Mechanical Shaft Lock

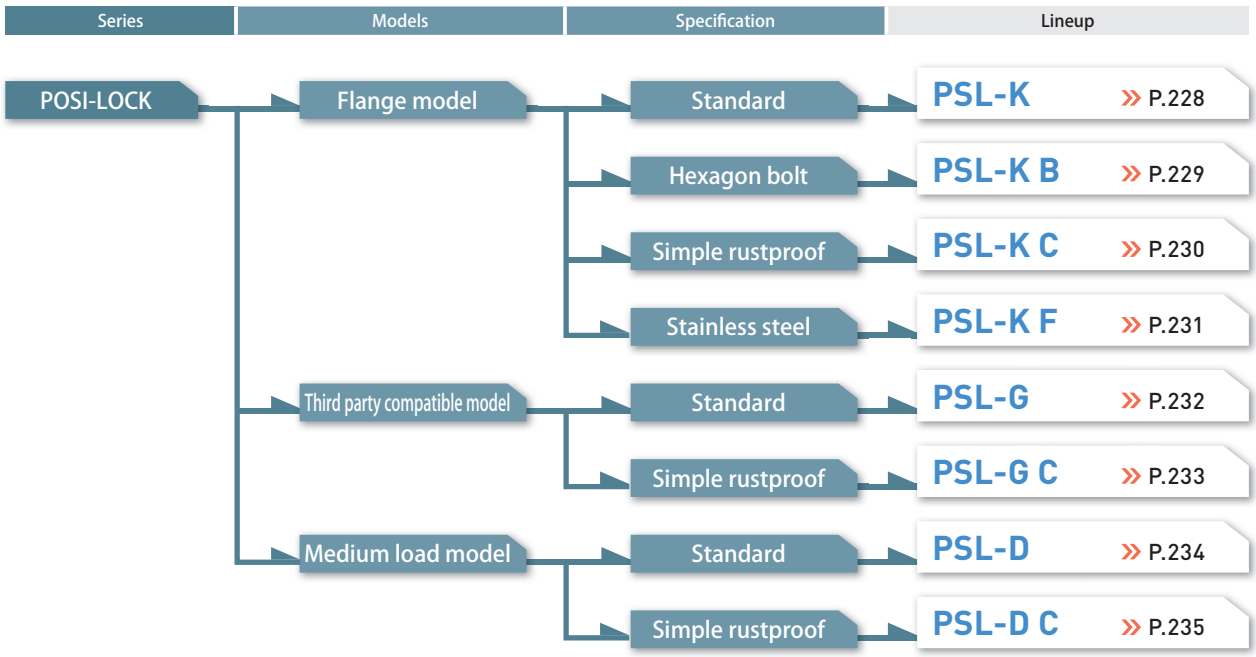
POSI-LOCK

Application	Machine tool, pump, molding machine, printing machine, palletizing robot, various jigs and tools

Connects the Shaft and Hub with the Wedging Action of the Tapered Surface

The shaft and hub are connected with the wedging action of the tapered surface. The machining tolerance of the shaft and hub is just the general fitting tolerance and no special finishing is needed. Compared to the key connection, high precision machining such as keyway machining is not needed, and the shaft and hub can be connected with high concentricity.

Available Models



Model Selection

Model/Type	Main body material	Surface finishing	Applied shaft diameter [mm]	Max. rated torque [N • m]	Max. rated thrust [N]	Operating temperature [℃]
PSL-K	S45C refined or equivalent	—	6 ～ 42	750	36000	−40 ～ 150
PSL-K B	S45C refined or equivalent	—	6 ～ 42	750	36000	−40 ～ 150
PSL-K C	S45C refined or equivalent	Electroless nickel plating	6 ～ 42	750	36000	−40 ～ 150
PSL-K F	SUS304 or an equivalent	—	6 ～ 35	504	28800	−40 ～ 150
PSL-G	S45C refined or equivalent	—	19 ～ 120	13500	225000	−40 ～ 150
PSL-G C	S45C refined or equivalent	Electroless nickel plating	19 ～ 60	2810	93600	−40 ～ 150
PSL-D	S45C refined or equivalent	—	6 ～ 50	1760	70300	−40 ～ 150
PSL-D C	S45C refined or equivalent	Electroless nickel plating	16 ～ 50	1760	70300	−40 ～ 150

Product Lineup

PSL-K

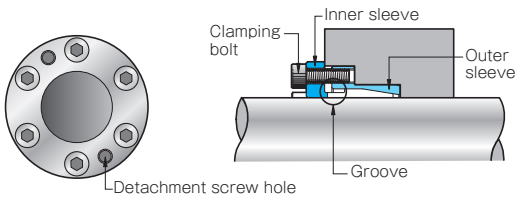
RoHS-compliant

The sleeve's internal/external diameter ratio is small. The mounting part's diameter as well as the moment of inertia can be reduced. The mechanism is simple and high concentricity can be maintained.

Max. rated torque	[N·m]	750
Max. rated thrust	[N]	36000
Applied shaft diameter	[mm]	6～42
Operating temperature	[℃]	−40～150

Operating Principle

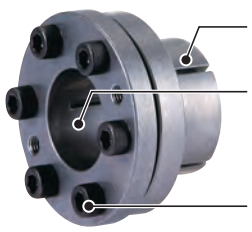
Tightening the clamping bolt moves the outer sleeve in the shaft direction. At this point, the wedge action of the tapered surface with the inner sleeve generates a force to press the inner surface of the shaft and hub and this force connects the shaft and hub completely. The groove of the inner sleeve increases the wedge effect so a high transmission torque can be obtained.



Variations and Materials

PSL-K

Standard type of the PSL-K model.



Outer sleeve material:
S45C tempered or an equivalent

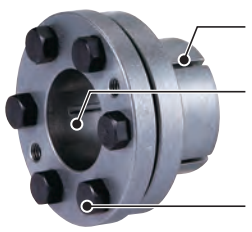
Inner sleeve material:
S45C tempered or an equivalent

Clamping bolt material:
Alloy steel for machine structural use
Surface finishing: Black coating

» P.228

PSL-K B

A hexagon bolt is used for the clamping bolt so the device can be mounted even in tight space in the thrust direction.



Outer sleeve material:
S45C tempered or an equivalent

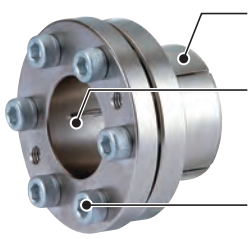
Inner sleeve material:
S45C tempered or an equivalent

Clamping bolt material:
Alloy steel for machine structural use
Surface finishing: Black coating

» P.229

PSL-K C

The main body is electroless nickel coated (simple rustproof finishing).



Outer sleeve material:
S45C tempered or an equivalent
Surface finishing: Electroless nickel plating

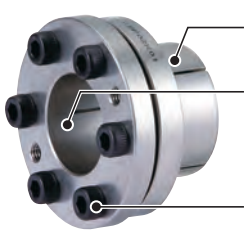
Inner sleeve material:
S45C tempered or an equivalent
Surface finishing: Electroless nickel plating

Clamping bolt material:
Alloy steel for machine structural use
Surface finishing: Antirust film coating

» P.230

PSL-K F

The main body is made of stainless material (rustproof coating).



Outer sleeve material:
SUS304 or an equivalent

Inner sleeve material:
SUS304 or an equivalent

Clamping bolt material:
SUH660 or an equivalent
Surface finishing: Solid film lubricant coating

» P.231

*A special coating is applied to the clamping bolt to stabilize the shaft force.

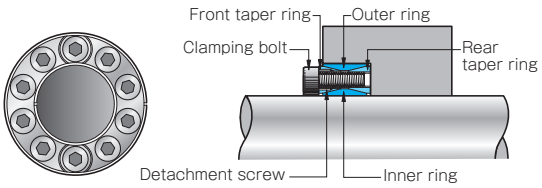
PSL-G

A simple structure and rigid parts provide uniform transmission and can withstand heavy load. A short shaft direction length saves space.

Max. rated torque	[N·m]	13500
Max. rated thrust	[N]	225000
Applied shaft diameter	[mm]	19 ~ 120
Operating temperature	[℃]	−40 ~ 150

Operating Principle

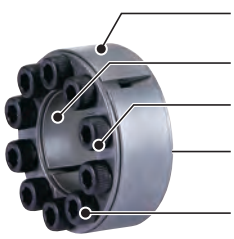
Tightening the clamping bolt moves the 2 tapered rings in the shaft direction. At this point, the outer ring and the inner ring independently generate a force to press the inner surface of the shaft and hub due to the wedge action of the tapered surface and this force connects the shaft and hub completely.



Variations and Materials

PSL-G

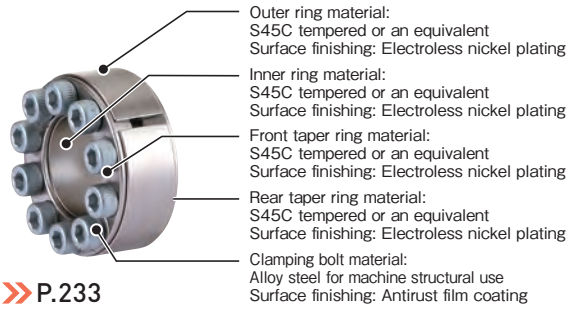
Standard type of the PLS-G model.



» P.232

PSL-G C

The main body is electroless nickel coated (simple rustproof finishing).



» P.233

PSL-D

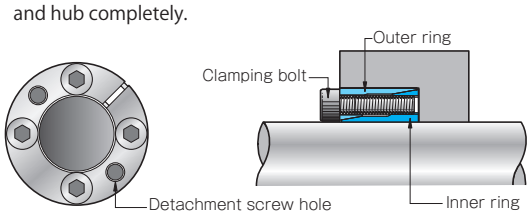
RoHS-compliant

This is designed for a medium load. The contact pressure is small and the mounting diameter and mass can be reduced. A short shaft direction length saves space.

Max. rated torque	[N·m]	1760
Max. rated thrust	[N]	70300
Applied shaft diameter	[mm]	6 ~ 50
Operating temperature	[℃]	−40 ~ 150

Operating Principle

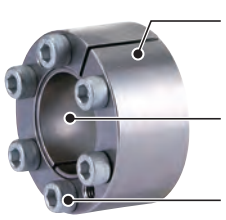
Tightening the clamping bolt moves the outer ring in the shaft direction. At this point, the wedge action of the tapered surface with the inner sleeve generates a force to press the inner surface of the shaft and hub and this force connects the shaft and hub completely.



Variations and Materials

PSL-D

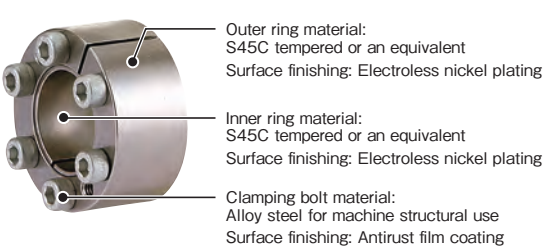
Standard type of the PSL-D model.



» P.234

PSL-D C

The main body is electroless nickel coated (simple rustproof finishing).



» P.235

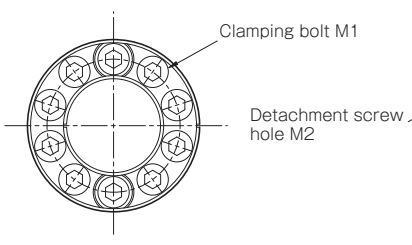
PSL-G Models

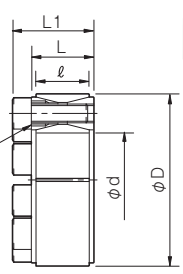
Specifications

Model	Rated torque [N·m]	Rated thrust [N]	Shaft contact pressure [N/mm²]	Hub contact pressure [N/mm²]	Tightening torque [N·m]	Moment of inertia [kg·m²]	Mass [kg]
PSL-G-19	289	30500	250	101	17	0.70×10^{-4}	0.22
PSL-G-20	305	30500	238	101	17	0.70×10^{-4}	0.21
PSL-G-22	335	30500	216	101	17	0.69×10^{-4}	0.20
PSL-G-24	411	34300	223	107	17	0.89×10^{-4}	0.23
PSL-G-25	428	34300	214	107	17	0.88×10^{-4}	0.22
PSL-G-28	533	38100	212	108	17	1.28×10^{-4}	0.26
PSL-G-30	571	38100	198	108	17	1.25×10^{-4}	0.25
PSL-G-32	731	45700	223	119	17	1.80×10^{-4}	0.30
PSL-G-35	800	45700	204	119	17	1.74×10^{-4}	0.28
PSL-G-38	1020	53500	220	129	17	2.43×10^{-4}	0.34
PSL-G-40	1070	53500	209	129	17	2.37×10^{-4}	0.32
PSL-G-42	1680	80200	253	142	41	5.26×10^{-4}	0.56
PSL-G-45	1800	80200	236	142	41	5.11×10^{-4}	0.53
PSL-G-48	1920	80200	222	133	41	6.51×10^{-4}	0.59
PSL-G-50	2010	80200	213	133	41	6.36×10^{-4}	0.56
PSL-G-55	2570	93600	226	146	41	8.01×10^{-4}	0.62
PSL-G-60	2810	93600	207	138	41	9.68×10^{-4}	0.65
PSL-G-65	3090	95000	194	133	41	12.8×10^{-4}	0.77
PSL-G-70	4800	137000	218	138	82	28.3×10^{-4}	1.34
PSL-G-75	5160	138000	203	132	82	32.9×10^{-4}	1.40
PSL-G-80	5510	138000	190	127	82	37.9×10^{-4}	1.46
PSL-G-85	6500	153000	199	135	82	44.3×10^{-4}	1.56
PSL-G-90	6880	153000	188	130	82	50.4×10^{-4}	1.62
PSL-G-95	7940	167000	195	137	82	56.6×10^{-4}	1.67
PSL-G-100	10100	202000	205	142	142	91.4×10^{-4}	2.36
PSL-G-110	11100	202000	187	133	142	113.9×10^{-4}	2.53
PSL-G-120	13500	225000	190	138	142	142.7×10^{-4}	2.74

* The rated torque values are those when the thrust is zero and the rated thrust values are those when the torque is zero.

Dimensions





CAD

How to Place an Order

PSL-G-□

Size

Old model ETP - G - □

Unit [mm]

Model	d	D	L	ℓ	L1	M1	M2
PSL-G-19	19	47	20	17	26	8-M6 × 18	2-M8
PSL-G-20	20	47	20	17	26	8-M6 × 18	2-M8
PSL-G-22	22	47	20	17	26	8-M6 × 18	2-M8
PSL-G-24	24	50	20	17	26	8-M6 × 18	2-M8
PSL-G-25	25	50	20	17	26	8-M6 × 18	2-M8
PSL-G-28	28	55	20	17	26	10-M6 × 18	2-M8
PSL-G-30	30	55	20	17	26	10-M6 × 18	2-M8
PSL-G-32	32	60	20	17	26	12-M6 × 18	2-M8
PSL-G-35	35	60	20	17	26	12-M6 × 18	2-M8
PSL-G-38	38	65	20	17	26	14-M6 × 18	2-M8
PSL-G-40	40	65	20	17	26	14-M6 × 18	2-M8
PSL-G-42	42	75	24	20	32	12-M8 × 22	2-M10
PSL-G-45	45	75	24	20	32	12-M8 × 22	2-M10
PSL-G-48	48	80	24	20	32	12-M8 × 22	2-M10
PSL-G-50	50	80	24	20	32	12-M8 × 22	2-M10
PSL-G-55	55	85	24	20	32	14-M8 × 22	2-M10
PSL-G-60	60	90	24	20	32	14-M8 × 22	2-M10
PSL-G-65	65	95	24	20	32	16-M8 × 22	3-M10
PSL-G-70	70	110	28	24	38	14-M10 × 25	3-M12
PSL-G-75	75	115	28	24	38	14-M10 × 25	3-M12
PSL-G-80	80	120	28	24	38	14-M10 × 25	3-M12
PSL-G-85	85	125	28	24	38	16-M10 × 25	3-M12
PSL-G-90	90	130	28	24	38	16-M10 × 25	3-M12
PSL-G-95	95	135	28	24	38	18-M10 × 25	3-M12
PSL-G-100	100	145	33	26	45	14-M12 × 30	3-M14
PSL-G-110	110	155	33	26	45	14-M12 × 30	3-M14
PSL-G-120	120	165	33	26	45	16-M12 × 30	3-M14

* L and L1 are dimensions before the POSI-LOCK is mounted.
* The nominal diameter of each bolt and tap is equal to the quantity minus the nominal diameter of the screw threads times the nominal length.
* Screw hole M2 for removal purpose is indicated with a tool mark for sizes 19 to 60 and indicated by marking the head of the bolt with paint for sizes 65 or more.

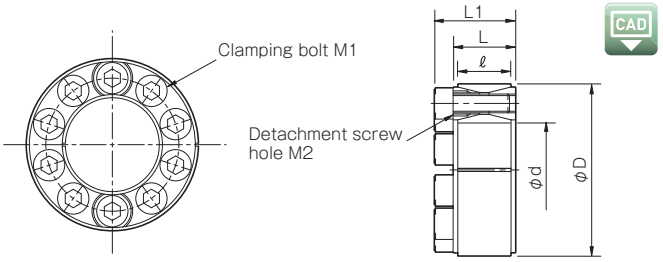
PSL-G C Types

Specifications

Model	Rated torque [N·m]	Rated thrust [N]	Shaft contact pressure [N/mm²]	Hub contact pressure [N/mm²]	Tightening torque [N·m]	Moment of inertia [kg·m²]	Mass [kg]
PSL-G-19-C	289	30500	250	101	17	0.70×10^{-4}	0.22
PSL-G-20-C	305	30500	238	101	17	0.70×10^{-4}	0.21
PSL-G-22-C	335	30500	216	101	17	0.69×10^{-4}	0.20
PSL-G-24-C	411	34300	223	107	17	0.89×10^{-4}	0.23
PSL-G-25-C	428	34300	214	107	17	0.88×10^{-4}	0.22
PSL-G-28-C	533	38100	212	108	17	1.28×10^{-4}	0.26
PSL-G-30-C	571	38100	198	108	17	1.25×10^{-4}	0.25
PSL-G-32-C	731	45700	223	119	17	1.80×10^{-4}	0.30
PSL-G-35-C	800	45700	204	119	17	1.74×10^{-4}	0.28
PSL-G-38-C	1020	53500	220	129	17	2.43×10^{-4}	0.34
PSL-G-40-C	1070	53500	209	129	17	2.37×10^{-4}	0.32
PSL-G-42-C	1680	80200	253	142	41	5.26×10^{-4}	0.56
PSL-G-45-C	1800	80200	236	142	41	5.11×10^{-4}	0.53
PSL-G-48-C	1920	80200	222	133	41	6.51×10^{-4}	0.59
PSL-G-50-C	2010	80200	213	133	41	6.36×10^{-4}	0.56
PSL-G-55-C	2570	93600	226	146	41	8.01×10^{-4}	0.62
PSL-G-60-C	2810	93600	207	138	41	9.68×10^{-4}	0.65

* The rated torque values are those when the thrust is zero and the rated thrust values are those when the torque is zero.

Dimensions



CAD

How to Place an Order

PSL-G-□-C
Size
Type (C: Simple antirust specifications)
Old model ETP - G - □ - C

Unit [mm]

Model	d	D	L	ℓ	L1	M1	M2
PSL-G-19-C	19	47	20	17	26	8-M6 × 18	2-M8
PSL-G-20-C	20	47	20	17	26	8-M6 × 18	2-M8
PSL-G-22-C	22	47	20	17	26	8-M6 × 18	2-M8
PSL-G-24-C	24	50	20	17	26	8-M6 × 18	2-M8
PSL-G-25-C	25	50	20	17	26	8-M6 × 18	2-M8
PSL-G-28-C	28	55	20	17	26	10-M6 × 18	2-M8
PSL-G-30-C	30	55	20	17	26	10-M6 × 18	2-M8
PSL-G-32-C	32	60	20	17	26	12-M6 × 18	2-M8
PSL-G-35-C	35	60	20	17	26	12-M6 × 18	2-M8
PSL-G-38-C	38	65	20	17	26	14-M6 × 18	2-M8
PSL-G-40-C	40	65	20	17	26	14-M6 × 18	2-M8
PSL-G-42-C	42	75	24	20	32	12-M8 × 22	2-M10
PSL-G-45-C	45	75	24	20	32	12-M8 × 22	2-M10
PSL-G-48-C	48	80	24	20	32	12-M8 × 22	2-M10
PSL-G-50-C	50	80	24	20	32	12-M8 × 22	2-M10
PSL-G-55-C	55	85	24	20	32	14-M8 × 22	2-M10
PSL-G-60-C	60	90	24	20	32	14-M8 × 22	2-M10

* L and L1 are dimensions before the POSI-LOCK is mounted.
* The nominal diameter of each bolt and tap is equal to the quantity minus the nominal diameter of the screw threads times the nominal length.

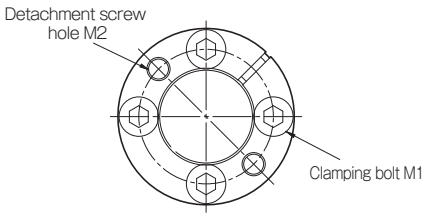
PSL-D Models

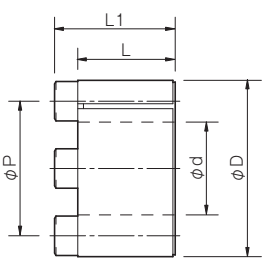
Specifications

Model	Rated torque [N·m]	Rated thrust [N]	Shaft contact pressure [N/mm²]	Hub contact pressure [N/mm²]	Tightening torque [N·m]	Moment of inertia [kg·m²]	Mass [kg]
PSL-D-6	6	2100	150	60	1	0.48×10^{-6}	0.012
PSL-D-7	8	2100	140	60	1	0.52×10^{-6}	0.013
PSL-D-8	10	2600	110	50	1	0.77×10^{-6}	0.015
PSL-D-9	15	3200	130	60	1	1.1×10^{-6}	0.020
PSL-D-10	16	3200	110	60	1	1.2×10^{-6}	0.019
PSL-D-11	17	3200	100	50	1	1.8×10^{-6}	0.024
PSL-D-12	19	3200	100	50	1	1.7×10^{-6}	0.022
PSL-D-14	34	4800	100	50	2	4.3×10^{-6}	0.039
PSL-D-15	36	4800	90	50	2	5.7×10^{-6}	0.044
PSL-D-16	67	8400	130	60	4	10×10^{-6}	0.068
PSL-D-17	70	8400	120	60	4	18×10^{-6}	0.093
PSL-D-18	75	8400	110	60	4	17×10^{-6}	0.090
PSL-D-19	80	8400	110	60	4	16×10^{-6}	0.085
PSL-D-20	140	13600	150	80	8	24×10^{-6}	0.120
PSL-D-22	150	13600	140	80	8	29×10^{-6}	0.130
PSL-D-24	230	19300	150	80	14	70×10^{-6}	0.220
PSL-D-25	240	19300	140	80	14	69×10^{-6}	0.210
PSL-D-28	400	28900	190	110	14	86×10^{-6}	0.240
PSL-D-30	430	28900	180	100	14	128×10^{-6}	0.270
PSL-D-32	460	28900	170	100	14	123×10^{-6}	0.260
PSL-D-35	670	38600	160	90	14	215×10^{-6}	0.370
PSL-D-38	730	38600	150	90	14	298×10^{-6}	0.420
PSL-D-40	770	38600	140	90	14	286×10^{-6}	0.410
PSL-D-42	1110	52700	150	80	34	682×10^{-6}	0.700
PSL-D-45	1200	52700	140	80	34	609×10^{-6}	0.630
PSL-D-48	1690	70300	190	110	34	769×10^{-6}	0.730
PSL-D-50	1760	70300	180	110	34	742×10^{-6}	0.710

* The rated torque values are those when the thrust is zero and the rated thrust values are those when the torque is zero.

Dimensions





CAD

How to Place an Order

PSL-D-□

Size

Old model ETP - D - □

Unit [mm]

Model	d	D	P	L	L1	M1	M2
PSL-D-6	6	16	11	11	13.5	3-M2.5 × 10	2-M2.5
PSL-D-7	7	17	12	11	13.5	3-M2.5 × 10	2-M2.5
PSL-D-8	8	18	13	11	13.5	3-M2.5 × 10	2-M2.5
PSL-D-9	9	20	15	13	15.5	4-M2.5 × 12	2-M2.5
PSL-D-10	10	20	15	13	15.5	4-M2.5 × 12	2-M2.5
PSL-D-11	11	22	17	13	15.5	4-M2.5 × 12	2-M2.5
PSL-D-12	12	22	17	13	15.5	4-M2.5 × 12	2-M2.5
PSL-D-14	14	26	20	17	20	4-M3 × 16	2-M3
PSL-D-15	15	28	21.5	17	20	4-M3 × 16	2-M3
PSL-D-16	16	32	24	17	21	4-M4 × 16	2-M4
PSL-D-17	17	35	27	21	25	4-M4 × 20	2-M4
PSL-D-18	18	35	27	21	25	4-M4 × 20	2-M4
PSL-D-19	19	35	27	21	25	4-M4 × 20	2-M4
PSL-D-20	20	38	29	21	26	4-M5 × 20	2-M5
PSL-D-22	22	40	31	21	26	4-M5 × 20	2-M5
PSL-D-24	24	47	36	26	32	4-M6 × 25	2-M6
PSL-D-25	25	47	36	26	32	4-M6 × 25	2-M6
PSL-D-28	28	50	39	26	32	6-M6 × 25	2-M6
PSL-D-30	30	55	43.5	26	32	6-M6 × 25	2-M6
PSL-D-32	32	55	43.5	26	32	6-M6 × 25	2-M6
PSL-D-35	35	60	47.5	31	37	8-M6 × 30	2-M6
PSL-D-38	38	65	52.5	31	37	8-M6 × 30	2-M6
PSL-D-40	40	65	52.5	31	37	8-M6 × 30	2-M6
PSL-D-42	42	75	60	36	44	6-M8 × 35	2-M8
PSL-D-45	45	75	60	36	44	6-M8 × 35	2-M8
PSL-D-48	48	80	65	36	44	8-M8 × 35	2-M8
PSL-D-50	50	80	65	36	44	8-M8 × 35	2-M8

* L and L1 are dimensions before the POSI-LOCK is mounted.
* The nominal diameter of each bolt and tap is equal to the quantity minus the nominal diameter of the screw threads times the nominal length.

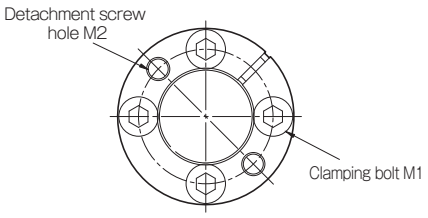
PSL-D C Types

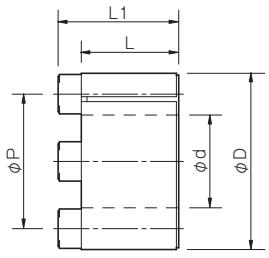
Specifications

Model	Rated torque [N·m]	Rated thrust [N]	Shaft contact pressure [N/mm²]	Hub contact pressure [N/mm²]	Tightening torque [N·m]	Moment of inertia [kg·m²]	Mass [kg]
PSL-D-16-C	67	8400	130	60	4	10×10^{-6}	0.068
PSL-D-17-C	70	8400	120	60	4	18×10^{-6}	0.093
PSL-D-18-C	75	8400	110	60	4	17×10^{-6}	0.090
PSL-D-19-C	80	8400	110	60	4	16×10^{-6}	0.085
PSL-D-20-C	140	13600	150	80	8	24×10^{-6}	0.120
PSL-D-22-C	150	13600	140	80	8	29×10^{-6}	0.130
PSL-D-24-C	230	19300	150	80	14	70×10^{-6}	0.220
PSL-D-25-C	240	19300	140	80	14	69×10^{-6}	0.210
PSL-D-28-C	400	28900	190	110	14	86×10^{-6}	0.240
PSL-D-30-C	430	28900	180	100	14	128×10^{-6}	0.270
PSL-D-32-C	460	28900	170	100	14	123×10^{-6}	0.260
PSL-D-35-C	670	38600	160	90	14	215×10^{-6}	0.370
PSL-D-38-C	730	38600	150	90	14	298×10^{-6}	0.420
PSL-D-40-C	770	38600	140	90	14	286×10^{-6}	0.410
PSL-D-42-C	1110	52700	180	110	34	682×10^{-6}	0.700
PSL-D-45-C	1200	52700	140	80	34	609×10^{-6}	0.630
PSL-D-48-C	1690	70300	190	110	34	769×10^{-6}	0.730
PSL-D-50-C	1760	70300	180	110	34	742×10^{-6}	0.710

* The rated torque values are those when the thrust is zero and the rated thrust values are those when the torque is zero.

Dimensions





CAD

How to Place an Order

PSL-D-□-C

Size

Type (C: Simple antirust specifications)

Old model ETP - D - □ - C

Unit [mm]

Model	d	D	P	L	L1	M1	M2
PSL-D-16-C	16	32	24	17	21	4-M4 × 16	2-M4
PSL-D-17-C	17	35	27	21	25	4-M4 × 20	2-M4
PSL-D-18-C	18	35	27	21	25	4-M4 × 20	2-M4
PSL-D-19-C	19	35	27	21	25	4-M4 × 20	2-M4
PSL-D-20-C	20	38	29	21	26	4-M5 × 20	2-M5
PSL-D-22-C	22	40	31	21	26	4-M5 × 20	2-M5
PSL-D-24-C	24	47	36	26	32	4-M6 × 25	2-M6
PSL-D-25-C	25	47	36	26	32	4-M6 × 25	2-M6
PSL-D-28-C	28	50	39	26	32	6-M6 × 25	2-M6
PSL-D-30-C	30	55	43.5	26	32	6-M6 × 25	2-M6
PSL-D-32-C	32	55	43.5	26	32	6-M6 × 25	2-M6
PSL-D-35-C	35	60	47.5	31	37	8-M6 × 30	2-M6
PSL-D-38-C	38	65	52.5	31	37	8-M6 × 30	2-M6
PSL-D-40-C	40	65	52.5	31	37	8-M6 × 30	2-M6
PSL-D-42-C	42	75	60	36	44	6-M8 × 35	2-M8
PSL-D-45-C	45	75	60	36	44	6-M8 × 35	2-M8
PSL-D-48-C	48	80	65	36	44	8-M8 × 35	2-M8
PSL-D-50-C	50	80	65	36	44	8-M8 × 35	2-M8

* L and L1 are dimensions before the POSI-LOCK is mounted.
* The nominal diameter of each bolt and tap is equal to the quantity minus the nominal diameter of the screw threads times the nominal length.

PSL-K/PSL-G/PSL-D Models

Items Checked for Design Purposes

Selection Procedure

(1) Selection is determined by the used shaft diameter. In general, find the torque, Ta, applied to the connecting element using the output capacity, P, of the driver and usage rotation speed, n. Next, obtain the thrust, Fa, applied to the connecting element.

$$Ta\ [N\cdot m] = 9550 \times \frac{P\ [kW]}{n\ [min^{-1}]}$$

Ta: Torque applied to the connecting element [N·m]
P: Driver's output [kW]
n: Connecting element's rotation speed [min^{-1}]
Fa: Thrust applied to the connecting element [N]

(2) Determine the service factor, K1, based on the load property and obtain the corrected torque, Td, and corrected thrust, Fd, applied to the connecting element.

$Td = Ta \times K1$
$Fd = Fa \times K1$

Td: Corrected torque applied to the connecting element [N·m]
Fd: Corrected thrust applied to the connecting element [N]
K1: Service factor based on the load property

(3) Correct the values according to the load property.

1. For the torque alone

Compare the connecting element's rated torque, T, based on the used diameter with the calculated corrected torque, Td.

$T \geqq Td$ T: Connecting element's rated torque [N·m]

2. For the thrust alone

Compare the connecting element's rated thrust, F, based on the used diameter with the calculated corrected thrust, Fd.

$F \geqq Fd$ F: Connecting element's rated thrust [N]

3. If torque and thrust are applied at the same time

Calculate the combined load, Mr, and compare the result with the rated torque, T.

$$Mr = \sqrt{Td^2 + (Fd \times \frac{d}{2})^2}$$

$T \geqq Mr$

Mr: Combined load applied to the connecting element [N·m]
d: Shaft diameter [m]

(4) Obtain the hub's minimum external diameter and the hollow shaft's maximum internal diameter.

1. Obtain the hub's minimum external diameter based on the used hub material's strength.

$$DO \geqq D\sqrt{\frac{\delta_{0.2N} + CP_2}{\delta_{0.2N} - CP_2}}$$

$C = 1 \quad B = L$
$C = 0.8 \quad L < B < 2L$
$C = 0.6 \quad B \geqq 2L$

DO: Hub's minimum external diameter [mm]
D : Hub's internal diameter [mm]
P_2 : Hub contact pressure [N/mm^2]
$\delta_{0.2N}$: Hub material's yield stress [N/mm^2]
B : Hub length [mm]
L : Effective contact length [mm]
C : Coefficient

If the hub material's yield stress value is large, make sure the ratio of the hub's minimum external diameter to the hub's internal diameter is more than about 1.3 times to prevent the hub's deformation.

2.Obtain the hollow shaft's maximum internal diameter based on the used hollow shaft material's strength.

$$di \leqq d\sqrt{\frac{\delta_{0.2N} - 2P_1C}{\delta_{0.2N}}}$$

$C = 0.6$ when using a single one
$C = 0.8$ when using multiple ones

di : Hollow shaft's maximum internal diameter [mm]
$\delta_{0.2N}$: Hollow shaft material's yield stress [N/mm^2]
P_1 : Shaft contact pressure [N/mm^2]
d: Shaft diameter [mm]
C: Coefficient

Service Factors

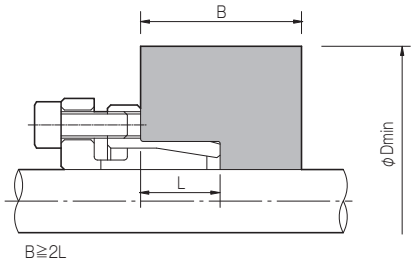
■ Service factor based on the load property: K1

Load property	Constant	Fluctuation: Small	Fluctuation: Medium	Fluctuation: Large
				
K1	1.0	1.25	1.75	2.25

Hub's Minimum External Diameters

If the stress applied to the hub is too large, the hub may be deformed. Select the appropriate external diameter size from the hub's minimum external diameters in the table below in the design phase.

■ PSL-K/PSL-K B/PSL-K C/PSL-K F



ø Dmin, unit [mm]

PSL-K PSL-K B PSL-K C (PSL-K F) size	Hub contact pressure [N/mm²]	Material's yield stress δ 0.2 (N/mm²)									
		150	180	210	230	250	280	300	350	400	450
		FC250	FC300 SS330 SC360 FCMB310	FC350 SS400 SC410 FCMB360 SUS304	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540 SUS201	FCD450 S35C SF590	FCD500 S45C SUS410	FCD600 S55C SUS403	FCD700 SUS420
6	80 (60)	17 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)
6.35	80 (60)	17 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)
7	80 (60)	17 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)
8	160 (120)	32 (25)	27 (23)	25 (21)	23 (21)	22 (20)	21 (20)	21 (20)	20 (20)	20 (20)	20 (20)
9	160 (120)	32 (25)	27 (23)	25 (21)	23 (21)	22 (20)	21 (20)	21 (20)	20 (20)	20 (20)	20 (20)
9.525	130 (100)	32 (27)	29 (25)	27 (24)	26 (24)	25 (24)	24 (24)	24 (24)	24 (24)	24 (24)	24 (24)
10	130 (100)	32 (27)	29 (25)	27 (24)	26 (24)	25 (24)	24 (24)	24 (24)	24 (24)	24 (24)	24 (24)
11	130 (100)	32 (27)	29 (25)	27 (24)	26 (24)	25 (24)	24 (24)	24 (24)	24 (24)	24 (24)	24 (24)
12	160 (120)	43 (34)	36 (31)	33 (29)	31 (28)	30 (27)	29 (26)	28 (26)	27 (26)	26 (26)	26 (26)
12.7	140 (110)	38 (32)	33 (29)	31 (28)	29 (27)	28 (26)	27 (26)	27 (26)	26 (26)	26 (26)	26 (26)
14	140 (110)	41 (35)	36 (32)	34 (30)	32 (30)	31 (29)	30 (29)	29 (29)	29 (29)	29 (29)	29 (29)
15	190 (150)	62 (46)	49 (40)	42 (36)	40 (35)	38 (34)	35 (32)	34 (31)	32 (30)	31 (30)	30 (30)
16	180 (140)	59 (45)	48 (40)	42 (37)	40 (35)	38 (34)	36 (33)	35 (32)	33 (32)	32 (32)	32 (32)
17	170 (130)	60 (46)	49 (41)	44 (38)	42 (37)	40 (36)	38 (35)	37 (34)	35 (34)	34 (34)	34 (34)
18	170 (130)	60 (46)	49 (41)	44 (38)	42 (37)	40 (36)	38 (35)	37 (34)	35 (34)	34 (34)	34 (34)
19	160 (120)	60 (47)	51 (43)	46 (40)	44 (39)	42 (38)	40 (37)	39 (37)	37 (37)	37 (37)	37 (37)
20	160 (120)	60 (47)	51 (43)	46 (40)	44 (39)	42 (38)	40 (37)	39 (37)	37 (37)	37 (37)	37 (37)
22	170 (130)	73 (57)	61 (51)	54 (47)	52 (46)	49 (44)	47 (43)	46 (42)	43 (42)	42 (42)	42 (42)
24	160 (120)	73 (57)	62 (52)	56 (49)	53 (47)	51 (46)	49 (45)	47 (45)	45 (45)	45 (45)	45 (45)
25	160 (120)	73 (57)	62 (52)	56 (49)	53 (47)	51 (46)	49 (45)	47 (45)	45 (45)	45 (45)	45 (45)
28	160 (120)	83 (66)	71 (60)	64 (56)	61 (54)	58 (52)	56 (51)	54 (51)	52 (51)	51 (51)	51 (51)
30	150 (120)	82 (69)	71 (63)	65 (59)	62 (57)	60 (55)	57 (54)	56 (54)	54 (54)	54 (54)	54 (54)
32	140 (110)	81 (69)	71 (63)	66 (60)	63 (58)	61 (56)	59 (56)	57 (56)	56 (56)	56 (56)	56 (56)
35	150 (120)	94 (79)	81 (72)	74 (67)	71 (65)	69 (63)	66 (62)	64 (62)	62 (62)	62 (62)	62 (62)
38	160	107	91	82	78	75	71	70	66	65	65
40	120	89	81	76	73	71	69	69	69	69	69
42	130	98	87	81	78	76	73	72	72	72	72

* The hub's minimum external diameter shows a value calculated based on C=0.6 in the selection procedure on P.236.
* The above SUS values are proof stress values (N/mm²) after quenching and tempering.
* The values in parentheses are those of PSL-KF.

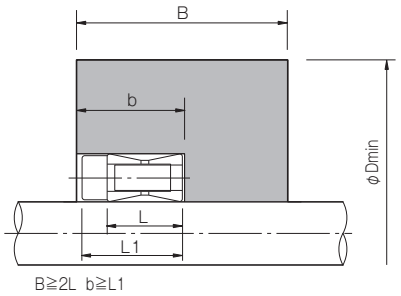
PSL-K/PSL-G/PSL-D Models

Items Checked for Design Purposes

Hub's Minimum External Diameters

If the stress applied to the hub is too large, the hub may be deformed. Select the appropriate external diameter size from the hub's minimum external diameters in the table below in the design phase.

■ PSL-G/PSL-G-C



ø Dmin, unit [mm]

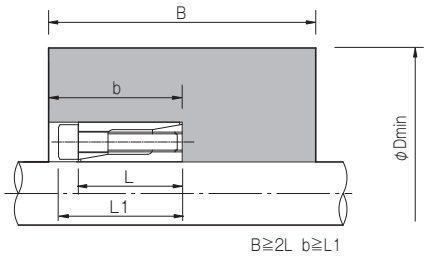
PSL-G PSL-G C size	Hub contact pressure [N/mm²]	Material's yield stress δ 0.2 [N /mm²]									
		150	180	210	230	250	280	300	350	400	450
		FC250	FC300 SS330 SC360 FCMB310	FC350 SS400 SC410 FCMB360 SUS304	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540 SUS201	FCD450 S35C SF590	FCD500 S45C SUS410	FCD600 S55C SUS403	FCD700 SUS420
19	101	72	67	63	62	62	62	62	62	62	62
20	101	72	67	63	62	62	62	62	62	62	62
22	101	72	67	63	62	62	62	62	62	62	62
24	107	79	73	69	67	65	65	65	65	65	65
25	107	79	73	69	67	65	65	65	65	65	65
28	108	87	80	76	73	72	72	72	72	72	72
30	108	87	80	76	73	72	72	72	72	72	72
32	119	101	91	85	83	80	78	78	78	78	78
35	119	101	91	85	83	80	78	78	78	78	78
38	129	115	103	96	92	90	86	85	85	85	85
40	129	115	103	96	92	90	86	85	85	85	85
42	142	143	125	115	111	107	103	100	98	98	98
45	142	143	125	115	111	107	103	100	98	98	98
48	133	145	129	119	115	111	107	105	104	104	104
50	133	145	129	119	115	111	107	105	104	104	104
55	146	166	145	133	127	123	117	117	117	117	117
60	138	168	148	137	131	127	122	119	117	117	117
65	133	172	153	142	136	132	127	125	124	124	124
70	138	205	181	167	160	155	149	146	143	143	143
75	132	207	184	171	165	160	154	151	150	150	150
80	127	210	189	176	169	164	159	156	156	156	156
85	135	229	203	188	181	175	168	165	163	163	163
90	130	231	207	192	185	180	173	170	169	169	169
95	137	250	221	204	196	190	183	179	176	176	176
100	142	276	243	223	214	207	199	194	189	189	189
110	133	280	250	231	223	216	208	204	202	202	202
120	138	307	271	250	241	233	224	219	215	215	215

* The hub's minimum external diameter shows a value calculated based on C=0.6 in the selection procedure on P.236.
* The above SUS values are proof stress values [N/mm²] after quenching and tempering.

Hub's Minimum External Diameters

If the stress applied to the hub is too large, the hub may be deformed. Select the appropriate external diameter size from the hub's minimum external diameters in the table below in the design phase.

■ PSL-D/PSL-D C



ø Dmin, unit [mm]

PSL-D PSL-D C size	Hub contact pressure [N/mm²]	Material's yield stress δ 0.2 [N /mm²]									
		150	180	210	230	250	280	300	350	400	450
		FC250	FC300 SS330 SC360 FCMB310	FC350 SS400 SC410 FCMB360 SUS304	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540 SUS201	FCD450 S35C SF590	FCD500 S45C SUS410	FCD600 S55C SUS403	FCD700 SUS420
6	60	21	21	21	21	21	21	21	21	21	21
7	60	23	23	23	23	23	23	23	23	23	23
8	50	24	24	24	24	24	24	24	24	24	24
9	60	26	26	26	26	26	26	26	26	26	26
10	60	26	26	26	26	26	26	26	26	26	26
11	50	29	29	29	29	29	29	29	29	29	29
12	50	29	29	29	29	29	29	29	29	29	29
14	50	34	34	34	34	34	34	34	34	34	34
15	50	37	37	37	37	37	37	37	37	37	37
16	60	42	42	42	42	42	42	42	42	42	42
17	60	46	46	46	46	46	46	46	46	46	46
18	60	46	46	46	46	46	46	46	46	46	46
19	60	46	46	46	46	46	46	46	46	46	46
20	80	53	50	50	50	50	50	50	50	50	50
22	80	56	53	52	52	52	52	52	52	52	52
24	80	65	62	62	62	62	62	62	62	62	62
25	80	65	62	62	62	62	62	62	62	62	62
28	110	80	73	69	67	66	65	65	65	65	65
30	100	84	78	74	72	72	72	72	72	72	72
32	100	84	78	74	72	72	72	72	72	72	72
35	90	87	82	78	78	78	78	78	78	78	78
38	90	95	89	85	85	85	85	85	85	85	85
40	90	95	89	85	85	85	85	85	85	85	85
42	80	105	99	98	98	98	98	98	98	98	98
45	80	105	99	98	98	98	98	98	98	98	98
48	110	128	118	111	107	105	104	104	104	104	104
50	110	128	118	111	107	105	104	104	104	104	104

* The hub's minimum external diameter shows a value calculated based on C=0.6 in the selection procedure on P.236.
* The above SUS values are proof stress values (N/mm²) after quenching and tempering.

PSL-K/PSL-G/PSL-D Models

Items Checked for Design Purposes

Mounting Shaft Tolerance, Mounting Hub Tolerance, and Surface Roughness

■ PSL-K

Model	Mounting shaft tolerance	Mounting hub tolerance	Surface roughness
PSL-K	h8	H7	12.5S (center line's average roughness 3.2a) or less
PSL-K B			
PSL-K C			
PSL-K F			

■ PSL-G

Model	Mounting shaft tolerance	Mounting hub tolerance	Surface roughness
PSL-G	h9	H8	12.5S (center line's average roughness 3.2a) or less
PSL-G C			

■ PSL-D

Model	Mounting shaft tolerance	Mounting hub tolerance	Surface roughness
PSL-D	h9	H9	12.5S (center line's average roughness 3.2a) or less
PSL-D C			

Operating Temperature Range

■ PSL-K

Model	Operating temperature range [℃]
PSL-K	− 40 ～ 150
PSL-K B	
PSL-K C	
PSL-K F	

■ PSL-G

Model	Operating temperature range [℃]
PSL-G	− 40 ～ 150
PSL-G C	

■ PSL-D

Model	Operating temperature range [℃]
PSL-D	− 40 ～ 150
PSL-D C	

Number of Attachments and Detachments

■ PSL-K

Model	No. of attachments/detachments
PSL-K	100
PSL-K B	
PSL-K C	
PSL-K F	50

■ PSL-G

Model	No. of attachments/detachments
PSL-G	100
PSL-G C	

■ PSL-D

Model	No. of attachments/detachments
PSL-D	100
PSL-D C	

When the Shaft Has a Keyway

When the shaft of a motor or speed reducer has a keyway, the PSL-D can be used if the keyway width meets the JIS standard, but the rated torque and rated thrust decrease 10% to 15%.

Bending Moment

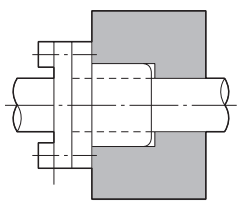
In principle, the POSI-LOCK does not allow a bending moment.

Centering Mechanism

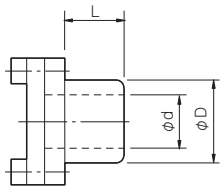
The POSI-LOCK does not have a centering mechanism. Accordingly, if you need accurate concentricity and runout, provide a centering mechanism. A centering mechanism brings the shaft in direct contact with part of the hub to control the concentricity and runout amount (see Figure A).

The accuracy by centering is determined by the centering length (the contact length of the shaft and the hub) and the fit tolerance. It is generally thought that the centering length (the contact length of the shaft and the hub) should be longer than the shaft diameter (see Figure B).

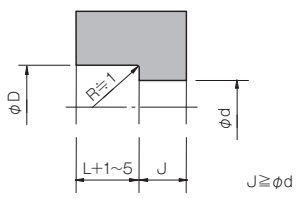
■ Figure A: Centering mechanism



■ PSL dimension series numbers



■ Figure B: Hub machining dimensions



The concentricity and runout accuracy by the centering mechanism is determined by the machining dimensions of the shaft and the hub. In other words, there is the possibility that the hub is inclined by a gap between the shaft's external diameter and the hub's internal diameter of the centering part. Accordingly, the shaft and the hub must be machined so that the concentricity and runout accuracy are within the desired values. Note that the concentricity and runout accuracy by the centering mechanisms can be calculated with the following formula.

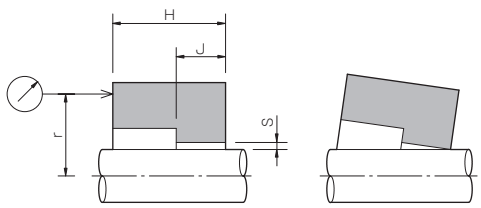
● Maximum runout accuracy:
Ea (the runout is measured at the radius r)

Ea ≒ 2 × r × S/J
S = [(hub's machining size) − (shaft's machining size)]/2

● Maximum concentricity runout: Eb

Eb ≒ H × S/J

■ Runout by the centering mechanism



J: Centering length (contact length of the shaft and the hub)
r: Measurement position of the runout accuracy
H: Overall length of the hub

Items Checked for Design Purposes

Mounting

(1) Wipe the rust, dust, and oil completely off the inner surface of the shaft and hub, and apply oil or grease to coat it thinly.

(2) Wipe the rust-proof oil and dirt off the exterior of the POSI-LOCK (the outer sleeve's (ring's) external surface and inner sleeve's (ring's) internal surface). Do not disassemble or wipe any other parts. Never allow oil containing molybdenum-based antifriction material to contact the surface. If that happens, the friction coefficient basically changes.

(3) Mount the POSI-LOCK to the shaft and hub, lightly tighten the clamping bolts so that the parts slightly contact each other, and then perform positioning.

At this point, never tighten the clamping bolts before mounting the POSI-LOCK to the shaft and hub.

(4) Tighten the clamping bolts.

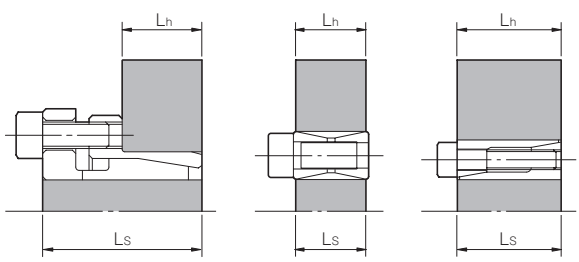
・For PSL-K/PSL-D
Loosen diagonally opposed clamping bolts evenly. After that, tighten all the clamping bolts to the specified torque using a torque wrench. The clamping bolts of the PSL-K F are made of stainless steel. Stainless steel can gall easily. Slowly tighten the stainless steel bolts to prevent galling.

・For PSL-G
The PSL-G has many clamping bolts compared with other POSI-LOCK models, so tighten diagonally opposed clamping bolts evenly about four times to the specified torque. (If you tighten a bolt four times, tighten it so that the torque will increase about 25% every time.) Finally, tighten all the clamping bolts again to the specified torque. To prevent the bolts from coming loose after tightening them, check the tightening torque again after operating for a certain period of time.

Standard Dimensions of the Shaft and the Hub

The performance of the POSI-LOCK is based on the case where the shaft and the hub have the effect for the entire standard shaft length (Ls) and the entire standard hub length (Lh), respectively. Accordingly, make sure in the design phase that the shaft and the hub have the effect for the respective entire standard length.

■ PSL-K ■ PSL-G ■ PSL-D



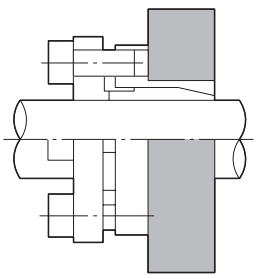
■ POSI-LOCK standard dimension series numbers

Model	Nominal standard dimensions	Dimensional drawing symbols
PSL-K	Shaft's standard dimension Ls	L1
	Hub's standard dimension Lh	L
PSL-G	Shaft's standard dimension Ls	ℓ
	Hub's standard dimension Lh	ℓ
PSL-D	Shaft's standard dimension Ls	L
	Hub's standard dimension Lh	L

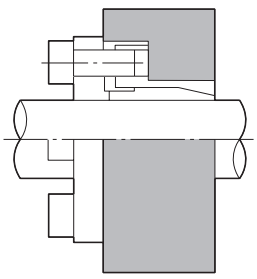
Hub's Movement in the Axial Direction

For the PSL-K and PSL-D models, mount the shaft and hub and then tighten the bolts. The hub will be slightly drawn and moved in the shaft direction. Special attention is required to mount it in the axial direction with high accuracy. However, if the hub is mounted as shown in Figure 1 for the PSL-K, tightening the bolt moves the hub (outer sleeve) slightly in the shaft direction. On the other hand, mounting the hub as shown in Figure 2 eliminates the movement in the shaft direction. In this case, the torque, thrust, and contact pressure decrease to 70% of the specified values.

■ Figure 1



■ Figure 2



Removal

(1) Before starting work, ensure safety by making sure no torque and thrust are applied to the POSI-LOCK and there is no risk of a fall due to the self-weight of the shaft and hub. The POSI-LOCK does not have a self-locking mechanism. The connecting force is instantaneously released by loosening the clamping bolts.

(2) Remove it.

・For PSL-K/PSL-D

The PSL-K or PSL-D model may not be removed by loosening the clamping bolts, because it is self-locked depending on the conditions. Never remove it forcibly, because the shaft, hub, and main body may be damaged. To remove it, first loosen the clamping bolts to open a gap between the flange and the clamping bolt bearing surface. (About a 2-mm gap is sufficient.) Then insert a bolt into the threaded hole for removal to release the connection. Normally one removal screw is enough to remove the device. If the device cannot be moved, use two screws.

・For PSL-G

After ensuring safety, loosen the clamping bolts. The parts are automatically separated from each other. The PSL-G may not be removed by loosening the clamping bolts depending on the conditions. Never remove it forcibly, because the shaft, hub, and main body may be damaged. If the rear tapering cannot be loosened by loosening the clamping bolts, tap on the heads of the clamping bolts. The spring action of each part moves the rear tapering backward so that it is released. If the front tapering cannot be loosened by loosening the clamping bolts, insert a bolt into the threaded hole for removal (which is one size larger than the clamping bolt) and tap the bolt head with a hammer. This will enable the front tapering to be released.