4. 規格資料 Specification

本規格資料中，內容以各協會公告為準

The contents of this catalog are for reference only. The latest specifications are published by the corresponding associations.

4.1 化學成份及機械性質 Chemical Compositions & Mechanical Properties.

4.1.1 JIS G3101 一般結構用鋼 Rolled Steels for General Structure

鋼種 Grade	化學成份 Chemical Compositions (%)					機械性質 Mechanical Properties									
						降伏點或降伏強度 Yield Point or Proof Stress (N/mm²)			抗拉強度 Tensile Strength (N/mm²)	鋼材厚度 Thickness T (mm)	試片 Test piece	伸長率 Elongation (%)	彎曲性質 Bend property		
						鋼材厚度 Thickness (mm)							彎曲角度 Angle of Bending	內側半徑 Inside Radius	試片 Test Piece
	C	Si	Mn	P	S	≦16	>16 ≦ 40	>40							
SS400	–	–	–	0.050 max.	0.050 max.	245 min.	235 min.	215 min.	400 | 510	T≦5	No. 5	21 min.	180°	厚度 × 1.5	No. 1
										5<T≦16	No. 1A	17 min.		1.5 times the thickness	
										16<T≦50	No. 1A	21 min.			
										T>40	No. 4	23 min.			
SS490	–	–	–	0.050 max.	0.050 max.	285 min.	275 min.	255 min.	490 | 610	T≦5	No. 5	19 min.	180°	厚度 × 2.0	No. 1
										5<T≦16	No. 1A	15 min.		2.0 times the thickness	
										16<T≦50	No. 1A	19 min.			
										T>40	No. 4	21 min.			

＊ 註:

1. 必要時可添加表列以外之合金元素。
2. 除非客戶特別指定要做彎曲試驗，否則該項試驗可取消。

＊ Remarks:

1. Alloying elements other than those given in table may be added as necessary.
2. The bend test may be omitted unless otherwise specified by the purchaser.

4.1.2 JIS G3106 熔接結構用鋼 Rolled Steels for Welded Structure

鋼種 Grade	厚度 Thickness T (mm)	化學成份 Chemical Compositions (%)					機械性質 Mechanical Properties									
							降伏點或降伏強度 Yield Point or Proof Stress (N/mm^2) 鋼材厚度 Thickness T (mm)			抗拉強度 Tensile Strength (N/mm^2)	鋼材厚度 Thickness T (mm)	試片 Test Piece	伸長率 Elongation (%)	試驗溫度 Temperature (℃)	夏比衝擊值 Charpy Absorption Energy (J)	試片 Test Piece
		C	Si	Mn	P	S	≦16	>16 ≦40	>40 ≦75							
SM400A	≦50	0.23 max.	—	2.5xC min.	0.035 max.	0.035 max.	245 min.	235 min.	215 min.	400 | 510	T≦5	No. 5	23 min.	—	—	V槽試片平行軋延方向 V-notch test piece rolling direction
	50<T≦100	0.25 max.														
SM400B	≦50	0.20 max.	0.35 max.	0.60 | 1.50							5<T≦16	No. 1A	18 min.	0	27 min. T>12	
	50<T≦100	0.22 max.														
SM400C	≦100	0.18 max.									16<T≦50	No. 1A	22 min.		47 min. T>12	
											T>40	No. 4	24 min.			
SM490A	≦50	0.20 max.	0.55 max.	1.65 max.	0.035 max.	0.035 max.	325 min.	315 min.	295 min.	490 | 610	T≦5	No. 5	22 min.	—	—	
	50<T≦100	0.22 max.														
SM490B	≦50	0.18 max.									5<T≦16	No. 1A	17 min.	0	27 min. T>12	
	50<T≦100	0.20 max.									16<T≦50	No. 1A	21 min.			
SM490C	≦100	0.18 max.									T>40	No. 4	23 min.		47 min. T>12	
SM490YA	≦100	0.20 max.	0.55 max.	1.65 max.	0.035 max.	0.035 max.	365 min.	355 min.	335 min.	490 | 610	T≦5	No. 5	19 min.	—	—	
											5<T≦16	No. 1A	15 min.			
SM490YB											16<T≦50	No. 1A	19 min.	0	27 min. T>12	
											T>40	No. 4	21 min.			
SM520B	≦100	0.20 max.	0.55 max.	1.65 max.	0.035 max.	0.035 max.	365 min.	355 min.	335 min.	520 | 640	T≦5	No. 5	19 min.	0	27 min. T>12	
											5<T≦16	No. 1A	15 min.			
SM520C											16<T≦50	No. 1A	19 min.		47 min. T>12	
											T>40	No. 4	21 min.			
SM570	型鋼 (H-Sections) ≦30	0.18 max.	0.55 max.	1.70 max.	0.035 max.	0.035 max.	460 min.	450 min.	430 min.	570 | 720	T≦16	No. 5	19 min.	-5	47 min. T>12	
											T>16	No. 5	26 min.			
											T>20	No. 4	20 min.			

＊ 註

1. 必要時可添加表列以外之合金元素。
2. 衝擊試驗適用於厚度超過12 mm之鋼料，且吸收能值為3個試片測試值之平均值。

＊ Remarks:

1. Alloying elements other than those given in table may be added as necessary.
2. The steel products over 12 mm in thickness shall be tested and the Charpy absorption energy shall be expressed by the average of measured values of three pieces.

4.1.3 JIS G3136 建築結構用鋼 Rolled Steel for Building Structure

鋼種 Grade	厚度 Thickness T (mm)	化學成份 Chemical Compositions (%)							降伏點或降伏強度 Yield point or Proof stress (N/mm^2)				抗拉強度 Tensile Strength (N/mm^2)
		C	Si	Mn	P	S	碳當量 Carbon Equivalent (%)	焊裂敏感度 Sensitivity of Welding Crack (%)	鋼材厚度 Thickness T (mm) ≧6 <12	≧12 < 16	≧16 ≦ 40	>40 ≦ 100	
SN400A	6≦T≦100	0.24 max.	—	—	0.050 max.	0.050 max.	—	—	235 min.	235 min.	235 min.	215 min.	400 | 510
SN400B	6≦T≦50	0.20 max.	0.35 max.	0.60 | 1.50	0.030 max.	0.015 max.	0.36 max.	0.26 max.	235 min.	235 | 355	235 | 355	215 | 335	400 | 510
	50<T≦100	0.22 max.											
SN400C	16≦T≦50	0.20 max.	0.35 max.	0.60 | 1.50	0.020 max.	0.008 max.			—	—			
	50<T≦100	0.22 max.											
SN490B	6≦T≦50	0.18max.	0.55 max.	1.65 max.	0.030 max.	0.015 max.	T≦40mm 0.44 max.	0.29 max.	325 min.	325 | 445	325 | 445	295 | 415	490 | 610
	50<T≦100	0.20 max.					T>40mm 0.46 max.						
SN490C	16≦T≦50	0.18 max.	0.55 max.	1.65 max.	0.020 max.	0.008 max.	T≦40mm 0.44 max.		—	—			
	50<T≦100	0.20 max.					T>40mm 0.46 max.						

＊註:

1. 必要時可添加表列以外之合金元素。
2. 碳當量 (%)=C+Mn/6+Si/24+Ni/40+Cr/5+Mo/4+V/14。
3. 焊裂敏感度 (%)=C+Si/30+Mn/20+Cu/20+Ni/60+Cr/20+Mo/15+V/10+5B。
4. 在買賣雙方同意下，可用焊裂敏感度取代碳當量。

＊ Remarks:

1. Alloying elements other than those given in table may be added as necessary.
2. Carbon equivalent (%)=C+Mn/6+Si/24+Ni/40+Cr/5+Mo/4+V/14.
3. Sensitivity of welding crack (%)=C+Si/30+Mn/20+Cu/20+Ni/60+Cr/20+Mo/15+V/10+5B.
4. Chemical composition on sensitivity of welding crack may be applied instead of carbon equivalent subject to the agreement between the purchaser and supplier.

機械性質 Mechanical Properties												
降伏比 Yield Ratio (%)				厚度方向特性 Through-thickness characteristics 收縮率 (Contraction %)		鋼材厚度 Thickness T (mm)	試片 Test Piece	伸長率 Elongation (%)	衝擊試驗 Impact Test		
鋼材厚度 Thickness T (mm)				鋼材厚度 Thickness T (mm)					試驗溫度 Temp. (℃)	夏比衝擊值 Energy (J)	試片 Test Piece
≧6 <12	≧12 <16	≧16 ≦40	>40 ≦100	最小單值 Minimum Individual Tested Value (%)	最小均值 Minimum Average of Three Tested Value (%)						
–	–	–	–	–	–	6≦T≦16	No. 1A	17min.	–	–	V槽試片平行軋延方向 V-notch test piece rolling direction
						16<T≦50	No. 1A	21 min.			
						40<T≦100	No. 4	23 min.			
	80 max.	80 max.		–	–	6≦T≦16	No. 1A	18 min.	0	27 min. T>12	
						16<T≦50	No. 1A	22 min.			
						40<T≦100	No. 4	24 min.			
	–			15 16≦T≦100	25 16≦T≦100	16	No. 1A	18 min.			
						16<T≦50	No. 1A	22 min.			
						40<T≦100	No. 4	24 min.			
	80 max.	80 max.		–	–	6≦T≦16	No. 1A	17 min.			
						16<T≦50	No. 1A	21 min.			
						40<T≦100	No. 4	23 min.			
	–			15 16≦T≦100	25 16≦T≦100	16	No. 1A	17 min.			
						16<T≦50	No. 1A	21 min.			
						40<T≦100	No. 4	23 min.			

＊ 註:

5. 對於腹板厚度9 mm以下之H型鋼，降伏強度的上限值不適用。
6. 衝擊試驗適用於厚度超過12 mm 之鋼料，且吸收能量值為3個試片測試值之平均值。個別試片測試值可小於27J，但一定要大於19J。
7. SN400C與SN490C厚度16 mm以上窄板須做超音波檢驗，檢驗規範依據JIS G 0901之Class Y定義。

＊ Remarks:

5. For the H sections, when t1 is 9 mm or less, the upper limit of the yield point or proof stress shall not be applied.
6. The steel products over 12 mm in thickness shall be tested and the Charpy absorption energy shall be expressed by the average of measured values of three test pieces. Further, one result among indivdual test results may be under 27J but shall be 19J or over.
7. For the Flat of SN400C and SN490C 16 mm or over in thickness, the UT (ultrasonic test) is required. According to the acceptance criteria,Class Y,specified in JIS G 0901.

4.1.4 CNS 2473 一般結構用鋼 Rolled Steels for General Structure

鋼種 Grade	化學成份 Chemical Compositions (%)						機械性質 Mechanical Properties									
							降伏點或降伏強度 Yield Point or Proof Stress (N/mm^2) 鋼材厚度 Thickness T (mm)			抗拉強度 Tensile Strength (N/mm^2)	鋼材厚度 Thickness T (mm)	試片 Test piece	伸長率 Elongation (%)	彎曲性質 Bend property		
														彎曲角度 Angle of Bending	內側半徑 Inside Radius	試片 Test Piece
	C	Si	Mn	P	S	B	≦16	>16 ≦40	>40							
SS400	—	—	—	0.050 max.	0.050 max.	<0.0008	245 min.	235 min.	215 min.	400 | 510	T≦5	No. 5	21 min.	180°	厚度 × 1.5	No. 1
											5<T≦16	No. 1A	17 min.		1.5 times the thickness	
											16<T≦50	No. 1A	21 min.			
											T>40	No. 4	23 min.			
SS490	—	—	—	0.050 max.	0.050 max.	<0.0008	285 min.	275 min.	255 min.	490 | 610	T≦5	No. 5	19 min.	180°	厚度 × 2.0	No. 1
											5<T≦16	No. 1A	15 min.		2.0 times the thickness	
											16<T≦50	No. 1A	19 min.			
											T>40	No. 4	21 min.			

規格資料

＊ 註:

1. 必要時可添加表列以外之合金元素。
2. 除非客戶特別指定要做彎曲試驗，否則該項試驗可取消。

＊ Remarks:

1. Alloying elements other than those given in table may be added as necessary.
2. The bend test may be omitted unless otherwise specified by the purchaser.

4.1.5 CNS 2947 熔接結構用鋼 Rolled Steels for Welded Structure

鋼種 Grade	厚度 Thickness T (mm)		化學成份 Chemical Compositions (%)						機械性質 Mechanical Properties									
									降伏點或降伏強度 Yield point or Proof stress (N/mm^2)			抗拉強度 Tensile Strength (N/mm^2)	鋼材厚度 Thickness T (mm)	試片 Test Piece	伸長率 Elongation (%)	試驗溫度 Temperature (^0C)	夏比衝擊值 Charpy Absorption Energy (J)	試片 Test Piece
			C	Si	Mn	P	S	B	≦16	>16 ≦40	>40 ≦75							
SM400A	≦50		0.23 max.	—	2.5xC min.	0.035 max.	0.035 max.	<0.0008	245 min.	235 min.	215 min.	400 | 510	T≦5	No. 5	23 min.	—	—	V槽試片平行軋延方向 V-notch test piece rolling direction
	50<T≦100		0.25 max.															
SM400B	≦50		0.20 max.	0.35 max.	0.60 | 1.50								5<T≦16	No. 1A	18 min.	0	27 min. T>12	
	50<T≦100		0.22 max.															
SM400C	≦100		0.18 max.										16<T≦50	No. 1A	22 min.		47 min. T>12	
													T>40	No. 4	24 min.			
SM490A	≦50		0.20max.	0.55 max.	1.65 max.				325 min.	315 min.	295 min.	490 | 610	T≦5	No. 5	22 min.	—	—	
	50<T≦100		0.22max.															
SM490B	≦50		0.18 max.										5<T≦16	No. 1A	17 min.	0	27 min. T>12	
	50<T≦100		0.20 max.										16<T≦50	No. 1A	21 min.			
SM490C	≦100		0.18 max.										T>40	No. 4	23 min.		47 min. T>12	
SM490YA	≦100		0.20 max.						365 min.	355 min.	335 min.	490 | 610	T≦5	No. 5	19 min.	—	—	
													5<T≦16	No. 1A	15 min.			
SM490YB													16<T≦50	No. 1A	19 min.	0	27 min. T>12	
													T>40	No. 4	21 min.			
SM520B	≦100								365 min.	355 min.	335 min.	520 | 640	T≦5	No. 5	19 min.	0	27 min. T>12	
													5<T≦16	No. 1A	15 min.			
SM520C													16<T≦50	No. 1A	19 min.		47 min. T>12	
													T>40	No. 4	21 min.			
SM570	型鋼 (H-sections)	≦30	0.18 max.	0.55 max.	1.70 max.	0.035 max.	0.035 max.	<0.0008	460 min.	450 min.	430 min.	570 | 720	T≦16	No. 5	19 min.	-5	47 min. T>12	
													T>16	No. 5	26 min.			
													T>20	No. 4	20 min.			

＊ 註:

1.必要時可添加表列以外之合金元素。

2.衝擊試驗適用於厚度超過12 mm之鋼料，且吸收能值為3個試片測試值之平均值。

＊ Remarks:

1.Alloying elements other than those given in table may be added as necessary.

2.The steel products over 12 mm in thickness shall be tested and the Charpy absorption energy shall be expressed by the average of measured values of three pieces.

規格資料

4.1.6 CNS 13812 建築結構用鋼 Rolled Steel for Building Structure

鋼種 Grade	厚度 Thickness T (mm)	化學成份 Chemical Compositions (%)								降伏點或降伏強度 Yield point or Proof stress (N/mm^2) 鋼材厚度 Thickness T (mm)			
		C	Si	Mn	P	S	B	碳當量 Carbon Equivalent (%)	焊裂敏感度 Sensitivity of Welding Crack (%)	≧6 <12	≧12 <16	≧16 ≦40	>40 ≦100
SN400A	6≦T≦100	0.24 max.	—	—	0.050 max.	0.050 max.	<0.0008	—	—	235 min.	235 min.	235 min.	215 min.
SN400B	6≦T≦50	0.20max.	0.35 max.	0.60 | 1.50	0.030 max.	0.015 max.	<0.0008	0.36 max.	0.26 max.	235 min.	235 | 355	235 | 355	215 | 335
	50<T≦100	0.22max.											
SN400C	16≦T≦50	0.20max.	0.35 max.	0.60 | 1.50	0.020 max.	0.008 max.	<0.0008	0.36 max.	0.26 max.	—	—		
	50<T≦100	0.22max.											
SN490B	6≦T≦50	0.18max.	0.55 max.	1.65 max.	0.030 max.	0.015 max.	<0.0008	T≦40mm 0.44max.	0.29 max.	325 min.	325 | 445	325 | 445	295 | 415
	50<T≦100	0.20max.						T>40mm 0.46max.					
SN490C	16≦T≦50	0.18max.	0.55 max.	1.65 max.	0.020 max.	0.008 max.	<0.0008	T≦40mm 0.44max.	0.29 max.	—	—		
	50<T≦100	0.20max.						T>40mm 0.46max.					
SN400YB	6≦T≦100	0.20 max.	0.35 max.	0.60 | 1.50	0.030 max.	0.015 max.	<0.0008	0.36 max.	0.26 max.	250 min.	250 | 355	250 | 355	250 | 335
SN400YC	16≦T≦100	0.20 max.	0.35 max.	0.60 | 1.50	0.020 max.	0.008 max.	<0.0008	0.36 max.		—	—		
SN490YB	6≦T≦40	0.18 max.	0.55 max.	1.65 max.	0.030 max.	0.015 max.	<0.0008	0.44max.	0.29 max.	325 | 445			
	40<T≦100							0.46max.					
SN490YC	16≦T≦40	0.18 max.	0.55 max.	1.65 max.	0.020 max.	0.008 max.	<0.0008	0.44max.		—	—	325 | 445	
	40<T≦100							0.46max.					

＊註:

1.必要時可添加表列以外之合金元素。

2.碳當量 (%)=C+Mn/6+Si/24+Ni/40+Cr/5+Mo/4+V/14。

3.銲裂敏感度 (%)=C+Si/30+Mn/20+Cu/20+Ni/60+Cr/20+Mo/15+V/10+5B。

4.在買賣雙方同意下，可用銲裂敏感度取代碳當量。

5.衝擊試驗適用於厚度超過12 mm之鋼料，且吸收能量值為3個試片測試值之平均值。個別試片測試值可小於27J，但一定要大於19J。

6.厚度16 mm以上之SN400C、SN400YC、SN490C及SN490YC窄板須做超音波檢驗，依CNS 12845 等級1規定。

機械性質 Mechanical Properties												
抗拉強度 Tensile Strength (N/mm^2)	降伏比 Yield Ratio (%) 鋼材厚度 Thickness T (mm) ≧6 <12	≧12 <16	≧16 ≦40	>40 ≦100	厚度方向特性 Through-thickness characteristics 收縮率 (Contraction %) 最小單值 Minimum Individual Tested Value (%)	最小均值 Minimum Average of Three Tested Value (%)	鋼材厚度 Thickness T (mm)	試片 Test Piece	伸長率 Elongation (%)	衝擊試驗 Impact Test 試驗溫度 Temp. (℃)	夏比衝擊值 Charpy Absorption Energy (J)	試片 Test Piece
400 | 510	—	—	—	—	—	—	6≦T≦16	No. 1A	17 min.	—	—	V槽試片平行軋延方向 V-notch test piece rolling direction
							16<T≦50	No. 1A	21 min.			
							40<T≦100	No. 4	23 min.			
400 | 510	—	80 max.	80 max.		—	—	6≦T≦16	No. 1A	18 min.	0	27 min. T>12	
							16<T≦50	No. 1A	22 min.			
							40<T≦100	No. 4	24 min.			
	—	—			15 16≦T≦100	25 16≦T≦100	16	No. 1A	18 min.			
							16<T≦50	No. 1A	22 min.			
							40<T≦100	No. 4	24 min.			
490 | 610	—	80 max.			—	—	6≦T≦16	No. 1A	17 min.			
							16<T≦50	No. 1A	21 min.			
							40<T≦100	No. 4	23 min.			
	—	—			15 16≦T≦100	25 16≦T≦100	16	No. 1A	17 min.			
							16<T≦50	No. 1A	21 min.			
							40<T≦100	No. 4	23 min.			
400 | 510	—	80 max.	80 max.	80 max.	—	—	6≦T≦16	No. 1A	20 min.	0	27 min. T>12	V槽試片平行軋延方向 V-notch test piece rolling direction
							16<T≦50	No. 1A	22 min.			
							40<T≦100	No. 4	24 min.			
	—	—	80 max.	80 max.	15 16≦T≦100	25 16≦T≦100	6≦T≦16	No. 1A	20 min.			
							16<T≦50	No. 1A	22 min.			
							40<T≦100	No. 4	24 min.			
490 | 610	80 max.				—	—	6≦T≦16	No. 1A	17 min.			
							16<T≦50	No. 1A	21 min.			
							40<T≦100	No. 4	23 min.			
	—	—	80 max.		15 16≦T≦100	25 16≦T≦100	6≦T≦16	No. 1A	17 min.			
							16<T≦50	No. 1A	21 min.			
							40<T≦100	No. 4	23 min.			

＊ Remarks:

1. Alloying elements other than those given in table may be added as necessary.
2. Carbon equivalent (%)=C+Mn/6+Si/24+Ni/40+Cr/5+Mo/4+V/14.
3. Sensitivity of welding crack (%)=C+Si/30+Mn/20+Cu/20+Ni/60+Cr/20+Mo/15+V/10+5B.
4. Chemical composition on sensitivity of welding crack may be applied instead of carbon equivalent subject to the agreement between the purchaser and supplier.
5. The steel products over 12 mm in thickness shall be tested and the Charpy absorption energy shall be expressed by the average of measured values of three test pieces. Further , one result among indivdual test results may be under 27J but shall be 19J or over.
6. For the Flat of grade SN400C、SN400YC、SN490C及SN490YC 16 mm or over in thickness , the UT (ultrasonic test) is required. According to the acceptance criteria, CNS 12845 Gr1.

4.1.7 CSC SM570M 高強度耐震結構用鋼 Seismic design of high strength structural steel

鋼種 Grade	產品別 Products	厚度 Thickness T (mm)	化學成份 Chemical Compositions (%)							下降伏點或降伏強度 Yield point or Proof stress (N/mm^2)
			C	Si	Mn	P	S	碳當量 Carbon Equivalent (%)	焊裂敏感度 Sensitivity of Welding Crack (%)	
SM570M-A	窄幅鋼板 (Flat steel)	20≦T≦40	0.18 max.	0.55 max.	1.60 max.	0.030 max.	0.008 max.	0.44 max.	0.29 max.	420 | 540
SM570M-B		20≦T≦40	0.18 max.	0.55 max.	1.60 max.	0.030 max.	0.008 max.	0.44 max.	0.29 max.	
SM570M-C		20≦T≦40	0.18 max.	0.55 max.	1.60 max.	0.020 max.	0.008 max.	T<40 0.44 max.	0.29 max.	
								T=40 0.44 max.	0.29 max.	

＊ 註:

1.碳當量 (%)=C+Mn/6+Si/24+Ni/40+Cr/5+Mo/4+V/14。

2.銲裂敏感度 (%)=C+Si/30+Mn/20+Cu/20+Ni/60+Cr/20+Mo/15+V/10+5B。

3.SM570M厚度20mm以上之窄板須做超音波檢驗，依JIS G0901 CLASS Y規定。

＊Remarks:

1.Carbon equivalent (%)=C+Mn/6+Si/24+Ni/40+Cr/5+Mo/4+V/14.

2.Sensitivity of welding crack (%)=C+Si/30+Mn/20+Cu/20+Ni/60+Cr/20+Mo/15+V/10+5B.

3.For the Flat of SM570M 20 mm or over in thickness , the UT (ultrasonic test) is required. According to the acceptance criteria, JIS G0901 Y class.

機械性質 Mechanical Properties									
抗拉強度 Tensile Strength (N/mm^2)	降伏比 Yield Ratio (%)	鋼材厚度 Thickness T (mm)	試片 Test Piece	伸長率 Elongation (%)	厚度方向特性 Through-thickness characteristics 收縮率 (Contraction %)		衝擊試驗 Impact Test		
					最小單值 Minimum Individual Tested Value (%)	最小均值 Minimum Average of Three Tested Value (%)	試驗溫度 Temp. (℃)	夏比衝擊值 Charpy Absorption Energy (J)	試片 Test Piece
570 | 720	85 max.	T≧20	No.4	20 min.	—	—	-5	47 min.	V槽試片平行軋延方向
								47 min.	
					15	25		47 min.	V-notch test piece rolling direction

規格資料

4.1.8 ASTM A709 橋樑結構用鋼 Structural Steel for Bridges

鋼種等級 Grade	化學成份 Chemical Compositions (%)															拉伸試驗 Tensile Test				
																降伏點 Yield Point	抗拉強度 Tensile Strength	伸長率(8) Elongation (%)		降伏比 Yield Ratio
	C	Si	Mn	P	S	V	Nb	Cu	Ni	Cr	Mo	N	Sn	B	碳當量(11) Carbon Equivalent, CE (%)	MPa	MPa	試片 GL=8 in. [200mm]	試片 GL=2 in. [50mm]	%
50	0.23 max.	0.40 max.	0.50(2) | 1.60	0.04 max.	0.050 max.	Type 2: 0.01 | 0.15	Type 2: –	0.20(1) min.	–	–	–	–	–	<0.0008	–	345 min.	450 min.	18 min.	21 min.	–
50S(5)	0.23 max.	0.40 max.	0.50(4) | 1.60	0.035 max.	0.045(4) max.	0.15(3) max.	0.05(3) max.	0.60 max.	0.45 max.	0.35 max.	0.15 max.	0.012(5) max.	<0.02	<0.0008	T≦50mm 0.45 max. T>50mm 0.47 max.	345 | 450	450 min.	18 min.	21 min.	85(6) max.

＊註:

1.指定為加銅鋼時，銅含量須在0.20%以上。

2.Mn/C比值不得小於2。C含量規格最大值每減少0.01%時，Mn含量規格最大值可增加0.06%，但Mn含量規格最大值不可高於1.60%。

3.釩與鈮共用時，最多不可超過0.15%。

4.在Mn/S的比值大於20的條件下，當厚度未滿25 mm時，Mn必須大於0.30%。

5.Grade 50S 煉鋼製程中若添加固氮元素時，N濃度可達150 ppm，若沒添加固氮元素，其N濃度不能超過120 ppm。

6. 試片若取在翼板則降伏比須小於0.85;若試片取於腹板位置，則降伏比須小於0.87。

7.除非客戶指定，否則不必進行衝擊試驗及超音波試驗。

8.當厚度未滿8 mm時，伸長率依ASTM A6規定得以遞減。

9.採購訂單有衝擊試驗要求，需於訂購前告知使用非臨界斷裂(F)或臨界斷裂(T)之試驗方式。

10.50F與50SF衝擊試驗取樣頻率依據A673/A673M規定之P頻率內容;50T與50ST試驗取樣頻率依據A673/A673M規定之H頻率內容。

11.碳當量=C+(Mn)/6+(Cr+Mo+V)/5+(Ni+Cu)/15。

機械性質 Mechanical Properties																
衝擊試驗 Impact test(7)、(9)、(10)																
鋼材厚度 Thickness (mm)	符號 Symbol	最低試驗值 Min. Test Value Energy (J)	Zone 1		Zone 2		Zone 3		符號 Symbol	Zone 1		Zone 2		Zone 3		
			試驗溫度 Temp. (℃)	夏比衝擊值 Charpy Energy (J)	試驗溫度 Temp. (℃)	夏比衝擊值 Charpy Energy (J)	試驗溫度 Temp. (℃)	夏比衝擊值 Charpy Energy (J)		試驗溫度 Temp. (℃)	夏比衝擊值 Charpy Energy (J)	試驗溫度 Temp. (℃)	夏比衝擊值 Charpy Energy (J)	試驗溫度 Temp. (℃)	夏比衝擊值 Charpy Energy (J)
≦ 50	F	27 min.	21	34 min.	4	34 min.	-12	34 min.	T	21	20 min.	4	20 min.	-12	20 min.
＞50 ≦ 100		33 min.	21	41 min.	4	41 min.	-12	41 min.		21	27 min.	4	27 min.	-12	27 min.
≦ 50		27 min.	21	34 min.	4	34 min.	-12	34 min.		21	20 min.	4	20 min.	-12	20 min.
＞50 ≦ 100		33 min.	21	41 min.	4	41 min.	-12	41 min.		21	27 min.	4	27 min.	-12	27 min.

規格資料

＊ Remarks:

1. Copper when specified shall have a minimum content of 0.20%.
2. The manganese to carbon ratio shall not be less than 2 to 1. For each reduction of 0.01 percentage point below the specified carbon maximum, an increase of 0.06 percentage point manganese above the specified maximum will be permitted , up to the maximum of 1.60%.
3. The sum of columbium and vanadium shall not exceed 0.15%.
4. Provided that the ratio of manganese to sulfur is not less than 20 to 1. the minimum limit for manganese for shapes with flange thickness not exceeding 25 mm shall be 0.30%.
5. For Grade 50S, the steelmaking practice used shall be one that produces steel having a nitrogen content not greater than 0.015% and includes the addition of one or more nitrogen-binding elements, or one that produces steel having a nitrogen content not greater than 0.012%.
6. The yield to tensile ratio shall be 0.87 or less for shapes that are tested from web location; for all other shapes the requirement is 0.85.
7. Impact test and Ultrasonic Examination shall not be tested unless specified in the purchase order or contract.
8. In according with ASTM A6, when using rectangular tension test specimen for testing thin material, adjustments in elongation requirements must be provided for thickness under 8 mm.
9. Purchase orders have impact test requirements. Before ordering need to inform the use of non-critical -fracture ,T, or critical fracture,F.
10. The grade 50F & 50SF for the CVN-impact testing shall be at "P" frequency in accordance with Specification of A673/A673M ; the grade 50T & 50ST for the CVN-impact testing shall be at "H" frequency in accordance with Specification of A673/A673M.
11. The carbon equivalent shall be calculated using the following formula：
    CE=C+(Mn)/6+(Cr+Mo+V)/5+(Ni+Cu)/15.

4.1.9 ASTM A36 結構用碳鋼 Carbon Structural Steel

鋼種 Grade	產品別 Products	寬度 Width B (mm)	厚度 Thickness T (mm)	化學成份 Chemical Compositions (%)							機械性質 Mechanical Properties					
											拉伸試驗 Tensile Test					
											降伏點 Yield Point		抗拉強度 Tensile Strength		伸長率(3) Elongation (%)	
				C	Si	Mn	P	S	Cu(1)	B	ksi	MPa	ksi	MPa	試片 GL=8 in. [200mm]	試片 GL=2 in. [50mm]
A36	H型鋼 (shapes)	All	All	0.26 max.	0.40 max.	—	0.040 max.	0.050 max.	0.20 min.	<0.0008	36 min.	250 min.	58 | 80	400 | 550	20 min.	21 min.
	(2) 鋼板 (Plates)	B≦380	≦20	0.26 max.	0.40 max.	—	0.040 max.	0.050 max.	0.20 min.	<0.0008					20(4) min.	23(4) min.
			20< T≦40	0.27 max.	0.40 max.	0.60 | 0.90	0.040 max.	0.050 max.	0.20 min.	<0.0008						
			40< T≦65	0.28 max.	0.40 max.	0.60 | 0.90	0.040 max.	0.050 max.	0.20 min.	<0.0008						
		B> 380	≦20	0.25 max.	0.40 max.	—	0.030 max.	0.030 max.	0.20 min.	<0.0008						
			20< T≦40	0.25 max.	0.40 max.	0.80 | 1.20	0.030 max.	0.030 max.	0.20 min.	<0.0008						
			40< T≦65	0.26 max.	0.15 | 0.40	0.80 | 1.20	0.030 max.	0.030 max.	0.20 min.	<0.0008						

＊註:

1.指定為加銅鋼時，銅含量須在0.20%以上。

2.當C含量規格最大值每減少0.01%時，Mn含量規格最大值可增加0.06%，但Mn含量規格最大值不可高於1.35%。

3.當厚度未滿8 mm時，伸長率依ASTM A6規定得以遞減。

4.當鋼板寬度超過600 mm，伸長率可減少2%。

＊ Remarks:

1. As for the Cu content, when specified shall have a minimum content of 0.20%.
2. For each reduction of 0.01 percentage point below the specified carbon maximum, an increase of 0.06 percentage point manganese above the specified maximum will be permitted, up to the maximum of 1.35%.
3. In according with ASTM A6, when using rectangular tension test specimen for testing thin material, adjustments in elongation requirements must be provided for thickness under 8 mm.
4. For plates wider than 600 mm, the elongation requirement is reduced two percentage points.

4.1.10 ASTM A572 加鈮釩高強度低合金結構用鋼
High-Strength Low-Alloy Columbium-Vanadium Structral Steel

鋼種等級 Grade	化學成份 Chemical Compositions (%)												機械性質 Mechanical Properties					
	C	Si	Mn[2][4]	P[6]	S[6]	Cu[1]	B	Type1	Type2	Type3			拉伸試驗 Tensile Test					
								Nb	V	Nb	V	Nb+V	降伏點 Yield Point		抗拉強度 Tensile Strength		伸長率[3][7] Elongation (%)	
													ksi	MPa	ksi	MPa	試片 GL=8 in. [200mm]	試片 GL=2 in. [50mm]
42 [290]	0.21 max.	0.40[5] max.	1.35 max.	0.04 max.	0.05 max.	0.20 min.	<0.0008	0.005 | 0.050	0.01 | 0.15	0.005 | 0.050	0.01 | 0.15	0.02 | 0.15	42 min.	290 min.	60 min.	415 min.	20 min.	24 min.
50 [345]	0.23 max.	0.40[5] max.	1.35 max.	0.04 max.	0.05 max.	0.20 min.	<0.0008						50 min.	345 min.	65 min.	450 min.	18 min.	21 min.
60 [415]	0.26 max.	0.40 max.	1.35 max.	0.04 max.	0.05 max.	0.20 min.	<0.0008						60 min.	415 min.	75 min.	520 min.	16 min.	18 min.

規格資料

＊註:

1.指定為加銅鋼時，銅含量須在0.20%以上。

2.Mn/C比值不得小於2。當C含量規格最大值每減少0.01%時，Mn含量規格最大值可增加0.06%，但Mn含量規格最大值不可高於1.60%。

3.當厚度未滿8 mm時，伸長率依ASTM A6規定得以遞減。

4.當鋼板厚度超過10 mm時，Mn含量不得低於0.80%；鋼板和其它產品厚度在10 mm以下時，Mn含量最低值為0.50%。

5.鋼板厚度超過40 mm時，Si含量最低值為0.15%。

6.鋼板寬度未滿380 mm時，P含量最高為0.030%，S含量最高為0.030。

7.當鋼板寬度超過600 mm，Grade[42]、[50]伸長率可減少2%；Grade[60]，伸長率可減少3%。

＊ Remarks:

1. As for the Cu content, when specified shall have a minimum content of 0.20%.
2. The manganese to carbon ratio shall not be less than 2 to 1. For each reduction of 0.01 percentage point below the specified carbon maximum, an increase of 0.06 percentage point manganese above the specified maximum will be permitted, up to the maximum of 1.60%.
3. In according with ASTM A6, when using rectangular tension test specimen for testing thin material, adjustments in elongation requirements must be provided for thickness under 8 mm.
4. Manganese, minimum, by heat analysis of 0.80% shall be required for all plates over 10 mm in thickness; a minimum of 0.50% shall be required for plates 10 mm and less in thickness, and for all other products.
5. Silcon, minimum, by heat analysis of 0.15% shall be required for all plates over 40 mm in thickness.
6. A maximum phosphorus content of 0.030% and a maximum sulfur content of 0.030% are permitted for plates<380 mm width.
7. For plates wider than 600 mm, the elongation requirement is reduced two percentage points for Grade [42]、[50], and three percentage points for Grade [60].

4.1.11 ASTM A992 結構用型鋼 Structural Steel Shapes

鋼種等級 Grade	化學成份 Chemical Compositions (%)															機械性質 Mechanical Properties						
																拉伸試驗 Tensile Test						
	C	Si	Mn(1)	P	S	Cu	Ni	Cr	Mo	V(2)	Nb(2)	N(3)	Sn	B	碳當量(4) Carbon Equivalent, CE (%)	降伏點(5) Yield Point		抗拉強度 Tensile Streng		伸長率(7) Elongation (%)		降伏比(6) Yield Ratio
																ksi	MPa	ksi	MPa	試片 GL=8 in. [200mm]	試片 GL=2 in. [50mm]	%
A992	0.23 max.	0.40 max.	0.50 | 1.60	0.035 max.	0.045 max.	0.60 max.	0.45 max.	0.35 max.	0.15 max.	0.15 max.	0.05 max.	0.012 max.	<0.02	<0.0008	T≦50mm 0.45 max. T>50mm 0.47 max	50 | 65	345 | 450	65 min.	450 min.	18 min.	21 min.	85 max.

＊註:

1.在Mn/S的比值大於20的條件下，當厚度小於25 mm時，Mn必須大於0.30%。

2.Nb+V的總和不得高於0.15%。

3. 煉鋼製程中若添固氮元素時，N濃度可達150 ppm，若沒添加固氮元素，其N濃度不能超過120 ppm。

4.碳當量=C+(Mn)/6+(Cr+Mo+V)/5+(Ni+Cu)/15。

5.若取腹板位置做試驗，則最大降伏強度可達70 ksi [480 MPa]。

6.若取腹板位置做試驗，則最大降伏比可達0.87。

7.當厚度未滿8 mm時，伸長率依ASTM A6規定得以遞減。

＊ Remarks:

1.Provided that the ratio of manganese to sulfur is not less than 20 to 1, the minimum limit for manganese for shapes with flange or leg thickness not exceeding 25 mm shall be 0.30%.

2.The sum of columbium and vanadium shall not exceed 0.15%.

3.The steelmaking practice used shall be one that produces steel having a nitrogen content not greater than 0.015% and includes the addition of one or more nitrogen-binding elements, or one that produces steel having a nitrogen content not greater than 0.012%.

4.The carbon equivalent shall be calculated using the following formula:
CE=C+(Mn)/6+(Cr+Mo+V)/5+(Ni+Cu)/15.

5.A maximum yield strength of 70ksi [480MPa] is permitted for sturcture shapes that are required to be tested from the web location.

6.A maximum ratio of 0.87 is permitted for structural shapes that are tested from the web location.

7.In according with ASTM A6, when using rectangular tension test specimen for testing thin material, adjustments in elongation requirements must be provided for thickness under 8 mm.

4.1.12 船用高強度鋼材 Higher Strength Hull Structural Steel

鋼種等級 Grade	化學成份 Chemical Compositions (%)														機械性質 Mechanical Properties					
															拉伸試驗 Tensile Test			衝擊試驗 Impact Test		
	C	Si	Mn[5]	P	S	V[3][4]	Nb[3][4]	Ti[3][4]	Cu	Cr	Mo	Ni	Al[2]	Ca[3]	降伏點 Yield Point (N/mm^2)	抗拉強度 Tensile Strength (N/mm^2)	伸長率[6] Elongation (%)	試驗溫度 Temp. (℃)	夏比衝擊值 Energy (J)	試片方向
AH32	0.18 max.	0.10 | 0.50	0.90 | 1.60	0.035 max.	0.035 max.	0.05 | 0.10	0.02 | 0.05	0.02 max.	0.35 max.	0.20 max.	0.08 max.	0.40 max.	0.020 min.	0.005 max.	315 min.	440 | 590	22 min.	0	T≦50mm 31min. 50＜T≦70mm 38 min.	V槽試片平行軋延方向 V-notch test piece rolling direction
DH32	0.18 max.	0.10 | 0.50	0.90 | 1.60	0.035 max.	0.035 max.	0.05 | 0.10	0.02 | 0.05	0.02 max.	0.35 max.	0.20 max.	0.08 max.	0.40 max.	0.020 min.	0.005 max.	315 min.	440 | 590	22 min.	-20	T≦50mm 31 min. 50＜T≦70mm 38 min.	
AH36	0.18 max.	0.10 | 0.50	0.90 | 1.60	0.035 max.	0.035 max.	0.05 | 0.10	0.02 | 0.05	0.02 max.	0.35 max.	0.20 max.	0.08 max.	0.40 max.	0.020 min.	0.005 max.	355 min.	490 | 620	21 min.	0	T≦50mm 34 min. 50＜T≦70mm 41 min.	
DH36	0.18 max.	0.10 | 0.50	0.90 | 1.60	0.035 max.	0.035 max.	0.05 | 0.10	0.02 | 0.05	0.02 max.	0.35 max.	0.20 max.	0.08 max.	0.40 max.	0.020 min.	0.005 max.	355 min.	490 | 620	21 min.	-20	T≦50mm 34 min. 50＜T≦70mm 41 min.	

＊註:

1.各國船用型鋼化性與物性要求依各驗船協會規定。

2.使用全鋁含量不得低於0.020%；表中之可溶酸鋁可替代全鋁，其含量不可低於0.015%。

3.除非有意添加，否則無需報列這些元素。

4.鋼材得含有單一或複合之鋁、鈮與釩或其它細晶粒化元素，採用單一種細晶粒化元素者，其含量應依上表所規定數值。如採用複合元素細晶粒者，得免依上表所規定數值。

5.AH鋼材厚度12.5 mm以下時，其最低錳含量可減至0.70%。

6.伸長量之標距L=5.65√A時之最小伸長率。(A:試片截面積)

＊ Remarks:

1.The chemical compositions and mechanical properties of hull structure steel are specified in each Shipping Association.

2.The total Aluminum content may be determined instead of the acid soluble content. In such cases, the total Aluminum content is be not less than 0.020%.

3.These elements need not be reported on the mill sheet unless intentionally added.

4.The steel is to contain Aluminum , Niobium and Vanadium or other suitable grain refining elements, either singly or in any combination. When used singly the steel is to contain the specified minimum content of the grain refining element. When used in combination , the specified minimum content of each gain refining element is not applicable.

5.AH steel 12.5 mm (0.50 in.) and under in thickness may have a minimum manganese content of 0.70%.

6.Minimum elongation on L = 5.65√A. (A: cross area of test piece)

4.1.13 BS EN 10025-2/BS EN 10025-3 熱軋結構鋼 Hot Rolled Products of Structural Steels

規格 Spec.	鋼種 Grade	厚度 Thickness T (mm)	化學成份 Chemical Compositions (%)												
			C	Si	Mn	P[1]	S[1]	N	Cu	Nb	V	Ti	Al	Cr	Ni
BS EN 10025-2	S275JR	T≦40	0.21 max.	—	1.50 max.	0.035 max.	0.035 max.	0.012 max.	0.55 max.	—	—	—	—	—	—
		T＞40	0.22 max.												
	S275J0	T＜63	0.18 max.	—	1.50 max.	0.030 max.	0.030 max.	0.012 max.	0.55 max.	—	—	—	—	—	—
	S355JR	T＜63	0.24 max.	0.55 max.	1.60 max.	0.035 max.	0.035 max.	0.012 max.	0.55 max.	—	—	—	—	—	—
	S355J0	T≦30	0.20 max.	0.55 max.	1.60 max.	0.030 max.	0.030 max.	0.012 max.	0.55 max.	—	—	—	—	—	—
		T＞30	0.22 max.												
	S355J2	T≦30	0.20 max.	0.55 max.	1.60 max.	0.025 max.	0.025 max.	—	0.55 max.	—	—	—	—	—	—
		T＞30	0.22 max.												
	S450J0[1]	T≦30	0.20 max.	0.55 max.	1.70 max.	0.030 max.	0.030 max.	0.025 max.	0.55 max.	0.05 max.	0.13 max.	0.05 max.	—	—	—
		T＞30	0.22 max.												
BS EN 10025-3	S460N[6]	T≦44.1	0.20 max.	0.60 max.	1.00 | 1.70	0.030 max.	0.025 max.	0.025 max.	0.55 max.	0.05 max.	0.20 max.	0.05 max.	0.02[5] min.	0.30 max.	0.80 max.

＊ 註:

1.針對長型產品，P與S含量上限可上調0.005%。

2.碳當量=C+(Mn)/6+(Cr+Mo+V)/5+(Ni+Cu)/15。

3.公稱厚度未滿6 mm不須做衝擊試驗。

4.伸長量之標距L=5.65√A時之最小伸長率。(A:試片截面積)

5.如有添加固氮元素，則Al的下限值可不管制。

6.V + Nb + Ti ≤ 0,22 % 、 Mo + Cr ≤ 0,30 %。

				機械性質 Mechanical Properties							
Mo	最大碳當量(2) Max. Carbon Equivalent Value CEV (%)			降伏強度 Yield Strength, (N/mm^2)			抗拉強度 Tensile Strength (N/mm^2)	最小伸長率 Percentage Elongation (%)		衝擊試驗(3) Charpy Impact Test	
	厚度區間 Nominal Thickness T (mm)										
	≦30	30＜T≦40	40＜T≦63	≦16	16＜T≦40	40＜T≦63	3≦T≦100	3≦T≦40	40＜T≦63	試驗溫度 Test Temp. (℃)	衝擊值 Min. Test Value (J)
—	0.40	0.40	0.42	275 min.	265 min.	255 min.	410 | 560	23	22	20	27
—	0.40	0.40	0.42	275 min.	265 min.	255 min.	410 | 560	23	22	0	27
—	0.45	0.47	0.47	355 min.	345 min.	335 min.	470 | 630	22	21	20	27
—	0.45	0.47	0.47	355 min.	345 min.	335 min.	470 | 630	22	21	0	27
—	0.45	0.47	0.47	355 min.	345 min.	335 min.	470 | 630	22	21	-20	27
—	0.47	0.49	0.49	450 min.	430 min.	410 min.	550 | 720	17	17	0	27
0.10 max.	0.53	0.53	0.53	460 min.	440 min.	430 min.	540 | 720	17	17	-20	40
										-10	43
										0	47
										20	55

＊ Remarks:

1.For long products the P and S content can be 0.005% higher.

2.Carbon equivalent value (CEV)=C+(Mn)/6+(Cr+Mo+V)/5+(Ni+Cu)/15.

3.Impact tests shall not be required for normal thickness less than 6 mm.

4.Minimum elongation on $L=5.65\sqrt{A}$. (A: cross area of test piece)

5.If sufficient other N-binding elements are present the minimum total Al content does not apply.

6.V + Nb + Ti ≤ 0,22 % and Mo + Cr ≤ 0,30 %.

4.1.14 AS/NZS 3679.1 熱軋結構型鋼 Structural Steel Hot Rolled Sections

鋼種等級 Grade	化學成份 Chemical Compositions (%)														機械性質 Mechanical Properties									
															拉伸試驗 Tensile test									
															上降伏應力 Yield Stress (R_{eH}) N/mm² (MPa)				下降伏應力 Lower Yield Stress (R_{eL}) N/mm² (MPa)				下降伏比 Lower Yield Ratio (%)	抗拉強度 Tensile Stress (R_m) (N/mm²)	伸長率[7] Elongation (%)
															鋼材厚度Thickness (mm)									
	C	Si	Mn	P	S	V[3][4]	Nb[3][4]	Nb+V[3][4]	Ti[1][3][4]	Cu[2]	Ni[2]	Cr[2]	Mo[2]	碳當量[6] Carbon Equivalent, CE (%)	< 11	≧11 ≦17	> 17 < 40	≧40	< 11	≧11 ≦17	> 17 < 40	≧40			
300	0.25 max.	0.50 max.	1.60 max.	0.040 max.	0.040 max.	0.030 max.	0.020 max.	0.030 max.	0.040 max.	0.50 max.	0.50 max.	0.30 max.	0.10 max.	0.44	320 min.	300 min.	280 min.	280 min.	-	-	-	-	-	440 min.	22 min.
300L0																									
300S0																			426 max.	399 max.	372 max.	372 max.	80 max.		25 min.
350[5]	0.22 max.	0.50 max.	1.60 max.	0.040 max.	0.040 max.	—	—	—	—	0.50 max.	0.50 max.	0.30 max.	0.10 max.	0.45	360 min.	340 min.	340 min.	330 min.	-	-	-	-	-	480 min.	20 min.
350L0[5]						—	—	—	—	0.50 max.	0.50 max.	0.30 max.	0.10 max.	0.45											
350S0[5]						—	—	—	—	0.50 max.	0.50 max.	0.30 max.	0.10 max.	0.45					479 max.	452 max.	452 max.	439 max.	80 max.		25 min.

鋼種等級 Grade	Test temperature	衝擊試驗 Charpy Impact Test					
		Minimum absorbed energy (J)					
		Size of test piece					
		10 mm× 10 mm		10 mm× 7.5 mm		10 mm× 5mm	
	℃	Average of 3 tests	Individual test	Average of 3 tests	Individual test	Average of 3 tests	Individual test
300L0 / 350L0	0	27	20	22	16	18	13
300S0 / 350S0[8]		70	50	-	-	-	-

＊ 註:

1.使用細晶元素鋁與鈦時，其總量不得超過0.15%，若單獨使用不可超過上表中各別管制量。
2.銅、鎳、鉻與鉬加總量不得超過1.00%。
3.300, 300S0鋼種厚度未滿15 mm時，鈦、鈮、釩與鈮釩混加不視為微量合金添加元素，厚度15 mm以上時單獨使用不可超過上表中各別管制量。
4.300, 300S0鋼種在厚度15 mm以上時， 微合金元性總合最大含量不得大於0.15%且各別微合金含量最大值如上表所列，對所使用之微量合金元素必須顯示於品質證明書上。
5.350, 350L0, 350S0鋼種微合金元素Nb、V與Ti總合最大含量不得大於0.15%。
6.碳當量=C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15。
7.最小伸長率之標點距離長度為=5.65√A。
8.S0等級之型鋼產品，厚度超過12 mm才需進行衝擊試驗。

＊ Remarks:

1.Grain refining elements, i.e. aluminium and titanium may be added, provided that the total content does not exceed 0.15%.
2.The Cu, Ni, Cr and Mo elements may be present to the limits stated, subject to a maximum total of 1.0%.
3.For grade 300, 300S0 the thickness less than 15 mm, titanium, niobium, vanadium and niobium plus vanadium are not considered as microalloying elements. The limit content lists as above table.
4.For grade 300, 300S0 the thickness greater than or equal to 15 mm, the maximum combined micro-alloying element content is 0.15%. Where micro-alloying elements are used, the percentage of each element is to be shown on the certificates.
5.For grades 350, 350L0, 350S0 micro-alloying elements niobium, vanadium and titanium may be added, provided that their total combined content does not exceed 0.15%.
6.Carbon equivalent (CE) is calculated from the following equation.
CE=C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15.
7.Minimum elongation on a gauge length of 5.65√A.
8.Impact testing for S0 only applies to sections with elements thickness greater more than 12 mm thick.

4.1.15 KS D3503 一般結構用鋼 Rolled Steels For General Structure

鋼種 Grade	化學成份 Chemical Compositions (%)					機械性質 Mechanical Properties									
						降伏點或降伏強度 Yield Point or Proof Stress (N/mm^2)			抗拉強度 Tensile Strength (N/mm^2)	鋼材厚度 Thickness T (mm)	試片 Test Piece	伸長率 Elongation (%)	彎曲性質 Bend property		
						鋼材厚度Thickness (mm)							彎曲角度 Angle of Bending	內側半徑 Inside Radius	試片 Test Piece
	C	Si	Mn	P	S	≦16	>16 ≦40	>40							
SS275 (SS400)	0.25 max.	0.45 max.	1.40 max.	0.050 max.	0.050 max.	275 min.	265 min.	245 min.	410 I 550	T≦5	No. 5	21 min.	180°	厚度×1.5 1.5 times the thickness	No.1
										5<T≦16	No.1A	18 min.			
										16<T≦40	No.1A	21 min.			
										T>40	No.4	23 min.			

＊註:

1.必要時可添加表列以外之合金元素。

＊ Remarks:

1.Alloying elements other than those given in table may be added as necessary.

規格資料

4.1.16 KS D3515 熔接結構用鋼 Rolled Steels For Welded Structure

鋼種 Grade	厚度 Thickness T(mm)	化學成份 Chemical Compositions (%)							機械性質 Mechanical Properties									
									降伏點或降伏強度 Yield Point or Proof Stress (N/mm^2) 鋼材厚度 (mm) Thickness			抗拉強度 Tensile Strength (N/mm^2)	鋼材厚度 Thickness T (mm)	試片 Test Piece	伸長率 Elongation (%)	衝擊試驗 Charpy Impact Test		
		C	Si	Mn	P	S	碳當量 Carbon Equivalent (%)	焊裂敏感度 Sensitivity of Welding Crack (%)	≦16	>16 ≦40	>40 ≦75					試驗溫度 Temperature (℃)	夏比衝擊值 Charpy Absorption Energy (J)	試片 Test Piece
SM355A (SM490A)	≦50	0.20 max.	0.55 max.	1.60 max.	0.035 max.	0.035 max.	0.47 max.	0.27 max.	355 min.	345 min.	335 min.	490 | 630	T≦5	No.5	22 min.	0	27 min.	V槽試片 平行軋延方向 V-notch test piece rolling direction
													5<T≦16	No.1A	17 min.			
	50<T≦100	0.22 max.					0.49 max.	0.29 max.					16<T≦40	No.1A	19 min.			
													T>40	No.4	23 min.			

＊註:

1.必要時可添加表列以外之合金元素。

2.碳當量 (%) =C+(Mn)/6+(Cr+Mo+V)/5+(Ni+Cu)/15。

3.銲裂敏感度 (%) =C+Si/30+Mn/20+Cu/20+Ni/60+Cr/20+Mo/15+V/14+5B。

4.在買賣雙方同意下，可用銲裂敏感度取代碳當量。

＊ Remarks:

1.Alloying elements other than those given in table may be added as necessary.

2.Carbon equivalent (%)=C+(Mn)/6+(Cr+Mo+V)/5+(Ni+Cu)/15.

3.Sensitivity of welding crack (%)=C+Si/30+Mn/20+Cu/20+Ni/60+Cr/20 +Mo/15+V/14+5B.

4.Chemical composition on sensitivity of welding crack may be applied instead of carbon equivalent subject to the agreement between the purchaser and supplier.

4.1.17 KS D3866 建築結構用鋼 Hot Rolled Steel Sections For Building Structure

鋼種 Grade	厚度 Thickness T (mm)	化學成份 Chemical Compositions (%)														機械性質 Mechanical Properties								
																降伏點或降伏強度 Yield Point or Proof Stress (N/mm²)	抗拉強度 Tensile Strength (N/mm²)	降伏比(6) Yield Ratio (%)	鋼材厚度 Thickness T (mm)	試片 Test Piece	伸長率 Elongation (%)	衝擊試驗 Charpy Impact Test		
		C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	Nb	Mn/S	碳當量 Carbon Equivalent (%)	焊裂敏感度 Sensitivity of Welding Crack (%)							試驗溫度 Temperature (℃)	夏比衝擊值 Charpy Absorption Energy (J)	試片 Test Piece
SHN355 (SHN490)	≦75	0.20 max.	0.40 max.	0.50 | 1.50	0.035 max.	0.030 max.	0.60 max.	0.45 max.	0.35 max.	0.15 max.	0.11 max.	0.05 max.	20 min.	0.45 max.	0.26 max.	355 | 475	490 | 610	85 max.	T≦40	No.1A	21min.	0	27 min.	V槽試片平行軋延方向 V-notch test piece rolling direction
																			T＞40	No. 4	23min.			

＊註:

1.必要時可添加表列以外之合金元素。

2.Nb+V≦0.15%。

3.碳當量(%)=C+(Mn)/6+(Cr+Mo+V)/5+(Ni+Cu)/15.

4.銲裂敏感度(%)=C+Si/30+Mn/20+Cu/20+Ni/60+Cr/20+Mo/15+V/14+5B。

5.在買賣雙方同意下，可用銲裂敏感度取代碳當量。

6.若型鋼厚度10 mm以下，則最大降伏比可達87%。

＊ Remarks:

1.Alloying elements other than those given in table may be added as necessary.

2.The sum of Nb and V shall not be over 0.15%.

3.Carbon equivalent (%)=C+(Mn)/6+(Cr+Mo+V)/5+(Ni+Cu)/15.

4.Sensitivity of welding crack (%)=C+Si/30+Mn/20+Cu/20+Ni/60+Cr/20 +Mo/15+V/14+5B.

5.Chemical composition on sensitivity of welding crack may be applied instead of carbon equivalent subject to the agreement between the purchaser and supplier.

6.The yield ratio of steel sections of 10 mm or under in thickness shall be 87%.

4.1.18 SAE & JIS G4051 機械構造用碳鋼Carbon Steel for Machine Structure

鋼種 Grade	化學成份 Chemical compositions (%)				
	C	Si	Mn	P	S
SAE 1006	0.08 max.	-	0.25 | 0.40	0.040 max.	0.050 max.
SAE 1008	0.10 max.	-	0.30 | 0.50	0.040 max.	0.050 max.
SAE 1010	0.08 | 0.13	-	0.30 | 0.60	0.040 max.	0.050 max.
SAE 1018	0.15 | 0.20	-	0.60 | 0.90	0.040 max.	0.050 max.
SAE 1022	0.18 | 0.23	-	0.70 | 1.00	0.040 max.	0.050 max.
JIS G4051 S45C	0.42 | 0.48	0.15 | 0.35	0.60 | 0.90	0.030 max.	0.035 max.
JIS G4051 S50C	0.47 | 0.53	0.15 | 0.35	0.60 | 0.90	0.030 max.	0.035 max.

＊註:

1.對SAE規格中當Si成份有要求時，可要求範圍為 0.10%max.； 0.10~0.20%； 0.15~0.35%； 0.20~0.40% 與0.30~0.60%。

2.殘留元素可由買賣雙方同意制訂，若無協定則為Cu≦0.35%，Ni≦0.25%，Cr≦0.20%，Mo≦0.06%。

3.對JIS規格中不純物Cr不可超過0.20%；Cu不可超過0.30%； Ni不可超過0.20%；Ni+Cr不可超過0.35%。

4.非上述鋼種需求者，請洽中龍營業處。

＊ Remarks:

1.When silicon is required, the following ranges and limits are commonly used for nonresulfurized steels: 0.10%max.； 0.10~0.20%；0.15~0.35%；0.20~0.40% and 0.30~0.60% for SAE asscociation.

2.Residual elements for specific application shall be agreed upon between purchaser and supplier. Unlessotherwise specified limits for residual elements will be Cu≦0.35%，Ni≦0.25%，Cr≦0.20%，Mo≦0.06%.

3.Cr shall be not over 0.20%,Cu shall be not over 0.30%;Ni shall be not over 0.20%；Ni and Cr shall be not over 0.35% and for JIS association.

4.Please contact Marketing Deparment for grade not listed above.