## Composition and mechanical properties of commonly used carbon steel and alloy steel

| steel | standard | | C | Si | Mn | P | S | Cr | Ni | Mo | Al | Cu | Ti | V | Nb | tensile strength (Mpa) | Yield Strength (Mpa) | Elongation % | Shrinkage % | Test temp. | Shock J | Hardness HB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A105 | ASTM A105-2011 | MIN | | 0.10 | 0.60 | | | | | | | | | | | 485 | 250 | 22 | 30 | | | |
| | | MAX | 0.35 | 0.35 | 1.05 | 0.035 | 0.040 | 0.30 | 0.40 | 0.12 | | 0.40 | | 0.08 | | | | | | | | 187 |
| 20# | 俄标 | MIN | 0.17 | 0.17 | 0.35 | | | | | | | | | | | 390 | 195 | 26 | 55 | | | 111 |
| | | MAX | 0.24 | 0.37 | 0.65 | 0.035 | 0.040 | 0.25 | 0.30 | | | 0.30 | | | | | | | | | | 156 |
| 20# | JB/T4726-2000 | MIN | 0.17 | 0.2 | 0.60 | | | | | | | | | | | 390 | 215 | 24 | | 20℃ | 34 | 106 |
| | | MAX | 0.23 | 0.37 | 1.00 | 0.03 | 0.020 | 0.25 | 0.25 | | | 0.25 | | | | 540 | | | | | | 159 |
| 20# | NB/T47008-2010 | MIN | 0.17 | 0.2 | 0.60 | | | | | | | | | | | 410～560 | 235 | 24 | | 0℃ | 31 | 110～160 |
| | | | | | | | | | | | | | | | | 400～550 | 225 | 24 | | | | |
| | | MAX | 0.23 | 0.40 | 1.00 | 0.030 | 0.020 | 0.25 | 0.25 | | | 0.25 | | | | 380～530 | 205 | 24 | | | | |
| C21 | VdTUV399/3:2007 | MIN | 0.18 | 0.2 | 0.80 | | | | | | | | | | | 485 | 250 | 20 | 45 | 20℃ | 31 | 143 |
| | | MAX | 0.23 | 0.35 | 1.35 | 0.035 | 0.030 | 0.30 | 0.40 | 0.12 | | 0.40 | | 0.030 | 0.020 | 630 | | | | | | 185 |
| C22.8 | VdTUV350/3:2009 | MIN | 0.18 | | 0.40 | | | | | | 0.015 | | | | | 410 | 250 | 20 | | 20℃ | 31 | 125 |
| 1.0460 | | MAX | 0.23 | 0.40 | 0.90 | 0.025 | 0.015 | 0.30 | 0.30 | 0.08 | 0.050 | 0.30 | | 0.020 | 0.010 | 540 | | | | | | 160 |
| 20Mn | GB/T699-1999 | MIN | 0.17 | 0.17 | 0.70 | | | | | | | | | | | 450 | 275 | 24 | 50 | | | |
| | | MAX | 0.23 | 0.37 | 1.00 | 0.035 | 0.035 | 0.25 | 0.30 | | | 0.25 | | | | | | | | | | |
| P245GH | EN10222-2:2000 | MIN | 0.08 | | 0.50 | | | | | | | | | | | 410 | 245 | 23 | | 20℃ | 27 | 125 |
| 1.0352 | | MAX | 0.20 | 0.40 | 1.30 | 0.025 | 0.015 | | 0.30 | 0.08 | | 0.30 | | 0.020 | 0.010 | 530 | | | | | | 160 |
| P280GH | EN10222-2:2000 | MIN | 0.08 | | 0.90 | | | | | | | | | | | 460 | 280 | 23 | | | | |
| 1.0426 | | MAX | 0.20 | 0.40 | 1.50 | 0.025 | 0.015 | | 0.30 | 0.08 | | 0.30 | | 0.020 | 0.01 | 580 | | | | | | |
| A350LF2 | ASTM A350:2010 | MIN | | 0.2 | 0.60 | | | | | | | | | | | 485 | 250 | 22 | 30 | –46℃ | 27 | |
| | | MAX | 0.30 | 0.30 | 1.35 | 0.035 | 0.040 | 0.30 | 0.40 | 0.12 | | 0.40 | | 0.030 | | 655 | | | | | | 197 |
| A350LF6 | ASTM A350:2010 | MIN | 0.22 | 0.2 | 1.15 | | | | | | | | | 0.04 | N 0.01 | 515 | 415 | 20 | 40 | | | |
| | | MAX | | 0.30 | 1.50 | 0.025 | 0.025 | 0.30 | 0.40 | 0.12 | | 0.40 | | 0.11 | N 0.03 | 690 | | | | | | 197 |
| Q235A | GB/T700-2006 | MIN | | | | | | | | | | | | | | 375 | 235 | 26 | | | | |
| | | MIX | 0.22 | 0.35 | 1.40 | 0.045 | 0.050 | | | | | | | | | 500 | | | | | | |
| Q235B | GB/T700-2006 | MIN | | | | | | | | | | | | | | 375 | 235 | 26 | | 20℃ | 27 | |
| | | MIX | 0.20 | 0.35 | 1.40 | 0.045 | 0.045 | | | | | | | | | 500 | | | | | | |
| P265GH | DIN10222-2 | MIN | 0.10 | 0.20 | 0.50 | | | | | | 0.020 | | | | | 410 | 265 | 23 | | | 31 | 138 |
| | | MAX | 0.20 | 0.40 | 1.40 | 0.025 | 0.020 | 0.30 | 0.30 | 0.08 | | 0.30 | 0.030 | 0.020 | | 530 | | | | | | 170 |
| P250GH | DIN10222-2 | MIN | 0.18 | | 0.40 | | | | | | 0.015 | | | | | 410 | 250 | 20 | | | 31 | 125 |
| 1.0460 | | MAX | 0.23 | 0.40 | 0.90 | 0.025 | 0.015 | 0.30 | 0.30 | 0.08 | 0.050 | 0.30 | | 0.020 | 0.010 | 540 | | | | | | 160 |
| 16Mn | NB/T47008-2010 | MIN | 0.13 | 0.20 | 1.20 | | | | | | | | | | | 480～630 | 305 | 20 | | 0℃ | 34 | 128～180 |
| | | | | | | | | | | | | | | | | 470～620 | 295 | 20 | | | | |
| | | MAX | 0.20 | 0.60 | 1.60 | 0.030 | 0.020 | 0.30 | 0.30 | | | 0.25 | | | | 450～600 | 275 | 20 | | | | |
| Steel | standard | | C | Si | Mn | P | S | Cr | Ni | Mo | Al | Cu | Ti | V | Nb | tensile strength (Mpa) | Yield Strength (Mpa) | Elongation % | Shrinkage % | Test temp. | Shock J | Hardness HB |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16MnD | NB/T47009-2010 | MIN | 0.13 | 0.20 | 1.20 | | | | | | | | | | | 480～630 | 305 | 20 | | –45℃ | 47 | |
| | | | | | | | | | | | | | | | | 470～620 | 295 | 20 | | –40℃ | | |
| | | MAX | 0.20 | 0.60 | 1.60 | 0.025 | 0.012 | 0.30 | 0.40 | | | 0.25 | | | 0.030 | 450～600 | 275 | 20 | | | | |
| 16Mn(HIC) | | MIN | | 0.20 | 1.15 | | | | | | O | Cep | | | | 450 | 275 | 20 | | –30℃ | 34 | |
| | | MAX | 0.20 | 0.40 | 1.30 | 0.008 | 0.002 | | 0.20 | | <0.004 | 0.43 | | | | 600 | | | | | | |
| Q345A/B | GB1591-2008 | MAX | 1.20 | 1.40 | 2.30 | 1.008 | 1.002 | | 1.20 | | <0.005 | 1.43 | | | | 601 | | | | | | |
| | | MAX | 0.20 | 0.50 | 1.70 | 0.035 | 0.035 | 0.30 | 0.50 | 0.10 | | 0.30 | 0.20 | 0.15 | 0.07 | 630 | | | | | | |
| Q345C | GB1591-2008 | MIN | | | | | | | | | 0.015 | | | | | 470 | 345 | 20 | | | | |
| | | MAX | 0.20 | 0.50 | 1.70 | 0.030 | 0.030 | 0.30 | 0.50 | 0.10 | | 0.30 | 0.20 | 0.15 | 0.07 | 630 | | | | | | |
| Q345D | GB1591-2008 | MIN | | | | | | | | | 0.015 | | | | | 470 | 345 | 21 | | | | |
| | | MAX | 0.18 | 0.50 | 1.70 | 0.030 | 0.025 | 0.30 | 0.50 | 0.10 | | 0.30 | 0.20 | 0.15 | 0.07 | 630 | | | | | | |
| Q345E | GB1591-2008 | MIN | | | | | | | | | 0.015 | | | | | 470 | 345 | 21 | | | | |
| | | MAX | 0.18 | 0.50 | 1.70 | 0.025 | 0.020 | 0.30 | 0.50 | 0.10 | | 0.30 | 0.20 | 0.15 | 0.07 | 630 | | | | | | |
| Q460C | GB1591-2008 | MIN | | | | | | | | | 0.015 | | | | | 550～720 | ≥400 | ≥16 | | 0℃ | 34 | |
| | | MAX | 0.20 | 0.60 | 1.80 | 0.030 | 0.030 | 0.30 | 0.80 | 0.20 | | 0.55 | 0.20 | 0.20 | 0.11 | 530～700 | ≥380 | ≥16 | | | | |
| Q500D | GB1591-2008 | MIN | | | | | | | | | 0.015 | | | | | 590～750 | ≥450 | ≥17 | | –20℃ | 47 | |
| | | MAX | 0.18 | 0.60 | 1.80 | 0.030 | 0.025 | 0.60 | 0.80 | 0.20 | | 0.20 | 0.20 | 0.12 | 0.11 | 540～730 | ≥440 | ≥17 | | | | |
| Q550D | GB1591-2008 | MIN | | | | | | | | | 0.015 | | | | | 600～790 | ≥500 | ≥16 | | –20℃ | 47 | |
| | | MAX | 0.18 | 0.60 | 2.00 | 0.030 | 0.025 | 1.00 | 0.80 | 0.30 | | 0.80 | 0.20 | 0.12 | 0.11 | 590～780 | ≥490 | ≥16 | | | | |
| 09Г$_2$С | Russian standard | MIN | 0.07 | 0.50 | 1.30 | | | | | | | | | | | 470 | 245 | 22 | 48 | -60℃ | 30 | 143 |
| | | MAX | 0.12 | 0.80 | 1.70 | 0.040 | 0.040 | 0.30 | 0.30 | | | 0.30 | | | | | | | | | | 179 |
| ST37.2 | | MIN | 0.10 | 0.2 | 0.50 | | | | | | | | | | | 340 | 235 | 24 | | 20℃ | 27 | 100 |
| | | MIX | 0.17 | 0.3 | 1.40 | 0.045 | 0.045 | | | | | 0.30 | | | | 470 | | | | | | 140 |
| S235JRG2 | EN10250-2 | MIN | | | | | | | | | | | | | | 340 | 235 | 24 | | 20℃ | 27 | 100 |
| | | MIX | 0.20 | 0.6 | 1.40 | 0.045 | 0.045 | | | | | | | | | 470 | | | | | | 140 |
| A516 F60 | ASTM A516-2010 | MIN | | 0.15 | 0.60 | | | | | | | | | | | 415 | 220 | 25 | | | | |
| | | MAX | 0.21 | 0.40 | 0.90 | 0.035 | 0.035 | | | | | | | | | 550 | | | | | | |
| A516 F65 | ASTM A516-2010 | MIN | | 0.15 | 0.85 | | | | | | | | | | | 450 | 240 | 23 | | | | |
| | | MAX | 0.24 | 0.40 | 1.20 | 0.035 | 0.035 | | | | | | | | | 585 | | | | | | |
| A516 F70 | ASTM A516-2010 | MIN | | 0.15 | 0.85 | | | | | | | | | | | 485 | 260 | 21 | | | | |
| | | MAX | 0.27 | 0.40 | 1.20 | 0.035 | 0.035 | | | | | | | | | 620 | | | | | | |
| A694 F52 | ASTM A694:2008 | MIN | | 0.15 | | | | | | | | | | | | 455 | 360 | 20 | | | | |
| | | MAX | 0.26 | 0.35 | 1.60 | 0.025 | 0.025 | | | | | | | | | | | | | | | |
| A694 F60 | ASTM A694:2008 | MIN | | 0.15 | | | | | | | | | | | | 515 | 415 | 20 | | | | |
| | | MAX | 0.26 | 0.35 | 1.60 | 0.025 | 0.025 | | | | | | | | | | | | | | | |
| A694 F65 | ASTM A694:2008 | MIN | | 0.15 | | | | | | | | | | | | 530 | 450 | 20 | | | | |
| | | MAX | 0.26 | 0.35 | 1.60 | 0.025 | 0.025 | | | | | | | | | | | | | | | |
| A694 F70 | ASTM A694:2008 | MIN | | 0.15 | | | | | | | | | | | | 565 | 485 | 18 | | | | |
| | | MAX | 0.26 | 0.35 | 1.60 | 0.025 | 0.025 | | | | | | | | | | | | | | | |
| Steel | standard | | C | Si | Mn | P | S | Cr | Ni | Mo | Al | Cu | Ti | V | Nb | tensile strength (Mpa) | Yield Strength (Mpa) | Elongation % | Shrinkage % | Test temp. | Shock J | Hardness HB |
| F11 Class2 | ASTM A182-2013 | MIN | 0.10 | 0.50 | 0.30 | | | 1.00 | | 0.44 | | | | | | 485 | 275 | 20 | 30 | | | 156 |
| | | MAX | 0.20 | 1.00 | 0.80 | 0.040 | 0.040 | 1.50 | | 0.65 | | | | | | | | | | | | 207 |
| F5 | ASTM A182-2013 | MIN | | | 0.30 | | | 4.00 | | 0.44 | | | | | | 485 | 275 | 20 | 35 | | | 143 |
| | | MAX | 0.15 | 0.50 | 0.60 | 0.030 | 0.030 | 6.00 | 0.50 | 0.65 | | | | | | | | | | | | 217 |
| F5A | ASTM A182-2013 | MIN | | | | | | 4.00 | | 0.44 | | | | | | 620 | 450 | 22 | 50 | | | 187 |
| | | MAX | 0.25 | 0.50 | 0.60 | 0.040 | 0.030 | 6.00 | 0.50 | 0.65 | | | | | | | | | | | | 248 |
| F9 | ASTM A182-2013 | MIN | | 0.50 | 0.30 | | | 8.00 | | 0.90 | | | | | | 585 | 380 | 20 | 40 | | | 179 |
| | | MAX | 0.15 | 1.00 | 0.60 | 0.030 | 0.030 | 10.00 | | 1.10 | | | | | | | | | | | | 217 |
| F22 Class3 | ASTM A182-2013 | MIN | 0.05 | | 0.30 | | | 2.00 | | 0.87 | | | | | | 515 | 310 | 20 | 30 | | | 156 |
| | | MAX | 0.15 | 0.50 | 0.60 | 0.04 | 0.040 | 2.50 | | 1.13 | | | | | | | | | | | | 207 |
| 1Cr5Mo | NB/T47008-2010 | MIN | | | | | | 4.00 | | 0.45 | | | | | | 590 | 390 | 18 | | 20℃ | 47 | |
| | | MAX | 0.15 | 0.50 | 0.60 | 0.025 | 0.015 | 6.00 | 0.50 | 0.65 | | 0.25 | | | | 760 | | | | | | |
| 15CrMo | NB/T47008-2010 | MIN | 0.12 | 0.10 | 0.30 | | | 0.80 | | 0.45 | | | | | | 480～640 | 280 | 20 | | 20℃ | 47 | |
| | | MAX | 0.18 | 0.60 | 0.80 | 0.025 | 0.015 | 1.25 | 0.30 | 0.65 | | 0.25 | | | | 470～630 | 270 | 20 | | | | |
| 12Cr1MoV | NB/T47008-2010 | MIN | 0.09 | 0.15 | 0.40 | | | 0.90 | | 0.25 | | | | 0.15 | | 470～630 | 280 | 20 | | 20℃ | 47 | |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12CrMoV | NB/T47008-2010 | MAX | 0.15 | 0.40 | 0.70 | 0.025 | 0.015 | 1.20 | 0.30 | 0.35 | | 0.25 | | 0.30 | | 460～620 | 270 | 20 | | 20℃ | | |
| 09MnNiD | NB/T47009-2010 | MIN | 0.06 | 0.15 | 1.20 | | | | 0.45 | | | | | | | 440～590 | 280 | 23 | | -70℃ | 60 | |
| | | MAX | 0.12 | 0.35 | 1.60 | 0.020 | 0.010 | 0.30 | 0.85 | | 0.05 | 0.25 | | | | 430～580 | 270 | 23 | | | | |
| 16Mo3 | EN10222-2:2000 | MIN | 0.12 | | 0.40 | | | | | 0.25 | | | | | | 440 | 295 | 23 | | | | |
| 1.5415 | | MAX | 0.20 | 0.35 | 0.90 | 0.025 | 0.015 | | | 0.35 | | | | | | 570 | | | | | | |
| 13CrMo4-5 | EN10222-2:2000 | MIN | 0.08 | | 0.40 | | | 0.70 | | 0.40 | | | | | | 440 | 295 | 20 | | 20℃ | 31 | 156 |
| 1.7335 | | MAX | 0.18 | 0.35 | 1.00 | 0.025 | 0.015 | 1.15 | | 0.60 | | | | | | 590 | | | | | | |
| 42CrMo | GB3077-88 | MIN | 0.38 | | 0.60 | | | 0.90 | | 0.15 | | | | | | 800 | 640 | 13 | 50 | | | |
| | | MAX | 0.45 | 0.40 | 0.90 | 0.035 | 0.035 | 1.20 | | 0.30 | | | | | | 1100 | | | | | | 240 |
| 20MnMo | GB3077-88 | MIN | 0.16 | 0.2 | 0.90 | | | | | 0.20 | | | | | | 530 | 370 | 18 | | 0℃ | 41 | |
| | | MAX | 0.22 | 0.4 | 1.20 | 0.030 | 0.035 | | | 0.30 | | | | | | 700 | | | | | | |

1、Seamless steel pipe, welded steel pipe (straight seam pipe and spiral steel pipe), stainless steel pipe, etc.

2、A series is international universal series (imperial tube), B series is domestic series (metric tube)

| Nominal diameter DN | Imperial | Outer | | thickness of pipe wall（mm) and theoretical weight（m/kg） | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 6 | 7 | 8 | 9 | 10 | 12 |
| 15 | 1/2" | 21.3 | 18 | 1 | 1.11 | 1.25 | 1.38 | 1.5 | 1.6 | | | | | | |
| 20 | 3/4" | 26.9 | 25 | 1.4 | 1.63 | 1.86 | 2.07 | 2.28 | 2.47 | 2.81 | 3.11 | | | | |
| 25 | 1" | 33.7 | 32 | 1.8 | 2.15 | 2.46 | 2.76 | 3.05 | 3.33 | 3.85 | 4.32 | 4.47 | | | |
| 32 | 1 1/4" | 42.4 | 38 | 2.2 | 2.59 | 2.98 | 3.35 | 3.72 | 4.07 | 4.74 | 5.35 | 5.95 | | | |
| 40 | 1 1/2" | 48.3 | 45 | 2.6 | 3.11 | 3.58 | 4.04 | 4.49 | 4.93 | 5.77 | 6.56 | 7.3 | 7.99 | | |
| 50 | 2" | 60.3 | 57 | 3.4 | 4 | 4.62 | 5.23 | 5.83 | 6.41 | 7.55 | 8.63 | 9.67 | 10.7 | | |
| 65 | 2 1/2" | 76.1 | 76 | 4.5 | 5.4 | 6.26 | 7.1 | 7.93 | 8.75 | 10.36 | 11.9 | 13.1 | 14.4 | | |
| 80 | 3" | 88.9 | 89 | 5.3 | 6.36 | 7.38 | 8.38 | 9.38 | 10.36 | 12.28 | 14.2 | 16 | 17.8 | | |
| 100 | 4" | 114 | 108 | 6.5 | 7.77 | 9.02 | 10.26 | 11.49 | 12.7 | 15.09 | 17.4 | 19.7 | 22 | | |
| 125 | 5" | 140 | 133 | | | | 12.73 | 14.26 | 15.78 | 18.79 | 21.8 | 24.7 | 27.5 | 30.33 | 35.81 |
| 150 | 6" | 168 | 159 | | | | | 17.15 | 18.99 | 22.64 | 26.2 | 29.8 | 33.3 | 36.75 | 43.5 |
| 200 | 8" | 219 | 219 | | | | | | | 31.52 | 36.6 | 41.6 | 46.6 | 51.54 | 61.26 |
| 250 | 10" | 273 | 273 | | | | | | | 39.51 | 45.9 | 52.3 | 58.6 | 64.86 | 77.24 |
| 300 | 12" | 324 | 325 | | | | | | | 47.2 | 54.9 | 62.5 | 70.1 | 77.68 | 92.63 |
| 350 | 14" | 355 | 377 | | | | | | | 54.89 | 63.9 | 72.8 | 81.7 | 90.51 | 108 |
| 400 | 16" | 406 | 426 | | | | | | | 62.14 | 72.3 | 82.5 | 92.6 | 102.6 | 122.5 |
| 450 | 18" | 457 | 480 | | | | | | | | | 93.1 | 105 | 115.9 | 139.5 |
| 500 | 20" | 508 | 530 | | | | | | | | | 103 | 116 | 128.2 | 154.3 |
| 600 | 24" | 610 | 630 | | | | | | | | | 123 | 138 | 152.9 | 182.9 |

| Steel grade | Material | C | Si | Mn | P | S | Cr | Steel grade | Material | Ni | Mo | Cu | V | Al | Mark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| J55 | —— | | | | ≤ 0.030 | ≤ 0.030 | | J55 | —— | | | | | | |
| | 37Mn5 | 0.34-0.39 | 0.20-0.35 | 1.25-1.50 | ≤ 0.025 | ≤ 0.015 | ≤0.15 | | 37Mn5 | ≤0.20 | | ≤0.20 | | 0.01-0.04 | |
| | 34Mn6 | 0.35 | 0.26 | 1.38 | 0.018 | 0.005 | 0.09 | | 34Mn6 | 0.04 | 0.011 | 0.07 | | 0.022 | |
| | 30Mn2Cr | 0.27-0.34 | 0.17-0.35 | 1.40-1.80 | ≤ 0.025 | ≤0.02 | 0.2-0.4 | | 30Mn2Cr | ≤0.25 | | ≤0.20 | | | |
| | 30Mn2 | 0.27-0.34 | 0.17-0.37 | 1.40-1.80 | Allowable residual content≦0.35 | Allowable residual content≦0.35 | Allowable residual content≦0.30 | | 30Mn2 | Allowable residual content≦0.30 | | Allowable residual content≦0.30 | | | |
| | 30CrMo | 0.26-0.34 | 0.17-0.37 | 0.40-0.70 | | | 0.80-1.10 | | 30CrMo | | 0.15-0.25 | | | | |
| | 25Mn2V | 0.24-0.28 | 0.17-0.37 | 1.40-1.70 | ≤0.02 | ≤ 0.015 | ≤0.15 | | 25Mn2V | ≤0.20 | | ≤0.20 | 0.08-0.12 | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 34Mn5 | 0.32-0.38 | 0.15-0.35 | 1.10-1.30 | ≤0.025 | ≤0.025 | | | 34Mn5 | | | | | 0.01-0.04 | |
| K55 | —— | | | | ≤0.030 | ≤0.030 | | K55 | —— | | | | | | |
| | 37Mn5 | 0.34-0.39 | 0.20-0.35 | 1.25-1.50 | ≤0.025 | ≤0.015 | ≤0.15 | | 37Mn5 | ≤0.20 | | ≤0.20 | | 0.01-0.04 | |
| | 34Mn6 | 0.35 | 0.26 | 1.38 | 0.018 | 0.005 | 0.09 | | 34Mn6 | 0.04 | 0.011 | 0.07 | | 0.022 | |
| | 30Mn2Cr | 0.27-0.34 | 0.17-0.35 | 1.40-1.80 | ≤0.025 | ≤0.02 | 0.2-0.4 | | 30Mn2Cr | ≤0.25 | | ≤0.20 | | | |
| L80-1 | —— | ≤0.50 | ≤0.45 | ≤1.90 | ≤0.030 | ≤0.030 | | L80-1 | —— | ≤0.25 | | ≤0.35 | | | |
| | 30Mn2 | 0.27-0.34 | 0.17-0.37 | 1.40-1.80 | Allowable residual content≦0.35 | Allowable residual content≦0.35 | Allowable residual content≦0.30 | | 30Mn2 | Allowable residual content≦0.30 | | Allowable residual content≦0.30 | | | |
| | 37Mn5 | 0.34-0.39 | 0.20-0.35 | 1.25-1.50 | ≤0.025 | ≤0.015 | ≤0.15 | | 37Mn5 | ≤0.20 | | ≤0.20 | | 0.01-0.04 | |
| | 34Mn6 | 0.35 | 0.26 | 1.38 | 0.018 | 0.005 | 0.09 | | 34Mn6 | 0.04 | 0.011 | 0.07 | | 0.022 | |
| | 30Mn2Cr | 0.27-0.34 | 0.17-0.35 | 1.40-1.80 | ≤0.025 | ≤0.02 | 0.2-0.4 | | 30Mn2Cr | ≤0.25 | | ≤0.20 | | | |
| | 25Mn2V | 0.24-0.28 | 0.17-0.37 | 1.40-1.70 | ≤0.02 | ≤0.015 | ≤0.15 | | 25Mn2V | ≤0.20 | | ≤0.20 | 0.08-0.12 | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25Mn2 | 0.32-0.39 | 0.17-0.37 | 1.40-1.80 | ≤0.025 | ≤0.025 | ≤0.30 | | 25Mn2 | ≤0.30 | | ≤0.25 | | | |
| | 36Mn2V | 0.34-0.39 | 0.25-0.40 | 1.45-1.70 | ≤0.025 | ≤0.015 | ≤0.15 | | 36Mn2V | ≤0.20 | | ≤0.20 | 0.11-0.16 | | |
| L80-1 | 37Mn2V | | | | | | | | 37Mn2V | | | | | | |
| | —— | | | | ≤0.030 | ≤0.030 | | | —— | | | | | | |
| N80Q | 37Mn5 | 0.34-0.39 | 0.20-0.35 | 1.25-1.50 | ≤0.025 | ≤0.015 | ≤0.15 | N80Q | 37Mn5 | ≤0.20 | | ≤0.20 | | 0.01-0.04 | |
| | 34Mn6 | 0.35 | 0.26 | 1.38 | 0.018 | 0.005 | 0.09 | | 34Mn6 | 0.04 | 0.011 | 0.07 | | 0.022 | |
| **Steel grade** | **Material** | **C** | **Si** | **Mn** | **P** | **S** | **Cr** | **Steel grade** | **Material** | **Ni** | **Mo** | **Cu** | **V** | **Al** | **Mark** |
| N80Q | 30Mn2 | 0.27-0.34 | 0.17-0.37 | 1.40-1.80 | Allowable residual content≦0.35 | Allowable residual content≦0.35 | Allowable residual content≦0.30 | | 30Mn2 | Allowable residual content≦0.30 | | Allowable residual content≦0.30 | | | |
| | 25Mn2 | 0.32-0.39 | 0.17-0.37 | 1.40-1.80 | ≤0.025 | ≤0.025 | ≤0.30 | | 25Mn2 | ≤0.30 | | ≤0.25 | | | |
| | 37Mn2V | | | | | | | N80Q | 37Mn2V | | | | | | |
| | 30Mn2Cr | 0.27-0.34 | 0.17-0.35 | 1.40-1.80 | ≤0.025 | ≤0.02 | 0.2-0.4 | | 30Mn2Cr | ≤0.25 | | ≤0.20 | | | |
| N80Q | 20Mn2 | 0.17-0.24 | 0.17-0.37 | 1.40-1.80 | ≤0.025 | ≤0.025 | ≤0.30 | | 20Mn2 | ≤0.30 | | ≤0.25 | | | |
| | SAE1527 | 0.22-0.29 | | 1.20-1.50 | ≤0.040 | ≤0.050 | | | SAE1527 | | | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | —— | | | | | | | | —— | | | | | | |
| | 25Mn2V | 0.24-0.28 | 0.17-0.37 | 1.40-1.70 | ≤0.02 | ≤0.015 | ≤0.15 | | 25Mn2V | ≤0.20 | | ≤0.20 | 0.08-0.12 | | |
| | 36Mn2V | 0.34-0.39 | 0.25-0.40 | 1.45-1.70 | ≤0.025 | ≤0.015 | ≤0.15 | | 36Mn2V | ≤0.20 | | ≤0.20 | 0.11-0.16 | | |
| | 37Mn2V | | | | | | | | 37Mn2V | | | | | | |
| | 30Mn2 | 0.27-0.34 | 0.17-0.37 | 1.40-1.80 | Allowable residual content≦0.35 | Allowable residual content≦0.35 | Allowable residual content≦0.30 | | 30Mn2 | Allowable residual content≦0.30 | | Allowable residual content≦0.30 | | | |
| **P110** | 30Mn2Cr | 0.27-0.34 | 0.17-0.35 | 1.40-1.80 | ≤0.025 | ≤0.02 | 0.2-0.4 | **P110** | 30Mn2Cr | ≤0.25 | | ≤0.20 | | | |
| | 37Mn5 | 0.34-0.39 | 0.20-0.35 | 1.25-1.50 | ≤0.025 | ≤0.015 | ≤0.15 | | 37Mn5 | ≤0.20 | | ≤0.20 | | 0.01-0.04 | |
| | 35CrMo | 0.32-0.40 | 0.17-0.37 | 0.40-0.70 | Allowable residual content≦0.035 | Allowable residual content≦0.035 | 0.80-1.10 | | 35CrMo | Allowable residual content≦0.030 | 0.15-0.25 | Allowable residual content≦0.030 | | | |
| | 30CrMo | 0.26-0.34 | 0.17-0.37 | 0.40-0.70 | | | 0.80-1.10 | | 30CrMo | | 0.15-0.25 | | | | |
| | —— | ≤0.35 | | ≤1.35 | ≤0.020 | ≤0.010 | ≤1.50 | | —— | ≤0.99 | ≤0.85 | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Q125** | 30CrMo | 0.26-0.34 | 0.17-0.37 | 0.40-0.70 | | | 0.80-1.10 | **Q125** | 30CrMo | | 0.15-0.25 | | | | |
| | 25CrMoMo | | | | | | | | 25CrMoMo | | | | | | |
| | HCP110 | | | | | | | | HCP110 | | | | | | |
| —— | 32Mn6 | 0.320 | 0.23 | 1.26 | 0.015 | 0.015 | 0.062 | —— | 32Mn6 | 0.065 | 0.020 | 0.15 | | 0.012 | |
| —— | 10# steel | 0.1 | 0.188 | 0.4 | 0.016 | 0.01 | | | | | | | | | |
| —— | 20#steel | 0.23 | 0.231 | 0.4 | 0.031 | 0.03 | 0.022 | —— | 20# steel | 0.018 | | 0.04 | | | |
| —— | 35#steel | 0.38 | 0.237 | 0.7 | 0.021 | 0.02 | 0.041 | —— | 35# steel | 0.028 | | 0.05 | | 0.051（Als） | |
| —— | H08steel | 0.07 | 0.022 | 0.5 | 0.016 | 0.020 | 0.017 | —— | H08 steel | 0.013 | | 0.05 | | | |

| Items | Steel grade | | Types of steel | chemical composition,% | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | C | Si | Mn | Cr | Ni | Cu | Ti | Mo | V | P | S |
| 1 | H40、J55 | | A658 Ⅱ | 0.27-0.3 | 0.17-0.37 | 1.25-1.50 | ≤0.25 | ≤0.25 | ≤0.20 | | — | 0.10-0.14 | ≤0.028 | ≤0.028 |
| | K55 | | 33MnV | 0.31-0.35 | 0.17-0.37 | 1.35-1.50 | ≤0.25 | ≤0.25 | ≤0.20 | — | — | 0.10-0.14 | ≤0.028 | ≤0.028 |
| 1 | N80Q | D＜244.48 | 30Mn | 0.28-0.32 | 0.17-0.37 | 1.30-1.45 | ≤0.25 | ≤0.25 | ≤0.20 | — | — | — | ≤0.028 | ≤0.028 |
| | | D≥244.48 | 25MnV | 0.22-0.29 | 0.17-0.37 | 1.30-1.60 | ≤0.25 | ≤0.25 | ≤0.20 | — | — | 0.07-0.12 | ≤0.025 | ≤0.025 |
| | L80 | D＜244.48 | 30Mn(L) | 0.28-0.32 | 0.17-0.37 | 1.30-1.45 | ≤0.25 | ≤0.25 | ≤0.20 | — | — | — | ≤0.020 | ≤0.020 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 1 series | D≥244.48 | 25MnV(L) | 0.22-0.29 | 0.17-0.37 | 1.30-1.60 | ≤0.25 | ≤0.20 | ≤0.20 | — | — | 0.07-0.12 | ≤0.020 | ≤0.020 |
| | C90 1 series<br>C90 2 series | | 27CrMoTi | 0.26-0.3 | 0.17-0.37 | 0.35-0.60 | 0.80-1.10 | ≤0.20 | ≤0.20 | 0.05-0.15 | 0.25-0.35 | — | ≤0.018 | ≤0.008 |
| | T95 1 series<br>T95 2 series | | 27CrMoTi | 0.26-0.3 | 0.17-0.37 | 0.35-0.60 | 0.80-1.10 | ≤0.20 | ≤0.20 | 0.05-0.15 | 0.25-0.35 | — | ≤0.018 | ≤0.008 |
| | C95 | | 25MnV | 0.22-0.29 | 0.17-0.37 | 1.30-1.60 | ≤0.25 | ≤0.20 | ≤0.20 | — | — | 0.07-0.12 | ≤0.025 | ≤0.025 |
| 3 | P110 | D＜244.48 | 25MnV | 0.22-0.29 | 0.17-0.37 | 1.30-1.60 | ≤0.25 | ≤0.20 | ≤0.20 | — | — | 0.07-0.12 | ≤0.025 | ≤0.025 |
| | | D≥244.48 | 25MnMoV | 0.22-0.29 | 0.17-0.37 | 1.30-1.60 | ≤0.25 | ≤0.20 | ≤0.20 | — | 0.20-0.30 | 0.07-0.12 | ≤0.025 | ≤0.025 |

1. As (arsenic) and Sn(tin) of petroleum pipe couplings shall meet: As≤0.03％， Sn≤0.01％， 0.4As+6Sn≤0.072％

2. When coupling material and finished coupling are delivered from the factory, Cr、Ni、Mo of Ni、Cu and C90、T95 listed

3. D in the table is the outer diameter of the steel pipe.

# Petroleum steel grade comparison table

## PSL1 Pipeline steel grade comparison table

| Steel grade | Yield strength Mpa | Tensile strength Mpa | Chinese | C% | Si% | Mn% | P% | S% | Cr% | Ni% | Mo% | V% | Cu% | delivery status |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L175 or A25 | ≥175 | ≥310 | 10# | 0.07-0.13 | 0.17-0.37 | 0.35-0.60 | ≤0.030 | ≤0.030 | ≤0.15 | ≤0.30 | — | — | ≤0.25 | Finish rolling or annealing |
| | | | 20# | 0.17-0.21 | 0.17-0.37 | 0.35-0.60 | ≤0.030 | ≤0.030 | ≤0.25 | ≤0.30 | — | — | ≤0.25 | |
| | | | API | ≤0.21 | — | ≤0.60 | ≤0.030 | ≤0.030 | — | — | — | — | | |
| L175P or A25P | ≥175 | ≥310 | 10# | 0.07-0.13 | 0.17-0.37 | 0.35-0.60 | ≤0.050 | ≤0.030 | ≤0.15 | ≤0.30 | — | — | ≤0.25 | Finish rolling or annealing |
| | | | 20# | 0.17-0.21 | 0.17-0.37 | 0.35-0.60 | ≤0.050 | ≤0.030 | ≤0.25 | ≤0.30 | — | — | ≤0.25 | |
| | | | API | ≤0.21 | — | ≤0.60 | 0.045-0.080 | ≤0.030 | — | — | — | — | | |
| L210 or A | ≥210 | ≥335 | 10# | 0.07-0.13 | 0.17-0.37 | 0.35-0.65 | ≤0.030 | ≤0.030 | ≤0.15 | ≤0.30 | — | — | ≤0.25 | Finish rolling or annealing |
| | | | 20# | 0.17-0.22 | 0.17-0.37 | 0.35-0.65 | ≤0.030 | ≤0.030 | ≤0.25 | ≤0.30 | — | — | ≤0.25 | |
| | | | API | ≤0.22 | — | ≤0.90 | ≤0.030 | ≤0.030 | — | — | — | — | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L245R or BP L245 or B | ≥245 | ≥415 | 20# | 0.17-0.23 | 0.17-0.37 | 0.35-0.65 | ≤0.030 | ≤0.030 | ≤0.25 | ≤0.30 | — | — | ≤0.25 | Finish rolling or anneal ing |
| | | | API | ≤0.28 | — | ≤1.20 | ≤0.030 | ≤0.030 | — | — | — | d | | |
| L290R or X42 L290 or X42 | ≥290 | ≥415 | 20# | 0.17-0.23 | 0.17-0.37 | 0.35-0.65 | ≤0.030 | ≤0.030 | ≤0.25 | ≤0.30 | — | — | ≤0.25 | Finish rolling or anneal ing |
| | | | 20G | 0.17-0.24 | 0.17-0.37 | 0.35-0.65 | ≤0.030 | ≤0.030 | ≤0.25 | ≤0.25 | ≤0.15 | — | ≤0.20 | |
| | | | API | ≤0.28 | — | ≤1.30 | ≤0.030 | ≤0.030 | — | — | — | d | | |
| L320 or X46 | ≥320 | ≥435 | 16Mn | 0.12-0.20 | 0.20-0.60 | 1.20-1.40 | ≤0.030 | ≤0.030 | ≤0.25 | ≤0.30 | — | — | ≤0.25 | Finish rolling or normal izing |
| | | | API | ≤0.28 | — | ≤1.40 | ≤0.030 | ≤0.030 | — | — | — | d | | |
| L360 or X52 | ≥360 | ≥460 | 16Mn | 0.12-0.20 | 0.20-0.60 | 1.20-1.40 | ≤0.030 | ≤0.030 | ≤0.25 | ≤0.30 | — | — | ≤0.25 | Finish rolling or normal izing |
| | | | 20Mn2 | 0.17-0.24 | 0.20-0.45 | 1.20-1.40 | ≤0.030 | ≤0.030 | — | — | — | — | — | |
| | | | API | ≤0.28 | — | ≤1.40 | ≤0.030 | ≤0.030 | — | — | — | d | — | |
| L390 or X56 | ≥390 | ≥490 | 20Mn2 | 0.17-0.24 | 0.20-0.45 | 1.20-1.40 | ≤0.030 | ≤0.030 | | | — | — | — | Finish rolling or normal izing |
| | | | 25Mn2 | 0.22-0.28 | 0.20-0.45 | 1.20-1.40 | ≤0.030 | ≤0.030 | | | — | — | — | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L390 or X56 | ≥390 | | 25Mn2V | 0.22-0.28 | 0.17-0.37 | 1.20-1.40 | ≤0.025 | ≤0.025 | ≤0.25 | ≤0.20 | — | 0.07-0.12 | ≤0.20 | Finish rolling or normalizing |
| | | | API | ≤0.28 | — | ≤1.40 | ≤0.030 | ≤0.030 | — | — | — | d | — | |
| L415 or X60 | ≥415 | ≥520 | 25Mn2 | 0.22-0.28 | 0.20-0.45 | 1.20-1.40 | ≤0.030 | ≤0.030 | — | — | — | — | — | Finish rolling + normalizing or tempering |
| | | | 25Mn2V | 0.22-0.28 | 0.17-0.37 | 1.20-1.40 | ≤0.025 | ≤0.025 | ≤0.25 | ≤0.20 | — | 0.07-0.12 | ≤0.20 | |
| | | | API | 0.28[e] | — | 1.40[e] | ≤0.030 | ≤0.030 | — | — | — | f | — | |
| L450 or X65 | ≥450 | ≥535 | 16Mn | 0.12-0.20 | 0.20-0.60 | 1.20-1.40 | ≤0.030 | ≤0.030 | ≤0.25 | ≤0.30 | — | — | ≤0.25 | Quenching + tempering |
| | | | 20Mn2 | 0.17-0.24 | 0.20-0.45 | 1.20-1.40 | ≤0.030 | ≤0.030 | — | — | — | — | — | |
| | | | 25Mn2 | 0.22-0.28 | 0.20-0.45 | 1.20-1.40 | ≤0.030 | ≤0.030 | — | — | — | — | — | |
| | | | 25Mn2V | 0.22-0.28 | 0.17-0.37 | 1.20-1.40 | ≤0.025 | ≤0.025 | ≤0.25 | ≤0.20 | — | 0.07-0.12 | ≤0.20 | |
| | | | API | 0.28[e] | — | 1.40[e] | ≤0.030 | ≤0.030 | — | — | — | f | — | |
| L485 or X70 | ≥485 | ≥570 | 16Mn | 0.12-0.20 | 0.20-0.60 | 1.20-1.40 | ≤0.030 | ≤0.030 | — | — | — | — | — | Quenching + tempering |
| | | | 20Mn2 | 0.17-0.24 | 0.20-0.45 | 1.20-1.40 | ≤0.030 | ≤0.030 | — | — | — | — | — | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L485 or X70 | ≥485 | | 25Mn2 | 0.22-0.28 | 0.20-0.45 | 1.20-1.40 | ≤0.030 | ≤0.030 | — | — | — | — | — | Quenching + tempering |
| | | | 25Mn2V | 0.22-0.28 | 0.17-0.37 | 1.20-1.40 | ≤0.025 | ≤0.025 | ≤0.25 | ≤0.20 | — | 0.07-0.12 | ≤0.20 | |
| | | | API | 0.28[e] | — | 1.40[e] | ≤0.030 | ≤0.030 | — | — | — | f | — | |

**PSL2 Pipeline Steel Grade Comparison Table**

| Steel grade | Yield strength Mpa | Tensile strength Mpa | China steel grade | | C% | Si% | Mn% | S% | Ni% | Nb% | Ti% | V% | Cu% | CE11W | CEPCm | Delivery status |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L245R or BR | 245-450 | 415-760 | 20# | | ≤0.17 | 0.17-0.37 | 0.35-0.65 | ≤0.015 | ≤0.30 | — | — | — | ≤0.25 | — | — | Rolled or annealed |
| L245N or BN | | | 16Mn | | | 0.20-0.40 | ≤1.20 | ≤0.015 | ≤0.30 | — | — | — | ≤0.25 | — | — | normalizing |
| L245Q or BQ | | | 20Mn | | | 0.17-0.37 | ≤1.20 | ≤0.015 | — | — | — | — | — | — | — | Quenching + tempering |
| L245M or BM | | | API | R、N | ≤0.24 | ≤0.40 | ≤1.20 | ≤0.015 | — | c | ≤0.04 | c | — | ≤0.43 | ≤0.25 | Heat treatment process of welded pipe |
| | | | | Q | ≤0.18 | ≤0.45 | ≤1.40 | ≤0.015 | — | ≤0.05 | ≤0.04 | ≤0.05 | — | ≤0.43 | ≤0.25 | |
| | | | | M | ≤0.22 | ≤0.45 | ≤1.20 | ≤0.015 | — | ≤0.05 | ≤0.04 | ≤0.05 | — | ≤0.43 | ≤0.25 | |
| L290R or X42R | 290-495 | 415-760 | 20# | | ≤0.17 | 0.17-0.37 | 0.35-0.65 | ≤0.015 | ≤0.30 | — | — | — | ≤0.25 | — | — | Rolled or annealed |
| L290N or X42N | | | 16Mn | | ≤0.17 | 0.20-0.40 | ≤1.20 | ≤0.015 | ≤0.30 | — | — | — | ≤0.25 | — | — | normalizing |
| L290Q or X42Q | | | 20Mn | | ≤0.17 | 0.17-0.37 | ≤1.20 | ≤0.015 | — | c | — | c | — | — | — | Quenching + tempering |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L290M or X42M | 290-495 | 415-760 | API | R、N | ≤0.24 | ≤0.40 | ≤1.20 | ≤0.015 | — | ≤0.05 | ≤0.04 | ≤0.06 | — | ≤0.43 | ≤0.25 | Heat treatment process of welded pipe |
| | | | | Q | ≤0.18 | ≤0.45 | ≤1.40 | ≤0.015 | — | ≤0.05 | ≤0.04 | ≤0.05 | — | ≤0.43 | ≤0.25 | |
| | | | | M | ≤0.22 | ≤0.45 | ≤1.30 | ≤0.015 | — | ≤0.05 | ≤0.04 | ≤0.05 | — | ≤0.43 | ≤0.25 | |
| L320N or X46N X46N | 320-525 | 435-760 | 16Mn | | ≤0.17 | 0.20-0.40 | ≤1.20 | ≤0.015 | ≤0.30 | — | — | — | ≤0.25 | — | — | normalizing |
| L320Q or X46Q | | | 20Mn | | ≤0.17 | 0.17-0.37 | ≤1.20 | ≤0.015 | — | — | — | — | — | — | — | Quenching + tempering |
| L320M or X46M | | | API | N | ≤0.24 | ≤0.40 | ≤1.40 | ≤0.015 | — | ≤0.05 | ≤0.04 | ≤0.07 | — | — | — | Heat treatment process of welded pipe |
| | | | | Q | ≤0.18 | ≤0.45 | ≤1.40 | ≤0.015 | — | ≤0.05 | ≤0.04 | ≤0.05 | — | — | — | |
| | | | | M | ≤0.22 | ≤0.45 | ≤1.30 | ≤0.015 | — | ≤0.05 | ≤0.04 | ≤0.05 | — | — | — | |
| L360N or X52N | 360-530 | 460-760 | 16Mn | | ≤0.17 | 0.20-0.40 | ≤1.20 | ≤0.015 | ≤0.30 | — | — | — | — | — | — | normalizing |
| L360Q or X52Q | | | 20Mn2 | | ≤0.17 | 0.17-0.37 | ≤1.20 | ≤0.015 | — | — | — | — | — | — | — | Quenching + tempering |
| L360M or X52M | | | API | N | ≤0.24 | ≤0.45 | ≤1.40 | ≤0.015 | — | ≤0.05 | ≤0.04 | ≤0.10 | — | ≤0.43 | ≤0.25 | Heat treatment process of welded pipe |
| | | | | Q | ≤0.18 | ≤0.45 | ≤1.50 | ≤0.015 | — | ≤0.05 | ≤0.04 | ≤0.05 | — | ≤0.43 | ≤0.25 | |
| | | | | M | ≤0.22 | ≤0.45 | ≤1.40 | ≤0.015 | — | d | d | d | — | ≤0.43 | ≤0.25 | |
| L390N or X56N | | | 20Mn2 | | ≤0.17 | 0.17-0.37 | ≤1.20 | ≤0.015 | — | — | — | — | — | — | — | normalizing |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L390Q or X56Q | 390-545 | 490-760 | (16Mn quenching) | | ≤0.17 | 0.20-0.40 | ≤1.20 | ≤0.015 | ≤0.30 | — | — | — | ≤0.25 | — | — | Quenching + tempering |
| L390M or X56M | 390-545 | 490-760 | API | N | ≤0.24 | ≤0.45 | ≤1.40 | ≤0.015 | — | ≤0.05 | ≤0.04 | ≤0.10[f] | — | ≤0.43 | ≤0.25 | Heat treatment process of welded pipe |
| | | | | Q | ≤0.18 | ≤0.45 | ≤1.50 | ≤0.015 | — | ≤0.05 | ≤0.04 | ≤0.07 | — | ≤0.43 | ≤0.25 | |
| | | | | M | ≤0.22 | ≤0.45 | ≤1.40 | ≤0.015 | — | d | d | d | — | — | — | |
| L415N or X60N | 415-565 | 520-760 | 16Mn | | ≤0.12 | 0.20-0.40 | ≤1.20 | ≤0.015 | ≤0.30 | — | — | — | ≤0.25 | — | — | Quenching + tempering |
| L415Q or X60Q | | | (N grade steel can use | | ≤0.12 | 0.20-0.45 | ≤1.40 | ≤0.015 | — | — | — | — | — | — | — | |
| L415M or X60M | | | API | N | ≤0.24[f] | ≤0.45[f] | ≤1.40[f] | ≤0.015 | — | ≤0.05[f] | ≤0.04[f] | ≤0.10[f] | — | By agreement | | |
| | | | | Q | ≤0.18[f] | ≤0.45[f] | ≤1.70[f] | ≤0.015 | — | — | — | — | — | ≤0.43 | ≤0.25 | |
| | | | | M | ≤0.12[f] | ≤0.45[f] | ≤1.60[f] | ≤0.015 | — | — | — | — | — | ≤0.43 | ≤0.25 | |
| L450Q or jX65Q | 450-600 | 535-760 | 16Mn | | ≤0.12 | 0.20-0.40 | ≤1.20 | ≤0.015 | ≤0.30 | — | — | — | ≤0.25 | — | — | Quenching + tempering |
| L450M or X65M | | | 16MnV | | ≤0.12 | 0.17-0.37 | 1.30-1.60 | — | — | — | — | 0.07-0.12 | — | — | — | |
| | | | API | Q | ≤0.18[f] | ≤0.45[f] | ≤1.70[f] | ≤0.015 | — | — | — | — | — | ≤0.43 | ≤0.25 | |
| | | | | M | ≤0.12[f] | ≤0.45[f] | ≤1.60[f] | ≤0.015 | — | — | — | — | — | ≤0.43 | ≤0.25 | |
| L485Q or X70 | 485-635 | 570-760 | 16Mn | | ≤0.12 | 0.20-0.40 | ≤1.20 | ≤0.015 | ≤0.30 | — | — | — | ≤0.25 | — | — | Quenching + tempering |
| L485M or X70 | | | 16MnV | | ≤0.12 | 0.17-0.37 | 1.30-1.60 | — | — | — | — | 0.07-0.12 | — | — | — | |
| | | | API | Q | ≤0.18[f] | ≤0.45[f] | ≤1.80[f] | ≤0.015 | — | — | — | — | — | ≤0.43 | ≤0.25 | |
| | | | | M | ≤0.12[f] | ≤0.45[f] | ≤1.70[f] | ≤0.015 | — | — | — | — | — | ≤0.43 | ≤0.25 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L555Q or X80 | 555-705 | 625-825 | 16Mn | | ≤0.12 | 0.20-0.40 | ≤1.20 | ≤ 0.015 | ≤0.30 | — | — | — | ≤ 0.25 | — | — | Quenching + tempering |
| L555M or X80 | | | 16MnV | | ≤0.12 | 0.17-0.37 | 1.30-1.60 | — | — | — | — | 0.07-0.12 | | — | — | |
| | | | API | Q | ≤0.18[f] | ≤0.45[f] | ≤1.90[f] | ≤ 0.015 | — | — | — | — | — | By agreement | | |
| | | | | M | ≤0.12[f] | ≤0.45[f] | ≤1.85[f] | ≤≤ 0.015 | — | — | — | — | — | ≤0.43 | ≤0.25 | |

Marks：

1. Hot-rolled "R" grade thin-walled pipes must be normalized, and thick-walled "N" grades can be replaced with normal-temperature rolling when the final rolling temperature is not less than 900 ° C.

2. When the purchaser designates steel pipes to be applied in acid environments or submarine pipelines, the steel grades cannot be implemented as shown in Table, another type of corrosion-resistant steel to be selected. The specific status is subject to the ordering technical agreement.

c indicates that unless otherwise agreed, the total content of niobium and titanium should be 0.06% or less

d indicates that the total content of niobium, vanadium and titanium should be less than or equal to 0.15%

f means that unless otherwise agreed, the total vanadium content should be less than or equal to 0.15%