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|  | SARA SAE ENGINEERING SPECIFICATION |             |
|   | Section: SES 26 – 799              |             |
|   | ISSUE "A"                          | REV "1"     |
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**MATERIAL SPECIFICATION FOR AISI 321 FORGINGS/ BARSTOCK/RING GASKETS**

| Rev | Reason of Change  | Date       | Made By | Reviewed By | Approved By | Status   |
|-----|---|------------|---------|-------------|-------------|----------|
| 0   |   | 05-05-2016 | DPR     | AS          | KKD         | Released |
| 1   | Quenching media temperature requirements amended & retention period added in clause 6.0 added as per API 6A 21st edition. | 03-10-2019 | MN      | URS         | AS          | Released |

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## **MATERIAL SPECIFICATION FOR AISI SS321 STAINLESS STEEL**

### **1.0 PURPOSE**

- 1.1** It is the purpose of this material specification to list in concise form of the material requirement for AISI SS 321 bar stock, forgings, centrifugal castings for Ring Joint Gaskets.
- 1.2** Product forms covered by this specification are Rolled Ring or Ring forgings for Gaskets.
- 1.3** This material specification is intended to aid the purchasing department in procuring and the vendor in supplying a material which meets the needs of its intended use, and the quality control department in the inspection and release of incoming material.
- 1.4** It is the responsibility of raw material/metal supplier/machined parts supplier of carbon, low alloy and martensitic stainless steel to have practices and procedures in place to assure that raw materials/parts delivered do not have excessive amounts of residual magnetism. Excessive residual magnetism is defined as greater than 3 gauss. Residual magnetism can occur due to factors such as lifting with magnets, magnetic particle inspection or stray welding current. The supplier's procedures/testing methods will be subject to verification during supplier audits.
- 1.5** The raw material supplier shall assure that Sara Sae does not receive material with greater than background level of radioactivity.

### **2.0 REQUIREMENTS**

- 2.1** The requirements of specification SES 26-590, SES 26-740 & SES 26-744 shall apply in addition to the following specific requirements.
- 2.1.1** **Chemical composition:** Chemical composition limits are listed below. An analysis of each heat of steel is made by the manufacturer, preferably from a ladle sample taken at or near the time of pouring. The listed elements shall be reported in weight percent. Reporting of residual elements is not required, but total residuals must not exceed 1%.

| <b>ELEMENTS</b> | <b>COMPOSITION RANGE (%)</b> |
|-----------------|------------------------------|
| Carbon (C)      | 0.08 (max.)                  |
| Manganese (Mn)  | 2.00 (max.)                  |
| Silicon (Si)    | 1.00 (max.)                  |
| Sulphur (S)     | 0.03 (max.)                  |
| Phosphorus (P)  | 0.045 (max.)                 |
| Nickel (Ni)     | 9.0-12.0                     |
| Chromium (Cr)   | 17.0-19.0                    |

**2.1.2** Elements that are not included in the application material specification but that may have been intentionally added by the mill shall be reported and are limited as follows. Total residuals must not exceed 1%.

| <b>ELEMENTS</b>                       | <b>COMPOSITION RANGE (%)</b> |
|---------------------------------------|------------------------------|
| Vanadium (V)                          | 0.08 (max.)                  |
| Aluminum (Al)                         | 0.055 (max.)                 |
| Nitrogen (N)                          | 0.010 (max.)                 |
| Hydrogen (H)                          | 0.010 (max.)                 |
| Niobium(Columbium)+Titanium +Vanadium | 0.12 (max.)                  |
| Boron                                 | 0.0005 (max.)                |

**3.0 Mechanical Properties:** Mechanical property requirements are listed below. Each heat shall be tested and the listed mechanical properties shall be reported.

| <b><u>MECHANICAL PROPERTIES</u></b> | <b><u>RANGE</u></b> |
|-------------------------------------|---------------------|
| HARDNESS                            | 83 HRB Max.         |

**4.0 HEAT TREATMENT:** - Heat treatment

| <b>PROCESS</b> | <b>ATMOSPHERE/MEDIA</b> | <b>TEMPERATURE</b>             | <b>TIME AT TEMPERATURE</b>                                       |
|----------------|-------------------------|--------------------------------|--|
| Normalizing    | Air                     | 1900-2050 °F<br>(1040-1120 °C) | 1/2 hour per inch of maximum through Thickness. One hour minimum |

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|           |       |   |
|-----------|-------|---|
| Quenching | Water | The temperature of quenching medium shall not exceed 100 °F (38 °C) at the start of the quench nor exceed 49°C (120°F) at any time during the quench cycle. |
|-----------|-------|---|

**Note: Maximum holding time shall not exceed Five times (5X) the maximum holding time. In all case, holding time shall not start until parts or materials have reached specified heat treatment temperature. The 5X rule does not apply to the separate QTC (e.g. ER 5")**

#### **5.0 DOCUMENTATION REQUIRED:-**

Each shipment shall be accompanied by material certifications for each lot of material, certifications must be positively relatable to the lot of material represented. Recheck of Chemical properties to be carried out by Sara Sae.

#### **6.0 WORKMANSHIP**

Ring gaskets shall be identified with the following: S321-4.

Material shall be inspected in accordance with part QA Plan. Material shall be free of injurious defects that are detrimental to the integrity of the final product, such as laps, scabs cracks and exogenous inclusions.

Suppliers shall retain heat treat charts in a secure area for a period of no less than 10 years (e.g. electronic or paper).