

Certification Report	1X2 Network RNG Evaluation Report for Switzerland
Report Identification	1X2-CH-220622-01-RC-R1
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UKAS ISO/IEC 17025 Accreditation No.	9263
Dates of certification work:	07 June 2022 to 13 June 2022
Certification report date	20 June 2022
Type of Product:	Random Number Generator (RNG)
Report prepared for:	1x2 Network Malta Ltd Santa Venera, 3, Advance Business Center, Triq G. Flores, Santa Venera, SVR 1950, Malta
Manufacturer	1x2 Network Malta Ltd Santa Venera, 3, Advance Business Center, Triq G. Flores, Santa Venera, SVR 1950, Malta
Software Provider	1x2 Network Malta Ltd Santa Venera, 3, Advance Business Center, Triq G. Flores, Santa Venera, SVR 1950, Malta
Jurisdiction	Switzerland Online
Regulation	Ordinance on Gambling (OJA) 7 November 2018 Classified Compilation of Federal Legislation 935.511 and the Ordinance on Casinos (OMJ) 7 November 2018 Classified Compilation of Federal Legislation 935.511.1 (Version 1.1 – 01.10.2019)
Testing Result	Complies (subject to the Conditions of Evaluation section of this Report)

1. Administration

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1.2 Version

Version	Description	Date
V0.1	Initial draft –MHAS	2022-06-14
V0.2	QA – BANS	2022-06-16
V1.0	Issued to 1x2 Network Malta Ltd	2022-06-22

2. RNG Components Details

The following table provides details of RNG components:

File name	SHA1
RNG.class	77481eecdd6aa8f8d3bc3cb38b6942e839740fd9

3. RNG Evaluation

3.1 Description of RNG

1x2 Network Malta Ltd Java SecureRandom is generally considered to be a cryptographically strong random number generator. On a system with sufficient entropy available, the output will be unpredictable without complete knowledge of the algorithm, its implementation, and the underlying system state.

The 1X2 Network RNG Evaluation Report for Switzerland the seed value is generated from system time and free space

3.2 Testing Methodology

The following methods were used during the testing of RNG for compliance with RNG related requirements listed in the Ordinance on Gambling (OJAR) 7 November 2018 Classified Compilation of Federal Legislation 935.511 and the Ordinance on Casinos (OMJ) 7 November 2018 Classified Compilation of Federal Legislation 935.511.1 (Version 1.1 – 01.10.2019).

- Software and System Version Control,
- Submitted Documentation Review,
- Statistical testing of RNG output
- Source Code Review,
- Jurisdictional Requirements Verification.

3.3 General online gaming characteristics

General online gaming characteristics	Answer	Settings or Remarks
Article 7 OMJ Game results The results of the game shall be determined only by invariant parameters. Any mechanisms such as a compensator or regulator are forbidden.	Yes	The game results are determined only by random numbers obtained from the RNG.
Article 11 OMJ Control and operation for automated money games: 1. All automated money games must: c. Have an internal or external random number generator to determine the events and results of play;	Yes	A combination of software and hardware RNG is being used to determine events and results of play, The RNG is part of game server, and no external RNG is being used.
2 The reliability of the random number generator must be demonstrated either by recognised probability calculation methods or by another procedure that is recognised by the FGB:	Yes	It has been verified, through statistical analysis, that raw and the scaled numbers generated from the pRNG are distributed in accordance with the expected probabilities for gameplay. See Annex A: Statistical testing of RNG output.
Article 10 OMJ Data storage for mechanical random number generators Roulette and other games for which the result is determined solely by a mechanical random number generator, may only be used if the numbers are collected or documented electronically or by other means.	N/A	No mechanical random number generators are used.
Article 46 OMJ Documentation of the casino games 3 The FGB may require the following indications and documents concerning automated money games operated online: a. Name and address of the supplier and name and address of the manufacturer, if different; b. Description of the hardware and software used, such as performance diagrams for example; e. Function and structure of the random number generator; l. Source code;	Yes	The required documentation/information has been provided by the manufacturer.

4. Conditions of Evaluation

1. **ga** has reported on what it has discovered through evaluation of 1x2 Network Malta Ltd RNG.
2. The scope of this certification report is limited to evaluation of RNG.
3. This compliance evaluation does not include evaluation of the games.
4. The evaluation was limited only to the Technical Standard requirements applicable to the RNG.
5. The compliance evaluation of the RNG was related only to the technical scope of work discussed in this report. Any other features or functions provided by the submission not related to these elements are excluded.
6. **ga** recommends the 1x2 Network Malta Ltd's RNG to be approved for use in the production system.

5. Statement of Compliance

Subject to the Conditions of Evaluation, 1x2 Network Malta Ltd RNG complies with requirements the Ordinance on Gambling (OJA) 7 November 2018 Classified Compilation of Federal Legislation 935.511 and the Ordinance on Casinos (OMJ) 7 November 2018 Classified Compilation of Federal Legislation 935.511.1 (Version 1.1 – 01.10.2019) (R480-0002) of Switzerland Casino Online Gaming.

If you have any question, please do not hesitate to contact us.

Yours sincerely,



Baha Ansari

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Annex A: Statistical testing of RNG output

Statistical analysis of 1x2 Network Malta Ltd output has been performed for:

- ♠ 1x2 Network Malta Ltd output and it pass the statistical tests

Statistical Testing Summary

Test Results

The results are summarised as follows:

Analysis of 1 set of 32 million raw numbers between 0 and $2^{32} - 1$ (inclusive)

Test Name	Sample Size	Test Result
Frequency (Monobits) Test	32,000,000	Pass
Frequency Test within a Block	32,000,000	Pass
Runs Test	32,000,000	Pass
Longest Run of Ones in a Block	32,000,000	Pass
Binary Matrix Rank Test	32,000,000	Pass
Discrete Fourier Transform (Spectral) Test	32,000,000	Pass
Non-Overlapping Template Matching Test	32,000,000	Pass
Maurer's "Universal Statistical" Test	32,000,000	Pass
Linear Complexity Test	32,000,000	Pass
Serial Test	32,000,000	Pass
Approximate Entropy Test	32,000,000	Pass
Cumulative Sums (Cumsum) Test	32,000,000	Pass
Random Excursions Test	32,000,000	Pass
Random Excursions Variant Test	32,000,000	Pass

In summary, the data set passed the NIST suite of tests at the 95% confidence level, confirming that the software RNG is functioning correctly from a bitwise randomness perspective.

Analysis of 3 sets of 3 million raw numbers between 0 and $2^{32} - 1$ (inclusive)

Test Name	Sample Size	Test Result
Birthday Spacing	3x 3,000,000	Pass
Overlapping 5-permutations	3x 3,000,000	Pass
Binary Rank 31x31	3x 3,000,000	Pass
Binary Rank 32x32	3x 3,000,000	Pass
Binary Rank 6x8	3x 3,000,000	Pass
Bitstreams	3x 3,000,000	Pass
OPSO	3x 3,000,000	Pass
OQSO	3x 3,000,000	Pass
DNA	3x 3,000,000	Pass
Count the 1's - Specific Bytes	3x 3,000,000	Pass
Count the 1's - Byte Stream	3x 3,000,000	Pass
Parking Lot	3x 3,000,000	Pass
Minimum Distance	3x 3,000,000	Pass
3-D Spheres	3x 3,000,000	Pass
Squeeze	3x 3,000,000	Pass
Overlapping Sums	3x 3,000,000	Pass
Runs	3x 3,000,000	Pass
Craps	3x 3,000,000	Pass

In summary, the data set passed the Diehard suite of tests at the 99% confidence level, confirming that the software RNG is functioning correctly from a bitwise randomness perspective.

Analysis of 40 sets of 1 million scaled numbers between 0 and 16 (inclusive)

Test Name	Sample Size	Test Result
Frequency test (Equidistribution test)	40,000,000	Pass
Serial test (non-overlapping pairs)	40,000,000	Pass
Gap test	40,000,000	Pass
Poker test (Partition test)	40,000,000	Pass
Permutation test	40,000,000	Pass
Run test	40,000,000	Pass

An additional assessment was applied across multiple sets of observations to ensure consistency with the expected behaviour of a high quality random number generator at the 95% confidence level. The frequency of occurrences of the possible outcomes was as expected for a random distribution and the outcomes covered the full range of possibilities.

Analysis of 40 sets of 1 million scaled numbers between 0 and 40 (inclusive)

Test Name	Sample Size	Test Result
Frequency test (Equidistribution test)	40,000,000	Pass
Serial test (non-overlapping pairs)	40,000,000	Pass
Gap test	40,000,000	Pass
Poker test (Partition test)	40,000,000	Pass
Permutation test	40,000,000	Pass
Run test	40,000,000	Pass

An additional assessment was applied across multiple sets of observations to ensure consistency with the expected behaviour of a high quality random number generator at the 95% confidence level. The frequency of occurrences of the possible outcomes was as expected for a random distribution and the outcomes covered the full range of possibilities.

Analysis of 40 sets of 1 million scaled numbers between 0 and 99 (inclusive)

Test Name	Sample Size	Test Result
Frequency test (Equidistribution test)	40,000,000	Pass
Serial test (non-overlapping pairs)	40,000,000	Pass
Gap test	40,000,000	Pass
Poker test (Partition test)	40,000,000	Pass
Permutation test	40,000,000	Pass
Run test	40,000,000	Pass

An additional assessment was applied across multiple sets of observations to ensure consistency with the expected behaviour of a high quality random number generator at the 95% confidence level. The frequency of occurrences of the possible outcomes was as expected for a random distribution and the outcomes covered the full range of possibilities.

Analysis of 100 sets of 1 million scaled numbers between 0 and 9999 (inclusive)

Test Name	Sample Size	Test Result
Frequency test (Equidistribution test)	100,000,000	Pass
Serial test (non-overlapping pairs)	100,000,000	Pass
Gap test	100,000,000	Pass
Poker test (Partition test)	100,000,000	Pass
Permutation test	100,000,000	Pass

Run test	100,000,000	Pass
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An additional assessment was applied across multiple sets of observations to ensure consistency with the expected behaviour of a high quality random number generator at the 95% confidence level. The frequency of occurrences of the possible outcomes was as expected for a random distribution and the outcomes covered the full range of possibilities.

Analysis of 2 million sets of shuffled numbers between 1 and 52 (inclusive)

Test Name	Sample Size	Test Result
Frequency test (Equidistribution test)	2,000,000 shuffles	Pass
Serial test (non-overlapping pairs)	2,000,000 shuffles	Pass
Gap test	2,000,000 shuffles	Pass
Poker test (Partition test)	2,000,000 shuffles	Pass
Permutation test	2,000,000 shuffles	Pass
Run test	2,000,000 shuffles	Pass

An additional assessment was applied across multiple sets of observations to ensure consistency with the expected behaviour of a high quality random number generator at the 95% confidence level. The frequency of occurrences of the possible outcomes was as expected for a random distribution and the outcomes covered the full range of possibilities.

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