GROUPS

ATC

THE BEST INDUSTRIAL EQUIPMENT

EMAIL
airtac.atcgroup@yahoo.com
WEBSITE
www.atcgroups.com

Product series intrduction

PAB Series

7 Kinds of Base Sizes		42mm-220mm
Rated Output Torque		14Nm-2000Nm
Ratio	1 Stage	3/4/5/6/7/8/10
	2 Stage	12/15/20/25/30/35/40/50/60/70/80/100
Backlash	1 Stage	≤3, ≤5 arcmin
	2 Stage	≤7, ≤10 arcmin

PABR Series

7 Kinds of Base Sizes		42mm-220mm
Rated Output Torque		14Nm-2000Nm
Ratio	1 Stage	3/4/5/6/7/8/10/14/20
	2 Stage	15/20/25/30/35/40/50/60/70/80/100/120/140/160/200
Backlash	1 Stage	≤10 arcmin
	2 Stage	< 15 arcmin

PABZ Series

7 Kinds of Base Sizes		60mm-180mm
Rated Output Torque		23Nm-1200Nm
Ratio	1 Stage	3/4/5/7/8/10
	2 Stage	12/15/20/25/30/35/40/50/70/80/100
Backlash	1 Stage	≤10 arcmin
	2 Stage	≤15 arcmin

PAD Series

7 Kinds of Base Sizes		47mm-255mm
Rated Output Torque		14Nm-2000Nm
Ratio	1 Stage	4/5/7/8/10
	2 Stage	20/25/35/40/50/70/100
Backlash	1 Stage	≤3, ≤5 arcmin
	2 Stage	≤7, ≤10 arcmin

PADR Series

7 Kinds of Base Sizes		47mm-255mm
Rated Output Torque		14Nm-2000Nm
Ratio	1 Stage	4/5/7/8/10/14/20
	2 Stage	20/25/35/40/50/70/100/140/200
Backlash	1 Stage	≤2, ≤4, ≤6 arcmin
	2 Stage	≤4, ≤7, ≤9 arcmin

PPG/PPGA Series

7 Kinds of Base Sizes		40mm-160mm
Rated Output Torque		9Nm-423Nm
Ratio	1 Stage	3/4/5/7/8/10
	2 Stage	12/15/20/25/30/35/40/50/70/100
Backlash	1 Stage	≤10 arcmin
	2 Stage	≤15 arcmin

Product structure diagram

PAB-1 Stage

PAB-2 Stage

PABR-1 Stage

PABR-2 Stage

PABZ-1 Stage

PABZ-2 Stage

PAD-1 Stage

PAD-2 Stage

PADR-1 Stage

PADR-2 Stage

PPG-1 Stage

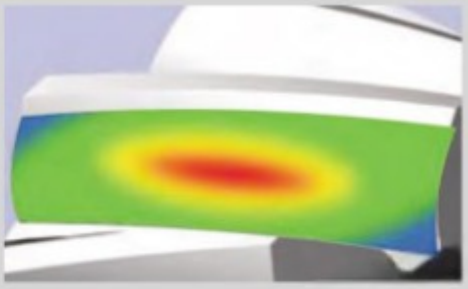
PPG-2 Stage

PPGA-1 Stage

PPGA-2 Stage

Product features

Gears gained optimum wear-resistant and shock-resistant performance from perfect nitrocarburized material

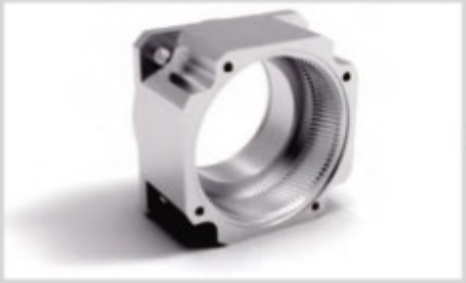


The gear rigidity was set through finite element analysis with the help of ANSYS. This technology also modified the tooth type and the lead. Thus it not only considerably trimed the noise created by engagement of gears but also increased the service life of gear trains.

The stable integral structure that output planetary carries adopted was formed through large span distributed front and back bearings inside the gearbox for highest torsional stiffness and precision.

Example

The high-grade steel which undergoes thermal treatment makes outstanding material density possible. The ring gear and output housing uses integral structure which ensures that all geometry dimensions could be processed at one time. Moreover, higher precision and robust are realized compared other embedded or clamped structures.



With its integral structure adoped by the input shaft and locking device, the symmetrically distributed double bolts can not only reach dynamic balance but effectively prevent the slippage of motor shaft operation. Thus high precision and nearly zero backlash performance can be realized.

Reducer selection and attentions

Planetary reducer selection

Selecting planetary gearboxes should comply with appropriateness and economy principles.That means the variety indexes of gearboxes should meet requirements of application and cost.Over or under this principle would bring wasted cost.

Improper reducers are the main reason why they ill-operate sometimes.So this selection step is a matter of cardinal significance.

Some internal factors need to be on the considering list such as structure type,loading capacity,gearbox ratio,output speed,axial force,radial force,torsional stiffness and backlash. ect. In addition,some external elements need to be considered as well.Such as installation forms,working environment and ambient temperature.ect.Here comes steps about choosing gear units appropriately for your convenience.

Step1: Determine reducer specifications.

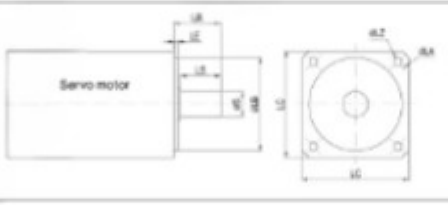
Step	Explanation	Term	Parameter Calculation						
1	Service Factor	f_1	Loading classification	Start-Ups Per Hour Z	Using fs Running Hours Per Day (h)				
					h<4	4<h<8	8<h<12	12<h<16	16<h<24
			Uniform	Z<10	0.85	0.95	1.00	1.20	1.60
				10<Z<30	0.90	1.10	1.15	1.40	1.80
				30<Z<100	1.00	1.20	1.30	1.60	2.00
			Medium shock	Z<10	1.00	1.20	1.30	1.60	2.00
				10<Z<30	1.10	1.35	1.45	1.80	2.20
				30<Z<100	1.20	1.45	1.60	2.00	2.40
			Heavy shock	Z<10	1.20	1.45	1.60	2.00	2.40
				10<Z<30	1.30	1.55	1.75	2.20	2.50
				30<Z<100	1.40	1.65	1.90	2.40	2.80
2	Torque Verification	T_{2N}	T2N>TC2 (The rated torque of selected reducer must be greater than calculated torque TC2) TC2=Tr2*fS (Tc2-calculated torque, Tr2-needed torque, fS-service factor)						
3	Rated Input Speed	n_1	Allowable max.output speed please check the gearbox profile.						
4	Gearbox Ratio	i	$i=n_1/n_2$						
5	Gear Efficiency	η	L1≥95%, L2≥92%						
6	Calculate the input power through needed torque or power of the application	P_1	$P_1=(T_2\times n_2)/(9550\times i\times\eta)$ Or $P_1=P_2\div\eta$						
7	Verify types of the gearbox based on the sheet of transmission force	T_{2N}, P_{1N}	$T_{2N}\geq T_1\times f_1\times f_2$ $P_{1N}\geq P_1\times f_1\times f_2$						
8	Confirm The radial and axial force of output shaft	Fr, Fa	Verify types of the gearbox based on the sheet of transmission force.						
9	Verify the working condition		Protection degree, operating temperature, chemical circumstance.ect.						
10	Confirm installation based on room		Coaxial installation, 90°right angle installation.						
11	Verify the gearbox type		Confirm specific series, type, specification and accessaries according to performance file, input and output way.						

Note: n_1, P_2 refer to the speed and the power of the working machine. P_1, T_2 refer to the power and the torque a working machine needs. P_{1N}, T_{2N} are the power and the torque a reducer needs in practice.

Step2:Determine the motors. Determine the motor manufacturers, specification models, performance indicators and external dimensions.

Motor Model:MHMD-082G1U

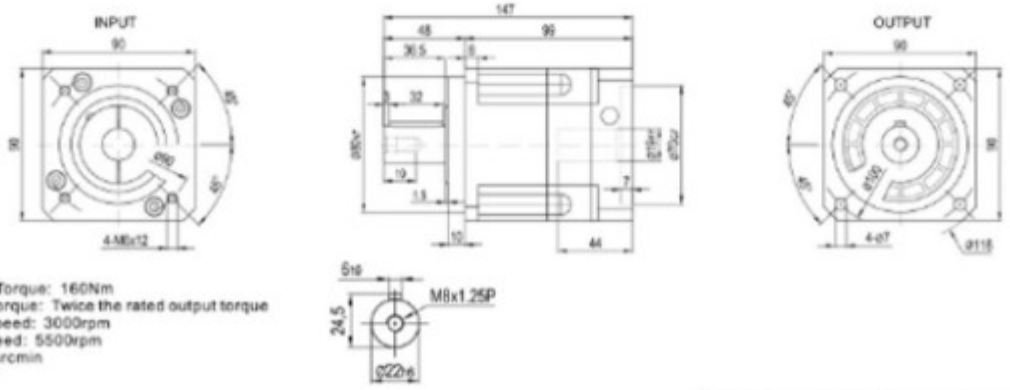
Output	0.75	kw
Rated Torque	2.4	NM
Max.Torque	7.1	NM
Rated Speed	3000	RPM
Max.Speed	4500	RPM
Inertia	6.6	Kg/cm²
Shaft Dia	Ø19	mm
Diameter	□80	mm
Flange	Ø70	mm
Central Distance	Ø90	mm



Notice for ordering

Motor Type And Dimension:
Planetary Gearbox Type:
Torque: Actual Grade:
Ratio:
Specific Requirement in Appearance And Installation:

Step3:Determine the specifications and models of the order planetary reducers,determine the CAD or PDF drawings given by the factory, and write the correct models, such as FAB090-05-52-P2/MHMD-082GIU.



1.Ratio: 1:5
2.Rated Output Torque: 160Nm
3.Max. Output Torque: Twice the rated output torque
4.Rated Input Speed: 3000rpm
5.Max. Input Speed: 5500rpm
6.Backlash: ≤5arcmin
7.Noise: ≤65dB

PAB090/5-Ø19-Ø70*24.5*M6

Configuration	PAB090-05-S2-P2

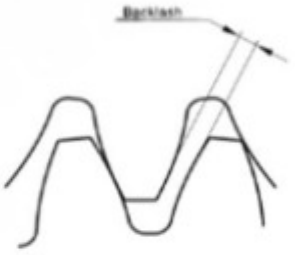
Reducer selection and attentions

ase concepts of precision planetary gear boxes

Ratio	Input speed/ Output speed
Rated Input Speed n_1[rpm]	It is drive speed of gearbox.The value is the same as motor speed when they are connected directly. Referred value in this brochure came out in the temperature around 20°C.Lower speed should be set under higher tempera
Output Speed n_2[rpm]	The input speed and ratio must be included in the calculation:
Stages	Large ratio could be achieved by 2 or 3 sets of planetary gears.That is to say higher ratio comes with more stages.With more gears, surely length of the reducer would be increased and its efficiency would be decreased.
Transmission Efficiency	It refers to the drive efficiency of a gearbox under a rated load.Higher ratio comes with more stages and lower efficiency.
Average Lifetime	Continuous operating time of a gearbox under the rated load.
Orientation Accuracy	It referred to two elements:a loaded deflection angle which involved backlash and torsional stiffness and a movement controled deflection angle involved synchronous deviation.

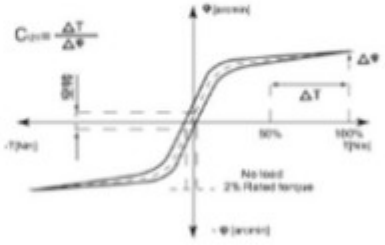
Backlash

Backlash is defined as the angle the gearbox output shaft can be rotated without the input shaftmoving. Backlash can be large (a few degrees) in cheap gears, much lower in precision gears.



Hysteresis Cycle

For the torsional stiffness of the gearbox, we could get a hysteresis cycle from tests. Firstly, fix the input shaft then persistently loading the maximum output torque T_{2b} from two directions respectively. Secondly, unload them gradually. Then the deviation angle could be recorded by testing instrument, which, is a closed curve. Finally, we could calculate its backlash J, and torsional stiffness C_{t21}.



Inertia

Inertia in this booklet all referred to inputs.It is the tendency of objects to keep moving in a straight line at constant velocity.

Inertia Ratio

Refers to the ratio between load inertia and the transmission system inertia. It decides the controllability of the system. The greater λ (differences between inertias) is, the harder the operation of high dynamic could be controlled precisely. Referenced value of λ should be controlled within 5. The unit could reduce inertia below $1/i^2$.

Noise

The value (dB) came out with 3000 r/min of input speed without load and at a distant of 1 m from the reducer.

Operating conditions

Operating temp ℃	-10℃~+90℃
Degree of protection	IP54/IP65
Lubrication	Life time lubrication
Mounting position	Any

Reducer selection and attentions

Basic concepts related to reducer selection

Rated Output Torque T_{2N}[Nm]	The rated output torque means the loadable torque without any abrasion under long time (working continually) operation of the gearbox. It should meet conditions as average loading, the safe factor S=1. Models under PPG160/PAB142 could be operated in 20000 hours theoretically. The rated lifetime of PAB180 and above would be 10000 hours. The value T_N complies with gear standard ISODP6336 and bearing standard ISO281.
Acceleration Torque [Nm]	It refers to the maximum torque loaded on output shaft within short period of time when under 1000 per hour in working cycle.The accelerating torque is the maximum value of periodic working system selection. When in practical application, it should be smaller than T_{2B} or the service time of the unit would be reduced.
Emergency Braking Torque [Nm]	Emergency braking torque means the maximum torque loaded by the output shaft of the gearbox. This torque could be loaded for 1000 times and never could it be greater than 1000 within its service life. (Note: The formula of models under PPG160/PAB142 is $T_{2NOT}=2*T_{2B}$ and above PAB180 is $T_{2NOT}=1.5*T_{2B}$)
No-Load Torque T_{012}[Nm]	The torque applied to the gearbox to offset the friction inside.
Max.Output Torque T_{2B}	It usually refers to the peak load or start-up load and was defined as the output torque a reducer could bear under the circumstances of standstill or frequent start-ups.
Needed Torque T_2[Nm]	The needed torque depends on the practical application thus the rated torque of a candidate reducer must be greater than this value.
Calculation Torque T_{C2}[Nm]	It can be needed when choosing a gearbox and is produced by two given magnitudes of needed torque T2 and coefficient fs through this equation:TC2=T2*fs≤TN
Tilting Torque [Nm]	The torque that axial and radial force exerted on the radial stressed point of an output bearing.The equation is: $M_{kenter}=[Fa*y_2+Fr*(X_2+Z_2)]/1000$
Tilting Torque [Nm]	The torque that axial and radial force exerted on the radial stressed point of an output bearing.The equation is: $M_{kenter}=[Fa*y_2+Fr*(X_2+Z_2)]/1000$
Axial Force Fa[N]	Axial force refers to a kind of force parallel to the shaft center whose action point would have a certain deviation Y_2. Then an extra bending moment force would be formed. Couplings would be needed to offset axial force when it overs the rated value the samples have shown.
Radial Force	It means a kind of force vertical to the axial force and is parallel to its output shaft. It's action point has a certain axial distance X_2 from the shaft end. This point formed a leverage point and the lateral force formed a bending moment force.
Radial Loading Axial Loading	The additional reason to choose a gearbox are the radial and axial forces added on the output shaft. The permitted radial load is determined by the stiffness and the load capacity of a bearing. The maximum value permitted which was showed in the brochure is the force added on the middle of extended shafts (which in 1/2L) in the worst direction. The closer action point is to shaft, the greater radial load permitted will be when the point is not at the middle of shafts and vice versa.
Safety Factor s	Ratio between rated input power of the reducer and the motor power
Service Factor f_1	It shows the applicable features of a reducer and refers to the loading type and operating hours prer day of the gearbox.
Torsional Stiffness [Nm/Arcmin]	It defines by the ratio between loading torque and torsion angle created. $C_{12}=\triangle T/\triangle$ It explains how large the torque is needed to rotate the output shaft an arc minute. The torsional stiffness is figured out from the hysteresis cycle in which we should focus on the 50% to 100% of T_{2B} only on the curve. This curve could be treated as a straight line to some extent.
Installation Torque [Nm]	Installing both of the gearbox and the gearbox-motor set needs installation torque.It would be better using a wrench to accomplish those installation steps.
Attention	Given dimensions of the input shaft was only a suggestion.Specific dimensions would be decided by a suitable motor.Therefore when real reducer dimension is different from this brochure, please comply with its data provided by technical drawing. The output shaft dimension should follow the standard in this book if there is no specific requirement.

Product overiew

Products features

This new generation of precision planetary gearboxes which developed by our team independently are designed for excellent practicality.With domestic and foreign advanced technology,they are marked by these features:

1. **Low noise:** under 65db.
2. **Low backlash:** backlash is under 3 arcmin for single stage and within 5 arcmin for Double Stagess.
3. **High efficiency:** efficiency for single stage exceeds 95% and 92% for Double Stagess.
4. **High input speed:** they can reach 8000 RPM at top.
5. **High torque:** their torques are higher than common standard planetary reducers.
6. **High stability:** with robust alloy steel and hardened gears (hardening treatment through the entire gear),the service can remin its original precision after a long operation time.
7. **High speed reduction ration:** this modular designed series with their high ratio over 1 100 makes those gearboxes connecting each other possible.

Precision usage

Precision planetary gear reducers are widely used in the fields as followed:

1. Aerospace and military industry.
2. Medical and health care and electronic information industry.
3. Industrial robots,production automation and CNC machine tool manufacturing industry.
4. Automotive,textile,printing,metallurgical,environmental protection engineering and warehouse logistics industry.