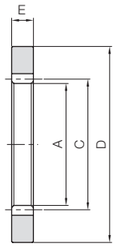
Steel Internal Gears

Specifications	
Precision grade	JIS grade N8 (JIS B1702-1: 1998)*
Gear teeth	Standard full depth
Pressure angle	20°
Material	S45C
Heat treatment	—
Tooth hardness	(less than 194HB)
Surface treatment	Black oxide coating

* The precision grade of products with a module of less than 0.8 is equivalent to the value shown in the table.



T1

Catalog Number	Module	No. of teeth	Shape	Outside dia. A	Pitch dia. C	Outside dia. D	Face width E	Allowable torque (N·m) Bending strength	Allowable torque (N·m) Surface durability	Allowable torque (kgf·m) Bending strength	Allowable torque (kgf·m) Surface durability	Backlash (mm)	Weight (kg)
SI0.5-60	***m*0.5**	60	T1	29	30	50	5	3.75	0.67	0.38	0.068	0.04~0.15	0.049
SI0.5-80		80		39	40	60		4.85	0.75	0.49	0.077		0.062
SI0.5-100		100		49	50	70		5.97	0.87	0.61	0.089		0.074
SI0.8-60	***m*0.8**	60		46.4	48	75	8	15.4	2.87	1.57	0.29	0.05~0.16	0.16
SI0.8-80		80		62.4	64	90		19.9	3.24	2.03	0.33		0.20
SI0.8-100		100		78.4	80	105		24.5	3.75	2.50	0.38		0.23
SI1-60	***m*1**	60		58	60	90	10	30.0	5.95	3.06	0.61	0.09~0.21	0.28
SI1-80		80		78	80	110		38.8	6.59	3.96	0.67		0.35
SI1-100		100		98	100	130		47.8	7.64	4.87	0.78		0.43
SI1.5-60	***m*1.5**	60		87	90	130	15	101	20.6	10.3	2.10	0.11~0.25	0.81
SI1.5-80		80		117	120	160		131	23.3	13.4	2.38		1.04
SI1.5-100		100		147	150	190		161	27.0	16.5	2.75		1.26
SI2-60	***m*2**	60		116	120	170	20	240	50.5	24.5	5.15	0.12~0.28	1.79
SI2-80		80		156	160	210		311	57.0	31.7	5.81		2.28
SI2-100		100		196	200	250		382	65.7	39.0	6.70		2.77
SI2.5-60	***m*2.5**	60		145	150	210	25	469	101	47.8	10.3	0.14~0.31	3.33
SI2.5-80		80		195	200	260		607	114	61.9	11.6		4.25

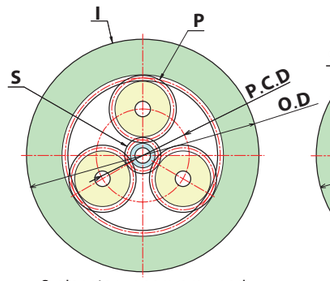
[Caution on Product Characteristics] ① The backlash values shown in the table are the theoretical values for the normal direction for the internal ring in mesh with an SS spur gear.
② The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 209 for more details.
③ Please check for the involute interference, trochoid interference and trimming interference prior to using internal gears.

Ground internal gears are available.

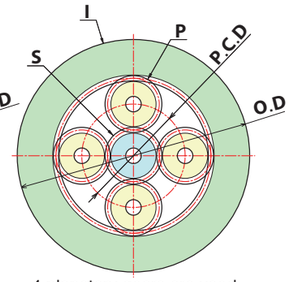
Klingelnberg Gear Grinding Machine VIPER 500W

Internal ground gear machining range	
Maximum gear accuracy	JIS B 1702-1:1998 Grade N5 (former JIS Grade 1)
Maximum module	About m4 (DP6, CP12), special sizes available
Max. helix angle	27°, right/left helix direction available
Maximum outer diameter	ϕ 500mm
Minimum inner diameter	ϕ 150mm
Maximum weight	500 kgf (jig weight included)

Planetary Gear Systems created by using KHK Stock Gears



3 planetary gears are used



4 planetary gears are used

KHK's stock internal and spur gears working together will allow you to create planetary gear devices.
"In the table below, we introduce examples of planetary gear
The Speed ratio Note 1 are for planetary gear systems created with a stationary internal gear. When used as speed reducers, the input is the sun gear and the output is the carrier.
"Selection of the number of teeth also enables you to create various planetary gear devices with different transmission

Speed ratio Note 1	Stock gears used in the system: Internal gears (I) OD(mm)	Internal gears (I) Catalog Number	Internal gears (I) No. of teeth	Planetary gears (P) Catalog Number	Planetary gears (P) No. of teeth	Planetary gears (P) Quantity	Planetary gears (P) P.C.D(mm)	Planetary gears (P) Equal angles	Sun gear (S) Catalog Number	Sun gear (S) No. of teeth	Allowable transmission torque (kgf·m) Sun gear_T1 Bending strength	Sun gear_T1 Surface durability	Planetary carrier _T2 Bending strength	Planetary carrier _T2 Surface durability	Total weight (kg)
6	90	SI1-60	60	SSA1-24	24	3	36	120°	SSS1-12	12	0.58	0.0023	3.47	0.11	0.48
	130	SI1.5-60		SSA1.5-24			54		SS1.5-12		1.77	0.0081	10.7	0.40	1.20
	170	SI2-60		SSA2-24			72		SS2-12		4.21	0.020	25.2	0.99	2.66
	210	SI2.5-60		SSA2.5-24			90		SS2.5-12		8.21	0.040	49.3	1.98	5.03
	110	SI1-80	80	SSA1-32	32	3	48	120°	SS1-16	16	0.99	0.0047	5.96	0.24	0.57
	160	SI1.5-80		SSA1.5-32			72		SS1.5-16		3.35	0.026	20.1	1.32	1.72
	210	SI2-80		SSA2-32			96		SS2-16		7.95	0.064	47.7	3.22	3.85
	260	SI2.5-80		SSA2.5-32			120		SS2.5-16		15.5	0.13	93.2	6.45	7.33
	105	SI0.8-100	100	SS0.8-40A	40	4	48	90°	SS0.8-20A	20	0.95	0.0082	5.68	0.41	0.59
	130	SI1-100		SSA1-40			60		SS1-20		1.85	0.016	11.1	0.82	0.84
	190	SI1.5-100		SSA1.5-40			90		SS1.5-20		6.24	0.058	37.5	2.90	2.62
	250	SI2-100		SSA2-40			120		SS2-20		14.8	0.14	88.8	7.09	6.01
5	60	SI0.5-80	80	SS0.5-30B	30	4	25	90°	SS0.5-20A	20	0.23	0.0012	1.13	0.070	0.12
	90	SI0.8-80		SS0.8-30C			40		SS0.8-20A		0.93	0.0050	4.65	0.30	0.40
	110	SI1-80		SSA1-30			50		SS1-20		1.82	0.010	9.08	0.60	0.59
	160	SI1.5-80		SSA1.5-30			75		SS1.5-20		6.13	0.035	30.63	2.13	1.86
	210	SI2-80		SSA2-30			100		SS2-20		14.5	0.087	72.6	5.21	4.18
	260	SI2.5-80		SSA2.5-30			125		SS2.5-20		28.4	0.17	142	10.4	7.97
3	60	SI0.5-80	80	SS0.5-20A	20	4	30	90°	(M)SSG0.5-40B	40	0.46	0.0016	1.39	0.10	0.13
	90	SI0.8-80		SS0.8-20A			48		SS0.8-40A		1.89	0.0068	5.68	0.41	0.35
	110	SI1-80		SSA1-20			60		SS1-40		3.70	0.014	11.1	0.82	0.60
	160	SI1.5-80		SSA1.5-20			90		SS1.5-40		12.5	0.048	37.5	2.91	1.77
	210	SI2-80		SSA2-20			120		SS2-40		29.6	0.12	88.8	7.12	3.93
	260	SI2.5-80		SSA2.5-20			150		SS2.5-40		57.8	0.24	173	14.3	7.47
	70	SI0.5-100	100	SS0.5-25B	25	3	37.5	120°	SS0.5-50B	50	0.47	0.0020	1.42	0.12	0.16
	130	SI1-100		SSA1-25			75		SS1-50		3.79	0.017	11.4	1.01	0.75
	190	SI1.5-100		SSA1.5-25			112.5		SS1.5-50		12.8	0.060	38.4	3.58	2.24
	250	SI2-100		SSA2-25			150		SS2-50		30.4	0.15	91.1	8.79	5.02

(M) ··· Made to Order

Calculation of Allowable Transmission Torque

One advantage of a planetary gear system is that they share load burdens by grouping multiple planetary gears.
This enables high torque capacity transmission.
The following formula is the calculation method for T1 (Allowable transmission torque of Sun Gear) and T2 (Allowable transmission torque of Planetary Carrier), shown in the table.

$T1=Ts\cdot Zp\cdot \eta$ (kgf·m) ····· (1)
$T2=Ts\cdot Zp\cdot u\cdot \eta$ (kgf·m) ····· (2)

Here,
Ts : Allowable transmission torque for a Sun gear (kgf·m) on a meshed pair of sun gear and planetary gear.
For a sun gear meshed with a planetary gear, the number of revolutions is set to 100rpm.
Zp : Number of planetary gears used in the system
u : Speed ratio
η : Contact efficiency for torque transmission
In consideration of machining accuracy, variation in tooth thickness or other factors on the planetary carrier, the contact efficiency is set to 75%.