# ProCon® — P14 Series with NEXUS®
## pH Sensor Transmitter Operating Manual

ICON PROCESS CONTROLS™ Corrosion-Free Instrumentation Equipment


0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

| Ultra-pure H2O | General | Complex | HF < 1000ppm | HF > 1000ppm | Seawater | Desulfurization |
|---|---|---|---|---|---|---|
| P14P | P14G | P14C | P14H | P14F | P14S | P14D |

Industrial Analytical Equipment

SimplCal® NEXUS® SimplConnect™ Cable Grip Connectors

## Preface

Please read this manual carefully before use.

Only properly skilled authorized personnel should carry out installation, setup and operation. Ensure that the power cable is physically separated from the power supply during the initial wiring connection or repair.

**For example,**

1. Apparent damage to the sensor
2. The sensor does not work properly or provides specified measurements
3. The sensor has been stored for a long time in an environment where the temperature exceeds 70°C

**Warning | Caution | Danger**
Indicates a potential hazard. Failure to follow all warnings may lead to equipment damage, injury, or death.

**Note | Technical Notes**
Highlights additional information or detailed procedure.

**Hand Tighten Only**
Over tightening may permanently damage product threads and lead to failure of the retaining nut.

**Do Not Use Tools**
Use of tool(s) may damage produced beyond repair and potentially void product warranty.

**Personal Protective Equipment (PPE)**
Always utilize the most appropriate PPE during installation and service of Truflo products.

## Safety Information

- De-pressurize and vent system prior to installation or removal
- Confirm chemical compatibility before use
- **DO NOT** exceed maximum temperature or pressure specifications
- **DO NOT** alter product construction
- **ALWAYS** wear safety goggles or face-shield during installation and/or service

## Preparation before measurement

**Important**

**Be sure to calibrate your sensor prior to use.**
**Please refer to the operating instructions of your ProCon® Controller for calibration details.**

Connect the wires from the sensor to the appropriate ProCon® controller. All ProCon® pH sensors come with an internal PT1000 temperature electrode. Refer to sensor wiring diagram of controller.

Prepare electrode maintenance before measurement When using the electrode, the protective bottle at the top shall be screwed off and placed at a place where it is not easy to touch. Then, the protective bottle cap shall be removed and the electrode bulb and liquid interface shall be immersed in the measured liquid.

## PH Sensor Calibration SimplCal®

1. Select two – three pH buffers, with values that are consistent with the pH value to be measured.
   USA (7.00, 4.01, 10.01) · NIST(6.86, 4.01, 9.18)
2. Unscrew the sensor protection cap and wash the sensing electrode with distilled water
3. Select the calibration mode in the controller (See manual for ProCon® SimplCal® for step by step simple instruction)
4. Insert the sensor into the first reference solution ensure the sensor tip is covered.
5. Stir
6. Wait for the reading to stabilize (60 seconds)
7. Press the Enter button on the ProCon® Controller
8. Wait until the DONE is display on screen
9. Insert sensor into 2nd, 3rd reference solutions and follow the above procedure
10. Once the sensor has been calibrated rinse with distilled water.

In order to ensure a fast response time, the electrode glass should always be kept wet. After the calibration is completed and the electrode is properly cleaned, store the sensor in a 3mol KCl Potassium Chloride solution.

**NOTE:** After use it is important to inspect the sensor glass membrane to ensure there are no deposits and the glass is transparent and not translucent. If deposits or the glass is hazy the sensor can be washed with a dilute HCL acid wash.

It is not recommended to store the sensor in distilled , or deionized water.

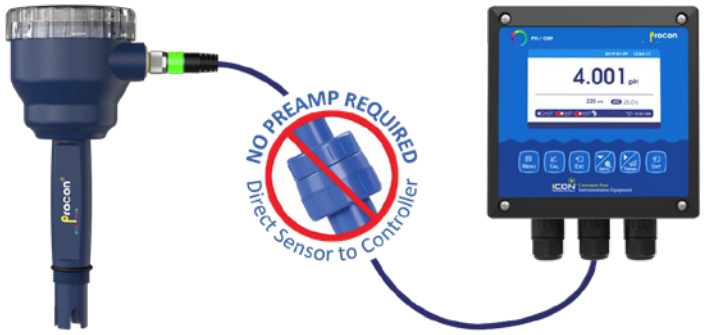
## High performance industrial pH sensor for harsh applications

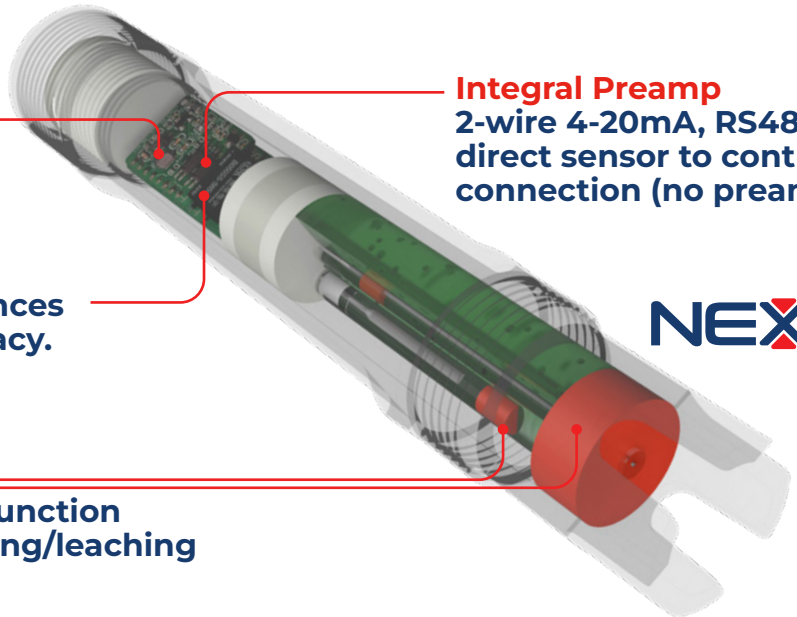
The ProCon® P14 series offers the ultimate combination of durability, functionality and long-term performance; exactly what is required for industry's most complex applications. The Nexus® reference eliminates reference poisoning. The sensors are available in flat planar or bulb style design.

All measurement functions are combined in one compact body — measuring electrode, temperature sensor and an inner reference chamber. The 2-wire 4-20mA, 4-wire or 4-20mA + RS485 output options simplify calibration and communication with remote displays and controllers..

- 4-20mA Output
- Temperature Compensated
- Nexus® Solid KCl Reference
- PP or PPS Body Materials
- RS 485 Modbus Communication
- No Preamp Required
- ¾" NPT Connection

**PREEMPT THE PREAMP**



**Enhanced chip technology allows for remote calibration as well as diagnostic data**

**Integral Preamp**
**2-wire 4-20mA, RS485 direct sensor to controller connection (no preamp)**

**Digital output — longer distances without compromising accuracy.**

**Nexus® technology**
- **Solid KCl infused reference junction**
- **Eliminates reference poisoning/leaching**
- **Extended life expectancy**

## 7 Distinct Sensors Designed for the Toughest pH Environments

| Ultra-pure H2O | General | Complex | HF < 1000ppm | HF > 1000ppm | Seawater | Desulfurization |
|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |
| P14P | P14G | P14C | P14H | P14F | P14S | P14D |

## Smart Sensor Technology

Advanced electronic circuity stores pH data for automatic sensor recognition and trouble-free calibration when connected to the ProCon® Controller.

## Outputs

1. 4-20mA 2-Wire
2. 4-20mA + RS485

Both the measuring and reference electrodes are encapsulated within the non-porous advanced KCl infused polymer known as Nexus®.

## Less Calibration and Maintenance

Most sensors require on-going recalibration and are prone to premature failure due to what is known as gradient drift, or sensor drift.

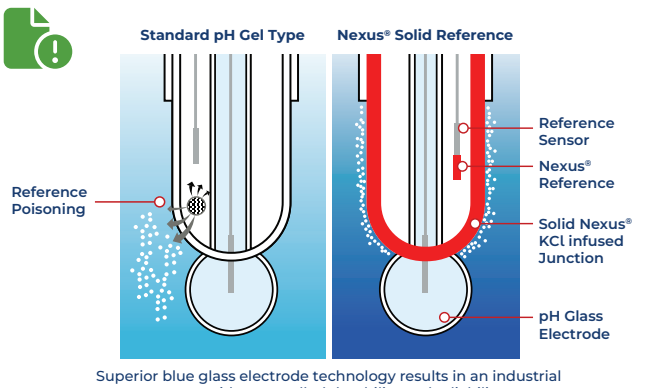
The Nexus® series is a solid reference material. Poisoning or leaching of the reference electrolyte that occurs in standard sensor is greatly reduced.

The Nexus reference helps to eliminate the need for ongoing maintenance or cleaning requirement due to fouling or film build up removal which occurs with many process applications with traditional pH sensors.

## Faster Response-Longer Lasting

The solid Nexus® reference provides for faster response time to changing pH values since there is no requirement for a junction.

- Double junction reference extends sensor life and protects against poisoning ions
- Durable crack resistant low ionic glass enhances performance and increased reliability
- Operates in sub-zero temperatures down to 14°F (-10°C)
- Advanced electronic diagnostics provides excellent repeatability and reliability



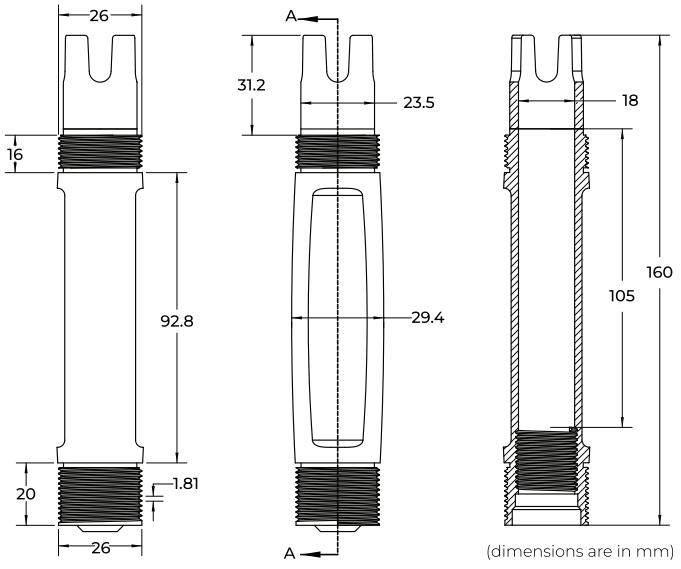
Superior blue glass electrode technology results in an industrial sensor with unequalled durability and reliability

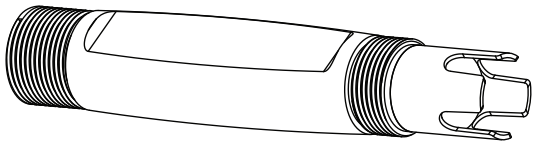
## Specifications

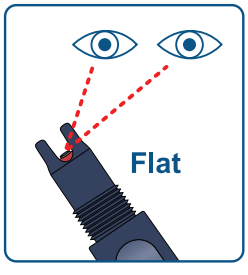
| | |
|---|---|
| **Measurement Range** | |
| pH | 0 – 14 |
| **Output Signal — No Preamp Required** | |
| 2 Wire Loop Powered \| 4-20mA + RS 485 Direct Sensor Output | |
| **Accuracy** | |
| 7.00 ± 0.25 | |
| **Operating Temperature** | |
| 14 to 176°F \| -10 to 80°C \| Automatic Temperature Compensation | |
| **Maximum Pressure** | |
| 150 Psi at 140°F (60°C) — See Pressure vs. Temp Graph | |
| **Design** | |
| Sensor body | PP Polypropylene (std) \| Ryton® \| PPS |
| Reference System | 3.3 Mol Ag / AgCl / KCl Double Junction |
| pH electrode | Blue Glass \| Bulb \| Flat |
| Reference | Solid Nexus® \| Porous Ceramic (P14G) |
| Connection | 3/4" NPT |
| Measuring Electrode Resistance | < 500 MΩ \| < 600 MΩ \| < 800 MΩ |
| Impedance Range | 102 – 675 MΩ |
| **Temperature Compensation/Output- 4-20 + RS485 Model** | |
| Pt-1000 (Std) | |
| Pt-100 | |

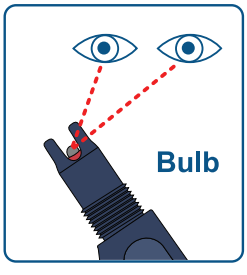
## Dimensions




(dimensions are in mm)

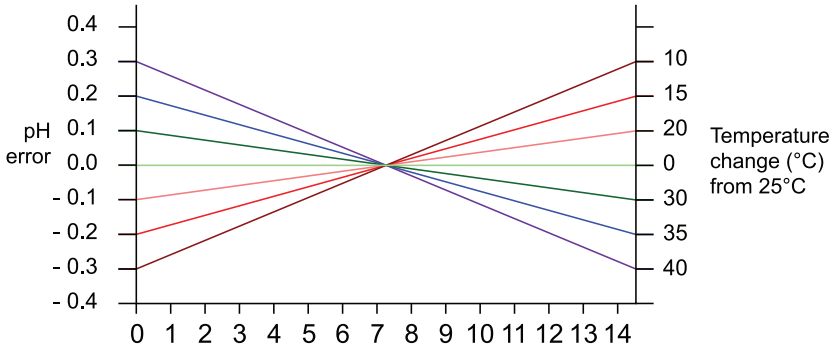




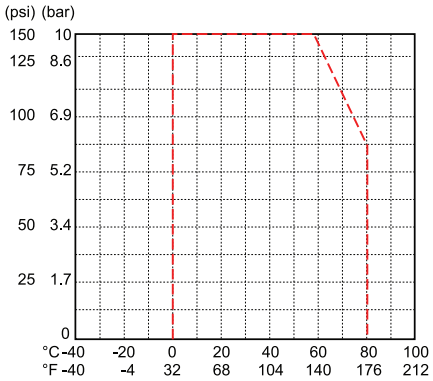



## Temperature Control

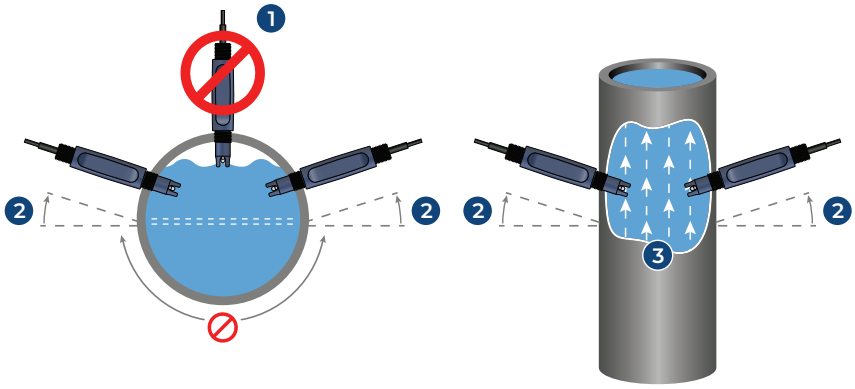



## Temperature vs. Pressure

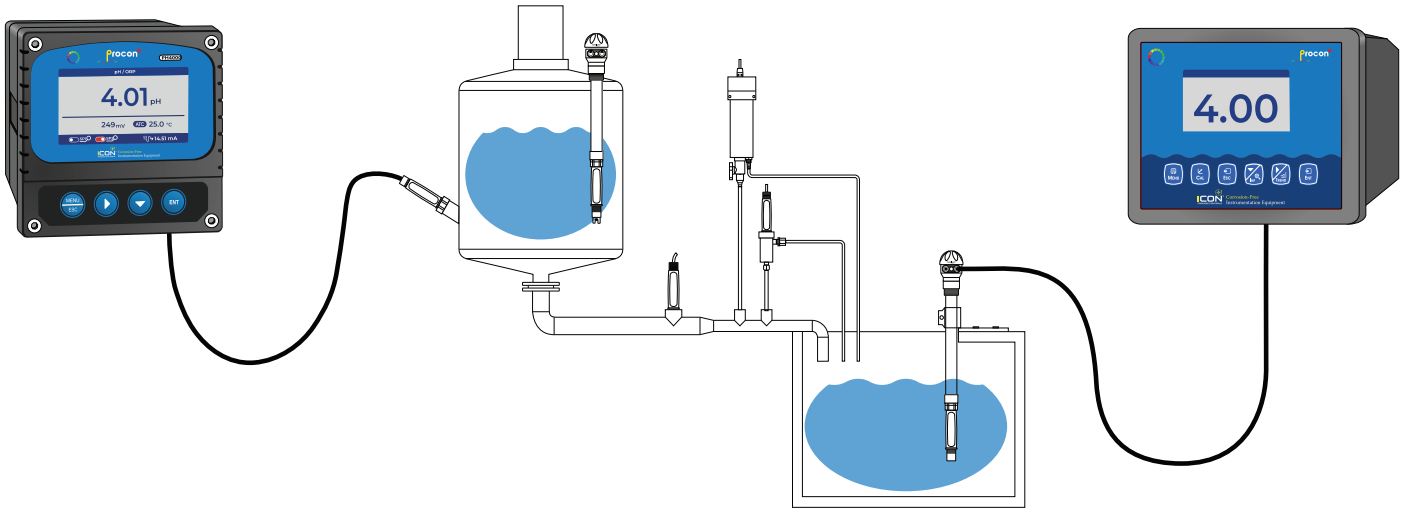



## In-line Mounting

1. Avoid vertical installation. (air may be present)
2. Optimum installation 15° above horizontal.
3. Process liquid should flow upward. (for downward flow ensure backpressure is present in order to avoid air within pipe)




## Typical Application



## Wiring — Flying Lead

### 4-20mA 2-wire

1. Blue: mA-
2. Brown: mA+

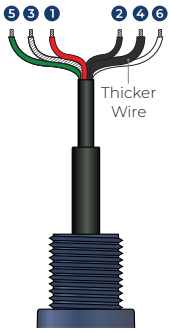

### 4-20mA 4-wire

1. Transparent: 4-20mA
2. Black (thick): Ref
3. Red: Temperature
4. Black: Temperature

Connects directly to ProCon® controller

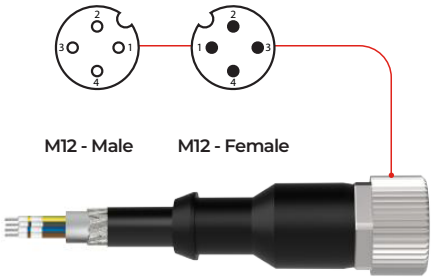

### 4-20mA + RS485 Output

1. Red: 9-24VDC +
2. Black: 9-24VDC -
3. Transparent: 4-20mA
4. Black (thick): Ref
5. Green: RS 485 A
6. White : RS 485 B

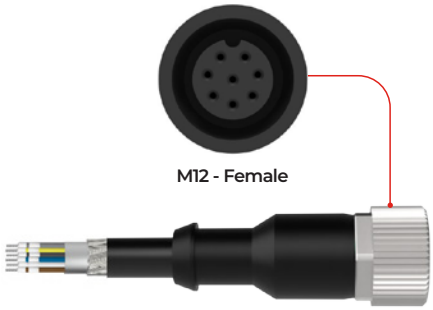



## Wiring — M12

### 4 Pin M12 Connection




### 8 Pin M12 Connection




### 4-20mA | 4 Pin

| Color | Description |
|---|---|
| Pin 1 – Brown | 4-20mA + |
| Pin 2 – Blue | 4-20mA - |
| | |
| | |

### 4-20mA + Controller | 4 Pin

| Color | Description |
|---|---|
| Red | Temperature |
| Black | Temperature |
| Black (Thick) | Reference |
| Transparent | 4-20mA |

### 4-20mA + RS485 | 8 Pin

| Color | Description |
|---|---|
| Red | 9-24 VDC + |
| Black | 9-24 VDC - |
| Transparent | 4-20mA |
| Black (Thick) | Reference |
| Green | RS485 A |
| White | RS485 B |

### 4 Pin IO - Link Connection



### I-O Link | 4 Pin

| Pin | Description |
|---|---|
| Pin 1 | 24 VDC + |
| Pin 2 | |
| Pin 3 | GND |
| Pin 4 | 4-20mA |

| P14G — General pH Sensor | | | | |
|---|---|---|---|---|
| Part Number | Material | Output | Type | Connection |
| P14G-P-D-1-F-M | PP | 4-wire (for ProCon® display) | Flat | M12 |
| P14G-P-D-1-B-M | PP | 4-wire (for ProCon® display) | Bulb | M12 |
| P14G-P-M-1-F-M | PP | 4-20mA (2-wire, std) | Flat | M12 |
| P14G-P-M-1-B-M | PP | 4-20mA (2-wire, std) | Bulb | M12 |
| P14G-P-S-1-F-M | PP | RS485 + 4-20mA | Flat | M12 |
| P14G-P-S-1-B-M | PP | RS485 + 4-20mA | Bulb | M12 |

Last digit:
“M” for M12 Connection (std)
“B” Blind (J-Box)
“F” Flying Lead

| P14C — Complex pH Sensor | | | | |
|---|---|---|---|---|
| Part Number | Material | Output | Type | Connection |
| P14C-P-D-1-F-M | PP | 4-wire (for ProCon® display) | Flat | M12 |
| P14C-P-D-1-B-M | PP | 4-wire (for ProCon® display) | Bulb | M12 |
| P14C-P-M-1-F-M | PP | 4-20mA (2-wire, std) | Flat | M12 |
| P14C-P-M-1-B-M | PP | 4-20mA (2-wire, std) | Bulb | M12 |
| P14C-P-S-1-F-M | PP | RS485 + 4-20mA | Flat | M12 |
| P14C-P-S-1-B-M | PP | RS485 + 4-20mA | Bulb | M12 |

Last digit:
“M” for M12 Connection (std)
“B” Blind (J-Box)
“F” Flying Lead

| P14H — HF < 1000ppm pH Sensor | | | | |
|---|---|---|---|---|
| Part Number | Material | Output | Type | Connection |
| P14H-P-D-F-M | PP | 4-wire (for ProCon® display) | Flat | M12 |
| P14H-P-D-B-M | PP | 4-wire (for ProCon® display) | Bulb | M12 |
| P14H-P-M-F-M | PP | 4-20mA (2-wire, std) | Flat | M12 |
| P14H-P-M-B-M | PP | 4-20mA (2-wire, std) | Bulb | M12 |
| P14H-P-S-F-M | PP | RS485 + 4-20mA | Flat | M12 |
| P14H-P-S-B-M | PP | RS485 + 4-20mA | Bulb | M12 |

Last digit:
“M” for M12 Connection (std)
“B” Blind (J-Box)
“F” Flying Lead

| P14F — HF > 1000ppm pH Sensor | | | | |
|---|---|---|---|---|
| Part Number | Material | Output | Type | Connection |
| P14F-P-D-F-M | PP | 4-wire (for ProCon® display) | Flat | M12 |
| P14F-P-D-B-M | PP | 4-wire (for ProCon® display) | Bulb | M12 |
| P14F-P-M-F-M | PP | 4-20mA (2-wire, std) | Flat | M12 |
| P14F-P-M-B-M | PP | 4-20mA (2-wire, std) | Bulb | M12 |
| P14F-P-S-F-M | PP | RS485 + 4-20mA | Flat | M12 |
| P14F-P-S-B-M | PP | RS485 + 4-20mA | Bulb | M12 |

Last digit:
“M” for M12 Connection (std)
“B” Blind (J-Box)
“F” Flying Lead

| P14S — Seawater pH Sensor | | | | |
|---|---|---|---|---|
| Part Number | Material | Output | Type | Connection |
| P14S-P-D-1-F-M | PP | 4-wire (for ProCon® display) | Flat | M12 |
| P14S-P-D-1-B-M | PP | 4-wire (for ProCon® display) | Bulb | M12 |
| P14S-P-M-1-F-M | PP | 4-20mA (2-wire, std) | Flat | M12 |
| P14S-P-M-1-B-M | PP | 4-20mA (2-wire, std) | Bulb | M12 |
| P14S-P-S-1-F-M | PP | RS485 + 4-20mA | Flat | M12 |
| P14S-P-S-1-B-M | PP | RS485 + 4-20mA | Bulb | M12 |

Last digit:
“M” for M12 Connection (std)
“B” Blind (J-Box)
“F” Flying Lead

| P14D — Desulfurization pH Sensor | | | | |
|---|---|---|---|---|
| Part Number | Material | Output | Type | Connection |
| P14D-P-D-1-F-M | PP | 4-wire (for ProCon® display) | Flat | M12 |
| P14D-P-D-1-B-M | PP | 4-wire (for ProCon® display) | Bulb | M12 |
| P14D-P-M-1-F-M | PP | 4-20mA (2-wire, std) | Flat | M12 |
| P14D-P-M-1-B-M | PP | 4-20mA (2-wire, std) | Bulb | M12 |
| P14D-P-S-1-F-M | PP | RS485 + 4-20mA | Flat | M12 |
| P14D-P-S-1-B-M | PP | RS485 + 4-20mA | Bulb | M12 |

Last digit:
“M” for M12 Connection (std)
“B” Blind (J-Box)
“F” Flying Lead

| P14P — Ultra-pure $H_2O$ pH Sensor | | | | |
|---|---|---|---|---|
| Part Number | Material | Output | Type | Connection |
| P14P-P-D-1-B-M | PP | 4-wire (for ProCon® display) | Bulb | M12 |
| P14P-P-M-1-B-M | PP | 4-20mA (2-wire, std) | Bulb | M12 |
| P14P-P-S-1-B-M | PP | RS485 + 4-20mA | Bulb | M12 |

Last digit:
“M” for M12 Connection (std)
“B” Blind (J-Box)
“F” Flying Lead

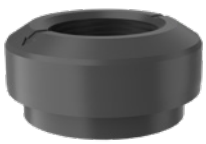
## Fittings

| Easy Install Clamp On Pipe Saddles | | | | | |
|---|---|---|---|---|---|
| Part Number | Material | Size | Seal | Thread | Connection |
| PSA-2 | PVC | 2" | FPM | ¾" NPT | PVC |
| PSA-3 | PVC | 3" | FPM | ¾" NPT | PVC |
| PSA-4 | PVC | 4" | FPM | ¾" NPT | PVC |
| PSA-6 | PVC | 6" | FPM | ¾" NPT | PVC |
| PSA-8 | PVC | 8" | FPM | ¾" NPT | PVC |

| True Union Tee Fitting | | | | | |
|---|---|---|---|---|---|
| Part Number | Material | Size | Seal | Thread | Connection |
| TUPA-PV-5 | PVC | 1/2" | FPM (std) \| EPDM | ¾" NPT | Socket \| NPT |
| TUPA-PP-5 | PP | 1/2" | FPM (std) \| EPDM | ¾" NPT | Butt \| NPT |
| TUPA-PF-5 | PVDF | 1/2" | FPM (std) \| EPDM | ¾" NPT | Butt\| NPT |
| TUPA-PV-7 | PVC | 3/4" | FPM (std) \| EPDM | ¾" NPT | Socket \| NPT |
| TUPA-PP-7 | PP | 3/4" | FPM (std) \| EPDM | ¾" NPT | Butt \| NPT |
| TUPA-PF-7 | PVDF | 3/4" | FPM (std) \| EPDM | ¾" NPT | Butt\| NPT |
| TUPA-PV-1 | PVC | 1" | FPM (std) \| EPDM | ¾" NPT | Socket \| NPT |
| TUPA-PP-1 | PP | 1" | FPM (std) \| EPDM | ¾" NPT | Butt \| NPT |
| TUPA-PF-1 | PVDF | 1" | FPM (std) \| EPDM | ¾" NPT | Butt\| NPT |
| TUPA-PV-15 | PVC | 1 1/2" | FPM (std) \| EPDM | ¾" NPT | Socket \| NPT |
| TUPA-PP-15 | PP | 1 1/2" | FPM (std) \| EPDM | ¾" NPT | Butt \| NPT |
| TUPA-PF-15 | PVDF | 1 1/2" | FPM (std) \| EPDM | ¾" NPT | Butt\| NPT |
| TUPA-PV-2 | PVC | 2" | FPM (std) \| EPDM | ¾" NPT | Socket \| NPT |
| TUPA-PP-2 | PP | 2" | FPM (std) \| EPDM | ¾" NPT | Butt \| NPT |
| TUPA-PF-2 | PVDF | 2" | FPM (std) \| EPDM | ¾" NPT | Butt\| NPT |

| Cast Iron Saddle Fitting | | | |
|---|---|---|---|
| Part Number | Material | Size | Seal |
| CISSP020 | Cast Iron / SS / PVC | 2" | FKM O-Rings |
| CISSP030 | Cast Iron / SS / PVC | 3" | FKM O-Rings |
| CISSP040 | Cast Iron / SS / PVC | 4" | FKM O-Rings |
| CISSP060 | Cast Iron / SS / PVC | 6" | FKM O-Rings |
| CISSP080 | Cast Iron / SS / PVC | 8" | FKM O-Rings |
| CISSP100 | Cast Iron / SS / PVC | 10" | FKM O-Rings |
| CISSP120 | Cast Iron / SS / PVC | 12" | FKM O-Rings |
| CISSP140 | Cast Iron / SS / PVC | 14" | FKM O-Rings |
| CISSP160 | Cast Iron / SS / PVC | 16" | FKM O-Rings |
| CISSF020 | Cast Iron/ SS/ PVDF | 2" | FKM O-Rings |
| CISSF030 | Cast Iron/ SS/ PVDF | 3" | FKM O-Rings |
| CISSF040 | Cast Iron/ SS/ PVDF | 4" | FKM O-Rings |
| CISSF060 | Cast Iron/ SS/ PVDF | 6" | FKM O-Rings |
| CISSF080 | Cast Iron/ SS/ PVDF | 8" | FKM O-Rings |
| CISSF100 | Cast Iron/ SS/ PVDF | 10" | FKM O-Rings |
| CISSF120 | Cast Iron/ SS/ PVDF | 12" | FKM O-Rings |
| CISSF140 | Cast Iron/ SS/ PVDF | 14" | FKM O-Rings |
| CISSF160 | Cast Iron/ SS/ PVDF | 16" | FKM O-Rings |

| Weldolet® Pipe Adaptor | | | |
|---|---|---|---|
| Part Number | Material | Size | Connection |
| WAS-2 | PVC | 2"-4" | ¾" NPT |
| WAS-6 | PVC | 6"-24" | ¾" NPT |
| WPF-SS-2 | SS | 2"-4" | ¾" NPT |
| WPF-SS-6 | SS | 6"-24" | ¾" NPT |



## Electrode preservation:

1. Clean the electrode correctly after use
2. Place the electrode in the electrode storage bottle for storage
3. The solution in the protective bottle is 3 mol/L KCl solution

| pH/ORP Process Sensor | |
|---|---|
| P14S | Seawater Environment |
| P14C | Strong Acid, Strong Base, Chemical Process |
| P14D | Flue Gas Desulfurization |
| P14P | Pure Water Low Ion Concentration |
| P14F | Hydrofluoric Acid Environmental Applicable Concentration < 1000 ppm |
| P14H | Hydrofluoric Acid Environmental Applicable Concentration > 1000 ppm |
| P14G | General Application, Industrial Wastewater |
| P14E | Light Duty Applications |

## Warranty

**Icon Process Controls** warrants this product to be free from significant deviations in material and workmanship for a period of one year from the date of purchase. If repair is necessary and has not been the result of abuse or misuse within the warranty period, please return to **Icon Process Controls** and amendment will be made without any charge. **Icon Process Controls** Customer Service Center will determine if product problem is due to deviations or customer abuse. Out of warranty products will be repaired on a charge basis.

Authorization must be obtained from **Icon Process Controls** Customer Service Center to issue a RIR number before returning items for any reason. When applying for authorization, please include the date and the reason of return. Instruments must be carefully packed to prevent damage in shipment and insured against possible damage or loss. **Icon Process Controls** will not be responsible for any damage resulting from careless or insufficient packing.

**Warning:** Damage as a result of inadequate packaging is the user / distributor's responsibility.

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## Use with any of the following controllers — NO PREAMP REQUIRED



### SINGLE INPUT



### DUAL INPUT


### FIVE INPUT

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