Thermal Treatment, General Welding and Machining Data

Thermal Treatment

Mill Treatment: (as produced 30RC typical)
Solution annealed at 1900°F for 7 hours. Aged at 1150°F for 4 hours. Double stress relieved. **Note:** Thermal treatment of **Mir 50** is different than 17-4 on the length of time for the H900 soak. 17-4 type of material requires only 1 hour. **Mir 50** requires 4 hours.

To re-harden Mir 50 from H1150 (30RC) to H900 (36 to 47RC):
Mir 50 is a modified 17-4/15-5 type of PH (precipitation hardening) stainless steel. The modifications consist of elements such as Moly, Silicon, Copper, Columbium, etc., combined with unique processing techniques. Thermal treatment of this product, however, remains *similar* to the standard solution treatment of a non-modified 17-4PH type base metal. Furnace heat the bar to 1875°F to 1925°F, hold 1 hour at temperature. Rapidly air-cool to room temperature. (May be oil quenched to room temperature if preferred). Re-heat to 900°F. Hold at temperature for 4 hours. Let material cool to room temperature. **Note:** Time at temperature is the same regardless of whether it is a 1-1/2"Diameter or at 4"Diameter.

General Welding Information

Mir 50 has a grain structure of tempered martensite, and a blended alloy composition that is favorable for welding without preheating. In most instances this alloy may be used "as welded", requiring no post weld heat treatment (PWHT).

The solidification mechanisms of **Mir 50** are the same as those of standard austenitic stainless steels, such as 304 and 316. Therefore the welding characteristics and approach should follow that typical to standard austenitic stainless steels. The use of certified welders, and adherence to the sound welding practices and precautions, recommended for the welding of standard austenitic grades, should always be observed.

Mir 50 welds superior to austenitic grades because the carbon content is generally lower than the standard austenitic grades. Ductility at the weld, however, is somewhat less than austenitic grades. A root pass with a highly ductile rod, such as a 308L, should be considered to minimize fracture potential where stress raisers, such as the undercut on a partial penetration weld, might present a potential crack initiation site. The weld may then be completed by use of a higher strength heat treatable filler metal. Type 630 filler wires and covered electrodes closely match the **Mir 50** base metal composition. (AMS-5763)

Where high strength is not a requirement, welds may be completed using only the 308L type rod. Use of this rod offers the most forgiving approach in maintenance field weld conditions. This type of weld is less susceptible to hydrogen embrittlement. Items in this category may be used in the as-welded condition. (If welding to dissimilar materials, consideration should be given to use of a higher alloyed rod, such as a 309 stainless, or Inconel type rod. Arc welding, gas-tungsten arc, gas-metal arc, and shielded metal arc welding processes, have all been used successfully for joining **Mir 50**, although gas-tungsten arc welds appear to be the most favored for greater weld metal cleanliness, highest ductility and toughness, especially following any post weld heat treatment. Maintain shortest arc. Where maintaining strength properties closest to the original properties of **Mir 50** is important, a post weld heat treatment (PWHT) of 1150°F for 4 hours should be employed.

General Machining Data

Use high speed tools. Turning Single Point, and box 70/90SFPM
IPR .015/.007. Turning and cut-off, 70SFPM IPR .0015
Drilling ¼"Dia SFPM50, IPR.004 ¾"Dia SFPM70 IPR.0015 Milling Cut-depth .050" SFPM85 IPR.001 to .004.
TAP SFPM 12 to 25