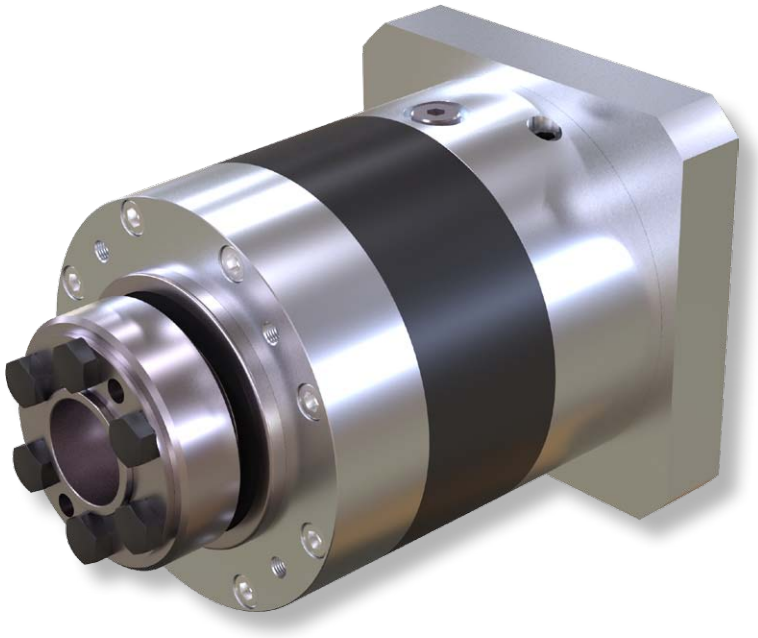
Servotak®

PRECISION GEARBOXES

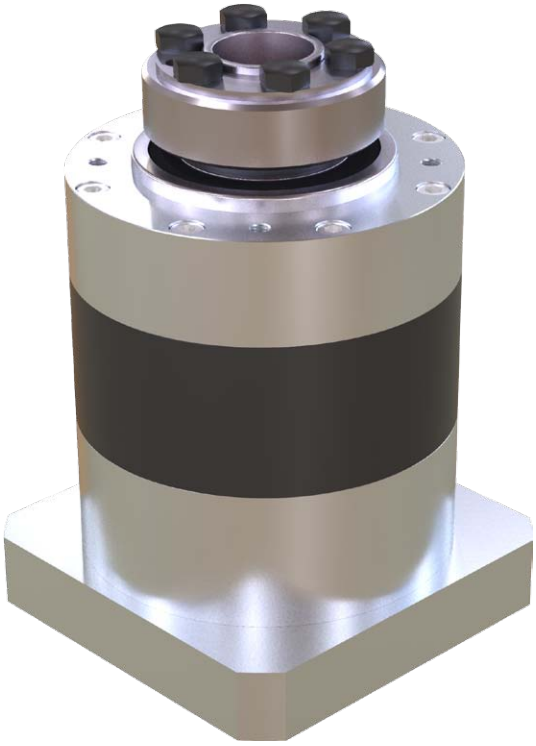


GSAH-250

Precision planetary servogearboxes

with hollow output shaft, for general automation

Increase your design’s value with GSAH gearboxes



High performance on every axis

Due to it’s high value, GSAH gearboxes are the ideal solution for OEMs that require the highest reliability at reasonable prices. Designed for use with servomotors, they are suitable for both continuous and intermittent duty cycles. They are suitable for all types of applications, from general automation to
multi-axis machines and robotics.

GSAH gearboxes are the natural evolution of the GE-Economy series, and offer notable improvements:

- Longer design life, up to 100000 hours.
- Higher load capacity on the output shaft.
- Thrice the torsional stiffness of GE-250.
- Smoother operation.

Highlights

Ratio	5 a 100
Max. Output Torque	287 Nm
Backlash	de <8’ a <12’ (arcmin)
Efficiency	97%
Design Life	100000 horas
Max. Radial Load	4500 N
Lifetime lubrication and maintenance-free	
Can be used in any mounting position.	
Hollow output shaft with shrink disk	

High reliability

GSAH series gearboxes employ high endurance limit steel gears with optimized tooth profiles, that grant them higher reliability even under the most stringent conditions.

High Value

The hollow shaft allows direct insertion of the machine shaft into the gearbox. This dispenses with the installation of a bulky intermediate coupling, which should be able to transmit at least 350 N-m, and whose cost is not insignificant.

Higher productivity

In a typical installation with a solid shaft planetary gearbox that must be connected to a solid shaft of the machine, the coupling adds transients that limit the effective cycle time. GSAH hollow-shaft gearboxes eliminate these transients, allowing for more cycles per minute.

Shorter drivetrains

GSAH gearboxes are installed directly on the solid shaft of the machine, without requiring couplings of any kind. Obviously, this results in a significant reduction of the length of the drivetrain, and consequently, projects using GSAH gearboxes are more compact.

GSAH-250

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.
- Grease lubrication is a poor match for S1 cycles, as it does a poor job at cooling gears and bearings. Make sure you request gearboxes with oil lubrication if you intend to use them for continuous duty.
- Tapered roller bearings generate a considerable amount of heat in S1 continuous cycles.
- High input speeds further increase generated heat and thus further reduce torque transmission capacity.
- Specific S1-ready gearbox designs, such as Servotak's GSC and GSD exist.

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

GSAH-250-M1 (1 etapa)		Ratio	
		5	10
Max. Acceleration output torque for 40000 hour design life in 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	287	232
	120 cycles/hour	263	215
	300 cycles/hour	233	191
	600 cycles/hour	228	180
	1500 cycles/hour	221	172
	3000 cycles/hour	213	166
	6000 cycles/hour	191	149
	9000 cycles/hour	171	137
	12000 cycles/hour	160	134
RMS average torque for 40000 hour design life in 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} Maximum cycle speed ≤n_{1max} As per DIN-3990 and ISO-6336	60 cycles/hour	143	116
	120 cycles/hour	131	108
	300 cycles/hour	116	96
	600 cycles/hour	114	90
	1500 cycles/hour	110	86
	3000 cycles/hour	106	83
	6000 cycles/hour	96	74
	9000 cycles/hour	85	69
	12000 cycles/hour	80	66
Emergency Stop Torque, T_{2E} (Nm) Up to 1000 times during product lifetime		607	505
Maximum input speed for S5 intermittent duty cycle operation, n_{1max} (rpm)		4500	4500
Average input speed for S5 intermittent service, n_{1TH} (rpm) Values for 20°C ambient temperature (For higher temperatures, reduce input speed).		2500	2700

Technical data for S1 continuous service

GSAH-250-M1 (1 etapa)		Ratio	
		5	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	230	175
	10000 hours	197	159
	25000 hours	172	144
	50000 hours	157	132
	100000 hours	148	128
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	139	106
	10000 hours	120	97
	25000 hours	104	87
	50000 hours	95	80
	100000 hours	92	77
Emergency Stop Torque T_{2E} (Nm) up to 1000 times during product lifetime		607	505
Maximum input speed for S1 continuous duty, n_{1max} (rpm) Only for short periods		2500	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

General technical data

GSAH-250-M1 (1 stage)		Ratio	
		5	10
Standard Torsional Backlash Δφ (arcmin)		<8	<10
Torsional Stiffness C (Nm / arcmin)		35	30
Efficiency η (%)		97%	97%
Inertia (kg·cm^2)		1,49	0,36
Inertia due to input shaft ⌀ (kg·cm^2)	ø11mm	1,58	1,58
	ø14mm	1,56	1,56
	ø19mm	2,32	2,32
	ø24mm	2,64	2,64
	ø32mm	3,68	3,68
Environmental conditions Values outside of this range available upon request		-15°C to 40°C	
Max. allowable housing temperature T (°C)		90°C	
Protection degree		IP 64	
Noise level, Unloaded, at n_1=3000 rpm, from a 1m distance		<69 dB(A)	
Lubrication		Lifetime grease lubrication	
Direction of rotation		Same as motor	
Weight (kg)		8	

Technical data for S5 intermittent service

GSAH-250-M2 (2 stages)		Ratio			
		25	35	50	100
Max. Acceleration output torque for 40000 hour design life in 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	287	287	287	232
	120 cycles/hour	263	263	263	215
	300 cycles/hour	233	233	233	191
	600 cycles/hour	228	228	228	180
	1500 cycles/hour	221	221	221	172
	3000 cycles/hour	213	213	213	166
	6000 cycles/hour	191	191	191	149
	9000 cycles/hour	171	171	171	137
	12000 cycles/hour	160	160	160	134
RMS average torque for 40000 hour design life in 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} Maximum cycle speed ≤n_{1max} As per DIN-3990 and ISO-6336	60 cycles/hour	143	143	143	116
	120 cycles/hour	131	131	131	108
	300 cycles/hour	116	116	116	96
	600 cycles/hour	114	114	114	90
	1500 cycles/hour	110	110	110	86
	3000 cycles/hour	106	106	106	83
	6000 cycles/hour	96	96	96	74
	9000 cycles/hour	85	85	85	69
	12000 cycles/hour	80	80	80	66
Emergency Stop Torque, T_{2E} (Nm) Up to 1000 times during product lifetime		607	607	607	505
Maximum input speed for S5 intermittent duty cycle operation, n_{1max} (rpm)		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).		2500	2500	2500	2700

Technical data for S1 continuous service

GSAH-250-M2 (2 stages)		Ratio			
		25	35	50	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	230	230	230	175
	10000 hours	197	197	197	159
	25000 hours	172	172	172	144
	50000 hours	157	157	157	132
	100000 hours	148	148	148	128
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	139	139	139	106
	10000 hours	120	120	120	97
	25000 hours	104	104	104	87
	50000 hours	95	95	95	80
	100000 hours	92	92	92	77
Emergency Stop Torque T_{2E} (Nm) up to 1000 times during product lifetime		607	607	607	505
Maximum input speed for S1 continuous duty, n_{1max} (rpm) Only for short periods		2500	2500	2500	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

General technical data

GSAH-250-M2 (2 stages)		Ratio			
		25	35	50	100
Standard Torsional Backlash Δφ (arcmin)		<12	<12	<12	<12
Torsional Stiffness C (Nm / arcmin)		35	35	35	30
Efficiency η (%)		97%	97%	97%	97%
Inertia (kg·cm^2)		0,75	0,38	0,19	0,18
Inertia due to input shaft ⌀ (kg·cm^2)	⌀11mm	1,58	1,58	1,58	1,58
	⌀14mm	1,56	1,56	1,56	1,56
	⌀19mm	2,32	2,32	2,32	2,32
	⌀24mm	2,64	2,64	2,64	2,64
	⌀32mm	3,68	3,68	3,68	3,68
Environmental conditions Values outside of this range available upon request		-15°C to 40°C			
Max. allowable housing temperature T (°C)		90°C			
Protection degree		IP 64			
Noise level, Unloaded, at n_1=3000 rpm, from a 1m distance		<69 dB(A)			
Lubrication		Lifetime grease lubrication			
Direction of rotation		Same as motor			
Weight (kg)		10,5			

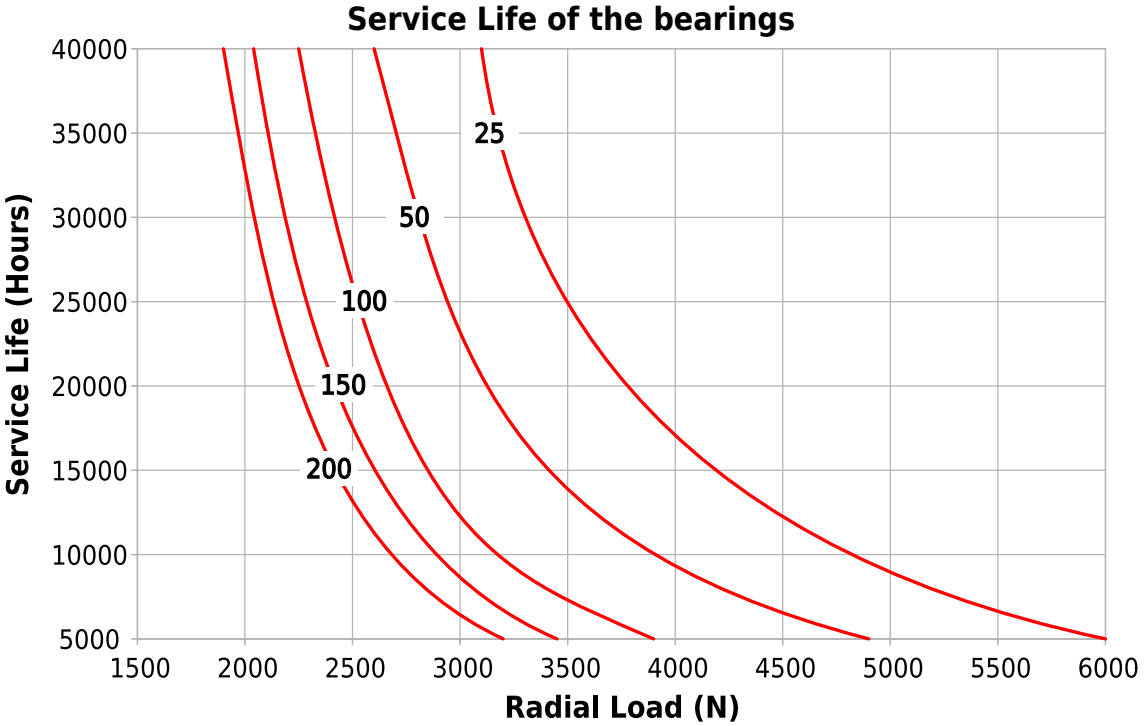
Bearings

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.

Permitted shaft loads

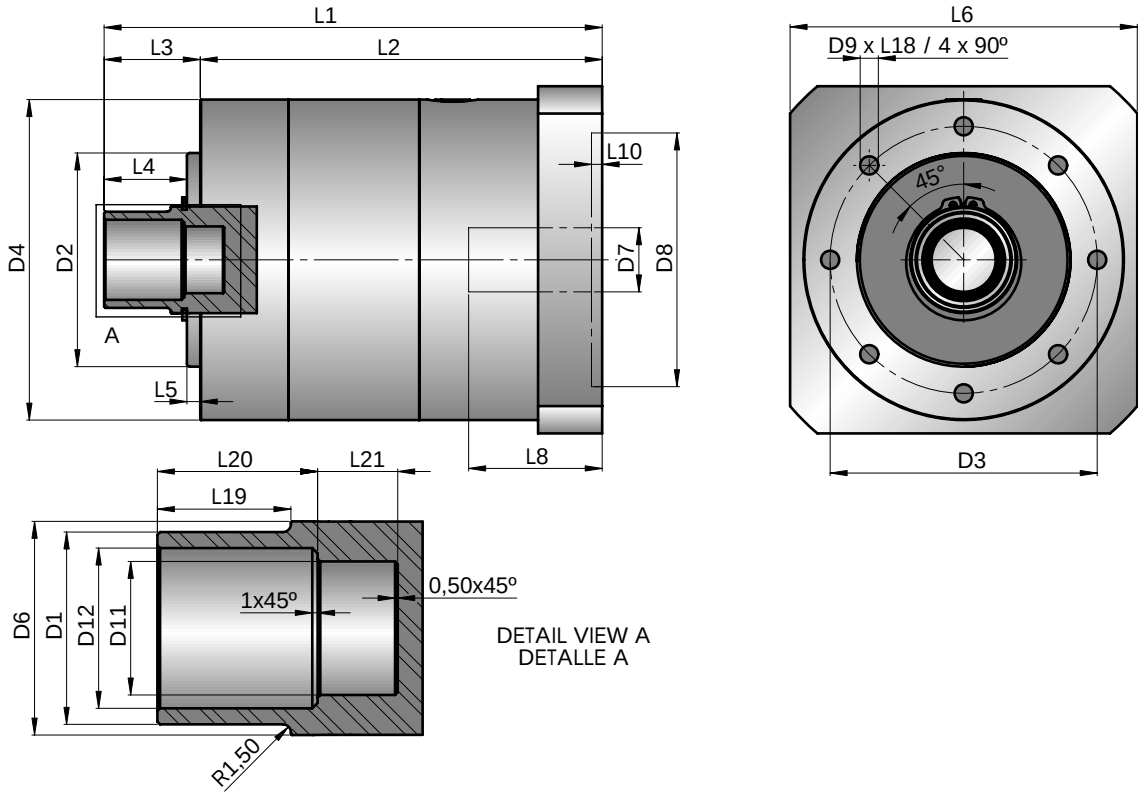
Based on nominal bearing lifetime (Lnh as per ISO 281)

	Maximum Value	10000 hour	20000 hour	30000 hour	40000 hour
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



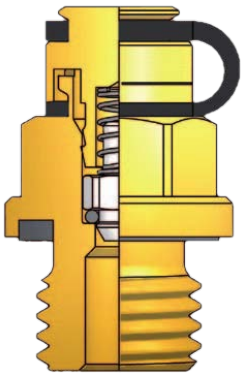
			GSAH-250-M1	GSAH-250-M2
D_1	Output shaft outside diameter		36 h6	36 h6
D_2	Pilot flange diameter		80 h6	80 h6
D_3	Output flange fixing hole P.C.D.		100	100
D_4	Output flange diameter		120	120
D_6	Output shaft root diameter		40	40
D_7	Input shaft diameter	min – max	19 – 37	19 – 35
D_8	Input pilot flange diameter	min – max	50 – 180	50 – 180
D_9	Output flange fixing hole diameter		M8	M8
D_{11}	Output shaft inside diameter		25 H7	25 H7
D_{12}	Output shaft inside diameter		30 H7	30 H7
L_1	Total length	min – max	174 – 205	212 – 243
L_2	Housing length	min – max	138 – 169	176 – 207
L_3	Length from the output flange		36	36
L_4	Output shaft length		31	31
L_5	Pilot diameter width		5	5
L_6	Input flange side	min – max	120 – 180	120 – 180
L_8	Input shaft length	min – max	40 – 80	40 – 80
L_{10}	Input pilot flange height	min – max	4 – 7	4 – 7
L_{16}	Output shaft root height		6	6
L_{18}	Output flange fixing hole thread depth		18	18
L_{19}	Output shaft length for the shrink disk		25	25
L_{20}	Hollow output shaft depth that for diameter D10		30	30
L_{21}	Hollow output shaft depth that for diameter D11		15	15

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.

Accesorios

Brida adaptadora B5 / B14 para GSAH-250

Dimensiones en mm. Otros tamaños de brida sobre demanda



Tapón de respiración de gases

Los tapones de respiración de gases VP-G disponen de la tecnología mas avanzada para la liberación de los gases producidos dentro del reductor. Un resorte de acero inoxidable permite que la válvula de seguridad libere los gases generados y a su vez bloquea la entrada de cuerpos extraños desde el exterior.

Los tapones de respiración de gases VP-G se instalan preferentemente en reductores con ciclos de trabajo continuo S1, o cuando las características del ciclo de trabajo de la aplicación así lo requieren. Se suministran instalados de fabrica en el lugar adecuado para el correcto funcionamiento del reductor. Una anilla de goma impide la perdida de lubricante durante el transporte e instalación.