

Gear Application

Summary And Evaluation Of Gears

(Reprinted from Handbook of Gears)

Type	Precision Rating	Features	Application	Comments Precision
Spur	Excellent	Parallel shafting. High speeds and loads. Highest efficiency.	Applicable to all types of trains and a wide range of velocity ratios.	Simplest tooth elements offering maximum precision. First choice, recommended for all gear meshes except where high speeds and loads or special features of other types, such as right-angle drives cannot be avoided.
Helical	Good	Parallel shafting. Very high speeds and loads. Efficiency slightly less than spur mesh.	Most applicable to high speeds and loads; also used wherever spurs are used.	Equivalent quality to spurs except for complication of their angle. Recommended for all high-speed and high-loads meshes. Axial thrust component must be accommodated.
Crossed-Helical	Poor	Skewed shafting, point contact, high sliding, low speeds and light loads.	Relatively low velocity ratio: low speeds and light loads only. Any angle skews shafts.	To be avoided for precision meshes. Point contact limited capacity and precision. Suitable for right-angle drives if light load. A less expensive substitute for bevel gears. Good lubrication essential.
Internal Spur	Fair	Parallel shafts, high speeds, and high loads.	Internal drives requiring high speeds and high loads; offers low sliding and high stress loading; good for high capacity long life. Used on planetary gears to produce large reduction ratios.	Not recommended for precision meshes because of design, fabrication and inspection limitations. Should only be used when internal feature is necessary.
Bevel	Fair to good.	Intersecting shafts, high speeds and high loads.	Suitable for 1:1 and higher velocity ratios and for right-angle meshes (and other angles).	Good choice for right-angle drive particularly low ratios. However, complicated tooth form and fabrication limits achievement or precision. Should be located at one of the less critical meshes of the train.
Worm Mesh	Fair to good.	Right-angle skew shafts, high velocity ratio, high speeds and loads. Low efficiency, most designs nonreversible.	High velocity ratio, angular meshes, and high loads.	Worm can be made to high precision, but worm gear has inherent limitations. To be considered for average precision meshes, but can be high precision with care. Best choice for combination high velocity ration and right-angle drive. High sliding requires excellent lubrication.