ICON PROCESS CONTROLS C250 Conductivity Sensor Instruction Manual

ProCon® — C Series
Conductivity Sensor Operating Manual

Contents

C250 Conductivity Sensor

C250	Sanitary	Complex	2-Pole Graphite	
				
High Purity	C350	C450	C554	
Titanium	Toroidal	Graphite	High Temp	High Temp
				
C650	C750	C850	C950	

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

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

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.

Preparation before measurement

The conductivity sensor has been factory calibrated. Initial on-site calibration should not be necessary. When measuring high-purity water, avoid pollution, correctly select the constant of conductivity electrode, and preferably adopt the sealed and flowing measurement method.
Otherwise, the conductivity value will increase quickly, because the carbon dioxide in the air will become conductive carbonate ions after being dissolved in high-purity water, which will affect the measured value.

If calibration is required, please follow these steps:

1. The conductivity electrode shall be rinsed twice with deionized water [or distilled water) less than 0.5us/cm before use, and then rinsed with the tested sample before measurement.
2. The value displayed by the instrument after measurement has been converted to the measured value at 25°C. If no compensation is needed, unplug the temperature electrode and the instrument displays 25°C. The measured value is the conductance value of the solution at that time.
3. The conductivity standard provides the simplest and most accurate method for calibrating conductivity sensors. Select a conductivity standard whose concentration is close to or higher than the expected sample concentration.
4. The conductivity standard can be used to verify whether the conductivity sensor responds correctly.

Re-calibration Procedure

1. Prepare a calibrated beaker of appropriate size, which will allow you to completely immerse the conductivity sensor tip.

2. Check to determine if there are any deposits on the electrode sensing area. If the sensing surface (platinum black) is coated, clean the sensor before continuing. Flush the sensor reaction area with distilled water.
3. Rinse the calibration beaker with some standard solutions, and then pour the selected conductivity standard solution into the calibration beaker.
4. Immerse the electrode and ensure that the sensing area of the electrode is completely immersed in water. If there is a vent hole in the sensing area, the electrode must be submerged under the vent hole. Shake sensor to ensure that trapped air bubbles are released from sensing area

   a) Bubbles in the control area of the conductivity electrode will cause serious interference to the ion flow and will lead to erroneous readings.

   b) When measuring high-purity water, avoid exposure to CO2, correctly select the constant of conductivity electrode.

   c) The recommended procedure is to adopt the sealed and flowing measurement method.

   5. Enter the standard value of the standard used from the menu.
5. Start calibration. Wait for the reading to stabilize, and then adjust the reading to the temperature compensation value of the conductivity standard.

   NOTE:

   a) Please refer to supporting instruments for specific calibration process.

   b) Repeat the process to ensure that the calibration is correct.

ProCon® C Series — Conductivity | TDS | Salinity | Resistivity Sensors

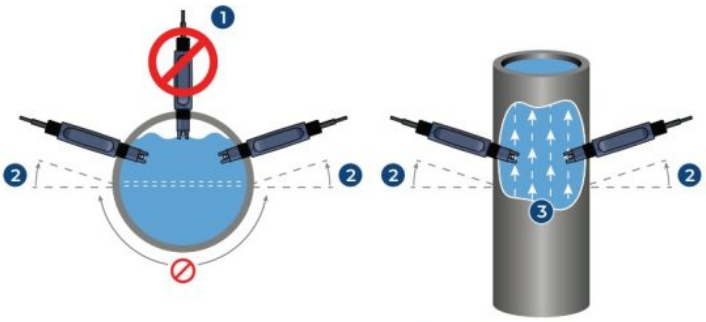
Tough but sensitive — High performance, industrial strength sensors for harsh applications from 0µS – 2,000mS

Measuring specific conductivity of aqueous solutions is becoming increasingly important for determining impurities in water. The ProCon®C series conductivity sensors have been proven to operate seamlessly in industrial process applications.
The ProCon ® line of analytical sensors have been designed for difficult industrial applications and to outperform even in extreme conditions.
The 2-wire 4-20mA, 4-wire or 4-20mA + RS485 output options simplify calibration and communication with remote displays and controllers.

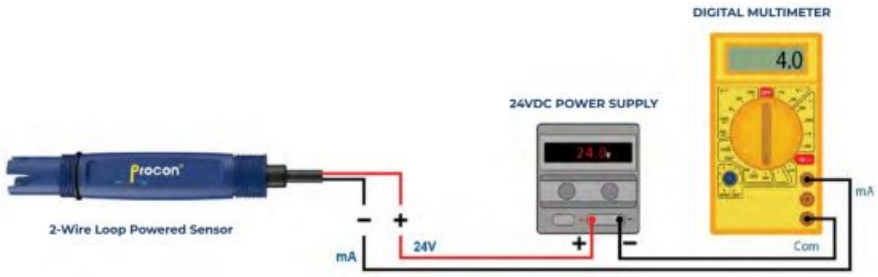
- Conductivity | TDS | Salinity | Resistivity
- Range 0µS – 2,000mS
- No Costly Conductivity Module Required
- Direct 4-20mA & RS485 Outputs
- ¾” NPT Connection
- Factory Calibrated

In-line Mounting

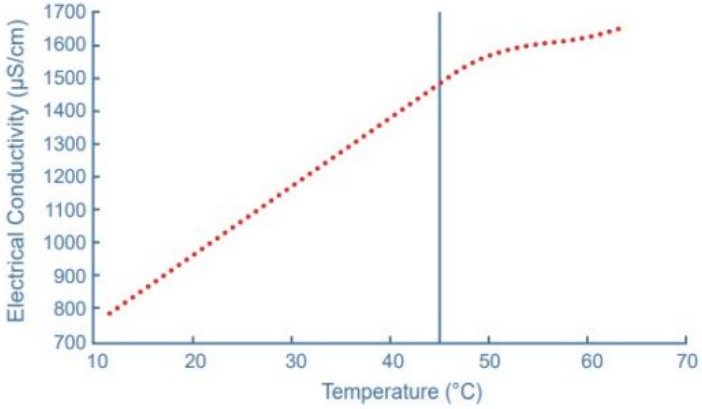
1. Avoid vertical installation. (air may be present)
2. Optimum installation 15° above horizontal.
3. Process liquid should flow upward. (for downward flow ensure backpressure is present in order to avoid air within pipe)



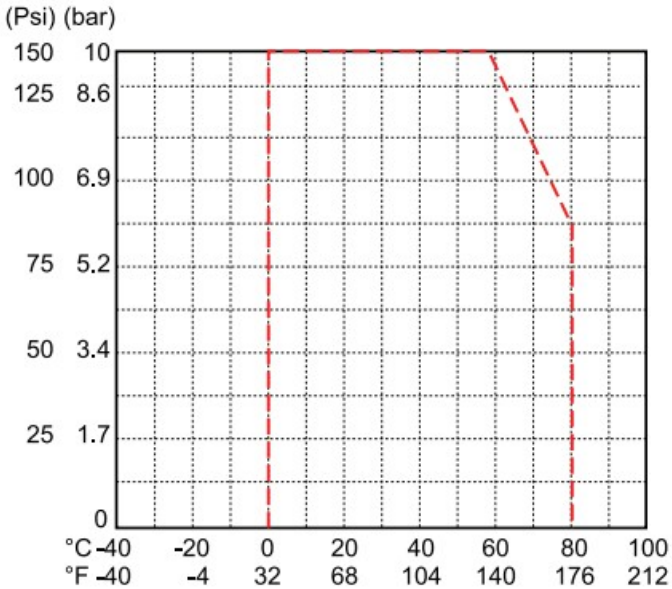
Testing 2-Wire Loop Powered Sensor



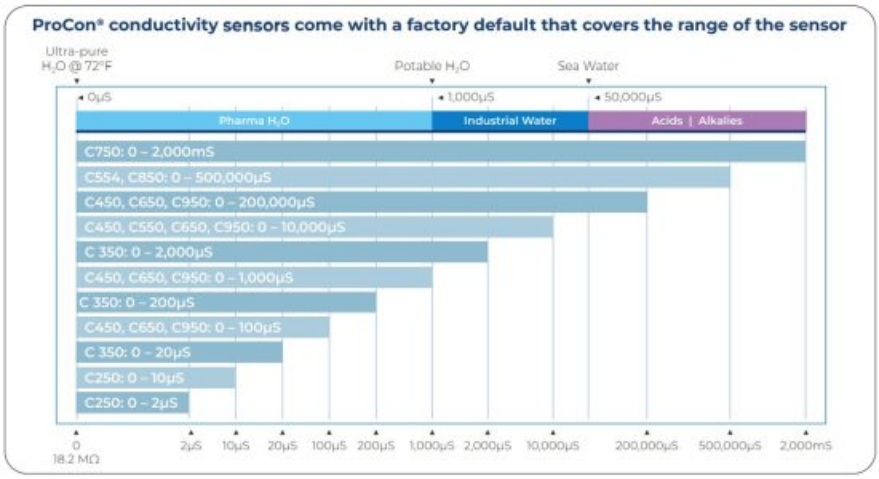
Temperature Effects



Temperature vs. Pressure



Factory Calibrated



Sensor Type

Cell	Models	Range
Cell 0.01	C250	0 – 2µS
Cell 0.01	C250	0 – 10µS
Cell 0.1	C350	0 – 20µS
Cell 0.01	C450, C650, C950	0 – 100µS
Cell 0.1	C350	0 – 200µS
Cell 0.1	C450, C650, C950	0 – 1,000µS
Cell 0.1	C350	0 – 2,000µS
Cell 1.0	C450, C550, C650, C950	0 – 10,000µS
Cell 10	C450, C650, C950	0 – 200,000µS
Cell 0.4	C554, C850	0 – 500,000µS
Toroidal	C750	0 – 2,000mS

Typical Applications

- High Purity Water
- Water Treatment
- Pharmaceutical
- Food and Beverage
- Interface Detection
- Desalination
- Chemical Plants
- Aquariums
- Agricultural Industries

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. Green: (+) Temperature
4. White: (-) Temperature

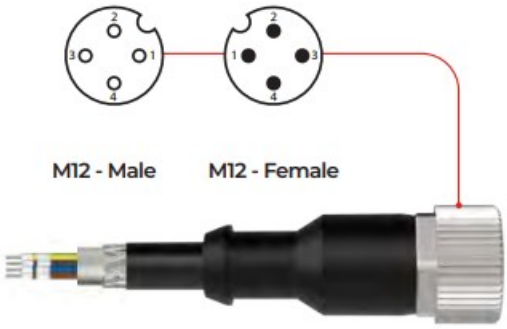
   Connects directly to ProCon® controller

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	
Pin 1 – Brown	**4-20mA +**
Pin 2 – Blue	**4-20mA –**

■ **4-20mA + Controller | 4 Pin**

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

■ **4-20mA + RS485 | 8 Pin**

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

C250 — High Purity Conductivity Sensor					
Part Number	**Material**	**Output**	**Cell Constant**	**Range**	**Connection**
C250-A-D-1-M	Titanium Alloy	4-wire (for ProCon® display)	0.01	0-2µS	M12
C250-D-D-1-M	Titanium Alloy	4-wire (for ProCon® display)	0.01	0-10µS	M12
C250-A-M-1-M	Titanium Alloy	2-wire 4-20mA	0.01	0-2µS	M12
C250-D-M-1-M	Titanium Alloy	2-wire 4-20mA	0.01	0-10µS	M12
C250-A-S-1-M	Titanium Alloy	RS485 + 4-20mA	0.01	0-2µS	M12
C250-D-S-1-M	Titanium Alloy	RS485 + 4-20mA	0.01	0-10µS	M12

Last digit: “M” for M12 Connection (std), “F” Flying Lead

C350 — Sanitary Conductivity Sensor						
Part Number	**Size**	**Material**	**Output**	**Cell Constant**	**Range**	**Connection**
C350-E-D-1-F-A	1″	316L SS	4-wire (for ProCon® display)	0.1	0-20µS	Flying Lead
C350-H-D-1-F-A	1″	316L SS	4-wire (for ProCon® display)	0.1	0-200µS	Flying Lead
C350-K-D-1-F-A	1″	316L SS	4-wire (for ProCon® display)	0.1	0-2,000µS	Flying Lead
C350-E-S-1-F-A	1″	316L SS	RS485	0.1	0-20µS	Flying Lead
C350-H-S-1-F-A	1″	316L SS	RS485	0.1	0-200µS	Flying Lead
C350-K-S-1-F-A	1″	316L SS	RS485	0.1	0-2,000µS	Flying Lead
C350-E-D-1-F-B	1.5″	316L SS	4-wire (for ProCon® display)	0.1	0-20µS	Flying Lead
C350-H-D-1-F-B	1.5″	316L SS	4-wire (for ProCon® display)	0.1	0-200µS	Flying Lead
C350-K-D-1-F-B	1.5″	316L SS	4-wire (for ProCon® display)	0.1	0-2,000µS	Flying Lead
C350-E-S-1-F-B	1.5″	316L SS	RS485	0.1	0-20µS	Flying Lead
C350-H-S-1-F-B	1.5″	316L SS	RS485	0.1	0-200µS	Flying Lead
C350-K-S-1-F-B	1.5″	316L SS	RS485	0.1	0-2,000µS	Flying Lead
C350-E-D-1-F-C	2″	316L SS	4-wire (for ProCon® display)	0.1	0-20µS	Flying Lead
C350-H-D-1-F-C	2″	316L SS	4-wire (for ProCon® display)	0.1	0-200µS	Flying Lead
C350-K-D-1-F-C	2″	316L SS	4-wire (for ProCon® display)	0.1	0-2,000µS	Flying Lead
C350-E-S-1-F-C	2″	316L SS	RS485	0.1	0-20µS	Flying Lead
C350-H-S-1-F-C	2″	316L SS	RS485	0.1	0-200µS	Flying Lead
C350-K-S-1-F-C	2″	316L SS	RS485	0.1	0-2,000µS	Flying Lead

C450 — Complex Conductivity Sensor					
Part Number	**Material**	**Output**	**Cell Constant**	**Range**	**Connection**
C450-G-D-1-M	Titanium Alloy	4-wire (for ProCon® Display)	0.01	0-100µS	M12
C450-J-D-1-M	Titanium Alloy	4-wire (for ProCon® Display)	0.1	0-1,000µS	M12
C450-M-D-1-M	Titanium Alloy	4-wire (for ProCon® Display)	1	0-10,000µS	M12
C450-P-D-1-M	Titanium Alloy	4-wire (for ProCon® Display)	10	0-200,000µS	M12
C450-G-M-1-M	Titanium Alloy	4-20mA (2-wire, std)	0.01	0-100µS	M12
C450-J-M-1-M	Titanium Alloy	4-20mA (2-wire, std)	0.1	0-1,000µS	M12
C450-M-M-1-M	Titanium Alloy	4-20mA (2-wire, std)	1	0-10,000µS	M12
C450-P-M-1-M	Titanium Alloy	4-20mA (2-wire, std)	10	0-200,000µS	M12
C450-G-S-1-M	Titanium Alloy	RS485 + 4-20mA	0.01	0-100µS	M12
C450-J-S-1-M	Titanium Alloy	RS485 + 4-20mA	0.1	0-1,000µS	M12
C450-M-S-1-M	Titanium Alloy	RS485 + 4-20mA	1	0-10,000µS	M12
C450-P-S-1-M	Titanium Alloy	RS485 + 4-20mA	10	0-200,000µS	M12

Last digit: “M” for M12 Connection (std), “F” Flying Lead Consult factory for custom ranges

C550 — 2-Pole Graphite Conductivity Sensor					
Part Number	**Material**	**Output**	**Cell Constant**	**Range**	**Connection**
C550-M-D-1-M	Graphite, PPMA	4-wire (for ProCon® Display)	1	0-10,000µS	M12
C550-M-M-1-M	Graphite, PPMA	4-20mA (2-wire, std)	1	0-10,000µS	M12
C550-M-S-1-M	Graphite, PPMA	RS485 + 4-20mA	1	0-10,000µS	M12

Last digit: “M” for M12 Connection (std), “F” Flying Lead

C554 — 4-Pole Graphite Conductivity Sensor					
Part Number	**Material**	**Output**	**Cell Constant**	**Range**	**Connection**
C554-R-D-1-M	Graphite, PPMA	4-wire (for ProCon® Display)	0.4	0-500,000µS	M12
C554-R-M-1-M	Graphite, PPMA	4-20mA (2-wire, std)	0.4	0-500,000µS	M12
C554-R-S-1-M	Graphite, PPMA	RS485 + 4-20mA	0.4	0-500,000µS	M12

Last digit: “M” for M12 Connection (std), “F” Flying Lead

C650 — Titanium Conductivity Sensor					
Part Number	**Material**	**Output**	**Cell Constant**	**Range**	**Connection**
C650-G-D-1-M	PP, Titanium	4-wire (for ProCon® Display)	0.01	0-100µS	M12
C650-J-D-1-M	PP, Titanium	4-wire (for ProCon® Display)	0.1	0-1,000µS	M12
C650-M-D-1-M	PP, Titanium	4-wire (for ProCon® Display)	1	0-10,000µS	M12
C650-P-D-1-M	PP, Titanium	4-wire (for ProCon® Display)	10	0-200,000µS	M12
C650-G-M-1-M	PP, Titanium	4-20mA (2-wire, std)	0.01	0-100µS	M12
C650-J-M-1-M	PP, Titanium	4-20mA (2-wire, std)	0.1	0-1,000µS	M12
C650-M-M-1-M	PP, Titanium	4-20mA (2-wire, std)	1	0-10,000µS	M12
C650-P-M-1-M	PP, Titanium	4-20mA (2-wire, std)	10	0-200,000µS	M12
C650-G-S-1-M	PP, Titanium	RS485 + 4-20mA	0.01	0-100µS	M12
C650-J-S-1-M	PP, Titanium	RS485 + 4-20mA	0.1	0-1,000µS	M12
C650-M-S-1-M	PP, Titanium	RS485 + 4-20mA	1	0-10,000µS	M12
C650-P-S-1-M	PP, Titanium	RS485 + 4-20mA	10	0-200,000µS	M12

Last digit: “M” for M12 Connection (std), “F” Flying Lead

C750 — Toroidal Conductivity Sensor					
Part Number	**Material**	**Output**	**Cell Constant**	**Range**	**Connection**
C750-T-D-1-F	PP	4-wire (for ProCon® Display)	Toroidal	0-2,000mS	Flying Lead

C850 — Graphite Conductivity Sensor					
Part Number	**Material**	**Output**	**Cell Constant**	**Range**	**Connection**
C850-R-D-1-M	Graphite, PPMA	4-wire (for ProCon® Display)	0.4	0-500,000µS	M12
C850-R-M-1-M	Graphite, PPMA	4-20mA (2-wire, std)	0.4	0-500,000µS	M12
C850-R-S-1-M	Graphite, PPMA	RS485 + 4-20mA	0.4	0-500,000µS	M12

Last digit: “M” for M12 Connection (std), “F” Flying Lead

C950 — Stainless Steel Conductivity Sensor					
Part Number	**Material**	**Output**	**Cell Constant**	**Range**	**Connection**
C950-G-D-1-M	Stainless Steel	4-wire (for ProCon® Display)	0.01	0-100µS	M12
C950-J-D-1-M	Stainless Steel	4-wire (for ProCon® Display)	0.1	0-1,000µS	M12
C950-M-D-1-M	Stainless Steel	4-wire (for ProCon® Display)	1	0-10,000µS	M12
C950-P-D-1-M	Stainless Steel	4-wire (for ProCon® Display)	10	0-200,000µS	M12
C950-G-M-1-M	Stainless Steel	4-20mA (2-wire, std)	0.01	0-100µS	M12
C950-J-M-1-M	Stainless Steel	4-20mA (2-wire, std)	0.1	0-1,000µS	M12
C950-M-M-1-M	Stainless Steel	4-20mA (2-wire, std)	1	0-10,000µS	M12
C950-P-M-1-M	Stainless Steel	4-20mA (2-wire, std)	10	0-200,000µS	M12
C950-G-S-1-M	Stainless Steel	RS485 + 4-20mA	0.01	0-100µS	M12
C950-J-S-1-M	Stainless Steel	RS485 + 4-20mA	0.1	0-1,000µS	M12
C950-M-S-1-M	Stainless Steel	RS485 + 4-20mA	1	0-10,000µS	M12
C950-P-S-1-M	Stainless Steel	RS485 + 4-20mA	10	0-200,000µS	M12

Last digit: “M” for M12 Connection (std), “F” Flying Lead

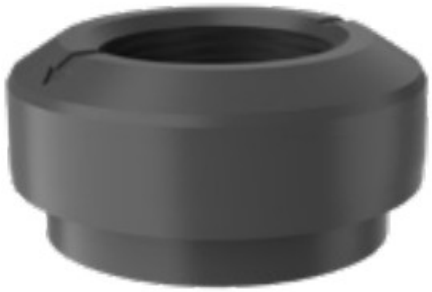
Fittings

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

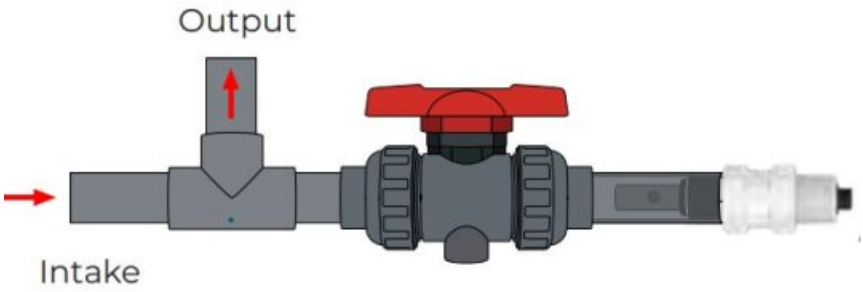
True Union Tee Fitting					
Part Number	**Material**	**Size**	**Seal**	**Thread**	**Connection**
TUPA-PV-5	PVC	1/2″	FPM (std) | EPDM	¾″ NPT	Socket | NPT
TUPA-PP-5	PP	1/2″	FPM (std) | EPDM	¾″ NPT	Butt | NPT
TUPA-PF-5	PVDF	1/2″	FPM (std) | EPDM	¾″ NPT	Butt| NPT
TUPA-PV-7	PVC	3/4″	FPM (std) | EPDM	¾″ NPT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



Typical Installation



Maintenance of conductive electrode

Cleaning of conductive electrode

1. The organic component contamination on the electrode can be cleaned with warm water containing detergent, or it can be cleaned with alcohol.
2. Calcium and magnesium precipitates are best cleaned with 10% citric acid.
3. The bright platinum electrode can be mechanically cleaned with a soft brush. Ensure that no nicks or scratches are made on the electrode sensor.

   Do Not use a screwdriver or sharp object to clean the electrode surface
4. The platinum electrode plated with platinum black should only be cleaned using the chemical method. The coating (platinum black) on the electrode surface will be damaged if cleaning with a soft brush.

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 date requiring 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. Please follow the guidelines below before transporting.
Use the original packaging material if possible, when transporting back the unit for repair. Otherwise wrap it with bubble pack and use a corrugated box for better protection. Include a brief description of any faults suspected for the convenience of Customer Service Center, if possible. If there are any questions, feel free to contact our Customer Service Center or distributors.

ProCon® Sensing Tomorrow's Innovations Today by ICON™ PROCESS CONTROLS Corrosion-Free Instrumentation Equipment

Use with any of the following controllers
NO CONDUCTIVITY MODULE REQUIRED

ICON™ PROCESS CONTROLS

Find Quality Products Online at:Valuetesters.com
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Documents / Resources

	ICON PROCESS CONTROLS C250 Conductivity Sensor [pdf] Instruction Manual C250, C350, C450, C550, C554, C650, C750, C850, C950, C250 Conductivity Sensor, C250, Conductivity Sensor, Sensor

References

- **User Manual**