

# Needle Sensors

## Sheathed Thermocouples

Sheathed thermocouples are similar to electric heating elements in construction. Ceramic insulators are strung on wires, the sheath is drawn over the insulated wires, and then the assembly is compacted.

EDL sets the highest standards in the thermocouple manufacturing industry by manufacturing only the highest quality sheathed thermocouple stock.

## Sheath

EDL uses the highest quality alloys whose molecular structure dramatically decreases the chance of thermocouple contamination, thus, ensuring longer life cycle and lower failure rate.

## Insulator

Highest compaction grade Magnesium Oxide assures the much desired insulator inertness. Inertness is crucial in thermocouple applications to avoid the migration of atoms between the insulator and the thermocouple wires that may cause sensor decalibration.

## Junction

The junctions are brazed or welded, unlike that of many companies who crimp their junctions to reduce the production costs. Brazing or welding the junctions increases impermeability of the sheath, thus, creating greater confidence in temperature measurement.

## Cold End Seal

High temperature cement is used to provide a solid barrier to moisture and contamination in the back end of the thermocouple.

## Sheath Alloy Types

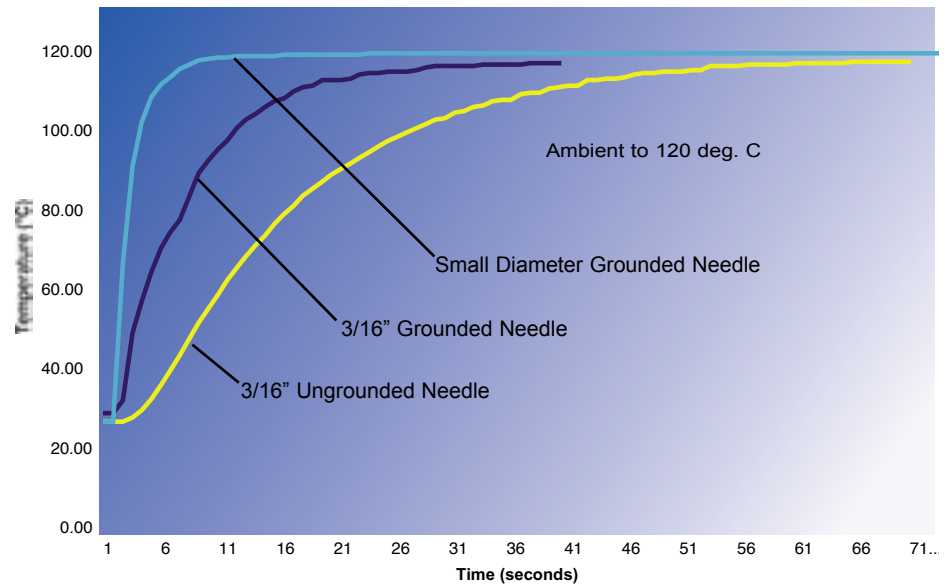
Sheath alloys are often needed in different types. The following is a list of sheaths types and their codes. There may be an increase in the cost of the thermocouple sensor due to the price of the sheath. Please contact our sales department for a quotation on items that are not in our catalog.

- S0 - Stainless Steel Type 310
- S1 - Stainless Steel Type 321
- S4 - Stainless Steel Type 304
- S6 - Stainless Steel Type 316
- I0 - Inconel Type 600
- I1 - Inconel Type 601
- I5 - Inconel Type 625

•• For ungrounded junctions please change the G to U and add \$5.00 to termination price••

**Response Times of EDL Needle Sensors**

| Type                | Designations | Dia.    |
|---------------------|--------------|---------|
| Fine                | N            | 0.010"  |
|                     | R            | 0.020"  |
|                     | E            | 0.035"  |
|                     | P            | 0.040"  |
| Standard            | T            | 0.050"  |
|                     | K            | 0.059"  |
|                     | F            | 0.072"  |
|                     | M            | 0.083"  |
|                     | Q            | 0.093"  |
|                     | D            | 0.125"  |
| Process & Insertion | V            | 0.187"  |
|                     | A            | 0.250"  |
|                     | C            | 0.3125" |
|                     | G            | 0.375"  |



## ASTM E-230 Tolerances on Initial Values of Emf vs. Temperature for Thermocouples

| Thermocouple Type | Temperature Range |              | Tolerances-Reference Junction 0°C (32°F) |        |                           |        |
|-------------------|-------------------|--------------|--|--------|---------------------------|--------|
|                   | °C                | °F           | Standard Tolerances                      |        | Special Tolerances        |        |
|                   |                   |              | °C (whichever is greater)                | °F     | °C (whichever is greater) | °F     |
| T                 | 0 to 370          | 32 to 700    | ±1 or ±0.75%                             | Note 2 | ±0.5 or 0.4%              | Note 2 |
| J                 | 0 to 760          | 32 to 1400   | ±2.2 or ±0.75%                           |        | ±1.1 or 0.4%              |        |
| E                 | 0 to 870          | 32 to 1600   | ±1.7 or ±0.5%                            |        | ±1 or ±0.4%               |        |
| K or N            | 0 to 1260         | 32 to 2300   | ±2.2 or ±0.75%                           |        | ±1.1 or ±0.4%             |        |
| R or S            | 0 to 1480         | 32 to 2700   | ±1.5 or ±0.25%                           |        | ±0.6 or ±0.1%             |        |
| B                 | 870 to 1700       | 1600 to 3100 | ±0.5%                                    |        | ±0.25%                    |        |
| C                 | 0 to 2315         | 32 to 4200   | ±4.4 or 1%                               | Note 2 |                           |        |
| T <sup>A</sup>    | -200 to 0         | -328 to 32   | ±1 or ±1.5%                              |        | B                         |        |
| E <sup>A</sup>    | -200 to 0         | -328 to 32   | ±1.7 or ±1%                              |        | B                         |        |
| K <sup>A</sup>    | -200 to 0         | -328 to 32   | ±2.2 or ±2%                              |        | B                         |        |

ASTM manual: Note 2 - See pg. 44, <sup>A</sup> See pg.44

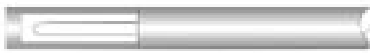
# Needle Sensors

## Needle Sensor Application Guide

### Grounded Junction



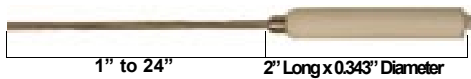
### Ungrounded Junction



Standard Needles use a grounded design for instantaneous response. Needles with an ungrounded construction are also available. In environments with static, stray EMFs, or monitoring conductive solutions, the ungrounded needle will be more suitable.

| Model           | Air | Liquid | Dense Solids | Semi Solids | Contoured | Limited Space |
|-----------------|-----|--------|--------------|-------------|-----------|---------------|
| Standard Needle | ✓   | ✓      |              | ✓           |           |               |
| Fine Needle NF  | ✓   | ✓      |              | ✓           |           | ✓             |
| Soft Needle NS  | ✓   | ✓      |              |             | ✓         | ✓             |
| Reinforced NR   |     | ✓      | ✓            | ✓           |           | ✓             |
| Tapered Cone    |     | ✓      | ✓            | ✓           |           |               |
| Threaded Bolt   |     | ✓      | ✓            |             |           | ✓             |
| Shielded Air AM | ✓   | ✓      |              |             |           |               |
| Air Cage AC     | ✓   | ✓      |              |             |           |               |
| Flexible Air AW | ✓   | ✓      |              |             |           |               |

## Standard Needle Sensors



- 0.050" to 0.93" diameter, 1" to 24" long
- For general use in liquids and subsurfaces
- Various sheath and lead lengths, and diameters are available  
**(please inquire for pricing)**

### Specifications

Sensing Tip..... diameter as ordered  
 Handle ..... 2" long x 0.343" diameter ceramic  
 Lead.....32" long thermocouple grade stranded #20 wire. Teflon insulated & twisted w/ stainless steel overbraid  
 Accuracy.....ASTM E-230 standard limits (pg. 15)  
 Response time ..... <1 second to 95% of reading

| Model                       | Temperature               | Junction | Alloy     | T/C                             | Diameter   | Length  | Terminations   | Price   |
|-----------------------------|---------------------------|----------|-----------|---------------------------------|--|---|--|---|
| <b>NB</b> -Blunt            | <b>06</b> =320°C (600°F)  | <b>G</b> | <b>S4</b> | <b>E, J, K</b> or <b>T</b>      | <b>T</b> =0.050"<br><b>K</b> =0.059"<br><b>F</b> =0.072"<br><b>M</b> =0.083"<br><b>Q</b> =0.093" | <b>1"</b><br><b>2"</b><br><b>3"</b><br><b>4"</b><br><b>6"</b> | <b>M</b> =Miniplug (Digital)<br><b>P</b> =Phonoplug (Analog)<br><b>C</b> =Coilcord w/Miniplug<br><b>L</b> =Standard Plug<br><b>U</b> =Unterminated<br><b>A</b> =Spade Lugs<br><b>E</b> =Miniplug(no lead)<br><b>R</b> =Must use HDRT Holder<br><b>F</b> =Standard Plug (no lead) | \$73.00<br>"<br>"<br>"<br>"<br>"<br>\$52.00<br>"<br>" |
| <b>NC</b> -Center Sharp     |                           |          |           |                                 |  |   |  |   |
| <b>NH</b> -Hypodermic Sharp | <b>15</b> =815°C (1500°F) | <b>G</b> | <b>S0</b> | Max Temp. for <b>T</b> is 400°C |  |   |  |   |

For Needles over 6" in length add \$2 per inch  
 For Ungrounded junction use **U** instead of **G**. For all needles add \$5.00 to termination price

## Fine Needle Sensors



- 0.040" or smaller, 0.25" to 12.0" Long
- For use in soft materials
- Fastest response time
- Various sheath and lead lengths, and diameters are available  
**(please inquire for pricing)**

### Specifications

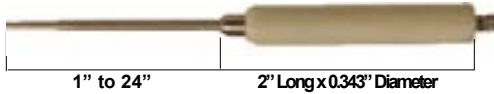
Sensing Tip..... diameter as ordered  
 Handle ..... 2" long x 0.343" diameter ceramic  
 Lead.....32" long thermocouple grade stranded #20 wire. Teflon insulated & twisted w/ stainless steel overbraid  
 Accuracy...ASTM E-230 standard limits (pg. 15)  
 Response time ..... <1 second to 95% of reading

| Model                             | Temperature               | Junction | Alloy     | T/C                             | Diameter   | Length                           | Terminations  | Price  |
|-----------------------------------|---------------------------|----------|-----------|---------------------------------|--|----------------------------------|---|--|
| <b>NBF</b> -Fine Blunt            | <b>06</b> =320°C (600°F)  | <b>G</b> | <b>S4</b> | <b>E, J, K</b> or <b>T</b>      | <b>R</b> =0.020"<br><b>E</b> =0.035"<br><b>P</b> =0.040" | <b>1/4"</b><br>thru<br><b>4"</b> | <b>M</b> =Miniplug (Digital)<br><b>P</b> =Phonoplug (Analog)<br><b>C</b> =Coilcord w/ Miniplug<br><b>L</b> =Standard Plug<br><b>U</b> =Unterminated<br><b>A</b> =Spade Lugs (Analog)<br><b>E</b> =Miniplug (No Lead)<br><b>R</b> =Must use HDRT holder<br><b>F</b> =Standard Plug (no lead) | \$93.00<br>"<br>"<br>"<br>"<br>\$72.00<br>"<br>" |
| <b>NCF</b> -Fine Center Sharp     |                           |          |           |                                 |  |                                  |   |  |
| <b>NHF</b> -Fine Hypodermic Sharp | <b>15</b> =815°C (1500°F) | <b>G</b> | <b>S0</b> | Max Temp. for <b>T</b> is 400°C |  |                                  |   |  |

For Needles over 4" please inquire for price

# Needle Sensors

## Reinforced Needles



- Any needle 1" or longer, sharp or blunt, low or high temperature can be reinforced with a heavier gauge stainless steel tubing.

- Various sheath and lead lengths, and diameters are available (please inquire for pricing)

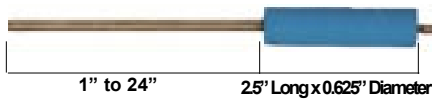
### Specifications

Sensing Diameter.....as ordered  
 Handle .....2" long x 0.343" diameter ceramic  
 Lead.....32" long thermocouple grade stranded #20 wire. Teflon insulated & twisted w/ stainless steel overbraid  
 Accuracy... ASTM E-230 standard limits (pg. 15)  
 Response time ..... <3.5 sec. to 95% of reading

| Model                            | Temperature                  | Junction | Alloy     | T/C                                   | Diameter   | Length                       | Terminations  | Price   |
|----------------------------------|------------------------------|----------|-----------|---------------------------------------|--|------------------------------|---|---|
| <b>NBR</b> -Reinf. Blunt         | <b>06</b> =320°C<br>(600°F)  | <b>G</b> | <b>S4</b> | <b>E, J, K</b><br>or <b>T</b>         | <b>T</b> =0.050"<br><b>K</b> =0.059"<br><b>F</b> =0.072" | <b>1"</b><br>to<br><b>6"</b> | <b>M</b> =Miniplug (Digital)<br><b>P</b> =Phonoplug (Analog)<br><b>C</b> =Miniplug w/Coilcord<br><b>L</b> =Standard Plug<br><b>U</b> =Unterminated<br><b>A</b> =Spade Lugs (Analog)<br><b>E</b> =Miniplug (No Lead)<br><b>R</b> =Must use HDRT holder<br><b>F</b> =Standard Plug (no lead)  | \$82.00<br>"<br>"<br>"<br>"<br>\$61.00<br>"       |
| <b>NCR</b> -Reinf. Center sharp  |                              |          |           |                                       |  |                              |   |   |
| <b>NHR</b> -Reinf. Hypodermic    | <b>15</b> =815°C<br>(1500°F) | <b>G</b> | <b>S0</b> | Max Temp.<br>for <b>T</b> is<br>400°C |  |                              |   |   |
| <b>NBFR</b> -Reinf. Fine Blunt   | <b>06</b> =320°C<br>(600°F)  | <b>G</b> | <b>S4</b> |                                       | <b>R</b> =0.020"<br><b>E</b> =0.035"<br><b>P</b> =0.040" | <b>1"</b><br>to<br><b>4"</b> | <b>M</b> =Miniplug (Digital)<br><b>P</b> =Phonoplug (Analog)<br><b>C</b> =Miniplug w/ Coilcord<br><b>L</b> =Standard Plug<br><b>U</b> =Unterminated<br><b>A</b> =Spade Lugs (Analog)<br><b>E</b> =miniplug (No Lead)<br><b>R</b> =Must use HDRT holder<br><b>F</b> =Standard Plug (no lead) | \$102.00<br>"<br>"<br>"<br>"<br>\$81.00<br>"<br>" |
| <b>NCFR</b> -Reinf. Fine Cntrshp |                              |          |           |                                       |  |                              |   |   |
| <b>NHFR</b> -Reinf. Fine Hyp.    | <b>15</b> =815°C<br>(1500°F) | <b>G</b> | <b>S0</b> |                                       |  |                              |   |   |

Longer Lengths are available

## Insertion Sensors



- Available with liquid or gas tight fittings

- Various sheath and lead lengths, and diameters are available (please inquire for pricing)

### Specifications

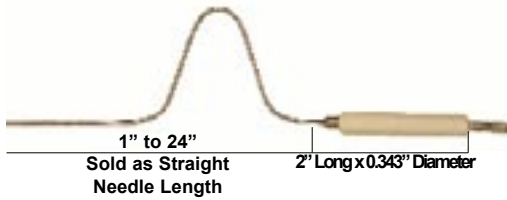
Sensing Tip..... diameter as ordered  
 Handle 2.5" long x 0.625" diameter aluminum  
 Lead...32" long thermocouple grade stranded #20 wire. Teflon insulated & twisted w/ stainless steel overbraid  
 Accuracy.... ASTM E-230 standard limits (pg. 15)  
 Response time ..... <5 sec. to 95% of reading

| Model                                  | Temperature   | Junction | Alloy     | T/C                                   | Diameter  | Length  | Termination   | Price  |
|--|---|----------|-----------|---------------------------------------|---|---|---|--|
| <b>NI</b> -Insertion                   | <b>06</b> =320°C<br>(600°F)   | <b>G</b> | <b>S4</b> | <b>E, J, K</b><br>or <b>T</b>         | <b>D</b> =0.125"<br><b>V</b> =0.187"<br><b>A</b> =0.250"<br><b>C</b> =0.3125"<br><b>G</b> =0.375" | <b>4"</b><br><b>6"</b><br><b>8"</b><br><b>10"</b><br><b>12"</b> | <b>M</b> =Miniplug (Digital)<br><b>P</b> =Phonoplug (Analog)<br><b>C</b> =Coilcord w/ Miniplug<br><b>L</b> =Standard Plug<br><b>U</b> =Unterminated<br><b>A</b> =Spade Lugs (Analog)<br><b>E</b> =Miniplug (No lead)<br><b>R</b> =Must use HDRT holder<br><b>F</b> =Standard Plug (no lead) | \$78.00<br>"<br>"<br>"<br>"<br>\$57.00<br>"<br>" |
|  | <b>15</b> =815°C<br>(1500°F)  | <b>G</b> | <b>S0</b> | Max Temp.<br>for <b>T</b> is<br>400°C |   |   |   |  |
|  | <b>20</b> =1090°C<br>(2000°F)   |          |           | <b>E</b> or <b>K</b>                  |   |   |   |  |
|  | <b>25</b> =1370°C<br>(2500°F)   |          |           | <b>K</b> only                         |   |   |   |  |
| <b>Specify Terminations</b>            | <b>Use above specifications</b>                                       |          |           |                                       |   |   |   |  |
| <b>NIA</b> - Teflon Coated Insertion   | (See page 20)   |          |           |                                       |   |   |   | \$104.00   |
| <b>NIC</b> -Center Sharp Insertion     | - (Temp. limited to <b>05</b> =500°F or 260°C on coated needles only) |          |           |                                       |   |   |   | \$88.00  |
| <b>NIH</b> -Hypodermic Sharp Insertion |   |          |           |                                       |   |   |   | \$88.00  |
| <b>NIR</b> -Reinforced Insertion       |   |          |           |                                       |   |   |   | \$88.00  |

For Needles over 12" please request quote  
 \*\*Insertion Sensors come with a removable 3" plastic extension handle\*\*

# Needle Sensors

## Soft Needles



- Magnesium oxide thermocouples covered with a soft annealed Stainless Steel sheath
- Accepts any bend and will follow any contour
- Manufactured in blunt style only
- Various sheath and lead lengths, and diameters are available (please inquire for pricing)

### Specifications

Sensing Tip..... diameter as ordered  
 Handle ..... 2" x 0.343" long ceramic  
 Lead ..... 32" long thermocouple grade stranded #20 wire. Teflon insulated & twisted w/ stainless steel overbraid.  
 Accuracy... ASTM E-230 standard limits (pg. 15)  
 Response time ... <5 seconds to 95% of reading

| Model                   | Temperature                | Junction | Alloy     | T/C            | Diameter         | Length                            | Terminations                 | Price                          |   |
|-------------------------|----------------------------|----------|-----------|----------------|------------------|-----------------------------------|------------------------------|--------------------------------|---|
| <b>NS-Soft Bendable</b> | <b>15</b> =815°C (1500°F)  | <b>G</b> | <b>S0</b> | <b>E, K, J</b> | <b>K</b> =0.059" | <b>2"</b>                         | <b>M</b> =Miniplug (Digital) | \$78.00                        |   |
|                         | <b>20</b> =1090°C (2000°F) |          |           |                | <b>F</b> =0.072" | <b>4"</b>                         | <b>P</b> =Phonoplug (Analog) | "                              |   |
|                         | <b>25</b> =1370°C (2500°F) |          |           |                | <b>E, or K</b>   | <b>D</b> =0.125"                  | <b>6"</b>                    | <b>C</b> =Miniplug w/ Coilcord | " |
|                         |                            |          |           |                |                  |                                   | <b>8"</b>                    | <b>L</b> =Standard Plug        | " |
|                         |                            |          |           |                | <b>K only</b>    |                                   | <b>10"</b>                   | <b>U</b> =Unterminated         | " |
|                         |                            |          |           |                | <b>12"</b>       | <b>E</b> =Miniplug (No Lead)      | \$57.00                      |                                |   |
|                         |                            |          |           |                |                  | <b>F</b> =Standard Plug (no lead) | "                            |                                |   |
|                         |                            |          |           |                |                  | <b>R</b> =Must use HDRT holder    |                              |                                |   |

Longer Lengths are available

## Tapered Cone



- Sharp, rugged, hardened tip 55/57 RC
- Ideal for penetrating semi solids and asphalts
- Various sheath and lead lengths, and diameters are available (please inquire for pricing)

### Specifications

Sensing Tip..... diameter as ordered  
 Handle ..... 2.5" long x 0.625" diameter aluminum  
 Lead..... 32" long thermocouple grade stranded #20 wire. Teflon insulated & twisted w/ stainless steel overbraid.  
 Accuracy... ASTM E-230 standard limits (pg. 15)  
 Response time .... <5 seconds to 95% of reading

| Model                   | Temperature                | Junction | Alloy     | T/C                           | Diameter          | Length                         | Terminations                   | Price   |
|-------------------------|----------------------------|----------|-----------|-------------------------------|-------------------|--------------------------------|--------------------------------|---------|
| <b>NTC-Tapered Cone</b> | <b>06</b> =320°C (600°F)   | <b>G</b> | <b>S4</b> | <b>E, K, J</b><br>or <b>T</b> | <b>D</b> =0.125"  | <b>2"</b>                      | <b>M</b> =Miniplug (Digital)   | \$95.00 |
|                         | <b>15</b> =815°C (1500°F)  |          |           |                               | <b>V</b> =0.187"  | <b>4"</b>                      | <b>P</b> =Phonoplug (Analog)   | "       |
|                         | <b>20</b> =1090°C (2000°F) |          |           |                               | <b>E, K, or J</b> | <b>6"</b>                      | <b>C</b> =Miniplug w/ Coilcord | "       |
|                         |                            |          |           |                               | <b>S0</b>         | <b>8"</b>                      | <b>L</b> =Standard Plug        | "       |
|                         |                            |          |           |                               | <b>E or K</b>     | <b>10"</b>                     | <b>U</b> =Unterminated         | "       |
|                         |                            |          |           |                               | <b>12"</b>        | <b>E</b> =Miniplug (No Lead)   | \$74.00                        |         |
|                         |                            |          |           |                               |                   | <b>R</b> =Must use HDRT holder | "                              |         |

**N**-Handle-Supplied with strain relief, aluminum handle w/ miniplug and spring armor cable

**S**-Handle 6" x 9/16" Stainless steel handle with nylon impact resistant guard and strain relief for use on tapered cones to aid in penetration of wooden crates or where the user finds difficulty in piercing the object under test. (See diagram below) with reinforced miniplug

**N**-Reinforced miniplug w/ spring armor cable \$124.00

**S**-Reinforced miniplug, spring armor cable, handle & nylon impact guard \$146.00

## Tapered Cone with Reinforced Handle

