



## **GSA-080**

*Precision planetary servogearboxes*

---

for general automation

# The first catalog for engineers

## Background

When an engineer needs to select a precision planetary gearbox from any major supplier, he finds himself in the following dilemma:

If the supplier is from Europe, he will have to deal with the following hurdles:

- Intermittent duty cycle is loosely defined as 1000 cycles per hour, with acceleration time, deceleration time, and dwell time undefined.
- There is no data for less than 1000 cycles per hour, and for more cycles per hour, the engineer must refer to generic tables for correction factors.
- Continuous duty cycle (ED=100%) is also either undefined, and whatever data relates to it is insufficient.
- Axial and radial capacities are vastly exaggerated for marketing purposes. Sometimes, they even don't respect the bearings static safety factors.
- Should an extended service life for the gear be required, there is no data on how to obtain it.

Additionally, if the supplier is from Asia, he might also have to deal with the following 3 extra issues:

- **Vastly overstated torque values that have little basis on reality.** Taking advantage of most customers' lack of knowledge (as they know most customers lack deep knowledge when it comes to mechanical transmissions), the listed values are hand picked from situations unlikely to resemble actual use, for purely marketing based reasons.
- **10000 hours actual design life** hidden in small print footnotes, in an attempt to justify the exaggerated torque values.
- **Misused or redefined terminology** that is clearly defined by ISO and DIN western standards. For example "**rated torque**" often means "**acceleration torque**".

## GS gearboxes: The professionals' choice

On the other hand, GE gearboxes present the following advantages:

- **Quick and reliable gearbox selection.** There is explicit data for every number of cycles per hour, from 60 to 12000, allowing the engineer to quickly and reliably select the needed gearbox. There is no wasted time checking additional tables or applying additional safety factors. In over 80% of the cases, there is no need to resort to specialized software to make the gearbox selection.
- **Longer service life.** For machines that require very long service life, such as machine tools, Servotak's listed torque values refer to up to 100000 hours design life for continuous duty cycles, and 40000 hours design life for intermittent duty cycles, doubling the western market standards and quadrupling the Asian ones. This is thanks to its use of high quality alloy steels used for the gears, and to the high quality tooth profile. Additionally Servotak employs case hardened gears which goes deep into the steel, unlike other manufacturers' nitrided gears that, while cheaper, only hardens a thin layer that wears out much faster. This allows us to offer higher safety on both tooth flanks and tooth roots, further extended service life.
- **100000 hour bearing design life.** In addition to providing the static radial load capacity, Servotak provides a graph plotting radial capacity vs speed, with design life up to 100000 hours. The gears' needle bearings are even longer lasting, with a design life of 120000 hours.

# Increase your design's value with GSA gearboxes



## High performance on every axis

Due to its high value, GSA 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.

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

- Longer design life, up to 100000 hours.
- Higher transmission capacity
- Smoother operation.

## Características destacadas

Ratio	3 to 100
Max. Output Torque	168 Nm
Backlash	from <8' to <12' (arcmin)
Efficiency	97%
Design Life	100000 hours
Max. Radial Load	3000 N
Lifetime lubrication and maintenance-free	
Can be used in any mounting position.	
DIN-6885-1 keyed shaft with DIN-332-2 axial fixing bore	

### For every mounting position

GSA gearboxes can be mounted in any position. However, if mounted horizontally, they can be lubricated with a special grease that increases torque transmission capabilities, offers an even smoother operation, and extends service life.

### High value for money

GSA offers high quality at a competitive price. This makes it ideal for general automation applications that require high reliability but only moderate precession.

### Simple motor mounting

Its modular design allows for input flanges to be designed for every possible motor. Installers will find that motor mounting is simple, safe, and error-free. A shrink disk with sideways tightening screws offers a more secure motor shaft connection.

# Rack & pinion linear systems with GSA gearboxes

## More competitive and reliable machines

Servotak's rack-pinion-gearbox systems are the ideal solution for OEMs requiring a highly reliable product that maintains a competitive price. They are used in machine tool and general automation machines that don't require the highest precision. For these cases, Servotak offers linear systems with moderate precision and feed forces.

With racks with modules ranging from 0,5 to 6 and GSA gearboxes, allow for multi-ton loads to be displaced with medium precision, quiet operation, and high reliability.

Servotak offers five rack and pinion series, Basic, Classic, Professional, Advanced and Master. with 15 modules for straight teeth systems, and 12 for helical teeth systems, it covers every use case. For higher precisions and heavier loads, SG gearboxes complete the set, and allow for feed forces of up to 400000 N.

## The safest racks

Servotak's Basic, Advanced and Master racks are taller than market standard ranks. This extra mass grants them higher rigidity and allows them to better absorb overloads, offer vibration free operation, and as a result, deliver better finishes when used in machine tools. Their 2-row fixing hole arrangement offers the most secure operation in emergency situations.



### Precision and Feed Force

5 rack series combined with GS gearboxes offer moderate precision and feed force at a high value per money, making them ideal for use cases such as general automation, machine tool and robotics,

### Smooth operation

Servotak linear systems are known for their remarkably smooth operation thanks to an optimized tooth profile on all gears, and a perfect balance on all the systems' parts.

### Maximum Reliability

Our engineers can offer complete rack-pinion-gearbox systems that are hand tuned for your specific application, and so can offer the highest reliability for even the most stringent requirements.

## GSA-080

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](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 in S1 cycles.

### Technical data for S5 intermittent service

GSA-080-M1 (1 stage)		Ratio			
		3	5	7	10
<b>Max. Acceleration output torque for 40000 hour design life in S5 intermittent duty cycles, <math>T_{2max}</math> (Nm)</b> S5 intermittent duty cycle Duty cycle ED<60%, Cycle duration $t_{cycle}$ <20 min Average cycle speed $\leq n_{1TH}$ Maximum cycle speed $\leq n_{1max}$ As per DIN-3990 and ISO-6336	60 cycles/hour	168	139	111	117
	120 cycles/hour	136	128	91	103
	300 cycles/hour	107	109	77	99
	600 cycles/hour	105	108	76	87
	1500 cycles/hour	102	103	75	86
	3000 cycles/hour	98	97	74	84
	6000 cycles/hour	85	93	73	83
	9000 cycles/hour	73	85	70	76
	12000 cycles/hour	68	82	64	70
<b>RMS average torque for 40000 hour design life in a typical S5 duty cycle, <math>T_{2TH}</math> (Nm)</b> S5 intermittent duty cycle Duty cycle ED<60%, Cycle duration $t_{cycle}$ <20 min Average cycle speed $n_{1TH}$ Maximum cycle speed $\leq n_{1max}$ As per DIN-3990 and ISO-6336	60 cycles/hour	84	69	56	59
	120 cycles/hour	68	64	45	52
	300 cycles/hour	55	55	40	50
	600 cycles/hour	53	54	39	45
	1500 cycles/hour	51	51	38	44
	3000 cycles/hour	49	48	37	43
	6000 cycles/hour	42	47	36	42
	9000 cycles/hour	37	43	35	38
	12000 cycles/hour	34	41	32	35
<b>Emergency Stop Torque, <math>T_{2E}</math> (Nm)</b> Up to 1000 times during product lifetime		190	230	200	200
<b>Maximum input speed for S5 intermittent duty cycle operation, <math>n_{1max}</math> (rpm)</b>		6000	7000	7000	7000
<b>Average input speed for S5 intermittent service, <math>n_{1TH}</math> (rpm)</b> Values for 20°C ambient temperature (For higher temperatures, reduce input speed).		2500	3200	3500	4000

### Technical data for S1 continuous service

GSA-080-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 $\leq n_{1TH}$ Maximum cycle speed $\leq n_{1max}$ As per DIN-3990	5000 hours	222	113	160	166
	10000 hours	190	103	102	137
	25000 hours	141	94	97	119
	50000 hours	124	88	93	117
	100000 hours	121	85	91	109
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 $\leq n_{1max}$ As per DIN-3990	5000 hours	148	75	107	110
	10000 hours	126	69	68	91
	25000 hours	94	63	65	80
	50000 hours	83	59	60	73
	100000 hours	80	57	58	78
Emergency Stop Torque $T_{2E}$ (Nm) up to 1000 times during product lifetime		190	230	200	200
Maximum input speed for S1 continuous duty, $n_{1max}$ (rpm) Only for short periods		3500	3500	4000	4000
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		2500	3300	3500	3700

### General technical data

GSA-080-M1 (1 stage)		Ratio			
		3	5	7	10
Standard Torsional Backlash $\Delta\phi$ (arcmin)		<8	<8	<8	<10
Torsional Stiffness C (Nm / arcmin)		10	11	11	10
Efficiency $\eta$ (%)		97	97	97	97
Inertia due to input shaft $\varnothing$ (kg·cm <sup>2</sup> )	$\varnothing 19\text{mm}$	0,885	0,615	0,551	0,529
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)		2,7	2,8	2,8	2,9

### Technical data for S5 intermittent service

GSA-080-M2 (2 stages)		Ratio					
		15	25	30	50	70	100
<b>Max. Acceleration output torque for 40000 hour design life in S5 intermittent duty cycles, <math>T_{2max}</math> (Nm)</b> S5 intermittent duty cycle Duty cycle ED<60%, Cycle duration $t_{cycle}$ <20 min Average cycle speed $\leq n_{1TH}$ Maximum cycle speed $\leq n_{1max}$ As per DIN-3990 and ISO-6336	60 cycles/hour	168	139	168	139	111	117
	120 cycles/hour	136	128	136	128	91	103
	300 cycles/hour	107	109	107	109	77	99
	600 cycles/hour	105	108	105	108	76	87
	1500 cycles/hour	102	103	102	103	75	86
	3000 cycles/hour	98	97	98	97	74	84
	6000 cycles/hour	85	93	85	93	73	83
	9000 cycles/hour	73	85	73	85	70	76
	12000 cycles/hour	68	82	68	82	64	70
<b>RMS average torque for 40000 hour design life in a typical S5 duty cycle, <math>T_{2TH}</math> (Nm)</b> S5 intermittent duty cycle Duty cycle ED<60%, Cycle duration $t_{cycle}$ <20 min Average cycle speed $n_{1TH}$ Maximum cycle speed $\leq n_{1max}$ As per DIN-3990 and ISO-6336	60 cycles/hour	84	69	84	69	56	59
	120 cycles/hour	68	64	68	64	45	52
	300 cycles/hour	55	55	55	55	40	50
	600 cycles/hour	53	54	53	54	39	45
	1500 cycles/hour	51	51	51	51	38	44
	3000 cycles/hour	49	48	49	48	37	43
	6000 cycles/hour	42	47	42	47	36	42
	9000 cycles/hour	37	43	37	43	35	38
	12000 cycles/hour	34	41	34	41	32	35
<b>Emergency Stop Torque, <math>T_{2E}</math> (Nm)</b> Up to 1000 times during product lifetime		190	230	190	230	200	200
<b>Maximum input speed for S5 intermittent duty cycle operation, <math>n_{1max}</math> (rpm)</b>		6000	7000	6000	7000	7000	7000
<b>Average input speed for S5 intermittent service, <math>n_{1TH}</math> (rpm)</b> Values for 20°C ambient temperature (For higher temperatures, reduce input speed).		3000	4000	3000	4000	4000	4000

### Technical data for S1 continuous service

GSA-080-M2 (2 stages)		Ratio					
		15	25	30	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 $\leq n_{1TH}$ Maximum cycle speed $\leq n_{1max}$ As per DIN-3990	5000 hours	222	113	222	113	160	166
	10000 hours	190	103	190	103	102	137
	25000 hours	141	94	141	94	97	119
	50000 hours	124	88	124	88	93	117
	100000 hours	121	85	121	85	91	109
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 $\leq n_{1max}$ As per DIN-3990	5000 hours	148	75	148	75	107	110
	10000 hours	126	69	126	69	68	91
	25000 hours	94	63	94	63	65	80
	50000 hours	83	59	83	59	60	73
	100000 hours	80	57	80	57	58	78
Emergency Stop Torque $T_{2E}$ (Nm) up to 1000 times during product lifetime		190	230	190	230	200	200
Maximum input speed for S1 continuous duty, $n_{1max}$ (rpm) Only for short periods		3500	4000	3500	4000	4000	4000
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		2500	3300	2500	3300	3500	3500

### General technical data

GSA-080-M2 (2 stages)		Ratio					
		15	25	30	50	70	100
Standard Torsional Backlash $\Delta\phi$ (arcmin)		<12	<15	<12	<15	<15	<15
Torsional Stiffness C (Nm / arcmin)		10	11	10	11	11	10
Efficiency $\eta$ (%)		94	94	94	94	94	94
Inertia due to input shaft $\phi$ (kg·cm <sup>2</sup> )	$\phi 19$ mm	0,64	0,62	0,53	0,55	0,53	0,53
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)		4 to 4,4					

## Bearings

For optimal gearbox performance, it is not just the gears that matter. If the gearbox is well designed, the limiting factor when it comes to service life is the bearings. GSA-080 gearboxes include 3 types of bearings:

- **Planetary gear bearings:** They support the planets, minimize internal friction, and provide high rigidity to the system. The planetary gears of the GSA-080 are fitted with needle roller bearings that are oversized for a life in excess of 120,000 hours, so that they are maintenance-free.
- **Input bearing:** Isolates the sun gear from possible eccentricities coming from the drive shaft that would generate unwanted vibrations. The input shaft uses a deep groove ball bearing, self-lubricating and sealed on both sides, which allows working at high speeds and has been oversized for a service life of more than 120,000 hours, thus requiring no maintenance.
- **Output bearings:** They isolate the planets from external loads, ensuring that a perfect concentricity of rotation of the planets with respect to the ring gear is maintained. For the output shaft of the GSA-080, self-lubricating deep groove ball bearings are used, sealed with protective covers on both sides, which allow a high load capacity and perfect sealing. These are the bearings that experience the greatest variability in their operating conditions. Their service life depends mainly on the output speed and radial load. Other factors such as type of lubricant, impurity, operating temperature, etc. have been taken into account. To know the service life as a function of radial load and speed at the output shaft, we provide the following graphs. The radial load is considered to be located at half the length of the output shaft. They can be supplied with standard bearings or as an option with reinforced bearings. For particular applications, please consult our engineers.

## Standard output shaft bearings

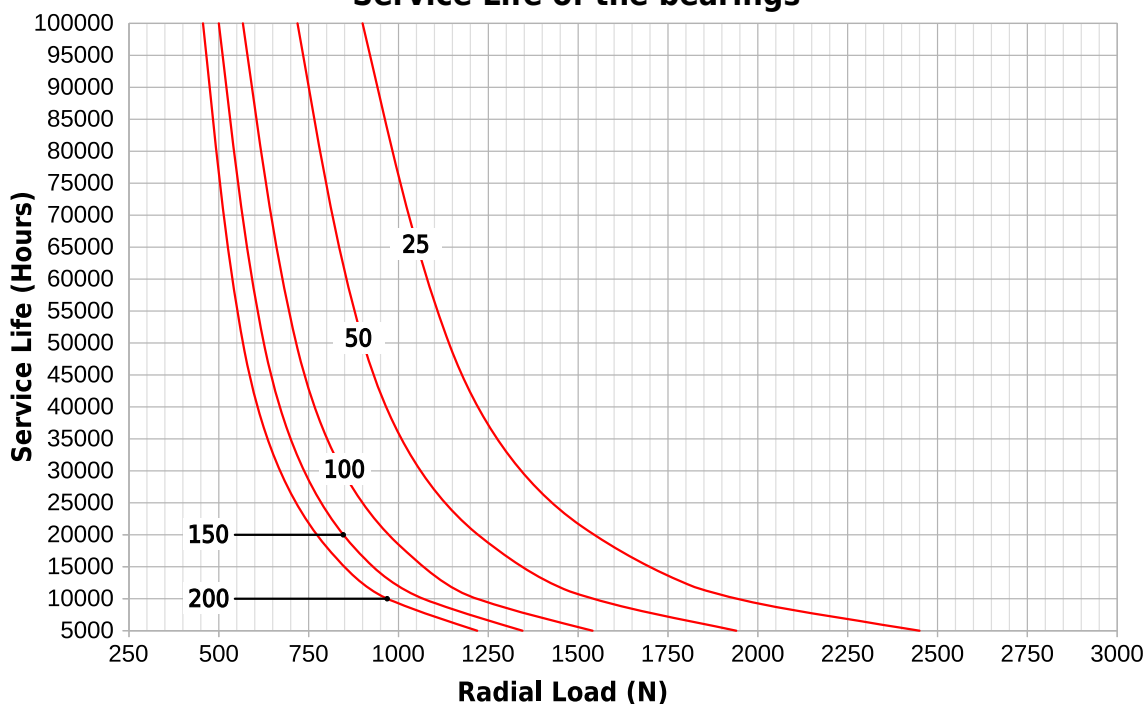
GSA-080 are supplied as standard with bearings conforming to DIN-620 and DIN ISO 1132 with tolerance class TN, which meet the quality requirements for bearings required for general automation.

### Permitted shaft loads

Based on nominal bearing lifetime (L<sub>nh</sub> as per ISO 281)

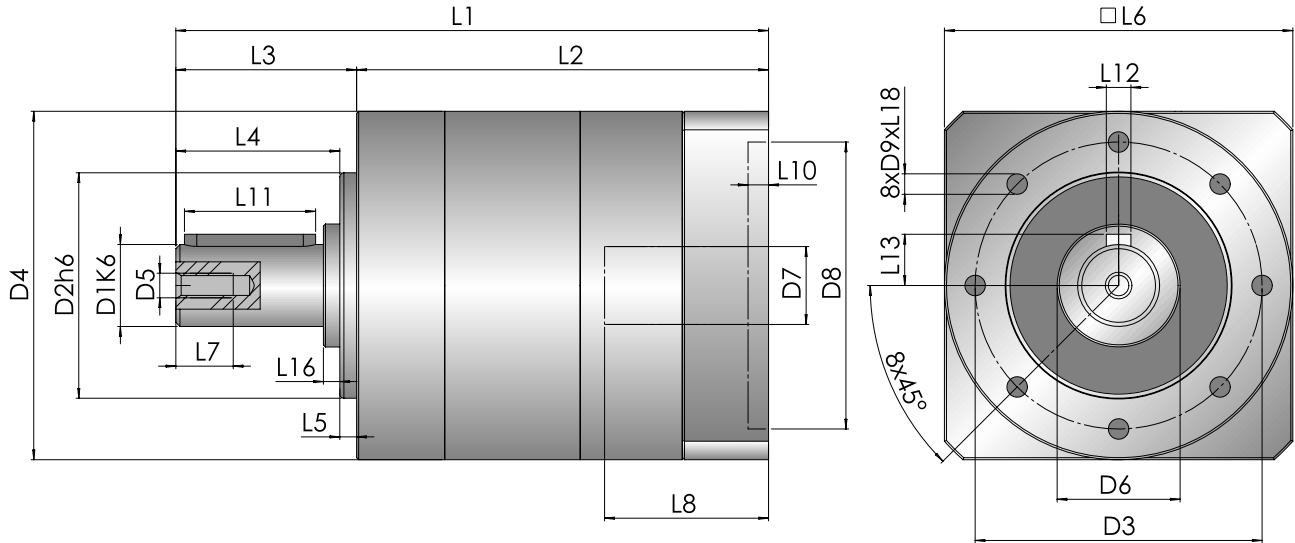
	Maximum Value	10000 hour	20000 hour	30000 hour	40000 hour
F <sub>2R</sub> (N) Allowable radial force (Applied to the middle of the output shaft and n <sub>2</sub> =100 rpm)	3000	1200	940	800	710
F <sub>2A</sub> (N) Allowable axial force n <sub>2</sub> =100rpm (For both push and pull)	5000	3500	2600	2100	1900
F <sub>2R</sub> = F <sub>2A</sub> (N) simultaneously. For other complex cases, please inquire.	2800	1100	850	760	700

### Service Life of the bearings



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

## Dimensions



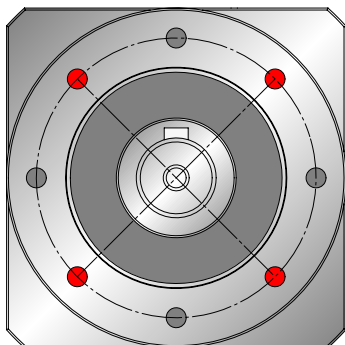
			<b>GSA-080-M1</b>	<b>GSA-080-M2</b>
D <sub>1</sub>	Output shaft diameter		20	20
D <sub>2</sub>	Pilot flange diameter		55	55
D <sub>3</sub>	Output flange fixing hole P.C.D.		70	70
D <sub>4</sub>	Output flange diameter		85	85
D <sub>5</sub>	DIN 332 hole diameter		M6	M6
D <sub>6</sub>	Output shaft root diameter		30	30
D <sub>7</sub>	Input shaft diameter	min	9	9
D <sub>7</sub>	Input shaft diameter	max	19	19
D <sub>8</sub>	Input pilot flange diameter	min	50	50
D <sub>8</sub>	Input pilot flange diameter	max	110	110
D <sub>9</sub>	Output flange fixing hole diameter		M6	M6
L <sub>1</sub>	Total length	min	140	165
L <sub>1</sub>	Total length	max	151	176
L <sub>2</sub>	Housing length	min	95	121
L <sub>2</sub>	Housing length	max	106	132
L <sub>3</sub>	Length from the output flange		44	44
L <sub>4</sub>	Output shaft length		36	36
L <sub>5</sub>	Pilot diameter width		4,1	4,1
L <sub>6</sub>	Input flange side	min	85	85
L <sub>6</sub>	Input flange side	max	120	120
L <sub>7</sub>	DIN 332 hole thread depth		14	14
L <sub>8</sub>	Input shaft length	min	45	45
L <sub>8</sub>	Input shaft length	max	56	56
L <sub>10</sub>	Input pilot flange height	min	3,5	3,5
L <sub>10</sub>	Input pilot flange height	max	10	10
L <sub>11</sub>	Key length		32	32
L <sub>12</sub>	Key width		6	6
L <sub>13</sub>	Height over shaft		22,5	22,5
L <sub>16</sub>	Output shaft root height		3,9	3,9
L <sub>18</sub>	Output flange fixing hole thread depth		14	14

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.

## More secure and flexible mounting

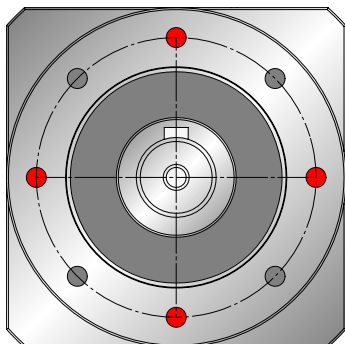
GSA-080 are the first precision planetary gearboxes with up to 8 holes for mounting on the machine. Modern machines are becoming more and more compact and some need to optimize the space of the servo motor-gearbox assembly. With 8 holes the customer can rotate the gearbox at 45° angles and find the best orientation. This cannot be achieved if there were only 4 threaded holes.

With 8 holes available you can attach the gear unit to the machine in a variety of ways:



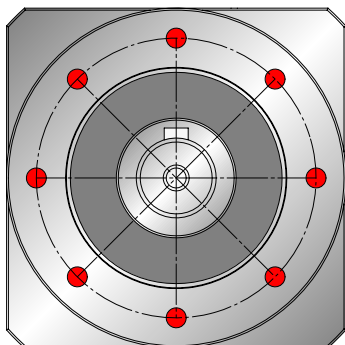
### X-shaped 4-screw arrangement

It is the most commonly used in a large number of industrial machines. If you use 8.8 quality screws, the shear safety factor of the screws is high but the slip safety factor is low. Check this if the machine starts more than 15 times per minute. We recommend using 12.9 quality screws.



### Cross-shaped 4-screw arrangement

To a lesser extent, 4 screws crosswise arrangements are also used. The performance in terms of safety is the same as in the previous arrangement.



### Star-shaped 8-screw arrangement

This arrangement has additional advantages:

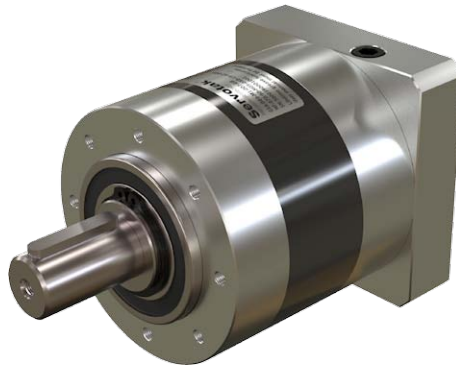
- Aligning the servo motor-gearbox assembly at 45° angles allows for optimizing the servo motor cable outlet position.
- For machine tools, packaging machines and other precision machines with a high number of starts/minute, this arrangement offers maximum safety against yield stress, slippage and shearing of the screws, as well as improved vibration absorption.
- With 8 screws of quality 8.8 the safety against emergency stops is tripled\*.
- With 8 screws of quality 12.9 the safety against emergency stops is increased fivefold\*.

\* Calculations made for a coefficient of friction between parts of 0.12, tightening factor 1.60, threaded holes in the gearbox, machine face made of non-alloy steel F114 - C45 or cast iron, maximum axial force of 1000 N, nominal bolt torque, surface roughness of the thread and bolt head support N8 (milled).

## Options

### Special paint for corrosive environments

GSA-080 gearboxes can be delivered coated with a special corrosion-resistant paint. It's composed of a 2K epoxy-polyamide resin based primer with zinc phosphates, plus a high quality high wear resistance coat of pain. It offers excellent protection against corrosion in both industrial environments and in exposed natural ones, such as in contact with sea waters, even on critical surfaces such as aluminum. It offers high chemical and abrasion resistance.



- Thick 2K epoxy-polyamide resin based primer
- RAL-9005 black paint finish.
- Treatment might be applied to the the whole housing, or only to the exposed steel parts

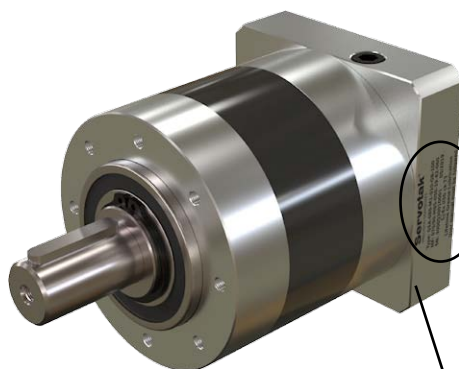
### Ready for explosive atmospheres (ATEX)

GSA-050 gearboxes can be ordered compliant with the requirements of directive 2014/34/UE relating to equipment and protective systems intended for use in potentially explosive atmospheres.



#### Ratings

- EX II 3G ck T3
- EX II 3D ck T3
- EX II 3GD ck T3
- EX II 2G ck T3
- EX II 2D ck T3
- EX II 2GD ck T3



Atex labeling



Available with input flanges for servomotors and for asynchronous IEC motors