

KOBELCO

Kobe Steel High-Strength Steel Plate for Welded Structures

K-TEN Series

KOBE STEEL, LTD.

IRON & STEEL BUSINESS

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KOBE STEEL, LTD.

Kobe Steel is the first choice in welding, and no product represents that more so than our K-TEN Series high-strength steel plate for welded structures.

Since operations first began in 1968 at the Kakogawa Works, Kobe Steel has been developing high-strength steel featuring excellent weldability. Kobe Steel's high-strength steel plate has been in use for nearly 50 years, in fields such as tanks, construction machinery, long-span bridges and penstocks, where its superior workability is greatly desired.

The K-TEN Series features a wide variety of products to correspond to different applications and strength classes.

■ Quenched and tempered high-strength steel plate for welded structures and pressure vessels (Standard Type)

Special Features	Product code	Thickness (mm)	Heat treatment	Applicable standards JIS,WES, etc.	Major applications
This heat treated high-strength steel plate with excellent weldability and mechanical properties is suitable for use in a wide range of fields.	K-TEN570	6 ≤ t ≤ 100	Quenched and tempered	ASTM : A537CL2 JIS : SM570Q WES : HW450QB	Bridges, building construction, penstocks, storage tanks, industrial machinery, pressure vessels, other
	K-TEN590	6 ≤ t ≤ 100		ASTM : A537CL2 JIS : SPV450Q WES : HW450QB,LT	Bridges, building construction, penstocks, storage tanks, industrial machinery, pressure vessels, other
	K-TEN610	6 ≤ t ≤ 75		ASTM : A537CL2 JIS : SPV490Q WES : HW490QB,LT	Bridges, building construction, penstocks, storage tanks, industrial machinery, pressure vessels, other
	K-TEN670	6 ≤ t ≤ 100		ASTM : A782CL1 JIS : — WES : HW550QB,LT	Bridges, penstocks, industrial machinery, construction machinery, pressure vessels, other
	K-TEN710	6 ≤ t ≤ 100		ASTM : A782CL2 JIS : — WES : HW620QB,LT	Bridges, penstocks, industrial machinery, construction machinery, pressure vessels, other
	K-TEN780 (Low temp. toughness type)	6 ≤ t ≤ 100		ASTM : A514,A517 JIS : SHY685N,NS WES : HW685QB,LT	Bridges, building construction, penstocks, industrial machinery, construction machinery, pressure vessels, oil drilling, other
	K-TEN780A (Standard type)	6 ≤ t ≤ 100		ASTM : A514,A517 JIS : SHY685 WES : HW685QB,LT	Bridges, building construction, penstocks, industrial machinery, construction machinery, pressure vessels, oil drilling, other

■ Quenched and tempered high-strength steel plate for welded structures with low crack susceptibility (Crack-Free Steel)

Special Features	Product code	Thickness (mm)	Heat treatment	Applicable standards JIS,WES, etc.	Major applications
In additions to the merits offered by standard-type K-TEN, Crack-Free Steel offers greatly reduced preheat temperatures and greatly improved weldability.	K-TEN590CF	6 ≤ t ≤ 75	Quenched and tempered	ASTM : A537CL2 JIS : SPV450Q WES : HW685QB,LT,QCF	Bridges, penstocks, storage tanks, construction machinery, pressure vessels, other
	K-TEN610CF	6 ≤ t ≤ 75		ASTM : A537CL2 JIS : SPV490Q WES : HW490QB,LT,QCF	
	K-TEN780CF	6 ≤ t ≤ 50		ASTM : A514,A517 JIS : SHY685N,NS WES : HW685QB	

■ Non heat treated high-strength steel plate for welded structures (R Series)

Special Features	Product code	Thickness (mm)	Heat treatment	Applicable standards JIS,WES, etc.	Major applications
Using sophisticated controlled rolling technologies, R Series K-TEN offers both high strength and weldability without requiring heat treatment.	K-TEN540-R	6 ≤ t ≤ 50	As rolled	JIS : SM520B WES : HW355R	Industrial machinery, construction machinery, other
	K-TEN570-R	6 ≤ t ≤ 32		JIS : SM570 WES : HW450R	
	K-TEN590-R	6 ≤ t ≤ 32		JIS : SPV450R WES : HW450R	
	K-TEN610-R	6 ≤ t ≤ 25		JIS : SPV490R WES : HW490R	
	K-TEN670-R	6 ≤ t ≤ 16		—	

Mechanical Properties

■ Quenched and tempered high-strength steel plate for welded structures and pressure vessels (Standard Type)

Product code	Thickness (mm)	Tensile test						Impact test				Bend radius	
		Thickness (mm)	Yield point/proof stress (N/mm ²)	Tensile strength (N/mm ²)	Elongation			Thickness (mm)	Temp. (°C)	Specimen JIS	Mean value of 3 (J)	Thickness (mm)	t: specimen thickness
					Thickness (mm)	Specimen JIS	(%)						
K-TEN570	6 ≤ t ≤ 100	t ≤ 16	≥ 460	570~720	t ≤ 16	No.5	≥ 19	12 < t	-5	V-notch	≥ 47	—	1.5 t
		16 < t ≤ 40	≥ 450		16 < t ≤ 50	No.5	≥ 26						
		40 < t ≤ 75	≥ 430		50 < t	No.4	≥ 20						
		75 < t	≥ 420		50 < t	No.4	≥ 20						
K-TEN590	6 ≤ t ≤ 100	—	≥ 450	590~710	t ≤ 16	No.5	≥ 20	12 < t ≤ 20	+10	V-notch	≥ 47	—	1.5 t
		16 < t ≤ 50	≥ 28		20 < t ≤ 32	-5							
		50 < t	≥ 20		32 < t	-10							
K-TEN610	6 ≤ t ≤ 75	—	≥ 490	610~730	t ≤ 16	No.5	≥ 19	12 < t ≤ 20	+5	V-notch	≥ 47	—	1.5 t
		16 < t ≤ 50	≥ 27		20 < t ≤ 32	-10							
		50 < t	≥ 19		32 < t	-15							
K-TEN670	6 ≤ t ≤ 100	t ≤ 50	≥ 550	670~800	t ≤ 16	No.5	≥ 18	12 < t ≤ 20	+5	V-notch	≥ 47	t ≤ 32	1.5 t
		16 < t ≤ 50	≥ 26		20 < t ≤ 32	-10							
		50 < t	≥ 530		650~780	50 < t	No.4	≥ 18	32 < t				
K-TEN710	6 ≤ t ≤ 100	t ≤ 50	≥ 620	710~840	t ≤ 16	No.5	≥ 17	12 < t ≤ 20	0	V-notch	≥ 47	t > 32	2.0 t
		16 < t ≤ 50	≥ 25		20 < t ≤ 32	-15							
		50 < t	≥ 600		690~820	50 < t	No.4	≥ 17	32 < t				
K-TEN780 (Low temp. toughness type)	6 ≤ t ≤ 100	t ≤ 50	≥ 685	780~930	t ≤ 16	No.5	≥ 16	12 < t ≤ 20	-40	V-notch	≥ 47	—	1.5 t
		16 < t ≤ 50	≥ 24		20 < t ≤ 32	-40							
		50 < t	≥ 665		760~910	50 < t	No.4	≥ 16	32 < t				
K-TEN780A (Standard type)	6 ≤ t ≤ 100	t ≤ 50	≥ 685	780~930	t ≤ 16	No.5	≥ 16	12 < t ≤ 20	-5	V-notch	≥ 47	—	1.5 t
		16 < t ≤ 50	≥ 24		20 < t ≤ 32	-15							
		50 < t	≥ 665		760~910	50 < t	No.4	≥ 16	32 < t				

■ Quenched and tempered high-strength steel plate for welded structures with low crack susceptibility (Crack-Free Steel)

Product code	Thickness (mm)	Tensile test						Impact test				Bend radius	
		Thickness (mm)	Yield point/proof stress (N/mm ²)	Tensile strength (N/mm ²)	Elongation			Thickness (mm)	Temp. (°C)	Specimen JIS	Mean value of 3 (J)	Thickness (mm)	t: specimen thickness
					Thickness (mm)	Specimen JIS	(%)						
K-TEN590CF	6 ≤ t ≤ 75	—	≥ 450	590~710	t ≤ 16	No.5	≥ 20	12 < t ≤ 20	+10	V-notch	≥ 47	—	1.5 t
		16 < t ≤ 50	≥ 28		20 < t ≤ 32	-5							
		50 < t	≥ 20		32 < t	-10							
K-TEN610CF	6 ≤ t ≤ 75	—	≥ 490	610~730	t ≤ 16	No.5	≥ 19	12 < t ≤ 20	+5	V-notch	≥ 47	—	1.5 t
		16 < t ≤ 50	≥ 27		20 < t ≤ 32	-10							
		50 < t	≥ 19		32 < t	-15							
K-TEN780CF	6 ≤ t ≤ 50	—	≥ 685	780~930	t ≤ 16	No.5	≥ 16	12 < t ≤ 20	-5	V-notch	≥ 47	—	1.5 t
		16 < t ≤ 50	≥ 24		20 < t ≤ 32	-15							
		50 < t	≥ 16		32 < t	-20							

■ Non heat treated high-strength steel plate for welded structures (R Series)

Product code	Thickness (mm)	Tensile test						Impact test				Bend radius	
		Thickness (mm)	Yield point/proof stress (N/mm ²)	Tensile strength (N/mm ²)	Elongation			Thickness (mm)	Temp. (°C)	Specimen JIS	Mean value of 3 (J)	Thickness (mm)	t: specimen thickness
					Thickness (mm)	Specimen JIS	(%)						
K-TEN540-R	6 ≤ t ≤ 50	—	≥ 350	540~660	t ≤ 16	No.1A	≥ 15	12 < t	0	V-notch	≥ 27	—	1.5 t
		16 < t	≥ 19										
K-TEN570-R	6 ≤ t ≤ 32	t ≤ 16	≥ 460	570~720	t ≤ 16	No.5	≥ 19	12 < t	-5	V-notch	≥ 47	—	1.5 t
		16 < t	≥ 450		16 < t	No.5	≥ 26						
K-TEN590-R	6 ≤ t ≤ 32	—	≥ 450	590~710	t ≤ 16	No.5	≥ 20	12 < t ≤ 20	+10	V-notch	≥ 47	—	1.5 t
		16 < t	≥ 28		20 < t	-5							
K-TEN610-R	6 ≤ t ≤ 25	—	≥ 490	610~730	t ≤ 16	No.5	≥ 19	12 < t ≤ 20	+5	V-notch	≥ 47	—	1.5 t
		16 < t	≥ 27		20 < t	-10							
K-TEN670-R	6 ≤ t ≤ 16	—	≥ 550	670~800	—	No.5	≥ 18	12 < t	+5	V-notch	≥ 47	—	1.5 t

1. Bend tests are omitted unless directly specified in written order form. 2. Impact test specimens are gathered in the direction of rolling.

Chemical composition

■ Quenched and tempered high-strength steel plate for welded structures and pressure vessels (Standard Type)

Product code	Thickness (mm)	Heat treatment	Chemical composition(%)																
			Thickness (mm)	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	Nb	B (ppm)	P _{CM}	C _{eq}		
K-TEN570	6 ≤ t ≤ 100	Quenched and tempered	t ≤ 50	≤ 0.18	—	≤ 1.50	—	—	≤ 0.015	—	—	—	—	—	—	—	—	≤ 0.44	
			t > 50	—	—	—	—	—									—	—	—
K-TEN590	6 ≤ t ≤ 100	Quenched and tempered	t ≤ 50	≤ 0.18	—	≤ 1.60	—	—	≤ 0.015	—	—	—	—	—	—	—	—	—	≤ 0.26
			t > 50	—	—	—	—	—											—
K-TEN610	6 ≤ t ≤ 75	Quenched and tempered	t ≤ 50	≤ 0.18	—	≤ 1.60	—	—	≤ 0.015	—	—	—	—	—	—	—	—	—	≤ 0.26
			t > 50	—	—	—	—	—											—
K-TEN670	6 ≤ t ≤ 100	Quenched and tempered	t ≤ 50	≤ 0.16	≤ 0.55	—	≤ 0.025	—	—	—	—	—	—	—	—	—	—	—	≤ 0.28
			t > 50	≤ 0.18	—	—	—												—
K-TEN710	6 ≤ t ≤ 100	Quenched and tempered	t ≤ 50	≤ 0.16	—	≤ 1.50	—	—	≤ 0.025	—	—	—	—	—	—	—	—	—	≤ 0.29
			t > 50	≤ 0.18	—	—	—	—											—
K-TEN780	6 ≤ t ≤ 100	Quenched and tempered	t ≤ 50	≤ 0.16	—	≤ 1.50	—	—	≤ 0.025	—	—	—	—	—	—	—	—	—	≤ 0.30
			t > 50	≤ 0.18	—	—	—	—											—
K-TEN780A	6 ≤ t ≤ 100	Quenched and tempered	t ≤ 50	≤ 0.16	—	≤ 1.50	—	—	≤ 0.025	—	—	—	—	—	—	—	—	—	≤ 0.30
			t > 50	≤ 0.18	—	—	—	—											—

■ Quenched and tempered high-strength steel plate for welded structures with low crack susceptibility (Crack-Free Steel)

Product code	Thickness (mm)	Heat treatment	Chemical composition(%)																										
			Thickness (mm)	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	Nb	B (ppm)	P _{CM}	C _{eq}												
K-TEN590CF	6 ≤ t ≤ 75	Quenched and tempered	—	0.10 ~ 0.04	0.60 ~ 0.40	1.60	≤ 0.025	≤ 0.015	—	—	—	—	—	—	—	—	—	—	—										
K-TEN610CF	6 ≤ t ≤ 75		0.04 ~ 0.09	1.60	≤ 0.025	≤ 0.015	—	—											—	—	—	—	—	—	—	—	—	—	—
K-TEN780CF	6 ≤ t ≤ 50		—	≤ 0.55	≤ 1.50	—	—	≤ 0.010											≤ 0.50	≤ 1.60	≤ 0.80	≤ 0.60	≤ 0.100	—	—	—	—	—	—

■ Non heat treated high-strength steel plate for welded structures (R Series)

Product code	Thickness (mm)	Heat treatment	Chemical composition(%)																											
			Thickness (mm)	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	Nb	B (ppm)	P _{CM}	C _{eq}													
K-TEN540-R	6 ≤ t ≤ 50	As rolled	—	≤ 0.20	—	≤ 1.50	—	—	≤ 0.025	≤ 0.015	—	—	—	—	—	—	—	—	≤ 0.28											
K-TEN570-R	6 ≤ t ≤ 32		—	—	—	≤ 1.50	—	—											—	—	—	—	—	—	—	—	—	—	—	
K-TEN590-R	6 ≤ t ≤ 32		—	—	—	≤ 1.60	—	—											—	—	—	—	—	—	—	—	—	—	—	≤ 0.44
K-TEN610-R	6 ≤ t ≤ 25		—	—	—	1.0 ~ 1.60	—	—											—	—	—	—	—	—	—	—	—	—	—	—
K-TEN670-R	6 ≤ t ≤ 16		—	—	—	2.0 ~ 2.0	—	—											—	—	—	—	—	—	—	—	—	—	—	≤ 0.47

1. PCM or C_{eq} can also be applied, if desired.

2. The formulas for calculating PCM and C_{eq} are as follows: P_{CM}=C+Si/30+Mn/20+Cu/20+Ni/60+Cr/20+Mo/15+V/10+5B(%) C_{eq}=C+Si/24+Mn/6+Ni/40+Cr/5+Mo/4+V/14(%)

Available Product Size Ranges

- Standard producible sizes are shown below.
- Some products have limitations on sizes. Contact your nearest Kobe Steel branch or sales office for details.

Quenched and tempered high-strength steel plate for welded structures and pressure vessels (Standard Type) OR Quenched and tempered high-strength steel plate for welded structures with low crack susceptibility (Crack-Free Steel) [heat treated types]

(Unit: mm)

Thickness	Width	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000	4200	4400	4500
		W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
6 ≤ t < 7										20	18	16	16							
7 ≤ t < 8										20	18	16	16							
8 ≤ t < 9										20	18	16	16							
9 ≤ t < 10						22									18	16				
10 ≤ t < 11						22									20	18	16			
11 ≤ t < 12						22									20	18	18			
12 ≤ t < 14						22									20	18	20			
14 ≤ t < 16						22									20	18	20			
16 ≤ t < 19						22									20	18	20			
19 ≤ t < 22						22									20	18	20			
22 ≤ t < 25						22									20	18	20			
25 ≤ t < 28						25									24	22.5	21.5	20.5	19.5	19
28 ≤ t < 32						25									23.5	22	21	19.5	17.5	16.5
32 ≤ t < 36						25									24	22	21	19.5	18.5	17.5
36 ≤ t < 40						25									24	22	21	19.5	18.5	17.5
40 ≤ t < 45						25									24	22	21	19.5	18.5	17.5
45 ≤ t < 50						25									24	22	21	19.5	18.5	17.5
50 ≤ t < 55						25									24	22	21	19.5	18.5	17.5
55 ≤ t < 60						25									24	22	21	19.5	18.5	17.5
60 ≤ t < 65						25									24	22	21	19.5	18.5	17.5
65 ≤ t < 70						25									24	22	21	19.5	18.5	17.5
70 ≤ t < 75						25									24	22	21	19.5	18.5	17.5
75 ≤ t < 80						25									24	22	21	19.5	18.5	17.5
80 ≤ t < 90						25									24	22	21	19.5	18.5	17.5
90 ≤ t ≤ 100						25									24	22	21	19.5	18.5	17.5

- Notes: 1. The values within the cells represent maximum manufacturable lengths.
 2. Minimum plate size is width 1,000 mm by length 3,000 mm.
 3. Values in grey cells () are available upon consultation.
 4. Flatness and dimensional tolerance adhere to JIS G3193 standards.

Non heat treated high-strength steel plate for welded structures (R Series) [controlled rolling type]

(Unit: mm)

Thickness	Width	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000	4200	4400	4500
		W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
6 ≤ t < 7																				
7 ≤ t < 8																				
8 ≤ t < 9																				
9 ≤ t < 10																				
10 ≤ t < 11																				
11 ≤ t < 12																				
12 ≤ t < 14																				
14 ≤ t < 16																				
16 ≤ t < 19																				
19 ≤ t < 22																				
22 ≤ t < 25																				
25 ≤ t < 28																				
28 ≤ t < 32																				
32 ≤ t < 36																				
36 ≤ t < 40																				
40 ≤ t < 45																				
45 ≤ t ≤ 50																				

- Notes: 1. The values within the cells represent maximum manufacturable lengths.
 2. Minimum plate size is width 1,000 mm by length 3,000 mm.
 3. Values in grey cells () are available upon consultation.
 4. Flatness and dimensional tolerance adhere to JIS G3193 standards.

Welding Materials/Welding Methods

- The information listed below is just some possible examples. For detailed information on welding conditions and the latest welding materials, see our Kobelco Welding Handbook.

<http://www.kobelco.co.jp/welding/catalog/>

Product code	Joint type	Welding electrodes (Kobe Steel specifications)				
		Shielded metal arc welding	Gas metal arc welding	Submerged arc welding	EGW	ESW
K-TEN570	Butt	T LB-62, T LB-62UL	T MG-60, T DW-60, T MG-S63B, T MX-60	T US-49 × F MF-38	T DW-S60G	T ES-60ST/EF-38
	Fillet	T LB-62, T LB-62UL	T MG-60, T DW-60, T MG-S63B, T MX-60F	T US-62A × T MF-63 (水平) T US-49 × T MF-38A (下向)	—	—
K-TEN590	Butt	T LB-62, T LB-62UL	T MG-60, T DW-60, T MG-S63B, T MX-60	T US-40 × F MF-38	T DW-S60G	T ES-60ST/EF-38
	Fillet	T LB-62, T LB-62UL	T MG-60, T DW-60, T MG-S63B, T MX-60F	T US-40 × F MF-38 (下向)	—	—
K-TEN610	Butt	T LB-62, T LB-62UL	T MG-S63B, T DW-62L	T US-40 × F MF-38	T DW-S60G	—
	Fillet	T LB-62, T LB-62UL	T MG-S63B, T DW-62L	T US-40 × F MF-38 (下向)	—	—
K-TEN670	Butt	T LB-106	T MG-70, T MG-S70	T US-255 × T PF-H80AK	—	—
	Fillet	T LB-106	T MG-70, T MG-S70	—	—	—
K-TEN710	Butt	T LB-106	T MG-80, T MG-S80	T US-255 × T PF-H80AK	—	—
	Fillet	T LB-106	T MG-80, T MG-S80	—	—	—
K-TEN780	Butt	T LB-88LT	T MG-S88A	T US-80LT × T PF-H80AK	—	—
	Fillet	T LB-88LT	T MG-S63B ¹ , T MG-S88A	—	—	—
K-TEN780A	Butt	T LB-116, T LB-80UL	T MG-80, T MG-S80, T MG-82	T US-80BN × T PF-H80AK T US-80LT × T PF-H80AK	—	—
	Fillet	T LB-116, T LB-80UL	T MG-S63B ¹ , T MG-80, T MG-S80, T MG-82	—	—	—
K-TEN590CF	Butt	T LB-62, T LB-62UL	T MG-60, T MG-S63B	T US-40 × F MF-38	T DW-S60G	T ES-60ST/EF-38
	Fillet	T LB-62, T LB-62UL	T MG-60, T MG-S63B	T US-40 × F MF-38 (下向)	—	—
K-TEN610CF	Butt	T LB-62, T LB-62UL	T MG-S63B, T DW-62L	T US-40 × F MF-38	T DW-S60G	—
	Fillet	T LB-62, T LB-62UL	T MG-S63B, T DW-62L	T US-40 × F MF-38 (下向)	—	—
K-TEN780CF	Butt	T LB-116, T LB-80UL	T MG-80, T MG-S80, T MG-82	T US-80BN × T PF-H80AK T US-80LT × T PF-H80AK	—	—
	Fillet	T LB-116, T LB-80UL	T MG-S63B ¹ , T MG-80, T MG-S80, T MG-82	—	—	—
K-TEN540-R	Butt	F LB-57, F LB-76	F MG-55(-56), F MG-55R(-56R), F SE-A55S	T US-49 × F MF-38	T DW-S60G	T ES-60ST/EF-38
	Fillet	F LB-57, F LB-76	F MG-55(-56), F MG-55R(-56R), F SE-A55S	T US-49 × T MF-63 (水平) T US-49 × F MF-38A (下向)	—	—
K-TEN570-R	Butt	T LB-62, T LB-62UL	T MG-60, T MG-S63B	T US-49 × F MF-38	T DW-S60G	T ES-60ST/EF-38
	Fillet	T LB-62, T LB-62UL	T MG-60, T MG-S63B	T US-62A × T MF-63 (水平) T US-49 × F MF-38A (下向)	—	—
K-TEN590-R	Butt	T LB-62, T LB-62UL	T MG-60, T MG-S63B	T US-40 × F MF-38	T DW-S60G	T ES-60ST/EF-38
	Fillet	T LB-62, T LB-62UL	T MG-60, T MG-S63B	T US-40 × F MF-38 (下向)	—	—
K-TEN610-R	Butt	T LB-62, T LB-62UL	T MG-S63B, T DW-62L	T US-40 × F MF-38	T DW-S60G	—
	Fillet	T LB-62, T LB-62UL	T MG-S63B, T DW-62L	T US-40 × F MF-38 (下向)	—	—
K-TEN670-R	Butt	*2	*2	*2	—	—
	Fillet	*2	*2	*2	—	—

Product names are abbreviated as follows:



Ref.: *1. For soft joint.

*2. These materials have special performance requirements. Please contact us for consultation, as necessary.