EVVA ELUS cylinder with temporary access function

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Introduction

EVVA[1] is a family owned company that develops and manufactures mechanical and electronic access control systems. It was founded over a century ago in Vienna, Austria. EVVA started as a research company and specialized on access control systems just before WWII.

EVVA is known for mechanical cylinders such as the MCS, Dual, ICS, 4KS and Akura 44. It is also known for its expertise in mechanical systems. Take for instance the ICS cylinder with the Temporary Access Function (TAF):

This cylinder comes with three keys:
- The PRIO key can switch between the two positions the cylinder can be in (depicted by ‘S’ (Service) and ‘I’ in the image above) and can operate the cylinder in both positions.
- The user key cannot switch positions, but can operate the cylinder in both positions.

[1] Originally, “Erfindungs-Versuchs-Verwertungs-Anstalt”

- The service key cannot switch positions and can only operate the cylinder in the service position.

A use case for this is for instance the use by a shop owner. The shop owner has the PRIO key with which cylinder can be set to the service position. During the day, store personnel can open and close the cylinder using the service key. At the end of the day, the owner uses the PRIO key to switch the cylinder to position I, so personnel no longer have access. The user key can act as an emergency key.

This cylinder was presented in 2019. But, several decades earlier, another kind of temporary access function was added to an EVVA cylinder, which is the topic of this paper.

The EVVA NL system

EVVA Netherlands (officially: EVVA Nederland B.V.) was founded some 40 years ago in Hengelo, the Netherlands. They created the NL system for the Dutch market, which resembles the TSC system that was created and marketed by EVVA internationally. It can be recognized by the text “EVVA NL” stamped on the key. Both the NL and TSC are pretty standard pin tumbler cylinders with 5 pins, available in several form factors.

Here is an EVVA NL half Eurocylinder:

The NL system offers master keying in the bitting. It also has multiple key profiles. The profile in the above image is marked ‘KG’ on the (opposite) bow of the key.

The EVVA ELUS system

I recently acquired a cylinder marked “ELUS DEMO”. It was in a demo block acquired by a locksmith several decades ago. I could not find any information about it online, so decided to take a look at the cylinder and share my findings through this paper.

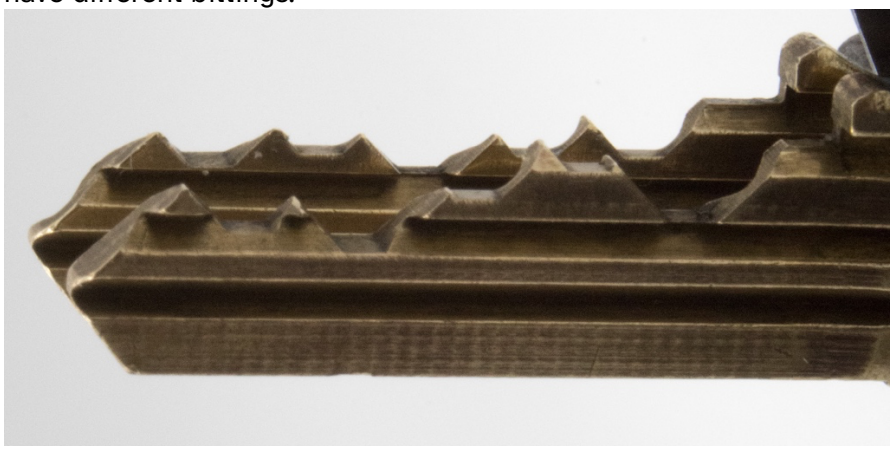
The cylinder comes with two keys, that have the text “EVVA NL” on the bow. Indeed, looking at the keyway, the ELUS cylinder has a profile similar to the NL system.

One key is marked “DEMO 01”, the other “DEMO HS”. “HS” stands for “Hoofdsleutel”, which is Dutch for master key. The “DEMO 01” key has profile 12, the master key profile 0.

The NL key with KG profile does not fit in this ELUS cylinder and the DEMO 01 key with 12 profile does not fit the NL cylinder. The master key fits in both cylinders. This indicates that the ELUS is a variant of the EVVA NL system.

The DEMO 01 key is a user key and the DEMO HS a master key. In the image above, you can see that the profiles of both keys are different. The master key has profile 0, which appears to be the master profile as it fits both the KG and 12 profiles.

The ELUS cylinder is also master keyed, which can be deduced from the fact that the keys have different bittings:

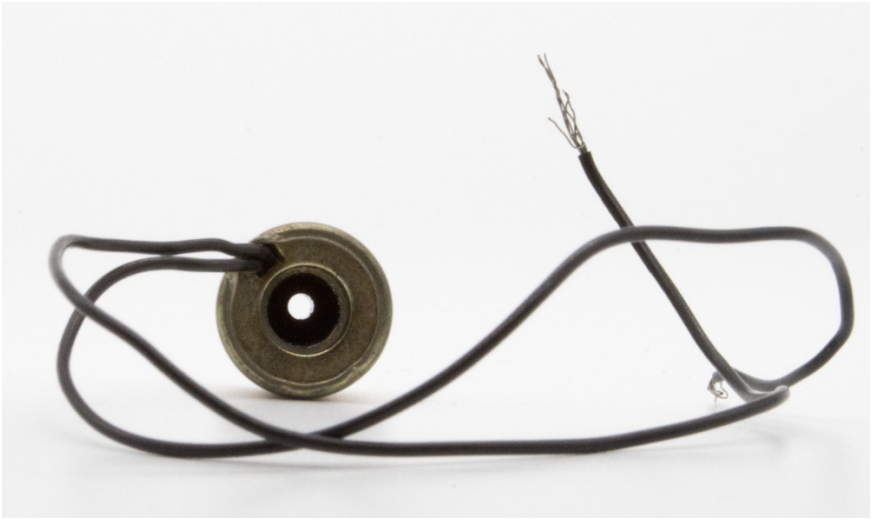


Looking closely, we can determine both keys have a different bitting depth on all of the five pin positions.

A 5-pin pin tumbler cylinder with master keying such as this one is not rare. Many manufacturers sell such systems. What makes this ELUS cylinder special, is that is has an electronically operated temporary access function that can render the user key inoperable, just as the PRIO key in the ICS TAF system can render the service key inoperable.

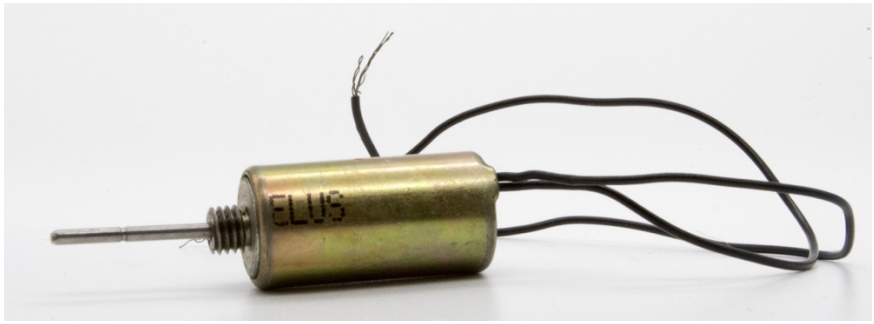
When looking at the image of the cylinder on the previous page, you'll see there is some light coming through under the word "ELUS". That is because the cylinder is shown in a disassembled state. In the bottom of the cylinder, there's a hole that holds a small device. Here we see the fully assembled cylinder:

The device sticking out is a small electromagnet, screwed into the housing. You can see a plastic protective cover on the back of it with two wires coming out. The picture below was taken from behind the electromagnet (being the underside when the cylinder is mounted). We can see that we are dealing with a simple coil with a hole in the middle. When applying a voltage to the coil, it becomes magnetic. The coil operates at 9 volts.



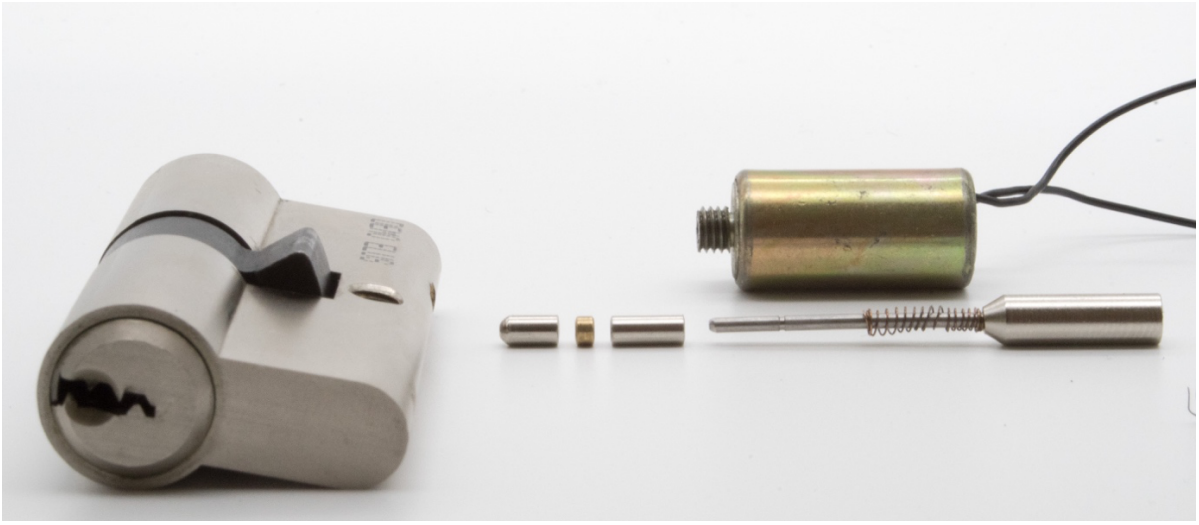
A metal rod is placed inside the coil. The thick end of that rod sits inside the coil; the thin end extends into the cylinder through the hole. The plastic cover prevents the rod from falling out when the magnet is off.

Combined, it looks like this:



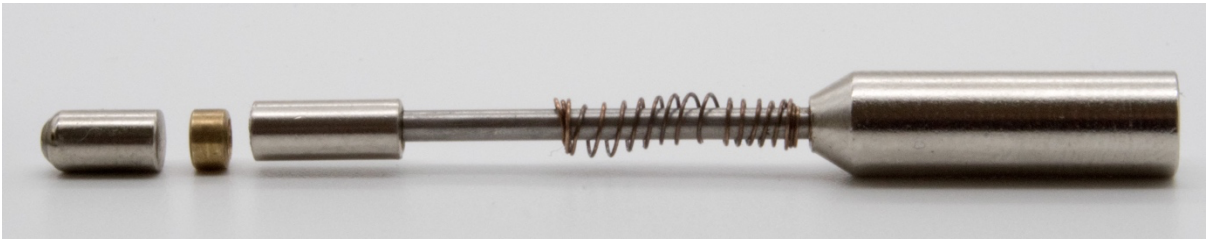
In the cylinder is a hole, through which the rod enters. If there were to be just this rod, it would go up through the housing into the plug, when the magnet is active. If the tip reaches into the plug, it blocks the shear line and prevents the cylinder from opening. The magnetic force is only moderate, so a key inserted into the keyway would very easily overcome the magnetic force and push the rod out of the plug into the housing, still being able to open the cylinder.

That would not be useful. What makes the system work, is how the rod interacts with a hollow housing pin and a hollow master pin. There is also a (regular, solid) driver pin in the pin stack.



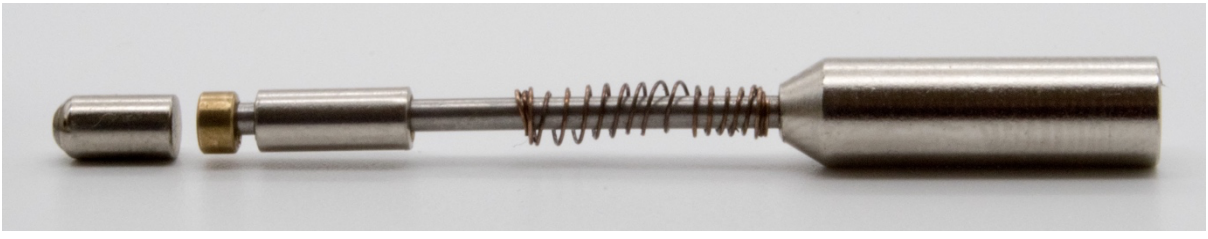
In the picture above, all parts are shown. The moving rod enters the hollow housing pin and hollow master pin when the electromagnet is activated. It reaches its highest position when it touches the solid driver pin and it will stay in that position when the magnet is on.

When the electromagnet is off, the rod will fall down due to gravity. In that “off” position, both keys work. That is because the rod is sitting like this:



The rod is in the hollow housing pin, but not in the master pin. There now are two possible bittings for the key at that position to open the cylinder. These are the two bittings in the “DEMO 01” and “DEMO HS” keys. This is why they both work when the magnet is off. With the magnet off, this is just a master keyed pinstack. Note that the spring is needed to push up the housing and master pins.

When 9 volts are applied to the electromagnet, the rod moves up (to the left in the image) as far as it can go, that is, it rests on the driver pin (see image below). The master and housing pins are now interconnected and this causes the key “DEMO 01” key to no longer work, as that uses the shear line that is between the master pin and the housing pin which is now blocked. The master key still works, because that key uses the other shear line, the one between the driver pin and the master pin. This shear line is unaffected by the magnet. With the master key inserted, the master and housing pins are still interconnected, but fully pushed into the housing.



The fact that the electromagnet only provides a weak force is important. When inserting a key, pins are being pushed down as the key is inserted (e.g. because the teeth in the bitting push the pins quite far down). If the rod operated by the electromagnet were to be pushing up with a lot of force, one would not be able to insert the key. When the electromagnet is on, the magnet operated rod can still be moved down by the key. Only when the key is fully inserted will the magnet operated rod reach its final, topmost position, interconnecting the master and housing pins.

When inserting the key, you can see the rod in the magnet move. The rod movement is shown here:

Commercial use

The EVVA ELUS is a rare cylinder. The locksmith I got the cylinder from told me he had not sold any of them. He only had this demo. After a conversation with EVVA Netherlands, I learned that this cylinder was designed by EVVA Netherlands (then led by Henk Duitman) and a partner of EVVA. A few demo cylinders were made, but it did not lead to it becoming a commercial product.

Conclusion

The EVVA ELUS is a very rare cylinder. It shows that about 25 years before EVVA created the ICS TAF cylinder, their researchers already came up with a solution for the same use case. With that, it is a great showcase of EVVA craftsmanship.