

High Speed Gears H-Series

Application Oriented Design

The BHS H-Series consists of highly pre-engineered gear units for “High Ratio” applications, such as motor to compressor and turbine to generator drives.

Technical Characteristics

- High casing stiffness and low noise emission, due to casing optimization through FEM
- Optimized, application adapted design
- Vibration-damping, rigid cast iron casing with integrated bearing mounts
- Increased power density due to adjustable bearing spans
- Provisions for all required monitoring instruments
- Compact design with integrated lubrication lines

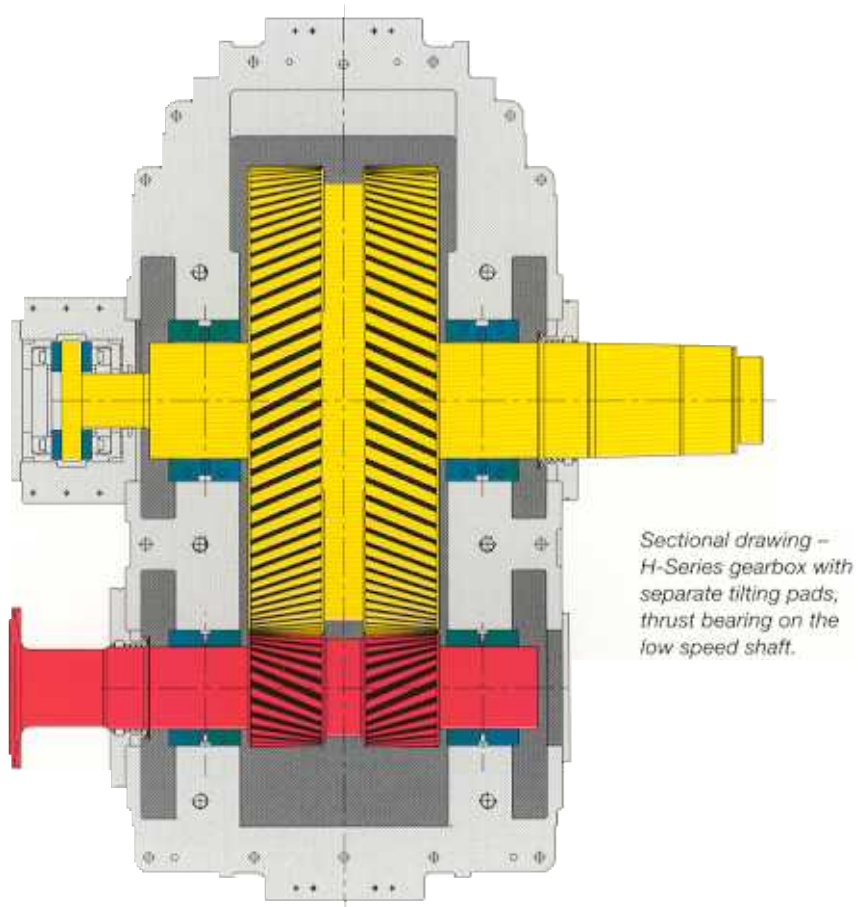
High power capacity

- Latest rating methods
- Optimized tooth corrections
- Precise bearing calculation verified on bearing teststands with regard to cold and warm clearance deflection and rotor tilting effects
- Adapted to application bearing geometry
- Less shaft deformation due to optimized bearing spans
- Highest demands as to precision and quality
- Long-term experience through the design of more than 10 000 high speed gear units.

Technical Design

Gear unit rating can be done in accordance with all national and international standards such as ISO, DIN, API, AGMA, British Standard, Classification Societies as well as customer standards. Computer-aided rating, design and manufacture possible. Casings and many other components are pre-engineered to minimize delivery times.

BHS H-Series gears are designed for high gear ratios and



Sectional drawing –
H-Series gearbox with
separate tilting pads,
thrust bearing on the
low speed shaft.

medium power range applications. Low gear ratios and high power applications are covered by the FD and AD-Series.

Casings

Rigid, deflection-resistant gear unit casings made from high quality grey cast iron guarantee low vibration and low noise operation. Inspection through apertures provided for this purpose.

The standard casing features provisions for mounting of temperature and vibration monitoring instruments.

Gear Design

Depending on the relevant application, the BHS H-Series is offered with double helical or single helical

gearing with or without thrust collar, or with spur gearing.

The gears are made from high-alloy case-hardened precision finished steel. Maximum gear quality and strict adherence to profile and longitudinal corrections, as required by the individual application, result in an optimum tooth load pattern, which ensures minimum vibration and noise emission.

Lube Oil

BHS gears are designed for pressure oil lubrication with a separate lube oil system. The main oil pump may be attached to the gear if required.

The oil drain can either be located at the bottom and/or side of the gear case (page 4).

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Shaft and Bearings

BHS H-Series shafts are made from high quality, through hardened and tempered steel. Shaft interfaces for all standard types of connections – eg. oil press fit, solid forged flange and fitted keys – are available.

Input and output shafts are equipped with split, non-contacting labyrinth seals. The shafts are supported by low-maintenance plain bearings which can be subjected to high loads and still provide a highly stable running behaviour. Depending on the journal speed and the load being imposed, standardized cylindrical, lemon bore, offset-half, multilobe or tilting pad bearings are installed.

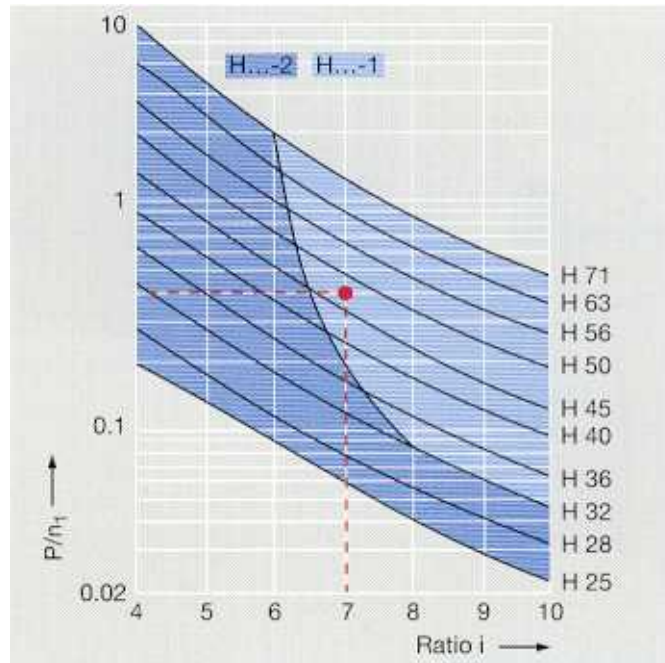
Axial forces are either absorbed by combined axial-radial bearings or by an axial bearing housed in a separate, built-on casing. BHS performs bearing stability calculations with warm bearing clearance and shaft displacements.

Since we produce our own bearings we have extensive experience with all types of bearing geometries. The leadtime for spares and repairs in emergency cases is extremely short.

Options

Various accessories are available for BHS H-Series:

- Bearing temperature measuring equipment
- Shaft vibration transmitters
- Casing vibration transmitters
- Rotor turning units
- TWINTORS® diaphragm couplings
- Lube oil pumps
- Axial face seals
- Separate axial bearings



Left:
Selection diagram,
Rating.

Below:
Reference values
for the application
factor K_A as per
DIN ISO 6331-1.

Working characteristics of the driving machine	Working characteristics of the driven machine			
	Generator uniform	Turbo compr. mean shocks	Pump mod. shocks	Piston machine heavy shocks
Turbine uniform	1,00	1,25	1,50	1,75
Asynchr. motor mean shocks	1,10	1,35	1,60	1,85
Synchr. motor mod. shocks	1,25	1,50	1,75	2,00 or more
Piston machine heavy shocks	1,50	1,75	2,00	2,25 or more

For applications with ratings in accordance with API 613, the application factor shall be increased by the reference value 1,25. For example: API service factor = 1,4 ; the rating factor $K_A = 1,4 \cdot 1,25 = 1,75$

Selection of size

BHS can provide a non-binding quotation for your drive application supplemented with an API-data sheet. For this purpose please provide us with the following information:

- Type of driving and driven machine, with power (kW) and speed (rpm)
- Special rating instructions of classification societies
- Service or application factor
- Special acceptance criteria
- Special operating conditions

Rating example

Driving machine: electric motor
Driven machine: compressor
No additional external load,
low starting shocks, thus $K_A = 1,35$

Conditions prevailing:

$$P_O = 3100 \text{ kW}$$

$$n_1 = 10\,500 \text{ rpm}$$

$$n_2 = 1500 \text{ rpm, thus } i = 7$$

Power rating:

$$P = P_O \cdot K_A = 3100 \cdot 1,35 = 4185 \text{ kW}$$

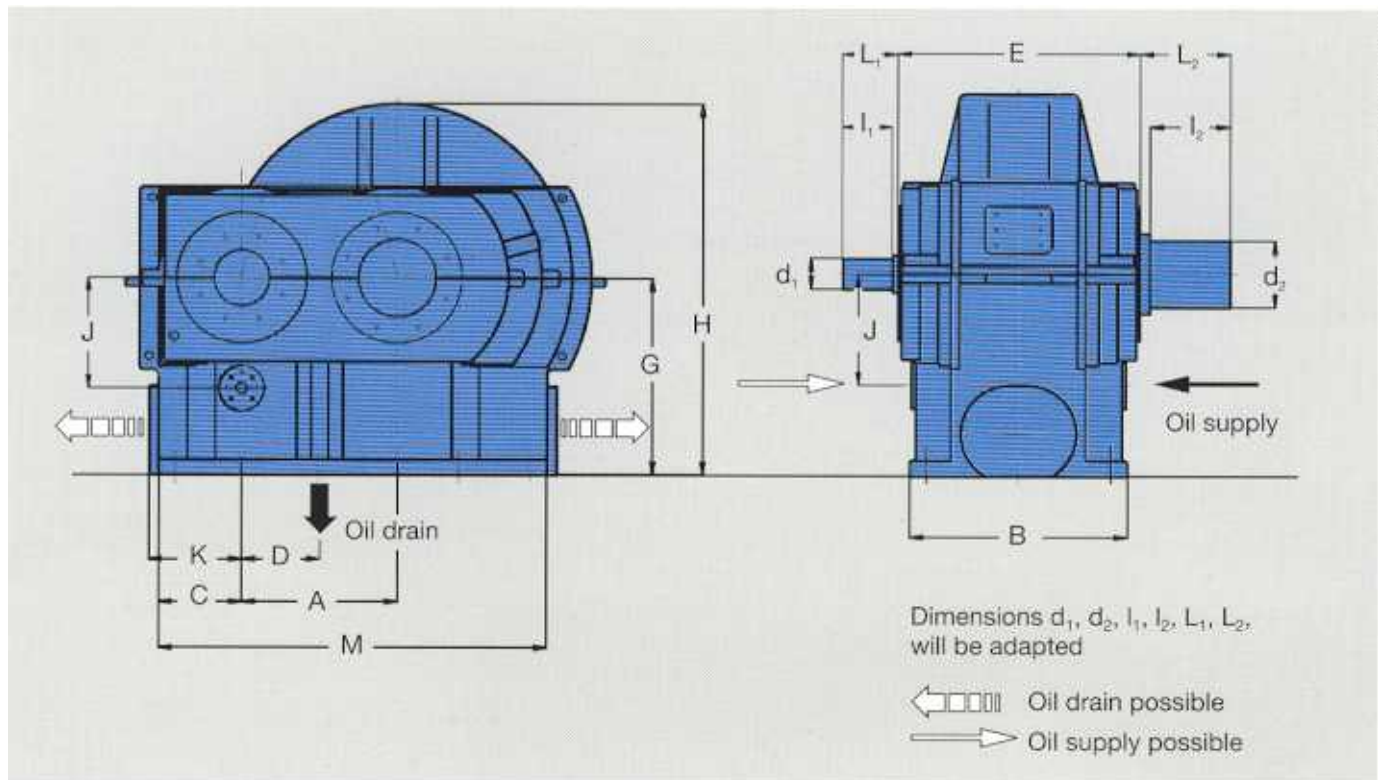
Ruling power factor:

$$\frac{P}{n_1} = \frac{4185}{10\,500} = \boxed{0,4 \text{ kW/rpm}}$$

Based upon the above example, a BHS-H 50-1 gear unit type would be selected.

Gear Dimensions

H-Series



Gear unit size	Main Casing dimensions (mm)								Design H...-1		Design H...-2		Weight for standard design kg* (approx.)	
	A	C	D	G	H	J	K	M	B	E	B	E	H...-1	H...-2
H 25	250	130	125	320	600	195	140	610	-	-	370	430	-	460
H 28	280	150	140	360	680	215	160	690	-	-	390	470	-	640
H 32	320	170	160	400	760	235	180	780	380	460	440	520	590	900
H 36	360	190	180	450	850	260	200	880	430	500	500	570	830	1270
H 40	400	205	200	500	950	280	215	980	480	550	550	620	1140	1730
H 45	450	230	225	560	1060	310	240	1100	540	610	620	690	1580	2400
H 50	500	260	250	630	1190	340	270	1230	600	670	690	760	2200	3320
H 56	560	290	280	710	1340	380	300	1380	670	740	780	850	3200	4540
H 63	630	320	315	800	1510	430	340	1560	750	820	870	940	4200	6390
H 71	710	360	355	900	1700	475	370	1750	840	910	980	1050	6000	8740

*subject to optimization

Application Examples H-Series



Fig. 1



Fig. 2



Fig. 3



Fig. 4

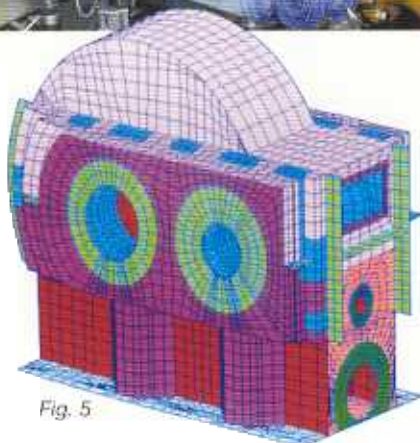


Fig. 5

Fig. 1: H 50 with BHS Rotor Turning Unit RDV 70.
Shaft driven, screw type oil pump.

Fig. 2: H-Series – a simple and robust design.
Thermoprobes internally wired, well protected.

Fig. 3: Back-to-back test of H 50-1 gear units.

Fig. 4: Highest quality standards as per DIN EN ISO 9001.

Fig. 5: FE-Analysis; H-Series casings were thoroughly studied with regard to deflection and noise emission during development phase.



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