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Sampling procedures and tables for periodic inspection by attributes (Apply to inspection of process stability)

周期检验计数抽样程序及表（适用于对过程稳定性的检验）

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Sampling procedures and tables for periodic inspection by attributes (Apply to inspection of process stability)

1 Scope

This Standard specifies the primary, secondary, and fifth sampling plans and sampling procedures based on the rejection quality level (expressed as the percentage of rejected products or the number of rejected products per hundred units) as the quality indicator. It is applicable to the inspection for process stability.

2 Normative references

The provisions in following documents become the provisions of this Standard through reference in this Standard. For dated references, the subsequent amendments (excluding corrigendum) or revisions do not apply to this Standard, however, parties who reach an agreement based on this Standard are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest edition of the referenced document applies.

GB/T 3358.1-1993, *Terms for statistics. Part I: Terms for general statistics*

GB/T 3358.2-1993, *Terms for statistics Part II: Terms for statistical quality control*

GB/T 2828[1)], *Sampling procedures for inspection by attributes (idt ISO 2859-1)*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 3358 as well as the followings apply.

[1)] In the process of revision (it is the revision of GB/T 2828-1987 "Sampling procedures and tables for lot-by-lot inspection by attributes (Apply to inspection of successive lots or batches)"). It is equivalent to ISO 28591: 1999.

the important quality characteristics of the unit product do not meet the regulations, or the quality characteristics of the unit product seriously do not meet the regulations

3.1.10 Class C rejection

the general quality characteristics of the unit product do not meet the regulations, or the quality characteristics of the unit product slightly do not meet the regulations

3.1.11 rejected product

there are one or more rejected unit products; according to the type of rejection, it can be generally divided into: Class A rejected product, Class B rejected product, Class C rejected product

3.1.12 Class A rejected product

there is one or more Class A rejection, and there may also be Class B and/or C rejection unit products

3.1.13 Class B rejected product

there is one or more Class B rejection, and there may also be Class C rejection, but excluding Class A rejection unit products

3.1.14 Class C rejected product

there is one or more Class C rejection, but excluding Class A and B rejection unit products

3.1.15 percentage of rejected products

the total number of all rejected products in the batch divided by the batch number, then multiplied by 100; that is:

Percentage of rejected products = (total number of rejected products in the batch / batch number) × 100

3.1.16 number of rejected products per hundred units

the total number of rejected products of all units in the batch divided by the batch number, and then multiplied by 100; that is:

Number of rejected products per hundred units = (total number of rejected products in all unit products in the batch / batch number) × 100

3.1.17 batch quality

in count acceptance sampling, the minimum number of rejection or rejected products that are not allowed in samples of a rejected batch

3.1.27 determination array

a combination of determined number of acceptance and determined number of rejection or determined number series of acceptance and determined number series of rejection

3.1.28 sampling plan

a specific plan for sample number and relevant acceptance criteria

3.1.29 sampling procedure

a process of using the sampling plan to determine whether the lot is qualified or not

3.1.30 primary sampling plan

a sampling plan composed of sample number and determination array [A_c, R_e]

3.1.31 secondary sampling plan

a sampling plan composed of the first sample number n_1, the second sample number n_z, and the determination array [A_1, A_2, R_1, R_2]

3.1.32 fifth sampling plan

a sampling plan composed of sample number series n_1, n_2, n_3, n_4, n_5 and determination array [A_1, A_2, A_3, A_4, A_5, R_1, R_2, R_3, R_4, R_5]

3.1.33 discrimination level

the level of ability to judge the stability of the production process that does not meet the specified requirements

3.1.34 probability of acceptance

when a definite sampling plan is used, the probability that a batch or process with a given quality level will be judged as acceptance

3.1.35 average sample number

when a certain sampling plan is used to make a decision of acceptance or rejection, the average number of samples to be inspected per batch expected

3.1.36 sampling characteristic curve (OC curve)

b) Select test items and form test groups;

c) Specify test methods and quality characteristics;

d) Specify rejection classification;

e) Specify rejection quality level;

f) Specify discrimination level;

g) Select sampling plan type;

h) Search sampling plan;

i) Extract sample;

j) Inspect sample;

k) Determine whether periodic inspection is accepted or rejected;

l) Disposal after periodic inspection.

5 Implementation of inspection

5.1 Provisions on inspection cycle

In the product technical standard or order contract, the inspection period shall be appropriately specified according to the approximate duration of the product production process, the test time and the test cost. Usually the inspection period is one month, two months, three months, half a year, or even one or two years.

In the same product technical standard or order contract, different inspection cycles are allowed for different test groups.

In addition, it is allowed to specify the inspection cycle according to the quantity manufactured by product.

5.2 Selection of test items and composition of test groups

In the product technical standard or order contract, the test items shall be selected according to the actual needs of the product and the possibility of implementation. Combine these test items into as few test groups as possible.

5.3 Provisions on test methods and quality characteristics

In the product technical standard or order contract, the corresponding test method shall be specified for each test item. Specify the technical performance, technical indicators, appearance and other quality characteristics for each

5.7 Selection of sampling plan type

This Standard, in Table 2~Table 4, Table 5~Table 7 and Table 8~Table 10, respectively gives three types of sampling plans: primary, secondary and fifth sampling plans. For a given set of rejection quality levels and discrimination levels, different types of corresponding sampling plans can be used. Usually, by comparing the management cost, average test time and average sample number of various types of corresponding sampling plans, it is decided to use either the primary, secondary or fifth sampling plan. The average sample number of the fifth sampling plan is smaller than the average sample number of the corresponding secondary sampling plan (except those corresponding to the determination array [1,2]). The average sample number of the secondary sampling plan is smaller than the average sample number of the corresponding primary sampling plan (see Figure 13~Figure 29). The average test time of the fifth sampling plan is greater than the average test time of the corresponding secondary sampling plan. The average test time of the secondary sampling plan is greater than the average test time of the corresponding primary sampling plan. In addition, the management cost of the fifth sampling plan is higher than the corresponding secondary sampling plan. The secondary sampling plan is higher than the corresponding primary sampling plan.

However, as long as the specified rejection quality level and the discrimination level are the same, no matter what corresponding sampling plan to the type of this Standard is used for inspection, its discrimination of whether the stability of the production process meets the specified requirements is basically the same.

5.8 Search of sampling plan

According to the rejection quality level and discrimination level, search the sampling plan in Table 2~Table 10.

5.8.1 Search for primary sampling plan

Respectively use Table 2, Table 3 and Table 4 to search the primary sampling plan of discrimination levels I, II and III.

Search method: In the designated sampling plan table, according to the affordable test cost and the existing capacity of the test equipment, select an appropriate sampling plan from a series of primary sampling plans determined from top to bottom by the specified rejection quality level.

Example 1: Adopt GB/T 2829 in the routine test of an electronic component. Specify RQL=30, DL=II. Find a primary sampling plan for a certain test group for routine test.

a) Because DL=II is specified, use Table 4 to search.

b) In Table 4, a series of primary sampling plans are determined by RQL=30 from top to

(3) n_1=10, A_1=0, R_1=3,

n_2=10, A_2=3, R_2=4;

(4) n_1=12, A_1=1, R_1=3,

n_2=12, A_2=4, R_2=5;

(5) n_1=16, A_1=1, R_1=5,

n_2=16, A_2=5, R_2=6;

(6) n_1=20, A_1=3, R_1=6,

n_2=20, A_2=7, R_2=8.

c) If the primary sampling plan has been selected according to the above conditions: n=12, A_c=1, R_e=2, then, according to the correspondence between primary and secondary sampling plans, from Table 1, it can be immediately determined that the secondary sampling plan for a certain test group for routine test is: n_1=n_2=8, A_1=0, R_1=2, A_2=1, R_2=2.

5.8.3 Search for fifth sampling plan

Use Table 8, Table 9 and Table 10 respectively for fifth sampling plans of search discrimination levels I, II and III.

Search method: It can copy the method for primary sampling plan to research. It can also, according to the one-to-one correspondence (a series of primary and fifth sampling plans determined by the same RQL from top to bottom are one-to-one correspondence) between the primary and fifth sampling plans in Table 2 and Table 8, Table 3 and Table 9, Table 4 and Table 10, search the fifth sampling plan from the selected primary sampling plan.

It is also possible to determine the fifth sampling plan corresponding to the primary sampling plan according to the correspondence provided in Table 1.

Example 3: Under the same conditions as in Example 1, find the fifth sampling plan for a certain test group in a routine test.

a) Because DL=III is specified, use Table 10 to search.

b) In Table 10, a series of fifth sampling plans are determined by RQL=30 from top to bottom:

(1) n=6, Ac=0, Rc=1; [3)]

[3)] There is no corresponding fifth plan.

method to extract samples shall ensure that the samples obtained can represent the actual technical level of this cycle. When it is convenient, it is best to take samples from different times of the cycle to form a sample for periodic inspection. If it is necessary to collect samples at a fixed time, it is best to do it after the unit product quantity to be manufactured in this cycle exceeds half.

When using secondary and fifth sampling plans, each sample must be taken for a sufficient quantity at the same time.

5.10 Sample inspection

Before conducting periodic inspection, all sample units shall be inspected for the items same for lot-by-lot inspection. If the sample unit is found to be rejected, it shall be replaced by the unit product normally manufactured in this cycle. Contain this information in the periodic inspection report, but it is not used as a basis for determining whether the periodic inspection is accepted.

When conducting periodic inspection, it shall be conducted in groups according to the test items, test methods and sequence specified in the product technical standard or order contract. After the test, each tested sample unit shall be inspected one by one according to the technical requirements. Finally, the total number of rejected products (or rejection) is accumulated by the test group (when the rejected products are divided into different categories, they shall be accumulated separately).

5.11 Determination for acceptance or rejection of periodic inspection

5.11.1 Determination method for acceptance or rejection of periodic inspection

According to the rejection quality level and the sampling plan determined by discrimination level, use the methods provided in 5.11.2 and 5.11.3 to determine. Only when all the determined sampling plans are determined to be accepted, can the product periodic inspection represented by this periodic inspection be finally determined as accepted. Otherwise, the product periodic inspection represented by this periodic inspection shall be determined as rejected.

5.11.2 Situation that uses percentage of rejected products to express batch quality

a) Primary sampling plan

According to the results of sample inspection, the determination is made according to the following rules.

If the number of rejected products found in the sample is less than or equal to the number of acceptance, then the batch is determined to be accepted.

second determined acceptance and is also less than the number of the second determined rejection, then extract the third sample for inspection.

If the sum of rejected products found in the first to third samples is less than or equal to the number the third determined acceptance, then this batch is determined as accepted. If the sum of rejected products found in the first to third samples is greater than or equal to the number of the third determined rejection, then this batch is determined as rejected. If the sum of rejected products found in the first to third samples is greater than the number of the third determined acceptance and also less than the number of the third determined rejection, then extract the fourth sample for inspection.

If the sum of rejected products found in the first to fourth samples is less than or equal to the number of the fourth determined acceptance, then this batch is determined as accepted. If the sum of rejected products found in the first to fourth samples is greater than or equal to the number of the fourth determined rejection, this batch is determined as rejected. If the sum of rejected products found in the first to fourth samples is greater than the number of the fourth determined acceptance and also less than the number of the fourth determined rejection, then extract the fifth sample for inspection.

If the sum of rejected products found in the first to fifth samples is less than or equal to the number of the fifth determined acceptance, this batch is determined as accepted. If the sum of rejected products found in the first to fifth samples is greater than or equal to the number of the fifth determined rejected, this batch is determined as rejected.

5.11.3 Situation that uses number of rejected products per hundred units to express batch quality

Except using “rejection” to replace “rejected products”, the rest are same with 5.11.2 for determination procedures.

5.12 Disposal after periodic inspection

5.12.1 Relationship between periodic inspection and lot-by-lot inspection

If there are periodic inspection and lot-by-lot inspection in the technical standards or order contracts, then lot-by-lot inspection can only be carried out on the basis of periodic inspection. For products with a relatively stable production process, it may perform lot-by-lot inspection with reference to the periodic inspection results of the previous cycle before the end of the periodic inspection of this cycle. But in the end, the periodic inspection results of this cycle must be used as the basis for the lot-by-lot inspection. This must be

undergone periodic inspection and the unit products that have not undergone periodic inspection. In the case of periodic inspection, even if the sample unit that has passed the periodic inspection as accepted according to the technical requirements cannot be delivered to the user as accepted product that meets the technical standards of the product or the order contract. Under special circumstances, it is allowed to repair the unit product that has passed periodic inspection. After getting the approval of the user, it can be delivered to the user. But it must be noted that the product has undergone the periodic inspection.

5.12.5 Special circumstances for periodic inspection

When the production has been stopped for more than one cycle and it is resumed, or when the product design, structure, process, and materials have changed significantly, it must perform periodic inspection. Only after the periodic inspection is passed, can normal batch production and lot-by-lot inspection be carried out.

6 Sampling characteristic curve and average sample number curve

6.1 Sampling characteristic curve (OC curve)

Figure 1~Figure 12 in this Standard that take the determination array [A_c, R_e] of the primary sampling plan as the order, based on Poisson distribution on the same graph, give sampling characteristic curves of primary sampling plan of design values corresponding to the three discrimination levels. At the same time, the sampling characteristic curves of the design value secondary and fifth sampling plans are basically the same as the corresponding design values of the sampling plan.

The abscissas of the sampling characteristic curves given in this Standard are all based on the ratio of batch quality p to RQL. If the abscissa value is multiplied by RQL, then p can be the sampling characteristic curve of a certain sampling plan on the abscissa.

The sampling characteristic curves of primary sampling plans in Table 2~Table 4 of this Standard obtained by the above method are almost consistent with the sampling characteristic curves based on Poisson distribution of primary sampling plans in Table 2~Table 4. At the same time, the sampling characteristic curves based on Poisson distribution for the secondary and fifth sampling plans are basically consistent with the sampling characteristic curves based on Poisson distribution of corresponding primary sampling plan.

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