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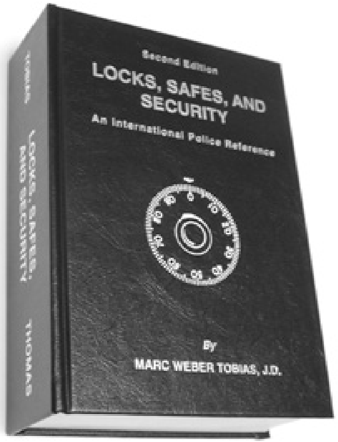
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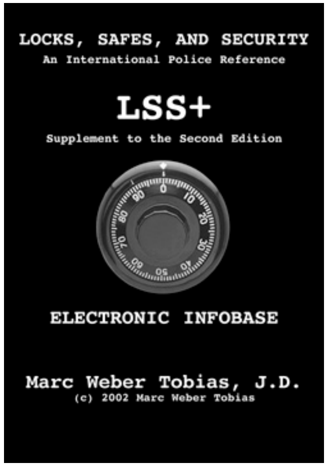
An International Police Reference
By
MARC WEBER TOBIAS, J.D.
TOBIAS
LOCKS, SAFES, AND SECURITY
THOMAS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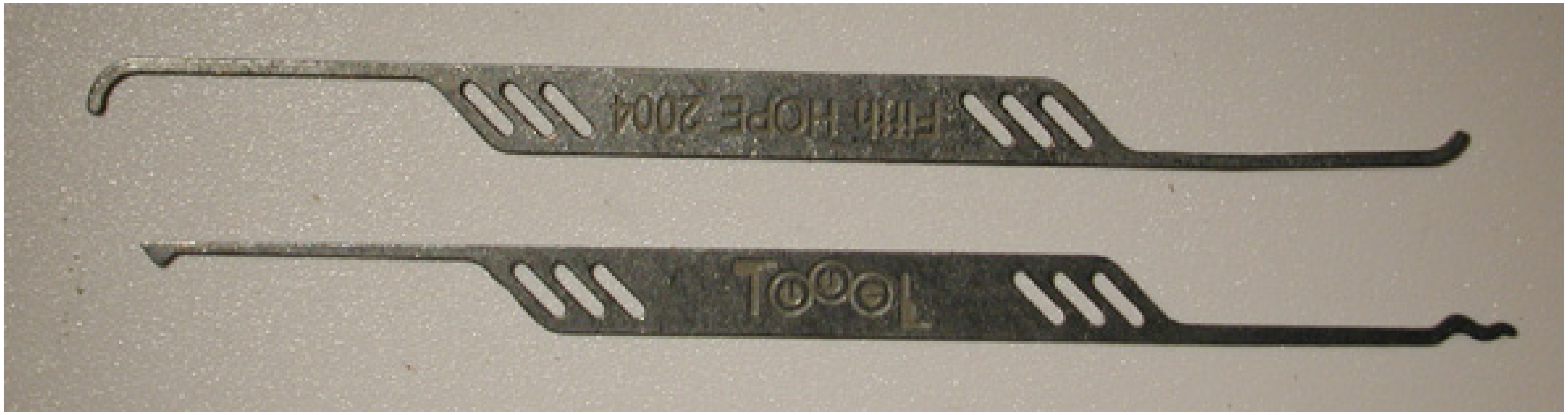
HOPE LOCK PICKS



SECURITY ISSUES

- MASTER KEYING
- HIGH SECURITY LOCKS: M3 AND V10 TO SECURE MK SYSTEMS
- 999 BUMP KEY
- EASY ENTRIE PROFILE MILLING MACHINE
- SCHLAGE EVEREST NOTES
- IMPRESSIONING NOTES
- ANTWERP BURGLARY: HOW TO STEAL $100,000,000

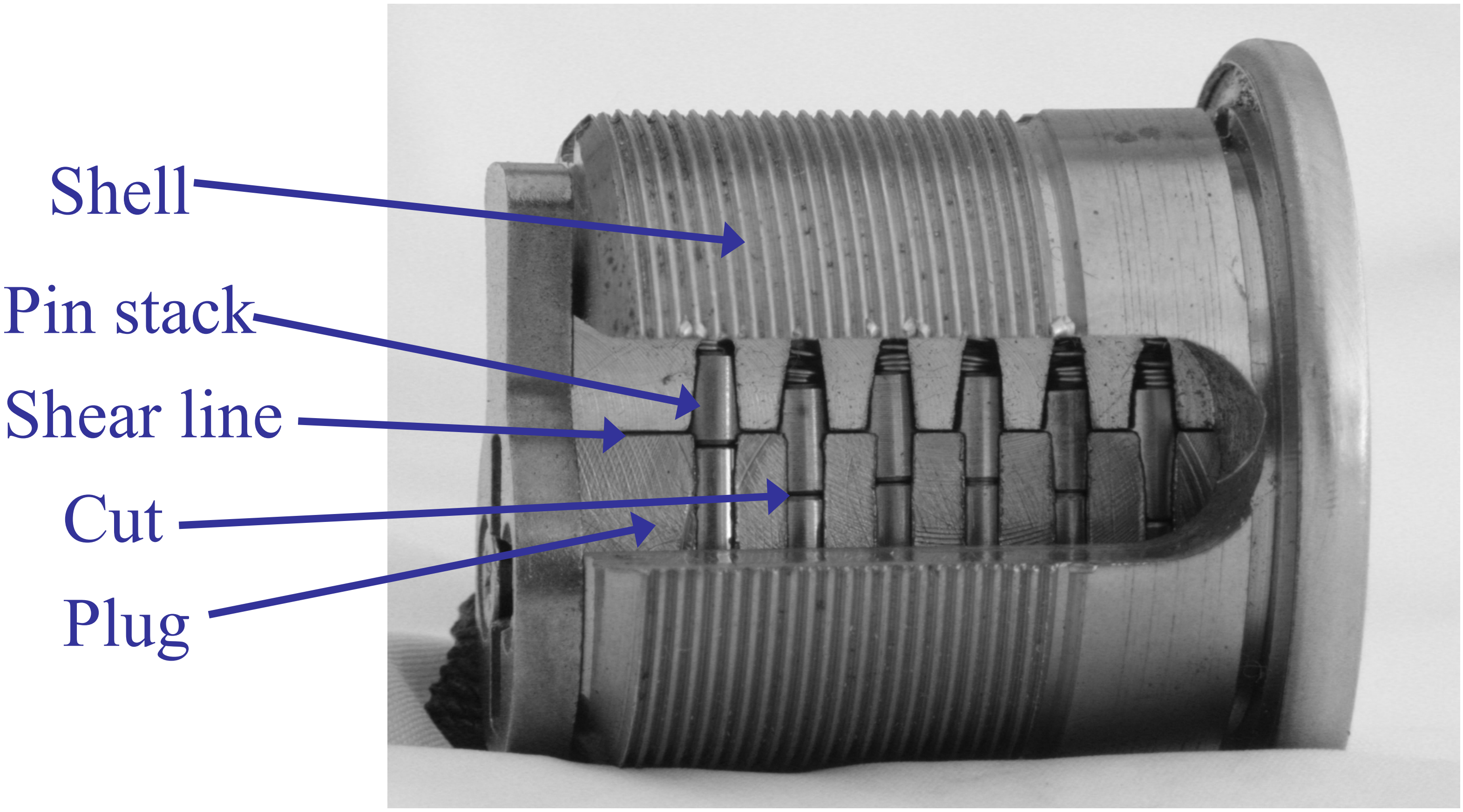
MASTER KEYING THEORY

THREAT FROM EXTRAPOLATION

PIN TUMBLER LOCKS

CONVENTIONAL MASTER KEYING

Inside the Pin Tumbler Lock



Shell

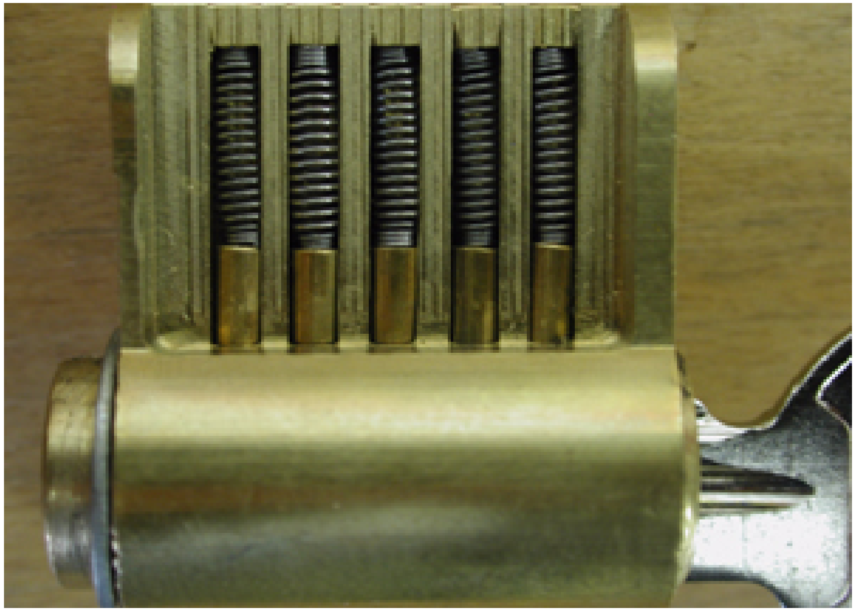
Pin stack

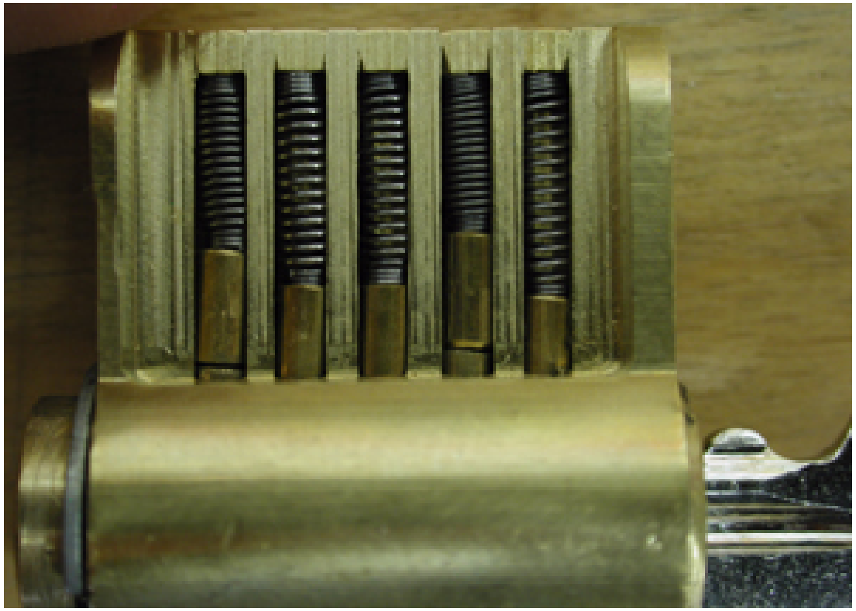
Shear line

Cut

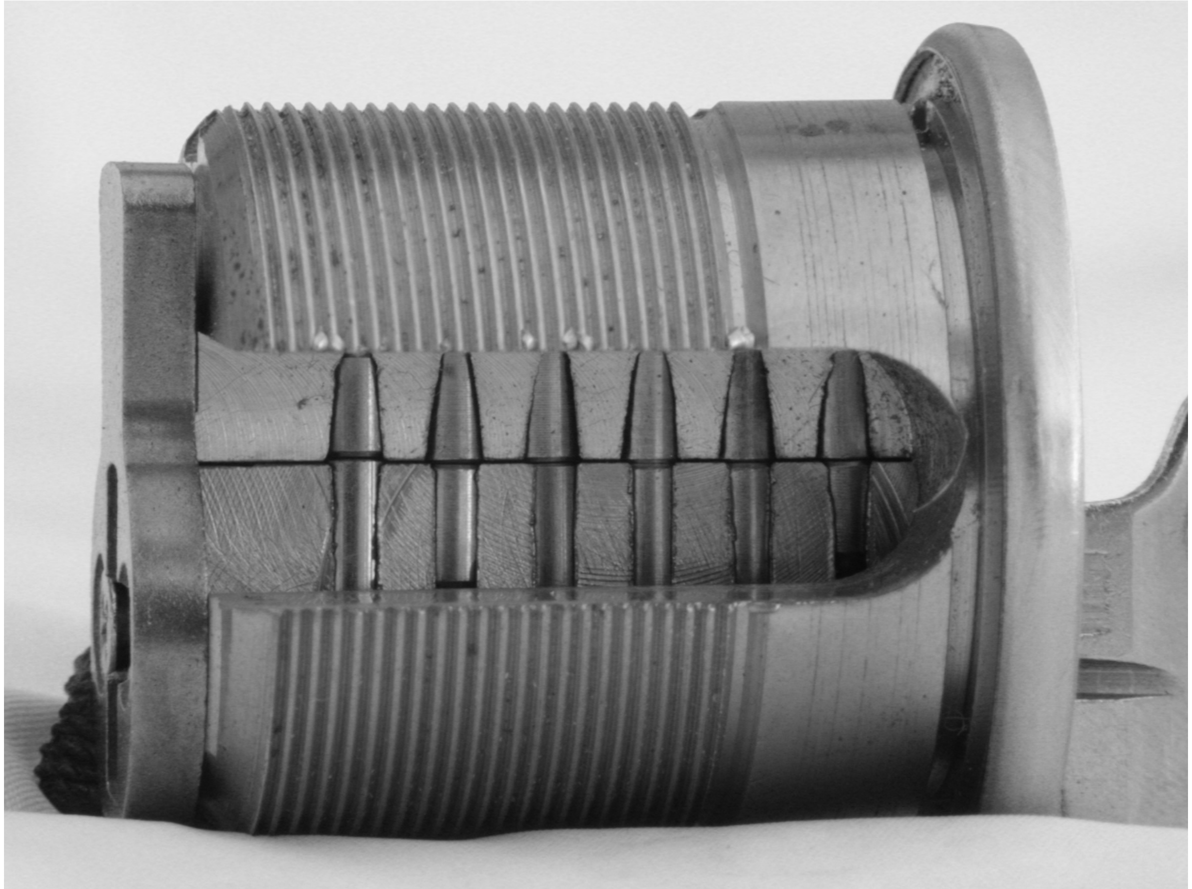
Plug

SHEAR LINE

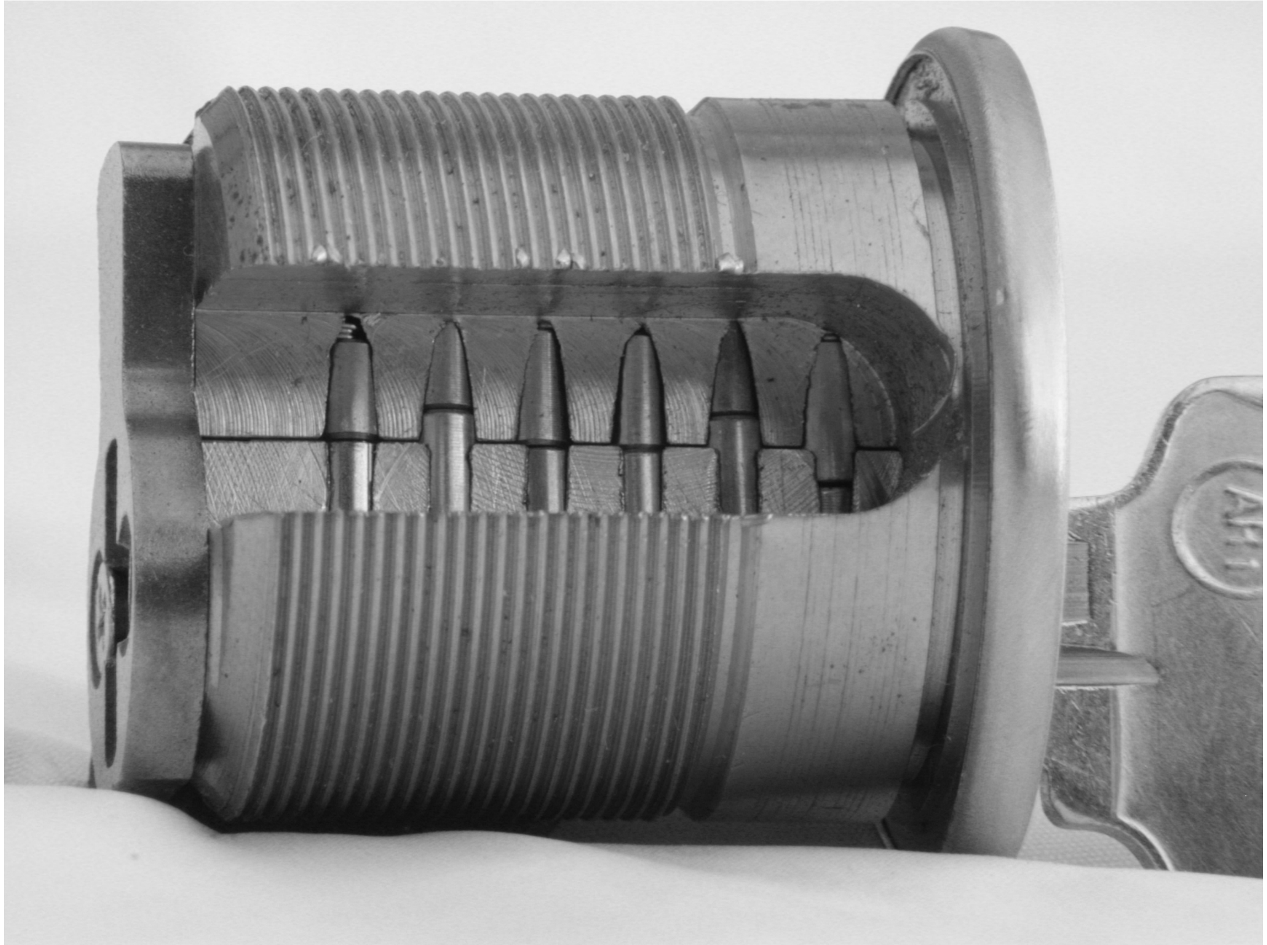




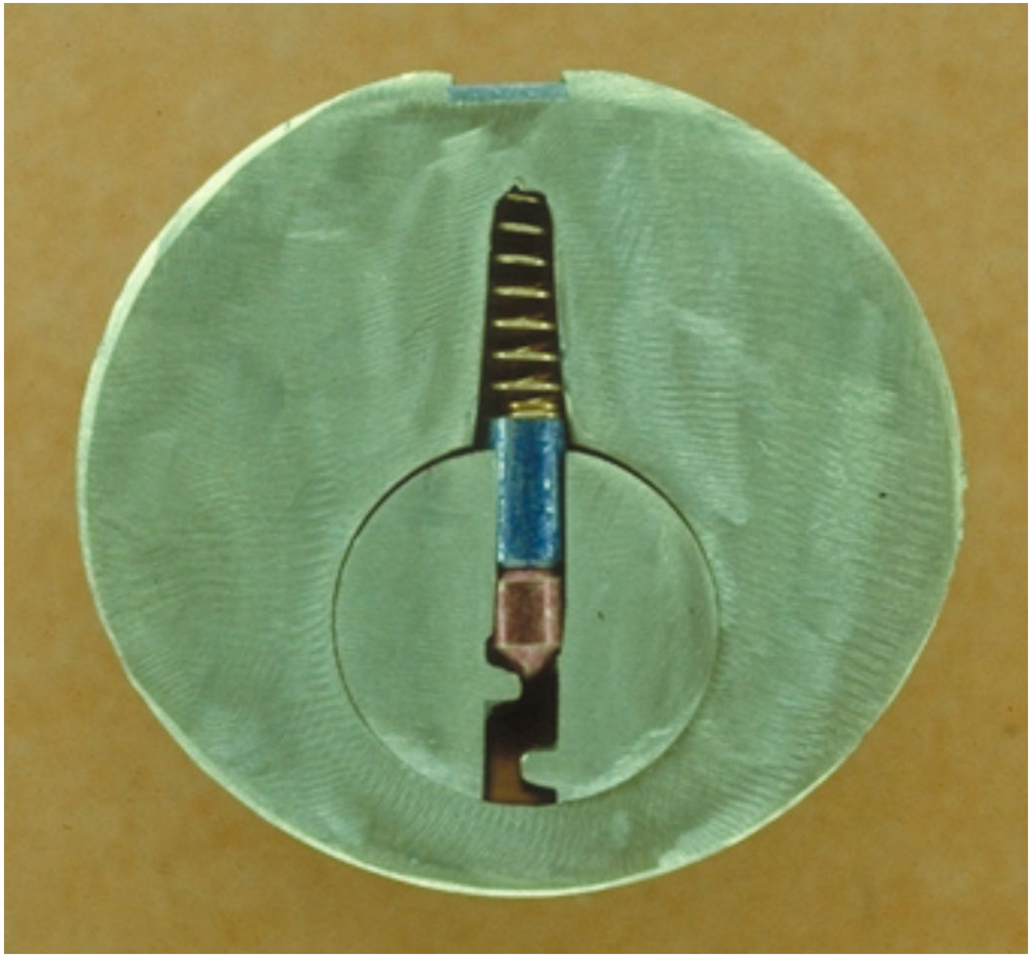
Correct Key Inserted



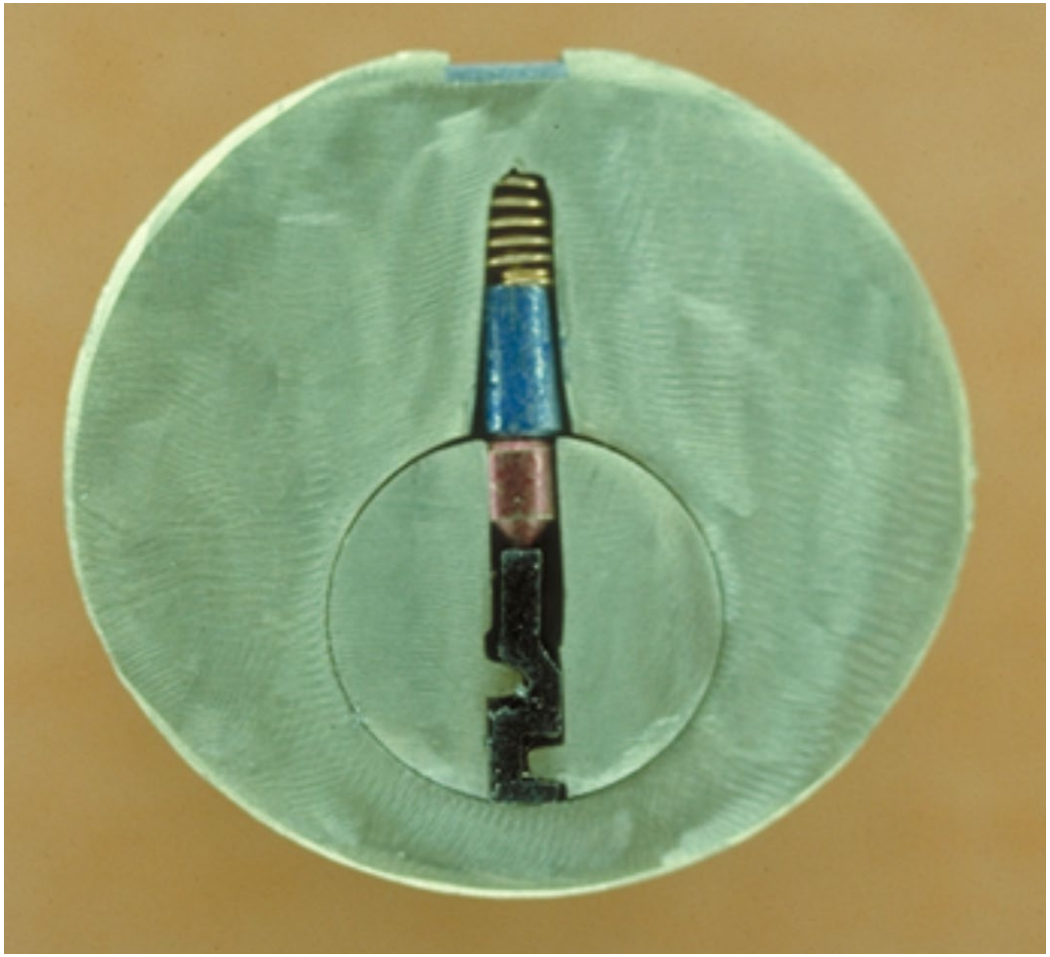
Incorrect Key Inserted



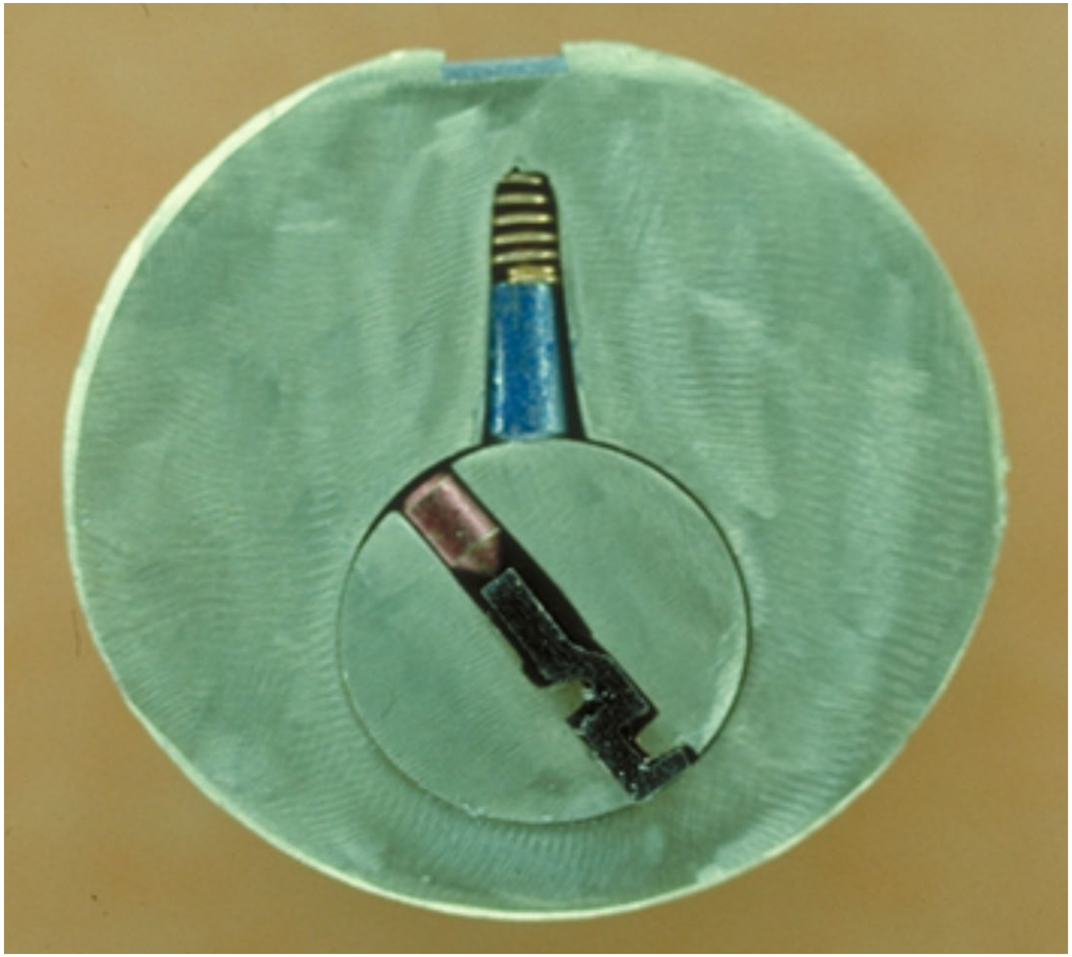
Locked



Pins at Shear Line



Plug Rotated



MASTER KEYING: WHY IMPORTANT

- Every large facility is master keyed
- Compromise of TMK
  - No risk
  - All locks
  - Absolute access
  - Not high tech
  - No forensic trace
  - No time limit to obtain

What is Master Keying

- Change keys
- Incidental master keys
- Top Level Master Keys
- Levels of master keying
- Security v. convenience
- Security rules against master keying

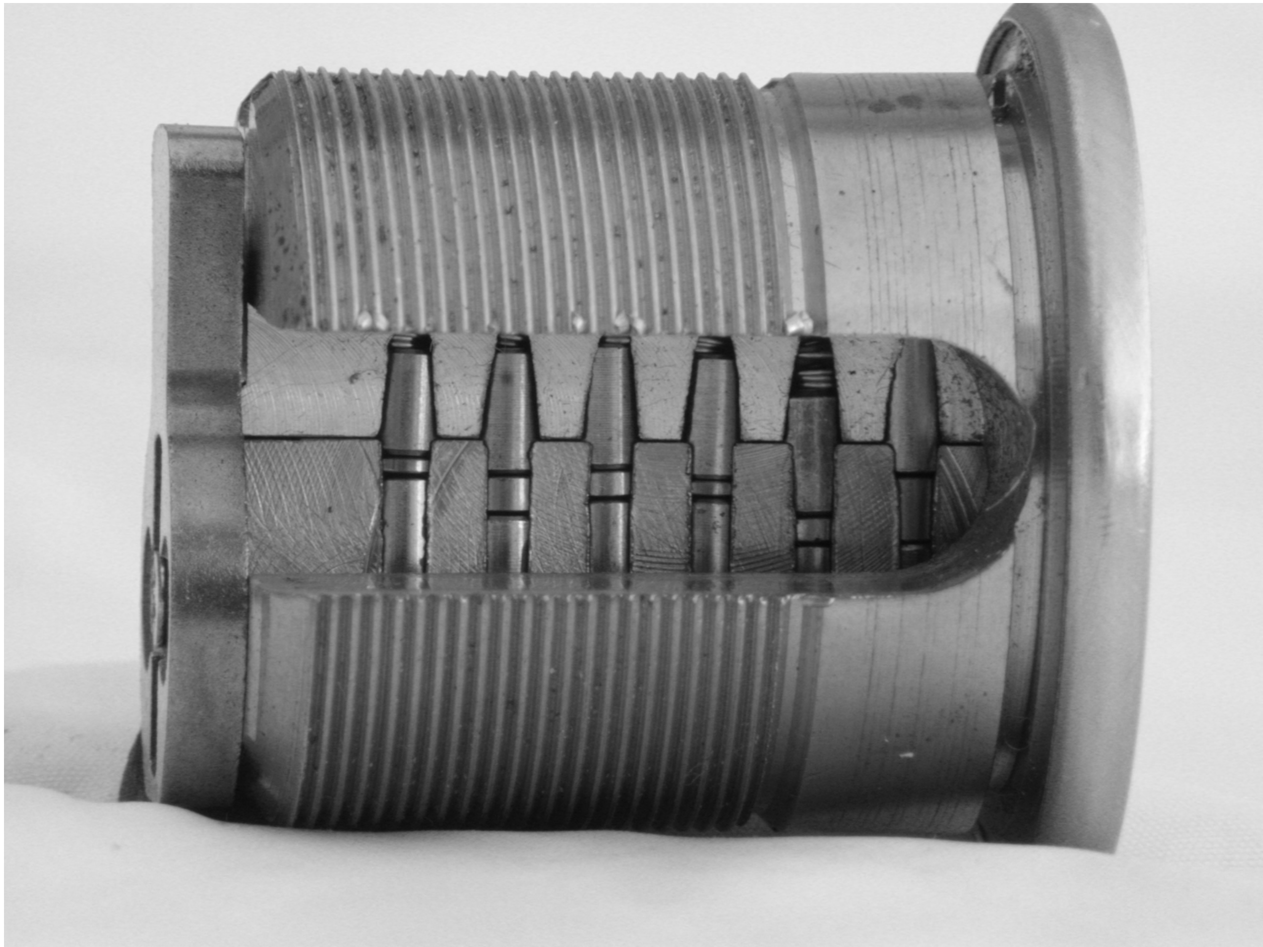
MK Security Design

- Difficulty in replicating blanks;
- Side millings;
- Undercuts (Schlage Everest);
- Specially designed ward patterns and activation of sliders (Medeco M3) or mechanically linked sidebars have been implemented;
- Secondary locking mechanisms and the apparent difficulty in replicating restricted blanks may not actually provide the expected level of security;

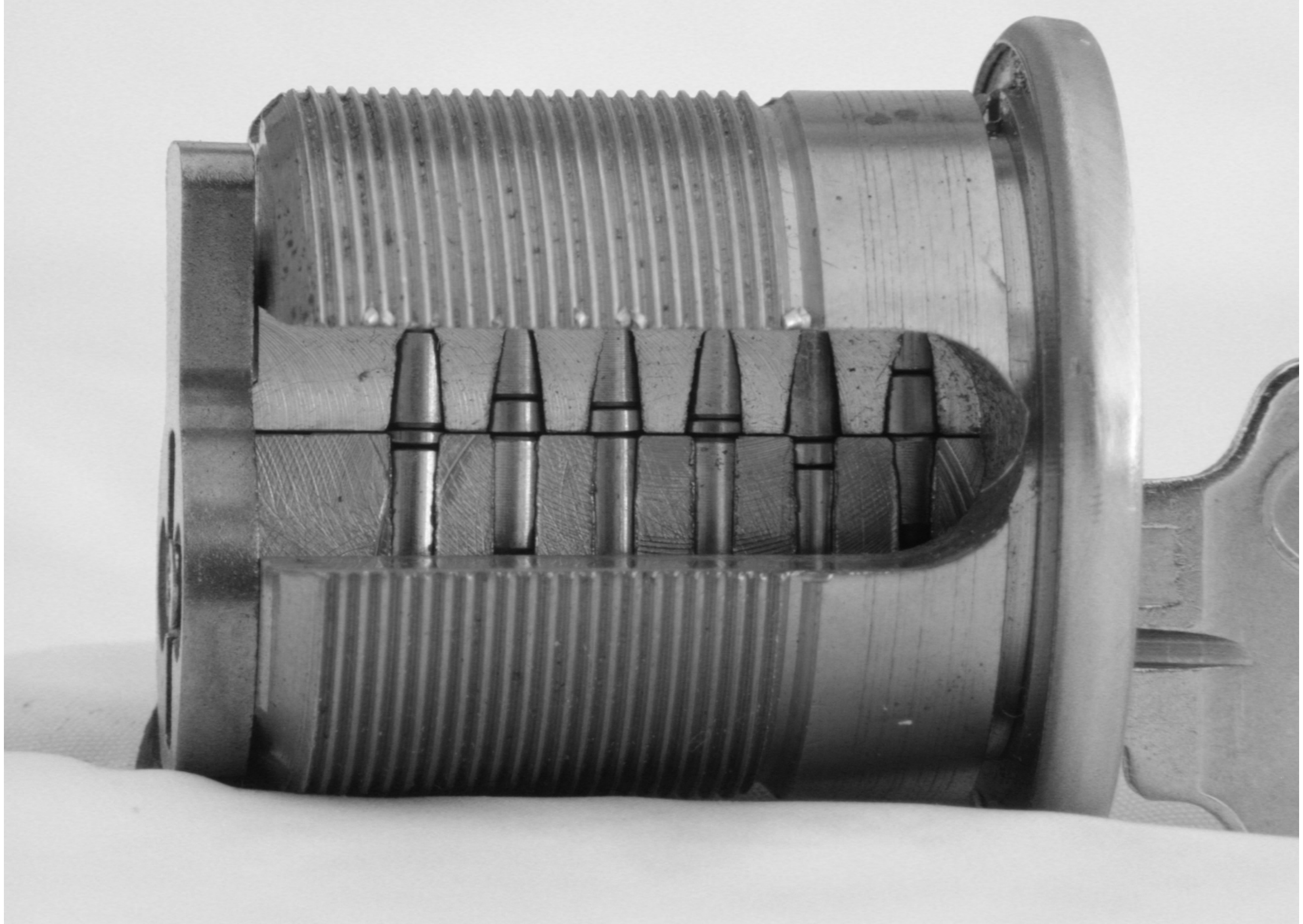
HOW ARE LOCKS MASTER KEYED: General Information

- Locks that can be master keyed
  - Lever
  - Wafer
  - Pin tumbler
  - Hybrid
- Types of master key systems
- Why are locks master keyed
- Other forms of keying

Two Lower Pins



Set of pins raised to shear line



INCIDENTAL MASTER KEYS

- COMPOSITE COMBINATIONS OF PINS

EXTRAPOLATION: THREAT TO SECURITY

EXTRAPOLATION

- Derive the code of the Top-Level Master Key (TMK)
- What is a master key system
- What is the difference between conventional and positional master key systems
- Why is this so critical

EXTRAPOLATION OVERVIEW

- Simple premise
- Easy to accomplish
- Much publicity
- NY TIMES, January 2003
- Serious threat to security
- Most buildings use conventional master keying

EXTRAPOLATION OVERVIEW

- No special tools
- No special expertise
- Common implements
- Totally covert
- No forensic traces
- Can be accomplished over time
- Access to one change key

EXTRAPOLATION DEFINED

- Use of any change key as a constant to probe sampled and target cylinders
- What is a change key
- What is a TMK
- What is an incidental master key

Extrapolation: Read the Lock

- Requires access to a single lock and its key
  - plus a few blank keys
- No disassembly or skill required
- Simple idea
  - a lock is an oracle that accepts or rejects keys
  - lock behaves the same way whether pins are at master or change height
  - learn the master height one pin at a time

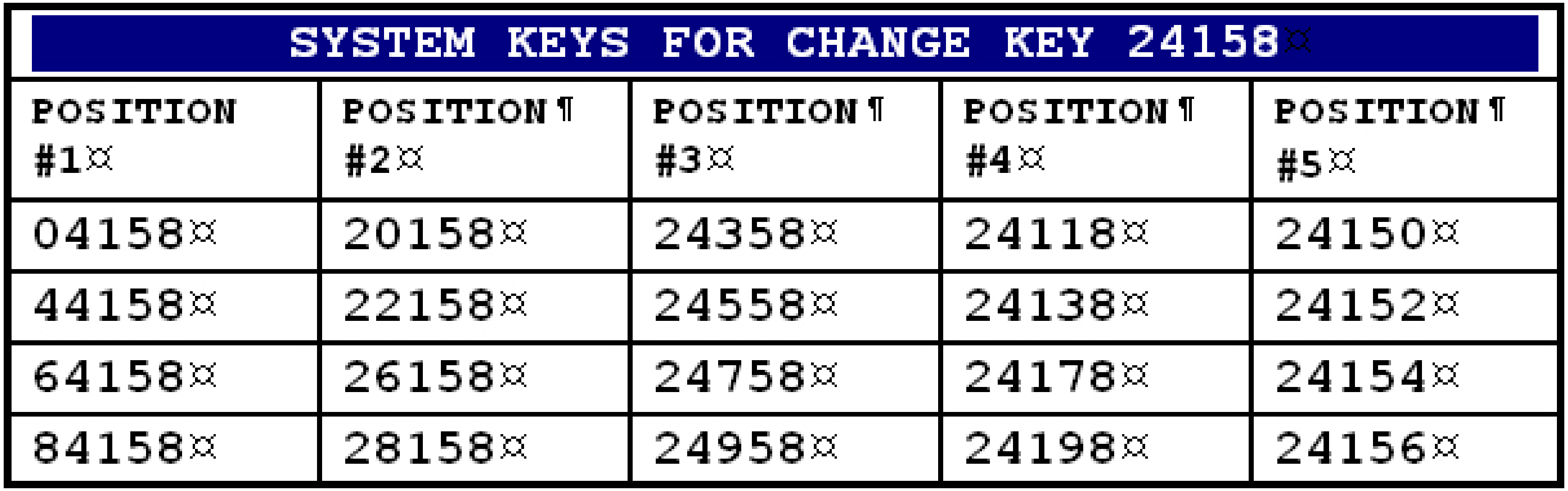
Some Practical Considerations

- Total cost of attack: $2.00 or less
- Blanks can be cut with a file or a machine
- Blanks are readily available for most locks
- Some systems don’t follow standard mastering practices (TPP, RC)
  - usually this makes the attack even easier
- Yes, it really works

Extrapolation Theory: Overview

- Conventional systems: split pin master keying
- Virtual shear lines created by each pin segment within each pin stack
- Different combinations: incidental master keys
- No more than two lower pins

Pre-cut System Keys for 24158

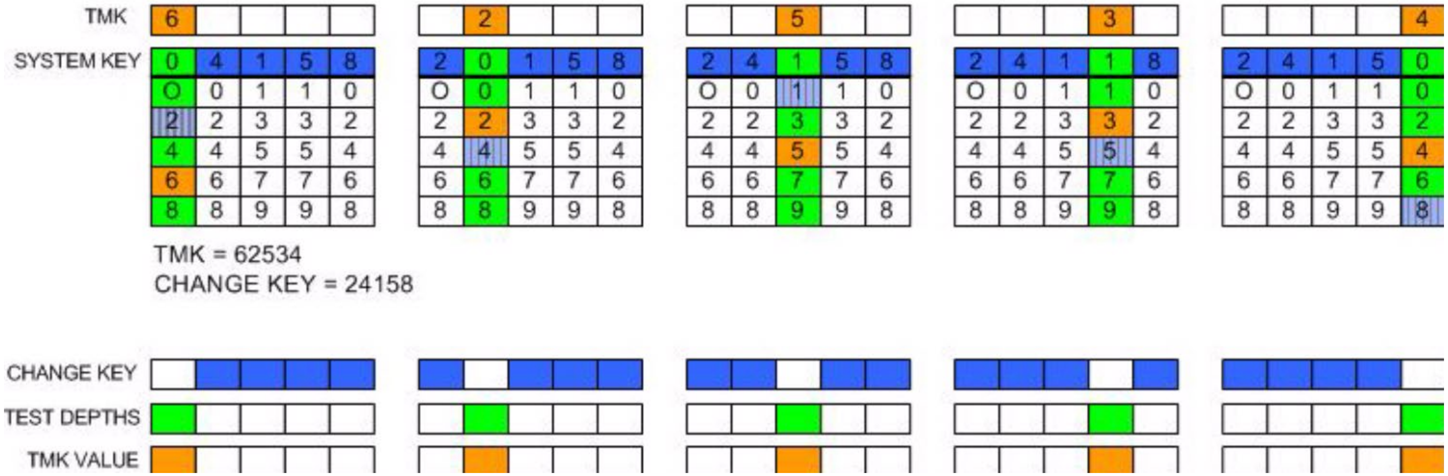


SYSTEM KEYS FOR CHANGE KEY 24158¤

POSITION #1¤	POSITION¶ #2¤	POSITION¶ #3¤	POSITION¶ #4¤	POSITION¶ #5¤
04158¤	20158¤	24358¤	24118¤	24150¤
44158¤	22158¤	24558¤	24138¤	24152¤
64158¤	26158¤	24758¤	24178¤	24154¤
84158¤	28158¤	24958¤	24198¤	24156¤

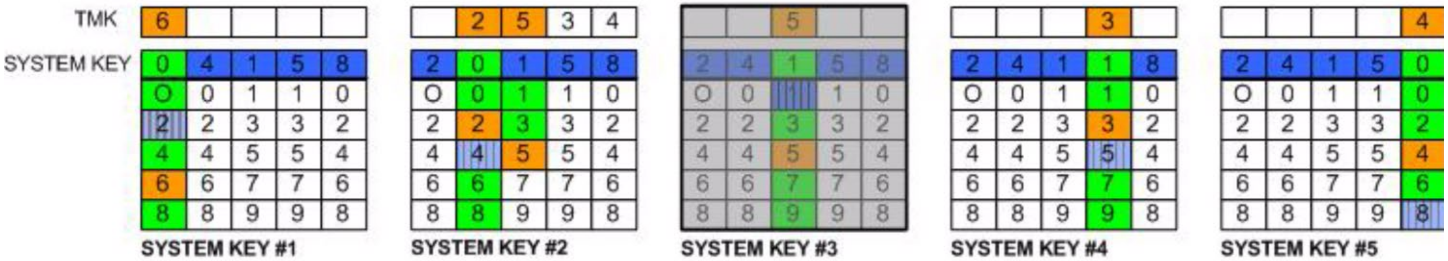
Decoding in one session

TOP LEVEL MASTER KEY EXTRAPOLATION
SYSTEM KEY DIAGRAM



TMK = 62534
CHANGE KEY = 24158

TOP LEVEL MASTER KEY EXTRAPOLATION
SYSTEM KEY DIAGRAM FOR MULTIPLE CUTS ON ONE KEY



TMK = 62534
CHANGE KEY = 24158

MAKING MK SYSTEMS MORE SECURE

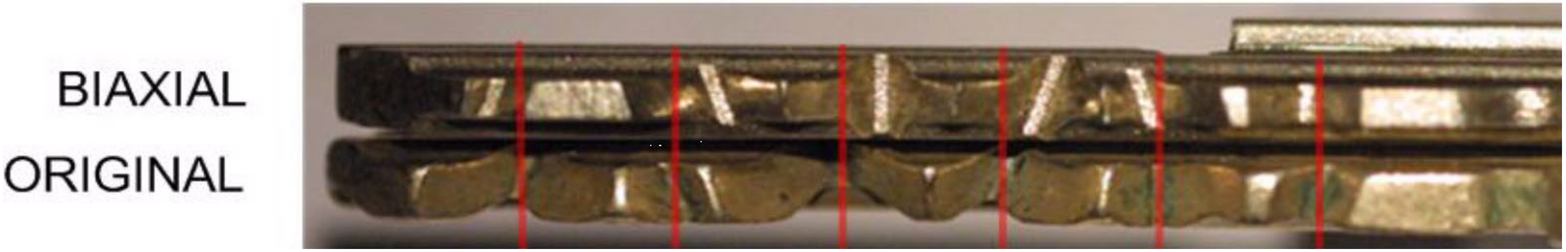
- MULTIPLE SIDEBAR CODES IN ONE SYSTEM
- DIFFICULT TO DECODE SAMPLE AND TARGET LOCK
- TWO TYPES OF MK SYSTEMS IN ONE LOCK: CONVENTIONAL AND POSITIONAL

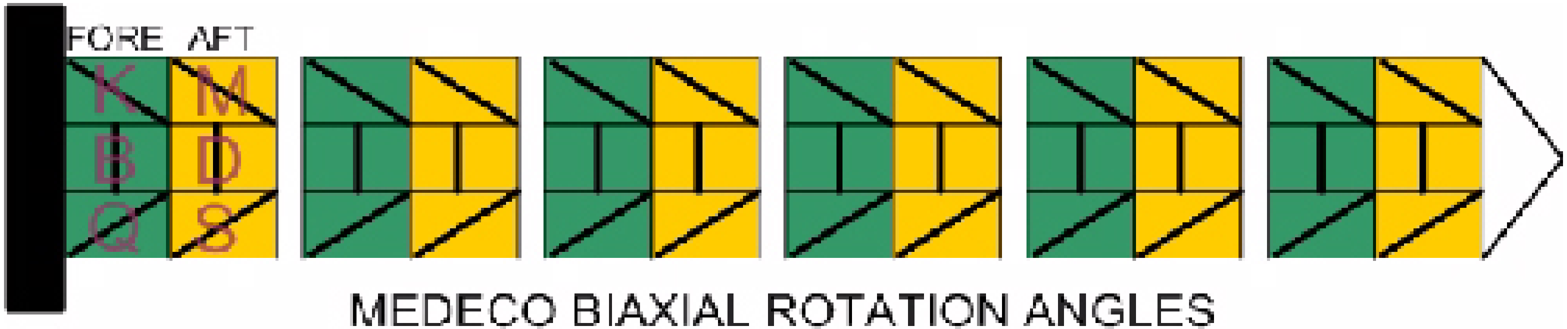
HIGH SECURITY LOCKS: MEDECO AND ASSA

- Can add security to a system if implemented properly
- Can be defeated
- Why consider these systems
- Concept of multiple sidebar codes

Medeco Original and Biaxial

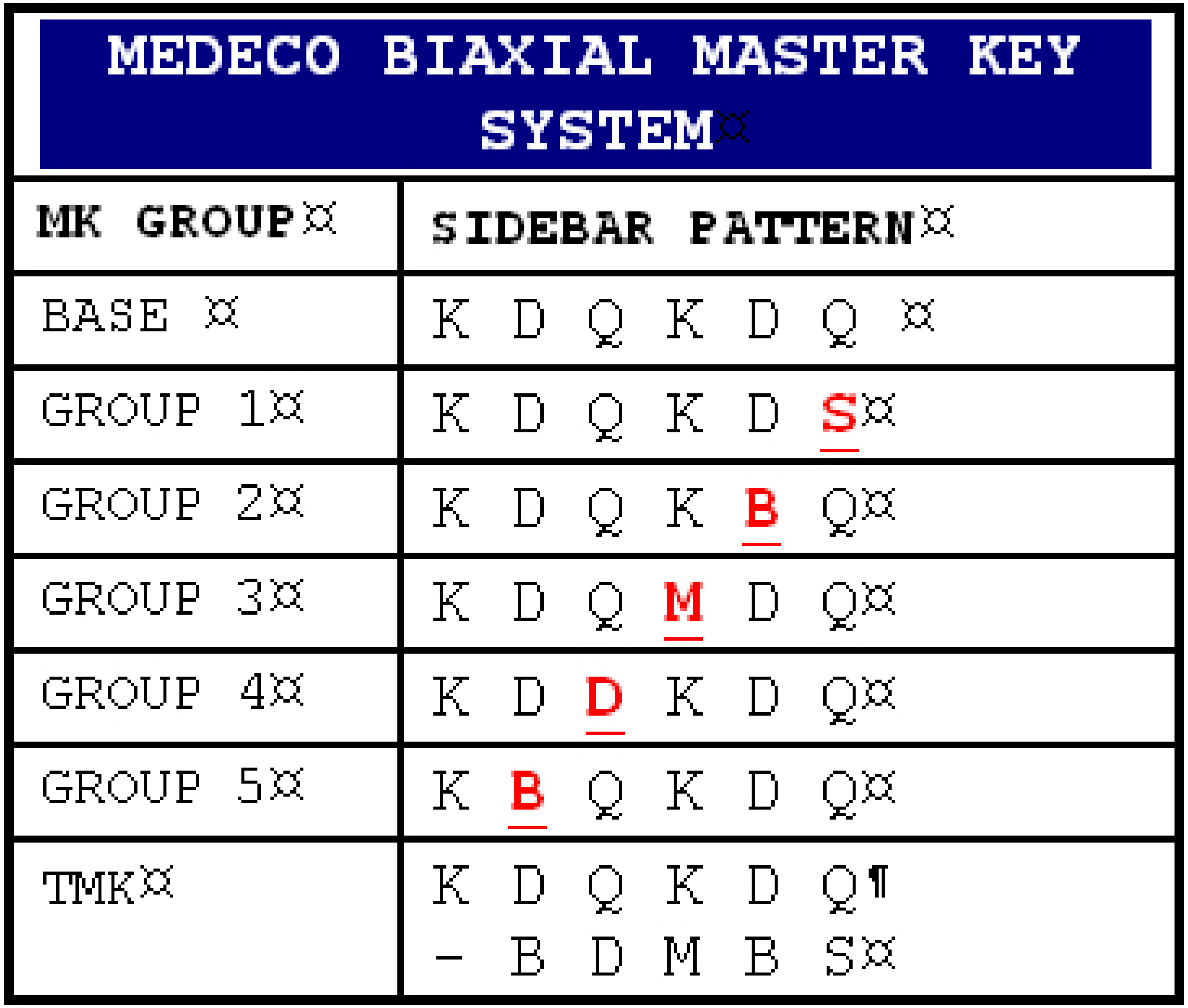
COMPARISON OF MEDECO ORIGINAL AND BIAXIAL DESIGNS





MEDECO BIAXIAL ROTATION ANGLES

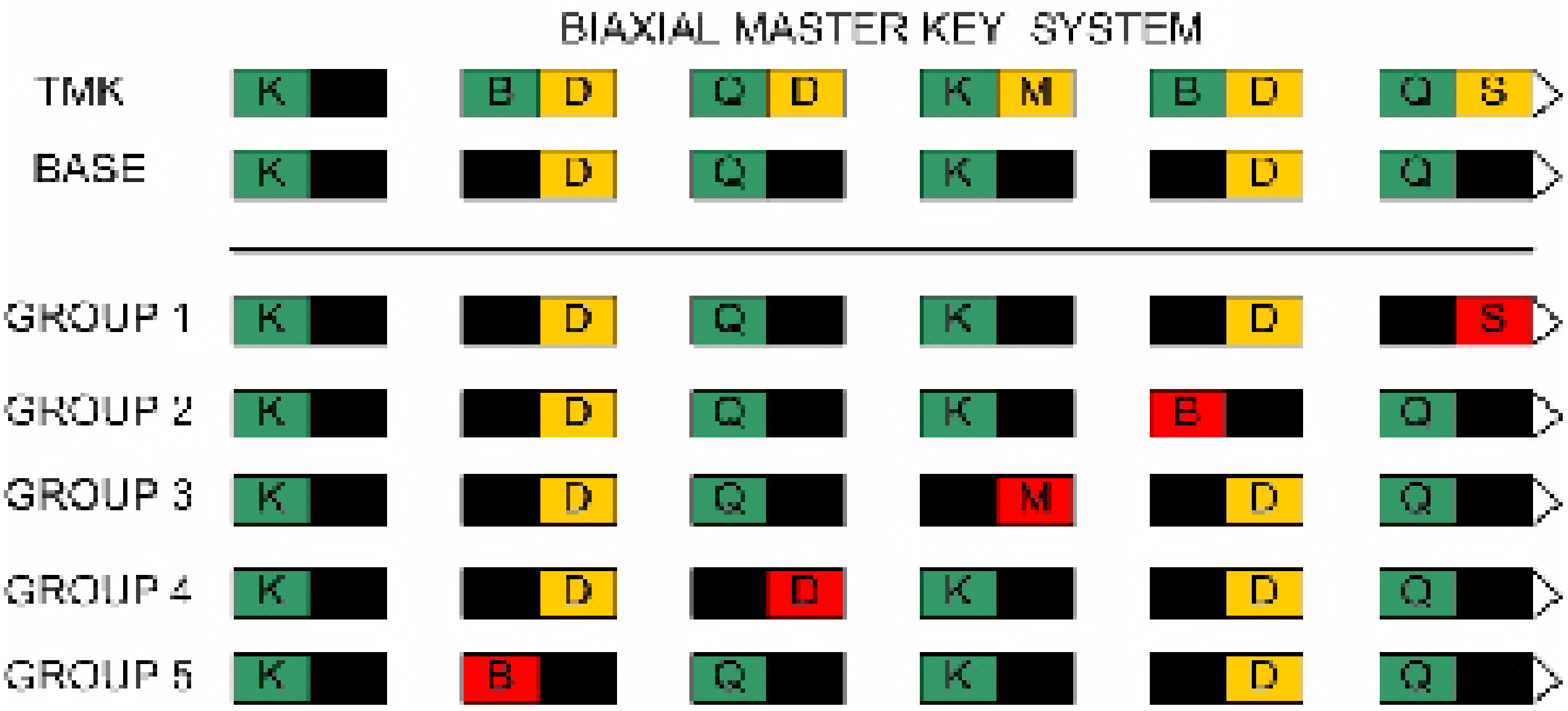
Medeco Biaxial



MEDECO BIAXIAL MASTER KEY SYSTEM¤

MK GROUP¤	SIDEBAR PATTERN¤
BASE ¤	K D Q K D Q ¤
GROUP 1¤	K D Q K D S¤
GROUP 2¤	K D Q K B Q¤
GROUP 3¤	K D Q M D Q¤
GROUP 4¤	K D D K D Q¤
GROUP 5¤	K B Q K D Q¤
TMK¤	K D Q K D Q¶ - B D M B S¤

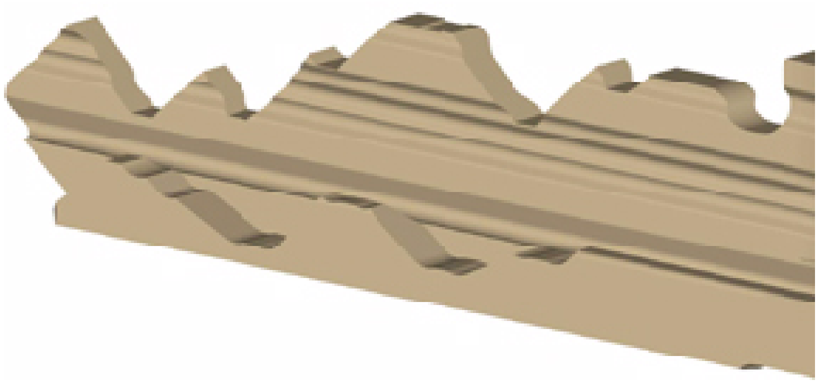
Medeco Biaxial Double Cut TMK

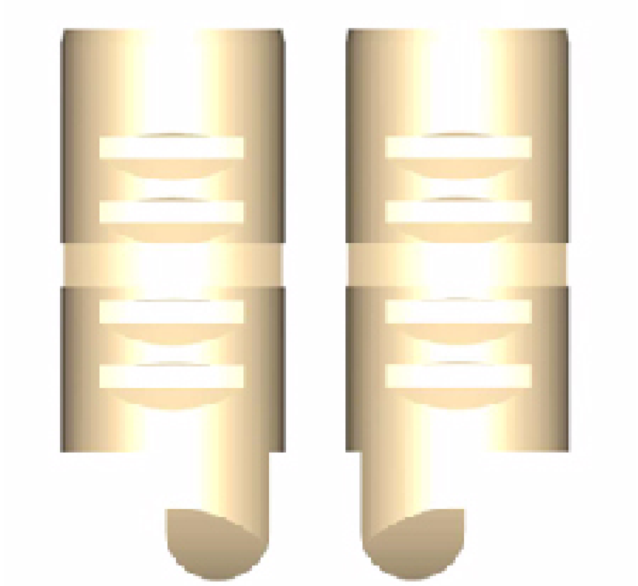


BIAXIAL MASTER KEY SYSTEM

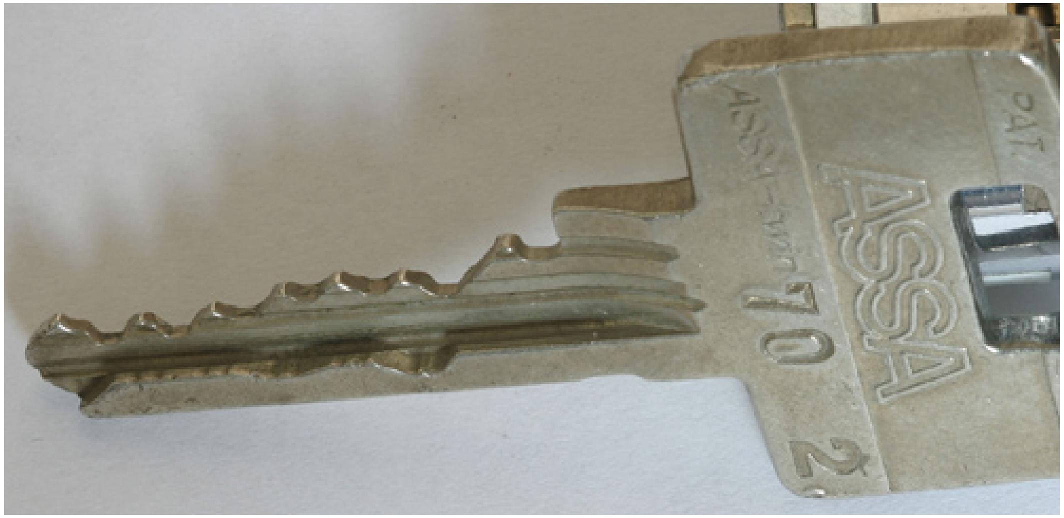
TMK	K		B	D	Q	D	K	M	B	D	Q	S
BASE	K			D	Q		K			D	Q	
GROUP 1	K			D	Q		K			D		S
GROUP 2	K			D	Q		K		B		Q	
GROUP 3	K			D	Q			M		D	Q	
GROUP 4	K			D		D	K			D	Q	
GROUP 5	K		B		Q		K			D	Q	

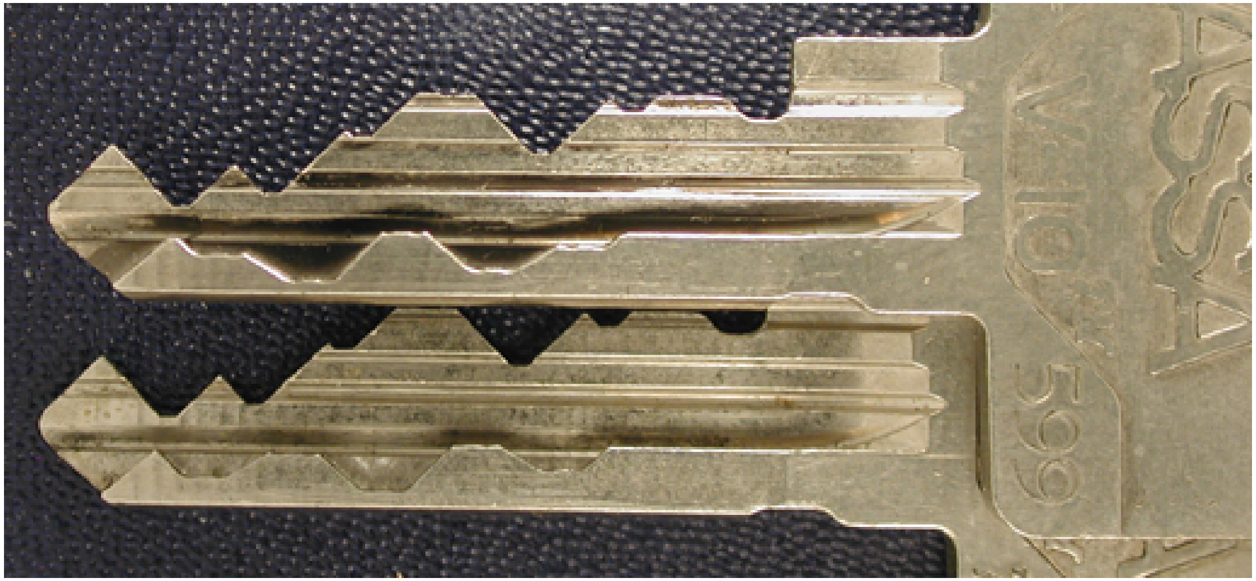
ASSA V10 (7000) SIDEBAR



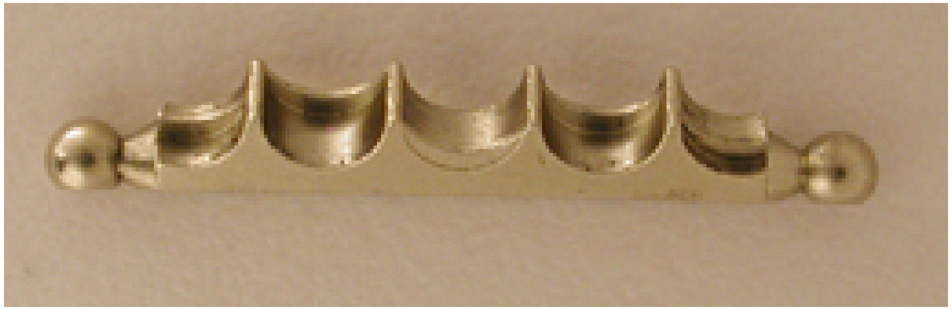


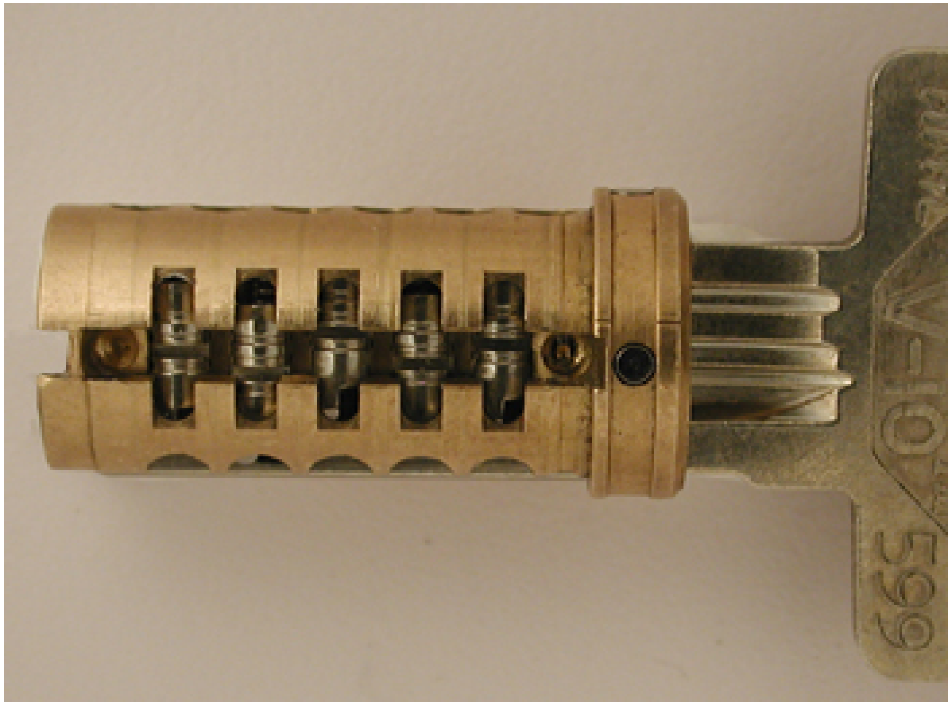
ASSA V10



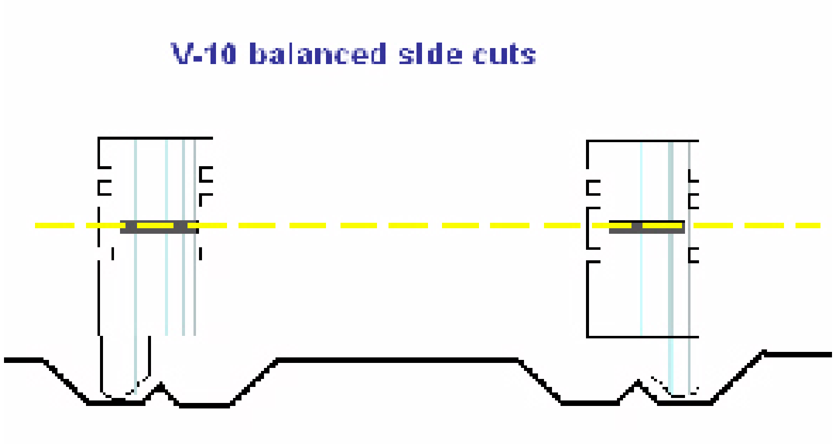


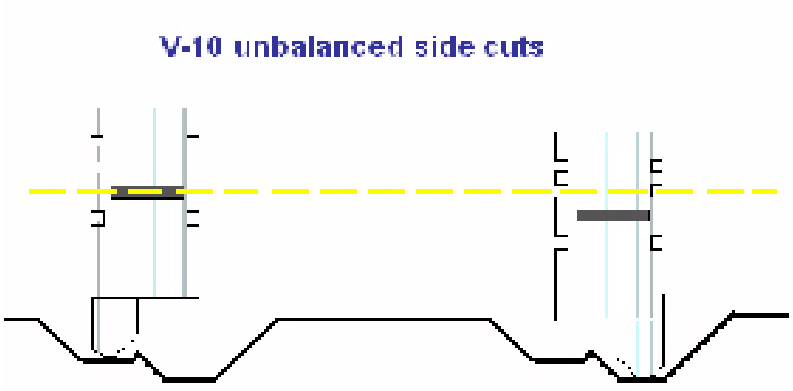
ASSA V10 SIDEBAR DETAIL



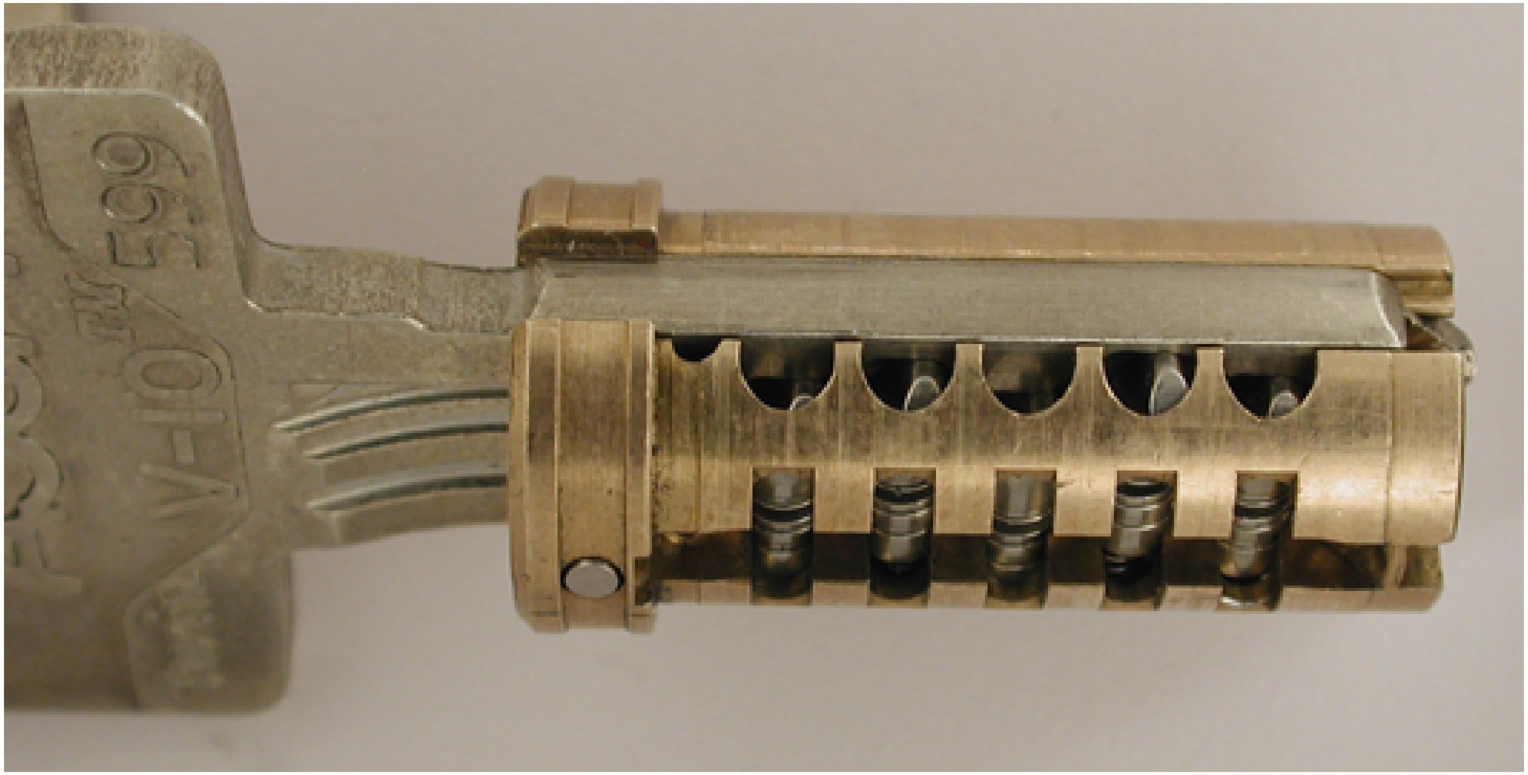


ASSA Right and Left Pins

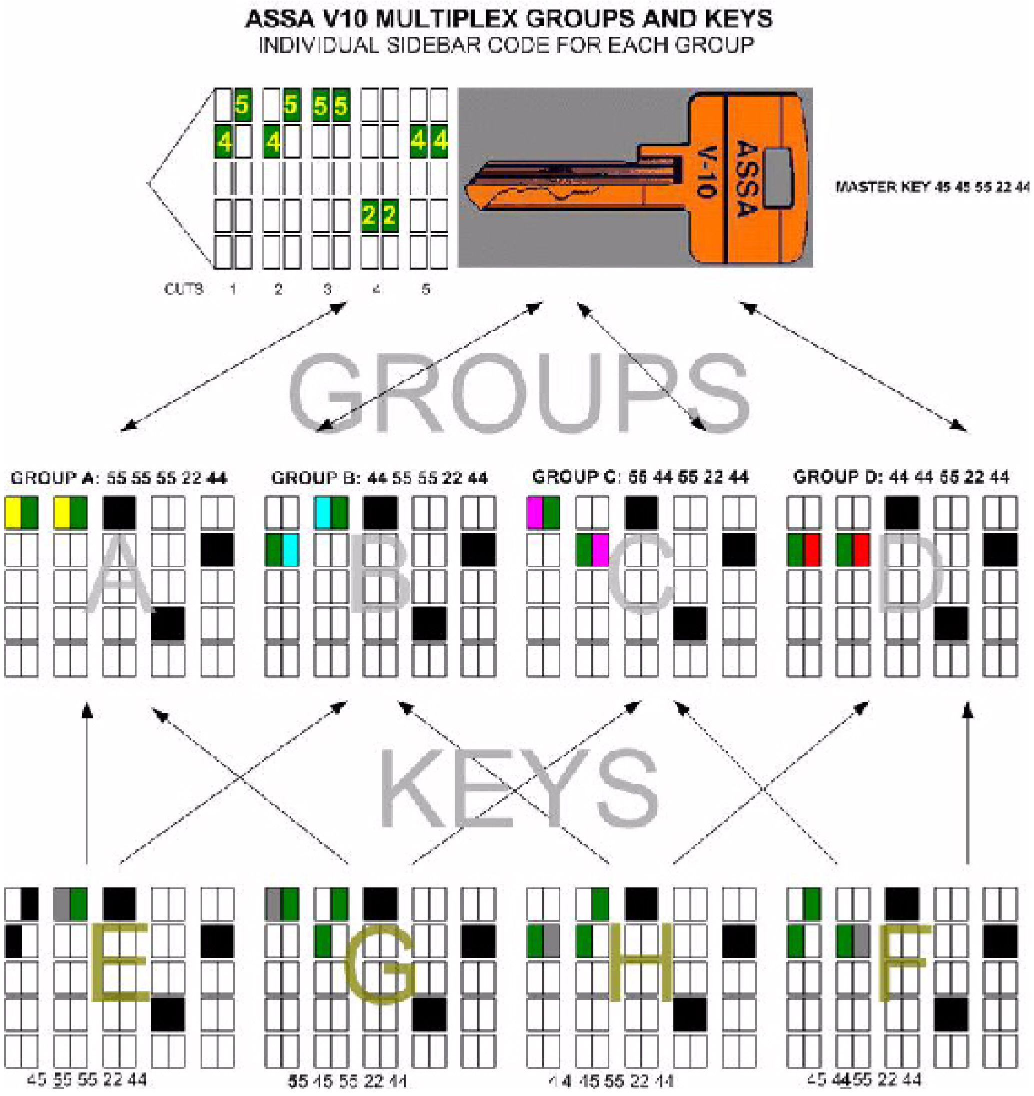

V-10 balanced side cuts


V-10 unbalanced side cuts

ASSA LEFT-RIGHT CONTACT



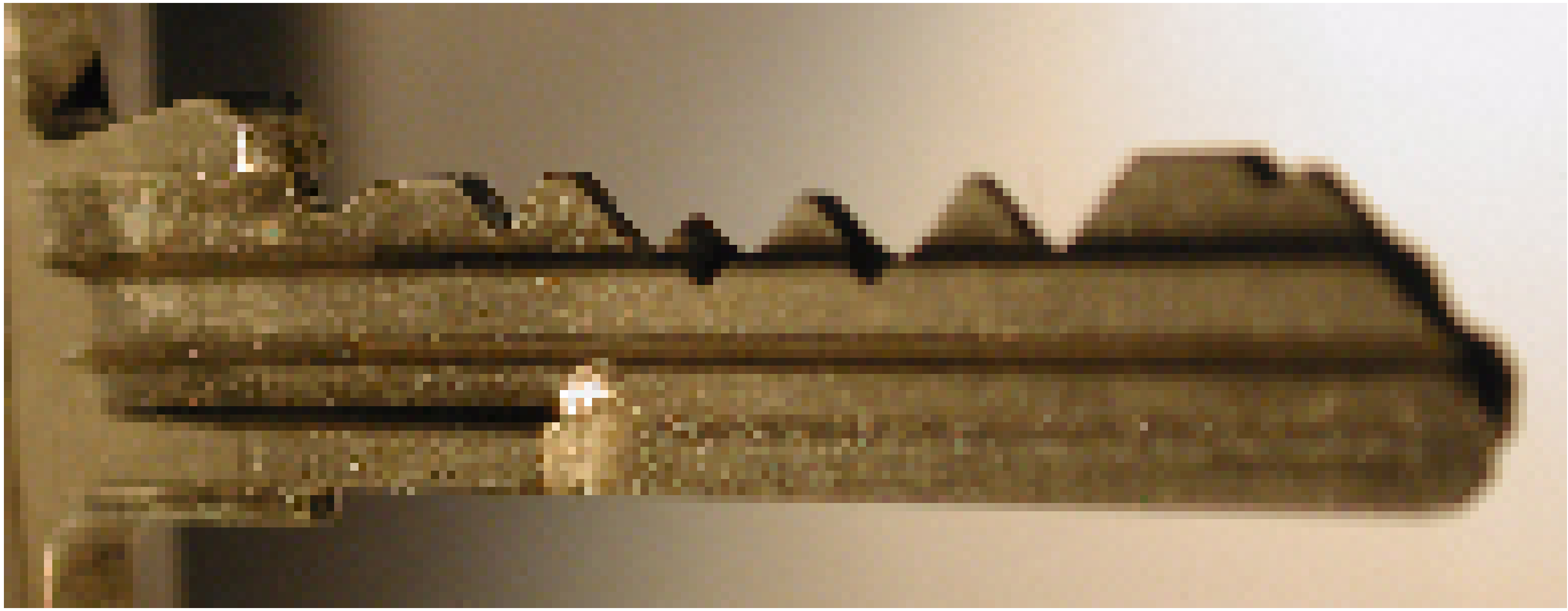
ASSA: Keys and Groups for Individual Sidebar Codes



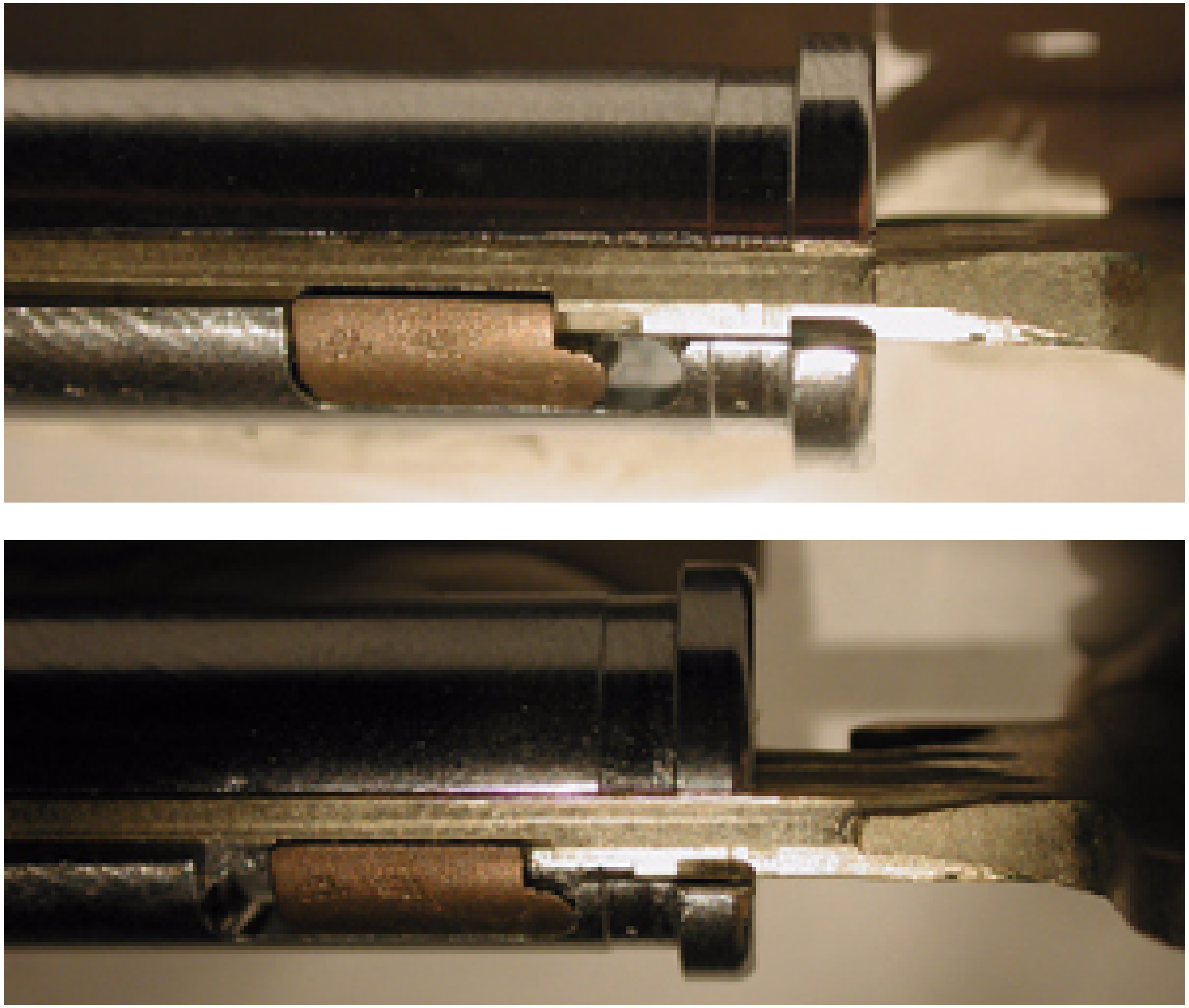
HIGH SECURITY LOCK

- Medeco M3
- Three levels of locking
  - Standard bitting
  - Sidebar
  - slider

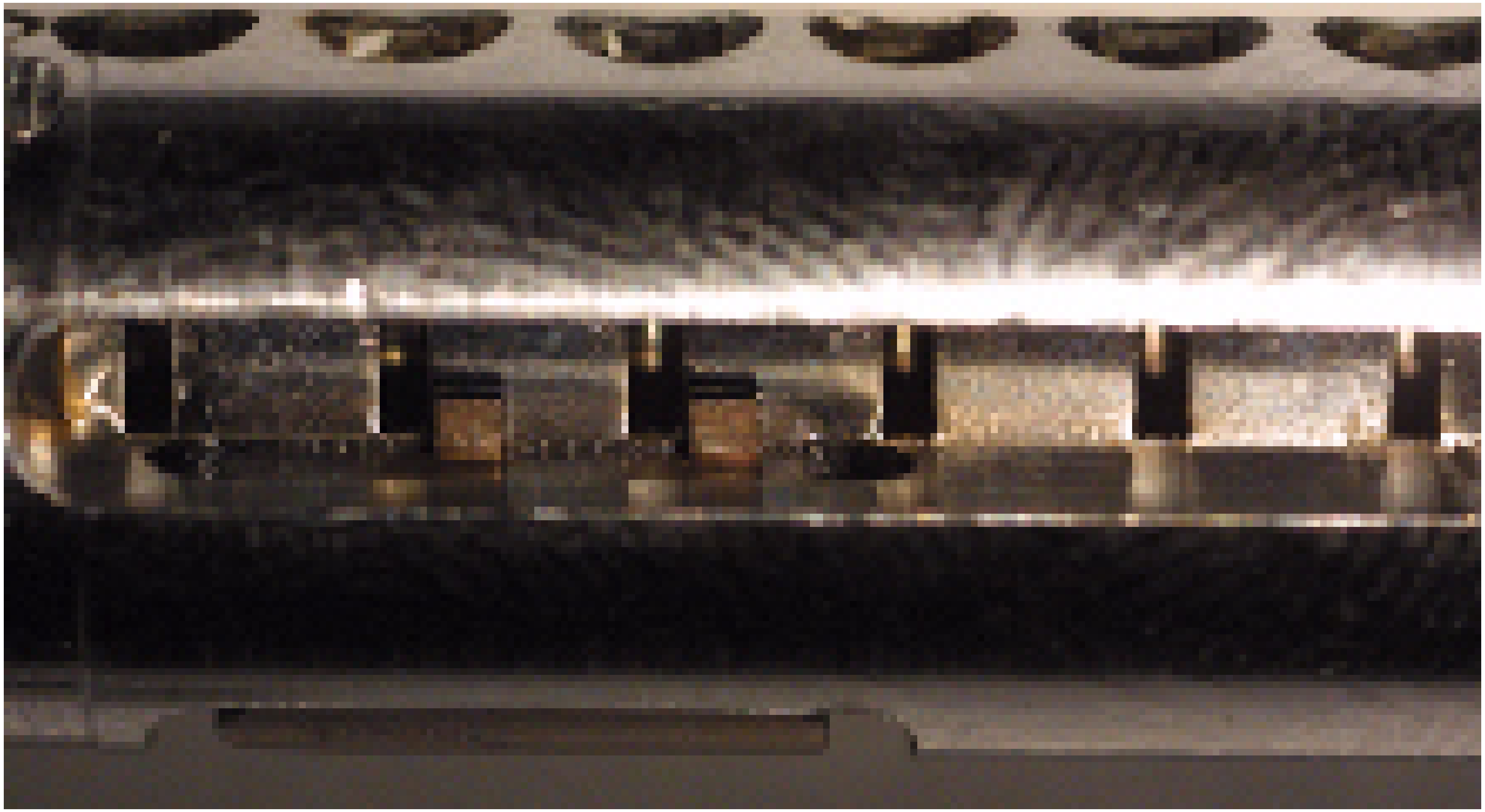
MEDECO M3



M3 SLIDER POSITIONS



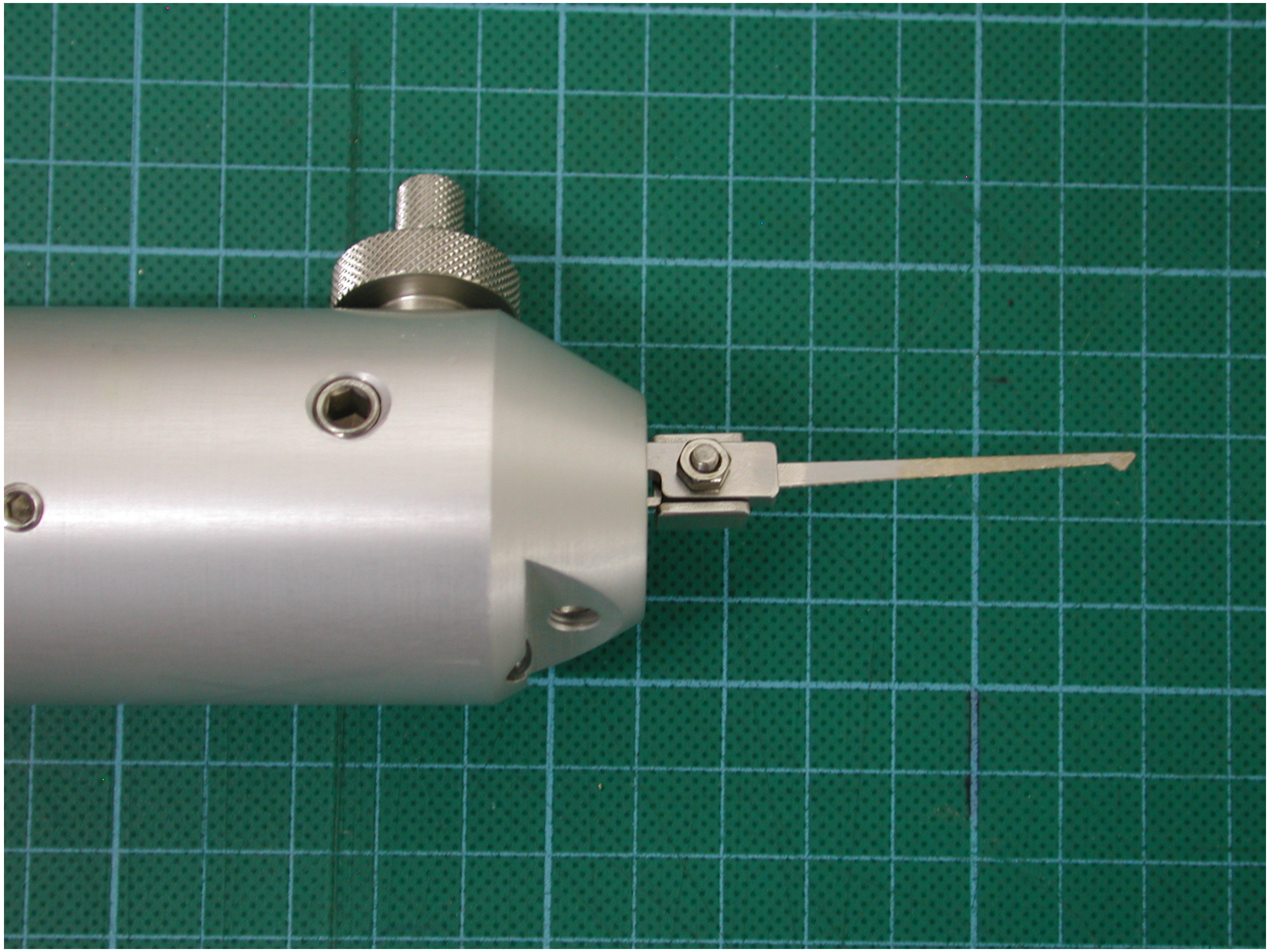
M3 SLIDER GATES



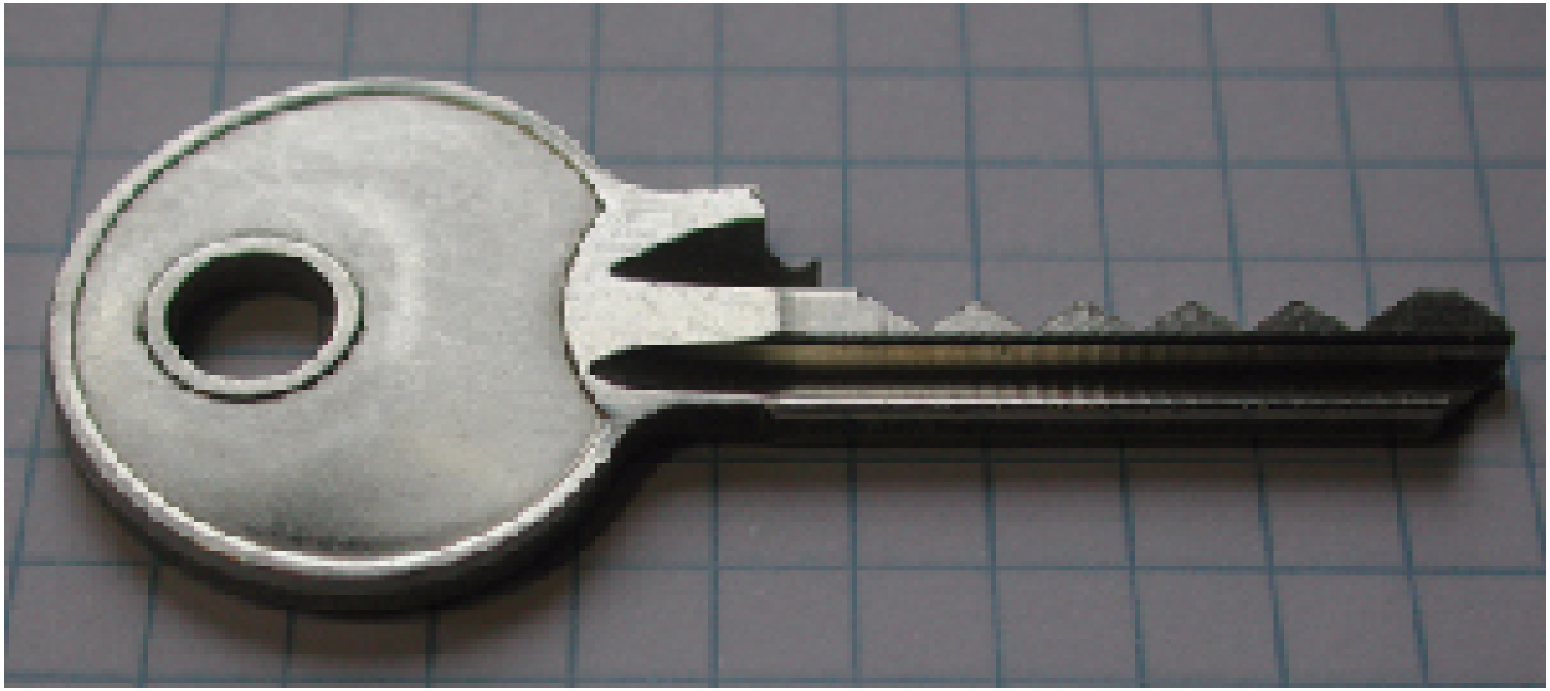
IMPACT PICKING

- PICK GUN
- VIBRATING ELECTRO-PICK
- 999 BUMP KEY

ELECTROPICK

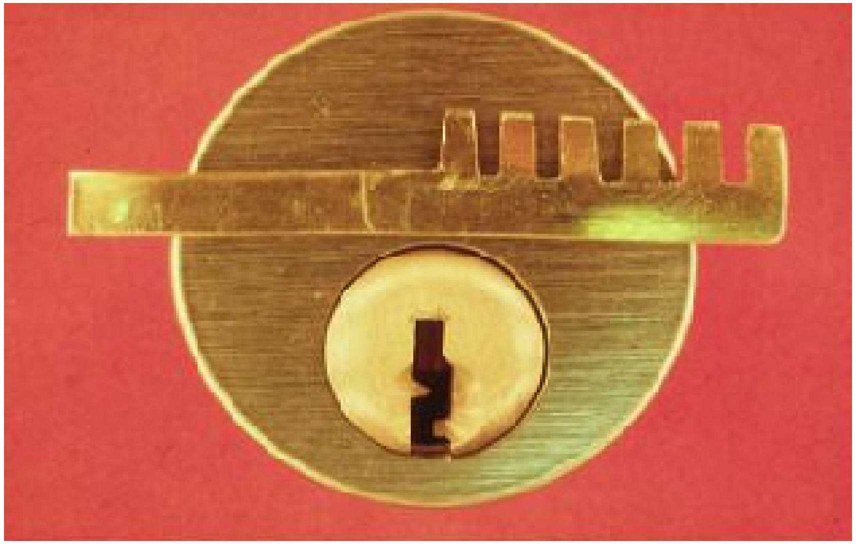


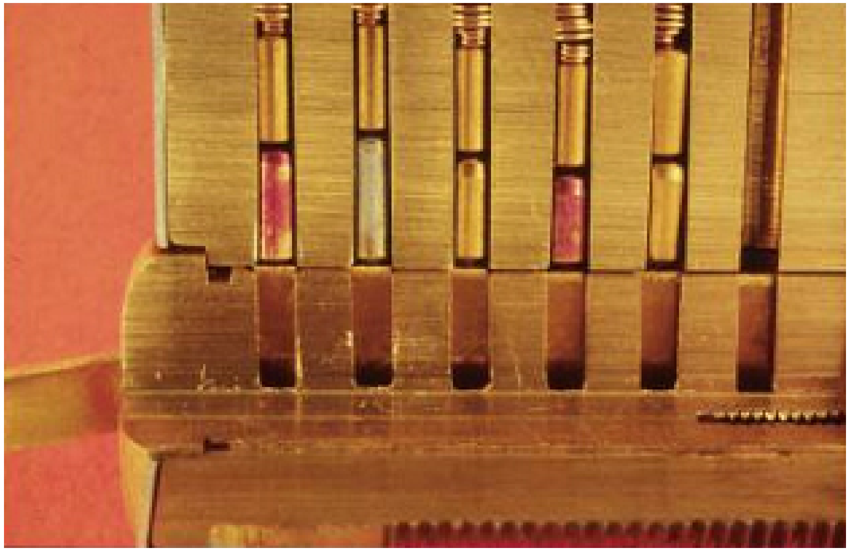
999 Bump Key



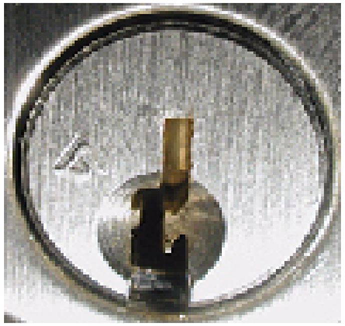
999 BUMP KEY DEMONSTRATION

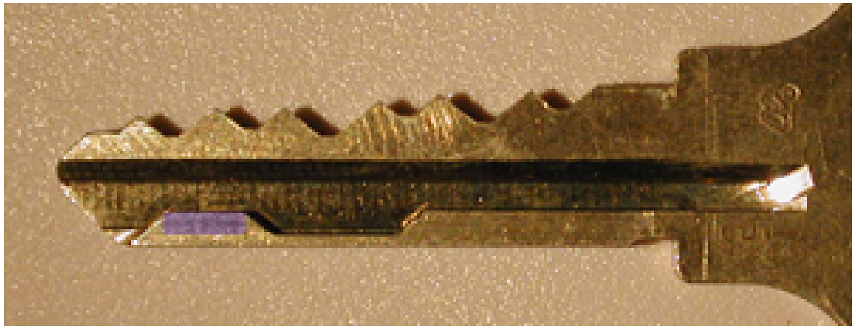
Comb picking

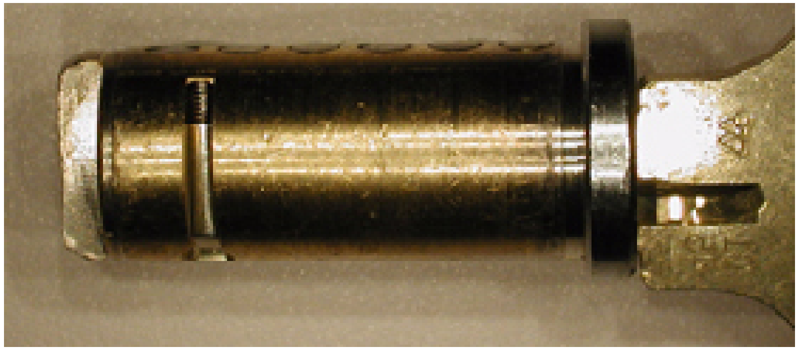


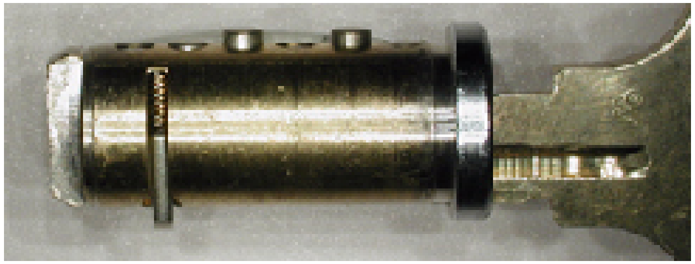


Schlage Everest

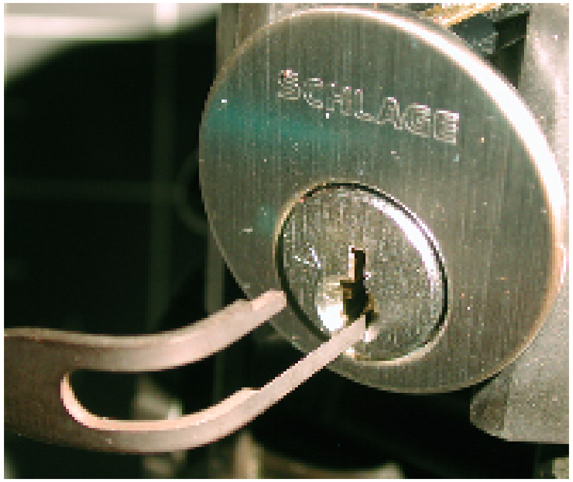


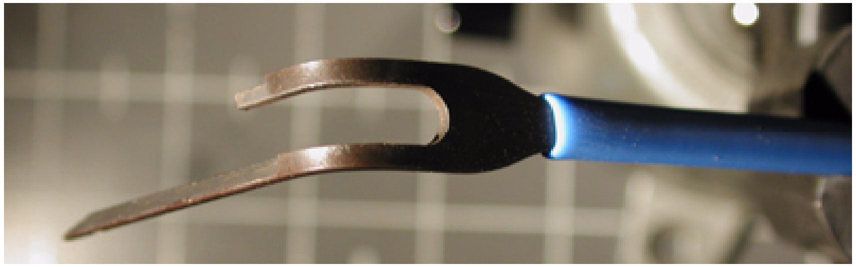




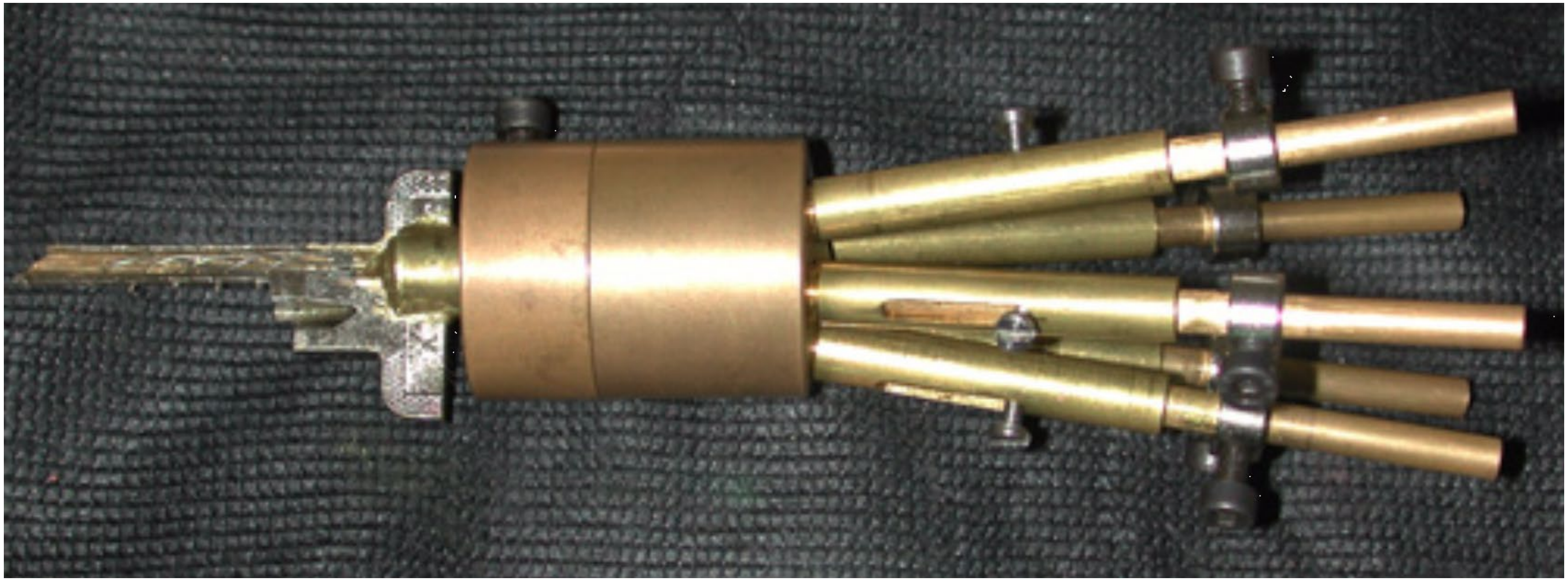


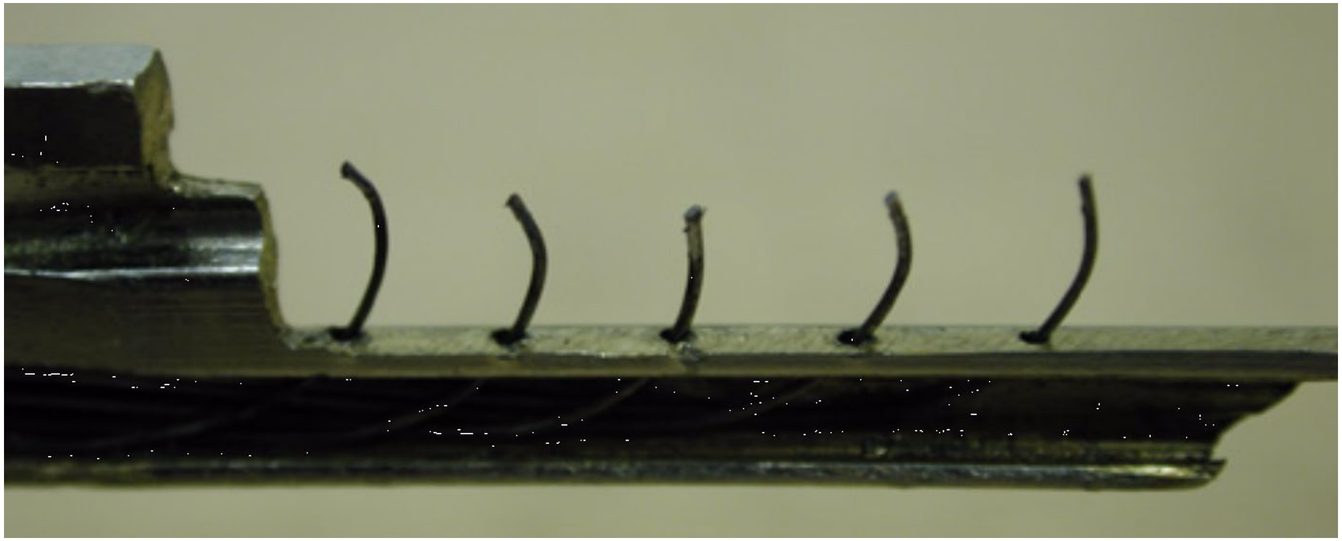
Schlage Everest: Picking



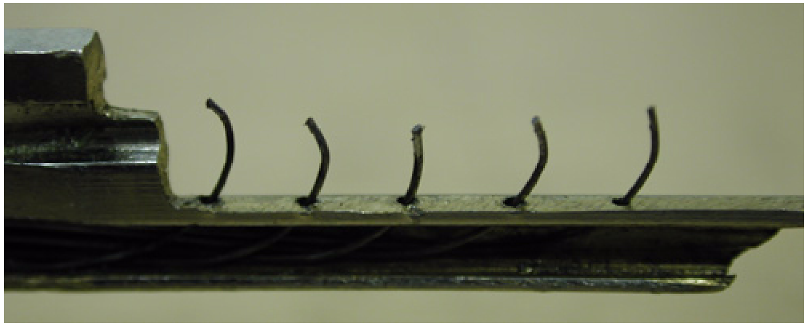


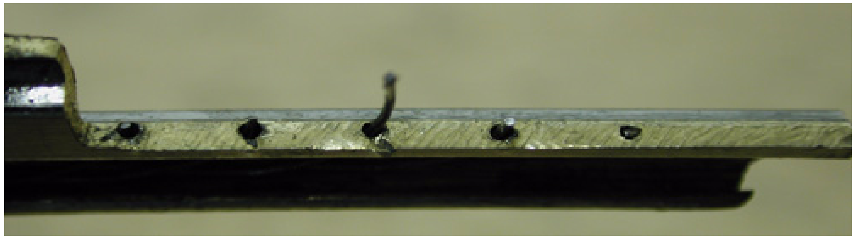
SPUTNIK PICK

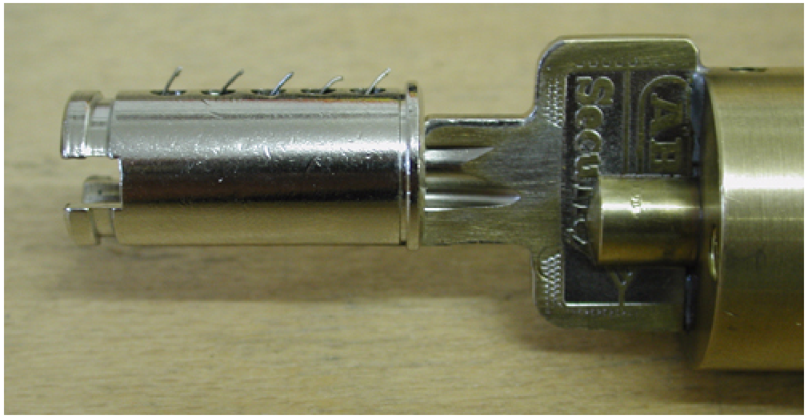




Feeler wires for Picking



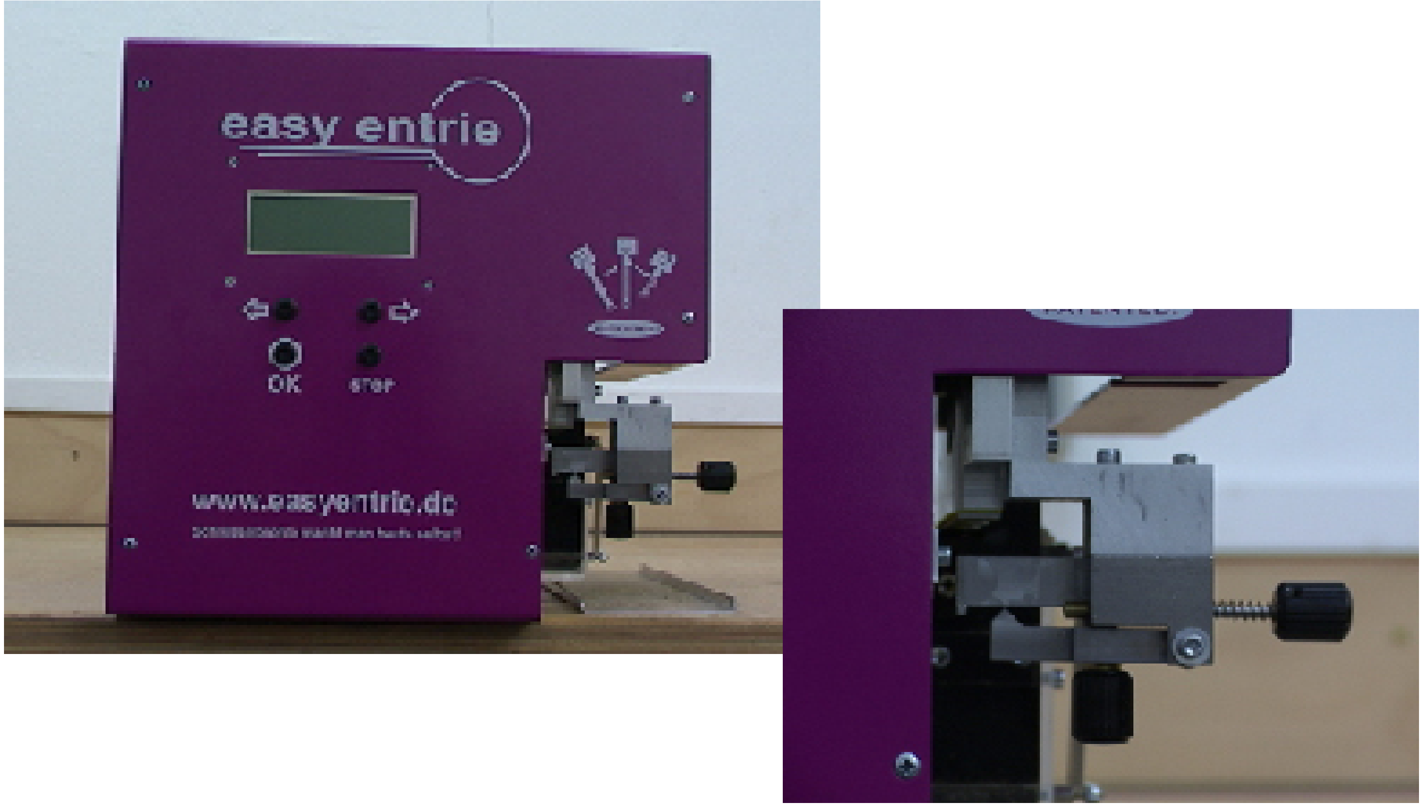




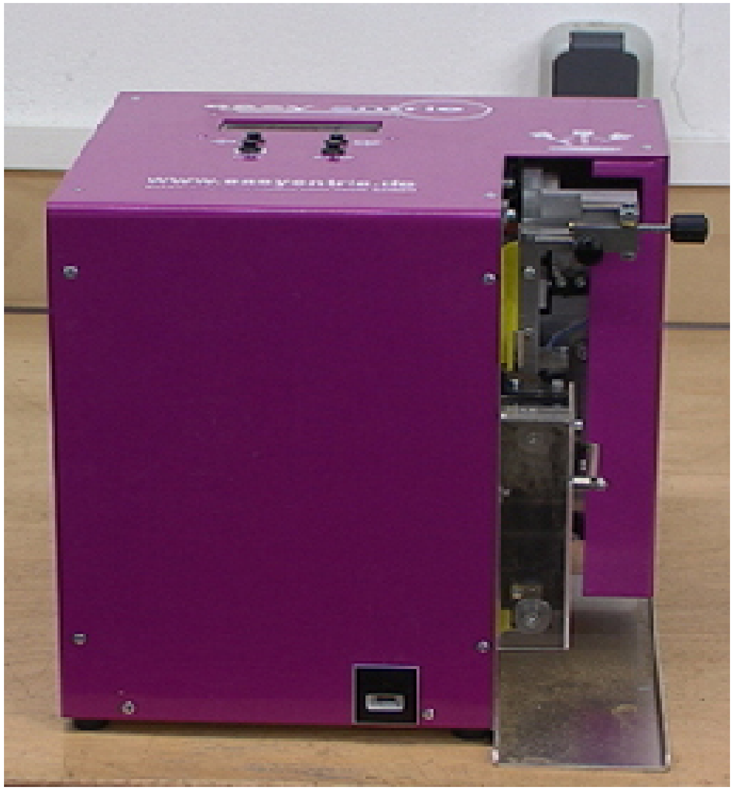
EASY ENTRIE

- PROFILE MILLING MACHINE
- REPLICATE RESTRICTED BLANKS FROM CUT KEYS
- GENERATE RESTRICTED BLANKS FROM PHOTOGRAPHS OF KEYWAY

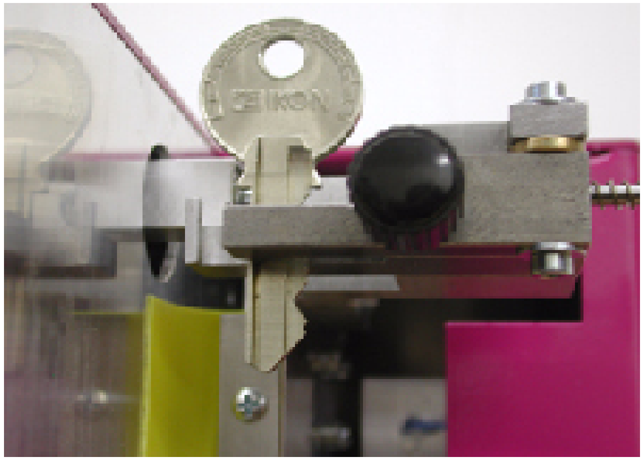
EASY ENTRIE

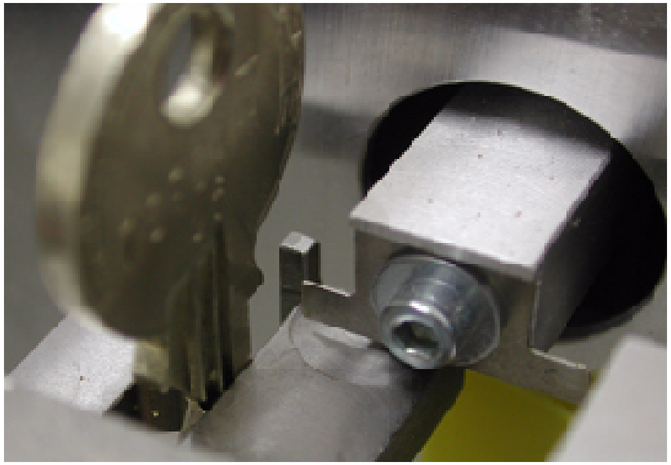


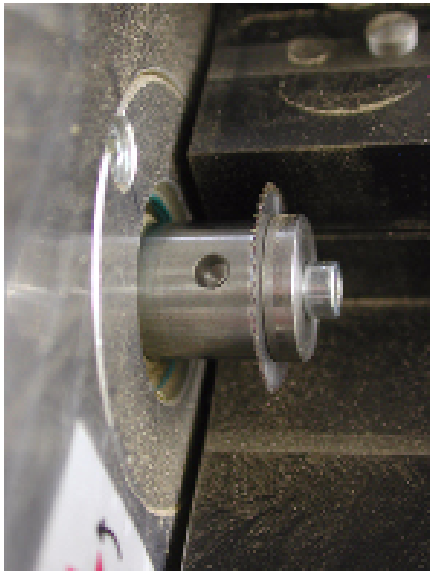
EASY ENTRIE PROFILE MILLING MACHINE

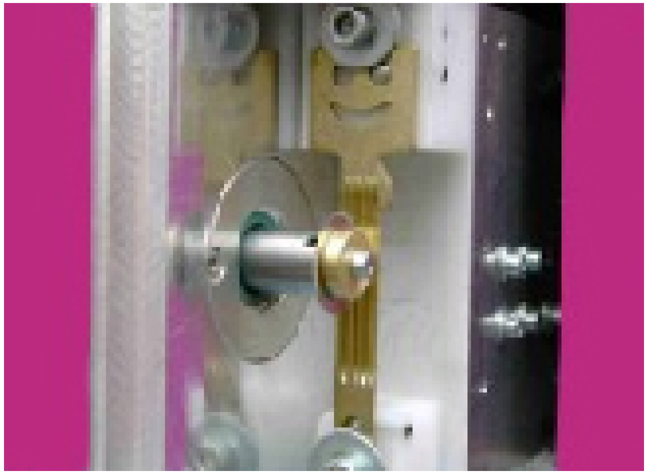


EASY ENTIRE COMPONENTS

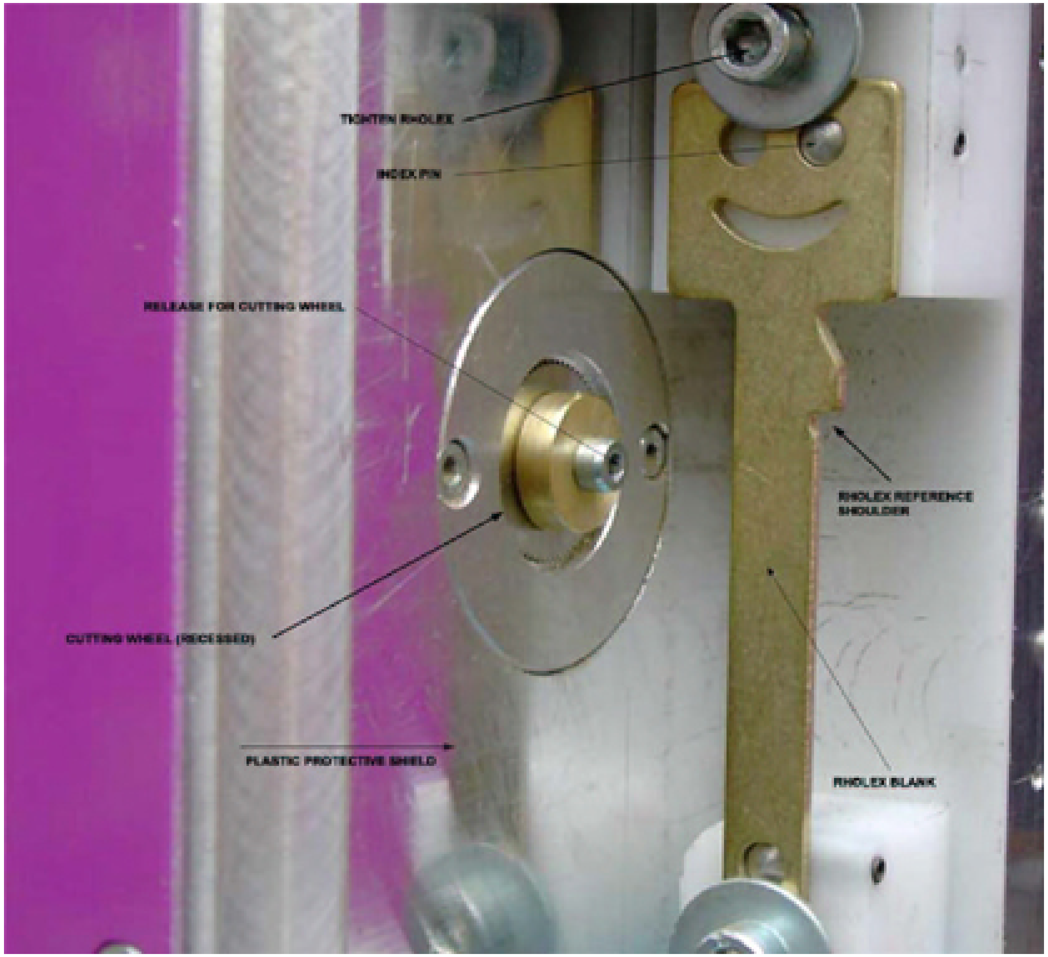




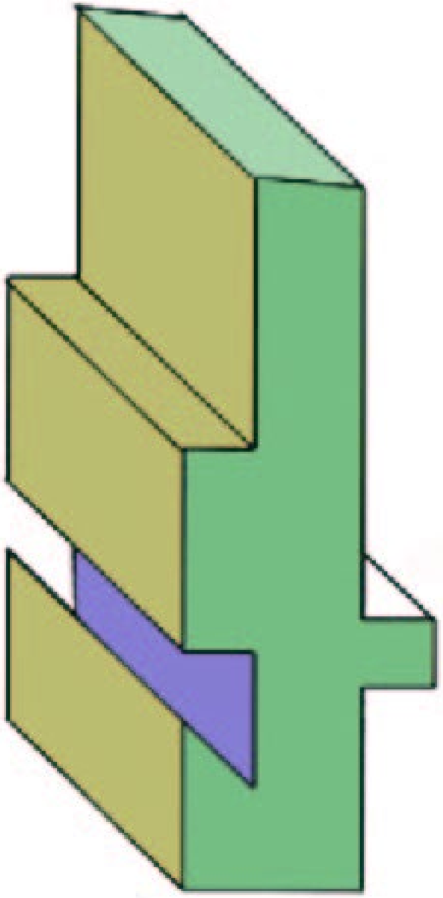


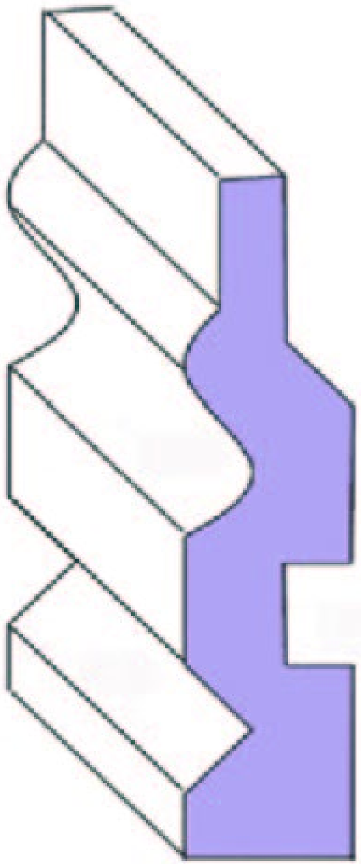


Easy Entrie Profile Milling

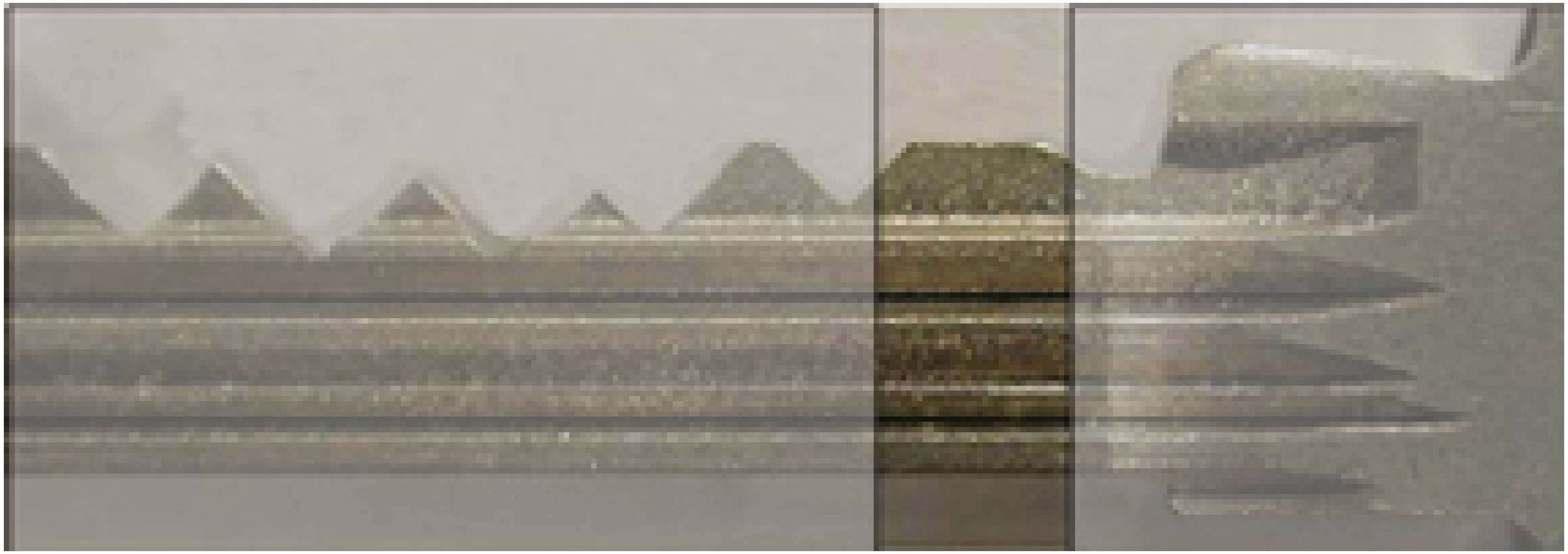

TIGHTEN RHOLEX
INDEX PIN
RELEASE FOR CUTTING WHEEL
RHOLEX REFERENCE SHOULDER
CUTTING WHEEL (RECESSED)
RHOLEX BLANK
PLASTIC PROTECTIVE SHIELD

Profile Measurement

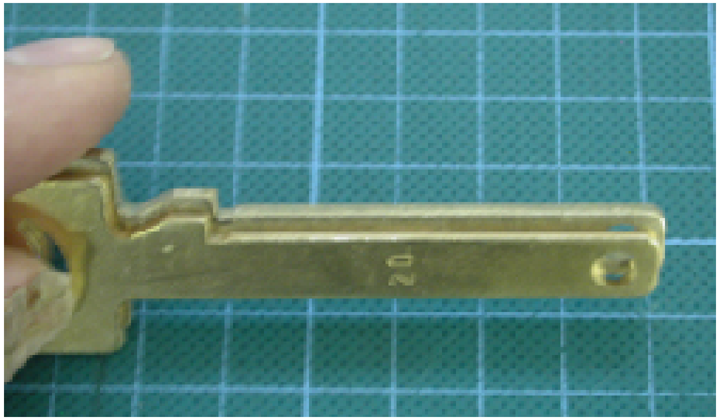


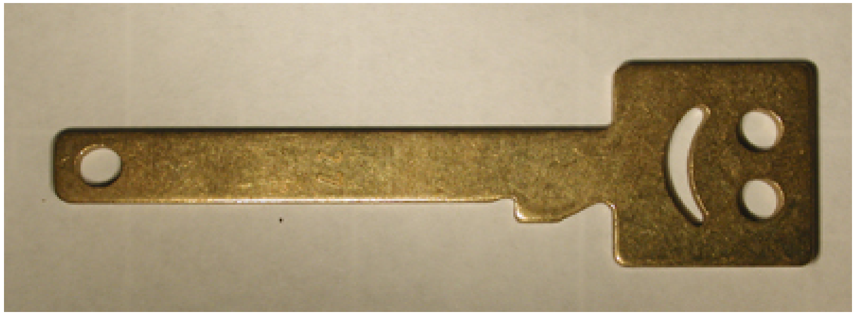


Change key to Blank key



EASY ENTRIE KEYS





EASY ENTRIE PC

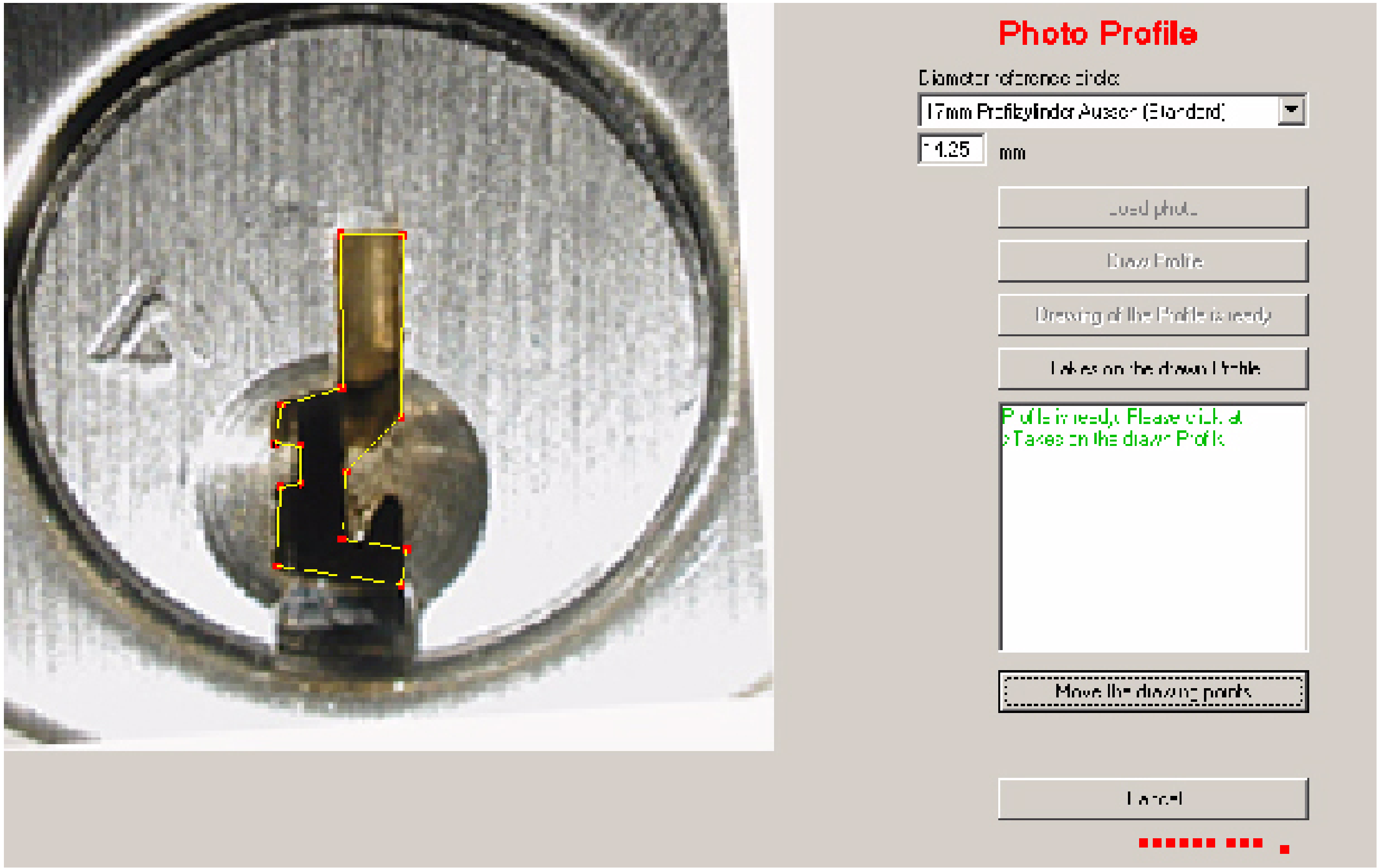


Photo Profile

Diameter reference circle

17mm Profilzylinder Aussen (Standard) ▼

11.25 mm

Load photo

Draw Profile

Drawing of the Profile is ready

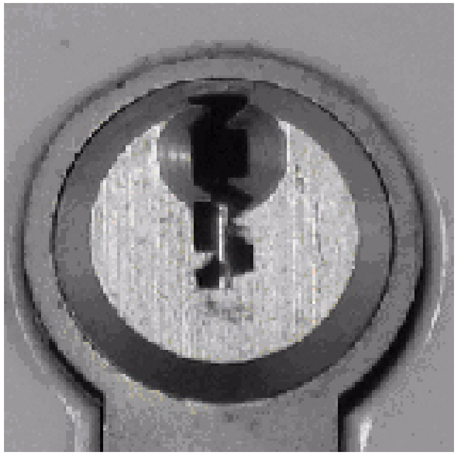
Takes on the drawn Profile

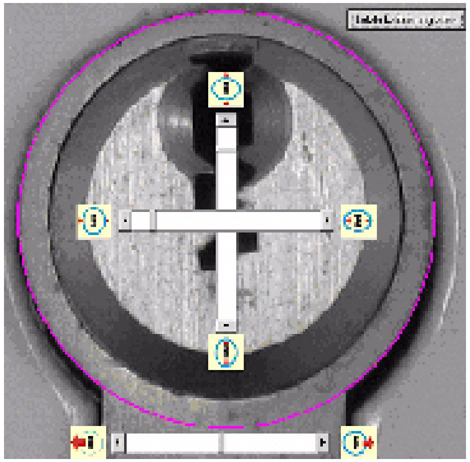
Profile is ready, Please click at
>Takes on the drawn Profile

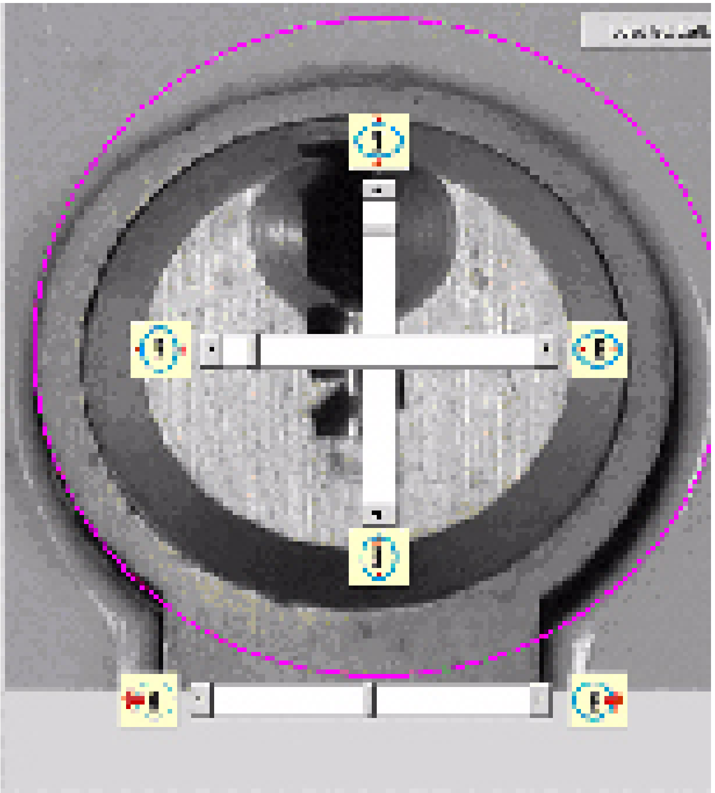
Move the drawing points

Cancel

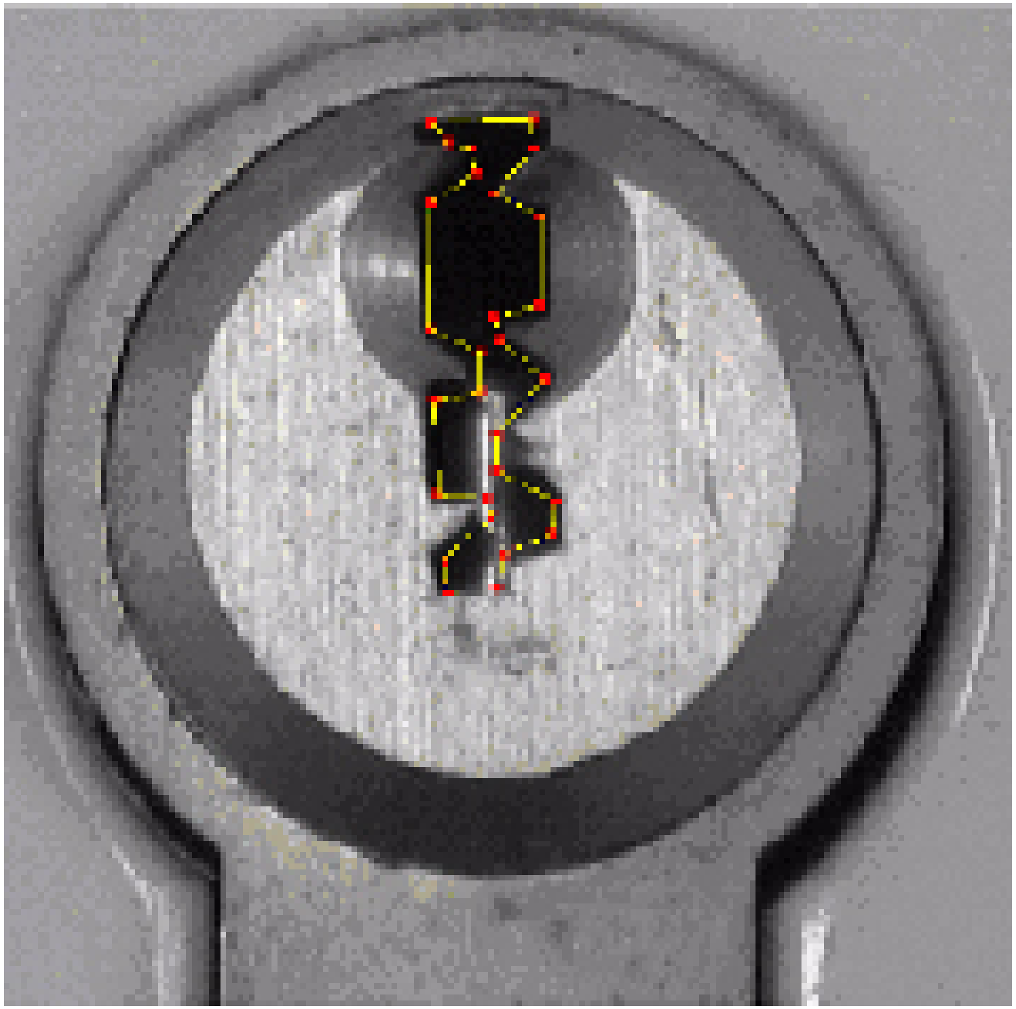
EASY ENTRIE PC



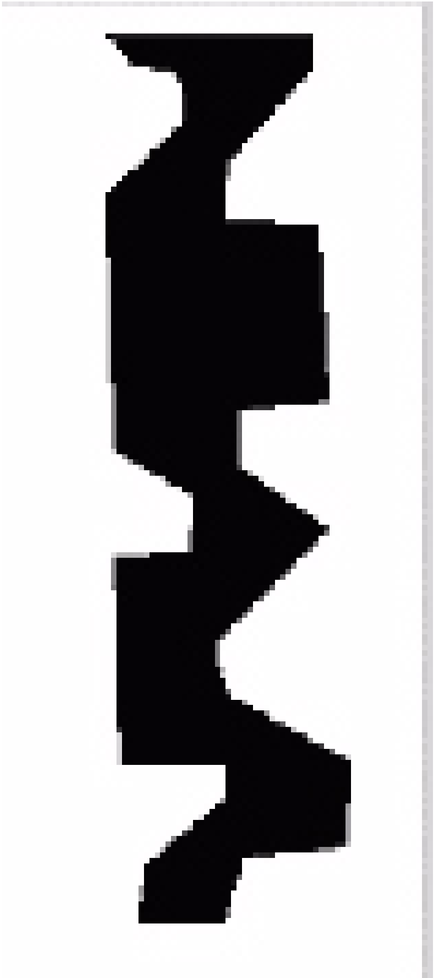


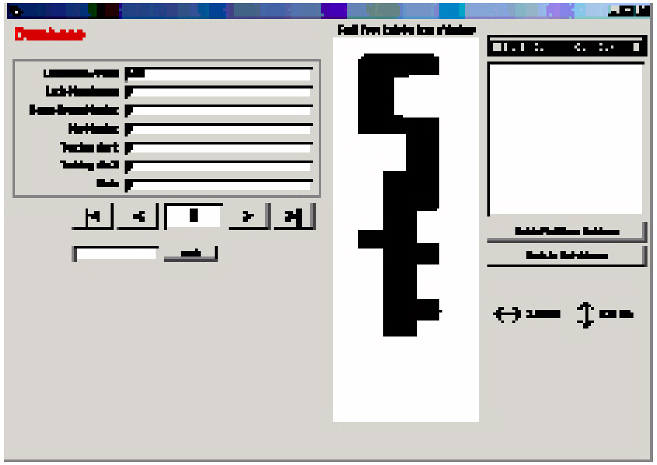


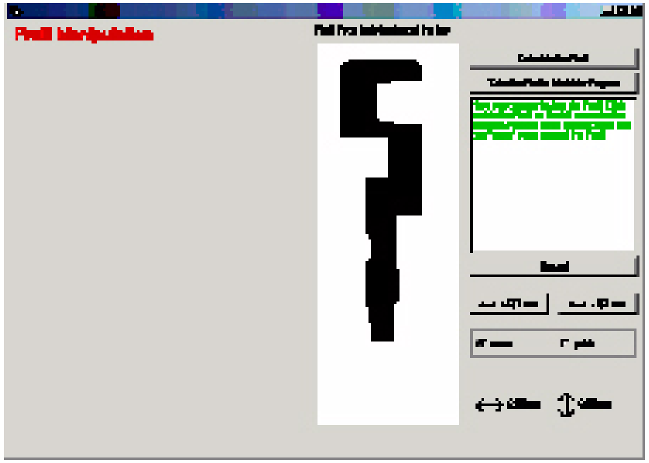
EASY ENTRIE DRAW MODE



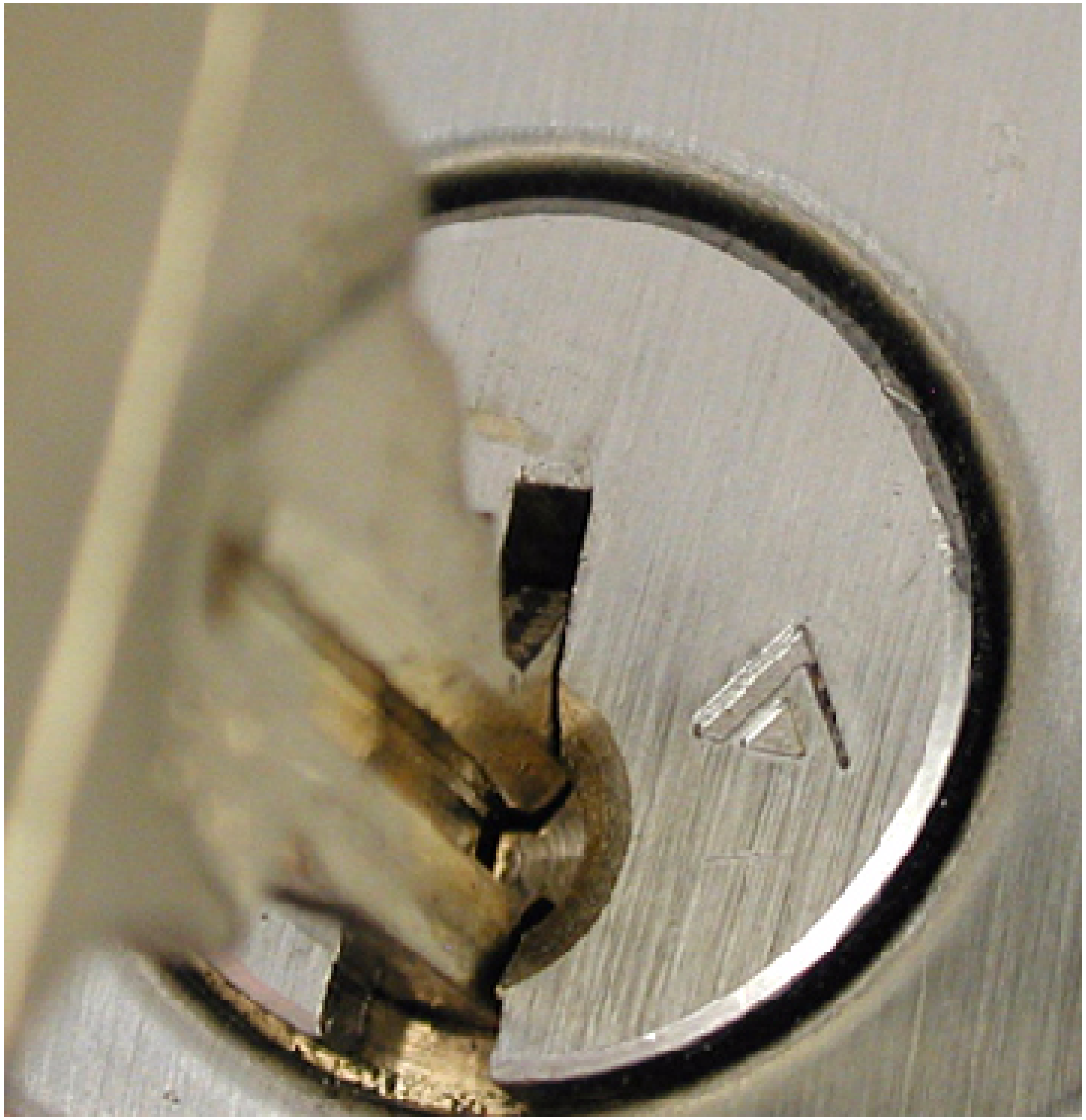
MODIFY PROFILE



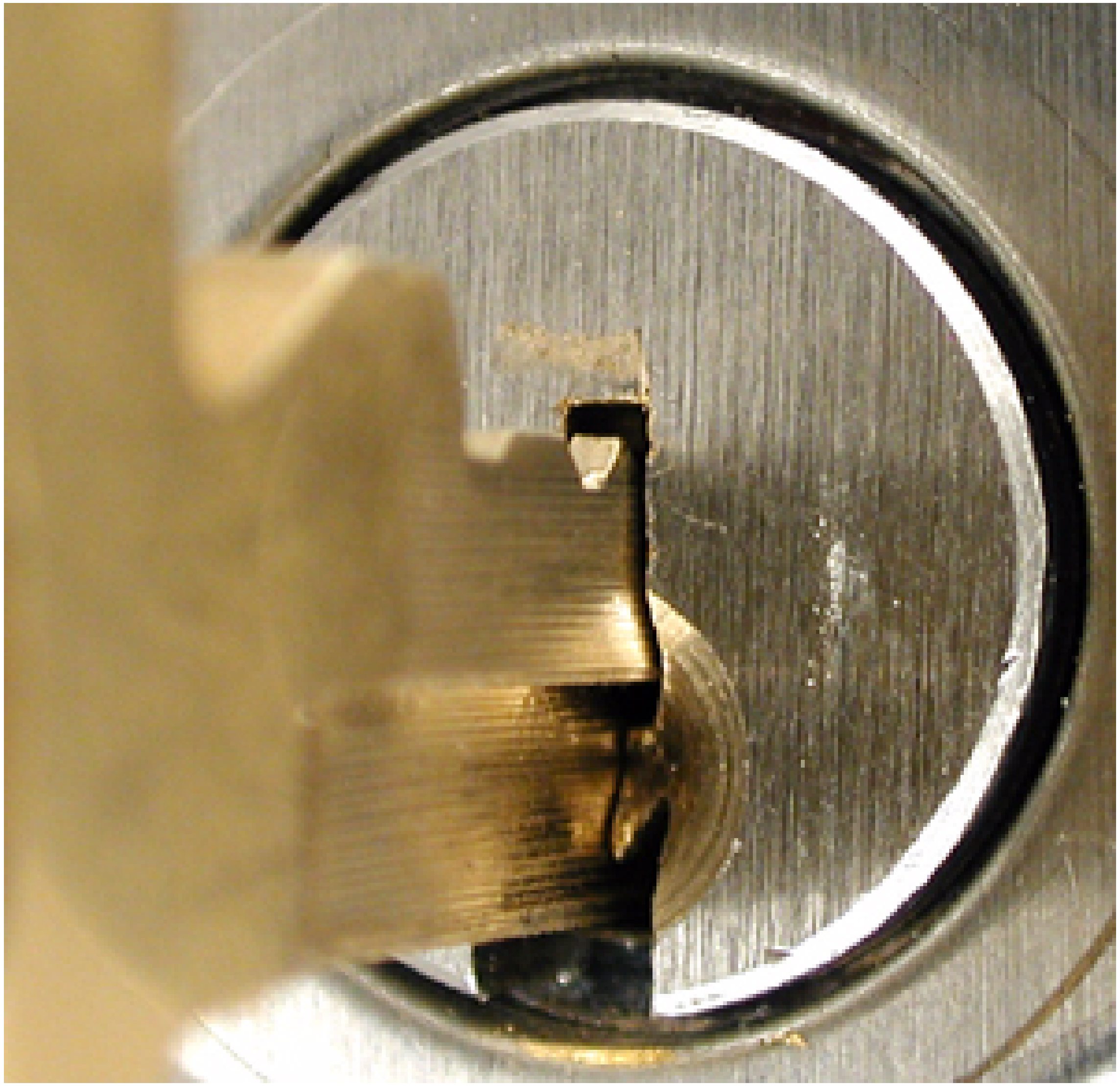




Original Profile: Everest



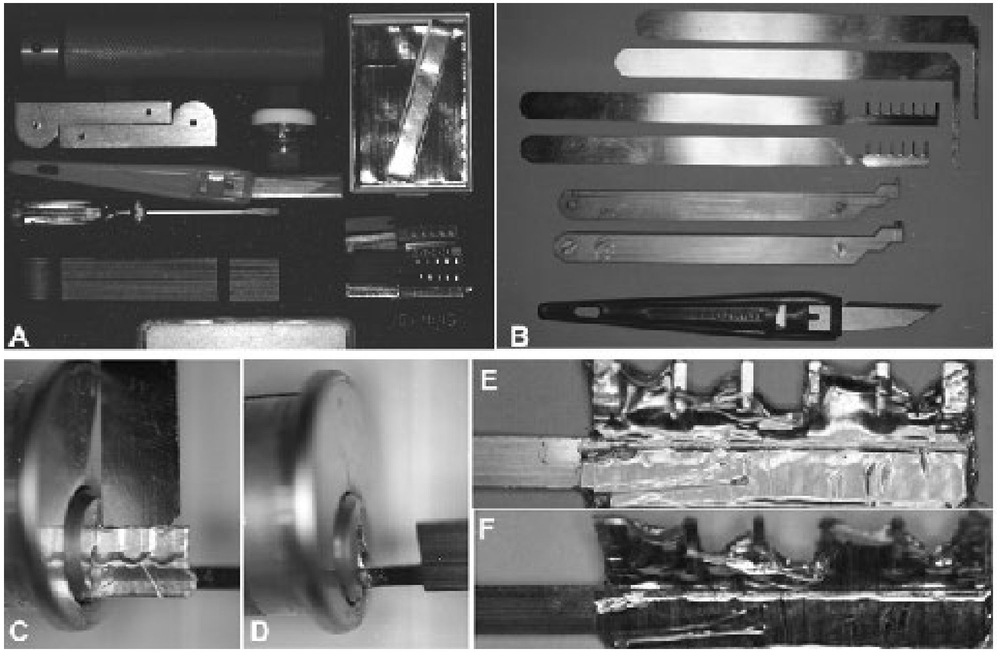
Modified Profile: Everest

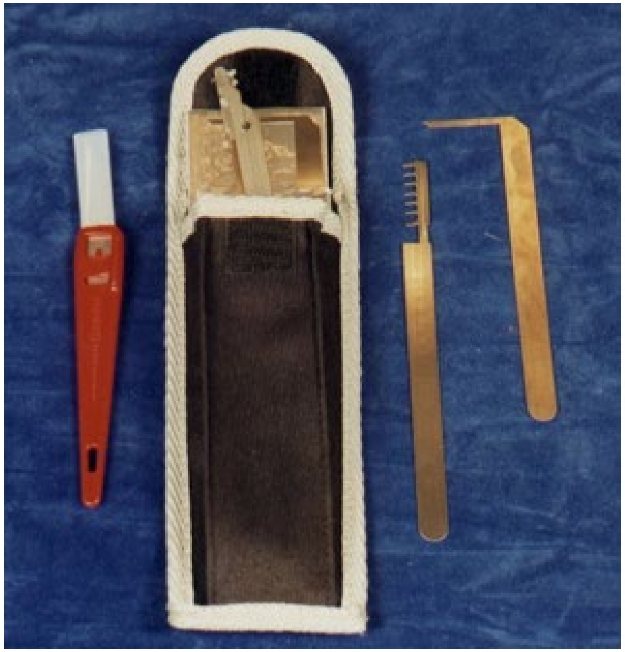


IMPRESSIONING NOTES

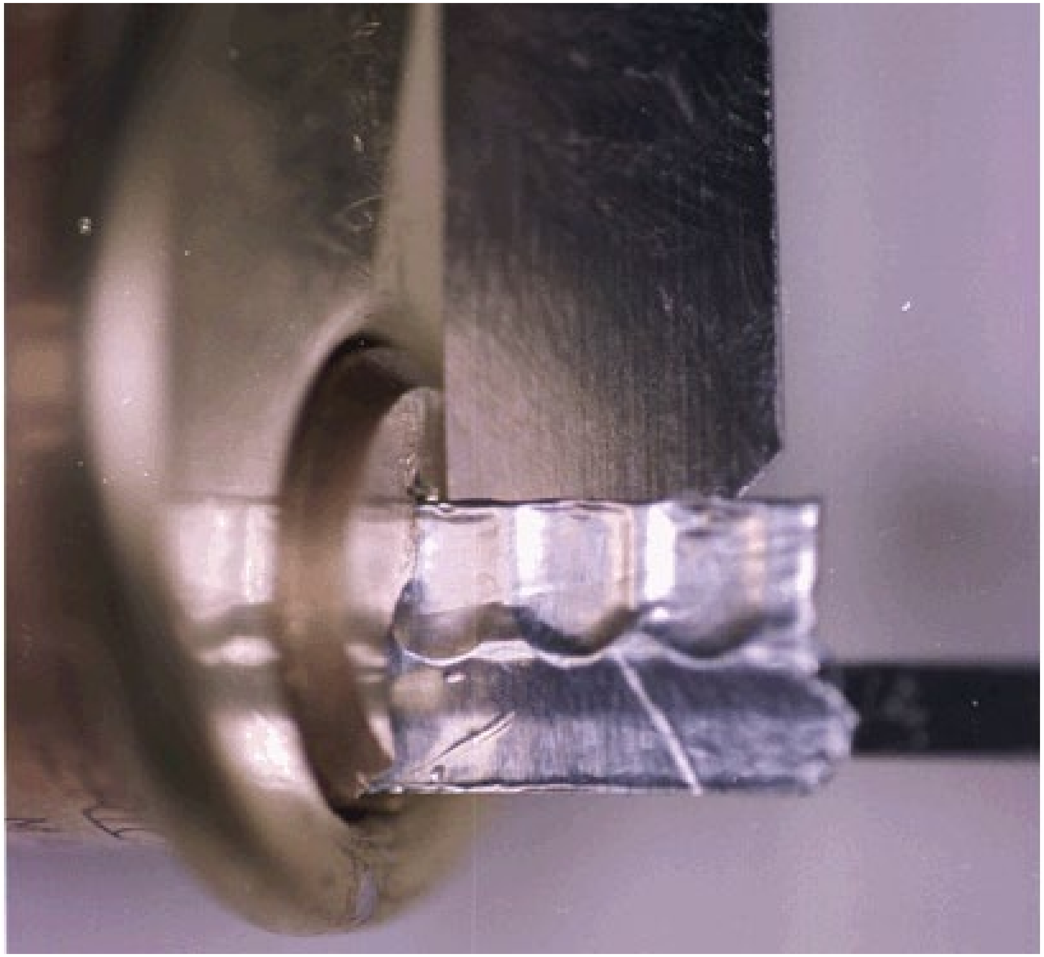
- JOHN FALLE FOIL KIT
- COMPUTER LOCK

FOIL IMPRESSIONING TOOLS

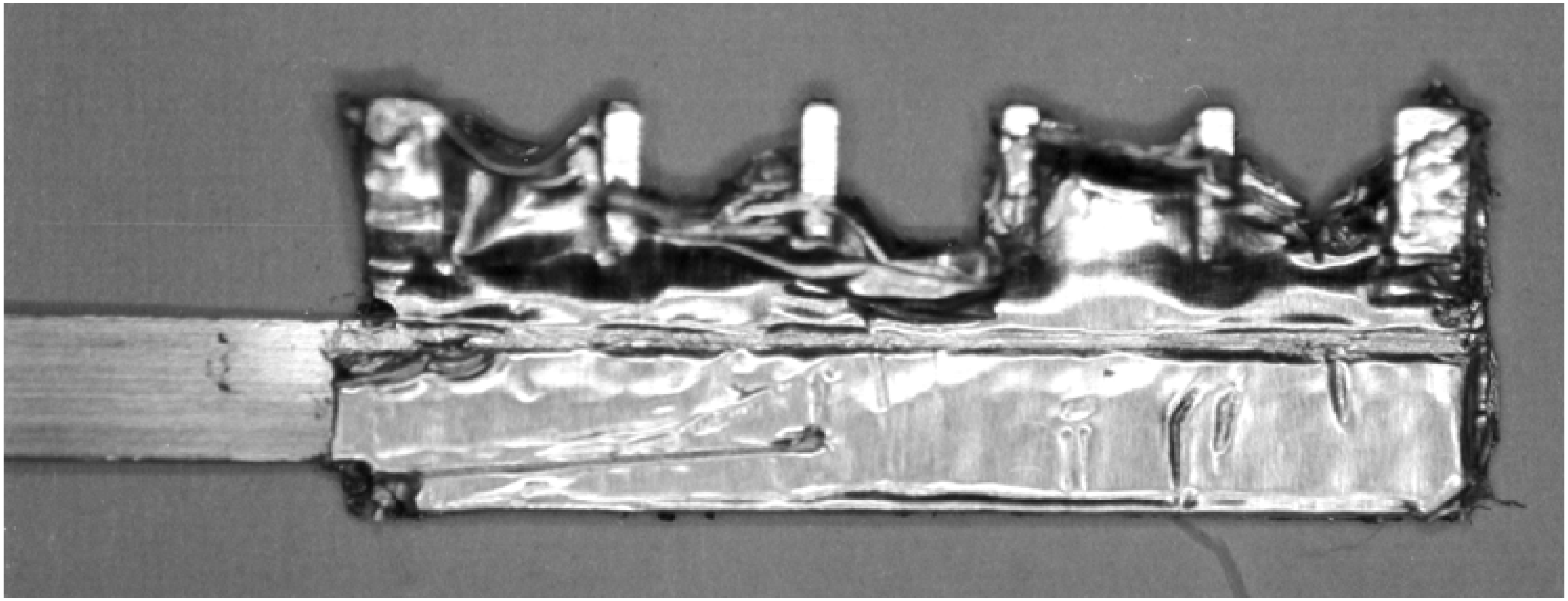




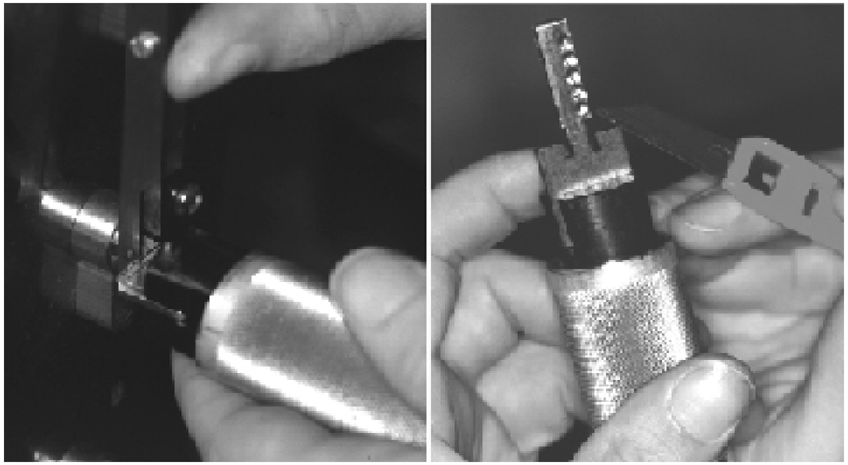
Foil Blank Key is Inserted

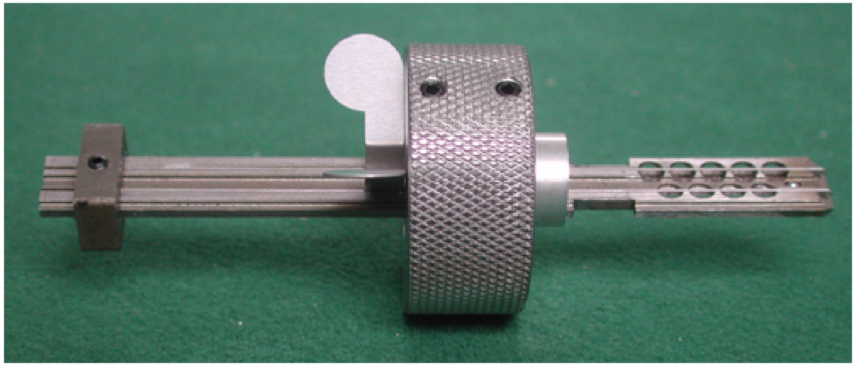


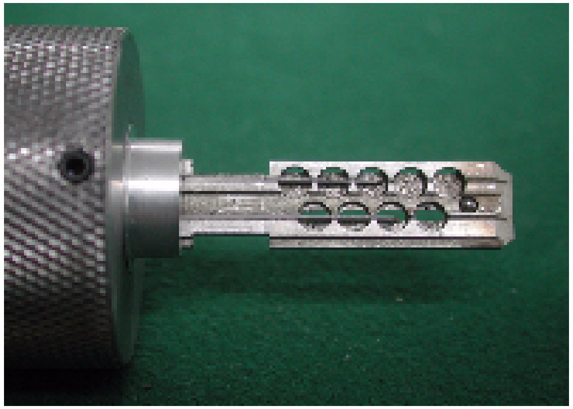
Foil Key is Produced



Falle Foil impressioning



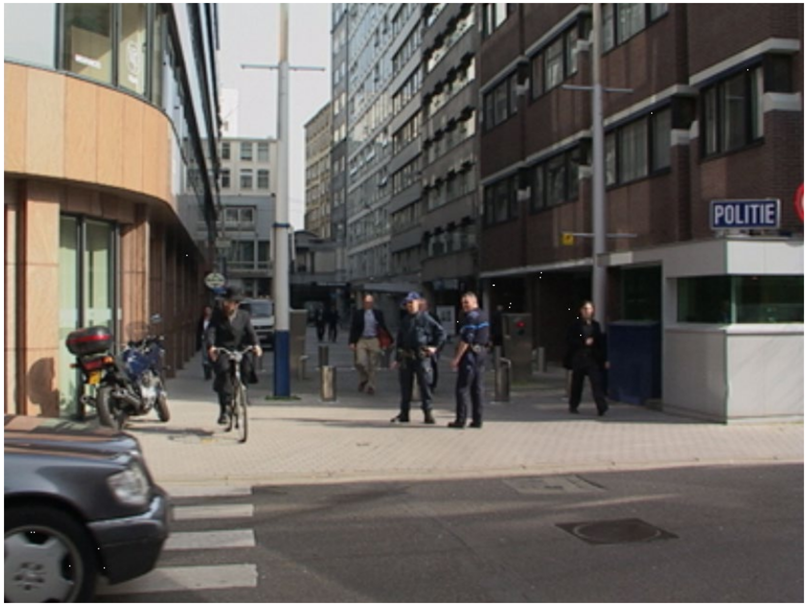




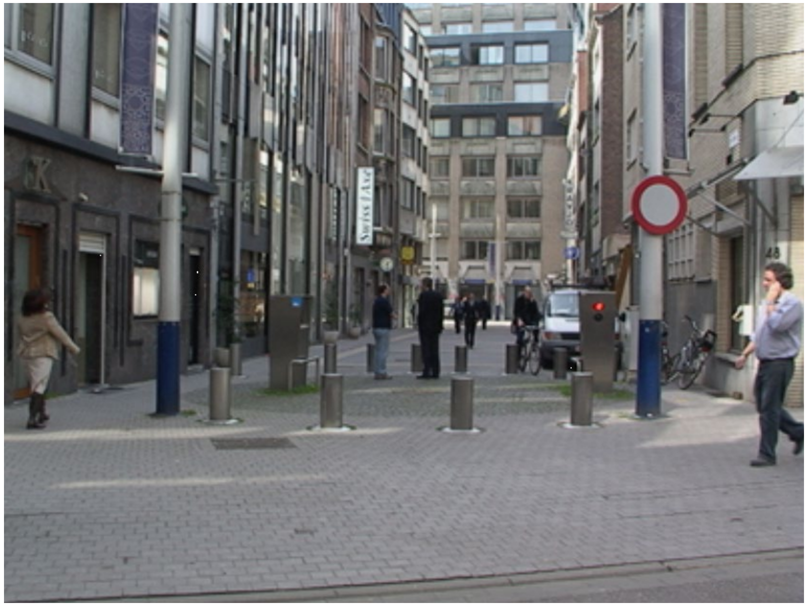
ANTWERP DIAMOND THEFT

- HOW TO STEAL $100,000,000
- 7 CAREER CRIMINALS
- TWO YEARS IN PLANNING
- NO DIAMONDS RECOVERED
- FIVE YEAR MAXIMUM PENALTY

DIAMOND EXCHANGE ENTRANCE



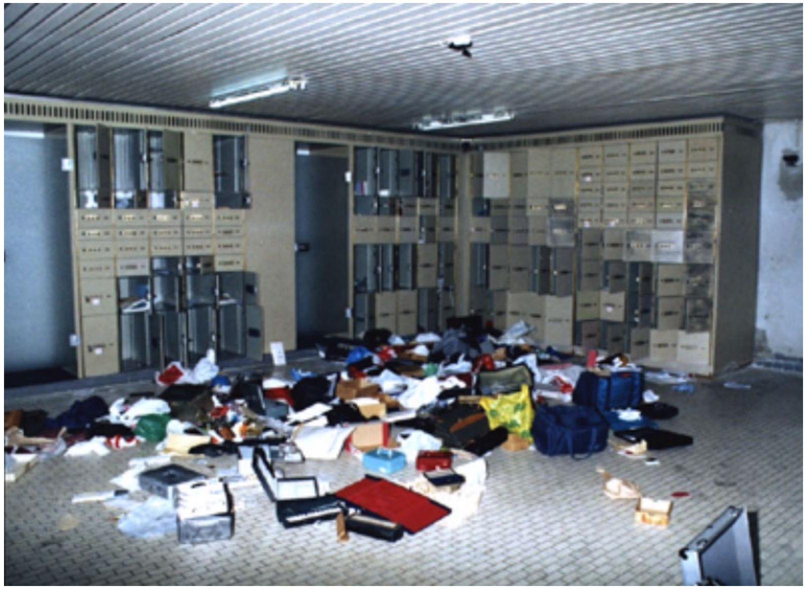
LIMITED ACCESS



DIAMOND CENTER BUILDING

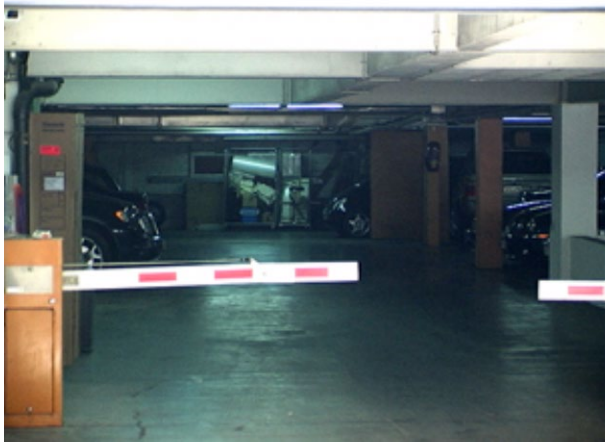
SECURE ENTRY

2/17/2003

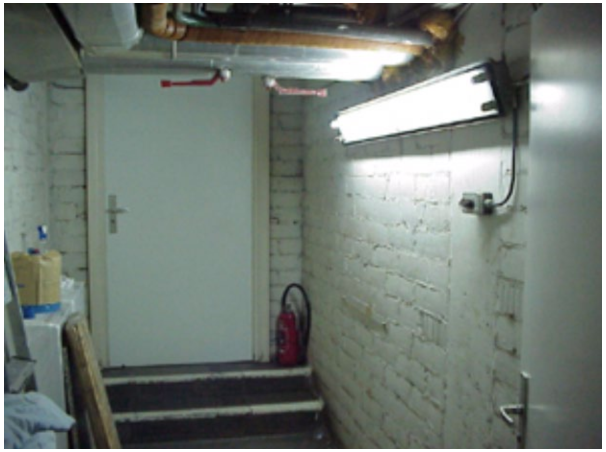


PARKING GARAGE

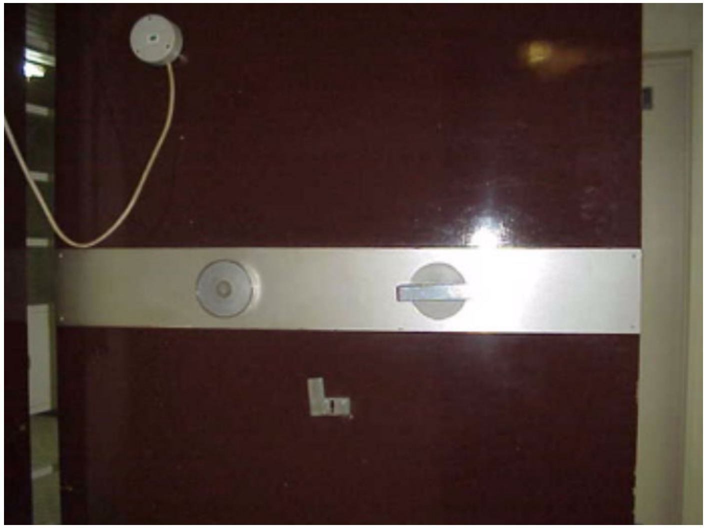
GARAGE ACCESS



NO ALARM TO VAULT AREA



LIPS VAULT, TWO LOCKS



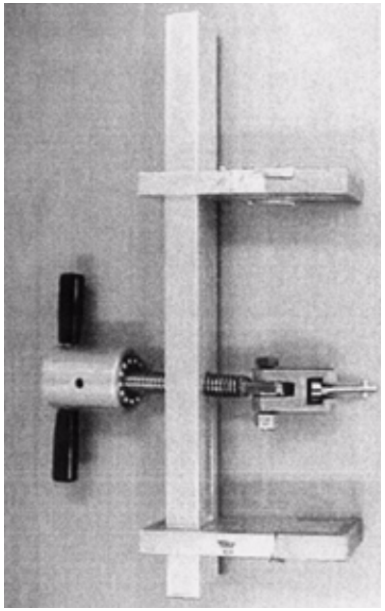
Key Cabinet not secure

IRON GATE ACCESS

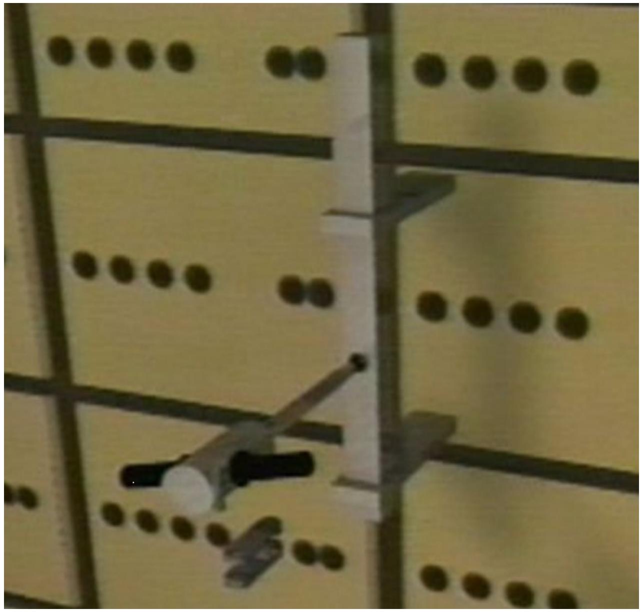
ALARM SENSORS

189 SAFE DEPOSIT VAULTS

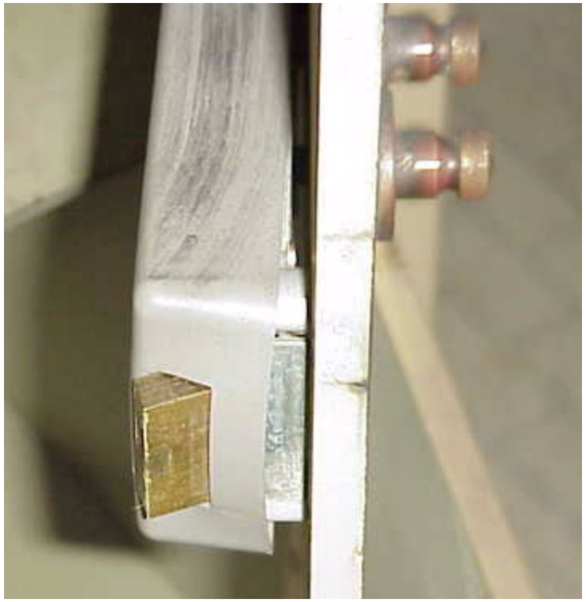
DENT PULLER



WARP THE BOLT

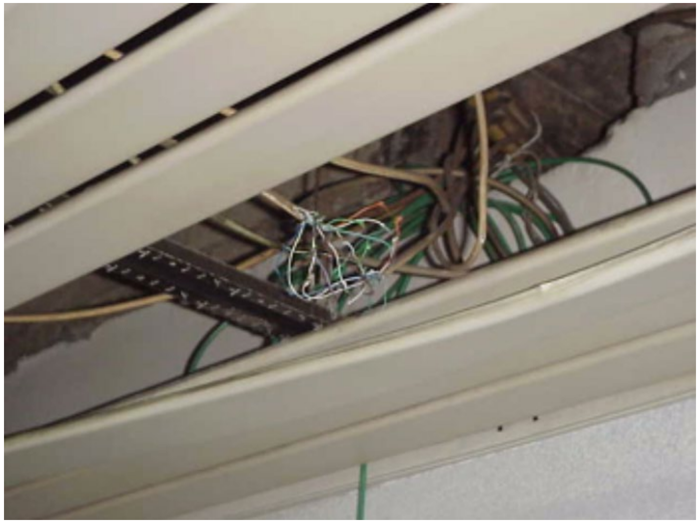


OPEN THE BOX

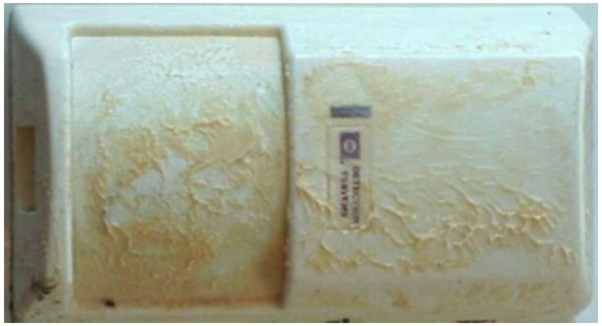


SPECIAL STEEL KEY FOR DENT PULLER

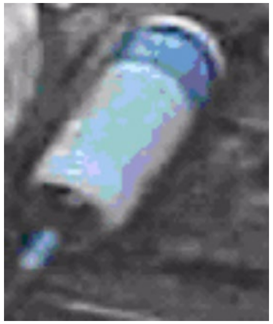
ALARM SYSTEM ACCESSED



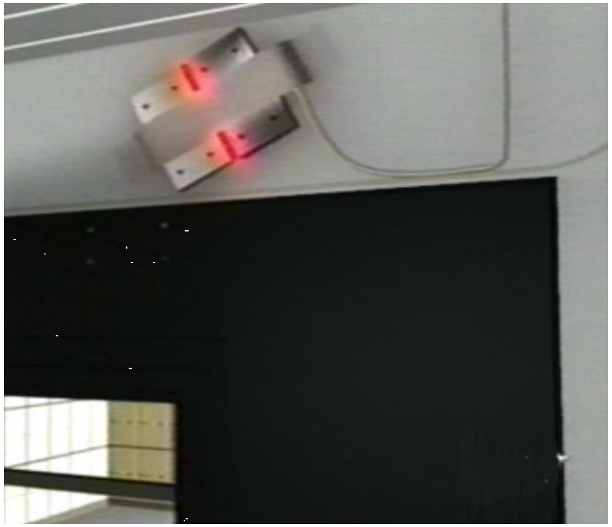
DUAL TECH SENSOR DISABLED



SILICONE SEAL

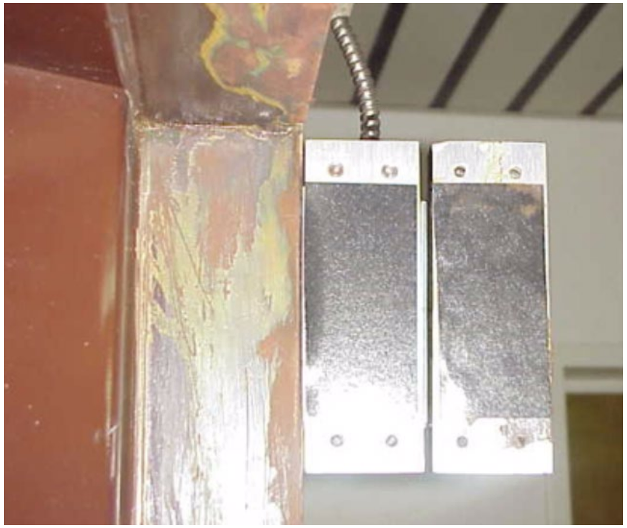


BALANCED MAGNETIC SWITCH



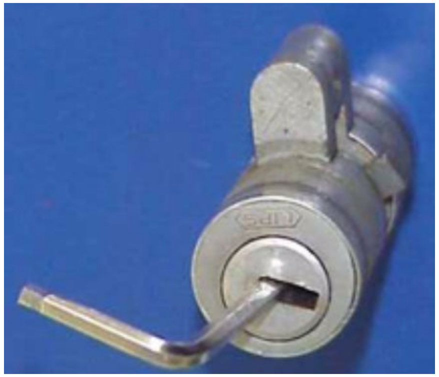
SWITCH REMOVED AND MOVED

WORK AS A PAIR



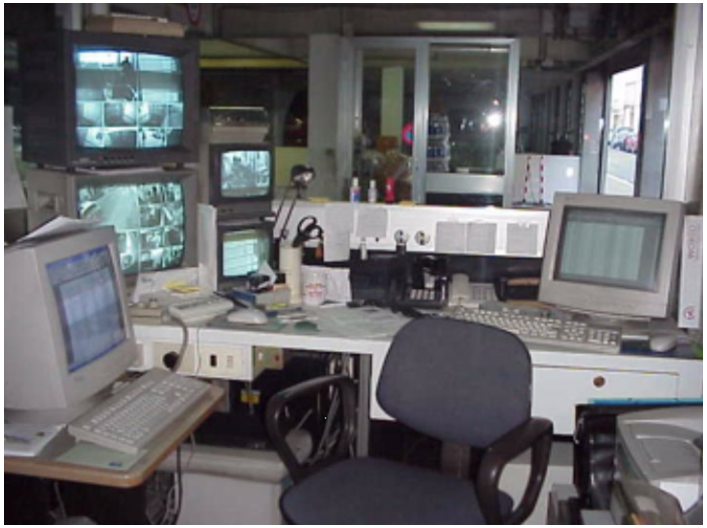
LIGHT SENSOR IN VAULT

LIPS DIMPLE LOCK

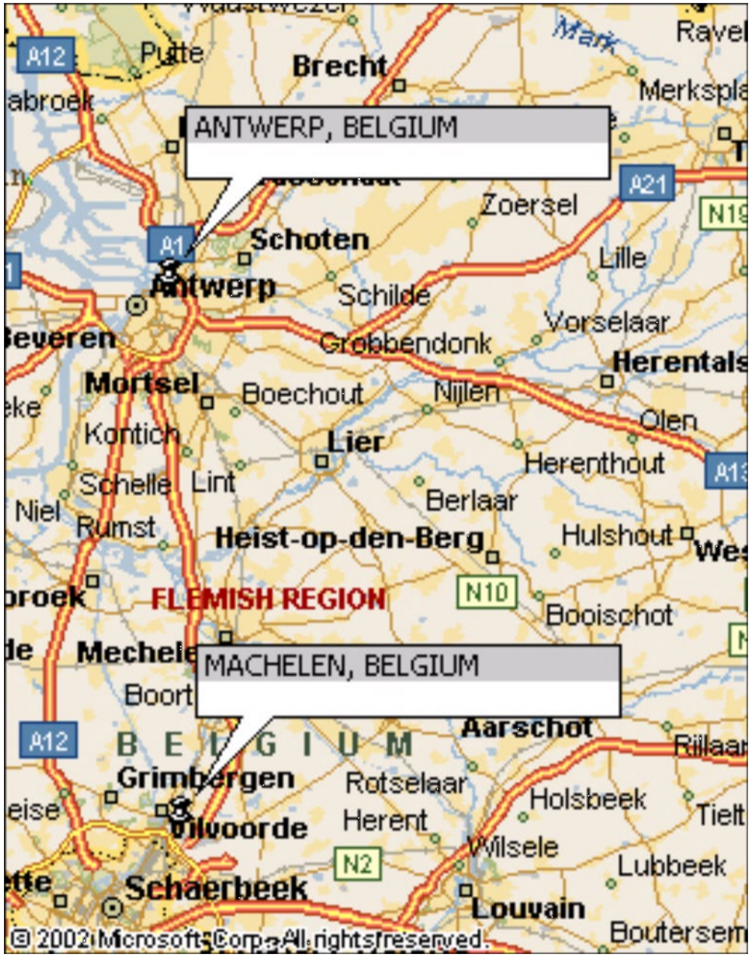


LIPS LOCK RAKE PICKED

CONTROL ROOM



THIEVES LEFT ANTWERP



GARBAGE FOUND AT MACHELEN

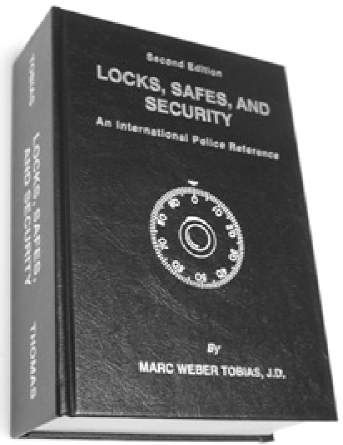
RESULT OF CRIME

- SEVEN SUSPECTS
- RING-LEADER BEING TRIED
- MAXIMUM PENALTY: FIVE YEARS
- LOSS: $100,000,000
- TWO YEARS TO PLAN
- MORAL OF STORY: REAL WORLD OF CRIME AND LOCKS AND SECURITY
- CRIME PAYS

WWW.SECURITY.ORG

mwtobias@security.org

- LSS+
- LOCKS, SAFES, AND SECURITY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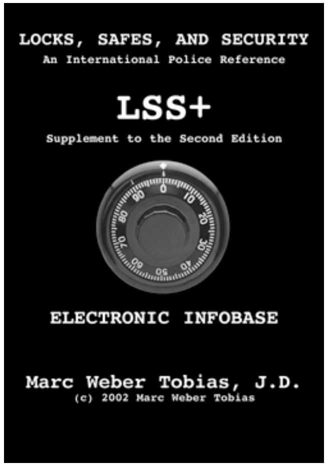
THOMAS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ELECTRONIC INFOBASE

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