

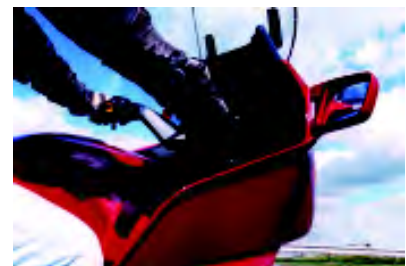


## 11. Motorcycles

The motorcycle market is becoming more and more high tech demanding in terms of performance, safety, reliability, speed and satisfaction. Extended operating life of motorcycles is via highly developed bearings with durable materials. HCH is currently supplying bearings to the major motorcycle brands in the world. In the mean time, HCH has a close and effective cooperation with our customers in research and development for new types of motorcycles as well as new bearings. In collaboration with our customers' design specialists, we have developed a wide range of specific solutions for engines, transmissions, chasises as well as for wheel system. The know-how provided by HCH experts guarantees the highest quality and optimum coordination for every area of application. In general, the benefits of applying HCH bearings includes:

- > Supporting the system cost reduction.
- > Increasing service life and system performance.
- > Reducing friction and weight.
- > Cutting energy consumption and emission.

Our range offers maximum benefits to motorcycle manufacturers and their customers, including an extended operating life of the motorcycles thanks to highly-developed components and assemblies, reduced fuel consumption, as well as increased operating efficiency through innovative engine components and weight-optimized parts. We support our customers with environmental friendly products that contribute to a reduction in CO<sub>2</sub> emissions, and offer them perfection by optimizing costs, performance and quality in an integrated approach.



Motorbike manufacturers are looking for a differentiation in terms of value recognition from the end user. Innovation. The combination of HCH new products and new solutions with a perfect integration with the original design achieve better performances leading to further technical standards.



## General requirements for motorcycles

### Comfort

For motorcycle drivers, it is absolutely vital that an optimal comfort level can be obtained during driving. Avoiding stress and fatigue is an important way to keep a good way of comfort. As for HCH, customer comfort considering is a prioritized area. We offer both original equipment manufacturers and drivers a range of excellent and reliable precision bearings to satisfy a high level of comfort.



### Save power by reducing friction

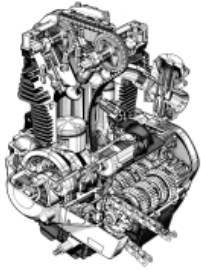
Friction causes vibration; vibration leads to noise, waste of energy and comfort troubles. HCH is equipped with advanced tools to make the best analysis focus on friction decreases. By choosing low-friction grease, optimized seals and shields design. Providing end-users with maintenance-free solutions is therefore a matter of course for the original equipment manufacturer and for HCH. With HCH systematic quality control, we offer you with the best application solutions for your energy saving purpose.



### Environmental friendly

A serious approach to environmental concerns is one of today's main issues for both manufacturers and drivers of motorcycles. Complying with ever changing environmental legislations is expensive but necessary. Here, HCH's expertise and innovative approaches to lubrication optimization, noise dampening and emission reduction is particularly valuable. With our lubrication and low friction solutions for bearings and seals, we reduce CO<sub>2</sub> emissions as well as grease and oil leakage, which helps protect the environment. Moreover, reduced fuel consumption and increased cost-efficiency is achieved by weight-optimized bearings through HCH highly reliable raw material.

## 11.1 Engine



Engine is the most demanding part from performance for motorcycles in respect to high power and speed conditions, reliability and long service life. The special feature of engine includes easy installation, high fuel efficiency, designed for high loads, durable, low-noise and cost-effective. HCH has developed numerous engine solutions in cooperation with our customers' engine design specialists. We offer customized solutions based on low friction bearings which can perform in severe operating conditions like: contamination condition, poor lubrication, and high temperature. During operation, the ball bearings are quiet and easy to maintain.

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### Crankshaft and camshaft

The crankshaft and camshaft are most important parts of the engine to achieve certain level of performance. The crankshaft runs at low friction in maintenance-free ball bearings. Crankshaft support bearing takes all the pressure generated by the engine power stroke. Camshaft manages the valves' operations with high accuracy supported by HCH bearings. The main technical demands for the crankshaft and camshaft bearings in motorcycle applications are:

- > Crankshaft accurate guidance resulting from limited radial and axial clearance value
- > Heat transfer resistance from engine combustion chambers
- > Protection to support engine oil solid and chemical contaminants
- > Long service life in terms of rolling contact fatigue resistance
- > Structural fatigue resistance due to housing deformation.



### HCH bearings for crankshaft and camshaft

HCH's strong commitment for a sustainable world in terms of less energy consumption, and HCH's contribution to the design's accuracy and the precise product customization make possible the positive net result of industrial activity and individual savings for the end user. HCH crankshaft and camshaft bearings are made from high quality bearing material which gives a good performance in hard operating conditions.

The special heat treatments for the rings provide better dimensional stability at higher operating temperature and contamination level.

For sealed bearings, sealing perfection in terms of improvement on lubrication preservation and dirt prevention optimizes the operation cost of the machine which has a direct impact on maintenance cost reduction and long service life. HCH has developed the seal lip design with new sealing standard and improves sealing properties like: low friction, speed ability, grease retention, dust exclusion, long service life and static and dynamic high pressure water exclusion.



By an accurate component selection, a correct assembly process and the right use, HCH can assure that the quality standards give a tangible added value to the Customer. HCH is prepared to face the challenge of obtaining a longer service life as well as the Customer and market's requests.

## 11.2 Transmission



Drivers of light and heavy motorcycles take durable components with high fuel economy for granted. Hidden from sight and totally reliable, rolling bearings play a decisive role. Low-noise, hi-speed gear bearing supported with lightweight, plastic cages increase the life of the transmission since they minimize the risk of false brinelling. The market performance expectations for motorcycles' transmissions are:

- > Low transmission losses
- > Low noise and vibration
- > Long service life
- > Trouble free operation in all working conditions



### HCH bearings for transmission

Developing and manufacturing lightweight and space-saving components is one of HCH's core areas of expertise. For over 30 years in this area, for example, we have produced rolling bearings with economical cold-formed bearing rings. We develop high-precision components with the lowest movable mass, which can economically be produced in volume.

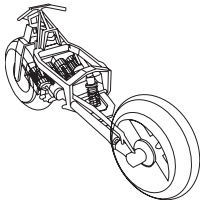
HCH optimized bearings for the transmission applications meet the customers' specific requirements by controlling radial clearance, special surface treatments and sealing aspects. HCH deep groove ball bearings for transmission applications offer:

- > Customized bearing solutions
- > Bearings for low noise and vibration.
- > Thin section bearings for compactness
- > Correct selection methods for low friction and reduced transmission losses
- > Advanced heat treatment for better wear resistance and dimensional stability



HCH provides customized bearing designs for the specific motorcycle applications by optimizing external dimensions, load carrying capacity, internal geometry, cage design, and seal design.

## 11.3 Steering



HCH does not want safety aspects to fall by the wayside. This is why we provide our customers with support in developing and designing the motorcycle steering system. A precise steering system ensures that the motorcycle performs exactly what the driver wants in critical situations. The motorcycle steering application demands:

- > Easy installation
- > Cost-effective
- > Designed for high loads
- > Maintenance free solutions
- > Longer service life under severe operating condition

### Steering column

The main application area, which is more critical for motorcycle steering system is steering column application. The bearings for steering columns are lubricated with the grease. The main constraints of this system are:

- > Ball & raceway wear out at early running
- > Complex & time consuming assembly method
- > No re-lubrication possibilities
- > Shorter service life due to water & contamination entry



### HCH bearings for steering column

HCH has the knowledge to offer solutions to face a steering column application under severe contamination and shock conditions. Adjustable HCH tapered roller bearings or deep groove ball bearings can absorb the highest loads and provide a precise steering system, thereby ensuring the driver's safety in extreme situations.

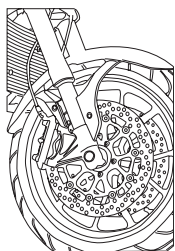
HCH tapered roller bearings consist of solid outer and inner rings with tapered raceways and tapered rollers with cages. The bearings are not self-retaining. This allows the inner ring with the rollers and cage to be fitted separately from the outer ring.

HCH deep groove ball bearings applied in this application are usually with larger clearance than normal to accurate the loads from radial or axial direction. With optimized grease selection and improved sealing design, HCH has developed a special system, which has the ability to keep the lubricant in perfect condition and the dust out. This solution keeps the steering column lubricated for a long working time. Moreover, The greases filled into the bearings are comparatively thicker to prevent interal metal-to-metal contact due to the ultra low speed.



Motorcycles with improved steering technology deliver a riding excellence and achieve a quick reaction on when unexpected situations turn up. As a result of HCH engineering knowledge of applications and integrated solution, it is now possible to upgrade your steering system.

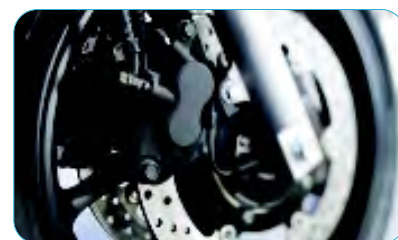
## 11.4 Wheels



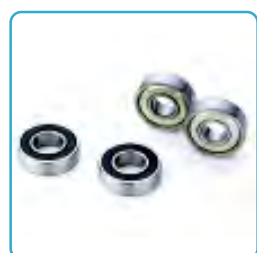
In wheel application, ball bearings with integrated seals that have been lubricated for life offer shock resistance and smooth operation. Their low friction and low wear also help to save fuel consumption. Low-friction ball bearings (with integrated seal as an optional extra), manufactured with the highest precision, are designed for the highest loads. During operation, the ball bearings are required to be stable and easy to maintain.

Lubrication humidity or oil leakage on a motorbike are synonymous of low cost components or extremely wrong use. This affects the brand's image and robustness. No HCH wheel bearing failure under severe operating conditions like:

- > Wet and dry contaminated environment
- > Speed and temperature increased
- > Poor maintenance
- > Heavy axial and radial loads
- > Compact size and light weight



Motorbike end users look for riding with satisfaction without any unexpected interruptions and for a long use in between maintenance service programs. By supplying confidence HCH can reach customer and the market prestige for bearing evaluated from a cost effective view instead of simply cost point of view.



### HCH bearing For wheel

HCH has developed a wide range of wheel bearings and wheel bearing sealing solutions for all kinds of motorcycle applications like mopeds, scooters, light and heavy motor cycles, off road and racing bikes to satisfy today's motorcycle market performance expectations like:

- > Low friction
- > Stiff rotary motion guidance
- > Long service life
- > Vibration free braking

No news about operation is the best news for a business and customer satisfaction point of view. No operation failure could be considered as a standard, but this is the result of the well done job more than a simple matter of chance. As for different motorcycles, we all have optimized choices:

- > HCH enhanced 2RS type seal leads the industry in protection from contaminants.
- > HCH 2RZ type bearings with non-contacted seals keep contaminants out of the bearings.
- > HCH nylon cage is a glass filled nylon that performs better in the oil less conditions.
- > HCH optimized grease is a high performance, wide temperature range synthetic with special rust inhibitor additives.
- > HCH optimized clearance is suggested to meet customers' specific application.