
Gas turbines — Procurement —

Part 9:

**Reliability, availability, maintainability and
safety**

Turbines à gaz — Spécifications pour l'acquisition —

Partie 9: Fiabilité, disponibilité, maintenabilité et sécurité



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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 3.

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 part of ISO 3977 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 3977-9 was prepared by Technical Committee ISO/TC 192, *Gas turbines*.

ISO 3977 consists of the following parts, under the general title *Gas turbines — Procurement*:

- *Part 1: General introduction and definitions*
- *Part 2: Standard reference conditions and ratings*
- *Part 3: Design requirements*
- *Part 4: Fuels and environment*
- *Part 5: Gas turbine applications*
- *Part 6: Combined cycles*
- *Part 7: Technical information*
- *Part 8: Inspection, testing, installation and commissioning*
- *Part 9: Reliability, availability, maintainability and safety*

Gas turbines — Procurement —

Part 9:

Reliability, availability, maintainability and safety

1 Scope

The purpose of this part of ISO 3977 is to provide a basis for exchange of information about reliability, availability, maintainability and safety between gas turbine manufacturers, users, consultants, regulatory bodies, insurance companies and others. It defines terms and definitions used within this part of ISO 3977 and also describes component life expectancy, repairs and criteria for determining overhaul intervals.

This part of ISO 3977 is applicable to all elements of the gas turbine, especially, but not limited to, the following:

- compressor
- turbine
- combustion system
- intercooler
- regenerator or recuperator
- air ducting system
- exhaust ducting system
- air intake system
- control system
- fuel system
- lubrication system
- cooling water system
- rotor bearings
- gears
- coupling
- starting equipment
- baseplate/foundation
- enclosures and ventilation system.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this part of ISO 3977. For dated references, subsequent amendments to, or revisions of, this publication do not apply. However, parties to agreements based on this part of ISO 3977 are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 2314:1989, *Gas turbines — Acceptance tests*.

3 Terms and definitions

For the purposes of this part of ISO 3977, the following terms and definitions apply.

3.1

actual unit starts

AUS

number of times the unit was actually synchronized or run from the shut-down situation up to the required speed

3.2

age

actual number of calendar years the unit has been in commercial service

3.3

ageing

loss of performance of a gas turbine due to wear and tear experienced in normal operation which is not recoverable by compressor cleaning, turbine cleaning, filter cleaning, etc.

NOTE It is normally the result of increased seal clearances due to vibration and wear, loss of profile and increased blade surface roughness due to corrosion, erosion, etc.

3.4

attempted unit starts

number of attempts to synchronize the unit or run up to the required speed after being shut down

NOTE Repeated failures to start for the same cause within the allowable specified starting time period, without attempting corrective action, are considered a single attempt.

3.5

available

state in which a unit is capable of providing service, whether or not it is actually in service, regardless of the capacity level that can be provided

3.6

available hours

AH

time, in hours, during which the unit is available for service

3.7

availability factor

AF

probability that a unit, major equipment or component will be usable at a point in time, based on the past experience with that specific gas turbine:

$$AF = 1 - \frac{FOH + POH}{PH} = \frac{AH}{PH}$$