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Sampling procedures for inspection by variables —

Part 3: Double sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection

Règles d'échantillonnage pour les contrôles par mesures —

Partie 3: Plans d'échantillonnage doubles pour le contrôle lot par lot, indexés d'après le niveau de qualité acceptable (NQA)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 3951-3 was prepared by Technical Committee ISO/TC 69, *Applications of statistical methods*, Subcommittee SC 5, *Acceptance sampling*.

ISO 3951 consists of the following parts, under the general title *Sampling procedures for inspection by variables*:

— *Part 1: Specification for single sampling plans indexed by acceptance quality limit (AQL) for lot-by-lot inspection for a single quality characteristic and a single AQL*

— *Part 2: General specification for single sampling plans indexed by acceptance quality limit (AQL) for lot-by-lot inspection of independent quality characteristics*

— *Part 3: Double sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

— *Part 5: Sequential sampling plans indexed by acceptance quality limit (AQL) for inspection by variables (known standard deviation)*

The following part is under preparation:

— *Part 4: Procedures for assessment of declared quality levels*

Introduction

Inspection by variables for percentage nonconforming items, as described in this part of ISO 3951, includes several possible modes, the combination of which leads to a presentation which may appear quite complicated to the user:

a) procedures for unknown process standard deviation (the "s" method), or procedures for where the process standard deviation is originally unknown then estimated with fair precision, or known since the start of inspection (the "σ" method);

b) a single specification limit, or double specification limits with separate, combined or complex control;

c) normal inspection, tightened inspection or reduced inspection;

d) Form k plans and Form p* plans;

e) a single quality characteristic (the univariate case) or a number of unrelated quality characteristics (the multivariate independent case).

The text has been arranged so that the simpler procedures may be implemented without necessarily understanding the more complicated procedures. The main text of this part of ISO 3951 is confined to the univariate case. The multivariate independent cases are treated separately in Annex A for the "s" method, in Annex B for the "σ" method and in Annex C for combined "s" method and "σ" method procedures. Annex D facilitates the use of the main text of the standard by directing the user to the clauses and tables concerning any univariate situation with which he might be confronted; it only deals with Clauses 16, 17, 21, 22 and 23 and, in every case, it is necessary to have read Clauses 1 to 15 and Clauses 18 to 20 first.

This part of ISO 3951 is complementary to the double sampling plans and procedures of ISO 2859-1. When specified by the responsible authority, it would be valid to reference both ISO 3951-3 and ISO 2859-1 in a product specification, a contract, inspection instructions, or other documents, and the provisions set forth therein shall govern. The "responsible authority" can then be designated in one of these documents.

In all parts of ISO 3951:

— the acronym AQL stands for "acceptance quality limit" rather than "acceptable quality level", in order to more accurately reflect its function;

— procedures are given for the case where the process standard is unknown (the "s" method) and for the case where it may be presumed to be known (the "σ" method);

— the sampling plans have been chosen so that their operating characteristic curves closely match those of the corresponding single sampling plans in ISO 2859-1;

— minimal statistical theory has been given (it being planned ultimately to provide this in a guidance document to sampling procedures for inspection by variables);

— text, charts and tables that are only informative have been consigned to annexes wherever practicable.

In none of the parts have methods been given based on the sample range, now that the availability of computers and calculators with a standard deviation function key is so widespread. Data for acceptance sampling by variables is often substantially more expensive to acquire than data for sampling by attributes, and the "s" method makes more efficient use of these data.

The coverage of ISO 3951-1 is constrained to the case of a single, normally distributed, quality characteristic with a single class of nonconformity, and includes the case of combined control of double specification limits.

ISO 3951-2 provides a more comprehensive treatment of single sampling plans by variables, including procedures for separate and complex control of double specification limits. Procedures are also given for multiple independent quality characteristics and/or multiple AQLs.

ISO 3951-3 provides plans for double sampling by variables, which on average provide substantial savings of inspection effort in comparison with plans for single sampling by variables. The savings are achieved by first selecting from the lot and inspecting a random sample that is typically nearly 40 % smaller than that of the corresponding single sampling plan. If these inspection results satisfy an acceptance criterion, an immediate decision is made to accept the lot without further inspection. Alternatively, if the inspection results satisfy a non-acceptance criterion, an immediate decision not to accept the lot is made without further inspection. Thus, when quality is very good or very poor, the saving in inspection effort can amount to nearly 40 %. Only when the inspection results from the first sample are equivocal is a second random sample, of the same size as the first, selected; the acceptability of the lot is then resolved by combining the results of the first and second samples and determining whether they satisfy a second acceptance criterion.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.