JIS

JAPANESE
INDUSTRIAL
STANDARD

JIS Z 9041-4 : 1999

(ISO 3494 : 1976)

Statistical interpretation of data — Part 4: Power of tests relating to means and variances

Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law:

To conform with the International Standard, **ISO 3494:1976** has been especially employed.

JIS Z 9041:1999 consists of the following 4 parts under the title "Statistical interpretation of data".

Part 1: Statistical presentation of data

Part 2: Techniques of estimation and test relating to means and variances

Part 3: Tests and confidence intervals relating to proportions

Part 4: Power of tests relating to means and variances

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Divisional Council on Basic Items

In the event of any doubts arising as to the contents, the original JIS is to be the final authority.

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Means			
Clause	Comparison tests	Variance(s)	Reference to table of **JIS Z 9041-2**
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2	Comparison of a mean with a given value	unknown	A'
3	Comparison of two means	known	C
4	Comparison of two means	unknown	C'

Variances		
Clause	Comparison tests	Reference to table of **JIS Z 9041-2**
5	Comparison of a variance with a given value	E
6	Comparison of two variances	G

Statistical interpretation of data —
Part 4: Power of tests relating to
means and variances

Introduction This Japanese Industrial Standard has been prepared based on **ISO 3494** *Statistical interpretation of data — Power of tests relating to means and variances* issued in 1976 as the first edition without changing the technical contents.

The portion underlined with dots in this Standard is not stated in the original International Standard.

Section One: Comparison tests

General remarks

1) This Standard follows on from "**JIS Z 9041-2** *Statistical interpretation of data — Techniques of estimation and tests relating to means and variances*".

   The conditions of application of this Standard are as stated in the "General remarks" in **JIS Z 9041-2**. It will be recalled that the tests used are valid if the distribution of the observed variable is assumed to be normal in each population (see comments on paragraph 3 of the "General remarks" in **JIS Z 9041-2**). **JIS Z 9041-2** is concerned only with the type I risk (or significance level). This International Standard puts forward notions of the type II risk and of power of the test.

2) **JIS Z 9041-2** will also be recalled that the type I risk is the probability of rejecting the null hypothesis (tested hypothesis) if this hypothesis is true (case of two-sided tests), or the maximum value of this probability (case of one-sided tests). The non-rejection of the null hypothesis produces, in practice, acceptance of the hypothesis, yet non-rejection does not mean that the hypothesis is true.

   Accordingly, the type II risk, designated by β, is the probability of not rejecting the null hypothesis when it is false. The complement of the probability of committing the error of the second kind $(1 - \beta)$ is the "power" of the test (see "Historical note" following these general remarks).

3) Whereas the value of the type I risk is chosen by the consumers according to the consequences that could arise from that risk (either of the values $\alpha = 0.05$ or $\alpha = 0.01$ is commonly employed), the type II risk is dependent on the true hypothesis (the null hypothesis H_0 being false) i.e. the alternative hypothesis to the null hypothesis. In the comparison of a population mean with a given value µ0, for example, a specific alternative corresponds to a value of the population mean of $\mu \neq \mu_0$ being a deviation $\mu - \mu_0 \neq 0$. As a general rule, in tests of comparison of means and variances, the alternatives are defined by the values that might be assumed by a parameter.

4) The operating characteristic curve of a test is the curve which shows the value β of the type II risk as a function of the parameter defining the alternative. β is also dependent on the value chosen for the type I risk, on size(s) of sample(s) and on the nature of the test (two-sided or one-sided). In the tests of comparison of means, β also depends on the standard deviation of the population(s). Where this is unknown, the risk β cannot be known exactly.