Liquid Conductivity
Two & Four Electrode Sensors

Industrial Process Control & Monitoring

- **Rugged Two Electrode Conductivity Sensors**
- **Unique Four Electrode Conductivity Sensors**
- **Versatile Installation Options (Threaded, Quick Change, Retractable)**
- **Specialized High Pressure / High Temperature Options**

Conductivity sensors measure the specific conductance of liquid processes. The specific conductance is directly related to the presence of ionic species and their concentration. Barben Analytical offers a full range of two electrode and four electrode contacting conductivity sensors for a variety of industrial measurement applications.

Two Electrode Conductivity Sensors

- Designed for pure water and other low to medium conductivity applications.
- Threaded in-line, submersible, and “Hot Tap” retractable product options
- Large range of cell constants to ensure the sensor range properly matches the application.

Four Electrode Conductivity Sensors

- Ideal for medium to high conductivity applications
- A great low cost alternative to toroidal sensor technology
- Additional electrode pair compensates for particulate and scale build-up.

Compatibility with All Major Vendor’s Electronics

- Proven with major vendors of conductivity analyzers (Rosemount, ABB, E&H, Mettler Toledo, Knick)
- Improve your measurement by replacing only the sensor
- Wiring information available

Industrial Mounting Options

- Mounting fittings for sample line installations
- Submersible cleaners and scrubbers
- Ball Valve “Hot Tap” retraction solutions
- Variety of materials for corrosive applications

Архангельск (8182)63-90-72
Астана +7(7172)727-132
Белгород (4722)40-23-64
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Казань (843)206-01-48
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Кемерово (3842)65-04-62
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Липецк (4742)52-20-81
Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Новосибирск (383)227-86-73
Орел (4862)44-53-42
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Пенза (8412)22-31-16
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Тверь (4822)63-31-35
Томск (3822)98-41-53
Тула (4872)74-02-29
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Уфа (347)229-48-12
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Ярославль (4852)69-52-93

Единый адрес для всех регионов: bnr@nt-rt.ru || www.barben.nt-rt.ru

Liquid Conductivity
Two & Four Electrode Sensors

Well known for industrial pH sensor technology; Barben Analytical also provides a full range of two and four electrode industrial conductivity sensors to support your applications.

Two Electrode Sensor Technology

Two electrode sensors provide a simple, time-proven method for conductivity measurement. Precision machined electrodes of various sizes (cell constants) are matched to the process based on their measurement range. Two electrode sensors are recommended for use in clean (non-coating) applications such as the following:

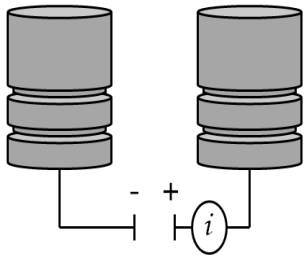
- **Ultrapure Water**
- **Demineralized / Deionized Water**
- **Reverse Osmosis**
- **Water for Injection**
- **Boiler Water**

Four Electrode Sensor Technology

As the name suggests, four electrode sensors add an additional pair of electrodes to the two electrode sensor design. This second pair of electrodes provides sensor diagnostics which can then be used to compensate the measurement if scale or particulate build-up occur on electrodes. Four electrode conductivity sensors can withstand coating and scale which might otherwise foul a traditional two electrode sensor. Typical applications include the following:

- **Leak Detection**
- **Condensate Return**
- **Salinity**
- **Chemical Concentration**
- **Clean-In-Place**

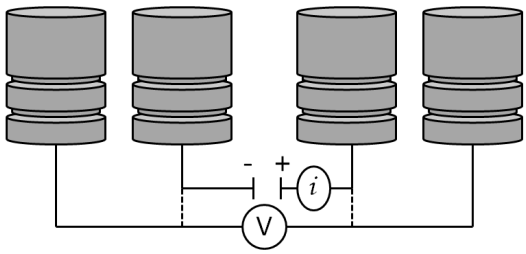
Sensor Technology
(How it works)



Two electrode conductivity measurement is based on the ability to conduct a current between two electrodes. The concentration of ions in the liquid are directly proportional to the conductance of the liquid.

Pros
- Simple, time-proven electrode design
- Industry standard cell constants determine measurement range.
- Works best for clean applications where electrodes do not get fouled.
- High accuracy and repeatability.

Cons
- Susceptible to coating and scale (no compensation)
- Susceptible to corrosion
- No diagnostics



Four electrode sensor designs keep a constant current through two of the electrodes and let the drive voltage change. If fouling occurs then the drive voltage can be increased to compensate the measurement.

Pros
- Compensation for coating and build-up
- Wide measurement range
- Sensor diagnostics if fouling is too great (analyzer dependent)
- No polarization affect

Cons
- Not as accurate as two electrode sensors at low conductivity
- Susceptible to corrosion
- Limited availability of analyzers (ABB, Rosemount, Mettler Toledo, Knick)
- Conductive field can be distorted by pipe walls and flow cells

Figure 1

Typical Measurement Ranges for Two & Four Electrode Sensors

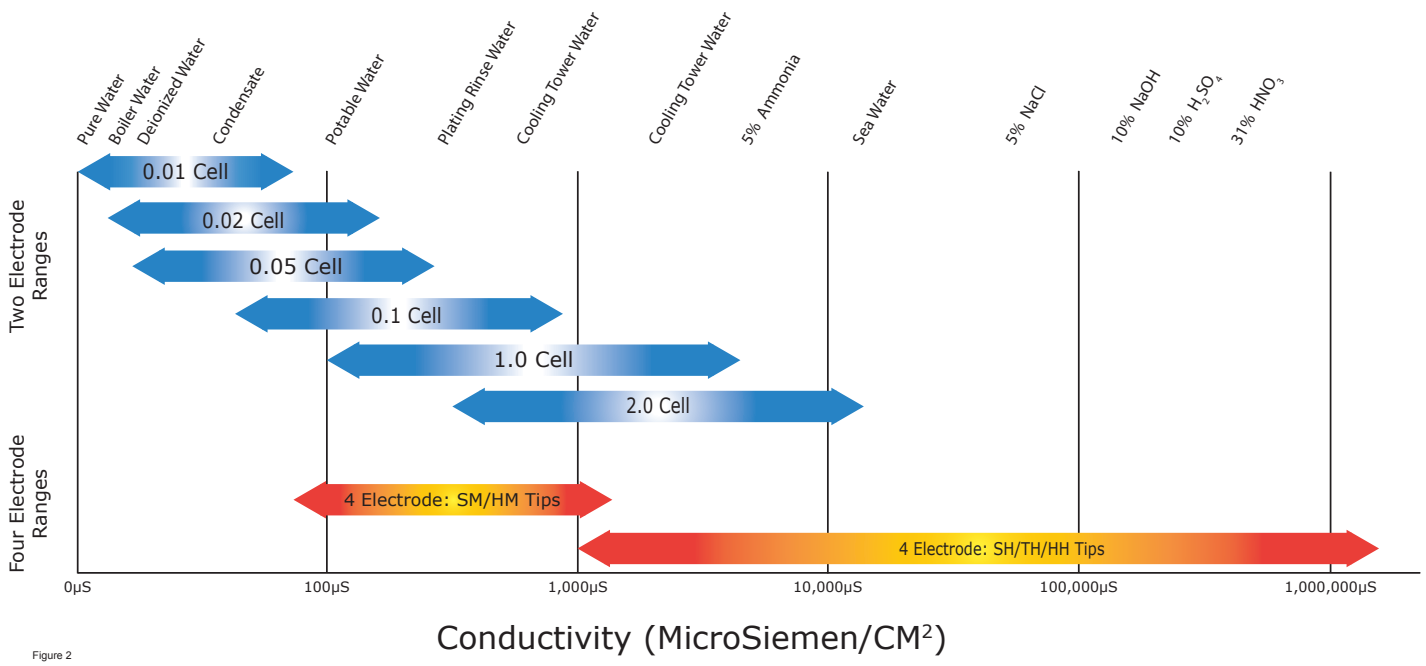
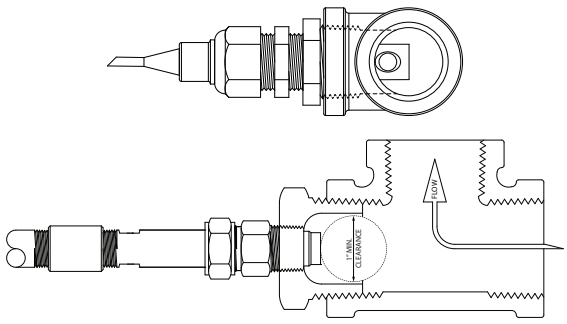


Figure 2

Sensor Selection: Mounting

Mounting should be considered as part of sensor selection. Examples of various process mounting configurations are provided below.

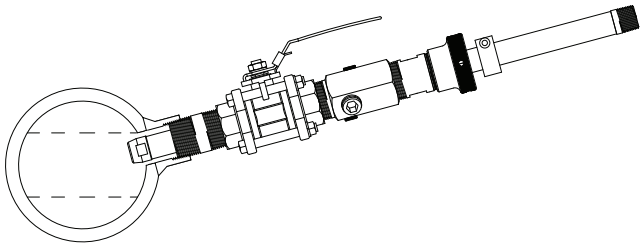
In-line Sensor Mounting: In-line installations are common on sample streams from the main process. The sensor may be mounted in a piping tee or a flow cell. The electrodes should be fully exposed to the process flow. Four Electrode Sensors require at least 1 inch of clearance from pipe walls to avoid any distortion of reading. Isolation valves should be upstream / downstream of sensor for removal.



In-line Mounting
CS51 Two Electrode Mounting (top)
551 Four Electrode Mounting (bottom)

Figure 3

Hot Tap Sensor Mounting: Hot Tap refers to the ability to remove the sensor from the process while under pressure. A ball valve is used to isolate the sensor for removal.



Hot Tap Mounting Example - 547 Four Electrode, Isolation Ball Valve & Hand Tight Compression fitting

Figure 4

Submersible Mounting: This mounting style is used when the sensor is installed in a tank, or open channel. The sensor must be mounted on a “dip tube” which is the hardware to submerge the sensor in the application.

Submersible Mounting Example - CS51 Two Electrode with threaded coupler and dip tube to seal cable from the process

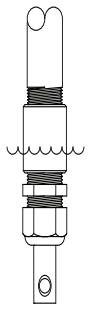


Figure 5

Liquid Conductivity
Two & Four Electrode Sensors

Model CS10 / CS51
Two Electrode Threaded In-line, Submersible

The threaded CS10 / CS51 products are ideal for clean water sample stream applications using the NPT process connection. The same NPT adapter fitting can be reversed to mount the sensor in submersible installations.

CS10 with 0.01 Electrode

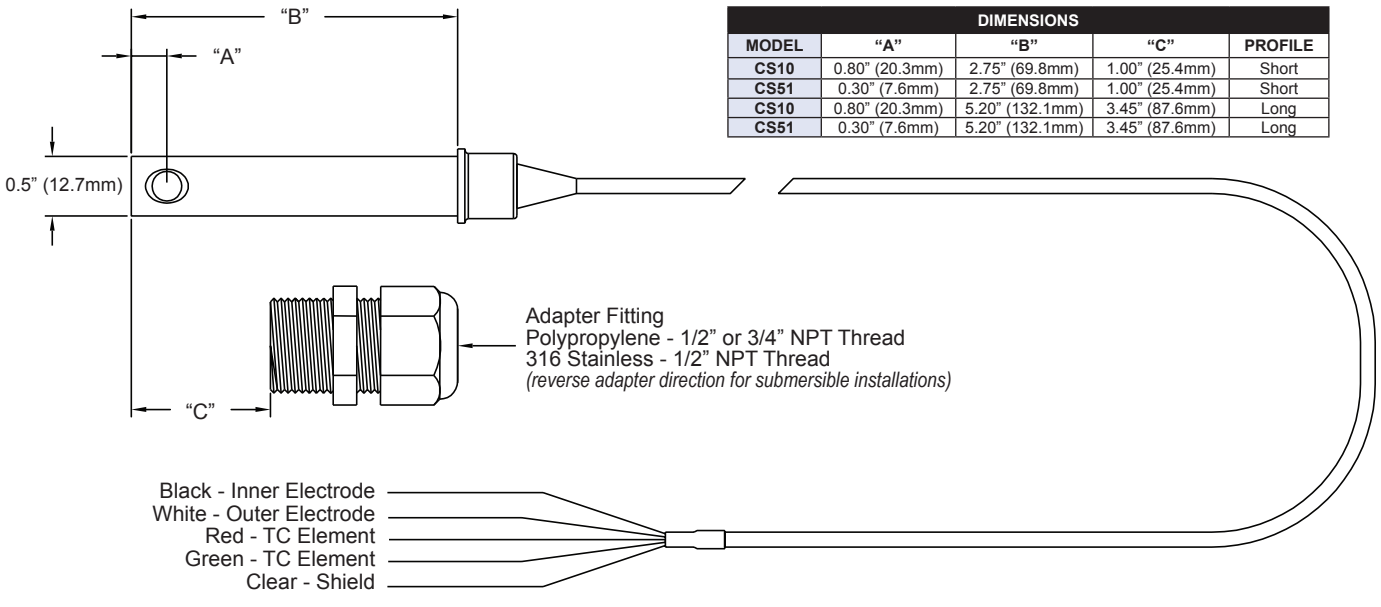
Wetted Material
- Electrodes 316 Stainless Steel
- Insulator Teflon
- Seals EPR
- Mounting Polypropylene or 316 Stainless

Temperature Compensation
- PT100 RTD
- PT1000 RTD
- 8550 Ohm (Honeywell)

Pressure / Temperature Ratings

Sensor Design	Max. Pressure / Temperature
Polypropylene Adapter	100 PSIG (690 kPa) @ 212°F (100°C)
316 Stainless Adapter	200 PSIG (1380 kPa) @ 248°F (120°C)

CS10 / CS51 Dimensions



DIMENSIONS				
MODEL	"A"	"B"	"C"	PROFILE
CS10	0.80" (20.3mm)	2.75" (69.8mm)	1.00" (25.4mm)	Short
CS51	0.30" (7.6mm)	2.75" (69.8mm)	1.00" (25.4mm)	Short
CS10	0.80" (20.3mm)	5.20" (132.1mm)	3.45" (87.6mm)	Long
CS51	0.30" (7.6mm)	5.20" (132.1mm)	3.45" (87.6mm)	Long

Figure 6

CS10 / CS51 Two Electrode In-line / Submersible Conductivity Sensors

Body	Cell Constant	TC	Cable	Terminations	Mounting Hardware	Length	
CS10	SS316/Teflon/EPDM Inline or Submersible for Pure Waters (0.01 / 0.02 / 0.05 Cell Constant)						
CS51	SS316/Teflon/EPDM General Purpose (0.1 /1.0 Cell Constant)						
	Cell Constant (True range is analyzer/electrode size dependant)						
	1	1.0 CS51 Only (0-20,000 MicroSiemens)					
	0.1	0.1 CS51 Only (0-1000 MicroSiemens)					
	0.05	0.05 CS10 Only (0-500 MicroSiemens)					
	0.02	0.02 CS10 Only (0-250 Microsiemens)					
	0.01	0.01 CS10 Only (0-100 MicroSiemens)					
		Integral Temperature Compensation					
		PT100	100 Ohm RTD				
		PT1000	1000 Ohm RTD				
		HW	8550 Ohm				
		(Blank)	Other				
			Cable				
			10	1 - 10 ft (whole #'s)			
			20	11 - 20 ft			
			30	21 - 30 ft			
			40	31 - 40 ft			
			50	41 - 50 ft			
			(Blank)	Other			
				Lead Terminations			
				TL	All tinned leads		
				SL	All spade leads		
				(Blank)	Other		
					Hardware Options for Non-Sanitary Flange		
					PP.5	1/2" MNPT Polypro Fitting	
					PP.75	3/4" MNPT Polypro Fitting	
					SS.5	1/2" MNPT SS316 Fitting	
					(Blank)	Other	
						Nominal Length (reduced by sanitary flange thickness if ordered)	
						Long	5.2" (recommended)
						Short	2.75"
Body	Cell	TC	Cable	Terminations	Hardware	Length	
CS10	0.1	PT1000	10	TL	SS.5	Long	Typical Sensor Configuration

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Model CS41
Two Electrode High Pressure Threaded In-line

The CS41 Two Electrode Conductivity Sensor is specifically designed to handle the high pressure requirements found in boiler water measurement. It uses a rugged, explosionproof junction box with a high temp terminal strip for internal wiring.

Wetted Material
- Electrodes 316 Stainless Steel
- Insulator PEEK
- Seals EPR (dual o-ring)
- Mounting 316 Stainless

Pressure / Temperature Ratings

Sensor Design	Max. Pressure / Temperature
316 Stainless	400 PSIG (2758 kPa) @ 212°F (100°C) 250 PSIG (1724 kPa) @ 401°F (205°C)

CS41 with 0.10 Electrode

Temperature Compensation
- PT100 RTD
- PT1000 RTD
- 8550 Ohm (Honeywell)

CS51 Dimensions

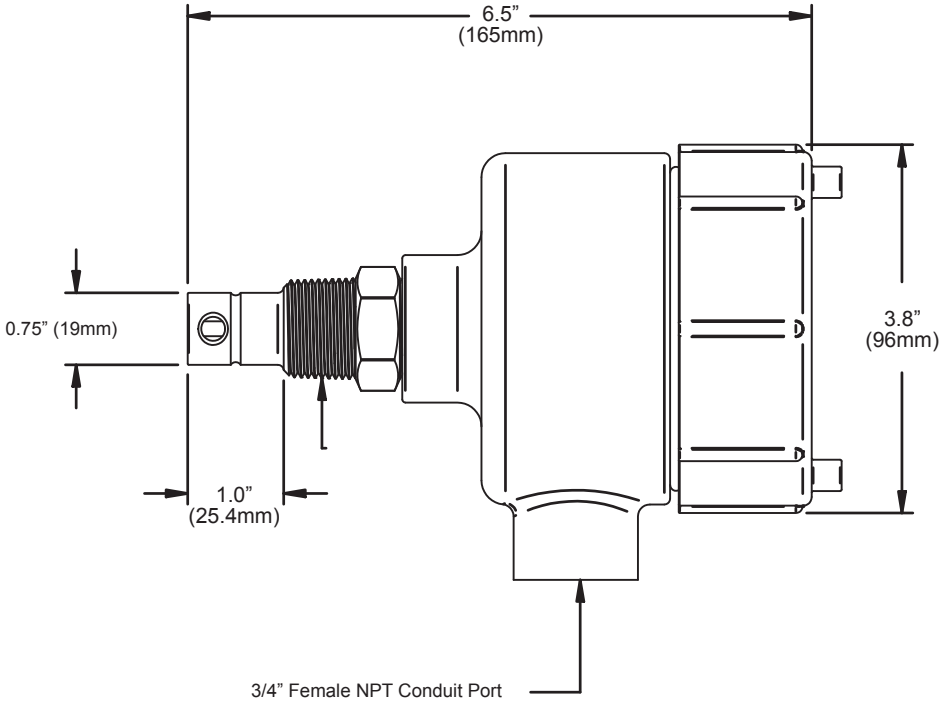


Figure 7

CS41 Two Electrode High Temperature In-line Conductivity Sensors

Body	Cell Constant	Pressure / Temp	TC	Length	Cable	
CS41	SS 316 / PCTFE (Kel-F) ¾" MNPT Inline Sensor					
	Cell Constant (True range is analyzer/electrode size dependant)					
	2	2.00 (0-30,000 MicroSiemens)				
	1	1.00 (0-20,000 MicroSiemens)				
	0.1	0.10 (0-1000 MicroSiemens)				
	0.05	0.05 (0-500 Microsiemens)				
		Pressure / Temperature Option				
		HT	High Temp. 0^0C to 205^0C, PEEK Insulator			
		HV	High Temp, Press, 6.5" OAL for use in 546 Hi-pressure insertion system			
			Integral Temperature Compensation			
			HW	8550 Ohm @ 25^0C (Honeywell)		
			Pt100	100 Ohm @ 0^0C, PTC (BAT and Others)		
			Pt1000	1000 Ohm @ 0^0C, PTC (BAT and Others)		
			(Blank)	Other		
				Insertion Depth		
				1	1.0" Insertion depth (standard)	
				2.6	2.6" Insertion depth for (HV) only	
					Cable	
					JB	Junc Bx, Expl Proof, Inc 8" lds & Term Strip
					PT	8" Pig Tail, for Cust Supp Junc Bx Inc Term Strip
					Coup	3/4" coupling on rear of sensor
					(Blank)	Other, (Call Factory For Price & Availability)
Body	Cell	Press / Temp	TC	Length	Hardware	
CS41	**0.1**	**HT**	**PT100**	**1**	**JB**	Typical Sensor Configuration

Liquid Conductivity
Two & Four Electrode Sensors

Model CS40
Two Electrode Hot Tap Retractable

For applications where a sample line is not present the CS40 Two Electrode Sensor provides an easy method to remove and isolate the sensor for cleaning and calibration.

CS40 with Hot Tap Valve Assembly

Wetted Material

- Electrodes 316 Stainless Steel
- Insulator Kel-F PCTEF (std), PEEK (high temp)
- Seals EPDM / Viton / Buna-N
- Hardware 316 Stainless

Pressure / Temperature Ratings

Sensor Design	Max. Pressure / Temperature
Standard Temp	100 PSIG (689 kPa) @ 302°F (150°C)
High Temp	250 PSIG (1724 kPa) @ 401°F (205°C)

Temperature Compensation

- PT100 RTD
- PT1000 RTD
- 8550 Ohm (Honeywell)

CS40 Dimensions

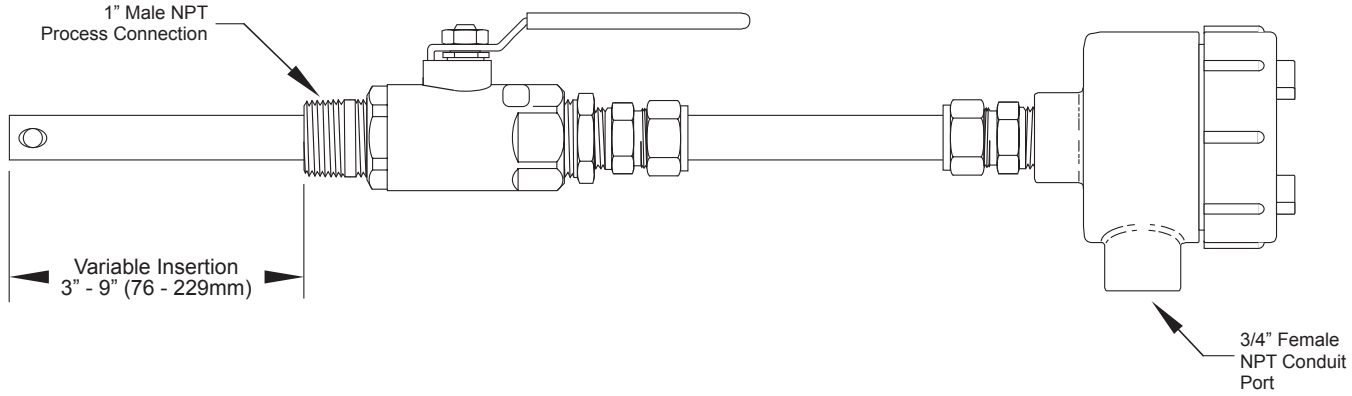


Figure 8

CS40 Two Electrode Hot Tap Retractable Conductivity Sensors

Body	Orings	Cell Constant	Temp Range	TC	Cable	Terminations	Hdw	
CS40	3/4" Diameter sensor for 1" valve							
	Orings							
	S	Standard - EPDM						
	V	Viton						
	B	Buna-N						
		Cell Constant (True range is analyzer/electrode size dependant)						
		2.00	2.00 (0-30,000 MicroSiemens)					
		1.00	1.00 (0-20,000 MicroSiemens)					
		0.20	0.20 (0-2000 MicroSiemens)					
		0.10	0.10 (0-1000 MicroSiemens)					
		0.02	0.02 (0-250 MicroSiemens)					
		0.01	0.01 (0-100 MicroSiemens)					
		High Range Cell Constants						
		20.00	20.0 (0-200 MilliSiemens)					
		10.00	10.0 (0-100 MilliSiemens)					
		5.00	5.0 (0-50 MilliSiemens)					
			Operational Temperature Range					
			(Blank)	Standard up to 150^{0}C, PCTFE Insulator				
			HT	Hi-Temp. 205^{0}C Max, PEEK Insulator **(Not Avail for High Range Constants)**				
				Integral Temperature Compensation				
				HW	8550 Ohm @25^{0}C, (Honeywell)			
				Pt100	100 Ohm @0^{0}C, PTC (BAT and Others)			
				Pt1000	1000 Ohm @0^{0}C, PTC (BAT and Others)			
				(Blank)	Other			
					Cable			
					JB	Junc Box, Exp Proof, Inc 8" Leads & Term		
					PT	8" Pig Tail, Inc Term Strip		
					10	Footage 1-10Ft (Whole Numbers Only)		
					20	Footage 11-20Ft		
					30	Footage 21-30Ft		
					40	Footage 31-40Ft		
					50	Footage 41-50Ft		
					(Blank)	Other		
						Lead Terminations		
						TL	All Tinned Leads	
						SL	All Spade Lugs	
						(Blank)	Other	
							Hardware	
							SSV	1" SS Ball Vlv, Cmp Ftg & Nip
							N	None
							(Blank)	Other
Body	**Orings**	**Cell Constant**	**Temp Range**	**TC**	**Cable**	**Terminations**	**Hdw**	
CS40	**S**	**0.1**		**PT100**	**10**	**TL**	**SSV**	**Typical Sensor Configuration**

Liquid Conductivity
Two & Four Electrode Sensors

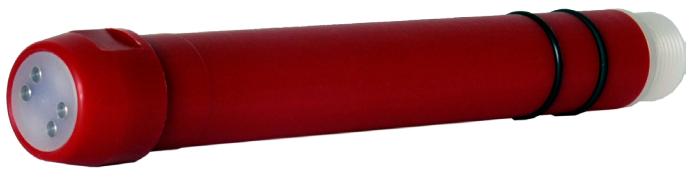
Model 551 / 546 / 547
Four Electrode In-line, Hot Tap, and Submersible

Barben's four electrode conductivity sensors use the same housing and accessories as our pH products.

Wetted Material

- Electrodes 316 Stainless, Titanium Gr2, Hastelloy C
- Insulator PEEK
- Seals EPDM / Viton
- Hardware *(see accessories guide for hardware options)*

547 Cartridge style Four Electrode Sensor



Temperature Compensation

- PT100 RTD
- PT1000 RTD
- 3K Ohm RTD (Balco)

Pressure / Temperature Ratings

Sensor Type	Installation Type		
	Threaded Nut Lock (plastic / metal body with hand nut only)	Threaded Nut Lock (metal body & metal hex nut only)	Flanged / Threaded Nut Lock (plastic body & metal hex nut only)
551	100 PSIG @ 158°F (70°C) 40 PSIG @ 212°F (100°C)	300 PSIG @ 176°F (80°C) 40 PSIG @ 266°F (130°C)	150 PSIG @ 73°F (25°C) 25 PSIG @ 266°F (130°C)

Sensor Type	Installation Type	
	3/4" In-line or Submersible*	High Pressure Hot Tap
546	150 PSIG @ 158°F (70°C) 40 PSIG @ 266°F (130°C)	300 PSIG @ 176°F (80°C) 40 PSIG @ 266°F (130°C)

Sensor Type	Installation Type	
	Threaded In-line High Pressure	Retractable
547	2500 PSIG @ 122°F (50°C) 50 PSIG @ 266°F (130°C)	150 PSIG @ 158°F (70°C) 40 PSIG @ 266°F (130°C)

Four Electrode Tip Options

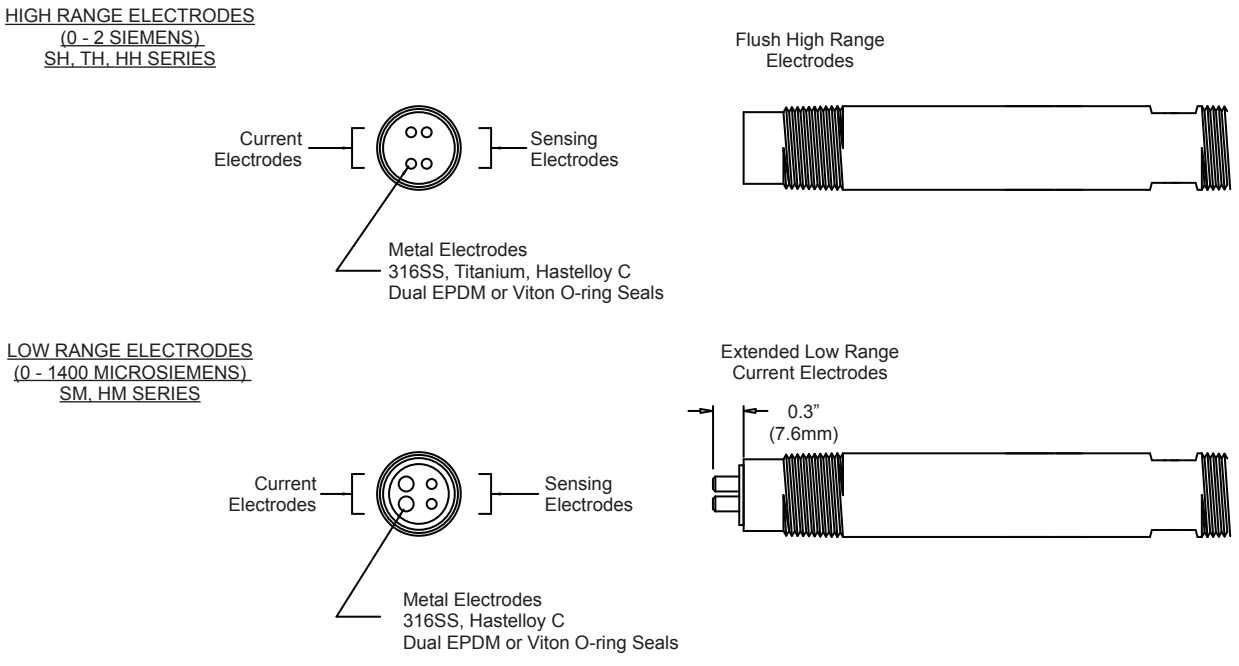
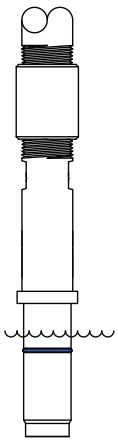
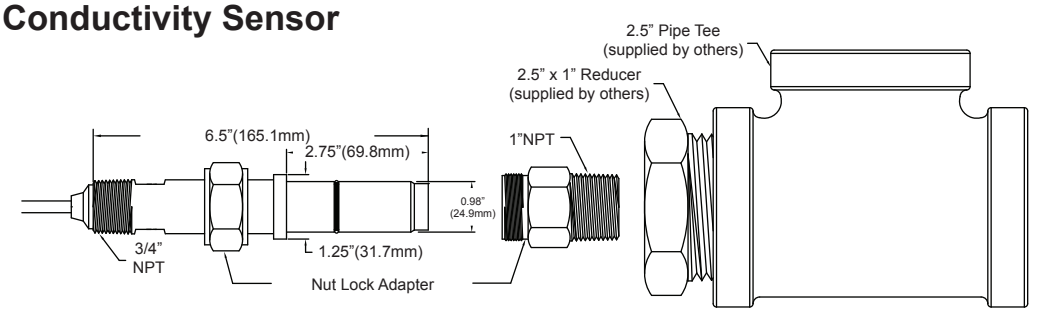


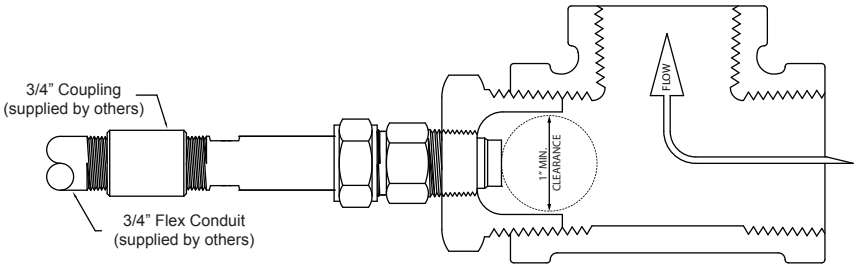
Figure 9

551 Four Electrode Conductivity Sensor



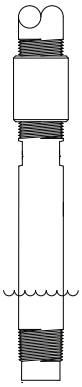
Example - 551 Sensor
Submersible installation



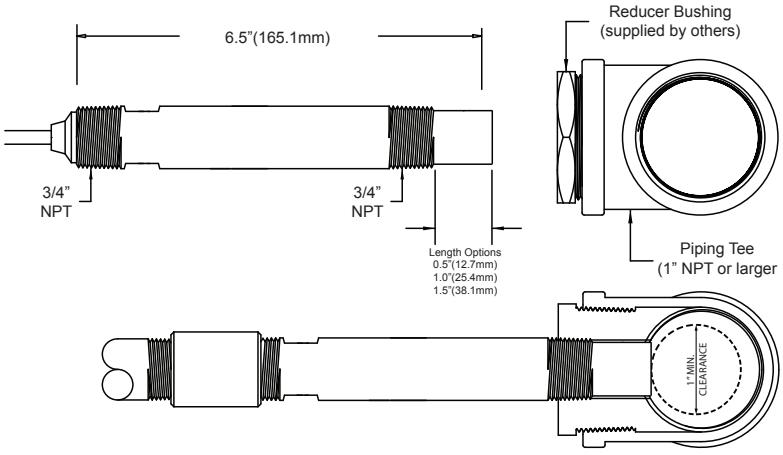


The full offering of mounting adapters and flowcells used with the 551 sensor can be found in the Barben Accessories Guide
(Consult technical support for more information)

546 Four Electrode Conductivity Sensor

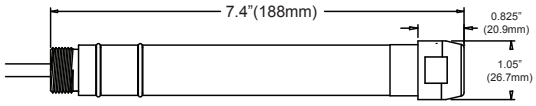


Example - 546 Sensor
Submersible installation



Flow cells and other accessories used with the 546 sensor can be found in the Barben Accessories Guide
(Consult Barben technical support for more information)

547 Four Electrode Conductivity Sensor



Bottom image show 547 sensor with hot tap retractable hardware
Barben offers an extensive offering of compression fittings, valve assemblies and sheath kits. These can be found in the Barben Accessories Guide
(Consult Barben technical support for more information)

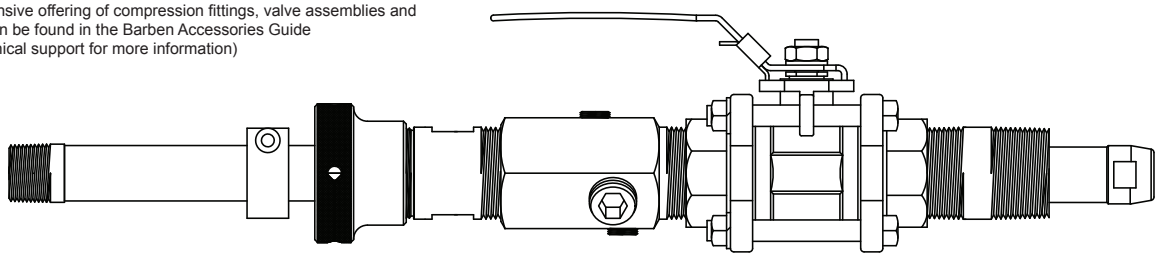


Figure 10

Liquid Conductivity
Two & Four Electrode Sensors

551 / 546 / 547 Four Electrode Conductivity Sensors

Material	Orings	Body Style	Electrodes	TC	Insertion Depth	Cable	Terminations	
B	Kynar body PEEK insulator							
	Seals							
	E	EPDM						
	V	Viton						
		Configuration						
		551	Quick-Change Inline (Drawing 2P0076)					
		546	Threaded In-line / Submersible 3/4" NPT (Drawing 2P0078)					
		547	Cartridge for Valve Insertion (Drawing 2P0079)					
			Electrode Range and Material (True range is analyzer dependant)					
			SM	0 - 1,400 MicroSiemens - SS 316, 0.0275 cell constant				
			SH	0 - 2 Siemens - SS 316, 0.3727 cell constant				
			TH	0 - 2 Siemens - Titanium Gr2, cell constant 0.3727				
			HM	0 - 1,400 MicroSiemens - Hastelloy C, 0.0275 cell constant				
			HH	0 - 2 Siemens - Hastelloy C, 0.3727 cell constant				
				Integral Temperature Compensation				
				K	PT1000			
				C	PT100			
				B	3K Ohm Balco (120^0C Max)			
				(Blank)	Other			
					Insertion Depth			
					S	551 / 547 Standard		
					0.5	546, 1/2"		
					1	546, 1"		
					1.5	546, 1-1/2"		
					(Blank)	Other 546 special order, (0.5" Increments), 5.0" Max		
						Cable		
						T	8" Pigtail for (Junction Box 546/551)	
						T1	8" Pigtail for (8" assy 547 or High Pressure 547)	
						T2	8" Pigtail for (16" 547 assy)	
						T3	8" Pigtail for (20" 547 assy or 546 Hot Tap)	
						T4	8" Pigtail for (24" 547 assy)	
						T5	8" Pigtail for (30" 547 assy)	
						T6	8" Pigtail for (36" 547 assy)	
						T7	8" Pigtail for (60" 547 assy)	
						1 to 5	Footage 1 - 5'	
						6 to 20	Footage 6 - 20'	
						21 to 30	Footage 21 - 30'	
						31 to 40	Footage 31 - 40'	
						41 to 75	Footage 41 - 75'	
						76 to 100	Footage 76 - 100'	
							Lead Terminations	
							T	All Tinned
							S	All Spades #6
Material	**Orings**	**Body Style**	**Electrodes**	**TC**	**Insertion Depth**	**Cable**	**Terminations**	
B	**E**	**547**	**SM**	**C**	**S**	**5**	**T**	**Typical Sensor Configuration**

Архангельск (8182)63-90-72
Астана +7(7172)727-132
Белгород (4722)40-23-64
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Липецк (4742)52-20-81
Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Новосибирск (383)227-86-73
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Тверь (4822)63-31-35
Томск (3822)98-41-53
Тула (4872)74-02-29
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Уфа (347)229-48-12
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Ярославль (4852)69-52-93

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