

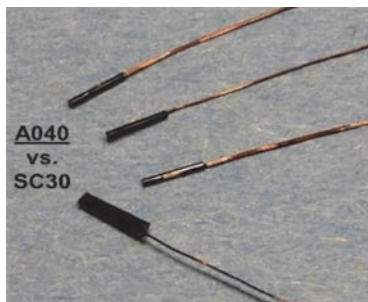
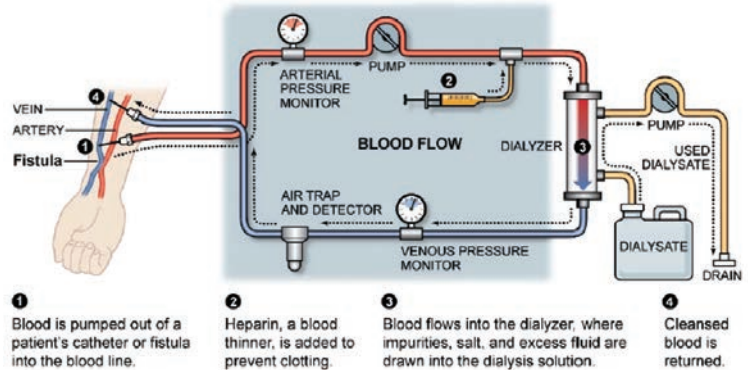


# Application Spotlight

## Temperature Monitoring in Hemodialysis

Hemodialysis (HD) is a process that uses a medical filtration device to remove waste and water from a person's blood stream. After a tube is hooked to the patient's artery, the blood is drawn through the device for cleaning. The "clean" blood is then sent back into the patient's body.

One of the most critical measurement parameters in Hemodialysis is Temperature. Monitoring the temperature of the patient's body, fluids, blood, as well as other components, within the dialysis device is important not only for the success of the process for the patient's health, but also for long-term use of the device itself. In some cases, temperature monitoring is even required by regulatory authorities.

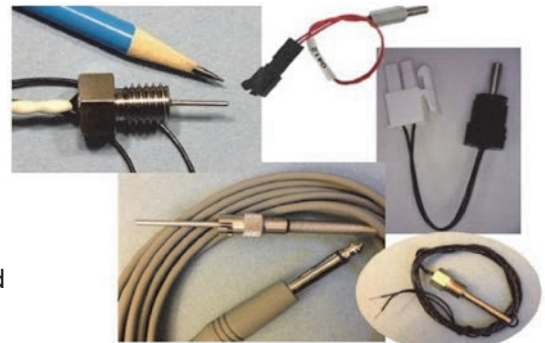


### How do we help?

Amphenol Advanced Sensors carries an extensive line of NTC Thermistors, Infrared (IR) Temperature Sensors and finished Probe Assemblies that meet the wide variety of application and temperature ranges required for Hemodialysis. These thermistors and sensors can be used in all temperature measurement and control applications with the added assurance of long-term stability and reliability.

### Custom Packaging – Makes us the right choice

What sets Amphenol Advanced Sensors apart is our ability to offer custom packaged assemblies. For Hemodialysis, finding the right solution with a variety of application temperature ranges in a packaged assembly can be an arduous task. Our attention to thermodynamic properties in the assembly design is critical for matching our customer's measurement protocol. Whether providing NTC/PTC Thermistors, IR Sensors, sub-assemblies, or fully-completed devices, our team is ready to partner with you.



**Amphenol**  
Advanced Sensors

# Temperature Monitoring in Hemodialysis

## Application Examples:

### Body Temperature

- Temperature gradients during circulation occurring outside the body can cause variable thermal energy between the patient and their environment.
- An increase in thermal energy can cause an increase in temperature leading to heat stress.
- Controlling body temperature can improve cardiovascular stability during the procedure.

### Dialysate Temperature

- Dialysate can significantly raise or lower body temperature because the blood is returned to the patient in thermal equilibrium with the dialysate.
- Temperature affects dialysis discomfort and post dialysis fatigue.
- Controlling temperature allows for the constriction of blood vessels, minimizing the risk of hypotension (low blood pressure).

### Recirculation Measurement

- By changing dialysis fluid temperature, the temperature difference between the venous and arterial sensors may be used to calculate the recirculation percentage.

### Disinfectant Circuit Temperature

- After the procedure, the machine must be cleaned and sterilized with hot water or a chemical solution maintained at the proper temperature for disinfection.

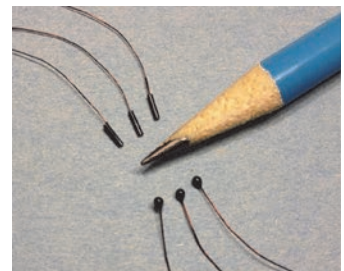
### Power Supply Temperature

- Due to the power required to support the long process of hemodialysis, safety regulations require power-supply self-monitoring for temperature to control cooling fans.

## Product Offerings for Hemodialysis Market

### MC and SC Series | NTC Thermistors

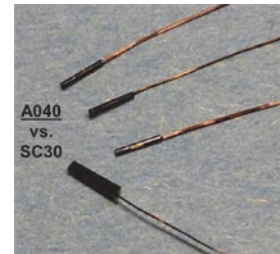
- Product prefix: MC65, SC50, SC30
- Interchangeability:
  - $\pm 0.05^{\circ}\text{C}$  @  $37^{\circ}\text{C}$  (A tolerance)
  - $\pm 0.10^{\circ}\text{C}$  @  $+37^{\circ}\text{C}$  (B tolerance)
  - $\pm 0.15^{\circ}\text{C}$  @  $+37^{\circ}\text{C}$  (C tolerance)
  - $\pm 0.10^{\circ}\text{C}$  from  $0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  (V tolerance)
  - $\pm 0.20^{\circ}\text{C}$  from  $0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  (W tolerance)
- R25: 2252  $\Omega$  to 100K  $\Omega$
- Max OD:
  - MC65 = 0.065"
  - SC50 = 0.050"
  - SC30 = 0.032"



# Temperature Monitoring in Hemodialysis

## Type A040 | NTC Thermistors

- Product prefix: A040
- Interchangeability:  $\pm 0.20^{\circ}\text{C}$  from  $+10^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$
- R25:  $2252\ \Omega$  (400 Series) and  $10\text{K}\ \Omega$
- Max OD:  $0.020''$
- Insulated leads



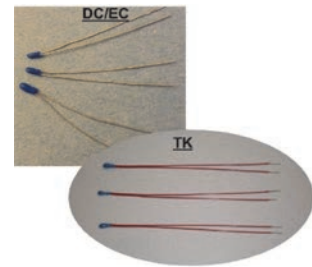
## ZTP Series Infrared (IR) Sensors

- Product prefix: ZTP
- Non-Contact Infrared (IR) Sensor
- Analog and digital options
- Hermetically-sealed TO packages



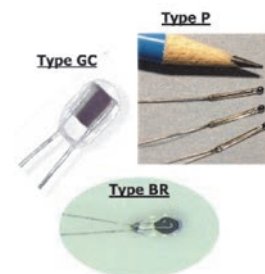
## DC, EC and TK Series | NTC Thermistors

- Product prefix: DC95, EC95, TK95
- Interchangeability:
  - $\pm 0.10^{\circ}\text{C}$  from  $0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  (V tolerance)
  - $\pm 0.20^{\circ}\text{C}$  from  $0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  (W tolerance)
  - $\pm 0.20^{\circ}\text{C}$  from  $0^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$  (Z tolerance)
  - $\pm 0.20^{\circ}\text{C}$  from  $-20^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  (V tolerance)
- R25:  $2\text{K}\ \Omega$  to  $100\text{K}\ \Omega$
- Max OD:  $0.095''$
- Insulated leads (TK95)
- Time constant: 10 sec nominal (still air)



## BR, GC and P Series | NTC Thermistors

- Product prefix: B10, BR11, BR14, BR16, BR23, BR32, BR42, BR55 GC11, GC14, GC16 P20, P25, P60, P65, P85, P100
- Max OD:  $0.012''$  to  $0.100''$
- Max temperature:  $+300^{\circ}\text{C}$  ( $+600^{\circ}\text{C}$  intermittent)
- Excellent long-term stability



## DK, GE, TH and MELF Series | NTC Thermistors

- Product prefix: DK, AL03006, TH
- DO-35 and SOD-80 style glass packages
- Temperature range:  $-40^{\circ}\text{C}$  to  $+300^{\circ}\text{C}$
- Resistant to corrosive atmospheres and harsh environments
- Axial, radial, and SMD wire forms



Medical Disclaimer: “You are hereby advised that Amphenol Advanced Sensors has not performed any biocompatibility or clinical testing of these products. The responsibility to ensure that all products comply with all applicable federal, state, and local laws lies with the OEM manufacturer or user.”

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