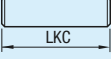

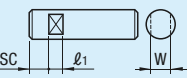
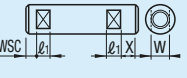
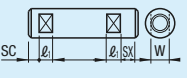
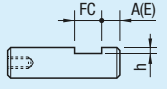
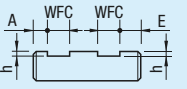
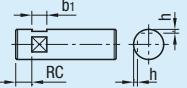
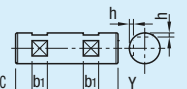
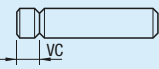
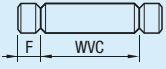



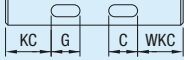
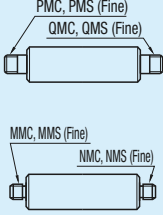


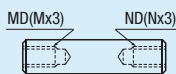


Shaft Alterations - Overview

Shaft Alterations - Overview

Alteration Type	Alterations	Code	Spec.
Tolerance Change	L Dimension Tolerance Change (Precision) 	LKC	Changes "L Tolerance" to a higher precision level. [Ordering Code] LKC L dimensions can be specified in 0.1mm increments for LKC. [Application Notes] See each product page for details.
	Revise O.D. Tolerance to h5 	DKC	O.D. tolerance is altered to h5. [Ordering Code] DKC [Application Notes] Available only for Hollow Shafts
Wrench Flats	Wrench Flats at One Location 	SC	Adds Wrench Flats at one location. [Ordering Code] SC5 SC=1mm Increment SC+ $\varnothing_1 \leq L$ SC ≥ 0 [Application Notes] Applicable to D=6 or more Not available in combination with WSC.
	Wrench Flats at Two Locations 	WSC	Adds Wrench Flats at two locations. [Ordering Code] WSC12-X8 WSC, X=1mm Increment WSC+X+ $\varnothing_1 \times 2 < L$ WSC(X) ≥ 0 [Application Notes] Applicable to D=6 or more Orientation between wrench flats is not coplanar. Not available in combination with SC or SX.
	Second Set of Wrench Flats 	SX	Adds a second set of Wrench Flats. [Ordering Code] SX15 SX=1mm Increment SC+SX+ $\varnothing_1 \times 2 < L$ SX ≥ 0 [Application Notes] Applicable to D=6 or more, only to With Wrench Flats Type. Orientation between wrench flats is not coplanar. Not available in combination with WSC.
Set Screw Flat	Set Screw Flat at One Location 	FC	Adds Set Screw Flat at one location. [Ordering Code] FC10-A8, FC10-E8 FC, A(E) = 1mm Increment FC $\leq 3 \times D$ When $1.5 \times D < FC$, FC $\leq L/2$ A(E)=0 or A(E) ≥ 2 Not available in combination with WFC.
	Set Screw Flats at Two Locations 	WFC	Adds Set Screw Flats at two locations. [Ordering Code] WFC10-A8-E20 WFC, A, E=1mm Increment WFC $\leq 3 \times D$ When $1.5 \times D < WFC$, $2WFC \leq L/2$ A(E)=0 or A(E) ≥ 2 Orientation between set screw flats is not coplanar. Not available in combination with FC.
	90-deg. Set Screw Flat at One Location 	RC	Adds 90-deg. Set Screw Flat at one location. [Ordering Code] RC10 RC=1mm Increment RC+ $b_1 \leq L$ RC ≥ 2 [Application Notes] Only applicable to D=10 ~ 30. Not available in combination with WRC; not applicable to Precision Type.
	90-deg. Set Screw Flats at Two Locations 	WRC	Adds 90-deg. Set Screw Flats at two locations. [Ordering Code] WRC10-Y10 WRC=1mm Increment WRC+ $b_1 \leq L$ WRC(Y) ≥ 2 [Application Notes] Only applicable to D=10 ~ 30. Orientation between set screw flats is not coplanar. Not available in combination with RC. Not applicable to Precision Type.
V Groove	V Groove at One Location 	VC	Adds V Groove at one location. VC=1mm Increment VC>W [Application Notes] Applicable to D=6 or more Different from VC Hollow Shafts.
	V Grooves at Two Locations 	WVC	V Grooves at Two Locations [Ordering Code] WVC180-F8 WVC, F=1mm Increment F>W [Application Notes] Applicable to D=6 or more Different from WVC Hollow Shafts.

Shaft Alterations - Overview

Alteration Type	Alterations	Code	Spec.																																																																																																																																																																																																																																																																																														
Keyway	Keyway A wide variety of Shafts with keyway alterations are available on the Rotary Shaft pages. P819~880 Keyway at One Location: KC 	KC WKC	KC: Adds Keyway at one location. [Ordering Code] KC10-G10 WKC: Adds Keyways at two locations. [Ordering Code] WKC10-C8-KC10-G10 KC, WKC, G, C=1mm Increment $4 \leq G(C) \leq 30$ $G(C) \leq L/3$ $2 \leq KC(WKC) \leq L/3, KC(WKC) = 0$ $G+C \leq L/3$ $Mx2 < KC+F$ For One End / Both Ends Stepped and Tapped Type, $Mx2 < KC+F$. [Application Notes] Only applicable to D=12, 16, 20, 25 and 30. For WKC, keyways cannot be machined coplanar. Not applicable to precision shafts. When KC and WKC=0, keyway is configured as the drawing on right. Ex.)  When KC+G>L, keyway is configured as the drawing on right. Ex.) 																																																																																																																																																																																																																																																																																														
	Keyways at Two Locations: WKC 																																																																																																																																																																																																																																																																																																
	For specifying KC locations, starting datum points vary depending on products. See details on related pages.																																																																																																																																																																																																																																																																																																
	Change to Fine Thread			Changes the threads to fine threads shown in the table below. (PMC, QMC, MMC, NMC→Applicable to bearing nut fine thread pitches.) (PMS, QMS, MMS, NMS→Applicable to cylinder fine thread pitches.) [Ordering Code] PMC15 Ex.) When requesting M15 with D20 and 1.0 bearing nut fine thread pitch																																																																																																																																																																																																																																																																																													
				<table border="1"> <thead> <tr> <th>D</th> <th colspan="10">PMC, QMC, MMC, NMC</th> <th colspan="3">PMS, QMS, MMS, NMS</th> </tr> </thead> <tbody> <tr><td>*3</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>*4</td><td>3</td><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>5</td><td>3</td><td>*4</td><td>*5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>6(7)</td><td>3</td><td>4</td><td>*5</td><td>*6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>8(9)</td><td>3</td><td>4</td><td>5</td><td>6</td><td>*8</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>10</td><td>4</td><td>5</td><td>6</td><td>8</td><td>*10</td><td></td><td></td><td></td><td></td><td></td><td>*10</td><td></td><td></td><td></td></tr> <tr><td>12</td><td></td><td>5</td><td>6</td><td>8</td><td>10</td><td>*12</td><td></td><td></td><td></td><td></td><td>10</td><td>*12</td><td></td><td></td></tr> <tr><td>13</td><td></td><td>5</td><td>6</td><td>8</td><td>10</td><td>*12</td><td></td><td></td><td></td><td></td><td>10</td><td></td><td></td><td></td></tr> <tr><td>15</td><td></td><td>5</td><td>6</td><td>8</td><td>10</td><td>12</td><td>*15</td><td></td><td></td><td></td><td>10</td><td>12</td><td></td><td></td></tr> <tr><td>(14)16(17)</td><td></td><td>5</td><td>6</td><td>8</td><td>10</td><td>12</td><td>*15</td><td></td><td></td><td></td><td>10</td><td>12</td><td>14</td><td></td></tr> <tr><td>18(19)</td><td></td><td>5</td><td>6</td><td>8</td><td>10</td><td>12</td><td>15</td><td>*17</td><td></td><td></td><td>10</td><td>12</td><td>14</td><td>*18</td></tr> <tr><td>20(22)</td><td></td><td></td><td>6</td><td>8</td><td>10</td><td>12</td><td>15</td><td>17</td><td>*20</td><td></td><td>10</td><td>12</td><td>14</td><td>18</td></tr> <tr><td>(24)25(26)</td><td></td><td></td><td></td><td>8</td><td>10</td><td>12</td><td>15</td><td>17</td><td>20</td><td>*25</td><td>10</td><td>12</td><td>14</td><td>18</td></tr> <tr><td>(28)30(31, 32)</td><td></td><td></td><td></td><td>8</td><td>10</td><td>12</td><td>15</td><td>17</td><td>20</td><td>25</td><td>*30</td><td>10</td><td>12</td><td>14</td><td>18</td></tr> <tr><td>*35</td><td></td><td></td><td></td><td></td><td>10</td><td>12</td><td>15</td><td>17</td><td>20</td><td>25</td><td>30</td><td>10</td><td>12</td><td>14</td><td>18</td></tr> <tr><td>(38)*40(45)</td><td></td><td></td><td></td><td></td><td></td><td>12</td><td>15</td><td>17</td><td>20</td><td>25</td><td>30</td><td>10</td><td>12</td><td>14</td><td>18</td></tr> <tr><td>*50</td><td></td><td></td><td></td><td></td><td></td><td></td><td>15</td><td>17</td><td>20</td><td>25</td><td>30</td><td>10</td><td>12</td><td>14</td><td>18</td></tr> <tr><td>Pitch</td><td>0.35</td><td>0.5</td><td>0.75</td><td>1.0</td><td>1.5</td><td>1.5</td><td>1.25</td><td>1.5</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table> D dimensions in () are only applied to Shaft Ends Configurable Type on P.225. * marked sizes are not applicable to Precision Type.	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	10	12	14	18	*50							15	17	20	25	30	10	12	14	18	Pitch	0.35	0.5	0.75	1.0	1.5	1.5	1.25	1.5			
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Thread Alterations	Change to Fine Tapped Thread 	MSC NSC JSC	Changes tapped threads to fine tapped threads shown in the table below. [Ordering Code] MSC14 Ex.) When requesting M14 with D20 and 1.5 fine thread pitch [Application Notes] Applicable to D=12 or more Not applicable to D=35 and more for precision shafts.																																																																																																																																																																																																																																																																																														
	Undercut 	PC QC	PC: Adds undercut(s) on P dimension area. QC: Adds undercut(s) on Q dimension area. [Ordering Code] PC For detailed undercut dimensions, see P.111. [Application Notes] Applicable to M=6 or more. Not applicable to D=Q and D=P.																																																																																																																																																																																																																																																																																														
	Change the effective tap depth to x3 	MD ND	Change the effective tap depth to M(N)x3. [Ordering Code] MD6/ND6 (M is changed to MD, N is changed to ND) [Application Notes] Only applicable to D=6~30, M(N)=6~20 One End Tapped: MDx2.5+4>L Both Ends Tapped: MDx2.5+4+NDx2.5+4>L																																																																																																																																																																																																																																																																																														

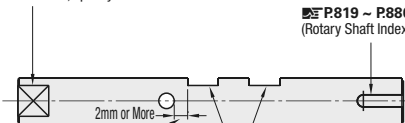
Cautions for Alteration Selections

- Alterations may lower hardness. See P.112
- When selecting multiple alteration additions, the distance between machined areas should be greater than 2mm. (See below)

Ex. 1

Wrench Flats (SC)

- When the flats are to start from the ends, specify as "SCO".



When Selecting Multiple Alterations

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

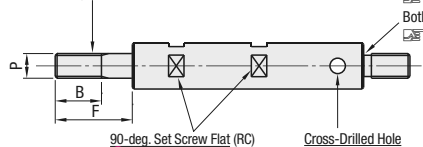
Set Screw Flat

- Orientation between two set screw flats is not coplanar.
- WFC (Set Screw Flats at Two Locations)
- WSC (Wrench Flats at Two Locations)
- WRC (90-deg. Set Screw Flats at Two Locations)
- WKC (Keyways at Two Locations)

Ex. 2

Threads

- Correlation between F and B:
 When P≤6, B≤F-2;
 when P=8 or 10, B≤F-3;
 when P≤6, B≤F-5

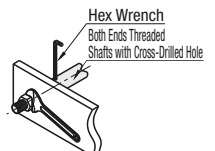


- 90-deg. Set Screw Flat (RC)
 Orientation between two set screw flats is not coplanar.
 Recommended to be used with Shaft Collar P.267.
- F Length:
 $5 \leq F \leq P \times 5$
- B Length:
 $B \geq \text{Pitch} \times 3$

Undercut (PC, QC)

- For the following types, PC and QC alterations are no longer available. Please see pages below.

- One End Threaded with Undercut
P.145, 147, 167, 169
- Both Ends Threaded with Undercuts
P.157, 159



Shafts with Cross-Drilled Hole are suitable for narrow work space.