

ISO/IEC 18031:2025-02 (E)

Information technology - Security techniques - Random bit generation

Contents		Page
Foreword		v
Introduction		vi
1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Symbols	7
5	Properties and requirements of a random bit generator	8
5.1	Properties of a random bit generator	8
5.2	Requirements of an RBG	9
5.3	Additional information for an RBG	10
6	RBG model	10
6.1	Conceptual functional model for random bit generation	10
6.2	RBG basic components	11
6.2.1	Introduction to the RBG basic components	11
6.2.2	Randomness source	11
6.2.3	Additional inputs	12
6.2.4	Internal state	12
6.2.5	Internal state transition functions	13
6.2.6	Output generation function	14
6.2.7	Health test	15
7	Types of RBGs	15
7.1	Introduction to the types of RBGs	15
7.2	Non-deterministic random bit generators	16
7.3	Deterministic random bit generators	17
7.4	The RBG spectrum	17
8	Overview and requirements for an NRBG	17
8.1	NRBG overview	17
8.2	Functional model of an NRBG	18
8.3	NRBG entropy sources	20
8.3.1	General	20
8.3.2	Primary entropy source for an NRBG	20
8.3.3	Physical entropy sources for an NRBG	22
8.3.4	NRBG non-physical entropy sources	22
8.3.5	NRBG additional entropy sources	23
8.3.6	Hybrid NRBGs	24
8.4	NRBG additional inputs	24
8.4.1	NRBG additional inputs overview	24
8.4.2	Requirements for NRBG additional inputs	24
8.5	NRBG internal state	25
8.5.1	NRBG internal state overview	25
8.5.2	Requirements for the NRBG internal state	25
8.5.3	Additional information for the NRBG internal state	26
8.6	NRBG internal state transition functions	26

8.6.1	NRBG internal state transition functions overview	26
8.6.2	Requirements for the NRBG internal state transition functions	27
8.6.3	Recommendations for the NRBG internal state transition functions	27
8.7	NRBG output generation function	27
8.7.1	NRBG output generation function overview	27
8.7.2	Requirements for the NRBG output generation function	28
8.8	NRBG health tests	28
8.8.1	NRBG health tests overview	28
8.8.2	General NRBG health test requirements	29
8.8.3	NRBG health test on deterministic components	29
8.8.4	NRBG health tests within entropy sources	30
8.8.5	NRBG health tests on random output	31
8.9	NRBG component interaction	32
8.9.1	NRBG component interaction overview	32
8.9.2	Requirements for NRBG component interaction	32
8.9.3	Recommendations for NRBG component interaction	33
9	Overview and requirements for a DRBG	33
9.1	DRBG overview	33
9.2	Functional model of a DRBG	33
9.3	DRBG randomness source	36
9.3.1	Primary randomness source for a DRBG	36
9.3.2	Generating seed values for a DRBG	37
9.3.3	Additional randomness sources for a DRBG	38
9.3.4	Hybrid DRBGs	38
9.4	Additional inputs for a DRBG	38
9.5	Internal state for a DRBG	39
9.6	Internal state transition function for a DRBG	39
9.7	Output generation function for a DRBG	40
9.8	Health tests for a DRBG	40
9.8.1	DRBG health tests overview	40
9.8.2	DRBG health test	41
9.8.3	DRBG deterministic algorithm test	41
9.8.4	DRBG software/firmware integrity test	41
9.8.5	DRBG critical functions test	41
9.8.6	DRBG software/firmware load test	41
9.8.7	DRBG manual key entry test	42
9.8.8	Continuous tests on noise sources in entropy sources	42
9.9	Additional requirements for DRBG keys	42
Annex A (normative)	Combining RBGs	44
Annex B (normative)	Conversion methods for random number generation	45
Annex C (informative)	Deterministic random bit generators	48
Annex D (informative)	NRBG examples	75
Annex E (informative)	Security considerations	84
Annex F (informative)	Discussion on the estimation of entropy	88
Annex G (informative)	RBG assurance	89
Annex H (normative)	RBG boundaries	90
Annex I (informative)	Rationale for the design of statistical tests	92
Bibliography	93