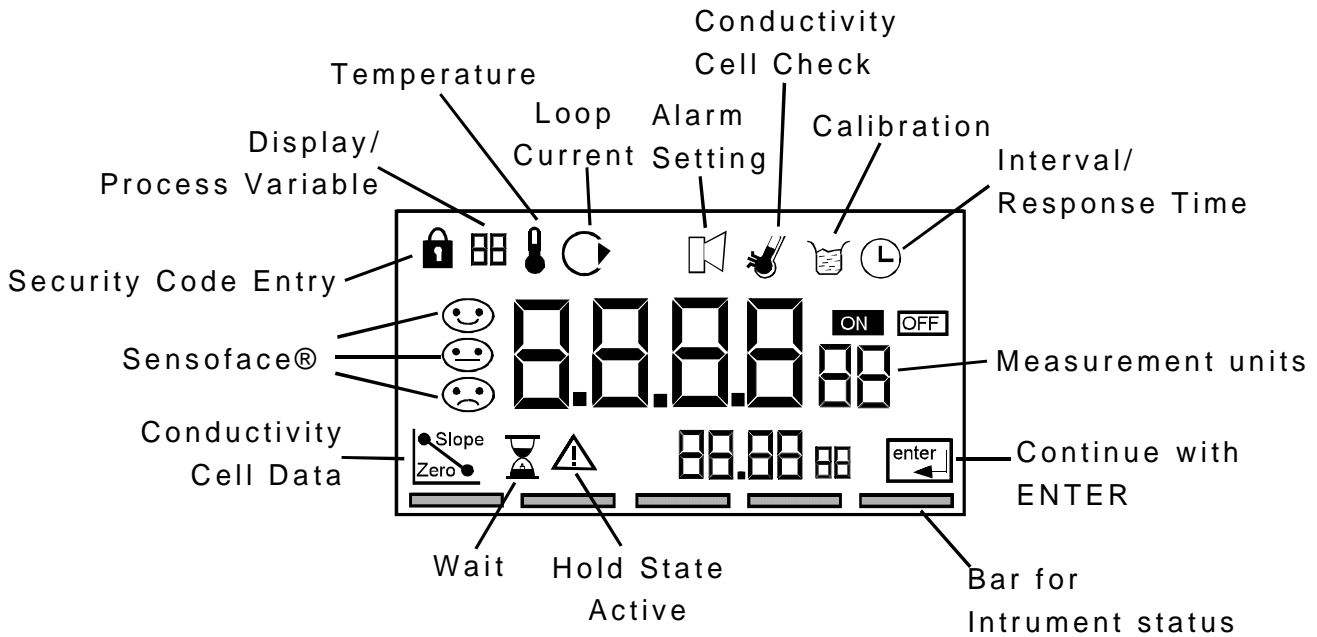
The inputs to the APT2000 Series include the Honeywell 5000TC toroidal conductivity cells, which feature a 1000 ohm Platinum RTD. In addition, a wide variety of other manufacturers' toroidal conductivity cells are compatible.

**Fully Certified**

The area certification for the ATP2000 TC is FM Class I, Div. 2, Groups A-D (non-incendive). In addition, 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 – APT2000TC Display Features**

Features
<ul style="list-style-type: none"> <li>• Large display with easy-to-read 0.75 inch measured value</li> <li>• Simple operator interface with basic pictographs</li> <li>• Application in hazardous and safe areas</li> <li>• HART bi-directional communications protocol</li> <li>• Continuous diagnostics for monitoring calibration, cell health, and transmitter self-test</li> <li>• Manual loopback check for integrity of 4-20 mA output</li> </ul>

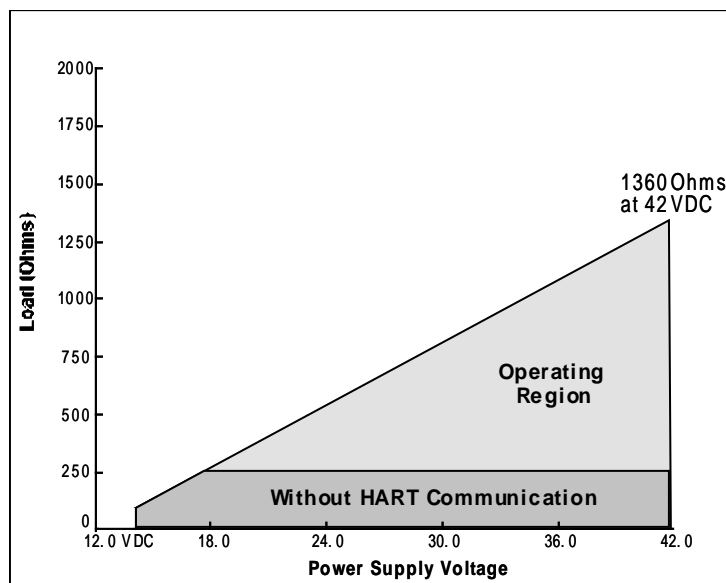
<ul style="list-style-type: none"> <li>• Robust, tightly sealed plastic enclosure</li> <li>• Wall, pipe or panel mounting</li> <li>• Easy installation with pre-assembled empty enclosure and plug-in terminals</li> <li>• Optical alarm signaling by blinking red LED</li> <li>• Integrated current source for simple checking of peripheral devices</li> <li>• Quick Response Time (less than five seconds per step change)</li> </ul>
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Applications
<p>The APT2000TC transmitter is designed to meet the measurement needs of a number of industries, including:</p> <ul style="list-style-type: none"> <li>• Chemical</li> <li>• Food &amp; Dairy</li> <li>• Pulp and Paper</li> <li>• Refinery</li> <li>• Metals</li> </ul>

## Specifications

Conductivity Input																											
<b>Conductivity Range</b>	00.00 to 99.99 mS/cm, 000.0 to 999.9 mS/cm, 0000 to 1999 mS/cm																										
<b>Concentration Range</b>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top;"> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">NaCl</td> <td>0-26.3% by wt (0 °C)</td> </tr> <tr> <td></td> <td>0-28.1 % by wt (100 °C)</td> </tr> <tr> <td>HCl</td> <td>0-17% by wt (-20 °C)</td> </tr> <tr> <td></td> <td>0-17 % by wt (50 °C)</td> </tr> <tr> <td>NaOH</td> <td>0-12% by wt (0 °C)</td> </tr> <tr> <td></td> <td>0-22 % by wt (100 °C)</td> </tr> </table> </td> <td style="width: 50%; vertical-align: top;"> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">H<sub>2</sub>SO<sub>4</sub></td> <td>0-25% by wt (-17 °C)</td> </tr> <tr> <td></td> <td>0-35 % by wt (110 °C)</td> </tr> <tr> <td>H<sub>2</sub>SO<sub>4</sub></td> <td>95-99 % by wt (-10 °C)</td> </tr> <tr> <td></td> <td>95-99 % by wt (110 °C)</td> </tr> <tr> <td>HNO<sub>3</sub></td> <td>0-28 % by wt (-20 °C)</td> </tr> <tr> <td></td> <td>0-28 % by wt (50 °C)</td> </tr> </table> </td> </tr> </table>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">NaCl</td> <td>0-26.3% by wt (0 °C)</td> </tr> <tr> <td></td> <td>0-28.1 % by wt (100 °C)</td> </tr> <tr> <td>HCl</td> <td>0-17% by wt (-20 °C)</td> </tr> <tr> <td></td> <td>0-17 % by wt (50 °C)</td> </tr> <tr> <td>NaOH</td> <td>0-12% by wt (0 °C)</td> </tr> <tr> <td></td> <td>0-22 % by wt (100 °C)</td> </tr> </table>	NaCl	0-26.3% by wt (0 °C)		0-28.1 % by wt (100 °C)	HCl	0-17% by wt (-20 °C)		0-17 % by wt (50 °C)	NaOH	0-12% by wt (0 °C)		0-22 % by wt (100 °C)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">H<sub>2</sub>SO<sub>4</sub></td> <td>0-25% by wt (-17 °C)</td> </tr> <tr> <td></td> <td>0-35 % by wt (110 °C)</td> </tr> <tr> <td>H<sub>2</sub>SO<sub>4</sub></td> <td>95-99 % by wt (-10 °C)</td> </tr> <tr> <td></td> <td>95-99 % by wt (110 °C)</td> </tr> <tr> <td>HNO<sub>3</sub></td> <td>0-28 % by wt (-20 °C)</td> </tr> <tr> <td></td> <td>0-28 % by wt (50 °C)</td> </tr> </table>	H <sub>2</sub> SO <sub>4</sub>	0-25% by wt (-17 °C)		0-35 % by wt (110 °C)	H <sub>2</sub> SO <sub>4</sub>	95-99 % by wt (-10 °C)		95-99 % by wt (110 °C)	HNO <sub>3</sub>	0-28 % by wt (-20 °C)		0-28 % by wt (50 °C)
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	0-28 % by wt (50 °C)																										
<b>Salinity Range</b>	0.0 % to 45.0 % (0 °C to 35 °C)																										
<b>Accuracy</b>	(1 % of measured value) ± (0.02 mS/cm) ± (1 of least significant digit)																										
<b>Step Change Response Time</b>	Less than 5 seconds																										
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 - Temperature probe adjustment																										
<b>Sensoface</b>	- Provides information on the electrode state via Sensocheck - Monitors asymmetry potential, slope, and response time during calibration																										
Temperature Input																											
<b>Range</b>	<i>Pt100/1000 Ω RTD, 100K Ω Thermistor:</i> -20.0 °C to +150.0 °C / +4 °F to +302 °F																										
<b>Resolution</b>	<i>Pt100/1000 Ω RTD, 100K Ω Thermistor:</i> 0.1 °C or 1 °F																										
<b>Accuracy</b>	<i>Pt1000 Ω RTD:</i> ± 0.5 °C <i>Pt100 Ω RTD:</i> ± 1 °C <i>100K Ω Thermistor:</i> ± 0.5 °C below 100 °C; less than 1 °C above 100 °C																										
<b>Temperature Compensation</b>	Automatic Compensation using Pt 100Ω/1000Ω RTD or 100 KΩ Thermistor, or manual adjust																										
<b>Display</b>	LCD display 76 mm x 48 mm dimensions (3" x 1 7/8"), 7-segment  <i>Cond Value:</i> character height 17 mm (.66") , meas. symbol 10 mm (.4") <i>Temperature:</i> character height 10 mm (.4") , meas. symbol 7 mm (.33") Sensoface with three states, 5 status bars, 16 pictographs / symbols, Red Alarm LED Security protection with four-digit mode codes to access calibration and configuration options																										
Calibration																											
<b>Sensor Standardization Options</b>	<i>Calibration by Cell Factor:</i> 0.100 to 19.99 <i>Calibration by Transfer Ratio:</i> 1.00 to 99.99 <i>Zero Point Air Calibration:</i> ± 0.5 mS/cm offset (low conductivity measurements) Calibration by Standardizing Solution																										
<b>Test Mode</b>	Resistance measurement by use of fixed resistor temporarily inserted through the sensor bore.																										

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>	14 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 3 – 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 and IP 65
<b>Cable glands</b>	3 breakthroughs for Pg 13.5 2 breakthroughs for NPT 1/2" or Rigid metallic conduit
<b>Weight</b>	Approximately 1 kg (2.2 lb.)

Area Certifications / Compliances	
Approvals	FM Class 1, Div. 2, Groups A-D
Data Retention	Parameters and calibration data > 10 years (EEPROM)
RFI Suppression / Immunity to ESD	To EN 50 081-1 and EN 50 081-2
Ambient Conditions	<i>Operation/Environmental temperature:</i> (T4) -20 °C to +55 °C (-4 °F to +131 °F) (T6) -20 °C to +40 °C (-4 °F to +104 °F)  <i>Transport and Storage temperature:</i> -20 °C to +70 °C (-4 to +158 °F)

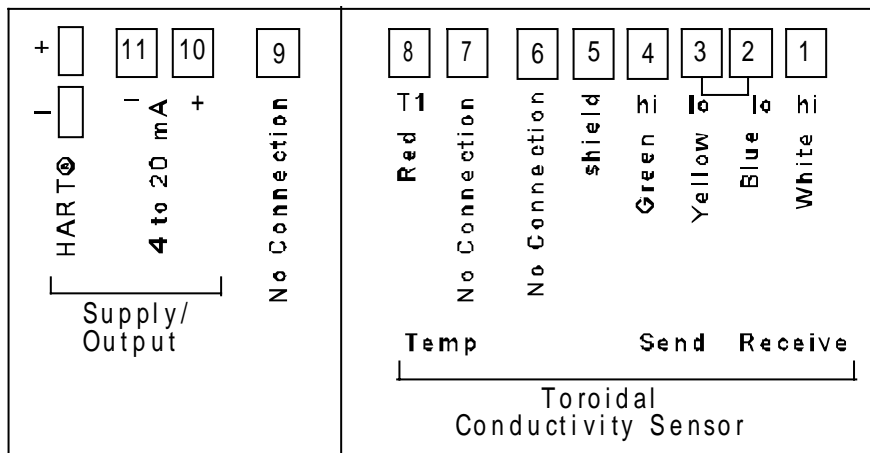


Figure 4 – APT2000TC Terminal Assignments

# Model Selection Guide

## 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 Glass Electrodes: Internal pre-amp used Durafet II Electrodes: Cap adapter is required Toroidal (Electrodeless) Conductivity Contacting Conductivity	APT 2000 PH  APT 2000 TC 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 CENELEC EEx ib [ia] IIC T6/T4	IS	•	•	•

**TABLE III - Optional Equipment**

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

## Accessory Parts

Accessory Parts	Part Number
Mounting Kits (ordered separately from Transmitter)	
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

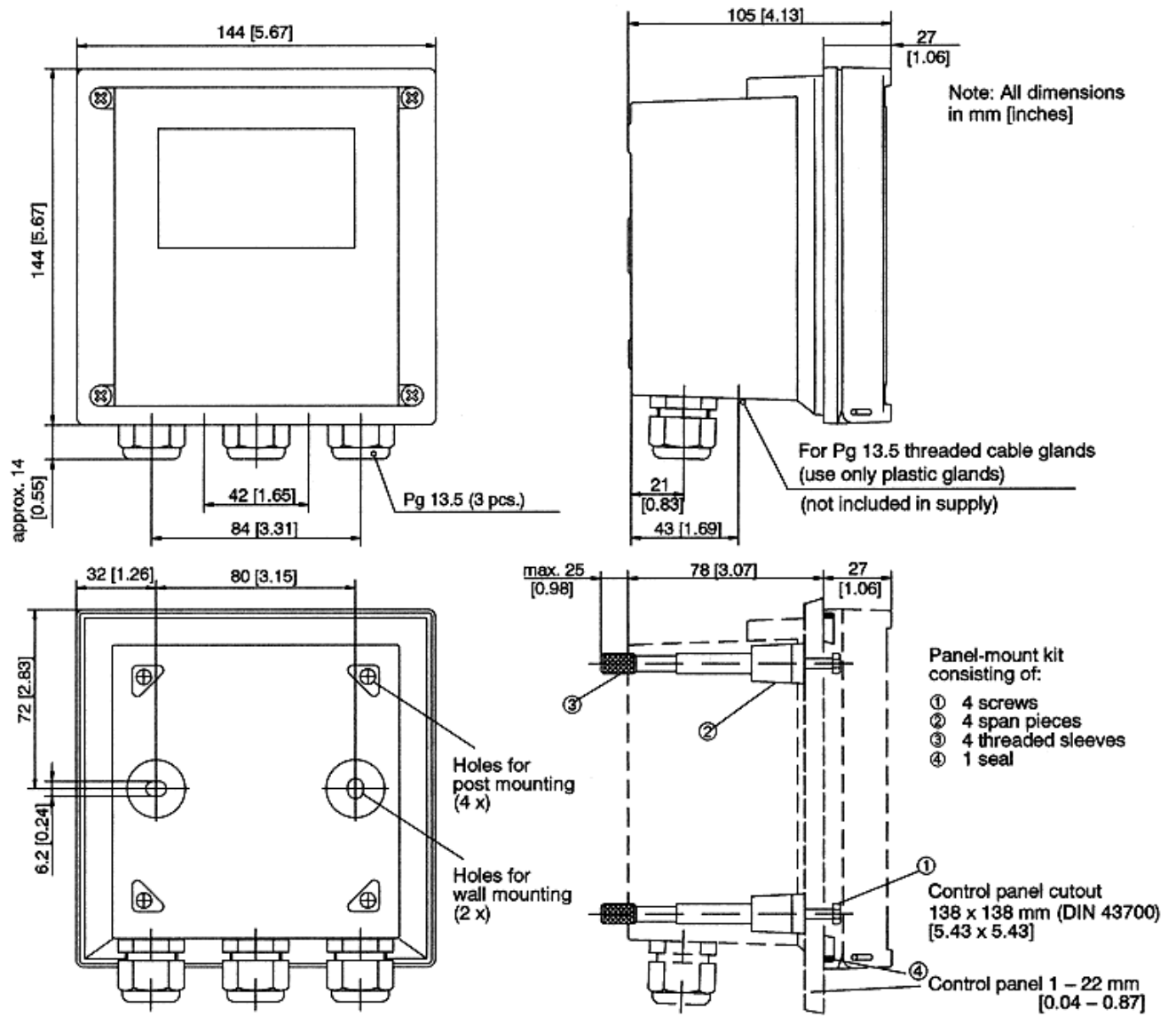
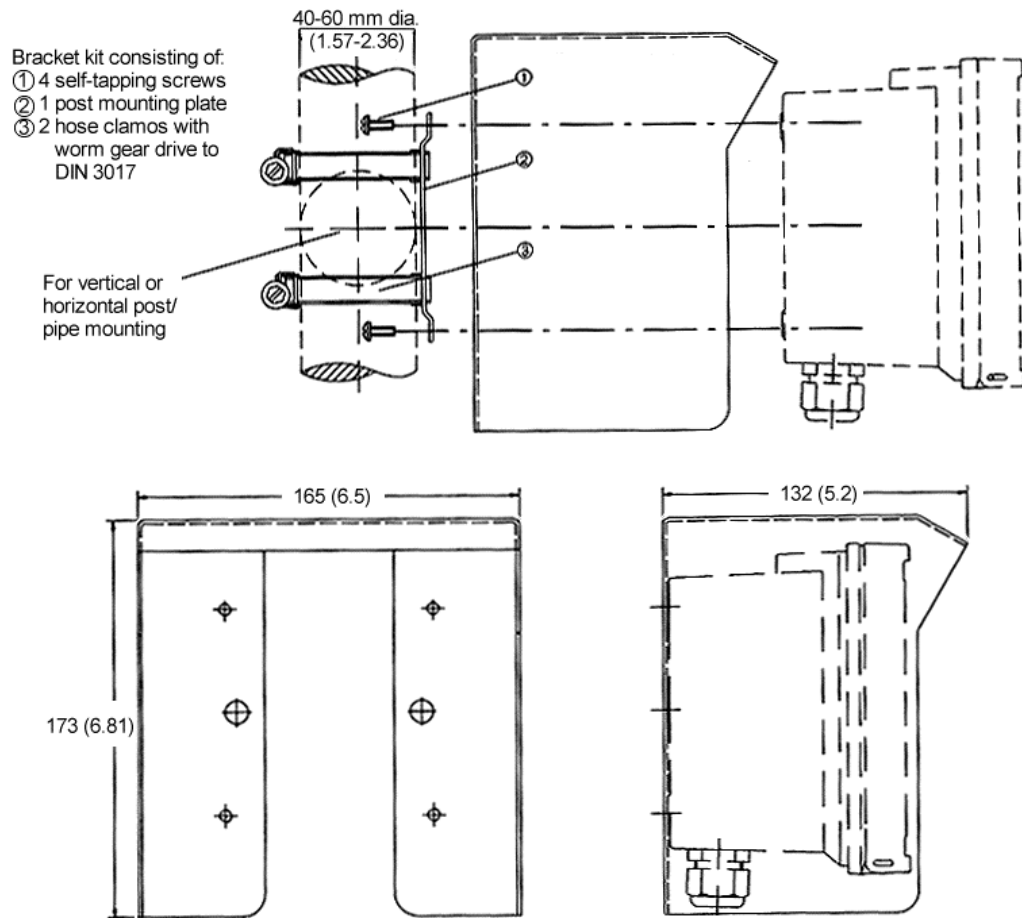


Figure 5 – Dimension Drawing for APT2000 and P/N 51205990-001 Panel Mounting Kit





**Figure 6 – 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.

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