

### Cross Reference Tables

| Nominal Composition             | Praxair Product | Melting Temperature |      |          |      | Recommended Brazing Ranges |           | Application Data  |
|---------------------------------|-----------------|---------------------|------|----------|------|----------------------------|-----------|---|
|                                 |                 | Solidus             |      | Liquidus |      | F                          | C         |   |
|                                 |                 | F                   | C    | F        | C    | F                          | C         |   |
| Co-8Si-19Cr-17Ni-4W-0.8B        | <b>CO-216</b>   | 2050                | 1121 | 2100     | 1149 | 2100-2250                  | 1149-1232 | CO-216 is designed for brazing of superalloys and cobalt based components. Advantages include high temperature strength, oxidation resistance, and low base metal penetration.  |
| Ni-0.8C-4.5Si-14.5Cr-3.3B-4.5Fe | <b>NI-167</b>   | 1790                | 977  | 1900     | 1038 | 1900-2200                  | 1066-1204 | NI-167 yields high strength joints suitable for high temperature applications. Recommended for gas turbine hardware.  |
| Ni-15Cr-3.5B                    | <b>NI-276</b>   | 1870                | 1020 | 1925     | 1050 | 1950-2100                  | 1066-1150 | NI-276 is a silicon free metal suitable for diffusion brazing applications. Excellent strength and resistance to high temperature oxidation.  |
| Ni-4.5Si-3B                     | <b>NI-298</b>   | 1800                | 982  | 1900     | 1038 | 1850-2150                  | 1010-1177 | NI-298 is a general utility filler metal recommended for use where deep recesses and tight clearances are encountered. Alloy is free flowing and wets well.   |
| Ni-4.2Si-7Cr-3B-3Fe             | <b>NI-362-3</b> | 1780                | 971  | 1830     | 999  | 1830-2150                  | 1010-1177 | NI-362-3 is similar to NI-167 but permits brazing at much lower temperatures. Alloy has excellent flow characteristics without Intergranular Attack (IGA) or other base dilutions. Ideal choice for joining thin sections such as heat exchanger or honeycomb components.   |
| Ni-10Si-19Cr                    | <b>NI-430</b>   | 1975                | 1079 | 2075     | 1135 | 2100-2200                  | 1147-1204 | NI-430 provides strong tough joints with excellent high temperature performance. Recommended for nuclear applications or those where boron cannot be tolerated.   |
| Ni-3.5Si-22Co-2.8B              | <b>NI-449-4</b> | 1750                | 954  | 2065     | 1129 | 2075-2200                  | 1135-1205 | NI-449-4 is excellent for applications with tight tolerances and thin sections. Cobalt promotes wetting and braze alloy solid solutioning to provide joints with superior fatigue resistance.   |
| Ni-3.5Si-1.8B                   | <b>NI-489</b>   | 1800                | 982  | 1950     | 1066 | 1950-2150                  | 1010-1177 | NI-489 has a broad melt range and flowability with moderate hardness. The alloy is sluggish thus appropriate for wide gap applications.   |
| Ni-4.5Si-14Cr-3B-4.5Fe          | <b>NI-510</b>   | 1790                | 977  | 1970     | 1077 | 1970-2200                  | 1077-1204 | NI-510 is chemically similar to NI-167 except has a lower carbon content to reduce carbide formation. Alloy is sluggish and recommended for wide gap applications. Resistant to chemical attack.  |
| Ni-17Cr-9Si-0.1B                | <b>NI-530</b>   |                     |      |          |      | 2100-2150                  | 1149-1177 | NI-530, NI-567, NI-568 Wide Gap Braze Filler Metals are blends of materials with different melting ranges. Low temperature component melts and dissolves other components to produce sluggish performance needed to bridge gaps. Strong ductile, non-porous joints can be obtained with clearances of 0.010" to 0.060". |
| Ni-26Si-2Cr-2B-1Fe              | <b>NI-567</b>   |                     |      |          |      | 2050-2110                  | 1121-1154 |   |
| Ni-15Cr-8Si                     | <b>NI-568</b>   |                     |      |          |      | 2150-2200                  | 1177-1204 |   |

Cross Reference Tables

**Standard Nickel & Cobalt Base Braze Filler Alloy Powders**

| Praxair Product | AMS  | AWS    | Amdry | Wall Colmonoy | GE           | Other                    |
|-----------------|------|--------|-------|---------------|--------------|--------------------------|
| CO-216          | 4783 | BCo-1  | 400   | 210           | B50T56       | PWA 713<br>EMS56650      |
| NI-167          | 4775 | BNi-1  | 750   | 125           |              | MSRR9500/103             |
| NI-276          |      |        | 775   | 150           | B50TF207 CLA |                          |
| NI-298          | 4778 | BNi-3  | 780   | 130           | B50TF205 CLA | EMS94778<br>MSRR9507/114 |
| NI-362-3        | 4777 | BNi-2  | 770   | L.M.          | B50TF204 CLA | EMS94777<br>MSRR9500/97  |
| NI-430          | 4782 | BNi-5  | 100   | 30            | B50TF81 CLA  | EMS94782<br>MSRR9500/116 |
| NI-449-4        |      |        | 915   |               | B50TF208 CLA | MSRR9517/705             |
| NI-489          | 4779 | BNi-4  | 790   | 135           | B50TF206 CLA | EMS94779<br>MSRR9500/700 |
| NI-510          | 4776 | BNi-1a | 760   | L.C.          |              | PWA996                   |
| NI-530          |      |        | 103   |               | B50TF142 CLA |                          |
| NI-567          |      |        |       |               | B50TF120 CLA |                          |
| NI-568          |      |        | 102   |               | B50TF143 CLA |                          |

| Composition                                      | Praxair Product | Specification     | Application Data  |
|--|-----------------|-------------------|---|
| <b>Precious Metal Braze Filler Alloy Powders</b> |                 |                   |   |
| AgPdCuMn   | AG-102          | RBO 170-263       | PRAXAIR Thermal Spray Products produces precious metal braze powders for use in rigorous (high temperature, corrosive, and oxidize-prone) applications. These filler metals perform well in aggressive environments, exhibit excellent wetting, flowability and little base metal dilution. |
| AgPdCuMn   | AG-103          | RBO 170-264       |   |
| AgPd   | AG-105          | RBO 170-062       |   |
| AgPd   | AG-106          | PWA 706           |   |
| AgPdCu   | AG-107          | PWA 715           |   |
| AgCu   | AG-108          | AMS 4765          |   |
| AuNiPdMn   | AU-102          | RBO 170-217       |   |
| AuNi   | AU-103          | AMS 4787/PWA 698  |   |
| AuNi   | AU-104          | PWA 718           |   |
| NiPdCrSiB  | NI-538          | PWA 36099/CPW 475 |   |
| NiAuCrSiFe                                       | NI-571          | B50TF145          |   |

| Commercial Designation                               | Praxair Product | Specification       | Application Data   |
|--|-----------------|---------------------|--|
| <b>Custom/Proprietary Braze Filler Alloy Powders</b> |                 |                     |  |
|  | CO-246          | PWA 1185-1          | PRAXAIR Thermal Spray Products works closely with many customers to develop special, custom alloy powders to meet application requirements. Many of these formulations are proprietary, and are held in strictest confidence, without disclosure. The table lists a few custom formulations. |
| MAR-M-509+B  | CO-333          |                     |  |
| IN-718+B   | NI-203          | B50TF203 CLA        |  |
| Proprietary  | NI-332          | B50TF108 CLA        |  |
| Proprietary  | NI-334          | B50TF90 CLA         |  |
| Proprietary  | NI-369          | PWA 36103-1/36117-1 |  |
| Proprietary  | NI-370          | PWA 36103-2         |  |
| BRB  | NI-377          |                     |  |
| MAR-M-200+B  | NI-405          |                     |  |
| Proprietary  | NI-533          | PWA 36118-1         |  |
|  | NI-555          | PWA 1179            |  |

| Commercial Designation                 | Praxair Product | Specification | Application Data  |
|--|-----------------|---------------|---|
| <b>Superalloy Matrix Metal Powders</b> |                 |               |   |
| MAR-M-509                              | CO-222          | PWA 1185-2    | A wide variety of superalloy powders, which are often blended with braze filler metals, are available. These blends are useful for "crack healing," dimensional restoration and other surface rejuvenation applications. Custom compositions for special application requirements can be provided upon request. |
| X-40                                   | CO-285          | B50TF185 CLA  |   |
| D-15                                   | NI-173          | B50TF173 CLA  |   |
| RENÉ 80                                | NI-183          | B50TF183 CLA  |   |
| IN-718                                 | NI-202          | B50TF202 CLA  |   |
| IN-738                                 | NI-284          |               |   |
| IN-625                                 | NI-328          |               |   |
| MAR-M-247                              | NI-335-5        | PWA 36117-2   |   |
| RENÉ 142                               | NI-365          | B50TF271      |   |
| RENÉ 77                                | NI-386          | B50TF186      |   |
| MAR-M-002                              | NI-378          |               |   |
| RENÉ 108                               | NI-414          | B50TF266      |   |
| RENÉ 41                                | NI-432          |               |   |
| RENÉ 125                               | NI-550          |               |   |

Table listing of comparable specifications and products does not imply OEM approval has been received or products are exact equivalents. Data herein is for information purposes by PRAXAIR Surface Technologies – Thermal Spray Products.

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