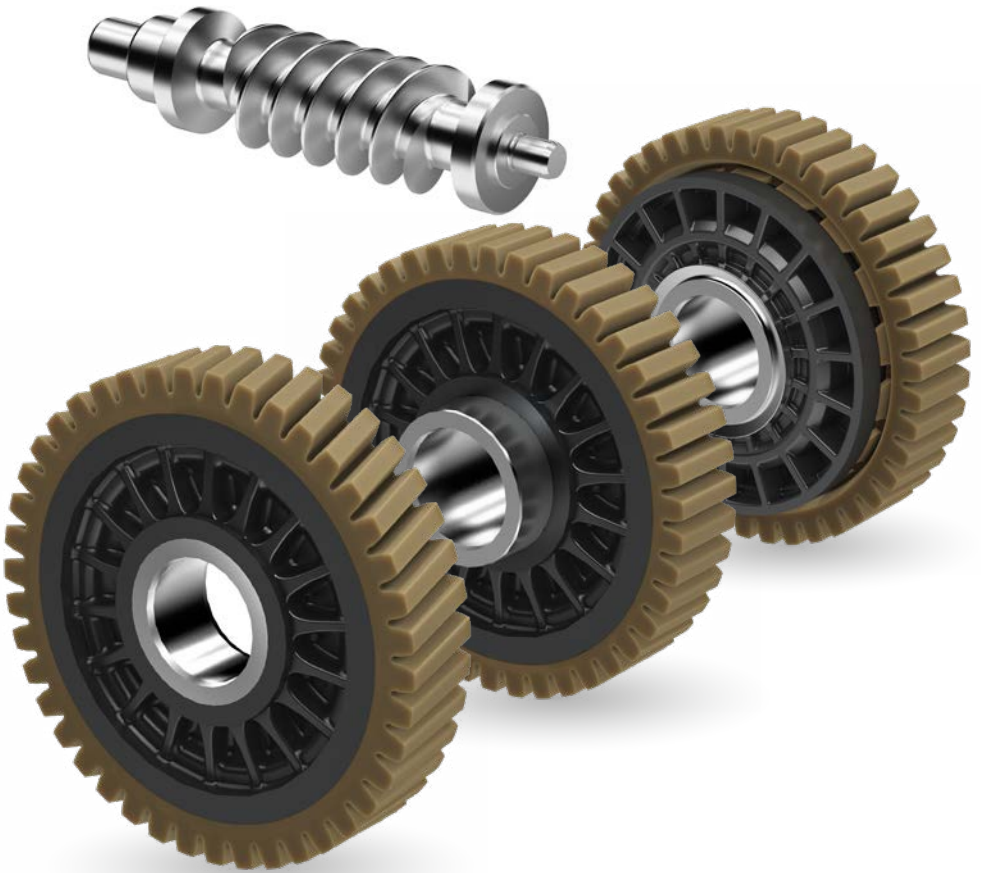


Electric Power Steering - standard worm wheel solutions for small and medium production runs

EPS Standard



Gear Technology. Worldwide.

IMS:GEAR

IMS Gear EPS Standard worm wheels are the solution for small and medium production volumes as well as for samples. This product line is characterized by fast availability and lower investment requirements.



Philosophy

FAST AVAILABILITY Given the market pressure for requirements such as improved functionality, fuel economy, and lowered costs, **ELECTRIC POWER STEERING (EPS)** systems are on the rise. IMS Gear's product line EPS Standard offers selected worm wheels that meet the specific requirements for two types of EPS systems. EPS Standard is the solution for small and medium production runs as well as sample testing under production conditions.

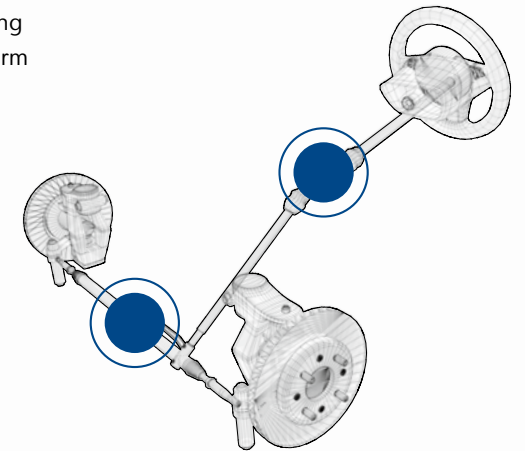
A track record of gear technology expertise spanning more than 30 years has been invested in the development and production of Standard EPS worm wheels. IMS Gear has brought over 40 million worm wheels into the market manifesting an outstanding quality. The high level of value added specific to IMS Gear products, assures fast delivery capability and an optimum price-performance ratio.

EPS STEERING SYSTEMS Modern cars can no longer be imagined without EPS systems. The different variations of EPS can be distinguished based on the location where they are installed. In the case of compact cars, it is attached to the steering column. In middle and upper-middle class cars, the servo unit is typically mounted to the pinion or dual pinion. A position which is axis-parallel is used for upper-class cars, SUVs and vans. IMS Gear develops and produces components and assemblies meeting the specific requirements of all three types of EPS systems.

WORM WHEELS IMS Gear develops and manufactures plastic worm wheels in dampened and rigid versions. In an injection molding process, we produce high-precision gears that require no subsequent processing of the gear teeth. EPS steering systems place high requirements on worm

gears in terms of durability, efficiency, and wear properties. We have developed a special plastic material (IMSamid®3, an unreinforced polyamide) that meets the special challenges for gear teeth in EPS systems. Our in-house development expertise also allows us to provide optimized gear mesh design and functionality between the worm shafts and worm wheels.

IMSAMID®3 Developed in-house by IMS Gear, IMSamid®3 is a special plastic material for gear tooth application. This unreinforced polyamide stands out due to its' fatigue strength ensuring high loads and a long life expectancy even at high temperatures. Moreover, IMSamid®3 offers outstanding efficiency and wear properties.



Column

This is a two-component worm wheel manufactured in a unique two-component IMS Gear developed injection molding process. The gear is helical and is made of IMSamid®3, our high performance unreinforced polyamide. The hub consists of high-strength steel. The web which connects gear-ring and hub is designed in a highly reinforced polyamide. The combination of this helical worm wheel with one of our worm shafts results in a worm gearing with a cross angle of 90°.



	Column	Dual Pinion	Dual Pinion Comfort
Characteristics	helical gear; IMS Gear 2K molding design; for Column as well as Pinion Solutions	spur gear; IMS Gear 2K molding design; for Dual Pinion as well as Single Pinion Solutions	spur gear, assembled and dampened Worm Wheel
Cross angle	90°	75°	75°
Ratio	i = 21	i = 21	i = 21
Packaging	Lead angle worm	15° left hand helix	15° left hand helix
	Tip Diameter Worm	Ø 21.05 mm	Ø 21.05 mm
	Center Distance	54 mm	52.44 mm
	Tip Diameter Worm Wheel	Ø 95.95 mm	Ø 92.83 mm
	Facewidth Worm Wheel	17.6 mm	17.6 mm
	Bore Worm Wheel Hub	Ø 24 mm	Ø 24 mm
	Width Worm Wheel Hub	17.6 mm	27.7 mm
Operating range	Ultimate Torque (Worm Wheel) *	> 350 Nm	> 350 Nm
	Parking Torque*	≈ 80 Nm	≈ 80 Nm
	Efficiency of worm gear unit	≥ 85 %	≥ 85 %
	Component Temperature	-40°C - 120°C	-40°C - 120°C

* Averaged data within a commonly accepted range of temperature and moisture. Data may vary according to required specifications

Dual Pinion

This is a two-component worm wheel manufactured in a unique IMS Gear developed injection molding process. It is spur-toothed. The gear-ring is made of IMSamid®3, our high performance unreinforced polyamide. The hub consists of high-strength steel. The web which connects gear-ring and hub, is designed in a highly reinforced polyamide. The combination of this spur-toothed worm wheel with one of our worm shafts results in a worm gearing with a cross angle of 75°.



	Column	Dual Pinion	Dual Pinion Comfort
Characteristics	helical gear; IMS Gear 2K molding design; for Column as well as Pinion Solutions	spur gear; IMS Gear 2K molding design; for Dual Pinion as well as Single Pinion Solutions	spur gear, assembled and dampened Worm Wheel
Cross angle	90°	75°	75°
Ratio	i = 21	i = 21	i = 21
Packaging	Lead angle worm	15° left hand helix	15° left hand helix
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	Bore Worm Wheel Hub	Ø 24 mm	Ø 24 mm
	Width Worm Wheel Hub	17.6 mm	27.7 mm
Operating range	Ultimate Torque (Worm Wheel) *	> 350 Nm	> 350 Nm
	Parking Torque*	≈ 80 Nm	≈ 80 Nm
	Efficiency of worm gear unit	≥ 85 %	≥ 85 %
	Component Temperature	-40°C - 120°C	-40°C - 120°C

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Dual Pinion Comfort

This is an assembled worm wheel. It is composed of a hub over-molded with a highly reinforced polyamide to form a flange, a gear-ring made of our high performance unreinforced polyamide IMSamid®3, two rubber dampers, a disc consisting of a highly reinforced polyamide and an axial locking ring that holds the complete assembly together.



	Column	Dual Pinion	Dual Pinion Comfort
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Cross angle	90°	75°	75°
Ratio	i = 21	i = 21	i = 21
Packaging	Lead angle worm	15° left hand helix	15° left hand helix
	Tip Diameter Worm	∅ 21.05 mm	∅ 21.05 mm
	Center Distance	54 mm	52.44 mm
	Tip Diameter Worm Wheel	∅ 95.95 mm	∅ 92.83 mm
	Facewidth Worm Wheel	17.6 mm	17.6 mm
	Bore Worm Wheel Hub	∅ 24 mm	∅ 24 mm
	Width Worm Wheel Hub	17.6 mm	27.7 mm
Operating range	Ultimate Torque (Worm Wheel) *	> 350 Nm	> 350 Nm
	Parking Torque*	≈ 80 Nm	≈ 80 Nm
	Efficiency of worm gear unit	≥ 85 %	≥ 85 %
	Component Temperature	-40°C - 120°C	-40°C - 120°C

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Worm Shafts

Our worm shafts are highly precise components with extremely tight tolerances. They are characterized by precisely defined surfaces that consider the frictional behavior related to the interaction between the worm shaft and the worm wheel. The surface finish exceeds even the highest quality requirements, dimensional accuracy and efficiency expectations. It excels with an extremely smooth flank surface as well as constant torque transmission. Shafts can be configured to fit specific gearbox interfaces relating to diameters and lengths, provided the tip diameter of 21.05 mm is the major diameter of the shaft.



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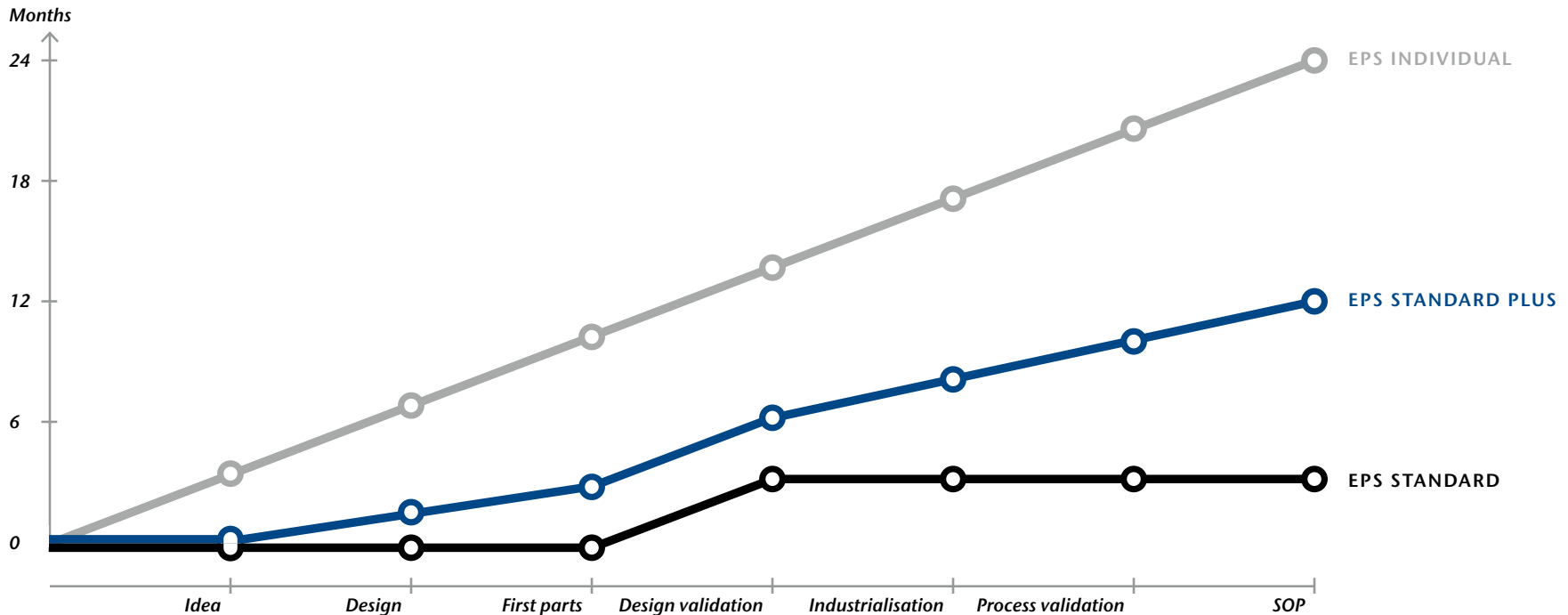
Interaction

EPS STANDARD worm wheels from IMS Gear constitute a fast solution from a standardized design concept, beginning with the validation of the first idea, through to principle tests, and function samples. The results can then be implemented in a short production run or a specification document or the creation of near-production sample components.

EPS STANDARD PLUS is a customized, flexible solution for specific toothing applications. The Center Distance can be adjusted within a range of approximately 50.5 mm to 56.5 mm. The Worm

Wheel can be produced with a minimum root diameter of 80.1 mm, and a maximum tip diameter of approximately 103 mm. Within this range, we can achieve various gear ratios. The helix angle of the Worm Wheel can be modified to achieve the desired mesh with the Worm Gear cross angle. The width of the Worm Wheel Hub can vary between 17.6 mm and 27.7 mm, and the Hub Bore is available in two sizes, 24 mm and 26 mm.

EPS INDIVIDUAL is our overall customized solution to meet the needs of specific customers.



IMS Gear Competencies

FOR INNOVATIVE GEAR SOLUTIONS, IMS Gear can draw on its deep knowledge of gear design, materials, and the dynamic features of the various gear types.

Our expertise and our innovative solutions in gear technology are based on a continuing history of Advanced Development in our field. We support our customers in product development and validation with application-specific know-how. For us, product development means precise dimensioning, gear design, and material selection as part of an optimal overall product. Even at the early stages of a project, process development represents a central part of our product development.

We design, test, and standardize all processes in-house specifically for the product concerned, thus meeting the highest demands

for quality, flexibility, and cost efficiency. Our customers benefit from our ability to efficiently design and build our own injection molds, process linking equipment as well as test and assembly equipment. The vertical integration of our production processes cover plastic injection molding of single-component, multicomponent or hybrid parts, metal cutting and forming processes including hardening, and the assembly of tested subassemblies and gears.

We are able to produce components with or without development support in large quantities and with short implementation times. Standardized processes form the basis of our production in Europe, North America and Asia. This allows us to reliably provide a globally standardized high level of quality to our customers in the various regions.



Donaueschingen headquarters



Eisenbach



Trossingen



Villingen-Schwenningen



Gainesville



Virginia Beach



Querétaro



Taicang



Seoul



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

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