LISHI.

LISHI 2-in-1 Tool System

Professional Technical Manual

PICKING · DECODING · KEY CUTTING

ENGLISH EDITION · TRANSLATED FROM THE CHINESE ORIGINAL



Automotive & Residential Locksmiths · Training · Distribution

122 source pages

SALES MANAGER NANCY · PHONE / WHATSAPP +86 186 9155 5689 | SALES MANAGER VICKY · PHONE / WHATSAPP +86 153 5368 6577

Editor's Note to the English Edition

This volume is a complete English translation of the Chinese edition of the LISHI 2-in-1 tool manual — a 122-page technical textbook covering tool anatomy, lock cylinder construction, key families, picking procedure, and model-by-model data for every tool in the range.

WHAT WAS TRANSLATED

Everything. Chapter titles, running text, numbered term definitions, tool data blocks, notes, table headings, and the call-out lettering inside the technical drawings. No section has been abbreviated, merged, or omitted. Where the original repeats itself, the English repeats it.

HOW THE ARTWORK IS HANDLED

All photographs, cylinder cut-aways, key silhouettes, bitting charts and tables are reproduced from the original scans at the resolution of the source file. Nothing has been redrawn, recoloured, rescaled or airbrushed: a technical drawing that has been "cleaned up" is a drawing you can no longer trust. Where a drawing carries Chinese lettering, the drawing itself is left untouched and an English callout legend is printed directly beneath it, so the reader can follow the original annotation without losing the original line work.

NUMBERS, CODES AND MODEL NAMES

Tool model designations, patent numbers, wafer counts, depth values, position numbers, key codes and vehicle names are carried over verbatim, in the original units. Depth figures use the unit printed in the original charts: **1/100 mm**. Where the source figure is ambiguous or a digit is not resolvable in the scan, the reading has been flagged in the translation quality report rather than silently "corrected".

TERMINOLOGY

A single controlled vocabulary is used throughout this volume — one English term per source term, held for all 122 pages — and the same list is kept as a terminology workbook (source term, English term, definition, page references) that we will send on request. The distinction between a *wafer* (the flat tumbler used in these automotive cylinders) and a *pin* (the cylindrical tumbler of a pin-tumbler cylinder) is maintained strictly, because the two lock families are picked differently.

EDITORIAL ADDITIONS

Nothing technical has been added. The chapter numbers, this note, the "how to use" page and the contents are editorial scaffolding for the English edition; the source page number printed at the head of each block ("Source page 13") lets any passage be checked against the Chinese original at a glance.

How to Use This Manual

STRUCTURE

Chapters 1 to 5 teach the system: the tool, the lock, the vocabulary, the cylinder families and the picking procedure. Chapter 6 is the reference section — one entry per tool model, each carrying applicable vehicles, picking direction, wafer and depth counts, decoding direction, numerical data, key cutting data and the special technique for that lock. The appendix cross-references every model number against the vehicles it covers.

FINDING A TOOL

Use the contents, or the PDF bookmarks (every model is a bookmark). If you know the vehicle but not the model, start at the appendix cross-reference tables at the back.

READING A DATA BLOCK

Each model entry follows the same order, so the eye learns where to look: *applicable vehicles*, *picking direction*, *wafer count*, *number of cut depths*, *decoding*, then the numerical data chart and the key cutting data.

FIGURES

Figures are numbered by source page and sequence — Fig. 13.1 is the first figure on source page 13. Where a figure carries Chinese lettering, the legend beneath it pairs the original term with its English equivalent, in the order the callouts appear on the drawing.

SOURCE PAGE MARKERS

The small grey line at the head of each block reads *Source page n*. It marks where the corresponding page of the Chinese original begins, so a passage can be checked side by side with the source, or with the bilingual edition.

SAFETY AND PROFESSIONAL USE

The techniques described are for use by professional locksmiths and technicians on locks they are authorised to open. Vehicle immobiliser and key programming operations must follow the manufacturer's procedure for the specific vehicle.

Contents

Page numbers refer to this edition. Every entry is a live link.

Tools Overview 1
Product Overview 1

Introduction to Automotive Locks 3

Terminology 5
1. Flat Key 5
2. Inner Groove 5
3. Sided Groove 5
Automotive Locks Professional Terminology 5
I. Tracks 5
(1) Single Track Flat Key 5
(2) Two Tracks Flat Key 5
(3) Two Tracks Inner Groove Key 5
(4) Four Tracks Inner Groove Key 5
(5) Sided Groove Two Track Key 6
(6) Sided Groove Four Tracks Key 6
2. The Difference Between Whole Wafer, Separated Wafer and Split Wafer 6
(1) Whole Wafer 6
(2) Separated Wafer and Split Wafer 6
3. A, B Tracks 6
4. Cutting Position 6

Cylinders and Key Types 8
5. The Code of Cutting Depth 8
6. Positioning 8
Cross View of Automotive Locks 8
Flat Key 8
Sided Groove Two Track Key 8
Two Tracks Inner Groove Key 8
Sided Groove Four Tracks Key 9
Four Tracks Inner Groove Key 9
Key Type 9
Flat Key 9
Two Tracks Inner Groove Key 12
Sided Groove Four Tracks Key 12
Sided Groove Two Track Key 12
Four Tracks Inner Groove Key 12
Single-Sided Two Tracks Inner Groove Key 13
Flat Key 13
Inner Groove 13
Sided Groove 15
Way to Insert the Tool Properly 15

The Picking Procedure 17
Way to Pick 17
1. Controlling the Tension Bar 17
2. Controlling the Lifter 17
Step 1. Preparations 19
Step 2. Picking Technique 19
Decoding 19

Tools in Detail 21
CHI 2-in-1 21
DWO4R 2-in-1 21
GT10 2-in-1 22
YM28 2-in-1 24
MIT11 2-in-1 24
NSN11 2-in-1 26
TOY43R 2-in-1 28
HYN11 2-in-1 28
HYN7R 2-in-1 30
HU46 2-in-1 33
F038 2-in-1 33
GM37 39 40 41 2-in-1 35
TOY43 2-in-1 39
B111 2-in-1 39
CY24 2-in-1 41
CY24 [8-8] 46
TOY38R 2-in-1 48
TOY38 52
TOY43AT 2-in-1 52
MAZ24 2-in-1 58
GT15 2-in-1 62
GT15 66
HY16 2-in-1 68
HU87 2-in-1 82
MIT8 2-in-1 85
HU83 2-in-1 92
HU92 2-in-1 92
HU100R 2-in-1 94
SIP22 2-in-1 94
HY20R 2-in-1 97
K9 2-in-1 97
HU66 2-in-1 99
HU100 2-in-1 106
TOY(2014) 2-in-1 111
TOY40 2-in-1 114
TOY48 2-in-1 117
TOY48 Four-Track Inner Groove Key: Picking Method and Key Cutting 123

HY22 2-in-1 125
VA2 2-in-1 127
VA2 129
VA6 2-in-1 132
HU43 2-in-1 141
YM30 2-in-1 143
HU56 2-in-1 143
GM45 2-in-1 145
HU64 2-in-1 145
HU64 150
HU101 2-in-1 152
HU101 155
HU39 2-in-1 158
HU58 2-in-1 169
NE78 2-in-1 171
HON66 2-in-1 173
DAT17 2-in-1 181
NE66 2-in-1 182
162T(8) 2-in-1 187
162T(9) 2-in-1 190
HU162T(9) 2-in-1 193
HU162T(10) 2-in-1 199
Renault One Track Inner Groove Key 2-in-1 208
NE72 2-in-1 208
TOY2 2-in-1 210
FO21 2-in-1 215
TBE1T 2-in-1 218
BAOJUN 2-in-1 223
HAIMA 2INL 2-in-1 226
QIRUI 2-in-1 228
CHANGAN 2-in-1 230
BQ SB 2-in-1 232

Appendix — Cross-Reference Tables 235

CHAPTER 1

Tools Overview

> The tool itself: its parts, its scales, and the problem it was designed to solve.

SOURCE PAGE 001

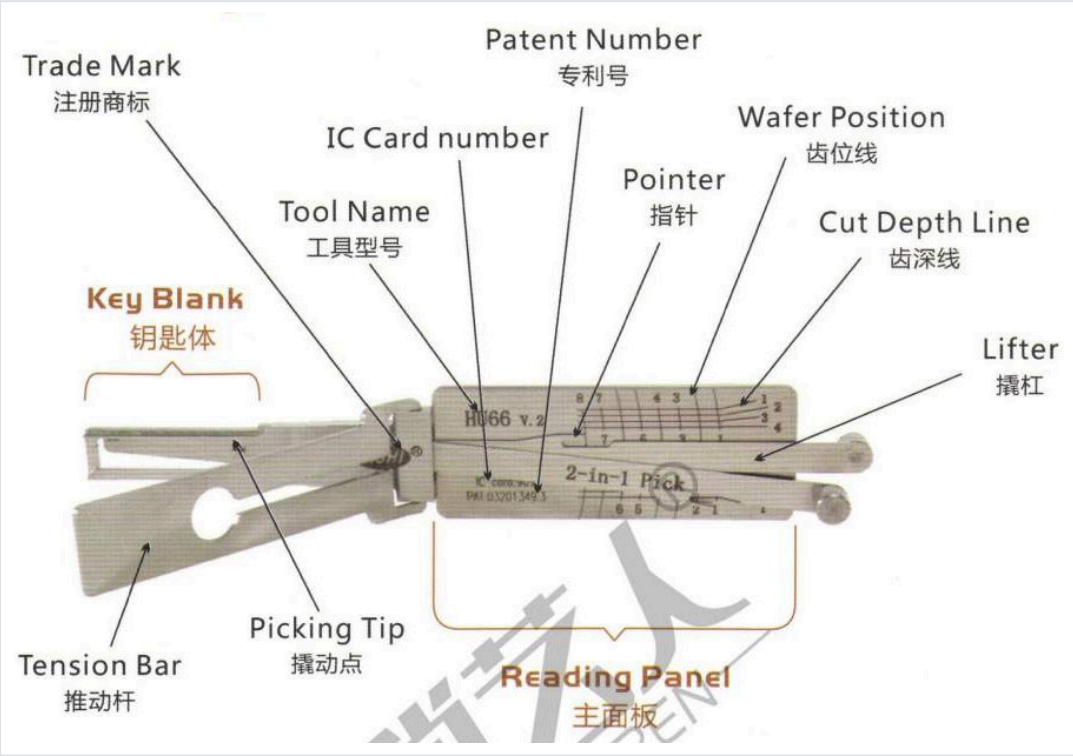


Fig. 1.1 Lishi 2-in-1 tool: component callouts and reading panel.

Product Overview

The Lishi 2-in-1 tool is used by locksmiths, auto repair shops, and the specialized trades in their daily work to open automotive lock cylinders non-destructively and to cut automotive mechanical keys without disassembling the lock.

The Lishi 2-in-1 tool is precisely built, well made, easy to carry, quick to use, and simple to learn, and every tool passes a strict quality inspection. It was developed by combining the Lishi picking principle with the company's teardown analysis of each vehicle lock. With accurate positioning you can see how each wafer moves, and testing shows clearly on the scale panel of the 2-in-1 tool whether a binding wafer has been released.

For a long time, automotive service personnel, working locksmiths, and people in the specialized trades have all studied how to open automotive lock cylinders non-destructively and how to cut a key quickly. Summed up, those techniques come down to a few methods: trial and error, visual observation, judgment from experience, brushing the wafers with a flexible tool, and applying rotational force while manipulating one wafer at a time. On principle, applying rotational force and manipulating the wafers one by one — defeating them individually — is the most effective method. Putting that method into practice, it is hard to find a suitable tool that will apply rotational force to the cylinder. With an ordinary door lock, the locksmith usually applies force to the dust shutter and then manipulates the wafers inside. That way of applying force gives no precise control over the amount, and once the dust shutter is damaged the method can no longer be used at all; on some locks the dust shutter can also swing freely. Even when the force is applied successfully, manipulating the wafers inside is another problem. The keyway is dark and the

wafer positions are hard to find, the pick cannot apply effective force to move a wafer once it is inside, and it is hard to judge what state each wafer is in during the manipulation. Add to that the very small keyway of many automotive locks, the large number of wafers inside, and the awkward working position of the cylinder (the trunk lock on some cars, for example), and opening the lock becomes extremely difficult. Some have tried shining light into the keyway or building a dedicated force-applying tool, but none of that solves the problem at its root.

CHAPTER 2

Introduction to Automotive Locks

> How vehicle lock cylinders are built, how their wafers work, and why a wafer lock can be read from outside.

SOURCE PAGE 002

The Lishi 2-in-1 tool solves both of these problems effectively. The part of the tool that sits in the keyway is made strictly to the dimensions of the key and makes full use of the space in the keyway, so that it enters the cylinder just like a key. Rotational force can then be applied to the cylinder effectively, evenly, and under easy control. The lifter threaded through the tool manipulates the wafers inside the cylinder at one end, while the pointer at the other end indicates the wafer position precisely on the external scale panel, bringing the tiny problem inside the cylinder out into the open and magnifying it. In use, the operator can accurately lift any single wafer in the cylinder and judge the state of any wafer. After the lock is open, the depth code of the wafer at every bitting position can still be measured, so a key can be made without disassembling the lock. The design of this tool runs through four characteristics — standardization, systematization, intelligence, and strong specificity — and takes the method of picking by precise positioning and cutting a key from measured depth codes a step further.

Introduction of Automotive Locks

Locksmiths have relatively few opportunities to build up hands-on experience with automotive locks in their daily work, and automotive locks come in many types and in large numbers. This manual therefore explains how to use the Lishi tools and at the same time presents a large number of illustrations of automotive locks stripped down, so that locksmiths can gain a thorough understanding of automotive locks while mastering the use of the Lishi tools.

With the development of society and progress in electronic technology, automotive locks have grown into mechatronic, automated, and intelligent vehicle anti-theft systems. Such a system now ranks alongside the vehicle's powertrain system, body stability system, driving safety system, and comfort system as one of the important systems fitted to a modern car. Within that system the mechanical automotive lock still plays an important role and keeps developing as technology advances. Apart from the lock block, the transmission mechanism, and the signal transmission mechanism, the automotive lock cylinder itself has always been a major subject of study. Structurally, common automotive lock cylinders use the pin tumbler structure, the springless wafer structure, or the wafer structure. Of these three, the wafer-structure cylinder is widely used in most cars because it resists contamination well, is not easily damaged under vibration, has a long service life, and takes up little space for its working parts. Today's automotive keys, whether saw-toothed or relief-milled, are mostly of wafer construction.

Automotive lock cylinders are mostly made of zinc (Zn), aluminum (Al), or copper (Cu) alloys. The composition of the alloy used differs from one lock brand to another. These materials are light in weight, resistant to corrosion and wear, high in mechanical strength, and easy to cast and machine, which makes them the first choice of many contemporary automotive cylinder manufacturers. Using the 2-in-1 tool, the operator can open a lock quickly and cut a key quickly. The tool was designed and built to be as refined as possible, which greatly lowers the demands on technique and experience and lets the operator learn it quickly and use it efficiently.

When you open an automotive mechanical lock with a key, your hand feels a resistance different from that of an ordinary residential lock. In a door lock the cylinder springs back by itself after the key is turned; in an ignition lock the key meets a firm detent when it reaches a particular position. Designs such as these keep the lock from being actuated in error in a shaking vehicle. On the door-lock keyway of an automotive mechanical lock, the designers usually fit a dust shutter: the key pushes the shutter open as it is inserted, and the shutter returns automatically when the key is withdrawn. This keeps sand, rainwater, and other corrosive matter out of the keyway and extends the service life of the lock.

At present, the structure of an automotive lock is mostly as shown in the figure (cross-section view of an automotive lock). Different wafers are fitted inside the cylinder. The wafers sit in the wafer slots, the cylinder shell carries two or more rows of locking grooves, and beside the travel track of the wafers in every automotive cylinder there is a blind hole — the assembly hole for the spring. When a valid key is inserted into the cylinder, the wafers are pressed by their springs so that the working point of every wafer drops onto the working point of the key and each wafer is released from its locked state. Turning the key drives the cylinder and the lock block mechanism into the open and locked states. When the key is withdrawn from the cylinder, the springs push the locking portion of each wafer into the locking groove of the shell.

CHAPTER 3

Terminology

> Key families, wafer types, bitting vocabulary, and the measurement conventions used throughout this manual.

SOURCE PAGE 003

Specific Professional Terminology

The automobile stands out among vehicles for being light, responsive, and quick, and it holds an important place among them. In locksmith service, automotive locks have become a category of their own and occupy a broad market. Everyone understands locks differently: in the past we identified an automotive lock cylinder only by the vehicle model, not by the lock itself. Because lock structure, wafer count, and wafer shape differ from one vehicle model to the next, we can sort the mechanical keys of common automotive locks into three major classes in order to tell them apart:

1. Flat Key

"Flat key" is one method of cutting a key. A key cut this way is saw-toothed, and that is the sense in which we use the term here: a key of this saw-toothed type.

2. Inner Groove

"Inner groove" is likewise a method of cutting a key. A key cut this way carries relief-milled bitting in the center of the blade but has no bitting on the edges.

3. Sided Groove

"Sided groove" is another common method of cutting a key. A key cut this way is similar to an inner groove key; the difference is that its bitting is "open", whereas inner groove bitting is "enclosed".

Automotive Locks Professional Terminology

I. Tracks

The track of a key is the curve formed by joining working points of different sizes and different heights, and these curves are arranged mostly in rows. For a given key, the number of such rows is the number of tracks we say it has. The working track of a key is simply the working points as they lift the wafers. (The other diagonal lines join the working points into a smooth curve so that the key can be inserted and withdrawn easily.)

(1) Single Track Flat Key

A single track flat key is a key cut by flat milling whose working points form only one row.

(2) Two Tracks Flat Key

A two tracks flat key is a saw-toothed key: the blade is saw-toothed with identical top and bottom profiles, so in use it can be inserted as soon as it is lined up with the keyway. A key of this kind has no orientation in use.

(3) Two Tracks Inner Groove Key

A two tracks inner groove key is an inner groove key with only two rows of working points.

(4) Four Tracks Inner Groove Key

A four tracks inner groove key is an inner groove key with four rows of working points.

SOURCE PAGE 004

(5) Sided Groove Two Track Key

A two track sided groove key is a sided groove key with only two rows of working points.

(6) Sided Groove Four Tracks Key

A four tracks sided groove key is a sided groove key with four rows of working points.

2. The Difference Between Whole Wafer, Separated Wafer and Split Wafer

(1) Whole Wafer

The whole wafer is the type used most widely in automotive locks of wafer construction. It travels in a dedicated slot inside the plug, and its shape is a closed ring, rectangular overall.

(2) Separated Wafer and Split Wafer

A separated wafer is an automotive lock wafer shaped roughly like half of a whole wafer. Every single half has its own working point and its own spring contact point, and the arrangement exists to make technical picking harder. The difference between separated wafers and split wafers shows up when the cylinder is assembled. When separated wafers go into a cylinder, each individual half has its own wafer bore and its own independent position. A split wafer is a set: two half-wafers placed in one wafer bore of the cylinder, as though a single whole wafer had been broken, which is why it is called a split wafer. Every split wafer likewise has its own working point and its own spring contact point.

A lock that carries separated wafers cannot be decoded while it is in the mid-travel "bound" state. You can decode only at the position before it binds, or after it binds by carrying the picking on through to the final position.

Once the plug has been picked open, the plug turns through a certain angle and then binds. At that point it can neither turn further forward nor return to position. If you withdraw the tool, a key will not go in either. This behavior is caused by the separated wafers in the plug. In this state only one set of wafers is doing the work. If you want the plug to return to position, all you have to do is manipulate that bound set of wafers back to where it was. When you do, do not keep applying force in the picking direction; manipulate the wafers directly, and if they will not move, ease the driven part of the tool gently in the opposite direction. This behavior is caused by the cylinder's own positioning spring.

3. A, B Tracks

Hold the key with the bow to the left and the tip to the right, facing you. The row of bitting on the upper edge of the key is the A group; the row of bitting on the lower edge is the B group. This distinction makes keys easy to identify. On a two tracks flat key car lock, the A group and the B group are the same. You need to understand this concept when you use a key reader or read with the 2-in-1.

4. Cutting Position

On the foundation of modern industry, any lock turned out by standardized manufacturing has its key cut at fixed positions, with a fixed number of cuts of different heights arranged in combination.

In today's society, automotive locks follow international standards, and their keys are no exception. For any one key, the bitting is always cut at fixed positions, and the positions where that bitting sits are the bitting positions.

Different locks differ in the number of bitting positions on the key and in the spacing between them.

CHAPTER 4

Cylinders and Key Types

Cut-away views of the cylinders the tools open, the key families they cover, and the wafer arrangements inside them.

SOURCE PAGE 005

5. The Code of Cutting Depth

The depth code is the code for the depth of the cut or hole made at a bitting position on the key.

6. Positioning

When an automotive key is inserted into a cylinder, it travels in to a fixed point and then will not move any further forward; this is because the key is positioned. Some keys are positioned at their tip, some keys are positioned at their shoulder.

Cross View of Automotive Locks

Flat Key

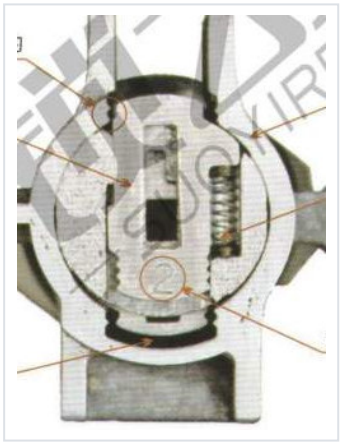


Fig. 5.1 Flat key cylinder, cross-section: wafer, spring, and housing.

弹片与锁套配合的锯齿，是防止技术性开锁的 → Serrations on the wafer that mate with the shell; an anti-picking feature

锁芯外套 → Cylinder housing

弹片上标识的代号 → Code mark on the wafer

用于锁止的弹片 → Locking wafer

弹片弹簧 → Wafer spring

锁闭槽 → Locking groove

Sided Groove Two Track Key

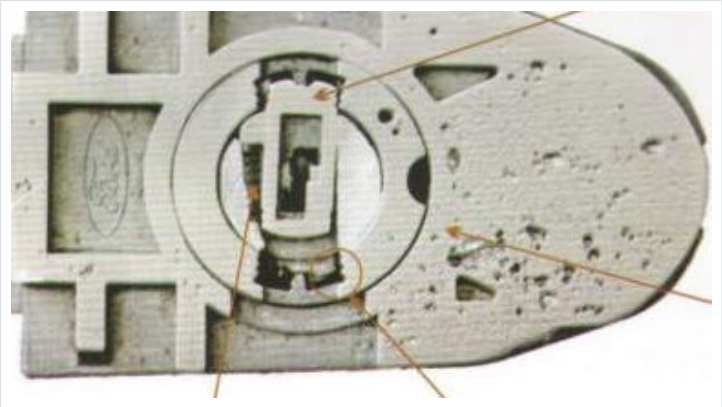


Fig. 5.2 Sided groove two track key cylinder, cut away.

用于锁止的弹片 → Locking wafer
弹片弹簧 → Wafer spring
锁芯外套 → Cylinder housing
弹片与锁套配合的锯齿，是防止技术性开锁的 → Serrations on the wafer that mate with the shell; an anti-picking feature

Two Tracks Inner Groove Key

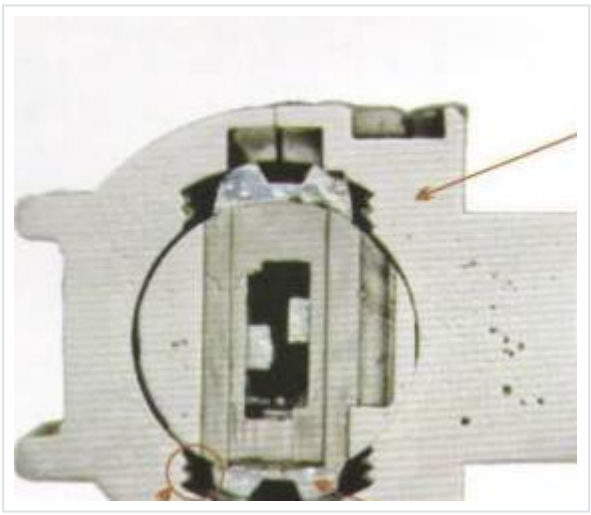


Fig. 5.3 Two tracks inner groove key cylinder, cut away.

锁芯外套 → Cylinder housing
用于锁止的弹片 → Locking wafer

SOURCE PAGE 006

Sided Groove Four Tracks Key

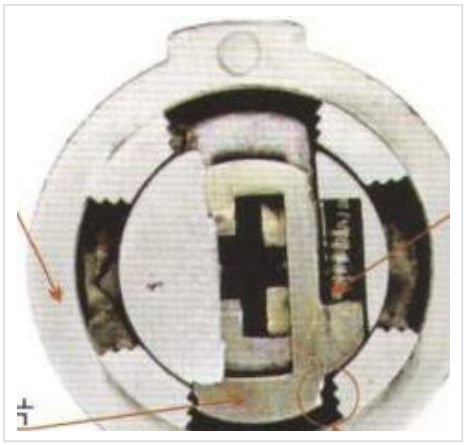


Fig. 6.1 Sided groove four tracks key cylinder, cut away.

锁芯外套 → Cylinder housing
弹片弹簧 → Wafer spring
用于锁止的弹片 → Locking wafer
弹片与锁套配合的锯齿，是防止技术性开锁的 → Serrations on the wafer that mate with the shell; an anti-picking feature

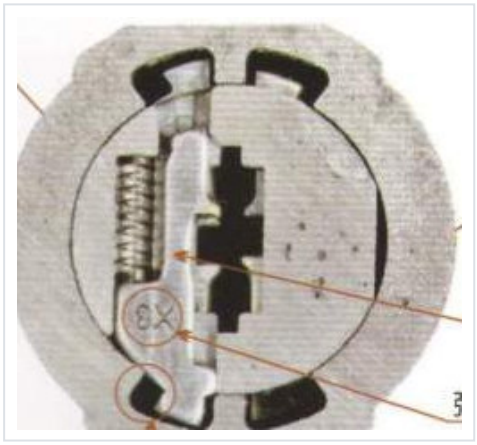


Fig. 6.2 The same cylinder from the opposite side.

弹片弹簧 → Wafer spring
用于锁止的弹片 → Locking wafer
锁芯外套 → Cylinder housing
弹片上标识的代号 → Code mark on the wafer

Four Tracks Inner Groove Key

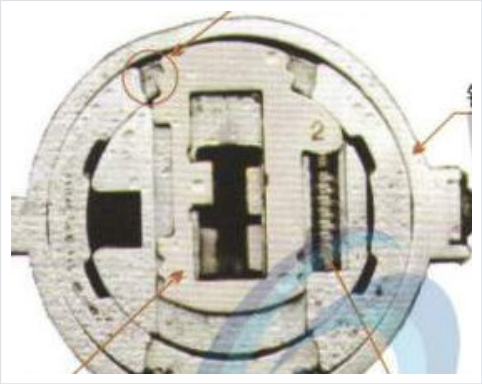


Fig. 6.3 Four tracks inner groove key cylinder, cut away.

弹片与锁套配合的锯齿，是防止技术性开锁的 → Serrations on the wafer that mate with the shell; an anti-picking feature

锁芯外套 → Cylinder housing

用于锁止的弹片 → Locking wafer

弹片弹簧 → Wafer spring



Fig. 6.4 The same cylinder from the opposite side.

用于锁止的弹片 → Locking wafer

锁芯外套 → Cylinder housing

Key Type

> (The blue line is the working track.)

Flat Key

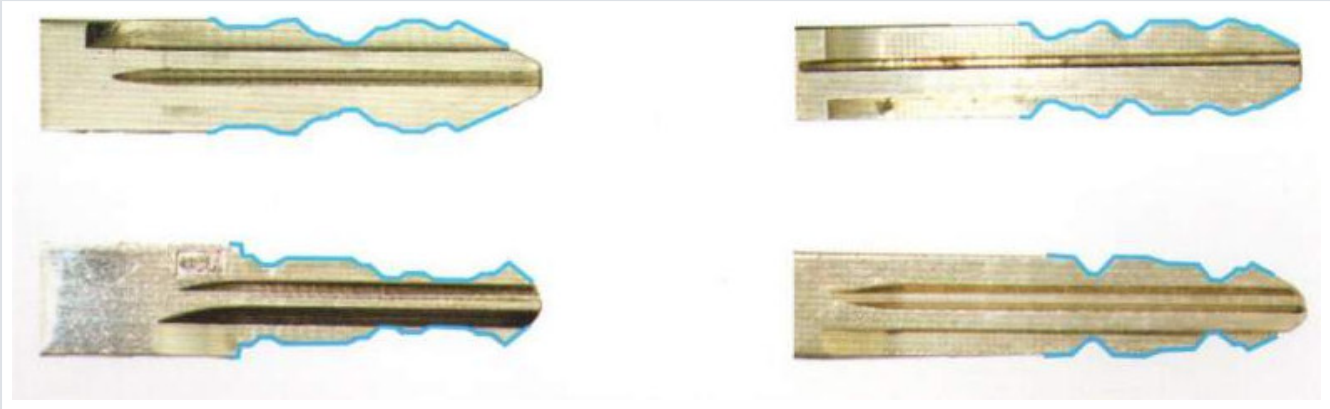


Fig. 6.5 Four flat keys; the blue line is the working track.

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Two Tracks Inner Groove Key

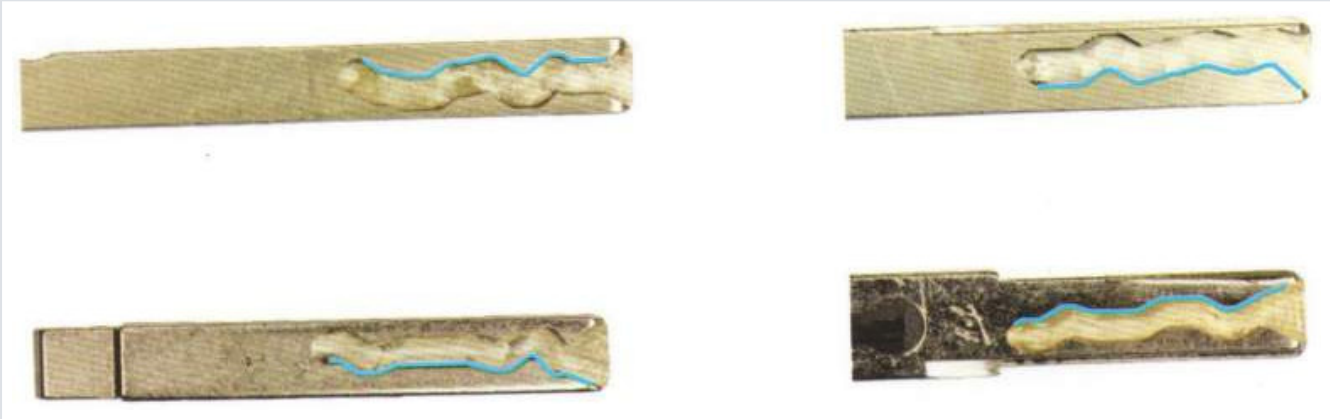


Fig. 7.1 Two tracks inner groove keys; the blue line is the working track.

Sided Groove Four Tracks Key



Fig. 7.2 Sided groove four tracks keys; the blue line is the working track.

Sided Groove Two Track Key



Fig. 7.3 Sided groove two track keys; the blue line is the working track.

Four Tracks Inner Groove Key

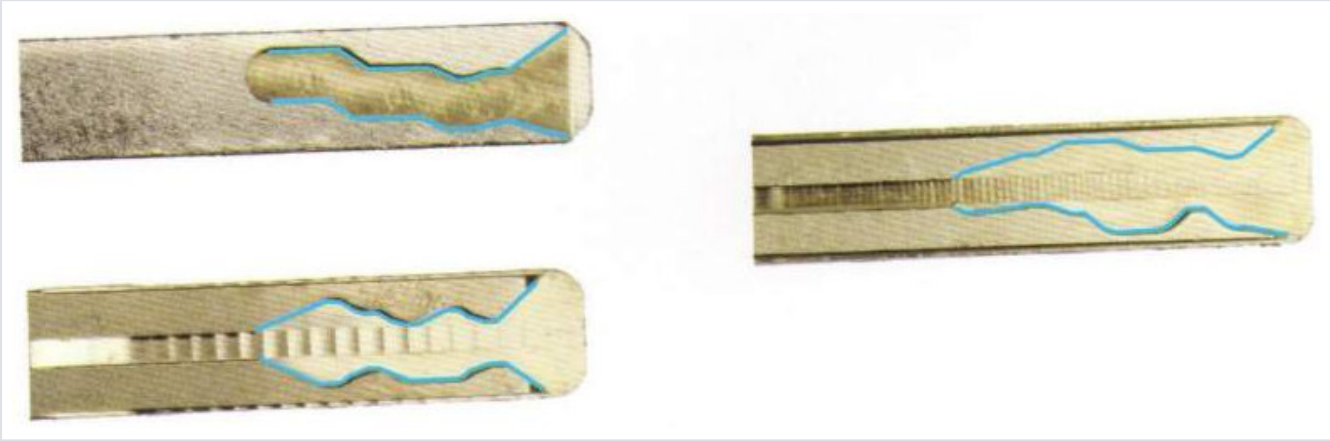


Fig. 7.4 Four tracks inner groove keys; the blue line is the working track.

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Single-Sided Two Tracks Inner Groove Key

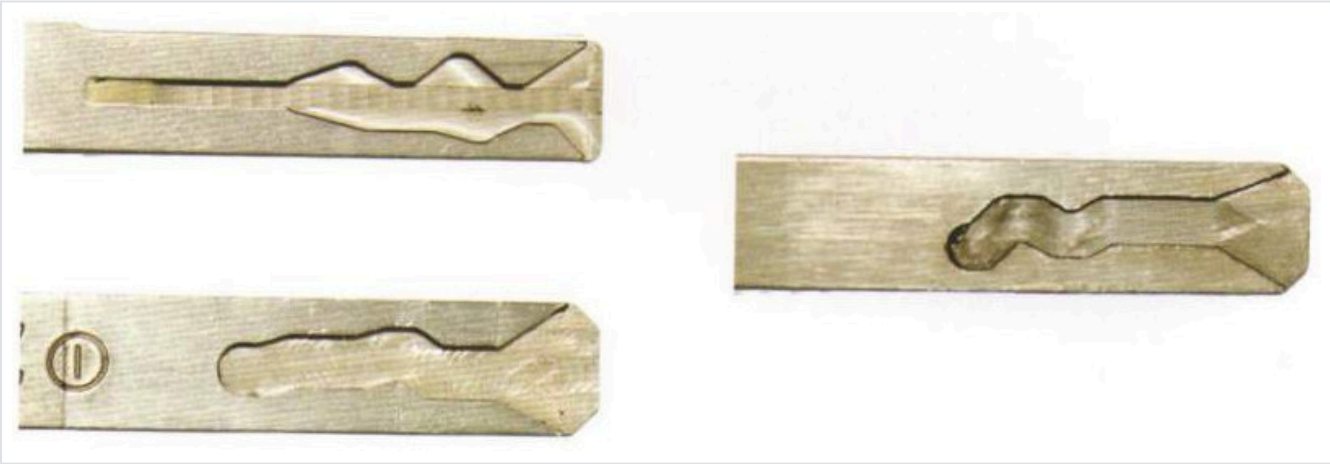


Fig. 8.1 Single-sided two tracks inner groove key blades.

单面内铣两轨迹 → Single-sided two tracks inner groove

Lock Wafer Structure

Flat Key



Fig. 8.2 Flat key wafers: upper and lower locking points, upper stop point, spring contact point, and working point.

上锁闭点 → Upper locking point
上止点 → Upper stop point
弹簧作用点 → Spring contact point
下锁闭点 → Lower locking point
工作点 → Working point

Inner Groove



Fig. 8.3 Inner groove wafers, numbered by wafer position.

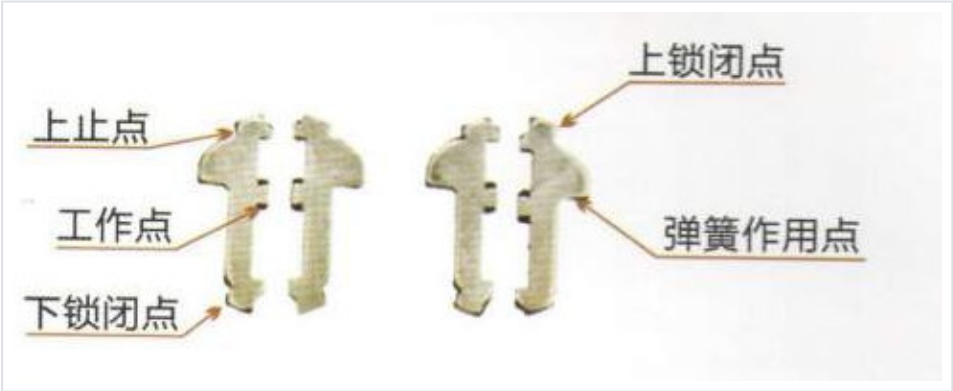


Fig. 8.4 Inner groove wafers: upper stop point, upper and lower locking points, working point, and spring contact point.

上止点 → Upper stop point
上锁闭点 → Upper locking point
工作点 → Working point
弹簧作用点 → Spring contact point
下锁闭点 → Lower locking point



Fig. 8.5 Additional inner groove wafer profiles.

SOURCE PAGE 009

Sided Groove



Fig. 9.1 Sided groove wafers: upper stop point, working point, upper and lower locking points, and spring contact point.

上止点 → Upper stop point
工作点 → Working point
下锁闭点 → Lower locking point
上锁闭点 → Upper locking point
弹簧作用点 → Spring contact point



Fig. 9.2 Additional sided groove wafer profiles, numbered by wafer position.

Technique and Tips

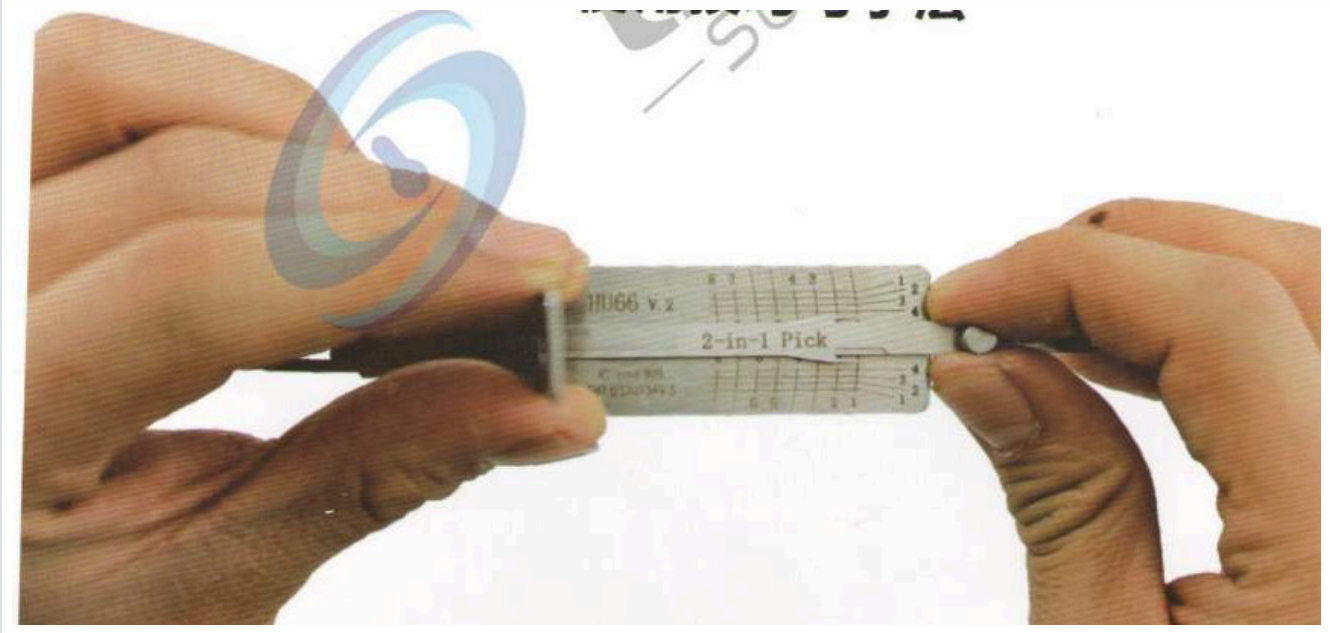


Fig. 9.3 Tool held with the lifter returned to the center position, ready for insertion.

Way to Insert the Tool Properly

First, bring the lifter back to the center position (as shown). Only then can you insert the tool into the keyway.

(The same applies when you withdraw the tool.)

CHAPTER 5

The Picking Procedure

> The four-step method, hand positions, technique, and decoding.

SOURCE PAGE 010

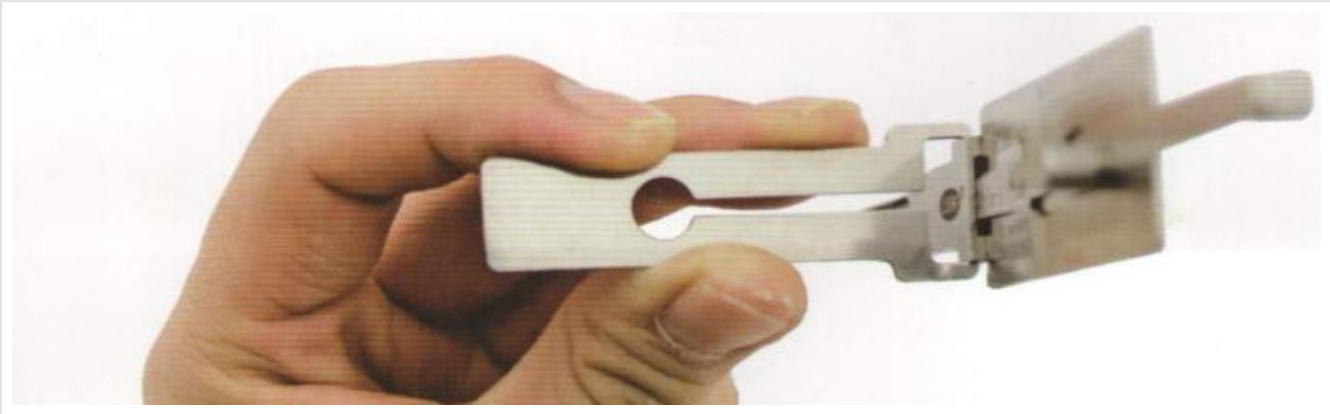


Fig. 10.1 Tool held against a cylinder, lifter advancing to the wafers.

Way to Pick

1. Controlling the Tension Bar

Use the thumb and one or two other fingers of one hand to grip the tension bar, and brace the remaining fingers against a fixed point. Only then can you control the advance and return of the tension bar.

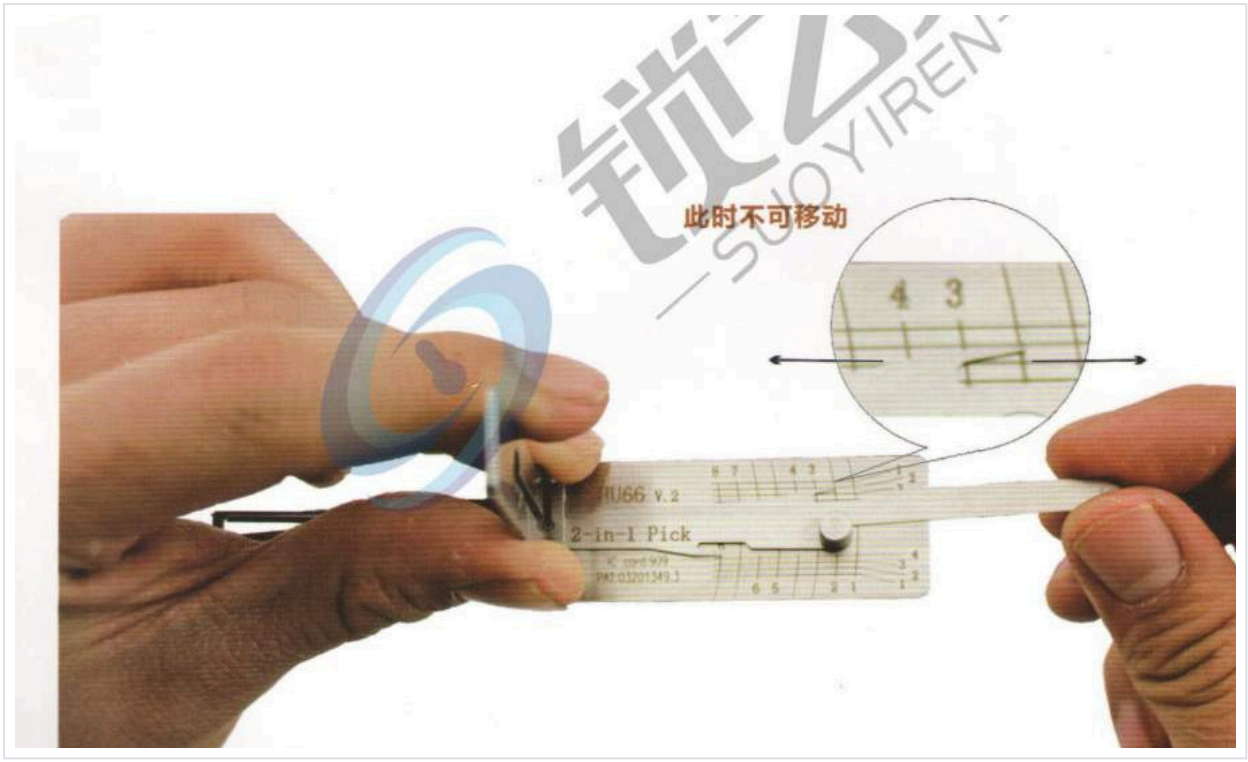


Fig. 10.2 Reading panel in working position, magnified at the position 4/3 marks.

此时不可移动 → Do not move the tool at this point

2. Controlling the Lifter

When you change bitting positions, the lifter has to move forward and back. You must return the lifter to the center position before you can move it forward and back.

SOURCE PAGE 011

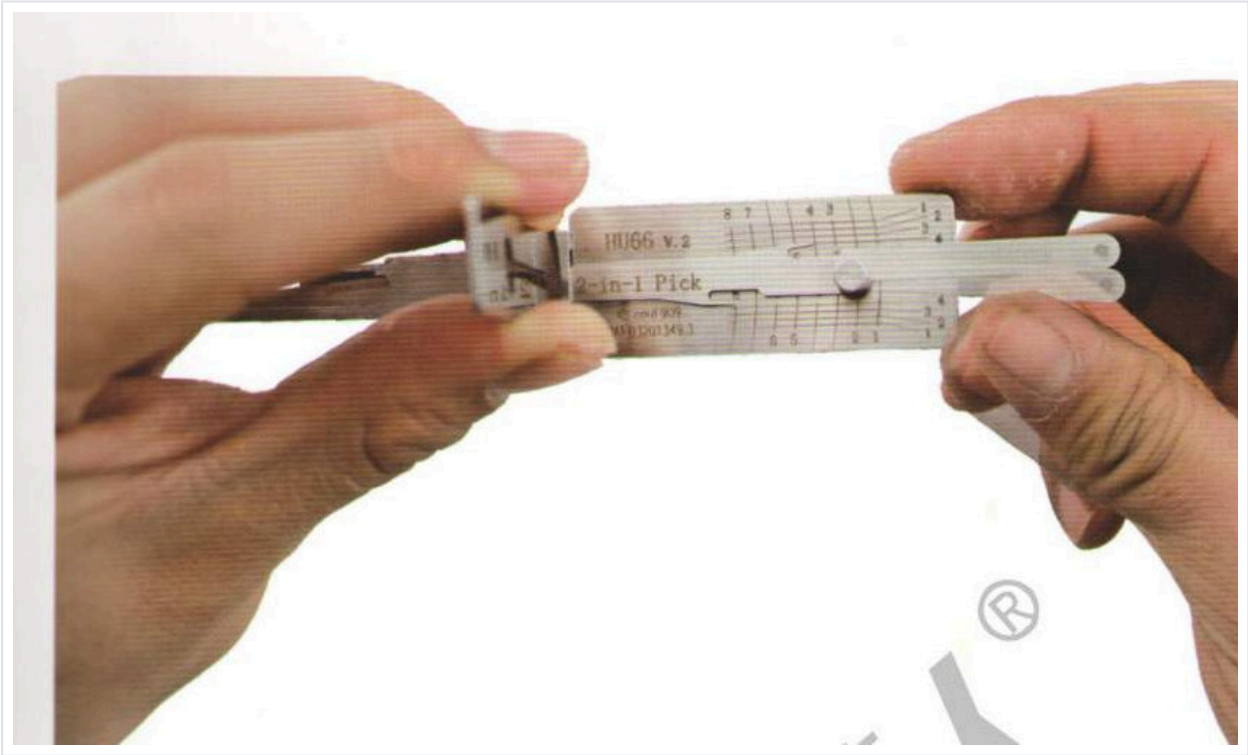


Fig. 11.1 Lifter pushed with one finger, another finger braced on the side of the reading panel.

When you work the lifter, push it with one finger only. Brace another finger against the side of the reading panel.

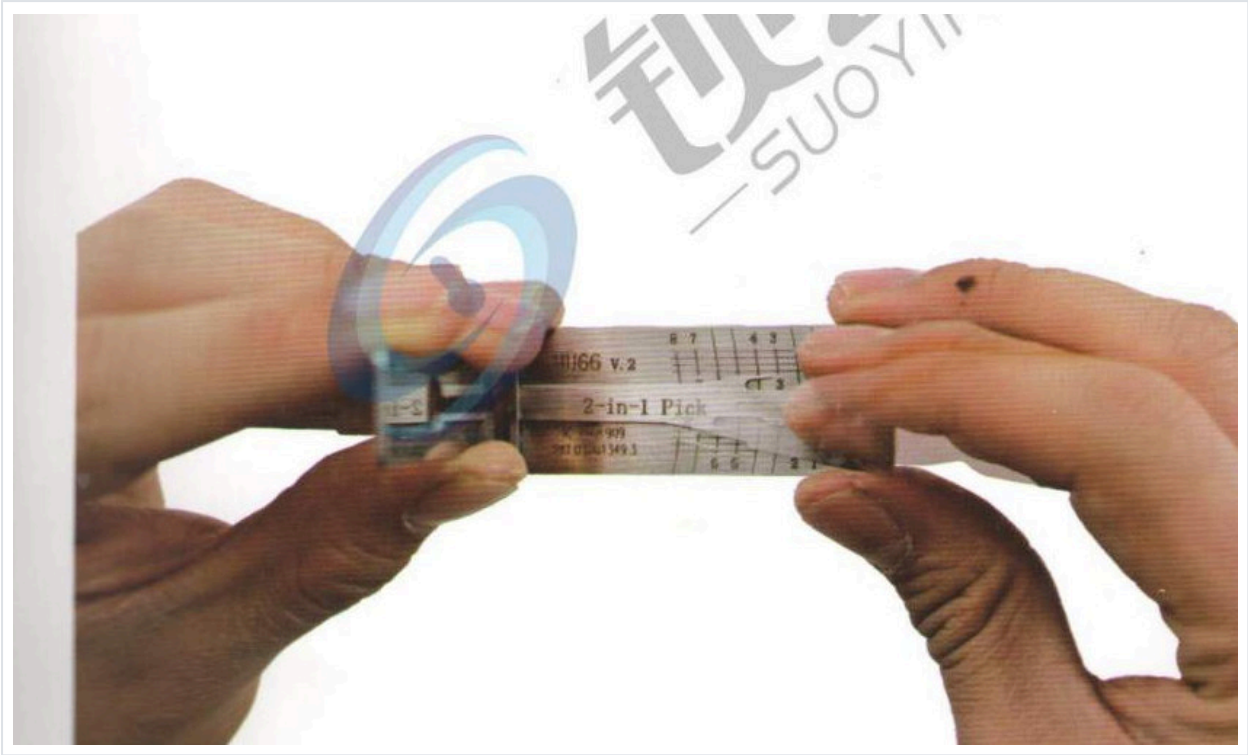


Fig. 11.2 Finger placement for working the lifter on the reading panel.

When you work the lifter, push it with one finger only. Brace another finger against the side of the reading panel.

SOURCE PAGE 012

Technique and Tips

Step 1. Preparations

First identify the vehicle make, learn the lock structure (know how many wafers that lock has), and select the matching tool. Set the tool's lifter to the center position (single-lifter, double-lifter, and four-lifter tools alike), then insert the tool into the keyway. If the tool is hard to insert, check the keyway for foreign objects and the wafers for damage. To tell whether the tool is fully seated, move the lifter pointer to each bitting position in turn and test it with a press-and-release motion; the positions that spring back give you the wafer count. If the wafer count is correct, the tool is fully seated.

Step 2. Picking Technique

With the preparations done, first apply force to the tension bar in the direction you want to open. Use the lifter to test each known bitting position one by one. Whichever position shows no spring by sight or by feel (it does not move) is the wafer with the greatest resistance (the hardest one). When you find the wafer with the greatest resistance, lift that wafer. If the hand working the lifter feels the effort, ease the tension bar back slightly; both hands working together are what lifts the wafer and clears the resistance. As soon as the resistance clears, apply force to the tension bar instantly so the other cleared wafers do not return. How much lifting is needed depends on the lock structure (some come into position after one cut depth line, others only after two or three). Test after every lift to see whether the resistance has cleared (a small spring movement). Then use the same method to find the wafer with the greatest resistance again, and clear them one after another until the plug turns.

Decoding

A 2-in-1 tool can only decode after the lock has been opened.

Once the lock is open, there are two decoding methods, depending on the lock structure.

The first method works through the lifter's picking tip and lifts the working position of the wafer. The decoding method for this lock is read forward: move the lifter gently to press the wafer to the end of its spring travel (press until it will not move). Whichever cut depth line the pointer then rests on is the depth code.

The second method works through the lifter's picking tip and lifts the bottom of the wafer to open the lock. These tools are all single-lifter designs. The decoding method for this lock is read backward: read the side opposite the direction in which the wafer is lifted; that side has no spring. Press the lifter gently until it will not move; whichever cut depth line the pointer then rests on is the depth code.

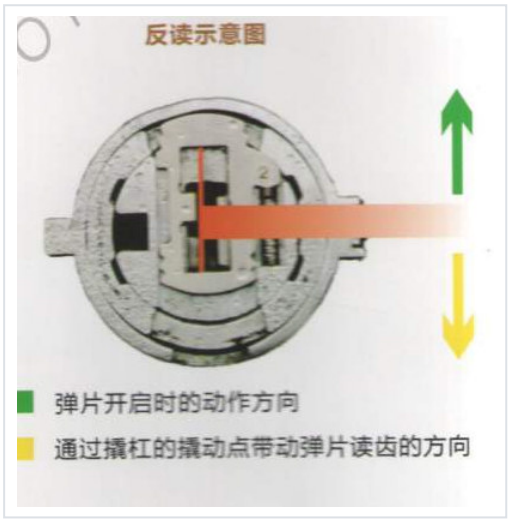


Fig. 12.1 Reverse reading schematic: cylinder cross-section with the two wafer travel directions.

反读示意图 → Reverse reading schematic

弹片开启时的动作方向 → Direction the wafer moves when the lock opens

通过撬杠的撬动点带动弹片读齿的方向 → Direction in which the lifter tip drives the wafer during decoding

CHAPTER 6

Tools in Detail

> Model-by-model technical data: applicable vehicles, picking direction, decoding, key cutting data, and special techniques.

SOURCE PAGE 013

Flat Key

CHI 2-in-1

APPLICABLE VEHICLES	Chevrolet Epica, Captiva, etc.
PICKING DIRECTION	Counterclockwise when the door lock is on the left side; clockwise when it is on the right side.
WAFERS	8 wafers on both the door lock and the ignition lock.
CUT DEPTHS	4 depth codes on the key. No. 1 is the shallowest, No. 4 the deepest.
DECODING	Read forward after opening.

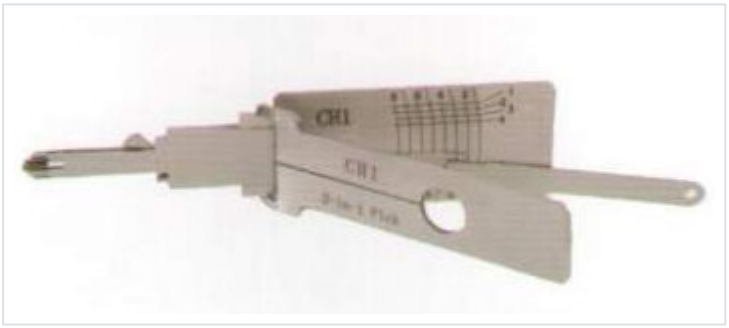


Fig. 13.1 CHI 2-in-1 tool with its reading panel and tension bar.

Numerical Data

The drawing at left gives the bitting position and cut depth data that apply to CH1. (Unit: 1/100 mm)

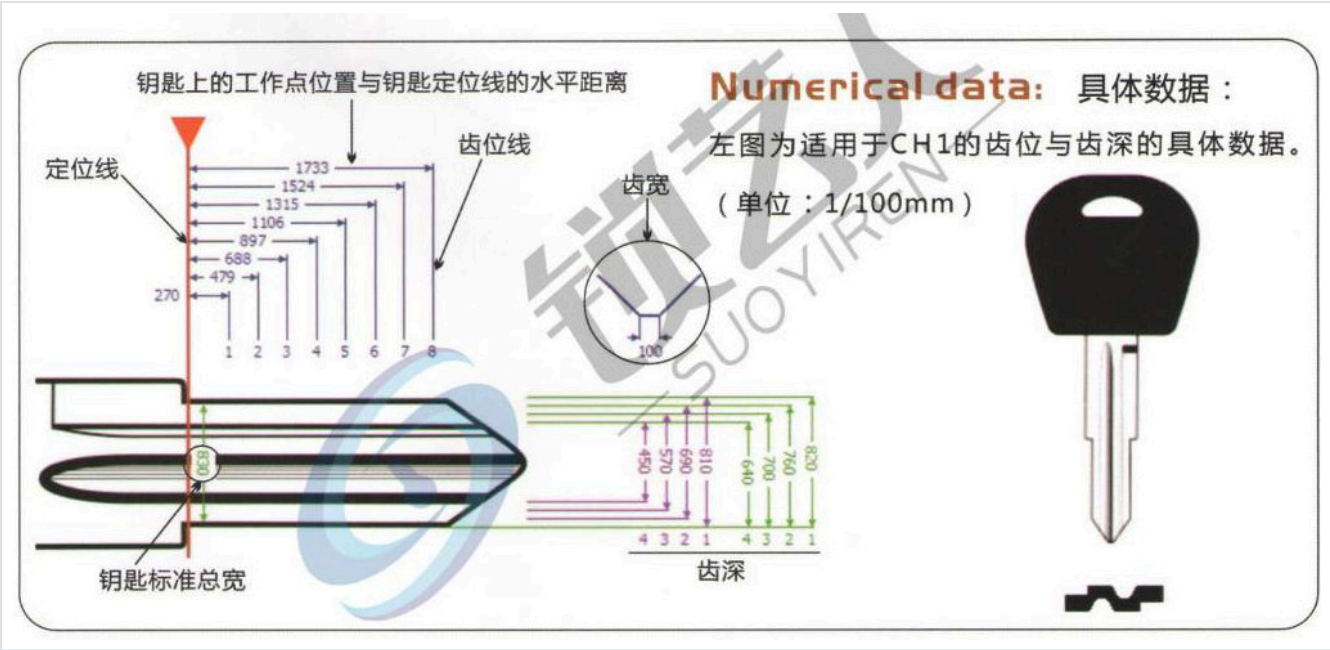


Fig. 13.2 CHI numerical data plate: distance from each working point to the key reference line at positions 1-8, the wafer width detail, the cut depth chart for both tracks, and the key profile.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
定位线 → Reference line
齿位线 → Wafer position line
齿宽 → Wafer width
钥匙标准总宽 → Key standard overall width
齿深 → Cut depth
具体数据 → Numerical data

DWO4R 2-in-1

APPLICABLE VEHICLES	Buick Excelle, Chevrolet Sail, Chevrolet Lova, etc.
PICKING DIRECTION	Counterclockwise when the door lock is on the left side; clockwise when it is on the right side.
WAFERS	8 wafers on both the door lock and the ignition lock.
CUT DEPTHS	4 depth codes on the key. No. 1 is the shallowest, No. 4 the deepest.
DECODING	Read forward after opening.



Fig. 13.3 DWO4R 2-in-1 tool with its reading panel and tension bar.

SOURCE PAGE 014

Numerical Data

The drawing at left gives the bitting position and cut depth data that apply to DWO4R. (Unit: 1/100 mm)

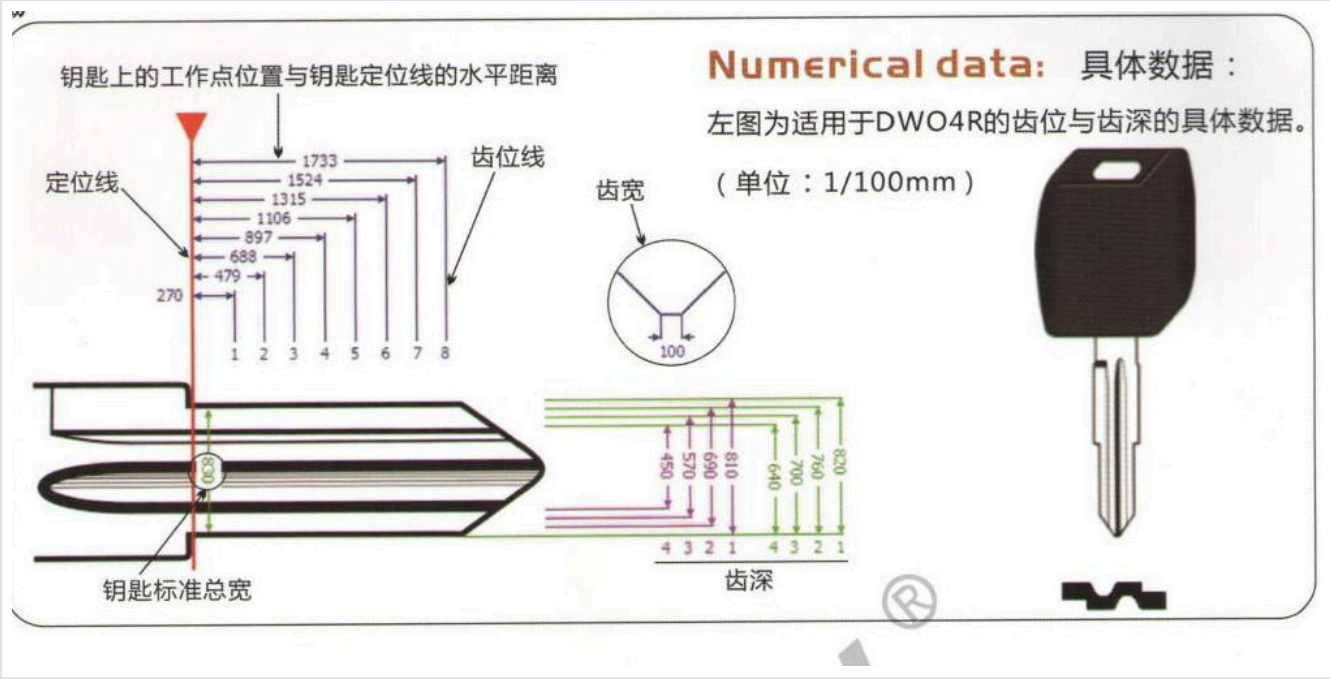


Fig. 14.1 DWO4R numerical data plate: distance from each working point to the key reference line at positions 1-8, the wafer width detail, the cut depth chart for both tracks, and the key profile.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
齿位线 → Wafer position line
钥匙标准总宽 → Key standard overall width
具体数据 → Numerical data
定位线 → Reference line
齿宽 → Wafer width
齿深 → Cut depth

GT10 2-in-1

APPLICABLE VEHICLES	IVECO
PICKING DIRECTION	Clockwise when the door lock is on the left side; counterclockwise when it is on the right side.
BITTING POSITIONS	7 bitting positions on this lock.
CUT DEPTHS	4 depth codes on the key. No. 1 is the shallowest, No. 4 the deepest.
DECODING	Read forward after opening.



Fig. 14.2 GT10 2-in-1 tool with its reading panel and tension bar.

Numerical Data

The drawing at left gives the bitting position and cut depth data that apply to GT10. (Unit: 1/100 mm)

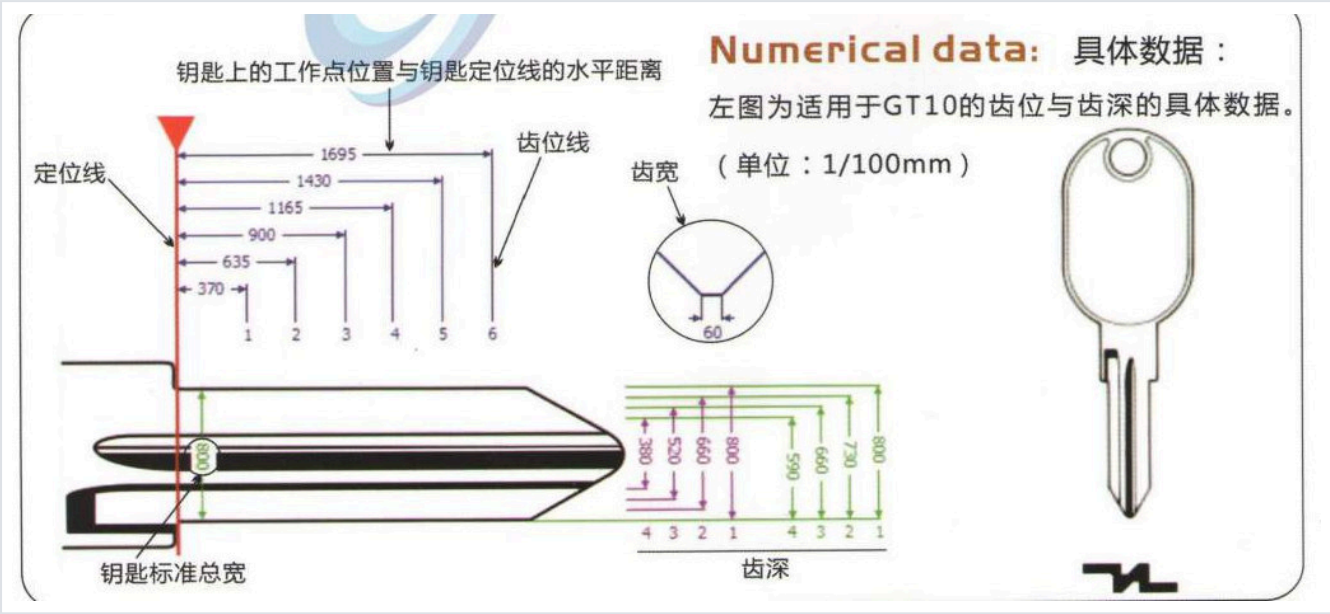


Fig. 14.3 GT10 numerical data plate: distance from each working point to the key reference line at positions 1-6, the wafer width detail, the cut depth chart for both tracks, and the key profile.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
定位线 → Reference line
齿位线 → Wafer position line
齿宽 → Wafer width
钥匙标准总宽 → Key standard overall width
齿深 → Cut depth
具体数据 → Numerical data

SOURCE PAGE 015

YM28 2-in-1

APPLICABLE VEHICLES	Opel
PICKING DIRECTION	Counterclockwise when the door lock is on the left side; clockwise when it is on the right side.
BITTING POSITIONS	10 positions in total; the door lock uses positions 2 through 8. Positions 1, 9, and 10 are absent.



Fig. 15.1 YM28 2-in-1 tool with its reading panel and tension bar.

Instacode (the database) can look up the actual depth codes for positions 1, 9, and 10.

There is also an HU46 that uses the same key: 7 positions on the door lock, and its ignition differs at positions 1, 9, and 10. Its picking method, decoding method, and key cutting are exactly the same.

CUT DEPTHS	4 depth codes on the key. No. 1 is the shallowest, No. 4 the deepest.
DECODING	Read forward after opening.

Numerical Data

The drawing at left gives the bitting position and cut depth data that apply to YM28. (Unit: 1/100 mm)

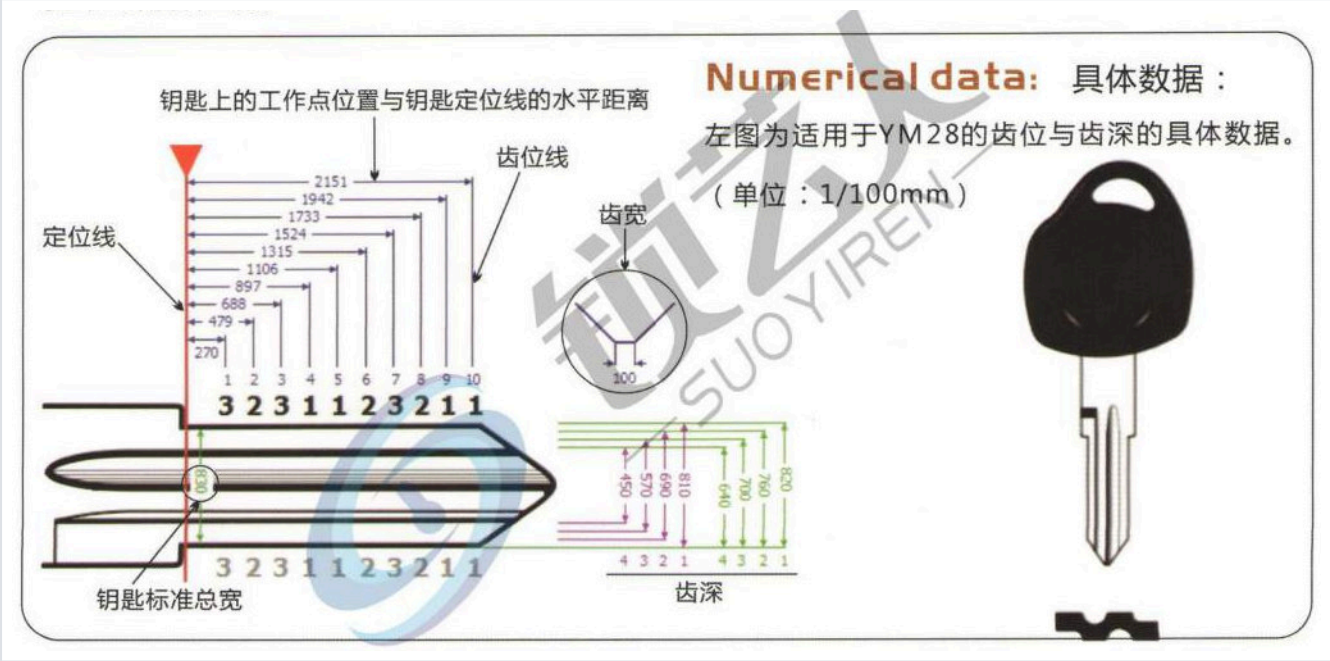


Fig. 15.2 YM28 numerical data plate: distance from each working point to the key reference line at positions 1-10, the sample bitting 3 2 3 1 1 2 3 2 1 1, the wafer width detail, the cut depth chart for both tracks, and the key profile.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
定位线 → Reference line
齿位线 → Wafer position line
齿宽 → Wafer width
钥匙标准总宽 → Key standard overall width
齿深 → Cut depth
具体数据 → Numerical data

MIT11 2-in-1

APPLICABLE VEHICLES	Mitsubishi models, Soueast models
PICKING DIRECTION	Clockwise when the door lock is on the left side; counterclockwise when it is on the right side.
WAFERS	8 wafers on both the door lock and the ignition lock.
CUT DEPTHS	5 depth codes on the key. At the cut edge of the key, No. 1 is the shallowest and No. 5 the deepest.
DECODING	Read forward after opening.

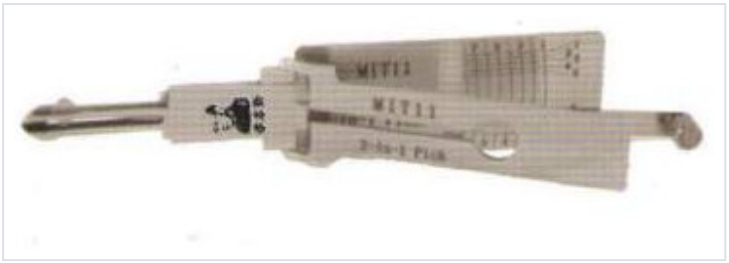


Fig. 15.3 MIT11 2-in-1 tool with its reading panel and tension bar.

SOURCE PAGE 016

Numerical Data

The chart below gives the bitting positions and cut depths that apply to TOY43R.

(Unit: 1/100 mm)

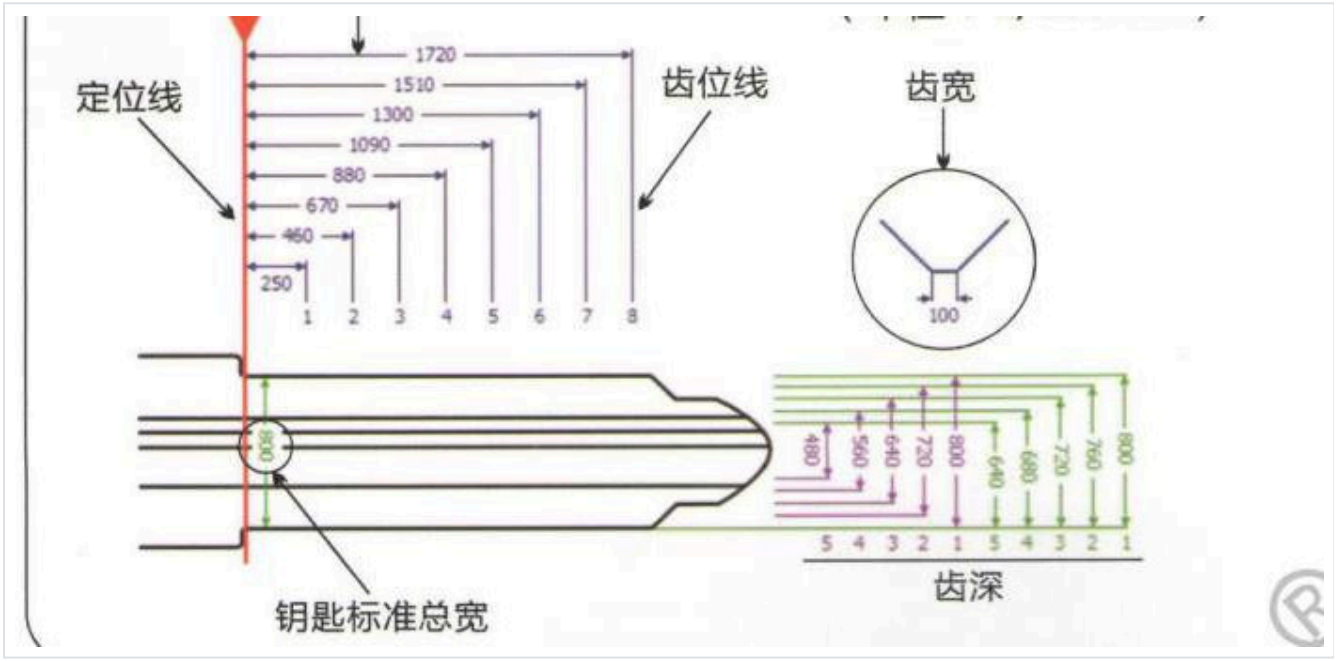


Fig. 16.1 TOY43R bitting position and cut depth chart.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
齿位线 → Wafer position line
钥匙标准总宽 → Key standard overall width
定位线 → Reference line
齿宽 → Wafer width
齿深 → Cut depth



Fig. 16.2 TOY43R key with its bitting profile.

NSN11 2-in-1



Fig. 16.3 NSN11 2-in-1 tool.

APPLICABLE VEHICLES	Older Nissan models
PICKING DIRECTION	With the door lock on the left side, pick counterclockwise; with the door lock on the right side, pick clockwise.
WAFERS	Both the door lock and the ignition lock on this model use 8 wafers.
CUT DEPTHS	The key has 4 depth codes in total. No. 1 is the shallowest and No. 4 is the deepest.
DECODING	Read forward after picking.

Numerical Data

The chart at left gives the bitting positions and cut depths that apply to NSN11.

(Unit: 1/100 mm)

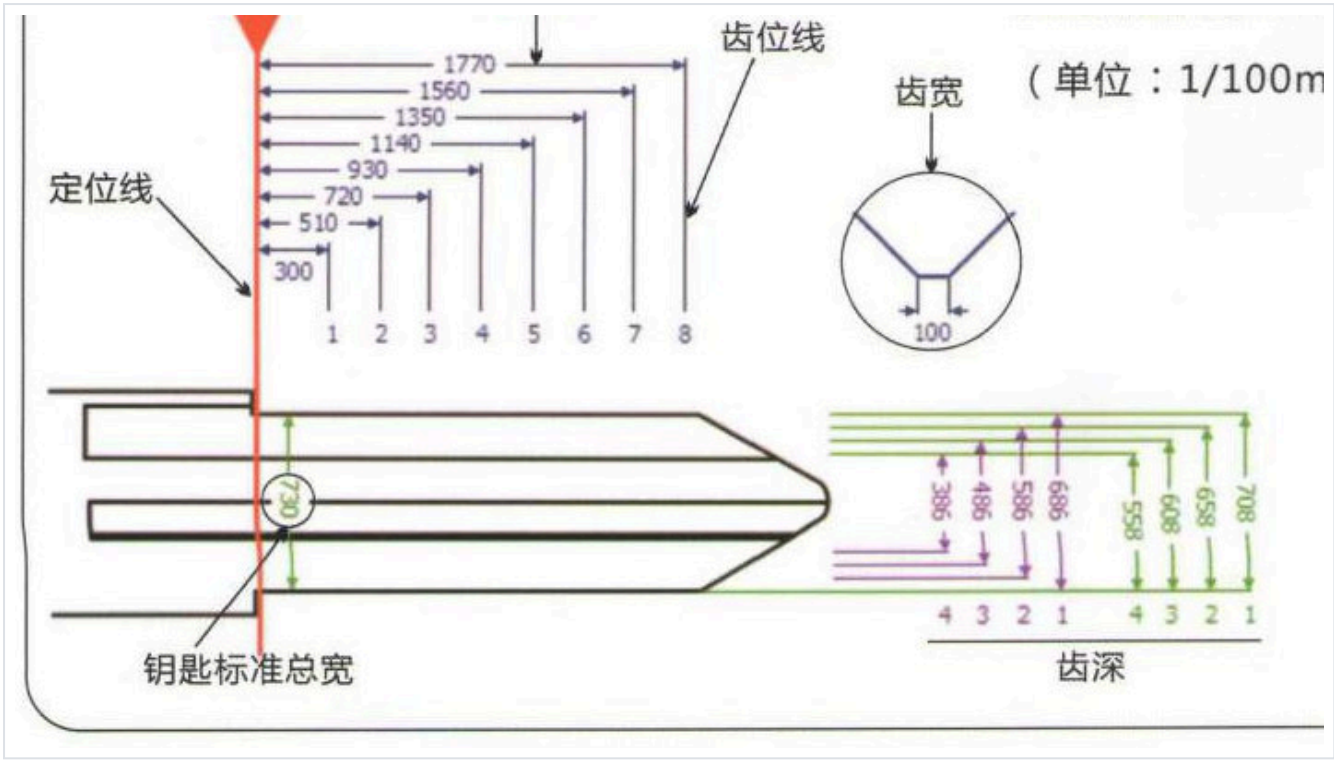


Fig. 16.4 NSN11 bitting position and cut depth chart.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
齿位线 → Wafer position line
钥匙标准总宽 → Key standard overall width
定位线 → Reference line
齿宽 → Wafer width
齿深 → Cut depth

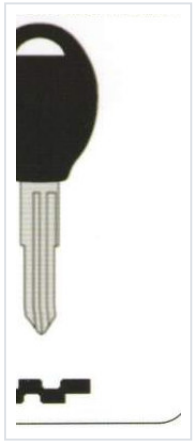


Fig. 16.5 NSN11 key with its bitting profile.

SOURCE PAGE 017

TOY43R 2-in-1



Fig. 17.1 TOY43R 2-in-1 tool.

APPLICABLE VEHICLES Older Toyota models

The door lock opens toward the rear of the car on a left-hand-drive vehicle; in other countries the picking direction is different.

On this lock the door cylinder uses positions 3 through 10, a total of 8 cuts. The ignition adds positions 1 and 2. The trunk adds an 11th position; that position is a standard No. 2 cut depth, so cut it to 2.

The keyway of this lock is the opposite of TOY43AT. This one is the right-side version, and their key blanks are exact opposites.

Numerical Data

The chart below gives the bitting positions and cut depths that apply to TOY43R.

(Unit: 1/100 mm)

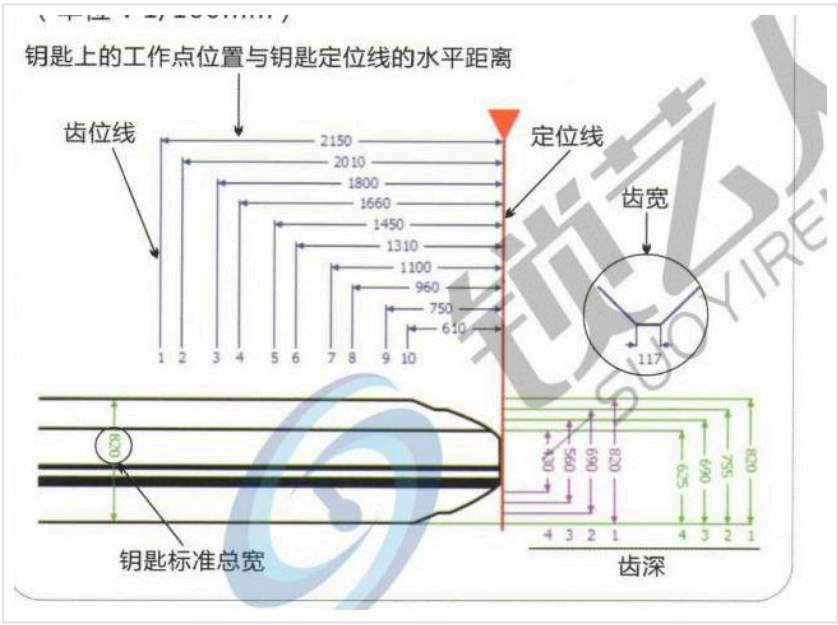


Fig. 17.2 TOY43R bitting position and cut depth chart for positions 1 through 10.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
齿位线 → Wafer position line
定位线 → Reference line
齿宽 → Wafer width
钥匙标准总宽 → Key standard overall width
齿深 → Cut depth

When you cut ignition positions 1 and 2, you can query Instacode (the database). What comes back may call for 4 or 5 keys. You can also work through the depth combinations (1,2) (2,1) (2,3) (3,2) (3,3) (3,4) (4,3) (4,4) one by one and produce the ignition key that way. The database will not give you only one key either; you still have to check the possibilities one at a time.

This key has 4 depth codes in total. No. 1 is the shallowest and No. 4 is the deepest.

Decoding: read forward after picking.

HYN11 2-in-1



Fig. 17.3 HYN11 2-in-1 tool.

APPLICABLE VEHICLES Hyundai, Kia

Picking direction: with the door lock on the left side, pick clockwise; with the door lock on the right side, pick counterclockwise.

Both the door lock and the ignition lock on this model use 8 wafers.

This key has 4 depth codes in total. No. 1 is the shallowest and No. 4 is the deepest.

Decoding: read forward after picking.

SOURCE PAGE 018

Numerical Data

The chart at left gives the bitting positions and cut depths that apply to HYN11.

(Unit: 1/100 mm)

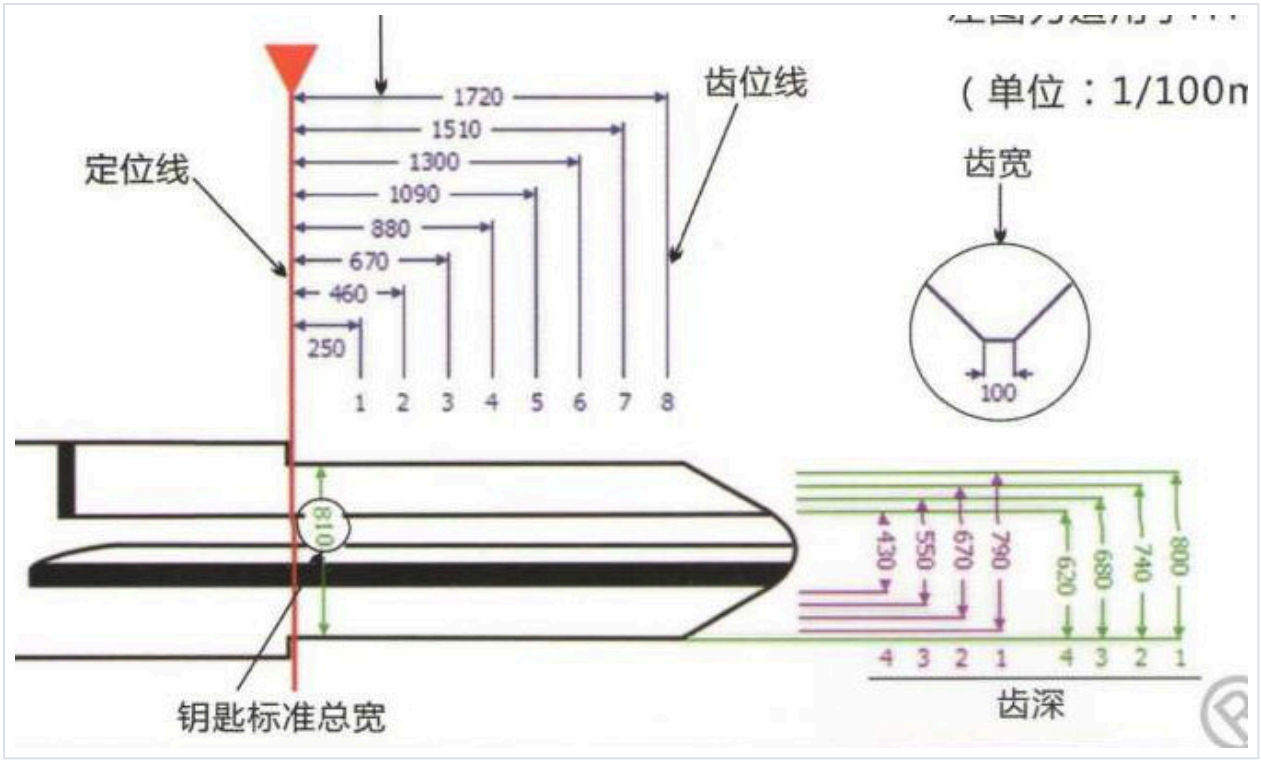


Fig. 18.1 HYN11 bitting position and cut depth chart for positions 1 through 8.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
定位线 → Reference line
齿位线 → Wafer position line
齿宽 → Wafer width
钥匙标准总宽 → Key standard overall width
齿深 → Cut depth



Fig. 18.2 HYN11 key with its bitting profile.

HYN7R 2-in-1



Fig. 18.3 HYN7R 2-in-1 tool.

APPLICABLE VEHICLES Hyundai Sonata, Mingyu

Picking direction: with the door lock on the left side, pick clockwise; with the door lock on the right side, pick counterclockwise.

Both the door lock and the ignition lock on this model use 8 wafers.

This key has 4 depth codes in total. No. 1 is the shallowest and No. 4 is the deepest.

Decoding: read forward after picking.

Numerical Data

This chart gives the bitting positions and cut depths that apply to HYN7R.

(Unit: 1/100 mm)

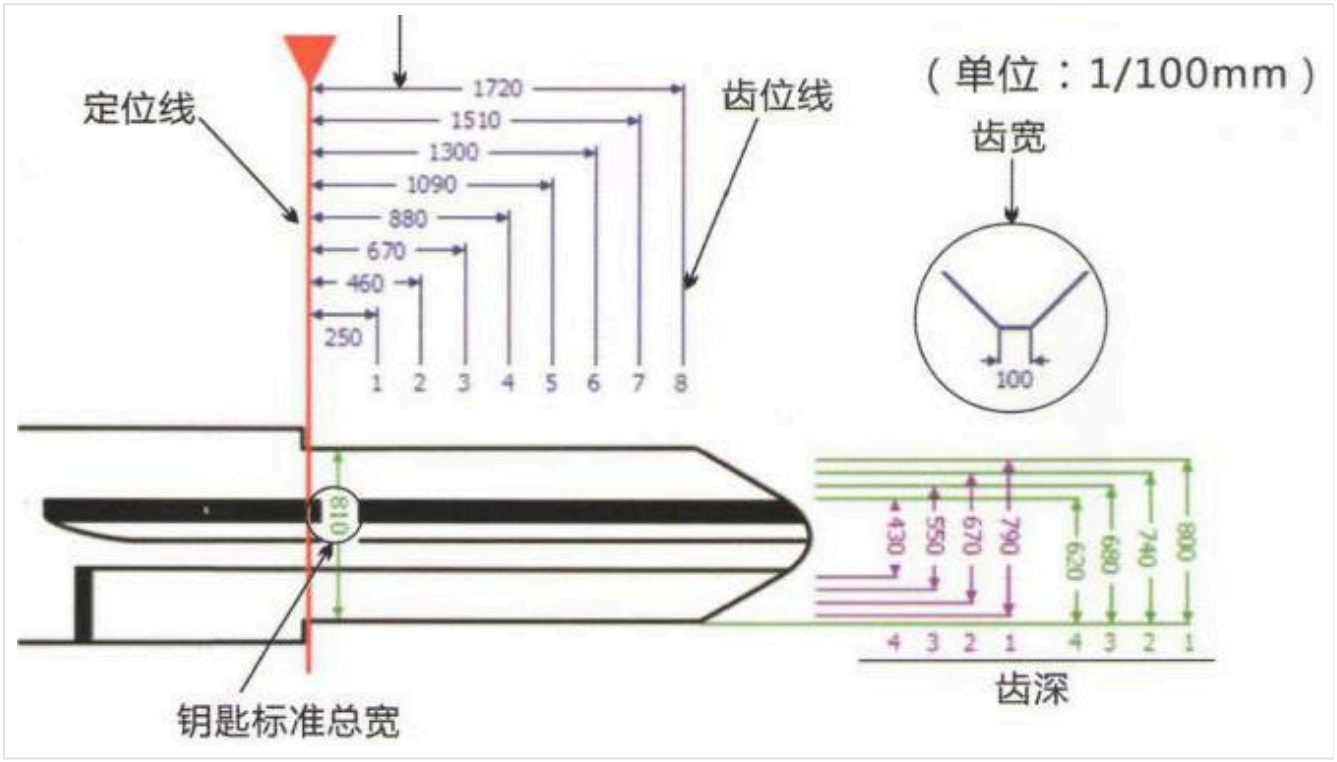


Fig. 18.4 HYN7R bitting position and cut depth chart for positions 1 through 8.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
定位线 → Reference line
齿位线 → Wafer position line
齿宽 → Wafer width
钥匙标准总宽 → Key standard overall width
齿深 → Cut depth



Fig. 18.5 HYN7R key with its bitting profile.

SOURCE PAGE 019

HU46 2-in-1



Fig. 19.1 HU46 2-in-1 tool.

APPLICABLE VEHICLES Opel, Antara, Sail

Picking direction: with the door lock on the left side, pick counterclockwise; with the door lock on the right side, pick clockwise.

This key has 4 depth codes in total. No. 1 is the shallowest and No. 4 is the deepest.

Decoding: read forward after picking.

Numerical Data

The chart at left gives the bitting positions and cut depths that apply to HU46.

(Unit: 1/100 mm)

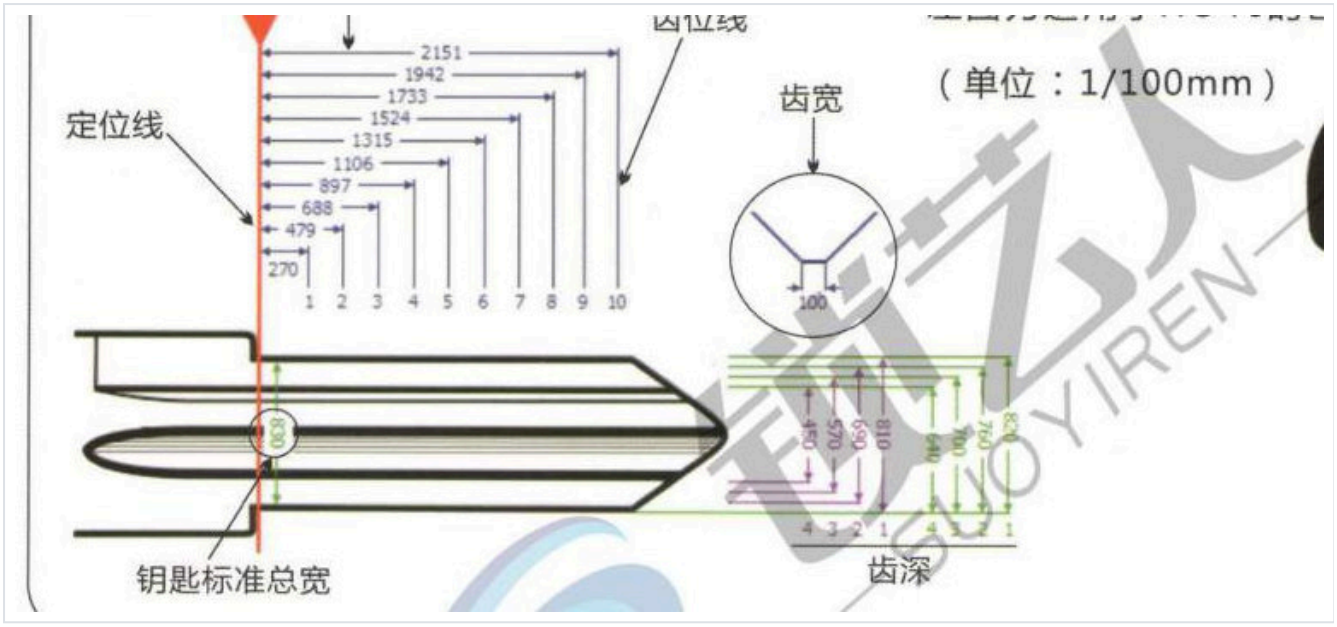


Fig. 19.2 HU46 bitting position and cut depth chart for positions 1 through 10.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
齿位线 → Wafer position line
钥匙标准总宽 → Key standard overall width
定位线 → Reference line
齿宽 → Wafer width
齿深 → Cut depth



Fig. 19.3 HU46 key with its bitting profile.

F038 2-in-1



Fig. 19.4 F038 2-in-1 tool.

APPLICABLE VEHICLES Ford

Picking direction: with the door lock on the left side, pick counterclockwise; with the door lock on the right side, pick clockwise.

This lock has 8 bitting positions in total. The door lock uses positions 2 through 7.

This key has 5 depth codes in total. No. 1 is the shallowest and No. 5 is the deepest.

Decoding: read forward after picking.

SOURCE PAGE 020

Numerical Data

The chart at left gives the bitting position and cut depth data for FO38. (Unit: 1/100 mm)

BITTING POSITION DISTANCES (POSITIONS 1-8)	2146, 1913, 1679, 1446, 1212, 978, 744, 510
CUT DEPTHS, FIRST DEPTH GROUP (CODES 5, 4, 3, 2, 1)	392, 518, 644, 772, 900
CUT DEPTHS, SECOND DEPTH GROUP (CODES 5, 4, 3, 2, 1)	646, 709, 772, 836, 900
WAFER WIDTH	100
KEY STANDARD OVERALL WIDTH	900

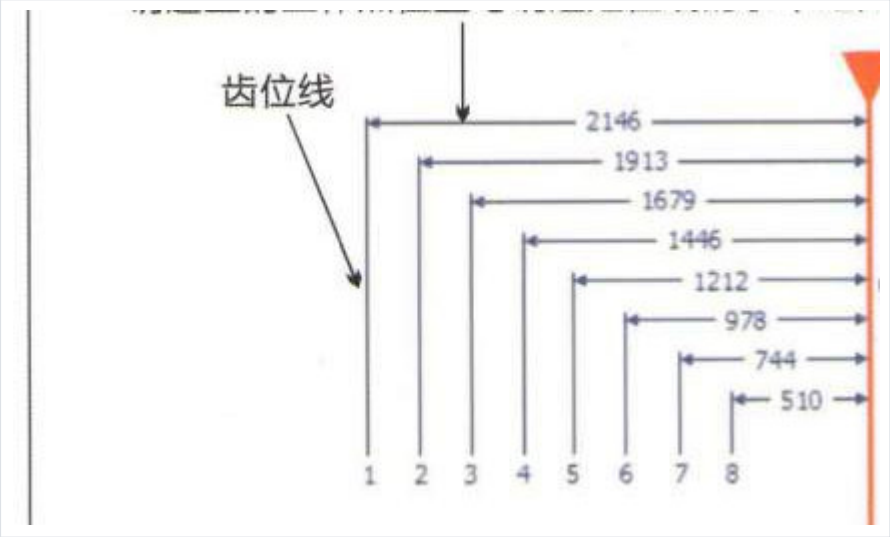


Fig. 20.1 FO38 bitting position distances, measured as the horizontal distance from each working point to the reference line.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line

定位线 → Reference line

齿位线 → Wafer position line

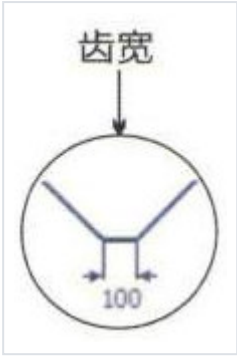


Fig. 20.2 FO38 keyway seen end-on: wafer width 100.

齿宽 → Wafer width

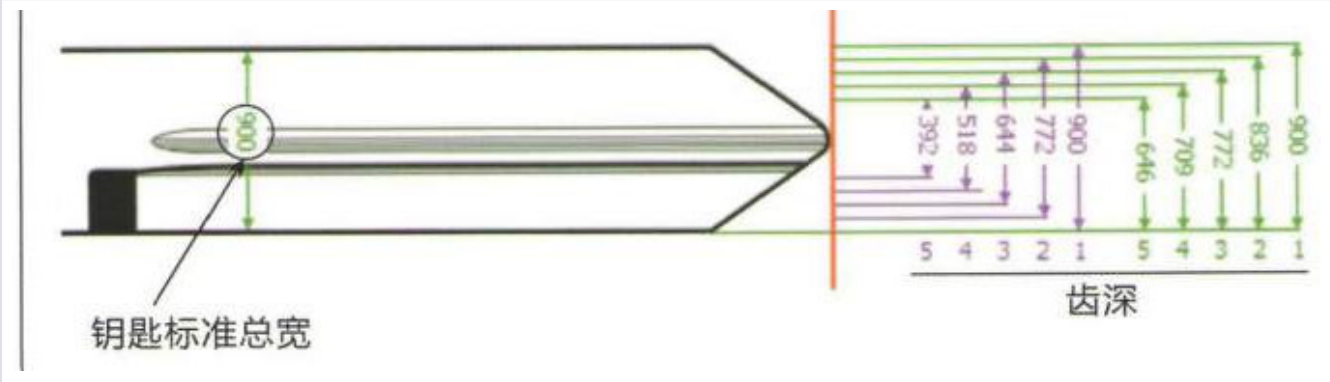


Fig. 20.3 FO38 key blade: standard overall width and the cut depths of both depth groups.

钥匙标准总宽 → Key standard overall width

齿深 → Cut depth



Fig. 20.4 FO38 OEM key and its keyway profile.

GM37 39 40 41 2-in-1



Fig. 20.5 GM37 39 40 41 2-in-1 tool.

李志勤 → Li Zhiqin

APPLICABLE VEHICLES	GL8, older Regal, etc.
PICKING DIRECTION	Door lock on the left side: pick counterclockwise. Door lock on the right side: pick clockwise.

In this lock family the ignition lock has 10 wafers. Door locks come with 7 wafers at positions 3-9, 7 wafers at positions 4-10, and 5 wafers at positions 6-10.

The key has 4 depth codes in all. No. 1 is the shallowest; No. 4 is the deepest.

Decoding: after opening, read forward.

Numerical Data

The chart at left gives the bitting position and cut depth data for GM37 (39 40 41). (Unit: 1/100 mm)

BITTING POSITION DISTANCES (POSITIONS 1-10)	2635, 2400, 2165, 1930, 1695, 1460, 1225, 990, 755, 520
CUT DEPTHS, FIRST DEPTH GROUP (CODES 4, 3, 2, 1)	410, 540, 670, 800
CUT DEPTHS, SECOND DEPTH GROUP (CODES 4, 3, 2, 1)	605, 670, 735, 800
WAFER WIDTH	100
KEY STANDARD OVERALL WIDTH	800

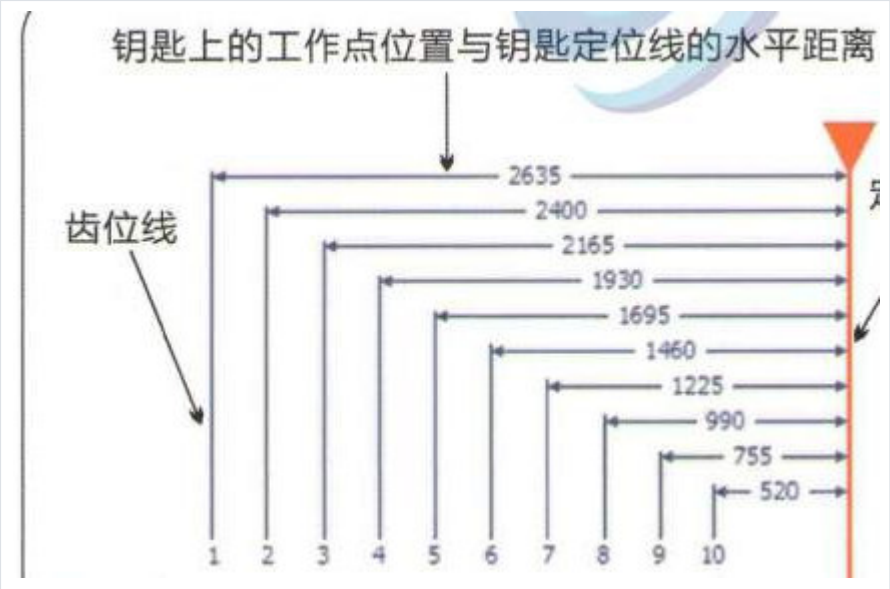


Fig. 20.6 GM37 (39 40 41) bitting position distances, measured as the horizontal distance from each working point to the reference line.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line

齿位线 → Wafer position line

定位线 → Reference line

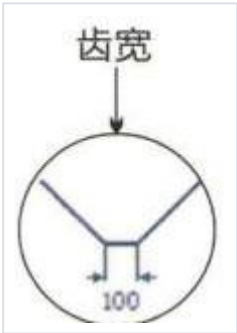


Fig. 20.7 GM37 keyway seen end-on: wafer width 100.

齿宽 → Wafer width

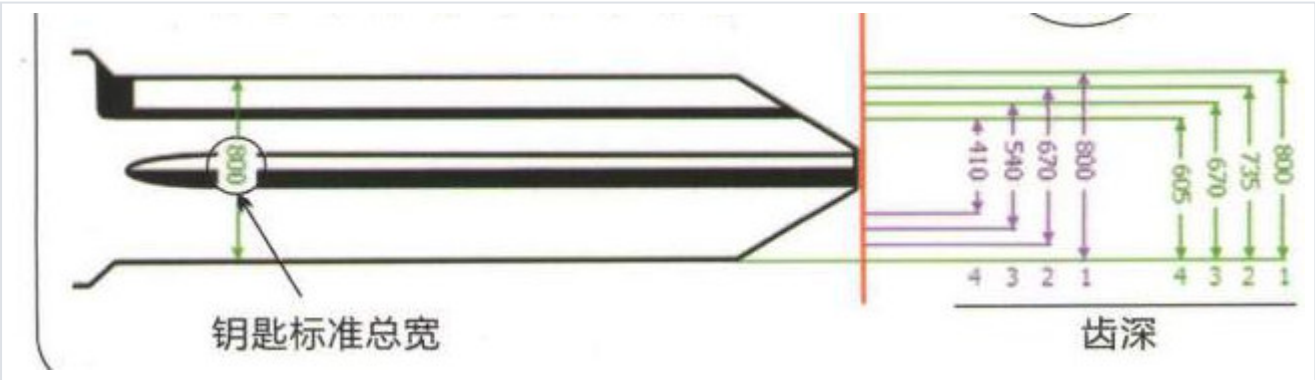


Fig. 20.8 GM37 key blade: standard overall width and the cut depths of both depth groups.

钥匙标准总宽 → Key standard overall width

齿深 → Cut depth



Fig. 20.9 GM37 OEM key and its keyway profile.

SOURCE PAGE 021

TOY43 2-in-1



Fig. 21.1 TOY43 2-in-1 tool.

李志勤 → Li Zhiqin　　2-in-1 Pick → 2-in-1 Pick

APPLICABLE VEHICLES	Toyota
PICKING DIRECTION	Door lock on the left side: pick clockwise. Door lock on the right side: pick counterclockwise.

The door lock and the ignition lock of this model both carry 8 wafers. Wafers 4 and 7 are half-wafers joined in pairs, and both halves of a pair take the same depth code. Wafers 1, 2, 5, 6 and 8 are whole wafers. One side of the plug carries wafers 2, 4, 6 and 8; the other side carries 1, 3, 5 and 7.

The key has 4 depth codes in all. No. 1 is the shallowest; No. 4 is the deepest.

Decoding: after opening, read forward.

Numerical Data

The chart at left gives the bitting position and cut depth data for TOY43. (Unit: 1/100 mm)

BITTING POSITION DISTANCES (POSITIONS 1-8)	2240, 2010, 1780, 1550, 1320, 1090, 860, 630
CUT DEPTHS, FIRST DEPTH GROUP (CODES 4, 3, 2, 1)	460, 580, 700, 820
CUT DEPTHS, SECOND DEPTH GROUP (CODES 4,	610, 700, 760, 820

3, 2, 1)	
WAFER WIDTH	100
KEY STANDARD OVERALL WIDTH	800

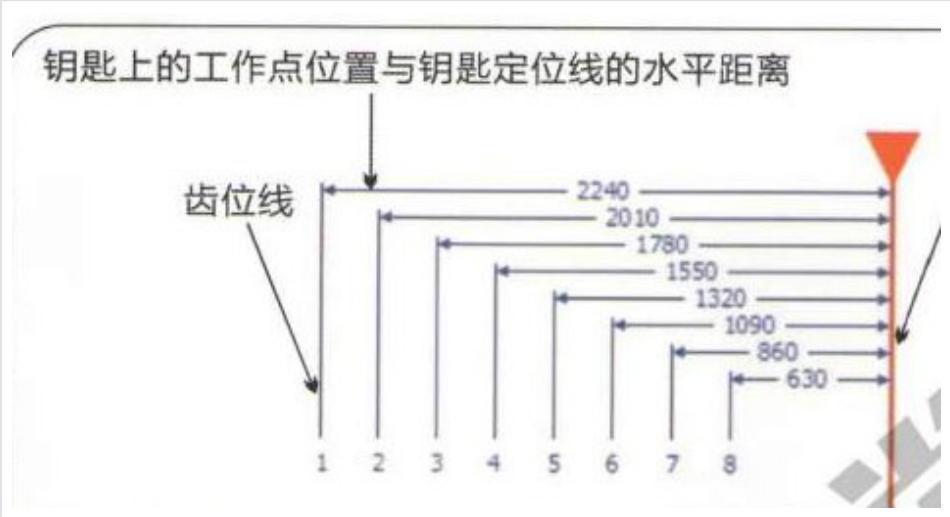


Fig. 21.2 TOY43 bitting position distances, measured as the horizontal distance from each working point to the reference line.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line

齿位线 → Wafer position line

定位线 → Reference line

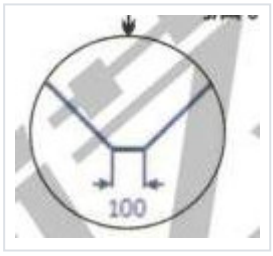


Fig. 21.3 TOY43 keyway seen end-on: wafer width 100.

齿宽 → Wafer width

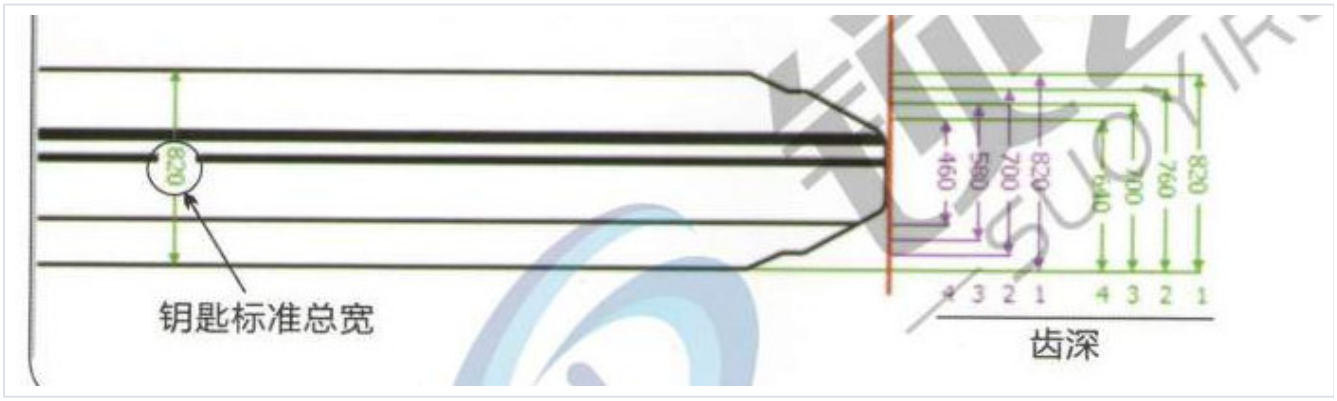


Fig. 21.4 TOY43 key blade: standard overall width and the cut depths of both depth groups.

钥匙标准总宽 → Key standard overall width

齿深 → Cut depth



Fig. 21.5 TOY43 OEM key and its keyway profile.

B111 2-in-1



Fig. 21.6 B111 2-in-1 tool.

B111 → B111
2-in-1 Pick → 2-in-1 Pick
李志勤 → Li Zhiqin

APPLICABLE VEHICLES	GM vehicles, Hummer, GMC
PICKING DIRECTION	Door lock on the left side: pick counterclockwise. Door lock on the right side: pick clockwise.

This lock has 10 bitting positions. Door cylinders come in two versions, 4-9 and 3-10.

The key has 5 depth codes in all. No. 1 is the shallowest; No. 5 is the deepest.

Decoding: after opening, read forward.

SOURCE PAGE 022

Numerical Data

The chart at left gives the bitting position and cut depth data for B111. (Unit: 1/100 mm)

BITTING POSITION DISTANCES (POSITIONS 1-10)	2627, 2393, 2159, 1923, 1689, 1456, 1222, 988, 754, 521
CUT DEPTHS, FIRST DEPTH GROUP (CODES 5, 4, 3, 2, 1)	419, 521, 623, 725, 825
CUT DEPTHS, SECOND DEPTH GROUP (CODES 5, 4, 3, 2, 1)	622, 673, 725, 775, 825

WAFER WIDTH	100
KEY STANDARD OVERALL WIDTH	800

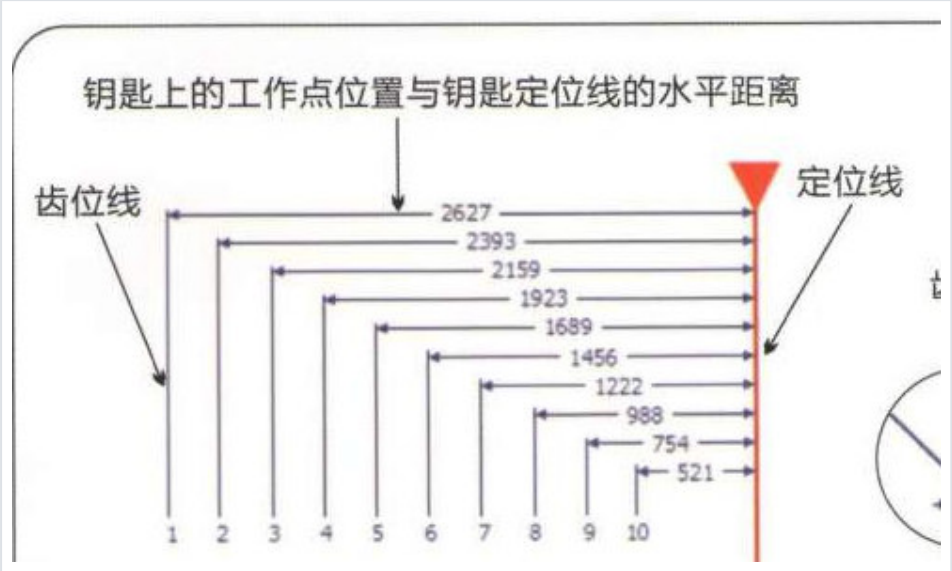


Fig. 22.1 B111 bitting position distances, measured as the horizontal distance from each working point to the reference line.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line

齿位线 → Wafer position line

定位线 → Reference line

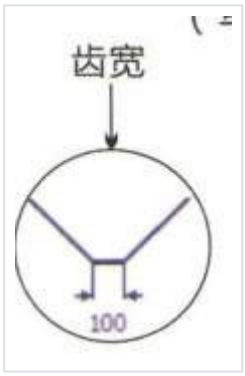


Fig. 22.2 B111 keyway seen end-on: wafer width 100.

齿宽 → Wafer width

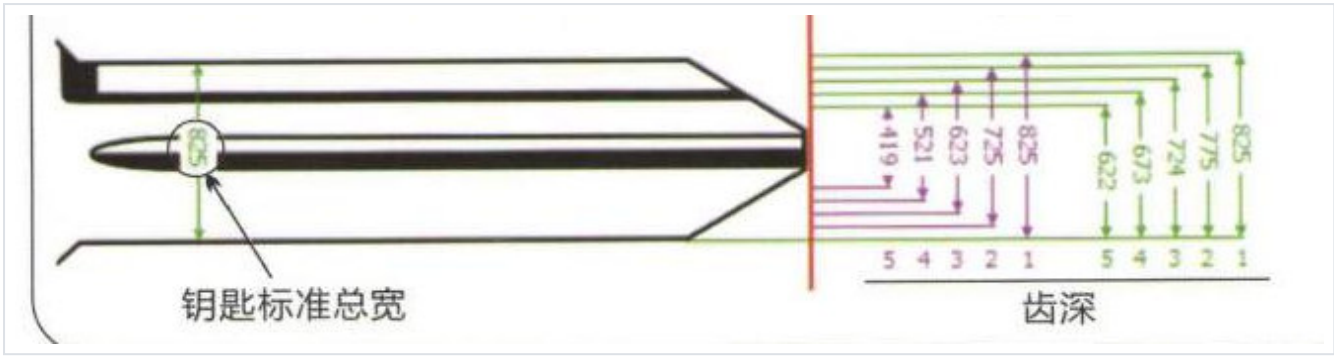


Fig. 22.3 B111 key blade: standard overall width and the cut depths of both depth groups.

钥匙标准总宽 → Key standard overall width

齿深 → Cut depth



Fig. 22.4 B111 OEM key and its keyway profile.

CY24 2-in-1



Fig. 22.5 CY24 2-in-1 tool.

CY24 → CY24

2-in-1 Pick → 2-in-1 Pick

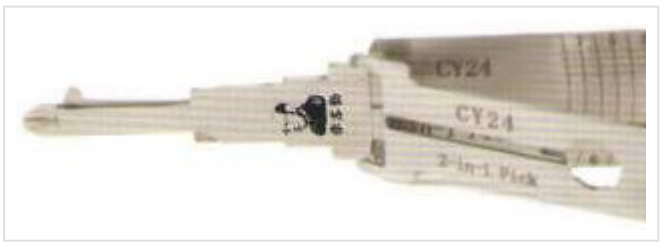


Fig. 22.6 CY24 2-in-1 tool, opposite view.

CY24 → CY24

2-in-1 Pick → 2-in-1 Pick

李志勤 → Li Zhiqin

APPLICABLE VEHICLES Chrysler, Jeep, Dodge

SOURCE PAGE 023

Picking Direction

When the driver's door is on the left side, pick clockwise.

When the driver's door is on the right side, pick counterclockwise.

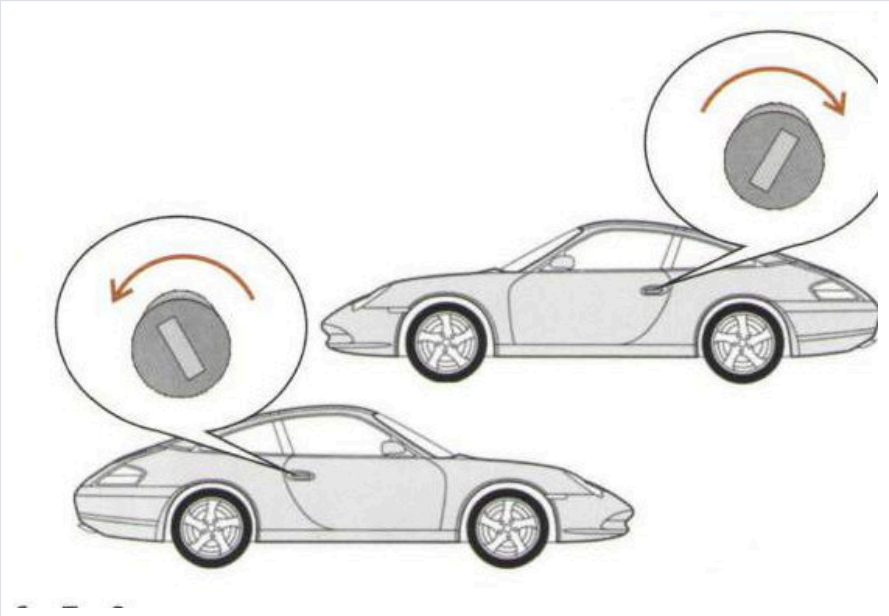


Fig. 23.1 Door lock rotation direction for a left-hand and a right-hand driver door.

Lock Overview

The door lock has 7 wafers, at sequence positions 2, 3, 4, 5, 6, 7 and 8.

There are 4 depths. No. 4 is the deepest and No. 1 the shallowest. Bitting position 1 is on the ignition lock.

From the door lock and the trunk lock you can work out position 1 in the database, or verify it one by one by elimination.

The glove box lock carries wafers at positions 5, 6, 7 and 8.

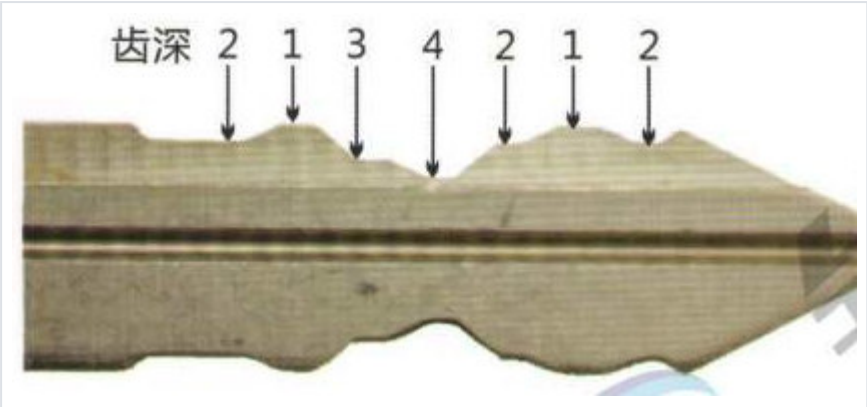


Fig. 23.2 Key blade with the cut depth of each bitting position marked above it.

齿深 → Cut depth

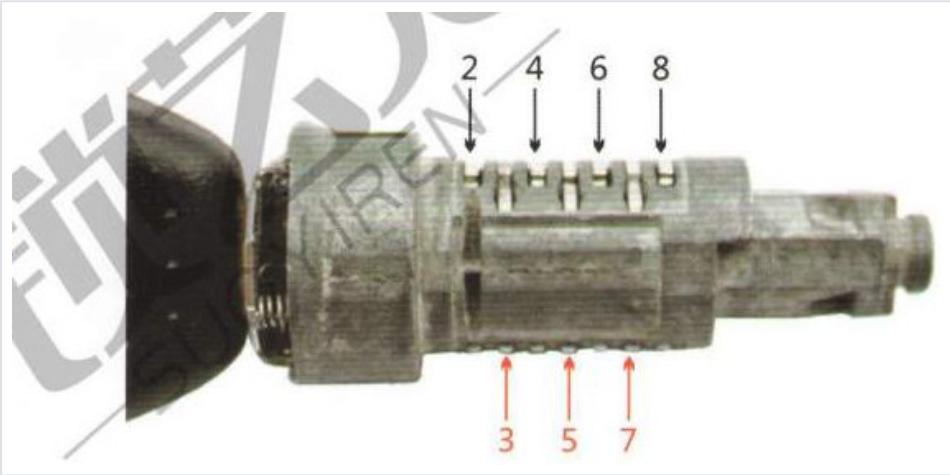


Fig. 23.3 Door cylinder, side view: wafers 2, 4, 6 and 8 sit in the upper row, wafers 3, 5 and 7 in the lower row.

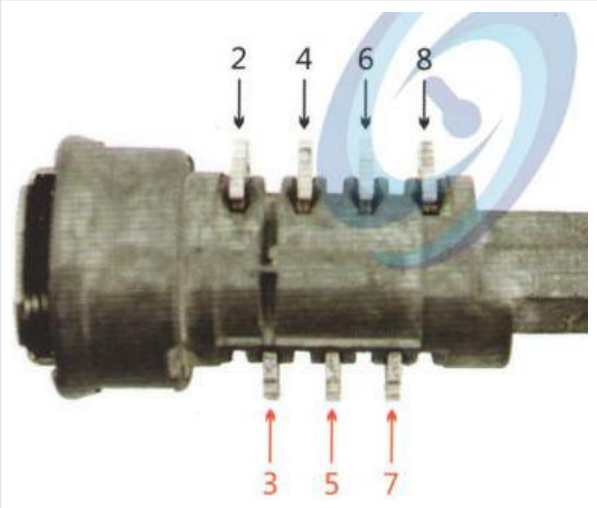


Fig. 23.4 The same cylinder seen from the other side, with both wafer rows and their position numbers.

Wafer quantity and position by lock location.

Position	1	2	3	4	5	6	7	8
Ignition	✓	✓	✓	✓	✓	✓	✓	✓

Position	1	2	3	4	5	6	7	8
Doors		✓	✓	✓	✓	✓	✓	✓
Trunk / Boot		✓	✓	✓	✓	✓	✓	✓
Glove Box					✓	✓	✓	✓

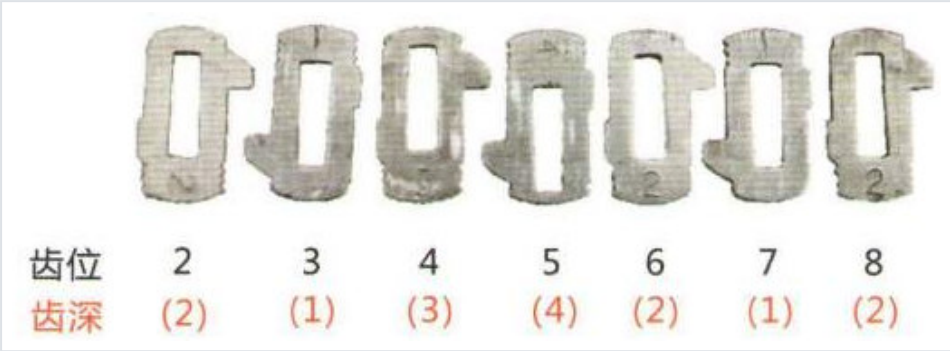


Fig. 23.5 Wafers by bitting position, with the depth code of each position underneath.

齿位 → Wafer position 齿深 → Cut depth

SOURCE PAGE 024

DECODING

Read forward after opening.

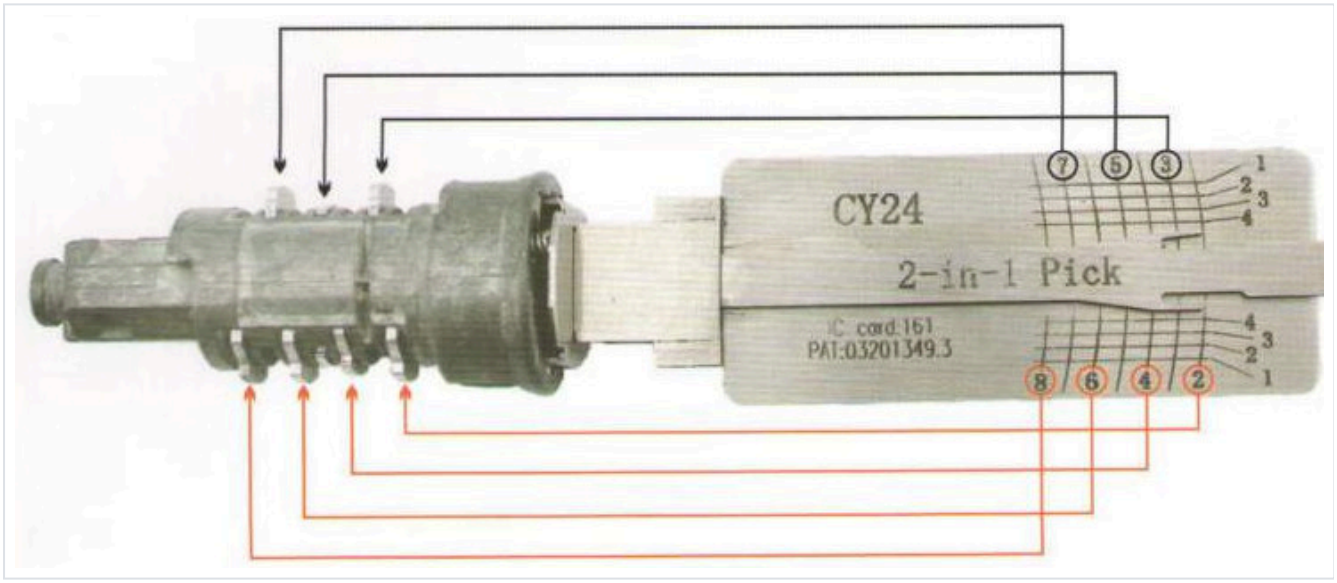


Fig. 24.1 CY24 2-in-1 Pick: decoding callouts 1 through 8 on the reading panel, upper and lower wafer rows.

CY24 [8-8]

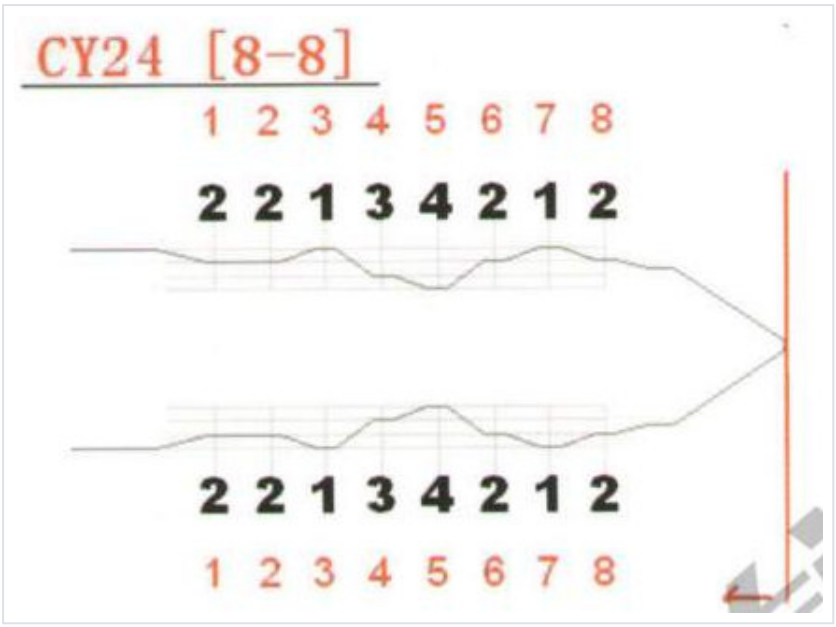


Fig. 24.2 CY24 key chart: bitting positions 1 through 8 with the cut profile 2 2 1 3 4 2 1 2 on the upper row and on the lower row.

KEY CUTTING

The figure above is a schematic of the key as cut on a CNC key machine. When you do not have a CNC machine, you must still refer to the slope between adjacent cuts on this chart when you cut a key.

Numerical Data

The figure below gives the specific bitting position and cut depth data that applies to CY24. (Unit: 1/100 mm)

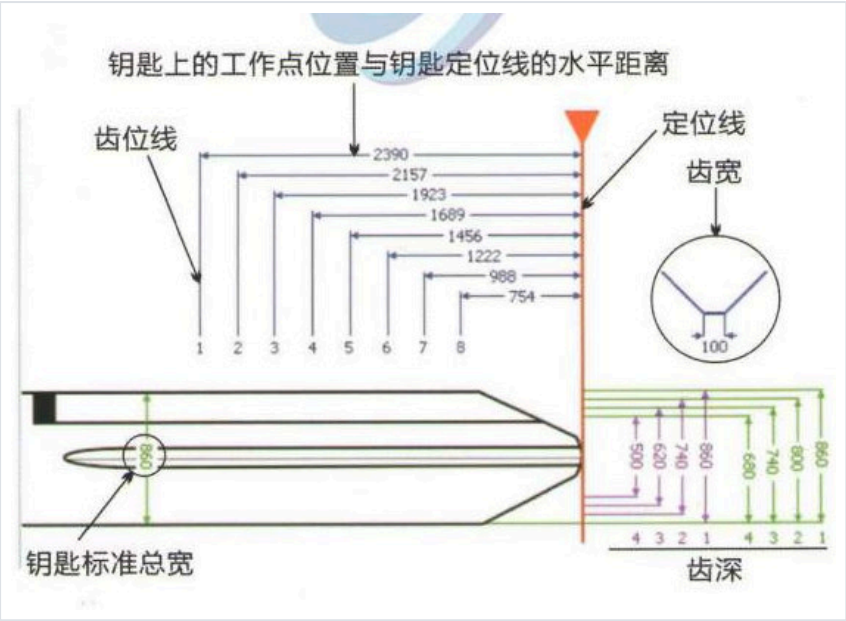


Fig. 24.3 CY24 bitting position and cut depth data. Positions 1 through 8 lie at 2390, 2157, 1923, 1689, 1456, 1222, 988 and 754 from the key reference line; cut width 100; key standard overall width 960; cut depths 500, 620, 740, 860 (codes 4, 3, 2, 1) and 680, 740, 800, 860 (codes 4, 3, 2, 1).

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point position on the key to the key reference line
齿位线 → Wafer position line
定位线 → Reference line
齿宽 → Cut width
齿深 → Cut depth
钥匙标准总宽 → Key standard overall width



Fig. 24.4 CY24 key blank: face view and side silhouette.

SOURCE PAGE 025

SPECIAL TECHNIQUE

This lock opens relatively easily counterclockwise.

TOY38R 2-in-1



Fig. 25.1 TOY38R 2-in-1 Pick with the reading panels opened out.



Fig. 25.2 TOY38R 2-in-1 Pick, reading panel face.

APPLICABLE VEHICLES

GM DAEWOO (Daewoo) / CHERYL (Xiali) / HAFEI (Hafei) / DOMESTIC CARS (some domestic Chinese vehicles)

PICKING DIRECTION

When the driver's door is on the left side of the vehicle, open clockwise.

When the driver's door is on the right side of the vehicle, open counterclockwise.

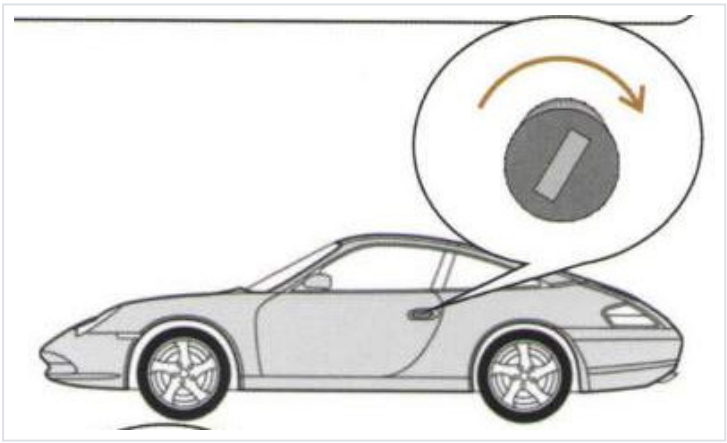


Fig. 25.3 Driver's door on the left side: turn the plug clockwise to pick the lock open.

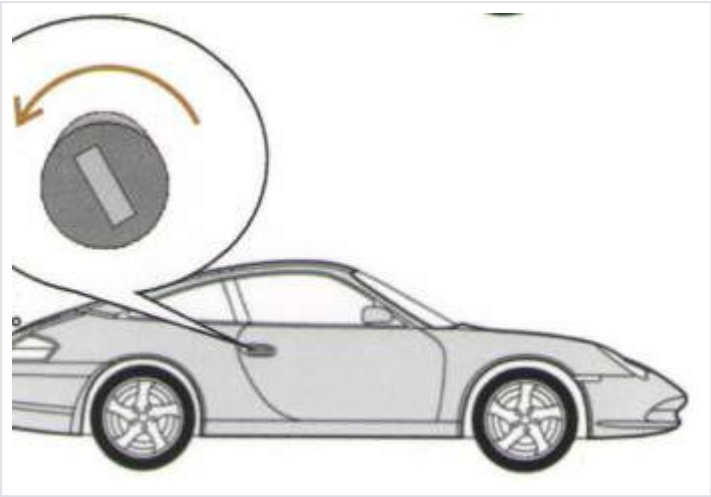


Fig. 25.4 Driver's door on the right side: turn the plug counterclockwise to pick the lock open.

LOCK OVERVIEW

This door lock has 8 wafers and 4 depths. The deepest is depth No. 4 and the shallowest is depth No. 1.

All 8 of these wafers are found in the door lock, the ignition and the trunk.

The glove box lock carries 4 wafers: 5 6 7 8.

SOURCE PAGE 026

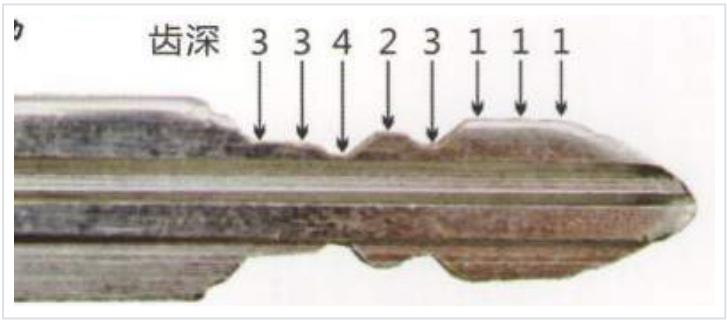


Fig. 26.1 TOY38R key: cut depth codes 3 3 4 2 3 1 1 1, read at the working points along the blade.

齿深 → Cut depth



Fig. 26.2 Wafers 1 through 8 with their wafer positions and cut depth codes (3) (3) (4) (2) (3) (1) (1) (1).

齿位 → Wafer position

齿深 → Cut depth

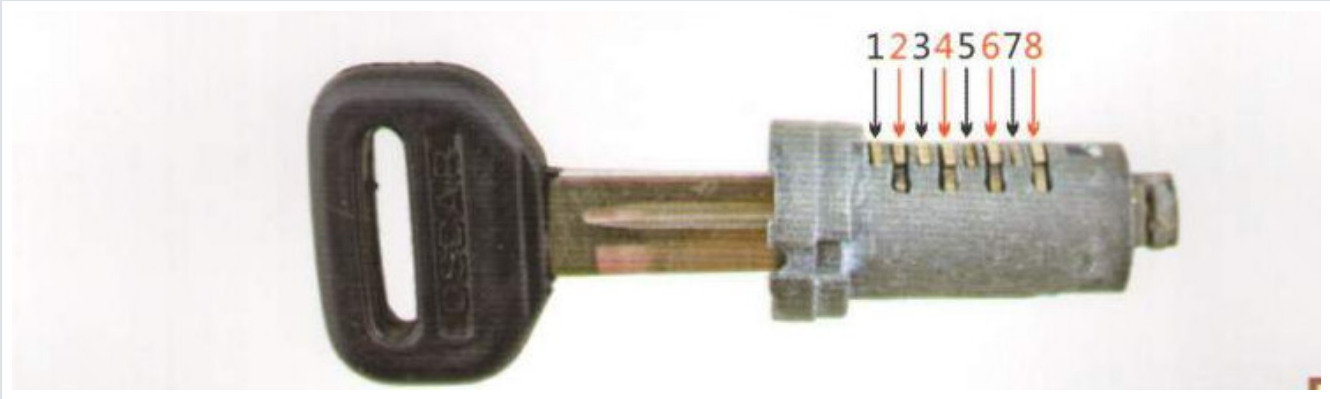


Fig. 26.3 Cylinder with the key inserted: wafers 1 through 8 in the plug.

DECODING

Read forward after opening.

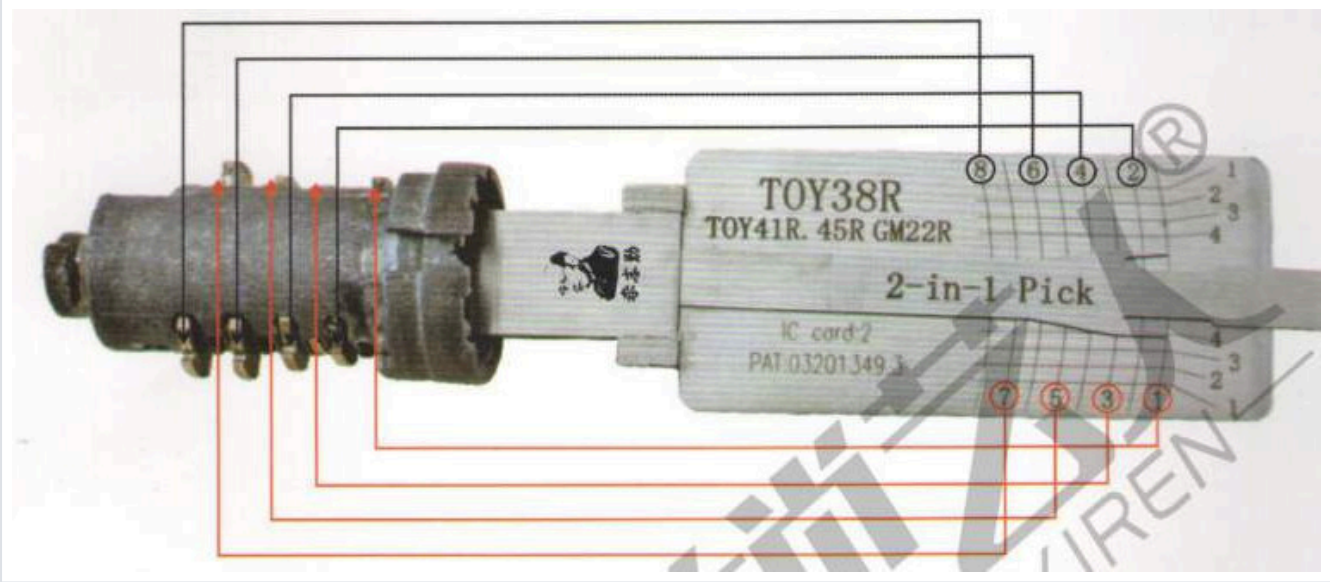


Fig. 26.4 TOY38R 2-in-1 Pick: decoding callouts 1 through 8 on the reading panel.

Numerical Data

The figure below gives the specific bitting position and cut depth data that applies to TOY38R. (Unit: 1/100 mm)

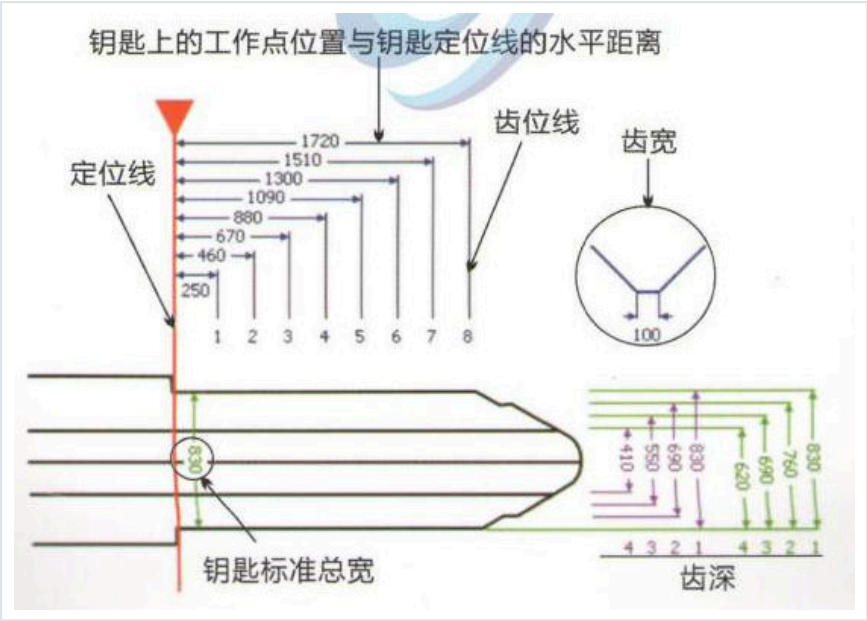


Fig. 26.5 TOY38R bitting position and cut depth data. Positions 1 through 8 at 1720, 1510, 1300, 1090, 880, 670, 460 and 250 from the reference line; cut width 100; key standard overall width 830; cut depths 410, 550, 660, 830 (codes 4, 3, 2, 1) and 620, 690, 730, 830 (codes 4, 3, 2, 1).

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point position on the key to the key reference line
定位线 → Reference line
齿位线 → Wafer position line
齿宽 → Cut width
钥匙标准总宽 → Key standard overall width
齿深 → Cut depth

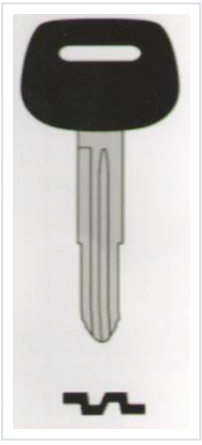


Fig. 26.6 TOY38R key blank: face view and side silhouette.

SOURCE PAGE 027

TOY38

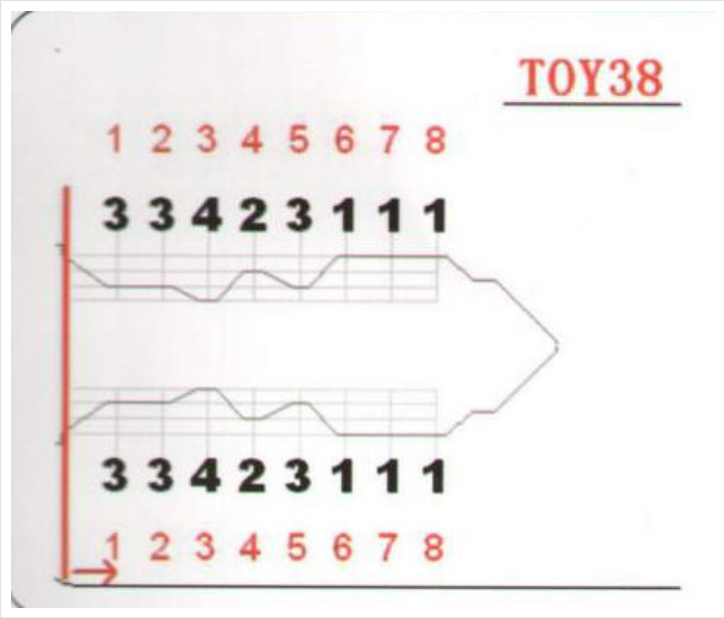


Fig. 27.1 TOY38 key chart: bitting positions 1 through 8 with the cut profile 3 3 4 2 3 1 1 1 on the upper and on the lower row.

KEY CUTTING

The figure above is a schematic of the key as cut on a CNC key machine. When you do not have a CNC machine, you must still refer to the slope between adjacent cuts on this chart when you cut a key.

SPECIAL TECHNIQUE

Do not use this tool on aftermarket locks. Forcing it will bend the lifter of the tool.

If you are cutting a key, pick to the left. Rotating the plug makes decoding more convenient.

If the pointer stays on the No. 4 cut depth line, the depth is definitely 3. If the pointer stays below the No. 4 cut depth line, the depth is 2 or 1. If it moves, the depth is 4. Always control the force of your hand while picking.

TOY43AT 2-in-1

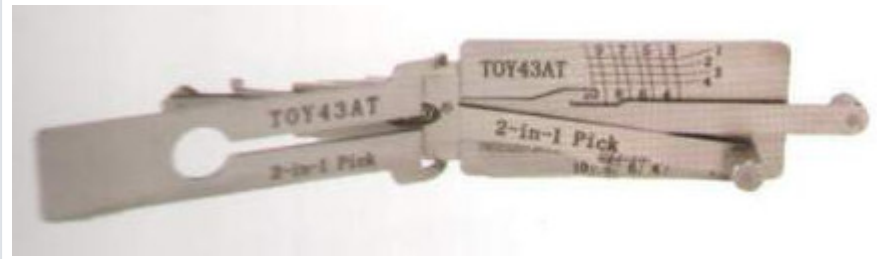


Fig. 27.2 TOY43AT 2-in-1 Pick, reading panel face.

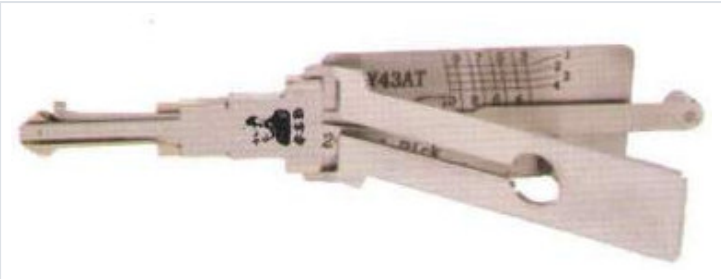


Fig. 27.3 TOY43AT 2-in-1 Pick with the reading panels opened out.

APPLICABLE VEHICLES TOYOTA (Toyota)

SOURCE PAGE 028

Picking Direction

When the driver's side is the left door, pick clockwise.

When the driver's side is the right door, pick counterclockwise.

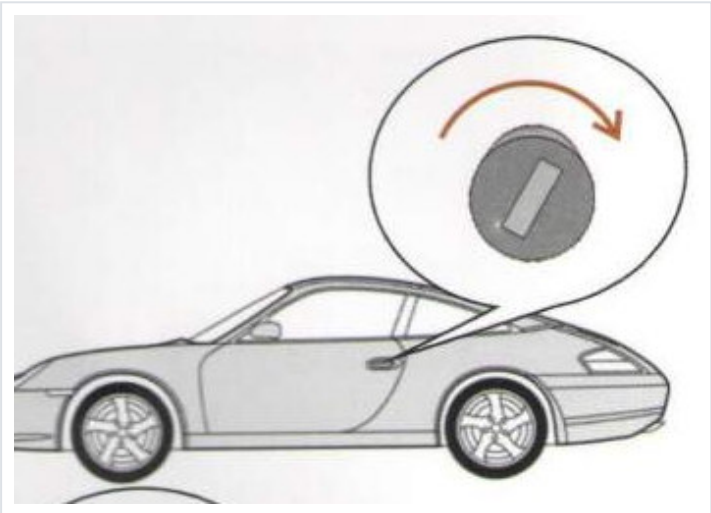


Fig. 28.1 Clockwise picking direction, driver's side at the left door.

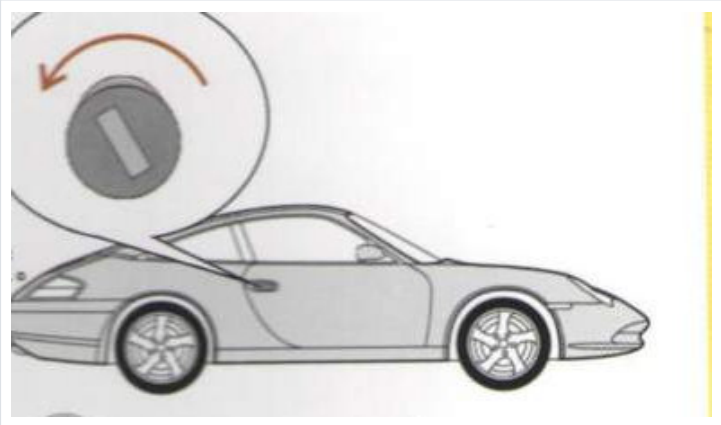


Fig. 28.2 Counterclockwise picking direction, driver's side at the right door.

Lock Overview

This door lock has 8 wafers and 4 depths. The deepest is No. 4 depth and the shallowest is No. 1 depth.

Wafers 1 and 2 are only on the ignition. The glove box carries only four wafers: 7, 8, 9 and 10.

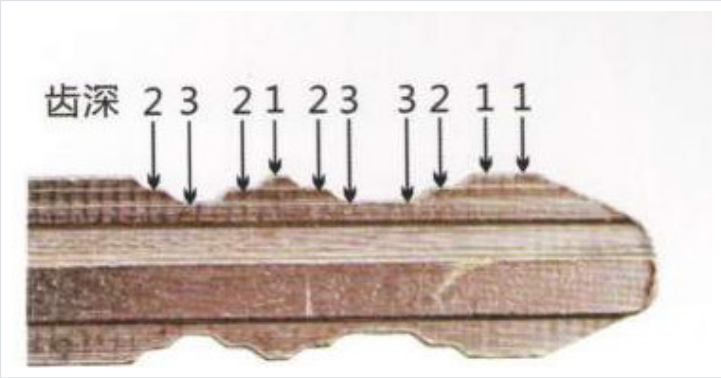


Fig. 28.3 Key blade with the depth code called out at bitting positions 1 through 10.

齿深 → Cut depth



Fig. 28.4 Wafers at bitting positions 3 through 10 with their depth codes.

齿位 → Wafer position

齿深 → Cut depth



Fig. 28.5 Wafer quantity and position by lock location.

各部位锁芯弹片数量及位置明细图 → Wafer quantity and position by lock location
位置 → Position
点火 → Ignition
门 → Doors
尾箱 → Trunk / Boot
杂物箱 → Glove Box

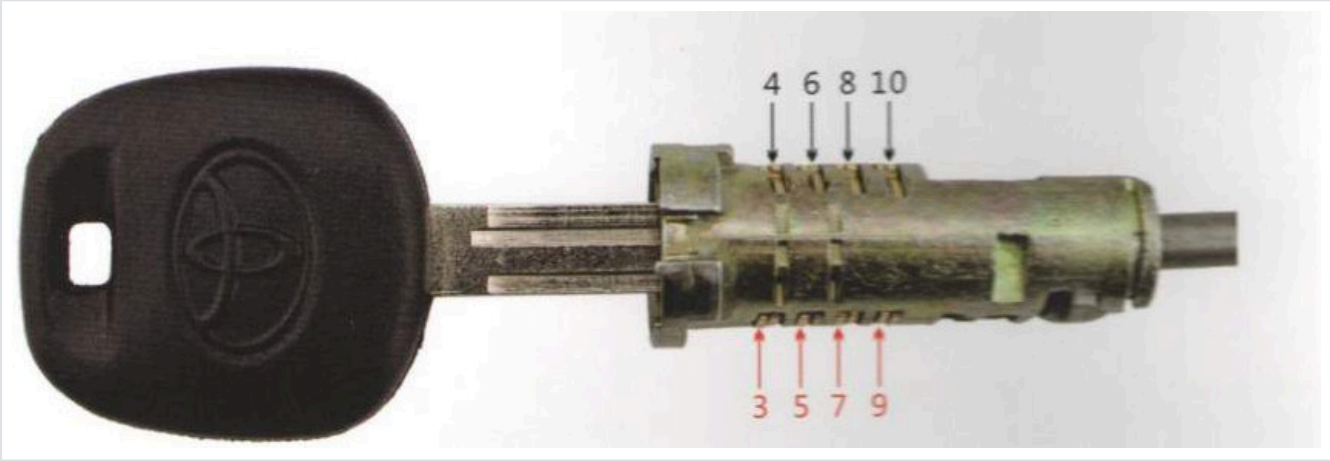


Fig. 28.6 Toyota key and door cylinder, with wafer positions 3 to 10 marked.

SOURCE PAGE 029

Decoding

Read forward after opening.

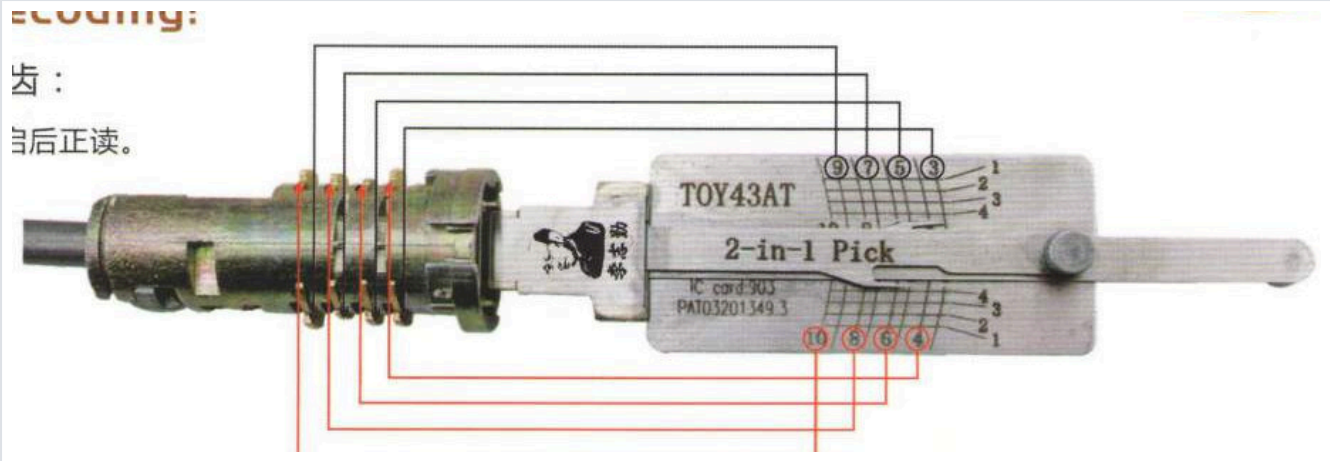


Fig. 29.1 Tool in the cylinder with the panel positions called out: wafers 3, 5, 7 and 9 on the upper row, wafers 4, 6, 8 and 10 on the lower row.

李志勤 → Li Zhiqin maker's seal

Key Cutting

The drawing at right is a schematic of a key as cut by a CNC key machine. When you do not have a CNC machine, cut the key with reference to the slope between adjacent cuts shown in this drawing.

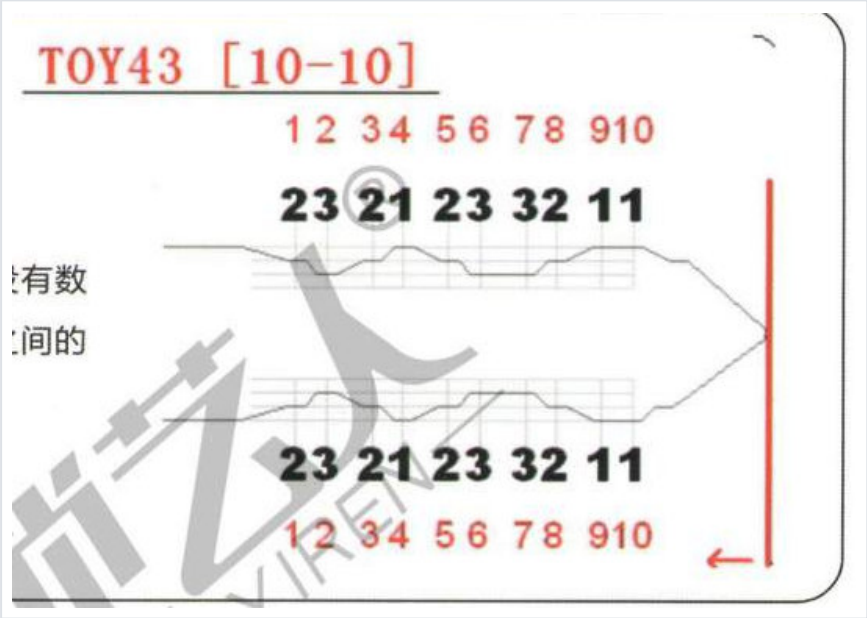


Fig. 29.2 TOY43 [10-10] key cutting chart: depth codes 2 3 2 1 2 3 3 2 1 1 at bitting positions 1 through 10, read from either edge.

Numerical Data

The drawing below gives the bitting position and cut depth data that apply to TOY43AT. (Unit: 1/100 mm)

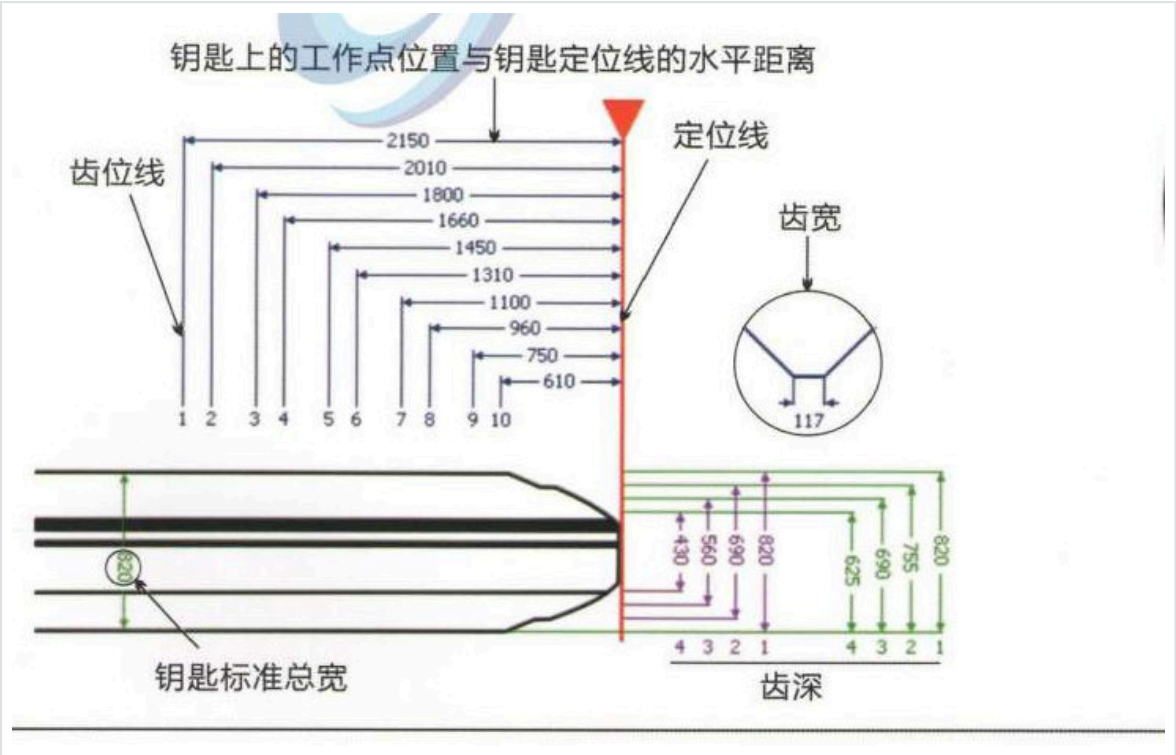


Fig. 29.3 TOY43AT bitting data: horizontal distance from each working point to the reference line (positions 1-10: 2150, 2010, 1800, 1660, 1450, 1310, 1100, 960, 750, 610), wafer width 117, key standard overall width, and the two cut depth scales.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
齿位线 → Wafer position line
定位线 → Reference line
齿宽 → Wafer width
钥匙标准总宽 → Key standard overall width
齿深 → Cut depth



Fig. 29.4 Toyota key blank and its edge profile.

SOURCE PAGE 030

Special Technique

Picking and decoding method: handle the tool exactly as you would any other tool — test the bitting positions first. Pick clockwise. To test whether a depth code has been reached, the wafer that moves is the one you have reached: on the No. 4 cut depth line, a slight movement is 4, no movement is 3, and a large movement is 2 or 1; below the No. 4 cut depth line, no movement is 1 or 2.

This lock has 8 cuts on the doors and 10 on the ignition, with cuts 1 and 2 missing. Because what you pick is a door or the trunk, you can only obtain the depth codes for bitting positions 3-10. The master key for this lock has an 11th

bitting position, and that position is always depth code 2; the tool's 11th position is already made to depth code 2, so that position is reached the moment the tool is fully inserted. From positions 3-10, these 8 wafers, you can look up the exact codes for bitting positions 1 and 2 in Instacode (the database). You can also read the height of codes 1 and 2 directly on the ignition lock.

There are two ways to make an ignition key. One is to look at the wafers in the keyway. First find the wafer at bitting position 1. Seen through the keyway, this lock's wafers are arranged one up, one down. If both wafers you see are high, the pair is (3, 3), (3, 4) or (4, 3): cut (3, 3) first; if it does not open, take one side to 4, that is (3, 4) or (4, 3); if it still does not open, go to (4, 4). If both wafers are low, the pair is (1, 1), (1, 2), (2, 1) or (2, 2). If one is high and one is low, it is definitely (3, 2). Two, check the database, which also yields 4 keys.

MAZ24 2-in-1



Fig. 30.1 MAZ24 2-in-1 tool, pick side.

李志勤 → Li Zhiqin maker's seal



Fig. 30.2 MAZ24 2-in-1 tool, reading panel side.

APPLICABLE VEHICLES MAZDA

SOURCE PAGE 031

Picking Direction

When the driver's side is the left door, pick clockwise.

When the driver's side is the right door, pick counterclockwise.

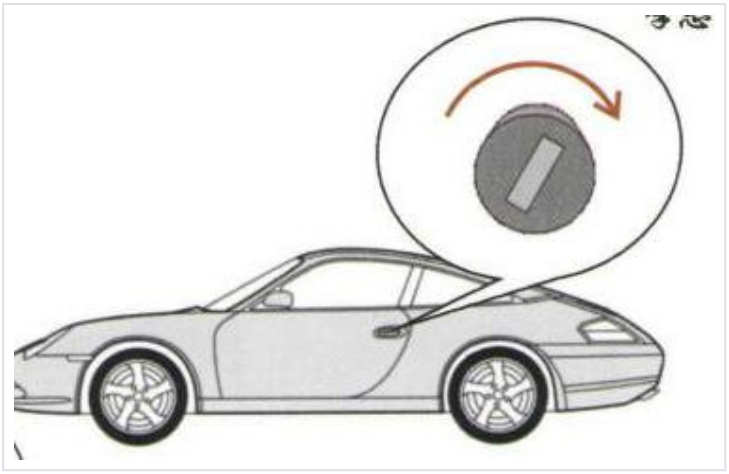


Fig. 31.1 Clockwise picking direction, driver's side at the left door.

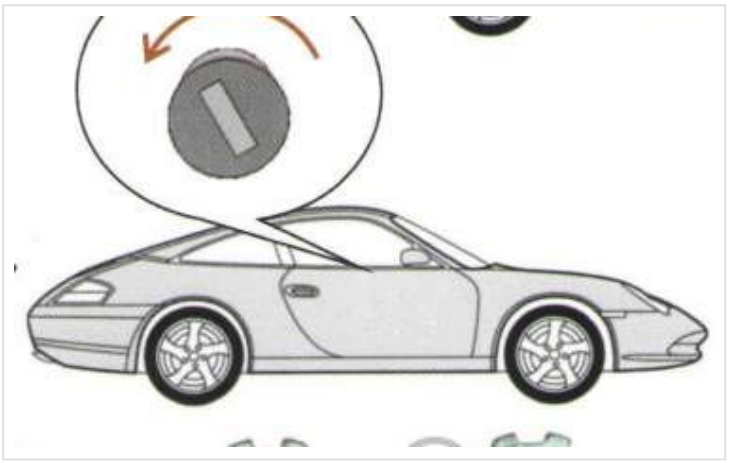


Fig. 31.2 Counterclockwise picking direction, driver's side at the right door.

Lock Overview

The door lock on this vehicle is 3-10, 8 cuts; the ignition has 1 and 2 in addition.

This key has 5 cut depths in total: No. 1 is the shallowest and No. 5 is the deepest.

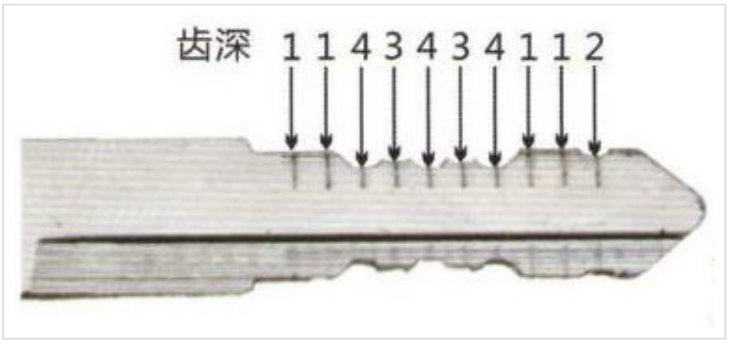


Fig. 31.3 Key blade with the depth codes called out at bitting positions 1 through 10.

齿深 → Cut depth

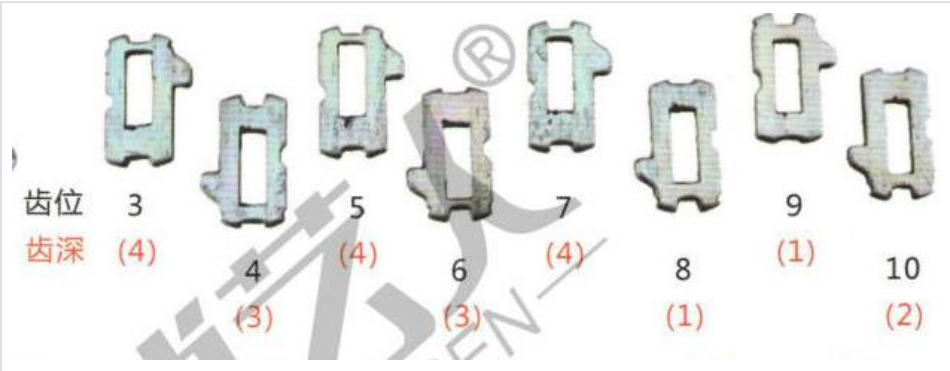


Fig. 31.4 Wafers at bitting positions 3 through 10 with their depth codes.

齿位 → Wafer position 齿深 → Cut depth

Decoding

Read forward after opening.

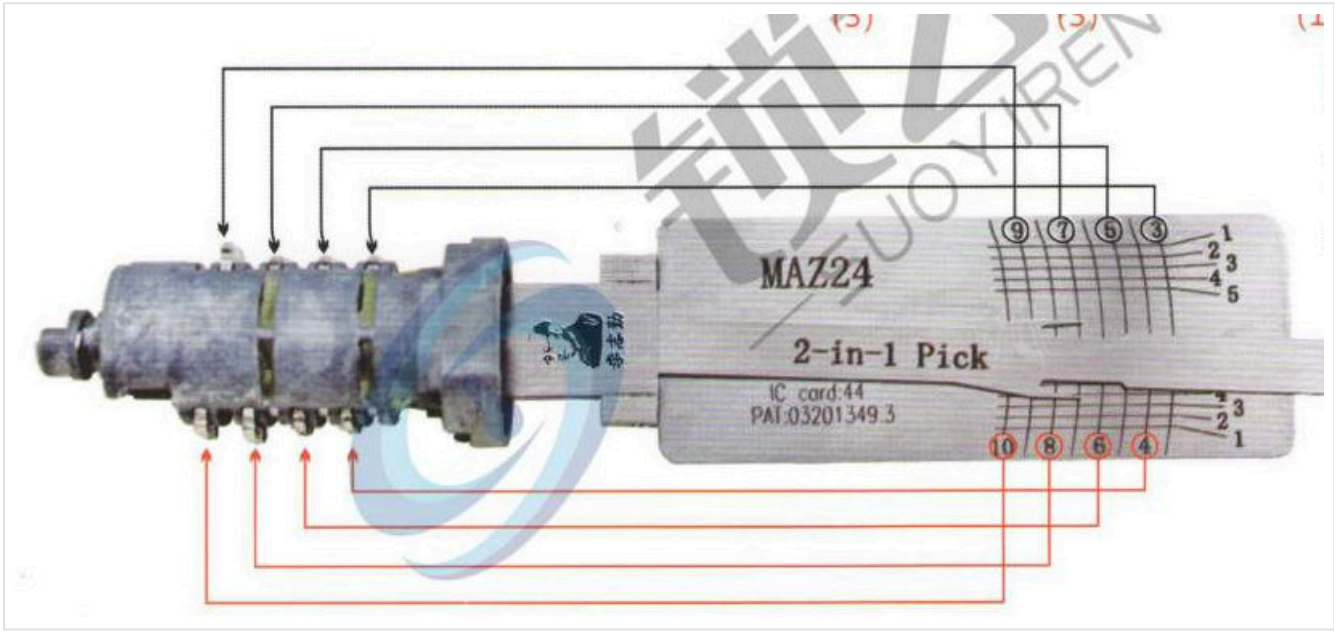


Fig. 31.5 Tool seated in the cylinder; panel positions 3, 5, 7 and 9 are called out on the upper row, 4, 6, 8 and 10 on the lower row.

李志勤 → Li Zhiqin maker's seal

Key Cutting

The drawing above is a schematic of a key as cut by a CNC key machine. When you do not have a CNC machine, cut the key with reference to the slope between adjacent cuts shown in this drawing.

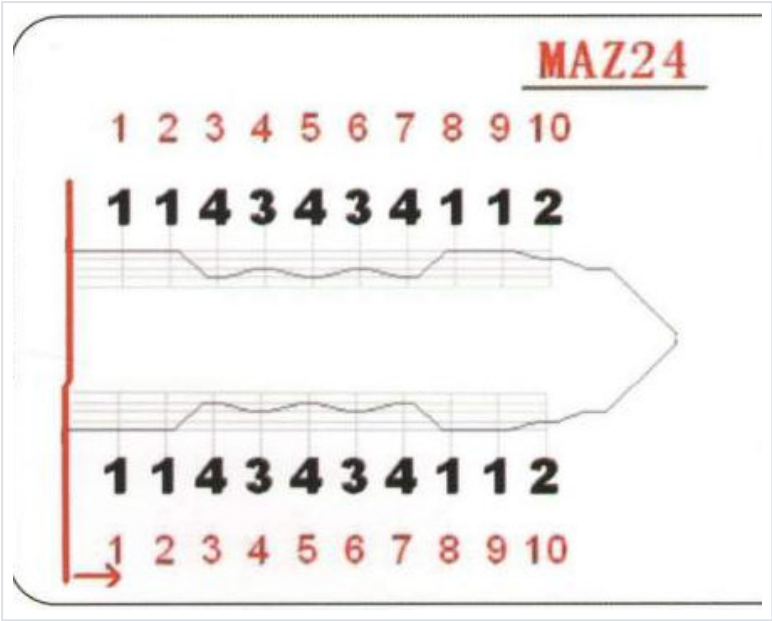


Fig. 31.6 MAZ24 key cutting chart: depth codes 1 1 4 3 4 3 4 1 1 2 at bitting positions 1 through 10, read from either edge.

SOURCE PAGE 032

Numerical Data

The figure below gives the numerical data for the bitting positions and cut depths that apply to MAZ24. (Unit: 1/100 mm)

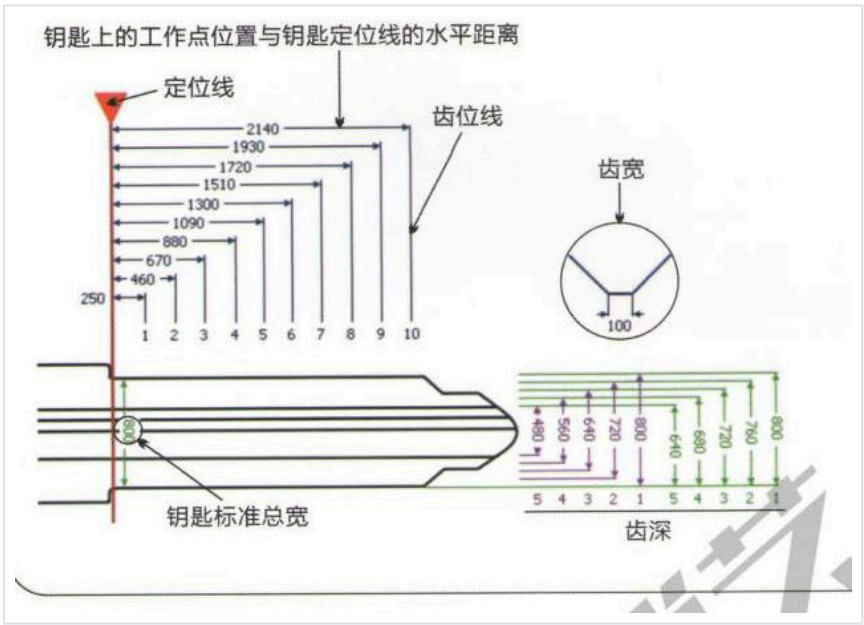


Fig. 32.1 MAZ24 bitting positions and cut depths: distance from the reference line to each working point (250, 460, 670, 880, 1090, 1300, 1510, 1720, 1930, 2140 for positions 1 through 10), wafer width 100, key standard overall width 800, and the two cut depth series.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
定位线 → Reference line
齿位线 → Wafer position line
钥匙标准总宽 → Key standard overall width
齿宽 → Wafer width
齿深 → Cut depth



Fig. 32.2 MAZ24 key blank, head and blade.



Fig. 32.3 MAZ24 key silhouette with its cut profile.

Special Technique

The exact depth codes for bitting positions 1 and 2 can be looked up in Instacode (the database).

GT15 2-in-1



Fig. 32.4 GT15 2-in-1 tool, reading panel side.



Fig. 32.5 GT15 2-in-1 tool, picking tip and lifter side.

SOURCE PAGE 033

APPLICABLE VEHICLES FIAT

Picking Direction

When the driver's door is on the left side of the vehicle, pick in the counterclockwise direction.

When the driver's door is on the right side of the vehicle, pick in the clockwise direction.

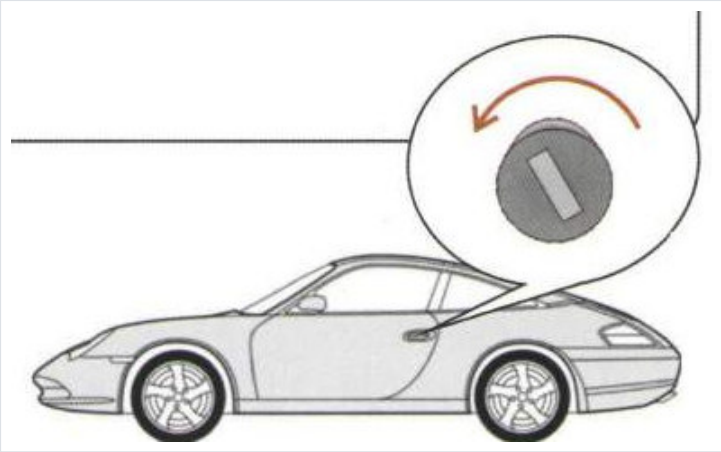


Fig. 33.1 Picking direction for a left-hand drive car: counterclockwise.

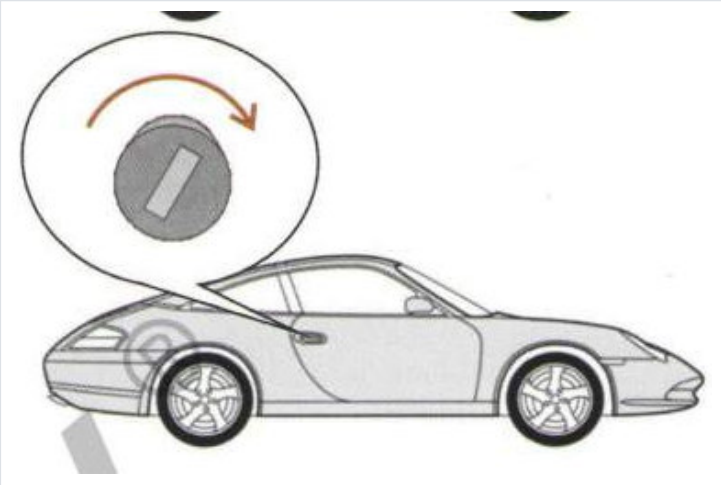


Fig. 33.2 Picking direction for a right-hand drive car: clockwise.

Lock Overview

This lock has 9 bitting positions and 3 depth codes; No. 1 is the shallowest and No. 3 is the deepest.

The door lock and the ignition lock are the same, and both have 9 wafers.

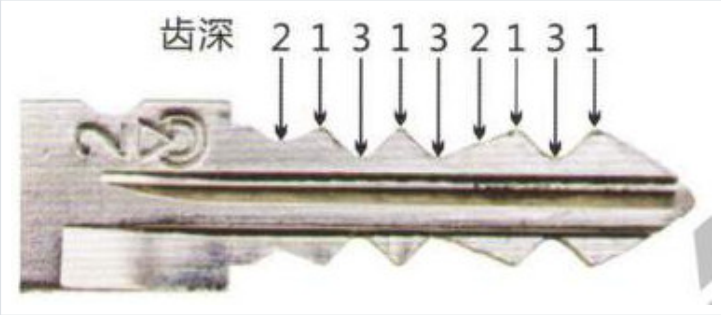


Fig. 33.3 FIAT key with its depth codes 2 1 3 1 3 2 1 3 1.

齿深 → Cut depth

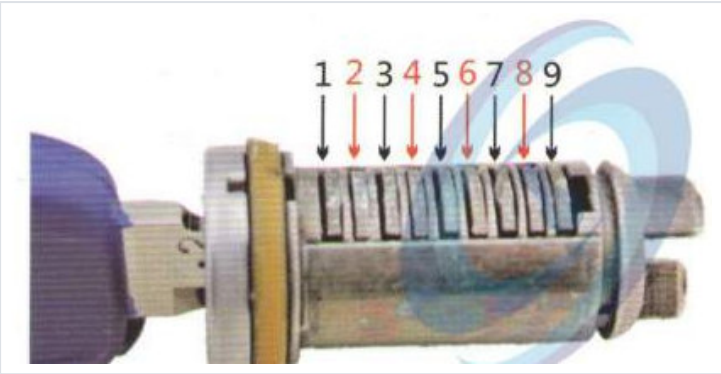


Fig. 33.4 Cylinder cut away, with the 9 wafer positions numbered 1 through 9.



Fig. 33.5 Wafer set: each wafer position 1 through 9 shown with its cut depth code in parentheses.

齿位 → Wafer position

齿深 → Cut depth

Decoding

Read forward after the lock is open.

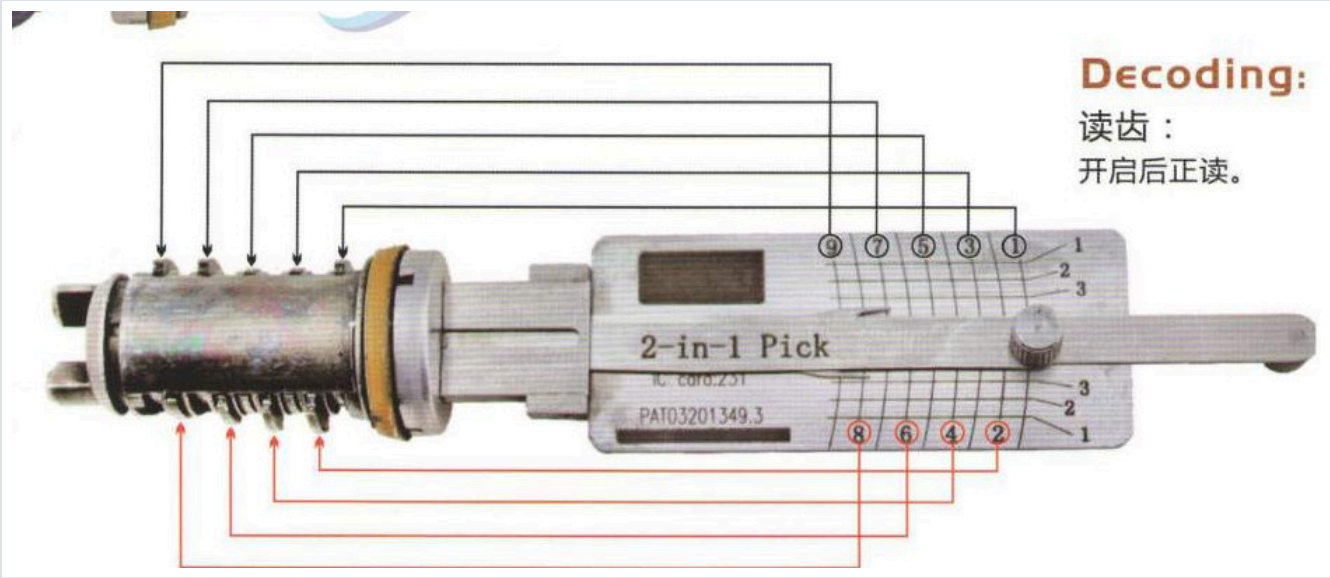


Fig. 33.6 Leader lines map each wafer in the cylinder to its numbered position on the tool's reading panel.

读齿 → Decoding

开启后正读 → Read forward after the lock is open

SOURCE PAGE 034

GT15

Key Cutting

The figure on the right is a schematic of a key cut on a CNC key machine. When you do not have a CNC machine, you still have to refer to the slope between adjacent cuts on this drawing when you cut a key.

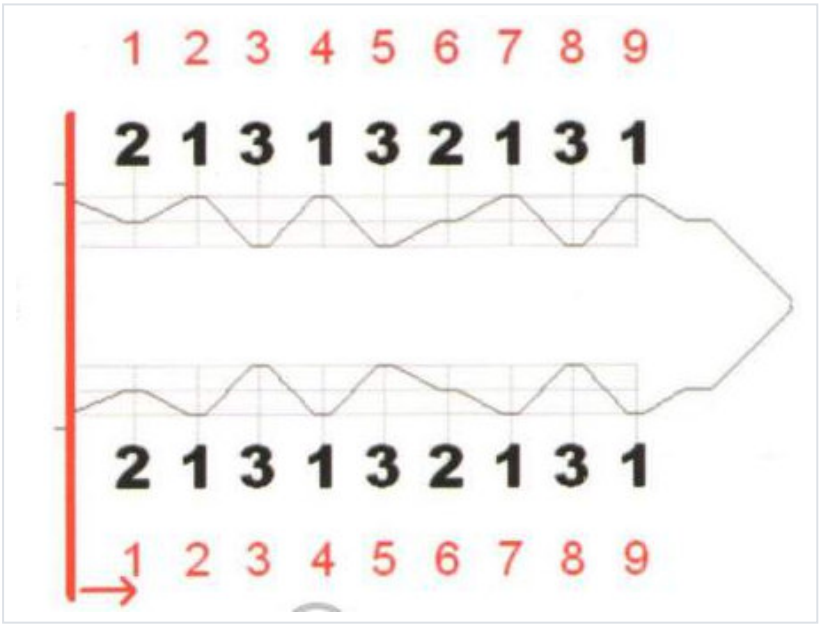


Fig. 34.1 GT15 key cutting schematic: bitting positions 1 through 9 carrying the depth codes 2 1 3 1 3 2 1 3 1, with the same run of cuts repeated mirrored below the profile; the slope between adjacent cuts is the reference for hand cutting.

Numerical Data

The figure on the left gives the numerical data for the bitting positions and cut depths that applies to GT15. (Unit: 1/100 mm)

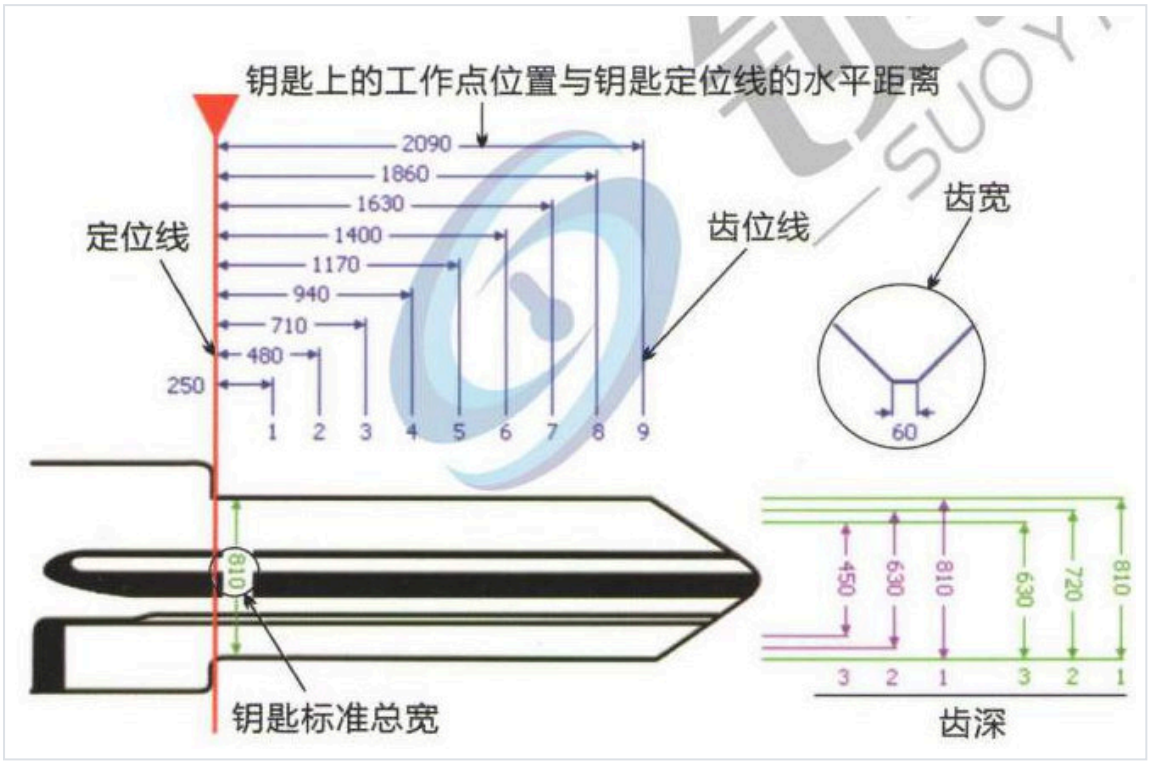


Fig. 34.2 GT15 bitting positions and cut depths: distance from the reference line to each working point (1 through 9), wafer width 60, key standard overall width 810, and the two cut depth series.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
定位线 → Reference line
齿位线 → Wafer position line
齿宽 → Wafer width
钥匙标准总宽 → Key standard overall width
齿深 → Cut depth

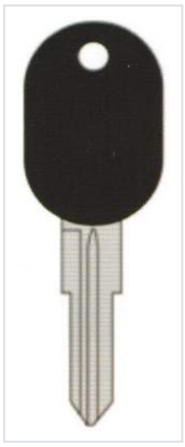


Fig. 34.3 GT15 key blank, head and blade.



Fig. 34.4 GT15 key silhouette with its cut profile.

HY16 2-in-1



Fig. 35.1 HY16 2-in-1 tool, reading panel side.



Fig. 35.2 HY16 2-in-1 tool, picking tip and lifter side.

APPLICABLE VEHICLES HYUNDAI, KIA

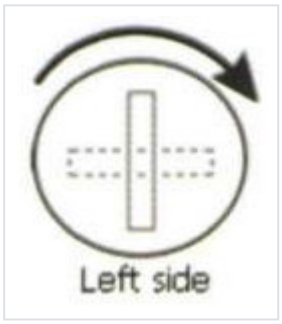


Fig. 35.3 Left side door: turn clockwise.



Fig. 35.4 Right side door: turn counterclockwise.



Fig. 35.5 Boot (trunk): turn clockwise.

Picking Direction

When the driver's door is on the left side of the vehicle, pick in the clockwise direction.

When the driver's door is on the right side of the vehicle, pick in the counterclockwise direction.

Lock Overview

This lock has 10 bitting positions in total. The tool shows positions 3 to 0, so 1 and 2 are missing; positions 1 and 2 are in the ignition.

The key has 5 cut depths in total; No. 1 is the shallowest and No. 5 is the deepest.

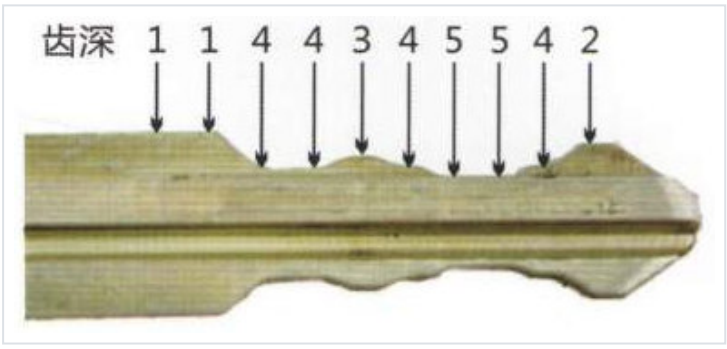


Fig. 35.6 HY16 key with its 10 cut depth codes 1 1 4 4 3 4 5 5 4 2.

齿深 → Cut depth

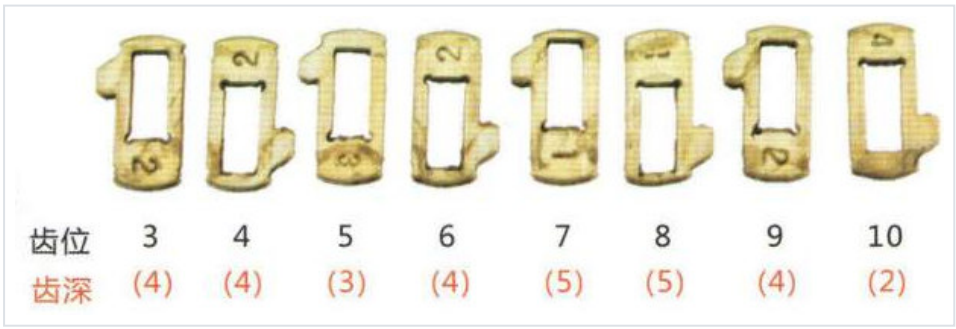


Fig. 35.7 Wafer set for bitting positions 3 through 10, each shown with its cut depth code in parentheses.

齿位 → Wafer position

齿深 → Cut depth

SOURCE PAGE 036

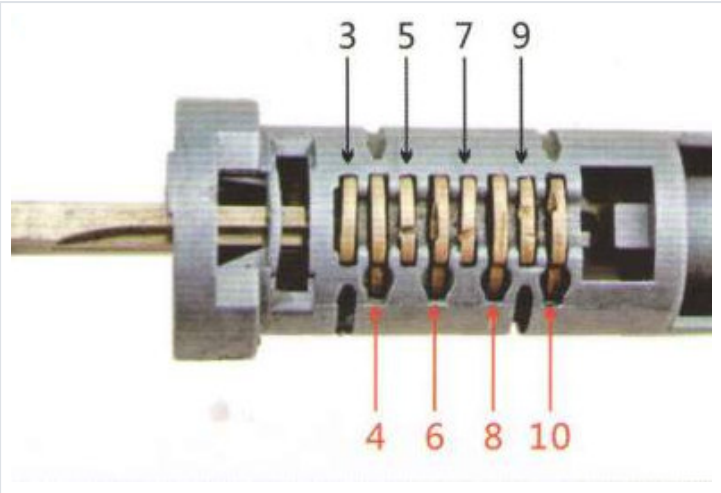


Fig. 36.1 Cylinder cutaway showing the odd-numbered wafer positions (3, 5, 7, 9) and the even-numbered wafer positions (4, 6, 8, 10).

Decoding

Read forward after opening.

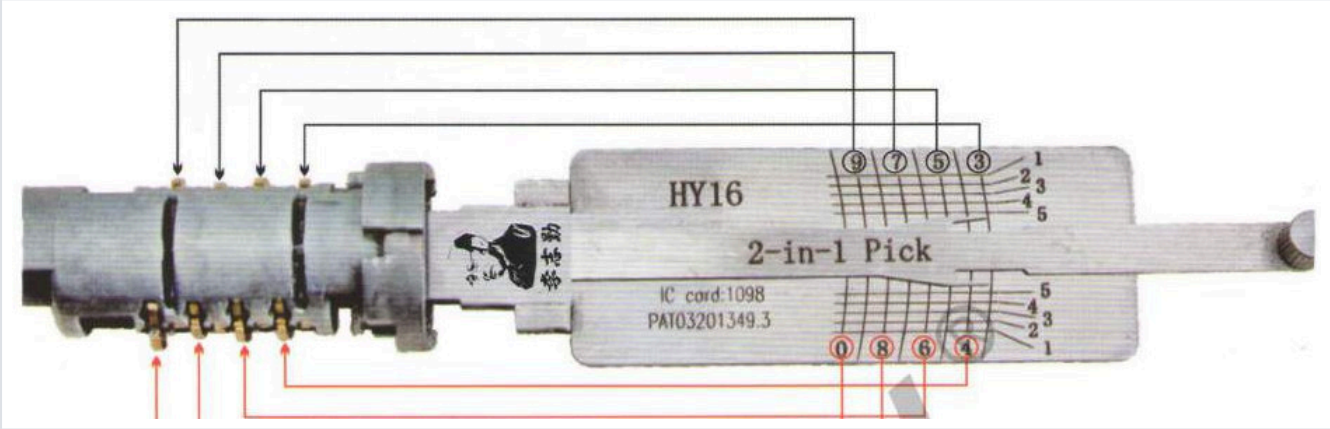


Fig. 36.2 HY16 2-in-1 Pick with the wafer positions marked on the reading panel and lined up with the wafers in the cylinder.

志勤 → Zhiqin
2-in-1 Pick → 2-in-1 Pick
PAT03201349.3 → PAT03201349.3
④ ⑥ ⑧ ⑩ → Wafer positions 4, 6, 8, 10 (lower track)
HY16 → HY16
IC card:1098 → IC card:1098
③ ⑤ ⑦ ⑨ → Wafer positions 3, 5, 7, 9 (upper track)

Key Cutting

The diagram at right shows a key as cut on a computer-controlled key machine. When no CNC machine is available, cut the key by hand using this chart as a reference for the slope between one cut and the next.



Fig. 36.3 HYN14 key cutting chart: bitting 1 1 4 4 3 4 5 5 4 2 at positions 1 to 10, shown from both edges of the blade.

Numerical Data

The chart at left gives the bitting position and cut depth data that applies to HY16. (Unit: 1/100 mm)

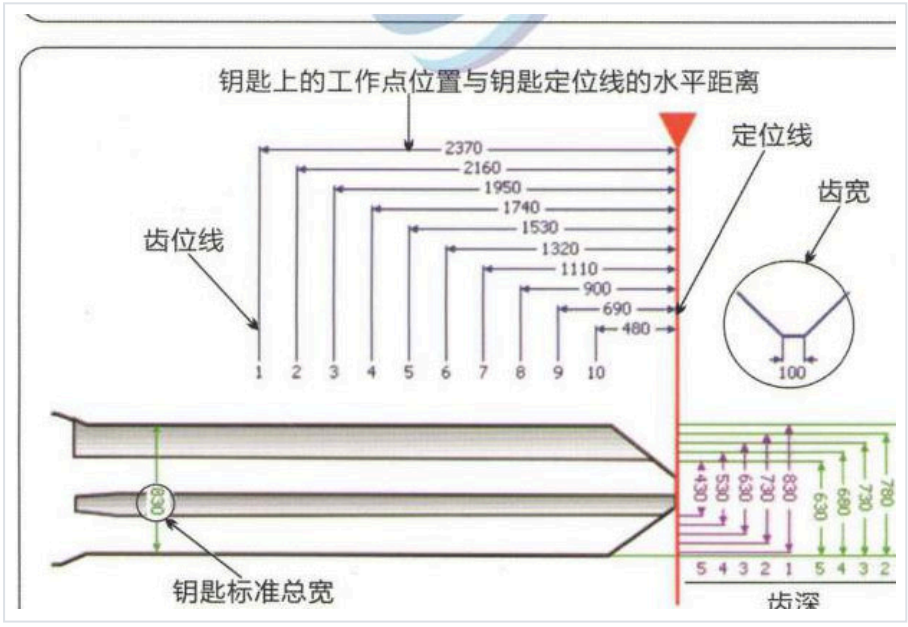


Fig. 36.4 HY16 bitting position and cut depth data: horizontal distance from each working point to the key reference line, plus the cut depths for both edges of the blade.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
定位线 → Reference line
钥匙标准总宽 → Key standard overall width
齿位线 → Wafer position line
齿宽 → Wafer width
齿深 → Cut depth

SOURCE PAGE 037



Fig. 37.1 Nissan key with the blade profile and the bitting silhouette printed below it.

Special Technique

From the door lock key code you can look up the exact cut codes for bitting positions 1 and 2 in Instacode (the database).

HY15 and HY16 are a right-hand and left-hand pair. Their picking method, decoding, and key cutting are all the same.

NSN14 2-in-1



Fig. 37.2 NSN14 2-in-1 Pick, shown from the reading-panel side and from the picking-tip side.

志勤 → Zhiqin
2-in-1 Pick → 2-in-1 Pick
NSN14 → NSN14
① ② ③ ④ ⑤ → Positions 1 to 5

APPLICABLE VEHICLES NISSAN, INFINITI

Picking Direction

When the driver's door is on the left side, pick clockwise.

When the driver's door is on the right side, pick counterclockwise.

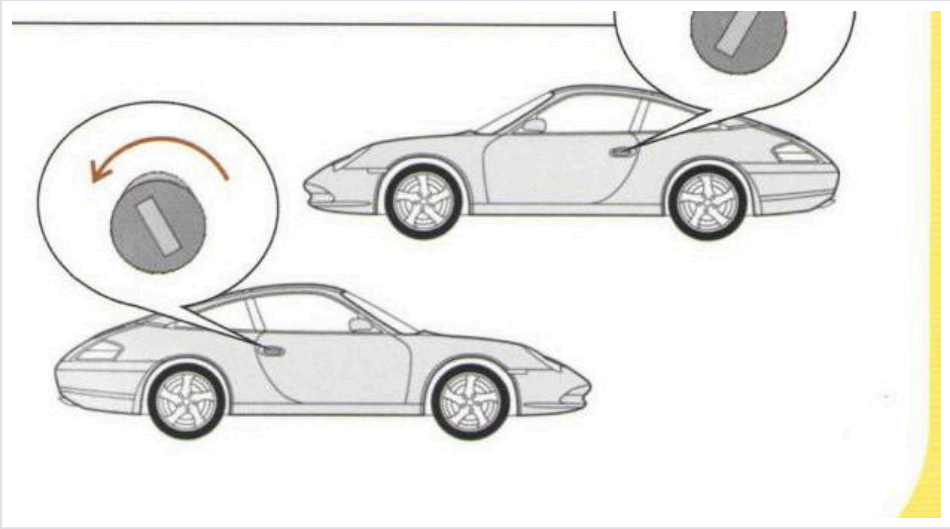


Fig. 37.3 Lock rotation on the left and right sides of the vehicle: clockwise for a left-hand drive, counterclockwise for a right-hand drive.

SOURCE PAGE 038

Lock Overview

The lock has 10 bitting positions. The doors use positions 3 to 10; the ignition adds positions 1 and 2.

The key has 4 cut depths. 1 is the shallowest and 4 is the deepest.

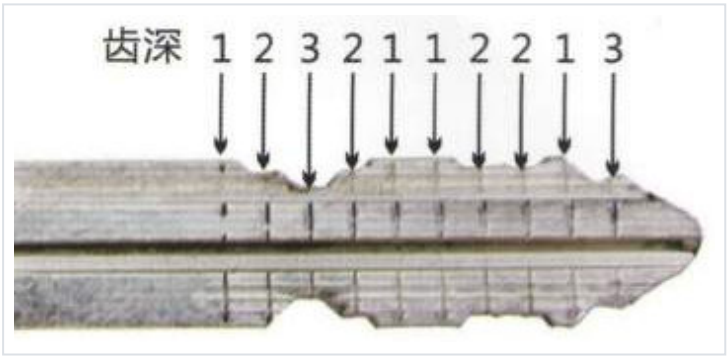


Fig. 38.1 NSN14 key with the depth code marked over each of the 10 bitting positions: 1 2 3 2 1 1 2 2 1 3.

齿深 → Cut depth

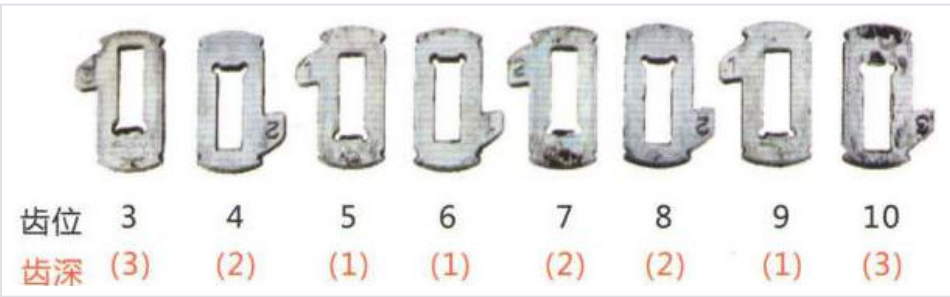


Fig. 38.2 The eight door wafers, with the bitting position and cut depth of each: position 3 to 10, depth 3 2 1 1 2 2 1 3.

齿位 → Bitting position

齿深 → Cut depth

Wafer Count and Position by Lock Function

Which bitting positions each lock function uses (green check = position present).

Position	1	2	3	4	5	6	7	8	9	10
Ignition	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Doors			✓	✓	✓	✓	✓	✓	✓	✓
Trunk / Boot			✓	✓	✓	✓	✓	✓	✓	✓
Glove Box							✓	✓	✓	✓

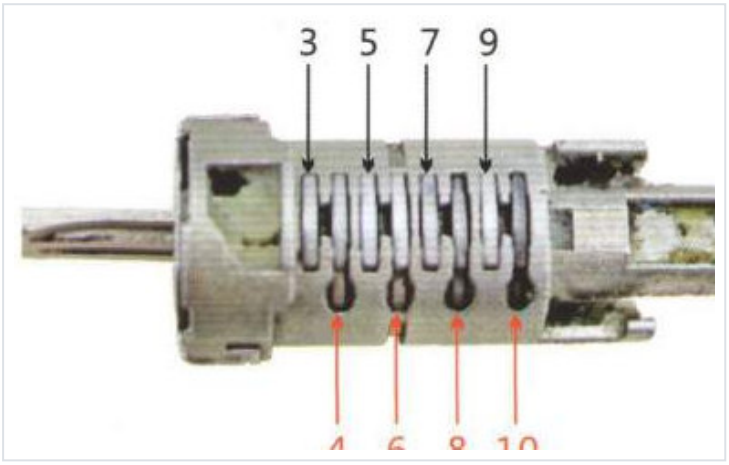


Fig. 38.3 Cylinder cutaway: the odd-numbered wafer positions (3, 5, 7, 9) and the even-numbered wafer positions (4, 6, 8, 10).

Decoding

Read forward after opening.



Fig. 38.4 NSN14 2-in-1 Pick with the wafer positions marked on the reading panel and lined up with the wafers in the cylinder.

志勤 → Zhiqin
2-in-1 Pick → 2-in-1 Pick
PAT:03201349.3 → PAT:03201349.3
NSN14 → NSN14
IC card:220 → IC card:220
④ ⑥ ⑧ ⑩ → Positions 4, 6, 8, 10

Key Cutting

The diagram at right shows a key as cut on a computer-controlled key machine. When no CNC machine is available, cut the key by hand using this chart as a reference for the slope between one cut and the next.

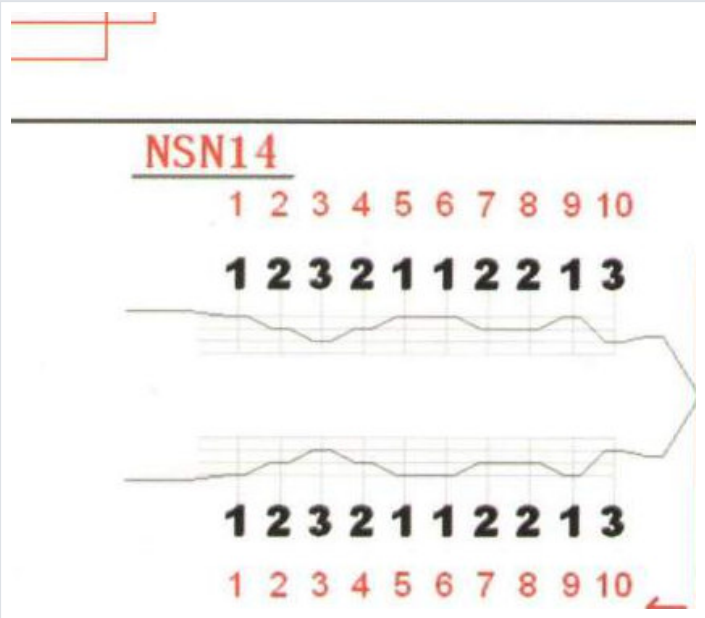


Fig. 38.5 NSN14 key cutting chart: bitting 1 2 3 2 1 1 2 2 1 3 at positions 1 to 10, shown from both edges of the blade.

SOURCE PAGE 039

Numerical Data

The chart below gives the bitting position and cut depth data that applies to NSN14. (Unit: 1/100 mm)

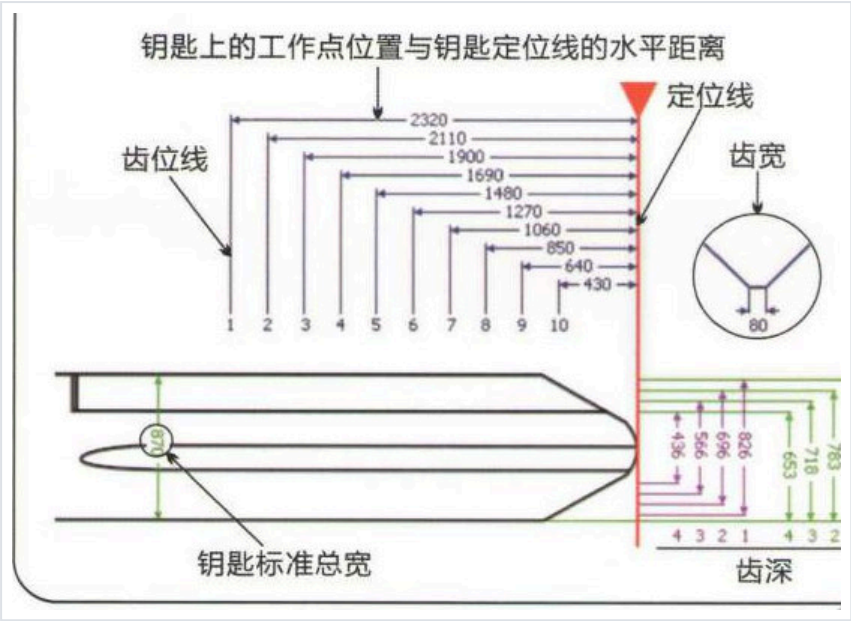


Fig. 39.1 NSN14 bitting position and cut depth data: horizontal distance from each working point to the key reference line, the key standard overall width, and the cut depths for both edges of the blade.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
齿位线 → Wafer position line
定位线 → Reference line
齿宽 → Wafer width
钥匙标准总宽 → Key standard overall width
齿深 → Cut depth



Fig. 39.2 NSN14 key, with the bitting silhouette printed below the blade.

Special Technique

Positions 1 and 2 are the ones that differ between the ignition cylinder and the door cylinder. Four pairs of cut codes — (1, 2), (2, 1), (2, 3), (3, 2) — are all you need to work them out.

HU49 2-in-1



Fig. 39.3 HU49 2-in-1 Pick, shown from the reading-panel side and from the picking-tip side.

志勤 → Zhiqin
HU49 → HU49
2-in-1 Pick → 2-in-1 Pick

SOURCE PAGE 040

APPLICABLE CARS

APPLICABLE VEHICLES	JETTA, SANTANA, B4

PICKING DIRECTION

When the driver's seat is on the left, pick the lock counterclockwise.

When the driver's seat is on the right, pick the lock clockwise.

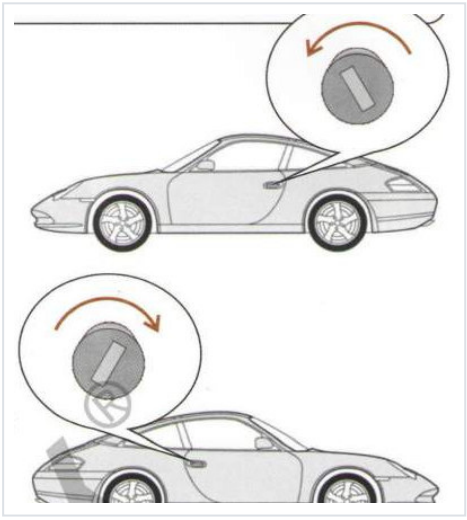


Fig. 40.1 Picking direction at the door: counterclockwise for left-hand drive, clockwise for right-hand drive.

LOCK OVERVIEW

This door lock has 7 wafers. On the tool's reading panel they read as follows: positions 1 and 3 carry wafers on one side, and positions 2, 4, 5, 6, and 7 carry wafers on the other side.

The ignition cylinder has 10 wafers and 4 cut depths. Depth 1 is the shallowest and depth 4 the deepest.

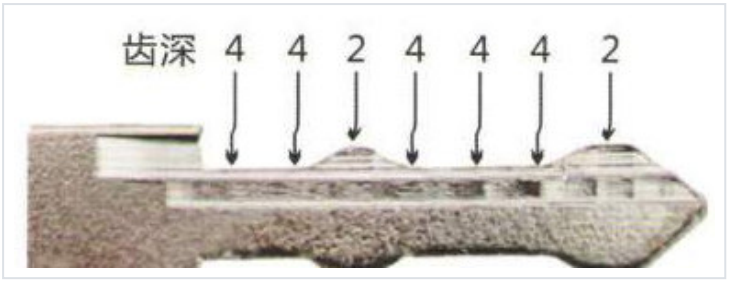


Fig. 40.2 Door key bitting: cut depths 4, 4, 2, 4, 4, 4, 2 in the same sequence as positions 1 through 7.

齿深 → Cut depth

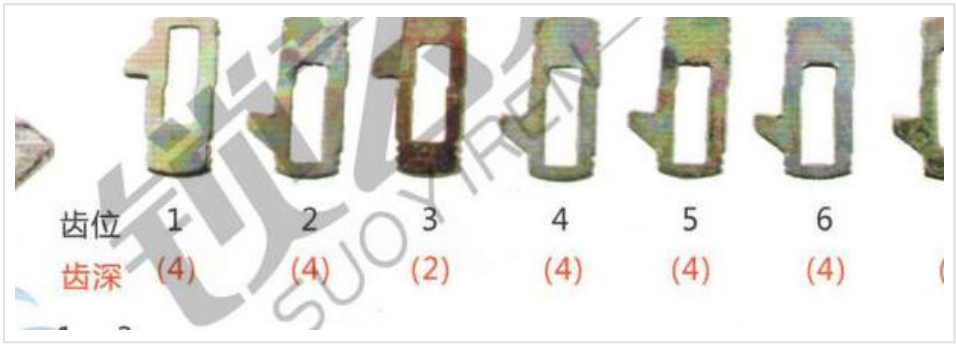


Fig. 40.3 The seven door-lock wafers in position order, with the cut depth carried by each: positions 1 to 7, depths 4, 4, 2, 4, 4, 4, 2.

齿位 → Wafer position

齿深 → Cut depth

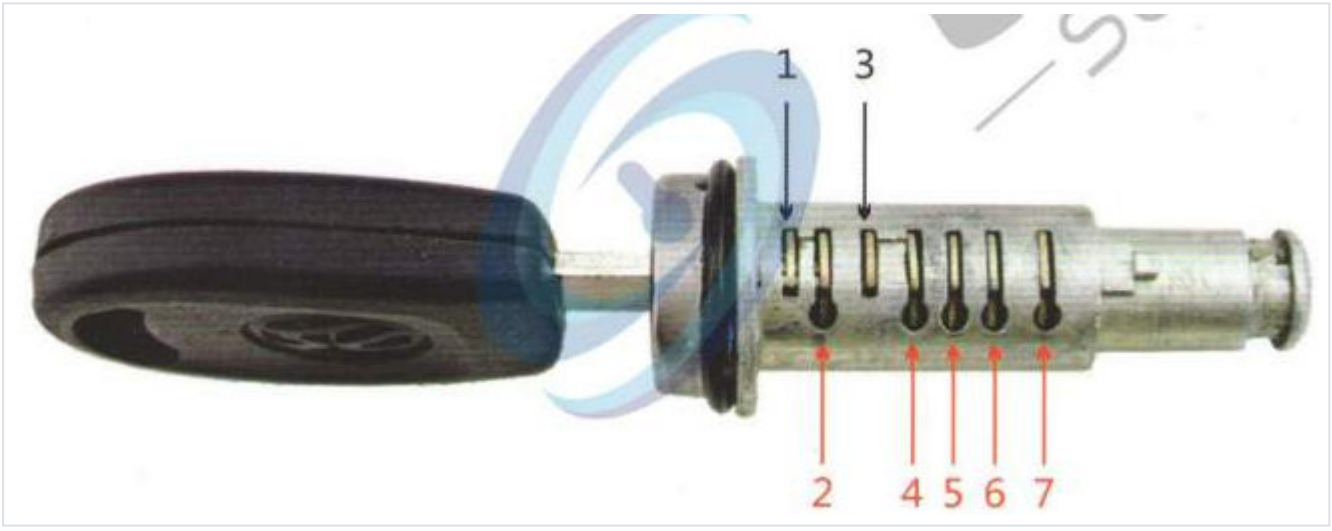


Fig. 40.4 Door cylinder with the key inserted: positions 1 and 3 on one side, positions 2, 4, 5, 6, and 7 on the other.

DECODING

Read forward once the lock is open.

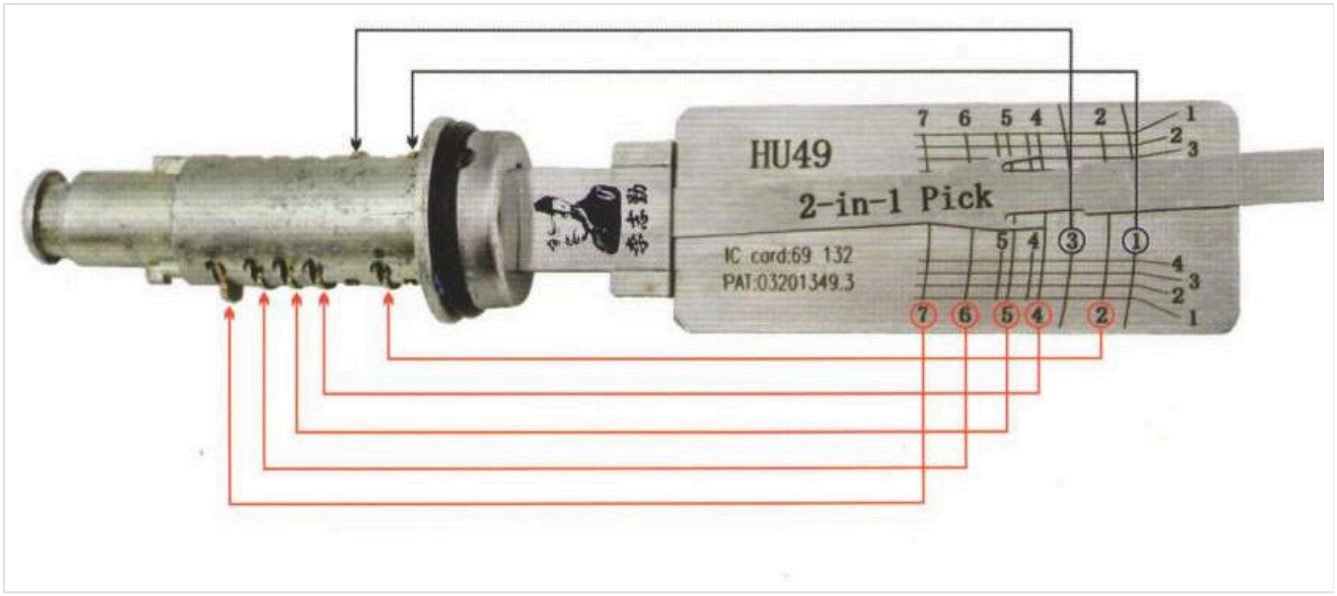


Fig. 40.5 HU49 tool in the door cylinder, with each wafer position arrowed to its line on the 2-in-1 reading panel.

SOURCE PAGE 041

This lock uses two wafer arrangements. One is 1 22 3 4 55 66 7; the other is 1 22 3 44 5 66 7.

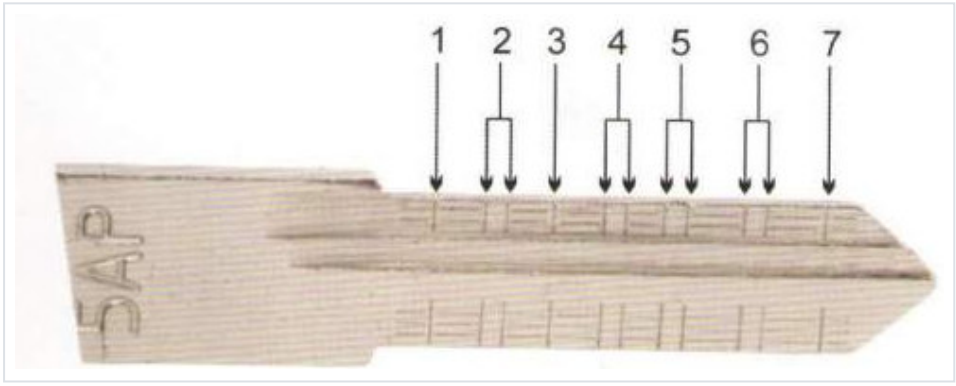


Fig. 41.1 Used HU49 key with the seven bitting positions marked 1 through 7.

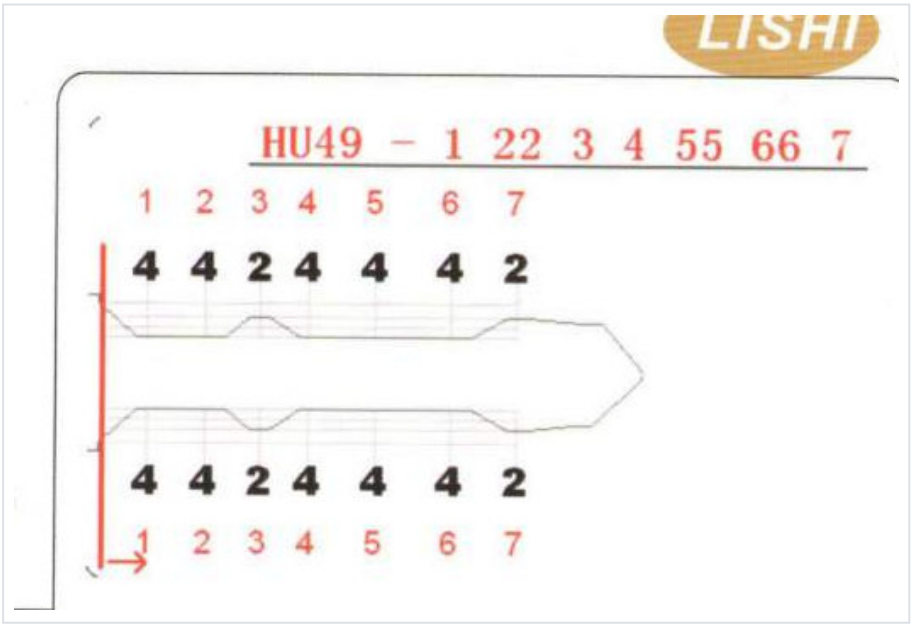


Fig. 41.2 HU49 key chart for the 1 22 3 4 55 66 7 arrangement: positions 1 through 7, with the depth row 4 4 2 4 4 4 2 on both edges.

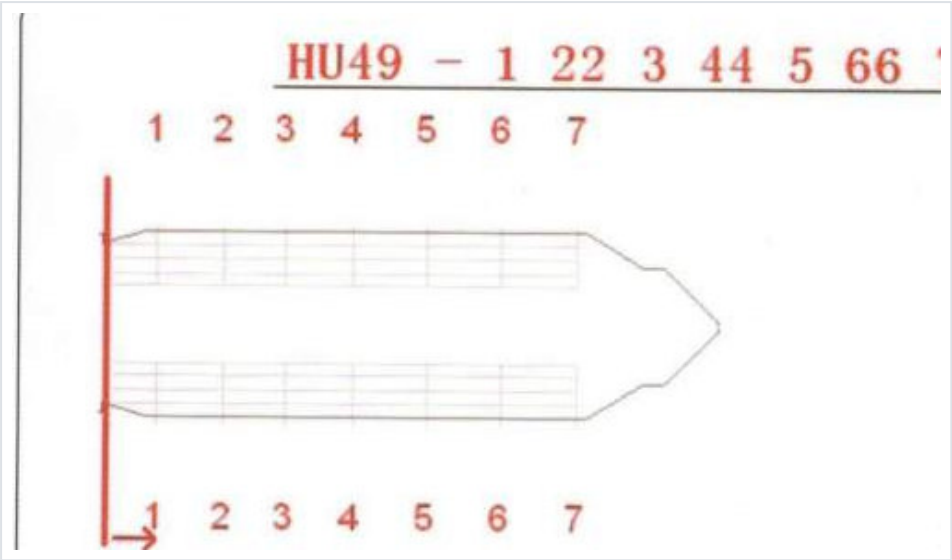


Fig. 41.3 HU49 key chart for the 1 22 3 44 5 66 7 arrangement, positions 1 through 7 counted from the reference line.

KEY CUTTING

The illustrations above and at left show keys cut on a CNC machine. When you do not have a CNC machine, you still have to follow the slope between one cut and the next on this chart when you cut a key.

NUMERICAL DATA

The diagram at right and the diagram at lower left give the bitting position and cut depth data for HU49. (Unit: 1/100 mm)

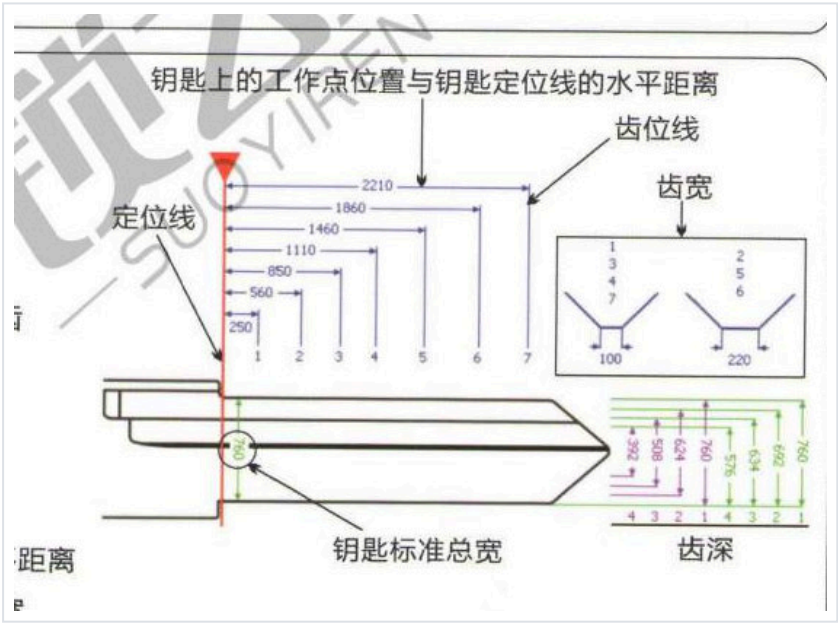


Fig. 41.4 HU49 numerical data for the 1 22 3 4 55 66 7 arrangement: working point distances from the reference line, wafer widths, and the two rows of cut depth values.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
定位线 → Reference line
齿位线 → Wafer position line
齿宽 → Wafer width
钥匙标准总宽 → Key standard overall width
齿深 → Cut depth

UNIT	1/100 mm

WORKING POINT DISTANCE FROM THE REFERENCE LINE, POSITIONS 1-7	250, 560, 850, 1110, 1460, 1860, 2210
KEY STANDARD OVERALL WIDTH	760
WAFER WIDTH, POSITIONS 1-7	100, 220, 100, 100, 220, 220, 100
CUT DEPTH, ROW 1, DEPTH CODES 1-4	760, 692, 634, 576
CUT DEPTH, ROW 2, DEPTH CODES 1-4	760, 624, 508, 392

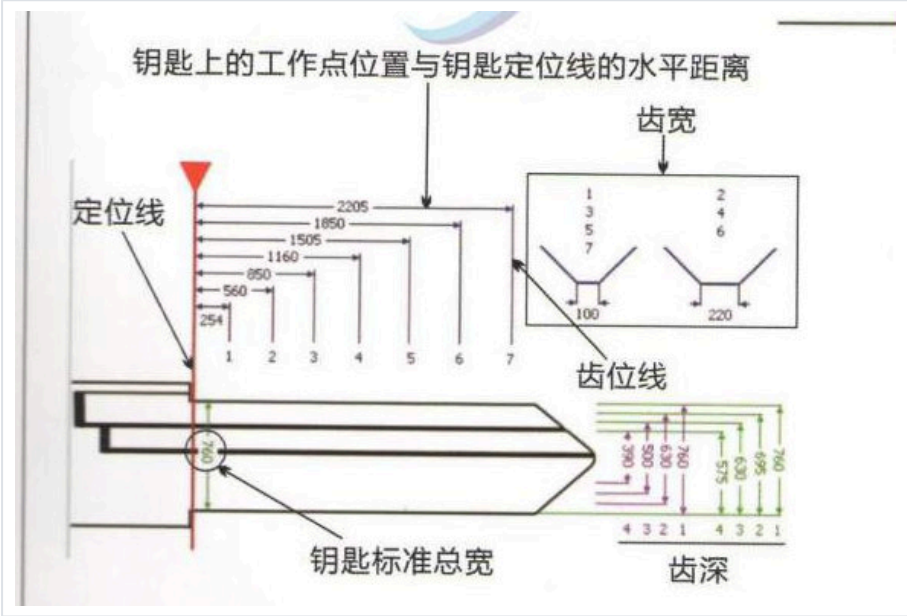


Fig. 41.5 HU49 numerical data for the 1 22 3 44 5 66 7 arrangement: working point distances from the reference line, wafer widths, and the two rows of cut depth values.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
定位线 → Reference line
齿宽 → Wafer width
齿位线 → Wafer position line
钥匙标准总宽 → Key standard overall width
齿深 → Cut depth

WORKING POINT DISTANCE FROM THE REFERENCE LINE, POSITIONS 1-7	254, 560, 850, 1160, 1505, 1850, 2205
KEY STANDARD OVERALL WIDTH	760
WAFER WIDTH, POSITIONS 1-7	100, 220, 100, 220, 100, 220, 100
CUT DEPTH, ROW 1, DEPTH CODES 1-4	760, 695, 630, 575
CUT DEPTH, ROW 2, DEPTH CODES 1-4	760, 630, 500, 390



Fig. 41.6 Cut HU49 key: black-headed key blank with the bitting cut on the blade.

SOURCE PAGE 042

SPECIAL TECHNIQUE

This key has 2 bitting position arrangements. In one of them, bitting positions 2, 5, and 6 have to be widened; in the other, bitting positions 2, 4, and 6 have to be widened. When you pick with the 2-in-1 tool you can tell whether it is position 4 or position 5 that has to be widened on this lock.

HU87 2-in-1



Fig. 42.1 HU87 2-in-1 tool, reading panel side.



Fig. 42.2 HU87 2-in-1 tool seen from the opposite side.

APPLICABLE CARS

APPLICABLE VEHICLES	SUZUKI

PICKING DIRECTION

When the driver's seat is on the left, pick the lock clockwise.

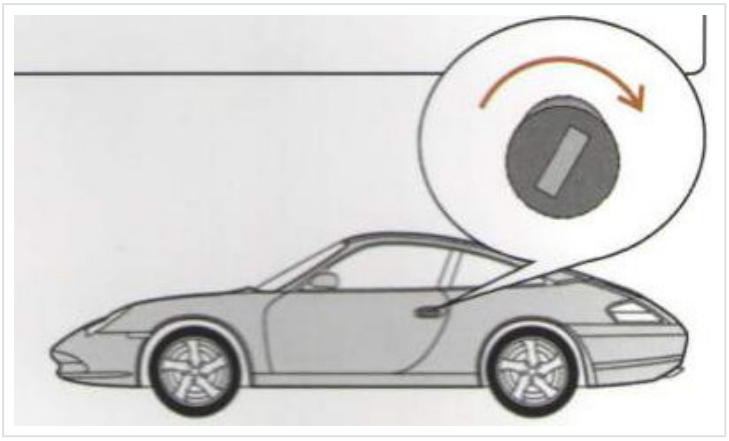


Fig. 42.3 Left-hand-drive car: turn the plug clockwise to pick the door lock.

When the driver's seat is on the right, pick the lock counterclockwise.

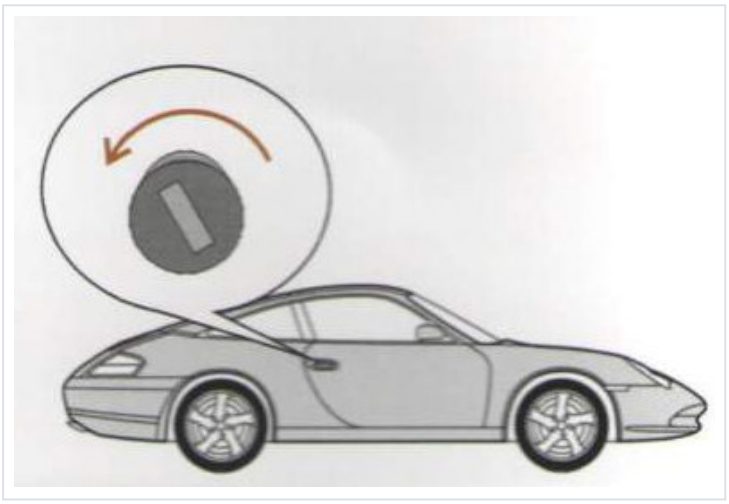


Fig. 42.4 Right-hand-drive car: turn the plug counterclockwise to pick the door lock.

LOCK OVERVIEW

This lock has 10 bitting positions in total. The door lock uses 2 through 8; the ignition lock adds 1, 9, and 10.

This key has 4 cut depths in total. Depth 1 is the shallowest and depth 4 the deepest.

SOURCE PAGE 043

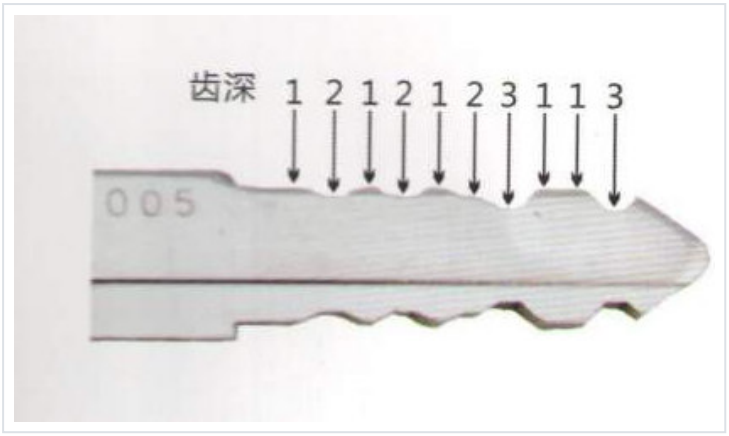


Fig. 43.1 HU87 key with the cut depth at each of the 10 bitting positions: 1 2 1 2 1 2 3 1 1 3. The blade is stamped 005.

齿深 → Cut depth

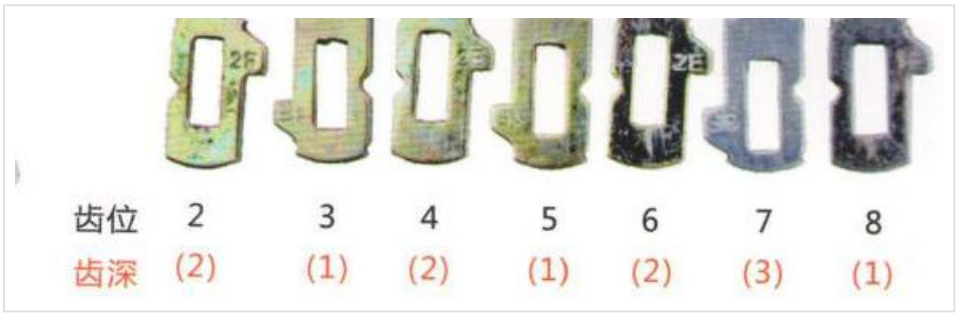


Fig. 43.2 Door-lock wafers at positions 2 through 8, with the cut depth of each: 2, 1, 2, 1, 2, 3, 1.

齿位 → Wafer position 齿深 → Cut depth

CUT DEPTHS, POSITIONS 1-10 1, 2, 1, 2, 1, 2, 3, 1, 1, 3

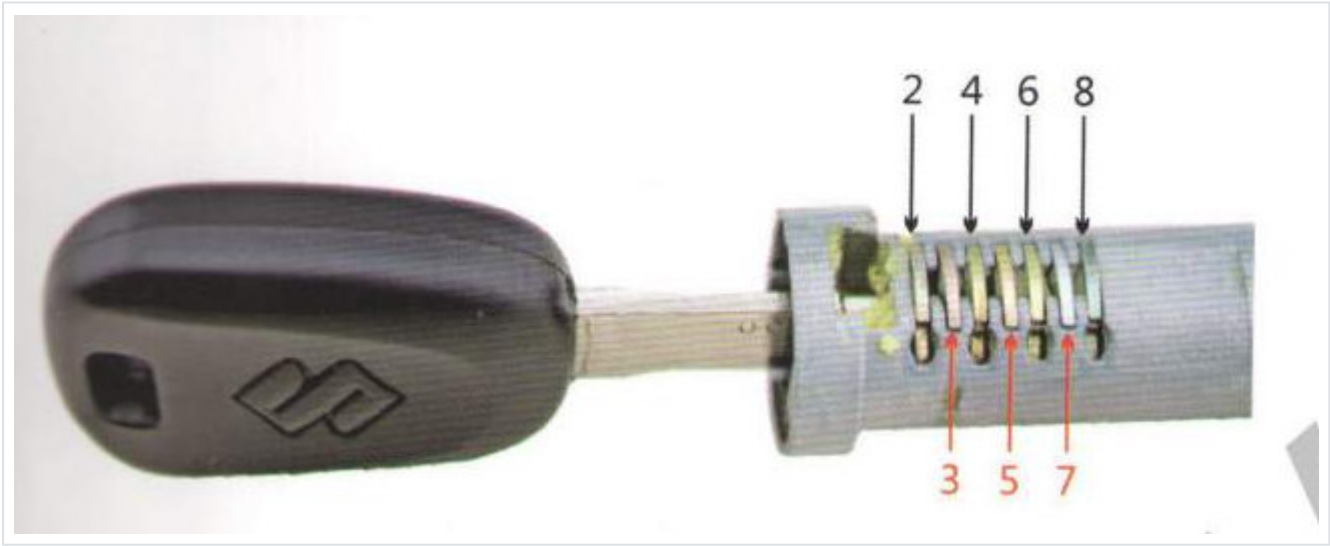


Fig. 43.3 Door cylinder with the key inserted. Wafers sit at positions 2, 4, 6, and 8 on one side and at positions 3, 5, and 7 on the other.

DECODING

Read forward once the lock is open.

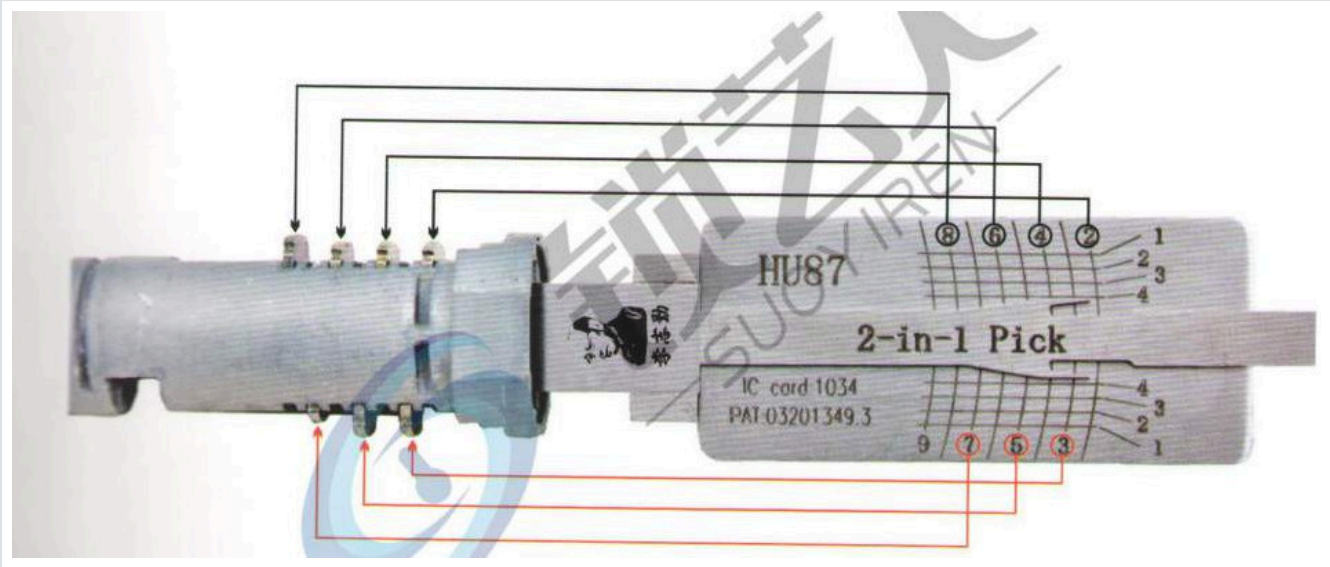


Fig. 43.4 HU87 tool in the door cylinder, with each wafer position arrowed to its line on the 2-in-1 reading panel.

KEY CUTTING

The diagram at right shows a key cut on a CNC machine. When you do not have a CNC machine, you still have to follow the slope between one cut and the next on this chart when you cut a key.

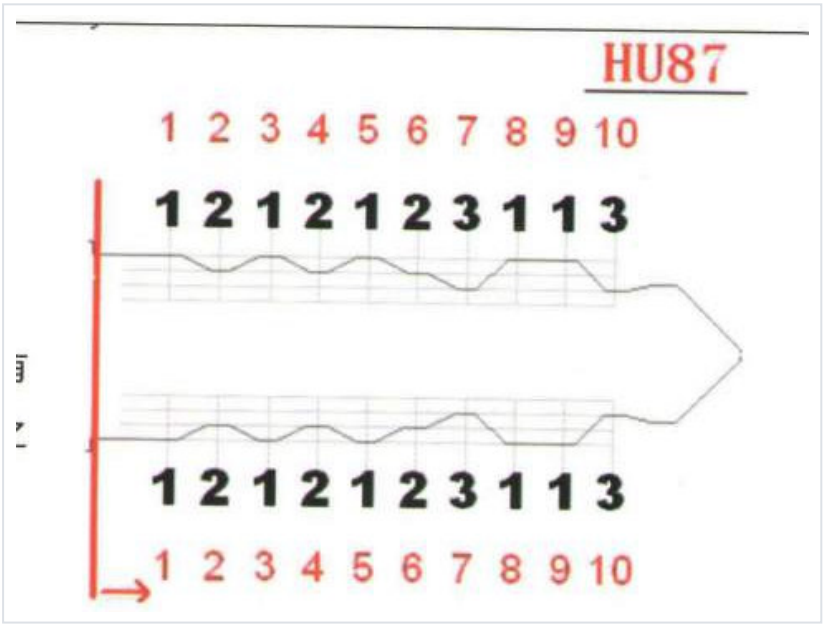


Fig. 43.5 HU87 key chart: positions 1 through 10, with the depth row 1 2 1 2 1 2 3 1 1 3 on both edges.

SOURCE PAGE 044

Numerical Data

The diagram below gives the bitting position and cut depth data for HU87. (Unit: 1/100 mm)

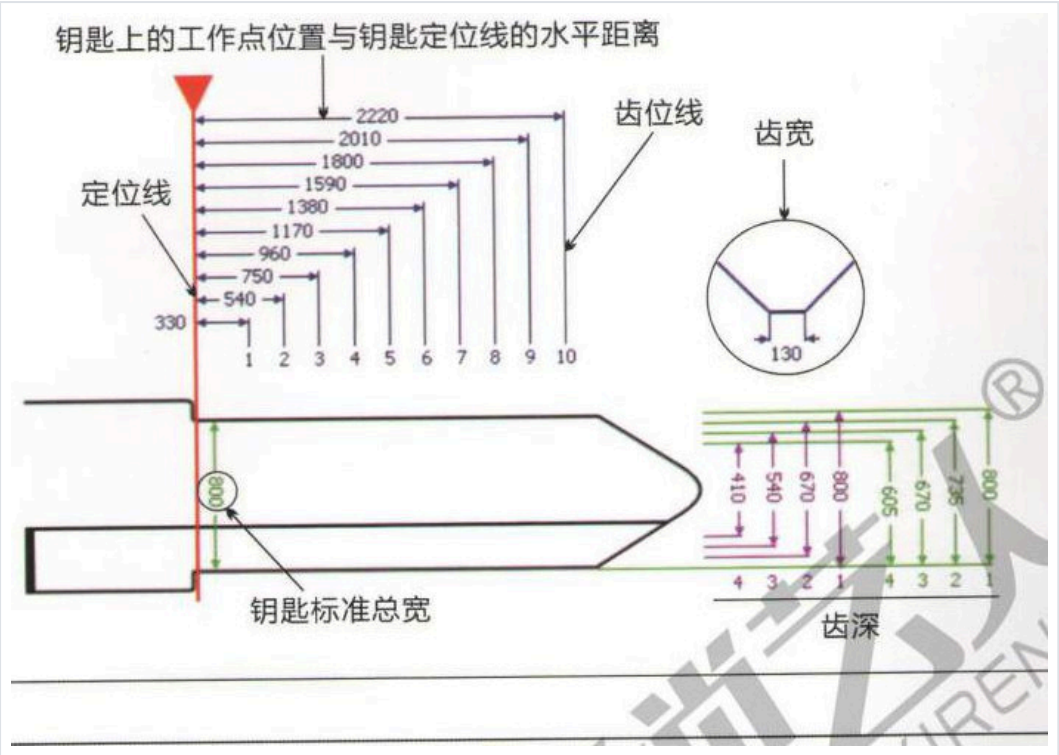


Fig. 44.1 HU87 bitting chart: the horizontal distance from the working point at bitting positions 1 through 10 to the key reference line, the key standard overall width, the wafer width, and the cut depth for positions 1 through 4 in each of the two depth rows.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
定位线 → Reference line
齿位线 → Wafer position line
齿宽 → Wafer width
齿深 → Cut depth
钥匙标准总宽 → Key standard overall width

DISTANCE FROM THE KEY REFERENCE LINE, BITTING POSITIONS 1-10	330, 540, 750, 960, 1170, 1380, 1590, 1800, 2010, 2220
KEY STANDARD OVERALL WIDTH	800
WAFER WIDTH	130
CUT DEPTH, POSITIONS 1-4, FIRST ROW	800, 670, 540, 410
CUT DEPTH, POSITIONS 1-4, SECOND ROW	800, 735, 670, 605
UNIT	1/100 mm



Fig. 44.2 HU87 key: blade profile, with the wafer groove shown in cross-section below the blade.

SPECIAL TECHNIQUE

You can look up the exact depth code for bitting positions 1, 9, and 10 of the ignition in the Instacode database.

MIT8 2-in-1



Fig. 44.3 MIT8 2-in-1 tool, reading panel side.

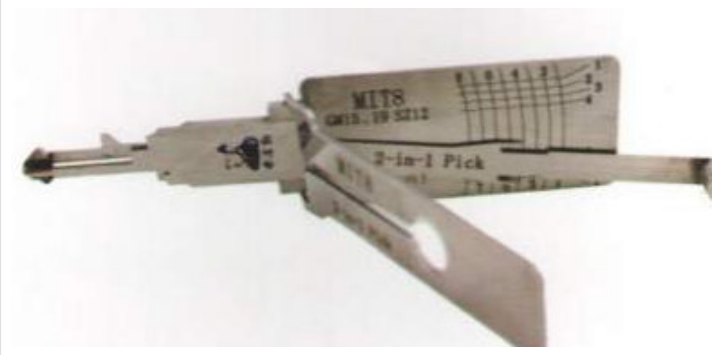


Fig. 44.4 MIT8 2-in-1 tool seen from the opposite side, with the lifter and tension bar extended.

SOURCE PAGE 045

APPLICABLE CARS

APPLICABLE VEHICLES	MITSUBISHI, DAIHATSU, CHRYSLER, CHEVOLRT, ZHONGHUA

PICKING DIRECTION

When the driver's seat is in the left-hand door, pick in the clockwise direction.

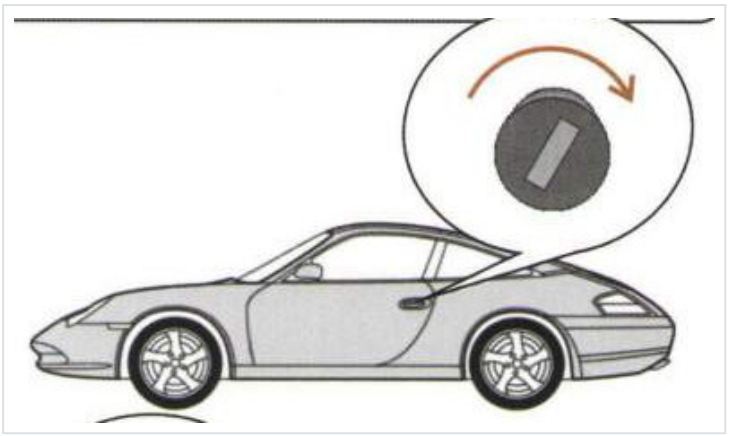


Fig. 45.1 Left-hand-drive car: turn the plug clockwise to pick the lock.

When the driver's seat is in the right-hand door, pick in the counterclockwise direction.

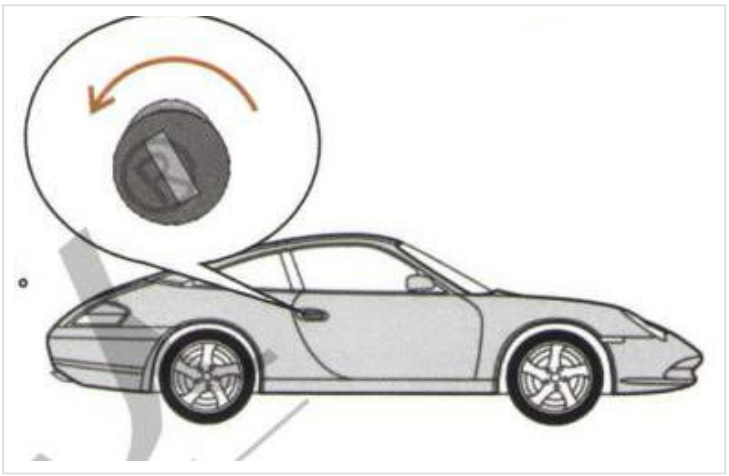


Fig. 45.2 Right-hand-drive car: turn the plug counterclockwise to pick the lock.

Lock Overview

This lock has 8 wafers and 4 depths. Depth 4 is the deepest and depth 1 the shallowest.

The ignition cylinder carries the same number of wafers as the door cylinder.

You can build an ignition key from the door lock and the trunk lock.

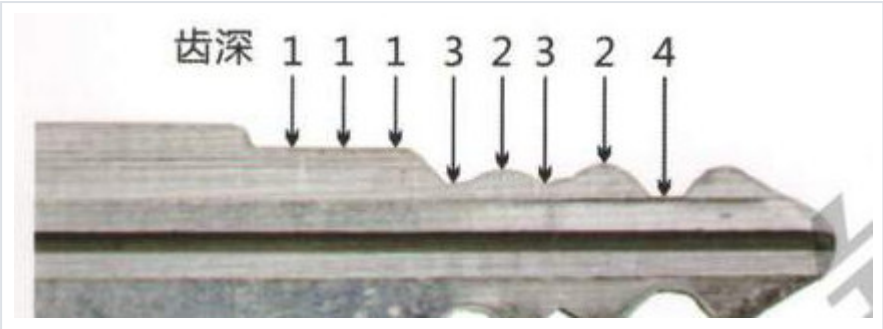


Fig. 45.3 MIT8 key blade with the cut depth marked at each of the 8 bitting positions: 1 1 1 3 2 3 2 4.

齿深 → Cut depth

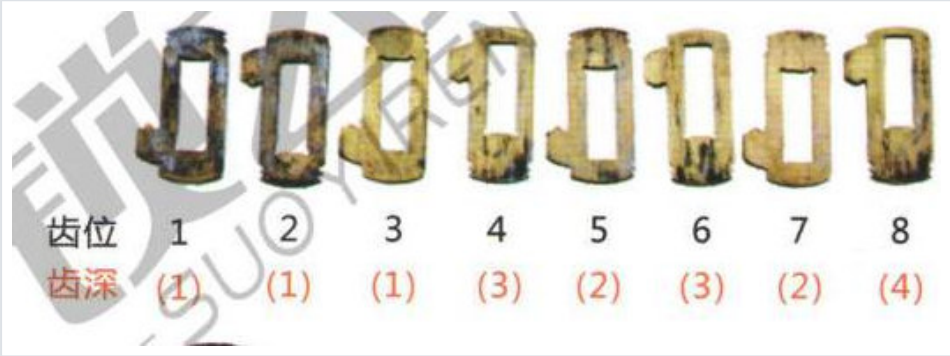


Fig. 45.4 The 8 wafers in order, with the bitting position number under each wafer and its cut depth in parentheses: 1 (1), 2 (1), 3 (1), 4 (3), 5 (2), 6 (3), 7 (2), 8 (4).

齿位 → Wafer position

齿深 → Cut depth

CUT DEPTH, POSITIONS 1-8 1, 1, 1, 3, 2, 3, 2, 4

DECODING

Read forward once the lock is open.

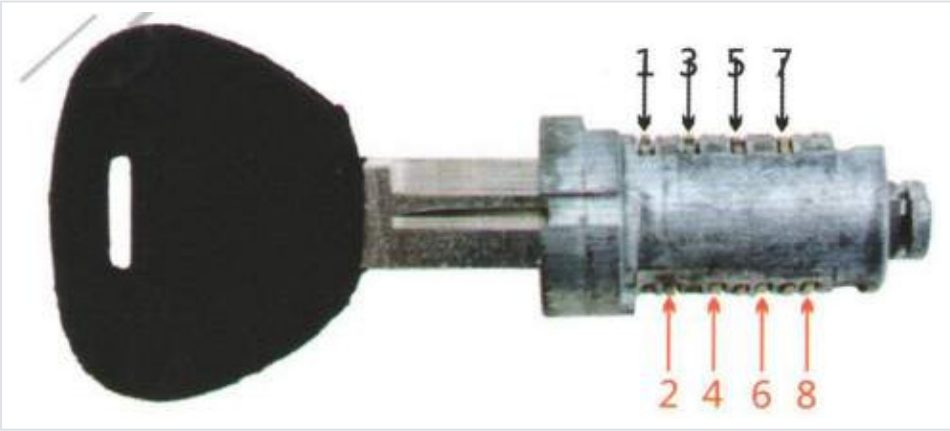


Fig. 45.5 Key in the cylinder: the odd bitting positions 1, 3, 5, and 7 sit on one side of the plug and the even positions 2, 4, 6, and 8 on the other.

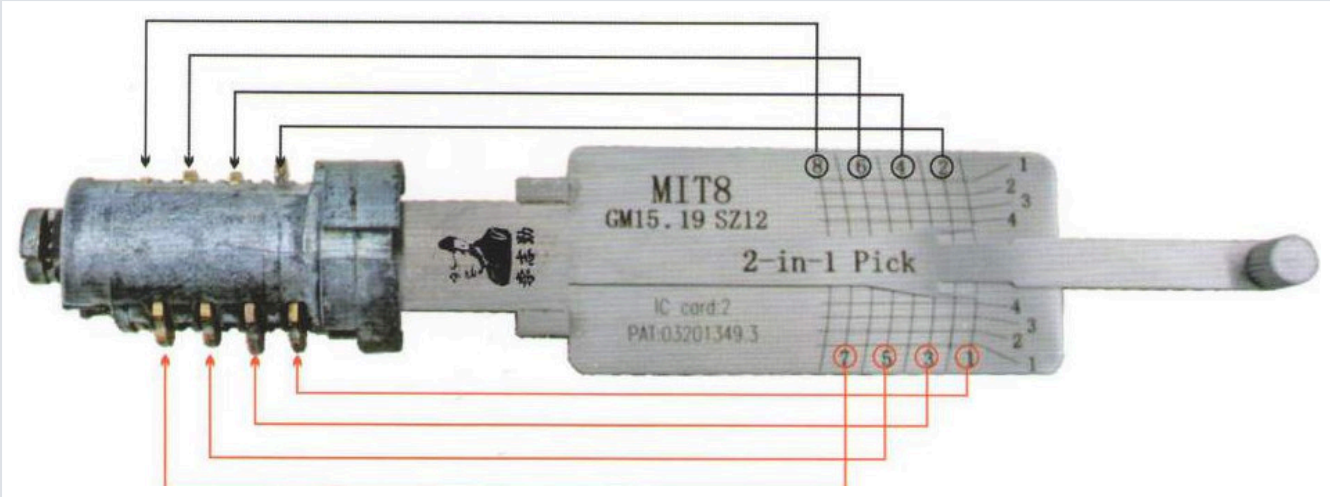


Fig. 45.6 MIT8 tool engaged on the cylinder. Leader lines tie each wafer to its number on the reading panel: positions 8, 6, 4, and 2 on the upper edge of the panel and positions 7, 5, 3, and 1 on the lower edge.

SOURCE PAGE 046

KEY CUTTING

The diagram at right shows a key cut on a CNC machine. When you do not have a CNC machine, you still have to follow the slope between one cut and the next on this chart when you cut a key.

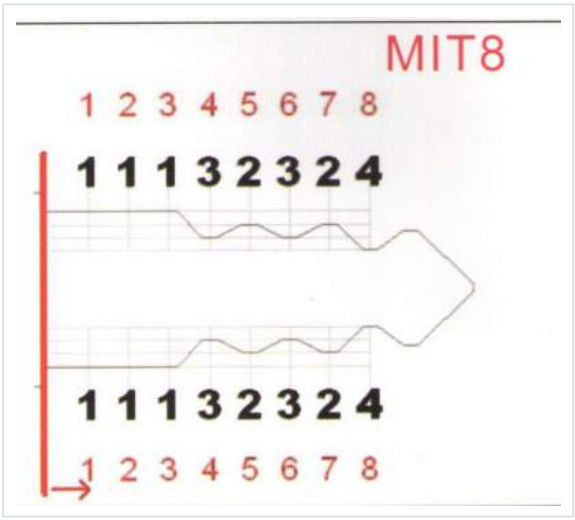


Fig. 46.1 MIT8 key cut on a CNC machine: bitting positions 1 through 8, with the depth row 1 1 1 3 2 3 2 4 on the upper edge and the same row on the lower edge.

Numerical Data

The diagram below gives the bitting position and cut depth data for MIT8. (Unit: 1/100 mm)

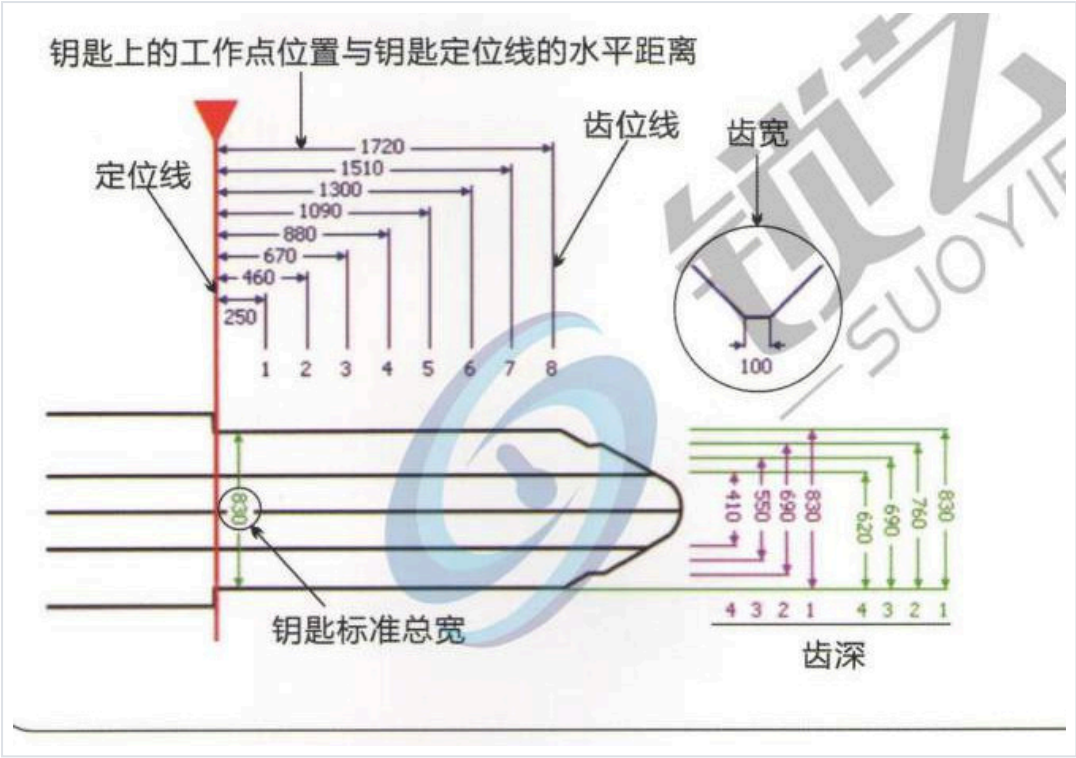


Fig. 46.2 MIT8 bitting chart: the horizontal distance from the working point at bitting positions 1 through 8 to the key reference line, the key standard overall width, the wafer width, and the cut depth for positions 1 through 4 in each of the two depth rows.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
定位线 → Reference line
齿位线 → Wafer position line
齿宽 → Wafer width
齿深 → Cut depth
钥匙标准总宽 → Key standard overall width

DISTANCE FROM THE KEY REFERENCE LINE, BITTING POSITIONS 1-8	250, 460, 670, 880, 1090, 1300, 1510, 1720
KEY STANDARD OVERALL WIDTH	630
WAFER WIDTH	100
CUT DEPTH, POSITIONS 1-4, FIRST ROW	830, 690, 550, 410
CUT DEPTH, POSITIONS 1-4, SECOND ROW	830, 760, 690, 620
UNIT	1/100 mm



Fig. 46.3 MIT8 key profile, with the wafer groove shown in cross-section below the blade.

SPECIAL TECHNIQUE

This lock is relatively easy to pick in the counterclockwise direction.

SOURCE PAGE 047

Two Tracks Inner Groove Key

HU83 2-in-1



Fig. 47.1 HU83 2-in-1 tool with its key blank.

Applicable vehicles: Peugeot, Citroën.

Picking direction: counterclockwise when the door lock is on the left side; clockwise when it is on the right side.

This lock comes in 2 versions: one with 7 wafers and one with 8 wafers.

The key has 4 depth codes in total. No. 1 is the shallowest and No. 4 the deepest.

Decoding: read forward once the lock is open.

NUMERICAL DATA

The diagram at left gives the bitting position and cut depth data for HU83. (Unit: 1/100 mm)

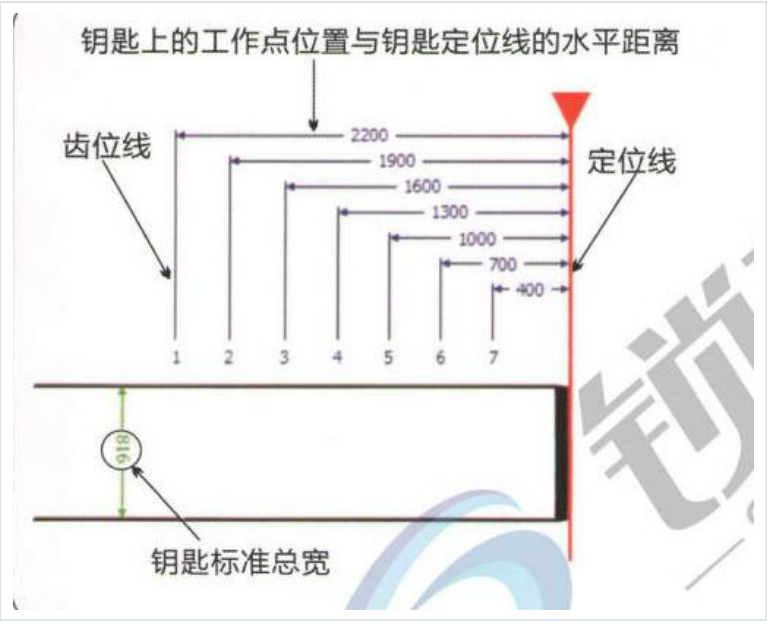


Fig. 47.2 HU83 bitting chart: the horizontal distance from the working point at bitting positions 1 through 7 to the key reference line, and the key standard overall width.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line

齿位线 → Wafer position line

定位线 → Reference line

钥匙标准总宽 → Key standard overall width



Fig. 47.3 HU83 cut depth chart: the four cuts of the blade, dimensioned 200, 260, 320, and 380 under the position labels 4, 3, 2, and 1.

齿深 → Cut depth

DISTANCE FROM THE KEY REFERENCE LINE, BITTING POSITIONS 1-7	2200, 1900, 1600, 1300, 1000, 700, 400
KEY STANDARD OVERALL WIDTH	810
CUT DEPTH, POSITIONS 4-1	200, 260, 320, 380
UNIT	1/100 mm



Fig. 47.4 HU83 key profile, with the wafer groove shown in cross-section below the blade.

HU92 2-in-1



Fig. 47.5 HU92 2-in-1 tool with its key blank.

Applicable vehicles: BMW, Land Rover, Rolls-Royce.

Picking direction: counterclockwise when the door lock is on the left side; clockwise when it is on the right side.

Both the door lock and the ignition on this car use 8 wafers. When you pick this lock, first bring positions 1, 3, 5, and 7 into place; once they are set, clear the wafers that are binding at 2, 4, 6, and 8.

The key has 4 depth codes in total. No. 1 is the shallowest and No. 4 the deepest.

Decoding: read forward once the lock is open.

SOURCE PAGE 048

Numerical Data

The diagram at left gives the bitting position and cut depth data that applies to HU92.

(Unit: 1/100 mm)

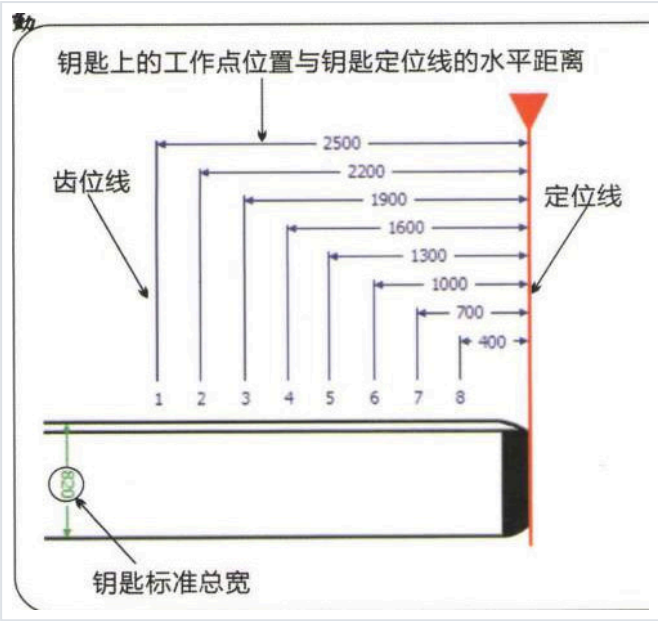


Fig. 48.1 Horizontal distance from the working point on the key to the key reference line, measured at bitting positions 1 through 8: 2500, 2200, 1900, 1600, 1300, 1000, 700, 400. Unit: 1/100 mm.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
齿位线 → Wafer position line
定位线 → Reference line
钥匙标准总宽 → Key standard overall width

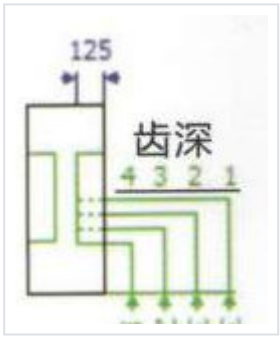


Fig. 48.2 Cut depths 4, 3, 2 and 1 on the same key, with the distance of each from the reference line: 377, 317, 257 and 197. Key width at the position line: 125. Unit: 1/100 mm.

齿深 → Cut depth
125 → 125
377 → 377
317 → 317
257 → 257
197 → 197

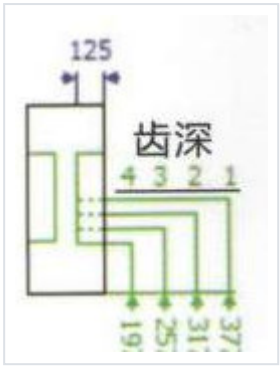


Fig. 48.3 Key with the molded head, shown with the blade profile at the foot of the drawing.

HU100R 2-in-1



Fig. 48.4 HU100R 2-in-1 tool, reading panel side, with the matching key blank below it.

APPLICABLE VEHICLES	BMW, Rolls-Royce
PICKING DIRECTION	When the door lock is on the left side, pick counterclockwise. When it is on the right side, pick clockwise.
WAFERS	This lock has 8 bitting positions in total.
CUT DEPTHS	This key has 4 depth codes in total. No. 1 is the shallowest and No. 4 the deepest.
DECODING	Read forward after opening.



Fig. 48.5 Key profile, black silhouette.

SIP22 2-in-1



Fig. 48.6 SIP22 2-in-1 tool, reading panel side.

APPLICABLE VEHICLES	Fiat
PICKING DIRECTION	When the door lock is on the left side, pick counterclockwise. When it is on the right side, pick clockwise.
WAFERS	Both the door lock and the ignition lock on this model have 8 wafers.
CUT DEPTHS	This key has 4 depth codes in total. No. 1 is the shallowest and No. 4 the deepest.
DECODING	Read backward after opening.

SOURCE PAGE 049

Numerical Data

The diagram at left gives the bitting position and cut depth data that applies to SIP22.

(Unit: 1/100 mm)

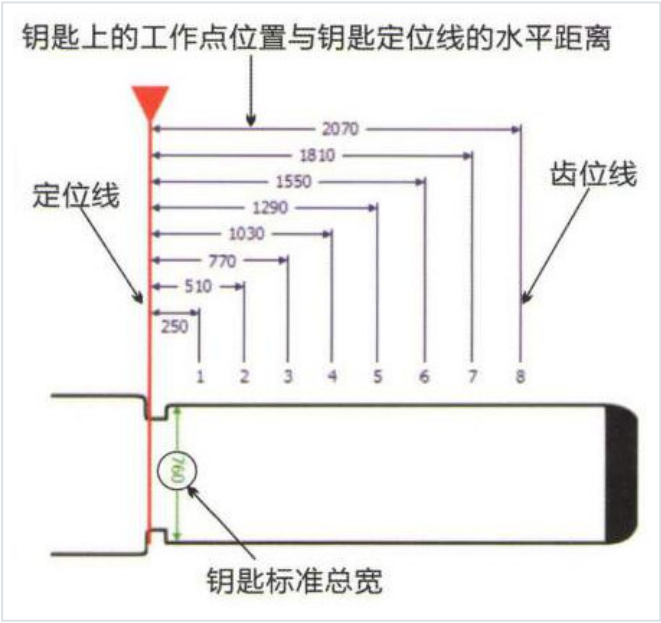


Fig. 49.1 Horizontal distance from the working point on the key to the key reference line, measured at bitting positions 1 through 8: 2070, 1810, 1550, 1290, 1030, 770, 510, 250. Key standard overall width: 760. Unit: 1/100 mm.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line

定位线 → Reference line

齿位线 → Wafer position line

钥匙标准总宽 → Key standard overall width

760 → 760

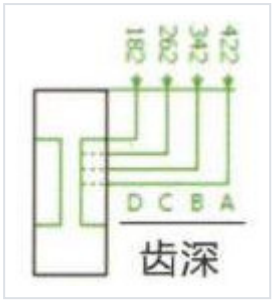


Fig. 49.2 Cut depth chart for the same key: depth letters D, C, B and A carry the distances 182, 262, 342 and 422. Unit: 1/100 mm.

齿深 →	Cut depth
C →	C
A →	A
262 →	262
422 →	422
D →	D
B →	B
182 →	182
342 →	342

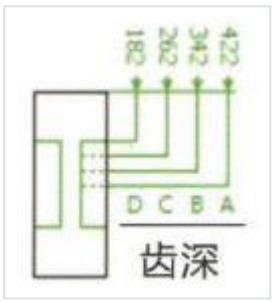


Fig. 49.3 Key for this model, with the blade profile at the foot of the drawing.

HY20R 2-in-1



Fig. 49.4 HY20R 2-in-1 tool with its key blank.

APPLICABLE VEHICLES	Hyundai
PICKING DIRECTION	When the door lock is on the left side, pick clockwise. When it is on the right side, pick counterclockwise.
WAFERS	This lock has 8 bitting positions in total.
CUT DEPTHS	This key has 5 depth codes in total. No. 1 is the shallowest and No. 5 the deepest.
DECODING	Read forward after opening.

K9 2-in-1



Fig. 49.5 K9 2-in-1 tool with the key blanks and the spare tool pieces supplied with it.

APPLICABLE VEHICLES	Kia
PICKING DIRECTION	When the door lock is on the left side, pick clockwise. When it is on the right side, pick counterclockwise.
WAFERS	Both the door lock and the ignition lock have 7 wafers. On the tool's reading panel they show as wafers at bitting positions 1, 3, 5 and 7 on one side, and at bitting positions 2, 4 and 6 on the other side. Cut the positions that do no work down to depth No. 3. This key needs only one primary blank and one secondary blank.
CUT DEPTHS	This key has 5 depth codes in total. No. 1 is the shallowest and No. 5 the deepest.
DECODING	Read forward after opening.

SOURCE PAGE 050

HU66 2-in-1



Fig. 50.1 HU66 2-in-1 tool, reading panel side. The panel is engraved HU66 V.2 and 2-in-1 Pick.

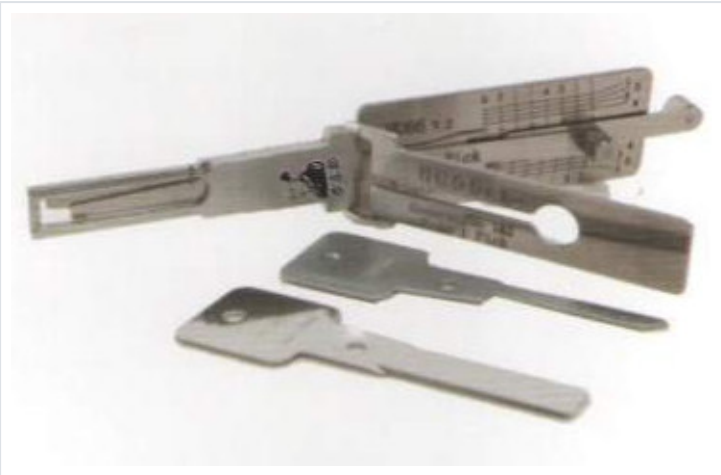


Fig. 50.2 HU66 2-in-1 tool, second view, with the loose picking blades and key blanks shown with it.

APPLICABLE CARS

APPLICABLE VEHICLES	AUDI, SKODA, BENTLEY, SEAT, BUGATTI, PORSCHE, LAMBORGHINI, VOLKSWAGEN, SCANIA, DUCATI

PICKING DIRECTION

When the driver's seat is on the left side, pick the door lock counterclockwise.

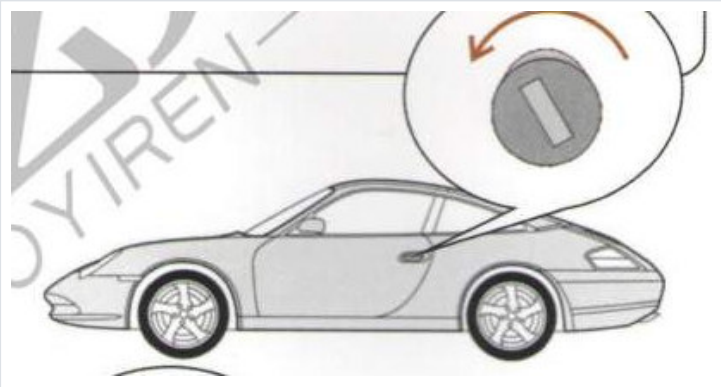


Fig. 50.3 Left-hand-drive car: turn the plug counterclockwise to pick the door lock.

When the driver's seat is on the right side, pick the door lock clockwise.

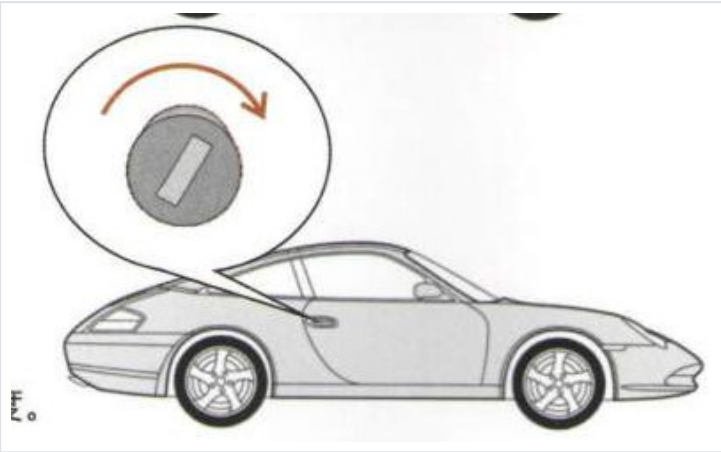


Fig. 50.4 Right-hand-drive car: turn the plug clockwise to pick the door lock.

LOCK OVERVIEW

This lock has 8 wafers and 4 cut depths. Depth No. 4 is the deepest and depth No. 1 the shallowest.

The door lock, the ignition and the trunk all carry 8 wafers.

An ignition key can be cut from the door cylinder or from the trunk cylinder.

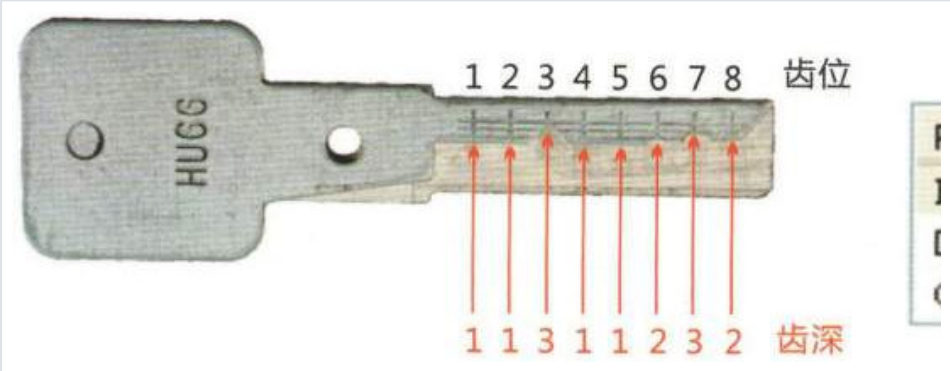


Fig. 50.5 HU66 key: bitting positions 1 through 8 carry the cut depths 1, 1, 3, 1, 1, 2, 3, 2. The blade is stamped HU66.

齿位 → Wafer position
齿深 → Cut depth
HU66 → HU66

Wafer quantity and position in each lock cylinder, positions 1 through 8.

Cylinder	1	2	3	4	5	6	7	8
Ignition	A	A	A	A	A	A	A	A
Doors	A	B	B	A	A	B	B	A
Glove Box				A	A	A		

SOURCE PAGE 051

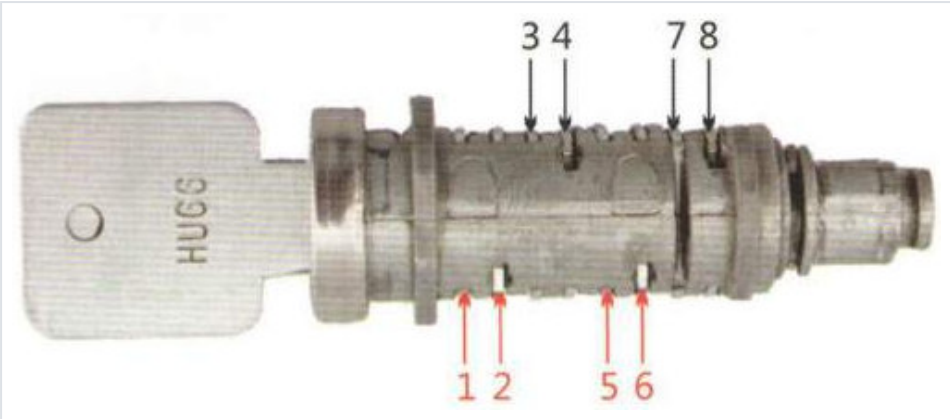


Fig. 51.1 HU66 cylinder with the key inserted. Wafers 3 and 4 sit on the upper side, wafers 7 and 8 further along the upper side; wafers 1 and 2 sit on the lower side, wafers 5 and 6 further along the lower side.

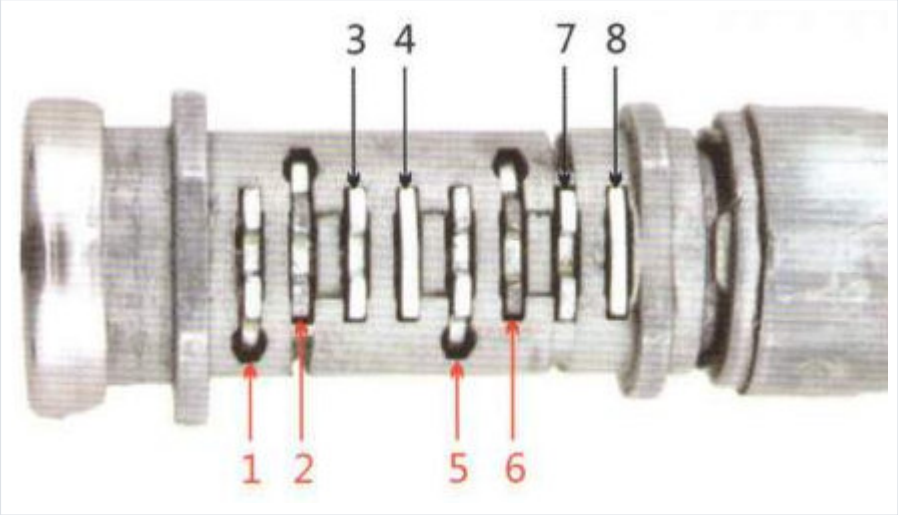


Fig. 51.2 The same cylinder opened up: wafers 3, 4, 7 and 8 on one side and 1, 2, 5, 6 on the other, each arrowed to its position number.

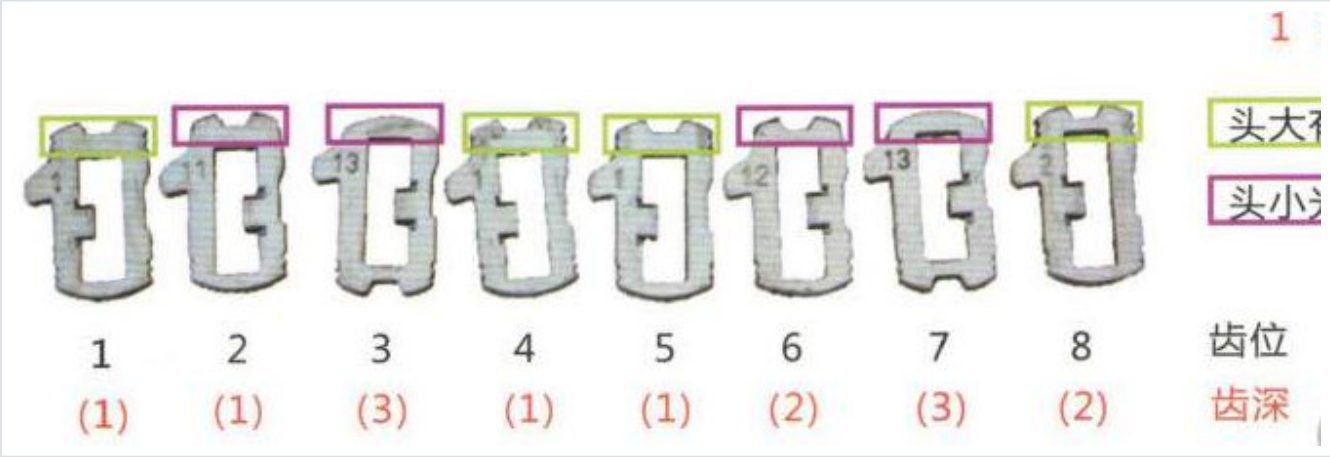


Fig. 51.3 The eight wafers of the HU66 lock, positions 1 through 8, with the cut depth carried by each in brackets: 1, 1, 3, 1, 1, 2, 3, 2. Green outline: large head with teeth. Pink outline: small smooth head.

齿位 → Wafer position
齿深 → Cut depth
头大有牙 → Large head with teeth
头小光滑 → Small smooth head

> A wafer with a large head and teeth takes the load first when force is applied to the tension bar, and so creates

resistance.

DECODING

Read forward after opening.

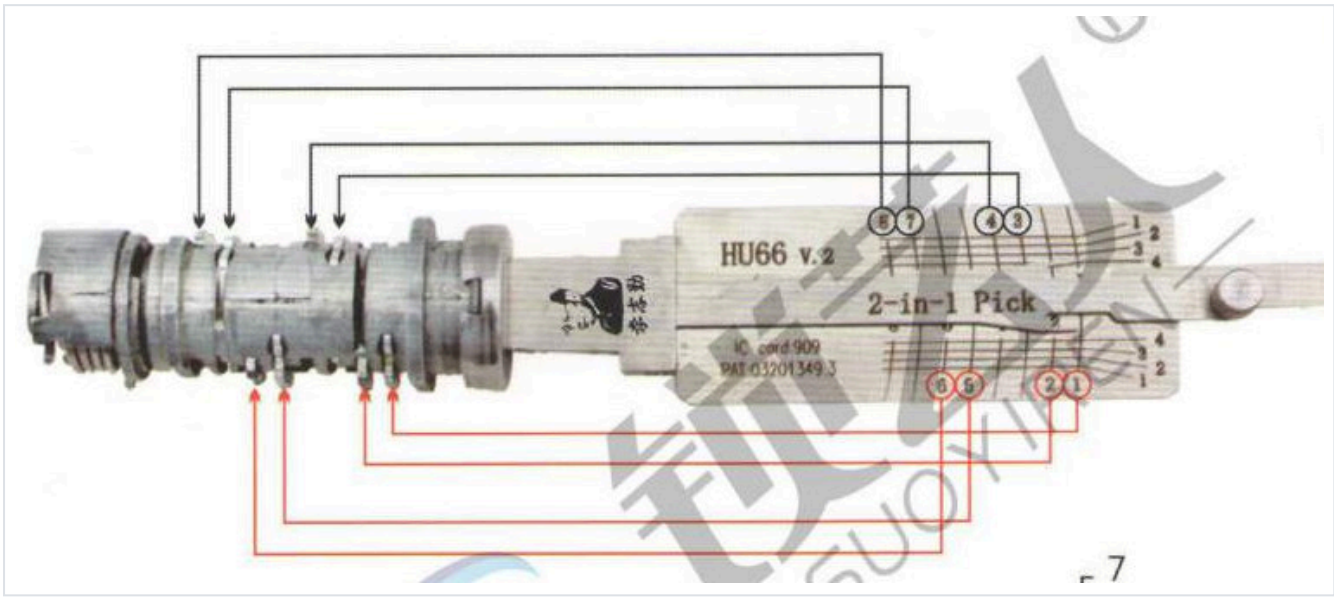


Fig. 51.4 The 2-in-1 tool in the HU66 cylinder, with every wafer position arrowed to its line on the reading panel: positions 8, 7 and 4, 3 along the top of the panel and 6, 5 and 2, 1 along the bottom.

WAFER POSITION ARRANGEMENT

HU66 locks come with two wafer arrangements.

As shown, the left one is the 1 3 5 7, 2 4 6 8 arrangement, and the right one is the 12 56, 34 78 arrangement.

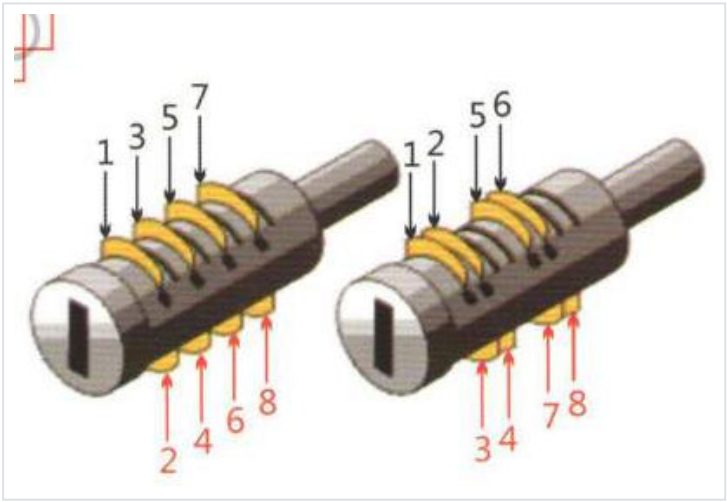


Fig. 51.5 Left: wafers 1, 3, 5, 7 above and 2, 4, 6, 8 below. Right: wafers 1, 2, 5, 6 above and 3, 4, 7, 8 below.

KEY CUTTING

The diagram at right shows a key cut on a CNC machine. When you do not have a CNC machine, you still have to follow the slope between one cut and the next on this chart when you cut a key.

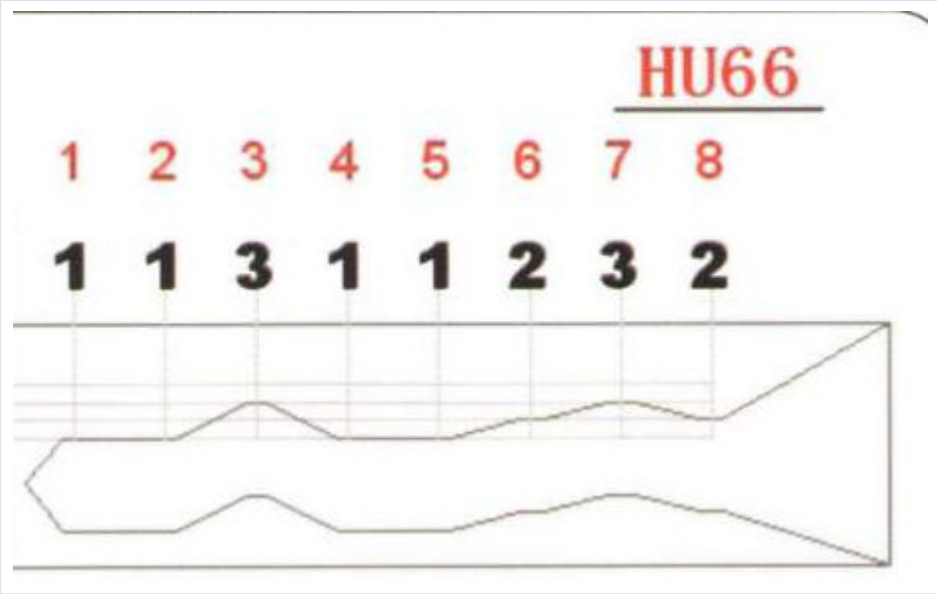


Fig. 51.6 HU66 key chart: bitting positions 1 through 8 with the cut depths 1, 1, 3, 1, 1, 2, 3, 2, and the slope between the cuts.

SOURCE PAGE 052

Numerical Data

The two charts below give the bitting positions and cut depths that apply to HU66. (Unit: 1/100 mm)

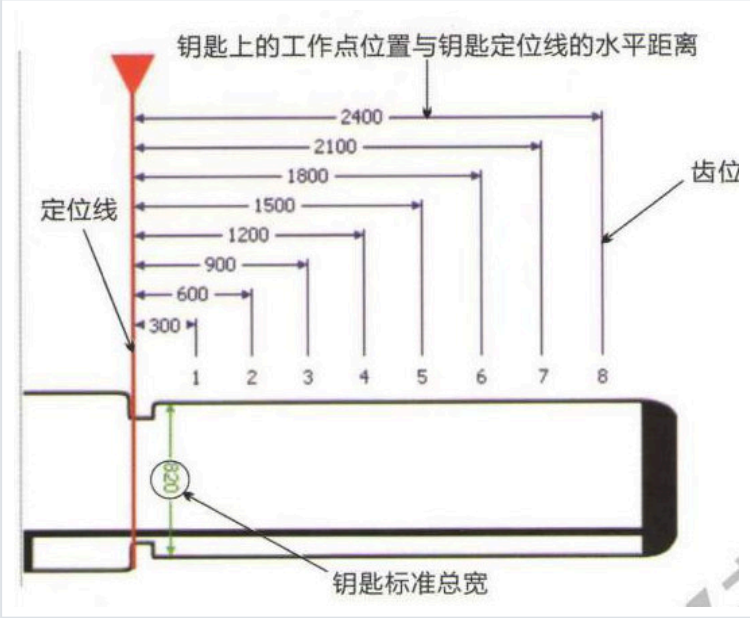


Fig. 52.1 HU66 bitting chart: horizontal distance from the working point at each bitting position 1-8 to the key reference line - 300, 600, 900, 1200, 1500, 1800, 2100, 2400 - and the key standard overall width 820.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
齿位线 → Wafer position line
齿位 → Bitting position
定位线 → Reference line
钥匙标准总宽 → Key standard overall width

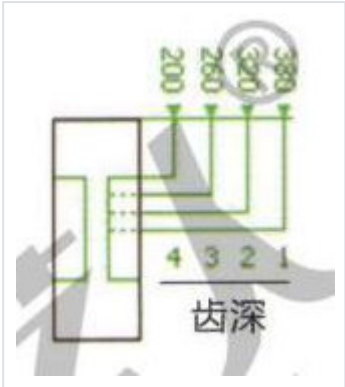


Fig. 52.2 HU66 cut depth chart: depth values 200, 260, 320 and 380, read against bitting positions 4, 3, 2 and 1.

齿深 → Cut depth　　齿位 → Bitting position



Fig. 52.3 HU66 key profile: key head and blade silhouette for reference.

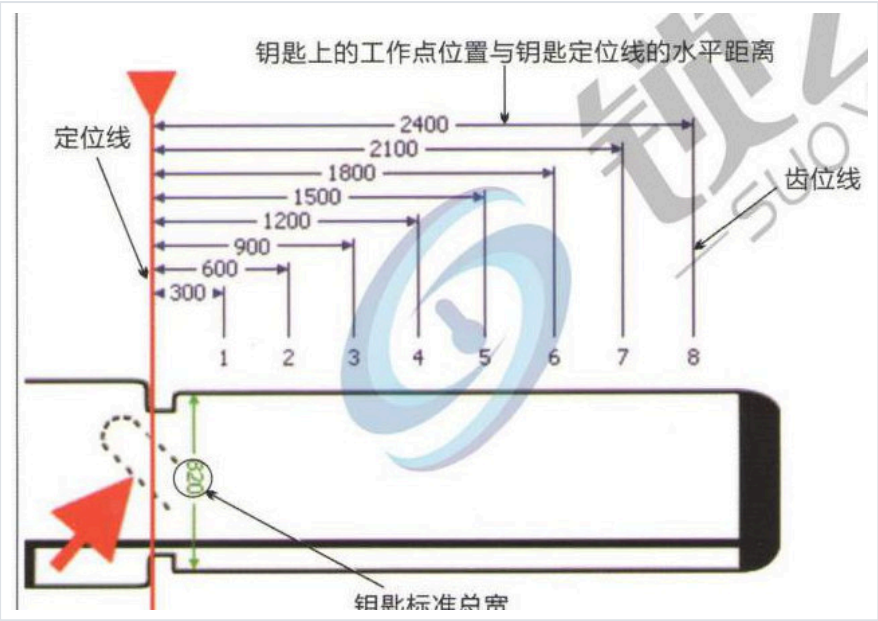


Fig. 52.4 HU66 bitting chart, second view: the same 300-2400 dimension chain at positions 1-8 and the 820 key standard overall width, with the tip insertion point arrowed.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
定位线 → Reference line
齿位线 → Wafer position line
钥匙标准总宽 → Key standard overall width
齿位 → Bitting position

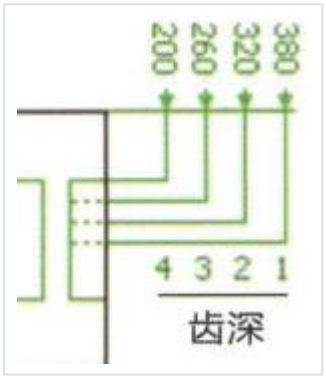


Fig. 52.5 HU66 cut depth chart, second view: depth values 200, 260, 320 and 380 against bitting positions 4, 3, 2 and 1.

齿深 → Cut depth
齿位 → Bitting position

Special Technique

When picking a lock with the 12 56, 34 78 arrangement counterclockwise, first find the binding wafers at bitting positions 1, 5, 8 and 4 and release them. Once the wafers at positions 1, 5, 8 and 4 have seated, work repeatedly through positions 3, 7, 6 and 2, finding the binding wafer there and releasing it.

SOURCE PAGE 053

HU100 2-in-1



Fig. 53.1 HU100 2-in-1 picking and decoding tool, with the lifter, reading panel, tension bar and key blank shown from the side.

Applicable Cars

APPLICABLE VEHICLES	BUICK, CHEVROLET®

Picking Direction

When the driver's seat is on the left, pick the lock counterclockwise.

When the driver's seat is on the right, pick the lock clockwise.

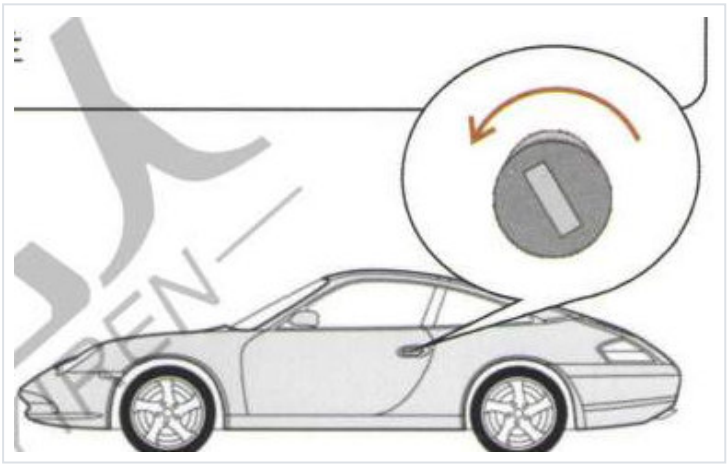


Fig. 53.2 Door cylinder rotated counterclockwise: picking direction when the driver's seat is on the left.

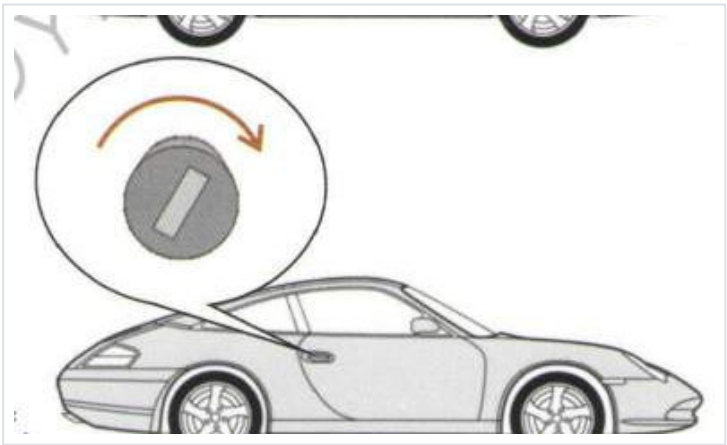


Fig. 53.3 Door cylinder rotated clockwise: picking direction when the driver's seat is on the right.

Lock Overview

This lock has 8 wafers and 4 cut depths. Depth 4 is the deepest and depth 1 is the shallowest.

The ignition lock carries the same number of wafers as the door lock.

An ignition key can be produced from the door lock cylinder and the trunk lock cylinder.

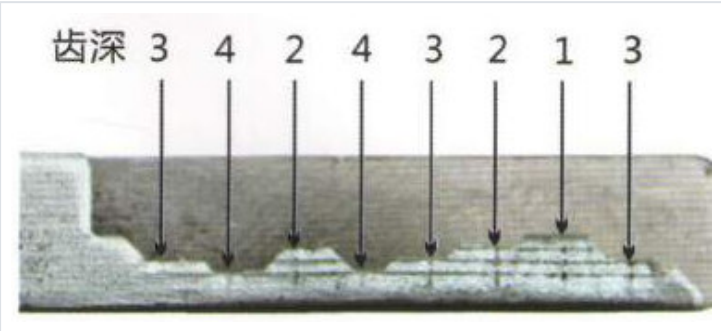


Fig. 53.4 HU100 key blade with the cut depths 3, 4, 2, 4, 3, 2, 1, 3 at bitting positions 1-8.

齿深 → Cut depth

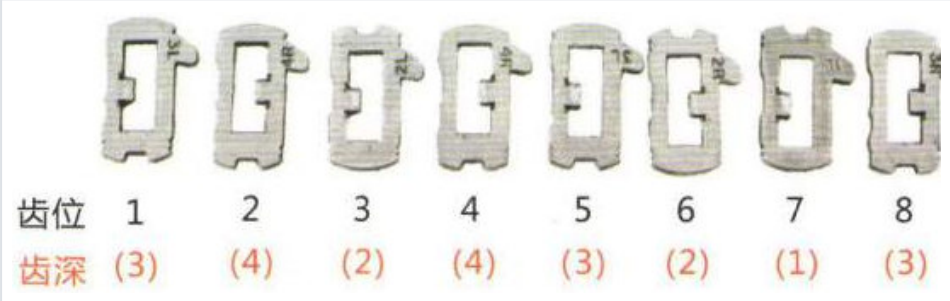


Fig. 53.5 Wafer stack for bitting positions 1-8 with the depth codes (3) (4) (2) (4) (3) (2) (1) (3).

齿位 → Bitting position

齿深 → Cut depth

SOURCE PAGE 054

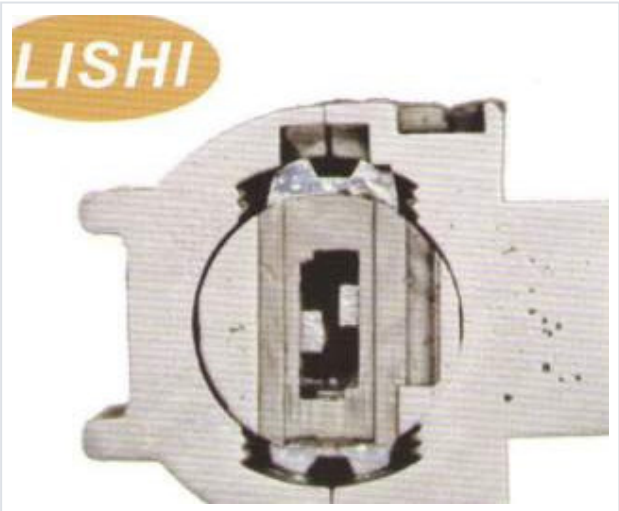


Fig. 54.1 HU100 cylinder housing with the plug and wafer bores exposed.

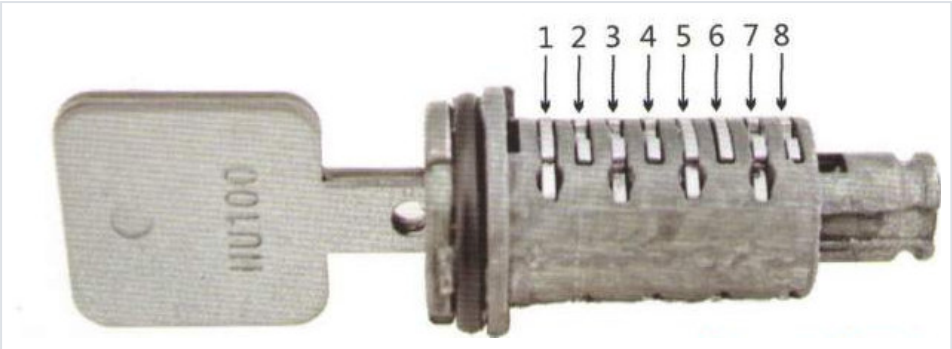


Fig. 54.2 HU100 key seated in the cylinder; the wafer positions are numbered 1 through 8 along the plug.

Decoding

Read forward after picking.

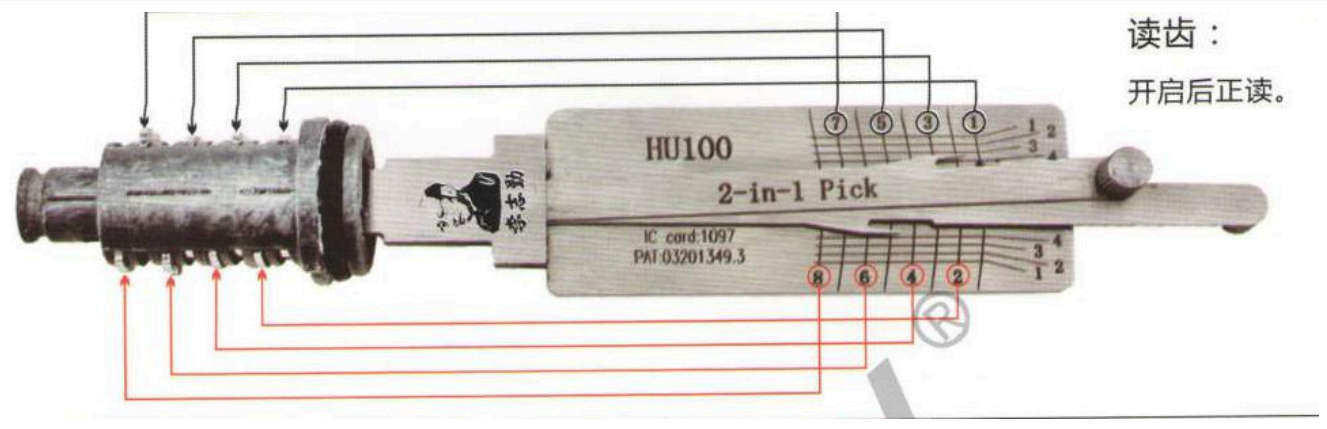


Fig. 54.3 Decoding with the tool in the cylinder: leader lines tie each wafer to its bitting position on the reading panel, 8 6 4 2 on the upper row and 7 5 3 1 on the lower row.

Key Cutting

The figure on the right is a schematic of a key cut on a CNC machine. When you do not have a CNC machine, refer to the slope between adjacent cuts on this chart when you cut the key.

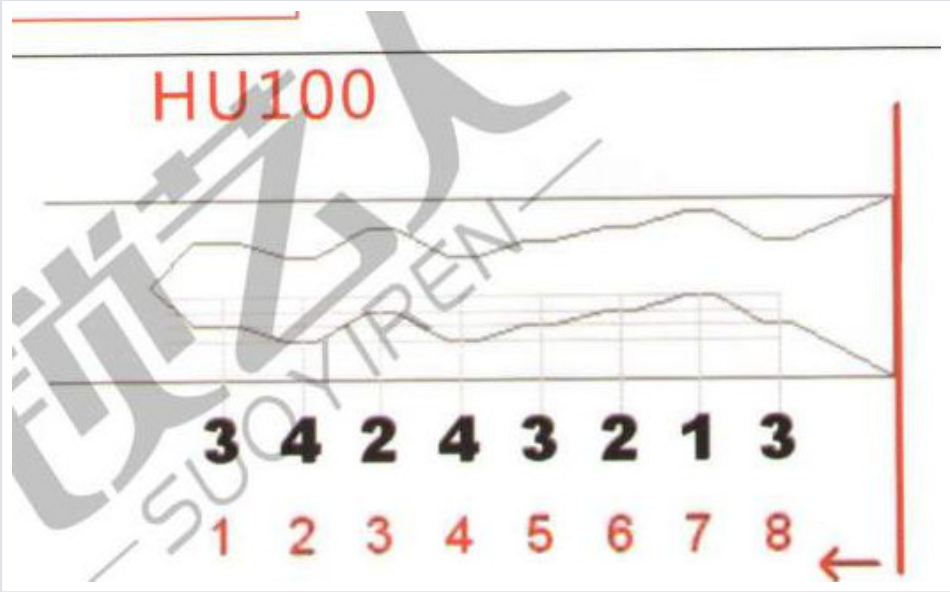


Fig. 54.4 HU100 key cutting chart: the cut profile with the depth codes 3 4 2 4 3 2 1 3 over bitting positions 1-8.

Numerical Data

The chart on the left gives the bitting positions and cut depths that apply to HU100. (Unit: 1/100 mm)

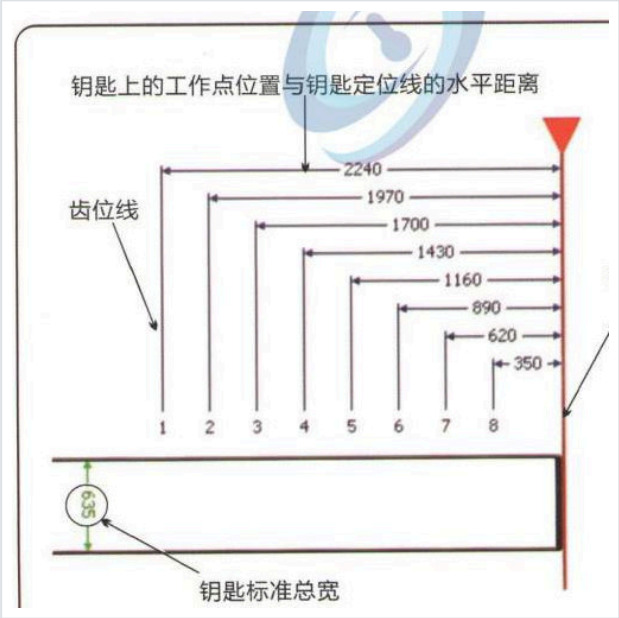


Fig. 54.5 HU100 bitting chart: horizontal distance from the working point at each bitting position to the key reference line - 350, 620, 890, 1160, 1430, 1700, 1970, 2240 - with the key standard overall width 635.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
定位线 → Reference line
齿位 → Bitting position
齿位线 → Wafer position line
钥匙标准总宽 → Key standard overall width

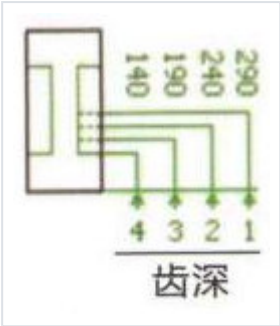


Fig. 54.6 HU100 cut depth chart: depth values 140, 190, 240 and 290, read against bitting positions 4, 3, 2 and 1.

齿深 → Cut depth　　齿位 → Bitting position

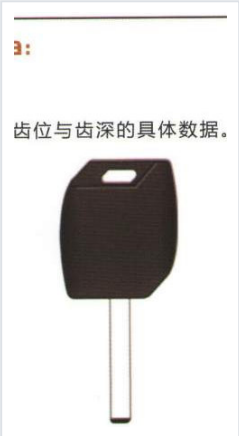


Fig. 54.7 HU100 key profile: key head and blade silhouette for reference.

SOURCE PAGE 055

TOY(2014) 2-in-1

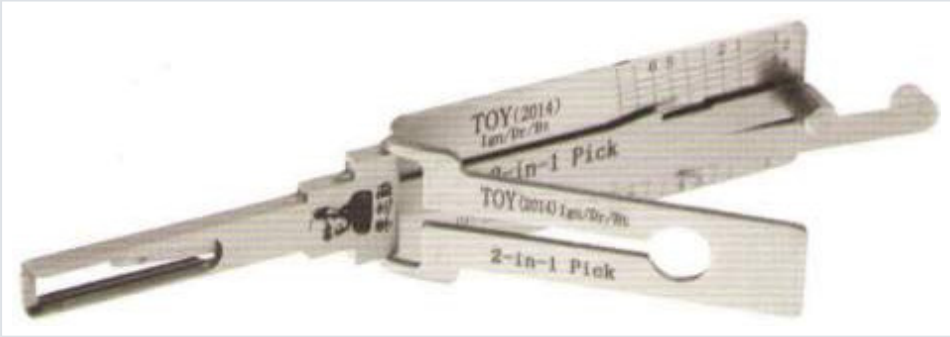


Fig. 55.1 TOY(2014) 2-in-1 tools, showing the lifter, reading panel and tension bar.



Fig. 55.2 TOY(2014) 2-in-1 tool with the matching Toyota key.

Applicable Cars

APPLICABLE VEHICLES	2014 COROLLA

Picking Direction

When the driver's seat is on the left, pick clockwise.

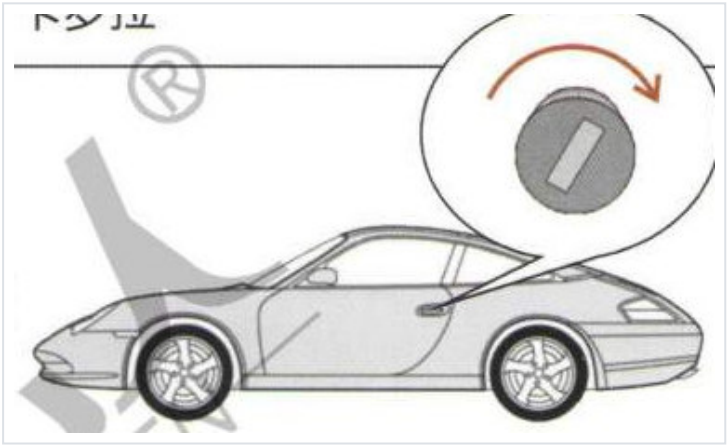


Fig. 55.3 Door cylinder rotated clockwise for picking.

Lock Overview

This lock has 8 bitting positions and 4 cut depths. Neither the door lock nor the ignition lock has a missing wafer.

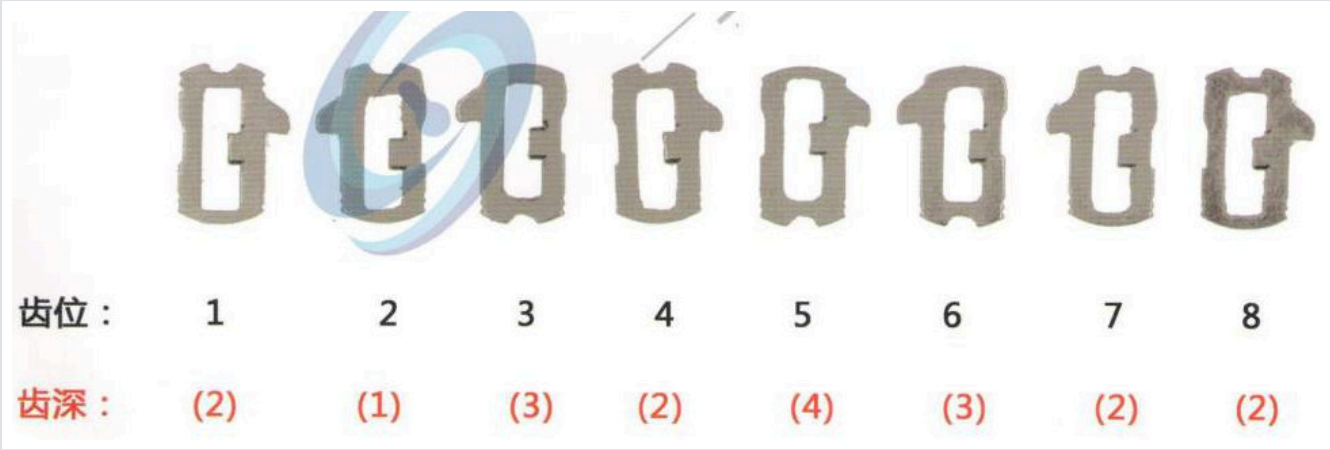


Fig. 55.4 Wafer set for bitting positions 1-8 with the depth codes (2) (1) (3) (2) (4) (3) (2) (2).

齿位 → Bitting position 齿深 → Cut depth

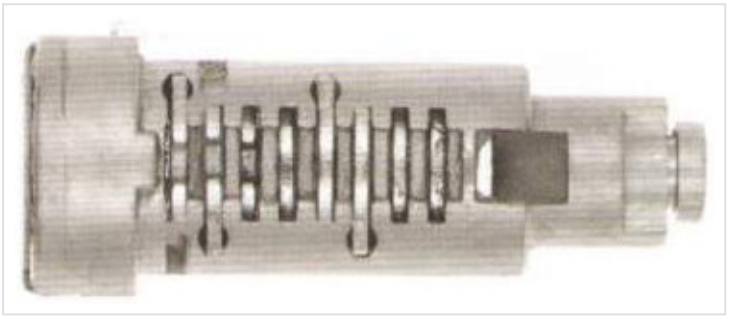


Fig. 55.5 Cylinder cutaway: the plug, the wafer stack and the springs in the housing.

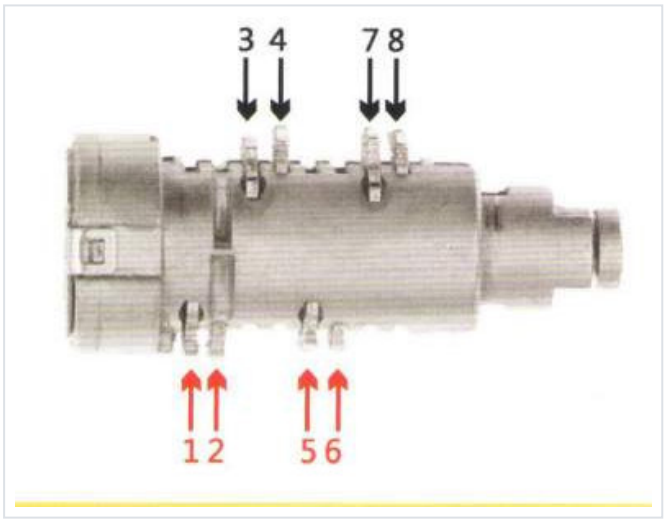


Fig. 55.6 Cylinder with the wafer order marked: 3 4 and 7 8 on the upper side, 1 2 and 5 6 on the lower side.

SOURCE PAGE 056

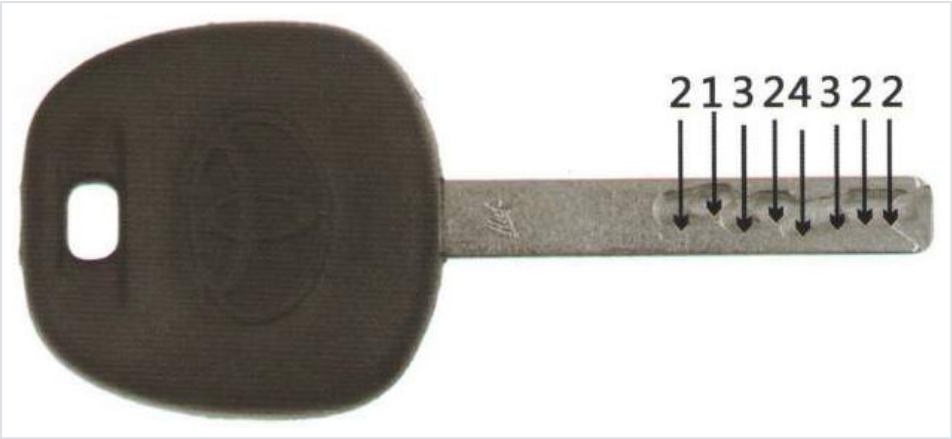


Fig. 56.1 TOY (2014) key with the cut depth at each of the 8 bitting positions: 2 1 3 2 4 3 2 2.

Picking Technique

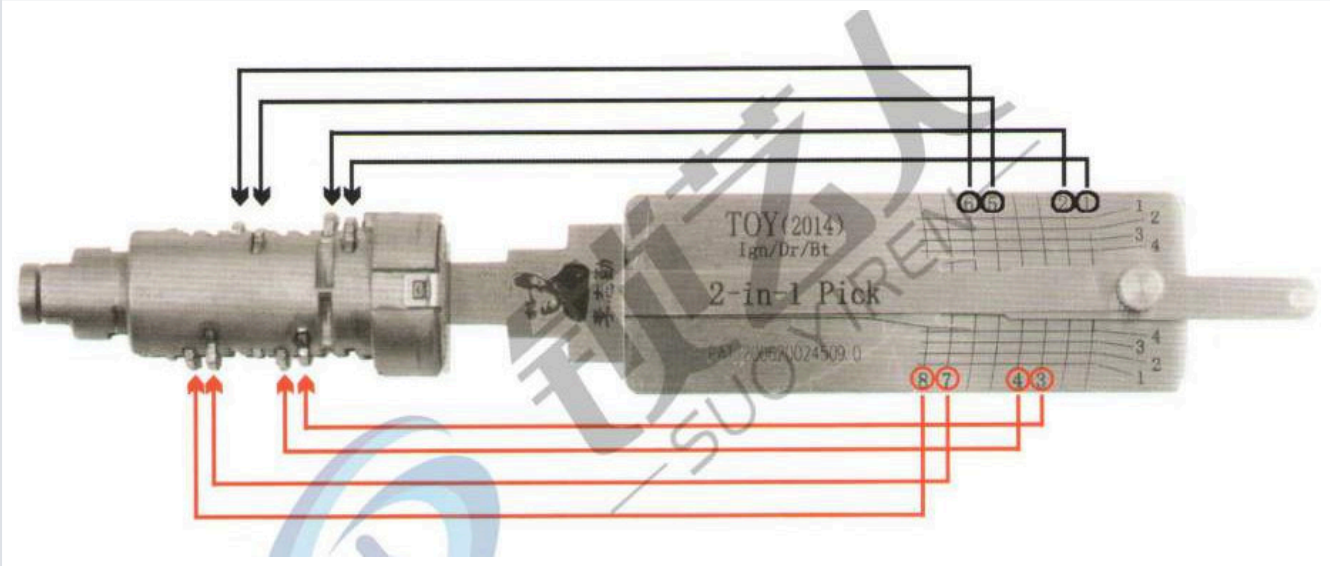


Fig. 56.2 TOY (2014) 2-in-1 Pick, engraved Ign/Dr/Bt, seated in the door cylinder. The callout lines run from the wafer positions on the reading panel to the wafers in the cylinder.

Decoding

Read forward once the lock is open.

SOURCE PAGE 057

Four Tracks Inner Groove Key

TOY40 2-in-1



Fig. 57.1 TOY40 2in1 picking and decoding tool with its matching key blank.

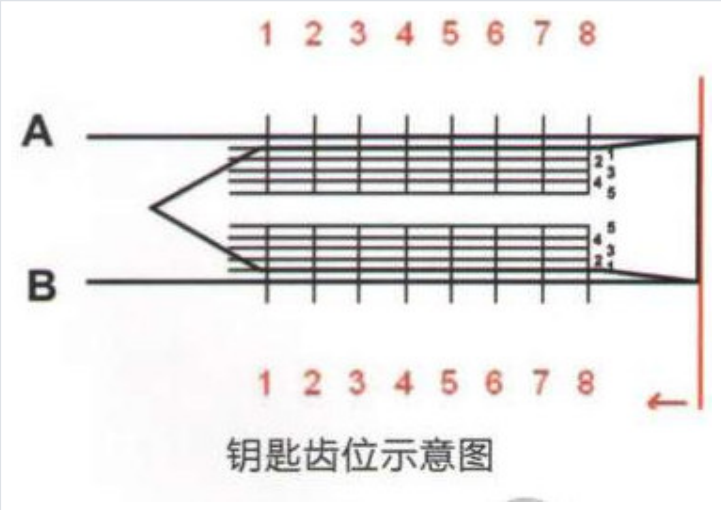


Fig. 57.2 TOY40 key bitting position schematic: rows A and B, 8 positions each and 5 cut depth lines per row, counted from the reference line at the shoulder.

钥匙齿位示意图 → Key bitting position schematic

APPLICABLE VEHICLES	Toyota, Lexus
PICKING DIRECTION	When the door lock is on the left side, turn clockwise to open; when it is on the right side, turn counterclockwise.

This key is a four tracks inner groove key, split into A and B groups. It has 8 bitting positions and 5 cut depths.

In the door lock, group A carries wafers at 5, 6, and 7, and group B carries wafers at 1, 2, 3, 4, 5, 6, and 7. The ignition carries extra wafers at 1, 2, 3, and 4. The trunk lock carries a wafer at 8.

Once this lock has turned through a certain angle, wafers 5, 6, and 7 still bind. You have to keep working them free before the lock opens completely.

Returning the plug also means finding the bind at 5, 6, and 7 and working it free.

Decoding

Read forward once the lock is open. When you cut a key, position 8 of group B is depth code 4 on every master key and depth code 2 on every valet key.

Numerical Data

The diagram at left gives the bitting position and cut depth data that apply to TOY40. (Unit: 1/100 mm)

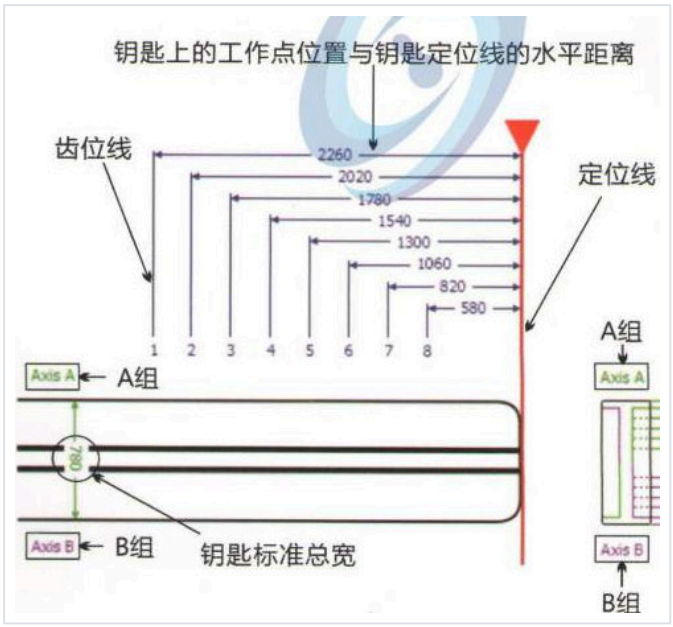


Fig. 57.3 TOY40 numerical data: horizontal distance from the working point at positions 1 through 8 to the reference line, the A and B axes, and the key standard overall width.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
齿位线 → Wafer position line
定位线 → Reference line
A组 → Group A
B组 → Group B
钥匙标准总宽 → Key standard overall width

UNIT	1/100 mm
WORKING POINT DISTANCE FROM THE REFERENCE LINE, POSITIONS 1-8	2260, 2020, 1780, 1540, 1300, 1060, 820, 580
KEY STANDARD OVERALL WIDTH	780

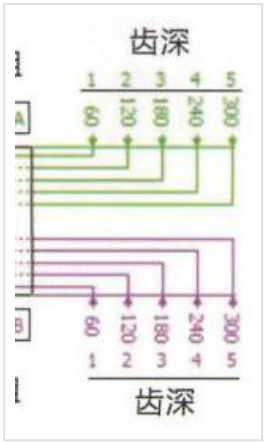


Fig. 57.4 TOY40 cut depth data on the A and B axes: depth codes 1 through 5 give 60, 120, 180, 240, and 300 in both groups.

齿深 → Cut depth
A组 → Group A
B组 → Group B

CUT DEPTH, GROUP A, DEPTH CODES 1-5	60, 120, 180, 240, 300



Fig. 57.5 TOY40 key with the inner groove profile, and the blade cross-section shown as a solid silhouette below it.

SOURCE PAGE 058

TOY48 2-in-1

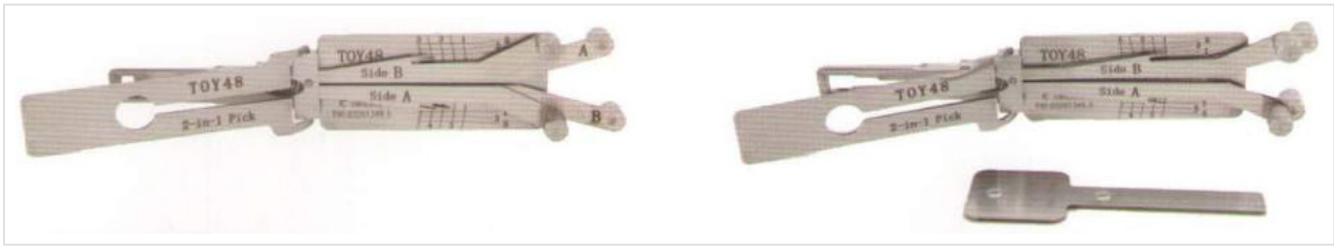


Fig. 58.1 TOY48 2in1 tool shown from both sides, with Side A and Side B marked on the reading panel, and the matching key blank.

APPLICABLE CARS	TOYOTA, LEXUS

Picking Direction

With the driver's seat on the left, turn the plug clockwise to open.

With the driver's seat on the right, turn the plug counterclockwise to open.



Fig. 58.2 Picking direction at the door: clockwise with the driver's seat on the left, counterclockwise with the driver's seat on the right.

> This lock has to be opened twice. The first opening stops at 45°.

> At that point half-wafers are still binding. Once you work them free, the plug turns all the way to 90° and the lock opens.

> On the way back the plug catches at 45° again. You still have to work the bind free before the wafers return.

Lock Overview

This door lock has 10 wafers and 3 cut depths: 1, 3, and 5. On the key, depth code 1 is the deepest cut and depth code 5 the shallowest.

You will find all 10 wafers in the door lock, the ignition, and the trunk.

The glove box carries 4 groups of wafers.

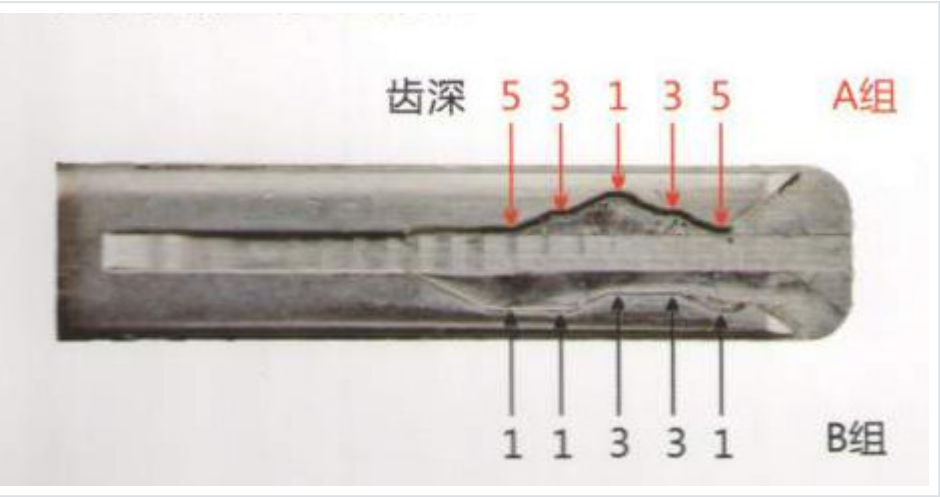


Fig. 58.3 TOY48 key with the cut depth called out at each position: group A reads 5 3 1 3 5 on the upper edge, group B reads 1 1 3 3 1 on the lower edge.

齿深 → Cut depth
A组 → Group A
B组 → Group B

CUT DEPTH, GROUP A, POSITIONS 1-5	5, 3, 1, 3, 5
CUT DEPTH, GROUP B, POSITIONS 1-5	1, 1, 3, 3, 1

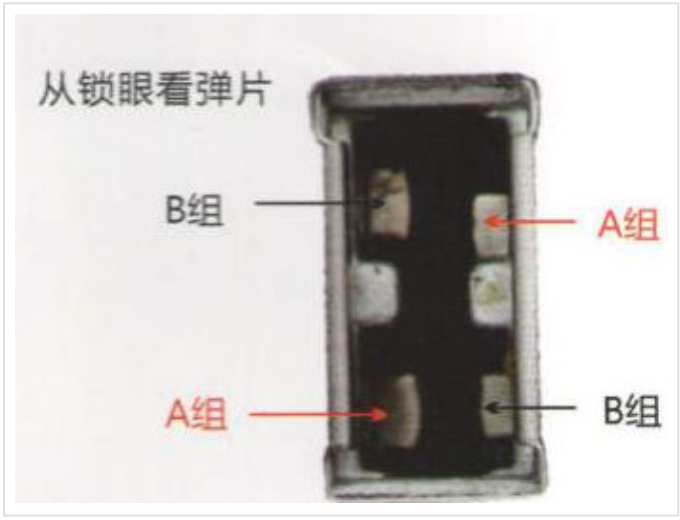


Fig. 58.4 Wafers seen straight down the keyway: group B on the left in the upper half and group A on the right, with the assignment reversed in the lower half.

从锁眼看弹片 → Wafers seen from the keyway
A组 → Group A
B组 → Group B

SOURCE PAGE 059

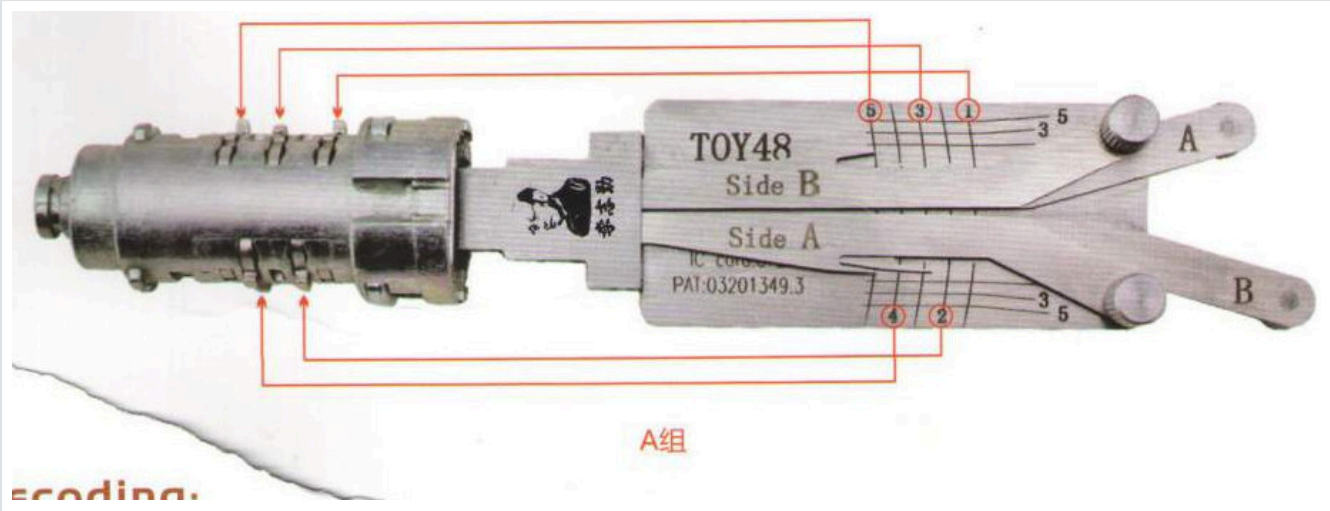


Fig. 59.1 TOY48 tool seated in the door cylinder, group A. The red callouts run from wafers A1 through A5 to positions 6, 3, and 1 on Side B and positions 4 and 2 on Side A of the reading panel.

A组 → Group A
Side A → Side A
Side B → Side B
TOY48 → TOY48

Decoding

Read forward once the lock is open.

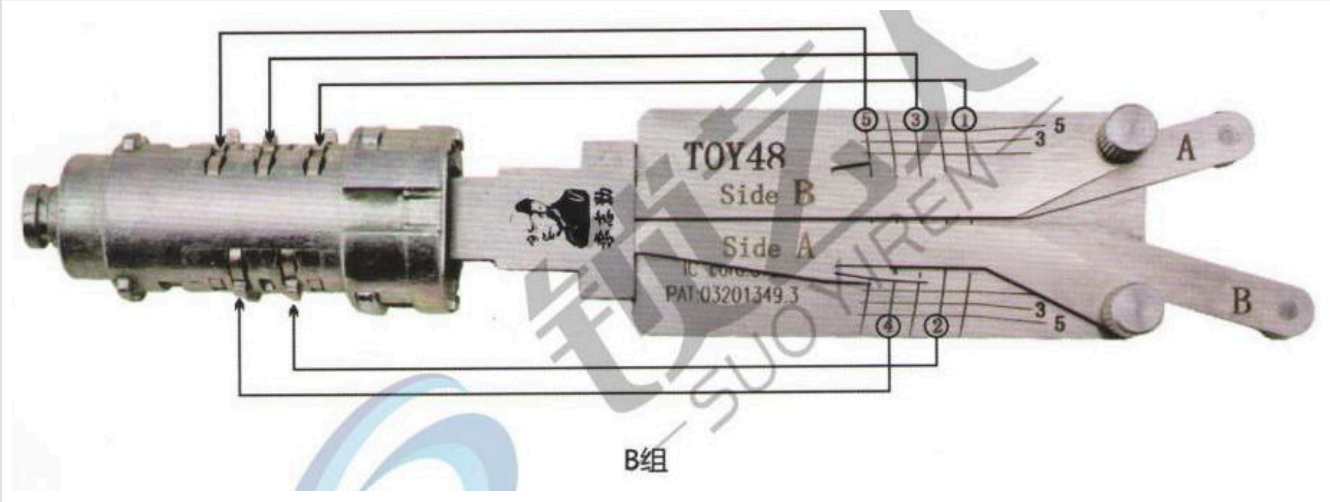


Fig. 59.2 The same cylinder, group B. The black callouts run from wafers B1 through B5 to positions 6, 3, and 1 on Side B and positions 4 and 2 on Side A of the reading panel.

B组 → Group B
Side A → Side A
Side B → Side B
TOY48 → TOY48

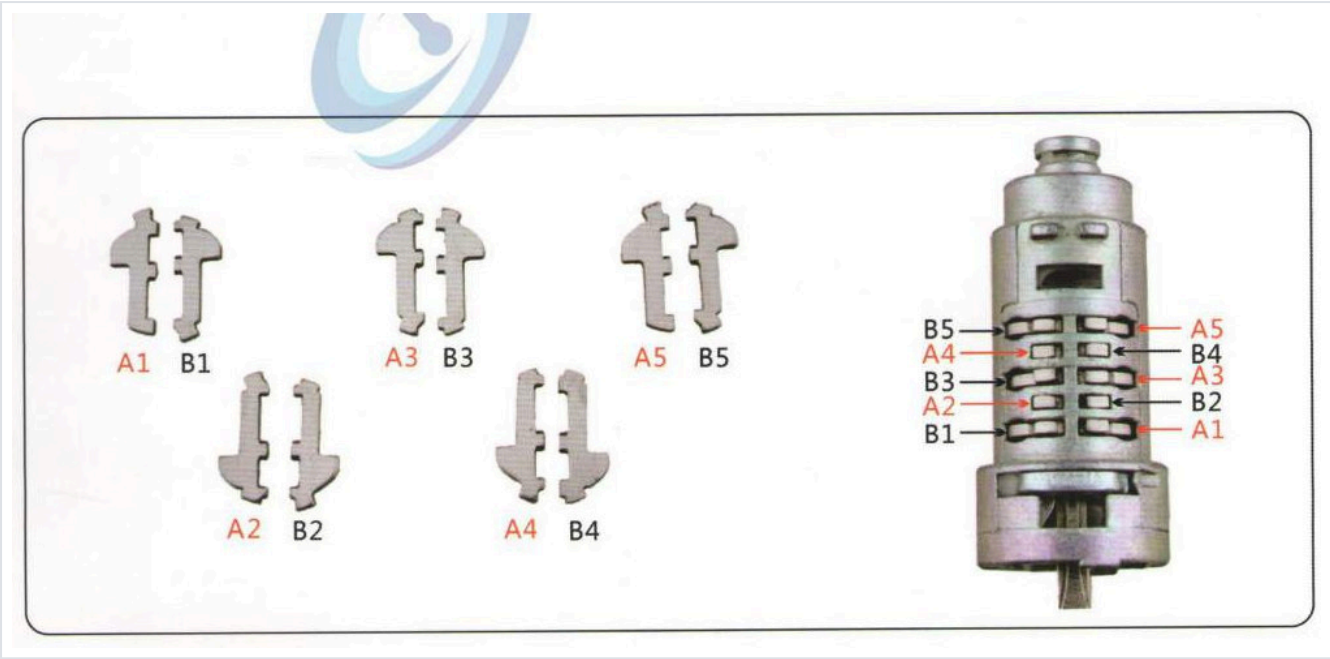


Fig. 59.3 TOY48 wafer set in A and B pairs (A1/B1, A2/B2, A3/B3, A4/B4, A5/B5), with the cylinder end view showing the two wafer stacks numbered on each side of the plug.

SOURCE PAGE 060



Fig. 60.1 TOY48 door cylinder cut away to show the A-group wafers: A1 through A5, one wafer of each group on either side of the keyway.

A1 → A1
A2 → A2
A3 → A3
A4 → A4
A5 → A5
A组 → A group



Fig. 60.2 A-group wafer profiles: A1(5), A2(3), A3(1), A4(3), A5(5).

A1(5) → A1(5)
A3(1) → A3(1)
A5(5) → A5(5)
A2(3) → A2(3)
A4(3) → A4(3)
A组弹片 → A-group wafers

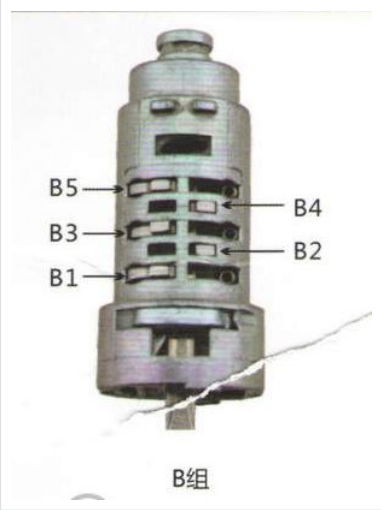


Fig. 60.3 The same cylinder cut away to show the B-group wafers: B1 through B5, fitted opposite the A group.

B1 → B1
B3 → B3
B5 → B5
B2 → B2
B4 → B4
B组 → B group



Fig. 60.4 B-group wafer profiles: B1(1), B2(1), B3(3), B4(3), B5(1).

B1(1) → B1(1)
B2(1) → B2(1)
B3(3) → B3(3)
B4(3) → B4(3)
B5(1) → B5(1)
B组弹片 → B-group wafers

A-GROUP WAFERS	A1(5), A2(3), A3(1), A4(3), A5(5)
B-GROUP WAFERS	B1(1), B2(1), B3(3), B4(3), B5(1)

KEY CUTTING

The figure above shows a key cut on a CNC machine. When you do not have a CNC machine, you still have to follow the slope between one cut and the next on this chart when you cut a key.

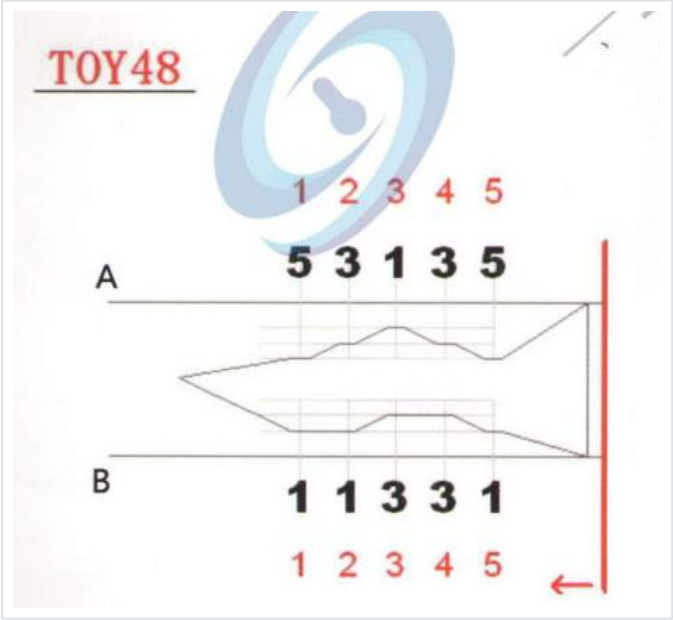


Fig. 60.5 TOY48 key cutting chart: bitting positions 1 to 5, row A at depths 5 3 1 3 5 and row B at depths 1 1 3 3 1, measured against the reference line at right.

SOURCE PAGE 061

Numerical Data

The figure below gives the bitting position and cut depth data that applies to TOY48. (Unit: 1/100 mm)

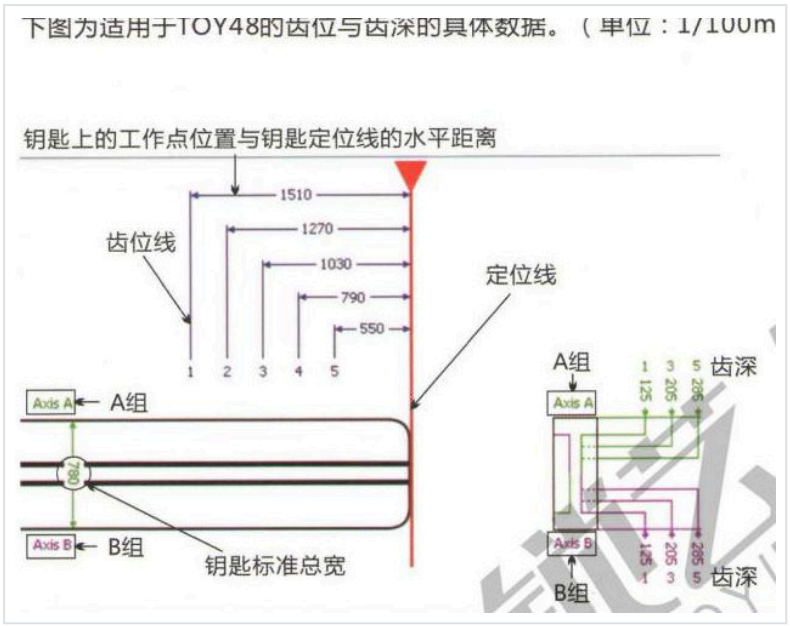


Fig. 61.1 TOY48 bitting chart: horizontal distance from the working point at bitting positions 1 through 5 to the key reference line, plus the A- and B-axis cut depths of the blade.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
齿位线 → Wafer position line
定位线 → Reference line
A组 → A group
B组 → B group
Axis A → Axis A
Axis B → Axis B
钥匙标准总宽 → Key standard overall width
齿深 → Cut depth



Fig. 61.2 TOY48 key blank: front view and blade cross-section.

BITTING POSITIONS 1-5, HORIZONTAL DISTANCE TO THE REFERENCE LINE	1510, 1270, 1030, 790, 550
KEY STANDARD OVERALL WIDTH	780
A-GROUP CUT DEPTHS AT DEPTH CODES 1, 3, 5	125, 205, 285

UNIT	1/100 mm

Special Technique

TOY48 Four-Track Inner Groove Key: Picking Method and Key Cutting

A four-track inner groove key has 4 working tracks, which is why it is called four-track. But both sides of this key are exactly the same. This tool has two lifters for the A group and two lifters for the B group.

The picking method is described below.

This tool can read the depth codes for the A and B groups before the lock has been opened. Write down the codes you read, then pick the lock to those codes, and the job is more convenient. (When you need to make a key, you can also read the codes straight off in the same way.)

This is how its decoding method works:

Push the tension bar to the left and hold it tight. Then use lifter A to press down, one at a time, every wafer it can reach. Once a wafer is pressed down, the number the lifter points to is the depth code of that wafer. Follow the same method with the tension bar pushed to the right and held tight: use lifter B to press down, one at a time, every wafer it controls. That is how you read the B-group depth codes.

> Notes:

1. The method is easy to remember in short form: tension to the left, read A; tension to the right, read B.
2. When reading a code you have to hold the wafer down tight with the lifter, but do not let it move. If a wafer shifts the way it does while you are picking the lock, you can no longer read the code and have to start over.
3. This method does not work on every car lock. Whether it can be used at all depends entirely on the internal structure of the cylinder.

SOURCE PAGE 062

This lock is divided into an A group and a B group. The lock has 5 pairs of half wafers, 10 wafers in all: 5 in the A group and 5 in the B group. Depth 1 is the deepest — you could also say it sits closest to the edge; depth 5 is the highest. When you cut a key, depth 5 needs no cutting; you only cut 1 and 3.

When you cut the key, true up the angle, straighten it, put the two halves together, insert it into the keyway, and test it. If it turns, file it again to a very smooth transition.

Now, with the depth codes known, picking:

Pick the A group first. This lock is picked toward the rear of the car; in a left-hand-drive car, pick toward the rear.

First pick 3 and 5 of the A group. Once A-group 3 and 5 are in position, pick 3 or 5 of the B group. While lifting, watch how much force you put on the lifter. Once the whole A group is in position, pick the B group. After both the A and B groups are all set, the lock turns 45°; once it has turned 45°, this lock still needs further picking of the B group.

After the lock is open, you also have to return the lock to position — again B-group 3 and 5. Control the force and it returns.

HY22 2-in-1

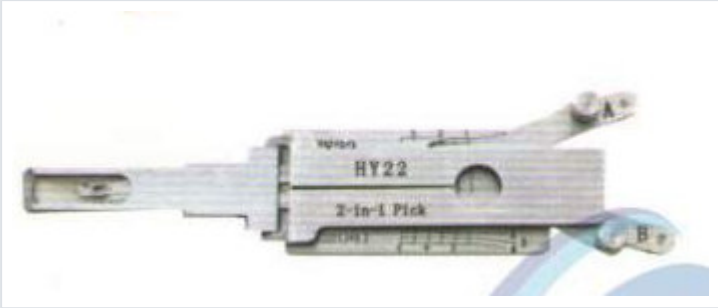


Fig. 62.1 HY22 2-in-1 tool, with the A lifter at one end and the B lifter at the other.

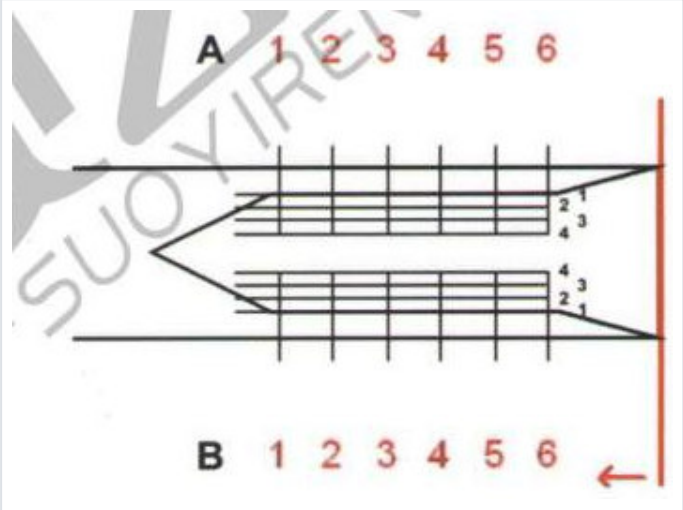


Fig. 62.2 HY22 key bitting schematic: bitting positions 1 through 6 on rows A and B, with depth scale 1 to 4 at each row and the reference line at right.

APPLICABLE VEHICLES Hyundai, Kia

The HY22 is built much like the TOY48. The cylinder it fits has 6 groups of half wafers, 12 wafers in all, and 4 depth codes. When you cut a key, depth 1 takes the most cutting and depth 4 the least. It is also a 4 track inner groove design and is likewise split into an A group and a B group.

Insert the tool into the keyway and test the bitting positions. On the tool's reading panel the A and B groups show as wafers at positions 1, 3, and 5 on one side and at positions 2, 4, and 6 on the other. In a left-hand-drive car this lock is picked toward the rear of the car, which means applying force to the tension bar clockwise. Test positions 1, 3, and 5 first, then 2, 4, and 6.

Start by probing each wafer with the lifter. Leave alone for now any wafer with a large amount of travel; a wafer that springs back within a very small range is probably already set. Look for the wafer that will not move at all, press it, then probe again. If it is set, it too will spring within a small range, and at the same time you will feel the tool turning in the direction of the force you are applying.

Because this lock uses half wafers, after it opens through one angle you still have to pick the B group. On a four-track inner groove lock picked clockwise, it is always the B group that is binding. Once it is fully open, decode it and write down the depth codes you read. Because this lock has 12 half wafers, when you pick it clockwise the B group is still binding, and it still has to be returned to position.

Now for cutting the key: depth 1 is the one closest to the edge of the key. Cut away the excess and you have the one key you need. After cutting, always file the transition smooth so the key inserts and withdraws easily.

Numerical Data

The figure at left gives the bitting position and cut depth data that applies to HY22. (Unit: 1/100 mm)

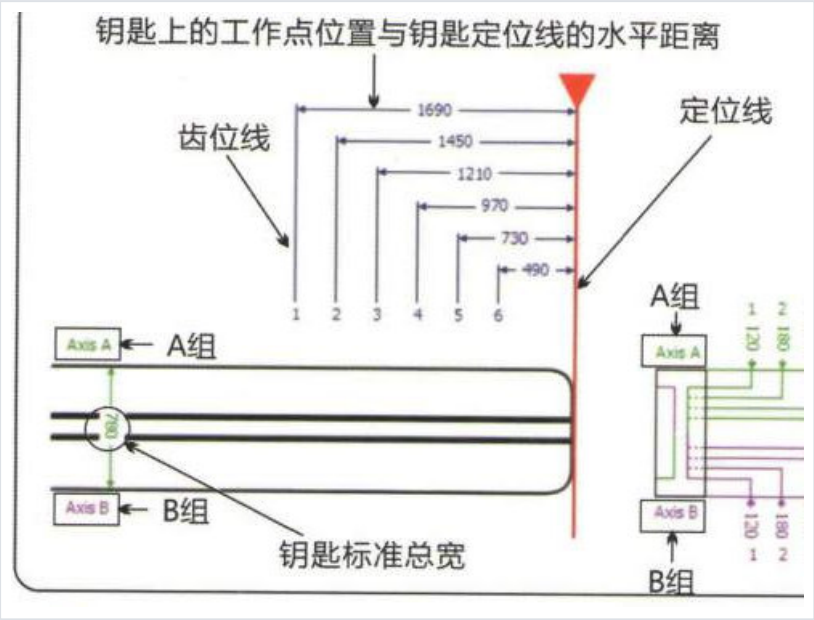


Fig. 63.1 HY22 bitting chart: horizontal distance from the working point at bitting positions 1 through 6 to the key reference line, drawn over the key blade outline.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
齿位线 → Wafer position line
定位线 → Reference line
A组 → A group
B组 → B group
Axis A → Axis A
Axis B → Axis B
钥匙标准总宽 → Key standard overall width

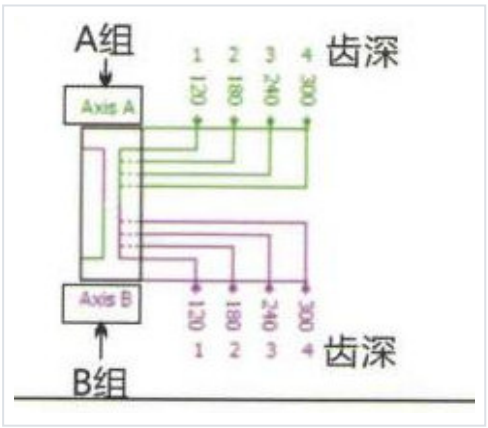


Fig. 63.2 Cut depth detail: the A axis and the B axis of the blade section, with depth codes 1 through 4 dimensioned on each.

A组 → A group
B组 → B group
Axis A → Axis A
Axis B → Axis B
齿深 → Cut depth



Fig. 63.3 HY22 key blank: front view and blade cross-section.

BITTING POSITIONS 1-6, HORIZONTAL DISTANCE TO THE REFERENCE LINE	1690, 1450, 1210, 970, 730, 490
KEY STANDARD OVERALL WIDTH	780
A-GROUP CUT DEPTHS AT DEPTH CODES 1, 2, 3, 4	120, 180, 240, 300
UNIT	1/100 mm

VA2 2-in-1



Fig. 63.4 VA2 2-in-1 tool, with its key blank below.



Fig. 63.5 VA2 2-in-1 tool seen from the opposite side.

Applicable Cars

APPLICABLE VEHICLES	PEUGEOT, CITROEN

Open Direction

When the driver's seat is on the left, open the lock counterclockwise.

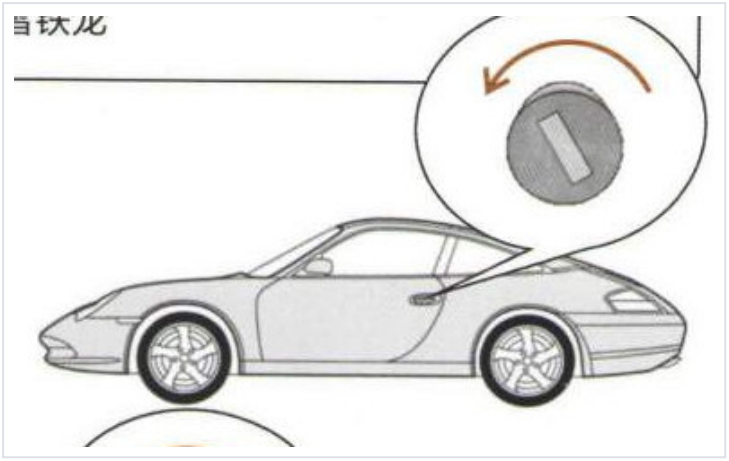


Fig. 63.6 Left-hand-drive car: turn the plug counterclockwise to open the door lock.

When the driver's seat is on the right, open the lock clockwise.

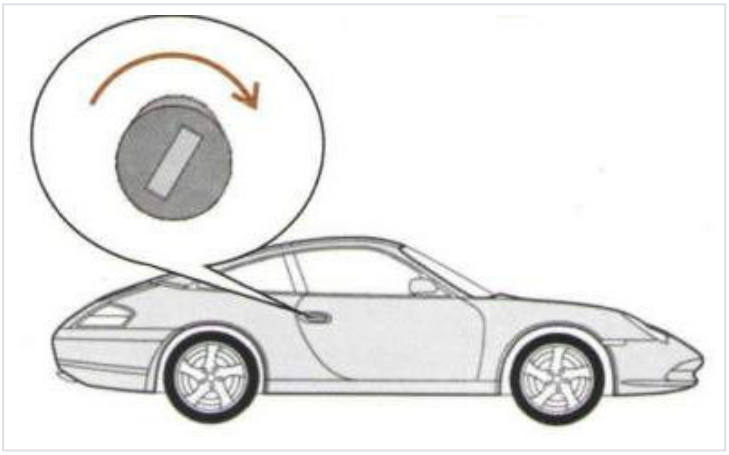


Fig. 63.7 Right-hand-drive car: turn the plug clockwise to open the door lock.

Lock Overview

This lock has 6 wafers and 6 cut depths. Depth 1 removes the most material from the key; depth 6 is the shallowest. The door lock and the ignition lock carry the same number of wafers; the fuel filler lock has wafers at 2, 3, 4, 5, and 6. The wafers are whole wafers, and because the drive points sit in different positions the key shows a four-track inner groove pattern.

SOURCE PAGE 064

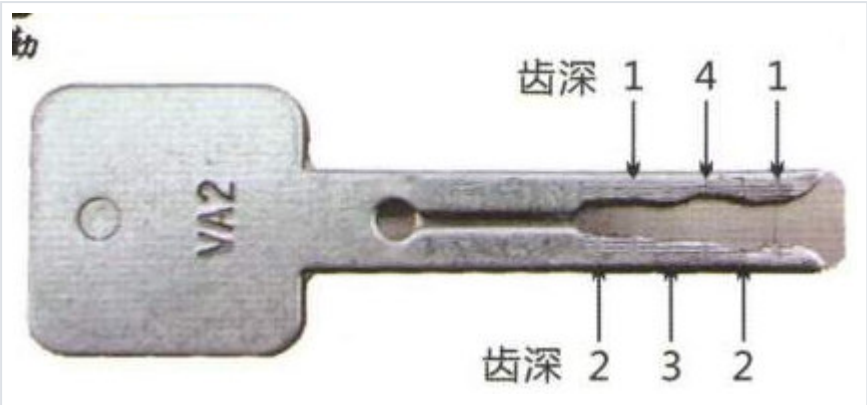


Fig. 64.1 VA2 key. The cut depth is marked over three positions along each edge: 1, 4, 1 on one edge and 2, 3, 2 on the other. The blade is stamped VA2.

齿深 → Cut depth

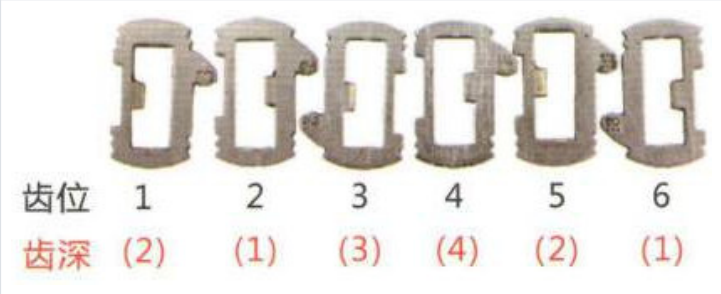


Fig. 64.2 The six wafers in position order, with the cut depth each one carries: position 1 (2), position 2 (1), position 3 (3), position 4 (4), position 5 (2), position 6 (1).

齿位 → Wafer position　　齿深 → Cut depth

WAFER POSITIONS	1, 2, 3, 4, 5, 6
CUT DEPTH AT EACH POSITION (WAFER CHART)	2, 1, 3, 4, 2, 1
CUT DEPTHS ON THE KEY, UPPER EDGE	1, 4, 1
CUT DEPTHS ON THE KEY, LOWER EDGE	2, 3, 2
KEY CUTTING CHART, ROW A (POSITIONS 2, 4, 6)	3, 2, 3
KEY CUTTING CHART, ROW B (POSITIONS 1, 3, 5)	4, 3, 1

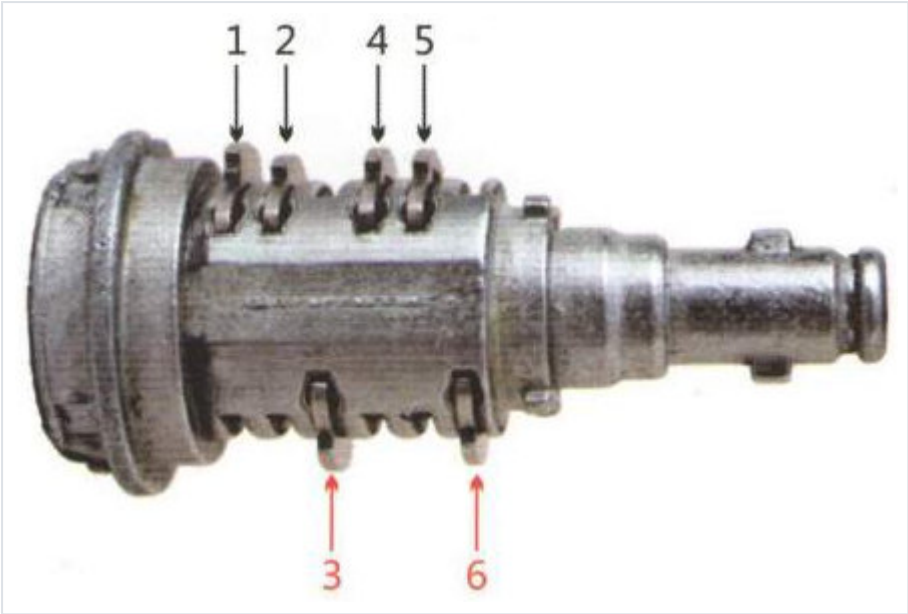


Fig. 64.3 Cylinder cutaway with the wafers exposed and no key inserted. Positions 1, 2, 4, and 5 are arrowed above the plug; positions 3 and 6 are arrowed below it.

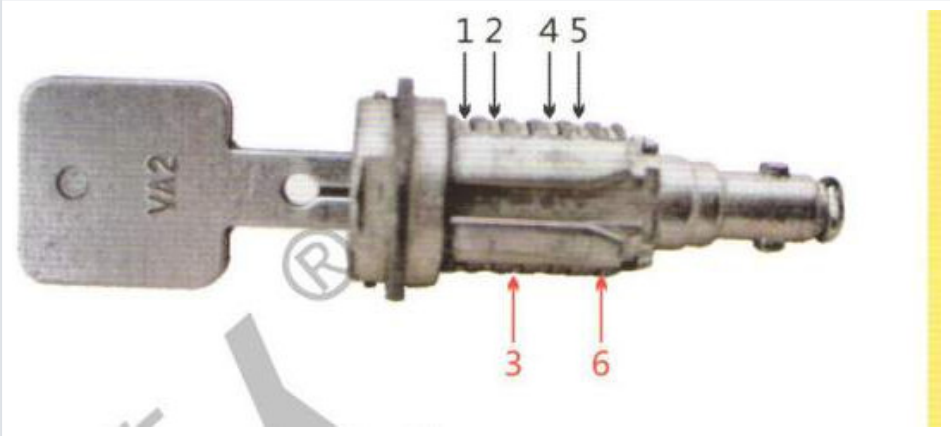


Fig. 64.4 The same cylinder with the VA2 key inserted. Positions 1, 2, 4, and 5 run along one side and positions 3 and 6 along the other.

DECODING

Read backward once the lock is open.

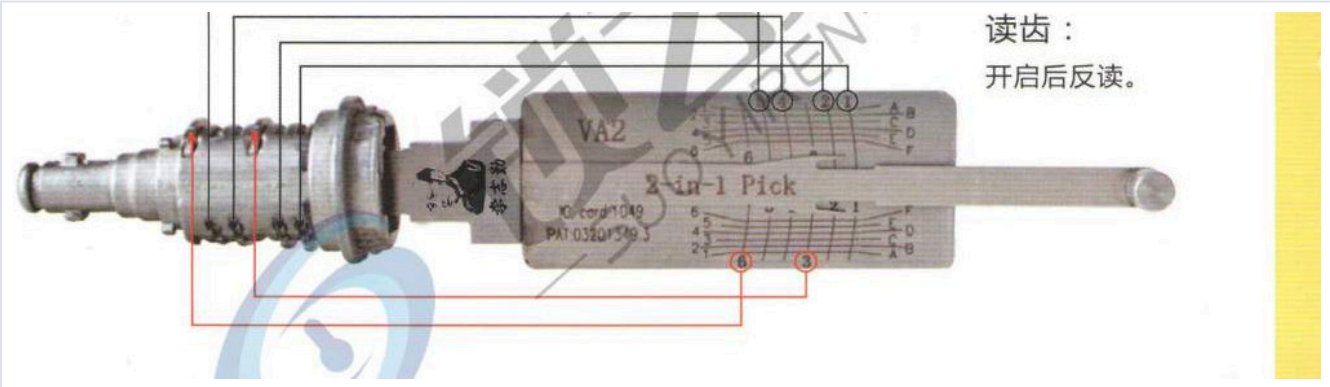


Fig. 64.5 VA2 2-in-1 tool in the cylinder, with each wafer position wired to its line on the reading panel. The red lines below pick up positions 3 and 6. The panel is engraved VA2, 2-in-1 Pick, IC card 1049, and PAT: 03201349.3.

VA2

KEY CUTTING

The diagram above shows a key as it comes off a CNC key machine. When you do not have a CNC machine, hand-cutting the key still has to follow the slope between one cut and the next on this chart.

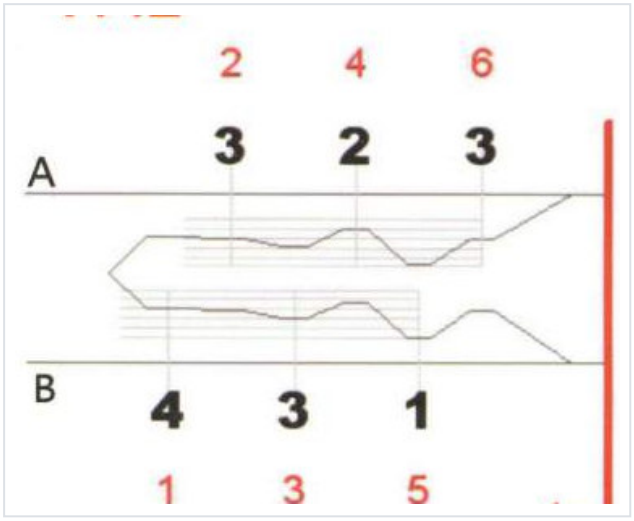


Fig. 64.6 VA2 key cutting chart. Row A carries depths 3, 2, 3 at positions 2, 4, and 6; row B carries depths 4, 3, 1 at positions 1, 3, and 5. The arrow marks the cutting direction, from the tip end.

SOURCE PAGE 065

Special Technique

Cutting a key on a CNC machine: when you enter the bitting numbers from the key card, enter them in reverse. If the card reads ABCDEF, enter FEDCBA (654321). Bitting numbers read off with the 2-in-1 tool are entered directly, as they read.

Cutting a key by hand: at a position that carries a cut, cut straight to the bitting number — group A 2 4 6, group B 1 3 5. The positions that carry no cut — A 1 3 5 and B 2 4 6 — still have to be cut.

(How to work out the bitting number for a position that has no cut: coefficient 7 minus B = A; coefficient 7 minus A = B. <After cutting, the inner groove is the same width.>)

> Note: a hand-cut key still carries surplus material, so you have to file the transition round and smooth before the key will slide into the keyway.

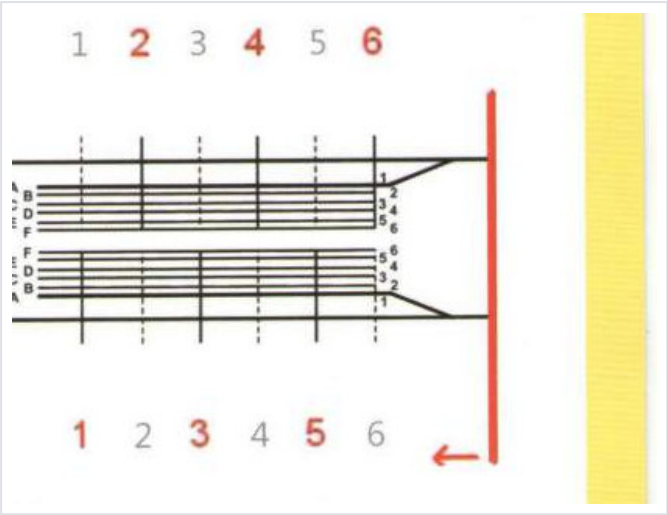


Fig. 65.1 VA2 bitting chart: group A above the reference line, group B below it, positions 1 through 6 along both edges. Depth codes run A to F on the A side and F to A on the B side, so the two groups mirror each other. The arrow gives the cutting direction.

Numerical Data

The diagram below gives the bitting position and cut depth data that applies to VA2. (Unit: 1/100 mm)

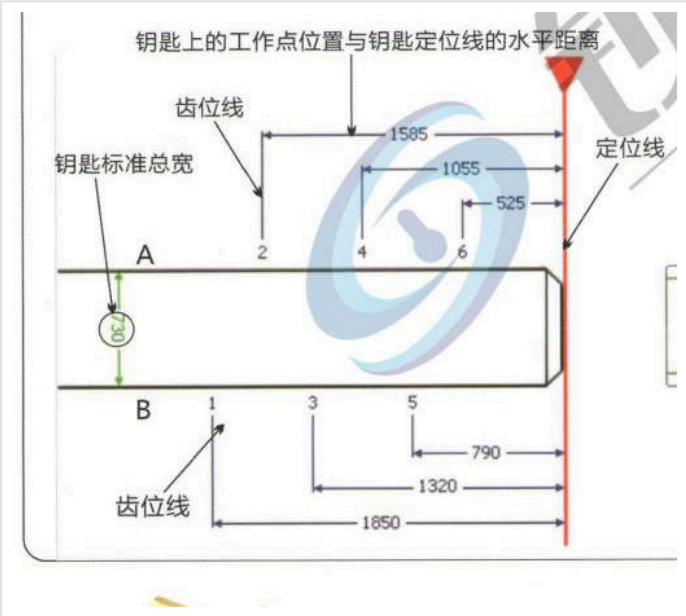


Fig. 65.2 VA2 numerical data. Positions 1 to 6 are laid out along the key, and each one is measured from its position line to the reference line. Key standard overall width 30.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line

齿位线 → Wafer position line

定位线 → Reference line

钥匙标准总宽 → Key standard overall width

POSITION 1 TO REFERENCE LINE	1850
POSITION 2 TO REFERENCE LINE	1585
POSITION 3 TO REFERENCE LINE	1320

POSITION 4 TO REFERENCE LINE	1055
POSITION 5 TO REFERENCE LINE	790
POSITION 6 TO REFERENCE LINE	525
KEY STANDARD OVERALL WIDTH	30
UNIT	1/100 mm

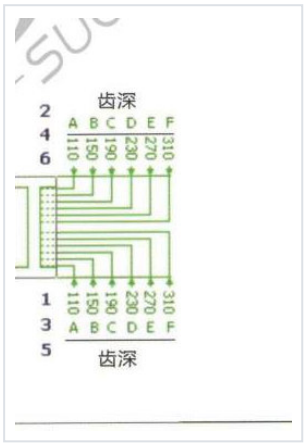


Fig. 65.3 VA2 depth chart. Group A (positions 2, 4, 6) and group B (positions 1, 3, 5) both run the depth codes A through F. The figures are the cut depth of each code in 1/100 mm.

齿深 → Cut depth

CUT DEPTH, CODE A	110
CUT DEPTH, CODE B	150
CUT DEPTH, CODE C	190
CUT DEPTH, CODE D	230
CUT DEPTH, CODE E	270
CUT DEPTH, CODE F	310
UNIT	1/100 mm



Fig. 65.4 Black-headed key blank, with the uncut blade below the head and the cut section shown as the solid black band.

VA6 2-in-1



Fig. 65.5 VA6 v.2 2-in-1 Picks, reading panel side. Each blade is engraved VA6 v.2 over 2-in-1 Pick.



Fig. 65.6 VA6 v.2 2-in-1 Pick with a black-headed key and a cylinder, seen from the opposite side.

SOURCE PAGE 066

Applicable Cars

APPLICABLE VEHICLES	peugeot, citroen, Renault, Toyota, DS, smart

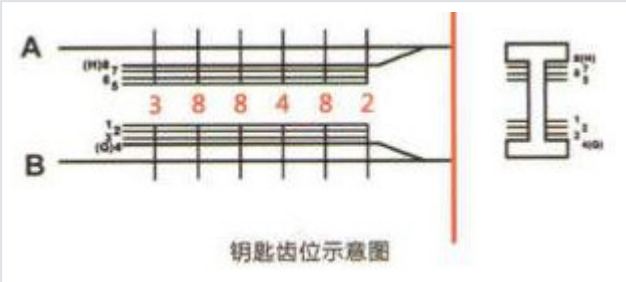


Fig. 66.1 Key bitting schematic: the A row above the reference line and the B row below it, with the depth figures 3, 8, 8, 4, 8, 2 at positions 1 through 6. The keyway section is drawn at right.

钥匙齿位示意图 → Key bitting schematic

This vehicle lock has 6 bitting positions and 8 cut depths. Neither the door lock nor the ignition lock has a missing wafer.

Lock Overview

VA6 is the upgraded version of VA2, so a VA2 tool will open the lock normally but cannot decode it normally!

When you have opened a lock with VA2 and then find that you cannot decode it, the lock is definitely VA6.



Fig. 66.2 Door lock cylinder face with the dust shutter closed; the keyway sits in the center of the plug.

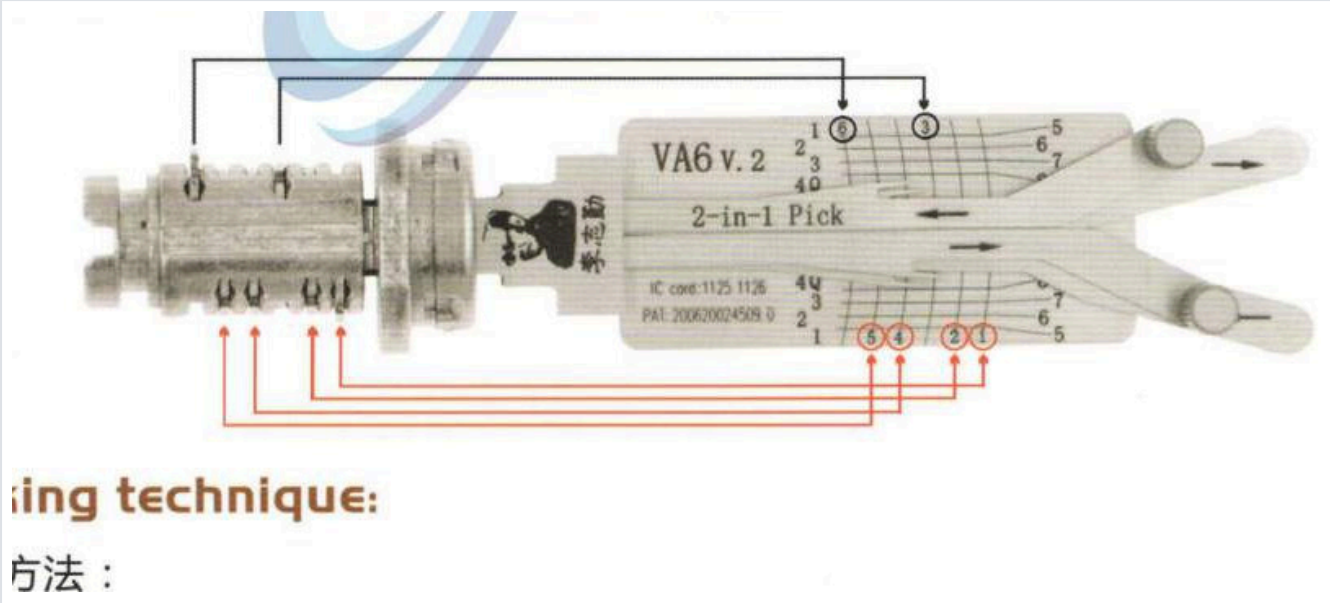


Fig. 66.3 VA6 v.2 2-in-1 Pick in the cylinder, with the wafer positions wired to the numbers on the reading panel: 6 and 3 on the upper panel, 5, 4, 2, and 1 on the lower panel. The arrows printed on the panel show the stroke direction. The panel is engraved VA6 v.2 / 2-in-1 Pick / IC card: 1125 1126.

Picking Technique

Start by inserting the tool and testing the bitting positions. VA6 is a special four-track inner groove key: it has no half wafers, and the tool acts directly on the working points. Because the lifter that controls each bitting position is not fixed, you have to test every position separately with all 4 lifters; the one that springs is the lifter that actually works that position.

> Once you have found them all, lift each one home in turn and the lock opens.

SOURCE PAGE 067

Decoding

Because this tool works on the working points, you decode forward when reading — the opposite of VA2, and the two must not be confused.

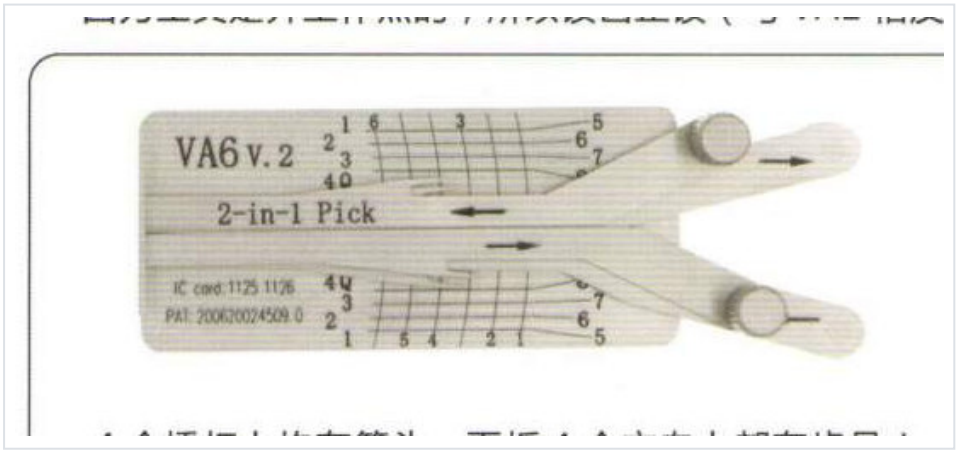


Fig. 67.1 VA6 v.2 2-in-1 Pick, reading panel side. Both panels are engraved VA6 v.2 / 2-in-1 Pick / IC card: 1125 1126, with position numbers and stroke arrows.

Decode after opening. Whichever lifter opened a position is the lifter you read that position with: press the lifter down against its spring and read in the direction the arrow on that lifter points, and record each bitting number in turn.

All 4 lifters carry an arrow, and the panel carries bitting numbers in all 4 directions!

Numerical Data

For CNC cutting, just enter the bitting numbers directly.

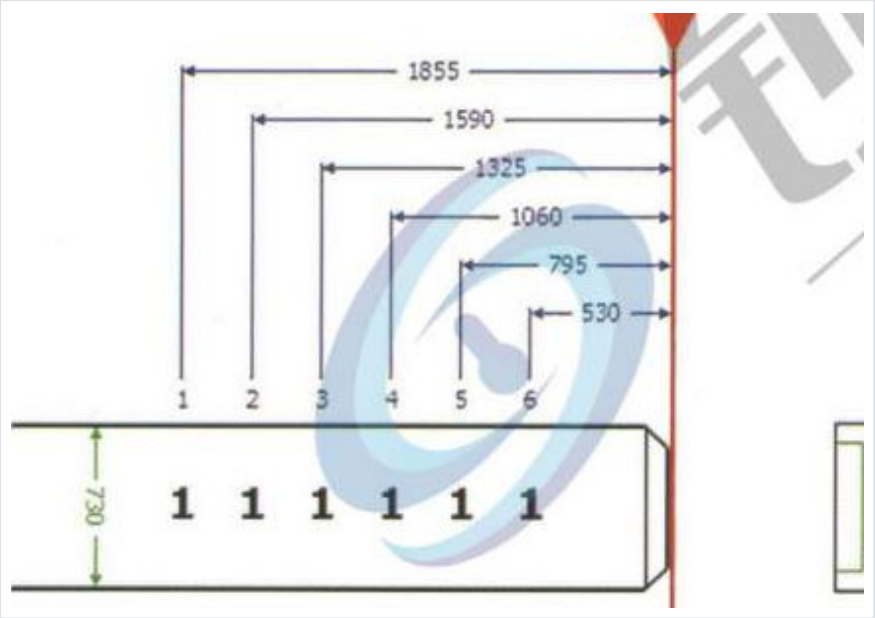


Fig. 67.2 VA6 numerical data: positions 1 to 6, each measured from its position line to the reference line, with the key standard overall width at left.

POSITION 1 TO REFERENCE LINE	1855
POSITION 2 TO REFERENCE LINE	1590
POSITION 3 TO REFERENCE LINE	1325
POSITION 4 TO REFERENCE LINE	1060
POSITION 5 TO REFERENCE LINE	795
POSITION 6 TO REFERENCE LINE	530
KEY STANDARD OVERALL WIDTH	730
UNIT	1/100 mm

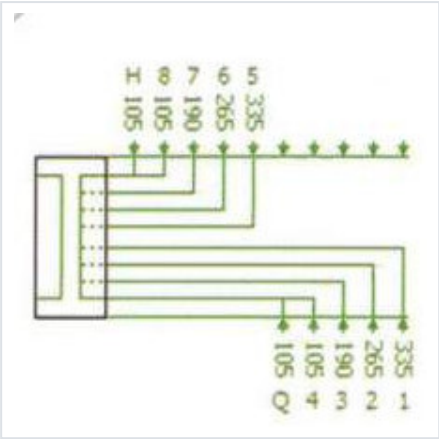


Fig. 67.3 VA6 depth chart. Group H covers positions 5 through 8 with cut depths 325, 265, 190, 105 and 105; group Q covers positions 1 through 4 with the same five figures, 325, 265, 190, 105 and 105.

CUT DEPTH, POSITION 5 (H)	325
CUT DEPTH, POSITION 6 (H)	265
CUT DEPTH, POSITION 7 (H)	190
CUT DEPTH, POSITION 8 (H)	105



Fig. 67.4 Black-headed key blank shown beside the data, with the cut section drawn below the blade.

Hand-Cutting a Key

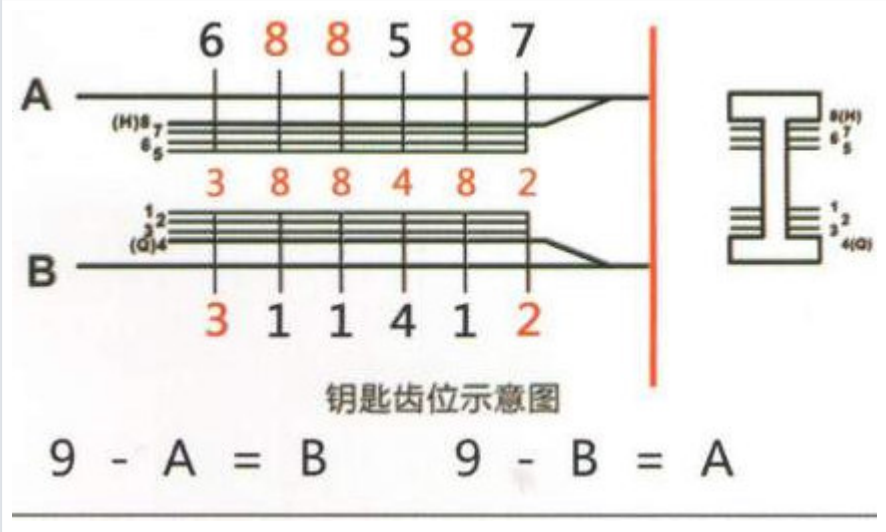


Fig. 67.5 Hand-cutting chart: black figures 6, 8, 8, 5, 8, 7 above the A line, red figures 3, 8, 8, 4, 8, 2 between the A and B lines, and red figures 3, 1, 1, 4, 1, 2 below the B line. The keyway section is drawn at right and the working formulas are printed beneath: 9 - A = B and 9 - B = A.

钥匙齿位示意图 → Key bitting schematic

Write the bitting numbers you have decoded into groups A and B: 1234 (Q) goes in group B, 5678 (H) goes in group A. As the illustration shows, the positions that carry no bitting number also have to be cut (how to work them out: coefficient 9 minus the group B bitting number = the group A bitting number to enter; coefficient 9 minus the group A bitting number = the group B bitting number. After cutting from the front, the inner groove is the same width).

SOURCE PAGE 068

Special Technique

How to enter the bitting from the tag number.



Fig. 68.1 Key tag with the barcode and the tag number C1NC 1SAFCCD; the second line of the sticker reads C9000001FUBJ.

Locate the tag number, then read its last six characters backward: that is the bitting.



Fig. 68.2 Key tag with the barcode and the tag number C1NF 1SCAFCAF; the second line of the sticker reads C9000000MW72.

For example: FACFAC (the bitting).

Sided Groove Two Track Key

HU43 2-in-1

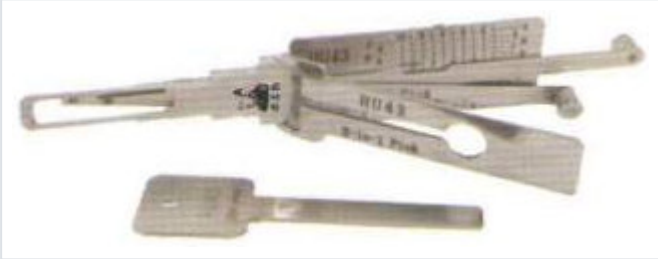


Fig. 69.1 HU43 2-in-1 tool with its lifter and tension bar, next to the matching key blank.

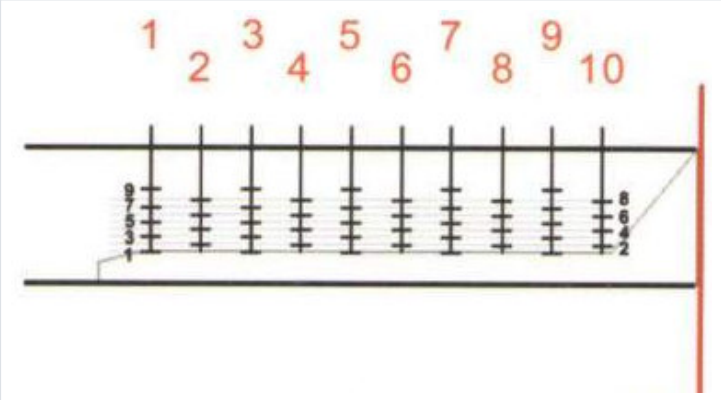


Fig. 69.2 Key wafer position schematic: bitting positions 1 through 10 along the blade, with the reference line at the shoulder.

APPLICABLE VEHICLES	Opel
PICKING DIRECTION	Door lock on the left side: open counterclockwise. Door lock on the right side: open clockwise.

This lock has 10 cuts at the ignition and 7 cuts at the door, positions 1 to 7. To cut a key from the door lock you have to look up 8, 9, and 10 in the database.

On this lock, bitting positions 1, 3, 5, 7, and 9 carry the depth codes 1, 3, 5, 7, and 9; bitting positions 2, 4, 6, 8, and 10 carry the depth codes 2, 4, 6, and 8. That makes 9 codes in all.

> Note: when you decode and cut a key, remember that the ignition lock on this vehicle has 10 bitting positions and 9 cut depths, while the door lock has 7 bitting positions, 1, 2, 3, 4, 5, 6, and 7, and no positions 8, 9, or 10. After decoding the door lock bitting you can look up the missing depth codes for 8, 9, and 10 in the database.

DEPTH CODES, BITTING POSITIONS 1, 3, 5, 7, 9	1, 3, 5, 7, 9
DEPTH CODES, BITTING POSITIONS 2, 4, 6, 8, 10	2, 4, 6, 8

The following is the picking and decoding method for this door lock.

On this lock, in a left-hand-drive car, opening toward the front of the car, that is counterclockwise, is easier. Insert the tool into the cylinder and test the bitting positions: test 1, 3, 5, and 7 first, then test 2, 4, and 6.

Ignition keys can be looked up through Instacode (database).

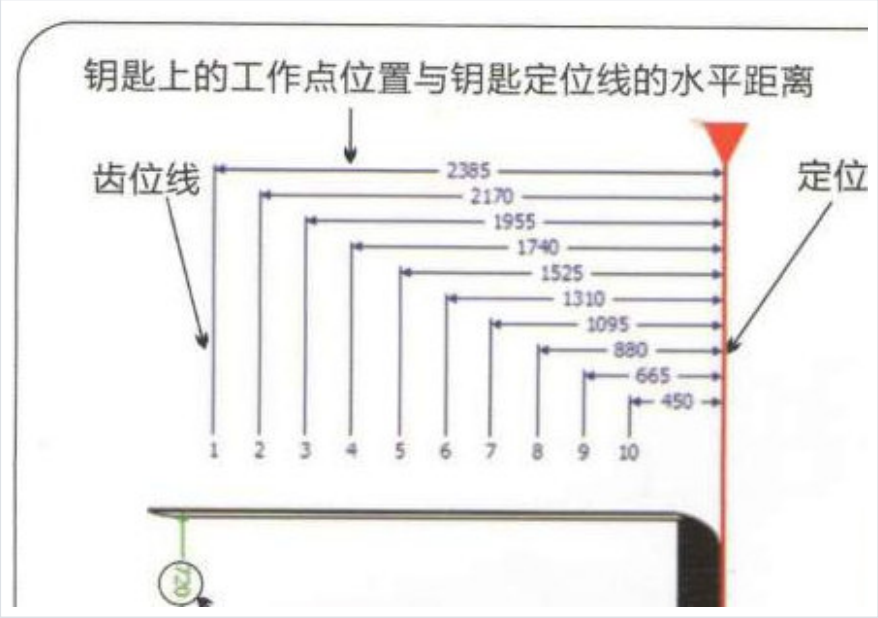


Fig. 69.3 Horizontal distance from the working point on the key to the key reference line, positions 1 through 10: 2385, 2170, 1955, 1740, 1525, 1310, 1095, 880, 665, 450, in 1/100 mm.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
齿位线 → Wafer position line
定位线 → Reference line
钥匙标准总宽 → Key standard overall width

NUMERICAL DATA

The chart at left gives the bitting position and cut depth data for HU43. (Unit: 1/100 mm)

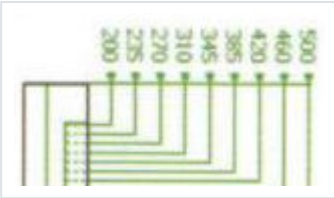


Fig. 69.4 Cut depth scale chart for HU43, the depth values stacked against the ten bitting positions.

齿深 → Cut depth



Fig. 69.5 HU43 key profile: the blade and the sided groove, shown with the cut key below.

SOURCE PAGE 070

YM30 2-in-1

APPLICABLE VEHICLES	SAAB
PICKING DIRECTION	Door lock on the left side: open counterclockwise. Door lock on the right side: open clockwise.



Fig. 70.1 YM30 2-in-1 tool with its lifter and tension bar, next to the matching key blank.

> Note: when decoding and cutting a key, the depth codes are as follows.

DEPTH CODES, BITTING POSITIONS 1, 3, 5, 7, 9	0, 2, 4, 6
DEPTH CODES, BITTING POSITIONS 2, 4, 6, 8, 10	1, 3, 5, 7

The door lock on this vehicle comes in 2 structures: one is missing bitting positions 2 and 3, the other is missing bitting positions 9 and 10.

The door lock has 8 wafers in all; the ignition lock has 10 wafers.

Once you have decoded the door lock bitting, look up the missing depth codes in Instacode (database).

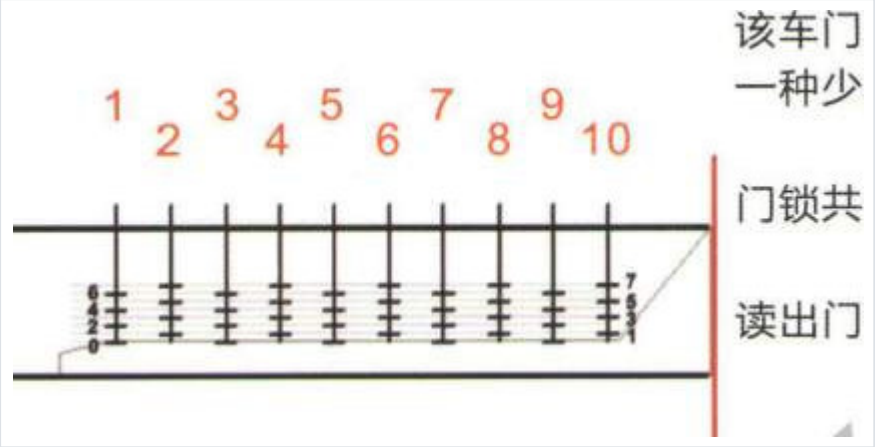


Fig. 70.2 Key wafer position schematic: bitting positions 1 through 10 along the blade, with the reference line at the shoulder.

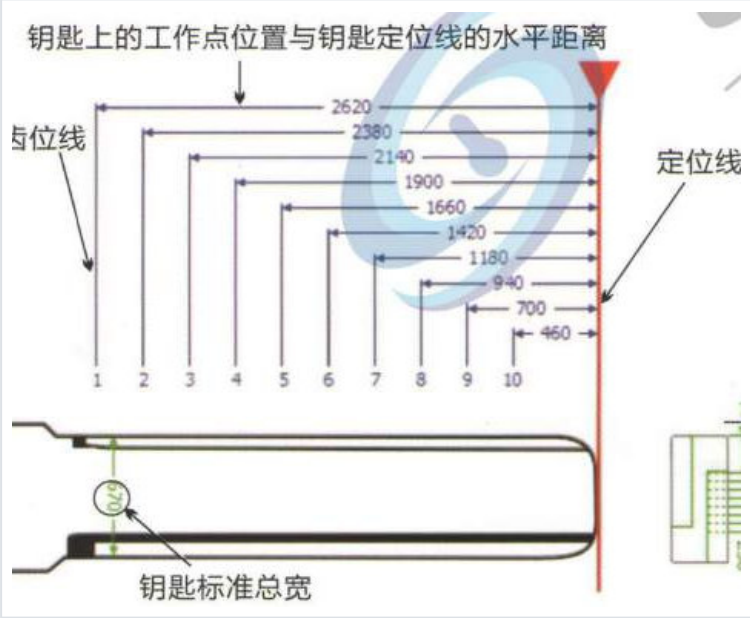


Fig. 70.3 Horizontal distance from the working point on the key to the key reference line, positions 1 through 10: 2620, 2380, 2140, 1900, 1660, 1420, 1180, 940, 700, 460, in 1/100 mm.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line

齿位线 → Wafer position line

定位线 → Reference line

钥匙标准总宽 → Key standard overall width

NUMERICAL DATA

The chart at left gives the bitting position and cut depth data for YM30. (Unit: 1/100 mm)

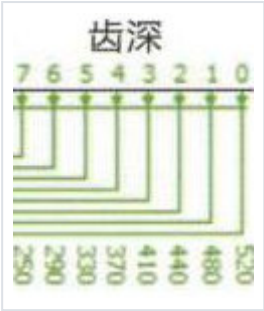


Fig. 70.4 Cut depth scale chart for YM30, the depth values stacked against the ten bitting positions.

齿深 → Cut depth



Fig. 70.5 YM30 key profile: the blade and its groove, with the key head below.

HU56 2-in-1

APPLICABLE VEHICLES Jaguar, Volvo

Opening toward the front of the car makes decoding easier.

On this lock both the door and the ignition have 8 bitting positions.

The key has 4 depth codes in all. No. 1 is the shallowest, No. 4 the deepest.

Decoding: read forward after opening.



Fig. 70.6 HU56 2-in-1 tool with its lifter and tension bar, next to the matching key blank.

SOURCE PAGE 071

GM45 2-in-1

APPLICABLE VEHICLES Holden



Fig. 71.1 GM45 2-in-1 tool with its lifter and tension bar, next to the matching key blank.

The door lock on this vehicle has 7 wafers; the ignition has 8.

The key has 6 depth codes in all. No. 1 is the shallowest, No. 6 the deepest.

For position 8, simply work in the order from 1 to 6.

Decoding: read forward after opening.

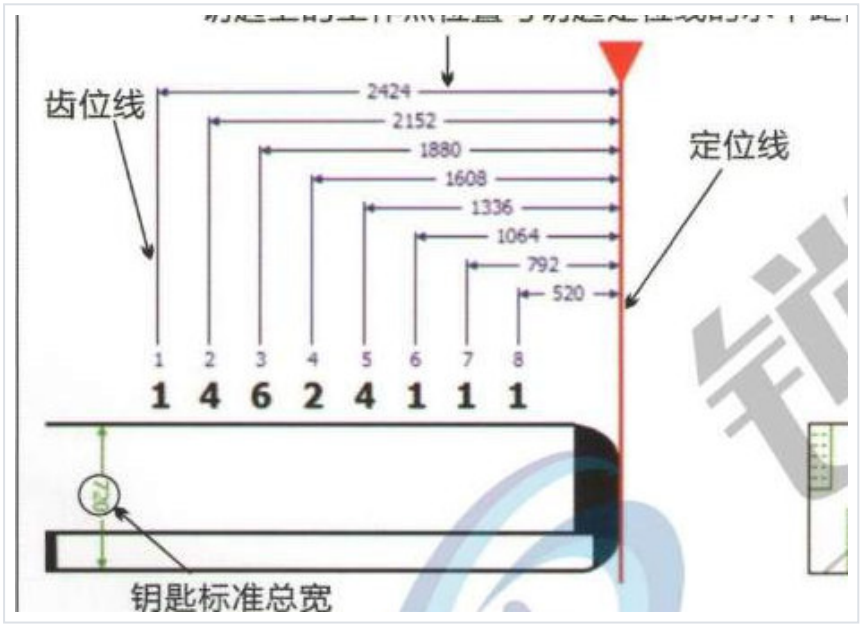


Fig. 71.2 Horizontal distance from the working point on the key to the key reference line, positions 1 through 8: 2424, 2152, 1880, 1608, 1336, 1064, 792, 520, in 1/100 mm. The depth row printed under the positions reads 1 4 6 2 4 1 1 1.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line

齿位线 → Wafer position line

定位线 → Reference line

钥匙标准总宽 → Key standard overall width

NUMERICAL DATA

The chart at left gives the bitting position and cut depth data for GM45. (Unit: 1/100 mm)

DEPTH ROW ON THE CHART, BITTING POSITIONS 1-8 1 4 6 2 4 1 1 1

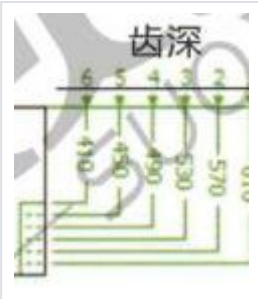


Fig. 71.3 Cut depth chart for GM45, the depth values 520, 792, 1064, 1336, 1608, 1880, 2152, and 2424 stacked against the eight bitting positions.

齿深 → Cut depth



Fig. 71.4 GM45 key profile: the blade and its groove, with the key head below.

HU64 2-in-1



Fig. 71.5 HU64 2-in-1 tool, reading panel face up, with the model marking HU64 and 2-in-1 Pick on the body.



Fig. 71.6 HU64 2-in-1 tool shown complete with the lifter and the tension bar.

APPLICABLE CARS

APPLICABLE VEHICLES MERCEDES-BENZ, CHRYSLER

SOURCE PAGE 072

PICKING DIRECTION

When the driver's seat is on the left, turn the plug counterclockwise to open the lock.

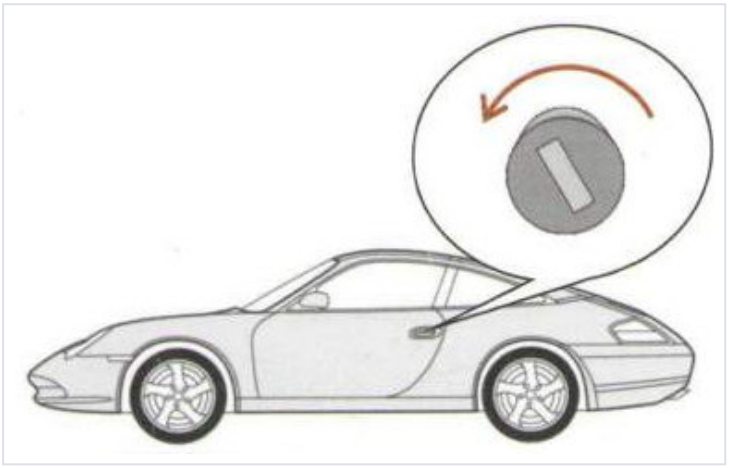


Fig. 72.1 Left-hand-drive car: turn the plug counterclockwise to pick the door lock.

When the driver's seat is on the right, turn the plug clockwise to open the lock.

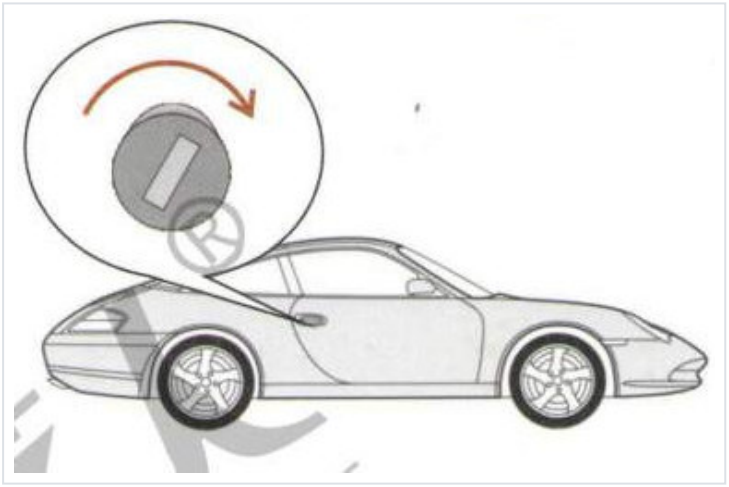


Fig. 72.2 Right-hand-drive car: turn the plug clockwise to pick the door lock.

LOCK OVERVIEW

This lock has 10 wafer positions and 5 cut depths in total. Depth 5 is the deepest and depth 1 the shallowest.



Fig. 72.3 Used HU64 (10) key, stamped 38, with the cut depth marked at each of the 10 bitting positions: 4 4 5 5 4 2 3 3 1 2.

齿深 → Cut depth

CUT DEPTHS, POSITIONS 1-10 4, 4, 5, 5, 4, 2, 3, 3, 1, 2

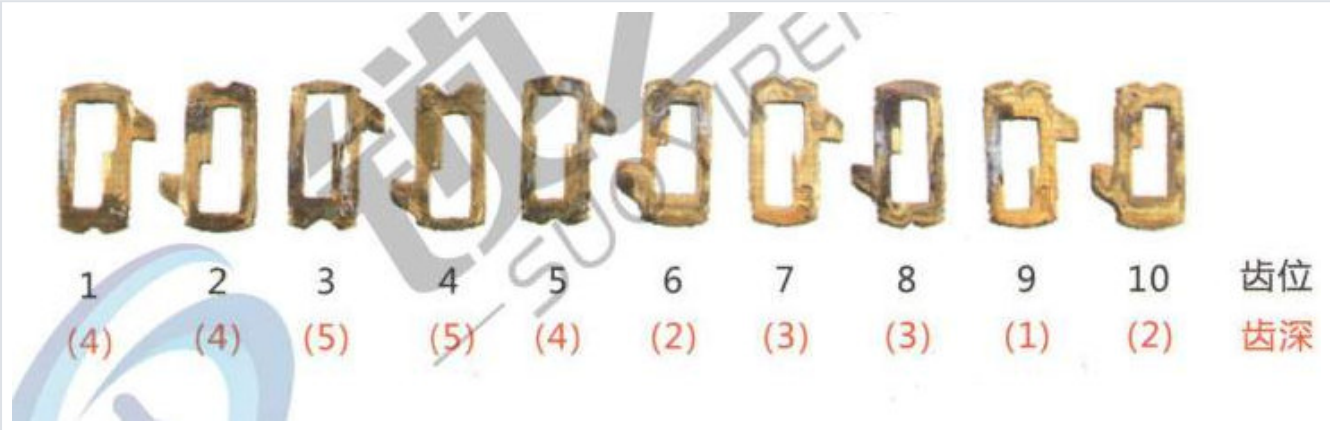


Fig. 72.4 The 10 wafers, one per bitting position, each with its cut depth: position 1 (4), 2 (4), 3 (5), 4 (5), 5 (4), 6 (2), 7 (3), 8 (3), 9 (1), 10 (2).

齿位 → Wafer position

齿深 → Cut depth

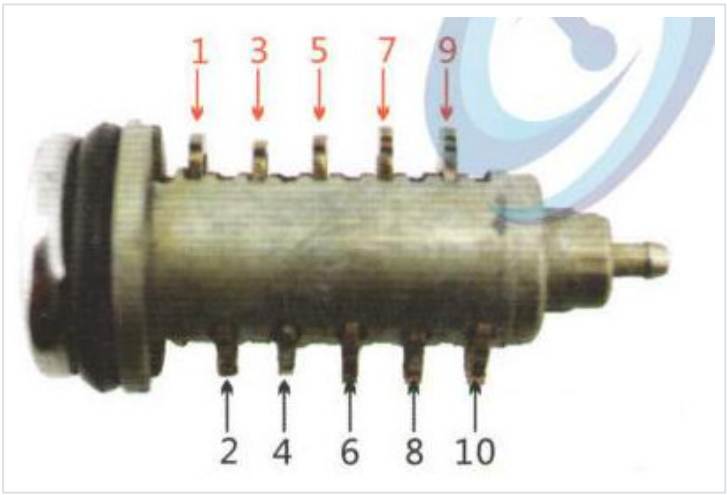


Fig. 72.5 Door cylinder with the key inserted. Wafers at positions 1, 3, 5, 7, and 9 sit on the upper side of the plug, and wafers at positions 2, 4, 6, 8, and 10 on the lower side.

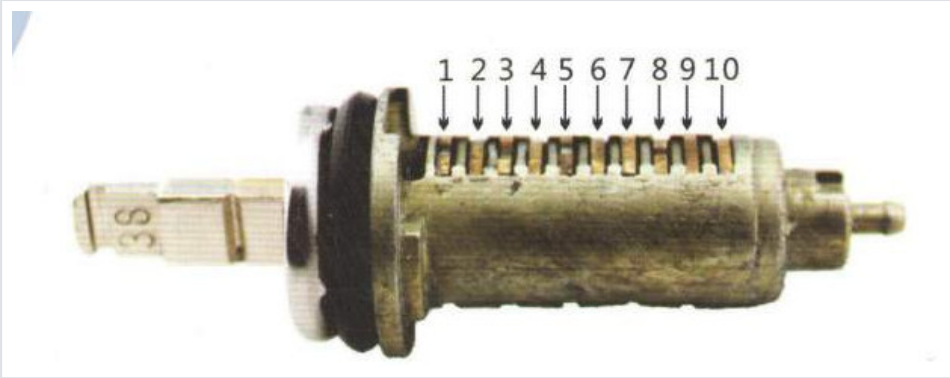


Fig. 72.6 The same cylinder seen from the opposite side, with the key in place and all 10 wafer positions numbered 1 through 10 in a single row.

DECODING

Read forward once the lock is open.

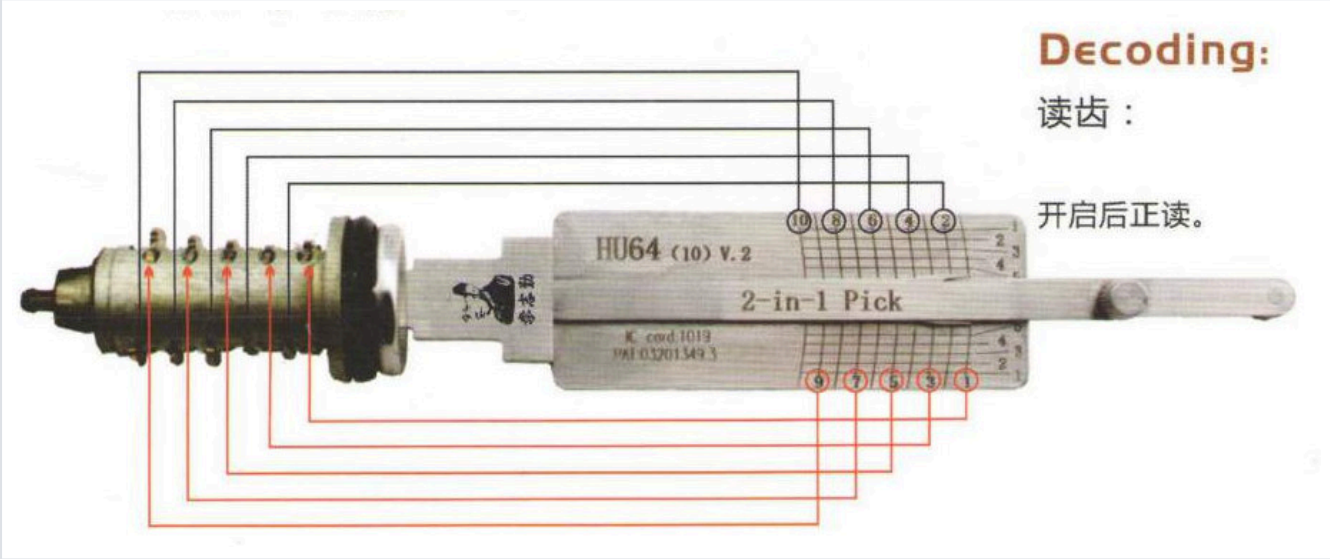


Fig. 72.7 HU64 (10) v.2 2-in-1 Pick in the cylinder, with every wafer leader-lined to its scale line on the reading panel: 10, 8, 6, 4, 2 on the upper row and 9, 7, 5, 3, 1 on the lower row.

李志勤 → Li Zhiqin
开启后正读。 → Read forward once the lock is open.
读齿 → Decoding

SOURCE PAGE 073

HU64

KEY CUTTING

The diagram above shows a key cut on a CNC machine. When you do not have a CNC machine, you still have to follow the slope between one cut and the next on this chart when you cut a key.

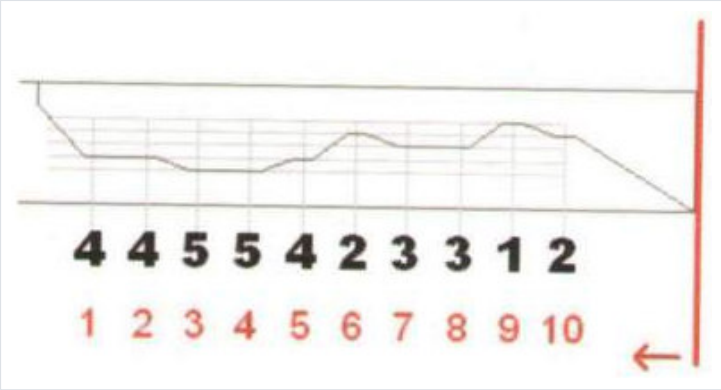


Fig. 73.1 HU64 key chart: bitting positions 1 through 10, with the depth row 4 4 5 5 4 2 3 3 1 2 and the direction of cut marked by the arrow.

NUMERICAL DATA

The diagram below gives the bitting position and cut depth data for HU64. (Unit: 1/100 mm)

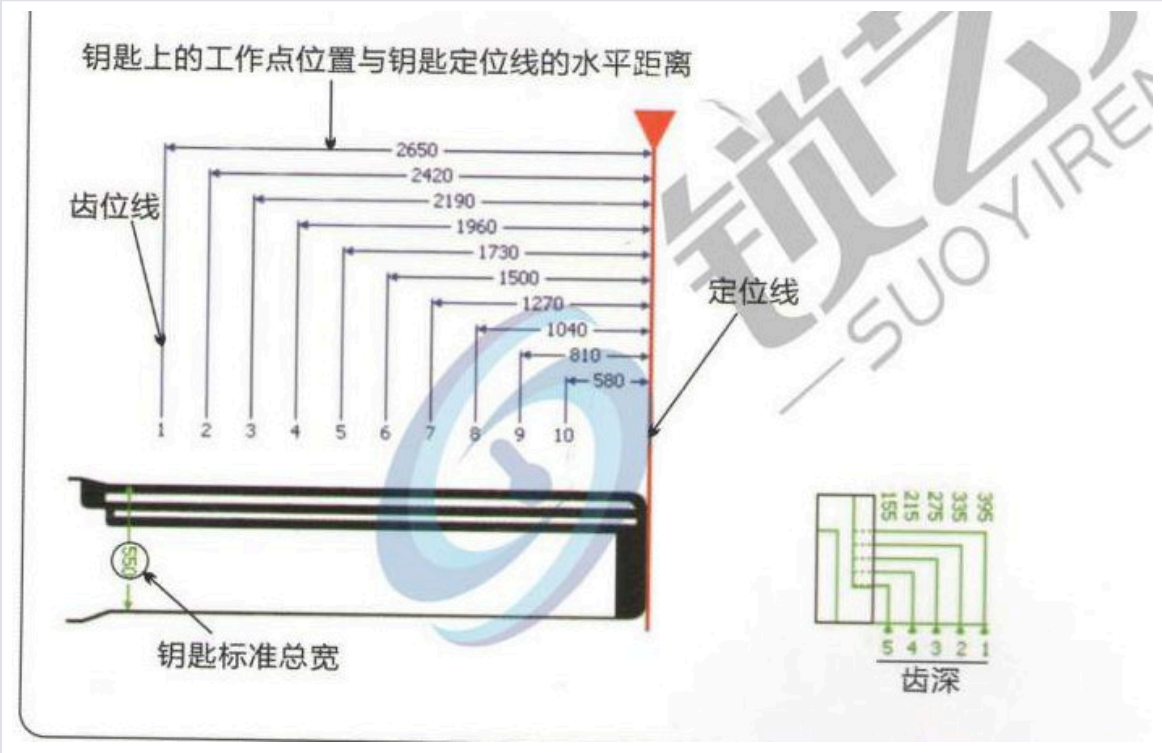


Fig. 73.2 HU64 numerical data: the horizontal distance from the working point at each bitting position to the key reference line (positions 1 through 10), the key standard overall width on the blade, and the cut depth chart for depth codes 1 through 5.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
齿位线 → Wafer position line
定位线 → Reference line
钥匙标准总宽 → Key standard overall width
齿深 → Cut depth

UNIT	1/100 mm
WORKING POINT DISTANCE FROM THE REFERENCE LINE, POSITIONS 1-10	2650, 2420, 2190, 1960, 1730, 1500, 1270, 1040, 810, 580
KEY STANDARD OVERALL WIDTH	265

CUT DEPTH, DEPTH CODES 1-5	395, 335, 275, 215, 155



Fig. 73.3 HU64 key profile: the key blank silhouette with its milled groove, and the keyway cross-section printed below it.

SPECIAL TECHNIQUE

The trunk lock sits upside down on the car. If that position is uncomfortable to work in, you can decode the wafers in the door lock instead and cut a key to open the trunk.

When you pick the door lock, the wafers drop back again and again if you pick toward the opening direction, while picking toward the locking direction is comparatively easy. Decode with the tool turned the other way, then pick forward according to those numbers, or cut a key and open the lock with it.

SOURCE PAGE 074

(On some late-model left-hand-drive locks, once the plug has been turned to the right through a small angle, every wafer shows a jump of one cut depth when you test it, and you can read the codes.)

This lock has 10 bitting positions and 5 cut depths.

The method for picking toward the rear of the car is described below.

Handling: apply force to the right on the tension bar, adding force clockwise, and test each wafer. While you lift with the lifter, watch how the tension bar in your left hand feels. If the tension bar is loaded heavily and the lifter will not move, you have to lift along with it; the two hands must work together and return together.

A wafer that stops above 5 is 4 or 3; a wafer that stops below 5 is 2 or 1; a wafer that stops at the 5 line is 5.

Decode once the lock is open: press the wafer that moved all the way down, and where it will not go any further is the depth code. A Mercedes HU64 has 10 bitting positions; some keys have 9 cuts in all and some have 10. The trunk and the ignition each have 10 cuts.

Pick toward the front of the car according to the depth codes you have read; picking toward the front of the car is the more critical technique. When you pick toward the rear of the car, keep the hand and the tension bar a little lighter and the lock opens more easily. When you pick toward the front, you must control every wafer: as you press each wafer you have to control the tension bar, or the wafer drops again as soon as you have pressed it.

First push the known No. 1 into position. When you lift the upper wafers, the lower ones must be pressed fully in; when you lift the lower wafers, the upper ones must be pressed fully in. Press them into position over and over, and the lock opens.

On some door locks, after the plug has been turned 90° to the left, leave the tool in that position and do not move it. Now pull the door handle outward with force. When you hear a mechanical click, let the door handle return and pull

the door handle again; this releases the locking mechanism of the door.

HU101 2-in-1



Fig. 74.1 HU101 2-in-1 tool, reading panel side. The panel is engraved HU101 and 2-in-1 Pick.



Fig. 74.2 The same HU101 2-in-1 tool from the opposite side, with the key blank shown below it.

APPLICABLE CARS

APPLICABLE VEHICLES	FORT, LAND ROVER, VOLVO, JAGUAR

SOURCE PAGE 075

PICKING DIRECTION

When the driver's seat is on the left, turn the plug clockwise to open the lock.

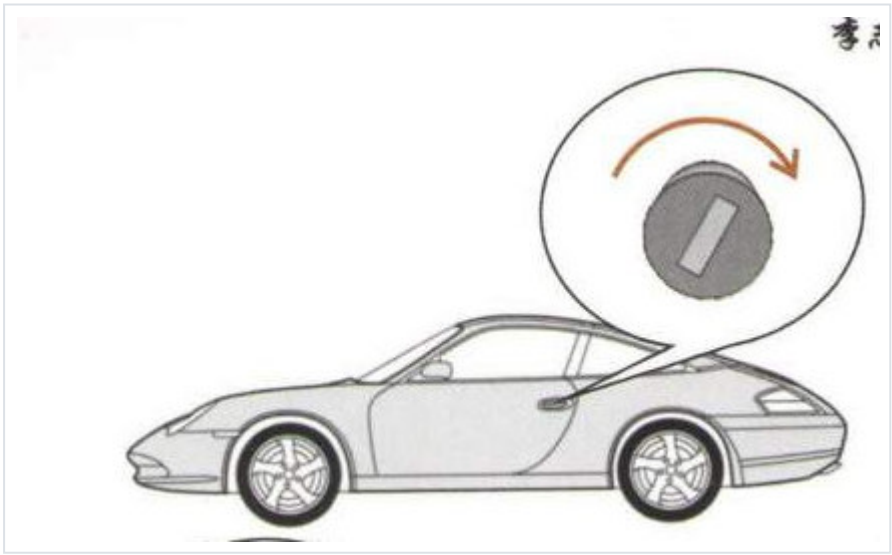


Fig. 75.1 Left-hand-drive car: turn the plug clockwise to pick the door lock.

When the driver's seat is on the right, turn the plug counterclockwise to open the lock.

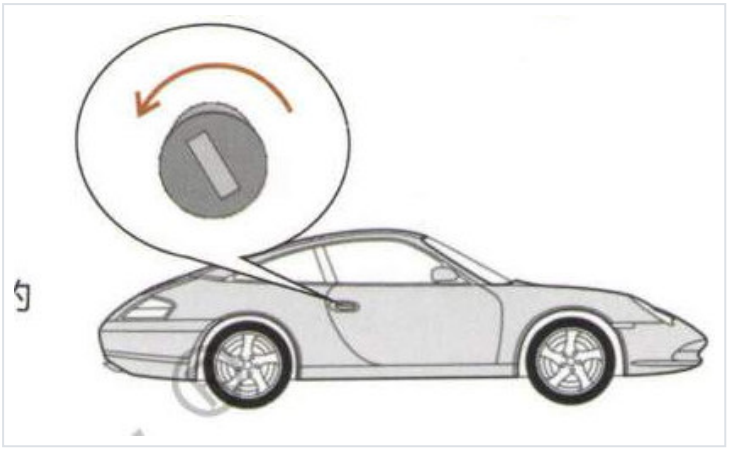


Fig. 75.2 Right-hand-drive car: turn the plug counterclockwise to pick the door lock.

LOCK OVERVIEW

This lock has 10 wafer positions and 5 cut depths in total. Depth 5 is the deepest and depth 1 the shallowest.

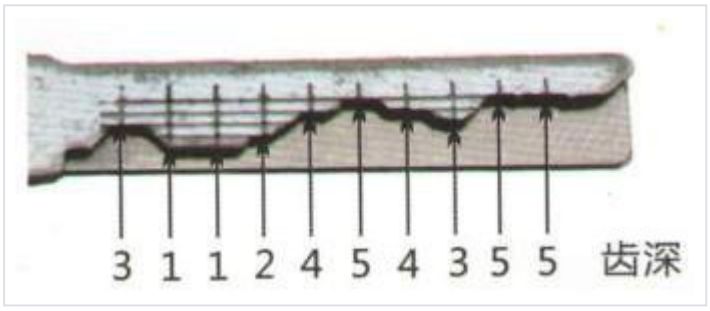


Fig. 75.3 Used HU101 key with the cut depth marked at each of the 10 bitting positions: 3 1 1 2 4 5 4 3 5 5.

齿深 → Cut depth

CUT DEPTHS, POSITIONS 1-10	3, 1, 1, 2, 4, 5, 4, 3, 5, 5

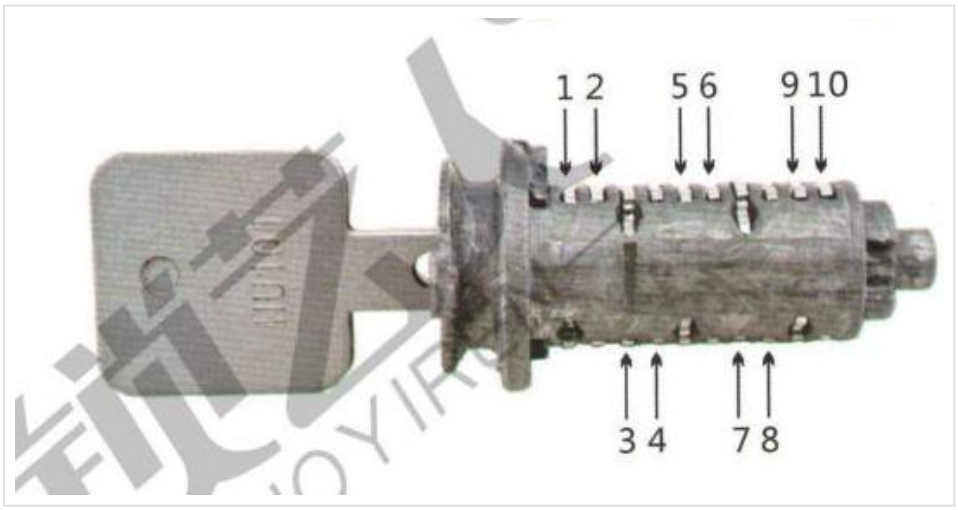


Fig. 75.4 Door cylinder with the key inserted. Wafers at positions 1, 2, 5, 6, 9, and 10 are arrowed from above, and wafers at positions 3, 4, 7, and 8 from below.

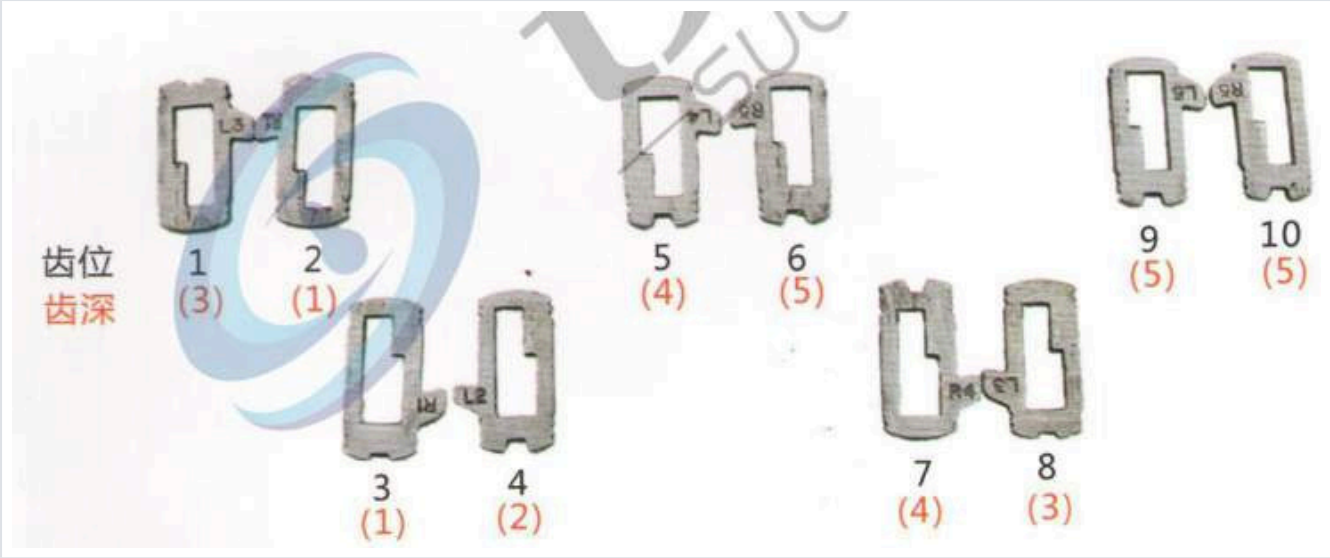


Fig. 75.5 The 10 wafers, each with its bitting position and cut depth: 1 (3), 2 (1), 3 (1), 4 (2), 5 (4), 6 (5), 7 (4), 8 (3), 9 (5), 10 (5).

齿位 → Wafer position
齿深 → Cut depth

DECODING

Read forward once the lock is open.

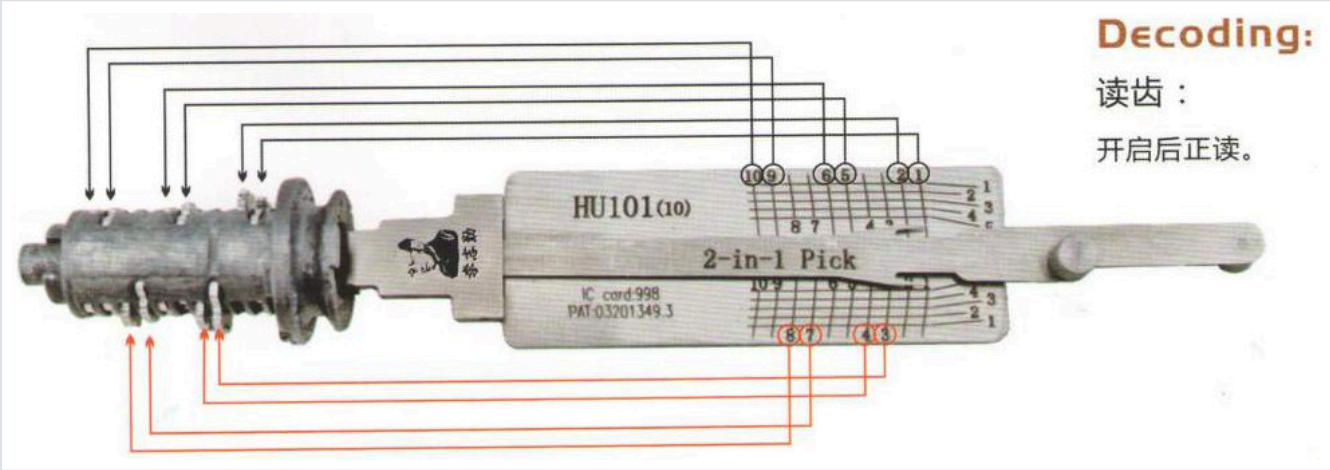


Fig. 75.6 HU101(10) 2-in-1 Pick in the cylinder, with every wafer leader-lined to its line on the reading panel: 10, 9, 6, 5, 2, 1 on the upper row and 8, 7, 4, 3 on the lower row.

李志勤 → Li Zhiqin
读齿 → Decoding
开启后正读。 → Read forward once the lock is open.

SOURCE PAGE 076

HU101

KEY CUTTING

The drawing at right shows a key cut on a CNC key machine. When you do not have a CNC machine, still follow the slope between adjacent cuts in this drawing when you cut a key.

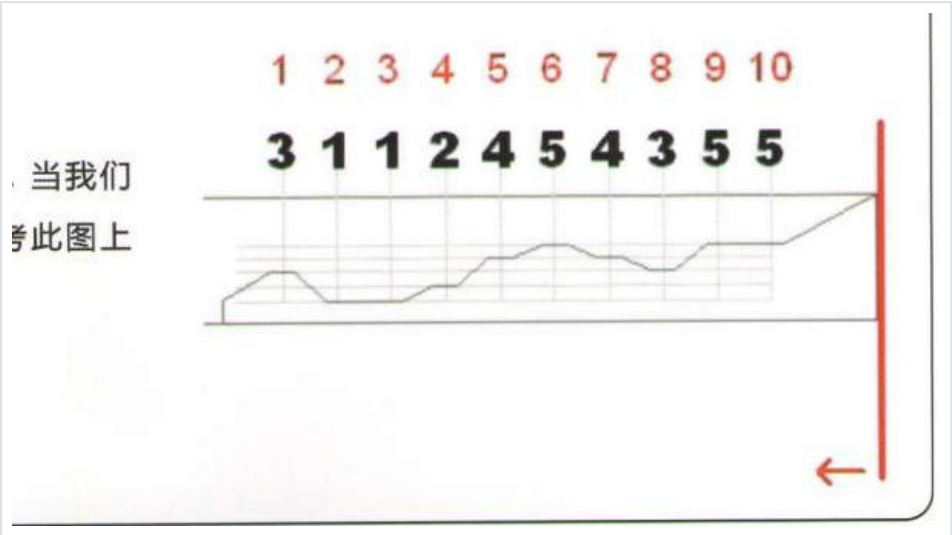


Fig. 76.1 HU101 key cut chart: cut depths 3 1 1 2 4 5 4 3 5 5 at positions 1 to 10, with the resulting cut profile and the direction of cut marked by the arrow at lower right.

NUMERICAL DATA

The drawing below gives the bitting position and cut depth data that apply to HU101. (Unit: 1/100 mm)

Horizontal distance from the working point on the key to the key reference line

DISTANCE FROM WORKING POINT TO REFERENCE LINE, POSITIONS 1-10	2520, 2290, 2060, 1830, 1600, 1370, 1140, 910, 680, 450
KEY STANDARD OVERALL WIDTH	550
CUT DEPTHS, POSITIONS 1-10	3, 1, 1, 2, 4, 5, 4, 3, 5, 5
CUT DEPTH SCALE	depth 1: 453; depth 2: 383; depth 3: 332; depth 4: 274; depth 5: 212

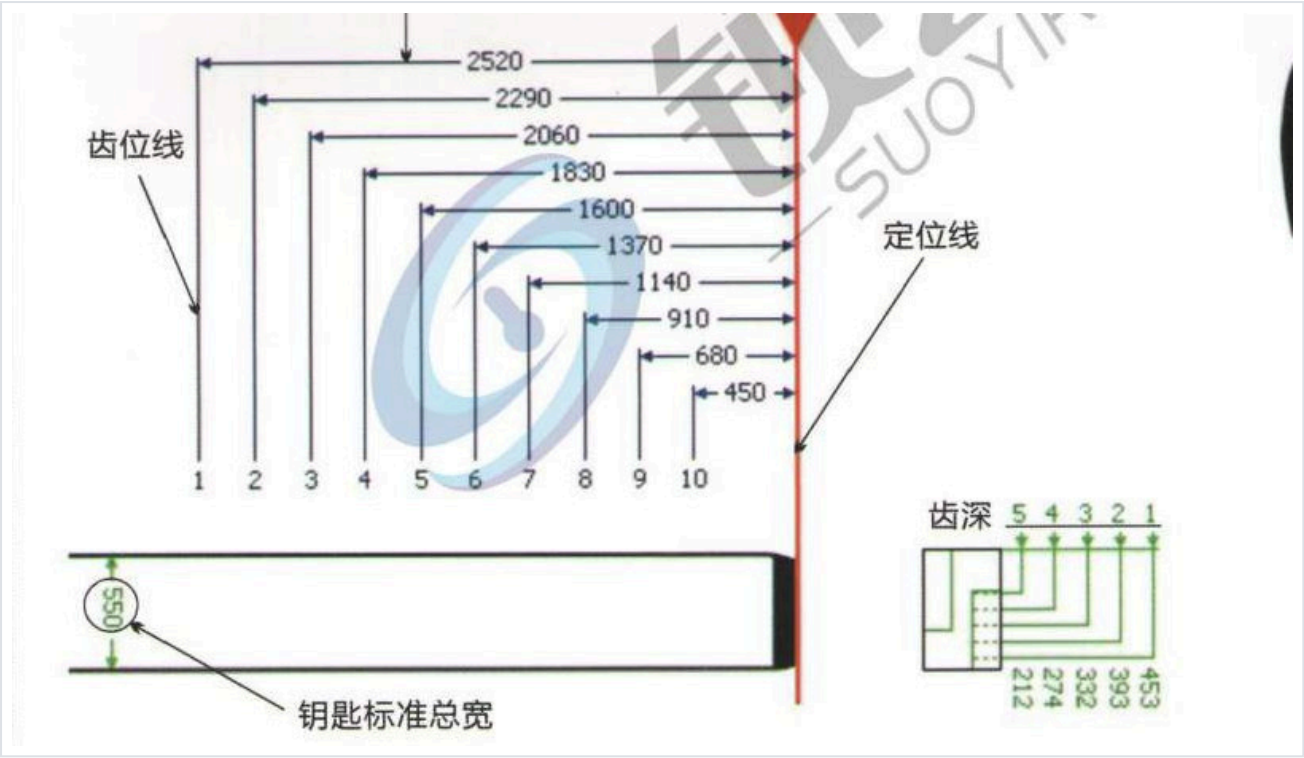


Fig. 76.2 HU101 numerical data. Dimension chain above the key gives the horizontal distance from the working point at each bitting position to the reference line; below it are the key standard overall width (550) and the cut depth scale for depths 5 to 1.

齿位线 → Wafer position line
钥匙标准总宽 → Key standard overall width
定位线 → Reference line
齿深 → Cut depth



Fig. 76.3 HU101 key profile: blade width and shoulder position used for key cutting.

SPECIAL TECHNIQUE

First look for the binding wafers at positions 1, 5, 9, 8, and 4 and release them. If you control the force on the tension bar well at this point, the wafers at 1, 5, 9, 8, and 4 will not drop; then look for the binding wafers at 2, 6, 10, 7, and 3 and release them. This is considerably quicker.

SOURCE PAGE 077

While picking, the hand that controls the tension bar must work together with the hand that controls the lifter.

After opening, decode the lock. Write the depth codes down so that a key can be cut. Cut two trial blades and keep one as the master; insert it into the lock and test it. If the test is good, dress these cuts so that they transition smoothly, then duplicate one key from it.

Sided Groove Four Tracks Key

HU39 2-in-1

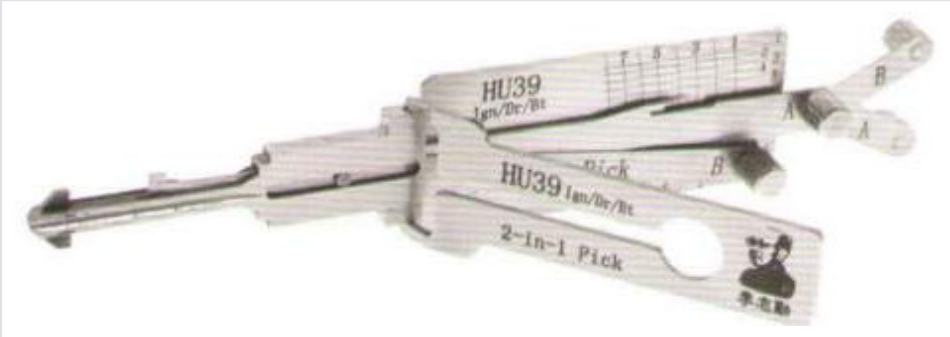


Fig. 78.1 HU39 2-in-1 Pick: reading panel on the upper arm, lifter below it, and the A/B/C lever at the right end.

李志勤 → Li Zhiqin

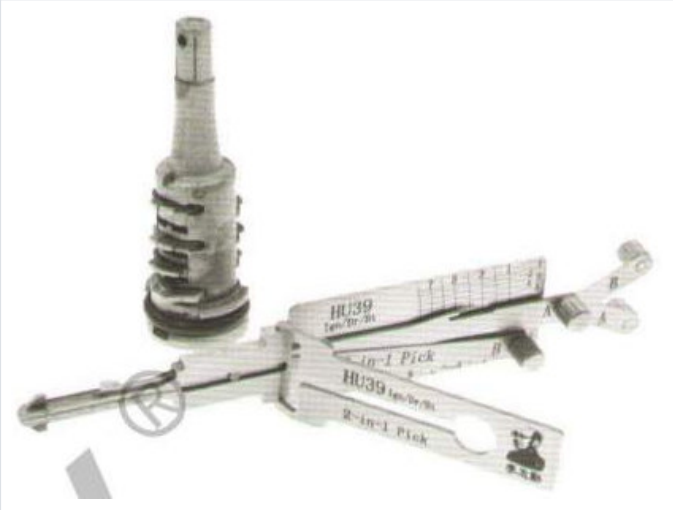


Fig. 78.2 HU39 2-in-1 Pick beside the Mercedes-Benz cylinder it works.

李志勤 → Li Zhiqin

APPLICABLE VEHICLES Mercedes-Benz

PICKING DIRECTION

When the driver's seat is on the left, pick counterclockwise.

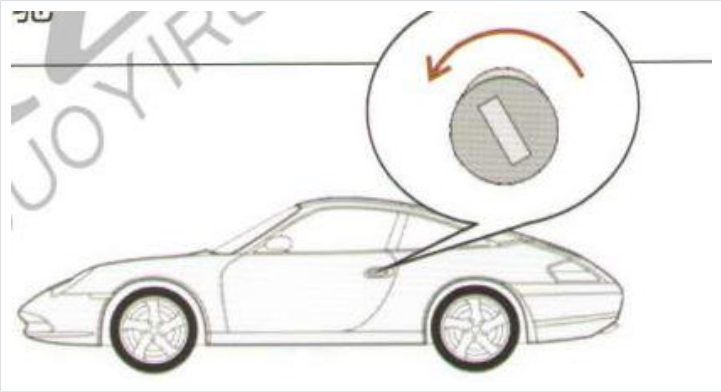


Fig. 78.3 Picking direction: with the driver's seat on the left, turn the plug counterclockwise.

LOCK OVERVIEW

This car lock comes in a 7-wafer version and an 8-wafer version.

The 7-wafer lock has 7 wafer positions and 5 cut depths; the 8-wafer lock has 8 wafer positions and 6 cut depths. But wafer No. 6 of the 8-wafer lock is never used!

So the tool was designed with only 5 cut depths, and one tool covers both the 7-wafer and the 8-wafer locks completely.

Next we will use an 8-wafer lock as the example. The 7-wafer lock follows the same principle.



Fig. 78.4 HU39 wafer schematic: the wafer shapes found in these cylinders.

弹片示意图 → Wafer schematic

> Note: wafer No. 8 of the whole wafers represents depth code 3.

SOURCE PAGE 079



Fig. 79.1 Group A: wafer callouts A7, A4, and A5 on the cylinder.

A 组 → Group A
A7 → A7
A4 → A4
A5 → A5



Fig. 79.2 Group B: wafer callouts B7, B5, B4, B3, B2, and B1 on the cylinder.

B 组 → Group B
B7 → B7
B5 → B5
B4 → B4
B3 → B3
B2 → B2
B1 → B1

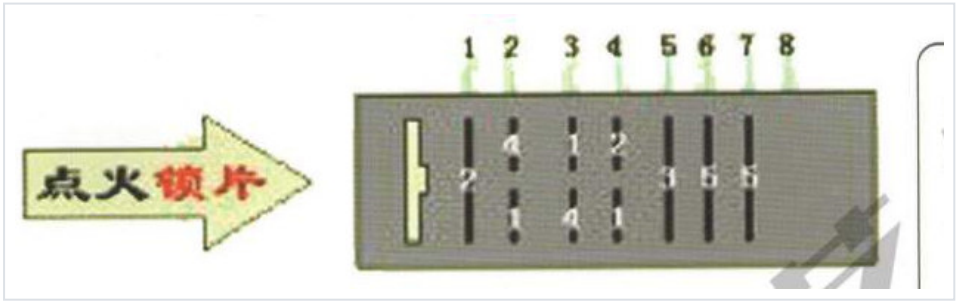


Fig. 79.3 Ignition lock wafers: bitting positions 1 to 8 are numbered above the plug and the wafer numbers are marked in each position.

点火锁片 → Ignition lock wafers

The ignition lock has 7 wafer positions and 3 groups of separated wafers.

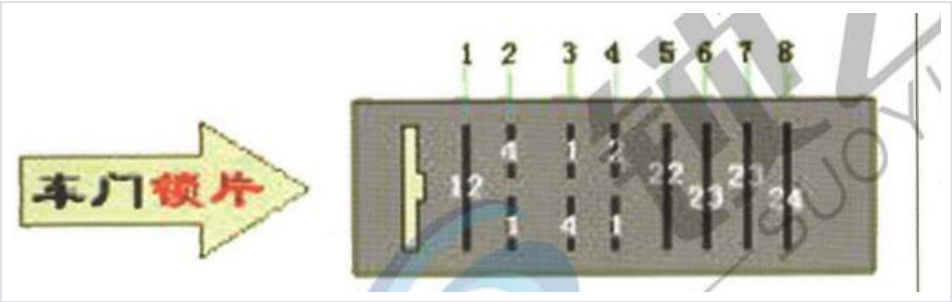


Fig. 79.4 Door lock wafers: bitting positions 1 to 8 are numbered above the plug and the wafer numbers are marked in each position.

车门锁片 → Door lock wafers

The door lock has 8 wafer positions and 3 groups of separated wafers.

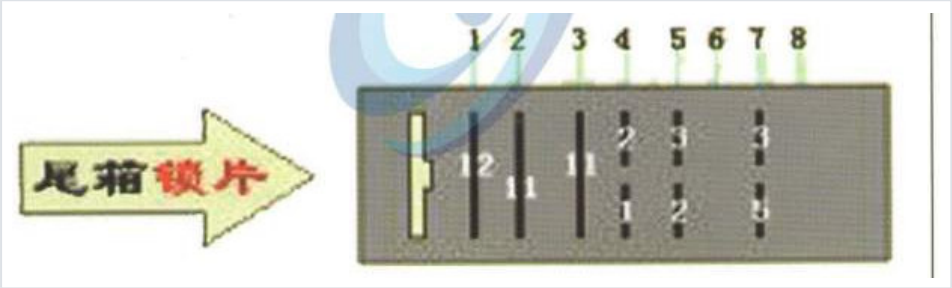


Fig. 79.5 Trunk lock wafers: bitting positions are numbered above the plug and the wafer numbers are marked in each position.

尾箱锁片 → Trunk lock wafers

The trunk lock has 6 wafer positions and 3 groups of separated wafers.

One group of separated wafers uses two tracks.

One whole wafer uses one track.

One group of separated wafers contains one track that a whole wafer uses.

(That is, one group of separated wafers contains a whole-wafer position taken from a wafer position in another lock.)

Example 1: the No. 2 wafer position of the door lock in the figure at left. In group A it is No. 4, in group B it is wafer No. 1. This group of separated wafers contains wafer No. 1 of group B from the No. 2 wafer position of the trunk lock.

Example 2: the No. 7 wafer position of the ignition lock and the No. 7 wafer position of the door lock use the group B and group A cut depths of the trunk lock respectively.

PICKING TECHNIQUE

Test the wafer positions of the a and b groups separately. Record the wafer position that each a and b lifter corresponds to, in order.

Then apply force with the tension bar: lift the point that does not move and leave the ones that do move alone. Once every point in the a and b groups is lifted into place, the plug will rotate 45 degrees!

At this point keep working the a group: test the a group and lift whichever wafer does not move. Once everything is open you can decode directly.

Sales Manager Nancy · Phone / WhatsApp +86 186 9155 5689 | Sales Manager Vicky · Phone / WhatsApp +86 153 5368 6577

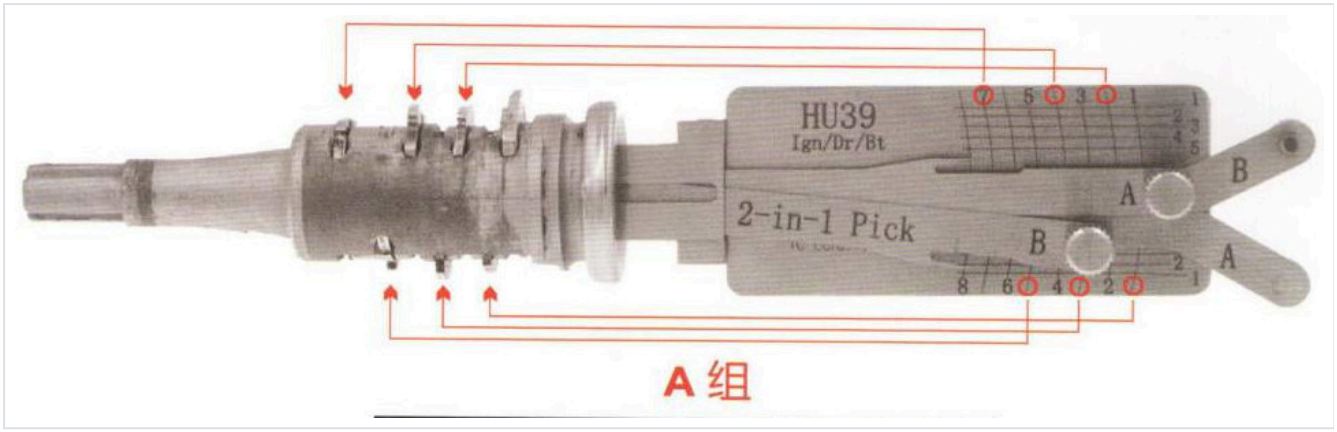


Fig. 80.1 HU39 2-in-1 Pick, group A. The leaders trace the eight circled positions on the A row of the reading panel (7, 5, 3, 1 above and 8, 6, 4, 2 below) to the corresponding wafers in the plug.

A组 → Group A

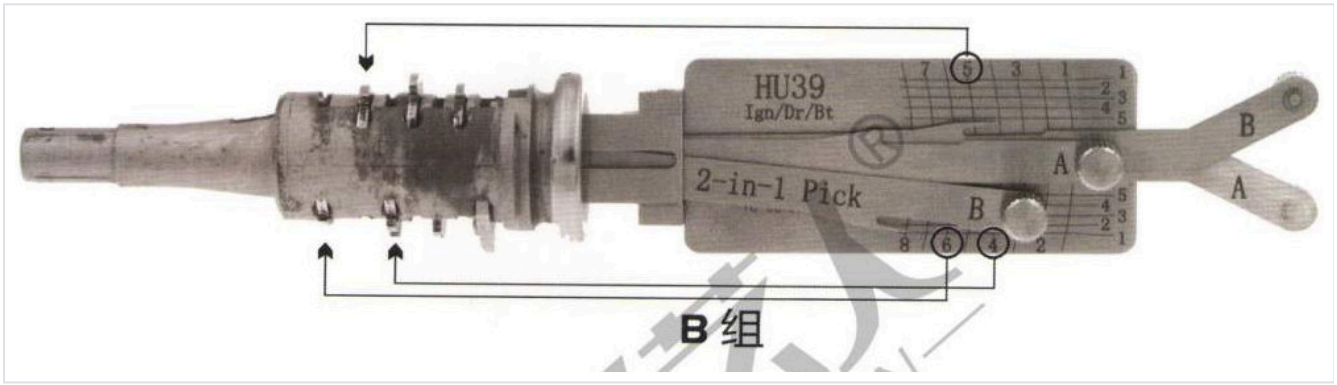


Fig. 80.2 HU39 2-in-1 Pick, group B. The leaders trace the B row of the reading panel (5, 3, 1 above and 8, 6, 4, 2 below) to the corresponding wafers in the plug.

B组 → Group B

Decoding

Decode only after the lock is fully opened. Use the four lifters in turn to overcome the spring pressure of the wafers, read the data at each bitting position, and record it. (Fill in and organize the data strictly according to the wafer position diagram in the key cutting method below.)

Numerical Data

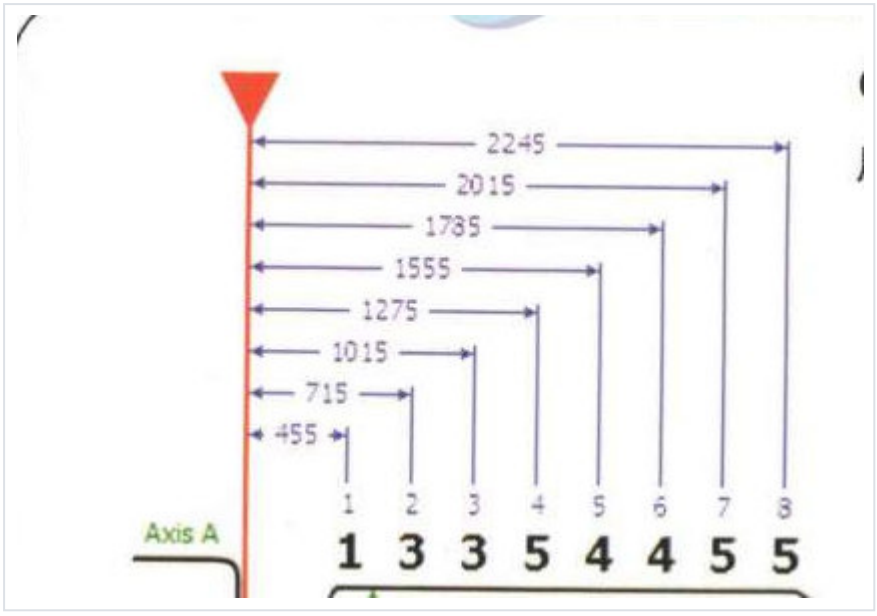


Fig. 80.3 HU39 bitting depth data: horizontal distance from the working point at bitting positions 1 through 8 to the reference line — 2245, 2015, 1785, 1555, 1275, 1015, 715, 455 (1/100 mm).

定位线 → Reference line

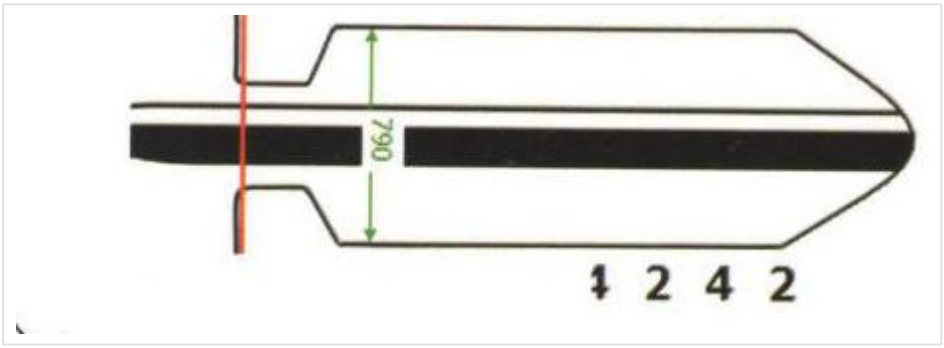


Fig. 80.4 HU39 key chart: cut depths 1 3 3 5 4 4 5 5 at bitting positions 1 through 8 on the upper edge, cuts 1 2 4 2 on the lower edge, and the key standard overall width 790 measured from Axis A (1/100 mm).

定位线 → Reference line

Depth 6 is never used, so ignore it. Depth 8 can be obtained by reverse lookup in the database.

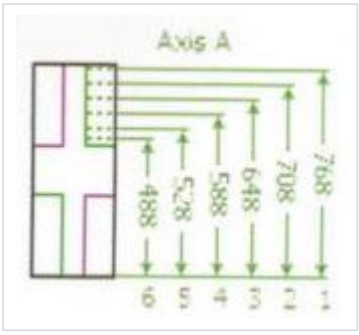


Fig. 80.5 HU39 cylinder cross-section, Axis A: distance from the axis line to the working point of wafers 1 through 6 — 768, 708, 648, 588, 528, 488 (1/100 mm).

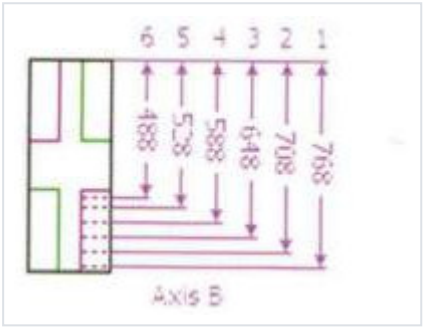


Fig. 80.6 HU39 cylinder cross-section, Axis B: distance from the axis line to the working point of wafers 1 through 6 — 768, 708, 648, 588, 528, 488 (1/100 mm).

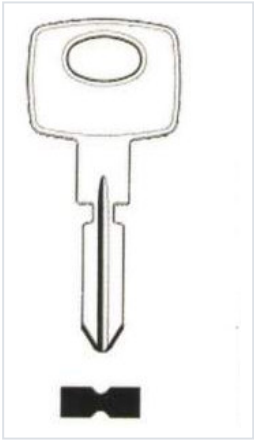


Fig. 80.7 HU39 key profile with the bow cross-section below it.

SOURCE PAGE 081

Key Cutting Method (8 Wafers)

1. Learn the wafer count and the bitting point locations of the ignition lock, the door lock, and the trunk lock.



Fig. 81.1 Ignition lock. Left: the plug with bitting positions 1 to 8 and the wafer slots. Right: the ignition key bitting pattern — A row 4 4 2, B row 2 1 1 1 3 5 5 2.

点火锁片 → Ignition lock wafers

点火齿型 → Ignition key bitting pattern



Fig. 81.2 Door lock. Left: the plug with bitting positions 1 to 8 and the door wafer numbers 12, 22, 23, 23 and 24. Right: the door key bitting pattern — A row 4 4 2 22 23 23 24, B row 12 1 1 1 2 2 2 2.

车门锁片 → Door lock wafers

车门齿型 → Door key bitting pattern



Fig. 81.3 Trunk lock. Left: the plug with bitting positions 1 to 8 and the trunk wafer numbers 12, 11, 11. Right: the trunk key bitting pattern — A row 2 2 2 3 2 at positions 4 to 8, B row 12 11 11 1 3 2 5 2.

尾箱锁片 → Trunk lock wafers

尾箱齿型 → Trunk key bitting pattern

Missing wafer positions by lock. The figures after 共缺 give the total number of missing positions and what remains after A1 and B8 are removed.

Lock	A row	B row	Deficit
Standard key	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	(bitting positions)
Ignition, missing	1, 5, 6, 7, 8	8	6 missing in total; after removing A1 and B8, 4 still missing
Door, missing	1	5, 6, 7, 8	5 missing in total; after removing A1 and B8, 3 still missing
Trunk, missing	1, 2, 3, 6, 8	6, 8	7 missing in total; after removing A1 and B8, 5 still missing

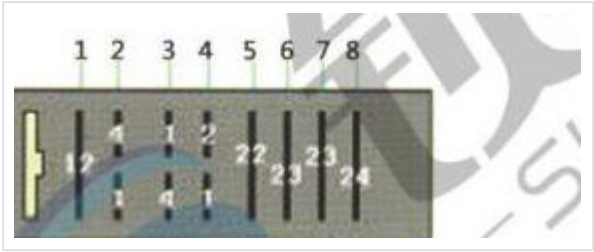


Fig. 81.4 Door lock plug: bitting positions 1 to 8, no wafer at position 1, and the door wafer numbers 12, 22, 23, 23 and 24 at positions 2, 5, 6, 7 and 8.

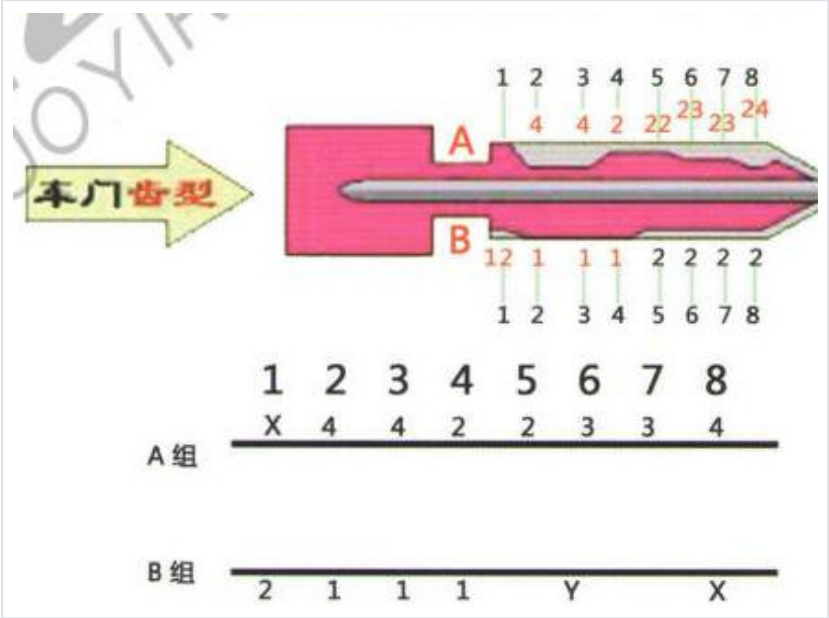


Fig. 81.5 Door key bitting pattern and the recording method. A row 4 4 2 22 23 23 24, B row 12 1 1 1 2 2 2 2. Group A record: X 4 4 2 2 3 3 4. Group B record: 2 1 1 1 at positions 1 to 4, Y at position 6, X at position 8.

车门齿型 → Door key bitting pattern
A组 → Group A
B组 → Group B

First use the decoder to read out every A and B group wafer number of the door lock wafers, then record them in the way shown in the figure at right.

> Tip: once you have decoded all the door lock data with the decoder, you can look it up in reverse in the database to obtain the wafer data for the other positions.

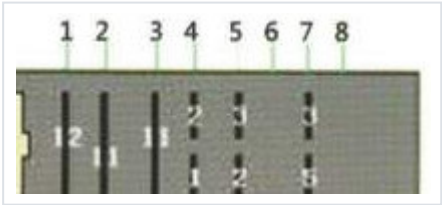


Fig. 81.6 Trunk lock plug: bitting positions 1 to 8 with the trunk wafer numbers 12, 11, 11 and the wafer slots at positions 1 to 5 and 7.

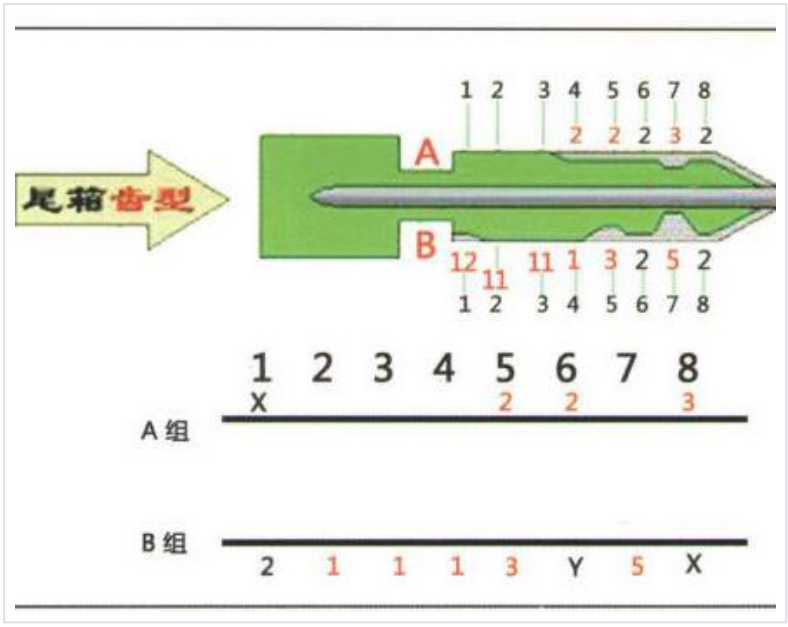


Fig. 81.7 Trunk key bitting pattern and the recording method. A row 2 2 2 3 2 at positions 4 to 8, B row 12 11 11 1 3 2 5 2. Group A record: X at position 1, 2 at position 5, 2 at position 6, 3 at position 8. Group B record: 2 1 1 1 3 Y 5 X at positions 1 to 8.

尾箱齿型 → Trunk key bitting pattern
A组 → Group A
B组 → Group B

Use the decoder to read out every A and B group wafer number of the door lock wafers, then record them in the way shown in the figure at right.

SOURCE PAGE 082

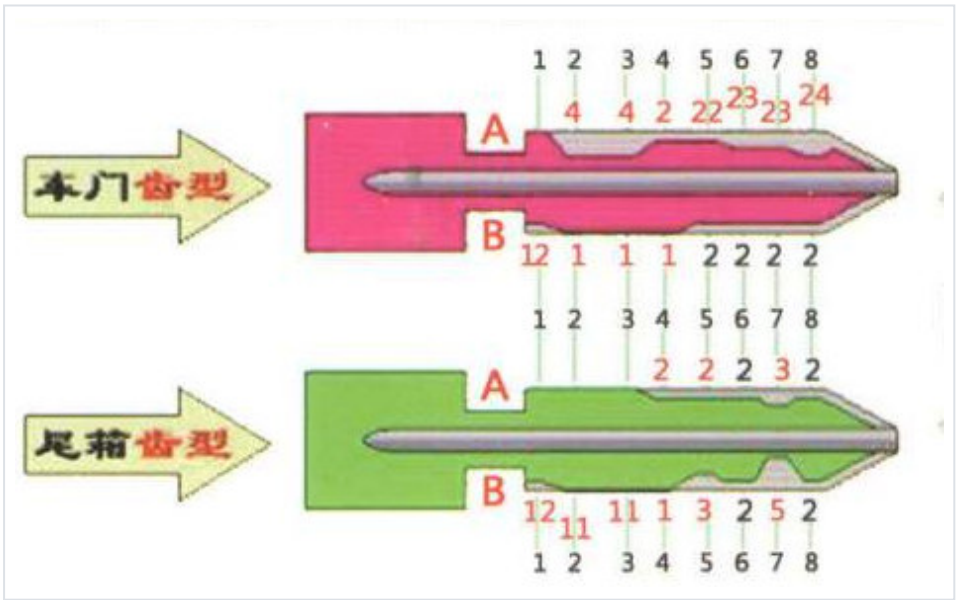


Fig. 82.1 Door key and trunk key. Door key — A row 4 4 2 22 23 23 24, B row 12 1 1 1 2 2 2 2. Trunk key — A row 2 2 2 3 2 at positions 4 to 8, B row 12 11 11 1 3 2 5 2.

车门齿型 → Door key bitting pattern
尾箱齿型 → Trunk key bitting pattern

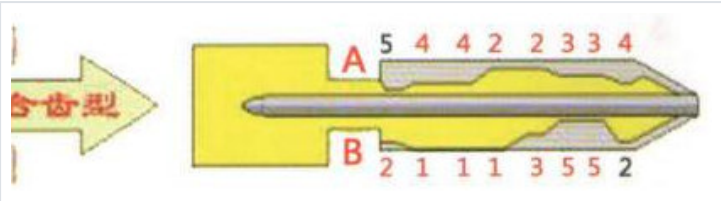


Fig. 82.2 Combined key: A row 5 4 4 2 2 3 3 4, B row 2 1 1 1 3 5 5 2.

综合齿型 → Combined bitting pattern

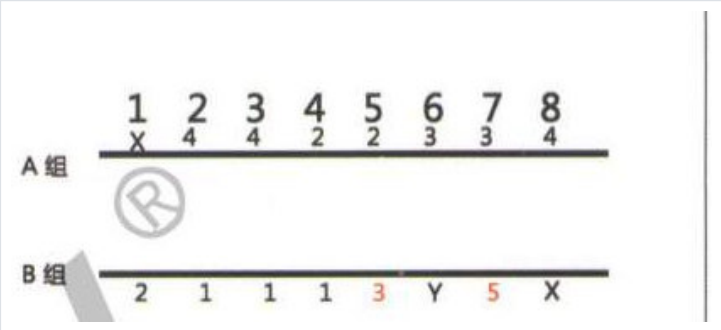


Fig. 82.3 Recording grid for the combined key. Group A: X 4 4 2 2 3 3 4. Group B: 2 1 1 1 3 Y 5 X.

A组 → Group A B组 → Group B

Use the decoder to read out the wafer data of the ignition lock and of the door lock separately.

Combine the two and you have a standard key.

In the method above, Y marks the extra wafer in the ignition lock. You can get the Y data by reverse lookup in the database, or you can try an opening by cutting gradually from depth 1 through depth 5. You can also open the ignition lock with the decoder and read the Y data directly.

X marks an empty position and can be any value. (Because A1 and B8 are whole wafers in all three locks, two tracks are missing.)

The 7-wafer key charts follow. Opening and decoding use the same method as for 8 wafers.

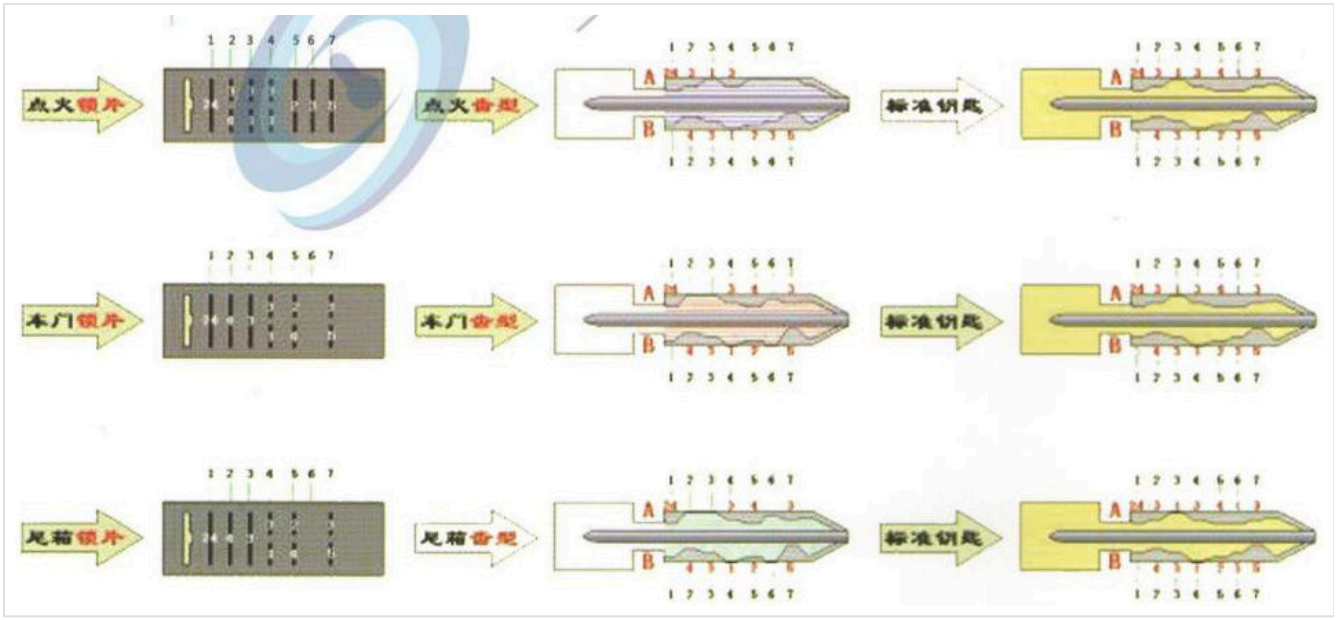


Fig. 82.4 7-wafer key charts for the ignition, door, and trunk locks. Each row runs from the wafer plate (positions 1 to 7) through the key bitting pattern (A and B rows) to the standard key cut from it.

点火锁片 → Ignition lock wafers
车门锁片 → Door lock wafers
尾箱锁片 → Trunk lock wafers
标准钥匙 → Standard key
点火齿型 → Ignition key bitting pattern
车门齿型 → Door key bitting pattern
尾箱齿型 → Trunk key bitting pattern

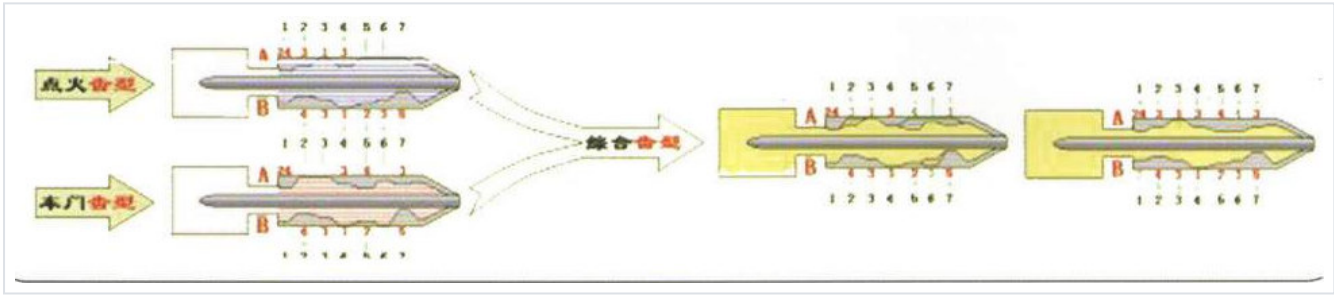


Fig. 82.5 Synthesis of the 7-wafer key: the ignition key and the door key are merged into the combined bitting pattern, and the standard key is cut from it.

点火齿型 → Ignition key bitting pattern
综合齿型 → Combined bitting pattern
车门齿型 → Door key bitting pattern

SOURCE PAGE 083

SPECIAL TECHNIQUE

On left-hand-drive vehicles (the domestic market) this lock is hard to pick directly, so pick it clockwise. After decoding, cut a key and open the door with it.

HU58 2-in-1



Fig. 83.1 HU58 2-in-1 Pick with its key blank.



Fig. 83.2 HU58 key chart: bitting positions 1, 3, 5, 7, 9, 11 on the A row and 2, 4, 6, 8, 10, 12 on the B row. The reference line runs down the left edge, and position 3 is circled in the artwork.

钥匙齿位示意图 → Key bitting position chart　　定位线 → Reference line

APPLICABLE VEHICLES BMW

Insert the HU58 tool into the keyway. Because of the way this lock is built, picking toward the front of the car — the direction that opens the door — is difficult, so pick toward the rear of the car first.

Decode after opening, or pick straight toward the front of the car following the depth codes, or simply cut a key and open the lock with it. If this lock is a right-hand door lock (the lock of a right-hand-drive car), pick toward the rear of the car (counterclockwise).

Do not put much force on the push rod when picking this lock; the wafers in this lock come into position with a single light push.

This type of vehicle lock comes in two versions. In one, all 12 wafers sit in the cylinder; in the other, the door cylinder has no wafers at bitting positions 3 and 9. The wafers for positions 3 and 9 can be found in the trunk. If you look the lock up in Instacode (the database), at most 4 or 5 keys are listed, and you can also make a key by this method.

How to make this key: write down all 12 depth codes, then enter 1, 3, 5, 7, 9 and 11 under group A and 2, 4, 6, 8, 10 and 12 under group B.

SOURCE PAGE 084

This car's ignition cylinder is missing wafer positions 11 and 12, so it uses only the 10 positions 1-10. The trunk cylinder comes in two versions: one is 1-10, 10 wafer positions in all; the other is 1-8, 8 wafer positions in all.

Its key is a sided groove four-track key. If you cut one from blank stock, cut two blades, and after you file the transitions smooth and round, put in a master blank and test the door and the trunk. If both open easily, finish all 12 cuts — the door and trunk are certain to open.

Numerical Data

The drawing at left gives the specific bitting position and cut depth data that apply to HU58.

(Unit: 1/100 mm)

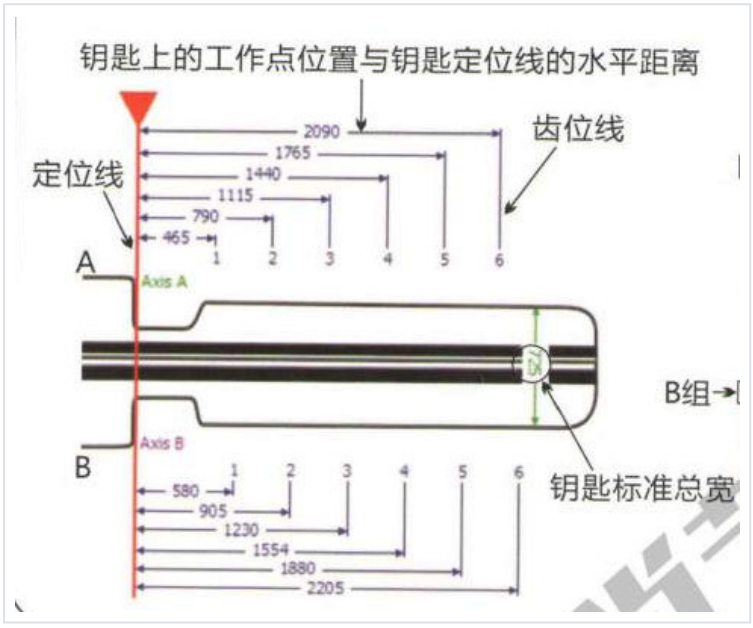


Fig. 84.1 HU58 key. Horizontal distance from each working point on the key to the key reference line, measured along Axis A (wafer positions 1-6) and Axis B (wafer positions 1-6), with the key standard overall width marked at the shoulder.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the key working point to the key reference line
定位线 → Reference line
齿位线 → Wafer position line
钥匙标准总宽 → Key standard overall width
A组 → Group A
B组 → Group B

Working point distances from the key reference line (unit: 1/100 mm)

Track	Wafer positions 1-6
Axis A	465, 790, 1115, 1440, 1765, 2090
Axis B	580, 905, 1230, 1554, 1880, 2205

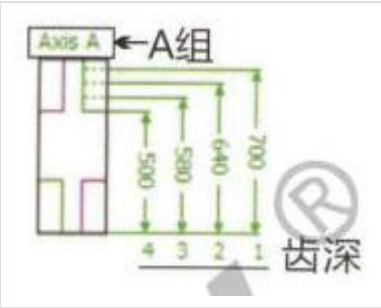


Fig. 84.2 Cut depth data, group A (Axis A). Reading left to right, wafer positions 4, 3, 2 and 1 measure 500, 580, 640 and 700 (1/100 mm).

A组 → Group A 齿深 → Cut depth

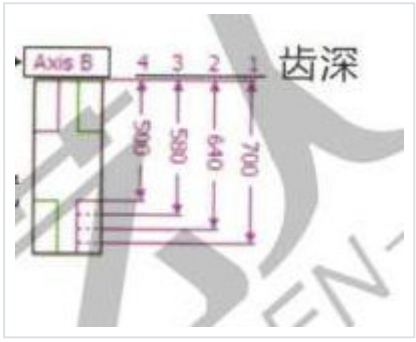


Fig. 84.3 Cut depth data, group B (Axis B). Reading left to right, wafer positions 4, 3, 2 and 1 measure 500, 580, 640 and 700 (1/100 mm).

齿深 → Cut depth

Cut depth by wafer position (unit: 1/100 mm)

Wafer position	Group A	Group B
1	700	700
2	640	640
3	580	580
4	500	500



Fig. 84.4 HU58 key blade with the sided groove profile.

NE78 2-in-1



Fig. 84.5 NE78 2-in-1 Pick with its reading panel, and a matching key blank below.

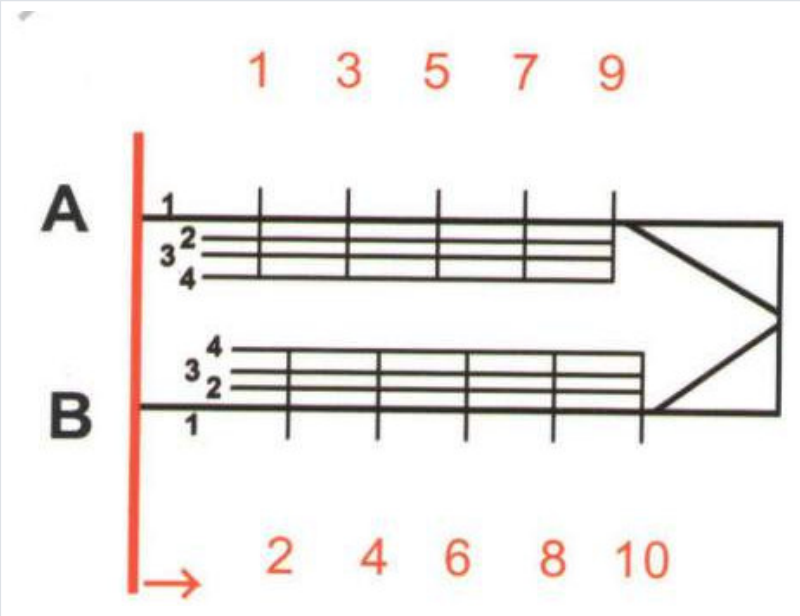


Fig. 84.6 Key bitting position chart: positions 1, 3, 5, 7 and 9 on track A, positions 2, 4, 6, 8 and 10 on track B, with four cut depths on each track.

APPLICABLE VEHICLES Peugeot

This lock spins free very easily.

When you open it with the tool, remember that this lock must always be picked clockwise. On a left-hand-drive car, if you are picking toward the front of the car, the tool still has to be turned toward the rear first — that is, clockwise. Left-hand drive or right-hand drive, always pick it clockwise.

Opening it is simple. Once it is open, decode the wafers, write down the depth codes you read, then pick it toward the front of the car, or cut a key and open it with that.

SOURCE PAGE 085

How to pick it clockwise: first test the wafer positions. It is the same as HU58 — do not put much force on the tension bar; add more and the plug free-spins. Open it while holding only a very slight force on the tension bar. Push the lifter gently, and leave alone any wafer that moves.

Once it is open you can add a little force. After the plug turns through an angle it carries the tail around with it, and at that point you can decode. Decoding is the same as HU58 as well: read in the opposite direction (read backward).

When you read backward there is no spring pressure at all — spring pressure exists only while picking, because the wafer has already been pushed all the way down by its spring, so there is none left. You do not have to press it hard.

Write down the depth codes you read. Positions 1, 3, 5, 7 and 9 are in group A; positions 2, 4, 6, 8 and 10 are in group B. Its key cutting method differs from HU58 in that it lacks a position 11 and a position 12 — one set of wafers fewer — and the wafers work in pairs.

When you cut the key on a CNC key machine, enter the decoded positions 1, 3, 5, 7 and 9 into group A and positions 2, 4, 6, 8 and 10 into group B, then cut the key directly. Both sides have to be cut.

If you cut the key by hand instead, you again cut two duplicate blanks, and after cutting you file the transitions smooth and round. Because the duplicate blank is then used to cut a working key from, you have to make this key perfect: bring it to a streamlined profile, keep every tooth point, never lose a working point, and make every junction between the cuts very smooth — otherwise the key is hard to pull out. The working points must be preserved, kept steady and kept on one flat plane, and the slope has to be right; only then can you copy a good key.

The ignition and the door lock carry exactly the same number of wafers.

HON66 2-in-1



Fig. 85.1 HON66 2-in-1 Pick, with the model code, the 2-in-1 Pick engraving and the patent line on the reading panel.

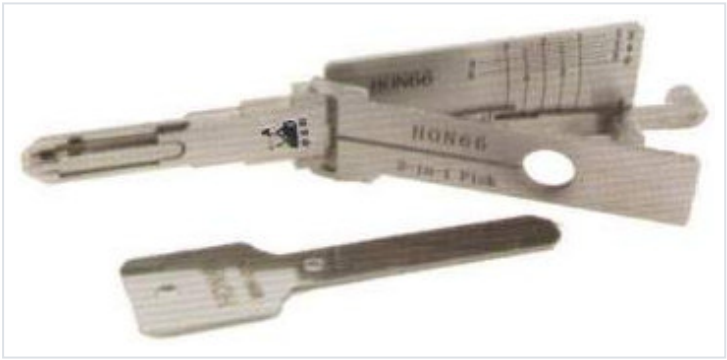


Fig. 85.2 HON66 2-in-1 Pick together with a matching key blank.

APPLICABLE VEHICLES HONDA, ACURA, EVERUS, TRUMPCHI

SOURCE PAGE 086

PICKING DIRECTION

When the driver's seat is on the left, pick clockwise.

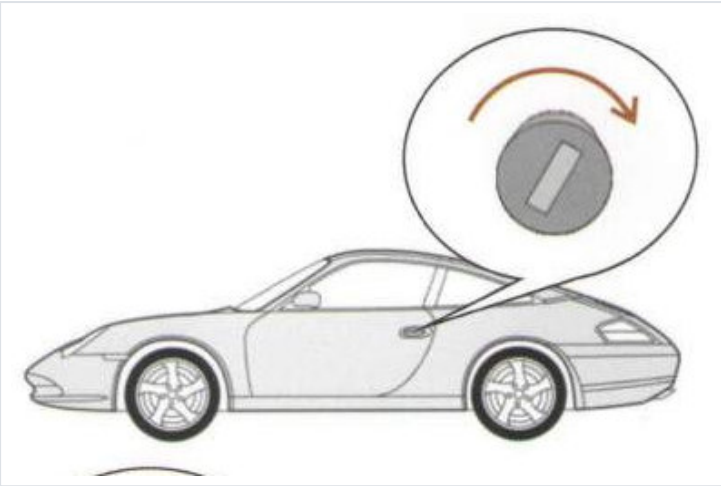


Fig. 86.1 Left-hand-drive car: rotate the plug clockwise.

When the driver's seat is on the right, pick counterclockwise.

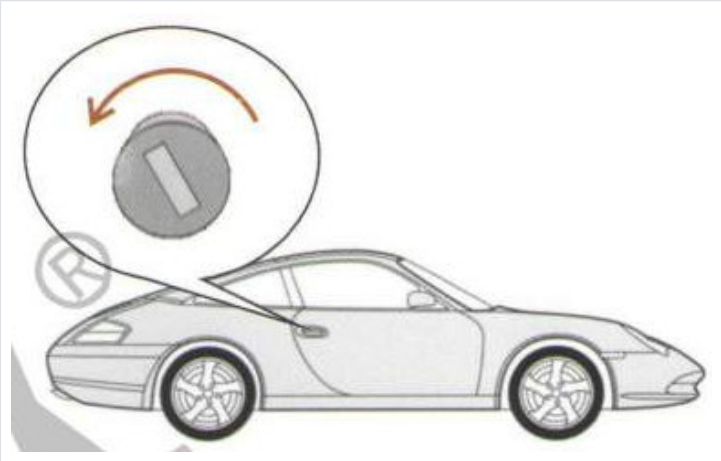


Fig. 86.2 Right-hand-drive car: rotate the plug counterclockwise.

- This lock has to be opened twice. The first opening binds at the 45° position.
- At that point a separated wafer is still acting as a resistance wafer. Only after it is cleared can the plug turn all the way to 90° and the lock open.
- On the way back this lock also binds at 45°, and the resistance wafer still has to be cleared before the plug will return.

LOCK OVERVIEW

This door lock has 7 separated wafers and one whole wafer. In group A, positions 2, 3 and 4 are separated wafers.

Group A position 1 is the one in the ignition lock, and group A has only 1, 2 and 3. In group B, positions 1, 2, 3 and 4 are separated wafers, and position 5 is a whole wafer.

Neither group A nor group B has a wafer at position 6, so when you cut a key, cut all of them to 1.



Fig. 86.3 HON66 wafer set: whole wafers on the right and separated half-wafers on the left.

HON66弹片示意 → HON66 wafer types

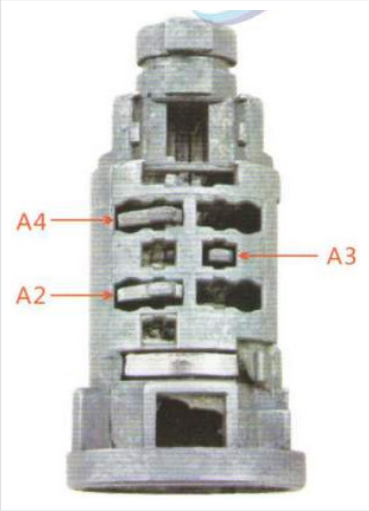


Fig. 86.4 Group A cylinder with the wafers arrowed: A4, A3, A2.

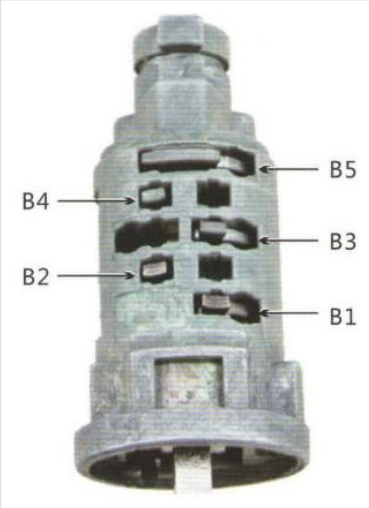


Fig. 86.5 Group B cylinder with the wafers arrowed: B4, B5, B3, B2, B1.

SOURCE PAGE 087

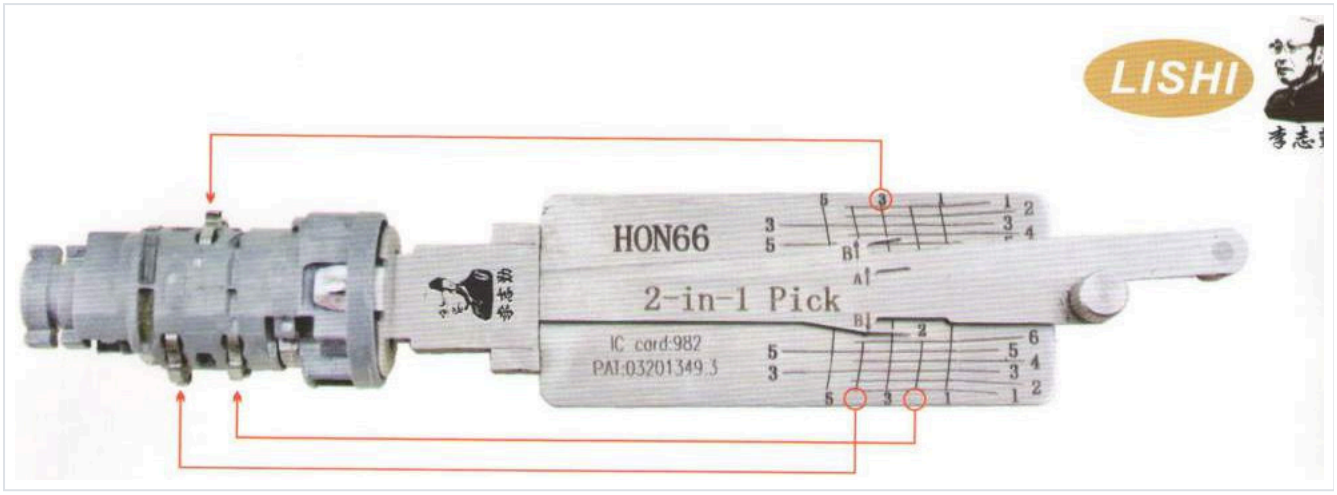


Fig. 87.1 Group A. HON66 2-in-1 in the cylinder, with red leader lines tying each wafer in the cylinder to its wafer position line on the reading panel.

A组 → Group A

李志勤 → Li Zhiqin

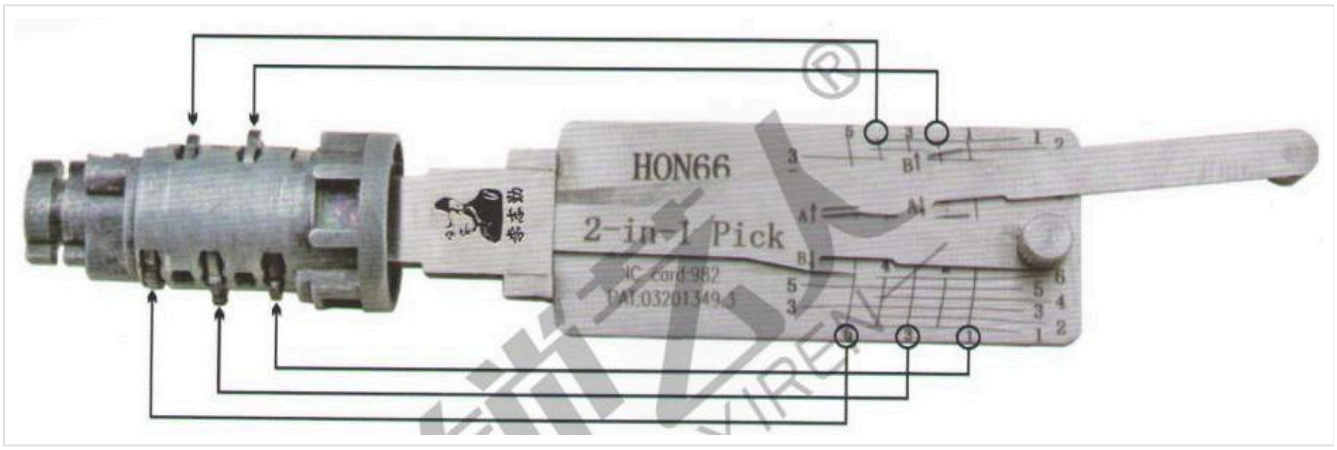


Fig. 87.2 Group B. The same tool and cylinder, with black leader lines tying the group B wafers to their lines on the reading panel.

B组 → Group B

李志勤 → Li Zhiqin

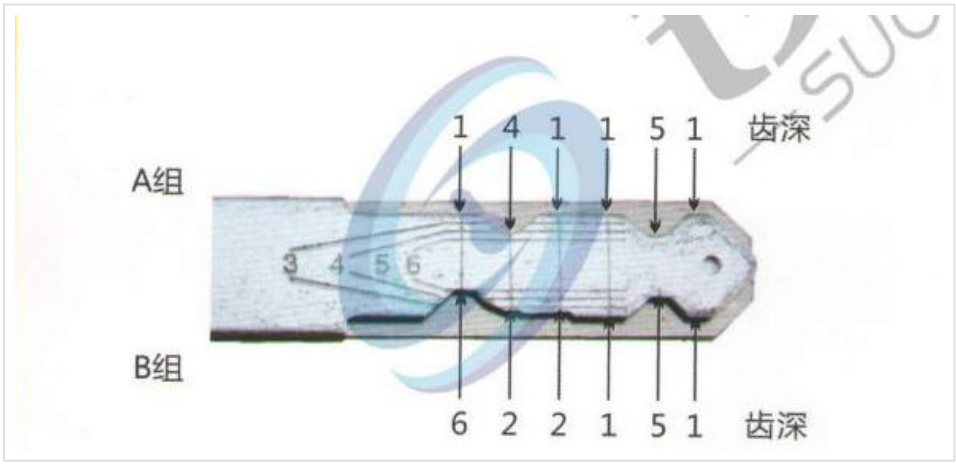


Fig. 87.3 Key decoded from the tool. Group A reads 1 4 1 1 5 1 and group B reads 6 2 2 1 5 1; the short arrows mark the cut depth at each position.

A组 → Group A

B组 → Group B

齿深 → Cut depth

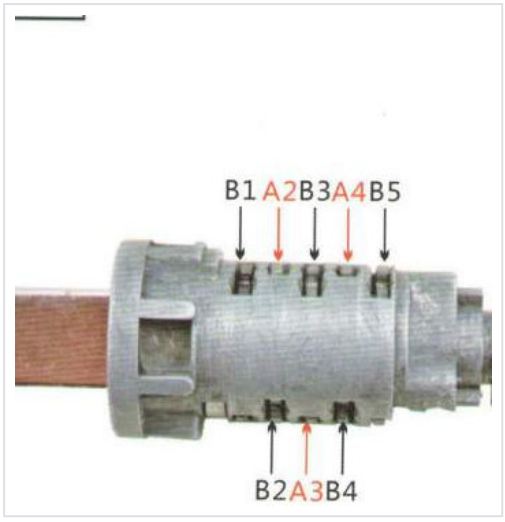


Fig. 87.4 Group B cylinder with the wafer positions arrowed: B1, A2, B3, A4 and B5 along the top edge, B2, A3 and B4 along the bottom edge.

KEY CUTTING

The drawing at left is a key cut by a CNC machine. When you do not have a CNC machine, you still have to refer to the slope between one cut and the next on this drawing when you cut a key by hand.

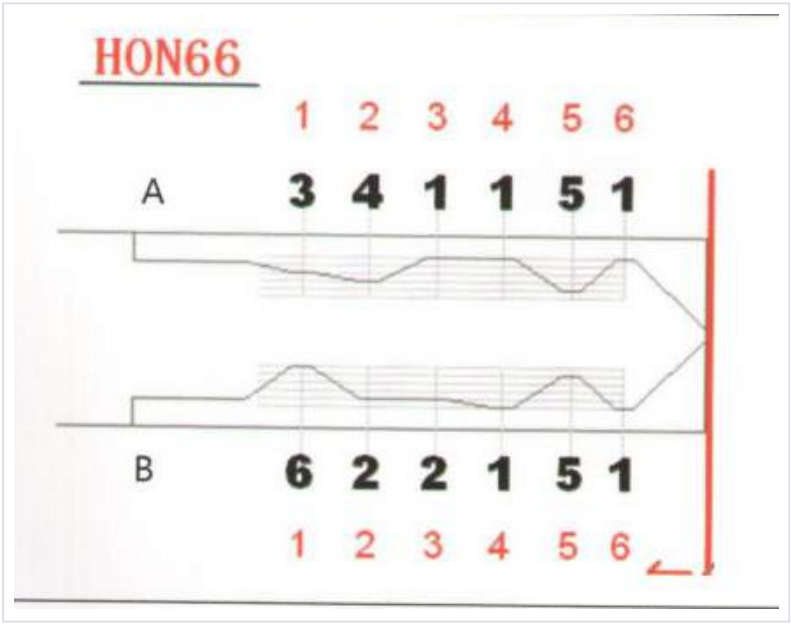


Fig. 87.5 HON66 key cutting chart. Track A cut depths 3 4 1 1 5 1 and track B cut depths 6 2 2 1 5 1 at positions 1-6, counted from the shoulder reference line at right, with the cut profile drawn below each row.

HON66 cut depth by wafer position

Track	Wafer positions 1-6
A	3, 4, 1, 1, 5, 1
B	6, 2, 2, 1, 5, 1

SOURCE PAGE 088

NUMERICAL DATA

The diagram below gives the bitting position and cut depth data that apply to HON66. (Unit: 1/100 mm)

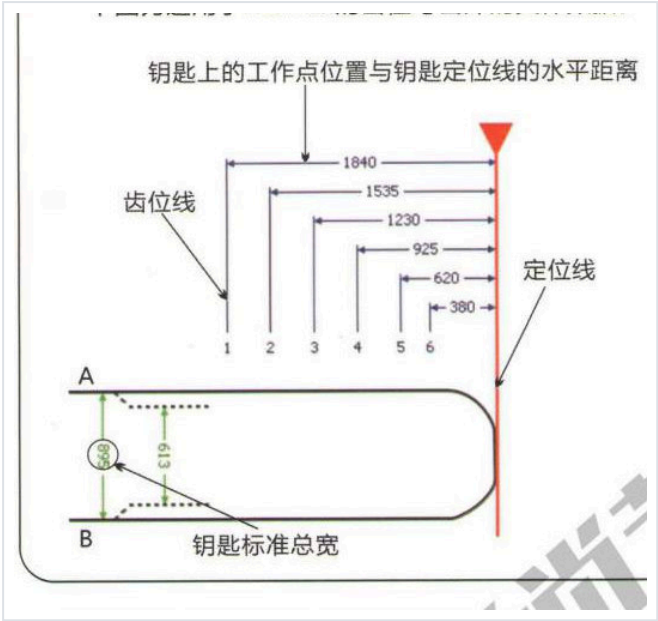


Fig. 88.1 HON66 numerical data: the horizontal distance from the working point at each bitting position to the key reference line — position 1 1840, 2 1535, 3 1230, 4 925, 5 620, 6 380 — together with the key standard overall width and the 613 blade dimension, all in 1/100 mm.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line

齿位线 → Wafer position line

定位线 → Reference line

钥匙标准总宽 → Key standard overall width

UNIT	1/100 mm
WORKING POINT DISTANCE FROM THE REFERENCE LINE, POSITIONS 1-6	1840, 1535, 1230, 925, 620, 380
KEY STANDARD OVERALL WIDTH	668
BLADE DIMENSION FROM EDGE A TO THE WAFER SLOT LINE	613

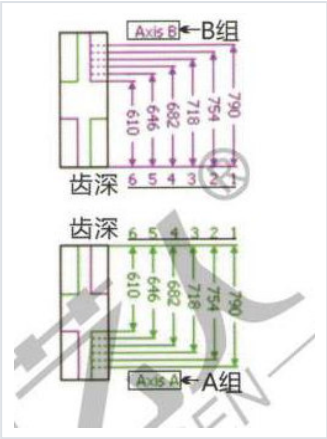


Fig. 88.2 HON66 cut depth chart, group B above and group A below. Depth codes 6 through 1 read 610, 646, 682, 718, 754, 790 in 1/100 mm.

齿深 → Cut depth
B组 → Group B
A组 → Group A



Fig. 88.3 HON66 key profile: the key blank with its blade, and the keyway cross-section printed below it.

SPECIAL TECHNIQUE

This lock is a four-track outer-milled key. That is, all four faces along the edge of the key carry working points. It is divided into 6 bitting positions and 6 cut depths, but all 6 of its positions use depth code 1.

At position 5 of group A, the original keys are all cut to depth 5. The door lock cylinder has no position 1 in group A; only the ignition lock has it, and in the ignition lock position 1 of group A carries only cut depths 1, 2, and 3. Position 5 of group B likewise carries only cut depth 3 or 5.

When you make a key, remember this: when you enter the depth codes into the CNC machine, enter 5 for all of the group A position 5 cuts and enter 1 for all of the group A and group B position 6 cuts. For position 1 of the ignition lock, enter 1 first; on the second and third attempts, work up to 2 and 3 in turn.

When you cut the key, you do not have to allow for position 5 in group A or position 6 in groups A and B, because they are already correct on the cutting plate.

On one face of group A, only position 3 has a wafer; on the other face, only positions 2 and 4 have wafers, while positions 1, 3, and 5 have none.

On one face of group B, positions 1, 3, and 5 have wafers and positions 2 and 4 do not. On the other face, positions 2 and 4 have wafers and positions 1, 3, and 5 do not.

Picking method: first test positions 2 and 4 on one face of group A, then test position 3 on the other face of group A. Work the wafers that will not move, and keep your hand light; group A of this lock reaches position very easily, so do not press past it. Next test positions 2 and 4 of group B, then positions 1, 3, and 5 of group B…

SOURCE PAGE 089

…press the wafers that do not move and leave the ones that do move alone, and watch the force in your hand. Once group A and group B have both been pressed into position, the plug turns 45°. At that point you can either keep opening group A, or first test position 3 of group A and then positions 2 and 4 of group A. When everything is open, decode first: write the depth codes down, then return the wafers to position; the return is still group A.

KEY CUTTING

When the cutting plate was designed, depth code 1 was already allowed for and needs no cut, and codes 4 and 5 share a single line, because the graduations sit too close together — ruling the line is difficult and reading it is difficult too. So note this: on a ruled key the first line is depth code 3, the second line is depth codes 4 and 5, and the third line is depth code 6. If the code is 2, cut between 1 and 3; if it is 4, keep half of the 4/5 line; if it is 5, cut a little past the 4/5 line; if it is 6, cut all the way down.

DAT17 2-in-1

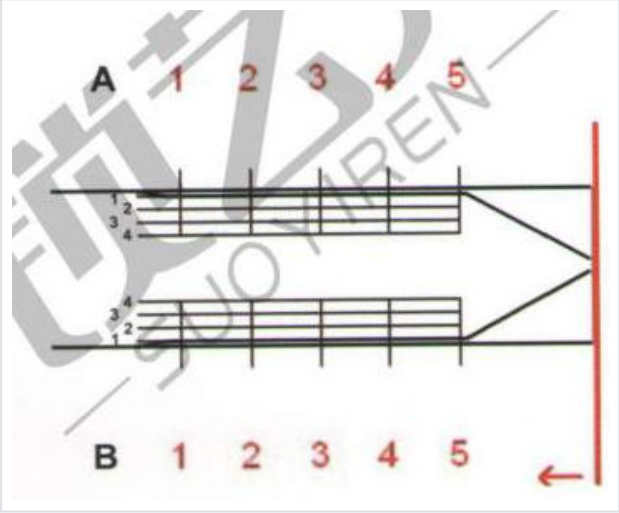


Fig. 89.1 DAT17 2-in-1 tool, reading panel side, with the matching key blank below it. The panel is engraved DAT17 and 2-in-1 Pick.

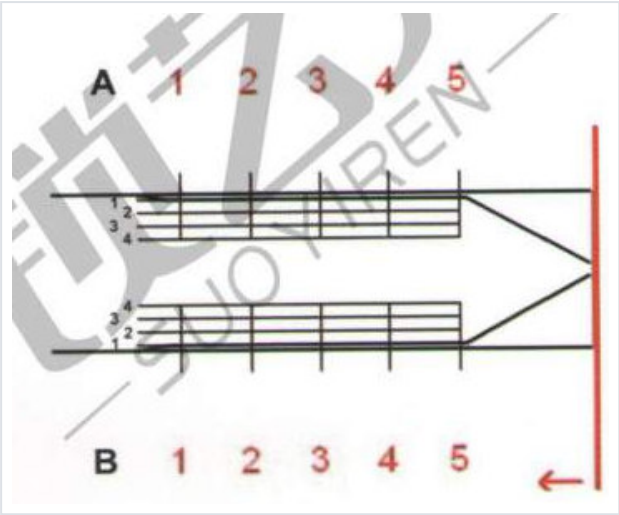


Fig. 89.2 DAT17 key bitting position schematic: row A with positions 1 through 5 above the blade and row B with positions 1 through 5 below it, with the depth lines 1 through 4 marked at the tip end of each row and the cutting direction arrowed at the right.

钥匙齿位示意图 → Key bitting position schematic

APPLICABLE VEHICLES	Subaru
PICKING DIRECTION	When the door lock is on the left side, pick clockwise; when it is on the right side, pick counterclockwise.

This is a four-track outer-milled key. It has 5 bitting positions and 4 cut depths. The outermost is depth code 1. This lock has four working tracks; A and B are the same, and the two sides of the key are exactly alike.

Picking method: this lock can only be decoded after it has been fully opened. First test the position of the wafers. On one face of groups A and B the positions are 1, 3, and 5; on the other face they are 2 and 4.

On this lock a left-hand-drive car opens toward the rear of the car (clockwise). Test each wafer and watch whether it moves; lift the wafers that do not move and leave the ones that do alone. Test them one by one, and apply a little more force to the tension bar.

It does not matter whether you open group A or group B first. After it turns 45°, keep working; once it has turned, you are on group A. When it opens, do not relax your hand — now you can decode. Press and release the lifter to read the wafers; pressed all the way down is the code.

Once it is open, return the wafers to position.

SOURCE PAGE 090

NUMERICAL DATA

This diagram gives the bitting position and cut depth data that apply to DAT17. (Unit: 1/100 mm)

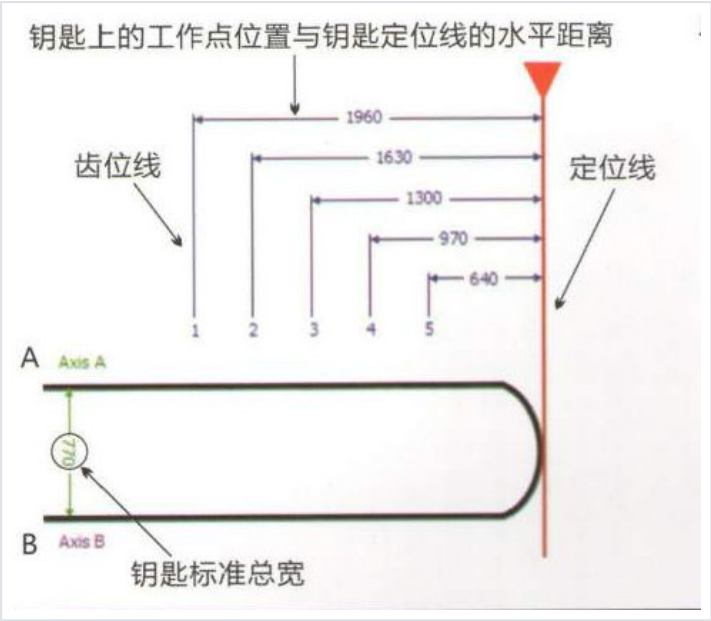


Fig. 90.1 DAT17 numerical data: the horizontal distance from the working point at each bitting position to the key reference line — position 1 1960, 2 1630, 3 1300, 4 970, 5 640 — with the key standard overall width marked on the blade, in 1/100 mm.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line
齿位线 → Wafer position line
定位线 → Reference line
钥匙标准总宽 → Key standard overall width

UNIT	1/100 mm
WORKING POINT DISTANCE FROM THE REFERENCE LINE, POSITIONS 1-5	1960, 1630, 1300, 970, 640
KEY STANDARD OVERALL WIDTH	770

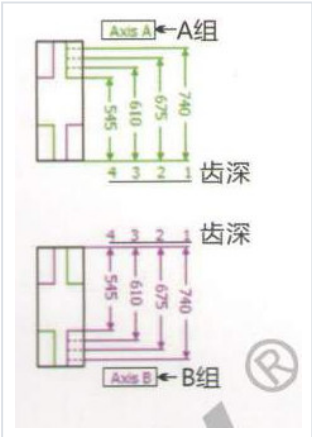


Fig. 90.2 DAT17 cut depth chart: group A on axis A above and group B on axis B below. Depth codes 4 through 1 read 545, 610, 675, 740 in 1/100 mm.

齿深 → Cut depth
A组 → Group A
B组 → Group B



Fig. 90.3 DAT17 key profile: the key blank silhouette with its shaped head, and the keyway cross-section printed below it.

NE66 2-in-1



Fig. 90.4 NE66 2-in-1 tool, reading panel side, with the matching key blank below it.

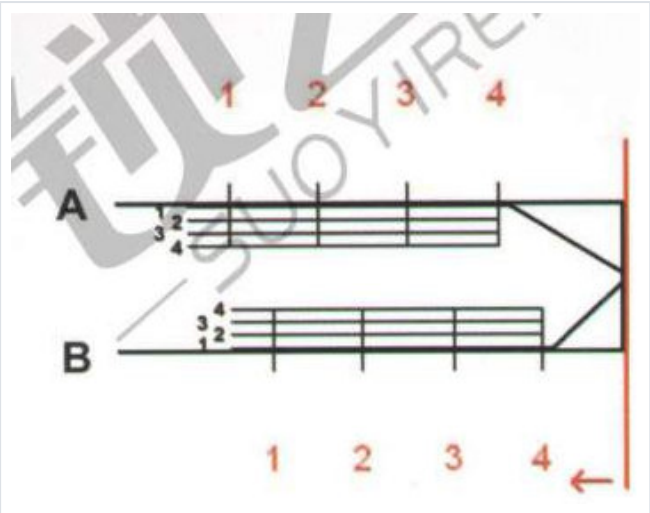


Fig. 90.5 NE66 key bitting position schematic: row A with positions 1 through 4 above the blade and row B with positions 1 through 4 below it, depth lines 1 through 4 marked at the tip end, and the cutting direction arrowed at the right.

钥匙齿位示意图 → Key bitting position schematic

APPLICABLE VEHICLES	Volvo
PICKING DIRECTION	When the door lock is on the left side, pick counterclockwise; when it is on the right side, pick clockwise.

This lock has 8 bitting positions in all: 4 in group A and 4 in group B.

Group A is 1, 3, 5, 7; group B is 2, 4, 6, 8.

Although the bitting positions on the tool's reading panel are marked (1, 1) (2, 2) (3, 3) (4, 4), you can also read them as (1, 2, 3, 4, 5, 6, 7, 8).

The key has 4 depth codes in all.

DECODING

Read forward once the lock is open.

SOURCE PAGE 091

NUMERICAL DATA

This diagram gives the bitting position and cut depth data that apply to NE66. (Unit: 1/100 mm)

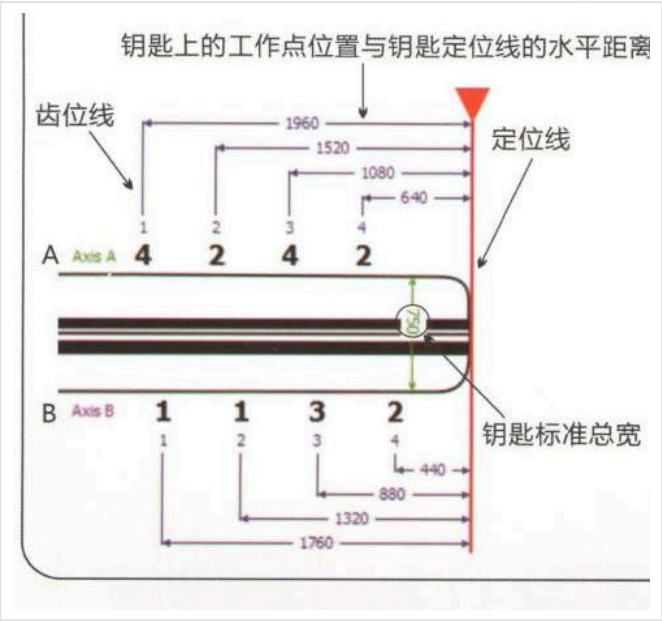


Fig. 91.1 NE66 numerical data: the horizontal distance from the working point at each bitting position to the key reference line, with depth codes 4, 2, 4, 2 marked at group A positions 1 through 4 and 1, 1, 3, 2 at group B positions 1 through 4, plus the key standard overall width marked on the blade.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working point on the key to the key reference line

齿位线 → Wafer position line

定位线 → Reference line

钥匙标准总宽 → Key standard overall width

UNIT	1/100 mm
WORKING POINT DISTANCE FROM THE REFERENCE LINE, GROUP A POSITIONS 1-4	1960, 1520, 1080, 640
WORKING POINT DISTANCE FROM THE REFERENCE LINE, GROUP B POSITIONS 1-4	1760, 1320, 880, 440
KEY STANDARD OVERALL WIDTH	750

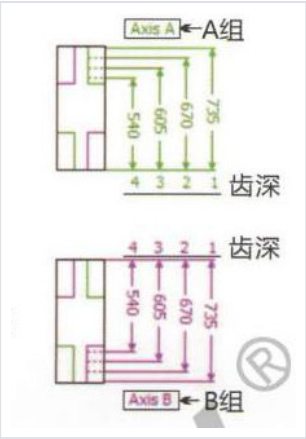


Fig. 91.2 NE66 cut depth chart: group A on axis A above and group B on axis B below. Depth codes 4 through 1 read 540, 605, 670, 735 in 1/100 mm.

齿深 → Cut depth
A组 → Group A
B组 → Group B



Fig. 91.3 NE66 key profile: the key blank with its black head and grooved blade, and the keyway cross-section printed below it.

SOURCE PAGE 092

Six Tracks Inner Groove Key

162T(8) 2-in-1

> VAG (2015) will be renamed 162T (8).

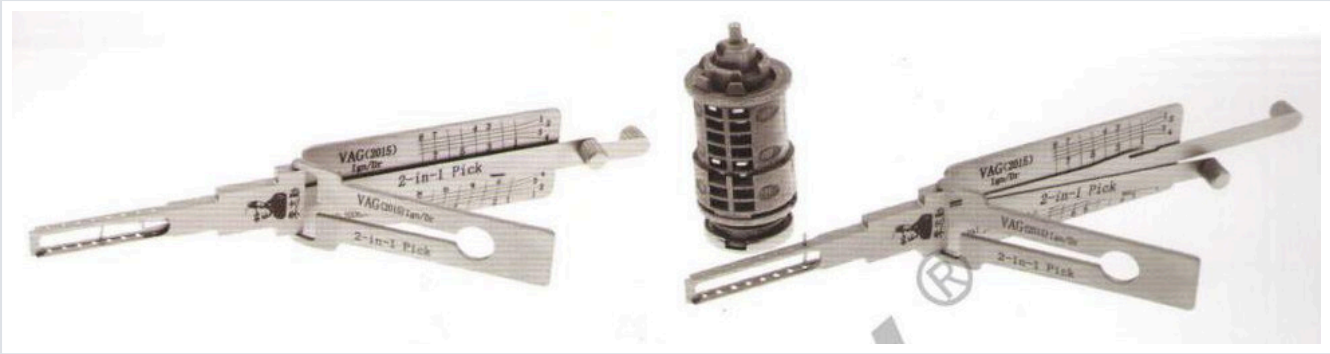


Fig. 92.1 162T(8) 2-in-1 tool, both sides, with the matching lock cylinder below.

APPLICABLE VEHICLES	Golf R (imported Golf)
PICKING DIRECTION	With the driver's seat on the left, open counterclockwise.

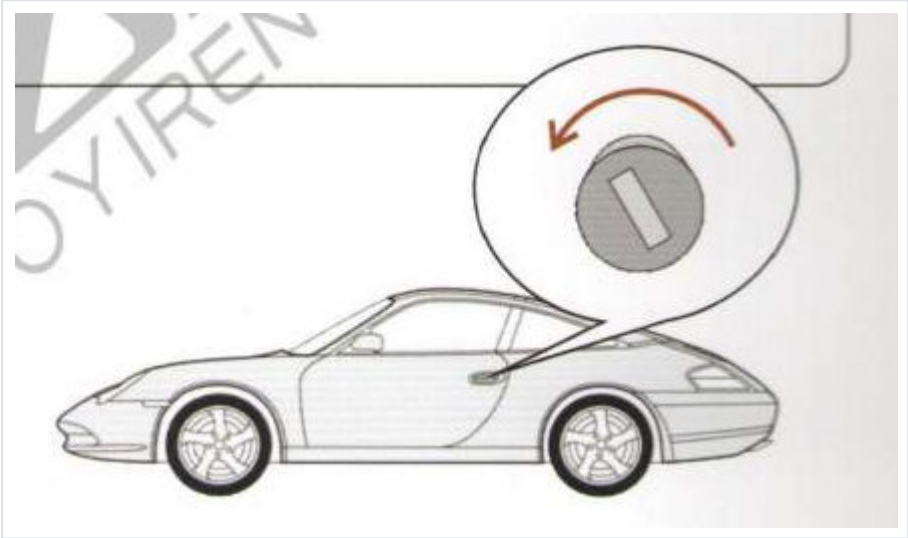


Fig. 92.2 Picking direction on the vehicle: counterclockwise with the driver's seat on the left.

Lock Overview



Fig. 92.3 Cylinder cutaway: the wafer stack as loaded in the plug.

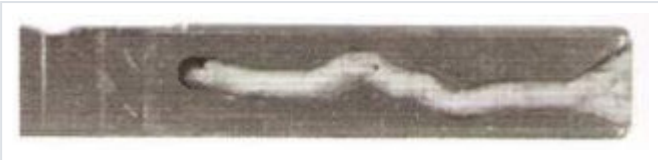


Fig. 92.4 Key blade profile: the groove track runs along the blade.

This lock has 8 bitting positions and 4 cut depths. Neither the door lock nor the ignition lock is missing wafers. The lock has no laterally moving wafers, so it is classified as a four-track inner groove lock.

SOURCE PAGE 093

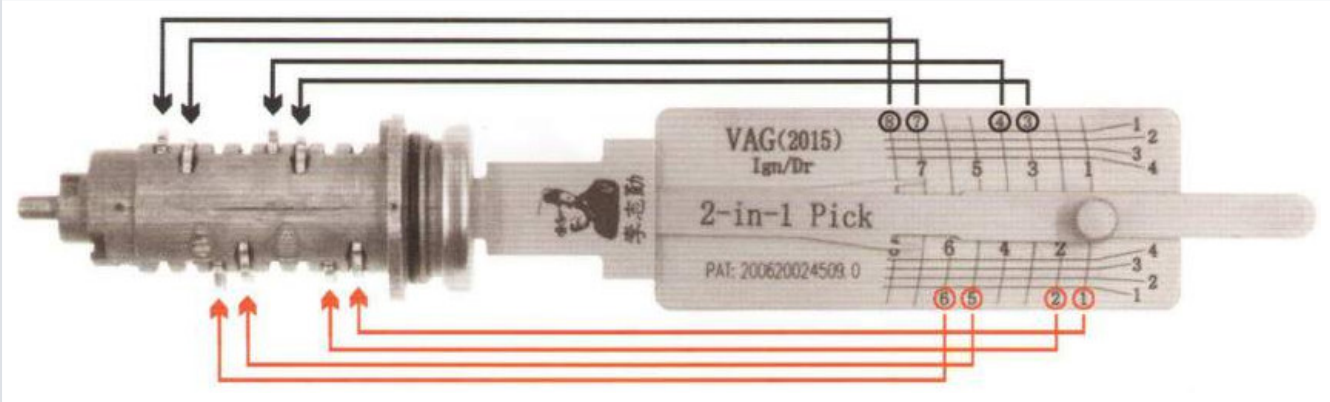


Fig. 93.1 Wafer positions mapped one by one from the cylinder to the reading panel of the 162T(8).

李志勤 → Li Zhiqin
Ign/Dr → Ign/Dr
PAT: 200620024509.0 → PAT: 200620024509.0
VAG(2015) → VAG(2015)
2-in-1 Pick → 2-in-1 Pick

Picking Technique

> Insert the tool and test the wafer positions. First use the lifter to open the inner-groove portion one position at a time until it is fully open — the wafer reaches its position! Once the wafer is fully open, there is also a slight springiness.)

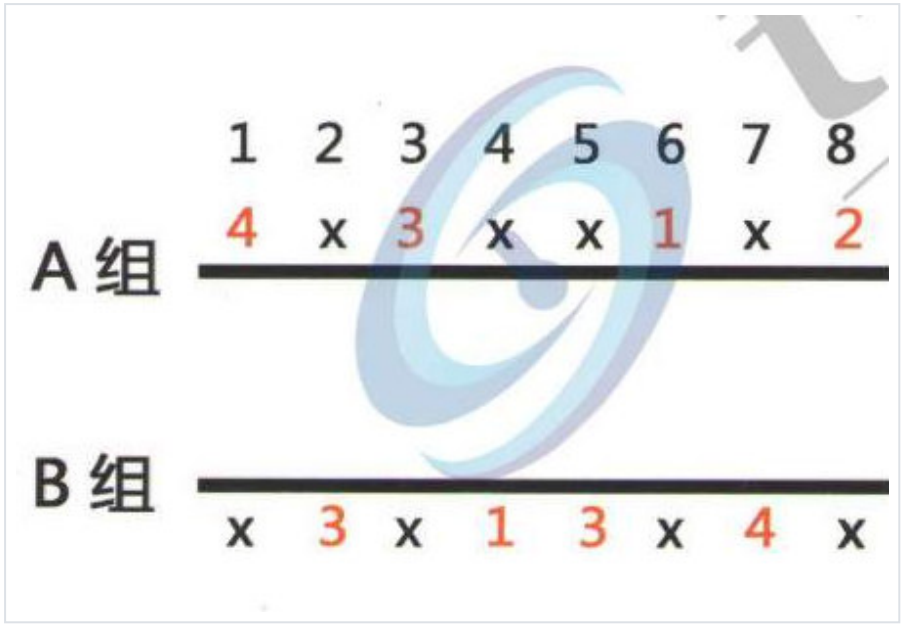


Fig. 93.2 Bitting chart for the A and B groups: positions 1 to 8 with the depth figures.

A组 → Group A

B组 → Group B

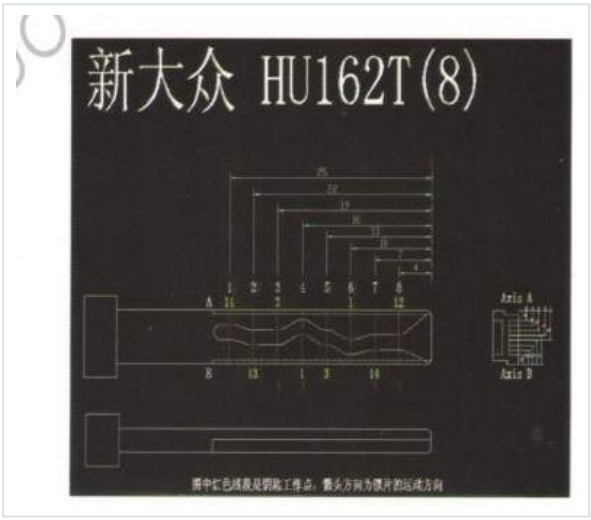


Fig. 93.3 Door and ignition key drawing for the new VW HU162T(8), with the working points and dimension chains.

新大众 → New VW

图中红色线是钥匙工作点，箭头方向为锁片的运动方向 → The red line in the drawing is the key working point; the arrow shows the direction of wafer travel

Note: the red figures indicate the actual bitting position; the black figures indicate bitting positions obtained by calculation. Data read off with the decoder should be entered at the positions where the red figures sit.

Positions present in the ignition and door locks — all 8 positions in both.

Position	1	2	3	4	5	6	7	8
Ignition	✓	✓	✓	✓	✓	✓	✓	✓
Doors	✓	✓	✓	✓	✓	✓	✓	✓

SOURCE PAGE 094

Decoding

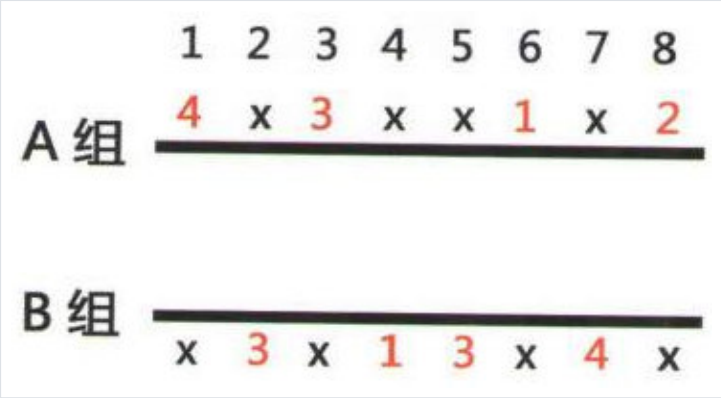


Fig. 94.1 Positions 1 to 8 read from the tool, entered into the A and B groups; x marks a position with no code.

A组 → Group A B组 → Group B

Read forward after opening.

Working through bitting positions 1 to 8 in turn, use the lifter to press each wafer to the end of its spring travel (until it will not compress any further) and record the cut depth line the pointer indicates. As shown in the figure below, enter positions 1, 3, 6 and 8 in Group A and positions 2, 4, 5 and 7 in Group B.

Positions with no depth code also have to be calculated and cut. (For a position that has no code, calculate the code with coefficient 6: 6 minus A = B, 6 minus B = A. Then enter all codes as shown in the figure below.)

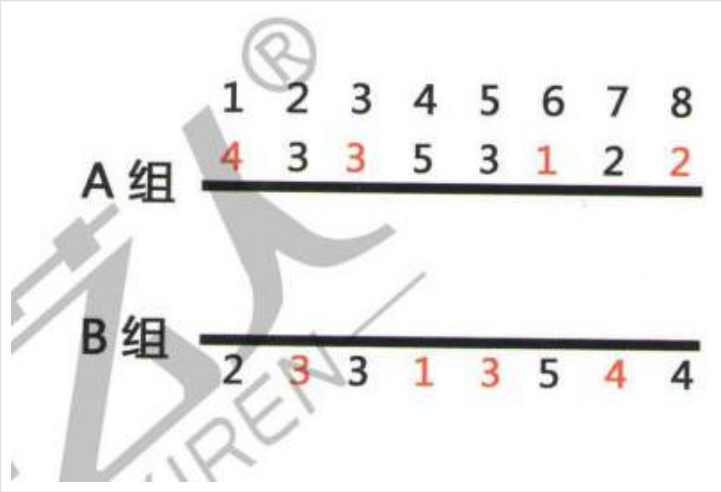


Fig. 94.2 All eight positions completed: the A and B rows filled in with the calculated codes.

A组 → Group A B组 → Group B

Special Technique

If a computer-controlled key machine is later upgraded to cut this key, you only have to input the red cut-depth data into the machine; the machine will read it automatically.

162T(9) 2-in-1

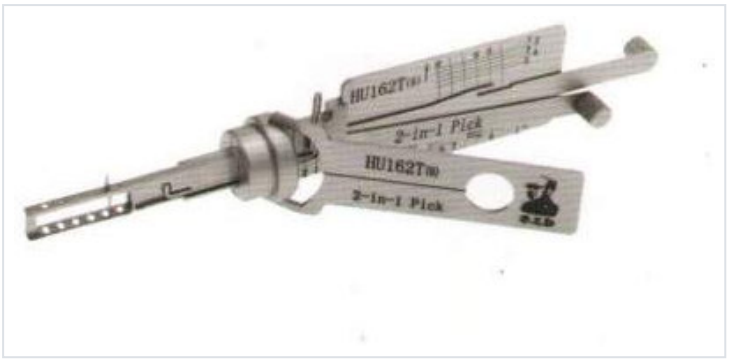


Fig. 94.3 162T(9) 2-in-1 tool with its key blank.

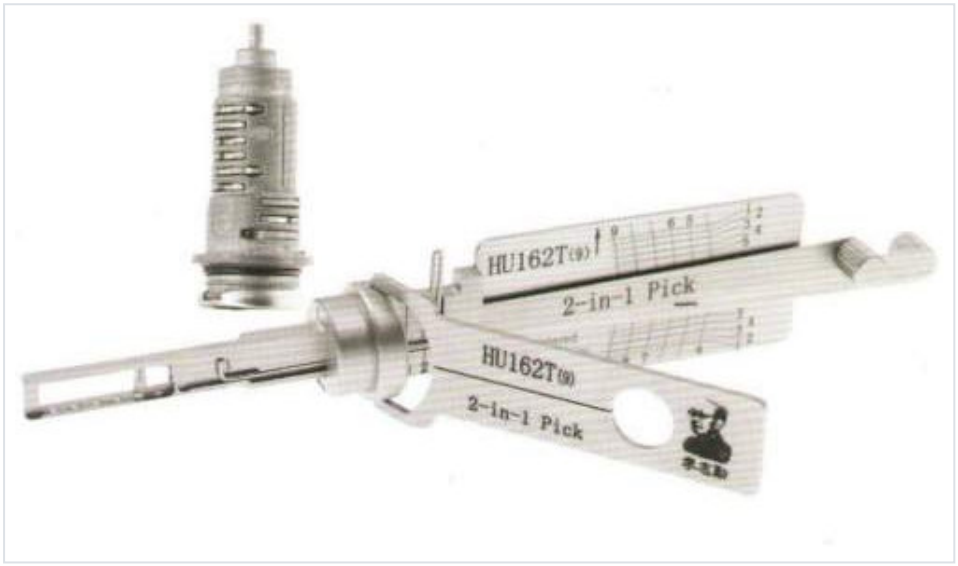


Fig. 94.4 162T(9) 2-in-1 tool shown with the matching lock cylinder.

HU162T(9) → HU162T(9)
2-in-1 Pick → 2-in-1 Pick
李志勤 → Li Zhiqin

SOURCE PAGE 095

APPLICABLE VEHICLES	VOLKSWAGEN, SKODA
PICKING DIRECTION	With the driver's door on the left, open counterclockwise toward the front of the vehicle.

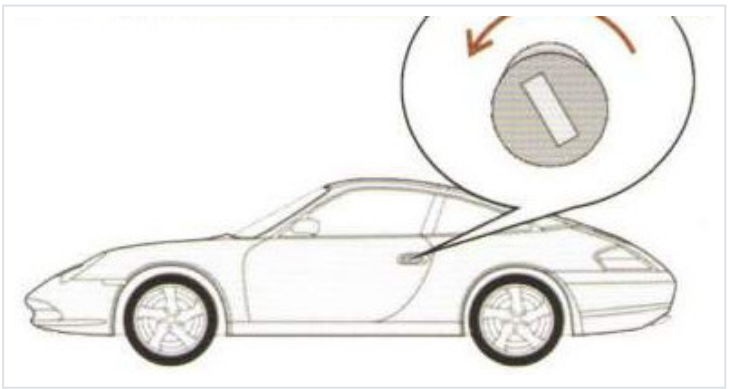


Fig. 95.1 Picking direction: counterclockwise toward the front of the vehicle with the driver's door on the left.

Lock Overview

This lock is the all-new 6-track lock most recently introduced by the Huf company.

For the first time, inner grooving and side grooving are combined in one lock.

The door lock has 9 bitting positions and 9 cut depths in total (the 3 vertically working positions have 4 cut depths; the 6 horizontally working positions have 5 cut depths). It is made up of 6 horizontally working wafers and 3 vertically working wafers.

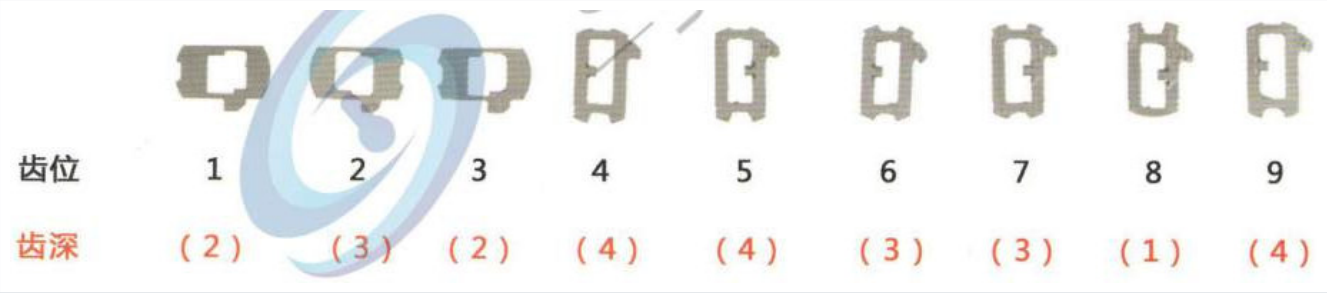


Fig. 95.2 Wafer silhouettes for positions 1 to 9 with the cut depth assigned to each position.

齿位 → Wafer position

齿深 → Cut depth

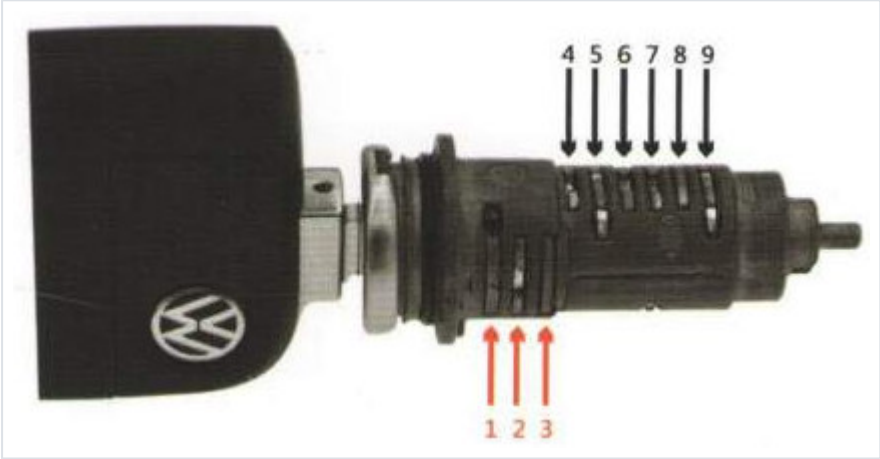


Fig. 95.3 Door cylinder on the plug: positions 4 to 9 read from the top, positions 1 to 3 from the bottom.

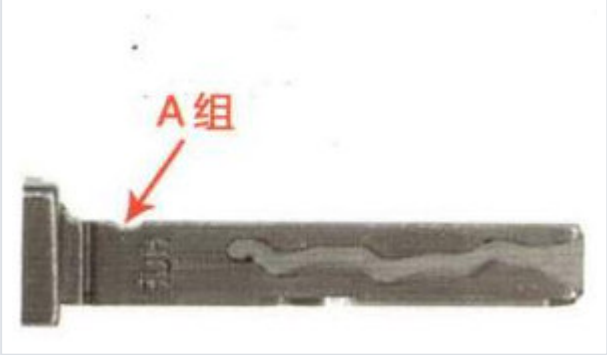


Fig. 95.4 Key blade: the red arrow marks the Group A row of cuts on the top edge.

A组 → Group A

SOURCE PAGE 096

HU162T(9) 2-in-1

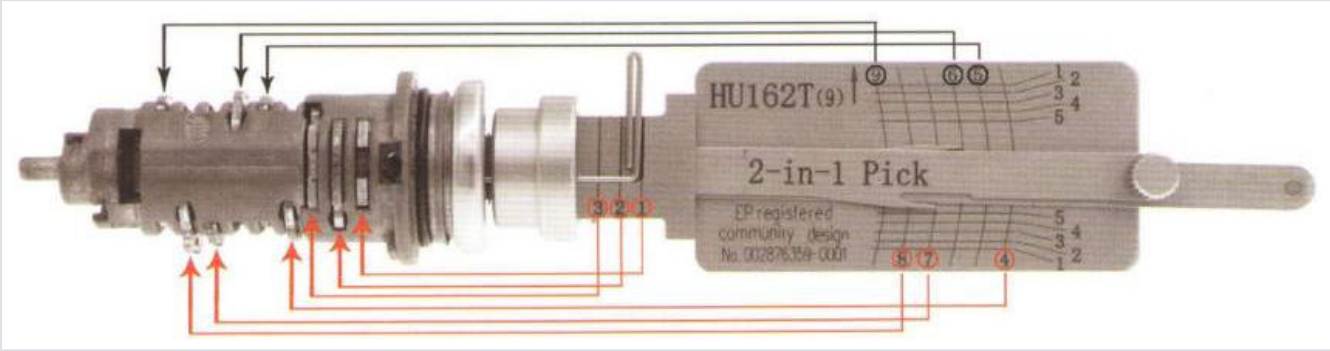


Fig. 96.1 HU162T(9) 2-in-1 Pick shown with the cylinder and tool in place. The red arrows trace each wafer to the corresponding position on the reading panel.

Picking Technique

Insert the tool and test the bitting positions. First use the lifter to bring the inner-groove portion fully into position in one pass, then use the swing arm to lift the three vertically working wafers into position. (The swing arm is used in exactly the same way as the standard lifter, and once a wafer reaches position there is a slight spring return as well.)

If the lock does not open, work the three lifters repeatedly to locate the wafers that are still locked, until the lock opens.



Fig. 96.2 HU162T(9) 2-in-1 tool callouts: key blank, picking tip, swing arm, tool name, pointer, wafer position line, cut depth line, lifter, tension bar, trade mark, patent number.

钥匙体 → Key blank
旋转撬杠 → Swing arm
指针 → Pointer
齿深线 → Cut depth line
推动针 → Tension bar
撬动点 → Picking tip
工具型号 → Tool name
齿位线 → Wafer position line
撬杠 → Lifter
商标 → Trade mark

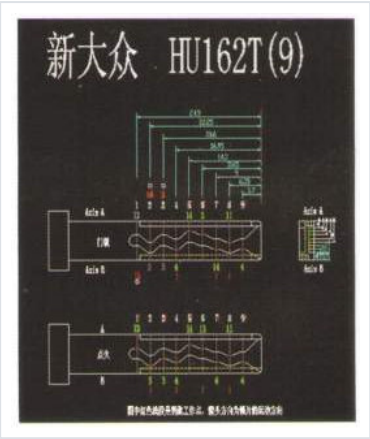


Fig. 96.3 HU162T(9) key chart for the door lock and ignition lock, with the bitting positions on axis A and axis B and the position dimensions.

新大众 → New Volkswagen
车门 → Door lock
点火 → Ignition lock

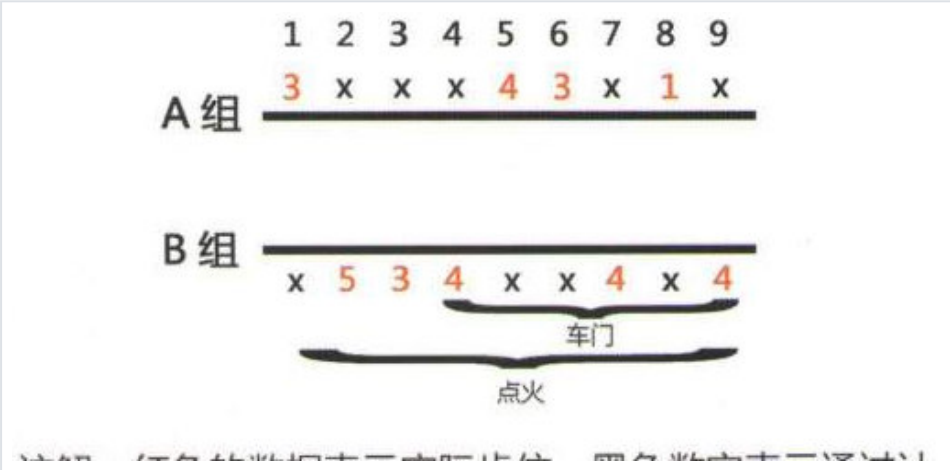


Fig. 96.4 HU162T(9) bitting chart. A group: 3 x x x 4 3 x 1 x. B group: x 5 3 4 x x 4 x 4. Red values are actual wafer positions. The upper brace marks the door-lock positions and the lower brace the ignition-lock positions.

A组 → A group
B组 → B group
车门 → Door lock
点火 → Ignition lock

> Red figures are the actual wafer positions; black figures are calculated positions. Enter the data read with the decoder at the positions marked in red.

SOURCE PAGE 097

Horizontal movement track section

Position	1	2	3
Ignition			
Doors	✓	✓	✓

Vertical movement swing-arm section

1	2	3	4	5	6	7	8	9

1	2	3	4	5	6	7	8	9
✓	✓	✓	✓	✓	✓	✓	✓	✓
			✓	✓	✓	✓	✓	✓

Decoding

Read forward after opening.

The door lock uses positions 4 through 9. Positions 1 through 9 are used for the ignition. Positions 4 through 9 together with the rotary positions 1, 2 and 3 make up the door key. Positions 1, 2 and 3 of the vertical lifter are used only in the ignition lock; this tool cannot read the ignition lock, so they are not covered here. The ignition tool will be introduced separately with the later tools.

Read forward after opening. Work through positions 4 through 9 in order: press each wafer with the lifter to the end of its spring travel (until it will not move) and note the cut depth line the pointer indicates. As shown in the chart below, enter positions 5, 6 and 8 in the A group and positions 4, 7 and 9 in the B group.

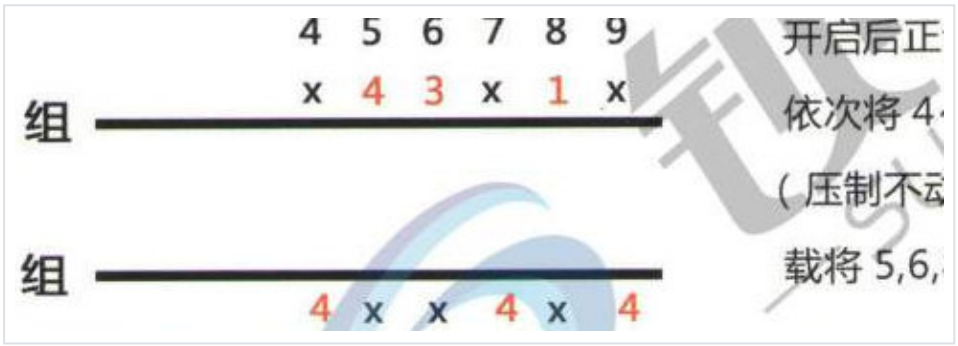


Fig. 97.1 A group and B group for positions 4 through 9. A group: x 4 3 x 1 x. B group: 4 x x 4 x 4.

A组 → A group B组 → B group

Positions without a bitting number also have to be calculated and cut. (To calculate a position with no bitting, use the factor 6: 6 minus A = B, and 6 minus B = A. Then enter all the bitting numbers as shown in the chart below.)

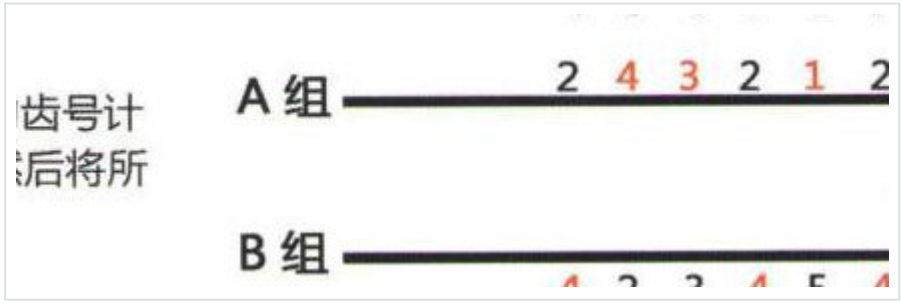


Fig. 97.2 Completed bitting for positions 4 through 9. A group: 2 4 3 2 1 2. B group: 4 2 3 4 5 4.

A组 → A group B组 → B group



Fig. 97.3 Face view of the plug with the cut depth marks for the horizontal track positions.

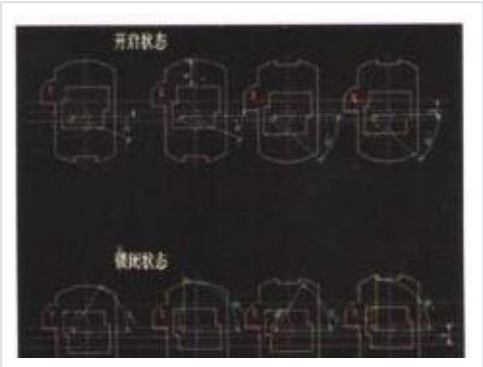


Fig. 97.4 Wafer travel in the cylinder, shown for the open state and the locked state.

开锁状态 → Open state　　锁闭状态 → Locked state

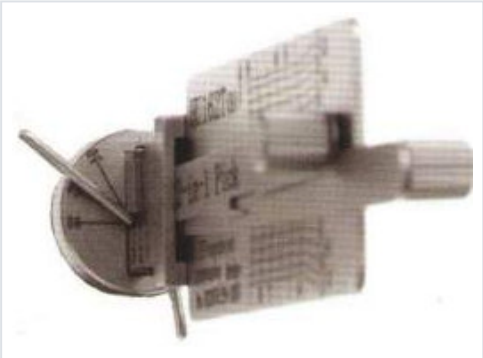


Fig. 97.5 The 2-in-1 Pick seated in the cylinder with the reading panel exposed.

Read backward before opening.

SOURCE PAGE 098

Read Backward Before Opening

BACKWARD READING METHOD

Use the swing arm to find the correct bitting position, then use the swing arm on the other side to read the opposite face of the wafer, pressing the swing arm until it will not move. At that point, record the angle the pointer indicates. (This backward reading method is the same as the original single-lifter backward reading method; there is simply one more lifter, and the reading is still taken on the opposite face of the same position in the opening direction.)

Read Forward After Opening

FORWARD READING METHOD

Use the swing arm to find the correct bitting position, then open with that lifter and read with that lifter. By turning the swing arm lightly, press the wafer to the end of its spring travel (that is, until it will not move) and record the angle the pointer indicates at that point.

Match the data read backward before opening with the data read forward after opening, and enter the two sets of data in the table strictly as follows.

State / Angle	Position 1	Position 2	Position 3
Before opening (read backward)	60°	90°	90°
After opening (read forward)	60°	60°	30°

Then find the cut depth that corresponds to wafer positions 1, 2 and 3.



Fig. 98.1 Swing arm reading: the pointer angle at each position is read against the 30°, 60° and 90° marks.

旋转撬杆读号说明 →
Swing arm reading instructions

Cut Depth Cross-Reference Table

Depth no.	Before opening (read backward)	After opening (read forward)
1 (cut depth)	60°	30°
2 (cut depth)	90°	30°
3 (cut depth)	60°	60°
4 (cut depth)	90°	60°

> Record every wafer position separately before opening and after opening, then use the recorded data to look up the matching cut depth number in the table.

Use the cut depth cross-reference table to find the depth number of the corresponding position and enter it under the A and B groups. Position 1 goes in the B group; positions 2 and 3 go in the A group.

The positions left empty in the A and B groups also have to be filled in and cut. (To calculate the number of an empty position, use the factor 5: 5 minus B = A; 5 minus A = B.) For example, see the chart below.

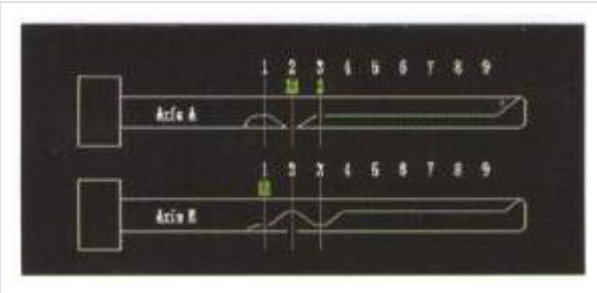


Fig. 98.2 Key cutting for the example: bitting positions 1 through 9 on axis A and axis B, with the values for positions 1, 2 and 3 marked.

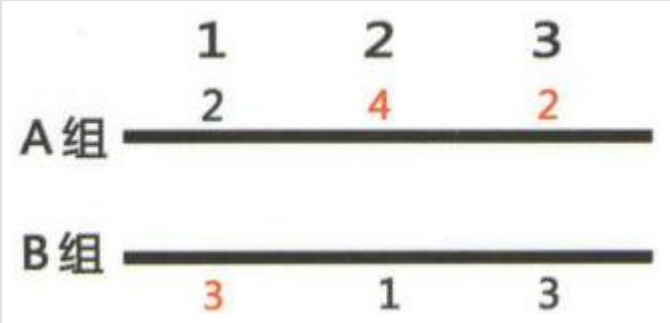


Fig. 98.3 Example for positions 1, 2 and 3. A group: 2 4 2. B group: 3 1 3.

A组 → A group
B组 → B group

SOURCE PAGE 099



Fig. 99.1 Positions 1 through 3 on the swing arm. A group: 2 4 2. B group: 3 1 3.

A组 → A group
B组 → B group
旋转撬杆所控制的 3 个齿 → The 3 wafers controlled by the swing arm

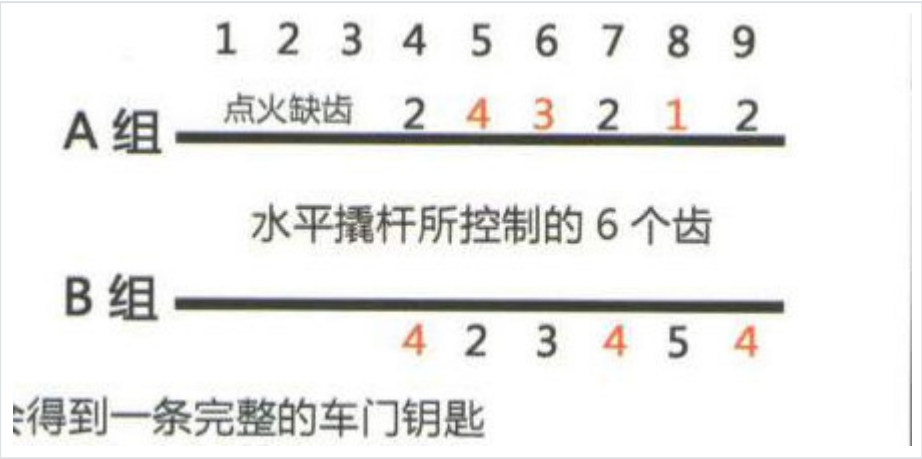


Fig. 99.2 Positions 1 through 9 on the horizontal lifter. A group: ignition positions 1-3 have no cut, values at 4-9 are 2 4 3 2 1 2. B group: values at 4-9 are 4 2 3 4 5 4.

A组 → A group
点火缺齿 → Ignition positions, no cut
B组 → B group
水平撬杆所控制的 6 个齿 → The 6 wafers controlled by the horizontal lifter

Combine the two sets of data and you get a complete door key.

Special Technique

If the CNC key machine is upgraded to cut this key at a later date, you only need to enter the red cut depth data into the CNC machine, and the machine works out the rest automatically.

HU162T(10) 2-in-1



Fig. 99.3 HU162T(10) 2-in-1 Pick, shown with the ignition cylinder and the key blank.

APPLICABLE VEHICLES Audi

Picking Direction

When the driver's door is on the left, pick counterclockwise toward the front of the car.

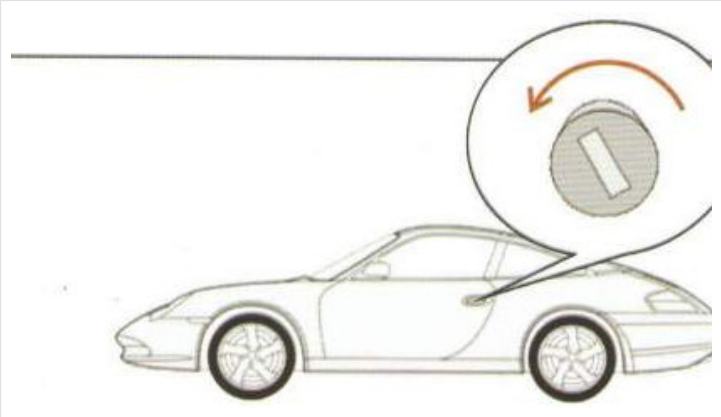


Fig. 99.4 Picking direction for the left-hand driver's door: counterclockwise toward the front of the car.

SOURCE PAGE 100

Lock Overview

This door lock has 10 bitting positions and 9 cut depths. (The 4 positions that work vertically have 5 cut depths; the 6 positions that work horizontally have 5 cut depths.) The lock is built from 6 horizontally working wafers and 4 vertically working wafers.



Fig. 100.1 Key silhouette chart: the 10 bitting positions along the blade, with the depth code read at each position.

齿位 → Wafer position

齿深 → Cut depth

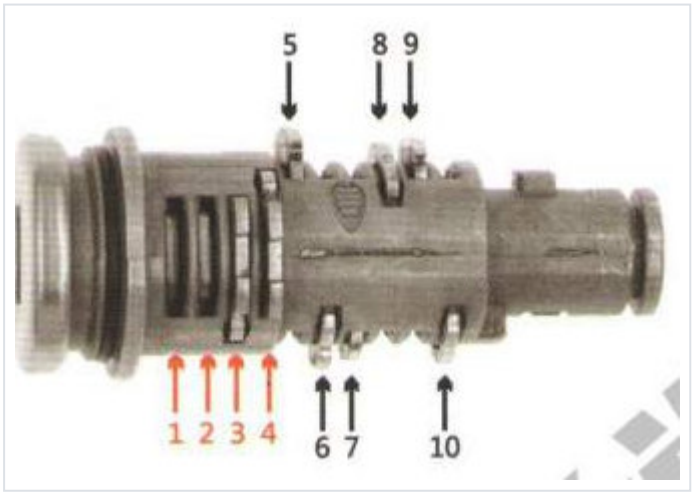


Fig. 100.2 Cylinder cutaway with the wafer positions numbered: 5, 8 and 9 on the upper row, 1, 2, 3, 4, 6, 7 and 10 on the lower row.

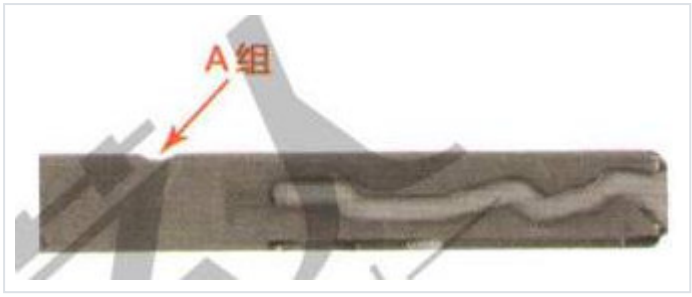


Fig. 100.3 The matching key blade, with the Group A track marked.

A组 → Group A

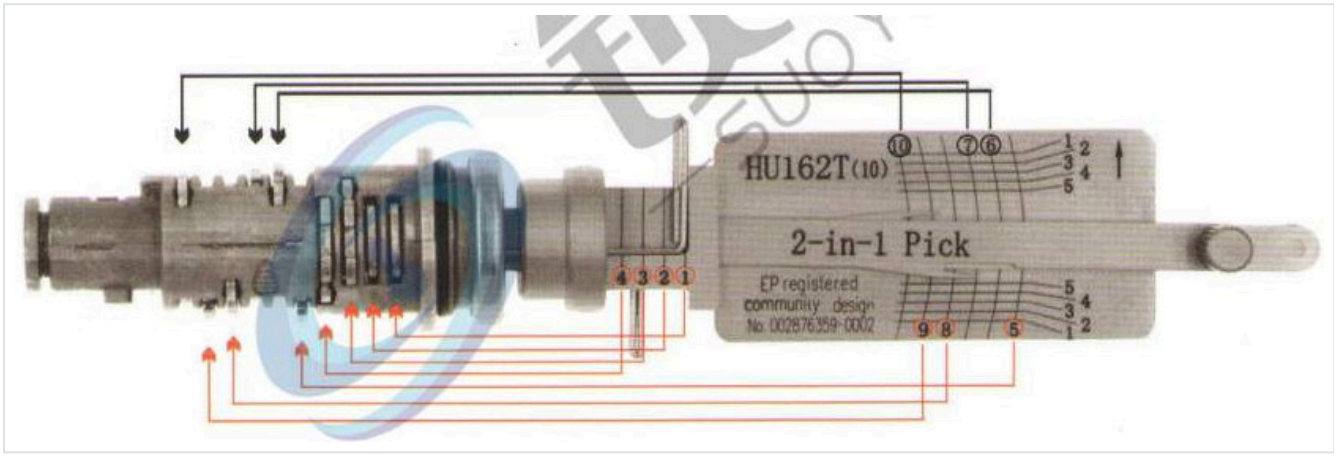


Fig. 100.4 HU162T(10) 2-in-1 Pick reading panel lined up with the cylinder: the lifters and the wafer positions 1 through 10 marked on the panel.

Picking Technique

Insert the tool and test the bitting positions. First use the lifter to bring the inner-groove section fully to position in one pass, then use the rotating lifter to bring the 4 horizontally working wafers fully to position. (The rotating lifter is used exactly the same way as the standard lifter, and a wafer that has gone fully to position still has a little spring in it.)

If the lock does not open, work the 4 lifters repeatedly to hunt for the wafer that is still binding, until it opens.

SOURCE PAGE 101

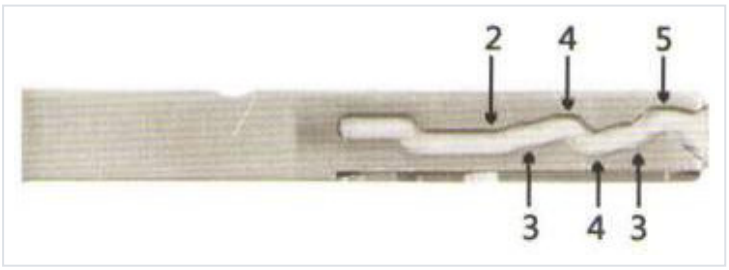


Fig. 101.1 Key blade with the depth codes marked on the upper edge (2, 4, 5) and on the lower edge (3, 4, 3).

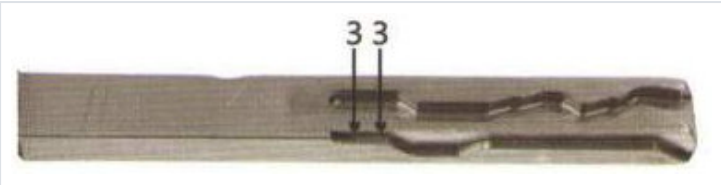


Fig. 101.2 Key blade with two adjacent cuts marked 3 and 3.

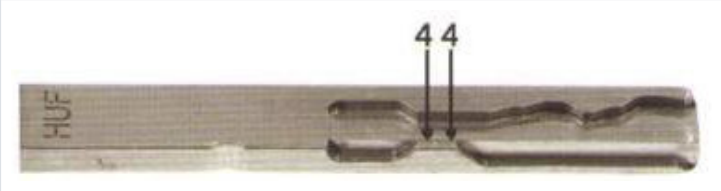


Fig. 101.3 Key blade stamped HUF, with two adjacent cuts marked 4 and 4.

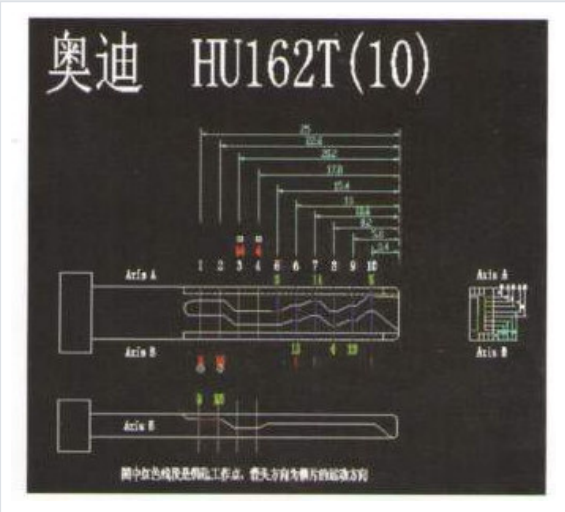


Fig. 101.4 Audi HU162T(10) key chart: bitting positions 1 through 10 with their spacing dimensions, the depth codes at each position, and the key profile on Axis A and Axis B.

奥迪 → Audi

图中红色线框是钥匙工作点，箭头方向为锁片的运动方向 → The red outlined lines mark the working points on the key; the arrows give the direction of wafer travel

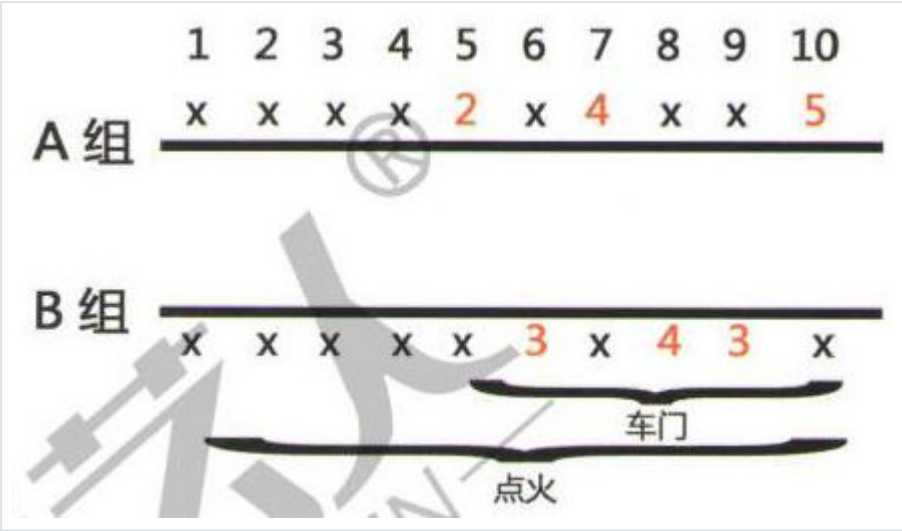


Fig. 101.5 Group A and Group B depth codes for HU162T(10): positions 5, 7 and 10 carry codes on the A group, positions 6, 8 and 9 on the B group, with the door and ignition ranges bracketed below.

A组 → Group A
B组 → Group B
车门 → Door
点火 → Ignition

Horizontal movement track section.

Position	1	2	3	4
Ignition				
Doors	✓	✓	✓	✓

Vertical movement rotating arm section.

1	2	3	4	5	6	7	8	9	10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
				✓	✓	✓	✓	✓	

Decoding

Decode forward after opening.

The door lock uses bitting positions 5 through 10; positions 1 through 10 are used for the ignition. Positions 5 through 10 together with positions 1, 2, 3 and 4 of the rotating lifter make up the door key. Positions 1, 2, 3 and 4 of the rotating lifter are used in the ignition lock only; this tool cannot decode the ignition lock, so they are not covered here. The ignition tool is covered separately under a later tool.

SOURCE PAGE 102

Decode forward after opening.

Working through bitting positions 5 to 10 in order, press each wafer to the end of its spring travel with the lifter (until it will not move any further) and record the cut depth line the pointer is indicating. Enter the readings as shown in the diagram: put positions 5, 7 and 10 in group A, and positions 6, 8 and 9 in group B.

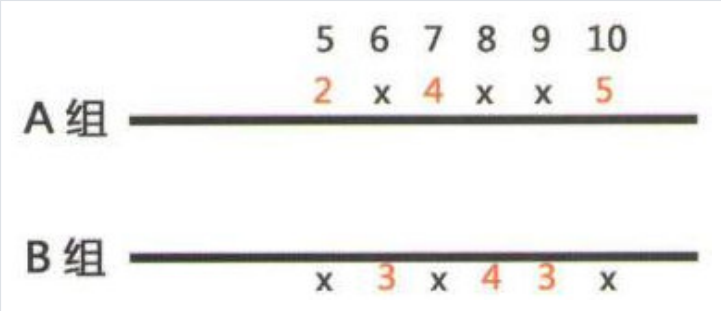


Fig. 102.1 Depth codes read at bitting positions 5 through 10 on the open lock, with the readings entered in group A and group B.

A组 → Group A　　B组 → Group B

Positions with no code also have to be calculated and cut. (For a position that carries no code, work the code out with the factor 6: 6 minus A = B, and 6 minus B = A. Then enter all the codes as shown in the diagram below.)

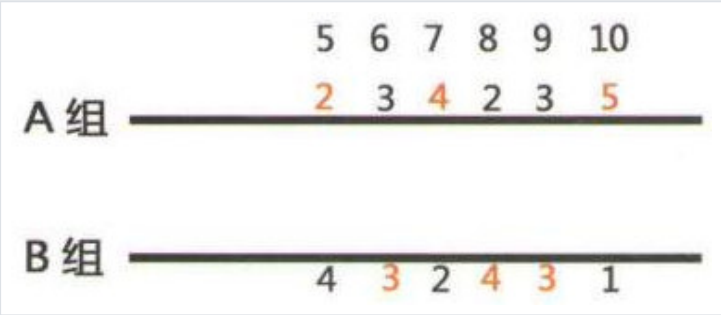


Fig. 102.2 Group A and group B codes for positions 5 through 10 with the missing codes calculated, ready for cutting.

A组 → Group A　　B组 → Group B



Fig. 102.3 Reading schematic: open state with forward reading above, locked state with backward reading below, drawn on four cylinder cross-sections.

开启状态 → Open state
锁闭状态 → Locked state
正读示意图 → Forward reading schematic
反读示意图 → Backward reading schematic

BEFORE OPENING: DECODE BACKWARD FIRST

BACKWARD READING METHOD

Use the rotating lifter to find the correct bitting position, then use the rotating lifter on the other side and read the opposite face of the wafer. Press the rotating lifter until it will not move. At that point, record the angle the pointer is indicating. (This backward reading method is the same as the original single-lifter backward reading method; there is simply one extra lifter, and the reading is still taken at the same bitting position, on the opposite side of the picking direction.)

DECODE FORWARD AFTER OPENING

FORWARD READING METHOD

Use the rotating lifter to find the correct bitting position, then open with that lifter and read with that same lifter. By rotating the lifter gently, press the wafer to the end of its travel (that is, until it will not move) and record the angle the pointer is indicating at that moment.

SOURCE PAGE 103

Example

Enter the data read backward before opening and the data read forward after opening into the table exactly as follows.

Angles recorded before and after opening, for bitting positions 1 through 4.

Status / Angle	Position 1	Position 2	Position 3	Position 4
Before opening (backward reading)	60°	60°	90°	90°
After opening (forward reading)	60°	60°	60°	60°

Then find the cut depth that corresponds to bitting positions 1, 2, 3 and 4.

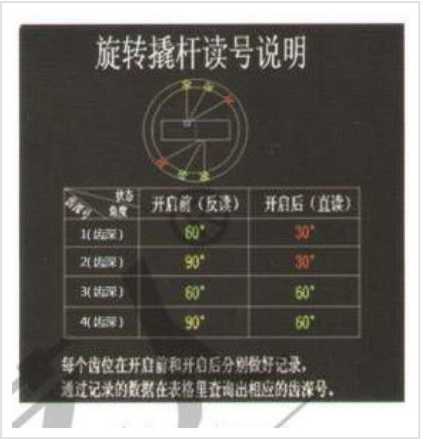


Fig. 103.1 Rotating lifter reading panel: the dial used to read the angle, and the angle table — depth 1: 60° before opening and 30° after; depth 2: 90° and 30°; depth 3: 60° and 60°; depth 4: 90° and 60°.

旋转撬杆读号说明 → Rotating Lifter Reading Instructions
角度 → Angle
开启前（反读） → Before opening (backward reading)
每个齿位在开启前和开启后分别做好记录，通过记录的数据在表格里查询出相应的齿深号 → Record every position before and after opening; use the recorded data to look up the matching depth code in the table
状态 → Status
齿位 → Wafer position
开启后（正读） → After opening (forward reading)

Cut Depth Cross-Reference Table

Look up the depth code for each bitting position in the cut depth cross-reference table and enter it under group A and group B. Positions 1 and 2 are entered in group B; positions 3 and 4 are entered in group A. Positions left blank in groups A and B must also be filled in and cut. (Method for calculating the code of a blank position: use the factor 5 — 5 minus B = A; use the factor 5 minus A = B.) Example: see the diagram below.

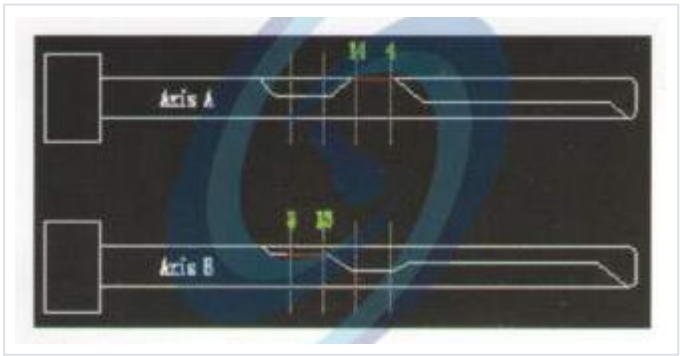


Fig. 103.2 Key profile for HU162T(10): Axis A and Axis B, with the example depth codes marked at positions 1 through 4.

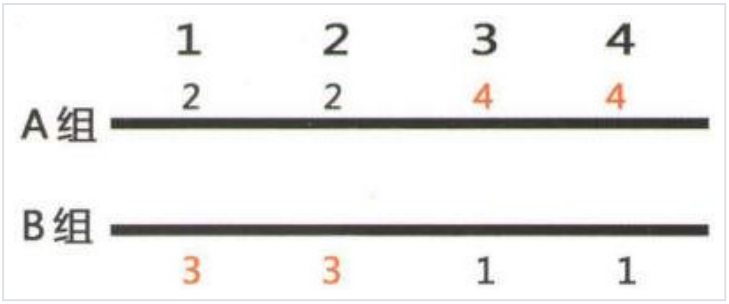


Fig. 103.3 Example codes for the 4 positions controlled by the rotating lifter: group A 2, 2, 4, 4 and group B 3, 3, 1, 1.

A组 → Group A
B组 → Group B



Fig. 103.4 The two data sets side by side: the 4 positions controlled by the rotating lifter at left and the 6 positions controlled by the horizontal lifter at right, where the ignition position carries no wafer.

A组 → Group A
旋转撬杆所控制的 4 个齿 → The 4 positions controlled by the rotating lifter
点火缺片 → Ignition: wafer missing
B组 → Group B
水平撬杆所控制的 6 个齿 → The 6 positions controlled by the horizontal lifter

Merge the two sets of data and you have a complete door key.

Special Technique

If a later upgrade of the CNC key machine makes this key cuttable, just enter the red depth data into the machine and the machine will decode it automatically.

SOURCE PAGE 104

Others

Renault One Track Inner Groove Key 2-in-1

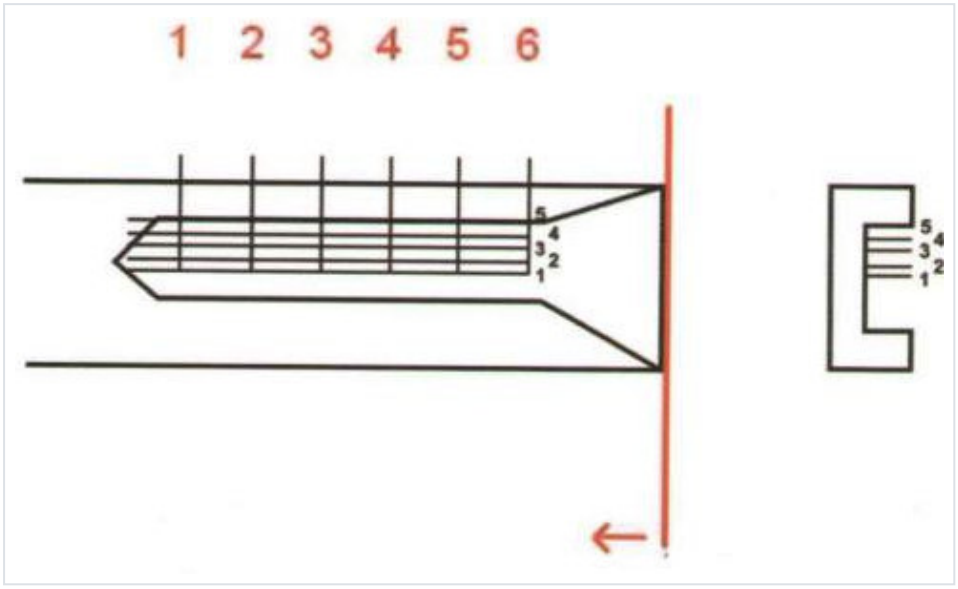


Fig. 104.1 Renault key chart, first version: bitting positions 1-6, depth scale 1-5, and keyway cross-section.

钥匙齿位示意图 → Key bitting position diagram

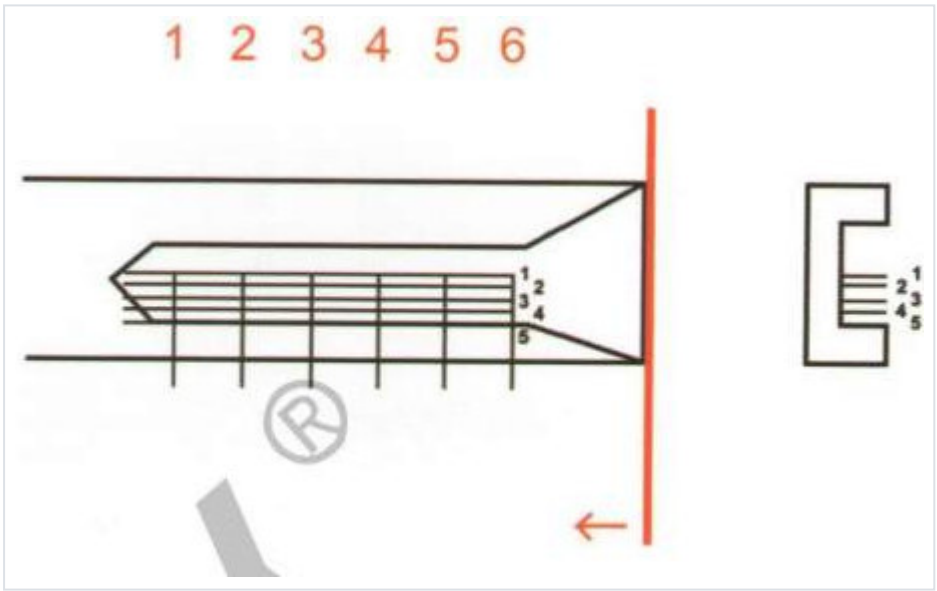


Fig. 104.2 Renault key chart, second (mirrored) version: bitting positions 1-6, depth scale 1-5, and keyway cross-section.

钥匙齿位示意图 → Key bitting position diagram

APPLICABLE VEHICLES	Renault
NUMBER OF CUT DEPTHS	5
NUMBER OF PICKING POSITIONS	6

The key has a single track that drives the wafers. This lock is built in two versions: one with the track on the left face, one with the track on the right face.

PICKING METHOD

Insert the 2-in-1 tool into the keyway and test first. This lock has 5 depth codes. Test which side has spring pressure: its wafers all face one direction. Opening toward the front of the car is difficult; opening toward the rear of the car is easier. Opening toward the rear of the car is clockwise.

Decode after opening. The decoding method is simple: whichever face you opened, that is the face you read. Write down the depth codes you read.

Our cutter is single-sided, so cut away the excess part of the key. Because the key for this lock is 2 mm thick, milling the cuts on one face is enough. After milling the cuts, insert a master blank and test it. When the key is made correctly, take a 3 mm end mill and mill one key along the edge; it will then open the ignition. The other face is on the reverse side; make that key the same way.

NE72 2-in-1



Fig. 104.3 NE72 2-in-1 tool.

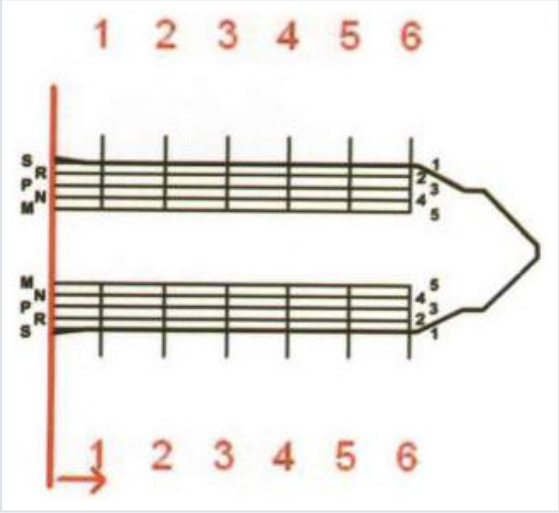


Fig. 104.4 NE72 key bitting chart: two tracks, positions 1-6 counted from the reference line, depth rows lettered S, P, N and M.

钥匙齿位示意图 → Key bitting position diagram

SOURCE PAGE 105

APPLICABLE VEHICLES	Peugeot, Citroën
NUMBER OF WAFERS	6
BITTING POSITIONS	1-6
DEPTH LETTER CODES	S = 1, R = 2, P = 3, N = 4, M = 5

This key is made double-sided so that it is convenient to insert: you do not have to turn it over. Both faces are cut, but in reality only one face carries the wafers.

PICKING METHOD

Test all 6: if all of them show spring pressure, the tool is inserted correctly. Opening toward the rear of the car and opening toward the front of the car are the same — both open equally easily.

Once the lock is open, turn it through an angle and you can decode: S, R, P, N and M stand for 1, 2, 3, 4 and 5 respectively. Write down the numbers you read.

Make both faces of the key perfectly symmetrical; this key then opens from either face. When one face is finished you can test it: insert it and test with the wafer side facing you. Once it tests good, finish the other face, and the key is complete.

The ignition and the door lock have exactly the same number of wafers.

Numerical Data

The diagram at left gives the bitting position and cut depth data for NE72.

(Unit: 1/100 mm)

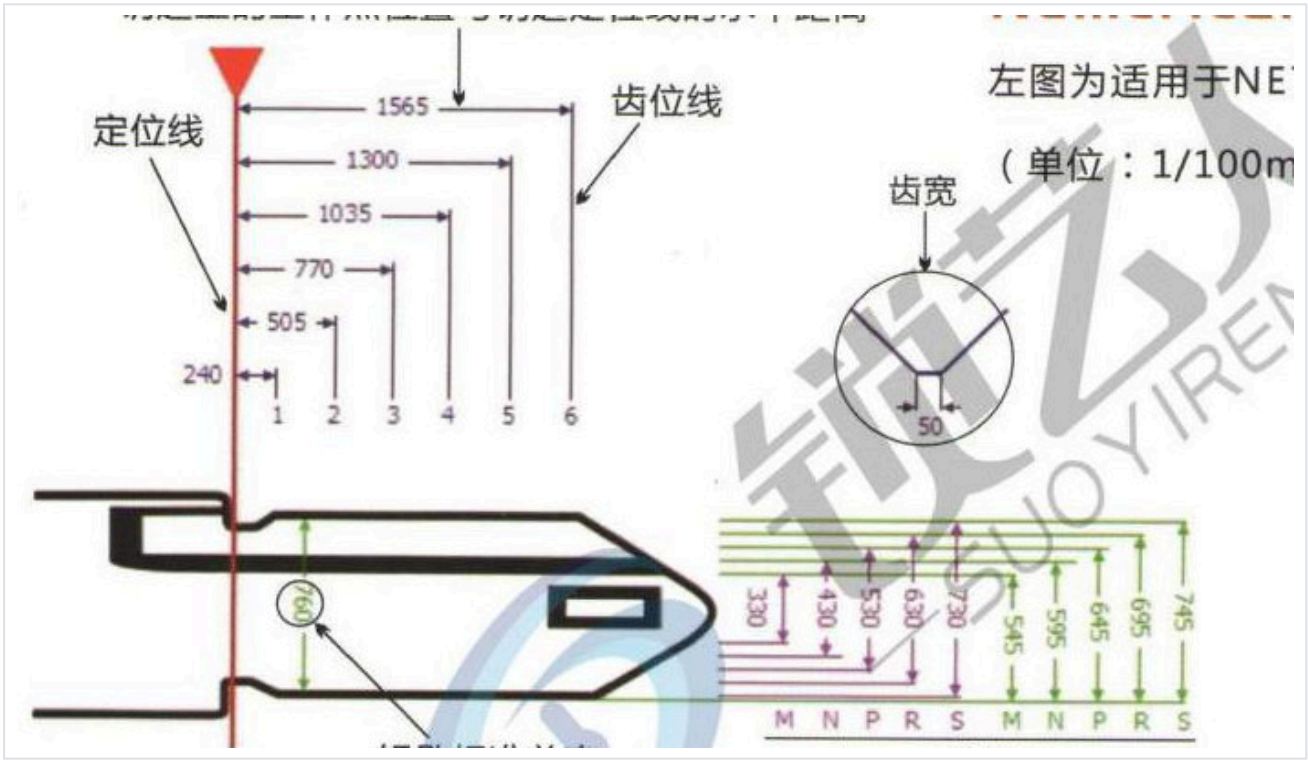


Fig. 105.1 NE72 bitting positions and cut depths: 240, 505, 770, 1035, 1300, 1565 from the reference line, and depth values 330, 430, 530, 630, 730 (track one) and 545, 595, 645, 695, 745 (track two) with letter codes M, N, P, R, S.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working points on the key to the key reference line
齿位线 → Wafer position line
钥匙标准总宽 → Key standard overall width
定位线 → Reference line
齿宽 → Wafer width
齿深 → Cut depth



Fig. 105.2 NE72 key and keyway cross-section.

TOY2 2-in-1



Fig. 105.3 TOY2 2-in-1 tool with key blank.

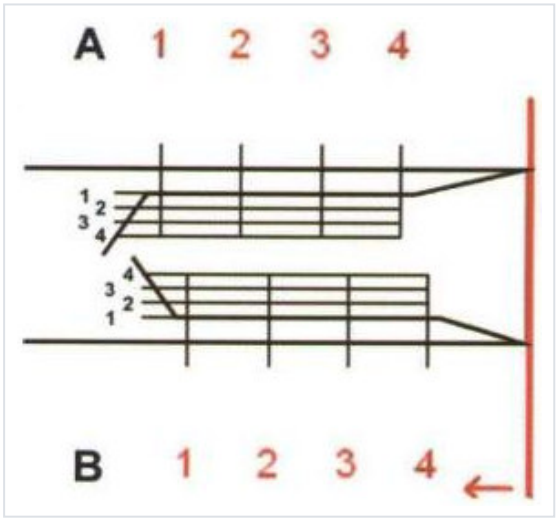


Fig. 105.4 TOY2 key chart, two-track numbering: track A positions 1-4, track B positions 1-4, depth scale 1-4.

钥匙齿位示意图 → Key bitting position diagram

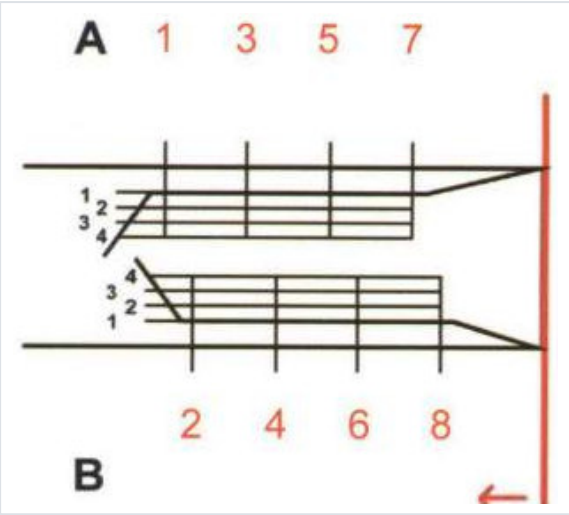


Fig. 105.5 TOY2 key chart, alternating numbering: track A positions 1, 3, 5, 7, track B positions 2, 4, 6, 8.

钥匙齿位示意图 → Key bitting position diagram

SOURCE PAGE 106

APPLICABLE VEHICLES	Toyota
NUMBER OF WAFERS	8 (4 in group A, 4 in group B)
BITTING POSITIONS	1-4 per group
CUT DEPTHS	1, 2, 3, 4
PICKING DIRECTION	Toward the rear of the car (clockwise)

On the latest Toyota models we call this a two-track inner groove key. Why two tracks? Because the back of the key is an empty slot that does nothing, so this much of it is milled away — there is a boss inside the cylinder, and that is why it is milled off.

There is also a smart key version, where this area is simply flat. That key is only two-thirds of this thickness and works on one face.

It has 8 wafers: 4 in group A and 4 in group B. The cut depths are 1, 2, 3 and 4. When you cut the key, depth 4 is not cut — you cut only 3, 2 and 1.

Using the tool and decoding: this tool is designed like the lock, so it is directional and can be inserted only one way. After inserting the tool, test the bitting positions: 1, 3, 5 and 7 are in group A; 2, 4, 6 and 8 are in group B.

This lock opens toward the rear of the car. The car is left-hand drive, so opening toward the rear is clockwise. Test the wafers and watch which ones move and which do not: leave the ones that move alone and lift the ones that do not. Once it opens and turns — after the lock is open, turn it through an angle — you read in the opposite direction when decoding.

This lock has no spring return, because all of its wafers are whole wafers. Record the depth codes you read.

Cut off the excess part of the key. With this lock you must be very careful when cutting the key: dress the excess very smooth, or it will not go into the keyway.

The cutting jig is just a jig and a master blade. When cutting, bend one leg, bend it to a 90° angle and cut one face; when the cut is finished, restore it. After restoring, compare it with the master blank: if it is very straight, insert it into the keyway, and if it tests well, copy the key directly.

Numerical Data

The diagram at left gives the bitting position and cut depth data for TOY2.

(Unit: 1/100 mm)

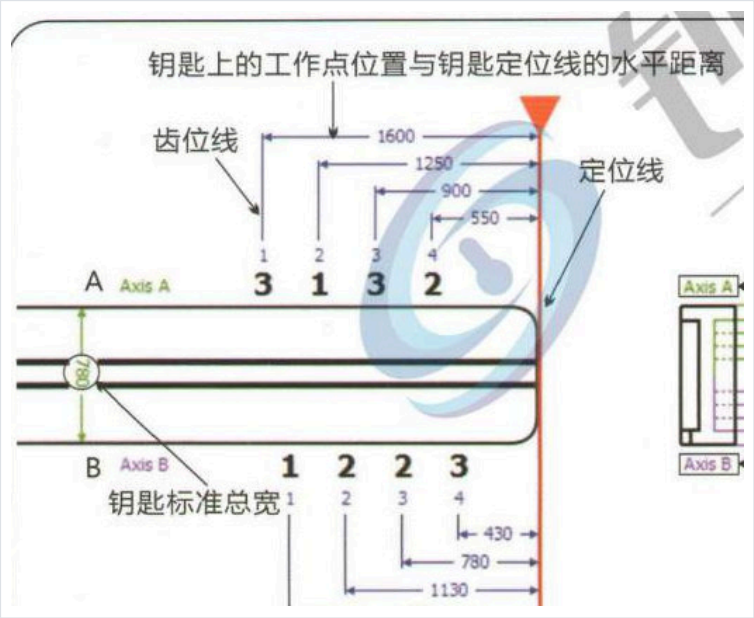


Fig. 106.1 TOY2 bitting positions measured from the reference line — 1600, 1250, 900, 550 — with track A cut codes 3, 1, 3, 2 and track B cut codes 1, 2, 2, 3; B-track distances 430, 780, 1130, 1480; key standard overall width 780.

钥匙上的工作点位置与钥匙定位线的水平距离 → Horizontal distance from the working points on the key to the key reference line
齿位线 → Wafer position line
定位线 → Reference line
钥匙标准总宽 → Key standard overall width
A → Track A
B → Track B

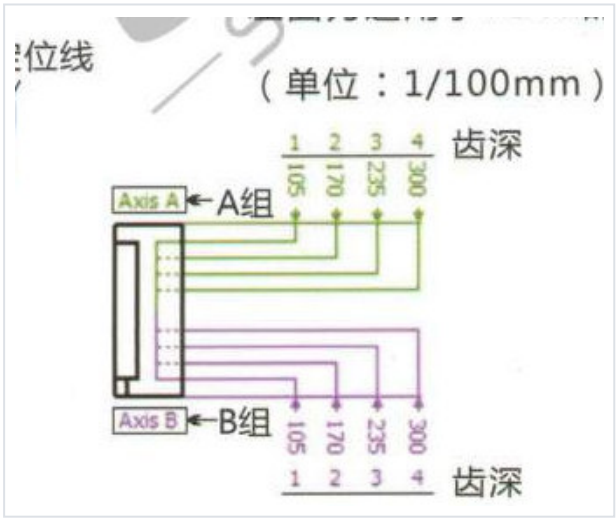


Fig. 106.2 TOY2 depth chart: group A and group B, positions 1-4, cut depths 105, 170, 235, 300.

A组 → Group A
齿深 → Cut depth
B组 → Group B
齿深 → Cut depth

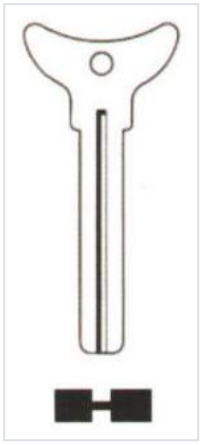


Fig. 106.3 TOY2 key silhouette with two-track groove, and keyway cross-section.

SOURCE PAGE 107

FO21 2-in-1

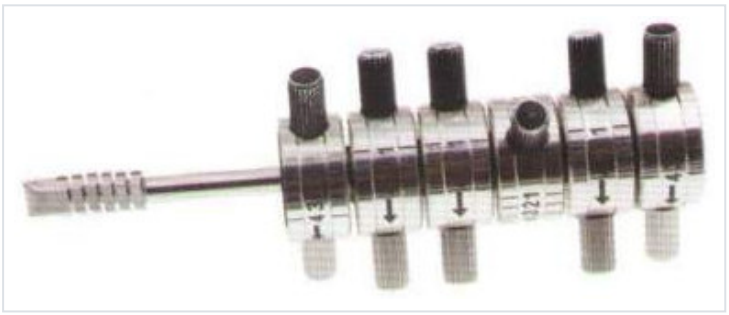


Fig. 107.1 FO21 wafer stack: six wafer positions with their springs on the demo shaft.

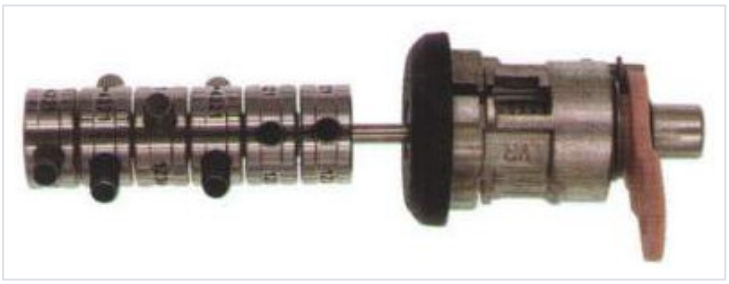


Fig. 107.2 FO21 wafer rack beside the door cylinder with its operating lever.

Applicable Cars

APPLICABLE CARS	Ford, MAZDA, JMC

Picking Direction

When the driver's seat is on the left, open counterclockwise.

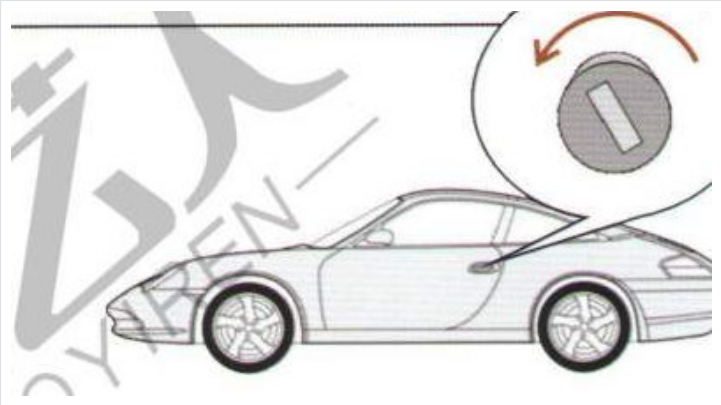


Fig. 107.3 Door lock turning counterclockwise.

Lock Overview

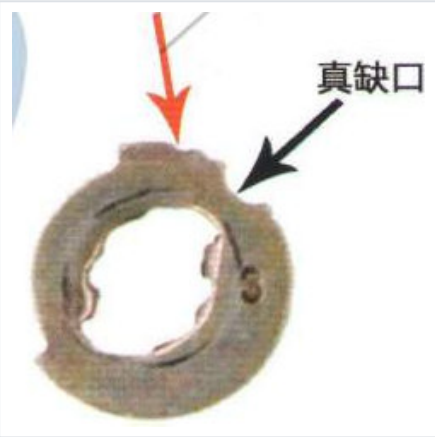


Fig. 107.4 Cylinder face and wafer ring, showing the false notch and the true notch.

假缺口 → False notch　　真缺口 → True notch



Fig. 107.5 Wafer rings for positions 1-6, with the values (3), (3), (1), (4), (1), (2).

This lock has a total of 6 bitting positions and 4 angular wafers. The ignition, the doors and the trunk all have 6 positions.

SOURCE PAGE 108

Picking Technique

Insert the tool and turn the rotating lifter counterclockwise.

One or two of the lifters will not turn. The lifter that will not turn is on wafer No. 4, and we use this immovable lifter as the tension bar. Turn the remaining lifters to No. 1 one at a time, apply force and push, then rotate each lifter in turn

toward the picking direction until the wafers reach the open position. Once a wafer has reached the open position, its lifter has noticeably more side-to-side play.

HOW TO TEST THE TRUE GATE AGAINST THE FALSE GATE

The true gate is larger in diameter than the false gate. So when the sidebar enters a false gate, the rocker arm turns through only a small angle; with a true gate the play is larger.

Decoding

With the lock open, the lifter that will not turn is on wafer No. 4. The wafer that lies farthest in angle from wafer No. 4 is wafer No. 1. Beside wafer No. 1 is wafer No. 2, and between wafer No. 2 and wafer No. 4 is wafer No. 3.

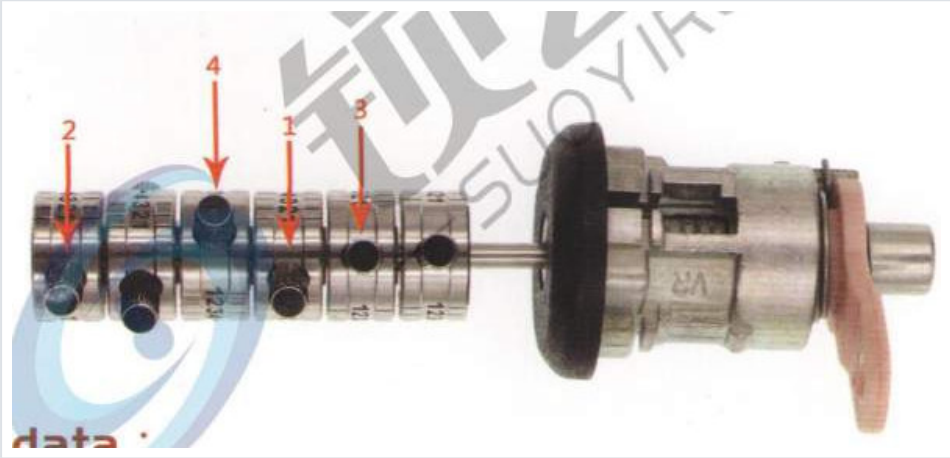


Fig. 108.1 Cylinder on the demo shaft: the arrows mark wafers 2, 4, 1 and 3 in the order they are identified when decoding.

Numerical Data

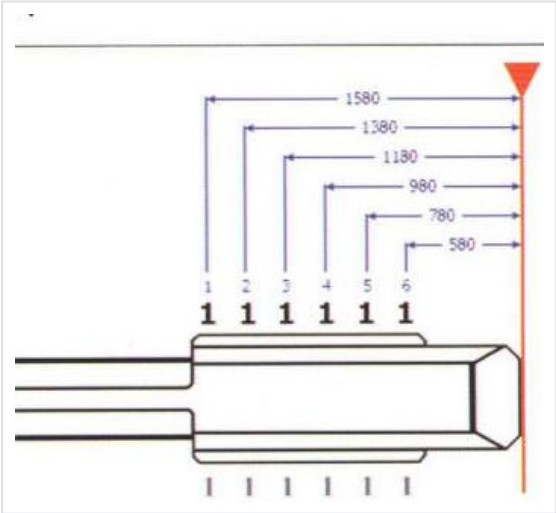


Fig. 108.2 Bitting chart, 6 positions: distance from the reference line to positions 1 through 6 is 1580, 1380, 1180, 980, 780 and 580. The code row printed beneath the positions reads 1 1 1 1 1 1.

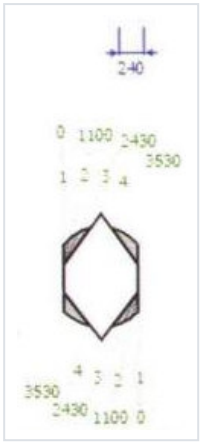


Fig. 108.3 Position pitch 2.40, and the depth figures 0, 1100, 2430 and 3530 keyed to depth codes 1 through 4, with the wafer profile below.



Fig. 108.4 Key silhouette and the matching key blank, with the keyway profile beneath.

SOURCE PAGE 109

TBE1T 2-in-1



Fig. 109.1 TBE1T wafer rack: the eight wafer positions with their springs on the demo shaft, numbered 1 through 8.



Fig. 109.2 The Jaguar door cylinder with its wafer rack, and the matching key fob.

Applicable Cars

APPLICABLE CARS	JAGUAR

Picking Direction

When the driver's seat is on the left, open clockwise.

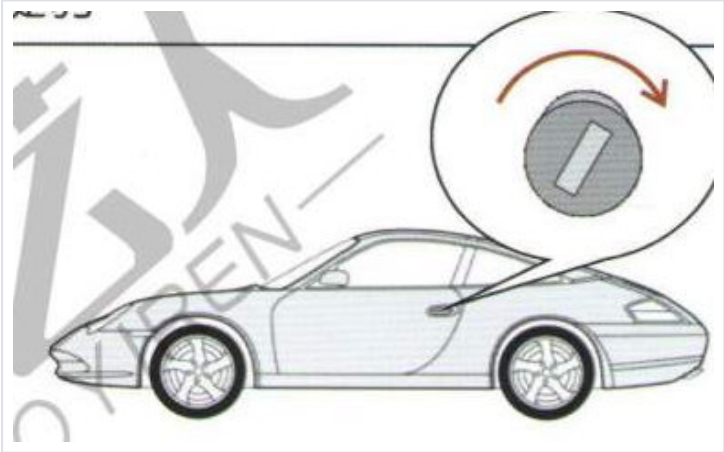


Fig. 109.3 Door lock turning clockwise, shown on the vehicle.

Lock Overview

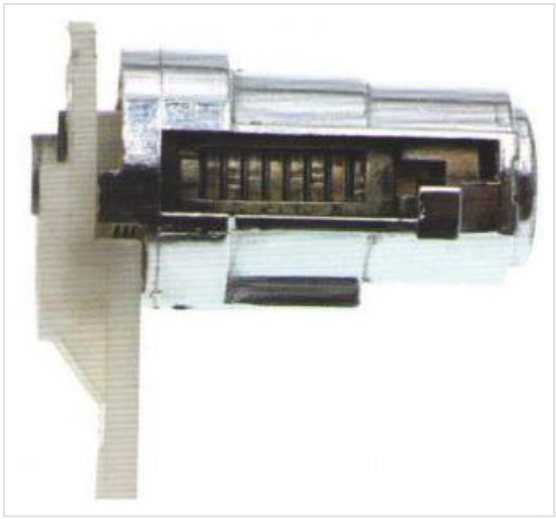


Fig. 109.4 Transparent door cylinder: the wafer stack in the plug, the sidebar and the operating arm at the left.

This lock has a total of 8 bitting positions and 3 angular wafers.

The ignition, the doors and the trunk all have 8 bitting positions.

On this lock, once the locking arm is set, the door can be locked with any key.

SOURCE PAGE 110



Fig. 110.1 Wafer taken out of the plug: the false gate at the top of the ring and the true gate on its upper right shoulder. The number 3 stamped on the wafer marks its position.

假缺口 → False gate　　真缺口 → True gate

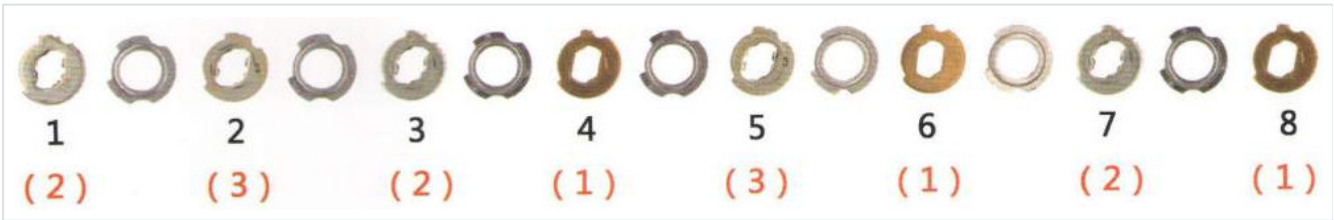


Fig. 110.2 The wafer rings for positions 1 through 8, with their values: (2), (3), (2), (1), (3), (1), (2) and (1).

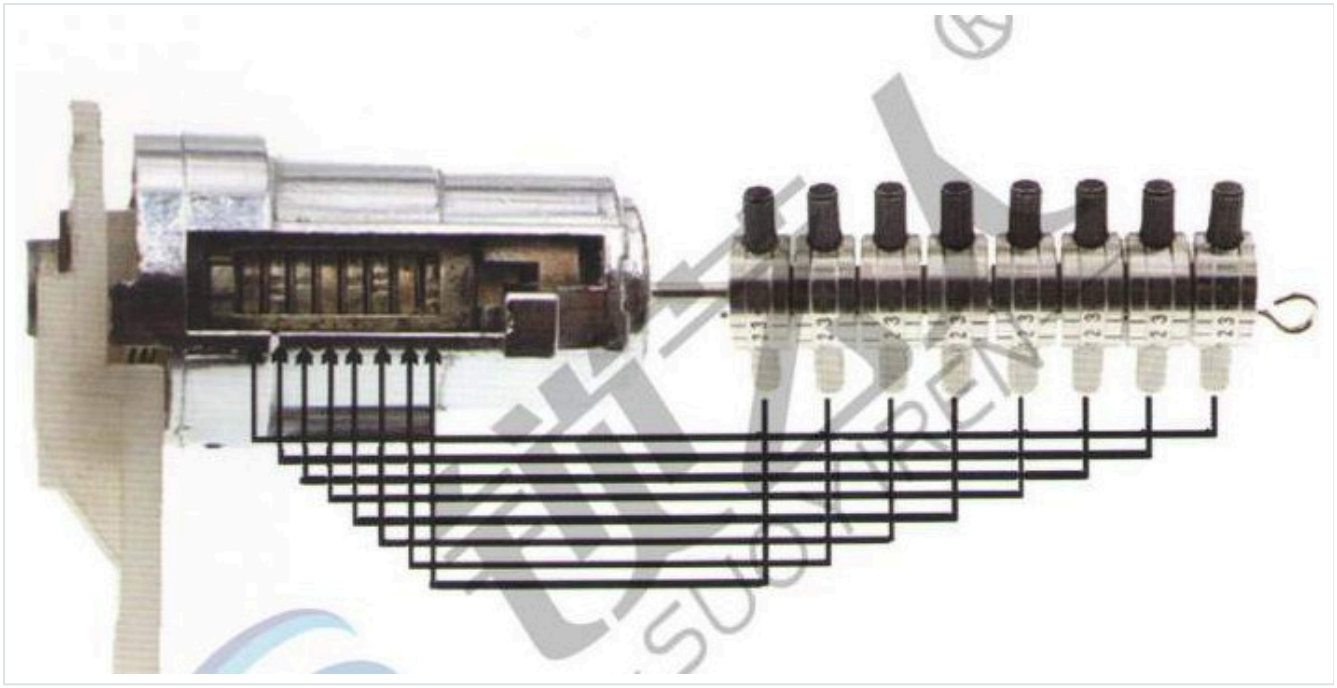


Fig. 110.3 Transparent door cylinder lined up with the wafer rack: the connector lines show which wafer on the rack belongs to which position in the plug.

Picking Technique

Insert the tool and turn the rotating rocker arm clockwise.

One or two of the rocker arms will not turn. The arm that will not turn is on wafer No. 3, and we use this immovable arm as the tension bar. Apply force and push, then rotate each rocker arm counterclockwise in turn until the wafers reach the open position. Once a wafer has reached the open position, its arm has noticeably more side-to-side play.

HOW TO TEST THE TRUE GATE AGAINST THE FALSE GATE

The true gate is larger in diameter than the false gate. So when the sidebar enters a false gate, the rocker arm turns through only a small angle; with a true gate the play is larger.

SOURCE PAGE 111

Decoding

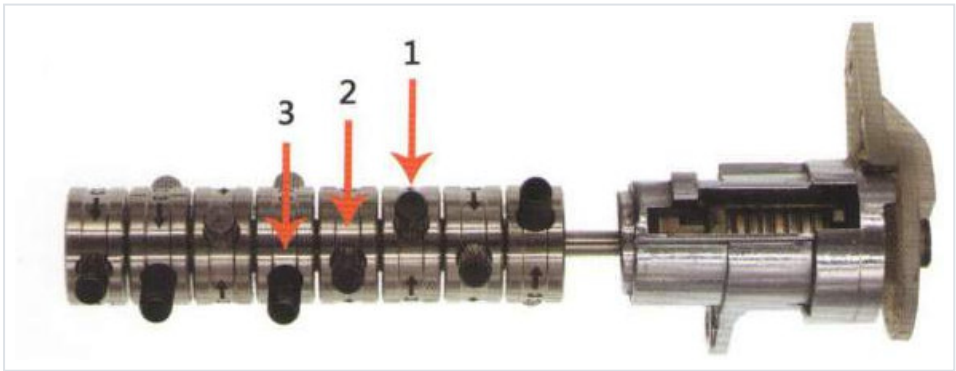


Fig. 111.1 Tool in the opened cylinder: the arrows mark wafers 3, 2 and 1 in the order in which they are identified.

With the lock open, the arm that will not turn is on wafer No. 3. Farthest in angle from wafer No. 3 is No. 1, and between No. 3 and No. 1 is wafer No. 2.

Numerical Data

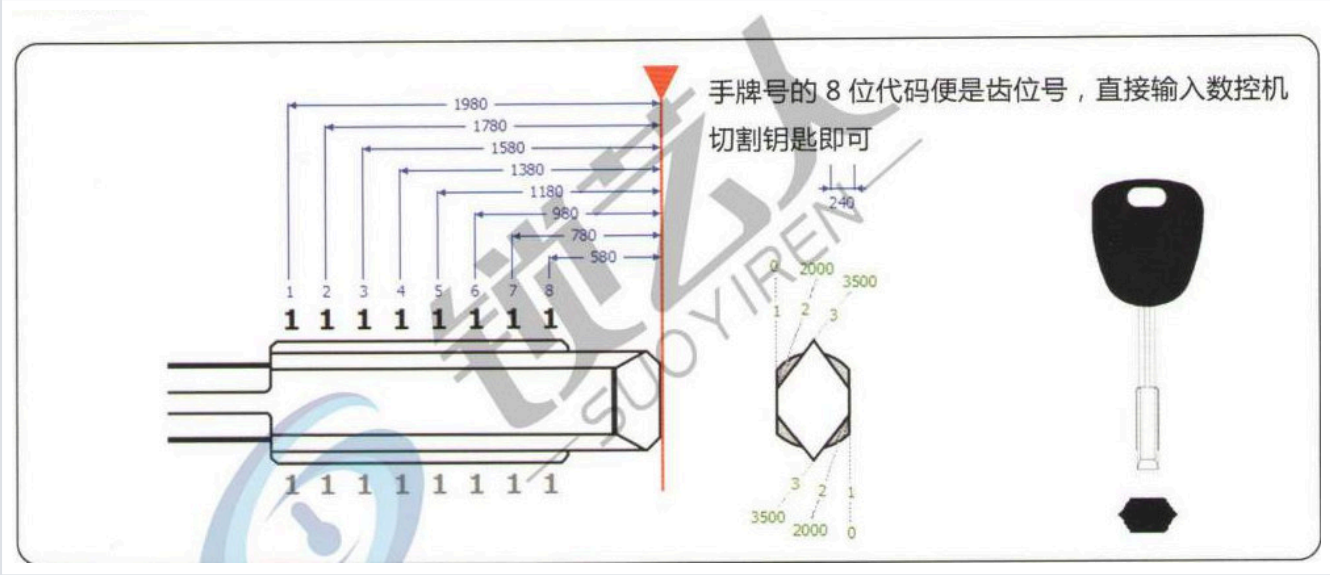


Fig. 111.2 Numerical data panel: bitting chart for the 8 positions, with 1980, 1780, 1580, 1380, 1180, 980, 780 and 580 measured from the reference line and the code rows above and below the blade each printed as 1 1 1 1 1 1 1 1; position pitch 2.40 with the depth values 0, 2000 and 3500 for angular positions 1 to 3; and the key silhouette with its keyway profile at the right.

手牌号的 8 位代码便是齿位号，直接输入数控机 切割钥匙即可 → The 8-digit code on the key tag is the bitting code: enter it directly into the CNC key-cutting machine and cut the key.

Special Technique

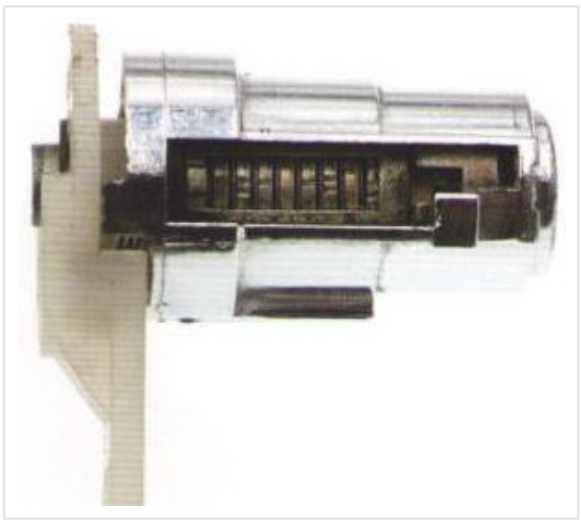


Fig. 111.3 The same door cylinder in its transparent housing: the wafer stack sits behind the window in the side of the housing.

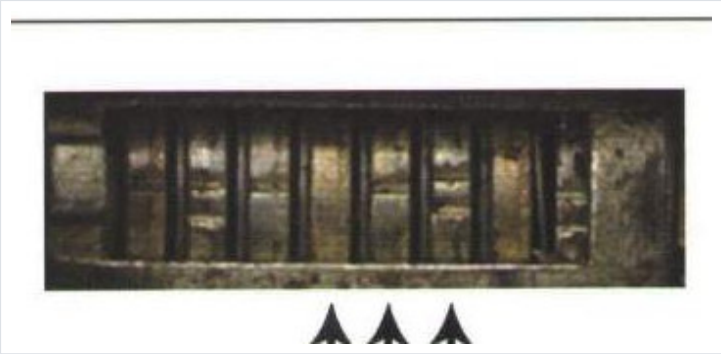


Fig. 111.4 The wafer stack seen through the window in the side of the lock; the arrows mark the wafers whose codes are 3, 1 and 2.

BITTING CODE 1 2 1 3 1 2 3 2

This lock does not have to be taken apart: the bitting code can be read straight through the window in the side of the lock.

SOURCE PAGE 112

Made Cars

BAOJUN 2-in-1



Fig. 112.1 BAOJUN 2-in-1 pick with both reading panels open and the depth scale visible.

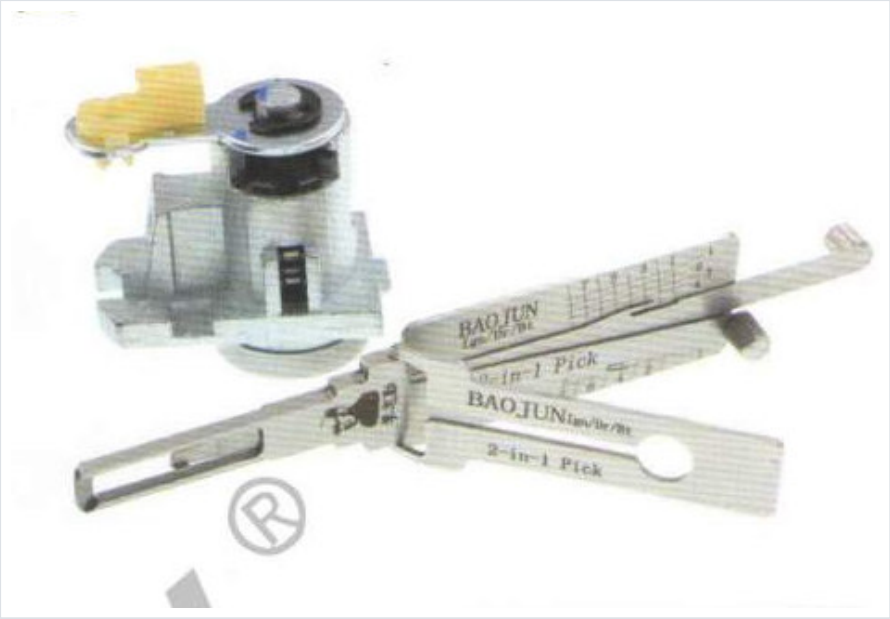


Fig. 112.2 BAOJUN door cylinder with the wafer pack exposed, beside the 2-in-1 pick.

Applicable Cars

APPLICABLE CARS	BAOJUN330, 560, 730
APPLICABLE VEHICLES	BAOJUN 330, BAOJUN 560, BAOJUN 730

Picking Direction

When the driver's seat is on the left, open counterclockwise.

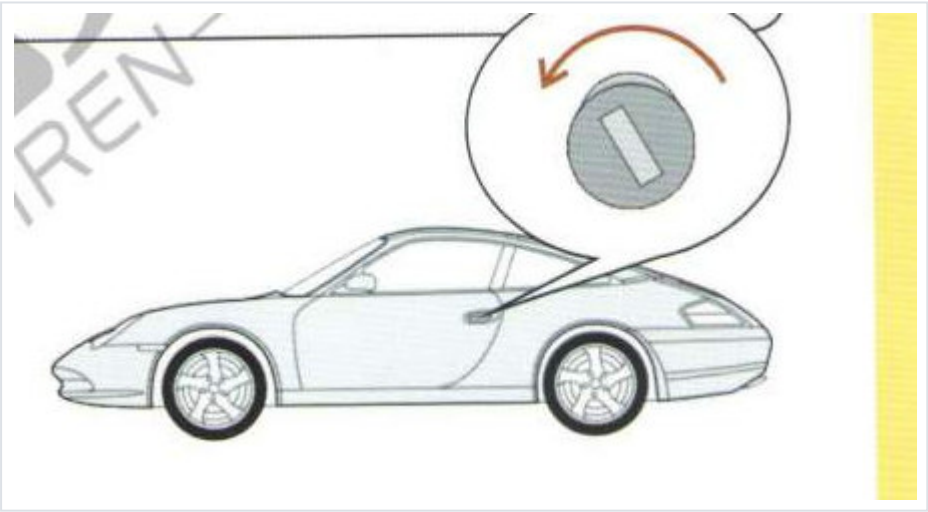


Fig. 112.3 Door lock turning counterclockwise.

Lock Overview

This lock has 8 bitting positions and 4 cut depths. Both the door lock and the ignition lock carry all of their wafers.

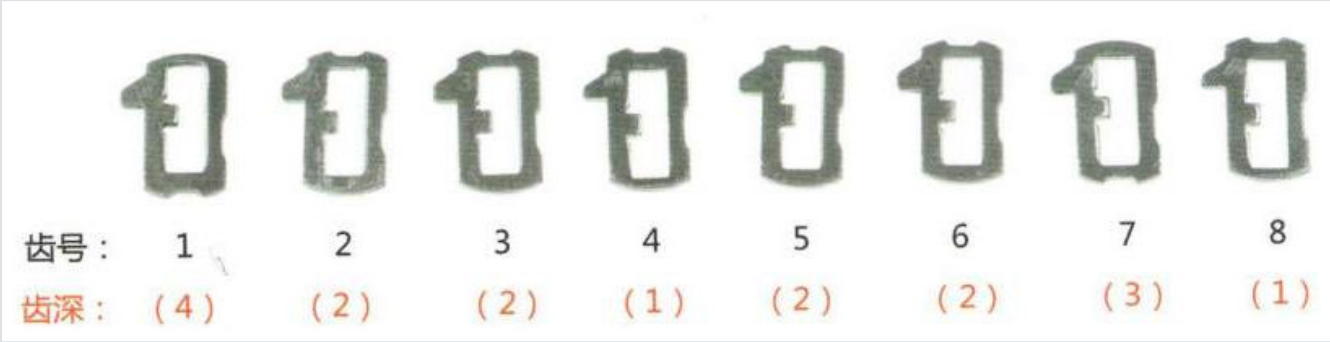


Fig. 112.4 Key sections at bitting positions 1-8, with the depth codes (4), (2), (2), (1), (2), (2), (3), (1).

齿号 → Bitting position number

齿深 → Cut depth

SOURCE PAGE 113

Picking Technique

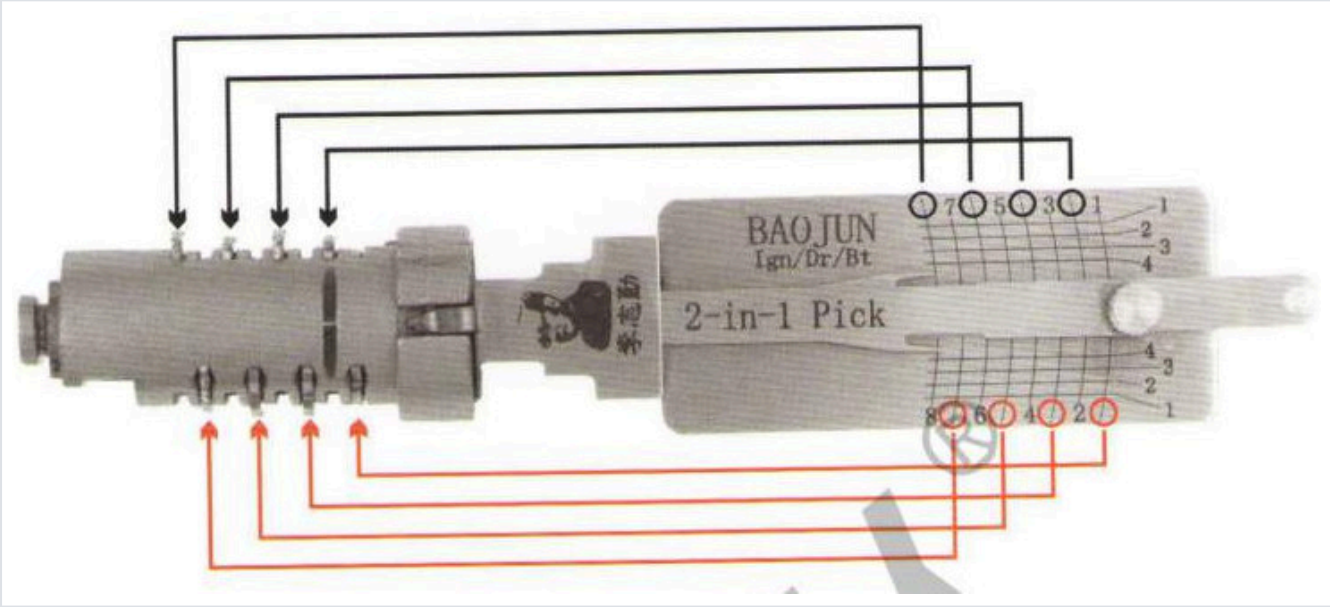


Fig. 113.1 Wafer-to-panel mapping on the BAOJUN pick: the four upper wafers, positions 7, 5, 3, 1, read on the upper scale row; the four lower wafers, positions 8, 6, 4, 2, read on the lower scale row.

Decoding

Read forward after opening.

Special Technique



Fig. 113.2 Smart key: the blade carries a small groove.

有小槽 → Has a small groove　　智能 → Smart key



Fig. 113.3 Folding key: the blade has no small groove.

无小槽 → No small groove　　折叠 → Folding key

The folding key can be used in both versions of the lock.

SOURCE PAGE 114

HAIMA 2INL 2-in-1



Fig. 114.1 HAIMA 2-in-1 pick with both reading panels open.



Fig. 114.2 HAIMA 2-in-1 pick with the ignition cylinder and its wafer stack.

Applicable Cars

APPLICABLE CARS	HAIMA, ZOTYE AUTO, CMC
APPLICABLE VEHICLES	HAIMA, ZOTYE, CMC

Lock Overview

This lock has a total of 7 bitting positions and 4 cut depths. The door lock and the ignition lock both have 7 bitting positions.

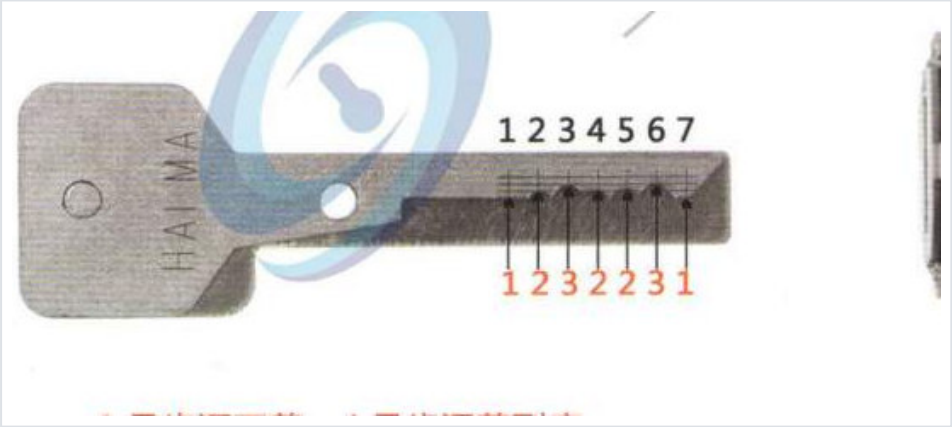


Fig. 114.3 HAIMA key chart: bitting positions 1-7 with the depth codes 1, 2, 3, 2, 2, 3, 1.

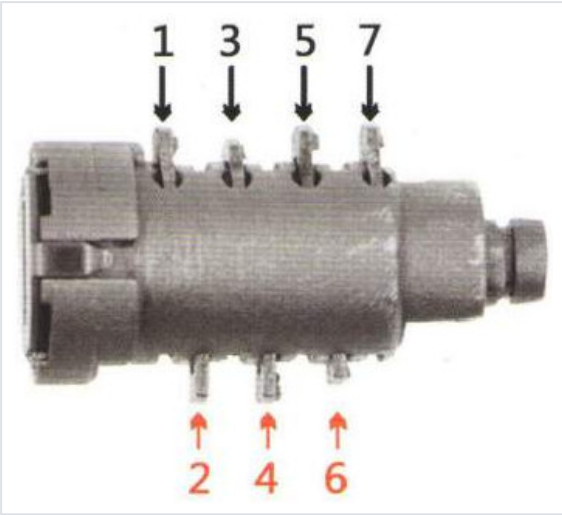


Fig. 114.4 Cylinder with the seven wafers numbered: 1, 3, 5, 7 on the upper row and 2, 4, 6 on the lower row.

> Depth code 1 is not cut; depth code 4 is cut all the way to the bottom.

Picking Technique

First apply force to the tension bar in the picking direction, then test each known bitting position one at a time with the lifter.

The position that does not move, seen or felt, is the wafer with the highest resistance. When you find the wafer with the highest resistance, lift that wafer.

Both hands must work together to lift a wafer and clear its resistance. Once the resistance clears, give the tension bar a brief pulse of force so the wafers you have already set do not spring back. Test after every lift: check whether there is already a small spring movement. Then work through the positions as described above, finding the wafer with the highest resistance each time and clearing them one after another until the plug turns.

SOURCE PAGE 115

Decoding



Fig. 115.1 HAIMA decoding map: the four upper wafers read on panel positions 7, 5, 3, 1, and the three lower wafers on panel positions 6, 4, 2.

开启后正读 → Read forward after opening

QIRUI 2-in-1

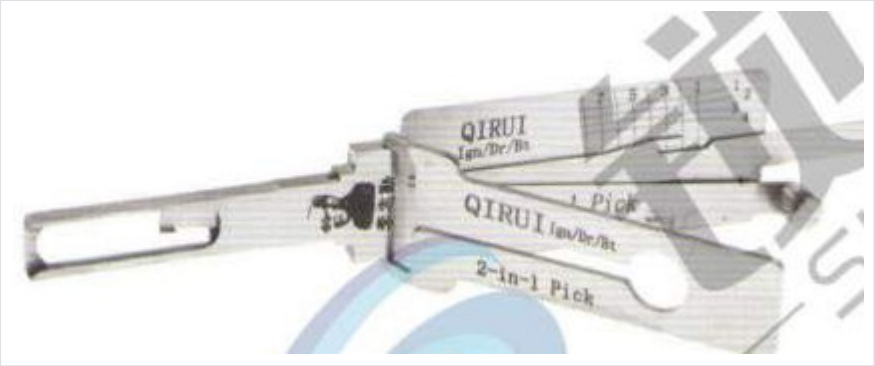


Fig. 115.2 QIRUI 2-in-1 pick with both reading panels open.



Fig. 115.3 QIRUI 2-in-1 pick with the ignition cylinder and its return spring.

Applicable Cars

APPLICABLE CARS	CheryE3, JAC
APPLICABLE VEHICLES	Chery E3, JAC

Picking Direction

When the driver's seat is on the left, open clockwise.

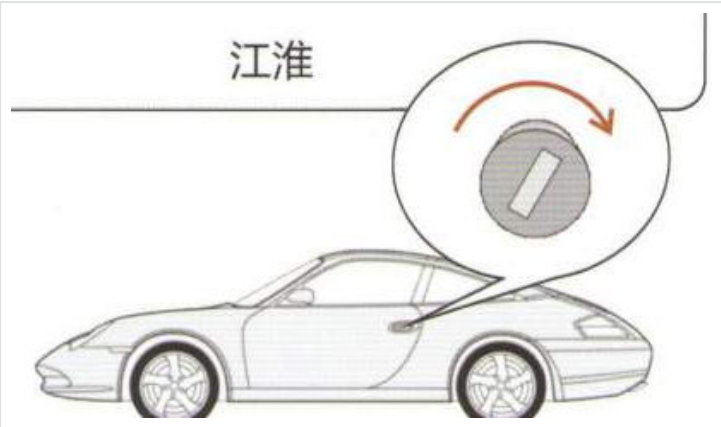


Fig. 115.4 Door lock turning clockwise.

江淮 → JAC

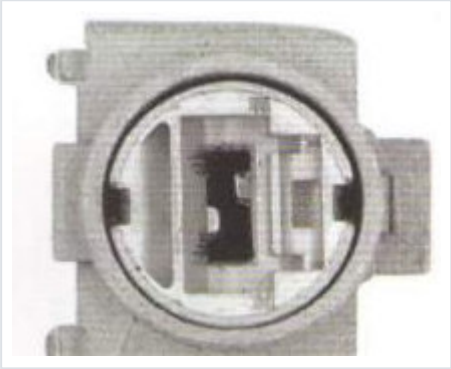


Fig. 115.5 Cylinder housing seen from the front, showing the keyway and the wafer slots in the bore.

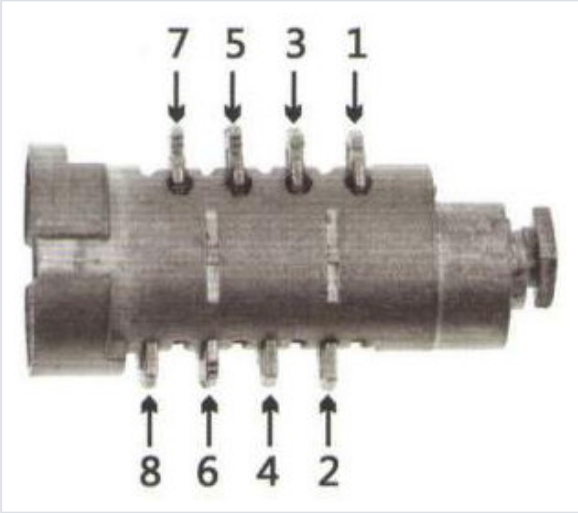


Fig. 115.6 QIRUI cylinder with its eight wafers numbered: 7, 5, 3, 1 on the upper row and 8, 6, 4, 2 on the lower row.

SOURCE PAGE 116

DECODING METHOD

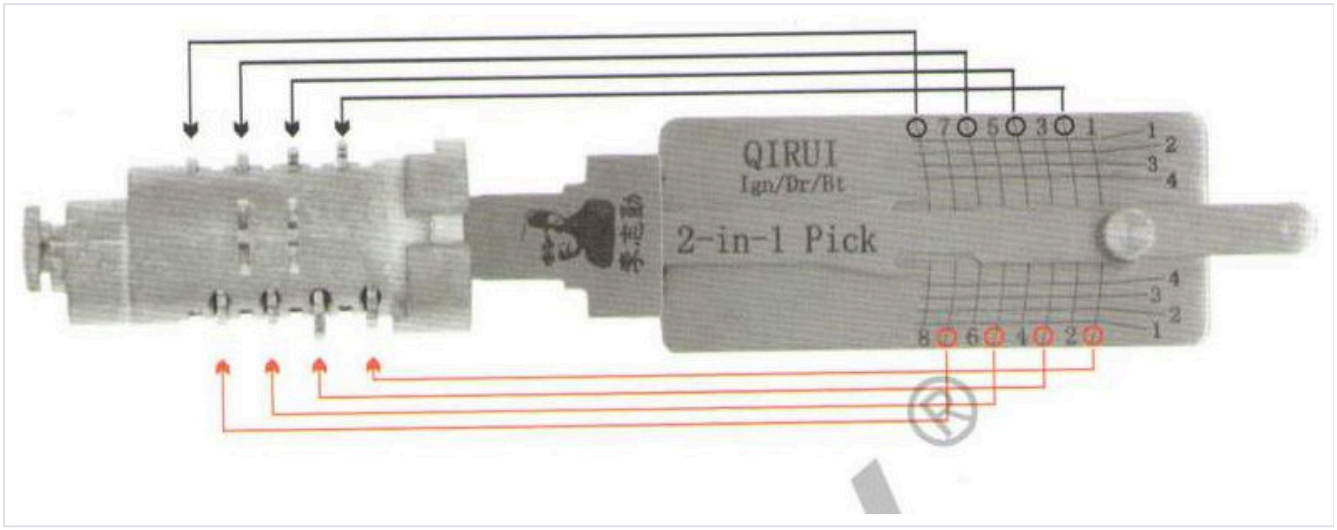


Fig. 116.1 QIRUI 2-in-1 Pick with the wafer positions and cut depths called out on the reading panel.

1 → 1
2 → 2
3 → 3
4 → 4
5 → 5
6 → 6
7 → 7
李氏 → LISHI
锁艺人 → Suoyiren

DECODING

Read forward after opening.

CHANGAN 2-in-1



Fig. 116.2 CHANGAN 2in1 tools: two working views of the pick and one cylinder view.

APPLICABLE VEHICLES CHANGAN (Changan)

Lock Overview

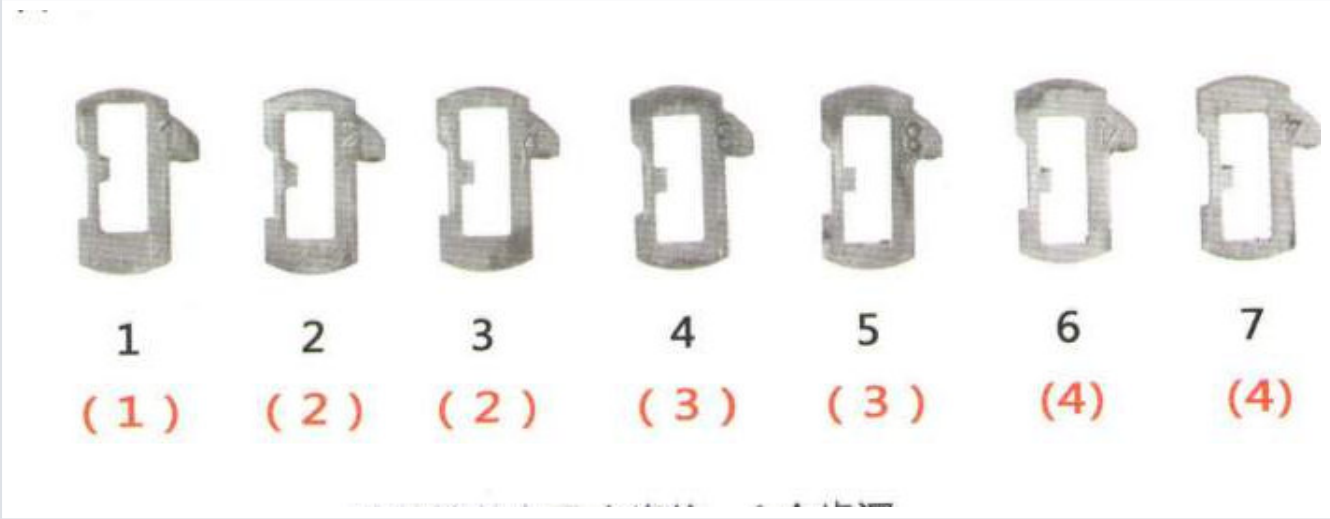


Fig. 116.3 Wafer silhouettes for bitting positions 1-7, with the matching depth codes in parentheses.

This lock has 7 bitting positions and 4 cut depths.

SOURCE PAGE 117

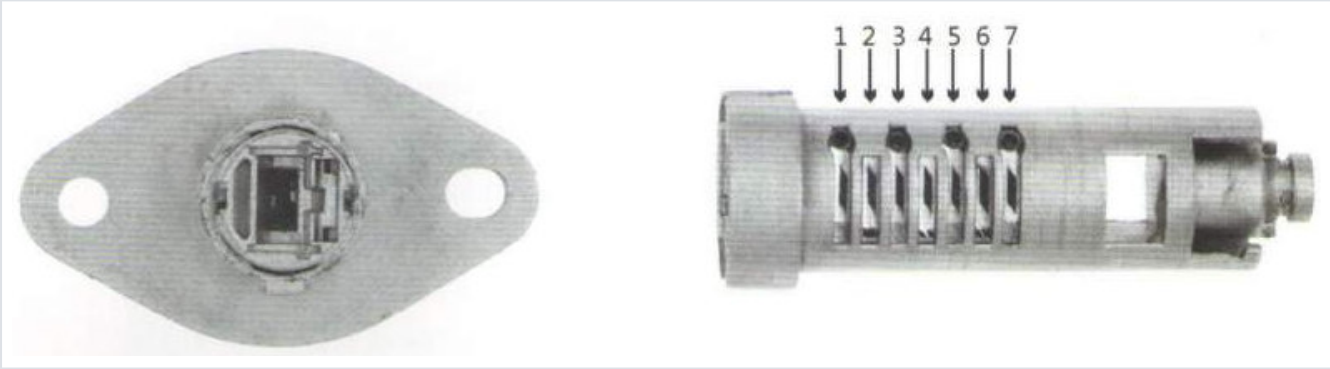


Fig. 117.1 Lock face and opened cylinder, with the seven wafer positions numbered 1-7.

DECODING METHOD

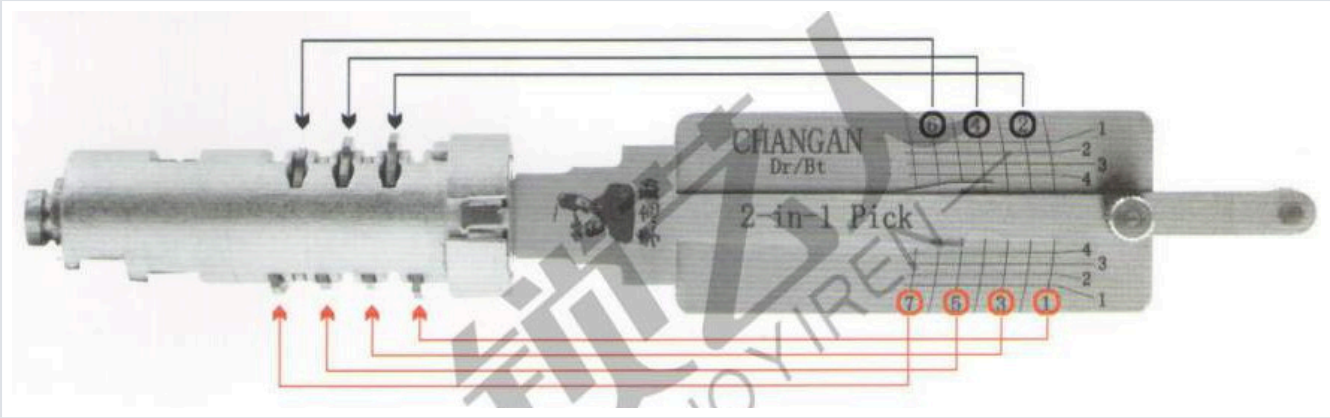


Fig. 117.2 BQ SB 2-in-1 Pick with the picking tip under the wafers and the decoding arrows on the reading panel.

1 → 1
3 → 3
5 → 5
7 → 7
Dr/Bt → Dr/Bt
李氏 → LISHI
2 → 2
4 → 4
6 → 6
CHANGAN → CHANGAN
2-in-1 Pick → 2-in-1 Pick
锁艺人 → Suoyiren

DECODING

Read forward after opening.

BQ SB 2-in-1



Fig. 117.3 BQ SB 2in1 tools with the matching cylinder and key blank.

APPLICABLE VEHICLES Beigi, BAIC Group, CHERY

SOURCE PAGE 118

Lock Overview



Fig. 118.1 BJ SB cylinder face and the matching key blade.

DECODING METHOD

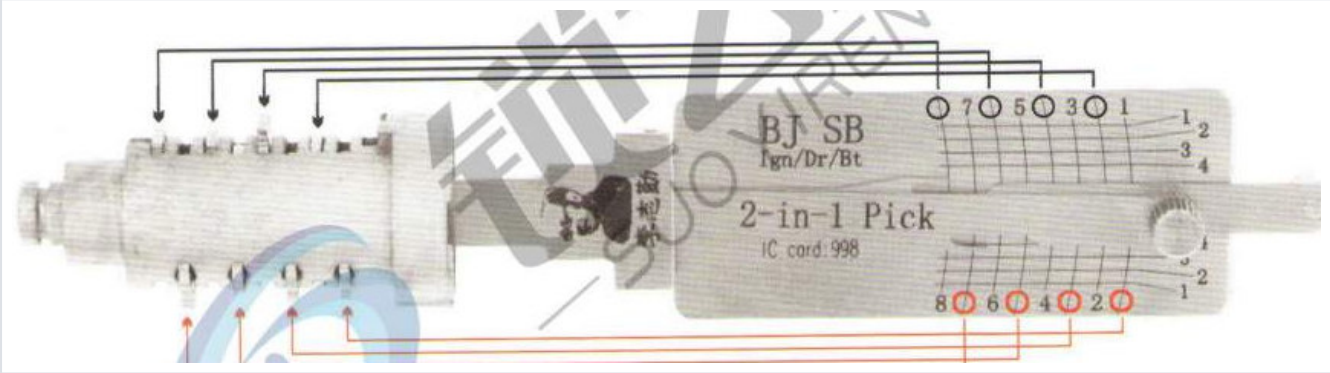


Fig. 118.2 BJ SB 2-in-1 Pick, IC card 998, with the eight bitting positions and the cut depths called out.

1 → 1
3 → 3
5 → 5
7 → 7
BJ SB → BJ SB
2-in-1 Pick → 2-in-1 Pick
李氏 → LISHI

2 → 2
4 → 4
6 → 6
8 → 8
Ign/Dr/Bt → Ign/Dr/Bt
Ic card 998 → Ic card 998
锁艺人 → Suoyiren

Picking Technique

First apply force to the tension bar in the picking direction, then test each known bitting position one at a time with the lifter.

The position that does not move, whether you see it or feel it, is the wafer under the greatest resistance. Once you find the wafer under the greatest resistance, lift that wafer.

It takes both hands working together to lift a wafer and clear its resistance. Once the resistance clears, apply force to the tension bar instantly so that the wafers you have already cleared do not spring back. Test after every lift to see whether the plug has already given a little. Then use the method above to find the next wafer under the greatest resistance, and clear them one by one until the plug turns.

APPENDIX

Appendix — Cross-Reference Tables

LISHI 2-in-1 model numbers against the vehicles each one covers.

SOURCE PAGE 119

LISHI 2-in-1 Cross-Reference Table

This page opens the appendix cross-reference table and carries rows 1 through 21, from HU43 and HU49 through the Hyundai HYN and HY models.

Rows 1-21.

No.	LISHI model	Vehicles covered
1	HU43 (ignition)	Opel, Daewoo, Holden, Pontiac, Chevrolet, Toyota
2	HU49 (ignition)	Volkswagen series: Jetta, Jetta King, Santana, B4, Audi 100, older Hongqi, Golf
3	HU46 (ignition)	Opel, Antara, Sail, Daewoo (GM)
4	HU56	Volvo, Mitsubishi S40 (before 2003)
5	HU58 (ignition)	Morgan, BMW older models, outer milled, four track
6	HU64 (ignition)	Mercedes-Benz, Chrysler, Maybach, Lorinser, Carlsson
7	HU66 (ignition)	Bugatti, Lamborghini, Porsche, Bentley, Volkswagen, Audi, Škoda, SEAT, Roewe 550, Great Wall C30, Zhonghua FSV, Junjie, Zotye ZC300, JMC Yusheng
8	HU83	older Peugeot 307, newer 508
9	HU87	Suzuki series: new Alto, Swift, SX4, Jimny, Vitara, etc.
10	HU92 (ignition)	BMW, Land Rover, MINI, MG, GM3, 7, HUF, Rolls-Royce, inner groove, two track, pre-2010, 5 Series, 7 Series
11	HU100 (ignition)	Cadillac, Opel, Vectra, Astra, new GL8, new Regal, Cruze, Buick Excelle, Malibu, Camaro, Aveo, inner groove, two track, wafer (Great Wall H8/H9)
12	HU101 (ignition)	Ford, Jaguar, Land Rover, Freelander, Volvo XC60 S40 v40, Focus, Fiesta, new Mondeo, C-Max, Saab, Chery
13	HU100R (ignition)	newer BMW, Rolls-Royce, 2010 model, inner groove, deep keyway, narrow, post-2010, 5 Series, 7 Series
14	HYN11 (ignition)	Hyundai series: Elantra, Tucson; Kia series: Cerato
15	HYN7R	Hyundai series, Kia series, Sonata, Mingyu
16	HY15	Hyundai series: Yuxiang, Lingxiang, etc.; Kia series: K2, etc.

No.	LISHI model	Vehicles covered
17	HY16	Hyundai series: new Elantra; Kia series: Forte
18	HY17	Hyundai Accent, Mistra
19	HY20	Hyundai (Korea)
20	HY20R	Hyundai (Korea)
21	HY22 (ignition)	Hyundai, Kia: Lingxiang, Sportage, Sportage R, IX35, 30, Verna, Elantra Langdong, K5, Sorento, Forte, Great Wall H5

SOURCE PAGE 120

LISHI 2-in-1 Cross-Reference Table

The table continues from the previous page, listing rows 22 through 48: LISHI models K9 through GT15, each with the vehicles it covers.

Rows 22-48.

No.	LISHI model	Vehicles covered
22	K9	K9
23	NSN11	older Nissan, Bluebird, Duke (with shoulder), older Subaru
24	NSN14	Nissan series: Teana, Tiida, Tiida Sedan, Livina; Infiniti; Subaru
25	HON66 (ignition)	Honda (Elysion, CR-V, Spirior, Civic, Odyssey, Accord, Fit, City, Crosstour); Acura; Everus; GAC Trumpchi; BYD F6; Great Wall
26	DAT17	Subaru Legacy, Forester, Impreza, Tribeca, Outback
27	TOY2 (ignition)	Toyota Tokaj Rika, new Crown, 4500, 4700, new Sequoia and other Toyota SUV off-road models; new Reiz; BYD inner groove; BYD Surui
28	TOY(2014)	2014 Corolla
29	TOY40 (ignition)	Lexus, Toyota, Mitsubishi
30	TOY43	older Toyota, 8-wafer, split wafer (bitting positions 4 and 7 are split wafers), Camry
31	TOY43AT	Toyota series: Camry, Reiz, Corolla, Corolla (older)
32	TOY43R	Subaru XV; Great Wall Florid; imported older Toyota; 2009 Haval H6; Subaru flat key
33	TOY48 (ignition)	Lexus, Toyota, new Subaru, Crown
34	VA2T (ignition)	Peugeot; Citroën; Peugeot 307, 408, 307CC; Citroën C4, C-Triomphe; Mercedes-Benz Smart
35	NE72 (ignition)	Peugeot 206, 207; Citroën C2; 2007 Picasso
36	NE78 (ignition)	Peugeot
37	NE66 (ignition)	Volvo Neiman, Valeo S80
38	MIT11 (ignition)	Mitsubishi series; Soueast series; domestic (Chinese market) cars such as Beidouxing; Chrysler; Dodge; Plymouth; Baojun
39	MAZ24	Mazda series; Soueast Haima

No.	LISHI model	Vehicles covered
40	CY24	Chrysler series 300C; Prowler; Cherokee; Dodge Jeep series; EAGLE; International; Plymouth; new Maserati smart key
41	FO38 (ignition)	Ford series: Edge, F150, Escape, Lincoln, Mustang, Mercury
42	GM45	Holden
43	CH1	Epica, Captiva, Harley
44	DWO4R	Buick series: Excelle, GL8, etc.; Chevrolet series: Lova, Sail, etc.
45	YM28 (ignition)	Opel, Holden, Lotus, Vauxhall, YMOS, Soul
46	YM30 (ignition)	Saab
47	GT10	Iveco
48	GT15	Fiat series: Palio, Weekend; older Ferrari; Alfa Romeo; Fiat; Lancia

SOURCE PAGE 121

LISHI 2-in-1 Cross-Reference Table

The table continues from the previous page. This page carries rows 49 through 75, resuming with the European and Renault models and running through the Asian and domestic (Chinese market) applications to the ignition-only models that close the appendix.

Rows 49-75.

No.	LISHI model	Vehicles covered
49	SIP22	Fiat 500, Alfa Romeo, Maserati, Iveco, Lancia
50	Renault v2	Renault Megane, Scenic, Koleos
51	LAGUNA3	Renault Samsung, Laguna
52	GM37	US cars: Hummer, Enclave, LaCrosse, Cadillac, GMC, Cadillac/LaCrosse; flat key, 10 wafers
53	GM39	GL8, older Regal, Buick
54	KW14	Kawasaki motorcycle
55	NE38	(USA, Australia) Honda, Ford, MG, MINI, Nissan, Land Rover
56	NE71R	(USA, Australia) Honda, Rover
57	MIT8 (GM15 19)	Mitsubishi series; some domestic (Chinese market) vans such as Wuling, Hafei
58	TOY38R	Hafei, Xiali, Daewoo, Zotye
59	GEELY	Geely Panda, Emgrand
60	BT01	Besturn B70, B50
61	B111	GM, Hummer, GMC
62	VA6	Renault
63	WT47T	Saab, newer Saab
64	HON58R	Honda, Acura, Holden, Isuzu

No.	LISHI model	Vehicles covered
65	BYD01	BYD
66	BYD01R	BYD
67	SSY3	SsangYong (Korea)
68	ISU5	Isuzu
69	YM15	Mercedes-Benz, Dodge
70	KY14	Kia (Korea)
71	HON70	Honda motorcycle
72	TOY43 (ignition only)	Older Toyota, 8-wafer split wafer (bitting positions 4 and 7 are split wafers), Camry
73	NSN14 (ignition only)	Nissan series, Nissan, Teana, Tiida, Tiida sedan, Livina, Infiniti, Subaru, JAC flat key
74	TOY43AT (ignition only)	Toyota series, Camry, Reiz, Corolla, Corolla (older)
75	MIT8 (ignition only)	Mitsubishi series; some domestic (Chinese market) vans such as Wuling, Hafei

SOURCE PAGE 122

LISHI 2-in-1 Cross-Reference Table

The table continues from the previous page. This page carries rows 76 through 99, resuming with the motorcycle tools and the newer Volkswagen/Audi group models and running through the Chinese domestic (Chinese market) applications and the ignition-only models to the end of the appendix.

Rows 76-99.

No.	LISHI model	Vehicles covered
76	YH35R	Yamaha motorcycle
77	SZ14	Suzuki motorcycle
78	HU162T<9>	newer Volkswagen, 2016, newer Škoda, 9 wafer
79	HU162T<10>	newer Audi, 2016, 10 wafer, 2016 newer BMW
80	VA6 four lifter (四撬杆)	Renault, Citroën, Peugeot, 2015 and later, smart, four cut depths
81	ICF03	Ford
82	HU39	
83	VAG2015	2015 newer Volkswagen, 8 wafer; imported Golf wagon, 2015 and later; currently the only such vehicle in the domestic (Chinese market)
84	"MAD2014"	newer Mazda
85	"MIT9/MIT6"	older Mitsubishi
86	HAIMA	Haima, inner groove; Zhonghua; Zotye Cloud 100 Z100
87	HU66 read	Volkswagen before 2002; read directly, no picking needed
88	CHANGAN	Changan, inner groove

No.	LISHI model	Vehicles covered
89	QIRUI	Chery E3; JAC, inner groove
90	BQ SB	BAIC Senova; Tiggo
91	BW9MH	BMW motorcycle, vertical milled
92	DAT12R	Hino heavy truck; opposite of the NSN11 tool
93	BAOJUN	Baojun 330, Baojun 560, Baojun 730, BAIC Huansu
94	MIT11 (ignition only)	Mitsubishi series; Soueast series; domestic (Chinese market) vehicles such as Big Dipper (Beidouxing); Chrysler; Dodge; Shunfeng; Baojun
95	MAZ24A (ignition only)	Mazda series; Soueast; Haima
96	HYN11 (ignition only)	Hyundai series; Elantra; Tucson; Kia series; Cerato
97	SX9	Dongfeng Citroën Fukang
98	ZD30	Ducati, vertical milled, motorcycle
99	KIA3R	Kia (Korea)