

# JIS Grade 1 13mm Wide Nylon Coated Steel Tape Correction

## Japan Industrial Standard (JIS-B7512) Steel Tape Grade 1 Tolerance

Measuring Length	Corresponding tolerance	Measuring Length	Corresponding tolerance	Measuring Length	Corresponding tolerance
0 ~ 2 m	± 0.4mm	0 ~ 30m	± 3.2mm	0 ~ 65m	± 6.7mm
0 ~ 5 m	± 0.7mm	0 ~ 35m	± 3.7mm	0 ~ 70m	± 7.2mm
0 ~ 10 m	± 1.2mm	0 ~ 40m	± 4.2mm	0 ~ 75m	± 7.7mm
0 ~ 15 m	± 1.7mm	0 ~ 45m	± 4.7mm	0 ~ 80m	± 8.2mm
0 ~ 20 m	± 2.2mm	0 ~ 50m	± 5.2mm	0 ~ 85m	± 8.7mm
0 ~ 25 m	± 2.7mm	0 ~ 60m	± 6.2mm	0 ~ 90m	± 9.2mm
				0 ~ 95m	± 9.7mm
				0 ~ 100m	±10.2mm

(Standard Tension : 100N, Temperature : 20 °C)

Although KDS measuring tapes are manufactured in the range of JIS grade 1 tolerance, measuring conditions shown above are not necessarily satisfied in usual measurement. If the tape is used without clearing these conditions, the tape's intrinsic error (in the range of JIS grade 1 tolerance above) must be further corrected. E.g., it is often seen that the tape head and tail are supported, segment between them is sagged in space, and tape is loaded with a body weight for tensing it under the intense sunlight. In such a case, temperature correction, sag correction and tensile correction are required. Calculating equations and correction tables have been prepared for these corrections, where the correct distance is L when the figure measured with tape is  $\ell$ .

## Equations

- Temperature correction value Ct  
 $Ct = \alpha \times (t-20) \times \ell$   
 $L = \ell + Ct$   
 T : Temperature (°C) in measurement
- Tensile correction value Cp  
 (A tape is put on a flat surface and tensed.)  
 $Cp = \frac{(P-100) \ell}{E \cdot A}$   
 $L = \ell + Cp$   
 P : Tension (N) in measurement
- Sag correction value Ch  
 (The correction is additionally executed to correction ② when the tape is supported at 2 points and segment between the points is sagged.)  
 $Ch = -\frac{W^2 \cdot \ell^3}{24P^2}$   
 $L = \ell + Ch$

L=Correct distance	mm
$\ell$ =Measuring Length	mm
T=Temperature in measurement	°C
P=Tension in measurement	N(N/9.8kgf)
Po=Standard tension	100N(10.2kgf)
$\alpha$ =Coefficient of linear thermal expansion	$11.5 \times 10^{-6}/^{\circ}C$
E=Young's modulus	$20.6 \times 10^4 N/mm^2 (2.1 \times 10^4 kgf/mm^2)$
A=Steel tape sectional area	$2.34 mm^2$
W=Unit weight	$0.228 \times 10^{-3} N/mm (0.0233 \times 10^{-3} kgf/mm)$

## Product correction value table

Fractions are rounded of to one decimal place.

Items	Length Conditions	Fractions are rounded of to one decimal place.																				
		5 m	10 m	15 m	20 m	25 m	30 m	35 m	40 m	45 m	50 m	55m	60m	65m	70m	75m	80m	85m	90m	95m	100m	
① Temperature correction	Temperature	-30°C	-2.9mm	-5.8mm	-8.6mm	-11.5mm	-14.4mm	-17.3mm	-20.1mm	-23.0mm	-25.9mm	-28.8mm	-31.6mm	-34.5mm	-37.4mm	-40.3mm	-43.1mm	-46.0mm	-48.9mm	-51.8mm	-54.6mm	-57.5mm
		-20°C	-2.3	-4.6	-6.9	-9.2	-11.5	-13.8	-16.1	-18.4	-20.7	-23.0	-25.3	-27.6	-29.9	-32.2	-34.5	-36.8	-39.1	-41.4	-43.7	-46.0
		-10°C	-1.7	-3.5	-5.2	-6.9	-8.6	-10.4	-12.1	-13.8	-15.5	-17.3	-19.0	-20.7	-22.4	-24.2	-25.9	-27.6	-29.3	-31.1	-32.8	-34.5
		-5°C	-1.4	-2.9	-4.3	-5.8	-7.2	-8.6	-10.1	-11.5	-12.9	-14.4	-15.8	-17.3	-18.7	-20.1	-21.6	-23.0	-24.4	-25.9	-27.3	-28.8
		0°C	-1.2	-2.3	-3.5	-4.6	-5.8	-6.9	-8.1	-9.2	-10.4	-11.5	-12.7	-13.8	-15.0	-16.1	-17.3	-18.4	-19.6	-20.7	-21.9	-23.0
		5°C	-0.9	-1.7	-2.6	-3.5	-4.3	-5.2	-6.0	-6.9	-7.8	-8.6	-9.5	-10.4	-11.2	-12.1	-12.9	-13.8	-14.7	-15.5	-16.4	-17.3
		10°C	-0.6	-1.2	-1.7	-2.3	-2.9	-3.5	-4.0	-4.6	-5.2	-5.8	-6.3	-6.9	-7.5	-8.1	-8.6	-9.2	-9.8	-10.4	-10.9	-11.5
		15°C	-0.3	-0.6	-0.9	-1.2	-1.4	-1.7	-2.0	-2.3	-2.6	-2.9	-3.2	-3.5	-3.7	-4.0	-4.3	-4.6	-4.9	-5.2	-5.5	-5.8
		20°C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		25°C	0.3	0.6	0.9	1.2	1.4	1.7	2.0	2.3	2.6	2.9	3.2	3.5	3.7	4.0	4.3	4.6	4.9	5.2	5.5	5.8
		30°C	0.6	1.2	1.7	2.3	2.9	3.5	4.0	4.6	5.2	5.8	6.3	6.9	7.5	8.1	8.6	9.2	9.8	10.4	10.9	11.5
		35°C	0.9	1.7	2.6	3.5	4.3	5.2	6.0	6.9	7.8	8.6	9.5	10.4	11.2	12.1	12.9	13.8	14.7	15.5	16.4	17.3
40°C	1.2	2.3	3.5	4.6	5.8	6.9	8.1	9.2	10.4	11.5	12.7	13.8	15.0	16.1	17.3	18.4	19.6	20.7	21.9	23.0		
45°C	1.4	2.9	4.3	5.8	7.2	8.6	10.1	11.5	12.9	14.4	15.8	17.3	18.7	20.1	21.6	23.0	24.4	25.9	27.3	28.8		
50°C	1.7	3.5	5.2	6.9	8.6	10.4	12.1	13.8	15.5	17.3	19.0	20.7	22.4	24.2	25.9	27.6	29.3	31.1	32.8	34.5		
② Corrective tension	Tension	50N(5.1kgf)	-0.5	-1.0	-1.6	-2.0	-2.5	-3.1	-3.6	-4.1	-4.6	-5.1	-5.6	-6.1	-6.6	-7.1	-7.6	-8.1	-8.6	-9.2	-9.7	-10.2
		100N(10.2kgf)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		150N(15.3kgf)	0.5	1.0	1.6	2.0	2.5	3.1	3.6	4.1	4.6	5.1	5.6	6.1	6.6	7.1	7.6	8.1	8.6	9.2	9.7	10.2
		200N(20.4kgf)	1.0	2.0	3.1	4.1	5.1	6.1	7.1	8.1	9.2	10.2	11.2	12.2	13.2	14.2	15.3	16.3	17.3	18.3	19.3	20.4
③ Sag correction	Tension	50N(5.1kgf)	-0.1	-0.9	-3.1	-7.2	-14.1	-24.4	-38.8	-57.9	-82.5	-113.1	-150.5	-195.4	-248.5	-310.3	-381.7	-463.3	-555.7	-659.6	-775.8	-904.8
		100N(10.2kgf)	0.0	-0.2	-0.8	-1.8	-3.5	-6.1	-9.7	-14.5	-20.6	-28.3	-37.6	-48.9	-62.1	-77.6	-95.4	-115.8	-138.9	-164.9	-193.9	-226.2
		150N(15.3kgf)	0.0	-0.1	-0.3	-0.8	-1.6	-2.7	-4.3	-6.4	-9.2	-12.6	-16.7	-21.7	-27.6	-34.5	-42.4	-51.5	-61.7	-73.3	-86.2	-100.5
		200N(20.4kgf)	0.0	-0.1	-0.2	-0.5	-0.9	-1.5	-2.4	-3.6	-5.2	-7.1	-9.4	-12.2	-15.5	-19.4	-23.9	-29.0	-34.7	-41.2	-48.5	-56.6

## Examples

★ The scale of tape that measured the distance between A and B at 200N (20.4kgf) of tension and 30°C of temperature read 50m. In such a case, how long is the correct distance (L) between A and B ?

Where the intrinsic tape error (Ce) is +2.0mm of the length between 0 and 50m :

(1) Measurement with the tape put on a flat surface (unit : mm)

$$L = \ell + Ce + Ct + Cp$$

= Read figure + intrinsic error + temperature correction value + tensile correction value

$$= 50,000 + (+2.0) + (5.8) + (+10.2)$$

$$= 50,018\text{mm} \quad \therefore 50.018\text{m}$$

(2) Measurement with the tape sagged in space (unit : mm)

$$L = \ell + Ce + Ct + Cp + Ch$$

= read figure + intrinsic error + temperature correction value + tensile correction value + sag correction value

$$= 50,000 + (+2.0) + (+5.8) + (+10.2) + (-7.1)$$

$$= 50,010.9\text{mm} \quad \therefore 50.0109\text{m}$$