

TolPro 4.1

Data concerning Cm-Value

Establishment of the minimum requirement aggregate tolerance for Cm-Value.

Cm-Value (single machine capability index) = $UTL-LTL / 6s$

Explanation:

UTL	=	Upper specification limit
UTG	=	Lower specification limit
S	=	Standard deviation

The Cm-Value shows only a possible long term capability if the process is statistically controlled during the testing period. It includes the control, but does not show any systematic influences.

In particular, it places the control processes in relation to the specification range.

Characteristic values for Cm:

1. **Cm-Value > 1,33** The scale of dispersion remains within the specification. It can however lead to errors if the process is not centered on a target value.
2. **Cm-Value = 1,33** The process just meets the specification requirement. A minimum 0,006 % error rate is generated, if the process is not centered.
3. **Cm-Value < 1,33** The scale of dispersion exceeds the specification. It leads to errors/failures.

The Cm-Value calculations are only feasible during the sampling/trial phase.

The tolerances in the drawing, specified by the designer, are only feasible if a Cm-Value of 3 is achieved.

If the calculated C_m -value is less than 3, to increase the C_m -value-to following options are available:

1. Different machines (electric - rather than hydraulic injection molding)
2. Optimization of gate geometry (minimize shear)
3. Process optimization by DOE (Design of Experiment)
4. Tool and melt temperature of raw material manufacturer
5. Possibly nuclear and slide cooling and / or additional cooling holes (purge) Fit
6. Wear resistant (heat steels), using high-quality steels
7. Possibly increase cooling time (inefficient)
8. tolerance expansion
9. material change

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Additional information about Machine capability index C_m value

Machine capability studies are intended to estimate the possible process capability over a short period with a relatively small number of data.

Machine capability is the measure of the actual quality of a machine, based on the specifications. The ability of a machine or process is measured by indicators. These indices tell how well a machine or process meets the requirements under the most constant conditions.

Symbols: =

UTL: Upper tolerance limit

UTG: Lower tolerance limit

The machine capability index includes only the scattering.
 S the standard deviation obtained from the machine capability study.

In the automotive industry, the following targets have been established for:

- $C_m < 1,67$ quality not capable
- $C_m > 1,67$ related quality-capable (accepted in serial production)
- $C_m > 2,00$ quality capability (called for in the sampling phase)

In contrast to the process capability is the study of the machine capability (C_m , C_{mk}) only over a short time. Sufficient capacity is a necessary condition for an effective process.

The proof of process capability (C_p , C_{pk}) must be for an extended period. The process capability of the machine consists of the ability to participate in the process equipment and other process parameters such as the effects of the machines, the material and the operator.

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