THERMOCOUPLE ASSEMBLIES

The following pages illustrate most of the commonly used types of industrial thermocouple assemblies. If you do not find exactly what you need, we will gladly manufacture special thermocouple assemblies per your exact specifications. When necessary, our own machine shop can quickly fabricate many types of unusual components to avoid unnecessary and costly delivery delays. We, at Sandelius, are committed to doing everything possible to supply our customers with exactly what they need, when they need it.

METAL SHEATH TYPE ASSEMBLIES

Pages A-2 through A-11 of this catalog deal with metal sheath type thermocouple assemblies. Sandelius metal sheath type thermocouples represent the current state-of-the-art in thermocouple probe technology. The outside metal sheath protects both the thermocouple conductors and the compacted magnesium oxide (MgO) insulation from potential damage and failure caused by corrosion, contamination, oxidation or mechanical shock. Metal sheath type assemblies are easy to work with and install. The sheath material can be bent to a radius equal to approximately twice its diameter without damage. It maintains its shape after bending allowing it to be formed to fit any application. The rugged, gas-tight nature of the metal sheath makes gas-tight sealing a simple matter even without the use of a thermowell or protecting tube. When used inside a thermowell or protecting tube, the metal sheath protects the conductors from oxidation and provides an added margin of protection without appreciable loss of response time.

RTD ASSEMBLIES

Sandelius Instruments, Inc. also manufactures a full line of RTD assemblies. Any of the assembly styles described in this brochure can be modified to incorporate an RTD element in place of the thermocouple element. Specifications and ordering numbers for some of the more commonly used RTD type assemblies can be found on pages 20 and 21 of this catalog. Or you may simply call us and describe the assembly you need.

NIST TRACEABLE CALIBRATION

Sandelius maintains a state-of-the-art computerized temperature calibration laboratory to provide temperature calibration tests which are fully traceable to the National Institute of Standards and Technology (NIST; formerly NBS). Certificates of Calibration are available for all calibrated items. Reports can be customized to suit any special customer requirements.

RUSH DELIVERY REQUIREMENTS

We realize the lack of a simple thermocouple, RTD or thermowell assembly can sometimes shutdown the entire plant or production line. Because we care about our customers, the people at Sandelius are ready to do whatever it takes to get out emergency orders in the minimum amount of time possible. In critical situations you will find we can even ship specially made materials in less than 24 hours.

If you do not have a current listing of our emergency late night and weekend telephone numbers, please call or write to request one. You never know when you may need it.

Sandelius Style 1A

Element with cold end stripped to expose solid conductors. (Normally ordered as a replacement element for an existing assembly.)

Maximum recommended “S” length: 0.188” O.D. or larger 4 inches

0.125” O.D. or smaller 1 inch

Sandelius Style 3A - Element with Insulated Leads

Intended exclusively for installations where the transition area is protected inside a thermowell, protecting tube, nipple or terminal head and is not subjected to mechanical stress. (Normally ordered as a replacement element. Available in 0.188” dia. and larger only).

Spring-Loading “A” Series Assemblies

1) If spring-loading is desired, insert an “S” in front of the assembly style designation (e.g. S1A). Standard Sandelius springs are 2” long high temperature Inconel swage type springs. These adjustable springs can be forced to slide up or down the sheath for accurate positioning in the field. Testing has proven that these springs will not slip in service even when subjected to temperatures of over 1500°F.

2) While Style 1A assemblies can be spring-loaded, we recommend the use of Style 3A assemblies with stranded leadwires for spring-loading.

3) When spring-loading either 1A or 3A Style assemblies, it is good practice to loop the conductors before attaching them to the terminal block. This loop provides the slack necessary to allow for up and down travel of the sheath.

To Order Specify

1A—250J316—G—24—S2—

Options if any. Mounting Fittings
Pgs. A-16 & A-17 Weld Pads Pg. A-11

L - length in inches

S - length in inches

Assembly Style (See below for spring-loading)

To Order Specify

3A—188K600—G—30—G1S—6

Leadwire see pg. 5

E Length in inches

Assembly Style (See below for spring-loading)
MEASURING JUNCTION STYLES

G-GROUNDED JUNCTION

The conductors and sheath material are simultaneously cap welded. This process forms a measuring junction which is an integral part of the end cap and electrically grounded to the sheath. The most common junction style, grounded junctions protect the thermocouple conductors from contamination and offer fast response times.

Order Symbol: G-Single or Dual Element

R-REMOTE OR UNGROUNDED JUNCTION

The conductors are first junction welded together. Prior to cap welding the sheath, the junction is covered with insulating material to insulate it from the sheath and end cap. Remote junctions protect the thermocouple conductors from both contamination and outside electrical interference. They are used whenever electrical isolation of the element is desirable.

Order Symbol: R – Single Element
RC* – Dual Element Common
RS* – Dual Element Separate

E-EXPOSED JUNCTION

The sheath material is stripped back slightly and the conductors are welded together to form a measuring junction. The exposed insulation is sealed against moisture penetration. Exposed junctions provide the fastest possible response times but do not offer protection to the thermocouple conductors.

Order Symbol: E – Single Element
EC* – Dual Element Common
ES* – Dual Element Separate

* When ordering dual element remote or exposed junctions, a “C” indicates common junction (all four conductors welded together forming a common junction); an “S” indicates separate junctions (each thermocouple element independently junctioned and isolated from each other).
Whenever a thermocouple must be welded in place it is advisable to use a weld pad and weld clips to protect against burn-through of the sheath material during field installation. Sandelius weld pads, weld clips and weld pad covers are available in a wide range of styles and materials.

Standard W1, W2 and W3 style weld pads measure 3/4" x 3/4" x 1/8". Inconel 600 or 310SS have proven to be excellent choices for most furnace applications. Other materials are available on request.

Sandelius Style W1D
- Material Designation
- Flat Formed
- Add forming information as required

Sandelius Style W2B
- Material Designation
- Formed so the thermocouple sheath wraps around the process tube. The amount of arc desired as well as the tube size should be specified on your order. (Shown with a Fig. 1 bend a=90º). Note “L” length of the T/C is measured from the center line of the tube.

Sandelius Style W3C Tip Mounted Weld Pad
- Material Designation

TYPICAL WELD PAD INSTALLATION AND EXPANSION LOOPS

Bending and expansion loops are best specified by sending a drawing or sketch with your order. The following are examples of commonly used configurations. Many other configurations are available. Expansion loops are normally designed to open with furnace tube movement.

Legend
- L = The total straight length of the thermocouple sheath before bending as shown in the drawing of each assembly style on pages 2-7. In assemblies including expansion loops and/or bends, this length should be specified as “0” in the part number allowing is to make the necessary calculations.
- Lc = The “point of measurement” toward the “cold” or reference end of the thermocouple. On a straight assembly with no bends M1 = Lc. On assemblies incorporating one of more bends M1 and subsequent points of measurement will vary with the type of bend as indicated in the figures above.
- M1 = The first “point of measurement” back from the “hot” or measuring junction end of the thermocouple. On a straight assembly with no bends M1 = Lc. On assemblies incorporating one of more bends M1 and subsequent points of measurement will vary with the type of bend as indicated in the figures above.
- B = The straight length of sheath between the center of an expansion loop and next measuring point toward the “Hot Junction”, usually “M1”. (Used only when an expansion loop is specified. If no expansion loop is specified “B” is left blank).
- C = The straight length of sheath between “Lc” and the first “point of measurement” encountered; usually either the center of an expansion loop or M1.

Ordering Information
First select a thermocouple assembly from pages 2-7 of this catalog. Complete the part number for the assembly desired and add the weld pad designation to the end of the part number.

Example: 1A-250K310-G-120-S3-W1D formed to fit 4" OD tube.

To order an assembly with an expansion loop, bend or both add a description of the loop and bending required.

Example: 3T.250K(600-G-00-P1-6-W2B Junction bend for Fig. 3R (a=180), Expansion loop per Fig. 4L, D=12", 3-Coils, B=15", C=90º (Note in this example the length is specified as “00” allowing us to calculate the material required).
ACCESSORIES

BAYONET TYPE FITTINGS AND ADAPTERS

<table>
<thead>
<tr>
<th>ORDER SYMBOL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>FB1</td>
<td>Bayonet Cap with spring stop brazed to sheath. Can be used on either 1/8” or 3/16” diameter.</td>
</tr>
<tr>
<td>FB4</td>
<td>Bayonet Cap with adjustable swage type spring. For use on 1/8” diameter probes.</td>
</tr>
<tr>
<td>FB5</td>
<td>Bayonet Cap with adjustable swage type spring. For use on 3/16” diameter probes.</td>
</tr>
</tbody>
</table>

ADJUSTABLE BAYONET FITTING
Order Symbol: FB2B (with Brass Ferrule)
FB2N (with Nylon Ferrule)
FB2T (with Teflon Ferrule)

Designed for use on 0.125” diameter sheath material. This fitting incorporates a compression type mounting feature. If nylon or Teflon ferrules are used, the fitting may be re-positioned as needed.

PIPE STRAP BAYONET ADAPTER
Order Symbol: FP – 4 – 2

Pipe strap adapters are available to fit any size tube or pipe. They provide an excellent means to achieve surface temperature measurements while allowing for easy replacement of thermocouple probes.

STANDARD BAYONET ADAPTER
Order Symbol: BA–(L)
Standard Lengths 7/8”, 1 1/2”, 2 1/2” and 3 1/2”. Other lengths and special thread sizes are available on request.

COMPRESSION FITTINGS

<table>
<thead>
<tr>
<th>ORDER SYMBOL*</th>
<th>THREAD NPT SIZE</th>
<th>MATERIAL</th>
<th>AVAILABLE TO FIT THESE SHEATH O.D. SIZES</th>
</tr>
</thead>
<tbody>
<tr>
<td>CB11</td>
<td>1/8”</td>
<td>Brass</td>
<td>0.063”, 0.125”, 0.188”, 0.250”</td>
</tr>
<tr>
<td>CF11</td>
<td>1/8”</td>
<td>Stainless Steel</td>
<td>0.063”, 0.125”, 0.188”, 0.250”</td>
</tr>
<tr>
<td>CB12</td>
<td>1/4”</td>
<td>Brass</td>
<td>0.063”, 0.125”, 0.188”, 0.250”, 0.312”, 0.375”</td>
</tr>
<tr>
<td>CF12</td>
<td>1/4”</td>
<td>Stainless Steel</td>
<td>0.063”, 0.125”, 0.188”, 0.250”, 0.312”, 0.375”</td>
</tr>
<tr>
<td>CB13</td>
<td>3/8”</td>
<td>Brass</td>
<td>0.125”, 0.250”, 0.312”, 0.375”</td>
</tr>
<tr>
<td>CF13</td>
<td>3/8”</td>
<td>Stainless Steel</td>
<td>0.125”, 0.250”, 0.312”, 0.375”</td>
</tr>
<tr>
<td>CB14</td>
<td>1/2”</td>
<td>Brass</td>
<td>0.125”, 0.250”, 0.375”, 0.500”</td>
</tr>
<tr>
<td>CF14</td>
<td>1/2”</td>
<td>Stainless Steel</td>
<td>0.125”, 0.250”, 0.375”, 0.500”</td>
</tr>
<tr>
<td>CB16</td>
<td>3/4”</td>
<td>Brass</td>
<td>0.250”, 0.375”, 0.500”</td>
</tr>
<tr>
<td>CF16</td>
<td>3/4”</td>
<td>Stainless Steel</td>
<td>0.250”, 0.375”, 0.500”</td>
</tr>
</tbody>
</table>

Readjustable compression fittings with Teflon sealant ferrules are available upon request. When ordering fittings with Teflon ferrules, simply add a “T” after the order symbol. Example: CF14T-250.

*When ordering fittings as a part of an assembly, the order symbol alone includes all the information required as the fitting will be sized to match the assembly. When ordering fittings separately, the sheath O.D. size must be included. Example: CB12-250. Other materials available upon request.
ACCESSORIES

FIXED FITTINGS – ARE BRAZED OR WELDED TO THE SHEATH

ORDER SYMBOL
STYLE 1 | STYLE 2
F11 | F21
F12 | F22
F14 | F24
F16 | F26
F18 | F28

THREAD SIZE | MATERIAL | AVAILABLE TO FIT THESE SHEATH O.D. SIZES
1/8" NPT | 304SS | 0.063, 0.125, 0.188 & 0.250
1/4" NPT | 304SS | 0.063, 0.125, 0.188, 0.250, 0.313 & 0.375
1/2" NPT | 304SS | 0.063, 0.125, 0.188, 0.250, 0.313, 0.375 & 0.500
3/4" NPT | 304SS | 0.063, 0.125, 0.188, 0.250, 0.313, 0.375 & 0.500

SPRING-LOADED FITTINGS

ORDER SYMBOL
STYLE 1 | STYLE 2
SF14 | SF24
SB14 | –
SPF14 | SPF24

THREAD NPT SIZE | MATERIAL | SPRING TYPE | AVAILABLE SHEATH SIZES
1/2" NPT | 304SS | Adjustable | 0.125, 0.188, 0.250, 0.312 & 0.375
1/2" NPT | BRASS | Adjustable | 0.125, 0.188, 0.250, 0.312 & 0.375
1/2" NPT | 304SS | Adjustable with Liquid-tight O-Ring | 0.125, 0.188 & 0.250

Miniature Aluminum Head
Part Number: M44" (1/2" x 1/2" NPT)
(Use “120” Series Terminal Blocks)
Max. No. of Terminals: 4 + Ground
*See note on page A-18

Ceramic Terminal Blocks
Fit Miniature Head Type: M

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP122</td>
<td>2 - Terminals</td>
</tr>
<tr>
<td>CP124</td>
<td>4 - Terminals</td>
</tr>
</tbody>
</table>

Miniature Weatherproof Thermoset Plastic Head
1/4" NPT x 1/4" NPT with 4 Integral Terminals

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Ambient Temperature Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>N22</td>
<td>350º F</td>
</tr>
<tr>
<td>W22</td>
<td>800º F</td>
</tr>
</tbody>
</table>