Introducing the Foxboro Smart pH Family

Dolphin PH10 Sensor

876PH Transmitter
Overview

> New Smart pH Sensor
  > Based on field proven PH10 DolpHin design
  > Sensor has electronics which converts signals to digital and provides memory
  > Smart sensor is used exclusively with new pH transmitter

> New pH Transmitter
  > Based on field proven 876PH design
  > Loop powered, two-wire transmitter with HART communications
  > New pH transmitter is used exclusively with Smart pH sensor
DolpHin PH10 Smart pH Sensor

- Smart electronics inside the sensor
- Spherical and flat glass pH electrodes
- Built-in temperature compensation
- Double junction reference using Nafion ion barrier
- PVDF (polyvinylidene fluoride, commercially known as Kynar) body with no metallic wetted parts
- 121 °C (250 °F), 6.9 bar (100 psi)
- Mounting accessories include bushings, insertion assemblies, flow chambers and more
Sensor Features

> Field proven measurement system since 2002
> Rugged PVDF* sensor body
> No metallic wetted parts, including solution ground
> Built-in solution ground is standard
> Flat, ruggedized pH electrode
> Double junction reference using Nafion ion barrier

*Polyvinylidene fluoride, commercially known as Kynar
Sensor Features

> Fast temperature response and accurate temperature compensation due to proximity of RTD near electrodes/process
> Easy to install, maintain and replace
> Easy, fast, reliable calibrations
> Long life in high temperature service
> Ideal for chemicals, pulp & paper, textiles, other high temperature
Sensor Construction

1. Nafion tube with internal reference junction
2. High temperature gel
3. RTD and solution ground assembly
4. Ceramic reference junction
5. Unique glass pH electrode
Easy to Install, Maintain and Replace

> Disposable type sensor
> Universal bore piece mounting design eliminates cable wind-up
> One sensor model fits all mounting accessories

> Smart Connector
> Avoids replacing sensor cable
> Avoids opening analyzer
> Avoids using tools
The Foxboro Brand Advantage

> Rugged PVDF sensor body

> Conductive, nonmetallic (PVDF) solution ground

> Flat, ruggedized pH electrode

> Double junction reference using Nafion ion barrier

> Built-in solution ground is standard
Nafion Reference Junction

- Silver ion combines with chloride to form negatively charged complex
- Negatively charged species cannot cross the membrane
- Silver compounds cannot clog the outer reference junction
Delivering Measurement Value

> Lower cost of ownership compared to other Smart pH sensors

1. Lower maintenance costs

2. Longer service life

Finally, a Smart pH sensor that is also robust
Delivering Measurement Value

> Lower cost of ownership compared to other Smart pH sensors

1. **Lower maintenance costs**

   > Unique *Nafion* ion barrier prevents reference junction fouling and **reduces the need for cleaning**
   > Enhanced Smart diagnostics **reduce the amount of time** required to assess sensor health
   > Unique sensor mounting design provides **faster insertion and removal** from the process
   > No glass sensor body and a flat, rugged electrode result in **reduced breakage** during handling

   **Finally, a Smart pH sensor that is also robust**
Delivering Measurement Value

> Lower cost of ownership compared to other Smart pH sensors

2. Longer service life

> Rugged PVDF sensor body is chemical and abrasion resistant, resulting in longer life
> No metallic wetted parts results in corrosion resistance and longer life in strong chemical solutions
> Unique pH electrode formulations, both flat glass for abrasion resistance and domed glass for high temperature service, provide long life, as proven in thousands of installations

Finally, a Smart pH sensor that is also robust
876PH Smart pH Transmitter

- Enclosure meets IP66 and NEMA 4X
- Two-wire loop powered intelligent transmitter
- 4 to 20 mA output with HART
- Transmitter and sensor diagnostics
- Intrinsically safe for Zone 0 applications
- FDT certified DTM
- HART Device Description (DD) and HART AMS package
Transmitter Features

> Sensor and Transmitter Diagnostics
  > Examples: broken glass and coated reference
  > Allows maintenance to be better managed

> Save and Restore Configurations
  > Up to two unique configuration profiles can be saved

> Easy Configurability
  > Alphanumeric keypad for local configuration
  > DTM provides easy PC configuration and easy cloning of configurations for multi-device installations
The Foxboro Brand Advantage

- Unique user interface with both alphanumeric and navigational controls
- Fast and easy data entry
- Calibration values, tag data, passcodes

- Ability to save and restore up to two sets of user defined configuration profiles
Sensor Management Using PC

- Optional USB patch cord connects sensor to PC
- Device Type Manager (DTM) Software is Field Device Tool (FDT) Group certified
- Sensor can be calibrated and its history log read and saved to a file
- Simplifies sensor calibration and diagnostic checking
Calibrate

Warning: Loop should be removed from automatic control.

**Calibration Setup**

- **Date of Calibration**: 23/01/2015
- **Name of Operator**: Katy
- **CalLinc**: Measurement
- **Number of Calibration Points**: 2
- **Type of Calibration**: Manual

Field Devices
Sensor History Log

Sensor History Log

Sensor Overview
Process Variables
- Sensor Configuration
  - General
  - Measurement
  - Temperature
  - Temperature Compensation
  - Diagnostic Configuration
  - Passcode Access
- Calibration
- Parameters
- Calibrate
- Faults
- Sensor History Log
- Sensor Status
  - Configuration Report
- Reference
  - Activity Log
  - Scratch Pad
  - Trending

Sensor History Saved Files List

Saved Sensor File Names: .csv

Export History File

Save as type: .csv,.csv

File name: Sensor History Export File

Save as: Yes

Date modified: 1/2/2015 4:14 PM
Type: File folder
Size: 1 KB

Date modified: 1/2/2015 12:48 PM
Type: File folder
Size: 1 KB

Date modified: 1/2/2015 4:10 PM
Type: Microsoft Excel
Size: 1 KB

File name: Example Sensor History File

Save as: Yes

Date modified: 1/2/2015 4:10 PM
Type: Microsoft Excel
Size: 1 KB
Why Buy Foxboro?

> 24/7 Technical Assistance Center provides answers to your questions when you need them
> Easy to use loop powered transmitters and line powered analyzers
> Deep domain knowledge in the industry segments of chemicals, power, paper, mining, food and more
> Broad range of rugged sensor solutions for pH, conductivity, resistivity and dissolved oxygen
  > Wide range of materials, sizes, geometries
  > Wide range of mounting methods and accessories
> World class, worldwide support and delivery
  > All the major certifications – FM, CSA, IECEX, ATEX, NEPSI and more
Glass Lab & Sensor Manufacturing in Foxboro, MA
Questions?
Customer Problem: Largest source of measurement error in electrochemical systems comes from an imperfect field system calibration

- Not allowing readings to stabilize
- Performing single point calibration when a two point calibration is called for
- Calibrating with a sensor which is approaching end of life
- Using calibration solutions whose temperatures are changing

Solution: Mitigate by performing a calibration under controlled conditions

- Perform the sensor calibration in an instrument shop, not in the field
- Smart Sensor stores its calibration parameters in an on-board memory chip
- Smart Sensor’s calibration gets uploaded to the field transmitter upon connection
- Result: Easier, faster and more reliable field calibration
Other Benefits of Smart Technology

> Digital signal from sensor less prone to RFI/EMI interference than conventional analog signal
> More efficient sensor management
  > Sensor can be connected directly to a PC, making the user experience easier and faster
  > A sensor that is trending toward end of life can be decommissioned in the instrument shop before reinstalling it in the process
  > A sensor that is healthy does not have to be serviced unnecessarily
> Less time is spent in the process areas, so a safer solution
> Easier reordering due to storage of model code in sensor memory
## What’s Different

<table>
<thead>
<tr>
<th></th>
<th>Conventional</th>
<th>Smart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor Signal</td>
<td>Analog</td>
<td>Digital</td>
</tr>
<tr>
<td>Termination</td>
<td>Integral cable or Variopin connector</td>
<td>Plastic connector with 3 pin connections</td>
</tr>
<tr>
<td>Cable</td>
<td>Thick with 6 to 9 wires</td>
<td>Thin, red with only 3 wires</td>
</tr>
<tr>
<td>Memory</td>
<td>None</td>
<td>Stores calibration and other data</td>
</tr>
<tr>
<td>Analyzers</td>
<td>Many types</td>
<td>Only new 876PH-S transmitter</td>
</tr>
<tr>
<td>Calibrate</td>
<td>Analyzer or transmitter</td>
<td>PC or transmitter</td>
</tr>
<tr>
<td>Diagnostics</td>
<td>Many</td>
<td>All previous and sensor calibration time</td>
</tr>
<tr>
<td>Cables</td>
<td>Standard and high temperature</td>
<td>One for all applications</td>
</tr>
<tr>
<td>Terminal Strip</td>
<td>Eleven positions</td>
<td>Three positions: 2 used (power+ and power-)</td>
</tr>
<tr>
<td>History Logs</td>
<td>One</td>
<td>Two</td>
</tr>
<tr>
<td>Real-time Clock</td>
<td>None</td>
<td>Included</td>
</tr>
</tbody>
</table>
What’s the Same

> Same sensor construction and wetted parts
> Same selections of electrodes
> Same mounting accessories for the sensor
> Same enclosure for transmitter
## Sensor Status Parameters

| Measurements – absolute, temperature, temperature compensated measurement |
| Glass and reference resistance |
| Time in service |
| Slope and asymmetry |
| Sensor response time |
| Calibration date, operator, low and high points |
| Firmware version |
| Model code |
| Serial number |
| Sales order number |
| Date of manufacture |

**Dynamic, live**

- All these items are readable directly from the sensor.

**Updated after calibration**

- Loaded at the factory

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Field Devices

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New Status Parameter – Sensor Calibration Time

> New feature not previously available
> Can be used as another predictive diagnostic to indicate coating or aging
> Sensor calibration time is measured from the time the user presses “enter” on the second calibration solution to the time the sensor reaches stability. Stability is a user programmable parameter, and can be set over a wide range, depending on how precise the user wishes the calibration to be.

<table>
<thead>
<tr>
<th>Status</th>
<th>Cal Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calibration Response</td>
<td>Stability</td>
</tr>
<tr>
<td>33 Seconds</td>
<td>100.0%</td>
</tr>
<tr>
<td>Min: 1 Max: 500</td>
<td>25.0 to 1000.0</td>
</tr>
<tr>
<td>Response Time Value</td>
<td>Calibration Stability</td>
</tr>
</tbody>
</table>
History Logs

- **Diagnostic**
  - View Faults
  - History Log
  - Sensor History
    - (Yes/No)
  - Suspend Faults
    - (Yes/No)
  - Resume Faults
  - Save Config 1
    - (Yes/No)
  - Save Config 2
    - (Yes/No)

- **History Log**
  - All History Logs
  - Calibration Log
  - Error Log
  - Operation Log
  - Clear History

- **Sensor History Log**
  - All Sensor History
  - Calibration Log
  - Sensor Error Log
  - Operation Log
  - Clear History

Includes cal lo, cal hi, meas and ref resistance, sensor response time

Includes event of sensor connection
Foxboro pH Sensor Range

- PH10 Analog and Smart
- PH12
- 871PH
- 871A
- EP462A