Keyless Spur Gears

Pressure Angle 20°, Module 1.0, 1.5, 2.0, 2.5, 3.0

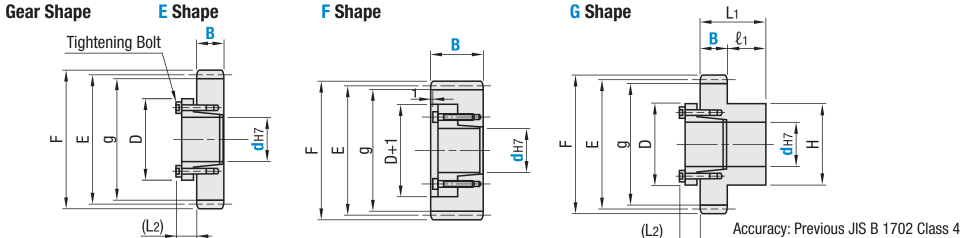
Feature: Additional machining to shafts (such as keyway) is not required, and the strength of shafts is not compromised. Easy positioning.

Keyless Spur Gears – Pressure Angle 20°, Module 1.0, 1.5, 2.0, 2.5, 3.0

RoHS10

Type	Material: Gears	Material: Bushing	Surface Treatment: Gears	Surface Treatment: Bushing	Accessories
GEAL	1045 Carbon Steel or Equivalent	1045 Carbon Steel or Equivalent	—	—	Hex Socket Head Cap Screw 4137 Alloy Steel Black Oxide or Equivalent
GEALB			Black Oxide		
GEALG			Electroless Nickel Plating		

Gear Shape E Shape F Shape G Shape



*Standard type bushings (ST) and Short Type bushings (SH) are available. Refer to the next page.

Accuracy: Previous JIS B 1702 Class 4 (New JIS B 1702-1 Class 8 Equivalent)

Part Number: Type	Part Number: Module	Number of Teeth	B	Gear Shape	Shaft Bore dia. d_{H7} Shape E / G: ST Bushing	Shape F: ST Bushing	Shape F: SH Bushing	E Reference Dia.	F Tip Dia.	G Root Dia.	ℓ_1	L_1	H	* Allowable Transmission Force (N·m) Bending Strength	GEAL E Shape	GEAL F Shape	GEAL G Shape	GEALB E Shape	GEALB F Shape	GEALB G Shape	GEALG E Shape	GEALG F Shape	GEALG G Shape
GEAL GEALB GEALG	1.0	35	10	G	8–10	—	—	35	37	32.5	10	20	30	12.13	—	—	•	—	—	•	—	—	•
		36						36	38	33.5				12.52			•			•			•
		38						38	40	35.5				13.46			•			•			•
		40			8–12			40	42	37.5				14.31			•			•			•
		42						42	44	39.5				15.24			•			•			•
		45						45	47	42.5				16.66			•			•			•
		48			8–18			48	50	45.5			44	18.04			•			•			•
		50						50	52	47.5			46	18.95			•			•			•
		52						52	54	49.5				19.87			•			•			•
		60			10–18			60	62	57.5			50	23.64			•			•			•
		70			12–32			70	72	67.5			56	28.31			•			•			•
		80			15–32			80	82	77.5			60	32.98			•			•			•
		100			17–32			100	102	97.5				42.59			•			•			•
		120						120	122	117.5			70	51.87			•			•			•
	1.5	20	15	E G	8	—	—	30	33	26.25	12	27	25	18.81	•	—	•	•	—	•	•	—	•
		24						36	39	32.25			30	24.45	•		•	•		•	•		•
		25						37.5	40.5	33.75				25.92	•		•	•		•	•		•
		26						39	42	35.25			32	27.42	•		•	•		•	•		•
		28			8–12			42	45	38.25			34	30.43	•		•	•		•	•		•
		30						45	48	41.25			35	33.30	•		•	•		•	•		•
		32			8–17			48	51	44.25			40	36.11	•		•	•		•	•		•
		35			8–18			52.5	55.5	48.75				40.93	•		•	•		•	•		•
		36						54	57	50.25				42.24	•		•	•		•	•		•
		40			8–30			60	63	56.2			45	48.31	•		•	•		•	•		•
		48			8–32			72	75	68.25			50	60.90	•		•	•		•	•		•
		50						75	78	71.25				63.97	•		•	•		•	•		•
		52						78	81	74.25				67.07	•		•	•		•	•		•
		60			12–32			90	93	86.25			55	79.80	•		•	•		•	•		•
		70						105	108	101.25			65	95.56	•		•	•		•	•		•
		80						120	123	116.25				111.30	•		•	•		•	•		•
	2.0	15	20	E F G	8	—	—	30	34	25	14	34	24	28.65	•	—	•	•	—	•	•	—	•
		18						36	40	31			30	38.07	•	—	•	•	—	•	•	—	•
		20					8	40	44	35			33	44.59	•	•	•	•	•	•	•	•	•
		24			8–17		8–12	48	52	43			40	57.96	•	•	•	•	•	•	•	•	•
		25						50	54	45				61.43	•	•	•	•	•	•	•	•	•
		26			8–18			52	56	47			42	64.99	•	•	•	•	•	•	•	•	•
		30						60	64	55			48	78.93	•	•	•	•	•	•	•	•	•
		32						64	68	59			50	85.59	•	•	•	•	•	•	•	•	•
		36			10–32			72	76	67			55	100.13	•	•	•	•	•	•	•	•	•
		40						80	84	75			60	114.52	•	•	•	•	•	•	•	•	•
		48						96	100	91			62	144.35	•	•	•	•	•	•	•	•	•
		50						100	104	95				151.64	•	•	•	•	•	•	•	•	•
		52			12–32			104	108	99			65	158.99	•	•	•	•	•	•	•	•	•
		60						120	124	115				189.16	•	•	•	•	•	•	•	•	•
	2.5	14	25	E F G	8	—	—	35	40	28.75	16	41	25	49.96	•	—	•	•	—	•	•	—	•
		15						37.5	42.5	31.25			30	55.96	•	—	•	•	—	•	•	—	•
		16					8	40	45	33.75			32	61.98	•	•	•	•	•	•	•	•	•
		18			8–14			45	50	38.75			38	74.36	•	•	•	•	•	•	•	•	•
		20				8–12	—	50	55	43.75			40	87.09	•	•	•	•	•	•	•	•	•
		24			8–22		14–19	60	65	53.75			48	113.19	•	•	•	•	•	•	•	•	•
		25			8–25			62.5	67.5	56.25			50	119.98	•	•	•	•	•	•	•	•	•
		28						70	75	63.75			60	140.86	•	•	•	•	•	•	•	•	•
		30						75	80	68.75			65	154.16	•	•	•	•	•	•	•	•	•
		32			10–28			80	85	73.75			70	167.17	•	•	•	•	•	•	•	•	•
		36			10–35			90	95	83.75			75	195.56	•	•	•	•	•	•	•	•	•
		40			10–42			100	105	93.75			80	223.66	•	•	•	•	•	•	•	•	•
		48			12–50			120	125	113.75			85	281.94	•	•	•	•	•	•	•	•	•
		50						125	130	118.75				296.17	•	•	•	•	•	•	•	•	•
	3.0	12	30	E F G	8	—	—	36	42	28.5	18	48	27	66.66	•	—	•	•	—	•	•	—	•
		14			8 / 10			42	48	34.5			32	86.33	•	—	•	•	—	•	•	—	•
		15			8–12	8	—	45	51	37.5			35	96.70	•	•	•	•	•	•	•	•	•
		16			8–17	8–10	11	48	54	40.5			40	107.10	•	•	•	•	•	•	•	•	•
		18				8–15	—	54	60	46.5			44	128.50	•	•	•	•	•	•	•	•	•
		20				8–17	18 or 19	60	66	52.5			50	150.49	•	•	•	•	•	•	•	•	•
		24			8–25	8–25	28	72	78	64.5			58	195.60	•	•	•	•	•	•	•	•	•
		25					28 or 30	75	81	67.5			60	207.33	•	•	•	•	•	•	•	•	•
		28			10–35		28–35	84	90	76.5			70	243.41	•	•	•	•	•	•	•	•	•
		30						90	96	82.5			75	266.40	•	•	•	•	•	•	•	•	•
		32						96	102	88.5				288.88	•	•	•	•	•	•	•	•	•
		36			12–42			108	114	100.5			80	337.93	•	•	•	•	•	•	•	•	•
		40			12–45			120	126	112.5			85	386.49	•	•	•	•	•	•	•	•	•

* Allowable Transmission Forces in the table are reference values calculated based on conditions shown on **P.1469**.

Keyless Spur Gears

Pressure Angle 20°, Module 1.0, 1.5, 2.0, 2.5, 3.0, *continued*

Part Number Example

Part Number	-	No. of Teeth	-	B	-	Gear Shape	-	Shaft Bore Dia. d
GEAL1.0	-	40	-	10	-	G	-	10

Bushings

Notes on Installation

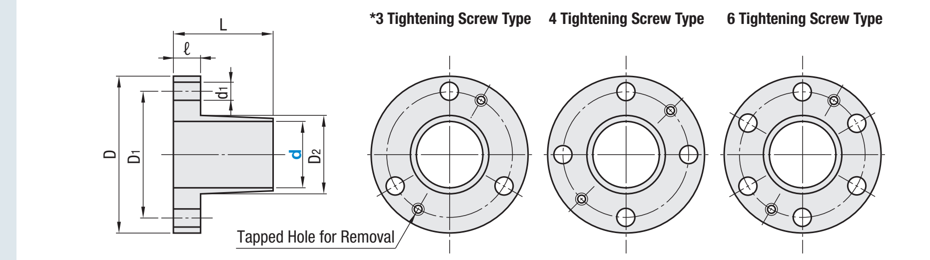
– When installing, be sure to apply oil or grease. When oil or grease is not applied, shaft may slip because of inadequate tightening.
– Tighten the bushing screws only after the shaft has been inserted. (The bushing will be deformed if tightened without a shaft inserted.)
– Use a torque wrench to tighten the screws.
– Do not use screws other than those included.

Installation

(1) Wipe dust off shaft surface with clean cloth and apply oil or grease.
(Do not use any oil or grease containing molybdenum type wear reduction agents).
(2) Wipe off and apply oil or grease on contact surfaces of spur gear and bushing.
Apply oil or grease to thread and seat of screws as well.
(3) Temporarily assemble spur gear and bushing and insert the shaft.
(Do not tighten the bushing before inserting the shaft.)
(4) After locating the gear on the shaft, tighten the clamping screws using a torque wrench in the diagonal pattern order, beginning lightly (approx. 1/4 of the prescribed tightening torque).
(5) Tighten the screws further to an increased torque (approximately 1/2 specified torque).
(6) Tighten to the prescribed full tightening torque.
(7) Finally, tighten the screws to the listed torque values in a circular order.

Removal

(1) Be sure to work after the system is completely shut down and stopped.
(2) Loosen the tightening screws in circular order.
(3) Insert screws into removal holes and tighten evenly.
(4) Repeat "Installation" process for re-installation.



Operating Temperature: -20–+80°C
*SH bushings have tapped holes for removal in 3 places.

Material: Main Body 1045 Carbon Steel or Equivalent
Screws 4137 Alloy Steel (Black Oxide)

Table 1: Bushing Dimension Table

Standard Type (ST)

Shaft Bore Dia. d	Screw Qty.	Screw Size	Tapped Hole for Removal	Max. Allowable Torque Nm	Allowable Thrust Load kN	Screw Tightening Torque Nm	(L_2)	D	D_1	D_2	d_1	L	ℓ
8	4	M3 x 12	M3 x 2	16	4.0	2.0	8.5	25.5	19	10	3.3	15.5	4
10	3	M4 x 16	M4 x 2	39	5.34	4.0	10.5	30	22	12	4.5	16.5	5
11				43				31	23	13			
12				48				32	24	14			
14	4	M4 x 18	M4 x 2	73	5.34	4.0	12	35	27	16.6	4.5	22	6
15				78				36	28	17.6			
16				83			13	37	29	18.6		23	7
17				88				38	30	19.6			
18	4	M5 x 20	M5 x 2	154	8.74	8.3	14	43	33	20.6	5.5	23	7
19				163				45	35	22.4			
20				171				46	36	23.4			
22				186				48	38	24.6			
24				206				50	40	26.6			
25				216				52	42	28.4			
28	6	M5 x 25	M5 x 2	353	8.74	8.3	15.5	54	44	30.6	5.5	24	8
30				382				57	47	33.4			
32				412			16.5	59	49	34.7		25	9
35				451				63	53	38.4		26.5	
38	6	M6 x 28	M6 x 2	686	12.3	13.7	19	70	58	42	6.6	28	10
40				725				71	59	43.5		30.5	
42				757			20	74	62	46		31.5	11
45	6	M8 x 35	M8 x 2	1490	22.7	34.3	24.5	84	69	49.5	8.8	38.5	13
48				1600				87	72	52.5			
50				1660				89	74	54.5			

– Shaft tolerance g6, shaft surface roughness Ra6.3 are standard. kgf=Nx0.101972
– When there is a keyway machining or a D cut on the shaft, transmitting torque is reduced by approximately 15% or more.
Electroless nickel plating reduces maximum allowable torque and thrust load capacities by 20–30%.

Short Type (SH)

Shaft Bore Dia. d	Screw Qty.	Screw Size	Tapped Hole for Removal	Max. Allowable Torque Nm	Allowable Thrust Load kN	Screw Tightening Torque Nm	D	D_1	D_2	d_1	L	ℓ
6	3	M3 x 10	M3 x 3	5.6	1.87	1.9	22.5	16	8.5	3.3	10.5	3
8				8.5	2.12		24.5	18	10.5			
10	3	M4 x 12	M4 x 3	18	3.59	3.9	29	21	12.75	4.4	13	4
11				20	3.63		30	22	13.75			
12				23	3.76		31	23	14.75			
14	4	M4 x 18	M4 x 2	37	5.21	3.9	36	26	17.65	4.4	17	5
15				39	5.10		37	27	18.65			
16				42	5.17		38	28	19.65			
17				45	5.23		39	29	20.65			
18				48	5.28		40	30	21.85			
19				49	5.12		42	32	22.85			
20	4	M5 x 18	M5 x 2	97	9.68	7.8	46	36	24.1	5.5	19	6
22				110	9.98		47	37	25.75			
24				121	10.00		49	39	27.75			
25				124	9.90		51	41	28.75			
28				141	10.00		53	43	31.75			
30				149	9.89		56	46	33.75			
32				163	10.12		58	47	35.75			
35				173	9.88		61	50	39.1		20	

kgf=Nx0.101972