

ISO 5725-3:2023-06 (E)

Accuracy (trueness and precision) of measurement methods and results - Part 3: Intermediate precision and alternative designs for collaborative studies

Contents		Page
Foreword		v
Introduction		vi
1	Scope	1
2	Normative references	2
3	Terms and definitions	2
4	Symbols	3
5	General requirements	4
6	Intermediate measures of the precision of a standard measurement method	5
6.1	Factors and factor levels	5
6.1.1	Definitions and examples	5
6.1.2	Selection of factors of interest	6
6.1.3	Random and fixed effects	6
6.1.4	Statistical model	7
6.2	Within-laboratory study and analysis of intermediate precision measures	9
6.2.1	Simplest approach	9
6.2.2	Alternative method	10
6.2.3	Effect of the measurement conditions on the final quoted result	10
7	Nested design	11
7.1	Balanced fully-nested design	11
7.2	Staggered-nested design	12
7.3	Balanced partially-nested design	13
7.4	Orthogonal array design	14
8	Design for heterogeneous material	16
8.1	Applications of the design for a heterogeneous material	16
8.2	Layout of the design for a heterogeneous material	17
8.3	Statistical analysis	17
9	Split-level design	17
9.1	Applications of the split-level design	17
9.2	Layout of the split-level design	19
9.3	Statistical analysis	19
10	Design across levels	19
10.1	Applications of the design across levels	19
10.2	Layout of the design across levels	20
10.3	Statistical analysis	20
11	Reliability of interlaboratory parameters	20
11.1	Reliability of precision estimates	20
11.2	Reliability of estimates of the overall mean	21
11.2.1	General	21
11.2.2	Balanced fully-nested design (2 factors)	21
11.2.3	Staggered nested design (2 factors)	21
11.2.4	Balanced partially-nested design	21
11.2.5	Orthogonal array design	21
11.2.6	Split-level design	22

Annex A (informative) Fully- and partially-nested designs	23
Annex B (informative) Analysis of variance for balanced fully-nested design.....	25
Annex C (informative) Analysis of variance for staggered design	30
Annex D (informative) Analysis of variance for the balanced partially-nested design (three factors).....	38
Annex E (informative) Statistical model for an experiment with heterogeneous material.....	41
Annex F (informative) Analysis of variance for split-level design.....	42
Annex G (informative) Example for split-level design	44
Annex H (informative) Design across levels.....	47
Annex I (informative) Restricted maximum likelihood (REML)	48
Annex J (informative) Examples of the statistical analysis of intermediate precision experiment.....	49
Annex K (informative) Example for an analysis across levels	55
Bibliography.....	57