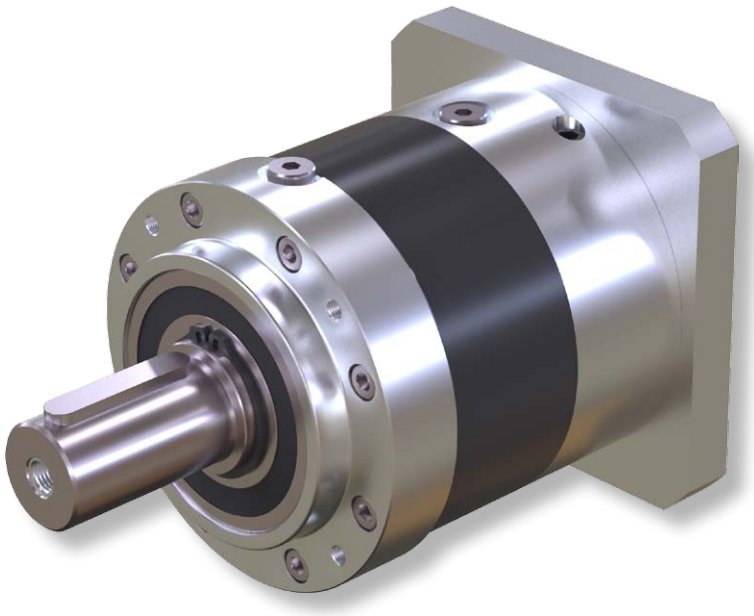
Servotak®

PRECISION GEARBOXES



GSD-250

Precision planetary servogearboxes

for general automation

GSD gearboxes, the perfect match for rack&pinion systems

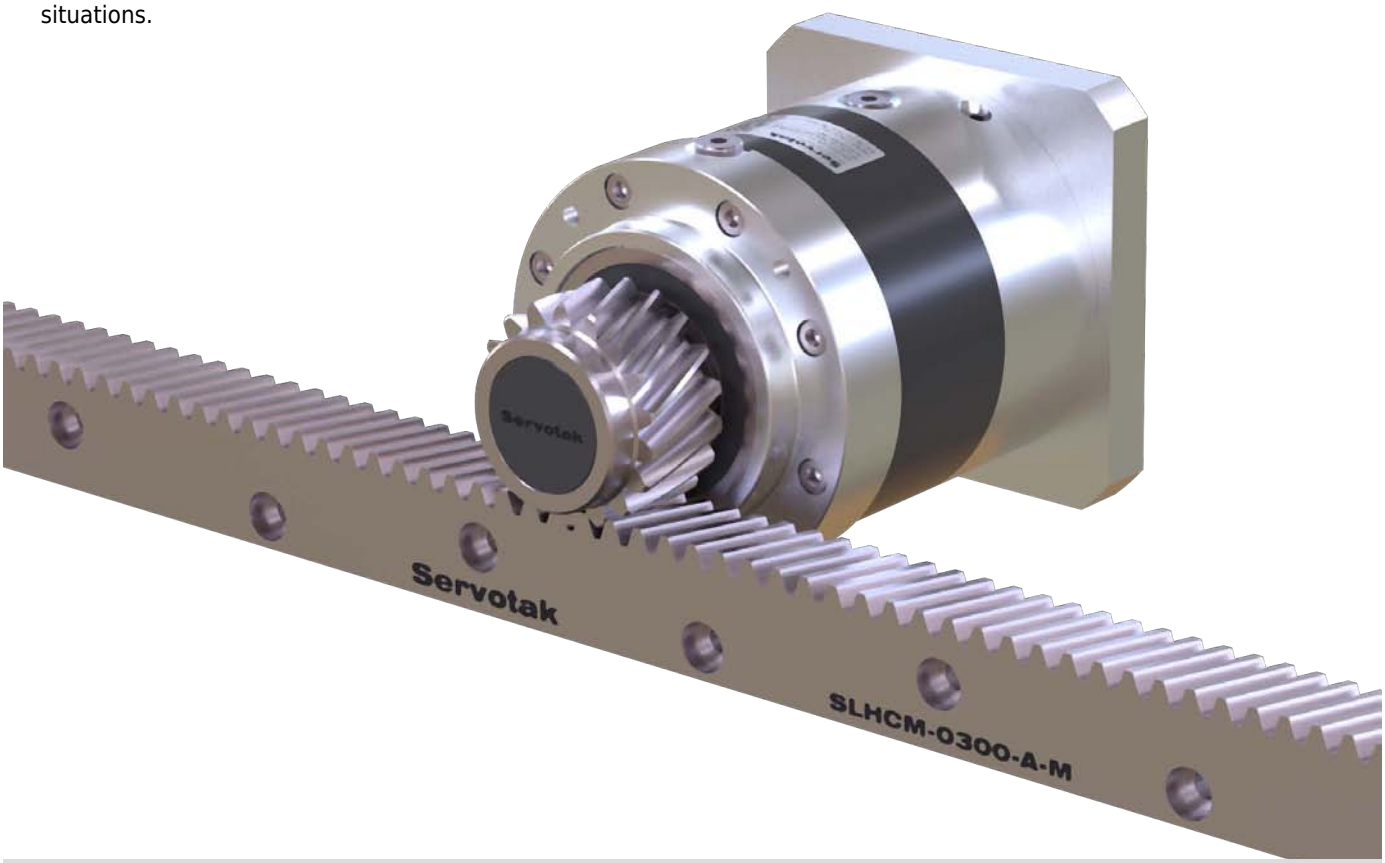
Better performance and increased reliability

Servotak Rack&Pinion systems are the best option when building machines that require linear motion with moderate feed force and precision. Available from module 0,5 to module 4, and combined with a GS series gearbox, they can to handle multi-ton loads with moderate precision, in a smooth and quiet fashion, while maintaining a very high reliability.

Servotak offers four rack&pinion series: Basic, Professional, Advanced and Master. With 15 metric modules for straight teeth systems, and 12 for helical teeth systems, they cover all the industry requirements. Should your precision and/or feed force requirements exceed what GS series gearboxes can offer, SG series gearboxes allow for extremely high precision and for thrust forces of up to 400000 N.

Racks offering the highest security

Servotak's Basic, Advanced and Master series racks have are taller than conventional racks. This extra mass give them superior rigidity to absorb overloads, allow for vibration-free operation, and result in better quality finishes for the machine tool they're installed in. Fixing holes are arranged in a two row, V-shaped pattern, that offers added safety in emergency situations.



Precission and Feed Force

4 series of racks , combines with GS series gearboxes, provide moderate precision and feed force at very reasonable prices, thus offering excellent value. This winning combination is ideal for general automation, machine tools and robotics.

Longer Design Life

Thanks to an output shaft optimized for pinion installation, and to the reinforced output bearings that GSD gearboxes can include, this combination has a design life that is over twice what conventional systems can offer.

Smooth Operation

Thanks to an optimized tooth profile, and to the fact that the system has been studied as a whole, thus ensuring that all components are sized appropriately to one another, Servotak linear systems provide a markedly smoother operation.

Highest Reliability

Our engineering team prides itself in the rigor of their case studies. This results in no surprises, and so allows us to promise the highest possible reliability, even for the most stringent applications.

GSD-250

Highlights

- Output Torque: 159 to 377 Nm
- Long design life, >40000 hours
- Thrice the torsional stiffness of GE-250
- Backlash: <6’ to <12’ (arcmin)
- Lifetime lubrication and maintenance-free.
- Can be used in any mounting position.
- DIN-6885-1 keyed shaft with DIN-332-2 axial fixing bore

Compact, reliable and made to last

The following technical specifications resulted from exhaustive calculations according to DIN, ISO and AGMA norms, years of research and experience, and Servotak’s traditional reliability-first approach. This is why our gearboxes can offer a design life of over 40000 hours, twice the market standard, with total confidence.

Ideal for S5 intermittent duty

Instead of offering a single output torque value, and then asking engineers to apply service factors depending on cycles per hour, we present a tabulated list of output torques at most common cycle rate values.

The listed values for S5 intermittent duty assume general purpose applications. Specific duty cycles might allow for higher output torques. Should you think that your specific application’s details don’t fit our assumptions, please contact our engineers for a through study. We also offer an online tool to calculate the RMS average torque for complex cycles at https://servotak.eu/tools/duty_cycle_calculator.

A word about S1 continuous duty

Over 90% of the commonly available planetary gearboxes are designed for intermittent duty cycles. They are not designed for S1 continuous duty cycles. The reason being that one of the main advantages of planetary gearboxes is their compact design. While this offers great space savings, it also reduces the outer surface needed to radiate heat, and in S1 cycles, this reduces the amount of power they can transmit. Should you require such duty cycles out of a planetary gearbox, there are some things you need to remember:

- Ensure there is good airflow around the gearbox. Transmissible torque can be further increased by using active cooling methods on the gearbox, such as forced cooling.
- The gearbox mounting surface can also act as a heat sink. If possible, ensure it extends around the gearbox, is exposed, and receives good airflow.
- Brushless motors generate considerable amount of heat, and thus further reduce the gearbox’s torque transmission capacity. Employ motors with built in cooling fins and cooling fans.
- Due to grease’s poor heat dissipation capabilities, when intended for S1 operation, GSD gearboxes come filled with synthetic oil.
- Tapered roller bearings generate great amounts of waste heat when used in S1 continuous duty. This is the reason why GSD-250 gearboxes come with angular contact ball bearings, that offer a high radial capacity while generating much less heat.
- High input speeds further increase generated heat and thus further reduce torque transmission capacity.

Our engineers will be more than happy to advise you on the different caveats of gearboxes en S1 cycles.

Technical data for S5 intermittent service

GSD-250-M1 (1 stage)		Ratio			
		3	5	7	10
Max. Acceleration output torque for S5 intermittent duty cycles T_{2max} (Nm) S5 intermittent duty cycle Duty cycle ED<60%, Cycle duration t_{cycle}<20 min Average cycle speed ≤ n_{1TH} Maximum cycle speed ≤n_{1max} As per DIN-3990 and ISO-6336	60 cycles/hour	377	344	320	302
	120 cycles/hour	328	289	265	258
	300 cycles/hour	307	269	251	242
	600 cycles/hour	306	263	249	239
	1500 cycles/hour	284	251	241	234
	3000 cycles/hour	232	239	221	215
	6000 cycles/hour	203	235	217	197
	9000 cycles/hour	175	208	192	173
	12000 cycles/hour	168	199	184	159
RMS average torque for a typical S5 duty cycle, T_{2TH} (Nm) S5 intermittent duty cycle Duty cycle ED<60%, Cycle duration t_{cycle}<20 min Average cycle speed ≤n_{1TH} As per DIN-3990 and ISO-6336	60 cycles/hour	188	172	160	151
	120 cycles/hour	164	144	133	133
	300 cycles/hour	157	135	126	121
	600 cycles/hour	153	132	124	120
	1500 cycles/hour	142	125	120	117
	3000 cycles/hour	116	120	111	108
	6000 cycles/hour	101	117	108	99
	9000 cycles/hour	88	104	96	86
	12000 cycles/hour	84	100	92	79
Emergency Stop Torque, T_{2E} (Nm) Up to 1000 times during product lifetime		505	607	607	505
Maximum input speed for S5 intermittent duty cycle operation, n_{1max} (rpm)		4000	4500	4500	4500
Average input speed for S5 intermittent service, n_{1TH} (rpm) Values for 20°C ambient temperature (For higher temperatures, reduce input speed).		2400	2500	2700	2700
Design life. Lh (Hours) as per ISO 6336		>40000			
Maximum permissible housing temperature, T (°C)		90 °C			

Technical data for S1 continuous service

GSD-250-M1 (1 stage)		Ratio			
		3	5	7	10
Maximum start-up torque for S1 continuous duty, T_{2max} (Nm) S1 continuous duty Duty Cycle ED>60% Cycle Duration t_{cycle}>20 min Average cycle speed ≤ n_{1TH} Maximum cycle speed ≤n_{1max} As per DIN-3990	5000 hours	313	345	331	280
	10000 hours	287	296	268	255
	20000 hours	268	258	239	130
	50000 hours	261	236	219	211
	100000 hours	246	229	215	207
S1 continuous duty output torque, T_{2TH} (Nm) S1 continuous duty Duty Cycle ED>60% Cycle Duration t_{cycle}>20 min Average cycle speed ≤ n_{1TH} Maximum cycle speed ≤n_{1max} As per DIN-3990	5000 hours	190	209	201	170
	10000 hours	174	179	163	155
	20000 hours	163	165	153	139
	50000 hours	161	143	133	128
	100000 hours	149	138	129	121
Emergency Stop Torque T_{2E} (Nm) up to 1000 times during product lifetime		505	607	607	505
Maximum input speed for S1 continuous duty, n_{1max} (rpm) Only for short periods		2500	2500	2800	2800
Maximum rated input speed for S1 continuous duty, n_{1TH} (rpm) Assumes ambient temperature of 20°C (if >20°C, lower the input speed) This speed can be maintained for the whole cycle		2200	2200	2200	2200
Max. allowable housing temperature T (°C)		90°C			

General technical data

GSD-250-M1 (1 stage)		Ratio			
		3	5	7	10
Standard Torsional Backlash Δφ (arcmin)		<8	<8	<8	<10
Reduced Torsional Backlash Δφ (arcmin)		<5	<5	<5	<8
Torsional Stiffness C (Nm/arcmin)		30	35	32	30
Efficiency η (%)		97%	97%	97%	97%
Inertia (kg·cm^2)		4,55	1,49	0,75	0,36
Inertia due to input shaft ø (kg·cm^2)	ø11mm	1,58	1,58	1,58	1,58
	ø14mm	1,56	1,56	1,56	1,56
	ø19mm	2,32	2,32	2,32	2,32
	ø24mm	2,64	2,64	2,64	2,64
	ø32mm	3,68	3,68	3,68	3,68
Environmental conditions Values outside of this range available upon request		-15°C a 40°C			
Protection degree		IP 64			
Noise level Unloaded, at n_1=3000 rpm, from a 1m distance		<69 dB(A)			
Lubrication		Lifetime grease lubrication or synthetic oil			
Direction of rotation		Same as motor			
Weight (kg)		8			

Technical data for S5 intermittent service

GSD-250-M2 (2 stages)		Ratio							
		15	21	25	30	35	50	70	100
Max. Acceleration output torque for S5 intermittent duty cycles T_{2max} (Nm) S5 intermittent duty cycle Duty cycle ED<60%, Cycle duration t_{cycle}<20 min Average cycle speed ≤ n_{1TH} Maximum cycle speed ≤n_{1max} As per DIN-3990 and ISO-6336	60 cycles/hour	377	377	344	377	344	344	320	302
	120 cycles/hour	328	328	289	328	289	289	265	258
	300 cycles/hour	307	307	269	307	269	269	251	242
	600 cycles/hour	306	306	263	306	263	263	249	239
	1500 cycles/hour	284	284	251	284	251	251	241	234
	3000 cycles/hour	232	232	239	232	239	239	221	215
	6000 cycles/hour	203	203	235	203	235	235	217	197
	9000 cycles/hour	175	175	208	175	208	208	192	173
	12000 cycles/hour	168	168	199	168	199	199	184	159
RMS average torque for a typical S5 duty cycle, T_{2TH} (Nm) S5 intermittent duty cycle Duty cycle ED<60%, Cycle duration t_{cycle}<20 min Average cycle speed ≤n_{1TH} As per DIN-3990 and ISO-6336	60 cycles/hour	188	188	172	188	172	172	160	151
	120 cycles/hour	164	164	144	164	144	144	133	133
	300 cycles/hour	157	157	135	157	135	135	126	121
	600 cycles/hour	153	153	132	153	132	132	124	120
	1500 cycles/hour	142	142	125	142	125	125	120	117
	3000 cycles/hour	116	116	120	116	120	120	111	108
	6000 cycles/hour	101	101	117	101	117	117	108	99
	9000 cycles/hour	88	88	104	88	104	104	96	86
	12000 cycles/hour	84	84	100	84	100	100	92	79
Emergency Stop Torque, T_{2E} (Nm) Up to 1000 times during product lifetime		505	505	607	505	607	607	607	505
Maximum input speed for S5 intermittent duty cycle operation, n_{1max} (rpm)		4000	4000	4500	4000	4500	4500	4500	4500
Average input speed for S5 intermittent service, n_{1TH} (rpm) Values for 20°C ambient temperature (For higher temperatures, reduce input speed).		2400	2400	2500	2400	2500	2500	2700	2700
Design life. Lh (Hours) as per ISO 6336		>40000							
Maximum permissible housing temperature, T (°C)		90 °C							

Technical data for S1 continuous service

GSD-250-M2 (2 stages)		Ratio							
		15	21	25	30	35	50	70	100
Maximum start-up torque for S1 continuous duty, T_{2max} (Nm) S1 continuous duty Duty Cycle ED>60% Cycle Duration t_{cycle}>20 min Average cycle speed ≤ n_{1TH} Maximum cycle speed ≤n_{1max} As per DIN-3990	5000 hours	313	313	345	313	345	345	331	280
	10000 hours	287	287	296	287	296	296	268	255
	20000 hours	268	268	258	268	258	258	239	130
	50000 hours	261	261	236	261	236	236	219	211
	100000 hours	246	246	229	246	229	229	215	207
S1 continuous duty output torque, T_{2TH} (Nm) S1 continuous duty Duty Cycle ED>60% Cycle Duration t_{cycle}>20 min Average cycle speed ≤ n_{1TH} Maximum cycle speed ≤n_{1max} As per DIN-3990	5000 hours	190	190	209	190	209	209	201	170
	10000 hours	174	174	179	174	179	179	163	155
	20000 hours	163	163	165	163	165	165	153	139
	50000 hours	161	161	143	161	143	143	133	128
	100000 hours	149	149	138	149	138	138	129	121
Emergency Stop Torque T_{2E} (Nm) up to 1000 times during product lifetime		505	505	607	505	607	607	607	505
Maximum input speed for S1 continuous duty, n_{1max} (rpm) Only for short periods		2500	2500	2500	2500	2500	2500	2800	2800
Maximum rated input speed for S1 continuous duty, n_{1TH} (rpm) Assumes ambient temperature of 20°C (if >20°C, lower the input speed) This speed can be maintained for the whole cycle		2200	2200	2200	2200	2200	2200	2200	2200
Max. allowable housing temperature T (°C)		90 °C							

General technical data

GSD-250-M2 (2 stages)		Ratio							
		15	21	25	30	35	50	70	100
Standard Torsional Backlash Δφ (arcmin)		<12	<12	<12	<12	<12	<12	<12	<12
Torsional Stiffness C (Nm/arcmin)		30	30	35	30	35	35	32	30
Efficiency η (%)		97%	97%	97%	97%	97%	97%	97%	97%
Inertia (kg·cm^2)		1,35	1,49	0,75	0,21	0,38	0,19	0,18	0,18
Inertia due to input shaft ⌀ (kg·cm^2)	⌀11mm	1,58	1,58	1,58	1,58	1,58	1,58	1,58	1,58
	⌀14mm	1,56	1,56	1,56	1,56	1,56	1,56	1,56	1,56
	⌀19mm	2,32	2,32	2,32	2,32	2,32	2,32	2,32	2,32
	⌀24mm	2,64	2,64	2,64	2,64	2,64	2,64	2,64	2,64
	⌀32mm	3,68	3,68	3,68	3,68	3,68	3,68	3,68	3,68
Environmental conditions Values outside of this range available upon request		-15°C a 40°C							
Protection degree		IP 64							
Noise level Unloaded, at n_1=3000 rpm, from a 1m distance		<69 dB(A)							
Lubrication		Lifetime grease lubrication or synthetic oil							
Direction of rotation		Same as motor							
Weight (kg)		10,5							

Bearings

Bearing service life depends mostly on output speed and axial load. Other factors, such as lubricant type, normally occurring impurities in the lubricant, operating temperature, etc. have also been taken into account. For the following chart, axial load is assumed to be in the middle of the output shaft. Contact our engineering team with your specific application.

GSD gearboxes come with standard bearings for general automation applications, and with reinforced bearings for demanding applications such as robotics or machine tools.

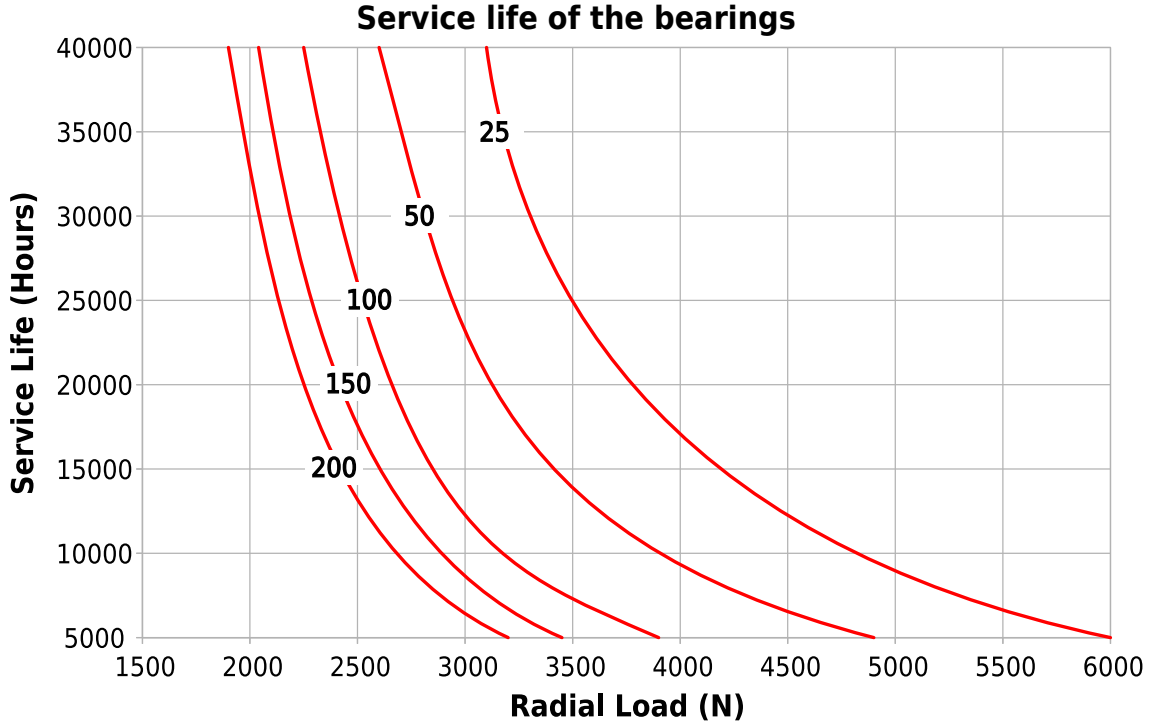
Standard bearings

GSD-250 gearboxes use deep groove ball bearings as the default configuration.

Permitted shaft loads

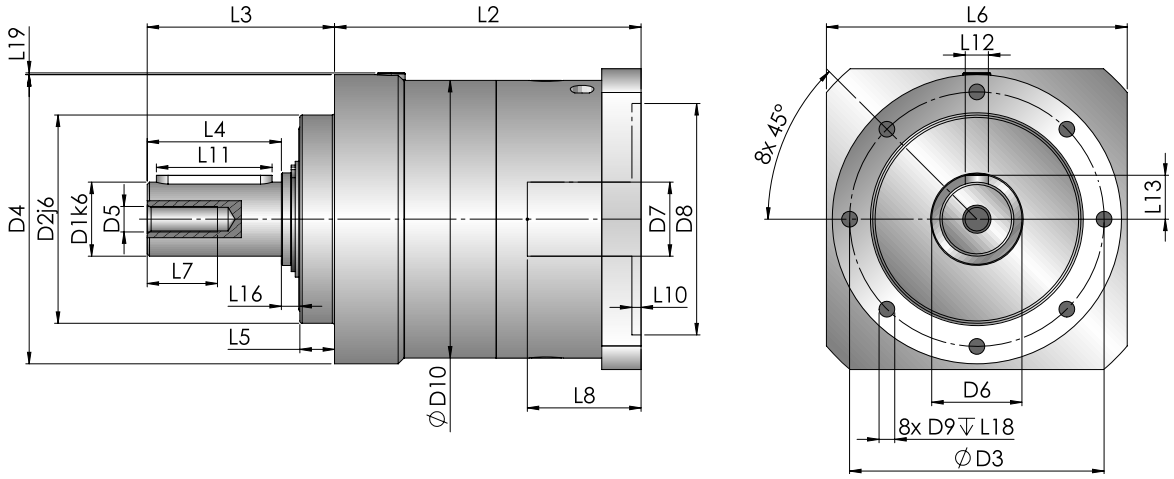
Based on nominal bearing lifetime (Lnh as per ISO 281)

	Maximum Value	10000 hours	20000 hours	30000 hours	40000 hours
F_{2R} (N) Allowable radial force (Applied to the middle of the output shaft and n_2=100 rpm)	4500	3100	2650	2400	2200
F_{2A} (N) Allowable axial force n_2=100rpm (For both push and pull)	5000	4000	3000	2500	2000
F2R = F2A (N) simultaneously. For other complex cases, please inquire.	4000	3000	2500	2200	2050



Bearing Service Life depending on radial load (N) and output speed (rpm)
Standard calculation as per DIN ISO 281

Dimensions

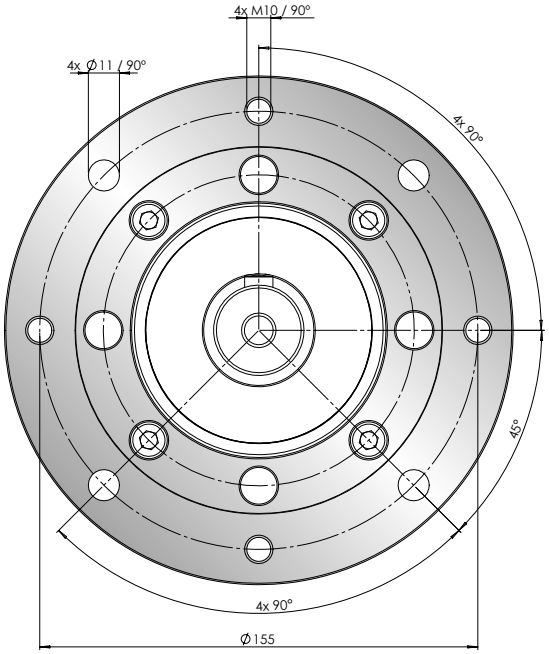


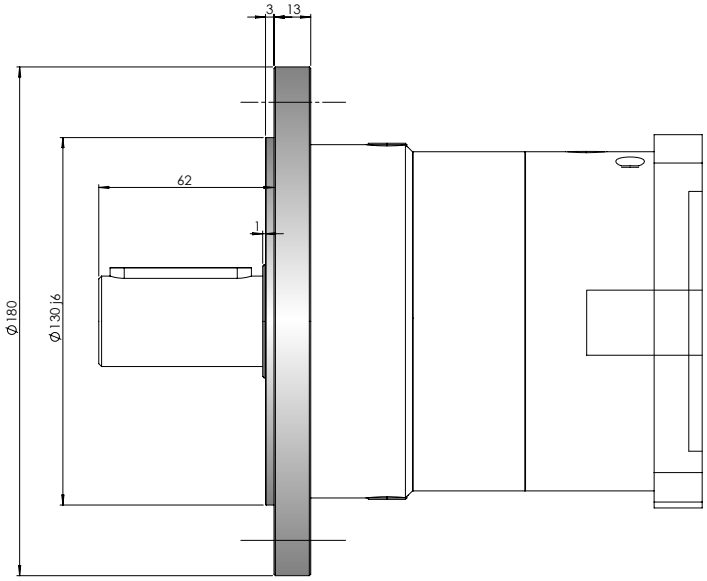
			GSD-250-M1	GSD-250-M2
D_1	Output shaft diameter		32	32
D_2	Pilot flange diameter		90	90
D_3	Output flange fixing hole P.C.D.		110	110
D_4	Output flange diameter		125	125
D_5	DIN 332 hole diameter		M10	M10
D_6	Output shaft root diameter		40	40
D_7	Input shaft diameter	min	19	19
D_7	Input shaft diameter	max	35	35
D_8	Input pilot flange diameter	min	50	50
D_8	Input pilot flange diameter	max	180	180
D_9	Output flange fixing hole diameter		M8	M8
D_{10}	Housing diameter		120	120
L_1	Total length	min	208	246
L_1	Total length	max	238	276
L_2	Housing length	min	127	165
L_2	Housing length	max	157	195
L_3	Length from the output flange		81	81
L_4	Output shaft length		58	58
L_5	Pilot diameter width		15	15
L_6	Input flange side	min	120	120
L_6	Input flange side	max	180	180
L_7	DIN 332 hole thread depth		28	28
L_8	Input shaft length	min	40	40
L_8	Input shaft length	max	80	80
L_{10}	Input pilot flange height	min	4	4
L_{10}	Input pilot flange height	max	7	7
L_{11}	Key length		50	50
L_{12}	Key width		10	10
L_{13}	Height over shaft		35	35
L_{16}	Output shaft root height		8	8
L_{18}	Output flange fixing hole thread depth		18	18
L_{19}	Plug Height		1,5	1,5

.All dimensions are in mm. Dimensions suitable for most motor models. For outliers, please inquire.
All values subject to change due to technical improvements without further notice.

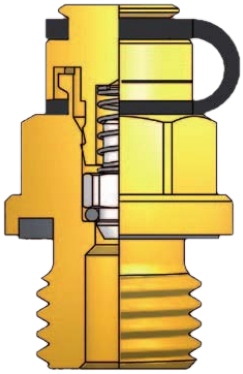
Accesories

B5 / B14 Adapter Flange for GSD-250





All dimensions in mm. Other flange sizes available upon request.



Vent Plugs

VP-G vent plugs use state of the art technology in pressure relief systems for gearboxes. A stainless steel spring lets the relief valve release generates gases while blocking ingress of contaminants.

VP-G plugs are most often installed for gearboxes that will either work under S1 continuous duty conditions, or whose duty cycle requires it. They are factory installed at the right location for the gearbox's correct operation. A rubber gasket seals the plug during transportation to prevent oil leakage.