



**TECHNICAL STANDARDS
FOR
ELECTRONIC DICE TUMBLERS
(SINGAPORE)**

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Technical Standards for Electronic Dice Tumblers (Singapore)

Preface

The purpose of this document is to establish the technical standards for the design and operation of an electronic dice tumbler for the casino industry in Singapore and to provide guidance to certification testing bodies on such technical standards.

An electronic dice tumbler is an electronic device that tumbles a set of physical **dice** in a controlled manner to generate random results.

The intent of this document is to ensure the electronic dice tumbler operates in a manner that:-

- a. Has integrity;
- b. Is secure;
- c. Is reliable; and
- d. Is auditable.

It is not the intent of this document to:-

- a. Mandate a single solution or method to realise an objective;
- b. Limit technology application to gaming equipment;
- c. Limit creativity and variety of choice;
- d. Limit any manufacturer of equipment; and
- e. Preclude research and development into new technologies or innovative ideas.

As far as possible, this document stipulates what the minimum technical standards for an electronic dice tumbler is instead of how these standards should be met and does not mandate a particular solution or method as a means to realise these standards.

The electronic dice tumbler used in casinos must comply with the technical standards provided in this document.

Where applicable, the provisions in the Casino Control Act 2006 and its subsidiary legislation shall take precedence over these technical standards. In the event of any inconsistency, the provisions in the Casino Control Act 2006 and its subsidiary legislations shall apply.

This document would be reviewed on an ongoing basis to take into account the evolution of technologies utilised in the electronic dice tumbler and the development of other casino related technologies that may require technical regulation.

Comments on this document can be forwarded to:

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1. INTRODUCTION

1.1 Purpose

1.1.1 The purpose of these technical standards is to:-

- a. Create technical standards that would ensure that the operation of electronic dice tumbler in casinos in Singapore is secure, reliable and auditable;
- b. Establish the minimum integrity standards for electronic dice tumblers;
- c. Construct technical standards that are technologically neutral wherever feasible; and
- d. Construct technical standards that do not specify or approve any particular method or algorithm. The intent being to allow a wide range of methods to be used to conform to these standards as long as the methods are secure, reliable and consistent with the best practices of the day for the relevant technologies.

1.2 Scope

1.2.1 The scope of these technical standards covers the minimum standards required in the operation of any electronic dice tumbler so that the security, reliability and integrity of the electronic dice tumbler is achieved.

1.2.2 These technical standards shall apply only to electronic dice tumblers that are designed to be deployed in a live table game or semi-automated electronic table game environment. Compliance with these technical standards shall not be regarded as evidence of, nor construed as demonstrating, compliance with any technical requirements that may apply to electronic dice tumblers deployed in any other gaming environment.

1.2.3 The scope of this technical standard does not cover requirements that are not related to gaming (such as health and safety).

1.3 Terminology

1.3.1 The following terminologies used in this document are to be interpreted as follows:-

- a. Shall: The requirement is mandatory, and therefore must be complied with;
- b. Should: The requirement is recommended. Non-compliance shall be documented and approved by the Authority. Where appropriate, compensating controls shall be implemented.

1.4 Testing

1.4.1 Testing of gaming equipment by Approved Test Service Providers (ATSPs) shall be aimed at determining compliance with the technical requirements provided in this document. Areas of non-compliance shall be reported in the test/certification report.

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Where, in the opinion of the ATSP, the technical requirements spelt out in this document are insufficient, inappropriate or not pertinent to the design of the subject gaming equipment, the ATSP shall seek direction and further clarification from the Authority before proceeding to testing/certification

1.5 Consistency of Interpretation

- 1.5.1 The Gambling Regulatory Authority of Singapore recognises that these technical standards may be subject to different interpretation by manufacturers, casino operators and ATSPs. As such, any questions or feedback on the interpretation of the technical standards provided in this document should be directed to the Authority for clarification when they arise.

2. DICE TUMBLER REQUIREMENTS

2.1 Construct

- 2.1.1 The housing in which the dice resides (dice housing) shall be made from a clear material that is resistant to damage from the impact of the dice, including but not limited to cracking, chipping or denting, and shall allow for complete visibility of the dice within.
- 2.1.2 The design of the electronic dice tumbler shall ensure that the dice housing is securely affixed to the base plate of the tumbler, incorporating a tamper-evident mechanism to prevent unauthorised access to the dice.
- 2.1.3 The dimensions of the dice housing shall be sufficient to allow free tumble of the dice.
- 2.1.4 The cover positioned over the dice housing of the electronic dice tumbler shall be constructed using solid and opaque material to prevent the dice from being seen before the cover is lifted.
- 2.1.5 The electronic dice tumbler shall have a manufacturer identification that is permanently affixed to the exterior to indicate the name of manufacturer, model/part number and unique serial number.

2.2 Deployment

- 2.2.1 The electronic dice tumbler shall be designed such that the tumbler can be firmly mounted on a leveled surface to prevent unnecessary movement when deployed.

2.3 Operational Integrity

- 2.3.1 The electronic dice tumbler shall tumble the dice adequately with each activation to ensure randomisation of the results. If a power interruption occurs, the tumbling shall stop instantly and shall not restart automatically when power resumes. A fresh activation shall be required to commence a new tumble.

2.4 Randomness

- 2.4.1 The electronic dice tumbler shall be designed to produce dice results that are statistically independent and unpredictable, such that:-
 - a. Each face of a die has an equal probability of occurring,
 - b. The outcome of one die does not influence the outcome of another dice, and

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- c. Aggregate game results are statistically consistent with the expected probabilities of the game

2.5 Firmware

- 2.5.1 For the purposes of this document, firmware shall include all firmware modules installed in the electronic dice tumbler. Firmware installed in the electronic dice tumbler shall be stored in either:-
 - a. Non-alterable memory storage units;
 - b. Memory storage units with the implementation of write protection; or
 - c. Memory storage units with access controls and mechanisms set in place by the manufacturer to restrict modification access.
- 2.5.2 The electronic dice tumbler shall incorporate a robust and reliable mechanism to verify the authenticity and integrity of its firmware.
- 2.5.3 The electronic dice tumbler shall also provide a convenient external interface or method for independent verification of firmware integrity.
- 2.5.4 Changes to firmware configuration of the electronic dice tumbler shall be protected with appropriate access control.

3. DICE RECOGNITION

This section is intended for electronic dice tumblers with added dice recognition capability. Dice recognition refers to the automated process of detecting and determining dice results, which may involve visual analysis of dice images or direct reading of dice face values.

3.1 Robustness

- 3.1.1 Dice recognition capability shall accurately provide the dice results for each tumble.
- 3.1.2 For closed cover game tumbles, where the standard game flow begins with the activation of dice tumbling before bet collection, all information relating to the dice results generated by dice recognition (whether processed internally by the electronic dice tumbler or externally through transmitted camera snapshots of dice images), shall only be transmitted or disclosed after the cover is lifted.
- 3.1.3 The electronic dice tumbler shall automatically detect and signal the need for manual intervention when the dice recognition results are unclear for determining the game outcome reliably due to (but not limited to) the following scenarios:
 - a. Dice Stacked on top of each other;
 - b. Partially obstructed dice;
 - c. Camera obstruction; or
 - d. Camera focus issues.