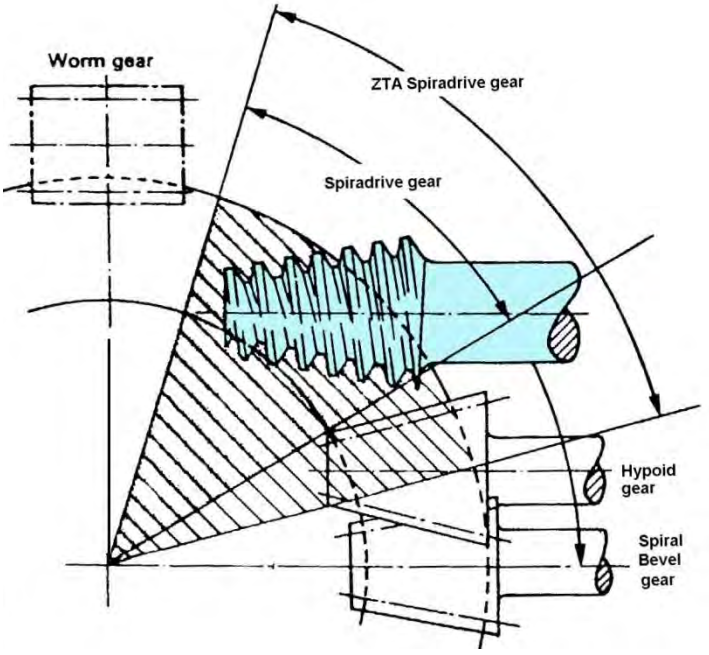


SPIRADRIVE® gear systems

- > High torque
- > High precision
- > Positive backlash control
- > Ratios 6:1 to 360:1

DAVALL GEARS
An MTI Company

SPIRADRIVE® gear systems

High torque density

High-performance alternative to worm and wheel gear sets, with the teeth on the face of the gear and moving the pinion inboard of the gear outside diameter creates a very compact package. Tribological conditions at the contact point allow both gear and pinion to be manufactured from high-strength steel for increased torque capacity.

Irreversible or controlled back-drive

Higher ratios of SPIRADRIVE® gear systems can be designed to be irreversible (statically self locking). Typical applications range from targeting and aiming systems to winches, hoists and robotic arms. Lower ratios allow backdriving and can operate as efficient speed increasers at ratios as high as 30:1.

Accurate control of backlash

Unlike worm gears, backlash in SPIRADRIVE® can be adjusted and controlled by adjusting the mounting position of the gear and pinion and still maintain proper conjugate action. Low backlash can be achieved by this method with a degree of reduction in life and efficiency.

Unique packaging

Frequently, Davall SPIRADRIVE® gearsets are employed to solve packaging problems (often where worm and wheels cannot achieve the torque capacity and duty cycle). The pinion can be mounted on any quarter of the gear either above or below the centreline. Non-perpendicular axis can also be accommodated.

Aerospace

Compact size, low weight, low backlash and high-torque capacity. SPIRADRIVE® can actuate:

- Flight control surfaces
- Missile fins, engine nozzles, actuators
- Fuselage utilities
- Ground equipment (handling and positioning)
- Cameras, drives, etc.

Robotics

Combining strength, smooth running and greater efficiency than worm gears at high ratios. SPIRADRIVE® can be applied to:

- Surgical robots
- Automatic welding applications
- Manipulators in automotive assembly lines

Defence

High-shock strength, positive backlash, self-locking control, rugged design and less sensitivity than worm gears to mounting errors, SPIRADRIVE® is used on:

- Satellite antennae
- Azimuth and elevation gun control
- Hatch and door operation
- Ancillary equipment where hydraulic systems are impractical

SPIRADRIVE® gearboxes

High-power transmission, universal mounting, high-torsional stiffness, sealed for life design, smooth, quiet running.

SPIRADRIVE® gear sets

Wide range of ratios, choice of material, self-locking, small size for given power, high-shock strength.

Wide range of ratios (6:1 to 360:1)

The design of a SPIRADRIVE® gear system is based around the mounting centre distance of the gear set and the diameter of the gear, meaning an interchangeable set of gear sets can be designed with ratios from 6:1 to 360:1. Lowest ratio limited by tooling geometry for manufacture. Highest ratio limited by manufacturability of cutting tools.

High-contact ratio

By spanning the mesh across the face width of the gear, high-contact ratios can be achieved. This results in:

- Quiet operation
- Low and controllable backlash
- High gearmesh stiffness for precise control systems
- High torque capacity

Suitable for moulding and sintering

The orientation of the teeth on the face of the gear makes the gear form particularly suitable for moulding and sintering for high-volume, low-cost applications.

Medical

SPIRADRIVE® gear technology has proved very successful in providing reduction systems in the medical sector, with minimised backlash and positional accuracy. SPIRADRIVE® is used in:

- Precision critical-imaging systems
- Drives and actuators

Bespoke applications

SPIRADRIVE® can achieve ultimate smoothness, Davall can offer :

- System design in unique applications demanding critical subjective feel

Industrial/commercial

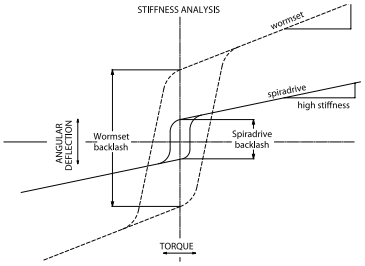
SPIRADRIVE® can provide a wide choice of ratios, 6:1 to 360:1 (in a single pair of gears), with self-locking capability.

Typical applications include:

- Machine tool measuring systems
- Robotic system manufacturers
- Coordinate measuring machines
- Remotely piloted vehicles

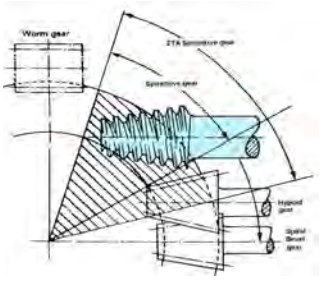
Custom systems

SPIRADRIVE® gearboxes and gear sets are designed, wherever possible, to meet specific customer requirements/applications.



Low backlash and high-torsional stiffness

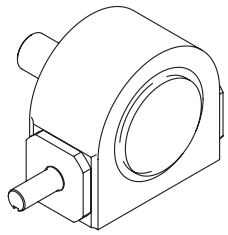
By virtue of the high-tooth contact ratio and low backlash, SPIRADRIVE® provides a much better control solution for closed-loop actuation systems. Much lower hysteresis and high-torsional stiffness allows much finer control tolerances to be achieved.



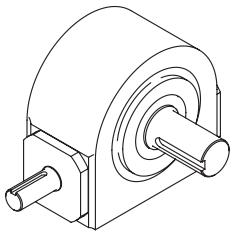
Improved efficiency

Due to a combination of both sliding and rolling action, SPIRADRIVE® has a better efficiency than an equivalent ratio worm and wheel.

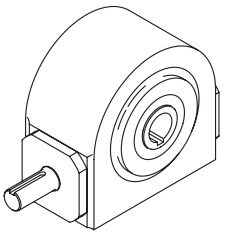
Standard gearboxes



Output shaft-left (L)



Output shaft-right (R)



Hollow output shaft (H)

Shaft configurations

The shaft permutations, as shown above, are available as standard. Where double-ended shafts are required, the dimensions will mirror those for a single-ended shaft.

Torque capacity

Derate performance characteristics for gearboxes/gear sets by dividing stated capacity by service factor from the table (Page 8).

Lubrication

The type of lubrication required is to a certain extent dictated by the input speed of the application. This has been overcome by offering two versions of each size of gearbox. The grease-packed version is recommended for use where input speeds up to 500 rpm are involved – this version may also be used for intermittent-duty applications, where the performance figures stated (pages 6 and 7) are not to be exceeded.

For higher speed and for continuous applications, we recommend the use of the oil-filled versions. All steel gearsets require an EP lubricant.

How to order

The possible permutations of shafts, ratio, lubrication and backlash are such that it is essential that the correct catalogue number is quoted in any enquiry or order.

The number has been designed to enable us to clearly identify the exact model required and is made up as follows:

Components of the number: e.g.

1st group 19SGB - this identifies it as a 19 mm SPIRADRIVE® gearbox

2nd group 19SGB-60 - this group is the required ratio (60:1)

3rd group 19SGB-60-S -
"S" for single-ended input shaft
"D" for double-ended input shaft

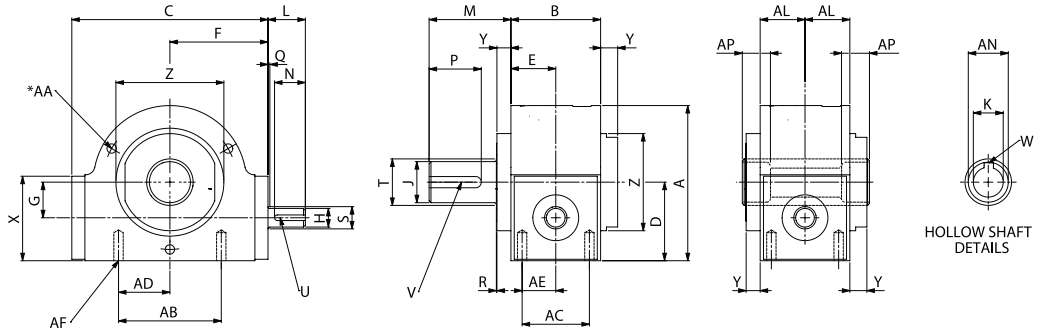
4th group 19SGB-60-S-L -
"L" for output shaft left
"R" for output shaft right
"H" for hollow output shaft
"D" for double-ended output shaft

5th group 19SGB-60-S-L-G – "G" for grease lubrication "O" for oil lubrication

6th group 19SGB-60-S-L-G-BL10 – BL10 for 10 minutes of arc backlash BL3 for 3 minutes or arc backlash*

*Only available for bronze wheel

Dimensions in millimetres



*Note SGB 50 & SGB 70 have four mounting holes equi-spaced at 45˚ to the vertical axis through the output shell.

SGB	A	B	C	D	E	F	G	H dia	J dia	K dia	L	M	N	P	Q	R	S dia	T dia
12	56.5	44	70	29	22	35	12	6.995 6.986	9.995 9.986	7.022 7.000	15	25	11	18	1	1	8	12
16	70	46	90	36	23	45	16	8.995 8.986	13.994 13.983	10.000	17.5	33.5	14	21	0.5	1	10	17
19	83	48	105	42	24	52.5	19	9.995 9.986	21.993 21.980	16.027 16.000	20.5	45	15	30	0.5	1	12	25
25	110	70	132	55	35	66	25	14.994 14.983	27.993 27.972	20.021 20.000	34	49	29	36	1	1	17	30
38	160	90	184	80	45	92	38	21.993 21.980	37.991 37.966	30.033 30.000	51	78	40	60	1	1.0 0.3	25	45
50	214	135	256	105	67.5	128	50	29.993 29.980	49.991 49.975	38.025 38.000	62	100	50	82	2	2	32	55
70	297	165	335	150	82.5	167.5	70	37.991 37.975	69.990 69.971	55.030 55.000	81	133	70	105	1	2	40	80

SGB	U	V	W	X	Y	Z dia	AA	AB	AC	AD	AE	AF	AL	AM dia	AN dia	AP	Ma kgs	F_1	F_0	F_a
12	2 wide 1.25 deep	3 wide 1.85 deep	2 wide 1.10 deep	33	4.5 3.5	36.00 35.95	M4x8 on 47 P.C.D.	34	34	17	17	M4x8	27	12	10	13	0.6	70	540	850
16	3 wide 1.85 deep	5 wide 3.05 deep	3 wide 1.45 deep	39.5	8.0 7.0	47.00 46.95	M5x10 on 60 P.C.D.	45	35	22.5	17.5	M5x10	31.5	17	14	14	1.1	110	880	930
19	3 wide 1.75 deep	6 wide 3.5 deep	5 wide 2.3 deep	46	8.5 7.5	52.00 51.92	M6x12 on 72 dia.	55	36	27.5	18	M6x12	34	25	21.4	15	1.4	145	1200	1825
25	5 wide 3.0 deep	8 wide 4.0 deep	6 wide 2.8 deep	55.4	6.5 5.5	75.00 74.95	M8x16 on 95 dia.	94	54	47	27	M8x16	42.5	30	–	–	3.5	220	1900	1800
38	6 wide 3.5 deep	10 wide 5.0 deep	8 wide 3.3 deep	80	6.5 5.5	99.99 99.95	M8x16 on 140 dia.	140	70	70	35	M8x20	52.5	45	–	–	10	400	3800	1275
50	8 wide 4.0 deep	14 wide 5.7 deep	10 wide 3.3 deep	103	8.5 7.5	130.00 129.94	M10x20 on 185 dia.†	190	105	95	52.5	M12x24	77.5	55	–	–	30	840	8400	6180
70	10 wide 5.0 deep	20 wide 7.5 deep	16 wide 4.3 deep	140	11.5 10.5	185.00 184.93	M12x24 on 255 dia.†	258	128	129	64	M16x32	95.5	80	–	–	63	1000	11000	9850

† 4 Holes

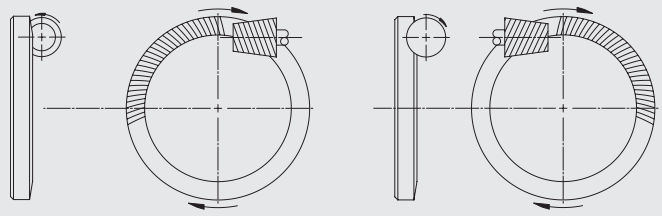
Maximum dynamic tangential load at 1500rpm (input) at G radius and at centre of keyway:
Input shaft F_1 Newtons.
Output shaft F_0 Newtons.
Axial thrust at 60rpm (gear over pinion).
Output shaft F_a Newtons.

For guidance on performance see Technical Section (pages 5 & 6)
Shaft Configurations – see notes above.

Construction:
Housing – cast aluminium alloy.
Shafts – high tensile steel.
Seals – lip type.
Bearings, input shaft – angular ball/taper roller.
Bearings, output shaft – ball bearings.
Gears – hardened high tensile steel or steel/bronze

Lubrication:
Oil-filled gearbox – Optigear BM 220
Grease-filled – Optigear PDO
Weight – Ma kg.
All dimensions are in mm.
General tolerance unless stated ±0.25mm.

SPIRADRIVE® gear sets



Right Hand | Left Hand

Convention

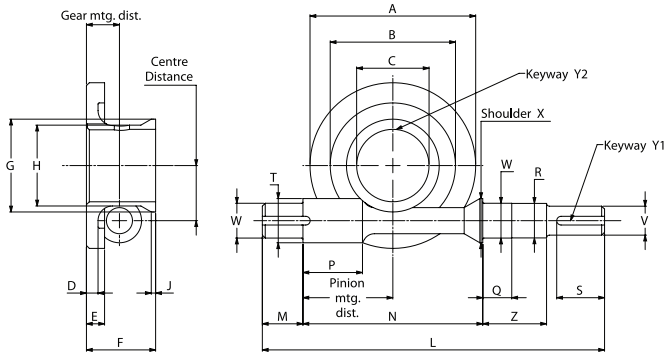
All stock gear sets are to RH convention.

For the appropriate catalogue numbers, please refer to tables below.

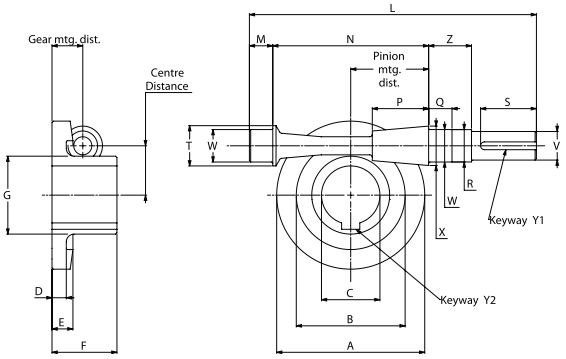
For guidance on performance, please see technical section (pages 5 and 6).

All dimensions in millimetres

All standard gearsets and gearboxes are right-hand gearing.



Configur ation A



Configuration B

Centre distance	Ratio	No. threads Pinion	No. teeth Gear	Mounting dist Pinion	Mounting dist Gear	Catalogue Number	A dia	B dia	C dia	D	E	F	G	H	J
12 CONFIG. A	10.20	5	51		9.00	012A1020									
	16.33	3	49		9.00	012A1633			12.013						
	25.50	2	51	19.00	9.00	012A2550	36.00	26.40	12.000	3.5	5.63	18.0	16.95	–	–
	36.00	1	36		9.00	012A3600									
16 CONFIG. A	10.20	5	51		11.00	016A1020									
	16.33	3	49		11.00	016A1633			17.018						
	25.50	2	51	26.00	11.00	016A2550	48.00	35.20	17.000	4.1	6.94	22.0	23.31	–	–
	36.00	1	36		11.00	016A3600									
	60.00	1	60		11.00	016A6000									
19 CONFIG. A	8.17	6	49		11.97	019A0817									
	10.25	4	41		11.37	019A1025			25.001 STEEL						
	12.33	3	37		11.16	019A1233			24.980 GEAR						
	25.50	2	51		11.68	019A2550									
	36.00	1	36	31.00	11.10	019A3600	57.15	43.20	24.988 BRONZE	4.0	6.0	23.5	32.0	28.0	1.5
	60.00	1	60		12.00	019A6000			24.967 GEAR						
	90.00	1	90		11.01	019A9000									
	108.00	1	108		11.38	019A10800									
25 CONFIG. A Tapered	10.25	4	41		19.42	025A1025									
	16.33	3	49		19.60	025A1633			30.021						
	25.50	2	51	41.00	19.62	025A2550	76.20	55.88	30.000	9.5	13.48	39.0	39.0	–	–
	36.00	1	36		18.60	025A3600									
	58.00	1	60		19.82	025A5800									
	100.00	1	100		20.75	025A10000									
38 CONFIG. B	10.20	5	51		24.04	038A1020									
	17.33	3	52		23.92	038A1733			45.025						
	25.50	2	51	60.00	23.70	038A2550	114.30	83.82	45.000	11.0	16.11	50.0	60.0	–	–
	31.00	1	31		21.62	038A3100									
	36.50	2	73		24.78	038A3650									
	58.00	1	58		24.34	038A5800									
	90.00	1	90		25.42	038A9000									
	120.00	1	120		25.35	038A12000									
50 CONFIG. B	10.20	5	51		34.28	050A1020									
	17.33	3	52		33.50	050A1733			55.030						
	25.50	2	51	81.00	33.56	050A2550	152.4	111.8	55.000	16.0	23.00	68.0	78.0	–	–
	38.00	1	38		33.78	050A3800									
	58.00	1	58		34.09	050A5800									
	90.00	1	90		36.06	050A9000									
	120.00	1	120		36.79	050A12000									
70 CONFIG. B	10.20	5	51		43.88	070A1020									
	17.33	3	52		43.87	070A1733									
	25.50	2	51	109.00	43.27	070A2550	209.55	153.67	80.03	20.00	29.58	87.0	112.0	–	–
	36.50	2	73		45.62	070A3650			80.00						
	58.00	1	58		43.70	070A5800									
	87.00	1	87		45.98	070A8700									
	120.00	1	120		46.57	070A12000									

Centre distance	Gear Form	L	M	N	P	Q	R	S	T dia	V dia	W dia	X dia	Y1	Y2	Z
12	Parallel	77	8	38.00	14.10	8.0	7.95 7.90	11.0	10.17	6.995 6.986	8.004 7.998	10.17	2.00 wide 1.25 deep	3.00 wide 1.40 deep	17.0
16	Parallel	98.5	10	52.00	19.46	10.0	9.95 9.91	14.0	15.0	8.995 8.986	10.004 9.998	15.0	3.00 wide 1.8 deep	4.00 wide 1.80 deep	19.8
19	Parallel	118	14	62.00	22.33	15.75	11.92 11.87	15.0	15.24	9.995 9.986	12.005 11.997	15.24	3.00 wide 1.8 deep	4.00 wide 1.80 deep	22.0
25	Tapered	154	13	82.00	29.92	12.0	16.95 16.90	29.0	23.0	14.994 14.983	17.005 16.997	23.0	5.00 wide 3.0 deep	6.00 wide 2.80 deep	25.0
38	Tapered	221	18	120.00	43.38	18.0	24.92 24.87	40.0	31.0	21.990 21.980	25.015 25.002	30.363 30.313	6.00 wide 3.60 deep	14.00 wide 3.80 deep	33.0
50	Tapered	297	26	162.00	59.00	26.0	32.00 31.84	50.0	42.0	29.993 29.980	35.018 35.002	41.5	8.00 wide 4.00 deep	16.00 wide 4.30 deep	49.0
70	Tapered	392	34.5	218.00	78.5	45.0	40.00 39.84	70.0	55.0	37.991 37.975	40.018 40.002	55.07	10.00 wide 5.00 deep	22.00 wide 5.40 deep	59.5

SPIRADRIVE® gearbox and gear-set performance

SPIRADRVE® 12 mm

Ratio	Gearbox & gearset Characteristics (steel)		Input speed rpm 1 N.m.	1 lb.f.ins.	250 N.m.	250 lb.f.ins.	500 N.m.	500 lb.f.ins.	1000 N.m.	1000 lb.f.ins.	1500 N.m.	1500 lb.f.ins.	3000 N.m.	3000 lb.f.ins.	Separating factor Force	Separating factor LoSide	Separating factor HiSide
10.2	Output Torque Efficiency	Continuous Intermittent (Approx.)	8.12 75	71.84	6.36 6.65 80	56.29 58.82	3.64 6.07 82	32.22 53.7	2.07 5.37 83	18.29 47.5	1.42 4.89 85	12.56 43.32	0.79 4.06 88	7.01 39.95	Fx Fy Fz	1.702 0.515 0.766	1.505 0.884 1.19
16.33	Output Torque Efficiency	Continuous Intermittent (Approx.) %	11.41 63	101.02	8.81 9.21 70	78.01 81.51	5.02 8.37 72	44.46 74.1	2.83 7.36 74	25.08 65.14	1.94 6.69 77	17.16 59.17	1.07 5.51 80	9.51 48.79	Fx Fy Fz	1.891 0.37 0.508	1.689 0.921 1.09
25.5	Output Torque Efficiency	Continuous Intermittent (Approx.) %	11.21 50	99.2	8.58 8.97 58	75.95 79.36	4.88 8.13 60	43.19 71.98	2.74 7.12 63	24.26 63.02	1.87 6.46 67	16.57 57.14	1.03 5.3 71	9.15 46.92	Fx Fy Fz	2.01 0.377 0.431	1.79 0.992 1.095
36	Output Torque Efficiency	Continuous Intermittent (Approx.) %	11.17 39	98.9	8.44 8.82 47	74.71 78.07	4.78 7.97 49	42.32 70.54	2.67 6.93 53	23.6 61.3	1.82 6.27 56	16.08 55.46	1 5.11 61	8.82 45.23	Fx Fy Fz	2.086 0.382 0.402	1.858 1.039 1.11

SPIRADRIVE® 16mm

Ratio	Gearbox & gearset Characteristics (steel)		Input speed rpm 1 N.m.	1 lb.f.ins.	250 N.m.	250 lb.f.ins.	500 N.m.	500 lb.f.ins.	1000 N.m.	1000 lb.f.ins.	1500 N.m.	1500 lb.f.ins.	3000 N.m.	3000 lb.f.ins.	Separating factor Force	Separating factor LoSide	Separating factor HiSide
10.2	Output Torque Efficiency	Continuous Intermittent (Approx.) %	18.55 74	164.2	14 14.63 81	123.9 129.5	7.914 13.19 82	70.02 116.7	4.4 11.43 85	38.96 101.2	3 10.33 86	26.52 91.45	1.64 8.4 89	14.45 74.33	Fx Fy Fz	1.283 0.388 0.571	1.137 0.741 0.946
16.33	Output Torque Efficiency	Continuous Intermittent (Approx.) %	26.56 64	235.1	19.93 20.83 72	176.5 184.4	11.26 18.76 73	99.6 166	6.24 16.22 77	55.28 143.6	4.25 14.65 79	37.61 129.7	2.32 11.89 82	20.48 105.2	Fx Fy Fz	1.399 0.276 0.393	1.261 0.688 0.817
25.5	Output Torque Efficiency	Continuous Intermittent (Approx.) %	26.85 49	237.6	19.71 20.6 58	174.5 182.3	11.24 18.73 60	97.86 163.1	6.07 15.77 65	53.75 139.6	4.11 14.18 67	36.4 125.5	2.22 11.39 73	19.66 100.8	Fx Fy Fz	1.512 0.283 0.322	1.359 0.755 0.824
36	Output Torque Efficiency	Continuous Intermittent (Approx.) %	25.84 41	288.7	19.03 19.89 50	168.4 176	10.69 17.82 52	94.62 157.7	5.88 15.28 57	52.05 135.2	3.98 13.74 60	35.26 121.6	2.16 11.06 65	19.08 97.87	Fx Fy Fz	1.548 0.285 0.304	1.388 0.776 0.83
60	Output Torque Efficiency	Continuous Intermittent (Approx.) %	26.4 26	233.7	19.09 19.95 35	169 176.6	10.66 17.77 36	94.4 157.33	5.83 15.13 42	51.55 133.9	3.93 13.55 44	34.77 119.9	2.11 10.8 51	18.65 95.62	Fx Fy Fz	1.606 0.289 0.292	1.441 0.812 0.846
90	Output Torque Efficiency	Continuous Intermittent (Approx.) %	24.32 24.32 23	215.2 215.2	17.52 18.31 31	155.0 162.0	9.77 16.28 34	86.5 144.1	5.27 13.70 38	46.7 121.3	3.48 12.01 40	30.8 106.3	1.85 9.48 45	16.4 83.9	Fx Fy Fz	1.348 0.244 0.287	1.327 0.797 0.300

SPIRADRIVE® 19mm

Ratio	Gearbox & gearset Characteristics (steel)		Input speed rpm 1 N.m.	1 lb.f.ins.	250 N.m.	250 lb.f.ins.	500 N.m.	500 lb.f.ins.	1000 N.m.	1000 lb.f.ins.	1500 N.m.	1500 lb.f.ins.	3000 N.m.	3000 lb.f.ins.	Separating factor Force	Separating factor LoSide	Separating factor HiSide
8.17	Output Torque Efficiency	Continuous Intermittent (Approx.) %	27.9 27.9 79	247 247	16.8 22.3 84	149 197	11.6 19.3 86	103 171	6.4 16.6 88	56.6 147	4.5 15 89	39.8 133	2.1 12.1 92	18.7 107	Fx Fy Fz	0.934 0.452 0.472	0.936 0.763 0.424
10.25	Output Torque Efficiency	Continuous Intermittent (Approx.) %	34.2 34.2 75	303 303	20.7 27.3 81	183 242	14.3 23.7 83	127 210	7.8 20.3 86	69.3 180	5.5 18.3 87	48.4 162	2.6 14.8 90	22.9 131	Fx Fy Fz	1.045 0.372 0.386	1.054 0.765 0.258
12.33	Output Torque Efficiency	Continuous Intermittent (Approx.) %	34.2 34.2 70	303 303	20.7 27.2 77	183 241	14.1 23.6 79	125 209	7.8 20.2 81	69 179	5.4 18.2 84	48 161	2.6 14.6 85	22.6 129	Fx Fy Fz	1.078 0.354 0.341	1.086 0.747 0.218
25.5	Output Torque Efficiency	Continuous Intermittent (Approx.) %	45.3 45.3 48	401 401	26.2 35 57	232 310	18.1 29.9 60	160 265	9.8 25.4 66	87 225	6.8 22.7 68	60.1 201	3.1 18 74	27.8 159	Fx Fy Fz	1.179 0.222 0.205	1.179 0.719 0.122
36	Output Torque Efficiency	Continuous Intermittent (Approx.) %	40.7 40.7 40	360 360	25.5 31.5 48	226 279	16.3 27 52	144 239	8.8 22.9 58	78.1 203	6.1 20.5 60	54.1 181	2.8 16.3 67	25.2 144	Fx Fy Fz	1.202 0.220 0.172	1.197 0.783 0.131
60	Output Torque Efficiency	Continuous Intermittent (Approx.) %	44.6 44.6 26	395 395	27.6 34 34	244 301	17.5 28.9 37	155 256	9.4 24.4 43	83.2 216	6.5 21.7 45	57.4 192	3 17.1 53	26.4 151	Fx Fy Fz	1.152 0.183 0.153	1.124 0.556 0.360
90	Output Torque Efficiency	Continuous Intermittent (Approx.) %	45.1 45.1 27	399 399	29 35 29	257 310	18 30 31	159 266	9.7 25.4 36	85.9 22.5	6.8 22.6 39	60.2 200	3.1 17.8 45	27.4 158	Fx Fy Fz	1.235 0.110 0.122	1.230 0.647 0.108
108	Output Torque Efficiency	Continuous Intermittent (Approx.) %	46 46 18	407 407	27.3 35.7 23	242 316	18.5 30.6 26	164 271	10 26 31	88.5 230	7 23.3 33	61.6 206	3.2 18.4 40	28.5 163	Fx Fy Fz	1.236 0.219 0.113	1.229 0.644 0.108

SPIRADRIVE® 25 mm

Ratio	Gearbox & gearset Characteristics (steel)		Input speed rpm 1 N.m.	1 lb.f.ins.	250 N.m.	250 lb.f.ins.	500 N.m.	500 lb.f.ins.	1000 N.m.	1000 lb.f.ins.	1500 N.m.	1500 lb.f.ins.	3000 N.m.	3000 lb.f.ins.	Separating factor Force	Separating factor LoSide	Separating factor HiSide
10.25	Output Torque Efficiency	Continuous Intermittent (Approx.) %	108.56 108.56 76	606.8 606.8	49.2 51.41 83	435.4 455	27.27 45.45 84	241.4 402.3	14.85 38.56 87	131.4 341.3	9.97 34.38 88	88.25 304.3	5.32 27.26 91	47.05 241.3	Fx Fy Fz	0.81 0.248 0.392	0.737 0.478 0.622
16.33	Output Torque Efficiency	Continuous Intermittent (Approx.) %	92.9 92.9 63	822.2 822.2	65.25 68.18 72	577.6 603.4	35.9 59.84 75	317.8 529.6	19.84 51.52 78	175.6 456	12.97 44.72 80	114.8 395.8	6.86 35.16 85	60.68 311.2	Fx Fy Fz	0.894 0.176 0.252	0.81 0.491 0.564
25.5	Output Torque Efficiency	Continuous Intermittent (Approx.) %	97.81 97.81 50	865.7 865.7	67.83 70.88 60	600.3 627.3	37.13 61.89 64	328.7 547.8	19.99 51.92 68	176.9 459.5	13.33 45.95 71	117.9 406.7	7.01 35.95 78	62.05 318.2	Fx Fy Fz	0.956 0.18 0.21	0.869 0.483 0.527
36	Output Torque Efficiency	Continuous Intermittent (Approx.) %	93.71 93.71 42	829.4 829.4	65.22 68.15 52	577.3 603.2	35.8 59.66 56	316.8 528	19.29 50.1 61	170.7 443.4	12.87 44.39 63	113.9 392.9	6.79 34.8 71	60.06 308	Fx Fy Fz	0.982 0.181 0.197	0.889 0.497 0.53
58	Output Torque Efficiency	Continuous Intermittent (Approx.) %	102.3 102.3 28	905.1 905.1	69.93 73.07 37	618.9 646.7	38.06 63.44 41	336.9 561.5	20.41 53.01 46	180.6 469.2	13.56 46.76 49	120 413.9	7.1 36.4 58	62.82 322.13	Fx Fy Fz	1.02 0.184 0.187	0.929 0.472 0.492
100	Output Torque Efficiency	Continuous Intermittent (Approx.) %	77.73 77.73 18	688 688	63.74 66.6 25	564.2 589.5	35.91 59.85 29	317.8 529.7	19.32 50.17 32	170.9 444	12.73 43.89 36	112.7 388.5	6.35 32.58 44	56.24 288.4	Fx Fy Fz	0.985 0.182 0.192	0.927 0.482 0.491

SPIRADRIVE® gearbox and gear-set performance

SPIRADRVE® 38 mm

Ratio	Gearbox & gearset Characteristics (steel)		Input speed rpm 1 N.m.	1 lb.f.ins.	250 N.m.	250 lb.f.ins.	500 N.m.	500 lb.f.ins.	1000 N.m.	1000 lb.f.ins.	1500 N.m.	1500 lb.f.ins.	3000 N.m.	3000 lb.f.ins.	Separating factors Force	LoSide	HiSide
10.2	Output Torque	Continuous	240	2128	149	1319	91.2	807	48.5	430	33.3	295	15.3	135	Fx	0.544	0.500
		Intermittent	240	2128	180	1591	151	1334	126.1	1116	111	985	86.2	769	Fy	0.221	0.390
	Efficiency	(Approx.) %	78		86		88		89		91		93		Fz	0.180	0.185
17.33	Output Torque	Continuous	331	2926	194	1717	122	1077	64.3	569	43.8	388	19.9	176	Fx	0.598	0.560
		Intermittent	331	2926	242	2143	201	1780	167	1478	147	1299	114	1006	Fy	0.137	0.347
	Efficiency	(Approx.) %	65		75		78		81		84		88		Fz	0.116	0.113
25.50	Output Torque	Continuous	330	2924	190	1682	119.3	1056	62.8	556	42.8	379	19.3	171	Fx	0.610	0.571
		Intermittent	330	2924	239	2115	197.3	1746	163	1445	143	1266	110	976	Fy	0.130	0.344
	Efficiency	(Approx.) %	54		66		70		73		76		83		Fz	0.099	0.105
31.0	Output Torque	Continuous	288	2551	169	1496	106	940	56.2	497	38.3	339	17.4	154	Fx	0.620	0.577
		Intermittent	288	2551	211	1868	175	1553	146	1291	128	1135	99.3	879	Fy	0.132	0.379
	Efficiency	(Approx.) %	51		63		67		71		74		80		Fz	0.088	0.101
36.5	Output Torque	Continuous	336	2972	192	1699	118	1045	61.8	547	41.9	371	18.8	166	Fx	0.628	0.588
		Intermittent	336	2972	239	2112	195	1728	161	1421	140	1240	107.3	950	Fy	0.124	0.343
	Efficiency	(Approx.) %	42		54		59		64		68		75		Fz	0.073	0.093
58.0	Output Torque	Continuous	326	2886	185	1637	114	1012	59.8	529	40.4	358	18.2	161	Fx	0.644	0.549
		Intermittent	326	2886	231	2046	189	1673	155	1375	135	1199	104	918	Fy	0.123	0.260
	Efficiency	(Approx.) %	31		43		48		52		57		66		Fz	0.054	0.194
90.0	Output Torque	Continuous	305	2699	179	1584	105	930	54.7	484	36.9	327	16.5	146	Fx	0.654	0.615
		Intermittent	305	2699	214	1891	174	1537	142	1257	123.5	1093	94.2	834	Fy	0.121	0.319
	Efficiency	(Approx.) %	22		31		36		40		45		54		Fz	0.042	0.066
120.0	Output Torque	Continuous	380	3363	204	1806	132	1171	68.8	609	46.3	410	20.7	183	Fx	0.671	0.604
		Intermittent	380	3363	270	2388	219	1936	179	1581	155	1373	118	1046	Fy	0.121	0.251
	Efficiency	(Approx.) %	17		25		29		33		37		46		Fz	0.020	0.132

SPIRADRIVE® 50 mm

Ratio	Gearbox & gearset Characteristics (steel)		Input speed rpm 1 N.m.	1 lb.f.ins.	250 N.m.	250 lb.f.ins.	500 N.m.	500 lb.f.ins.	1000 N.m.	1000 lb.f.ins.	1500 N.m.	1500 lb.f.ins.	3000 N.m.	3000 lb.f.ins.	Separating factors Force	LoSide	HiSide
10.2	Output Torque	Continuous	559	5047	315	2791	194	1721	102	904	69	614	31	274	Fx	0.374	0.344
		Intermittent	559	5047	380	3363	324	2868	265	2349	231	2047	177	1567	Fy	0.117	0.222
	Efficiency	(Approx.) %	76		84		87		89		91		93		Fz	0.202	0.299
17.33	Output Torque	Continuous	792	7009	421	3724	247	2366	139	1235	95	835	42	371	Fx	0.426	0.399
		Intermittent	792	7009	526	4655	412	3943	362	3208	315	2784	239	2119	Fy	0.086	0.218
	Efficiency	(Approx.) %	63		74		78		82		84		88		Fz	0.135	0.257
25.50	Output Torque	Continuous	788	6978	413	3650	261	2310	121	1201	92	810	40	358	Fx	0.453	0.424
		Intermittent	788	6978	516	4563	435	3850	352	3119	305	2699	231	2047	Fy	0.088	0.235
	Efficiency	(Approx.) %	51		64		69		73		77		83		Fz	0.114	0.258
38.0	Output Torque	Continuous	755	6687	396	3506	251	2219	131	1154	88	779	39	345	Fx	0.468	0.438
		Intermittent	755	6687	495	4382	418	3698	339	2998	293	2596	222	1970	Fy	0.088	0.246
	Efficiency	(Approx.) %	41		54		59		65		69		76		Fz	0.103	0.261
58.0	Output Torque	Continuous	829	7340	424	3753	267	2362	138	1219	93	819	41	361	Fx	0.485	0.456
		Intermittent	829	7340	530	4691	445	3937	358	3167	309	2731	233	2062	Fy	0.090	0.232
	Efficiency	(Approx.) %	29		42		47		53		58		65		Fz	0.096	0.242
90.0	Output Torque	Continuous	787	6933	392	3473	246	2177	126	1117	85	748	37	329	Fx	0.496	0.464
		Intermittent	787	6933	490	4341	410	3629	328	2902	282	2494	212	1878	Fy	0.090	0.263
	Efficiency	(Approx.) %	19		30		34		40		45		51		Fz	0.093	0.270
120.0	Output Torque	Continuous	1154	10212	545	4824	359	3179	184	1628	123	1089	54	478	Fx	0.500	0.468
		Intermittent	1154	10212	717	6347	599	5298	478	4229	410	3630	308	2730	Fy	0.091	0.266
	Efficiency	(Approx.) %	15		24		27		33		38		43		Fz	0.093	0.272

SPIRADRIVE® 70 mm

Ratio	Gearbox & gearset Characteristics (steel)		Input speed rpm 1 N.m.	1 lb.f.ins.	250 N.m.	250 lb.f.ins.	500 N.m.	500 lb.f.ins.	1000 N.m.	1000 lb.f.ins.	1500 N.m.	1500 lb.f.ins.	3000 N.m.	3000 lb.f.ins.	Separating factors Force	LoSide	HiSide
10.2	Output Torque	Continuous	1458	12909	781	6916	475	4206	246	2174	165	1463	73	645	Fx	0.267	0.247
		Intermittent	1458	12909	941	8333	792	7010	638	5647	551	4877	416	3686	Fy	0.084	0.143
	Efficiency	(Approx.) %	77		86		88		91		93		94		Fz	0.152	0.207
17.33	Output Torque	Continuous	1633	14454	816	7219	511	4522	262	2317	175	1551	77	679	Fx	0.311	0.289
		Intermittent	1633	14454	1020	9024	851	7536	680	6017	584	5169	438	3881	Fy	0.091	0.158
	Efficiency	(Approx.) %	64		77		80		84		87		90		Fz	0.117	0.186
25.50	Output Torque	Continuous	2015	17837	993	8714	620	5486	316	2800	211	1870	92	817	Fx	0.328	0.307
		Intermittent	2015	17837	1241	10983	1033	9143	822	7273	704	6235	528	4670	Fy	0.063	0.170
	Efficiency	(Approx.) %	52		68		71		77		81		84		Fz	0.083	0.188
36.50	Output Torque	Continuous	2049	18138	986	8725	610	5402	309	2737	206	1822	90	792	Fx	0.343	0.322
		Intermittent	2049	18138	1232	10906	1017	9003	803	7110	686	6075	512	4528	Fy	0.064	0.180
	Efficiency	(Approx.) %	40		56		61		68		73		77		Fz	0.074	0.191
58.0	Output Torque	Continuous	2124	18802	1021	9038	632	5600	321	2838	214	1889	93	822	Fx	0.353	0.332
		Intermittent	2124	18802	1276	11298	1054	9333	833	7372	712	6298	531	4696	Fy	0.065	0.169
	Efficiency	(Approx.) %	30		45		50		57		63		68		Fz	0.070	0.176
87.0	Output Torque	Continuous	2149	19018	1059	9374	625	5530	315	2788	209	1852	91	803	Fx	0.360	0.339
		Intermittent	2149	19018	1265	11193	1041	9217	818	7242	697	6172	518	4586	Fy	0.066	0.173
	Efficiency	(Approx.) %	21		34		38		46		52		57		Fz	0.068	0.178
120.0	Output Torque	Continuous	2541	22487	1120	9914	731	6468	368	3254	244	2158	106	934	Fx	0.364	0.344
		Intermittent	2541	22487	1483	13123	1218	10780	955	8451	813	7195	603	5337	Fy	0.066	0.158
	Efficiency	(Approx.) %	16		27		31		38		44		49		Fz	0.067	0.162

NOTES

1 Heat dissipation limits gearbox continuous torque. So for intermittent use take the high value. For open gearsets, given good heat dissipation, use the higher value.
2 Breaking strength exceeds 1.5 of 1rpm level given adequate bearing support as with stock gearboxes.
3 Bronze gearbox/gearset torque capacity is 60% of stated intermittent levels.
4 Refer to service factors on following page.
5 Static self locking applies marginally at 25.5 ratio and positively above this value. Vibration can sometimes result in non self locking of almost any ratio.
6 See chart for use of separating factors to find bearing reactions.

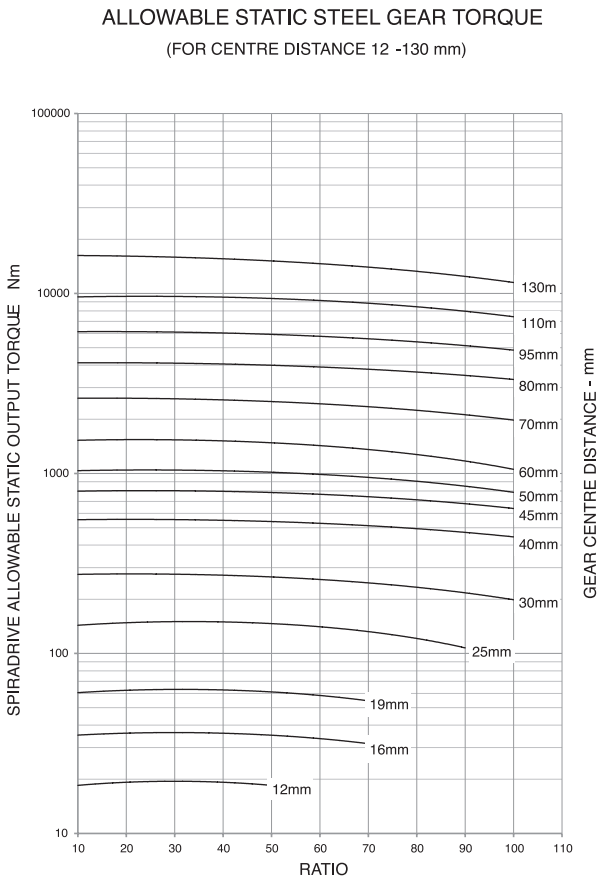
Polar moments of inertia of masses

Input shaft I_1 kgm²
Output shaft I_0 kgm²
Total inertia of gearbox at input

$$= I_1 + \frac{I_0}{\text{ratio}^2} \text{ kgm}^2$$

SGB crs	I_1	I_0
12	3.11×10^{-7}	8.00×10^{-6}
16	1.03×10^{-5}	6.75×10^{-5}
19	3.49×10^{-6}	7.99×10^{-5}
25	1.19×10^{-5}	3.95×10^{-4}
38	9.28×10^{-5}	3.34×10^{-2}
50	1.74×10^{-3}	1.05×10^{-2}
70	2.43×10^{-3}	4.90×10^{-2}

Gear torques



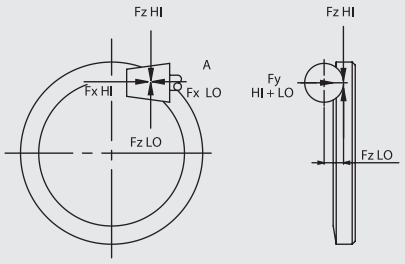
Allowable static gear torque (steel) for gear centre distances 12-130mm)

NOTE:
We reserve the right to make changes and corrections without notice. Every effort has been made to provide accurate technical and product information. The company disclaims responsibility for any error or omission regarding technical and product information published.

Customers are advised to confirm 'fitness for purpose' for their specific application by suitable testing.

Bearing thrusts

Axial Thrust (Pinion)	= TQ x Fx x 39.37 Newtons = TQ (lbf ins) x Fx lbf
Radial Thrust (Pinion)	= TQ (Nm x Fz x 39.37 Newtons = TQ (lbf ins) x Fz lbf
* Axial Thrust (Gear)	= TQ (Nm x Fy x 39.37 Newtons = TQ (lbf ins) x Fy lbf
*Radial Thrust (Gear)	= Axial Thrust (Pinion)



(TQ = Torque)

*NB Gear thrusts are offset forces. Refer to table above for appropriate separating force factors and obtain thrust components using above formula.
(Torque required = output torque.)

NOTE: Clockwise pinion drive (viewed from A) results in Hi side drive and anticlockwise pinion drive in Lo side drive.

Service factors

Prime Mover	Duration of service	Driven machine load classifications: Uniform	Moderate shock	Heavy shock
Electric Motor (normal service)	Occasional - 1/2 hr/day total	0.80	0.90	1.00
	Intermittent - 2 hr/day total	0.90	1.00	1.25
	10 hours per day	1.00	1.25	1.50
	24 hours per day	1.25	1.50	1.75
Electric Motor (more than 10 starts per hour)	Occasional - 1/2 hr/day total	0.90	1.00	1.25
	Intermittent - 2 hr/day total	1.00	1.25	1.50
	10 hours per day	1.25	1.50	1.75
	24 hours per day	1.50	1.75	2.00
Multi-cylinder internal combustion engine	Occasional - 1/2 hr/day total	0.90	1.00	1.25
	Intermittent - 2 hr/day total	1.00	1.25	1.50
	10 hours per day	1.25	1.50	1.75
	24 hours per day	1.50	1.75	2.00
Single cylinder internal combustion engine	Occasional - 1/2 hr/day total	1.00	1.25	1.50
	Intermittent - 2 hr/day total	1.25	1.50	1.75
	10 hours per day	1.50	1.75	2.00
	24 hours per day	1.75	2.00	2.25

Depending upon applications, modify the charted figures by dividing them by the appropriate service factor above.

Quality

Davall operates a fully approved quality system, which meets the requirements of ISO 9001, AS9100, NADCAP and the approval of many notable prime contractors in the aerospace and defence industry.

Accredited Nadcap™ Nonconventional Machining

AS9100 SYSTEM CERTIFICATION SGS UKAS QUALITY MANAGEMENT 005

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