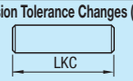
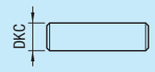
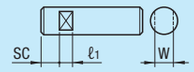
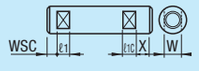
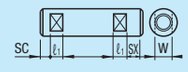
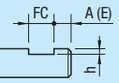
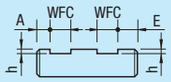
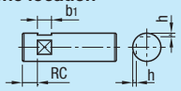
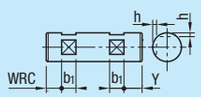
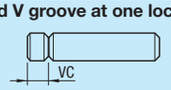
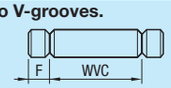
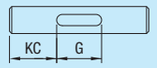
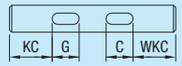
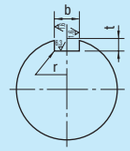
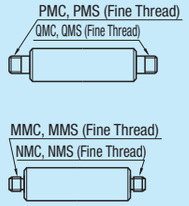
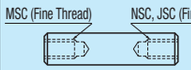
Please refer to website for current pricing.

Shaft Alteration Guide

■Shaft alteration guide

Alteration Type	Alterations	Code	Spec.	Price Adder
Tolerance Change	**L Dimension Tolerance Changes (Precision)** 	LKC	Changes "L Tolerance" to a higher precision level. (P)L<200 ···›L±0.03 Ordering Code LKC 200≤L<500 ···›L±0.05 When using LKC, L dimensions can be specified in 0.1 increment L≥500 ···›L±0.1 Application Notes See each product page for details.	4.00
	Change to h5 O.D. tolerance 	DKC	Outer diameter tolerance is altered to h5. Ordering Code DKC Application Notes ⊗ DKC alterations are only applied to Hollow Shafts from June 2010 onwards. Please specify new part numbers on related page for orders.	4.00
Wrench Flats	**Add a set of wrench flats.** 	SC	Wrench flat is added at one location. Ordering Code SC5 (P) SC=1mm Increment (P) SC+ℓ1≤L (P) SC=0 or SC≥1 Application Notes Applicable to D = 6 and over ⊗Can not be used with WSC (P) D dimensions in ( ) are only applied to Shaft End Configurable Type **P.193**	4.00
	Add wrench flats at two locations 	WSC	Add wrench flat at two locations. Ordering Code WSC12-X8 (P) Specify WSC/X in 1mm increments. (P) WSC+X+ℓ1x2<L (P) WSC (X)=0 or WSC (X)≥1 Application Notes Applicable to D = 6 and over ⊗Orientation between wrench flat features is random. Can not be used with SC and SX (P) D dimensions in ( ) are only applied to Shaft End Configurable Type **P.193**	8.00
	Add wrench flats at two locations 	SX	Adds a second set of wrench flats. Ordering Code SX15 (P) Specify SX in 1mm increments (P) SC+SX+ℓ1x2<L (P) SX = 0 or SX ≥ 1 Application Notes Applicable to D = 6 and over, only with wrench flats. ⊗Orientation between wrench flat features is random. Can not be used with WSC.	4.00
Set Screw Flat	**Add set screw flat at one location**  (P) 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 (P) Specify FC and A (E) in 1mm increments. (P) FC≤3xD (P) When 1.5XD<FC, FC≤L/2 (P) A (E) = 0 or A (E) ≥ 2 ⊗Cannot be used in combination with WFC, not applicable to Precision Type.	2.00
	Add set screw flats at two locations 	WFC	Adds 2 set screw flats. Ordering Code WFC10-A8-E20 (P) Specify WFC, A and E in 1mm increments (P) WFC≤3xD (P) When 1.5xD<FC, 2WFC≤L/2 (P) 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.	4.00
	Add 90-deg. set screw flat at one location 	RC	Adds 90-deg. set screw flats. Ordering Code RC10 (P) RC=Specify in 1mm Increments (P) RC+b1≤L (P) RC≥2 Application Notes Applicable to D=10 ~ 30 ⊗Cannot be used with WRC, Not applicable to Precision Type	5.00
	2 x 90-deg. set screw flats 	WRC	Adds 2 sets of 90-deg. set screw flats. Ordering Code WRC10-Y10 (P) Specify WRC in 1mm increments. (P) WRC+b1≤L (P) WRC (Y)≥2 Application Notes Applicable to D=10 ~ 30 ⊗Orientation between set screw features is random. Can not be used with RC. Not applicable to Precision Type.	10.00
V-groove	**Add V groove at one location** 	VC	Adds one V-groove. (P) VC=Specify in 1 mm Increments (P) VC>W Application Notes Applicable to D = 6 and over ⊗Different from VC Hollow Shafts	2.00
	Two V-grooves. 	WVC	Two V-grooves. Ordering Code WVC180-F8 (P) WVC/F=Specify in 1mm increments (P) F>W Application Notes Applicable to D = 6 and over ⊗Different from WVC Hollow Shafts	4.00

■Shaft alteration guide

Alteration Type	Alterations	Code	Spec.	Price Adder
Keyway	**Keyway** (P) A wide variety of Shafts with keyway alterations is available on Rotary Shaft pages. **P.729~788** **Keyway at one location : KC**  **Keyways at two locations: WKC**  (P) 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 (P) KC / WKC / G / C=Specified in 1 mm Increment (P) 4≤G / C≤30 (P) G / C≤L/3 (P) 2≤KC / WKC≤L/3 (P) G+C≤L/3 (P) Mx2<KC+F (P) 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 (P) When KC=0, keyway is shaped as the drawing on right. Ex.) (P) When KC+G≥L, keyway is shaped as the drawing on right. Ex.) 	KC :5.00 WKC: 10.00
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 (P) Ex.) When requesting M15 with D20 and 1.0 bearing nut fine thread pitch,	3.00
	Change to fine thread tap. 	MSC NSC JSC	Tapped thread changed to fine thread listed in the table below. Ordering Code MSC14 (P) 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.	3.00
	Undercut 	PC QC	PC: Add undercut(s) on P dimension area QC: Add undercut(s) on Q dimension area Ordering Code PC (P) For detailed undercut dimensions, please see **P.103** Application Notes Applicable to M = 6 or more ⊗Not applicable to D=Q and D=P	Free

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	

(P) D dimensions in () are only applied to Shaft End Configurable Type. *marked sizes are not applicable for Precision Type. **P.193**

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

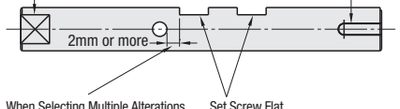
(P) Alterations may lower hardness. **P.104**

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

Ex.1

Wrench Flats (SC)
(P) When the flats are to start from the ends, specify as "SC0".

Keyway Alteration (KC)
(P) See Rotary Shaft pages for more variations. **P.729~P.788** (Rotary Shaft Index)

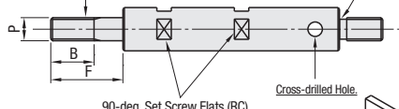


When Selecting Multiple Alterations
(P) the distance between machined areas should be greater than 2mm.

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

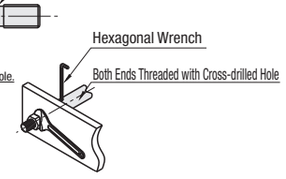
Ex.2

Threads
(P) Correlation between F and B
When P≤6, B≤F-2
When P=8/10, B≤F-3
When P≤6, B≤F-5
(P) F length 5≤F≤Px5
(P) B length B≥Pitchx3



90-deg. Set Screw Flats (RC)
(P) Orientation between set screw features is random.
(P) Recommended to use with Shaft Collars **P.237**

Thread Undercut (PC / QC)
(P) PC and QC alterations were previously available. Please select on the following pages.
One End Threaded with Undercut
P.129-131-147-149
Both Ends Threaded with Undercuts
P.139-141



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