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INTERNATIONAL STANDARD

NORME INTERNATIONALE

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Rules for steam turbine thermal acceptance tests – Part 0: Wide range of accuracy for various types and sizes of turbines

Règles pour les essais thermiques de réception des turbines à vapeur – Partie 0: Plage de précision étendue pour différents types et dimensions de turbines

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CONTENTS

FOREWORD 7
INTRODUCTION 9
1 Scope 11
1.1 General 11
1.2 Object 11
1.3 Matters to be considered in the contract 12
2 Normative references 12
3 Units, symbols, terms and definitions 12
3.1 General 12
3.2 Symbols, units 13
3.3 Subscripts, superscripts and definitions 14
3.4 Definition of guarantee values and test results 16
3.4.1 Guidance on guarantee parameters 16
3.4.2 Thermal efficiency 16
3.4.3 Heat rate 18
3.4.4 Thermodynamic efficiency 18
3.4.5 Steam rate 19
3.4.6 Main steam flow capacity 19
3.4.7 Power output 19
3.4.8 Guarantee values for extraction and mixed-pressure turbines 20
3.4.9 Thermal Load Capacity (for Nuclear applications) 20
4 Guiding principles 20
4.1 Advance planning for test 20
4.2 Preparatory agreements and arrangements for tests 21
4.3 Planning of the test 22
4.3.1 Time for acceptance tests 22
4.3.2 Direction of acceptance tests 22
4.4 Preparation of the tests 22
4.4.1 Condition of the plant 22
4.4.2 Condition of the steam turbine 23
4.4.3 Condition of the condenser 23
4.4.4 Isolation of the cycle 24
4.4.5 Checks for leakage of condenser and feed water heaters 26
4.4.6 Cleanliness of the steam strainers 26
4.4.7 Checking of the test measuring equipment 26
4.5 Comparison measurements 26
4.6 Settings for tests 27
4.6.1 Load settings 27
4.6.2 Special settings 28
4.7 Preliminary tests 28
4.8 Acceptance tests 28
4.8.1 Constancy of test conditions 28
4.8.2 Maximum deviation and fluctuation in test conditions 28
4.8.3 Duration of test runs and frequency of reading 29
4.8.4 Reading of integrating measuring instruments 30
4.8.5 Alternative methods 30
4.8.6 Recording of tests 30

4.8.7 Additional measurement 30
4.8.8 Preliminary calculations 30
4.8.9 Consistency and number of tests 30
4.9 Repetition of acceptance tests 31
5 Measuring techniques and measuring instruments 31
5.1 Overview 31
5.1.1 Instrument accuracy requirements 31
5.1.2 Measuring instruments 31
5.1.3 Measuring uncertainty 31
5.1.4 Calibration of instruments 32
5.1.5 Alternative instrumentation 32
5.2 Measurement of power 36
5.2.1 Determination of mechanical turbine output 36
5.2.2 Measurement of boiler feed pump power 36
5.2.3 Determination of electrical power of a turbine generator 37
5.2.4 Measurement of electrical power 38
5.2.5 Electrical instrument connections 38
5.2.6 Electrical instruments 38
5.2.7 Instrument transformers 39
5.3 Flow measurement 39
5.3.1 Determination of flows to be measured 39
5.3.2 Measurement of primary flow 39
5.3.3 Installation and location of flow measuring devices 42
5.3.4 Calibration of primary flow devices for water flow 43
5.3.5 Inspection of flow measuring devices 44
5.3.6 Differential pressure measurements 45
5.3.7 Water flow fluctuation 45
5.3.8 Secondary flow measurements 45
5.3.9 Occasional secondary flows 48
5.3.10 Density of water and steam 49
5.3.11 Determination of cooling water flow of condenser 49
5.4 Pressure measurement (excluding condensing turbine exhaust pressure) 50
5.4.1 Pressures to be measured 50
5.4.2 Instruments 50
5.4.3 Main pressure measurements 50
5.4.4 Pressure tapping holes and connecting lines 51
5.4.5 Shut-off valves 52
5.4.6 Calibration of pressure measuring devices 52
5.4.7 Atmospheric pressure 52
5.4.8 Correction of readings 52
5.5 Condensing turbine exhaust pressure measurement 53
5.5.1 General 53
5.5.2 Plane of measurement 53
5.5.3 Pressure taps 53
5.5.4 Manifolds 54
5.5.5 Connecting lines 54
5.5.6 Instruments 54
5.5.7 Calibration 54
5.6 Temperature measurement 54

5.6.1 Points of temperature measurement 54
5.6.2 Instruments 55
5.6.3 Main temperature measurements 55
5.6.4 Feed train temperature measurements (including bled steam) 55
5.6.5 Condenser cooling water temperature measurement 56
5.6.6 Thermometer wells 56
5.6.7 Precautions to be observed in the measurement of temperature 57
5.7 Steam quality determination 57
5.7.1 General 57
5.7.2 Tracer technique 57
5.7.3 Condensing method 58
5.7.4 Constant rate injection method 61
5.7.5 Extraction enthalpy determined by constant rate injection method 62
5.7.6 Tracers and their use 64
5.8 Time measurement 65
5.9 Speed measurement 65
6 Evaluation of tests 65
6.1 Preparation of evaluation 65
6.2 Computation of results 66
6.2.1 Calculation of average values of instrument readings 66
6.2.2 Correction and conversion of averaged readings 66
6.2.3 Checking of measured data 66
6.2.4 Thermodynamic properties of steam and water 67
6.2.5 Calculation of test results 68
7 Correction of test results and comparison with guarantee 68
7.1 Guarantee values and guarantee conditions 68
7.2 Correction of initial steam flow capacity 68
7.3 Correction of output 69
7.3.1 Correction of maximum output 69
7.3.2 Correction of Output with specified initial steam flow 69
7.4 Correction of the thermal performance 69
7.5 Definition and application of correction values 70
7.6 Correction methods 70
7.6.1 General 70
7.6.2 Correction by heat balance calculation 71
7.6.3 Correction by use of correction curves prepared by the manufacturer 72
7.6.4 Tests to determine correction values 72
7.7 Variables to be considered in the correction of specific turbine cycles 72
7.7.1 Scope of corrections 72
7.7.2 Turbines with regenerative feed-water heating 72
7.7.3 Turbines which have no provision for the addition or extraction of steam after partial expansion 74
7.7.4 Turbines with steam extraction for purposes other than feed-water heating (extraction turbines) 74
7.7.5 Other types of turbine 74
7.8 Guarantee comparison 75
7.8.1 Tolerance and weighting 75
7.8.2 Guarantee comparison with locus curve 75
7.8.3 Guarantee comparison with guarantee point 76

7.8.4 Guarantee comparison for turbines with throttle governing 76
7.8.5 Guarantee comparison for extraction turbines 76
7.9 Deterioration of turbine performance (ageing) 77
7.9.1 Timing to minimise deterioration 77
7.9.2 Correction with comparison tests 77
7.9.3 Correction without comparison tests 77
8 Measuring uncertainty 78
8.1 General 78
8.2 Determination of measuring uncertainty of steam and water properties 79
8.2.1 Pressure 79
8.2.2 Temperature 79
8.2.3 Enthalpy and enthalpy difference 79
8.3 Calculation of measuring uncertainty of output 80
8.3.1 Electrical measurement 80
8.3.2 Mechanical measurement 82
8.3.3 Additional uncertainty allowance because of unsteady load conditions 82
8.4 Determination of measuring uncertainty of mass flow 82
8.4.1 Measuring uncertainty of mass flow measurements 82
8.4.2 Measuring uncertainty of multiple measurements of primary flow 82
8.4.3 Uncertainty allowance for cycle imperfections 83
8.5 Calculation of measuring uncertainty of results 83
8.5.1 General 83
8.5.2 Measuring uncertainty of thermal efficiency 83
8.5.3 Measuring uncertainty of thermodynamic efficiency 84
8.5.4 Uncertainty of corrections 84
8.5.5 Guiding values for the measuring uncertainty of results 85
8.6 Example uncertainty calculation 85
Annex A (normative) Feedwater heater leakage and condenser leakage tests 87
A.1 Feedwater heater leakage tests 87
A.2 Condenser leakage tests 87
Annex B (normative) Evaluation of multiple measurements, compatibility 88
Annex C (normative) Mass flow balances 89
C.1 General 89
C.2 Flows for further evaluations (informative) 90
Annex D (informative) Short-statistical definition of measuring uncertainty and error propagation in acceptance tests 92
Annex E (informative) Temperature variation method 96
E.1 Description of the problem 96
E.2 Possibility to determine the leakage flow 96
E.3 Applied example 98
Bibliography 102

Figure 1 – Diagrams for interpretation of symbols and subscripts 17
Figure 2 – Diagram showing location and type of test instrumentation (fossil fuel plant) 33
Figure 3 – Diagram showing location and type of test instrumentation (nuclear plant) 34
Figure 4 – USM with flow conditioner or flow straightener. 41
Figure 5 – Throttle steam quality calculations for boiling water reactor 60

Figure 6 – Throttle steam quality calculations for pressurized water reactor 61
Figure 7 – Typical installation of injection and sampling points 63
Figure 8 – Oxygen content of sample stream 64
Figure 9 – Guarantee comparison on locus curve 76
Figure 10 – Correction factor for steam table tolerance 80
Figure C.1 – Diagram of cycle for plant with steam turbine with single reheating and five stages of regenerative feedwater heating extraction 90
Figure E.1 – IP turbine bowl expansion line depending on different labyrinth flow rates 97
Figure E.2 – Schematic diagram of a combined HP/IP1/IP2 turbine 98
Figure E.3 – Result of temperature variation tests. IP2 turbine bowl efficiency as a function of the labyrinth flow rate (sealing 2) for varying live and reheat temperatures 101

Table 1 – Maximum deviations and fluctuations in operating conditions 29
Table 2 – Acceptable instrumentation and uncertainties for acceptance tests 35
Table 3 – Apportionment of unaccounted leakages 67
Table 4 – Average deterioration by ageing 77
Table 5 – Deterioration of thermal efficiency and power output 77
Table 6 – Guiding values for the uncertainty of test results 85
Table 7 – Example uncertainty calculation for reheat cycle with uncalibrated primary flows measurements 86
Table E.1 – Measured thermodynamic parameters and calculated IP2 turbine bowl isentropic efficiencies 100

INTERNATIONAL ELECTROTECHNICAL COMMISSION

RULES FOR STEAM TURBINE THERMAL ACCEPTANCE TESTS –

Part 0: Wide range of accuracy for various types and sizes of turbines

FOREWORD

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IEC 60953-0 has been prepared by subcommittee WG 11/MT 14: Thermal Acceptance Test, of IEC technical committee 5: Steam Turbines. It is an International Standard.

This first edition cancels and replaces IEC 60953-2, published in 1990. This edition constitutes a technical revision.This edition includes the following significant technical changes with respect to the previous edition:

a) IEC 60953-2:1990 has been used as the basis to develop IEC 60953-0;
b) Outdated measuring techniques have been updated and the corresponding reduction of the expected test result measuring uncertainty indicated;
c) Guarantee of power output at specified steam flow has been included;
d) A proposal for assignment of unaccounted for leakages has been included;
e) Correction methods and guarantee comparisons are updated;
f) Various appendices deleted:
   – Appendix B (flow nozzle)
   – Appendix E (generalized correction curves)
   – Appendix G (power measurement uncertainty)

g) Annex added:

– Annex E (Temperature variation method) taken over from IEC 60953-3:2002,Annex L

The text of thisInternational Standard is based on the following documents:

Draft	Report on voting
5/248/FDIS	5/250/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

A list of all parts in the IEC 60953 series, published under the general title *Rules for steam turbine thermal acceptance tests*, can be found on the IEC website.

The language used for the development of thisInternational Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement,available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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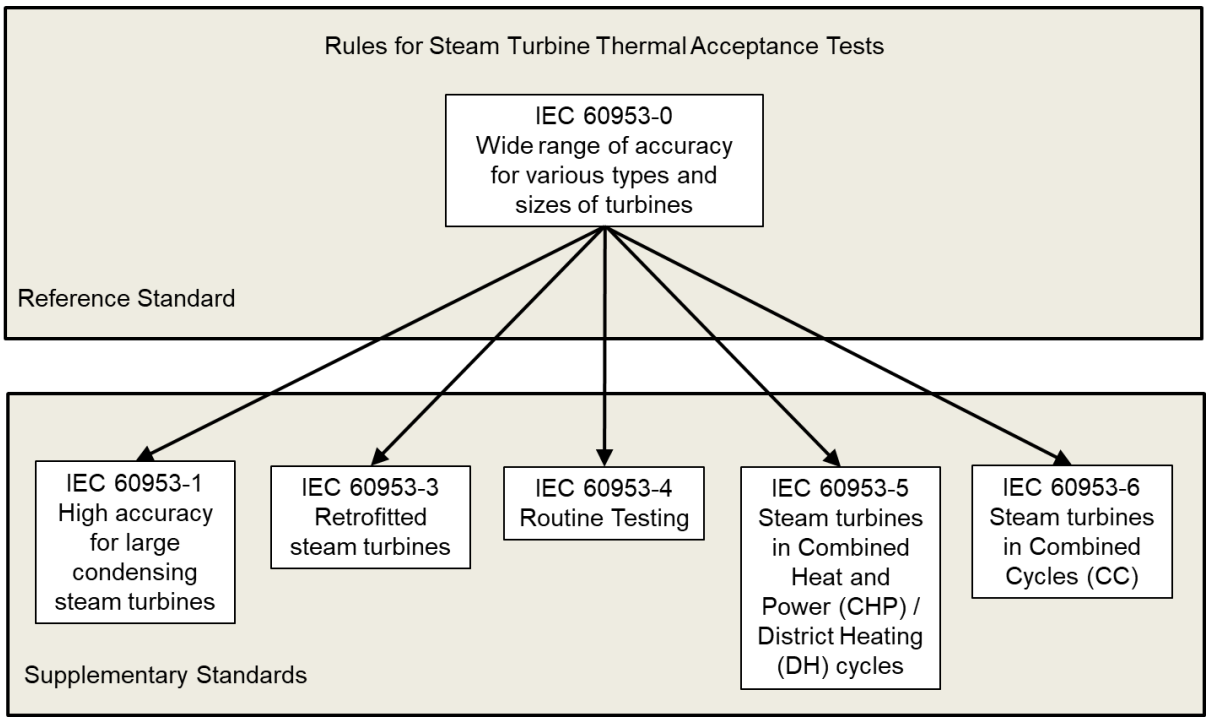
INTRODUCTION

The continuing development of measuring techniques, the increasing capacity of steam turbines and increasing variety of steam turbine configurations has necessitated a revision of IEC 60953:1990.

Since all the needs of the power industry could not be satisfied by one single performance test standard covering the requirements for all of the steam turbine configurations and accuracy, the revision to this standard is based upon one reference standard and various supplementary parts as indicated below:



1) Basic philosophy and figures on uncertainty

   IEC 60953-0 provides for acceptance tests of steam turbines of various types and capacities with corresponding measuring uncertainty, it is based upon the Method B of IEC 60953-2:1990. Additional and alternative guidance will be given for specific steam turbine applications in the supplementary standards where it is required.

   Instrumentation and measuring procedures are chosen accordingly from a scope specified in the standard series which is centred mainly on standardized instrumentation and procedures, but may extend up to high accuracy provisions requiring calibration of flow measuring devices. The resulting measuring uncertainty of the test result is then determined by calculating methods presented in the standard series and normally, if not stated otherwise in the contract, taken into account in the comparison between test result and guarantee value. The total cost of an acceptance test can therefore be maintained in relationship with the economic value of the guarantee values to be ascertained.

   When good-standardized instrumentation and procedures are applied in a test, the measuring uncertainty given in Table 6 can be achieved. The parties to the test should reach agreement on the measuring uncertainty desired for the acceptance tests.

2) Guiding principles

   The requirements concerning the preparation and conditions of the test and especially such conditions of the test as duration, deviations and constancy of test conditions are defined.

The test should be conducted preferably within eight weeks after first synchronisation. It is the intent during this period to minimize performance deterioration and risk of damage to the turbine.

Enthalpy drop tests should be made during this period to monitor HP and IP turbine section performance. However, these tests do not provide LP section performance and for this reason it is imperative to conduct the acceptance tests as soon as practicable.

Adjustment of the heat rate and power output test results for the effects of aging preferably by use of start-up enthalpy drop efficiency tests or by application of a standard allowance according to 7.9 is to be applied unless otherwise agreed in the contract.

3) Instruments and methods of measurement

   a) Measurement instruments (for electrical power, pressure, temperature)
   The measuring instruments used should be individually calibrated shortly before the test.

   b) Flow measurement devices
   For the measurement of main flows, uncalibrated or calibrated standardized flow measuring devices may be used.
   Typically uncalibrated standardized flow measuring devices are used, however calibration is recommended where a reduction of overall measuring uncertainty is desirable. Double or multiple measurement of primary flow is recommended for the reduction of measuring uncertainty and a method for checking the compatibility is described.

4) Evaluation of tests

   The preparatory work for the evaluation and calculation of the test results is covered.

   Detailed methods for calculation of measuring uncertainty values of measured variables and tests results are given.

5) Correction of test results and comparison with guarantees

   The correction of test results to guarantee conditions is covered. The measuring uncertainty of the result is taken into account in the guarantee comparison.

6) Proposals for application

   Since the acceptance test method to be applied has to be considered in the details of the plant design, it should be stated as early as possible, preferably in the turbine contract, which method will be used.

   This standard series can be applied to steam turbines of any type and any power. The desired measuring uncertainty should be decided upon sufficiently early, so that the necessary provisions can be included in the plant.

   If the guarantee includes the complete power plant or large parts thereof, the relevant parts of this standard series can be applied for an acceptance test in accordance with the definition of the guarantee value.