Rack and Pinion Design

Sample document - numeric values are only included in the purchased Pro export.

Project: _____ Part/Position: _____ Prepared by: _____

Overall assessment: PASS

Inputs

Module m	? ? ? mm
Pinion tooth count z	? ? ?
Helix angle beta	? ? ? °
Travel speed v	? ? ? m/min
moving mass mLast	? ? ? kg
Friction coefficient mu	? ? ?
Acceleration a	? ? ? m/s^2
Process force Fp	? ? ? N
Installation	? ? ?
Face width ratio psi_m = b/m	? ? ?
Application factor KA	? ? ?
Material / sigma_Fzul	? ? ?

Kinematics

Pitch diameter d	? ? ? mm
Feed per revolution u	? ? ? mm/U
Pinion speed n	? ? ? 1/min

Forces and power

Feed force F	? ? ? N
Pinion torque M	? ? ? Nm
Power P	? ? ? kW
Tangential force Ft	? ? ? N
Normal force Fn	? ? ? N
Radial (separating) force Fr	? ? ? N
Axial force Fa	? ? ? N

Evaluation criteria

Criterion	Value	Limit	Status
Module m against required module m_erf (estimate)	? ? ? mm	? ? ? mm	● PASS

Module pre-sizing (estimate)

selected module m	? ? ? mm
required module m_erf	? ? ? mm
allowable tooth root stress sigma_Fzul	? ? ? N/mm^2

Notes and calculation basis

Pre-sizing of a pinion on a rack as a linear-axis drive. Calculation path: pitch diameter d = m·z/cos(beta), feed per revolution u = pi·d and pinion speed n = 1000·v/u, feed force F either direct or derived from moving mass, friction, acceleration, process force and installation, pinion torque M = F·d/2000 and power P = F·v/60000, gear mesh force breakdown (normal force Fn, radial/separating force Fr, and for helical gearing an additional axial force Fa), plus a module estimate using the Roloff/Matek approximation m_erf = sqrt(2·KA·Ft/(psi_m·sigma_Fzul·Y_F)) with Y_F ~ ? ? ?. Simplification: the estimate does not replace a load capacity verification per ISO 6336 (see the spur gear calculator); lubrication, wear and guide stiffness remain manufacturer-specific and are not part of this calculation.

Note: The results are design and orientation aids. They do not replace independent verification, calculation and approval by a qualified person. The terms of use at maschinenbaurechner.de apply.