

Carbon Steels: Chemical Composition

Grades	% Chemical Composition													Deoxidation
	C	Mn	Si	S	P	Al	Cr	Ni	Cu	Nb	V	Ti	N	
IS 1079 Gr O	0.15 max	0.6 max	-	0.055 max	0.055 max	-	-	-	-	-	-	-	-	Semi Killed / Killed
IS 1079 Gr D	0.12 max	0.5 max	-	0.04 max	0.04 max	-	-	-	-	-	-	-	-	Semi Killed / Killed
IS 1079 Gr DD	0.1 max	0.4 max	-	0.035 max	0.035 max	0.02 min	-	-	-	-	-	-	-	Al Killed
IS 1079 Gr EDD	0.08 max	0.4 max	-	0.03 max	0.03 max	0.02 min	-	-	-	-	-	-	-	Al Killed
IS 2062 E250 A	0.23 max	1.5 max	0.40 max	0.045 max	0.045 max	-	-	-	-	-	-	-	-	Semi Killed / Killed
IS 2062 E250 B	0.22 max	1.5 max	0.40 max	0.045 max	0.045 max	-	-	-	-	-	-	-	-	Killed
IS 2062 E250 C	0.2 max	1.5 max	0.40 max	0.04 max	0.04 max	-	-	-	-	-	-	-	-	Killed
IS 2062 E250Cu C	0.2 max	1.5 max	0.40 max	0.04 max	0.04 max	-	-	-	0.2- 0.35	-	-	-	-	Killed
IS 2062 E410	0.20 max	1.6 max	0.45 max	0.045 max	0.045 max	-	-	-	-	-	-	-	-	Killed
IS 2062 E450 D	0.22 max	1.6 max	0.45 max	0.045 max	0.045 max	-	-	-	-	-	-	-	-	Killed
IS 2062 E450 E	0.22 max	1.80 max	0.45 max	0.045 max	0.045 max	-	-	-	-	-	-	-	-	Killed
IS 5986 Fe410	0.20 max	1.20 max	-	0.040 max	0.040 max	-	-	-	-	-	-	-	-	Killed
IS 10748 Gr 1	0.10 max	0.50 max	-	0.040 max	0.040 max	-	-	-	-	-	-	-	-	killed
IRS M 41-97/ SAILCOR	0.1 max	0.25- 0.45	0.28- 0.72	0.03 max	0.075- 0.14	0.08 max	0.35- 0.60	0.20- 0.47	0.3- 0.6	-	-	-	-	Killed
SS 4012A-E34	0.1 max	0.7 max	0.2 max	0.03 max	0.03 max	0.02- 0.05	-	-	-	0.055 max	0.095 max	0.045 max	-	Al Killed
SS 4012A-E38	0.1 max	1.0 max	0.4 max	0.03 max	0.03 max	0.02- 0.05	-	-	-	0.055 max	0.095 max	0.045 max	-	Al Killed
SAILMA 350/350 Hi	0.25	1.50	0.40	0.055	0.055	0.01 min	-	-	-	-	-	-	-	Killed
SAILMA 410/410Hi	0.25	1.50	0.40	0.055	0.055	0.01 min	-	-	-	-	-	-	-	Killed
SAILMA 450/450 Hi	0.25	1.50	0.40	0.055	0.055	0.01 min	-	-	-	-	-	-	-	Killed

Micro Alloying elements like Nb, V, Ti may be present simply or in combination, the limits are given below:

Grade	Nb, V, Ti (max)
IS 2062 E250 A, B, C, Cu C IS 2062 E410 IS 2062 E450 D, IS 2062 E 450 E	0.25%
SAILMA350 SAILMA 350 Hi	0.20 %
SAILMA410 SAILMA 410 Hi	0.20 %
SAILMA450 SAILMA 450 Hi	0.20 %

Incidental element limit in grade IRSM-41/97/SAILCOR is as follows

Element	Limit
Mo	0.05 max
V	0.05 max
Al	0.08 max
Nb	0.04 max
Mo + V + Al + Nb	0.15 max

Maximum carbon equivalent for grades is as follows:

Grade	Carbon Equivalent (max)
IS 2062 E250 A	0.42
IS 2062 E250 B	0.41
IS 2062 E250 C	0.39
IS 2062 E410	0.44
IS 2062 E450 D	0.46
IS 2062 E450 E	0.48
IS 5986 Fe410	0.42

MECHANICAL PROPERTIES OF STANDARD GRADES

Grades	YS N/mm ²	UTS N/mm ²	% El (Min) GL= 5.65√So	Bend Test (t)	Hard R _B	Charpy V-Notch Impact Energy (min)
IS 1079 Gr O	-	-	-	2 t	-	-
IS 1079 Gr D	-	240- 400	25	1 t	-	-
IS 1079 Gr DD	-	260-390	28	Close	-	-
IS 1079 Gr EDD	-	260-380	32	Close	-	-
IS 2062 E250 A	250 min	410 min	23	3 t	-	-
IS 2062 E250 B	250 min	410 min	23	2 t	-	27 J at Room temp See Note
IS 2062 E250 C	250 min	410 min	23	2 t	-	27 J at Room temp See Note
IS2062E250Cu C	250 min	410 min	23	2 t	-	27 J at Room temp See Note
IS 2062 E410	410 min	540 min	23	2 t	-	50 J at Room temp See Note
IS 2062 E450 D	450 min	570 min	20	2 t	-	45 J at Room temp See Note
IS 2062 E450 E	450 min	590 min	20	2 t	-	45 J at Room temp See Note
IS 5986 Fe410	255 min	410-520	24 for t >3/0 mm *	2t	-	-
IS 10748 Grade I	170 min	290 min	30	T	-	-
SS 4012A E-34	334-412	392-490	27	Close (For 't' < 7.0 mm) 0.5 t (For 't' = 7.0)	-	-
SS4012A E-38	373-461	442-559	25	0.5 t	-	-
IRS M 41-97/ SAILCOR	340 min	480 min	22	1 t	-	-

't' : Nominal thickness of test piece, * : Elongation 15 min N in 80 mm GL for t ≤ 3.0 mm

Note: For grade IS 2062 E250 B, IS 2062 E250 C, E410, E450 D, E450 E Impact Test shall be certified for product thickness of 12 mm or more. The testing temperature will be room temperature unless otherwise specified in the order.

Standard Product Tolerance: Hot Rolled Stainless Steel