

 A JOULON COMPANY	NOV SARA ENGINEERING SPECIFICATION	
	SECTION SES 26 – 778	
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EN 9 CARBON STEEL FORGED OR WROUGHT
45,000 MINIMUM YIELD

Rev	Reason of Change	Date	Made By	Reviewed By	Approved By	Status
0	-----	16-09-2014	Pankaj	D.P. Raturi	K.C. Raturi	Released
1	Quenching media temperature requirements amended as per API 6A 21 st edition.	04-10-2019	MN	USR	AS	Released

EN 9 CARBON STEEL FORGED OR WROUGHT
45,000 MINIMUM YIELD

1.0 SCOPE

- 1.1 EN-9 carbon steel forgings and wrought shapes heat-treated to 60,000 PSI minimum yield strength for standard service.
- 1.2 Product forms covered by this specification are closed die, Open die and ring forgings bar and mill shapes.

2.0 REQUIREMENTS

- 2.1 The requirements of specification S.E.S. 26-590 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 be 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%.

ELEMENTS	COMPOSITION RANGE (%)
Carbon (C)	0.50-0.60
Manganese (Mn)	0.50-0.90
Silicon (Si)	0.10-0.40
Sulphur (S)	0.06 (max.)
Phosphorus (P)	0.06 (max.)

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

MECHANICAL PROPERTIES	RANGE
TENSILE STRENGTH	87,000 PSI (600 MPa) Min.
YIELD STRENGTH	45,000 PSI (310 MPa) Min.
ELONGATION IN 2" Gage Length	16% Min.
REDUCTION IN AREA	40% Min.
BRINELL HARDNESS	170-223 BHN

2.1.3 Heat Treatment :

PROCESS	ATMOSPHERE / MEIDA	TEMPERATURE	TIME AT TEMPERATURE
Austenitizing (See note)	Air or Nitrogen	1508 °F - 1544 °F (820 °C- 840 °C)	½ hour per inch maximum of through thickness. One hour minimum
Quench	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.	
	Polymer	50 °F (10 °C) minimum before quenching	
	Oil	-----	
Temper	Air or Nitrogen	1022 °F - 1220 °F (550 °C - 660 °C)	1 hour per inch of maximum through thickness. One hour minimum.

Slow cool to room temperature

Note : The minimum start temperature of 50 °F (10 °C) for oil and polymer Quenching shall be followed except when a lower minimum start temperature is permitted for specific quenching by the quenching manufacturer. The start temperature shall be documented for all products.