Introduction
Weighing results are affected by the environment, by the user or simply by random processes. To guarantee safe and reproducible results, compensate occurring deviations by applying a safety factor to your calibration and minimum weight limits.

Effect of the Safety Factor
• With a safety factor of 1, the car driver below cannot tolerate any deviation at all to avoid crashing into the wall.
• With a safety factor of 2, the driver can react to occurring deviations, such as wind, irregular pavement or drinking coffee while steering, and he still drives safely on the road.
• With a safety factor of 5, the driver could even handle an evasion maneuver with a deer on the road.

In weighing processes, the safety factor determines the margin between accurate measurement results and those being out of tolerance. Choose a safety factor > 1 to avoid deviations triggered by changes in the environment, the weighing process and user handling.

Figure 1: Impact of a safety factor when driving a car.
Evaluating a Reasonable Safety Factor

Several influences affect the choice of the safety factor. The most important are:

**Users** – Different handling techniques may influence the weighing results.
- Quantity of users: The smaller the number of users, the lower the likelihood that measurement results vary
  - One user: A lower safety factor is satisfactory
  - Many users: Increase safety factor
- Skill of users: The better the users are trained, the less the measurements vary
  - Well trained users: Choose a lower safety factor
  - Untrained users: Increase safety factor

**Environment** – Environmental conditions can have a strong influence on the measurement results.
- Temperature fluctuations:
  - Fluctuation ≤ 5 °C per day: Choose a lower safety factor
  - Fluctuation > 5 °C per day: Increase safety factor
  - If the adjustment feature in the balance is activated (e.g. FACT): Choose a lower safety factor
- Draft occurrence during balance use:
  - Draft does not occur: Choose a lower safety factor
  - Draft occurs: Increase safety factor
- Electrostatics, magnetism, and other factors affecting weighing accuracy:
  - If none: Choose a lower safety factor
  - If existing: Increase the safety factor

**Weighing Risk, Impact and Accuracy** – What are acceptable deviations in your business?
- Low risk and low accuracy: Choose a lower safety factor
- High risk and high accuracy: Increase safety factor

<table>
<thead>
<tr>
<th>Safety Factor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 1</td>
<td>Weighing process is safe even if affected by external influences</td>
</tr>
<tr>
<td>= 1</td>
<td>Any operational variations will lead to failure of the weighing process</td>
</tr>
<tr>
<td>&lt; 1</td>
<td>Weighing process will fail</td>
</tr>
</tbody>
</table>

For regular processes a safety factor of 2 is recommended. For higher risk processes choose a factor ≥ 3.

### Table of minimum sample weight values (minimum weights) for different weighing accuracies and various safety factors

<table>
<thead>
<tr>
<th>Weight Accuracy</th>
<th>1x (no safety factor)</th>
<th>2x (safety factor of 2)</th>
<th>3x (safety factor of 3)</th>
<th>5x (safety factor of 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1%</td>
<td>0.16497 g</td>
<td>0.33191 g</td>
<td>0.50085 g</td>
<td>0.84489 g</td>
</tr>
<tr>
<td>0.2%</td>
<td>0.08224 g</td>
<td>0.16497 g</td>
<td>0.24819 g</td>
<td>0.41613 g</td>
</tr>
<tr>
<td>0.5%</td>
<td>0.03284 g</td>
<td>0.06575 g</td>
<td>0.09875 g</td>
<td>0.16497 g</td>
</tr>
<tr>
<td>1%</td>
<td>0.01641 g</td>
<td>0.03284 g</td>
<td>0.04929 g</td>
<td>0.08224 g</td>
</tr>
<tr>
<td>2%</td>
<td>0.00820 g</td>
<td>0.01641 g</td>
<td>0.02462 g</td>
<td>0.04106 g</td>
</tr>
<tr>
<td>5%</td>
<td>0.00328 g</td>
<td>0.00656 g</td>
<td>0.00984 g</td>
<td>0.01641 g</td>
</tr>
</tbody>
</table>

Figure 2: Minimum weight determination for a weighing accuracy of 1% and a safety factor of 2 (METTLER TOLEDO Standard Calibration Certificate, SCC).