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TECHNICAL SPECIFICATION FOR AF913® PLUS – 125K ROUND BARS

Document 913PLUS-125K Rev. 2

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Note: a vertical line on the left of the text or a grey background in the table indicates variation with respect to the previous revision.

TECHNICAL SPECIFICATION FOR AF913® PLUS – 125K ROUND BARS

I. PRODUCT FEATURES

MATERIAL:	UNS S41425, AF913® PLUS – 125K
SHAPE:	ROUND BARS
STANDARD DIAMETER:	3.0” – 12.5” (76.2 mm – 317.5 mm)
LENGTH:	RANDOM IN THE RANGE 11.5-29.5 ft (3500-9000 mm)
PROCESSING:	HOT WORKED, QUENCHED AND TEMPERED
FORGING REDUCTION RATIO:	4:1 MIN
SURFACE CONDITION:	PEELED AND POLISHED

II. REFERENCE DOCUMENTS

- AMS 2750: Pyrometry
- API Specification 6A: Specification for Wellhead and Tree Equipment
- ASTM A370: Standard Test Methods and Definitions for Mechanical Testing of Steel Products
- ASTM E8/E8M: Standard Test Methods for Tension Testing of Metallic Materials
- ASTM E18: Standard Test Methods for Rockwell Hardness of Metallic Materials
- ASTM E23: Standard Test Methods for Notched Bar Impact Testing of Metallic Materials
- ASTM E45: Standard Test Methods for Determining the Inclusion Content of Steel
- ASTM E112: Standard Test Methods for Determining Average Grain Size
- ASTM E1245: Standard Practice for Determining the Inclusion or Second-Phase Constituent Content of Metals by Automatic Image Analysis

Unless otherwise noted, the last available revision of these documents is applicable to the extent herein specified.

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III. MELTING PROCESS: EAF + AOD

IV. CHEMICAL COMPOSITION (weight percent)

Cr	12.5-14.0	**Mn**	0.50-1.00	**Cu**	≤ 0.15	**V+Al**	≤ 0.50
Ni	4.5-6.0	**N**	0.06-0.10	**P**	≤ 0.020	**PRE**	≥ 19
Mo	1.60-2.00	**Si**	≤ 0.50	**S**	≤ 0.005		
Fe	Balance	**C**	≤ 0.03	**Ti+Nb**	≤ 0.50		

PRE= %Cr + 3.3%Mo + 16%N

V. HEAT TREATMENT

Heat treatment shall be carried out in furnaces and associated instrumentation calibrated and hearth surveyed to AMS 2750.

Material shall be austenitized in the temperature range from 950 °C to 1190°C (1742 °F to 2174 °F), quenched in air and tempered at 570-630°C (1058-1166 °F) for 10-20 hours.

Austenitizing treatment shall be monitored using furnace thermocouples; tempering treatment shall be monitored by thermocouples embedded in heat sinks.

VI. SAMPLING, TESTING AND MATERIAL PROPERTIES

A heat treatment lot consists of all bars of the same diameter manufactured from the same heat under the same processing conditions and heat treated in the same furnace load.

Per each heat treatment lot, at least one set of the following properties is determined:

- microstructure (ferrite content, grain size and microstructure examination);
- tensile and impact properties;
- cross-section hardness;
- hardness on bar surface

Microstructure, tensile and impact properties are determined on specimens obtained by machining at mid radius of a test sample.

Cross-section hardness is determined by hardness readings at center, four positions 90° apart at mid radius and four positions 90° apart near surface (3 mm below surface) of a test sample.

Hardness on bar surface is determined by portable hardness testers according to ASTM E18 on a smooth and clean flat of 1 mm maximum depth prepared by light grinding at one end of at least one bar of the lot.

Test samples consist of bar prolongations cut from one end of bars of the lot after completion of the heat treatment.

The inclusion content is determined on heat basis on specimens removed from the aforementioned test samples.

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VII. MICROSTRUCTURE

Inclusion content per ASTM E45 - Method A: $A \leq 1$, $B \leq 2$, $C \leq 2$, $D \leq 2$

Ferrite content per ASTM E1245: < 0.5 %

Grain Size per ASTM E112: No. 2 or finer.

One photo at 100X of microstructure at mid-radius shall be provided with the certification package.

VIII. MECHANICAL PROPERTIES

The mechanical properties will comply with the following requirements:

Longitudinal Tensile Test per ASTM E8 @ room temperature

Yield Strength (0.2% offset):	125 -145 ksi (860-1000 MPa)
Ultimate Tensile Strength:	135-165 ksi (931-1138 MPa)
Minimum 4D Elongation:	15 %
Minimum Reduction of Area:	35 %

Impact Charpy-V-Notch (CVN) Test per ASTM E23 @ -10 °C (+14 °F) or lower

Longitudinal

Minimum Impact Absorbed Energy:	45/35 ft·lbs (61/48 J) average/single
Minimum Lateral Expansion:	30 mils (0.76 mm)
Minimum Shear:	70 %

Transverse

Minimum Impact Absorbed Energy:	35/30 ft·lbs (48/41 J) average/single
Lateral Expansion:	20 mils (0.51 mm)
Minimum Shear:	60 %

Hardness Test per ASTM E18

Hardness shall be in the range from 30 to 35 HRC.

IX. NDE

Surface crack detection by Eddy-current method, visual, dimensional and PMI inspection of each bar.

Ultrasonic testing of 100% volume of each bar according to requirements of API 6A – PSL3.

Tolerance on bar diameter shall be –0/+2 mm.

Straightness variation shall be maximum 2.00 mm/m and the maximum curvature (depth of chord) shall not exceed 2.00 mm multiplied by the length expressed in meter.

X. MARKING

Each bar is identified with the following details stamped on both ends: UNS S41425, heat number, position of the end in the original ingot (T/top, P/bottom, M/middle), lot number, bar number and brand of manufacturer.

XI. CERTIFICATION

Material shall be certified by stating compliance with this specification in the “Specification” section of the certificate template.

Certification package shall be provided in pdf format by electronic transmission.

Acronyms

AOD: Argon-Oxygen Decarburization

EAF: Electric Arc Furnace

FIO : For Information Only

NDE: Non-Destructive Examination

PMI : Positive Material Identification