

5.8 Calculation of mechanic transmissions

The mechanic drive, or transmission, has the target to transmit at motor wheels the torque of traction motors: the dimension of gear cogs and of the shafts must be calculated in function of maximal tractive effort, plus a margin. Do not forget that fixations and silent-blocs must hold out, also after aging.

The most difficult part of the calculation is on another place: this is an oscillating system with multiples inertia joined with torsion shafts. The complexity of systems grows with the class number (see page 5-1.1). For a system of class 3, the number of freedom degrees can reach 20. Depending of the rolling speed, some mechanical resonance frequencies can be found. If more, one of these frequencies is an integer multiple of an electrical frequency caused by the network or the harmonics of converter, some majors problems are encountered. The science of mechanic engineer is to survey that these resonance frequencies would not be excited in normal operating conditions, in particular with an adequate choice of elasticity factor of each part.

In the calculation of dimension of the gear cog, the number of contact points has to be constant, to provide the generation of vibrations.

At certain speed, a runout of wheels – one or two tenth of millimeters – can generate vibrations which excite a resonance in the mechanic structure.

5.9 Cog-rack Transmissions

For the climbing of steep ramps, the adhesion is not sufficient to insure the traction and some cog wheels, meshing on a rack, are installed.

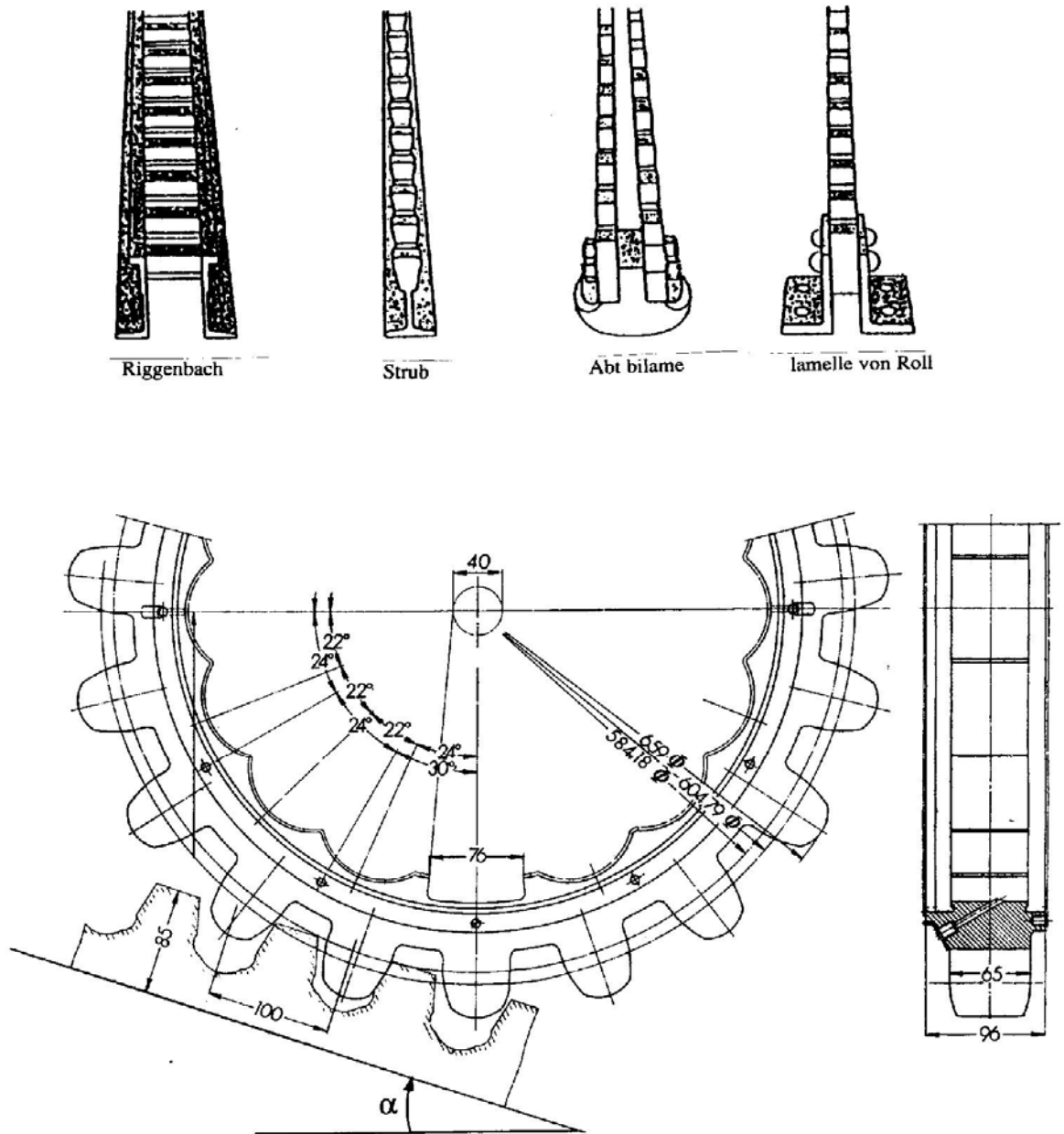


Fig. 5.36 Cog wheel and rack.