

A-5-2.2 LU Series (Miniature type)

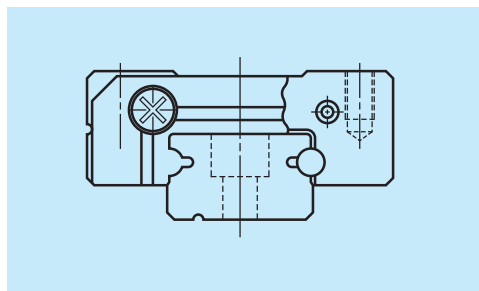


Fig. 1 LU Series

1. Features

(1) Super-small type

This compact guide owes its design to the single ball groove on both right and left sides (Gothic arch).

(2) Equal load carrying capacity in vertical and lateral directions

The contact angle is set at 45 degrees, thus facilitating the equal load carrying capacity in vertical and lateral directions. This also provides equal rigidity in both directions.

(3) Stainless steel is also standardized

Items made of the martensitic stainless steel are available as standard.

(4) Some series have a ball retainer

Ball slide types AR and TR come with a ball retainer. Balls are retained in the retainer and do not fall out when the ball slide is withdrawn from the rail. (Ball slides of random-matching type as well as LU15 come with ball retainer.)

(5) Fast delivery

Random-matching of rails and ball slides are available. (LU09 to LU15)

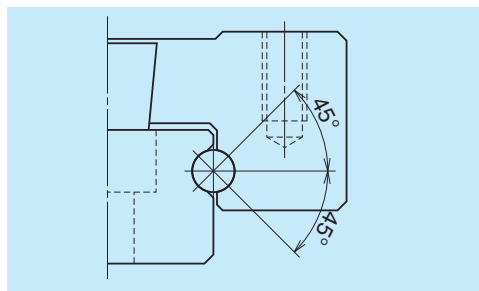


Fig. 2 Balls are in contact.

2. Ball slide shape

Ball slide Model	Shape/installation method	Type (Upper row, Rating: Lower row, Ball slide length)	
		Standard type Standard	High-load type Long
AL TL AR TR BL UL		AL, TL, TR, AR 	BL, UL

3. Accuracy and preload

(1) Running parallelism of ball slide

Table 1

Unit: μm

Rail length (mm) over or less	Preloaded assembly type (not random matching)				Random-matching type
	Super precision P4	High precision P5	Precision grade P6	Normal grade PN	Normal grade PC
- 50	2	2	4.5	6	6
50 - 80	2	3	5	6	6
80 - 125	2	3.5	5.5	6.5	6.5
125 - 200	2	4	6	7	7
200 - 250	2.5	5	7	8	8
250 - 315	2.5	5	8	9	9
315 - 400	3	6	9	11	11
400 - 500	3	6	10	12	12
500 - 630	3.5	7	12	14	14
630 - 800	4.5	8	14	16	16
800 - 1000	5	9	16	18	18
1000 - 1250	6	10	17	20	20

(2) Accuracy standard

The preloaded assembly type has four accuracy grades; Super precision P4, High precision P5, Precision P6, and Normal grade PN, while the random-matching type has Normal grade PC only.

Table 2 shows the accuracy standard for the preloaded assembly type, while **Table 3** shows the accuracy standard for the random-matching type.

• **Tolerance of preloaded assembly**

Table 2 Unit: μm

Characteristics	Accuracy grade	Super precision P4	High precision P5	Precision grade P6	Normal grade PN
Mounting height H Variation of H (All ball slides on a set of rails)		± 10 5	± 15 7	± 20 15	± 40 25
Mounting width W_2 or W_3 Variation of W_2 or W_3 (All ball slides on reference rail)		± 15 7	± 20 10	± 30 20	± 50 30
Running parallelism of surface C to surface A Running parallelism of surface D to surface B		Refer to Table 1 and Fig. 3			

• **Tolerance of random-matching type: Normal grade PC**

Table 3 Unit: μm

Characteristics	Accuracy grade	LU09, 12, 15
Mounting height H		± 20
Variation of mounting height H		40
Mounting width W_2 or W_3		± 20
Variation of mounting width W_2 or W_3		40
Running parallelism of surface C to surface A Running parallelism of surface D to surface B		Refer to Table 1 and Fig. 3

(3) Assembled accuracy

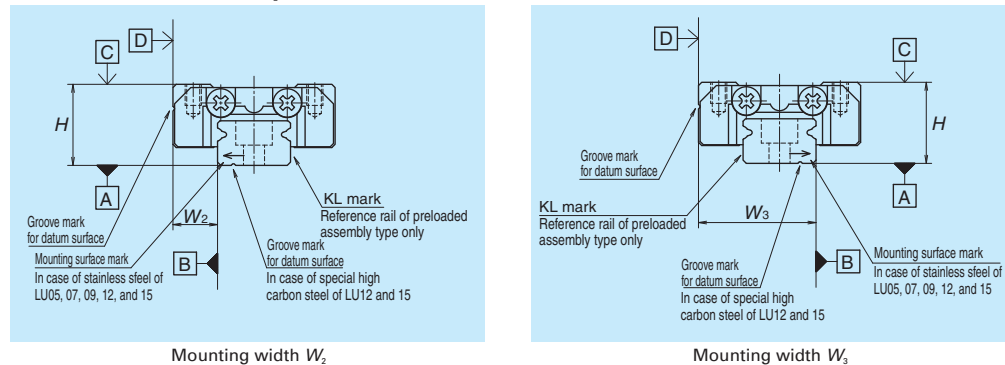


Fig. 3

Note: Please refer to page A67 for marks on the datum surfaces.

(4) Preload and rigidity

We offer three levels of preload: Slight preload Z1 and Fine clearance Z0, along with random-matching type of Fine clearance ZT. Values for preload and rigidity of the preloaded assembly type are shown in **Table 4**. Rigidities are for the median of the preload range.

• **Preload and rigidity of preloaded assembly**

Table 4

Model No.	Preload (N)	Rigidity (N/ μm)
	Slight preload (Z1)	Slight preload (Z1)
Standard type		
LU05 TL	0 – 3	15
LU07 AL	0 – 8	22
LU09 AL, TL	0 – 12	26
LU09 AR, TR	0 – 10	30
LU12 AL, TL	0 – 17	33
LU12 AR, TR	0 – 17	33
LU15 AL	0 – 33	45
High-load type		
LU09 BL, UL	0 – 17	43
LU12 BL, UL	0 – 25	52
LU15 BL	0 – 51	75

Note: Clearance of Fine clearance Z0 is 0 to 3 μm . Therefore, preload is zero. However, the clearance of the Z0 of PN grade is 3 to 10 μm .

• **Clearance of random-matching type**

Table 5 Unit: μm

Model No.	Fine clearance ZT
LU09	0 – 15
LU12	
LU15	

4. Maximum rail length

Table 6 shows the limitations of rail length.

However, the limitations vary by accuracy grades.

Table 6 Length limitation of rails Unit: mm

Series	Size Material	Unit: mm				
		05	07	09	12	15
LU	Special high carbon steel	–	–	1 200	1 800	2 000
	Stainless steel	210	375	600	800	1 000

Note: Rails can be butted if user requirement exceeds the rail length shown in the table. Please consult NSK.

5. Installation

(1) Permissible values of mounting error

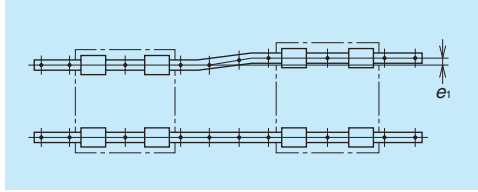


Fig. 4

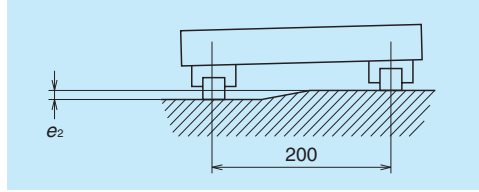


Fig. 5

Table 7

Unit: μm

Value	Preload	Model No.				
		LU05	LU07	LU09	LU12	LU15
Permissible values of parallelism in two rails e_1	Z0, ZT	10	12	15	20	25
	Z1	7	10	13	15	21
Permissible values of parallelism (height) in two rails e_2	Z0, ZT	150 $\mu\text{m}/200\text{ mm}$				
	Z1	90 $\mu\text{m}/200\text{ mm}$				

(2) Shoulder height of the mounting surface and corner radius r

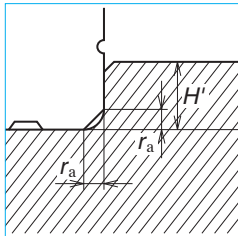


Fig. 6 Shoulder for the rail datum surface

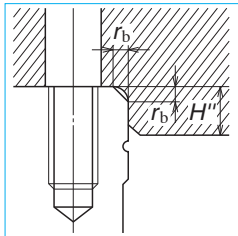


Fig. 7 Shoulder for the ball slide datum surface

Table 8

Unit: mm

Model No.	Corner radius (maximum)		Shoulder height	
	r_a	r_b	H'	H''
LU05	0.2	0.2	0.7	2
LU07	0.2	0.3	1.2	3
LU09	0.3	0.3	1.9	3
LU12	0.3	0.3	2.5	4
LU15	0.3	0.5	3.5	5

6. Lubrication accessories

There is no standard grease fitting for LU05 to LU15.

For the LU Series, apply grease directly to the ball grooves of rail using a point nozzle.

7. Dust-proof components

(1) Standard specification

End seal: Provided to both ends of the ball slide as a standard feature.

LU05TL, LU07AL, LU09AL, and LU09TL can install the side seal as an option.

• Seal friction per standard ball slide is shown in Table 9.

Table 9 Seal friction per ball slide (maximum value)

Unit: N

Series	Size	05	07	09	12	15
		LU	0.3	0.3	0.5	0.5

(2) NSK K1™ lubrication unit

The installed dimensions of the NSK K1 lubrication unit are shown in Table 10.

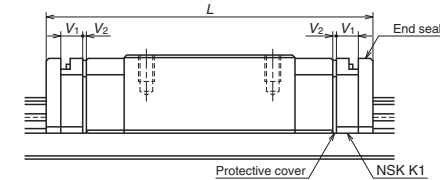


Table 10

Unit: mm

Model No.	Ball slide length	Ball slide model	Standard ball slide length	Ball slide length installed with two NSK K1 L	Per NSK K1 thickness V_1	Protective cover thickness V_2
LU05	Standard	TL	18*	24.4	2.0	0.5
LU07	Standard	AL	20.4*	29.4	2.5	0.5
LU09	Standard	AR, TR	30	36.4	2.7	0.5
	Long	BL, UL	41	47.4		
LU12	Standard	AR, TR	35.2	42.2	3.0	0.5
	Long	BL, UL	47.5	54.5		
LU15	Standard	AL	43.6	51.8	3.5	0.6
	Long	BL	61	69.2		

*) Standard ball slide length of LU05TL, LU07AL, LU09AL and LU09TL does not include the thickness of the end seal (1.5 mm). However, it includes the height of the screw head for end cap installation (Included length – LU05, 0.8 mm; LU07, no projection; LU09, 1 mm)

Note: Ball slide length equipped with NSK K1 =

$$(\text{Standard ball slide length}) + (\text{Thickness of NSK K1, } V_1 \times \text{Number of NSK K1}) + (\text{Thickness of the protective cover } V_2 \times 2)$$

8. Reference number

Reference numbers shall be set to individual NSK linear guide when its specifications are finalized, and it is indicated on its specification drawing.

Please specify the reference number, except design serial number, to identify the product when ordering, requiring estimates, or inquiring about specifications from NSK.

(1) Reference number for preloaded assembly

LU 12 0270 ARK 2 - P5 1**

Series name	12	0270	ARK	2	-**	P5	1	
Size							Preload code (See page A264.)	
Rail length (mm)							0: Z0, 1: Z1	
Ball slide shape code (See page A262.)							Accuracy code (See Table 12.)	
Material/surface treatment code (See Table 11.)							Design serial number	
C: Special high carbon steel (NSK standard), K: Stainless steel							Added to the reference number.	
							Number of ball slides per rail	

(2) Reference number for random-matching type

LAU 12 ARS -K

Ball slide	LAU	12	ARS	-K
Random-matching ball slide series code				Option code
LAU: LU Series random-matching ball slide				-K: Equipped with NSK K1
Size				Material code
Ball slide shape code (See page A262.)				No code: Special high carbon steel (NSK standard), S: Stainless steel

L1U12 0270 RKN - PC T**

Rail	L1U12	0270	RKN	-**	PC	T
Random-matching rail series code						Preload code (See page A264.)
L1U: LU Series random-matching rail						T: Fine clearance
Size						Accuracy code: PC
Rail length (mm)						PC: Normal grade is only available.
Rail shape code						Design serial number
L: Standard. R: LU09 and LU12 standard, equipped with ball retainer. S: LU09 and LU12 with ball retainer and mounting holes for M3 T: LU09 and LU12 without ball retainer and mounting holes for M3						Added to the reference number.
Material/surface treatment code (See Table 11.)						*Butting rail specification
						N: Non-butting. L: Butting specification
*Please consult with NSK for butting rail specification.						

The reference number coding for the assembly of random-matching type is the same as that of the preloaded assembly. However, only the preload code of "Fine clearance T" is available (refer to page A264).

Table 11 Material/surface treatment code

Code	Description
C	Special high carbon steel (NSK standard)
K	Stainless steel
D	Special high carbon steel with surface treatment
H	Stainless steel with surface treatment
Z	Other, special

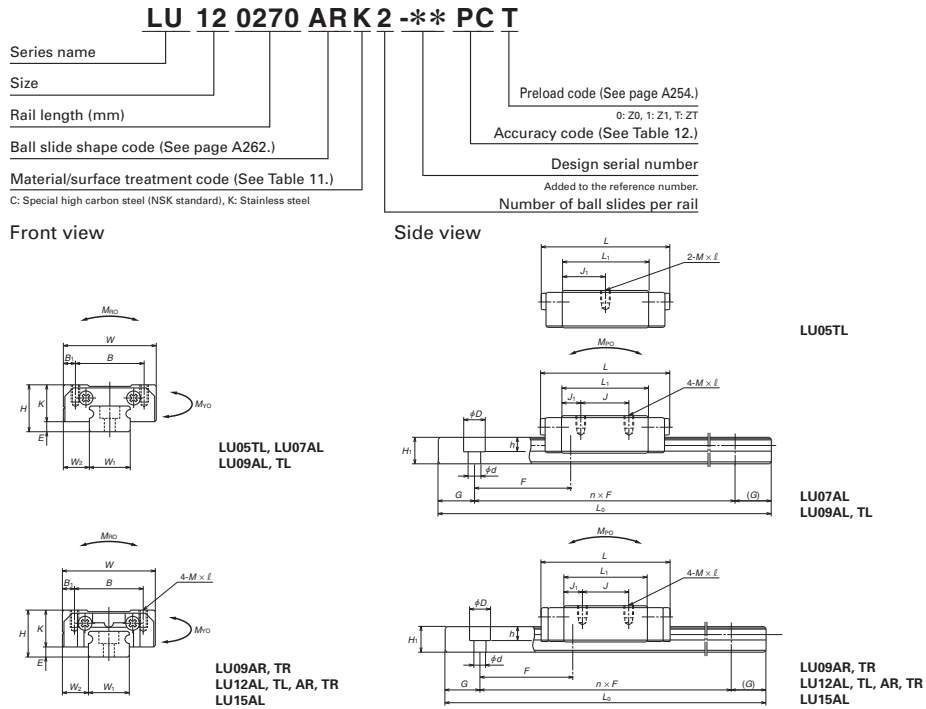
Table 12 Accuracy code

Accuracy	Standard (Without NSK K1)	With NSK K1
Super precision grade	P4	K4
High precision grade	P5	K5
Precision grade	P6	K6
Normal grade	PN	KN
Normal grade (random-matching type)	PC	KC

Note: Refer to page A38 for NSK K1 lubrication unit.

9. Dimensions

- LU-AL (Standard type / Standard, LU15 is equipped with ball retainer)
- LU-TL (Standard type / Standard, Large mounting hole)
- LU-AR (Standard type / Standard, With ball retainer)
- LU-TR (Standard type / Standard, Large mounting hole, with ball retainer)



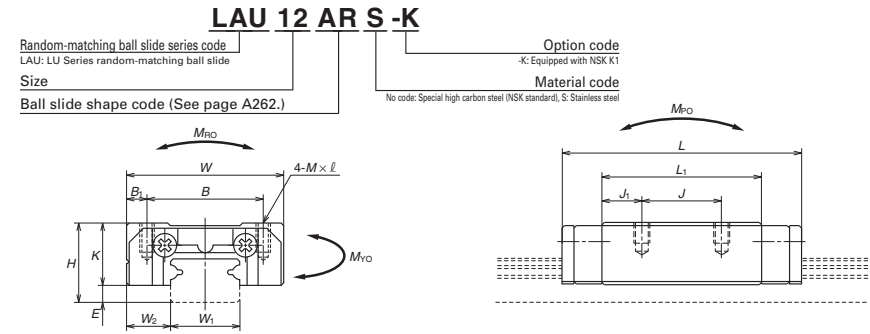
Model No.	Assembly				Ball slide								Width	Height
	Height	E	W ₂	W	Mounting hole									
					B	J	M×pitch×ℓ	B ₁	L ₁	J ₁	K	W ₁		
LU05TL	6	1	3.5	12	18	8	—	M2×0.4×1.5	2	12	6	5	5	3.2
LU07AL	8	1.5	5	17	20.4	12	8	M2×0.4×2.4	2.5	13.6	2.8	6.5	7	4.7
LU09AL LU09TL	10	2.2	5.5	20	26.8	15	13 10	M2×0.4×2.5 M3×0.5×3	2.5	18	2.5 4	7.8	9	5.5
LU09AR LU09TR	10	2.2	5.5	20	30	15	13 10	M2×0.4×2.5 M3×0.5×3	2.5	20	3.5 5	7.8	9	5.5
LU12AL LU12TL	13	3	7.5	27	34	20	15	M2.5×0.45×3 M3×0.5×3.5	3.5	21.8	3.4	10	12	7.5
LU12AR LU12TR	13	3	7.5	27	35.2	20	15	M2.5×0.45×3 M3×0.5×3.5	3.5	21.8	3.4	10	12	7.5
LU15AL	16	4	8.5	32	43.6	25	20	M3×0.5×4	3.5	27	3.5	12	15	9.5

Notes 1) LU05TL, LU07AL, LU09TL, LU09AR, LU09TR, LU12AR and LU12TR come in stainless steel only.
 2) Ball slide of LU05TL has only two mounting tap holes in the center.
 3) End seals of LU05TL, LU07AL, LU09AL and LU09TL are available on request.

Reference number for ball slide of random-matching type

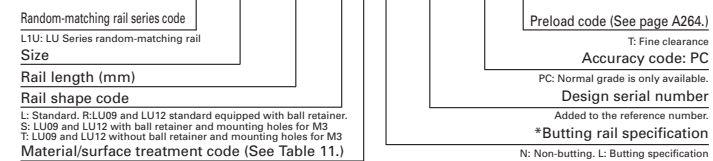
Random matching with retainer: LU09 - 12 are AR/TR, LU15 is AL.

- LAU-AR (With ball retainer)**
- LAU-TR (Large mounting hole, with ball retainer)**
- LAU-AL (LU15 is equipped with ball retainer)**

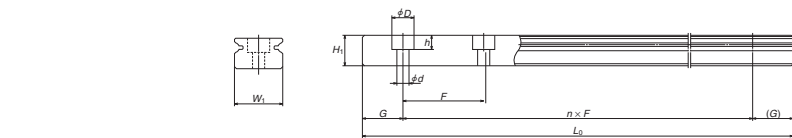


Reference number for rail of random-matching type

L1U12 0270 RKN - PC T**



*Please consult with NSK for butting rail specification.



Unit: mm

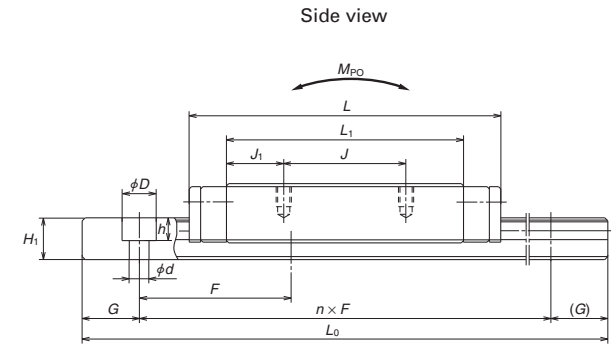
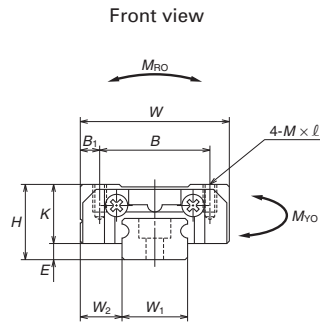
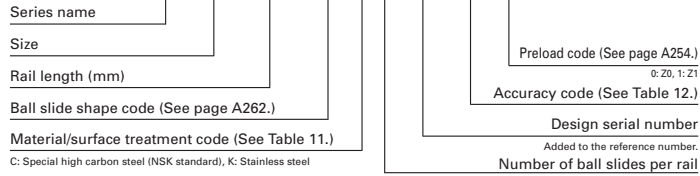
Pitch	Rail				Basic load rating						Weight	
	Mounting bolt hole	G	Max. length L _{0MAX.} () for stainless	Dynamic C (N)	Static C ₀ (N)	Static moment (N-m)				Ball slide (g)	Rail (g/100 mm)	
						M _{RO}	M _{PO}		M _{VO}			
15	2.3×3.3×1.5	5	— (210)	545	740	1.93	1.22	8.85	1.22	8.85	4	11
15	2.4×4.2×2.3	5	— (375)	1 090	1 370	4.90	2.66	18.6	2.66	18.6	10	23
20	2.6×4.5×3	7.5	1 200 (600)	1 760	2 220	10.2	6.10	38.5	6.10	38.5	17	35
20	2.6×4.5×3	7.5	— (600)	1 490	2 150	9.9	6.10	41.0	6.10	41.0	19	35
25	3×5.5×3.5	10	1 800 (800)	2 830	3 500	21.1	11.4	78.5	11.4	78.5	38	65
25	3×5.5×3.5	10	— (800)	2 830	3 500	21.1	11.4	81.5	11.4	81.5	38	65
40	3.5×6×4.5	15	2 000 (1 000)	5 550	6 600	49.5	25.6	193	25.6	193	70	105

4) To fix rail of LU05TL, use M2 × 0.4 cross-recessed pan head machine screw for precision instrument. (JIS 10-70 No. 0 pan head machine screw No.1.) (JIS: Japanese Camera Industrial Standard.)

5) Basic dynamic load rating is a load that allows for a 50-km rating fatigue life and is a vertical and constant load on the ball slide mounting surface. To convert C to C₁₀₀ for a 100-km rating fatigue life, divide C by 1.26.

LU-BL (High-load type / Long)
LU-UL (High-load type / Long, large mounting hole)

LU 12 0270 BL K 2 - P5 1**



Model No.	Assembly			Ball slide								Width	Height	
	Height	E	W ₂	Width	Length	Mounting hole			B ₁	L ₁	J ₁			K
						B	J	Mxpitchxl						
LU09BL	10	2.2	5.5	20	41	15	16	M2x0.4x2.5	2.5	31.2	7.6	7.8	9	5.5
LU09UL								M3x0.5x3						
LU12BL	13	3	7.5	27	47.5	20	20	M2.5x0.45x3	3.5	35.3	7.65	10	12	7.5
LU12UL								M3x0.5x3.5						
LU15BL	16	4	8.5	32	61	25	25	M3x0.5x4	3.5	44.4	9.7	12	15	9.5

Notes 1) LU09UL is available only in stainless steel.
 2) LU15BL is equipped with ball retainer.

Unit: mm

Pitch	Rail			Basic load rating						Weight		
	Mounting bolt hole	G	Max. length L _{DMAX} () for stainless	Dynamic C (N)	Static C ₀ (N)	Static moment (N-m)				Ball slide (g)	Rail (g/100 mm)	
						M _{RO}	M _{PO}		M _{YO}			
20	2.6x4.5x3 3.5x6x4.5	7.5	1 200 (600)	2 600	3 900	17.9	17.2	98.0	17.2	98.0	29	35
25	3x5.5x3.5 3.5x6x4.5	10	1 800 (800)	4 000	5 700	34.5	28.3	169	28.3	169	59	65
40	3.5x6x4.5	15	2 000 (1 000)	8 100	11 300	84.5	69.5	435	69.5	435	107	105

3) Basic dynamic load rating is a load that allows for a 50-km rating fatigue life and is a vertical and constant load on the ball slide mounting surface. To convert C to the dynamic load rating C₁₀₀ for a 100-km rating fatigue life, divide C by 1.26.