Cylinders

Service Manual

MUL-T-LOCK®

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MT5® +

Cylinder construction and structure

Mul-T-Lock's new cylinder platform, the MT5, raises security to new levels. The standard product, MT5, has six chambers: five containing ten plug pins and ten driver pins, and one containing a patented eccentric pin.

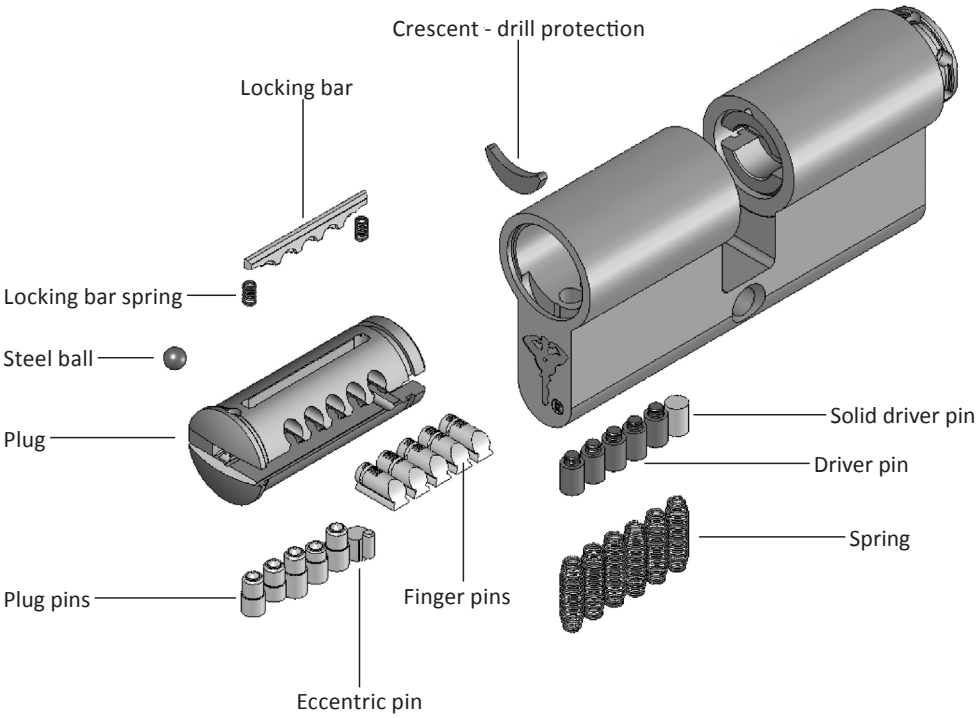
The advanced product, MT5+, has the same six chambers, plus five chambers containing 5 finger pins for the locking bar mechanism.

All MT5+ keys are reversible with one set of dimple cuts for the telescopic pin mechanism and another cut - the milled pattern, for the locking bar.

The milled pattern is also used to create exclusive keyways for locksmiths in their respective markets.

A patented Alpha spring interacts with the eccentric pin in the cylinder, creating another shear line. This combination provides enhanced key security and high manipulation resistance.

The MT5 supports master key systems incorporating hierarchy and matrix requirements even within the same suite.



Pinning concept

The MT5+ cylinder contains 3 locking mechanisms, providing enhanced security: telescopic pins, a patented eccentric pin and 5 finger pins together with a locking bar.

The eccentric pin It actually is raised to the shear line by using a Mul-T-Lock MT5 patented key. The patented chamber is located in the last position to increase manipulation resistance.

MT5 key

The keys of the MT5 series are different from the keys of Mul-T-Lock's other telescopic pin platforms, such as Classic or Interactive.

MT5 keys are reversible with one set of dimple cuts for the telescopic pin mechanism, and a patented Alpha spring designed to interact with the patented eccentric pin in the cylinder, creating another shear line.

MT5+ keys have an additional cut, the milled pattern, for the locking bar mechanism.

The milled pattern is also used to create exclusive keyways.

MT5 keys are provided with a coded magnetic duplication card - which can be read by the dedicated KC5 key cutting machine.

Pin specification

The telescopic pins, both external and internal, are different in structure from the pins used in the Classic and Interactive platforms, but are marked in the same way:
A, B, C, D for external pins, 1, 2, 3, 4, 5 for internal pins.

In addition you will find a new eccentric pin, a solid driver pin and 5 finger pins operating with the locking bar.

Note: Pin A ABK will be assembled in MT5 cylinders/locks only (not in MT5+).

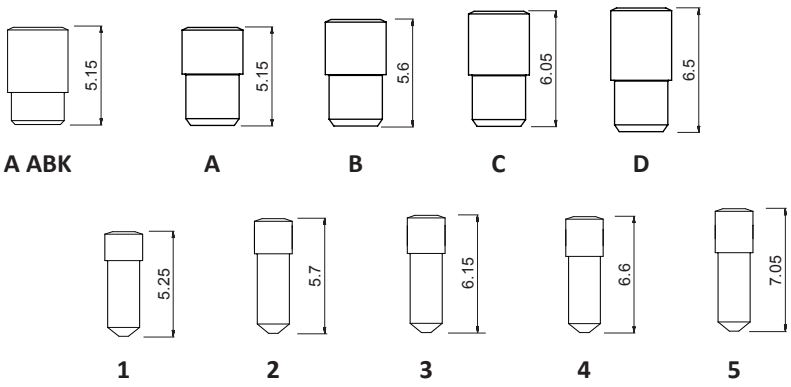
- At least one pin A ABK will be assembled. If more then one A pin exist in a combination pin A ABK will be assembled nearest to plug tail.
- Pin A ABK **will not** be assembled in master key systems.

Plug pins

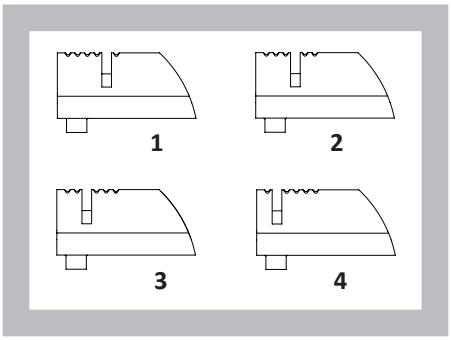
Material: Nickel silver

Structure: External pins are built as tubes, to hold the internal pins within

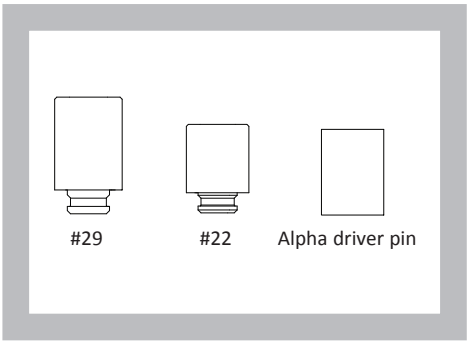
Diameter: 3.2mm for external pins; 2mm for internal pins

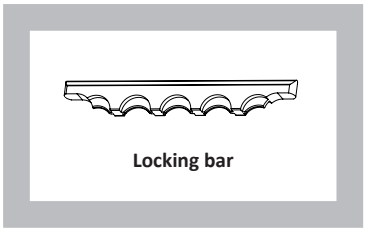


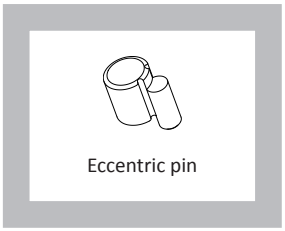
Finger pins



Driver pins







MUL-T-LOCK®

Interactive® +

Interactive+ cylinder construction and structure

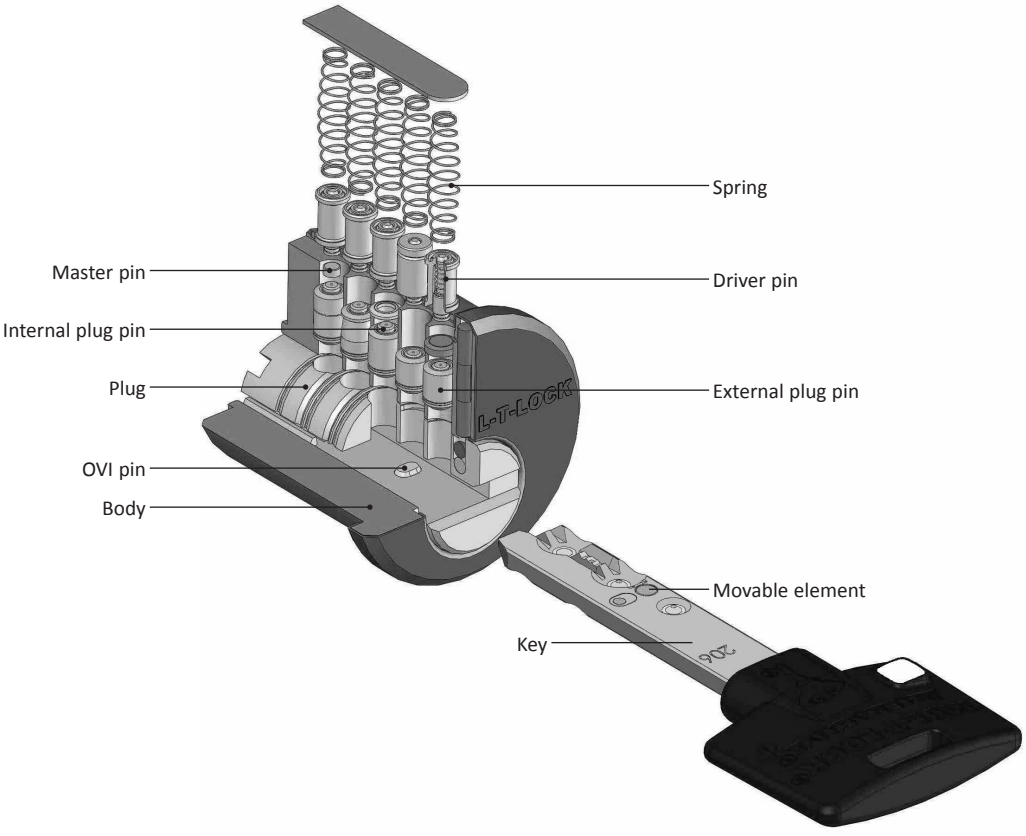
Interactive+ utilizes patent-pending technology for enhanced high security. The system's advanced telescopic pin technology together with the cylinder's moving elements are the basis for its protective features.

A telescopic pin tumbler mechanism requires the simultaneous alignment of both internal and external shear lines for plug rotation.

New OVI pin in the plug.

Limit Key Duplication — control over production, availability limited to trained and authorized Mul-T-Lock dealers and patented features in the key together provide greater protection against key duplication.

With backwards compatibility, Interactive+ works with existing Interactive systems allowing you to migrate to the latest platform at your own pace.



Pinning concept

Mul-T-Lock Interactive+ cylinder uses the same assortment code pins (plug pins) as the Interactive. Inserting Interactive+ key to the cylinder will raise the pins to the shear line. The interactive chamber may be located in the first or second chamber.

Interactive+ key

The keys in the Interactive+ series are cut in the same way as Classic/Interactive keys. It is only necessary to cut four positions. The movable pin has already been embedded at the factory.

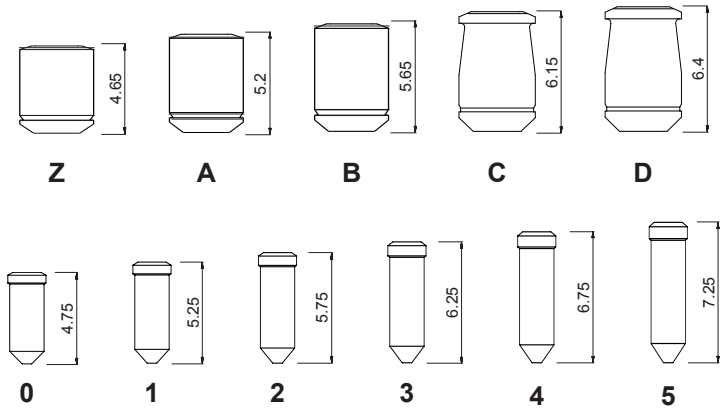
Pins specification

Plug pins

Material: Nickel silver, stainless steel

Structure: Externals are built in a tube shape, to hold the internal pins within

Diameter: 4mm for external pins; 2mm for internal pins

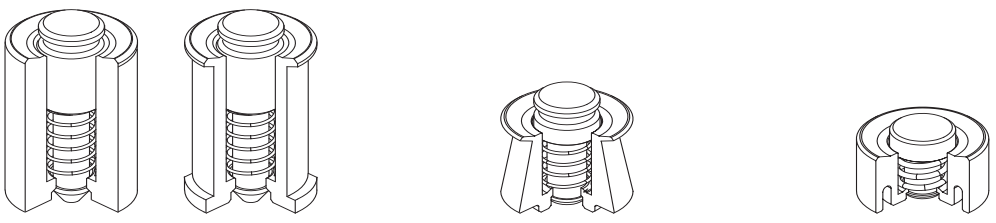


Note: For the Interactive+ G type products a new external plug pin **G** was added to the assortment of code pins. the is identified by 2 grooves around the circumference of the pin. This new pin must be assembled in the Interactive chamber in Interactive+ G type only.

Patented combined driver pins (body pins)

Material: Nickel silver

Length: Varies according to product size



Smooth Mushroom — 29mm (standard)

Mushroom — 22mm products

Smooth — 19mm products

Interactive®

Interactive cylinder construction and structure

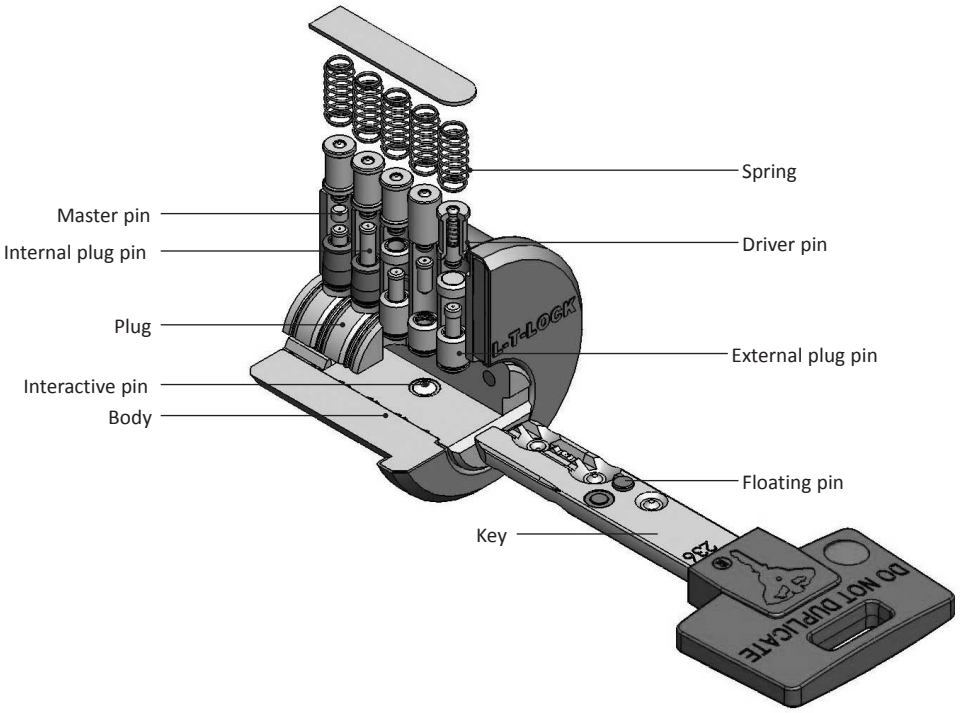
Mul-T-Lock's patented High Security Interactive platform raises the user's level of security to new heights, thanks to several special features:

A spring-loaded pin placed inside the cylinder plug, which produces a "virtual combination" when the key with the floating pin is inserted.

Mul-T-Lock's unique telescopic pin tumbler mechanism, with internal and external pins – requiring the simultaneous alignment of both internal and external shear lines for the plug to rotate.

A specially designed plug, which forms a spherical, 3-dimensional shear line with the top and bottom pins, within the cylinder body.

Key limitation is ensured by the patented key and key blank, supplied together with a coded Mul-T-Lock key card in every Interactive package. Additional keys should be cut by authorized Mul-T-Lock dealers, upon presentation of the key card – in accordance with Mul-T-Lock's official key cutting procedures.



Pinning concept

Mul-T-Lock patented Interactive cylinder adds two new pins to the assortment of code pins. The new pins are shorter than the ones used before in the Classic platform. They actually work above the blank level, creating a virtual combination, which can be raised to the shear line only by using a Mul-T-Lock Interactive patented key. The interactive chamber may be located in the first or second chamber, and can be A0, Z0, or Z1.

Interactive key

The keys in the Interactive series are cut in the same way as Classic keys, with a slight difference.

It is only necessary to cut four positions. The interactive pin has already been embedded at the factory.

The Interactive key will contain one of the following cuts: A0, Z0, Z1 – which has been embedded into the key blank during the manufacturing process.

Pins specification

The Interactive line of products differs from other Mul-T-Lock profiles in two ways:

A. The interactive pin is embedded in the patented key blank during the manufacturing process

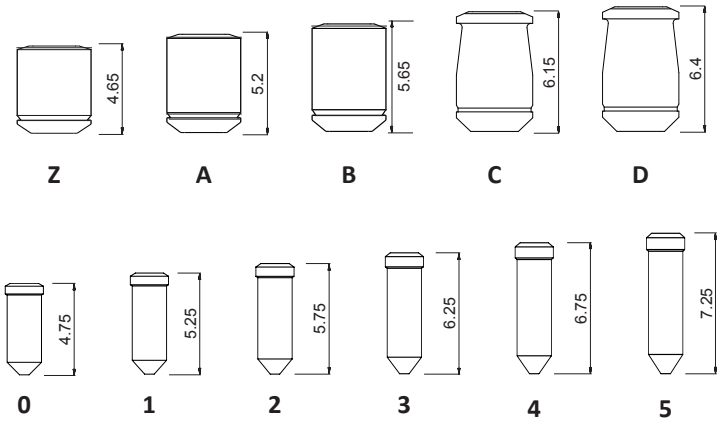
B. The spring loaded pin embedded in the plug in the first or second position

Plug pins

Material: Nickel silver, stainless steel

Structure: Externals are built in a tube shape, to hold the internal pins within

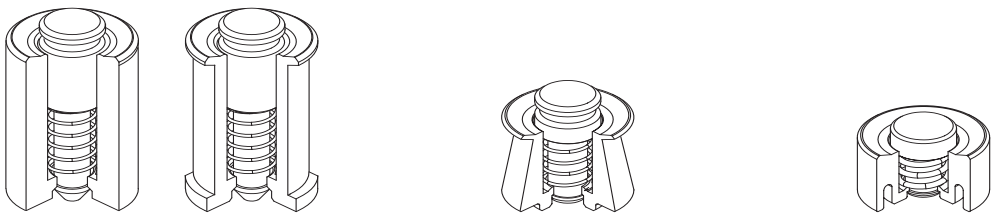
Diameter: 4mm for external pins; 2mm for internal pins



Patented combined driver pins (body pins)

Material: Nickel silver

Length: Varies according to product size



Smooth Mushroom
29mm (standard)

Mushroom
22mm products

Smooth
19mm products

Integrator®

Cylinder construction and structure

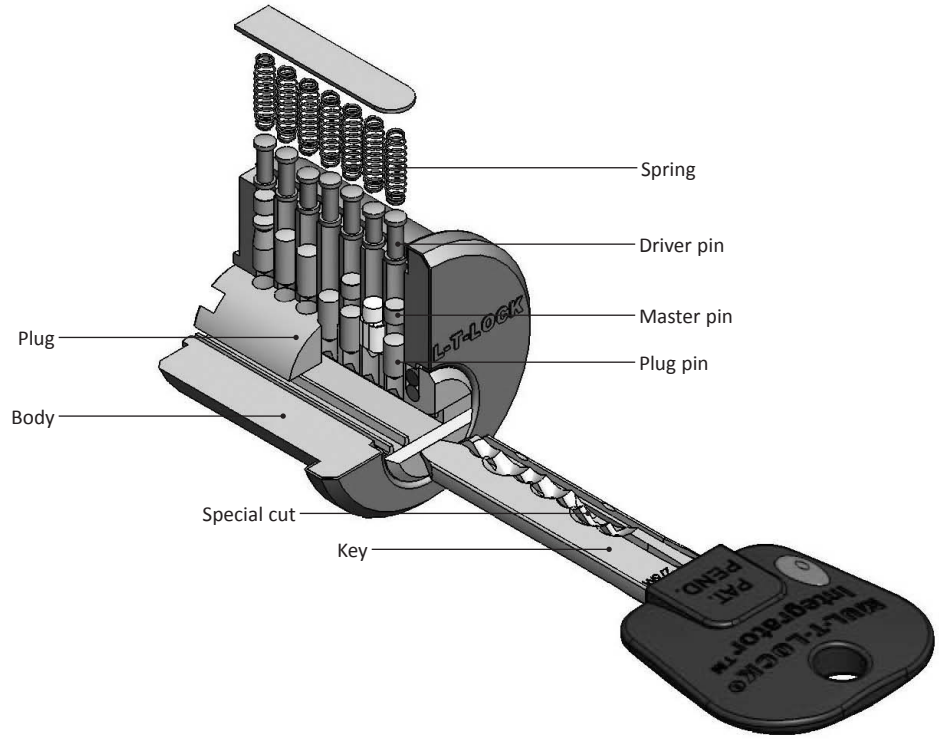
The Mul-T-Lock patented (patent pending) Integrator platform provides the added advantage of a patented protection to key security.

The specially designed Integrator pin adds a new dimension to the 7x7 line. For the purposes of master keying, this new dimension can be used for the creation of hierarchical levels.

Key limitation is ensured by the key and key blank, supplied together with a coded Mul-T-Lock key card in every Integrator package. Additional keys may be cut by authorized Mul-T-Lock dealers, upon presentation of the key card – in accordance with Mul-T-Lock's official key cutting procedures.

The Integrator platform technology is retro-compatible with the Mul-T-Lock 7X7 system, allowing existing locks to be integrated into one system with Integrator cylinders.

The Mul-T-Lock Integrator standard product has seven chambers, seven plug pins and seven driver pins.



Integrator key

The keys in the Integrator platform are cut in the same manner as Mul-T-Lock 7x7 keys, with a slight difference.

You only need to cut six positions because the seventh position, the Integrator pin combination, has been pre-cut in the key blank during the manufacturing process.

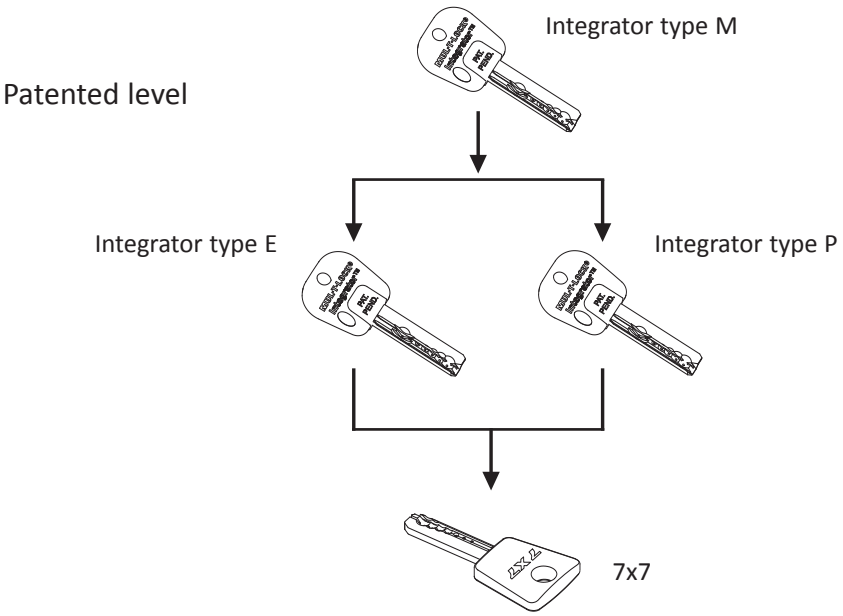
The Integrator key blank will contain one of the following cuts:

M - Master cut

E - External cut

P - Internal cut

Key systems – Integrator & 7x7 system hierarchy



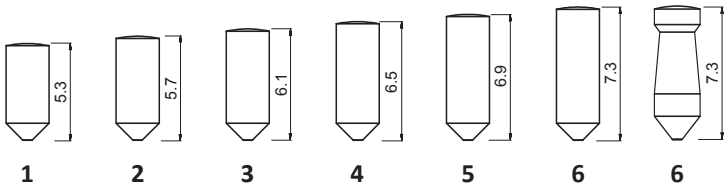
Pins specification

The following pins have been added to the Mul-T-Lock 7x7 re-keying kits:

- Double Launcher pin for M type keys.
- Single Launcher pin that can be used for internal or external combination.

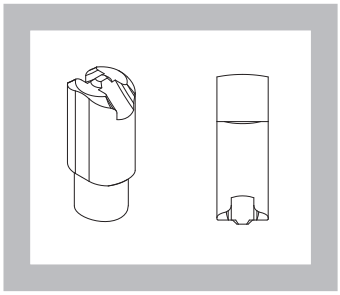
Plug pins

Material: Brass/Stainless Steel



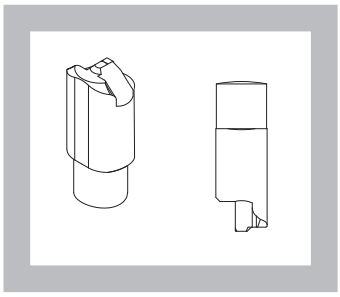
Double launcher pin

Material: Nickel silver



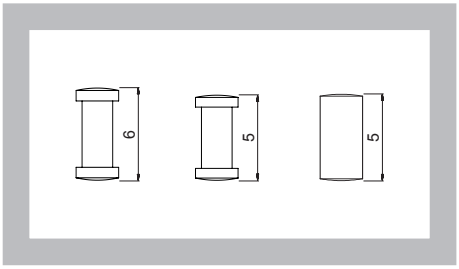
Single launcher pin

Material: Nickel silver



Driver pins

Material: Brass/Stainless Steel



Classic

Basic cylinder construction and structure

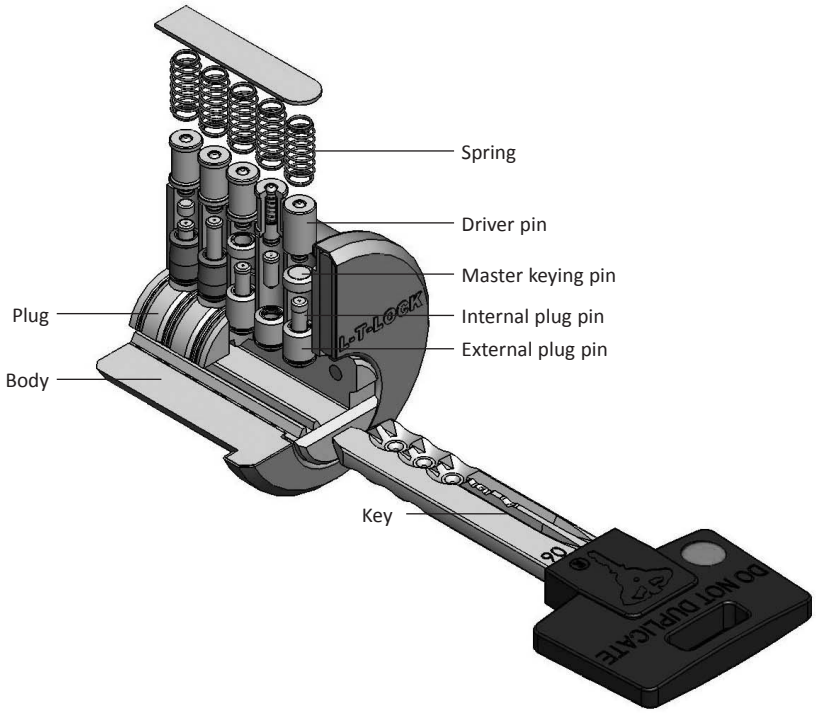
Mul-T-Lock cylinders are built and operate on the basic principles of a standard pin tumbler lock mechanism.

A plug, rotating within a shell, turns a tail/cam/gear when pins of various lengths are aligned at a shear line by means of a key. All pins must be elevated to the shear line simultaneously before the plug can be turned within the shell.

Mul-T-Lock High-Security cylinders have an added unique telescopic pin tumbler mechanism with internal and external pins. Both the internal and the external shear lines must be aligned simultaneously in order for the plug to rotate.

This dual-locking principle and other patented features contribute to Mul-T-Lock's high number of different combinations, master keying capability, and extreme pick resistance.

The standard product has five chambers, containing ten plug pins and ten driver pins. Mul-T-Lock cylinders are also protected against various forms of physical attack by hardened drill-resistant inserts within the shell and the plug, which protect the shear line. When master keyed, additional side pins or back pins can be incorporated to allow even greater control and flexibility.



Pinning concept

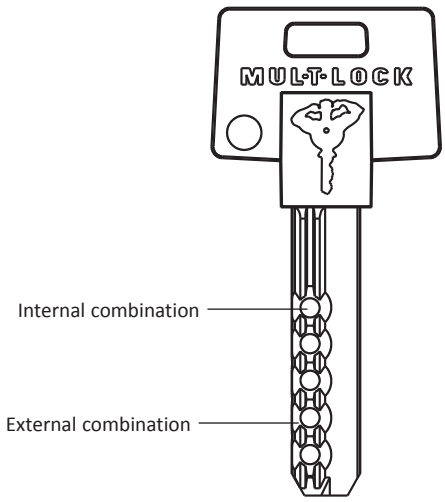
Mul-T-Lock High Security cylinders have a unique telescopic pin tumbler mechanism with internal and external pins. Both the internal and the external shear lines must be aligned simultaneously in order for the plug to rotate.

Classic key

Mul-T-Lock keys contain five double dimple cuts to provide two combinations in each chamber: internal and external.

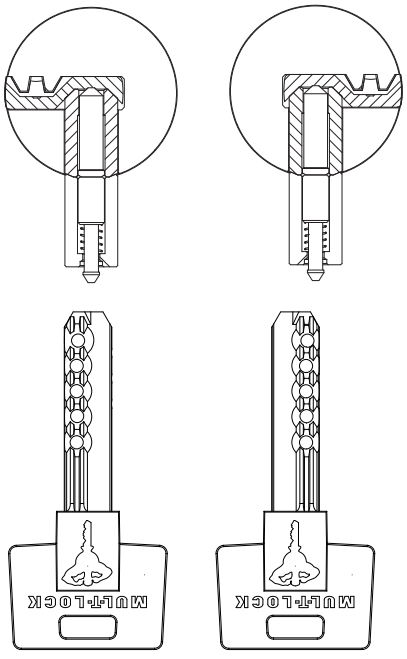
The cuts are numbered from bow to tip, from 1 to 5. The distance from the tip, which is also the key stop, to the center of the fifth cut is 5.3mm for both left hand (LH) and right hand (RH) keys. The spacing (distance from center to center of each cut) is 4.8mm.

When the cylinder has 4, 3 or 2 chambers, the first cuts are omitted from the cylinder. The key always has all five cuts so that it can fit other products within a keying system.



Key hand groups

Mul-T-Lock keys are divided into two major groups according to their profiles: right hand (RH) and left hand (LH). To determine the key hand, hold the key head with the tip pointing upwards. If the cuts and/or milling appear on the right, this is a right hand key. If the cuts and/or milling appear on the left, this is a left hand key.



Left hand profile Right hand profile

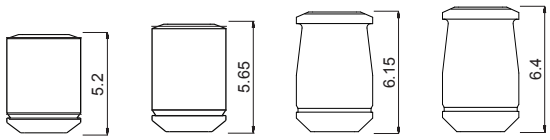
Pins specification

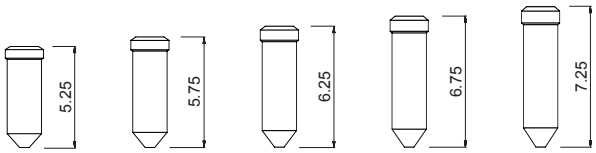
Plug pins

Material: Nickel silver, stainless steel.

Structure: Externals are built in as tubes, to hold the internal pins within.

Diameter: 4mm for external pins; 2mm for internal pins.

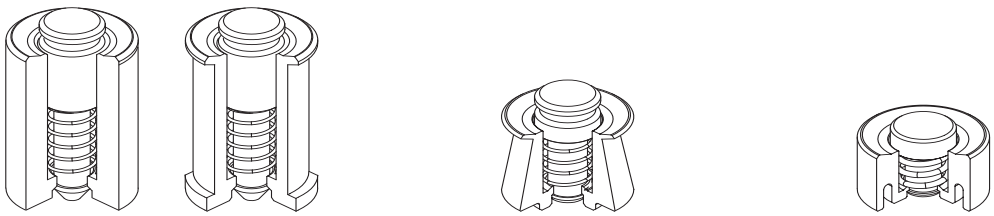




Patented combined driver pins (body pins)

Material: Nickel silver

Length: Varies according to product size



Smooth Mushroom — 29mm (standard)

Mushroom — 22mm products

Smooth — 19mm products

MUL-T-LOCK®

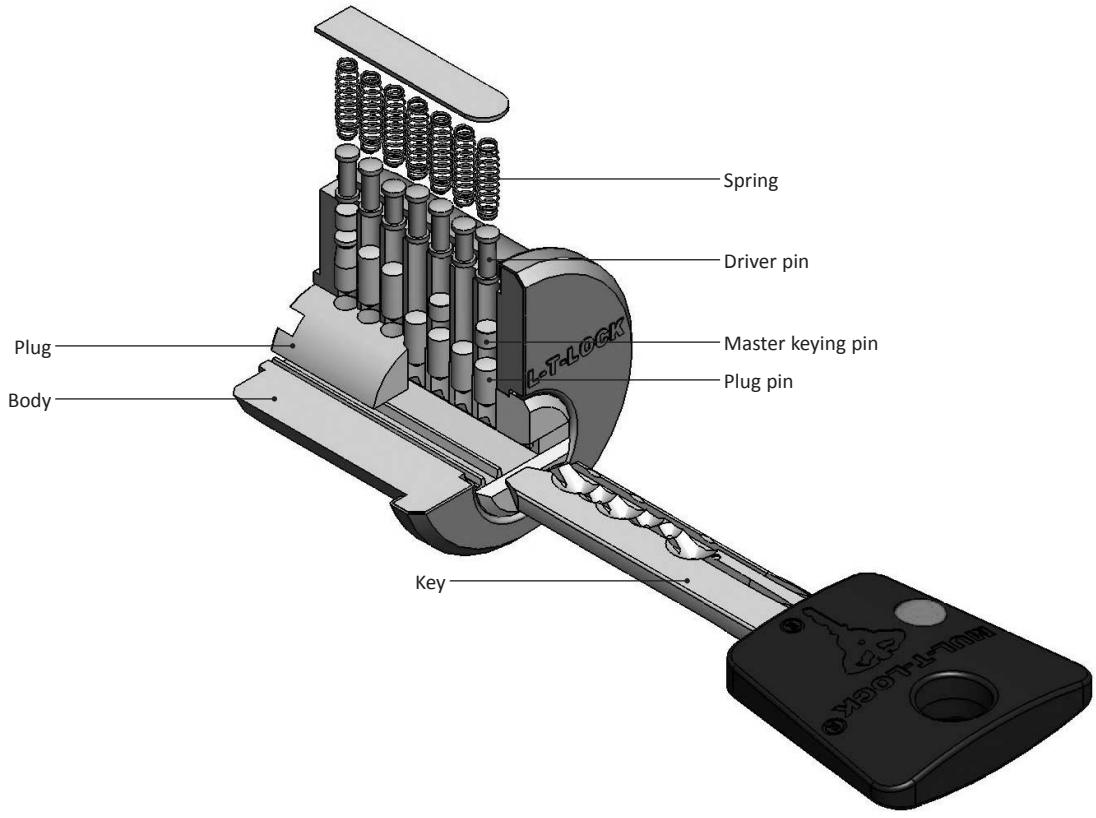
7x7®

General description

Cylinder construction and structure

Mul-T-Lock 7x7 is a single pin tumbler mechanism, operating on a flat dimple cut key. The pins and keys are made of nickel silver.
A plug, rotating within a shell, turns a tail or cam when pins of various lengths are aligned at a shear line by means of a key.

The 7x7 key platform standard product comes with seven chambers, seven plug pins, and seven driver pins.



Pinning concept

Mul-T-Lock 7x7 security cylinders have a seven pin tumbler mechanism.

Pins must be aligned to shear lines in order for the plug to rotate.

7x7 key

Mul-T-Lock 7x7 keys contain seven dimple cuts. The cuts are numbered from bow to tip, from 1 to 7. The distance from the tip, which is also the key stop, to the center of the seventh cut is 4.9mm.

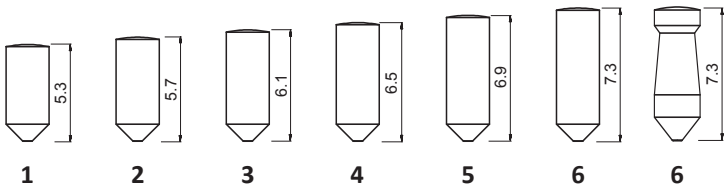
The spacing (distance from center to center of each cut) is 3.4mm.

When the cylinder has two, three, or four chambers, the first cuts are omitted from the cylinder. The key always has all seven cuts so that it can fit other products within a keying system.

Pins specification

Plug pins

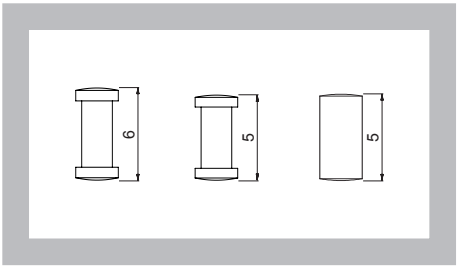
Material: Brass/Stainless Steel



Driver pins

Material: Brass/Stainless Steel

Length: Varies



MT5® + Double Cylinder

Servicing instructions

To service the MT5+ double cylinder is it necessary to use sliced follower and a one piece follower. Two operating keys are required when using the sliced follower technique.

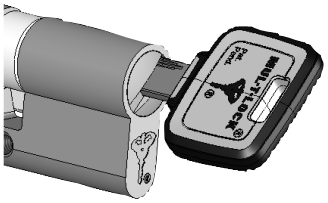
A filed key and spring clamp cannot be used for servicing a double-sided cylinder.

• Remove both E-clips. **Do not reuse.**

Note: If keys are inserted do not pull them out, since this will pull the plug.

1

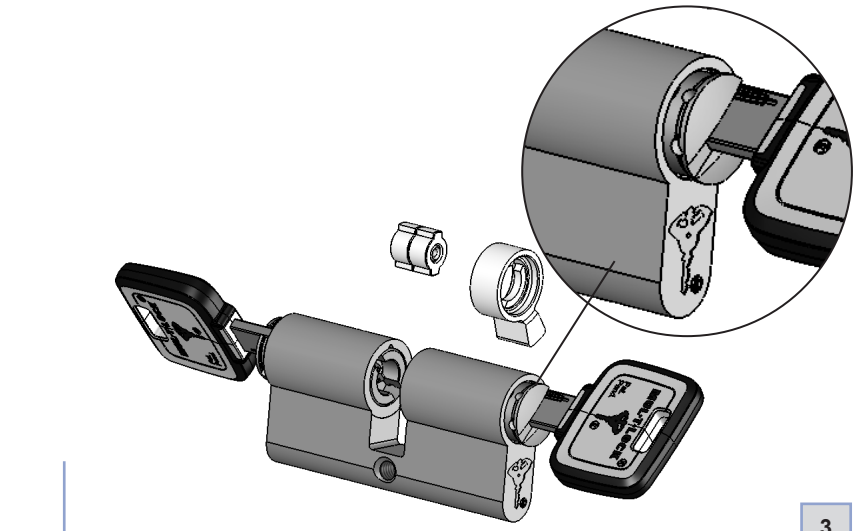
• Insert a key into one side and rotate cylinder plug half turn (180°) degrees.



2

MUL-T-LOCK®

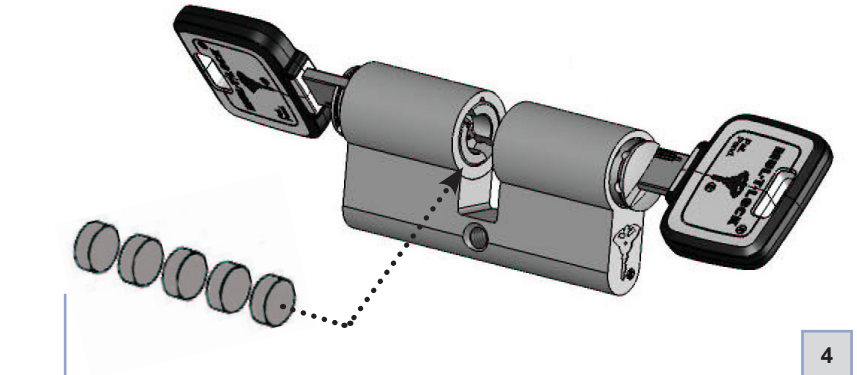
- Pull the plug out carefully until the first chamber is seen.
- Repeat step 2 for the second side and pull second plug until first chamber is seen.
- Take out the cam/cogwheel along with the coupling.



3

Insert sliced follower portions (4-5), one at a time, through the middle opening and push plug and key out.

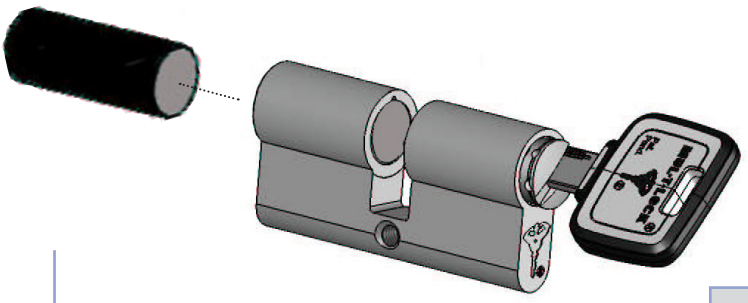
Note: Pay attention to the locking bar and springs.



4

- Insert follower and push sliced follower portions out. Continue pushing follower and take out the second plug.
- After removing the plugs, remove the keys and take out the content of the plugs (i.e. plug pins, finger pins, locking bar).

Note: Pay attention to the crescent (anti-drill) plate inside the cylinder body and to the locking bar and springs.



5

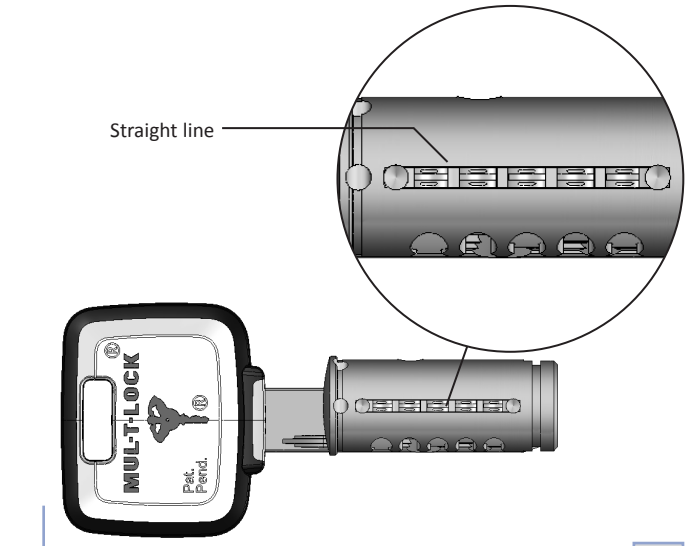
- Re-pin finger pins according to the new finger pins combination, with lower finger pointing to plug center.

Note: Do not insert the key into the plug before assembling the finger pins.

6

MUL-T-LOCK®

• Insert the new key. Verify that a straight line is obtained in the finger pin combination.

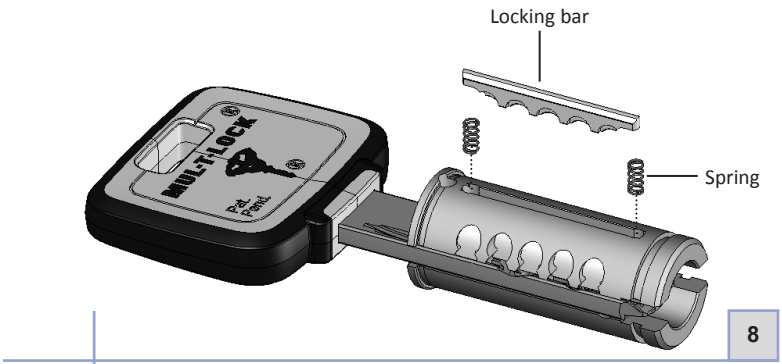


7

• Insert 2 locking bar springs into the holes in the plug.

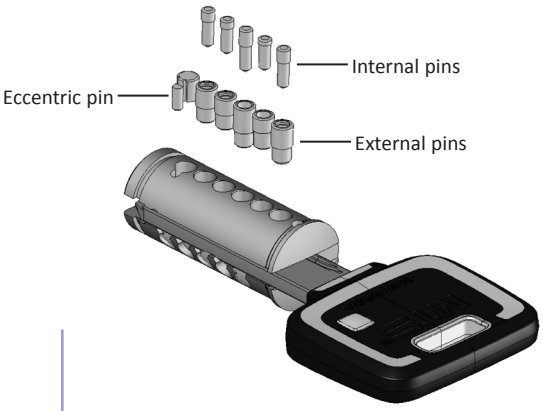
• Place locking bar over the 2 springs, press it down inside the groove, and hold it pressed.

Note: The locking bar is symmetrical.



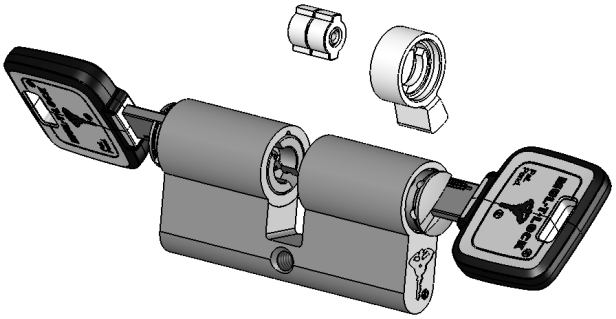
8

- Re-pin plugs with appropriate internal and external pins, according to the combination. Make sure that a proper shear line is obtained.
- Insert eccentric pin into chamber number 6, with eccentric pin leg pointing down into the keyway.



8

- Verify that the steel ball and the crescent drill plate are assembled (see also general view).
- Position the plug with the locking bar pointing down (half turn rotated). Insert one plug while pushing the follower out. Repeat the same procedure on the other side until the plug end is flushed with cylinder body.
- Assemble cam/cogwheel and coupling.

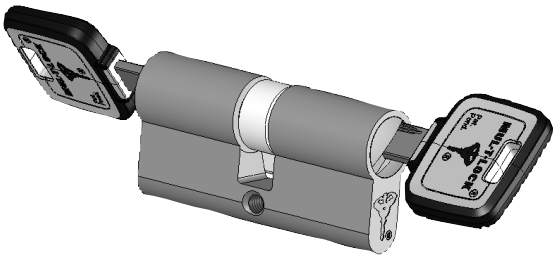


9

MUL-T-LOCK®

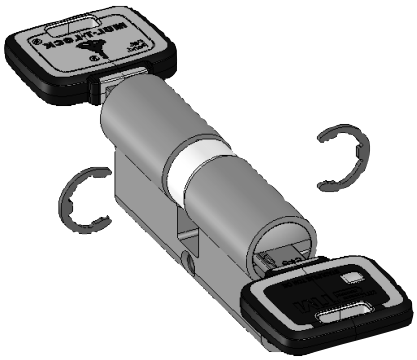
- Rotate the cam/cogwhell gently while applying pressure on both plugs. When one plug snaps into place, rotate the key to zero position and take the key out. When removing the key, apply pressure to the plug to prevent it from coming out. Repeat the same procedure on the other side.

Caution: Do not rotate keys or plugs before the plugs are fully inserted.



10

- Assemble **new** E-clips, making sure that the rounded surface of the E-clips is faces the cylinder body.
- Insert the key and check for a proper operation of the cylinder from both sides.



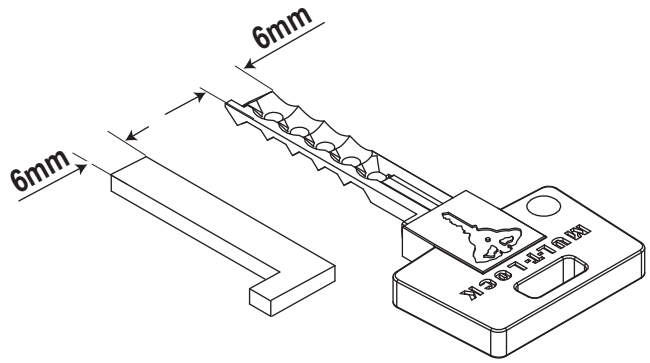
11

Cylinder servicing using filed key

This method is especially effective for servicing double profile cylinders, enabling you to work on each side simultaneously.

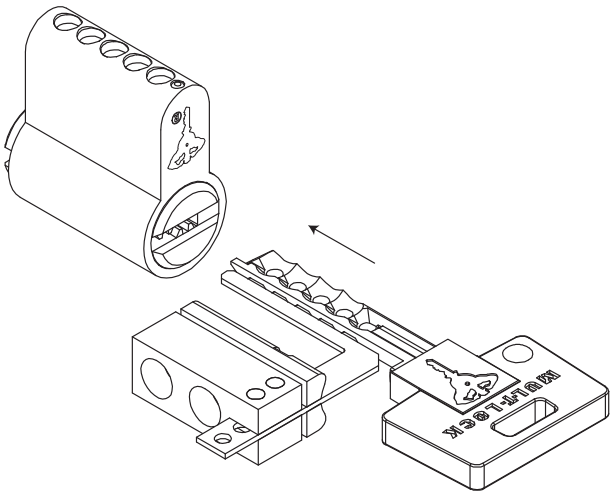
Note: This method can not be applied on MT5+ cylinders.

• File a matching key to a width of 6mm. A 6mm side jig is provided in the pinning kit.



1

• Insert the filed key into the cylinder together with the appropriate spring clamp. Three types of spring clamps are available: 19mm, 22mm and 29mm. The 29mm spring clamp is provided in the pinning kit. Push the holder up to the cylinder body.



2

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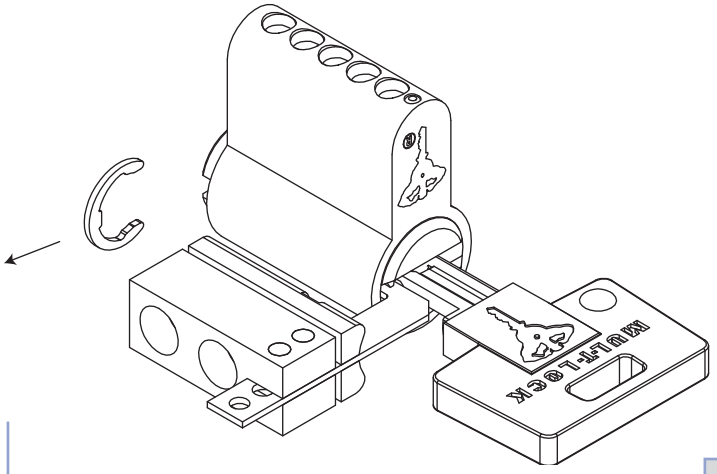
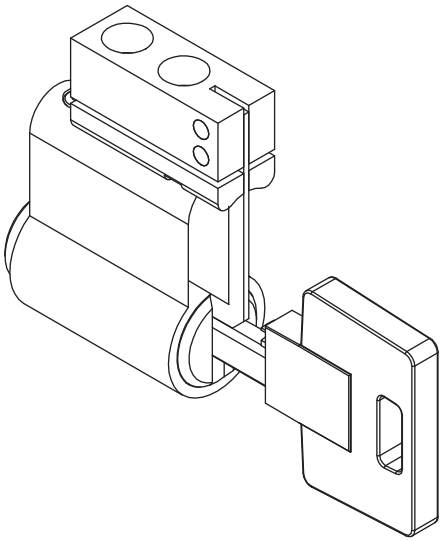
• Remove the E-clip, which holds the plug in place.



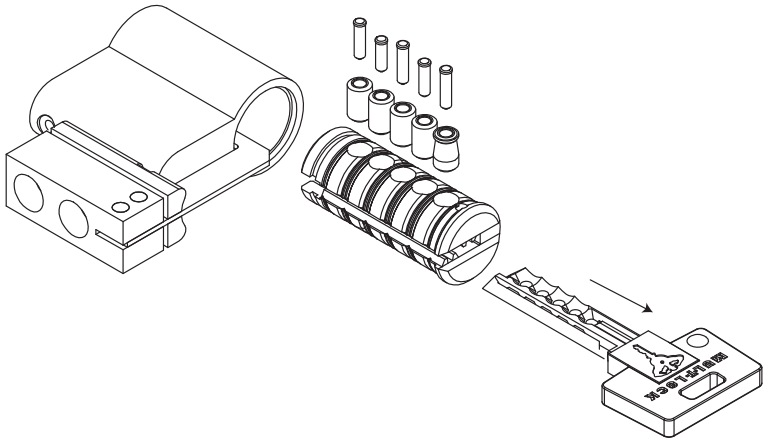
3

• Turn the key and the spring clamp clockwise until it rests on the cylinder body.



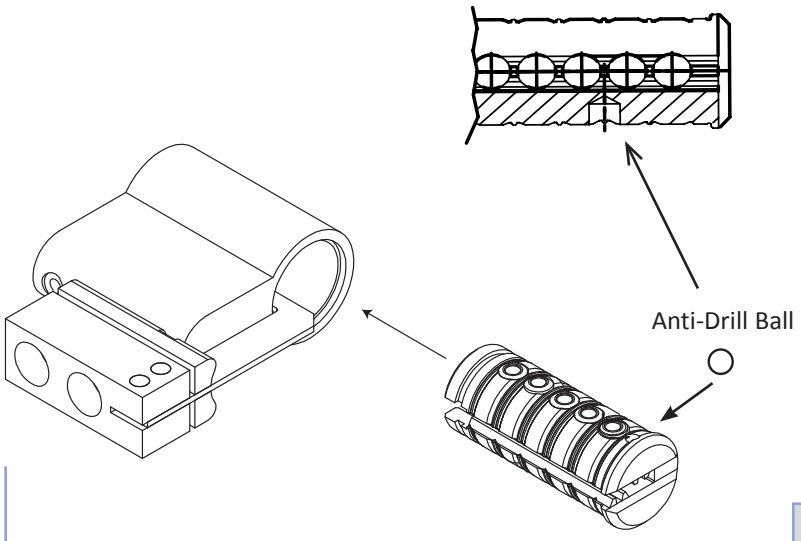
4

- Remove the plug and the filed key from the cylinder body, making sure that the spring clamp is held in place. Remove all plug pins and the filed key from the plug. Insert a new key into the plug and re-insert the pins to align with the new key, making sure that a proper shear line is obtained.



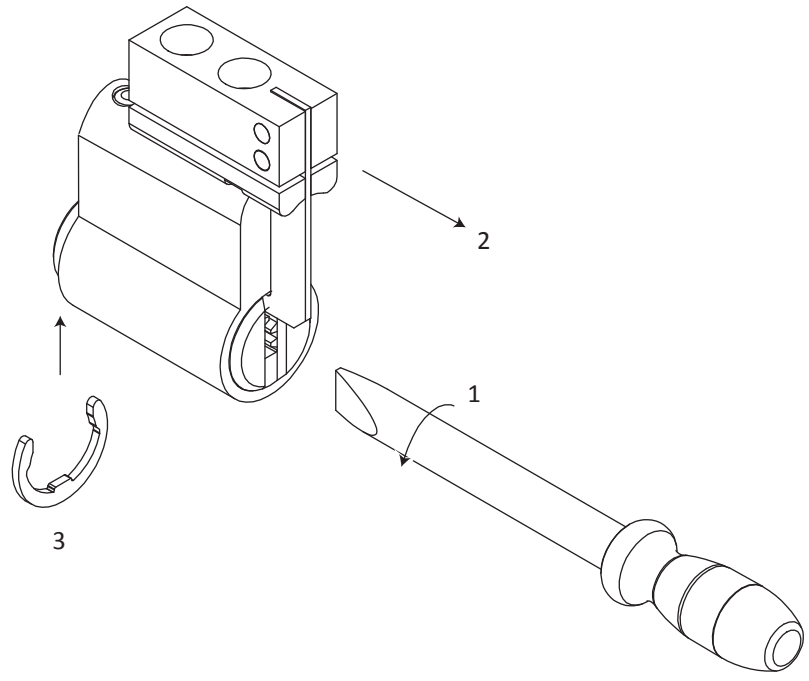
5

- Remove the key from the plug. Insert the plug with anti-drilling ball located in the technical hole into the cylinder body, while making sure that the plug reaches all the way to the back end of the cylinder.



6

- Use a screwdriver or a key tip to turn the plug clockwise until the driver pins pop into place. Remove the spring clamp. Make sure that the cylinder operates properly with the new key. Reassemble new E-clip.



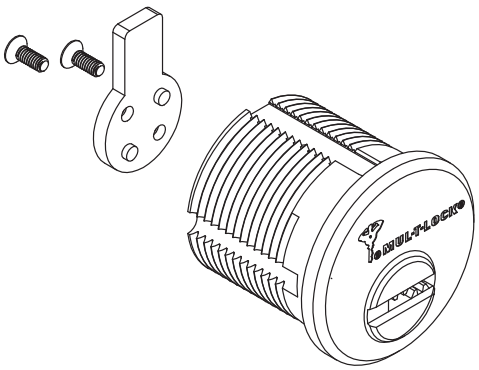
7

Single cylinder

Servicing instructions

In this example, we have used a mortise cylinder. This method is suitable for any kind of single cylinder.

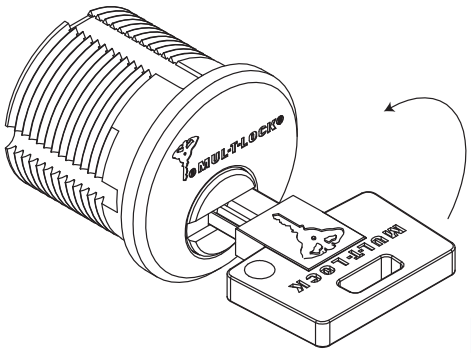
- Disassemble the two screws mounted on the back end of the cylinder. Remove the cam. Different types of cams, or a tail for a rim cylinder, may be fitted to the cylinder. (Pay attention to spacer mounted in longer cylinders).



1

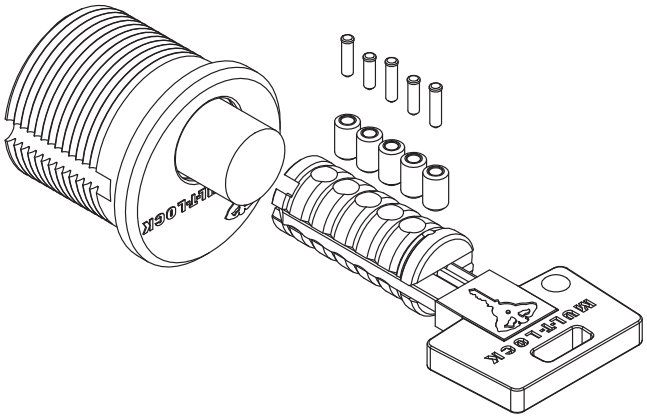
- Using the operating key, turn the plug half turn (180°).

Note: For cylinders with back pins, turn the plug only 25° degrees.



2

- Using the follower, push the plug out. Rekey the plug, making sure that a proper shear line is obtained.



3

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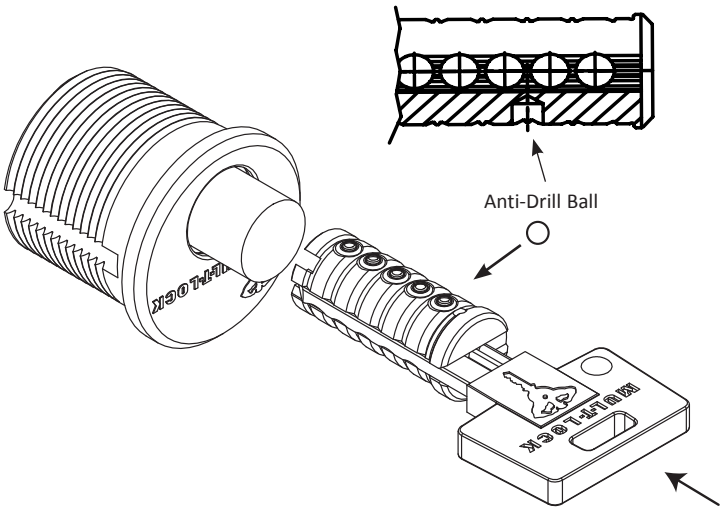
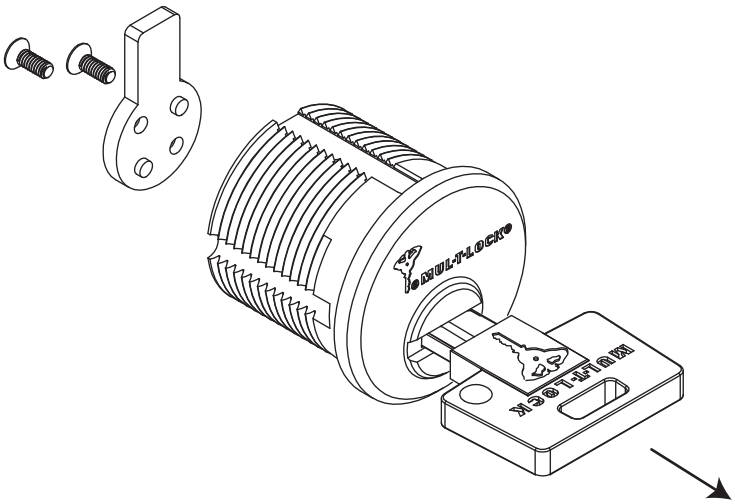
- Push the plug with the anti-drilling ball and all plug pins in place into the cylinder body, making sure that the plug is touching the follower and reaches the back end of the cylinder. Use the key to turn the plug until it is fixed in the proper position.



4

- Remove the key while holding the plug in place. Reassemble the spacer, cam or tail piece, as necessary.



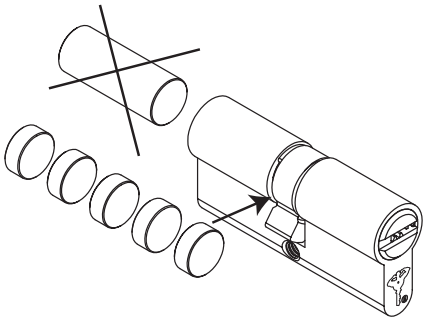
5

Double cylinder

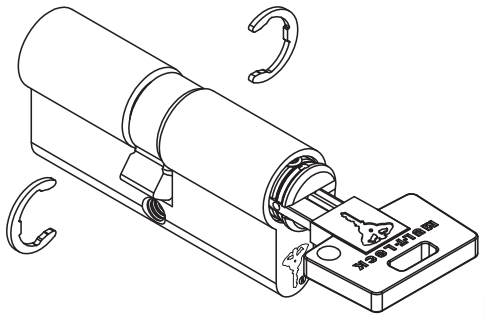
Servicing instructions

Since a regular one piece follower cannot be used to disassemble a double-sided cylinder, a filed key or sliced follower can be used.

Note: Two operating keys are needed when using the sliced follower technique.

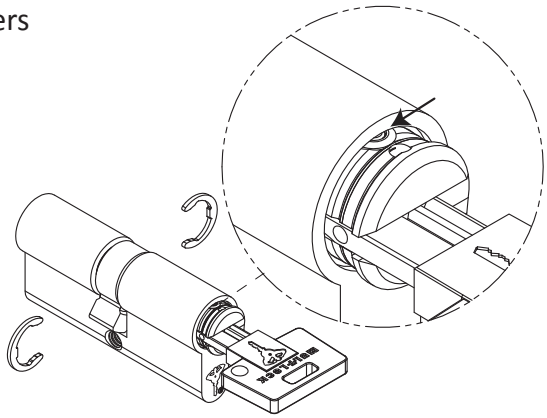


- Remove both E-clips (do not reuse).



1

- Rotate plug half turn (180°). (For cylinders with back pins, rotate only 25°).
- Pull the plug out carefully until the first chamber is seen.

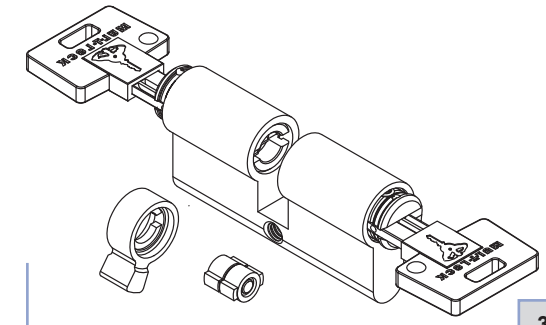


2

MUL-T-LOCK®

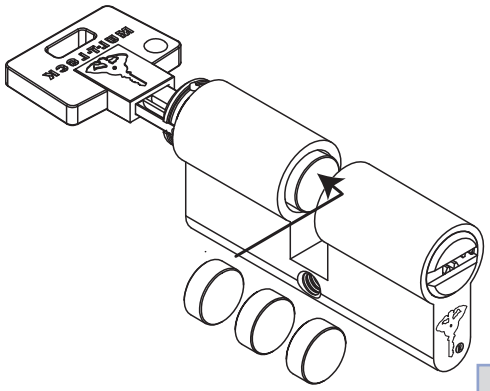
- Repeat step 2 for the other side and pull second plug until first chamber is seen.
- Take out the cam/cogwheel along with the coupling.

Note: The coupling is the key stopper. After its removal, you must find the right key position inside the plug to obtain a shear line.



3

- Insert sliced follower portions (4-5), one at a time, through the middle opening and push plug and key out.
- Insert follower and push sliced follower portions out. Continue pushing follower and take out the second plug.

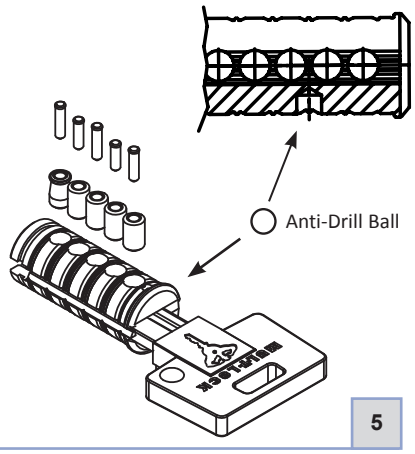


4

- After removing the plugs, remove the keys and take out the content of the plugs.
- Re-pin the plug to a new combination with appropriate internal and external pins, making sure that a proper shear line is obtained.

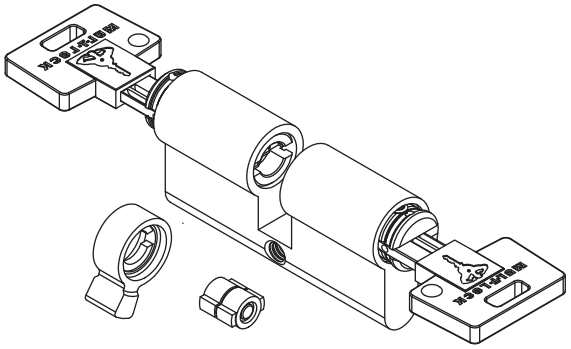
Note: Verify that the steel ball and the crescent drill plate are assembled.

- Position the plug, rotated half turn (180°) and Insert one plug while pushing the follower out until the plug end is flushed with cylinder body. Repeat the same procedure on the other side.



5

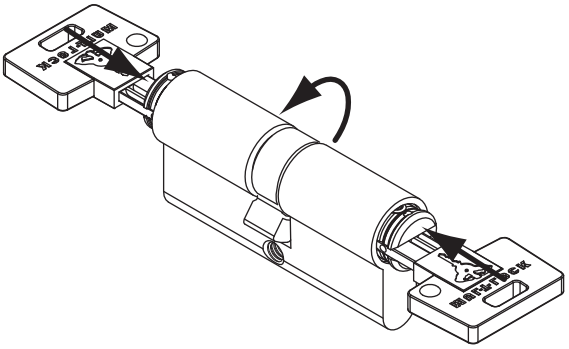
• Assemble cam/cogwheel and coupling.



6

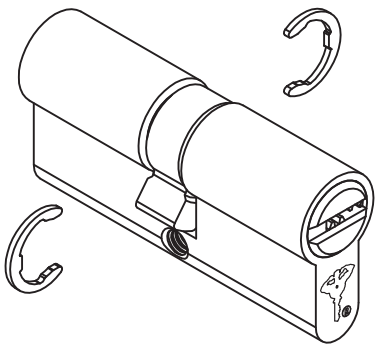
• Rotate the cam while applying pressure on both plugs. When one plug snaps into place, rotate the key to the zero position and take it out. When removing the key, apply pressure on the plug to prevent it from coming out. Repeat the same for the other side.

Caution: Do not rotate keys or plugs before the plugs are fully inserted.



7

• Insert new E-clips, making sure that the rounded surface of the E-clips is facing the cylinder body



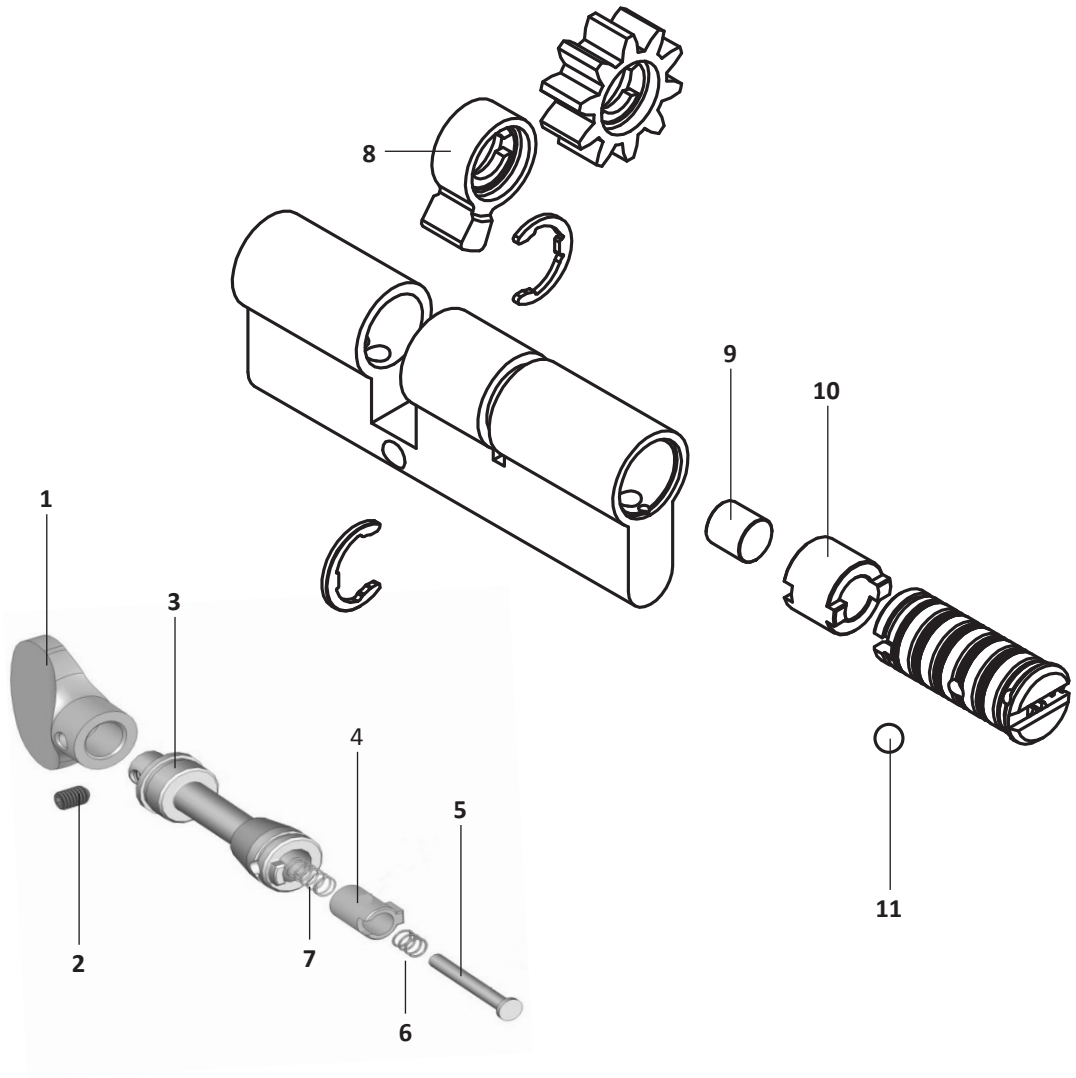
8

MUL-T-LOCK®

Thumbturn cylinder

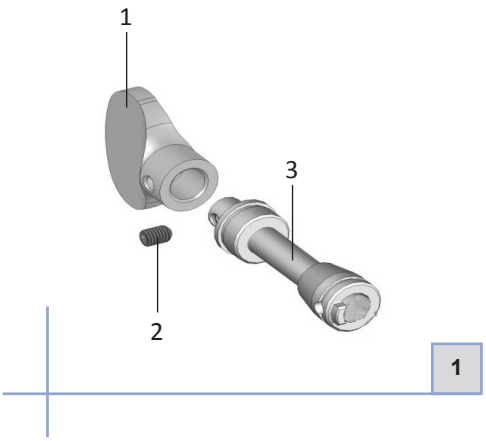
Assembly instructions

Thumbturn structure

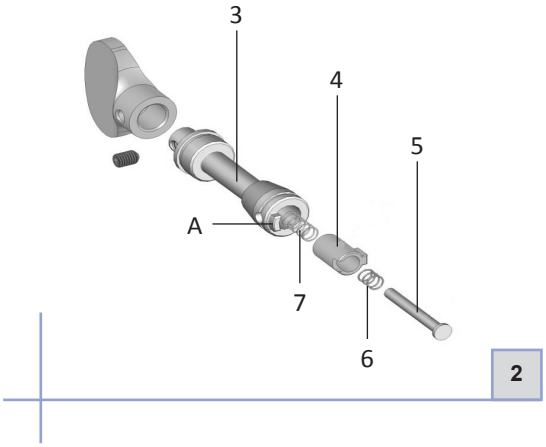


No.	Part	No.	Part	No.	Part
1	Thumbturn	5	Pin	9	Plug spacer
2	Screw	6	Spring	10	Plug adaptor
3	Thumbturn plug	7	Back spring	11	Anti-drilling ball
4	Coupling	8	Cam/gear for thumbturn		

• To replace the knob unscrew one retaining Allen screw (2).



• Insert parts (4, 5, 6, 7) into the plug (3).



Note:

Two types of stopping pins covers the entire range of cylinders:

• Standard length – 23.5mm long (P/N 83000036)

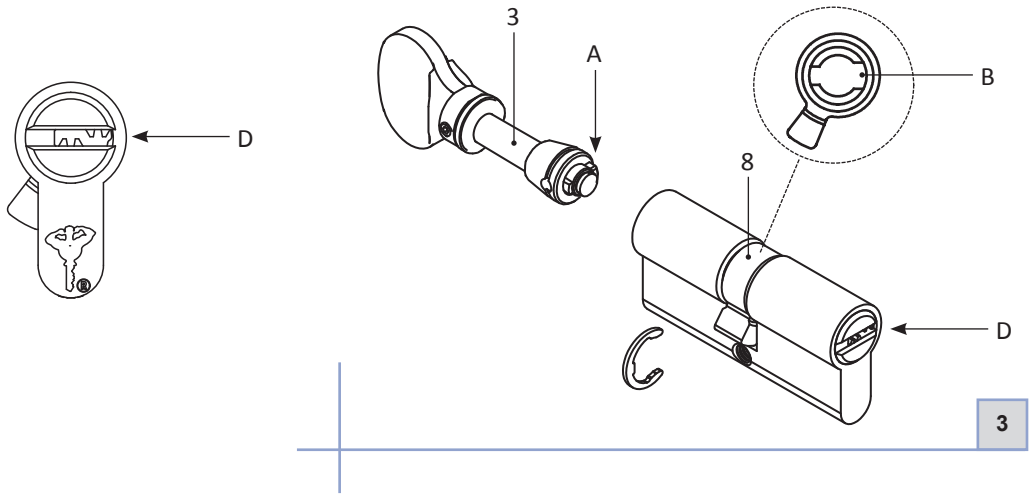
• For Thumbturn cylinder with **key side** of 35mm - the stopping pin has a ticker head and with an overall length of 25.5mm (P/N 83000061)

Thumbturn plug is changing in accordance with cylinder length (See Table).

- Position the cam (8) with the wide opening (B) on same side as the keyway (D). Insert the thumbturn plug all the way into the body. The thumbturn plug tip (A) should go into the wide opening side of the cam (B) as shown.
- Check that the mechanism is integrated and working properly both with and without the key!
- Hold the plug pushed toward the body until you fix it into place with new E-clip, otherwise the spring's pressure will force it to pop out.

Note:

- During the assembly of the plug make sure that the spacer is with the narrow side toward the cam.
- Cam or gear must be appropriate for the thumbturn.
- There are no modular plugs for the thumbturn.



Modular cylinder type

Concept

Mul-T-Lock modular cylinder provides you with the ability to build a cylinder to a desired length. The cylinder is built over a center bar. The bar has two sides; each side is identified with a number that indicates the length group to which it belongs.

The modular cylinder kit is based on a single box configuration.

Structure

A wide assortment of parts will allow you to build any "side" from a minimum of 31mm up to 80mm. You can build cylinders of 31x31, 33x78 or 35x40 or any other tailored length.

There are two bar types:

- A double-sided cylinder bar, called "x,x" (see Double cylinder structure)
- A single-side cylinder bar, called "x" (see Modular cylinder structure)

See the Reference Table for the parts required for building the cylinder side according to the desired length.

Assembly

Assembly is as easy as 1-2-3. Just decide the length you need, select the right parts and assemble them. For example, if you want a 31x46 cylinder you will need:

- One bar type 1, 2 (side 1 for the 31mm, and side 2 for the 46mm) and a bar adaptor.
- For the 31mm side, you will need body type 31, Plug 31, and nothing else!
- For the 46mm side, you will need body type 31, Plug 31, 15mm body spacer, 15mm plug spacer and 15mm plug adaptor.
- 4 threaded pins.

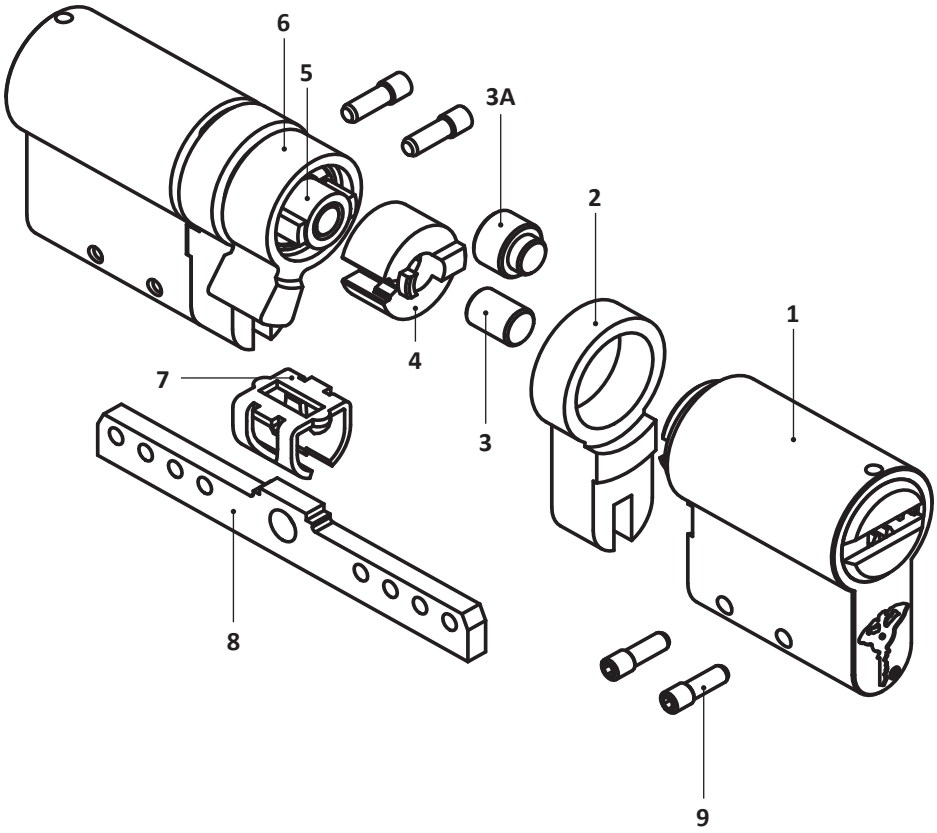
Note: Bodies and plugs should be ordered separately according to the profile (key way) that you use, and to the reference table.

In order to replenish the contents of your box, you should use the special catalogue numbers.

Use the reference table below to determine the parts needed for building the cylinder side length you need, according to the instructions below.

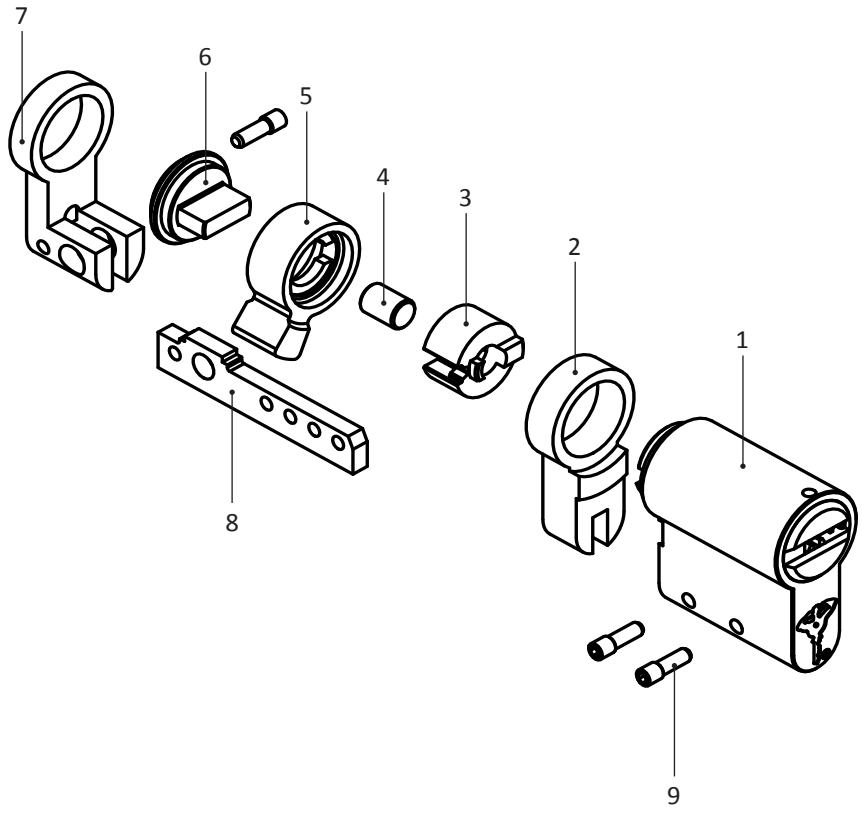
For Catalogue Numbers see table 2 at the end of this section.

Double cylinder structure



No.	Part	No.	Part	No.	Part
1	Modular cylinder	4	Plug adaptor	8	Bar
2	Body spacer	5	Coupling	9	Threaded pin
3	5mm Plug spacer	6	Cam/gear		
3A	7mm Plug spacer	7	Bar adaptor		

Single cylinder structure



No.	Part	No.	Part	No.	Part
1	Modular cylinder	4	5mm Plug spacer	7	Adaptor for single cylinder
2	Body spacer	5	Cam/gear	8	Bar for single cylinder
3	Plug adaptor	6	Improved one-piece coupling	9	Threaded pin

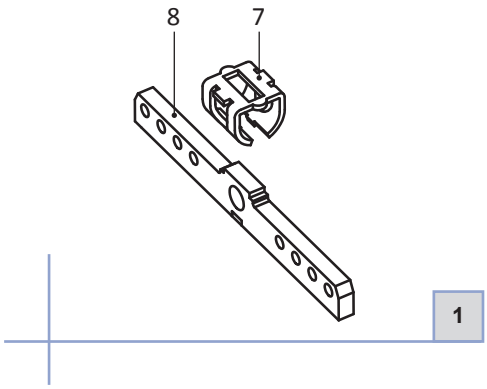
Modular cylinder

Assembly instructions

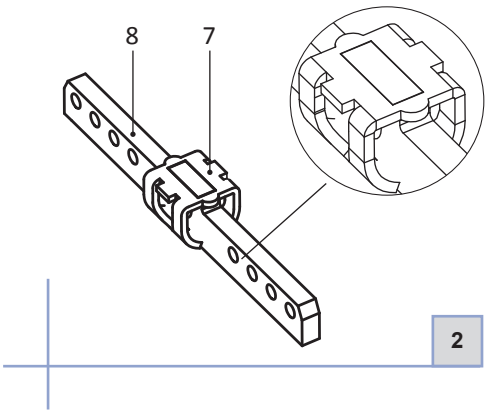
Table 1: Reference table

Cylinder Side	Bar	Body	Plug	Body Spacer	Plug Spacer	Plug Adaptor
31	1	31	31.0	0	0	0
33	1	33	32.5	0	0	0
35	1	35	34.5	0	Ø7x2	0
38	1	33	37.5	5	Ø7x5	0
40	1	35	39.5	5	Ø7x7	0
41	2	31	31.0	10	Ø5x10	Ø5x10
43	2	33	32.5	10	Ø5x10	Ø5x10
45	2	35	34.5	10	Ø5x12	Ø5x10
46	2	31	31.0	15	Ø5x15	Ø5x15
48	2	33	32.5	15	Ø5x15	Ø5x15
50	2	35	34.5	15	Ø5x17	Ø5x15
51	3	31	31.0	20	Ø5x20	Ø5x20
53	3	33	32.5	20	Ø5x20	Ø5x20
55	3	35	34.5	20	Ø5x22	Ø5x20
56	3	31	31.0	25	Ø5x25	Ø5x25
58	3	33	32.5	25	Ø5x25	Ø5x25
60	3	35	34.5	25	Ø5x27	Ø5x25
61	4	31	31.0	30	Ø5x30	Ø5x30
63	4	33	32.5	30	Ø5x30	Ø5x30
65	4	35	34.5	30	Ø5x32	Ø5x30
66	4	31	31.0	35	Ø5x35	Ø5x35
68	4	33	32.5	35	Ø5x35	Ø5x35
70	4	35	34.5	35	Ø5x37	Ø5x35
71	5	31	31.0	40	Ø5x40	Ø5x40
73	5	33	32.5	40	Ø5x40	Ø5x40
75	5	35	34.5	40	Ø5x42	Ø5x40
76	5	31	31.0	45	Ø5x45	Ø5x45
78	5	33	32.5	45	Ø5x45	Ø5x45
80	5	35	34.5	45	Ø5x47	Ø5x45

- Mount the bar adaptor (7) on the bar (8).
- Be careful not to over-spread the bar adaptor (7).



- Make sure that the bar adaptor fits correctly.

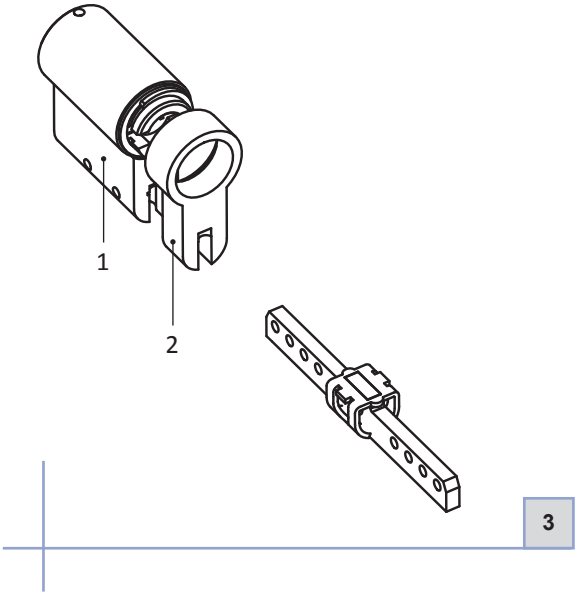


- If necessary, mount the required body spacer (2) onto the cylinder (1).

Note: At this stage, the cylinder should already be keyed to the desired combination

- Slide the two parts together on the correct bar side until the holes in the body of the cylinder are aligned with holes in the bar.

Note: It is recommended to start with the longer side first.



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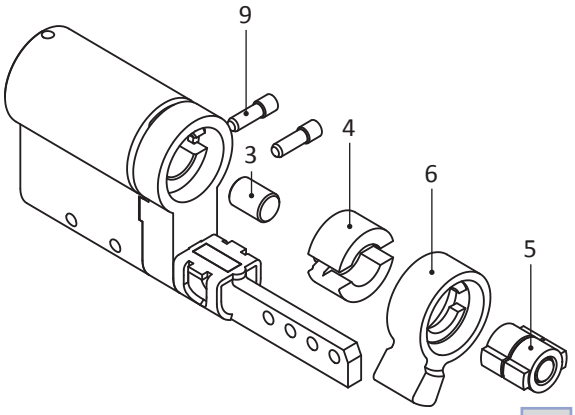
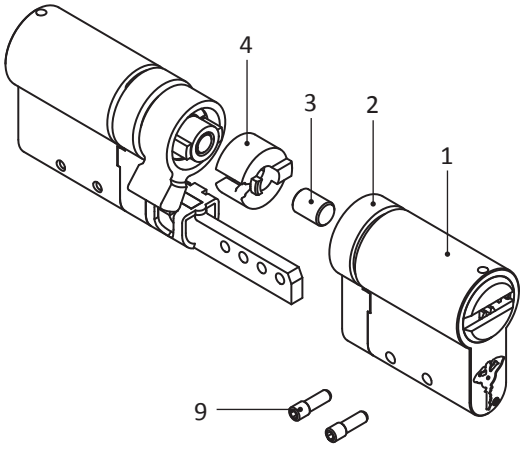
• Screw the two threaded pins (9) using a 1.5mm Allen key (provided in the parts kit). Do not tighten them all the way. Slide in the plug spacers and adaptor (3, 4) (If needed), the cam (6) and the coupling (5).

Note: Threaded pins can only fit one side



4

• Mount the appropriate body spacer (2) onto the cylinder (1). Insert plug spacers and the adaptor (3, 4). Slide them all on the other side of the bar. Insert threaded pin (9), confirm that the cylinder is straight and tighten all the threaded pins.



5

3-IN-1 cylinder type

Concept

Mul-T-Lock designed the 3-IN-1 cylinder to allow users to easily change their own key combinations.

It is a simple and speedy process: the user inserts and operates the next key in a sequence of three keys. The introduction of each new key invalidates the previous key. The product is packaged with three key types, color-coded green, yellow and red. The combination change is possible thanks to an internal pin with the special structure. The combination change occurs when the round part of the special pin is sheered off at the pin.

Cylinder structure

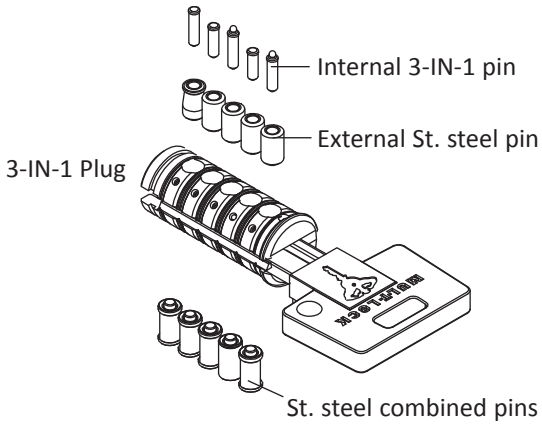
The special parts in the 3-in-1 cylinder are:

- Plug with special holes for the round part
- Two 3-IN-1 internal plug pins

In the chamber where the change takes place, the driver pin (driver) and the external plug pin must be made of steel for increased security.

The cylinder can be keyed simply by dismantling it, inserting new internal pins and removing the cut-off round parts.

Note: There is no option for adding master pins in chambers with the 3-IN-1 internal pin.

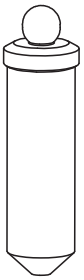


Available pins:

5-3

4-2

3-1



Operation concept

The ‘3 IN 1’ cylinder has been designed by Mul-T-Lock to allow users to easily change their key combinations through a simple and speedy process:
The user inserts and operates the next key in a sequence of three keys, and the introduction of each new key invalidates the previous key combination.

When all three combinations have been used, the cylinder may be re-keyed by an authorised Mul-T-Lock locksmith.

The ‘3 IN 1’ cylinder may be ordered with three separate duplicating cards for the green, yellow and red keys.

Mul-T-Lock allows up to two changes per cylinder, for a total of three key changes starting from the original. The combination change occurs when the breaking off portion of the special pin is sheered off as described below:

- Green key - When a green key is used in the cylinder, the breaking off portion of the special internal pin is above the shear line.
- Yellow key - When a yellow key is inserted into the cylinder, the breaking off portion of the special internal pin is below the shear line. When beginning to turn for the first time, the pins rotates with the plug, while the breaking off portion is sheered and stays in the cylinder body. During the rotation of the plug the "cut-off" part is pushed into a special hole in the plug.
- Cylinder with a yellow key in regular operation. The sheered part of the special internal pin is inserted into the special hole in the '3 IN 1' plug. Each change is done in a different chamber, so the process described above will be repeated in another chamber for the change from the yellow to the red key.

Introduction to master keying

This section provides an overview of the Mul-T-Lock master keying process, and is intended to serve as a guide and reference for those who have received training in master keying. It has been designed to assist you in organizing and implementing a better master key system to meet your customer's specific needs.

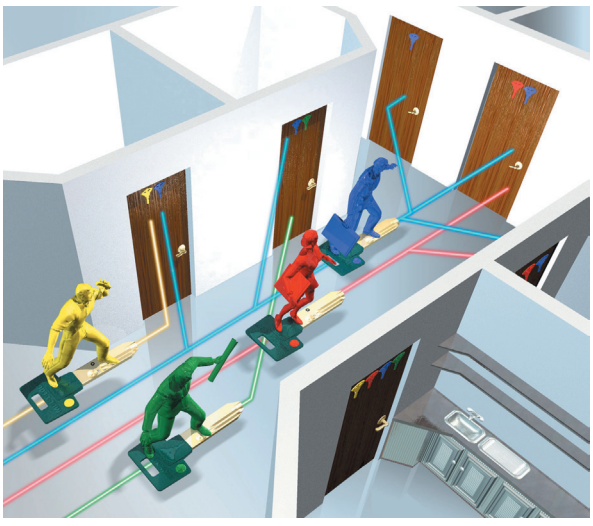
There is no one correct solution for a master system. For each customer, there will be many possible solutions, but only a few will be both optimal and professional.

Master key systems are a changing and dynamic business; they do not end when you complete the sale and installation. There will be ongoing work in cutting keys, expanding the system, and maintenance. It is a long-lasting business relationship and service. A well-designed and professionally implemented system will not only make you proud, but will provide a constant flow of income for years to come. On the other hand, a poorly designed and unprofessional implementation may damage the company's reputation and cause a flow of "free service calls".

This is the reason why master keying is for the professional locksmith. Mul-T-Lock believes that professional design and installation of our systems is essential. To help you accomplish this, we provide professional back-up and support from the initial design through the final installation. Contact your authorized local distributor if you have any questions regarding master keying.

Playing it safe

Maintain a proper balance between security and convenience starting at early stages of the design of the system.



Masterpiece – Mul-T-Lock software for M.K.S designer

Only Mul-T-Lock M.K.S created by last version of Masterpiece software available will be approved.

Trying to create master system manually will cost you time and may cause you to use an unauthorized combinations. The only approved biting list is embedded inside Masterpiece.

The Masterpiece software makes the master keying process faster, easier and more efficient. It does not deny knowledge about master keying, however, it automatically produces the necessary information for the viewing and production of master keying systems, either specified as a hierarchical system (tree mode) or in the matrix format.

- The hierarchical system method (tree mode) supports progression and rotating constantly.
- Cross keying can be done only in matrix format.

After gathering all the necessary information about the system & system characterization, use Masterpiece to build and design the system. Masterpiece will automatically create the necessary combinations.

In addition to the computerized generation of combinations, the program enables you to:

- Print a lock scheme of the system for approval by the customer
- Print labels with relevant information to mark packaging.
- Keep records of the system: the key holders, the cylinders/padlocks that were used and how many were originally requested.
- Full compatibility with Multimanager software.

Multimanager software

Multimanager software is a program that enables you to keep track of the keys in a system. Whenever someone is given a key, it is stored in a database and a receipt is printed, The receipt will be signed and stored in an archive. The program keeps track of and displays reports about the number of keys in stock, the number of keys on loan and how many keys have been discarded or lost. The program enables handling more than one system.

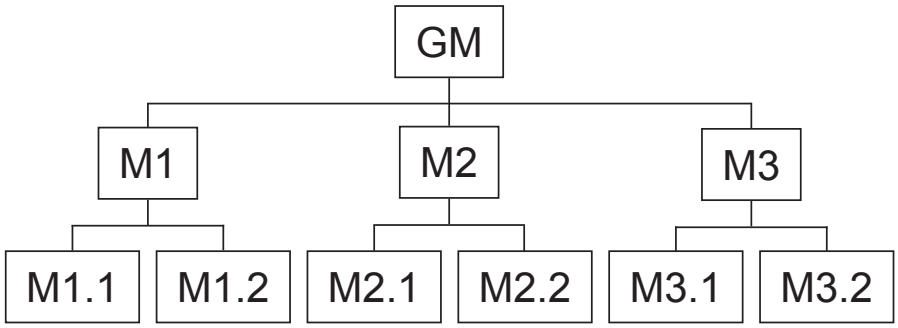
Design methods

Hierarchical presentation of master key system

A common name for a hierarchical structure is a "tree" or "flow chart". In a hierarchical presentation, every node represents a key and cylinder. This presentation has a rigid structure that will not allow flexibility in current design, although with a good initial design it will be easy to expand in the future. This type of design supports entrance doors.

The logic of this presentation is in enabling several levels of access authorization; superior levels are authorized to open only related subordinate levels (e.g. M1 can open M1.1 but cannot open M3.1). There is no access authorization on the same level (e.g. key M1 cannot open cylinder M2). The highest level is the grand master key (GM), which can open all the cylinders in the system. The lowest level includes keys that can open only a single cylinder.

We use a common method for marking the hierarchy: each dot represents dropping one level (e.g. M1 is the second level (below the GM), M1.1 is in the third level.



Hierarchical key system

Matrix representation of master key system

This structure allows very flexible design and supports cross keying.

Once the system is installed, changes may involve rekeying of installed cylinders. It is recommended to include all expansions in the initial design.

Using a matrix chart, each column represents a cylinder and each row represents a key.

Each X marks an opening, meaning the cylinders that each key can open (e.g. key K4 opens cylinders C1 and C4).

	C1	C2	C3	C4	C5
K1	X	X	X	X	X
K2	X	X			
K3	X		X		
K4	X			X	
K5	X				X

A schematic of a matrix key system

Comparison between hierarchical and matrix structures

The table below compares hierarchical (tree) and matrix key systems:

	Tree	Matrix
Future expansion	Possible to expand the system in a relatively flexible way if you plan for it in the initial design	You must incorporate the exact expansions in the initial design. There is no easy way of expanding an existing M.K.S
Cross keying	Limited to common entrance doors	Supports cross keying.
Amount of master pins	Usually one layer of master pins. (Except entrance doors)	In matrix with cross keying there are cylinders loaded with master pins stacking

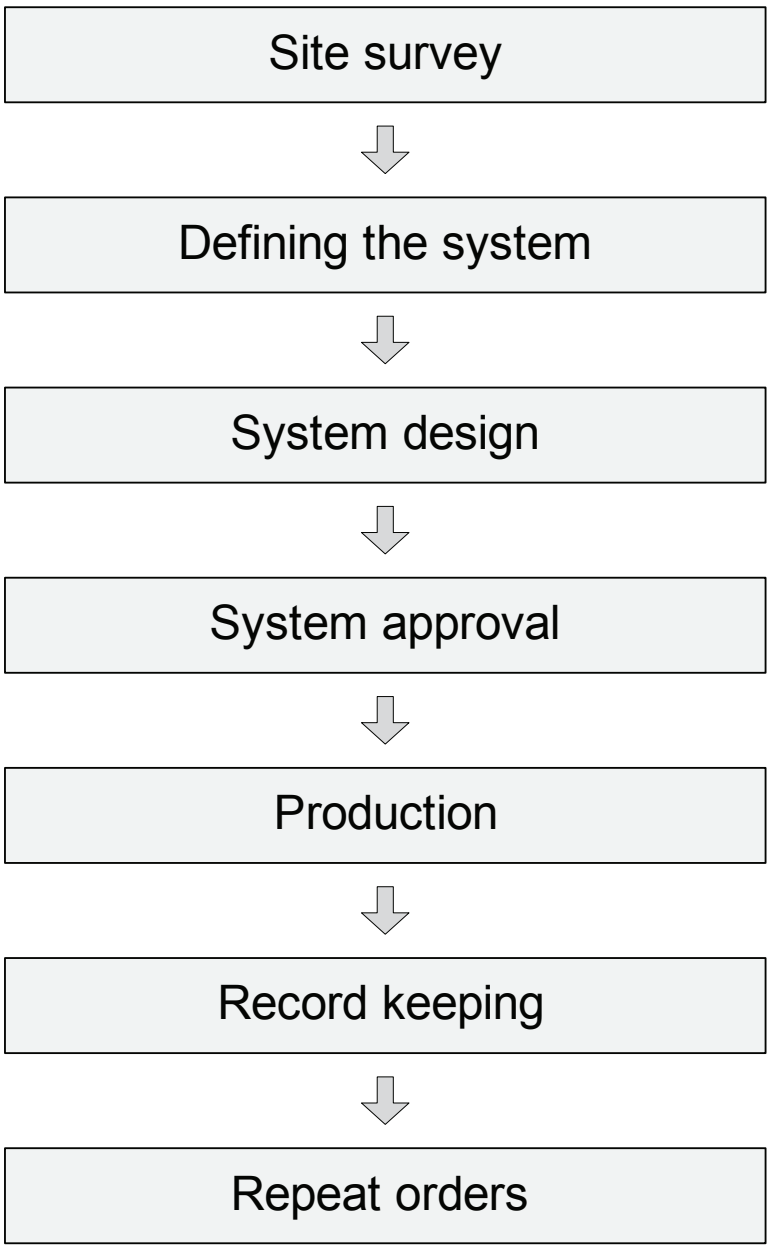
Remember: Try to simplify the structure of a system. A simple design will be easier to maintain and expand over the years, and will last longer.

Always start with the basic hierarchical design and introduce a matrix only when necessary.

A recent Mul-T-Lock's Masterpiece software facilitates building a structure that combines the two methods in a way that the main design of the system is hierarchical but can create sub-matrices for specific nodes when required.

Master key systems

Work flow



Guidelines

Always try to avoid cross keying, the tree structure is preferable to the matrix structure. Try to leave as many constant chambers as possible, but not less than one. If top master keys are stolen or lost, the security of the M.K.S. is breached, and the only solution is to re-key the entire system. It is recommended to split large M.K.S. into a number of smaller ones. Smaller systems have fewer master pins, are safer, and will limit the damage in the event of loss or theft of a master key. People change more often than functions or job titles, so it is better to name keys and cylinders according to jobs and functions rather than using names (e.g. name a key “R&D Manager”, rather than “Mr. Smith”, who may no longer be working for the company). The cylinder with the lowest M.K. capability is the top barrier for master keying (e.g. if you have a cylinder with three chambers and two side pins, you can use only three chambers and two side pins for the master of the entire master key system).

Progression sequence in cutting chambers is as follows: first the middle chambers, then the chamber closest to the tip of the key, and finally the chamber nearest to the key head. An interactive chamber is not counted. Due to the sensitivity of master cylinders (multiple shear lines), we differentiate master cylinders from regular cylinders so that regular keys will not to be able to enter the system at all. The regular cylinders have right profiles, so the left profiles are kept for master keying.

In addition, we strongly recommend using side pins as added security.

Site survey

The first step in site survey is to obtain the full list of the cylinders to be incorporated into this M.K.S., their type, and complementary hardware.

It is recommended that the locksmith who is intended to install the M.K.S. carries out the survey. A list from the customer can be helpful - but it is better to do it yourself.

One good reason for a survey is to gain an understanding of the nature of the premises and system. However, the most important reason is to avoid errors in the type of cylinders, or overlook doors and cylinders.

Do not forget that there are other cylinders, except doors with padlocks or cabinets locks.

At the end of the day, your list should include all cylinder numbers for available side and back pins, the length and number of chambers, profile, and driver (body) pins type (standard, 22mm or 19mm).

We recommend creating a blue print to obtain them.

Specifying the system

This stage is very important and will determine if the design is to be a tree or a matrix. The role of the locksmith is to advise and guide the client to stipulate the best and safest M.K.S. for his needs. Establish the authorization structure for which keys will open which locks. Future developments concerning authorization must be discussed with the client and future expansion of the system will be jointly formulated. Always try to achieve the maximum possible capability without overloading the system with master pins for cylinders that will never be installed. Do not forget that we are not talking about expansion in the next year but rather for entire lifespan of the system. Decide the visible markings on cylinders and keys. It is critical to mark the cylinders and keys for later management of the M.K.S. Be careful not to make it too obvious, and do not leave identifying details on the keys, such as the company name. After all, keys will inevitably be lost or stolen, and there is no reason to make life easy for the bad guys. Use sequential numbers or any other non-distinguishable methods. For a tree, our default markings are GM, M1, M1.1, and so on. If you want customized marking, make it simple. Decide how many keys will be provided with each cylinder, packaging, and package markings. Finally decide the contact person with whom you will work.

System approval

We strongly recommended that the final design, including the system layout and combinations, should be sent to the customer for their written approval.

Production

Print cylinder and key combinations from the Masterpiece software. Assemble the cylinders and cut the keys according to the output. Mark cylinder and keys as agreed with the client.

Insert each cylinder into a separate nylon bag with the appropriate label (printed with Masterpiece). Repeat the process for the keys.

Record keeping

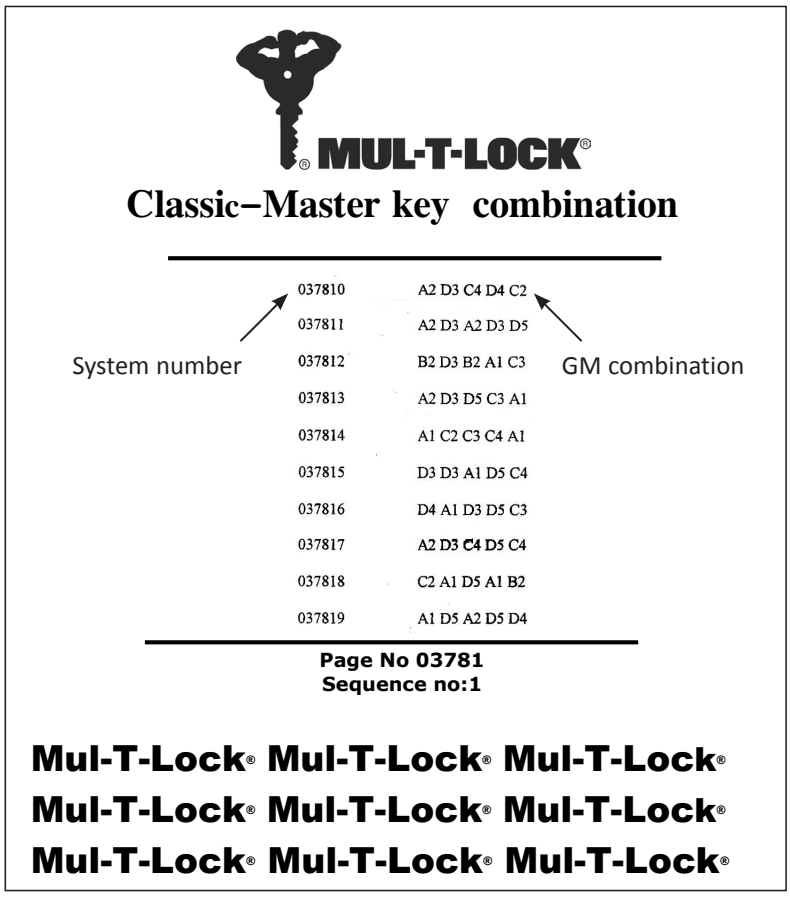
We recommend saving a Masterpiece file by using a system number. Make sure that there is a back-up file and keep it updated. Keep a hard copy as well, including all relevant documents. It is essential to keep track of what was actually installed on the site, as this will give you better control of changes and will protect you from allegations of malpractice caused by someone else making changes in the system. All this data is confidential and sensitive - you must secure it and restrict access to the hard copy and computer archive.

Repeat orders

Refer to production and updated records. Changes in design with regard to the limitation of the existing system are carried out in the same way as the first stage in the initial design.

GM combination and system number

Determine the system number and GM combination using GM combination package. The idea is to prevent random repetition of GM combinations for different M.K.S. There are different kinds of GM combination packages for each platform (Classic, 7x7 etc.) The GM combination package contain a list of ten different combinations, each one identified by unique identification number. Each combination is intended for the production of one unique master key system (see sample list). Ten cards, each stamped with an identification number that appear in the list. This card is given to the end user so that the locksmith can produce extra keys, change combinations, service the system, etc. Mul-T-Lock works only with system numbers, making it essential to keep the card for future dealings with us.



Design options

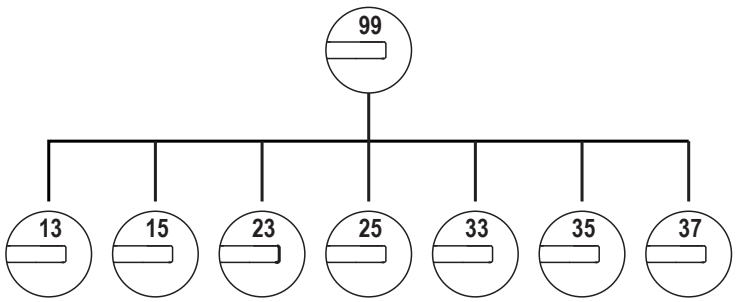
Profiles and keys

LH keyways for master keying

In addition to our extensive master capability, Mul-T-Lock offers hierarchical structure of keyways (multi-profile structures).

The multiplex system consists of master keyway 99 and seven sub-keyways.

It is essential to use left hand (LH) keyways for master keying.



Using a reversible key

A reversible key in the master key system may be used to create greater system manipulation and flexibility. By cutting each side of the key differently, each side can become a different key. To distinguish one side from the other, there is colored nylon insert on one side. One way of using a reversible key is to create a GM for the M.K.S. with two combinations that can have only two cylinders (e.g. home and office), or big systems that are keyed alike. These systems do not use master pins, and are therefore more secure and more durable. They may be produced using keys and cylinders from stock. Central M.K.S. uses reversible keys in the following two ways:

- A reversible GM for two different M.K.S. on one key. This option allows us to create a larger M.K.S., bearing in mind that we have to ensure that the cylinder on one side will not be opened accidentally by the other.
- The recommend option: use one side for the M.K.S. and the other with an uncut cylinder for the entrance door. Entrance doors are the weakest point in any M.K.S. This cylinder works much harder than all other cylinders in the system, because all users go through this door. For entrance doors, use cylinders with multiple master pins, as these cylinders are more vulnerable than other cylinders. Using a reversible key for the entrance door allows the use of a non “M.K.S. cylinder”. The result is a significant improvement in the lifespan of the cylinder.

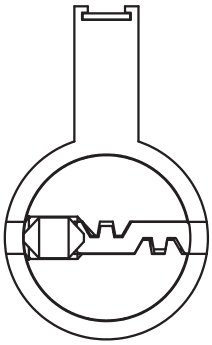
Side/Back pins

Introduction

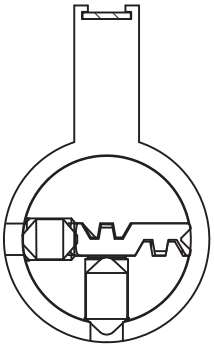
Side and back pins enable us to deal with bigger and more sophisticated systems and at the same time increase the mechanical reliability of the cylinder.

The plugs and body are pre-drilled for side pins. The number of side/back pins can vary according to cylinder type, length and platform.

The person who builds the master key system will insert the pins and also cut the corresponding dimples (cuts) on the key edge or back.



Side pin mechanism



Side and back pins mechanism

Solid plug pins

Introduction, basic construction

This revolution in master keying concept is only available in telescopic pin tumblers. The concept can be explained as follows: we took the “multiple shear line” away from the plug shear line and moved it into the key side.

By doing so we increased the reliability of a master keyed cylinder, while the system performance and possibilities also increase.

The core of the approach is “merging” some sets of telescopic pins, and by doing so we obtained 12 pins that will be added to the Master keying kits.

Benefits of the concept

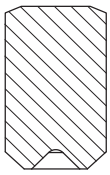
- The mechanical reliability of master keyed cylinder is enhanced as a result of fewer parts in each chamber.
- The security of master key systems to “lockout” of unauthorized keys is always achieved with the external plug pin.
- Ease of assembly – parts are larger than previously.
- The ability to solve complex cross keying challenges is improved.

Pin categories

The solid plug pins are divided into three categories:

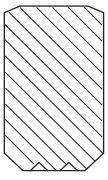
A. Pins that designed to work on the external cut only. Those pins are identified by a letter followed by a minus (-) sign.

A–
B–
C–
D–



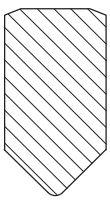
B. Pins that designed to work on both external and internal, at the same time – or on the shallower of the two. Those pins are identified by double letters.

AA
BB
CC
DD



C. These pins are with a “point” and designed to work on the internal cut only. They are identified by a letter followed by a plus (+) sign.

Z+
A+
B+
C+



S1/S2 driver pins

Introduction

The new driver pins S1 & S2 have been added to the range of pins designed for cylinders of master key systems for 29 and 22mm products. Thus, when solutions for master key systems are created, these pins will be included in the solution printout produced by the software.

The S1 driver pin will replace the standard driver pin and one 1+ solid master pin.

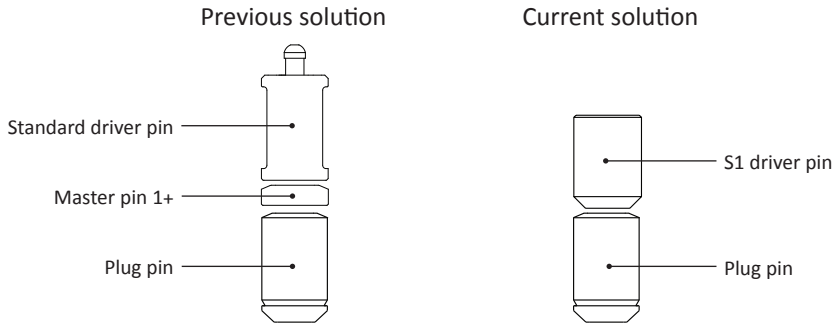
The S2 driver pin will replace the standard driver pin and two 1+ solid master pins.

Benefits of the concept

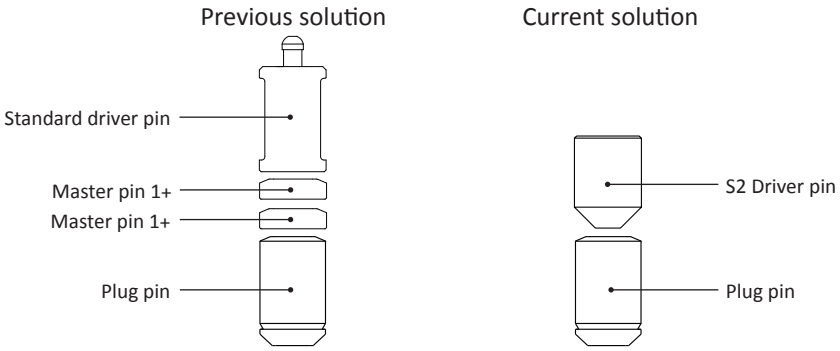
- The mechanical reliability of the master keyed cylinder is enhanced.
- Fewer parts are used for assembly.

Note: Warnings appear in the solution printout, as a reminder for replacing the standard combined driver pins in specific chambers.

S1 assembly illustration



S2 assembly illustration



MUL-T-LOCK®

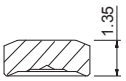
Master key components

MT5

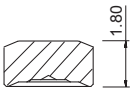
Solid master pin #1

Solid master pin #2

Solid master pin #3



Solid master pin #4



External master pin #1

External master pin #2

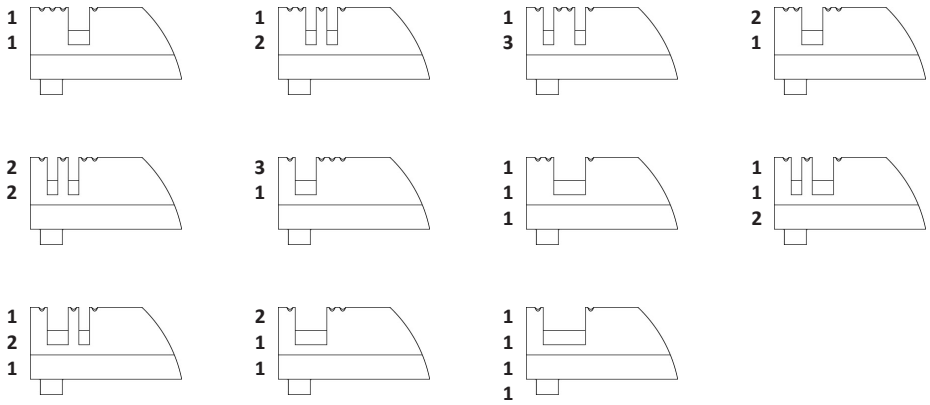
External master pin #3

Internal master pin #2

Internal master pin #3

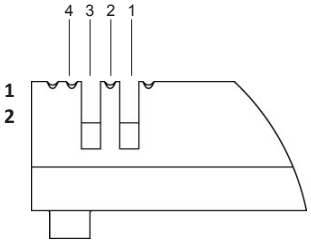
Internal master pin #4

Master finger pins



Example

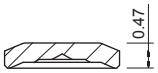
For this example we use master finger pin #12.
The start position is 1 (first combination groove) then jumping 2 positions to the third groove.



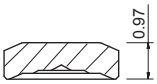
Master key components

Classic/Interactive

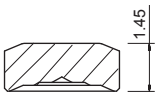
Solid master pin #1



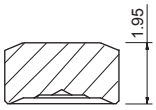
Solid master pin #2



Solid master pin #3

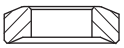


Solid master pin #4

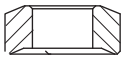


External master pin #1

External master pin #2



External master pin #3



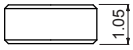
Internal master pin #2

Internal master pin #3

Internal master pin #4

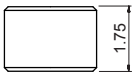
7x7/Integrator

Solid master pin #2



2

Solid master pin #4



4

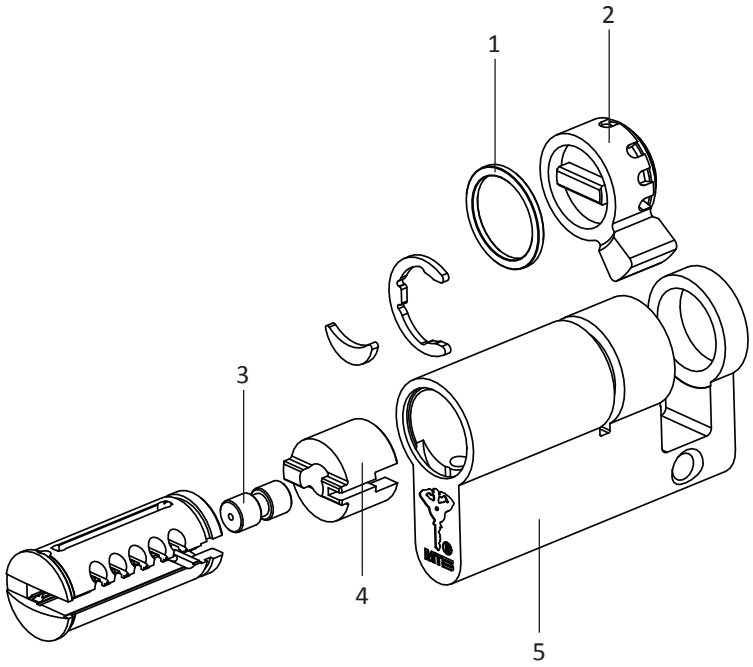
MUL-T-LOCK®

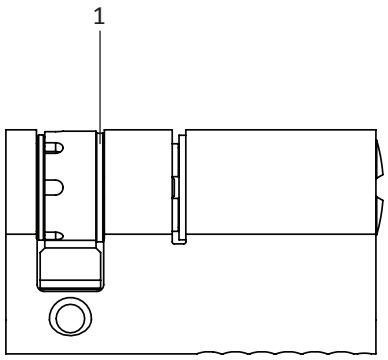
Half cylinder with 8 positions cam

When assembling half cylinder 40mm side and above with 8 positions cam (2) an additional ring (1) is needed to complete the assembly.

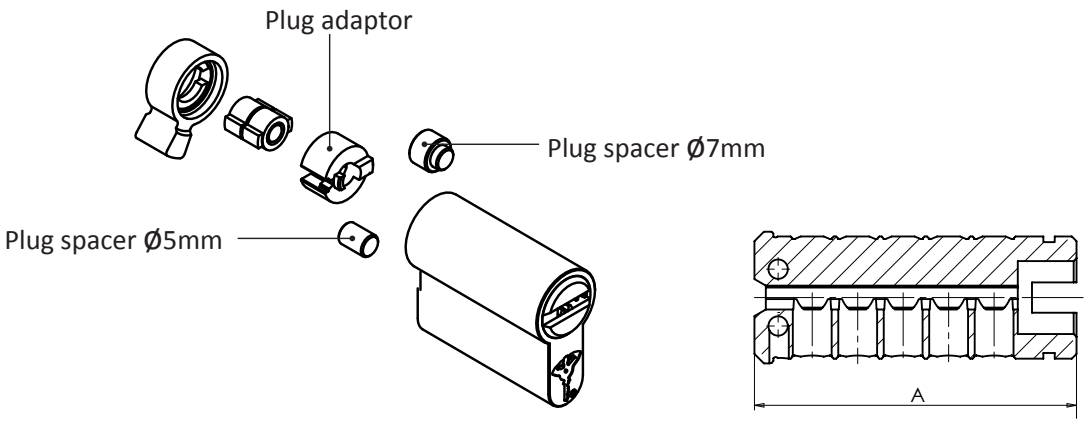
Assemble plug adaptors (4) and plug spacers (3) according to spacers and adaptors table (page 70).

Note: Ring (1) part number - 51057833





Spacers and Adaptors



Cylinder	Plug (A - mm)	Plug Spacer (mm)	Plug Spacer (P/N)	Plug Adaptor (mm)	Plug Adaptor (P/N)	TT plug (P/N)
31	31.0	-	-	-	-	83000214
33	32.5	-	-	-	-	83000215
35	34.5	Ø7x2	80000322	-	-	83000217
38	37.5	Ø7x5	88000018	-	-	83000219
40	32.5	Ø5x7	88000051	7	80100612	83000220
43	32.5	Ø5x10	88000052	10	80100613	83000222
45	32.5	Ø5x12	88000053	12	80100614	83000223
48	32.5	Ø5x15	88000054	15	80100615	83000226
50	32.5	Ø5x17	88000055	17	80100616	83000227
53	32.5	Ø5x20	88000056	20	80100617	83000229
55	32.5	Ø5x22	88000057	22	80100618	83000230
58	32.5	Ø5x25	88000058	25	80002027	83000232
60	32.5	Ø5x27	88000059	27	80002028	83000233
63	32.5	Ø5x30	88000060	30	80002029	83000235
65	32.5	Ø5x32	88000061	32	80002031	83000236
68	32.5	Ø5x35	88000062	35	80002032	83000237
70	32.5	Ø5x37	88000063	37	80002033	83000238
75	32.5	Ø5x42	88000065	42	80002035	83000239
80	32.5	Ø5x47	88000067	47	80002037	83000240

MUL-T-LOCK®

FlexControl cylinder

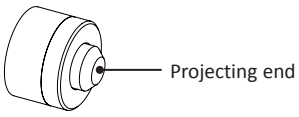
Main features:

- Available in Mul-T-Lock's Interactive+ platform.
- Includes 4 types of keys:
  - Blue Key - (the secondary key) This key is the controlled key which works by the "authorization mode" operated in accordance with the management control determined by the Red & Green keys.
  - Red Key - When rotating full turn CW (clockwise) or CCW (counter clockwise), on the cylinder external side, it activates the lock out and prevents the Blue key holder from operating the cylinder.
  - Green Key - When rotating full turn CW (clockwise) or CCW (counter clockwise), on the cylinder external side, it allows the Blue key (the secondary key) holders to operate the cylinder.
  - White Key - (the primary key) for day-to-day use which works in all cases, at all times.
- Fits products which can operate after installation, at least full turn CW (clockwise) and CCW (counter clockwise).
- Supplied with a single magnetic strip card, printed with all key codes, magnetic strip carries only the white key code.

Note: Red & White keys have a special cut on the side of the key blank.

Plunger assembly

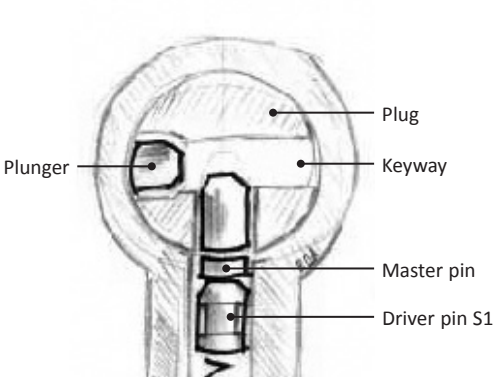
- Insert the plunger into the designated chamber with the projecting end pointing into the keyway. The plunger designated chamber is located at the side of the plug (similar to side pin chamber).
- Verify free movement of the plunger inside the chamber.



Plug pins assembly

- Insert the Green Key (identified by the Green insert in the key head) into the plug.
- Set the combination according to the Green key printed key code.
- Take the key out and add master pin (1+) to the telescopic combination in chamber number 5.

Note: S1 Driver pin is assembled in chamber number 5.



FlexControl & Master suites

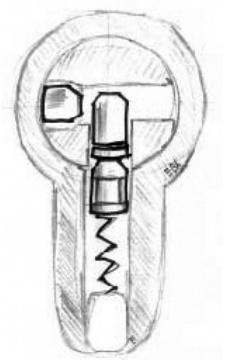
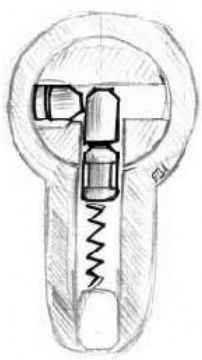
Using the FlexControl within a master suite can limit the overall design. It is possible to use up to 4 telescopic chambers and 4 side pins (on a 5 chamber cylinder).
Please contact us with your master suite requirements to discuss this.

FlexControl cylinder

Schematic sketches (describing working principle)

Green key	Red key
	
Master pin inside the chamber	Master pin inside plunger chamber

Operation

			
Operating	Operating	Not operating	Operating

MUL-T-LOCK®

General

E-clip assembly

1. The E-clip should be replaced to a new one and not reassembled on any service operation performed on the cylinder.
2. Assembly of the E-clips will be with the rounded edges facing the cylinder body. Confirm that it is properly aligned with the plug groove
3. After re-assembly, make sure that the cylinder operates properly with the new key on both sides.

Cylinder lubrication

a cylinder like any other mechanical assembly requires a regular preventive maintenance and need to be lubricated. Lubricate the cylinder using Mul-T-Lock Lubricating Spray.

1. It is recommended to lubricate twice a year (every 6 months) in regular use. With frequent use, or in harsh weather conditions lubricate at least 4 times a year.
2. Use only Mul-T-Lock approved lubricant.
3. Do not use graphite.

Cylinder installation

1. Do not use a power driver to secure cylinder screws!
2. Do not apply torque above 4 N/M for fixing cylinder screws!

Master suite cylinders

When disassembling cylinder plugs assembled to a master suite (with master pins), verify that no master pins have been left inside the body.
Two options available for verifying:

1. Use a key with the deepest cuts possible in all chambers for the specific cylinder.
2. Remove the plug without a follower, take out all driver pins and the master pins inside the body, and reload the body.

MUL-T-LOCK®

www.mul-t-lock.com

For close to 40 years, Mul-T-Lock has been designing, manufacturing, marketing and distributing innovative High Security locking solutions to people, places and organizations globally. Adhering to the world's most stringent standards, Mul-T-Lock High Security solutions are at work on every continent, in nearly 70 countries, and securing over 100 million users. Using advanced and patented technologies, Mul-T-Lock stays a step ahead of the market by anticipating customers' security and operational needs.

As a member of the ASSA ABLOY group, and with availability through over 20,000 authorized and trained service centers, customers rely on Mul-T-Lock to provide proven, proactive and protective High Security locking platforms.

An ASSA ABLOY Group brand

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