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Jameco Part Number 357595

| Properties            | Flexinol Name                                 | 025        | 037   | 050   | 075   | 100                           | 125    | 150    | 200    | 250                                                                                                                                                                  | 300    | 375     |  |
|-----------------------|-----------------------------------------------|------------|-------|-------|-------|-------------------------------|--------|--------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------|--|
| Physical              | Wire Diameter (µm)                            | 25         | 37    | 50    | 75    | 100                           | 125    | 150    | 200    | 250                                                                                                                                                                  | 300    | 375     |  |
|                       | Minimum Ben Radius (mm)                       | 1.3        | 1.85  | 2.5   | 3.75  | 5.0                           | 6.25   | 7.5    | 10.0   | 12.50                                                                                                                                                                | 15.0   | 18.75   |  |
|                       | Cross-sectional Area (µm <sup>2</sup> )       | 490        | 1,075 | 1,960 | 4,420 | 7,850                         | 12,270 | 17,700 | 31,420 | 49,100                                                                                                                                                               | 70,700 | 110,450 |  |
| Electrical            | Linear Resistance (Ω/m)                       | 1,770      | 860   | 510   | 200   | 150                           | 70     | 50     | 31     | 20                                                                                                                                                                   | 13     | 8       |  |
|                       | Recommended Current <sup>†</sup> (mA)         | 20         | 30    | 50    | 100   | 180                           | 250    | 400    | 610    | 1,000                                                                                                                                                                | 1,750  | 2,750   |  |
|                       | Recommended Power <sup>†</sup> (W/m)          | 0.71       | 0.78  | 1.28  | 2.0   | 4.86                          | 4.4    | 8.00   | 12.0   | 20.0                                                                                                                                                                 | 39.8   | 60.5    |  |
| Strength*             | Max. Recovery Weight @ 600 MPa (g)            | 29         | 65    | 117   | 250   | 469                           | 736    | 1,056  | 1,860  | 2,933                                                                                                                                                                | 4,240  | 6,630   |  |
|                       | Rec. Recovery Weight @ 190 MPa (g)            | 7          | 20    | 35    | 80    | 150                           | 230    | 330    | 590    | 930                                                                                                                                                                  | 1,250  | 2,000   |  |
|                       | Rec. Deformation Weight @ 35 MPa (g)          | 2          | 4     | 8     | 815   | 28                            | 43     | 62     | 110    | 172                                                                                                                                                                  | 245    | 393     |  |
| Speed                 | Typical Contraction Speed <sup>††</sup> (sec) | 1.0        | 1.0   | 1.0   | 1.0   | 1.0                           | 1.0    | 1.0    | 1.0    | 1.0                                                                                                                                                                  | 1.0    | 1.0     |  |
|                       | LT Relaxation Speed <sup>††</sup> (sec)       | 0.16       | 0.25  | 0.3   | 0.5   | 0.8                           | 1.6    | 2.0    | 3.5    | 5.5                                                                                                                                                                  | 8.0    | 13.0    |  |
|                       | LT Alloy Thermal Cycle Rate (cyc/min)         | 52         | 48    | 46    | 40    | 33                            | 23     | 20     | 13     | 9                                                                                                                                                                    | 7      | 4       |  |
|                       | HT Relaxation Speed <sup>††</sup> (sec)       | n.a.       | 0.09  | 0.1   | 0.2   | 0.4                           | 0.9    | 1.2    | 2.2    | 3.5                                                                                                                                                                  | 6      | 10      |  |
|                       | HT Alloy Thermal Cycle Rate (cyc/min)         | n.a.       | 55    | 55    | 50    | 43                            | 32     | 27     | 19     | 13                                                                                                                                                                   | 9      | 5       |  |
| Thermal               | Activation Start Temp. (°C)                   | LT Alloy   |       |       |       | HT Alloy                      |        |        |        | † In still air, at 20°C.<br>* To obtain force in Newtons, multiply mass in grams by 0.0098.<br>†† Depends greatly on local heating and cooling conditions. See text. |        |         |  |
|                       | Activation Finish Temp. (°C)                  | 68         |       |       |       | 88                            |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Relaxation Start Temp. (°C)                   | 78         |       |       |       | 98                            |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Relaxation Finish Temp. (°C)                  | 52         |       |       |       | 72                            |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Annealing Temp. (°C)                          | 42         |       |       |       | 62                            |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Melting Temp. (°C)                            | 300        |       |       |       | 300                           |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Melting Temp. (°C)                            | 1,300      |       |       |       | 1,300                         |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Specific Heat (cal/g°C )                      | 0.077      |       |       |       | 0.077                         |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Heat Capacity (Joule/g°C)                     | 0.32       |       |       |       | 0.32                          |        |        |        |                                                                                                                                                                      |        |         |  |
| Latent Heat (Joule/g) | 24.2                                          |            |       |       | 24.2  |                               |        |        |        |                                                                                                                                                                      |        |         |  |
| Material              | Density (g/cc)                                | 6.45       |       |       |       |                               |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Maximum Recovery Force (MPa)                  | 600        |       |       |       | (~43 ton / in <sup>2</sup> )  |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Recommended Deformation Force (MPa)           | 35         |       |       |       | (~2.5 ton / in <sup>2</sup> ) |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Breaking Strength (MPa)                       | 1,000      |       |       |       | (~71 ton / in <sup>2</sup> )  |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Poisson's Ratio                               | 0.33       |       |       |       |                               |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Work Output (Joule/g)                         | 1          |       |       |       |                               |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Energy Conversion Efficiency (%)              | 5          |       |       |       |                               |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Maximum Deformation Ratio (%)                 | 8          |       |       |       |                               |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Recommended Deformation Ratio (%)             | 3-5        |       |       |       |                               |        |        |        |                                                                                                                                                                      |        |         |  |
| Phase Related         | Phase                                         | Martensite |       |       |       | Austenite                     |        |        |        | Figure 2.8 Flexinol Muscle Wire Properties<br>This table shows values for various sizes of Flexinol Muscle Wires that have a transition temperature of 70°C.         |        |         |  |
|                       | Resistivity (µΩcm)                            | 76         |       |       |       | 82                            |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Young's Modulus (GPa)                         | 28         |       |       |       | 75                            |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Magnetic Susceptibility (µemu/g)              | 2.5        |       |       |       | 3.8                           |        |        |        |                                                                                                                                                                      |        |         |  |
|                       | Thermal Conductivity (W/cm°C)                 | 0.08       |       |       |       | 0.18                          |        |        |        |                                                                                                                                                                      |        |         |  |

<sup>†</sup> In still air, at 20°C.

<sup>\*</sup> To obtain force in Newtons, multiply mass in grams by 0.0098.

<sup>††</sup> Depends greatly on local heating and cooling conditions. See text.

**Figure 2.8 Flexinol Muscle Wire Properties**  
This table shows values for various sizes of Flexinol Muscle Wires that have a transition temperature of 70°C.

**Poisson's Ratio** — Describes how much a material narrows when pulled at each end (i.e. the cross-sectional shrinkage in a material under strain). For nitinol it is about 0.33 (the same as aluminum). Like Young's Modulus, this ratio varies widely, and depends greatly on the alloy's composition, training and temperature.

**Magnetic Fields & Susceptibility**  
Nitinol is virtually non magnetic. Also a straight wire carrying a current generates a much smaller magnetic field than does a coil of wire (as in motors and solenoids).

## Electrical Properties

Voltage, current, and resistance of a Muscle Wire follow the basic equation of electricity, Ohm's Law:

$$V = i \times R$$

voltage (in volts) equals current (in amps) times resistance (in ohms)

So if you know a wire's resistance (which varies directly with its length) and the recommended current level to activate it, you can calculate the required voltage by using Ohm's Law. For example, a 10 cm