

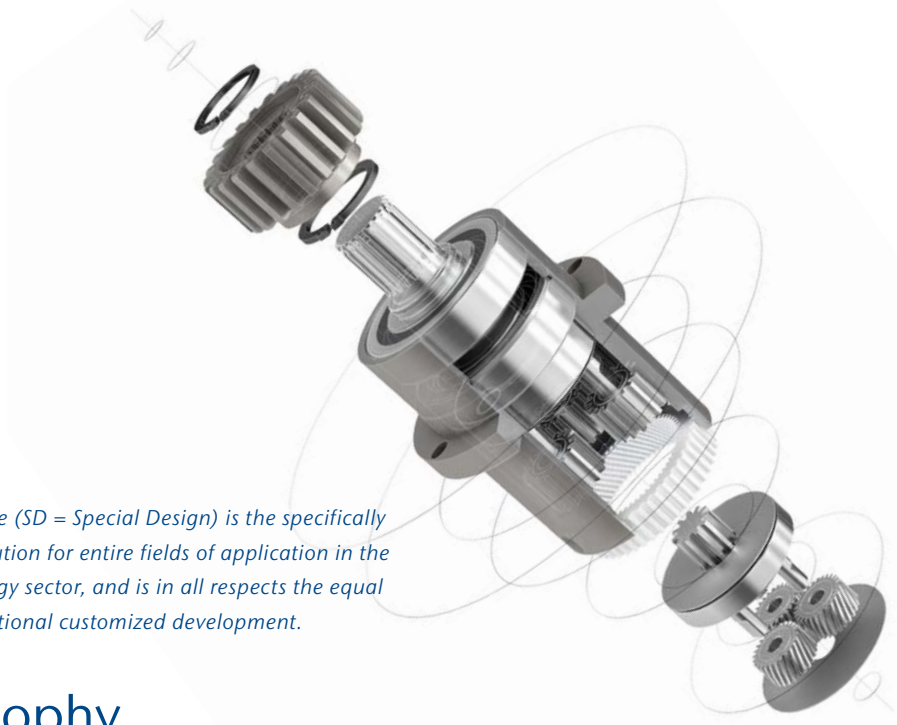
Specific optimized solutions for interbranch applications

Planetary Gears IMS.**SD**line



Gear Technology. Worldwide.

IMS:GEAR



The IMS.SDline (SD = Special Design) is the specifically optimized solution for entire fields of application in the gear technology sector, and is in all respects the equal of any conventional customized development.

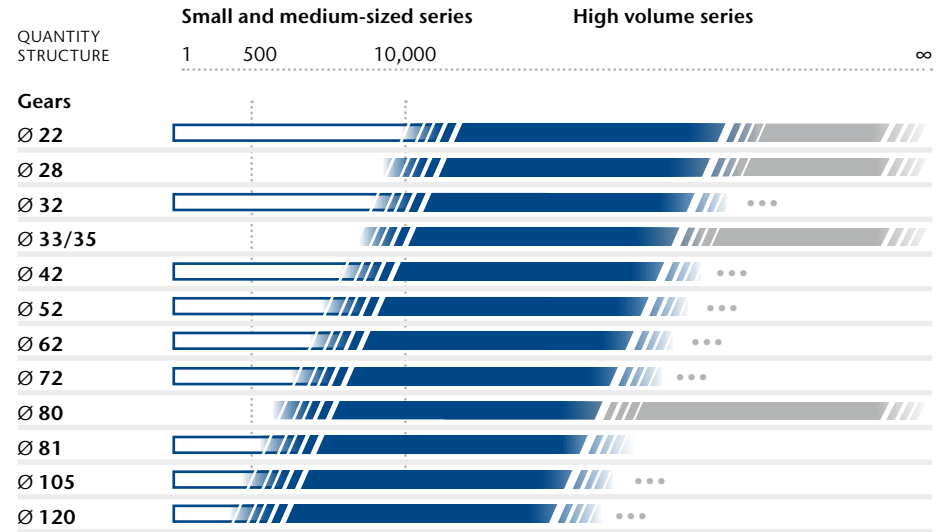
Philosophy

ATTENTION FOCUSED ON ENTIRE FIELDS OF APPLICATION The IMS.SDline stands for specifically optimized solutions developed by IMS Gear for interbranch applications.

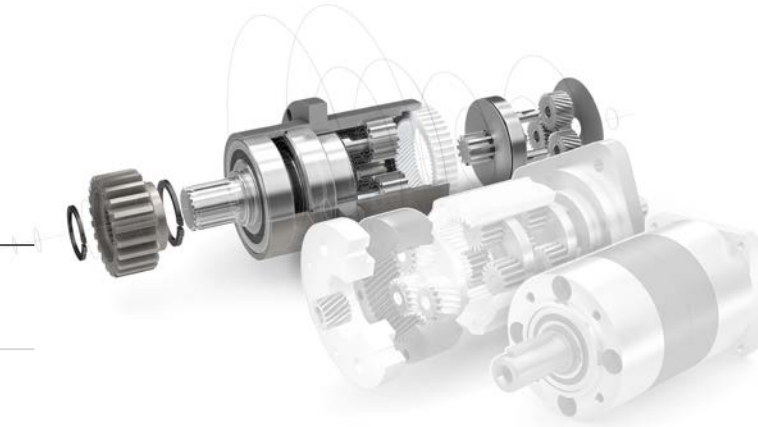
IN CONTRAST TO the modular systems of IMS.baseline and IMS.techline, the IMS.SDline system also enables the design of gear components to be modified, for example to reflect the changing needs of component geometry or materials. This makes it possible, while retaining an unmodified gear tooth profile, to achieve the highest possible levels of individualization.

Always the optimum

	IMS.baseline	IMS.techline	IMS.SDline
MODIFICATION OPTIONS: — /			
Motor-/output end	✓	✓	✓
Geardrive diameter	—	✓	✓
Material mix	—	✓	✓
Reduction ratio	—	✓	✓
Geometry of toothed parts	—	—	✓
Material of toothed parts	—	—	✓
Tooth shape	—	—	—



! All figures are approximate values. Variations are possible and may arise for example due to non-standardized inspection and measurement methods. For more detailed information, please contact us directly. The company always reserves the right to make technical modifications. For current status, please consult our website www.imsgear.com



Interaction

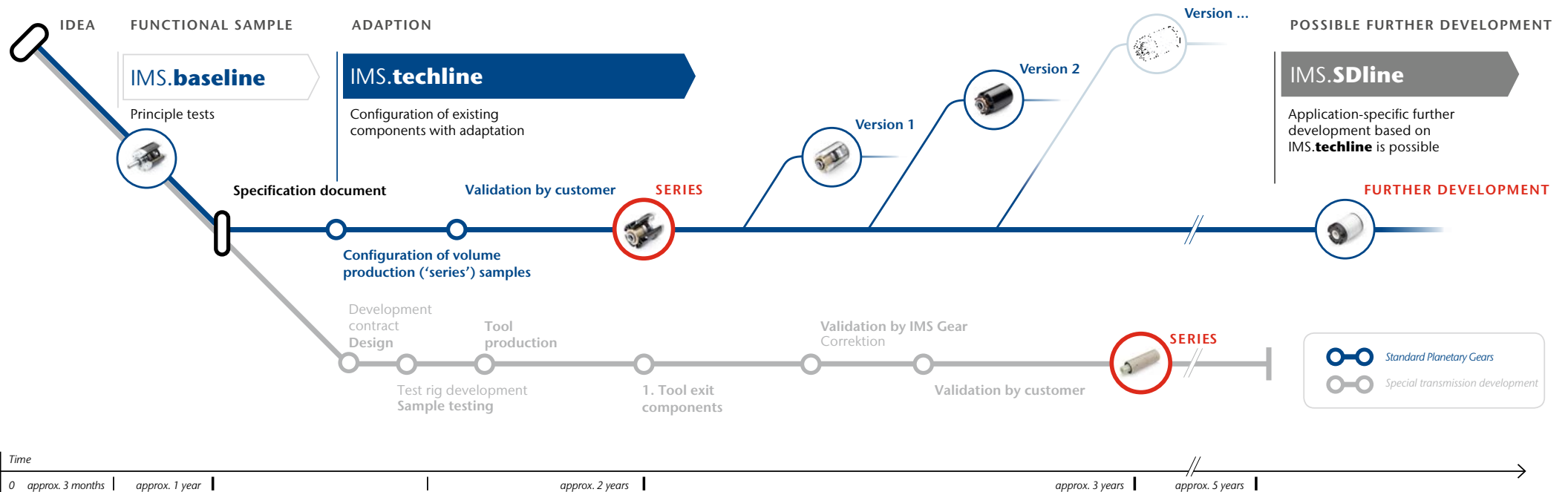
The alternative to customized solutions

WITH IMS.SDline, IMS Gear is developing gear drive solutions for interbranch applications. These further developments are always worth considering whenever a product based on the IMS.techline modular system has been on the market for several years and technical requirements have become established in the application field.

IMS.SDline

IMS.techline

IMS.baseline



Development of a spindle drive

IMS.baseline

IMS.techline



START VERSION → VERSION 02 → VERSION 03 → VERSION 04

Sample Sample Advance development in volume prod.

PM 32	PK 32	PK 32	PK 32 LN
Initial functional samples	Optimization of price-performance ratio through the use of plastic	Customer-specific design of motor end and output end	Optimization of acoustic properties through the use of 'low noise' components in the 1st stage

Motor-/output end	✓	✓	✓
Geardrive diameter	-	✓	✓
Material mix	-	✓	✓
Ratio	-	✓	✓
Geometry of toothed parts	-	-	-
Material of toothed parts	-	-	-
Tooth shape	-	-	-

VOLUME < 100

IMS.SDline



VERSION 05 → VERSION 06 → VERSION 07 → VERSION 08

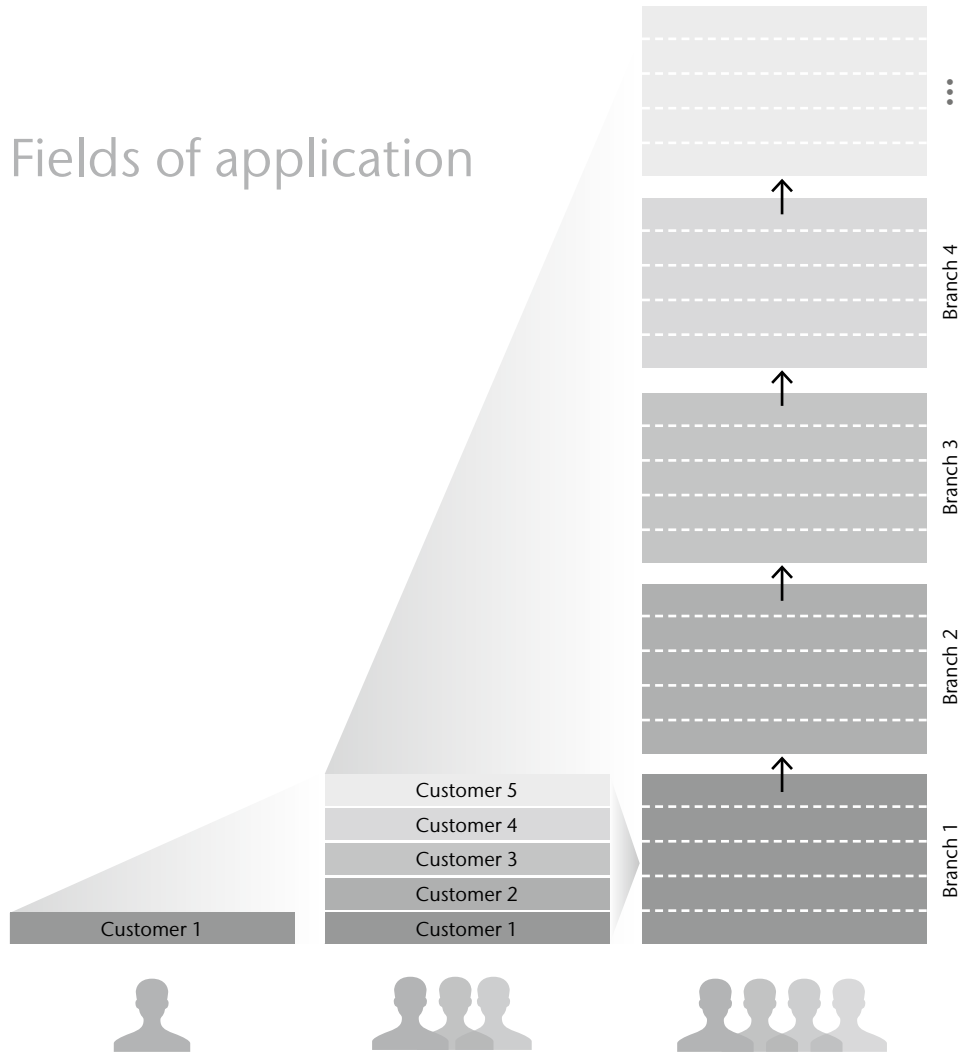
in volume prod. in volume prod. in volume prod. New development

PM 28 LN	PM 28 LN	PK 28 LN	PK 28 LN-SD
Optimization of installation space through reduction of diameter to Ø 28	Planetary gear carrier out of plastic	Plastic Gear housing	IMS Gear development influenced by market and branch experiences like: <ul style="list-style-type: none"> entirely plastic output geometrically optimized gear components specialist materials

✓	✓	✓	✓
✓	✓	✓	✓
✓	✓	✓	✓
✓	✓	✓	✓
-	-	-	✓
-	-	-	-
-	-	-	-

> SEVERAL 1,000 PER VARIANT AND YEAR

Fields of application



IMS.baseline

Customer specific solution for function samples and small-volume series

IMS.techline

Application specific solutions for high-volume series and different customers, for example spoiler-adjustment

IMS.SDline

Specific optimized solutions for interbranch applications for example PK33 SD:

- spoiler-adjustment
- bed-adjustment
- roof window control
- ...

The new freedoms with IMS.SDline

With its IMS.SDline, IMS Gear bridges the gap between the capabilities of IMS.techline and bespoke development of a customer-specific ‘special’ gear head.

That is achieved through the additional levels of freedom afforded by IMS.SDline in respect of:

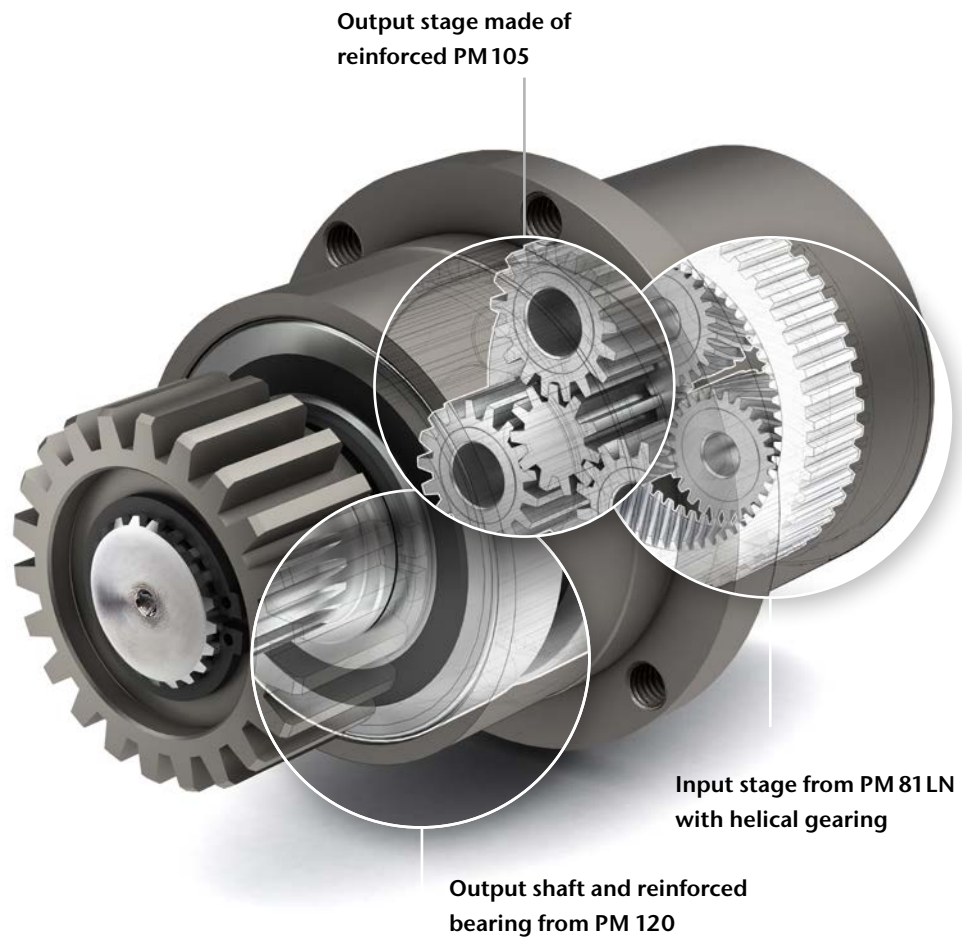
- Adaptation of geometry to suit gear components (e.g longer or shorter planetary gears, thicker bearing bolts, etc.)
- Extended choice of materials (e.g. thermoplastic elastomers, or high-temperature plastics)
- Combination of different product line diameters within a single transmission (e.g. PM 81 components in the 1st stage and PM 105 transmission components in the 2nd stage)

That enables IMS.SDline to eliminate the remaining module restrictions faced by IMS.techline. With one exception: The market-proven, special-purpose IMS Gear designs of gearing can also be used in IMS.SDline.

In this way, IMS.SDline gearing solutions provide an innovative response to the continuously rising expectations on price and performance of a global market for high-volume solutions aimed at a broad spread of market sectors:

- Great adaptability, comparable to bespoke or customized ‘special’ gear head development
- Short ‘time to market’ implementation lead times
- Low levels of investment through further development of the IMS.techline modules
- Proven IMS Gear designs for gear components

PM 80 LN-SD

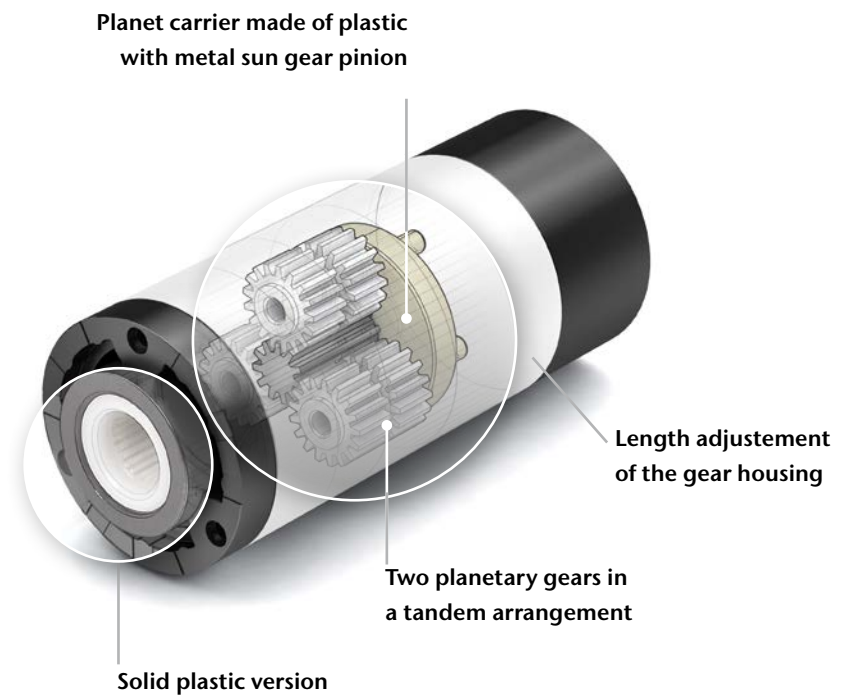


Technical features

- 2-stage
- 45:1
- approx. 105 Nm*
- Material mix

* The acceptable output torque for IMS.SDline gear drives is depending on the configuration and life time expectations.

PK 22 SD



Technical features

- 2-stage
- 29:1
- approx. 1,8 Nm*
- Material mix

Our international locations

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Optimized drive solutions from
the modular design range for planetary gears

Planetary Gears plg.technology



Gear Technology. Worldwide.

IMS:GEAR

Modular solutions

PLANETARY GEARS ARE RENOWNED FOR THEIR HIGH EFFICIENCY RATING. Compared to other designs of gear heads, their compact design offers a high power-to-weight ratio and a high torque transmission rating and requires minimal installation space. These factors make planetary gears the preferred fit in the design of energy-efficient drive solutions.

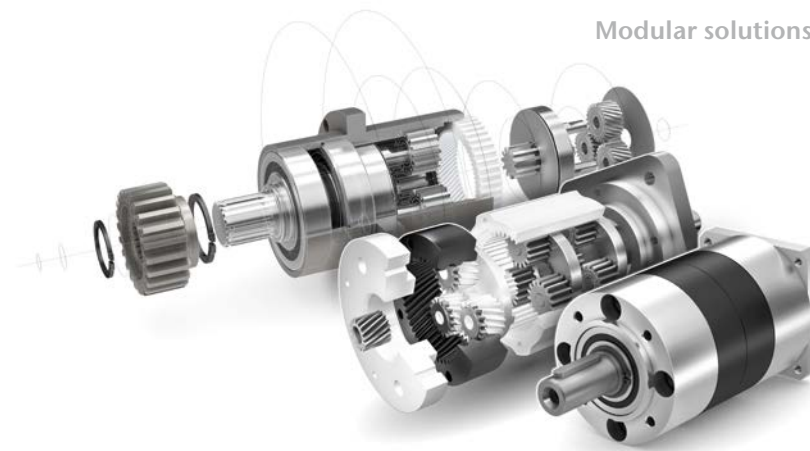
With its modular design concept for planetary gears, IMS Gear combines the benefits of standardization - fast availability of tried-and-tested technology and an attractive price-performance ratio even in a volume production context - with outstanding scope for individual customization.

Even the entry-level system, IMS.baseline, offers more than 1,300 possible variants in terms of motor and output end connection options. Prompt delivery assures rapid access to small to medium-sized quantities. For high-volume production applications, IMS.techline is preferred, since it offers well over 10,000 configuration options. As well

as adaptations for the motor and output end, examples being motor pinions, flanges or output components, IMS.techline can offer a broad range of reduction ratios, diameter variants and material combinations involving the use of metal and plastic. These features increase again the individualization to a certain extent by still favourable start of production possibilities.

IMS.SDline constitutes the ultimate option in terms of module-based individualization and optimization. It makes it possible to offer design changes to gear components while at the same time retaining the same tooth profile, explaining why it constitutes the optimum solution for entire fields of application.

This applies to all three product lines: Planetary gear solutions based on a modular design concept have much shorter lead times than bespoke or 'special' gear heads, meaning that they can get to market much faster.



WITH ITS MORE THAN 40 YEARS OF EXPERIENCE AND EXPERTISE, IMS Gear is able to provide the market with a continuous stream of innovations relating to planetary gears, including:

- The tandem gear
- Planetary gear bearing designed to optimize service life
- Laser-welded plastic gear housings
- Various sizes combined in a single gear drive configuration
- Solid plastic planet carrier
- Plastic motor pinion
- ...

Despite having well over 10,000 configuration variants, at some point even the modular design system encounters its limits. For example with design requirements for hollow shaft gear, whole-number reduction ratios and with wishes from Production for sintered gears or grinded gear profiles.

Mind you, are you quite certain that you need these features? Talk to us: We are sure to inspire you by proposing a possible solution that you were not expecting to hear. In the majority of applications, our modular design system for planetary gears can provide viable approaches and reliable solutions.

Our know-how for your project

TO ENABLE US TO OFFER YOU OPTIMUM QUALITY, fast availability and the very latest of cutting edge technology, we are committed to having a vertically integrated scope of in-house operations - extending from development through to logistics. That lays the global foundations for optimized process right across the value-added chain and beyond, and assures maximum flexibility.

Thanks to our central Development Center in Donaueschingen we are able to provide our know-how and expertise to all of our production locations right around the world.

 SOFTWARE DEVELOPMENT	 VOLUME PRODUCTION OF PLASTIC
 DESIGN	 VOLUME PRODUCTION OF METAL
 SAMPLE AND SMALL SERIES PRODUCTION	 HEAT TREATMENT TECHNOLOGY
 TEST LAB	 ASSEMBLY
 PROCESS PLANNING	 LOGISTICS
 MOLD MAKING	

Our skills set

Your benefits

Material mix

- Solid metal
- Solid plastic
- Metal-plastic mix

- + Noise optimization
- + Optimum price-performance ratio
- + Weight optimization

Motor connection

- Flange-mounting to all motors worldwide
- Design rating by IMS Gear

- + Optimum interface configuration
- + Free choice of motor

Quality philosophy

- Production facilities devised to suit market needs around the globe
- Standardized quality level

- + Production lines based on standardization
- + Suitable for duplication globally

Information management

- All locations networked
- Standardized systems

- + Standardized global information flow
- + Information available everywhere and at all times

Internationalism

- Sales and production in:
 - Europe
 - Americas
 - Asia

- + Closeness to customers
- + On-site service
- + Low exposure to exchange rate risk
- + Low transportation costs
- + High level of deadline flexibility

Volume scenario

- Small and medium volumes with IMS.**baseline**
- High-volume production runs with IMS.**techline**
- Specifically optimized solutions for Interbranch applications with IMS.**SDline**

- + Optimum gear drive solutions for any volume scenario

Specialization

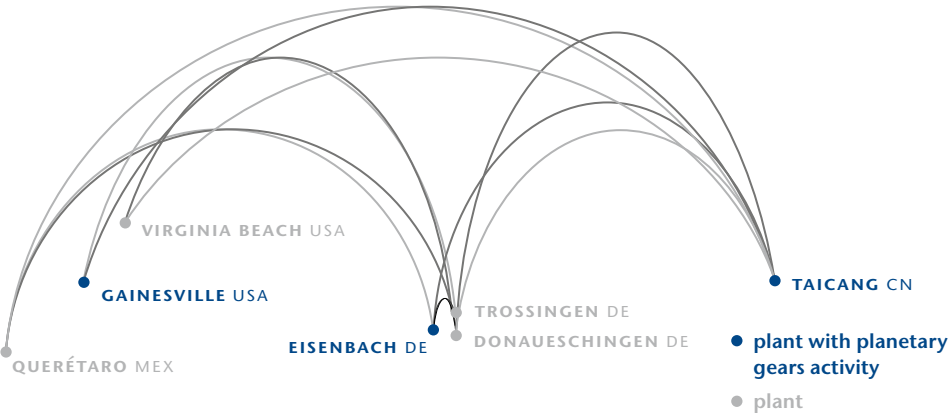
- Specializing in planetary gears
- No integrated system provider
- Exclusive focus on planetary gear development

- + Independence from motor manufacturers
- + Insider in the planetary gear technology sector
- + New developments can be adapted rapidly
- + Consistent further development of the modular system concept

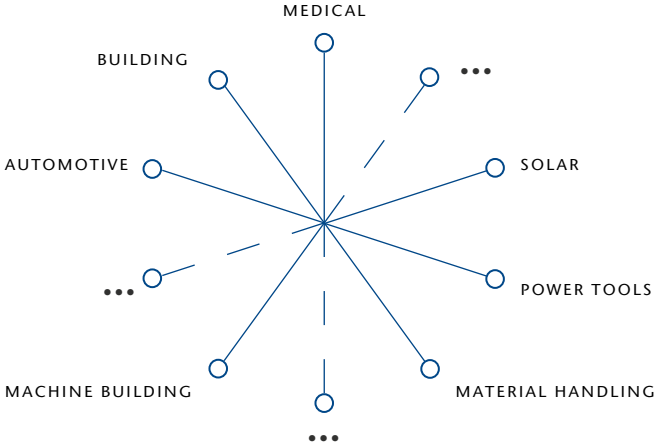
TOTAL OF PROPERTIES OF
IMS GEAR PLANETARY GEARS

MORE THAN 150 YEARS OF TRANSMISSION EXPERIENCE, OF WHICH 40 YEARS INVOLVED WITH PLANETARY GEARS

Internationalism

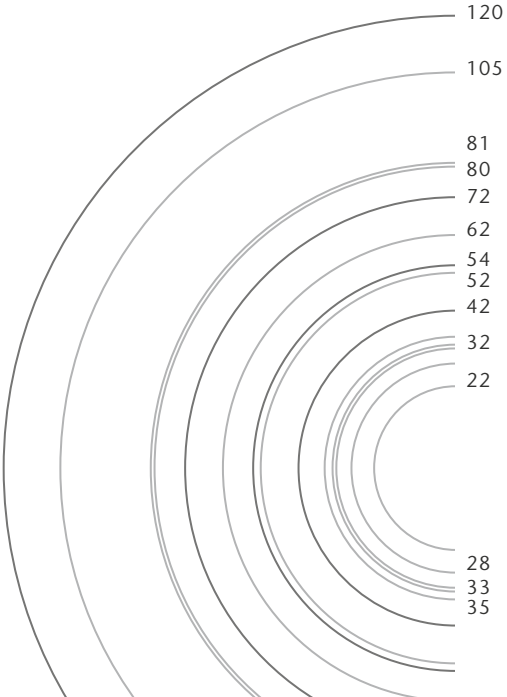


Fields of application

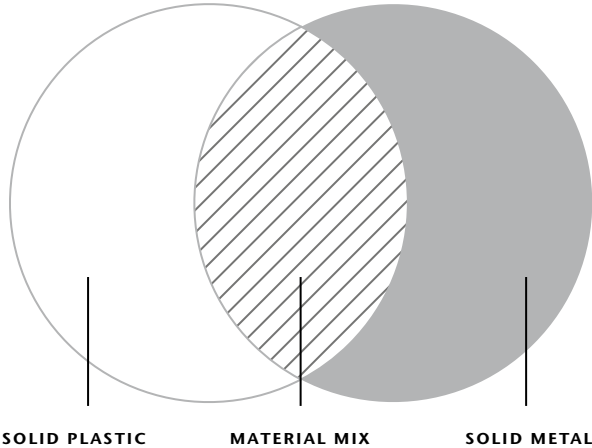


Gear head diameter

in mm



Material



Like the Solar System

OPERATING METHOD: Planetary gears function as their name implies: At their center is a 'sun gear' driven by the motor. This transmits its rotational movement to three satellite-like 'planet gears' that comprise one gear stage. They are arranged on the bearing bolts of a planetary carrier.

The last planet carrier is rigidly mounted to the output shaft, enabling it to transmit power to the output end. The outside circumference of the planet gears rotate inside an internally splined transmission housing, known as the ring gear or 'annulus'.

PROPERTIES: The input and output are arranged coaxially, and the shafts rotate synchronously. Planetary gears are suitable for clockwise as well as counter-clockwise rotation, for alternating, continuous as well as intermittent operation, and are characterized by their high efficiency rating.

Compared to other designs of transmission, their compact design delivers a great power-to-weight ratio - in other words high torque transmission levels from a remarkably small installation space.

What you really need to know about our gear drives

DRIVING TORQUE

Output torque is the most important parameter when choosing a planetary gear head. Gear reduction reduces the relatively high rotational speed of the motor (rpm), delivering a lower rotational speed at the output end. This increases the output torque in an inverse ratio.

CONNECTING FLANGE

This is where the flexibility of the PLG manufacturer comes into its own. All IMS Gear planetary gear heads can be adapted to fit all (!) motors. Individual solutions are possible at the input and output ends.

LOAD ON OUTPUT

As different manufacturers use different measuring methods, great care must be taken when seeking to make a comparison. We would be pleased to calculate the maximum axial and radial load for your specific application under consideration of all parameters. Higher loads can be achieved through design measures.

OPERATIONAL DYNAMICS

High levels of operational dynamics, achieved through low inertia torques, smooth running and low levels of mechanical wear. IMS Gear Planetary Gears uses plastic instead of metal for its planetary gears wherever appropriate and technically feasible. This delivers low inertia torques. Smooth running is something we achieve when required through the use of high-quality needle bearings, or through the low friction coefficients achievable between plastic and metal. We achieve low levels of mechanical wear through our specialist design of gearing and through the use of plastic gears. The material mix characteristics of IMS Gear assures superlative operational dynamics.

Also refer to ball bearings

OPERATING FACTOR c_B

The mentioned operating factor $c_B = 1,0$ does refer to a constant direction of rotation, no shock load and a daily operating time of 3 hours.

OPERATING TEMPERATURE

The operating temperature depends on the material and lubrication. Our pure metal versions with standard lubrication range between -30° and $+120^{\circ}$ C, the PK-series made of plastic between -15° und $+65^{\circ}$ C.

SEALING MEASURES

The types of protection are defined in acc. with DIN EN 60529. IMS.baseline gear drives fulfill the following protection categories:

- Gear drives with sintered bearings: IP00
- Gear drives with ball bearings (2RS): IP53

Upon request you can obtain output and motor gaskets that enable you to leverage higher protection classes.

INSTALLATION POSITION

Due to grease lubrication the planetary gear drives of IMS Gear can be installed in any desired position. In vertically arranged outputs, additional sealing measures can be provided upon request.

GEAR BACKLASH

Gear backlash depends on a large number of factors: Type of load, number of gear ratios, bearing, version or combination of materials. When seeking to compare different manufacturers, always remember that here, too, there are no standardized measuring methods.

BALL BEARINGS

In standard versions, the outer race of the ball bearing is designed as a rigid interference fit, while the inner race on the output shaft is designed as a loose interference fit (i.e. one capable of rotation). If required, other designs can also be provided.

SERVICE LIFE

Depending on environmental conditions and the operating data of the drive system, the service life of a PLG ranges between 200 and 15,000 hours. The great variety of application options precludes any generally applicable forecast of service life.

SCOPE OF DELIVERY

IMS Gear Planetary Gears can supply you with gears completely assembled and tested with any motor of your choice, or singly with a motor pinion for self-assembly.

LUBRICATION

Our PLG's are lubricated with grease and therefore maintenance-free during their service life. Depending on requirements profile, we select the optimum lubricant from more than ten options.

LOW-NOISE TRANSMISSIONS

To obtain optimum acoustic performance, increased demands on concentricity and axial run-out of the motor end plate, flange and shaft need to be met. Axial forces act on the motor shaft due to helical gearing. Sufficient dimensioning of the motor shaft bearings should be taken into account here. To counteract the grease-promoting effect of helical gears, radial shaft sealing rings or sealed motor bearings can be used.

OVERLOAD TORQUE

Maximum overload torque (impact loading) is the short-term overloading of the permitted output torque, i.e. when starting the motor. In case of plastic PLG's the max. overload torque equals the permitted output torque. In case of metal-plastic combinations or full metal versions, the max. overload torque can even amount to 1.5 times of the permitted output torque.

GEAR REDUCTIONS

By changing the number of teeth of the sun wheel and the planetary wheels, a number of reductions are possible in one stage.

IMS Gear Planetary Gears combines reduction ratios in up to four gear stages. This allows the realization of a huge variety of different gear specifications.

HEAT TREATMENT

Structural conversion during hardening of the individual metal parts acts positively on the strength and wear behavior of the gears. IMS Gear has its own heat treatment shop. As the entire metal manufacturing is inhouse, we can choose from various steels for hardening.

EFFICIENCY

The gear efficiency rating only takes account of the rolling motion of the gear, whereas the gear head efficiency rating takes account of all the losses of the entire bearing. We also always quote the transmission efficiency rating at this point. By necessity this is lower than the gear efficiency rating. As there are no standardized measuring methods, a comparison of efficiency levels of different manufacturers always requires special attention. In case of any specific requirements, please talk to us.



All figures in this brochure are approximate values. Variations are possible and may arise for example due to non-standardized inspection and measurement methods. For more detailed information, please contact us directly. The company always reserves the right to make technical modifications.

For current status, please consult our website www.imsgear.com

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