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Varroa Killer VK30-5 SofiTronic R18

Technical conditions	
Battery (recommended):	± 6 VDC/12 Ah
Battery Consumption:	max. 55 mA
Volume (1 speaker):	105 dBSPL
Number of speaker outputs:	5
Number of speakers:	1x5, 2x5, 3x5
Number of adjustable frequencies:	8
Operating temperature:	0 °C to 55 °C
Relative humidity	
Non-condensing:	90 %
Cover:	IP 20
Mounting the Speakers and Cover:	
Recommended height:	8 to 10 cm
Speaker Hole	78.0 mm
The lid is insulated on the inside	

VK30-5 SofiTronic

This document also uses data and conclusions from documents that are freely available on the Internet.

1. **The VK30-5 SofiTronic enables:**
   - 1.1. Simultaneous treatment of 5 to 15 hives against varroosis caused by the mite Varroa Destructor.
   - 1.2. Create lids with multiple speakers.
   - 1.3. Charge both 6 V batteries as one 12 V battery.

2. **The VK30-5 SofiTronic brings:**
   - 2.1. Possibility of year-round suppression of the Varroa Destructor mite.
   - 2.2. Year-round treatment against VD is becoming a question of the survival of bee colonies.
   - 2.3. Ultrasound does not affect the laying of honey in any way.
   - 2.4. Protect the battery from over-discharge by turning off the battery when the battery voltage drops below 2 x 6.0 = 12.0 V.
   - 2.5. Switching on again is only possible after the battery has been charged to more than 12.5 V.
   - 2.6. Ultrasound generated by the VK30-5 SofiTronic system:
     - It causes adult VD found on bees and exposed to ultrasound with an intensity of at least 80 dBSPL to stop eating. They weaken and fall from the bees in the hive, but they also fall from the bees during the flight, since they no longer have enough strength to hold on to the body of the flying bee. They die in 5-10 days. (Freely available on the Internet.)
     - It interrupts the developmental cycle of VD in all fetal cells in which the sound intensity reaches a value of at least 55 dBSPL. Some authors report that sufficient sound intensity in

cells starts at 35 dBSPL. (Freely available on the Internet.) However, the bee brood remains INTACT.

2.7. Since the VK30-5 system causes a significant increase in the gradient of bee mites, we can use it as a diagnostic tool. Its deployment for 7 to 10 days on bee colonies will provide sufficient information to assess the degree of bee mite contamination of bee colonies. It also makes it possible to assess the differences in the degree of contamination of individual bee colonies by the bee mite. We get the best overview if we count the fall of Bee Mites on a daily basis. If the natural gradient in 24 hours is in the area of units, then after the ultrasound is applied, it usually rises to tens or more.

2.8. Any accidental short-circuit of any output will not affect the operation of the remaining non-short-circuited outputs.

2.9. Very low operating costs consisting of the cost of charging the battery.

3. VK30-5 SofiTronic Cap Design with Speakers:

If we have decided on a lid with one speaker, we will place this one in the middle of the lid. The hole for the speaker has a diameter of 78 mm. Seal the inside of the lid with a suitable sealant of at least 2 mm. It is also advisable to seal the lid from the outside. It is also advisable to warm the lid from the outside. The thickness of the insulation on the outside is not specified, it depends on the decision of the beekeeper. If we have opted for a lid with multiple speakers, we will place these so that the ultrasound best covers the expected position of the brooder.

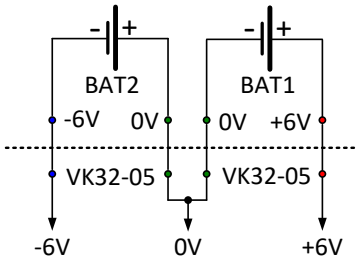
4. Positioning the lid of the VK30-5 SofiTronic system

Place the lid with the speaker on the top extension under the original lid. Between the speaker and the upper slats, we no longer put any insulators, foils, nets, etc. These would significantly reduce the sound level in the hive. Above the upper slats, there must be free space for ultrasound propagation. At the same time, we can place the VK30-5 SofiTronic system on the lid with the speaker and cover it with the original lid in free-standing bee colonies. This will protect the VK30-5 SofiTronic from rain and direct sunlight. The original lid must be equipped with a thermal insulator(s) so that the temperature under this lid does not exceed 55 °C.
The highest efficiency of the VK30-5 SofiTronic system is achieved in bee colonies that are on a single extension, as ultrasound effectively acts on the highest percentage of bees in the hive.
The VK30-5 is supplied set to one of three modes according to the customer's requirements.
Mode 1: VK30-51 – for one speaker on each of the 5 outputs, a total of 5 speakers.
Mode 2: VK30-52 – for two speakers on each of the 5 outputs, a total of 10 speakers.
Mode 3: VK30-53 – for three speakers on each of the 5 outputs, a total of 15 speakers.
The speakers can be placed in the lids one by one, in pairs or in triplets.

The single-speaker cap generates an ultrasonic signal with a volume of 105 dBSPL, the two-speaker cap generates 108 dBSPL and the three-speaker cap up to almost 110 dBSPL (109.77 dBSPL).
Upon request, the manufacturer will set the VK30-5 mode to the value required by the customer.

5. Battery for VK30-5 SofiTronic

The VK30-5 SofiTronic system uses a battery consisting of a pair of batteries with a voltage of 6 V. These are connected in series as shown below.



It is possible to buy 6-volt batteries from several manufacturers that have different characteristics. These are summarized in the following table.

Table 5.1. The most commonly used batteries

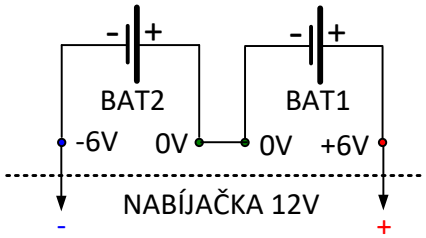
Relative Battery Capacity			
Charge Level v %	**Maintenance-free batteries Battery voltage (V)**	**Gel batteries Battery voltage (V)**	**AGM Batteries Battery voltage (V)**
100 %	12,70+	12,85+	12,80+
75 %	12,40	12,65	12,60
50 %	12,20	12,00	12,00
25 %	12,00	12,00	12,00
0 %	11,80	11,80	11,80

6. Charging the battery for the VK30-5 SofiTronic during operation

Charging the battery is also possible while the device is operating. The use of a suitable solar system is also possible. Connect the positive pole, i.e. **the + pole of the 12 volt charger/solar system,** to the terminal of the +6V battery and the negative pole, i.e**. - the pole of the 12 volt charger/solar system, to** the terminal -6V. Set the charging current according to the capacity of the battery used in accordance with the manufacturer's recommendation. The batteries are charged to the voltage recommended by the manufacturer.

7. Charging the battery for the VK30-5 SofiTronic separately

Disconnect the batteries from the VK30-5 system. According to the picture, we connect the battery terminals marked 0V and connect the charger. The positive, i.e. + pole of the 12 volt charger is connected to the BAT1 terminal of the +6V connected battery and the negative, i.e. - pole of the charger is connected to the BAT2 terminal of the –6V connected battery as shown.



8. Positioning the battery of the VK30-5 SofiTronic system

Place the battery as close as possible to the VK30-5 SofiTronic system. We will provide the climatic conditions for the battery specified in the relevant battery documentation.

9. Setting the VK30-5 SofiTronic frequency

The VK30-5 SofiTronic allows you to set 8 different frequencies.
The lowest frequency of 15 kHz is set when all buttons are labeled: 2 kHz, 4 kHz, and 8 kHz **PUSHED.**
The highest frequency is achieved if all buttons are labeled: 2 kHz, 4 kHz and 8 kHz **NOT PUSHED**.
(Mnemonic: all "down" buttons = lowest operating frequency. All "up" buttons = highest operating frequency.)

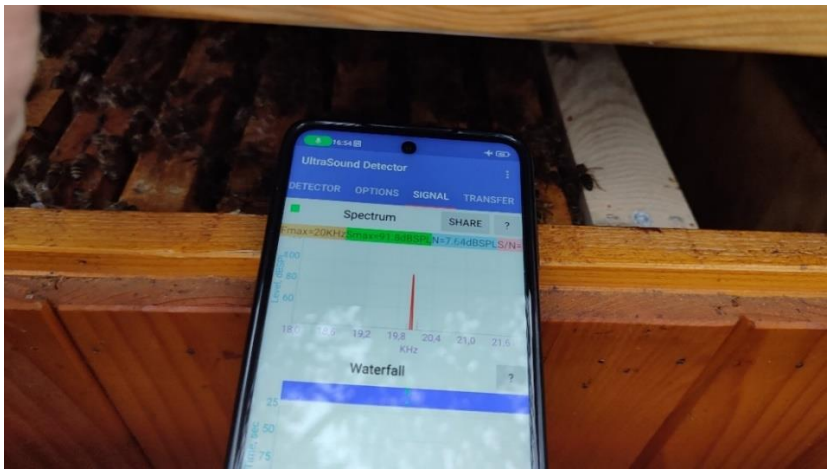
The treatment of bees against the tick using ultrasound is in its infancy. The most effective way of using ultrasound will be able to be explored by beekeepers, and various beekeeping institutes and other institutions. The VK30-5 SofiTronic provides, for example, the following options:

- Finding the most efficient/most suitable working frequency for the type of hive used by the beekeeper.
- The ability to find out whether it is better to use one "optimal" operating frequency, or whether it is more efficient to vary the operating frequencies.
- The ability to see if it is more effective to use a permanent tone or if it is advisable to turn off the tone for a certain period of time.
  During the period of turning off the tone in bee colony "A", it would be possible to treat bee colony "B".
- Use a multi-speaker cap design. Again, it provides a wide range of options for investigating efficacy and optimizing the treatment procedure.
- For B10 hives, lids with a pair of speakers are recommended.

The author verified the efficiency of frequencies up to 37.5 kHz. It has been verified that all frequencies used from 15 kHz to 37.5 kHz are highly efficient. The differences in the efficiency of individual frequencies have not yet been examined in detail.

10. Activity review

Checking the activity consists of verifying that the speaker is actually making a sound. Seniors usually no longer hear frequencies higher than 4 to 10 kHz. However, this is very individual.
Therefore, to check the activity, it is advisable to use a mobile phone – Smartphone, in which a suitable ultrasonic detector application is installed. This detector usually "hears" frequencies from about 18 kHz to 21 kHz. Therefore, in order to check whether the speaker actually emits ultrasound, it is necessary to set the frequency that in the operating interval of the respective ultrasonic detector. In the picture, in addition to the ultrasound signal (red vertical line), we can also see that the bees are completely calm.



11. **VK30-5x system variants**

There are 3 variants of the VK30-5 marked:

VK30-51: only one speaker **can be** connected to each bus . The total number of speakers connected to the VK30-51 system is 5.

VK30-52: it **is always necessary** to connect a pair of speakers to each bus, which are connected in series. The total number of speakers connected to the VK30-52 system is 10.

VK30-53: it **is always necessary** to connect three speakers to each bus, which are connected in series. The total number of speakers connected to the VK30-53 is 15.

The wiring can be seen in Fig. 11.

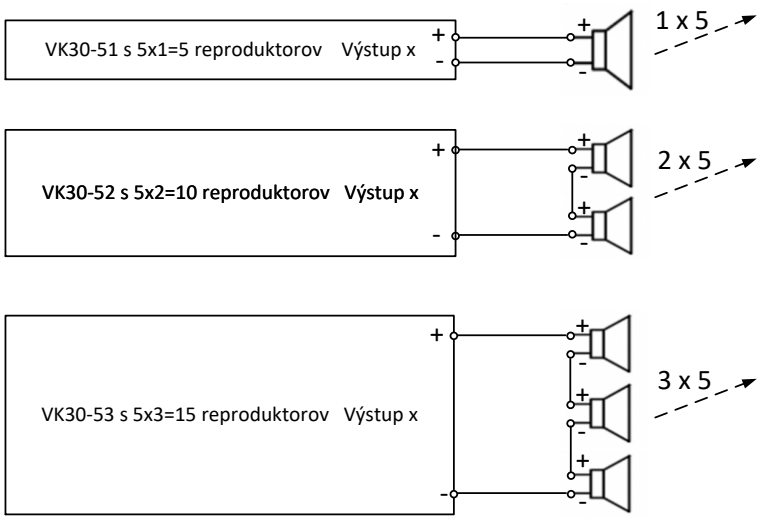
- In the VK30-51 version, the speakers can be mounted in 5 separate caps with a volume level of 105 dBSPL each, as shown in Figure 11, or in a single lid, even **all 5 speakers, for research purposes,** for example. The volume level reaches up to **112 dBSPL.**

- For the VK30-52 version**, 2 speakers wired as shown in Figure 11** MUST always be used. If only one speaker is connected to the bus, it will be damaged/destroyed. The speakers can be mounted in separate caps with a volume level of 105 dBSPL or **a pair of speakers in a single lid** with a volume level of **108 dBSPL** (11.19897 dBSPL).

- For the VK30-53 version**, 3 speakers wired** as shown in Figure 11 MUST always be used. If only one or two speakers are used, these will be damaged/destroyed. The speakers can be mounted in fifteen separate lids with a volume level of 105 dBSPL or even five triplets, each triplet in a single lid with a volume level of almost **110 dBSPL** (109.7712 dBSPL).

When working with ultrasound, it is recommended to use silencers.
See: https://cs.wikipedia.org/wiki/Decibel

Fig. 11 Speaker Wiring Methods



Single speaker cap

Dual speaker cap

A protective mesh is not necessary.