THALES

Thales Luna PCIe HSM 7

COMPLIANCE GUIDE

Document Information

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Regulatory Compliance

This product complies with the following regulatory regulations. To ensure compliancy, ensure that you install the products as specified in the installation instructions and use only Thales-supplied or approved accessories.

USA, FCC

This equipment has been tested and found to comply with the limits for a “Class B” digital device, pursuant to part 15 of the FCC rules.

Canada

This class B digital apparatus meets all requirements of the Canadian interference-causing equipment regulations.

Europe

This product is in conformity with the protection requirements of EC Council Directive 2014/30/EU. This product satisfies the CLASS B limits of EN55032.

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PREFACE: About the Compliance Guide

This guide provides information about Luna HSM's compliance with various international standards, and how you can ensure that the HSM is configured to comply with these standards. This document contains the following chapters:

> "FIPS Compliance" on page 1

> "Common Criteria/eIDAS Compliance" on page 17

> "Electrical Standards Compliance" on page 10

The preface includes the following information about this document:

> "Customer Release Notes" below

> "Audience" below

> "Document Conventions" below

> "Support Contacts" on page 9

For information regarding the document status and revision history, see "Document Information" on page 2.

Customer Release Notes

The Customer Release Notes (CRN) provide important information about specific releases. Read the CRN to fully understand the capabilities, limitations, and known issues for each release. You can view the latest version of the CRN at www.thalesdocs.com.

Audience

This document is intended for personnel responsible for maintaining your organization's security infrastructure. This includes Luna HSM users and security officers, key manager administrators, and network administrators.

All products manufactured and distributed by Thales are designed to be installed, operated, and maintained by personnel who have the knowledge, training, and qualifications required to safely perform the tasks assigned to them. The information, processes, and procedures contained in this document are intended for use by trained and qualified personnel only.

It is assumed that the users of this document are proficient with security concepts.

Document Conventions

This document uses standard conventions for describing the user interface and for alerting you to important information.

Notes

Notes are used to alert you to important or helpful information. They use the following format:

> **NOTE** Take note. Contains important or helpful information.

Cautions

Cautions are used to alert you to important information that may help prevent unexpected results or data loss. They use the following format:

> **CAUTION!** Exercise caution. Contains important information that may help prevent unexpected results or data loss.

Warnings

Warnings are used to alert you to the potential for catastrophic data loss or personal injury. They use the following format:

> ****WARNING** Be extremely careful and obey all safety and security measures. In this situation you might do something that could result in catastrophic data loss or personal injury.**

Command syntax and typeface conventions

Format	Convention
bold	The bold attribute is used to indicate the following: > Command-line commands and options (Type **dir /p**.) > Button names (Click **Save As**.) > Check box and radio button names (Select the **Print Duplex** check box.) > Dialog box titles (On the **Protect Document** dialog box, click **Yes**.) > Field names (**User Name**: Enter the name of the user.) > Menu names (On the **File** menu, click **Save**.) (Click **Menu** > **Go To** > **Folders**.) > User input (In the **Date** box, type **April 1**.)
italics	In type, the italic attribute is used for emphasis or to indicate a related document. (See the *Installation Guide* for more information.)
<variable>	In command descriptions, angle brackets represent variables. You must substitute a value for command line arguments that are enclosed in angle brackets.
[**optional**] [<optional>]	Represent optional **keywords** or <variables> in a command line description. Optionally enter the keyword or <variable> that is enclosed in square brackets, if it is necessary or desirable to complete the task.

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Format	Convention
{**a**|**b**|**c**} {<a>|<b>|<c>}	Represent required alternate **keywords** or <variables> in a command line description. You must choose one command line argument enclosed within the braces. Choices are separated by vertical (OR) bars.
[**a**|**b**|**c**] [<a>|<b>|<c>]	Represent optional alternate keywords or variables in a command line description. Choose one command line argument enclosed within the braces, if desired. Choices are separated by vertical (OR) bars.

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Support Contacts

If you encounter a problem while installing, registering, or operating this product, please refer to the documentation before contacting support. If you cannot resolve the issue, contact your supplier or Thales Customer Support. Thales Customer Support operates 24 hours a day, 7 days a week. Your level of access is governed by the support plan negotiated between Thales and your organization. Please consult this plan for details regarding your entitlements, including the hours when telephone support is available to you.

Customer Support Portal

The Customer Support Portal, at https://supportportal.thalesgroup.com, is where you can find solutions for most common problems and create and manage support cases. It offers a comprehensive, fully searchable database of support resources, including software and firmware downloads, release notes listing known problems and workarounds, a knowledge base, FAQs, product documentation, technical notes, and more.

> **NOTE** You require an account to access the Customer Support Portal. To create a new account, go to the portal and click on the **REGISTER** link.

Telephone

The support portal also lists telephone numbers for voice contact (Contact Us).

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CHAPTER 1: Electrical Standards Compliance

Standards-compliance documents for Luna Network HSM 7 and Luna PCIe HSM 7 are available on the Support Portal at :

KB0029775 - Luna Network HSM UL/CSA Certificate of Compliance

KB0029776 - Luna PCIe HSM UL/CSA Certificate of Compliance

CHAPTER 2: FIPS Compliance

Luna HSMs are compliant with the Federal Information Processing Standard (FIPS), defined by the National Institute of Standards and Technology (NIST), a division of the U.S. Department of Commerce. The full capabilities of Luna HSMs, however, extend far beyond the limitations prescribed by FIPS. If your organization requires FIPS compliance, you must configure the HSM to ensure compliance by restricting these extended capabilities. This section provides guidance on setting up and using the Luna HSM to comply with FIPS, and ensuring that compliance is maintained across firmware updates. ,Luna Network HSM 7 Luna PCIe HSM 7, Luna USB HSM 7 and Luna Backup HSM 7 are FIPS 140-3 Level 3 certified.

Refer to the following sections for guidance on FIPS compliance:

> "Install Only FIPS-Validated Firmware" below
> "Configuring the HSM to Operate in FIPS 140 Approved Configuration" on the next page
> "Other FIPS Considerations" on page 4
> "RNG Entropy" on page 6
> "Changes to Mechanisms and Operations in FIPS 140 Approved Configuration by Firmware Version" on page 6

Install Only FIPS-Validated Firmware

The Luna HSM firmware introduces new functionality with each new version, and to be compliant with FIPS, a new firmware version must be inspected and validated by NIST. Since this validation can take a long time, Thales does not submit every firmware version it releases to NIST as a FIPS candidate. In order to be compliant with the FIPS standard, you must have a FIPS-validated firmware version installed. If your organization requires FIPS validation, *update the HSM firmware only to versions listed below*.

> **NOTE** Luna HSM Client software does not affect FIPS compliance; only the HSM firmware version. Thales recommends keeping your clients updated to the latest version whenever possible, to take advantage of the latest functionality and bug fixes.

While older firmware versions on the list below are still considered validated, each new version contains changes to the HSM functions that ensure continued compliance with the revised standard. Certain mechanisms or specific operations that have fallen below the security standard set by NIST since the last certified version are restricted. Likewise, newer mechanisms that have been validated by NIST may be allowed in FIPS 140 approved configuration (formerly FIPS mode), where they were restricted in older versions. Thales recommends that you keep your Luna HSMs requiring FIPS compliance updated to the latest FIPS-validated version, as specified in the list below.

FIPS 140-3 Level 3 Certified Luna HSM Firmware Versions

The following Luna HSM firmware versions are FIPS 140-3 Level 3 certified per certificate #4684:

https://csrc.nist.gov/projects/cryptographic-module-validation-program/Certificate/4684

- Luna HSM Firmware 7.8.5 (recommended)
- Luna HSM Firmware 7.8.4

FIPS 140-2 Level 3 Certified Luna HSM Firmware Versions

The following Luna HSM firmware versions are FIPS 140-2 Level 3 certified per certificate #4090:

https://csrc.nist.gov/projects/cryptographic-module-validation-program/Certificate/4090

- Luna HSM Firmware 7.7.1-20
- Luna HSM Firmware 7.7.0

The following Luna HSM firmware versions are FIPS 140-2 Level 3 certified per certificate #3205:

https://csrc.nist.gov/projects/cryptographic-module-validation-program/Certificate/3205

- Luna HSM Firmware 7.3.3
- Luna HSM Firmware 7.0.3
- Luna HSM Firmware 7.0.2
- Luna HSM Firmware 7.0.1

FIPS 140-3 Level 3 Certified Luna Backup HSM 7 Firmware Versions

The following Luna Backup HSM 7 firmware versions are FIPS 140-3 Level 3 certified per NIST certificate #4962:

https://csrc.nist.gov/projects/cryptographic-module-validation-program/certificate/4962

- Luna Backup HSM 7 Firmware 7.7.3 (recommended)

Configuring the HSM to Operate in FIPS 140 Approved Configuration

Luna HSMs have many capabilities that are not certified by NIST. To be FIPS-compliant, the HSM must be set to **FIPS 140 approved configuration**, where any mechanisms or cryptographic operations that are not FIPS-certified are blocked from use. FIPS 140 approved configuration (formerly FIPS mode) is set using HSM or partition policies as described below.

Setting FIPS 140 Approved Configuration on the Cryptographic Module (HSM)

You can globally set the HSM to FIPS 140 approved configuration using **HSM policy 12:** Allow non-FIPS algorithms. When this policy is set to **0**, algorithms that are not FIPS-validated are blocked from use on every partition on the HSM, and the HSM is operating in FIPS 140 approved configuration. There are two methods of setting this policy:

- The HSM SO can use a policy template to set the policy at initialization (see Setting HSM Policies Using a Template). This method is recommended for auditing purposes -- it ensures that the HSM is in FIPS 140 approved configuration for its entire use cycle.
- The HSM SO can set the policy manually after initializing the HSM (see Setting HSM Policies Manually).

> **NOTE** **HSM policy 12:** Allow non-FIPS algorithms is destructive; changing it results in the entire HSM being zeroized and all partitions destroyed. This is to prevent keys that were created and used in a non-FIPS approved environment from existing in a FIPS-approved environment, and vice-versa.

To check the current status of FIPS 140 approved configuration on the HSM, log in to LunaCM and use lunacm:> hsm showinfo. In FIPS 140 approved configuration, a variation of the following text is displayed:

```
*** The HSM is in FIPS approved operation mode. ***
```

Setting FIPS 140 approved configuration on individual application partitions

Using Luna HSM Firmware 7.7.1 or newer (Luna HSM Firmware 7.7.1-20 Patch recommended), you can now set FIPS 140 approved configuration on individual application partitions, independently of other partitions on the same HSM.

Prerequisite

HSM policy 12: Allow non-FIPS algorithms must be set to **1** on the cryptographic module (entire HSM) level, to allow non-FIPS algorithms if not otherwise excluded, but to also allow individual partitions to be set to the stricter FIPS-140-only configuration.

To set FIPS 140 approved configuration on an application partition

You can set the partition to FIPS 140 approved configuration (formerly FIPS mode) using **partition policy 43:** Allow non-FIPS algorithms. When this policy is set to **0**, algorithms that are not FIPS-validated are blocked from use, and the partition is operating in FIPS 140 approved configuration. There are two methods of setting this policy:

- The Partition SO can use a policy template to set the policy to **0** at initialization (see Setting Partition Policies Using a Template). This method is recommended for auditing purposes -- it ensures that the partition is in FIPS 140 approved configuration for its entire use cycle.
- The Partition SO can set the policy to **0** manually after initializing the partition (see Setting Partition Policies Manually).

> **NOTE** **Partition policy 43:** Allow non-FIPS algorithms is destructive when changing from **0** to **1**; this change results in the partition being zeroized. This is to prevent keys that were created and used in a FIPS-approved environment from existing in a non-FIPS-approved environment.

Setting FIPS 140 Approved Configuration on Luna Backup HSM 7

Luna Backup HSM Firmware 7.7.1 and newer uses the same updated cloning protocol as Luna HSM Firmware 7.7.0 and newer. For the Luna Backup HSM 7 to be FIPS-compliant, it must restrict restore operations to application partitions that use the new protocol. This restriction is applied by setting **HSM policy 55:** Enable Restricted Restore to **1** on the backup HSM. The Luna Backup HSM 7 must be initialized and connected to a Luna HSM Client computer to set this policy.

When this policy is enabled on the Luna Backup HSM 7, objects that have been backed up from partitions using firmware older than Luna HSM Firmware 7.7.0 can be restored to Luna HSM Firmware 7.7.0 or newer (V0 or V1) partitions only.

CAUTION! FIPS compliance requires that objects are never cloned or restored to an HSM using less secure firmware, and this includes restoring from Luna Backup HSM 7 firmware.

If you have backups already stored on the Luna Backup HSM 7 that were taken from pre-7.7.0 partitions, turning this policy ON will prevent you from restoring them to the same source partition. You must update the HSM containing the source partition to Luna HSM Firmware 7.7.0 or newer before restoring from backup.

NOTE **HSM policy 12:** Allow non-FIPS algorithms, which is used to set FIPS-compliant mode on other Luna HSMs, does not apply to the Luna Backup HSM 7. Attempts to change this policy will fail with the error `CKR_CANCEL`.

To configure the Luna Backup HSM 7 for FIPS compliance

1. On the Luna HSM Client computer, run LunaCM.
2. Set the active slot to the Luna Backup HSM 7.

   lunacm:> **slot set -slot** <slot_id>
3. Log in as Backup HSM SO.

   lunacm:> **role login -name so**
4. Set **HSM policy 55:** Enable Restricted Restore to **1**.

   lunacm:> **hsm changehsmpolicy -policy 55 -value 1**
5. [Optional] Check that the Luna Backup HSM 7 is now in FIPS approved operation mode.

   lunacm:> **hsm showinfo**

   ```
   *** The HSM is in FIPS 140-2 approved operation mode. ***
   ```

Other FIPS Considerations

Certain Luna features can affect FIPS compliance, or the behavior of the HSM in FIPS 140 approved configuration (formerly FIPS mode). Those features and their effects on FIPS are described below.

NOTE By design (approved by NIST) HSS keys cannot be copied/cloned and therefore are not for use in an HA group, and cannot be backed-up or restored.

- Do not generate an HSS key pair on an HA virtual slot.
- Do not add a partition to an HA group if the partition has an HSS private key on it.
- LMS-HSS key creation and use is supported only in partition mode on the Luna HSM, and is not supported in key rings,
- LMS-HSS does not support PKA (per-key authentication).

NOTE Luna USB HSM 7 does not support Functionality Modules (FMs).

Functionality Modules and FIPS 140 Approved Configuration

FMs change the abilities of the HSM firmware, adding new cryptographic algorithms or other functions. Since the new functionality is not certified by NIST, be sure that your FM does not break FIPS compliance. To be certain that your organization is meeting FIPS requirements, ensure that you are using a FIPS-certified version of the Luna HSM firmware, and that your Luna PCIe HSM 7 has the following HSM policy settings:

- **HSM policy 12: Allow non-FIPS algorithms**: **0**
- **HSM policy 50: Allow Functionality Modules**: **0**

> **CAUTION!** Allowing Functionality modules (setting HSM policy 50 to ON):
> - is an HSM-wide change that is permanent, not reversible (the FMHOK is applied and the original HOK is deleted),
> - is an HSM-wide change that applies to all partitions, and is not adjustable on a per-partition basis.

> **CAUTION!** When **HSM policy 50** is turned on, all partitions and keys on the HSM are destroyed. Since it is not possible to clone or restore keys from a standard partition to a partition on an HSM where the FM policy is enabled, Thales recommends enabling FMs on a new or repurposed Luna PCIe HSM 7 only.

> **NOTE** Using Luna HSM Firmware 7.4.2 and older, it is not possible to set **HSM policy 50: Allow Functionality Modules** to **1** while **HSM policy 12: Allow non-FIPS algorithms** is **0**.
>
> Using newer firmware versions, it is possible to enable Functionality Modules (FMs) on an HSM operating in a FIPS-approved configuration. In this state, the HSM enforces compliance by restricting the use of any non-FIPS-approved native algorithms. However, your FM must also be FIPS validated in order to maintain overall FIPS compliance.

If FIPS compliance is not required, then enabling FMs does not present an issue for you. Enabling Functionality Modules (setting **HSM policy 50: Allow Functionality Modules** to **1**) is not reversible. For more information about HSM policies, see HSM Capabilities and Policies.

Mixed FIPS/non-FIPS High-Availability Groups

Thales does not recommend creating HA groups using a combination of FIPS and non-FIPS partitions, as such groups would not be FIPS compliant for auditing purposes. If you do wish to create such groups, however, you require a minimum client version or the operation will be blocked:

- If you are using Luna HSM Client 10.4.0 or newer, you *can* set up an HA group with a mix of FIPS and non-FIPS partitions as members. However, some limitations must be considered. For more information, refer to Key Replication.
- If you are using Luna HSM Client 10.3.0 or older, you *cannot* set up an HA group with a mix of FIPS and non-FIPS partitions as members.

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RSA-186 Mechanism Remapping for FIPS Compliance

Under FIPS 186-3/4, the only RSA methods permitted for generating keys are 186-3 with primes and 186-3 with aux primes. RSA PKCS and X9.31 key generation is not approved in a FIPS-compliant HSM. While Luna 6.10.9 firmware allows these older mechanisms, later firmware does not (and keys created using these mechanisms cannot be replicated to Luna 7 HSMs or Luna Cloud HSM services).

If you have older applications that use RSA PKCS and X9.31 key generation, you can remap these calls to use the newer, secure mechanisms. Add a line to the **Chrystoki.conf/crystoki.ini** configuration file as follows:

```
[Misc]
RSAKeyGenMechRemap=1
```

> **NOTE** This setting is intended for older applications that call outdated mechanisms, to redirect calls to FIPS-approved mechanisms. The ideal solution is to update your applications to call the approved mechanisms.
>
> Mechanism remapping is automatic, and ignores the configuration file entry if:
>
> - you are using Luna HSM Client 10.1.0 or newer, and
> - HSM firmware is older than Luna HSM Firmware 7.7.1 (which introduced FIPS mode on individual partitions; clients up to and including Luna HSM Client 10.3.0 are unaware of the independent partition setting and do not remap mechanisms).
>
> Luna HSM Client 10.4.0 and newer are aware of the change in Luna HSM Firmware 7.7.1 and perform the mechanism remapping as expected when the current partition is in FIPS mode.

RNG Entropy

Luna HSM 7 Firmware includes a FIPS 140-2 Level 3-certified Random Bit Generator with an SP 800-90B certified entropy source. The entropy source is the bit that generates the raw entropy bits, conditions these to increase entropy per-bit and health-tests the samples. These bits are then fed to a Deterministic Random Bit Generator (DRBG) which independently is NIST CAVP approved.

The Random Bit Generator and entropy source are FIPS 140-2 Level 3 certified per certificate #E98:

https://csrc.nist.gov/projects/cryptographic-module-validation-program/entropy-validations/certificate/98

Changes to Mechanisms and Operations in FIPS 140 Approved Configuration by Firmware Version

This section provides details about changes to mechanisms and their functionality when in FIPS 140 approved configuration.

> **NOTE** Thales is continuously updating FIPS criteria with each new firmware version; even if a particular firmware is not submitted for FIPS validation, it may include changes to the way mechanisms work in FIPS 140 approved configuration. It is possible to operate any Luna firmware version in FIPS 140 approved configuration, but only versions validated by NIST are considered compliant with the standard (see "Install Only FIPS-Validated Firmware" on page 1).

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> **NOTE** RSA public exponent value e=3 was deprecated, and Luna HSM does not support its use in FIPS 140 configuration. By default, use RSA exponent value 65537 (2^16 + 1) instead, or refer to the FIPS 186-5 Appendix A.1.1 specification for detailed guidance.
>
> See also Impact on Exponents.

FIPS Changes in Luna HSM Firmware 7.9.0 and Newer

New restrictions have been added to some mechanisms when the HSM or partition is in FIPS approved configuration (**HSM policy 12:** Allow non-FIPS algorithms or **partition policy 43:** Allow non-FIPS algorithms set to **0**), to comply with FIPS 186-5 Digital Signature Standard (NIST SP 800-186).

RSA Key Pair Generation Mechanisms for FIPS 186-3 Allow 6144- and 8192-Bit Keys

Using the following mechanisms, you can now generate 6144-bit and 8192-bit RSA keypairs in FIPS approved configuration:

- CKM_RSA_FIPS_186_3_AUX_PRIME_KEY_PAIR_GEN
- CKM_RSA_FIPS_186_3_PRIME_KEY_PAIR_GEN

New Partition Policy Allows Signature Verification with ECDSA and RSA

A new **partition policy 45:** Allow ECDSA/RSA Prehash SigVer enables a prehash operation that allows mechanisms that do not have a hash function to perform verification. With this policy enabled, the following mechanisms are now permitted to perform verification in FIPS approved configuration:

- CKM_DSA
- CKM_ECDSA
- CKM_RSA_PKCS
- CKM_RSA_PKCS_PSS
- CKM_RSA_X9_31

FIPS Changes in Luna HSM Firmware 7.8.9 and Newer

New restrictions have been added to some mechanisms when the HSM or partition is in FIPS approved configuration (**HSM policy 12:** Allow non-FIPS algorithms or **partition policy 43:** Allow non-FIPS algorithms set to **0**), to comply with FIPS 186-5 Digital Signature Standard (NIST SP 800-186).

Mechanisms that are now available in FIPS 140 approved configuration

The following mechanisms are now available for use in FIPS 140 approved configuration (formerly FIPS mode):

- CKM_EDDSA
- CKM_SHA224_EDDSA
- CKM_SHA256_EDDSA
- CKM_SHA384_EDDSA
- CKM_SHA512_EDDSA
- CKM_SHA3_224_EDDSA

- CKM_SHA3_256_EDDSA
- CKM_SHA3_384_EDDSA
- CKM_SHA3_512_EDDSA

Mechanisms no longer available in FIPS 140 approved configuration

The following mechanism is now restricted from use in FIPS 140 approved configuration (formerly FIPS mode):

- CKM_EC_MONTGOMERY_KEY_PAIR_GEN

Mechanisms now check for approved EC curves in FIPS 140 approved configuration

The following mechanisms now verify that the specified EC curve is FIPS-approved, and reject operations that specify non-approved curves:

- CKM_ECDH1_COFACTOR_DERIVE
- CKM_ECDH1_DERIVE
- CKM_ECDSA
- CKM_ECDSA_SHA1
- CKM_ECDSA_SHA224
- CKM_ECDSA_SHA256
- CKM_ECDSA_SHA384
- CKM_ECDSA_SHA512
- CKM_ECDSA_SHA3_224
- CKM_ECDSA_SHA3_256
- CKM_ECDSA_SHA3_384
- CKM_ECDSA_SHA3_512
- CKM_ECIES
- CKM_EC_KEY_PAIR_GEN
- CKM_EC_KEY_PAIR_GEN_W_EXTRA_BITS

Allowed Elliptic Curves

Curve Name	Mechanisms	Curve Field Type	Security Strength	Permitted Operations		
				Sign	Verify	Derive
B-233	ECDSA, EC key establishment Thales terminology	Binary Field – GF(2m)	112-bits	X	X	X

Curve Name	Mechanisms	Curve Field Type	Security Strength	Permitted Operations		
				Sign	Verify	Derive
B-283	ECDSA, EC key establishment	Binary Field – GF(2m)	128-bits	X	X	X
B-409	ECDSA, EC key establishment	Binary Field – GF(2m)	192-bits	X	X	X
B-571	ECDSA, EC key establishment	Binary Field – GF(2m)	256-bits	X	X	X
K-233	ECDSA, EC key establishment	Binary Field – GF(2m)	112-bits	X	X	X
K-283	ECDSA, EC key establishment	Binary Field – GF(2m)	128-bits	X	X	X
K-409	ECDSA, EC key establishment	Binary Field – GF(2m)	192-bits	X	X	X
K-571	ECDSA, EC key establishment	Binary Field – GF(2m)	256-bits	X	X	X
P-244	ECDSA, EC key establishment	Prime field – GF (p)	112-bits	X	X	X
P-256	ECDSA, EC key establishment	Prime field – GF (p)	128-bits	X	X	X
P-384	ECDSA, EC key establishment	Prime field – GF (p)	192-bits	X	X	X
P-521	ECDSA, EC key establishment	Prime field – GF (p)	256-bits	X	X	X
Edwards448	EdDSA	Prime field – GF (p)	224-bits	X	X	X
Edwards25519	EdDSA	Prime field – GF (p)	128-bits	X	X	X
Brainpool P512r1	ECDSA, EC key establishment	Prime field – GF (p)	256-bits	X	X	X
Brainpool P512t1	ECDSA, EC key establishment	Prime field – GF (p)	256-bits	X	X	X

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Curve Name	Mechanisms	Curve Field Type	Security Strength	Permitted Operations		
				Sign	Verify	Derive
Brainpool P-384r1	ECDSA, EC key establishment	Prime field – GF (p)	192-bits	X	X	X
Brainpool P-384t1	ECDSA, EC key establishment	Prime field – GF (p)	192-bits	X	X	X
Brainpool P320r1	ECDSA, EC key establishment	Prime field – GF (p)	160-bits	X	X	X
Brainpool P320t1	ECDSA, EC key establishment	Prime field – GF (p)	160-bits	X	X	X
secp256k1	Blockchain	Prime field – GF (p)	128-bits	X	X	no*
Brainpool P-256r1	ECDSA, EC key establishment	Prime field – GF (p)	128-bits	X	X	X
Brainpool P-256t1	ECDSA, EC key establishment	Prime field – GF (p)	128-bits	X	X	X
Brainpool P-224r1	ECDSA, EC key establishment	Prime field – GF (p)	112-bits	X	X	X
Brainpool P-224t1	ECDSA, EC key establishment	Prime field – GF (p)	112-bits	X	X	X

The above table applies to Luna HSM Firmware 7.8.9 and newer.

*The secp256k1 (BIP32) curve cannot be used for ECDH or ECIES derivation in FIPS 140 approved configuration.

FIPS Changes in Luna HSM Firmware 7.8.7 and Newer

New restrictions have been added to some mechanisms when the HSM or partition is in FIPS approved configuration (**HSM policy 12:** Allow non-FIPS algorithms or **partition policy 43:** Allow non-FIPS algorithms set to **0**), to comply with FIPS 186-5 Digital Signature Standard (NIST SP 800-186).

Mechanisms no longer available in FIPS 140 approved configuration

The following mechanisms are now restricted from use in FIPS 140 approved configuration:

- CKM_AES_MAC
- CKM_AES_MAC_GENERAL
- CKM_DES3_MAC
- CKM_DES3_MAC_GENERAL

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- CKM_DSA_KEY_PAIR_GEN
- CKM_DSA_PARAMETER_GEN

Mechanisms not permitted to sign objects in FIPS 140 approved configuration

The following mechanisms are not permitted to sign objects in FIPS 140 approved configuration:

- CKM_DSA
- CKM_DSA_SHA224
- CKM_DSA_SHA256
- CKM_RSA_X9_31
- CKM_SHA3_224_DSA
- CKM_SHA3_256_DSA
- CKM_SHA3_384_DSA
- CKM_SHA3_512_DSA
- CKM_SHA224_RSA_X9_31
- CKM_SHA256_RSA_X9_31
- CKM_SHA384_RSA_X9_31
- CKM_SHA512_RSA_X9_31

FIPS Changes in Luna HSM Firmware 7.8.4 and Newer

New restrictions have been added to some mechanisms when the HSM or partition is in FIPS approved configuration (**HSM policy 12:** Allow non-FIPS algorithms or **partition policy 43:** Allow non-FIPS algorithms set to **0**), to comply with NIST's planned withdrawal of FIPS SP800-67 Rev2 on January 1, 2024.

Mechanisms not permitted to encrypt objects in FIPS mode

The following mechanisms are not permitted to encrypt objects in FIPS mode:

- CKM_DES_CFB8
- CKM_DES_CFB64
- CKM_DES_OFB64
- CKM_DES3_CBC
- CKM_DES3_CBC_PAD
- CKM_DES3_CTR
- CKM_DES3_ECB

Mechanisms no longer available in FIPS approved configuration

The following encryption mechanisms are no longer available in FIPS approved configuration:

- CKM_DES3_CBC_ENCRYPT_DATA
- CKM_DES3_ECB_ENCRYPT_DATA

DES3 encryption not permitted using ECIES mechanisms

DES3 encryption is now blocked using the following ECIES mechanisms:

- CKM_DES_CFB8
- CKM_DES_CFB64
- CKM_DES_OFB64
- CKM_DES3_CBC
- CKM_DES3_CBC_PAD
- CKM_DES3_CBC_PAD_IPSEC
- CKM_DES3_CMAC
- CKM_DES3_CMAC_GENERAL
- CKM_DES3_CTR
- CKM_DES3_ECB

HMAC mechanisms not permitted to sign using DES3 keys

The following HMAC mechanisms are blocked from using a DES3 key for signing:

- CKM_SHA_1_HMAC
- CKM_SHA_1_HMAC_GENERAL
- CKM_SHA224_HMAC
- CKM_SHA224_HMAC_GENERAL
- CKM_SHA256_HMAC
- CKM_SHA256_HMAC_GENERAL
- CKM_SHA384_HMAC
- CKM_SHA384_HMAC_GENERAL
- CKM_SHA512_HMAC
- CKM_SHA512_HMAC_GENERAL
- CKM_SHA3_224_HMAC
- CKM_SHA3_224_HMAC_GENERAL
- CKM_SHA3_256_HMAC
- CKM_SHA3_256_HMAC_GENERAL
- CKM_SHA3_384_HMAC
- CKM_SHA3_384_HMAC_GENERAL
- CKM_SHA3_512_HMAC
- CKM_SHA3_512_HMAC_GENERAL

Mechanisms not permitted to sign objects

The following mechanisms are not permitted to sign objects:

- CKM_DES3_CMAC
- CKM_DES3_CMAC_GENERAL

CKM_RSA_PKCS not permitted to decrypt/unwrap objects

To comply with FIPS 140-3 requirements, RSA-based key transport schemes that use only PKCS#1-v1.5 padding are disallowed. Therefore, CKM_RSA_PKCS is now restricted from performing decrypt/unwrap operations.

> **NOTE** When the HSM or partition is in FIPS approved configuration (**HSM policy 12:** Allow non-FIPS algorithms or **partition policy 43:** Allow non-FIPS algorithms set to **0**), CKM_RSA_PKCS is disabled even if **partition policy 33:** Allow RSA PKCS mechanism is set to **1**.

3DES usage counter has been removed

The 3DES usage counter attribute (CKA_BYTES_REMAINING) has been removed in Luna HSM Firmware 7.8.4 and newer, to comply with FIPS 140-3 requirements. This attribute is now ignored on any keys where it is already set.

Firmware 7.8.4 and newer - behavior notes

[This section added for LKX-10826]

In addition to the above, if you update your HSM's firmware to version 7.8.4 or newer, be aware of the following.

Cloning protocol versions and interactions

Cloning protocol version 1 (CPv1) has been the standard protocol for many years,

- to clone keys and objects between Luna HSMs (between application partitions on the same or different HSMs) directly, including Luna Cloud HSM
- to clone keys and objects among members of HA groups
- to clone keys and objects when backing up to a Luna backup HSM or when restoring from backup.

CPv1 uses older mechanisms, and is being superseded by CPv4.

Noteworthy between the two is that CPv4 permits a selection of cipher suites to secure the cloning process. Most situations would be perfectly fine with whatever ciphers are negotiated from those available, while some industries or government standards might mandate excluding certain ciphers.

As of firmware 7.8.4, CPv1 is *disallowed* when the HSM is in FIPS 140 approved configuration (HSM Policy 12: *Enable non-FIPS algorithms* set to value 0), which means that only CPv4 is available for cloningThis includes cloning in either direction between Luna Cloud HSM and on-premises Luna HSMs. When that HSM-level policy is 0 (known as FIPS 140 approved configuration) all application partitions in the HSM are forced to FIPS mode.

If the HSM is in non-FIPS 140 approved configuration (HSM Policy 12 set to value 1), then FIPS 140 approved configuration can be set ON or OFF for individual application partitions. This has the effect that CPv1 is still allowed for an individual partition within the HSM if Partition Policy 43 is set to value 0, for that partition.

Firmware update effects on crypto mechanism behaviors always prevail

Partition Policy 33: Allow RSA PKCS mechanism can still be set to value 1 to function as before, if you had been using that setting. However, the mechanism settings enforced by your current firmware version will prevent disallowed operations -- as newer and newer firmware versions are released, older/weaker mechanisms can be further restricted or disallowed, for reasons of security and of compliance with standards. Always check the latest documentation in case a new firmware might disrupt your use-case.

HA Login implication

High Availability Indirect Login is a form of High Availability grouping that some customers implement via the Luna Software Development Kit and Thales' extensions to PKCS#11. See High Availability Indirect Login. Older versions, prior to HSM firmware version 7.7.0 use RSA_PKCS to encrypt the RND value during HA Indirect Login Setup. Versions 1.x cannot be used (we block logging in from latest-FW primary to a secondary FW that uses Version 1.x). Version 2 (FW >= 7.7.0) uses AES-256-KWP instead.

FIPS Changes in Luna HSM Firmware 7.8.0 and Newer

The following mechanism is now restricted from use when the HSM or partition is in FIPS approved configuration (**HSM policy 12:** Allow non-FIPS algorithms or **partition policy 43:** Allow non-FIPS algorithms set to **0**):

- CKM_X9_42_DH_PARAMETER_GEN

FIPS Changes in Luna HSM Firmware 7.7.2 and Newer

The following mechanisms have new operation restrictions when the HSM or partition is in FIPS approved configuration (**HSM policy 12:** Allow non-FIPS algorithms or **partition policy 43:** Allow non-FIPS algorithms set to **0**):

- CKM_RSA_PKCS: cannot encrypt | Cannot legacy decrypt | Cannot legacy unwrap
- CKM_RSA_PKCS_OAEP: Cannot legacy decrypt | Cannot legacy unwrap

FIPS Changes in Luna HSM Firmware 7.7.0 and Newer

New restrictions have been added to some mechanisms when the HSM or partition is in FIPS approved configuration (**HSM policy 12:** Allow non-FIPS algorithms or **partition policy 43:** Allow non-FIPS algorithms set to **0**), to comply with FIPS SP800-131a Rev2, published in March 2019.

Mechanisms not permitted to wrap objects in FIPS mode

The following mechanisms are not permitted to wrap objects in FIPS mode (unwrap operations are permitted):

- CKM_AES_CBC
- CKM_AES_CBC_PAD
- CKM_AES_CTR
- CKM_AES_ECB
- CKM_DES3_CBC
- CKM_DES3_CBC_PAD
- CKM_DES3_CTR

- CKM_DES3_ECB
- CKM_RSA_PKCS

Mechanisms not permitted to sign data in FIPS mode

The following mechanisms are not permitted to sign data in FIPS mode (verify operations are permitted):

- CKM_AES_MAC
- CKM_AES_MAC_GENERAL
- CKM_DES3_MAC
- CKM_DES3_MAC_GENERAL
- CKM_DSA_SHA1
- CKM_ECDSA_SHA1
- CKM_SHA1_RSA_PKCS
- CKM_SHA1_RSA_PKCS_PSS
- CKM_SHA1_RSA_X9_31

Mechanisms approved for use in FIPS mode

The following mechanisms are now approved for use in FIPS mode:

- CKM_SHA3_224
- CKM_SHA3_224_DSA
- CKM_SHA3_224_ECDSA
- CKM_SHA3_224_RSA_PKCS
- CKM_SHA3_224_RSA_PKCS_PSS
- CKM_SHA3_256
- CKM_SHA3_256_DSA
- CKM_SHA3_256_ECDSA
- CKM_SHA3_256_RSA_PKCS
- CKM_SHA3_256_RSA_PKCS_PSS
- CKM_SHA3_384
- CKM_SHA3_384_DSA
- CKM_SHA3_384_ECDSA
- CKM_SHA3_384_RSA_PKCS
- CKM_SHA3_384_RSA_PKCS_PSS
- CKM_SHA3_512
- CKM_SHA3_512_DSA
- CKM_SHA3_512_ECDSA
- CKM_SHA3_512_RSA_PKCS

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- CKM_SHA3_512_RSA_PKCS_PSS
- CKM_SHAKE_128
- CKM_SHAKE_256

3DES Usage Counter

Using Luna HSM Firmware 7.7.0 and newer, 3DES keys have a usage counter attribute (CKA_BYTES_REMAINING) that limits each key instance to encrypting a maximum of $2^{\wedge 16}$ 8-byte blocks of data when the HSM is in FIPS approved configuration (**HSM policy 12:** Allow non-FIPS algorithms or **partition policy 43:** Allow non-FIPS algorithms set to **0**). When the counter runs out, that key can *no longer* be used for encryption, wrapping, deriving, or signing, but can still be used for decrypting, unwrapping, and verifying pre-existing objects. The CKA_BYTES_REMAINING attribute cannot be viewed if the HSM/partition is not in FIPS approved configuration.

The attribute is preserved through backup/restore using a Luna Backup HSM 7; restoring the key restores the counter's setting at the time of backup.

The attribute is not preserved through backup/restore using a Luna Backup HSM G5; restoring the key resets the counter to the maximum.

FIPS Changes in Luna HSM Firmware 7.1.0 and Newer

The following mechanism is now available in FIPS 140 approved configuration:

- CKM_EC_MONTGOMERY_KEY_PAIR_GEN

CHAPTER 3: Common Criteria/eIDAS Compliance

Luna HSMs regularly qualify against relevant standards that are important in the information security, data protection, and transaction protection spaces, and for which a business case supports the resource expenditure. Validation is repeated/updated when product changes warrant doing so, according to the respective standards and the requirements of the qualified testing laboratories. HSM validations are reacquired when major new versions of applicable standards are released, and are also kept up with minor submissions and adjustments when a standard is tweaked or when interpretations shift on the part of testing/validation laboratories.

Under Common Criteria, Thales has looked to qualify our Luna HSM products against eIDAS standards relevant to general purpose hardware security modules.

Luna HSMs are eIDAS certified as Qualified Signature Creation Devices and Qualified Seal Creation Devices (QSCD), and are used by Qualified Trust Service Providers (QTSP) in the role of their root of trust.

See https://cpl.thalesgroup.com/compliance/eidas

CC takes the view that a solution is validated for a purpose, which generally means that a number of moving parts are considered in concert. Thus an HSM is evaluated as an element of an overall solution that also includes software products, procedures, and systems all interacting. The following documents provide expanded detail on the relevant topics.

- Thales Luna K7(+) Cryptographic Module COMMON CRITERIA USER GUIDANCE - PART 1: PREPARATIVE PROCEDURES
- Thales Luna K7(+) Cryptographic Module COMMON CRITERIA USER GUIDANCE - PART 2: OPERATIONAL GUIDANCE
- Thales Luna K7(+) Cryptographic Module COMMON CRITERIA USER GUIDANCE - PART 3: EIDAS GUIDANCE
- Thales Luna K7(+) Cryptographic Module COMMON CRITERIA USER GUIDANCE - PART 4 TOE INTEGRATION FOR USE IN COMPOSITE EVALUATION

The K7 module referred to in those document titles,

- is the heart of the Luna Network HSM 7 (Luna Network HSM appliance) and
- is also available in a separate PCIe card format for insertion in a host system (Luna PCIe HSM).

Roles	Principal Duties
HSM Security Officer (HSM SO) [Admin Partition Role]	The HSM SO is responsible for managing the HSM. As such, they are authorized to install and configure the HSM, set and maintain global HSM security policies. They are also able to request the load of new HSM firmware update files (FUF), new Configuration Update Files (CUF) and new Functional Modules (FM). The HSM SO is able to create and delete partitions, but is not authorized to generate, load or use keys stored on the user partitions that have been created. The HSM SO is able to create, manage and use keys created in the Admin Partition alongside is responsible for initializing the 'Administrator role'. The HSM SO can reset the Administrator password (configuration dependent). The HSM can have only one HSM SO.
[Admin Partition Role]	The Administrator is authorized to create, use, transfer and destroy key objects contained in the Admin partition. This role has privileges that are a subset of the HSM SO role.
Partition Security Officer (Partition SO) [User Partition Role]	The Partition SO creates the partition level Partition CO role, activates partition, sets and changes partition-level policies, with an option to reset the Partition CO password (configuration dependent).
Partition Crypto Officer (Partition CO) [User Partition Role]	The Partition CO role is authorized to create, use, destroy and transfer key objects for a given partition. The Partition CO can optionally create the Partition LCO and Partition CU, and perform initial assignment of key authorization data.
Partition Limited Crypto Officer (Partition LCO) [User Partition Role]	The Partition LCO is an optional partition role authorized to create and use key objects, and perform initial assignment of key authorization data. The role is only permitted to delete key objects where per-key authorization is used and the correct authorization data for a given key object can be presented to the cryptographic module.
Partition Crypto User (Partition CU) [User Partition Role]	The Partition CU is the partition role authorized to use the key objects within the partition (e.g. sign, encrypt/decrypt).
Audit User [Admin Partition Role]	The Audit User initializes the secret key used to generate Message Authentication Code (MAC) for secure audit messages alongside configuring logging levels for the HSM.
Key Owner [Admin or User Partition Role]	Implicit role used to authenticate the owner of a key through verification of the related key authorization data.

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Roles	Principal Duties
STC User [Admin or User Partition Role]	The STC user is optional role used with a remote Thales Luna client to initiate a secure tunnel with a target partition. Once successfully authenticated based on pre-registered authentication credentials, the STC user is able to submit commands to the target partition over a trusted channel.

Audit

The HSM logs events within the HSM. You must initialize the Audit role within the HSM, to configure the criteria (such as event severity, whether certain key usage is logged for first use only, or for every use, etc.), to ensure a balance between logging necessary for the security and oversight regime under which you operate, and the effect on cryptographic performance as logging demands increase. The more events are logged, the faster the HSM memory fills, and the more urgent the need for you to configure *rotation of log entries off the HSM* and into log files in the host file-system. The secure audit function ensures that audit log integrity can be validated. It is then your responsibility to secure the further handling of such logs within your organization.

The appliance also logs system events, which is a separate function from HSM logging.

The HSM (cryptographic module) and the appliance that hosts it provide their logs (as configured), but what you do with them is determined by the security regime under which you operate.

Compliance

Common Criteria validation ensures that a given version of HSM is suitable and can be used in conformity with the stipulated behaviors within the larger framework of operational security for applications and services. Thales Group regularly submits HSM products for Common Criteria evaluation, and provides links and updates as appropriate. See the table below for current and estimated statuses.

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Luna HSM Firmware Version	CC			Remote QSCD			QSCD		
	Start Date	Expiration Date	Reference	Start Date	Expiration Date	Reference	Start Date	Expiration Date	Reference
7.8.5 7.7.2 7.7.1 7.7.0	2025/09/05	2030/09/05	TrustCB NSCIB Documents*: > CC Certificate > CC Certification Report > CC Security Target Document	ETA Dec 2025			2025/09/05	2030/09/05	TrustCB NSCIB Documents*: > eIDAS Certificate > eIDAS Certification Report > eIDAS Security Target Document
7.7.2 7.7.1 7.7.0	2022/07/20	2027/07/20	Superseded by new certification issued 2025/09/05	2024/02/21	Until revoked	eIDAS Dashboard** A-SIT Published QSCD Certificates: > A-Sit Certification Report	2022/07/20	2027/07/20	Superseded by new certification issued 2025/09/05

* Search for "Thales" in the table

** List of Qualified Signature/Seal Creation Devices and Secure Signature Creation Devices

How to Check Bootloader, Firmware, and Hardware Numbers

To check bootloader, firmware, and hardware numbers, run the following command:

lunacm:> hsm showinfo

CHAPTER 4: Lithium Content of Luna Products for Transport and Other Compliance

The following statements concern Luna HSM products and the lithium content of any batteries they might contain.

Luna PED (PIN Entry Device)

This device does not contain a battery. This device is used only to present authentication data to multifactor quorum-authenticated versions of Luna HSM devices.

Luna PCIe HSM 7 (K7 crypto module)

This cryptographic module circuit board includes a single 2/3AA format (non -rechargeable) cell with a lithium content of approximately 0.5 gram.

Luna Network HSM 7 appliance

The appliance contains:

- a motherboard with a BR2032 (non -rechargeable) coin cell having a lithium content of 0.06 gram
- a cryptographic module circuit board that includes a single 2/3AA format (non -rechargeable) cell with a lithium content of approximately 0.5 gram.

Luna USB HSM 7

This USB-connected cryptographic module contains a BR2032 (non -rechargeable) coin cell having a lithium content of 0.06 gram.

Luna Backup HSM 7

This USB-connected backup device contains a BR2032 (non -rechargeable) coin cell having a lithium content of 0.06 gram.