

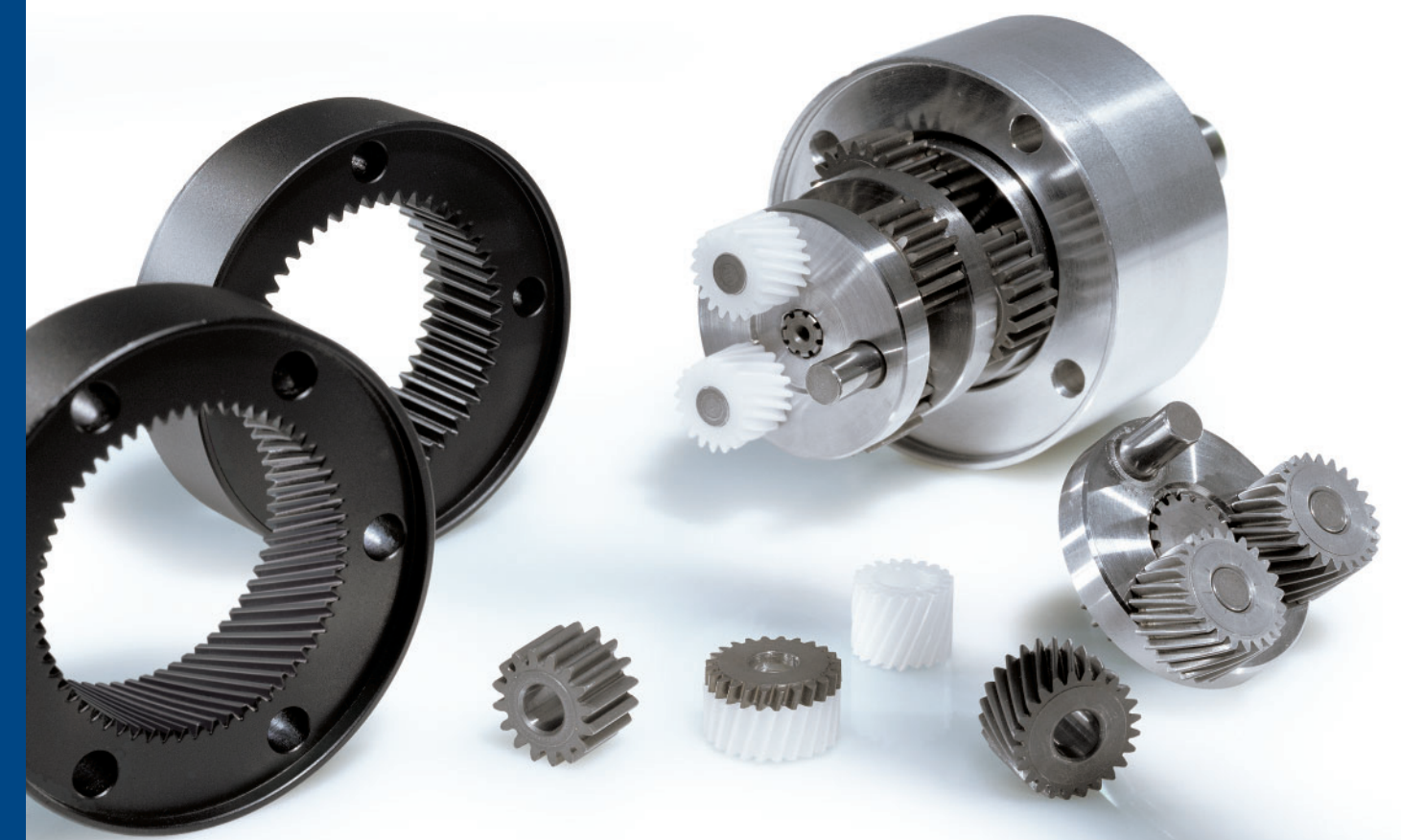


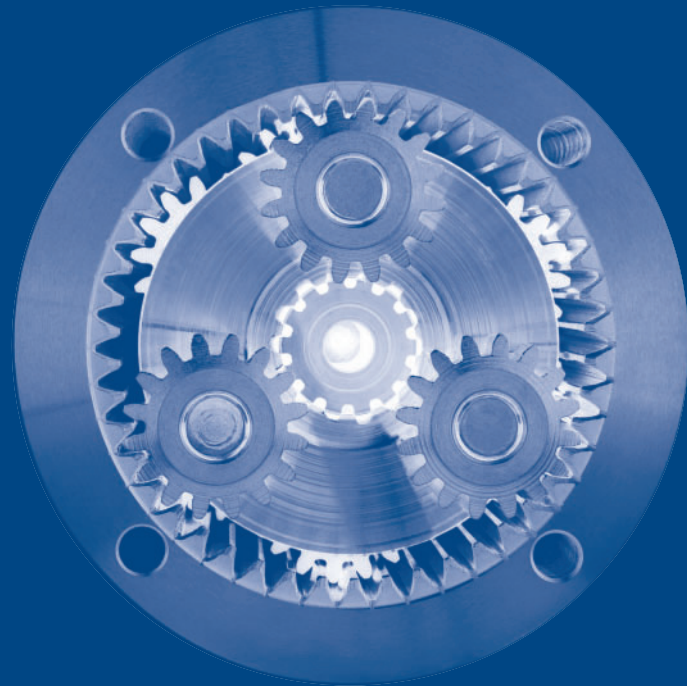
IMS:GEAR

Technomotive

Modular System for Planetary Gears

- Ø 22 to 120 mm
- 0.2 to 300 Nm
- Plastic and metal
- Low-noise





*“If you understand geometry
you will understand everything in this world.”*
Galileo Galilei

Our planetary gearbox catalogue

and what you'll find in it

This catalogue
and its limits

Our modular system offers almost 10,000 combination options. This immense variety allows us to present only a selected number of gear units in this catalogue. If the unit you are looking for is not listed, please contact us. We'd be pleased to help.

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2	Thinking ahead
4	Our vast expertise
6	Our planetary gear units
8	Our modular system for planetary gearboxes
10	Your ultimate planetary gearbox

Our type series

metal (PM), plastic (PK) and low-noise (LN)

13	∅ 22 mm	PK	0.2 – 0.7 Nm
15	∅ 22 mm	PM	0.6 – 1.0 Nm
17	∅ 32 mm	PK	0.4 – 2.0 Nm
19	∅ 32 mm	PM/LN	0.8 – 4.5 Nm
21	∅ 42 mm	PK	0.8 – 4.0 Nm
23	∅ 42 mm	PM/LN	3.0 – 15.0 Nm
25	∅ 52 mm	PK	2.0 – 10.0 Nm
27	∅ 52 mm	PM/LN	4.0 – 25.0 Nm
29	∅ 62 mm	PM/LN	8.0 – 50.0 Nm
31	∅ 72 mm	PM/LN	14.0 – 84.0 Nm
33	∅ 81 mm	PM/LN	20.0 – 120.0 Nm
35	∅ 105 mm	PM/LN	35.0 – 195.0 Nm
37	∅ 120 mm	PM	50.0 – 300.0 Nm

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Clemens Rosenstiel and
Norbert Willmann
Directors IMS Gear GmbH

Thinking ahead

IMS Gear keeps the world on the move

IMS Gear have been specialists in metal gearing, tooling and toothed-wheel engineering since 1863. In 1983, we added plastic materials to our product range. The entire value-added and responsibility chain from the development stage to final assembly is handled by us in-house. We have adapted the concept of "all under one roof" and taken it to its logical conclusion.

The IMS Gear Technomotive Division supplies you with planetary gears in modular design in plastic, plastic-metal composites or in all-metal versions for the most varied of uses and for a wide range of applications.

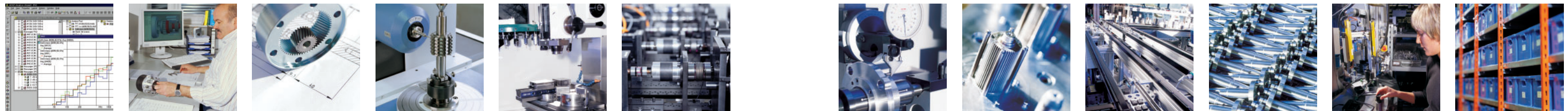
Our claim for consistent improvement of customer satisfaction goes back to our aim of a sustained and positive business development which, in turn, is based on our vision of the future and our long-term corporate strategy.

Our expertise and experiences in the global automotive business in terms of product quality and technology leadership are our defining requirements in terms of speed, adaptability, reliability and efficiency.



Our vast expertise

and what it means for you



1 Software development for tooth profile enhancement

We use our own software to improve tooth profiles beyond DIN standards. This means that our gears have less backlash, are more resistant to wear and tear with optimum performance in terms of strength. They are smoother and quieter running, and are less sensitive to tolerances.

2 Design

The in-house design department of IMS Gear Technomotive is consistently engaged in the development of the entire modular system. That's not all! Our team of experts is on standby for comprehensive and rapid adaptations to match your specific requirements and specifications.

3 Gear cutting tooling

We at IMS make our own tools for cutting the metal gears. This gives you an enormous advantage in lead time, and all the steps from theory to practice are handled by a single supplier.

4 Prototype and small batch production

IMS Gear Technomotive will supply you with custom-made sample gear units right through to small batches within a couple of days. We achieve this degree of flexibility with our comprehensive production capability and our independence from subcontractors and outside suppliers.

5 Test laboratories

In addition to the quality assurance accompanying Series production, IMS Gear Technomotive continually carries out stress, wear and tear and life tests. Accompanying every development, our design department together with the Automotive division uses the noise laboratory and the climate testing laboratory of our Technology Centre in Donaueschingen.

6 Process planning

This is where IMS Gear Technomotive benefits from the immense wealth of experience of the Automotive division with its large batch production runs. The entire production process from development through to packaging is planned and optimised down to the last detail. The Technomotive standard toothed components are also large volume products. In-house process planning results in reliable production at minimum cost, low reject rates and ultimate quality.

7 Mould tool manufacture

The in-house production of plastic injection moulding tools allows us to realise and implement our own designs. It also provides measurable proof of our production capability and documentation.

8 Equipment design and construction

Since we design and build our own assembly and test equipment, production tooling, and parts feeding systems for our machines and their peripherals, we are capable of responding quickly and efficiently to complex production or customer specific requirements.

9 Series production

IMS Gear Technomotive makes virtually all its Planetary Gearbox components in-house. As both metal and plastic component production is in-house, we can produce quickly and with ultimate cost-efficiency.

10 Assembly

Manual assembly for a single unit is integrated in micro-batch production. We produce each series on dedicated assembly lines with large volume capacity; and we assemble customer or application specific gear solutions in high unit quantities on automated assembly units.

11 Logistics and delivery capability

We permanently hold stocks of all standard toothed parts for our modular planetary gearboxes. Many interfacing parts such as motor pinions, flanges or output shafts are in stock as semi-finished products.

Our planetary gear units

and what you should know about them

Mode of function

Planetary gearboxes (PLGs) operate as their name implies: the motor-driven sun wheel is in the middle, transmitting its movement to three circumferential planet gears which form one stage. They are arranged on the bearing pins of a planet carrier. The last planet carrier in each sequence is rigidly linked to the output shaft and so ensures the power transmission to the output shaft. The planet gears run in an internally toothed outer ring gear.

Properties

Input and output are co-axial. The shafts turn in the same direction. PLGs are suitable for clockwise and anti-clockwise rotation, for alternating, continuous and cyclic operation, and they excel due to their high degree of efficiency. Unlike other gear types, their compact design provides ultimate power density and excellent torque transfer in the smallest space. Their resistance to shock loads is high due to load distribution over several components (the three planetary wheels) and the support of the annular gear.

Exploded drawing PM 72



Planetary gears

- ① Motor pinion input side
- ② Motor flange
- ③ Metal planet gears, Stage 1
- ④ Planet carrier, Stage 1
- ⑤ Outer ring gear
- ⑥ Metal planet gears and planet carrier, Stage 2
- ⑦ Metal planet gears, Stage 3
- ⑧ Output flange
- ⑨ Ball bearing
- ⑩ Output shaft

Low-noise variant

- ① Motor pinion input side, helical tooting
- ③ Plastic planet gears, helical tooting
- ⑤ Outer ring gear, helical tooting

Connecting flanges

This is where the flexibility of the PLG manufacturer really shows. IMS planetary gear units can be fitted to any (!) motor, with individual solutions possible on both the input side and the output side. Contact us with your specific requirements.

Delivery

IMS Gear Technomotive can supply your gearbox with the motor of your choice, fully assembled and inspected, or individually with separate motor pinion for remote assembly. We can also assist you with motor selection.

Efficiency

The inter-gear efficiency takes only the gear-making process into account, whereas the gearbox efficiency relates to the losses in the entire gearbox assembly. In this brochure we always specify the gearbox efficiency which is necessarily lower than the inter-gear efficiency. Since there are no standardised measuring methods, care is required when comparing the efficiency specified by different manufacturers.

Gear backlash

Gear backlash depends on a large number of factors: type of load, number of stages, bearing, design or material combination. When comparing different manufacturers, please note that there are also no standardised measurement methods. The values specified in this catalogue were measured with no load and with blocked input drive.

Heat treatment

The structural transformation during heat treatment of the metal components has positive effects on strength and wear performance of the gear units. IMS has its own heat treatment shop. Since we also have the entire metal machining activity in-house, we are capable of selecting from a wide choice of heat treatable alloy steels.

Load on output shaft

Different manufacturers use different methods of measurement making comparison difficult. Comparisons must be made with caution. The details in the IMS catalogue are based on the following conditions: rotational motor speed 3,000 rpm, lowest reduction ratio for

each stage, simultaneous axial and radial load, radial load in the centre of the driven shaft. Send us your specification and parameters, we'll be pleased to calculate the maximum axial and radial loads for your application. By modifying aspects of the basic design, we can also tolerate higher loads. Give us a call.

Low-noise gears

Optimum noise performance makes more stringent demands on true running and axial eccentricity of the motor bearing plate, flange and shaft. The helical tooting causes axial forces to act on the motor shaft, with the effect that adequate dimensioning of the motor shaft bearing must be ensured. To counter the grease-pumping effect of the helical tooting, radial shaft sealing gaskets or sealed motor bearings are recommended.

Lubrication

Our PLGs are grease-packed and therefore maintenance free throughout their life. Depending on the application, we select the best possible lubricant from as many as ten different options.

Mounting position

The grease lubrication and the different sealing modes allow the IMS planetary gears to be installed in any position.

Operating temperature

The operating temperature range depends on material selection and choice of lubricant. The temperature range of our all-metal versions with standard lubrication is between -30 and +140 °C, that of the plastic PK series is between -15 and +65 °C.

Operational dynamics

Optimum operating dynamics are achieved through low moments of inertia, freedom of rotation and low wear and tear. Wherever appropriate, IMS Gear Technomotive uses plastic instead of metal for the planet gears and arranges these at balanced 120° angles. This results in low moments of inertia. If required, we achieve the ultimate ease of movement by fitting high-grade needle bearings or by selecting favourable friction values between metal and plastic. Wear is reduced by using a special gear tooth

profile with tip relief and by using plastic wheels. Thus the selected IMS material mix guarantees excellent operational dynamics.

Output torque

When selecting a planetary gear, the output torque or moment is one of the most important variables. The reduction ratio lowers the relatively high rotational motor speed to a lower output speed, increasing the output torque in inverse proportion. Please refer to page 10 to calculate the output.

Overload torque

The permitted overload torque (shock load) is defined as a short-term increase in output torque, e.g. during the start-up of a motor. In plastic PLGs, the peak torque equals the overload torque. In plastic-metal combinations or in all-metal versions, the overload torque can be as much as 1.5 times the peak load.

Reduction ratios

If the number of teeth of the sun wheel and the planetary wheels is changed, different reduction ratios are possible within one and the same stage. IMS Gear Technomotive combines these reduction ratios in as many as four stages and so achieves as many as 68 (!) non-integer reduction ratios. An enormous variety of different combinations can be implemented.

Sealing modes

The protection classes are defined in accordance with DIN 40500 Part 9. We are also capable of supplying output seals which will allow you to implement higher protection classes.

Service life


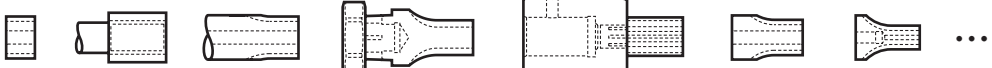

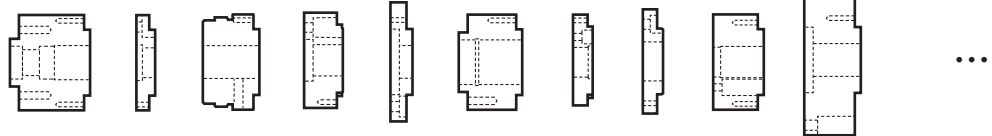





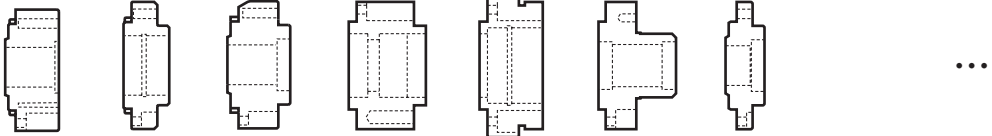


Depending on ambient and environmental conditions and on the operational specification of the driving system, the useful service life of a PLG is between 200 and 10,000 hours. The wide variety of potential applications prohibits generally applicable values for the useful service life.

Our modular system for planetary gearboxes

and its almost 10,000 optional variants

Even using standard gearing components, our modular system offers an immense variety of options. Also, pinion variants, flanges, outputs, bearings, lubricants and seals provide a wide range of options for virtually every combination. Since we stock all common parts, we are capable of delivering, even small quantities at short

notice. For clarity, we have listed only the metal (P) or plastic (PK) PLG series in this catalogue, but we will send you any reasonable material mix on request. Give us a call. We are here to advise you.

<p>Motor pinions</p> <p>... virtually unlimited options</p> 		<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Adaptation</p>	<p>Our planetary gears are designed for connecting any current type of motor, using three different modes: with adaptable motor pinion in various designs, or using our option involving bearing-mounted input shafts. With appropriate quantities and after consultations with the motor manufacturer, the motor</p>	<p>shaft can also be intermeshed directly. With an adapted motor mounting plate, the motor can then be connected to the annular wheel without any additional motor flange, allowing shorter and more cost-effective gearing assemblies.</p>
<p>Motor flange</p> <p>... to date, almost 1,300 options</p> 			<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Standard</p>	<p>Flanges are available in plastic, die cast zinc or aluminium, as basic, standard or special flange, adapted individually depending on requirements. For diameters below 42 mm and with PK 52, the motor is connected to the gear via a special flange. For larger quantities you can also obtain tool-</p>
<p>Planetary gears PK/PM</p> <p>... to date, 1,270 standard gear variants</p> 		<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Standard</p>		<p>Nine different diameters with as many as four gear stages and a wide variety of reduction ratios ranging from 3.7:1 to 2,075.9:1 are available in plastic, metal or material mix versions with output torques ranging from 0.2 to 300 Nm. Although this results in an immense variety of options, we describe as standard</p>
<p>Planetary gears Low-noise</p> 			<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Adaptation</p>	<p>The new low-noise modules for the first stage feature a well-attuned combination of module, number of teeth, helical angle, gearing width and choice of material, guaranteeing ultimate smooth running and high torque stability. With the new tandem planetary gears (patent applied for), even high peak loads are</p>
<p>Output flange</p> <p>... to date, over 1,300 options</p> 		<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Adaptation</p>		<p>The output flange includes the bearing. Sintered metal bearings or ball bearings can be selected to match the operating requirements. Gearboxes with two RS seals in the ball bearing of the output shaft are protection class IP 53, whereas with two Z cover disks they are protection class IP 42. Sintered metal</p>
<p>Output</p> <p>... virtually unlimited adaptation options</p> 			<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Adaptation</p>	<p>The output shaft is linked to the last planet carrier and can be designed in any customer specific layout depending on the machine to be driven.</p>

Your ultimate planetary gearbox

and how to select it

The T_{AB} output torque is the most important variable when selecting the most suitable PLG. Use the equation compendium below to calculate this variable. The next important factor is the gear diameter. Once you have calculated the maximum output torque T_{AB} , you can refer to the

diagram on the right to read the PLG type series with the appropriate diameter. In most cases and depending on the number of gearing stages, a T_{AB} value can be implemented with several PLG type series. Any questions? Give us a call. We are there to help you.

- i = Reduction ratio
- n_M = Motor speed
- n_{AB} = Output speed

- T_N = Nominal output torque
- T_M = Motor torque
- η = Gear efficiency

- T_{AB} = Output torque
- C_B = Operating factor

The reduction ratio i is used to reduce the relatively high motor speed n_M to a lower output speed n_{AB} .
With:

$$i = n_M / n_{AB}$$

Your desired nominal output torque T_N is therefore calculated as follows:

$$T_N = T_M \cdot i \cdot \eta$$

To determine the reduction ratio i and the gear efficiency η , please refer to the appropriate type series in this catalogue.

When calculating the actual output torque T_{AB} , the calculated nominal output torque T_N and the operating factor C_B should also be taken into account. C_B is merely a factor which addresses the different working conditions of a PLG and which is the result of your subjective appraisal. It is therefore only meant as a guide value. We include the following factors in the rough estimation of the operating factor C_B : direction of rotation, load (shocks) and daily operating time. Refer to the table below to calculate the approximate operating factor C_B .

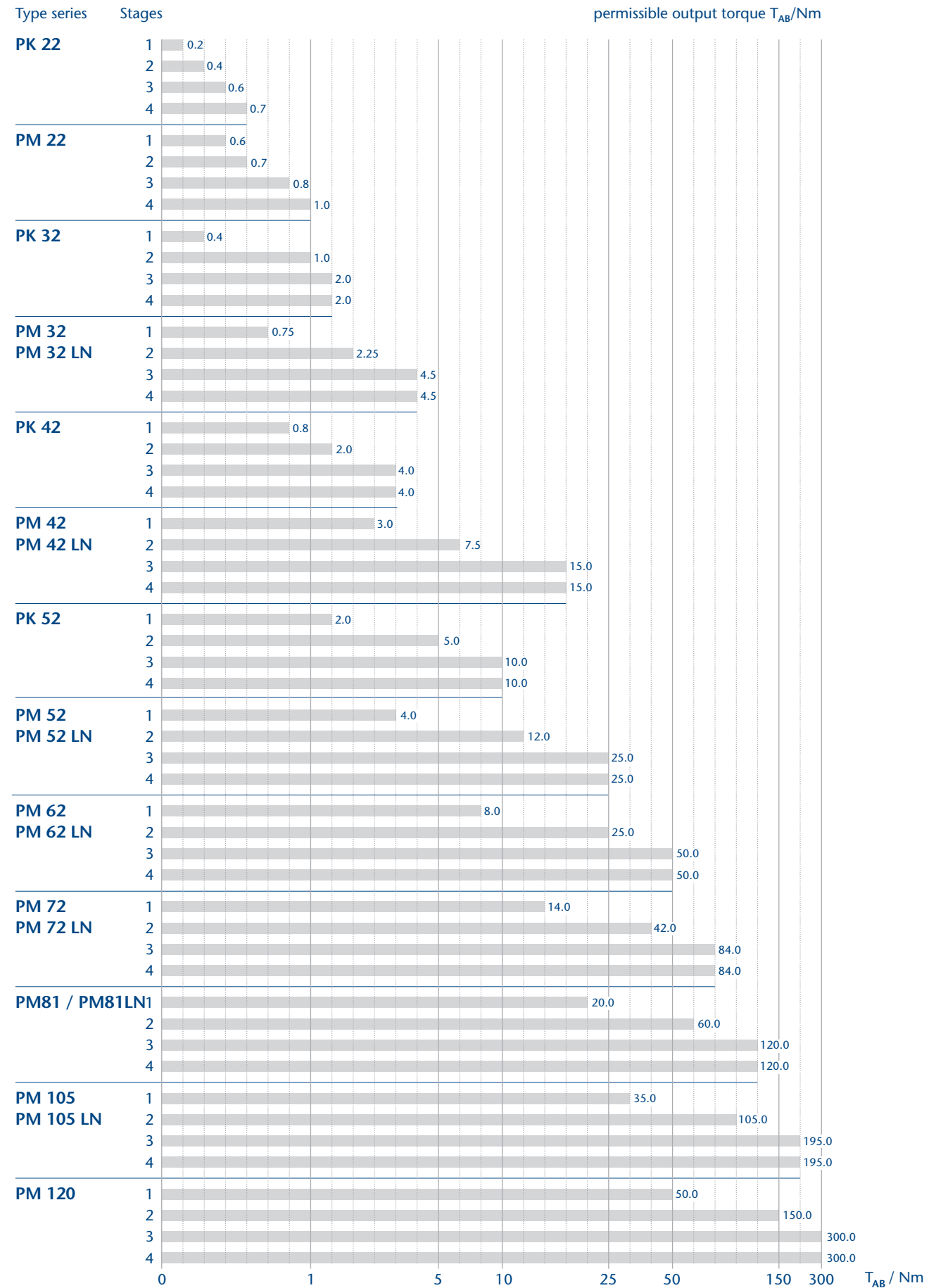
Determining the operating factor C_B

Direction of rotation	Load (shocks)	Daily operating time		
		3h	8h	24h
constant	none	$C_B = 1.0$	$C_B = 1.1$	$C_B = 1.3$
	medium	$C_B = 1.2$	$C_B = 1.3$	$C_B = 1.5$
	strong	$C_B = 1.4$	$C_B = 1.5$	$C_B = 1.8$
alternating	none	$C_B = 1.3$	$C_B = 1.4$	$C_B = 1.6$
	medium	$C_B = 1.6$	$C_B = 1.7$	$C_B = 1.9$
	strong	$C_B = 1.9$	$C_B = 2.0$	$C_B = 2.2$

The maximum output torque T_{AB} is calculated as follows:

$$T_{AB} = T_N \cdot C_B$$

All details in the catalogue refer to $C_B = 1.0$.
Therefore: $T_{AB} = T_N$



Once you have calculated the maximum output torque using the equation compendium on the left, you can then refer to the diagram on the top and see which IMS planetary gear matches. The figures in the type

series description denote the gear diameter. Each IMS type series is available with four stages, which means that several diameters are often available for one and the same output torque.

Alternative motor pinion variants

Short pinion



Bushing + pinion



Cup-type pinion



Clamp-type pinion



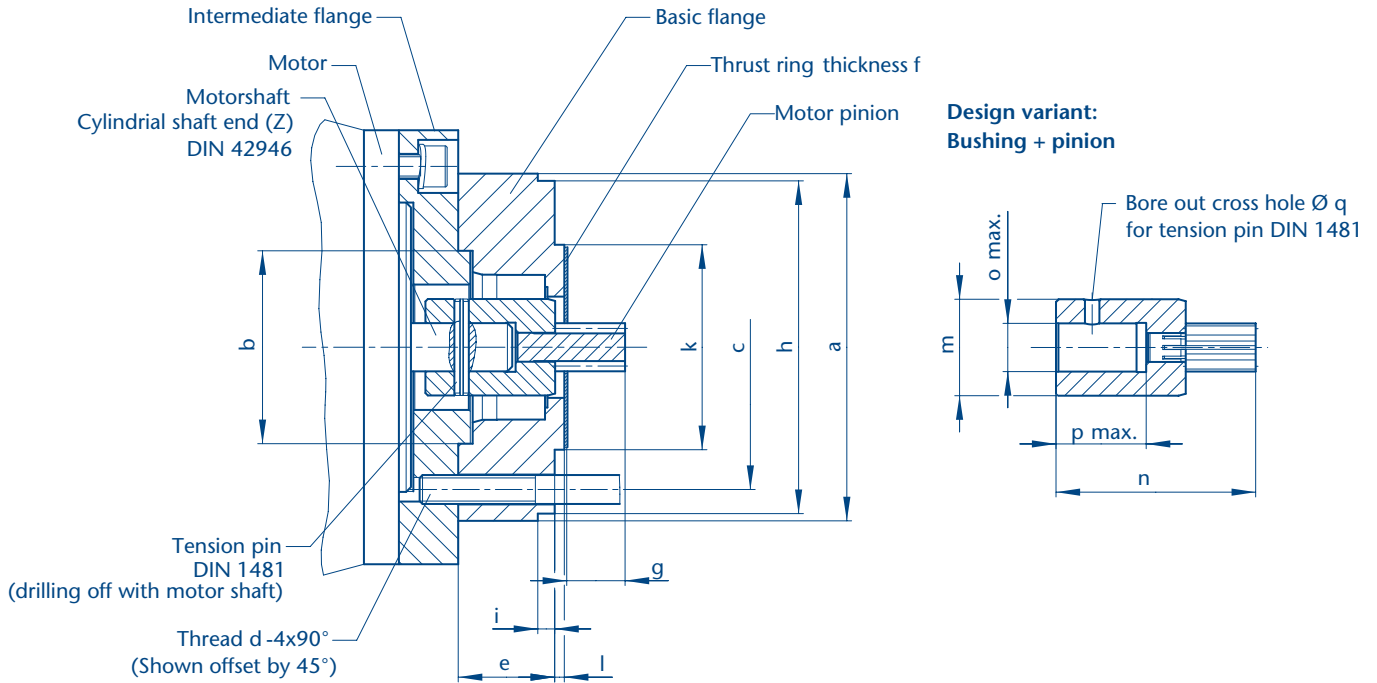
Geared shaft



Attachment options

- pinning
- cross thread
- keyway
- pressfit
- bonding
- clamping

Specifications for motor attachment



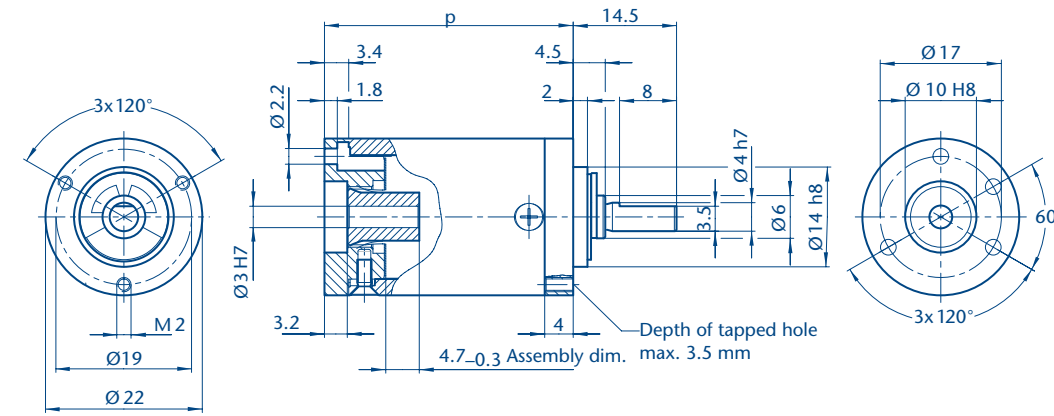
	PM32 PM32LN	PK32	PM42 PM42LN	PK42	PM52 PM52LN	PK52	PM62 PM62LN	PM72 PM72LN	PM81 PM81LN	PM105 PM105LN	PM120
Flange											
a	32	32	42	42	52	52	62	72	81	105	120
b	14 H8	14 H8	20 H7	20 H7	30 H7	30 H8	40 H7	40 H7	40 H7	50 H7	60 H7
c	28.1 _{-0.15}	28.1 _{-0.15}	33.3	33.3	42.5	42.5	51	59	69.5	86	100
d	M2	M2	M4	M4	M4	M4	M5	M6	M6	M10	M10
e	11	11	10.4	10	10.4	10	15.4	20	18.5	20	20
f	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.5	0.3	0.5	0.5
g	6.1 _{-0.4}	6.1 _{-0.4}	8 ^{+0.3}	8 ^{+0.3}	8 ^{+0.3}	8 ^{+0.3}	10.4 _{-0.3}	12.1 _{-0.3}	13.5 ^{+0.15} _{-0.25}	18.3 _{-0.3}	19.4 ^{+0.2} _{-0.3}
h	-	-	39 _{-0.02}	-	49 _{-0.02}	-	59 _{-0.025}	69 _{-0.025}	78 _{-0.025}	100 _{-0.025}	115 ^{k7}
i	-	-	2.5	-	3	-	3.0	3.5	3.5	3.5	3.3
k	22.1 _{-0.02} *	22.1 _{-0.02}	24.2 _{-0.2}	24.7 _{-0.03}	32.8 _{-0.2}	33.34 _{-0.03}	39 _{-0.2}	42.5 _{-0.2}	51.8 _{-0.2}	63.8 _{-0.2}	76 ^{±0.1}
l	1.8 ^{+0.1}	1.8 ^{+0.1}	2 ^{+0.1}	2.5 ^{+0.1}	2 ^{+0.1}	2.5 ^{+0.1}	2 ^{+0.1}	2 ^{+0.1}	2 ^{+0.1}	2 ^{+0.1}	6.1 ^{±0.05}
Pinion											
m	10	10	11-12	11	15	15	18-20	20	24	30	35.6
n	16	16	27.5	27.5	34	34	38	41.4	48.5	60	70
o	3	3	7	7	10	10	12	14	18	21	26
p	6	6	11	11	16	16	18	19	21	26	28
q	-	-	2	2	3	3	3	3	3	5	5

* k in PM32LN is = 21,1_{-0.02}

Parameter	1-stage	2-stage	3-stage	4-stage
Perm. output torque (Appl. factor $C_B=1.0$)	0.2 Nm	0.4 Nm	0.6 Nm	0.7 Nm
Gearbox efficiency, approx.	0.80	0.75	0.70	0.65
Max. backlash in ° DEG	1.50°	2.00°	2.50°	3.00°
Recommended initial speed	6,000 rpm	6,000 rpm	6,000 rpm	6,000 rpm
Operating temperature	-15 °C to +65 °C	-15 °C to +65 °C	-15 °C to +65 °C	-15 °C to +65 °C
Output side with sintered metal bearing				
Max. load, radial (10mm from flange)	15 N	30 N	45 N	60 N
Max. load, axial	30 N	30 N	30 N	30 N
Max. perm. fitting pressure	150 N	150 N	150 N	150 N
Gearbox length p	26.6 ± 0.5 mm	34.8 ± 0.5 mm	43.0 ± 0.5 mm	51.2 ± 0.5 mm
Ø x Total length	22.0 x 41.1 mm	22.0 x 49.3 mm	22.0 x 57.5 mm	22.0 x 65.7 mm
Weight	41 g	52 g	63 g	74 g

· Gear reductions see last page (fold-out page)

Basic design



Refer to the above table for the values of p.

Ordering codes

- 01 Basic flange
- 06 Special flange
- 09 Bearing-mounted input shaft (see page 39)

Order example

You wish to order a plastic planetary gear with a diameter of 22 mm of type series PK 22 with the reduction ratio 169:1, with basic flange on the motor and output side.

PK 22. 169. 01 / 01

- Planetary gear, plastic
- Type series
- Reduction ratio rounded
- Flange, motor side (see ordering codes)
- Flange, output side (see ordering codes)

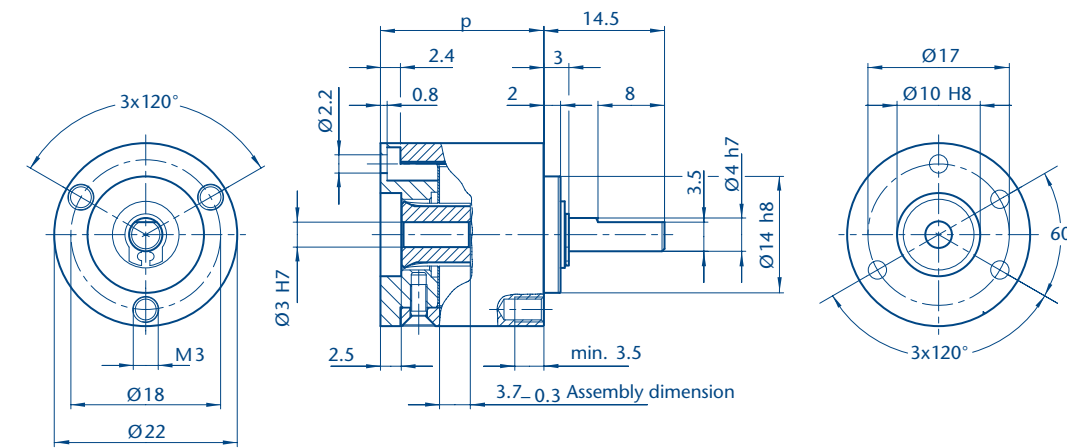
Feel free to contact us – we are happy to help you

The details given herein are recommended values. Minor variances due to reduction ratios or non-standard testing or measuring methods etc. may occur. Please refer to pages 6 to 11 and 39 of this catalogue for basic or additional information, or contact us directly. Technical details subject to change without notice.

Parameter	1-stage	2-stage	3-stage	4-stage
Perm. output torque (Appl. factor $C_B=1.0$)	0.6 Nm	0.7 Nm	0.8 Nm	1.0 Nm
Gearbox efficiency, approx.	0.90	0.80	0.70	0.60
Max. backlash in ° DEG	1.5°	2.0°	2.5°	3.0°
Recommended initial speed	6,000 rpm	6,000 rpm	6,000 rpm	6,000 rpm
Operating temperature	-15 °C to +65 °C	-15 °C to +65 °C	-15 °C to +65 °C	-15 °C to +65 °C
Output side with sintered metal bearing				
Max. load, radial (10mm from flange)	80 N	80 N	80 N	80 N
Max. load, axial	30 N	30 N	30 N	30 N
Max. perm. fitting pressure	150 N	150 N	150 N	150 N
Gearbox length p	19.7 ± 0.3 mm	26.4 ± 0.3 mm	33.1 ± 0.3 mm	39.8 ± 0.3 mm
Ø x Total length	22.0 x 34.2 mm	22.0 x 40.9 mm	22.0 x 47.6 mm	22.0 x 54.3 mm
Weight	48 g	61 g	74 g	87 g

· Gear reductions see last page (fold-out page)

Basic design



Refer to the above table for the values of p.

Ordering codes

- 01 Basic flange
- 06 Special flange
- 09 Bearing-mounted input shaft (see page 39)

Order example

You wish to order a metal planetary gear with a diameter of 22 mm of type series PM 22 with the reduction ratio 169:1, with basic flange on the motor and output side.

Planetary gear, metal
 Type series
 Reduction ratio rounded
 Flange, motor side (see ordering codes)
 Flange, output side (see ordering codes)

PM 22. 169. 01 / 01

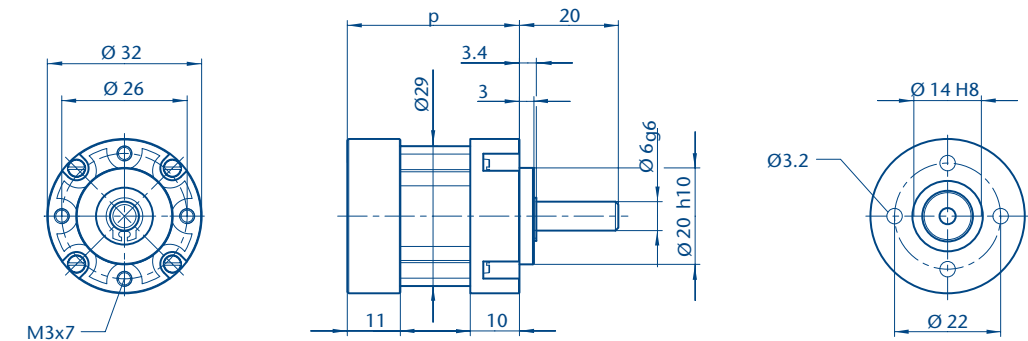
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Parameter	1-stage	2-stage	3-stage	4-stage
Perm. output torque (Appl. factor $C_B=1.0$)	0.4 Nm	1.0 Nm	2.0 Nm	2.0 Nm
Gearbox efficiency, approx.	0.75	0.70	0.65	0.60
Max. backlash in ° DEG	1.90°	1.95°	2.00°	2.05°
Recommended initial speed	3,000 rpm	3,000 rpm	3,000 rpm	3,000 rpm
Operating temperature	-15 °C to +65 °C	-15 °C to +65 °C	-15 °C to +65 °C	-15 °C to +65 °C
Output side with sintered metal bearing				
Max. load, radial	15 N	30 N	45 N	45 N
Max. load, axial	5 N	10 N	15 N	15 N
Max. perm. fitting pressure	150 N	150 N	150 N	150 N
Gearbox length p	36.0 ± 0.5 mm	45.5 ± 0.5 mm	55.0 ± 0.5 mm	64.7 ± 0.5 mm
Ø x Total length	32.0 x 56.0 mm	32.0 x 65.5 mm	32.0 x 75.0 mm	32.0 x 84.7 mm
Weight	100 g	115 g	130 g	145 g
Output side with ball bearing (2Z)				
Max. load, radial	40 N	70 N	100 N	100 N
Max. load, axial	10 N	20 N	30 N	30 N
Max. perm. fitting pressure	120 N	120 N	120 N	120 N
Gearbox length p	32.3 ± 0.5 mm	41.8 ± 0.5 mm	51.3 ± 0.5 mm	61.0 ± 0.5 mm
Ø x Total length	32.0 x 52.3 mm	32.0 x 61.8 mm	32.0 x 71.3 mm	32.0 x 81.0 mm
Weight	120 g	135 g	150 g	165 g

· Gear reductions see last page (fold-out page)
 · Specifications for motor attachment see page 12.1 (fold-out page)

Basic design



Refer to the above table for the values of p.

Ordering codes

- 01 Basic flange
- 06 Special flange
- 07 Bearing flange of plastic, sintered bearing on output shaft
- 08 Bearing flange of die-cast zinc, ball bearing on output shaft
- 09 Bearing-mounted input shaft (see page 39)

Order example

You wish to order a plastic planetary gear with a diameter of 32 mm of type series PK 32, with the reduction ratio 46:1, basic flange on motor side, bearing flange of plastic, sintered bearing on output side.

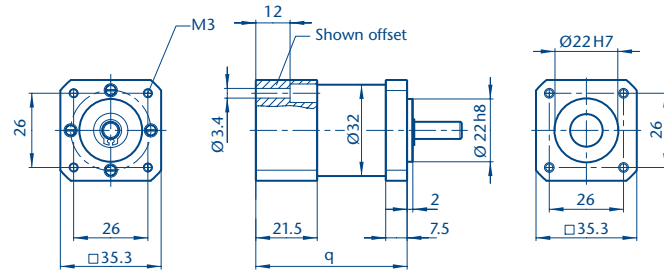
PK 32. 46. 01 / 07

- Planetary gear, plastic
- Type series
- Reduction ratio rounded
- Flange, motor side (see ordering codes)
- Flange, output side (see ordering codes)

Feel free to contact us – we are happy to help you

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NEMA flange 14



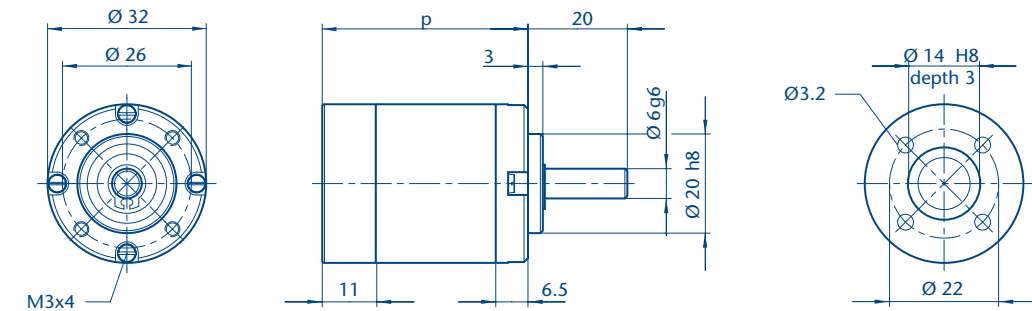
Refer to the table on the right for the values of q.

Parameter	1-stage	2-stage	3-stage	4-stage
Perm. output torque (Appl. factor $C_B=1.0$)	0.75 Nm	2.25 Nm	4.50 Nm	4.50 Nm
Gearbox efficiency, approx.	0.80	0.75	0.70	0.65
Max. backlash in ° DEG	1.50° (LN: 2.00°) ¹⁾	1.55°	1.60°	1.65°
Recommended initial speed	3,000 rpm	3,000 rpm	3,000 rpm	3,000 rpm
Operating temperature	-30 °C to +140 °C	-30 °C to +140 °C	-30 °C to +140 °C	-30 °C to +140 °C
Output side with ball bearing (ZZ)				
Max. load, radial	40 N	70 N	100 N	130 N
Max. load, axial	10 N	20 N	30 N	40 N
Max. perm. fitting pressure	120 N	120 N	120 N	120 N
Gearbox length p	32.3 mm ± 0.5 mm	41.8 mm ± 0.5 mm	51.3 mm ± 0.5 mm	60.8 mm ± 0.5 mm
Gearbox length q	43.5 mm ± 0.5 mm	53.0 mm ± 0.5 mm	62.5 mm ± 0.5 mm	72.0 mm ± 0.5 mm
Ø x Total length (p+length from bearing flange)	32.0 x 52.0 mm	32.0 x 61.5 mm	32.0 x 71.0 mm	32.0 x 80.5 mm
Weight (for gearbox length p)	160 g	210 g	260 g	310 g

¹⁾ For plastic PL wheels only! Impact of 1st stage for 2-4 stage versions is negligible.

· Gear reductions see last page (fold-out page)
 · Specifications for motor attachment see page 12.1 (fold-out page)

Basic design



Refer to the above table for the values of p.

Ordering codes

- 01 Basic flange
- 06 Special flange
- 09 Bearing-mounted input shaft (see page 39)
- 14 NEMA flange

Order example

You wish to order a metal planetary gear with a diameter of 32 mm of type series PM 32 with the reduction ratio 35:1, with basic flange on the motor and output side.

PM 32 LN. 35. 01 / 01

- Planetary gear, metal
- Type series
- Low-noise design
- Reduction ratio rounded
- Flange, motor side (see ordering codes)
- Flange, output side (see ordering codes)

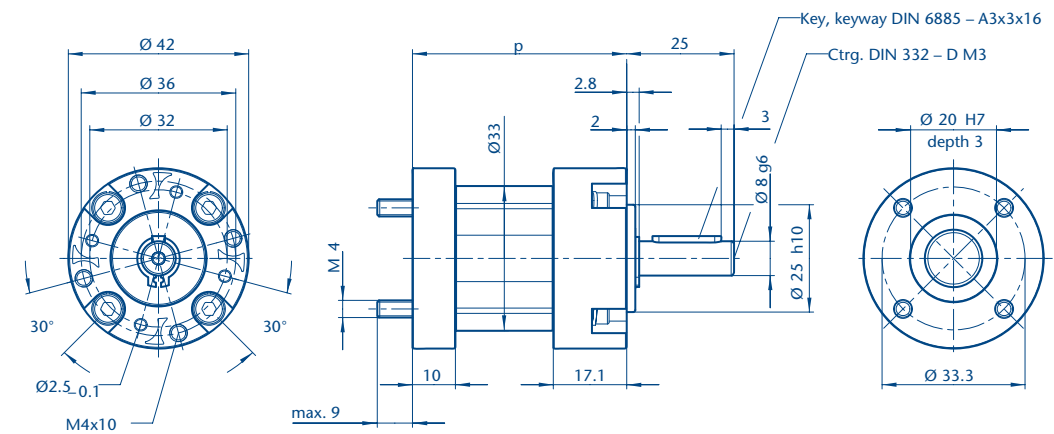
Feel free to contact us – we are happy to help you

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Parameter	1-stage	2-stage	3-stage	4-stage
Perm. output torque (Appl. factor $C_B=1.0$)	0.8 Nm	2.0 Nm	4.0 Nm	4.0 Nm
Gearbox efficiency, approx.	0.80	0.75	0.70	0.65
Max. backlash in ° DEG	1.70°	1.75°	1.80°	1.85°
Recommended initial speed	3,000 rpm	3,000 rpm	3,000 rpm	3,000 rpm
Operating temperature	-15 °C to +65 °C	-15 °C to +65 °C	-15 °C to +65 °C	-15 °C to +65 °C
Output side with sintered metal bearing				
Max. load, radial	15 N	30 N	45 N	45 N
Max. load, axial	5 N	10 N	30 N	30 N
Max. perm. fitting pressure	150 N	150 N	150 N	150 N
Gearbox length p	48.9 ± 0.5 mm	61.9 ± 0.5 mm	74.9 ± 0.5 mm	87.9 ± 0.5 mm
Ø x Total length	42.0 x 73.9 mm	42.0 x 86.9 mm	42.0 x 99.9 mm	42.0 x 112.9 mm
Weight	200 g	300 g	400 g	500 g
Output side with ball bearing (2RS)				
Max. load, radial	160 N	230 N	300 N	300 N
Max. load, axial	50 N	80 N	110 N	110 N
Max. perm. fitting pressure	320 N	320 N	320 N	320 N
Gearbox length p	48.9 ± 0.5 mm	61.9 ± 0.5 mm	74.9 ± 0.5 mm	87.9 ± 0.5 mm
Ø x Total length	42.0 x 73.9 mm	42.0 x 86.9 mm	42.0 x 99.9 mm	42.0 x 112.9 mm
Weight	400 g	500 g	600 g	700 g

· Gear reductions see last page (fold-out page)
 · Specifications for motor attachment see page 12.1 (fold-out page)

Basic design



Refer to the above table for the values of p.

Ordering codes

- 01 Basic flange
- 06 Special flange
- 07 Bearing flange of plastic, sintered bearing on output shaft
- 08 Bearing flange of plastic, ball bearing on output shaft
- 09 Bearing-mounted input shaft (see page 39)
- 10 Bearing flange of plastic, direct bearing

Order example

You wish to order a plastic planetary gear with a diameter of 42 mm of type series PK 42 with the reduction ratio 46:1, special flange on motor side, bearing flange of plastic, sintered bearing on output side.

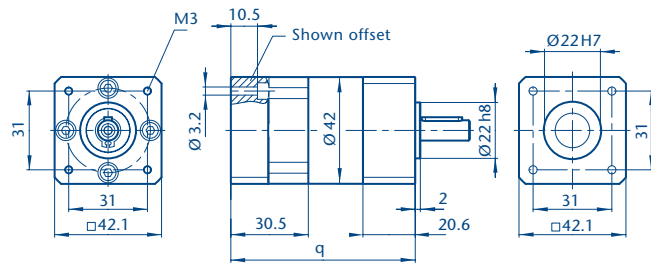
PK 42. 46. 06 / 07

- Planetary gear, plastic
- Type series
- Reduction ratio rounded
- Flange, motor side (see ordering codes)
- Flange, output side (see ordering codes)

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NEMA flange 17



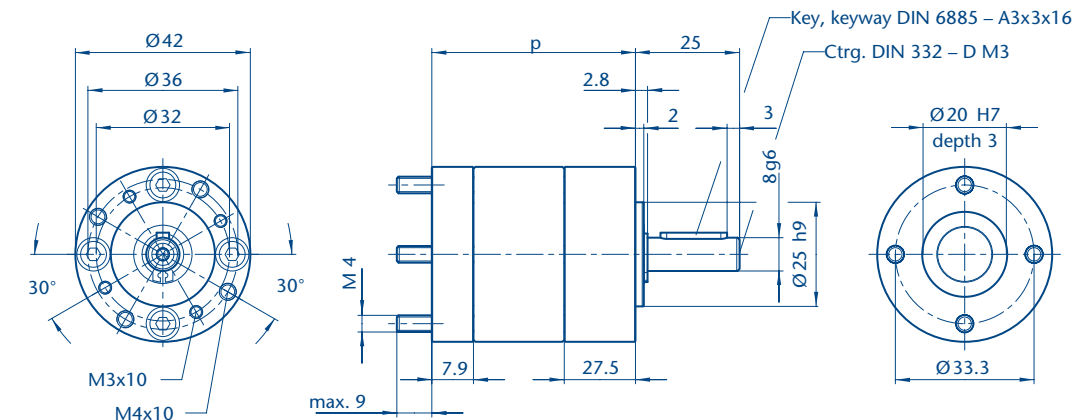
Refer to the table on the right for the values of q.

Parameter	1-stage	2-stage	3-stage	4-stage
Perm. output torque (Appl. factor $C_B=1.0$)	3.0 Nm	7.5 Nm	15.0 Nm	15.0 Nm
Gearbox efficiency, approx.	0.80	0.75	0.70	0.65
Max. backlash in ° DEG	0.90° (LN: 1.30°) ¹⁾	0.95°	1.00°	1.05°
Recommended initial speed	3,000 rpm	3,000 rpm	3,000 rpm	3,000 rpm
Operating temperature	-30 °C to +140 °C	-30 °C to +140 °C	-30 °C to +140 °C	-30 °C to +140 °C
Output side with ball bearing (2RS)				
Max. load, radial	160 N	230 N	300 N	360 N
Max. load, axial	50 N	80 N	110 N	140 N
Max. perm. fitting pressure	320 N	320 N	320 N	320 N
Gearbox length p	49.1 ± 0.5 mm	62.2 ± 0.5 mm	75.3 ± 0.5 mm	88.4 ± 0.5 mm
Gearbox length q	72.6 ± 0.5 mm	85.7 ± 0.5 mm	98.8 ± 0.5 mm	111.9 ± 0.5 mm
Ø x Total length (p + length from bearing flange)	42.0 x 74.1 mm	42.0 x 87.2 mm	42 x 100,3 mm	42.0 x 113.4 mm
Weight (for gearbox length p)	400 g	500 g	600 g	700 g

¹⁾ For plastic PL wheels only! Impact of 1st stage for 2-4 stage versions is negligible.

· Gear reductions see last page (fold-out page)
 · Specifications for motor attachment see page 12.1 (fold-out page)

Basic design



Refer to the above table for the values of p.

Ordering codes

- 01 Basic flange
- 06 Special flange
- 09 Bearing-mounted input shaft (see page 39)
- 17 NEMA flange

Order example

You wish to order a metal planetary gear with a diameter of 42 mm of type series PM 42 with the reduction ratio 46:1, special flange on motor side, basic flange on output side.

PM 42 LN. 46. 06 / 01

- Planetary gear, metal
- Type series
- Low-noise design
- Reduction ratio rounded
- Flange, motor side (see ordering codes)
- Flange, output side (see ordering codes)

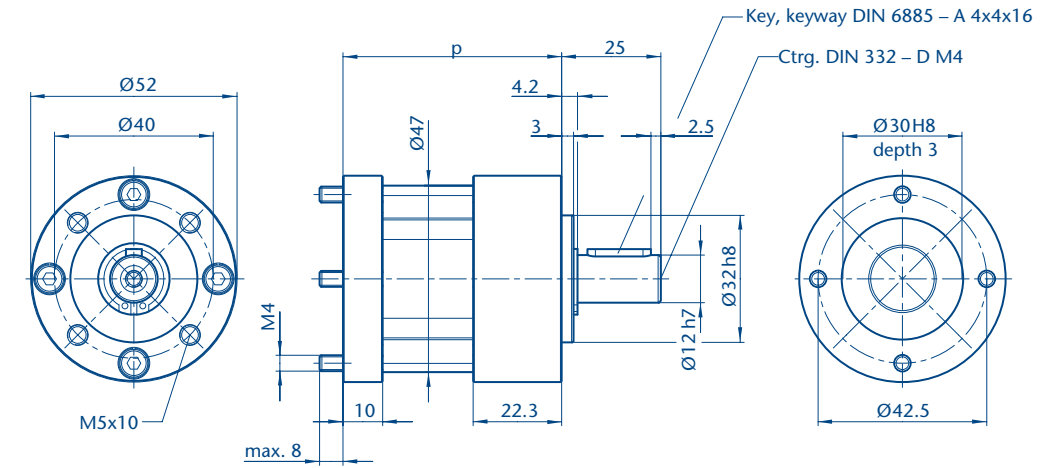
Feel free to contact us – we are happy to help you

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Parameter	1-stage	2-stage	3-stage	4-stage
Perm. output torque (Appl. factor $C_B=1.0$)	2.0 Nm	5.0 Nm	10.0 Nm	10.0 Nm
Gearbox efficiency, approx.	0.75	0.70	0.65	0.60
Max. backlash in ° DEG	1.10°	1.15°	1.20°	1.25°
Recommended initial speed	3,000 rpm	3,000 rpm	3,000 rpm	3,000 rpm
Operating temperature	-15 °C to +65 °C	-15 °C to +65 °C	-15 °C to +65 °C	-15 °C to +65 °C
Output side with ball bearing (2RS)				
Max. load, radial	200 N	320 N	450 N	500 N
Max. load, axial	60 N	100 N	150 N	200 N
Max. perm. fitting pressure	500 N	500 N	500 N	500 N
Gearbox length p	55.1 ± 0.5 mm	69.2 ± 0.5 mm	83.3 ± 0.5 mm	97.4 ± 0.5 mm
Ø x Total length	52.0 x 80.1 mm	52.0 x 94.2 mm	52.0 x 108.3 mm	52.0 x 122.4 mm
Weight	400 g	500 g	600 g	700 g

· Gear reductions see last page (fold-out page)
 · Specifications for motor attachment see page 12.1 (fold-out page)

Basic design



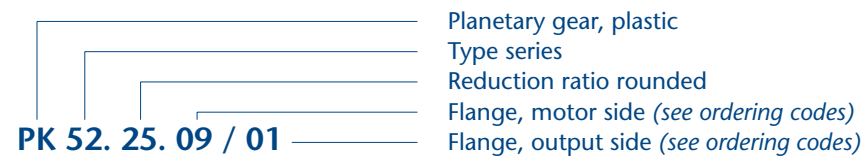
Refer to the above table for the values of p.

Ordering codes

- 01 Basic flange
- 06 Special flange
- 09 Bearing-mounted input shaft (see page 39)

Order example

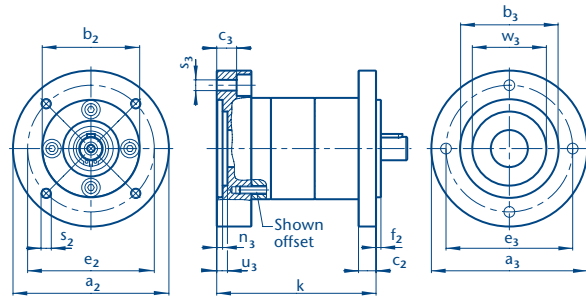
You wish to order a plastic planetary gear, with a diameter of 52 mm of type series PK 52 with the reduction ratio 25:1, bearing-mounted input shaft on motor side, basic flange on output side.



Feel free to contact us – we are happy to help you

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Standard flange



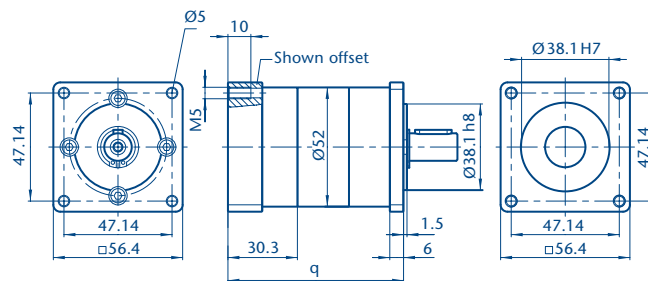
Refer to the table on the right for the values of k.

Dim. of motor mount./flange ¹⁾	a ₃	b ₃	w ₃	c ₃	e ₃	n ₃	u ₃	s ₃
C 80 ²⁾	80	50 H7	38 H7	10.2	65	3	5.5	5.5
C 105 ²⁾	105	70 H7		10.2	85	3		6.5

Dimensions of gear unit output/flange	a ₂	b ₂	c ₂	e ₂	f ₂	s ₂
C 80	80	50 j7	9	65	2.5	M5
C 90	90	60 j7	9	75	2.5	5.5
C 105	105	70 j7	9	85	2.5	6.5
C 120	120	80 j7	9	100	3.0	6.5

¹⁾ standard motors ²⁾ motor size 56 (B14, B3/B14)

NEMA flange 23



Refer to the table on the right for the values of q.

Ordering codes

- 01 Basic flange
- 02 C 80
- 03 C 90
- 04 C 105
- 05 C 120
- 06 Special flange
- 09 Bearing-mounted input shaft (see page 39)
- 23 NEMA flange

Order example

You wish to order a metal planetary gear with a diameter of 52 mm of type series PM 52 with the reduction ratio 46:1, special flange on motor side, basic flange on output side.

PM 52 LN. 46. 06 / 01

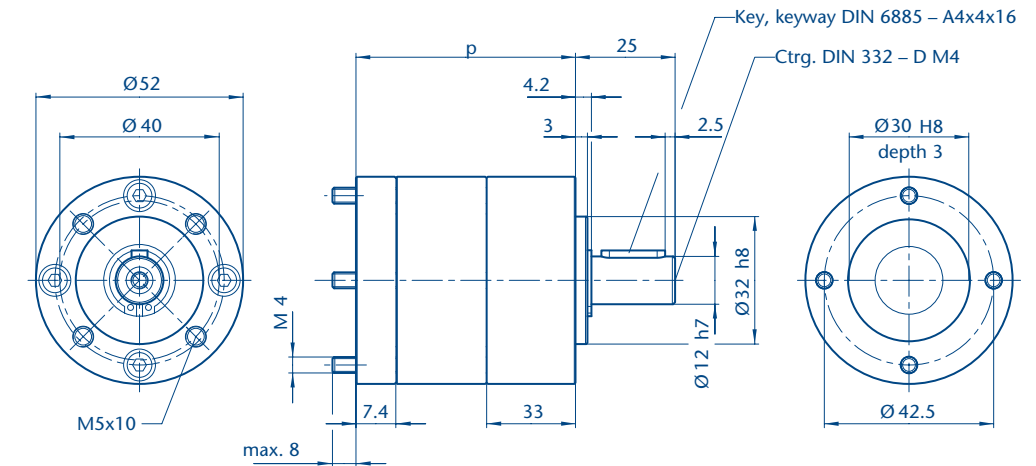
- Planetary gear, metal
- Type series
- Low-noise design
- Reduction ratio rounded
- Flange, motor side (see ordering codes)
- Flange, output side (see ordering codes)

Parameter	1-stage	2-stage	3-stage	4-stage
Perm. output torque (Appl. factor C _B =1.0)	4.0 Nm	12.0 Nm	25.0 Nm	25.0 Nm
Gearbox efficiency, approx.	0.80	0.75	0.70	0.65
Max. backlash in ° DEG	0.70° (LN: 1,10°) ¹⁾	0.75°	0.80°	0.85°
Recommended initial speed	3,000 rpm	3,000 rpm	3,000 rpm	3,000 rpm
Operating temperature	-30 °C to +140 °C	-30 °C to +140 °C	-30 °C to +140 °C	-30 °C to +140 °C
Output side with ball bearing (2RS)				
Max. load, radial	200 N	320 N	450 N	500 N
Max. load, axial	60 N	100 N	150 N	200 N
Max. perm. fitting pressure	500 N	500 N	500 N	500 N
Gearbox length p	55.3 ± 0.5 mm	69.5 ± 0.5 mm	83.7 ± 0.5 mm	97.9 ± 0.5 mm
Gearbox length k (motorsize 56)	82.0 ± 0.5 mm	96.2 ± 0.5 mm	110.4 ± 0.5 mm	124.6 ± 0.5 mm
Gearbox length q	76.6 ± 0.6 mm	90.8 ± 0.6 mm	105.0 ± 0.6 mm	119.2 ± 0.6 mm
Ø x Total length (p+length from bearing flange)	52.0 x 80.3 mm	52.0 x 94.5 mm	52.0 x 108.7 mm	52.0 x 122.9 mm
Weight (for gearbox length p)	0.7 kg	0.9 kg	1.1 kg	1.3 kg

¹⁾ For plastic PL wheels only! Impact of 1st stage for 2-4 stage versions is negligible.

· Gear reductions see last page (fold-out page)
 · Specifications for motor attachment see page 12.1 (fold-out page)

Basic design

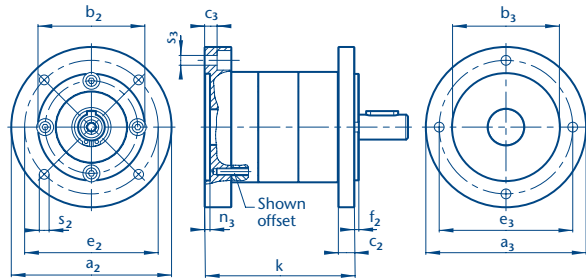


Refer to the above table for the values of p.

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Standard flange



Refer to the table on the right for the values of k.

Dim. of motor mount./flange ¹⁾	a ₃	b ₃	c ₃	e ₃	f ₃	s ₃
C 80 ²⁾	80	50 H7	7	65	3.0	5.5
C 105 ²⁾	105	70 H7	7	85	3.0	6.5
C 90 ³⁾	90	60 H7	7	75	3.0	5.5
C 120 ³⁾	120	80 H7	7	100	3.5	6.5

Dimensions of gear unit output/flange	a ₂	b ₂	c ₂	e ₂	f ₂	s ₂
C 80	80	50 j7	9	65	2.5	M5
C 90	90	60 j7	9	75	2.5	5.5
C 105	105	70 j7	9	85	2.5	6.5
C 120	120	80 j7	9	100	3.0	6.5

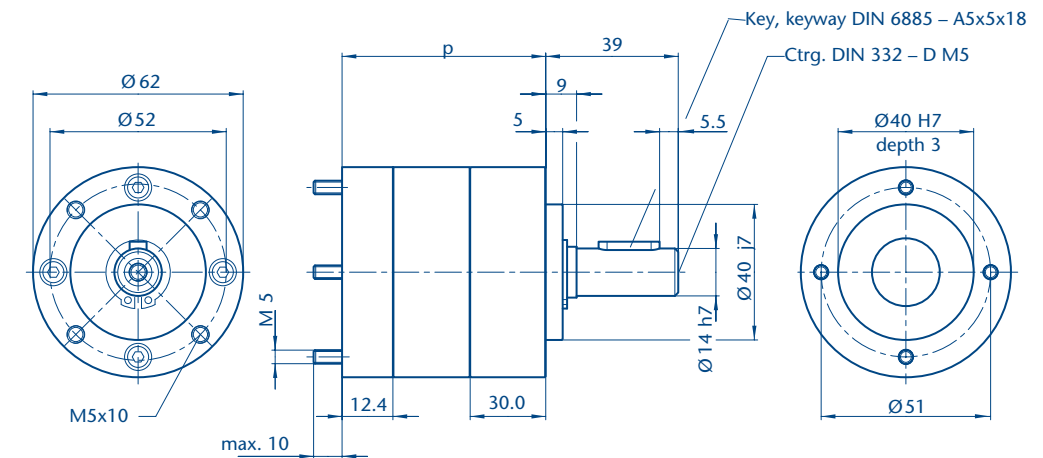
¹⁾ standard motors ²⁾ motor size 56 (B14, B3/B14) ³⁾ motor size 63 (B14, B3/B14)

Parameter	1-stage	2-stage	3-stage	4-stage
Perm. output torque (Appl. factor C _B =1.0)	8 Nm	25 Nm	50 Nm	50 Nm
Gearbox efficiency, approx.	0.80	0.75	0.70	0.65
Max. backlash in ° DEG	0.65° (LN: 0,95°) ¹⁾	0.70°	0.75°	0.80°
Recommended initial speed	3,000 rpm	3,000 rpm	3,000 rpm	3,000 rpm
Operating temperature	-30 °C to +140 °C	-30 °C to +140 °C	-30 °C to +140 °C	-30 °C to +140 °C
Output side with ball bearing (2RS)				
Max. load, radial	240 N	360 N	520 N	640 N
Max. load, axial	70 N	100 N	150 N	200 N
Max. perm. fitting pressure	1,000 N	1,000 N	1,000 N	1,000 N
Gearbox length p	58.2 ± 0.5 mm	75.1 ± 0.5 mm	92.0 ± 0.5 mm	108.9 ± 0.5 mm
Gearbox length k (motorsize 56 and 63)	82.3 ± 0.6 mm	99.2 ± 0.6 mm	116.1 ± 0.6 mm	133.0 ± 0.6 mm
Ø x Total length (p+length from bearing flange)	62.0 x 97.2 mm	62.0 x 114.1 mm	62.0 x 131.0 mm	62.0 x 147.9 mm
Weight (for gearbox length p)	0.8 kg	1.2 kg	1.6 kg	2.0 kg

¹⁾ For plastic PL wheels only! Impact of 1st stage for 2-4 stage versions is negligible.

· Gear reductions see last page (fold-out page)
 · Specifications for motor attachment see page 12.1 (fold-out page)

Basic design



Refer to the above table for the values of p.

Ordering codes

- 01 Basic flange
- 02 C 80
- 03 C 90
- 04 C 105
- 05 C 120
- 06 Special flange
- 09 Bearing-mounted input shaft (see page 39)

Order example

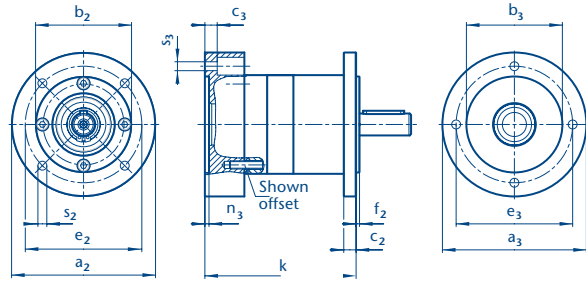
You wish to order a metal planetary gear with a diameter of 62 mm of type series PM 62 with the reduction ratio 46:1, flange C 80 on motor side, flange C 105 on output side.

Planetary gear, metal
 Type series
 Reduction ratio rounded
 Flange, motor side (see ordering codes)
 Flange, output side (see ordering codes)
PM 62. 46. 02 / 04

Feel free to contact us – we are happy to help you

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Standard flange



Refer to the table on the right for the values of k.

Dim. of motor mount./flange	a ₃	b ₃	c ₃	e ₃	f ₃	s ₃
C 80	80	50 H7	9	65	3.0	5.5
C 90	90	60 H7	9	75	3.0	5.5
C 105	105	70 H7	9	85	3.0	6.5
C 120	120	80 H7	9	100	3.5	6.5

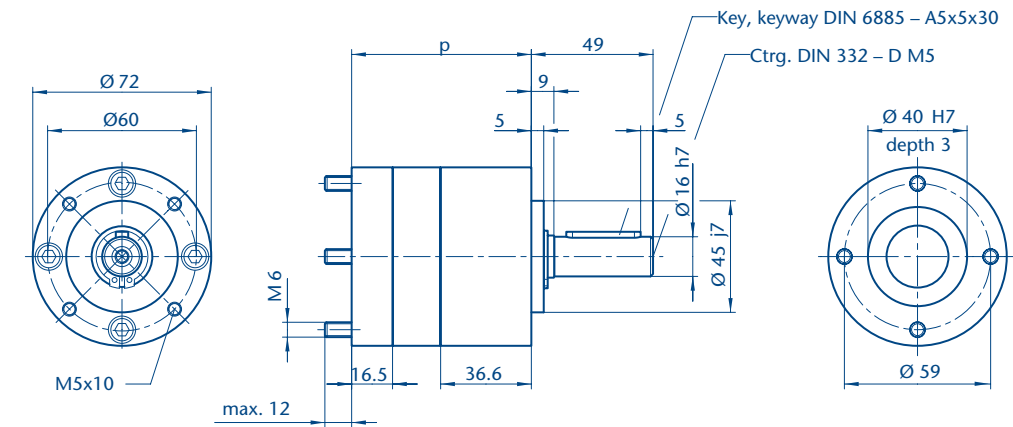
Dimensions of gear unit output/flange	a ₂	b ₂	c ₂	e ₂	f ₂	s ₂
C 80	80	50 j7	9	65	2.5	M5
C 90	90	60 j7	9	75	2.5	M5
C 105	105	70 j7	9	85	2.5	6.5
C 120	120	80 j7	9	100	3.0	6.5

Parameter	1-stage	2-stage	3-stage	4-stage
Perm. output torque (Appl. factor C _B =1.0)	14 Nm	42 Nm	84 Nm	84 Nm
Gearbox efficiency, approx.	0.80	0.75	0.70	0.65
Max. backlash in ° DEG	0.60° (LN: 0.90°) ¹⁾	0.65°	0.70°	0.75°
Recommended initial speed	3,000 rpm	3,000 rpm	3,000 rpm	3,000 rpm
Operating temperature	-30 °C to +140 °C	-30 °C to +140 °C	-30 °C to +140 °C	-30 °C to +140 °C
Output side with ball bearing (2RS)				
Max. load, radial	320 N	480 N	760 N	1,000 N
Max. load, axial	70 N	100 N	160 N	220 N
Max. perm. fitting pressure	1,300 N	1,300 N	1,300 N	1,300 N
Gearbox length p	73.4 ± 0.5 mm	93.0 ± 0.5 mm	112.6 ± 0.5 mm	132.2 ± 0.5 mm
Gearbox length k (motorsize 56 and 63)	94.6 ± 0.6 mm	114.2 ± 0.6 mm	133.8 ± 0.6 mm	154.4 ± 0.6 mm
Ø x Total length (p + length from bearing flange)	72.0 x 122.4 mm	72.0 x 142.0 mm	72.0 x 161.6 mm	72.0 x 181.2 mm
Weight (for gearbox length p)	1.4 kg	1.9 kg	2.4 kg	2.9 kg

¹⁾ For plastic PL wheels only! Impact of 1st stage for 2-4 stage versions is negligible.

· Gear reductions see last page (fold-out page)
 · Specifications for motor attachment see page 12.1 (fold-out page)

Basic design



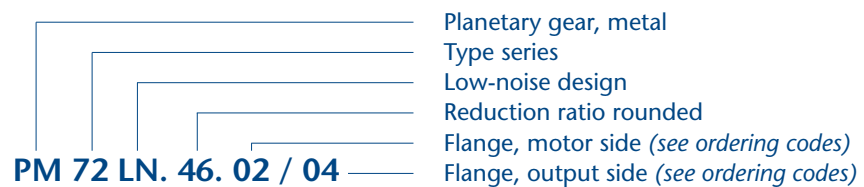
Refer to the above table for the values of p.

Ordering codes

- 01 Basic flange
- 02 C 80
- 03 C 90
- 04 C 105
- 05 C 120
- 06 Special flange
- 09 Bearing-mounted input shaft (see page 39)

Order example

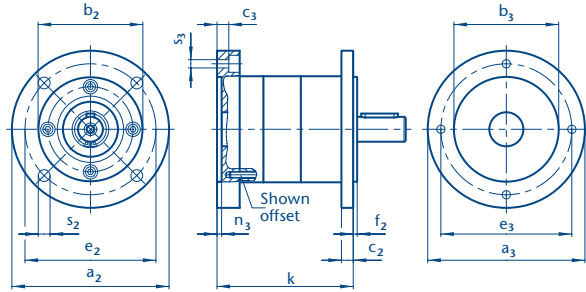
You wish to order a metal planetary gear with a diameter of 72 mm of type series PM 72 with the reduction ratio 46:1, flange C 80 on motor side, flange C 105 on output side.



Feel free to contact us – we are happy to help you

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Standard flange



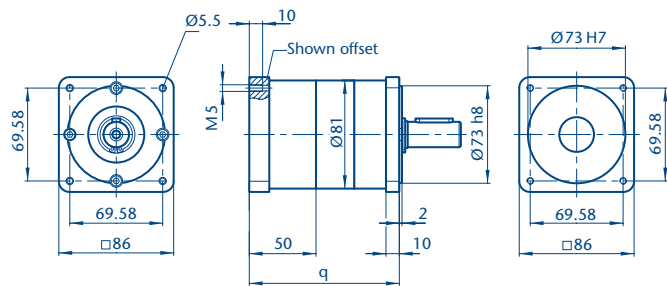
Refer to the table on the right for the values of k.

Dim. of motor mount./flange ¹⁾	a ₃	b ₃	c ₃	e ₃	n ₃	s ₃
C 80 ²⁾	81	50 H7	9	65	3.0	5.5
C 90 ³⁾	90	60 H7	9	75	3.0	5.5
C 105 ²⁾	105	70 H7	9	85	3.0	6.5
C 120 ³⁾	120	80 H7	9	100	3.5	6.5

Dimensions of gear unit output/flange	a ₂	b ₂	c ₂	e ₂	f ₂	s ₂
C 90	90	60 j7	9	75	2.5	M5
C 105	105	70 j7	9	85	2.5	M6
C 120	120	80 j7	9	100	3.0	6.5

¹⁾ standard motors ²⁾ motor size 56 (B14, B3/B14) ³⁾ motor size 63 (B14, B3/B14)

NEMA flange 34



Refer to the table on the right for the values of q.

Ordering codes

- 01 Basic flange
- 02 C 80
- 03 C 90
- 04 C 105
- 05 C 120
- 06 Special flange
- 09 Bearing-mounted input shaft (see page 39)
- 34 NEMA flange

Order example

You wish to order a metal planetary gear with a diameter of 81 mm of type series PM 81 with the reduction ratio 46:1, special flange on motor side, basic flange on output side.

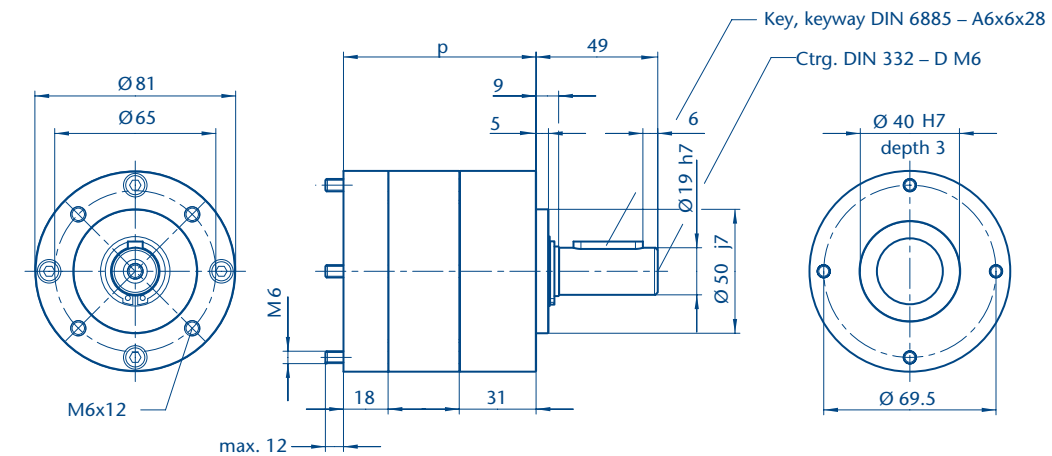
Planetary gear, metal
 Type series
 Low-noise design
 Reduction ratio rounded
 Flange, motor side (see ordering codes)
PM 81 LN. 46. 06 / 01
 Flange, output side (see ordering codes)

Parameter	1-stage	2-stage	3-stage	4-stage
Perm. output torque (Appl. factor C _B =1.0)	20 Nm	60 Nm	120 Nm	120 Nm
Gearbox efficiency, approx.	0.80	0.75	0.70	0.65
Max. backlash in ° DEG	0.50° (LN: 0.85°) ¹⁾	0.55°	0.60°	0.65°
Recommended initial speed	3,000 rpm	3,000 rpm	3,000 rpm	3,000 rpm
Operating temperature	-30 °C to +140 °C	-30 °C to +140 °C	-30 °C to +140 °C	-30 °C to +140 °C
Output side with ball bearing (2RS)				
Max. load, radial	400 N	600 N	1,000 N	1,300 N
Max. load, axial	80 N	120 N	200 N	280 N
Max. perm. fitting pressure	1,500 N	1,500 N	1,500 N	1,500 N
Gearbox length p	77.9 ± 0.5 mm	99.6 ± 0.5 mm	121.3 ± 0.5 mm	143.0 ± 0.5 mm
Gearbox length k (motorsize 56 and 63)	104.1 ± 0.6 mm	125.8 ± 0.6 mm	147.5 ± 0.6 mm	169.2 ± 0.6 mm
Gearbox length q	112.4 ± 0.5 mm	134.1 ± 0.5 mm	155.8 ± 0.5 mm	177.5 ± 0.5 mm
Ø x Total length (p+length from bearing flange)	81.0 x 126.9 mm	81.0 x 148.6 mm	81.0 x 170.3 mm	81.0 x 192.0 mm
Weight (for gearbox length p)	1.8 kg	2.5 kg	3.2 kg	3.9 kg

¹⁾ For plastic PL wheels only! Impact of 1st stage for 2-4 stage versions is negligible.

· Gear reductions see last page (fold-out page)
 · Specifications for motor attachment see page 12.1 (fold-out page)

Basic design

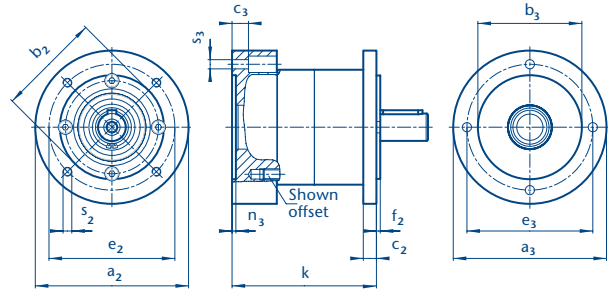


Refer to the above table for the values of p.

Feel free to contact us – we are happy to help you

The details given herein are recommended values. Minor variances due to reduction ratios or non-standard testing or measuring methods etc. may occur. Please refer to pages 6 to 11 and 39 of this catalogue for basic or additional information, or contact us directly. Technical details subject to change without notice.

Standard flange

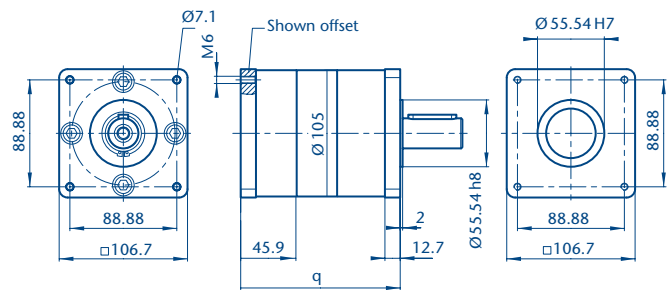


Refer to the table on the right for the values of k.

Dim. of motor mount./flange ¹⁾	a ₃	b ₃	c ₃	e ₃	n ₃	s ₃
C 105	105	70 H7	15	85	3.0	6.5
C 120	120	80 H7	15	100	3.5	6.5
C 140	140	95 H7	15	115	3.5	8.5
C 160	160	110 H7	15	130	4.0	8.5

Dimensions of gear unit output/flange	a ₂	b ₂	c ₂	e ₂	f ₂	s ₂
C 120	120	80 j7	12	100	3.0	M6
C 140	140	95 j7	12	115	3.5	M8
C 160	160	110 j7	12	130	3.5	M8

NEMA flange 42



Refer to the table on the right for the values of q.

Ordering codes

- 01 Basic flange
- 02 C 105
- 03 C 120
- 04 C 140
- 05 C 160
- 06 Special flange
- 09 Bearing-mounted input shaft (see page 39)
- 42 NEMA flange

Order example

You wish to order a metal planetary gear with a diameter of 105 mm of type series PM 105 with the reduction ratio 46:1, special flange on motor side, basic flange on output side.

PM 105 LN. 46. 06 / 01

- Planetary gear, metal
- Type series
- Low-noise design
- Reduction ratio rounded
- Flange, motor side (see ordering codes)
- Flange, output side (see ordering codes)

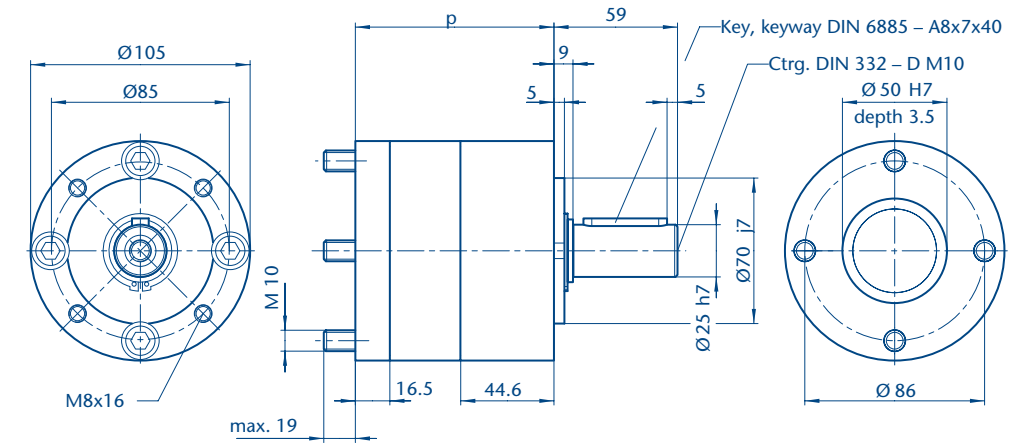
Parameter	1-stage	2-stage	3-stage	4-stage
Perm. output torque (Appl. factor C _B =1.0)	35 Nm	105 Nm	195 Nm	195 Nm
Gearbox efficiency, approx.	0.80	0.75	0.70	0.65
Max. backlash in ° DEG	0.55° (LN: 0.90°) ¹⁾	0.60°	0.65°	0.70°
Recommended initial speed	3,000 rpm	3,000 rpm	3,000 rpm	3,000 rpm
Operating temperature	-30 °C to +140 °C	-30 °C to +140 °C	-30 °C to +140 °C	-30 °C to +140 °C

Output side with ball bearing (2RS)	1-stage	2-stage	3-stage	4-stage
Max. load, radial	600 N	900 N	1,500 N	1,750 N
Max. load, axial	120 N	180 N	300 N	400 N
Max. perm. fitting pressure	2,000 N	2,000 N	2,000 N	2,000 N
Gearbox length p	92.9 ± 0.5 mm	124.0 ± 0.5 mm	155.1 ± 0.5 mm	186.2 ± 0.5 mm
Gearbox length k (motorsize 71)	129.2 ± 0.6 mm	160.3 ± 0.6 mm	191.4 ± 0.6 mm	222.5 ± 0.6 mm
Gearbox length k (motorsize 80)	139.2 ± 0.6 mm	170.3 ± 0.6 mm	201.4 ± 0.6 mm	232.5 ± 0.6 mm
Gearbox length q	132.6 ± 0.5 mm	163.7 ± 0.5 mm	194.8 ± 0.5 mm	225.9 ± 0.5 mm
Ø x Total length (p + length from bearing flange)	105.0 x 151.9 mm	105.0 x 183.0 mm	105.0 x 214.1 mm	105.0 x 245.2 mm
Weight (for gearbox length p)	4.4 kg	6.0 kg	7.6 kg	9.2 kg

¹⁾ For plastic PL wheels only! Impact of 1st stage for 2-4 stage versions is negligible.

· Gear reductions see last page (fold-out page)
 · Specifications for motor attachment see page 12.1 (fold-out page)

Basic design

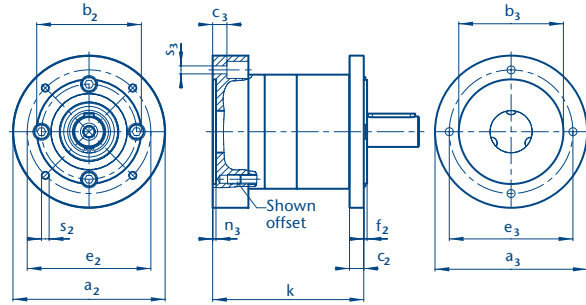


Refer to the above table for the values of p.

Feel free to contact us – we are happy to help you

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Standard flange



Refer to the table on the right for the values of k.

Dim. of motor mount./flange ¹⁾	a ₃	b ₃	c ₃	e ₃	f ₃	s ₃
C 105 ²⁾	120	70 H7	15	85	3.0	6.5
C 140 ²⁾	140	95 H7	15	115	3.5	8.5
C 120 ³⁾	120	80 H7	15	100	3.5	6.4
C 160 ³⁾	160	110 H7	15	130	4.0	8.5

Dimensions of gear unit output/flange	a ₂	b ₂	c ₂	e ₂	f ₂	s ₂
C 140	140	95 j7	15	115	3.0	M8
C 160	160	110 j7	15	130	3.5	M8

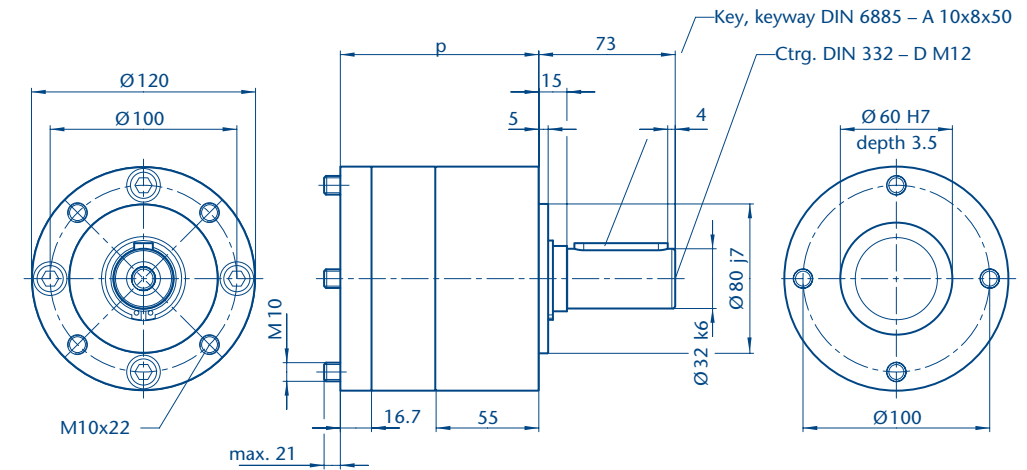
¹⁾ standard motors ²⁾ motor size 71 (B14, B3/B14) ³⁾ motor size 80 (B14, B3/B14)

Parameter	1-stage	2-stage	3-stage	4-stage
Perm. output torque (Appl. factor C _B =1.0)	50 Nm	150 Nm	300 Nm	300 Nm
Gearbox efficiency, approx.	0.80	0.75	0.70	0.65
Max. backlash in ° DEG	1.00°	1.50°	2.00°	2.50°
Recommended initial speed	3,000 rpm	3,000 rpm	3,000 rpm	3,000 rpm
Operating temperature	-30 °C to +140 °C	-30 °C to +140 °C	-30 °C to +140 °C	-30 °C to +140 °C

Output side with ball bearing (2RS)	1-stage	2-stage	3-stage	4-stage
Max. load, radial	600 N	900 N	1,500 N	1,750 N
Max. load, axial	120 N	180 N	300 N	400 N
Max. perm. fitting pressure	2,500 N	2,500 N	2,500 N	2,500 N
Gearbox length p	106.4 ± 0.5 mm	140.6 ± 0.5 mm	174.8 ± 0.5 mm	209.0 ± 0.5 mm
Gearbox length k (motorsize 71)	148.9 ± 0.6 mm	183.1 ± 0.6 mm	217.3 ± 0.6 mm	251.5 ± 0.6 mm
Gearbox length k (motorsize 80)	158.9 ± 0.6 mm	193.1 ± 0.6 mm	227.3 ± 0.6 mm	261.5 ± 0.6 mm
Ø x Total length (p+length from bearing flange)	120.0 x 179.4 mm	120.0 x 213.6 mm	120.0 x 247.8 mm	210.0 x 282.0 mm
Weight (for gearbox length p)	5.6 kg	8.0 kg	10.4 kg	12.8 kg

· Gear reductions see last page (fold-out page)
 · Specifications for motor attachment see page 12.1 (fold-out page)

Basic design



Refer to the above table for the values of p.

Ordering codes

- 01 Basic flange
- 02 C 105
- 03 C 120
- 04 C 140
- 05 C 160
- 06 Special flange
- 09 Bearing-mounted input shaft (see page 39)

Order example

You wish to order a metal planetary gear with a diameter of 120 mm of type series PM 120 with the reduction ratio 46:1, flange C 120 on motor side, flange C 140 on output side.

Planetary gear, metal
 Type series
 Reduction ratio rounded
 Flange, motor side (see ordering codes)
 Flange, output side (see ordering codes)
PM 120. 46. 03 / 04

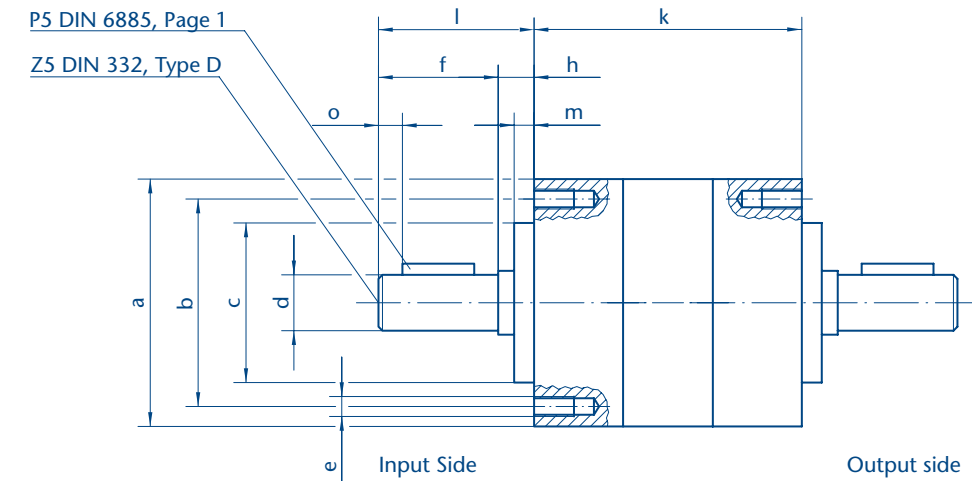
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Option bearing-mounted input shaft

	PK22	PK32, PM32, LN	PK32	PK42, PM42, LN	PK52, PM52, LN	PM62, LN	PM72, LN	PM81, LN	PM105, LN	PM120	
Shaft load based on shaft centre and $n_1 = 3,000$ rpm											
radial	10N	25N	25N	70N	110N	120N	160N	200N	240N	300N	
axial	3N	10N	10N	40N	50N	60N	80N	100N	125N	150N	
Fitting pressure	max. 150N	max. 120N	max. 120N	max. 320N	max. 500N	max. 1,000N	max. 1,300N	max. 1,500N	max. 1,800N	max. 2,500N	
Dimensions											
Stages	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	
k	27 35 44 52	38 47 57 66	41 51 60 70	61 74 87 100	71 85 99 113	69 86 103 120	83 102 122 142	90 112 134 155	106 137 169 200	132 166 200 234	
a	22	32	32	42	52	62	72	81	105	120	
b	19	26	26	36	40	52	60	65	85	100	
c	14 h8	20 h8	20 h8	25 h9	32 h8	40 j7	45 j7	50 j7	70 j7	80 j7	
d	4 h7	6 h7	6 h7	6 h7	10 h7	12 h7	14 h7	16 h7	19 h7	28 h7	
e	M2 x 4 3 x 120°	M3 x 4 4 x 90°	M3 x 4 4 x 90°	M4 x 10 ^{a)} 4 x 90° ^{a)}	M5 x 10 4 x 90°	M5 x 10 4 x 90°	M5 x 10 4 x 90°	M6 x 12 4 x 90°	M8 x 16 4 x 90°	M10 x 22 4 x 90°	
f	10	16,6	16,6	22,2	20	30	30	40	40	58	
h	4,5	3,4	3,4	2,8	5	9	9	9	9	15	
l	14,5	20	20	25	25	39	39	49	49	73	
m	2	3	3	2	3	5	5	5	5	5	
o		2,5	2,5	3	2	5	5,5	5	6	4	
p	Area 3,5 x 8	A2 x 2 x 12	A2 x 2 x 12	A2 x 2 x 16	A3 x 3 x 16	A4 x 4 x 20	A5 x 5 x 22	A5 x 5 x 30	A6 x 6 x 28	A10 x 8 x 50	
z					M3 x 9	M4 x 10	M5 x 12,5	M5 x 12,5	M6 x 16	M10 x 22	
Bearings	Sintered bearing	Ball bearing	Sintered bearing	Ball bearing	Ball bearing	Ball bearing	Ball bearing	Ball bearing	Ball bearing	Ball bearing	

^{a)} Position $\hat{=}$ M4 output side



Ordering codes

09 Bearing-mounted input shaft

Order example

You wish to order a metal planetary gear with a diameter of 120 mm of type series PM 120 with the reduction ratio 46:1, bearing-mounted input shaft, flange C 140 on output side.

Planetary gear, metal
 Type series
 Reduction ratio rounded
 bearing-mounted input shaft (see ordering codes)
 Flange, output side (see ordering codes)

PM 120. 46. 09 / 04

Feel free to contact us – we are happy to help you

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PM type series in ATEX design

Designed for use in potentially explosive atmospheres, the planetary gear range PM 32 to PM 120 is also available in explosion-protected design in compliance with ATEX 100a.

The explosion-protected planetary gears comply with Directive 94/9/EG for explosion protection in non-electric operational equipment for device group II, category 2 in gas atmospheres.

For more detailed information on our ATEX planetary gears, please contact us. We'd be pleased to help.

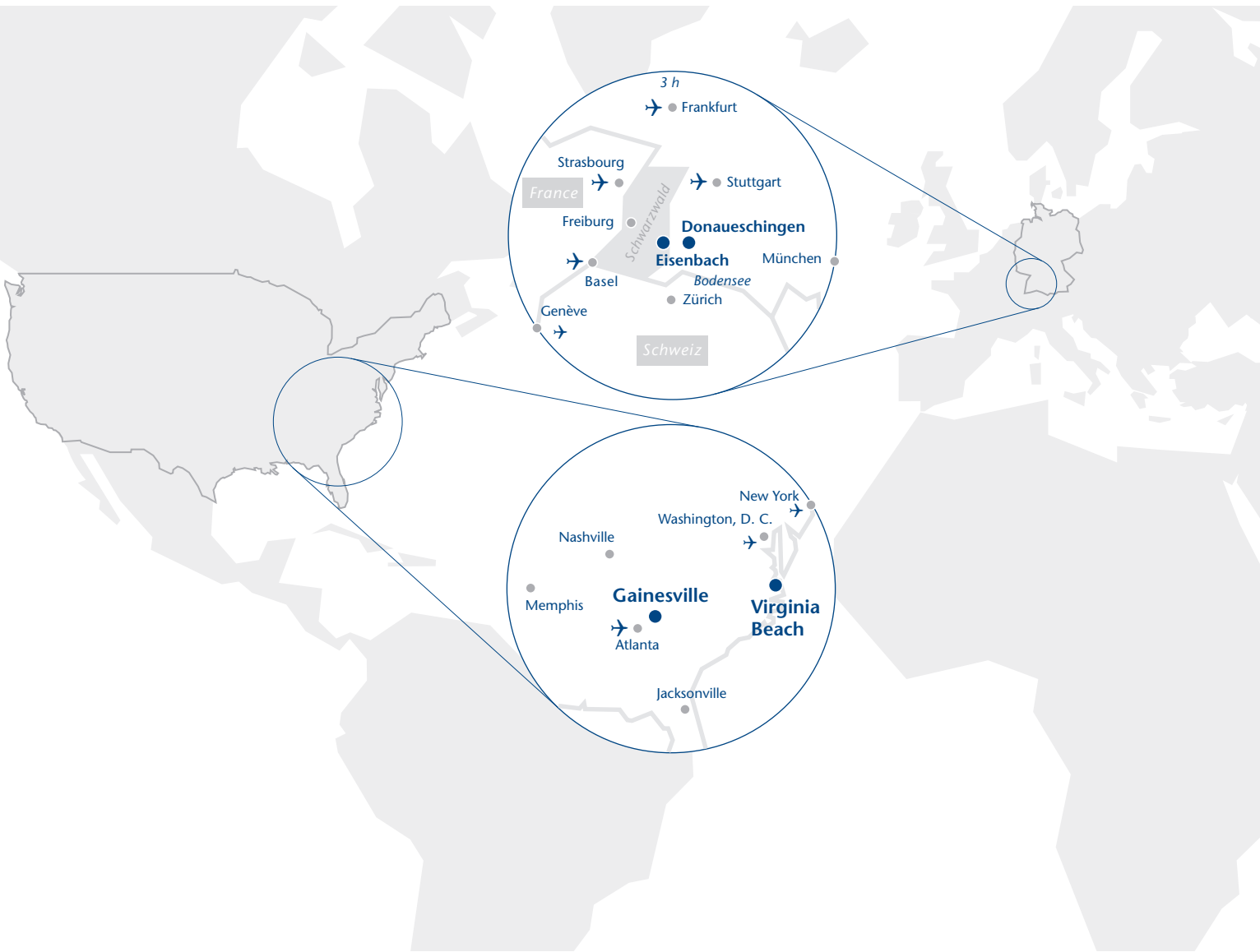
Feel free to contact us – we are happy to help you

Conversion table

Torque			Force			Length			Mass		
From	→	to	From	→	to	From	→	to	From	→	to
ozin	/ 141.61	Nm	oz	/ 3.60	N	in	* 2.54	cm	oz	* 28.35	g
lbft	/ 0.738	Nm	lbf	/ 0.225	N	ft	* 30.48	cm	lbs	* 453.5	g
Nm	* 141.61	ozin	N	* 3.60	oz	cm	/ 2.54	in	g	/ 28.35	oz
Nm	* 0.738	lbft	N	* 0.225	lbf	cm	/ 30.48	ft	g	/ 453.5	lbs

Please open up!

Our international sites and locations and how to contact us



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Gear reductions

1-stage			2-stage			3-stage			4-stage				
	PK	PM LN	PK	PM LN	PK	PM LN	PK	PM LN	PK	PM LN	PK	PM LN	
Ø22*	•	• -	-	- -	-	- -	Ø22*	•	• -	-	-	-	
Ø32	•	• •	-	- -	-	- -	Ø32	•	• •	•	-	-	
Ø42	•	• -	-	- -	•	Ø42	•	• -	-	-	•	Ø42	•
Ø52	•	• -	-	- -	•	Ø52	•	• -	-	-	•	Ø52	•
Ø62	-	• -	-	- -	•	Ø62	-	• -	-	-	•	Ø62	-
Ø72	-	• -	-	- -	•	Ø72	-	• -	-	-	•	Ø72	-
Ø81	-	• -	-	- -	•	Ø81	-	• -	-	-	•	Ø81	-
Ø105	-	• -	-	- -	•	Ø105	-	• -	-	-	•	Ø105	-
Ø120*	-	• -	-	- -	-	Ø120*	-	• -	-	-	-	Ø120*	-

* not all reduction ratios available ex stock

Reduction ratios i rounded							
4:1 (3.70)	4:1 (3.65)	14:1 (13.73)	14:1 (13.53)	51:1 (50.89)	50:1 (50.16)	189:1 (188.61)	186:1 (185.88)
4:1 (4.28)	5:1 (4.59)	16:1 (15.88)	16:1 (15.65)	59:1 (58.85)	58:1 (58.01)	218:1 (218.12)	215:1 (214.96)
5:1 (5.18)	5:1 (5.36)	18:1 (18.36)	17:1 (17.01)	68:1 (68.06)	67:1 (67.08)	252:1 (252.24)	249:1 (248.59)
7:1 (6.75)	7:1 (6.55)	19:1 (19.20)	19:1 (18.92)	71:1 (71.16)	70:1 (70.13)	264:1 (263.72)	260:1 (259.91)
	9:1 (8.63)	22:1 (22.20)	23:1 (22.96)	79:1 (78.71)	81:1 (81.11)	292:1 (291.71)	287:1 (287.49)
		25:1 (25.01)	25:1 (24.65)	93:1 (92.70)	91:1 (91.36)	305:1 (304.99)	301:1 (300.57)
		27:1 (26.85)	28:1 (27.76)	95:1 (95.17)	98:1 (98.07)	337:1 (337.35)	339:1 (338.56)
		29:1 (28.93)	28:1 (28.05)	100:1 (99.5)	101:1 (101.89)	344:1 (343.54)	348:1 (347.60)
		35:1 (34.97)	34:1 (33.92)	107:1 (107.20)	106:1 (105.65)	353:1 (352.71)	361:1 (361.17)
		46:1 (45.56)	45:1 (44.69)	115:1 (115.07)	115:1 (114.77)	369:1 (368.76)	365:1 (364.66)
			58:1 (58.22)	124:1 (123.97)	123:1 (123.20)	397:1 (397.29)	392:1 (391.53)
				130:1 (129.62)	128:1 (127.74)	408:1 (407.89)	420:1 (420.28)
				139:1 (139.13)	137:1 (136.99)	426:1 (426.46)	425:1 (425.34)
				150:1 (149.90)	145:1 (145.36)	459:1 (459.45)	457:1 (456.56)
				169:1 (168.84)	166:1 (166.40)	480:1 (480.36)	473:1 (473.40)
				181:1 (181.24)	176:1 (175.75)	493:1 (493.18)	492:1 (491.89)
				195:1 (195.26)	192:1 (191.54)	516:1 (515.62)	515:1 (515.24)
				236:1 (236.09)	232:1 (231.59)	531:1 (531.34)	533:1 (533.08)
				308:1 (307.54)	302:1 (301.68)	556:1 (555.52)	547:1 (547.47)
					393:1 (392.98)	596:1 (596.30)	595:1 (594.73)
						626:1 (625.73)	623:1 (622.97)
						642:1 (642.42)	638:1 (638.40)
						672:1 (671.67)	679:1 (678.94)
						721:1 (720.98)	713:1 (713.15)
						724:1 (723.63)	745:1 (745.38)
						777:1 (776.76)	775:1 (774.72)
						837:1 (836.86)	832:1 (831.60)
						875:1 (874.94)	862:1 (862.27)
						939:1 (939.18)	925:1 (924.65)
						1012:1 (1011.84)	1046:1 (1046.08)
						1140:1 (1139.73)	1123:1 (1123.21)
						1223:1 (1223.41)	1200:1 (1200.07)
						1318:1 (1318.05)	1293:1 (1292.91)
						1594:1 (1593.65)	1563:1 (1563.24)
						2076:1 (2075.94)	2036:1 (2036.33)
							2653:1 (2652.59)

Notes on selecting the reduction ratios

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