NLGI Grade of a Lubricating Grease

What is an NLGI Grade?

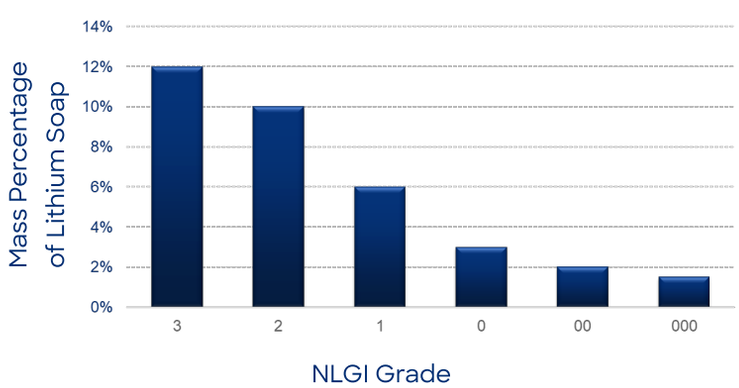
Similar to how industrial lubricating oils are classified according to their ISO viscosity grades (32, 100, 220…), greases are classified according to their NLGI grade. In industry we often hear the need for an “EP 2 grease”, where the number 2 designates the NLGI grade, and “EP” describes extreme pressure properties.

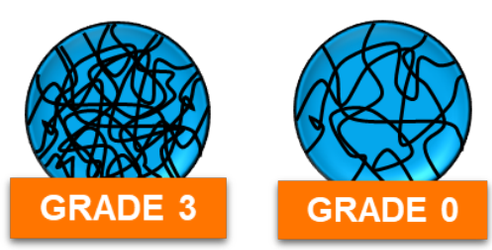
This NLGI grade characterizes the consistency of the grease. In scientific terms, the consistency is **the degree to which a plastic material like grease resists to deformation under the application of force.** Expressed in a simpler way, **the higher the NLGI grade, the “harder” the grease is**.

NLGI grade is determined by a standardized penetration test, which measures the depth of penetration of a cone into the grease under controlled conditions. ASTM D 217 or ISO 2137 describes the method and the numerical scale for classifying the consistency of greases. NLGI grades go from 000 (softest, almost liquid) to 6 (hard as bar soap). We very rarely see greases with a grade 4, 5 or 6 and the most used grade for maintenance greases are grades 0, 1 and 2.

What Influences the NLGI Grade?

The NLGI grade is directly linked to the amount of thickener in the grease. The graph below shows the typical quantity of lithium soap used for manufacturing different grades of a lithium grease like QH QUANTOL™ TEK series.





Simple illustration of the density of the soap thickener in an NLGI grade 3 grease and an NLGI grade 0 grease.

WATCH OUT!

Don't confuse grease consistency with oil viscosity!

While each grease has an NLGI grade determined by thickener content, the base oil contained within the thickener's matrix has a viscosity (expressed in cSt or mm^2/s) that determines lubricating film properties.

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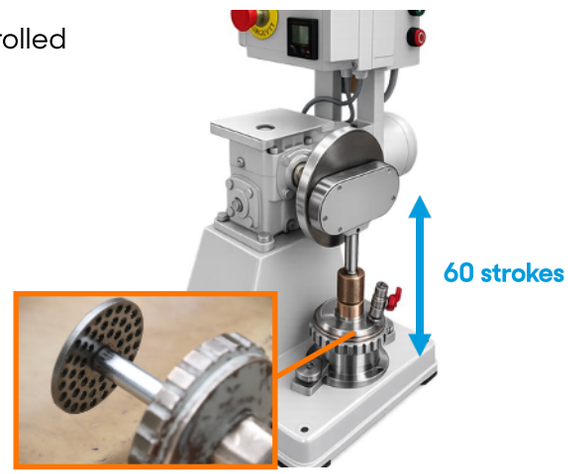
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Measuring the NLGI Grade - ASTM D 217

Step 1 : Working of the Grease (Grease Worker)

Before the actual penetration measurement, a cylinder of metal is filled with the grease and then subjected to controlled mechanical working using a grease worker.



The grease worker consists of a **plate with 6.5 mmØ holes** in it going up and down (typically 60 strokes) into 400 grams of grease.

Objective: To simulate the actual shear stresses experienced by the grease in service (pumping, bearings, gears).

Step 2 : Cone Penetration Measurement

The cup filled with the worked grease is placed under a penetrometer equipped with a standard cone of defined mass and geometry. The grease should be at 25°C.



Test procedure

1. The cone is positioned in contact with the grease surface
2. It is released for 5 seconds
3. The penetration depth is measured accurately in tenths of a millimeter

The value of penetration indicates the consistency of the grease. The table below shows the grade corresponding to each penetration value.

NLGI GRADE	PENETRATION RANGE (1/10 MM)	APPEARANCE
000	445-475	Very fluid
000	400-430	Fluid
0	355-385	Semi fluid
1	310-340	Very soft
2	265-295	Soft
3	220-250	Mixed
4	175-205	Hard
5	130-160	Very hard
6	85-115	Extra hard (block)

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