MIL-STD-1916 (Acceptance Sampling for Attributes)

Summary

MIL-STD-1916 is a standard sampling methodology that has been established for the acceptance or rejection of lots based on the evaluation of item attributes. A sample of *n* units is taken from a batch or lot containing *N* units. If the sample contains no nonconforming units, the batch or lot is accepted. Otherwise, the batch or lot is rejected. Such a plan is often referred to as a "zero acceptance number sampling plan".

The MIL-STD-1916 standard specifies the appropriate sample sizes for different verification levels, which are usually specified by contract. It also contains rules for switching between normal inspection, tightened inspection, and reduced inspection, based on the results of recent samples.

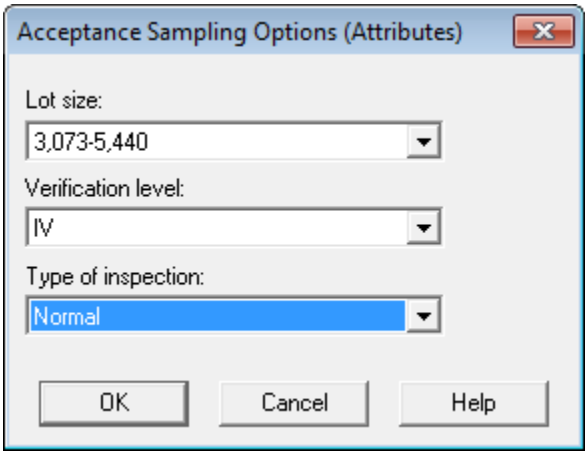
This procedure calculates the required sample sizes. It also plots operating characteristic curves to compare alternative sampling plans.

Full details of the standard may be found in the publication titled Department of Defense Test Method Standard: DOD Preferred Methods for Acceptance of Product.

Sample StatFolio: *milstd1916A.sgp*

Data Input

The initial dialog box displayed when the procedure is selected is shown below:



- **Lot size:** the size of the lot or batch from which units will be randomly selected.

- **Verification level**: the verification level to be used. The standard describes seven inspection levels. Larger verification levels require larger sample sizes. Usually, the verification level is specified by contract.

- **Type of inspection**: *normal*, *tightened*, or *reduced*. When beginning a sampling scheme, normal inspection is used. Tightened inspection is implemented when recent inspection results have been poor. Reduced inspection is implemented when recent inspection has been very good. The MIL-STD-1916 standard includes rules for switching between the three types of inspection.

Selection of Sampling Plan

Given the information provided in the data input dialog box, a sampling plan is generated by:

Step 1: Assignment of sample size code letter

Based on the lot size and verification level, a sample size code letter is assigned. The code may be either A, B, C, D, or E.

Step 2: Determination of sample size

Based on the assigned sample size code letter, the verification level, and the type of inspection, the required sample size is determined.

Analysis Summary

As an example, consider the entries in the dialog box above. This requests that units be selected from a batch or lot containing between 3,073 and 5,440 units, and that each unit be inspected using Normal inspection at Verification Level IV.

When the *OK* button is pressed, an analysis window is created containing the following *Analysis Summary*:

MIL-STD-1916 (Attributes)
Lot size: 3,073-5,440
Verification Level: IV
Type of inspection: Normal

Sampling plan: Single (code D)

Sample size	*Acceptance number*	*Rejection number*
160	0	1

Alternative Continuous Sampling Plan

	Units
Screening phase clearance number	815
Sampling phase sampling frquency	1/34

The assigned sample size code letter is D. 160 units are to be inspected. If all units are acceptable, then the lot will be accepted. Otherwise, the lot will be rejected.

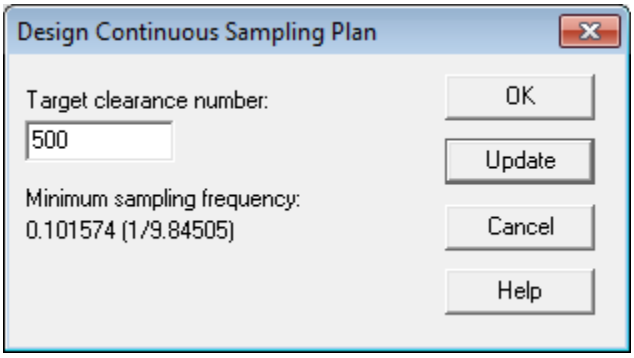
Continuous Sampling Plans

The *Analysis Summary* also displays an alternative continuous sampling plan, which may be useful if many lots of the indicated size are to be inspected. Continuous sampling plans consist of two phases:

> *Screening Phase* – In this phase, 100% inspection is applied to the first *m* units produced (*m* is called the *clearance number*). If any units are found to be unacceptable, the screening phase is restarted. If all *m* units are acceptable, the screening phase ends.
>
> *Sampling Phase* – In this phase, only a fraction *f* of all units are inspected. The sampling phase continues as long as all units are found to be acceptable, production is interrupted for more than 3 days, or the product configuration changes in some way. Otherwise, a new screening phase must be started.

For the example, 100% inspection would be applied to the first 815 units. If all units were acceptable, inspection would be reduced to 1 out of every 34 subsequent units.

MIL-STD-1916 also permits lowering the clearance number, but only if the sampling frequency is increased. The *Analysis Options* dialog box shown below will calculate alternatives:



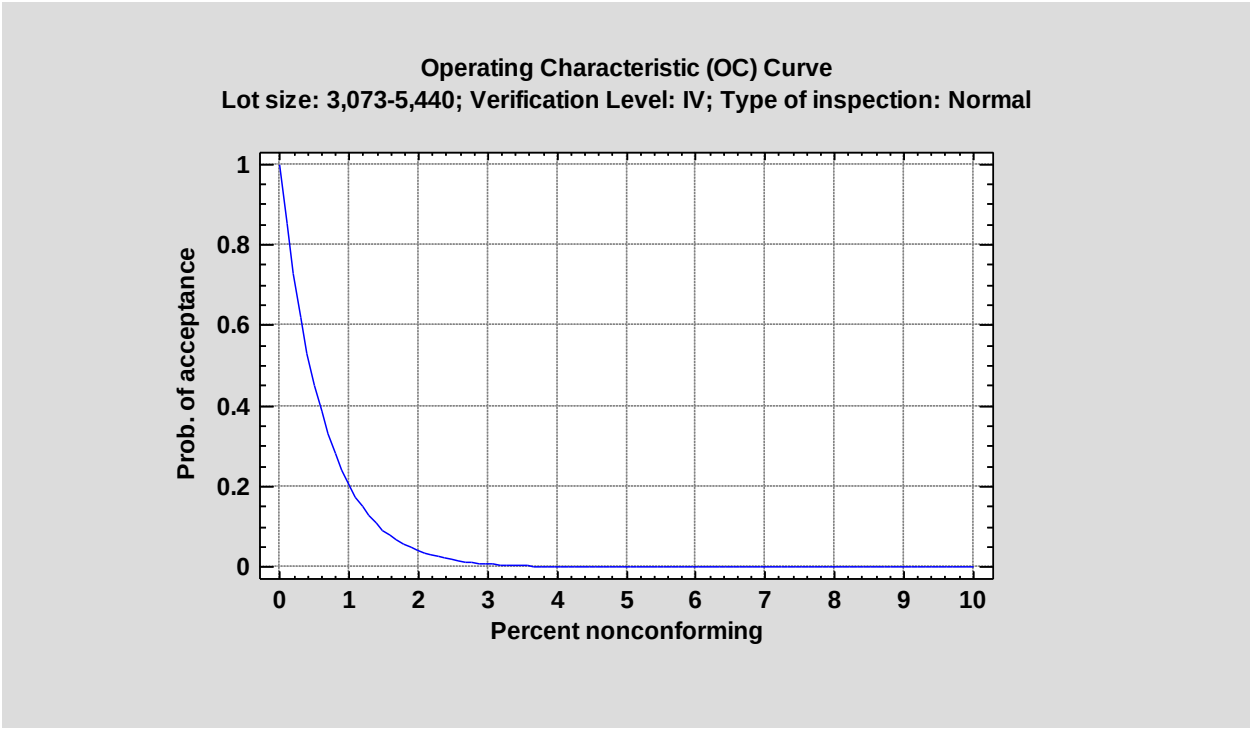
To calculate the required sample frequency, enter the desired clearance number and press the *Update* button. The program will calculate the smallest sampling frequency allowed during the sampling phase for that clearance number. For example, if only $m = 500$ units are inspected during the screening phase instead of 815, then the frequency of sampling during the sampling phase must be increased from $f = 1/34$ to a fraction greater than or equal to $f = 0.101574$ (such as 1/9 or 2/19):

Alternative Continuous Sampling Plan

	Units
Screening phase clearance number	500
Sampling phase sampling fraction	2/19

Operating Characteristic Curve

This pane displays the OC Curve, which shows the probability that a lot will be rejected using the derived sampling plan given various values for the true percent of nonconforming units in the lot.



For example, if the lot contains 1% nonconforming units, then the probability of accepting the lot is approximately 0.20 or 20%. This OC curve may be compared to that of other sampling plans.