



# Helical Gear

## Module 1.5 Shaft Bore Configurable Type, Helix Angle 19°31'42"

Features: Compared to spur gears, these gears have excellent transmission accuracy and quietness.

Type			Material	Surface Treatment	Accessories
Straight Bore	Straight Bore + Tap	Keyway, Keyway + Tap			
HGEARHB	HGEARB	HGEARKB	1045 Carbon Steel	Black Oxide Electroless nickel plating	Set Screw (4137 Alloy Steel, Black Oxide)
HGEARHBB	HGEARB	HGEARKBB			
HGEARHBG	HGEARBG	HGEARKBG			

① Set Screw is not included when an untapped specification is selected.

Gear Specifications	
Datum Section of Gears	Teeth perpendicular
Module	1.5
Pressure Angle	20°
Helix Angle	19°31'42"
Gear Accuracy	Old JIS B 1702 Class 4 (Equivalent to the new JIS B 1702-1 Class 8)

Shaft Bore Specifications (Selectable Gear Shapes)			
Straight Bore (Shape A, Shape B)		Straight Bore + Tap (Shape B)	
Keyway (Shape A)		Keyway + Tap (Shape B)	

① Refer to the dimensions table for keyway dimension details.  
② Relative positioning of keyway and teeth is not fixed.

Part Number	Number of Teeth	B Face Width	Gear Shape	Shaft Bore Dia. P <sub>H7</sub> (Unit: mm)		Twisting Direction	d Reference Dia.	D Tip Dia.	G Root Dia.	H	L	ℓ <sub>1</sub>	ℓ <sub>2</sub>	M (Coarse)	*1 Allowable Torque (N·m)									
				Straight Bore	Keyway										Bending Strength	Tooth Surface Strength								
Straight Bore (Shape A, Shape B) <b>HGEARHB</b> <b>HGEARHBB</b> <b>HGEARHBG</b>  Straight Bore + Tap (Shape B) <b>HGEARB</b> <b>HGEARB</b> <b>HGEARB</b>  Keyway (Shape A) Keyway + Tap (Shape B) <b>HGEARKB</b> <b>HGEARKBB</b> <b>HGEARKBG</b>	15	15	A B	12 to 50	12 to 45	L (Left) R (Right)	27	12	6	70	27	12	6	M6	15.17	0.99								
	16														6 to 8	8	23.87	26.87	20.12	16	16.76	1.15		
	17														6 to 12	8 to 12	27.06	30.06	23.31	19	18.37	1.32		
	18																28.65	31.65	24.90	20	20.02	1.51		
	19														6 to 13	8 to 13	30.24	33.24	26.49	22	21.69	1.80		
	20														6 to 15		31.83	34.83	28.08	24	23.38	2.04		
	21														6 to 18	8 to 15	33.42	36.42	29.67	25	25.09	2.28		
	22																35.01	38.01	31.26	27	26.82	2.55		
	23																36.61	39.61	32.86	28	28.56	2.83		
	24														6 to 20	8 to 17	38.20	41.20	34.45	30	30.32	3.12		
	25																39.79	42.79	36.04	32	32.09	3.44		
	26														6 to 22	8 to 19	41.38	44.38	37.63	33	33.88	3.77		
	27														6 to 23		42.97	45.97	39.22	35	35.67	4.12		
	28														6 to 24	8 to 24	44.56	47.56	40.81	36	37.48	4.49		
	29																46.16	49.16	42.41	38	39.30	4.87		
	30														47.75	50.75	44.00	39	41.12	5.28				
	32														6 to 28	8 to 24	50.93	53.93	47.18	43	44.80	6.14		
	33																52.52	55.52	48.77	44	46.65	6.60		
	34																54.11	57.11	50.36	46	48.51	7.08		
	35																55.70	58.70	51.95	47	50.37	7.58		
	36																57.30	60.30	53.55	49	52.24	8.10		
	38																60.48	63.48	56.73	52	55.99	9.19		
	39																6 to 35	8 to 30	62.07	65.07	58.32	54	57.88	9.77
	40																		63.66	66.66	59.91	55	59.77	10.37
	42																66.85	69.85	63.10	59	63.56	11.63		
	44																10 to 30	10 to 30	70.03	73.03	66.28	62	67.37	12.97
	45																		71.62	74.62	67.87	63	69.28	13.67
	46																		73.21	76.21	69.46	65	71.20	14.39
	48																		76.39	79.39	72.64	68	75.03	15.90
	49																		77.99	80.99	74.24	68	76.96	16.69
	50														79.58	82.58			75.83	68	78.88	17.50		
	51														8 to 40	10 to 33	81.17	84.17	77.42	68	80.81	18.34		
	52																82.76	85.76	79.01	68	82.74	19.19		
	54																85.94	88.94	82.19	70	86.61	20.97		
	55																87.54	90.54	83.79	70	88.55	21.89		
	56																89.13	92.13	85.38	70	90.49	22.83		
	57																90.72	93.72	86.97	70	92.43	23.80		
	58																92.31	95.31	88.56	70	94.38	24.79		
	60																95.49	98.49	91.74	70	98.27	26.84		
	62																98.68	101.68	94.93	70	102.17	28.98		
	63																100.27	103.27	96.52	70	104.13	30.09		
	64														101.86	104.86	98.11	70	106.08	31.22				
	65														103.45	106.45	99.70	70	108.04	32.37				
	66														105.04	108.04	101.29	70	109.99	33.55				
	68														108.23	111.23	104.48	70	113.91	35.98				
	69														109.82	112.82	106.07	70	115.87	37.23				

Part Number	Number of Teeth	B Face Width	Gear Shape	Shaft Bore Dia. P <sub>H7</sub> (Unit: mm)		Twisting Direction	d Reference Dia.	D Tip Dia.	G Root Dia.	H	L	ℓ <sub>1</sub>	ℓ <sub>2</sub>	M (Coarse)	*1 Allowable Torque (N·m)	
				Straight Bore	Keyway										Bending Strength	Tooth Surface Strength
Straight Bore (Shape A, Shape B) <b>HGEARHB</b> <b>HGEARHBB</b> <b>HGEARHBG</b>  Straight Bore + Tap (Shape B) <b>HGEARB</b> <b>HGEARB</b> <b>HGEARB</b>  Keyway (Shape A) Keyway + Tap (Shape B) <b>HGEARKB</b> <b>HGEARKBB</b> <b>HGEARKBG</b>	70	15	A B	12 to 50	12 to 45	L (Left) R (Right)	70	27	12	6	M6	111.41	114.41	107.66	117.84	38.51
	72											114.59	117.59	110.84	121.76	41.13
	75											119.37	122.37	115.62	127.66	45.25
	76											120.96	123.96	117.21	129.63	46.68
	77											122.55	125.55	118.80	131.60	48.13
	78											124.14	127.14	120.39	133.57	49.60
	80											127.32	130.32	123.57	137.52	52.63
	81											128.92	131.92	125.17	139.49	54.18
	84											133.69	136.69	129.94	145.42	58.98
	85											135.28	138.28	131.53	147.39	60.63
	88											140.06	143.06	136.31	153.33	65.75
	90											143.24	146.24	139.49	157.28	69.29
	91											144.83	147.83	141.08	159.27	71.10
	92											146.42	149.42	142.67	161.25	72.93
	95											151.20	154.20	147.45	167.19	78.60
	96											152.79	155.79	149.04	169.18	80.54
	98											155.97	158.97	152.22	173.14	84.51
	99											157.56	160.56	153.81	175.13	86.53
	100											159.16	162.16	155.41	177.11	88.58
	120											190.99	193.99	187.24	216.90	135.35

- ① Shaft Bore Dia. 9 is not available for Keyway + Tap.
  - ② The tooth trace is twisted, generating thrust. Design the bearing to be able to withstand axial thrust.
  - ③ Helical gears engage with the same helix angle with right and left twisting. Please bear this in mind when selecting as part of a set.
- \*1 Allowable Transmission Forces in the table are reference values calculated with prescribed conditions. For conditions, see P.1586.

**Part Number Example**

Part Number	Number of Teeth	B	Gear Shape	P	Twisting Direction
HGEARHB1.5	25	15	A	10	L
HGEARB1.5	38	15	B	10	R
HGEARKB1.5	18	15	A	12	L

When selecting Keyway types, see the table on the right.

New JIS (B1301) Keyway Dimensions				
Nominal	d <sub>H7</sub>	b <sub>JS9</sub>	t	Tolerance
8	8	+0.015	3	+0.0125
10	10	0	4	1.4
11	11	0	4	1.8
12	12	0	5	2.3
13	13	0	5	2.3
14	14	+0.018	5	+0.1
15	15	0	6	2.8
16	16	0	6	2.8
17	17	0	6	2.8
18	18	0	6	2.8
19	19	0	6	2.8
20	20	+0.021	6	2.8
21	21	0	6	2.8
22	22	0	6	2.8

Nominal	d <sub>H7</sub>	b <sub>JS9</sub>	t	Tolerance
23	23	0	8	3.3
24	24	0	8	3.3
25	25	0	8	3.3
26	26	0	8	3.3
27	27	0	8	3.3
28	28	0	8	3.3
29	29	0	8	3.3
30	30	0	8	3.3
31	31	0	8	3.3
32	32	0	8	3.3
33	33	0	8	3.3
34	34	+0.025	10	+0.2
35	35	0	10	3.3
36	36	0	10	3.3
37	37	0	10	3.3
38	38	0	10	3.3

# Helical Gear

## Module 1.5 Shaft Bore Configurable Type, Helix Angle 19°31'42", continued

Part Number Alterations	Part Number	Number of Teeth	B	Gear Shape	P	Twisting Direction	(KC90, KC120, BS, BH, etc.)
	HGEARHB1.5	25	15	A	10	LH	QFC28 - M3
	HGEARBG1.5	38	15	B	10	RH	BS10 - BH40

Alterations	Set Screw	Tapped Hole Dimension								
Code	KC90 / KC120	TPC								
Spec.	<p>KC90: Adds another set screw at 90° position.                      KC120: Adds another set screw at 120° position.  <b>Ordering Code:</b> KC90</p> <ul style="list-style-type: none"> <li>⊗ Not applicable to Shape A.</li> <li>⊗ Not applicable to Straight Bore Type.</li> </ul>	<p>Changes the tapped hole dimension.  <b>Ordering Code:</b> TPC4</p> <ul style="list-style-type: none"> <li>⊗ Not applicable to Shape A.</li> <li>⊗ Not applicable to Straight Bore Type</li> <li>① <math>\ell_1 - \ell_2 &gt; TPC/2</math></li> <li>① When TCP0, no tapped hole.</li> </ul> <table border="1"> <thead> <tr> <th>M</th> <th>TPC</th> </tr> </thead> <tbody> <tr> <td>M4</td> <td>MO M3 M5</td> </tr> <tr> <td>M5</td> <td>MO M4 M6</td> </tr> <tr> <td>M6</td> <td>MO M5 M8</td> </tr> </tbody> </table>	M	TPC	M4	MO M3 M5	M5	MO M4 M6	M6	MO M5 M8
M	TPC									
M4	MO M3 M5									
M5	MO M4 M6									
M6	MO M5 M8									

Alterations	Hub Shortening	Hub O.D. Cut
Code	BS	BH
Spec.	<p>Cuts the hub length in 0.5 mm Increments  <b>Ordering Code:</b> BS6.5</p> <ul style="list-style-type: none"> <li>⊗ Not available for A Shape.</li> <li>① Straight Bore Type: <math>0 &lt; BS \leq \ell_1</math></li> <li>① Straight Bore + Tap Type: <math>BS=0; M+3 &lt; BS \leq \ell_1</math></li> <li>① Keyway + Tap Type: <math>BS=0; M+3 &lt; BS \leq \ell_1</math></li> <li>① When <math>BS=0</math>, there are no tapped holes</li> </ul>	<p>Cut hub O.D. for specified dimension. (1 mm Increment)  <b>Ordering Code:</b> BH10</p> <ul style="list-style-type: none"> <li>⊗ Not available for A Shape.</li> <li>① Straight Bore Type: <math>P+4 &lt; BH &lt; H</math></li> <li>① Straight Bore + Tap Type: <math>P+6 &lt; BH &lt; H</math></li> <li>① Keyway + Tap Type: <math>P+14 &lt; BH &lt; H</math></li> </ul>

Alterations	Stepped Hole	Both Ends Stepped Bore	Side Slotted Hole										
Code	DHL / DHR	WDH	LFC / LTC										
Spec.	<p>Changes shaft bores to stepped bores.                      (Z: 1 mm Increment J: 0.1 mm Increment)  <b>Ordering Code:</b> DHL-Z20-J4.0</p> <ul style="list-style-type: none"> <li>① Applicable to Straight Bore Type Only.</li> </ul> <p><b>DHL</b></p> <ul style="list-style-type: none"> <li>① Shape A: <math>P+2 &lt; Z \leq G-4, 2 \leq J \leq B-3</math></li> <li>① Shape B: <math>P+2 &lt; Z \leq G-4, 2 \leq J \leq L-3</math></li> </ul> <p><b>DHR</b></p> <ul style="list-style-type: none"> <li>① Shape A: <math>P+2 &lt; Z \leq G-4, 2 \leq J \leq B-3</math></li> <li>① Shape B: <math>P+2 &lt; Z \leq H-4, 2 \leq J \leq \ell_1</math></li> </ul>	<p>Changes shaft bores to both ends stepped bore.                      (Q / R / S / T: 1 mm Increment) ① S, T <math>\geq 3</math>  <b>Ordering Code:</b> WDH-Q10-R10-S5-T5</p> <ul style="list-style-type: none"> <li>① Applicable to Straight Bore Type Only.</li> <li>General tolerance on P.</li> </ul> <p><b>Shape A</b></p> <ul style="list-style-type: none"> <li>① <math>P+2 &lt; Q, R \leq H-4</math></li> <li>① <math>S+T \leq B-3</math></li> </ul> <p><b>Shape B</b></p> <ul style="list-style-type: none"> <li>① <math>P+2 &lt; Q, R \leq H-4</math></li> <li>① <math>S+T \leq L-3</math></li> </ul>	<p>Machines slotted holes on the side surface (30°)                      (LFC / LTC: 1 mm Increment)  <b>M Selection:</b> M3 / M4 / M5 / M6  <b>Ordering Code:</b> LFC20-M3</p> <ul style="list-style-type: none"> <li>① Applicable to Shape A Only.</li> <li>① <math>P+C+4 \leq LFC(LTC) \leq G-C-4</math></li> </ul> <table border="1"> <thead> <tr> <th>M</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>M3</td> <td>3.5</td> </tr> <tr> <td>M4</td> <td>4.5</td> </tr> <tr> <td>M5</td> <td>5.5</td> </tr> <tr> <td>M6</td> <td>6.5</td> </tr> </tbody> </table>	M	C	M3	3.5	M4	4.5	M5	5.5	M6	6.5
M	C												
M3	3.5												
M4	4.5												
M5	5.5												
M6	6.5												

Alterations	Side Through Hole	Side Tapped Hole	Size Counter Bored Hole																				
Code	KSC / KFC / KTC	QSC / QFC / QTC	ZFC / ZTC																				
Spec.	<p>Machines through holes on the side surface                      (KFC/KTC 1 mm Increment / K: 0.5 mm Increment)  <b>K Selection:</b> K3.0-K6.0  <b>Ordering Code:</b> KFC20-K3.5</p> <p><b>Shape A</b></p> <ul style="list-style-type: none"> <li>① <math>P+K+4 \leq KSC(KFC/KTC) \leq G-K-4</math></li> </ul> <p><b>Shape B</b></p> <ul style="list-style-type: none"> <li>① <math>P+K+4 \leq KSC(KFC/KTC) \leq H-K-4</math></li> <li>① <math>H+K+4 \leq KSC(KFC/KTC) \leq G-K-4</math></li> </ul> <p>Location of Holes</p> <ul style="list-style-type: none"> <li>① Spec conditions depends on the shaft bore type.</li> </ul>	<p>Machines tapped holes on the side surface of the gear                      (QFC/QTC: 1 mm Increment)  <b>M Selection:</b> M3 / M4 / M5 / M6                      ① Depth of Tapped Hole: <math>M \times 2</math> (if <math>B &lt; M \times 2</math>, then thru)</p> <p><b>Shape A</b></p> <ul style="list-style-type: none"> <li>① <math>P+M+4 \leq QSC(QFC/QTC) \leq G-M-4</math></li> </ul> <p><b>Shape B</b></p> <p><b>Ordering Code (R Side):</b> QFC25-M3-RR  <b>Ordering Code (L Side):</b> QFC25-M3-LL</p> <ul style="list-style-type: none"> <li>① <math>P+M+4 \leq QSC(QFC/QTC) \leq H-M-4</math></li> <li>① <math>H+M+4 \leq QSC(QFC/QTC) \leq G-M-4</math></li> </ul> <p>Location of Holes</p> <ul style="list-style-type: none"> <li>① Spec conditions depends on the shaft bore type.</li> </ul>	<p>Machines counterbore holes on the side surface of the hub side                      (ZFC/ZTC: 1 mm Increment)  <b>Selection:</b> U3 / U4 / U5 / U6</p> <p><b>Shape A</b></p> <ul style="list-style-type: none"> <li>① <math>P+Ux2+3 \leq ZFC(ZTC) \leq G-Ux2-4</math></li> </ul> <table border="1"> <thead> <tr> <th>U Set</th> <th>U1</th> <th>U2</th> <th>F</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>6.5</td> <td>3.5</td> <td>3.5</td> </tr> <tr> <td>4</td> <td>8</td> <td>4.5</td> <td>4.5</td> </tr> <tr> <td>5</td> <td>9.5</td> <td>5.5</td> <td>5.5</td> </tr> <tr> <td>6</td> <td>11</td> <td>6.5</td> <td>6.5</td> </tr> </tbody> </table> <p><b>Shape B</b></p> <p><b>Ordering Code (R Side):</b> ZFC20-U3-RR  <b>Ordering Code (L Side):</b> ZFC20-U3-LL</p> <ul style="list-style-type: none"> <li>① <math>P+Ux2+3 \leq ZFC(ZTC) \leq H-Ux2-4</math></li> <li>① <math>H+Ux2+4 \leq ZFC(ZTC) \leq G-Ux2-4</math></li> </ul> <p>Location of Holes</p> <ul style="list-style-type: none"> <li>① Spec conditions depends on the shaft bore type.</li> </ul>	U Set	U1	U2	F	3	6.5	3.5	3.5	4	8	4.5	4.5	5	9.5	5.5	5.5	6	11	6.5	6.5
U Set	U1	U2	F																				
3	6.5	3.5	3.5																				
4	8	4.5	4.5																				
5	9.5	5.5	5.5																				
6	11	6.5	6.5																				