

Durafet[®] III pH Electrode with Vario Pin Connector

Operator's Manual

70-82-25-115

Rev. 1
1/04

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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.

Industrial Measurement and Control

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About This Document

Abstract

The purpose of this manual is to support the installation, operation, and maintenance of the Durafet® III pH Electrode with Vario Pin Connector. The electrodes are designated by the following Part Numbers:

Part Number	Description
51453503-001	3/4" NPT body, in-line, mounting (no sensor guard), 8550 ohm temperature sensor, KCl reference fill, Viton media seal
51453503-005	3/4" NPT body, immersion, mounting (with sensor guard), 8550 ohm temperature sensor, KCl reference fill, Viton media seal
51453503-002	3/4" NPT body, in-line, mounting (no sensor guard), 1000 ohm RTD temperature sensor, KCl reference fill, Viton media seal
51453503-006	3/4" NPT body, immersion, (with sensor guard), 1000 ohm RTD temperature sensor, KCl reference fill, Viton media seal

Revision Notes

The following list provides notes concerning all revisions of this document.

Rev. ID	Date	Notes
1	1/04	This is the initial release of this manual. The basis for this manual was from the Honeywell manual 70-82-25-87 Rev 1.

Contacts

World Wide Web

The following lists Honeywell's World Wide Web sites that will be of interest to our customers.

Honeywell Organization	WWW Address (URL)
Corporate	http://www.honeywell.com
Industrial Measurement and Control	http://www.honeywell.com/imc

Telephone

Contact us by telephone at the numbers listed below.

	Organization	Phone Number	
United States and Canada	Honeywell	1-800-423-9883	Tech. Support
		1-888-423-9883	Q&A Faxback (TACFACS)
		1-800-525-7439	Service

Symbol Definitions

The following table lists those symbols used in this document to denote certain conditions.

Symbol	Definition
	This CAUTION symbol on the equipment refers the user to the Product Manual for additional information. This symbol appears next to required information in the manual.
	WARNING: risk of electrical shock. This symbol warns the user of a potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 VDC may be accessible.
	ATTENTION, Electrostatic Discharge (ESD) hazards. Observe precautions for handling electrostatic sensitive devices
	Protective Earth (PE) terminal. Provided for connection of the protective earth (green or green/yellow) supply system conductor.
	Functional earth terminal. Used for non-safety purposes such as noise immunity improvement. NOTE: This connection shall be bonded to protective earth at the source of supply in accordance with national local electrical code requirements.
	Earth Ground. Functional earth connection. NOTE: This connection shall be bonded to Protective earth at the source of supply in accordance with national and local electrical code requirements.
	Chassis Ground. Identifies a connection to the chassis or frame of the equipment shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.

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1. Introduction

1.1 Overview

The Honeywell Durafet® III Series of industrial electrodes has been designed to provide accurate and stable pH measurements for a wide variety of industrial applications. The Durafet III pH electrode is a non-glass pH electrode. The pH measurement is based on ISFET (Ion Selective Field Effect Transistor) technology, which results in a solid state pH-sensing electrode. The Durafet pH electrode is more rugged than the traditional glass pH electrode. The practically unbreakable pH electrode reduces replacement and inventory costs. The solid state sensing element is packaged in a durable Ryton® body that results in a pH electrode that has extended life in a wide variety of process conditions. The ISFET technology also produces an electrode that is up to 10 times faster than glass electrodes. This fast response improves product quality and provides better process control to optimize chemical usage.



1.2 Description

Durafet III pH electrodes are available in a number of designs to meet customer application and installation needs. There are two basic designs in a 1" diameter body. The 1" diameter electrode has a 3/4" NPT thread at both ends. The electrode is available as a combination electrode. A temperature sensor is mounted internal to the electrode to measure process temperature and provide a temperature signal for automatic (Nernstian) temperature compensation. Two temperature sensors are available: 8550 ohm thermistor, and 1000 ohm RTD. The electrodes come with a Vario Pin for separate cable connection. The Durafet III pH electrode is compatible with various pH instrumentation:

- DirectLine® Model DL421 with Durafet remote cable
- Honeywell 7082 and 9782 Series pH Analyzers with Cap Adapter.
- APT2000/4000 Series with Cap Adapter.
- Non-Honeywell instruments with Cap Adapter. Contact your Honeywell sales consultant for a list of instruments with this compatibility.

1.3 Compatibility

Cap Adapter

The Durafet III Series Electrode is compatible with the Cap Adapter conditioning module. This module is mounted integral with the electrode cable. The Cap Adapter eliminates mounting of a separate preamplifier. It also eliminates maintenance on a separate component. Separate cables with the integral Cap Adapter are:

- 51453388-001, 20-foot cable with Cap Adapter
- 51453388-002, 50-foot cable with Cap Adapter

These cables have a connector at one end to mate with the Durafet III electrode connector. The other end has tinned leads to connect to the pH instrument.

DirectLine pH Modules

The Durafet III Series Electrode is compatible with DirectLine pH modules, Model DL421, only as a remote electrode. There is no integral Durafet III electrode. To use a Durafet III electrode with a DirectLine Module you must use one of the following Durafet cables:

- 51453225-001 20-foot remote sensor cable
- 51453225-002 50-foot remote sensor cable

1.4 Automatic Temperature Compensation Considerations

The temperature sensor is located approximately 1/2" above the sensor tip. The electrode body should be immersed at least 1" into the process to achieve the best temperature measurement. If process temperature changes abruptly, a small transient error in pH value may result from temperature lag.

1.5 Connections

Electrical connections to electrode to instrument are dependent upon the electrode and measuring system used. Connections are described in the appropriate electrode mounting or instrument manuals.

ATTENTION



ESD sensitive devices inside cap adapter and Durafet III electrodes.

1.6 Calibration

For calibration procedures, refer to the instrument manual for the instrument you are using with the electrode. For best results, Durafet III electrodes should be calibrated periodically.

1.7 Restrictions

Avoid using the Durafet III series pH electrode with these chemicals and applications:

- Hydrofluoric acid
- High purity water (<10 $\mu\text{S}/\text{cm}$)
- Hot caustic (see Figure 1-1 below)

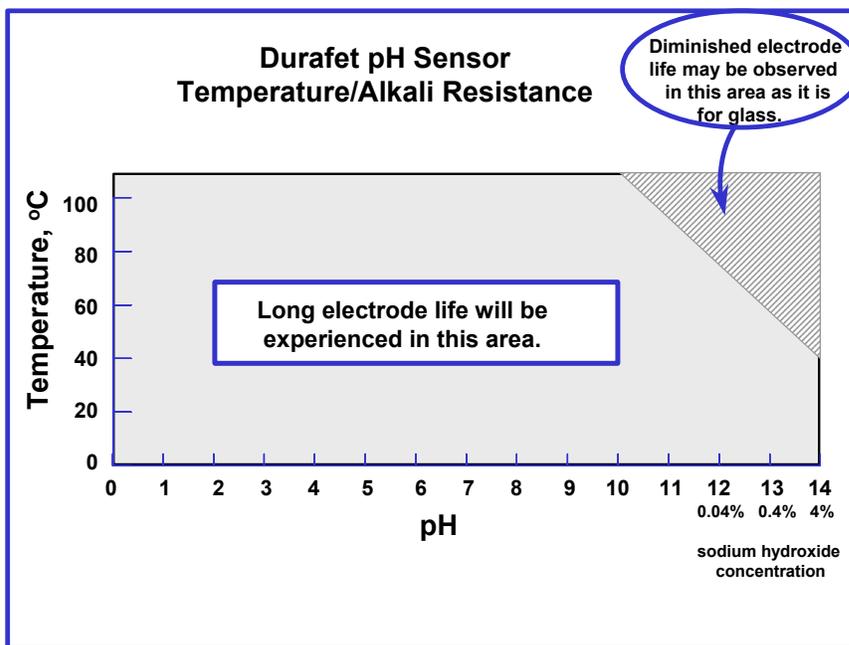
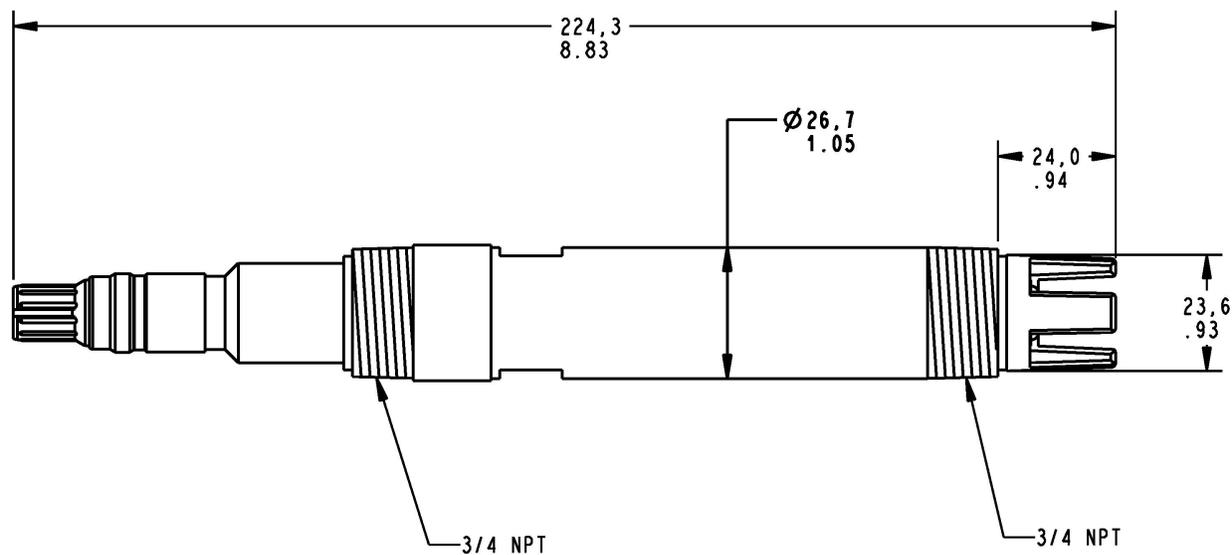


Figure 1-1 Temperature vs. Alkali Resistance

2. Specifications

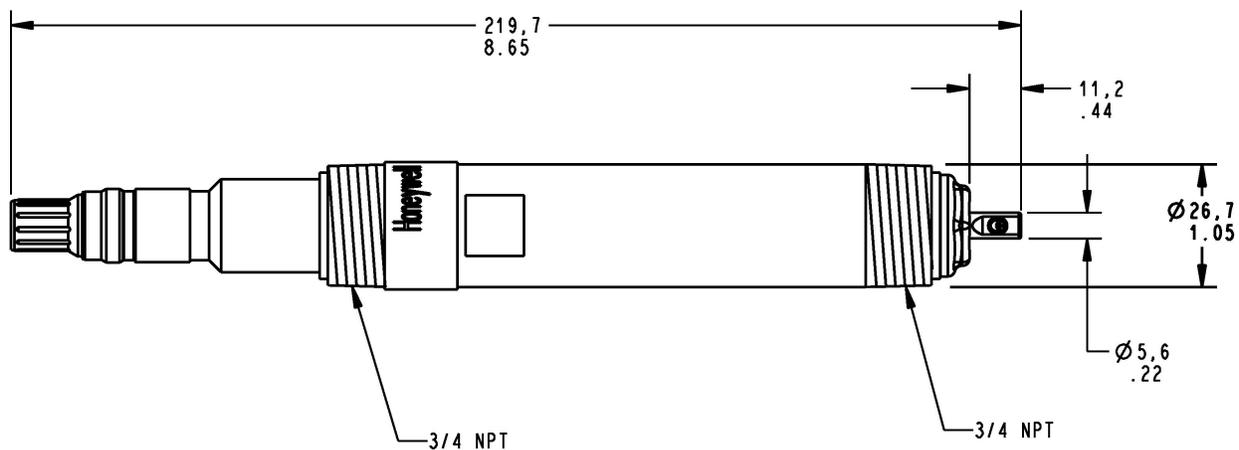
Operating Range	0-14 pH
Operating Temperature Range	-10 °C to 110 °C
Maximum Process Pressure	50 psig @ 100 °C 100 psig @ 50 °C
Body	Glass-filled polyphenylene sulfide, PPS (Ryton®)
Weight	0.23 kg (0.5 lb.)
Internal Reference	Silver-silver chloride gel-filled diffusion type
Temperature Compensation	Automatic
Cable Connection	11-pin Vario Pin Connector
Materials in Contact with Process Solution	PPS, high alumina ceramic, silicon, viton, EPDM

3. Electrode Dimensions



mm
inches

Figure 3-1 Guarded Tip Dimensions



mm
inches

Figure 3-2 Smooth Tip Dimensions

4. Electrode Preparation

4.1 Unpacking

To safely unpack your Durafet III Electrode, use the following procedure:

1. Carefully remove the electrode from the shipping carton.
2. Remove the plastic storage cap from the sensing end.
3. The fluid inside the cap is water. The water protects the porous reference junction from drying during shipment and storage.
4. Keep the black anti-static cap over the electrical connection end until you are ready to connect the electrode cable.
5. Save the black connector cap for ESD protection whenever the electrode cable is disconnected.
6. Any excess salt crystals on the sensor can be removed by placing the electrode under warm tap water until dissolved. If electrical connector end is wet, wipe dry before connecting to cable.

4.2 Precautions

- Do not allow liquids or other foreign matter to contact the cable connectors. Leave the protective cap in place on the electrode connector whenever the cable is not installed on an electrode.
- Avoid touching sensor area. Pressure applied to this area could damage the sensor.
- Avoid contaminating electrical connector contacts. Contamination can result in electrical leakage paths that affect the accuracy of pH measurements.
- Always replace the plastic storage cap over the sensor when the electrode is not in use. *Be sure to reinstall the anti-static connector cap whenever the electrode is removed from service.* Ensure that the plastic storage cap is filled with water.
- Remove the reference junction assembly only if gel replacement is necessary.
- Do not expose the electrode to hydrofluoric acid.
- The sensor will have a reduced service life in processes that use high temperatures in combination with alkaline conditions. Do not install electrodes where temperatures go below $-10\text{ }^{\circ}\text{C}$ ($+14\text{ }^{\circ}\text{C}$) or freeze damage may result. Observe upper temperature limit specifications.
- In abrasive process streams, the electrode should be oriented so that the sensor surface faces downstream. In oily process streams, orient the sensor so that it faces 90° to the process flow. For Durafet III electrodes the “H” of the Honeywell logo on the label is aligned with the sensor.
- Promptly remove any water that might inadvertently come in contact with the electrode connector or cable connector. Blow drying with clean, low-pressure (15 psi) instrument air is a simple and effective means for drying the connector(s).

4.3 Cable Connection

Make sure electrode connector and cable connector are clean and dry. Align key way on VarioPin connector of electrode with tab inside mating connector on cable. Press cable connector onto electrode firmly. Tighten knurled bushing of cable connector by hand to ensure waterproof seal.

5. Shelf Life and Storage

5.1 Description

Periodic maintenance is required to ensure that the electrode does not dry out after prolonged shelf storage. Stored electrodes should be checked every 6 months to ensure that the water is still in the storage cap.

The procedure below should be performed once per year for stored electrodes.

1. Remove the electrode from its storage box and remove the plastic cap from the sensing end.
2. Remove any excess crystals on sensor area by rinsing with warm tap water.
3. Refill the cap with distilled water.
4. Replace the cap on the electrode.
5. Place electrode in its storage box.
6. Mark the date on the box.

ATTENTION

Do not store electrode at or below $-10\text{ }^{\circ}\text{C}$ ($+14\text{ }^{\circ}\text{F}$) or above $50\text{ }^{\circ}\text{C}$ ($122\text{ }^{\circ}\text{F}$)

6. Cleaning

6.1 Overview

The frequency of cleaning is dependent on process conditions. Some process materials tend to adhere to the sensor and could interfere with the accuracy or time response of measurements. Note the following information before attempting to clean your electrode.

- Remove the electrode from service.
- Disconnect the cable from the electrode.
- Install anti-static electrode connector cap.
- Placing the electrode under flowing warm tap water will normally remove loose or lodged debris.
- Oil deposits can be removed using a household detergent (Joy or Windex) or a laboratory detergent (Micro or Sparkleen).
- The PPS electrode body can be cleaned with almost any cleaning agent.
- Use dilute hydrochloric acid or other dilute acid to clean mineral scaling off the sensor. After cleaning, rinse thoroughly in distilled water. Allow it to soak for an hour in a neutral buffer (i.e. - 6.86 pH buffer, Honeywell Part Number 31103002).
- The sensor area can be wiped gently with a soft wet cotton swab.

The procedure outlined below should be performed if the reference electrode junction is clogged or dried.

1. Remove the storage cap from the electrode (if necessary) for the cleaning process.

ATTENTION

For P/N 51453503-005 and -006 do not remove the slotted tip.

2. Immerse the end of the electrode for one hour in tap water at approximately 90 °C.

If the procedure outlined above does not fully unclog the reference electrode junction, perform the following additional steps.

3. Place the electrode in a beaker of saturated potassium chloride (KCl) solution and heat to boiling.
4. Remove from heat and allow the electrode to soak in this solution until it cools to room temperature.

7. Accessories and Replacement Parts

Description	Part Number
Accessories	
NIST Buffer – 4.01 pH	31103001
NIST Buffer – 8.86 pH	31103002
NIST Buffer – 9.18 pH	31103003
Reference Gel refill kit	51205807-002
Replacement Parts	
Guarded Electrode Tip (immersion) <i>see Figure 7-1, item 1</i>	51204992-001
Smooth Electrode Tip (In-line) <i>see Figure 7-1, item 2</i>	51204993-001
Frit O-Ring (small) <i>see Figure 7-1, item 3</i>	51198302-001
Frit O-Ring (large) <i>see Figure 7-1, item 4</i>	31074364
ESD Protective cap <i>see Figure 7-1, item 5</i>	51500474-003

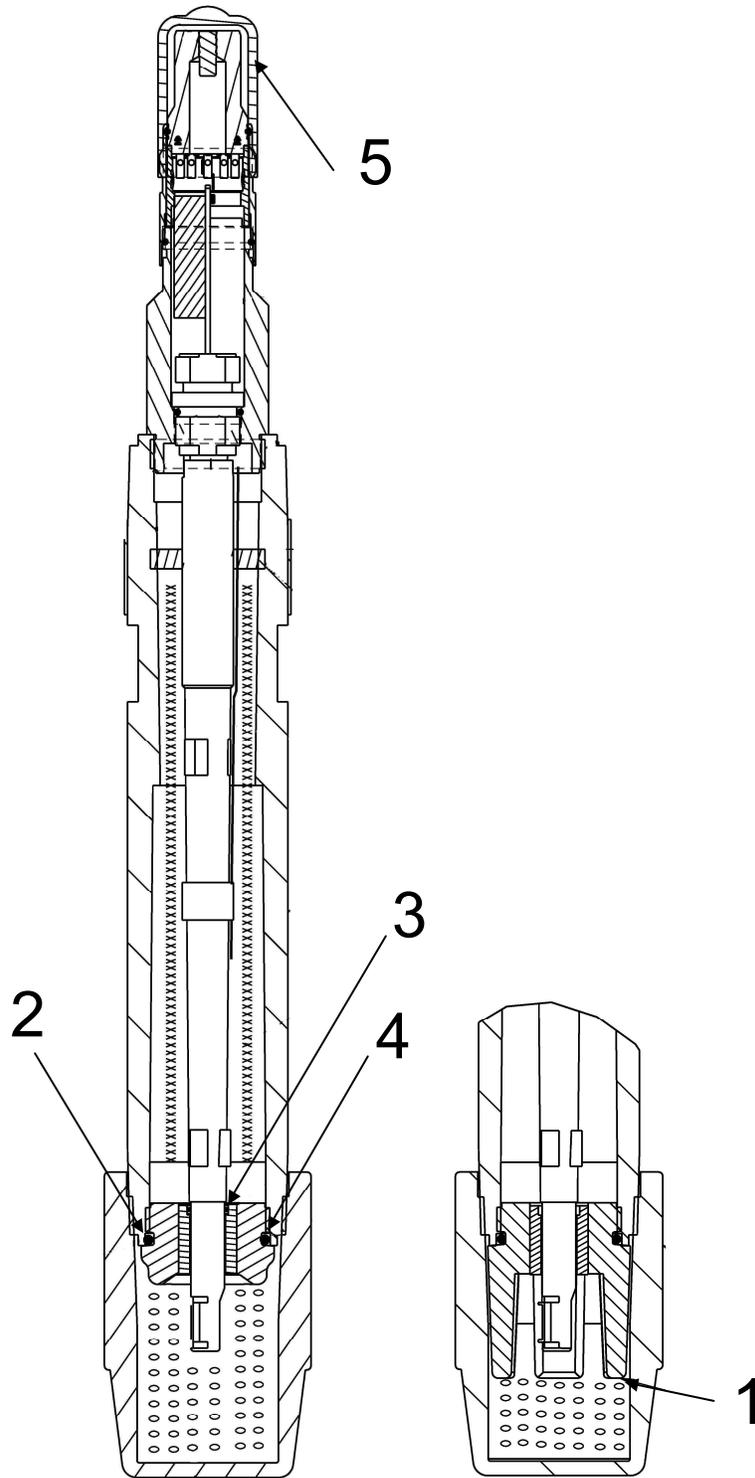


Figure 7-1 Durafet III parts

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