

Certification Report

NXP Secure Smart Card Controller P40C008/012/024/040/072 VD/VE

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Standard

Common Criteria for Information Technology Security Evaluation (CC),

Version 3.1 Revision 4 (ISO/IEC 15408)

Certificate number CC-15-65655

TÜV Rheinland Nederland B.V. certifies:

Certificate holder and developer

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Product and assurance level NXP Secure Smart Card Controller P40C008/012/024/040/072 VD/VE.

Assurance Package:

EAL5 augmented with ALC_DV\$.2, AVA_VAN.5, and ASE_TSS 2

Protection Profile Conformance:

Security IC Platform Protection Profile with Augmentation Packages, registered and certified by Bundesamt fuer Sicherheit in der Informationstechnik (BSI) under the reference BSI-PP-0084-2014, version 1.0, 13.01.2014. No Augmentation Packages used.

Project number

NSCIB-CC-15-65655

Evaluation facility

Brightsight BV located in Delft, the Netherlands



Applying the Common Methodology for Information Technology Security Evaluation (CEM), Version 3.1 Revision 4 (ISO/IEC 18045)

Common Criteria Recognition Arrangement for components up to EAL2



The IT product identified in this certificate has been evaluated at an accredited and licensed/approved evaluation facility using the Common Methodology for IT Security Evaluation version 3.1 Revision 4 for conformance to the Common Criteria for IT Security Evaluation version 3.1 Revision 4. This certificate applies only to the specific version and release of the product in its evaluated configuration and in conjunction with the complete certification report. The evaluation has been conducted in accordance with the provisions of the Netherlands scheme for certification in the area of IT security [NSCIB] and the conclusions of the evaluation facility in the evaluation technical report are consistent with the evidence adduced. This certificate is not an endorsement of the IT product by TÜV Rheinland Nederland B.V. or by other organisation that recognises or gives effect to this certificate, and no warranty of the IT product by TUV Rheinland Nederland B.V. or by any other organisation that recognises or gives effect to this certificate, is either expressed or implied

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CONTENTS:

Foreword	
Recognition of the certificate	5
1 Executive Summary	6
2 Certification Results	7
2.1 Identification of Target of Evaluation 2.2 Security Policy 2.3 Assumptions and Clarification of Scope 2.4 Architectural Information 2.5 Documentation 2.6 IT Product Testing 2.7 Re-used evaluation results 2.8 Evaluated Configuration 2.9 Results of the Evaluation 2.10 Comments/Recommendations	7 7 8 8 8 8 9 11 11 11
3 Security Target	13
4 Definitions	13
5 Bibliography	14



Foreword

The Netherlands Scheme for Certification in the Area of IT Security (NSCIB) provides a third-party evaluation and certification service for determining the trustworthiness of Information Technology (IT) security products. Under this NSCIB, TÜV Rheinland Nederland B.V. has the task of issuing certificates for IT security products as well as for protection profiles and sites.

Part of the procedure is the technical examination (evaluation) of the product, protection profile or site according to the Common Criteria assessment guidelines published by the NSCIB. Evaluations are performed by an IT Security Evaluation Facility (ITSEF) under the oversight of the NSCIB Certification Body, which is operated by TÜV Rheinland Nederland B.V. in cooperation with the Ministry of the Interior and Kingdom Relations.

An ITSEF in the Netherlands is a commercial facility that has been licensed by TÜV Rheinland Nederland B.V. to perform Common Criteria evaluations; a significant requirement for such a license is accreditation to the requirements of ISO Standard 17025, General requirements for the accreditation of calibration and testing laboratories.

By awarding a Common Criteria certificate, TÜV Rheinland Nederland B.V. asserts that the product or site complies with the security requirements specified in the associated (site) security target, or that the protection profile (PP) complies with the requirements for PP evaluation specified in the Common Criteria for Information Security Evaluation. A (site) security target is a requirements specification document that defines the scope of the evaluation activities.

The consumer should review the security target or protection profile, in addition to this certification report, in order to gain an understanding of any assumptions made during the evaluation, the intended environment, its security requirements, and the level of confidence (i.e., the evaluation assurance level) that the product or site satisfies the security requirements stated in the (site) security target.

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Recognition of the certificate

Presence of the Common Criteria Recognition Arrangement and SOG-IS logos on the certificate would indicate that this certificate is issued in accordance with the provisions of the CCRA and the SOG-IS agreement and will be recognised by the participating nation.

International recognition

The CCRA has been signed by the Netherlands in May 2000 and provides mutual recognition of certificates based on the CC. Starting 8 September 2014 the CCRA has been updated to provide mutual recognition of certificates based on cPPs (exact use) or STs with evaluation assurance components up to and including EAL2+ALC_FLR. The current list of signatory nations and approved certification schemes can be found on: http://www.commoncriteriaportal.org.

European recognition

The European SOGIS-Mutual Recognition Agreement (SOGIS-MRA) version 3 effective from April 2010 provides mutual recognition of Common Criteria and ITSEC certificates at a basic evaluation level for all products. A higher recognition level for evaluation levels beyond EAL4 (resp. E3-basic) is provided for products related to specific technical domains. This agreement was initially signed by Finland, France, Germany, The Netherlands, Norway, Spain, Sweden and the United Kingdom. Italy joined the SOGIS-MRA in December 2010. The current list of signatory nations, approved certification schemes and the list of technical domains for which the higher recognition applies can be found on: http://www.sogisportal.eu.



1 Executive Summary

This Certification Report states the outcome of the Common Criteria security evaluation of the NXP Secure Smart Card Controller P40C008/012/024/040/072 VD/VE. The developer is NXP Semiconductors Germany GmbH, Business Unit Security & Connectivity located in Hamburg, Germany and they also act as the sponsor of the evaluation and certification. A Certification Report is intended to assist prospective consumers when judging the suitability of the IT security properties of the product for their particular requirements.

This Certification Report is a new certification, based on the evaluation of the "P40C012/040/072 VD" (NSCIB-CC-13-37658). The major changes are a larger selection of memory sizes (for the VD) and a small change of the hardware (for the VE). Small changes to the guidance are also included.

A full, up to date vulnerability analysis has been made, as well as renewed testing, renewing the certificate's reusability date to the date of the ETR.

The evaluator has determined that the VD and VE variants are equivalent in behaviour.

The Target of Evaluation (TOE) is a hardware secure smart card controller IC with IC Dedicated software. A Smartcard Embedded Software developer may create Security IC Embedded Software to execute on the NXP P40C008/012/024/040/072 VD/VE hardware. This software is stored in arbitrary memory of the NXP P40C008/012/024/040/072 VD/VE hardware and is not part of the TOE.

The TOE provides a hardware co-processor for Triple-DES (3DES) and AES, an AIS31-compliant True Random Number Generator (TRNG), a memory management unit (MMU) for access control management and ISO/IEC 7816 contact interface with UART.

The TOE also contains IC Dedicated software which provides support functionalities such as basic NVM access, Post-Delivery Configuration feature, self-testing, error counter handling and TOE reset.

The TOE has been evaluated by Brightsight B.V. located in Delft, The Netherlands and was completed on July 29th, 2015 with the acceptance of the ETR. The certification procedure has been conducted in accordance with the provisions of the Netherlands Scheme for Certification in the Area of IT Security *[NSCIB]*.

The scope of the evaluation is defined by the Security Target [ST], which identifies assumptions made during the evaluation, the intended environment for the TOE, the security requirements, and the level of confidence (evaluation assurance level) at which the product is intended to satisfy the security requirements. Consumers of the TOE are advised to verify that their own environment is consistent with the Security Target, and to give due consideration to the comments, observations and recommendations in this certification report.

The results documented in the evaluation technical report [ETR]¹ for this product provide sufficient evidence that it meets the EAL5 augmented (EAL5+) assurance requirements for the evaluated security functionality. This assurance level is augmented with ALC_DVS.2 (Sufficiency of security measures), AVA_VAN.5 (Advanced methodical vulnerability analysis), and ASE_TSS.2 (TOE summary specification with architectural design summary).

The evaluation was conducted using the Common Methodology for Information Technology Security Evaluation, Version 3.1 Revision 4 [CEM], for conformance to the Common Criteria for Information Technology Security Evaluation, version 3.1 Revision 4 [CC].

TÜV Rheinland Nederland B.V., as the NSCIB Certification Body, declares that the NXP Secure Smart Card Controller P40C008/012/024/040/072 VD/VE evaluation meets all the conditions for international recognition of Common Criteria Certificates and that the product will be listed on the NSCIB Certified Products list. It should be noted that the certification results only apply to the specific version of the product as evaluated.

¹ The Evaluation Technical Report contains information proprietary to the developer and/or the evaluator, and is not releasable for public review.



Certification Results

Identification of Target of Evaluation

The Target of Evaluation (TOE) for this evaluation is the NXP Secure Smart Card Controller P40C008/012/024/040/072 VD/VE from NXP Semiconductors Germany GmbH, Business Unit Security & Connectivity located in Hamburg, Germany.

This report pertains to the TOE which is comprised of the following main components:

Туре	Name	Release	Date	Form of delivery
IC Hardware	P40C008/012/024/040/072 VD	VD	2014-02-06	wafer, module (dice have nameplate 9511D)
IC Dedicated Test Software	Test Software	00h	2014-02-06	Stored in ROM
IC Dedicated	Boot Software	00h	2014-02-06	Stored in ROM
Support Software	HAL Software	00h	2014-02-06	Stored in ROM

Туре	Name	Release	Date	Form of delivery
IC Hardware	P40C008/012/024/040/072 VE	VE	2015-02-16	Wafer, module (dice have nameplate 9511E)
IC Dedicated Test Software	Test Software	00h	2015-02-16	Stored in ROM
IC Dedicated	Boot Software	00h	2015-02-16	Stored in ROM
Support Software	HAL Software	00h	2015-02-16	Stored in ROM

To ensure secure usage a set of guidance documents is provided together with the TOE. Details can be found in section 2.5 of this report.

The TOE is delivered by NXP as a wafer in phase 3 or in packaged form in phase 4 of the smart card life cycle as defined in the Smart Card IC Protection Profile [BSI-PP-0084]. Security IC Embedded Software (not part of the TOE) can be loaded in ROM in Phase 3.

2.2 Security Policy

A Security IC must provide high security in particular when being used in the banking and finance market, in electronic commerce or in governmental applications.

Hence the TOE shall maintain:

- Ø the integrity and the confidentiality of code and data stored in its memories,
- Ø the different CPU modes with the related capabilities for configuration and memory access,
- Ø the integrity, the correct operation and the confidentiality of security functionality provided by the TOE.

This is ensured by the construction of the TOE and its security functionality.

NXP Secure Smart Card Controller P40C008/012/024/040/072 VD/VE basically provides a hardware platform for an implementation of a smart card application with

- Ø functionality to calculate Data Encryption Standard (Triple-DES) with up to three keys,
- Ø hardware to calculate Advanced Encryption Standard (AES) with different key lengths,
- Ø a True Random Number Generator,
- Ø memory management control, and
- Ø an ISO/IEC 7816 contact interface with UART.



In addition, several security mechanisms are implemented to ensure proper operation as well as integrity and confidentiality of stored data. For example, this includes security mechanisms for memory protection and security exceptions as well as sensors, which allow operation under specified conditions only. Memory encryption is used for memory protection and chip shielding is added to the chip.

Hardware support for large integer arithmetic operations like multiplication, addition and logical operations, which are suitable for public key cryptography and elliptic curve cryptography, as well as support for cyclic redundancy check (CRC) calculation, is functionally in the TOE, however <u>not</u> part of the claimed security functionality.

2.3 Assumptions and Clarification of Scope

2.3.1 Assumptions

The Assumptions defined in the Security Target are not covered by the TOE itself. These aspects lead to specific Security Objectives to be fulfilled by the TOE-Environment. The following objectives for the environment are of relevance:

- Ø OE.Plat-Appl: Usage of Hardware Platform
- Ø OE.Resp-Appl: Treatment of User Data
- Ø OE.Process-Sec-IC: Protection during Packaging, Finishing and Personalisation
- Ø OE.Check-Init: Check of initialization data by the Security IC Embedded Software

Details can be found in the Security Target [ST] sections 4.2 and 4.3.

2.3.2 Clarification of scope

The evaluation did not reveal any threats to the TOE that are not countered by the evaluated security functions of the product.

Please note that although the TOE contains accelerators for CRC and large number arithmetic, the functionality and security of these features has <u>not</u> been topic of this evaluation. Composite product developers should do their own security analysis and/or testing.

2.4 Architectural Information

This chapter provides a high-level description of the IT product and its major components based on the evaluation evidence described in the Common Criteria assurance family entitled "TOE design (ADV_TDS)". The intent of this chapter is to characterise the degree of architectural separation of the major components and to show dependencies between the TOE and products using the TOE in a composition (e.g. dependencies between HW and SW).

The target of evaluation (TOE) is a Security IC with Dedicated Test Software and Dedicated Support Software.

The TOE does not include any Security IC Embedded Software. See [ST] section 1.4 for details.

2.5 Documentation

The following documentation is provided with the product by the developer to the customer:

Туре	Name	Release	Date	Form of delivery
Document	Product data sheet SmartMX2 P40 family P40C008/012/024/040/072, Secure high performance smart card controller, NXP Semiconductors	262931	2015-06-26	Electronic document
Document	Product data sheet addendum SmartMX2 P40 family P40Cxxx, Firmware interface specification, NXP Semiconductors	275833	2015-06-26	Electronic document



Туре	Name	Release	Date	Form of delivery
Document	Product data sheet addendum SmartMX2 P40 family P40Cxxx, User Mode, NXP Semiconductors	275730	2015-04-01	Electronic document
Document	Product data sheet addendum SmartMX2 P40 family P40Cxxx, System Mode, NXP Semiconductors	267530	2015-04-01	Electronic document
Document	Product data sheet addendum SmartMX2 P40 family P40Cxxx, Chip Health Mode, NXP Semiconductors	269730	2015-04-01	Electronic document
Document	Product data sheet addendum SmartMX2 P40 family P40Cxxx, Post Delivery Configuration, NXP Semiconductors	269630	2015-04-01	Electronic document
Document	Product data sheet addendum SmartMX2 P40 family P40Cxxx, Instruction Set Manual, NXP Semiconductors	258132	2015-06-26	Electronic document
Document	Product data sheet addendum SmartMX2 P40 family P40Cxxx VA, VD, and VE, Wafer specification, NXP Semiconductors	269832	2015-05-30	Electronic document
Document	Guidance and Operation Manual NXP Secure Smart Card Controller P40C008/012/024/040/072, Information on Guidance and Operation, NXP Semiconductors	269432	2015-05-07	Electronic document

2.6 IT Product Testing

Testing (depth, coverage, functional tests, independent testing): The evaluators examined the developer's testing activities documentation and verified that the developer has met their testing responsibilities.

2.6.1 Testing approach and depth

The developer has performed extensive testing on functional specification, subsystem and module level. All parameter choices have been addressed at least once. All boundary cases identified have been tested explicitly, and additionally the near-boundary conditions have been covered probabilistically. The testing was largely automated using industry standard and proprietary test suites. Test scripts were extensively used to verify that the functions return the expected values.

The hardware test results are extendable to composite evaluations on this hardware TOE, as the hardware is operated according to its guidance and the composite evaluation requirements are met.

For the testing performed by the evaluators, the developer has provided a testing environment. The evaluators have reproduced a selection of the developer tests, as well as a small number of test cases designed by the evaluator.

2.6.2 Independent Penetration Testing

The evaluator independent penetration tests were devised after performing an Evaluator Vulnerability Analysis. This was done in the following steps: The reference for attack techniques against which smart card-related devices controllers such as the TOE must be protected against is the document "Attack methods for smart cards" [JIL-AM]. The vulnerability of the TOE for these attacks has been analysed in a white box investigation conforming to AVA VAN.5.

1. Inventory of required resistance



This step uses the JIL attack list [JIL-AM] as a reference for completeness and studies the ST claims to decide which attacks in the JIL attack list apply for the TOE.

2. Validation of security functionalities

This step identifies the implemented security functionalities and performs tests to verify implementation and to validate proper functioning. This step has been performed as part of ATE evaluation.

3. Vulnerability analysis

This step first gives an overview against which attacks the implemented security functionalities are meant to provide protection. Secondly in this step the design of the implemented security functionalities is studied. Thirdly, an analysis is performed to determine whether the design contains vulnerabilities against the respective attacks of step 1. This step has been performed as part of AVA evaluation.

4. Analysis of input from other evaluation activities

This step first analyses the input from other CC-evaluation classes expressed as possible vulnerabilities. Secondly, the evaluators made an analysis of the TOE in its intended environment to check whether the developer vulnerability analysis provides sufficient assurance or whether penetration testing is needed to provide sufficient assurance. This step has been performed as part of AVA evaluation.

5. Design assurance evaluation

This step analyses the results from an attack perspective as defined in step 1. Based on this design analysis the evaluators determine whether the design provides sufficient assurance or whether penetration testing is needed to provide sufficient assurance. This step has been performed as part of AVA evaluation.

6. Penetration testing

This step performs the penetration tests identified in step 4 and step 5. This step has been performed as part of AVA evaluation.

7. Conclusions on resistance

This step performs a [JIL-AM] compliant rating on the results of the penetration tests in relation with the assurance already gained by the design analysis. Based on the ratings the evaluators draw conclusions on the resistance of the TOE against attackers possessing a high attack potential. This step has been performed as part of AVA evaluation.

In total 40 weeks of testing effort was spent on 6 light manipulation, 2 voltage manipulation and 11 side channel analysis attack scenarios.

2.6.3 Test Configuration

The developer provided the evaluator with the TOE including a proprietary test operating system called IC Dedicated Test Software. See the [ETR] for details.

2.6.4 Testing Results

The testing activities, including configurations, procedures, test cases, expected results and observed results are summarised in the [ETR], with references to the documents containing the full details.

The developer's tests and the independent functional tests produced the expected results, giving assurance that the TOE behaves as specified in its ST and functional specification.

No exploitable vulnerabilities were found with the independent penetration tests.

The algorithmic security level of cryptographic functionality has not been rated in this certification process, but the current consensus on the algorithmic security level in the open domain, i.e. from the current best cryptanalytic attacks published, has been taken into account.

The algorithmic security level exceeds 100 bits for all evaluated cryptographic functionality as required for high attack potential (AVA VAN.5).



The strength of the implementation of the cryptographic functionality has been assessed in the evaluation, as part of the AVA_VAN activities. These activities revealed that for all cryptographic functionality the security level exceeds 100 bits.

For composite evaluations, please consult the [ETRfC] for details.

2.7 Re-used evaluation results

This security evaluation is a new evaluation e under NSCIB. Documentary evaluation results of the earlier version (the VD version) of the TOE have been re-used, testing has been renewed.

There has been extensive re-use of the ALC aspects for the sites, by use of two site certificates and eight times re-use following the [AIS38] methodology. No sites have been visited as part of this evaluation.

2.8 Evaluated Configuration

The TOE was tested in the major configuration with an EEPROM of 72 kBytes (P40C072 VD and P40C072 VE).

All major configurations as well as all minor configuration options that can be selected are described in chapter 1.4.2.2 of the [ST]. All major and minor configurations are available to the evaluator. Besides the size of the available EEPROM memory, there are no differences between the major configurations. The major configurations do not have dependencies to security features. All minor configuration options that are part of the evaluation were tested and behave as specified.

Therefore the results described in this document are applicable for the major configurations P40C008, P40C012, P40C024, P40C040, and P40C072, in both VD and VE edition, as well as for all minor configurations described in the [ST].

2.9 Results of the Evaluation

The evaluation lab documented their evaluation results in the $[ETR]^2$ which references several Intermediate Reports and other evaluator documents. To support composite evaluations according to [CCDB-2007-09-01] a derived document [ETRfC] was provided and approved. This document provides details of the TOE evaluation that have to be considered when this TOE is used as platform in a composite evaluation.

The verdict of all claimed assurance requirements is: Pass.

Based on the above evaluation results the evaluation lab concluded the NXP Secure Smart Card Controller P40C008/012/024/040/072 VD/VE to be **CC Part 2 extended, CC Part 3 conformant**, and to meet the requirements of EAL5 augmented with ALC_DVS.2, AVA_VAN.5, and ASE_TSS.2. This implies that the product satisfies the security technical requirements specified in the Security Target *[ST]*.

The Security Target claims strict conformance to the Protection Profile [BSI-PP-0084]. No Augmentation Packages from the PP have been used.

2.10 Comments/Recommendations

The user guidance (as outlined in section 2.5 of this report) contains necessary information about the usage of the TOE. Certain aspects of the TOE's security functionality, in particular the countermeasures against attacks, depend on accurate conformance to the user guidance.

Please note that although the TOE contains accelerators for CRC and large number arithmetic, the functionality and security of these features has <u>not</u> been topic of this evaluation. Composite product developers should do their own security analysis and/or testing.

The customer or user of the product shall consider the results of the certification within his system risk management process. In order for the evolution of attack methods and techniques to be covered, he

² The Evaluation Technical Report contains information proprietary to the developer and/or the evaluator, and is not releasable for public review.





should define the period of time until a re-assessment for the TOE is required and thus requested from the sponsor of the certificate.

The strength of the implemented cryptographic algorithms was not rated in the course of this evaluation. To fend off attackers with high attack potential appropriate cryptographic algorithms with adequate key lengths must be used (references can be found in national and international documents and standards).



3 Security Target

The Security Target [ST] is included here by reference. A sanitized public version [ST-lite] is available, in accordance to [ST-SAN].

4 Definitions

This list of Acronyms and the glossary of terms contains elements that are not already defined by the CC or CEM:

AES Advanced Encryption Standard

CRC Cyclic Redundancy Check
DES Data Encryption Standard

IC Integrated Circuit

IT Information Technology

ITSEF IT Security Evaluation Facility

NSCIB Nederlands Schema voor Certificatie op het gebied van IT-Beveiliging

PP Protection Profile

TRNG True Random Number Generator

TOE Target of Evaluation



5 Bibliography

This section lists all referenced documentation used as source material in the compilation of this report:

[AIS31] AIS31: Funktionalitätsklassen und Evaluationsmethodologie für physikalische

Zufallszahlengeneratoren, Bundesamt für Sicherheit in der Informationstechnik.

Version 2.0, September 18, 2011.

[AIS38] AIS 38 Reuse of evaluation results, version 2.9, June 8th 2011

[BSI-PP-0084] Security IC Platform Protection Profile with Augmentation Packages", reference

BSI-CC-PP-0084-2014, version 1.0, 13.01.2014.

[CC] Common Criteria for Information Technology Security Evaluation, Parts I version

3.1 revision 1, and Part II and III, version 3.1 revision 4.

[CEM] Common Methodology for Information Technology Security Evaluation, version 3.1,

Revision 4.

[ETR] Brightsight, Evaluation Technical Report NXP Secure Smart Card Controller

P40C008/012/024/040/072 VD/VE EAL5+, 15-RPT-200, version 2.0, dated 29 July

2015.

[ETRfC] Brightsight, Evaluation Technical Report for Composition NXP Secure Smart Card

Controller P40C008/012/024/040/072 VD/VE EAL5+, 15-RPT-178, version 4.0

dated 29 July 2015.

[JIL] JIL Application of Attack Potential to Smartcards, version 2.9, January 2013.

[NSCIB] Nederlands Schema for Certification in the Area of IT Security, Version 2.1, August

1st, 2011.

[ST] NXP Secure Smart Card Controllers P40C008/012/024/040/072 VD/VE Security

Target, Rev. 2.0, 2015-07-07

[ST-lite] NXP Secure Smart Card Controller P40C008/012/024/040/072 VD/VE Security

Target Lite, Rev. 1.3, 2015-07-07

[ST-SAN] ST sanitising for publication, CC Supporting Document CCDB-2006-04-004, April

2006.

(This is the end of this report).