

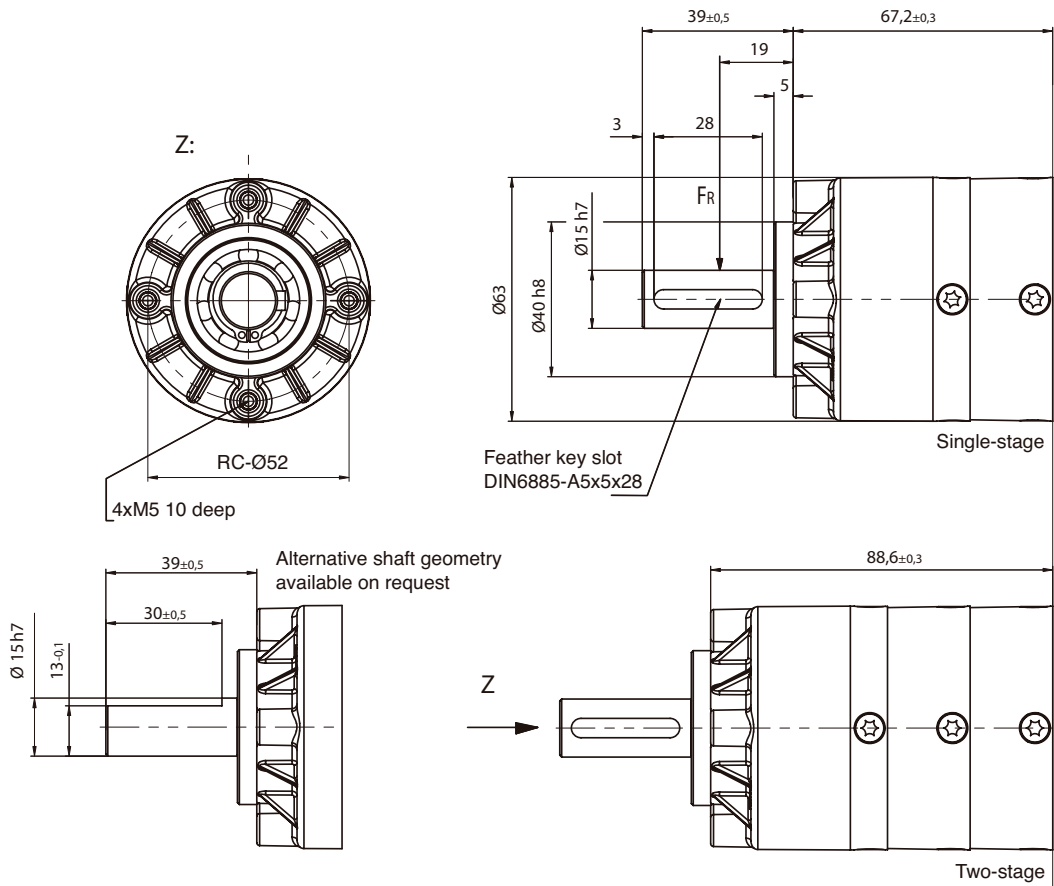


# ZEITLAUF®

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antriebstechnik  
it's time for tomorrow

## Performax®63HRL



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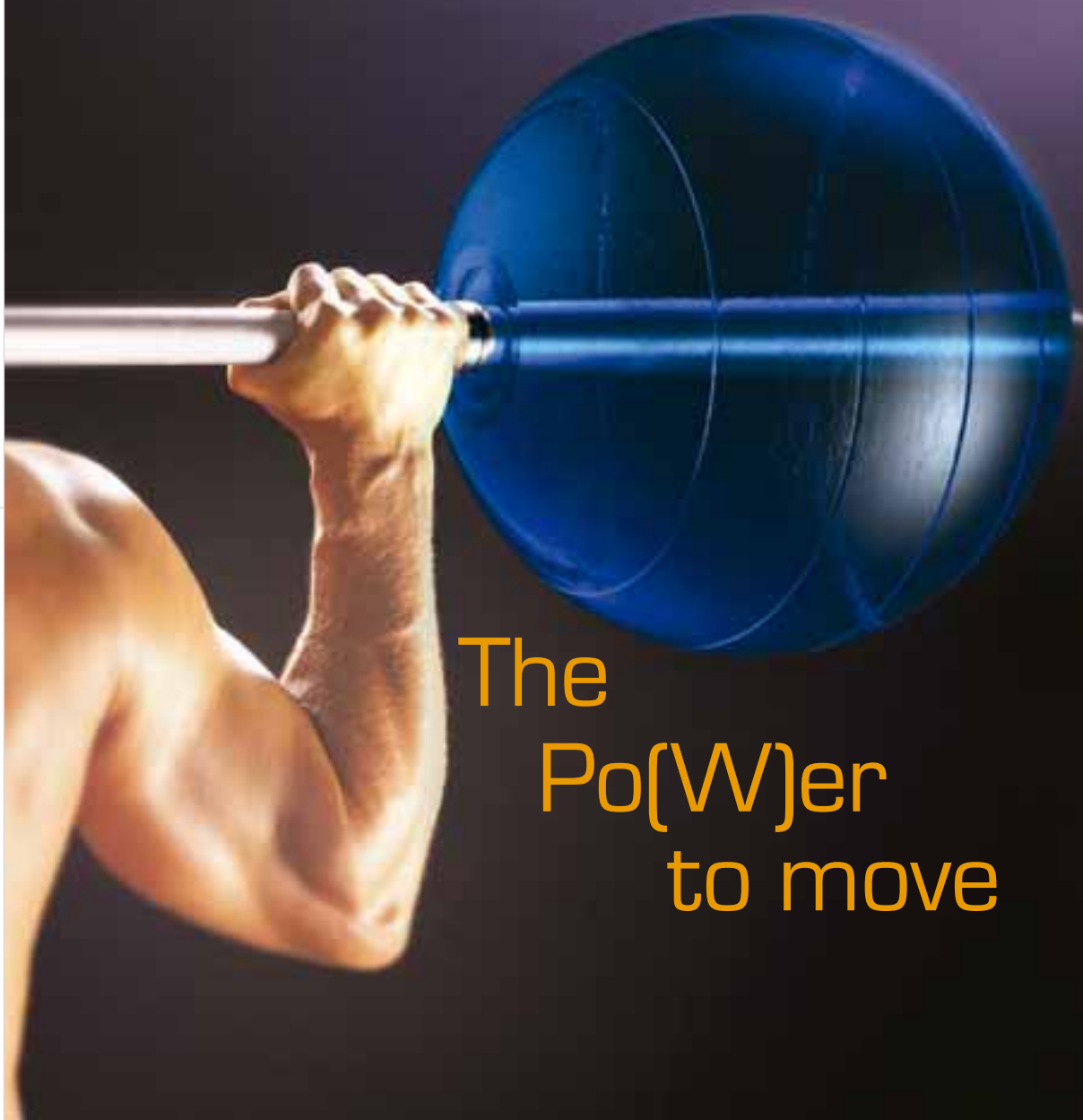
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ZEITLAUF®

antriebstechnik

it's time for tomorrow



The  
Po(W)er  
to move

Planetary gearhead modules for high radial loads

Performax®HRL

# Success at every stage: Performax®HRL modular system

**Outstanding performance and top marks in all disciplines:  
planetary gearhead modules for high radial loads – Performax®HRL!**

A true success story is continued in the form of Performax®HRL. The innovative (patent pending) concept of the Performax® series is now capable of managing the highest radial loads. This increases not only the application options of this excellent construction concept, but also its capabilities. Smoothness of running, gear reduction, torque, effectiveness or radial load – the top marks of Performax®HRL delight every time. Deciding on Performax®HRL means deciding on durable performance without the compromises.

	Radial load	Smoothness of running	Effectiveness	Torque	Maximum total gear reduction
Planetary gearhead <sup>*)</sup>	✓	✓	✓	✓	✓
Mechanical planetary gearhead <sup>*)</sup>	✓✓	✓	✓	✓✓	✓
Spur wheel gearbox <sup>*)</sup>	✓	✓	✓	✓	✓✓
Worm gearbox <sup>*)</sup>	✓	✓✓		✓	
<b>Performax®HRL</b>	✓✓	✓✓	✓	✓✓	✓



<sup>\*)</sup> Standard gearbox in comparable performance categories

# Quality, every step of the way



## Input stage

The Performax®HRL is optimally tailored to the high speeds in the first stage! To reduce noise, both the planet wheels and the hollow wheels are made of plastic as standard, with the hollow wheel being accommodated in a diecast zinc housing. Thanks to their favourable noise-reduction properties, these materials help to minimise noise-producing vibrations. The helical gears in the first stage also allow better engagement properties and therefore higher transferable loads. The helical gears also allow more even "flowing" engagement. This means that rather than one tooth engaging after the other, the next tooth is engaged before the previous tooth has even left the combing gearwheel.

Because a sliding material is used, in this stage, the holes in the plastic planet wheels require no special bearing assembly. However, the wheel holes still also have a cross-grind from "honing" in order to achieve optimum lifelong lubricant embedding.

The modular design of Performax®HRL drives allows the use of these noise-optimised components both in the first stage of multi-stage gears and in single-stage gears.



## Radial load stage

The HRL bearing housing forms the basis for the success and high radial load bearing capacity of our Performax®HRL. The needles of the planet wheels in this diecast zinc housing have double-sided bearings and are guided precisely. In this way, the radial forces are optimally supported on the needles during operation. The bearing housing itself is guided not only from the output side, but also from the drive side by means of a deep-groove ball bearing. The resulting large bearing distance has significantly increased the permissible radial forces. The closure between the bearing housing and the cast output shaft ensures high transferable torques, optimum concentric running properties and an excellent smooth running even at top radial loads.

The HRL stage makes our Performax®HRL into the ultimate drive solution for the most discerning of demands and maximum radial loads.



## Output stage

The final stage of the multi-stage Performax®HRL gearbox contains spur teeth cast into the diecast zinc planet housing. The mould for these cast teeth was optimally tailored to the shrinkage behaviour of the material in several stages. The result is inner teeth of above-average quality, similar to teeth made by metal cutting.

In the output stage of Performax®HRL gearheads we find mainly low speeds and high torques. If helical teeth were used in this area, due to the helix angle high axial forces would arise, which, in turn, would cause friction on the flat surfaces of the wheels. Since this gear stage is less critical in terms of noise, but is important for the power that can be transferred, the output stage was designed entirely with power and support of the radial loads in mind:

- Pinion gears and planet wheels made of case-hardened steel.
- Roller bearings of the planet wheels on the hardened needles of the planet carrier.
- Double-sided bearings of the needles in the HRL bearing housing.
- Cast, knurled output shaft.
- Double-sided ball-bearing HRL bearing housing.

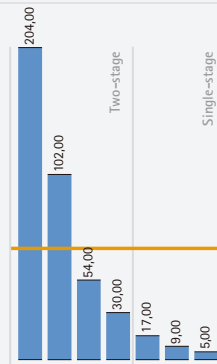


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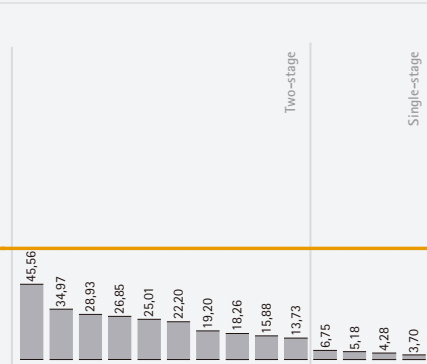


### Reduction series

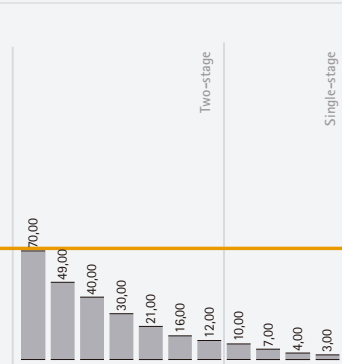
Performax®HRL



Comparable product I <sup>1)</sup>



Comparable product D <sup>2)</sup>

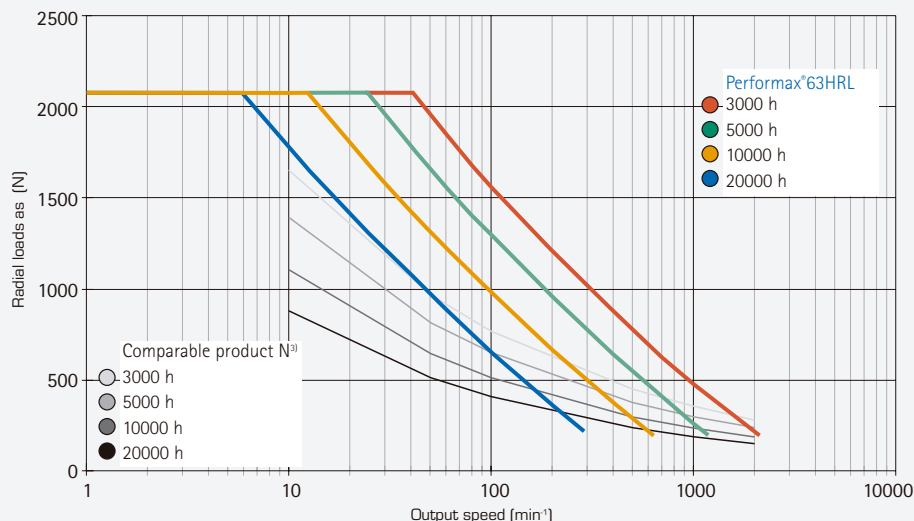


vs.



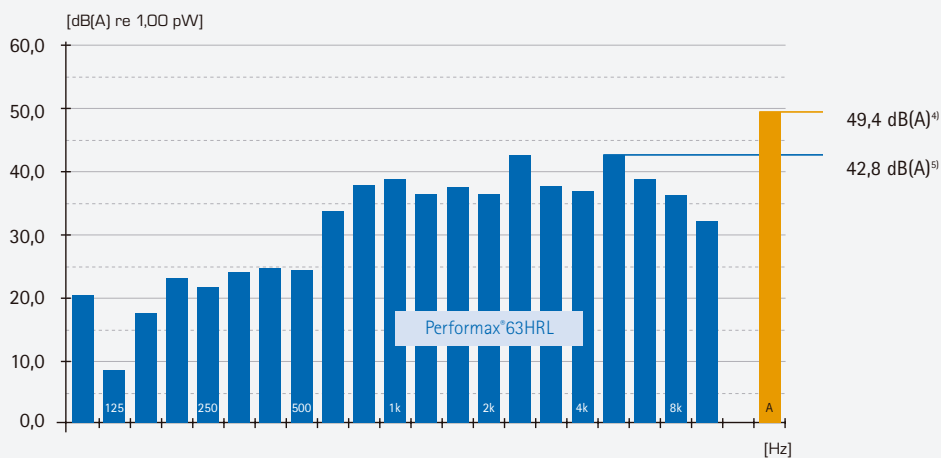
### Radial loads

As a function of speed and service life at an axial load of 500 N



### Sound output

Performax®63HRL, i=54:1 idling, measurement in accordance with DIN EN ISO 3744 and DIN EN ISO 1680 by the LGA QualiTest GmbH, Nuremberg



<sup>1)</sup> Catalogue: IMS Gear GmbH Technomotive company Status: 04/2001

<sup>2)</sup> Catalogue: Dunker Motoren Alcatel Sel AG, GR series of DC geared motors, status: 02/2005

<sup>3)</sup> Neugart GmbH company, catalogue of precision planetary gearheads, status 04/2003

<sup>4)</sup> sound power level

<sup>5)</sup> greatest sound power level at a frequency of 5 kHz



# Performax®HRL modular system – no compromises at high radial loads

**Performax®HRL offers the same number of gear stages with the greatest reduction ranges for standard planetary gearheads**

The Performax®HRL offers reductions of between 5:1 and 204:1 for 2-stage gears.

The highest reduction achieved by a two-stage gear of comparable products is a maximum of 70:1. The reduction ranges which are standard with the Performax®HRL are designed in harmonious stages. Naturally, it is possible to realise further reductions for special applications.

With regard to the reduction range covered, the Performax®HRL series offers a unique spectrum: No competitor planetary gearhead can achieve reductions of up to 17:1 in one stage – for most, the limit is a maximum reduction of 10:1!

In the two-stage gear range, the Performax®HRL series extends right up to a reduction of  $i = 204:1$ . This exceeds the maximum reduction of competitors' products by more than 190%!

**... enables considerably higher radial loads ...**

With Performax®HRL, standard planetary gearheads can now also be loaded with top radial loads. A thrust bearing of the output shaft in the application can therefore be dispensed with. Thanks to the innovative manufacturing technology and the perfected design, Performax®HRL leaves other standard planetary gearheads wanting when it comes to transferable radial loads, and indeed, it has advanced into a different performance category.

In the area of high radial loads, mechanical planetary gearheads are generally used: even compared to these, the Performax®HRL series performs outstandingly.

**... and offers unique smooth running even at a maximum radial load ...**

Measurements taken by a certified noise laboratory (LGA QualiTest GmbH, Nuremberg) confirm the excellent smooth running of the Performax®HRL gears. The optimum reduction stage and the use of plastic as the tooth material in the first stage really pay off. The sound power level of a two-stage Performax®HRL 63 during idling is less than 49.4 dB(A). The running noise hardly changes even when subjected to maximum radial loads.

**... performance is an obligation: Performax®HRL!**

## Even compared to other types of gear, Performax®HRL performs outstandingly

### Performax®HRL can transfer higher torques than typical spur gear systems ...

Higher applied radial loads and simultaneously high-transferable torques are simply not an issue for our Performax®HRL. Thanks to the planetary gearhead technology and the HRL stage, the Performax®HRL series also makes the grade when compared to spur gear systems of similar size. Due to the simultaneous engagement of at least 3 planet wheels and the associated greater overlap, the Performax®HRL can transfer much higher torques than standard spur wheel gears.

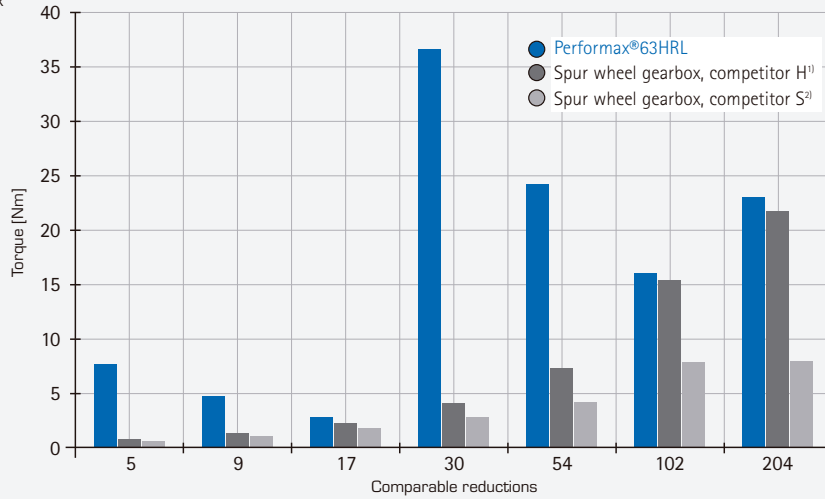
### ... and is significantly more efficient than standard worm gears ...

The efficiency of our Performax®HRL is hardly impaired even at high reductions. Comparable worm gears achieve relatively poor efficiency ratings at medium reductions. At a reduction of 55:1, efficiency is only around 40%.

... for performance can be measured: **Performax®HRL!**

### Torque comparison

Performax®63HRL  
with spur wheel gearbox

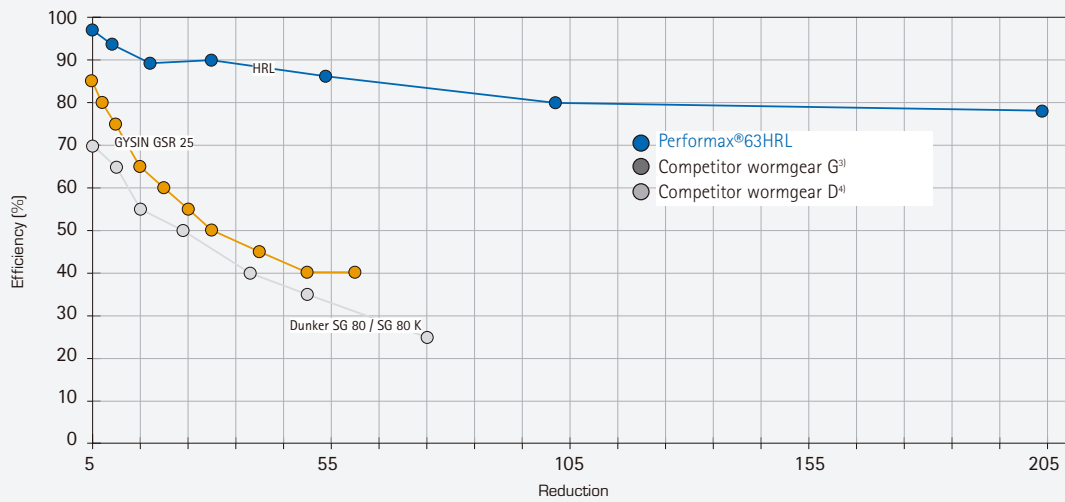


vs.



### Efficiency comparison

Performax®63HRL  
with worm gearbox  
as a reduction function



vs.



<sup>1)</sup> Heidolph Elektro GmbH & Co. KG / catalogue Heidrive Version: 04/2000, spur wheel gearboxes Q065  
<sup>2)</sup> SPG Co., Ltd., catalogue: DC geared motor, status: Printed in Korea, 2004, spur wheel gearboxes SPG S8D40-90A

<sup>3)</sup> Gysin AG, download from the Internet, worm gearboxes, GSR 25, download status: 15.09.2005, worm gearboxes GSR 25  
<sup>4)</sup> Alcatel SEL AG Dunkermotoren, catalogue: DC geared motors GR/ G series, version: 02/2005, worm gearboxes SG80



Performax®HRL

Spur wheel gearboxes

Worm gearboxes

# Output shafts and combinations of materials



## Standard 1: feather key slot

One of the two available standard output shafts of the Performax®HRL gearhead provides torque transfer via a feather key connection (DIN 6885, Form A). The shafts of the respective gear sizes are designed not just for optimum strength with regard to their diameter, their length and the size of the feather key, but are also orientated to the most common geometries. The lengths of the feather keys are dimensioned so that the output torques can also be transferred to hubs made of softer materials and so that narrower hubs can be fitted at both ends of the shaft. Output shafts with a feather key slot are case-hardened in order to obtain a wear-resistant surface combined with high shaft core strength. This prevents the walls of the feather key slots from rupturing because of excessive brittleness. The diameter of the output shafts is ground in the h7 IT tolerance class.

## Standard 2: Drive carrier surface

The second standard type of output shaft geometry available offers the possibility of torque transfer through the drive carrier surface. Here too, ZEITLAUF® is geared to the usual dimensions on the market. Shafts with a carrier surface are made of tempered steel and are then hardened. This guarantees a wear-free surface even in the vicinity of the surface. The diameter of these output shafts is ground in the h7 IT tolerance class.

## Special output shafts

The gearhead can be fitted with special output shafts without any problem: almost all customer-specific requirements such as double surface, shoulders, (threaded) holes on the front and circumference, recesses, bevel seats and serrations, or the fitting of provided components, can be realised. A special feature of the Performax®HRL gearhead is the option of loading extremely long output shafts with high radial loads.

## Possible combinations of materials

		Plastic (POM)	Brass	Steel, unhardened	Steel, hardened	Stainless steel	Diecast zinc
	Sun wheel			●	●		
	Planet wheel	●	●		●		
	Hollow wheel	●					●
	Sun wheel			●	●		
	Planet wheel	●	●		●		
	Hollow wheel	●			●		●
	Output shaft				●	●	
	Housing						●

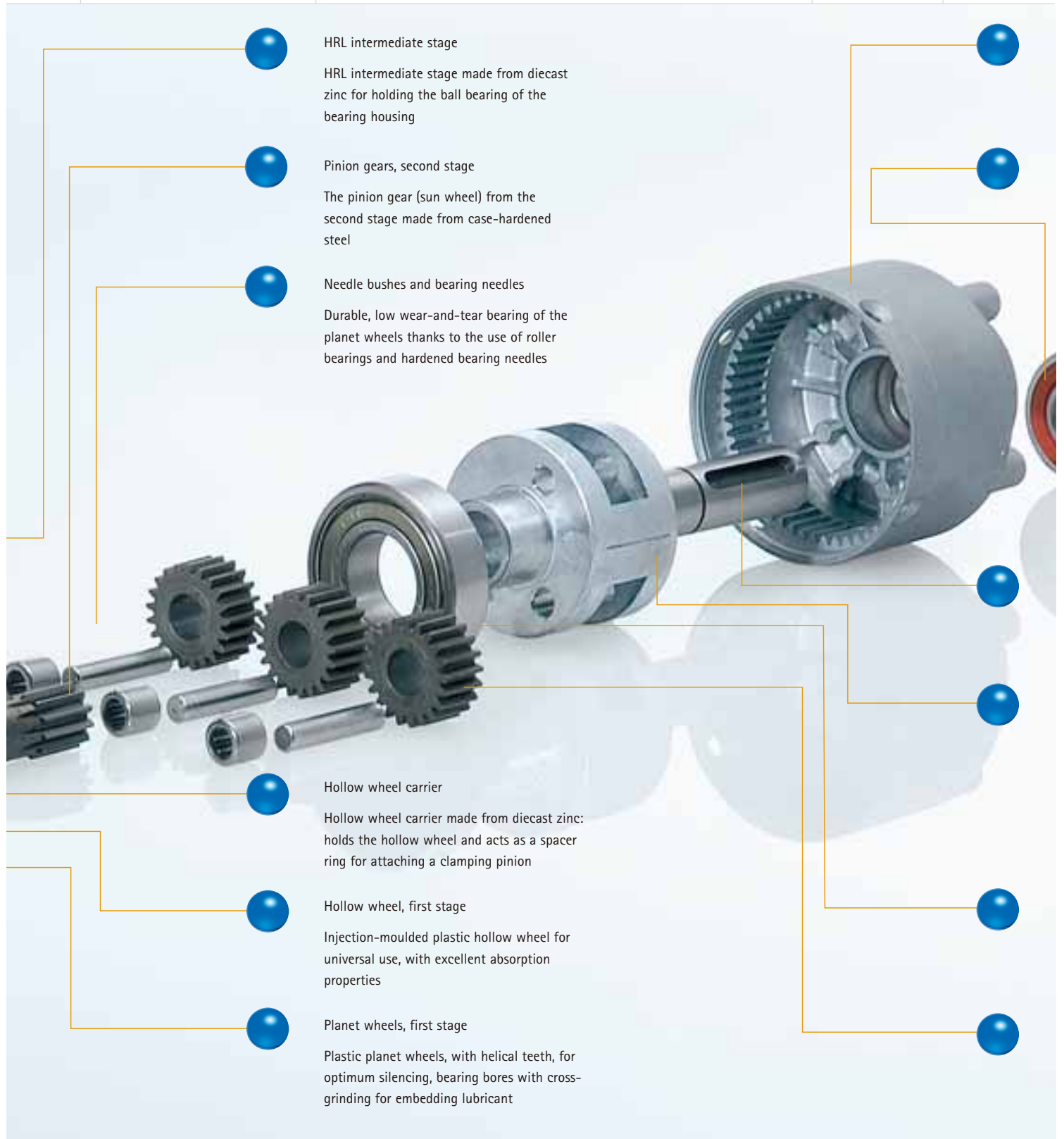
- Possible materials
- Materials used in the standard modular programme



You have the most abstract requirements. We have the modular system for the most discerning demands and uncompromising solutions: Performax®HRL



Motor pinion  
Sun wheel with helical teeth to minimise noise in the high revolution first gear stage



**HRL intermediate stage**

HRL intermediate stage made from diecast zinc for holding the ball bearing of the bearing housing

**Pinion gears, second stage**

The pinion gear (sun wheel) from the second stage made from case-hardened steel

**Needle bushes and bearing needles**

Durable, low wear-and-tear bearing of the planet wheels thanks to the use of roller bearings and hardened bearing needles

**Hollow wheel carrier**

Hollow wheel carrier made from diecast zinc: holds the hollow wheel and acts as a spacer ring for attaching a clamping pinion

**Hollow wheel, first stage**

Injection-moulded plastic hollow wheel for universal use, with excellent absorption properties

**Planet wheels, first stage**

Plastic planet wheels, with helical teeth, for optimum silencing, bearing bores with cross-grinding for embedding lubricant

# Fitting possibilities

## Planet housing

Optimised diecast zinc housing with cast internal toothing: sound absorption thanks to high ductility of the material

## Ball bearing

Durable, sealed deep-groove ball bearing for bearing radial and axial forces



## Output shaft

Hardened, polished output shaft as standard, with an option of feather key slot or carrier surface. Diameter tolerance: h7

## HRL bearing housing

Torsion-proof HRL bearing housing made from diecast zinc for holding the double-sided underpropped needles for the planet wheel bearing and the HRL ball bearing: greatest torque transfer and optimum smooth running properties thanks to recasting of the knurled output shaft

## HRL ball bearing

Covered deep-groove ball bearing for supporting the bearing housing: for the highest radial loads

## Planet wheels, second stage

Spur-toothed planet wheels made from case-hardened steel for transferring high loads



Direct fitting

Bonded pinion

Push-on pinion

## Direct fitting

Normally, we supply Performax®HRL drives as a complete motor / gearhead unit. The teeth of the sun wheel (pinion) of the first stage are milled directly into the motor shaft in this case. The directly-toothed motor shaft guarantees the ideal true running quality of the otherwise noise-critical sun wheel teeth of the first stage. If a motor with a toothed motor shaft is to be used, the motor shaft must be ordered from ZEITLAUF® before the motor is fitted, or the motor manufacturer must provide it so that the teeth can be made. This is normally possible with almost all motor manufacturers, but requires a certain degree of preparation.

## Fitting with bonded pinion

To fit a gearhead to a motor directly provided (already assembled) by the customer, ZEITLAUF® offers the possibility of fitting it using a bonded pinion. The use of a special adhesive for the high-strength connection of metallic components guarantees permanent transfer of the motor torque to the first gear stage. Good true running properties are achieved thanks to comparatively narrow tolerances in the vicinity of this joining point. Fitting the motor using a bonded pinion must be done at ZEITLAUF® due to the technically very demanding bonding process. Only by keeping exactly to the process parameters during the bonding process can we guarantee permanent connection and optimum true running properties.

## Push-on pinion connection

In order to offer customers the possibility of also fitting Performax®HRL drives without providing the motors, the gearheads of this series are also available with a push-on pinion connection. The motor pinion is fixed to the shaft of the motor, in this case, by means of a clamping ring. The gearhead can then be fitted on the motor via a matching intermediate flange (here, ZEITLAUF® supplies flanges for all common motor sizes and types). Fitting a gearhead to stepping motors in particular is intended to be made possible with this fitting method. For this purpose, flanges are available in the sizes NEMA 17, 23 and 34, as well as a clamping pinion with inch dimensions. The gearhead length increases by the width of one gear stage with this type of connection. A one-stage gearhead thus has the length of a two-stage, directly-fitted gearhead.