

## 6092/SiC/17.5p - Precise-to-Form Extrusions

- Complex, net-shape capability
- Open and closed sections
- Seamed and seamless
- ANSI or better dimensional tolerances
- Circle sizes of 2-20in (50-500mm)
- Tempers: T6, T4, As-extruded

Typical Mechanical Properties of 6092/SiC/17.5p Extrusion

| Material System                                   | 6092/SiC/17.5p |              |              |              |              |
|---------------------------------------------------|----------------|--------------|--------------|--------------|--------------|
| Form                                              | Extrusion      |              |              |              |              |
| Temper                                            | T-6            |              |              |              |              |
| Thickness- in (mm)                                | 0.070 (1.78)   | 0.090 (2.29) | 0.150 (3.81) | 0.250 (6.35) | 0.820 (20.8) |
| Density- lb/in <sup>3</sup> (gm/cm <sup>3</sup> ) | .1011 (2.80)   |              |              |              |              |
| Basis                                             | Average        |              |              |              |              |
| F, tu- ksi (MPa)                                  |                |              |              |              |              |
| L                                                 | 74 (510)       | 74 (510)     | 71 (490)     | 71 (490)     | 67 (642)     |
| LT                                                | --             | --           | --           | --           | --           |
| F, ty- ksi (MPa)                                  |                |              |              |              |              |
| L                                                 | 65 (448)       | 65 (448)     | 63 (434)     | 61 (421)     | 57 (393)     |
| LT                                                | --             | --           | --           | --           | --           |
| F, cy- ksi (MPa)                                  |                |              |              |              |              |
| L                                                 | 67 (462)       | 67 (462)     | 60 (414)     | 59 (407)     | 53 (365)     |
| LT                                                | --             | --           | --           | --           | --           |
| F, su- ksi (MPa)                                  |                |              |              |              |              |
| L                                                 | 44 (303)       | 44 (303)     | 43 (296)     | 44 (303)     | 40 (276)     |
| LT                                                | --             | --           | --           | --           | --           |
| F, bru- ksi (MPa)                                 |                |              |              |              |              |
| L, (e/D= 1.5)                                     | 123 (848)      | 115 (793)    | 101 (696)    | 105 (724)    | 93 (641)     |
| L, (e/D= 2.0)                                     | 153 (1,055)    | 145 (1,000)  | 134 (924)    | 133 (917)    | 116 (800)    |
| LT, (e/D= 1.5)                                    | --             | --           | --           | --           | --           |
| LT, (e/D= 2.0)                                    | --             | --           | --           | --           | --           |
| F, bry- ksi (MPa)                                 |                |              |              |              |              |
| L, (e/D= 1.5)                                     | 108 (745)      | 102 (703)    | 93 (641)     | 94 (648)     | 87 (600)     |
| L, (e/D= 2.0)                                     | 130 (896)      | 120 (827)    | 116 (800)    | 114 (786)    | 105 (724)    |
| LT, (e/D= 1.5)                                    | --             | --           | --           | --           | --           |
| LT, (e/D= 2.0)                                    | --             | --           | --           | --           | --           |
| e, (percent)                                      |                |              |              |              |              |
| L                                                 | 6              | 7            | 6            | 6            | 7            |
| LT                                                | --             | --           | --           | --           | --           |
| E, t- msi (GPa)                                   |                |              |              |              |              |
| L                                                 | 15.3 (105)     | 15.2 (105)   | 15.5 (107)   | 15.6 (108)   | 15.7 (108)   |
| LT                                                | --             | --           | --           | --           | --           |
| E, c- msi (GPa)                                   |                |              |              |              |              |
| L                                                 | 15.4 (106)     | 15.3 (105)   | 15.4 (106)   | 15.5 (107)   | 15.1 (104)   |
| LT                                                | --             | --           | --           | --           | --           |
| CTE ppm/°F (ppm/°C)                               |                |              |              |              |              |
| L                                                 | --             | --           | --           | 9.2 (16.6)   | --           |
| LT                                                | --             | --           | --           | --           | --           |

Additional data and manufacturing information available upon request



21100 Superior Street Chatsworth, CA 91311  
 Phone: 818-998-1504  
 Fax: 818-998-0343  
[www.dwa-dra.com](http://www.dwa-dra.com)

# 6092/SiC/17.5p - Sheet and plate

- Standard and user defined thicknesses
- ANSI or better dimensional tolerances:
- Tempers: T6, T4, As-rolled

| Typical Mechanical Properties of 6092/SiC/17.5p Sheet |                |              |              |              |              |
|-------------------------------------------------------|----------------|--------------|--------------|--------------|--------------|
| Material System                                       | 6092/SiC/17.5p |              |              |              |              |
| Form                                                  | Sheet          |              |              |              |              |
| Temper                                                | T-6            |              |              |              |              |
| Thickness- in (mm)                                    | 0.040 (1.01)   | 0.060 (1.52) | 0.080 (2.03) | 0.100 (2.54) | 0.125 (3.17) |
| Density- lb/in <sup>3</sup> (gm/cm <sup>3</sup> )     | .1011 (2.80)   |              |              |              |              |
| Basis                                                 | Average        |              |              |              |              |
| F, tu- ksi (MPa)                                      |                |              |              |              |              |
| L                                                     | 64 (476)       | 67 (462)     | 66 (455)     | 67 (462)     | 67 (462)     |
| LT                                                    | 66 (455)       | 65 (448)     | 65 (448)     | 66 (455)     | 70 (483)     |
| F, ty- ksi (MPa)                                      |                |              |              |              |              |
| L                                                     | 58 (400)       | 58 (400)     | 56 (386)     | 57 (393)     | 57 (393)     |
| LT                                                    | 54 (372)       | 52 (359)     | 52 (359)     | 53 (365)     | 53 (365)     |
| F, cy- ksi (MPa)                                      |                |              |              |              |              |
| L                                                     | 71 (490)       | 66 (455)     | 56 (386)     | 59 (407)     | 62 (427)     |
| LT                                                    | 66 (455)       | 63 (434)     | 56 (386)     | 56 (386)     | 59 (407)     |
| F, su- ksi (MPa)                                      |                |              |              |              |              |
| L                                                     | 44 (303)       | 43 (296)     | 42 (290)     | 42 (290)     | 43 (296)     |
| LT                                                    | 44 (303)       | 43 (296)     | 42 (290)     | 42 (290)     | 42 (290)     |
| F, bru- ksi (MPa)                                     |                |              |              |              |              |
| L, (e/D= 1.5)                                         | 119 (820)      | 118 (814)    | 109 (752)    | 106 (731)    | 107 (738)    |
| L, (e/D= 2.0)                                         | 157 (1,082)    | 150 (1,034)  | 144 (993)    | 139 (958)    | 140 (965)    |
| LT, (e/D= 1.5)                                        | 117 (807)      | 114 (786)    | 108 (745)    | 110 (758)    | 104 (717)    |
| LT, (e/D= 2.0)                                        | 156 (1,076)    | 152 (1,048)  | 142 (979)    | 139 (958)    | 136 (938)    |
| F, bry- ksi (MPa)                                     |                |              |              |              |              |
| L, (e/D= 1.5)                                         | 117 (807)      | 116 (800)    | 101 (696)    | 100 (689)    | 100 (689)    |
| L, (e/D= 2.0)                                         | 147 (1,104)    | 144 (993)    | 125 (862)    | 124 (855)    | 122 (841)    |
| LT, (e/D= 1.5)                                        | 116 (800)      | 112 (772)    | 100 (689)    | 101 (696)    | 95 (655)     |
| LT, (e/D= 2.0)                                        | 147 (1,014)    | 145 (1,000)  | 123 (848)    | 122 (841)    | 119 (820)    |
| e, (percent)                                          |                |              |              |              |              |
| L                                                     | 7              | 8            | 8            | 8            | 8            |
| LT                                                    | 7              | 8            | 8            | 7            | 8            |
| E, t- msi (GPa)                                       |                |              |              |              |              |
| L                                                     | 14.6 (101)     | 14.7 (101)   | 14.7 (101)   | 14.7 (101)   | 14.7 (101)   |
| LT                                                    | 14.7 (101)     | 14.4 (99)    | 14.7 (101)   | 14.7 (101)   | 14.7 (101)   |
| E, c- msi (GPa)                                       |                |              |              |              |              |
| L                                                     | 14.1 (97)      | 14.3 (99)    | 14.3 (99)    | 14.5 (100)   | 14.1 (97)    |
| LT                                                    | 13.9 (96)      | 14.0 (97)    | 14.0 (97)    | 14.5 (100)   | 14.2 (98)    |
| CTE- ppm/°F (ppm/°C)                                  |                |              |              |              |              |
| L                                                     | 9.3 (16.7)     | 9.4 (16.9)   | 9.3 (16.7)   | 9.1 (16.4)   | 9.3 (16.7)   |
| LT                                                    | 9.1 (16.4)     | 9.2 (16.6)   | 9.2 (16.6)   | 9.4 (16.9)   | 9.1 (16.4)   |

Additional data and manufacturing information available upon request



21100 Superior Street Chatsworth, CA 91311  
 Phone: 818-998-1504  
 Fax: 818-998-0343  
[www.dwa-dra.com](http://www.dwa-dra.com)



# 6092/SiC/25p - Stiffness Driven Applications

- Titanium stiffness with aluminum density
- User specified extrusions, forgings, and sheet and plate

| Typical Mechanical Properties of 6092/SiC/25p Extrusion |              |              |              |              |             |
|---------------------------------------------------------|--------------|--------------|--------------|--------------|-------------|
| Material System                                         | 6092/SiC/25p |              |              |              |             |
| Form                                                    | Extrusion    |              |              |              |             |
| Temper                                                  | T-6          |              |              |              |             |
| Thickness- in (mm)                                      | 0.250 (6.35) | 0.350 (8.89) | 0.500 (12.7) | 0.630 (16.0) | 0.74 (18.8) |
| Density- lb/in <sup>3</sup> (gm/cm <sup>3</sup> )       | .1025 (2.84) |              |              |              |             |
| Basis                                                   | Average      |              |              |              |             |
| F, tu- ksi (MPa)                                        |              |              |              |              |             |
| L                                                       | 78 (538)     | 79 (545)     | 75 (517)     | 76 (524)     | 75 (517)    |
| LT                                                      | 75 (517)     | 76 (524)     | 70 (483)     | 70 (483)     | 70 (483)    |
| F, ty- ksi (MPa)                                        |              |              |              |              |             |
| L                                                       | 65 (448)     | 65 (448)     | 61 (421)     | 62 (427)     | 61 (421)    |
| LT                                                      | 62 (427)     | 63 (434)     | 58 (400)     | 57 (393)     | 58 (400)    |
| F, cy- ksi (MPa)                                        |              |              |              |              |             |
| L                                                       | 71 (490)     | 66 (455)     | 56 (386)     | 59 (407)     | 62 (427)    |
| LT                                                      | 66 (455)     | 63 (434)     | 56 (386)     | 56 (386)     | 59 (407)    |
| F, su- ksi (MPa)                                        |              |              |              |              |             |
| L                                                       | 48 (331)     | 48 (331)     | 46 (317)     | 45 (310)     | 45 (310)    |
| LT                                                      | 45 (310)     | 44 (303)     | 42 (290)     | 39 (269)     | 42 (290)    |
| F, bru- ksi (MPa)                                       |              |              |              |              |             |
| L, (e/D= 1.5)                                           | 108 (745)    | 110 (758)    | 101 (696)    | 102 (703)    | 102 (703)   |
| L, (e/D= 2.0)                                           | 135 (931)    | 140 (965)    | 130 (896)    | 131 (903)    | 137 (945)   |
| LT, (e/D= 1.5)                                          | 106 (731)    | 110 (758)    | 103 (710)    | 103 (710)    | 101 (696)   |
| LT, (e/D= 2.0)                                          | 143 (966)    | 148 (1,020)  | 141 (972)    | 135 (931)    | 132 (910)   |
| F, bry- ksi (MPa)                                       |              |              |              |              |             |
| L, (e/D= 1.5)                                           | 104 (717)    | 103 (710)    | 94 (648)     | 94 (648)     | 99 (683)    |
| L, (e/D= 2.0)                                           | 124 (855)    | 124 (855)    | 113 (779)    | 112 (772)    | 121 (834)   |
| LT, (e/D= 1.5)                                          | 105 (724)    | 102 (703)    | 96 (662)     | 95 (665)     | 99 (683)    |
| LT, (e/D= 2.0)                                          | 127 (876)    | 125 (862)    | 117 (807)    | 113 (779)    | 121 (834)   |
| e, (percent)                                            |              |              |              |              |             |
| L                                                       | 4            | 4            | 5            | 5            | 5           |
| LT                                                      | 3            | 3            | 4            | 5            | 4           |
| E, t- msi (GPa)                                         |              |              |              |              |             |
| L                                                       | 17.9 (123)   | 17.9 (123)   | 17.7 (122)   | 17.9 (123)   | 17.6 (121)  |
| LT                                                      | 17.3 (119)   | 17.2 (119)   | 16.8 (116)   | 17.0 (117)   | 16.6 (114)  |
| E, c- msi (GPa)                                         |              |              |              |              |             |
| L                                                       | 17.6 (121)   | 17.5 (121)   | 17.3 (119)   | 17.5 (121)   | 17.5 (121)  |
| LT                                                      | 16.7 (115)   | 16.4 (113)   | 16.3 (112)   | 16.4 (113)   | 16.4 (113)  |
| CTE- ppm/°F (ppm/°C)                                    |              |              |              |              |             |
| L                                                       | --           | --           | 8.5 (15.3)   | --           | --          |
| LT                                                      | --           | --           | --           | --           | --          |

Additional data and manufacturing information available upon request



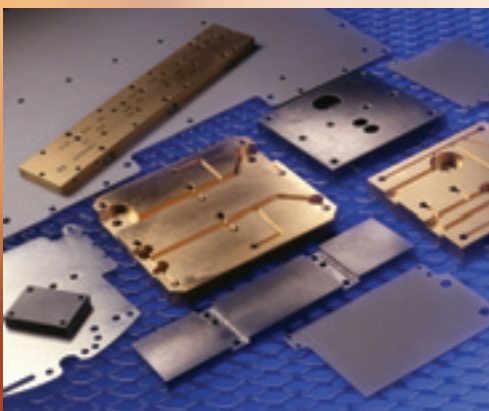
21100 Superior Street Chatsworth, CA 91311  
 Phone: 818-998-1504  
 Fax: 818-998-0343  
[www.dwa-dra.com](http://www.dwa-dra.com)

## 6092/SiC/44p and 6063/SiC/50p - High Stability Requirements

- 6092/SiC/44p
  - Enhanced YS & UTS high stiffness and low CTE
  - Beryllium replacement and electronic packaging
- 6063/SiC/50p
  - Low CTE & high thermal conductivity, high stiffness
  - Thermal management and electronic packaging
- Supplied as billets for machined parts
- Suitable for simple forging

### MMCs vs. Conventional Materials

|                      | Density,<br>gm/cc | CTE,<br>ppm/°C | Thermal K,<br>W/M °K | Modulus,<br>GPa |
|----------------------|-------------------|----------------|----------------------|-----------------|
| 6092/SiC/44p MMC     | 2.9               | 12.1           | 190                  | 138             |
| 6063/SiC/50p MMC     | 2.9               | 9.6            | 218                  | 178             |
| Aluminum, Pure       | 2.7               | 23.4           | 221                  | 70              |
| Aluminum, 6061       | 2.7               | 23.4           | 180                  | 70              |
| Copper, Pure         | 8.8               | 17.5           | 391                  | 117             |
| Alumina              | 3.2               | 7.0            | 30                   | 345             |
| Kovar                | 8.1               | 5.4            | 17                   | 152             |
| Cu/Invar/Cu          | 8.1               | 5.4            | 131                  | --              |
| ThermkonTM83, (Cu-W) | 14.8              | 8.3            | 190                  | 234             |
| Molybdenum           | 10.1              | 5.2            | 146                  | 345             |



Additional data and manufacturing information available upon request

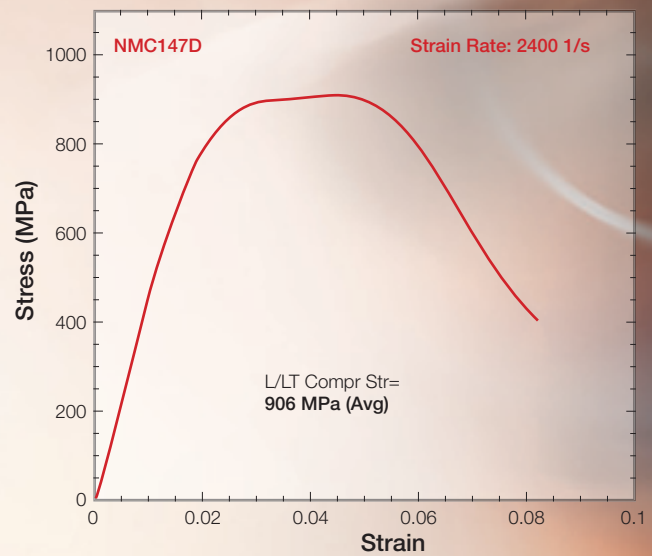
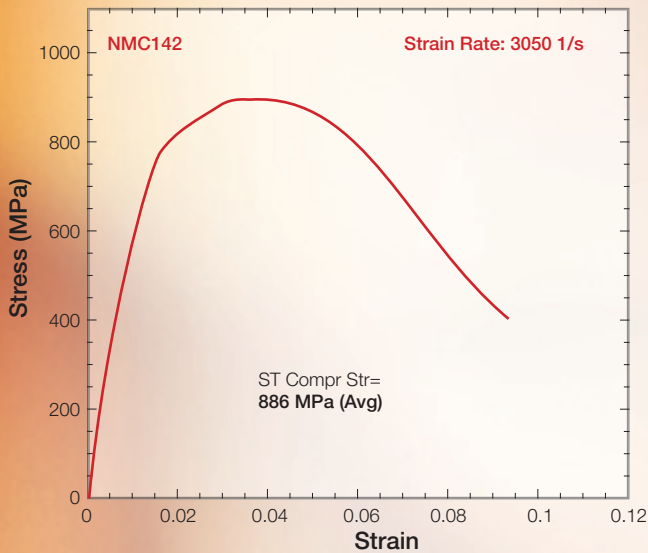


21100 Superior Street Chatsworth, CA 91311  
 Phone: 818-998-1504  
 Fax: 818-998-0343  
[www.dwa-dra.com](http://www.dwa-dra.com)

# 5083/B4C/10p- Trimodal Survivability Solutions

- Multi-use force protection
- Nanotechnology based steel replacement
- Dynamic compressive strength approaching steel at 1/3 the density
- Supplied in plate forms

## Dynamic Compressive Stress-Strain Plots for Trimodal Al MMC Forgings



## Dynamic Compressive Strength Summary for Trimodal Al MMCs

| Billet Serial No. | Billet Dia. (in) | Forging Dia. (in) | Loading Relative to Forging | Samples Tested | Average Max Stress (MPa) | Strain Rates Tested (1/s) | Approx. Strains Reached (%)* | Ultimate Failure |
|-------------------|------------------|-------------------|-----------------------------|----------------|--------------------------|---------------------------|------------------------------|------------------|
| 1561-D1           | 14               | 1                 | 90°                         | 2              | 790                      | 3240, 3470                | 11.2, 12.5                   | Yes              |
| 1561-D2           | 14               | 1                 | 90°                         | 2              | 797                      | 3420, 3420                | 12.3, 15.8                   | No               |
| 1561-D3           | 14               | 1                 | 90°                         | 2              | 799                      | 3070, 3370                | 11.2, 12.4                   | No               |
| 1561-D4           | 14               | 1                 | 90°                         | 2              | 791                      | 3490, 2880                | 9.8, 10.0                    | Yes              |
| 1561-D5           | 14               | 1                 | 90°                         | 2              | 822                      | 3180, 3390                | 9.8, 11.8                    | Yes              |
| 1561-D6           | 14               | 1                 | 90°                         | 2              | 823                      | 3400, 3100                | 13.0, 11.0                   | Yes              |
| 1561-D7           | 14               | 1                 | 90°                         | 2              | 830                      | 3220, 3520                | 9.6, 10.0                    | Yes              |
| 1561-D8           | 14               | 1                 | 0°                          | 2              | 811                      | 3750, 3450                | 9.5, 13.0                    | Yes              |
|                   |                  | 1                 | 90°                         | 2              | 863                      | 3580, 2950                | 14.0, 8.0                    | Yes              |
| 1561-D10          | 14               | 1                 | 0°                          | 2              | 829                      | 3050, 3200                | 8.5, 7.7                     | No               |
|                   |                  | 1                 | 90°                         | 2              | 873                      | 2900, 3000                | 10.6, 7.8                    | Yes              |
| 1561-D10R         | 14               | 1                 | 90°                         | 2              | 848                      | 3275, 3300                | 8.8, 9.8                     | Yes              |
| 1561-D11          | 14               | 1                 | 90°                         | 2              | 827                      | 3525, 3550                | 10.2, 9.9                    | Yes              |
| 1561-7            | 14               | 3                 | 0°                          | 2              | 796                      | 3280, 3370                | 10.1, 9.5                    | Yes              |
|                   |                  |                   | 90°                         | 2              | 840                      | 2750, 3130                | 11.5, 9.0                    | Yes              |

\*Approximate strain to failure is an estimate based on a point the curve begins unloading or the slope changes due to failure. It is an estimate of potential strain in the material and not an exact measure, because rise times for loading can vary.

Development supported by US Army Research Laboratory, TARDEC and Office of Naval Research



21100 Superior Street Chatsworth, CA 91311  
 Phone: 818-998-1504  
 Fax: 818-998-0343  
 www.dwa-dra.com

# 2009/SiC/15p - Ideal Forgeability

- Complex, net-shape capability
- Tempers: T6, T4

| SiCp Loading (V/O) | SiCp Size (FEPA) | SiCp d50 Value (Microns) | Temper | Extusion Ratio            | Test Orientation | F, ty |       | F, tu |       | Elong (%) | E, t  |       |
|--------------------|------------------|--------------------------|--------|---------------------------|------------------|-------|-------|-------|-------|-----------|-------|-------|
|                    |                  |                          |        |                           |                  | (ksi) | (MPa) | (ksi) | (MPa) |           | (msi) | (GPa) |
| 0                  | n/a              | n/a                      | T4     | 20:1 <sup>1</sup>         | L                | 37    | 255   | 52    | 358   | 10        | 10.3  | 71    |
| 5                  | F1000            | 6.43                     | T4     | 496:1 <sup>2</sup>        | L                | 58    | 400   | 77    | 531   | 10        | 11.5  | 79    |
| 15                 | F1000            | 6.43                     | T4     | 14:1 <sup>3</sup>         | LT               | 50    | 348   | 70    | 483   | 5.2       | 13.6  | 94    |
| 15                 | F1000            | 6.43                     | T6     | 14:1 <sup>3</sup>         | L                | 56    | 383   | 77    | 530   | 8.5       | 14.5  | 100   |
| 15                 | F1000            | 6.43                     | T4     | 496:1 <sup>2</sup>        | L                | 61    | 424   | 86    | 594   | 9.8       | 15.2  | 105   |
| 20                 | F1000            | 6.43                     | T4     | 20:1 <sup>1</sup>         | L                | 61    | 424   | 88    | 608   | 3.7       | 15.9  | 110   |
| 25                 | F1000            | 6.43                     | T4     | 14:1 <sup>3</sup>         | LT               | 54    | 372   | 72    | 496   | 1.7       | 16.2  | 112   |
| 25                 | F1500            | 1.92                     | T4     | 14:1 <sup>3</sup>         | LT               | 61    | 421   | 79    | 545   | 1.8       | 16.5  | 114   |
| 25                 | F1500            | 1.92                     | T4     | 14:1 + Forge <sup>4</sup> | LT               | 62    | 427   | 85    | 586   | 1.8       | 17.0  | 117   |
| 25                 | F1500            | 1.92                     | T4     | 14:1 + Forge <sup>4</sup> | L                | 65    | 448   | 96    | 662   | 2.4       | 17.5  | 121   |
| 25                 | F1000            | 6.43                     | T4     | 496:1 <sup>2</sup>        | L                | 67    | 462   | 97    | 669   | 5.1       | 17.3  | 119   |
| 25                 | F1500            | 1.92                     | T4     | 496:1 <sup>2</sup>        | L                | 70    | 483   | 97    | 669   | 3.2       | 17.8  | 123   |

**General Notes:**

- 1) Average data for a minimum of four (4) specimens.
- 2) SiCp d50 value measured by DWA using Coulter diffraction device.
- 3) T6 heat treatment- solution= 493±5°C, cold water quench, precipitation aging= 160±5°C for 24 hrs.
- 4) T4 heat treatment- solution= 498±5°C, cold water quench, natural age= ≥96 hrs.

**Extrusion Ratio Footnotes:**

- <sup>1</sup>12mm thick rectangular bar
- <sup>2</sup>16mm diameter bar
- <sup>3</sup>95mm diameter bar
- <sup>4</sup>95mm diameter bar forged to 25mm thick rectangular bar

| Product Form                           | Test Orientation | Mfgers Lots:<br>15QS4545<br>15QS4644<br>15QS4658 | F, ty       |            | F, tu       |            | Elong (%) | E, t        |           |
|----------------------------------------|------------------|--------------------------------------------------|-------------|------------|-------------|------------|-----------|-------------|-----------|
|                                        |                  |                                                  | (ksi)       | (MPa)      | (ksi)       | (MPa)      |           | (msi)       | (GPa)     |
| 3.75 in (95mm)<br>Extruded Bar         | LT               | Avg                                              | 52.4        | 360.9      | 72.5        | 499.7      | 7.6       | 13.1        | 90.3      |
|                                        |                  | Std Dev                                          | 0.24        | 1.53       | 3.40        | 21.91      | 1.37      | 0.12        | 0.77      |
|                                        |                  | Min                                              | 52.1        | 359.0      | 65.8        | 454.0      | 5.9       | 13.0        | 89.4      |
|                                        |                  | Max                                              | 52.8        | 363.9      | 75.3        | 519.2      | 9.6       | 13.3        | 91.6      |
| <b>Specification Minimum</b>           |                  |                                                  | <b>47.9</b> | <b>330</b> | <b>65.3</b> | <b>450</b> | <b>3</b>  | <b>12.8</b> | <b>88</b> |
| 1 in (25mm)<br>Blocker<br>Die Forgings | LT               | Avg                                              | 52.2        | 359.6      | 78.9        | 544.2      | 6.4       | 13.7        | 94.6      |
|                                        |                  | Std Dev                                          | 1.40        | 9.68       | 2.19        | 15.07      | 1.04      | 0.31        | 2.17      |
|                                        |                  | Min                                              | 50.6        | 349.0      | 77.5        | 534.5      | 5.0       | 13.2        | 90.7      |
|                                        |                  | Max                                              | 54.4        | 375.0      | 83.3        | 574.5      | 7.8       | 14.0        | 96.7      |
| Closed Die<br>Forgings                 | LT               | Avg                                              | 53.4        | 368.2      | 77.6        | 535.3      | 9.4       | 13.2        | 90.7      |
|                                        |                  | Std Dev                                          | 0.55        | 3.77       | 0.40        | 2.73       | 0.72      | 0.20        | 1.40      |
|                                        |                  | Min                                              | 52.7        | 363.3      | 77.0        | 531.0      | 8.5       | 12.9        | 88.9      |
|                                        |                  | Max                                              | 54.0        | 372.2      | 78.0        | 538.0      | 10.6      | 13.3        | 92.0      |
| <b>Specification Minimum</b>           |                  |                                                  | <b>49.3</b> | <b>340</b> | <b>69.6</b> | <b>480</b> | <b>3</b>  | <b>12.8</b> | <b>88</b> |
| 1 in (25mm)<br>Blocker<br>Die Forgings | L                | Avg                                              | 55.2        | 380.7      | 83.0        | 572.1      | 7.5       | 14.3        | 98.4      |
|                                        |                  | Std Dev                                          | 0.53        | 3.67       | 0.49        | 3.36       | 0.47      | 0.32        | 2.18      |
|                                        |                  | Min                                              | 54.5        | 376.0      | 82.3        | 567.3      | 7.0       | 13.9        | 95.5      |
|                                        |                  | Max                                              | 56.0        | 386.0      | 83.5        | 575.6      | 8.3       | 14.6        | 100.6     |
| Closed Die<br>Forgings                 | L                | Avg                                              | 52.7        | 363.5      | 78.4        | 540.3      | 9.4       | 13.6        | 93.4      |
|                                        |                  | Std Dev                                          | 1.38        | 9.55       | 1.26        | 8.66       | 0.81      | 0.30        | 2.03      |
|                                        |                  | Min                                              | 51.5        | 355.0      | 76.5        | 527.4      | 8.3       | 13.1        | 90.5      |
|                                        |                  | Max                                              | 55.0        | 379.2      | 80.1        | 552.6      | 10.1      | 13.9        | 95.7      |
| <b>Specification Minimum</b>           |                  |                                                  | <b>50.8</b> | <b>790</b> | <b>69.6</b> | <b>480</b> | <b>5</b>  | <b>13.1</b> | <b>90</b> |

Additional data and manufacturing information available upon request



21100 Superior Street Chatsworth, CA 91311  
 Phone: 818-998-1504  
 Fax: 818-998-0343  
 www.dwa-dra.com

# 7050x/SiC/15p- High Strength Requirements

- Complex, net-shape extrusions
- Open and closed sections
- Seamed and seamless
- ANSI or better dimensional tolerances
- Circle sizes of 2-20in (50-500mm)
- Tempers: T6, T4, As-extruded

| Matrix Alloy   | SiCp Loading (V/O) | SiCp Size (FEPA) | SiCp d <sub>50</sub> Value (Microns) | Temper | Extrusion Ratio    | Test Orientation | YS, MPa (ksi)     | UTS, MPa (ksi)    | Elongation, % | E, GPa (msi)       |
|----------------|--------------------|------------------|--------------------------------------|--------|--------------------|------------------|-------------------|-------------------|---------------|--------------------|
| 7050X          | 15                 | F800             | 9.48                                 | T6     | 14:1 <sup>1</sup>  | LT               | 510.2 (74)        | 547.4 (79)        | 1.46          | 94.1 (13.6)        |
| 7050X          | 15                 | F800             | 9.48                                 | T6     | 14:1 <sup>1</sup>  | LT               | 487.3 (71)        | 525.0 (76)        | 1.01          | 94.4 (13.7)        |
| 7050X          | 15                 | F800             | 9.48                                 | T6     | 14:1 <sup>1</sup>  | LT               | 520.6 (75)        | 540.7 (78)        | 1.00          | 94.9 (13.8)        |
| <b>Average</b> |                    |                  |                                      |        |                    |                  | <b>506.0 (73)</b> | <b>537.7 (78)</b> | <b>1.16</b>   | <b>94.5 (13.7)</b> |
| 7050X          | 15                 | F800             | 9.48                                 | T6     | 496:1 <sup>2</sup> | L                | 606.4 (88)        | 660.3 (96)        | 4.42          | 99.7 (14.5)        |
| 7050X          | 15                 | F800             | 9.48                                 | T6     | 496:1 <sup>2</sup> | L                | 606.2 (88)        | 666.9 (97)        | 4.14          | 95.9 (13.9)        |
| 7050X          | 15                 | F800             | 9.48                                 | T6     | 496:1 <sup>2</sup> | L                | 612.9 (89)        | 657.8 (95)        | 3.93          | 99.9 (14.5)        |
| <b>Average</b> |                    |                  |                                      |        |                    |                  | <b>608.5 (88)</b> | <b>661.7 (96)</b> | <b>4.16</b>   | <b>98.5 (14.3)</b> |

**General Notes:**

- 1) SiCp d<sub>50</sub> value measured by DWA using Coulter laser diffraction device.  
 2) T6 heat treatment- Solution= 482±5°C, Cold water quench, precipitation aging= 121±5°C for 24 hours.

**Footnotes:**

- <sup>1</sup>95mm diameter round bar  
<sup>2</sup>16mm diameter round bar

Additional data and manufacturing information available upon request



21100 Superior Street Chatsworth, CA 91311  
 Phone: 818-998-1504  
 Fax: 818-998-0343  
[www.dwa-dra.com](http://www.dwa-dra.com)