

**MAXIMUM RECOMMENDED SHEATH WATT DENSITIES FOR VARIOUS MATERIALS**

THE MAXIMUM SHEATH WATT DENSITY VALUES LISTED BELOW ARE INTENDED AS A GENERAL GUIDE. SAFE VALUES VARY WITH OPERATING TEMPERATURES, FLOW VELOCITY, AND HEAT TRANSFER RATE THROUGH THE MATERIAL. IN GENERAL, THE HIGHER THE MATERIAL TEMPERATURE, THE LOWER THE SHEATH WATT DENSITY SHOULD BE.

| MATERIAL BEING HEATED                             | SUGGESTED SHEATH MATERIAL | MAX. OPERATING TEMP. |           | RECOMMENDED MAX.                              |                        |
|---|---------------------------|----------------------|-----------|---|------------------------|
|   |                           | °F                   | °C        | WATTS/SQ. INCH                                | WATTS/SQ. CM           |
| Acid Solution — Low percentages by volume         | 316 St. Steel             | 180°                 | 82°       | 20  | 3.1                    |
| Mild Alkali & Cleaning Solutions — Oakite, etc.   | Steel<br>St. Steel        | 212°                 | 100°      | 40  | 6.2                    |
| Asphalt, Tar & Similar Products                   | Steel                     | 200°                 | 93°       | 10 for circ.<br>5 for non-circ                | 1.6<br>0.8             |
|   |                           | 400°-500°            | 204°-260° | 6 for circ.<br>3 for non-circ.                | 0.9<br>0.5             |
| Caustic-Soda — less than 5%<br>5-20%<br>above 20% | St. Steel                 | 210°                 | 99°       | 45  | 7.0                    |
|   |                           | 210°                 | 99°       | 25  | 3.9                    |
|   |                           | 200°-180°            | 93°-82°   | 20 and down                                   | 3.1                    |
| Dowtherm A  | Steel                     | 600°                 | 316°      | 20 and down                                   | 3.1                    |
| Dowtherm E  | Steel                     | 400°                 | 204°      | 12  | 1.9                    |
| Ethylene Glycol                                   | Steel                     | 300°                 | 149°      | 20-30   | 3.1-4.7                |
| Freon   | Steel                     | 300°                 | 149°      | 2-3   | 0.3-0.5                |
| Fuel Oil — light grade                            | Steel                     | 160°-180°            | 71°-82°   | 25-30 circ.<br>15-20 non-circ.                | 3.9-4.7<br>2.3-3.1     |
|   |                           |                      |           | heavy — Bunker C                              | Steel                  |
| Gasoline and Kerosene                             | Steel                     | 300°                 | 149°      | 2-5   | 0.3-0.8                |
| Heat Transfer Oils                                | Steel                     | 500°-600°            | 206°-316° | 20-15   | 3.1-2.3                |
| Lead-stereotype Pot                               | Cast Iron<br>Steel        | 600°                 | 316°      | 35 (casting)                                  | 5.4                    |
| Linseed Oil                                       | Steel                     | 150°                 | 66°       | 50  | 7.8                    |
| Machine Oil                                       | Steel                     | 250°                 | 121°      | 20-25 circ.<br>15-20 non-circ.                | 3.1-3.9<br>2.3-3.1     |
| Metal Melting Pot                                 | Steel-St. Stl.            | 500°-900°            | 260°-482° | 25-20   | 3.9-3.1                |
| Molasses  | Steel                     | 100°                 | 38°       | 3-5   | 0.5-0.8                |
| Paraffin or Wax                                   | Steel                     | 150°                 | 66°       | 15  | 2.3                    |
| Salt Bath — Molten                                | St. Steel                 | 800°-950°            | 427°-510° | 30-25   | 4.7-3.9                |
| Steel tubing cast in aluminum                     |                           | 750°                 | 399°      | 50  | 7.8                    |
| Steel tubing cast in cast iron                    |                           | 1000°                | 538°      | 55  | 8.5                    |
| Tin — Molten                                      | Steel                     | 600°                 | 316°      | 20  | 3.1                    |
| Trichlorethylene                                  | Steel                     | 150°                 | 66°       | 20  | 3.1                    |
| Vapor Degreasing Solutions                        | Steel                     | 275°                 | 135°      | 20  | 3.1                    |
| Vegetable Oil, Shortening in liquid state         | Steel-St. Stl.            | 400°                 | 204°      | 30-40 Circulating<br>15-25 non-circulating    | 4.7-6.2<br>2.3-3.9     |
|   |                           |                      |           | Shortening below 100 F                        | Steel                  |
| Water   | Copper<br>Incoloy         | 35°-150°             | 2°-66°    | 100-125 Circulating<br>75-100 non-circulating | 15.5-19.4<br>11.6-15.5 |
|   |                           | 212°                 | 100°      | 75 Circulating<br>50 non-circulating          | 11.6<br>7.8            |
|   |                           | 300°                 | 149°      | Low flow volume 10<br>High flow volume 25-30  | 1.6<br>3.9-4.7         |
| Steam   | St. Steel<br>Incoloy      | 500°                 | 260°      | Low flow 5-10<br>High flow 20-25              | 0.8-1.6<br>3.1-3.9     |
|   |                           | 700°                 | 371°      | Low flow 5<br>High flow 15-20                 | 0.8<br>2.3-3.1         |