ME 232: Positional Tolerance

The tolerances on dimensions of position (or location) are dependent upon the size tolerances, and hence the fits, specified for the mating parts in the assembly. The objective is to provide for the maximum possible variation in the locational dimensions while still ensuring that the parts will assemble under the size conditions specified by the designated fit. If desired, a smaller value for the tolerance of position may then be specified although this would entail higher production costs.

The critical conditions of the assembly, with regard to fit and position, must be considered to obtain the maximum positional tolerance. These critical conditions are listed below along with the determining relationships for the various assembly types.

**Critical conditions:**

1. the size dimensions of the mating parts are at MMC
2. the distance between mating features is at a maximum for one feature and at a minimum for the other (2 components)
3. the distances between features alternate between a maximum and a minimum for one feature and a minimum and a maximum for the other (three or more components)

Three major cases (of assembly) are considered in the determination of positional tolerances.

1) **Fixed pin:** fixed pins (cylindrical component) on one part in combination with holes on the other. Note: all statements below refer to one dimensional direction only. The figure numbers refer to the accompanying sheet.
   a) Two components, same allowance between parts: (fig. 1)
      Positional tolerance is equal to the allowance between mating parts.
   b) Two components, different allowance between parts: (fig. 2)
      Positional tolerance is equal to the average allowance between mating parts.
   c) Three or more components, same allowance between parts: (fig. 7)
      Positional tolerance is equal to one-half the allowance between mating parts. Datum is preferred to be an end pair.
   d) Three components, in any combination: (fig. 5)
      Positional tolerance is equal to one-half the allowance between the outside pairs.
   e) Four or more components, the allowance between one pair is different: (fig. 8)
      Positional tolerance is equal to one-half the allowance that occurs more than once. Datum must be taken at the differing pair.

2) **Floating pin:** clearance hole on two parts
   a) Two components: (fig. 3)
      Positional tolerance is equal to twice the allowance between mating parts.
   b) Three or more components, same allowance between parts: (fig. 9)
      Positional tolerance is equal to the allowance between mating parts. Note: If a differing allowance on one fixed pair is present, the datum is taken to be at this hole and this allowance is not used for the computation of positional tolerance.

3) **Combination fixed and floating pin**
   a) Two components: (fig. 4)
      Positional tolerance is equal to one-half of: the sum of twice the allowance of the floating pin plus the allowance for the fixed pin.