

EN 10225 Chemical & Mechanical Properties

Chemical Properties

| Group | Steel name | Steel number | C | Si | Mn | P | S | Cr | Mo | Ni | Al (Total) ^a | Cu | N | Nb | Ti | V | Cr+Mo+Nb+Cu | Nb+V | Nb+V+Ti |
|-----------------------------|--|----------------------|-------------------|--------------|--------------|--------|--------|--------|-------------------|-------------------|-------------------------|--------|--------|--------|--------|--------|-------------|--------|---------|
| | | | max. % | % | % | max. % | max. % | max. % | max. % | max. % | max. % | max. % | max. % | max. % | max. % | max. % | max. % | max. % | max. % |
| Ladle analysis ^b | | | | | | | | | | | | | | | | | | | |
| 1 | S355G2+N | 1.8801+N | 0,20 | 0,50 max. | 0,90 to 1,65 | 0,035 | 0,030 | 0,30 | 0,10 | 0,50 | 0,020 min | 0,35 | 0,015 | 0,060 | 0,030 | 0,12 | - | - | - |
| 1 | S355G3+N | 1.8802+N | 0,18 | 0,50 max. | 0,90 to 1,65 | 0,030 | 0,025 | 0,30 | 0,10 | 0,50 | 0,020 min | 0,35 | 0,015 | 0,060 | 0,030 | 0,12 | - | - | - |
| 1 | S355G5+M | 1.8804+M | 0,14 | 0,50 max. | 1,60 max. | 0,035 | 0,030 | - | 0,20 | 0,30 | 0,020 min. | - | 0,015 | 0,050 | 0,050 | 0,10 | - | - | - |
| 1 | S355G6+M | 1.8805+M | 0,14 | 0,50 max. | 1,60 max. | 0,030 | 0,025 | - | 0,20 | 0,30 | 0,020 min. | - | 0,015 | 0,050 | 0,050 | 0,10 | - | - | - |
| Ladle and product analysis | | | | | | | | | | | | | | | | | | | |
| 2 | S355G7+M ^c S355G7+N ^c | 1.8808+M 1.8808+N | 0,14 | 0,15 to 0,55 | 1,00 to 1,65 | 0,020 | 0,010 | 0,25 | 0,08 | 0,50 | 0,015/0,055 | 0,30 | 0,010 | 0,040 | 0,025 | 0,060 | 0,90 | 0,06 | 0,08 |
| 3 | S355G8+M ^c S355G8+N ^c | 1.8810+M 1.8810+N | 0,14 | 0,15 to 0,55 | 1,00 to 1,65 | 0,020 | 0,007 | 0,25 | 0,08 | 0,50 | 0,015/0,055 | 0,30 | 0,010 | 0,040 | 0,025 | 0,060 | 0,90 | 0,06 | 0,08 |
| 2 | S355G9+N ^c S355G9+M ^c | 1.8811+N 1.8811+M | 0,12 | 0,15 to 0,55 | 1,65 max. | 0,020 | 0,010 | 0,20 | 0,08 ^d | 0,70 ^e | 0,015/0,055 | 0,30 | 0,010 | 0,030 | 0,025 | 0,060 | - | 0,06 | 0,08 |
| 3 | S355G10+N ^c S355G10+M ^c | 1.8813+N 1.8813+M | 0,12 | 0,15 to 0,55 | 1,65 max. | 0,015 | 0,005 | 0,20 | 0,08 ^d | 0,70 ^e | 0,015/0,055 | 0,30 | 0,010 | 0,030 | 0,025 | 0,060 | - | 0,06 | 0,08 |
| 2 | S420G1+Q ^c S420G1+M ^c | 1.8830+Q 1.8830+M | 0,14 ^f | 0,15 to 0,55 | 1,65 max. | 0,020 | 0,010 | 0,25 | 0,25 | 0,70 | 0,015/0,055 | 0,30 | 0,010 | 0,040 | 0,025 | 0,080 | 0,90 | 0,09 | 0,11 |
| 3 | S420G2+Q ^c S420G2+M ^c | 1.8857+Q 1.8857+M | 0,14 ^f | 0,15 to 0,55 | 1,65 max. | 0,020 | 0,007 | 0,25 | 0,25 | 0,70 | 0,015/0,055 | 0,30 | 0,010 | 0,040 | 0,025 | 0,080 | 0,90 | 0,09 | 0,11 |
| 2 | S460G1+Q ^c S460G1+M ^c | 1.8878+Q 1.8878+M | 0,14 ^f | 0,15 to 0,55 | 1,65 max. | 0,020 | 0,010 | 0,25 | 0,25 | 0,70 | 0,015/0,055 | 0,30 | 0,010 | 0,040 | 0,025 | 0,080 | 0,90 | 0,09 | 0,11 |
| 3 | S460G2+Q ^c S460G2+M ^c | 1.8887+Q 1.8887+M | 0,14 ^f | 0,15 to 0,55 | 1,65 max. | 0,020 | 0,007 | 0,25 | 0,25 | 0,70 | 0,015/0,055 | 0,30 | 0,010 | 0,040 | 0,025 | 0,080 | 0,90 | 0,09 | 0,11 |

NOTE For details on delivery conditions refer back to 7.3.1.

a For product chemical composition variations see Table 1.2.

b The total aluminium to nitrogen ratio shall be a minimum of 2:1. When other nitrogen binding elements are used, the minimum Al value and Al:N ratio does not apply.

c The levels of the residual elements arsenic, antimony, tin, lead, bismuth and calcium shall not exceed 0,03 % As, 0,010 % Sb, 0,020 % Sn, 0,010 % Pb, 0,010 % Bi and 0,005 % Ca. Boron (B) shall not exceed 0,0005 %. These elements shall be checked at least once every 5 000 tonnes at each manufacturing location and shall be reported as a ladle analysis.

d For thicknesses greater than 75 mm, maximum Mo content of 0,20 % shall apply for delivery condition +M.

e See option 30. For thicknesses greater than 40 mm, the minimum Ni content shall be 0,30 %.

f A maximum carbon value of 0,15 % is permitted for thicknesses less than 15 mm.

Mechanical Properties

| Group | Steel name | Steel number | Tensile strength R _m ^a | | Minimum yield strength R _{eH} for thickness t (mm) | | | | | | Minimum elongation A on gauge length of 5,65√S ₀ ^c | Minimum average Charpy V-notch impact test value | | Thickness maximum |
|-------|------------|--------------|--|------------------------|---|------------------|------------------|------------------|------------------|------------------|--|--|--------|-------------------|
| | | | Thickness t (mm) ≤ 100 | Thickness t (mm) > 100 | τ ≤ 16 | 16 < τ ≤ 25 | 25 < τ ≤ 40 | 40 < τ ≤ 63 | 63 < τ ≤ 100 | 100 < τ ≤ 150 | | Temp. | Energy | |
| | | | | | MPa ^a | MPa ^a | MPa ^a | MPa ^a | MPa ^a | MPa ^a | MPa ^a | | | MPa ^a |
| 1 | S355G2+N | 1.8801+N | 470 to 630 | - | 355 | 345 | - | - | - | - | 22 | -20 | 50 | 20 |
| 1 | S355G3+N | 1.8802+N | 470 to 630 | - | 355 | 345 | 345 | - | - | - | 22 | -40 | 50 | 40 |
| 1 | S355G5+M | 1.8804+M | 470 to 610 | - | 355 | 345 | - | - | - | - | 22 | -20 | 50 | 20 |
| 1 | S355G6+M | 1.8805+M | 470 to 610 | - | 355 | 345 | 345 | - | - | - | 22 | -40 | 50 | 40 |
| 2 | S355G7+N | 1.8808+N | 470 to 630 | 460 to 620 | 355 | 355 | 345 | 335 | 325 | 320 | 22 | -40 | 50 | 150 ^b |
| 3 | S355G8+N | 1.8810+N | 470 to 630 | 460 to 620 | 355 | 355 | 345 | 335 | 325 | 320 | 22 | -40 | 50 | 150 ^b |
| 2 | S355G7+M | 1.8808+M | 470 to 630 | - | 355 | 355 | 345 | 335 | 325 | - | 22 | -40 | 50 | 100 ^b |
| 3 | S355G8+M | 1.8810+M | 470 to 630 | - | 355 | 355 | 345 | 335 | 325 | - | 22 | -40 | 50 | 100 ^b |
| 2 | S355G9+N | 1.8811+N | 470 to 630 | 460 to 620 | 355 | 355 | 345 | 335 | 325 | 320 | 22 | -40 | 50 | 150 ^b |
| 2 | S355G9+M | 1.8811+M | 470 to 630 | - | 355 | 355 | 345 | 335 | 325 | - | 22 | -40 | 50 | 100 ^b |
| 3 | S355G10+N | 1.8813+N | 470 to 630 | 460 to 620 | 355 | 355 | 345 | 335 | 325 | 320 | 22 | -40 | 50 | 150 ^b |
| 3 | S355G10+M | 1.8813+M | 470 to 630 | - | 355 | 355 | 345 | 335 | 325 | - | 22 | -40 | 50 | 100 ^b |

NOTE

a The specified tensile strength and elongation values apply to the maximum thickness for which minimum yield strengths are specified.

b Charpy V-notch mid-thickness tests are also required for thicknesses over 40 mm.

In the case of piling material the mid-thickness impacts shall be carried out at -30 °C in lieu of -40 °C.

c 1MPa = 1 N/mm².