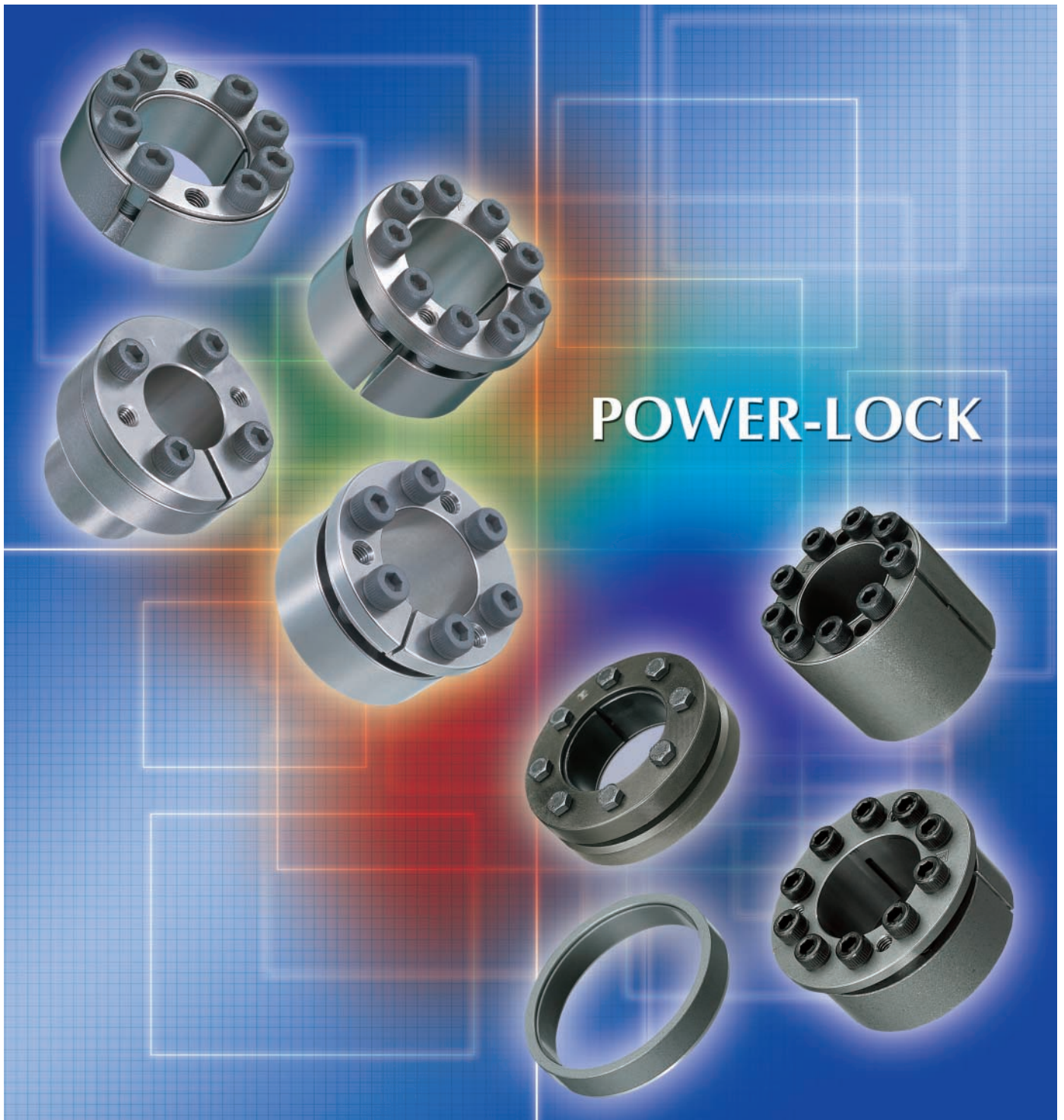


POWER-LOCK



User-Friendliness is Our Motto

Power-Lock shaft-hub locking devices provide simple and highly secure connections.



AS Series

Multipurpose locking devices available in stainless steel and electroless nickel-plated finish, in addition to standard models.



ADN Series

Capable of transmitting 1.5 to 3 times the AS Series rated torque capacity. Suitable for applications requiring very high torque.



AE Series

Simply constructed units with only an inner and an outer ring with a few locking bolts.



KE Series

Suitable for small shafts with a wide range of tolerances (m6,k6,js6,h6~h10). Available in stainless steel and electroless nickel-plated KP models.



TF Series

Excellent for small hub applications. Available in electroless nickel-plated finish.



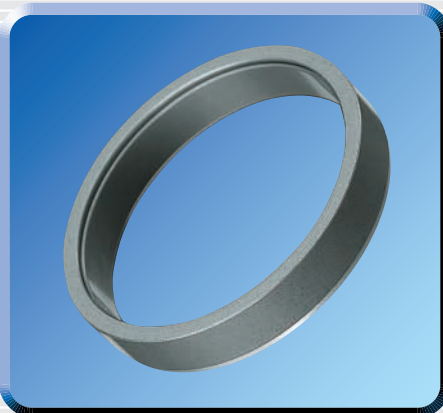
SL Series

External locking devices installed over outer hub diameters. Especially suitable for hollow shaft connections.



EF Series

Pressure flange type locking devices with twice the rated torque capacity of EL Series.



EL Series

Although these shaft-hub locking devices cannot connect independently, they require minimum installation space and offer compact design configurations.

BEST

The Tsubaki Emerson Power-Lock line has been highly acclaimed since its introduction in 1978.

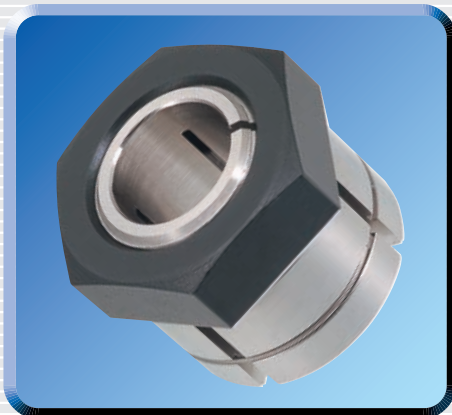
These shaft-hub locking devices carry many attractive features and come in a wide range of models that are guaranteed to upgrade your equipment.

No keys required!



RE Series

Corrosion resistant stainless steel locking devices ideal for connecting to small shafts. Available in flange or straight types.



ML Series (ML and MG Types)

These units are quick to connect with a single nut.

Contents

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VALUE, BEST CONNECTION

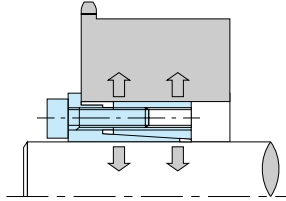
**Power-Lock Series to Fit
Every Application**

Power-Lock Selection Guide 1

KE Series



1. Designed to suit a wide range of shaft tolerances.
2. Compact with only a small difference between the inner and outer diameters.
3. Self-centering.
4. Excellent for locking small shafts.
5. Available in stainless steel and electroless nickel-plated finish.



ADN Series



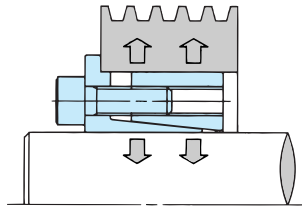
High Torque

Wide Range of Tolerances

AE Series



1. Self-centering.
2. Designed with the same inner and outer diameters as an AS Series Power-Lock.



Multipurpose Flange

AS Series Multipurpose



Environment Resistant

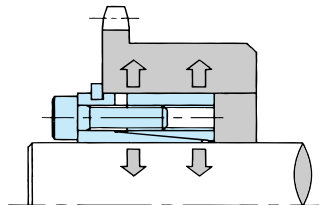
External Locks

RE Series Stainless Steel

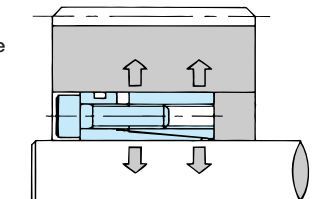
1. Main unit made of austenite stainless steel for corrosion resistance.
2. Install or remove the snap ring to use as a flange or straight type.
3. Excellent for locking small shafts.
4. Self-centering.



Flange Type



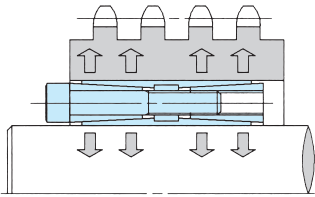
Straight Type



SL Series



1. Offers 1.5 to 3 times the rated torque capacity of the AS Series.
2. Self-centering.
3. Designed with the same inner and outer diameters as an AS Series Power-Lock.



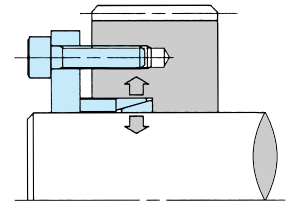
Locking Elements



EL Series



1. Offers flexible design configurations.
2. Designed for applications requiring space restrictions.
3. Excellent cost performance.

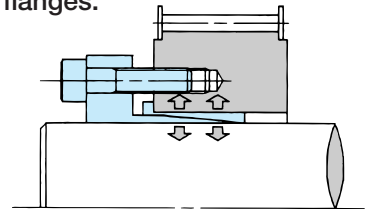


Pressure Flange

EF Series

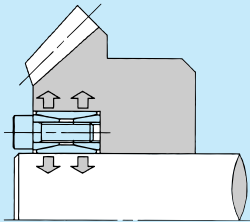


1. Pressure flange type locking elements.
2. Offers 2 to 3 times the rated torque capacity of the EL Series.
3. Self-centering.
4. Eliminates the hassle of manufacturing pressure flanges.



Low Profile

1. Easy-handling and multipurpose.
2. Compatible with large shafts.
3. Inch sizes and environment resistant models available.



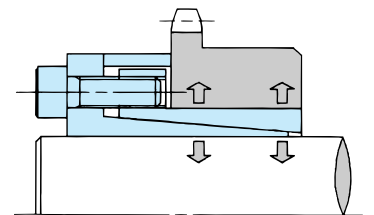
Environment resistant models in stainless steel (AS-SS Series) and electroless nickel-plated finish (AS-KP Series) available.

Small Hub Diameters

TF Series

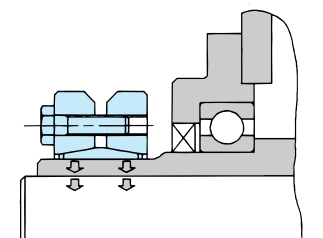


1. Excellent for locking small hubs.
2. Minimum number of bolts used.
3. Self-centering.
4. Available in electroless nickel-plated finish.



Nut Locking

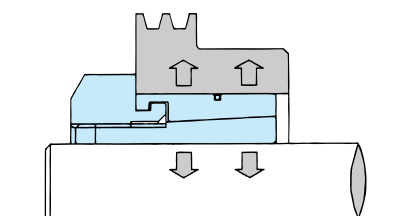
1. Installs over outer hub diameters.
2. Excellent for locking hollow shafts.
3. Low profile for applications with space restrictions.









ML Series (ML and MG Types)



1. Quick to install with a single nut.
2. No assembly lubrication required.
3. Self-centering.
4. Suitable for narrow hubs.



Power-Lock Selection Guide 2

Series	Hub Movement	Transmissible Thrust kN	Self-Centering	Shaft/Hub Tolerances	Surface Roughness	Lubrication	Ambient Temp.			
 Multipurpose AS	N/A	26.5~ 1000	N/A (A precentered hub is required.)	h8/H8	Below 12S	Required	-30 °C ~ 200 °C			
 Environment Resistant AS-KP (Electroless Nickel-Plated)						N/R				
 Environment Resistant AS-ss (Stainless Steel)		21.6~ 278				N/R				
 High Torque ADN		40.6~ 2600				Required				
 Multipurpose Flange AE		28.1~ 361				Required				
 Environment Resistant RE-ss (Stainless Steel)	None, with snap ring Some, without snap ring	1.89~ 76.3	Yes	h8/H8	Below 12S	N/R				
 Wide range of Tolerances KE	N/A	2.86~ 187				※h10~m6		Required		
 Environment Resistant KE-KP (Electroless Nickel-Plated)						h8/H8		N/R		
 Environment Resistant KE-ss (Stainless Steel)		1.89~ 31.6				※h10~m6		N/R		
 Small Hub Diameters TF		3.78~ 196				h8/H8		Required		
 Environment Resistant TF-KP (Electroless Nickel-Plated)		8.70~ 196					Required			
 External Locks SL		Some movement.				17.9~ 2370	—	h6/H7/h7	Below 6S	N/R
 Nut Locking ML (ML and MG Types)						2.65~ 56	Yes	h8/H8		Required
 Pressure Flange EF						7.79~ 211				
 Locking Elements EL		Yes, if pressure is applied on the inner ring. No, if pressure is applied on the outer ring.				1.37~ 140	N/A (A precentered hub is required.)	h6/H7 h8/H8	Below 6S	Required

※See section for KE Series.

Shaft Sizes and Transmissible Torque								
$\phi 10$	$\phi 20$		$\phi 50$	$\phi 100$	$\phi 150$	$\phi 200$	$\phi 250$	$\phi 300$
	$\phi 19$	245 N·m {25 kgf·m} ~ 151000 N·m {15400 kgf·m}						$\phi 300$
		Eg. Model No. PL 024×050 AS						
	$\phi 19$	245 N·m {25 kgf·m} ~ 151000 N·m {15400 kgf·m}						$\phi 300$
		Eg. Model No. PL 024×050 AS-KP						
	$\phi 19$	196 N·m {20 kgf·m} ~ 20900 N·m {2130 kgf·m}				$\phi 150$		
		Eg. Model No. PL 024×050 AS-SS						
	$\phi 19$	382 N·m {39kgf·m} ~ 429000 N·m {43800 kgf·m}						$\phi 300$
		Eg. Model No. PL 024×050 AD-N						
	$\phi 19$	265 N·m {27 kgf·m} ~ 27000 N·m {2760 kgf·m}				$\phi 150$		
		Eg. Model No. PL 024×050 AE						
	$\phi 5$	5 N·m {0.5 kgf·m} ~ 2020 N·m {206 kgf·m}			$\phi 50$			
		Eg. Model No. PL 024×043 RE-SS						
	$\phi 5$	7.5 N·m {0.8 kgf·m} ~ 9900 N·m {1010 kgf·m}				$\phi 100$		
		Eg. Model No. PL 024×042 KE						
	$\phi 5$	7.5 N·m {0.8 kgf·m} ~ 9900 N·m {1010 kgf·m}				$\phi 100$		
		Eg. Model No. PL 024×042 KE-KP						
	$\phi 5$	5 N·m {0.5 kgf·m} ~ 836 N·m {85 kgf·m}			$\phi 50$			
		Eg. Model No. PL 024×042 KE-SS						
	$\phi 6$	11 N·m {1.2 kgf·m} ~ 8820 N·m {900 kgf·m}				$\phi 90$		
		Eg. Model No. PL 024×034 TF						
	$\phi 10$	44 N·m {4.4 kgf·m} ~ 8820 N·m {900 kgf·m}				$\phi 90$		
		Eg. Model No. PL 024×034 TF-KP						
	$\phi 24$	167 N·m {17 kgf·m} ~ 290000 N·m {29600 kgf·m}						$\phi 300$
		Eg. Model No. PL 030×060 SL						
	$\phi 5$	6.8 N·m {0.7 kgf·m} ~ 2000 N·m {204 kgf·m}				$\phi 75$		
		Eg. Model No.s PL 024×041 M PL 040×067 MG						
	$\phi 10$	39 N·m {4 kgf·m} ~ 12600 N·m {1290 kgf·m}				$\phi 120$		
		Eg. Model No. PL 024×028 EF						
	$\phi 10$	11.3 N·m {1.1 kgf·m} ~ 13100 N·m {1340 kgf·m}				$\phi 150$		
		Eg. Model No. PL 024×028 E						

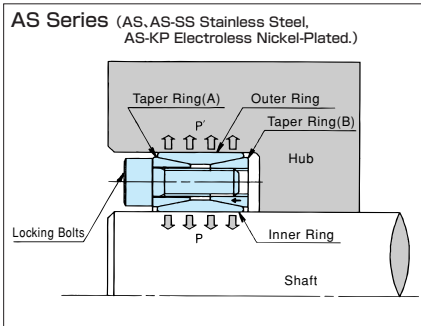
Power-Lock Selection Guide 3

(1) Shaft Diameters and Transmissible Torque

Unit : N·m

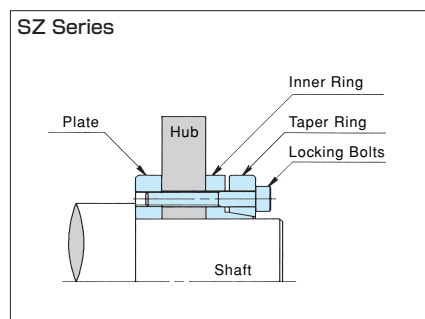
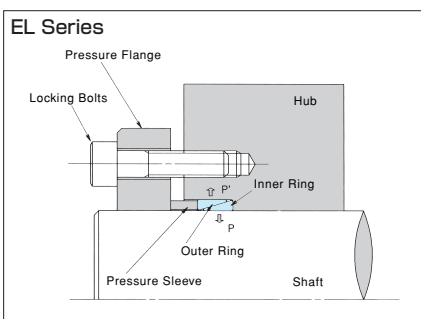
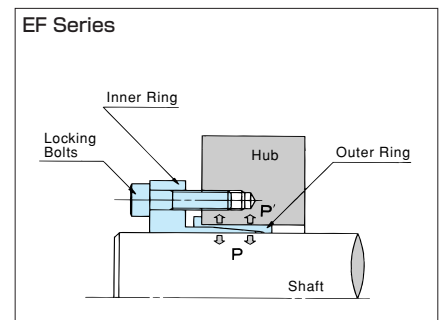
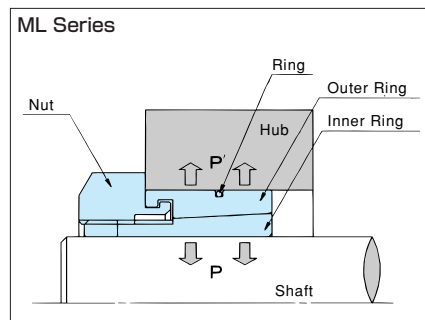
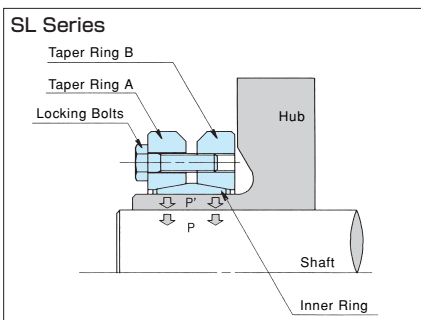
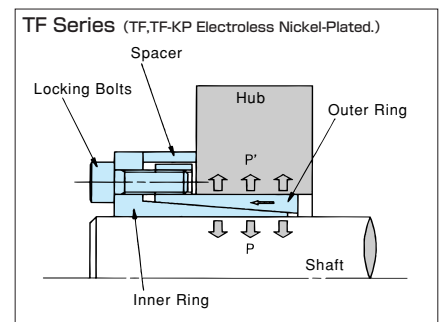
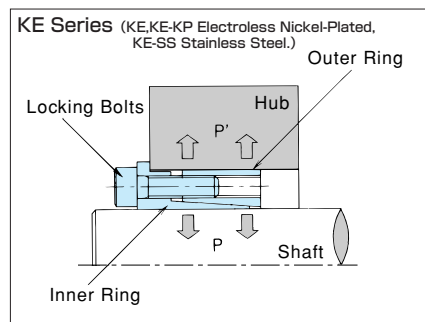
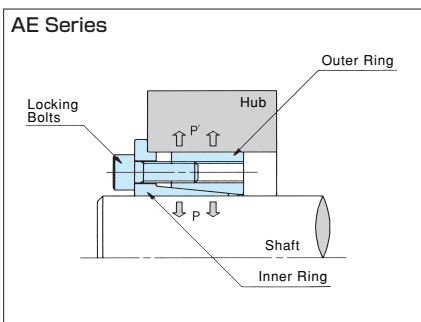
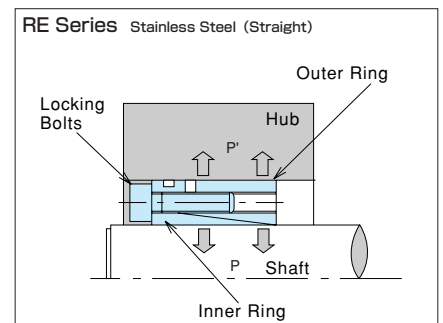
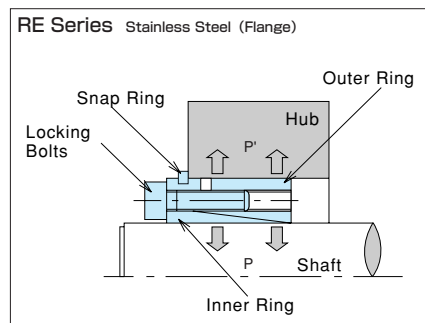
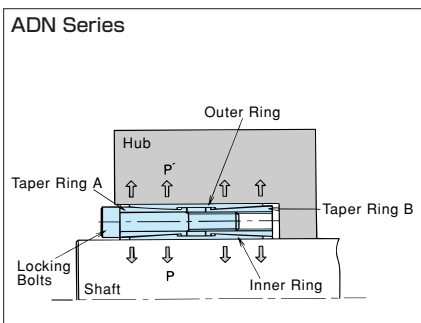
Shaft Diameter (mm)	AS (AS-KP)	ADN	AE	TF (TF-KP)	ML (MG)	KE (KE-KP)	KE-SS	RE	AS-SS	EF	EL	SL
								Flange/Straight				
5					6.76	7.5	5.0	5.01/6.73				
6				11	8.13	9	6.0	6.02/9.23				
7				13	22.5							
8				26	26.5	24.5	14.2	10.7/18.5				
9					29.4							
10				44	42.1	31.4	17.7	23.8/41		39	6.9	
11				48	46.1	34.3	19.6	26.1/45.1		43	8.2	
12				52	50	50	28.4	35.6/61.6		47	9.8	
13											11.6	
14				61	108	73.5	41.6	49.9/86.2		73	19.2	
15				107	118	94.1	44.5	53.5/92.3		78	22.1	
16				114	127	101	47.4	57/98.5		124	25.1	
17					196	107	60.6	60.6/105		132	28.3	
18				196	206	113	64.1	64.2/111		154	31.8	
19	245	382	265	206	216	120	67.7	90.3/156	196	163	35.3	167
20	265	402	274	216	245	206	141	141/244	216	171	39.2	205
21												243
22	294	441	304	245	274	226	156	156/269	235	186	47	
24	402	647	392	265	294	329	170	226/391	343	206	56.8	256
25	421	676	412	274	374	343	177	236/407	353	216	60.8	297
26												340
28	470	755	519	461	421	432	264	330/570	402	353	76.4	459
30	510	784	559	500	451	515	283	354/611	431	382	88.2	570
31												599
32	676	1270	745	529	480	549	302	377/652	568	412	100	
34					570							784
35	745	1370	823	774	590	678	351	495/855	627	451	136	857
36					600						144	934
38	892	1670	892	843	640	921	508	635/1100	745	686	160	1010
40	941	1760	931	882	720	969	535	668/1150	794	725	195	1180
42	1490	3530	1640	931	760	1010	561	842/1450	1230	1010	216	1360/1120
45	1600	3820	1750	1850	810	1090	602	902/1560	1330	1490	321	1390
48	1700	4070	2060	1970	1350	1390	722	962/1660	1410	1600	367	1680/1850
50	1770	4210	2160	2060	1430	1700	836	1170/2020	1480	1660	397	2080/1780
52												2220
55	2390	4610	2350	2550	1560	1860			1990	1820	480	2230/2590
56											603	
60	2610	6170	2550	2770	1650	2180			2170	1990	692	2870/3310
63											764	
65	3090	6760	3330	3010	1770	2360			2560	2870	813	4120/3720
70	4800	11600	4800	5150	1900	3750			4020	3100	1110	4560/5600
71											1140	
75	5190	12300	5100	5490	2000	4030			4310	4150	1260	6700/6840
80	5490	14400	6570	7840		5010			4610	4420	1770	8090/8250
85	6370	15300	6960	8330		5320			5390	5980	2000	9360/1020
90	6760	17500	7450	8820		8960			5680	6330	2240	11800
95	7740	18500	9110			9460			6470	6680	2500	13500/1460
100	10000	26500	10300			9900			8400	8790	3450	16600
110	11100	31700	11400						9300	9670	4170	21600
120	13100	39900	14900						11100	12600	4950	32600
130	17800	50700	19600						15000		7840	35900
140	20500	62900	21100						17200		9110	49100/5480
150	24700	71900	27000						20900		10500	64600
160	27700	81500										75200/8300
170	34100	106000										95700/111000
180	38400	120000										126000
190	47600	134000										141000/149000
200	52700	141000										169000
220	69100	183000										219000
240	83800	220000										277000
260	104000	238000										
280	129000	364000										
300	151000	429000										

(2) Design Configurations and Locking Principles



Self-centering function : A function that reduces runouts caused by hub rotations.

Hub movement : The hub's movement in the direction of the thrust during Power-Lock installation.

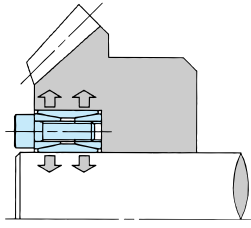


Application Examples

Standard Installation

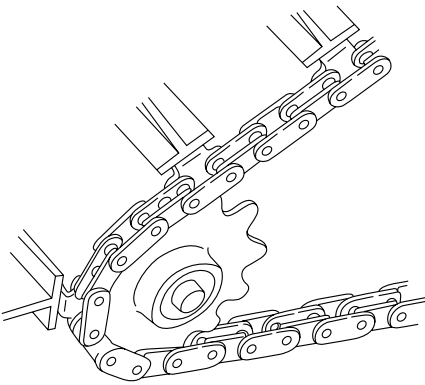
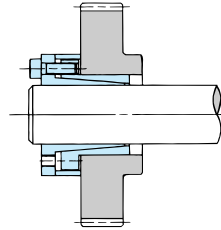
Single AS Unit

Generally, a single unit can transmit high torque and axial load.



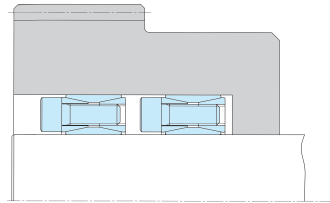
Single TF Unit

Below is the most standard installation form.



Two AS Units in a Row

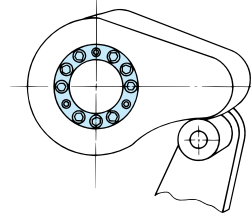
Torque transmission M_t and thrust load are doubled.



Phase Adjustments

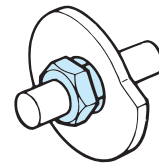
Cam Phase Adjustments for AS Series

Restriction-free, fine phase adjustments can boost system performances.



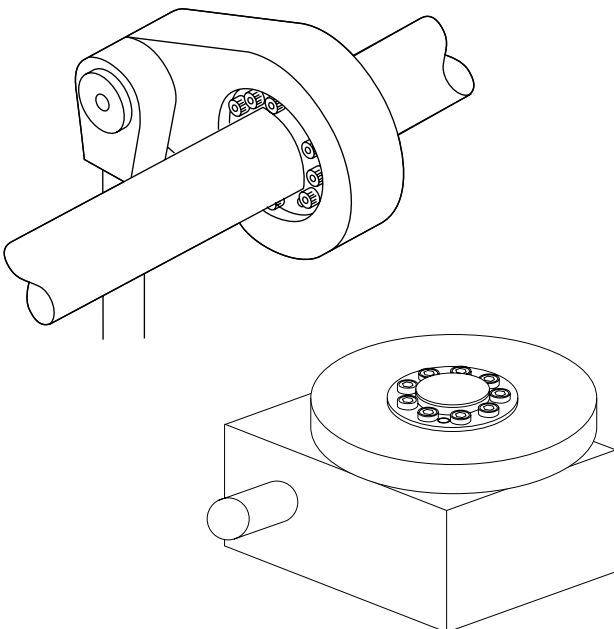
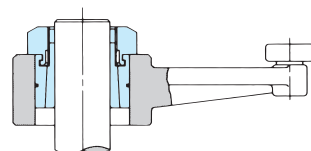
Cam Plate Installation for ML Series

Restriction-free, fine phase adjustments can boost system performances.

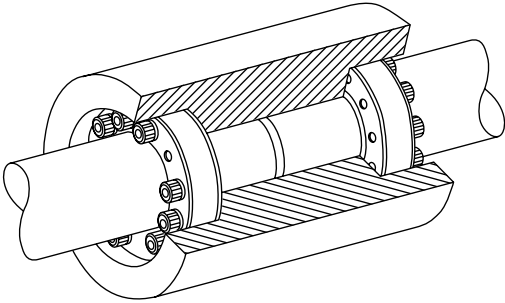


Arm Installation for ML Series

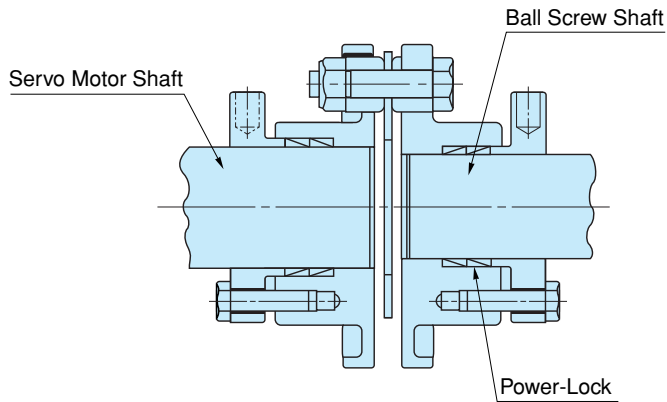
Restriction-free phase adjustments are possible.



Couplings

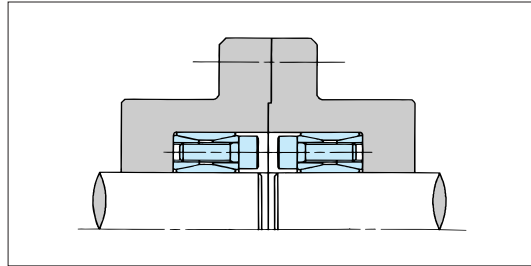


Backlash free and highly accurate disc couplings are excellent with Power-Locks. (Below shows an example using an EL Series unit.)



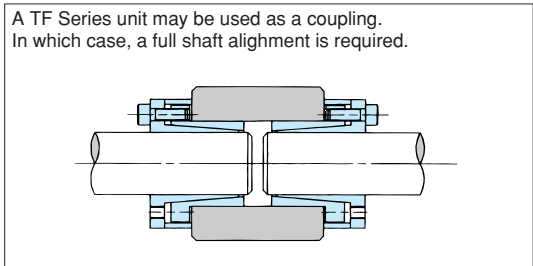
Power-Lock-disc coupling sets are also available. Please see [Tsubaki Emerson Flexible Couplings catalog](#) for details.

Coupling Installation for AS Series



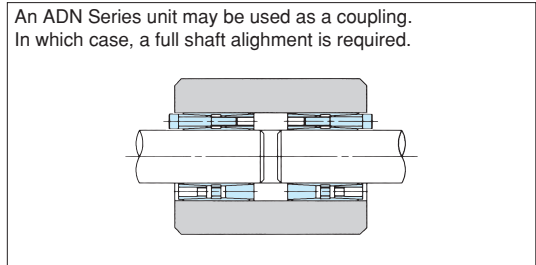
Coupling Installation for TF Series

A TF Series unit may be used as a coupling. In which case, a full shaft alignment is required.



Coupling Installation for ADN Series

An ADN Series unit may be used as a coupling. In which case, a full shaft alignment is required.



Compact Designs

Space Saving Installation for TF Series

Suitable for applications requiring minimum installation space.

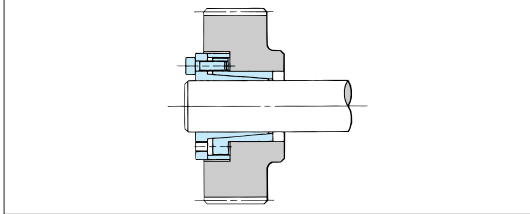
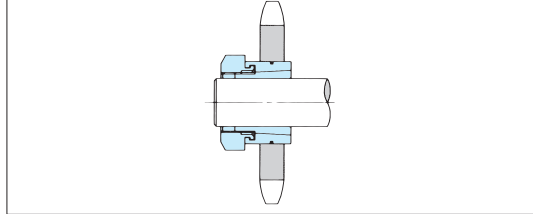


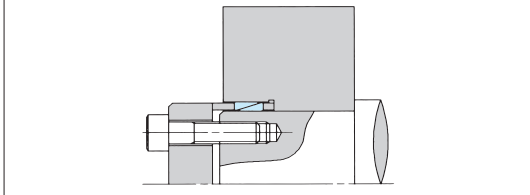
Plate Installation for ML Series

Excellent with A-Type sprockets.



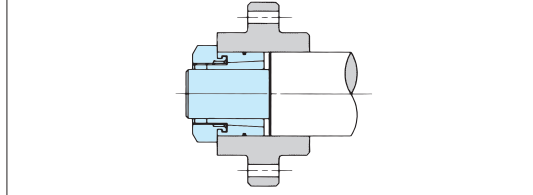
Pressure Flange-Shaft Installation for EL Series

Below illustrates an example where the bolt heads and pressure flange are mounted into the hub bore.



Step Shaft Installation for ML Series

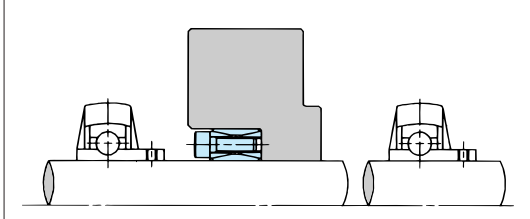
Suitable for small hubs and applications requiring compact installation.



Special Shaft Installation

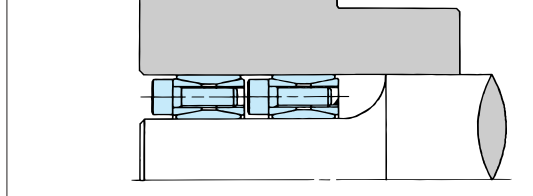
Midway Long Shaft Installation for AS Series

Eliminates the hassle of machining keyways.



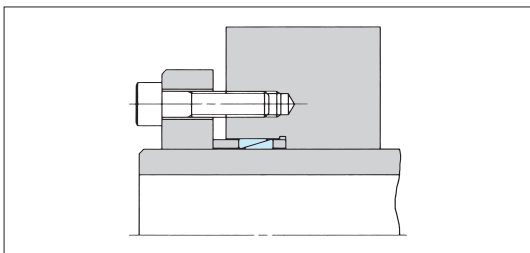
Step Shaft Installation for AS Series

Suitable for applications requiring limited hub space and straight bores.

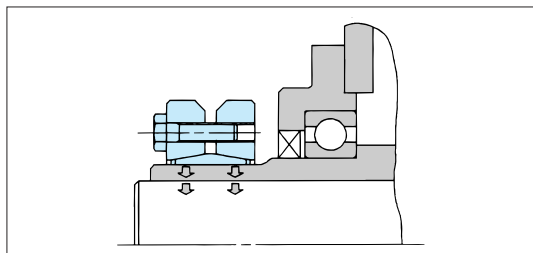


Hollow Shaft Installation

EL Series



SL Series



POWER-LOCK AS Series

Sizes : $\phi 19 \sim \phi 300$
 Shaft tolerance : h8
 Hub bore tolerance : H8
 Surface roughness : Below 12S



All models are RoHS compliant.

Features

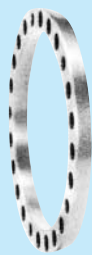
- 1 Multipurpose**
Ideally structured and highly reliable locking devices.
- 2 Low Machining Costs**
Keyways, splines, presses and thermal fittings are not required. Optimum performance is achieved with low shaft and hub tolerances of h8 and H8 respectively, thereby minimizing the total machining costs.
- 3 Easy to Install and Remove**
Installs or removes just by the tightening or loosening of bolts. No need to hassle with adjusting keyways and thermal fittings.
- 4 Options to Fit Every Application**
Stainless steel and electroless nickel plating options are offered for standard models. Both are highly durable in corrosive or clean room environments.

AS

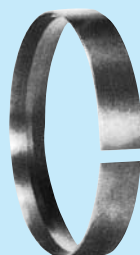
Parts



Locking Bolts



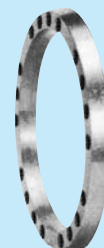
Taper Ring (A)



Outer Ring



Inner Ring



Taper Ring (B)

The AS Series Power-Locks are simply constructed of the following five parts: taper rings (A) and (B), inner and outer rings and locking bolts. Simply tighten these bolts to achieve a completely secure connection.

Reference Number System

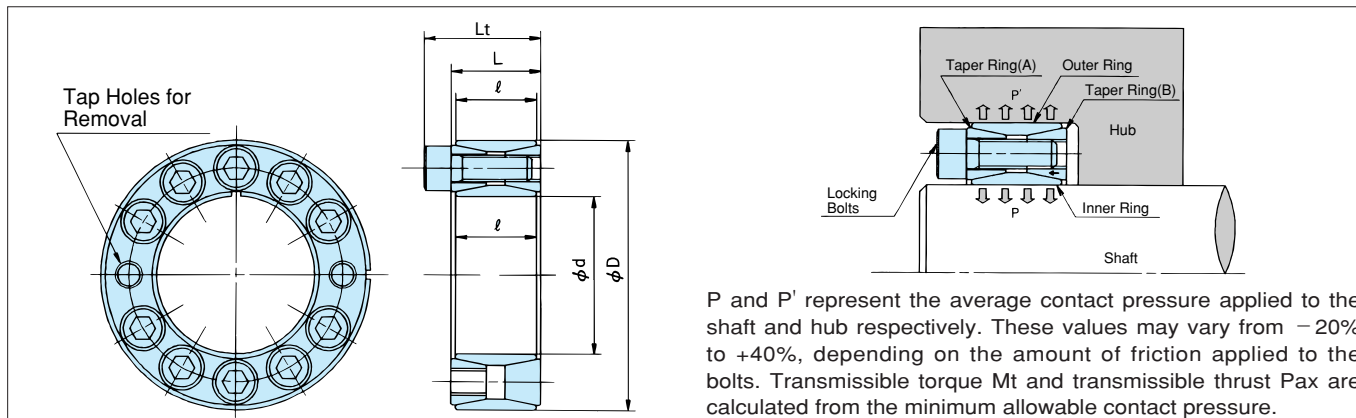
PL 020 X 047 AS

Power-Lock
 Shaft Diameter mm
 Outer Diameter mm

Series
 AS : Standard
 AS-SS : Stainless Steel
 AS-KP : Electroless Nickel-Plated

Model Numbers and Specifications

Standard



Model No. ($d \times D$ Shaft Diameter X Outer Diameter) mm	Dimensions mm			Transmissible Torque		Transmissible Thrust		Shaft Contact Pressure		Hub Contact Pressure		Locking Bolts			Mass kg	
	L	l	Lt	Mt		Pax		P		P'		Quantity	Size	Tightening Torque M_A		
				N·m	{kgf·m}	kN	{kgf}	MPa	{kgf/mm ² }	MPa	{kgf/mm ² }			N·m		{kgf·m}
PL 019 X 047 AS	20	18	26	245	25	26.5	2700	210	21.4	85	8.7	6	M6×18	16.7	1.7	0.20
PL 020 X 047 AS	20	18	26	265	27	26.5	2700	199	20.3	85	8.7	6	M6×18	16.7	1.7	0.20
PL 022 X 047 AS	20	18	26	294	30	26.5	2700	181	18.5	85	8.7	6	M6×18	16.7	1.7	0.19
PL 024 X 050 AS	20	18	26	402	41	33.3	3400	211	21.5	101	10.3	8	M6×18	16.7	1.7	0.22
PL 025 X 050 AS	20	18	26	421	43	33.3	3400	203	20.7	101	10.3	8	M6×18	16.7	1.7	0.22
PL 028 X 055 AS	20	18	26	470	48	33.3	3400	180	18.4	92	9.4	8	M6×18	16.7	1.7	0.25
PL 030 X 055 AS	20	18	26	510	52	33.3	3400	169	17.2	92	9.4	8	M6×18	16.7	1.7	0.24
PL 032 X 060 AS	20	18	26	676	69	42.1	4300	198	20.2	106	10.8	10	M6×18	16.7	1.7	0.27
PL 035 X 060 AS	20	18	26	745	76	42.1	4300	181	18.5	106	10.8	10	M6×18	16.7	1.7	0.27
PL 038 X 065 AS	20	18	26	892	91	47.0	4800	183	18.7	107	10.9	11	M6×18	16.7	1.7	0.30
PL 040 X 065 AS	20	18	26	941	96	47.0	4800	174	17.8	107	10.9	11	M6×18	16.7	1.7	0.30
PL 042 X 075 AS	24	21	32	1490	152	70.6	7200	214	21.8	121	12.3	9	M8×22	40.2	4.1	0.51
PL 045 X 075 AS	24	21	32	1600	163	70.6	7200	200	20.4	121	12.3	9	M8×22	40.2	4.1	0.51
PL 048 X 080 AS	24	21	32	1700	173	70.6	7200	188	19.2	113	11.5	9	M8×22	40.2	4.1	0.55
PL 050 X 080 AS	24	21	32	1770	181	70.6	7200	180	18.4	113	11.5	9	M8×22	40.2	4.1	0.55
PL 055 X 085 AS	24	21	32	2390	244	86.2	8800	201	20.5	130	13.3	11	M8×22	40.2	4.1	0.60
PL 060 X 090 AS	24	21	32	2610	266	86.2	8800	184	18.8	123	12.5	11	M8×22	40.2	4.1	0.64
PL 065 X 095 AS	24	21	32	3090	315	94.1	9600	184	18.8	126	12.9	12	M8×22	40.2	4.1	0.69
PL 070 X 110 AS	28	25	38	4800	490	138	14100	210	21.4	133	13.6	11	M10×25	81.3	8.3	1.21
PL 075 X 115 AS	28	25	38	5190	530	138	14100	196	20.0	127	13.0	11	M10×25	81.3	8.3	1.27
PL 080 X 120 AS	28	25	38	5490	560	138	14100	184	18.8	123	12.5	11	M10×25	81.3	8.3	1.33
PL 085 X 125 AS	28	25	38	6370	650	150	15300	189	19.3	128	13.1	12	M10×25	81.3	8.3	1.41
PL 090 X 130 AS	28	25	38	6760	690	150	15300	178	18.2	123	12.6	12	M10×25	81.3	8.3	1.47
PL 095 X 135 AS	28	25	38	7740	790	163	16600	183	18.7	129	13.2	13	M10×25	81.3	8.3	1.54
PL 100 X 145 AS	33	29	45	10000	1020	201	20500	184	18.8	127	13.0	11	M12×30	142	14.5	2.09
PL 110 X 155 AS	33	29	45	11100	1130	201	20500	168	17.1	120	12.2	11	M12×30	142	14.5	2.25
PL 120 X 165 AS	33	29	45	13100	1340	220	22400	168	17.1	123	12.5	12	M12×30	142	14.5	2.42
PL 130 X 180 AS	38	34	50	17800	1820	274	28000	166	16.9	120	12.2	15	M12×35	142	14.5	3.38
PL 140 X 190 AS	38	34	50	20500	2090	292	29800	164	16.7	121	12.3	16	M12×35	142	14.5	3.59
PL 150 X 200 AS	38	34	50	24700	2520	329	33600	172	17.5	129	13.2	18	M12×35	142	14.5	3.82
PL 160 X 210 AS	38	34	50	27700	2830	347	35400	170	17.3	129	13.2	19	M12×35	142	14.5	4.03
PL 170 X 225 AS	44	40	58	34100	3480	402	41000	157	16.0	119	12.1	16	M14×40	225	23.0	5.49
PL 180 X 235 AS	44	40	58	38400	3920	426	43500	158	16.1	121	12.3	17	M14×40	225	23.0	5.78
PL 190 X 250 AS	52	48	66	47600	4860	502	51200	147	15.0	112	11.4	20	M14×45	225	23.0	7.89
PL 200 X 260 AS	52	48	66	52700	5380	527	53800	146	14.9	113	11.5	21	M14×45	225	23.0	8.26
PL 220 X 285 AS	56	51	72	69100	7050	628	64100	149	15.2	115	11.7	18	M16×50	348	35.5	10.6
PL 240 X 305 AS	56	51	72	83800	8550	698	71200	152	15.5	120	12.2	20	M16×50	348	35.5	11.5
PL 260 X 325 AS	56	51	72	104000	10600	803	81900	161	16.4	129	13.2	23	M16×50	348	35.5	12.4
PL 280 X 355 AS	66	61	84	129000	13200	923	94200	144	14.7	114	11.6	22	M18×60	475	48.5	18.7
PL 300 X 375 AS	66	61	84	151000	15400	1000	102000	147	15.0	118	12.0	24	M18×60	475	48.5	19.9

Notes) 1. Stocked models are in bold.

2. M_t indicates torque at 0 transmissible thrust, while P_{ax} indicates transmissible thrust at 0 torque. If transmissible torque and thrust apply simultaneously calculate and compare the combined value with the transmissible torque provided in the table.

Model Numbers and Specifications

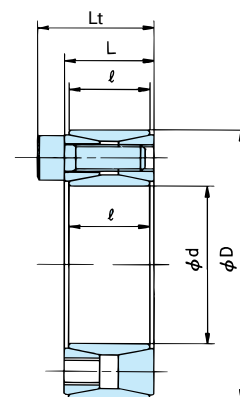
Electroless Nickel-Plated (AS-KP) Models

Important Notes

1. Dimensions and transmissible torque are the same as the standard AS models.
2. The units are plated with peel-proof electroless nickel.
3. The locking bolts are DISGO treated so that assembly lubrication is not necessary. The electroless nickel-plated models are chrome-free and environmentally friendly.

Applications

Most suitable for clean-room operation requiring minimum rust.


AS

Model No. ($d \times D$ Shaft Diameter X Outer Diameter) mm	Dimensions mm			Transmissible Torque		Transmissible Thrust		Shaft Contact Pressure		Hub Contact Pressure		Locking Bolts			Mass kg	
	L	l	Lt	Mt		Pax		P		P'		Qty.	Size	Tightening Torque M_A		
				N·m	{kgf·m}	kN	{kgf}	MPa	{kgf/mm ² }	MPa	{kgf/mm ² }			N·m		{kgf·m}
PL019 X 047 AS-KP	20	18	26	245	25	26.5	2700	210	21.4	85	8.7	6	M6×18	16.7	1.7	0.20
PL020 X 047 AS-KP	20	18	26	265	27	26.5	2700	199	20.3	85	8.7	6	M6×18	16.7	1.7	0.20
PL022 X 047 AS-KP	20	18	26	294	30	26.5	2700	181	18.5	85	8.7	6	M6×18	16.7	1.7	0.19
PL024 X 050 AS-KP	20	18	26	402	41	33.3	3400	211	21.5	101	10.3	8	M6×18	16.7	1.7	0.22
PL025 X 050 AS-KP	20	18	26	421	43	33.3	3400	203	20.7	101	10.3	8	M6×18	16.7	1.7	0.22
PL028 X 055 AS-KP	20	18	26	470	48	33.3	3400	180	18.4	92	9.4	8	M6×18	16.7	1.7	0.25
PL030 X 055 AS-KP	20	18	26	510	52	33.3	3400	169	17.2	92	9.4	8	M6×18	16.7	1.7	0.24
PL032 X 060 AS-KP	20	18	26	676	69	42.1	4300	198	20.2	106	10.8	10	M6×18	16.7	1.7	0.27
PL035 X 060 AS-KP	20	18	26	745	76	42.1	4300	181	18.5	106	10.8	10	M6×18	16.7	1.7	0.27
PL038 X 065 AS-KP	20	18	26	892	91	47.0	4800	183	18.7	107	10.9	11	M6×18	16.7	1.7	0.30
PL040 X 065 AS-KP	20	18	26	941	96	47.0	4800	174	17.8	107	10.9	11	M6×18	16.7	1.7	0.30
PL042 X 075 AS-KP	24	21	32	1490	152	70.6	7200	214	21.8	121	12.3	9	M8×22	40.2	4.1	0.51
PL045 X 075 AS-KP	24	21	32	1600	163	70.6	7200	200	20.4	121	12.3	9	M8×22	40.2	4.1	0.51
PL048 X 080 AS-KP	24	21	32	1700	173	70.6	7200	188	19.2	113	11.5	9	M8×22	40.2	4.1	0.55
PL050 X 080 AS-KP	24	21	32	1770	181	70.6	7200	180	18.4	113	11.5	9	M8×22	40.2	4.1	0.55
PL055 X 085 AS-KP	24	21	32	2390	244	86.2	8800	201	20.5	130	13.3	11	M8×22	40.2	4.1	0.60
PL060 X 090 AS-KP	24	21	32	2610	266	86.2	8800	184	18.8	123	12.5	11	M8×22	40.2	4.1	0.64
PL065 X 095 AS-KP	24	21	32	3090	315	94.1	9600	184	18.8	126	12.9	12	M8×22	40.2	4.1	0.69
PL070 X 110 AS-KP	28	25	38	4800	490	138	14100	210	21.4	133	13.6	11	M10×25	81.3	8.3	1.21
PL075 X 115 AS-KP	28	25	38	5190	530	138	14100	196	20.0	127	13.0	11	M10×25	81.3	8.3	1.27
PL080 X 120 AS-KP	28	25	38	5490	560	138	14100	184	18.8	123	12.5	11	M10×25	81.3	8.3	1.33
PL085 X 125 AS-KP	28	25	38	6370	650	150	15300	189	19.3	128	13.1	12	M10×25	81.3	8.3	1.41
PL090 X 130 AS-KP	28	25	38	6760	690	150	15300	178	18.2	123	12.6	12	M10×25	81.3	8.3	1.47
PL095 X 135 AS-KP	28	25	38	7740	790	163	16600	183	18.7	129	13.2	13	M10×25	81.3	8.3	1.54
PL100 X 145 AS-KP	33	29	45	10000	1020	201	20500	184	18.8	127	13.0	11	M12×30	142	14.5	2.09
PL110 X 155 AS-KP	33	29	45	11100	1130	201	20500	168	17.1	120	12.2	11	M12×30	142	14.5	2.25
PL120 X 165 AS-KP	33	29	45	13100	1340	220	22400	168	17.1	123	12.5	12	M12×30	142	14.5	2.42
PL130 X 180 AS-KP	38	34	50	17800	1820	274	28000	166	16.9	120	12.2	15	M12×35	142	14.5	3.38
PL140 X 190 AS-KP	38	34	50	20500	2090	292	29800	164	16.7	121	12.3	16	M12×35	142	14.5	3.59
PL150 X 200 AS-KP	38	34	50	24700	2520	329	33600	172	17.5	129	13.2	18	M12×35	142	14.5	3.82
PL160 X 210 AS-KP	38	34	50	27700	2830	347	35400	170	17.3	129	13.2	19	M12×35	142	14.5	4.03
PL170 X 225 AS-KP	44	40	58	34100	3480	402	41000	157	16.0	119	12.1	16	M14×40	225	23.0	5.49
PL180 X 235 AS-KP	44	40	58	38400	3920	426	43500	158	16.1	121	12.3	17	M14×40	225	23.0	5.78
PL190 X 250 AS-KP	52	48	66	47600	4860	502	51200	147	15.0	112	11.4	20	M14×45	225	23.0	7.89
PL200 X 260 AS-KP	52	48	66	52700	5380	527	53800	146	14.9	113	11.5	21	M14×45	225	23.0	8.26
PL220 X 285 AS-KP	56	51	72	69100	7050	628	64100	149	15.2	115	11.7	18	M16×50	348	35.5	10.6
PL240 X 305 AS-KP	56	51	72	83800	8550	698	71200	152	15.5	120	12.2	20	M16×50	348	35.5	11.5
PL260 X 325 AS-KP	56	51	72	104000	10600	803	81900	161	16.4	129	13.2	23	M16×50	348	35.5	12.4
PL280 X 355 AS-KP	66	61	84	129000	13200	923	94200	144	14.7	114	11.6	22	M18×60	475	48.5	18.7
PL300 X 375 AS-KP	66	61	84	151000	15400	1000	102000	147	15.0	118	12.0	24	M18×60	475	48.5	19.9

Notes) 1. Stocked models are in bold.

2. Mt indicates torque at 0 transmissible thrust, while Pax indicates transmissible thrust at 0 torque. If transmissible torque and thrust apply simultaneously calculate and compare the combined value with the transmissible torque provided in the table.

Model Numbers and Specifications

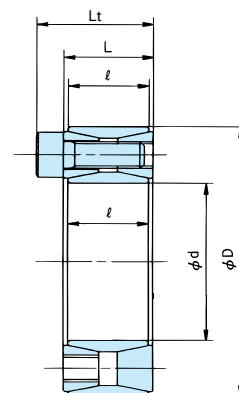
Stainless Steel (AS-SS) Models

● Important Notes

- The main unit is built with stainless steel while the locking bolts (M12 or below) are made of specially lubricated stainless steel (SUH660). These materials minimize dust and maintain a constant friction coefficient and high efficiency.
- The locking bolts are highly tensile.

● Applications

Suitable for operation conducted in corrosive or contaminated environments.



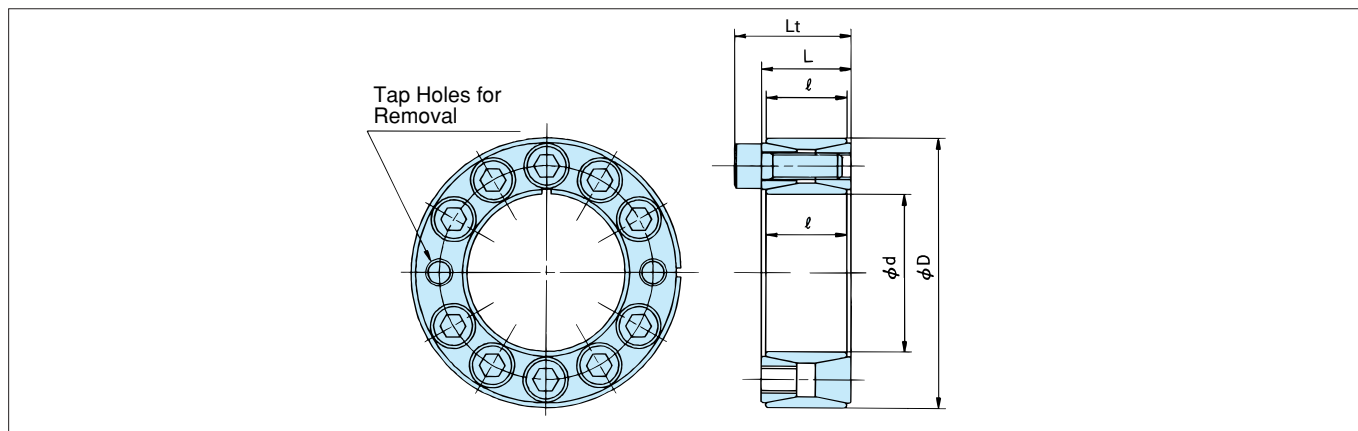
Model No. ($d \times D$ Shaft Diameter X Outer Diameter) mm	Dimensions mm			Transmissible Torque		Transmissible Thrust		Shaft Contact Pressure		Hub Contact Pressure		Locking Bolts				Mass
	L	l	Lt	Mt		Pax		P		P'		Qty.	Size	Tightening Torque M_A		kg
				N·m	{kgf·m}	kN	{kgf}	MPa	{kgf/mm ² }	MPa	{kgf/mm ² }			N·m	{kgf·m}	
PL 019 X 047 AS-SS	20	18	26	196	20	21.6	2200	175	17.9	72	7.3	6	M6×18	13.7	1.4	0.20
PL 020 X 047 AS-SS	20	18	26	216	22	21.6	2200	167	17.0	72	7.3	6	M6×18	13.7	1.4	0.20
PL 022 X 047 AS-SS	20	18	26	235	24	21.6	2200	152	15.5	72	7.3	6	M6×18	13.7	1.4	0.19
PL 024 X 050 AS-SS	20	18	26	343	35	28.4	2900	186	19.0	89	9.1	8	M6×18	13.7	1.4	0.22
PL 025 X 050 AS-SS	20	18	26	353	36	28.4	2900	178	18.2	89	9.1	8	M6×18	13.7	1.4	0.22
PL 028 X 055 AS-SS	20	18	26	402	41	28.4	2900	160	16.3	81	8.3	8	M6×18	13.7	1.4	0.25
PL 030 X 055 AS-SS	20	18	26	431	44	28.4	2900	149	15.2	81	8.3	8	M6×18	13.7	1.4	0.24
PL 032 X 060 AS-SS	20	18	26	568	58	35.3	3600	174	17.8	93	9.5	10	M6×18	13.7	1.4	0.27
PL 035 X 060 AS-SS	20	18	26	627	64	35.3	3600	160	16.3	93	9.5	10	M6×18	13.7	1.4	0.27
PL 038 X 065 AS-SS	20	18	26	745	76	39.2	4000	157	16.0	95	9.7	11	M6×18	13.7	1.4	0.30
PL 040 X 065 AS-SS	20	18	26	794	81	39.2	4000	149	15.2	95	9.7	11	M6×18	13.7	1.4	0.30
PL 042 X 075 AS-SS	24	21	32	1230	126	58.8	6000	187	19.1	105	10.7	9	M8×22	33.3	3.4	0.51
PL 045 X 075 AS-SS	24	21	32	1330	136	58.8	6000	174	17.8	105	10.7	9	M8×22	33.3	3.4	0.51
PL 048 X 080 AS-SS	24	21	32	1410	144	58.8	6000	164	16.7	98	10.0	9	M8×22	33.3	3.4	0.55
PL 050 X 080 AS-SS	24	21	32	1480	151	58.8	6000	157	16.0	98	10.0	9	M8×22	33.3	3.4	0.55
PL 055 X 085 AS-SS	24	21	32	1990	203	71.5	7300	174	17.8	113	11.5	11	M8×22	33.3	3.4	0.60
PL 060 X 090 AS-SS	24	21	32	2170	221	71.5	7300	160	16.3	107	10.9	11	M8×22	33.3	3.4	0.64
PL 065 X 095 AS-SS	24	21	32	2560	261	78.4	8000	161	16.4	110	11.2	12	M8×22	33.3	3.4	0.69
PL 070 X 110 AS-SS	28	25	38	4020	410	117	11900	185	18.9	119	12.1	11	M10×25	67.6	6.9	1.21
PL 075 X 115 AS-SS	28	25	38	4310	440	117	11900	173	17.7	113	11.5	11	M10×25	67.6	6.9	1.27
PL 080 X 120 AS-SS	28	25	38	4610	470	117	11900	163	16.6	109	11.1	11	M10×25	67.6	6.9	1.33
PL 085 X 125 AS-SS	28	25	38	5390	550	127	13000	167	17.0	114	11.6	12	M10×25	67.6	6.9	1.41
PL 090 X 130 AS-SS	28	25	38	5680	580	127	13000	158	16.1	109	11.1	12	M10×25	67.6	6.9	1.47
PL 095 X 135 AS-SS	28	25	38	6470	660	138	14100	162	16.5	114	11.6	13	M10×25	67.6	6.9	1.54
PL 100 X 145 AS-SS	33	29	45	8400	860	170	17300	162	16.5	113	11.5	11	M12×30	118	12.0	2.09
PL 110 X 155 AS-SS	33	29	45	9300	950	170	17300	148	15.1	105	10.7	11	M12×30	118	12.0	2.25
PL 120 X 165 AS-SS	33	29	45	11100	1130	185	18900	148	15.1	108	11.0	12	M12×30	118	12.0	2.42
PL 130 X 180 AS-SS	38	34	50	15000	1530	231	23600	146	14.9	106	10.8	15	M12×35	118	12.0	3.38
PL 140 X 190 AS-SS	38	34	50	17200	1760	247	25200	144	14.7	107	10.9	16	M12×35	118	12.0	3.59
PL 150 X 200 AS-SS	38	34	50	20900	2130	278	28400	152	15.5	114	11.6	18	M12×35	118	12.0	3.82

Notes) 1. Stocked models are in bold.

2. Mt indicates torque at 0 transmissible thrust, while Pax indicates transmissible thrust at 0 torque. If transmissible torque and thrust apply simultaneously calculate and compare the combined value with the transmissible torque provided in the table.

Model Numbers and Specifications

Inch Size Models



Model No. Shaft Diameter	Dimensions					Transmissible Torque		Transmissible Thrust		Shaft Contact Pressure		Hub Contact Pressure		Locking Bolts			Mass kg	
	d	D	L	l	Lt	Mt		Pax		P		P'		Qty.	Size	Tightening Torque MA		
						N·m	{kgf·m}	kN	{kgf}	MPa	{kgf/mm ² }	MPa	{kgf/mm ² }			N·m	{kgf·m}	
PL 3/4	19.05	47	20	18	26	254	26	26.5	2704	209	21.3	85.4	8.7	6	M6×18	16.7	1.7	0.21
PL 7/8	22.225	47	20	18	26	294	30	26.5	2704	249	25.4	85.4	8.7	6	M6×18	16.7	1.7	0.18
PL 1	25.4	50	20	18	26	430	44	33.3	3398	200	20.4	101	10.3	8	M6×18	16.7	1.7	0.22
PL 1 1/8	28.575	55	20	18	26	479	49	33.3	3398	176	17.9	92.3	9.4	8	M6×18	16.7	1.7	0.25
PL 1 3/16	30.163	54.837	20.8	18	26.8	510	52	33.3	3398	168	17.1	92.3	9.4	8	M6×18	16.7	1.7	0.24
PL 1 1/4	31.75	60	20	18	26	675	69	42.1	4296	200	20.4	106	10.8	10	M6×18	16.7	1.7	0.3
PL 1 3/8	34.925	60.075	19.6	18	25.6	745	76	42.1	4296	182	18.5	106	10.8	10	M6×18	16.7	1.7	0.27
PL 1 7/16	36.513	65	20	18	26	862	88	47	4796	191	19.5	107	10.9	11	M6×18	16.7	1.7	0.34
PL 1 1/2	38.1	65	20	18	26	890	91	47	4796	183	18.7	107	10.9	11	M6×18	16.7	1.7	0.32
PL 1 5/8	41.275	75	24	21	32	1468	150	70.6	7204	218	22.2	121	12.3	9	M8×22	40.2	4.1	0.56
PL 1 3/4	44.45	75	24	21	32	1575	161	70.6	7204	207	21.1	121	12.3	9	M8×22	40.2	4.1	0.56
PL 1 7/8	47.625	80	24	21	32	1683	172	70.6	7204	189	19.3	113	11.5	9	M8×22	40.2	4.1	0.59
PL 1 15/16	49.213	80	24	21	32	1741	178	70.6	7204	183	18.7	113	11.5	9	M8×22	40.2	4.1	0.56
PL 2	50.8	85	24.0	21	32	2201	225	86.2	8796	218	22.2	130	13.3	11	M8×22	40.2	4.1	0.67

Notes) 1. Stocked models are in bold.

2. Mt indicates torque at 0 transmissible thrust, while Pax indicates transmissible thrust at 0 torque. If transmissible torque and thrust apply simultaneously calculate and compare the combined value with the transmissible torque provided in the table.

3. Consult Tsubaki Emerson for other available dimensions.

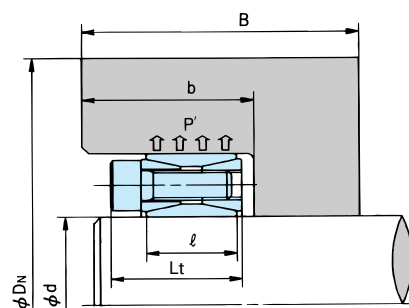
Hub Diameters (1)

Standard AS and Electroless Nickel-Plated AS-KP Models (Same dimensions and capacities)

Hub Diameters for Single Unit Installation

ϕ_{DN} is the minimum hub diameter required to tolerate P' or the pressure exerted from within the hub.

$$B \geq 2 \ell$$



Hub Configuration Coefficient $K_3=0.6$

Hub Configuration Coefficient $K_3=0.6$

Minimum hub diameter ϕ_{DN} (mm)

Model No. d X D Shaft Diameter X Outer Diameter mm	Yield Point of Hub Material $\sigma_{0.2}$									
	Hub Contact Pressure P'		206	225	245	274	294	343	392	441
	MPa	kgf/mm ²	21	23	25	28	30	35	40	45
			FC350 SS400 SC410 S10C FCMB360	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540	FCD450 S35C SF590	FCD500 S45C	FCD600 S55C	FCD700
PL 019 X 047 AS(-KP)	85	8.7	61	60	59	57	57	55	54	53
PL 020 X 047 AS(-KP)	85	8.7	61	60	59	57	57	55	54	53
PL 022 X 047 AS(-KP)	85	8.7	61	60	59	57	57	55	54	53
PL 024 X 050 AS(-KP)	101	10.3	68	66	65	63	62	60	59	58
PL 025 X 050 AS(-KP)	101	10.3	68	66	65	63	62	60	59	58
PL 028 X 055 AS(-KP)	92	9.4	73	71	70	68	67	65	64	63
PL 030 X 055 AS(-KP)	92	9.4	73	71	70	68	67	65	64	63
PL 032 X 060 AS(-KP)	106	10.8	83	81	79	76	75	73	71	70
PL 035 X 060 AS(-KP)	106	10.8	83	81	79	76	75	73	71	70
PL 038 X 065 AS(-KP)	107	10.9	90	88	85	83	82	79	77	76
PL 040 X 065 AS(-KP)	107	10.9	90	88	85	83	82	79	77	76
PL 042 X 075 AS(-KP)	121	12.3	109	105	102	99	97	93	91	89
PL 045 X 075 AS(-KP)	121	12.3	109	105	102	99	97	93	91	89
PL 048 X 080 AS(-KP)	113	11.5	113	109	107	103	102	98	96	94
PL 050 X 080 AS(-KP)	113	11.5	113	109	107	103	102	98	96	94
PL 055 X 085 AS(-KP)	130	13.3	127	123	119	114	112	108	104	102
PL 060 X 090 AS(-KP)	123	12.5	131	127	123	119	117	112	109	107
PL 065 X 095 AS(-KP)	126	12.9	140	135	131	127	124	119	116	113
PL 070 X 110 AS(-KP)	133	13.6	166	160	155	149	146	140	136	133
PL 075 X 115 AS(-KP)	127	13.0	170	164	159	154	151	145	141	137
PL 080 X 120 AS(-KP)	123	12.5	175	169	164	158	155	150	146	142
PL 085 X 125 AS(-KP)	128	13.1	186	179	174	167	164	158	153	150
PL 090 X 130 AS(-KP)	123	12.6	190	183	178	172	169	162	158	154
PL 095 X 135 AS(-KP)	129	13.2	201	194	188	181	177	170	165	162
PL 100 X 145 AS(-KP)	127	13.0	215	207	201	193	190	182	177	173
PL 110 X 155 AS(-KP)	120	12.2	223	216	210	203	199	192	187	183
PL 120 X 165 AS(-KP)	123	12.5	240	232	225	218	213	206	200	196
PL 130 X 180 AS(-KP)	120	12.2	259	251	244	236	231	223	217	213
PL 140 X 190 AS(-KP)	121	12.3	275	265	258	249	245	236	229	225
PL 150 X 200 AS(-KP)	129	13.2	298	287	278	268	263	252	245	239
PL 160 X 210 AS(-KP)	129	13.2	313	301	292	281	276	265	257	251
PL 170 X 225 AS(-KP)	119	12.1	323	312	304	294	288	278	271	265
PL 180 X 235 AS(-KP)	121	12.3	340	328	319	308	303	292	284	278
PL 190 X 250 AS(-KP)	112	11.4	351	340	331	321	316	305	298	292
PL 200 X 260 AS(-KP)	113	11.5	366	355	346	335	329	318	310	304
PL 220 X 285 AS(-KP)	115	11.7	404	391	381	369	362	350	341	334
PL 240 X 305 AS(-KP)	120	12.2	439	425	413	399	392	378	367	360
PL 260 X 325 AS(-KP)	129	13.2	484	466	452	435	426	410	398	389
PL 280 X 355 AS(-KP)	114	11.6	501	486	473	458	450	435	424	415
PL 300 X 375 AS(-KP)	118	12.0	537	519	505	488	479	462	450	441

Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.
2. Calculate hub diameters using the formula $K_3=0.6$ as discussed in Selection Procedure.

Hub Diameters (2)

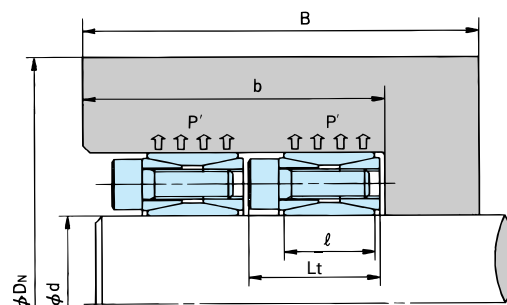
Standard AS and Electroless Nickel-Plated AS-KP Models (Same dimensions and capacities)

Hub Diameters for Multiple Unit Installation

D_N is the minimum hub diameter required to tolerate P' or the pressure exerted from within the hub.

$$B \geq Z \cdot Lt + Lt$$

Z : Number of units ($2 \leq Z \leq 4$)



Hub Configuration Coefficient $K_3=0.8$

Hub Configuration Coefficient $K_3=0.8$

Minimum hub diameter ϕ_{DN} (mm)

Model No. d X D Shaft Diameter X Outer Diameter mm	Yield Point of Hub Material $\sigma_{0.2}$									
	Hub Contact Pressure P'		206	225	245	274	294	343	392	441
	MPa	kgf/mm ²	21	23	25	28	30	35	40	45
			FC350 SS400 SC410 S10C FCMB360	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540	FCD450 S35C SF590	FCD500 S45C	FCD600 S55C	FCD700
PL019 X 047 AS(-KP)	85	8.7	67	65	63	61	60	58	57	55
PL020 X 047 AS(-KP)	85	8.7	67	65	63	61	60	58	57	55
PL022 X 047 AS(-KP)	85	8.7	67	65	63	61	60	58	57	55
PL024 X 050 AS(-KP)	101	10.3	76	73	71	68	67	64	62	61
PL025 X 050 AS(-KP)	101	10.3	76	73	71	68	67	64	62	61
PL028 X 055 AS(-KP)	92	9.4	80	78	76	73	72	69	67	66
PL030 X 055 AS(-KP)	92	9.4	80	78	76	73	72	69	67	66
PL032 X 060 AS(-KP)	106	10.8	93	90	86	83	81	78	75	73
PL035 X 060 AS(-KP)	106	10.8	93	90	86	83	81	78	75	73
PL038 X 065 AS(-KP)	107	10.9	102	97	94	90	88	84	82	80
PL040 X 065 AS(-KP)	107	10.9	102	97	94	90	88	84	82	80
PL042 X 075 AS(-KP)	121	12.3	125	119	114	109	106	101	97	94
PL045 X 075 AS(-KP)	121	12.3	125	119	114	109	106	101	97	94
PL048 X 080 AS(-KP)	113	11.5	128	123	118	113	110	105	102	99
PL050 X 080 AS(-KP)	113	11.5	128	123	118	113	110	105	102	99
PL055 X 085 AS(-KP)	130	13.3	149	141	134	127	124	117	112	109
PL060 X 090 AS(-KP)	123	12.5	152	144	138	131	128	121	117	113
PL065 X 095 AS(-KP)	126	12.9	163	154	148	140	136	129	124	120
PL070 X 110 AS(-KP)	133	13.6	196	184	176	166	161	152	146	141
PL075 X 115 AS(-KP)	127	13.0	198	188	180	170	166	157	151	146
PL080 X 120 AS(-KP)	123	12.5	202	192	184	175	170	161	155	151
PL085 X 125 AS(-KP)	128	13.1	217	205	196	186	180	171	164	159
PL090 X 130 AS(-KP)	123	12.6	220	208	200	190	185	175	169	164
PL095 X 135 AS(-KP)	129	13.2	235	222	212	201	195	185	177	172
PL100 X 145 AS(-KP)	127	13.0	250	237	226	215	209	197	190	184
PL110 X 155 AS(-KP)	120	12.2	257	244	235	223	218	207	199	194
PL120 X 165 AS(-KP)	123	12.5	277	263	252	240	234	222	213	207
PL130 X 180 AS(-KP)	120	12.2	298	284	272	259	253	240	231	225
PL140 X 190 AS(-KP)	121	12.3	316	301	288	275	268	254	245	238
PL150 X 200 AS(-KP)	129	13.2	348	329	314	298	28	274	263	254
PL160 X 210 AS(-KP)	129	13.2	366	345	330	313	304	287	276	267
PL170 X 225 AS(-KP)	119	12.1	371	353	339	323	315	299	288	280
PL180 X 235 AS(-KP)	121	12.3	391	372	357	340	331	314	303	294
PL190 X 250 AS(-KP)	112	11.4	399	381	367	351	343	327	316	307
PL200 X 260 AS(-KP)	113	11.5	416	398	383	366	357	341	329	320
PL220 X 285 AS(-KP)	115	11.7	461	439	423	404	394	375	362	352
PL240 X 305 AS(-KP)	120	12.2	505	480	461	439	428	407	392	281
PL260 X 325 AS(-KP)	129	13.2	566	534	510	484	470	444	426	413
PL280 X 355 AS(-KP)	114	11.6	571	545	525	501	489	466	450	438
PL300 X 375 AS(-KP)	118	12.0	615	585	563	537	523	497	479	466

Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.
2. Calculate hub diameters using the formula $K_3=0.8$ as discussed in Selection Procedure.

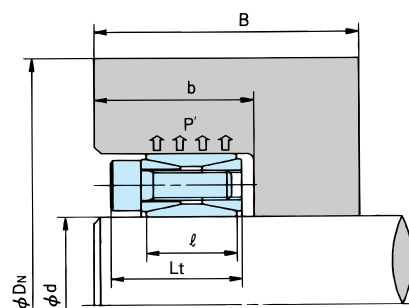
Hub Diameters (3)

Stainless Steel AS-SS Models

Hub Diameters for Single Unit Installation

ϕ_{DN} is the minimum hub diameter required to tolerate P' or the pressure exerted from within the hub.

$$B \geq 2 \ell$$



Hub Configuration Coefficient $K_3=0.6$

Hub Configuration Coefficient $K_3=0.6$

Minimum hub diameter ϕ_{DN} (mm)

Model No. d X D { Shaft Diameter X Outer Diameter } mm	Hub Contact Pressure P' MPa kgf/mm ²		Yield Point of Hub Material $\sigma_{0.2}$									
			176	206	225	245	274	294	343	392	441	
			18	21	23	25	28	30	35	40	45	
			FC300 SS330 SC360 SUS405	FC350 SS400 SC410 S10C SUS304	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540	FCD450 S35C SF590	FCD500 S45C	FCD600 S55C	FCD700	
PL 019 X 047 AS-SS	72	7.3	61	59	57	57	56	55	54	53	52	
PL 020 X 047 AS-SS	72	7.3	61	59	57	57	56	55	54	53	52	
PL 022 X 047 AS-SS	72	7.3	61	59	57	57	56	55	54	53	52	
PL 024 X 050 AS-SS	89	9.1	69	66	64	63	61	61	59	58	57	
PL 025 X 050 AS-SS	89	9.1	69	66	64	63	61	61	59	58	57	
PL 028 X 055 AS-SS	81	8.3	74	71	69	68	66	66	64	63	62	
PL 030 X 055 AS-SS	81	8.3	74	71	69	68	66	66	64	63	62	
PL 032 X 060 AS-SS	93	9.5	84	80	78	76	74	73	71	70	69	
PL 035 X 060 AS-SS	93	9.5	84	80	78	76	74	73	71	70	69	
PL 038 X 065 AS-SS	95	9.7	91	87	85	83	81	80	77	76	75	
PL 040 X 065 AS-SS	95	9.7	91	87	85	83	81	80	77	76	75	
PL 042 X 075 AS-SS	105	10.7	109	103	100	98	95	94	91	89	87	
PL 045 X 075 AS-SS	105	10.7	109	103	100	98	95	94	91	89	87	
PL 048 X 080 AS-SS	98	10.0	114	108	105	103	100	98	96	94	92	
PL 050 X 080 AS-SS	98	10.0	114	108	105	103	100	98	96	94	92	
PL 055 X 085 AS-SS	113	11.5	128	120	116	113	110	108	104	102	100	
PL 060 X 090 AS-SS	107	10.9	132	125	121	118	115	113	109	107	105	
PL 065 X 095 AS-SS	110	11.2	141	133	129	126	122	120	116	113	111	
PL 070 X 110 AS-SS	119	12.1	169	158	153	149	144	141	136	133	130	
PL 075 X 115 AS-SS	113	11.5	173	162	157	153	148	146	141	137	135	
PL 080 X 120 AS-SS	109	11.1	177	167	162	158	153	151	146	142	140	
PL 085 X 125 AS-SS	114	11.6	188	177	171	167	162	159	153	150	147	
PL 090 X 130 AS-SS	109	11.1	192	181	176	171	166	163	158	154	151	
PL 095 X 135 AS-SS	114	11.6	203	191	185	180	175	171	166	161	158	
PL 100 X 145 AS-SS	113	11.5	218	204	198	193	187	184	178	173	170	
PL 110 X 155 AS-SS	105	10.7	226	213	207	202	196	193	187	183	179	
PL 120 X 165 AS-SS	108	11.0	243	229	222	217	210	207	200	195	192	
PL 130 X 180 AS-SS	106	10.8	263	248	241	235	228	225	218	212	209	
PL 140 X 190 AS-SS	107	10.9	279	263	255	249	242	238	230	225	220	
PL 150 X 200 AS-SS	114	11.6	301	283	274	267	258	254	245	239	234	

Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.

2. Calculate hub diameters using the formula $K_3=0.6$ as discussed in Selection Procedure.

Hub Diameters (4)

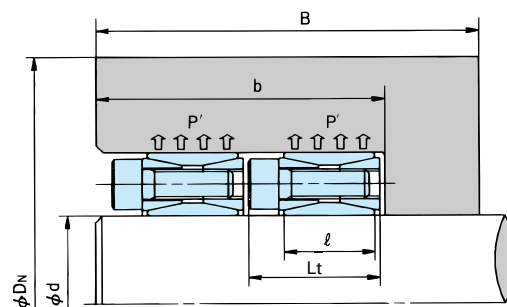
Stainless Steel AS-SS Models

Hub Diameters for Multiple Unit Installation

ϕ_{DN} is the minimum hub diameter required to tolerate P' or the pressure exerted from within the hub.

$$B \geq Z \cdot Lt + Lt$$

Z : Number of units ($2 \leq Z \leq 4$)



Hub Configuration Coefficient $K_3=0.8$

Hub Configuration Coefficient $K_3=0.8$

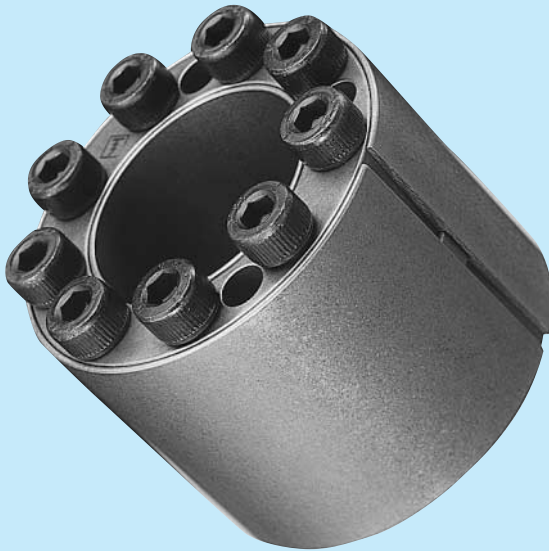
Minimum hub diameter ϕ_{DN} (mm)

Model No. d X D (Shaft Diameter X Outer Diameter) mm	Yield Point of Hub Material $\sigma_{0.2}$										
	MPa kgf/mm ²		176	206	225	245	274	294	343	392	441
	MPa	kgf/mm ²	18	21	23	25	28	30	35	40	45
	Hub Contact Pressure P'		FC300 SS330 SC360	FC350 SS400 SC410 S10C	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540	FCD450 S35C SF590	FCD500 S45C	FCD600 S55C	FCD700
PL 019 X 047 AS-SS	72	7.3	66	63	61	60	59	58	56	55	54
PL 020 X 047 AS-SS	72	7.3	66	63	61	60	59	58	56	55	54
PL 022 X 047 AS-SS	72	7.3	66	63	61	60	59	58	56	55	54
PL 024 X 050 AS-SS	89	9.1	77	72	70	68	66	65	62	61	59
PL 025 X 050 AS-SS	89	9.1	77	72	70	68	66	65	62	61	59
PL 028 X 055 AS-SS	81	8.3	82	77	75	73	71	69	67	66	64
PL 030 X 055 AS-SS	81	8.3	82	77	75	73	71	69	67	66	64
PL 032 X 060 AS-SS	93	9.5	95	88	85	83	80	78	75	73	72
PL 035 X 060 AS-SS	93	9.5	95	88	85	83	80	78	75	73	72
PL 038 X 065 AS-SS	95	9.7	104	96	93	90	87	85	82	80	78
PL 040 X 065 AS-SS	95	9.7	104	96	93	90	87	85	82	80	78
PL 042 X 075 AS-SS	105	10.7	126	116	111	108	103	101	97	94	91
PL 045 X 075 AS-SS	105	10.7	126	116	111	108	103	101	97	94	91
PL 048 X 080 AS-SS	98	10.0	129	120	116	112	108	106	101	98	96
PL 050 X 080 AS-SS	98	10.0	129	120	116	112	108	106	101	98	96
PL 055 X 085 AS-SS	113	11.5	150	136	130	126	120	117	112	108	105
PL 060 X 090 AS-SS	107	10.9	153	141	135	130	125	122	117	113	110
PL 065 X 095 AS-SS	110	11.2	165	150	144	139	133	130	124	120	117
PL 070 X 110 AS-SS	119	12.1	201	182	173	166	158	154	147	141	137
PL 075 X 115 AS-SS	113	11.5	203	184	176	170	162	158	151	146	142
PL 080 X 120 AS-SS	109	11.1	207	189	181	174	167	163	156	151	147
PL 085 X 125 AS-SS	114	11.6	222	201	192	185	177	173	165	159	155
PL 090 X 130 AS-SS	109	11.1	224	205	196	189	181	177	169	163	159
PL 095 X 135 AS-SS	114	11.6	239	217	208	200	191	186	178	171	167
PL 100 X 145 AS-SS	113	11.5	255	232	222	214	204	200	190	184	179
PL 110 X 155 AS-SS	105	10.7	260	239	230	222	213	208	199	193	188
PL 120 X 165 AS-SS	108	11.0	282	258	247	239	229	224	214	207	202
PL 130 X 180 AS-SS	106	10.8	304	279	268	259	248	243	232	225	219
PL 140 X 190 AS-SS	107	10.9	323	296	284	274	263	257	246	238	232
PL 150 X 200 AS-SS	114	11.6	354	322	307	296	283	276	263	254	247

Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.
2. Calculate hub diameters using the formula $K_3=0.8$ as discussed in Selection Procedure.

POWER-LOCK ADN Series

Sizes : $\phi 19 \sim \phi 300$
 Shaft tolerance : h8
 Hub bore tolerance : H8
 Surface roughness : Below 12S

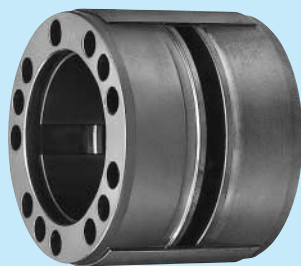


RoHS compliant.

Features

- 1 **High Capacity**
 Capable of transmitting 1.5 to 3 times the rated torque of the AS Series.
- 2 **Same Inner and Outer Diameters as the AS Series**
 Designed with the same inner and outer diameters as an AS Series Power-Lock.
- 3 **Self-Centering**
 These units provide accurate shaft-hub alignment and concentricity, allowing straight bore mounting.
- 4 **Easy to Handle**
 The built-in tapers of the inner and outer rings provide tight-fit around shafts and offer easy handling.

Parts



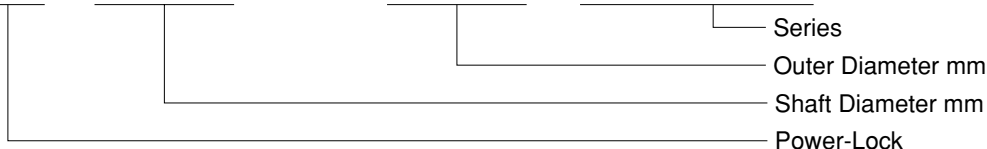
<Caution>

The taper angles of the ADN Power-Locks are smaller compared to those of others. To install or remove an ADN Power-Lock, you must tighten the bolts gradually. Rapid tightening will damage the bolts and screw holes. Even tightening may be best accomplished by turning each bolt in increments of approximately 30°.

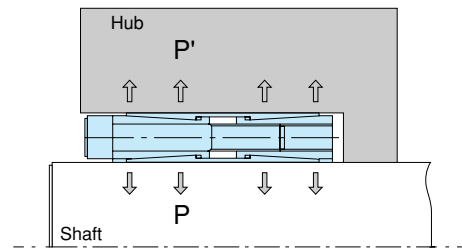
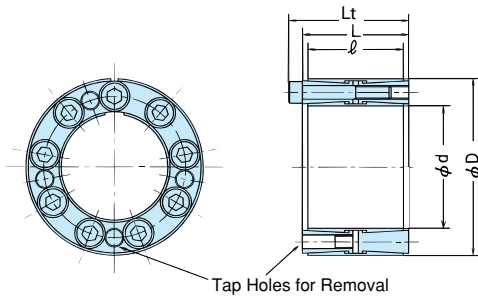
These Power-Locks come in a complete one-piece unit, so the only removable parts are the locking bolts. The holes that do not contain bolts when delivered are the tap holes prepared for removal.

Reference Number System

PL 045 X 075 AD - N



Model Numbers and Specifications



P and P' represent the average contact pressure applied to the shaft and hub respectively. These values may vary from -20% to +40%, depending on the amount of friction applied to the bolts. Transmissible torque Mt and transmissible thrust Pax are calculated from the minimum allowable contact pressure.



Model No. (d X D Shaft Diameter X Outer Diameter) mm	Dimensions mm			Transmissible Torque		Transmissible Thrust		Contact Pressure				Locking Bolts			Mass kg	
	ℓ	L	Lt	Mt		Pax		Shaft P		Hub P'		Qty.	Size	Tightening Torque MA		
				N·m	{ kgf·m }	kN	{ kgf }	MPa	{ kgf/mm² }	MPa	{ kgf/mm² }			N·m		{ kgf·m }
PL 019 X 047 AD-N	30	35	41	382	39	40.6	4140	237	24.1	96	9.8	6	M6 × 28	16.7	1.7	0.36
PL 020 X 047 AD-N	30	35	41	402	41	40.6	4140	225	22.9	96	9.8	6	M6 × 28	16.7	1.7	0.35
PL 022 X 047 AD-N	30	35	41	441	45	40.6	4140	204	20.8	96	9.8	6	M6 × 28	16.7	1.7	0.33
PL 024 X 050 AD-N	35	40	46	647	66	54.2	5530	214	21.8	103	10.5	8	M6 × 30	16.7	1.7	0.42
PL 025 X 050 AD-N	35	40	46	676	69	54.2	5530	205	21.0	103	10.5	8	M6 × 30	16.7	1.7	0.41
PL 028 X 055 AD-N	35	40	46	755	77	54.2	5530	183	18.7	93	9.5	8	M6 × 30	16.7	1.7	0.49
PL 030 X 055 AD-N	35	40	46	784	80	54.2	5530	171	17.5	93	9.5	8	M6 × 30	16.7	1.7	0.46
PL 032 X 060 AD-N	45	50	56	1270	130	81	8300	189	19.2	101	10.3	10	M6 × 35	16.7	1.7	0.72
PL 035 X 060 AD-N	45	50	56	1370	140	81	8300	172	17.6	101	10.3	10	M6 × 35	16.7	1.7	0.66
PL 038 X 065 AD-N	52	57	63	1670	170	89	9100	151	15.4	88	9.0	11	M6 × 40	16.7	1.7	0.88
PL 040 X 065 AD-N	52	57	63	1760	180	89	9100	144	14.7	88	9.0	11	M6 × 40	16.7	1.7	0.83
PL 042 X 075 AD-N	56	64	72	3530	360	170	17300	192	19.6	108	11.0	9	M8 × 50	40.2	4.1	1.36
PL 045 X 075 AD-N	56	64	72	3820	390	170	17300	179	18.3	108	11.0	9	M8 × 50	40.2	4.1	1.27
PL 048 X 080 AD-N	56	64	72	4070	415	170	17300	168	17.1	101	10.3	9	M8 × 50	40.2	4.1	1.43
PL 050 X 080 AD-N	56	64	72	4210	430	170	17300	162	16.5	101	10.3	9	M8 × 50	40.2	4.1	1.38
PL 055 X 085 AD-N	56	64	72	4610	470	170	17300	147	15.0	95	9.7	9	M8 × 50	40.2	4.1	1.49
PL 060 X 090 AD-N	56	64	72	6170	630	208	21200	165	16.8	110	11.2	11	M8 × 50	40.2	4.1	1.59
PL 065 X 095 AD-N	56	64	72	6760	690	208	21200	130	13.3	89	9.1	11	M8 × 50	40.2	4.1	1.71
PL 070 X 110 AD-N	70	78	88	11600	1180	330	33700	179	18.3	114	11.6	11	M10 × 70	81.3	8.3	3.18
PL 075 X 115 AD-N	70	78	88	12300	1260	330	33700	167	17.0	109	11.1	11	M10 × 70	81.3	8.3	3.36
PL 080 X 120 AD-N	70	78	88	14400	1470	360	36700	171	17.4	114	11.6	12	M10 × 70	81.3	8.3	3.52
PL 085 X 125 AD-N	70	78	88	15300	1560	360	36700	161	16.4	109	11.1	12	M10 × 70	81.3	8.3	3.70
PL 090 X 130 AD-N	70	78	88	17500	1790	390	39800	165	16.8	114	11.6	13	M10 × 70	81.3	8.3	3.88
PL 095 X 135 AD-N	70	78	88	18500	1890	390	39800	156	15.9	110	11.2	13	M10 × 70	81.3	8.3	4.06
PL 100 X 145 AD-N	90	100	112	26500	2700	531	54200	157	16.0	108	11.0	12	M12 × 90	142	14.5	6.13
PL 110 X 155 AD-N	90	100	112	31700	3230	576	58800	155	15.8	110	11.2	13	M12 × 90	142	14.5	6.65
PL 120 X 165 AD-N	90	100	112	39900	4070	664	67800	164	16.7	119	12.1	15	M12 × 90	142	14.5	7.13
PL 130 X 180 AD-N	104	116	130	50700	5170	779	79500	153	15.6	111	11.3	13	M14 × 90	225	23.0	8.32
PL 140 X 190 AD-N	104	116	130	62900	6420	900	91800	164	16.7	121	12.3	15	M14 × 90	225	23.0	8.67
PL 150 X 200 AD-N	104	116	130	71900	7340	959	97900	164	16.7	123	12.5	16	M14 × 90	225	23.0	9.15
PL 160 X 210 AD-N	104	116	130	81500	8320	1020	104000	163	16.6	123	12.6	17	M14 × 90	225	23.0	9.69
PL 170 X 225 AD-N	134	146	162	106000	10800	1240	127000	146	14.9	110	11.2	15	M16 × 120	348	35.5	17.7
PL 180 X 235 AD-N	134	146	162	120000	12200	1330	136000	147	15.0	113	11.5	16	M16 × 120	348	35.5	18.5
PL 190 X 250 AD-N	134	146	162	134000	13700	1410	144000	148	15.1	113	11.5	17	M16 × 120	348	35.5	21.4
PL 200 X 260 AD-N	134	146	162	141000	14400	1410	144000	140	14.3	108	11.0	17	M16 × 120	348	35.5	22.5
PL 220 X 285 AD-N	134	146	162	183000	18700	1670	170000	150	15.3	118	12.0	20	M16 × 120	348	35.5	26.6
PL 240 X 305 AD-N	134	146	162	220000	22400	1830	187000	151	15.4	120	12.2	22	M16 × 120	348	35.5	28.7
PL 260 X 325 AD-N	134	146	162	238000	24300	1830	187000	114	11.6	91	9.3	22	M16 × 120	348	35.5	30.9
PL 280 X 355 AD-N	165	177	197	364000	37100	2600	265000	150	15.3	118	12.0	20	M20 × 150	676	69.0	46.8
PL 300 X 375 AD-N	165	177	197	429000	43800	2860	292000	154	15.7	123	12.5	22	M20 × 150	676	69.0	49.7

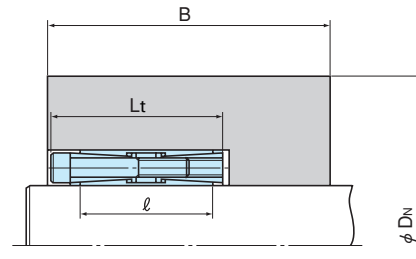
Notes) 1. Stocked models are in bold.

2. Mt indicates torque at 0 transmissible thrust, while Pax indicates transmissible thrust at 0 torque. If transmissible torque and thrust apply simultaneously calculate and compare the combined value with the transmissible torque provided in the table.

Hub Diameters (1)

(1) Installing to hubs with a guide portion
 when $B \geq 2 \ell$
 (See Installation Example A)

D_N is the minimum hub diameter required to tolerate P' or the pressure exerted from within the hub.



Installation Example(A)
 When installing to hubs with a guide portion
 the hub configuration coefficient is as follows: $K_3=0.6$

Hub Configuration Coefficient $K_3=0.6$

Minimum hub diameter ϕD_N (mm)

Model No. d X D Shaft Diameter X Outer Diameter mm	Hub Contact Pressure P' MPa / kgf/mm ²		Yield Point of Hub Material $\sigma_{0.2}$							
			206	225	245	274	294	343	392	441
			21	23	25	28	30	35	40	45
			FC350 SS400 SC410	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540	FCD450 S35C SF590	FCD500 S45C	FCD600 S55C	FCD700
PL 019 X 047 AD-N	96	9.8	63	61	60	59	58	56	55	54
PL 020 X 047 AD-N	96	9.8	63	61	60	59	58	56	55	54
PL 022 X 047 AD-N	96	9.8	63	61	60	59	58	56	55	54
PL 024 X 050 AD-N	103	10.5	69	67	65	63	62	60	59	58
PL 025 X 050 AD-N	103	10.5	69	67	65	63	62	60	59	58
PL 028 X 055 AD-N	94	9.5	73	71	70	68	67	65	64	63
PL 030 X 055 AD-N	94	9.5	73	71	70	68	67	65	64	63
PL 032 X 060 AD-N	101	10.3	82	79	78	76	74	72	71	69
PL 035 X 060 AD-N	101	10.3	82	79	78	76	74	72	71	69
PL 038 X 065 AD-N	89	9.0	85	83	81	80	79	76	75	74
PL 040 X 065 AD-N	89	9.0	85	83	81	80	79	76	75	74
PL 042 X 075 AD-N	108	11.0	104	101	99	96	94	91	89	87
PL 045 X 075 AD-N	108	11.0	104	101	99	96	94	91	89	87
PL 048 X 080 AD-N	101	10.3	109	106	103	101	99	96	94	92
PL 050 X 080 AD-N	101	10.3	109	106	103	101	99	96	94	92
PL 055 X 085 AD-N	95	9.7	113	111	108	105	104	101	99	97
PL 060 X 090 AD-N	110	11.2	126	122	119	115	113	110	107	105
PL 065 X 095 AD-N	89	9.1	125	122	119	116	115	112	110	108
PL 070 X 110 AD-N	114	11.6	156	151	147	142	140	135	132	129
PL 075 X 115 AD-N	109	11.1	160	155	152	147	145	140	137	134
PL 080 X 120 AD-N	114	11.6	170	165	160	155	153	147	144	141
PL 085 X 125 AD-N	109	11.1	174	169	165	160	157	152	148	146
PL 090 X 130 AD-N	114	11.6	184	178	174	168	165	160	156	152
PL 095 X 135 AD-N	110	11.2	188	183	178	173	170	164	160	157
PL 100 X 145 AD-N	108	11.0	201	196	191	185	182	176	172	169
PL 110 X 155 AD-N	110	11.2	216	210	205	198	195	189	184	181
PL 120 X 165 AD-N	119	12.1	237	229	223	216	212	204	199	195
PL 130 X 180 AD-N	111	11.3	252	244	238	231	227	219	214	210
PL 140 X 190 AD-N	121	12.3	275	266	258	250	245	236	230	225
PL 150 X 200 AD-N	123	12.5	291	281	273	264	259	249	242	237
PL 160 X 210 AD-N	123	12.6	307	296	288	278	272	262	255	249
PL 170 X 225 AD-N	110	11.2	314	305	297	288	283	274	267	262
PL 180 X 235 AD-N	113	11.5	331	320	312	303	297	287	280	275
PL 190 X 250 AD-N	113	11.5	352	341	332	322	316	306	298	292
PL 200 X 260 AD-N	108	11.0	361	350	341	331	326	315	308	302
PL 220 X 285 AD-N	118	12.0	401	388	377	365	358	346	337	330
PL 240 X 305 AD-N	120	12.2	439	424	412	399	391	377	367	360
PL 260 X 325 AD-N	91	9.3	427	416	408	398	392	382	374	368
PL 280 X 355 AD-N	118	12.0	508	492	478	463	454	438	427	418
PL 300 X 375 AD-N	123	12.5	546	527	512	494	485	467	454	444

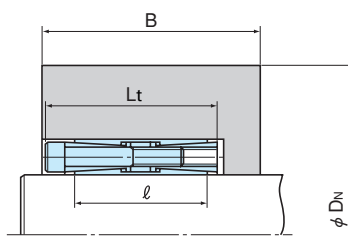
Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.
 2. Calculate hub diameters using the formula $K_3=0.6$ as discussed in Selection Procedure.

Hub Diameters (2)

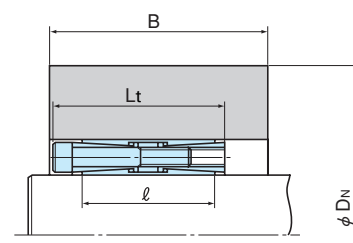
(2) Installing to hubs with a guide portion
when $L_t < B < 2\ell$
(See Installation Example B)

(3) Installing to hubs without a guide portion
(See Installation Example C)

ϕ_{DN} is the minimum hub diameter required to tolerate P' or the pressure exerted from within the hub.



Installation Example(B)
When installing to hubs
with a guide portion,
the hub configuration coefficient
is as follows: $K_3=1.0$



Installation Example(C)
When installing to hubs
without a guide portion,
the hub configuration coefficient
is as follows: $K_3=1.0$

Hub Configuration Coefficient $K_3=1.0$ Minimum hub diameter ϕ_{DN} (mm)

Model No. d X D Shaft Diameter X Outer Diameter mm	Hub Contact Pressure P' MPa {kgf/mm ² }		Yield Point of Hub Material $\sigma_{0.2}$									
			206	225	245	274	294	343	392	441		
			21	23	25	28	30	35	40	45		
			FC350 SS400 SC410	SC450	FC400 SS490 SC480	S30C SF540	FCD450	FCD500	FCD600	FCD700		
			FCMB360	S15C SF440	S20C SF490	S30C SF540	S35C SF590	S45C	S55C			
PL 019 X 047 AD-N	96	9.8	78	74	71	68	66	63	61	59		
PL 020 X 047 AD-N	96	9.8	78	74	71	68	66	63	61	59		
PL 022 X 047 AD-N	96	9.8	78	74	71	68	66	63	61	59		
PL 024 X 050 AD-N	103	10.5	87	82	79	75	73	69	66	64		
PL 025 X 050 AD-N	103	10.5	87	82	79	75	73	69	66	64		
PL 028 X 055 AD-N	94	9.5	90	86	83	79	77	73	71	69		
PL 030 X 055 AD-N	94	9.5	90	86	83	79	77	73	71	69		
PL 032 X 060 AD-N	101	10.3	103	97	93	89	86	82	79	76		
PL 035 X 060 AD-N	101	10.3	103	97	93	89	86	82	79	76		
PL 038 X 065 AD-N	89	9.0	103	99	95	91	86	85	82	80		
PL 040 X 065 AD-N	89	9.0	103	99	95	91	89	85	82	80		
PL 042 X 075 AD-N	108	11.0	134	127	121	114	111	104	100	97		
PL 045 X 075 AD-N	108	11.0	134	127	121	114	111	104	100	97		
PL 048 X 080 AD-N	101	10.3	137	130	124	118	115	109	105	101		
PL 050 X 080 AD-N	101	10.3	137	130	124	118	115	109	105	101		
PL 055 X 085 AD-N	95	9.7	140	134	128	122	119	113	109	106		
PL 060 X 090 AD-N	110	11.2	163	154	146	138	134	126	120	116		
PL 065 X 095 AD-N	89	9.1	152	145	140	134	131	125	120	117		
PL 070 X 110 AD-N	114	11.6	206	192	182	172	166	156	149	144		
PL 075 X 115 AD-N	109	11.1	208	195	186	175	170	160	153	148		
PL 080 X 120 AD-N	114	11.6	224	210	199	187	181	170	162	157		
PL 085 X 125 AD-N	109	11.1	226	213	202	191	185	174	167	161		
PL 090 X 130 AD-N	114	11.6	243	227	216	203	196	184	176	170		
PL 095 X 135 AD-N	110	11.2	245	230	219	207	200	188	180	175		
PL 100 X 145 AD-N	108	11.0	261	245	233	220	214	201	193	187		
PL 110 X 155 AD-N	110	11.2	281	264	251	237	230	216	207	200		
PL 120 X 165 AD-N	119	12.1	319	297	281	263	254	237	226	218		
PL 130 X 180 AD-N	111	11.3	328	308	293	276	268	252	241	233		
PL 140 X 190 AD-N	121	12.3	373	346	327	305	295	275	262	252		
PL 150 X 200 AD-N	123	12.5	397	368	347	324	312	291	277	266		
PL 160 X 210 AD-N	123	12.6	422	390	367	342	330	307	292	281		
PL 170 X 225 AD-N	110	11.2	409	384	365	345	334	314	301	291		
PL 180 X 235 AD-N	113	11.5	434	407	386	364	352	331	316	305		
PL 190 X 250 AD-N	113	11.5	461	432	411	387	374	352	336	325		
PL 200 X 260 AD-N	108	11.0	465	438	418	395	383	361	345	334		
PL 220 X 285 AD-N	118	12.0	538	501	474	444	429	401	382	369		
PL 240 X 305 AD-N	120	12.2	591	549	519	486	469	439	418	403		
PL 260 X 325 AD-N	91	9.3	522	499	480	459	448	427	412	401		
PL 280 X 355 AD-N	118	12.0	682	635	600	563	543	508	485	467		
PL 300 X 375 AD-N	123	12.5	747	691	651	607	586	546	519	500		

Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.
2. Calculate hub diameters using the formula $K_3=1.0$ as discussed in Selection Procedure.

POWER-LOCK AE Series

Sizes : $\phi 19 \sim \phi 150$
Shaft tolerance : h8
Hub bore tolerance : H8
Surface roughness : Below 12S



RoHS compliant.

Features

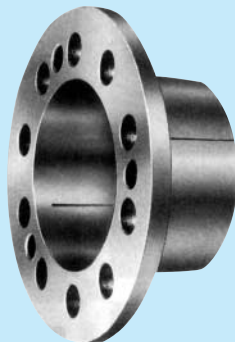
- 1 Self-Centering**
These units provide accurate shaft-hub alignment and concentricity, allowing straight bore mounting.
- 2 Same Inner and Outer Diameters as the AS Series**
Designed with the same inner and outer diameters as an AS Series Power-Lock.
- 3 Simple Construction**
Simply constructed with only an inner and an outer ring and a few locking bolts.

Parts

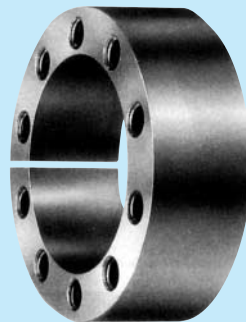
Locking Bolts



Inner Ring



Outer Ring



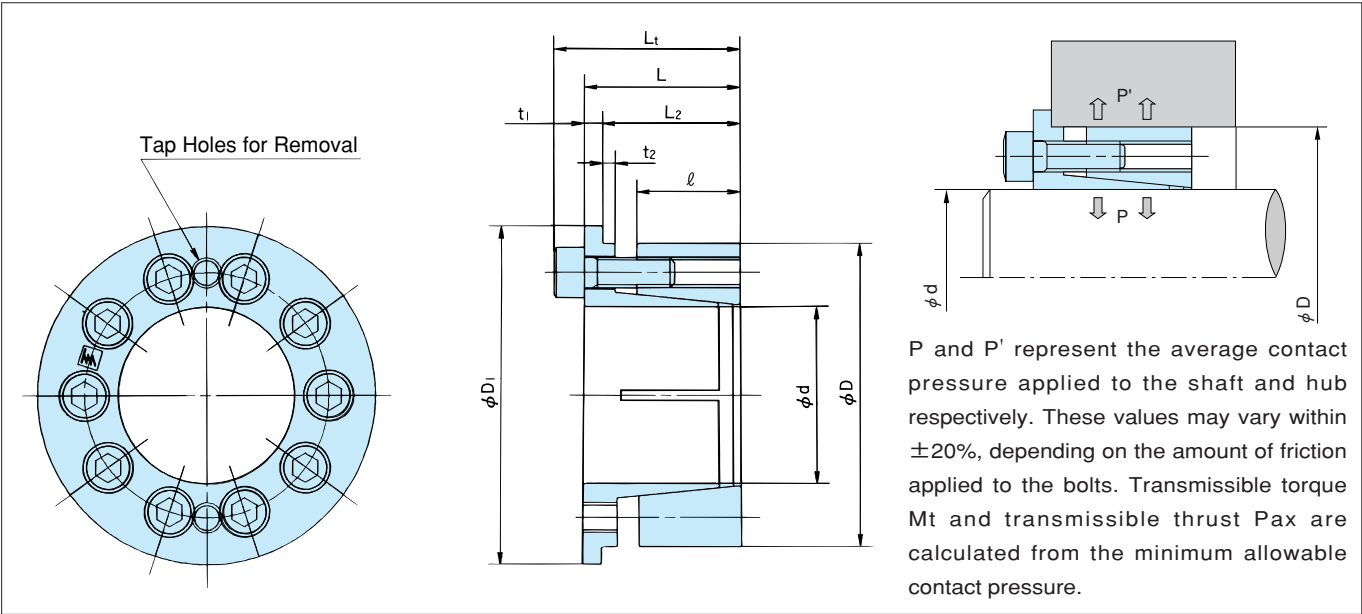
The AE Series Power-Locks are simply constructed of the following three parts: inner and outer rings and a few locking bolts. Simply tighten these bolts to achieve a completely secure connection.

Reference Number System

PL 019 X 047 AE

Series
Outer Diameter mm
Shaft Diameter mm
Power-Lock

Model Numbers and Specifications



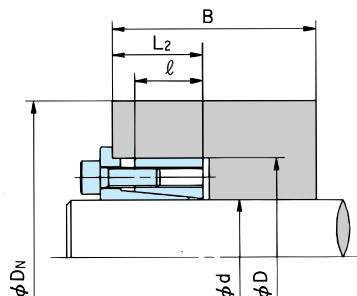
Model No. [d X D Shaft Diameter X Outer Diameter] mm	Dimensions mm							Transmissible Torque		Transmissible Thrust		Contact Pressure				Locking Bolts			Mass kg	
	l	L ₂	L	L _t	t ₁	t ₂	D ₁	Mt		Pax		Shaft P		Hub P'		Qty.	Size	Tightening Torque M _A		
								N·m	[kgf·m]	kN	[kgf]	MPa	[kgf/mm ²]	MPa	[kgf/mm ²]			N·m		[kgf·m]
PL 019 X 047 AE	19	24.8	27.3	33.3	2.5	3	53	265	27	28.1	2870	287	29.3	93	9.5	6	M6×18	16.7	1.7	0.28
PL 020 X 047 AE	19	24.8	27.3	33.3	2.5	3	53	274	28	28.1	2870	272	27.8	93	9.5	6	M6×18	16.7	1.7	0.27
PL 022 X 047 AE	19	24.8	27.3	33.3	2.5	3	53	304	31	28.1	2870	248	25.3	93	9.5	6	M6×18	16.7	1.7	0.26
PL 024 X 050 AE	19	25.3	27.8	33.8	2.5	3	57	392	40	32.8	3350	274	28.0	102	10.4	7	M6×18	16.7	1.7	0.29
PL 025 X 050 AE	19	25.3	27.8	33.8	2.5	3	57	412	42	32.8	3350	282	28.8	102	10.4	7	M6×18	16.7	1.7	0.29
PL 028 X 055 AE	19	25.3	28.6	34.6	3.3	3	62	519	53	37.5	3830	269	27.4	106	10.8	8	M6×18	16.7	1.7	0.35
PL 030 X 055 AE	19	25.3	28.6	34.6	3.3	3	62	559	57	37.5	3830	251	25.6	106	10.8	8	M6×18	16.7	1.7	0.34
PL 032 X 060 AE	20.5	27.3	30.9	36.9	3.6	3	67	745	76	46.9	4790	267	27.2	113	11.5	10	M6×18	16.7	1.7	0.44
PL 035 X 060 AE	20.5	27.3	30.9	36.9	3.6	3	67	823	84	46.9	4790	244	24.9	113	11.5	10	M6×18	16.7	1.7	0.41
PL 038 X 065 AE	20.5	27.5	31.1	37.1	3.6	3	73	892	91	46.9	4790	228	23.3	104	10.6	10	M6×18	16.7	1.7	0.48
PL 040 X 065 AE	20.5	27.5	31.1	37.1	3.6	3	73	931	95	46.9	4790	217	22.1	104	10.6	10	M6×18	16.7	1.7	0.45
PL 042 X 075 AE	23.5	30.8	34.8	42.8	4	3	83	1640	167	78.1	7970	285	29.1	130	13.3	9	M8×22	40.2	4.1	0.76
PL 045 X 075 AE	23.5	30.8	34.8	42.8	4	3	83	1750	179	78.1	7970	266	27.1	130	13.3	9	M8×22	40.2	4.1	0.71
PL 048 X 080 AE	23.5	31.0	35	43	4	3	88	2060	210	86.8	8860	280	28.6	136	13.9	10	M8×22	40.2	4.1	0.81
PL 050 X 080 AE	23.5	31.0	35	43	4	3	88	2160	220	86.8	8860	270	27.5	136	13.9	10	M8×22	40.2	4.1	0.77
PL 055 X 085 AE	23.5	30.8	34.8	42.8	4	3	94	2350	240	86.8	8860	242	24.7	128	13.1	10	M8×22	40.2	4.1	0.84
PL 060 X 090 AE	23.5	30.8	34.8	42.8	4	3	99	2550	260	86.8	8860	219	22.3	122	12.4	10	M8×22	40.2	4.1	0.90
PL 065 X 095 AE	23.5	30.8	34.8	42.8	4	3	104	3330	340	104	10600	246	25.1	137	14.0	12	M8×22	40.2	4.1	0.96
PL 070 X 110 AE	28	36.5	41	51	4.5	4	120	4800	490	137	14000	247	25.2	132	13.5	10	M10×25	81.3	8.3	1.70
PL 075 X 115 AE	28	36.5	41	51	4.5	4	125	5100	520	137	14000	230	23.5	126	12.9	10	M10×25	81.3	8.3	1.79
PL 080 X 120 AE	28	36.5	41	51	4.5	4	130	6570	670	165	16800	260	26.5	145	14.8	12	M10×25	81.3	8.3	1.89
PL 085 X 125 AE	28	36.5	41	51	4.5	4	135	6960	710	165	16800	244	24.9	139	14.2	12	M10×25	81.3	8.3	1.98
PL 090 X 130 AE	28	37.5	43	53	5.5	4	140	7450	760	165	16800	241	24.6	134	13.7	12	M10×25	81.3	8.3	2.15
PL 095 X 135 AE	28	37.5	43	53	5.5	4	145	9110	930	193	19700	267	27.2	151	15.4	14	M10×25	81.3	8.3	2.24
PL 100 X 145 AE	34	44.0	50	60	6	4	155	10300	1050	207	21100	218	22.2	123	12.6	15	M10×25	81.3	8.3	3.07
PL 110 X 155 AE	34	44.0	50	60	6	4	167	11400	1160	207	21100	198	20.2	116	11.8	15	M10×25	81.3	8.3	3.35
PL 120 X 165 AE	34	44.0	50	60	6	4	177	14900	1520	248	25300	218	22.2	130	13.3	18	M10×25	81.3	8.3	3.59
PL 130 X 180 AE	38	50.0	57	69	7	6	195	19600	2000	301	30700	214	21.8	129	13.2	15	M12×35	142	14.5	5.04
PL 140 X 190 AE	38	50.0	57	69	7	6	205	21100	2150	301	30700	198	20.2	123	12.6	15	M12×35	142	14.5	5.38
PL 150 X 200 AE	38	50.0	58	70	8	6	215	27000	2760	361	36800	221	22.6	140	14.3	18	M12×35	142	14.5	5.81

Notes) 1. Stocked models are in bold.
 2. Mt indicates torque at 0 transmissible thrust, while Pax indicates transmissible thrust at 0 torque. If transmissible torque and thrust apply simultaneously calculate and compare the combined value with the transmissible torque provided in the table.

Hub Diameters (1)

(1) Installing to hubs with a guide portion
 when $B \geq 2 \ell$
 (See Installation Example A)

ϕ_{DN} is the minimum hub diameter required to tolerate P' or the pressure exerted from within the hub.



Installation Example(A)
 When installing to hubs with a guide portion, the hub configuration coefficient is as follows: $K_3=0.8$

Hub Configuration Coefficient $K_3=0.8$

Minimum hub diameter ϕ_{DN} (mm)

Model No. (d X D Shaft Diameter X Outer Diameter) mm	Hub Contact Pressure P' MPa {kgf/mm ² }		Yield Point of Hub Material $\sigma_{0.2}$							
			206	225	245	274	294	345	392	441
			21	23	25	28	30	35	40	45
			FC350 SS400 SC410 S10C FCMB360	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540	FCD450 S35C SF590	FCD500 S45C	FCD600 S55C	FCD700
PL 019 X 047 AE	93	9.5	69	67	65	63	61	59	57	56
PL 020 X 047 AE	93	9.5	69	67	65	63	61	59	57	56
PL 022 X 047 AE	93	9.5	69	67	65	63	61	59	57	56
PL 024 X 050 AE	102	10.4	77	74	71	68	67	64	62	61
PL 025 X 050 AE	102	10.4	77	74	71	68	67	64	62	61
PL 028 X 055 AE	106	10.8	86	82	79	76	74	71	69	67
PL 030 X 055 AE	106	10.8	86	82	79	76	74	71	69	67
PL 032 X 060 AE	113	11.5	96	92	89	85	83	79	76	74
PL 035 X 060 AE	113	11.5	96	92	89	85	83	79	76	74
PL 038 X 065 AE	104	10.6	100	96	93	89	87	84	81	79
PL 040 X 065 AE	104	10.6	100	96	93	89	87	84	81	79
PL 042 X 075 AE	130	13.3	132	124	119	112	109	103	99	96
PL 045 X 075 AE	130	13.3	132	124	119	112	109	103	99	96
PL 048 X 080 AE	136	13.9	145	136	130	122	119	112	107	103
PL 050 X 080 AE	136	13.9	145	136	130	122	119	112	107	103
PL 055 X 085 AE	128	13.1	148	139	133	126	123	116	112	108
PL 060 X 090 AE	122	12.4	151	143	137	131	127	121	116	113
PL 065 X 095 AE	137	14.0	173	162	154	146	141	133	127	123
PL 070 X 110 AE	132	13.5	195	184	175	166	161	152	146	141
PL 075 X 115 AE	126	12.9	197	187	179	170	165	156	150	146
PL 080 X 120 AE	145	14.8	228	213	201	189	183	171	163	158
PL 085 X 125 AE	139	14.2	230	215	205	193	187	176	168	162
PL 090 X 130 AE	134	13.7	232	219	209	197	191	180	173	167
PL 095 X 135 AE	151	15.4	265	246	232	217	209	195	186	179
PL 100 X 145 AE	123	12.6	245	233	223	212	206	196	188	183
PL 110 X 155 AE	116	11.8	252	240	231	221	215	205	198	192
PL 120 X 165 AE	130	13.3	289	273	260	247	240	226	217	210
PL 130 X 180 AE	129	13.2	313	296	283	268	260	246	236	229
PL 140 X 190 AE	123	12.6	321	305	292	277	270	256	246	239
PL 150 X 200 AE	140	14.3	369	346	328	309	299	281	269	260

Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.
 2. Calculate hub diameters using the formula $K_3=0.8$ as discussed in Selection Procedure.

Hub Diameters (2)

(2) Installing to hubs with a guide portion when $L_2 < B < 2\ell$
(See Installation Example B)

(3) Installing to hubs without a guide portion
(See Installation Example C)

D_N is the minimum hub diameter required to tolerate P' or the pressure exerted from within the hub.

Installation Example(B)
When installing to hubs with a guide portion, the hub configuration coefficient is as follows: $K_3=1.0$

Installation Example(C)
When installing to hubs without a guide portion, the hub configuration coefficient is as follows: $K_3=1.0$

Hub Configuration Coefficient $K_3=1.0$ Minimum hub diameter ϕ_{DN} (mm)

Model No. (d X D Shaft Diameter X Outer Diameter) mm	Yield Point of Hub Material $\sigma_{0.2}$											
	Hub Contact Pressure P'		MPa / kgf/mm ²									
			206	225	245	274	294	345	392	441		
	MPa	{kgf/mm ² }	21	23	25	28	30	35	40	45		
			FC350 SS400 SC410 S10C FCMB360	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540	FCD450 S35C SF590	FCD500 S45C	FCD600 S55C	FCD700		
PL 019 X 047 AE	93	9.5	77	73	71	67	66	63	60	59		
PL 020 X 047 AE	93	9.5	77	73	71	67	66	63	60	59		
PL 022 X 047 AE	93	9.5	77	73	71	67	66	63	60	59		
PL 024 X 050 AE	102	10.4	87	82	78	74	72	68	66	64		
PL 025 X 050 AE	102	10.4	87	82	78	74	72	68	66	64		
PL 028 X 055 AE	106	10.8	98	92	88	83	81	76	73	71		
PL 030 X 055 AE	106	10.8	98	92	88	83	81	76	73	71		
PL 032 X 060 AE	113	11.5	111	104	99	93	90	85	81	78		
PL 035 X 060 AE	113	11.5	111	104	99	93	90	85	81	78		
PL 038 X 065 AE	104	10.6	114	107	103	97	95	89	86	83		
PL 040 X 065 AE	104	10.6	114	107	103	97	95	89	86	83		
PL 042 X 075 AE	130	13.3	159	146	136	126	121	112	106	102		
PL 045 X 075 AE	130	13.3	159	146	136	126	121	112	106	102		
PL 048 X 080 AE	136	13.9	178	162	150	138	133	122	115	111		
PL 050 X 080 AE	136	13.9	178	162	150	138	133	122	115	111		
PL 055 X 085 AE	128	13.1	177	163	153	142	136	126	120	115		
PL 060 X 090 AE	122	12.4	178	165	156	145	140	131	125	120		
PL 065 X 095 AE	137	14.0	213	193	179	165	158	146	137	132		
PL 070 X 110 AE	132	13.5	236	216	202	187	179	166	157	150		
PL 075 X 115 AE	126	12.9	236	217	204	190	183	170	161	155		
PL 080 X 120 AE	145	14.8	289	258	238	217	207	189	177	169		
PL 085 X 125 AE	139	14.2	285	258	239	219	210	193	182	174		
PL 090 X 130 AE	134	13.7	284	259	241	222	213	197	186	179		
PL 095 X 135 AE	151	15.4	345	304	277	251	239	217	203	193		
PL 100 X 145 AE	123	12.6	290	269	253	236	227	212	201	194		
PL 110 X 155 AE	116	11.8	293	274	259	243	235	221	211	203		
PL 120 X 165 AE	130	13.3	349	320	299	277	266	247	234	224		
PL 130 X 180 AE	129	13.2	377	346	324	301	289	268	254	244		
PL 140 X 190 AE	123	12.6	380	352	331	309	298	277	264	254		
PL 150 X 200 AE	140	14.3	460	415	384	352	336	309	291	278		

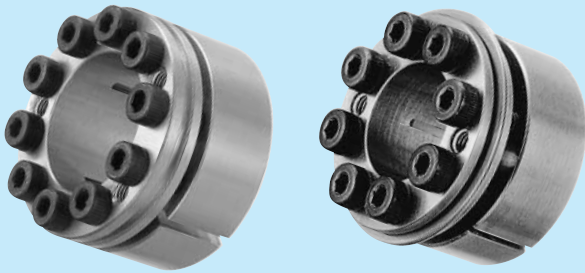
Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.
2. Calculate hub diameters using the formula $K_3=1.0$ as discussed in Selection Procedure.



POWER-LOCK RE Series

Sizes : $\phi 5 \sim \phi 50$
 Shaft tolerance : h8
 Hub bore tolerance : H8
 Surface roughness : Below 12S

Stainless Steel



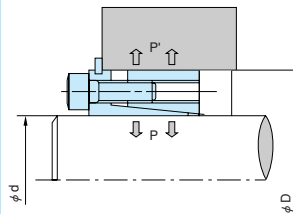
RoHS compliant.

Features

1 Installation Options
 Available in flange and straight installation types.

2 Austenite Stainless Steel
 The main unit is made of highly anticorrosive austenite stainless steel, which makes the entire product excellent for clean-room operation.

3 No Lubrication Required
 Locking bolts are lubricated so that no additional lubrication is necessary during assembly.



P and P' represent the average contact pressure applied to the shaft and hub respectively. These values may vary within $\pm 20\%$ depending on the amount of friction applied to the bolts.

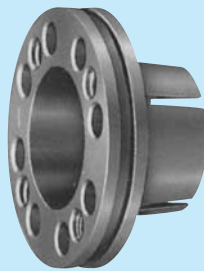
Parts



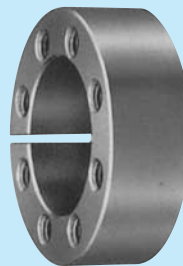
Locking Bolts



Snap Ring



Inner Ring

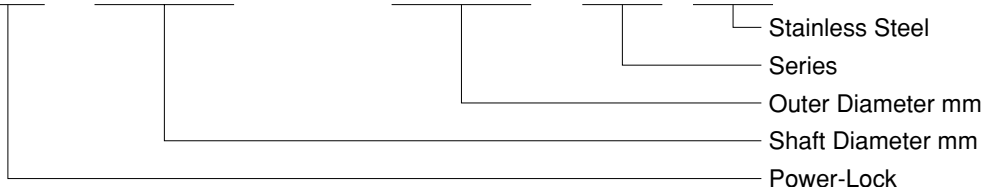


Outer Ring

The RE Series Power-Locks are simply constructed of the following four parts: inner and outer rings, a snap ring and locking bolts. Simply tighten these bolts to achieve a completely secure connection.

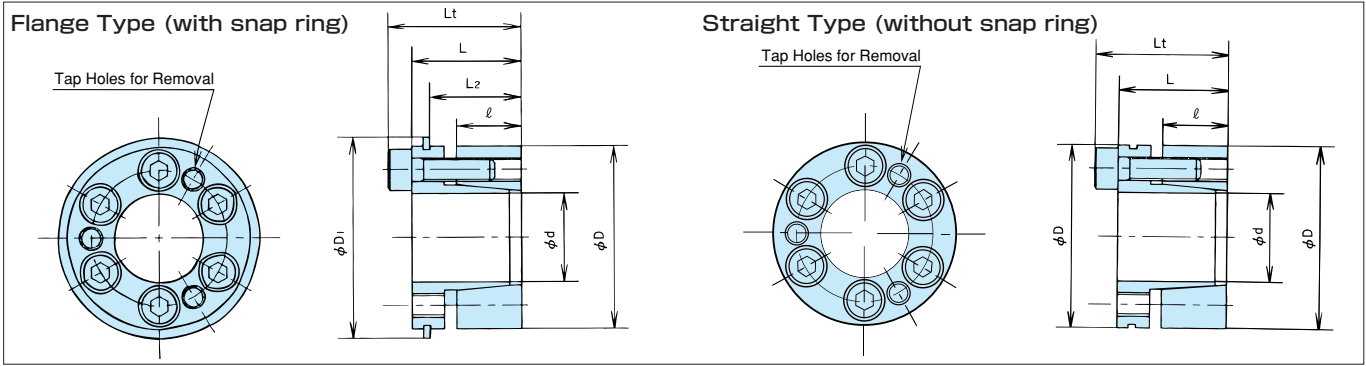
Reference Number System

PL 010 X 026 RE-SS



Units are shipped as flange types. Remove the snap ring to use each as a straight type.

Model Numbers and Specifications



Flange Types	Model No. (d X D Shaft Diameter X Outer Diameter) mm	Dimensions mm					Transmissible Torque		Transmissible Thrust		Contact Pressure				Locking Bolts			Mass kg	
		l	L ₂	L	Lt	D ₁	Mt		Pax		Shaft P		Hub P'		Qty.	Size	Tightening Torque M _A		
							N·m	{kgf·m}	kN	{kgf}	MPa	{kgf/mm ² }	MPa	{kgf/mm ² }			N·m		{kgf·m}
PL005 X 018 RE-SS	8	11	13.5	16.5	20	5.01	0.51	1.89	193	111	11.3	31	3.1	3	M3×10	0.9	0.092	0.02	
PL006 X 019 RE-SS	8	11	13.5	16.5	21.5	6.02	0.61	1.89	193	92	9.4	29	3.0	3	M3×10	0.9	0.092	0.02	
PL008 X 021 RE-SS	8	11	13.5	16.5	23.5	10.7	1.1	2.52	258	92	9.4	35	3.6	4	M3×10	0.9	0.092	0.03	
PL010 X 026 RE-SS	10	14	16.5	20.5	28.7	23.8	2.4	4.49	458	105	10.7	40	4.1	4	M4×14	2.2	0.22	0.06	
PL011 X 027 RE-SS	10	14.5	17	21	29.7	26.1	2.7	4.49	458	96	9.7	39	4.0	4	M4×14	2.2	0.22	0.06	
PL012 X 028 RE-SS	10	15	17.5	21.5	30.7	35.6	3.6	5.61	573	109	11.2	47	4.8	5	M4×14	2.2	0.22	0.06	
PL014 X 030 RE-SS	11	15.5	18.5	22.5	33.1	49.9	5.1	6.73	687	102	10.4	48	4.9	6	M4×14	2.2	0.22	0.08	
PL015 X 031 RE-SS	11	15.5	18.5	22.5	34.1	53.5	5.5	6.73	687	96	9.7	46	4.7	6	M4×14	2.2	0.22	0.08	
PL016 X 032 RE-SS	11	15.5	18.5	22.5	35.1	57.0	5.8	6.73	687	90	9.1	45	4.6	6	M4×14	2.2	0.22	0.08	
PL017 X 033 RE-SS	12	16.5	19.5	23.5	36.6	60.6	6.2	6.73	687	77	7.9	40	4.1	6	M4×14	2.2	0.22	0.09	
PL018 X 034 RE-SS	12	16.5	19.5	23.5	37.6	64.2	6.5	6.73	687	73	7.4	39	3.9	6	M4×14	2.2	0.22	0.10	
PL019 X 035 RE-SS	12	16.5	20	24	38.5	90.3	9.2	8.98	916	92	9.4	50	5.1	8	M4×14	2.2	0.22	0.11	
PL020 X 039 RE-SS	13.5	19.5	23.5	28.5	43.2	141	14.4	13.3	1360	116	11.8	59	6.1	6	M5×20	5.3	0.54	0.15	
PL022 X 041 RE-SS	13.5	19.5	23.5	28.5	45	156	15.9	13.3	1360	105	10.7	56	5.8	6	M5×20	5.3	0.54	0.16	
PL024 X 043 RE-SS	15	22	26	31	47.5	226	23.1	17.8	1820	116	11.8	65	6.6	8	M5×20	5.3	0.54	0.19	
PL025 X 044 RE-SS	15	22	26	31	48.5	236	24.1	17.8	1820	111	11.3	63	6.4	8	M5×20	5.3	0.54	0.20	
PL028 X 049 RE-SS	16.5	23.5	28.5	33.5	53.8	330	33.7	22.2	2270	113	11.5	64	6.6	10	M5×20	5.3	0.54	0.27	
PL030 X 050 RE-SS	16.5	23.5	28.5	33.5	54.8	354	36.1	22.2	2270	105	10.7	63	6.4	10	M5×20	5.3	0.54	0.26	
PL032 X 052 RE-SS	17	24	29	34	56.7	377	38.5	22.2	2270	96	9.8	59	6.0	10	M5×20	5.3	0.54	0.28	
PL035 X 058 RE-SS	17	25.5	30.5	35.5	63	495	50.5	26.8	2730	105	10.7	63	6.5	12	M5×20	5.3	0.54	0.38	
PL038 X 060 RE-SS	18	26.5	31.5	37.5	65	635	64.8	31.6	3220	108	11.0	68	7.0	10	M6×25	9.0	0.92	0.39	
PL040 X 063 RE-SS	18	26.5	31.5	37.5	68.5	668	68.2	31.6	3220	103	10.5	65	6.6	10	M6×25	9.0	0.92	0.43	
PL042 X 066 RE-SS	19	28.5	34	40	71.3	842	85.9	37.8	3860	111	11.3	71	7.2	12	M6×25	9.0	0.92	0.50	
PL045 X 068 RE-SS	19	28.5	34	40	73.7	902	92.1	37.8	3860	104	10.6	69	7.0	12	M6×25	9.0	0.92	0.50	
PL048 X 072 RE-SS	19	28.5	34	40	78.3	962	98.2	37.8	3860	97	9.9	65	6.6	12	M6×25	9.0	0.92	0.57	
PL050 X 075 RE-SS	19	30	35.5	41.5	81.2	1170	119	44.2	4510	109	11.1	73	7.4	14	M6×25	9.0	0.92	0.62	

Straight Types	Model No. (d X D Shaft Diameter X Outer Diameter) mm	Dimensions mm			Transmissible Torque		Transmissible Thrust		Contact Pressure				Locking Bolts			Mass kg	
		l	L	Lt	Mt		Pax		Shaft P		Hub P'		Qty.	Size	Tightening Torque M _A		
					N·m	{kgf·m}	kN	{kgf}	MPa	{kgf/mm ² }	MPa	{kgf/mm ² }			N·m		{kgf·m}
PL005 X 018 RE-SS	8	13.5	16.5	16.5	6.73	0.69	3.27	334	191	19.5	53	5.4	3	M3×10	0.9	0.092	0.02
PL006 X 019 RE-SS	8	13.5	16.5	16.5	9.23	0.94	3.27	334	159	16.3	50	5.1	3	M3×10	0.9	0.092	0.02
PL008 X 021 RE-SS	8	13.5	16.5	18.5	1.9	4.36	445	159	16.3	61	6.2	4	M3×10	0.9	0.092	0.03	
PL010 X 026 RE-SS	10	16.5	20.5	20.5	41.0	4.2	7.75	791	181	18.5	70	7.1	4	M4×14	2.2	0.22	0.06
PL011 X 027 RE-SS	10	17	21	21	45.1	4.6	7.75	791	165	16.8	67	6.9	4	M4×14	2.2	0.22	0.06
PL012 X 028 RE-SS	10	17.5	21.5	21.5	61.6	6.3	9.69	989	189	19.3	81	8.3	5	M4×14	2.2	0.22	0.06
PL014 X 030 RE-SS	11	18.5	22.5	22.5	86.2	8.8	11.7	1190	177	18.0	82	8.4	6	M4×14	2.2	0.22	0.08
PL015 X 031 RE-SS	11	18.5	22.5	22.5	92.3	9.4	11.7	1190	165	16.8	80	8.1	6	M4×14	2.2	0.22	0.08
PL016 X 032 RE-SS	11	18.5	22.5	22.5	98.5	10.1	11.7	1190	155	15.8	77	7.9	6	M4×14	2.2	0.22	0.08
PL017 X 033 RE-SS	12	19.5	23.5	23.5	105	10.7	11.7	1190	133	13.6	69	7.0	6	M4×14	2.2	0.22	0.09
PL018 X 034 RE-SS	12	19.5	23.5	23.5	111	11.3	11.7	1190	126	12.9	67	6.8	6	M4×14	2.2	0.22	0.10
PL019 X 035 RE-SS	12	20	24	24	156	15.9	15.5	1580	159	16.2	86	8.8	8	M4×14	2.2	0.22	0.11
PL020 X 039 RE-SS	13.5	23.5	28.5	28.5	244	24.9	23.0	2350	200	20.4	103	10.5	6	M5×20	5.3	0.54	0.15
PL022 X 041 RE-SS	13.5	23.5	28.5	28.5	269	27.4	23.0	2350	182	18.6	98	10.0	6	M5×20	5.3	0.54	0.16
PL024 X 043 RE-SS	15	26	31	31	391	39.9	30.8	3140	200	20.4	112	11.4	8	M5×20	5.3	0.54	0.19
PL025 X 044 RE-SS	15	26	31	31	407	41.6	30.8	3140	192	19.6	109	11.1	8	M5×20	5.3	0.54	0.20
PL028 X 049 RE-SS	16.5	28.5	33.5	33.5	570	58.2	38.4	3920	195	19.9	111	11.4	10	M5×20	5.3	0.54	0.27
PL030 X 050 RE-SS	16.5	28.5	33.5	33.5	611	62.3	38.4	3920	182	18.6	109	11.1	10	M5×20	5.3	0.54	0.26
PL032 X 052 RE-SS	17	29	34	34	652	66.5	38.4	3920	165	16.9	102	10.4	10	M5×20	5.3	0.54	0.28
PL035 X 058 RE-SS	17	30.5	35.5	35.5	855	87.3	46.2	4710	182	18.5	110	11.2	12	M5×20	5.3	0.54	0.38
PL038 X 060 RE-SS	18	31.5	37.5	37.5	1100	112	54.5	5560	187	19.0	118	12.1	10	M6×25	9.0	0.92	0.39
PL040 X 063 RE-SS	18	31.5	37.5	37.5	1150	118	54.5	5560	177	18.1	113	11.5	10	M6×25	9.0	0.92	0.43
PL042 X 066 RE-SS	19	34	40	40	1450	148	65.4	6670	192	19.6	122	12.5	12	M6×25	9.0	0.92	0.50
PL045 X 068 RE-SS	19	34	40	40	1560	159	65.4	6670	179	18.3	119	12.1	12	M6×25	9.0	0.92	0.50
PL048 X 072 RE-SS	19	34	40	40	1660	170	65.4	6670	168	17.1	112	11.4	12	M6×25	9.0	0.92	0.57
PL050 X 075 RE-SS	19	35.5	41.5	41.5	2020	206	76.3	7790	188	19.2	125	12.8	14	M6×25	9.0	0.92	0.62

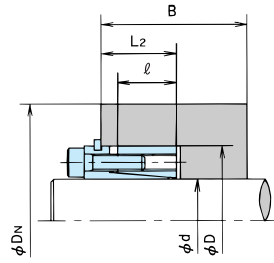
Notes) 1. Stocked models are in bold.

2. Mt indicates torque at 0 transmissible thrust, while Pax indicates transmissible thrust at 0 torque. If transmissible torque and thrust apply simultaneously calculate and compare the combined value with the transmissible torque provided in the table.

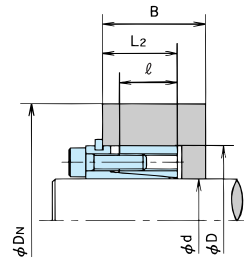


Hub Diameters (1)

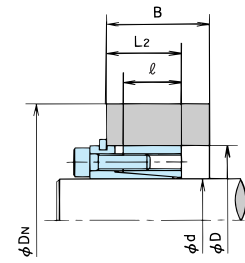
Installing Flange Types
(with snap rings)



$B \geq 2\ell$
Hub Configuration Coefficient
 $K_3=0.8$



$L_2 < B < 2\ell$
Hub Configuration Coefficient
 $K_3=1.0$



No Guide Portion
Hub Configuration Coefficient
 $K_3=1.0$

Hub Configuration Coefficient $K_3=0.8$

Minimum hub diameter ϕ_{DN} (mm)

Model No. (Shaft Diameter X Outer Diameter) mm	MPa		Yield Point of Hub Material $\sigma_{0.2}$									
	[kgf/mm ²]		147	176	206	225	245	274	294	343	392	441
	MPa	[kgf/mm ²]	FC250	FC300 SS330 SC360	FC350 SS400 SC410 S10C SUS304	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540	FCD450 S35C SF590	FCD500 S45C	FCD600 S55C	FCD700
PL005 X 018 RE-SS	31	3.1	22	21	21	21	21	21	21	21	21	21
PL006 X 019 RE-SS	29	3.0	23	22	22	22	22	22	22	22	22	22
PL008 X 021 RE-SS	35	3.6	26	25	25	24	24	24	24	24	24	24
PL010 X 026 RE-SS	40	4.1	33	32	31	31	30	30	30	29	29	29
PL011 X 027 RE-SS	39	4.0	34	33	32	32	31	31	31	30	30	30
PL012 X 028 RE-SS	47	4.8	37	35	34	34	33	33	32	32	31	31
PL014 X 030 RE-SS	48	4.9	40	38	37	36	36	35	35	34	34	34
PL015 X 031 RE-SS	46	4.7	41	39	38	37	37	36	36	35	35	35
PL016 X 032 RE-SS	45	4.6	42	40	39	38	38	37	37	36	36	36
PL017 X 033 RE-SS	40	4.1	42	40	39	39	38	38	37	37	37	37
PL018 X 034 RE-SS	39	3.9	43	41	40	40	39	39	38	38	38	38
PL019 X 035 RE-SS	50	5.1	47	45	43	42	42	41	41	40	39	39
PL020 X 039 RE-SS	59	6.1	55	52	50	49	48	47	46	45	44	44
PL022 X 041 RE-SS	56	5.8	57	54	52	51	50	49	48	47	46	46
PL024 X 043 RE-SS	65	6.6	63	59	56	55	54	53	52	51	50	49
PL025 X 044 RE-SS	63	6.4	63	60	57	56	55	54	53	52	51	50
PL028 X 049 RE-SS	64	6.6	71	67	64	62	61	60	59	58	56	56
PL030 X 050 RE-SS	63	6.4	72	68	65	63	62	61	60	59	57	57
PL032 X 052 RE-SS	59	6.0	73	69	66	65	64	62	62	60	59	58
PL035 X 058 RE-SS	63	6.5	84	78	75	73	72	70	70	68	67	66
PL038 X 060 RE-SS	68	7.0	89	83	79	77	76	74	73	71	70	68
PL040 X 063 RE-SS	65	6.6	92	86	82	80	79	77	76	74	73	71
PL042 X 066 RE-SS	71	7.2	100	93	88	86	84	82	81	78	77	76
PL045 X 068 RE-SS	69	7.0	101	94	90	88	86	84	83	80	79	78
PL048 X 072 RE-SS	65	6.6	105	98	94	91	90	88	87	84	83	82
PL050 X 075 RE-SS	73	7.4	114	106	101	98	96	93	92	89	88	86

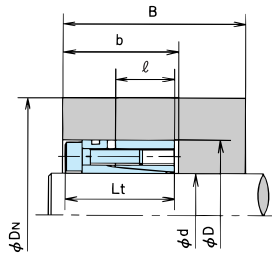
Hub Configuration Coefficient $K_3=1.0$

PL005 X 018 RE-SS	31	3.1	23	22	21	21	21	21	21	21	21	21
PL006 X 019 RE-SS	29	3.0	24	23	22	22	22	22	22	22	22	22
PL008 X 021 RE-SS	35	3.6	27	26	25	25	25	24	24	24	24	24
PL010 X 026 RE-SS	40	4.1	35	33	32	32	31	31	30	30	29	29
PL011 X 027 RE-SS	39	4.0	36	34	33	33	32	32	31	31	30	30
PL012 X 028 RE-SS	47	4.8	39	37	36	35	34	34	33	33	32	32
PL014 X 030 RE-SS	48	4.9	43	40	38	38	37	36	36	35	34	34
PL015 X 031 RE-SS	46	4.7	43	41	39	39	38	37	37	36	35	35
PL016 X 032 RE-SS	45	4.6	44	42	40	40	39	38	38	37	36	36
PL017 X 033 RE-SS	40	4.1	44	42	41	40	39	39	38	38	37	37
PL018 X 034 RE-SS	39	3.9	45	43	42	41	40	40	39	39	38	38
PL019 X 035 RE-SS	50	5.1	50	47	45	44	44	43	42	41	40	40
PL020 X 039 RE-SS	59	6.1	60	56	53	52	50	49	48	47	46	45
PL022 X 041 RE-SS	56	5.8	62	58	55	53	52	51	50	49	48	47
PL024 X 043 RE-SS	65	6.6	69	64	60	58	57	55	54	53	51	50
PL025 X 044 RE-SS	63	6.4	70	65	61	59	58	56	55	54	52	51
PL028 X 049 RE-SS	64	6.6	79	72	68	66	65	63	62	60	58	57
PL030 X 050 RE-SS	63	6.4	80	73	69	67	66	64	63	61	59	58
PL032 X 052 RE-SS	59	6.0	80	74	70	68	67	65	64	62	61	60
PL035 X 058 RE-SS	63	6.5	93	85	80	78	76	74	73	70	69	68
PL038 X 060 RE-SS	68	7.0	100	91	85	83	80	78	77	74	72	71
PL040 X 063 RE-SS	65	6.6	102	93	88	85	83	81	79	77	75	74
PL042 X 066 RE-SS	71	7.2	112	101	95	92	89	86	85	82	80	78
PL045 X 068 RE-SS	69	7.0	113	103	97	94	91	88	87	84	82	80
PL048 X 072 RE-SS	65	6.6	116	106	100	97	95	92	91	88	86	84
PL050 X 075 RE-SS	73	7.4	129	117	109	105	102	99	97	93	91	89

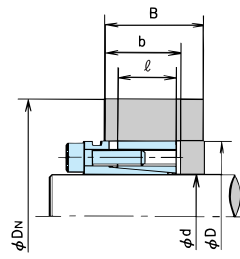
Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.
2. Calculate hub diameters using the formula, $K_3=0.8$ or 1.0 as discussed in Selection Procedure.

Hub Diameters (2)

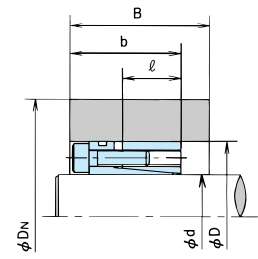
Installing Straight Types
(without snap rings)



$B \geq 2l$
Hub Configuration Coefficient
 $K_3=0.8$



$b < B < 2l$
Hub Configuration Coefficient
 $K_3=1.0$



No Guide Portion
Hub Configuration Coefficient
 $K_3=1.0$

Hub Configuration Coefficient $K_3=0.8$

Minimum hub diameter ϕ_{DN} (mm)

Model No. (d X D) Shaft Diameter X Outer Diameter mm	MPa		Yield Point of Hub Material $\sigma_{0.2}$								
	[kgf/mm ²]		176	206	225	245	274	294	343	392	441
	Hub Contact Pressure P'		FC300 SS330 SC360	FC350 SS400 SC410 S10C	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540	FCD450 S35C SF590	FCD500 S45C	FCD600 S55C	FCD700
	MPa	[kgf/mm ²]	SUS405	SUS304							
PL005 X 018 RE-SS	53	5.4	24	23	22	22	22	21	21	21	21
PL006 X 019 RE-SS	50	5.1	24	24	23	23	23	22	22	22	22
PL008 X 021 RE-SS	61	6.2	28	27	27	26	26	25	25	24	24
PL010 X 026 RE-SS	70	7.1	37	35	34	33	32	32	31	31	30
PL011 X 027 RE-SS	67	6.9	37	36	35	34	33	33	32	31	31
PL012 X 028 RE-SS	81	8.3	42	39	38	37	36	36	34	34	33
PL014 X 030 RE-SS	82	8.4	45	42	41	40	39	38	37	36	35
PL015 X 031 RE-SS	80	8.1	46	43	42	41	40	39	38	37	36
PL016 X 032 RE-SS	77	7.9	47	44	43	42	41	40	39	38	37
PL017 X 033 RE-SS	69	7.0	46	44	43	42	41	40	39	39	38
PL018 X 034 RE-SS	67	6.8	47	45	44	43	42	41	40	39	39
PL019 X 035 RE-SS	86	8.8	53	50	49	47	46	45	43	42	41
PL020 X 039 RE-SS	103	10.5	65	60	58	56	54	52	50	49	48
PL022 X 041 RE-SS	98	10.0	66	62	59	58	55	54	52	51	50
PL024 X 043 RE-SS	112	11.4	76	69	66	64	61	59	57	55	53
PL025 X 044 RE-SS	109	11.1	76	70	67	64	62	60	58	56	54
PL028 X 049 RE-SS	111	11.4	86	78	75	72	69	67	64	62	61
PL030 X 050 RE-SS	109	11.1	87	79	76	73	70	68	65	63	62
PL032 X 052 RE-SS	102	10.4	86	80	76	74	71	70	67	65	63
PL035 X 058 RE-SS	110	11.2	101	92	88	85	81	79	76	73	71
PL038 X 060 RE-SS	118	12.1	110	99	94	91	86	84	80	77	75
PL040 X 063 RE-SS	113	11.5	111	101	97	93	89	87	83	80	78
PL042 X 066 RE-SS	122	12.5	124	111	105	101	96	94	89	86	83
PL045 X 068 RE-SS	119	12.1	124	112	107	103	98	96	91	88	85
PL048 X 072 RE-SS	112	11.4	126	115	110	106	102	99	95	91	89
PL050 X 075 RE-SS	125	12.8	143	128	122	116	111	107	102	98	95

Hub Configuration Coefficient $K_3=1.0$

PL005 X 018 RE-SS	53	5.4	25	24	23	23	22	22	22	21	21
PL006 X 019 RE-SS	50	5.1	26	25	24	24	23	23	23	22	22
PL008 X 021 RE-SS	61	6.2	31	29	28	28	27	26	26	25	25
PL010 X 026 RE-SS	70	7.1	40	38	36	35	34	34	32	32	31
PL011 X 027 RE-SS	67	6.9	41	38	37	36	35	35	33	33	32
PL012 X 028 RE-SS	81	8.3	46	43	41	40	38	38	36	35	34
PL014 X 030 RE-SS	82	8.4	50	46	45	43	41	41	39	38	37
PL015 X 031 RE-SS	80	8.1	51	47	45	44	42	41	40	39	38
PL016 X 032 RE-SS	77	7.9	52	48	46	45	43	42	41	40	39
PL017 X 033 RE-SS	69	7.0	50	47	46	45	43	42	41	40	39
PL018 X 034 RE-SS	67	6.8	51	48	47	45	44	43	42	41	40
PL019 X 035 RE-SS	86	8.8	60	55	53	51	49	48	46	44	43
PL020 X 039 RE-SS	103	10.5	76	68	64	61	58	57	54	51	50
PL022 X 041 RE-SS	98	10.0	77	69	66	63	60	58	55	53	52
PL024 X 043 RE-SS	112	11.4	91	79	75	71	67	65	61	58	56
PL025 X 044 RE-SS	109	11.1	91	80	75	72	68	65	62	59	57
PL028 X 049 RE-SS	111	11.4	104	90	85	81	76	73	69	66	64
PL030 X 050 RE-SS	109	11.1	103	91	85	81	77	74	70	67	65
PL032 X 052 RE-SS	102	10.4	101	90	85	81	77	75	71	68	66
PL035 X 058 RE-SS	110	11.2	120	105	99	94	89	86	81	78	75
PL038 X 060 RE-SS	118	12.1	135	116	108	102	96	92	86	82	79
PL040 X 063 RE-SS	113	11.5	134	117	109	104	98	95	89	85	82
PL042 X 066 RE-SS	122	12.5	155	131	122	115	107	103	96	92	88
PL045 X 068 RE-SS	119	12.1	154	132	122	116	108	105	98	93	90
PL048 X 072 RE-SS	112	11.4	153	133	125	118	112	108	102	97	94
PL050 X 075 RE-SS	125	12.8	183	153	141	132	123	119	111	105	101

Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.

2. Calculate hub diameters using the formula, $K_3=0.8$ or 1.0 as discussed in Selection Procedure.

POWER-LOCK KE Series

Sizes : $\phi 5 \sim \phi 100$
 Shaft tolerance : h8
 Hub bore tolerance : H8
 Surface roughness : Below 12S

Shafts that do not have the recommended tolerance. Standard shaft tolerance is h8. If shafts with h9 or h10 tolerances are used, transmissible torque will reduce by 10%.
 ※Electroless nickel-plated models specifically require h8 tolerance shafts.

Outer Shaft Diameter Tolerance	Inner Hub Diameter Tolerance	Transmissible Torque Mt
h9 · h10	H8	Catalog Value × 90%
h6 · h7		Catalog Value (Catalog Value × 90% for Keyed Shafts)
js6 · js7		
k6		
m6		



All models are RoHS compliant.

Features

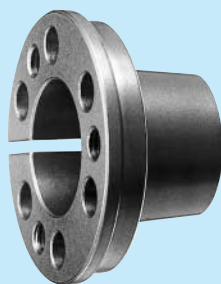
- Wide Range of Shaft Tolerances**
 Compatible with m6,k6,js6,h6~h10 shaft tolerances.
 ※Excludes electroless nickel-plated models.
- Self-Centering**
 These units provide accurate shaft-hub alignment and concentricity, allowing straight bore mounting.
- Designed to Fit Small Diameters**
 The small difference between the inner and outer diameters reduces contact pressure and makes mounting to small hubs possible.
- Options to Fit Every Application**
 Available in stainless steel and electroless nickel-plated finish. Suitable for operation conducted in clean room or corrosive environments.

Parts

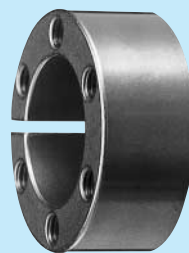
Locking Bolts



Inner Ring



Outer Ring



The KE Series Power-Locks are simply constructed of the following three parts: inner and outer rings and a few locking bolts. Simply tighten these bolts to achieve a completely secure connection.

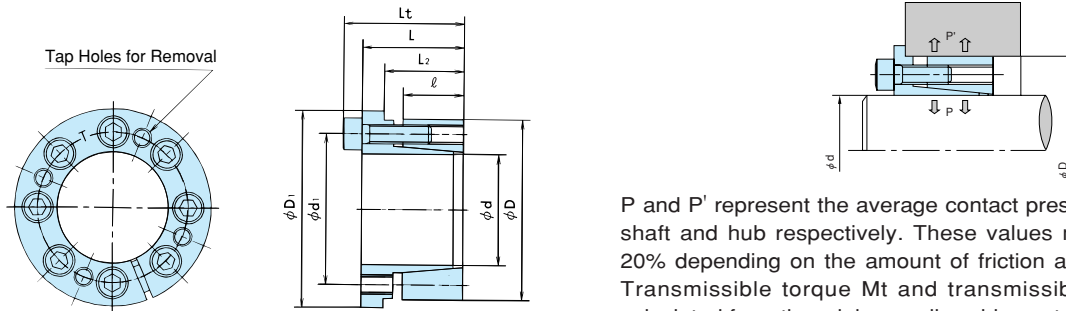
Reference Number System

PL 005 X 016 KE

- KE : Standard
- KE-SS : Stainless Steel
- KE-KP : Electroless Nickel-Plated
- Outer Diameter mm
- Shaft Diameter mm
- Power-Lock

Model Numbers and Specifications

Standard KE Models



P and P' represent the average contact pressure applied to the shaft and hub respectively. These values may vary within $\pm 20\%$ depending on the amount of friction applied to the bolts. Transmissible torque Mt and transmissible thrust Pax are calculated from the minimum allowable contact pressure.

Model No. ($d \times D$ Shaft Diameter X Outer Diameter) mm	Dimensions mm						Transmissible Torque		Transmissible Thrust		Contact Pressure				Locking Bolts			Mass kg	
	ℓ	L_2	L	L_t	d_1	D_1	Mt N·m	{kgf·m}	Pax kN	{kgf}	Shaft P MPa	{kgf/mm ² }	Hub P' MPa	{kgf/mm ² }	Qty.	Size	Tightening Torque MA N·m		{kgf·m}
PL005 X 016 KE	8	12	13.5	16.5	11.5	18.5	7.5	0.77	2.86	292	223	22.8	70	7.1	3	M 3×10	1.86	0.19	0.02
PL006 X 017 KE	8	12	13.5	16.5	12.5	19.5	9.0	0.92	2.86	292	186	19.0	66	6.7	3	M 3×10	1.86	0.19	0.02
PL008 X 021 KE	10	14.5	16.5	20.5	15.6	23.5	24.5	2.5	5.96	608	232	23.7	88	9.0	3	M 4×12	4.8	0.49	0.03
PL010 X 023 KE	10	14.5	16.5	20.5	17.6	25.5	31.4	3.2	5.96	608	186	19.0	80	8.2	3	M 4×12	4.8	0.49	0.04
PL011 X 024 KE	10	14.5	16.5	20.5	18.6	26.5	34.3	3.5	5.96	608	169	17.2	77	7.9	3	M 4×12	4.8	0.49	0.04
PL012 X 026 KE	10	14.5	16.5	20.5	20	28.5	50.0	5.1	7.94	810	207	21.1	95	9.7	4	M 4×12	4.8	0.49	0.05
PL014 X 028 KE	12	17.5	20	24	22	30.5	73.5	7.5	9.90	1010	184	18.8	92	9.4	5	M 4×14	4.8	0.49	0.06
PL015 X 029 KE	12	17.5	20	24	23	31.5	94.1	9.6	11.9	1210	207	21.1	107	10.9	6	M 4×14	4.8	0.49	0.07
PL016 X 030 KE	12	17.5	20	24	24	32.5	101	10.3	11.9	1210	194	19.8	103	10.5	6	M 4×14	4.8	0.49	0.07
PL017 X 031 KE	12	17.5	20	24	25	33.5	107	10.9	11.9	1210	182	18.6	100	10.2	6	M 4×14	4.8	0.49	0.07
PL018 X 032 KE	12	17.5	20	24	26	34.5	113	11.5	11.9	1210	172	17.6	97	9.9	6	M 4×14	4.8	0.49	0.08
PL019 X 033 KE	12	17.5	20	24	27	35.5	120	12.2	11.9	1210	163	16.6	94	9.6	6	M 4×14	4.8	0.49	0.08
PL020 X 038 KE	15	20.5	25	30	30	42	206	21.0	19.4	1980	203	20.7	107	10.9	6	M 5×18	9.8	1.0	0.14
PL022 X 040 KE	15	20.5	25	30	32	44	226	23.1	19.4	1980	184	18.8	101	10.3	6	M 5×18	9.8	1.0	0.15
PL024 X 042 KE	15	20.5	25	30	34	46	329	33.6	25.9	2640	225	23.0	128	13.1	8	M 5×18	9.8	1.0	0.16
PL025 X 043 KE	15	20.5	25	30	35	47	343	35.0	25.9	2640	216	22.0	125	12.8	8	M 5×18	9.8	1.0	0.17
PL028 X 046 KE	17	22.5	28	33	38.5	50	432	44.1	29.2	2980	191	19.5	117	11.9	9	M 5×18	9.8	1.0	0.21
PL030 X 048 KE	17	22.5	28	33	40.5	52	515	52.5	32.4	3310	199	20.3	124	12.7	10	M 5×18	9.8	1.0	0.22
PL032 X 050 KE	17	22.5	28	33	42.5	54	549	56.0	32.4	3310	186	19.0	120	12.2	10	M 5×18	9.8	1.0	0.23
PL035 X 057 KE	19	25	32	38	47.5	62	678	69.2	36.6	3730	172	17.5	106	10.8	8	M 6×22	16.7	1.7	0.36
PL038 X 060 KE	19	25	32	38	50.5	65	921	94.0	45.8	4670	198	20.2	125	12.8	10	M 6×22	16.7	1.7	0.39
PL040 X 062 KE	19	25	32	38	52.5	67	969	98.9	45.8	4670	188	19.2	122	12.4	10	M 6×22	16.7	1.7	0.40
PL042 X 064 KE	19	25	32	38	54.5	69	1010	103	45.8	4670	179	18.3	118	12.0	10	M 6×22	16.7	1.7	0.42
PL045 X 067 KE	19	25	32	38	57.5	72	1090	111	45.8	4670	168	17.1	113	11.5	10	M 6×22	16.7	1.7	0.44
PL048 X 070 KE	19	25	32	38	60.5	75	1390	142	54.9	5600	188	19.2	129	13.2	12	M 6×22	16.7	1.7	0.46
PL050 X 072 KE	19	26	34.5	40.5	63.5	77	1700	173	64.1	6540	211	21.5	146	14.9	14	M 6×25	16.7	1.7	0.50
PL055 X 077 KE	19	26	34.5	40.5	67.5	82	1860	190	64.1	6540	191	19.5	137	14.0	14	M 6×25	16.7	1.7	0.55
PL060 X 082 KE	19	26	34.5	40.5	72.5	87	2180	222	68.6	7000	188	19.2	137	14.0	15	M 6×25	16.7	1.7	0.59
PL065 X 087 KE	19	26	34.5	40.5	77.5	92	2360	241	68.6	7000	173	17.7	129	13.2	15	M 6×25	16.7	1.7	0.63
PL070 X 097 KE	22	31.5	40.5	48.5	85.5	102	3750	383	101	10300	206	21.0	148	15.1	12	M 8×30	40.2	4.1	0.99
PL075 X 102 KE	22	31.5	40.5	48.5	90.5	107	4030	411	101	10300	192	19.6	141	14.4	12	M 8×30	40.2	4.1	1.0
PL080 X 107 KE	22	31.5	41.5	49.5	95.5	112	5010	511	118	12000	210	21.4	157	16.0	14	M 8×30	40.2	4.1	1.1
PL085 X 112 KE	22	31.5	41.5	49.5	100.5	117	5320	543	118	12000	198	20.2	150	15.3	14	M 8×30	40.2	4.1	1.2
PL090 X 123 KE	29	41.5	54	64	109.5	128	8960	914	187	19100	224	22.9	165	16.8	14	M10×40	81.3	8.3	2.1
PL095 X 128 KE	29	41.5	54	64	114.5	133	9460	965	187	19100	213	21.7	158	16.1	14	M10×40	81.3	8.3	2.2
PL100 X 133 KE	29	41.5	54	64	119.5	138	9900	1010	187	19100	203	20.7	152	15.5	14	M10×40	81.3	8.3	2.3

Notes) 1. Stocked models are in bold.

2. Mt indicates torque at 0 transmissible thrust, while Pax indicates transmissible thrust at 0 torque. If transmissible torque and thrust apply simultaneously calculate and compare the combined value with the transmissible torque provided in the table.



Model Numbers and Specifications

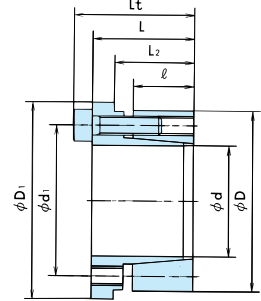
Electroless Nickel-Plated (KE-KP) Models

● Important Notes

1. Dimensions and transmissible torque are the same as the standard KE models.
2. The units are plated with peel-proof electroless nickel.
3. The locking bolts are DISGO treated so that assembly lubrication is not necessary. The electroless nickel-plated models are chrome-free and environmentally friendly.

● Applications

Most suitable for clean-room operation requiring minimum rust.



Model No. ($d \times D$ Shaft Diameter X Outer Diameter) mm	Dimensions mm						Transmissible Torque		Transmissible Thrust		Contact Pressure				Locking Bolts			Mass kg	
	ℓ	L_2	L	L_t	d_1	D_1	Mt		Pax		Shaft P		Hub P'		Qty.	Size	Tightening Torque MA		
							N·m	{kgf·m}	kN	{kgf}	MPa	{kgf/mm ² }	MPa	{kgf/mm ² }			N·m	{kgf·m}	
PL005 X 016 KE-KP	8	12	13.5	16.5	11.5	18.5	7.5	0.77	2.86	292	223	22.8	70	7.1	3	M 3×10	1.86	0.19	0.02
PL006 X 017 KE-KP	8	12	13.5	16.5	12.5	19.5	9.0	0.92	2.86	292	186	19.0	66	6.7	3	M 3×10	1.86	0.19	0.02
PL008 X 021 KE-KP	10	14.5	16.5	20.5	15.6	23.5	24.5	2.5	5.96	608	232	23.7	88	9.0	3	M 4×12	4.8	0.49	0.03
PL010 X 023 KE-KP	10	14.5	16.5	20.5	17.6	25.5	31.4	3.2	5.96	608	186	19.0	80	8.2	3	M 4×12	4.8	0.49	0.04
PL011 X 024 KE-KP	10	14.5	16.5	20.5	18.6	26.5	34.3	3.5	5.96	608	169	17.2	77	7.9	3	M 4×12	4.8	0.49	0.04
PL012 X 026 KE-KP	10	14.5	16.5	20.5	20	28.5	50.0	5.1	7.94	810	207	21.1	95	9.7	4	M 4×12	4.8	0.49	0.05
PL014 X 028 KE-KP	12	17.5	20	24	22	30.5	73.5	7.5	9.90	1010	184	18.8	92	9.4	5	M 4×14	4.8	0.49	0.06
PL015 X 029 KE-KP	12	17.5	20	24	23	31.5	94.1	9.6	11.9	1210	207	21.1	107	10.9	6	M 4×14	4.8	0.49	0.07
PL016 X 030 KE-KP	12	17.5	20	24	24	32.5	101	10.3	11.9	1210	194	19.8	103	10.5	6	M 4×14	4.8	0.49	0.07
PL017 X 031 KE-KP	12	17.5	20	24	25	33.5	107	10.9	11.9	1210	182	18.6	100	10.2	6	M 4×14	4.8	0.49	0.07
PL018 X 032 KE-KP	12	17.5	20	24	26	34.5	113	11.5	11.9	1210	172	17.6	97	9.9	6	M 4×14	4.8	0.49	0.08
PL019 X 033 KE-KP	12	17.5	20	24	27	35.5	120	12.2	11.9	1210	163	16.6	94	9.6	6	M 4×14	4.8	0.49	0.08
PL020 X 038 KE-KP	15	20.5	25	30	30	42	206	21.0	19.4	1980	203	20.7	107	10.9	6	M 5×18	9.8	1.0	0.14
PL022 X 040 KE-KP	15	20.5	25	30	32	44	226	23.1	19.4	1980	184	18.8	101	10.3	6	M 5×18	9.8	1.0	0.15
PL024 X 042 KE-KP	15	20.5	25	30	34	46	329	33.6	25.9	2640	225	23.0	128	13.1	8	M 5×18	9.8	1.0	0.16
PL025 X 043 KE-KP	15	20.5	25	30	35	47	343	35.0	25.9	2640	216	22.0	125	12.8	8	M 5×18	9.8	1.0	0.17
PL028 X 046 KE-KP	17	22.5	28	33	38.5	50	432	44.1	29.2	2980	191	19.5	117	11.9	9	M 5×18	9.8	1.0	0.21
PL030 X 048 KE-KP	17	22.5	28	33	40.5	52	515	52.5	32.4	3310	199	20.3	124	12.7	10	M 5×18	9.8	1.0	0.22
PL032 X 050 KE-KP	17	22.5	28	33	42.5	54	549	56.0	32.4	3310	186	19.0	120	12.2	10	M 5×18	9.8	1.0	0.23
PL035 X 057 KE-KP	19	25	32	38	47.5	62	678	69.2	36.6	3730	172	17.5	106	10.8	8	M 6×22	16.7	1.7	0.36
PL038 X 060 KE-KP	19	25	32	38	50.5	65	921	94.0	45.8	4670	198	20.2	125	12.8	10	M 6×22	16.7	1.7	0.39
PL040 X 062 KE-KP	19	25	32	38	52.5	67	969	98.9	45.8	4670	188	19.2	122	12.4	10	M 6×22	16.7	1.7	0.40
PL042 X 064 KE-KP	19	25	32	38	54.5	69	1010	103	45.8	4670	179	18.3	118	12.0	10	M 6×22	16.7	1.7	0.42
PL045 X 067 KE-KP	19	25	32	38	57.5	72	1090	111	45.8	4670	168	17.1	113	11.5	10	M 6×22	16.7	1.7	0.44
PL048 X 070 KE-KP	19	25	32	38	60.5	75	1390	142	54.9	5600	188	19.2	129	13.2	12	M 6×22	16.7	1.7	0.46
PL050 X 072 KE-KP	19	26	34.5	40.5	63.5	77	1700	173	64.1	6540	211	21.5	146	14.9	14	M 6×25	16.7	1.7	0.50
PL055 X 077 KE-KP	19	26	34.5	40.5	67.5	82	1860	190	64.1	6540	191	19.5	137	14.0	14	M 6×25	16.7	1.7	0.55
PL060 X 082 KE-KP	19	26	34.5	40.5	72.5	87	2180	222	68.6	7000	188	19.2	137	14.0	15	M 6×25	16.7	1.7	0.59
PL065 X 087 KE-KP	19	26	34.5	40.5	77.5	92	2360	241	68.6	7000	173	17.7	129	13.2	15	M 6×25	16.7	1.7	0.63
PL070 X 097 KE-KP	22	31.5	40.5	48.5	85.5	102	3750	383	101	10300	206	21.0	148	15.1	12	M 8×30	40.2	4.1	0.99
PL075 X 102 KE-KP	22	31.5	40.5	48.5	90.5	107	4030	411	101	10300	192	19.6	141	14.4	12	M 8×30	40.2	4.1	1.0
PL080 X 107 KE-KP	22	31.5	41.5	49.5	95.5	112	5010	511	118	12000	210	21.4	157	16.0	14	M 8×30	40.2	4.1	1.1
PL085 X 112 KE-KP	22	31.5	41.5	49.5	100.5	117	5320	543	118	12000	198	20.2	150	15.3	14	M 8×30	40.2	4.1	1.2
PL090 X 123 KE-KP	29	41.5	54	64	109.5	128	8960	914	187	19100	224	22.9	165	16.8	14	M10×40	81.3	8.3	2.1
PL095 X 128 KE-KP	29	41.5	54	64	114.5	133	9460	965	187	19100	213	21.7	158	16.1	14	M10×40	81.3	8.3	2.2
PL100 X 133 KE-KP	29	41.5	54	64	119.5	138	9900	1010	187	19100	203	20.7	152	15.5	14	M10×40	81.3	8.3	2.3

Notes) 1. Stocked models are in bold.

2. Mt indicates torque at 0 transmissible thrust, while Pax indicates transmissible thrust at 0 torque. If transmissible torque and thrust apply simultaneously calculate and compare the combined value with the transmissible torque provided in the table.

Model Numbers and Specifications

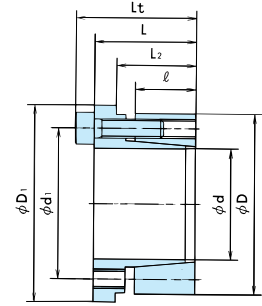
Stainless Steel (KE-SS) Models

● Notes

1. The main unit is made of highly anticorrosive austenite stainless steel.
2. Locking bolts are lubricated so that no additional lubrication is necessary during assembly.

● Applications

Most suitable for clean-room operation requiring minimum rust.



Model No. ($d \times D$ Shaft Diameter X Outer Diameter) mm	Dimensions mm						Transmissible Torque		Transmissible Thrust		Contact Pressure				Locking Bolts			Mass kg	
	ℓ	L_2	L	L_t	d_1	D_1	Mt		Pax		Shaft P		Hub P'		Qty.	Size	Tightening Torque MA		
							N·m	{kgf·m}	kN	{kgf}	MPa	{kgf/mm ² }	MPa	{kgf/mm ² }			N·m	{kgf·m}	
PL005 X 016 KE-SS	8	12	13.5	16.5	11.5	18.5	5.0	0.51	1.89	193	111	11.3	35	3.5	3	M 3×10	0.9	0.092	0.02
PL006 X 017 KE-SS	8	12	13.5	16.5	12.5	19.5	6.0	0.61	1.89	193	92	9.4	33	3.3	3	M 3×10	0.9	0.092	0.02
PL008 X 021 KE-SS	10	14.5	16.5	20.5	15.6	23.5	14.2	1.5	3.37	344	98	10.1	38	3.8	3	M 4×14	2.2	0.22	0.03
PL010 X 023 KE-SS	10	14.5	16.5	20.5	17.6	25.5	17.7	1.8	3.37	344	79	8.0	34	3.5	3	M 4×14	2.2	0.22	0.04
PL011 X 024 KE-SS	10	14.5	16.5	20.5	18.6	26.5	19.6	2.0	3.37	344	72	7.3	33	3.4	3	M 4×14	2.2	0.22	0.04
PL012 X 026 KE-SS	10	14.5	16.5	20.5	20	28.5	28.4	2.9	4.49	458	88	8.9	40	4.1	4	M 4×14	2.2	0.22	0.05
PL014 X 028 KE-SS	12	17.5	20	24	22	30.5	41.6	4.2	5.61	573	78	8.0	39	4.0	5	M 4×14	2.2	0.22	0.06
PL015 X 029 KE-SS	12	17.5	20	24	23	31.5	44.5	4.5	5.61	573	73	7.4	38	3.9	5	M 4×14	2.2	0.22	0.07
PL016 X 030 KE-SS	12	17.5	20	24	24	32.5	47.4	4.8	5.61	573	68	7.0	36	3.7	5	M 4×14	2.2	0.22	0.07
PL017 X 031 KE-SS	12	17.5	20	24	25	33.5	60.6	6.2	6.73	687	77	7.9	42	4.3	6	M 4×14	2.2	0.22	0.07
PL018 X 032 KE-SS	12	17.5	20	24	26	34.5	64.1	6.5	6.73	687	73	7.4	41	4.2	6	M 4×14	2.2	0.22	0.08
PL019 X 033 KE-SS	12	17.5	20	24	27	35.5	67.7	6.9	6.73	687	69	7.1	40	4.1	6	M 4×14	2.2	0.22	0.08
PL020 X 038 KE-SS	15	20.5	25	30	30	42	141	14.4	13.4	1363	104	10.6	55	5.6	6	M 5×20	5.3	0.54	0.14
PL022 X 040 KE-SS	15	20.5	25	30	32	44	156	15.9	13.4	1363	95	9.7	52	5.3	6	M 5×20	5.3	0.54	0.15
PL024 X 042 KE-SS	15	20.5	25	30	34	46	170	17.3	13.4	1363	87	8.9	50	5.1	6	M 5×20	5.3	0.54	0.16
PL025 X 043 KE-SS	15	20.5	25	30	35	47	177	18.0	13.4	1363	83	8.5	48	4.9	6	M 5×20	5.3	0.54	0.17
PL028 X 046 KE-SS	17	22.5	28	33	38.5	50	264	26.9	17.8	1818	88	8.9	53	5.4	8	M 5×20	5.3	0.54	0.21
PL030 X 048 KE-SS	17	22.5	28	33	40.5	52	283	28.9	17.8	1818	82	8.3	51	5.2	8	M 5×20	5.3	0.54	0.22
PL032 X 050 KE-SS	17	22.5	28	33	42.5	54	302	30.8	17.8	1818	77	7.8	49	5.0	8	M 5×20	5.3	0.54	0.23
PL035 X 057 KE-SS	19	25	32	38	47.5	62	351	35.8	18.9	1932	67	6.8	41	4.2	6	M 6×25	9.0	0.92	0.36
PL038 X 060 KE-SS	19	25	32	38	50.5	65	508	51.8	25.2	2577	82	8.4	52	5.3	8	M 6×25	9.0	0.92	0.39
PL040 X 062 KE-SS	19	25	32	38	52.5	67	535	54.6	25.2	2577	78	7.9	50	5.1	8	M 6×25	9.0	0.92	0.40
PL042 X 064 KE-SS	19	25	32	38	54.5	69	561	57.3	25.2	2577	74	7.6	49	5.0	8	M 6×25	9.0	0.92	0.42
PL045 X 067 KE-SS	19	25	32	38	57.5	72	602	61.4	25.2	2577	69	7.1	46	4.7	8	M 6×25	9.0	0.92	0.44
PL048 X 070 KE-SS	19	25	32	38	60.5	75	722	73.7	28.4	2899	73	7.4	50	5.1	9	M 6×25	9.0	0.92	0.46
PL050 X 072 KE-SS	19	26	34.5	40.5	63.5	77	836	85.3	31.6	3221	78	7.9	54	5.5	10	M 6×25	9.0	0.92	0.50

Notes) 1. All models are in stock.

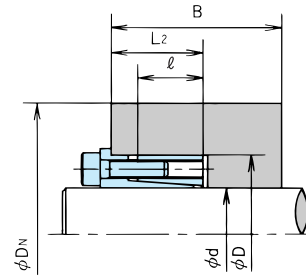
2. Mt indicates torque at 0 transmissible thrust, while Pax indicates transmissible thrust at 0 torque. If transmissible torque and thrust apply simultaneously calculate and compare the combined value with the transmissible torque provided in the table.

Hub Diameters (1)

Standard KE and Electroless Nickel-Plated KE-KP Models (Same dimensions and capacities)

(1) Installing to hubs with a guide portion
 when $B \geq 2 \ell$
 (See Installation Example A)

D_N is the minimum hub diameter required to tolerate P' or the pressure exerted from within the hub.



Installation Example(A)
 When installing to hubs with a guide portion,
 the hub configuration coefficient is as follows: $K_3=0.8$

Hub Configuration Coefficient $K_3=0.8$

Minimum hub diameter ϕD_N (mm)

Model No. d X D Shaft Diameter X Outer Diameter mm	Yield Point of Hub Material $\sigma_{0.2}$									
	MPa		206	225	245	274	294	343	392	441
	[kgf/mm ²]		21	23	25	28	30	35	40	45
Hub Contact Pressure P'	MPa	[kgf/mm ²]	FC350 SS400 SC410 S10C FCMB310	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540	FCD450 S35C SF590	FCD500 S45C	FCD600 S55C	FCD700
PL005 X 016 KE(-KP)	70	7.1	22	21	21	20	20	19	19	19
PL006 X 017 KE(-KP)	66	6.7	23	22	22	21	21	20	20	20
PL008 X 021 KE(-KP)	88	9.0	31	30	29	28	27	26	26	25
PL010 X 023 KE(-KP)	80	8.2	32	31	31	30	29	28	28	27
PL011 X 024 KE(-KP)	77	7.9	33	32	32	31	30	29	29	28
PL012 X 026 KE(-KP)	95	9.7	39	37	36	35	34	33	32	31
PL014 X 028 KE(-KP)	92	9.4	41	40	39	37	37	35	34	34
PL015 X 029 KE(-KP)	107	10.9	46	44	42	41	40	38	37	36
PL016 X 030 KE(-KP)	103	10.5	46	44	43	41	41	39	38	37
PL017 X 031 KE(-KP)	100	10.2	47	45	44	42	41	40	39	38
PL018 X 032 KE(-KP)	97	9.9	48	46	45	43	42	41	40	39
PL019 X 033 KE(-KP)	94	9.6	49	47	46	44	43	42	41	40
PL020 X 038 KE(-KP)	107	10.9	60	57	55	53	52	50	48	47
PL022 X 040 KE(-KP)	101	10.3	61	59	57	55	54	51	50	49
PL024 X 042 KE(-KP)	128	13.1	73	69	66	63	61	58	55	54
PL025 X 043 KE(-KP)	125	12.8	74	70	67	64	62	59	56	55
PL028 X 046 KE(-KP)	117	11.9	76	72	69	66	64	61	59	58
PL030 X 048 KE(-KP)	124	12.7	82	78	74	71	69	65	63	61
PL032 X 050 KE(-KP)	120	12.2	83	79	76	72	71	67	65	63
PL035 X 057 KE(-KP)	106	10.8	89	85	82	79	77	74	71	70
PL038 X 060 KE(-KP)	125	12.8	103	97	93	89	86	82	78	76
PL040 X 062 KE(-KP)	122	12.4	104	99	95	90	88	83	80	78
PL042 X 064 KE(-KP)	118	12.0	105	100	96	92	90	85	82	80
PL045 X 067 KE(-KP)	113	11.5	108	103	99	95	92	88	85	83
PL048 X 070 KE(-KP)	129	13.2	122	115	110	105	102	96	92	89
PL050 X 072 KE(-KP)	146	14.9	138	128	121	114	110	103	98	95
PL055 X 077 KE(-KP)	137	14.0	140	132	125	118	114	108	103	100
PL060 X 082 KE(-KP)	137	14.0	149	140	133	126	122	115	110	106
PL065 X 087 KE(-KP)	129	13.2	152	143	137	130	126	119	115	111
PL070 X 097 KE(-KP)	148	15.1	187	174	165	154	149	140	133	128
PL075 X 102 KE(-KP)	141	14.4	189	177	168	158	153	144	138	133
PL080 X 107 KE(-KP)	157	16.0	218	201	189	176	169	158	150	144
PL085 X 112 KE(-KP)	150	15.3	219	203	192	179	173	162	154	149
PL090 X 123 KE(-KP)	165	16.8	263	241	225	208	200	185	175	168
PL095 X 128 KE(-KP)	158	16.1	262	242	227	211	203	189	179	172
PL100 X 133 KE(-KP)	152	15.5	263	244	230	215	207	193	184	177

Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.
 2. Calculate hub diameters using the formula $K_3=0.8$ as discussed in Selection Procedure.

Hub Diameters (2)

Standard KE and Electroless Nickel-Plated KE-KP Models (Same dimensions and capacities)

(2) Installing to hubs with a guide portion
 when $L_2 < B < 2\ell$
 (See Installation Example B)

(3) Installing to hubs without a guide portion
 (See Installation Example C)

D_N is the minimum hub diameter required to tolerate P' or the pressure exerted from within the hub.

Installation Example(B)
 When installing to hubs with a guide portion, the hub configuration coefficient is as follows: $K_3=1.0$

Installation Example(C)
 When installing to hubs without a guide portion, the hub configuration coefficient is as follows: $K_3=1.0$

Hub Configuration Coefficient $K_3 = 1.0$ Minimum hub diameter ϕ_{DN} (mm)

Model No. d X D Shaft Diameter X Outer Diameter mm	Yield Point of Hub Material $\sigma_{0.2}$									
	MPa		206	225	245	274	294	343	392	441
	[kgf/mm ²]		21	23	25	28	30	35	40	45
Hub Contact Pressure P'	MPa	[kgf/mm ²]	FC350 SS400 SC410 S10C FCMB310	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540	S35C SF590	S45C	S55C	FCD700
PL005 X 016 KE(-KP)	70	7.1	23	23	22	21	21	20	20	19
PL006 X 017 KE(-KP)	66	6.7	24	23	23	22	22	21	21	20
PL008 X 021 KE(-KP)	88	9.0	34	32	31	30	29	28	27	26
PL010 X 023 KE(-KP)	80	8.2	35	34	33	32	31	30	29	28
PL011 X 024 KE(-KP)	77	7.9	36	35	34	33	32	31	30	29
PL012 X 026 KE(-KP)	95	9.7	43	41	40	38	37	35	34	33
PL014 X 028 KE(-KP)	92	9.4	46	44	42	40	39	37	36	35
PL015 X 029 KE(-KP)	107	10.9	52	49	47	44	43	41	39	38
PL016 X 030 KE(-KP)	103	10.5	52	50	47	45	44	41	40	39
PL017 X 031 KE(-KP)	100	10.2	53	50	48	46	45	42	41	40
PL018 X 032 KE(-KP)	97	9.9	54	51	49	47	46	43	42	41
PL019 X 033 KE(-KP)	94	9.6	55	52	50	48	46	44	43	41
PL020 X 038 KE(-KP)	107	10.9	68	64	61	58	56	53	51	49
PL022 X 040 KE(-KP)	101	10.3	69	65	62	59	58	55	53	51
PL024 X 042 KE(-KP)	128	13.1	88	81	76	70	68	63	60	57
PL025 X 043 KE(-KP)	125	12.8	88	81	76	71	68	64	60	58
PL028 X 046 KE(-KP)	117	11.9	88	82	78	73	70	66	63	61
PL030 X 048 KE(-KP)	124	12.7	97	90	85	79	76	71	67	65
PL032 X 050 KE(-KP)	120	12.2	98	91	86	80	77	72	69	67
PL035 X 057 KE(-KP)	106	10.8	101	95	91	86	84	79	76	73
PL038 X 060 KE(-KP)	125	12.8	122	113	106	99	95	89	84	81
PL040 X 062 KE(-KP)	122	12.4	123	114	107	100	97	90	86	83
PL042 X 064 KE(-KP)	118	12.0	123	115	108	102	98	92	88	85
PL045 X 067 KE(-KP)	113	11.5	124	117	111	104	101	95	91	88
PL048 X 070 KE(-KP)	129	13.2	147	135	126	117	113	105	99	95
PL050 X 072 KE(-KP)	146	14.9	175	156	144	131	125	114	107	102
PL055 X 077 KE(-KP)	137	14.0	173	157	145	134	128	118	111	107
PL060 X 082 KE(-KP)	137	14.0	184	167	155	143	136	126	119	114
PL065 X 087 KE(-KP)	129	13.2	183	168	157	146	140	130	123	118
PL070 X 097 KE(-KP)	148	15.1	240	214	196	178	169	154	145	138
PL075 X 102 KE(-KP)	141	14.4	237	213	197	181	173	158	149	143
PL080 X 107 KE(-KP)	157	16.0	292	253	229	205	194	176	164	156
PL085 X 112 KE(-KP)	150	15.3	283	250	229	207	197	179	168	160
PL090 X 123 KE(-KP)	165	16.8	370	312	278	247	232	208	193	183
PL095 X 128 KE(-KP)	158	16.1	353	305	276	247	234	211	197	187
PL100 X 133 KE(-KP)	152	15.5	343	302	275	249	236	215	201	191

Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.
 2. Calculate hub diameters using the formula $K_3=1.0$ as discussed in Selection Procedure.

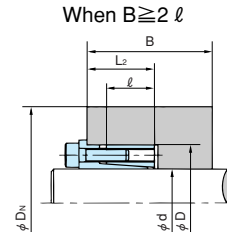


Hub Diameters (3)

Stainless Steel KE-SS Models

(1) Installing to hubs with a guide portion
 when $B \geq 2 \ell$
 (See Installation Example A)

D_N is the minimum hub diameter required to tolerate P' or the pressure exerted from within the hub.



Installation Example(A)
 When installing to hubs with a guide portion,
 the hub configuration coefficient
 is as follows: $K_3=0.8$

Hub Configuration Coefficient $K_3=0.8$ (Installation Example A)

Minimum hub diameter ϕ_{DN} (mm)

Model No. ($d \times D$) Shaft Diameter X Outer Diameter mm	Yield Point of Hub Material $\sigma_{0.2}$											
	MPa		147	176	206	225	245	274	294	343	392	441
	[kgf/mm ²]		15	18	21	23	25	28	30	35	40	45
Hub Contact Pressure P'	MPa	[kgf/mm ²]	FC250	FC300 SS330 SC360 SUS405	FC350 SS400 SC410 S10C SUS304	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540	FCD450 S35C SF590	S45C	S55C	FCD700
PL005 X 016 KE-SS	35	3.5	19	19	19	19	19	19	19	19	19	19
PL006 X 017 KE-SS	33	3.3	20	20	20	20	20	20	20	20	20	20
PL008 X 021 KE-SS	38	3.8	26	25	24	24	24	24	24	24	24	24
PL010 X 023 KE-SS	34	3.5	28	27	26	26	26	26	26	26	26	26
PL011 X 024 KE-SS	33	3.4	29	28	27	27	27	27	27	27	27	27
PL012 X 026 KE-SS	40	4.1	33	31	30	30	30	29	29	29	29	29
PL014 X 028 KE-SS	39	4.0	35	34	33	32	32	32	32	32	32	32
PL015 X 029 KE-SS	38	3.9	36	34	34	33	33	33	33	33	33	33
PL016 X 030 KE-SS	36	3.7	37	35	35	34	34	34	34	34	34	34
PL017 X 031 KE-SS	42	4.3	38	37	36	36	35	35	35	35	35	35
PL018 X 032 KE-SS	41	4.2	40	39	38	37	37	36	36	36	36	36
PL019 X 033 KE-SS	40	4.1	37	37	37	37	37	37	37	37	37	37
PL020 X 038 KE-SS	55	5.6	52	49	47	46	46	45	44	43	43	43
PL022 X 040 KE-SS	52	5.3	54	51	49	48	48	47	46	45	45	45
PL024 X 042 KE-SS	50	5.1	55	53	51	50	49	49	48	47	46	46
PL025 X 043 KE-SS	48	4.9	56	54	52	51	50	50	49	48	48	48
PL028 X 046 KE-SS	53	5.4	62	59	57	56	55	54	53	52	51	51
PL030 X 048 KE-SS	51	5.2	64	61	59	58	57	56	55	54	53	53
PL032 X 050 KE-SS	49	5.0	66	63	61	60	59	58	57	56	55	55
PL035 X 057 KE-SS	41	4.2	71	69	67	66	65	64	64	63	62	62
PL038 X 060 KE-SS	52	5.3	80	76	74	72	71	70	69	68	67	66
PL040 X 062 KE-SS	50	5.1	82	78	76	74	73	72	71	70	69	68
PL042 X 064 KE-SS	49	5.0	84	80	77	76	75	74	73	72	71	70
PL045 X 067 KE-SS	46	4.7	87	83	80	79	78	77	76	75	74	73
PL048 X 070 KE-SS	50	5.1	93	88	85	84	83	81	80	79	78	77
PL050 X 072 KE-SS	54	5.5	97	93	89	87	86	84	83	82	80	79

Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.
 2. Calculate hub diameters using the formula $K_3=0.8$ as discussed in Selection Procedure.

Hub Diameters (4)

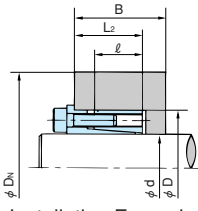
Stainless Steel KE-SS Models

(2) Installing to hubs with a guide portion
when $L_2 < B < 2\ell$
(See Installation Example B)

(3) Installing to hubs without a guide portion
(See Installation Example C)

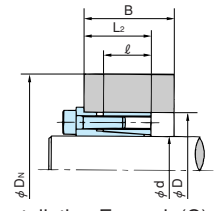
ϕ_{DN} is the minimum hub diameter required to tolerate P' or the pressure exerted from within the hub.

When $L_2 < B < 2\ell$



Installation Example(B)
When installing to hubs with a guide portion, the hub configuration coefficient is as follows: $K_3=1.0$

Hubs without a guide portion



Installation Example(C)
When installing to hubs without a guide portion, the hub configuration coefficient is as follows: $K_3=1.0$

Hub Configuration Coefficient $K_3=0.8$ (Installation Example B, C)

Minimum hub diameter ϕ_{DN} (mm)

Model No. d X D Shaft Diameter X Outer Diameter mm	Yield Point of Hub Material $\sigma_{0.2}$											
	MPa	147	176	206	225	245	274	294	343	392	441	
	[kgf/mm ²]	15	18	21	23	25	28	30	35	40	45	
Hub Contact Pressure P'	FC250	FC300 SS330 SC360	FC350 SS400 SC410 S10C SUS304	FC400 SS450 SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540	FCD450	FCD500	FCD600	FCD700		
MPa	[kgf/mm ²]	SUS405	S45C	S55C								
PL005 X 016 KE-SS	35	3.5	20	20	19	19	19	19	19	19	19	19
PL006 X 017 KE-SS	33	3.3	21	21	20	20	19	19	19	19	19	20
PL008 X 021 KE-SS	38	3.8	27	26	25	24	24	24	24	24	24	24
PL010 X 023 KE-SS	34	3.5	29	28	27	27	26	26	26	26	26	26
PL011 X 024 KE-SS	33	3.4	34	33	32	31	31	30	30	30	28	27
PL012 X 026 KE-SS	40	4.1	34	33	32	31	31	30	30	29	29	29
PL014 X 028 KE-SS	39	4.0	37	35	34	33	33	32	32	32	32	32
PL015 X 029 KE-SS	38	3.9	38	36	35	34	34	33	33	33	33	33
PL016 X 030 KE-SS	36	3.7	39	37	36	35	35	34	34	34	34	34
PL017 X 031 KE-SS	42	4.3	41	39	38	37	36	36	35	35	35	35
PL018 X 032 KE-SS	41	4.2	43	41	39	38	38	37	37	36	36	36
PL019 X 033 KE-SS	40	4.1	44	42	40	39	39	38	38	37	37	37
PL020 X 038 KE-SS	55	5.6	56	52	50	49	48	47	46	45	44	43
PL022 X 040 KE-SS	52	5.3	58	54	52	51	50	48	48	47	46	45
PL024 X 042 KE-SS	50	5.1	60	56	54	53	52	50	50	49	48	47
PL025 X 043 KE-SS	48	4.9	61	57	55	54	53	51	51	50	49	48
PL028 X 046 KE-SS	53	5.4	67	63	60	59	57	56	55	54	53	52
PL030 X 048 KE-SS	51	5.2	69	65	62	60	59	58	57	56	55	54
PL032 X 050 KE-SS	49	5.0	71	67	64	62	61	60	59	58	57	56
PL035 X 057 KE-SS	41	4.2	76	72	70	69	67	66	66	64	63	63
PL038 X 060 KE-SS	52	5.3	87	81	78	76	74	73	72	70	69	68
PL040 X 062 KE-SS	50	5.1	88	83	79	78	76	75	74	72	71	70
PL042 X 064 KE-SS	49	5.0	90	85	81	80	78	77	76	74	72	71
PL045 X 067 KE-SS	46	4.7	93	88	84	83	81	80	79	77	75	74
PL048 X 070 KE-SS	50	5.1	100	94	90	88	86	84	83	81	80	78
PL050 X 072 KE-SS	54	5.5	106	99	94	92	90	88	87	84	83	81

Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.
2. Calculate hub diameters using the formula $K_3=1.0$ as discussed in Selection Procedure.



POWER-LOCK TF Series

Sizes : $\phi 6 \sim \phi 90$
 Shaft tolerance : h8
 Hub bore tolerance : H8
 Surface roughness : Below 12S



All models are RoHs compliant.

Features

1 Designed to Fit Small Hub Diameters

The small difference between the inner and outer diameters reduces contact pressure and makes mounting to small hubs possible.

2 Self-Centering

These units provide accurate shaft-hub alignment and concentricity, allowing straight bore mounting.

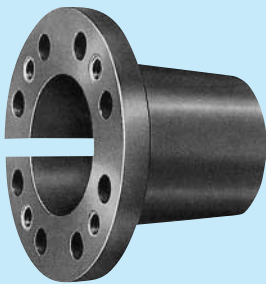
3 Full Line of Electroless Nickel-Plated Models

Electroless nickel-plated finish is available for all units above $\phi 10$. Most suitable for clean-room operation requiring minimum rust.

Parts



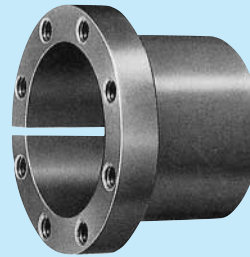
Locking Bolts



Inner Ring



Spacer

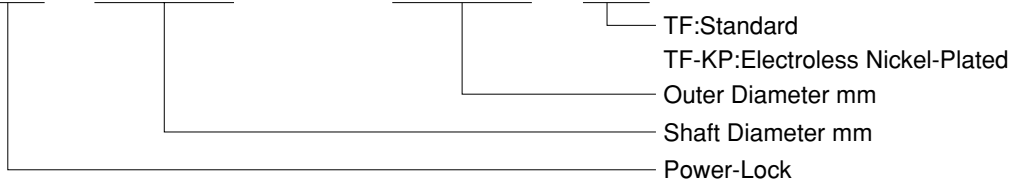


Outer Ring

The TF Series Power-Locks are simply constructed of the following four parts: inner and outer rings, a spacer and locking bolts. Simply tighten these bolts to achieve a completely secure connection.

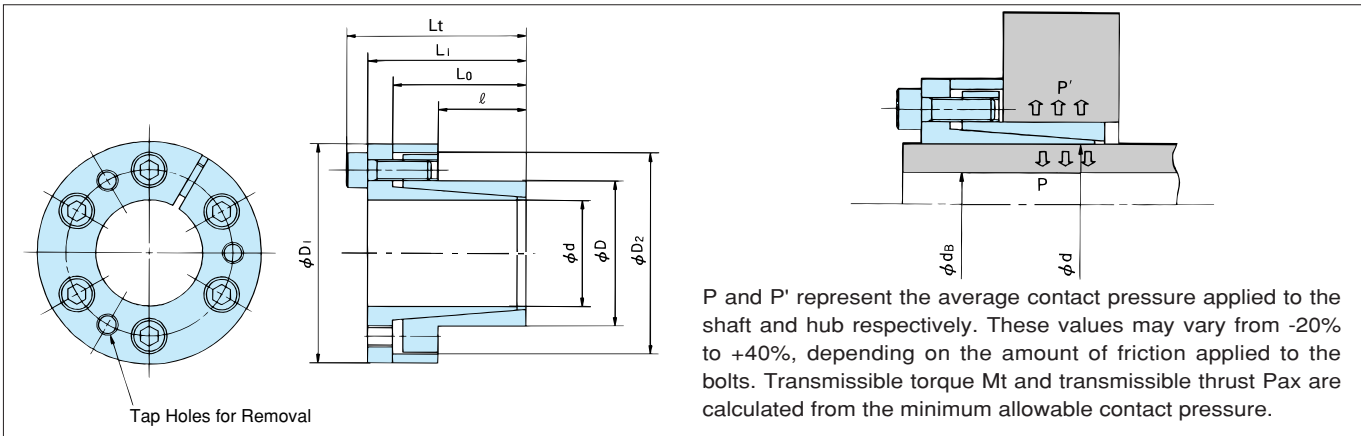
Reference Number System

PL 010 X 018 TF



Model Numbers and Specifications

Standard (TF) Models



P and P' represent the average contact pressure applied to the shaft and hub respectively. These values may vary from -20% to +40%, depending on the amount of friction applied to the bolts. Transmissible torque Mt and transmissible thrust Pax are calculated from the minimum allowable contact pressure.

Model No. d X D Shaft Diameter X Outer Diameter	Dimensions mm						Transmissible Torque		Transmissible Thrust		Contact Pressure				Locking Bolts			Mass kg	
	ℓ	L0	L1	Lt	D1	D2	Mt		Pax		Shaft P		Hub P'		Qty.	Size	Tightening Torque MA		
							N·m	{kgf·m}	kN	{kgf}	MPa	{kgf/mm²}	MPa	{kgf/mm²}			N·m		{kgf·m}
PL 006 X 012 TF	10	19	21	24	25	23.0	11	1.2	3.78	386	186	19.0	93	9.5	3	M3×10	2.25	0.23	0.05
PL 007 X 012 TF	10	19	21	24	25	22.5	13	1.4	3.78	386	160	16.3	93	9.5	3	M3×10	2.25	0.23	0.05
PL 008 X 015 TF	12	22	25	29	27	24.0	26	2.7	6.53	666	200	20.4	107	10.9	3	M4×10	4.80	0.49	0.07
PL 010 X 018 TF	14	23	26	30	32	28.0	44	4.4	8.70	888	183	18.7	102	10.4	4	M4×10	4.80	0.49	0.09
PL 011 X 018 TF	14	23	26	30	32	28.0	48	4.9	8.70	888	167	17.0	102	10.4	4	M4×10	4.80	0.49	0.08
PL 012 X 020 TF	14	23	26	30	34	30.0	52	5.3	8.70	888	153	15.6	92	9.3	4	M4×10	4.80	0.49	0.10
PL 014 X 022 TF	14	23	26	30	38	33.0	61	6.2	8.70	888	131	13.4	83	8.5	4	M4×10	4.80	0.49	0.12
PL 015 X 023 TF	14	24	30	35	39	35.5	107	10.9	14.2	1450	199	20.4	130	13.3	4	M5×14	9.80	1.00	0.12
PL 016 X 024 TF	14	24	30	35	40	36.5	114	11.6	14.2	1450	187	19.1	125	12.7	4	M5×14	9.80	1.00	0.16
PL 018 X 026 TF	18	31	38	44	47	42	196	20	21.6	2200	217	22.1	126	12.9	4	M6×18	16.7	1.7	0.27
PL 019 X 027 TF	18	31	38	44	49	43	206	21	21.6	2200	205	20.9	122	12.4	4	M6×18	16.7	1.7	0.29
PL 020 X 028 TF	18	31	38	44	50	44	216	22	21.6	2200	195	19.9	118	12.0	4	M6×18	16.7	1.7	0.30
PL 022 X 032 TF	25	38	45	51	54	48	245	25	21.6	2200	121	12.3	74	7.5	4	M6×18	16.7	1.7	0.38
PL 024 X 034 TF	25	38	45	51	56	50	265	27	21.6	2200	111	11.3	70	7.1	4	M6×18	16.7	1.7	0.41
PL 025 X 034 TF	25	38	45	51	56	50	274	28	21.6	2200	107	10.9	70	7.1	4	M6×18	16.7	1.7	0.39
PL 028 X 039 TF	25	38	45	51	61	55	461	47	32.3	3300	142	14.5	91	9.3	6	M6×18	16.7	1.7	0.47
PL 030 X 041 TF	25	38	45	51	62	57	500	51	32.3	3300	133	13.6	86	8.8	6	M6×18	16.7	1.7	0.48
PL 032 X 043 TF	25	38	45	51	65	59	529	54	32.3	3300	124	12.7	82	8.4	6	M6×18	16.7	1.7	0.52
PL 035 X 047 TF	32	45	52	58	69	62	774	79	44.1	4500	116	11.8	78	8.0	8	M6×18	16.7	1.7	0.63
PL 038 X 050 TF	32	45	52	58	72	66	843	86	44.1	4500	107	10.9	74	7.5	8	M6×18	16.7	1.7	0.67
PL 040 X 053 TF	32	45	52	58	75	69	882	90	44.1	4500	101	10.3	70	7.1	8	M6×18	16.7	1.7	0.73
PL 042 X 055 TF	32	45	52	58	78	71	931	95	44.1	4500	96	9.8	68	6.9	8	M6×18	16.7	1.7	0.78
PL 045 X 059 TF	45	62	70	78	86	80	1850	189	82.3	8400	119	12.1	82	8.4	8	M8×22	40.2	4.1	1.23
PL 048 X 062 TF	45	62	70	78	87	81	1970	201	82.3	8400	111	11.3	78	8.0	8	M8×22	40.2	4.1	1.24
PL 050 X 065 TF	45	62	70	78	92	86	2060	210	82.3	8400	107	10.9	74	7.6	8	M8×22	40.2	4.1	1.40
PL 055 X 071 TF	55	72	80	88	98	92	2550	260	92.1	9400	87	8.9	63	6.4	9	M8×22	40.2	4.1	1.70
PL 060 X 077 TF	55	72	80	88	104	98	2770	283	92.1	9400	80	8.2	58	5.9	9	M8×22	40.2	4.1	1.90
PL 065 X 084 TF	55	72	80	88	111	105	3010	307	92.1	9400	74	7.6	53	5.4	9	M8×22	40.2	4.1	2.21
PL 070 X 090 TF	65	86	96	106	119	113	5150	525	147	15000	92	9.4	67	6.8	9	M10×25	81.3	8.3	3.05
PL 075 X 095 TF	65	86	96	106	126	119	5490	560	147	15000	86	8.8	63	6.4	9	M10×25	81.3	8.3	3.32
PL 080 X 100 TF	65	86	96	106	131	125	7840	800	196	20000	108	11.0	79	8.1	12	M10×25	81.3	8.3	3.50
PL 085 X 106 TF	65	86	96	106	137	131	8330	850	196	20000	101	10.3	75	7.7	12	M10×25	81.3	8.3	3.81
PL 090 X 112 TF	65	86	96	106	144	137	8820	900	196	20000	96	9.8	72	7.3	12	M10×25	81.3	8.3	4.20

Notes) 1. Stocked models are in bold.

2. Mt indicates torque at 0 transmissible thrust, while Pax indicates transmissible thrust at 0 torque. If transmissible torque and thrust apply simultaneously calculate and compare the combined value with the transmissible torque provided in the table.



Model Numbers and Specifications

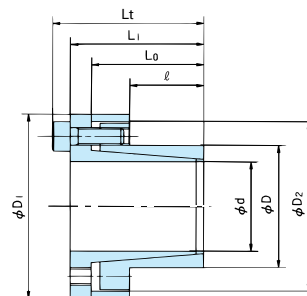
Electroless Nickel-Plated (TF-KP) Models

●Notes

1. Dimensions and transmissible torque are the same as the standard TF models.
2. The units are plated with peel-proof electroless nickel.
3. The locking bolts are DISGO treated so that assembly lubrication is not necessary. The electroless nickel-plated models are chrome-free and environmentally friendly.

●Applications

Most suitable for clean-room operation requiring minimum rust.



Model No. ($d \times D$ Shaft Diameter X Outer Diameter)	Dimensions mm						Transmissible Torque		Transmissible Thrust		Contact Pressure				Locking Bolts			Mass	
	l	L_0	L_1	L_t	D_1	D_2	Mt		Pax		Shaft P		Hub P'		Qty.	Size	Tightening Torque M_A		kg
							N·m	{kgf·m}	kN	{kgf}	MPa	{kgf/mm ² }	MPa	{kgf/mm ² }			N·m	{kgf·m}	
PL 010 X 018 TF-KP	14	23	26	30	32	28.0	44	4.4	8.70	888	183	18.7	102	10.4	4	M 4×10	4.80	0.49	0.09
PL 011 X 018 TF-KP	14	23	26	30	32	28.0	48	4.9	8.70	888	167	17.0	102	10.4	4	M 4×10	4.80	0.49	0.08
PL 012 X 020 TF-KP	14	23	26	30	34	30.0	52	5.3	8.70	888	153	15.6	92	9.3	4	M 4×10	4.80	0.49	0.10
PL 014 X 022 TF-KP	14	23	26	30	38	33.0	61	6.2	8.70	888	131	13.4	83	8.5	4	M 4×10	4.80	0.49	0.12
PL 015 X 023 TF-KP	14	24	30	35	39	35.5	107	10.9	14.2	1450	199	20.4	130	13.3	4	M 5×14	9.80	1.00	0.12
PL 016 X 024 TF-KP	14	24	30	35	40	36.5	114	11.6	14.2	1450	187	19.1	125	12.7	4	M 5×14	9.80	1.00	0.16
PL 018 X 026 TF-KP	18	31	38	44	47	42	196	20	21.6	2200	217	22.1	126	12.9	4	M 6×18	16.7	1.7	0.27
PL 019 X 027 TF-KP	18	31	38	44	49	43	206	21	21.6	2200	205	20.9	122	12.4	4	M 6×18	16.7	1.7	0.29
PL 020 X 028 TF-KP	18	31	38	44	50	44	216	22	21.6	2200	195	19.9	118	12.0	4	M 6×18	16.7	1.7	0.30
PL 022 X 032 TF-KP	25	38	45	51	54	48	245	25	21.6	2200	121	12.3	74	7.5	4	M 6×18	16.7	1.7	0.38
PL 024 X 034 TF-KP	25	38	45	51	56	50	265	27	21.6	2200	111	11.3	70	7.1	4	M 6×18	16.7	1.7	0.41
PL 025 X 034 TF-KP	25	38	45	51	56	50	274	28	21.6	2200	107	10.9	70	7.1	4	M 6×18	16.7	1.7	0.39
PL 028 X 039 TF-KP	25	38	45	51	61	55	461	47	32.3	3300	142	14.5	91	9.3	6	M 6×18	16.7	1.7	0.47
PL 030 X 041 TF-KP	25	38	45	51	62	57	500	51	32.3	3300	133	13.6	86	8.8	6	M 6×18	16.7	1.7	0.48
PL 032 X 043 TF-KP	25	38	45	51	65	59	529	54	32.3	3300	124	12.7	82	8.4	6	M 6×18	16.7	1.7	0.52
PL 035 X 047 TF-KP	32	45	52	58	69	62	774	79	44.1	4500	116	11.8	78	8.0	8	M 6×18	16.7	1.7	0.63
PL 038 X 050 TF-KP	32	45	52	58	72	66	843	86	44.1	4500	107	10.9	74	7.5	8	M 6×18	16.7	1.7	0.67
PL 040 X 053 TF-KP	32	45	52	58	75	69	882	90	44.1	4500	101	10.3	70	7.1	8	M 6×18	16.7	1.7	0.73
PL 042 X 055 TF-KP	32	45	52	58	78	71	931	95	44.1	4500	96	9.8	68	6.9	8	M 6×18	16.7	1.7	0.78
PL 045 X 059 TF-KP	45	62	70	78	86	80	1850	189	82.3	8400	119	12.1	82	8.4	8	M 8×22	40.2	4.1	1.23
PL 048 X 062 TF-KP	45	62	70	78	87	81	1970	201	82.3	8400	111	11.3	78	8.0	8	M 8×22	40.2	4.1	1.24
PL 050 X 065 TF-KP	45	62	70	78	92	86	2060	210	82.3	8400	107	10.9	74	7.6	8	M 8×22	40.2	4.1	1.40
PL 055 X 071 TF-KP	55	72	80	88	98	92	2550	260	92.1	9400	87	8.9	63	6.4	9	M 8×22	40.2	4.1	1.70
PL 060 X 077 TF-KP	55	72	80	88	104	98	2770	283	92.1	9400	80	8.2	58	5.9	9	M 8×22	40.2	4.1	1.90
PL 065 X 084 TF-KP	55	72	80	88	111	105	3010	307	92.1	9400	74	7.6	53	5.4	9	M 8×22	40.2	4.1	2.21
PL 070 X 090 TF-KP	65	86	96	106	119	113	5150	525	147	15000	92	9.4	67	6.8	9	M10×25	81.3	8.3	3.05
PL 075 X 095 TF-KP	65	86	96	106	126	119	5490	560	147	15000	86	8.8	63	6.4	9	M10×25	81.3	8.3	3.32
PL 080 X 100 TF-KP	65	86	96	106	131	125	7840	800	196	20000	108	11.0	79	8.1	12	M10×25	81.3	8.3	3.50
PL 085 X 106 TF-KP	65	86	96	106	137	131	8330	850	196	20000	101	10.3	75	7.7	12	M10×25	81.3	8.3	3.81
PL 090 X 112 TF-KP	65	86	96	106	144	137	8820	900	196	20000	96	9.8	72	7.3	12	M10×25	81.3	8.3	4.20

Notes) 1. Stocked models are in bold.

2. Mt indicates torque at 0 transmissible thrust, while Pax indicates transmissible thrust at 0 torque. If transmissible torque and thrust apply simultaneously calculate and compare the combined value with the transmissible torque provided in the table.

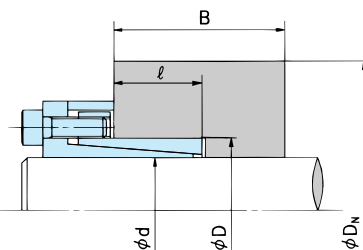
Hub Diameters (1)

Standard (TF) and Electroless Nickel-Plated (TF-KP) Models (Same dimensions and capacities)

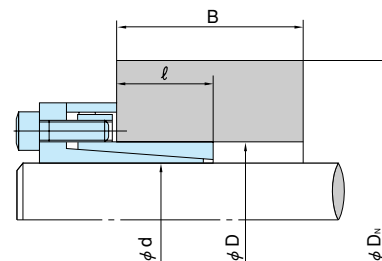
(1) Installing to hubs with a guide portion when $B \geq 2 \ell$
(See Installation Example A)

(2) Installing to hubs without a guide portion when $B \geq 2 \ell$
(See Installation Example B)

ϕ_{DN} is the minimum hub diameter required to tolerate P' or the pressure exerted from within the hub.



Installation Example(A)
When installing to hubs with a guide portion, the hub configuration coefficient is as follows: $K_3=0.8$



Installation Example(B)
When installing to hubs without a guide portion, the hub configuration coefficient is as follows: $K_3=0.8$

Hub Configuration Coefficient $K_3=0.8$

Minimum hub diameter ϕ_{DN} (mm)

Model No. ($d \times D$ Shaft Diameter X Outer Diameter) mm	Yield Point of Hub Material $\sigma_{0.2}$									
	Hub Contact Pressure P' MPa	MPa kgf/mm ²	206	225	245	274	294	343	392	441
			FC350 SS400 SC410 S10C FCMB360	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540	FCD450 S35 SF590	FCD500 S45C	FCD600 S55C	FCD700
PL 006 X 012 TF	93	9.5	25	25	25	25	25	25	25	25
PL 007 X 012 TF	93	9.5	25	25	25	25	25	25	25	25
PL 008 X 015 TF	107	10.9	27	27	27	27	27	27	27	27
PL 010 X 018 TF(-KP)	102	10.4	32	32	32	32	32	32	32	32
PL 011 X 018 TF(-KP)	102	10.4	32	32	32	32	32	32	32	32
PL 012 X 020 TF(-KP)	92	9.3	34	34	34	34	34	34	34	34
PL 014 X 022 TF(-KP)	83	8.5	38	38	38	38	38	38	38	38
PL 015 X 023 TF(-KP)	130	13.3	41	39	39	39	39	39	39	39
PL 016 X 024 TF(-KP)	125	12.7	41	40	40	40	40	40	40	40
PL 018 X 026 TF(-KP)	126	12.9	47	47	47	47	47	47	47	47
PL 019 X 027 TF(-KP)	122	12.4	49	49	49	49	49	49	49	49
PL 020 X 028 TF(-KP)	118	12.0	50	50	50	50	50	50	50	50
PL 022 X 032 TF(-KP)	74	7.5	54	54	54	54	54	54	54	54
PL 024 X 034 TF(-KP)	70	7.1	56	56	56	56	56	56	56	56
PL 025 X 034 TF(-KP)	70	7.1	56	56	56	56	56	56	56	56
PL 028 X 039 TF(-KP)	91	9.3	61	61	61	61	61	61	61	61
PL 030 X 041 TF(-KP)	86	8.8	62	62	62	62	62	62	62	62
PL 032 X 043 TF(-KP)	82	8.4	65	65	65	65	65	65	65	65
PL 035 X 047 TF(-KP)	78	8.0	69	69	69	69	69	69	69	69
PL 038 X 050 TF(-KP)	74	7.5	72	72	72	72	72	72	72	72
PL 040 X 053 TF(-KP)	70	7.1	75	75	75	75	75	75	75	75
PL 042 X 055 TF(-KP)	68	6.9	78	78	78	78	78	78	78	78
PL 045 X 059 TF(-KP)	82	8.4	86	86	86	86	86	86	86	86
PL 048 X 062 TF(-KP)	78	8.0	87	87	87	87	87	87	87	87
PL 050 X 065 TF(-KP)	74	7.6	92	92	92	92	92	92	92	92
PL055 X 071 TF(-KP)	63	6.4	98	98	98	98	98	98	98	98
PL060 X 077 TF(-KP)	58	5.9	104	104	104	104	104	104	104	104
PL065 X 084 TF(-KP)	53	5.4	111	111	111	111	111	111	111	111
PL070 X 090 TF(-KP)	67	6.8	119	119	119	119	119	119	119	119
PL075 X 095 TF(-KP)	63	6.4	126	126	126	126	126	126	126	126
PL080 X 100 TF(-KP)	79	8.1	138	134	131	131	131	131	131	131
PL085 X 106 TF(-KP)	75	7.7	144	140	137	137	137	137	137	137
PL090 X 112 TF(-KP)	72	7.3	149	146	144	144	144	144	144	144

Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.
2. Calculate hub diameters using the formula $K_3=0.8$ as discussed in Selection Procedure.

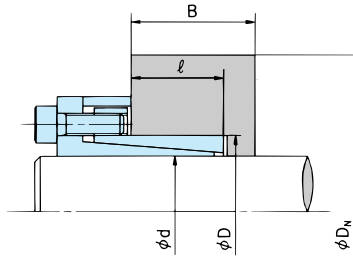


Hub Diameters (2)

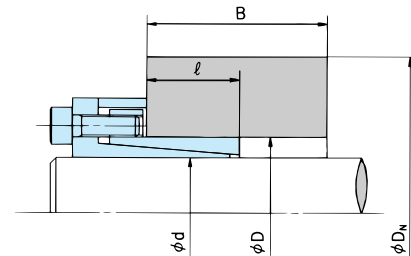
Standard (TF) and Electroless Nickel-Plated (TF-KP) Models (Same dimensions and capacities)

(3) Installing to hubs with a guide portion when $l \leq B < 2l$
(See Installation Example C)

(4) Installing to hubs without a guide portion when $l \leq B < 2l$
(See Installation Example D)



Installation Example(C)
When installing to hubs with a guide portion, the hub configuration coefficient is as follows: $K_3=1.0$



Installation Example(D)
When installing to hubs without a guide portion, the hub configuration coefficient is as follows: $K_3=1.0$

ϕ_{DN} is the minimum hub diameter required to tolerate P' or the pressure exerted from within the hub.

Hub Configuration Coefficient $K_3=1.0$

Minimum hub diameter ϕ_{DN} (mm)

Model No. d X D Shaft Diameter X Outer Diameter mm	Yield Point of Hub Material $\sigma_{0.2}$									
	Hub Contact Pressure P'	MPa								
		MPa	kgf/mm ²	206	225	245	274	294	343	392
			21	23	25	28	30	35	40	45
			FC350 SS400 SC410 S10C FCMB360	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540	FCD450 S35 SF590	FCD500 S45C	FCD600 S55C	FCD700
PL 006 X 012 TF	93	9.5	25	25	25	25	25	25	25	25
PL 007 X 012 TF	93	9.5	25	25	25	25	25	25	25	25
PL 008 X 015 TF	107	10.9	27	27	27	27	27	27	27	27
PL 010 X 018 TF(-KP)	102	10.4	32	32	32	32	32	32	32	32
PL 011 X 018 TF(-KP)	102	10.4	32	32	32	32	32	32	32	32
PL 012 X 020 TF(-KP)	92	9.3	34	34	34	34	34	34	34	34
PL 014 X 022 TF(-KP)	83	8.5	38	38	38	38	38	38	38	38
PL 015 X 023 TF(-KP)	130	13.3	49	45	42	39	39	39	39	39
PL 016 X 024 TF(-KP)	125	12.7	49	45	43	40	40	40	40	40
PL 018 X 026 TF(-KP)	126	12.9	54	49	47	47	47	47	47	47
PL 019 X 027 TF(-KP)	122	12.4	54	50	49	49	49	49	49	49
PL 020 X 028 TF(-KP)	118	12.0	54	50	50	50	50	50	50	50
PL 022 X 032 TF(-KP)	74	7.5	54	54	54	54	54	54	54	54
PL 024 X 034 TF(-KP)	70	7.1	56	56	56	56	56	56	56	56
PL 025 X 034 TF(-KP)	70	7.1	56	56	56	56	56	56	56	56
PL 028 X 039 TF(-KP)	91	9.3	63	61	61	61	61	61	61	61
PL 030 X 041 TF(-KP)	86	8.8	65	62	62	62	62	62	62	62
PL 032 X 043 TF(-KP)	82	8.4	66	65	65	65	65	65	65	65
PL 035 X 047 TF(-KP)	78	8.0	71	69	69	69	69	69	69	69
PL 038 X 050 TF(-KP)	74	7.5	73	72	72	72	72	72	72	72
PL 040 X 053 TF(-KP)	70	7.1	76	75	75	75	75	75	75	75
PL 042 X 055 TF(-KP)	68	6.9	78	78	78	78	78	78	78	78
PL 045 X 059 TF(-KP)	82	8.4	91	87	86	86	86	86	86	86
PL 048 X 062 TF(-KP)	78	8.0	93	90	87	87	87	87	87	87
PL 050 X 065 TF(-KP)	74	7.6	96	92	92	92	92	92	92	92
PL055 X 071 TF(-KP)	63	6.4	98	98	98	98	98	98	98	98
PL060 X 077 TF(-KP)	58	5.9	104	104	104	104	104	104	104	104
PL065 X 084 TF(-KP)	53	5.4	111	111	111	111	111	111	111	111
PL070 X 090 TF(-KP)	67	6.8	126	123	120	119	119	119	119	119
PL075 X 095 TF(-KP)	63	6.4	131	127	126	126	126	126	126	126
PL080 X 100 TF(-KP)	79	8.1	151	145	141	136	133	131	131	131
PL085 X 106 TF(-KP)	75	7.7	156	151	146	141	138	137	137	137
PL090 X 112 TF(-KP)	72	7.3	161	156	152	147	144	144	144	144

Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.
2. Calculate hub diameters using the formula $K_3=1.0$ as discussed in Selection Procedure.

POWER-LOCK SL Series

Sizes : $\phi 24 \sim \phi 300$
 Hub outer diameter tolerance : h7
 Hub bore tolerance : H7
 Surface roughness : Below 12S
 (Shaft tolerance : h6)

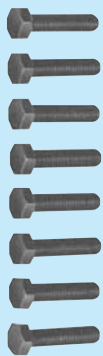


RoHS compliant.

Features

- 1 External Lock**
Excellent for hollow shaft or space restricted installation.
- 2 High Torque**
The larger the shaft diameter, the greater the transmissible torque.
- 3 Easy to Install and Remove**
Installs or removes just by the tightening or loosening of bolts. No need to hassle with adjusting keyways and thermal fittings.
- 4 Simple Construction**
Simply constructed with only an inner ring and taper rings A and B. Simply tighten the locking bolts to achieve a completely secure connection.

Parts



Locking Bolts



Taper Ring A



Inner Ring



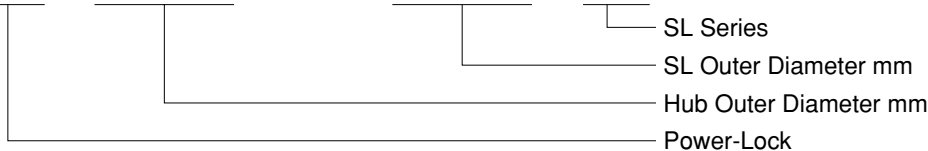
Taper Ring B

The SL Series Power-Locks consist of a taper ring A and B—each with a tapered inner diameter—and an inner ring with a tapered outer diameter. As the locking bolts are tightened, the tapered surfaces of the taper rings A and B slide together.

SL

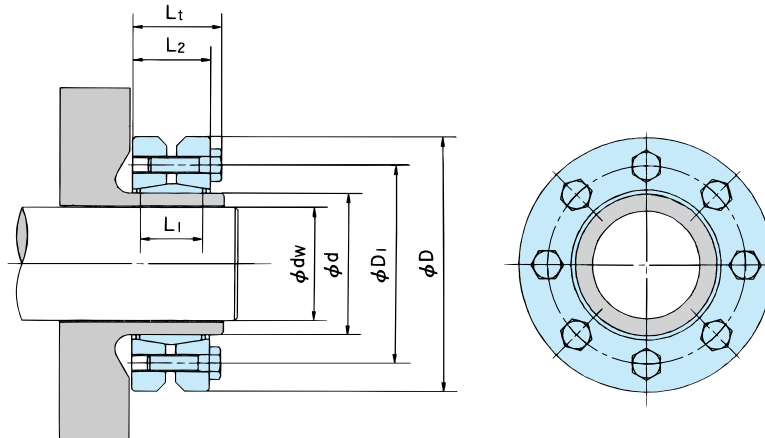
Reference Number System

PL 024 X 050 SL



The inner ring and locking bolts are coated with a special lubricant to avoid rust and to maintain a constant friction coefficient. Application of oil and grease is thus not necessary.

Model Numbers and Specifications

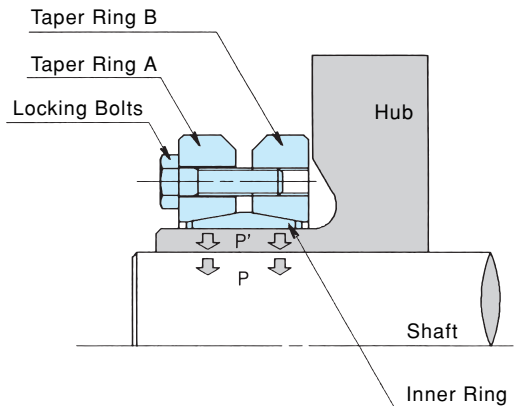


Model No. d X D Hub Outer Diameter X SL Outer Diameter mm	Dimensions mm					Transmissible Torque		Transmissible Thrust		Shaft Contact Pressure		Hub Contact Pressure		Locking Bolts			Mass kg	
	dw	D ₁	L ₁	L ₂	L _t	M _t		P _{ax}		P		P'		Qty.	Size	Tightening Torque M _A		
						N·m	{kgf·m}	kN	{kgf}	MPa	{kgf/mm ² }	MPa	{kgf/mm ² }			N·m		{kgf·m}
PL 024 X 050 SL	19	36	14	19.5	23	167	17	17.9	1830	199	20.3	314	32.0	6	M 5×18	4.9	0.5	0.2
	20					205	21	20.6	2100	216	22.1							
	21					243	25	23.2	2370	232	23.7							
PL 030 X 060 SL	24	44	16	21.5	25	256	26	21.4	2180	164	16.7	254	26.0	7	M 5×18	4.9	0.5	0.3
	25					297	30	23.7	2420	175	17.8							
	26					340	35	26.2	2670	185	18.9							
PL 036 X 072 SL	28	52	18	23.5	27.5	459	47	32.8	3350	192	19.6	271	27.6	5	M 6×20	11.8	1.2	0.4
	30					570	58	38.0	3880	208	21.2							
	31					599	61	38.7	3950	204	20.8							
PL 044 X 080 SL	34	61	20	25.5	29.5	784	80	46.1	4700	200	20.4	278	28.4	7	M 6×20	11.8	1.2	0.6
	35					857	87	49.0	5000	206	21.0							
	36					934	95	51.9	5300	212	21.7							
PL 050 X 090 SL	38	70	22	27.5	31.5	1010	103	53.0	5410	187	19.1	258	26.3	8	M 6×22	11.8	1.2	0.8
	40					1180	120	58.8	6000	197	20.1							
	42					1360	139	64.8	6610	207	21.1							
PL 055 X 100 SL	42	75	23	30.5	34.5	1120	115	53.5	5460	163	16.7	226	23.0	8	M 6×25	11.8	1.2	1.1
	45					1390	142	61.7	6300	176	17.9							
	48					1680	172	70.2	7160	187	19.1							
PL 062 X 110 SL	48	86	23	30.5	34.5	1850	189	77.2	7880	195	19.9	249	25.4	10	M 6×25	11.8	1.2	1.3
	50					2080	212	83.1	8480	202	20.6							
	52					2220	227	85.6	8730	200	20.4							
PL 068 X 115 SL	50	86	23	30.5	34.5	1780	182	71.2	7270	173	17.6	229	23.4	10	M 6×25	11.8	1.2	1.4
	55					2230	227	80.9	8260	179	18.2							
	60					2870	293	95.7	9770	194	19.8							
PL 075 X 138 SL	55	100	25	32.5	38	2590	265	94.4	9630	192	19.5	253	25.9	7	M 8×30	29.4	3.0	1.7
	60					3310	338	111	11300	206	21.0							
	65					4120	421	126	12900	218	22.2							
PL 080 X 145 SL	60	100	25	32.5	38	2980	304	99.3	10100	185	18.9	239	24.4	7	M 8×30	29.4	3.0	1.9
	65					3720	380	115	11700	197	20.1							
	70					4560	465	130	13300	208	21.2							
PL 090 X 155 SL	65	114	30	39	44.5	4600	469	141	14400	203	20.7	255	26.0	10	M 8×35	29.4	3.0	3.3
	70					5600	571	160	16300	213	21.7							
	75					6700	684	178	18200	222	22.6							
PL 100 X 170 SL	70	124	34	44	49.5	5710	582	163	16600	191	19.5	242	24.7	12	M 8×35	29.4	3.0	4.7
	75					6840	698	182	18600	200	20.4							
	80					8090	826	202	20600	208	21.2							
PL 110 X 185 SL	75	136	39	50	57	6960	711	185	18900	177	18.1	226	23.1	9	M10×40	57.8	5.9	5.9
	80					8250	842	207	21100	185	18.8							
	85					9360	955	221	22500	186	18.9							

Notes) 1. Stocked models are in bold.

2. M_t indicates torque at 0 transmissible thrust, while P_{ax} indicates transmissible thrust at 0 torque. If transmissible torque and thrust apply simultaneously calculate and compare the combined value with the transmissible torque provided in the table.

Model Numbers and Specifications

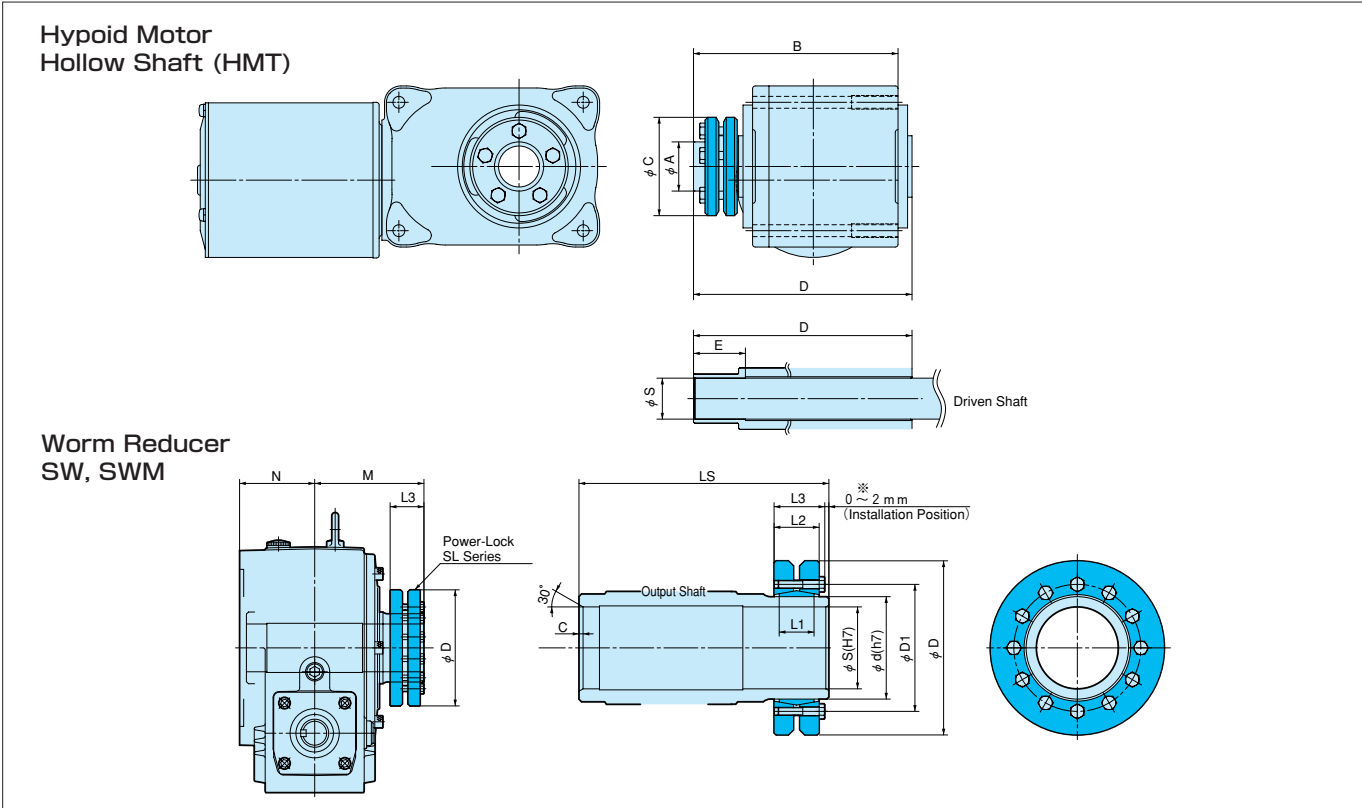


When an SL Power-Lock is tightened, the wedging action between the inner ring and the taper rings applies radial pressure P' on the hub exterior. This pressure P' molds the hub towards the radial direction and strengthens the hub-shaft connection. The greater the value of P' , the tighter the connection.

Model No. d X D Hub Outer Diameter X SL Outer Diameter mm	Dimensions mm					Transmissible Torque		Transmissible Thrust		Shaft Contact Pressure		Hub Contact Pressure		Locking Bolts			Mass kg	
	dw	D ₁	L ₁	L ₂	L _t	Mt		Pax		P		P'		Qty.	Size	Tightening Torque M _A		
						N·m	{kgf·m}	kN	{kgf}	MPa	{kgf/mm ² }	MPa	{kgf/mm ² }			N·m		{kgf·m}
PL 125 X 215 SL	85	160	42	54	61	10200;	1040	240	24500	187	19.1	240	24.4	12	M10×40	57.8	5.9	8.3
	90					11800;	1200	262	26700	194	19.8							
	95					13500;	1380	285	29100	200	20.4							
PL 140 X 230 SL	95	175	46	60.5	68.5	14600;	1490	308	31400	196	20.0	242	24.7	10	M12×45	98.0	10	10
	100					16600;	1690	331	33800	201	20.5							
	105					18700;	1910	357	36400	206	21.0							
PL 155 X 265 SL	105	192	50	64.5	72.5	19200;	1960	366	37300	195	19.9	237	24.2	12	M12×50	98.0	10	15
	110					21600;	2200	392	40000	199	20.3							
	115					24000;	2450	417	42600	203	20.7							
PL 165 X 290 SL	115	210	56	71	81	29500;	3010	513	52300	222	22.7	259	26.4	8	M16×55	245	25	22
	120					32600;	3330	544	55500	226	23.0							
	125					35300;	3600	564	57600	225	23.0							
PL 175 X 300 SL	125	220	56	71	81	32600;	3330	522	53300	208	21.2	246	25.1	8	M16×55	245	25	22
	130					35900;	3660	552	56300	212	21.6							
	135					39400;	4020	584	59600	215	22.0							
PL 185 X 330 SL	135	236	71	86	96	45000;	4590	666	68000	194	19.8	228	23.2	10	M16×65	245	25	37
	140					49100;	5010	702	71600	197	20.1							
	145					53500;	5460	738	75300	200	20.4							
PL 195 X 350 SL	140	246	71	86	96	54800;	5590	783	79900	220	22.5	254	26.0	12	M16×65	245	25	41
	150					64600;	6590	861	87900	226	23.0							
	155					69800;	7120	901	91900	228	23.3							
PL 200 X 350 SL	150	246	71	86	96	64600;	6590	861	87900	226	23.0	254	26.0	12	M16×65	245	25	41
	155					69800;	7120	901	91900	228	23.3							
	160					75200;	7670	940	95900	231	23.6							
PL 220 X 370 SL	160	270	88	104	114	83000;	8470	1040	106000	206	21.0	234	23.9	15	M16×80	245	25	54
	165					89200;	9100	1080	110000	208	21.2							
	170					95700;	9770	1130	115000	210	21.4							
PL 240 X 405 SL	170	295	92	109	122	111000;	11300	1300	133000	233	23.8	260	26.6	12	M20×80	480	49	67
	180					126000;	12900	1400	143000	237	24.2							
	190					141000;	14400	1490	152000	238	24.2							
PL 260 X 430 SL	190	321	103	120	133	149000;	15200	1570	160000	224	22.9	251	25.6	14	M20×90	480	49	82
	200					169000;	17200	1690	172000	228	23.3							
	210					188000;	19200	1790	183000	231	23.6							
PL 280 X 460 SL	210	346	114	134	147	196000;	20000	1860	190000	218	22.2	241	24.6	16	M20×100	480	49	102
	220					219000;	22300	1990	203000	221	22.5							
	230					242000;	24700	2110	215000	224	22.8							
PL 300 X 485 SL	230	364	122	142	155	251000;	25600	2190	223000	217	22.2	237	24.2	18	M20×100	480	49	118
	240					277000;	28300	2310	236000	220	22.5							
	245					290000;	29600	2370	242000	221	22.6							

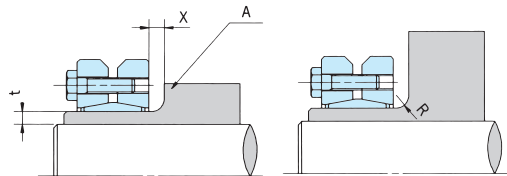
Notes) 1. Mt indicates torque at 0 transmissible thrust, while Pax indicates transmissible thrust at 0 torque. If transmissible torque and thrust apply simultaneously calculate and compare the combined value with the transmissible torque provided in the table.

Design Examples



Notes on mounting to high-rigidity hubs (Refer to the diagram below)

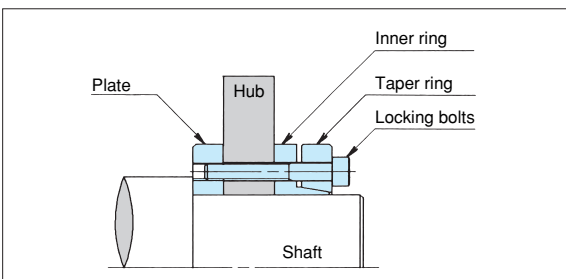
When mounting an SL Power-Lock to a highly rigid hub having a large diameter at A shown in the diagram, distance X or the clearance between the Power-Lock and the hub shoulder must be considered. When X is too small it indicates an incomplete installation, thus standard torque will not be achieved. In this case, increase X so that it is greater than the thickness of the hub wall t. Install an SL Power-Lock only if X > t. For flanges or other hubs with large outer diameters, make sure the value of R is also large or at least R6mm.



Sister Product

SZ Types are Sister Products to SL Series

SZ Type

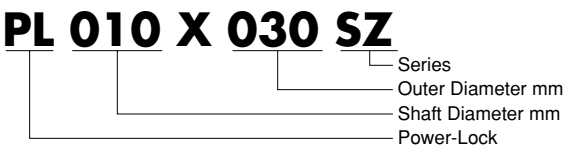


Unlike frictional locking devices, the SZ Type Power-Locks can be used with hubs that have low material strengths.

Features

- 1. Highly Suitable for Hubs with Low Material Strengths**
Structured to produce low contact pressure so that they provide excellent, reliable connections with hubs made from low yield point materials such as copper and aluminum.
- 2. Backlash Free**
Completely backlash free. No need to consider shaft wears and burns caused by shock and vibration.
- 3. Simple Positioning and Phase Adjustment**
Restriction-free shaft positioning and easy phase adjustment. No hub movement during installation.

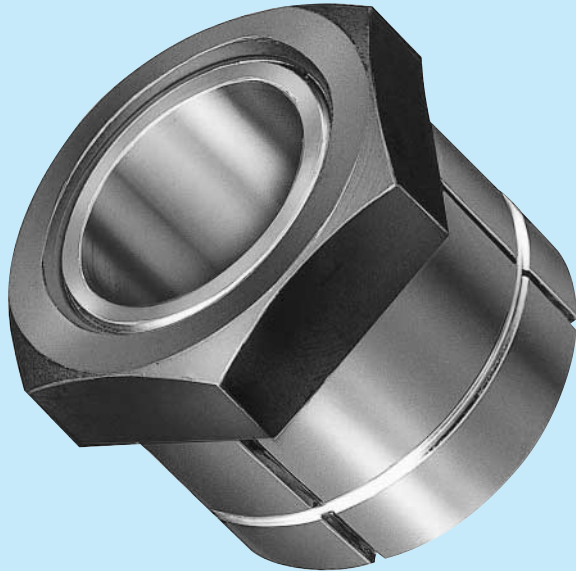
Reference Number System



SZ models are made to order. Please contact us for details on specifications, price and delivery.

POWER-LOCK **ML** Series

Sizes : $\phi 5 \sim \phi 75$
 Shaft tolerance : h8
 Hub bore tolerance : H8
 Surface roughness : Below 12S

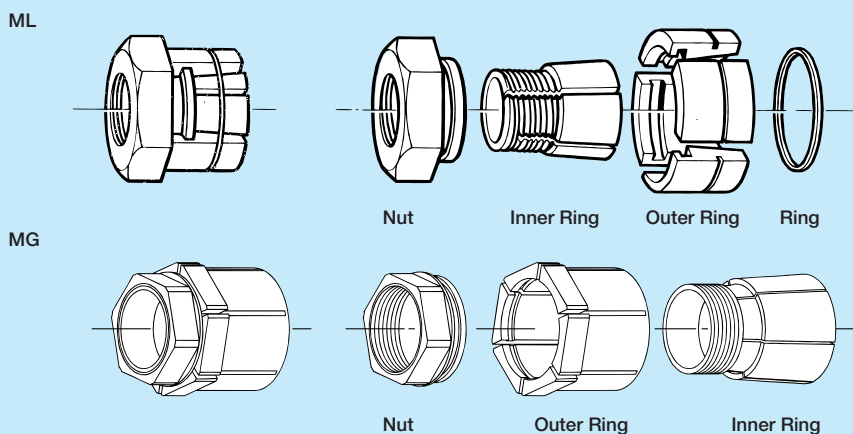


Please contact for RoHS compliant models.

Features

- 1 Self-Centering**
 These units provide accurate shaft-hub alignment and concentricity, allowing straight bore mounting.
- 2 Suitable for Narrow Hubs**
 Suitable for both narrow and wide hubs. Also fitting for hubs whose lengths are shorter than the widths of ML (MG) Power-Locks.
- 3 Easy to Install and Remove**
 Installs or removes just by the loosening or tightening of bolts. No need to hassle with adjusting keyways and thermal fittings.
- 4 Compact Design**
 Compact and space saving.

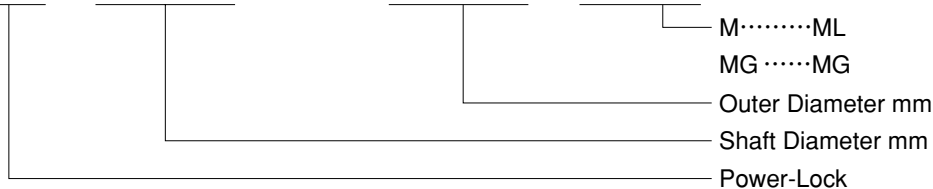
Parts



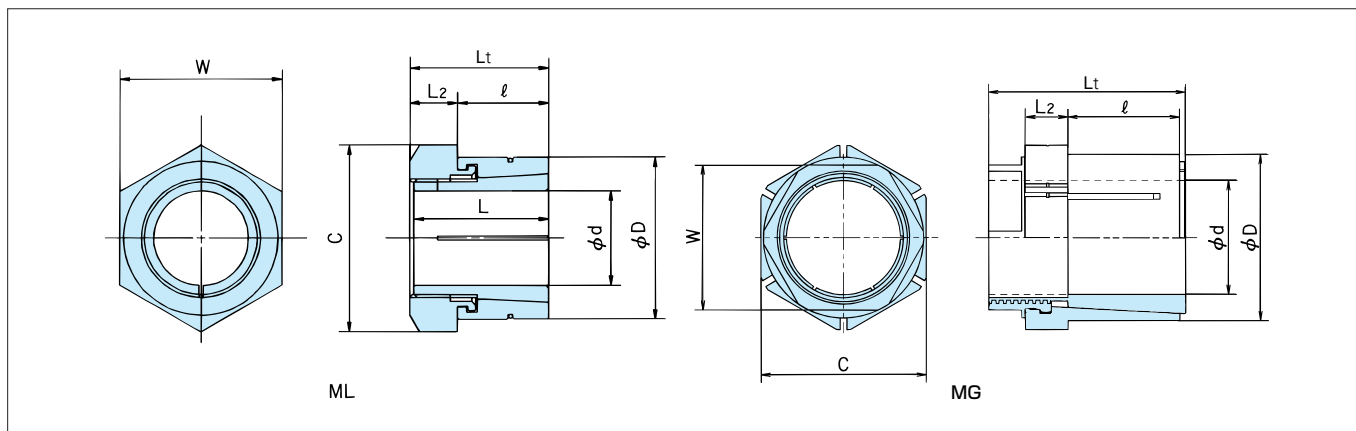
The ML Series Power-Locks are simply constructed of the following four parts: inner and outer rings, a nut and retaining ring. The outer ring is divided into four parts. The nut and outer ring are designed to interlock with each other while the retaining ring holds the outer ring in place.

Reference Number System

PL 040 X 067 MG



Model Numbers and Specifications



Model No. d X D Shaft Diameter X Outer Diameter mm	Dimensions mm						Transmissible Torque		Transmissible Thrust		Contact Pressure				Tightening Torque		Mass
	Lt	l	L ₂	L	W	C	Mt		Pax		Shaft P		Hub P'		M _A		kg
							N·m	{kgf·m}	kN	{kgf}	MPa	{kgf/mm ² }	MPa	{kgf/mm ² }	N·m	{kgf·m}	
PL 005 X 016 M	15	10	5	14	17	19.6	6.76	0.69	2.65	270	181	18.5	45	4.6	5.39	0.55	0.02
PL 006 X 016 M							8.13	0.83			161	16.4					
PL 007 X 021 M	21	14	7	20	22	25.4	22.5	2.3	6.57	670	179	18.3	60	6.1	16.7	1.7	0.05
PL 008 X 021 M							26.5	2.7			163	16.6					
PL 009 X 021 M							29.4	3.0			150	15.3					
PL 010 X 024 M	22	14	8	21	24	27.7	42.1	4.3	8.43	860	180	18.4	68	6.9	24.5	2.5	0.06
PL 011 X 024 M							46.1	4.7			172	17.5					
PL 012 X 024 M							50.0	5.1			164	16.7					
PL 014 X 031 M	27	17	10	26	32	37	108	11	16.1	1640	186	19.0	81	8.3	60.8	6.2	0.13
PL 015 X 031 M							118	12			179	18.3					
PL 016 X 031 M							127	13			173	17.7					
PL 017 X 036 M	33	21	12	32	36	41.6	196	20	22.8	2330	181	18.5	80	8.2	104	10.6	0.20
PL 018 X 036 M							206	21			175	17.9					
PL 019 X 036 M							216	22			171	17.4					
PL 020 X 041 M	35	23	12	34	41	47.3	245	25	24.9	2540	156	15.9	71	7.2	129	13.2	0.27
PL 022 X 041 M							274	28			149	15.2					
PL 024 X 041 M							294	30			144	14.7					
PL 025 X 046 M	37	25	12	36	46	53.1	374	38	30.1	3070	138	14.1	70	7.1	178	18.2	0.33
PL 028 X 046 M							421	43			131	13.4					
PL 030 X 050 M	41	28	13	40	50	57.7	451	46	30.1	3070	111	11.3	66	6.7	274	28.0	0.41
PL 032 X 050 M							480	49			104	10.6					
*PL 034 X 060 MG D=60.5	70.0	38.0	13.0	-	50	60.3	570	58	33.7	3430	65	6.6	39	4.0	260	26.6	0.77
*PL 035 X 060 MG D=60.5							590	60			63	6.4					
*PL 036 X 060 MG D=60.5							600	61			61	6.2					
*PL 038 X 060 MG D=60.5							640	65			58	5.9					
PL 040 X 067 MG	79.5	43.0	17.5	-	60	66.7	720	73	36.2	3690	53	5.4	34	3.5	316	32.3	1.05
PL 042 X 067 MG							760	77			51	5.2					
PL 045 X 067 MG							810	82			47	4.8					
PL 048 X 073 MG	90.5	51.0	19.0	-	65	73.0	1350	137	57.5	5860	60	6.1	42	4.3	554	56.6	1.36
PL 050 X 073 MG							1430	145			57	5.8					
PL 055 X 080 MG	95.3	54.0	20.5	-	70	79.4	1560	159	56.8	5790	49	5.0	38	3.9	600	61.3	2.13
PL 060 X 086 MG	98.4	57.2	19.0	-	75	85.7	1650	168	55.1	5620	41	4.2	30	3.1	635	64.8	2.27
PL 065 X 092 MG	103.2	60.3	20.5	-	82	92.1	1770	180	54.5	5560	36	3.7	27	2.8	680	69.4	2.68
PL 070 X 092 MG							1900	193			33	3.4					
PL 075 X 100 MG	108.0	63.5	20.5	-	90	98.4	2000	204	56.0	5710	30	3.1	24	2.4	750	76.6	2.72

Notes) 1. Note that model numbers marked with an asterisk do not indicate the exact outer diameter dimensions.

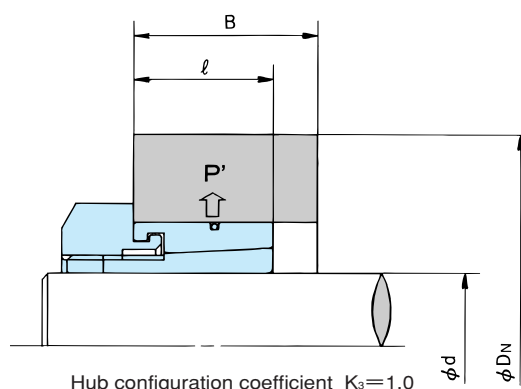
2. Stocked models are in bold.

3. Mt indicates torque at 0 transmissible thrust, while Pax indicates transmissible thrust at 0 torque. If transmissible torque and thrust apply simultaneously calculate and compare the combined value with the transmissible torque provided in the table.

Hub Diameters for ML Models

Hub diameters when $B \geq \ell$

D_N is the minimum hub diameter required to tolerate P' or the pressure exerted from within the hub.



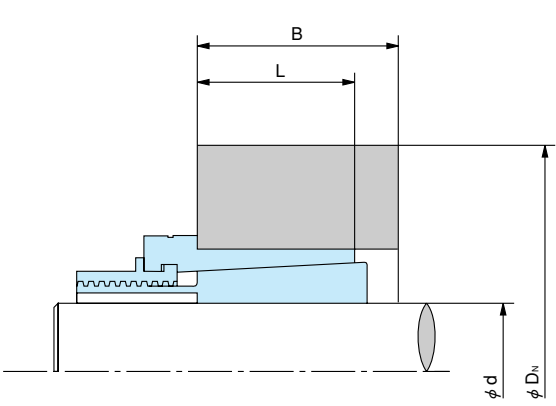
Hub Configuration Coefficient $K_3=1.0$

Minimum hub diameter ϕ_{DN} (mm)

Model No. d X D Shaft Diameter X Outer Diameter mm	Tightening Torque	Yield Point of Hub Material $\sigma_{0.2}$											
		Hub Contact Pressure P' MPa [kgf/mm ²]	MPa kgf/mm ²										
			147 15	176 18	206 21	225 23	245 25	274 28	294 30	343 35	392 40	441 45	
PL 005 X 016 M	MA50	22.5 2.3	20	20	20	20	20	20	20	20	20	20	20
	MA75	33.3 3.4	21	20	20	20	20	20	20	20	20	20	20
PL 006 X 016 M	MA	45.0 4.6	22	21	20	20	20	20	20	20	20	20	20
	MA50	30.4 3.1	26	26	26	26	26	26	26	26	26	26	26
PL 007 X 021 M	MA75	46.1 4.7	30	28	27	26	26	26	26	26	26	26	26
	MA	60.0 6.1	33	30	29	28	27	27	26	26	26	26	26
PL 010 X 024 M	MA50	33.3 3.4	31	30	29	29	29	29	29	29	29	29	29
	MA75	51.9 5.3	35	33	32	31	30	30	29	29	29	29	29
PL 012 X 024 M	MA	68.0 6.9	40	36	34	33	32	31	31	31	30	29	29
	MA50	41.2 4.2	42	40	38	38	38	38	38	38	38	38	38
PL 014 X 031 M	MA75	60.8 6.2	49	45	43	41	40	39	39	39	38	38	38
	MA	81.0 8.3	58	51	47	46	44	42	42	42	42	39	38
PL 017 X 036 M	MA50	41.2 4.2	48	46	44	44	44	44	44	44	44	44	44
	MA75	60.8 6.2	56	52	49	48	47	46	45	44	44	44	44
PL 019 X 036 M	MA	80.0 8.2	65	59	55	53	51	49	48	46	45	44	44
	MA50	35.3 3.6	53	51	50	50	50	50	50	50	50	50	50
PL 020 X 041 M	MA75	53.9 5.5	61	57	54	53	52	50	50	50	50	50	50
	MA	71.0 7.2	70	63	59	57	56	54	53	51	50	50	50
PL 025 X 046 M	MA50	35.3 3.6	59	57	56	56	56	56	56	56	56	56	56
	MA75	51.9 5.3	67	63	60	59	57	56	56	56	56	56	56
PL 028 X 046 M	MA	70.0 7.1	77	70	66	64	62	60	59	57	56	56	56
	MA50	33.3 3.4	62	60	58	58	57	56	56	56	55	54	53
PL 030 X 050 M	MA75	49.0 5.0	70	66	63	62	61	59	59	57	56	55	55
	MA	66.0 6.7	80	73	69	67	65	63	62	60	59	58	58

Note) 1. The above figures do not take safety rates into account. Consider them prior to operation.

Hub Diameters for MG Models



Note) When the hub length is smaller than ℓ or when $B < \ell$, use the formula below to calculate the hub diameter.

$$D_N \geq D \sqrt{\frac{\sigma_{0.2} + P'_k}{\sigma_{0.2} - P'_k}}$$

$$P'_k = P' \times \frac{\ell}{B}$$

$\sigma_{0.2}$: Hub material yield point. MPa {kgf/mm²}
 P'_k : Contact pressure exerted from within the hub. MPa {kgf/mm²}

Hub configuration coefficient $K_3=1.0$

Hub Configuration Coefficient $K_3=1.0$

Minimum hub diameter ϕD_N (mm)

Model No. d X D Shaft Diameter X Outer Diameter mm	Yield Point of Hub Material $\sigma_{0.2}$											
	MPa	147	176	206	225	245	274	294	343	392	441	
	{kgf/mm ² }	15	18	21	23	25	28	30	35	40	45	
	Hub Contact Pressure P'	FC250	FC300 SS330 SC360	FC350 SS400 SC410 S10C FCMB310	SC450 S15C SF440	FC400 SS490 SC480 S20C SF490	S30C SF540	FCD450 S35 SF590	FCD500 S45C	FCD600 S55C	FCD700	
	MPa											
	{kgf/mm ² }											
※PL034 X 060 MG D=60.5	39	4.0	80	76	74	73	72	70	70	68	67	67
※PL035 X 060 MG D=60.5	39	4.0	80	76	74	73	72	70	70	68	67	67
※PL036 X 060 MG D=60.5	39	4.0	80	76	74	73	72	70	70	68	67	67
※PL038 X 060 MG D=60.5	39	4.0	80	76	74	73	72	70	70	68	67	67
PL040 X 067 MG	34	3.5	85	82	80	78	78	76	76	75	74	73
PL042 X 067 MG	34	3.5	85	82	80	78	78	76	76	75	74	73
PL045 X 067 MG	34	3.5	85	82	80	78	78	76	76	75	74	73
PL048 X 073 MG	42	4.3	98	94	90	89	87	86	85	83	82	81
PL050 X 073 MG	42	4.3	98	94	90	89	87	86	85	83	82	81
PL055 X 080 MG	38	3.9	105	100	97	95	94	92	92	90	89	88
PL060 X 086 MG	30	3.1	106	103	100	99	98	96	96	94	93	93
PL065 X 092 MG	27	2.8	111	108	105	104	103	102	101	100	99	98
PL070 X 092 MG	27	2.8	111	108	105	104	103	102	101	100	99	98
PL075 X 100 MG	24	2.4	118	115	113	112	111	110	109	108	107	106

Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.

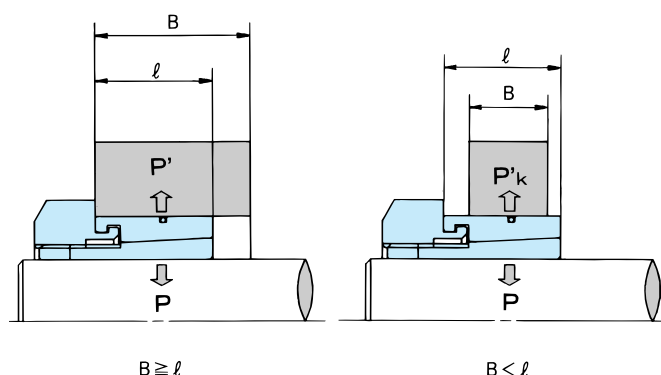
2. Note that model numbers marked with an asterisk do not indicate the exact outer diameter dimensions.

Notes on Non-Ferrous Materials

Hubs made from non-ferrous materials may be used. However, since $\sigma_{0.2B} \leq 1.4P'(P'_k)$ avoid using shafts consisting of such materials. Otherwise, the friction coefficient of steel will change, which may affect the ML Power-Lock features.

ML Model Tightening Torque and its Effects

Transmissible torque, thrust and contact pressure of ML Power-Locks are all proportional to their tightening torque. Below shows tightening torque M_A at 1/2 or 3/4 of the M_A values indicated in the Model Numbers and Specifications table. Refer to the table below when reducing your tightening or transmissible torque and contact pressure. Note that allowable range for M_A is $1/2 M_A \sim 1.1 M_A$.



Note) When the hub length is less than l or when $B < l$, use the formula below to calculate the hub contact pressure P'_k .

$$P'_k = P' \times \frac{l}{B}$$

Model No. d X D Shaft Diameter X Outer Diameter mm	$M_{A50} = 0.5M_A$										$M_{A75} = 0.75M_A$									
	Transmissible Torque Mt ₅₀		Transmissible Thrust Pax ₅₀		Contact Pressure				Tightening Torque M _{A50}		Transmissible Torque Mt ₇₅		Transmissible Thrust Pax ₇₅		Contact Pressure				Tightening Torque M _{A75}	
					Shaft P ₅₀		Hub P' ₅₀								Shaft P ₇₅		Hub P' ₇₅			
N·m	{kgf·m}	kN	{kgf}	MPa	{kgf/mm ² }	MPa	{kgf/mm ² }	N·m	{kgf/mm ² }	N·m	{kgf·m}	kN	{kgf}	MPa	{kgf/mm ² }	MPa	{kgf/mm ² }	N·m	{kgf·m}	
PL 005 X 016 M	3.33	0.34			89.0	9.1				4.90	0.5			132	13.5					
PL 006 X 016 M	3.92	0.40	1.27	130	79.0	8.1	23	2.3	2.65	0.27	5.90	0.6	1.86	190	118	12.0	33	3.4	3.92	0.4
PL 007 X 021 M	11.8	1.2			90.0	9.2				16.7	1.7			137	14.0					
PL 008 X 021 M	12.7	1.3	3.23	330	81.0	8.3	30	3.1	8.33	0.85	19.6	2.0	5.00	510	124	12.7	46	4.7	12.7	1.3
PL 009 X 021 M	14.7	1.5			75.0	7.7				22.5	2.3			115	11.7					
PL 010 X 024 M	19.6	2.0			87.0	8.9				31.4	3.2			137	14.0					
PL 011 X 024 M	21.6	2.2	4.02	410	82.0	8.4	33	3.4	11.8	1.2	34.3	3.5	6.37	650	130	13.3	52	5.3	18.6	1.9
PL 012 X 024 M	23.5	2.4			79.0	8.1				37.2	3.8			124	12.7					
PL 014 X 031 M	53.9	5.5			93.0	9.5				79.4	8.1			138	14.1					
PL 015 X 031 M	58.8	6.0	8.04	820	90.0	9.2	41	4.2	30.4	3.1	87.2	8.9	11.9	1210	133	13.6	61	6.2	45.1	4.6
PL 016 X 031 M	63.7	6.5			87.0	8.9				94.1	9.6			129	13.2					
PL 017 X 036 M	98.0	10.0			93.0	9.5				147	15.0			137	14.0					
PL 018 X 036 M	103	10.5	11.6	1180	90.0	9.2	41	4.2	52.9	5.4	152	15.5	17.2	1750	132	13.5	61	6.2	78.4	8.0
PL 019 X 036 M	108	11.0			87.0	8.9				162	16.5			129	13.2					
PL 020 X 041 M	123	12.5			78.0	8.0				181	18.5			119	12.1					
PL 022 X 041 M	137	14.0	12.4	1270	74.0	7.6	35	3.6	64.7	6.6	206	21.0	18.8	1920	114	11.6	54	5.5	98.0	10.0
PL 024 X 041 M	147	15.0			73.0	7.4				216	22.0			110	11.2					
PL 025 X 046 M	186	19			71.0	7.2				274	28			104	10.6					
PL 028 X 046 M	206	21	15.2	1550	67.0	6.8	35	3.6	90.2	9.2	314	32	22.4	2290	99.0	10.1	52	5.3	133	13.6
PL 030 X 050 M	225	23			56.0	5.7				333	34			83.3	8.5					
PL 032 X 050 M	235	24	15.0	1530	52.0	5.3	33	3.4	137	14.0	353	36	22.5	2300	78.4	8.0	50	5.1	206	21

Note) 1. The above figures do not take safety rates into account. Consider them prior to operation.

POWER-LOCK EF Series

Sizes : $\phi 10 \sim \phi 120$
 Shaft tolerance : h8
 Hub bore tolerance : H8
 Surface roughness : Below 12S



RoHS compliant.

Features

1 Same Inner and Outer Diameters as the EL Series

Designed with the same inner and outer diameters as an EL Series Power-Lock.

2 Self-Centering

These units provide accurate shaft-hub alignment and concentricity, allowing straight bore mounting.

3 Simple Construction

Constructed with only an inner and an outer ring and locking bolts. Simply tighten these bolts to achieve a completely secure connection.

Parts

Locking Bolts



Inner Ring



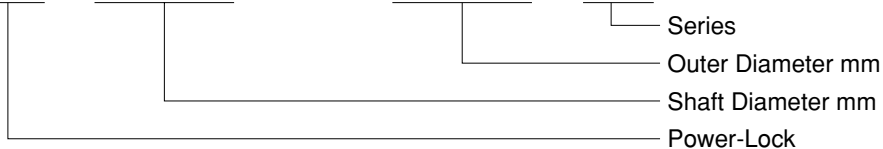
Outer Ring



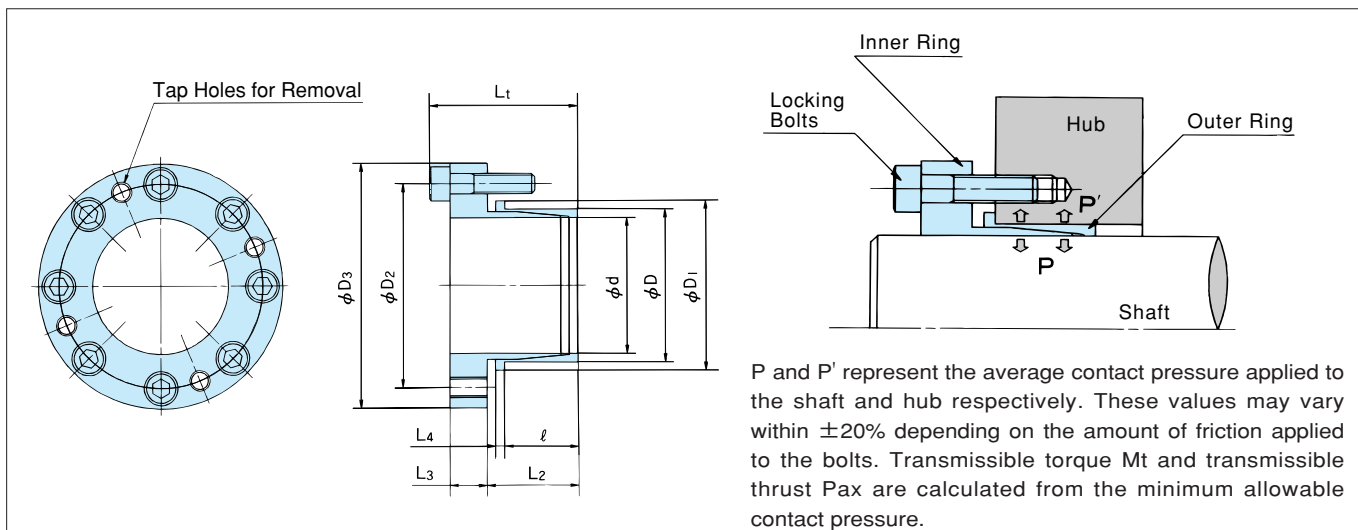
The EF Series Power-Locks are simply constructed of the following three parts : inner and outer rings, and locking bolts. Simply tighten these bolts to achieve a completely secure connection.

Reference Number System

PL 018 X 022 EF



Model Numbers and Specifications



P and P' represent the average contact pressure applied to the shaft and hub respectively. These values may vary within $\pm 20\%$ depending on the amount of friction applied to the bolts. Transmissible torque M_t and transmissible thrust P_{ax} are calculated from the minimum allowable contact pressure.

Model No. d X D Shaft Diameter X Outer Diameter	Dimensions								Locking Bolts				
	mm								Qty.	Size	Tightening Torque (MA)		
	ℓ	L_2	L_3	L_4	L_t	D_1	D_2	D_3			N·m	{kgf·m}	
PL 010 X 013 EF	11.5	14.5	5	1.5	23.5	16	22	30	3	M 4 × 16	4.0	0.41	
PL 011 X 014 EF	11.5	14.5	5	1.5	23.5	17	23	31	3	M 4 × 16	4.0	0.41	
PL 012 X 015 EF	11.5	14.5	5	1.5	23.5	18	24	32	3	M 4 × 16	4.0	0.41	
PL 014 X 018 EF	16.0	20.0	6	2.0	30.0	22	27	35	4	M 4 × 18	4.0	0.41	
PL 015 X 019 EF	16.0	20.0	6	2.0	30.0	23	28	36	4	M 4 × 18	4.0	0.41	
PL 016 X 020 EF	16.0	20.0	7	2.0	31.0	24	29	37	6	M 4 × 18	4.0	0.41	
PL 017 X 021 EF	16.0	20.0	7	2.0	31.0	25	30	38	6	M 4 × 18	4.0	0.41	
PL 018 X 022 EF	16.0	20.0	7	2.0	32.0	26	33	43	4	M 5 × 20	8.3	0.85	
PL 019 X 024 EF	16.0	20.0	7	2.0	32.0	28	35	45	4	M 5 × 20	8.3	0.85	
PL 020 X 025 EF	16.0	20.0	7	2.0	32.0	29	36	46	4	M 5 × 20	8.3	0.85	
PL 022 X 026 EF	16.0	20.0	7	2.0	32.0	30	38	48	4	M 5 × 20	8.3	0.85	
PL 024 X 028 EF	16.0	20.0	7	2.0	32.0	32	40	50	4	M 5 × 20	8.3	0.85	
PL 025 X 030 EF	16.0	20.0	7	2.0	32.0	34	42	52	4	M 5 × 20	8.3	0.85	
PL 028 X 032 EF	16.0	20.5	8	2.0	33.5	36	44	54	6	M 5 × 25	8.3	0.85	
PL 030 X 035 EF	16.0	20.5	8	2.0	33.5	39	47	57	6	M 5 × 25	8.3	0.85	
PL 032 X 036 EF	16.0	21.0	9	2.5	35.0	41	49	59	6	M 5 × 25	8.3	0.85	
PL 035 X 040 EF	17.5	22.5	9	2.5	36.5	45	53	63	6	M 5 × 25	8.3	0.85	
PL 038 X 044 EF	17.5	23.0	10	2.5	39.0	49	58	70	6	M 6 × 28	13.7	1.4	
PL 040 X 045 EF	20.0	25.5	10	2.5	41.5	50	59	71	6	M 6 × 28	13.7	1.4	
PL 042 X 048 EF	20.0	25.5	11	2.5	42.5	53	62	74	8	M 6 × 28	13.7	1.4	
PL 045 X 052 EF	25.0	31.5	13	3.0	52.5	58	69	84	6	M 8 × 35	34.3	3.5	
PL 048 X 055 EF	25.0	31.5	13	3.0	52.5	61	72	87	6	M 8 × 35	34.3	3.5	
PL 050 X 057 EF	25.0	31.5	13	3.0	52.5	63	74	89	6	M 8 × 35	34.3	3.5	
PL 055 X 062 EF	25.0	31.5	13	3.0	52.5	68	79	94	6	M 8 × 35	34.3	3.5	
PL 060 X 068 EF	27.0	34.0	13	3.5	55.0	75	86	101	6	M 8 × 35	34.3	3.5	
PL 065 X 073 EF	27.0	34.0	15	3.5	57.0	80	91	106	8	M 8 × 40	34.3	3.5	
PL 070 X 079 EF	31.0	38.0	15	3.5	61.0	86	97	112	8	M 8 × 40	34.3	3.5	
PL 075 X 084 EF	31.0	38.5	16	3.5	62.5	91	102	117	10	M 8 × 40	34.3	3.5	
PL 080 X 091 EF	34.0	42.0	17	4.0	67.0	99	110	125	10	M 8 × 40	34.3	3.5	
PL 085 X 096 EF	34.0	42.5	19	4.0	71.5	104	118	137	8	M10 × 45	67.6	6.9	
PL 090 X 101 EF	34.0	42.5	19	4.0	71.5	109	123	142	8	M10 × 45	67.6	6.9	
PL 095 X 106 EF	34.0	42.5	19	4.0	71.5	114	128	147	8	M10 × 45	67.6	6.9	
PL 100 X 114 EF	42.0	50.5	20	4.0	80.5	122	136	155	10	M10 × 45	67.6	6.9	
PL 110 X 124 EF	42.0	50.5	20	4.0	80.5	132	146	165	10	M10 × 45	67.6	6.9	
PL 120 X 134 EF	42.0	50.5	22	4.0	82.5	142	156	175	12	M10 × 50	67.6	6.9	

Note) 1. Stocked models are in bold.



Model Numbers and Specifications

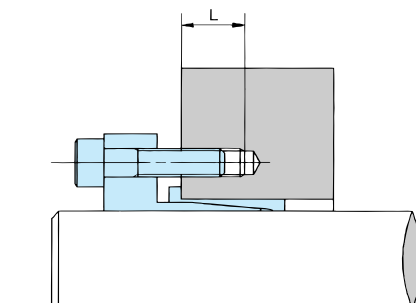
■ Hub Tap Holes

The locking bolts for EF Power-Locks are equally spaced.
Prepare hub screw holes accordingly. The depths of tap holes should be determined by the following formula.

$$L = (\text{The nominal length of bolts}) - (L_3 + L_4)$$

L_3 : Inner Ring Flange Thickness

L_4 : Outer Ring Flange Thickness



Model No. d X D { Shaft Diameter X Outer Diameter } mm	Transmissible Torque		Transmissible Thrust		Shaft Contact Pressure		Hub Contact Pressure		Mass
	Mt		Pax		P		P'		Kg
	N·m	{kgf·m}	kN	{kgf}	MPa	{kgf/mm ² }	MPa	{kgf/mm ² }	
PL 010 X 013 EF	39	4.0	7.79	795	292	29.8	224	22.9	0.04
PL 011 X 014 EF	43	4.4	7.79	795	266	27.1	209	21.3	0.04
PL 012 X 015 EF	47	4.8	7.79	795	243	24.8	195	19.9	0.04
PL 014 X 018 EF	73	7.4	10.4	1060	209	21.3	163	16.6	0.06
PL 015 X 019 EF	78	8.0	10.4	1060	195	19.9	154	15.7	0.07
PL 016 X 020 EF	124	12.7	15.6	1590	273	27.9	219	22.3	0.08
PL 017 X 021 EF	132	13.5	15.6	1590	258	26.3	209	21.3	0.08
PL 018 X 022 EF	154	15.7	17.1	1740	267	27.2	218	22.2	0.10
PL 019 X 024 EF	163	16.6	17.1	1740	252	25.7	200	20.4	0.11
PL 020 X 025 EF	171	17.4	17.1	1740	240	24.5	192	19.6	0.12
PL 022 X 026 EF	186	19.0	17.1	1740	218	22.2	184	18.8	0.12
PL 024 X 028 EF	206	21.0	17.1	1740	200	20.4	172	17.5	0.12
PL 025 X 030 EF	216	22.0	17.1	1740	192	19.6	160	16.3	0.16
PL 028 X 032 EF	353	36.0	25.6	2610	257	26.2	224	22.9	0.16
PL 030 X 035 EF	382	39.0	25.6	2610	240	24.5	206	21.0	0.19
PL 032 X 036 EF	412	42.0	25.6	2610	224	22.9	200	20.4	0.20
PL 035 X 040 EF	451	46.0	25.6	2610	178	18.2	157	16.0	0.23
PL 038 X 044 EF	686	70.0	36.1	3680	231	23.6	200	20.4	0.33
PL 040 X 045 EF	725	74.0	36.1	3680	180	18.4	161	16.4	0.33
PL 042 X 048 EF	1010	103	48.0	4900	229	23.4	201	20.5	0.40
PL 045 X 052 EF	1490	152	66.3	6770	244	24.9	211	21.5	0.65
PL 048 X 055 EF	1600	163	66.3	6770	228	23.3	199	20.3	0.68
PL 050 X 057 EF	1660	169	66.3	6770	220	22.4	192	19.6	0.69
PL 055 X 062 EF	1820	186	66.3	6770	199	20.3	176	18.0	0.74
PL 060 X 068 EF	1990	203	66.3	6770	164	16.7	144	14.7	0.86
PL 065 X 073 EF	2870	293	88.5	9030	201	20.5	179	18.3	1.1
PL 070 X 079 EF	3100	316	88.5	9030	177	18.1	158	16.1	1.2
PL 075 X 084 EF	4150	423	111	11290	207	21.1	185	18.9	1.3
PL 080 X 091 EF	4420	451	111	11290	176	18.0	155	15.8	1.7
PL 085 X 096 EF	5980	610	141	14360	212	21.6	187	19.1	2.2
PL 090 X 101 EF	6330	646	141	14360	200	20.4	178	18.2	2.3
PL 095 X 106 EF	6680	682	141	14360	189	19.3	170	17.3	2.4
PL 100 X 114 EF	8790	897	176	17950	165	16.8	144	14.7	3.0
PL 110 X 124 EF	9670	987	176	17950	150	15.3	133	13.6	3.3
PL 120 X 134 EF	12600	1290	211	21540	165	16.8	148	15.1	3.8

Note) 1. Mt indicates torque at 0 transmissible thrust, while Pax indicates transmissible thrust at 0 torque. If transmissible torque and thrust apply simultaneously calculate and compare the combined value with the transmissible torque provided in the table.

Hub Diameters (1)

(1) Installing to hubs with a guide portion

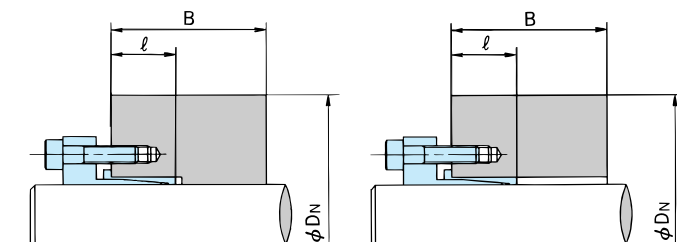
when $B \geq 2 \ell$

(See Installation Example A)

(2) Installing to hubs without a guide portion

when $B \geq 2 \ell$

(See Installation Example B)



Installation Example(A)
When installing to hubs with a guide portion, the hub configuration coefficient is as follows: $K_3=0.8$

Installation Example(B)
When installing to hubs without a guide portion, the hub configuration coefficient is as follows: $K_3=0.8$

D_N is the minimum hub diameter required to tolerate P' or the pressure exerted from within the hub.

Hub Configuration Coefficient $K_3=0.8$

Minimum hub diameter ϕD_N (mm)

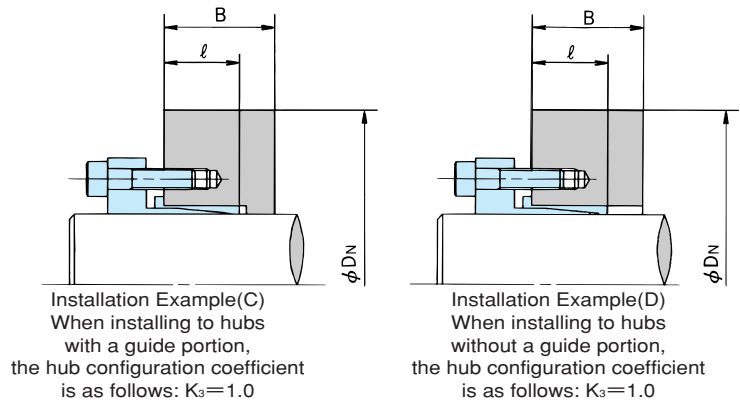
Model No. d X D Shaft Diameter X Outer Diameter mm	Yield Point of Hub Material $\sigma_{0.2}$							
	Hub Contact Pressure P'		245	274	294	343	392	441
	MPa	{kgf/mm ² }	25	28	30	35	40	45
			FCD400 SS490 SC480 S20C SF490	S30S SF540	S35C SF590	S45C	S55C	
PL 010 X 013 EF	224	22.9	38	33	31	31	31	31
PL 011 X 014 EF	209	21.3	37	33	31	31	31	31
PL 012 X 015 EF	195	19.9	36	33	32	32	32	32
PL 014 X 018 EF	163	16.6	37	35	35	35	35	35
PL 015 X 019 EF	154	15.7	38	38	38	38	38	38
PL 016 X 020 EF	219	22.3	53	47	44	40	37	37
PL 017 X 021 EF	209	21.3	53	47	45	40	38	38
PL 018 X 022 EF	218	22.2	59	52	49	44	44	44
PL 019 X 024 EF	200	20.4	58	52	50	45	45	45
PL 020 X 025 EF	192	19.6	58	53	50	46	46	46
PL 022 X 026 EF	184	18.8	58	53	51	50	50	50
PL 024 X 028 EF	172	17.5	58	54	52	52	52	52
PL 025 X 030 EF	160	16.3	59	55	53	53	53	53
PL 028 X 032 EF	224	22.9	87	75	71	63	58	55
PL 030 X 035 EF	206	21.0	85	76	71	65	60	57
PL 032 X 036 EF	200	20.4	84	76	72	65	61	60
PL 035 X 040 EF	157	16.0	76	71	69	64	64	64
PL 038 X 044 EF	200	20.4	103	92	87	79	74	71
PL 040 X 045 EF	161	16.4	87	81	78	73	73	73
PL 042 X 048 EF	201	20.5	112	100	95	86	81	77
PL 045 X 052 EF	211	21.5	129	115	108	98	91	86
PL 048 X 055 EF	199	20.3	128	115	109	99	93	89
PL 050 X 057 EF	192	19.6	128	116	110	101	95	91
PL 055 X 062 EF	176	18.0	128	118	113	105	99	95
PL 060 X 068 EF	144	14.7	122	115	111	105	101	101
PL 065 X 073 EF	179	18.3	151	139	133	122	116	111
PL 070 X 079 EF	158	16.1	148	138	134	125	119	115
PL 075 X 084 EF	185	18.9	178	162	155	142	134	128
PL 080 X 091 EF	155	15.8	167	157	151	141	135	130
PL 085 X 096 EF	187	19.1	206	188	179	164	154	147
PL 090 X 101 EF	178	18.2	207	190	182	168	158	152
PL 095 X 106 EF	170	17.3	208	193	185	172	163	156
PL 100 X 114 EF	144	14.7	200	189	183	172	165	159
PL 110 X 124 EF	133	13.6	208	197	192	182	174	169
PL 120 X 134 EF	148	15.1	238	223	216	203	194	187

Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.
2. Calculate hub diameters using the formula $K_3=0.8$ as discussed in Selection Procedure.

Hub Diameters (2)

(3) Installing to hubs with a guide portion
when $l < B < 2l$
(See Installation Example C)

(4) Installing to hubs without a guide portion
when $l < B < 2l$
(See Installation Example D)



ϕ_{DN} is the minimum hub diameter required to tolerate P' or the pressure exerted from within the hub.

Hub Configuration Coefficient $K_3=1.0$

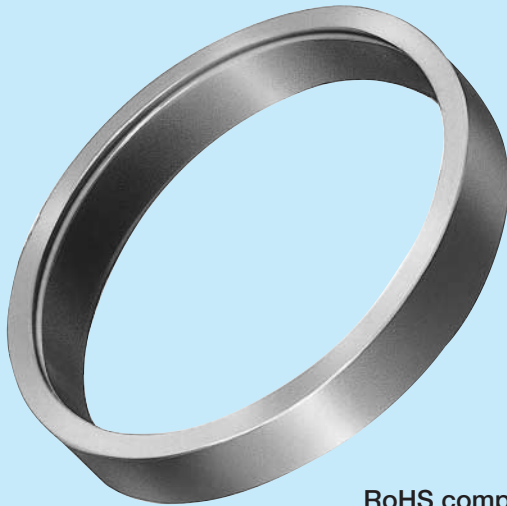
Minimum hub diameter ϕ_{DN} (mm)

Model No. d X D Shaft Diameter X Outer Diameter mm	Yield Point of Hub Material $\sigma_{0.2}$							
	Hub Contact Pressure P'		245	274	294	343	392	441
	MPa	{kgf/mm ² }	25	28	30	35	40	45
			FCD400 SS490 SC480 S20C SF490	S30C SF540	S35C SF590	S45C	S55C	FCD700
PL 010 X 013 EF	224	22.9	67	46	40	33	33	33
PL 011 X 014 EF	209	21.3	54	42	38	33	33	33
PL 012 X 015 EF	195	19.9	49	41	38	33	33	33
PL 014 X 018 EF	163	16.6	45	40	38	35	35	35
PL 015 X 019 EF	154	15.7	44	40	38	38	38	38
PL 016 X 020 EF	219	22.3	88	64	57	47	42	39
PL 017 X 021 EF	209	21.3	79	61	55	47	43	40
PL 018 X 022 EF	218	22.2	96	70	62	52	47	43
PL 019 X 024 EF	200	20.4	81	66	60	52	48	45
PL 020 X 025 EF	192	19.6	77	65	60	53	48	48
PL 022 X 026 EF	184	18.8	75	64	60	53	49	49
PL 024 X 028 EF	172	17.5	72	64	60	54	50	50
PL 025 X 030 EF	160	16.3	71	64	61	55	52	52
PL 028 X 032 EF	224	22.9	158	107	93	75	67	62
PL 030 X 035 EF	206	21.0	124	98	89	76	68	64
PL 032 X 036 EF	200	20.4	119	96	88	76	69	64
PL 035 X 040 EF	157	16.0	91	82	78	71	67	64
PL 038 X 044 EF	200	20.4	145	118	107	92	84	78
PL 040 X 045 EF	161	16.4	105	95	90	81	76	72
PL 042 X 048 EF	201	20.5	159	129	117	100	91	85
PL 045 X 052 EF	211	21.5	198	152	136	115	103	96
PL 048 X 055 EF	199	20.3	179	146	134	115	105	98
PL 050 X 057 EF	192	19.6	172	144	133	116	106	99
PL 055 X 062 EF	176	18.0	162	141	133	118	109	103
PL 060 X 068 EF	144	14.7	142	130	125	115	108	104
PL 065 X 073 EF	179	18.3	194	168	157	139	128	121
PL 070 X 079 EF	158	16.1	178	161	152	138	130	123
PL 075 X 084 EF	185	18.9	234	199	185	162	149	140
PL 080 X 091 EF	155	15.8	200	181	172	157	147	140
PL 085 X 096 EF	187	19.1	273	231	214	188	172	162
PL 090 X 101 EF	178	18.2	265	230	215	190	176	166
PL 095 X 106 EF	170	17.3	259	229	215	193	179	169
PL 100 X 114 EF	144	14.7	234	215	205	189	178	171
PL 110 X 124 EF	133	13.6	239	221	213	197	187	180
PL 120 X 134 EF	148	15.1	280	255	244	223	210	200

Notes) 1. The above figures do not take safety rates into account. Consider them prior to operation.
2. Calculate hub diameters using the formula $K_3=1.0$ as discussed in Selection Procedure.

POWER-LOCK EL Series

Sizes : $\phi 10 \sim \phi 150$
 Shaft tolerances : ($\phi 10 \sim \phi 38$) h6
 ($\phi 40 \sim \phi 150$) h8
 Hub bore tolerances : ($\phi 10 \sim \phi 38$) H7
 ($\phi 40 \sim \phi 150$) H8
 Surface roughness : Below 6S



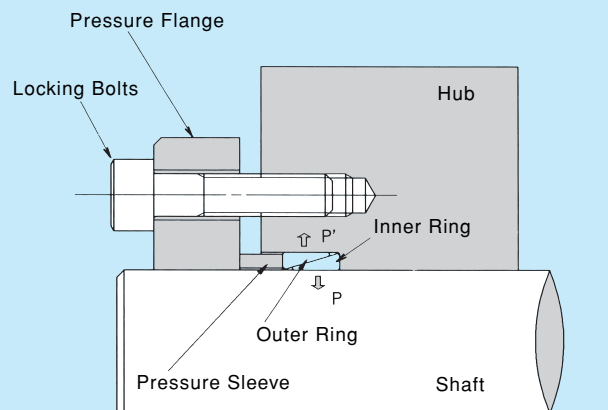
RoHS compliant.

Features

- 1 Space Saving**
Extremely compact and lightweight. Excellent for applications where installation space is a concern.
- 2 Various Design Configurations**
No requirements on the size and number of bolts to be tightened or even the number of ELs to be installed. Use as necessary depending on your design needs.
- 3 Dynamic Balance**
The no-slit, complete ring design offers a dynamic balance.
- 4 Tight Seal**
Completely sealed with high pressure so that they may be used in contaminated environments.
- 5 Simple Construction**
Simply constructed with just an inner and an outer ring.

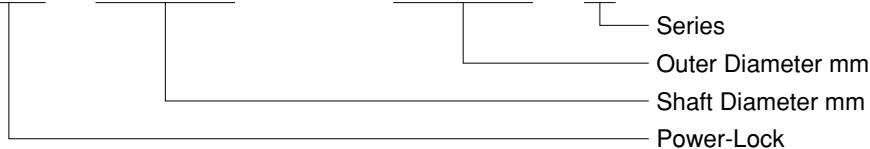
Parts

Outer Ring Inner Ring



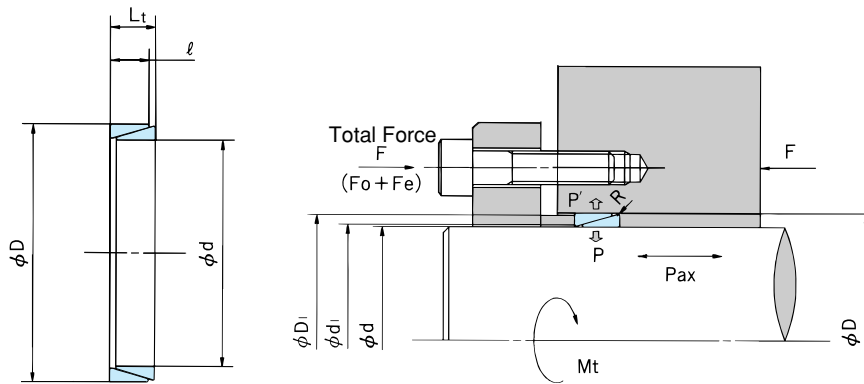
Reference Number System

PL 010 X 013 E



EL

Model Numbers and Specifications



※To simplify your calculations, the figures provided below are based on the maximum transmissible torque and thrust at shaft contact pressure, $P=98\text{Mpa}\{10\text{Kgf/mm}^2\}$.
When other F_e values apply, calculate specifications proportionally.

Model No. d X D Shaft Diameter X Outer Diameter mm	Dimensions mm		Preload Force $F_o^{1)}$		Actual Locking Force $[F_e]^{2)}$		Transmissible Torque $[M_t]^{3)}$		Transmissible Thrust $[P_{ax}]^{3)}$		Contact Pressure				Mass g
	Lt	ℓ	kN	{kgf}	kN	{kgf}	N·m	{kgf·m}	kN	{kgf}	Shaft P		Hub P'		
											MPa	{kgf/mm ² }	MPa	{kgf/mm ² }	
PL 010 X 013 E	4.5	3.7	5.9	600	6.2	630	6.9	0.70	1.37	140	98	10	75	7.7	1.82
PL 011 X 014 E	4.5	3.7	5.4	553	6.7	690	8.2	0.84	1.50	153	98	10	77	7.9	2.08
PL 012 X 015 E	4.5	3.7	5.0	510	7.4	750	9.8	1	1.64	167	98	10	78	8.0	2.14
PL 013 X 016 E	4.5	3.7	4.7	480	8.0	820	11.6	1.18	1.77	181	98	10	79	8.1	2.30
PL 014 X 018 E	6.3	5.3	8.1	830	12.3	1260	19.2	1.96	2.74	280	98	10	76	7.8	4.83
PL 015 X 019 E	6.3	5.3	10.3	1050	13.2	1350	22.1	2.25	2.94	300	98	10	77	7.9	5.13
PL 016 X 020 E	6.3	5.3	9.8	1000	14.1	1440	25.1	2.56	3.14	320	98	10	78	8	5.43
PL 017 X 021 E	6.3	5.3	9.2	940	15.0	1530	28.3	2.89	3.33	340	98	10	79	8.1	5.73
PL 018 X 022 E	6.3	5.3	8.9	910	15.9	1620	31.8	3.24	3.53	360	98	10	80	8.2	6.04
PL 019 X 024 E	6.3	5.3	12.3	1260	16.8	1710	35.3	3.6	3.72	380	98	10	77	7.9	7.89
PL 020 X 025 E	6.3	5.3	11.9	1210	17.6	1800	39.2	4	3.92	400	98	10	78	8	8.26
PL 022 X 026 E	6.3	5.3	8.9	910	19.4	1980	47.0	4.8	4.31	440	98	10	83	8.5	7.24
PL 024 X 028 E	6.3	5.3	8.2	840	21.2	2160	56.8	5.8	4.70	480	98	10	84	8.6	7.85
PL 025 X 030 E	6.3	5.3	9.7	990	22.1	2250	60.8	6.2	4.90	500	98	10	81	8.3	10.1
PL 028 X 032 E	6.3	5.3	7.2	730	24.7	2520	76.4	7.8	5.49	560	98	10	86	8.8	9.05
PL 030 X 035 E	6.3	5.3	8.3	850	26.5	2700	88.2	9	5.88	600	98	10	84	8.6	11.9
PL 032 X 036 E	6.3	5.3	7.7	790	28.2	2880	100	10.2	6.27	640	98	10	87	8.9	10.3
PL 035 X 040 E	7	6	9.9	1010	34.9	3560	136	13.9	7.74	790	98	10	86	8.8	15.5
PL 036 X 042 E	7	6	11.4	1160	35.9	3660	144	14.7	7.94	810	98	10	84	8.6	19
PL 038 X 044 E	7	6	10.9	1110	37.9	3870	160	16.3	8.43	860	98	10	84	8.6	20
PL 040 X 045 E	8	6.6	13.5	1380	44.1	4500	195	19.9	9.75	995	98	10	87	8.9	20.2
PL 042 X 048 E	8	6.6	15.3	1560	46.1	4700	216	22	10.3	1050	98	10	86	8.8	25
PL 045 X 052 E	10	8.6	25.6	2610	64.7	6600	321	32.8	14.3	1460	98	10	85	8.7	40.3
PL 048 X 055 E	10	8.6	24.1	2460	68.6	7000	367	37.4	15.3	1560	98	10	85	8.7	42.8
PL 050 X 057 E	10	8.6	23.2	2370	71.5	7300	397	40.5	15.9	1620	98	10	86	8.8	44.5
PL 055 X 062 E	10	8.6	21.3	2170	78.4	8000	480	49	17.4	1780	98	10	87	8.9	48.6
PL 056 X 064 E	12	10.4	28.6	2920	97.0	9900	603	61.5	21.6	2200	98	10	86	8.8	68.9
PL 060 X 068 E	12	10.4	26.9	2740	104	10600	692	70.6	23.0	2350	98	10	86	8.8	73.5
PL 063 X 071 E	12	10.4	25.6	2610	109	11100	764	78	24.2	2470	98	10	87	8.9	77
PL 065 X 073 E	12	10.4	24.9	2540	113	11500	813	83	25.0	2550	98	10	87	8.9	79.2
PL 070 X 079 E	14	12.2	30.4	3100	142	14500	1110	113	31.6	3220	98	10	87	8.9	113
PL 071 X 080 E	14	12.2	30.0	3060	144	14700	1140	116	32.0	3270	98	10	87	8.9	114
PL 075 X 084 E	14	12.2	33.7	3440	152	15500	1260	129	33.8	3450	98	10	87	8.9	120
PL 080 X 091 E	17	15	47.1	4810	200	20400	1770	181	44.1	4500	98	10	86	8.8	193
PL 085 X 096 E	17	15	44.6	4550	212	21600	2000	204	47.0	4800	98	10	86	8.8	204
PL 090 X 101 E	17	15	42.2	4310	224	22900	2240	229	50.0	5100	98	10	87	8.9	215
PL 095 X 106 E	17	15	40.1	4090	237	24200	2500	255	52.9	5400	98	10	88	9	227
PL 100 X 114 E	21	18.7	59.8	6100	311	31700	3450	352	69.6	7100	98	10	86	8.8	379
PL 110 X 124 E	21	18.7	64.1	6540	342	34900	4170	425	76.4	7800	98	10	87	8.9	415
PL 120 X 134 E	21	18.7	59.0	6020	373	38100	4950	505	83.3	8500	98	10	88	9	450
PL 130 X 148 E	28	25.3	93.8	9570	547	55800	7840	800	122	12400	98	10	86	8.8	850
PL 140 X 158 E	28	25.3	87.5	8930	589	60100	9110	930	131	13350	98	10	87	8.9	910
PL 150 X 168 E	28	25.3	82.0	8370	631	64380	10500	1070	140	14300	98	10	87	8.9	970

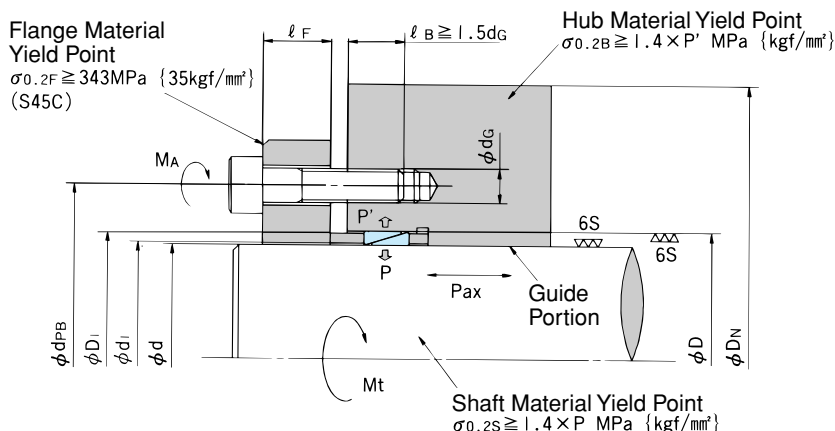
Notes) 1) F_o is the preload force required to achieve a 0 clearance fit between the rings and the shaft or hub, when installing an EL Power-Lock.
2) $[F_e]$ is the actual locking force that generates torque or contact pressure. F_o and $[F_e]$ are added to calculate the total force. Therefore, $F = F_o + [F_e]$.
3) $[M_t]$ indicates torque at 0 transmissible thrust while $[P_{ax}]$ indicates transmissible thrust at 0 torque. If transmissible torque and thrust apply simultaneously, calculate and compare the combined value with the transmissible torque provided in the table.
4) Stocked models are in bold.

Recommended Designs (1) (Hub-pressure flange mounting)

Shaft Diameter (d) and Hub Tap Diameter (D) Tolerances

Shaft Diameter (d)	Shaft Diameter Tolerance (d)	Hub Bore Tolerance (D)
φ10~φ38	h6	H7
φ40~φ150	h8	H8

- Refer to Pressure System Designs for d₁ and D₁ measurements.
- Determine the length of a guide portion based on the required centering accuracy. (d/2 or above is most commonly used.)



Notes) 1. Tightening torque or Ma values shown in the table below are based on 10.9 strength bolts. Use 10.9 or 12.9 strength bolts accordingly.

2. Use the following formula to calculate transmissible thrust, Pax. $Pax = \frac{2000 \times Mt}{d}$

(Mt : Transmissible Torque N·m{kgf·m}
d : Shaft Diameter mm)

3. For pressure flange designs, see Pressure System Designs on page 72.

Model No. (d X D Shaft Diameter X Outer Diameter) mm	Locking Bolts			Transmissible Torque Mt								Contact Pressure				Pressure Flange	
	Qty.	Size dG	Tightening Torque MA	Number of EL Power-Locks								Shaft P		Hub P'		PCD DIA	Thickness ℓF
				1		2		3		4		MPa	kgf/mm ²	MPa	kgf/mm ²		
PL 010 X 013 E	3	M 4	4.0 0.41	11.3	1.15	17.4	1.78	20.9	2.13	22.5	2.30	161	16.4	123	12.6	25	8
PL 011 X 014 E	3	M 4	4.0 0.41	12.8	1.31	19.9	2.03	23.7	2.42	25.6	2.62	153	15.6	120	12.3	26	8
PL 012 X 015 E	3	M 4	4.0 0.41	14.7	1.50	22.7	2.32	27.2	2.78	29.4	3.00	147	15.0	118	12.0	27	8
PL 013 X 016 E	3	M 4	4.0 0.41	16.3	1.66	25.3	2.58	30.1	3.07	32.5	3.32	138	14.1	113	11.5	28	8
PL 014 X 018 E	4	M 4	4.0 0.41	20.6	2.10	31.9	3.26	38.2	3.90	41.2	4.20	105	10.7	81	8.3	30	8
PL 015 X 019 E	6	M 4	4.0 0.41	36.3	3.70	56.3	5.74	67.6	6.90	72.5	7.40	161	16.4	126	12.9	31	8
PL 016 X 020 E	6	M 4	4.0 0.41	39.2	4.00	61.7	6.30	73.5	7.50	79.4	8.10	155	15.8	123	12.6	32	8
PL 017 X 021 E	6	M 4	4.0 0.41	43.1	4.40	66.6	6.80	79.4	8.10	86.2	8.80	149	15.2	121	12.3	33	8
PL 018 X 022 E	6	M 4	4.0 0.41	46.1	4.70	71.5	7.30	85.3	8.70	92.1	9.40	141	14.4	116	11.8	34	8
PL 019 X 024 E	6	M 4	4.0 0.41	41.2	4.20	64.7	6.60	76.4	7.80	83.3	8.50	116	11.8	91	9.3	36	8
PL 020 X 025 E	6	M 4	4.0 0.41	45.1	4.60	69.6	7.10	83.3	8.50	90.2	9.20	112	11.4	89	9.1	37	8
PL 022 X 026 E	6	M 4	4.0 0.41	55.9	5.70	87.2	8.90	104	10.6	112	11.4	117	11.9	99	10.1	38	8
PL 024 X 028 E	6	M 4	4.0 0.41	63.7	6.50	99.0	10.1	119	12.1	128	13.1	111	11.3	95	9.7	40	8
PL 025 X 030 E	6	M 4	4.0 0.41	61.7	6.30	95.1	9.7	114	11.6	123	12.6	99	10.1	82	8.4	42	8
PL 028 X 032 E	6	M 4	4.0 0.41	77.4	7.90	120	12.2	142	14.5	154	15.7	99	10.1	86	8.8	44	8
PL 030 X 035 E	8	M 4	4.0 0.41	115	11.7	177	18.1	213	21.7	229	23.4	127	13.0	109	11.1	47	8
PL 032 X 036 E	8	M 4	4.0 0.41	123	12.6	192	19.6	229	23.4	248	25.3	122	12.4	108	11.0	50	8
PL 035 X 040 E	6	M 5	8.3 0.85	167	17.0	259	26.4	309	31.5	333	34.0	120	12.2	105	10.7	55	10
PL 036 X 042 E	6	M 5	8.3 0.85	166	16.9	257	26.2	307	31.3	331	33.8	113	11.5	97	9.9	57	10
PL 038 X 044 E	6	M 5	8.3 0.85	175	17.9	272	27.8	325	33.2	352	35.9	108	11.0	93	9.5	59	10
PL 040 X 045 E	6	M 6	13.7 1.4	268	27.3	416	42.4	496	50.6	536	54.7	134	13.7	120	12.2	61	12
PL 042 X 048 E	6	M 6	13.7 1.4	275	28.1	426	43.5	510	52.0	549	56.0	125	12.8	110	11.2	64	12
PL 045 X 052 E	8	M 6	13.7 1.4	364	37.1	568	58.0	676	69.0	725	74.0	111	11.3	96	9.8	67	12
PL 048 X 055 E	8	M 6	13.7 1.4	399	40.7	617	63.0	735	75.0	794	81.0	107	10.9	93	9.5	72	12
PL 050 X 057 E	8	M 6	13.7 1.4	419	42.8	647	66.0	774	79.0	843	86.0	104	10.6	91	9.3	73	12
PL 055 X 062 E	10	M 6	13.7 1.4	657	67.0	970	99.0	1150	118	1250	128	127	13.0	113	11.5	78	12
PL 056 X 064 E	6	M 8	34.3 3.5	666	68.0	1040	106	1230	126	1340	137	109	11.1	95	9.7	82	16
PL 060 X 068 E	6	M 8	34.3 3.5	735	75.0	1130	115	1350	138	1460	149	103	10.5	91	9.3	86	16
PL 063 X 071 E	8	M 8	34.3 3.5	1100	112	1710	174	2030	207	2200	224	141	14.4	125	12.8	89	16
PL 065 X 073 E	8	M 8	34.3 3.5	1140	116	1750	179	2100	214	2260	231	136	13.9	122	12.4	91	16
PL 070 X 079 E	10	M 8	34.3 3.5	1540	157	2380	243	2840	290	3070	313	136	13.9	121	12.3	97	16
PL 071 X 080 E	10	M 8	34.3 3.5	1560	159	2410	246	2880	294	3120	318	134	13.7	120	12.2	99	16
PL 075 X 084 E	10	M 8	34.3 3.5	1610	164	2500	255	2980	304	3220	329	124	12.7	111	11.3	102	16
PL 080 X 091 E	8	M10	67.6 6.9	2150	219	3330	340	3970	405	4260	435	119	12.1	104	10.6	111	20
PL 085 X 096 E	8	M10	67.6 6.9	2310	236	3590	366	4260	435	4610	470	114	11.6	101	10.3	116	20
PL 090 X 101 E	10	M10	67.6 6.9	3190	326	4950	505	5930	605	6370	650	139	14.2	124	12.7	121	20
PL 095 X 106 E	10	M10	67.6 6.9	3390	346	5240	535	6270	640	6760	690	133	13.6	120	12.2	126	20
PL 100 X 114 E	12	M10	67.6 6.9	4170	425	6420	655	7740	790	8330	850	118	12.0	103	10.5	134	24
PL 110 X 124 E	10	M12	118 12	5680	580	8820	900	10500	1070	11400	1160	133	13.6	119	12.1	146	24
PL 120 X 134 E	10	M12	118 12	6220	635	9700	990	11600	1180	12400	1270	123	12.6	111	11.3	156	24
PL 130 X 148 E	10	M14	186 19	9110	930	11200	1140	16900	1720	18200	1860	113	11.5	99	10.1	170	28
PL 140 X 158 E	10	M14	186 19	9900	1010	15300	1560	18300	1870	19800	2020	106	10.8	94	9.6	180	28
PL 150 X 168 E	12	M14	186 19	13100	1340	20400	2080	24300	2480	26300	2680	123	12.5	110	11.2	190	28



Recommended Designs (2) (Shaft-pressure flange mounting)

Shaft Diameter (d) and Hub Tap Diameter (D) Tolerances

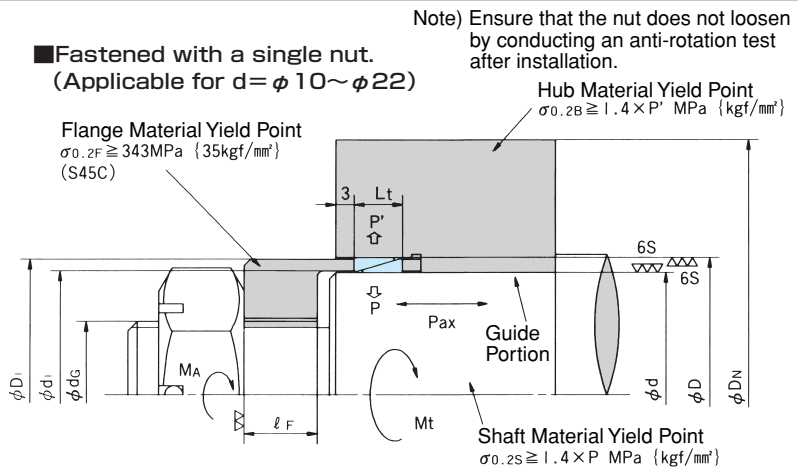
Shaft Diameter (d)	Shaft Diameter Tolerance (d)	Hub Bore Tolerance (D)
φ10~φ38	h6	H7
φ40~φ150	h8	H8

- Refer to Pressure System Designs for d₁ and D₁ measurements.
- Determine the length of a guide portion based on the required centering accuracy. (d/2 or above is most commonly used.)

Notes) 1. Tightening torque or Ma values shown in the table below are based on 10.9 strength bolts. Use 10.9 or 12.9 strength bolts accordingly.

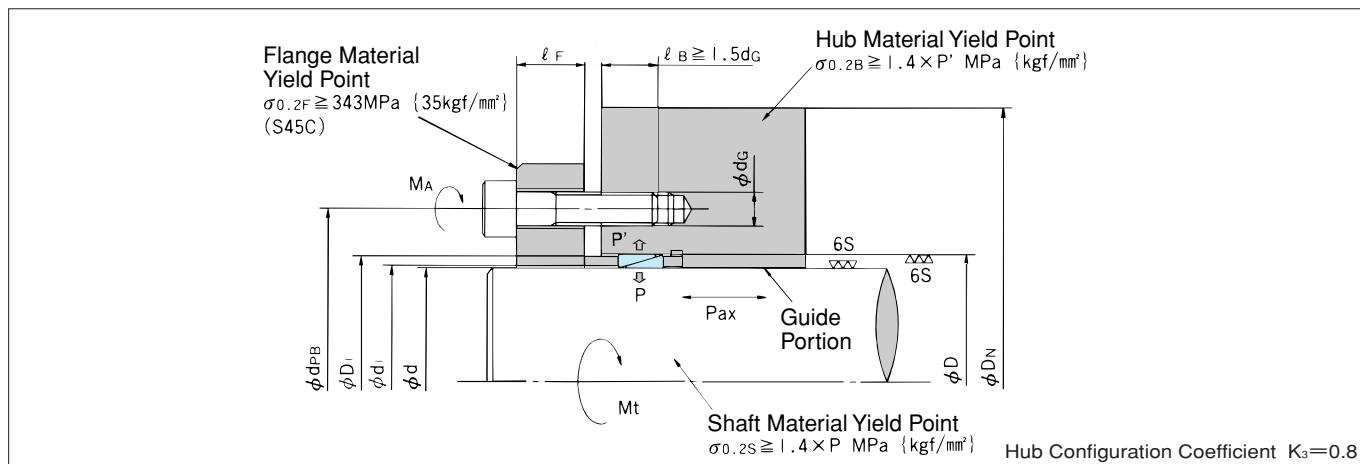
2. Use the following formula to calculate transmissible thrust, Pax. $Pax = \frac{2000 \times Mt}{d}$ (Mt : Transmissible Torque N·m(kgf·m) d : Shaft Diameter mm)

3. For pressure flange designs, see Pressure System Designs on page 72.



Model No. (d X D Shaft Diameter X Outer Diameter) mm	Locking Bolts			Transmissible Torque Mt								Contact Pressure				Pressure Flange		
	Qty.	Size d _B	Tightening Torque Ma	Number of EL Power-Locks								Shaft P		Hub P'		PCD d _{PS}	Thickness ℓ _F	
				1	2	3	4	MPa	kgf/mm ²	MPa	kgf/mm ²							
PL 010 X 013 E	1	M 8	24.5	2.5	11.5	1.17	17.7	1.81	21.2	2.16	22.8	2.33	164	16.7	125	12.8		4
PL 011 X 014 E	1	M 8	24.5	2.5	13.0	1.33	20.2	2.06	24.1	2.46	26.1	2.66	156	15.9	121	12.6		4
PL 012 X 015 E	1	M 8	24.5	2.5	14.9	1.52	23.1	2.36	27.5	2.81	29.8	3.04	149	15.2	120	12.2		4
PL 013 X 016 E	1	M 8	24.5	2.5	16.5	1.68	25.6	2.61	30.5	3.11	33.0	3.37	140	14.3	114	11.6		4
PL 014 X 018 E	1	M10	48.0	4.9	27.2	2.78	42.1	4.30	51.0	5.20	54.9	5.60	139	14.2	108	11.0		5
PL 015 X 019 E	1	M10	48.0	4.9	25.7	2.62	40.2	4.10	47.0	4.80	51.0	5.20	114	11.6	90	9.2		5
PL 016 X 020 E	1	M10	48.0	4.9	28.2	2.88	44.1	4.50	51.9	5.30	56.8	5.80	111	11.3	88	9.0		5
PL 017 X 021 E	1	M10	48.0	4.9	31.1	3.17	48.0	4.90	57.8	5.90	61.7	6.30	108	11.0	87	8.9		5
PL 018 X 022 E	1	M10	48.0	4.9	33.1	3.38	51.0	5.20	61.7	6.30	66.6	6.80	102	10.4	83	8.5		5
PL 019 X 024 E	1	M12	84.3	8.6	52.9	5.40	82.3	8.40	98.0	10.0	106	10.8	147	15.0	117	11.9		7
PL 020 X 025 E	1	M12	84.3	8.6	56.8	5.80	82.2	9.00	106	10.8	114	11.6	143	14.6	115	11.7		7
PL 022 X 026 E	1	M12	84.3	8.6	69.6	7.10	108	11.0	128	13.1	139	14.2	144	14.7	122	12.4		7
PL 024 X 028 E	3	M 5	9.8	1.0	62.7	6.40	97.0	9.90	116	11.8	124	12.7	108	11.0	92	9.4	11	10
PL 025 X 030 E	3	M 5	9.8	1.0	59.8	6.10	93.1	9.50	111	11.3	120	12.2	97	9.9	81	8.3	12	10
PL 028 X 032 E	3	M 6	13.7	1.4	92.1	9.40	143	14.6	172	17.5	185	18.9	119	12.1	104	10.6	14	12
PL 030 X 035 E	3	M 6	13.7	1.4	96.0	9.80	148	15.1	177	18.1	191	19.5	107	10.9	91	9.3	16	12
PL 032 X 036 E	3	M 6	13.7	1.4	104	10.6	161	16.4	192	19.6	208	21.2	102	10.4	90	9.2	16	12
PL 035 X 040 E	4	M 6	13.7	1.4	154	15.7	239	24.4	285	29.1	309	31.5	111	11.3	97	9.9	19	12
PL 036 X 042 E	4	M 6	13.7	1.4	153	15.6	237	24.2	282	28.8	306	31.2	104	10.6	89	9.1	20	12
PL 038 X 044 E	4	M 6	13.7	1.4	163	16.6	252	25.7	300	30.6	324	33.1	100	10.2	86	8.8	22	12
PL 040 X 045 E	6	M 6	13.7	1.4	268	27.3	417	42.5	495	50.5	534	54.5	134	13.7	120	12.2	24	12
PL 042 X 048 E	6	M 6	13.7	1.4	275	28.1	426	43.5	510	52.0	549	56.0	125	12.8	110	11.2	26	12
PL 045 X 052 E	8	M 6	13.7	1.4	364	37.1	564	57.5	671	68.5	725	74.0	111	11.3	96	9.8	29	12
PL 048 X 055 E	8	M 6	13.7	1.4	397	40.5	617	63.0	735	75.0	794	81.0	107	10.9	93	9.5	32	12
PL 050 X 057 E	8	M 6	13.7	1.4	421	43.0	652	66.5	774	79.0	843	86.0	104	10.6	91	9.3	34	12
PL 055 X 062 E	8	M 6	13.7	1.4	475	48.5	735	75.0	882	90.0	951	97.0	97	9.9	86	8.8	39	12
PL 056 X 064 E	6	M 8	34.3	3.5	671	68.5	1040	106	1230	126	1350	138	109	11.1	95	9.7	38	16
PL 060 X 068 E	6	M 8	34.3	3.5	730	74.5	1130	115	1350	138	1460	149	103	10.5	91	9.3	42	16
PL 063 X 071 E	8	M 8	34.3	3.5	1100	112	1710	174	2030	207	2200	224	141	14.4	125	12.8	45	16
PL 065 X 073 E	8	M 8	34.3	3.5	1140	116	1750	179	2100	214	2260	231	136	13.9	122	12.4	47	16
PL 070 X 079 E	6	M10	67.6	6.9	1450	148	2250	230	2700	275	2910	297	128	13.1	114	11.6	50	20
PL 071 X 080 E	6	M10	67.6	6.9	1480	151	2280	233	2730	279	2950	301	127	13.0	113	11.5	51	20
PL 075 X 084 E	6	M10	67.6	6.9	1530	156	2360	241	2820	288	3050	311	119	12.1	106	10.8	55	20
PL 080 X 091 E	8	M10	67.6	6.9	2150	219	3330	340	3970	405	4310	440	119	12.1	104	10.6	60	20
PL 085 X 096 E	8	M10	67.6	6.9	2130	236	3590	366	4260	435	4610	470	114	11.6	101	10.3	65	20
PL 090 X 101 E	10	M10	67.6	6.9	3190	326	4950	505	5930	605	6370	650	139	14.2	124	12.7	70	20
PL 095 X 106 E	10	M10	67.6	6.9	3390	346	5240	535	6270	640	6760	690	133	13.6	120	12.2	75	20
PL 100 X 114 E	12	M10	67.6	6.9	4170	425	6420	655	7740	790	8330	850	118	12.0	103	10.5	80	20
PL 110 X 124 E	10	M12	118	12	5680	580	8820	900	10500	1070	11400	1160	133	13.6	119	12.1	88	24
PL 120 X 134 E	10	M12	118	12	6220	635	9700	990	11600	1180	12400	1270	123	12.6	111	11.3	98	24
PL 130 X 148 E	10	M14	186	19	9110	930	14100	1440	16900	1720	18200	1860	113	11.5	99	10.1	108	28
PL 140 X 158 E	10	M14	186	19	9900	1010	15300	1560	18300	1870	19800	2020	106	10.8	94	9.6	118	28
PL 150 X 168 E	12	M14	186	19	13100	1340	20400	2080	24300	2480	26300	2680	123	12.5	110	11.2	128	28

Hub Diameters (1)



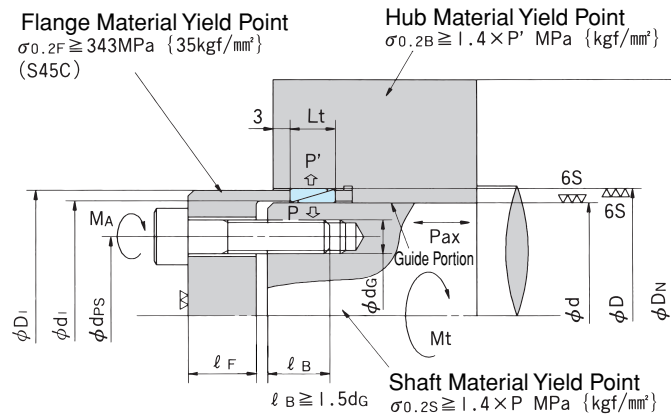
Minimum hub diameter φDN (mm)

Model No. d X D Shaft Diameter X Outer Diameter mm	Yield Point of Hub Material $\sigma_{0.2}$									
	MPa kgf/mm ²		206	225	245	274	294	343	392	441
	Hub Contact Pressure P'		FC350 SS400 SC410 S10C FCMB360	23 SC450 S15C SF440	25 FCD400 SS490 SC480 S20C SF490	28 S30C SF540	30 S35C SF590	35 S45C	40 S55C	45
PL 010 X 013 E	123	12.6	35	35	35	35	35	35	35	35
PL 011 X 014 E	120	12.3	36	36	36	36	36	36	36	36
PL 012 X 015 E	118	12.0	37	37	37	37	37	37	37	37
PL 013 X 016 E	113	11.5	38	38	38	38	38	38	38	38
PL 014 X 018 E	81	8.3	40	40	40	40	40	40	40	40
PL 015 X 019 E	126	12.9	41	41	41	41	41	41	41	41
PL 016 X 020 E	123	12.6	42	42	42	42	42	42	42	42
PL 017 X 021 E	121	12.3	43	43	43	43	43	43	43	43
PL 018 X 022 E	116	11.8	44	44	44	44	44	44	44	44
PL 019 X 024 E	91	9.3	46	46	46	46	46	46	46	46
PL 020 X 025 E	89	9.1	47	47	47	47	47	47	47	47
PL 022 X 026 E	99	10.1	48	48	48	48	48	48	48	48
PL 024 X 028 E	95	9.7	50	50	50	50	50	50	50	50
PL 025 X 030 E	82	8.4	52	52	52	52	52	52	52	52
PL 028 X 032 E	86	8.8	54	54	54	54	54	54	54	54
PL 030 X 035 E	109	11.1	59	57	57	57	57	57	57	57
PL 032 X 036 E	108	11.0	60	59	59	59	59	59	59	59
PL 035 X 040 E	105	10.7	67	66	66	66	66	66	66	66
PL 036 X 042 E	97	9.9	68	68	68	68	68	68	68	68
PL 038 X 044 E	93	9.5	70	70	70	70	70	70	70	70
PL 040 X 045 E	120	12.2	80	77	74	73	73	73	73	73
PL 042 X 048 E	110	11.2	82	78	76	76	76	76	76	76
PL 045 X 052 E	96	9.8	83	80	79	79	79	79	79	79
PL 048 X 055 E	93	9.5	86	84	84	84	84	84	84	84
PL 050 X 057 E	91	9.3	89	86	85	85	85	85	85	85
PL 055 X 062 E	113	11.5	105	101	97	93	91	90	90	90
PL 056 X 064 E	95	9.7	102	99	96	96	96	96	96	96
PL 060 X 068 E	91	9.3	106	103	100	100	100	100	100	100
PL 063 X 071 E	125	12.8	129	123	118	112	109	104	103	103
PL 065 X 073 E	122	12.4	130	124	119	114	111	106	105	105
PL 070 X 079 E	121	12.3	139	133	128	122	119	113	111	111
PL 071 X 080 E	120	12.2	140	134	129	123	120	115	113	113
PL 075 X 084 E	111	11.3	141	135	131	125	123	117	116	116
PL 080 X 091 E	104	10.6	150	144	140	134	132	127	127	127
PL 085 X 096 E	101	10.3	155	150	145	140	137	132	132	132
PL 090 X 101 E	124	12.7	181	172	165	158	154	146	141	137
PL 095 X 106 E	120	12.2	185	177	170	163	159	151	146	142
PL 100 X 114 E	103	10.5	184	177	172	165	162	156	151	150
PL 110 X 124 E	119	12.1	216	206	199	190	185	177	171	166
PL 120 X 134 E	111	11.3	224	215	208	199	195	187	181	176
PL 130 X 148 E	99	10.1	234	226	219	212	208	200	194	190
PL 140 X 158 E	94	9.6	244	236	230	222	218	210	204	200
PL 150 X 168 E	110	11.2	278	266	257	247	241	231	223	218

Note) 1) The above values are based on the minimum outer hub diameter DN of each model.



Hub Diameters (2)



Minimum hub diameter φ_{DN} (mm)

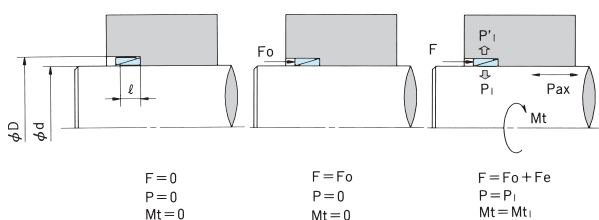
Model No. d X D Shaft Diameter X Outer Diameter mm	Yield Point of Hub Material σ _{0.2}									
	MPa kgf/mm ²		206	225	245	274	294	343	392	441
	Hub Contact Pressure P'	MPa kgf/mm ²	FC350 SS400 SC410 S10C FCMB360	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540	S35C SF590	S45C	FCD450 FCD500 FCD600 S55C	FCD700
PL 010 X 013 E	123	12.6	19	18	18	17	17	16	16	15
PL 011 X 014 E	120	12.6	21	20	20	19	19	18	17	17
PL 012 X 015 E	118	12.0	22	21	20	20	19	19	18	18
PL 013 X 016 E	113	11.5	23	23	21	21	20	20	19	19
PL 014 X 018 E	81	8.3	25	24	24	23	23	22	21	21
PL 015 X 019 E	126	12.9	25	24	24	23	23	22	22	21
PL 016 X 020 E	123	12.6	26	25	25	24	24	23	23	23
PL 017 X 021 E	121	12.3	27	27	26	25	25	24	24	24
PL 018 X 022 E	116	11.8	28	28	27	26	26	25	25	25
PL 019 X 024 E	91	9.3	34	33	32	31	31	30	29	28
PL 020 X 025 E	89	9.1	35	34	33	32	32	31	30	29
PL 022 X 026 E	99	10.1	38	36	35	34	33	32	31	31
PL 024 X 028 E	95	9.7	37	36	35	34	34	33	32	32
PL 025 X 030 E	82	8.4	38	37	37	36	35	35	34	34
PL 028 X 032 E	86	8.8	44	43	42	40	40	38	38	37
PL 030 X 035 E	109	11.1	46	45	44	43	42	41	40	40
PL 032 X 036 E	108	11.0	47	46	45	44	43	42	41	41
PL 035 X 040 E	105	10.7	53	52	51	50	49	47	46	46
PL 036 X 042 E	97	9.9	55	53	52	51	50	49	48	47
PL 038 X 044 E	93	9.5	57	56	55	53	53	51	50	50
PL 040 X 045 E	120	12.2	65	63	61	59	58	56	54	53
PL 042 X 048 E	110	11.2	67	65	63	61	60	58	57	56
PL 045 X 052 E	96	9.8	69	68	66	64	63	62	60	59
PL 048 X 055 E	93	9.5	73	71	69	68	67	65	63	62
PL 050 X 057 E	91	9.3	75	73	72	70	69	67	66	65
PL 055 X 062 E	113	11.5	80	78	77	75	74	72	71	70
PL 056 X 064 E	95	9.7	85	83	81	79	78	76	74	73
PL 060 X 068 E	91	9.3	89	87	85	83	82	80	78	77
PL 063 X 071 E	125	12.8	104	100	98	94	92	89	86	84
PL 065 X 073 E	122	12.4	106	102	99	96	94	91	88	86
PL 070 X 079 E	121	12.3	111	108	105	102	100	97	94	92
PL 071 X 080 E	120	12.2	113	109	106	103	101	98	95	93
PL 075 X 084 E	111	11.3	116	112	110	106	105	101	99	97
PL 080 X 091 E	104	10.6	124	121	118	115	113	109	107	105
PL 085 X 096 E	101	10.3	130	126	124	120	118	115	112	110
PL 090 X 101 E	124	12.7	148	143	138	134	131	126	122	120
PL 095 X 106 E	120	12.2	153	147	143	139	136	131	128	125
PL 100 X 114 E	103	10.5	155	151	147	143	141	137	134	131
PL 110 X 124 E	119	12.1	178	172	167	162	159	153	149	146
PL 120 X 134 E	111	11.3	187	182	177	172	169	163	159	156
PL 130 X 148 E	99	10.1	200	194	190	185	182	177	173	170
PL 140 X 158 E	94	9.6	210	205	200	195	192	187	183	180
PL 150 X 168 E	110	11.2	235	227	222	215	211	205	200	196

Note) 1) The above values are based on the minimum outer hub diameter D_N of each model.

Basic Characteristics

1. Transmissible Torque, Transmissible Thrust and Contact Pressure

- Mt : Transmissible Torque
- Pax : Transmissible Load
- P, P' : Contact Pressure
- Fo : Preload Force
- Fe : Actual Locking Force
- F : Total Force



The EL Series Power-Locks require preload force Fo to obtain a 0 clearance shaft-hub connection.

The degree of tightness achieved by applying the actual locking force Fe in addition to the preload force Fo, is directly proportional to the Fe as indicated in the above diagram. Accordingly, we use the following formula to calculate the total force required to reach the desired degree of tightness. $F=Fe+Fo$.

Transmissible torque and contact pressure are generally determined by the following formulas.

$$Mt = N \times \mu \times \frac{d}{2} \quad (\mu : \text{Friction Coefficient}) \quad (1)$$

$$Pax = N \times \mu = 2Mt/d \quad (2)$$

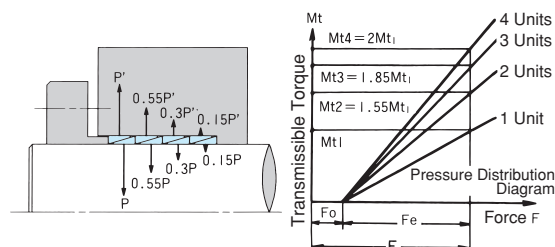
$$P = N / \pi d \ell \quad (3)$$

$$P' = N / \pi D \ell \quad (4)$$

$$N = \frac{Fe}{\tan \beta + 2} \quad (\beta : \text{EL Power-Lock taper angle}) \quad (5)$$

Note) Mt1, P1, P'1 refer to single unit installation

2. Contact Pressure and Transmissible Torque for Multiple Power-Lock Installation



In the case of multiple EL Power-Lock installation the pressure applied on the rings will distribute as illustrated above.

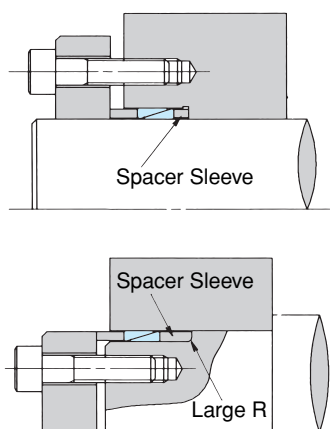
The following table indicates transmissible torque ratios for specific numbers of unit(s) installed.

No. of Unit(s) Z	Multiplying Ratio
1	1.0
2	1.55
3	1.85
4	2.0

A maximum of four EL Power-Locks may be installed.

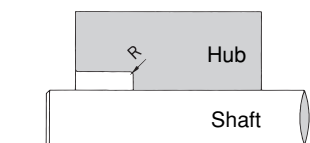
Spacer Sleeves

Use a spacer sleeve (as illustrated below) if indentations or large Corner R values cannot be avoided due to specific machining requirements.



Corner R Values

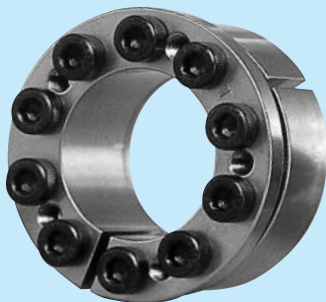
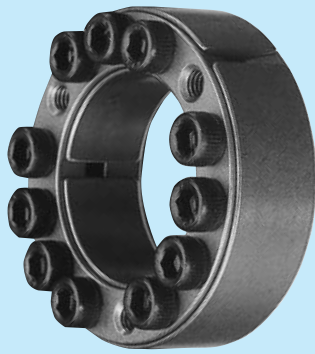
If you are not using a spacer sleeve, maintain the following Corner R values.



(mm)

Model No.	Corner R	Model No.	Corner R
PL010X013E	Below 0.2	PL070X079E	Below 0.3
PL042X048E		PL090X106E	
PL045X052E	Below 0.3	PL100X114E	Below 0.4
PL065X073E		PL150X168E	





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(2) Selection by Series

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- ④ EL

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- 3) EL

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Selection Guide and Procedure

(1) Maximum Torque and Maximum Thrust

Calculate maximum torque and thrust based on transmissible capacity and safety factor f .

When using Power-Locks for servo motor or stepping motor applications, use a safety factor greater than 1 for every maximum or peak torque.

SI Unit	Gravitational Unit
$T_{\max} = \frac{30000 \times H}{\pi \cdot n} \cdot f$	$T_{\max} = \frac{974 \times H}{n} \cdot f$
$T_{\max} = \text{Max. Generated Torque (N} \cdot \text{m)}$	$T_{\max} = \text{Max. Generated Torque (kgf} \cdot \text{m)}$
H: Transmissible Capacity (kW)	H: Transmissible Capacity (kW)
n: Rotational Speed of the Shaft with PL Installed (r/min)	n: Rotation Speed of the Shaft with PL Installed (r.p.m)
f: Safety Factor	f: Safety Factor

$P_{\max} = P_{ax} \cdot f$
P_{\max} : Max. Thrust Load kN {kgf}
P_{ax} : Thrust Load kN {kgf}
f: Safety Factor

f: Safety Factor

Loading Conditions		Safety Factor
Smooth with no shock	Low inertia	1.5~2.5
Some shock	Medium inertia	2.0~4.0
Severe shock	High inertia	3.0~5.0

If torque and thrust apply simultaneously:

Calculate and compare the total load M_R with the rated transmissible torque M_t .

$$M_R = \sqrt{T_{\max}^2 + (P_{\max} \times \frac{d}{2})^2}$$

T_{\max} : Max. transmissible torque N·m {kgf·m}

P_{\max} : Max. transmissible thrust N {kgf}

d: Shaft diameter m

Compare the T_{\max} or M_R obtained from the above calculation with the catalog rated transmissible torque M_t .

$M_t \geq T_{\max}$ or M_R → Acceptable

$M_t < T_{\max}$ or M_R → Use larger or multiple units.

* Installing multiple units is possible for some series.

When installing more than one unit, multiply the M_t value with the appropriate multiplying ratio given below.

Multiplying Ratio by Series and Number of Units (Table 1)

No. of Units	1	2	3	4
AS	1	2	3	4
ADN	1	2	N/A	N/A
TF KE	1	2	N/A	N/A
ML (MG)	1	1.2	N/A	N/A
EL	1	1.55	1.85	2
Others	1	N/A	N/A	N/A

(2) Selection by Series

1. AS, ADN, AE, KE, RE, EF, TF Series

STEP1 Shaft and Hub

(1) Material Strength

Large contact pressure applies to both the shaft and hub during installation.

Select shaft and hub materials that meet the following strength requirements.

$$\sigma_{0.2S} \geq K_2 \times P \quad \sigma_{0.2B} \geq K_2 \times P'$$

P: Contact pressure on the shaft
MPa {kgf/mm²}

P': Contact pressure on the hub
MPa {kgf/mm²}

$\sigma_{0.2S}$: Yield point of shaft material
MPa {kgf/mm²}

$\sigma_{0.2B}$: Yield point of hub material
MPa {kgf/mm²}

K_2 : Series coefficient (Table 2)

Series Coefficient K_2 (Table 2)

Series	Series Coefficient
AS, ADN, TF, ML	1.4
AE, EF, KE, RE	1.2

(2) Hub Outer Diameter

Refer to the Hub Diameters table provided for each series.

If none of the materials listed apply, calculate the minimum hub diameter using the following formula.

$$\text{Hub outer diameter } D_N \geq D \sqrt{\frac{\sigma_{0.2B} + K_3 \cdot P'}{\sigma_{0.2B} - K_3 \cdot P'}}$$

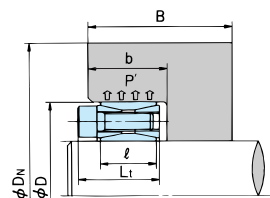
D_N : Hub outer diameter mm

D: Hub inner diameter mm

P': Hub contact pressure MPa {kgf/mm²}

$\sigma_{0.2B}$: Yield point of hub material
MPa {kgf/mm²}

K_3 : Hub configuration coefficient
(Refer to the appropriate Hub Diameters table.)



(3) Hollow Shaft Inner Diameter

Calculate the inner diameter of a hollow shaft, using the following formula.

$$\text{Hollow shaft inner diameter } d_B \leq d \times \sqrt{\frac{\sigma_{0.2S} - 2 \cdot P \cdot K_3}{\sigma_{0.2S}}}$$

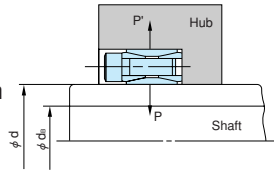
d_B : Hollow shaft inner diameter mm

d : Shaft diameter mm

P : Contact pressure on the shaft MPa {kgf/mm²}

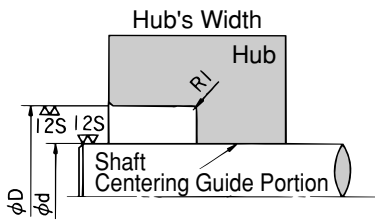
$\sigma_{0.2S}$: Yield point of shaft material MPa {kgf/mm²}

K_3 : Hub configuration coefficient (Refer to the Hub Diameters table by series.)



STEP2 AS Series Centering Guide Portion

Accurate centering is achieved by adjusting the hub's width to a value calculated based on the length of a centering guide portion above $d/2$ (half of shaft diameter). In addition, the guide portion tolerance should be determined according to the required degree of accuracy.



STEP3 Radial Load

If radial loads apply to Power-Locks as in wheel applications, calculate the contact pressure on the shaft P_{rad} , and hub P'_{rad} . Then, compare the values with those provided in the appropriate catalog table and confirm that they fall within the allowable deviance range.

P_r : Radial load N {kgf}

l : Power-Lock width mm

d : Shaft diameter mm

D : Hub inner diameter mm

P : Contact pressure on the shaft MPa {kgf/mm²}

P' : Contact pressure on the hub MPa {kgf/mm²}

$$P_{rad} = \frac{1.3 \times P_r}{d \times l}$$

$$P'_{rad} = \frac{1.3 \times P_r}{D \times l}$$

If a radial load applies, calculate the required hub outer diameter D_o and inner hollow shaft diameter d_B by adding P_{rad} and P'_{rad} to P and P' respectively.

Table 4. Allowable Contact Pressure

Series	$P_{rad}(P'_{rad}) / P(P')$
AS, ADN, TF	50% and less
KE, AE, EF	20% and less

2. SL Series

STEP1 Shaft and Hub

(1) Material Strength

Large contact pressure applies to both the shaft and hub during installation. Select shaft and hub materials that meet the following strength requirements.

$$\sigma_{0.2S} \geq 1.2 \times P \quad \sigma_{0.2B} \geq 1.2 \times P'$$

P : Contact pressure on the shaft MPa {kgf/mm²}

P' : Contact pressure on the hub MPa {kgf/mm²}

$\sigma_{0.2S}$: Yield point of shaft material MPa {kgf/mm²}

$\sigma_{0.2B}$: Yield point of hub material MPa {kgf/mm²}

(2) Hub Material Strength

Torque and contact pressure will combine and produce stress on the hub. Calculate this stress using one of the following formulas.

(a) Stress applied to the hub from a normal direction (σ_w)

$$\sigma_w = -P \text{ MPa} \{ \text{kgf/mm}^2 \}$$

P : Shaft contact pressure MPa {kgf/mm²}

(b) Stress applied to the hub from a tangential direction (σ_t)

$$\sigma_t = \frac{P(1+Q^2) - 2 \times P'}{1-Q^2} \text{ MPa} \{ \text{kgf/mm}^2 \}$$

$$Q = \frac{d_w}{d}$$

P : Contact pressure on the shaft MPa {kgf/mm²}

P' : Contact pressure on the hub MPa {kgf/mm²}

d_w : Shaft diameter mm

d : Hub outer diameter mm

(c) Shearing stress applied to the hub by torsional force (τ_B)

$$\tau_B = \frac{16000 \times T_{max} \cdot d_w}{\pi (d^4 - d_w^4)} \text{ MPa} \{ \text{kgf/mm}^2 \}$$

(d) Combined stress applied to the hub (σ_v)

$$\sigma_v = \sqrt{\sigma_t^2 + \sigma_w^2 - \sigma_t \cdot \sigma_w + 3 \times \tau_B^2} \text{ MPa} \{ \text{kgf/mm}^2 \}$$

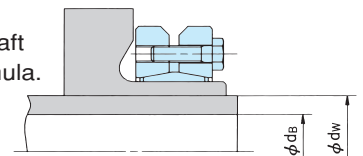
Make sure $\sigma_{0.2B}$ (yield point of the hub material) is greater than σ_v .

$$\sigma_v < \sigma_{0.2B}$$

(3) Hollow Shaft Inner Diameter

Calculate the inner diameter of a hollow shaft using the following formula.

$$d_B \leq d_w \sqrt{\frac{\sigma_{0.2S} - 1.6 \times P}{\sigma_{0.2S}}}$$



d_B : Hollow shaft inner diameter mm

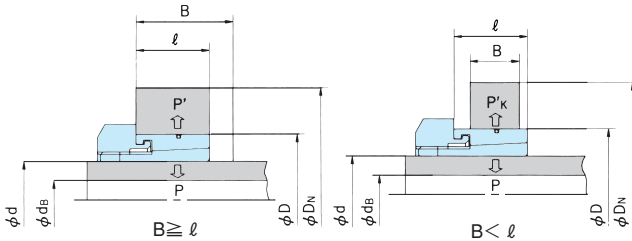
d_w : Hollow shaft outer diameter mm

$\sigma_{0.2S}$: Yield point of shaft material MPa {kgf/mm²}

P : Contact pressure between the inner ring and shaft MPa {kgf/mm²}

3. ML Series

STEP1 Shaft and Hub



(1) Material Strength

Large contact pressure applies to both the shaft and hub during installation. Select shaft and hub materials that meet the following strength requirements.

$$\sigma_{0.2S} \geq 1.4 \times P$$

$$\sigma_{0.2B} \geq 1.4 \times P' \quad (\text{When } B \geq l)$$

$$\sigma_{0.2B} \geq 1.4 \times P'_{\kappa} \quad (\text{When } B < l)$$

When $B < l$ calculate P'_{κ} using the following formula.

$$P'_{\kappa} = P' \cdot \frac{l}{B}$$

P : Contact pressure on the shaft
MPa {kgf/mm²}

P' , P'_{κ} : Contact pressure on the hub
MPa {kgf/mm²}

$\sigma_{0.2S}$: Yield point of shaft material
MPa {kgf/mm²}

$\sigma_{0.2B}$: Yield point of hub material
MPa {kgf/mm²}

Typical yield point values of various steel materials are listed in the Technical Data section.

(2) Hub Outer Diameter

After determining the Power-Lock size, hub material and contact pressure between the outer ring and hub, find the required minimum outer hub diameter D_N in the Hub Diameters table for ML Series.

$$D_N \leq \text{Outer hub diameter}$$

If you are calculating the outer hub diameter use one of the following formulas.

$$D_N \geq D \sqrt{\frac{\sigma_{0.2B} + K_3 \cdot P'}{\sigma_{0.2B} - K_3 \cdot P'}} \quad (\text{When } B \geq l)$$

$$D_N \geq D \sqrt{\frac{\sigma_{0.2B} + K_3 \cdot P'_{\kappa}}{\sigma_{0.2B} - K_3 \cdot P'_{\kappa}}} \quad (\text{When } B < l)$$

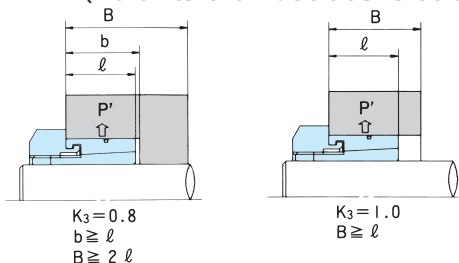
D_N : Hub outer diameter mm

D : Hub inner diameter mm

$\sigma_{0.2B}$: Yield point of hub material
MPa {kgf/mm²}

P' , P'_{κ} : Contact pressure between the outer ring and hub MPa {kgf/mm²}

K_3 : Hub configuration coefficient
(Refer to the illustrations below.)



(3) Hollow Shaft Inner Diameter

Calculate the hollow shaft inner diameter using the following formula.

$$d_B \leq d \sqrt{\frac{\sigma_{0.2S} - 2 \times P}{\sigma_{0.2S}}}$$

d_B : Maximum hollow shaft inner diameter mm

d : Shaft diameter mm

$\sigma_{0.2S}$: Yield point of shaft material
MPa {kgf/mm²}

P : Contact pressure between the inner ring and shaft MPa {kgf/mm²}

4. EL Series

STEP1 Actual Locking Force, Transmissible Torque and Contact Pressure

(1) When the required transmissible torque M_t is different from the { M_t } listed in the Model Numbers and Specifications table

Calculate the actual locking force F_e , thrust P_{ax} , contact pressure P and P' using the following formulas.

$$C_1 = M_t / \{M_t\}$$

(Required transmissible torque ratio)

$$F_e = C_1 \times \{F_e\} \text{ N {kgf}}$$

(Actual locking force)

$$F = F_0 + F_e \text{ N {kgf}} \quad (\text{Total force})$$

$$P_{ax} = C_1 \times \{P_{ax}\} \text{ N {kgf}}$$

(Transmissible thrust)

$$P = C_1 \times \{P\} \text{ MPa {kgf/mm}^2}$$

(Contact pressure on the shaft)

$$P' = C_1 \times \{P'\} \text{ MPa {kgf/mm}^2}$$

(Contact pressure on the hub)

M_t : Required transmissible torque
N·m {kgf·m}

F_0 , $\{F_e\}$, $\{M_t\}$, $\{P_{ax}\}$, $\{P'\}$: Refer to Model Numbers and Specifications tables.

(2) When the required actual locking force F_e is different from $\{F_e\}$ listed in the Model Numbers and Specifications table

Calculate transmissible torque M_t , thrust P_{ax} , contact pressure P and P' using the following formulas.

$$C_2 = F_e / \{F_e\}$$

(Required actual locking force ratio)

$$M_t = C_2 \times \{M_t\} \text{ N·m {kgf·m}}$$

(Transmissible torque)

$$P_{ax} = C_2 \times \{P_{ax}\} \text{ N {kgf}}$$

(Transmissible thrust)

$$P = C_2 \times \{P\} \text{ MPa {kgf/mm}^2}$$

(Contact pressure on the shaft)

$$P' = C_2 \times \{P'\} \text{ MPa {kgf/mm}^2}$$

(Contact pressure on the hub)

F_e : Required actual locking force MPa {kgf/mm²}

F_0 , $\{F_e\}$, $\{M_t\}$, $\{P_{ax}\}$, $\{P'\}$: Refer to the Model Numbers and Specifications tables.

Note) $0.25 \leq C_2 \leq 2$

(3) Multiple Power-Lock Installation

Calculate transmissible torque M_{tz} , thrust P_{axz} and contact pressure P_z and P'_z using the following formulas.

(z is the number of EL units installed.)

$$M_{tz} = S \cdot M_t$$

$$P_{axz} = S \cdot P_{ax}$$

$$P_z = P_1 \quad (\text{Contact pressure on the shaft})$$

$$P'_z = P'_1 \quad (\text{Contact pressure on the hub})$$

M_t , P_{ax} , P'_1 apply to single unit installation.

Z	S
1	1
2	1.55
3	1.85
4	2

STEP2 Shaft and Hub

EL Series Power-Locks do not have a self-centering function. A hub must be pre-centered, using the guide portion provided between the shaft and hub. A guide portion length above $d/2$ is generally preferred. Also, select guide tolerance based on the degree of accuracy you desire.

(1) Material Strength

Select shaft and hub materials that meet the following strength requirements.

$$\sigma_{0.2S} \geq 1.4 \times P$$

$$\sigma_{0.2B} \geq 1.4 \times P'$$

$\sigma_{0.2S}$, $\sigma_{0.2B}$: Yield point of shaft and hub material
MPa {kgf/mm²}

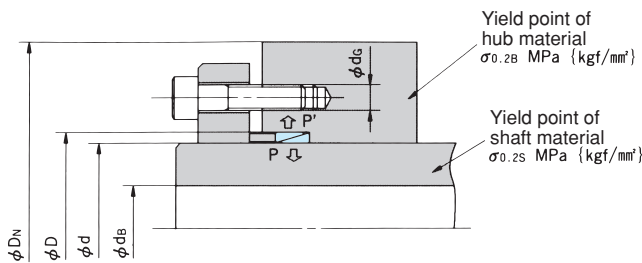
P , P' : Contact pressure on the shaft and hub bore
MPa {kgf/mm²}

(2) Required Hub Outer Diameter D_N and Allowable Hollow Shaft Bore Diameter d_B

Hubs must have a D_N that is greater than the value obtained from the following formula.

If using a hollow shaft, its bore must be equivalent to or less than the d_B obtained from the appropriate formula below.

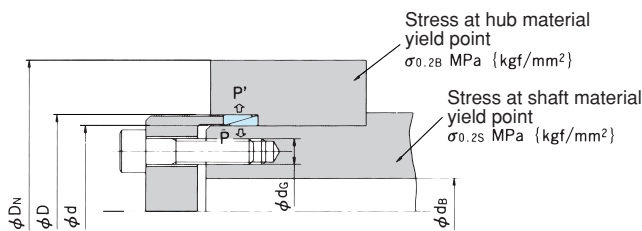
(a) Bolts Fastened to the Hub Section



$$D_N \geq D \sqrt{\frac{\sigma_{0.2B} + 0.8 \times P'}{\sigma_{0.2B} - 0.8 \times P'}} + d_g$$

$$d_B \leq d \sqrt{\frac{\sigma_{0.2S} - 1.2 \times P}{\sigma_{0.2S}}}$$

(b) Bolts Fastened to the Shaft Section



$$D_N \geq D \sqrt{\frac{\sigma_{0.2B} + 0.6 \times P'}{\sigma_{0.2B} - 0.6 \times P'}}$$

$$d_B \leq d \sqrt{\frac{\sigma_{0.2S} - 1.6 \times P}{\sigma_{0.2S}}} - d_g$$

P , P' : Contact pressure on the shaft and hub.
MPa {kgf/mm²}

STEP3 Selecting Locking Bolts

(1) Bolt Strength Classes and Mechanical Properties

See section for Bolt Strength Classes and Mechanical Properties for details. In general, however, 10.9 and 12.9 class bolts should be used. These bolts are less affected by vibration and do not loosen as easily as others. The tightening torque for 10.9 bolts may be used for 12.9 bolts.

(2) Bolt Head Bearing Surface Pressure

When using 10.9 or 12.9 bolts, check the pressure at their bearing surfaces. If this pressure exceeds the maximum values provided below, the bearing surfaces will eventually deform, causing the bolts to loosen from decreased axial force. When the bearing pressure rises above the maximum values, reduce by increasing the strength of pressure flange (either change the material or treat with heat) or by lowering the tightening torque in order to prevent the bearing surfaces from deforming to a large degree.

Bearing surface area = A_s

$$= \frac{\pi}{4} (D^2 - d_{a \max}^2) \text{ mm}^2$$

D : Bolt head diameter mm
(Refer to Technical Data)

$d_{a \max}$: Nominal diameter mm
(Refer to Technical Data)

Bearing surface pressure

$$P_s = F_v / A_s \text{ MPa \{kgf/mm}^2\}$$

F_v : Tightening torque N {kgf}

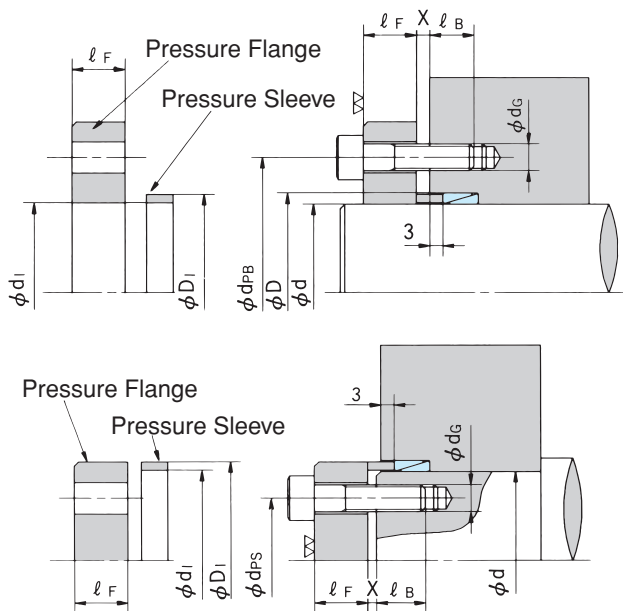
Maximum Surface Pressure by Material (Junker)

Name	Material		Mechanical Properties				Maximum Surface Pressure P_w	
	German Standards	JIS Equivalent	Tensile Strength MPa {kgf/mm ² }		Yield Point in Compression MPa {kgf/mm ² }		MPa	kgf/mm ²
Low-Carbon Steel	St37	S10C	346	35.3	272	27.9	294	30
Medium-Carbon Steel	St50	S30C	505	51.5	329	33.6	490	50
Heat Treated Carbon Steel	C45	S45C Thermally Refined	721	73.6	478	48.8	882	90
Cast Iron	GG22	—	228	23.3	443	45.2	980	100

STEP4 Pressure System Designs

Unit:mm

Pressure flanges experience a great deal of stress while locking bolts are being tightened. To avoid plastic deformation, use a pressure flange with the appropriate material strength and provide enough leeway in the design to account for some stress. Provided below are example pressure system design and calculations.



See table on the right for d₁, D₁ and X dimensions.

- (1) Bolt Pitch Circle Diameter dp_B, dp_S mm

(When d = φ10~φ30)

$$dp_B = D + 8 + dg$$

$$dp_S = d - 8 - dg$$

(When d = φ32~φ150)

$$dp_B = D + 10 + dg$$

$$dp_S = d - 10 - dg$$

However, if you are mounting a pressure flange to the hub, use 1/2 of the maximum number of bolts allowed or less, so that they may fit into the dp_B circumference.

- (2) Thickness of Pressure Flange l_F mm

$$l_F \geq 2 \times dg$$

- (3) Strength of Pressure Flange (σ_{0.2F})

When tightening with the torque required for 8.8 bolts.

$$\sigma_{0.2F} \geq 294 \text{ MPa} \{30 \text{ kgf/mm}^2\} (\text{S35C equivalent})$$

When tightening with the torque required for 10.9 bolts.

$$\sigma_{0.2F} \geq 343 \text{ MPa} \{35 \text{ kgf/mm}^2\} (\text{S45C equivalent})$$

When tightening with the torque required for 12.9 bolts.

$$\sigma_{0.2F} \geq 392 \text{ MPa} \{40 \text{ kgf/mm}^2\} (\text{S55C equivalent})$$

σ_{0.2F} : Yield point of pressure flange

MPa {kgf/mm²}

- (4) Functioning Length of the Screw l_B mm

$$l_B \geq 1.5 \times dg$$

Model No. d X D Shaft Diameter X Outer Diameter(P.L.) mm	Gap X Number of EL P.L.s Installed				Pressure Sleeve Diameters	
	1	2	3	4	d ₁	D ₁
PL010×013 E	2	2	3	3	10.1	12.9
PL011×014 E	2	2	3	3	11.1	13.9
PL012×015 E	2	2	3	3	12.1	14.9
PL013×016 E	2	2	3	3	13.1	15.9
PL014×018 E	3	3	4	5	14.1	17.9
PL015×019 E	3	3	4	5	15.1	18.9
PL016×020 E	3	3	4	5	16.1	19.9
PL017×021 E	3	3	4	5	17.1	20.9
PL018×022 E	3	3	4	5	18.1	21.9
PL019×024 E	3	3	4	5	19.2	23.8
PL020×025 E	3	3	4	5	20.2	24.8
PL022×026 E	3	3	4	5	22.2	25.8
PL024×028 E	3	3	4	5	24.2	27.8
PL025×030 E	3	3	4	5	25.2	29.8
PL028×032 E	3	3	4	5	28.2	31.8
PL030×035 E	3	3	4	5	30.2	34.8
PL032×036 E	3	3	4	5	32.2	35.8
PL035×040 E	3	3	4	5	35.2	39.8
PL036×042 E	3	3	4	5	36.2	41.8
PL038×044 E	3	3	4	5	38.2	43.8
PL040×045 E	3	4	5	6	40.2	44.8
PL042×048 E	3	4	5	6	42.2	47.8
PL045×052 E	3	4	5	6	45.2	51.8
PL048×055 E	3	4	5	6	48.2	54.8
PL050×057 E	3	4	5	6	50.2	56.8
PL055×062 E	3	4	5	6	55.2	61.8
PL056×064 E	3	4	5	7	56.2	63.8
PL060×068 E	3	4	5	7	60.2	67.8
PL063×071 E	3	4	5	7	63.2	70.8
PL065×073 E	3	4	5	7	65.2	72.8
PL070×079 E	3	5	6	7	70.3	78.7
PL071×080 E	3	5	6	7	71.3	79.7
PL075×084 E	3	5	6	7	75.3	83.7
PL080×091 E	4	5	6	8	80.3	90.7
PL085×096 E	4	5	6	8	85.3	95.7
PL090×101 E	4	5	6	8	90.3	100.7
PL095×106 E	4	5	6	8	95.3	105.7
PL100×114 E	4	6	7	9	100.3	113.7
PL110×124 E	4	6	7	9	110.3	123.7
PL120×134 E	4	6	7	9	120.3	133.7
PL130×148 E	5	7	9	11	130.4	147.6
PL140×158 E	5	7	9	11	140.4	157.6
PL150×168 E	5	7	9	11	150.4	167.6

X: The number of EL Series Power-Locks provided are based on the minimum space available when the ring between the pressure flange and the hub or shaft is under pressure.

Installation and Removal 1: AS, ADN, AE, KE, TF and EF Series

A. Installation

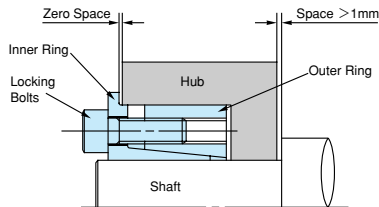
- (1) Verify that the shaft and the inner surface of the hub are clean and lightly oiled.

Note: Do not use silicone or molybdenum lubricants. Otherwise, friction coefficient will reduce, and standard torque will not be achieved.

- (2) Remove the bolts and clean all contact surfaces. Lightly coat the bolts, including their bearing surfaces, with oil or grease. For ADN Series Power-Locks, use an oil bath or a spray method to thoroughly lubricate each part.
- (3) Tighten the bolts part way, and preliminarily assemble the Power-Lock.

Notes: 1. Pre-assemble by keeping the phases of the slit and the taps for removal out of synch. For ADN Series, maintain maximum space between the taper rings.

2. In the case of step shaft installation for AE Series, make sure the space between the hub and the steps is greater than 1 mm.



- (4) Mount hub to shaft, and lightly push the Power-Lock to the end of the hub. Take caution in carrying out this process with the ADN Series for their taper angles are relatively small.

When the hub does not smoothly slide onto the shaft, either loosen the bolts or lightly tap on the hub until it is fixed into place.

Notes: 1. Do not hit the Power-Lock with a hammer. This will severely damage the product and possibly lead to accidents.

2. A spacer must be used with a TF Series Power-Lock. Without the spacer, the unit will not transmit torque.

- (5) Determine the position of the hub along the shaft circumference and length. Using a torque wrench, tighten one bolt to approximately quarter of the specified torque M_A , and then tighten the one diagonally across in the same manner. Repeat for the other bolts.
- (6) Using the torque wrench, tighten the bolts to one-half the specified torque M_A and repeat the tightening procedure in step (5).
- (7) Bring up to full tightening torque M_A and tighten as in step (5).
- (8) Tighten each bolt to full torque M_A in a circular order. Repeat a few times until the bolts are completely tightened.

Notes: 1. **A torque wrench must be used to tighten the locking bolts.** Be sure to follow the above instructions to tighten the bolts to the specified torque. Hand-tightening or tightening with a wrench other than a torque

wrench will result in incomplete installation, and lead to accidents.

2. Exceeding the specified tightening torque M_A will damage the bolts. On the other hand, tightening to torque below M_A will cause the bolts to loosen during operation. Be sure to use the correct torque to tighten these bolts.
3. Do not use bolts other than those provided. Otherwise, bolts may damage and cause accidents. If you misplace or damage any bolts, contact Tsubaki Emerson for replacement.

B. Removal

- (1) Verify that no torque or thrust is applied to the hub and shaft.

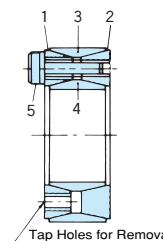
Note that in cases where a heavy shaft, hub or chain is used, disassembly may be slightly complicated. After removing the load, disassemble the unit by loosening the bolts in the correct order described in Installation A.

Caution: Loosening the bolts will release the locking function, which may cause the shaft to spin or jump out.

- (2) If the unit does not remove even after loosening all the bolts, tighten the bolts into the screw holes prepared for removal. This will instantly release the lock.

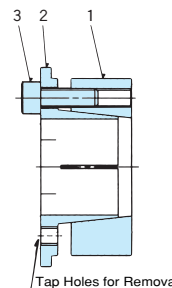
Note: Take caution in installing and removing ADN Series Power-Locks for they have relatively smaller taper angles.

AS Series



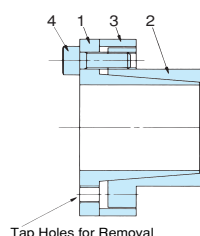
- Parts
- 1 : Taper Ring A
 - 2 : Taper Ring B
 - 3 : Outer Ring
 - 4 : Inner Ring
 - 5 : Locking Bolts

AE Series

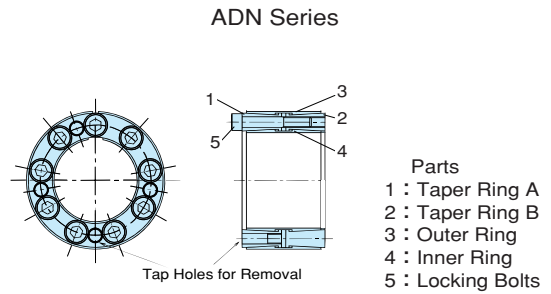
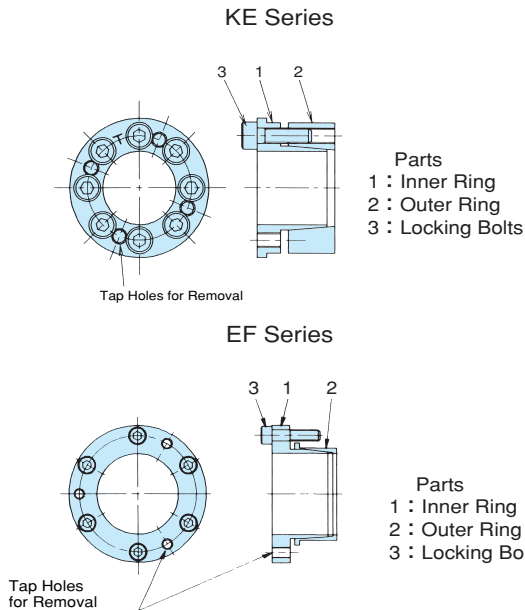


- Parts
- 1 : Outer Ring
 - 2 : Inner Ring
 - 3 : Locking Bolts

TF Series



- Parts
- 1 : Inner Ring
 - 2 : Outer Ring
 - 3 : Spacer
 - 4 : Locking Bolts



C. Reusability

Assembly and disassembly of the Power-Locks may be repeated a few times. However, if the hub and shaft material yield stresses $\sigma_{0.2}$ cannot tolerate the contact pressure P and P' , repeated assembly and disassembly may damage certain parts of the hub-shaft contact surfaces.

Installation and Removal 2: AS-SS, AS-KP, KE-SS, KE-KP, TF-KP, RE-SS, SL and ML (MG) Series

A. Installation

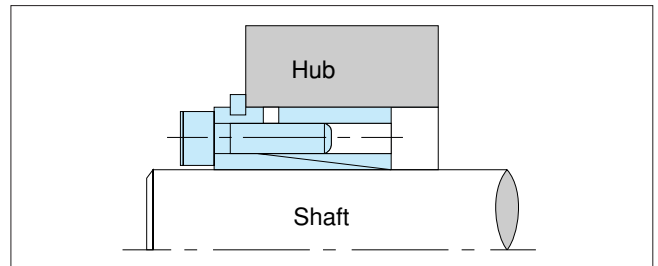
- (1) Remove dust and oil from the hub and shaft with a cloth or alcohol. Be sure to completely remove any grease and oil. Otherwise, standard torque may not be achieved.
 Note: The locking bolts are coated with a special substance so no lubrication is required.
- (2) Mount the Power-Lock onto the hub or shaft. Loosen the bolts or nut if difficult to install.
- (3) Using a torque wrench, tighten the bolts at quarter of the specified torque M_A , starting with one bolt then another diagonally across and repeating for the other bolts. Then, tighten the bolts further to one-half the specified torque M_A in the same crisscross sequence. Finally, tighten each bolt to full torque M_A in a circular order. Repeat until each bolt is completely tightened.

- Notes:
1. Do not hit the Power-Lock with a hammer. This will severely damage the product and possibly lead to accidents.
 2. **A torque wrench must be used to tighten the locking bolts.** Be sure to follow the above instructions to tighten the bolts to the specified torque. Hand-tightening or tightening with a wrench other than a torque wrench will result in incomplete installation, and lead to accidents.
 3. Exceeding the specified tightening torque M_A will damage the bolts. On the other hand, tightening to torque below M_A will cause the bolts to loosen during operation. Be sure to use the correct torque to tighten these bolts.
 4. Do not use bolts or nuts other than those provided. Otherwise, bolts and nuts may damage and lead to accidents.

■ Notes on RE Series

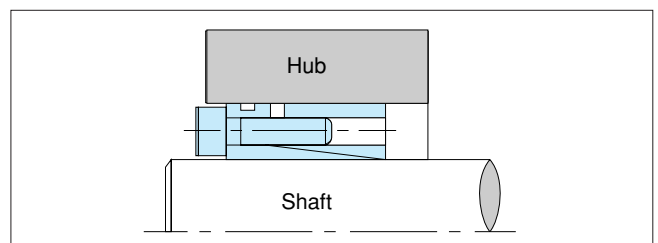
(1) Installation A: With a Snap Ring

- ① Use a snap ring to prevent the hub from moving in the direction of the thrust.



(2) Installation B: Without a Snap Ring

- ① The hub will move in the direction of the thrust while the unit is being installed. See RE Series Movement in the Shaft Direction for amount of hub movement.
- ② Compared to Installation A, installation without a snap ring can transmit torque up to 1.7 times. Take note of the hub and shaft material strengths for this installation. The contact pressure generated at the hub and shaft from this setup is much larger than that achieved from Installation A. It is very important to check the hub material strength, for if the contact pressure is too high, the hub may displace itself. For required hub diameters, refer to the appropriate Hub Diameters table.



③The snap ring can be easily removed with a flat-blade screwdriver.

- Removing a snap ring:

The snap rings for Power-Locks are shaped like spirals. Insert a flat-blade screwdriver in the slit of the snap ring and slightly lift to remove. See Illustration 1.

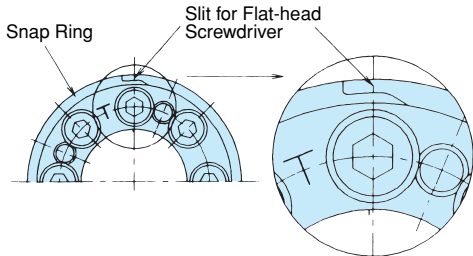


Illustration 1 Removing a Snap Ring

■ Notes on SL Series

Before installing an SL Power-Lock, loosen the locking bolts and remove the spacer inserted between the taper rings A and B. See Illustration 2.

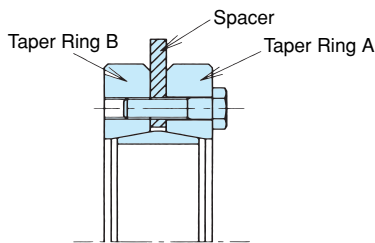


Illustration 2

■ Notes on ML (MG) Series

When installing, if the widths of ML Power-Lock (L1) and hub (B) are as follows: $B \geq l$, refer to Illustration 3. In contrast, if $B < l$, while the hub and nut ends are in contact, place B at the approximate midpoint of l .

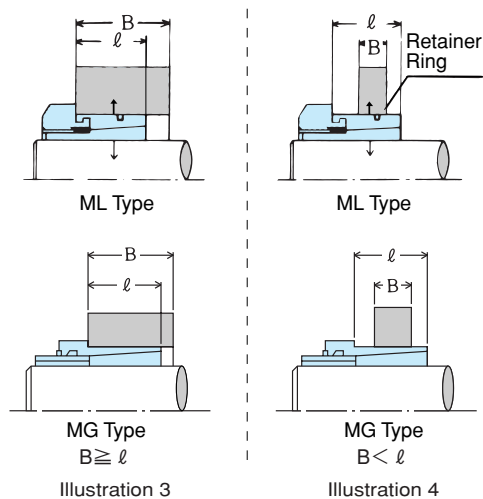


Illustration 3

Illustration 4

B. Removal

- (1) Verify that no torque or thrust is applied to the hub and shaft.

Note that in cases where a heavy shaft, hub or chain is used, disassembly may be slightly complicated. After removing the load, disassemble the unit by loosening the bolts in the correct order described in Installation A.

△ Caution: Loosening the bolts will release the locking function, which may cause the shaft to spin or jump out.

- (2) If the unit does not remove even after loosening all the bolts, tighten the bolts into the screw holes prepared for removal. This will instantly release the lock.

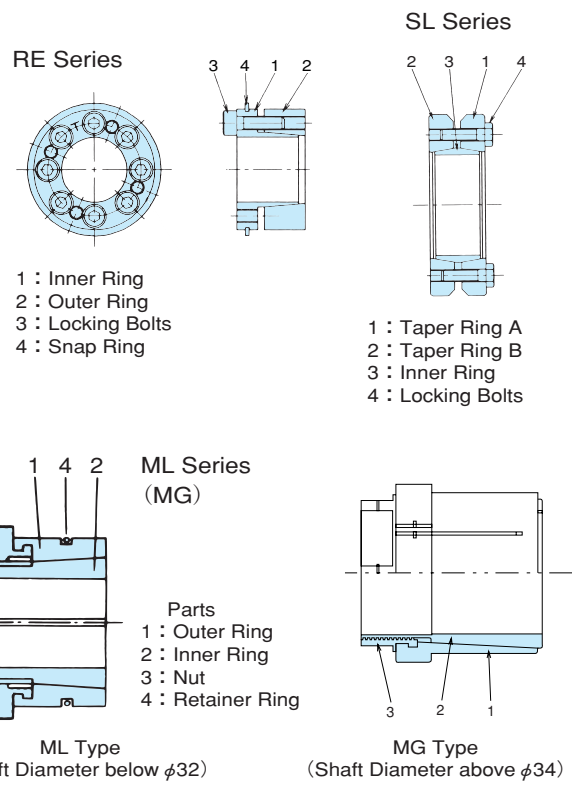


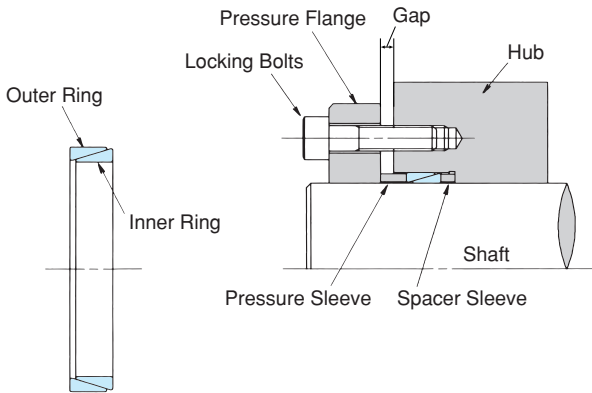
Illustration 5 Parts

C. Reusability

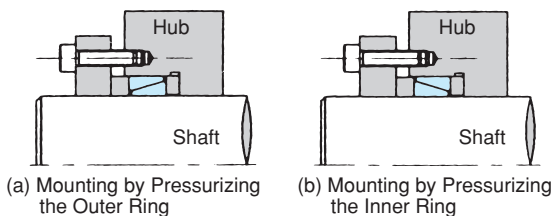
- (1) When Power-Locks with specially lubricated bolts and inner rings start to flake, they cannot be reused. Also, if the end of a locking bolt seems to be damaged or if other parts show signs of wear, the product cannot be reused.
- (2) Assembly and disassembly of the Power-Locks may be repeated a few times. However, if the hub and shaft material yield stresses $\sigma_{0.2}$ cannot tolerate the contact pressure P and P' , repeated assembly and disassembly may damage certain parts of the hub-shaft contact surfaces.

Installation and Removal 3: EL Series

A. Removal



- (1) Verify that the shaft and the inner surface of the hub are clean and lightly oiled.
 ⚠ Note: Do not use silicone or molybdenum lubricants. Otherwise, friction coefficient will reduce, and standard torque will not be achieved.
- (2) If an indentation in the inner hub corner or a large R is machined, a spacer sleeve must be used.
- (3) An EL Power-Lock can be installed in two ways, resulting in different transmissible torque: (a) Install by pressurizing the outer ring or (b) by pressurizing the inner ring. Pay close attention to the installation position during this procedure.
- (4) Mount the Power-Lock so that it slightly moves in parallel to the shaft.



- (5) Mount by tightening the bolts on the pressure flange evenly, in a crisscross sequence. Make sure that the amount of space between the pressure flange and the hub is uniform throughout the circumference.

Note: If the pressure flange material strength is insufficient, adequate pressure cannot be achieved. Confirm the catalog rate for pressure flange material strength before installing and avoid damages to the Power-Lock and the bolt head bearing surfaces.

- (6) Hand-tighten the bolts until the pressure flange no longer moves in the shaft direction. Then, adjust the hub position and phase.

Note: Do not use a spring washer or toothed washer with the pressure flange and bolts.

- (7) Using a torque wrench or a hexagonal spanner wrench tighten the bolts to approximately quarter of the specified torque.
- (8) Using the wrench tighten the bolts to one-half the specified torque.
- (9) Bring up to full tightening torque M_A until the bolts do not turn any further. Use the torque wrench to complete this final step and make sure that the space between the pressure flange and the hub or shaft end is uniform throughout the circumference.

■ Notes on AS and EL Series

When using a Power-Lock that is not self-centering, mount a guiding unit to the hub. However, do not center by tightening the bolts. Instead, center or align the hub and shaft by adjusting the guide portion itself. The alignment accuracy is determined by the length and tolerance of the guide portion.

B. Removal

- (1) Tighten the bolts in a crisscross sequence.
 Normally, when the bolts are loosened, the Power-Lock will remove itself.
- (2) If it does not remove after loosening all the bolts, clean the surrounding surface and lightly hit the Power-Lock with a hammer.
- (3) If an EL Power-Lock does not remove by procedure (2), an increase in friction coefficient may have taken place due to damaged contact surfaces or a dislocation of the unit may have happened due to incorrect mounting or a plastic deformation may have occurred. In these cases, the unit must be disassembled and the problem investigated before reassembling.

C. Reusability

- (1) An EL Power-Lock cannot be reused if the bolt ends or other parts are damaged.
- (2) Assembly and disassembly of the Power-Locks may be repeated a few times. However, if the hub and shaft material yield stresses $\sigma_{0.2}$ cannot tolerate the contact pressure P and P' , repeated assembly and disassembly may damage certain parts of the hub-shaft contact surfaces.

Precautions

1. Installing to Keyed Shafts

Mounting to keyed shafts such as motored shafts will reduce the transmissible torque M_t and transmissible thrust P_{ax} by 10%.

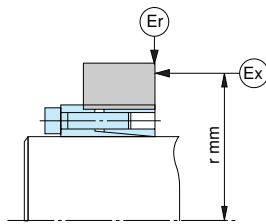
Transmissible torque : $M_t \times 0.9$
 Transmissible thrust : $P_{ax} \times 0.9$

2. Installation Accuracy

When a Power-Lock is installed into a straight hub bore, the installation accuracy depends on the hub's length as shown below.

Ex: Hub End Face Runout Below $0.002 \times r$ mm
 Er: Outer Hub Diameter Runout Below 0.05mm

Series	Hub Length B
ADN	L
AE	L_2
RE	L_2
KE	L_2
TF	ℓ
EF	ℓ



When an ML Series Power-Lock is installed into a straight hub bore and when the hub length B is ℓ installation accuracy is as follows:

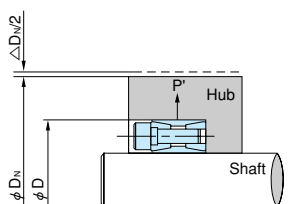
Model Number	Exmax (mm)	Ermax (mm)
PL005X016M~PL006X016M	$0.0035 \times r$	0.05
PL007X021M~PL016X031M	$0.0023 \times r$	0.05
PL017X036M~PL075X100MG	$0.0017 \times r$	0.05

AS and EL Series are not self-centering.
 Refer to Selection Procedure for details.

3. Hub's Outer Diameter Deformation

When a Power-Lock is mounted onto a hub, contact pressure P' will exert on the hub's inner surface, causing the hub's outer diameter to experience a plastic deformation. The specific degree of deformation cannot be determined for it depends on the distribution of P' and the type of hub. However, the following formula can be used to obtain rough deformation values.

$$\Delta D_N \cong \frac{D_N}{E} \times \frac{2 \times K_3 \times P'}{\left(\frac{D_N}{D}\right)^2 - 1}$$



P' : Contact pressure of the hub MPa
 E : Young's Modulus
 For steel: $E=205800$ MPa
 D : Hub inner diameter mm
 D_N : Hub outer diameter mm
 ΔD_N : Hub's outer diameter deformation mm
 K_3 : Hub configuration coefficient
 (See appropriate Hub Diameters table.)

4. Ambient Temperature

Power-Locks must be operated in an appropriate environment with a temperature ranging from -30°C to 200°C .

5. Allowable Deviation of Tightening Torque M_A

The allowable deviation from the specified tightening torque is $\pm 5\%$. If the bolts are correctly tightened within this range with a torque wrench as instructed, the unit should achieve adequate transmissible torque M_A and thrust P_{ax} .

6. Hub Movement

The hub may move, depending on the type of Power-Lock installed. See Selection and Procedure for details.

(1) RE Series Hub Movement

The hub will move when installing an RE Power-Lock without a snap ring. This movement is caused by the deformation of the shaft and hub and varies depending on the hub's inner-to-outer diameter ratio a_N . See table below.

$$a_N = \frac{D_N}{D} \quad D : \text{Inner Hub Diameter mm} \\ D_N : \text{Outer Hub Diameter mm}$$

Model No. d X D Shaft Diameter x Outer Diameter mm	Hub Movement (mm)		
	$a_N=3$	$a_N=2$	$a_N=1.5$
PL005X018 RE-SS	0.06	0.07	0.10
PL006X019 RE-SS	0.06	0.07	0.10
PL008X021 RE-SS	0.08	0.09	0.13
PL010X026 RE-SS	0.11	0.13	0.18
PL011X027 RE-SS	0.12	0.14	0.19
PL012X028 RE-SS	0.14	0.17	0.23
PL014X030 RE-SS	0.15	0.18	0.25
PL015X031 RE-SS	0.16	0.19	0.25
PL016X032 RE-SS	0.15	0.18	0.25
PL017X033 RE-SS	0.14	0.17	0.23
PL018X034 RE-SS	0.14	0.17	0.23
PL019X035 RE-SS	0.19	0.22	0.30
PL020X039 RE-SS	0.24	0.29	0.39
PL022X041 RE-SS	0.24	0.29	0.39
PL024X043 RE-SS	0.31	0.36	0.49
PL025X044 RE-SS	0.30	0.36	0.48
PL028X049 RE-SS	0.33	0.39	0.53
PL030X050 RE-SS	0.34	0.40	0.54
PL032X052 RE-SS	0.33	0.39	0.53
PL035X058 RE-SS	0.38	0.45	0.60
PL038X060 RE-SS	0.44	0.52	0.70
PL040X063 RE-SS	0.44	0.52	0.70
PL042X065 RE-SS	0.49	0.58	0.79
PL045X068 RE-SS	0.50	0.59	0.80
PL048X072 RE-SS	0.55	0.65	0.88
PL050X075 RE-SS	0.56	0.67	0.90

Precautions

(2) EF Series Hub Movement

The hub will move when connecting a shaft and hub with an EF Power-Lock. This movement is caused by the deformation of the shaft and hub bore and varies depending on the hub's inner-to-outer diameter ratio a_N .

$$a_N = \frac{D_N}{D} \quad D : \text{Inner Hub Diameter mm}$$

D_N : Outer Hub Diameter mm

Model No. d X D Shaft Diameter x Outer Diameter mm	Hub Movement (mm)		
	$a_N = 1.5$	$a_N = 2.0$	$a_N = 3.0$
PL010X013 EF	0.29	0.22	0.18
PL011X014 EF	0.29	0.22	0.18
PL012X015 EF	0.29	0.22	0.18
PL014X018 EF	0.29	0.22	0.18
PL015X019 EF	0.29	0.22	0.18
PL016X020 EF	0.44	0.32	0.27
PL017X021 EF	0.44	0.32	0.27
PL018X022 EF	0.48	0.35	0.30
PL019X024 EF	0.48	0.36	0.30
PL020X025 EF	0.48	0.36	0.30
PL022X026 EF	0.48	0.35	0.30
PL024X028 EF	0.48	0.36	0.30
PL025X030 EF	0.48	0.36	0.30
PL028X032 EF	0.72	0.53	0.45
PL030X035 EF	0.72	0.53	0.45
PL032X036 EF	0.62	0.46	0.39
PL035X040 EF	0.63	0.46	0.39
PL038X044 EF	0.88	0.65	0.55
PL040X045 EF	0.72	0.54	0.45
PL042X048 EF	0.96	0.71	0.60
PL045X052 EF	1.10	0.81	0.69
PL048X055 EF	1.09	0.81	0.68
PL050X057 EF	1.10	0.81	0.68
PL055X062 EF	1.09	0.81	0.68
PL060X068 EF	0.98	0.73	0.61
PL065X073 EF	1.31	0.97	0.82
PL070X079 EF	1.25	0.92	0.78
PL075X084 EF	1.55	1.15	0.97
PL080X091 EF	1.41	1.04	0.88
PL085X096 EF	1.80	1.33	1.12
PL090X101 EF	1.80	1.33	1.13
PL095X106 EF	1.80	1.33	1.12
PL100X114 EF	1.64	1.22	1.03
PL110X124 EF	1.65	1.22	1.03
PL120X134 EF	1.98	1.47	1.24

7. Assembly Lubrication

A Power-Lock's main body and bolts must be lubricated during assembly. Some may be concerned that the lubrication may cause Power-Locks to slip, or the bolts to loosen. However, specified tightening torque for the bolts is calculated provided that the bolts are thoroughly lubricated. Oil is also required for the tapered surfaces to slide smoothly. If the unit is not lubricated, transmissible torque will decrease approximately 25% due to a reduction in axial force. The bolts may also deform and lead to failure. In the case of a stainless steel or an electroless nickel-plated model, however, the bolts are coated with a special substance and the main unit is prepared so that it can be operated in the "dry state". Do not lubricate these models during assembly.

(3) ML Series Hub Movement

The hub will move after tightening the nut but before achieving the specified torque, and while the shaft and hub bore have not yet generated contact pressure. This movement is caused by the deformation of the shaft and hub bore and varies depending on the hub's inner-to-outer diameter ratio a_N .

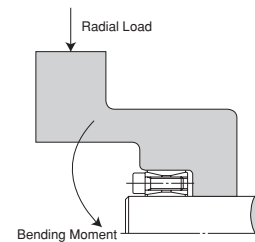
$$a_N = \frac{D_N}{D} \quad D : \text{Inner Hub Diameter mm}$$

D_N : Outer Hub Diameter mm

Model No. d X D Shaft Diameter x Outer Diameter mm	Hub Movement (mm)			
	$a_N = 3$	$a_N = 2$	$a_N = 1.5$	$a_N = 1.2$
PL005X016 M	0.13	0.15	0.20	0.34
PL006X016 M	0.13	0.16	0.20	0.35
PL007X021 M	0.21	0.25	0.33	0.58
PL008X021 M	0.22	0.25	0.33	0.58
PL009X021 M	0.22	0.26	0.34	0.59
PL010X024 M	0.28	0.32	0.43	0.75
PL011X024 M	0.28	0.33	0.43	0.76
PL012X024 M	0.29	0.34	0.44	0.76
PL014X031 M	0.42	0.49	0.65	1.16
PL015X031 M	0.43	0.50	0.66	1.16
PL016X031 M	0.43	0.50	0.66	1.17
PL017X036 M	0.49	0.57	0.76	1.34
PL018X036 M	0.50	0.58	0.76	1.34
PL019X036 M	0.50	0.58	0.77	1.35
PL020X041 M	0.48	0.56	0.75	1.33
PL022X041 M	0.49	0.57	0.76	1.34
PL024X041 M	0.50	0.59	0.77	1.35
PL025X046 M	0.53	0.62	0.83	1.47
PL028X046 M	0.55	0.64	0.85	1.49
PL030X050 M	0.54	0.63	0.84	1.50
PL032X050 M	0.53	0.62	0.83	1.48

8. Bending Moment

Power-Locks cannot tolerate bending moments. Contact Tsubaki Emerson if a bending moment applies as illustrated below.



9. Outdoor Use

Power-Lock performance is not affected by moisture or rain due to the tight seal of parts maintained by their high interfacial contact pressure. However, the exterior surfaces will begin to rust. The rust will reduce the bolts' tensile strengths and cause a sudden drop in the general tightening force. In order to prevent this, you must use a cover, thoroughly grease the unit and take countermeasures against corrosion. If the cover causes any inconvenience, opt for the anticorrosive stainless steel or electroless nickel-plated models. Also, note that although the exterior surfaces of SL Power-Locks are coated with a special lubricant, it may not be effective after a certain period of time. It may be wise to lubricate them after assembly.

Technical Data: Fit Tolerances and Allowable Dimensional Deviations (JIS B0401)

Dimensional deviations for regular fits (JIS B0401)

Shafts

(Unit : μm)

Standard Dimensions (mm)		d9		e7		e8		f7		f8		g6		h7		h8		h9		h10	
Above	Below	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation
3	6	-30	-60	-20	-32	-20	-38	-10	-22	-10	-28	-4	-12	0	-12	0	-18	0	-30	0	-48
6	10	-40	-76	-25	-40	-25	-47	-13	-28	-13	-35	-5	-14	0	-15	0	-22	0	-36	0	-58
10	18	-50	-93	-32	-50	-32	-59	-16	-34	-16	-43	-6	-17	0	-18	0	-27	0	-43	0	-70
18	30	-65	-115	-40	-61	-40	-73	-20	-41	-20	-53	-7	-20	0	-21	0	-33	0	-52	0	-84
30	50	-80	-142	-50	-75	-50	-89	-25	-50	-25	-64	-9	-25	0	-25	0	-39	0	-62	0	-100
50	80	-100	-174	-60	-90	-60	-106	-30	-60	-30	-76	-10	-29	0	-30	0	-46	0	-74	0	-120
80	120	-120	-207	-72	-107	-72	-126	-36	-71	-36	-90	-12	-34	0	-35	0	-54	0	-87	0	-140
120	180	-145	-245	-85	-125	-85	-148	-43	-83	-43	-106	-14	-39	0	-40	0	-63	0	-100	0	-160
180	250	-170	-285	-100	-146	-100	-172	-50	-96	-50	-122	-15	-44	0	-46	0	-72	0	-115	0	-185
250	315	-190	-320	-110	-162	-110	-191	-56	-108	-56	-137	-17	-49	0	-52	0	-81	0	-130	0	-210
315	400	-210	-350	-135	-182	-125	-214	-62	-119	-62	-151	-18	-54	0	-57	0	-89	0	-140	0	-230
400	500	-230	-385	-135	-198	-135	-232	-68	-131	-68	-165	-20	-60	0	-63	0	-97	0	-155	0	-250

Standard Dimensions (mm)		h5		h6		j6		k5		k6		k11		m5		m6		n6	
Above	Below	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation
3	6	0	-5	0	-8	+7	-1	+6	+1	+9	+1	+75	0	+9	+4	+12	+4	+16	+8
6	10	0	-6	0	-9	+7	-2	+7	+1	+10	+1	+90	0	+12	+6	+15	+6	+19	+10
10	18	0	-8	0	-11	+8	-3	+9	+1	+12	+1	+110	0	+15	+7	+18	+7	+23	+12
18	30	0	-9	0	-13	+9	-4	+11	+2	+15	+2	+130	0	+17	+8	+21	+8	+28	+15
30	50	0	-11	0	-16	+11	-5	+13	+2	+18	+2	+160	0	+20	+9	+25	+9	+33	+17
50	80	0	-13	0	-19	+12	-7	+15	+2	+21	+2	+190	0	+24	+11	+30	+11	+39	+20
80	120	0	-15	0	-22	+13	-9	+18	+3	+25	+3	+220	0	+28	+13	+35	+13	+45	+23
120	180	0	-18	0	-25	+14	-11	+21	+3	+28	+3	+250	0	+33	+15	+40	+15	+52	+27
180	250	0	-20	0	-29	+16	-13	+24	+4	+33	+4	+290	0	+37	+17	+46	+17	+60	+31
250	315	0	-23	0	-32	+16	-16	+27	+4	+36	+4	+320	0	+43	+20	+52	+20	+66	+34
315	400	0	-25	0	-36	+18	-18	+29	+4	+40	+4	+360	0	+46	+21	+57	+21	+73	+37
400	500	0	-27	0	-40	+20	-20	+32	+5	+45	+5	+400	0	+50	+23	+63	+23	+80	+40

Bores

(Unit : μm)

Standard Dimensions (mm)		D9		E7		E8		F7		F8		G7		H6		H7		H8		H9	
Above	Below	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation
3	6	+60	+30	+32	+20	+38	+20	+22	+10	+28	+10	+16	+4	+8	0	+12	0	+18	0	+30	0
6	10	+76	+40	+40	+25	+47	+25	+28	+13	+35	+13	+20	+5	+9	0	+15	0	+22	0	+36	0
10	18	+93	+50	+50	+32	+59	+32	+34	+16	+43	+16	+24	+6	+11	0	+18	0	+27	0	+43	0
18	30	+117	+65	+61	+40	+73	+40	+41	+20	+53	+20	+28	+7	+13	0	+21	0	+33	0	+52	0
30	50	+142	+80	+75	+50	+89	+50	+50	+25	+64	+25	+34	+9	+16	0	+25	0	+39	0	+62	0
50	80	+174	+100	+90	+60	+106	+60	+60	+30	+76	+30	+40	+10	+19	0	+30	0	+46	0	+74	0
80	120	+207	+120	+107	+72	+126	+72	+71	+36	+90	+36	+47	+12	+22	0	+35	0	+54	0	+87	0
120	180	+245	+145	+125	+85	+148	+85	+83	+43	+106	+43	+54	+14	+25	0	+40	0	+63	0	+100	0
180	250	+285	+170	+146	+100	+172	+100	+96	+50	+122	+50	+61	+15	+29	0	+46	0	+72	0	+115	0
250	315	+320	+190	+162	+110	+191	+110	+108	+56	+137	+56	+69	+17	+32	0	+52	0	+81	0	+130	0
315	400	+350	+210	+182	+125	+214	+125	+119	+62	+151	+62	+75	+18	+36	0	+57	0	+89	0	+140	0
400	500	+385	+230	+198	+135	+232	+135	+131	+68	+165	+68	+83	+20	+40	0	+63	0	+97	0	+155	0

Standard Dimensions (mm)		H11		J6		J7		K6		K7		K11		M6		M7		N6		N7	
Above	Below	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation	Upper Deviation	Lower Deviation
3	6	+75	0	+4	-4	+5	-7	+2	-6	+3	-9	0	-75	-1	-9	0	-12	-5	-13	-4	-16
6	10	+90	0	+5	-4	+8	-7	+2	-7	+5	-10	0	-90	-3	-12	0	-15	-7	-16	-4	-19
10	18	+110	0	+6	-5	+10	-8	+2	-9	+6	-12	0	-110	-4	-15	0	-18	-9	-20	-5	-23
18	30	+130	0	+8	-5	+12	-9	+2	-11	+6	-15	0	-130	-4	-17	0	-21	-11	-24	-7	-28
30	50	+160	0	+10	-6	+14	-11	+3	-13	+7	-18	0	-160	-4	-20	0	-25	-12	-28	-8	-33
50	80	+190	0	+13	-6	+18	-12	+4	-15	+9	-21	0	-190	-5	-24	0	-30	-14	-33	-9	-39
80	120	+220	0	+16	-6	+22	-13	+4	-18	+10	-25	0	-220	-8	-28	0	-35	-16	-38	-10	-45
120	180	+250	0	+18	-7	+26	-14	+4	-21	+12	-28	0	-250	-8	-33	0	-40	-20	-45	-12	-52
180	250	+290	0	+22	-7	+30	-16	+5	-24	+13	-33	0	-290	-8	-37	0	-46	-22	-51	-14	-60
250	315	+320	0	+25	-7	+36	-18	+5	-27	+16	-36	0	-320	-9	-41	0	-52	-25	-57	-14	-66
315	400	+360	0	+29	-7	+39	-18	+7	-29	+17	-40	0	-360	-10	-46	0	-57	-26	-62	-16	-73
400	500	+400	0	+33	-7	+43	-20	+8	-32	+18	-45	0	-400	-10	-50	0	-63	-27	-67	-17	-80

Technical Data: Iron and Steel Material Strengths

Name	JIS Standard No.	Steel Products No.	Standard				Quenching, Tempering					
			Yield Point $\sigma_{0.2}$		Tensile Strength σ_B		Yield Point $\sigma_{0.2}$		Tensile Strength σ_B			
			MPa	kgf/mm ²	MPa	kgf/mm ²	MPa	kgf/mm ²	MPa	kgf/mm ²		
Rolled Steel for General Structural Use	G3101	SS330	177	18	333~431	34~44						
		SS400	216	22	402~510	41~52						
		SS490	255	26	490~607	50~62						
Carbon Steel for Machine Structural Use	G4051	S15C	235	24	373	38	333	34	539	55		
		S25C	265	27	441	45						
		S30C	284	29	471	48						
		S35C	304	31	510	52						
		S40C	324	33	539	55						
		S45C	343	35	569	58						
		S50C	363	37	608	62						
		S55C	392	40	647	66						
Nickel-chromium Steel	G4102	SNC236					588	60	735	75		
		SNC631					735	75	833	85		
		SNC836					784	80	882	90		
Nickel-chromium- molybdenum Steel	G4103	SNCM240					784	80	882	90		
		SNCM431					686	70	833	85		
		SNCM439					882	90	980	100		
		SNCM447					931	95	1030	105		
		SNCM625					833	85	931	95		
		SNCM630					882	90	1079	110		
Chromium- molybdenum Steel	G4105	SCM430					686	70	833	85		
		SCM432					735	75	882	90		
		SCM435					784	80	931	95		
		SCM440					833	85	980	100		
		SCM445					882	90	1030	105		
Manganese Steel for Machine Structural Use and Manganese-chromium Steel	G4106	SMn433					539	55	686	70		
		SMn438					588	60	735	75		
		SMn443					637	65	784	80		
		SMnC443					784	80	931	95		
		SCr420					637	65	784	80		
Chrome Steel	G4104	SCr435					735	75	882	90		
		SCr440					784	80	931	95		
		SCr445					833	85	980	100		
		SUS301	206	21	520	53	Note5					
SUS302	206	21	520	53								
SUS303	206	21	520	53								
SUS304	206	21	520	53								
SUS308	206	21	520	53								
SUS316	206	21	520	53								
SUS317	206	21	520	53								
SUS347	206	21	520	53								
SUS405	177	18	412	42								
SUS429	206	21	451	46								
SUS430	206	21	451	46								
SUS434	206	21	451	46								
SUS403					392	40					588	60
SUS410					343	35					539	55
SUS416					343	35					539	55
SUS431					586	60					785	80

Note 1) Normalized
Note 4) Martensite Stainless Steel

Note 2) Austenite Stainless Steel
Note 5) Solution Treated

Note 3) Ferrite Stainless Steel
Note 6) Annealed

Technical Data: Cast and Wrought Product Material Strengths

Name	JIS Standard No.	Steel Products No.	Standard				Quenching, Tempering							
			Yield Point $\sigma_{0.2}$		Tensile Strength σ_B		Yield Point $\sigma_{0.2}$		Tensile Strength σ_B					
			MPa	kgf/mm ²	MPa	kgf/mm ²	MPa	kgf/mm ²	MPa	kgf/mm ²				
Carbon Steel Forgings for General Use	G3201	SF340A	176	18	343~441	35~45	294	30	539~686	55~70				
		SF390A	196	20	392~490	40~50								
		SF440A	226	23	441~539	45~55								
		SF490A	245	25	490~588	50~60								
		SF540A	275	28	539~637	55~65								
		SF590A	294	30	588~686	60~70								
		SF540B									324	33	588~736	65~75
		SF590B									343	35	637~785	65~80
Carbon Steel Castings	G5101	SC360	177	18	363	37								
		SC410	205	21	412	42								
		SC450	225	23	451	46								
		SC480	245	25	481	49								
Gray Iron Castings	G5502	FC200	117	12	167	17								
		FC250	147	15	216	22								
		FC300	186	19	265	27								
		FC350	215	22	314	32								
Spheroidal Graphite Iron Castings	G5502	FCD400	255	26	392	40								
		FCD450	284	29	441	45								
		FCD500	324	33	490	50								
		FCD600	373	38	588	60								
		FCD700	422	43	686	70								
Black Heart Malleable Iron Castings	G5702	FCMB210	167	17	275	28								
		FCMB310	186	19	314	32								
		FCMB340	206	21	343	35								
		FCMB360	216	22	363	37								

Note 1) Annealed, normalized or normalized and tempered.

Note 2) Cast iron products do not have a yield point. For the purpose of designing convenience, use the 70% value of each product's tensile strength to calculate the required hub outer diameter.

Technical Data: Locking Bolts

Optimum Power-Lock performance is achieved by using high tensile locking bolts and tightening them to efficient torque.

JISB1176, JISB1180

Bolt Strength Class		8.8	10.9	12.9	(13.9)	14.9
Tensile Strength σ_B	MPa	784	980	1176	1274	1372
	kgf/mm ²	80	100	120	130	140
Yield Point $\sigma_{0.2}$	MPa	627	882	1058	1147	1235
	kgf/mm ²	64	90	108	117	126

JIS B1176: Hexagon Socket Head Cap Screws
Bolt Strength Classes: 10.9 and 12.9

JIS B1180: Hexagon Head Bolts
Bolt Strength Classes: 8.8, 10.9, 12.9 and eight other classes including 4.6 are compatible.

※ Tightening Torque M_A and Tightening Force F_v
Bolt Data (Metric Coarse Thread Screws)

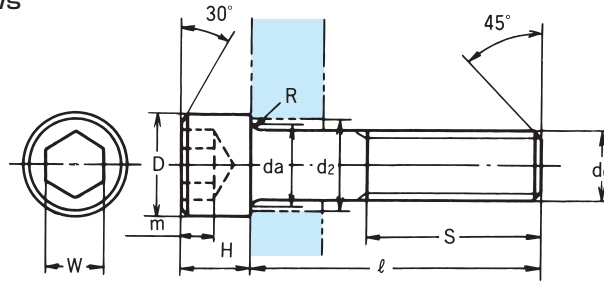
Bolt Strength Class	8.8				10.9				12.9			
	M_A		F_v		M_A		F_v		M_A		F_v	
	N·m	{kgf·m}	kN	{kgf}	N·m	{kgf·m}	kN	{kgf}	N·m	{kgf·m}	kN	{kgf}
M 3	1.37	0.14	2.21	225	1.86	0.19	3.09	315	2.25	0.23	3.72	380
	4	0.29	3.82	390	4.02	0.41	5.34	545	4.80	0.49	6.42	655
5	5.88	0.6	6.22	635	8.33	0.85	8.77	895	9.8	1	10.5	1070
6	9.8	1	8.82	900	13.7	1.4	12.3	1260	16.7	1.7	14.8	1510
8	24.5	2.5	16.2	1650	34.3	3.5	22.7	2320	40.2	4.1	27.3	2790
10	48.0	4.9	25.7	2620	67.6	6.9	36.2	3690	81.3	8.3	43.4	4430
12	84.3	8.6	37.5	3830	118	12	52.9	5400	142	14.5	63.2	6450
14	132	13.5	51.5	5250	186	19	72.5	7400	225	23	86.7	8850
16	206	21	71.5	7300	289	29.5	100	10200	348	35.5	121	12300
18	284	29	86.2	8800	397	40.5	122	12400	475	48.5	145	14800
20	402	41	112	11400	568	58	157	16000	676	69	188	19200
22	539	55	138	14100	764	78	195	19900	911	93	234	23900
24	696	71	161	16400	980	100	225	23000	1180	120	270	27600
27	1030	105	211	21500	1470	150	296	30200	1760	180	356	36300
30	1420	145	257	26200	1960	200	361	36800	2350	240	433	44200

M_A : Tightening Torque
 F_v : Tightening Force per 1 Bolt

Technical Data: Locking Bolt Dimensions

1. Hexagon Socket Head Cap Screws

JIS B1176



(Unit : mm)

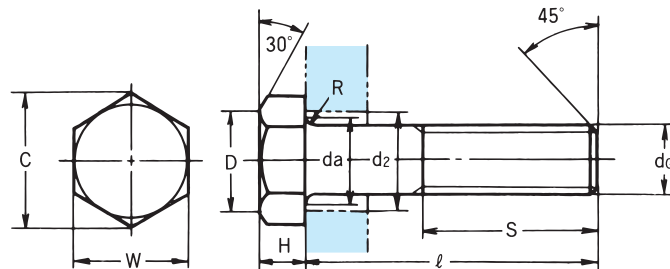
Nominal (dg)	M3	M4	M5	M6	M8	M10	M12	(M14)	M16	(M18)	M20	(M22)	M24	(M27)
P (Pitch) Coarse	0.5	0.7	0.8	1.0	1.25	1.5	1.75	2.0	2.0	2.5	2.5	2.5	3.0	3.0
d ₂ ^{Note 1)}	3.4	4.5	5.5	6.6	9	11	14	16	18	20	22	24	26	30
D	5.5	7	8.5	10	13	16	18	21	24	27	30	33	36	40
H	3	4	5	6	8	10	12	14	16	18	20	22	24	27
W	2.5	3	4	5	6	8	10	12	14	14	17	17	19	19
m (min)	1.6	2.2	2.5	3	4	5	6	7	8	9	10	11	12	13.5
da (max)	3.6	4.7	5.7	6.8	9.2	11.2	14.2	16.2	18.2	20.2	22.4	24.4	26.4	30.4
R (min)	0.1	0.2	0.2	0.25	0.4	0.4	0.6	0.6	0.6	0.6	0.8	0.8	0.8	1
ℓ	4~20	4~25	8~32	10~50	12~100	14~125	18~125	20~160	25~160	28~180	35~180	45~180	50~300	55~300
S ^{Note 2)}	12	14	16	18	22	26	30	34	38	42	46	50	54	60
								40	44	48	52	56	60	66
													73	79

Note 1) JIS B1001 2nd Class

Note 2) $\ell \leq 125\text{mm}$, $S=2d+6$, $125\text{mm} < \ell \leq 200\text{mm}$, $S=2d+12$, $200\text{mm} < \ell$, $S=2d+25$

2. Hexagon Head Cap Screws

JIS B1180



(Unit : mm)

Nominal (dg)	M3	M4	M5	M6	M8	M10	M12	(M14)	M16	(M18)	M20	(M22)	M24	(M27)
P (Pitch) Coarse	0.5	0.7	0.8	1.0	1.25	1.5	1.75	2.0	2.0	2.5	2.5	2.5	3.0	3.0
d ₂ ^{Note 1)}	3.4	4.5	5.5	6.6	9	11	14	16	18	20	22	24	26	30
D	5.3	6.8	7.8	9.8	12.6	16.5	18	21	23	26	29	31	34	39
H	2	2.8	3.5	4	5.5	7	8	9	10	12	13	14	15	17
W	5.5	7	8	10	13	17	19	22	24	27	30	32	36	41
C (approx.)	6.4	8.1	9.2	11.5	15	19.6	21.9	25.4	27.7	31.2	34.6	37	41.6	47.3
da (max)	3.6	4.7	5.7	6.8	9.2	11.2	14.2	16.2	18.2	20.2	22.4	24.4	26.4	50.4
R (min)	0.1	0.2	0.2	0.25	0.4	0.4	0.6	0.6	0.6	0.6	0.8	0.8	0.8	1
ℓ	5~32	6~40	7~50	7~70	11~100	14~100	18~140	2~140	22~140	25~200	28~200	28~200	30~200	35~240
S ^{Note 2)}	12	14	16	18	22	26	30	34	38	42	46	50	54	60
							36	40	44	48	52	56	60	66
														79

Note 1) JIS B1001 2nd Class

Note 2) $\ell \leq 125\text{mm}$, $S=2d+6$, $125\text{mm} < \ell \leq 200\text{mm}$, $S=2d+12$, $200\text{mm} < \ell$, $S=2d+25$

MEMO

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MEMO

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MEMO

A series of horizontal dashed lines for writing.

SAFETY INFORMATION

WARNING

Observe the following safety precautions to prevent serious injuries.

- Be sure to use a torque wrench to tighten each bolt to its specified torque.
- Do not use bolts other than those provided. If you misplace the bolts, contact your distributor or Tsubaki Emerson for replacement.
- Observe the Labor Safety and Hygiene Regulations, General Criteria, Paragraph 1, Chapter 1, Edition 2.
- Observe the following when installing, removing, maintaining or inspecting the product.
 - Dress appropriately and wear safety glasses, gloves and shoes where necessary.
 - Turn off the power and make sure it does not reconnect accidentally.
 - Operate according to the instructions provided in the manual or catalog (where appropriate).
- To inspect a Power-Lock, you must either remove the load, including any suspended equipment, or implement a protective measure against the disconnection of hub and shaft. Removing the product without care may result in accidents.

CAUTION

Observe the following safety precautions to prevent accidents.

- Do not use a torque wrench without an adjusting scale because the bolts may not tighten to the specified torque and may cause accidents. Do not attach a pipe to the torque wrench lever. Doing so will affect the accuracy of the wrench.
- Install a safety device to your equipment, if the bolts have been loosened, or if danger is suspected due to installation, operation or environment conditions. Periodic inspection of the bolts for tightness is recommended.
- The instruction manual must be delivered to the final user.

■ Warranty:

1. Warranty period without charge
18 months effective the date of shipment or 12 months effective the first use of Goods, including installation of Goods to Buyer's equipment or machines - whichever comes first.
2. Warranty coverage
Should any damage or problem with the Goods arise within the warranty period, given that the Goods were operated and maintained according to the instructions provided in the manual, Seller would repair and replace at no charge once the Goods are returned to the Seller. This warranty does not cover the following:
 - 1) Any costs related to removal of Goods from the Buyer's equipment or machine to repair or replace parts.
 - 2) Cost to transport Buyer's equipment or machines to the Buyer's repair shop.
 - 3) Costs to reimburse any profit loss due to any repair or damage and consequential losses caused by the Buyer.
3. Warranty with charge
Seller will charge any investigation and repair of Goods caused by:
 - 1) Improper installation by failing to follow the instruction manual.
 - 2) Insufficient maintenance or improper operation by the Buyer.
 - 3) Incorrect installation of Goods into other equipment or machines.
 - 4) Any modifications or alterations of Goods by the Buyer.
 - 5) Any repair by engineers other than the Seller or those designated by the Seller.
 - 6) Operation in an inappropriate environment not specified in the manual.
 - 7) Force Majeure or forces beyond the Seller's control such as natural disasters and injustices done by a third party.
 - 8) Secondary damage or problem incurred by the Buyer's equipment or machines.
 - 9) Defected parts supplied, or specified by the Buyer.
 - 10) Incorrect wiring or parameter setting by the Buyer.
 - 11) The end of life cycle of the Goods under normal usage.
 - 12) Loss or damage not liable to the Seller.
4. Dispatch Service
Service to dispatch a Seller's engineer to investigate, adjust or trial test Seller's Goods is at the Buyer's expense.



The information contained herein is intended merely to assist you through the product selection process. Read the actual instruction manual before you operate the product.



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