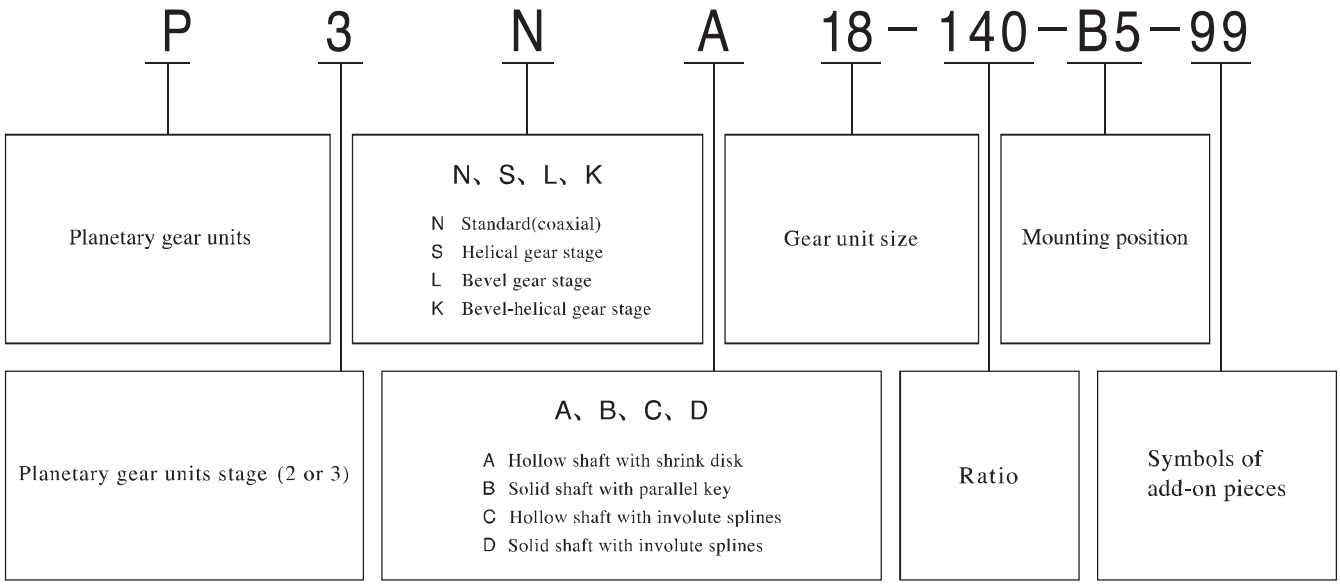
P series gear units overview:

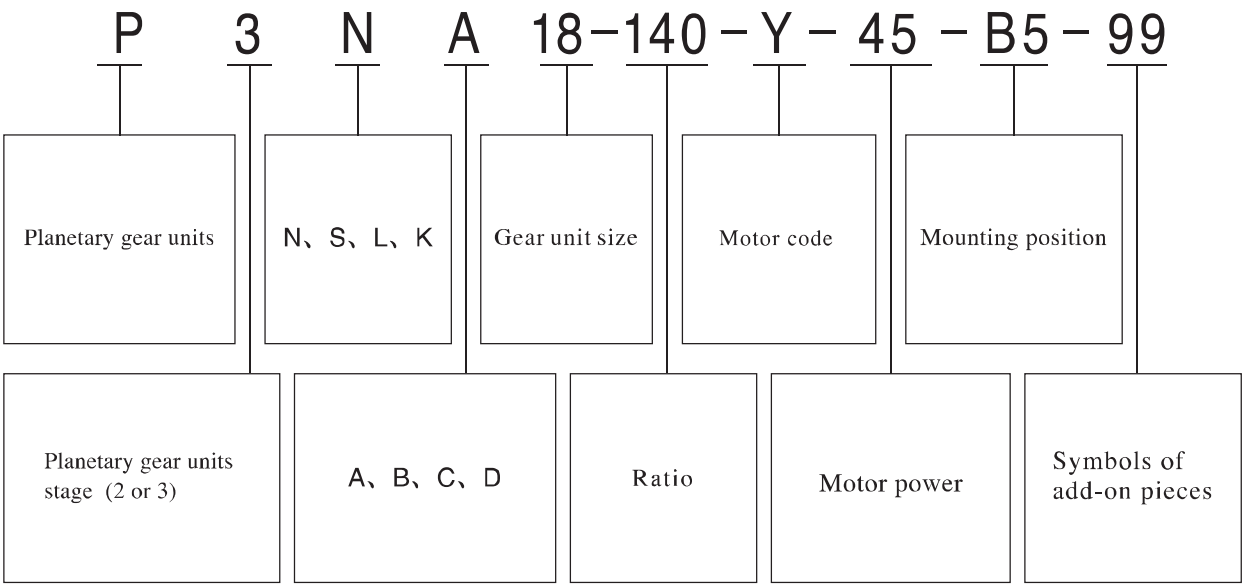
- ❑ Modular design realizes variable combination.
- ❑ Housing is made of cast iron, which improve its rigidity and anti-vibration.
- ❑ Sun and planet gears are processed by cementite and hardening, gears are processed by grinding, which improve the efficiency and lifetime of gear units.
- ❑ Input mode: coaxial input, helical gear input, bevel-helical gear input.
- ❑ Out put mode: internal involute spline, hollow shaft with shrink disk, external involute spline, solid shaft with flat key.
- ❑ Mounting mode: horizontal vertical, torque-arm.
- ❑ P series sizes 9-34, transmission stage: 2, 3, ratio: 25-4000, ratio will be larger in combination with R, K series.

P series model expressing example:

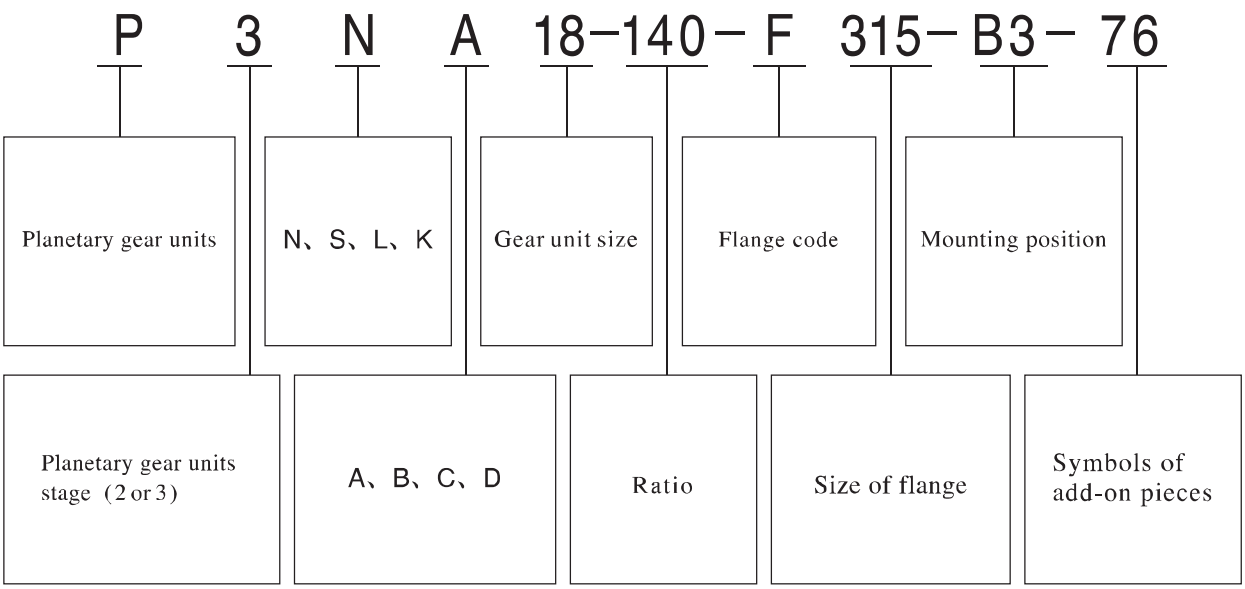
Basic type illustration:



Compact motor mode illustration:



Motor-flange mode illustration:



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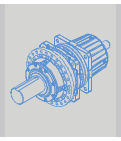


P series type selection example:

Steps	Specification	Symbol	Calculate parameter
1	Driven machine factor	f1	See P307 f1 table
2	Factor for prime mover	f2	Factor for prime mover: f2 Electric motors, hydraulic motors, turbines: 1.0 Piston engines 4 - 6 cylinders cyclic variation 1 : 100 to 1 : 200: 1.25 1–3缸活塞发动机，周期变化1：100 Piston engines 1 - 3 cylinders cyclic variation up to 1 : 100: 1.5
3	Permissible input speed	n_1	≤1500
4	Determine ratio	i	$i=n_1/n_2$
5	Efficiency	η	Type / η / Type / η P2N 94% P3N 92% P2L 93% P3S 91% P2S 93% P3K 89% P2K 91%
6	Determine input power	P1	$P1=T2 \cdot n1/(9550 \cdot i \cdot \eta)$ or $P1=P2/\eta$
7	By calculation, defermine type in reference to transmission table	T_{2N} P_{1N}	$T2N \geqslant T2 \cdot f1 \cdot f2$ or $P1N \geqslant P1 \cdot f1 \cdot f2$ If not meet: $3.33 \cdot P1 \geqslant P1N$ please consult us.
8	Check for maximum torque	T_A	$PIN \geqslant T_A \cdot n1 \cdot f3/9550$

f3	Load peaks per hour			
	1 5	6 30	31 100	>100
Steady direction of load	0.5	0.65	0.7	0.85
Alternating direction of load	0.7	0.95	1.10	1.25

9	Verify axial and radial forces	Fr、Fa	See page 306, P series Fr table

10	Determine power utilization factor	f14	Utilization = P1/P1N · 100% Determine f14.

Utilization	30%	40%	50%	60%	70%	80%	90%	100%
f14	0.66	0.77	0.83	0.90	0.90	0.95	1.0	1.0

11	Verify thermal capacity	P_G	If P1 > PG , auxilliary cooling system shoulld be installed.

Ambient temperature factor f4

Ambient Temperature	Operating cycle per hour (ED) in %				
	100	80	60	40	20
10 °C	1.14	1.20	1.32	1.54	2.04
20 °C	1.00	1.06	1.16	1.35	1.79
30 °C	0.87	0.93	1.00	1.18	1.56
40 °C	0.71	0.75	0.82	0.96	1.27
50 °C	0.55	0.58	0.64	0.74	0.98

12	Verify lubrication method		V1 、V3、 V11 、V31: Dip lubrication; B51:Pump lubrication; others: splash lubrication.
13	Determine type according to the above.		

Peak torque: Maximum torque is maximum starting torque, maximum braking torque.

P

Selection example

Conveyer, input speed 1000r/min,

Max starting torque 2000N · m, output speed 12.5r/min,

Output torque 68000N · m, service time 12h/day.

Dnration of load 60% of workin circle, ambient

temperature 0～20℃, wind velocity 5m/s, large

workshops, altitude below 1000m,

horizontal flange-mounted with solid output shaft.

f_1=1.5

f_2=1

n1=1000

i=1000/12.5=80

Choose P2S according to the above data.

η =0.93

P1=T2 · n1/(9550 · i · η)

=68000 × 1000/(9550 × 80 × 0.93)=95.7kW

T2N ⩾ T2 × f1 × f2=68000N · m × 1.5 × 1=102kN · m

P1N ⩾ P1 × f1 × f2=95.7 × 1.5 × 1=143.55kW

Refer to transmission capacity table,

choose P2SB14-80-B5-99,

P1N=153kW PG1=94kW iex=78.827

Check: 3.33 × P1 ⩾ P1N

3.33 × 95.7 = 318.681 kW > P_{1N}

Check verify peak torque:

P1N=153kW ⩾ T_A · n1 · f3/9550

=2000 × 1000 × 0.5/9550=104.71kW

Check thermal capacities:

Utilization =P1/1PN=95.7/153=0.625=62.5%

So f14=1 Get f4=1.16, according to working conditions.

PG1 × f4 × f14=94 × 1.16 × 0.9=100.32kW > P1

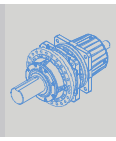
No attached cooling devices can meet requirement.

Mounting position B5

Lubrication method: splash

TYPE: **P2SB14-80-B5-99**

P



Symbol description:

ED =operating cycle per hour, express as percent, for example ED=60%/h

f1=Factor for driven machine

f2=Factor for prime mover

f3=Peak torquq factor

f4 =Ambient temperature factor

f14 = Utilization factor

PG1=Thermal capacity for gear units without auxiliary cooling,

Fr2= Permissible radial forces

P_{N1}= Required power rating

T_A =Tax. torque occurring on input shaft,e.g. peak operating, starting- or braking torque

P series Fr(N) table:

n_1 (r/min)	n_{2N}	i_N	Fr 2 (N)													
			9	10	11	12	13	14	16	17	18	19-20	21-22	23-24	25-26	27-28
1450	58.0	25	9538	23353	32518	42407	34737	41183	72297	64454	69713	70477	99136	99347	123583	126071
	51.8	28	9905	24252	33770	44039	36057	42768	75080	66935	72396	73190	102952	103171	128341	130925
	46.0	31.5	10302	25223	35122	45803	37519	44481	78086	69616	75295	76121	107075	107302	133480	136167
	40.8	35.5	10720	26249	36550	47665	39044	46289	81261	72446	78356	79215	111428	111665	138907	141703
	36.3	40	11155	27314	38033	49599	40629	48167	84559	75386	81536	82430	115950	116196	144544	147454
	32.2	45	11602	28408	39556	51585	42256	50096	87945	78404	84801	85731	120593	120849	150332	153358
	29.0	50	12017	29423	40970	53429	43766	51887	91088	81207	87832	88795	124903	125169	155705	158840
	25.9	56	12479	30556	42547	55486	45451	53884	94595	84333	91214	92214	129712	129988	161700	164955
	23.0	63	12979	31779	44251	57708	47271	56042	98383	87710	94866	95906	134906	135193	168175	171560
	20.4	71	13507	33071	46050	60054	49193	58320	102382	91276	98723	99805	140390	140689	175011	178534
	18.1	80	14055	34413	47919	62491	51189	60687	106537	94980	102729	103856	146088	146398	182114	185780
	16.1	90	14618	35791	49838	64993	53239	63117	110803	98783	106843	108014	151937	152260	189406	193219
	14.5	100	15140	37071	51619	67316	55142	65373	114764	102314	110662	111875	157368	157703	196176	200125
	12.9	112	15723	38498	53606	69908	57265	67890	119182	106253	114922	116182	163427	163774	203729	207830
	11.6	125	16309	39933	55605	72514	59400	70421	123626	110215	119207	120514	169520	169880	211325	215578
	10.4	140	16937	41471	57746	75306	61687	73132	128385	114458	123796	125153	176046	176420	219460	223878

Note: If there is lower output speed, please choose the maximum Fr2 in above table.

Service Factors f1

Factor for driven machine				f1
Driven machines	Effective daily operating period under load in hours			
	0.5	>0.5-10	>10	
Waste water treatment				
Thickeners (central drive)	–	–	1.2	
Filter presses	1.0	1.3	1.5	
Flocculation apparata	0.8	1.0	1.3	
Aerators	–	1.8	2.0	
Raking equipment	1.0	1.2	1.3	
Combined longitudinal and rotary rakes	1.0	1.3	1.5	
Pre-thickeners	–	1.1	1.3	
Screw pumps	–	1.3	1.5	
Water turbines	–	–	2.0	
Pumps				
Centrifugal pumps	1.0	1.2	1.3	
Positive-displacement pumps				
1 piston	1.3	1.4	1.8	
> 1piston	1.2	1.4	1.5	
Dredgers				
Bucket conveyors	–	1.6	1.6	
Dumping devices	–	1.3	1.5	
Carterpillar travelling gears	1.2	1.6	1.8	
Bucket wheel excavators				
as pick-up	–	1.7	1.7	
for primitive material	–	2.2	2.2	
Cutter heads	–	2.2	2.2	
Traversing gears	–	1.4	1.8	
Plate bending machines	–	1.0	1.0	
Chemical industry				
Extruders	–	–	1.6	
Dough mills	–	1.8	1.8	
Rubber calenders	–	1.5	1.5	
Cooling drums	–	1.3	1.4	
Mixers for				
uniform media	1.0	1.3	1.4	
non-uniform media	1.4	1.6	1.7	
Agitators for media with				
uniform density	1.0	1.3	1.5	
non-uniform density	1.2	1.4	1.6	
non-uniform gas absorption	1.4	1.6	1.8	
Toasters	1.0	1.3	1.5	
Centrifuges	1.0	1.2	1.3	
Metal working mills				
Plate tilters	1.0	1.0	1.2	
Ingot pushers	1.0	1.2	1.2	
Winding machines	–	1.6	1.6	
Cooling bed transfer frames	–	1.5	1.5	
Roller straighteners	–	1.6	1.6	
Roller tables				
continuous	–	1.5	1.5	
intermittent	–	2.0	2.0	
Reversing tube mills	–	1.8	1.8	
Shears				
continuous	–	1.5	1.5	
crank type	1.0	1.0	1.0	
Continuous casting drivers	–	1.4	1.4	
Rolls				
Reversing blooming mills	–	2.5	2.5	
Reversing slabbing mills	–	2.5	2.5	
Reversing wire mills	–	1.8	1.8	
Reversing sheet mills	–	2.0	2.0	
Reversing plate mills	–	1.8	1.8	
Roll adjustment drives	0.9	1.0	–	

Driven machines	Effective daily operating period under load in hours		
	0.5	>0.5-10	>10
Conveyors			
Bucket conveyors	–	1.4	1.5
Hauling winches	1.4	1.6	1.6
Hoists	–	1.5	1.8
Belt conveyors ⩽ 150 kW	1.0	1.2	1.3
Belt conveyors ⩾ 150 kW	1.1	1.3	1.4
Goods lifts	–	1.2	1.5
Passenger lifts	–	1.5	1.8
Apron conveyors	–	1.2	1.5
Escalators	1.0	1.2	1.4
Rail travelling gears	–	1.5	–
Frequency converters	–	1.8	2.0
Reciprocating compressors	–	1.8	1.9
Cranes			
Slewing gears	1.0	1.4	1.8
Luffing gears	1.0	1.1	1.4
Travelling gears	1.1	1.6	2.0
Hoisting gears	1.0	1.1	1.4
Derricking jib cranes	1.0	1.2	1.6
Cooling towers			
Cooling tower fans	–	–	2.0
) Blowers (axial and radial)	–	1.4	1.5
Food industry			
Cane sugar production			
Cane knives	–	–	1.7
Cane mills	–	–	1.7
Beet sugar production			
Beet cossettes macerators,	–	–	1.2
Extraction plants, Mechanical refrigerators, Juice boilers,	–	–	1.4
Sugar beet washing machines, Sugar beet cutters	–	–	1.5
Paper machines			
of all-kind	–	1.8	2.0
Pulper drives	On request		
Centrifugal compressors	–	1.4	1.5
Cableways			
Material ropeways	–	1.3	1.4
To- and fro system aerial ropeways	–	1.6	1.8
T-bar lifts	–	1.3	1.4
Continuous ropeways	–	1.4	1.6
Cement industry			
Concrete mixers	–	1.5	1.5
Breakers	–	1.2	1.4
Rotary kilns	–	–	2.0
Tube mills	–	–	2.0
Separators	–	1.6	1.6
Roll crushers	–	–	2.0

1. Design for power rating of driven machine P_2

*) Designed power corresponding to max. torque

**) Load can be exactly classified, for Instance.

***) A check for thermal capacity is absolutely essential.

2. The listed factors are empirical values. Prerequisite for their application is that the machinery and equipment mentioned correspond to generally accepted design and load specifications. In case of deviations from standard conditions, please refer to us.

3. For driven machines which are not listed in this table, please refer to us.

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