NICKEL BASE ALLOY- INCONEL 718 (150/120)

Summary:

This specification covers nickel base alloy of use in H_2S, CO_2 and Cl. This specification should not be used for tubing hangers, or for parts made from bar with a diameter greater than 10 inches, without checking with Engineering. The preferred specification to use is SES 26-612, which meets API 6A 718.

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1.0 SCOPE

1.1 This specification covers nickel base alloy for use in H2S, CO2 and Cl. Material meeting API 6A 718 or SARA Specification SES 26-612 will also meet this specification. SARA specification SES 26-612 is the specification that should be used for tubing hangers and bar stock over 10" diameter.

2.0 APPLICABLE SPECIFICATIONS

2.1 UNS N07718

3.0 APPROVED VENDORS

3.1 Material supplied to meet this specification shall originate at one of the following sources, for both primary and secondary melting:

Foroni	Allvac
Special Metals Corporation	Corpenter Technologies
Aubert Duval - Techpy	Thyssen Krupp VDM
Firth Rixson Superalloys (FRS)	WASA
Bohler Edelstahl	Villares Metals Brazil

4.0 CHEMISTRY REQUIREMENTS

4.1 The chemical analysis shall be as follows:

Nickel (plus Cobalt)*	50.0 – 55.0%
Chromium	17.0 – 21.0%
Iron	Balance
Molybdenum	2.80 – 3.30%
Columbium (plus Ta)	4.75 – 5.20%
Carbon	0.045% max.
Manganese	0.35% max.
Silicon	0.35% max.

Phosphorus ..... 0.010% max.

Sulfur ..... 0.010% max.

Aluminum ..... 0.20 – 0.80%

Titanium ..... 0.80 – 1.15%

Copper ..... 0.23% max.

*Cobalt contect maximum 1.00% but not required for routine acceptance.

5.0 MECHANICAL PROPERTIES

5.1 Refer to SARA Engineering Specification to determine the size of the coupon or test block to certify the material for the appropriate Product Specification (API 6A, 14D, or 16A) and PSL levels (PSL 1, 2, 3 or PSL 4). Bar stock and rolled or extruded tubes shall be qualified by integral prolongation.

The material shall meet the following mechanical properties:

Tensile strength, min ..... 150,000 PSI

Yield strength, min ..... 120,000 PSI

Elongation in 2", or 4D, min 20%

Reduction of Area, min 25%

Rockwell Hardness ..... 39 HRC max*

* NOTE : NACE allows o maximum hardness of 40 HRC and will be the final upper hardness limit. However, in order avoid exceeding the 40 HRC limit after machining, vendors supplying material to this specification should plan for an inspection limit of 39 HRC in their processing.

6.0 MECHANICAL PROPERTIES

6.1 Charpy V-notch impact testing shall be performed in accordance with ASTM A370. All tests shall be performed at or below – 75° F (- 60° C). Impact testing shall be performed on a set three specimens. Impact testing shall be performed in the transverse direction unless the size or geometry of the QTC or prolongation prevents the use of transverse specimens. In this case, the longitudinal direction can be used.

6.2 For material up to 10" in diameter or thickness, the minimum average charpy impact value shall be 30 Ft.lbs (47 J). No single value shall be lower than 30 Ft.lbs (41 J).

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6.3 For material over 10" in diameter or thickness the minimum average charpy impact valve shall be 30 Ft.lbs (41 J). No single valve shall be lower than 27 Ft.lbs (37J).

7.0 FORGING and HOT WORKING REQUIREMENTS

7.1 The minimum total hot work reduction ratio shall be 4:1.

8.0 HEAT TREATMENT

8.1 The material shall be solution annealed and age hardened by the following procedure in order to achieve the specified properties of Section 5.1.

8.1.1 Solution anneal at 1870°F to 1925°F (1021°C to 1052°C) for one to two and a half hours, than air cool, inert gas quench, or water quench to ambient temperature.

8.1.2 Age harden at 1425°F to 1475°F (774°C to 802°C) for six to eight hours then air cool or faster to ambient temperature.

8.2 Material may also be purchased in the annealed condition and subsequently age hardened to meet above mechanical properties.

9.0 MARKINGS

9.1 Each piece of material shall be identified with the heat number in stenciled letters or marked with low stress or interrupted dot stamps.

10.0 INSPECTION

10.1 The material shall be inspected and free of defects that would be detrimental to the intended service.