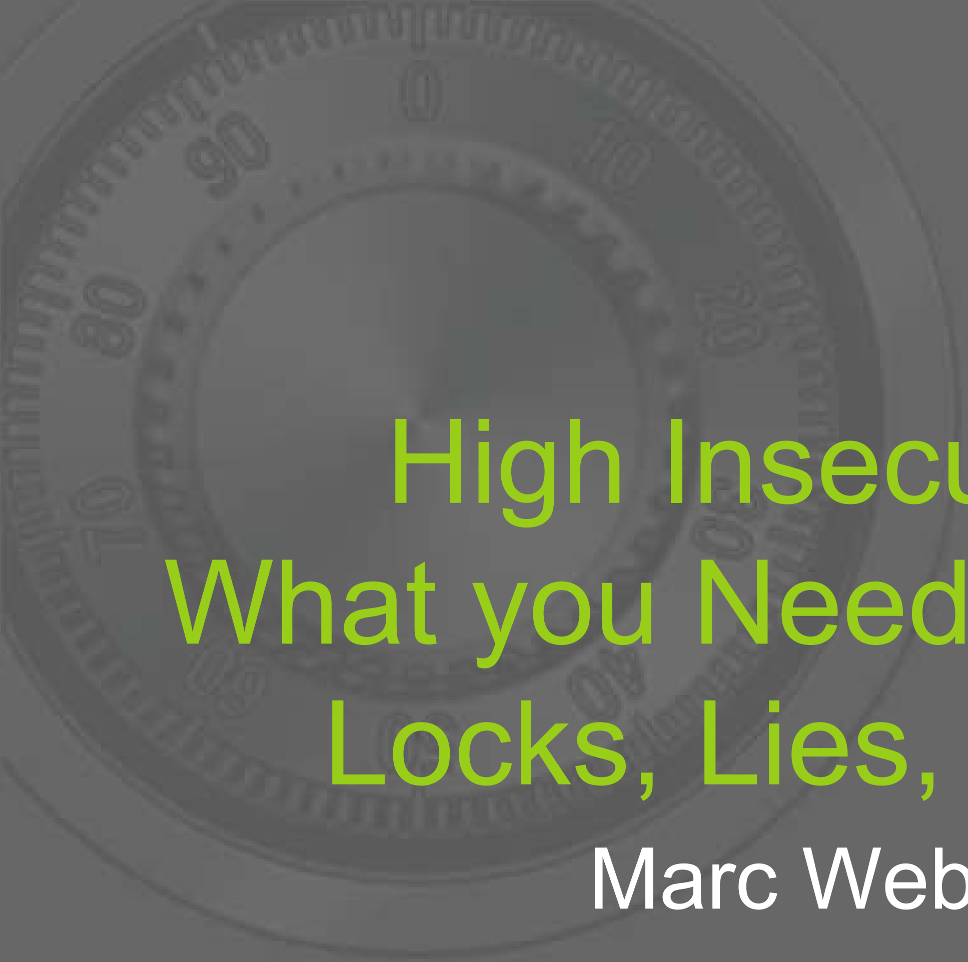


High Insecurity Locks: What you Need to Know about Locks, Lies, and Liability

Marc Weber Tobias

in.Security.Org

Agenda

- Conventional v. High Security Locks
- Security Standards
    - Conventional and High Security
    - UL-437
    - ANSI /BHMA (A156.5-2001)
    - ANSI (A156.30)
- LOCKS:
    - Bypass Methods
- LIES:
    - Representations
    - Design issues
- LIABILITY:
    - Legal issues

Conventional Pin Tumbler Locks

- Minimal security against covert methods of entry and forced entry
- Bump open easily
- No standards for security, some grades of strength and endurance
- Not used for high security locations
- No secondary locking systems as in high security cylinders

High Security Locks: Critical Elements?

- What are they?
- When are they used and why?
- Standards and what they mean?
- What you need to know!
- Manufacturer knowledge: representations and the truth
- Misrepresentations by lock makers
- Medeco® case study

What is a High Security Lock

- High tolerance
- Quality materials and workmanship
- Expensive: a form of insurance
- Extended testing for security
- Special distribution channels
- Many security enhancements
- Two or three separate parallel systems
- More difficult to compromise than conventional cylinders

Use of High Security Locks: When you need to be sure!

- High value targets
- Critical infrastructure
  - I-T, Command and Control Centers
  - High value business: banks, gems, drugs
  - Government Installations
  - White House, Pentagon, Nuclear security
  - Embassies, Critical Missions

Why We Need High Security Locks

Protect Against Special security vulnerabilities:

- Bumping
- Picking
- Replication of keys and key control
- Extrapolation of Top Level Master Keys

Standards: What they Mean

- High security lock standards:
  - Benchmarks for everyone to rely upon because most cannot test locks themselves
  - Facility specifications based on standards:
    - In U.S. UL/ANSI
    - In Germany: Vd.S
- How are locks tested and by whom
- Standards are inadequate for real world
- Case Example: Medeco® High Security Locks

High Security Locks: Primary Protection Criteria

- Forced Entry
- Covert Entry
- Key Control
- What is not covered: Common exploits
  - Bumping
  - Special forms of picking
  - Mechanical bypass
  - “Real World” Techniques
  - Bypass of key control

UL-437 Attack Resistance

(Door locks and Cylinders)

Picking	10 Minutes
Impressioning	10 Minutes
Forcing	5 Minutes
Drilling	5 Minutes
Sawing	5 Minutes
Prying	5 Minutes
Pulling	5 Minutes
Driving	5 Minutes

Standards (ANSI A156.5) Security Tests

- Impact
- Tension
- Torque
- Impact
- Sawing
- Pressure
- Tensile

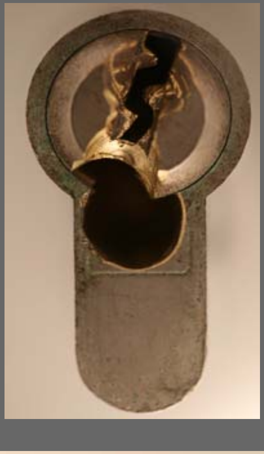
In addition to the above requirements all cylinders must meet all DRILLING(5min) and PICKING(10min) requirements of UL-437

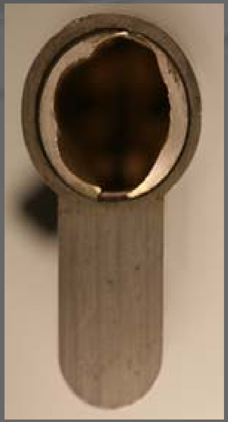
Security Against Forced Entry

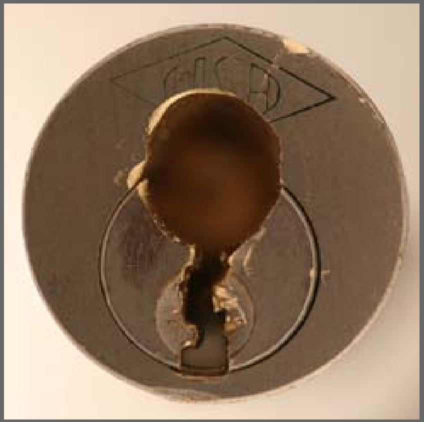
in.Security.Org

Drills and End-Mills: A common attack

Forced Entry: Drilling Conventional Cylinders







UL-437 Tools used for Testing (Hand or Electric)

Forced Entry

- Pry bars(up to 3ft)
- Chisels
- Screwdrivers (max 15in)
- Hammers (max 3lbs)
- Wrenches
- Pliers
- Drills
- Saw blades
- Pulling tools

Covert Entry

- Picking
- Impressioning

Standards (ANSI A156.30) High Security Cylinders

- Key Control (ratings are cumulative)
  - C - Manufacturer restricted blanks
  - B - Blanks protected by law
  - A - Authorization required
- Forced Entry
  - Test for different methods of attack

Standards (ANSI A156.30): Covert Methods of Entry

- Pick Resistance (Cumulative)

C: Minimum of 2 Security Pins

Paracentric Keyway

Minimum of one bore depth designed to prevent over-lifting

B: Meets all levels of C plus UL-437 for pick resistance (10 min)

A: Resist picking for 15 min as tested by 5 “ALOA Certified” Locksmiths with “commercially” available tools

Covert Entry - Picking

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Mechanical Bypass

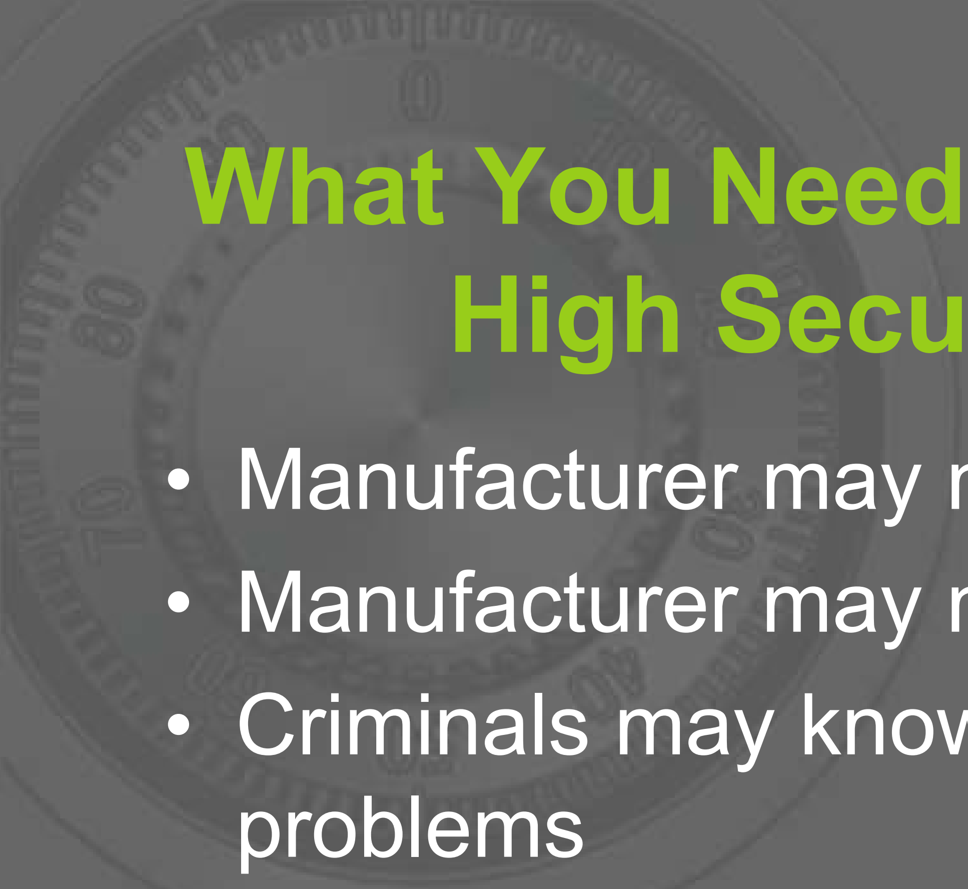
- Defeating locks in less than a minute
- Often not included in standards
  - May be forced or covert entry
- Many certified locks can be compromised
- Public is misled into a false sense of security

Mechanical Bypass: Another Method of Entry

- Wires and shims
- Vibration, shock, bumping
- Air pressure
- Magnetism
- Breaking of internal components
- Radio Frequency energy
- Temperature

Manufacturers: What they Know and will Disclose

- Great R&D
- Some have a poor understanding of methods of bypass
- Cannot Make secure if don’t know how to break
- Failure of Imagination
- Misrepresentations of security:
  - Know and will not disclose
  - Don’t know, negligent misrepresentation



What You Need to Know about High Security Locks

- Manufacturer may not know or tell you
- Manufacturer may not fix: Its about $
- Criminals may know and exploit problems
- Mechanical bypass often simple
- Medeco® deadbolt: Secure for 20 years
- Tobias attack: Secure for 40 years

Representations by Manufacturers

- Locks are secure
- Implied representations
- Know or should have known of problems
- Meet specifications?
- Need truth in packaging and advertising
- Design issues and failures
- Bypass methods not contemplated

Failure of Imagination

- Mechanical bypass
- Forced entry techniques
- Covert entry techniques
- Key control compromise
  - Manufacturers cannot find the vulnerabilities
  - Why we need White Hat hackers

Design Issues

- Failure of imagination
- Design engineer problem
- Key never unlocks the lock
- Moshe Dyan problem: Design issues can create a two-way path

Design Defects

- Failure to understand laws of physics
- Failure to understand methods of entry
- Failure to imagine
  - Generally simple design failures
  - Directly affect the security of the lock
  - Affect any security ratings
  - Mislead the consumer

Medeco® Security:
A Classic Case Example

- Do they know or are they incompetent?
- They continue to represent:
  - Locks cannot be bumped
    - Even after JennaLynn, the 12 year old bumped open their lock at Defcon 15
  - Locks cannot be picked
  - Key control cannot be compromised

MEDECO®:
The High Security Cylinder

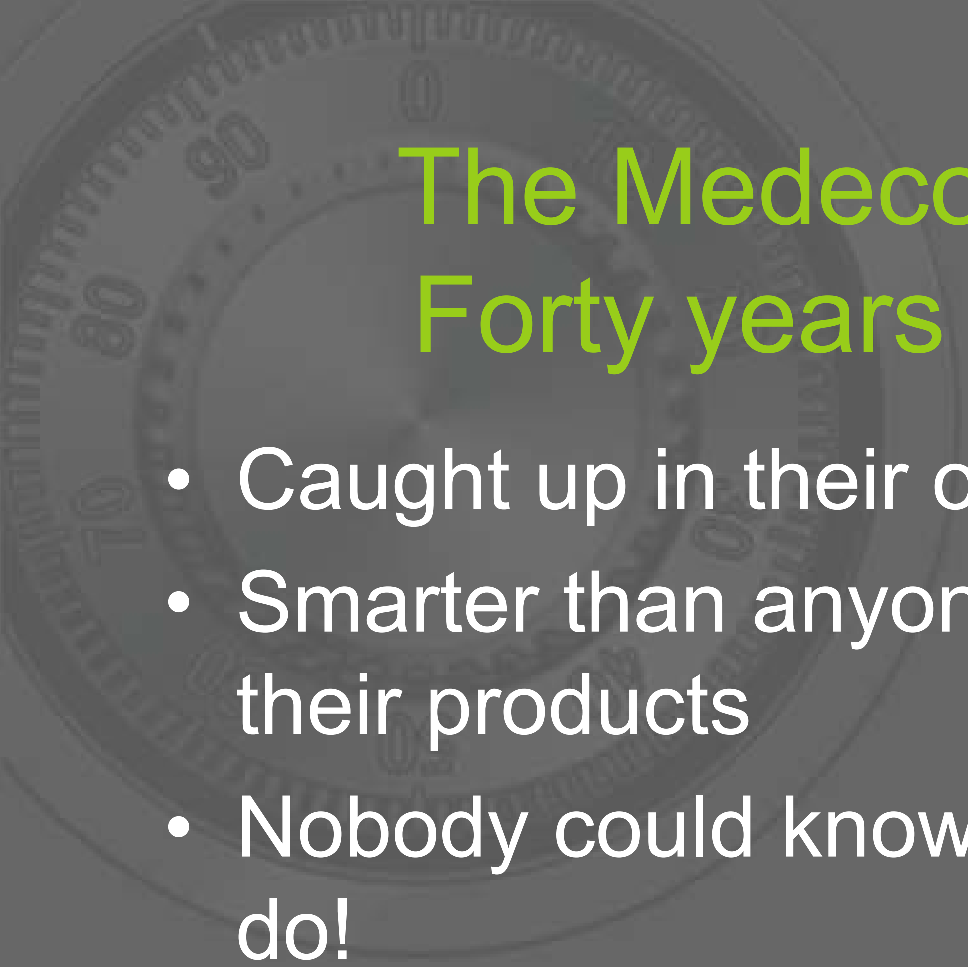
- Protects high value and critical targets
- Leading U.S. High Security manufacturer
- For 35 years: THE lock to attack
- UL-437 and ANSI 156.30 rated and VdS
- Everyone trusts their security
- Best engineering in industry

More Medeco® Security

- Many attacks during past 35 years: difficult, complex, high skill level, not consistent results
- Global presence of company, owned by Assa-Abloy
- Two or three separate security levels, all of which must be compromised

Medeco®: Ultimate Security?

- Invented the modern sidebar
- Almost every lock has copied
- Revolutionary design in 1968
- Three generations:
  - Original
  - Biaxial
  - M3 and Bilevel



The Medeco® Problem: Forty years of success!

- Caught up in their own arrogance
- Smarter than anyone else regarding their products
- Nobody could know as much as they do!
- Inability to properly test for “real world” vulnerabilities

MEDECO® “CAVEATS”

- High quality locks and hardware
- Secure for most locations and uses
- May be vulnerable for high value targets
- User needs to assess security
- All Medeco® locks cannot be compromised
- Security depends upon many factors
  - Location and value of target
  - Expected sophistication of attack
  - Master key or non-master key system

It all Began with Bumping: A chronology of Events

- Marc Tobias and Barry Wels: Hope Conference, New York: Introduce Bumping to U.S. July, 2006
- Marc Tobias and Matt Fiddler: Defcon 14, Las Vegas: Bumping, August 2006
- JennaLynn, 11 year old, bumps Kwikset
- August 4, 2006, Medeco® press release: “Our locks are bump proof”

Can Medeco® Locks be Bumped: A research project

- Marc Tobias + Tobias Bluzmanis begin year-long research project re Medeco®
- Originally: Can the locks be bumped? Medeco® said no!
- Resulted in wider inquiry:
  - Reliable method of picking
  - Method to bypass high level key control
  - Hardware bypass: deadbolt disaster

Medeco® 2006:
“Our Locks Cannot be bumped”

- October meeting at Medeco®
  - Early research stages
  - Tryout keys not perfected
  - Bumped some but not all locks
    - 24 hours later, opened the test locks from factory
  - Medeco® was not impressed because of early demonstration; They did not believe it.

Miami Vice: Detailed Demonstration for Medeco®!

- Detailed demonstration on video, submitted to Medeco® in December, 2006, showing:
  - – Bumping
  - – Picking
  - – Bypass of key control
  - – Simulation of bump keys

December 2006-Present: Bypass of Medeco® security

- Perfected ability to bump open locks with four keys
  - Non-master keyed cylinders
  - Must have correct keyway
  - Not all locks can be bumped open, but many
  - Very reliable process

Four Keys to the Kingdom!

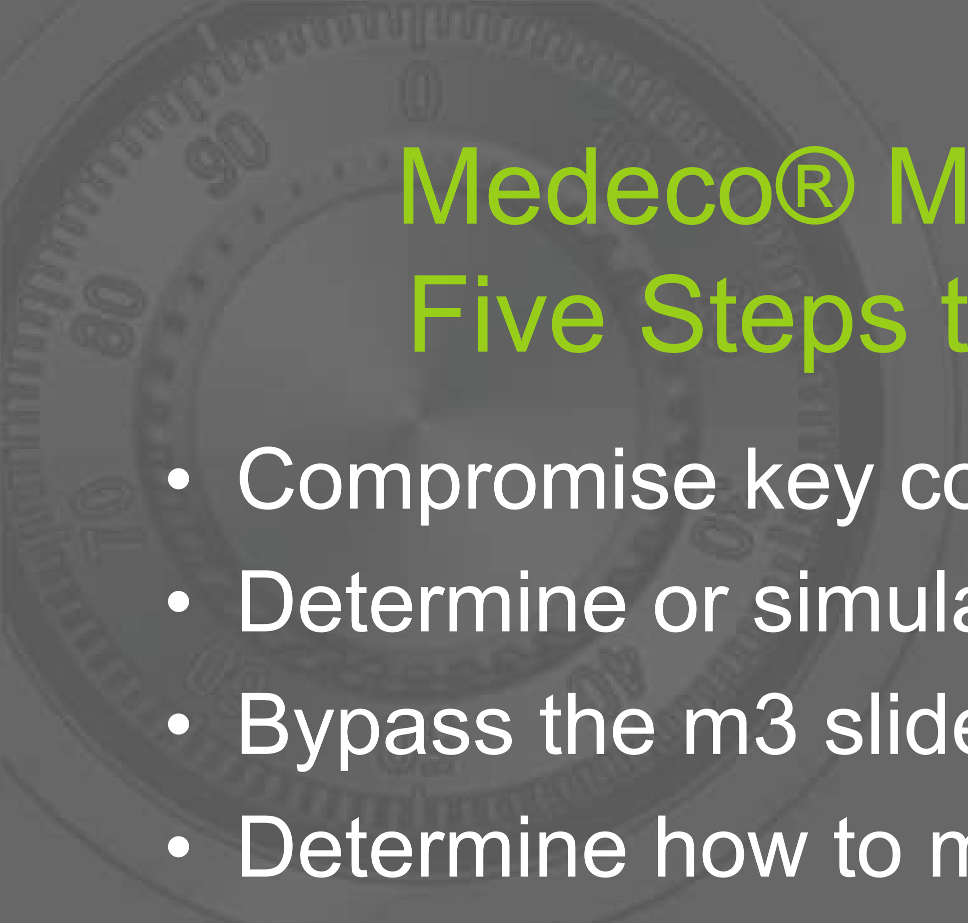
- Four tryout keys to theoretically open all Medeco® non-master keyed cylinders

Bumping to Picking to Bypass of Key Control

- Bumping expanded our research and method of attack
  - Developed a method to reliably pick virtually all Medeco® Biaxial and m3
  - Developed a technique to determine sidebar coding

Medeco® Security Compromise: A Year of Research

- Medeco® Security: 3 levels + key control
  - Conventional pin tumblers
  - Sidebar: a combination of angles
  - M3 slider blocks sidebar
  - Restricted keyways and blanks
  - Each security level has been compromised



Medeco® Methodology: Five Steps to Insecurity

- Compromise key control
- Determine or simulate sidebar code
- Bypass the m3 slider with a paper clip
- Determine how to make a bump key
- Develop a reliable means of picking

Bypass of Key Control

- Analyzed Key control of m3: wider keyway: needed a way to produce blanks
- Simulated restricted keyways
- Made regular keys to open locks
- Made bump keys from simulated blanks with known sidebar code
- Made a bump key with simulated code

Sidebar Codes:
Learn or Simulate

- Obtain correct sidebar code to produce a bump key or simulated bump key
- Simulate sidebar codes to open locks
- Two levels of security:
  - First Level: known sidebar code
  - Second level: unknown code, must simulate

The Steps to Insecurity: How we Began

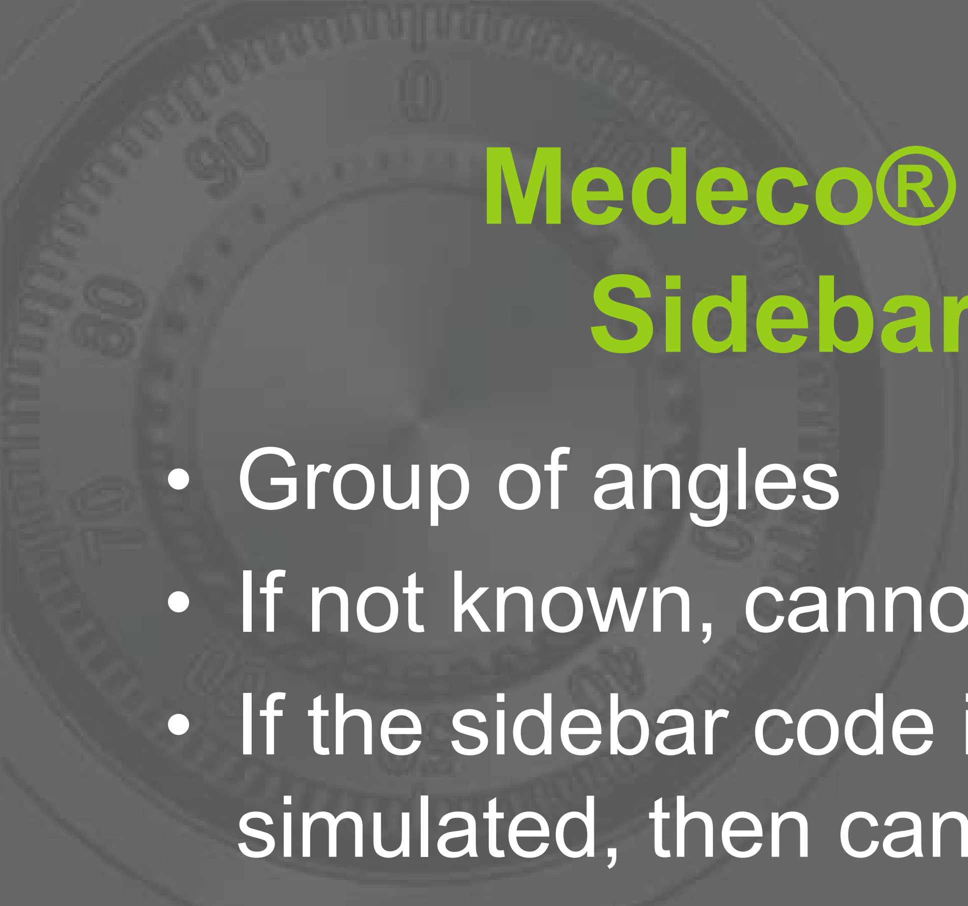
- Bump one lock with known sidebar code
- Simulate a blank to bypass restricted keyways
- Analyze all Medeco® codes
- Analyze lock tolerances
- Synthesize all codes to four keys
- Leverage use of keys for picking

Result: Compromise of all levels of Medeco® security

- Open locks by bumping
- Open locks by picking
- Compromise m3 key control
- Pick and bump one level of ARX pin

Latest Technology: The MEDECO m^3

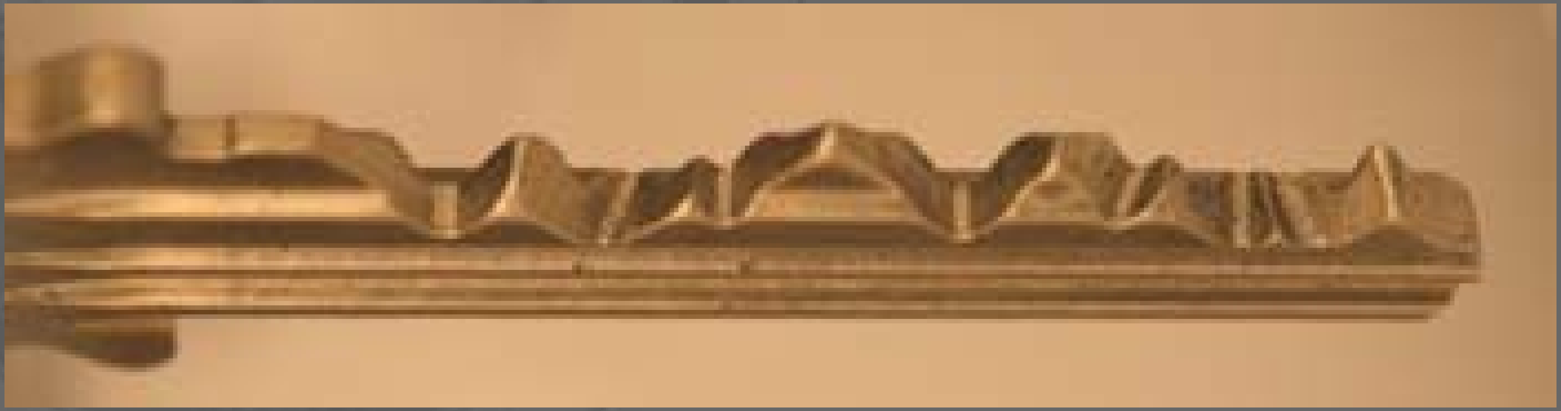
- Replaced the Biaxial in 2005 when patent expired
- Biaxial design with slider
- Three levels of security:
  - Pin tumblers elevated to shear line
  - Pin tumblers rotated to correct angles
  - Slider moved to correct position



Medeco® Security: Sidebar Codes

- Group of angles
- If not known, cannot open the lock
- If the sidebar code is known or can be simulated, then can bypass security
- Each lock or system has unique code
  - First level of compromise: know the code
  - Second level: unknown code

Sidebar Codes: A Combination of Angles



Common Myth #1: Key Control

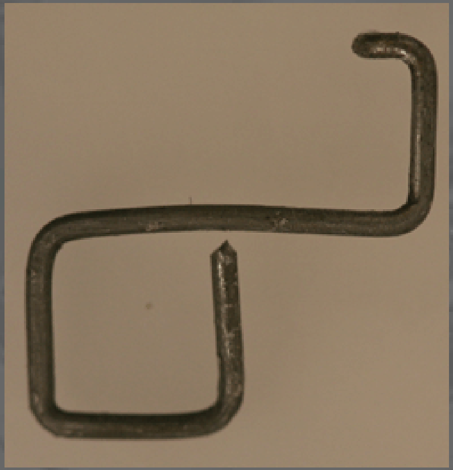
- UL 437: No key control criteria
- ANSI 156.30
  - – Patent protected blanks
  - – Cannot replicate the blanks
  - – Cannot duplicate the keys
  - – Factory control of keys produced by code

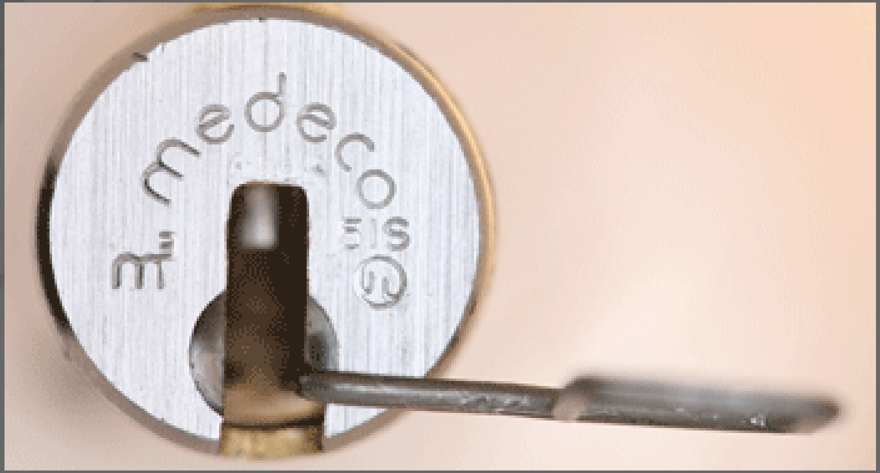
Medeco® Security: Key Control

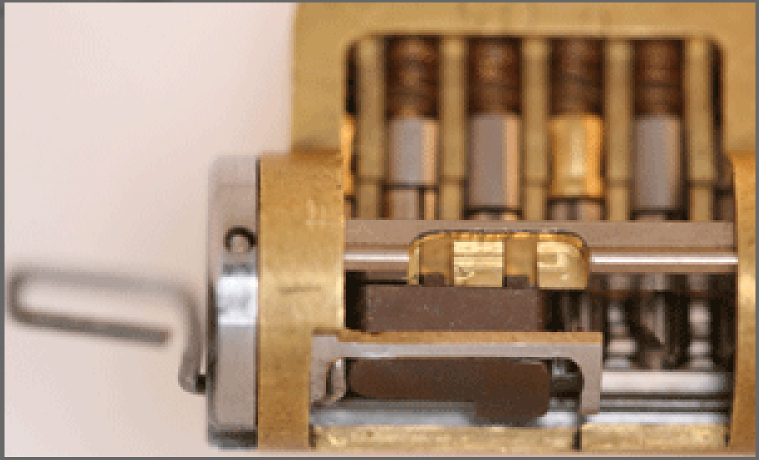
- Restricted blanks
- Inability to replicate means cannot make keys
  - Key simulation
  - Bypass virtually all key control
  - Make regular and bump keys to open lock

Medeco m^3 Meets the Paper Clip

"Michaud M3 Degrade Attack"







in.Security.Org

Bypassing m3 Key Control

- Circumventing m3 key control with a paper clip

Common Myth #2: Bumping

- Some High security locks can be bumped open
- Medeco®, Assa®, Mul-t-Lock®
- Locks can be bumped: Not all but many
  - Depends on many factors
  - Sidebar codes must be known or simulated
  - Patent filing for technique to bump

Medeco Not Bump-proof

- Medeco®:
  - – “Our locks are bump proof!”
  - – “Our locks are virtually bump proof!”
  - – Our locks are “virtually resistant”

Virtually bump proof = virtual reality

Medeco® Virtual Reality

- “Virtually Resistant”

THEY CAN'T REALLY BUMP AND PICK OUR LOCKS...CAN THEY?
DUDE, THESE GLASSES ROCK!
medeco
medeco

JennaLynn:
Bumps a Medeco® at age 12

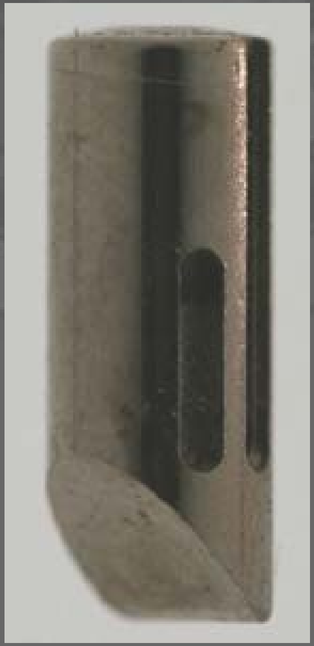
- Bumping Medeco® Locks

JennaLynn One Year after opening the Kwikset at Defcon 14

in.Security.Org

Bumping High Security ARX pins

- ARX pins are the most secure



Common Myth #3: Picking

- Special pick and decoder tools developed
- Medeco® locks can be extremely difficult to pick because of pin rotation
- A target for 35 years
- Attempts largely unsuccessful
- Caveats

Picking Medeco® Locks

- Medeco® locks can be picked with conventional tools with a special technique disclosed in patent filing
- High percentage of these locks can be picked

Picking the Medeco® m3

- A reliable means of picking has been developed

Common Myth #4: Hardware Bypass

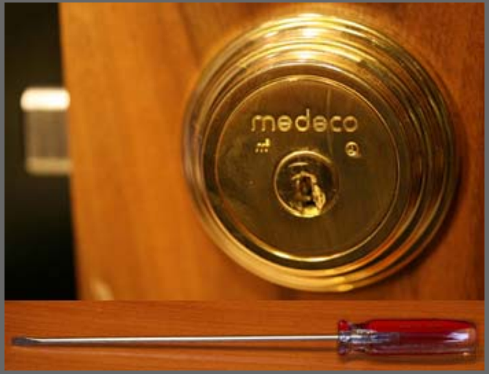
- Medeco® hardware security: Is it really secure?
- Example: Deadbolts - A failure of imagination

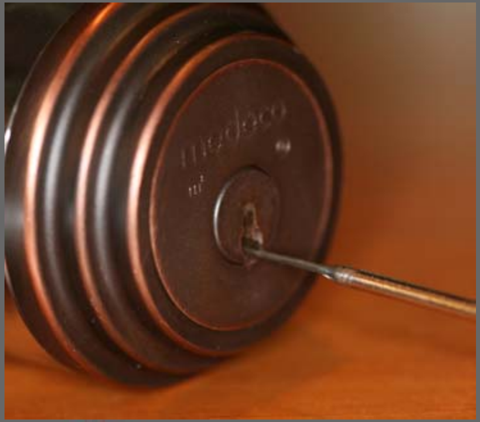
“The key never unlocks the lock!”

Medeco® Deadbolt: The Final Straw

- 20 year design history
- The best design in the industry?
- Bypass in 30 seconds with a 2$ screwdriver
- Bypass of all internal security
- UL, ANSI rated for minimum of five minutes
- No security

Bypass Internal Mechanisms: Medeco® Deadbolt





in.Security.Org

Simplicity Itself: Opening the Medeco® Deadbolt

- Opened in 30 seconds
- Incompetent engineering

LIABILITY

- Defective or deficient products
- Negligent designs
- Misrepresentations in packaging
- Manufacturers are experts
- Federal statutes
- Fiduciary duty to customers
  - DCR v. PEAK

NEEDED: Real World Testing

- Propose Security Laboratories
  - Security professionals
  - Manufacturers
  - Law enforcement
  - Locksmiths
  - Hackers: Vulnerability Geeks
    - Why we need Physical Security Hackers

Thank You

Marc Weber Tobias
mwtobias@security.org

Web: http://security.org
Blog: http://in.security.org