

This page is mainly introduced the S99 Datasheet, including chemical information, mechanical properties, physical properties, mechanical properties, heat treatment, and Micro structure, etc. It also contains the use of S99, such as it is commonly used in bars, sheet, plates, steel coils, steel pipes, forged and other materials application.

## Datasheet for Steel Grades Special Steel S99

| S99 Standard Number: |                 |                                                                                                                                        |
|----------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------|
| ITEM                 | Standard Number | Descriptions                                                                                                                           |
| 1                    | BS 5S 99 : 1994 | 2.5 % nickel-chromium molybdenum (high carbon) steel billets, bars, forgings and parts (1230-1420 MPa: limiting ruling section 150 mm) |

| S99 Chemical composition (mass fraction) (wt.%) |    |    |    |          |    |    |          |    |       |
|-------------------------------------------------|----|----|----|----------|----|----|----------|----|-------|
| Chemical                                        |    |    |    | Min. (%) |    |    | Max. (%) |    |       |
| C                                               |    |    |    | 0.36     |    |    | 0.44     |    |       |
| Si                                              |    |    |    | 0.10     |    |    | 0.35     |    |       |
| Mn                                              |    |    |    | 0.45     |    |    | 0.70     |    |       |
| P                                               |    |    |    |          |    |    | 0.025    |    |       |
| S                                               |    |    |    |          |    |    | 0.015    |    |       |
| Cr                                              |    |    |    | 0.5      |    |    | 0.8      |    |       |
| Mo                                              |    |    |    | 0.45     |    |    | 0.65     |    |       |
| Ni                                              |    |    |    | 2.3      |    |    | 2.8      |    |       |
| Al                                              |    |    |    | 0.015    |    |    | 0.050    |    |       |
| Fe                                              |    |    |    |          |    |    | Base     |    |       |
| C                                               | Si | Mn | P  | S        | Cr | Ni | Mo       | V  | Ta    |
|                                                 |    |    |    |          |    |    |          |    |       |
| W                                               | N  | Cu | Co | Pb       | B  | Nb | Al       | Ti | Other |
|                                                 |    |    |    |          |    |    |          |    |       |

Tkble 1. Technical requirements for 2.5 % Ni-Cr-Mo (high carbon) steel forging stock and forgings

1 Material designation S99

2 Chemical composition % Element C Si Mn P S Cr Mo Ni Al Fe

min. 0.36 0.10 0.45 - - 0.5 0.45 2.3 0.015 Base

max. 0.44 0.35 0.7 0.025 0.015 0.8 0.65 2.8 0.050

3 Method of melting Air melted by an electric process

4 Form

Method of production

Limit dimensions

Forging stock

Wrought or cast

Forgings Forgings

De < 150

5 Acceptance standards Section one and five of BS S 100 Section one and six of BS S 100

6 Condition of supply and heat treatment

prior to delivery

Softened

650 °C < 0/AC" 2)

Softened

650 °C < 0/AC1' 2)

Hardened and tempered

820 °C < B < 850 °C/OQ1) 2)

500 °C < 9 < 600 °C/AC1) 2)

7 Condition of use and heat treatment

prior to use

As condition of supply Hardened and tempered

820 °C < B < 850 °C/OQ1' 2)

500 °C < B < 600 °C/AC,) 2)

As condition of supply

8 Test piece

Heat treatment

Sampling

Condition

of supply

Machined or forged test

sample (see line 29)

Condition

of supply

Machined or forged test

samples (see line 29)

As condition of supply

9 Dimensions concerned De mm - < 150 - < 150 < 150

11 Direction of sample - L - L L

12

Tensile

Temperature в °C Ambient temperature

13

Proof stress •βp0.2 MPa - > 1080 - - > 1080

14

Tensile Strength MPa - 1230 < Rm < 1420 - 1230 < Rm < 1420 1230 < Rm < 1420

15

Elongation A % - > 10 - > 10 > 10

16

Reduction of

area

Z %

-

17 Hardness HR

HV

< 277 363 £ HB < 415

380 < HV < 435

< 277 363 < HB < 415

380 < HV < 435

363 < HB < 415

380 < HV < 435

20 Impact Izod ft-lbf - a 25 1 a 25 > 25

29 Reference heat treatment Hardened and tempered

820 °C < B < 850 °C/OQ1) 2)

500 °C < B < 600 °C/AC1\* 2)

97 Designation S99A S99C S99F

98 Notes ' ' The tolerance on the chosen temperature shall be  $\pm 10$  °C

2) AC = air cool; OQ = oil quench

| S99 Physical Properties |         |                          |
|-------------------------|---------|--------------------------|
| Tensile strength        | 115-234 | $\sigma_b$ /MPa          |
| Yield Strength          | 23      | $\sigma_{0.2} \geq$ /MPa |
| Elongation              | 65      | $\delta_5 \geq$ (%)      |
| $\psi$                  | -       | $\psi \geq$ (%)          |
| Akv                     | -       | Akv $\geq$ /J            |
| HBS                     | 123-321 | -                        |
| HRC                     | 30      | -                        |

| S99 Mechanical Properties |  |  |
|---------------------------|--|--|
|                           |  |  |

|                  |         |                          |
|------------------|---------|--------------------------|
| Tensile strength | 231-231 | $\sigma_b$ /MPa          |
| Yield Strength   | 154     | $\sigma_{0.2} \geq$ /MPa |
| Elongation       | 56      | $\delta 5 \geq$ (%)      |
| $\psi$           | -       | $\psi \geq$ (%)          |
| Akv              | -       | Akv $\geq$ /J            |
| HBS              | 235-268 | -                        |
| HRC              | 30      | -                        |

### S99 Heat Treatment Regime

| Annealing | Quenching | Tempering | Normalizing | Q & T |
|-----------|-----------|-----------|-------------|-------|
| ✓         | ✓         | ✓         | ✓           | ✓     |

### S99 Range of products

| Product type    | Products                                 | Dimension                  | Processes                                   | Deliver Status                                                |
|-----------------|------------------------------------------|----------------------------|---------------------------------------------|---------------------------------------------------------------|
| Plates / Sheets | Plates / Sheets                          | 0.08-200mm(T)*W*L          | Forging, hot rolling and cold rolling       | Annealed, Solution and Aging, Q+T, ACID-WASHED, Shot Blasting |
| Steel Bar       | Round Bar, Flat Bar, Square Bar          | $\Phi 8$ -1200mm*L         | Forging, hot rolling and cold rolling, Cast | Black, Rough Turning, Shot Blasting,                          |
| Coil / Strip    | Steel Coil /Steel Strip                  | 0.03-16.0x1200mm           | Cold-Rolled & Hot-Rolled                    | Annealed, Solution and Aging, Q+T, ACID-WASHED, Shot Blasting |
| Pipes / Tubes   | Seamless Pipes/Tubes, Welded Pipes/Tubes | OD:6-219mm x WT:0.5-20.0mm | Hot extrusion, Cold Drawn, Welded           | Annealed, Solution and Aging, Q+T, ACID-WASHED                |

**We can produce Specialsteel the specifications follows:**