

Rolling Bearings in the Wheelsets, Gearboxes, and Current Collectors of the MOVIA Trains for London Underground

FAG

Examples of Application Engineering

WL 07 548 GB-D



MOVIA 248 pre-series train, designed and built by Bombardier Transportation

Photo: Bombardier Transportation

In 1863, London Underground was opened as the world's first underground railway. When the first lines at even deeper levels opened in 1890, the network became known as "tube". Today, London has one of the biggest metro systems in the world and carries nearly 1 billion passengers a year with a fleet of more than 4 000 trains.

Bombardier Transportation received from Metronet Rail, the company responsible for maintaining and upgrading two thirds of the system, a large order for trains to replace part of the fleet. A follow-up order was placed early in 2006, so that now a total of 1 778 metro cars have been ordered, including 47 eight-car *Bombardier* MOVIA** 248 trains for the Victoria Line.

The trains of the now fieldproven *MOVIA* family are of a modular design to minimize maintenance work and maintenance costs.

Schaeffler Group Industrial has already equipped the two pre-series trains for the Victoria Line with FAG axlebox bearings as well as FAG rolling bearings for current collectors and gearboxes.

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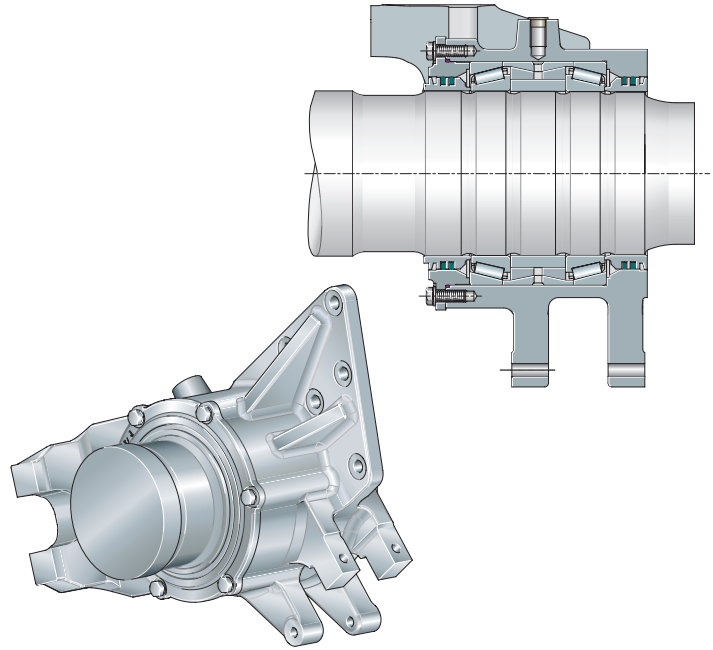
SCHAEFFLER GROUP
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Technical data of *MOVIA* 248 trains

Train configuration	2 half-trains, each consisting of 4 cars
Max. speed	80 km/h
Mileage	135 000 km/year
Expected vehicle life	40 years

Axlebox bearings

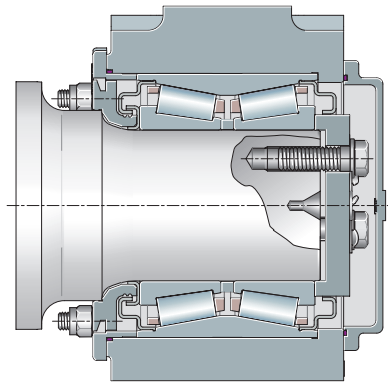
All motor bogies and carrying bogies are equipped with axlebox housings of type **AMG100-T** and rolling bearings of type **TAROL100/175**. Wheelset guidance is provided by a metal/rubber spring. The axlebox housings were subjected to extensive calculations (FEM) and load testing. The axlebox bearing has passed a performance test based on EN 12082 requirements at Schaeffler's own DAP-accredited test bay. Thus a modern TAROL bearing is used for the first time in London Underground trains whose performance surpasses that of all earlier bearing versions.



Gearbox

The double-stage helical gear is built by the manufacturer Wateeuw. It is supported on one side directly on the axle via the output shaft bearings; on the other side it is connected to the bogie frame via an elastically supported torque arm.

On the pinion shaft, two cylindrical roller bearings take up the radial forces whereas a radially relieved four point bearing accommodates the thrust loads. The tapered roller bearing pairs on the intermediate shaft and output shaft are mounted in X-arrangement each.



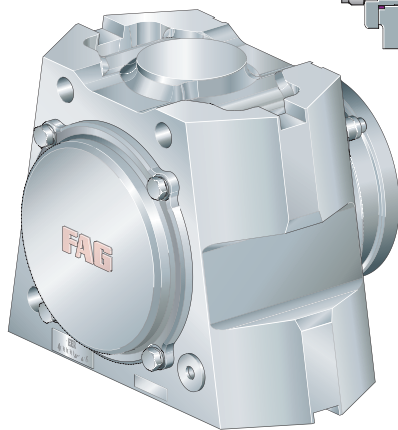
Special designs

Pinion shaft: 2 × **NU212-E** (Cylindrical roller bearings)
1 × **QJ212** (Four point contact bearings)

Intermediate shaft: 2 × **33211** (Tapered roller bearings)

Output shaft: 2 × **T4DB170** (Tapered roller bearings)

The cylindrical roller bearings and four point bearings are equipped with machined brass cages. The tapered roller bearings have pressed steel cages, some of them of reinforced design. To prevent creeping of the outer rings, all bearings have retaining grooves for locking pins.



Negative shoe gear bearing assembly for current collectors

The special traction current supply system of London Underground makes an additional negative shoe gear bearing assembly in the middle of the motor bogie wheelsets necessary. For this application, Schaeffler Group Industrial supplies an FAG assembly, consisting of tapered roller bearings that are paired in X-arrangement, in a housing of type **AZZ165-K**. A collector shoe is attached to the assembly which slides on the negative conductor rail.

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