FAG Gearbox Bearings in Montserrat Rack Railway Trains

Examples of Application Engineering

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Rack railway train GTW Beh 2/6: Developed and built by Stadler Bussnang AG, Switzerland

Courtesy of Stadler Bussnang AG

The old rack railway line running to the world-famous monastery of Montserrat near Barcelona was dismantled in 1957. After long years of planning, the decision was taken to reconstruct the line between Monistrol and the monastery of Montserrat.

In September 2000, Ferrocarrils de la Generalitat de Catalunya (FGC) ordered five trains of type GTW 2/6 from the Swiss Stadler Bussnang AG Group. Stadler is considered the number one supplier of rack railway vehicles worldwide.

The trains are equipped with a drive system for mixed adhesion and rack-and-pinion operation.

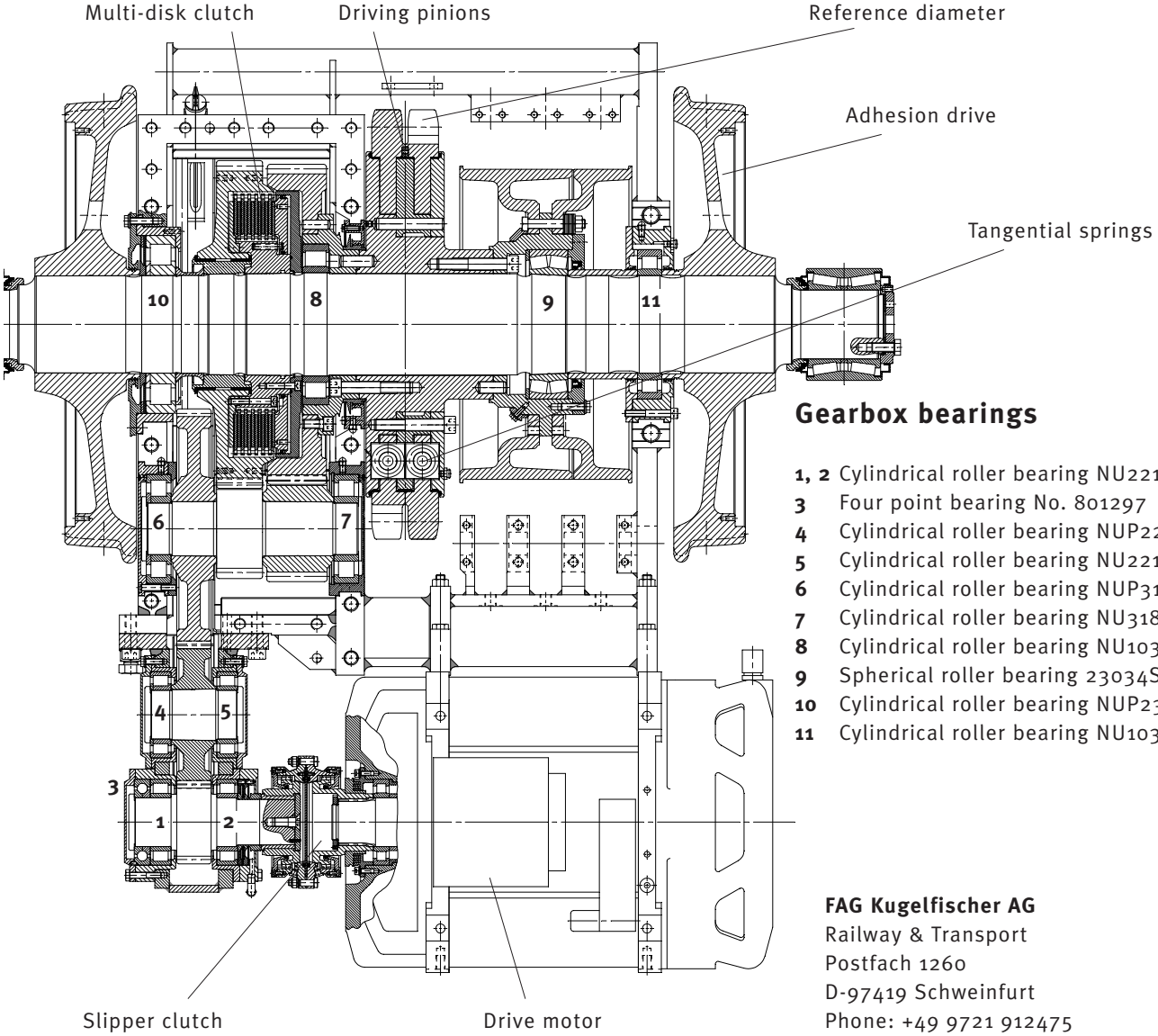
All bearings for the wheelset drive were supplied by FAG Kugelfischer AG.

Vehicle data, technical data

Wheel arrangement:	2´B02´
Gauge	1,000 mm
Max. gradient	150 ‰
Electric drive system	1,500 VDC
Drive wheel diameter	776/750 mm
Gearwheel reference diameter	687.55 mm
max. power on wheel	800 kW
Starting tractive power	110 kN
v_{max} rack:	
uphill	30 km/h
uphill	24 km/h (gradient of 200 ‰)
v_{max} in adhesion operation	45 km/h
Gear ratio in:	
-rack-and-pinion operation	i = 1:10.130
-adhesion operation	i = 1:11.241

Rack-and-pinion drive

Drive motor and rack-and-pinion drive form a unit which is supported on the drive shaft via two cylindrical roller bearings and is suspended from the bogie frame near the middle of the bogie.
A slipper clutch at the gearbox input of the drive shaft transmits the torque of the drive motor. It limits the torque and protects the axle drive.
The driving pinion and the drive wheels for adhesion operation are driven via two gear steps.
To avoid excessive wear, the drive wheels of the adhesion drive are disengaged on the rack stretches by means of a multi-disk clutch.
In addition, tangential springs in the driving pinions compensate for any rack pitch errors.



Gearbox bearings

1, 2 Cylindrical roller bearing NU2217E
3 Four point bearing No. 801297
4 Cylindrical roller bearing NUP2217E
5 Cylindrical roller bearing NU2217E
6 Cylindrical roller bearing NUP318E
7 Cylindrical roller bearing NU318E
8 Cylindrical roller bearing NU1036E
9 Spherical roller bearing 23034SK
10 Cylindrical roller bearing NUP234E
11 Cylindrical roller bearing NU1034

FAG Kugelfischer AG
Railway & Transport
Postfach 1260
D-97419 Schweinfurt
Phone: +49 9721 912475
Fax: +49 9721 913788
E-mail: rail_transport@fag.de
www.fag.com

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