

ISO 16336:2014-07 (E)

Applications of statistical and related methods to new technology and product development process - Robust parameter design (RPD)

Contents	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions and symbols	1
3.1 Term and definitions	1
3.2 Symbols	3
4 Robust parameter design -- Overview	4
4.1 Requirements	4
4.2 Assessing the robustness of a system	4
4.3 Robustness assessment through SN ratio	6
4.4 An efficient method for assessing technical ideas -- Parameter design	7
4.5 Two-step optimization (Strategy of parameter design)	8
4.6 Determination of the optimum design	10
5 Assessment of robustness by SN ratio	10
5.1 Concepts of SN ratio	10
5.2 Types of SN ratio	11
5.3 Procedure of the quantification of robustness	11
5.4 Formulation of SN ratio: Calculation using decomposition of total sum of squares	13
5.5 Some topics of SN ratio	19
6 Procedure of a parameter design experiment	20
6.1 General	20
6.2 (Step 1) Clarify the system's ideal function	20
6.3 (Step 2) Select a signal factor and its range	21
6.4 (Step 3) Select measurement method of output response	21
6.5 (Step 4) Develop noise strategy and select noise factors and their levels	21
6.6 (Step 5) Select control factors and their levels from design parameters	22
6.7 (Step 6) Assign experimental factors to inner or outer array	22
6.8 (Step 7) Conduct experiment and collect data	23
6.9 (Step 8) Calculate SN ratio, , and sensitivity, S	23
6.10 (Step 9) Generate factorial effect diagrams on SN ratio and sensitivity	26
6.11 (Step 10) Select the optimum condition	28
6.12 (Step 11) Estimate the improvement in robustness by the gain	28
6.13 (Step 12) Conduct a confirmation experiment and check the gain and "reproducibility".	29
7 Case study -- Parameter design of a lamp cooling system	30
Annex A (informative) Comparison of a system's robustness using SN ratio	40
Annex B (informative) CasestudiesandSNratioinvarioustechnicalfields	47
Bibliography	72