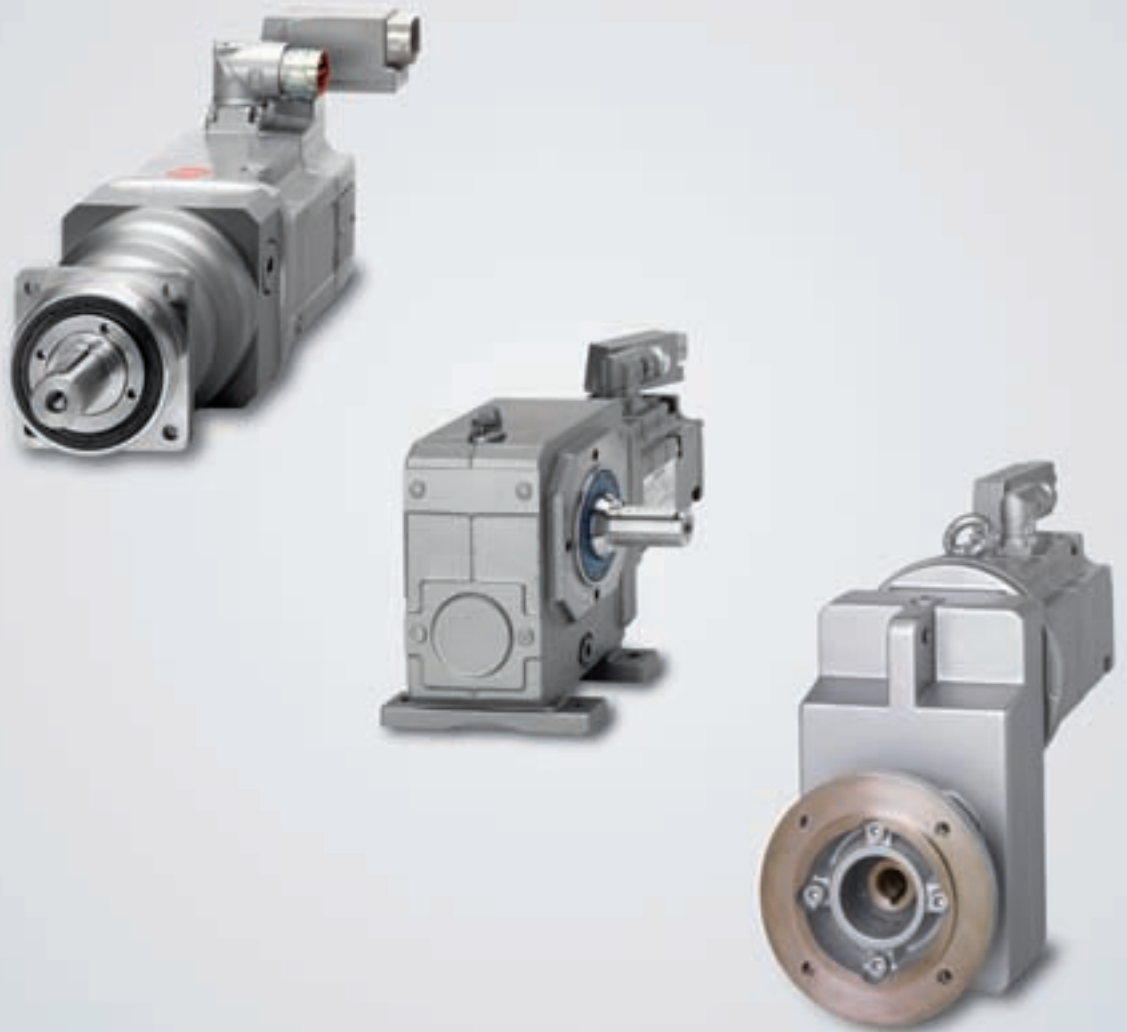


# Geared servo motors

For every Motion Control application  
the appropriate geared motor

Brochure · September 2008



Motors

**SIEMENS**

# Geared servo motors

## Overview








For motion control applications, Siemens offers an extensive range of rotary servomotors. These are available in both synchronous and induction versions up to linear and high-precision torque motors with a high dynamic performance. The proven 1FK7, 1FT7 and 1FT6 synchronous servomotors are also available from the factory with various gear unit versions.

With the wide variety of different gear units for the 1FK7, 1FT7 and 1FT6 series, we address a wide range of applications regarding:

- Speed/torque ranges
- Accuracy/dynamic performance specifications
- Mounting types
- Encoders

All of the geared servo motors provide optimum performance due to their high balance quality and compact design. They are characterized by their high precision with low torsional backlash. This is the reason that they are ideally suited for cyclic operation in motion control applications.

In the version equipped with DRIVE-CLiQ interface and electronic type plate, drive configurations with geared servo motors and the SINAMICS S120 drive system are commissioned extremely quickly.

Gear unit	Motor type	Version	Gear ratio <i>i</i>	Rated output speed $n_{N2}$	Rated power $P_2$	Output torque (53-60 %) $M_2$
<b>Helical gear units</b>						
 Helical gear units	1FK7-CT	Gear unit directly mounted	3.8 ... 70	34 ... 782 rpm	0.3 ... 8 kW (0.4 ... 10.72 HP)	3.6 ... 1737 Nm (2.68 ... 1281 lb <sub>f</sub> -ft)
 Offset-shaft gear units	1FK7-CT	Gear unit directly mounted	4.3 ... 35	85 ... 696 rpm	0.3 ... 7.93 kW (0.4 ... 10.63 HP)	4 ... 587 Nm (2.95 ... 433 lb <sub>f</sub> -ft)
<b>Angled gear units</b>						
 Worm gear units	1FK7-CT	Gear unit directly mounted	9.2 ... 70	43 ... 326 rpm	0.28 ... 4.45 kW (0.38 ... 5.97 HP)	8.5 ... 399 Nm (6.27 ... 294 lb <sub>f</sub> -ft)
 Bevel gear units	1FK7-CT	Gear unit directly mounted	4 ... 76	43 ... 750 rpm	0.3 ... 7.83 kW (0.4 ... 10.5 HP)	3.8 ... 1626 Nm (2.8 ... 1199 lb <sub>f</sub> -ft)
<b>Planetary gear units</b>						
 Series LP+	1FK7-CT 1FK7-HD	Through a coupling	5, 10	200 ... 800 rpm	0.41 ... 7.9 kW (0.55 ... 10.59 HP)	5 ... 200 Nm (3.69 ... 148 lb <sub>f</sub> -ft)
 Series DYA	1FK7-DYA	Gear unit directly mounted	5, 10	200 ... 740 rpm	0.37 ... 1.88 kW (0.5 ... 2.41 HP)	8.4 ... 91 Nm (6.2 ... 67 lb <sub>f</sub> -ft)
 Series SP+	1FK7 / 1FT7 / 1FT6	Through a coupling	4, 5, 7, 10 16, 20, 28, 40, 50	38 ... 825 rpm	0.19 ... 57 kW (0.25 ... 76.4 HP)	4 ... 2500 Nm (2.95 ... 1844 lb <sub>f</sub> -ft)

# Geared servo motors

## User-friendly tools for electrical and mechanical design

### SIZER engineering tool



*SIZER: Motors are quickly selected and dimensioned using motor Wizards*

Geared servo motors are quickly and simply selected and dimensioned using the SIZER engineering tool.

Based on the mechanical and process data of the application entered, SIZER quickly selects the optimum geared motor in addition, it also supplies the mechanical dimensions so that the geared motor can be simply integrated into the overall mechanical system.

You can get to know more about the SIZER engineering tool under:

[www.siemens.com/sizer](http://www.siemens.com/sizer)

### CAD CREATOR – for dimension drawing and 2D/3D CAD data



*CAD CREATOR: Simple and fast access to dimension drawings and CAD data*

Using the CAD CREATOR tool, dimension drawings, CAD data and technical data of geared servo motors can be quickly and easily generated – for use in plant or system documentation.

The CAD CREATOR is either available online or on CD ROM. You can get to know more under:

[www.siemens.com/cad-creator](http://www.siemens.com/cad-creator)

You will find more information on the geared motors in the Internet under:  
[www.siemens.com/motioncontrol/motors](http://www.siemens.com/motioncontrol/motors)

All of the required ordering data are also included in:

Catalog PM 21 (for use in production machines)

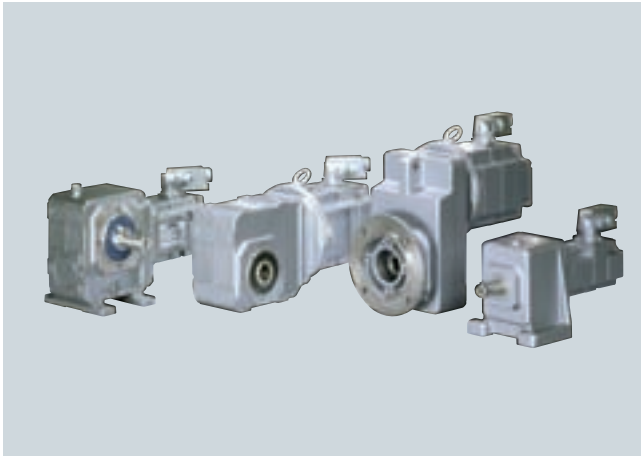
Order No. E86060-K4921-A101-A1-7600

Catalog NC 61 (for use in machine tools)

Order No. E86060-K4461-A101-A2-7600

# Geared servo motors

with helical and angled gear units



Compact 1FK7-CT motors with helical and angled gears are available for average to high motion control applications where precision and dynamic performance is demanded. Depending on the particular gear unit version and ratio, rated speeds extend from 40 up to approx. 780 rpm, the output torques from 3.63 to 1737 Nm (2.68 to 1281 lb<sub>r</sub>-ft).

These geared servo motors can even be used where space is restricted as the gear unit is directly mounted without coupling and the fact that 1FK7-CT motors are extremely compact. The different gear unit versions, the different types of construction and mounting positions allow the optimum geared motors to be selected for almost any mounting situation.

The gear units have a high degree of efficiency, are torsionally stiff and have low torsional backlash.

The gear wheels have helical teeth, where the gear units have extremely smooth running characteristics and are quiet.

The motor and gear assemblies are supplied as unit with gears already filled with oil in the factory. This means that the unit is quickly and simply mounted in the machine.

The CAD CREATOR tool – that is freely accessible – supplies the mechanical data required for the mounting.

In operation, these geared servo motors are maintenance-friendly: The gear units are rugged and generally it is not necessary to change the oil.

The geared servo motors with helical and angled gear units are available with the same encoder options as for 1FK7 servomotors.

## Applications areas

As a result of their features, geared servo motors are especially suitable for the following applications:

- Transport conveyor belts and positioning/adjusting axes in high-bay racking units and other handling equipment
- In assembly equipment
- In packaging machines
- In plastic machines
- In woodworking, glass and ceramic processing
- In the food & beverage industry
- In the paper & printing industry
- In general machine constructions



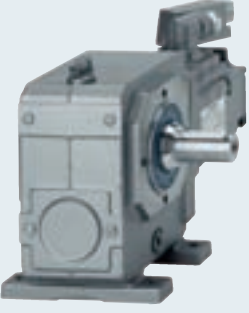

## Benefits and features

- Extremely compact design – the motor is directly mounted onto the gear unit
- High efficiency
- Low torsional backlash
- Low running noise as a result of the helical teeth
- Rugged and maintenance free
- Suitable for continuous operation and cyclic operation with alternating load



# Geared servo motors

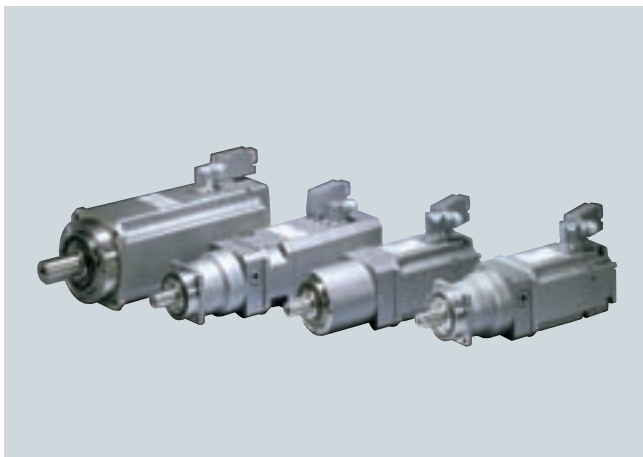
with helical and angled geared unit

Helical geared motor		
	<p>Nominal ratio            Rated output torque (S3-60 %)            Max. permissible accelerating torque            Torsional backlash            Efficiency            Mechanical options</p>	<p><math>I_{nom} = 3.8 \dots 70</math>  <math>M_2 = 3.6 \dots 1737 \text{ Nm (2.68...1281 lb}_f\text{-ft)}</math>  <math>M_{2max} = 19 \dots 4140 \text{ Nm (14...3054 lb}_f\text{-ft)}</math>            10 ... 20 arcmin            94 ... 96 %</p> <ul style="list-style-type: none"> <li>• Solid shaft with key</li> <li>• Flange</li> <li>• Foot</li> <li>• Circle of threaded holes</li> </ul>
Offset-shaft geared motor		
	<p>Nominal ratio            Rated output torque (S3-60 %)            Max. permissible accelerating torque            Torsional backlash            Efficiency            Mechanical options</p>	<p><math>I_{nom} = 4.3 \dots 35</math>  <math>M_2 = 4 \dots 587 \text{ Nm (2.95...433 lb}_f\text{-ft)}</math>  <math>M_{2max} = 24 \dots 1100 \text{ Nm (17.7...811 lb}_f\text{-ft)}</math>            10 ... 11 arcmin            94 ... 96 %</p> <ul style="list-style-type: none"> <li>• Solid shaft</li> <li>• Hollow shaft with key</li> <li>• Hollow shaft with clamping element/ shrunk disk</li> <li>• Flange</li> <li>• Foot</li> <li>• Circle of threaded holes</li> </ul>
Worm geared motor		
	<p>Nominal ratio            Rated output torque (S3-60 %)            Max. permissible accelerating torque            Torsional backlash            Mechanical options</p>	<p><math>I_{nom} = 9.2 \dots 70</math>  <math>M_2 = 8.5 \dots 399 \text{ Nm (6.27...294 lb}_f\text{-ft)}</math>  <math>M_{2max} = 43 \dots 791 \text{ Nm (31.7...583 lb}_f\text{-ft)}</math>            Dependent on the gear unit size and ratio</p> <ul style="list-style-type: none"> <li>• Solid shaft</li> <li>• Hollow shaft with key</li> <li>• Hollow shaft with clamping element/ shrunk disk</li> <li>• Flange</li> <li>• Foot</li> <li>• Circle of threaded holes</li> <li>• Torque bracket</li> </ul>
Bevel geared motor		
	<p>Nominal ratio            Rated output torque (S3-60 %)            Max. permissible accelerating torque            Torsional backlash            Efficiency            Mechanical options</p>	<p><math>I_{nom} = 4 \dots 76</math>  <math>M_2 = 3.8 \dots 1626 \text{ Nm (2.8...1199 lb}_f\text{-ft)}</math>  <math>M_{2max} = 20 \dots 4650 \text{ Nm (14.75...3430 lb}_f\text{-ft)}</math>            10 ... 12 arcmin            94 ... 96 %</p> <ul style="list-style-type: none"> <li>• Solid shaft</li> <li>• Hollow shaft with key</li> <li>• Hollow shaft with clamping element/ shrunk disk</li> <li>• Flange</li> <li>• Foot</li> <li>• Circle of threaded holes</li> <li>• Torque bracket</li> </ul>



# Geared servo motors

## with planetary gear units



Servomotors with planetary gear units are the optimum choice for motion control applications where high to very high requirements are placed on precision and dynamic performance. Depending on the actual requirement, three different versions are available:

- Planetary gear units, series LP+, mounted onto 1FK7 motors are extremely precise and compact.
- Planetary gear units, series SP+, mounted onto 1FK7, 1FT6 and 1FT7 motors distinguish themselves as a result of their compact design and also the highest degree of precision.
- Compact geared motors, 1FK7-DYA are the smallest geared motor solution taking up the least space.

As a result of their mechanical design, planetary gear units are extremely compact. Together with the compact synchronous servomotors, they provide solutions for applications where the mounting space is restricted. The highly integrated 1FK7-DYA compact geared motor is especially space-saving. It can be mounted in a wide variety of positions that allows the optimum planetary geared motor to be selected for every mounting situation.

The planetary gear units have a high efficiency, are torsionally stiff and have the lowest torsional backlash. This makes them

admirably suited for applications with extremely high demands on the precision. The motor and gear unit are supplied as unit and the gear units are already filled with oil or grease in the factory. This means that they can be quickly and simply mounted in any position. The CAD CREATOR tool – that is freely accessible – supplies the mechanical data required for the mounting.

As a result of the rugged design and the permanent lubrication filled in the factory, geared servo motors with planetary gearboxes are maintenance-friendly. Geared servo motors with planetary gears are available with the same encoder options as the 1FK7/1FT6/1FT7 servomotors.

### Applications

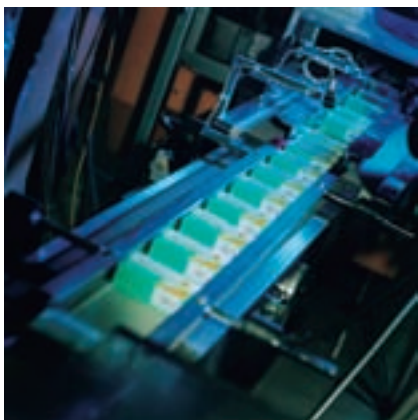
As a result of their features, geared servo motors are preferably used in the following applications:

- Transport conveyor belts and positioning/adjusting axes in handling systems
- Assembly equipment
- Packaging machines
- Plastic machines
- Woodworking, glass and ceramic processing
- Machine tools

The main reason for selecting planetary geared motor over helical and angled geared motor is due to their higher dynamic performance and precision.


### Benefits and features

- Extremely high efficiency
- Extremely low torsional backlash
- Low noise as a result of the helical teeth used for SP+ gears
- In conjunction with 1FT6 motors, available in non-ventilated, force-ventilated and water cooled versions
- Rugged and maintenance friendly
- Any mounting position
- Suitable for continuous operation and cyclic operation with alternating loads



# Geared servo motors

with planetary gear units

1FK7 motors with LP+ geared units		
	<p>Nominal ratio            Rated output torque (S3-60 %)            Max. permissible accelerating torque            Max. input speed            Torsional backlash            Efficiency            Mechanical options</p>	<p><math>I_{nom}</math> = 5, 10  <math>M_2</math> = 5 ... 200 Nm (3.69...148 lb<sub>f</sub>-ft)  <math>M_{2max}</math> = 12 ... 450 Nm (8.85...332 lb<sub>f</sub>-ft)  <math>n_{1max}</math> = 8000 rpm            12 arcmin            97 %  <ul style="list-style-type: none"> <li>• Solid shaft with key</li> <li>• Types of construction IM B14, IM V18, IM V19</li> <li>• Degree of protection IP64</li> </ul> </p>
1FK7-DYA		
	<p>Nominal ratio            Rated output torque (S3-60 %)            Max. permissible accelerating torque            Max. input speed            Torsional backlash            Efficiency            Mechanical options</p>	<p><math>I_{nom}</math> = 5, 10  <math>M_2</math> = 8.4 ... 91 Nm (6.2...67 lb<sub>f</sub>-ft)  <math>M_{2max}</math> = 32 ... 242 Nm (23.6...179 lb<sub>f</sub>-ft)  <math>n_{1max}</math> = 6000 rpm            8 arcmin            97 %  <ul style="list-style-type: none"> <li>• Solid shaft with key</li> <li>• Types of construction IM B5, IM V1, IM V3, IM B14, IM V18, IM V19</li> <li>• Degree of protection IP64</li> </ul> </p>
1FK7 motors with SP+ gear unit		
	<p>Nominal ratio            Rated output torque (S3-60 %)            Max. permissible accelerating torque            Max. input speed            Torsional backlash            Efficiency            Mechanical options</p>	<p><math>I_{nom}</math> = 4, 5, 7, 10 (1-stage)            16, 20, 28, 40, 50 (2-stage)  <math>M_2</math> = 4 ... 1400 Nm (2.95...1032 lb<sub>f</sub>-ft)  <math>M_{2max}</math> = 7 ... 2900 Nm (5.16...2139 lb<sub>f</sub>-ft)  <math>n_{1max}</math> = 6000 rpm            4 arcmin (1-stage)            6 arcmin (2-stage)            97 % (1-stage)            94 % (2-stage)  <ul style="list-style-type: none"> <li>• Solid shaft with/without key</li> <li>• Types of construction IM B5, IM V1, IM V3</li> <li>• Degree of protection IP65</li> </ul> </p>
1FT6/1FT7 motors with SP+ gear unit		
	<p>Nominal ratio            Rated output torque (S3-60 %)            Max. permissible accelerating torque            Max. input speed            Torsional backlash            Efficiency            Mechanical options</p>	<p><math>I_{nom}</math> = 4, 5, 7, 10 (1-stage)            16, 20, 28, 40, 50 (2-stage)  <math>M_2</math> = 2 ... 2500 Nm (1.48...1844 lb<sub>f</sub>-ft)  <math>M_{2max}</math> = 6 ... 4500 Nm (4.43...3319 lb<sub>f</sub>-ft)  <math>n_{1max}</math> = 6000 rpm            4 arcmin (1-stage)            6 arcmin (2-stage)            97 % (1-stage)            94 % (2-stage)  <ul style="list-style-type: none"> <li>• Solid shaft with/without key</li> <li>• Types of construction IM B5, IM V1, IM V3</li> <li>• Degree of protection IP65</li> </ul> </p>

Industry Sector  
Drive Technologies  
Motion Control  
Postfach 3180  
91050 ERLANGEN  
GERMANY

Subject to change without prior notice  
Order No. 6ZB5711-0AL02-0AA1  
Dispo 18401  
BR 0908 6.0 VOG 8 EN / 822295  
Printed in Germany  
© Siemens AG 2008

[www.siemens.com/motioncontrol/motors](http://www.siemens.com/motioncontrol/motors)

The information provided in this brochure contains descriptions or characteristics of performance which in case of actual use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of contract. Availability and technical specifications are subject to change without notice.

All product designations may be trademarks or product names of Siemens AG or supplier companies whose use by third parties for their own purposes could violate the rights of the owners.