
**Statistical methods in process
management — Capability and
performance —**

**Part 3:
Machine performance studies for
measured data on discrete parts**

*Méthodes statistiques dans la gestion de processus — Aptitude et
performance —*

*Partie 3: Études de performance de machines pour des données
mesurées sur des parties discrètes*



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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 22514-3 was prepared by Technical Committee ISO/TC 69, *Applications of statistical methods*, Subcommittee SC 4, *Applications of statistical methods in process management*.

ISO 22514 consists of the following parts, under the general title *Statistical methods in process management — Capability and performance*:

- *Part 1: General principles and concepts*
- *Part 3: Machine performance studies for measured data on discrete parts*
- *Part 4: Process capability estimates and performance measures* [Technical Report]

In the future, it is planned to revise ISO 21747:2006 (*Statistical methods — Process performance and capability statistics for measured quality characteristics*) as Part 2.

NOTE ISO 22514-3 was initially prepared as ISO/DIS 13700. It was renumbered before publication to include it in the ISO 22514 series.

Introduction

This part of ISO 22514 has been prepared to provide guidance in circumstances where a study is necessary to determine if the output from a machine, for example, is acceptable according to some criteria. Such circumstances are common in engineering when the purpose for the study is part of an acceptance trial. These studies may also be used when diagnosis is required concerning a machine's current level of performance or as part of a problem solving effort. The method is very versatile and has been applied to many situations.

Machine performance studies of this type provide information about the behaviour of a machine under very restricted conditions such as limiting, as far as possible, external sources of variation that are commonplace within a process, e.g. multi-factor and multi-level situations. The data gathered in a study might come from items made consecutively, although this may be altered according to the study requirements. The data are assumed to have been, generally, gathered manually.

The study procedure and reporting will be of interest to engineers, supervisors and management wishing to establish whether a machine should be purchased or put in for maintenance, to assist in problem solving or to understand the level of variation due to the machine itself.

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Statistical methods in process management — Capability and performance —

Part 3: Machine performance studies for measured data on discrete parts

1 Scope

This part of ISO 22514 prescribes the steps to be taken in conducting short-term performance studies that are typically performed on machines where parts produced consecutively under repeatability conditions are considered. The number of observations to be analysed will vary according to the patterns the data produce, or if the runs (the rate at which items are produced) on the machine are low in quantity. The methods are not recommended where the sample size produced is less than 30 observations. Methods to be used for handling the data and carrying out the calculations are described. In addition, machine performance indices and the actions required at the conclusion of a machine performance study are described.

The document is not applicable when tool wear patterns are expected to be present during the duration of the study, nor if autocorrelation between observations is present. The situation where a machine has captured the data, sometimes thousands of data points collected in a minute, is not considered suitable for the application of this part of ISO 22514.

2 Symbols and abbreviations

P_m	machine performance index
P_{mk}	minimum machine performance index
P_{mkL}	lower machine performance index
P_{mkU}	upper machine performance index
f	frequency
Σf	cumulative frequency
i	subscript used to identify values of a variable
L	lower specification limit
N	total sample size
$X_{\alpha\%}$	$\alpha\%$ distribution fractile
X_i	i th value in a sample