

# MIM Material Properties

| Material Designation             | Alloy Composition (wt %)  | Condition                | UTS (MPa) | YS (0.2%) (MPa) | Elongation (%) | Hardness    | Density g/cm <sup>3</sup> (min) | Remarks                                 |
|----------------------------------|---|--------------------------|-----------|-----------------|----------------|-------------|---------------------------------|---|
| <b>SUPER ALLOYS &amp; OTHERS</b> |   |                          |           |                 |                |             |                                 |   |
| INDO-MIM NIM 90                  | C 0.13% max,<br>Fe 5% max,<br>Ti 2-3%,<br>Al 1-2%,<br>Co 15-21%,<br>Cr 17-21%,<br>Ni Balance                  | Hipped &<br>Heat treated | 1162      | 782             | 12             | 300-450 HV1 | 7.70                            | Can be heat treated to<br>300 - 450 HV1 |
| INDO-MIM XEV                     | C 0.35-0.65%<br>Ni 3.5-5.5%<br>Mn 8-10%<br>Cr 20-22%<br>Nb 1.3-2.5%<br>W 0.8-1.5%<br>N 0.4-0.7%<br>Fe Balance | Heat treated             | 950       | 580             | 10             | 275-400 HV1 | 7.80                            | Can be heat treated to<br>275 - 400 HV1 |
| INDO-MIM MoCrSi2882              | C 0.08% max<br>Ni 1.5% max<br>Mo 25-30%<br>Si 1.8-3%<br>Cr 7-10%<br>Co Balance                                | Hipped                   | -         | 625 min         | -              | 52 - 60 HRC | 8.60                            | -                                       |
| INDO-MIM F15                     | C 0.04%<br>Ni 28.5-29.5%<br>Co 16.75-17.25%<br>Fe Balance   | Sintered                 | 460       | 300             | 25             | 90 HRB max  | 7.75                            | -                                       |
|                                  |   | Hipped                   | 470       | 330             | 30             | 90 HRB max  | 8.18                            |   |

**Note:**

The material Designation indicated in green font is the equivalent MPIF STD 35 designation.

- Chemical composition indicated is only for principal/major alloying elements. Elements like Mn, Si, P, S and others will be present. Detailed chemistry and the material properties can be had upon request
- The mechanical property data is generated as per MPIF Standard 50
- The above indicated values of mechanical properties are typical
- Material property details apart from above list can be had by request
- Also INDO-MIM can cater to special chemistry requirement upon request.

The data presented herein are typical values, and do not warrant suitability for any specific application or use of this material. Normal variations in the chemical composition, the size of the product and heat treatment parameters may result in different values for the various physical and mechanical properties.

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**INDO-MIM<sup>®</sup>**  
COMPLEXITY SIMPLIFIED

| Material Designation                      | Alloy Composition (wt %)   | Condition             | UTS (MPa) | YS (0.2%) (MPa) | Elongation (%) | Hardness    | Density g/cm <sup>3</sup> (min) | Remarks   |
|---|--|-----------------------|-----------|-----------------|----------------|-------------|---------------------------------|---|
| <b>CASE HARDENED STEELS</b>               |  |                       |           |                 |                |             |                                 |   |
| INDO-MIM 4600<br>(MIM 2200)               | Ni 1.5-2.5%<br>Mo 0.50% max<br>C 0.15% max<br>Fe Balance                       | Sintered              | 300       | 170             | 22             | 100 HRB max | 7.50                            | Can be case hardened to surface hardness of 600 - 750 HV1 |
| INDO-MIM 4600<br>(Modified)<br>(MIM 2700) | Ni 6-8%<br>Mo 0.5% max<br>C 0.15% max<br>Fe Balance                            | Sintered              | 425       | 300             | 13             | 350 HV1 max | 7.55                            | Can be case hardened to surface hardness of 500 - 600 HV1 |
| INDO-MIM 8620                             | Cr 0.5-1%<br>Ni 0.5-1%<br>Mo 0.1-0.25%<br>C 0.2% max<br>Fe Balance             | Sintered              | 320       | 130             | 25             | 100 HRB max | 7.50                            | Can be case hardened to surface hardness of 600 - 750 HV1 |
| INDO-MIM 9310                             | Cr 0.3-0.8%<br>Ni 2.5-3.5%<br>Mo 0.1-0.25%<br>C 0.2% max<br>Fe Balance         | Sintered              | 540       | 350             | 15             | 375 HV1 max | 7.50                            | Can be case hardened to surface hardness of 600 - 750 HV1 |
| <b>HARDENED &amp; TEMPERED STEELS</b>     |  |                       |           |                 |                |             |                                 |   |
| INDO-MIM 4605<br>(MIM 4605)               | Ni 1.5-2.5%<br>Mo 0.50% max<br>C 0.3-0.6%<br>Fe Balance                        | Sintered              | 600       | 235             | 10             | 100 HRB max | 7.50                            | Can be heat treated to 32 - 50 HRC                        |
|   |  | Heat Treated          | 1200      | 1100            | 5              | 32 - 38 HRC |                                 |   |
| INDO-MIM 4630<br>- modified               | Ni 6-8%<br>Mo 0.5% max<br>C 0.2-0.5%<br>Fe Balance                             | Sintered              | 700       | 430             | 7              | 45 HRC max  | 7.50                            | Can be heat treated to 35 - 50 HRC                        |
|   |  | Heat Treated          | 1200      | 1000            | 6              | 32 - 38 HRC |                                 |   |
| INDO-MIM 4340                             | Ni 1.5-2.5%<br>Cr 0.75-1.25%<br>Mo 0.50% max<br>C 0.3-0.6%<br>Fe Balance       | Sintered              | 750       | 300             | 9              | 100 HRB max | 7.50                            | Can be heat treated to 32 - 50 HRC                        |
|   |  | Heat Treated          | 1200      | 1100            | 6              | 32 - 38 HRC |                                 |   |
| INDO-MIM 4140                             | Ni 0.75-1.25%<br>Cr 0.75-1.25%<br>Mo 0.50% max<br>C 0.3-0.6%<br>Fe Balance     | Sintered              | 750       | 300             | 9              | 100 HRB max | 7.50                            | Can be heat treated to 32 - 50 HRC                        |
|   |  | Heat Treated          | 1200      | 1100            | 7              | 32 - 38 HRC |                                 |   |
| INDO-MIM 52100                            | Ni 0.25% max<br>Cr 1.3-1.8%<br>Mo 0.5% max<br>C 0.8-1.2%<br>Fe Balance         | Sintered              | 1000      | 650             | 5              | 35 HRC max  | 7.50                            | Can be heat treated to 55 - 66 HRC                        |
|   |  | Heat Treated          | 1500      | 1100            | 2              | 60 - 65 HRC |                                 |   |
| <b>STAINLESS STEELS</b>                   |  |                       |           |                 |                |             |                                 |   |
| INDO-MIM SS 316<br>(MIM SS 316L)          | C 0.08% max<br>Ni 10-14%<br>Mo 2-3%<br>Cr 16-18%<br>Fe Balance                 | Sintered              | 480       | 150             | 45             | 100 HRB max | 7.65                            | -   |
| INDO-MIM SS 304                           | C 0.08% max<br>Ni 8-11%<br>Cr 17.5-20%<br>Si-1% max<br>Mn-2% max<br>Fe Balance | Sintered              | 450       | 160             | 25             | 100 HRB max | 7.55                            | -   |
| INDO-MIM SS 316 Duplex                    | C 0.08% max<br>Ni 4.5-7.0%<br>Cr 21-23%<br>Mo 2.5-3.5%<br>Fe Balance           | Sintered              | 732       | 447             | 24             | 100 HRB max | 7.65                            | -   |
| INDO-MIM SS 440C                          | C 0.9-1.2%<br>Cr 16-18%<br>Ni 0.75% max<br>Mo 0.5% max<br>Fe Balance           | Hipped                | 725       | 600             | 4              | 40 HRC max  | 7.50                            | Can be heat treated to 52 - 63 HRC                        |
|   |  | Hipped & Heat Treated | 1700      | 1550            | <1             | 55-63 HRC   |                                 |   |
| INDO-MIM SS 420<br>(MIM 420)              | C 0.15-0.4%<br>Cr 12-14%<br>Fe balance   | Heat Treated          | 1450      | 1150            | 5              | 39-46 HRC   | 7.24                            | Can be heat treated to 39 - 46 HRC                        |

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|---|--|---------------------|-----------|-----------------|----------------|--------------|---------------------------------|--|
| INDO-MIM 17-4 PH<br>(MIM 17-4 PH)         | C 0.07% max,<br>Cr 15-18%,<br>Cu 3-5%,<br>Ni 3-5%,<br>Nb 0.15-0.45%,<br>Fe Balance                                   | Sintered            | 900       | 730             | 7              | 35 HRC max   | 7.50                            | Can be heat treated to H900, H1050, H1100 Conditions   |
|   |  | Heat Treated (H900) | 1220      | 1100            | 7              | 35 - 40 HRC  |                                 |  |
| INDO-MIM HK 30                            | C 0.2-0.5%<br>Cr 23-27%<br>Ni 19-22%<br>Nb 1.2-1.5%<br>Fe Balance  | Sintered            | 550       | 200             | 30             | 325 HV1 max  | 7.40                            | -  |
| INDO-MIM Nickel Free SS                   | C 0.2% max<br>Ni 0.25% max<br>Cr 16.5-17.5%<br>Mo 3.0-3.5%<br>Mn 10-12%<br>Si 1% max<br>Fe Balance                   | Sintered            | 790       | 550             | 20             | 50-60 HR 15N | 7.70                            | -  |
| <b>TOOL STEELS</b>                        |  |                     |           |                 |                |              |                                 |  |
| INDO-MIM S7                               | C 0.45-0.7%<br>Cr 2.5-3.5%<br>Si 0.2-1.0%<br>Mo 1.0-1.8%<br>Ni 0.30% max<br>Fe Balance                               | Heat Treated        | 1750      | 1530            | 2              | 46 - 53 HRC  | 7.30                            | Can be heat treated to 45 - 53 HRC   |
| INDO-MIM M2                               | C 0.8-1.1%<br>Cr 3.5-4.5%<br>Mo 4.5-5.5%<br>W 5.5-6.5%<br>V 1.5-2.2%<br>Fe Balance                                   | Sintered            | 700       | 400             | 1              | 55 - 63 HRC  | 7.90                            | Can be heat treated to 55 - 66 HRC   |
|   |  | Heat Treated        | 900       | 700             | 1              | 60 - 65 HRC  |                                 |  |
| <b>MAGNETIC MATERIALS</b>                 |  |                     |           |                 |                |              |                                 |  |
| INDO-MIM Fe-3Si<br>(MIM -FE-3%Si Grade 1) | C 0.08% max,<br>Si 2.5-3.5%,<br>Fe Balance   | Sintered            | 525       | 372             | 23             | 90 HRB max   | 7.55                            | -  |
| INDO-MIM Fe-49Co-2V<br>(MIM - FE-50% Co)  | C 0.08% max,<br>Co 47-50%<br>V 2.5% max<br>Fe Balance  | Sintered            | 201       | 132             | <1             | 100 HRB max  | 7.85                            | -  |
| INDO-MIM SS 430<br>(MIM SS 430L)          | C 0.08% max,<br>Cr 16-18%,<br>Fe Balance   | Sintered            | 438       | 242             | 25             | 100 HRB max  | 7.32                            | -  |
| INDO-MIM Fe-50Ni<br>(MIM -Fe50Ni)         | C 0.05% max<br>Ni 49-51%<br>Si 1% max<br>Fe Balance  | Sintered            | 455       | 160             | 30             | 100 HRB max  | 7.85                            | -  |
| <b>TUNGSTEN HEAVY ALLOYS</b>              |  |                     |           |                 |                |              |                                 |  |
| INDO-MIM WHA1                             | Ni 2.5-3.5%<br>Fe 0.5-1.0%<br>W Balance  | Sintered            | -         | -               | -              | -            | 17.50                           | WHA are characterised by the density values. INDO-MIM can produce WHA with density ranging from c. 17 to 18.25 g/c |
| INDO-MIM WHA2                             | Ni 3-4%<br>Cu/Fe 1% max<br>W Balance   | Sintered            | -         | -               | -              | -            | 17.50                           |  |
| <b>TITANIUM &amp; TITANIUM ALLOYS</b>     |  |                     |           |                 |                |              |                                 |  |
| INDO-MIM CPTi Grade 2                     | C 0.08% max<br>O 0.25% max<br>H 0.015% max<br>N 0.03% max<br>Fe 0.3% max<br>Ti Balance                               | Sintered            | 420 min   | 360 min         | 17 min         | 100 HRB max  | 4.30                            | -  |
| INDO-MIM Ti-6Al-4V Grade 5                | C 0.08% max<br>O 0.20% max<br>H 0.015% max<br>N 0.05% max<br>Fe 0.3% max<br>Al 5.5-6.75%<br>V 3.5-4.5%<br>Ti Balance | Sintered            | 780 min   | 680 min         | 10 min         | 30 HRC max   | 4.20                            | -  |