

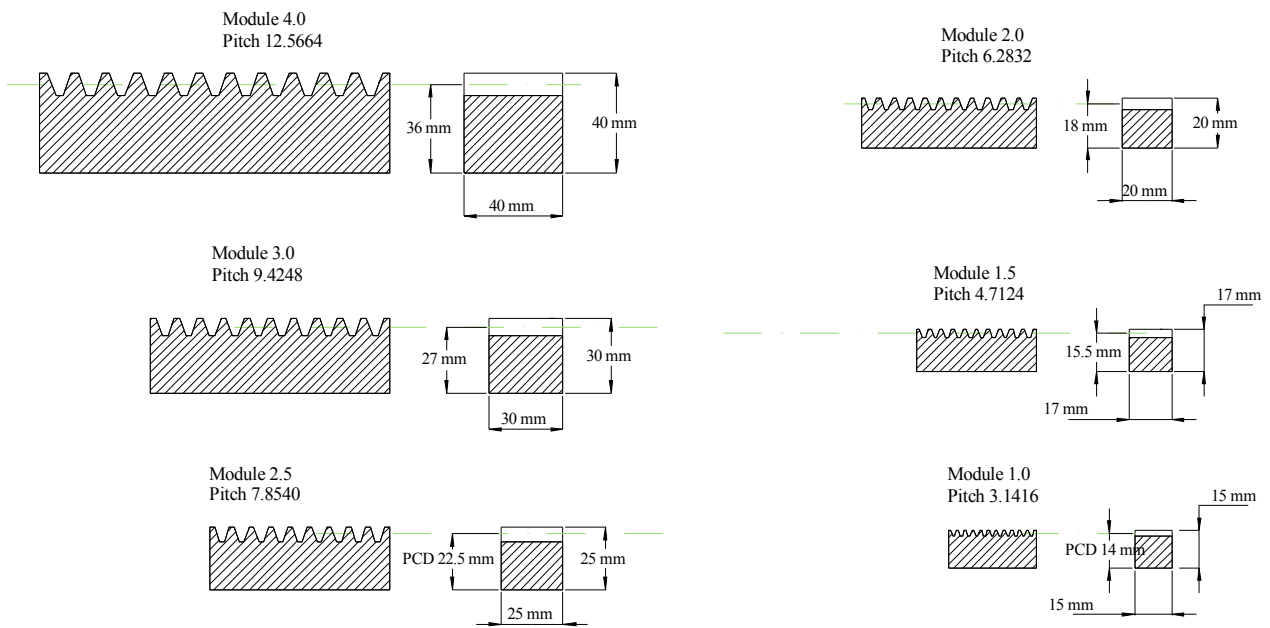
Spur Gear and Racking – Stock Industrial Range



Standard metric spur gears and rack available from stock in non-hardened form. Rack and pinion is a traditional drive system that provides a compact and rugged linear or geared drive. Standard racks are 2m long and can be butt joined for an unlimited length. A great benefit of rack and pinion is its high rigidity even in very long length applications. It is also easy to install and can operate at high speed.

Rack and pinions in plastic, stainless, hardened circular cross section, and high torque helical are available on indent to suit almost any application.

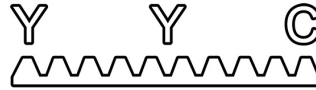
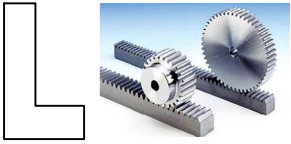
Racks



Module	Cross section	# Teeth	Actual Length mm	Precision JIS9e27
1	15x15	636	1998.05	0.056/300mm
1.5	17x17	424	1998.05	0.059/300mm
2	20x20	318	1998.05	0.059/300mm
2.5	25x25	255	2002.77	0.063/300mm
3	30x30	212	1998.05	0.065/300mm
4	40x40	159	1998.05	0.068/300mm

Material S45C (SAE 1045) can be welded and hardened.

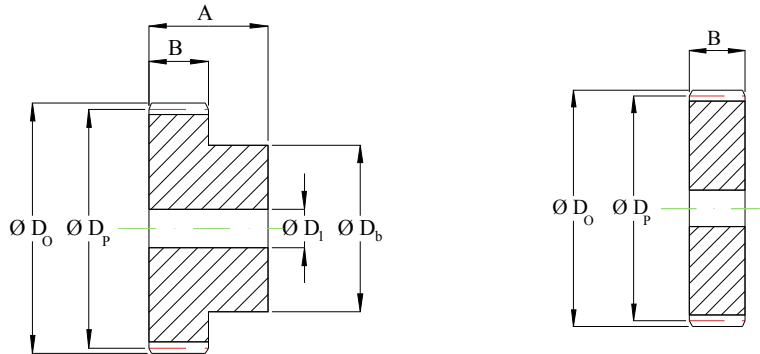
Racks can be cut to your required length and lengths are specially machined to be butt jointed. Special designs with pre drilled or counter bored holes can also be supplied on request.



Spur Gears



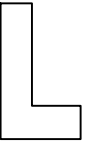
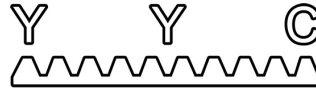
- Material C45 – heat or nitride treatable.
- Torque values can be factor up to 2.5 times with hardening.



Mod 1 - 2.5

Items in **bold** are regular stock items

z	Mod 1					Mod. 1.5					Mod 2					Mod.2.5				
	B=15		A=25			B=17		A=30			B=20		A=35			B=25		A=45		
	Outside \varnothing Do	Pitch \varnothing Dp	Hub \varnothing Db	Bore \varnothing D1	Torque Nm	Outside \varnothing Do	Pitch \varnothing Dp	Hub \varnothing Db	Bore \varnothing D1	Torque Nm	Outside \varnothing Do	Pitch \varnothing Dp	Hub \varnothing Db	Bore \varnothing D1	Torque Nm	Outside \varnothing Do	Pitch \varnothing Dp	Hub \varnothing Db	Bore \varnothing D1	Torque Nm
12	14	12	9	-	0.2	21	18	14	8	0.8	28	24	18	10	1.7	35	30	22	10	2.4
13	15	13	10	-	0.3	22.5	19.5	15	8	0.9	30	26	20	10	1.9	37.5	32.5	25	10	3.4
14	16	14	11	-	0.3	24	21	17	8	1.1	32	28	22	10	2.2	40	35	28	10	4.2
15	17	15	12	-	0.4	25.5	22.5	18	8	1.2	□□	30	24	10	2.6	42.5	37.5	30	10	5
16	18	16	13	-	0.5	27	24	19	8	1.4	36	32	25	10	3	45	40	32	12	5.8
17	19	17	14	-	0.6	28.5	25.5	20	8	1.7	38	34	25	10	3.5	47.5	42.5	35	12	6.7
18	20	18	15	8	0.7	30	27	20	8	1.9	40	36	25	10	4	50	45	35	12	7.7
19	21	19	15	8	0.8	31.5	28.5	20	8	2.1	42	38	25	10	4.4	52.5	47.5	35	12	8.6
20	22	20	16	8	0.9	33	30	25	8	2.3	44	40	30	10	4.9	55	50	40	12	9.5
21	23	21	16	8	1	34.5	31.5	25	10	2.5	46	42	30	12	5.5	57.5	52.5	40	14	10.4
22	24	22	16	8	1.1	36	33	25	10	2.8	48	44	30	12	6	60	55	45	14	11.4
23	25	23	18	8	1.2	37.5	34.5	25	10	3	50	46	30	12	6.6	62.5	57.5	45	14	12.4
24	26	24	20	10	1.3	39	36	25	10	3.4	52	48	35	12	7.2	65	60	45	14	13.5
25	27	25	20	10	1.4	40.5	37.5	25	10	3.6	54	50	35	12	7.8	67.5	62.5	50	14	14.6
26	28	26	20	10	1.5	42	39	30	12	3.9	56	52	40	12	8.1	70	65	50	14	15.8
27	29	27	20	10	1.6	43.5	40.5	30	12	4.1	58	54	40	12	8.7	72.5	67.5	50	14	17
28	30	28	20	10	1.7	45	42	30	12	4.4	60	56	40	12	9.3	75	70	50	14	18.1
29	31	29	20	10	1.8	46.5	43.5	30	12	4.8	62	58	40	14	10	77.5	72.5	50	14	19.4
30	32	30	20	10	1.9	48	45	30	12	5	64	60	40	14	10.6	80	75	55	14	20.7
31	33	31	25	10	2	49.5	46.5	35	12	5.4	66	62	45	14	11.3	82.5	77.5	55	16	22
32	34	32	25	10	2.1	51	48	35	12	5.7	68	64	45	14	12	85	80	55	16	23.4
33	35	33	25	10	2.3	52.5	49.5	35	12	6	70	66	45	14	12.7	87.5	82.5	55	16	24.8
34	36	34	25	10	2.4	54	51	35	12	6.2	72	68	45	14	13.4	90	85	55	16	26.3
35	37	35	25	10	2.6	55.5	52.5	35	12	6.6	74	70	45	14	14.1	92.5	87.5	60	16	27.8
36	38	36	25	10	2.7	57	54	35	12	6.9	76	72	45	14	14.9	95	90	60	16	29.3
37	39	37	25	10	2.8	58.5	55.5	40	12	7.3	78	74	50	14	15.6	97.5	92.5	60	16	31
38	40	38	25	10	3	60	57	40	12	7.6	80	76	50	14	16.5	100	95	60	16	32.5
39	41	39	25	10	3.1	61.5	58.5	40	12	8	82	78	50	14	17.3	102.5	97.5	60	16	34.1
40	42	40	25	10	3.3	63	60	40	12	8.4	84	80	50	14	18.1	105	100	70	16	35.9
41	43	41	30	10	2.4	64.5	61.5	40	12	8.8	86	82	55	16	19	107.5	102.5	70	16	37.9
42	44	42	30	10	3.6	66	63	50	12	9.2	88	84	55	16	19.8	110	105	70	16	39.4
43	45	43	30	10	3.8	67.5	64.5	50	12	9.6	90	86	55	16	20.7	112.5	107.5	70	16	41.7
44	46	44	30	10	3.9	69	66	50	12	10	92	88	60	16	21.6	115	110	70	16	43.7

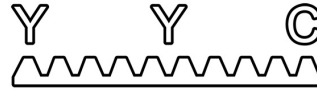
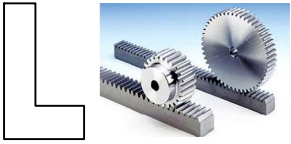


z	Mod 1					Mod. 1.5					Mod 2					Mod.2.5				
	B=15		A=25			B=17		A=30			B=20		A=35			B=25		A=45		
	Outside ∅	Pitch ∅	Hub ∅	Bore ∅	Torque Nm	Outside ∅	Pitch ∅	Hub ∅	Bore ∅	Torque Nm	Outside ∅	Pitch ∅	Hub ∅	Bore ∅	Torque Nm	Outside ∅	Pitch ∅	Hub ∅	Bore ∅	Torque Nm
45	47	45	30	12	4.1	70.5	67.5	50	12	10.5	94	90	60	16	22.6	117.5	112.5	70	16	45
46	48	46	30	12	4.3	72	69	50	14	10.9	96	92	60	16	23.5	120	115	70	16	47.8
47	49	47	30	12	4.5	73.5	70.5	50	14	11.4	98	94	70	16	24.5	122.5	117.5	80	20	49.9
48	50	48	30	12	4.6	75	72	50	14	11.8	100	96	70	16	25.5	125	120	80	20	50.8
49	51	49	30	12	4.8	76.5	73.5	50	14	12.3	102	98	70	16	26.6	127.5	122.5	80	20	54.3
50	52	50	30	12	5	78	75	50	14	12.8	104	100	70	16	27.6	130	125	80	20	55
51	53	51	40	12	5.1	79.5	76.5	60	14	13.4	106	102	70	16	29.0	132.5	127.5	80	20	58.8
52	54	52	40	12	5.2	81	78	60	14	13.9	108	104	70	16	30.1	135	130	90	20	61.2
53	55	53	40	12	5.4	82.5	79.5	60	14	14.4	110	106	70	16	31.2	137.5	132.5	90	20	63.5
54	56	54	40	12	5.6	84	81	60	14	14.8	112	108	70	16	31.9	140	135	90	20	63.5
55	57	55	40	12	5.8	85.5	82.5	60	14	15.5	114	110	70	16	33.5	142.5	137.5	90	20	68.5
56	58	56	40	12	6	87	84	60	16	15.8	116	112	70	16	34.2	145	140	100	20	68
57	59	57	40	12	6.1	88.5	85.5	60	16	16.4	118	114	70	16	35.4	147.5	142.5	100	20	73.6
58	60	58	40	12	6.3	90	87	60	16	17.1	120	116	70	16	37.1	150	145	100	20	76.2
59	61	59	40	12	6.5	91.5	88.5	60	16	17.7	122	118	70	16	38.3	152.5	147.5	100	20	78.9
60	62	60	40	12	6.7	93	90	60	16	18	124	120	70	16	39	155	150	100	20	77

Mod 3 – 6

Items in **bold** are regular stock items

z	Mod 3					Mod 4					Mod 5					Mod 6				
	B=30		A=50			B=40		A=60			B=50		A=75			B=60		A=80		
	Outside ∅	Pitch ∅	Hub ∅	Bore ∅	Torque Nm	Outside ∅	Pitch ∅	Hub ∅	Bore ∅	Torque Nm	Outside ∅	Pitch ∅	Hub ∅	Bore ∅	Torque Nm	Outside ∅	Pitch ∅	Hub ∅	Bore ∅	Torque Nm
12	42	36	27	12	5.4	56	48	35	14	12.3	70	60	45	20	24.3	84	72	54	20	52.3
13	45	39	30	12	6.3	60	52	40	14	15.2	75	65	50	20	30.7	90	78	60	20	50.3
14	48	42	33	12	7.6	64	56	45	14	18.2	80	70	55	20	36.7					
15	51	45	35	12	9.1	68	60	45	14	21.2	85	75	60	20	42.4	102	90	70	20	62.8
16	54	48	38	14	10.6	72	64	50	16	24.2	90	80	65	20	48.1	108	96	75	20	71.7
17	57	51	42	14	12.3	76	68	50	16	27.4	95	85	70	20	53.1					
18	60	54	45	14	13.9	80	72	50	16	30.7	100	90	70	20	61.8	120	108	80	20	90.7
19	63	57	45	14	15	84	76	60	16	34.2	105	95	70	20	68.7					
20	66	60	45	14	16.5	88	80	70	16	37.8	110	100	80	20	75.8	132	120	90	20	111.2
21	69	63	50	16	18.2	92	84	70	16	41.6	115	105	80	20	83.2					
22	72	66	50	16	20	96	88	70	16	45.5	120	110	80	20	90.9					
23	75	69	50	16	21.7	100	92	75	20	49.5	125	115	90	20	98.8					
24	78	72	50	16	23.6	104	96	75	20	53.7	130	120	90	20	107	156	144	110	25	156.8
25	81	75	60	16	25.5	108	100	75	20	58.1	135	125	90	20	115.6	162	150	110	25	169.2
26	84	78	60	16	28.5	112	104	75	20	62.5	140	130	100	20	124.2					
27	87	81	60	16	30.7	116	108	75	20	67.3	145	135	100	20	133.2					
28	90	84	60	16	33	120	112	75	20	72.1	150	140	100	25	142.5	180	168	-	25	209
29	93	87	60	16	35.3	124	116	75	20	77	155	145	110	25	152.1					
30	96	90	60	16	37.6	128	120	75	20	82.1	160	150	110	25	162	192	180	-	25	247.4
31	99	93	60	16	40.1	132	124	80	20	88.3										
32	102	96	70	16	42.6	136	128	80	20	93.1	170	160	-	25	186.6	204	192	-	25	285.0
33	105	99	70	16	45.2	140	132	80	20	100.0										
34	108	102	70	16	47.8	144	136	80	20	106.1										
35	111	105	70	16	50.6	148	140	80	20	111.7	185	175	-	25	222.4	222	210	-	25	
36	114	108	70	20	53.4	152	144	80	25	118.2										
37	117	111	70	20	56.3															
38	120	114	80	20	59.3	160	152	-	25	132.2	200	190	-	25	260.9	240	228	-	25	396.8
39	123	117	80	20	62.3															



z	Mod 3					Mod 4					Mod 5					Mod 6				
	B=30		A=50			B=40		A=60			B=50		A=75			B=60		A=80		
	Outside ∅	Pitch ∅	Hub ∅	Bore ∅	Torque Nm	Outside ∅	Pitch ∅	Hub ∅	Bore ∅	Torque Nm	Outside ∅	Pitch ∅	Hub ∅	Bore ∅	Torque Nm	Outside ∅	Pitch ∅	Hub ∅	Bore ∅	Torque Nm
40	126	120	80	20	65.4	168	160	-	25	146.2	210	200	-	25	300.2	252	240	-	25	446.7
41	129	123	80	20	68.5															
42	132	126	80	20	71.7															
43	135	129	80	20	75.4															
44	138	132	90	20	78.9															
45	141	135	90	20	81.9	188	180	-	25	185.2	235	225	-	25	381					
46	144	138	90	20	86.2															
47	147	141	100	20	90.0															
48	150	144	100	20	93	200	192	-	25	210.7	250	240	-	25	434					
50	156	150	-	20	100.4	208	200	-	25	228.8	260	250	-	30	456.8					
52	162	156	-	20	110.2	216	208	-	25	246.4	270	260	-	20	503.5					
55	171	165	-	20	123.2	228	220	-	25	275.4	285	275	-	30	563.5					
57	177	171	-	20	132.4	236	228	-	25	295.6	295	285	-	30	605.4					
60	186	180	-	20	143	248	240	-	25	327.2	310	300	-	30	678.4					

Sizing a rack and pinion drive

Sizing a rack and pinion drive is based on the maximum torque the pinion can provide. This can be calculated as follows.

$$T_p = \frac{F_U \cdot d}{2000} \cdot K_A \cdot S_B \quad \text{Pinion torque}$$

For vertical applications: $F_U = m \cdot g + m \cdot a$

For horizontal applications: $F_U = m \cdot g \cdot \mu + m \cdot a$

Acceleration: $a = \frac{v}{t}$

Where:

T_p	=	Torque on the pinion	N.m
d	=	Pinion diameter	mm
F_u	=	Drive force	N
g	=	Gravitational acceleration (9.81)	m/s^2
a	=	Acceleration	m/s^2
m	=	Mass	kg
v	=	Velocity	m/s
K_A	=	Load factor	
S_B	=	Safety factor	

Load factor, K_A

Drive (Machine movement)	Type of machine load		
	Uniform	Medium Shocks	Heavy Shocks
Uniform	1.00	1.25	1.75
Light Shocks	1.25	1.50	2.00
Medium Shocks	1.50	1.75	2.25

Safety factor, S_B should be from engineering judgement but typically 1.1 for light duty non critical to 3 for mission critical high-risk applications.