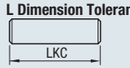
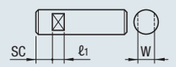
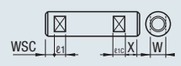
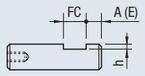
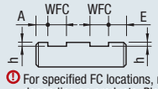
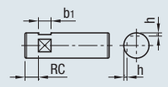
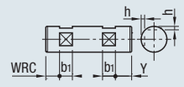
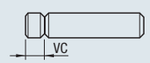
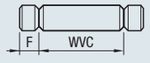
Shaft Alteration Guide

Alteration Type	Alterations	Code	Spec.
Tolerance Change	**L Dimension Tolerance Changes (Precision)** 	LKC	Changes L Tolerance to a higher precision level. ⓘ L<200 → L±0.03; 200≤L<500 → L±0.05; L≥500 → L±0.1 **Ordering Code:** LKC When using LKC, L dimensions can be specified in 0.1 increment **Application Notes:** See each product page for details.
	Change to h5 O.D. tolerance 	DKC	Outer diameter tolerance is altered to h5. **Ordering Code:** DKC **Application Notes:** ⊗
Wrench Flats	**Add a set of wrench flats** 	SC	Wrench flat is added at one location. **Ordering Code:** SC5 ⓘ SC=1 mm Increment ⓘ SC+ℓ1≤L ⓘ SC=0 or SC≥1 **Application Notes:** Applicable to D=6 and over ⊗ Cannot be used with WSC ⓘ D dimensions in ( ) are only applied to Shaft End Configurable Type **P.286**.
	Add wrench flats at two locations 	WSC	Add wrench flat at two locations. **Ordering Code:** WSC12-X8 ⓘ Specify WSC/X in 1 mm increments. ⓘ WSC+X+ℓ1x2<L ⓘ WSC (X)=0 or WSC (X)≥1 **Application Notes:** Applicable to D=6 and over ⊗ Orientation between wrench flat features is random. Cannot be used with SC and SX ⓘ D dimensions in ( ) are only applied to Shaft End Configurable Type **P.286**.
	Add wrench flats at two locations 	SX	Adds a second set of wrench flats. **Ordering Code:** SX15 ⓘ Specify SX in 1 mm increments ⓘ SC+SX+ℓ1x2<L ⓘ SX=0 or SX≥1 **Application Notes:** Applicable to D=6 and over, only with wrench flats. ⊗ Orientation between wrench flat features is random. Cannot be used with WSC.
Set Screw Flat	**Add set screw flat at one location**  ⓘ For specified FC locations, reference point varies depending on products. Please check the details in each section.	FC	Adds one set screw flat. **Ordering Code:** FC10-A8, FC10-E8 ⓘ Specify FC and A (E) in 1 mm increments. ⓘ FC≤3xD ⓘ When 1.5XD<FC, FC≤L/2 ⓘ A (E)=0 or A (E)≥2 ⊗ Cannot be used in combination with WFC, not applicable to Precision Type.
	Add set screw flats at two locations 	WFC	Adds two set screw flats. **Ordering Code:** WFC10-A8-E20 ⓘ Specify WFC, A and E in 1 mm increments ⓘ WFC≤3xD ⓘ When 1.5xD<FC, 2WFC≤L/2 ⓘ A (E)=0 or A (E)≥2 ⊗ Orientation between set screw flats is random. Not for use in combination with FC. Not applicable to precision type.
	Add 90° set screw flat at one location 	RC	Adds 90° set screw flats. **Ordering Code:** RC10 ⓘ RC=Specify in 1 mm Increments ⓘ RC+b1≤L ⓘ RC≥2 **Application Notes:** Applicable to D=10–30 ⊗ Cannot be used with WRC, Not applicable to Precision Type
	2 x 90° set screw flats 	WRC	Adds two sets of 90° set screw flats. **Ordering Code:** WRC10-Y10 ⓘ Specify WRC in 1 mm increments. ⓘ WRC+b1≤L ⓘ WRC (Y)≥2 **Application Notes:** Applicable to D=10–30 ⊗ Orientation between set screw features is random. Cannot be used with RC. Not applicable to Precision Type.
V-groove	**Add V-Groove at one location** 	VC	Adds one V-groove. ⓘ VC=Specify in 1 mm Increments ⓘ VC>W **Application Notes:** Applicable to D=6 and over ⊗ Different from VC Hollow Shafts
	Two V-Grooves 	WVC	Two V-grooves. **Ordering Code:** WVC180-F8 ⓘ WVC/F=Specify in 1 mm increments ⓘ F>W **Application Notes:** Applicable to D=6 and over ⊗ Different from WVC Hollow Shafts

D	h5 Tolerance
6	0 -0.005
8, 10	0 -0.006
12–16	0 -0.008
20–30	0 -0.009
35–50	0 -0.011

D	W	ℓ1	D	W	ℓ1
6 (7)	5	8	20 (22)	17	10
8 (9)	7		(24) 25 (26)	22	
10	8		(28) 30 (31 / 32)	27	15
12	10		35	30	
13	11		(38) 40 (45)	36	20
(14) 15	13	10	50	41	
16 (17)	14				
18 (19)	16				

D	W	ℓ1	D	W	ℓ1
6 (7)	5	8	20 (22)	17	10
8 (9)	7		(24) 25 (26)	22	
10	8		(28) 30 (31 / 32)	27	15
12	10		35	30	
13	11		(38) 40 (45)	36	20
(14) 15	13	10	50	41	
16 (17)	14				
18 (19)	16				

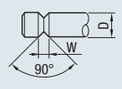
D	W	ℓ1	D	W	ℓ1
6	5	8	18	16	10
8	7		20	17	
10	8		25	22	
12	10		30	27	15
13	11	10	35	30	
15	13		40	36	20
16	14		50	41	

D	h
3–5	0.5
6–18	1
20–40	2
50	3

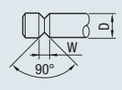
D	b1	h
10	6	0.5
12–20	6	1.0
25	10	1.0
30	12	1.0

D	b1	h
10	6	0.5
12–20	6	1.0
25	10	1.0
30	12	1.0

D	b1	h
10	6	0.5
12–20	6	1.0
25	10	1.0
30	12	1.0



D	W
6, 8	2
10–18	4
20–25	6
30–35	8
40–50	12

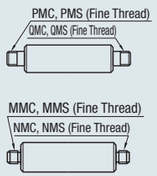
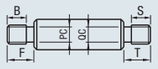


D	W
6, 8	2
10–18	4
20–25	6
30–35	8
40–50	12

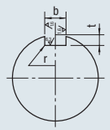
MiSUMi

Shaft Alteration Guide

continued

Alteration Type	Alterations	Code	Spec.
Keyway	**Keyway** ⓘ A wide variety of Shafts with keyway alterations is available on Rotary Shaft pages. **P.852–911** **Keyway at one location: KC**  **Keyways at two locations: WKC**  ⓘ For specified KC locations, reference point varies depending on products. Please check the details on related pages.	KC WKC	KC: Keyway is added at one location **Ordering Code:** KC10-G10 WKC: Keyways are added at two locations **Ordering Code:** WKC10-C8-KC10-G10 ⓘ KC / WKC / G / C=Specified in 1 mm Increment ⓘ 4≤G / C≤30 ⓘ G / C≤L/3 ⓘ 2≤KC / WKC≤L/3 ⓘ G+C≤L/3 ⓘ Mx2<KC+F ⓘ Only One End / Both Ends Stepped and Tapped Mx2<KC+F **Application Notes:** Applicable only to D=12, 16, 20, 25 or 30. ⊗ For WKC, orientation between keyways is random. Not applicable to precision type Ex. ⓘ When KC=0, keyway is shaped as the drawing on left. Ex. ⓘ When KC+G≥L, keyway is shaped as the drawing on left.
Thread modifications	**Change to fine threads** 	PMC PMS QMC QMS MMC MMS NMC NMS	Changes the threads to Fine Threads shown in the table below. (PMC / QMC / MMC / NMC → Applicable for Bearing nut fine threads) (PMS / QMS / MMS / NMS → Applicable for Cylinder fine thread pitches) **Ordering Code:** PMC15 ⓘ Ex.) When requesting M15 with D20 and 1.0 bearing nut fine thread pitch
	Undercut 	PC QC	PC: Add undercut(s) on P dimension area QC: Add undercut(s) on Q dimension area **Ordering Code:** PC ⓘ Undercut width=F(T)-B(S) **Application Notes:** Applicable to M=6 or more
	Change to fine thread tap 	MSC NSC JSC	Tapped thread changed to fine thread listed in the table below. **Ordering Code:** MSC14 ⓘ Ex.) When requesting M14 with D20 and 1.5 fine thread pitch **Application Notes:** Applicable to D=6 or more ⊗ Not applicable to precision shafts 35 and over.

Shaft Diameter	b Nominal Dimension	b Tolerance (N9)	t Nominal Dimension	t Tolerance	r
12	4	0 -0.03	2.5	+0.1 0	0.08–0.16
16	5		3.0		
20	6		3.5		0.16–0.25
25	8	0 -0.036	4.0	+0.2 0	
30					



D	PMC / QMC / MMC / NMC											PMS / QMS / MMS / NMS			
*3	3														
*4	3	4													
5	3	*4	*5												
6 (7)	3	4	*5	*6											
8 (9)	3	4	5	6	*8										
10		4	5	6	8	*10						*10			
12			5	6	8	10	*12					10	*12		
13			5	6	8	10	*12					10			
15			5	6	8	10	12	*15				10	12		
(14) 16 (17)			5	6	8	10	12	15				10	12	14	
18 (19)			5	6	8	10	12	15	*17			10	12	14	*18
20 (22)				6	8	10	12	15	17	*20		10	12	14	18
(24) 25 (26)					8	10	12	15	17	20	*25	10	12	14	18
(28) 30 (31, 32)					8	10	12	15	17	20	25 *30	10	12	14	18
*35						10	12	15	17	20	25 30	10	12	14	18
(38) *40 (45)							12	15	17	20	25 30		12	14	18
*50								15	17	20	25 30			14	18
Pitch	0.35	0.5	0.75	1.0							1.5	1.25	1.5		

·Coarse Threads

P Q	PC QC
6	4.4
8	6.0
10	7.7
12	9.4
16	13.0
20	16.4
24	19.6
30	25.0

·Combined with Fine Thread Alterations

PMC QMC	PC QC
6	4.8
8	6.4
10	8.4
12	10.4
15	13.4
17	15.4
20	18.4
25	22.7
30	22.7

PMS QMS	PC QC
10	8
12	9.7
14	11.7
18	15.7

D	MSC / NSC / JSC				
12, 13	8				
15, 16	8	10			
18	8	10	12		
20	8	10	12	14	
25–35	8	10	12	14	18
40		10	12	14	18
50			12	14	18
Pitch	1.0	1.25	1.5		

Cautions for Alteration Selections

ⓘ Alterations may lower hardness. **P.199**

ⓘ When selecting multiple alteration additions, the distance between machined areas should be greater than 2 mm. (See below)

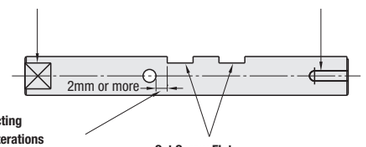
Example 1

Wrench Flats (SC)

ⓘ When the flats are to start from the ends, specify as "SC0".

Keyway Alteration (KC)

ⓘ See Rotary Shaft pages for more variations. **P.852–911** (Rotary Shaft Index)



When Selecting Multiple Alterations

ⓘ The distance between machined areas should be greater than 2 mm.

Set Screw Flat

ⓘ Orientation between set screw flats is random.
WFC (Set Screw Flat)
WSC (Wrench Flats)
WRC (90° Set Screw Flats)
WKC (Keyway Alteration)

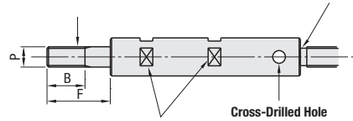
Example 2

Threads

ⓘ Correlation between F and B
When P ≤ 6, B ≤ F - 2
When P = 8/10, B ≤ F - 3
When P ≤ 6, B ≤ F - 5

ⓘ F Length
5 ≤ F ≤ P x 5

ⓘ B Length
B ≥ Pitch x 3



Cross-Drilled Hole

90° Set Screw Flats (RC)

ⓘ Orientation between set screw features is random.

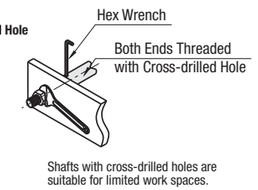
ⓘ Recommended to use with Shaft Collars **P.330**.

Thread Undercut (PC / QC)

ⓘ PC and QC alterations were previously available. Please select on the following pages.

One End Threaded with Undercut please see **P.224**.

Both Ends Threaded with Undercuts please see **P.234**.



Shafts with cross-drilled holes are suitable for limited work spaces.