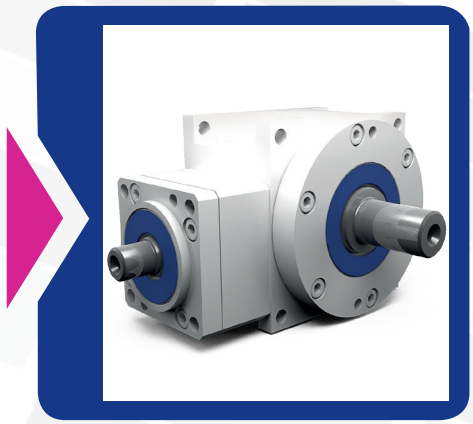
Product Catalogue

ATEK

ANTRIEBSTECHNIK

Das Winkelgetriebe

Performance-optimized
hypoid gearboxes



ATEK ANTRIEBSTECHNIK

Gear ratios: i = 1:1 to 4:1
Maximum output torque: 16 Nm
2 gearbox sizes with edge lengths of 035 to 045 mm
Speeds up to n_1 = 3000 rpm
Low-backlash construction < 10 angular minutes possible

Small, lightweight, space-saving,
Aluminium design
Housing made of aluminium
Spiral-toothed gear sets
Maintenance-free

Miniature bevel gearboxes

Gear ratios: i = 1:1 to 6:1
Maximum output torque: 5400 Nm
9 gearbox sizes with edge lengths of 065 to 350 mm
Speeds up to n_1 = 3000 rpm
Low-backlash construction < 6 angular minutes possible

Sturdy, powerful, compact
Housing made of grey cast iron or steel
Spiral-toothed gear sets
Maintenance-free

Bevel gearboxes

Gear ratios: i = 1:1 to 6:1
Maximum output torque: 430 Nm
4 gearbox sizes with edge lengths of 065 to 140 mm
Low-backlash construction < 10 angular minutes possible

Corrosion-proof, hygienic, powerful
All outside parts made of VA steel
Housing made of 1.4305 material
Maintenance-free

Hygiene-design gearboxes

Gear ratios: i = 3:1 to 15:1
Maximum output torque: 1700 Nm
6 gearbox sizes with edge lengths of 090 to 260 mm
Speeds up to n_1 = 8000 rpm

Dynamic, powerful, compact
Housing made of aluminium
Hypoid gear sets
Axial offset between drive and output-
Maintenance-free

Hypoid gearboxes

Nominal gear ratios: i = 5:1 to 83:1
Maximum output torque: 13,720 Nm
9 sizes, centre-to-centre distance of 040 to 250 mm
Speeds up to n_1 = 3000 rpm
Low-backlash construction < 6 angular minutes possible

Sturdy, powerful, low-noise
Housing made of grey cast iron
Axial offset between drive and output
Maintenance-free

Worm gearboxes

Type VLM – Type VL with motor
Nominal gear ratios: i = 1:1 to 6:1
Maximum output torque: 2310 Nm
Output from 0.12 to 30 kW
IEC standard motor

Type SLM – Type SL with motor
Nominal gear ratios: i = 5:1 to 83:1
Maximum output torque: 13,720 Nm
Output from 0.18 to 35 kW
IEC standard motor

Gearbox motors

Bevel gearboxes suitable for fitting servo-motors
Worm gearboxes suitable for fitting servo-motors
Gear ratios: i = 1:1 to 26:1
Maximum acceleration torque on output: 700 Nm
6 gearbox sizes with edge lengths of 065 to 200 mm

High speeds up to n_1 = 6000 rpm
Minimized circumferential backlash (optional)
High precision
Housing made of grey cast iron

Servo gearboxes (precision gearboxes)

In addition to our standard program we develop and manufacture special gearboxes according to customer requirements.

Questionary

Special gearboxes

We offer gearboxes for use in potentially explosive atmospheres According to EU Directive 2014/34 / EU (ATEX).

Design sheet

ATEX gearboxes

Spiral-toothed bevel gear sets
High-quality worm gear sets
Gear ratios: i = 1:1 to 83:1
Maximum output torque: 13,720 Nm
Toothing module from 0.8 to 12.5 mm

Gear sets

Service
Spare parts drawings for bevel gearboxes
Spare parts drawings for worm gearboxes

Lubricant table
Local contacts

Service

ATEK ANTRIEBSTECHNIK

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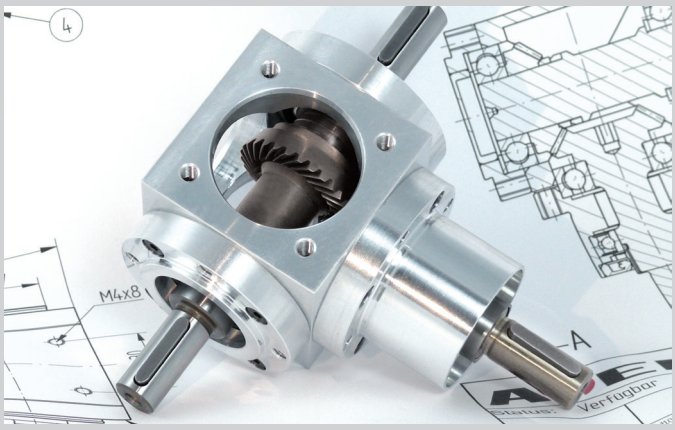

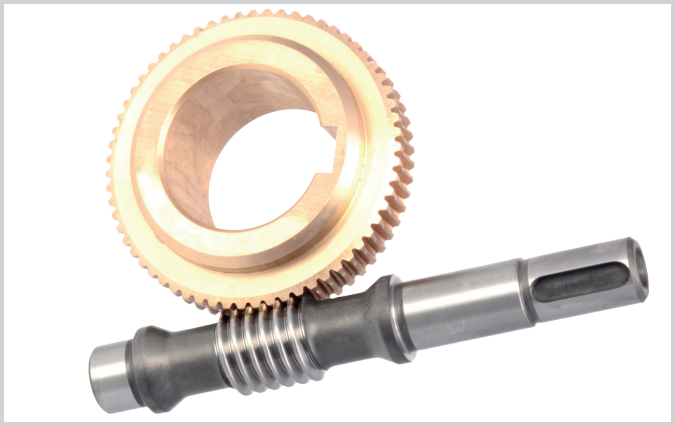

Legal information:
We give no warranty for the correctness of the contents, in spite of thorough processing. With the publishing of this catalogue, all previous catalogues are rendered invalid. We reserve the right to change the design, weight, and dimensions of our angular gearboxes. Deliveries and services are provided according to our “General Terms and Conditions”.

ATEK ANTRIEBSTECHNIK

ATEK Antriebstechnik

As a medium-sized gearbox manufacturer, today we look back on over 75 years of tradition. For more than 30 years, everything for us has “revolved” around right-angle power transmission.

Today, as from the beginning, we are driven by one thing: solving your drive-engineering problems. – technically competent, economical, reliable and fast!

Developed and assembled in the Hamburg metropolitan region and distributed throughout the world, our range of products comprising single-stage angular gearboxes has allowed us to secure a large market share which has been steadily growing for the past number of years.

The modularly structured product range primarily comprises bevel gears and worm gears and the servo series which can be combined with modern servo-motors. Our angular gearboxes stand out thanks to their compact build, extensive performance spectrum and variety of feasible step-up/down ratios. Thanks to our enormous warehouse we can often supply our standard series within a matter of hours.
Be it for application-specific drive train solutions for special machine construction or series products for general machine construction: The ATEK modular system leaves nothing to be desired.

Our customers benefit from well-engineered drive train solutions, top-quality products and processes, established know-how and very reasonable value for money.

In addition to a worldwide distribution network which guarantees competent, on-site support, round-the-clock contact and communication can also be established over the Internet. A gearbox configurator is available via our www.atek.de homepage, from which customers and interested parties can download the 3D CAD data of all ATEK bevel gearboxes, worm gearboxes and servo gearboxes, thus allowing them to be more effectively integrated into the construction and supply process.

1939
Formation of Willi Glapiak turnery in Hamburg

1978
Change of legal form into a GmbH (limited liability company)

1983
Merger of Willi Glapiak GmbH and ATEK Ingenieurbüro f. Antriebstechnik to today’s ATEK Antriebstechnik Willi Glapiak GmbH and transfer of the company seat to Rellingen

1985
Focussing on single-stage bevel gearboxes and worm gearboxes

Our motto is Vmax…
and not only with regard to the rotational speed of our products

Drive
Our hallmark:
Excellent ability to supply

Efficient logistics:
High parts availability at our locations and those of our partners

Fast and almost constant reachability

Know-how
Realisation of our high quality standards through selected, highly specialised suppliers and a qualified and experienced staff team

Our processes are subject to continuous monitoring

Our management system is certified

Performance
Whether standard or special manufacture, maintenance or advisory service...
Your drive-engineering task definition is our challenge!

We set benchmarks as to reliability, dynamics, and high precision

We stand for long-standing partnerships, loyalty and confidence

1995
Inclusion of servo gearboxes (Ad-Servo series) into the product range

1997
Relocation to Prisdorf / Expansion of production capacities

Since 2002
Internationalisation / Development / extension of foreign markets

2009
Inclusion of miniature gearboxes (L series) into the product range

2012
Inclusion of hypoid gears (HC series) into the product range

2013
Relocation to Rellingen with renewed expansion of production capacities

4.1 Gearboxes

"A gearbox is a machine element used to change movement parameters. Sometimes, the change of a force or a torque plays the decisive role. The movement to be changed is often a rotary movement." (Wikipedia)
ATEK offers angular gearboxes of the following types that deflect the direction of a rotary movement by 90° and, if desired, also change the rotational speed and the torque.

Bevel gearboxes – types

L	miniature
LC	prepared for the mounting of a servo-motor
V	with free shaft ends
HDV	Hygiene-design bevel gearboxes
VS	the through-shaft is fast-running
VL	prepared for the mounting of an IEC standard motor
VLM	complete with IEC motor
VC	prepared for the mounting of a servo-motor

Hypoid gearboxes – types

H	with free shaft ends
HC	prepared for the mounting of a servo-motor

Worm gearboxes – types

S	with free shaft ends
SL	prepared for the mounting of an IEC standard motor
SLM	complete with IEC motor
SC	prepared for the mounting of a servo-motor

4.2 Legal classification

The gearboxes are "incomplete machines" within the meaning of the Machinery Directive. They are designed for the European market. In non-EU countries, the respective provisions must be observed. The gearbox must not be put into service until it has been ascertained, if appropriate, that the machine into which the gearbox is to be installed complies with the Directive 3006/42/EC.

4.3 Designations

4.3.1 Designations used

Drive
The shaft of the gearbox that is supplied with energy is designated as drive shaft.

Output
The shaft(s) of the gearbox from which energy is taken is/are designated as output shaft(s).

Designation of gearbox sides
The 6 surfaces of the gearbox housing are designated with the numbers 1–6.
They indicate the fixing side and the installation position.

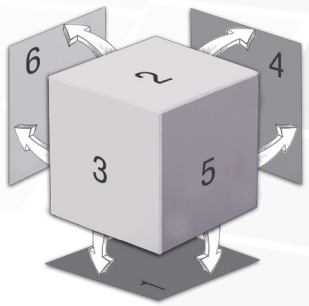

Figure **4.3.1-1; Gearbox sides**

Threaded mounting hole
All gearboxes provide many mounting options on all sides.
For details, please refer to the type-specific information.

Fixing side
The fixing side is the side of the gearbox on which it is connected to the machine rack. It is important, among other things, for the determination of the arrangement of the vent filters. For details, please refer to the type-specific information.

Installation position
The installation position defines the gearbox side which is directed downwards during operation. In the above Figure, the installation position 1 is shown. The information on the installation position is needed for assessing the lubricating conditions, the determination of the vent filter arrangement, and the design of the roller bearings.

Gear ratio

"In engineering, an apparatus with a gear/transmission ratio is a device which transforms the value of a physical variable into another value of the same variable where both values are in a constructively determined ratio to each other." (Wikipedia)

For the gearboxes, the gear ratio (transmission ratio) [i] is defined as:

$$i = \frac{\text{teeth number}_{\text{output}}}{\text{teeth number}_{\text{drive}}}$$

The transmitted variables are rotational speed [n] and torque [T]

$$i = \frac{n_{\text{drive}}}{n_{\text{output}}} \text{ and } i = \frac{T_{\text{output}}}{T_{\text{drive}}} * \frac{1}{\eta}$$

Efficiency

The efficiency [η] is the ratio of power output to power input. The efficiencies specified in the tables can be achieved at maximum permissible rated output during continuous operation. They are guidance values for run-in gearboxes at operating temperature with standard sealing.

Rotational direction of the shaft

The shaft's rotational direction is always seen from the shaft end face towards the gearbox centre.
It is indicated as "clockwise" = CW or "counterclockwise" = CCW

4.4 Corrosion protection

4.4.1 Prime-coated C1 (standard)

If no additional information is given, ATEK gearboxes are delivered with a prime coat of epoxy-resin based two-component paint base.

Example of order code: V 090 1:1 E0 -9.9- 700/0000

Gearbox part	Material	Protection	Application
Housing	Grey cast iron	1x prime coat	Layer thickness > 40 µm
Flanges	Grey cast iron or steel	1x prime coat	Layer thickness > 40 µm
Shafts	C45	greased	

Table **4.4.1-1**

The layer thickness of the surface protection alters the fits defined in the dimensional sketches.
If fits are not to receive corrosion protection, please notify us thereof.

4.4.2 Varnished C2

Upon request, ATEK gearboxes can be varnished in standard and special colour shades. Please contact us.
Example of order code: V 090 1:1 E0 -9.9- 700/C2

Gearbox part	Material	Protection	Application
Housing	Grey cast iron	1x prime coat, 1x covering varnish	Layer thickness > 80 µm
Flanges	Grey cast iron or steel	1x prime coat, 1x covering varnish	Layer thickness > 80 µm
Shafts	C45	greased	

Table **4.4.2-1**

The layer thickness of the surface protection alters the fits defined in the dimensional sketches.
If fits are not to receive corrosion protection, please notify us thereof.

4.4.3 Varnished C3

Upon request, ATEK gearboxes can be equipped with a paint system for the use in an environment exposed to sulphur dioxide.
Please contact us. Example of order code: V 090 1:1 E0 -9.9- 700/C3

Gearbox part	Material	Protection	Application
Housing	Grey cast iron	2x prime coat, 1x covering varnish 1x covering varnish	Layer thickness > 120 µm
Flanges	Grey cast iron or steel	2x prime coat, 1x covering varnish 1x covering varnish	Layer thickness > 120 µm
Shafts	C45	greased	

Table **4.4.3-1**

The layer thickness of the surface protection alters the fits defined in the dimensional sketches.
If fits are not to receive corrosion protection, please notify us thereof.

4.4.4 Varnished C4

Upon request, ATEK gearboxes can be equipped with a paint system for the use in an industrial environment exposed to salt.
Please contact us. Example of order code: V 090 1:1 E0 -9.9- 700/C4

Gearbox part	Material	Protection	Application
Housing	Grey cast iron	1x zinc protection, 1x prime coat 1x covering varnish	Layer thickness > 160 µm
Flanges	Grey cast iron or steel	1x zinc protection, 1x prime coat 1x covering varnish	Layer thickness > 160 µm
Shafts	C45	greased	

Table **4.4.4-1**

The layer thickness of the surface protection alters the fits defined in the dimensional sketches.
If fits are not to receive corrosion protection, please notify us thereof.

4.4.5 Electroplated

Chemically plated with nickel. Example of order code: V 090 1:1 E0 -9.9- 700/KB

Gearbox part	Material	Protection	Application
Housing	Grey cast iron	Ni	~30 µm
Flanges	Grey cast iron or steel	Ni	~30 µm
Shafts	Stainless steel	greased	

Table **4.4.5-1**

4.4.6 Aluminium

Valid for all miniature gearboxes
Example of order code: L 045 1:1 E0 -9.9- 700/0000

Gearbox part	Material	Protection	Application
Housing	Aluminium	-	-
Flanges	Aluminium	-	-
Shafts	C45	greased	

Table **4.4.6-1**

4.4.7 Coated (anodised)

Aluminium anodised
Example of order code: L 045 1:1 E0 -9.9- 700/EL

Gearbox part	Material	Protection	Application
Housing	Aluminium	Anodised coating	~10 µm
Flanges	Aluminium	Anodised coating	~10 µm
Shafts	C45	greased	

Table **4.4.7-1**

4.4.8 Stainless steel

ATEK gearboxes with the “HD” type designation as a prefix will be delivered in a stainless-steel design.
See chapter 7 “Hygiene-design gearboxes”

4.5 Protection classes

Protection class	Seal
IP 54 (standard)	Standard seal NBR, form A
IP 56	Special seal, form AS

Table **4.5-1**

Other protection classes are available on request.

4.6 Shaft types

4.6.1 Construction types

The construction types are classified by rotational direction and design of the output shaft.

Overhung-mounted output shaft	A0	F0
Drive shaft and output shaft have the **same direction of rotation**	B0	G0
Drive shaft and output shaft have **opposite directions of rotation**	C0	H0
One **continuous output shaft** made of solid material	D0	J0
One **continuous hollow shaft** at the output	E0	K0

4.6.2 Solid shaft

In the standard design, a shaft fit with the ISO tolerance field 6 is provided.
The parallel keyways of the individual shafts are aligned with each other during the assembly. Due to the gear meshing, positional deviations may occur.

4.6.3 Hollow shaft

The order code of the hollow shaft design is coded with 4 characters. The first two characters define the construction type. The third character defines the type of force transmission, and the fourth character defines the gearbox side with the selected force transmission.

1st numeral	2nd numeral	3rd numeral	4th numeral
Construction types		Force transmission	On gearbox side
E	0	K (splined shaft)	5
K	1	N (groove)	6
	2	S (clamping hub)	0 (5+6)
		P (polygon shaft)	

Standard hollow shaft E0N* (K0N*) *- Gearbox sides

The output shaft will be constructed as a hollow shaft with the ISO tolerance field 7. It will then be delivered with a parallel keyway: according to DIN 6885, Sheet 1. (Order code E0N, K0N) Many gearbox sizes can also be delivered with an enlarged hollow shaft bore (order code /SH).

Hollow shaft with splined hub profile E0K* (K0K*) *- Gearbox sides

The hollow shaft gearboxes can also be delivered with a hollow shaft with splined shaft profile according to DIN ISO 14.
(Order code E0K, K0K)

Hollow shaft with shrink disc E0S* (K0S*) *- Gearbox sides
The hollow shaft with shrink disc enables non-positive (frictional) transmission of the torque. The bore of the hollow shafts is stepped for easier mounting and has a bronze bushing on the guide side. (Order code E0S, K0S)

Hollow shaft with polygon profile (E0P*, K0P*) *- Gearbox sides
The hollow shaft gearboxes can also be delivered with a hollow shaft with polygon profile according to DIN 32711. (Order code E0P, K0P)

4.7 Lubricants

ATEK gearboxes are factory-filled with synthetic oils. Especially for applications in machines of the food industry and pharmaceutical industry, the gearboxes can optionally be delivered with NOTOX lubricants (order code /NT) that meet the requirements according to NSF H-1. All lubricant designations and alternatives can be gathered from the lubricant table on page 423.
No oil change will be necessary during the gearbox lifetime if the mechanical and thermal limit ratings are observed.
The lifetime of the bearings can be increased by the factor 1.5 if the oil is changed after the first 500 service hours and then every 5000 service hours.

4.8 Radial shaft seal rings

The rotating shafts are sealed by radial shaft seal rings according to DIN3761.
In the standard application, the type A made of NBR material (nitrile butadiene rubber) is used. In a dust-bearing environment, the type AS with an additional dust lip is used. For oil temperatures up to 130°C, shaft seal rings made of FCR (fluorocarbon rubber) can be used.

4.9 Gearbox data and layout

4.9.1 Lifetime
In case of intended use, the lifetime of all gearbox elements will be more than 15,000 hours. The precondition is that the layout and the operation are according to the guidelines of the catalogue.

4.9.2 Noise generation
The noise generation depends on many factors. Examples are gearbox size, speed, direction of rotation, lubrication, and installation position. Other important influences result from the installation conditions.

4.9.3 Output and torque values
The values in the performance tables are valid for the lubrication with synthetic oils. A lubricant temperature of 90°C is taken as a basis for the thermal limit rating. If an exceeding of the permissible oil temperature is safely prevented by special measures (e.g. oil cooler) examination of the thermal limit rating may be refrained from.

In special cases, e.g. in case of very short operating time or only static load, an increase of the permissible torques is possible, if appropriate.

The permissible rated power inputs $\mathbf{P_{1N}}$ and rated output torques $\mathbf{T_{2N}}$, which are listed in the performance tables, are valid for shock-free operation, 10 hours of daily operation period, 10 run-ups per hour. The rated thermal outputs $\mathbf{P_{1Nt}}$ and output torques $\mathbf{T_{2Nt}}$, respectively, are valid for an ambient temperature of 20°C and continuous operation. The maximum output torque $\mathbf{T_{2max}}$ may be achieved during short-time load peaks, but must not be exceeded. The operating conditions according to the design factors are presupposed. (see 4.8.6.2)

4.9.4 On-period ED
The on-period (ED, abbrev. for German term Einschaltdauer) designates a maximum permissible operating interval of a piece of equipment after which a rest period is required in order not to damage or destroy the piece of equipment. The rated modes are specified, inter alia, in the DIN VDE 0530-1. The on-period can be indicated dimensionless as a percentage value (ratio of useful life to the observation period). Generally, the utilisation period is indicated in addition to the percentage value. If not, the utilisation period is considered to be 10 minutes. (Wikipedia)

VDE 0530-1	Operating mode
S1	Continuous operation, constant load
S2	Short-time operation, constant load
S3	Intermittent operation without influence of starting on the temperature
S4	Intermittent operation with influence of starting on the temperature
S5	Intermittent operation with influence of starting and braking on the temperature
S6	Continuous operation with intermittent load
S7	Continuous operation with starting and braking
S8	Continuous operation with load change

4.9.5 Abbreviations used

Abbreviation	[Unit]	Designation
F_r	[N]	Radial force
F_a	[N]	Axial force
i_{ist}	[-]	Actual gear ratio
i	[-]	Nominal gear ratio
P_1	[kW]	effective input power
P_2	[kW]	effective output power
P_{1N}	[kW]	permissible nominal input power, mechanical
P_{1Nt}	[kW]	permissible nominal input power, thermal
P_{1m}	[kW]	corrected input power, mechanical
P_{1t}	[kW]	corrected input power, thermal
T_1	[Nm]	input torque
T_{1B}	[Nm]	permissible acceleration torque at the input drive (servo gearbox)
T_{1NOT}	[Nm]	permissible input torque in case of emergency shut-off (servo gearbox)
T_2	[Nm]	effective output torque
T_{2B}	[Nm]	permissible acceleration torque at the output drive
T_{2N}	[Nm]	permissible nominal output torque, mechanical
T_{2NOT}	[Nm]	permissible output torque in case of emergency shut-off
T_{2Nt}	[Nm]	permissible nominal output torque, thermal
T_{2m}	[Nm]	corrected output torque, mechanical
T_{2max}	[Nm]	maximum permissible output torque
T_{2t}	[Nm]	corrected output torque, thermal
T_A	[Nm]	starting torque
J	[kgcm^2]	inertia moment
J_1	[kgcm^2]	inertia moment related to the fast-rotating shaft
$J_{ex.\ red.}$	[kgcm^2]	external inertia moments reduced to drive shaft
J_{mot}	[kgcm^2]	inertia moment of the motor
N_1		fast-rotating shaft
N_2		slowly rotating shaft
f_1	[-]	operating factor
f_2	[-]	starting factor
f_3	[-]	lubrication factor
f_4	[-]	temperature factor
f_5	[-]	duty-cycle factor
f_{MB}	[-]	mass acceleration factor
n_1	[rpm]	speed of fast-rotating shaft
n_2	[rpm]	speed of slowly rotating shaft
t_u	[°C]	ambient temperature
η	[-]	efficiency
η'	[-]	efficiency in case of driving worm gear

4.9.6 Layout

Calculation of power and torque

The following relations exist between the power (P), the torque (T) and the rotational speed (n):

$P_1 = T_1 * n_1$

$n_1 = n_2 * i$

$P_2 = T_2 * n_2$

P_1: Power is input to the shaft (torque and rotational direction have the same sense of rotation)
P_2: Power is taken off (torque and rotational direction have an opposite sense of rotation)
n_1: speed of fast-rotating shaft
n_2: speed of slowly rotating shaft
The following formulas apply to the (normal) case where power is input to the fast-rotating shaft (the shaft N_1 is driven): $P_2 = P_1 * \eta$

Required input power with **given** output torque and output speed of the **driven machine**

$$P_1\,[kW] = \frac{T_2\,[Nm] * n_2\,[rpm]}{\eta * 9550}$$

Formula 1

Available output torque with **given** input power and input speed of the **driving machine**

$$T_2\,[Nm] = \frac{P_1\,[kW] * i * \eta * 9550}{n_1\,[rpm]}$$

Formula 2

When selecting the gearbox size, it is necessary to consider the influences that the gearbox will be exposed to later.
This is done through the design factors specified below.
The transmittable power, or the torque, may be reduced by these factors!
In order to determine the gearbox size, the required input power or the output torque must be calculated by means of the operating factors.
Mechanical and thermal influences are taken account of by the formulas.

Mechanical:
$P_{1m} = P_1 * f_1 * f_2 * f_3$
$T_{2m} = T_2 * f_1 * f_2 * f_3$

The following conditions apply:
$P_{1m} < P_{1N}$
$T_{2m} < T_{2N}$

Thermal:
$P_{1t} = P_1 * f_3 * f_4 * f_5$
$T_{2t} = T_2 * f_3 * f_4 * f_5$

The following conditions apply:
$P_{1t} < P_{1Nt}$
$T_{2t} < T_{2Nt}$

Design factors (f_1, f_2, f_3, f_4, f_5, f_6)

Operating factor f_1

Determination of load group f_{MB}

$$f_{MB} = \frac{J_{ex.\,red.}}{J_{mot}}$$

f_{MB}	Group	Examples
< 0.25	G low load / without shocks	Filling machines, elevators, light conveyor spirals, light conveyor belts, blowers, small agitators, inspection machines, assembly lines, machine tool auxiliary drives, centrifuges, packaging machines.
< 3.00	M medium load / slight shocks	Reels, agitators, slat conveyors, calendering machines, cargo lifts, mixers, balancing machines, heavy conveyor belts, sheet-metal bending machines, road construction machines, planing machines, shears, extruders, machine tool main drives, kneading machines, weaving looms, light roller beds.
< 10.00	S high load / severe shocks	Excavators, heavy mixers, presses, edge mills, rolling mills, heavy roller beds, cold-rolling mills, stone crushers, eccentric presses, cutting heads, edge-forming machines, belt conveyors (parcelled cargo/goods), barking drums, running gears, punching machines, piston pumps, rotary furnaces, mills/pulverisers, plate turnover devices.

Table **4.9.6-1**

Determination of operating factor f_1

Driving machine	Load group	Operating hours / day			
	fMB	<0.5	3	10	24
Electric motor	G	0.80	0.90	1.00	1.25
Hydraulic motor	M	0.90	1.00	1.25	1.50
Turbine	S	1.00	1.25	1.50	1.75
Combustion engine	G	0.90	1.00	1.25	1.50
4-6-cylinder engine	M	1.00	1.25	1.50	1.75
	S	1.25	1.50	1.75	2.00
Combustion engine	G	1.00	1.25	1.50	1.75
1-2-cylinder engine	M	1.25	1.50	1.75	2.00
	S	1.50	1.75	2.00	2.25

Table **4.9.6-2**

Starting factor f_2

Starts per hour	up to 10	10-60	60-500	500-1500
f_2	1.0	1.1	1.2	1.3

Table **4.9.6-3**

Lubrication factor f_3

	Synthetic oil	Mineral oil	Mineral oil
	Bevel gearboxes, worm gearboxes	Worm gearboxes	Worm gearboxes
	All sizes	Size 040-080	Size 100-200
f_3	1.0	1.2	1.25

Table **4.9.6-4**

Temperature factor f_4

The factor f_4 considers the influence of the ambient temperature

t_u [°C]	10	20	30	40	50
f_4	0.9	1	1.15	1.4	1.7

Table **4.9.6-5**

Operating mode / duty-cycle factor f_5

The operating mode is defined via the duty cycle (on-period). The on-period can be indicated dimensionless as a percentage value.

$$ED = \frac{\text{Loading time}}{\text{Observation period}} * 100\%$$

Generally, the utilisation period is indicated in addition to the percentage value. If not, the utilisation period is considered to be 10 minutes.

	Operating mode	On-period
S1	Continuous operation	more than 60% of the cycle time or longer than 20 minutes
S5	Cyclic operation	Here, the on-period is less than 60% of the process procedure and less than 20 minutes

Table **4.9.6-6**

Principally, the limit values for speed, torque, acceleration and temperature must be observed in all operating modes.

On-period in %	100	80	60	40	20
f_5	1.0	0.95	0.86	0.75	0.56

Table **4.9.6-7**

4.10 Maintenance and starting-up

For information on starting-up and maintenance, please refer to the operating instructions. They can be found on the Internet by accessing www.atek.de/download. There you can also find information on the Machinery Directive 2006/42 EC.

4.11 Ordering

ATEK gearboxes are available in many variants. When a gearbox is first ordered, we will define a unique article number. In case of follow-up orders, it is enough to specify our article number to reorder exactly the same gearbox type.