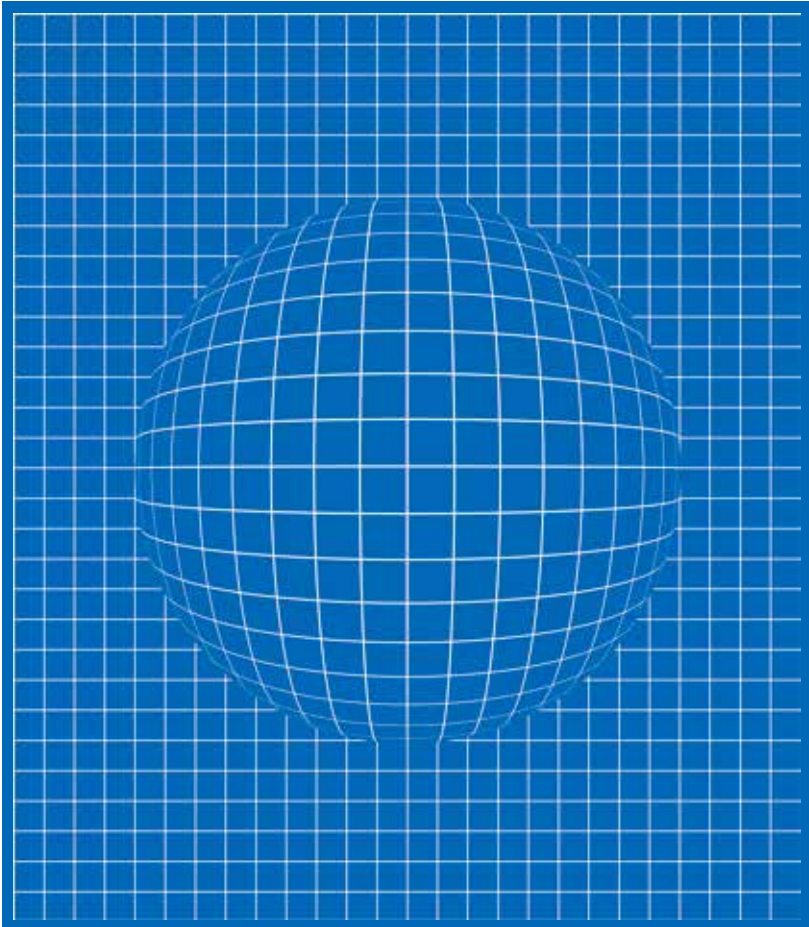


Wire Rods and Bars Specification Tables



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① Table of composition for JIS wire rods and secondary processed products of wire rods

1-1) G3502 Piano wire rods (Date of revision: March 20, 2004)

Code	C	Si	Mn	P	S	Cu
SWRS 62A	0.60 ~ 0.65	0.12 ~ 0.32	0.30 ~ 0.60	≦ 0.025	≦ 0.025	≦ 0.20
SWRS 62B	0.60 ~ 0.65	0.12 ~ 0.32	0.60 ~ 0.90	≦ 0.025	≦ 0.025	≦ 0.20
SWRS 67A	0.65 ~ 0.70	0.12 ~ 0.32	0.30 ~ 0.60	≦ 0.025	≦ 0.025	≦ 0.20
SWRS 67B	0.65 ~ 0.70	0.12 ~ 0.32	0.60 ~ 0.90	≦ 0.025	≦ 0.025	≦ 0.20
SWRS 72A	0.70 ~ 0.75	0.12 ~ 0.32	0.30 ~ 0.60	≦ 0.025	≦ 0.025	≦ 0.20
SWRS 72B	0.70 ~ 0.75	0.12 ~ 0.32	0.60 ~ 0.90	≦ 0.025	≦ 0.025	≦ 0.20
SWRS 75A	0.73 ~ 0.78	0.12 ~ 0.32	0.30 ~ 0.60	≦ 0.025	≦ 0.025	≦ 0.20
SWRS 75B	0.73 ~ 0.78	0.12 ~ 0.32	0.60 ~ 0.90	≦ 0.025	≦ 0.025	≦ 0.20
SWRS 77A	0.75 ~ 0.80	0.12 ~ 0.32	0.30 ~ 0.60	≦ 0.025	≦ 0.025	≦ 0.20
SWRS 77B	0.75 ~ 0.80	0.12 ~ 0.32	0.60 ~ 0.90	≦ 0.025	≦ 0.025	≦ 0.20
SWRS 80A	0.78 ~ 0.83	0.12 ~ 0.32	0.30 ~ 0.60	≦ 0.025	≦ 0.025	≦ 0.20
SWRS 80B	0.78 ~ 0.83	0.12 ~ 0.32	0.60 ~ 0.90	≦ 0.025	≦ 0.025	≦ 0.20
SWRS 82A	0.80 ~ 0.85	0.12 ~ 0.32	0.30 ~ 0.60	≦ 0.025	≦ 0.025	≦ 0.20
SWRS 82B	0.80 ~ 0.85	0.12 ~ 0.32	0.60 ~ 0.90	≦ 0.025	≦ 0.025	≦ 0.20
SWRS 87A	0.85 ~ 0.90	0.12 ~ 0.32	0.30 ~ 0.60	≦ 0.025	≦ 0.025	≦ 0.20
SWRS 87B	0.85 ~ 0.90	0.12 ~ 0.32	0.60 ~ 0.90	≦ 0.025	≦ 0.025	≦ 0.20
SWRS 92A	0.90 ~ 0.95	0.12 ~ 0.32	0.30 ~ 0.60	≦ 0.025	≦ 0.025	≦ 0.20
SWRS 92B	0.90 ~ 0.95	0.12 ~ 0.32	0.60 ~ 0.90	≦ 0.025	≦ 0.025	≦ 0.20

1-2) G3505 Mild wire rods (Date of revision: March 20, 2004)

Code	C	Mn	P	S
SWRM 6	≦ 0.08	≦ 0.60	≦ 0.040	≦ 0.040
SWRM 8	≦ 0.10	≦ 0.60	≦ 0.040	≦ 0.040
SWRM 10	0.08 ~ 0.13	0.30 ~ 0.60	≦ 0.040	≦ 0.040
SWRM 12	0.10 ~ 0.15	0.30 ~ 0.60	≦ 0.040	≦ 0.040
SWRM 15	0.13 ~ 0.18	0.30 ~ 0.60	≦ 0.040	≦ 0.040
SWRM 17	0.15 ~ 0.20	0.30 ~ 0.60	≦ 0.040	≦ 0.040
SWRM 20	0.18 ~ 0.23	0.30 ~ 0.60	≦ 0.040	≦ 0.040
SWRM 22	0.20 ~ 0.25	0.30 ~ 0.60	≦ 0.040	≦ 0.040

Remarks If specified as killed steel, letter K is added at the end of type code.

Ex: SWRM 10K

1-3) G3506 Hard wire rods (Date of revision: March 20, 2004)

Code	C	Si	Mn	P	S
SWRH 27	0.24 ~ 0.31	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.030
SWRH 32	0.29 ~ 0.36	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.030
SWRH 37	0.34 ~ 0.41	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.030
SWRH 42A	0.39 ~ 0.46	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.030
SWRH 42B	0.39 ~ 0.46	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.030
SWRH 47A	0.44 ~ 0.51	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.030
SWRH 47B	0.44 ~ 0.51	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.030
SWRH 52A	0.49 ~ 0.56	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.030
SWRH 52B	0.49 ~ 0.56	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.030
SWRH 57A	0.54 ~ 0.61	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.030
SWRH 57B	0.54 ~ 0.61	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.030
SWRH 62A	0.59 ~ 0.66	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.030
SWRH 62B	0.59 ~ 0.66	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.030
SWRH 67A	0.64 ~ 0.71	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.030
SWRH 67B	0.64 ~ 0.71	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.030
SWRH 72A	0.69 ~ 0.76	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.030
SWRH 72B	0.69 ~ 0.76	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.030
SWRH 77A	0.74 ~ 0.81	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.030
SWRH 77B	0.74 ~ 0.81	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.030
SWRH 82A	0.79 ~ 0.86	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.030
SWRH 82B	0.79 ~ 0.86	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.030

Remarks Content of C can be designated by reducing both upper and lower limits in the above table by 0.01% each through arrangements between the customer and manufacturer.

1-4) G3561 Oil-tempered wire for valve springs

(Date of revision: June 1, 1994)

Code of wire	C	Si	Mn	P	S	Cr	Cu	V
SWO-V	0.60 ~ 0.75	0.12 ~ 0.32	0.60 ~ 0.90	≤ 0.025	≤ 0.025	-	≤ 0.20	-
SWOCV-V	0.45 ~ 0.55	0.15 ~ 0.35	0.65 ~ 0.95	≤ 0.025	≤ 0.025	0.80 ~ 1.10	≤ 0.20	0.15 ~ 0.25
SWOSC-V	0.51 ~ 0.59	1.20 ~ 1.60	0.50 ~ 0.80	≤ 0.025	≤ 0.025	0.50 ~ 0.80	≤ 0.20	-

1-5) G3507-1 Cold heading quality carbon steel – Section 1: Wire rods

(Date of revision: October 20, 2010)

Code	C	Si	Mn	P	S	Al	Remarks
SWRCH 6R	≤ 0.08	–	≤ 0.60	≤ 0.040	≤ 0.040	–	Rimmed-equivalent steel
SWRCH 8R	≤ 0.10	–	≤ 0.60	≤ 0.040	≤ 0.040	–	
SWRCH10R	0.08 ~ 0.13	–	0.30 ~ 0.60	≤ 0.040	≤ 0.040	–	
SWRCH12R	0.10 ~ 0.15	–	0.30 ~ 0.60	≤ 0.040	≤ 0.040	–	
SWRCH15R	0.13 ~ 0.18	–	0.30 ~ 0.60	≤ 0.040	≤ 0.040	–	
SWRCH17R	0.15 ~ 0.20	–	0.30 ~ 0.60	≤ 0.040	≤ 0.040	–	
SWRCH 6A	≤ 0.08	≤ 0.10	≤ 0.60	≤ 0.030	≤ 0.035	≥ 0.02	
SWRCH 8A	≤ 0.10	≤ 0.10	≤ 0.60	≤ 0.030	≤ 0.035	≥ 0.02	
SWRCH10A	0.08 ~ 0.13	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.035	≥ 0.02	
SWRCH12A	0.10 ~ 0.15	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.035	≥ 0.02	
SWRCH15A	0.13 ~ 0.18	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.035	≥ 0.02	
SWRCH16A	0.13 ~ 0.18	≤ 0.10	0.60 ~ 0.90	≤ 0.030	≤ 0.035	≥ 0.02	
SWRCH18A	0.15 ~ 0.20	≤ 0.10	0.60 ~ 0.90	≤ 0.030	≤ 0.035	≥ 0.02	
SWRCH19A	0.15 ~ 0.20	≤ 0.10	0.70 ~ 1.00	≤ 0.030	≤ 0.035	≥ 0.02	
SWRCH20A	0.18 ~ 0.23	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.035	≥ 0.02	
SWRCH22A	0.18 ~ 0.23	≤ 0.10	0.70 ~ 1.00	≤ 0.030	≤ 0.035	≥ 0.02	
SWRCH25A	0.22 ~ 0.28	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.035	≥ 0.02	
SWRCH10K	0.08 ~ 0.13	0.10 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.035	–	Killed steel
SWRCH12K	0.10 ~ 0.15	0.10 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.035	–	
SWRCH15K	0.13 ~ 0.18	0.10 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.035	–	
SWRCH16K	0.13 ~ 0.18	0.10 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035	–	
SWRCH17K	0.15 ~ 0.20	0.10 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.035	–	
SWRCH18K	0.15 ~ 0.20	0.10 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035	–	
SWRCH20K	0.18 ~ 0.23	0.10 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.035	–	
SWRCH22K	0.18 ~ 0.23	0.10 ~ 0.35	0.70 ~ 1.00	≤ 0.030	≤ 0.035	–	
SWRCH24K	0.19 ~ 0.25	0.10 ~ 0.35	1.35 ~ 1.65	≤ 0.030	≤ 0.035	–	
SWRCH25K	0.22 ~ 0.28	0.10 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.035	–	
SWRCH27K	0.22 ~ 0.29	0.10 ~ 0.35	1.20 ~ 1.50	≤ 0.030	≤ 0.035	–	
SWRCH30K	0.27 ~ 0.33	0.10 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035	–	
SWRCH33K	0.30 ~ 0.36	0.10 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035	–	
SWRCH35K	0.32 ~ 0.38	0.10 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035	–	
SWRCH38K	0.35 ~ 0.41	0.10 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035	–	
SWRCH40K	0.37 ~ 0.43	0.10 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035	–	
SWRCH41K	0.36 ~ 0.44	0.10 ~ 0.35	1.35 ~ 1.65	≤ 0.030	≤ 0.035	–	
SWRCH43K	0.40 ~ 0.46	0.10 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035	–	
SWRCH45K	0.42 ~ 0.48	0.10 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035	–	
SWRCH48K	0.45 ~ 0.51	0.10 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035	–	
SWRCH50K	0.47 ~ 0.53	0.10 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035	–	

· Cu, Ni and Cr must not exceed 0.30%, 0.20%, and 0.20%, respectively.

1-6) G3508-1 Cold heading quality boron steel - Section 1: Wire rods

(Date of revision: October 20, 2010)

Code	C	Si	Mn	P	S	B
SWRCHB223	0.20 ~ 0.26	0.10 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.030	≥ 0.0008
SWRCHB237	0.34 ~ 0.40	0.10 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.030	≥ 0.0008
SWRCHB320	0.17 ~ 0.23	0.10 ~ 0.35	0.70 ~ 1.00	≤ 0.030	≤ 0.030	≥ 0.0008
SWRCHB323	0.20 ~ 0.26	0.10 ~ 0.35	0.70 ~ 1.00	≤ 0.030	≤ 0.030	≥ 0.0008
SWRCHB331	0.28 ~ 0.34	0.10 ~ 0.35	0.70 ~ 1.00	≤ 0.030	≤ 0.030	≥ 0.0008
SWRCHB334	0.31 ~ 0.37	0.10 ~ 0.35	0.70 ~ 1.00	≤ 0.030	≤ 0.030	≥ 0.0008
SWRCHB420	0.17 ~ 0.23	0.10 ~ 0.35	0.80 ~ 1.10	≤ 0.030	≤ 0.030	≥ 0.0008
SWRCHB526	0.23 ~ 0.29	0.10 ~ 0.35	0.90 ~ 1.20	≤ 0.030	≤ 0.030	≥ 0.0008
SWRCHB620	0.17 ~ 0.23	0.10 ~ 0.35	1.10 ~ 1.40	≤ 0.030	≤ 0.030	≥ 0.0008
SWRCHB623	0.20 ~ 0.26	0.10 ~ 0.35	1.10 ~ 1.40	≤ 0.030	≤ 0.030	≥ 0.0008
SWRCHB726	0.23 ~ 0.29	0.10 ~ 0.35	1.20 ~ 1.50	≤ 0.030	≤ 0.030	≥ 0.0008
SWRCHB734	0.31 ~ 0.37	0.10 ~ 0.35	1.20 ~ 1.50	≤ 0.030	≤ 0.030	≥ 0.0008

· Cu, Ni and Cr must not exceed 0.30%, 0.20%, and 0.20%, respectively.

Note) The lower limit of Si can be set less than 0.10% through arrangements between orderer and manufacturer.

Content of B can be set at 0.0005% or more through arrangements between orderer and manufacturer.

Distance from quenching end and its hardness

Code	Distance from quenching end and its hardness (HRC)															Heat treatment temperature °C		
	mm Hardness	1.5	3	5	7	9	11	13	15	20	25	30	35	40	45	50	Normalizing	Quenching
SWRCHB223	Upper limit	50	49	48	46	41	32	24	21	-	-	-	-	-	-	-	900	875
	Lower limit	42	40	22	20	-	-	-	-	-	-	-	-	-	-	-	-	-
SWRCHB237	Upper limit	58	58	57	55	52	46	38	32	26	24	23	21	-	-	-	870	845
	Lower limit	50	47	37	26	21	-	-	-	-	-	-	-	-	-	-	-	-
SWRCHB320	Upper limit	48	47	46	44	39	31	26	23	-	-	-	-	-	-	-	925	925
	Lower limit	40	39	33	21	-	-	-	-	-	-	-	-	-	-	-	-	-
SWRCHB323	Upper limit	50	49	48	46	42	33	27	23	-	-	-	-	-	-	-	900	870
	Lower limit	42	41	34	20	-	-	-	-	-	-	-	-	-	-	-	-	-
SWRCHB331	Upper limit	54	53	52	51	48	36	29	25	20	-	-	-	-	-	-	900	870
	Lower limit	46	45	39	23	-	-	-	-	-	-	-	-	-	-	-	-	-
SWRCHB334	Upper limit	57	56	55	54	51	47	39	31	24	22	-	-	-	-	-	870	845
	Lower limit	49	48	45	30	21	-	-	-	-	-	-	-	-	-	-	-	-
SWRCHB420	Upper limit	48	48	47	45	41	35	30	27	22	-	-	-	-	-	-	925	925
	Lower limit	40	38	32	22	-	-	-	-	-	-	-	-	-	-	-	-	-
SWRCHB526	Upper limit	52	52	51	50	48	45	41	33	23	-	-	-	-	-	-	900	870
	Lower limit	44	43	40	28	21	-	-	-	-	-	-	-	-	-	-	-	-
SWRCHB620	Upper limit	48	48	48	47	46	44	40	36	29	25	21	-	-	-	-	925	925
	Lower limit	40	39	37	30	22	-	-	-	-	-	-	-	-	-	-	-	-
SWRCHB623	Upper limit	50	50	49	48	48	46	44	41	30	22	-	-	-	-	-	900	870
	Lower limit	42	41	39	35	27	20	-	-	-	-	-	-	-	-	-	-	-
SWRCHB726	Upper limit	52	52	52	51	50	49	48	45	36	27	23	20	-	-	-	900	870
	Lower limit	44	43	42	40	34	27	23	20	-	-	-	-	-	-	-	-	-
SWRCHB734	Upper limit	57	56	56	55	55	54	53	51	43	33	28	25	22	20	-	870	845
	Lower limit	49	48	47	45	43	37	31	26	20	-	-	-	-	-	-	-	-

1-7) G3509-1 Cold heading quality alloy steel - Section 1: Wire rods

(Date of revision: February 22, 2010)

Unit %

Code of type	C	Si	Mn	P	S	Ni	Cr	Mo
SMn420RCH	0.17 ~ 0.23	0.15 ~ 0.35	1.20 ~ 1.50	0.030 or less	0.030 or less	0.25 or less	0.35 or less	–
SMn420HRCH	0.16 ~ 0.23	0.15 ~ 0.35	1.15 ~ 1.55	0.030 or less	0.030 or less	0.25 or less	0.35 or less	–
SMn433RCH	0.30 ~ 0.36	0.15 ~ 0.35	1.20 ~ 1.50	0.030 or less	0.030 or less	0.25 or less	0.35 or less	–
SMn433HRCH	0.29 ~ 0.36	0.15 ~ 0.35	1.15 ~ 1.55	0.030 or less	0.030 or less	0.25 or less	0.35 or less	–
SMn438RCH	0.35 ~ 0.41	0.15 ~ 0.35	1.35 ~ 1.65	0.030 or less	0.030 or less	0.25 or less	0.35 or less	–
SMn438HRCH	0.34 ~ 0.41	0.15 ~ 0.35	1.30 ~ 1.70	0.030 or less	0.030 or less	0.25 or less	0.35 or less	–
SMn443RCH	0.40 ~ 0.46	0.15 ~ 0.35	1.35 ~ 1.65	0.030 or less	0.030 or less	0.25 or less	0.35 or less	–
SMn443HRCH	0.39 ~ 0.46	0.15 ~ 0.35	1.30 ~ 1.70	0.030 or less	0.030 or less	0.25 or less	0.35 or less	–
SMnC420RCH	0.17 ~ 0.23	0.15 ~ 0.35	1.20 ~ 1.50	0.030 or less	0.030 or less	0.25 or less	0.35 ~ 0.70	–
SMnC433RCH	0.40 ~ 0.46	0.15 ~ 0.35	1.35 ~ 1.65	0.030 or less	0.030 or less	0.25 or less	0.35 ~ 0.70	–
SCr415RCH	0.13 ~ 0.18	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	–
SCr415HRCH	0.12 ~ 0.18	0.15 ~ 0.35	0.55 ~ 0.95	0.030 or less	0.030 or less	0.25 or less	0.85 ~ 1.25	–
SCr420RCH	0.18 ~ 0.23	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	–
SCr420HRCH	0.17 ~ 0.23	0.15 ~ 0.35	0.55 ~ 0.95	0.030 or less	0.030 or less	0.25 or less	0.85 ~ 1.25	–
SCr430RCH	0.28 ~ 0.33	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	–
SCr430HRCH	0.27 ~ 0.34	0.15 ~ 0.35	0.55 ~ 0.95	0.030 or less	0.030 or less	0.25 or less	0.85 ~ 1.25	–
SCr435RCH	0.33 ~ 0.38	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	–
SCr435HRCH	0.32 ~ 0.39	0.15 ~ 0.35	0.55 ~ 0.95	0.030 or less	0.030 or less	0.25 or less	0.85 ~ 1.25	–
SCr440RCH	0.38 ~ 0.43	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	–
SCr440HRCH	0.37 ~ 0.44	0.15 ~ 0.35	0.55 ~ 0.95	0.030 or less	0.030 or less	0.25 or less	0.85 ~ 1.25	–
SCM415RCH	0.13 ~ 0.18	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.15 ~ 0.25
SCM415HRCH	0.12 ~ 0.18	0.15 ~ 0.35	0.55 ~ 0.95	0.030 or less	0.030 or less	0.25 or less	0.85 ~ 1.25	0.15 ~ 0.30
SCM418RCH	0.16 ~ 0.21	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.15 ~ 0.25
SCM418HRCH	0.15 ~ 0.21	0.15 ~ 0.35	0.55 ~ 0.95	0.030 or less	0.030 or less	0.25 or less	0.85 ~ 1.25	0.15 ~ 0.30
SCM420RCH	0.18 ~ 0.23	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.15 ~ 0.25
SCM420HRCH	0.17 ~ 0.23	0.15 ~ 0.35	0.55 ~ 0.95	0.030 or less	0.030 or less	0.25 or less	0.85 ~ 1.25	0.15 ~ 0.30
SCM425RCH	0.23 ~ 0.28	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.15 ~ 0.30
SCM425HRCH	0.23 ~ 0.28	0.15 ~ 0.35	0.55 ~ 0.95	0.030 or less	0.030 or less	0.25 or less	0.85 ~ 1.25	0.15 ~ 0.30
SCM430RCH	0.28 ~ 0.33	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.15 ~ 0.30
SCM435RCH	0.33 ~ 0.38	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.15 ~ 0.30
SCM435HRCH	0.32 ~ 0.39	0.15 ~ 0.35	0.55 ~ 0.95	0.030 or less	0.030 or less	0.25 or less	0.85 ~ 1.25	0.15 ~ 0.35
SCM440RCH	0.38 ~ 0.43	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.15 ~ 0.30
SCM440HRCH	0.37 ~ 0.44	0.15 ~ 0.35	0.55 ~ 0.95	0.030 or less	0.030 or less	0.25 or less	0.85 ~ 1.25	0.15 ~ 0.35
SCM445RCH	0.43 ~ 0.48	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.15 ~ 0.30
SCM445HRCH	0.42 ~ 0.49	0.15 ~ 0.35	0.55 ~ 0.95	0.030 or less	0.030 or less	0.25 or less	0.85 ~ 1.25	0.15 ~ 0.35
SCM822RCH	0.20 ~ 0.25	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.35 ~ 0.45
SCM822HRCH	0.19 ~ 0.25	0.15 ~ 0.35	0.55 ~ 0.95	0.030 or less	0.030 or less	0.25 or less	0.85 ~ 1.25	0.35 ~ 0.45
SNC415RCH	0.12 ~ 0.18	0.15 ~ 0.35	0.35 ~ 0.65	0.030 or less	0.030 or less	2.00 ~ 2.50	0.20 ~ 0.50	–
SNC415HRCH	0.11 ~ 0.18	0.15 ~ 0.35	0.30 ~ 0.70	0.030 or less	0.030 or less	1.95 ~ 2.50	0.20 ~ 0.55	–
SNC631RCH	0.27 ~ 0.35	0.15 ~ 0.35	0.35 ~ 0.65	0.030 or less	0.030 or less	2.50 ~ 3.00	0.60 ~ 1.00	–
SNC631HRCH	0.26 ~ 0.35	0.15 ~ 0.35	0.30 ~ 0.70	0.030 or less	0.030 or less	2.45 ~ 3.00	0.55 ~ 1.05	–
SNC815CH	0.12 ~ 0.18	0.15 ~ 0.35	0.35 ~ 0.65	0.030 or less	0.030 or less	3.00 ~ 3.50	0.60 ~ 1.00	–
SNC815HRCH	0.11 ~ 0.18	0.15 ~ 0.35	0.30 ~ 0.70	0.030 or less	0.030 or less	2.95 ~ 3.50	0.55 ~ 1.05	–

Unit %

Code of type	C	Si	Mn	P	S	Ni	Cr	Mo
SNCM220RCH	0.17 ~ 0.23	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.40 ~ 0.70	0.40 ~ 0.60	0.15 ~ 0.25
SNCM220HRCH	0.17 ~ 0.23	0.15 ~ 0.35	0.60 ~ 0.95	0.030 or less	0.030 or less	0.35 ~ 0.75	0.35 ~ 0.65	0.15 ~ 0.30
SNCM240RCH	0.38 ~ 0.43	0.15 ~ 0.35	0.70 ~ 1.00	0.030 or less	0.030 or less	0.40 ~ 0.70	0.40 ~ 0.60	0.15 ~ 0.30
SNCM420RCH	0.17 ~ 0.23	0.15 ~ 0.35	0.40 ~ 0.70	0.030 or less	0.030 or less	1.60 ~ 2.00	0.40 ~ 0.60	0.15 ~ 0.30
SNCM420HRCH	0.17 ~ 0.23	0.15 ~ 0.35	0.40 ~ 0.70	0.030 or less	0.030 or less	1.55 ~ 2.00	0.35 ~ 0.65	0.15 ~ 0.30
SNCM439RCH	0.36 ~ 0.43	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	1.60 ~ 2.00	0.60 ~ 1.00	0.15 ~ 0.30
SNCM447RCH	0.44 ~ 0.50	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	1.60 ~ 2.00	0.60 ~ 1.00	0.15 ~ 0.30
SNCM616RCH	0.13 ~ 0.20	0.15 ~ 0.35	0.80 ~ 1.20	0.030 or less	0.030 or less	2.80 ~ 3.20	1.40 ~ 1.80	0.40 ~ 0.60

Remarks

- Cu must not exceed 0.30% as impurities.
- Al can be added for crystal grain refining through arrangements between the parties involved in the delivery.
- Elements not specified in this table must not be added intentionally for any purpose other than finishing molten steel, unless otherwise agreed upon between the parties involved in the delivery.
- The lower limit of Si can be set at a value less than 0.15%. Decide between orderer and manufacturer.

Distance from quenching end and its hardness

Code	Distance from quenching end and its hardness (HRC)															Heat treatment temperature °C		
	Hardness mm	1.5	3	5	7	9	11	13	15	20	25	30	35	40	45	50	Normalizing	Quenching
SMn420HRCH	Upper limit	48	46	42	36	30	27	25	24	21	-	-	-	-	-	-	925	925
	Lower limit	40	36	21	-	-	-	-	-	-	-	-	-	-	-	-		
SMn433HRCH	Upper limit	57	56	53	49	42	36	33	30	27	25	24	23	22	21	21	900	870
	Lower limit	50	46	34	26	23	20	-	-	-	-	-	-	-	-	-		
SMn438HRCH	Upper limit	59	59	57	54	51	46	41	39	35	33	31	30	29	28	27	870	845
	Lower limit	52	49	43	34	28	24	22	21	-	-	-	-	-	-	-		
SMn443HRCH	Upper limit	62	61	60	59	57	54	50	45	37	34	32	31	30	29	28	870	845
	Lower limit	55	53	49	39	33	29	27	26	23	22	20	-	-	-	-		
SCr415HRCH	Upper limit	46	45	41	35	31	28	27	26	23	20	-	-	-	-	-	925	925
	Lower limit	39	34	26	21	-	-	-	-	-	-	-	-	-	-	-		
SCr420HRCH	Upper limit	48	48	46	40	36	34	32	31	29	27	26	24	23	23	22	925	925
	Lower limit	40	37	32	28	25	22	21	-	-	-	-	-	-	-	-		
SCr430HRCH	Upper limit	56	55	53	51	48	45	42	39	35	33	31	30	28	26	25	900	870
	Lower limit	49	46	42	37	33	30	28	26	21	-	-	-	-	-	-		
SCr435HRCH	Upper limit	58	57	56	55	53	51	47	44	39	37	35	34	33	32	31	870	845
	Lower limit	51	49	46	42	37	32	29	27	23	21	-	-	-	-	-		
SCr440HRCH	Upper limit	60	60	59	58	57	55	54	52	46	41	39	37	37	36	35	870	845
	Lower limit	53	52	50	48	45	41	37	34	29	26	24	22	-	-	-		
SCM415HRCH	Upper limit	46	45	42	38	34	31	29	28	26	25	24	24	23	23	22	925	925
	Lower limit	39	36	29	24	21	20	-	-	-	-	-	-	-	-	-		
SCM418HRCH	Upper limit	47	47	45	41	38	35	33	32	30	28	27	27	26	26	25	925	925
	Lower limit	39	37	31	27	24	22	21	20	-	-	-	-	-	-	-		
SCM420HRCH	Upper limit	48	48	47	44	42	39	37	35	33	31	30	30	29	29	28	925	925
	Lower limit	40	39	35	31	28	25	24	23	20	20	-	-	-	-	-		
SCM425HRCH	Upper limit	52	52	51	50	48	46	43	41	37	35	33	32	31	31	31	900	870
	Lower limit	44	43	40	37	34	32	29	27	23	21	20	-	-	-	-		
SCM435HRCH	Upper limit	58	58	57	56	55	54	53	51	48	45	43	41	39	38	37	870	845
	Lower limit	51	50	49	47	45	42	39	37	32	30	28	27	27	26	26		
SCM440HRCH	Upper limit	60	60	60	59	58	58	57	56	55	53	51	49	47	46	44	870	845
	Lower limit	53	53	52	51	50	48	46	43	38	35	33	33	32	31	30		
SCM445HRCH	Upper limit	63	63	62	62	61	61	61	60	59	58	57	56	55	55	54	870	845
	Lower limit	56	55	55	54	53	52	52	51	47	43	39	37	35	35	34		
SCM822HRCH	Upper limit	50	50	50	49	48	46	43	41	39	38	37	36	36	36	36	925	925
	Lower limit	43	42	41	39	36	32	29	27	24	24	23	22	22	21	21		
SNC415HRCH	Upper limit	45	44	39	35	31	28	26	24	21	-	-	-	-	-	-	925	925
	Lower limit	37	32	24	-	-	-	-	-	-	-	-	-	-	-	-		
SNC631HRCH	Upper limit	57	57	56	56	55	55	55	54	53	51	49	47	45	44	43	900	870
	Lower limit	49	48	47	46	45	43	41	39	35	31	29	28	27	26	26		
SNC815HRCH	Upper limit	46	46	46	46	45	44	43	41	38	35	34	34	33	33	32	925	845
	Lower limit	38	37	36	34	31	29	27	26	24	22	22	22	21	21	21		
SNM220HRCH	Upper limit	48	47	44	40	35	32	30	29	26	24	23	23	23	22	22	925	925
	Lower limit	41	37	30	25	22	20	-	-	-	-	-	-	-	-	-		
SNM420HRCH	Upper limit	48	47	46	42	39	36	34	32	29	26	25	24	24	24	24	925	925
	Lower limit	41	38	34	30	27	25	23	22	-	-	-	-	-	-	-		

② JIS bars

2-1) G3101 Rolled steel for general structures

(Date of revision: May 20, 2010)

Table of composition

Code (SI)	C	Mn	P	S
SS330	–	–	≤ 0.050	≤ 0.050
SS400	–	–	≤ 0.050	≤ 0.050
SS490	–	–	≤ 0.050	≤ 0.050
SS540	≤ 0.30	≤ 1.60	≤ 0.040	≤ 0.040

Remarks Alloy elements other than those specified in this table can be added as necessary.

Mechanical properties

Code (SI)	Tensile test						Bending test			
	Yield point or proof stress N/mm ²			Tensile strength N/mm ²	Elongation			Bending angle	Inner radius	Test piece
	Diameter, side mm ²				Size mm	Test piece	%			
	16 or less	16 ~ 40	40 ~ 100							
SS330	≥ 205	≥ 195	≥ 175	330 ~ 430	25 or less More than 25	No. 2 No. 14A	≥ 25 ≥ 28	180°	0.5 times the diameter	No. 2
SS400	≥ 245	≥ 235	≥ 215	400 ~ 510	25 or less More than 25	No. 2 No. 14A	≥ 20 ≥ 22	180°	1.5 times the diameter	No. 2
SS490	≥ 285	≥ 275	≥ 255	490 ~ 610	25 or less More than 25	No. 2 No. 14A	≥ 18 ≥ 20	180°	2.0 times the diameter	No. 2
SS540	≥ 400	≥ 390	–	≥ 540	25 or less More than 25 to 40	No. 2 No. 14A	≥ 13 ≥ 16	180°	2.0 times the diameter	No. 2

Remarks In cases where diameter or side of steel products SS330, SS400, and SS490, exceeds 100 mm, the yield point or proof stress shall be 165 N/mm² or more, 205 N/mm², and 245 N/mm² or more, respectively.

2-2) G3105 Round steel for chains

(Date of revision: December 20, 2004)

Table of composition

Code (SI)	C	Si	Mn	P	S
SBC300	≤ 0.13	≤ 0.04	≤ 0.50	≤ 0.040	≤ 0.040
SBC490	≤ 0.25	0.15 ~ 0.40	1.00 ~ 1.50	≤ 0.040	≤ 0.040
SBC690	≤ 0.36	0.15 ~ 0.55	1.00 ~ 1.90	≤ 0.040	≤ 0.040

Remarks For SBC690, alloy elements, such as Ni, Cr, Mo, and V, in addition to those specified in the chemical composition in the table, can be added as necessary.

Mechanical properties

Code (SI)	Code(SI)				Bending test			Impact test			Condition of specimen
	Tensile strength N/mm ²	Test piece	Elongation %	Reduction of area %	Bending angle	Inner radius	Test piece	Testing temperature	Absorbed energy J	Test piece	
SBC300	≥ 300	No. 14A No. 2	≥ 30 ≥ 25	– –	180°	0.5 times the diameter	No. 2	–	–	–	As rolled
SBC490	≥ 490	No. 14A No. 2	≥ 22 ≥ 18	– –	180°	1.5 times the diameter	No. 2	–	–	–	As rolled or normalized
SBC690	≥ 690	No. 14A No. 2	≥ 17 ≥ 12	≥ 40	–	–	–	0°C	≥ 60	V notch rolling direction	Heat treatments such as quenching and tempering

Remarks Charpy absorbed energy shall be the average of three test pieces.

2-3) G3108 General steel products for cold finished steel bars

(Date of revision: October 20, 2004)

Table of composition

Code	C	Mn	P	S
SGDA	–	–	≤ 0.045	≤ 0.045
SGDB	–	–		
SGD1	≤ 0.10	0.30 ~ 0.60	≤ 0.045	≤ 0.045
SGD2	0.10 ~ 0.15	0.30 ~ 0.60	≤ 0.045	≤ 0.045
SGD3	0.15 ~ 0.20	0.30 ~ 0.60	≤ 0.045	≤ 0.045
SGD4	0.20 ~ 0.25	0.30 ~ 0.60	≤ 0.045	≤ 0.045

Mn of SGD1 to 4 can be set at 0.60 to 0.90% through arrangements between the parties involved in the delivery.

In this case, M is added to the end of type code.

Mechanical properties

Code	Tensile testing						
	Yield point N/mm ²			Tensile strength N/mm ²	Elongation		
	Diameter, side mm				Dimensions mm	Test piece	%
	16 or less	16 ~ 40	More than 40				
SGDA	–	–	–	290 ~ 390	25 or less More than 25	No. 2 No. 14A	≥ 26 ≥ 29
SGDB	≥ 245	≥ 235	≥ 215	400 ~ 510	25 or less More than 25	No. 2 No. 14A	≥ 20 ≥ 22

Remarks 1. Tensile strength in cases where the diameter of Type B exceeds 30 mm can be set at 370 N/mm² or more through arrangements.

2. Yield point, in cases the where diameter of Type B exceeds 100 mm, shall be 205 N/mm² or more.

2-4) G3138 Rolled bars for building structures

(Date of revision: March 20, 2005)

Table of composition

Code of type	Diameter or opposite side distance	C	Si	Mn	P	S
SNR400A	At least 6 mm, but no more than 100 mm	≤ 0.24	–	–	≤ 0.050	≤ 0.050
SNR400B	At least 6 mm, but no more than 50 mm	≤ 0.20	≤ 0.35	0.60 ~ 1.40	≤ 0.030	≤ 0.030
	More than 50 mm, but no more than 100 mm	≤ 0.22				
SNR490B	At least 6 mm, but no more than 50 mm	≤ 0.18	≤ 0.55	1.60 or less	≤ 0.030	≤ 0.030
	More than 50 mm, but no more than 100 mm	≤ 0.20				

Remarks Alloy elements other than those specified in the table can be added as necessary.

Mechanical properties

Code of type	Yield point or bearing force N/mm ²			Tensile strength N/mm ²	Yield ratio %		Elongation %	
	Diameter or side mm				Diameter or side mm		No. 2 test piece	No. 14A test piece
	At least 6, but less than 12	At least 12, but no more than 40	More than 40, but no more than 100		At least 6, but less than 12	At least 12, but no more than 100	At least 6, but no more than 25	More than 25, but no more than 100
	SNR400A	≥ 235	≥ 235		≥ 215	≥ 400 ≤ 510	–	–
SNR400B	≥ 235	≥ 235 ≤ 355	≥ 215 ≤ 335	≥ 400 ≤ 510	–	≤ 80	≥ 21	≥ 22
SNR490B	≥ 325	≥ 325 ≤ 445	≥ 295 ≤ 415	≥ 490 ≤ 610	–	≤ 80	≥ 20	≥ 21

Remarks A test can be conducted using a No. 4 test piece instead of a No. 14A test piece through arrangements between the parties involved in the delivery.

In this case, elongation shall be in accordance with the arrangements between the parties involved in the delivery.

③ Table of composition for carbon steel and alloy steel for JIS machine structures

3-1) G4051 Carbon steel products for machine structures

(Date of revision: November 20, 2009)

Code	C	Si	Mn	P	S
S10C	0.08 ~ 0.13	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.035
S12C	0.10 ~ 0.15	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.035
S15C	0.13 ~ 0.18	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.035
S17C	0.15 ~ 0.20	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.035
S20C	0.18 ~ 0.23	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.035
S22C	0.20 ~ 0.25	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.035
S25C	0.22 ~ 0.28	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.030	≤ 0.035
S28C	0.25 ~ 0.31	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035
S30C	0.27 ~ 0.33	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035
S33C	0.30 ~ 0.36	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035
S35C	0.32 ~ 0.38	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035
S38C	0.35 ~ 0.41	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035
S40C	0.37 ~ 0.43	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035
S43C	0.40 ~ 0.46	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035
S45C	0.42 ~ 0.48	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035
S48C	0.45 ~ 0.51	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035
S50C	0.47 ~ 0.53	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035
S53C	0.50 ~ 0.56	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035
S55C	0.52 ~ 0.58	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035
S58C	0.55 ~ 0.61	0.15 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.035
S09CK	0.07 ~ 0.12	0.10 ~ 0.35	0.30 ~ 0.60	≤ 0.025	≤ 0.025
S15CK	0.13 ~ 0.18	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.025	≤ 0.025
S20CK	0.18 ~ 0.23	0.15 ~ 0.35	0.30 ~ 0.60	≤ 0.025	≤ 0.025

Remarks S09CK, S15CK, and S20CK must not contain impurities that exceed 0.25% in the case of Cu, 0.20% in the case of Ni, 0.20% in the case of Cr, and 0.30% in the case of Ni + Cr. For other codes, impurities must not exceed 0.30% in the case of Cu, 0.20% in the case of Ni, 0.20% in the case of Cr, and 0.35% in the case of Ni + Cr.

3-2) G4053 Alloy steel products for machine structures

(Date of revision: November 20, 2008)

Unit %

Code of type	C	Si	Mn	P	S	Ni	Cr	Mo
SMn420	0.17 ~ 0.23	0.15 ~ 0.35	1.20 ~ 1.50	0.030 or less	0.030 or less	0.25 or less	0.35 or less	—
SMn433	0.30 ~ 0.36	0.15 ~ 0.35	1.20 ~ 1.50	0.030 or less	0.030 or less	0.25 or less	0.35 or less	—
SMn438	0.35 ~ 0.41	0.15 ~ 0.35	1.35 ~ 1.65	0.030 or less	0.030 or less	0.25 or less	0.35 or less	—
SMn443	0.40 ~ 0.46	0.15 ~ 0.35	1.35 ~ 1.65	0.030 or less	0.030 or less	0.25 or less	0.35 or less	—
SMnC420	0.17 ~ 0.23	0.15 ~ 0.35	1.20 ~ 1.50	0.030 or less	0.030 or less	0.25 or less	0.35 ~ 0.70	—
SMnC443	0.40 ~ 0.46	0.15 ~ 0.35	1.35 ~ 1.65	0.030 or less	0.030 or less	0.25 or less	0.35 ~ 0.70	—
SCr415	0.13 ~ 0.18	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	—
SCr420	0.18 ~ 0.23	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	—
SCr430	0.28 ~ 0.33	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	—
SCr435	0.33 ~ 0.38	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	—
SCr440	0.38 ~ 0.43	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	—
SCr445	0.43 ~ 0.48	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	—
SCM415	0.13 ~ 0.18	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.15 ~ 0.25
SCM418	0.16 ~ 0.21	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.15 ~ 0.25

Unit %

Code of type	C	Si	Mn	P	S	Ni	Cr	Mo
SCM420	0.18 ~ 0.23	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.15 ~ 0.25
SCM421	0.17 ~ 0.23	0.15 ~ 0.35	0.70 ~ 1.00	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.15 ~ 0.25
SCM425	0.23 ~ 0.28	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.15 ~ 0.30
SCM430	0.28 ~ 0.33	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.15 ~ 0.30
SCM432	0.27 ~ 0.37	0.15 ~ 0.35	0.30 ~ 0.60	0.030 or less	0.030 or less	0.25 or less	1.00 ~ 1.50	0.15 ~ 0.30
SCM435	0.33 ~ 0.38	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.15 ~ 0.30
SCM440	0.38 ~ 0.43	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.15 ~ 0.30
SCM445	0.43 ~ 0.48	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.15 ~ 0.30
SCM822	0.20 ~ 0.25	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.25 or less	0.90 ~ 1.20	0.35 ~ 0.45
SNC236	0.32 ~ 0.40	0.15 ~ 0.35	0.50 ~ 0.80	0.030 or less	0.030 or less	1.00 ~ 1.50	0.50 ~ 0.90	–
SNC415	0.12 ~ 0.18	0.15 ~ 0.35	0.35 ~ 0.65	0.030 or less	0.030 or less	2.00 ~ 2.50	0.20 ~ 0.50	–
SNC631	0.27 ~ 0.35	0.15 ~ 0.35	0.35 ~ 0.65	0.030 or less	0.030 or less	2.50 ~ 3.00	0.60 ~ 1.00	–
SNC815	0.12 ~ 0.18	0.15 ~ 0.35	0.35 ~ 0.65	0.030 or less	0.030 or less	3.00 ~ 3.50	0.60 ~ 1.00	–
SNC836	0.32 ~ 0.40	0.15 ~ 0.35	0.35 ~ 0.65	0.030 or less	0.030 or less	3.00 ~ 3.50	0.60 ~ 1.00	–
SNCM220	0.17 ~ 0.23	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	0.40 ~ 0.70	0.40 ~ 0.60	0.15 ~ 0.25
SNCM240	0.38 ~ 0.43	0.15 ~ 0.35	0.70 ~ 1.00	0.030 or less	0.030 or less	0.40 ~ 0.70	0.40 ~ 0.60	0.15 ~ 0.30
SNCM415	0.12 ~ 0.18	0.15 ~ 0.35	0.40 ~ 0.70	0.030 or less	0.030 or less	1.60 ~ 2.00	0.40 ~ 0.60	0.15 ~ 0.30
SNCM420	0.17 ~ 0.23	0.15 ~ 0.35	0.40 ~ 0.70	0.030 or less	0.030 or less	1.60 ~ 2.00	0.40 ~ 0.60	0.15 ~ 0.30
SNCM431	0.27 ~ 0.35	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	1.60 ~ 2.00	0.60 ~ 1.00	0.15 ~ 0.30
SNCM439	0.36 ~ 0.43	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	1.60 ~ 2.00	0.60 ~ 1.00	0.15 ~ 0.30
SNCM447	0.44 ~ 0.50	0.15 ~ 0.35	0.60 ~ 0.90	0.030 or less	0.030 or less	1.60 ~ 2.00	0.60 ~ 1.00	0.15 ~ 0.30
SNCM616	0.13 ~ 0.20	0.15 ~ 0.35	0.80 ~ 1.20	0.030 or less	0.030 or less	2.80 ~ 3.20	1.40 ~ 1.80	0.40 ~ 0.60
SNCM625	0.20 ~ 0.30	0.15 ~ 0.35	0.35 ~ 0.60	0.030 or less	0.030 or less	3.00 ~ 3.50	1.00 ~ 1.50	0.15 ~ 0.30
SNCM630	0.25 ~ 0.35	0.15 ~ 0.35	0.35 ~ 0.60	0.030 or less	0.030 or less	2.50 ~ 3.50	2.50 ~ 3.50	0.50 ~ 0.70
SNCM815	0.12 ~ 0.18	0.15 ~ 0.35	0.30 ~ 0.60	0.030 or less	0.030 or less	4.00 ~ 4.50	0.70 ~ 1.00	0.15 ~ 0.30
SACM645	0.40 ~ 0.50	0.15 ~ 0.50	0.60 or less	0.030 or less	0.030 or less	0.25 or less	1.30 ~ 1.70	0.15 ~ 0.30

Note) All steel products in this table must not contain more than 0.30% of Cu in impurities.

The lower limit of Mo for SNCM630 can be set at 0.30% through arrangements between the parties involved in the delivery.

A1 for SACM645 shall be from 0.70% to 1.20%.

3-3) G4107 Alloy steel bolt products for high temperatures

(Date of revision: May 20, 2010)

Type	Code	Chemical composition %							
		C	Si	Mn	P	S	Cr	Mo	V
Type 1	SNB 5	≥ 0.10	≤ 1.00	≤ 1.00	≤ 0.040	≤ 0.030	4.00 ~ 6.00	0.40 ~ 0.65	–
Type 2	SNB 7	0.38 ~ 0.48	0.20 ~ 0.35	0.75 ~ 1.00	≤ 0.040	≤ 0.040	0.80 ~ 1.10	0.15 ~ 0.25	–
Type 3	SNB16	0.36 ~ 0.44	0.20 ~ 0.35	0.45 ~ 0.70	≤ 0.040	≤ 0.040	0.80 ~ 1.15	0.50 ~ 0.65	0.25 ~ 0.35

Remarks The upper limit of carbon content in Type 2 can be set at 0.50% when the bolt products have a diameter of 90 mm or more.

3-4) G4108 Bars for special-use alloy steel bolts

(Date of revision: May 20, 2010)

Type	Code	Chemical composition %								
		C	Si	Mn	P	S	Ni	Cr	Mo	V
No. 1 to 5 of Type 1	SNB 21-1 ~ 5	0.36 ~	0.20 ~	0.45 ~	≤ 0.025	≤ 0.025	-	0.80 ~	0.50 ~	0.25 ~
		0.44	0.35	0.70				1.15	0.65	0.35
No. 1 to 5 of Type 2	SNB 22-1 ~ 5	0.39 ~	0.20 ~	0.65 ~	≤ 0.025	≤ 0.025	-	0.75 ~	0.15 ~	-
		0.46	0.35	1.10				1.20	0.25	
No. 1 to 5 of Type 3	SNB 23-1 ~ 5	0.37 ~	0.20 ~	0.60 ~	≤ 0.025	≤ 0.025	1.55 ~	0.65 ~	0.20 ~	-
		0.44	0.35	0.95			2.00	0.95	0.30	
No. 1 to 5 of Type 4	SNB 24-1 ~ 5	0.37 ~	0.20 ~	0.70 ~	≤ 0.025	≤ 0.025	1.65 ~	0.70 ~	0.30 ~	-
		0.44	0.35	0.90			2.00	0.95	0.40	

3-5) G4052 Structural steel products assuring hardenability (H-section steel)

(Date of revision: November 20, 2008)

Code	C	Si	Mn	P,S	Ni	Cr	Mo
SMn 420H	0.16 ~ 0.23	0.15 ~ 0.35	1.15 ~ 1.55	≤ 0.030	-	-	-
SMn 433H	0.29 ~ 0.36	0.15 ~ 0.35	1.15 ~ 1.55	≤ 0.030	-	-	-
SMn 438H	0.34 ~ 0.41	0.15 ~ 0.35	1.30 ~ 1.70	≤ 0.030	-	-	-
SMn 443H	0.39 ~ 0.46	0.15 ~ 0.35	1.30 ~ 1.70	≤ 0.030	-	-	-
SMnC420H	0.16 ~ 0.23	0.15 ~ 0.35	1.15 ~ 1.55	≤ 0.030	-	0.35 ~ 0.70	-
SMnC443H	0.39 ~ 0.46	0.15 ~ 0.35	1.30 ~ 1.70	≤ 0.030	-	0.35 ~ 0.70	-
SCr 415H	0.12 ~ 0.18	0.15 ~ 0.35	0.55 ~ 0.95	≤ 0.030	-	0.85 ~ 1.25	-
SCr 420H	0.17 ~ 0.23	0.15 ~ 0.35	0.55 ~ 0.95	≤ 0.030	-	0.85 ~ 1.25	-
SCr 430H	0.27 ~ 0.34	0.15 ~ 0.35	0.55 ~ 0.95	≤ 0.030	-	0.85 ~ 1.25	-
SCr 435H	0.32 ~ 0.39	0.15 ~ 0.35	0.55 ~ 0.95	≤ 0.030	-	0.85 ~ 1.25	-
SCr 440H	0.37 ~ 0.44	0.15 ~ 0.35	0.55 ~ 0.95	≤ 0.030	-	0.85 ~ 1.25	-
SCM 415H	0.12 ~ 0.18	0.15 ~ 0.35	0.55 ~ 0.95	≤ 0.030	-	0.85 ~ 1.25	0.15 ~ 0.30
SCM 418H	0.15 ~ 0.21	0.15 ~ 0.35	0.55 ~ 0.95	≤ 0.030	-	0.85 ~ 1.25	0.15 ~ 0.30
SCM 420H	0.17 ~ 0.23	0.15 ~ 0.35	0.55 ~ 0.95	≤ 0.030	-	0.85 ~ 1.25	0.15 ~ 0.30
SCM 425H	0.23 ~ 0.28	0.15 ~ 0.35	0.55 ~ 0.95	≤ 0.030	-	0.85 ~ 1.25	0.15 ~ 0.30
SCM 435H	0.32 ~ 0.39	0.15 ~ 0.35	0.55 ~ 0.95	≤ 0.030	-	0.85 ~ 1.25	0.15 ~ 0.35
SCM 440H	0.37 ~ 0.44	0.15 ~ 0.35	0.55 ~ 0.95	≤ 0.030	-	0.85 ~ 1.25	0.15 ~ 0.35
SCM 445H	0.42 ~ 0.49	0.15 ~ 0.35	0.55 ~ 0.95	≤ 0.030	-	0.85 ~ 1.25	0.15 ~ 0.35
SCM 822H	0.19 ~ 0.25	0.15 ~ 0.35	0.55 ~ 0.95	≤ 0.030	-	0.85 ~ 1.25	0.35 ~ 0.45
SNC 415H	0.11 ~ 0.18	0.15 ~ 0.35	0.30 ~ 0.70	≤ 0.030	1.95 ~ 2.50	0.20 ~ 0.55	-
SNC 631H	0.26 ~ 0.35	0.15 ~ 0.35	0.30 ~ 0.70	≤ 0.030	2.45 ~ 3.00	0.55 ~ 1.05	-
SNC 815H	0.11 ~ 0.18	0.15 ~ 0.35	0.30 ~ 0.70	≤ 0.030	2.95 ~ 3.50	0.55 ~ 1.05	-
SNCM220H	0.17 ~ 0.23	0.15 ~ 0.35	0.60 ~ 0.95	≤ 0.030	0.35 ~ 0.75	0.35 ~ 0.65	0.15 ~ 0.30
SNCM420H	0.17 ~ 0.23	0.15 ~ 0.35	0.40 ~ 0.70	≤ 0.030	1.55 ~ 2.00	0.35 ~ 0.65	0.15 ~ 0.30

Remarks 1. For all types, Cu must not exceed 0.30% in impurities.

2. Steel types other than nickel chrome steel products and nickel chrome molybdenum steel products must not contain more than 0.25% of Ni as impurities.

3. Manganese steel must not contain more than 0.35% of Cr.

Distance from quenching end and its hardness

Code	Distance from quenching end and its hardness (HRC)															Heat treatment temperature °C		
	Hardness mm	1.5	3	5	7	9	11	13	15	20	25	30	35	40	45	50	Normalizing	Quenching
SMn 420H	Upper limit	48	46	42	36	30	27	25	24	21	-	-	-	-	-	-	925	925
	Lower limit	40	36	21	-	-	-	-	-	-	-	-	-	-	-	-		
SMn 433H	Upper limit	57	56	53	49	42	36	33	30	27	25	24	23	22	21	21	900	870
	Lower limit	50	46	34	26	23	20	-	-	-	-	-	-	-	-	-		
SMn 438H	Upper limit	59	59	57	54	51	46	41	39	35	33	31	30	29	28	27	870	845
	Lower limit	52	49	43	34	28	24	22	21	-	-	-	-	-	-	-		
SMn 443H	Upper limit	62	61	60	59	57	54	50	45	37	34	32	31	30	29	28	870	845
	Lower limit	55	53	49	39	33	29	27	26	23	22	20	-	-	-	-		
SMnC 420H	Upper limit	48	48	45	41	37	33	31	29	26	24	23	-	-	-	-	925	925
	Lower limit	40	39	33	27	23	20	-	-	-	-	-	-	-	-	-		
SMnC 443H	Upper limit	62	62	61	60	59	58	56	55	50	46	42	41	40	39	38	870	845
	Lower limit	55	54	53	51	48	44	39	35	29	26	25	24	23	22	21		
SCr 415H	Upper limit	46	45	41	35	31	28	27	26	23	20	-	-	-	-	-	925	925
	Lower limit	39	34	26	21	-	-	-	-	-	-	-	-	-	-	-		
SCr 420H	Upper limit	48	48	46	40	36	34	32	31	29	27	26	24	23	23	22	925	925
	Lower limit	40	37	32	28	25	22	21	-	-	-	-	-	-	-	-		
SCr 430H	Upper limit	56	55	53	51	48	45	42	39	35	33	31	30	28	26	25	900	870
	Lower limit	49	46	42	37	33	30	28	26	21	-	-	-	-	-	-		
SCr 435H	Upper limit	58	57	56	55	53	51	47	44	39	37	35	34	33	32	31	870	845
	Lower limit	51	49	46	42	37	32	29	27	23	21	-	-	-	-	-		
SCr 440H	Upper limit	60	60	59	58	57	55	54	52	46	41	39	37	37	36	35	870	845
	Lower limit	53	52	50	48	45	41	37	34	29	26	24	22	-	-	-		
SCM 415H	Upper limit	46	45	42	38	34	31	29	28	26	25	24	24	23	23	22	925	925
	Lower limit	39	36	29	24	21	20	-	-	-	-	-	-	-	-	-		
SCM 418H	Upper limit	47	47	45	41	38	35	33	32	30	28	27	27	26	26	25	925	925
	Lower limit	39	37	31	27	24	22	21	20	-	-	-	-	-	-	-		
SCM 420H	Upper limit	48	48	47	44	42	39	37	35	33	31	30	30	29	29	28	925	925
	Lower limit	40	39	35	31	28	25	24	23	20	20	-	-	-	-	-		
SCM 425H	Upper limit	52	52	51	50	48	46	43	41	37	35	33	32	31	31	31	900	870
	Lower limit	44	43	40	37	34	32	29	27	23	21	20	-	-	-	-		
SCM 435H	Upper limit	58	58	57	56	55	54	53	51	48	45	43	41	39	38	37	870	845
	Lower limit	51	50	49	47	45	42	39	37	32	30	28	27	27	26	26		
SCM 440H	Upper limit	60	60	60	59	58	57	56	55	53	51	49	47	46	44	44	870	845
	Lower limit	53	53	52	51	50	48	46	43	38	35	33	32	31	30	30		
SCM 445H	Upper limit	63	63	62	62	61	61	60	59	58	57	56	55	55	54	54	870	845
	Lower limit	56	55	55	54	53	52	52	51	47	43	39	37	35	35	34		
SCM 822H	Upper limit	50	50	50	49	48	46	43	41	39	38	37	36	36	36	36	925	925
	Lower limit	43	42	41	39	36	32	29	27	24	24	23	22	22	21	21		
SNC 415H	Upper limit	45	44	39	35	31	28	26	24	21	-	-	-	-	-	-	925	925
	Lower limit	37	32	24	-	-	-	-	-	-	-	-	-	-	-	-		
SNC 631H	Upper limit	57	57	56	55	55	55	54	53	51	49	47	45	44	43	43	900	870
	Lower limit	49	48	47	46	45	43	41	39	35	31	29	28	27	26	26		
SNC 815H	Upper limit	46	46	46	46	45	44	43	41	38	35	34	34	33	33	32	925	845
	Lower limit	38	37	36	34	31	29	27	26	24	22	22	22	21	21	21		
SNM220H	Upper limit	48	47	44	40	35	32	30	29	26	24	23	23	23	22	22	925	925
	Lower limit	41	37	30	25	22	20	-	-	-	-	-	-	-	-	-		
SNM420H	Upper limit	48	47	46	42	39	36	34	32	29	26	25	24	24	24	24	925	925
	Lower limit	41	38	34	30	27	25	23	22	-	-	-	-	-	-	-		

④ Material properties of carbon steel and alloy steel for JIS machine structures

(Reference) Standard mechanical properties and mass effect of carbon steel for machine structures

Code	Heat treatment °C				Heat treatment	Mechanical properties						
	Normalizing (N)	Annealing (A)	Quenching (H)	Tempering (H)		Yield point N/mm ² (or more)	Tensile strength N/mm ² (or more)	Elongation % (or more)	Drawing % (or more)	Charpy impact value J/cm ² (or more)	Hardness HB	Effective diameter mm
S10C	900 ~ 950 Air cooling	Approx. 900 Furnace cooling	—	—	N	205	310	33	—	—	109 ~ 156	—
					A	—	—	—	—	—	109 ~ 149	—
S09CK	900 ~ 950 Air cooling	Approx. 900 Furnace cooling	Primary 880 to 920 Oil (water) cooling Secondary 750 to 800 Water cooling	150 ~ 200 Air cooling	A	—	—	—	—	—	107 ~ 149	—
					H	245	390	23	55	137	121 ~ 179	—
S12C S15C	880 ~ 930 Air cooling	Approx. 880 Furnace cooling	—	—	N	235	270	30	—	—	111 ~ 167	—
					A	—	—	—	—	—	111 ~ 149	—
S15CK	880 ~ 930 Air cooling	Approx. 880 Furnace cooling	Primary 870 to 920 Oil (water) cooling Secondary 750 to 800 Water cooling	150 ~ 200 Air cooling	A	—	—	—	—	—	111 ~ 149	—
					H	345	490	20	50	118	143 ~ 235	—
S17C S20C	870 ~ 920 Air cooling	Approx. 860 Furnace cooling	—	—	N	245	400	28	—	—	116 ~ 174	—
					A	—	—	—	—	—	114 ~ 153	—
S20CK	870 ~ 920 Air cooling	Approx. 860 Furnace cooling	Primary 870 to 920 Oil (water) cooling Secondary 750 to 800 Water cooling	150 ~ 200 Air cooling	A	—	—	—	—	—	114 ~ 153	—
					H	390	540	18	45	98	159 ~ 241	—
S22C S25C	860 ~ 910 Air cooling	Approx. 850 Furnace cooling	—	—	N	265	440	27	—	—	123 ~ 183	—
					A	—	—	—	—	—	121 ~ 156	—
S28C S30C	850 ~ 900 Air cooling	Approx. 840 Furnace cooling	850 ~ 900 Water cooling	550 ~ 650 Rapid cooling	N	285	470	25	—	—	137 ~ 197	—
					A	—	—	—	—	—	126 ~ 156	—
S33C S35C	840 ~ 890 Air cooling	Approx. 830 Furnace cooling	840 ~ 890 Water cooling	550 ~ 650 Rapid cooling	N	305	510	23	—	—	149 ~ 207	—
					A	—	—	—	—	—	126 ~ 163	—
S38C S40C	830 ~ 880 Air cooling	Approx. 820 Furnace cooling	830 ~ 880 Water cooling	550 ~ 650 Rapid cooling	H	390	570	22	55	98	167 ~ 235	32
					N	325	540	22	—	—	156 ~ 217	—
S43C S45C	820 ~ 870 Air cooling	Approx. 810 Furnace cooling	820 ~ 870 Water cooling	550 ~ 650 Rapid cooling	A	—	—	—	—	—	131 ~ 163	—
					H	440	610	20	50	88	179 ~ 255	35
S48C S50C	810 ~ 860 Air cooling	Approx. 800 Furnace cooling	810 ~ 860 Water cooling	550 ~ 650 Rapid cooling	N	345	570	20	—	—	167 ~ 229	—
					A	—	—	—	—	—	137 ~ 170	—
S53C S55C	800 ~ 850 Air cooling	Approx. 790 Furnace cooling	800 ~ 850 Water cooling	550 ~ 650 Rapid cooling	H	490	690	17	45	78	201 ~ 269	37
					N	365	610	18	—	—	179 ~ 235	—
S58C	800 ~ 850 Air cooling	Approx. 790 Furnace cooling	800 ~ 850 Water cooling	550 ~ 650 Rapid cooling	A	—	—	—	—	—	143 ~ 187	—
					H	540	740	15	40	69	212 ~ 277	40
S53C S55C	800 ~ 850 Air cooling	Approx. 790 Furnace cooling	800 ~ 850 Water cooling	550 ~ 650 Rapid cooling	N	390	650	15	—	—	183 ~ 255	—
					A	—	—	—	—	—	149 ~ 192	—
S58C	800 ~ 850 Air cooling	Approx. 790 Furnace cooling	800 ~ 850 Water cooling	550 ~ 650 Rapid cooling	H	590	780	14	35	59	229 ~ 285	42
					N	390	650	15	—	—	183 ~ 255	—
S58C	800 ~ 850 Air cooling	Approx. 790 Furnace cooling	800 ~ 850 Water cooling	550 ~ 650 Rapid cooling	A	—	—	—	—	—	149 ~ 192	—
					H	590	780	14	35	59	229 ~ 285	42

A standard test piece of each steel type is tested when normalizing and annealing or quenching and tempering are conducted.

(Reference) Mechanical properties of nickel chrome steel products

Code	Heat treatment °C		Tensile testing (No. 4 test piece)				Impact test (No. 3 test piece)	Hardness test
	Quenching	Tempering	Yield point N/mm ² (or more)	Tensile strength N/mm ² (or more)	Elongation % (or more)	Drawing % (or more)	Impact value (Charpy) J/cm ² (or more)	Hardness HB
SNC236	820 to 880 Oil cooling	550 ~ 650 Rapid cooling	590	740	22	50	118	217 ~ 277
SNC415	Primary 850 to 900 oil cooling Secondary 740 to 790 water cooling or 780 to 830 oil cooling	150 ~ 200 Air cooling	—	780	17	45	88	235 ~ 341
SNC631	820 to 880 Oil cooling	550 ~ 650 Rapid cooling	685	830	18	50	118	248 ~ 302
SNC815	Primary 830 to 880 oil cooling Secondary 750 to 800 oil cooling	150 ~ 200 Air cooling	—	980	12	45	78	285 ~ 388
SNC836	820 to 880 Oil cooling	550 ~ 650 Rapid cooling	785	930	15	45	78	269 ~ 321

(Reference) Mechanical properties of nickel chrome molybdenum steel products

Code	Heat treatment °C		Tensile testing (No. 4 test piece)				Impact test (No. 3 test piece)	Hardness test
	Quenching	Tempering	Yield point N/mm ² (or more)	Tensile strength N/mm ² (or more)	Elongation % (or more)	Drawing % (or more)	Impact value (Charpy) J/cm ² (or more)	Hardness HB
SNCM220	Primary 850 to 900 oil cooling Secondary 800 to 850 oil cooling	150 ~ 200 Air cooling	—	830	17	40	59	248 ~ 341
SNCM240	820 to 870 oil cooling	580 ~ 680 Rapid cooling	785	880	17	50	69	255 ~ 311
SNCM415	Primary 850 to 900 oil cooling Secondary 780 to 830 oil cooling	150 ~ 200 Air cooling	—	880	16	45	69	255 ~ 341
SNCM420	Primary 850 to 900 oil cooling Secondary 770 to 820 oil cooling	150 ~ 200 Air cooling	—	980	15	40	69	293 ~ 375
SNCM431	820 to 870 oil cooling	580 ~ 680 Rapid cooling	885	830	20	55	98	248 ~ 302
SNCM439	820 to 870 oil cooling	580 ~ 680 Rapid cooling	885	980	16	45	69	293 ~ 352
SNCM447	820 to 870 oil cooling	580 ~ 680 Rapid cooling	930	1030	14	40	59	302 ~ 368
SNCM616	Primary 850 to 900 air cooling (oil cooling) Secondary 770 to 830 air cooling (oil cooling)	100 ~ 200 Air cooling	—	1180	14	40	78	341 ~ 415
SNCM625	820 to 870 oil cooling	570 ~ 670 Rapid cooling	835	930	18	50	78	269 ~ 321
SNCM630	850 to 950 air cooling (oil cooling)	550 ~ 650 Rapid cooling	885	1080	15	45	78	302 ~ 352
SNCM815	Primary 830 to 880 oil cooling Secondary 750 to 800 oil cooling	150 ~ 200 Air cooling	—	1080	12	40	69	311 ~ 375

(Reference) Mechanical properties of chrome steel products

Code	Heat treatment °C		Tensile testing (No. 4 test piece)				Impact test (No. 3 test piece)	Hardness test
	Quenching	Tempering	Yield point N/mm ² (or more)	Tensile strength N/mm ² (or more)	Elongation % (or more)	Drawing % (or more)	Impact value (Charpy) J/cm ² (or more)	
SCr415	Primary 850 to 900 oil cooling Secondary 800 to 850 oil cooling (water cooling) or 850 to 900 oil cooling after 925 retaining	150 ~ 200 Air cooling	–	780	15	40	59	217 ~ 302
SCr420	Primary 850 to 900 oil cooling Secondary 800 to 850 or 850 to 900 oil cooling after 925 retaining	150 ~ 200 Air cooling	–	830	14	35	49	235 ~ 321
SCr430	830 to 880 oil cooling	520 ~ 620 Rapid cooling	635	780	18	55	88	229 ~ 293
SCr435	830 to 880 oil cooling	520 ~ 620 Rapid cooling	735	880	15	50	69	255 ~ 321
SCr440	830 to 880 oil cooling	520 ~ 620 Rapid cooling	785	930	13	45	59	269 ~ 331
SCr445	830 to 880 oil cooling	520 ~ 620 Rapid cooling	835	980	12	40	49	285 ~ 352

(Reference) Mechanical properties of chromium molybdenum steel products

Code	Heat treatment °C		Tensile testing (No. 4 test piece)				Impact test (No. 3 test piece)	Hardness test
	Quenching	Tempering	Yield point N/mm ² (or more)	Tensile strength N/mm ² (or more)	Elongation % (or more)	Drawing % (or more)	Impact value (Charpy) J/cm ² (or more)	
SCM415	Primary 850 to 900 oil cooling Secondary 800 to 850 oil cooling or 850 to 900 oil cooling after 925 retaining	150 ~ 200 Air cooling	–	830	16	40	69	235 ~ 321
SCM418	Primary 850 to 900 oil cooling Secondary 800 to 850 oil cooling or 850 to 900 oil cooling after 925 retaining	150 ~ 200 Air cooling	–	880	15	40	69	248 ~ 331
SCM420	Primary 850 to 900 oil cooling Secondary 800 to 850 oil cooling or 850 to 900 oil cooling after 925 retaining	150 ~ 200 Air cooling	–	930	14	40	59	262 ~ 352
SCM421	Primary 850 to 900 oil cooling Secondary 800 to 850 oil cooling or 850 to 900 oil cooling after 925 retaining	150 ~ 200 Air cooling	–	980	14	35	59	285 ~ 375
SCM430	830 to 880 oil cooling	530 ~ 630 Rapid cooling	685	830	18	55	108	241 ~ 302
SCM432	830 to 880 oil cooling	530 ~ 630 Rapid cooling	735	880	16	50	88	255 ~ 321
SCM435	830 to 880 oil cooling	530 ~ 630 Rapid cooling	785	930	15	50	78	269 ~ 331
SCM440	830 to 880 oil cooling	530 ~ 630 Rapid cooling	835	980	12	45	59	285 ~ 352
SCM445	830 to 880 oil cooling	530 ~ 630 Rapid cooling	885	1030	12	40	39	302 ~ 363
SCM822	Primary 850 to 900 oil cooling Secondary 800 to 850 oil cooling or 850 to 900 oil cooling after 925 retaining	150 ~ 200 Air cooling	–	1030	12	30	59	302 ~ 415

(Reference) Mechanical properties of manganese steel products and manganese chrome steel products for machine structures

Code	Heat treatment °C		Tensile testing (No. 4 test piece)				Impact test (No. 3 test piece)	Hardness test
	Quenching	Tempering	Yield point N/mm ² (or more)	Tensile strength N/mm ² (or more)	Elongation % (or more)	Drawing % (or more)	Impact value (Charpy) J/cm ² (or more)	Hardness HB
SMn420	Primary 850 to 900 oil cooling Secondary 780 to 830 oil cooling	150 ~ 200 Air cooling	—	690	14	30	49	201 ~ 311
SMn433	830 to 880 water cooling	550 ~ 650 Rapid cooling	540	690	20	55	98	201 ~ 277
SMn438	830 to 880 oil cooling	550 ~ 650 Rapid cooling	590	740	18	50	78	212 ~ 285
SMn443	830 to 880 oil cooling	550 ~ 650 Air cooling	635	780	17	45	78	229 ~ 302
SMnC420	Primary 850 to 900 oil cooling Secondary 780 to 830 oil cooling	150 ~ 200 Air cooling	—	830	13	30	49	235 ~ 321
SMnC443	830 to 880 oil cooling	550 ~ 650 Rapid cooling	785	930	13	40	49	269 ~ 321

Mechanical properties of alloy steel bolt products for high temperatures

Type	Code	Diameter mm	Bearing force N/mm ²	Tensile strength N/mm ²	Elongation %	Drawing %	Heat treatment
Type 1	SNB 5	≤ 100	≥ 550	≥ 690	≥ 16	≥ 50	Normalizing and tempering or quenching and tempering Tempering temperature of 595°C or more
Type 2	SNB 7	≤ 63	≥ 725	≥ 860	≥ 16	≥ 50	
		More than 63, but no more than 100	≥ 655	≥ 800	≥ 16	≥ 50	
Type 3	SNB 16	More than 100, but no more than 120	≥ 520	≥ 690	≥ 18	≥ 50	
		≤ 63	≥ 725	≥ 860	≥ 18	≥ 50	Normalizing and tempering or quenching and tempering Tempering temperature of 650°C or more
		More than 63, but no more than 100	≥ 655	≥ 760	≥ 17	≥ 50	
		More than 100, but no more than 180	≥ 590	≥ 690	≥ 16	≥ 50	

Mechanical properties of bars for special-use alloy steel bolts

Heat treatment

- (1) Bars shall be annealed or quenched and tempered if requested by customer. However, the tempering temperature be higher than 455°C.
 (2) If a bar is straightened, stress relief annealing must be applied at a temperature no less than 55°Cof, the tempering temperature.

Code	Diameter mm	Bearing force N/mm ²	Tensile strength N/mm ²	Elongation %	Drawing %	Hardness HB	Impact absorbed energy J	
							Average of three	Individual value *
SNB 21-1	100 or less	≥ 1030	≥ 1140	≥ 10	≥ 35	321 ~ 429	**	
SNB 21-2	100 or less	≥ 960	≥ 1070	≥ 11	≥ 40	311 ~ 401	**	
SNB 21-3	75 or less	≥ 890	≥ 1000	≥ 12	≥ 40	293 ~ 352	**	
	More than 75, but no more than 150					302 ~ 375		
SNB 21-4	75 or less	≥ 825	≥ 930	≥ 13	≥ 45	269 ~ 331	**	
	More than 75, but no more than 150					277 ~ 352		
SNB 21-5	50 or less	≥ 715	≥ 820	≥ 15	≥ 50	241 ~ 285	**	
	More than 50, but no more than 150	≥ 658	≥ 790			248 ~ 302	**	
	More than 150, but no more than 200	≥ 685	≥ 790			255 ~ 311		
SNB 22-1	38 or less	≥ 1030	≥ 1140	≥ 10	≥ 35	321 ~ 401	**	
SNB 22-2	75 or less	≥ 960	≥ 1070	≥ 11	≥ 40	311 ~ 401	**	
SNB 22-3	50 or less	≥ 890	≥ 1000	≥ 12	≥ 40	293 ~ 363	**	
	More than 50, but no more than 100					302 ~ 375		
SNB 22-4	25 or less	≥ 825	≥ 930	≥ 13	≥ 45	269 ~ 341	≥ 47	≥ 40
	More than 25, but no more than 100					277 ~ 363	**	
SNB 22-5	50 or less	≥ 715	≥ 820	≥ 15	≥ 50	248 ~ 293	≥ 47	≥ 40
	More than 50, but no more than 100	≥ 685	≥ 790			255 ~ 302	**	
SNB 23-1	75 or less	≥ 1030	≥ 1140	≥ 10	≥ 35	321 ~ 415	**	
	More than 75, but no more than 150					331 ~ 429	**	
	More than 150, but no more than 200					341 ~ 444		
SNB 23-2	75 or less	≥ 960	≥ 1070	≥ 11	≥ 40	311 ~ 388	≥ 40	≥ 34
	More than 75, but no more than 150					311 ~ 401	**	
	More than 150, but no more than 240					321 ~ 415		
SNB 23-3	75 or less	≥ 890	≥ 1000	≥ 12	≥ 40	293 ~ 363	≥ 40	≥ 34
	More than 75, but no more than 150					302 ~ 375		
	More than 150, but no more than 240					311 ~ 388	**	
SNB 23-4	75 or less	≥ 825	≥ 930	≥ 13	≥ 45	269 ~ 341	≥ 47	≥ 40
	More than 75, but no more than 150					277 ~ 352		
	More than 150, but no more than 240					285 ~ 363	**	
SNB 23-5	150 or less	≥ 715	≥ 820	≥ 15	≥ 50	248 ~ 311	≥ 47	≥ 40
	More than 150, but no more than 200	≥ 685	≥ 790			255 ~ 321		
	More than 200, but no more than 240	≥ 685	≥ 790			262 ~ 321	**	
SNB 24-1	150 or less	≥ 1030	≥ 1140	≥ 10	≥ 35	321 ~ 415	≥ 34	≥ 27
	More than 150, but no more than 200					331 ~ 429	**	
SNB 24-2	175 or less	≥ 960	≥ 1070	≥ 11	≥ 40	311 ~ 401	≥ 40	≥ 34
	More than 175, but no more than 240					321 ~ 415	**	
SNB 24-3	75 or less	≥ 890	≥ 1000	≥ 12	≥ 40	293 ~ 363	≥ 40	≥ 34
	More than 75, but no more than 200					302 ~ 388		
	More than 200, but no more than 240					311 ~ 388	**	
SNB 24-4	75 or less	≥ 825	≥ 930	≥ 13	≥ 45	269 ~ 341	≥ 47	≥ 40
	More than 75, but no more than 150					277 ~ 352		
	More than 150, but no more than 200					285 ~ 363	**	
	More than 200, but no more than 240					293 ~ 363		
SNB 24-5	150 or less	≥ 715	≥ 820	≥ 15	≥ 50	248 ~ 311	≥ 47	≥ 40
	More than 150, but no more than 200	≥ 685	≥ 790			255 ~ 321		
	More than 200, but no more than 240	≥ 685	≥ 790			262 ~ 321	**	

Note) * The impact test values must not include two values that fall below the specified average of three.

** Impact test must be conducted and the absorbed energy value must be reported.

Remarks 1. Charpy impact test temperature be -12°C.

2. Ductile fracture ratio at Charpy impact test must also be reported.

5 Table of composition for JIS special-use steel

5-1) G4401 Carbon tool steel products

(Date of revision: November 20, 2009)

Code	Chemical composition				
	C	Si	Mn	P	S
SK140	1.30 ~ 1.50	0.10 ~ 0.35	0.10 ~ 0.50	≦ 0.030	≦ 0.030
SK120	1.15 ~ 1.25	0.10 ~ 0.35	0.10 ~ 0.50	≦ 0.030	≦ 0.030
SK105	1.00 ~ 1.10	0.10 ~ 0.35	0.10 ~ 0.50	≦ 0.030	≦ 0.030
SK95	0.90 ~ 1.00	0.10 ~ 0.35	0.10 ~ 0.50	≦ 0.030	≦ 0.030
SK90	0.85 ~ 0.95	0.10 ~ 0.35	0.10 ~ 0.50	≦ 0.030	≦ 0.030
SK85	0.80 ~ 0.90	0.10 ~ 0.35	0.10 ~ 0.50	≦ 0.030	≦ 0.030
SK80	0.75 ~ 0.85	0.10 ~ 0.35	0.10 ~ 0.50	≦ 0.030	≦ 0.030
SK75	0.70 ~ 0.80	0.10 ~ 0.35	0.10 ~ 0.50	≦ 0.030	≦ 0.030
SK70	0.65 ~ 0.75	0.10 ~ 0.35	0.10 ~ 0.50	≦ 0.030	≦ 0.030
SK65	0.60 ~ 0.70	0.10 ~ 0.35	0.10 ~ 0.50	≦ 0.030	≦ 0.030
SK60	0.55 ~ 0.65	0.10 ~ 0.35	0.10 ~ 0.50	≦ 0.030	≦ 0.030

Remarks For all types, Cu, Cr, and Ni must not exceed 0.25%, 0.30%, and 0.25%, respectively, in impurities.

5-2) G4801 Spring steel products (Date of revision: August 20, 2005)

Code	C	Si	Mn	P	S	Cr	Mo	V	B
SUP6	0.56 ~ 0.64	1.50 ~ 1.80	0.70 ~ 1.00	≦ 0.030	≦ 0.030	-	-	-	-
SUP7	0.56 ~ 0.64	1.80 ~ 2.20	0.70 ~ 1.00	≦ 0.030	≦ 0.030	-	-	-	-
SUP9	0.52 ~ 0.60	0.15 ~ 0.35	0.65 ~ 0.95	≦ 0.030	≦ 0.030	0.65 ~ 0.95	-	-	-
SUP9A	0.56 ~ 0.64	0.15 ~ 0.35	0.70 ~ 1.00	≦ 0.030	≦ 0.030	0.70 ~ 1.00	-	-	-
SUP10	0.47 ~ 0.55	0.15 ~ 0.35	0.65 ~ 0.95	≦ 0.030	≦ 0.030	0.80 ~ 1.10	-	0.15 ~ 0.25	-
SUP11A	0.56 ~ 0.64	0.15 ~ 0.35	0.70 ~ 1.00	≦ 0.030	≦ 0.030	0.70 ~ 1.00	-	-	≧ 0.0005
SUP12	0.51 ~ 0.59	1.20 ~ 1.60	0.60 ~ 0.90	≦ 0.030	≦ 0.030	0.60 ~ 0.90	-	-	-
SUP13	0.56 ~ 0.64	0.15 ~ 0.35	0.70 ~ 1.00	≦ 0.030	≦ 0.030	0.70 ~ 0.90	0.25 ~ 0.35	-	-

Remarks P and S values can be set at 0.35% or less through arrangements between the parties involved.

For all types, Cu must not exceed 0.30% in impurities.

5-3) G4804 Sulfur and sulfur compound free-cutting steel products

(Date of revision: February 20, 2008)

Code	C	Mn	P	S	Pb
SUM21	0.13 or less	0.70 ~ 1.00	0.07 ~ 0.12	0.16 ~ 0.23	-
SUM22	0.13 or less	0.70 ~ 1.00	0.07 ~ 0.12	0.24 ~ 0.33	-
SUM22L	0.13 or less	0.70 ~ 1.00	0.07 ~ 0.12	0.24 ~ 0.33	0.10 ~ 0.35
SUM23	0.09 or less	0.75 ~ 1.05	0.04 ~ 0.09	0.26 ~ 0.35	-
SUM23L	0.09 or less	0.75 ~ 1.05	0.04 ~ 0.09	0.26 ~ 0.35	0.10 ~ 0.35
SUM24L	0.15 or less	0.85 ~ 1.15	0.04 ~ 0.09	0.26 ~ 0.35	0.10 ~ 0.35
SUM25	0.15 or less	0.90 ~ 1.40	0.07 ~ 0.12	0.30 ~ 0.40	-
SUM31	0.14 ~ 0.20	1.00 ~ 1.30	0.040 or less	0.08 ~ 0.13	-
SUM31L	0.14 ~ 0.20	1.00 ~ 1.30	0.040 or less	0.08 ~ 0.13	0.10 ~ 0.35
SUM32	0.12 ~ 0.20	0.60 ~ 1.10	0.040 or less	0.10 ~ 0.20	-
SUM41	0.32 ~ 0.39	1.35 ~ 1.65	0.040 or less	0.08 ~ 0.13	-
SUM42	0.37 ~ 0.45	1.35 ~ 1.65	0.040 or less	0.08 ~ 0.13	-
SUM43	0.40 ~ 0.48	1.35 ~ 1.65	0.040 or less	0.24 ~ 0.33	-

Note) There is no specification for Si.

However, limit or range values, such as 0.10% or less, 0.10 to 0.20%, and 0.15 to 0.35%, can be set through arrangements between orderer and manufacturer.

· Elements not specified in this table must not be intentionally added to steel for purposes other than finishing molten steel unless otherwise agreed upon between orderer and manufacturer.

· The upper value of Mn in SUM22 and SUM22L can be set at 1.10% through arrangements between the parties involved in the delivery.

5-4) G4805 High-carbon chromium bearing steel products

(Date of revision: February 20, 2008)

Code	C	Si	Mn	P	S	Cr	Mo
SUJ2	0.95 ~ 1.10	0.15 ~ 0.35	≤ 0.50	≤ 0.025	≤ 0.025	1.30 ~ 1.60	–
SUJ3	0.95 ~ 1.10	0.40 ~ 0.70	0.90 ~ 1.15	≤ 0.025	≤ 0.025	0.90 ~ 1.20	–

Remarks 1. Ni and Cu must not exceed 0.25% in impurities. However, Cu in wire rods shall be 0.20% or less.
2. Mo in SUJ2 and SUJ3 must not exceed 0.08% in impurities.
3. Elements not specified in this table must not be intentionally added to steel for purposes other than finishing molten steel unless otherwise agreed upon between the parties involved in the delivery. However, elements not specified in this table can be added, if the content is 0.25% or less, through arrangements between the parties involved in the delivery.

⑥ Table of composition for Kobe Steel's wire rod and bar products

6-1) Piano wire rods (KRS®, KPR®)

Code	C	Si	Mn	P	S	Cu	Ni	Cr
KRS62A	0.60 ~ 0.65	0.15 ~ 0.30	0.40 ~ 0.60	≤ 0.020	≤ 0.020	≤ 0.10	≤ 0.10	≤ 0.10
KRS72A	0.70 ~ 0.75	0.15 ~ 0.30	0.40 ~ 0.60	≤ 0.020	≤ 0.020	≤ 0.10	≤ 0.10	≤ 0.10
KRS82A	0.80 ~ 0.85	0.15 ~ 0.30	0.40 ~ 0.60	≤ 0.020	≤ 0.020	≤ 0.10	≤ 0.10	≤ 0.10
KPR92A-C	0.90 ~ 0.95	0.15 ~ 0.25	0.40 ~ 0.60	≤ 0.020	≤ 0.020	≤ 0.10	≤ 0.10	≤ 0.10
KPR100A-E	0.95 ~ 1.05	0.15 ~ 0.25	0.40 ~ 0.60	≤ 0.020	≤ 0.020	≤ 0.10	≤ 0.10	≤ 0.10
KPR110A	1.05 ~ 1.15	0.15 ~ 0.25	0.40 ~ 0.60	≤ 0.020	≤ 0.020	≤ 0.10	≤ 0.10	0.10 ~ 0.25

6-2) Wire rods for valve springs (HRS®, KHV®)

	Code	C	Si	Mn	P	S	Cu	Ni	Cr	V
Si-Cr series	HRS6	0.51 ~ 0.59	1.30 ~ 1.60	0.60 ~ 0.90	≤ 0.025	≤ 0.025	≤ 0.15	≤ 0.20	0.60 ~ 0.90	-
Si-Cr-V series	KHV6N	0.57 ~ 0.62	1.30 ~ 1.60	0.50 ~ 0.80	≤ 0.020	≤ 0.020	≤ 0.15	0.20 ~ 0.50	0.80 ~ 1.00	0.05 ~ 0.10
		0.60 ~ 0.65	1.30 ~ 1.60	0.50 ~ 0.70	≤ 0.020	≤ 0.020	≤ 0.15	≤ 0.20	0.50 ~ 0.70	0.08 ~ 0.18
	KHV10N	0.56 ~ 0.61	1.80 ~ 2.20	0.70 ~ 1.00	≤ 0.020	≤ 0.020	≤ 0.15	0.20 ~ 0.40	0.85 ~ 1.05	0.05 ~ 0.15

6-3) Steel for suspension springs with excellent sag

and corrosion resistance (SRS®, UHS®)

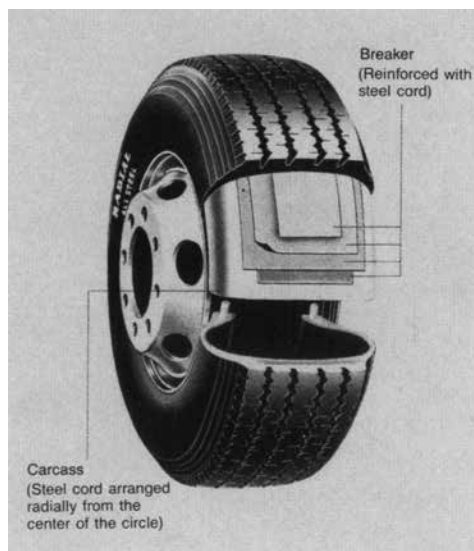
Code	C	Si	Mn	P	S	Cu	Ni	Cr	V	Ti
SRS60	0.58 ~ 0.63	1.35 ~ 1.60	0.35 ~ 0.60	≤ 0.030	≤ 0.030	≤ 0.20	≤ 0.20	0.40 ~ 0.70	0.15 ~ 0.25	-
UHS1900	0.38 ~ 0.42	1.70 ~ 1.90	0.10 ~ 0.45	≤ 0.025	≤ 0.025	0.20 ~ 0.30	0.30 ~ 0.60	1.00 ~ 1.10	0.15 ~ 0.20	0.05 ~ 0.09
UHS1900M	0.46 ~ 0.49	1.90 ~ 2.10	0.60 ~ 0.90	≤ 0.025	≤ 0.025	0.15 ~ 0.25	0.20 ~ 0.40	0.15 ~ 0.25	0.125 ~ 0.175	0.055 ~ 0.09
UHS1970	0.40 ~ 0.44	1.85 ~ 2.05	0.10 ~ 0.45	≤ 0.020	≤ 0.020	0.20 ~ 0.40	0.50 ~ 0.70	0.95 ~ 1.10	0.10 ~ 0.20	0.05 ~ 0.09

6-4) Wire rods for PC steel wires

Code	C	Si	Mn	P	S	Cu	Ni	Cr	V	Remarks
72BPG	0.70 ~ 0.75	0.12 ~ 0.32	0.60 ~ 0.90	≤ 0.025	≤ 0.025	≤ 0.20	≤ 0.15	≤ 0.10	–	KKP
77BPG	0.75 ~ 0.80	0.12 ~ 0.32	0.60 ~ 0.90	≤ 0.025	≤ 0.025	≤ 0.20	≤ 0.15	≤ 0.10	–	
82BPG	0.80 ~ 0.85	0.12 ~ 0.32	0.60 ~ 0.90	≤ 0.025	≤ 0.025	≤ 0.20	≤ 0.15	≤ 0.10	–	
82BPG-E	0.80 ~ 0.85	0.12 ~ 0.32	0.60 ~ 0.90	≤ 0.025	≤ 0.025	≤ 0.20	≤ 0.15	0.10 ~ 0.20	–	
82BPG-A	0.80 ~ 0.85	0.12 ~ 0.32	0.60 ~ 0.90	≤ 0.025	≤ 0.025	≤ 0.20	≤ 0.15	0.20 ~ 0.30	–	
82BPG-EX	0.80 ~ 0.85	0.12 ~ 0.32	0.60 ~ 0.90	≤ 0.025	≤ 0.025	≤ 0.20	≤ 0.15	0.10 ~ 0.20	Addition	KKP-SUPER
82BPG-EY	0.80 ~ 0.85	0.12 ~ 0.32	0.60 ~ 0.90	≤ 0.025	≤ 0.025	≤ 0.20	≤ 0.15	0.10 ~ 0.20	Addition	
82BPG-KM	0.80 ~ 0.85	0.80 ~ 1.00	0.60 ~ 0.80	≤ 0.025	≤ 0.025	≤ 0.20	≤ 0.15	≤ 0.10	–	
87BPG-AY	0.85 ~ 0.90	0.12 ~ 0.32	0.60 ~ 0.90	≤ 0.025	≤ 0.025	≤ 0.20	≤ 0.15	0.20 ~ 0.30	Addition	

6-5) Wire rods for steel cords (KSC®)

Code	C	Si	Mn	P	S	Cu	Ni	Cr
KSC60	0.58 ~ 0.63	0.15 ~ 0.30	0.40 ~ 0.60	≤ 0.020	≤ 0.020	≤ 0.05	≤ 0.05	≤ 0.05
KSC72	0.70 ~ 0.75	0.15 ~ 0.30	0.40 ~ 0.60	≤ 0.020	≤ 0.020	≤ 0.05	≤ 0.05	≤ 0.05
KSC82	0.80 ~ 0.85	0.15 ~ 0.30	0.40 ~ 0.60	≤ 0.020	≤ 0.020	≤ 0.05	≤ 0.05	≤ 0.05
KSC90	0.88 ~ 0.93	0.15 ~ 0.30	0.40 ~ 0.60	≤ 0.020	≤ 0.020	≤ 0.05	≤ 0.05	≤ 0.05
KSC92-E	0.90 ~ 0.95	0.10 ~ 0.25	0.30 ~ 0.50	≤ 0.020	≤ 0.020	≤ 0.20	≤ 0.05	0.10 ~ 0.30
KSC105-E	1.02 ~ 1.07	0.15 ~ 0.30	0.20 ~ 0.40	≤ 0.020	≤ 0.020	≤ 0.05	≤ 0.05	0.10 ~ 0.30



6-6) Soft magnetic material (ELCH®)

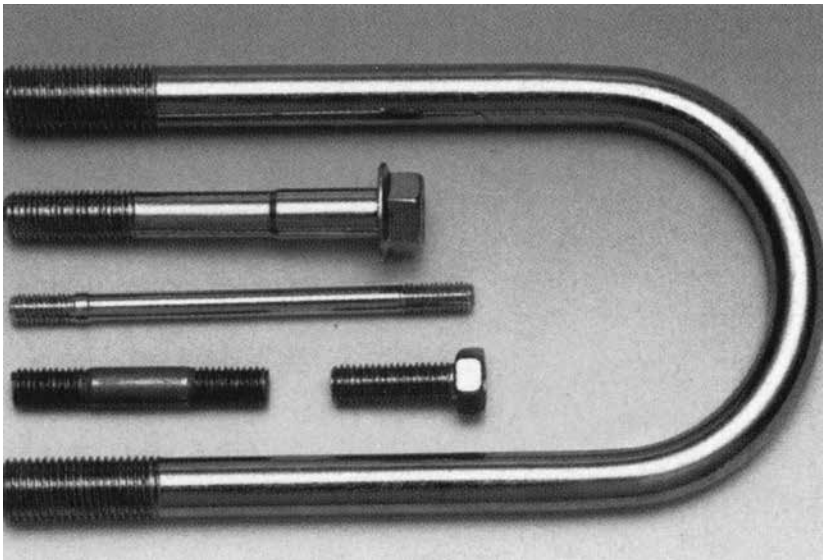
Code	C	Si	Mn	P	S	Cu	Ni	Cr
ELCH2	≤ 0.020	≤ 0.03	0.20 ~ 0.30	≤ 0.030	≤ 0.030	≤ 0.25	≤ 0.15	≤ 0.15
ELCH2S	≤ 0.020	≤ 0.03	0.23 ~ 0.33	≤ 0.030	0.020 ~ 0.030	≤ 0.25	≤ 0.15	≤ 0.15

6-7) Wire rods for non-refining bolts (KNCH®)

Code	Class of strength	Name of steel type	Chemical composition (%)					
			C	Si	Mn	Cr	V	Nb
Basic type	(7T)	KNCH7	0.19 ~ 0.25	0.15 ~ 0.30	1.35 ~ 1.65	≤ 0.20	–	–
	8.8 (8T)	KNCH8	0.27 ~ 0.33	0.15 ~ 0.30	1.35 ~ 1.65	≤ 0.20	–	–
Cold forging-oriented type	(7T)	KNCH7S	0.19 ~ 0.25	≤ 0.10	1.20 ~ 1.50	≤ 0.20	–	–
	8.8 (8T)	KNCH8S	0.27 ~ 0.33	≤ 0.10	1.35 ~ 1.65	Addition	–	–
High toughness type	8.8 (8T)	KNCH8P	0.12 ~ 0.18	≤ 0.10	1.35 ~ 1.65	≤ 0.20	Addition	Addition
High strength type	10.9 (10T)	KNCH10	0.37 ~ 0.43	0.15 ~ 0.35	1.00 ~ 1.30	≤ 0.20	Addition	–

· P is less than or equal to 0.030%, S is less than or equal to 0.030%

· Cu is less than or equal to 0.30%, Ni is less than or equal to 0.20%



6-8) Cold heading quality carbon steel wire rods Silicone-killed steel (KCH x x K series) (KCH®)

Code	Chemical composition (%)					Equivalent to JIS Standards	Equivalent to AISI Standards
	C	Si	Mn	P	S		
KCH8KT	0.10 or less	0.10 ~ 0.20	0.30 ~ 0.50	≤ 0.030	≤ 0.030		1008
KCH10KT	0.08 ~ 0.13	0.10 ~ 0.20	0.30 ~ 0.60	≤ 0.030	≤ 0.030	SWRCH10K	1010
KCH12KT	0.10 ~ 0.15	0.10 ~ 0.20	0.30 ~ 0.60	≤ 0.030	≤ 0.030	SWRCH12K	1012
KCH15KT	0.13 ~ 0.18	0.10 ~ 0.20	0.30 ~ 0.60	≤ 0.030	≤ 0.030	SWRCH15K	1015
KCH16KT	0.13 ~ 0.18	0.10 ~ 0.20	0.60 ~ 0.90	≤ 0.030	≤ 0.030	SWRCH16K	1016
KCH17KT	0.15 ~ 0.20	0.10 ~ 0.20	0.30 ~ 0.60	≤ 0.030	≤ 0.030	SWRCH17K	1017
KCH18KT	0.15 ~ 0.20	0.10 ~ 0.20	0.60 ~ 0.90	≤ 0.030	≤ 0.030	SWRCH18K	1018
KCH19KT	0.15 ~ 0.20	0.10 ~ 0.20	0.70 ~ 1.00	≤ 0.030	≤ 0.030	SWRCH18K	1019
KCH20KT	0.18 ~ 0.23	0.15 ~ 0.30	0.30 ~ 0.60	≤ 0.030	≤ 0.030	SWRCH20K	1020
KCH21KT	0.18 ~ 0.23	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.030	≤ 0.030	SWRCH22K	1021
KCH22KT	0.18 ~ 0.23	0.15 ~ 0.30	0.70 ~ 1.00	≤ 0.030	≤ 0.030	SWRCH22K	1022
KCH23KT	0.20 ~ 0.25	0.15 ~ 0.30	0.30 ~ 0.60	≤ 0.030	≤ 0.030		1023
KCH25KT	0.23 ~ 0.28	0.15 ~ 0.30	0.30 ~ 0.60	≤ 0.030	≤ 0.030	SWRCH25K	1025
KCH30KT	0.28 ~ 0.33	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.030	≤ 0.030	SWRCH30K	1030
KCH33KT	0.31 ~ 0.36	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.030	≤ 0.030	SWRCH33K	
KCH35KT	0.33 ~ 0.38	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.030	≤ 0.030	SWRCH35K	1035
KCH38KT	0.35 ~ 0.40	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.030	≤ 0.030	SWRCH38K	1038
KCH40KT	0.38 ~ 0.43	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.030	≤ 0.030	SWRCH40K	1040
KCH43KT	0.40 ~ 0.45	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.030	≤ 0.030	SWRCH43K	1040
KCH45KT	0.43 ~ 0.48	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.030	≤ 0.030	SWRCH45K	1045
KCH48KT	0.45 ~ 0.50	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.030	≤ 0.030	SWRCH48K	1045
KCH50KT	0.48 ~ 0.53	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.030	≤ 0.030	SWRCH50K	1050
KCH53KT	0.50 ~ 0.55	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.030	≤ 0.030		1055
KCH55KT	0.53 ~ 0.58	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.030	≤ 0.030		1055
KCH58KT	0.55 ~ 0.60	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.030	≤ 0.030		1055

· Cu is less than or equal to 0.30%, Ni is less than or equal to 0.20%, Cr is less than or equal to 0.20%

Aluminum-killed steel (KCH x x A series) (KCH®)

Code	Chemical composition (%)						Equivalent to JIS Standards	Equivalent to AISI Standards
	C	Si	Mn	P	S	Al		
KCH5AT	≤ 0.06	≤ 0.10	≤ 0.35	≤ 0.030	≤ 0.030	≥ 0.02		1005
KCH6AT	≤ 0.08	≤ 0.10	0.25 ~ 0.40	≤ 0.030	≤ 0.030	≥ 0.02	SWRCH6A	1006
KCH8AT	≤ 0.10	≤ 0.10	0.30 ~ 0.50	≤ 0.030	≤ 0.030	≥ 0.02	SWRCH8A	1008
KCH10AT	0.08 ~ 0.13	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.030	≥ 0.02	SWRCH10A	1010
KCH12AT	0.10 ~ 0.15	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.030	≥ 0.02	SWRCH12A	1012
KCH13AT	0.11 ~ 0.16	≤ 0.10	0.50 ~ 0.80	≤ 0.030	≤ 0.030	≥ 0.02		1013
KCH15AT	0.13 ~ 0.18	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.030	≥ 0.02	SWRCH15A	1015
KCH16AT	0.13 ~ 0.18	≤ 0.10	0.60 ~ 0.90	≤ 0.030	≤ 0.030	≥ 0.02		1016
KCH18AT	0.15 ~ 0.20	≤ 0.10	0.60 ~ 0.90	≤ 0.030	≤ 0.030	≥ 0.02	SWRCH18A	1018
KCH19AT	0.15 ~ 0.20	≤ 0.10	0.70 ~ 1.00	≤ 0.030	≤ 0.030	≥ 0.02	SWRCH19A	1019
KCH20AT	0.18 ~ 0.23	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.030	≥ 0.02	SWRCH20A	1020
KCH21AT	0.18 ~ 0.23	≤ 0.10	0.60 ~ 0.90	≤ 0.030	≤ 0.030	≥ 0.02		1021
KCH22AT	0.18 ~ 0.23	≤ 0.10	0.70 ~ 1.00	≤ 0.030	≤ 0.030	≥ 0.02	SWRCH22A	1022
KCH23AT	0.20 ~ 0.25	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.030	≥ 0.02		1023
KCH25AT	0.22 ~ 0.28	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.030	≥ 0.02		1025
KCH30AT	0.28 ~ 0.34	≤ 0.10	0.60 ~ 0.90	≤ 0.030	≤ 0.030	≥ 0.02		1030
KCH35AT	0.32 ~ 0.38	≤ 0.10	0.60 ~ 0.90	≤ 0.030	≤ 0.030	≥ 0.02		1035
KCH38AT	0.35 ~ 0.42	≤ 0.10	0.60 ~ 0.90	≤ 0.030	≤ 0.030	≥ 0.02		1038
KCH40AT	0.37 ~ 0.44	≤ 0.10	0.60 ~ 0.90	≤ 0.030	≤ 0.030	≥ 0.02		1040

· Cu is less than or equal to 0.30%, Ni is less than or equal to 0.20%, Cr is less than or equal to 0.20%

CC-rimmed steel (KCH x x R series) (KCH®)

CC-rimmed steel (%)					
Code	C	Si	Mn	P	S
KCH2R5	≤ 0.03	≤ 0.05	≤ 0.30	≤ 0.030	≤ 0.035
KCH4R6	≤ 0.05	≤ 0.05	≤ 0.30	≤ 0.030	≤ 0.035
KCH6R8	≤ 0.08	≤ 0.05	≤ 0.30	≤ 0.030	≤ 0.035
KCH8R10	≤ 0.10	≤ 0.05	0.20 ~ 0.50	≤ 0.030	≤ 0.035
KCH10R12	0.08 ~ 0.13	≤ 0.05	0.30 ~ 0.60	≤ 0.030	≤ 0.035
KCH12R15	0.10 ~ 0.15	≤ 0.05	0.30 ~ 0.60	≤ 0.030	≤ 0.035
KCH15R17	0.13 ~ 0.18	≤ 0.05	0.30 ~ 0.60	≤ 0.030	≤ 0.035
KCH17R20	0.15 ~ 0.20	≤ 0.05	0.30 ~ 0.60	≤ 0.030	≤ 0.035
KCH6R8N	≤ 0.08	≤ 0.05	0.20 ~ 0.50	≤ 0.030	0.025 ~ 0.040
KCH8R10N	≤ 0.10	≤ 0.05	0.20 ~ 0.50	≤ 0.030	0.025 ~ 0.040
KCH10R12N	0.08 ~ 0.13	≤ 0.05	0.30 ~ 0.60	≤ 0.030	0.025 ~ 0.040
KCH12R15N	0.10 ~ 0.15	≤ 0.05	0.30 ~ 0.60	≤ 0.030	0.025 ~ 0.040
KCH15R17N	0.13 ~ 0.18	≤ 0.05	0.30 ~ 0.60	≤ 0.030	0.025 ~ 0.040
KCH17R20N	0.15 ~ 0.20	≤ 0.05	0.30 ~ 0.60	≤ 0.030	0.025 ~ 0.040

· Cu is less than or equal to 0.30%, Ni is less than or equal to 0.20%, Cr is less than or equal to 0.20%

Manganese steel (KCH15 x x T, KCH13H x x T series) (KCH®)

Code	C	Si	Mn	P	S	Equivalent to JIS Standards	Equivalent to AISI Standards
KCH1524T	0.19 ~ 0.25	0.15 ~ 0.30	1.35 ~ 1.65	≤ 0.03	≤ 0.03	SWRCH24K	1524
KCH1527T	0.22 ~ 0.29	0.15 ~ 0.30	1.20 ~ 1.50	≤ 0.03	≤ 0.03	SWRCH27K	1527
KCH1536T	0.30 ~ 0.37	0.15 ~ 0.30	1.20 ~ 1.50	≤ 0.03	≤ 0.03		1536
KCH1541T	0.36 ~ 0.44	0.15 ~ 0.30	1.35 ~ 1.65	≤ 0.03	≤ 0.03	SWRCH41K	1541
KCH1330T	0.28 ~ 0.33	0.15 ~ 0.30	1.60 ~ 1.90	≤ 0.03	≤ 0.03		1330
KCH1335T	0.33 ~ 0.38	0.15 ~ 0.30	1.60 ~ 1.90	≤ 0.03	≤ 0.03		1335
KCH1340T	0.38 ~ 0.43	0.15 ~ 0.30	1.60 ~ 1.90	≤ 0.03	≤ 0.03		1340
KCH1345T	0.43 ~ 0.48	0.15 ~ 0.30	1.60 ~ 1.90	≤ 0.03	≤ 0.03		1345

· Cu is less than or equal to 0.30%, Ni is less than or equal to 0.20%, Cr is less than or equal to 0.20%

Boron steel (KCH x x BT series)

Boron steel gains even better hardenability by containing an appropriate amount of boron. It offers sufficient strength and toughness even when it contains a low amount of carbon and does not inhibit cold workability. It is mainly used in high strength bolts.

It is recommended that boron steel should be applied in a wider range of areas, taking advantage of its features.

Kobe Steel manufactures boron steel based on silicone-killed steel and manganese steel of KCH. Consultation for ordering boron steel shall be separately provided.

6-9) Cold heading quality wire rods with excellent mold life (KTCH®) Silicone-killed steel (KTCH x x K series)

Code	C	Si	Mn	P	S	Cr	B
KTCH25KT	0.23 ~ 0.28	0.15 ~ 0.30	0.30 ~ 0.60	≤ 0.030	≤ 0.030	Addition	Addition
KTCH35KT	0.33 ~ 0.38	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.030	≤ 0.030	Addition	Addition

· Cu is less than or equal to 0.30%, Ni is less than or equal to 0.20%, Cr is less than or equal to 0.20%

Aluminum-killed steel (KTCH x x A series)

Code	C	Si	Mn	P	S	Al	Cr	B
KTCH10AT	0.08 ~ 0.13	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.030	≥ 0.02	Addition	Addition
KTCH15AT	0.13 ~ 0.18	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.030	≥ 0.02	Addition	Addition
KTCH20AT	0.18 ~ 0.23	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.030	≥ 0.02	Addition	Addition

· Cu is less than or equal to 0.30%, Ni is less than or equal to 0.20%, Cr is less than or equal to 0.20%

6-10) Cold heading quality wire rods with excellent deformability (KECH®)

Code	C	Si	Mn	P	S	Cu	Ni	Cr
KECH01KTM	0.012 ~ 0.022	0.16 ~ 0.30	0.25 ~ 0.45	≤ 0.015	≤ 0.015	≤ 0.05	≤ 0.05	≤ 0.10

6-11) Steel for high-strength bolts (KNDS®)

Code	C	Si	Mn	P	S	Ni	Cr	Mo	V	Ti
KNDS2 (SCM435T)	0.32 ~ 0.39	0.15 ~ 0.35	0.55 ~ 0.95	≤ 0.010	≤ .010	-	0.85 ~ 1.25	0.15 ~ 0.30	-	Addition
KNDS4	0.37 ~ 0.42	≤ 0.10	0.40 ~ 0.60	≤ 0.010	≤ 0.010	0.45 ~ 0.65	0.85 ~ 1.15	0.90 ~ 1.10	Addition	Addition

6-12) Manganese steel for machine structures

1) KMN x x (for machine structure) (KMN®)

Code	C	Si	Mn	P	S	Mo
KMN27-A	0.27 ~ 0.32	0.15 ~ 0.35	1.35 ~ 1.65	≤ 0.03	≤ 0.03	-
KMN36-A	0.30 ~ 0.36	0.15 ~ 0.35	1.50 ~ 1.90	≤ 0.03	≤ 0.03	-
KMN36-B	0.30 ~ 0.36	0.15 ~ 0.35	1.35 ~ 1.65	≤ 0.03	≤ 0.03	-
KMN41	0.39 ~ 0.45	0.15 ~ 0.35	1.35 ~ 1.65	≤ 0.03	≤ 0.03	-
KMN41-A	0.39 ~ 0.45	0.15 ~ 0.35	1.35 ~ 1.65	≤ 0.03	≤ 0.03	Minor addition

2) KBC x x (for chain) (KBC®)

Code	C	Si	Mn	P	S	Cu
KBC50	0.20 ~ 0.25	0.15 ~ 0.35	1.20 ~ 1.50	≤ 0.030	≤ 0.035	–
KBC60	0.22 ~ 0.27	0.15 ~ 0.35	1.35 ~ 1.65	≤ 0.030	≤ 0.035	–
KBC60-A	0.20 ~ 0.27	0.15 ~ 0.35	1.30 ~ 1.60	≤ 0.030	≤ 0.035	0.30 ~ 0.50

(Reference) Performance of mechanical properties after normalizing.

Code	\bar{x} σ	Normalizing process						Conditions for heating treatment
		Yield point N/mm ²	Tensile strength N/mm ²	Elongation (G, L = 4√A) %	Drawing %	Charpy impact value J/cm ²	Brinell hardness HB	
KBC50	\bar{x}	393	569	34.6	69.7	216	167.6	900°C/60'/A.C
	σ	16	19	1.39	1.07	17	9.02	
KBC60	\bar{x}	424	623	34.5	69.6	204	174.3	
	σ	16	23	1.18	1.34	16	10.06	
KBC60-A	\bar{x}	456	669	31.8	66.8	194	191.9	
	σ	17	24	1.25	1.37	16	10.12	

Remarks: The above figures shall be the values from the test conducted after applying the heat treatment under the conditions indicated in the above table to a standard specimen of ϕ 25 mm specified in JIS G0303 (General Rules for Inspection of Steel).

6-13) Boron steel

Code of steel type	Main elements (%)					Steel types similar to JISG3508		
	C	Si	Mn	Ni	Cr			
Carbon boron steel	1018B	0.15 ~ 0.20	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.20	0.10 ~ 0.20	SWRCHB220	
	1018B-M	0.15 ~ 0.20	0.15 ~ 0.30	0.80 ~ 1.10	≤ 0.20	0.10 ~ 0.20	–	
	1021B	0.18 ~ 0.23	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.20	0.10 ~ 0.20	SWRCHB220 · 223	
	1021B-M	0.18 ~ 0.23	0.15 ~ 0.30	0.80 ~ 1.10	≤ 0.20	0.10 ~ 0.20	SWRCHB420 · 423	
	1021BA	0.18 ~ 0.23	≤ 0.10	0.80 ~ 1.10	≤ 0.20	0.10 ~ 0.20	–	
	1023B-M	0.20 ~ 0.25	0.15 ~ 0.30	0.70 ~ 1.00	≤ 0.20	0.10 ~ 0.20	SWRCHB323 · 320	
	1028B-M	0.23 ~ 0.32	≤ 0.15	0.75 ~ 1.00	≤ 0.20	0.35 ~ 0.45	–	
	1030B	0.28 ~ 0.33	0.15 ~ 0.30	0.70 ~ 1.00	≤ 0.20	0.10 ~ 0.20	SWRCHB331	
	1033B	0.30 ~ 0.36	0.15 ~ 0.30	0.70 ~ 1.00	≤ 0.20	0.10 ~ 0.20	SWRCHB334	
	1035B	0.32 ~ 0.38	0.15 ~ 0.30	0.70 ~ 1.00	≤ 0.20	0.10 ~ 0.20	SWRCHB334	
Manganese boron steel	1038B	0.35 ~ 0.41	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.20	0.10 ~ 0.20	SWRCHB237	
	1524B	0.20 ~ 0.25	0.15 ~ 0.30	1.35 ~ 1.65	≤ 0.20	0.10 ~ 0.20	SWRCHB823	
	1525B	0.23 ~ 0.28	0.15 ~ 0.30	0.90 ~ 1.20	≤ 0.20	0.10 ~ 0.20	SWRCHB526	
	1525B-M	0.23 ~ 0.28	0.15 ~ 0.30	1.20 ~ 1.50	≤ 0.20	0.10 ~ 0.20	SWRCHB726	
	1525BA	0.23 ~ 0.28	≤ 0.10	0.90 ~ 1.20	≤ 0.20	0.20 ~ 0.30	–	
Alloy boron steel	1536B	0.32 ~ 0.37	0.15 ~ 0.30	1.20 ~ 1.50	≤ 0.20	0.10 ~ 0.20	SWRCHB734 · 737	
	5040B	0.37 ~ 0.44	0.15 ~ 0.35	0.80 ~ 1.20	≤ 0.25	0.30 ~ 0.70	–	
	SNC22B-A	0.20 ~ 0.25	0.10 ~ 0.20	0.70 ~ 0.90	0.30 ~ 0.60	0.70 ~ 0.90	–	
	SCR22B-A	0.18 ~ 0.23	0.10 ~ 0.20	0.70 ~ 0.90	≤ 0.20	0.70 ~ 0.90	–	
	SCM27B	0.25 ~ 0.30	0.15 ~ 0.35	0.90 ~ 1.20	≤ 0.20	0.75 ~ 1.05	Mo0.15-0.30	–
	4037B	0.35 ~ 0.40	0.15 ~ 0.30	0.70 ~ 0.90	≤ 0.20	≤ 0.20	Mo0.20-0.30	–

P is less than or equal to 0.030%, S is less than or equal to 0.030%, Cu is less than or equal to 0.25%, B is greater than or equal to 0.0008%.

6-14) High manganese non-magnetic steel

Classification	Code	C	Si	Mn	P	S	Cu	Ni	Cr	N
Basic steel	PCD65	0.60 ~ 0.70	0.60 ~ 0.90	13.25 ~ 14.75	≤ 0.050	≤ 0.030	≤ 0.30	≤ 0.30	2.00 ~ 2.50	Addition
Steel for processing	PCD23	0.20 ~ 0.25	1.70 ~ 2.20	22.50 ~ 24.50	≤ 0.030	≤ 0.010	≤ 0.30	2.80 ~ 3.30	5.40 ~ 6.00	-
Steel for processing and corrosion resistant steel	PCD18	0.05 ~ 0.25	0.20 ~ 0.70	17.50 ~ 18.50	≤ 0.040	≤ 0.015	≤ 0.30	1.50 ~ 4.00	14.00 ~ 17.00	Addition
Steel for cutting	PCD40	0.35 ~ 0.45	0.50 ~ 0.90	7.80 ~ 9.30	≤ 0.040	0.17 ~ 0.23	1.80 ~ 2.30	5.50 ~ 6.30	4.70 ~ 5.50	-

6-15) Cold forging quality bars (KCF®)

Code	C	Si	Mn	P	S	Al
KCF6A	≤ 0.08	≤ 0.10	0.25 ~ 0.40	≤ 0.030	≤ 0.035	0.02 ~ 0.06
KCF8A	≤ 0.10	≤ 0.10	0.30 ~ 0.50	≤ 0.030	≤ 0.035	0.02 ~ 0.06
KCF10A	0.08 ~ 0.13	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.035	0.02 ~ 0.06
KCF12A	0.10 ~ 0.15	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.035	0.02 ~ 0.06
KCF15A	0.13 ~ 0.18	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.035	0.02 ~ 0.06
KCF17A	0.15 ~ 0.20	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.035	0.02 ~ 0.06
KCF20A	0.18 ~ 0.23	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.035	0.02 ~ 0.06

· Cu is less than or equal to 0.30%, Ni is less than or equal to 0.20%, Cr is less than or equal to 0.20%

6-16) Cold heading quality bars with excellent die life (KTCF®) Silicone-killed steel (KTCF x x K series)

Code	C	Si	Mn	P	S	Cr	B
KTCF25K	0.23 ~ 0.28	0.15 ~ 0.30	0.30 ~ 0.60	≤ 0.030	≤ 0.030	Addition	Addition
KTCF35K	0.33 ~ 0.38	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.030	≤ 0.030	Addition	Addition

· Cu is less than or equal to 0.30%, Ni is less than or equal to 0.20%, Cr is less than or equal to 0.20%

Aluminum-killed steel (KTCF x x A series)

Code	C	Si	Mn	P	S	Al	Cr	B
KTCF10A	0.08 ~ 0.13	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.030	≥ 0.02	Addition	Addition
KTCF15A	0.13 ~ 0.18	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.030	≥ 0.02	Addition	Addition
KTCF20A	0.18 ~ 0.23	≤ 0.10	0.30 ~ 0.60	≤ 0.030	≤ 0.030	≥ 0.02	Addition	Addition

· Cu is less than or equal to 0.30%, Ni is less than or equal to 0.20%, Cr is less than or equal to 0.20%

6-17) Hot forging quality non-refining steel (KNF®)

	Code	C	Si	Mn	P	S	Cr	V	Cu	Ni
Basic type	KNF40	0.37 ~ 0.43	0.15 ~ 0.25	0.70 ~ 1.00	≤ 0.030	≤ 0.035	≤ 0.20	0.04 ~ 0.15	≤ 0.30	≤ 0.20
	KNF43	0.40 ~ 0.46	0.15 ~ 0.25	0.70 ~ 1.00	≤ 0.030	≤ 0.035	≤ 0.20	0.04 ~ 0.15	≤ 0.30	≤ 0.20
	KNF45	0.42 ~ 0.48	0.15 ~ 0.25	0.70 ~ 1.00	≤ 0.030	≤ 0.035	≤ 0.20	0.04 ~ 0.15	≤ 0.30	≤ 0.20
	KNF48	0.45 ~ 0.51	0.15 ~ 0.25	0.70 ~ 1.00	≤ 0.030	≤ 0.035	≤ 0.20	0.04 ~ 0.15	≤ 0.30	≤ 0.20

Remarks1. CE (carbon equivalent) shall be set for each applicable part.

$$CE = C + 0.28Mn - 1.035S + 0.323Cr + 1.69V$$

2. In cases of semi free-cutting steel, S shall be the suffix of the code.

S: S0.040 to 0.070%

3. In cases of Mn high side (1.00 to 1.30), M shall be the suffix of the code.

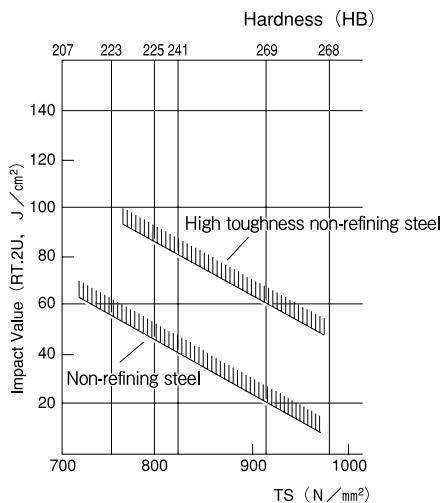
	Code	C	Si	Mn	P	S	Cr	Cu	Ni	V
Toughness-oriented type	KNF23M	0.20 ~ 0.25	0.15 ~ 0.35	1.20 ~ 1.70	≤ 0.030	0.040 ~ 0.070	0.20 ~ 0.60	≤ 0.30	≤ 0.20	0.06 ~ 0.20

Remarks1. CE (carbon equivalent) shall be set for each applicable part.

$$CE = C + 0.287Mn + 0.295Cr + 1.21V - 1.78S$$

2. Not applicable for high-frequency quenching

Relation between strength and toughness in non-refining steel



6-18) Free-cutting non-refining steel (bars) (KNR®)

Code	Chemical composition (%)								
	C	Si	Mn	P	S	Cu	Ni	Cr	V
KNR65	0.40 ~ 0.46	0.15 ~ 0.35	0.70 ~ 1.00	≤ 0.030	≤ 0.035	≤ 0.25	≤ 0.20	≤ 0.20	–
KNR70S (High toughness)	0.27 ~ 0.33	0.15 ~ 0.35	1.10 ~ 1.40	≤ 0.030	≤ 0.035	≤ 0.25	≤ 0.20	0.20 ~ 0.40	0.05 ~ 0.15
KNR75	0.40 ~ 0.46	0.15 ~ 0.35	1.00 ~ 1.30	≤ 0.030	≤ 0.035	≤ 0.25	≤ 0.20	≤ 0.20	0.05 ~ 0.15
KNR85	0.42 ~ 0.48	0.15 ~ 0.35	1.00 ~ 1.30	≤ 0.030	≤ 0.035	≤ 0.25	≤ 0.20	≤ 0.20	0.10 ~ 0.20
KNR90	0.47 ~ 0.53	0.15 ~ 0.35	1.00 ~ 1.30	≤ 0.030	≤ 0.035	≤ 0.25	≤ 0.20	≤ 0.20	0.10 ~ 0.20

Mechanical properties

Code	Mechanical properties (Product size: Less than φ 50) Reference value					
	T · S (N/mm ²)	Y · P (N/mm ²)	E · L (%)	R · A (%)	I · V (J/cm ²)	Hardness (HB)
KNR65	≥ 640	≥ 370	≥ 20	≥ 40	≥ 49	156 ~ 217
KNR70S (High toughness)	≥ 690	≥ 490	≥ 17	≥ 45	≥ 78	201 ~ 269
KNR75	≥ 740	≥ 490	≥ 17	≥ 40	≥ 59	201 ~ 269
KNR85	≥ 830	≥ 540	≥ 15	≥ 35	≥ 29	229 ~ 285
KNR90	≥ 880	≥ 570	≥ 14	≥ 30	≥ 20	235 ~ 321

Code	Mechanical properties (Product size: φ 50 or more) Reference value					
	T · S (N/mm ²)	Y · P (N/mm ²)	E · L (%)	R · A (%)	I · V (J/cm ²)	Hardness (HB)
KNR65	≥ 640	≥ 370	≥ 20	≥ 40	≥ 39	156 ~ 217
KNR75	≥ 740	≥ 440	≥ 17	≥ 35	≥ 39	201 ~ 269
KNR85	≥ 830	≥ 490	≥ 15	≥ 30	≥ 20	229 ~ 285
KNR90	≥ 880	≥ 530	≥ 13	≥ 25	≥ 20	235 ~ 321

6-19) Tool steel

Code	C	Si	Mn	P	S	Cr	V
KA40	0.38 ~ 0.43	0.20 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.030	0.50 ~ 0.70	0.07 ~ 0.15
KA45	0.43 ~ 0.50	0.20 ~ 0.35	0.60 ~ 0.90	≤ 0.030	≤ 0.030	0.50 ~ 0.70	0.07 ~ 0.15
KA70	0.65 ~ 0.75	0.15 ~ 0.30	0.60 ~ 0.90	≤ 0.030	≤ 0.030	≤ 0.15	0.10 ~ 0.20

6-20) Steel for gear

1) High strength steel for gears (KKG®)

Steel type	C	Si	Mn	P	S	Cu	Ni	Cr	Mo
KKG3	0.13 ~ 0.19	≤ 0.15	0.55 ~ 0.90	≤ 0.030	≤ 0.030	≤ 0.30	≤ 0.25	0.85 ~ 1.25	0.35 ~ 0.45
KKG4	0.17 ~ 0.23	≤ 0.15	0.55 ~ 0.90	≤ 0.030	≤ 0.030	≤ 0.30	≤ 0.25	0.85 ~ 1.25	0.35 ~ 0.45
KKG8	0.17 ~ 0.23	≤ 0.15	0.55 ~ 0.90	≤ 0.030	≤ 0.030	≤ 0.30	≤ 0.25	0.85 ~ 1.25	0.75 ~ 0.85

2) Steel for high strength low alloy steel die gear

Steel type	C	Si	Mn	P	S	Cu	Ni	Cr	Mo
KMNC418H	0.15 ~ 0.21	≤ 0.15	1.35 ~ 1.65	≤ 0.012	0.005 ~ 0.020	≤ 0.30	≤ 0.25	0.90 ~ 1.20	≤ 0.10

3) Steel for gear with high surface-pressure resistance

Steel type	C	Si	Mn	P	S	Cu	Ni	Cr	Mo
KSCM418H	0.15 ~ 0.21	0.40 ~ 0.60	0.30 ~ 0.60	≤ 0.015	0.010 ~ 0.020	≤ 0.30	≤ 0.25	1.20 ~ 1.60	0.40 ~ 0.50

6-21) Free-cutting steel (KGMS®)

Category	Code	C	Mn	P	S	Equivalent to JIS
Sulfur free-cutting steel	1116A (KFS103)	0.13 ~ 0.20	1.00 ~ 1.40	≤ 0.070	0.16 ~ 0.23	
	1117	0.14 ~ 0.20	1.00 ~ 1.30	≤ 0.040	0.08 ~ 0.13	SUM31
	1137	0.32 ~ 0.39	1.35 ~ 1.65	≤ 0.040	0.08 ~ 0.13	SUM41
	1141	0.37 ~ 0.45	1.35 ~ 1.65	≤ 0.040	0.08 ~ 0.13	SUM42
	1144	0.40 ~ 0.48	1.35 ~ 1.65	≤ 0.040	0.24 ~ 0.33	SUM43
Sulfur compound free-cutting steel	1215	≤ 0.09	0.75 ~ 1.05	0.04 ~ 0.09	0.26 ~ 0.35	SUM23
	1215A (KFS201A)	≤ 0.09	0.90 ~ 1.35	0.04 ~ 0.09	0.28 ~ 0.35	
Lead-free free-cutting steel	KGMS1215	≤ 0.09	1.40 ~ 1.60	0.040 ~ 0.090	0.34 ~ 0.46	

Category	Code	Basic composition	M	S
Semi free-cutting steel	SXXCS1	S10C ~ S25C	0.50 ~ 0.90	0.04 ~ 0.07
		S28C ~ S58C	0.70 ~ 1.10	0.04 ~ 0.07
	SXXCS2	S10C ~ S25C	0.60 ~ 1.00	0.08 ~ 0.12
		S28C ~ S58C	0.80 ~ 0.12	0.08 ~ 0.12

7 Rolling size and shape

Wire rods

Diameter (mm)	Diameter (mm)	Diameter (mm)	Diameter (mm)
5.5	11.0	18.3	30.0
5.7	11.5	18.7	31.0
6.0	12.0	19.0	32.0
6.1	12.1	19.5	33.0
6.4	12.3	20.0	34.0
6.5	12.5	20.3	35.0
7.0	12.7	20.6	36.0
7.3	13.0	21.0	37.0
7.5	13.5	21.5	38.0
7.6	14.0	22.0	39.0
7.8	14.3	22.4	40.0
8.0	15.0	22.6	42.0
8.3	15.2	22.8	43.0
8.7	15.5	23.0	44.0
8.9	15.7	23.5	45.0
9.0	16.0	24.0	46.0
9.5	16.3	25.0	52.0
9.7	16.7	25.4	55.0
10.0	17.0	26.0	
10.3	17.5	27.0	
10.5	17.9	28.0	
10.7	18.0	29.0	

AISI. Bar Tolerance

Size mm (in.)	Size tolerance mm (in.)		Ovality mm (in.)
	+	-	
≤ 7.94 (5/16)	0.13 (0.005)	0.13 (0.005)	≤ 0.20 (0.008)
More than 7.94, but no more than 11.11 (5/16 to 7/16)	0.15 (0.006)	0.15 (0.006)	≤ 0.23 (0.009)
More than 11.11, but no more than 15.88 (7/16 to 5/8)	0.18 (0.007)	0.18 (0.007)	≤ 0.25 (0.010)
More than 15.88, but no more than 22.22 (5/8 to 7/8)	0.20 (0.008)	0.20 (0.007)	≤ 0.30 (0.012)
More than 22.22, but no more than 25.40 (7/8 to 1)	0.23 (0.009)	0.23 (0.009)	≤ 0.33 (0.013)
More than 25.40, but no more than 28.58 (1 to 1-1/8)	0.25 (0.010)	0.25 (0.010)	≤ 0.38 (0.015)
More than 28.58, but no more than 31.75 (1-1/8 to 1-1/4)	0.28 (0.011)	0.28 (0.011)	≤ 0.41 (0.016)
More than 31.75, but no more than 34.93 (1-1/4 to 1-3/8)	0.30 (0.012)	0.30 (0.012)	≤ 0.46 (0.018)
More than 34.93, but no more than 38.10 (1-3/8 to 1-1/2)	0.36 (0.014)	0.36 (0.014)	≤ 0.53 (0.021)
More than 38.10, but no more than 50.80 (1-1/2 to 2)	0.40 (1/64)	0.40 (1/64)	≤ 0.58 (0.023)
More than 50.80, but no more than 63.50 (2 to 2-1/2)	0.79 (1/32)	0	≤ 0.58 (0.023)

Shape

Plant	Dimensions (mm)	Specifications for coil shape (mm)			Standard coil weight (kg)
		Inner diameter (min.)	Outer diameter (max.)	Height (max.)	
No.7 Wire rod Mill	5.5 ~ 22.0	850	1,450	1,000	1,000
				1,750	2,000
No.8 Wire rod Mill	5.5 ~ 18.0 (Small diameter)	750	1,350	2,000	2,000
	8.0 ~ 18.0 (Large diameter)	850	1,450	1,750	2,000
Bar Mill	29.0 ~ 60.0	900	1,450	1,300	2,000
				1,300	2,000
				1,600	3,000
				1,700	3,500

Bars

Diameter mm	Cross-section cm ²	Unit weight kg/m	Diameter mm	Cross-section cm ²	Unit weight kg/m
18	2.545	2.00	48	18.10	14.2
19	2.835	2.23	50	19.64	15.4
20	3.142	2.47	52	21.24	16.7
21	3.464	2.72	53	22.06	17.3
22	3.801	2.98	55	23.76	18.7
23	4.155	3.26	57	25.52	20.0
24	4.524	3.55	58	26.42	20.8
25	4.909	3.85	60	28.27	22.2
26	5.309	4.17	62	30.19	23.7
27	5.726	4.49	63	31.17	24.5
28	6.158	4.83	64	32.17	25.3
29	6.605	5.18	65	33.18	26.0
30	7.069	5.55	66	34.21	26.8
31	7.548	5.92	67	35.26	27.7
32	8.042	6.31	68	36.32	28.5
33	8.553	6.72	70	38.48	30.2
34	9.079	7.13	72	40.72	32.0
35	9.621	7.55	73	41.85	32.8
36	10.18	7.99	74	43.01	33.8
37	10.75	8.44	75	44.18	34.7
38	11.34	8.90	78	47.78	37.5
39	11.95	9.38	80	50.27	39.5
40	12.57	9.87	83	54.11	42.5
41	13.20	10.4	85	56.75	44.5
42	13.85	10.9	88	60.82	47.7
43	14.52	11.42	90	63.62	49.9
44	15.21	11.9	95	70.88	55.6
45	15.90	12.5	100	78.54	61.7
46	16.62	13.0	105	86.59	68.0
47	17.35	13.6			

Length: ϕ 18 to ϕ 105 m 3.5 to 8 m Size tolerance: \pm 1.5%, Min. 0.4 mm

③ Table of composition of SAE (AISI) iron and steel

(1) How to assign SAE No. (Quoted from SAE J402 NOV93)

SAE code	Steel grade
	Carbon steel
10xx	Carbon steel without added sulfur Mn 1.00% at max.
11xx	Sulfur free-cutting steel
12xx	Phosphorus and sulfur free-cutting steel
15xx	Carbon steel without added sulfur Mn more than 1.00% at max.
	Alloy steel
13xx	Manganese steel
23xx	Nickel steel
25xx	Nickel steel
31xx	Nickel chrome steel
32xx	Nickel chrome steel
33xx	Nickel chrome steel
34xx	Nickel chrome steel
40xx	Molybdenum steel
41xx	Chromium molybdenum steel
43xx	Nickel chromium molybdenum steel
44xx	Molybdenum steel
46xx	Nickel molybdenum steel
47xx	Nickel chromium molybdenum steel
48xx	Nickel molybdenum steel
50xx	Chrome steel
51xx	Chrome steel
50xxx	Chrome steel
51xxx	Chrome steel
52xxx	Chrome steel
61xx	Chrome vanadium steel
71xxx	Tungsten chrome steel
72xx	Tungsten chrome steel
81xx	Nickel chromium molybdenum steel
86xx	Nickel chromium molybdenum steel
87xx	Nickel chromium molybdenum steel
88xx	Nickel chromium molybdenum steel
92xx	Silicone manganese steel
93xx	Nickel chromium molybdenum steel
94xx	Nickel chromium molybdenum steel
97xx	Nickel chromium molybdenum steel
98xx	Nickel chromium molybdenum steel
	Carbon steel, alloy steel
xxBxx	B represents boron steel.
xxLxx	L represents lead-contained steel.
xxVxx	V represents vanadium steel.

(2) Carbon steel (Quoted from SAE J403 DEC2009)

a. Carbon steel

SAE No. (AISI)	Chemical composition %		SAE No. (AISI)	Chemical composition %	
	C	Mn		C	Mn
1002	0.02 ~ 0.04	0.35 Max	1037	0.32 ~ 0.38	0.70 ~ 1.00
1003	0.02 ~ 0.06	0.35 Max	1038	0.35 ~ 0.42	0.60 ~ 0.90
1004	0.02 ~ 0.08	0.35 Max	1039	0.37 ~ 0.44	0.70 ~ 1.00
1005	0.06 Max	0.35 Max	1040	0.37 ~ 0.44	0.60 ~ 0.90
1006	0.08 Max	0.25 ~ 0.40	1042	0.40 ~ 0.47	0.60 ~ 0.90
1007	0.02 ~ 0.10	0.50 Max	1043	0.40 ~ 0.47	0.70 ~ 1.00
1008	0.10 Max	0.30 ~ 0.50	1044	0.43 ~ 0.50	0.30 ~ 0.60
1009	0.15 Max	0.60 Max	1045	0.43 ~ 0.50	0.60 ~ 0.90
1010	0.08 ~ 0.13	0.30 ~ 0.60	1046	0.43 ~ 0.50	0.70 ~ 1.00
1012	0.10 ~ 0.15	0.30 ~ 0.60	1049	0.46 ~ 0.53	0.60 ~ 0.90
1013	0.11 ~ 0.16	0.30 ~ 0.60	1050	0.48 ~ 0.55	0.60 ~ 0.90
1015	0.13 ~ 0.18	0.30 ~ 0.60	1053	0.48 ~ 0.55	0.70 ~ 1.00
1016	0.13 ~ 0.18	0.60 ~ 0.90	1055	0.50 ~ 0.60	0.60 ~ 0.90
1017	0.15 ~ 0.20	0.30 ~ 0.60	1060	0.55 ~ 0.65	0.60 ~ 0.90
1018	0.15 ~ 0.20	0.60 ~ 0.90	1065	0.60 ~ 0.70	0.60 ~ 0.90
1019	0.15 ~ 0.20	0.70 ~ 1.00	1070	0.65 ~ 0.75	0.60 ~ 0.90
1020	0.18 ~ 0.23	0.30 ~ 0.60	1074	0.70 ~ 0.80	0.50 ~ 0.80
1021	0.18 ~ 0.23	0.60 ~ 0.90	1075	0.70 ~ 0.80	0.40 ~ 0.70
1022	0.18 ~ 0.23	0.70 ~ 1.00	1078	0.72 ~ 0.85	0.30 ~ 0.60
1023	0.20 ~ 0.25	0.30 ~ 0.60	1080	0.75 ~ 0.88	0.60 ~ 0.90
1025	0.22 ~ 0.28	0.30 ~ 0.60	1084	0.80 ~ 0.93	0.60 ~ 0.90
1026	0.22 ~ 0.28	0.60 ~ 0.90	1085	0.80 ~ 0.93	0.70 ~ 1.00
1029	0.25 ~ 0.31	0.60 ~ 0.90	1086	0.80 ~ 0.93	0.30 ~ 0.50
1030	0.28 ~ 0.34	0.60 ~ 0.90	1090	0.85 ~ 0.98	0.60 ~ 0.90
1033	0.30 ~ 0.36	0.70 ~ 1.00	1095	0.90 ~ 1.03	0.30 ~ 0.50
1035	0.32 ~ 0.38	0.60 ~ 0.90			

b. High manganese carbon steel

SAE No. (AISI)	Chemical composition %	
	C	Mn
1515	0.13 ~ 0.18	1.10 ~ 1.40
1521	0.18 ~ 0.23	1.10 ~ 1.40
1522	0.18 ~ 0.24	1.10 ~ 1.40
1524	0.19 ~ 0.25	1.35 ~ 1.65
1526	0.22 ~ 0.29	1.10 ~ 1.40
1527	0.22 ~ 0.29	1.20 ~ 1.50
1536	0.30 ~ 0.37	1.20 ~ 1.50
1541	0.36 ~ 0.44	1.35 ~ 1.65
1547	0.43 ~ 0.51	1.35 ~ 1.65
1548	0.44 ~ 0.52	1.10 ~ 1.40
1552	0.47 ~ 0.55	1.20 ~ 1.50
1566	0.60 ~ 0.71	0.85 ~ 1.15

Remarks 1. P is less than or equal to 0.030% and S is less than or equal to 0.050% throughout all of the types.

2. Specifications of impurities shall be determined through arrangements between the parties involved in the delivery. However, the upper limits of Cu, Ni, Cr, and Mo shall be 0.35%, 0.25%, 0.20%, and 0.06%, respectively, unless otherwise specified in the standards.

3. Lead: 0.15 to 0.35% of lead can be added to carbon steel to increase the cutting properties.

These steel types can be identified by an "L" inserted between the second and third numeric characters in the code, for example 10L45.

4. Boron: 0.0005 to 0.003% of boron can be added to fine standard killed carbon steel to increase the hardenability.

These steel types can be identified by an "B" inserted between the second and third numeric characters in the code, for example 10B46.

5. Si: Bars, semi-finished products – When a range or limit of Si is required, the following range shall be applied in general.

Less than or equal to 0.10%, 0.10 to 0.20%, 0.15 to 0.35%, 0.20 to 0.40%, or 0.30 to 0.60%

Wire rods – When Si is specified in carbon steel without added sulfur, the following range and limit shall be applied in general.

Less than or equal to 0.10%, 0.07 to 0.15%, 0.10 to 0.20%, 0.15 to 0.35%, 0.20 to 0.40%, 0.30 to 0.60%

(3) Free-cutting steel (Quoted from SAE J403 DEC2009)

a. Sulfur free-cutting steel

SAE No. (AISI)	Chemical composition %				
	C	Mn	P	S	V
1117	0.14 ~ 0.20	1.00 ~ 1.30	0.030	0.08 ~ 0.13	-
1118	0.14 ~ 0.20	1.30 ~ 1.60	0.030	0.08 ~ 0.13	-
1126	0.23 ~ 0.29	0.70 ~ 1.00	0.030	0.08 ~ 0.13	-
1132	0.27 ~ 0.34	1.35 ~ 1.65	0.030	0.08 ~ 0.13	-
1137	0.32 ~ 0.39	1.35 ~ 1.65	0.030	0.08 ~ 0.13	-
1138	0.34 ~ 0.40	0.70 ~ 1.00	0.030	0.08 ~ 0.13	-
1140	0.37 ~ 0.44	0.70 ~ 1.00	0.030	0.08 ~ 0.13	-
1141	0.37 ~ 0.45	1.35 ~ 1.65	0.030	0.08 ~ 0.13	-
11V41	0.37 ~ 0.45	1.35 ~ 1.65	0.030	0.08 ~ 0.13	0.04 ~ 0.08
1144	0.40 ~ 0.48	1.35 ~ 1.65	0.030	0.24 ~ 0.33	-
1146	0.42 ~ 0.49	0.70 ~ 1.00	0.030	0.08 ~ 0.13	-
1151	0.48 ~ 0.55	0.70 ~ 0.90	0.030	0.08 ~ 0.13	-

b. Phosphorus and sulfur free-cutting steel

SAE No. (AISI)	Chemical composition %				
	C (max)	Mn	P	S	Pb
1212	0.13	0.70 ~ 1.00	0.07 ~ 0.12	0.16 ~ 0.23	-
1213	0.13	0.70 ~ 1.00	0.07 ~ 0.12	0.24 ~ 0.33	-
1215	0.09	0.75 ~ 1.05	0.04 ~ 0.09	0.26 ~ 0.35	-
12L14	0.15	0.85 ~ 1.15	0.04 ~ 0.09	0.26 ~ 0.35	0.15 ~ 0.35

Remarks 1. Specifications of impurities shall be determined through arrangements between the parties involved in the delivery.

However, the upper limits of Cu, Ni, Cr, and Mo shall be 0.35%, 0.25%, 0.20%, and 0.06%, respectively, unless otherwise specified in the standards.

2. Lead: 0.15 to 0.35% of lead can be added to carbon steel to increase the cutting properties.

These steel types can be identified by an "L" inserted between the second and third numeric characters in the code, for example 11L37.

3. Si: Si is not added to 12xx series steel from the viewpoint of cutting properties.

(4) Alloy steel (Quoted from SAE J404 APR94)

SAE No. (AISI)	Chemical composition ^{a)} %								
	C	Mn	P	S	Si	Ni	Cr	Mo	V
1335	0.33 ~ 0.38	1.60 ~ 1.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	—	—	—
1340	0.38 ~ 0.43	1.60 ~ 1.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	—	—	—
4023	0.20 ~ 0.25	0.70 ~ 0.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	—	0.20 ~ 0.30	—
4027	0.25 ~ 0.30	0.70 ~ 0.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	—	0.20 ~ 0.30	—
4037	0.35 ~ 0.40	0.70 ~ 0.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	—	0.20 ~ 0.30	—
4047	0.45 ~ 0.50	0.70 ~ 0.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	—	0.20 ~ 0.30	—
4118	0.18 ~ 0.23	0.70 ~ 0.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	0.40 ~ 0.60	0.08 ~ 0.15	—
4120	0.18 ~ 0.23	0.90 ~ 1.20	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	0.40 ~ 0.60	0.13 ~ 0.20	—
4130	0.28 ~ 0.33	0.40 ~ 0.60	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	0.80 ~ 1.10	0.15 ~ 0.25	—
4137	0.35 ~ 0.40	0.70 ~ 0.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	0.80 ~ 1.10	0.15 ~ 0.25	—
4140	0.38 ~ 0.43	0.75 ~ 1.00	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	0.80 ~ 1.10	0.15 ~ 0.25	—
4142	0.40 ~ 0.45	0.75 ~ 1.00	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	0.80 ~ 1.10	0.15 ~ 0.25	—
4145	0.43 ~ 0.48	0.75 ~ 1.00	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	0.80 ~ 1.10	0.15 ~ 0.25	—
4150	0.48 ~ 0.53	0.75 ~ 1.00	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	0.80 ~ 1.10	0.15 ~ 0.25	—
4320	0.17 ~ 0.22	0.45 ~ 0.65	≤ 0.030	≤ 0.040	0.15 ~ 0.35	1.65 ~ 2.00	0.40 ~ 0.60	0.20 ~ 0.30	—
4340	0.38 ~ 0.43	0.60 ~ 0.80	≤ 0.030	≤ 0.040	0.15 ~ 0.35	1.65 ~ 2.00	0.70 ~ 0.90	0.20 ~ 0.30	—
E4340 ^{b)}	0.38 ~ 0.43	0.65 ~ 0.85	≤ 0.025	≤ 0.025	0.15 ~ 0.35	1.65 ~ 2.00	0.70 ~ 0.90	0.20 ~ 0.30	—
4620	0.17 ~ 0.22	0.45 ~ 0.65	≤ 0.030	≤ 0.040	0.15 ~ 0.35	1.65 ~ 2.00	—	0.20 ~ 0.30	—
4820	0.18 ~ 0.23	0.50 ~ 0.70	≤ 0.030	≤ 0.040	0.15 ~ 0.35	3.25 ~ 3.75	—	0.20 ~ 0.30	—
50B46 ^{c)}	0.44 ~ 0.49	0.75 ~ 1.00	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	0.20 ~ 0.35	—	—
5120	0.17 ~ 0.22	0.70 ~ 0.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	0.70 ~ 0.90	—	—
5130	0.28 ~ 0.33	0.70 ~ 0.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	0.80 ~ 1.10	—	—
5132	0.30 ~ 0.35	0.60 ~ 0.80	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	0.75 ~ 1.00	—	—
5140	0.38 ~ 0.43	0.70 ~ 0.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	0.75 ~ 0.90	—	—
5150	0.48 ~ 0.53	0.70 ~ 0.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	0.70 ~ 0.90	—	—
5160	0.56 ~ 0.64	0.75 ~ 1.00	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	0.70 ~ 0.90	—	—
51B60 ^{c)}	0.56 ~ 0.64	0.75 ~ 1.00	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	0.70 ~ 0.90	—	—
E52100 ^{b)}	0.98 ~ 1.10	0.25 ~ 0.45	≤ 0.025	≤ 0.025	0.15 ~ 0.35	—	1.30 ~ 1.60	—	—
6150	0.48 ~ 0.53	0.70 ~ 0.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	—	0.80 ~ 1.10	—	At least 0.15
8615	0.13 ~ 0.18	0.70 ~ 0.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	0.40 ~ 0.70	0.40 ~ 0.60	0.15 ~ 0.25	—
8617	0.15 ~ 0.20	0.70 ~ 0.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	0.40 ~ 0.70	0.40 ~ 0.60	0.15 ~ 0.25	—
8620	0.18 ~ 0.23	0.70 ~ 0.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	0.40 ~ 0.70	0.40 ~ 0.60	0.15 ~ 0.25	—
8622	0.20 ~ 0.25	0.70 ~ 0.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	0.40 ~ 0.70	0.40 ~ 0.60	0.15 ~ 0.25	—
8630	0.28 ~ 0.33	0.70 ~ 0.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	0.40 ~ 0.70	0.40 ~ 0.60	0.15 ~ 0.25	—
8640	0.38 ~ 0.43	0.75 ~ 1.00	≤ 0.030	≤ 0.040	0.15 ~ 0.35	0.40 ~ 0.70	0.40 ~ 0.60	0.15 ~ 0.25	—
8645	0.43 ~ 0.48	0.75 ~ 1.00	≤ 0.030	≤ 0.040	0.15 ~ 0.35	0.40 ~ 0.70	0.40 ~ 0.60	0.15 ~ 0.25	—
8720	0.18 ~ 0.23	0.70 ~ 0.90	≤ 0.030	≤ 0.040	0.15 ~ 0.35	0.40 ~ 0.70	0.40 ~ 0.60	0.20 ~ 0.30	—
8822	0.20 ~ 0.25	0.75 ~ 1.00	≤ 0.030	≤ 0.040	0.15 ~ 0.35	0.40 ~ 0.70	0.40 ~ 0.60	0.30 ~ 0.40	—
9254	0.51 ~ 0.59	0.60 ~ 0.80	≤ 0.030	≤ 0.040	1.20 ~ 1.60	≤ 0.25	0.60 ~ 0.80	—	—
9259	0.56 ~ 0.64	0.75 ~ 1.00	≤ 0.030	≤ 0.040	0.70 ~ 1.10	—	0.45 ~ 0.65	—	—
9260	0.56 ~ 0.64	0.75 ~ 1.00	≤ 0.030	≤ 0.040	1.80 ~ 2.20	—	—	—	—

Note)

a) If no composition is specified in the standards, 0.35% or less of Cu, 0.25% or less of Ni, 0.20% or less of Cr and 0.06%, or less of Mo is allowed.

b) Electric furnace steel

c) Boron: 0.0005 to 0.003%

(5) Composition of H-section steel and hardenability of carbon steel and alloy steel

(SAE J1268 MAY95)

a. H-section steel of carbon steel and carbon boron steel

SAE No. (AISI)	Chemical composition %				
	C	Mn	Si	P ₁ max ²	Si max ²
1038H	0.34 ~ 0.43	0.50 ~ 1.00	0.15 ~ 0.35	0.030	0.050
1045H	0.42 ~ 0.51	0.50 ~ 1.00	0.15 ~ 0.35	0.030	0.050
1522H	0.17 ~ 0.25	1.00 ~ 1.50	0.15 ~ 0.35	0.030	0.050
1524H	0.18 ~ 0.26	1.25 ~ 1.75	0.15 ~ 0.35	0.030	0.050
1526H	0.21 ~ 0.30	1.00 ~ 1.50	0.15 ~ 0.35	0.030	0.050
1541H	0.35 ~ 0.45	1.25 ~ 1.75	0.15 ~ 0.35	0.030	0.050
15B21H ¹	0.17 ~ 0.24	0.70 ~ 1.20	0.15 ~ 0.35	0.030	0.050
15B28H ¹	0.25 ~ 0.34	1.00 ~ 1.50	0.15 ~ 0.35	0.030	0.050
15B30H ¹	0.27 ~ 0.35	0.70 ~ 1.20	0.15 ~ 0.35	0.030	0.050
15B35H ¹	0.31 ~ 0.39	0.70 ~ 1.20	0.15 ~ 0.35	0.030	0.050
15B37H ¹	0.30 ~ 0.39	1.00 ~ 1.50	0.15 ~ 0.35	0.030	0.050
15B41H ¹	0.35 ~ 0.45	1.25 ~ 1.75	0.15 ~ 0.35	0.030	0.050
15B48H ¹	0.43 ~ 0.53	1.00 ~ 1.50	0.15 ~ 0.35	0.030	0.050
15B62H ¹	0.54 ~ 0.67	1.00 ~ 1.50	0.40 ~ 0.60	0.030	0.050

Remarks 1. This steel contains 0.0005 to 0.003% of B.

b. H-section steel of alloy steel

SAE No. (AISI)	Chemical composition %						
	C	Mn	Si	Ni	Cr	Mo	V
1330H	0.27 ~ 0.33	1.45 ~ 2.05	0.15 ~ 0.35	—	—	—	—
1335H	0.32 ~ 0.38	1.45 ~ 2.05	0.15 ~ 0.35	—	—	—	—
1340H	0.37 ~ 0.44	1.45 ~ 2.05	0.15 ~ 0.35	—	—	—	—
1345H	0.42 ~ 0.49	1.45 ~ 2.05	0.15 ~ 0.35	—	—	—	—
4027H	0.24 ~ 0.30	0.60 ~ 1.00	0.15 ~ 0.35	—	—	0.20 ~ 0.30	—
4028H ²	0.24 ~ 0.30	0.60 ~ 1.00	0.15 ~ 0.35	—	—	0.20 ~ 0.30	—
4032H	0.29 ~ 0.35	0.60 ~ 1.00	0.15 ~ 0.35	—	—	0.20 ~ 0.30	—
4037H	0.34 ~ 0.41	0.60 ~ 1.00	0.15 ~ 0.35	—	—	0.20 ~ 0.30	—
4042H	0.39 ~ 0.46	0.60 ~ 1.00	0.15 ~ 0.35	—	—	0.20 ~ 0.30	—
4047H	0.44 ~ 0.51	0.60 ~ 1.00	0.15 ~ 0.35	—	—	0.20 ~ 0.30	—
4118H	0.17 ~ 0.23	0.60 ~ 1.00	0.15 ~ 0.35	—	0.30 ~ 0.70	0.08 ~ 0.15	—
4120H	0.18 ~ 0.23	0.90 ~ 1.20	0.15 ~ 0.35	—	0.40 ~ 0.60	0.13 ~ 0.20	—
4130H	0.27 ~ 0.33	0.30 ~ 0.70	0.15 ~ 0.35	—	0.75 ~ 1.20	0.15 ~ 0.25	—
4135H	0.32 ~ 0.38	0.60 ~ 1.00	0.15 ~ 0.35	—	0.75 ~ 1.20	0.15 ~ 0.25	—
4137H	0.34 ~ 0.41	0.60 ~ 1.00	0.15 ~ 0.35	—	0.75 ~ 1.20	0.15 ~ 0.25	—
4140H	0.37 ~ 0.44	0.65 ~ 1.10	0.15 ~ 0.35	—	0.75 ~ 1.20	0.15 ~ 0.25	—
4142H	0.39 ~ 0.46	0.65 ~ 1.10	0.15 ~ 0.35	—	0.75 ~ 1.20	0.15 ~ 0.25	—
4145H	0.42 ~ 0.49	0.65 ~ 1.10	0.15 ~ 0.35	—	0.75 ~ 1.20	0.15 ~ 0.25	—
4147H	0.44 ~ 0.51	0.65 ~ 1.10	0.15 ~ 0.35	—	0.75 ~ 1.20	0.15 ~ 0.25	—
4150H	0.47 ~ 0.54	0.65 ~ 1.10	0.15 ~ 0.35	—	0.75 ~ 1.20	0.15 ~ 0.25	—
4161H	0.55 ~ 0.65	0.65 ~ 1.10	0.15 ~ 0.35	—	0.65 ~ 0.95	0.25 ~ 0.35	—
4320H	0.17 ~ 0.23	0.40 ~ 0.70	0.15 ~ 0.35	1.55 ~ 2.00	0.35 ~ 0.65	0.20 ~ 0.30	—
4340H	0.37 ~ 0.44	0.55 ~ 0.90	0.15 ~ 0.35	1.55 ~ 2.00	0.65 ~ 0.95	0.20 ~ 0.30	—
E4340H ¹	0.37 ~ 0.44	0.60 ~ 0.95	0.15 ~ 0.35	1.55 ~ 2.00	0.65 ~ 0.95	0.20 ~ 0.30	—
4620H	0.17 ~ 0.23	0.35 ~ 0.75	0.15 ~ 0.35	1.55 ~ 2.00	—	0.20 ~ 0.30	—
4718H	0.15 ~ 0.21	0.60 ~ 0.95	0.15 ~ 0.35	0.85 ~ 1.25	0.30 ~ 0.60	0.30 ~ 0.40	—
4720H	0.17 ~ 0.23	0.45 ~ 0.75	0.15 ~ 0.35	0.85 ~ 1.25	0.30 ~ 0.60	0.15 ~ 0.25	—
4815H	0.12 ~ 0.18	0.30 ~ 0.70	0.15 ~ 0.35	3.20 ~ 3.80	—	0.20 ~ 0.30	—
4817H	0.14 ~ 0.20	0.30 ~ 0.70	0.15 ~ 0.35	3.20 ~ 3.80	—	0.20 ~ 0.30	—
4820H	0.17 ~ 0.23	0.40 ~ 0.80	0.15 ~ 0.35	3.20 ~ 3.80	—	0.20 ~ 0.30	—
50B40H ³	0.37 ~ 0.44	0.65 ~ 1.10	0.15 ~ 0.35	—	0.30 ~ 0.70	—	—
50B44H ³	0.42 ~ 0.49	0.65 ~ 1.10	0.15 ~ 0.35	—	0.30 ~ 0.70	—	—
5046H	0.43 ~ 0.50	0.65 ~ 1.10	0.15 ~ 0.35	—	0.13 ~ 0.43	—	—
50B46H ³	0.43 ~ 0.50	0.65 ~ 1.10	0.15 ~ 0.35	—	0.13 ~ 0.43	—	—
50B50H ³	0.47 ~ 0.54	0.65 ~ 1.10	0.15 ~ 0.35	—	0.30 ~ 0.70	—	—
50B60H ³	0.55 ~ 0.65	0.65 ~ 1.10	0.15 ~ 0.35	—	0.30 ~ 0.70	—	—
5120H	0.17 ~ 0.23	0.60 ~ 1.00	0.15 ~ 0.35	—	0.60 ~ 1.00	—	—
5130H	0.27 ~ 0.33	0.60 ~ 1.00	0.15 ~ 0.35	—	0.75 ~ 1.20	—	—
5132H	0.29 ~ 0.35	0.50 ~ 0.90	0.15 ~ 0.35	—	0.65 ~ 1.10	—	—
5135H	0.32 ~ 0.38	0.50 ~ 0.90	0.15 ~ 0.35	—	0.70 ~ 1.15	—	—
5140H	0.37 ~ 0.44	0.60 ~ 1.00	0.15 ~ 0.35	—	0.60 ~ 1.00	—	—
5147H	0.45 ~ 0.52	0.60 ~ 1.05	0.15 ~ 0.35	—	0.80 ~ 1.25	—	—
5150H	0.47 ~ 0.54	0.60 ~ 1.00	0.15 ~ 0.35	—	0.60 ~ 1.00	—	—
5155H	0.50 ~ 0.60	0.60 ~ 1.00	0.15 ~ 0.35	—	0.60 ~ 1.00	—	—
5160H	0.55 ~ 0.65	0.65 ~ 1.10	0.15 ~ 0.35	—	0.60 ~ 1.00	—	—
51B60H ³	0.55 ~ 0.65	0.65 ~ 1.10	0.15 ~ 0.35	—	0.60 ~ 1.00	—	—
6118H	0.15 ~ 0.21	0.40 ~ 0.80	0.15 ~ 0.35	—	0.40 ~ 0.80	—	0.10 ~ 0.15
6150H	0.47 ~ 0.54	0.60 ~ 1.00	0.15 ~ 0.35	—	0.75 ~ 1.20	—	0.15min
81B45H ³	0.42 ~ 0.49	0.70 ~ 1.05	0.15 ~ 0.35	0.15 ~ 0.45	0.30 ~ 0.60	0.08 ~ 0.15	—
8617H	0.14 ~ 0.20	0.60 ~ 0.95	0.15 ~ 0.35	0.35 ~ 0.75	0.35 ~ 0.65	0.15 ~ 0.25	—
8620H	0.17 ~ 0.23	0.60 ~ 0.95	0.15 ~ 0.35	0.35 ~ 0.75	0.35 ~ 0.65	0.15 ~ 0.25	—
8622H	0.19 ~ 0.25	0.60 ~ 0.95	0.15 ~ 0.35	0.35 ~ 0.75	0.35 ~ 0.65	0.15 ~ 0.25	—
8625H	0.22 ~ 0.28	0.60 ~ 0.95	0.15 ~ 0.35	0.35 ~ 0.75	0.35 ~ 0.65	0.15 ~ 0.25	—
8627H	0.24 ~ 0.30	0.60 ~ 0.95	0.15 ~ 0.35	0.35 ~ 0.75	0.35 ~ 0.65	0.15 ~ 0.25	—
8630H	0.27 ~ 0.33	0.60 ~ 0.95	0.15 ~ 0.35	0.35 ~ 0.75	0.35 ~ 0.65	0.15 ~ 0.25	—

SAE No. (AISI)	Chemical composition %						
	C	Mn	Si	Ni	Cr	Mo	V
86B30H ³	0.27 ~ 0.33	0.60 ~ 0.95	0.15 ~ 0.35	0.35 ~ 0.75	0.35 ~ 0.65	0.15 ~ 0.25	–
8637H	0.34 ~ 0.41	0.70 ~ 1.05	0.15 ~ 0.35	0.35 ~ 0.75	0.35 ~ 0.65	0.15 ~ 0.25	–
8640H	0.37 ~ 0.44	0.70 ~ 1.05	0.15 ~ 0.35	0.35 ~ 0.75	0.35 ~ 0.65	0.15 ~ 0.25	–
8642H	0.39 ~ 0.46	0.70 ~ 1.05	0.15 ~ 0.35	0.35 ~ 0.75	0.35 ~ 0.65	0.15 ~ 0.25	–
8645H	0.42 ~ 0.49	0.70 ~ 1.05	0.15 ~ 0.35	0.35 ~ 0.75	0.35 ~ 0.65	0.15 ~ 0.25	–
86B45H ³	0.42 ~ 0.49	0.70 ~ 1.05	0.15 ~ 0.35	0.35 ~ 0.75	0.35 ~ 0.65	0.15 ~ 0.25	–
8650H	0.47 ~ 0.54	0.70 ~ 1.05	0.15 ~ 0.35	0.35 ~ 0.70	0.35 ~ 0.65	0.15 ~ 0.25	–
8655H	0.50 ~ 0.60	0.70 ~ 1.05	0.15 ~ 0.35	0.35 ~ 0.75	0.35 ~ 0.65	0.15 ~ 0.25	–
8660H	0.55 ~ 0.65	0.70 ~ 1.05	0.15 ~ 0.35	0.35 ~ 0.75	0.35 ~ 0.65	0.15 ~ 0.25	–
8720H	0.17 ~ 0.23	0.60 ~ 0.95	0.15 ~ 0.35	0.35 ~ 0.75	0.35 ~ 0.65	0.20 ~ 0.30	–
8740H	0.37 ~ 0.44	0.70 ~ 1.05	0.15 ~ 0.35	0.35 ~ 0.75	0.35 ~ 0.65	0.20 ~ 0.30	–
8822H	0.19 ~ 0.25	0.70 ~ 1.05	0.15 ~ 0.35	0.35 ~ 0.75	0.35 ~ 0.65	0.30 ~ 0.40	–
9259H	0.56 ~ 0.64	0.65 ~ 1.10	0.70 ~ 1.20	–	0.45 ~ 0.65	–	–
9260H	0.55 ~ 0.65	0.65 ~ 1.10	1.70 ~ 2.20	–	–	–	–
E9310H ⁴	0.07 ~ 0.13	0.40 ~ 0.70	0.15 ~ 0.35	2.95 ~ 3.55	1.00 ~ 1.45	0.08 ~ 0.15	–
94B15H ³	0.12 ~ 0.18	0.70 ~ 1.05	0.15 ~ 0.35	0.25 ~ 0.65	0.25 ~ 0.55	0.08 ~ 0.15	–
94B17H ³	0.14 ~ 0.20	0.70 ~ 1.05	0.15 ~ 0.35	0.25 ~ 0.65	0.25 ~ 0.55	0.08 ~ 0.15	–
94B30H ³	0.27 ~ 0.33	0.70 ~ 1.05	0.15 ~ 0.35	0.25 ~ 0.65	0.25 ~ 0.55	0.08 ~ 0.15	–

- Remarks 1. If no composition is specified in the standards, 0.35% or less of Cu, 0.25% or less of Ni, 0.20% or less of Cr and 0.06%, or less of Mo shall be allowed.
2. This steel contains 0.035 to 0.050% of S.
3. This steel contains 0.0005 to 0.003% of B.
4. Electric furnace steel

Distance from quenching end and its hardness

SAE No.	Distance from quenching end and its hardness (HRC)															Heat treatment temperature °C		
	mm Hardness	1.5	3	5	7	9	11	13	15	20	25	30	35	40	45	50	Normalizing	Quenching
SAE 1038H	Upper limit	58	56	49	33	29	27	26	25	24	22	-	-	-	-	-	870	845
	Lower limit	51	37	25	22	20	-	-	-	-	-	-	-	-	-	-	-	-
SAE 1045H	Upper limit	62	59	50	35	32	31	30	29	28	26	-	-	-	-	-	870	845
	Lower limit	55	44	30	27	26	25	24	22	20	-	-	-	-	-	-	-	-
SAE 1522H	Upper limit	50	47	44	37	31	27	-	-	-	-	-	-	-	-	-	925	925
	Lower limit	41	34	22	20	-	-	-	-	-	-	-	-	-	-	-	-	-
SAE 1524H	Upper limit	51	49	44	38	34	30	27	25	23	-	-	-	-	-	-	900	870
	Lower limit	42	39	26	21	-	-	-	-	-	-	-	-	-	-	-	-	-
SAE 1526H	Upper limit	53	50	44	37	32	28	25	24	-	-	-	-	-	-	-	900	870
	Lower limit	44	39	24	20	-	-	-	-	-	-	-	-	-	-	-	-	-
SAE 1541H	Upper limit	60	59	57	53	49	44	38	35	32	30	-	-	-	-	-	870	845
	Lower limit	53	50	43	36	29	25	23	22	20	-	-	-	-	-	-	-	-
SAE 15B21H	Upper limit	48	48	46	43	38	30	-	-	-	-	-	-	-	-	-	925	925
	Lower limit	41	40	36	27	-	-	-	-	-	-	-	-	-	-	-	-	-
SAE 15B28H	Upper limit	53	53	53	52	51	50	48	45	35	29	26	25	24	23	20	900	870
	Lower limit	47	47	46	43	35	24	21	20	-	-	-	-	-	-	-	-	-
SAE 15B30H	Upper limit	55	53	52	51	49	44	37	31	26	22	20	-	-	-	-	900	870
	Lower limit	48	47	46	39	25	20	-	-	-	-	-	-	-	-	-	-	-
SAE 15B35H	Upper limit	58	56	55	54	52	47	39	32	27	25	24	23	22	20	-	870	845
	Lower limit	51	50	49	45	32	24	21	20	-	-	-	-	-	-	-	-	-
SAE 15B37H	Upper limit	58	56	55	54	53	51	50	47	38	30	28	26	25	23	-	870	845
	Lower limit	50	50	49	46	39	31	26	23	20	-	-	-	-	-	-	-	-
SAE 15B41H	Upper limit	60	60	59	58	58	57	56	55	53	50	45	39	35	32	31	870	845
	Lower limit	53	52	52	51	50	49	47	41	26	24	23	21	20	-	-	-	-
SAE 15B48H	Upper limit	63	63	62	61	60	59	57	56	49	39	33	31	30	29	28	870	845
	Lower limit	56	55	55	54	53	45	33	30	27	25	24	23	22	-	-	-	-
SAE 15B62H	Upper limit	-	-	65	65	65	65	64	64	63	60	56	48	42	37	34	870	845
	Lower limit	60	60	60	59	58	56	50	42	34	32	31	30	29	27	26	-	-
SAE 1330H	Upper limit	56	56	55	53	51	48	45	43	39	35	33	32	31	31	30	900	870
	Lower limit	49	47	44	38	32	28	25	24	20	-	-	-	-	-	-	-	-
SAE 1335H	Upper limit	58	58	57	55	53	50	47	45	41	37	35	33	32	31	30	870	845
	Lower limit	51	49	46	42	36	31	28	27	23	21	-	-	-	-	-	-	-
SAE 1340H	Upper limit	60	60	59	58	57	56	54	52	47	41	39	37	36	35	34	870	845
	Lower limit	53	52	50	48	42	36	32	30	26	24	23	22	21	20	20	-	-
SAE 1345H	Upper limit	63	63	63	62	61	60	59	58	55	51	48	47	46	45	45	870	845
	Lower limit	56	56	54	52	46	38	35	31	29	27	26	25	24	24	24	-	-
SAE 4027H	Upper limit	52	50	45	38	31	28	26	25	23	22	21	-	-	-	-	900	870
	Lower limit	45	40	30	24	21	-	-	-	-	-	-	-	-	-	-	-	-
SAE 4032H	Upper limit	57	55	51	44	36	32	29	27	24	23	23	22	21	20	-	900	870
	Lower limit	50	46	34	27	24	22	20	-	-	-	-	-	-	-	-	-	-
SAE 4037H	Upper limit	59	57	54	49	41	35	32	30	27	26	25	25	25	24	23	870	845
	Lower limit	52	50	42	32	27	24	21	20	-	-	-	-	-	-	-	-	-
SAE 4042H	Upper limit	62	61	58	54	48	40	36	33	31	29	28	28	27	27	26	870	845
	Lower limit	55	53	47	36	30	27	25	24	23	22	21	20	-	-	-	-	-
SAE 4047H	Upper limit	64	63	60	57	53	48	43	39	34	33	31	30	30	29	29	870	845
	Lower limit	57	55	49	39	33	30	28	27	25	24	24	23	23	22	21	-	-
SAE 4118H	Upper limit	48	46	40	34	29	27	25	24	21	-	-	-	-	-	-	925	925
	Lower limit	41	37	27	22	-	-	-	-	-	-	-	-	-	-	-	-	-

SAE No.	Distance from quenching end and its hardness (HRC)															Heat treatment temperature °C		
	mm Hardness	1.5	3	5	7	9	11	13	15	20	25	30	35	40	45	50	Normalizing	Quenching
SAE 4120H	Upper limit	48	47	44	40	35	33	30	29	26	24	23	23	22	22	925	925	
	Lower limit	41	37	31	25	22	20	-	-	-	-	-	-	-	-			
SAE 4130H	Upper limit	56	55	53	51	48	44	41	39	34	33	33	32	31	31	30	900	870
	Lower limit	49	46	40	36	32	28	26	25	24	23	22	20	-	-	-		
SAE 4135H	Upper limit	58	58	57	56	56	55	53	52	49	45	43	41	40	39	37	870	845
	Lower limit	51	50	49	48	46	42	39	37	32	30	28	27	27	26	26		
SAE 4137H	Upper limit	59	59	58	58	57	56	55	55	52	48	46	44	43	42	41	870	845
	Lower limit	52	51	50	49	48	45	42	39	35	33	31	30	29	29	29		
SAE 4140H	Upper limit	60	60	60	59	59	58	57	57	55	53	51	49	48	46	45	870	845
	Lower limit	53	52	52	51	50	48	46	43	38	35	33	32	32	31	30		
SAE 4142H	Upper limit	62	62	62	62	61	61	60	60	58	56	55	53	52	51	50	870	845
	Lower limit	55	54	54	53	52	51	49	48	43	39	36	35	34	33	33		
SAE 4145H	Upper limit	63	63	63	62	62	61	61	60	59	58	57	56	55	55	55	870	845
	Lower limit	56	55	55	54	53	52	51	50	47	42	39	37	35	34	34		
SAE 4147H	Upper limit	64	64	64	64	63	63	63	63	62	60	59	58	57	57	56	870	845
	Lower limit	57	57	56	55	55	55	54	53	50	45	42	39	37	36	36		
SAE 4150H	Upper limit	65	65	65	65	65	65	65	64	63	62	61	60	59	58	58	870	845
	Lower limit	59	59	58	58	57	57	56	55	51	47	44	41	39	38	38		
SAE 4161H	Upper limit	65	65	65	65	65	65	65	65	65	64	63	63	63	63	870	845	
	Lower limit	60	60	60	60	60	60	60	60	58	56	53	50	46	43			41
SAE 4320H	Upper limit	48	47	45	42	39	36	34	32	28	26	25	25	24	24	24	925	925
	Lower limit	41	39	35	30	27	25	23	22	-	-	-	-	-	-	-		
SAE 4340H	Upper limit	60	60	60	60	60	60	60	60	59	58	58	57	57	56	56	870	845
	Lower limit	53	53	53	53	53	53	52	52	50	48	46	44	43	42	40		
SAE E4340H	Upper limit	60	60	60	60	60	60	60	60	60	59	58	58	57	57	57	870	845
	Lower limit	53	53	53	53	53	53	53	52	51	50	49	47	46	44	44		
SAE 4620H	Upper limit	48	46	42	37	33	30	27	26	23	22	21	-	-	-	-	925	925
	Lower limit	41	37	28	23	-	-	-	-	-	-	-	-	-	-	-		
SAE 4718H	Upper limit	47	47	45	42	38	35	33	32	29	27	26	26	25	25	24	925	925
	Lower limit	40	40	37	31	28	25	23	22	21	20	-	-	-	-	-		
SAE 4720H	Upper limit	48	47	43	38	33	30	28	27	24	23	22	21	20	-	-	925	925
	Lower limit	41	39	30	25	22	20	-	-	-	-	-	-	-	-	-		
SAE 4815H	Upper limit	45	45	44	42	40	37	35	32	29	27	26	25	24	24	23	925	845
	Lower limit	38	36	33	28	25	22	20	-	-	-	-	-	-	-	-		
SAE 4817H	Upper limit	46	46	45	44	42	39	37	34	31	28	27	26	25	25	25	925	845
	Lower limit	39	38	35	31	28	25	23	21	-	-	-	-	-	-	-		
SAE 4820H	Upper limit	48	48	48	46	45	43	40	39	35	32	29	28	27	26	26	925	845
	Lower limit	41	40	39	36	32	29	27	25	22	21	20	-	-	-	-		
SAE 50B40H	Upper limit	60	60	60	59	59	58	57	56	50	43	37	35	34	32	30	870	845
	Lower limit	53	53	52	51	49	44	38	33	27	24	22	-	-	-	-		
SAE 50B44H	Upper limit	63	63	62	62	61	61	60	59	55	49	42	38	37	35	34	870	845
	Lower limit	56	56	55	54	52	49	42	36	30	27	25	23	21	-	-		
SAE 5046H	Upper limit	63	62	59	54	48	39	35	34	32	30	29	27	26	24	23	870	845
	Lower limit	56	54	40	30	27	26	25	25	22	20	-	-	-	-	-		
SAE 50B46H	Upper limit	63	62	61	60	59	58	56	53	42	37	35	34	32	31	29	870	845
	Lower limit	56	55	53	47	35	31	29	28	26	24	22	21	-	-	-		
SAE 50B50H	Upper limit	65	65	65	64	63	63	62	61	59	54	49	44	40	38	37	870	845
	Lower limit	59	59	58	57	55	52	46	39	32	29	27	26	24	22	20		

SAE No.	Distance from quenching end and its hardness (HRC)															Heat treatment temperature °C		
	mm Hardness	1.5	3	5	7	9	11	13	15	20	25	30	35	40	45	50	Normalizing	Quenching
SAE 50B60H	Upper limit	-	-	-	-	-	-	65	64	63	62	59	56	52	48	45	870	845
	Lower limit	60	60	60	60	59	57	51	44	36	34	32	30	28	27	25		
SAE 5120H	Upper limit	48	46	41	34	31	29	27	25	22	-	-	-	-	-	925	925	
	Lower limit	40	35	25	22	20	-	-	-	-	-	-	-	-	-			
SAE 5130H	Upper limit	56	55	53	50	48	45	42	39	35	33	31	30	28	26	24	900	870
	Lower limit	49	46	42	37	33	30	27	25	21	-	-	-	-	-			
SAE 5132H	Upper limit	57	56	54	52	49	45	42	39	35	33	32	31	29	27	25	900	870
	Lower limit	50	47	42	38	33	29	26	25	21	-	-	-	-	-			
SAE 5135H	Upper limit	58	58	56	54	53	50	47	44	40	37	35	34	33	32	31	870	845
	Lower limit	51	49	46	41	36	32	30	27	23	21	-	-	-	-			
SAE 5140H	Upper limit	60	59	58	57	55	53	50	47	42	39	36	35	34	33	32	870	845
	Lower limit	53	52	50	45	40	35	32	30	28	25	23	21	-	-			
SAE 5147H	Upper limit	64	64	63	62	61	61	60	60	58	57	55	53	52	50	49	870	845
	Lower limit	57	56	55	54	52	49	44	39	33	31	29	27	25	23	21		
SAE 5150H	Upper limit	65	65	64	63	62	60	58	57	52	47	44	42	40	39	38	870	845
	Lower limit	59	58	57	54	50	43	37	35	31	29	28	27	26	24	22		
SAE 5155H	Upper limit	-	65	64	64	63	62	61	60	56	50	46	44	43	42	41	870	845
	Lower limit	60	59	58	56	53	48	40	37	34	32	30	29	28	27	25		
SAE 5160H	Upper limit	-	-	-	-	65	64	64	62	58	52	48	46	44	42	41	870	845
	Lower limit	60	60	60	59	57	52	46	40	36	34	32	30	28	27	27		
SAE 51B60H	Upper limit	-	-	-	-	-	-	-	65	63	61	57	54	51	47	870	845	
	Lower limit	60	60	60	60	59	58	56	52	40	37	35	32	30	28			25
SAE 6118H	Upper limit	46	44	37	32	30	28	27	25	24	23	22	21	20	-	-	925	925
	Lower limit	39	36	28	23	20	-	-	-	-	-	-	-	-	-	-		
SAE 6150H	Upper limit	65	65	65	64	63	63	61	60	58	53	50	47	45	44	43	900	870
	Lower limit	59	58	57	55	53	50	46	42	37	35	33	31	29	27	25		
SAE 81B45H	Upper limit	63	63	63	63	63	62	60	58	56	54	52	50	47	44	870	845	
	Lower limit	56	56	56	56	55	53	49	47	38	35	33	31	29	28			27
SAE 8617H	Upper limit	46	44	42	37	32	29	27	25	23	22	20	-	-	-	-	925	925
	Lower limit	39	33	27	23	20	-	-	-	-	-	-	-	-	-	-		
SAE 8620H	Upper limit	48	47	44	40	35	33	30	29	26	24	23	23	22	22	925	925	
	Lower limit	41	37	31	25	22	20	-	-	-	-	-	-	-	-			-
SAE 8622H	Upper limit	50	50	47	43	39	35	32	31	28	26	25	24	24	24	24	925	925
	Lower limit	43	39	34	28	25	22	20	-	-	-	-	-	-	-	-		
SAE 8625H	Upper limit	52	51	48	45	41	38	35	33	29	28	27	26	26	26	25	900	870
	Lower limit	45	40	35	31	28	25	23	21	-	-	-	-	-	-	-		
SAE 8627H	Upper limit	54	53	50	47	44	41	38	35	32	30	28	27	27	27	27	900	870
	Lower limit	47	43	38	34	30	27	25	24	21	20	-	-	-	-	-		
SAE 8630H	Upper limit	56	55	54	51	48	44	41	38	34	31	30	29	29	29	29	900	870
	Lower limit	49	46	42	37	33	29	27	26	23	21	20	-	-	-	-		
SAE 86B30H	Upper limit	56	56	55	55	54	54	53	53	52	50	48	46	43	41	40	900	870
	Lower limit	49	49	48	48	48	47	46	44	39	35	33	30	28	27	25		
SAE 8637H	Upper limit	59	59	58	57	55	54	52	50	45	40	38	36	35	35	35	870	845
	Lower limit	52	51	49	47	43	39	36	33	29	27	25	24	24	23	23		
SAE 8640H	Upper limit	60	60	60	58	57	55	53	48	43	40	39	38	37	37	870	845	
	Lower limit	53	53	52	50	47	42	38	35	30	28	26	25	24	24			24
SAE 8642H	Upper limit	62	62	62	61	60	59	58	56	52	47	44	41	40	39	39	870	845
	Lower limit	55	54	53	51	49	46	42	38	32	29	28	27	27	26	26		

SAE No.	Distance from quenching end and its hardness (HRC)															Heat treatment temperature °C			
	mm Hardness	1.5	3	5	7	9	11	13	15	20	25	30	35	40	45	50	Normalizing	Quenching	
SAE 8645H	Upper limit	63	63	63	63	62	61	59	58	54	49	46	43	42	42	41	870	845	
	Lower limit	56	56	55	53	51	48	45	41	34	31	29	28	27	27	27			
SAE 86B45H	Upper limit	63	63	63	62	62	61	61	60	59	58	58	57	57	56	56	870	845	
	Lower limit	56	56	55	54	53	52	51	51	49	45	40	36	33	32	31			
SAE 8650H	Upper limit	65	65	65	65	64	63	62	61	59	57	54	52	49	47	46	870	845	
	Lower limit	59	59	58	56	55	53	50	46	38	34	32	31	30	29	29			
SAE 8655H	Upper limit	–	–	–	–	–	–	–	–	65	64	62	61	59	57	56	54	870	845
	Lower limit	60	60	59	57	56	55	53	51	42	39	36	34	34	33	32			
SAE 8660H	Upper limit	–	–	–	–	–	–	–	–	–	65	64	63	62	61	60	870	845	
	Lower limit	60	60	60	60	59	58	56	53	46	42	39	38	37	36	35			
SAE 8720H	Upper limit	48	47	44	40	36	33	31	29	27	25	24	23	23	23	22	925	925	
	Lower limit	41	38	34	28	25	22	21	–	–	–	–	–	–	–	–			
SAE 8740H	Upper limit	60	60	60	60	58	57	56	54	50	45	43	41	40	39	38	870	845	
	Lower limit	53	52	51	49	46	43	39	36	31	29	28	27	27	26	26			
SAE 8822H	Upper limit	50	49	47	45	41	38	35	33	31	29	29	28	27	27	27	925	925	
	Lower limit	43	42	38	31	28	26	24	23	22	21	20	–	–	–	–			
SAE 9259H	Upper limit	–	–	–	65	64	64	63	62	59	52	48	45	42	39	37	900	870	
	Lower limit	60	60	60	59	57	52	46	42	37	33	32	33	29	28	27			
SAE 9260H	Upper limit	–	–	65	63	62	60	58	54	47	40	38	37	36	35	35	900	870	
	Lower limit	60	60	58	50	42	38	36	35	33	32	31	30	29	28	28			
SAE E9310H	Upper limit	43	43	43	42	42	42	41	40	38	36	35	35	34	34	33	925	845	
	Lower limit	36	35	34	33	31	30	28	27	26	25	25	25	25	24	24			
SAE 94B15H	Upper limit	45	45	45	44	42	40	38	36	31	28	26	24	23	22	22	925	925	
	Lower limit	38	38	37	34	29	25	23	20	–	–	–	–	–	–	–			
SAE 94B17H	Upper limit	46	46	46	45	44	43	41	39	34	30	28	26	25	24	23	925	925	
	Lower limit	39	39	38	36	31	26	24	22	–	–	–	–	–	–	–			
SAE 94B30H	Upper limit	56	56	55	55	54	53	53	52	50	46	43	40	37	36	34	900	870	
	Lower limit	49	49	48	47	46	44	41	38	31	26	24	23	22	21	20			

9 Comparison table between JIS and related foreign standards

Related to carbon steel and alloy steel for machine structure

(Quoted from Reference 8, Ferrous Materials & Metallurgy I, JIS Handbook 2011)

Japanese Industrial Standards		Steel grade related to foreign standards					
Standard No. and Name	Code	ISO 683-1, 10, 11 ⁴⁾	AISI SAE	BS EN 10277-1 ~ 5 BS EN 10084 BS/EN 10083-1,2,3	DIN EN 10084 DIN EN 10083-1,2,3	NF EN 10084 NF EN 10083-1,2,3	
JIS G 4051 Carbon steel products for machine structures	S10C	C10	1010	C10E C10R	C10E C10R	C10E C10R	
	S12C	–	1012	–	–	–	
	S15C	C15E4 C15M2	1015	C15E C15R	C15E C15R	C15E C15R	
	S17C	–	1017	–	–	–	
	S20C	–	1020	C22E C22R	C22 C22E C22R	C22 C22E C22R	
	S22C	–	1023	–	–	–	
	S25C	C25 C25E4 C25M2	1025	–	–	–	
	S28C	–	1029	–	–	–	
	S30C	C30 C30E4 C30M2	1030	–	–	–	
	S33C	–	–	–	–	–	
	S35C	C35 C35E4 C35M2	1035	C35 C35E C35R	C35 C35E C35R	C35 C35E C35R	
	S38C	–	1038	–	–	–	
	S40C	C40 C40E4 C40M2	1039 1040	C40 C40E C40R	C40 C40E C40R	C40 C40E C40R	
	S43C	–	1042 1043	–	–	–	
	S45C	C45 C45E4 C45M2	1045 1046	C45 C45E C45R	C45 C45E C45R	C45 C45E C45R	
	S48C	–	–	–	–	–	
	S50C	C50 C50E4 C50M2	1049	C50E C50R	C50E C50R	C50E C50R	
	S53C	–	1050 1053	–	–	–	
	S55C	C55 C55E4 C55M2	1055	C55 C55E C55R	C55 C55E C55R	C55 C55E C55R	
	S58C	C60 C60E4 C60M2	1059 1060	C60 C60E C60R	C60 C60E C60R	C60 C60E C60R	
	S09CK	–	–	–	C10E	C10E	C10E
	S15CK	–	–	–	C15E	C15E	C15E
	S20CK	–	–	–	–	–	XC18

Japanese Industrial Standards		Steel grade related to foreign standards					
Standard No. and Name	Code	ISO 683-1, 10, 11 ⁴⁾	AISI SAE	BS EN 10277-1 - 5 BS EN 10084 BS/EN 10083-1,2,3	DIN EN 10084 DIN EN 10083-1,2,3	NF EN 10084 NF EN 10083-1,2,3	
JIS G 4053 Alloy steel products for machine structures	SNC236	-	-	-	-	-	
	SNC415	-	-	-	-	-	
	SNC631	-	-	-	-	-	
	SNC815	15NiCr13	-	15NiCr13	15NiCr13	15NiCr13	
	SNC836	-	-	-	-	-	
	SNCM220	20NiCrMo2	8615	8617	20NiCrMo2-2	20NiCrMo2-2	20NiCrMo2-2
		20NiCrMoS2	8620 8622	8620	20NiCrMoS2-2	20NiCrMoS2-2	20NiCrMoS2-2
	SNCM240	41CrNiMo2	8637	8640	-	-	-
		41CrNiMoS2	8640	8640	-	-	-
	SNCM415	-	-	-	-	-	
SNCM420	-	4320	-	-	-		
SNCM431	-	-	-	-	-		
SNCM439	-	4340	-	-	-		
SNCM447	-	-	-	-	-		
SNCM616	-	-	-	-	-		
SNCM625	-	-	-	-	-		
SNCM630	-	-	-	-	-		
SNCM815	-	-	-	-	-		
SNCM645	41CrAlMo7 4	-	-	-	-	-	
SCr415	-	-	-	17Cr3 17CrS3	17Cr3 17CrS3	17Cr3 17CrS3	
	-	-	-	-	-	-	
SCr420	20Cr4	5120	5120	-	-	-	
	20CrS4	-	-	-	-	-	
SCr430	34Cr4	5130	5130	34Cr4	34Cr4	34Cr4	
	34CrS4	5132	5132	34CrS4	34CrS4	34CrS4	
SCr435	34Cr4	5132	5132	37Cr4	37Cr4	37Cr4	
	34CrS4			37CrS4	37CrS4	37CrS4	
	37Cr4			37CrS4	37CrS4	37CrS4	
	37CrS4			37CrS4	37CrS4	37CrS4	
SCr440	37Cr4	5140	5140	530M40	41Cr4	41Cr4	
	37CrS4			41Cr4	41CrS4	41CrS4	
	41Cr4			41CrS4	41CrS4	41CrS4	
	41CrS4			41CrS4	41CrS4	41CrS4	
SCr445	-	-	-	-	-		
SCM415	-	-	-	-	-		
SCM418	18CrMo4	-	-	18CrMo4	18CrMo4	18CrMo4	
	18CrMoS4	-	-	18CrMoS4	18CrMoS4	18CrMoS4	
SCM420	-	-	-	-	-		
SCM421	-	-	-	-	-		
SCM425	25CrMo4	-	-	25CrMo4	25CrMo4	25CrMo4	
SCM430	-	4130	4130	-	-	-	
SCM432	-	-	-	-	-	-	
SCM435	34CrMo4	4137	4137	34CrMo4	34CrMo4	34CrMo4	
	34CrMoS4			34CrMoS4	34CrMoS4		
SCM440	42CrMo4	4140	4140	42CrMo4	42CrMo4	42CrMo4	
	42CrMoS4	4142	4142	42CrMoS4	42CrMoS4	42CrMoS4	

Japanese Industrial Standards		Steel grade related to foreign standards				
Standard No. and Name	Code	ISO 683-1, 10, 11 ⁴⁾	AISI SAE	BS EN 10277-1 - 5 BS EN 10084 BS/EN 10083-1,2,3	DIN EN 10084 DIN EN 10083-1,2,3	NF EN 10084 NF EN 10083-1,2,3
JIS G 4053 (Continued)	SCM445	–	4145 4147	–	–	–
	SCM822	–	–	–	–	–
	SMn420	22Mn6	1522	–	–	–
	SMn433	–	1536	–	–	–
	SMn438	36Mn6	1541	–	–	–
	SMn443	42Mn6	1541	–	–	–
	SMnC420	–	–	–	–	–
	SMnC443	–	–	–	–	–
	SACM645	41CrAlMo74	–	–	–	–
JIS G 4052 Structural steel products assuring hardenability (H-section steel)	SMn420H	22Mn6H	1522H	–	–	–
	SMn433H	–	–	–	–	–
	SMn438H	36Mn6H	1541H	–	–	–
	SMn443H	42Mn6H	1541H	–	–	–
	SMnC420H	–	–	–	–	–
	SMnC443H	–	–	–	–	–
	SCr415H	–	–	17Cr3 17CrS3	17Cr3 17CrS3	17Cr3 17CrS3
	SCr420H	20Cr4H 20CrS4	5120H	–	–	–
	SCr430H	34Cr4	5130H	34Cr4	34Cr4	34Cr4
		34CrS4	5132H	34CrS4	34CrS4	34CrS4
	SCr435H	34Cr4	5135H	37Cr4	37Cr4	37Cr4
		34CrS4		37CrS4	37CrS4	
		37Cr4		37CrS4	37CrS4	
	SCr440H	37Cr4	5140H	41Cr4	41Cr4	41Cr4
		37CrS4		41CrS4	41CrS4	
		41Cr4		–	–	
		41CrS4		–	–	
	SCM415H	–	–	–	–	–
	SCM418H	18CrMo4	–	18CrMo4	18CrMo4	18CrMo4
		18CrMoS4		18CrMoS4	18CrMoS4	
	SCM420H	–	–	–	–	–
	SCM425H	25CrMo4	–	25CrMo4	25CrMo4	25CrMo4
	SCM435H	34CrMo4	4135H	34CrMo4	34CrMo4	34CrMo4
		34CrMoS4	4137H	34CrMoS4	34CrMoS4	34CrMoS4
	SCM440H	42CrMo4	4140H	42CrMo4	42CrMo4	42CrMo4
		42CrMoS4	4142H	42CrMoS4	42CrMoS4	42CrMoS4
	SCM445H	–	4145H 4147H	–	–	–
	SCM822H	–	–	–	–	–
	SNC415H	–	–	–	–	–
	SNC631H	–	–	–	–	–
SNC815H	15NiCr13	–	15NiCr13	15NiCr13	15NiCr13	

Japanese Industrial Standards		Steel grade related to foreign standards				
Standard No. and Name	Code	ISO 683-1, 10, 11 ⁴⁾	AISI SAE	BS EN 10277-1 - 5 BS EN 10084 BS/EN 10083-1,2,3	DIN EN 10084 DIN EN 10083-1,2,3	NF EN 10084 NF EN 10083-1,2,3
JIS G 4052 (Continued)	SNCM220	20NiCrMo2 20NiCrMoS2	8617H 8620H 8622H	20NiCrMo2-2 20NiCrMoS2-2	20NiCrMo2-2 20NiCrMoS2-2	20NiCrMo2-2 20NiCrMoS2-2
	SNCM420H	–	4320H	–	–	–
JIS G 4107 Alloy steel bolt products for high temperatures	SNB5	–	501	–	–	–
	SNB7	42CrMo4 42CrMoS4	4140 4142 4145	42CrMo4	42CrMo4	42CrMo4
		–	–	–	–	–
	SNB16	–	–	40CrMoV4-6 ¹⁾	40CrMoV47 ²⁾	40CrMoV4-6 ³⁾
JIS G 4108 Bar products for special-use alloy steel bolt	SNB21-1 ~ 5	–	–	40CrMoV4-6 ¹⁾	40CrMoV47 ²⁾	40CrMoV4-6 ³⁾
	SNB22-1 ~ 5	42CrMo4 42CrMoS4	4142H	–	42CrMo4 ²⁾	–
		–	–	–	–	–
	SNB24-1 ~ 5	–	4340	–	–	–

Note1) BS EN 10269

2) DIN EN 10269

3) NF EN 10269

4) For ISO 683-1, 10, and 11, the translated versions are issued by JIS as JIS G 7501, G 7502, and G 7503, respectively.

⑩ Approximation conversion table to Brinell hardness of steel

(Quoted from SAE J417 DEC83)

Brinell indent diameter mm	Brinell hardness		Vickers hardness	Rockwell hardness (2)		Shore hardness	Tensile strength (approximate value) N/mm ² , MPa
	Standard ball	Tungsten carbide ball		B scale	C scale		
-	-	-	940	-	68.0	97	-
-	-	-	920	-	67.5	96	-
-	-	-	900	-	67.0	95	-
-	-	(767)	880	-	66.4	93	-
-	-	(757)	860	-	65.9	92	-
2.25	-	(745)	840	-	65.3	91	-
-	-	(733)	820	-	64.7	90	-
-	-	(722)	800	-	64.0	88	-
2.30	-	(712)	-	-	-	-	-
-	-	(710)	780	-	63.3	87	-
-	-	(698)	760	-	62.5	86	-
-	-	(684)	740	-	61.8	-	-
2.35	-	(682)	737	-	61.7	84	-
-	-	(670)	720	-	61.0	83	-
-	-	(656)	700	-	60.1	-	-
2.40	-	(653)	697	-	60.0	81	-
-	-	(647)	690	-	59.7	-	-
-	-	(638)	680	-	59.2	80	-
-	-	630	670	-	58.8	-	-
2.45	-	627	667	-	58.7	79	-
-	-	-	677	-	59.1	-	-
2.50	-	601	640	-	57.3	77	-
-	-	-	640	-	57.3	-	-
2.55	-	578	615	-	56.0	75	-
-	-	-	607	-	55.6	-	-
2.60	-	555	591	-	54.7	73	2055
-	-	-	579	-	54.0	-	2015
2.65	-	534	569	-	53.5	71	1985
-	-	-	553	-	52.5	-	1915
2.70	-	514	547	-	52.1	70	1890
-	(495)	-	539	-	51.6	-	1855
2.75	-	495	528	-	51.1	-	1825
-	(477)	-	516	-	50.3	-	1820
-	-	-	516	-	50.3	-	1780
2.80	-	477	508	-	49.6	-	1740
-	(461)	-	508	-	49.6	66	1740
-	-	-	495	-	48.8	-	1680
2.85	-	461	491	-	48.5	-	1670
-	-	-	491	-	48.5	65	1670
-	444	-	474	-	47.2	-	1595
2.90	-	444	472	-	47.1	-	1585
-	-	-	472	-	47.1	63	1585
2.95	429	429	455	-	45.7	61	1510
3.00	415	415	440	-	44.5	59	1460
3.05	401	401	425	-	43.1	58	1390
3.10	388	388	410	-	41.8	56	1330
3.15	375	375	396	-	40.4	54	1270
3.20	363	363	383	-	39.1	52	1220
3.25	352	352	372	(110.0)	37.9	51	1180
3.30	341	341	360	(109.0)	36.6	50	1130
3.35	331	331	350	(108.5)	35.5	48	1095
3.40	321	321	339	(108.0)	34.3	47	1060
3.45	311	311	328	(107.5)	33.1	46	1025
3.50	302	302	319	(107.0)	32.1	45	1005
3.55	293	293	309	(106.0)	30.9	43	970
3.60	285	285	301	(105.5)	29.9	-	950
3.65	277	277	292	(104.5)	28.8	41	925
3.70	269	269	284	(104.0)	27.6	40	895
3.75	262	262	276	(103.0)	26.6	39	875

Brinell indent diameter mm	Brinell hardness		Vickers hardness	Rockwell hardness (2)		Shore hardness	Tensile strength (approximate value) N/mm ² , MPa
	Standard ball	Tungsten carbide ball		B scale	C scale		
3.80	255	255	269	(102.0)	25.4	38	850
3.85	248	248	261	(101.0)	24.2	37	825
3.90	241	241	253	100.0	22.8	36	800
3.95	235	235	247	99.0	21.7	35	785
4.00	229	229	241	98.2	20.5	34	765
4.05	223	223	234	97.3	(18.8)	–	–
4.10	217	217	228	96.4	(17.5)	33	725
4.15	212	212	222	95.5	(16.0)	–	705
4.20	207	207	218	94.6	(15.2)	32	690
4.25	201	201	212	93.8	(13.8)	31	675
4.30	197	197	207	92.8	(12.7)	30	655
4.35	192	192	202	91.9	(11.5)	29	640
4.40	187	187	196	90.7	(10.0)	–	620
4.45	183	183	192	90.0	(9.0)	28	615
4.50	179	179	188	89.0	(8.0)	27	600
4.55	174	174	182	87.8	(6.4)	–	585
4.60	170	170	178	86.8	(5.4)	26	570
4.65	167	167	175	86.0	(4.4)	–	560
4.70	163	163	171	85.0	(3.3)	25	545
4.80	156	156	163	82.9	(0.9)	–	525
4.90	149	149	156	80.8	–	23	505
5.00	143	143	150	78.7	–	22	490
5.10	137	137	143	76.4	–	21	460
5.20	131	131	137	74.0	–	–	450
5.30	126	126	132	72.0	–	20	435
5.40	121	121	127	69.8	–	19	415
5.50	116	116	122	67.6	–	18	400
5.60	111	111	117	65.7	–	15	385

Note) The figures inside the brackets () for Brinell hardness are for reference purposes only as they are rarely used.

11 Various conversion table

Ratio of in to mm conversion table

in		mm	in		mm
1/64	0.015625	0.396875	33/64	0.515625	13.096875
1/32	0.031250	0.793750	17/32	0.531250	13.493750
3/64	0.046875	1.190625	35/64	0.546875	13.890625
1/16	0.062500	1.587500	9/16	0.562500	14.287500
5/64	0.078125	1.984375	37/64	0.578125	14.684375
3/32	0.093750	2.381250	19/32	0.593750	15.081250
7/64	0.109375	2.778125	39/64	0.609375	15.478125
1/8	0.125000	3.175000	5/8	0.625000	15.875000
9/64	0.140625	3.571875	41/64	0.640625	16.271875
5/32	0.156250	3.968750	21/32	0.656250	16.668750
11/64	0.171875	4.365625	43/64	0.671875	17.065625
3/16	0.187500	4.762500	11/16	0.687500	17.462500
13/64	0.203125	5.159375	45/64	0.703125	17.859375
7/32	0.218750	5.556250	23/32	0.718750	18.256250
15/64	0.234375	5.953125	47/64	0.734375	18.653125
1/4	0.250000	6.350000	3/4	0.750000	19.050000
17/64	0.265625	6.746875	49/64	0.765625	19.446875
9/32	0.281250	7.143750	25/32	0.781250	19.843750
19/64	0.296875	7.540625	51/64	0.796875	20.240625
5/16	0.312500	7.937500	13/16	0.812500	20.637500
21/64	0.328125	8.334375	53/64	0.828125	21.034375
11/32	0.343750	8.731250	27/32	0.843750	21.431250
23/64	0.359375	9.128125	55/64	0.859375	21.828125
3/8	0.375000	9.525000	7/8	0.875000	22.225000
25/64	0.390625	9.921875	57/64	0.890625	22.621875
13/32	0.406250	10.318750	29/32	0.906250	23.018750
27/64	0.421875	10.715625	59/64	0.921875	23.415625
7/16	0.437500	11.112500	15/16	0.937500	23.812500
29/64	0.453125	11.509375	61/64	0.953125	24.209375
15/32	0.468750	11.906250	31/32	0.968750	24.606250
31/64	0.484375	12.303125	63/64	0.984375	25.003125
1/2	0.500000	12.700000	1	1.000000	25.400000

in to mm
conversion table

in	mm
1	25.4
2	50.8
3	76.2
4	101.6
5	127.0
6	152.4
7	177.8
8	203.2
9	228.6
10	254.0
11	279.4
12	304.8

ft to mm
conversion table

ft	mm
1	304.8
2	609.6
3	914.4
4	1219.2
5	1524.0
6	1828.8
7	2133.6
8	2438.4
9	2743.2
10	3048.0

Temperature conversion table

°F	°C	°F	°C	°F	°C	°F	°C	°F	°C
0	-18	750	399	1500	816	2250	1232	3000	1649
50	10	800	427	1550	843	2300	1260	3050	1677
100	38	850	454	1600	871	2350	1288	3100	1704
150	66	900	482	1650	899	2400	1316	3150	1732
200	93	950	510	1700	927	2450	1343	3200	1760
250	121	1000	538	1750	954	2500	1371	3250	1788
300	149	1050	566	1800	982	2550	1399	3300	1816
350	177	1100	593	1850	1010	2600	1427	3350	1843
400	204	1150	621	1900	1038	2650	1454	3400	1871
450	232	1200	649	1950	1066	2700	1482	3450	1899
500	260	1250	677	2000	1093	2750	1510	3500	1927
550	288	1300	704	2050	1121	2800	1538	3550	1954
600	316	1350	732	2100	1149	2850	1566	3600	1982
650	343	1400	760	2150	1177	2900	1593	3650	2010
700	371	1450	788	2200	1204	2950	1621	3700	2038

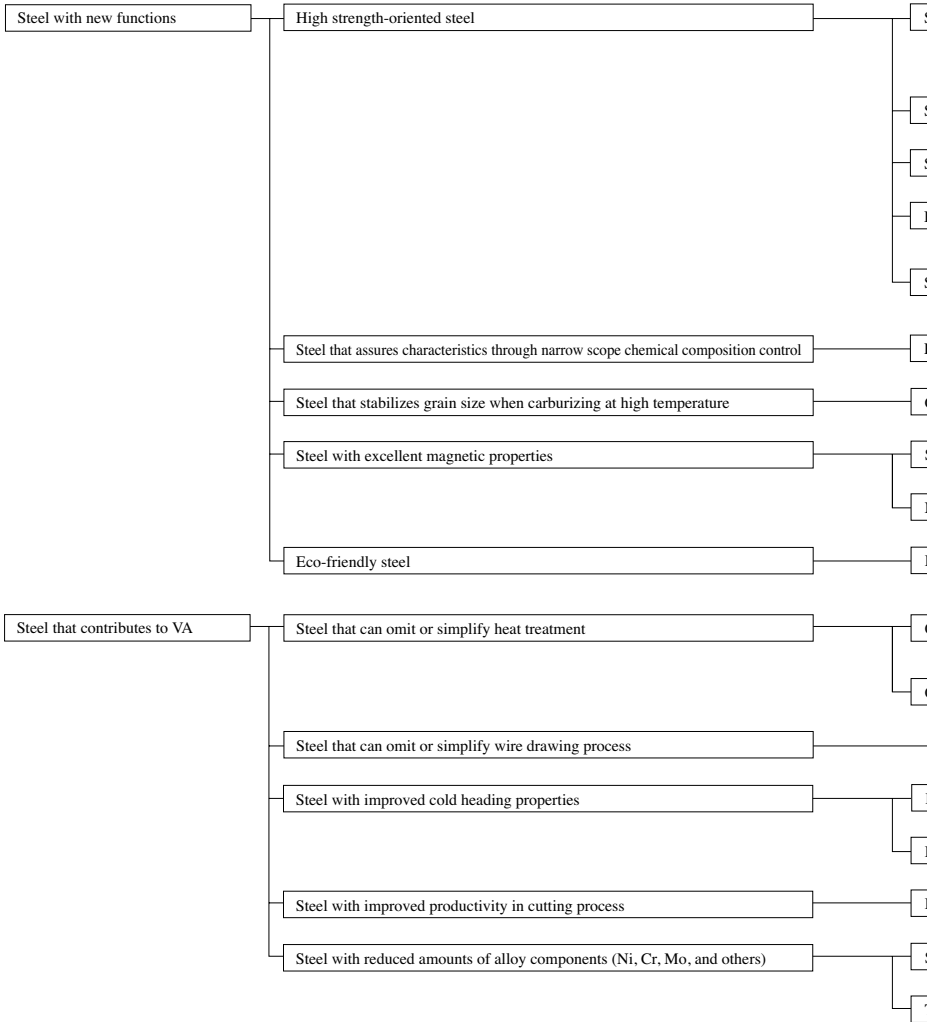
Stress conversion table

kgf/mm²→MPa (N/mm²)

1kgf/mm² = 9.80665MPa (N/mm²)

kgf/mm ²	0	1	2	3	4	5	6	7	8	9
	MPa (or N/mm ²)									
–	–0	9.807	19.61	29.42	39.23	49.03	58.84	68.65	78.45	88.26
10	98.07	107.9	117.7	127.5	137.3	147.1	156.9	166.7	176.5	186.3
20	196.1	205.9	215.9	225.6	235.4	245.2	255.0	264.8	274.6	284.4
30	294.2	304.0	313.8	323.6	333.4	343.2	353.0	362.8	372.7	382.5
40	392.3	402.1	411.9	421.7	431.5	441.1	451.1	460.9	470.7	480.5
50	490.3	500.1	509.9	519.8	529.6	539.4	549.2	559.0	568.8	578.6
60	588.4	598.2	608.0	617.8	627.6	637.4	647.2	657.0	666.9	676.7
70	686.5	696.3	706.1	715.9	725.7	735.5	745.3	755.1	764.9	774.7
80	784.5	794.3	804.1	814.0	823.8	833.6	843.4	853.2	863.0	872.8
90	882.6	892.4	902.2	912.0	921.8	931.6	941.4	951.2	961.1	970.9
100	980.7	990.5	1,000	1,010	1,020	1,030	1,040	1,049	1,059	1,069
110	1,079	1,089	1,098	1,108	1,118	1,128	1,138	1,147	1,157	1,167
120	1,177	1,187	1,196	1,206	1,216	1,226	1,236	1,245	1,255	1,265
130	1,275	1,285	1,294	1,304	1,314	1,324	1,334	1,344	1,353	1,363
140	1,373	1,383	1,393	1,402	1,412	1,422	1,432	1,442	1,451	1,461
150	1,471	1,481	1,491	1,500	1,510	1,520	1,530	1,540	1,549	1,559
160	1,569	1,579	1,589	1,598	1,608	1,618	1,628	1,638	1,648	1,657
170	1,667	1,677	1,687	1,697	1,706	1,716	1,726	1,736	1,746	1,755
180	1,765	1,775	1,785	1,795	1,804	1,814	1,824	1,834	1,844	1,853
190	1,863	1,878	1,883	1,893	1,902	1,912	1,922	1,932	1,942	1,952
200	1,961	1,971	1,981	1,991	2,001	2,010	2,020	2,030	2,040	2,050

12 Kobe Steel's wire rod and bar products: Functional classifications



Spring steel	Super clean steel for valve springs (HRS6)
	High strength steel for valve springs (KHV series)
	Sag resistant steel for suspension springs (SRS60)
	Steel for high strength suspension springs (UHS series)
Steel for bolts	Steel with improved delayed fracture resistant characteristics (KNDS series)
Steel for steel cords	Wire rods for high strength steel cords (KSC92-E, KSC105-E)
Bearing steel	Super clean bearing steel
Steel for gears (case hardening steel)	Steel for high strength gears (KKG series)
	Steel for gear with high surface-pressure resistance (KSCM418H)
Hardenability	Steel assuring narrow hardenability
Control of abnormal structure when carburizing	Steel assuring austenite grains size
Soft magnetism	Pure iron wire rods, soft magnetic steel (ELCH series)
Non-magnetic	High-Mn non-magnetic steel (PCD series)
Improved machinability without lead	Lead-free free-cutting steel (KGMS1215)
Omission of softening annealing	Low-carbon steel wire rods omitting annealing (KCH8ATDM)
	Low-carbon boron steel
Omission of patenting	KKP wire rods
	Wire rods and bars with high dimensional precision
Improvement of deformability	Cold heading quality wire rods with excellent deformability (KECH series)
Improved life of cold heading tools	Cold heading quality wire rods with excellent cold heading tool life (KTCH series)
Improvement of cutting process life	12 series steel with improved machinability (1215-A)
Steel for gears (case hardening steel)	Steel for high strength low alloy steel gear (KMnC418H)
Tough steel	Tough steel in SC boron series, Mn boron series, and alloy boron series

* For detailed information about each product, please request informational material from the offices listed on the back cover or visit our website: <http://www.kobelco.co.jp/english/steel/>

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