Bicycle Locks

Requirements

VF 5029:4

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Varefakta requirements for bicycle locks, VF 5029:4

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VAREFAKTA REQUIREMENTS IN GENERAL

These Requirements are utilized to approve bicycle locks from requirements established by Varefakta. An approval by Varefakta includes both the approval of the bicycle lock itself as well as the approval of the text present on the Varefakta Lock Certificate, the user manual, the mounting guide and on the packaging. With the approval, Varefakta is permitting the client to use Varefakta labelling, which includes the corresponding logo and the phrase "VAREFAKTA KONTROLLERET", on e.g., packaging.

Varefakta does not verify the legality of trade names.

The goal of VAREFAKTA-controlled products is to ensure that the product in question can be marketed and sold in Denmark to Danish consumers in agreement with national and EU-legislations as well as specific requirements established by Varefakta.

Due to Varefaktas cooperation with Insurance & Pension Denmark, Varefakta labelled bicycle locks are insurance approved in Denmark and fulfill the requirements established by legislation and by the Varefakta Requirements.

SCOPE OF APPLICATION

This Varefakta Requirement replaces the former requirement for bicycle locks, VF 5029:3. The Varefakta Requirement has been developed with the cooperation of the Danish Cyclists' Federation, the Danish Police, Force Technology, and Insurance & Pension Denmark.

This requirement is applicable to mechanical and electronic bicycle locks including potential mechanical and/or electronic keys.

Electronic bicycle locks include locks in which the locking mechanism is operated manually or by mechanical or electronical means. Furthermore, electronic locks may communicate with a key by wireless radio communication. The key can thereby either be a physical device or software running on e.g., a smartphone.

The Varefakta Requirements does not cover test methods for any underlying communication or IT systems as well as accessories for locks e.g., alarms or integrated wire locks.

THE VAREFAKTA LOCK CERTIFICATE

The Varefakta Lock Certificate is created by Varefakta from the information provided in the specification form. Access to the specification form will be provided after the beginning of the agreed partnership when the cooperation agreement has been signed. The packaging, user

manual and mounting instructions of the bicycle lock must be approved by Varefakta before printing, see more under *PRIOR TO LABELLING*.

The Varefakta Lock Certificate is the consumers warranty that the lock has been tested and approved by Varefakta. The Lock Certificate must always accompany the lock when bought from a Danish retailer. The Varefakta Lock Certificate must be stamped by the retailer including the date of purchase.

It is not possible to order a new Lock Certificate as it is delivered with a retailer stamp and date of purchase. Furthermore, the consumer must write down the frame number of the bike that the lock is intended for use with. If the consumer wishes to use the lock with another bicycle than the one written on the Lock Certificate, the insurance company must always be contacted.

The Varefakta Lock Certificate should be delivered as a physical certificate in paper form when purchasing the lock. Varefakta recommends that the consumer takes a picture of the Lock Certificate if an electronic version is desired.

If the Lock Certificate is to be delivered electronically when purchasing an approved lock, the manufacturer must account for how to secure the Lock Certificate against abuse, especially that only the locks rightful owner has access to the Lock Certificate and that the Lock Certificate only can be used for a single bike at a time.

The consumer ought to write down the frame number of the bike on the lock certificate and save it for future use. If the bike with the approved lock installed and locked is stolen, the theft must immediately be reported to the police, and the Varefakta Lock Certificate must be sent if requested to the insurance company to cover the theft.

A list of insurance approved locks can be found on the Varefakta webpage.

INFORMATION ON THE VAREFAKTA LOCK CERTIFICATE

The Lock Certificate is created from the information provided in the specification form for the lock in question. The information on the Lock Certificate must thereafter be approved by the client. If the client chooses to change the information in the forwarded Lock Certificate, the changes must be approved by Varefakta.

The information written on the Lock Certificate is divided into mandatory and voluntary information. The mandatory information is demanded by Varefakta, and the voluntary information, can be added to the Lock Certificate if the client requests it (see *REQUIREMENTS FOR INDIVIDUAL INFORMATION (LOCK CERTIFICATE))*. The information listed must be provided on the specification form mentioned previously.

If a product is marketed under various trade names with the same Lock Certificate, Varefakta must be informed of all trade names.

Information concerning features of the lock which has not been mentioned in these Requirements, can be added to the Lock Certificate if it is approved by Varefakta. Furthermore, Varefakta is at liberty to demand special information regarding e.g., safety requirements and use of the lock.

DESIGN OF THE VAREFAKTA LOCK CERTIFICATE

The Varefakta Lock Certificate must be clear, easily readable and the text unremovable. Text and symbols ought to be in a color that differs from the background color. A font size of 8 (approximate height of 2mm) is the smallest readable size, and is required for the Lock Certificate

Any illustrations and text on the packaging ought not to be misguiding for the consumer with regards to the lock certificate or product.

The Varefakta Lock Certificate is, as previously mentioned, designed, and created by Varefakta. The design of the Lock Certificate must be approved by the client. If the client wishes to change the design of the forwarded Lock Certificate, the changes must be approved by Varefakta.

Please note, that the Varefakta Logo must be present on the Lock Certificate and ought to be such a size so the phrase "VAREFAKTA KONTROLLERET" is easily readable, cf. Varefakta Design Guide can be downloaded at Varefaktas webpage. It is recommended to use a frame around the Lock Certificate where the Varefakta logo and frame must be printed in the same color which may be freely chosen. Examples of Lock Certificates have been created from the available templates and can be found cf. *EXAMPLES OF VAREFAKTA LOCK CERTIFICATES*.

The finished lock certificate, packaging, user manual and mounting guide must be approved by Varefakta prior to printing, either as proof sheet or layout.

PRIOR TO LABELLING

Prior to issuing a labelling permission, the bicycle lock must be approved. The approval is done by inspecting and testing the lock with regards to the Varefakta Requirements, and it must be ensured that the bicycle lock and its features fulfill the minimum requirements stated.

Test expenses for the approval of the lock are covered by the labelling owner. If extern test institutes or collaborators have been utilized, then the labelling owner must pay the test institute and other extern collaborators directly.

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Time spent by Varefakta in connection with inspection, test organization and assessment of test reports and declaration will be invoiced based on the current hourly rate whether the lock receives the final approval or not.

INSPECTION OF BICYCLE LOCK

The bicycle lock is inspected by a small group of lock experts, the Lock Expert Committee, elected by Varefakta and including a Varefakta representative.

The following must be forwarded to Varefakta for the purpose of inspection of a bicycle lock:

- A sample with all relevant mounting brackets.
- A demonstration-model.
- A set of construction drawings.
- Information regarding the practical key variation number for key locks and the number of possible combinations for combination locks.
- Possible declarations of conformity (see section *Minimum Requirements*).
- Possibly a mounting guide.

For electronic locks, the following must additionally be forwarded to Varefakta:

- User manual (see section *User manual*).
- Description of the lock's functions (e.g., if the key is software on a smartphone).
- Information regarding the number of combinations.
- Description of procedure for updating software (if relevant).
- Documentation for the lock's resistance towards "*hacking*", "*brute force*"-attack and "*spoofing*" ("*play-back*").

During the inspection of the lock, it is assessed whether the lock immediately will meet the minimum requirements. If this is the case the Lock Expert Committee will prepare a test plan which will depend on the design of the lock. A date is determined by the Lock Expert Committee where the bicycle lock must endure the physical testing (cf. Appendix I).

TESTING OF BICYCLE LOCK

The tests (cf. Appendix I) are carried out by an impartial institution, elected by Varefakta with the participation of at least one member of the Lock Expert Committee.

For the purpose of testing, 8 bicycle locks from each type of lock for declaration must be forwarded to Varefakta. The Lock Expert Committee determines the exact number of locks which are required to complete the determined test plan.

The testing of a bicycle lock is done by using a bicycle fragment (cf. Appendix II), however, it is possible to receive dispensation for the use of an alternative element, if it is considered relevant for the type of bicycle lock (e.g., a handlebar lock). The alternative element should be sent to Varefakta along with the locks mentioned above.

APPROVAL OF THE PACKAGING AND VAREFAKTA LOCK CERTIFICATE

Varefakta must approve the finished packaging, user manual and mounting guide before printing. The Varefakta Lock Certificate is to be approved by the client and if any changes are implemented, they are to be approved by Varefakta before printing the Lock Certificate, for more information see *VAREFAKTA LOCK CERTIFICATE*.

Any subsequent change of the bicycle lock, packaging, user manual, mounting guide and/or the Lock Certificate must be notified to and approved by Varefakta.

It is accepted by Varefakta if the user manual, mounting guide and Lock Certificate is on the packaging.

DEFINITION OF A BICYCLE LOCK

For use in these Requirements, a bicycle lock is assumed to consist of three elements:

1) Bicycle lock – It can be mechanical or electronic. Electronic locks function in the same way as mechanical locks but are activated electronically.
2) Key unit – It can be mechanical, electronic, or digital. The key unit can be a separate device or software e.g. an app on a smartphone.
3) Management system – A(n) (IT-)system controlling the issuance of key cards as well as controlling the version of the integrated software in electronic locking systems.

The bicycle lock system is illustrated in figure 1. The key unit and bicycle lock can be a combined unit meaning the lock is activated by e.g. entering a code on the lock.

A distinction will always be made between mechanical and electronic bicycle locks.

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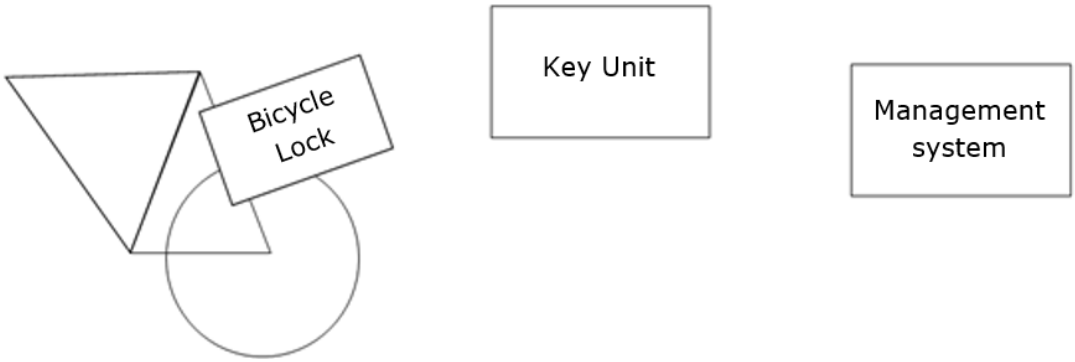

Figure 1: Illustration of a bicycle lock system with its three elements: bicycle lock, key unit and management system.

CATEGORIES OF BICYCLE LOCKS

In these Requirements a distinction is made between the following categories of bicycle locks:

Key Lock	The lock is activated by means of a mechanical and/or electronic key. An electronic key can be software on a smartphone (an App), a RFID-chip or a smart card. In addition, the key and lock may communicate wirelessly.
Combination Lock	The lock is activated by the user by loading the required combination on the lock e.g. by using a series of scroll wheels to set the correct order of symbols or by moving a lock button in a given pattern.
Code Lock	The lock is activated by the user loading a code on the lock e.g. a PIN code, a biometric code (e.g. fingerprints, facial recognition or iris scan) or another type of code.

TYPES OF BICYCLE LOCKS

In these Requirements a distinction is made between the following types of bicycle locks:

Ring lock	A ring-shaped lock for permanent mounting at the rear wheel with a movable bolt blocking the rear wheel in a locked condition.
U-lock	Lock for permanent mounting (e.g. by clamps) consisting of a fixed bracket and a movable bolt blocking the rear wheel in a locked condition.
Loose U-lock	A U-lock not intended for permanent mounting on the bicycle. The movable bolt is typically designed as a removable locking unit.
Handlebar lock	Lock that holds the front wheel at a certain angle to the frame.

Chain lock	Lock consisting of a chain which can be twisted around the bike's rear wheel and frame and possibly around street furniture. Chain locks are always "loose" locks.
Foldable lock	Lock consisting of a "chain" with usually 6-10 joints with a length of 15-25cm each. The joints ("the chain") can be led through the bike's rear wheel and frame and possibly around street furniture. Foldable locks are always "loose" locks, however, often a bicycle lock holder for mounting on the bicycle is included with the purchase.

MINIMUM REQUIREMENTS

- ✉ displays which items Varefakta must receive documentation for in the means of a test report with the measured values.
- 🗏 displays which items Varefakta must receive documentation for in the means of a test report or declaration of conformity.

If a lock expert or a test institution appointed by Varefakta, detects a safety or security related shortcoming on a bicycle lock, the lock cannot be declared.

Test reports, declarations of conformity and other documentation must not be more than 1 year old when a lock is to be approved.

It is possible to be granted dispensation for the "1-year rule", if the manufacturer declares that absolutely no changes have occurred in the production of the lock as well as the materials used after the last documentation has been received. Whether or not dispensation is possible for granting is decided by Varefakta.

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MINIMUM REQUIREMENTS FOR THE SAFETY OF THE BICYCLE LOCK

Varefakta Requirements	Test method	Documentation
The bicycle lock must fulfill Danish and European legislation regarding product safety: • Law on products and market surveillance (LOV no. 799 of June 9th, 2020) • Order on product safety and coordination between control authorities (BEK no. 839 of June 10th, 2020) • EU directive on product safety (2001/95/EF) • EU regulation on market surveillance and compliance of product (2019/1020)		Declaration of conformity from the manufacturer. Varefakta must, by request, be able to see underlying documentation.
Bicycle locks must not contain chemical substances in amounts or concentrations exceeding the restrictions in the REACH regulation (1907/2006/EU).	Relevant analytical methods.	Declaration of conformity from the manufacturer. Varefakta must, by request, be able to see underlying documentation.

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Varefakta Requirements	Test method	Documentation
Electronic bicycle locks **without** a wireless remote must comply with legislation requirements for: • Electromagnetic compatibility (EMC directive 2014/30/EU). • Restriction of the use of certain hazardous substances in electrical and electronic equipment (ROHS directive 2011/65/EU with later changes). • Safety for electric material (Order BEK 1285 of 04/11/2016)	Described in the standards that are harmonized for the mentioned European directives and Danish orders.	Declaration of conformity from the manufacturer. Varefakta must, by request, be able to see underlying documentation.
Electronic bicycle locks **with** a remote must comply with legislation requirements for: • Radio equipment and electrical safety (RED directive 2014/53/EU). • Restriction of the use of certain hazardous substances in electrical and electronic equipment (ROHS directive 2011/65/EU with later changes).	Described in the standards that are harmonized for the mentioned European directives and Danish orders.	Declaration of conformity from the manufacturer. Varefakta must, by request, be able to see underlying documentation.

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Varefakta Requirements	Test method	Documentation
Batteries in the lock or key unit may only be replaced using tools. Alternatively, it must require two simultaneous movements to open the battery compartment. This requirement for the key unit does not apply if the "key" is software on a foreign unit e.g. a smartphone.	Inspection of bicycle lock and key unit.	Inspection report from the Lock Expert Committee appointed by Varefakta.

MINIMUM REQUIREMENTS FOR THE BICYCLE LOCK'S ENVIRONMENTAL MEASURES

Varefakta Requirements	Test Method	Documentation
Bicycle locks containing electrical or electronical parts must comply with the legislation concerning waste electrical and electronic equipment (cf. WEEE directive 2012/19/EU).	Inspection of the bicycle lock.	Inspection report from the Lock Expert Committee appointed by Varefakta.
Bicycle locks containing batteries or accumulators which the consumer cannot replace oneself must comply with the requirements for batteries and accumulators (cf. directive on batteries and accumulators 2006/66/EC with later changes).	Inspection of the bicycle lock.	Inspection report from the Lock Expert Committee appointed by Varefakta.

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MINIMUM REQUIREMENTS FOR THE BICYCLE LOCK'S MARKING

Varefakta Requirements	Test Method	Documentation
It must not be possible to use the marking or labelling on the lock to reveal or decipher the lock code. Key locks must not have the key number marked or labelled on the lock. Combination locks must not have any other numbers marked or labelled than the type number and batch number.	Inspection of the bicycle lock.	Inspection report from the Lock Expert Committee appointed by Varefakta.
Bicycle locks must be marked with the following information: • The name of the manufacturer or the brand. • Address where the manufacturer can be contacted. • Designation for the lock's model and type. • Batch number or other type of identification code which will ensure trace-ability to a production batch or time (date, week, month, year or similar).	Inspection of bicycle lock, Lock Certificate and packaging.	Inspection report from the Lock Expert Committee appointed by Varefakta.

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Varefakta Requirements	Test Method	Documentation
Electronic bicycle locks must in addition be marked with the following information: • WEEE-symbol. • CE-mark. If it is not possible to find space for all this information on the lock, it can be moved to the Lock Certificate or the packaging.	Inspection of bicycle lock, Lock Certificate and packaging.	Inspection report from the Lock Expert Committee appointed by Varefakta.

MINIMUM REQUIREMENTS FOR THE BICYCLE LOCK'S FUNCTIONALITY

Varefakta Requirements	Test method	Documentation
Bicycle locks must be safe to operate and use. Bicycle locks may not have any obvious or hidden defects or shortcomings, nor may they be difficult to use.	Inspection of bicycle lock.	Inspection report from the Lock Expert Committee appointed by Varefakta.
A locked bicycle lock must either prevent rotation of at least one wheel or maintain the front fork at an angle of at least 30° compared to the straight-ahead position assuring that the bicycle cannot be used.	Inspection of bicycle lock.	Inspection report from the Lock Expert Committee appointed by Varefakta.

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Varefakta Requirements	Test method	Documentation
A mechanical lock may have a maximum of 3 keys when purchased. An electronic lock may only have a maximum of 3 active keys at a time. If the key is a physical unit, then the same requirement as for mechanical bicycle locks apply.	Review of documentation.	Declaration of conformity from client.
Bicycle locks must be able to withstand attempts to open them with hand tools and must not be opened by electric, magnetic or electromagnetic influences.	Laboratory test of bicycle lock. Test method and requirements are described in Appendix I. Electromagnetic influences are tested from EN 61000-4-2 (see the specifications in Appendix I).	Test report with the measured values. The manufacturer can enclose a test report documenting the locks resistance towards electromagnetic influences.
Electronic bicycle locks (lock, key unit and management system) must be resistant to digital attacks.	Review of documentation. Requirements are described in Appendix I.	Technical documentation from manufacturer.
If the software in an electronic lock and its key must be updated, the manufacturer must have procedures for this. The manufacturer must declare an estimated time horizon for how long the software is expected to be updated.	Review of documentation. Requirements are described in Appendix I.	Technical documentation from manufacturer.

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Varefakta Requirements	Test method	Documentation
If the software in an electronic bicycle lock or it's corresponding key may be updated, the manufacturer must have procedures for how Varefakta is to be informed if an update of the software is necessary. Furthermore, a procedure must be sent to Varefakta on how the consumer is to be contacted, if it is necessary for the update.	Review of documentation.	Technical documentation or declaration of conformity from client.
If the key for an electronic bicycle lock is an app on a smartphone, documentation must be enclosed on which operative system(s) that are applicable for the lock's corresponding app as well as the minimum version useable.	Review of documentation.	Technical documentation from manufacturer.
Bicycle locks must not accidentally activate or in any other way be dangerous. Electronic locks must only be able to be closed manually. Electronically driven closing mechanisms are not allowed (movement of the bolt). The locking mechanism may be electromechanically driven.	Inspection of bicycle lock.	Inspection report from the Lock Expert Committee appointed by Varefakta.

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Varefakta Requirements	Test method	Documentation
Electronic locks must always be opened by a physical, active action. Electronic locks that open "passively", i.e. due to the key unit being nearby, the lock must be turned on or be activated by e.g. a button on the lock, so the lock does not search permanently after the key unit. When the lock is searching for the key unit, it should not be searching for more than 2 minutes, before the lock must be activated again. Furthermore, the lock must only be opened if the key unit is within 5 meters of the lock. For electronic locks that open actively i.e. by the press of a button on the key unit or using an app, the lock should be able to open within 5 meters of the lock.	Inspection of bicycle lock.	Inspection report from the Lock Expert Committee appointed by Varefakta.
Bicycle locks shall not be activated without simultaneously engaging and blocking the intended part of the bicycle.	Inspection of bicycle lock.	Inspection report from the Lock Expert Committee appointed by Varefakta.

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Varefakta Requirements	Test method	Documentation
Electronic locks must clearly indicate when being locked or unlocked e.g. by an acoustic signal. An electronic lock must not have a permanent signal indicating whether it is locked or unlocked.	Inspection of bicycle lock.	Inspection report from the Lock Expert Committee appointed by Varefakta.
Electronic locks should clearly indicate with a signal of sorts when the battery needs replacing. After the signal has appeared the first time the lock must be able to lock at least 20 times or work for at least 30 days at 10°C ± 2 °C before the battery runs out of power.	Laboratory test of bicycle lock.	Test report with the measured values or technical documentation from the manufacturer.
Bicycle locks must not have openings, holes or similar elements that allow manipulation of or picking open the locks.	Inspection of bicycle lock followed by a possible laboratory test of the bicycle lock.	Inspection report from the Lock Expert Committee appointed by Varefakta as well as possible test report with the measured values.
Bicycle locks must be weather resistant. Electronic locks must have a density classification of at least IPX5.	Laboratory test of bicycle lock. Test method and requirements are described in Appendix I. Density classification is tested from EN 60529.	Test report with the measured values. The manufacturer can enclose a test report documenting the lock's density class of at least IPX5.

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Varefakta Requirements	Test method	Documentation
Bicycle locks must be robust to the mechanical influences and vibrations to which they may be subjected to during ordinary and predictable use.	Laboratory test of bicycle lock. The robustness of the bicycle lock is tested from EN 60068-2-27 and ISO 11243:2016 with the values described in Appendix I or similar tests.	Test report with the measured values. ✉ The manufacturer can enclose a test report documenting the lock's robustness towards the given parameters. ✉
Electronic keys must be able to withstand expectable treatment, including being dropped in water or on a hard surface. Electronic keys should either have a density classification of minimum IPX7 or pass the test described in Appendix I. This requirement does not apply if the "key" is software on a foreign unit e.g. a smartphone.	Laboratory test of bicycle lock. Test method and requirements are described in Appendix I. Density classification is tested from EN 60529.	Test report with the measured values. ✉ The manufacturer can enclose a test report documenting the keys density classification of minimum IPX7. ✉
Replacing the battery, a discharged battery or any kind of battery damage on an electronic lock must not cause the lock to open or close. This requirement is also permitted for electronic locks where the battery is not meant to be replaced.	Inspection of bicycle lock. Possible laboratory test of bicycle lock.	Inspection report from the Lock Expert Committee appointed by Varefakta. If laboratory test performed: test report with the measured values. ✉
For combination locks it must not be possible to read the combination by means of scratches, cuts, etc.	Laboratory test of bicycle lock. Test method and requirements are described in Appendix I.	Test report with the measured values. ✉

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Varefakta Requirements	Test method	Documentation
On bicycle locks, the code must not be readable by means of inspection through the keyhole or other openings in the locked bicycle lock.	Inspection of bicycle lock.	Inspection report from the Lock Expert Committee appointed by Varefakta.
A bicycle lock must not lose its function even if fittings are dismounted, removed or destroyed whilst the lock is activated.	Inspection of bicycle lock.	Inspection report from the Lock Expert Committee appointed by Varefakta.
Bicycle locks must make up an interconnected unit, except any mounting fittings and keys. For chain locks, the chain and the lock must always be inseparable. For loose U-locks it is allowed that the locking unit (bar or pipe) is a separate unit, provided that this unit is not usable for other types of locking in general or that it cannot be exchanged for another common locking unit.	Inspection of bicycle lock.	Inspection report from the Lock Expert Committee appointed by Varefakta.
Loose bicycle locks must, as a minimum, be able to enclose a frame element and the rear wheel on a city bicycle with 40 mm wide wheel rims and corresponding tyres.	Laboratory test of bicycle lock.	Test report with the measured values. ✉

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Varefakta Requirements	Test method	Documentation
Bicycle locks intended to be mounted by the consumer/user must be possible to install by means of standard hand tools.	Inspection of bicycle locks.	Inspection report from the Lock Expert Committee appointed by Varefakta.
Key locks must have a practical number of key variations of 1000.		Declaration or technical documentation from manufacturer.
Combination locks must have at least 10.000 different combinations.		Declaration or technical documentation from manufacturer.
Electronic locks must have at least 1.000.000 lock combinations.		Declaration or technical documentation from manufacturer.

EXTRA REQUIREMENTS FOR ELECTRONIC LOCKS

Electronic locks have extra requirements for its locking administrative functions when the key unit is software on a commonly used device e.g. a smartphone. For the following, the key which is in possession of the rightful owner of the lock and thereby the Lock Certificate is referred to as the "Master-key".

Electronic bicycle locks, where others than the Master-key holder can reset the lock or recreate the key cannot be approved by Varefakta.

Electronic locks must not allow more than 3 active keys in circulation at a time. One of the 3 active keys must always be the Master-key. The Master-key holder must be able to delete lent keys.

If the lender of a key is to relend the key to another party, the lender must have received permission by the Master-key holder to perform the relending. The relending process will deactivate the key of the lender who relends the key, unless the key is the Master key. Furthermore, the Master-key holder should be able to withdraw the lending permission if wished. In other words, this requirement is that if the second party lends the key to a third party after receiving permission from the Master-key holder, the second party key must be inactivated by the lending process, and the third party must receive permission from the Master-key holder if the third party wishes to lend the key to a fourth party or back to the second party, and so on.

REQUIREMENTS FOR OEM LOCKS

An OEM lock is typically intended for retailers who will attach it to a bicycle, meaning the lock is sold without any packaging. However, it is possible to buy these locks from the retailer, where the necessary parts for correct mounting must accompany the lock. Whether the OEM lock is purchased mounted on a bike or on its own, the corresponding Lock Certificate (and possibly a mounting guide) must be included in the purchase.

REQUIREMENTS FOR INDIVIDUAL INFORMATION ON THE LOCK CERTIFICATE

Sentences which are mandatory to write on the Varefakta Lock Certificate are written in green.

Sentences which are voluntary to write on the Varefakta Lock Certificate are written in blue.

The Varefakta Lock Certificate is written in Danish by Varefakta from a specification form which corresponds to the following sections. All text must be in Danish on the Lock Certificate for sale to Danish consumers, however these requirements have been translated to English for the understanding of non-Danish clients. Examples of Lock Certificates can be found after the following sections, where template A, B or C can be chosen for the Lock Certificate. Possible questions or comments may be forwarded to Varefakta at cykellaase@varefakta.dk or via your consultant.

The same statements listed below can be found in Danish at https://varefakta.dk/om-varefakta/forskrift/cykellaase-forskrift/.

1. CONTROLLED BY VAREFAKTA

Every product at Varefakta has a product/control number (VK-number) which is created by Varefakta with the approval of the lock. The VK-number is created for control purposes and spot testing. The current VK-number must be stated beneath the Varefakta logo as "VK XXXXX" on the Lock Certificate.

For the purpose of Varefakta control, the Varefakta Requirements' identification code "VF 5029:4" must be present on the Lock Certificate. Both numbers may be printed in fonts with a minimum letter height of 2 mm e.g. in the corner of the Lock Certificate.

The following sentence should be stated on the Varefakta Lock Certificate:

"The information on the Lock Certificate information is verified by Varefakta, www.varefakta.dk"

2. PRODUCT NAME

The product name/trade name and possibly model or type number of the bicycle lock must be present. The name must be written identically on the Varefakta Lock Certificate, the packaging and in the moment of purchase (on webpages).

3. CATEGORY AND TYPE

The category and type of the bicycle lock is stated according to the following scheme:

Mechanical lock						
Category/Type	Ring lock	U-lock	Loose U-lock	Handlebar lock	Chain lock	Foldable lock
Key lock	"Ring lock with key"	"U-lock with key"	"Loose U-lock with key"	"Handlebar lock with key"	"Chain lock with key"	"Foldable lock with key"
Combination lock	"Combination lock"	"Combination Lock"	"Loose combination lock"	-	"Combination chain lock"	"Foldable combination lock"
Code lock	-	-	-	-	-	-

Note: "-" = not of relevance

Electronic lock						
Category/Type	Ring lock	U-lock	Loose U-lock	Handlebar lock	Chain lock	Foldable lock
Key lock*	"Electronic Ring lock with key"	"Electronic U-lock with key"	"Loose electronic U-lock with key"	"Electronic handlebar lock with key"	"Electronic chain lock with key"	"Electronic foldable lock with key"
Combination lock	-	-	-	-	-	-
Code lock	"Electronic Ring lock with code"	"Electronic U-lock with code"	"Loose electronic U-lock with code"	"Electronic handlebar lock with code"	"Electronic chain lock with code"	"Electronic foldable lock with code"

Note: "-" = not of relevance

* Electronic locks with keys must further describe if the key is not a physical key included when purchasing the lock e.g. "The key is an app running on a smartphone (e.g. Apple or Android)."

If a ring lock contains a plug-in hole to integrate the lock with a wire, chain or cable the following is added to the above-mentioned statement:

"with plug-in for the possibility of combining the ring lock with a chain, cable or wire"

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The designations "fixed" or "for permanent mounting" must appear if the lock has been classified as such at the inspection in accordance with these Requirements.

For electronic locks where the key is software in the sense of an app running on a smartphone, it must be declared what operative system(s) the app is compatible with as well as a minimum version where the app is functional.

For locks where the consumer mounts the lock on the bicycle, a statement is required regarding the necessary tools needed for mounting.

If wanted, other characteristics concerning the construction of the bicycle lock may be mentioned.

4. AREAS OF APPLICATION

For locks that are declared as "fixed" or "for permanent mounting" the following must be included on the Lock Certificate:

"The lock protects against theft if mounted and used correctly. The lock fulfills the insurance requirements with regards to bicycle locks."

For locks that are not declared as suitable for permanent mounting, the following must be included on the Lock Certificate:

"The lock protects against theft if used correctly."

For loose U-locks, chain locks and foldable locks, the following is added:

"Frame and rear wheel should be locked to a fixed item."

The following statement must be included for all loose locks:

"The lock fulfills the insurance requirements with regards to bicycle locks."

For loose U-locks, chain locks and foldable locks that do not fulfill the requirements with regards to locks for two wheeled mopeds, the following must be included on the Lock Certificate:

"The lock does not fulfill authority requirements with regards to moped locks."

The lock requirement for two wheeled mopeds is determined by the Danish Ministry of Justice cf. Order (BEK) no. 154 of April 20th, 1977, including subsequent alterations. The lock and chain, U-element and similar must be of a strength equaling that of a hardened material with a thickness of at least 9 mm.

If wanted and relevant, it can be added that the bicycle lock fulfills the authority requirements with regards to moped locks.

5. KEY NUMBER AND FRAME NUMBER

The key number of the bicycle lock must be printed on the Lock Certificate, otherwise a suitable box or empty line must be available on the Lock Certificate for the consumers possibility of writing it themselves. On the Lock Certificate the printed key number or the above-mentioned box or empty line must be present after the headline "Key number".

Similarly, it must be possible to write down the bicycle frame number in an empty box or on an empty line with the headline: "Bicycle frame number".

6. MATERIALS

The manufacturer must provide information regarding the materials of which the bicycle lock consists of in the specification form using commonly used material designations. The information provided in the specification form will hereafter be stated on the Lock Certificate by Varefakta. Only fractions amounting to more than 5% of the total weight of the lock must be declared, however electronics must always be declared even if its weight percentage is below 5%. Possible batteries and electronic is simply indicated as "Battery" and "Electronics", a detailed description of the battery and electronics is therefore not necessary.

Materials can be specified in a simplified list of materials where only the larger components of the lock will be listed, e.g.: "Hardened steel with plastic coating (ABS) and electronics.".

If wanted by the client, the materials can be specified in a more detailed list as weight percentages, e.g.: "Steel 78%, Plastic (ABS) 8%, Battery 8% and Electronics 4%".

7. DISPOSAL

For mechanical locks, the disposal of the lock can be specified e.g. "The lock is disposed of as metal waste." or more elaborated as:

"Bicycle locks are metal waste which should not be disposed of with common household waste. Bicycle locks that are no more in use must instead be delivered to the municipal collection arrangements, on the municipal recycling sites or similar."

For electronic locks, the disposal of the lock is required e.g. "The lock is disposed of as electronic waste and the battery is disposed of as battery waste.". If the battery cannot be replaced the latter is left out.

8. BATTERY (ONLY ELECTRONIC LOCKS)

For electronic locks where the battery is replaceable, the Lock Certificate must contain instructions on battery change as well as information regarding the correct battery type. Furthermore, a description of the indication the lock provides when the battery needs to be replaced is required.

9. OTHER INFORMATION

The manufacturer may state claims and other information on the Lock Certificate if the information is not misleading or obscures the mandatory information.

Claims and other voluntary information must always be approved by Varefakta in advance.

For electronic locks with updateable software the Lock Certificate must contain a statement if the consumer should perform an act of sorts when updating the lock's software, as well as a detailed description or a reference to the user manual for more information.

It must be stated on the Lock Certificate how to order extra keys, e.g. by:

"Extra keys can be ordered from X."

With X is the manufacturer (which is already present on the Lock Certificate), a webpage or similar.

10. ADVICE ON STORAGE OF THE LOCK CERTIFICATE AND NOTIFICATION OF THEFT

The Varefakta Lock Certificate must contain the following statement:

"Write down the frame number and keep this Varefakta Lock Certificate. Theft must be reported to the police immediately and the Varefakta Lock Certificate must be forwarded if requested to the insurance company along with a claim form."

11. COMPANY

The name of the manufacturer, importer or other sales organization within EEA must be stated on the Lock Certificate.

A website is accepted instead of an address if the mail or contact address is clearly and unequivocally stated on the website.

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12. RETAILER STAMP AND DATE

For all bicycle locks for subsequent mounting and loose locks, an empty box of at least 15 cm^2 with a height and width of at least 3cm and 5cm, respectively, must be included on the Varefakta Lock Certificate for the retailer stamp and date.

For all bicycle locks for mounting by the consumer, the box must include the following keywords:

"Retailer stamp and date"

Examples of Varefakta Lock Certificates

The following examples have been created from the corresponding template A, B and C which is chosen by the client. The templates are not limited to certain types of locks.

Voluntary information is written in blue.

EXAMPLE A: RING LOCK FOR MOUNTING BY THE CONSUMER

Anker 12/111

VAREFAKTA LOCK CERTIFICATE

Ring lock with key for permanent mounting on bicycles.
The lock is mounted at the rear wheel with a screwdriver.

The lock protects against theft if mounted and used correctly.

The lock fulfills the insurance requirements with regards to bicycle locks.

Spare keys can be ordered from the manufacturer's webpage.

Materials: Hardened steel with plastic coating (ABS).
The lock is disposed of as metal waste.

Write down the frame number and keep this Varefakta Lock Certificate. Theft must be reported to the police immediately and the Varefakta Lock Certificate must be forwarded if requested to the insurance company along with a claim form.

Key number:

Frame number:

Retailer stamp and date:

VAREFAKTA KONTROLLERET

VF 5029:4
VK XXXXX

Manufacturer:
Lock and Strike ApS
10 Lock Alley
12345 Lock City

The information on the Varefakta Lock Certificate is verified by Varefakta, www.varefakta.

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EXAMPLE B: LOOSE U-LOCK

Link Type 91

VAREFAKTA LOCK CERTIFICATE

VAREFAKTA KONTROLLERET

Loose U-lock with key for bicycles. Frame and rear wheel should be locked to a fixed item.

The lock protects against theft if mounted and used correctly.

Materials: Hardened steel with plastic coating (ABS).

The lock fulfills the insurance requirements with regards to bicycle locks.

VF 5029:4
VK XXXXX

Spare keys can be ordered from the manufacturer.

The lock does not fulfull authority requirements with regards to moped locks.

Key number: _____

Retailer stamp and date:

Frame number: _____

Write down the frame number and keep this Varefakta Lock Certificate. Theft must be reported to the police immediately and the Varefakta Lock Certificate must be forwarded if requested to the insurance company along with a claim form.

Manufacturer: Lock and Strike ApS, 10 Lock Alley, 12345 Lock City

The information on the Varefakta Lock Certificate is verified by Varefakta, www.varefakta.

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EXAMPLE C: ELECTRONIC RING LOCK

Anker 12/123-G

VAREFAKTA LOCK CERTIFICATE

Electronic ring lock with key (RFID-chip) for permanent mounting on bicycle. The lock is mounted with the included fittings by using a screwdriver.

User manual and mounting guide is enclosed with the lock.

The lock protects against theft if mounted and used correctly. The lock fulfills the insurance requirements with regards to bicycle locks.

Spare keys can be ordered from the manufacturer's webpage.

VAREFAKTA KONTROLLERET

VF 5029:4

VK XXXXX

Manufacturer:
Lock and Strike ApS
1 Lock Alley
12345 Lock City
Webpage

Key number:

Frame number:

Materials: Headlock in aluminium with a hardened shackle and plastic coating (ABS) as well as electronics.
Disposal: The lock is disposed of as electronic waste. The battery is disposed of as battery waste.
Battery: The battery is replaceable which is done by demounting the lock, whereafter the battery cover is opened with a screwdriver and replaced. The lock indicates when the battery needs to be replaced by a 3-times blinking red light as well as a sound when locking and unlocking.

Forhandlerstempel og dato

Write down the frame number and keep this Varefakta Lock Certificate. Theft must be reported to the police immediately and the Varefakta Lock Certificate must be forwarded if requested to the insurance company along with a claim form.

The information on the Varefakta Lock Certificate is verified by Varefakta, www.varefakta.

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User manual

Along with the bicycle lock a user manual in Danish must be delivered. The user manual can be stated on the Lock Certificate after the headline "User manual", however, if the user manual appears elsewhere a reference may be made to this on the Lock Certificate. If the user manual and the Lock Certificate are both on the packaging, no reference is needed.

The user manual must be approved by Varefakta and should, as a minimum, provide the following information:

- Correct mounting (mounting guide if the mounting is to be done by the consumer).
- Area of application, including the information regarding the recommended use of locks on the rear wheel, unless stated otherwise, and that the product is not a handlebar lock.
- The daily operation of the lock, particularly including how the lock is opened and closed.

For key locks, the following must also be stated in the user manual:

- Information regarding the possibility of getting a new key

For combination locks it must be stated in the user manual how to change the combination if possible.

For electronic locks information regarding the locking administrative functions and where to find them must be stated.

The user manual for locks with updateable software must inform the consumer about how the lock is updated as well as how the consumer receives this information and what to do when the lock needs updating (if the consumer must perform an act of sorts). Furthermore, an estimate for how often the software is expected to be updated is required as well as an estimate for how long it is expected that the software will be kept updated.

The user manual may include a statement as to how support is provided if the electronic key/app contrary to expectations does not work. The statement could e.g. a referral to the retailer or a guideline on the company's webpage.

Furthermore, the following text must be included for disposal of electronic locks no more in use:

"Products marked with the crossed-out wheelie bin are electric and electronic equipment which cannot be disposed of with common household waste because it contains hazardous substances which can endanger the environment and human health. Instead, the electric and electronic waste must be delivered to the municipal collection arrangements, on the municipal recycling sites or similar."

Finally, the user manual for electronic locks with replaceable batteries must also include an instruction to how the battery is replaced as well as information regarding the correct battery type. It must also include a description of the indication the lock gives when the battery needs to be replaced. It must be described in the user manual, what the consumer must do, if their bike has been locked in a longer period of time which have resulted in a discharged battery.

Packaging

The Varefakta Lock Certificate must be clear, easily readable and the text unremovable. Text and symbols ought to be in a color that differs from the background color. A font size of 8 (approximate height of 2mm) is the smallest readable size and is required for the packaging.

The packaging should, as a minimum, contain the following information:

- Product/Trade name and possibly model- or type number.
- Lock type.
- Batch number if it is not visible on the lock when in packaging (or other type of identification code to trace the product).
- Manufacturer name and address.
- Possibly name and address of importer.
- Varefakta logo and VK-number.

For electronic locks, the packaging should furthermore contain the following information:

- WEEE-symbol
- CE-mark
- Information regarding e.g. the battery

Adding the user manual, mounting guide and the Lock Certificate on the packaging is allowed.

Obligatory random checks

Varefakta is at liberty to perform random checks amongst declared bicycle locks, which is also known as spot or sample testing. A maximum of 8 copies can be drawn of each declared type.

The spot check is performed in order to verify whether the Varefakta minimum requirements are fulfilled and whether the Lock Certificate and the information on the packaging agree with the product features and the lastly approved prints.

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RESULTS OF THE RANDOM CHECK

If the check identifies deviations with no functional or safety-related significance, Varefakta will notify the manufacturer/importer for questioning and further comments.

Varefakta can specify a deadline for which the deviations must have been corrected. Varefakta will then organize further sample testing which must agree with the Varefakta Requirements, if not, Varefakta will decide whether the product can withhold its labelling permission.

If the test identifies larger deviations of the minimum requirements or defects of the lock causing the product to not comply with the Varefakta Requirements, it is considered abuse of the Varefakta logo and labelling. Varefakta is at liberty to withdraw labelling permission effective immediately.

In each individual case, Varefakta will decide whether the products must be recalled from retail or whether any other steps must be implemented. Before a new labelling permission may be issued, test results must be made available that verifies that the product in question is fulfilling all requirements included in the Varefakta Requirements.

TEST EXPENSES

Test expenses are covered by the labelling owner. If extern test institutes or collaborators have been utilized, then the labelling owner must pay the test institute and other extern collaborators directly.

Time spent by Varefakta in connection the spot check will be invoiced based on the current hourly rate.

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Appendix I: Test methods and requirements

The following appendix describes the test methods and requirements utilized in the labelling of a bicycle lock with Varefakta.

1. GENERAL INFORMATION

1.1. NUMBER OF SAMPLES

Up to 8 samples of each type of bicycle lock must be submitted.

If the lock is electronic and the key unit is software on a smartphone, the submitter is entitled to enclose the number of smartphones with the software installed with the submission if it is necessary to be able to activate all samples of the lock.

Excess locks and forwarded smartphones can be delivered back after the testing has ended upon agreement with the client. The cost of the delivery will be paid for by the client.

1.2. PREPARATION OF THE TEST PROGRAM

The test program is prepared in order to perform as many tests as possible on as few locks as possible, unless the submitter has a special agreement with Varefakta or the test institute concerning the order.

The individual test can be implemented on any one of the samples.

The execution of multiple tests on the same sample is allowed if it does not influence the outcome of the test. However, a sample must only be subjected to a single requirement for resistance towards electrical influences (cf. section 5 and 5.2). The lock which has been subjected to the corrosion test (cf. section 3.1) must not be used for other attempts at unlocking.

An attempt at unlocking must not take more than 3 minutes when testing for mechanical resistance (cf. section 7). Pausing the test is allowed, as well as the time, if it is necessary for the Lock Expert Committee to inspect the lock, provide advice to the tester or similar. However, the total, effective time used on the attempt at unlocking must not exceed 3 minutes. If the test has been paused during an attack and the lock fails or is expected to fail with a new approach, the attack must be repeated on a new sample without interruptions for the results to be valid.

The attempts at unlocking are executed by a person with good craftmanship qualifications. Upon test initiation, he must be able to evaluate the lock itself but without the use of drawings,

tools or similar, and during each individual attempt at unlocking, he must not receive any assistance from other people present other than advice and instructions.

Non-productive time during each attempt at unlocking must be minimized, e.g. by preplanning the attempt and placing tools in relevant places.

During the test, at least one representative from the Lock Expert Committee must be present and this person must ensure that attempts at unlocking are carried out as planned and defined by the inspection team.

1.3. LABELLING THE LOCKS

The submitted bicycle locks are labelled before testing to distinguish them from each other during testing. Locks that are to endure cold tests will be put in the freezer at -18°C ± 2°C the day before the test day.

1.4. TEST SETUP

All attempts at unlocking are, by default, carried out with the bicycle lock mounted onto the bicycle fragment (Appendix II), unless it is assessed that the attempt of unlocking can be executed just as realistically without the lock being mounted, e.g. manipulation of the lock cylinder.

During the attempts at unlocking, the bicycle fragment must be fixated onto a solid stanchion which is properly attached to the floor, e.g. through attachment onto the leg of a workshop table. The fragment must be attached by means of a clamp through the bottom bracket. The stanchion must not be utilized as an additional tool during the attempts at unlocking.

Bicycle locks that are not meant for permanent mounting must at least surround the rear wheel rim and tyre and one frame part during the attempts of unlocking. If the size of the lock allows it, the frame part should be the saddle tube. Another setup can be chosen, if it is assessed that the hindrance of wheel rotation is better suited with this other setup. Other setups than the default is accepted because the testing should reveal that the lock can withstand the attacks, even if the consumer mounts the lock in the least secure manner.

Any remarks from the test institution or pictures of the setup must be noted in the test report.

1.5. TOOL SELECTION

Attempts at unlocking the lock shall be made with tools from the list below.

A maximum of two tools shall be selected for each attempt. Furthermore, the tester is permitted to use a lighter, a burner, a battery or an "ESD generator" in the testing if deemed appropriate.

Nails, screws and other small items are not subject to the limitation of only 2 tools in use during an attempt at unlocking.

The tools may be used simultaneously or alternately.

Tool	Remark
Screwdriver	Max length 270 mm Max blade width 8 mm
Universal screw spanner	Max length 150 mm
Tongue-and-groove pliers	Max length 300 mm
Pipe wrench	Max length 280 mm
Cutting nippers with gear	Max length 240 mm
Wire cutter	Max length 240 mm
Pincers	Max length 200 mm
Junior hacksaw	
HSS Hacksaw blade	
Pocket knife	
Hammer	Max weight 320 g
Mandrel	
Manipulation tool	
Dummy key	Key that fits the lock but with the wrong coding
Small magnet	Magnetic field strength of 0,6 T ± 10% with a maximum lifting capacity of iron of 100 N (max diameter of 20 mm)
Large magnet	Magnetic field strength of 0,6 T ± 10% with a maximum lifting capacity of iron of 400-600 N (max diameter of 60 mm)
Storm lighter or creme brûlée burner	Maximum flame height is required to be able to set at 50 mm
Battery	9 V with 20 cm long cords

Tool	Remark
Apparatus for production of overvoltage	E.g. an Electrostatic Discharge generator (ESD-Generator)
Nails, screws, steel wire, clips and similar "small items" subject to the tester's choice.	

The tool must be in a generally good shape with sharp and intact jaws and blades.

In cases where a maximum tool size is mentioned, a smaller size tool should be used if this leads to better attempts at unlocking.

1.6. DISCONTINUEMENT OF THE TESTS AND TEST SERIES

The test series or the single attempt at unlocking may be discontinued ahead of time if the test institution and the representatives of the Lock Expert Committee agrees that further attempts of unlocking will be fruitless.

If a lock fails an attempt at unlocking, meaning the lock opening, the test must be repeated on at least one other lock to determine the extent of the flaws of the lock. By mechanical attempts at unlocking, the locks must be able to resist an attack for 3 minutes, however at random checks, the locks must resist the attack for 2:45 minutes.

By default, the testing sequence is discontinued if the lock fails an attempt at unlocking on at least two samples. However, in some instances it can be relevant to continue certain tests, but only if it is assessed that it might have a positive significance for the manufacturer to continue the testing.

2. OVERVIEW OF TESTS AND REQUIREMENTS

The following table displays an overview of the tests the bicycle lock can be subjected to as well as the requirements investigated depending on whether the lock is mechanical or electronic. The tests and requirements are specified in the following sections of this appendix.

Tests and Requirements	Mechanical Bicycle Locks	Electronic Bicycle Locks
3.1. Climate Test	X	X
3.3. Severe cold	-	X
3.4. Water	-	X

Tests and Requirements		Mechanical Bicycle Locks	Electronic Bicycle Locks
4.1.	Resistance towards scratching	X[a]	-
4.2.	Mechanical resistance (the lock)	X	X
4.3.	Mechanical resistance (the key)	X	X
4.4.	Lock suitability for two wheeled mopeds	X[b]	X[b]
5.1.	Protection against electrostatic discharges	-	X
5.2.	Protection against overvoltage	-	X
5.3.	Protection against magnetic fields	-	X
6.1.	Protection against heat	X	X
7.	Protection against mechanical attempts at unlocking	X	X
8.1.	Resistance towards "*brute force*"-attack	-	X
8.2.	Protection against "*spoofing*" ("*playback*")	-	X
8.3.	Protection against "*hacking*"	-	X
8.4.	Updating software in lock and/or key unit	-	X
8.5.	Functional safety	-	X[c]

"X" = The requirement applies to this type of lock. "-" = The requirement does not apply to this type of lock

[a] Only combination locks

[b] Only loose U-locks, chain locks, foldable locks and similar types of locks

[c] Only locks where the key is software e.g. on a commonly used devise such as a smartphone.

3. WEATHER RESISTANCE

A sample of the lock is tested for correct functionality by locking and unlocking it.

3.1. CLIMATE TEST

A sample of the lock is tested for correct functionality by locking and unlocking it 50 times before the following tests. The climate test is in two parts but are done on the same lock in the following order.

3.1.1. CORROSION

The lock is placed in a salt fog chamber for 2 hours in accordance with ASTM B117-18 with the following exception: it may not be rinsed or otherwise cleaned upon completion of the salt fog

test. Immediately afterwards, it is placed in a chamber with 100% relative humidity and low air supply at 35-40°C for 30 days.

Requirements: After the test, the lock must not have lost its functions.

It must not be so rusty that the lock function is affected or that it can be activated by accident.

Based on locking and unlocking the lock, as well as inspection of the lock, it is decided whether the requirement is fulfilled or not.

Independently of the result, any remarks from the test institution must be stated in the test report.

3.1.2. COLD

The lock is subjected to 100% relative humidity and low air supply at 35-40°C until condensation is evident on the lock but for a maximum of 5 hours.

Immediately afterwards, without wiping off the drops of water, it is subjected to a temperature of -5°C for 16 hours.

Requirements: The lock functions must not be significantly reduced after the test.

Based on locking and unlocking the lock, as well as inspection of the lock, it is decided whether the requirement is fulfilled or not.

Independently of the result, any remarks from the test institution must be stated in the test report.

3.2. SEVERE COLD (ONLY ELECTRONIC LOCKS AND KEYS)

The lock is subjected to -20°C for a minimum of 4 hours (however, maximum 72 hours), henceforth the lock is removed, and the locking mechanism is tested by locking and unlocking it 10 times before its temperature rises significantly.

If the key unit is a physical, electronic key, this must be able to work after being subjected to -20°C for a minimum of 2 hours. The key is removed from the freezer, and it is immediately tested whether the key can lock and unlock the cold lock. The cold key should be able to open the cold lock within 30 seconds. The test is not required for keys which comprises of software on a smartphone.

Requirements: The lock functions must not be significantly reduced after the test.

Based on locking and unlocking the lock, as well as inspection of the lock, it is decided whether the requirement is fulfilled or not.

Independently of the result, any remarks from the test institution must be stated in the test report.

3.3. WATER (ONLY ELECTRONIC LOCKS)

Electronic locks must have a water protection classification of minimum IPX5 according to EN 60529.

The bicycle lock is subjected to the density test from EN 60529, whereafter the activation of the lock by the key unit is tested within two minutes of terminating the EN 60529 test.

Keys containing electronics and electromechanical parts must be waterproof. If the key unit is a piece of software on a smartphone, this test is not considered relevant and thereby not performed.

The density of the key is tested by subjecting it to water in the bottom of a basin with 10 cm of water for 10 seconds. The key is removed from the water, and it is tested whether the lock can be opened or closed within two minutes with the key. It is permitted to dry off the water on the outside of the key with a cloth before trying to activate the lock.

Requirements: The lock must function correctly, when trying to activate the lock immediately after the density test.

The key must function correctly and activate the lock correctly when trying to use the key immediately after the density test.

Independently of the result, any remarks from the test institution must be stated in the test report.

Note: If the key has an Ingress Protection classification of minimum IPX7 according to EN 60529 it is considered to have passed the density requirements given here. The manufacturer should in this case present a test report, stating that the key complies with the requirements of minimum IPX7.

4. DURABILITY TOWARDS ABRASIONS AND MECHANICAL INFLUENCES

4.1. RESISTANCE TOWARDS SCRATCHING (ONLY COMBINATION LOCKS)

It must not be possible to scratch or abrade the combination lock so the code for the lock can be deciphered by looking at the scratches and abrasions on the lock.

A sample of the lock is opened and closed 500 times in such manner that the scratches and abrasions only occur as by normal use.

Requirements: After the test, it must not be possible to decipher the lock combination by the scratches and abrasions on the lock.

4.2. MECHANICAL RESISTANCE (THE LOCK)

A lock must be able to resist the bumping and vibrations which can occur on a bicycle.

4.2.1. RESISTANCE TO BUMPING

A sample of the lock is tested according to EN 60068-2-27 with the following parameters:

- Shape of curve: half sinusoidal
- Peak acceleration: 400 m/s^2 (40 g)
- Duration per impact: 6 ms
- Minimum waiting time between two impacts: 0,2 s
- Number of impacts in each direction: 100
- Number of directions: along the three axes, positive and negative

A similar mechanical resistance test is accepted but the setup must be approved by Varefakta.

Requirements: The lock functions must not be significantly reduced after the test.

Based on locking and unlocking the lock, as well as inspection of the lock, it is decided whether the requirement is fulfilled or not.

Independently of the result, any remarks from the test institution must be stated in the test report.

4.2.2. RESISTANCE TO VIBRATIONS

A sample of the lock is tested according to ISO 11243:2016, section 5.11.3, with the following parameters:

- Frequency of 7 Hz
- Vertical, sinusoidal strokes of 10 mm
- 100.000 cycles (corresponds to appr. 4 hours of constant vibration)

A similar vibration test is accepted but the setup must be approved by Varefakta.

Requirements: The lock functions must not be significantly reduced after the test.

Based on locking and unlocking the lock, as well as inspection of the lock, it is decided whether the requirement is fulfilled or not.

Independently of the result, any remarks from the test institution must be stated in the test report.

4.3. MECHANICAL RESISTANCE (ELECTRONIC KEYS)

This test does not apply to locks where the key is software running on e.g. a smartphone.

The key is subjected to 10 drops from a height of 150 cm ± 10cm onto a hard surface e.g. a concrete floor.

Requirements: The key must be able to open the lock after the 10 drops.

If the key breaks apart during the test in such manner that it can be reassembled, this will be done, and the testing will continue until the 10 drops have been completed. Hereafter the key must be able to open the lock.

If the key breaks and cannot be reassembled, it is registered as the lock failing the test.

Independently of the result, any remarks from the test institution must be stated in the test report.

4.4. THE LOCKS SUITABILITY FOR TWO WHEELED MOPEDS

It must be checked whether loose U-locks, chain locks, foldable locks and similar types of locks comply with the strength requirement for use as locks for two wheeled mopeds. The lock requirement for two wheeled mopeds is determined by the Danish Ministry of Justice cf. Order (BEK) no. 154 of April 20th, 1977, including subsequent alterations. The lock and chain, U-element and similar must be of a strength equaling that of a hardened material with a thickness of at least 9 mm.

Requirements: Referring to the Danish Ministry of Justice, Order (BEK) no. 154 of April 20th, 1977 including subsequent alterations.

Independently of the result, any remarks from the test institution must be stated in the test report.

5. RESISTANCE TOWARDS ELECTRICAL AND MAGNETIC ATTEMPTS AT UNLOCKING

The following requirements only apply to electronic locks.

These tests are completed before the tests for *Resistance against mechanical attempts of unlocking* (cf. section 7).

5.1. PROTECTION AGAINST ELECTROSTATIC DISCHARGES

The test is setup to display that the lock cannot be released or opened by affecting it with electrostatic discharges on electronic or other parts of the lock.

The bicycle lock is locked and hereafter exposed to electrostatic discharges according to EN 61000-4-2 on the lock's outer parts. It is permitted to detach the battery cover and battery and thereby affect the electronics through the battery room. The insertion of a dummy key or tool, as described in section 1.5, is allowed.

A test voltage of 8 kV is used when the electrode is in contact with the lock and 15 kV when the discharge is occurring without lock contact.

The lock is affected by discharges on the surface, in the battery room and on the surface of the key (not relevant if the key unit is software on e.g. a smartphone). Tools listed previously are appropriate to use.

Up to 5 positions on the lock are chosen and tested, from an expectation of what will release the lock the easiest. Op to 10 discharges can be performed on each position, and there must be at least 1 second between each discharge.

Requirements: The lock must not be activated by the affections.

> If the lock breaks, as a result of the test, but is still locked, it is registered as a pass for the lock.
>
> If the lock functions correctly after the test, it must only be with the correct key unit connected to the lock.
>
> Independently of the result, any remarks from the test institution must be stated in the test report.

5.2. PROTECTION AGAINST OVERVOLTAGE

The test is setup to display that the lock cannot be released or opened by affecting the electronics with overvoltage.

The battery cover is detached, and the battery is removed. The battery contacts are affected by a voltage equal to the nominal battery voltage plus 6 V. The current is limited to a maximum of 600 mA. The overvoltage is held for 10 seconds.

It is permitted to repeat the overvoltage on all accessible electronic parts including possible cables for chargers, etc.

It is permitted to conduct the testing with reversed polarity.

Requirements: The lock must not be activated by the affections.

If the lock breaks, as a result of the test, but is still locked, it is registered as a pass for the lock.

If the lock functions correctly after the test, it must only be with the correct key unit connected to the lock.

Independently of the result, any remarks from the test institution must be stated in the test report.

5.3. PROTECTION AGAINST MAGNETIC FIELDS

The test is setup to display that the lock cannot be released or opened by powerful, permanent magnets.

A small and/or a large, permanent magnet is utilized for the testing.

The magnets are led around the bicycle lock and especially around the locking mechanisms itself. The test must not take more than 3 minutes.

Requirements: The lock must not be activated by the affections.

If the lock breaks, as a result of the test, but is still locked, it is registered as a pass for the lock.

If the lock functions correctly after the test, it must only be with the correct key unit connected to the lock.

Independently of the result, any remarks from the test institution must be stated in the test report.

6. RESISTANCE TOWARDS HEAT

6.1. PROTECTION AGAINST HEAT

The test is setup to display that the lock cannot be released or opened by a strong, external heat exposure.

For the test, either a cigarette lighter ("storm lighter") or a small gas burner is used. It is permitted to use another type of lighter with corresponding properties concerning flame height and heat generation if it is appropriate for the safety of the testing personnel.

The flame height of the burning device is set at maximum, however, not more than 50 mm.

The lock and, especially the locking element, is attempted at releasing by affecting them with the flame from the burner.

The test must not take more than 3 minutes.

Requirements: The lock must not be activated by the affections.

After the test, the lock must function correctly and with the key unit connected to the lock.

If the lock breaks, as a result of the test, but without it opening, it is registered as a pass for the lock.

Independently of the result, any remarks from the test institution must be stated in the test report.

7. RESISTANCE TOWARDS MECHANICAL ATTEMPS AT UNLOCKING

The test is setup to display that the lock cannot be released or opened by using common hand tools (see the list *tool selection* in section 1.5) within the time of attack of 3 minutes.

7.1. REQUIREMENTS FOR COMPLETION OF THE ATTEMPS AT UNLOCKING

Every bicycle lock must be exposed to the types of attacks that is has been assessed to be most vulnerable to. As a minimum, the following attacks are considered:

- Manipulation/picking of the lock through the cylinder and other openings in the bicycle lock
- Wrenching the lock open with a screwdriver and pliers/universal screw spanner (forced twisting/torsional)
- Opening the lock case with screwdriver and pliers
- Twisting the lock open using force
- Cutting through the lock with a saw
- Hitting U-elements and bars at a bicycle lock temperature of -20°C ± 2°C
- Forced turning and pulling out the lock cylinder

Furthermore, it should be considered whether the lock would be vulnerable to other types of attacks ("special attacks"). If it is assessed that this might be the case such "special attacks" must be included in the testing (under the same conditions as the other mechanical attacks which may last a maximum of 3 minutes and executed with the use of maximum 2 tools).

Picking of the lock (manipulation) must only be attempted on a fresh copy of the lock. Furthermore, it must not be performed as a combination attack with other types of attacks, meaning, picking the lock must not be utilized during any other type of attack

Heating the lock with a lighter or burner may be included in an attempt of unlocking if it is assessed as being relevant for the lock in question.

For electronic locks it is possible to utilize the mechanical attempts at unlocking to access the electrical parts which can be affected by a battery or the ESD generator and thereby releasing or opening the lock.

It must not be possible to open the sample of the lock without using the key during or after each of the performed attempts at unlocking.

If the bicycle fragment is so damaged by the attempt at unlocking that it would not be possible to ride a bike with similar damages, the bicycle lock is considered to have passed the attempt at unlocking in question.

8. DIGITAL SECURITY

The following requirements only apply to locks with built-in electronic or electromechanical parts.

The requirements are checked by reviewing the documentation provided by the manufacturer.

8.1. PROTECTION AGAINST "BRUTE FORCE"-ATTACK

The bicycle lock must be able to withstand "*brute force*"-attacks where the attacker attempts opening the lock by utilizing a code generator to generate codes which are then send to the lock as fast as possible while the lock is in a state where it can receive codes for unlocking. The idea is that the correct code will be acquired at some point if the attacker attempts this for long enough time.

The resistance of the lock is characterized by the parameter "*Mean Time to Compromise*" or MTC. MTC is the time it averagely takes to guess the correct combination. The MTC-value is determined by the following equation:

$$MTC = \frac{N}{2 \times W \times A}$$

Where *N* is the number of possible codes, *W* is the maximum allowed number of users for at lock and *A* is the number of allowed attempts per hour.

Requirements: MTC must be at least 6 hours.

Independently of the result, any remarks from the test institution must be stated in the test report.

8.2. PROTECTION AGAINST "SPOOFING" ("PLAYBACK")

The bicycle lock must be able to resist "*spoofing*"-attacks where the attacker is lurking and hereby deciphers a correct code with a "snuffer" to attempt opening the lock later. The attacker will either send the correct code again or send a falsified code which will be misinterpreted as a correct code and thereby activating the lock.

The manufacturer must document how the bicycle lock is secured towards these types of attacks, including how the system is secured towards the application or falsification of possible "master" codes.

Requirements: The lock must not be able to open by a "*spoofing*" attack.

Independently of the result, any remarks from the test institution must be stated in the test report.

8.3. PROTECTION AGAINST "HACKING"

The overall system (bicycle lock, key unit and management system, cf. figure 1 in the section entitled *Definition*) must be secured towards hacking. An attacker must not be able to transfer a modified code or command which will activate or in other ways affect one or more bicycle locks resulting in e.g. the locks opening or not functioning.

The manufacturer must account for how the system is secured towards hacking by known methods, especially if the system is comprising of a key unit and/or bicycle lock which contain soft- or firmware which will be updated during the lock's lifetime.

Furthermore, the manufacturer must account for its breach procedures concerning data security.

Requirements: It must not be possible to "hack" the system using known methods and thereby opening the lock.

The manufacturer must have procedures for notifying Varefakta if a bicycle lock and/or key unit no longer will be updated which will make it vulnerable to hacking. When notified of this, it is possible for Varefakta to withdraw the labeling permission of the lock.

The manufacturer must have procedures for notifying Varefakta and the consumers (e.g. by webpage or in app) if a bicycle lock is hacked and thereby can be opened by a third party. When notified of this, it is possible for Varefakta to withdraw the labeling permission of the lock.

8.4. UPDATING SOFTWARE IN LOCK AND/OR KEY UNIT

If the software in the lock or key unit must be updated at some time, the manufacturer must have procedures for this as well as an estimate for how the software will be kept updated and for how long.

If the software in the lock or key unit is updatable, the client must have procedures for how Varefakta is informed if this update is necessary. Hereafter, a procedure for how the consumer is informed must be sent to Varefakta.

Requirements: The manufacturer must have documented procedures for how the software in the lock and/or the key unit will be kept updated during the lifetime of the locking system.

The expected lifetime of the locking system, i.e. the time, the manufacturer expects to keep the software in the system updated, must be stated in the user manual.

If the locking system can be updated but is not expected to be, the client must have documented procedures for how Varefakta is to be contacted id the software requires to be updated.

Varefakta may withdraw the labelling permission of the lock when the software is no longer being updated.

8.5. FUNCTIONAL SAFETY (ONLY LOCKS WHERE THE KEY IS SOFTWARE ON A COMMONLY USED DEVICE E.G. A SMARTPHONE)

The functions of the overall system of a lock with a key unit must be secure to use without compromising the security of the lock.

The manufacturer must account for all built-in locking administrative functions for the user (i.e. functions for administration of lending, sharing and transfer of keys), as well as how these are secured towards abuse (unintentional and intentional). The statement from the manufacturer must cover the following functions as a minimum where it is relevant for the lock in question:

- Sharing of keys between multiple users
- Lending of keys
- Sale of bicycle with the lock mounted
- Resetting of the system so lent and shared keys are canceled
- Recreation of the key if the phone is lost or replaced.

Requirements: Lock administrative functions in the locking systems must not compromise the efficiency of the system.

From the minimum requirements, bicycle locks with the following functions cannot be approved by Varefakta according to these Requirements:

- Bicycle locks which allow a lender of the key to re-lend the key to a third party, without deactivating the lender's key.
- Bicycle locks which allow more than 3 active keys in circulation at a time
- Bicycle locks where others than the rightful owner of the lock (i.e. the owner of the Lock Certificate) can reset the lock or recreate the key.

9. REPORTS

A test report is made by the test institution. Furthermore, the client/manufacturer must enclose test reports or technical documentation for digital security.

9.1. TEST REPORTS

A report from the test must be prepared.

The test report must clearly identify the tested bicycle lock with the following information:

- Name of manufacturer
- Model or type designation
- Lock type
- Possibly color, surface treatment or other relevant characteristics
- Photo of the lock

Furthermore, the test report should describe the results of the investigations and tests conducted. The time of the testing must be included in the report.

The report must be dated and signed.

9.2. REPORT CONCERNING THE ATTEMPTS OF UNCLOCKING BY ATTACKING THE LOCK

The test report must inform which of the types of attacks from section 7.4 have been performed due to their relevance in the attempts of unlocking.

For each of the completed attempts at unlocking the following must be reported:

- Which sample(s) the attempt was conducted on
- What the attempt was concerning
- If a bicycle fragment was utilized for the attempt
- The mounting/placement of the sample attempted at unlocking
- The duration of the attempt
- Utilized tools with dimension and simultaneity/sequence
- The result of the attempt

For locks that work by maintaining the front fork at an angle compared to the straight-ahead position, this angle must be reported.

The sequence of the information is voluntary, but it must be the same from report to report.

If some of the parameters for multiple attempts are the same, it is adequate to mention them once and note which attempts they apply to.

It is recommended to use photos and video to document the course and result of the attempts at unlocking.

9.3. REPORT CONCERNING THE LOCK'S SUITABILITY TOWARDS USE FOR TWO WHEELED MOPEDS

For loose U-locks, chain locks, foldable locks and similar types of locks it must always be reported whether they comply with the strength requirement for use as locks for two wheeled mopeds according to the Danish Mistry of Justice cf. Order (BEK) no. 154 of April 20th 1977, including subsequent alterations.

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Appendix II: Sketch of bicycle fragment

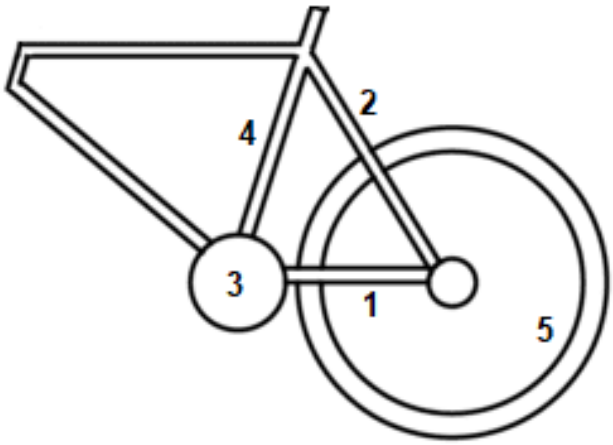

Figure 2: Sketch of bicycle fragment for testing of bicycle locks.

The bicycle fragment consists of:

1. Rear fork
2. Rear crossbar
3. Bottom bracket
4. Saddle tube
5. Rear wheel

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Bibliography

All publications referred to in these Varefakta Requirements can be found in the following list:

Type	Document Code	Title
Other		Conditions for use of Varefakta on Products
Directive	2001/95/EF	Directive on general product safety.
Directive	2006/66/EF	Directive on batteries and accumulators and waste batteries and accumulators. Including subsequent alterations and additions to the directive.
Directive	2011/65/EU	Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment. Including subsequent alterations and additions to the directive.
Directive	2012/19/EU	Directive on waste electrical and electronic equipment (WEEE).
Directive	2014/30/EU	Directive on the harmonization of the laws of the Member States relating to electromagnetic compatibility.
Directive	2014/53/EU	Directive on the harmonization of the laws of the Member States relating to the making available on the market of radio equipment.
Law	LOV 799 of 09/06/2020	Law on products and market surveillance. Danish title: "Lov om produkter og markedsovervågning"
Order	BEK 154 of 20/04/1977	Executive order on vehicle interiors and equipment, etc. Including subsequent alterations and additions to the order. Danish title: "Bekendtgørelse om køretøjers indretning og udstyr m.v."
Order	BEK 1285 of 04/11/2016	Executive order on safety for electrical equipment. Danish title: "Bekendtgørelse om sikkerhed for elektrisk materiel."

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Type	Document Code	Title
Order	BEK 829 of 10/06/2020	Executive order on product safety in general and coordination between control authorities. Danish title: "Bekendtgørelse om produktsikkerhed i almindelighed og koordination mellem kontrolmyndigheder"
Regulation	1907/2006/EF	REACH Regulation– Appendix XVII.
Regulation	2019/1020/EU	Regulation on market surveillance and compliance of product
Standard	ASTM B117-19	Standard Practice for Operating Salt Spray (Fog) Apparatus
Standard	EN 60068-2-27:2009	Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock
Standard	EN 60529:1991/A2/AC:2019	Degrees of protection provided by enclosures (IP Code)
Standard	EN 61000-4-2:2009	Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test
Standard	ISO 11243:2016	Cycles – Luggage carriers for bicycles – Requirements and test methods

The various types of publications can be obtained as follows (please be aware that standard must be purchased):

Publication	Obtainment	Payment
Other	Varefakta www.varefakta.dk Stationsparken 26, 3tv 2600 Glostrup, Denmark Tlf. 46 30 45 00 varefakta@varefakta.dk	-
Directives Regulations	www.eur.lex.europa.eu	-

Orders (BEK)	www.retsinformation.dk	-
Standards	Danish Standards www.ds.dk or where you buy your European standards.	X
ASTM Standard	Danish Standards www.ds.dk ASTM International www.astm.org or where you buy your international standards.	X