Thread Standards and Definitions

United States, Canada, and United Kingdom use the Unified or Unified Inch profile, in accordance with the Unified and American Screw Threads – ASA B1.1-1989.

UNC – Unified National Coarse
UNF – Unified National Fine
UNEF – Unified National Extra Fine
UNS – Unified National Special
UNR – Unified National Round (round root)
ISO – International Standards Organization (metric)

Two major Unified thread series are in use: UN and UNR. For the UN series, you specify C (coarse), F (fine), or EF (extra fine), as required. For the UNR series, the root radius must also be specified. The UNR series screws are better for fatigue because the root radius reduces stress concentrations. The basic thread geometry for ISO and Unified threads is shown below.

Unified and ISO Thread Geometry

Pitch (p) – The distance between adjacent thread forms measured parallel to the thread axis.
Lead (L) – The distance the nut moves parallel to the screw axis when the nut is given one turn.
TPI (n) – The number of Threads Per Inch, related to the pitch by \( p = 1/n \).
Root (minor) Diameter – Smallest diameter of screw - \( d_r \).
Major Diameter – Largest diameter of screw - \( d_c \) (sometimes designated as \( d \)).
Mean (pitch) Diameter – Average diameter of screw - \( d_m \) (sometimes designated as \( d_p \)).
Lead Angle (\( \lambda \)) – The angle defining the inclination of the thread (see figure below).
Helix Angle (\( \psi \)) – The angle between the thread axis and the lead angle (\( \psi + \lambda = 90^\circ \)).
Thread Classifications: There are three classes of thread fit;

Loose (where the joint is frequently disassembled) – Class 1
Standard (general assembly) – Class 2
Close (high accuracy, fine fits) – Class 3

Designations for each class and the type of thread (inside or outside) for Unified and Metric are given below.

<table>
<thead>
<tr>
<th>Class</th>
<th>Unified External Thread</th>
<th>Unified Internal Thread</th>
<th>Metric External Thread</th>
<th>Metric Internal Thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loose</td>
<td>1A</td>
<td>1B</td>
<td>8g</td>
<td>7h</td>
</tr>
<tr>
<td>Standard</td>
<td>2A</td>
<td>2B</td>
<td>6g</td>
<td>6h</td>
</tr>
<tr>
<td>Close</td>
<td>3A</td>
<td>3B</td>
<td>4g</td>
<td>5h</td>
</tr>
</tbody>
</table>

Nomenclature: Examples of the nomenclature for specifying a threaded fastener are given below for Unified National and Metric specifications

**Unified National:**
- Major Diameter
- Threads per inch
- Classification: UNC - unified national coarse
- UNF - unified national fine
- UNEF - unified national extra fine
- Tolerance specification (class of fit)
- Type of thread (A - External, B - Internal)
- Hand of thread (L = left, R = right)

**Metric:**
- Nominal size (diameter)
- Pitch (mm)
- Fit classification
- Metric
- Length (mm)

\[
\begin{align*}
L &= p \\
L &= 2p
\end{align*}
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