

**STMicroelectronics**

**ST33J2M0 D01  
including optional cryptographic library NESLIB,  
and optional technology MIFARE4Mobile®  
Security Target for composition**

**Common Criteria for IT security evaluation**

**SMD\_ST33J2M0\_ST\_19\_004 Rev D01.3**

**December 2019**



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# ST33J2M0 D01 platform Security Target for composition

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## Common Criteria for IT security evaluation

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### 1 Introduction (ASE\_INT)

#### 1.1 Security Target reference

- 1 Document identification: ST33J2M0 D01 including optional cryptographic library NesLib, and optional technology MIFARE4Mobile® SECURITY TARGET FOR COMPOSITION.
- 2 Version number: Rev D01.3, issued in December 2019.
- 3 Registration: registered at ST Microelectronics under number SMD\_ST33J2M0\_ST\_19\_004.

#### 1.2 TOE reference

- 4 This document presents **the Security Target (ST)** of the **ST33J2M0 D01** Security Integrated Circuit (IC), designed on the **ST33 platform of STMicroelectronics**, with firmware version 3.2.5 and 3.3.0, optional cryptographic library **NesLib 6.3.4**, and optional technology **MIFARE4Mobile® rev 2.2.9 and 2.2.10**.
- 5 The precise reference of the Target of Evaluation (TOE) is given in [Section 1.4: TOE identification](#) and the security IC features are given in [Section 1.6: TOE description](#).
- 6 A glossary of terms and abbreviations used in this document is given in [Appendix A: Glossary](#).

# Contents

- 1 Introduction (ASE\_INT) ..... 3**
  - 1.1 Security Target reference ..... 3
  - 1.2 TOE reference ..... 3
  - 1.3 Context .....11
  - 1.4 TOE identification .....11
  - 1.5 TOE overview ..... 12
  - 1.6 TOE description ..... 14
    - 1.6.1 TOE hardware description ..... 14
    - 1.6.2 TOE software description ..... 15
    - 1.6.3 TOE documentation ..... 17
    - 1.6.4 Delivery format and method ..... 17
  - 1.7 TOE life cycle ..... 17
  - 1.8 TOE environment ..... 19
    - 1.8.1 TOE Development Environment ..... 19
    - 1.8.2 TOE production environment ..... 20
    - 1.8.3 TOE operational environment ..... 20
  
- 2 Conformance claims (ASE\_CCL, ASE\_ECD) ..... 21**
  - 2.1 Common Criteria conformance claims ..... 21
  - 2.2 PP Claims: ..... 21
    - 2.2.1 PP Reference ..... 21
    - 2.2.2 PP Additions ..... 22
    - 2.2.3 PP Claims rationale ..... 22
  
- 3 Security problem definition (ASE\_SPD) ..... 23**
  - 3.1 Description of assets ..... 24
  - 3.2 Threats ..... 25
  - 3.3 Organisational security policies ..... 27
  - 3.4 Assumptions ..... 30
  
- 4 Security objectives (ASE\_OBJ) ..... 31**
  - 4.1 Security objectives for the TOE ..... 32
  - 4.2 Security objectives for the environment ..... 37

4.3	Security objectives rationale	40
4.3.1	Assumption "Usage of secure values for M4M-DESFire"	43
4.3.2	Assumption "Terminal support to ensure integrity and confidentiality for M4M-DESFire"	43
4.3.3	Assumption "Identification by M4M Framework"	44
4.3.4	TOE threat "Abuse of Functionality"	44
4.3.5	TOE threat "Memory Access Violation"	44
4.3.6	TOE threat "Diffusion of open samples"	44
4.3.7	TOE threat "Unauthorized data modification for M4M-DESFire"	45
4.3.8	TOE threat "Impersonating authorized users during authentication for M4M-DESFire"	45
4.3.9	TOE threat "Cloning for M4M-DESFire"	45
4.3.10	TOE threat "M4M-DESFire resource unavailability"	45
4.3.11	TOE threat "M4M-DESFire code confidentiality"	46
4.3.12	TOE threat "M4M-DESFire data confidentiality"	46
4.3.13	TOE threat "M4M-DESFire code integrity"	46
4.3.14	TOE threat "M4M-DESFire data integrity"	46
4.3.15	Organisational security policy "Controlled usage to Loader Functionality"	47
4.3.16	Organisational security policy "Additional Specific Security Functionality"	47
4.3.17	Organisational security policy "Confidentiality during communication for M4M-DESFire"	47
4.3.18	Organisational security policy "Transaction mechanism for M4M-DESFire"	48
4.3.19	Organisational security policy "Un-traceability of end-users for M4M-DESFire"	48
4.3.20	Organisational security policy "Treatment of user data"	48
<b>5</b>	<b>Security requirements (ASE_REQ)</b>	<b>50</b>
5.1	Security functional requirements for the TOE	50
5.1.1	Security Functional Requirements from the Protection Profile	54
5.1.2	Additional Security Functional Requirements for the cryptographic services	57
5.1.3	Additional Security Functional Requirements for the memories protection	60
5.1.4	Additional Security Functional Requirements related to the loading and authentication capabilities	62
5.1.5	Additional Security Functional Requirements related to the Secure Diagnostic capabilities	65

5.1.6	Additional Security Functional Requirements related to M4M-DESFire	66
5.2	TOE security assurance requirements	73
5.3	Refinement of the security assurance requirements	74
5.3.1	Refinement regarding delivery procedure (ALC_DEL)	75
5.3.2	Refinement regarding functional specification (ADV_FSP)	75
5.3.3	Refinement regarding test coverage (ATE_COV)	76
5.3.4	Refinement regarding preparative procedures (AGD_PRE)	76
5.4	Security Requirements rationale	77
5.4.1	Rationale for the Security Functional Requirements	77
5.4.2	Extended security objectives are suitably addressed	82
5.4.3	Additional security requirements are consistent	88
5.4.4	Dependencies of Security Functional Requirements	91
5.4.5	Rationale for the Assurance Requirements	96
<b>6</b>	<b>TOE summary specification (ASE_TSS)</b>	<b>97</b>
6.1	Limited fault tolerance (FRU_FLT.2)	97
6.2	Failure with preservation of secure state (FPT_FLS.1)	97
6.3	Limited capabilities (FMT_LIM.1) / Test, Limited capabilities (FMT_LIM.1) / Sdiag, Limited capabilities (FMT_LIM.1) / Loader, Limited availability (FMT_LIM.2) / Test, Limited availability (FMT_LIM.2) / Sdiag & Limited availability (FMT_LIM.2) / Loader	97
6.4	Inter-TSF trusted channel (FTP_ITC.1) / Sdiag	98
6.5	Audit review (FAU_SAR.1) / Sdiag	98
6.6	Stored data confidentiality (FDP_SDC.1)	98
6.7	Stored data integrity monitoring and action (FDP_SDI.2)	98
6.8	Audit storage (FAU_SAS.1)	98
6.9	Resistance to physical attack (FPT_PHP.3)	98
6.10	Basic internal transfer protection (FDP_ITT.1), Basic internal TSF data transfer protection (FPT_ITT.1) & Subset information flow control (FDP_IFC.1)	99
6.11	Random number generation (FCS_RNG.1)	99
6.12	Cryptographic operation: DES operation (FCS_COP.1) / TDES if EDES+	99
6.13	Cryptographic operation: AES operation (FCS_COP.1) / AES if HW_AES	99
6.14	Cryptographic operation: RSA operation (FCS_COP.1) / RSA if NesLib	100
6.15	Cryptographic operation: Elliptic Curves Cryptography operation (FCS_COP.1) / ECC if NesLib	100

6.16	Cryptographic operation: SHA-1 & SHA-2 operation (FCS_COP.1) / SHA, if NesLib 101	
6.17	Cryptographic operation: Keccak & SHA-3 operation (FCS_COP.1) / Keccak, if NesLib 101	
6.18	Cryptographic operation: Keccak-p operation (FCS_COP.1) / Keccak-p, if NesLib 102	
6.19	Cryptographic operation: Diffie-Hellman operation (FCS_COP.1) / Diffie-Hellman, if NesLib 102	
6.20	Cryptographic operation: DRBG operation (FCS_COP.1) / DRBG, if NesLib . 102	
6.21	Cryptographic key generation: Prime generation (FCS_CKM.1) / Prime-generation, if NesLib 102	
6.22	Cryptographic key generation: RSA key generation (FCS_CKM.1) / RSA-key-generation, if NesLib 103	
6.23	Static attribute initialisation (FMT_MSA.3) / Memories . . . . .	103
6.24	Management of security attributes (FMT_MSA.1) / Memories & Specification of management functions (FMT_SMF.1) / Memories	103
6.25	Complete access control (FDP_ACC.2) / Memories & Security attribute based access control (FDP_ACF.1) / Memories	103
6.26	Authentication Proof of Identity (FIA_API.1) . . . . .	103
6.27	Inter-TSF trusted channel (FTP_ITC.1) / Loader, Basic data exchange confidentiality (FDP_UCT.1) / Loader, Data exchange integrity (FDP_UIT.1) / Loader & Audit storage (FAU_SAS.1) / Loader	104
6.28	Subset access control (FDP_ACC.1) / Loader & Security attribute based access control (FDP_ACF.1) / Loader	104
6.29	Failure with preservation of secure state (FPT_FLS.1) / Loader . . . . .	104
6.30	Static attribute initialisation (FMT_MSA.3) / Loader . . . . .	104
6.31	Management of security attributes (FMT_MSA.1) / Loader & Specification of management functions (FMT_SMF.1) / Loader	104
6.32	Security roles (FMT_SMR.1) / Loader . . . . .	104
6.33	Timing of identification (FIA_UID.1) / Loader & Timing of authentication (FIA_UAU.1) / Loader	105
6.34	Audit review (FAU_SAR.1) / Loader . . . . .	105
6.35	Security roles (FMT_SMR.1) / M4M-DESFire . . . . .	105
6.36	Subset access control (FDP_ACC.1) / M4M-DESFire . . . . .	105
6.37	Security attribute based access control (FDP_ACF.1) / M4M-DESFire .	105
6.38	Static attribute initialisation (FMT_MSA.3) / M4M-DESFire . . . . .	106
6.39	Management of security attributes (FMT_MSA.1) / M4M-DESFire . . . .	106

6.40 Specification of Management Functions (FMT\_SMF.1) / M4M-DESFire 106

6.41 Import of user data with security attributes (FDP\_ITC.2) / M4M-DESFire .. 107

6.42 Inter-TSF basic TSF data consistency (FPT\_TDC.1) / M4M-DESFire .. 107

6.43 Cryptographic key destruction (FCS\_CKM.4) / M4M-DESFire ..... 107

6.44 User identification before any action (FIA\_UID.2) / M4M-DESFire .... 107

6.45 User authentication before any action (FIA\_UAU.2) / M4M-DESFire .. 107

6.46 Multiple authentication mechanisms (FIA\_UAU.5) / M4M-DESFire .... 107

6.47 Management of TSF data (FMT\_MTD.1) / M4M-DESFire ..... 107

6.48 Trusted path (FTP\_TRP.1) / M4M-DESFire ..... 108

6.49 Basic rollback (FDP\_ROL.1) / M4M-DESFire ..... 108

6.50 Replay detection (FPT\_RPL.1) / M4M-DESFire ..... 108

6.51 Unlinkability (FPR\_UNL.1) / M4M-DESFire ..... 108

6.52 Minimum and maximum quotas (FRU\_RSA.2) / M4M-DESFire ..... 108

6.53 Subset residual information protection (FDP\_RIP.1) / M4M-DESFire .. 108

**7 Identification ..... 109**

**8 References ..... 113**

**Appendix A Glossary ..... 116**

A.1 Terms.....116

A.2 Abbreviations.....118



## List of tables

Table 1.	TOE components	12
Table 2.	Derivative devices configuration possibilities	13
Table 3.	Composite product life cycle phases	19
Table 4.	Summary of security aspects	23
Table 5.	Summary of security objectives	31
Table 6.	Security Objectives versus Assumptions, Threats or Policies	41
Table 7.	Summary of functional security requirements for the TOE	50
Table 8.	FCS_COP.1 iterations (cryptographic operations)	57
Table 9.	FCS_CKM.1 iterations (cryptographic key generation)	60
Table 10.	TOE security assurance requirements	73
Table 11.	Impact of EAL5 selection on <a href="#">BSI-CC-PP-0084-2014</a> refinements	75
Table 12.	Security Requirements versus Security Objectives	77
Table 13.	Dependencies of security functional requirements	91
Table 14.	TOE components	109
Table 15.	Guidance documentation	109
Table 16.	Sites list	110
Table 17.	Common Criteria	113
Table 18.	Protection Profile	113
Table 19.	Other standards	113
Table 20.	List of abbreviations	118

## List of figures

Figure 1. ST33J2M0 D01 platform block diagram ..... 15

Figure 2. Security IC Life-Cycle if Security IC Embedded Software is loaded by Security IC Dedicated Software into the programmable non-volatile Memory18

## 1.3 Context

7 The Target of Evaluation (TOE) referred to in [Section 1.4: TOE identification](#), is evaluated under the French IT Security Evaluation and Certification Scheme and is developed by the Secure Microcontrollers Division of STMicroelectronics (ST).

8 The assurance level of the performed Common Criteria (CC) IT Security Evaluation is EAL5 augmented by ADV\_IMP.2, ADV\_INT.3, ADV\_TDS.5, ALC\_CMC.5, ALC\_DVS.2, ALC\_FLR.1, ALC\_TAT.3, ASE\_TSS.2, ATE\_COV.3, ATE\_FUN.2 and AVA\_VAN.5.

9 The intent of this Security Target is to specify the Security Functional Requirements (SFRs) and Security Assurance Requirements (SARs) applicable to the TOE security ICs, and to summarise their chosen TSF services and assurance measures.

10 This ST claims to be an instantiation of the "[Eurosmart - Security IC Platform Protection Profile with Augmentation Packages](#)" (PP) registered and certified under the reference [BSI-CC-PP-0084-2014](#) in the German IT Security Evaluation and Certification Scheme, **with the following augmentations:**

- Addition #1: "Support of Cipher Schemes" from [AUG](#)
- Addition #4: "Area based Memory Access Control" from [AUG](#)
- Additions specific to this Security Target, some of which in compliance with [JIL SRFPDCL](#) and [ANSSI-CC-CER/F/06.003](#).

The original text of this PP is typeset as [indicated here](#), its augmentations from [AUG](#) as [indicated here](#), and text originating in [JIL SRFPDCL](#) and [ANSSI-CC-CER/F/06.003](#) as [indicated here](#), when they are reproduced in this document.

This ST instantiates the following packages from the above mentioned PP:

- Authentication of the Security IC
- Loader dedicated for usage in secured environment only
- Loader dedicated for usage by authorized users only.

11 Extensions introduced in this ST to the SFRs of the Protection Profile (PP) are **exclusively** drawn from the Common Criteria part 2 standard SFRs.

12 This ST makes various refinements to the above mentioned PP and [AUG](#). They are all properly identified in the text typeset as **indicated here** or [here](#). The original text of the PP is repeated as scarcely as possible in this document for reading convenience. All PP identifiers have been however prefixed by their respective origin label: **BSI** for [BSI-CC-PP-0084-2014](#), **AUG1** for Addition #1 of [AUG](#), **AUG4** for Addition #4 of [AUG](#)., and **ANSSI** for [JIL SRFPDCL](#) and [ANSSI-CC-CER/F/06.003](#).

## 1.4 TOE identification

13 The Target of Evaluation (TOE) is the ST33J2M0 D01 platform.

14 "ST33J2M0 D01" completely identifies the TOE including its components listed in [Table 1: TOE components](#), its guidance documentation detailed in [Table 15: Guidance documentation](#), and its development and production sites indicated in [Table 16: Sites list](#).

15 D01 is the version of the evaluated platform. Any change in the TOE components, the guidance documentation and the list of sites leads to a new version of the evaluated platform, thus a new TOE.

Table 1. TOE components

IC Maskset name	Master identification number <sup>(1)</sup>	IC version	Firmware version	Optional NesLib crypto library version	Optional MIFARE4Mobile version
K500A	0137h	H	3.2.5 and 3.3.0	6.3.4	2.2.9 and 2.2.10
		I	3.3.0		

1. Part of the product information.

- 16 The IC maskset name is the product hardware identification. The IC version is updated for any change in hardware (i.e. part of the layers of the maskset) or in the OST software.
- 17 All along the product life, the marking on the die, a set of accessible registers and a set of specific instructions allow the customer to check the product information, providing the identification elements, as listed in [Table 1: TOE components](#), and the configuration elements as detailed in the Data Sheet, referenced in [Table 15: Guidance documentation](#).

## 1.5 TOE overview

- 18 The ST33J2M0 is a serial access microcontroller designed for secure mobile applications that incorporates the most recent generation of ARM processors for embedded secure systems. Its SecurCore® SC300™ 32-bit RISC core is built on the Cortex® M3 core with additional security features to help to protect against advanced forms of attacks.
- 19 Cadenced at 70 MHz, the SC300™ core brings great performance and excellent code density thanks to the Thumb®-2 instruction set.
- 20 Strong and multiple fault protection mechanisms ensure a guaranteed high-detection coverage that facilitates the development of highly secure software. This is achieved by using two CPUs in locked-step mode, error codes in sensitive memories and hardware logic.
- 21 The high-speed embedded Flash memory introduces flexibility to the system.
- 22 Different derivative devices may be configured depending on the customer needs:
- either by ST during the manufacturing or packaging process,
  - or by the customer during the packaging, composite product integration, or personalisation process.
- 23 The derivative devices all share the same hardware design and the same maskset (denoted by the Master identification number). The Master identification number is unique for all product configurations.
- 24 The configuration of the derivative devices is realized in Admin configuration, by ST or by the customer. It can impact the available NVM size, IOs, the availability of Nescrypt, AES accelerator, EDES+ accelerator, Crypto1, and the availability of the LPU, as detailed here below:

**Table 2. Derivative devices configuration possibilities**

Features	Possible values
NVM size	Selectable by 128 Kbytes granularity from 2048 Kbytes to 512 Kbytes
I2C	Active, Inactive
IART	Active, Inactive
SWP	Active, Inactive
SPI	Active, Inactive
Nescrypt	Active, Inactive
AES accelerator (HW_AES)	Active, Inactive
EDES+ accelerator	Active, Inactive
Library Protection Unit (LPU)	Active, Inactive
Crypto1	Active, Inactive

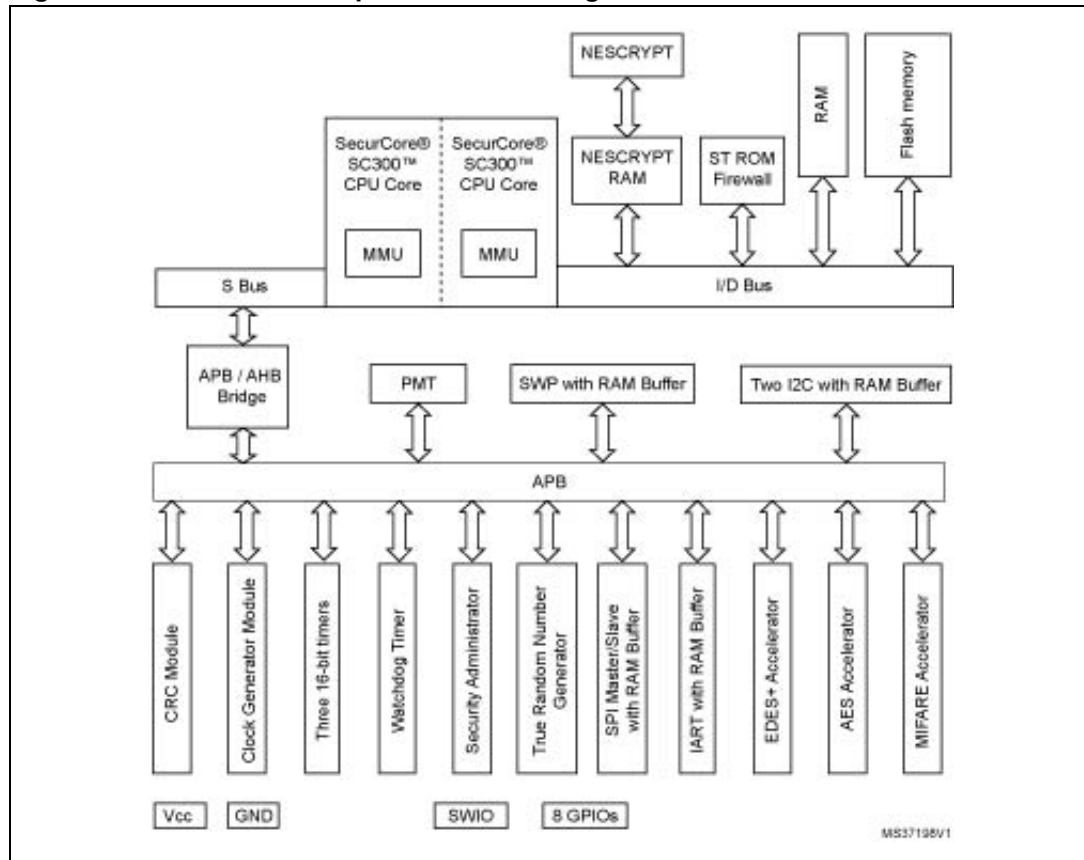
- 25 All combinations of different features values are possible and covered by this certification. All possible configurations can vary under a unique IC, and without impact on security.
- 26 The Master identification number is unique for all product configurations. Each derivative device has a specific Child product identification number, also part of the product information, and specified in the Data Sheet and in the Firmware User Manual, referenced in [Table 15](#).
- 27 The rest of this document applies to all possible configuration of the TOE, with or without NesLib or MIFARE4Mobile libraries, except when a restriction is mentioned. For easier reading, the restrictions are typeset as [indicated here](#).
- 28 Note that the IC version I with Firmware version 3.2.5 is not in the scope of this evaluation.
- 29 In a few words, the ST33J2M0 D01 offers a unique combination of high performances and very powerful features for high level security:
- Two instances of the SecurCore® SC300™ CPU connected in Lockstep mode,
  - Die integrity,
  - Monitoring of environmental parameters,
  - Protection mechanisms against faults,
  - AIS20/AIS31 class PTG.2 compliant True Random Number Generator,
  - Memory Management Unit,
  - CRC calculation block,
  - optional Hardware Security Enhanced DES accelerator,
  - optional Hardware Security AES accelerator,
  - optional NExt Step CRYPTography accelerator (NESCRYPT),
  - optional cryptographic library,
  - optional secure MIFARE4Mobile® library.

## 1.6 TOE description

### 1.6.1 TOE hardware description

- 30 The TOE features hardware accelerators for advanced cryptographic functions, with built-in countermeasures against side channel and fault attacks.
- 31 If **AES is active**, the AES (Advanced Encryption Standard) accelerator provides a high-performance implementation of AES-128, AES-192 and AES-256 algorithms. It can operate in ECB (Electronic Code Book) and CBC (Cipher Block Chaining) mode.
- 32 If **EDES+ is active**, the 3-key triple DES accelerator (EDES+) supports efficiently the Data Encryption Standard (TDES [2]), enabling DES computation. It can operate in ECB (Electronic Code Book) and CBC (Cipher Block Chaining) mode.  
Note that a triple DES can be performed by a triple DES computation or by 3 single DES computations.
- 33 If **Nescrypt is active**, the NESCRYPT crypto-processor allows fast and secure implementation of the most popular public key cryptosystems with a high level of performance ([7], [12], [15],[16], [17], [18]).
- 34 The TOE offers 50 Kbytes of User RAM and up to 2048 Kbytes of secure User high-density Flash memory (NVM). A memory management unit (MMU) allows to use virtual addressing on these memories, and enables the user to define its own region organization with specific protection and access permissions.
- 35 As randomness is a key stone in many applications, the ST33J2M0 D01 features a highly reliable True Random Number Generator (TRNG), compliant with PTG.2 Class of AIS20/AIS31 [1] and directly accessible thru dedicated registers.
- 36 The TOE also provides a 16- and 32-bit ISO 3309 CRC calculation block (compliant to ISO13239, IEEE 802.3, etc.).
- 37 The ST33J2M0 D01 offers a serial communication interface fully compatible with the ISO/IEC 7816-3 standard (T=0, T=1) and a single-wire protocol (SWP) interface for communication with a near field communication (NFC) router in Secure Element applications.  
Two I2C Master/Slave interfaces are available as well as an SPI Master/Slave interface for communication in non-SIM applications.  
Three general-purpose 16-bit timers as well as a watchdog timer are available.  
**All these IOs are configurable** as detailed in [Table 2: Derivative devices configuration possibilities](#).
- 38 The detailed features of this TOE are described in the Data Sheet and in the Cortex SC300 Technical Reference Manual, referenced in [Table 15](#).
- 39 [Figure 1](#) provides an overview of the ST33J2M0 D01 platform.

Figure 1. ST33J2M0 D01 platform block diagram



### 1.6.2 TOE software description

40 The OST ROM contains a Dedicated Software which provides full test capabilities (operating system for test, called "OST"), not accessible by the Security IC Embedded Software (ES), after TOE delivery.

41 The System ROM and ST NVM of the TOE contain a Dedicated Software (Firmware) which provides:

- a Secure Flash Loader, enabling to securely and efficiently download the Security IC Embedded Software (ES) into the NVM. It also allows the evaluator to load software into the TOE for test purpose. The Secure Flash Loader is available in Admin configuration. The customer can choose to activate it in any phase of the product life-cycle under highly secured conditions, or to deactivate it definitely at a certain step.
- low-level functions called Flash Drivers, enabling the Security IC Embedded Software (ES) to modify and manage the NVM contents. The Flash Drivers are available in User configuration.
- a set of protected commands for device testing and product profiling, not intended for the Security IC Embedded Software (ES) usage, and not available in User configuration.
- a very reduced set of uncritical commands for basic diagnostic purpose (field return analysis), only reserved to STMicroelectronics.
- a set of highly protected commands for secure diagnostic purpose (advanced quality investigations), that can only be activated by the customer and be operated by

STMicroelectronics on its own audited sites. This feature is protected by specific strong access control, completed by environmental measures which prevent access to customer assets. Furthermore, it can be permanently deactivated by the customer.

42 The Security IC Embedded Software (ES) is in User NVM.

The TOE optionally comprises a specific application in User NVM: this applicative Embedded Software is a cryptographic library called NesLib. NesLib is a cutting edge cryptographic library in terms of security and performance.

NesLib is embedded by the ES developer in his applicative code.

Note that the NesLib RSA, ECC and Diffie-Hellman functions can only be used if **Nescrypt is active**, the NesLib AES functions can only be used if the **AES accelerator is active** and the NesLib EDES functions can only be used if the **EDES+ accelerator is active**.

NesLib is a cryptographic toolbox supporting the most common standards and protocols:

- an asymmetric key cryptographic support module, supporting secure modular arithmetic with large integers, with specialized functions for Rivest, Shamir & Adleman Standard cryptographic algorithm (RSA [17]), and Diffie-Hellman [23],
- an asymmetric key cryptographic support module that provides very efficient basic functions to build up protocols using Elliptic Curves Cryptography on prime fields GF(p) with elliptic curves in short Weierstrass form [15], and provides support for ECDH key agreement [21] and ECDSA generation and verification [5].
- a module for supporting elliptic curve cryptography on Edwards curve 25519, in particular ed25519 signature generation, verification and point decompression [26].
- a cryptographic support module that provides secure hash functions (SHA-1<sup>(a)</sup>, SHA-2 [4], SHA-3, Keccak and a toolbox for cryptography based on Keccak-p, the permutation underlying SHA-3 [25],
- a symmetric key cryptographic support module whose base algorithm is the Data Encryption Standard cryptographic algorithm (DES) [2],
- a symmetric key cryptographic support module whose base algorithm is the Advanced Encryption Standard cryptographic algorithm (AES) [6],
- support for Deterministic Random Bit Generators [19],
- prime number generation and RSA key pairs generation [3].

43 The TOE optionally comprises a specific application in User NVM: this applicative Embedded Software is MIFARE4Mobile®, a MIFARE technology library [30].

This library is configurable according to the customer's choice. It can include MIFARE Classic®, or MIFARE® DESFire® EV1, or both.

The part of MIFARE4Mobile® featuring MIFARE® DESFire® EV1 is in the scope of this evaluation while the part of MIFARE4Mobile® featuring MIFARE Classic® is not in the scope of this evaluation.

M4M-DESFire features a mutual three pass authentication, a data encryption on RF channel, and a flexible self-securing file system.

Note that:

- MIFARE4Mobile can only be used if the **LPU** is active.
- M4M-DESFire can only be used if the **EDES+ accelerator** and the **AES accelerator** are

a. Note that SHA-1 is no longer recommended as a cryptographic function in the context of smart card applications. Hence, Security IC Embedded Software may need to use another SHA to achieve a suitable strength.



active.

- M4M-Classic can only be used if the [Crypto1](#) is active (this hardware cryptographic accelerator is dedicated to MIFARE Classic support, thus not in the scope of this evaluation).

44 In this Security Target, the terms:

- "M4M" means MIFARE4Mobile<sup>(b)</sup>,
- "M4M-DESFire" denotes the part of MIFARE4Mobile<sup>(b)</sup> featuring MIFARE<sup>(c)</sup> DESFire<sup>(c)</sup> EV1<sup>(c)</sup>,
- "M4M-Classic" denotes the part of MIFARE4Mobile<sup>(b)</sup> featuring MIFARE Classic<sup>(d)</sup>.

45 **Note: The ES is not part of the TOE and is out of scope of the evaluation, except NesLib and M4M-DESFire, when they are embedded.**

### 1.6.3 TOE documentation

46 The user guidance documentation, part of the TOE, consists of:

- the product Data Sheet and die description,
- the product family Security Guidance,
- the AIS31 user manuals,
- the product family programming manual,
- the ARM SC300 Technical Reference Manual,
- the Firmware user manual,
- optionally the NesLib user manual,
- optionally the MIFARE4Mobile.

47 The complete list of guidance documents is detailed in [Table 15](#).

### 1.6.4 Delivery format and method

48 The IC part of the TOE can be delivered in form of wafers, micromodules or packages, as described in the Data Sheet referenced in [Table 15](#).

All the possible forms of delivery are equivalent from a security point of view.

49 The firmware is integrated on the IC before delivery, as well as the MIFARE libraries.

50 The NesLib library is delivered in form of a ciphered binary file, so that the ES developer embeds it, linked to his applicative code.

51 All the guidance documents are delivered as ciphered pdf files.

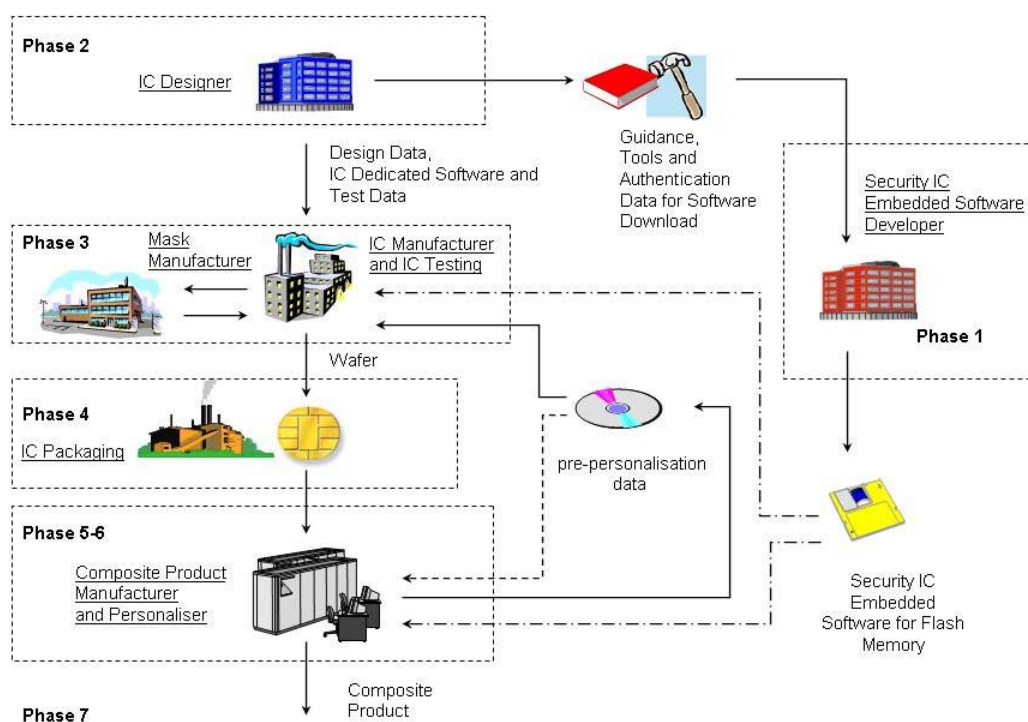
## 1.7 TOE life cycle

52 This Security Target is fully conform to the claimed PP. In the following, just a summary and some useful explanations are given. For complete details on the TOE life cycle, please refer to the [Eurosmart - Security IC Platform Protection Profile with Augmentation Packages \(BSI-CC-PP-0084-2014\)](#), section 1.2.3.

- b. MIFARE4Mobile is a registered trademark of NXP B.V. and is used under license.
- c. MIFARE DESFire are registered trademarks of NXP B.V. and are used under license.
- d. MIFARE and MIFARE Classic are registered trademarks of NXP B.V. and are used under license.

53 The composite product life cycle is decomposed into 7 phases. Each of these phases has the very same boundaries as those defined in the claimed protection profile.

**Figure 2. Security IC Life-Cycle if Security IC Embedded Software is loaded by Security IC Dedicated Software into the programmable non-volatile Memory**



54 The life cycle phases are summarized in [Table 3](#).

55 The sites potentially involved in the TOE life cycle are listed in [Table 16](#).

56 The limit of the evaluation corresponds to phases 2, 3 and optionally 4, including the delivery and verification procedures of phase 1, and the TOE delivery either to the IC packaging manufacturer or to the composite product integrator ; procedures corresponding to phases 1, 5, 6 and 7 are outside the scope of this evaluation.

57 In the following, the term "Composite product manufacturing" is uniquely used to indicate phases 1, optionally 4, 5 and 6 all together. This ST also uses the term "Composite product manufacturer" which includes all roles responsible of the TOE during phases 1, optionally 4, 5 and 6.

58 The TOE is delivered after phase 3 in form of wafers or after phase 4 in packaged form, depending on the customer's order.

- 59 In the following, the term "TOE delivery" is uniquely used to indicate:
- after phase 3 (or before phase 4) if the TOE is delivered in form of wafers or sawn wafers (dice) or
  - after phase 4 (or before phase 5) if the TOE is delivered in form of packaged products.
- 60 The TOE is delivered in Admin (aka Issuer) or User configuration.

**Table 3. Composite product life cycle phases**

Phase	Name	Description
1	Security IC embedded software development	security IC embedded software development specification of IC pre-personalization requirements
2	IC development	IC design IC dedicated software development
3	IC manufacturing and testing	integration and photomask fabrication IC manufacturing IC testing IC pre-personalisation
4	IC packaging	security IC packaging (and testing) pre-personalisation if necessary
5	Security IC product finishing process	composite product finishing process composite product testing
6	Security IC personalisation	composite product personalisation composite product testing
7	Security IC end usage	composite product usage by its issuers and consumers

## 1.8 TOE environment

- 61 Considering the TOE, three types of environments are defined:
- Development environment corresponding to phase 2,
  - Production environment corresponding to phase 3 and optionally 4,
  - Operational environment, including phase 1 and from phase 4 or 5 to phase 7.

### 1.8.1 TOE Development Environment

- 62 To ensure security, the environment in which the development takes place is secured with controllable accesses having traceability. Furthermore, all authorized personnel involved fully understand the importance and the strict implementation of defined security procedures.
- 63 The development begins with the TOE's specification. All parties in contact with sensitive information are required to abide by Non-Disclosure Agreements.
- 64 Design and development of the IC then follows, together with the dedicated and engineering software and tools development. The engineers use secure computer systems (preventing unauthorized access) to make their developments, simulations, verifications and generation of the TOE's databases. Sensitive documents, files and tools, databases on tapes, and

printed circuit layout information are stored in appropriate locked cupboards/safe. Of paramount importance also is the disposal of unwanted data (complete electronic erasures) and documents (e.g. shredding).

65 The development centres possibly involved in the development of the TOE are denoted by the activity "DEV" in [Table 16](#).

66 Reticules and photomasks are generated from the verified IC databases; the former are used in the silicon Wafer-fab processing. As reticules and photomasks are generated off-site, they are transported and worked on in a secure environment. During the transfer of sensitive data electronically, procedures are established to ensure that the data arrive only at the destination and are not accessible at intermediate stages (e.g. stored on a buffer server where system administrators make backup copies).

67 The authorized sub-contractors potentially involved in the TOE mask manufacturing are denoted by the activity "MASK" in [Table 16](#).

### 1.8.2 TOE production environment

68 As high volumes of product commonly go through such environments, adequate control procedures are necessary to account for all product at all stages of production.

69 Production starts within the Wafer-fab; here the silicon wafers undergo the diffusion processing. Computer tracking at wafer level throughout the process is commonplace. The wafers are then taken into the test area. Testing and pre-personalization of each TOE occurs to assure conformance with the device specification and to load the customer information.

70 The authorized front-end plant possibly involved in the manufacturing of the TOE are denoted by the activity "FE" in [Table 16](#).

71 The authorized EWS plant potentially involved in the testing of the TOE are denoted by the activity "EWS" in [Table 16](#).

72 Wafers are then scribed and broken such as to separate the functional from the non-functional ICs. The latter is discarded in a controlled accountable manner. The good ICs are then packaged in phase 4, in a back-end plant. When testing, programming or deliveries are done offsite, ICs are transported and worked on in a secure environment with accountability and traceability of all (good and bad) products.

73 When the product is delivered after phase 4, the authorized back-end plants possibly involved in the packaging of the TOE are denoted by the activity "BE" in [Table 16](#).

74 All sites denoted by the activity "WHS" in [Table 16](#) can be involved for the logistics.

### 1.8.3 TOE operational environment

75 A TOE operational environment is the environment of phases 1, optionally 4, then 5 to 7.

76 At phases 1, 4, 5 and 6, the TOE operational environment is a controlled environment.

77 End-user environments (phase 7): composite products are used in a wide range of applications to assure authorized conditional access. Examples of such are banking cards, brand protection, portable communication SIM cards, health cards, transportation cards, access management, identity and passport cards. The end-user environment therefore covers a wide range of very different functions, thus making it difficult to avoid and monitor any abuse of the TOE.

## 2 Conformance claims (ASE\_CCL, ASE\_ECD)

### 2.1 Common Criteria conformance claims

78 The ST33J2M0 D01 platform Security Target claims to be conformant to the Common Criteria version 3.1 revision 5.

79 Furthermore it claims to be CC Part 2 ([CCMB-2017-04-002](#)) extended and CC Part 3 ([CCMB-2017-04-003](#)) conformant.

80 The extended Security Functional Requirements are those defined in the [Eurosmart - Security IC Platform Protection Profile with Augmentation Packages \(BSI-CC-PP-0084-2014\)](#):

- **FCS\_RNG** Generation of random numbers,
- **FMT\_LIM** Limited capabilities and availability,
- **FAU\_SAS** Audit data storage,
- **FDP\_SDC** Stored data confidentiality,
- **FIA\_API** Authentication proof of identity .

The reader can find their certified definitions in the text of the "[BSI-CC-PP-0084-2014](#)" Protection Profile.

81 The assurance level for the ST33J2M0 D01 platform Security Target is **EAL 5** augmented by ADV\_IMP.2, ADV\_INT.3, ADV\_TDS.5, ALC\_CMC.5, ALC\_DVS.2, ALC\_FLR.1, ALC\_TAT.3, ASE\_TSS.2, ATE\_COV.3, ATE\_FUN.2 and AVA\_VAN.5.

### 2.2 PP Claims:

#### 2.2.1 PP Reference

82 The ST33J2M0 D01 platform Security Target claims strict conformance to the [Eurosmart - Security IC Platform Protection Profile with Augmentation Packages \(BSI-CC-PP-0084-2014\)](#), for the part of the TOE covered by this PP (Security IC), as required by this Protection Profile.

83 The following packages have been selected from the [BSI-CC-PP-0084-2014](#):

- Package "Authentication of the Security IC",
- Packages for Loader:
  - Package 1: Loader dedicated for usage in Secured Environment only,
  - Package 2: Loader dedicated for usage by authorized users only.

## 2.2.2 PP Additions

84 The main additions operated on the [BSI-CC-PP-0084-2014](#) are:

- Addition #4: “Area based Memory Access Control” from [AUG](#),
- Addition #1: “Support of Cipher Schemes” from [AUG](#),
- Specific additions for the Loader, to comply with [JIL SRFPDCL](#) and [ANSSI-CC-CER/F/06.003](#),
- Specific additions for the Secure Diagnostic capability,
- Specific additions for M4M,
- Refinement of assurance requirements.

85 All refinements are indicated with type setting text **as indicated here**, original text from the [BSI-CC-PP-0084-2014](#) being typeset **as indicated here** or **here**. Text originating in [AUG](#) is typeset **as indicated here**. Text originating in [JIL SRFPDCL](#) and [ANSSI-CC-CER/F/06.003](#) is typeset **as indicated here**.

86 The security environment additions relative to the PP are summarized in [Table 4](#).

87 The additional security objectives relative to the PP are summarized in [Table 5](#).

88 A simplified presentation of the TOE Security Policy (TSP) is added.

89 The additional SFRs for the TOE relative to the PP are summarized in [Table 7](#).

90 The additional SARs relative to the PP are summarized in [Table 10](#).

## 2.2.3 PP Claims rationale

91 The differences between this Security Target security objectives and requirements and those of [BSI-CC-PP-0084-2014](#), to which conformance is claimed, have been identified and justified in [Section 4](#) and in [Section 5](#). They have been recalled in the previous section.

92 In the following, the statements of the security problem definition, the security objectives, and the security requirements are consistent with those of the [BSI-CC-PP-0084-2014](#).

93 The security problem definition presented in [Section 3](#), clearly shows the additions to the security problem statement of the PP.

94 The security objectives rationale presented in [Section 4.3](#) clearly identifies modifications and additions made to the rationale presented in the [BSI-CC-PP-0084-2014](#).

95 Similarly, the security requirements rationale presented in [Section 5.4](#) has been updated with respect to the protection profile.

96 All PP requirements have been shown to be satisfied in the extended set of requirements whose completeness, consistency and soundness have been argued in the rationale sections of the present document.

### 3 Security problem definition (ASE\_SPD)

- 97 This section describes the security aspects of the environment in which the TOE is intended to be used and addresses the description of the assets to be protected, the threats, the organisational security policies and the assumptions.
- 98 Note that the origin of each security aspect is clearly identified in the prefix of its label. Most of these security aspects can therefore be easily found in the *Eurosmart - Security IC Platform Protection Profile with Augmentation Packages (BSI-CC-PP-0084-2014)*, section 3. Only those originating in *AUG* or in *JIL SRFPDCL / ANSSI-CC-CER/F/06.003*, and the ones introduced in this Security Target, are detailed in the following sections.
- 99 A summary of all these security aspects and their respective conditions is provided in *Table 4*.

**Table 4. Summary of security aspects**

	Label	Title
TOE threats	BSI.T.Leak-Inherent	Inherent Information Leakage
	BSI.T.Phys-Probing	Physical Probing
	BSI.T.Malfunction	Malfunction due to Environmental Stress
	BSI.T.Phys-Manipulation	Physical Manipulation
	BSI.T.Leak-Forced	Forced Information Leakage
	BSI.T.Abuse-Func	Abuse of Functionality
	BSI.T.RND	Deficiency of Random Numbers
	BSI.T.Masquerade-TOE	Masquerade the TOE
	AUG4.T.Mem-Access	Memory Access Violation
	ANSSI.T.Open-Samples-Diffusion	Diffusion of open samples
	T.Data-Modification-DESFire	Unauthorized data modification for M4M-DESFire
	T.Impersonate-DESFire	Impersonating authorized users during authentication for M4M-DESFire
	T.Cloning-DESFire	Cloning for M4M-DESFire
	T.Confid-Applic-Code-DESFire	M4M-DESFire code confidentiality
	T.Confid-Applic-Data-DESFire	M4M-DESFire data confidentiality
	T.Integ-Applic-Code-DESFire	M4M-DESFire code integrity
	T.Integ-Applic-Data-DESFire	M4M-DESFire data integrity
	T.Resource-DESFire	M4M-DESFire resource unavailability

Table 4. Summary of security aspects (continued)

	Label	Title
OSPs	BSI.P.Process-TOE	Protection during TOE Development and Production
	BSI.P.Lim-Block-Loader	Limiting and blocking the loader functionality
	BSI.P.Ctrl-Loader	Controlled usage to Loader Functionality
	AUG1.P.Add-Functions	Additional Specific Security Functionality (Cipher Scheme Support)
	P.Confidentiality	Confidentiality during communication for M4M-DESFire
	P.Transaction	Transaction mechanism for M4M-DESFire
	P.No-Trace-DESFire	Un-traceability of end-users for M4M-DESFire
	P.Resp-Appl	Treatment of user data
Assumptions	BSI.A.Process-Sec-IC	Protection during Packaging, Finishing and Personalisation
	BSI.A.Resp-Appl	Treatment of User Data
	A.Secure-Values-DESFire	Usage of secure values for M4M-DESFire
	A.Terminal-Support-DESFire	Terminal support to ensure integrity and confidentiality for M4M-DESFire
	A.M4MFramework-Identification	Identification by M4M Framework

### 3.1 Description of assets

100 Since this Security Target claims strict conformance to the [Eurosmart - Security IC Platform Protection Profile with Augmentation Packages \(BSI-CC-PP-0084-2014\)](#), the assets defined in section 3.1 of the Protection Profile are applied and the assets regarding threats are clarified in this Security Target.

101 The assets regarding the threats are:

- logical design data, physical design data, IC Dedicated Software, and configuration data,
- Initialisation data and pre-personalisation data, specific development aids, test and characterisation related data, material for software development support, and photomasks and product in any form,
- the TOE correct operation,
- the Security IC Embedded Software, stored in the TOE's protected memories and in operation,
- the security services provided by the TOE for the Security IC Embedded Software,
- the cryptographic co-processors for Triple-DES and AES, the random number generator,
- when M4M-DESFire is embedded, the special functions for the communication with an external interface device,
- the User Data comprising, especially when M4M-DESFire is embedded,
  - authentication data like keys,
  - issuer data like card holder name or processing options,
  - representation of monetary values, e.g. a stored value for transport applications,
- the TSF Data.



102 This Security Target includes optionally Security IC Embedded Software and therefore does contain more assets compared to [BSI-CC-PP-0084-2014](#). These assets are described above.

103 Application note:  
The TOE providing a functionality for Security IC Embedded Software secure loading into NVM, the ES is considered as User Data being stored in the TOE's memories at this step, and the Protection Profile corresponding packages are integrated, as well as the requirements from [JIL SRFPDCL](#).

### **3.2 Threats**

104 The threats are described in the [BSI-CC-PP-0084-2014](#), section 3.2. Only those originating in [AUG](#), [ANSSI-CC-CER/F/06.003](#), and those related to M4M-DESFire are detailed in the following section.

- [BSI.T.Leak-Inherent](#)      [Inherent Information Leakage](#)
- [BSI.T.Phys-Probing](#)      [Physical Probing](#)
- [BSI.T.Malfunction](#)      [Malfunction due to Environmental Stress](#)
- [BSI.T.Phys-Manipulation](#)      [Physical Manipulation](#)
- [BSI.T.Leak-Forced](#)      [Forced Information Leakage](#)
- [BSI.T.Abuse-Func](#)      [Abuse of Functionality](#)
- [BSI.T.RND](#)      [Deficiency of Random Numbers](#)
- [BSI.T.Masquerade-TOE](#)      [Masquerade the TOE](#)

AUG4.T.Mem-Access Memory Access Violation:

Parts of the **Security IC** Embedded Software may cause security violations by accidentally or deliberately accessing restricted data (which may include code). Any restrictions are defined by the security policy of the specific application context and must be implemented by the **Security IC** Embedded Software.

Clarification: This threat does not address the proper definition and management of the security rules implemented by the Security IC Embedded Software, this being a software design and correctness issue. This threat addresses the reliability of the abstract machine targeted by the software implementation. To avert the threat, the set of access rules provided by this TOE should be undefeated if operated according to the provided guidance. The threat is not realized if the Security IC Embedded Software is designed or implemented to grant access to restricted information. It is realized if an implemented access denial is granted under unexpected conditions or if the execution machinery does not effectively control a controlled access.

Here the attacker is expected to (i) take advantage of flaws in the design and/or the implementation of the TOE memory access rules (refer to BSI.T.Abuse-Func but for functions available after TOE delivery), (ii) introduce flaws by forcing operational conditions (refer to BSI.T.Malfunction) and/or by physical manipulation (refer to BSI.T.Phys-Manipulation). This attacker is expected to have a high level potential of attack.

ANSSI.T.Open-Samples-Diffusion

Diffusion of open samples:

An attacker may get access to open samples of the TOE and use them to gain information about the TSF (loader, memory management unit, ROM code, ...). He may also use the open samples to characterize the behavior of the IC and its security functionalities (for example: characterization of side channel profiles, perturbation cartography, ...). The execution of a dedicated security features (for example: execution of a DES computation without countermeasures or by de-activating countermeasures) through the loading of an adequate code would allow this kind of characterization and the execution of enhanced attacks on the IC.

105 The following additional threats are related to M4M-DESFire. They are valid in case M4M-DESFire is embedded in the TOE.

T.Data-Modification-DESFire

Unauthorized data modification for M4M-DESFire:

User data stored by the TOE may be modified by unauthorized subjects. This threat applies to the processing of modification commands received by the TOE, it is not concerned with verification of authenticity.

T.Impersonate-DESFire	<p>Impersonating authorized users during authentication for M4M-DESFire:</p> <p>An unauthorized subject may try to impersonate an authorized subject during the authentication sequence, e.g. by a man-in-the middle or replay attack.</p>
T.Cloning-DESFire	<p>Cloning for M4M-DESFire:</p> <p>User and TSF data stored on the TOE (including keys) may be read out by an unauthorized subject in order to create a duplicate.</p>
T.Confid-Applic-Code-DESFire	<p>M4M-DESFire code confidentiality:</p> <p>M4M-DESFire Licensed product code must be protected against unauthorized disclosure. This relates to attacks at runtime to gain read or compare access to memory area where the M4M-DESFire licensed product executable code is stored. The attacker executes an application to disclose code belonging to M4M-DESFire Licensed product.</p>
T.Confid-Applic-Data-DESFire	<p>M4M-DESFire data confidentiality:</p> <p>M4M-DESFire Licensed product data must be protected against unauthorized disclosure. This relates to attacks at runtime to gain read or compare access to the M4M-DESFire licensed product data by another application. For example, the attacker executes an application that tries to read data belonging to M4M-DESFire Licensed product.</p>
T.Integ-Applic-Code-DESFire	<p>M4M-DESFire code integrity:</p> <p>M4M-DESFire Licensed product code must be protected against unauthorized modification. This relates to attacks at runtime to gain write access to memory area where the M4M-DESFire licensed product executable code is stored. The attacker executes an application that tries to alter (part of) the M4M-DESFire code.</p>
T.Integ-Applic-Data-DESFire	<p>M4M-DESFire data integrity:</p> <p>M4M-DESFire Licensed product data must be protected against unauthorized modification. This relates to attacks at runtime to gain write access to the M4M-DESFire Licensed product data by another application. The attacker executes an application that tries to alter (part of) the M4M-DESFire Licensed product data.</p>
T.Resource-DESFire	<p>M4M-DESFire resource unavailability:</p> <p>The availability of resources for the M4M-DESFire Licensed product shall be controlled to prevent denial of service or malfunction. An attacker prevents correct execution of M4M-DESFire through consumption of some resources of the card: e.g. RAM or non volatile RAM.</p>

### 3.3 Organisational security policies

106 The TOE provides specific security functionality that can be used by the **Security IC Embedded Software**. In the following specific security functionality is listed which is not

derived from threats identified for the TOE's environment because it can only be decided in the context of the **Security IC** application, against which threats the **Security IC** Embedded Software will use the specific security functionality.

107 ST applies the Protection policy during TOE Development and Production (*BSI.P.Process-TOE*) as specified below.

108 *BSI.P.Lim-Block-Loader* and *BSI.P.Ctrl-Loader* are dedicated to the Secure Flash Loader, and described in the *BSI-CC-PP-0084-2014* packages "Loader dedicated for usage in secured environment only" and "Loader dedicated for usage by authorized users only". *BSI.P.Ctrl-Loader* has been completed in accordance with *JIL SRFPDCL*.

109 **ST** applies the Additional Specific Security Functionality policy (*AUG1.P.Add-Functions*) as specified below.

110 New Organisational Security Policies (OSPs) are defined here below:

111 P.Confidentiality, P.Transaction and P.No-Trace-DESFire are related to *M4M-DESFire*, and valid in case *M4M-DESFire* is embedded in the TOE.

112 P.Resp-Appl is related to the ES that is part of the evaluation (*NesLib* and/or *M4M-DESFire*), and valid in case *NesLib* or *M4M-DESFire* are embedded in the TOE.

*BSI.P.Process-TOE* Identification during TOE Development and Production:

An accurate identification **is** established for the TOE. This requires that each instantiation of the TOE carries this unique identification.

*BSI.P.Lim-Block-Loader* Limiting and blocking the loader functionality:

The composite manufacturer uses the Loader for loading of Security IC Embedded Software, user data of the Composite Product or IC Dedicated Support Software in charge of the IC Manufacturer. He limits the capability and blocks the availability of the Loader<sup>(1)</sup> in order to protect stored data from disclosure and manipulation.

1. Note that blocking the Loader is not required, as only authorized users can use the Loader as stated in *BSI.P.Ctrl-Loader*.

BSI.P.Ctrl-Loader

Controlled usage to Loader Functionality:

Authorized user controls the usage of the Loader functionality in order to protect stored and loaded user data from disclosure and manipulation.

The activation of the loaded Additional Code ~~Code~~ **user data** is possible if:

- integrity and authenticity of the Additional Code ~~Code~~ **user data** have been successfully checked;
- the loaded Additional Code ~~Code~~ **user data** is targeted to the Initial TOE (Identification Data of the Additional Code ~~Code~~ **user data** and the Initial TOE will be used for this check).

Identification Data of the resulting Final TOE shall identify the Initial TOE and the ~~activated~~ Additional Code ~~Code~~ **user data**. Identification Data shall be protected in integrity.

Note: Here, the term TOE denotes the TOE itself as well as the composite TOE which both may be maintained by loading of data.

AUG1.P.Add-Functions

Additional Specific Security Functionality:

The TOE shall provide the following specific security functionality to the Security IC Embedded Software:

- Triple Data Encryption Standard (TDES), if EDES+ is active,
- Advanced Encryption Standard (AES), if AES is active,
- **Elliptic Curves Cryptography**, if NesLib is embedded,
- **Secure Hashing (SHA-1<sup>(1)</sup>, SHA-2, SHA-3)**, if NesLib is embedded,
- **Keccak**, if NesLib is embedded,
- **Keccak-p**, if NesLib is embedded,
- **Diffie-Hellman**, if NesLib is embedded,
- **Rivest-Shamir-Adleman (RSA)**, if NesLib is embedded,
- **Deterministic Random Bit Generator (DRBG)**, if NesLib is embedded,
- **Prime Number Generation**, if NesLib is embedded.

1. Note that SHA-1 is no longer recommended as a cryptographic function in the context of smart card applications. Hence, Security IC Embedded Software may need to use another SHA to achieve a suitable strength.

P.Confidentiality

Confidentiality during communication for M4M-DESFire:

The TOE shall provide the possibility to protect selected data elements from eavesdropping during contact-less communication. The TOE shall also provide the possibility to detect replay or man-in-the-middle attacks within a session.

P.Transaction

Transaction mechanism for M4M-DESFire:

The TOE shall provide the possibility to combine a number of data modification operations in one transaction, so that either all operations or no operation at all is performed.

P.No-Trace-DESFire	Un-traceability of end-users for M4M-DESFire:  The TOE shall provide the ability that authorized subjects can prevent that end-user of TOE may be traced by unauthorized subjects without consent. Tracing of end-users may happen by performing a contact-less communication with the TOE when the end-user is not aware of it. Typically this involves retrieving the UID or any freely accessible data element.
P.Resp-Appl	Treatment of user data:  The Security IC Embedded Software, part of the TOE, treats user data according to the assumption A.Resp-Appl defined in <a href="#">BSI-CC-PP-0084-2014</a> .

### 3.4 Assumptions

113 The following assumptions are described in the [BSI-CC-PP-0084-2014](#), section 3.4.

<a href="#">BSI.A.Process-Sec-IC</a>	<a href="#">Protection during Packaging, Finishing and Personalisation</a>
<a href="#">BSI.A.Resp-Appl</a>	<a href="#">Treatment of User Data of the Composite TOE</a>

114 The following assumptions are defined for M4M-DESFire only. Thus, they do not contradict with the security problem definition of the [BSI-CC-PP-0084-2014](#), as they are only related to assets which are out of the scope of this PP.

115 In consequence, the addition of these assumptions does not contradict with the strict conformance claim on the [BSI-CC-PP-0084-2014](#).

116 The following assumptions are valid in case [M4M-DESFire](#) is embedded in the TOE.

A.Secure-Values-DESFire Usage of secure values for M4M-DESFire:

Only confidential and secure keys shall be used to set up the authentication and access rights in M4M-DESFire. These values are generated outside the TOE and they are downloaded to the TOE.

A.Terminal-Support-DESFire Terminal support to ensure integrity and confidentiality for M4M-DESFire:

The terminal verifies information sent by the TOE in order to ensure integrity and confidentiality of the communication.

A.M4MFramework-Identification Identification by M4M Framework:

A subject getting access to M4M-DESFire through the M4M host interface is previously identified and authorized as specified in the M4M specification ([M4M specification](#)).

## 4 Security objectives (ASE\_OBJ)

- 117 The security objectives of the TOE cover principally the following aspects:
- integrity and confidentiality of assets,
  - protection of the TOE and associated documentation during development and production phases,
  - provide random numbers,
  - provide cryptographic support and access control functionality.
- 118 A summary of all security objectives is provided in [Table 5](#).
- 119 Note that the origin of each objective is clearly identified in the prefix of its label. Most of these security aspects can therefore be easily found in the [BSI-CC-PP-0084-2014](#), sections 4.1 and 7.3. Only those which have been amended, those originating in [AUG](#), those originating in [JIL SRFPDCL](#), and the ones introduced in this Security Target, are detailed in the following sections.

**Table 5. Summary of security objectives**

	Label	Title
TOE	BSI.O.Leak-Inherent	Protection against Inherent Information Leakage
	BSI.O.Phys-Probing	Protection against Physical Probing
	BSI.O.Malfunction	Protection against Malfunctions
	BSI.O.Phys-Manipulation	Protection against Physical Manipulation
	BSI.O.Leak-Forced	Protection against Forced Information Leakage
	BSI.O.Abuse-Func	Protection against Abuse of Functionality
	BSI.O.Identification	TOE Identification
	BSI.O.RND	Random Numbers
	BSI.O.Cap-Avail-Loader	Capability and Availability of the Loader
	BSI.O.Ctrl_Auth_Loader	Access control and authenticity for the Loader
	ANSSI.O.Prot-TSF-Confidentiality	Protection of the confidentiality of the TSF
	ANSSI.O.Secure-Load-ACode	Secure loading of the Additional Code
	ANSSI.O.Secure-AC-Activation	Secure activation of the Additional Code
	ANSSI.O.TOE-Identification	Secure identification of the TOE
	O.Secure-Load-AMemImage	Secure loading of the Additional Memory Image
	O.MemImage-Identification	Secure identification of the Memory Image
	BSI.O.Authentication	Authentication to external entities
	AUG1.O.Add-Functions	Additional Specific Security Functionality
	AUG4.O.Mem-Access	<b>Dynamic</b> Area based Memory Access Control

Table 5. Summary of security objectives (continued)

	Label	Title
TOE	<i>O.Access-Control-DESFire</i>	Access Control for M4M-DESFire
	<i>O.Authentication-DESFire</i>	Authentication for M4M-DESFire
	<i>O.Confidentiality-DESFire</i>	M4M-DESFire Confidential Communication
	<i>O.Type-Consistency-DESFire</i>	M4M-DESFire Data type consistency
	<i>O.Transaction-DESFire</i>	M4M-DESFire Transaction mechanism
	<i>O.No-Trace-DESFire</i>	Preventing Traceability for M4M-DESFire
	<i>O.Resp-AppI</i>	Treatment of user data for M4M-DESFire
	<i>O.Resource-DESFire</i>	Resource availability for M4M-DESFire
	<i>O.Firewall-DESFire</i>	M4M-DESFire firewall
	<i>O.Shr-Res-DESFire</i>	M4M-DESFire data cleaning for resource sharing
	<i>O.Verification-DESFire</i>	M4M-DESFire code integrity check
Environments	<i>BSI.OE.Resp-AppI</i>	Treatment of User Data of the Composite TOE
	<i>BSI.OE.Process-Sec-IC</i>	Protection during composite product manufacturing
	<i>BSI.OE.Lim-Block-Loader</i>	Limitation of capability and blocking the Loader
	<i>BSI.OE.Loader-Usage</i>	Secure communication and usage of the Loader
	<i>BSI.OE.TOE-Auth</i>	External entities authenticating of the TOE
	<i>OE.Composite-TOE-Id</i>	Composite TOE identification
	<i>OE.TOE-Id</i>	TOE identification
	<i>OE.Enable-Disable-Secure-Diag</i>	Enabling or disabling the Secure Diagnostic
	<i>OE.Secure-Diag-Usage</i>	Secure communication and usage of the Secure Diagnostic
	<i>OE.Secure-Values-DESFire</i>	Generation of secure values for M4M-DESFire
	<i>OE.Terminal-Support-DESFire</i>	Terminal support to ensure integrity and confidentiality for M4M-DESFire
<i>OE.M4MFramework-Identification</i>	Identification by M4M Framework	

## 4.1 Security objectives for the TOE

<i>BSI.O.Leak-Inherent</i>	Protection against Inherent Information Leakage
<i>BSI.O.Phys-Probing</i>	Protection against Physical Probing
<i>BSI.O.Malfunction</i>	Protection against Malfunctions
<i>BSI.O.Phys-Manipulation</i>	Protection against Physical Manipulation
<i>BSI.O.Leak-Forced</i>	Protection against Forced Information Leakage



BSI.O.Abuse-Func	Protection against Abuse of Functionality
BSI.O.Identification	TOE Identification
BSI.O.RND	Random Numbers
BSI.O.Cap-Avail-Loader	Capability and Availability of the Loader
BSI.O.Ctrl-Auth-Loader	Access control and authenticity for the Loader
BSI.O.Authentication	Authentication to external entities
ANSSI.O.Prot-TSF-Confidentiality	<p>Protection of the confidentiality of the TSF:</p> <p>The TOE must provide protection against disclosure of confidential operations of the Security IC (loader, memory management unit, ...) through the use of a dedicated code loaded on open samples.</p>
ANSSI.O.Secure-Load-ACode	<p>Secure loading of the Additional Code:</p> <p>The Loader of the Initial TOE shall check an evidence of authenticity and integrity of the loaded Additional Code. The Loader enforces that only the allowed version of the Additional Code can be loaded on the Initial TOE. The Loader shall forbid the loading of an Additional Code not intended to be assembled with the Initial TOE.</p> <p>During the Load Phase of an Additional Code, the TOE shall remain secure.</p> <p>Note: Concretely, the TOE manages the Additional Code as a Memory Image.</p>
ANSSI.O.Secure-AC-Activation	<p>Secure activation of the Additional Code:</p> <p>Activation of the Additional Code and update of the Identification Data shall be performed at the same time in an Atomic way.</p> <p>All the operations needed for the code to be able to operate as in the Final TOE shall be completed before activation.</p> <p>If the Atomic Activation is successful, then the resulting product is the Final TOE, otherwise (in case of interruption or incident which prevents the forming of the Final TOE), the Initial TOE shall remain in its initial state or fail secure.</p>

**ANSSI.O.TOE-Identification** Secure identification of the TOE:

The Identification Data identifies the Initial TOE and Additional Code. The TOE provides means to store Identification Data in its non-volatile memory and guarantees the integrity of these data.

After Atomic Activation of the Additional Code, the Identification Data of the Final TOE allows identifications of Initial TOE and Additional TOE. The user shall be able to uniquely identify Initial TOE and Additional Code(s) which are embedded in the Final TOE.

**O.Secure-Load-AMemImage** Secure loading of the Additional Memory Image:

The Loader of the TOE shall check an evidence of authenticity and integrity of the loaded Memory Image.

The Loader enforces that only the allowed version of the Additional Memory Image can be loaded after the Initial Memory Image. The Loader shall forbid the loading of an Additional Memory Image not intended to be assembled with the Initial Memory Image.

Note: This objective is similar to ANSSI.O.Secure-Load-ACode, applied to user data (e.g. embedded software).

**O.MemImage-Identification** Secure identification of the Memory Image:

The Identification Data identifies the Initial Memory Image and Additional Memory Image. The TOE provides means to store Identification Data in its non-volatile memory and guarantees the integrity of these data.

Storage of the Additional Memory Image and update of the Identification Data shall be performed at the same time in an Atomic way, otherwise (in case of interruption or incident which prevents this alignment), the Memory Image shall remain in its initial state or the TOE shall fail secure.

The Identification Data of the Final Memory Image allows identifications of Initial Memory Image and Additional Memory Image.

Note: This objective is similar to ANSSI.O.Secure-AC-Activation and ANSSI.O.TOE-Identification, applied to user data (e.g. embedded software).

## AUG1.O.Add-Functions

Additional Specific Security Functionality:

The TOE must provide the following specific security functionality to the **Security IC** Embedded Software:

- Triple Data Encryption Standard (TDES), if **EDES+** is active,
- Advanced Encryption Standard (AES), if **AES** is active,
- **Elliptic Curves Cryptography**, if **NesLib** is embedded,
- **Secure Hashing (SHA-1<sup>(1)</sup>, SHA-2, SHA-3)**, if **NesLib** is embedded,
- **Keccak**, if **NesLib** is embedded,
- **Keccak-p**, if **NesLib** is embedded,
- **Diffie-Hellman**, if **NesLib** is embedded,
- **Rivest-Shamir-Adleman (RSA)**, if **NesLib** is embedded,
- **Deterministic Random Bit Generator (DRBG)**, if **NesLib** is embedded,
- **Prime Number Generation**, if **NesLib** is embedded.

1. Note that SHA-1 is no longer recommended as a cryptographic function in the context of smart card applications. Hence, Security IC Embedded Software may need to use another SHA to achieve a suitable strength.

## AUG4.O.Mem-Access

**Dynamic** Area based Memory Access Control:

The TOE must provide the **Security IC** Embedded Software with the capability to define **dynamic memory segmentation and protection**. The TOE must then enforce **the defined access rules** so that access of software to memory areas is controlled as required, for example, in a multi-application environment.

120

The following objectives are only valid in case **M4M-DESFire** is embedded:

O.Access-Control-DESFire Access Control for M4M-DESFire:

The TOE must provide an access control mechanism for data stored by it. The access control mechanism shall apply to read, modify, create and delete operations for data elements and to reading and modifying security attributes as well as authentication data. It shall be possible to limit the right to perform a specific operation to a specific user. The security attributes (keys) used for authentication shall never be output.

O.Authentication-DESFire Authentication for M4M-DESFire:

The TOE must provide an authentication mechanism in order to be able to authenticate authorized users. The authentication mechanism shall be resistant against replay and man-in-the-middle attacks.

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O.Confidentiality-DESFire	<p>M4M-DESFire Confidential Communication:</p> <p>The TOE must be able to protect the communication by encryption. This shall be implemented by security attributes that enforce encrypted communication for the respective data element. The TOE shall also provide the possibility to detect replay or man-in-the-middle attacks within a session. This shall be implemented by checking verification data sent by the terminal and providing verification data to the terminal.</p>
O.Type-Consistency-DESFire	<p>M4M-DESFire Data type consistency:</p> <p>The TOE must provide a consistent handling of the different supported data types. This comprises over- and underflow checking for values, for data file sizes and record handling.</p>
O.Transaction-DESFire	<p>M4M-DESFire Transaction mechanism:</p> <p>The TOE must be able to provide a transaction mechanism that allows to update multiple data elements either all in common or none of them.</p>
O.No-Trace-DESFire	<p>Preventing Traceability for M4M-DESFire:</p> <p>The TOE must be able to prevent that the TOE end-user can be traced. This shall be done by providing an option that disables the transfer of any information that is suitable for tracing an end-user by an unauthorized subject.</p>
O.Resp-AppI	<p>Treatment of user data:</p> <p>Security relevant User Data (especially cryptographic keys) are treated by the Security IC Embedded Software as required by the security needs of the specific application context. For example the Security IC Embedded Software will not disclose security relevant user data to unauthorized users or processes when communicating with a terminal.</p>
O.Resource-DESFire	<p>Resource availability for M4M-DESFire:</p> <p>The TOE shall control the availability of resources for M4M-DESFire Licensed product.</p>
O.Firewall-DESFire	<p>M4M-DESFire firewall:</p> <p>The TOE shall ensure isolation of data and code between M4M-DESFire and the other applications. An application shall not read, write, compare any piece of data or code belonging to the M4M-DESFire Licensed product.</p>

O.Shr-Res-DESFire	<p>M4M-DESFire data cleaning for resource sharing:</p> <p>It shall be ensured that any hardware resource, that is shared by M4M-DESFire and other applications or by any application which has access to such hardware resource, is always cleaned (using code that is part of the M4M-DESFire system and its certification) whenever M4M-DESFire is interrupted by the operation of another application. The only exception is buffers as long as these buffers do not contain other information than what is communicated over the contactless interface or has a form that is no different than what is normally communicated over the contactless interface.</p> <p>For example, no data shall remain in a hardware cryptographic coprocessor when M4M-DESFire is interrupted by another application.</p>
O.Verification-DESFire	<p>M4M-DESFire code integrity check:</p> <p>The TOE shall ensure that M4M-DESFire code is verified for integrity and authenticity prior being executed.</p>

## 4.2 Security objectives for the environment

121 Security Objectives for the Security IC Embedded Software development environment (phase 1):

BSI.OE.Resp-Appl Treatment of User Data of the Composite TOE

122 Security Objectives for the operational Environment (phase 4 to 7):

BSI.OE.Process-Sec-IC Protection during composite product manufacturing Up to phase 6

BSI.OE.Lim-Block-Loader Limitation of capability and blocking the Loader: Up to phase 6

The Composite Product Manufacturer will protect the Loader functionality against misuse, limit the capability of the Loader and, **if desired**, terminate irreversibly the Loader after intended usage of the Loader.

Note that blocking the Loader is not required, as only authorized users can use the Loader as stated in BSI.P.Ctrl-Loader.

BSI.OE.Loader-Usage	Secure communication and usage of the Loader: Up to phase 7
	<p>The authorized user must support the trusted communication channel with the TOE by confidentiality protection and authenticity proof of the data to be loaded and fulfilling the access conditions required by the Loader.</p> <p>The authorized user must organize the maintenance transactions to ensure that the additional code (loaded as data) is able to operate as in the Final composite TOE. The authorized user must manage and associate unique Identification to the loaded data.</p>
BSI.OE.TOE-Auth	External entities authenticating of the TOE: Up to phase 7
	<p>The operational environment shall support the authentication verification mechanism and know authentication reference data of the TOE.</p>
OE.Composite-TOE-Id	Composite TOE identification: Up to phase 7
	<p>The composite manufacturer must maintain a unique identification of a composite TOE under maintenance.</p>
OE.TOE-Id	TOE identification: Up to phase 7
	<p>The IC manufacturer must maintain a unique identification of the TOE under maintenance.</p>
OE.Enable-Disable-Secure-Diag	Enabling or disabling the Secure Diagnostic: Up to phase 7
	<p>If desired, the Composite Product Manufacturer will enable (or disable) irreversibly the Secure Diagnostic capability, thus enabling the IC manufacturer (or disabling everyone) to exercise the Secure Diagnostic capability.</p>

	OE.Secure-Diag-Usage	Secure communication and usage of the Secure Diagnostic:  The IC manufacturer must support the trusted communication channel with the TOE by fulfilling the access conditions required by the Secure Diagnostic. The IC manufacturer must manage the Secure Diagnostic transactions so that they cannot be used to disclose critical user data of the Composite TOE, manipulate critical user data of the Composite TOE, manipulate Security IC Embedded Software or bypass, deactivate, change or explore security features or security services of the TOE	Up to phase 7
123		This section details the security objectives for the operational environment, related to M4M-DESFire, and to be enforced after TOE delivery up to phase 7.	
124		The following security objectives for the operational environment are only valid if <a href="#">M4M-DESFire</a> is embedded in the TOE:	
	OE.Secure-Values-DESFire	Generation of secure values for M4M-DESFire:  The environment shall generate confidential and secure keys for authentication purpose. These values are generated outside the TOE and they are downloaded to the TOE during the personalisation or usage in phase 5 to 7.	
	OE.Terminal-Support-DESFire	Terminal support to ensure integrity and confidentiality for M4M-DESFire:  The terminal shall verify information sent by the TOE in order to ensure integrity and confidentiality of the communication. This involves checking of MAC values, verification of redundancy information according to the cryptographic protocol and secure closing of the communication session.	
	OE.M4MFramework-Identification	Identification by M4M Framework:  The MIFAREforMobile Framework shall identify and authorize a user getting access to M4M-DESFire through the M4M host interface, as specified in the M4M specification ( <a href="#">M4M specification</a> ).	

### 4.3 Security objectives rationale

- 125 The main line of this rationale is that the inclusion of all the security objectives of the [BSI-CC-PP-0084-2014](#) protection profile, together with those in [AUG](#), and those introduced in

this ST, guarantees that all the security environment aspects identified in [Section 3](#) are addressed by the security objectives stated in this chapter.

126 Thus, it is necessary to show that:

- security environment aspects from [AUG](#) and from this ST, are addressed by security objectives stated in this chapter,
- security objectives from [AUG](#) and from this ST, are suitable (i.e. they address security environment aspects),
- security objectives from [AUG](#) and from this ST, are consistent with the other security objectives stated in this chapter (i.e. no contradictions).

127 The selected augmentations from [AUG](#) introduce the following security environment aspects:

- TOE threat "[Memory Access Violation, \(AUG4.T.Mem-Access\)](#)",
- organisational security policy "[Additional Specific Security Functionality, \(AUG1.P.Add-Functions\)](#)".

128 The augmentation made in this ST introduces the following security environment aspects:

- TOE threats "[Diffusion of open samples, \(ANSSI.T.Open-Samples-Diffusion\)](#)", "[Unauthorized data modification for M4M-DESFire, \(T.Data-Modification-DESFire\)](#)", "[Impersonating authorized users during authentication for M4M-DESFire, \(T.Impersonate-DESFire\)](#)", "[Cloning for M4M-DESFire, \(T.Cloning-DESFire\)](#)", "[M4M-DESFire code confidentiality, \(T.Confid-Applic-Code-DESFire\)](#)", "[M4M-DESFire data confidentiality, \(T.Confid-Applic-Data-DESFire\)](#)", "[M4M-DESFire code integrity, \(T.Integ-Applic-Code-DESFire\)](#)", "[M4M-DESFire data integrity, \(T.Integ-Applic-Data-DESFire\)](#)", and "[M4M-DESFire resource unavailability, \(T.Resource-DESFire\)](#)".
- organisational security policies "[Confidentiality during communication for M4M-DESFire, \(P.Confidentiality\)](#)", "[Transaction mechanism for M4M-DESFire, \(P.Transaction\)](#)", "[Un-traceability of end-users for M4M-DESFire, \(P.No-Trace-DESFire\)](#)", and "[Treatment of user data, \(P.Resp-App\)](#)".
- assumptions "[Usage of secure values for M4M-DESFire, \(A.Secure-Values-DESFire\)](#)", "[Terminal support to ensure integrity and confidentiality for M4M-DESFire, \(A.Terminal-Support-DESFire\)](#)", and "[Identification by M4M Framework, \(A.M4MFramework-Identification\)](#)".

129 The justification of the additional policies, additional threats, and additional assumptions provided in the next subsections shows that they do not contradict to the rationale already given in the protection profile [BSI-CC-PP-0084-2014](#) for the assumptions, policies and threats defined there.

130 In particular, the added assumptions do not contradict with the policies, threats and assumptions of the [BSI-CC-PP-0084-2014](#) Protection Profile, to which strict conformance is claimed, because they are all exclusively related to M4M-DESFire, which are out of the scope of this protection profile.



Table 6. Security Objectives versus Assumptions, Threats or Policies

Assumption, Threat or Organisational Security Policy	Security Objective	Notes
<i>BSI.A.Resp-Appl</i>	<i>BSI.OE.Resp-Appl</i>	Phase 1
<i>BSI.P.Process-TOE</i>	<i>BSI.O.Identification</i>	Phase 2-3 optional Phase 4
<i>BSI.A.Process-Sec-IC</i>	<i>BSI.OE.Process-Sec-IC</i>	Phase 5-6 optional Phase 4
<i>BSI.P.Lim-Block-Loader</i>	<i>BSI.O.Cap-Avail-Loader</i> <i>BSI.OE.Lim-Block-Loader</i>	
<i>BSI.P.Ctrl-Loader</i>	<i>BSI.O.Ctrl_Auth_Loader</i> <i>ANSSI.O.Secure-Load-ACode</i> <i>ANSSI.O.Secure-AC-Activation</i> <i>ANSSI.O.TOE-Identification</i> <i>O.Secure-Load-AMemImage</i> <i>O.MemImage-Identification</i> <i>BSI.OE.Loader-Usage</i> <i>OE.TOE-Id</i> <i>OE.Composite-TOE-Id</i>	
<i>A.Secure-Values-DESFire</i>	<i>OE.Secure-Values-DESFire</i>	
<i>A.Terminal-Support-DESFire</i>	<i>OE.Terminal-Support-DESFire</i>	
<i>A.M4MFramework-Identification</i>	<i>OE.M4MFramework-Identification</i>	
<i>AUG1.P.Add-Functions</i>	<i>AUG1.O.Add-Functions</i>	
<i>P.Confidentiality</i>	<i>O.Confidentiality-DESFire</i> <i>OE.Terminal-Support-DESFire</i>	
<i>P.Transaction</i>	<i>O.Transaction-DESFire</i>	
<i>P.No-Trace-DESFire</i>	<i>O.No-Trace-DESFire</i> <i>O.Access-Control-DESFire</i> <i>O.Authentication-DESFire</i>	
<i>P.Resp-Appl</i>	<i>O.Resp-Appl</i>	
<i>BSI.T.Leak-Inherent</i>	<i>BSI.O.Leak-Inherent</i>	
<i>BSI.T.Phys-Probing</i>	<i>BSI.O.Phys-Probing</i>	
<i>BSI.T.Malfunction</i>	<i>BSI.O.Malfunction</i>	
<i>BSI.T.Phys-Manipulation</i>	<i>BSI.O.Phys-Manipulation</i>	
<i>BSI.T.Leak-Forced</i>	<i>BSI.O.Leak-Forced</i>	

Table 6. Security Objectives versus Assumptions, Threats or Policies (continued)

Assumption, Threat or Organisational Security Policy	Security Objective	Notes
<i>BSI. T.Abuse-Func</i>	<i>BSI. O.Abuse-Func</i> <i>OE.Enable-Disable-Secure-Diag</i> <i>OE.Secure-Diag-Usage</i>	
<i>BSI. T.RND</i>	<i>BSI. O.RND</i>	
<i>BSI. T.Masquerade-TOE</i>	<i>BSI. O.Authentication</i> <i>BSI. OE. TOE-Auth</i>	
<i>AUG4. T.Mem-Access</i>	<i>AUG4. O.Mem-Access</i>	
<i>ANSSI. T.Open-Samples-Diffusion</i>	<i>ANSSI. O.Prot-TSF-Confidentiality</i> <i>BSI. O.Leak-Inherent</i> <i>BSI. O.Leak-Forced</i>	
<i>T.Data-Modification-DESFire</i>	<i>O.Access-Control-DESFire</i> <i>O.Type-Consistency-DESFire</i> <i>OE.Terminal-Support-DESFire</i>	
<i>T.Impersonate-DESFire</i>	<i>O.Authentication-DESFire</i>	
<i>T.Cloning-DESFire</i>	<i>O.Access-Control-DESFire</i> <i>O.Authentication-DESFire</i>	
<i>T.Confid-Applic-Code-DESFire</i>	<i>O.Firewall-DESFire</i>	
<i>T.Confid-Applic-Data-DESFire</i>	<i>O.Firewall-DESFire</i>	
<i>T.Integ-Applic-Code-DESFire</i>	<i>O.Verification-DESFire</i> <i>O.Firewall-DESFire</i>	
<i>T.Integ-Applic-Data-DESFire</i>	<i>O.Shr-Res-DESFire</i> <i>O.Firewall-DESFire</i>	
<i>T.Resource-DESFire</i>	<i>O.Resource-DESFire</i>	

#### 4.3.1 Assumption "Usage of secure values for M4M-DESFire"

131 The justification related to the assumption "Usage of secure values for M4M-DESFire, (*A.Secure-Values-DESFire*)" is as follows:

132 Since *OE.Secure-Values-DESFire* requires from the Administrator, Application Manager or the Application User to use secure values for the configuration of the authentication and access control as assumed in *A.Secure-Values-DESFire*, the assumption is covered by the objective.

133 *A.Secure-Values-DESFire* and *OE.Secure-Values-DESFire* do not contradict with the security problem definition of the *BSI-CC-PP-0084-2014*, because they are only related to M4M-DESFire, which is out of the scope of this protection profile.

#### 4.3.2 Assumption "Terminal support to ensure integrity and confidentiality for M4M-DESFire"

134 The justification related to the assumption "Terminal support to ensure integrity and confidentiality for M4M-DESFire, ([A.Terminal-Support-DESFire](#))" is as follows:

135 The objective [OE.Terminal-Support-DESFire](#) is an immediate transformation of the assumption [A.Terminal-Support-DESFire](#), therefore it covers the assumption.

136 [A.Terminal-Support-DESFire](#) and [OE.Terminal-Support-DESFire](#) do not contradict with the security problem definition of the [BSI-CC-PP-0084-2014](#), because they are only related to M4M-DESFire, which is out of the scope of this protection profile.

#### 4.3.3 Assumption "Identification by M4M Framework"

137 The justification related to the assumption "Identification by M4M Framework, ([A.M4MFramework-Identification](#))" is as follows:

138 The objective [OE.M4MFramework-Identification](#) is an immediate transformation of the assumption [A.M4MFramework-Identification](#), therefore it covers the assumption.

139 [A.M4MFramework-Identification](#) and [OE.M4MFramework-Identification](#) do not contradict with the security problem definition of the [BSI-PP-0084](#), because they are only related to M4M-DESFire, which is out of the scope of this protection profile.

#### 4.3.4 TOE threat "Abuse of Functionality"

140 The justification related to the threat "Abuse of Functionality, ([BSI.T.Abuse-Func](#))" is as follows:

141 The threat [BSI.T.Abuse-Func](#) is directly covered by the security objective [BSI.O.Abuse-Func](#), supported by the security objectives for the operational environment [OE.Enable-Disable-Secure-Diag](#) and [OE.Secure-Diag-Usage](#) for the particular case of the Secure Diagnostic. Therefore [BSI.T.Abuse-Func](#) is covered by these three objectives.

#### 4.3.5 TOE threat "Memory Access Violation"

142 The justification related to the threat "Memory Access Violation, ([AUG4.T.Mem-Access](#))" is as follows:

143 According to [AUG4.O.Mem-Access](#) the TOE must enforce the **dynamic memory segmentation and protection** so that access of software to memory areas is controlled. Any restrictions are to be defined by the **Security IC** Embedded Software. Thereby security violations caused by accidental or deliberate access to restricted data (which may include code) can be prevented (refer to [AUG4.T.Mem-Access](#)). The threat [AUG4.T.Mem-Access](#) is therefore removed if the objective is met.

144 The added objective for the TOE [AUG4.O.Mem-Access](#) does not introduce any contradiction in the security objectives for the TOE.

#### 4.3.6 TOE threat "Diffusion of open samples"

145 The justification related to the threat "Diffusion of open samples, ([ANSSI.T.Open-Samples-Diffusion](#))" is as follows:

146 According to threat [ANSSI.T.Open-Samples-Diffusion](#), the TOE shall provide protection against attacks using open samples of the TOE to characterize the behavior of the IC and its

security functionalities. The objective *ANSSI.O.Prot-TSF-Confidentiality* requires protection against disclosure of confidential operations of the Security IC through the use of a dedicated code loaded on open samples. Additionally, *BSI.O.Leak-Inherent* and *BSI.O.Leak-Forced* ensures protection against disclosure of confidential data processed in the Security IC. Therefore *ANSSI.T.Open-Samples-Diffusion* is covered by these three objectives.

147 The added objective for the TOE *ANSSI.O.Prot-TSF-Confidentiality* does not introduce any contradiction in the security objectives for the TOE.

#### 4.3.7 TOE threat "Unauthorized data modification for M4M-DESFire"

148 The justification related to the threat "Unauthorized data modification for M4M-DESFire, (*T.Data-Modification-DESFire*)" is as follows:

149 According to threat *T.Data-Modification-DESFire*, the TOE shall avoid that user data stored by the TOE may be modified by unauthorized subjects. The objective *O.Access-Control-DESFire* requires an access control mechanism that limits the ability to modify data elements stored by the TOE. *O.Type-Consistency-DESFire* ensures that data types are adhered, so that data cannot be modified by abusing type-specific operations. The terminal must support this by checking the TOE responses, which is required by *OE.Terminal-Support-DESFire*. Therefore *T.Data-Modification-DESFire* is covered by these three objectives.

150 The added objectives for the TOE *O.Access-Control-DESFire* and *O.Type-Consistency-DESFire* do not introduce any contradiction in the security objectives for the TOE.

#### 4.3.8 TOE threat "Impersonating authorized users during authentication for M4M-DESFire"

151 The justification related to the threat "Impersonating authorized users during authentication for M4M-DESFire, (*T.Impersonate-DESFire*)" is as follows:

152 The threat is related to the fact that an unauthorized subject may try to impersonate an authorized subject during authentication, e.g. by a man-in-the middle or replay attack. The goal of *O.Authentication-DESFire* is that an authentication mechanism is implemented in the TOE that prevents these attacks. Therefore the threat is covered by *O.Authentication-DESFire*.

153 The added objective for the TOE *O.Authentication-DESFire* does not introduce any contradiction in the security objectives for the TOE.

#### 4.3.9 TOE threat "Cloning for M4M-DESFire"

154 The justification related to the threat "Cloning for M4M-DESFire, (*T.Cloning-DESFire*)" is as follows:

155 The concern of *T.Cloning-DESFire* is that all data stored on the TOE (including keys) may be read out in order to create a duplicate. The objective *O.Authentication-DESFire* together with *O.Access-Control-DESFire* requires that unauthorized users can not read any information that is restricted to the authorized subjects. The cryptographic keys used for the authentication are stored inside the TOE protected. *O.Access-Control-DESFire* states that no keys used for authentication shall ever be output. Therefore the two objectives cover *T.Cloning-DESFire*.

#### 4.3.10 TOE threat "M4M-DESFire resource unavailability"

- 156 The justification related to the threat "M4M-DESFire resource unavailability, (*T.Resource-DESFire*)" is as follows:
- 157 The concern of *T.Resource-DESFire* is to prevent denial of service or malfunction of M4M-DESFire, that may result from an unavailability of resources. The goal of *O.Resource-DESFire* is to control the availability of resources for M4M-DESFire. Therefore the threat is covered by *O.Resource-DESFire*.
- 158 The added objective for the TOE *O.Resource-DESFire* does not introduce any contradiction in the security objectives for the TOE.

#### 4.3.11 TOE threat "M4M-DESFire code confidentiality"

- 159 The justification related to the threat "M4M-DESFire code confidentiality, (*T.Confid-Applic-Code-DESFire*)" is as follows:
- 160 Since *O.Firewall-DESFire* requires that the TOE ensures isolation of code between M4M-DESFire and the other applications, the code of M4M-DESFire is protected against unauthorized disclosure, therefore *T.Confid-Applic-Code-DESFire* is covered by *O.Firewall-DESFire*.
- 161 The added objective for the TOE *O.Firewall-DESFire* does not introduce any contradiction in the security objectives for the TOE.

#### 4.3.12 TOE threat "M4M-DESFire data confidentiality"

- 162 The justification related to the threat "M4M-DESFire data confidentiality, (*T.Confid-Applic-Data-DESFire*)" is as follows:
- 163 Since *O.Firewall-DESFire* requires that the TOE ensures isolation of data between M4M-DESFire and the other applications, the data of M4M-DESFire is protected against unauthorized disclosure, therefore *T.Confid-Applic-Data-DESFire* is covered by *O.Firewall-DESFire*.

#### 4.3.13 TOE threat "M4M-DESFire code integrity"

- 164 The justification related to the threat "M4M-DESFire code integrity, (*T.Integ-Applic-Code-DESFire*)" is as follows:
- 165 The threat is related to the alteration of M4M-DESFire code by an attacker. *O.Verification-DESFire* requires that the TOE verifies the code integrity before its execution. Complementary, *O.Firewall-DESFire* requires that the TOE ensures isolation of code between M4M-DESFire and the other applications, thus protecting the code of M4M-DESFire against unauthorized modification. Therefore the threat is covered by *O.Verification-DESFire* together with *O.Firewall-DESFire*.
- 166 The added objective for the TOE *O.Verification-DESFire* does not introduce any contradiction in the security objectives for the TOE.

#### 4.3.14 TOE threat "M4M-DESFire data integrity"

- 167 The justification related to the threat "M4M-DESFire data integrity, (*T.Integ-Applic-Data-DESFire*)" is as follows:

- 168 The threat is related to the alteration of M4M-DESFire data by an attacker. Since [O.Firewall-DESFire](#) and [O.Shr-Res-DESFire](#) require that the TOE ensures isolation of data between M4M-DESFire and the other applications, the data of M4M-DESFire is protected against unauthorized modification, therefore [T.Integ-Applic-Data-DESFire](#) is covered by [O.Firewall-DESFire](#) together with [O.Shr-Res-DESFire](#).
- 169 The added objective for the TOE [O.Shr-Res-DESFire](#) does not introduce any contradiction in the security objectives for the TOE.

#### 4.3.15 Organisational security policy "Controlled usage to Loader Functionality"

- 170 The justification related to the organisational security policy "Controlled usage to Loader Functionality, ([BSI.P.Ctrl-Loader](#))" is as follows:
- 171 As stated in [BSI-CC-PP-0084-2014](#), the organisational security policy "Controlled usage to Loader Functionality ([BSI.P.Ctrl-Loader](#))" is implemented by the security objective for the TOE "Access control and authenticity for the Loader ([BSI.O.Ctrl\\_Auth\\_Loader](#))" and the security objective for the TOE environment "Secure communication and usage of the Loader ([BSI.OE.Loader-Usage](#))".
- The security objectives "Secure loading of the Additional Code ([ANSSI.O.Secure-Load-ACode](#))", "Secure activation of the Additional Code ([ANSSI.O.Secure-AC-Activation](#))", and "Secure identification of the TOE ([ANSSI.O.TOE-Identification](#))" specified by [JIL SRFPDCL](#) additionally enforce this policy since they require authenticity, atomicity, identification of the loaded additional code, part of the TOE. "Secure identification of the TOE ([ANSSI.O.TOE-Identification](#))" is supported by the security objective for the TOE environment "TOE identification ([OE.TOE-Id](#))".
- Similarly, the security objectives "Secure loading of the Additional Memory Image ([O.Secure-Load-AMemImage](#))", and "Secure identification of the Memory Image ([O.MemImage-Identification](#))", enforce this policy since they require authenticity, atomicity, identification of the loaded additional memory image for the user data (embedded software). "Secure identification of Memory Image ([O.MemImage-Identification](#))" is supported by the security objective for the TOE environment "Composite TOE identification ([OE.Composite-TOE-Id](#))".
- Therefore the policy is covered by these nine objectives.

#### 4.3.16 Organisational security policy "Additional Specific Security Functionality"

- 172 The justification related to the organisational security policy "Additional Specific Security Functionality, ([AUG1.P.Add-Functions](#))" is as follows:
- 173 Since [AUG1.O.Add-Functions](#) requires the TOE to implement exactly the same specific security functionality as required by [AUG1.P.Add-Functions](#), **and in the very same conditions**, the organisational security policy is covered by the objective.
- 174 Nevertheless the security objectives [BSI.O.Leak-Inherent](#), [BSI.O.Phys-Probing](#), [BSI.O.Malfunction](#), [BSI.O.Phys-Manipulation](#) and [BSI.O.Leak-Forced](#) define how to implement the specific security functionality required by [AUG1.P.Add-Functions](#). (Note that these objectives support that the specific security functionality is provided in a secure way as expected from [AUG1.P.Add-Functions](#).) Especially [BSI.O.Leak-Inherent](#) and [BSI.O.Leak-Forced](#) refer to the protection of confidential data (User Data or TSF data) in general. User Data are also processed by the specific security functionality required by [AUG1.P.Add-Functions](#).

175 The added objective for the TOE [AUG1.O.Add-Functions](#) does not introduce any contradiction in the security objectives for the TOE.

#### 4.3.17 Organisational security policy "Confidentiality during communication for M4M-DESFire"

176 The justification related to the organisational security policy "Confidentiality during communication for M4M-DESFire, ([P.Confidentiality](#))" is as follows:

177 The policy [P.Confidentiality](#) requires the TOE to provide the possibility to protect selected data elements from eavesdropping during contact-less communication. In addition, the data transfer is protected in a way that injected and bogus commands, within the communication session before the protected data transfer, can be detected. The terminal must support this by checking the TOE responses, which is required by [OE.Terminal-Support-DESFire](#). Since [O.Confidentiality-DESFire](#) requires that the security attribute for a data element contains an option that the communication related to this data element must be encrypted and protected, and because [OE.Terminal-Support-DESFire](#) ensures the support by the terminal, the two objectives cover the policy.

178 The added objective for the TOE [O.Confidentiality-DESFire](#) does not introduce any contradiction in the security objectives.

#### 4.3.18 Organisational security policy "Transaction mechanism for M4M-DESFire"

179 The justification related to the organisational security policy "Transaction mechanism for M4M-DESFire, ([P.Transaction](#))" is as follows:

180 According to this policy, the TOE shall be able to provide the possibility to combine a number of data modification operations in one transaction, so that either all operations or no operation at all is performed. This is exactly the goal of the objective [O.Transaction-DESFire](#), therefore the policy [P.Transaction](#) is covered by [O.Transaction-DESFire](#).

181 The added objective for the TOE [O.Transaction-DESFire](#) does not introduce any contradiction in the security objectives.

#### 4.3.19 Organisational security policy "Un-traceability of end-users for M4M-DESFire"

182 The justification related to the organisational security policy "Un-traceability of end-users for M4M-DESFire, ([P.No-Trace-DESFire](#))" is as follows:

183 The policy requires that the TOE has the ability to prevent tracing of end-users. Tracing can be performed with the UID or with any freely accessible data element stored by the TOE. The objective [O.No-Trace-DESFire](#) requires that the TOE shall provide an option to prevent the transfer of any information that is suitable for tracing an end-user by an unauthorized subject, which includes the UID. The objectives [O.Authentication-DESFire](#) and [O.Access-Control-DESFire](#) provide means to authorise subjects and to implement access control to data elements in a way that unauthorized subjects cannot read any element usable for tracing. Therefore the policy is covered by these three objectives.

184 The added objective for the TOE [O.No-Trace-DESFire](#) does not introduce any contradiction in the security objectives.



**4.3.20 Organisational security policy "Treatment of user data"**

- 185 The justification related to the organisational security policy "Treatment of user data, (*P.Resp-AppI*)" is as follows:
- 186 The policy states that the Security IC Embedded Software included in the TOE, treats user data according to the PP assumption *BSI.A.Resp-AppI*. *O.Resp-AppI* has the same objective as *BSI.OE.Resp-AppI* defined in the PP. Thus, the objective *O.Resp-AppI* covers the policy *P.Resp-AppI*.
- 187 The added objectives for the TOE *O.Resp-AppI* do not introduce any contradiction in the security objectives.



## 5 Security requirements (ASE\_REQ)

188 This chapter on security requirements contains a section on security functional requirements (SFRs) for the TOE ([Section 5.1](#)), a section on security assurance requirements (SARs) for the TOE ([Section 5.2](#)), a section on the refinements of these SARs ([Section 5.3](#)) as required by the "[BSI-CC-PP-0084-2014](#)" Protection Profile. This chapter includes a section with the security requirements rationale ([Section 5.4](#)).

### 5.1 Security functional requirements for the TOE

189 Security Functional Requirements (SFRs) from the "[BSI-CC-PP-0084-2014](#)" Protection Profile (PP) are drawn from [CCMB-2017-04-002](#), except the following SFRs, that are **extensions** to [CCMB-2017-04-002](#):

- **FCS\_RNG** Generation of random numbers,
- **FMT\_LIM** Limited capabilities and availability,
- **FAU\_SAS** Audit data storage,
- **FDP\_SDC** Stored data confidentiality,
- **FIA\_API** Authentication proof of identity .

The reader can find their certified definitions in the text of the "[BSI-CC-PP-0084-2014](#)" Protection Profile.

190 All extensions to the SFRs of the "[BSI-CC-PP-0084-2014](#)" Protection Profile (PP) are **exclusively** drawn from [CCMB-2017-04-002](#).

191 All iterations, assignments, selections, or refinements on SFRs have been performed according to section C.4 of [CCMB-2017-04-001](#). They are easily identified in the following text as they appear **as indicated here**. Note that in order to improve readability, iterations are sometimes expressed within tables.

192 In order to ease the definition and the understanding of these security functional requirements, a simplified presentation of the TOE Security Policy (TSP) is given in the following section.

193 The selected security functional requirements for the TOE, their respective origin and type are summarized in [Table 7](#).

**Table 7. Summary of functional security requirements for the TOE**

Label	Title	Addressing	Origin	Type
FRU_FLT.2	Limited fault tolerance	Malfunction	<a href="#">BSI-CC-PP-0084-2014</a>	<a href="#">CCMB-2017-04-002</a>
FPT_FLS.1	Failure with preservation of secure state			

Table 7. Summary of functional security requirements for the TOE (continued)

Label	Title	Addressing	Origin	Type
FMT_LIM.1 / Test	Limited capabilities - Test	Abuse of Test functionality	<a href="#">BSI-CC-PP-0084-2014</a>	Extended
FMT_LIM.2 / Test	Limited availability - Test			
FAU_SAS.1	Audit storage	Lack of TOE identification	<a href="#">BSI-CC-PP-0084-2014</a> Operated	CCMB-2017-04-002
FDP_SDC.1	Stored data confidentiality	Physical manipulation & probing		
FDP_SDI.2	Stored data integrity monitoring and action			
FPT_PHP.3	Resistance to physical attack	Leakage	<a href="#">BSI-CC-PP-0084-2014</a>	
FDP_ITT.1	Basic internal transfer protection			
FPT_ITT.1	Basic internal TSF data transfer protection			
FDP_IFC.1	Subset information flow control			
FCS_RNG.1	Random number generation	Weak cryptographic quality of random numbers	<a href="#">BSI-CC-PP-0084-2014</a> Operated	Extended
FCS_COP.1	Cryptographic operation	Cipher scheme support	<a href="#">AUG #1</a> Operated	CCMB-2017-04-002
FCS_CKM.1 (if <a href="#">NesLib</a> is embedded only)	Cryptographic key generation		Security Target Operated	
FDP_ACC.2 / Memories	Complete access control - Memories	Memory access violation	Security Target Operated	
FDP_ACF.1 / Memories	Security attribute based access control - Memories		<a href="#">AUG #4</a> Operated	
FMT_MSA.3 / Memories	Static attribute initialisation - Memories			
FMT_MSA.1 / Memories	Management of security attributes - Memories	Correct operation		
FMT_SMF.1 / Memories	Specification of management functions - Memories		Security Target Operated	

Table 7. Summary of functional security requirements for the TOE (continued)

Label	Title	Addressing	Origin	Type
FIA_API.1	Authentication Proof of Identity	Masquerade	BSI-CC-PP-0084-2014 Operated	Extended
FMT_LIM.1 / Loader	Limited capabilities - Loader	Abuse of Loader functionality		
FMT_LIM.2 / Loader	Limited availability - Loader			
FTP_ITC.1 / Loader	Inter-TSF trusted channel - Loader	Loader violation	BSI-CC-PP-0084-2014 Operated	CCMB-2017-04-002
FDP_UCT.1 / Loader	Basic data exchange confidentiality - Loader			
FDP_UIT.1 / Loader	Data exchange integrity - Loader			
FDP_ACC.1 / Loader	Subset access control - Loader			
FDP_ACF.1 / Loader	Security attribute based access control - Loader			
FMT_MSA.3 / Loader	Static attribute initialisation - Loader	Correct Loader operation	Security Target Operated	
FMT_MSA.1 / Loader	Management of security attributes - Loader			
FMT_SMR.1 / Loader	Security roles - Loader			
FIA_UID.1 / Loader	Timing of identification - Loader			
FIA_UAU.1 / Loader	Timing of authentication - Loader			
FMT_SMF.1 / Loader	Specification of management functions - Loader			
FPT_FLS.1 / Loader	Failure with preservation of secure state - Loader			
FAU_SAR.1 / Loader	Audit review - Loader	Lack of TOE identification	Extended	
FAU_SAS.1 / Loader	Audit storage - Loader			

Table 7. Summary of functional security requirements for the TOE (continued)

Label	Title	Addressing	Origin	Type
FMT_SMR.1 / M4M-DESFire	Security roles - M4M-DESFire	M4M-DESFire access control (if M4M-DESFire is embedded only)	Security Target Operated	CCMB-2017-04-002
FDP_ACC.1 / M4M-DESFire	Subset access control - M4M-DESFire			
FDP_ACF.1 / M4M-DESFire	Security attribute based access control - M4M-DESFire			
FMT_MSA.3 / M4M-DESFire	Static attribute initialisation - M4M-DESFire			
FMT_MSA.1 / M4M-DESFire	Management of security attributes - M4M-DESFire			
FMT_SMF.1 / M4M-DESFire	Specification of management functions - M4M-DESFire			
FDP_ITC.2 / M4M-DESFire	Import of user data with security attributes - M4M-DESFire			
FPT_TDC.1 / M4M-DESFire	Inter-TSF basic TSF data consistency - M4M-DESFire			
FIA_UID.2 / M4M-DESFire	User identification before any action - M4M-DESFire			
FIA_UAU.2 / M4M-DESFire	User authentication before any action - M4M-DESFire			
FIA_UAU.5 / M4M-DESFire	Multiple authentication mechanisms - M4M-DESFire			
FMT_MTD.1 / M4M-DESFire	Management of TSF data - M4M-DESFire			
FTP_TRP.1 / M4M-DESFire	Trusted path - M4M-DESFire			
FCS_CKM.4 / M4M-DESFire	Cryptographic key destruction - M4M-DESFire			

Table 7. Summary of functional security requirements for the TOE (continued)

Label	Title	Addressing	Origin	Type	
FDP_ROL.1 / M4M-DESFire	Basic rollback - M4M-DESFire	M4M-DESFire robustness (if M4M-DESFire is embedded only)	Security Target Operated	CCMB-2017-04-002	
FPT_RPL.1 / M4M-DESFire	Replay detection - M4M-DESFire				
FPR_UNL.1 / M4M-DESFire	Unlinkability - M4M-DESFire				
FRU_RSA.2 / M4M-DESFire	Minimum and maximum quotas - M4M-DESFire	M4M-DESFire correct operation (if M4M-DESFire is embedded only)			
FDP_RIP.1 / M4M-DESFire	Subset residual information protection - M4M-DESFire	M4M-DESFire intrinsic confidentiality and integrity (if M4M-DESFire is embedded only)			
FTP_ITC.1 / Sdiag	Inter-TSF trusted channel - Secure Diagnostic	Abuse of Secure Diagnostic functionality			Extended
FAU_SAR.1 / Sdiag	Audit review - Secure Diagnostic				
FMT_LIM.1 / Sdiag	Limited capabilities - Secure Diagnostic				
FMT_LIM.2 / Sdiag	Limited availability - Secure Diagnostic				

### 5.1.1 Security Functional Requirements from the Protection Profile

#### Limited fault tolerance (FRU\_FLT.2)

194 The TSF shall ensure the operation of all the TOE's capabilities when the following failures occur: **exposure to operating conditions which are not detected according to the requirement Failure with preservation of secure state (FPT\_FLS.1).**

#### Failure with preservation of secure state (FPT\_FLS.1)

195 The TSF shall preserve a secure state when the following types of failures occur: **exposure to operating conditions which may not be tolerated according to the requirement Limited fault tolerance (FRU\_FLT.2) and where therefore a malfunction could occur.**

196 **Refinements:**

**The term "failure" above also covers "circumstances". The TOE prevents failures for the "circumstances" defined above.**

**Regarding application note 14 of BSI-CC-PP-0084-2014, the secure state is reached by an immediate interrupt or by a reset, depending on the current context.**

**Regarding application note 15 of BSI-CC-PP-0084-2014, the TOE provides information on the operating conditions monitored during Security IC Embedded Software**

*execution and after a warm reset. No audit requirement is however selected in this Security Target.*

#### **Limited capabilities (FMT\_LIM.1) / Test**

197 The TSF shall be designed and implemented in a manner that limits their capabilities so that in conjunction with “Limited availability (FMT\_LIM.2)” the following policy is enforced:  
***Limited capability and availability Policy / Test.***

#### **Limited availability (FMT\_LIM.2) / Test**

198 The TSF shall be designed and implemented in a manner that limits their availability so that in conjunction with “Limited capabilities (FMT\_LIM.1) / Test” the following policy is enforced:  
***Limited capability and availability Policy / Test.***

199 ***SFP 1: Limited capability and availability Policy / Test***

*Deploying Test Features after TOE Delivery does not allow User Data of the Composite TOE to be disclosed or manipulated, TSF data to be disclosed or manipulated, software to be reconstructed and no substantial information about construction of TSF to be gathered which may enable other attacks.*

#### **Audit storage (FAU\_SAS.1)**

200 The TSF shall provide ***the test process before TOE Delivery*** with the capability to store the ***Initialisation Data and/or Pre-personalisation Data and/or supplements of the Security IC Embedded Software*** in the ***NVM***.

#### **Stored data confidentiality (FDP\_SDC.1)**

201 The TSF shall ensure the confidentiality of the information of the user data while it is stored in ***all the memory areas where it can be stored.***

#### **Stored data integrity monitoring and action (FDP\_SDI.2)**

202 The TSF shall monitor user data stored in containers controlled by the TSF for ***integrity errors*** on all objects, based on the following attributes: ***user data stored in all possible memory areas, depending on the integrity control attributes.***

203 Upon detection of a data integrity error, the TSF shall ***signal the error and react.***

#### **Resistance to physical attack (FPT\_PHP.3)**

204 The TSF shall resist ***physical manipulation and physical probing***, to the ***TSF*** by responding automatically such that the SFRs are always enforced.

**205** ***Refinement:***

***The TSF will implement appropriate mechanisms to continuously counter physical manipulation and physical probing. Due to the nature of these attacks (especially manipulation) the TSF can by no means detect attacks on all of its elements. Therefore, permanent protection against these attacks is required ensuring that security functional requirements are enforced. Hence, “automatic response” means here (i) assuming that there might be an attack at any time and (ii) countermeasures are provided at any time.***

**Basic internal transfer protection (FDP\_ITT.1)**

206 The TSF shall enforce the **Data Processing Policy** to prevent the **disclosure** of user data when it is transmitted between physically-separated parts of the TOE.

**Basic internal TSF data transfer protection (FPT\_ITT.1)**

207 The TSF shall protect TSF data from **disclosure** when it is transmitted between separate parts of the TOE.

**208 Refinement:**

*The different memories, the CPU and other functional units of the TOE (e.g. a cryptographic co-processor) are seen as separated parts of the TOE.*

*This requirement is equivalent to FDP\_ITT.1 above but refers to TSF data instead of User Data. Therefore, it should be understood as to refer to the same Data Processing Policy defined under FDP\_IFC.1 below.*

**Subset information flow control (FDP\_IFC.1)**

209 The TSF shall enforce the **Data Processing Policy** on **all confidential data when they are processed or transferred by the TOE or by the Security IC Embedded Software**.

**210 SFP 2: Data Processing Policy**

*User Data of the Composite TOE and TSF data shall not be accessible from the TOE except when the Security IC Embedded Software decides to communicate the User Data via an external interface. The protection shall be applied to confidential data only but without the distinction of attributes controlled by the Security IC Embedded Software.*

**Random number generation (FCS\_RNG.1)**

211 The TSF shall provide a **physical** random number generator that implements:

- **(PTG.2.1) A total failure test detects a total failure of entropy source immediately when the RNG has started. When a total failure is detected, no random numbers will be output.**
- **(PTG.2.2) If a total failure of the entropy source occurs while the RNG is being operated, the RNG prevents the output of any internal random number that depends on some raw random numbers that have been generated after the total failure of the entropy source.**
- **(PTG.2.3) The online test shall detect non-tolerable statistical defects of the raw random number sequence (i) immediately when the RNG has started, and (ii) while the RNG is being operated. The TSF must not output any random numbers before the power-up online test has finished successfully or when a defect has been detected.**
- **(PTG.2.4) The online test procedure shall be effective to detect non-tolerable weaknesses of the random numbers soon.**
- **(PTG.2.5) The online test procedure checks the quality of the raw random number sequence. It is triggered externally. The online test is suitable for detecting non-tolerable statistical defects of the statistical properties of the raw random numbers within an acceptable period of time.**

- 212 The TSF shall provide *octets of bits* that meet
- (PTG.2.6) *Test procedure A does not distinguish the internal random numbers from output sequences of an ideal RNG.*
  - (PTG.2.7) *The average Shannon entropy per internal random bit exceeds 0.997.*

## 5.1.2 Additional Security Functional Requirements for the cryptographic services

### Cryptographic operation (FCS\_COP.1)

- 213 The TSF shall perform *the operations in Table 8* in accordance with a specified cryptographic algorithm *in Table 8* and cryptographic key sizes *of Table 8* that meet the *standards in Table 8. The list of operations depends on the presence of cryptographic accelerators or NesLib, as indicated in Table 8 (Restrict).*

Table 8. FCS\_COP.1 iterations (cryptographic operations)

Restrict	Iteration label	[assignment: list of cryptographic operations]	[assignment: cryptographic algorithm]	[assignment: cryptographic key sizes]	[assignment: list of standards]
If EDES+	TDES	* encryption * decryption - in Cipher Block Chaining (CBC) mode - in Electronic Code Book (ECB) mode	Triple Data Encryption Standard (TDES)	168 bits	<a href="#">NIST SP 800-67</a> <a href="#">NIST SP 800-38A</a>
If HW-AES	AES	* encryption (cipher) * decryption (inverse cipher) - in Cipher Block Chaining (CBC) mode - in Electronic Code Book (ECB) mode	Advanced Encryption Standard	128, 192 and 256 bits	<a href="#">FIPS PUB 197</a>
If HW-AES and NesLib		* Message authentication Code computation (CMAC) * Authenticated encryption/decryption in Galois Counter Mode (GCM) * Authenticated encryption/decryption in Counter with CBC-MAC (CCM)			



Table 8. FCS\_COP.1 iterations (cryptographic operations) (continued)

Restrict	Iteration label	[assignment: list of cryptographic operations]	[assignment: cryptographic algorithm]	[assignment: cryptographic key sizes]	[assignment: list of standards]
If NesLib and Nescrypt	RSA	<ul style="list-style-type: none"> <li>* RSA public key operation</li> <li>* RSA private key operation without the Chinese Remainder Theorem</li> <li>* RSA private key operation with the Chinese Remainder Theorem</li> <li>* EMSA PSS and PKCS1 signature scheme coding</li> <li>* RSA Key Encapsulation Method (KEM)</li> </ul>	Rivest, Shamir & Adleman's	up to 4096 bits	<a href="#">PKCS #1 V2.1</a>
If NesLib and Nescrypt	ECC on Weierstrass curves	<ul style="list-style-type: none"> <li>* private scalar multiplication</li> <li>* prepare Jacobian</li> <li>* public scalar multiplication</li> <li>* point validity check</li> <li>* convert Jacobian to affine coordinates</li> <li>* general point addition</li> <li>* point expansion</li> <li>* point compression</li> <li>* Diffie-Hellman (ECDH) key agreement computation</li> <li>* digital signature algorithm (ECDSA) generation and verification</li> </ul>	Elliptic Curves Cryptography on GF(p) on curves in Weierstrass form	up to 640 bits	<a href="#">IEEE 1363-2000, chapter 7</a> <a href="#">IEEE 1363a-2004</a>  <a href="#">NIST SP 800-56A</a>  <a href="#">FIPS PUB 186-4</a> <a href="#">ANSI X9.62, section 7</a>
If NesLib	ECC on Edwards curves	<ul style="list-style-type: none"> <li>* ed25519 generation</li> <li>* ed25519 verification</li> <li>* ed25519 point decompression</li> </ul>	Elliptic Curves Cryptography on GF(p) on curves in Edwards form, with curve 25519	256 bits	<a href="#">EdDSA rfc</a> <a href="#">EDDSA</a> <a href="#">EDDSA2</a>

Table 8. FCS\_COP.1 iterations (cryptographic operations) (continued)

Restrict	Iteration label	[assignment: list of cryptographic operations]	[assignment: cryptographic algorithm]	[assignment: cryptographic key sizes]	[assignment: list of standards]
If NesLib	SHA	* SHA-1 <sup>(1)</sup> * SHA-224 * SHA-256 * SHA-384 * SHA-512 * Protected SHA-1 <sup>(1)</sup> * Protected SHA-256 * Protected SHA-384 * Protected SHA-512	Secure Hash Algorithm	assignment pointless because algorithm has no key	<a href="#">FIPS PUB 180-2</a>
		* HMAC using Protected SHA-1 <sup>(1)</sup> or Protected SHA-256		up to 512 bits	<a href="#">FIPS PUB 198-1</a>
If NesLib	Keccak and SHA-3	* SHAKE128, * SHAKE256, * SHA3-224, * SHA3-256, * SHA3-384, * SHA3-512, * Keccak[r,1600-r], * protected SHAKE128, * protected SHAKE256, * protected SHA3-224, * protected SHA3-256, * protected SHA3-384, * protected SHA3-512, * Protected Keccak[r,1600-r]	Keccak	no key for plain functions, variable key length up to security level for protected functions (security level is last number in function names and 1600-c for Keccak)	<a href="#">FIPS PUB 202</a>
If NesLib	Keccak-p	* Keccak-p[1600,n_r = 24], * Keccak-p[1600, n_r=12], * protected Keccak-p[1600,n_r = 24], * protected Keccak-p[1600, n_r=12]	Keccak-p	no key for plain functions, any key length up to 256 bits for protected functions	<a href="#">FIPS PUB 202</a>
If NesLib and Nescrypt	Diffie-Hellman	Diffie-Hellman	Diffie-Hellman	up to 4096 bits	<a href="#">ANSI X9.42</a>

Table 8. FCS\_COP.1 iterations (cryptographic operations) (continued)

Restrict	Iteration label	[assignment: list of cryptographic operations]	[assignment: cryptographic algorithm]	[assignment: cryptographic key sizes]	[assignment: list of standards]
If NesLib	DRBG	* SHA-1 <sup>(1)</sup> * SHA-224 * SHA-256 * SHA-384 * SHA-512	Hash-DRBG	none	<a href="#">NIST SP 800-90</a> <a href="#">FIPS PUB 180-2</a>
		*AES	CTR-DRBG	128, 192 and 256 bits	<a href="#">NIST SP 800-90</a> <a href="#">FIPS PUB 197</a>

1. Note that SHA-1 is no longer recommended as a cryptographic function in the context of smart card applications. Hence, Security IC Embedded Software may need to use another SHA to achieve a suitable strength.

### Cryptographic key generation (FCS\_CKM.1)

214 If NesLib is embedded, the TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm, in [Table 9](#), and specified cryptographic key sizes of [Table 9](#) that meet the following standards in [Table 9](#).

Table 9. FCS\_CKM.1 iterations (cryptographic key generation)

Iteration label	[assignment: cryptographic key generation algorithm]	[assignment: cryptographic key sizes]	[assignment: list of standards]
Prime generation	prime generation and RSA prime generation algorithm, optionally protected against side channel attacks, and/or optionally with conditions	up to 2048 bits	<a href="#">FIPS PUB 140-2</a> <a href="#">FIPS PUB 186-4</a>
RSA key generation	RSA key pair generation algorithm, optionally protected against side channel attacks, and/or optionally with conditions	up to 4096 bits	<a href="#">FIPS PUB 140-2</a> <a href="#">ISO/IEC 9796-2</a> <a href="#">PKCS #1 V2.1</a>

### 5.1.3 Additional Security Functional Requirements for the memories protection

215 The following SFRs are extensions to "[BSI-CC-PP-0084-2014](#)" Protection Profile (PP), related to the memories protection.

#### Static attribute initialisation (FMT\_MSA.3) / Memories

216 The TSF shall enforce the **Dynamic Memory Access Control Policy** to provide **minimally protective**<sup>(e)</sup> default values for security attributes that are used to enforce the SFP.

e. See the Datasheet referenced in [Section 7](#) for actual values.

217 The TSF shall allow **none** to specify alternative initial values to override the default values when an object or information is created.

Application note:

The security attributes are the set of access rights currently defined. They are dynamically attached to the subjects and objects locations, i.e. each logical address.

#### **Management of security attributes (FMT\_MSA.1) / Memories**

218 The TSF shall enforce the **Dynamic Memory Access Control Policy** to restrict the ability to **modify** the security attributes **current set of access rights** to **software running in privileged mode**.

#### **Complete access control (FDP\_ACC.2) / Memories**

219 The TSF shall enforce the **Dynamic Memory Access Control Policy** on **all subjects (software), all objects (data including code stored in memories)** and all operations among subjects and objects covered by the SFP.

220 The TSF shall ensure that all operations between any subject controlled by the TSF and any object controlled by the TSF are covered by an access control SFP.

#### **Security attribute based access control (FDP\_ACF.1) / Memories**

221 The TSF shall enforce the **Dynamic Memory Access Control Policy** to objects based on the following: **software mode, the object location, the operation to be performed, and the current set of access rights**.

222 The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed: **the operation is allowed if and only if the software mode, the object location and the operation matches an entry in the current set of access rights**.

223 The TSF shall explicitly authorise access of subjects to objects based on the following additional rules: **none**.

224 The TSF shall explicitly deny access of subjects to objects based on the following additional rules:

- **in User configuration, any access (read, write, execute) to the OST ROM is denied,**
- **in User configuration, any write access to the ST NVM is denied,**
- **If M4M-DESFire is part of the TOE, another application cannot read, write, compare any piece of data or code belonging to M4M-DESFire.**

225 **Note:** It should be noted that this level of policy detail is not needed at the application level. The composite Security Target writer should describe the ES access control and information flow control policies instead. Within the ES High Level Design description, the chosen setting of IC security attributes would be shown to implement the described policies relying on the IC SFP presented here.

226 The following SFP **Dynamic Memory Access Control Policy** is defined for the requirement "Security attribute based access control (FDP\_ACF.1) / Memories":

#### SFP 3: Dynamic Memory Access Control Policy

*The TSF must control read, write, execute accesses of software to data, based on the software mode and on the current set of access rights.*

**Specification of management functions (FMT\_SMF.1) / Memories**

228 The TSF will be able to perform the following management functions: ***modification of the current set of access rights security attributes by software running in privileged mode, supporting the Dynamic Memory Access Control Policy.***

**5.1.4 Additional Security Functional Requirements related to the loading and authentication capabilities****Authentication Proof of Identity (FIA\_API.1)**

The TSF shall provide a ***command based on a cryptographic mechanism*** to prove the identity of the TOE to an external entity.

**Limited capabilities (FMT\_LIM.1) / Loader**

229 The TSF shall be designed and implemented in a manner that limits its capabilities so that in conjunction with “Limited availability (FMT\_LIM.2)” the following policy is enforced: ***Loader Limited Capability Policy.***

230 *SFP 4: Loader Limited Capability Policy*

231 *Deploying Loader functionality after **delivery** does not allow stored user data to be disclosed or manipulated by unauthorized user.*

**Limited availability (FMT\_LIM.2) / Loader**

232 The TSF shall be designed and implemented in a manner that limits its availability so that in conjunction with “Limited capabilities (FMT\_LIM.1)” the following policy is enforced: ***Loader Limited Availability Policy.***

233 *SFP 5: Loader Limited Availability Policy*

234 *The TSF prevents deploying the Loader functionality after **blocking of the loader.***

235 **Note:** Blocking the loader is just an option.

**Inter-TSF trusted channel (FTP\_ITC.1) / Loader**

236 The TSF shall provide a communication channel between itself and another trusted IT product that is logically distinct from other communication channels and provides assured identification of its end points and protection of the channel data from modification or disclosure.

237 The TSF shall permit another trusted IT product to initiate communication via the trusted channel.

**238** The TSF shall initiate communication via the trusted channel for ***Maintenance transaction.***

**239** ***Refinement:***

***In practice, the communication is not initiated by the TSF.***

**Basic data exchange confidentiality (FDP\_UCT.1) / Loader**

240 The TSF shall enforce the *Loader SFP* to receive user data in a manner protected from unauthorized disclosure.

**Data exchange integrity (FDP\_UIT.1) / Loader**

- 241 The TSF shall enforce the *Loader SFP* to receive user data in a manner protected from modification, deletion, insertion errors.
- 242 The TSF shall be able to determine on receipt of user data, whether modification, deletion, insertion has occurred.

**Subset access control (FDP\_ACC.1) / Loader**

- 243 The TSF shall enforce the *Loader SFP* on:
- the subjects ***ST Loader, User Loader, and Delegated Loader***,
  - the objects user data in ***User NVM and ST data in ST NVM***,
  - the operation ***Maintenance transaction***.

**Security attribute based access control (FDP\_ACF.1) / Loader**

- 244 The TSF shall enforce the *Loader SFP* to objects based on the following: ***all subjects, objects and attributes defined in the Loader SFP***.
- 245 The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed: ***if the user authenticated role is allowed to perform the maintenance transaction and the maintenance transaction is legitimate and the loaded data emanates from an authorized originator***.
- Note that the term "data" also addresses Additional Code, as this code is seen as data by the TSF.*
- 246 The TSF shall explicitly authorize access of subjects to objects based on the following additional rules: ***none***.
- 247 The TSF shall explicitly deny access of subjects to objects based on the following additional rules: ***none***.
- 248 The following SFP ***Loader SFP*** is defined for the requirements "Basic data exchange confidentiality (FDP\_UCT.1) / Loader", "Data exchange integrity (FDP\_UIT.1) / Loader", "Subset access control (FDP\_ACC.1) / Loader", "Security attribute based access control (FDP\_ACF.1) / Loader", "Static attribute initialisation (FMT\_MSA.3) / Loader", and "Management of security attributes (FMT\_MSA.1) / Loader":

249 *SFP 6: Loader SFP*

- 250 ***The TSF must enforce that a maintenance transaction is performed if and only if the user authenticated role is allowed to perform the maintenance transaction and the maintenance transaction is legitimate and the loaded data emanates from an authorized originator.***
- The TSF ruling is done according to a fixed access rights matrix, based on the subject, object and security attributes listed below.*

The Security Function Policy (SFP) Loader SFP uses the following definitions:

- the subjects are the ST Loader, the User Loader, and the Delegated Loader,
- the objects are ST NVM and User NVM,
- the operation is Maintenance transaction,
- the security attributes linked to the subjects are the remaining sessions, the number of consecutive authentication failures, the allowed memory areas, the logging capacity, the transaction identification.

Note that subjects are authorized by cryptographic keys. These keys are considered as authentication data and not as security attributes.

#### Failure with preservation of secure state (FPT\_FLS.1) / Loader

- 251 The TSF shall preserve a secure state when the following types of failures occur: **the maintenance transaction is incomplete**.

#### Static attribute initialisation (FMT\_MSA.3) / Loader

- 252 The TSF shall enforce the **Loader SFP** to provide **restrictive** default values for security attributes that are used to enforce the SFP.
- 253 The TSF shall allow **none** to specify alternative initial values to override the default values when an object or information is created.

#### Management of security attributes (FMT\_MSA.1) / Loader

- 254 The TSF shall enforce the **Loader SFP** to restrict the ability to **modify** the security attributes **remaining sessions, transaction identification** to **the ST Loader or User Loader**.

#### Specification of management functions (FMT\_SMF.1) / Loader

- 255 The TSF will be able to perform the following management functions: **change the role authentication data, change the remaining sessions, block a role, under the Loader SFP**.

#### Security roles (FMT\_SMR.1) / Loader

- 256 The TSF shall maintain the roles: **ST Loader, User Loader, Delegated Loader, Secure Diagnostic, and Everybody**.
- 257 The TSF shall be able to associate users with roles.

#### Timing of identification (FIA\_UID.1) / Loader

- 258 The TSF shall allow **boot, authentication command and non-critical queries** on behalf of the user to be performed before the user is identified.
- 259 The TSF shall require each user to be successfully identified before allowing any other TSF mediated actions on behalf of that user.

#### Timing of authentication (FIA\_UAU.1) / Loader

- 260 The TSF shall allow **boot, authentication command and non-critical queries** on behalf of the user to be performed before the user is authenticated.

261 The TSF shall require each user to be successfully authenticated before allowing any other TSF mediated actions on behalf of that user.

#### **Audit storage (FAU\_SAS.1) / Loader**

262 The TSF shall provide *the Loader* with the capability to store the *transaction identification of the loaded data* in the *NVM*.

263 **Refinement:**

*The TSF shall systematically store the transaction identification provided by the ST Loader or User Loader together with the loaded data.*

#### **Audit review (FAU\_SAR.1) / Loader**

264 The TSF shall provide *Everybody* with the capability to read the *Product information and the Identification of the last completed maintenance transaction, if any*, from the audit records.

265 The TSF shall provide the audit records in a manner suitable for the user to interpret the information.

### **5.1.5 Additional Security Functional Requirements related to the Secure Diagnostic capabilities**

#### **Limited capabilities (FMT\_LIM.1) / Sdiag**

266 The TSF shall be designed and implemented in a manner that limits its capabilities so that in conjunction with “Limited availability (FMT\_LIM.2)” the following policy is enforced: **Sdiag Limited Capability Policy**.

267 SFP 7: Sdiag Limited Capability Policy

268 *Deploying Secure Diagnostic capability does not allow stored user data of the Composite TOE to be disclosed or manipulated, TSF data to be disclosed or manipulated, software to be reconstructed and no substantial information about construction of TSF to be gathered which may enable other attacks.*

#### **Limited availability (FMT\_LIM.2) / Sdiag**

269 The TSF shall be designed and implemented in a manner that limits its availability so that in conjunction with “Limited capabilities (FMT\_LIM.1)” the following policy is enforced: **Sdiag Limited Availability Policy**.

270 SFP 8: Sdiag Limited Availability Policy

271 *The TSF prevents deploying the Secure Diagnostic capability unless the Secure Diagnostic mode is explicitly enabled by the authorized user. When the Secure Diagnostic capability is deployed, the TSF allows performing only authorized and authentic diagnostic transactions.*

272 **Refinement:**

*By enabling the Secure Diagnostic capability, the Composite Product Manufacturer gives authority to the IC manufacturer to exercise the Secure Diagnostic capability known to abide by SFP\_7.*



**Inter-TSF trusted channel (FTP\_ITC.1) / Sdiag**

- 273 The TSF shall provide a communication channel between itself and another trusted IT product that is logically distinct from other communication channels and provides assured identification of its end points and protection of the channel data from modification or disclosure.
- 274 The TSF shall permit another trusted IT product to initiate communication via the trusted channel.
- 275 The TSF shall initiate communication via the trusted channel for **Secure Diagnostic transaction**.
- 276 **Refinement:**  
**In practice, the communication is initiated by the trusted IT product.**

**Audit review (FAU\_SAR.1) / Sdiag**

- 277 The TSF shall provide **Everybody** with the capability to read the **Secure Diagnostic enable status**, from the audit records.
- 278 The TSF shall provide the audit records in a manner suitable for the user to interpret the information.

**5.1.6 Additional Security Functional Requirements related to M4M-DESFire**

- 279 The following SFRs are extensions to "**BSI-CC-PP-0084-2014**" Protection Profile (PP), related to the capabilities and protections of M4M-DESFire.
- 280 They are only valid in case **M4M-DESFire** is embedded.
- 281 **Note:** M4M-DESFire library directly relies upon the following IC SFRs:
- FRU\_FLT.2 in providing services as part of the security countermeasures implemented in the library,
  - FPT\_FLS.1 in order to generate a software reset,
  - FCS\_RNG.1 for the provision of random numbers,
  - FCS\_COP.1 / TDES for DES cryptographic operations,
  - FCS\_COP.1 / AES for AES cryptographic operations.
- 282 It also relies upon the other SFRs (except those of NesLib), which provide general low level security mechanisms.

**Security roles (FMT\_SMR.1) / M4M-DESFire**

- 283 The TSF shall maintain the roles **VC Administrator, VC Manager, Service Manager, Application Manager, Application User and Everybody**.
- 284 The TSF shall be able to associate users with roles.
- 285 **Note:** Based on the definition, Nobody is not considered as a role.

**Subset access control (FDP\_ACC.1) / M4M-DESFire**

- 286 The TSF shall enforce the **M4M-DESFire Access Control Policy** on **all subjects, objects, operations and attributes defined by the M4M-DESFire Access Control Policy**.

**Security attribute based access control (FDP\_ACF.1) / M4M-DESFire**

- 287 The TSF shall enforce the **M4M-DESFire Access Control Policy** to objects based on the following: **all subjects, objects and attributes**.
- 288 The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed:
- **The VC Manager can create virtual cards.**
  - **The Service Manager can delete a virtual card.**
  - **The VC Administrator of a virtual card can create and delete applications within this virtual card.**
  - **The Service Manager can create and delete applications.**
  - **The Application Manager of an application can delete this application, create data file and values within this application, delete data files and values within this application.**
  - **An Application User can read or write a data file; read, increase or decrease a value based on the access control settings in the respective file attribute.**
- 289 The TSF shall explicitly authorise access of subjects to objects based on the following additional rules:
- **Everybody can create applications if this is allowed by a specific card attribute.**
  - **Everybody can create and delete data files or values of a specific application if this is allowed by a specific application attribute.**
  - **Everybody can read or write a data file; read, increase or decrease a value if this is allowed by a specific file attribute.**
- 290 The TSF shall explicitly deny access of subjects to objects based on the following additional rules:
- **Nobody can read or write a data file; read, increase or decrease a value if this is explicitly set for the respective operation on the respective data file or value.**
- 291 The following SFP **M4M-DESFire Access Control Policy** is defined for the requirement "Security attribute based access control (FDP\_ACF.1) / M4M-DESFire":
- 292 SFP 9: M4M-DESFire Access Control Policy  
The Security Function Policy (SFP) M4M-DESFire Access Control Policy uses the following definitions:  
The subjects are:
- *The VC Manager i.e. the subject that owns or has access to a wholesale VC creation key.*
  - *The Service Manager i.e. the subject that uses the M4M host interface without owning or having access to the VC creation key or a wholesale VC creation key.*
  - *The VC Administrator i.e. the subject that owns or has access to the card master key.*
  - *The Application Manager i.e. the subject that owns or has access to an application master key. Note that the TOE supports multiple applications and therefore multiple Application Managers, however for one application there is only one Application Manager.*
  - *The Application User i.e. the subject that owns or has access to a key that allows to perform operations with application objects. Note that the TOE supports multiple*

*Application Users within each application and the assigned rights to the Application Users can be different, which allows to have more or less powerful Application Users.*

- *Any other subject belongs to the role Everybody. This includes the card holder (i.e. end-user) and any other subject e.g. an attacker. These subjects do not possess any key and can not perform operations that are restricted to the VC Administrator, VC Manager, Service Manager, Application Manager and Application User.*
- *The term Nobody will be used to explicitly indicate that no rights are granted to any subject.*

*The objects are:*

- *The MIFARE implementation itself.*
- *The MIFARE implementation can store a number of virtual cards.*
- *A virtual card can store a number of Applications.*
- *An application can store a number of Data Files of different types.*
- *One specific type of data file are Values.*

*Note that data files and values can be grouped in standard files and backup files, with values belonging to the group of backup files. When the term "file" is used without further information then both data files and values are meant.*

*The operations that can be performed with the objects are:*

- *read a value or data from a data file,*
- *write data to a data file,*
- *increase a value (with a limit or unlimited),*
- *decrease a value,*
- *create a virtual card, an application, a value or a data file,*
- *delete a virtual card, an application, a value or a data file and*
- *modify attribute of the MIFARE implementation, a virtual card, an application, a value or a data file.*

*Note that 'freeze' will be used as specific form of modification that prevents any further modify.*

*The security attributes are:*

- *Attributes of the MIFARE implementation, virtual cards, applications, values and data files.*

*There is a set of attributes for the MIFARE implementation, a set of attributes for every virtual card, a set of attributes for every application and a set of attributes for every single file within an application.*

*The term "MIFARE implementation attributes" will be used for the set of attributes related to the MIFARE implementation, the term "card attributes" will be used for the set of attributes related to a virtual card, the term "application attributes" will be used for the set of application attributes and the term "file attributes" will be used for the attributes of values and data files.*

*Note that subjects are authorized by cryptographic keys or the usage of the M4M host interface. These keys are considered as authentication data and not as security attributes. The MIFARE implementation has a VC creation key. Every virtual card has a card master key. Every application has an application master key and a variable number of keys used for operations on data files or values (all these keys are called application keys). The application keys within an application are numbered.*

*Implications of the M4M-DESFire Access Control Policy:*

The M4M-DESFire Access Control Policy has some implications, that can be drawn from the policy and that are essential parts of the TOE security functions.

- The TOE end-user does normally not belong to the group of authorized users (VC Administrator, VC Manager, Service Manager, Application Manager, Application User), but regarded as 'Everybody' by the TOE. This means that the TOE cannot determine if it is used by its intended end-user (in other words: it cannot determine if the current card holder is the owner of the card).
- The VC Manager can create and associate virtual cards, and write the initial value of the card master key.
- The VC Administrator and the Service Manager can delete virtual cards.
- The VC Administrator can have the exclusive right to create and delete applications on the virtual card, however he can also grant this privilege to Everybody. Additionally, changing the virtual card attributes is reserved for the VC Administrator. Application keys, at delivery time should be personalized to a preliminary, temporary key only known to the VC Administrator and the Application Manager.
- At application personalization time, the Application Manager uses the preliminary application key in order to personalize the application keys, whereas all keys, except the application master key, can be personalized to a preliminary, temporary key only known to the Application Manager and the Application User. Furthermore, the Application Manager has the right to create files within his application scope.

#### Static attribute initialisation (FMT\_MSA.3) / M4M-DESFire

293 The TSF shall enforce the **M4M-DESFire Access Control Policy** to provide **permissive** default values for security attributes that are used to enforce the SFP.

294 The TSF shall allow **no subject** to specify alternative initial values to override the default values when an object or information is created.

295 Application note:

The only initial attributes are the MIFARE implementation attributes. All other attributes have to be defined at the same time the respective object is created.

#### Management of security attributes (FMT\_MSA.1) / M4M-DESFire

296 The TSF shall enforce the **M4M-DESFire Access Control Policy** to restrict the ability to **modify or freeze** the security attributes **MIFARE implementation attributes, virtual card attributes, application attributes and file attributes** to the **VC Administrator, Application Manager and Application User, respectively**.

297 **Refinement:**

**The detailed management abilities are:**

- **The VC Administrator can modify the MIFARE implementation attributes. The MIFARE implementation attributes contain a flag that when set will prevent any**

*further change of the MIFARE implementation attributes, thereby allowing to freeze the MIFARE implementation attributes.*

- *The VC Administrator can modify the card attributes. The card attributes contain a flag that when set will prevent any further change of the card attributes, thereby allowing to freeze the card attributes.*
- *The Application Manager can modify the application attributes. The application attributes contain a flag that when set will prevent any further change of the application attributes, thereby allowing to freeze the application attributes.*
- *The Application Manager can decide to restrict the ability to modify the file attributes to the Application Manager, an Application User, Everybody or to Nobody. The restriction to Nobody is equivalent to freezing the file attributes.*
- *As an implication of the last rule, any subject that receives the modify abilities from the Application Manger gets these abilities transferred.*
- *The implication given in the previous rule includes the possibility for an Application User to modify the file attributes if the Application Manager decides to transfer this ability. If there is no such explicit transfer an Application User does not have the ability to modify the file attributes.*

#### Specification of Management Functions (FMT\_SMF.1) / M4M-DESFire

298 The TSF shall be capable of performing the following security management functions:

- *Authenticating a user,*
- *Invalidating the current authentication state based on the functions: Selecting an application or the virtual card, Changing a key, Occurrence of any error during the execution of a command, Reset,*
- *Changing a security attribute,*
- *Creating or deleting a virtual card, an application, a value or a data file.*

#### Import of user data with security attributes (FDP\_ITC.2) / M4M-DESFire

299 The TSF shall enforce the **M4M-DESFire Access Control Policy** when importing user data, controlled under the SFP, from outside of the TOE.

300 The TSF shall use the security attributes associated with the imported user data.

301 The TSF shall ensure that the protocol used provides for the unambiguous association between the security attributes and the user data received.

302 The TSF shall ensure that interpretation of the security attributes of the imported user data is as intended by the source of the user data.

303 The TSF shall enforce the following rules when importing user data controlled under the SFP from outside the TOE: **no additional rules**.

#### Inter-TSF basic TSF data consistency (FPT\_TDC.1) / M4M-DESFire

304 The TSF shall provide the capability to consistently interpret **data files and values** when shared between the TSF and another trusted IT product.

305 The TSF shall use **the rule: data files or values can only be modified by their dedicated type-specific operations honouring the type-specific boundaries** when interpreting the TSF data from another trusted IT product.

Application note:

The TOE does not interpret the contents of the data, e.g. it can not determine if data stored

in a specific data file is an identification number that adheres to a specific format. Instead the TOE distinguishes different types of files and ensures that type-specific boundaries can not be violated, e.g. values do not overflow, single records are limited by their size and cyclic records are handled correctly.

#### **Cryptographic key destruction (FCS\_CKM.4) / M4M-DESFire**

306 The TSF shall destroy cryptographic keys in accordance with a specified cryptographic key destruction method ***overwriting of memory*** that meets the following: ***none***.

#### **User identification before any action (FIA\_UID.2) / M4M-DESFire**

307 The TSF shall require each user to be successfully identified before allowing any other TSF-mediated actions on behalf of that user.

Application Note:

The Service Manager is identified by the usage of the M4M host interface. Identification of the other users is performed upon an authentication request based on the currently selected context and the key number. For example, if an authentication request for key number 0 is issued after selecting a specific application, the user is identified as the Application Manager of the respective application. Before any authentication request is issued, the user is identified as 'Everybody'.

#### **User authentication before any action (FIA\_UAU.2) / M4M-DESFire**

308 The TSF shall require each user to be successfully authenticated before allowing any other TSF-mediated actions on behalf of that user.

Application Note:

The Service Manager is the only user authenticated outside the TOE.

#### **Multiple authentication mechanisms (FIA\_UAU.5) / M4M-DESFire**

309 The TSF shall provide ***'none' and cryptographic authentication*** to support user authentication.

310 The TSF shall authenticate any user's claimed identity according to the ***following rules***:

- ***The 'none' authentication is performed with anyone who communicates with the TOE without issuing an explicit authentication request. The 'none' authentication implicitly and solely authorises the 'Everybody' subject.***
- ***The cryptographic authentication is used to authorise the VC Administrator, VC Manager, Application Manager and Application User.***

#### **Management of TSF data (FMT\_MTD.1) / M4M-DESFire**

311 The TSF shall restrict the ability to ***change\_default, modify or freeze*** the ***card master key, application master keys and application keys*** to ***the VC Administrator, Application Manager and Application User***.

312 ***Refinement:***



*The detailed management abilities are:*

- *The VC Administrator can modify the card master key. The virtual card attributes contain a flag that when set will prevent any further change of the card master key, thereby allowing to freeze the card master key.*
- *The VC Administrator can change the default key that is used for the application master key and for the application keys when an application is created.*
- *The Application Manager of an application can modify the application master key of this application. The application attributes contain a flag that when set will prevent any further change of the application master key, thereby allowing to freeze the application master key.*
- *The Application Manager can decide to restrict the ability to modify the application keys to the Application Manager, the Application Users or to Nobody. The restriction to Nobody is equivalent to freezing the application keys. The Application Users can either change their own keys or one Application User can be defined that can change all keys of the Application Users within an application.*
- *As an implication of the last rule, any subject that receives the modify abilities from the Application Manager gets these abilities transferred.*

#### **Trusted path (FTP\_TRP.1) / M4M-DESFire**

- 313 The TSF shall provide a communication path between itself and *remote* users that is logically distinct from other communication paths and provides assured identification of its end points and protection of the communicated data from *modification or disclosure*.
- 314 The TSF shall permit *remote users* to initiate communication via the trusted path.
- 315 The TSF shall require the use of the trusted path for *authentication requests with DES and AES, confidentiality and/or data integrity verification for data transfers protected with AES and based on a setting in the file attributes*.

#### **Basic rollback (FDP\_ROL.1) / M4M-DESFire**

- 316 The TSF shall enforce *the M4M-DESFire Access Control Policy* to permit the rollback of the *operations that modify the value or data file objects* on the *backup files*.
- 317 The TSF shall permit operations to be rolled back within the *scope of the current transaction, which is defined by the following limitative events: chip reset, (re-) authentication (either successful or not), select command, explicit commit, explicit abort, command failure*.

#### **Replay detection (FPT\_RPL.1) / M4M-DESFire**

- 318 The TSF shall detect replay for the following entities: *authentication requests with DES and AES, confidentiality and/or data integrity verification for data transfers protected with AES and based on a setting in the file attributes*.
- 319 The TSF shall perform *rejection of the request* when replay is detected.

#### **Unlinkability (FPR\_UNL.1) / M4M-DESFire**

- 320 The TSF shall ensure that *unauthorized subjects other than the card holder* are unable to determine whether *any operation of the TOE were caused by the same user*.

**Minimum and maximum quotas (FRU\_RSA.2) / M4M-DESFire**

- 321 The TSF shall enforce maximum quotas of the following resources **NVM and RAM** that **subjects** can use **simultaneously**.
- 322 The TSF shall ensure the provision of minimum quantity of **the NVM and the RAM** that is available for **subjects** to use **simultaneously**.
- Application note:  
The subjects addressed here are M4M-DESFire, and all other applications running on the TOE.  
The goal is to ensure that M4M-DESFire always have enough NVM and RAM for its own usage.

**Subset residual information protection (FDP\_RIP.1) / M4M-DESFire**

- 323 The TSF shall ensure that any previous information content of a resource is made unavailable upon the **deallocation of the resource from** the following objects: **M4M-DESFire**.

**5.2 TOE security assurance requirements**

- 324 **Security Assurance Requirements for the TOE for the evaluation of the TOE are those taken from the Evaluation Assurance Level 5 (EAL5) and augmented by taking the following components:**
- ADV\_IMP.2, ADV\_INT.3, ADV\_TDS.5, ALC\_CMC.5, **ALC\_DVS.2**, ALC\_FLR.1, ALC\_TAT.3, ASE\_TSS.2, ATE\_COV.3, ATE\_FUN.2 and **AVA\_VAN.5**.
- 325 Regarding application note 21 of [BSI-CC-PP-0084-2014](#), the continuously increasing maturity level of evaluations of Security ICs justifies the selection of a higher-level assurance package.
- 326 The component ALC\_FLR.1 is chosen as an augmentation in this ST because a solid flaw management is key for the continuous improvement of the security IC platforms, especially on markets which need highly resistant and long lasting products.
- 327 The component ASE\_TSS.2 is chosen as an augmentation in this ST to give architectural information on the security functionality of the TOE.
- 328 The set of security assurance requirements (SARs) is presented in [Table 10](#), indicating the origin of the requirement.

**Table 10. TOE security assurance requirements**

Label	Title	Origin
ADV_ARC.1	Security architecture description	EAL5/ <a href="#">BSI-CC-PP-0084-2014</a>
ADV_FSP.5	Complete semi-formal functional specification with additional error information	EAL5
ADV_IMP.2	Complete mapping of the implementation representation of the TSF	Security Target
ADV_INT.3	Minimally complex internals	Security Target
ADV_TDS.5	Complete semiformal modular design	Security Target



Table 10. TOE security assurance requirements (continued)

Label	Title	Origin
AGD_OPE.1	Operational user guidance	EAL5/ <a href="#">BSI-CC-PP-0084-2014</a>
AGD_PRE.1	Preparative procedures	EAL5/ <a href="#">BSI-CC-PP-0084-2014</a>
ALC_CMC.5	Advanced support	Security Target
ALC_CMS.5	Development tools CM coverage	EAL5
ALC_DEL.1	Delivery procedures	EAL5/ <a href="#">BSI-CC-PP-0084-2014</a>
ALC_DVS.2	Sufficiency of security measures	<a href="#">BSI-CC-PP-0084-2014</a>
ALC_FLR.1	Basic flaw remediation	Security Target
ALC_LCD.1	Developer defined life-cycle model	EAL5/ <a href="#">BSI-CC-PP-0084-2014</a>
ALC_TAT.3	Compliance with implementation standards - all parts	Security Target
ASE_CCL.1	Conformance claims	EAL5/ <a href="#">BSI-CC-PP-0084-2014</a>
ASE_ECD.1	Extended components definition	EAL5/ <a href="#">BSI-CC-PP-0084-2014</a>
ASE_INT.1	ST introduction	EAL5/ <a href="#">BSI-CC-PP-0084-2014</a>
ASE_OBJ.2	Security objectives	EAL5/ <a href="#">BSI-CC-PP-0084-2014</a>
ASE_REQ.2	Derived security requirements	EAL5/ <a href="#">BSI-CC-PP-0084-2014</a>
ASE_SPD.1	Security problem definition	EAL5/ <a href="#">BSI-CC-PP-0084-2014</a>
ASE_TSS.2	TOE summary specification with architectural summary	Security Target
ATE_COV.3	Rigorous analysis of coverage	Security Target
ATE_DPT.3	Testing: modular design	EAL5
ATE_FUN.2	Ordered functional testing	Security Target
ATE_IND.2	Independent testing - sample	EAL5/ <a href="#">BSI-CC-PP-0084-2014</a>
AVA_VAN.5	Advanced methodical vulnerability analysis	<a href="#">BSI-CC-PP-0084-2014</a>

### 5.3 Refinement of the security assurance requirements

- 329 As [BSI-CC-PP-0084-2014](#) defines refinements for selected SARs, these refinements are also claimed in this Security Target.
- 330 The main customizing is that the IC Dedicated Software is an operational part of the TOE after delivery, although it is mainly not available to the user.
- 331 Regarding application note 22 of [BSI-CC-PP-0084-2014](#), the refinements for all the assurance families have been reviewed for the hierarchically higher-level assurance components selected in this Security Target.
- 332 The text of the impacted refinements of [BSI-CC-PP-0084-2014](#) is reproduced in the next sections.
- 333 For reader's ease, an impact summary is provided in [Table 11](#).

Table 11. Impact of EAL5 selection on *BSI-CC-PP-0084-2014* refinements

Assurance Family	<i>BSI-CC-PP-0084-2014</i> Level	ST Level	Impact on refinement
ALC_DEL	1	1	New refinement related to the Loader
ALC_DVS	2	2	None
ALC_CMS	4	5	None, refinement is still valid
ALC_CMC	4	5	None, refinement is still valid
ADV_ARC	1	1	None
ADV_FSP	4	5	Presentation style changes, IC Dedicated Software is included
ADV_IMP	1	2	None, refinement is still valid
ATE_COV	2	3	IC Dedicated Software is included
AGD_OPE	1	1	None
AGD_PRE	1	1	New refinement related to the Loader
AVA_VAN	5	5	None

### 5.3.1 Refinement regarding delivery procedure (ALC\_DEL)

334 According to *JIL SRFPDCL*:

335 For the delivery of the Initial TOE, Additional Code and Final TOE, all the guidance describing the delivery procedures shall be taken into account.

336 They must especially describe the protection measures of the proof associated to the Additional Codes and the protection measures of the cryptographic keys used to generate this proof. The measures described in the guidance will have to be audited.

### 5.3.2 Refinement regarding functional specification (ADV\_FSP)

337 ~~Although the IC Dedicated Test Software is a part of the TOE, the test functions of the IC Dedicated Test Software are not described in the Functional Specification because the IC Dedicated Test Software is considered as a test tool delivered with the TOE but not providing security functions for the operational phase of the TOE. The IC Dedicated Software provides security functionalities as soon as the TOE becomes operational (boot software). These are properly identified in the delivered documentation.~~

338 The Functional Specification *refers to datasheet to* trace security features that do not provide any external interface but that contribute to fulfil the SFRs e.g. like physical protection. Thereby they are part of the complete instantiation of the SFRs.

339 The Functional Specification *refers to design specifications to detail the* mechanisms against physical attacks *described* in a more general way only, but detailed enough to be able to support Test Coverage Analysis also for those mechanisms where inspection of the layout is of relevance or tests beside the TSFI may be needed.

340 The Functional Specification *refers to data sheet to* specify operating conditions of the TOE. These conditions include but are not limited to the frequency of the clock, the power supply, and the temperature.

341 All functions and mechanisms which control access to the functions provided by the IC Dedicated Test Software (refer to the security functional requirement (FMT\_LIM.2)) **are part of the** Functional Specification. Details will be given in the document for ADV\_ARC, ~~refer to Section 6.2.1.5.~~ In addition, all these functions and mechanisms **are** subsequently ~~be~~ refined according to all relevant requirements of the Common Criteria assurance class ADV because these functions and mechanisms are active after TOE Delivery and need to be part of the assurance aspects Tests (class ATE) and Vulnerability Assessment (class AVA). Therefore, all necessary information **is** provided to allow tests and vulnerability assessment.

342 Since the selected higher-level assurance component requires a security functional specification presented in a “semi-formal style” (ADV\_FSP.5.2C) the changes affect the style of description, the [BSI-CC-PP-0084-2014](#) refinements can be applied with changes covering the IC Dedicated Test Software and are valid for ADV\_FSP.5.

### 5.3.3 Refinement regarding test coverage (ATE\_COV)

343 The TOE **is** tested under different operating conditions within the specified ranges. These conditions include but are not limited to the frequency of the clock, the power supply, and the temperature. This means that “Fault tolerance (FRU\_FLT.2)” **is** proven for the complete TSF. The tests ~~must~~ also cover functions which may be affected by “ageing” (such as *NVM* writing).

344 The existence and effectiveness of measures against physical attacks (as specified by the functional requirement FPT\_PHP.3) cannot be tested in a straightforward way. Instead **STMicroelectronics provides** evidence that the TOE actually has the particular physical characteristics (especially layout design principles). This **is** done by checking the layout (implementation or actual) in an appropriate way. The required evidence pertains to the existence of mechanisms against physical attacks (unless being obvious).

345 ~~The IC Dedicated Test Software is seen as a “test tool” being delivered as part of the TOE. However, the Test Features do not provide security functionality. Therefore, Test Features need not to be covered by the Test Coverage Analysis but all functions and mechanisms which limit the capability of the functions (cf. FMT\_LIM.1) and control access to the functions (cf. FMT\_LIM.2) provided by the IC Dedicated Test Software must be part of the Test Coverage Analysis. The IC Dedicated Software provides security functionalities as soon as the TOE becomes operational (boot software). These are part of the Test Coverage Analysis.~~

### 5.3.4 Refinement regarding preparative procedures (AGD\_PRE)

346 According to [JIL SRFPDCL](#):

347 Preparative user guidance are intended to be used by persons responsible for the following tasks:

- acceptance of the Initial TOE and of the Additional Code;
- installation of the TOE: download of the Additional Code onto the Initial TOE, activation of the Additional Code, checking of the resulting Identification Data.

## 5.4 Security Requirements rationale

### 5.4.1 Rationale for the Security Functional Requirements

348 Just as for the security objectives rationale of [Section 4.3](#), the main line of this rationale is that the inclusion of all the security requirements of the [BSI-CC-PP-0084-2014](#) protection profile, together with those in [AUG](#), and with those introduced in this Security Target, guarantees that all the security objectives identified in [Section 4](#) are suitably addressed by the security requirements stated in this chapter, and that the latter together form an internally consistent whole.

**Table 12. Security Requirements versus Security Objectives**

Security Objective	TOE Security Functional and Assurance Requirements
<a href="#">BSI.O.Leak-Inherent</a>	<p>“Basic internal transfer protection” FDP_ITT.1</p> <p>“Basic internal TSF data transfer protection” FPT_ITT.1</p> <p>“Subset information flow control” FDP_IFC.1</p>
<a href="#">BSI.O.Phys-Probing</a>	<p>“Stored data confidentiality” FDP_SDC.1</p> <p>“Resistance to physical attack” FPT_PHP.3</p>
<a href="#">BSI.O.Malfunction</a>	<p>“Limited fault tolerance” FRU_FLT.2</p> <p>“Failure with preservation of secure state” FPT_FLS.1</p>
<a href="#">BSI.O.Phys-Manipulation</a>	<p>“Stored data integrity monitoring and action” FDP_SDI.2</p> <p>“Resistance to physical attack” FPT_PHP.3</p>
<a href="#">BSI.O.Leak-Forced</a>	<p>All requirements listed for <a href="#">BSI.O.Leak-Inherent</a>  <a href="#">FDP_ITT.1</a>, <a href="#">FPT_ITT.1</a>, <a href="#">FDP_IFC.1</a>  plus those listed for <a href="#">BSI.O.Malfunction</a> and <a href="#">BSI.O.Phys-Manipulation</a>  <a href="#">FRU_FLT.2</a>, <a href="#">FPT_FLS.1</a>, <a href="#">FDP_SDI.2</a>, <a href="#">FPT_PHP.3</a></p>
<a href="#">BSI.O.Abuse-Func</a>	<p>“Limited capabilities - Test” FMT_LIM.1 / Test</p> <p>“Limited availability - Test” FMT_LIM.2 / Test</p> <p>“Limited capabilities - Secure Diagnostic” FMT_LIM.1 / Sdiag</p> <p>“Limited availability - Secure Diagnostic” FMT_LIM.2 / Sdiag</p> <p>“Inter-TSF trusted channel - Secure Diagnostic” FTP_ITC.1 / Sdiag</p> <p>“Audit review - Secure Diagnostic” FAU_SAR.1 / Sdiag</p> <p>plus those for <a href="#">BSI.O.Leak-Inherent</a>, <a href="#">BSI.O.Phys-Probing</a>,  <a href="#">BSI.O.Malfunction</a>, <a href="#">BSI.O.Phys-Manipulation</a>, <a href="#">BSI.O.Leak-Forced</a>  <a href="#">FDP_ITT.1</a>, <a href="#">FPT_ITT.1</a>, <a href="#">FDP_IFC.1</a>, <a href="#">FDP_SDC.1</a>, <a href="#">FDP_SDI.2</a>,  <a href="#">FPT_PHP.3</a>, <a href="#">FRU_FLT.2</a>, <a href="#">FPT_FLS.1</a></p>
<a href="#">BSI.O.Identification</a>	<p>“Audit storage” FAU_SAS.1</p>
<a href="#">BSI.O.RND</a>	<p>“Random number generation” FCS_RNG.1</p> <p>plus those for <a href="#">BSI.O.Leak-Inherent</a>, <a href="#">BSI.O.Phys-Probing</a>,  <a href="#">BSI.O.Malfunction</a>, <a href="#">BSI.O.Phys-Manipulation</a>, <a href="#">BSI.O.Leak-Forced</a>  <a href="#">FDP_ITT.1</a>, <a href="#">FPT_ITT.1</a>, <a href="#">FDP_IFC.1</a>, <a href="#">FDP_IFC.1</a>, <a href="#">FDP_SDC.1</a>,  <a href="#">FPT_PHP.3</a>, <a href="#">FRU_FLT.2</a>, <a href="#">FPT_FLS.1</a></p>
<a href="#">BSI.OE.Resp-Appl</a>	Not applicable

Table 12. Security Requirements versus Security Objectives

Security Objective	TOE Security Functional and Assurance Requirements
<i>BSI.OE.Process-Sec-IC</i>	Not applicable
<i>BSI.OE.Lim-Block-Loader</i>	Not applicable
<i>BSI.OE.Loader-Usage</i>	Not applicable
<i>BSI.OE.TOE-Auth</i>	Not applicable
<i>OE.Enable-Disable-Secure-Diag</i>	Not applicable
<i>OE.Secure-Diag-Usage</i>	Not applicable
<i>BSI.O.Authentication</i>	"Authentication Proof of Identity" <i>FIA_API.1</i>
<i>BSI.O.Cap-Avail-Loader</i>	"Limited capabilities - Loader" <i>FMT_LIM.1 / Loader</i> "Limited availability - Loader" <i>FMT_LIM.2 / Loader</i>
<i>BSI.O.Ctrl_Auth_Loader</i>	"Inter-TSF trusted channel - Loader" <i>FTP_ITC.1 / Loader</i> "Basic data exchange confidentiality - Loader" <i>FDP_UCT.1 / Loader</i> "Data exchange integrity - Loader" <i>FDP_UIT.1 / Loader</i> "Subset access control - Loader" <i>FDP_ACC.1 / Loader</i> "Security attribute based access control - Loader" <i>FDP_ACF.1 / Loader</i> "Static attribute initialisation - Loader" <i>FMT_MSA.3 / Loader</i> "Management of security attributes - Loader" <i>FMT_MSA.1 / Loader</i> "Specification of management functions - Loader" <i>FMT_SMF.1 / Loader</i> "Security roles - Loader" <i>FMT_SMR.1 / Loader</i> "Timing of identification - Loader" <i>FIA_UID.1 / Loader</i> "Timing of authentication - Loader" <i>FIA_UAU.1 / Loader</i>
<i>ANSSI.O.Prot-TSF-Confidentiality</i>	"Inter-TSF trusted channel - Loader" <i>FTP_ITC.1 / Loader</i> "Basic data exchange confidentiality - Loader" <i>FDP_UCT.1 / Loader</i> "Data exchange integrity - Loader" <i>FDP_UIT.1 / Loader</i> "Subset access control - Loader" <i>FDP_ACC.1 / Loader</i> "Security attribute based access control - Loader" <i>FDP_ACF.1 / Loader</i> "Static attribute initialisation - Loader" <i>FMT_MSA.3 / Loader</i> "Management of security attributes - Loader" <i>FMT_MSA.1 / Loader</i> "Specification of management functions - Loader" <i>FMT_SMF.1 / Loader</i> "Security roles - Loader" <i>FMT_SMR.1 / Loader</i> "Timing of identification - Loader" <i>FIA_UID.1 / Loader</i> "Timing of authentication - Loader" <i>FIA_UAU.1 / Loader</i>

Table 12. Security Requirements versus Security Objectives

Security Objective	TOE Security Functional and Assurance Requirements
<i>ANSSI.O.Secure-Load-ACode</i>	<p><i>“Inter-TSF trusted channel - Loader” FTP_ITC.1 / Loader</i></p> <p><i>“Basic data exchange confidentiality - Loader” FDP_UCT.1 / Loader</i></p> <p><i>“Data exchange integrity - Loader” FDP_UIT.1 / Loader</i></p> <p><i>“Subset access control - Loader” FDP_ACC.1 / Loader</i></p> <p><i>“Security attribute based access control - Loader” FDP_ACF.1 / Loader</i></p> <p><i>“Static attribute initialisation - Loader” FMT_MSA.3 / Loader</i></p> <p><i>“Management of security attributes - Loader” FMT_MSA.1 / Loader</i></p> <p><i>“Specification of management functions - Loader” FMT_SMF.1 / Loader</i></p> <p><i>“Security roles - Loader” FMT_SMR.1 / Loader</i></p> <p><i>“Timing of identification - Loader” FIA_UID.1 / Loader</i></p> <p><i>“Timing of authentication - Loader” FIA_UAU.1 / Loader</i></p> <p><i>“Audit storage - Loader” FAU_SAS.1 / Loader</i></p>
<i>ANSSI.O.Secure-AC-Activation</i>	<i>“Failure with preservation of secure state - Loader” FPT_FLS.1 / Loader</i>
<i>ANSSI.O.TOE-Identification</i>	<p><i>“Audit storage - Loader” FAU_SAS.1 / Loader</i></p> <p><i>“Audit review - Loader” FAU_SAR.1 / Loader</i></p> <p><i>“Stored data integrity monitoring and action” FDP_SDI.2</i></p>
<i>O.Secure-Load-AMemImage</i>	<p><i>“Inter-TSF trusted channel - Loader” FTP_ITC.1 / Loader</i></p> <p><i>“Basic data exchange confidentiality - Loader” FDP_UCT.1 / Loader</i></p> <p><i>“Data exchange integrity - Loader” FDP_UIT.1 / Loader</i></p> <p><i>“Subset access control - Loader” FDP_ACC.1 / Loader</i></p> <p><i>“Security attribute based access control - Loader” FDP_ACF.1 / Loader</i></p> <p><i>“Static attribute initialisation - Loader” FMT_MSA.3 / Loader</i></p> <p><i>“Management of security attributes - Loader” FMT_MSA.1 / Loader</i></p> <p><i>“Specification of management functions - Loader” FMT_SMF.1 / Loader</i></p> <p><i>“Security roles - Loader” FMT_SMR.1 / Loader</i></p> <p><i>“Timing of identification - Loader” FIA_UID.1 / Loader</i></p> <p><i>“Timing of authentication - Loader” FIA_UAU.1 / Loader</i></p> <p><i>“Audit storage - Loader” FAU_SAS.1 / Loader</i></p>
<i>O.MemImage-Identification</i>	<p><i>“Failure with preservation of secure state - Loader” FPT_FLS.1 / Loader</i></p> <p><i>“Audit storage - Loader” FAU_SAS.1 / Loader</i></p> <p><i>“Audit review - Loader” FAU_SAR.1 / Loader</i></p> <p><i>“Stored data integrity monitoring and action” FDP_SDI.2</i></p>
<i>OE.Composite-TOE-Id</i>	Not applicable
<i>OE.TOE-Id</i>	Not applicable

Table 12. Security Requirements versus Security Objectives

Security Objective	TOE Security Functional and Assurance Requirements
<i>AUG1.O.Add-Functions</i>	<p>“Cryptographic operation” <i>FCS_COP.1</i></p> <p>“Cryptographic key generation” <i>FCS_CKM.1</i></p>
<i>AUG4.O.Mem-Access</i>	<p>“Complete access control - Memories” <i>FDP_ACC.2 / Memories</i></p> <p>“Security attribute based access control - Memories” <i>FDP_ACF.1 / Memories</i></p> <p>“Static attribute initialisation - Memories” <i>FMT_MSA.3 / Memories</i></p> <p>“Management of security attributes - Memories” <i>FMT_MSA.1 / Memories</i></p> <p>“Specification of management functions - Memories” <i>FMT_SMF.1 / Memories</i></p>
<i>O.Access-Control-DESFire</i>	<p>“Security roles - M4M-DESFire” <i>FMT_SMR.1 / M4M-DESFire</i></p> <p>“Subset access control - M4M-DESFire” <i>FDP_ACC.1 / M4M-DESFire</i></p> <p>“Security attribute based access control - M4M-DESFire” <i>FDP_ACF.1 / M4M-DESFire</i></p> <p>“Static attribute initialisation - M4M-DESFire” <i>FMT_MSA.3 / M4M-DESFire</i></p> <p>“Management of security attributes - M4M-DESFire” <i>FMT_MSA.1 / M4M-DESFire</i></p> <p>“Specification of management functions - M4M-DESFire” <i>FMT_SMF.1 / M4M-DESFire</i></p> <p>“Import of user data with security attributes - M4M-DESFire” <i>FDP_ITC.2 / M4M-DESFire</i></p> <p>“Cryptographic key destruction - M4M-DESFire” <i>FCS_CKM.4 / M4M-DESFire</i></p> <p>“Management of TSF data - M4M-DESFire” <i>FMT_MTD.1 / M4M-DESFire</i></p>
<i>O.Authentication-DESFire</i>	<p>“Cryptographic operation - DES” <i>FCS_COP.1 / DES</i></p> <p>“Cryptographic operation - AES” <i>FCS_COP.1 / AES</i></p> <p>“User identification before any action - M4M-DESFire” <i>FIA_UID.2 / M4M-DESFire</i></p> <p>“User authentication before any action - M4M-DESFire” <i>FIA_UAU.2 / M4M-DESFire</i></p> <p>“Multiple authentication mechanisms - M4M-DESFire” <i>FIA_UAU.5 / M4M-DESFire</i></p> <p>“Trusted path - M4M-DESFire” <i>FTP_TRP.1 / M4M-DESFire</i></p> <p>“Replay detection - M4M-DESFire” <i>FPT_RPL.1 / M4M-DESFire</i></p>
<i>O.Confidentiality-DESFire</i>	<p>“Cryptographic operation - DES” <i>FCS_COP.1 / DES</i></p> <p>“Cryptographic operation - AES” <i>FCS_COP.1 / AES</i></p> <p>“Trusted path - M4M-DESFire” <i>FTP_TRP.1 / M4M-DESFire</i></p> <p>“Replay detection - M4M-DESFire” <i>FPT_RPL.1 / M4M-DESFire</i></p>
<i>O.Type-Consistency-DESFire</i>	<p>“Inter-TSF basic TSF data consistency - M4M-DESFire” <i>FPT_TDC.1 / M4M-DESFire</i></p>



Table 12. Security Requirements versus Security Objectives

Security Objective	TOE Security Functional and Assurance Requirements
<i>O.Transaction-DESFire</i>	<i>“Basic rollback - M4M-DESFire” FDP_ROL.1 / M4M-DESFire</i>
<i>O.No-Trace-DESFire</i>	<i>“Unlinkability - M4M-DESFire” FPR_UNL.1 / M4M-DESFire</i>
<i>O.Resp-Appl</i>	All SFRs defined additionally in the ST
<i>O.Resource-DESFire</i>	<i>“Minimum and maximum quotas - M4M-DESFire” FRU_RSA.2 / M4M-DESFire</i>
<i>O.Verification-DESFire</i>	<i>“Complete access control - Memories” FDP_ACC.2 / Memories</i> <i>“Security attribute based access control - Memories” FDP_ACF.1 / Memories</i> <i>“Static attribute initialisation - Memories” FMT_MSA.3 / Memories</i> <i>“Failure with preservation of secure state” FPT_FLS.1</i>
<i>O.Firewall-DESFire</i>	<i>“Complete access control - Memories” FDP_ACC.2 / Memories</i> <i>“Security attribute based access control - Memories” FDP_ACF.1 / Memories</i> <i>“Static attribute initialisation - Memories” FMT_MSA.3 / Memories</i>
<i>O.Shr-Res-DESFire</i>	<i>“Subset residual information protection - M4M-DESFire” FDP_RIP.1 / M4M-DESFire</i>
<i>OE.Secure-Values-DESFire</i>	Not applicable
<i>OE.Terminal-Support-DESFire</i>	Not applicable
<i>OE.M4MFramework-Identification</i>	Not applicable

349 As origins of security objectives have been carefully kept in their labelling, and origins of security requirements have been carefully identified in [Table 7](#) and [Table 12](#), it can be verified that the justifications provided by the [BSI-CC-PP-0084-2014](#) protection profile and [AUG](#) can just be carried forward to their union.

350 From [Table 5](#), it is straightforward to identify additional security objectives for the TOE ([AUG1.O.Add-Functions](#) and [AUG4.O.Mem-Access](#)) tracing back to [AUG](#), additional objectives ([ANSSI.O.Prot-TSF-Confidentiality](#), [ANSSI.O.Secure-Load-ACode](#), [ANSSI.O.Secure-AC-Activation](#) and [ANSSI.O.TOE-Identification](#)) tracing back to [JIL SRFPDCL / ANSSI-CC-CER/F/06.003](#), and additional objectives ([O.Secure-Load-AMemImage](#), [O.MemImage-Identification](#), [O.Access-Control-DESFire](#), [O.Authentication-DESFire](#), [O.Confidentiality-DESFire](#), [O.Type-Consistency-DESFire](#), [O.Transaction-DESFire](#), [O.No-Trace-DESFire](#), [O.Resp-Appl](#), [O.Resource-DESFire](#), [O.Verification-DESFire](#), [O.Firewall-DESFire](#) and [O.Shr-Res-DESFire](#)) introduced in this Security Target. This rationale must show that security requirements suitably address them all.



- 351 Furthermore, a careful observation of the requirements listed in [Table 7](#) and [Table 12](#) shows that:
- there are security requirements introduced from [AUG](#) ([FCS\\_COP.1 / Memories](#), [FDP\\_ACC.2 / Memories](#), [FDP\\_ACF.1 / Memories](#), [FMT\\_MSA.3 / Memories](#) and [FMT\\_MSA.1 / Memories](#)),
  - there are additional security requirements introduced by this Security Target ([FCS\\_CKM.1](#), [FMT\\_MSA.3 / Loader](#), [FMT\\_MSA.1 / Loader](#), [FMT\\_SMF.1 / Loader](#), [FMT\\_SMR.1 / Loader](#), [FIA\\_UID.1 / Loader](#), [FIA\\_UAU.1 / Loader](#), [FPT\\_FLS.1 / Loader](#), [FAU\\_SAS.1 / Loader](#), [FAU\\_SAR.1 / Loader](#), [FMT\\_SMF.1 / Memories](#), [FMT\\_SMR.1 / M4M-DESSFire](#), [FDP\\_ACC.1 / M4M-DESSFire](#), [FDP\\_ACF.1 / M4M-DESSFire](#), [FMT\\_MSA.3 / M4M-DESSFire](#), [FMT\\_MSA.1 / M4M-DESSFire](#), [FMT\\_SMF.1 / M4M-DESSFire](#), [FDP\\_ITC.2 / M4M-DESSFire](#), [FPT\\_TDC.1 / M4M-DESSFire](#), [FIA\\_UID.2 / M4M-DESSFire](#), [FIA\\_UAU.2 / M4M-DESSFire](#), [FIA\\_UAU.5 / M4M-DESSFire](#), [FMT\\_MTD.1 / M4M-DESSFire](#), [FTP\\_TRP.1 / M4M-DESSFire](#), [FCS\\_CKM.4 / M4M-DESSFire](#), [FDP\\_ROL.1 / M4M-DESSFire](#), [FPT\\_RPL.1 / M4M-DESSFire](#), [FPR\\_UNL.1 / M4M-DESSFire](#), [FRU\\_RSA.2 / M4M-DESSFire](#), [FDP\\_RIP.1 / M4M-DESSFire](#), [FTP\\_ITC.1 / Sdiag](#), [FAU\\_SAR.1 / Sdiag](#), [FMT\\_LIM.1 / Sdiag](#), [FMT\\_LIM.2 / Sdiag](#), and various assurance requirements of EAL5+).
- 352 Though it remains to show that:
- security objectives from this Security Target, from [JIL SRFPDCL / ANSSI-CC-CER/F/06.003](#) and from [AUG](#) are addressed by security requirements stated in this chapter,
  - additional security requirements from this Security Target and from [AUG](#) are mutually supportive with the security requirements from the [BSI-CC-PP-0084-2014](#) protection profile, and they do not introduce internal contradictions,
  - all dependencies are still satisfied.
- 353 The justification that the additional security objectives are suitably addressed, that the additional security requirements are mutually supportive and that, together with those already in [BSI-CC-PP-0084-2014](#), they form an internally consistent whole, is provided in the next subsections.

## 5.4.2 Extended security objectives are suitably addressed

### Security objective “Dynamic Area based Memory Access Control ([AUG4.O.Mem-Access](#))”

- 354 The justification related to the security objective “**Dynamic** Area based Memory Access Control ([AUG4.O.Mem-Access](#))” is as follows:
- 355 The security functional requirements “**Complete access control** ([FDP\\_ACC.2 / Memories](#))” **and** “**Security attribute based access control** ([FDP\\_ACF.1 / Memories](#))”, with the related Security Function Policy (SFP) “**Dynamic Memory Access Control Policy**” exactly require to implement a **Dynamic** area based memory access control as demanded by [AUG4.O.Mem-Access](#). Therefore, [FDP\\_ACC.2 / Memories](#) **and** [FDP\\_ACF.1 / Memories](#) with **their** SFP **are** suitable to meet the security objective.
- 356 The security functional requirement “**Static attribute initialisation** ([FMT\\_MSA.3 / Memories](#))” requires that the TOE provides default values for security attributes. The ability to update the security attributes is restricted to privileged subject(s) **as further detailed in the security functional requirement** “**Management of security attributes** ([FMT\\_MSA.1 /](#)

*Memories*". These management functions ensure that the required access control can be realised using the functions provided by the TOE.

### Security objective "Additional Specific Security Functionality (*AUG1.O.Add-Functions*)"

357 The justification related to the security objective "Additional Specific Security Functionality (*AUG1.O.Add-Functions*)" is as follows:

358 The security functional requirements "*Cryptographic operation (FCS\_COP.1)*" and "*Cryptographic key generation (FCS\_CKM.1)*" exactly require those functions to be implemented that are demanded by *AUG1.O.Add-Functions*. Therefore, *FCS\_COP.1* is suitable to meet the security objective, **together with** *FCS\_CKM.1*.

### Security objective "Protection against Abuse of Functionality (*BSI.O.Abuse-Func*)"

359 This objective states that abuse of functions (especially provided by the IC Dedicated Test Software, for instance in order to read secret data) must not be possible in Phase 7 of the life-cycle. There are two possibilities to achieve this: (i) They cannot be used by an attacker (i. e. its availability is limited) or (ii) using them would not be of relevant use for an attacker (i. e. its capabilities are limited) since the functions are designed in a specific way. The first possibility is specified by "*Limited availability (FMT\_LIM.2) / Test*" and "*Limited availability (FMT\_LIM.2) / Sdiag*", and the second one by "*Limited capabilities (FMT\_LIM.1) / Test*" and "*Limited capabilities (FMT\_LIM.1) / Sdiag*". Since these requirements are combined to support the policy, which is suitable to fulfil O.Abuse-Func, **these** security functional requirements together are suitable to meet the objective.

360 Other security functional requirements which prevent attackers from circumventing the functions implementing these two security functional requirements (for instance by manipulating the hardware) also support the objective. The relevant **Security Functional requirements** are also listed in *Table 12*.

### Security objective "Access control and authenticity for the Loader (*BSI.O.Ctrl\_Auth\_Loader*)"

361 The justification related to the security objective "Access control and authenticity for the Loader (*BSI.O.Ctrl\_Auth\_Loader*)" is as follows:

362 The **security functional requirement** "*Subset access control (FDP\_ACC.1) / Loader*" defines the subjects, objects and operations of the Loader SFP enforced by the SFR *FTP\_ITC.1 / Loader*, *FDP\_UCT.1 / Loader*, *FDP\_UIT.1 / Loader* and *FDP\_ACF.1 / Loader*. The **security functional requirement** "*Inter-TSF trusted channel (FTP\_ITC.1) / Loader*" requires the TSF to establish a trusted channel with assured identification of its end points and protection of the channel data from modification or disclosure. The **security functional requirement** "*Basic data exchange confidentiality (FDP\_UCT.1) / Loader*" requires the TSF to receive data protected from unauthorized disclosure. The **security functional requirement** "*Data exchange integrity (FDP\_UIT.1) / Loader*" requires the TSF to verify the integrity **and the rightfulness** of the received data. The **security functional requirement** "*Security attribute based access control (FDP\_ACF.1) / Loader*" requires the TSF to implement access control for the Loader functionality. Therefore, *FTP\_ITC.1 / Loader*, *FDP\_UCT.1 / Loader*, *FDP\_UIT.1 / Loader*, *FDP\_ACC.1 / Loader* and *FDP\_ACF.1 / Loader* with their SFP are suitable to meet the security objective.

- 363 Complementary, the security functional requirement "*Static attribute initialisation (FMT\_MSA.3) / Loader*" requires that the TOE provides default values for security attributes. The ability to update the security attributes is restricted to privileged subject(s) as further detailed in the security functional requirement "*Management of security attributes (FMT\_MSA.1) / Loader*".
- The security functional requirements "*Security roles (FMT\_SMR.1) / Loader*", "*Timing of identification (FIA\_UID.1) / Loader*" and "*Timing of authentication (FIA\_UAU.1) / Loader*" specify the roles that the TSF recognises and the actions authorized before their identification.
- The security functional requirement "*Specification of management functions (FMT\_SMF.1) / Loader*" provides additional controlled facility for adapting the loader behaviour to the user's needs. These management functions ensure that the required access control, associated to the loading feature, can be realized using the functions provided by the TOE.
- Security objectives "Protection of the confidentiality of the TSF (ANSSI.O.Prot-TSF-Confidentiality)", "Secure loading of the Additional Code (ANSSI.O.Secure-Load-ACode)" and "Secure loading of the Additional Memory Image (O.Secure-Load-AMemlImage)"**
- 364 The justification related to the security objectives "Protection of the confidentiality of the TSF (ANSSI.O.Prot-TSF-Confidentiality)", "Secure loading of the Additional Code (ANSSI.O.Secure-Load-ACode)" and "Secure loading of the Additional Memory Image (O.Secure-Load-AMemlImage)" is as follows:
- 365 The security functional requirement "*Subset access control (FDP\_ACC.1) / Loader*" defines the subjects, objects and operations of the Loader SFP enforced by the SFR FTP\_ITC.1, FDP\_UCT.1, FDP\_UIT.1 and FDP\_ACF.1/Loader.
- The security functional requirement "*Inter-TSF trusted channel (FTP\_ITC.1) / Loader*" requires the TSF to establish a trusted channel with assured identification of its end points and protection of the channel data from modification or disclosure.
- The security functional requirement "*Basic data exchange confidentiality (FDP\_UCT.1) / Loader*" requires the TSF to receive data protected from unauthorized disclosure.
- The security functional requirement "*Data exchange integrity (FDP\_UIT.1) / Loader*" requires the TSF to verify the integrity of the received data.
- The security functional requirement "*Security attribute based access control (FDP\_ACF.1) / Loader*" requires the TSF to implement access control for the Loader functionality.
- The security functional requirement "*Static attribute initialisation (FMT\_MSA.3) / Loader*" requires that the TOE provides default values for security attributes.
- The ability to update the security attributes is restricted to privileged subject(s) as further detailed in the security functional requirement "*Management of security attributes (FMT\_MSA.1) / Loader*".
- The security functional requirements "*Security roles (FMT\_SMR.1) / Loader*", "*Timing of identification (FIA\_UID.1) / Loader*" and "*Timing of authentication (FIA\_UAU.1) / Loader*" specify the roles that the TSF recognises and the actions authorized before their identification.
- The security functional requirement "*Specification of management functions (FMT\_SMF.1) / Loader*" provides additional controlled facility for adapting the loader behaviour to the user's needs. These management functions ensure that the required access control, associated to the loading feature, can be realised using the functions provided by the TOE.
- The security functional requirement "*Audit storage (FAU\_SAS.1) / Loader*" requires to store the identification data needed to enforce that only the allowed version of the Additional Memory Image can be loaded on the Initial TOE.

366 Therefore, *FTP\_ITC.1 / Loader*, *FDP\_UCT.1 / Loader*, *FDP\_UIT.1 / Loader*, *FDP\_ACC.1 / Loader*, *FDP\_ACF.1 / Loader* together with *FMT\_MSA.3 / Loader*, *FMT\_MSA.1 / Loader*, *FMT\_SMR.1 / Loader*, *FMT\_SMF.1 / Loader*, *FIA\_UID.1 / Loader*, *FIA\_UAU.1 / Loader*, and *FAU\_SAS.1 / Loader* are suitable to meet these security objectives.

**Security objective “Secure activation of the Additional Code (ANSSI.O.Secure-AC-Activation)”**

367 The justification related to the security objective “Secure activation of the Additional Code (ANSSI.O.Secure-AC-Activation)” is as follows:

368 The security functional requirement "*Audit storage (FAU\_SAS.1) / Loader*" requires the TSF to fail secure unless the Loading of the Additional Memory Image, including update of the Identification data, is comprehensive, as specified by *ANSSI.O.Secure-AC-Activation*.

369 Therefore, *FPT\_FLS.1 / Loader* is suitable to meet this security objective.

**Security objective “Secure identification of the TOE (ANSSI.O.TOE-Identification)”**

370 The justification related to the security objective “Secure identification of the TOE (ANSSI.O.TOE-Identification)” is as follows:

371 The security functional requirement "*Audit storage (FAU\_SAS.1) / Loader*" requires the TSF to store the Identification Data of the Memory Images.

The security functional requirement "*Stored data integrity monitoring and action (FDP\_SDI.2)*" requires the TSF to detect the integrity errors of the stored data and react in case of detected errors.

The security functional requirement "*Audit review (FAU\_SAR.1) / Loader*" allows any user to read this Identification Data.

372 Therefore, *FAU\_SAS.1 / Loader*, and *FAU\_SAR.1 / Loader* together with *FDP\_SDI.2* are suitable to meet this security objective.

**Security objective “Secure identification of the Memory Image (O.MemImage-Identification)”**

373 The justification related to the security objective “Secure identification of the Memory Image (O.MemImage-Identification)” is as follows:

374 The security functional requirement "*Audit storage (FAU\_SAS.1) / Loader*" requires the TSF to store the Identification Data of the Memory Images.

The security functional requirement "*Stored data integrity monitoring and action (FDP\_SDI.2)*" requires the TSF to detect the integrity errors of the stored user data and react in case of detected errors.

The security functional requirement "*Audit review (FAU\_SAR.1) / Loader*" allows any user to read this Identification Data.

The security functional requirement "*Audit storage (FAU\_SAS.1) / Loader*" requires the TSF to fail secure unless the Loading of the Additional Memory Image, including update of the Identification data, is comprehensive, as specified by *ANSSI.O.Secure-AC-Activation*.

375 Therefore, *FAU\_SAS.1 / Loader*, *FAU\_SAR.1 / Loader* together with *FDP\_SDI.2* and *FPT\_FLS.1 / Loader* are suitable to meet this security objective.

**Security objective “Access control for M4M-DESFire (*O.Access-Control-DESFire*)”**

- 376 The justification related to the security objective “Access control for M4M-DESFire (*O.Access-Control-DESFire*)” is as follows:
- 377 The security functional requirement "*Security roles (FMT\_SMR.1) / M4M-DESFire*" defines the roles of the M4M-DESFire Access Control Policy.  
The security functional requirements "*Subset access control (FDP\_ACC.1) / M4M-DESFire*" and "*Security attribute based access control (FDP\_ACF.1) / M4M-DESFire*" define the rules and "*Static attribute initialisation (FMT\_MSA.3) / M4M-DESFire*" and "*Management of security attributes (FMT\_MSA.1) / M4M-DESFire*" the attributes that the access control is based on.  
The security functional requirement "*Management of TSF data (FMT\_MTD.1) / M4M-DESFire*" provides the rules for the management of the authentication data.  
The management functions are defined by "*Specification of Management Functions (FMT\_SMF.1) / M4M-DESFire*".  
Since the TOE stores data on behalf of the authorized subjects, import of user data with security attributes is defined by "*Import of user data with security attributes (FDP\_ITC.2) / M4M-DESFire*".  
Since cryptographic keys are used for authentication (refer to *O.Authentication-DESFire*), these keys have to be removed if they are no longer needed for the access control (i.e. an application is deleted). This is required by "*Cryptographic key destruction (FCS\_CKM.4) / M4M-DESFire*". These nine SFRs together provide an access control mechanism as required by the objective *O.Access-Control-DESFire*.

**Security objective “Authentication for M4M-DESFire (*O.Authentication-DESFire*)”**

- 378 The justification related to the security objective “Authentication for M4M-DESFire (*O.Authentication-DESFire*)” is as follows:
- 379 The two security functional requirements "*Cryptographic operation (FCS\_COP.1) / DES*" and "*Cryptographic operation (FCS\_COP.1) / AES*" require that the TOE provides the basic cryptographic algorithms that can be used to perform the authentication.  
The security functional requirements "*User identification before any action (FIA\_UID.2) / M4M-DESFire*", "*User authentication before any action (FIA\_UAU.2) / M4M-DESFire*" and "*Multiple authentication mechanisms (FIA\_UAU.5) / M4M-DESFire*" together define that users must be identified and authenticated before any action. The ‘none’ authentication of "*Multiple authentication mechanisms (FIA\_UAU.5) / M4M-DESFire*" also ensures that a specific subject is identified and authenticated before an explicit authentication request is sent to the TOE.  
"*Trusted path (FTP\_TRP.1) / M4M-DESFire*" requires a trusted communication path between the TOE and remote users; FTP\_TRP.1.3 especially requires “authentication requests”.  
Together with "*Replay detection (FPT\_RPL.1) / M4M-DESFire*" which requires a replay detection for these authentication requests, the seven security functional requirements fulfil the objective *O.Authentication-DESFire*.

**Security objective “M4M-DESFire Confidential Communication (*O.Confidentiality-DESFire*)”**

- 380 The justification related to the security objective “M4M-DESFire Confidential communication (*O.Confidentiality-DESFire*)” is as follows:



381 The two security functional requirements "*Cryptographic operation (FCS\_COP.1) / DES*" and "*Cryptographic operation (FCS\_COP.1) / AES*" require that the TOE provides the basic cryptographic algorithm AES that can be used to protect the communication by encryption. "*Trusted path (FTP\_TRP.1) / M4M-DESFire*" requires a trusted communication path between the TOE and remote users; FTP\_TRP.1.3 especially requires "confidentiality and/or data integrity verification for data transfers protected with AES and based on a setting in the file attributes". Together with "*Replay detection (FPT\_RPL.1) / M4M-DESFire*" which requires a replay detection for these data transfers, the three security functional requirements fulfil the objective *O.Confidentiality-DESFire*.

**Security objective "M4M-DESFire Data type consistency (*O.Type-Consistency-DESFire*)"**

382 The justification related to the security objective "M4M-DESFire Data type consistency (*O.Type-Consistency-DESFire*)" is as follows:

383 The security functional requirement "*Inter-TSF basic TSF data consistency (FPT\_TDC.1) / M4M-DESFire*" requires the TOE to consistently interpret data files and values. The TOE will honour the respective file formats and boundaries (i.e. upper and lower limits, size limitations). This meets the objective *O.Type-Consistency-DESFire*.

**Security objective "M4M-DESFire Transaction mechanism (*O.Transaction-DESFire*)"**

384 The justification related to the security objective "M4M-DESFire Transaction mechanism (*O.Transaction-DESFire*)" is as follows:

385 The security functional requirement "*Basic rollback (FDP\_ROL.1) / M4M-DESFire*" requires the possibility to rollback a set of modifying operations on backup files in total. The set of operations is defined by the scope of the transaction, which is itself limited by some boundary events. This fulfils the objective *O.Transaction-DESFire*.

**Security objective "Preventing traceability for M4M-DESFire (*O.No-Trace-DESFire*)"**

386 The justification related to the security objective "Preventing traceability for M4M-DESFire (*O.No-Trace-DESFire*)" is as follows:

387 The security functional requirement "*Unlinkability (FPR\_UNL.1) / M4M-DESFire*" requires that unauthorized subjects other than the card holder are unable to determine whether any operation of the TOE were caused by the same user. This meets the objective *O.No-Trace-DESFire*.

**Security objective "Treatment of user data for M4M-DESFire (*O.Resp-AppI*)"**

388 The justification related to the security objective "Treatment of user data for M4M-DESFire (*O.Resp-AppI*)" is as follows:

389 The objective was translated from an environment objective in the PP into a TOE objective in this ST. The objective is that "Security relevant User Data (especially cryptographic keys) are treated by the Security IC Embedded Software as required by the security needs of the specific application context." The application context is defined by the security environment described in this ST. The additional SFRs defined in this ST do address the additional TOE objectives of the ST based on the ST security environment, therefore *O.Resp-AppI* is fulfilled by the additional ST SFRs.

**Security objective “NVM resource availability for M4M-DESFire (*O.Resource-DESFire*)”**

390 The justification related to the security objective “Resource availability for M4M-DESFire (*O.Resource-DESFire*)” is as follows:

391 The security functional requirement "*Minimum and maximum quotas (FRU\_RSA.2) / M4M-DESFire*" requires that sufficient parts of the NVM and RAM are reserved for M4M-DESFire use. This fulfils the objective *O.Resource-DESFire*.

**Security objective “M4M-DESFire code integrity check (*O.Verification-DESFire*)”**

392 The justification related to the security objective “M4M-DESFire code integrity check (*O.Verification-DESFire*)” is as follows:

393 The security functional requirements "*Complete access control (FDP\_ACC.2) / Memories*" and "*Security attribute based access control (FDP\_ACF.1) / Memories*", supported by "*Static attribute initialisation (FMT\_MSA.3) / Memories*", require that M4M-DESFire code integrity is protected when it is part of the TOE. In addition, the security functional requirement "*Failure with preservation of secure state (FPT\_FLS.1)*" requires that in case of error on NVM, M4M-DESFire execution is stopped. This meets the objective *O.Verification-DESFire*.

**Security objective “M4M-DESFire firewall (*O.Firewall-DESFire*)”**

394 The justification related to the security objective “M4M-DESFire firewall (*O.Firewall-DESFire*)” is as follows:

395 The security functional requirements "*Complete access control (FDP\_ACC.2) / Memories*" and "*Security attribute based access control (FDP\_ACF.1) / Memories*", supported by "*Static attribute initialisation (FMT\_MSA.3) / Memories*", require that no application can read, write, compare any piece of data or code belonging to M4M-DESFire. This meets the objective *O.Firewall-DESFire*.

**Security objective “M4M-DESFire data cleaning for resource sharing (*O.Shr-Res-DESFire*)”**

396 The justification related to the security objective “M4M-DESFire data cleaning for resource sharing (*O.Shr-Res-DESFire*)” is as follows:

397 The security functional requirement "*Subset residual information protection (FDP\_RIP.1) / M4M-DESFire*" requires that the information content of a resource is made unavailable upon its deallocation from M4M-DESFire. This meets the objective *O.Shr-Res-DESFire*.

### 5.4.3 Additional security requirements are consistent

**"Cryptographic operation (*FCS\_COP.1*) & key generation (*FCS\_CKM.1*)"**

398 These security requirements have already been argued in *Section : Security objective “Additional Specific Security Functionality (AUG1.O.Add-Functions)”* above.

- "Static attribute initialisation ([FMT\\_MSA.3 / Memories](#)),  
Management of security attributes ([FMT\\_MSA.1 / Memories](#)),  
Complete access control ([FDP\\_ACC.2 / Memories](#)),  
Security attribute based access control ([FDP\\_ACF.1 / Memories](#))"**
- 399 These security requirements have already been argued in [Section : Security objective "Dynamic Area based Memory Access Control \(AUG4.O.Mem-Access\)"](#) above.
- "Static attribute initialisation ([FMT\\_MSA.3 / Loader](#)),  
Management of security attributes ([FMT\\_MSA.1 / Loader](#)),  
Specification of management function ([FMT\\_SMF.1 / Loader](#)),  
Security roles ([FMT\\_SMR.1 / Loader](#)),  
Timing of identification ([FIA\\_UID.1 / Loader](#)),  
Timing of authentication ([FIA\\_UAU.1 / Loader](#))"**
- 400 These security requirements have already been argued in [Section : Security objective "Access control and authenticity for the Loader \(BSI.O.Ctrl\\_Auth\\_Loader\)"](#) and [Section : Security objectives "Protection of the confidentiality of the TSF \(ANSSI.O.Prot-TSF-Confidentiality\)"](#), ["Secure loading of the Additional Code \(ANSSI.O.Secure-Load-ACode\)"](#) and ["Secure loading of the Additional Memory Image \(O.Secure-Load-AMemImage\)"](#) above.
- "Audit storage ([FAU\\_SAS.1 / Loader](#)),  
Audit review ([FAU\\_SAR.1 / Loader](#))"**
- 401 These security requirements have already been argued in [Section : Security objective "Secure identification of the TOE \(ANSSI.O.TOE-Identification\)"](#) and [Section : Security objective "Secure identification of the Memory Image \(O.MemImage-Identification\)"](#) above.
- "Failure with preservation of secure state ([FPT\\_FLS.1 / Loader](#))"**
- 402 This security requirement has already been argued in [Section : Security objective "Secure activation of the Additional Code \(ANSSI.O.Secure-AC-Activation\)"](#) and [Section : Security objective "Secure identification of the Memory Image \(O.MemImage-Identification\)"](#) above.
- "Inter-TSF trusted channel([FTP\\_ITC.1 / Sdiag](#)),  
Audit review ([FAU\\_SAR.1 / Sdiag](#)),  
Limited capabilities ([FMT\\_LIM.1 / Sdiag](#)),  
Limited availability ([FMT\\_LIM.2 / Sdiag](#))"**
- 403 These security requirements have already been argued in [Section : Security objective "Protection against Abuse of Functionality \(BSI.O.Abuse-Func\)"](#) above.



- "Security roles ([FMT\\_SMR.1 / M4M-DESFire](#)),  
Subset access control ([FDP\\_ACC.1 / M4M-DESFire](#)),  
Security attribute based access control ([FDP\\_ACF.1 / M4M-DESFire](#)),  
Static attribute initialisation ([FMT\\_MSA.3 / M4M-DESFire](#)),  
Management of security attributes ([FMT\\_MSA.1 / M4M-DESFire](#)),  
Specification of TSF data ([FMT\\_MTD.1 / M4M-DESFire](#))  
Specification of management function ([FMT\\_SMF.1 / M4M-DESFire](#))  
Import of user data with security attributes ([FDP\\_ITC.2 / M4M-DESFire](#))  
Cryptographic key destruction ([FCS\\_CKM.4 / M4M-DESFire](#))"**
- 404 These security requirements have already been argued in [Section : Security objective "Secure activation of the Additional Code \(ANSSI.O.Secure-AC-Activation\)"](#) above.
- "User identification before any action ([FIA\\_UID.2 / M4M-DESFire](#)),  
User authentication before any action ([FIA\\_UAU.2 / M4M-DESFire](#)),  
Multiple authentication mechanisms ([FIA\\_UAU.5 / M4M-DESFire](#))"**
- 405 These security requirements have already been argued in [Section : Security objective "Authentication for M4M-DESFire \(O.Authentication-DESFire\)"](#) above.
- "Trusted path ([FTP\\_TRP.1 / M4M-DESFire](#)),  
Replay detection ([FPT\\_RPL.1 / M4M-DESFire](#))"**
- 406 These security requirements have already been argued in [Section : Security objective "M4M-DESFire Confidential Communication \(O.Confidentiality-DESFire\)"](#) above.
- "Inter-TSF basic TSF data consistency ([FPT\\_TDC.1 / M4M-DESFire](#))"**
- 407 This security requirement has already been argued in [Section : Security objective "M4M-DESFire Data type consistency \(O.Type-Consistency-DESFire\)"](#) above.
- "Basic rollback ([FDP\\_ROL.1 / M4M-DESFire](#))"**
- 408 This security requirement has already been argued in [Section : Security objective "M4M-DESFire Transaction mechanism \(O.Transaction-DESFire\)"](#) above.
- "Unlinkability ([FPR\\_UNL.1 / M4M-DESFire](#))"**
- 409 This security requirement has already been argued in [Section : Security objective "Preventing traceability for M4M-DESFire \(O.No-Trace-DESFire\)"](#) above.
- "Minimum and maximum quotas ([FRU\\_RSA.2 / M4M-DESFire](#))"**
- 410 This security requirement has already been argued in [Section : Security objective "NVM resource availability for M4M-DESFire \(O.Resource-DESFire\)"](#) above.
- "Subset residual information protection ([FDP\\_RIP.1 / M4M-DESFire](#))"**
- 411 This security requirement has already been argued in [Section : Security objective "M4M-DESFire data cleaning for resource sharing \(O.Shr-Res-DESFire\)"](#) above.

#### 5.4.4 Dependencies of Security Functional Requirements

412 All dependencies of Security Functional Requirements have been fulfilled in this Security Target except :

- those justified in the [BSI-CC-PP-0084-2014](#) protection profile security requirements rationale,
- those justified in [AUG](#) security requirements rationale,
- the dependency of [FCS\\_COP.1](#) and [FCS\\_CKM.1](#) on FCS\_CKM.4 (see discussion below),
- the dependency of [FAU\\_SAR.1 / Loader](#) on FAU\_GEN.1 (see discussion below),
- the dependency of [FAU\\_SAR.1 / Sdiag](#) on FAU\_GEN.1 (see discussion below).

413 Details are provided in [Table 13](#) below.

**Table 13. Dependencies of security functional requirements**

Label	Dependencies	Fulfilled by security requirements in this Security Target	Dependency already in <a href="#">BSI-CC-PP-0084-2014</a> or in <a href="#">AUG</a>
FRU_FLT.2	FPT_FLS.1	Yes	Yes, <a href="#">BSI-CC-PP-0084-2014</a>
FPT_FLS.1	None	No dependency	Yes, <a href="#">BSI-CC-PP-0084-2014</a>
FMT_LIM.1 / Test	FMT_LIM.2 / Test	Yes	Yes, <a href="#">BSI-CC-PP-0084-2014</a>
FMT_LIM.2 / Test	FMT_LIM.1 / Test	Yes	Yes, <a href="#">BSI-CC-PP-0084-2014</a>
FMT_LIM.1 / Loader	FMT_LIM.2 / Loader	Yes	Yes, <a href="#">BSI-CC-PP-0084-2014</a>
FMT_LIM.2 / Loader	FMT_LIM.1 / Loader	Yes	Yes, <a href="#">BSI-CC-PP-0084-2014</a>
FMT_LIM.1 / Sdiag	FMT_LIM.2 / Sdiag	Yes	Yes, <a href="#">BSI-CC-PP-0084-2014</a>
FMT_LIM.2 / Sdiag	FMT_LIM.1 / Sdiag	Yes	Yes, <a href="#">BSI-CC-PP-0084-2014</a>
FAU_SAS.1	None	No dependency	Yes, <a href="#">BSI-CC-PP-0084-2014</a>
FDP_SDC.1	None	No dependency	Yes, <a href="#">BSI-CC-PP-0084-2014</a>
FDP_SDI.2	None	No dependency	Yes, <a href="#">BSI-CC-PP-0084-2014</a>
FPT_PHP.3	None	No dependency	Yes, <a href="#">BSI-CC-PP-0084-2014</a>
FDP_ITT.1	FDP_ACC.1 or FDP_IFC.1	Yes	Yes, <a href="#">BSI-CC-PP-0084-2014</a>
FPT_ITT.1	None	No dependency	Yes, <a href="#">BSI-CC-PP-0084-2014</a>
FDP_IFC.1	FDP_IFF.1	No, see <a href="#">BSI-CC-PP-0084-2014</a>	Yes, <a href="#">BSI-CC-PP-0084-2014</a>
FCS_RNG.1	None	No dependency	Yes, <a href="#">BSI-CC-PP-0084-2014</a>

Table 13. Dependencies of security functional requirements (continued)

Label	Dependencies	Fulfilled by security requirements in this Security Target	Dependency already in <i>BSI-CC-PP-0084-2014</i> or in <i>AUG</i>
FCS_COP.1	[FDP_ITC.1 or FDP_ITC.2 or FCS_CKM.1]	Yes, by FCS_CKM.1, see also discussion below	Yes, <i>AUG #1</i>
	FCS_CKM.4	No, see discussion below	
FCS_CKM.1	[FDP_CKM.2 or FCS_COP.1]	Yes, by FCS_COP.1	
	FCS_CKM.4	No, see discussion below	
FDP_ACC.2 / Memories	FDP_ACF.1 / Memories	Yes	<b>No</b> , <i>CCMB-2017-04-002</i>
FDP_ACF.1 / Memories	FDP_ACC.1 / Memories	Yes, by FDP_ACC.2 / Memories	Yes, <i>AUG #4</i>
	FMT_MSA.3 / Memories	Yes	
FMT_MSA.3 / Memories	FMT_MSA.1 / Memories	Yes	Yes, <i>AUG #4</i>
	FMT_SMR.1 / Memories	No, see <i>AUG #4</i>	
FMT_MSA.1 / Memories	[FDP_ACC.1 / Memories or FDP_IFC.1]	Yes, by FDP_ACC.2 / Memories and FDP_IFC.1	Yes, <i>AUG #4</i>
	FMT_SMF.1 / Memories	Yes	<b>No</b> , <i>CCMB-2017-04-002</i>
	FMT_SMR.1 / Memories	No, see <i>AUG #4</i>	Yes, <i>AUG #4</i>
FMT_SMF.1 / Memories	None	No dependency	<b>No</b> , <i>CCMB-2017-04-002</i>
FIA_API.1	None	No dependency	Yes, <i>BSI-CC-PP-0084-2014</i>
FTP_ITC.1 / Loader	None	No dependency	Yes, <i>BSI-CC-PP-0084-2014</i>
FDP_UCT.1 / Loader	[FTP_ITC.1 / Loader or FTP_TRP.1 / Loader]	Yes, by FTP_ITC.1 / Loader	Yes, <i>BSI-CC-PP-0084-2014</i>
	[FDP_ACC.1 / Loader or FDP_IFC.1 / Loader]	Yes, by FDP_ACC.1 / Loader	

Table 13. Dependencies of security functional requirements (continued)

Label	Dependencies	Fulfilled by security requirements in this Security Target	Dependency already in <i>BSI-CC-PP-0084-2014</i> or in <i>AUG</i>
FDP_UIT.1 / Loader	[FTP_ITC.1 / Loader or FTP_TRP.1 / Loader]	Yes, by FTP_ITC.1 / Loader	Yes, <i>BSI-CC-PP-0084-2014</i>
	[FDP_ACC.1 / Loader or FDP_IFC.1 / Loader]	Yes, by FDP_ACC.1 / Loader	
FDP_ACC.1 / Loader	FDP_ACF.1 / Loader	Yes	Yes, <i>BSI-CC-PP-0084-2014</i>
FDP_ACF.1 / Loader	FDP_ACC.1 / Loader	Yes	Yes, <i>BSI-CC-PP-0084-2014</i>
	FMT_MSA.3 / Loader	Yes	
FMT_MSA.3 / Loader	FMT_MSA.1 / Loader	Yes	<b>No</b> , <i>CCMB-2017-04-002</i>
	FMT_SMR.1 / Loader	Yes	
FMT_MSA.1 / Loader	[FDP_ACC.1 / Loader or FDP_IFC.1]	Yes, by FDP_ACC.1 / Loader	<b>No</b> , <i>CCMB-2017-04-002</i>
	FDP_SMF.1 / Loader	Yes	
	FDP_SMR.1 / Loader	Yes	
FMT_SMR.1 / Loader	FIA_UID.1 / Loader	Yes	<b>No</b> , <i>CCMB-2017-04-002</i>
FIA_UID.1 / Loader	None	No dependency	<b>No</b> , <i>CCMB-2017-04-002</i>
FIA_UAU.1 / Loader	FIA_UID.1 / Loader	Yes	<b>No</b> , <i>CCMB-2017-04-002</i>
FDP_SMF.1 / Loader	None	No dependency	<b>No</b> , <i>CCMB-2017-04-002</i>
FPT_FLS.1 / Loader	None	No dependency	<b>No</b> , <i>CCMB-2017-04-002</i>
FAU_SAS.1 / Loader	None	No dependency	Yes, <i>BSI-CC-PP-0084-2014</i>
FAU_SAR.1 / Loader	FAU_GEN.1	No, by FAU_SAS.1 / Loader instead, see discussion below	<b>No</b> , <i>CCMB-2017-04-002</i>
FTP_ITC.1 / Sdiag	None	No dependency	<b>No</b> , <i>CCMB-2017-04-002</i>
FAU_SAR.1 / Sdiag	FAU_GEN.1	No, see discussion below	<b>No</b> , <i>CCMB-2017-04-002</i>

Table 13. Dependencies of security functional requirements (continued)

Label	Dependencies	Fulfilled by security requirements in this Security Target	Dependency already in <i>BSI-CC-PP-0084-2014</i> or in <i>AUG</i>
FMT_SMR.1 / M4M-DESEFire	FIA_UID.1 / M4M-DESEFire	Yes, by FIA_UID.2 / M4M-DESEFire	<b>No</b> , <i>CCMB-2017-04-002</i>
FDP_ACC.1 / M4M-DESEFire	FDP_ACF.1 / M4M-DESEFire	Yes	<b>No</b> , <i>CCMB-2017-04-002</i>
FDP_ACF.1 / M4M-DESEFire	FDP_ACC.1 / M4M-DESEFire	Yes	<b>No</b> , <i>CCMB-2017-04-002</i>
	FMT_MSA.3 / M4M-DESEFire	Yes	
FMT_MSA.3 / M4M-DESEFire	FMT_MSA.1 / M4M-DESEFire	Yes	<b>No</b> , <i>CCMB-2017-04-002</i>
	FMT_SMR.1 / M4M-DESEFire	Yes	
FMT_MSA.1 / M4M-DESEFire	[FDP_ACC.1 / M4M-DESEFire or FDP_IFC.1]	Yes, by FDP_ACC.1 / M4M-DESEFire	<b>No</b> , <i>CCMB-2017-04-002</i>
	FMT_SMF.1 / M4M-DESEFire	Yes	
	FMT_SMR.1 / M4M-DESEFire	Yes	
FMT_SMF.1 / M4M-DESEFire	None	No dependency	<b>No</b> , <i>CCMB-2017-04-002</i>
FDP_ITC.2 / M4M-DESEFire	[FDP_ACC.1 / M4M-DESEFire or FDP_IFC.1]	Yes, by FDP_ACC.1 / M4M-DESEFire	<b>No</b> , <i>CCMB-2017-04-002</i>
	[FPT_ITC.1 or FPT_TRP.1 / M4M-DESEFire]	Yes, by FPT_TRP.1 / M4M-DESEFire	
	FPT_TDC.1 / M4M-DESEFire	Yes	
FPT_TDC.1 / M4M-DESEFire	None	No dependency	<b>No</b> , <i>CCMB-2017-04-002</i>
FIA_UID.2 / M4M-DESEFire	None	No dependency	<b>No</b> , <i>CCMB-2017-04-002</i>
FIA_UAU.2 / M4M-DESEFire	FIA_UID.1	Yes, by FIA_UID.2 / M4M-DESEFire	<b>No</b> , <i>CCMB-2017-04-002</i>
FIA_UAU.5 / M4M-DESEFire	None	No dependency	<b>No</b> , <i>CCMB-2017-04-002</i>

Table 13. Dependencies of security functional requirements (continued)

Label	Dependencies	Fulfilled by security requirements in this Security Target	Dependency already in <i>BSI-CC-PP-0084-2014</i> or in <i>AUG</i>
FMT_MTD.1 / M4M-DESFire	FMT_SMR.1 / M4M-DESFire	Yes	<b>No</b> , <i>CCMB-2017-04-002</i>
	FMT_SMF.1 / M4M-DESFire	Yes	
FPT_TRP.1 / M4M-DESFire	None	No dependency	<b>No</b> , <i>CCMB-2017-04-002</i>
FCS_CKM.4 / M4M-DESFire	[FDP_ITC.1 or FDP_ITC.2 / M4M-DESFire or FCS_CKM.1]	Yes, by FDP_ITC.2 / M4M-DESFire	<b>No</b> , <i>CCMB-2017-04-002</i>
FDP_ROL.1 / M4M-DESFire	[FDP_ACC.1 / M4M-DESFire or FDP_IFC.1]	Yes, by FDP_ACC.1 / M4M-DESFire	<b>No</b> , <i>CCMB-2017-04-002</i>
FPT_RPL.1 / M4M-DESFire	None	No dependency	<b>No</b> , <i>CCMB-2017-04-002</i>
FPR_UNL.1 / M4M-DESFire	None	No dependency	<b>No</b> , <i>CCMB-2017-04-002</i>
FRU_RSA.2 / M4M-DESFire	None	No dependency	<b>No</b> , <i>CCMB-2017-04-002</i>
FDP_RIP.1 / M4M-DESFire	None	No dependency	<b>No</b> , <i>CCMB-2017-04-002</i>

- 414 Part 2 of the Common Criteria defines the dependency of "*Cryptographic operation (FCS\_COP.1)*" on "Import of user data without security attributes (FDP\_ITC.1)" or "Import of user data with security attributes (FDP\_ITC.2)" or "Cryptographic key generation (FCS\_CKM.1)". In this particular TOE, "*Cryptographic key generation (FCS\_CKM.1)*" may be used for the purpose of creating cryptographic keys, but also, the ES has all possibilities to implement its own creation function, in conformance with its security policy.
- 415 Part 2 of the Common Criteria defines the dependency of "*Cryptographic operation (FCS\_COP.1)*" and "*Cryptographic key generation (FCS\_CKM.1)*" on "Cryptographic key destruction (FCS\_CKM.4)". In this particular TOE, there is no specific function for the destruction of the keys. The ES has all possibilities to implement its own destruction function, in conformance with its security policy. Therefore, FCS\_CKM.4 is not defined in this ST.
- 416 Part 2 of the Common Criteria defines the dependency of "*Audit review (FAU\_SAR.1) / Loader*" on "Audit data generation (FAU\_GEN.1)". In this particular TOE, "*Audit storage (FAU\_SAS.1) / Loader*" is used to ensure the storage of audit data, because FAU\_GEN.1 is too comprehensive to be used in this context. Therefore this dependency is fulfilled by "*Audit storage (FAU\_SAS.1) / Loader*" instead.
- 417 Part 2 of the Common Criteria defines the dependency of "*Audit review (FAU\_SAR.1) / Sdiag*" on "Audit data generation (FAU\_GEN.1)". In this particular TOE, there is no specific

function for audit data generation, the data to be audited are just stored. Therefore, FAU\_GEN.1 is not defined in this ST.

## 5.4.5 Rationale for the Assurance Requirements

### Security assurance requirements added to reach EAL5 ([Table 10](#))

418 Regarding application note 21 of [BSI-CC-PP-0084-2014](#), this Security Target chooses EAL5 because developers and users require a high level of independently assured security in a planned development and require a rigorous development approach without incurring unreasonable costs attributable to specialist security engineering techniques.

419 EAL5 represents a meaningful increase in assurance from EAL4 by requiring semiformal design descriptions, a more structured (and hence analyzable) architecture, extensive testing, and improved mechanisms and/or procedures that provide confidence that the TOE will not be tampered during development.

420 The assurance components in an evaluation assurance level (EAL) are chosen in a way that they build a mutually supportive and complete set of components. The requirements chosen for augmentation do not add any dependencies, which are not already fulfilled for the corresponding requirements contained in EAL5. Therefore, these components add additional assurance to EAL5, but the mutual support of the requirements and the internal consistency is still guaranteed.

421 Note that detailed and updated refinements for assurance requirements are given in [Section 5.3](#).

### Dependencies of assurance requirements

422 Dependencies of security assurance requirements are fulfilled by the EAL5 package selection.

423 The augmentation to this package identified in paragraph [324](#) does not introduce dependencies not already satisfied by the EAL5 package, and is considered as consistent augmentation:

- ALC\_FLR.1 has no dependency.
- ASE\_TSS.2 dependencies (ASE\_INT.1, ASE\_REQ.1 and ADV\_ARC.1) are fulfilled by the assurance requirements claimed by this ST.

## 6 TOE summary specification (ASE\_TSS)

424 This section demonstrates how the TOE meets each Security Functional Requirement, which will be further detailed in the ADV\_FSP documents.

### 6.1 Limited fault tolerance (FRU\_FLT.2)

425 The TSF provides limited fault tolerance, by managing a certain number of faults or errors that may happen, related to random number generation, power supply, data flows and cryptographic operations, thus preventing risk of malfunction.

### 6.2 Failure with preservation of secure state (FPT\_FLS.1)

426 The TSF provides preservation of secure state by detecting and managing the following events, resulting in an immediate interruption or reset:

- Die integrity violation detection,
- Errors on memories and registers,
- Glitches,
- High voltage supply,
- CPU errors,
- MMU errors,
- Faults on crypto processors or libraries.

427 The ES can generate a software reset.

### 6.3 Limited capabilities (FMT\_LIM.1) / Test, Limited capabilities (FMT\_LIM.1) / Sdiag, Limited capabilities (FMT\_LIM.1) / Loader, Limited availability (FMT\_LIM.2) / Test, Limited availability (FMT\_LIM.2) / Sdiag & Limited availability (FMT\_LIM.2) / Loader

428 The TOE is either in Test, Admin or User configuration.

429 The TOE may also be in Basic Diagnostic (aka Diagnostic), Secure Diagnostic or Genuine Check volatile configuration.

430 The Test and Diagnostics configurations are reserved to ST.

431 The TSF ensures the switching and the control of TOE configuration, the corresponding access control and the control of the corresponding capabilities. The transition controls rely on several strong mechanisms including fuse, authentication and control registers. Part of the transitions are only possible in the STMicroelectronics audited environment.

432 The TSF reduces the available features depending on the TOE configuration.

433 The customer can choose to disable irreversibly the Loading capability.



434 The customer can choose to irreversibly enable or disable the Secure Diagnostic capability. Only if the customer enables it, for quality investigation purpose, ST can exercise the Secure Diagnostic capability with a secure protocol, in an audited environment.

## **6.4 Inter-TSF trusted channel (FTP\_ITC.1) / Sdiag**

435 In Secure Diagnostic volatile configuration, the System Firmware provides a secure channel to allow another IT product to operate a Secure Diagnostic transaction.

## **6.5 Audit review (FAU\_SAR.1) / Sdiag**

436 The System Firmware allows to read the Secure Diagnostic status (permanently disabled, permanently enabled, disabled but still configurable).

## **6.6 Stored data confidentiality (FDP\_SDC.1)**

437 The TSF ensures confidentiality of the User Data, thanks to the following features:

- Memories scrambling and encryption,
- Protection of NVM sectors,
- MMU,
- LPU.

## **6.7 Stored data integrity monitoring and action (FDP\_SDI.2)**

438 The TSF ensures integrity of the stored data, thanks to the following features:

- Memories parity control,
- Protection of NVM sectors,
- MMU,
- LPU.

## **6.8 Audit storage (FAU\_SAS.1)**

439 In User configuration, the TOE provides commands to store data and/or pre-personalisation data and/or supplements of the ES in the NVM. These commands are only available to authorized processes before delivery.

## **6.9 Resistance to physical attack (FPT\_PHP.3)**

440 The TSF ensures resistance to physical tampering, thanks to the following features:

- The TOE implements a set of countermeasures that reduce the exploitability of physical probing.
- The TOE is physically protected by active shields that command an automatic reaction on die integrity violation detection.

## 6.10 Basic internal transfer protection (FDP\_ITT.1), Basic internal TSF data transfer protection (FPT\_ITT.1) & Subset information flow control (FDP\_IFC.1)

441 The TSF prevents the disclosure of internal and user data thanks to:

- Memories scrambling and encryption,
- Bus encryption,
- Mechanisms for operation execution concealment,
- Leakage protection in libraries.

## 6.11 Random number generation (FCS\_RNG.1)

442 The TSF provides 8-bit true random numbers that can be qualified with the test metrics required by the [BSI-AIS20/AIS31](#) standard for a PTG.2 class device.

## 6.12 Cryptographic operation: DES operation (FCS\_COP.1) / TDES if EDES+

443 The TOE provides optionally an EDES+ accelerator that has the capability to perform Triple DES encryption and decryption in Electronic Code Book (ECB) and Cipher Block Chaining (CBC) mode conformant to [NIST SP 800-67](#) and [NIST SP 800-38A](#).

If [NesLib](#) is embedded, the cryptographic library NesLib instantiates the same standard DES cryptographic operations, in Electronic Code Book (ECB) and Cipher Block Chaining (CBC) mode.

444 The M4M-DESFire library uses Triple DES as cryptographic operation (EDES+ accelerator). Cryptographic operations are used for setting up the mutual authentication, for encryption and message authentication.

## 6.13 Cryptographic operation: AES operation (FCS\_COP.1) / AES if HW\_AES

445 The TOE provides optionally an AES accelerator allowing the following standard AES cryptographic operations for key sizes of 128, 192 and 256 bits, conformant to [FIPS PUB 197](#) with intrinsic counter-measures against attacks:

- cipher,
- inverse cipher.

446 The AES accelerator can operate in Electronic Code Book (ECB) and Cipher Block Chaining (CBC) mode.

- 447 If [NesLib](#) is embedded, the cryptographic library NesLib instantiates the same standard AES cryptographic operations, in Electronic Code Book (ECB) and Cipher Block Chaining (CBC) mode, and additionally provides:
- message authentication Code computation (CMAC),
  - authenticated encryption/decryption in Galois Counter Mode (GCM),
  - authenticated encryption/decryption in Counter with CBC-MAC (CCM).
- 448 The M4M-DESFire library uses AES as cryptographic operation (AES accelerator). Cryptographic operations are used for setting up the mutual authentication, for encryption and message authentication.

## 6.14 Cryptographic operation: RSA operation (FCS\_COP.1) / RSA if [NesLib](#)

- 449 The cryptographic library NesLib provides to the ES developer the following RSA functions, all conformant to [PKCS #1 V2.1](#):
- RSA public key cryptographic operation for modulus sizes up to 4096 bits,
  - RSA private key cryptographic operation with or without CRT for modulus sizes up to 4096 bits,
  - RSA signature formatting,
  - RSA Key Encapsulation Method.

## 6.15 Cryptographic operation: Elliptic Curves Cryptography operation (FCS\_COP.1) / ECC if [NesLib](#)

- 450 The cryptographic library NesLib provides to the ES developer the following efficient basic functions for Elliptic Curves Cryptography over prime fields, all conformant to [IEEE 1363-2000](#) and [IEEE 1363a-2004](#), including:
- private scalar multiplication,
  - preparation of Elliptic Curve computations in affine coordinates,
  - public scalar multiplication,
  - point validity check,
  - Jacobian conversion to affine coordinates,
  - general point addition,
  - point expansion and compression.
- 451 Additionally, the cryptographic library NesLib provides functions dedicated to the two most used elliptic curves cryptosystems:
- Elliptic Curve Diffie-Hellman (ECDH), as specified in [NIST SP 800-56A](#),
  - Elliptic Curve Digital Signature Algorithm (ECDSA) generation and verification, as stipulated in [FIPS PUB 186-4](#) and specified in [ANSI X9.62](#), section 7.

- 452 The cryptographic library NesLib provides to the ES developer the following efficient basic functions for Elliptic Curves Cryptography over prime fields on curves in Edwards form, with curve 25519, all conformant to [EdDSA rfc](#), including:
- generation,
  - verification,
  - point decompression.

## 6.16 Cryptographic operation: SHA-1 & SHA-2 operation (FCS\_COP.1) / SHA, if NesLib

- 453 The cryptographic library NesLib provides the SHA-1<sup>(f)</sup>, SHA-224, SHA-256, SHA-384, SHA-512 secure hash functions conformant to [FIPS PUB 180-2](#).
- 454 The cryptographic library NesLib provides the SHA-1<sup>(e)</sup>, SHA-256, SHA-384, SHA-512 secure hash functions conformant to [FIPS PUB 180-2](#), and offering resistance against side channel and fault attacks.
- 455 Additionally, the cryptographic library NesLib offers support for the HMAC mode of use, as specified in [FIPS PUB 198-1](#), to be used in conjunction with the protected versions of SHA-1<sup>(e)</sup> and SHA-256.

## 6.17 Cryptographic operation: Keccak & SHA-3 operation (FCS\_COP.1) / Keccak, if NesLib

- 456 The cryptographic library NesLib provides the operation of the following extendable output functions conformant to [FIPS PUB 202](#):
- SHAKE128,
  - SHAKE256,
  - Keccak[r,c] with choice of  $r < 1600$  and  $c = 1600 - r$ .
- 457 The cryptographic library NesLib provides the operation of the following hash functions, conformant to [FIPS PUB 202](#):
- SHA3-224,
  - SHA3-256,
  - SHA3-384,
  - SHA3-512.
- 458 The cryptographic library NesLib provides the operation of the following extendable output functions conformant to [FIPS PUB 202](#), offering resistance against side channel and fault attacks:
- SHAKE128,
  - SHAKE256,
  - Keccak[r,c] with choice of  $r < 1600$  and  $c = 1600 - r$ .

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f. Note that SHA-1 is no longer recommended as a cryptographic function in the context of smart card applications. Hence, Security IC Embedded Software may need to use another SHA to achieve a suitable strength.

- 459 The cryptographic library NesLib provides the operation of the following hash functions, conformant to [FIPS PUB 202](#), offering resistance against side channel and fault attacks:
- SHA3-224,
  - SHA3-256,
  - SHA3-384,
  - SHA3-512.

## 6.18 Cryptographic operation: Keccak-p operation (FCS\_COP.1) / Keccak-p, if NesLib

- 460 The cryptographic library NesLib provides a toolbox for building modes on top of the following permutations, conformant to [FIPS PUB 202](#):
- Keccak-p[1600,n\_r = 24],
  - Keccak-p[1600,n\_r = 12].

- 461 The cryptographic library NesLib provides a toolbox for building modes on top of the following permutations, conformant to [FIPS PUB 202](#), offering resistance against side channel and fault attacks:
- Keccak-p[1600,n\_r = 24],
  - Keccak-p[1600,n\_r = 12].

## 6.19 Cryptographic operation: Diffie-Hellman operation (FCS\_COP.1) / Diffie-Hellman, if NesLib

- 462 The cryptographic library NesLib provides the Diffie-Hellman key establishment operation over GF(p) for size of modulus p up to 4096 bits, conformant to [ANSI X9.42](#).

## 6.20 Cryptographic operation: DRBG operation (FCS\_COP.1) / DRBG, if NesLib

- 463 The cryptographic library NesLib gives support for a DRBG generator, based on cryptographic algorithms specified in [NIST SP 800-90](#).
- 464 The cryptographic library NesLib implements two of the DRBG specified in [NIST SP 800-90](#):
- Hash-DRBG,
  - CTR-DRBG.

## 6.21 Cryptographic key generation: Prime generation (FCS\_CKM.1) / Prime-generation, if NesLib

- 465 The cryptographic library NesLib provides prime numbers generation for prime sizes up to 2048 bits conformant to [FIPS PUB 140-2](#) and [FIPS PUB 186-4](#), optionally with conditions and/or optionally offering resistance against side channel and fault attacks.

## 6.22 Cryptographic key generation: RSA key generation (FCS\_CKM.1) / RSA-key-generation, if NesLib

466 The cryptographic library NesLib provides standard RSA public and private key computation for key sizes upto 4096 bits conformant to [FIPS PUB 140-2](#), [ISO/IEC 9796-2](#) and [PKCS #1 V2.1](#), optionally with conditions and/or optionally offering resistance against side channel and fault attacks.

## 6.23 Static attribute initialisation (FMT\_MSA.3) / Memories

467 The TOE enforces a default memory management policy when none other is programmed by the ES.  
Additionally, at product start all the LPU static attributes are initialised, allowing to protect the segments where M4M-DESFire code and data are stored, if [M4M-DESFire](#) is part of the TOE.

## 6.24 Management of security attributes (FMT\_MSA.1) / Memories & Specification of management functions (FMT\_SMF.1) / Memories

468 The TOE provides a dynamic Memory Management Unit (MMU), that can be configured by the ES.

469 Other complementary memory protections are also available to the ES (LPU, NVM sector protection, limitation in unprivileged mode).

## 6.25 Complete access control (FDP\_ACC.2) / Memories & Security attribute based access control (FDP\_ACF.1) / Memories

470 The TOE enforces the dynamic memory management policy for data access and code access thanks to a dynamic Memory Management Unit (MMU), a Library Protection Unit (LPU), and complementary protection mechanisms, programmed by the ES.  
In case [M4M-DESFire](#) is present, the Library Protection Unit is reserved to ST usage to isolate the M4M-DESFire firmware (code and data) from the rest of the code embedded in the device.

471 Overriding the MMU and LPU set of access rights, depending on the TOE configuration, the TOE enforces additional protections on specific parts of the memories.

## 6.26 Authentication Proof of Identity (FIA\_API.1)

472 In Admin configuration or Genuine check configuration, the System Firmware provides commands based on a cryptographic mechanism which allows another IT product to check that the TOE is a genuine TOE.

## **6.27 Inter-TSF trusted channel (FTP\_ITC.1) / Loader, Basic data exchange confidentiality (FDP\_UCT.1) / Loader, Data exchange integrity (FDP\_UIT.1) / Loader & Audit storage (FAU\_SAS.1) / Loader**

473 In Admin configuration, the System Firmware provides a secure channel to allow another IT product to operate a maintenance transaction.

474 The ciphered data is automatically decrypted then stored in the requested memory.

475 A maintenance transaction can end only after a successful integrity check of the loaded data or an erase. The identification data associated with the memory update is automatically logged during the session,

## **6.28 Subset access control (FDP\_ACC.1) / Loader & Security attribute based access control (FDP\_ACF.1) / Loader**

476 In Admin configuration, during a maintenance transaction, the System Firmware verifies if the Loader access conditions are satisfied and returns an error when this is not the case.

477 In particular, the additional memory update must be intended to be assembled with the memory update previously loaded.

## **6.29 Failure with preservation of secure state (FPT\_FLS.1) / Loader**

478 In Admin configuration, the System Firmware enforces that a maintenance transaction can only end when it is consistent or canceled by an erase.

## **6.30 Static attribute initialisation (FMT\_MSA.3) / Loader**

479 In Admin configuration, the System Firmware provides restrictive default values for the Flash Loader security attributes.

## **6.31 Management of security attributes (FMT\_MSA.1) / Loader & Specification of management functions (FMT\_SMF.1) / Loader**

480 In Admin configuration, the System Firmware provides the capability for an authorized user to change part of the Flash Loader security attributes.

## **6.32 Security roles (FMT\_SMR.1) / Loader**

481 The System Firmware supports the assignment of roles to users through the assignment of different keys for the different roles. This allows to distinguish between the roles of ST Loader, User Loader, Delegated Loader, Secure Diagnostic, and Everybody.

### 6.33 Timing of identification (FIA\_UID.1) / Loader & Timing of authentication (FIA\_UAU.1) / Loader

482 The System Firmware identifies the user through the key selected for authentication. This is performed by verifying an encryption, thus preventing to unveil the key.

483 After this authentication, both parties share a session key.

484 A limited number of operations is allowed on behalf of the user before the user is identified and authenticated, such as boot, authentication and non-critical queries.

### 6.34 Audit review (FAU\_SAR.1) / Loader

485 In Admin configuration, the System Firmware allows to read the product information and the identification data of all memory updates previously loaded on the TOE.

### 6.35 Security roles (FMT\_SMR.1) / M4M-DESFire

486 M4M-DESFire supports the assignment of roles to users through the assignment of different keys for the different roles and through the structure and configuration of the access rights. This allows to distinguish between the roles of VC Administrator, VC Manager, Application Manager, Application User, and Everybody.

### 6.36 Subset access control (FDP\_ACC.1) / M4M-DESFire

487 For each M4M-DESFire command subject to access control, the M4M-DESFire library verifies if the M4M-DESFire access conditions are satisfied and returns an error when this is not the case.

### 6.37 Security attribute based access control (FDP\_ACF.1) / M4M-DESFire

488 The M4M-DESFire library verifies the M4M-DESFire security attributes during the execution of M4M-DESFire commands to enforce the Access Control Policy defined by the M4M-DESFire interface specification.

489 On Virtual Card level, the security attributes define:

- if change of card configuration is allowed,
- if administrator master authentication is required for create/delete applications,
- if change of card master key is allowed,
- the type of master key used: Single DES, 2 Key Triple DES, 3 Key Triple DES or AES.<sup>(g)</sup>
- if format card is allowed,
- if random UID is enabled.

---

g. Note that DES is no longer recommended as an encryption function in the context of smart card applications. Hence, Security IC Embedded Software may need to use triple DES to achieve a suitable strength.



- 490 On Application level, the security attributes define:
- the key identifier and the conditions for changing the application manager key,
  - if change of application configuration is allowed,
  - if application manager authentication is required for create/delete applications,
  - if application manager authentication is required for directory access,
  - if change of application manager key is allowed,
  - the type of application key used: Single DES, 2 Key Triple DES, 3 Key Triple DES or AES.<sup>(f)</sup>
- 491 On File level, the security attributes define:
- the type of file:
  - standard data file (without rollback),
  - value file (with rollback),
  - backup data file (with rollback),
  - linear record file (with rollback),
  - cyclic record file (with rollback),
  - the communication settings: plain, with MACing or enciphered,
  - the Application user identifier or Nobody or Everybody,
  - the type of master key used: Single DES, 2 Key Triple DES, 3 Key Triple DES or AES.<sup>(f)</sup>
- 492 On Value file level, the security attributes define:
- the lower limit,
  - the upper limit,
  - the limited credit limit,
  - if the limited credit is enabled.

### **6.38 Static attribute initialisation (FMT\_MSA.3) / M4M-DESFire**

- 493 The M4M-DESFire library initialises all the static attributes to the values defined by M4M-DESFire interface specifications before they can be used by the Embedded Software.

### **6.39 Management of security attributes (FMT\_MSA.1) / M4M-DESFire**

- 494 The M4M-DESFire library verifies the M4M-DESFire security attributes during the execution of M4M-DESFire commands to enforce the Access Control Policy on the security attributes.

### **6.40 Specification of Management Functions (FMT\_SMF.1) / M4M-DESFire**

- 495 The M4M-DESFire library implements the management functions defined by the M4M-DESFire interface specifications for authentication, changing security attributes and creating or deleting a virtual card, an application, a value or a data file.

#### **6.41 Import of user data with security attributes (FDP\_ITC.2) / M4M-DESFire**

496 The M4M-DESFire library implements the M4M-DESFire interface specifications and enforces the Access Control Policy to associate the user data to the security attributes.

#### **6.42 Inter-TSF basic TSF data consistency (FPT\_TDC.1) / M4M-DESFire**

497 The M4M-DESFire library implements the M4M-DESFire interface specifications, supporting consistent interpretation and modification control of inter-TSF exchanges.

#### **6.43 Cryptographic key destruction (FCS\_CKM.4) / M4M-DESFire**

498 The M4M-DESFire library erases key values from memory after their context becomes obsolete.

#### **6.44 User identification before any action (FIA\_UID.2) / M4M-DESFire**

499 The M4M-DESFire library identifies the user through the key selected for authentication as specified by the M4M-DESFire Interface Specification.

#### **6.45 User authentication before any action (FIA\_UAU.2) / M4M-DESFire**

500 During the authentication, the M4M-DESFire library verifies that the user knows the selected key. This is performed by verifying an encryption, thus preventing to unveil the key.

501 After this authentication, both parties share a session key.

#### **6.46 Multiple authentication mechanisms (FIA\_UAU.5) / M4M-DESFire**

502 The M4M-DESFire library implements the M4M-DESFire Interface Specification, that has a mechanism to authenticate VC Administrator, VC Manager, Application Manager and Application User, while Everybody is assumed when there is no valid authentication state.

503 Two types of authentication are supported: the native M4M-DESFire 3-pass authentication and the ISO authentication.

#### **6.47 Management of TSF data (FMT\_MTD.1) / M4M-DESFire**

504 The M4M-DESFire library implements the M4M-DESFire Interface Specification, restricting key modifications in ways configurable through the security attributes to authenticated users, or disabling key modification capabilities.

### **6.48 Trusted path (FTP\_TRP.1) / M4M-DESFire**

505 The M4M-DESFire library implements the M4M-DESFire Interface Specification allowing to establish and enforce a trusted path between itself and remote users.

### **6.49 Basic rollback (FDP\_ROL.1) / M4M-DESFire**

506 The M4M-DESFire library implements the M4M-DESFire transaction mechanism ensuring that either all or none of the (modifying) file commands within a transaction are performed. If not, they are rolled back.

### **6.50 Replay detection (FPT\_RPL.1) / M4M-DESFire**

507 The M4M-DESFire library implements the M4M-DESFire authentication command, and authenticated commands, that allow replay detection.

### **6.51 Unlinkability (FPR\_UNL.1) / M4M-DESFire**

508 M4M-DESFire provides an Administrator option to use random UID during the ISO 14443 anti-collision sequence, preventing the traceability through UID. At higher level, the M4M-DESFire access control - when configured for this purpose - provides traceability protection.

### **6.52 Minimum and maximum quotas (FRU\_RSA.2) / M4M-DESFire**

509 The M4M-DESFire library ensures the memory required for its operation is available.

### **6.53 Subset residual information protection (FDP\_RIP.1) / M4M-DESFire**

510 At the end of commands execution or upon interrupt, the M4M-DESFire library cleans the confidential data from registers it uses.

## 7 Identification

**Table 14. TOE components**

IC Maskset name	Master identification number <sup>(1)</sup>	IC version	Firmware version	Optional NesLib crypto library version	Optional MIFARE4Mobile version
K500A	0137h	H	3.2.5 and 3.3.0	6.3.4	2.2.9 and 2.2.10
		I	3.3.0		

1. Part of the product information.

**Table 15. Guidance documentation**

Component description	Reference	Version
ST33J2M0 datasheet: Secure MCU with 32-bit SecurCore SC300 CPU with SWP, ISO, SPI, I2C & Flash	DS_ST33J2M0	8
ST33J Secure MCU platforms Security Guidance	AN_SECU_ST33J	10
ARM® SC300 r0p1 Technical Reference Manual	ARM_DDI_0447	A
ARM® Cortex M3 r2p0 Technical Reference Manual	ARM DDI 0337F3c	F3c
ARM® SecurCore SC300 Errata	PR326-PRDC-009983	11
ST33J2M0 firmware V3 User manual	UM_ST33J2M0_FWv3	19
ST33J platform - AIS31 compliant random number - User manual	UM_ST33J_AIS31	1
ST33J platform - AIS Reference implementation: Startup, on-line and total failure tests - AN	AN_ST33J_AIS1	1
NesLib cryptographic library NesLib 6.3 - User manual	UM_NesLib_6.3	4
ST33J secure MCU platforms NesLib 6.3 security recommendations - Application note	AN_SECU_ST33J_NESLIB_6.3	4
NesLib 6.3.4 for ST33 Lockstep platforms – Release note	RN_ST33J_NESLIB_6.3.4	3
MIFARE4Mobile® library 2.2 for the ST33J platform - User manual	UM_33J_MIFARE4MOBILE-2.2	4
MIFARE4Mobile® library 2.2.9 for the ST33J platform - Application note	AN_ST33J_M4M_Lib	1
MIFARE4Mobile® library 2.2.10 for the ST33J platform - Application note	AN_ST33J_M4M_Lib	2

Table 16. Sites list

Site	Address	Activities <sup>(1)</sup>
ST Rousset	STMicroelectronics SMD division 190 Avenue Célestin Coq, ZI, 13106 Rousset Cedex France	DEV EWS WHS
ST Crolles	STMicroelectronics 850 rue Jean Monnet 38926 Crolles France	DEV FE MASK
ST Ang Mo Kio 1	STMicroelectronics 5A Serangoon North Avenue 5 Singapore 554574	DEV
ST Zaventem	STMicroelectronics Green Square, Lambroekstraat 5, Building B 3d floor 1831 Diegem/Machelen Belgium	DEV
ST Grenoble	STMicroelectronics 12 rue Jules Horowitz, BP 217 38019 Grenoble Cedex France	DEV
ST Ljubljana	Tehnoloski park 21, 1000 Ljubljana, Slovenia	DEV
ST Rennes	STMicroelectronics 10 rue de Jouanet, ePark 35700 Rennes France	DEV
ST Sophia	STMicroelectronics 635 route des lucioles 06500 Valbonne France	DEV
ST Gardanne	CMP Georges Charpak 880 Avenue de Mimet 13541 Gardanne France	BE

Table 16. Sites list (continued)

Site	Address	Activities <sup>(1)</sup>
ST Toa Payoh	STMicroelectronics 629 Lorong 4/6 Toa Payoh 319521 Singapore Singapore	EWS
ST Shenzhen	STS Microelectronics 16 Tao hua Rd. Futian free trade zone 518038 Shenzhen P.R. China	BE
ST Bouskoura	STMicroelectronics 101 Boulevard des Muriers – BP97 20180 Bouskoura Maroc	BE WHS
ST Calamba	STMicroelectronics 9 Mountain Drive, LISP II, Brgy La mesa Calamba 4027 Philippines	BE WHS
ST Loyang	STMicroelectronics 7 Loyang Drive 508938 Singapore	WHS
ST Ang Mo Kio 6	STMicroelectronics 18 Ang Mo Kio Industrial park 2 569505 Singapore	WHS
ST Tunis	STMicroelectronics Elgazala Technopark, Raoued, Gouvernorat de l'Ariana, PB21, 2088 cedex, Ariana, Tunisia	IT
Amkor ATP3/4	AMKOR Technology ATP3/4: 119 N. Science Avenue, Laguna Technopark, Binan, Laguna, 4024 Philippines	BE
Amkor ATP1	AMKOR Technology ATP1: Km 22 East Service Rd., South Superhighway, Muntipula City 1771 Philippines	BE

Table 16. Sites list (continued)

Site	Address	Activities <sup>(1)</sup>
Amkor ATT1	AMKOR Technology Taiwan, Inc. T1: 1F, N°1, Kao-Ping Sec, Chung-Feng Rd, Lungtan Township, Taoyuan County 325, Taiwan, R.O.C.	BE
Amkor ATT3	AMKOR Technology Taiwan, Inc. T3: 11 Guangfu Road, Hsinchu Industrial Park Hukou County, HSINCHU 303 Taiwan, R.O.C.	BE
Amkor ATT6	AMKOR Technology Taiwan, Inc. T6: No. 333, Longyuan 1st Rd., Hsinchu Science Park, Longtan Dist., Taoyuan City, Taiwan, R.O.C.	BE
WINSTEK	WINSTEK - STATS ChipPAC (SCT) No 176-5, 6 Ling, Hualung Chun, Chiung Lin, 307 Hsinchu, Taiwan	BE
STATS JSCC	STATS ChipPAC Semiconductor Jiangyin CO. Ltd No. 78 Changshan Road, Jiangyin, 214437, Jiangsu P.R. China	BE
Feiliks	Feili Logistics (Shenzhen) CO., Ltd Zhongbao Logistics Building, No. 28 Taohua Road, FFTZ, Shenzhen, Guangdong 518038, China	WHS
DNP Japan	Dai Nippon printing Co ltd. 2-2-1 Kami-Fukuoka, Fujimino-shi, Saitama,356-8507 Japan	MASK
DPE Italy	Dai Printing Europe Via C. Olivetti, 2/A, I-20041 Agrate, Italy	MASK
AMTC / Toppan Germany	Advanced Mask Technology Center Gmbh & Co KG Rahnitzer Allee 9 01109 Dresden Germany	MASK

1. DEV = development, FE = front end manufacturing, EWS = electrical wafer sort and pre-perso, BE = back end manufacturing, MASK = mask manufacturing, WHS = warehouse

## 8 References

**Table 17. Common Criteria**

Component description	Reference	Version
Common Criteria for Information Technology Security Evaluation - Part 1: Introduction and general model, April 2017	CCMB-2017-04-001	3.1 Rev 5
Common Criteria for Information Technology Security Evaluation - Part 2: Security functional components, April 2017	CCMB-2017-04-002	3.1 Rev 5
Common Criteria for Information Technology Security Evaluation - Part 3: Security assurance components, April 2017	CCMB-2017-04-003	3.1 Rev 5

**Table 18. Protection Profile**

Component description	Reference	Version
Eurosmart - Security IC Platform Protection Profile with Augmentation Packages	BSI-CC-PP-0084-2014	1.0

**Table 19. Other standards**

Ref	Identifier	Description
[1]	BSI-AIS20/AIS31	A proposal for: Functionality classes for random number generators, W. Killmann & W. Schindler BSI, Version 2.0, 18-09-2011
[2]	NIST SP 800-67	NIST SP 800-67, Recommendation for the Triple Data Encryption Algorithm (TDEA) Block Cipher, revised January 2012, National Institute of Standards and Technology
[3]	FIPS PUB 140-2	FIPS PUB 140-2, Security Requirements for Cryptographic Modules, National Institute of Standards and Technology (NIST), up to change notice December 3, 2002
[4]	FIPS PUB 180-2	FIPS PUB 180-2 Secure Hash Standard with Change Notice 1 dated February 25, 2004, National Institute of Standards and Technology, U.S.A., 2004
[5]	FIPS PUB 186-4	FIPS PUB 186-4, Digital Signature Standard (DSS), National Institute of Standards and Technology (NIST), July 2013
[6]	FIPS PUB 197	FIPS PUB 197, Advanced Encryption Standard (AES), National Institute of Standards and Technology, U.S. Department of Commerce, November 2001
[7]	ISO/IEC 9796-2	ISO/IEC 9796, Information technology - Security techniques - Digital signature scheme giving message recovery - Part 2: Integer factorization based mechanisms, ISO, 2002



Table 19. Other standards

Ref	Identifier	Description
[8]	NIST SP 800-38A	NIST SP 800-38A Recommendation for Block Cipher Modes of Operation, 2001, with Addendum Recommendation for Block Cipher Modes of Operation: Three Variants of Ciphertext Stealing for CBC Mode, October 2010
[9]	NIST SP 800-38B	NIST special publication 800-38B, Recommendation for Block Cipher Modes of Operation: The CMAC Mode for Authentication, National Institute of Standards and Technology (NIST), May 2005
[10]	NIST SP 800-38C	NIST special publication 800-38C, Recommendation for Block Cipher Modes of Operation: The CCM Mode for Authentication and Confidentiality, National Institute of Standards and Technology (NIST), May 2004
[11]	NIST SP 800-38D	NIST special publication 800-38D, Recommendation for Block Cipher Modes of Operation: Galois/Counter mode (GCM) and GMAC, National Institute of Standards and Technology (NIST), November 2007
[12]	ISO/IEC 14888	ISO/IEC 14888, Information technology - Security techniques - Digital signatures with appendix - Part 1: General (1998), Part 2: Identity-based mechanisms (1999), Part 3: Certificate based mechanisms (2006), ISO
[13]	AUG	Smartcard Integrated Circuit Platform Augmentations, Atmel, Hitachi Europe, Infineon Technologies, Philips Semiconductors, Version 1.0, March 2002.
[14]	MIT/LCS/TR-212	On digital signatures and public key cryptosystems, Rivest, Shamir & Adleman Technical report MIT/LCS/TR-212, MIT Laboratory for computer sciences, January 1979
[15]	IEEE 1363-2000	IEEE 1363-2000, Standard Specifications for Public Key Cryptography, IEEE, 2000
[16]	IEEE 1363a-2004	IEEE 1363a-2004, Standard Specifications for Public Key Cryptography - Amendment 1: Additional techniques, IEEE, 2004
[17]	PKCS #1 V2.1	PKCS #1 V2.1 RSA Cryptography Standard, RSA Laboratories, June 2002
[18]	MOV 97	Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, Handbook of Applied Cryptography, CRC Press, 1997
[19]	NIST SP 800-90	NIST Special Publication 800-90, Recommendation for random number generation using deterministic random bit generators (Revised), National Institute of Standards and Technology (NIST), March 2007

Table 19. Other standards

Ref	Identifier	Description
[20]	FIPS PUB 198-1	FIPS PUB 198-1, The Keyed-Hash Message Authentication Code (HMAC), National Institute of Standards and Technology (NIST), July 2008
[21]	NIST SP 800-56A	NIST SP 800-56A Revision 2, Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography, National Institute of Standards and Technology (NIST), May 2013
[22]	ANSI X9.31	ANSI X9.31, Digital Signature Using Reversible Public Key Cryptography for the Financial Services Industry (rDSA), American National Standard for Financial Services, 1998
[23]	ANSI X9.42	ANSI X9.42, Public Key Cryptography for the Financial Services Industry: Agreement of Symmetric Keys Using Discrete Logarithm Cryptography, American National Standard for Financial Services, 2003 (R2013)
[24]	ANSI X9.62	ANSI X9.62, Public Key Cryptography for the Financial Services Industry, The Elliptic Curve Digital Signature Algorithm (ECDSA), American National Standard for Financial Services, 2005
[25]	FIPS PUB 202	FIPS PUB 202, SHA-3 Standard: Permutation-Based Hash and Extendable-Output Functions, August 2015
[26]	EdDSA rfc	S. Josefsson and I. Liusvaara., Edwards-curve Digital Signature Algorithm (EdDSA) draft-irtf-cfrg-eddsa-08, Network Working Group Internet-Draft, IETF, August 19, 2016, available from <a href="https://tools.ietf.org/html/draft-irtf-cfrg-eddsa-08">https://tools.ietf.org/html/draft-irtf-cfrg-eddsa-08</a>
[27]	EDDSA	Bernstein, D., Duif, N., Lange, T., Schwabe, P., and B. Yang, "High-speed high-security signatures", <a href="http://ed25519.cr.yt.to/ed25519-20110926.pdf">http://ed25519.cr.yt.to/ed25519-20110926.pdf</a> September 2011
[28]	EDDSA2	Bernstein, D., Josefsson, S., Lange, T., Schwabe, P., and B. Yang, "EdDSA for more curves", WWW <a href="http://ed25519.cr.yt.to/eddsa-20150704.pdf">http://ed25519.cr.yt.to/eddsa-20150704.pdf</a> July 2015
[29]	NOTE 12.1	Note d'application: Modélisation formelle des politiques de sécurité d'une cible d'évaluation NOTE/12.1, N°587/SGDN/DCSSI/SDR DCSSI, 25-03-2008
[30]	M4M specification	MIFARE4Mobile specification v2.1.1, MIFARE4Mobile Industry Group, 2013
[31]	JIL SRFPDCL	Security requirements for post-delivery code loading, Joint Interpretation Library, Version 1.0, February 2016
[32]	ANSSI-CC-CER/F/06.003	PP0084: Interpretations, ANSSI, June 2016

## Appendix A Glossary

### A.1 Terms

#### Additional Code

From the loader perspective, code activated by the Atomic Activation on the Initial TOE to generate the final TOE. For instance, Additional Code could: correct flaws, add new functionalities, update the operating system. An Additional Code is a particular « memory image » that has been activated in an authorized way on behalf of the TOE owner.

#### Authorized user

A user who may, in accordance with the TSP, perform an operation.

#### Composite product

Security IC product which includes the Security Integrated Circuit (i.e. the TOE) and the Embedded Software and is evaluated as composite target of evaluation.

#### End-consumer

User of the Composite Product in Phase 7.

#### Final TOE

From the loader perspective, the Final TOE is generated from the Initial TOE and the Additional Code. It is the resulting product of the Atomic Activation of the Additional Code onto the Initial TOE. Here the term TOE denotes the TOE itself as well as the composite TOE considered as a memory image which both may be maintained by a maintenance transaction.

#### Integrated Circuit (IC)

Electronic component(s) designed to perform processing and/or memory functions.

#### IC Dedicated Software

IC proprietary software embedded in a Security IC (also known as IC firmware) and developed by ST. Such software is required for testing purpose (IC Dedicated Test Software) but may provide additional services to facilitate usage of the hardware and/or to provide additional services (IC Dedicated Support Software).

#### IC Dedicated Test Software

That part of the IC Dedicated Software which is used to test the TOE before TOE Delivery but which does not provide any functionality thereafter.

#### IC developer

Institution (or its agent) responsible for the IC development.

#### IC manufacturer

Institution (or its agent) responsible for the IC manufacturing, testing, and pre-personalization.

#### IC packaging manufacturer

Institution (or its agent) responsible for the IC packaging and testing.

#### Initial TOE

From the loader perspective, the Initial TOE is the product on which the Additional Code is loaded and with the Loader as part of the embedded software. Here the term TOE denotes the TOE itself as well as the composite TOE which both may be maintained by loading of an additional memory image.

**Initialisation data**

Initialisation Data defined by the TOE Manufacturer to identify the TOE and to keep track of the Security IC's production and further life-cycle phases are considered as belonging to the TSF data. These data are for instance used for traceability and for TOE identification (identification data)

**Loader**

The Loader is the software developed by the Product Manufacturer. It is used to load and activate the Additional Code into the Product FLASH or EEPROM memory. The Loader is included in the ~~embedded~~ dedicated software and is ~~considered as part of the Initial~~ TOE.

**Maintenance transaction**

Modification of an initial memory image by an additional memory image resulting in a final memory image.

**Memory image**

Set of mappings of memory addresses onto data.

**Object**

An entity within the TSC that contains or receives information and upon which subjects perform operations.

**Packaged IC**

Security IC embedded in a physical package such as micromodules, DIPs, SOICs or TQFPs.

**Pre-personalization data**

Any data supplied by the Card Manufacturer that is injected into the non-volatile memory by the Integrated Circuits manufacturer (Phase 3). These data are for instance used for traceability and/or to secure shipment between phases. If "Package 2: Loader dedicated for usage by authorized users only" is used the Pre-personalisation Data may contain the authentication reference data or key material for the trusted channel between the TOE and the authorized users using the Loader.

**Secret**

Information that must be known only to authorized users and/or the TSF in order to enforce a specific SFP.

**Security IC**

Composition of the TOE, the Security IC Embedded Software, User Data, and the package.

**Security IC Embedded Software (ES)**

Software embedded in the Security IC and not developed by the IC designer. The Security IC Embedded Software is designed in Phase 1 and embedded into the Security IC in Phase 3.

**Security IC embedded software (ES) developer**

Institution (or its agent) responsible for the security IC embedded software development and the specification of IC pre-personalization requirements, if any.

**Security attribute**

Information associated with subjects, users and/or objects that is used for the enforcement of the TSP.

**Sensitive information**

Any information identified as a security relevant element of the TOE such as:

- the application data of the TOE (such as IC pre-personalization requirements, IC and system specific data),
- the security IC embedded software,
- the IC dedicated software,
- the IC specification, design, development tools and technology.

#### Smartcard

A card according to ISO 7816 requirements which has a non volatile memory and a processing unit embedded within it.

#### Subject

An entity within the TSC that causes operations to be performed.

#### Test features

All features and functions (implemented by the IC Dedicated Software and/or hardware) which are designed to be used before TOE Delivery only and delivered as part of the TOE.

#### TOE Delivery

The period when the TOE is delivered which is after Phase 3 or Phase 4 in this Security target.

#### TSF data

Data created by and for the TOE, that might affect the operation of the TOE.

#### User

Any entity (human user or external IT entity) outside the TOE that interacts with the TOE.

#### User data

All data managed by the Smartcard Embedded Software in the application context. User data comprise all data in the final Smartcard IC except the TSF data.

## A.2 Abbreviations

Table 20. List of abbreviations

Term	Meaning
AIS	Application notes and Interpretation of the Scheme (BSI).
BE	Back End manufacturing.
BSI	Bundesamt für Sicherheit in der Informationstechnik.
CBC	Cipher Block Chaining.
CC	Common Criteria.
CPU	Central Processing Unit.
CRC	Cyclic Redundancy Check.
DCSSI	Direction Centrale de la Sécurité des Systèmes d'Information.
DES	Data Encryption Standard.

Table 20. List of abbreviations (continued)

Term	Meaning
DESFire	MIFARE® DESFire® EV1.
DEV	Development.
DIP	Dual-In-Line Package.
DRBG	Deterministic Random Bit Generator.
EAL	<a href="#">Evaluation Assurance Level.</a>
ECB	Electronic Code Book.
EDES	Enhanced DES.
EEPROM	Electrically Erasable Programmable Read Only Memory.
ES	Security IC Embedded Software.
EWS	Electrical Wafer Sort.
FE	Front End manufacturing.
FIPS	Federal Information Processing Standard.
I/O	Input / Output.
IC	<a href="#">Integrated Circuit.</a>
ISO	International Standards Organisation.
IT	<a href="#">Information Technology.</a>
LPU	Library Protection Unit.
MASK	Mask manufacturing.
MMU	Memory Management Unit.
M4M	MIFARE4Mobile®.
NESCRYPT	Next Step Cryptography Accelerator.
NIST	National Institute of Standards and Technology.
NVM	Non Volatile Memory.
OSP	Organisational Security Policy.
OST	Operating System for Test.
PP	<a href="#">Protection Profile.</a>
PUB	Publication Series.
RAM	Random Access Memory.
RF	Radio Frequency.
ROM	Read Only Memory.
RSA	Rivest, Shamir & Adleman.
SAR	Security Assurance Requirement.
SFP	Security Function Policy.

Table 20. List of abbreviations (continued)

Term	Meaning
SFR	Security Functional Requirement.
SOIC	Small Outline IC.
ST	Context dependent : STMicroelectronics or <a href="#">Security Target</a> .
TDES	Triple Data Encryption Standard
TOE	<a href="#">Target of Evaluation</a> .
TQFP	Thin Quad Flat Package.
TRNG	True Random Number Generator.
TSC	<a href="#">TSF Scope of Control</a> .
TSF	<a href="#">TOE Security Functionality</a> .
TSFI	TSF Interface.
TSP	TOE Security Policy.
TSS	TOE Summary Specification.
WHS	Warehouse.

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