

NLGI Grade

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NLGI Grade is a widely used classification for lubricating greases. It was established by the National Lubricating Grease Institute. Greases are classified in one of nine grades based on their consistency.

NLGI Grade alone is not sufficient for specifying the grease for a particular application but it is a useful qualitative measure. While the science of tribology is still developing, NLGI Grade, in combination with other test-based properties is the only method for determining the potential suitability of various greases for a specific application.

The nine grades are defined by a range of worked penetration test results. The NLGI grade for a specific grease is determined using two test apparatus. The first apparatus consists of a closed container and a piston-like plunger. The face of the plunger is perforated to allow grease to flow from one side of the plunger to another as the plunger is worked up and down. The test grease is inserted into the container and the plunger is stroked 60 times while the test apparatus and grease are maintained at a temperature of 25 °C.

Once worked, the grease is placed in a penetration test apparatus. This apparatus consists of a container, a specially-configured cone and a dial indicator. The container is filled with the grease and the top surface of the grease is smoothed over. The cone is placed so that its tip just touches the grease surface and a dial indicator is set to zero at this position. When the test starts the weight of the cone will cause it to penetrate into the grease. After a specific time interval the depth of penetration is measured.

The following table.^[1] shows the NLGI grades and the worked penetration ranges:

NLGI Grade	Worked penetration after 60 Strokes at 25 °C (0.1 mm)	Appearance	Consistency food analog
000	445-475	fluid	cooking oil
00	400-430	semi-fluid	applesauce
0	355-385	very soft	brown mustard
1	310-340	soft	tomato paste
2	265-295	"normal" grease	peanut butter
3	220-250	firm	vegetable shortening
4	175-205	very firm	frozen yogurt
5	130-160	hard	smooth pate
6	85-115	very hard	cheddar cheese

NLGI Grades 000 to 1 are used in application requiring low viscous friction. Examples include enclosed gear drives operating at low speeds and open gearing. Grades 0, 1 and 2 are used in highly loaded gearing. Grades 1 through 4 are often used in rolling contact bearings where grade 2 is the most common.

Grease Consistency — Lower numbers are softer and flow better, while higher numbers are firmer, tend to stay in place, and are a good choice when leakage is a concern. The table above compares the most common NLGI grades with household products that have similar consistencies.

References

- [^] Rudnick, Leslie R. (2005). *Synthetics, Mineral Oils, and Bio-Based Lubricants: Chemistry and Technology (Chemical Industries)*. CRC. pp. 468. ISBN 1574447238.

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