

API 5L Grade X70 Pipe Data Sheet

For more info please visit <https://www.octalsteel.com/resources/api-5l-x70-pipe>
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Chemical Composition API 5L X70 PSL1								
Steel grade (Steel name)	Mass fraction, based upon heat and product analyses ^{a, g}							
	%							
	C	Mn	P		S	V	Nb	Ti
max ^b	max ^b	min	max	max	max	max	max	max
Seamless pipe								
L485 or X70	0.28 ^e	1.4 ^e	—	0.03	0.03	f	f	f
Welded pipe								
L485 or X70	0.26 ^e	1.65 ^e	—	0.03	0.03	f	f	f

- a. Cu ≤ 0.50 %; Ni ≤ 0.50 %; Cr ≤ 0.50 % and Mo ≤ 0.15 %
- b. For each reduction of 0.01 % below the specified maximum concentration for carbon, an increase of 0.05 % above the specified maximum concentration for Mn is permissible, up to a maximum of 1.65 % for grade ≥ L245 or B, but ≤ L360 or X52; up to a maximum of 1.75 % for grade > L360 or X52, but < L485 or X70; and up to a maximum of 2.00 % for grade L485 or X70.
- c. Unless otherwise agreed, Nb + V ≤ 0.06 %.
- d. Nb + V + Ti ≤ 0.15 %.
- e. Unless otherwise agreed.
- f. Unless otherwise agreed, Nb + V + Ti ≤ 0.001%
- g. No deliberate addition of B is permitted and the residual B ≤ 0.001 %.

Mechanical Properties for API 5L X70 PSL1 pipe				
Pipe grade	Pipe body of seamless and welded pipes			Weld seam of EW, LW,
	Yield strength ^a	Tensile strength ^a	Elongation	Tensile strength ^b
	R _{10.5}	R _m	A _f	R _m
	MPa (psi)	MPa (psi)	%	MPa (psi)
minimum	minimum	minimum	minimum	
L485 or X70	485 (70 300)	570 (82 700)	c	570 (82 700)

- a. For intermediate grades, the difference between the specified minimum tensile strength and minimum yield strength for the pipe body shall be as given in the table for the next higher grade.
- b. For intermediate grades, the specified minimum tensile strength for the weld seam shall be the same value as was determined for the pipe body using footnote a)
- c. The specified minimum elongation, A_f, expressed in percent and rounded to the nearest percent, shall be as determined using the following equation:

$$A_f = C \frac{A_{xc}^{0,2}}{U^{0,9}}$$

where

C is 1 940 for calculations using SI units and 625 000 for calculations using USC units;

A_{xc} is the applicable tensile test piece cross-sectional area, expressed in square millimetres (square inches), as follows:

- for circular cross-section test pieces, 130 mm² (0.20 in²) for 12.7 mm (0.500 in) and 8.9 mm (0.350 in) diameter test pieces; and 65 mm² (0.10 in²) for 6.4 mm (0.250 in) diameter test pieces;
- for full-section test pieces, the lesser of a) 485 mm² (0.75 in²) and b) the cross-sectional area of the test piece, derived using the specified outside diameter and the specified wall thickness of the pipe, rounded to the nearest 10 mm² (0.01 in²);
- for strip test pieces, the lesser of a) 485 mm² (0.75 in²) and b) the cross-sectional area of the test piece, derived using the specified width of the test piece and the specified wall thickness of the pipe, rounded to the nearest 10 mm² (0.01 in²);

U is the specified minimum tensile strength, expressed in megapascals (pounds per square inch).

API 5L Grade X70 PSL2 Pipe Data Sheet

Steel grade (Steel name)	Chemical Composition API 5L X70 PSL2										
	Mass fraction, based upon heat and product analyses									Carbon equivalent ^a % maximum	
	%										
	C ^b	Si	Mn ^b	P	S	V	Nb	Ti	Other	CE _{IW}	CE _{pc}
Seamless pipe											
L485Q or X70Q	0.18 ^f	0.45 ^f	1.80 ^f	0.025	0.015	g	g	g	hl	0.43	0.25
Welded pipe											
L485M or X70M	0.12 ^f	0.45 ^f	1.70 ^f	0.025	0.015	g	g	g	hl	0.43	0.25

a. Based upon product analysis. For seamless pipe with $t > 20.0$ mm (0.787 in), the CE limits shall be agreed. The CE_{IW} limits apply if C > 0.12 % and the CE_{pc} limits apply if C ≤ 0.12 %.

b. For each reduction of 0.01% below the specified maximum concentration for carbon, an increase of 0.05 % above the specified maximum for Mn is permissible, up to a maximum of 1.65% for grade ≥ L245 or B, but ≤ L360 or X52; up to a maximum of 1.75 % for grade > L360 or X52, but < L485 or X70; and up to a maximum of 2.00 % for grade L485 or X70, but ≤ L555 or X80, and up to a maximum of 2.20 % for grades > L555 or X80.

c. Unless otherwise agreed, Nb + V ≤ 0.06 %.

d. Nb + V + Ti ≤ 0.15 %.

e. Unless otherwise agreed, Cu ≤ 0.50 %; Ni ≤ 0.30 %; Cr ≤ 0.30% and Mo ≤ 0.15 %.

f. Unless otherwise agreed.

g. Unless otherwise agreed, Nb + V + Ti ≤ 0.15 %.

h. Unless otherwise agreed, Cu ≤ 0.50%; Ni ≤ 0.50%; Cr ≤ 0.50 % and Mo ≤ 0.15 %

i. Unless otherwise agreed, Cu ≤ 0.50%; Ni ≤ 1.00%; Cr ≤ 0.50 % and Mo ≤ 0.50 %

j. B ≤ 0.004 %.

k. Unless otherwise agreed, Cu ≤ 0.50 %; Ni ≤ 1.00 %; Cr ≤ 0.55% and Mo ≤ 0.80 %.

l. For all PSL 2 pipe grades except those grades to which footnote j already applies, the following applies. Unless otherwise agreed no intentional addition of B is permitted and residual B 0.001 %.

Mechanical Properties for API 5L B PSL2 pipe							
Pipe grade	Pipe body of seamless and welded pipes					Weld seam of EW, LW, SAW	
	Yield strength ^a		Tensile strength ^a		Ratio ^{a, c}	Elongation	Tensile strength ^d
	R _{t0.5}		R _m		R _{t0.5} /R _m	A _f	R _m
	MPa (psi)		MPa (psi)			%	MPa (psi)
	minimum	maximum	minimum	maximum	maximum	minimum	minimum
L485Q or X70Q	485	635	570	760	0.93	f	570
L485M or X70M	(70 300)	(92 100)	(82 700)	(110 200)			

a. For intermediate grades, the difference between the specified maximum yield strength and the specified minimum yield strength shall be as given in the table for the next higher grade, and the difference between the specified minimum tensile strength and the specified minimum yield strength shall be as given in the table for the next higher grade. For intermediate grades up to Grade L320 or X46, the tensile strength shall be ≤ 655 MPa (95 000 psi). For intermediate grades greater than Grade L320 or X46 and lower than Grade L555 or X80, the tensile strength shall be ≤ 760 MPa (110 200 psi). For intermediate grades higher than Grade L555 or X80, the maximum permissible tensile strength shall be obtained by interpolation. For SI units, the calculated value shall be rounded to the nearest 5 MPa. For USC units, the calculated value shall be rounded to the nearest 100 psi.

b. For grades , L625 or X90, R_{p0.2} applies.

c. This limit applies for pipe with OD > 323.9 mm (12.750 in).

d. For intermediate grades, the specified minimum tensile strength for the weld seam shall be same value as was determined for the pipe body using

e. For pipe requiring longitudinal testing, the maximum yield strength shall be ≤ 495 MPa (71 800 psi).

f. The specified minimum elongation, A_f, shall be as determined using the following equation:

$$A_f = C \frac{A_{xc}^{0.2}}{U^{0.9}}$$

where

C is 1 940 for calculations using SI units and 625 000 for calculations using USC units;

A_{sc} is the applicable tensile test piece cross-sectional area, expressed in square millimetres (square inches), as follows:

- for circular cross-section test pieces, 130 mm² (0.20 in²) for 12.7 mm (0.500 in) and 8.9 mm (0.350 in) diameter test pieces; and 65 mm² (0.10 in²) for 6.4 mm (0.250 in) diameter test pieces;
- for full-section test pieces, the lesser of a) 485 mm² (0.75 in²) and b) the cross-sectional area of the test piece, derived using the specified outside diameter and the specified wall thickness of the pipe, rounded to the nearest 10 mm² (0.01 in²);
- for strip test pieces, the lesser of a) 485 mm² (0.75 in²) and b) the cross-sectional area of the test piece, derived using the specified width of the test piece and the specified wall thickness of the pipe, rounded to the nearest 10 mm² (0.01 in²);

U is the specified minimum tensile strength, expressed in megapascals (pounds per square inch).

g. Lower values of $R_{t0.5}/R_m$ may be specified by agreement.

h. For grades > L625 or X90, $R_{p0.2}/R_m$ applies. Lower values of $R_{p0.2}/R_m$ may be specified by agreement.

API 5L Grade X70 Sour Service Pipe Data Sheet

Steel grade (Steel name)	Chemical Composition API 5L X70 Sour Service										Carbon equivalent ^a	
	Mass fraction, based upon heat and product analyses										% maximum	
	%										CE _{IW}	CE _{Pcm}
	C ^b	Si	Mn ^b	P	S	V	Nb	Ti	Other ^{c,d}			
Seamless pipe												
L485QS or X70QS	0.16	0.45	1.65	0.020	0.003 ^e	0.09	0.05	0.06	g,i,k	0.42	0.22 ^h	
Welded pipe												
L485QS or X70MS	0.10	0.45	1.60	0.020	0.002 ^e	0.10	0.08	0.06	g,i,j	—	0.22	

a. Based upon product analysis (see 9.2.4 and 9.2.5). The CE_{IW} limits apply if C > 0.12 % and the CE_{Pcm} limits apply if C ≤ 0.12 %.

b. For each reduction of 0.01 % below the specified maximum for C, an increase of 0.05 % above the specified maximum for Mn is permissible, up to a maximum increase of 0.20 %.

c. Al_{total} ≤ 0.060 %; N ≤ 0.012 %; Al/N 2:1 (not applicable to titanium-killed or titanium-treated steel); Cu ≤ 0.35 % (if agreed, Cu ≤ 0.10 %); Ni ≤ 0.30 %; Cr ≤ 0.30 %; Mo ≤ 0.15 %; B ≤ 0.0005 %.

d. For welded pipe where calcium is intentionally added, unless otherwise agreed, Ca/S ≥ 1.5 if S > 0.0015 %. For SMLS and welded pipes, Ca ≤ 0.006 %.

e. The maximum limit for S may be increased to 0.008 % for SMLS pipe and, if agreed, to 0.006 % for welded pipe. For such higher S levels in welded pipe, lower Ca/S ratios may be agreed.

f. Unless otherwise agreed, Nb + V ≤ 0.06 %.

g. Nb + V + Ti ≤ 0.15 %.

h. For SMLS pipe, the listed CE_{Pcm} value may be increased by 0.03.

i. If agreed, Mo ≤ 0.35 %

j. If agreed, Cr ≤ 0.45 %.

k. If agreed, Cr ≤ 0.45 % and Ni ≤ 0.50 %.

Mechanical Properties for API 5L B SOUR SERVICE						
Pipe grade	Pipe body of seamless and welded pipes					Weld seam of EW, LW, SAW and COW pipes
	Yield strength ^a		Tensile strength ^a		Ratio ^b	Elongation
	R _{t0.5}		R _m		R _{t0.5} /R _m	A _f
	MPa (psi)		MPa (psi)			%
	minimum	maximum	minimum	maximum	maximum	minimum
L485QS or X70QS	485	635	570	760	0.93	e
L485MS or X70MS	(70 300)	(92 100)	(82 700)	(110 200)		
						R _m
						MPa (psi)
						minimum
						570
						(82 700)

a. For intermediate grades, the difference between the specified maximum yield strength and the specified minimum yield strength shall be as given in the table for the next higher grade, and the difference between the specified minimum tensile strength and the specified minimum yield strength shall be as given in the table for the next higher grade. For intermediate grades, the tensile strength shall be ≤ 760 MPa (110 200 psi).

b. This limit applies for pipe with D > 323.9 mm (12.750 in).

c. For intermediate grades, the specified minimum tensile strength for the weld seam shall be same value as was determined for the pipe body using

d. For pipe requiring longitudinal testing, the maximum yield strength shall be ≤ 495 MPa (71 800 psi).

e. The specified minimum elongation, A_f , on 50 mm or 2 in, expressed in percent and rounded to the nearest percent, shall be as determined using the following equation:

$$A_f = C \frac{A_{xc}^{0,2}}{U^{0,9}}$$

where

C is 1 940 for calculations using SI units and 625 000 for calculations using USC units;

A_{xc} is the applicable tensile test piece cross-sectional area, expressed in square millimetres (square inches), as follows:

- for circular cross-section test pieces, 130 mm² (0.20 in²) for 12.7 mm (0.500 in) and 8.9 mm (0.350 in) diameter test pieces; and 65 mm² (0.10 in²) for 6.4 mm (0.250 in) diameter test pieces;

- for full-section test pieces, the lesser of a) 485 mm² (0.75 in²) and b) the cross-sectional area of the test piece, derived using the specified outside diameter and the specified wall thickness of the pipe, rounded to the nearest 10 mm² (0.01 in²);

- for strip test pieces, the lesser of a) 485 mm² (0.75 in²) and b) the cross-sectional area of the test piece, derived using the specified width of the test piece and the specified wall thickness of the pipe, rounded to the nearest 10 mm² (0.01 in²);

U is the specified minimum tensile strength, expressed in megapascals (pounds per square inch).

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