

**User manual**

**”Tracker”**

***VS3***

Patented

**Version 2.6**

Applicable to transmitters from version 2.02 onward



## Contents

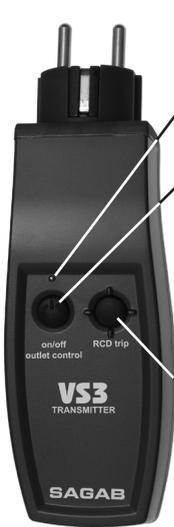
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*SAGAB Electronic AB retains the right to amend and modify the user manual at any time and without prior notice. We have been as thorough as possible but take no responsibility for any errors or oversights.*

*We are grateful for any suggestions for changes or additions that can improve the use.*

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## Transmitter buttons and functions



### LED indicator

The LED flashes when the transmitter is on.

### On/Off button ☺

Button to switch the transmitter on and off. Active transmitter is indicated by a flashing light in the LED. When there is voltage to one of the probes the instrument cannot be switched off.

If the button is pressed while there is voltage to one of the probes, the transmitter transmits information to the receiver about the configuration of the outlet (how the outlet is connected).

The probes must be voltage free to switch off the transmitter. The button is held in for 0.5 seconds.

### RCD/RCOB test button ⚡

When this button is pressed a 30 mA fault current is generated between phase and ground terminal. The duration of the fault current is a maximum of 300 ms.

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## Receiver buttons and functions



### Sensors

The sensors for current and voltage are placed on top of the instrument

### Symbol field

Symbol for active menu

Battery status of transmitter and receiver

Signal status from transmitter

Signal strength from transmitter

### On/Off button ☺

Also used with the Fuse connection  menu to select high or low sensitivity. (Read more on page 11)

Hold the button down for 2 seconds to switch off the receiver.

### Menu button ○

This button is used to select the menu that is required. Hold the button down for 0.5 seconds to change the menu. Active menu is displayed with accompanying symbol in the symbol field.

### User configuration

Settings, such as contrast, background lighting etc. are selected using a special button press. (Read more on page 16)

## Introductory description of the Tracker's functions and operating method

### Areas of use

The VS3 is a patented tool for electricians in their daily installation work. It is especially designed for fault tracing and fuse detection in single phase 230V applications during maintenance and repair.

VS3 consists of two battery powered sections: a transmitter and a receiver. The transmitter and the receiver communicate via the radio frequency 869 MHz.

### The following functions are available

#### Outlet configuration

- Shows how a single phase outlet is connected
- Measures voltage and frequency in the electrical outlet

#### Phase connections

- To identify phase connections for protective apparatus and consumers in relationship to the electrical outlet to which the transmitter is connected

#### Fuse connections

- To identify protective apparatus (fuses, mini circuit breakers, RCD and RCBOs) in relation to a given outlet

#### RCD tests

- To check a 30 mA RCD function and trip time.

### Automatic switch-off

The transmitter and the receiver switch off automatically.

The receiver switches itself off after approximately 1 hour if an electric field has not been applied to the top end of the receiver.

The receiver switches off automatically after approximately 1 hour.

An audible signal in the receiver sounds one minute before the transmitter switches off. One press on the transmitter's  button means that the transmitter is active for a further hour.

### Manual switch-off

The transmitter and the receiver can also be switched off manually.

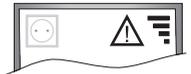
**The transmitter must be unpowered to be switched off.**

### Connection checks

There are two symbols on the receiver display which show the quality of the radio connection.

The symbol  shows that the receiver is receiving data from the transmitter and the symbol  shows the strength of the incoming signal from the transmitter.

If the symbol  is displayed in the upper field it means that there is another transmitter nearby that the receiver is receiving data from. Always check that the other transmitter is not interfering with your own readings.



### Range

The transmitter and receiver communicate with each other via radio on 869 MHz and have good contact with each other up to a distance of 1.2 km line of sight.

If there are many, thick walls or other obstacles, the range is limited.

## Safety regulations



For safe use of the VS3 we recommend that you read through the manual and understand how the instrument functions. Read the special paragraphs covering the instrument's limits carefully.

The following symbols are used in the user manual



**This text contains important information, for example about the instrument's limits**



*This text contains information and tips which can be helpful to clarify the function.*



**The transmitter and the receiver are synchronised to each other. If a new transmitter is to be used with the receiver the receiver must be set to communicate with it. Read more on relevant page of the user manual.**



**Never use the instrument if it seems damaged**



**Never open the instrument other than to change batteries. There are no parts inside that can be replaced by anyone other than authorised personnel.**



**If the instrument will not be used for 30 days the batteries must be removed to prevent leakage damage**



**Test the transmitter by switching it on, connecting it to an outlet with known voltage and reading off the voltage and frequency of the receiver.**



**The transmitter in the wall outlet and the handheld receiver communicate by radio signal. The signal can be interrupted by other strong transmitters or weakened by long range or screening materials, walls and roofs. Check that there is sufficient signal strength using the symbol on the receiver display.**



**The instrument may only be cleaned using a rag with a mild soap solution. The instrument must be dry before use.**

### CE conformity declaration

We certify that this product corresponds to the applicable norms and standards according to R&TTE, EMC and LVD

SAGAB Electronic AB



## Outlet configuration



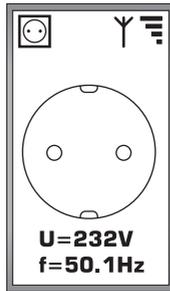
VS3 can display how an outlet is connected quickly and easily. Both earthed and un-earthed outlets can be checked.

1. Start the transmitter and receiver by pressing the ☺ button on the relevant unit.
2. Check that the symbol ☺ is shown on the receiver's display and that the symbol  shows at least one bar, preferably several.



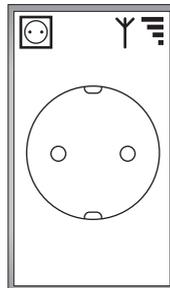
The symbol ☺ must also be displayed. If the symbol is not displayed press the ○ button repeatedly until ☺ is displayed.

3. Insert the transmitter in the outlet to be checked.

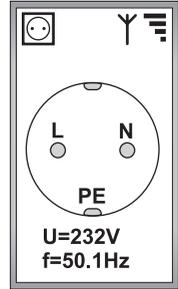


The display on the receiver shows a symbolic image of the outlet and also information about the voltage and frequency there.

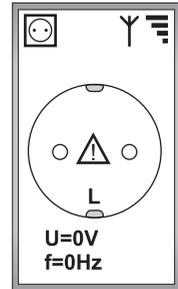
-  *Note! The transmitter must have a voltage on either of its two connection pins to enable display of "U" and "f". If the fuse is blown, the MCB is switched off or there is any other reason for the absence of voltage to one of the pins, there will be no voltage and frequency information displayed*



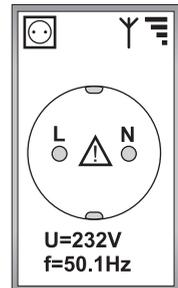
4. Press the transmitter's ☺ button and hold it in
5. The display shows the configuration and voltage and frequency of the outlet.
6. The voltage and frequency are also displayed when the transmitter's ☺ button has been released.



-  *Incorrectly connected outlets that could cause personal injury are indicated by a warning triangle and audible signal.*



-  *The transmitter cannot determine whether the outlet into which it has been inserted is earthed or un-earthed. However, a warning triangle is always presented if an earth connection is missing. If the outlet is unearthed, this warning has no significance. Readings can be taken, but RCD testing cannot be performed.*



-  **The outlet's configuration is only displayed on the receiver display while the ☺ button on the transmitter is pressed in and held for 5 seconds afterwards.**



## Outlet configuration

 VS3 cannot measure the voltage if only the live conductor is connected and neither the neutral nor the earth are connected. There may be dangerous voltage in the outlet without it being indicated.

 If the transmitter's probes are voltage free (including the earth probe) the transmitter switches off when the ☺ button is pressed. The transmitter must be unpowered to be switched off.

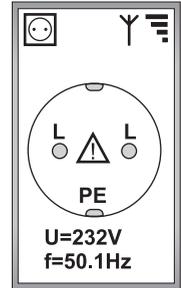
 The display shifts automatically to the Outlet menu when the ☺-button is pressed on the transmitter. (if the transmitter is in a powered outlet)

## Important information

Certain faults cannot be identified  
Under certain circumstances a number of faulty outlets can be indicated in a way which is not correct.

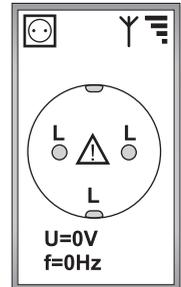
### When neutral is missing

*When neutral is not connected (but ground is connected) the non-connected probe can be indicated as voltage conducting.*



### When neutral and ground are missing

*When neither neutral nor ground are connected all probes can be indicated as voltage conducting. The voltage is indicated as zero volts because the reference to ground is missing.*



### Why check phase connections?

In the event of uneven load a unit may need to be checked to determine what loads are on which phase.

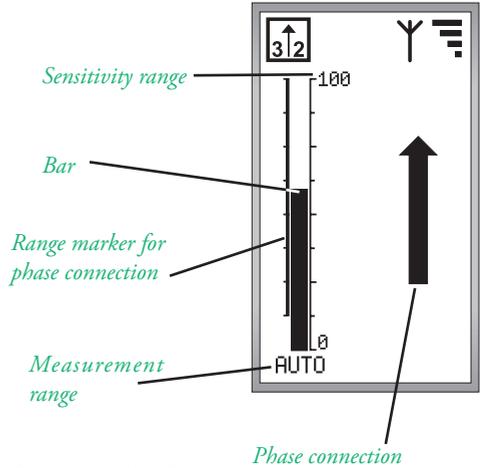
Connect the transmitter to a wall outlet and measure the main fuse that is overloaded. Note the phase position. Then measure the outlets and installations where large current consumption can occur. Note the phase position of these. Decide if any outlet or machine can be reconnected to obtain a more even load.

Note that the transmitter must remain in the same outlet, or in another outlet within the same phase, for the phase indication to be accurate. It is the phase that acts as reference phase.

### What does the display show?

In “phase connection” mode, VS3 shows a bar. It shows the strength of the signal received relative to the entire sensitivity range of the instrument. In “AUTO” mode, the scale changes automatically from 0-25%, via 0-50%, to 0-100%. It is possible to lock the scale for each range.

Beside the bar is a range marker. Phase connection is shown within this range. It is also necessary for the transmitter to be switched on, connected to the mains and within radio range.



### Carry out the following

1. Start the transmitter and receiver by pressing the  button on the relevant unit.
2. Check that the symbol  is shown on the receiver's display and that the symbol  shows at least one bar, preferably several.

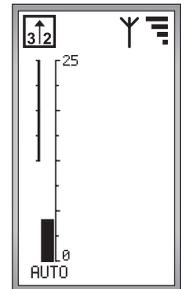


The symbol  must also be displayed. If the symbol is not displayed press the  button one or more times until  is displayed.

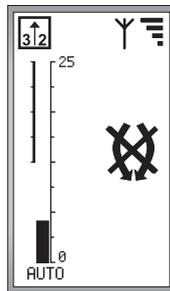
3. Connect the transmitter in the powered outlet to be checked.

The field strength bar normally employs automatic range selection. The text AUTO is displayed below the bar. Pressing the  button repeatedly switches the sensitivity between

(AUTO) → (0-25) →  
(0-50) → (0-100).



If the transmitter is not in an outlet which is supplied with voltage it cannot give a phase reference. This is shown by crossed out arrows on the receiver display.

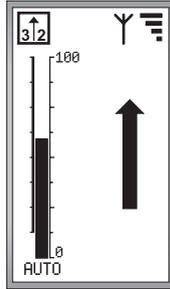




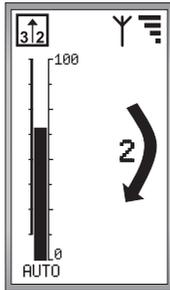
## Phase connections

4. Move the top end of the receiver over the fuses or wall outlets to be checked, or hold it to the connection cables for those consumers that are to be checked.

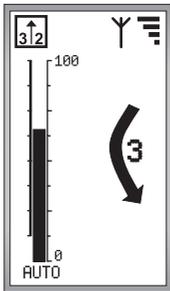
*That the cable or contact that the receiver tip measures belongs to the same phase as the outlet that the transmitter is connected to is displayed here.*



*In this case the measurement point belongs to the subsequent phase, referred to the phase at the outlet where the transmitter is connected.*



*In this case the measurement point belongs to the previous phase, referred to the phase at the outlet where the transmitter is connected.*



*Measurements cannot be taken on the outside of screened cables, earth cables with jackets or cables in steel or lead pipes. Certain rubber cables can display screened characteristics*

5. Switch off the transmitter and receiver by pressing the ☺ button on the relevant unit for a moment. The transmitter must be unpowered to be switched off.



**Functions as follows**

The transmitter generates a current of approximately 7 KHz frequency. This current is superimposed on the mains voltage and passes through the connection cable to the fuse and onwards to the transformer station. This means that it will be on rails and connected cables that are between the fuse and the transformer. An electric current causes a magnetic field and it is this field that the receiver senses.

**What does the display show?**

In “fuse connection” mode, VS3 shows double bars. One, designated Main Bar, shows the strength of the signal received relative to the entire sensitivity range of the instrument. The other, designated Subsidiary Bar, shows a magnification of the Main Bar, allowing greater precision.

**Peak value marking**

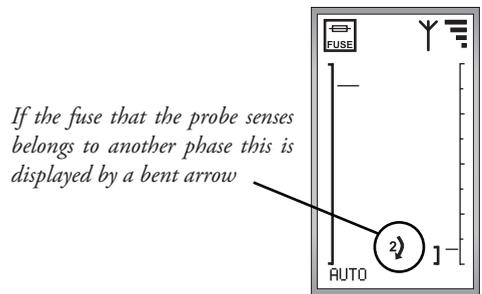
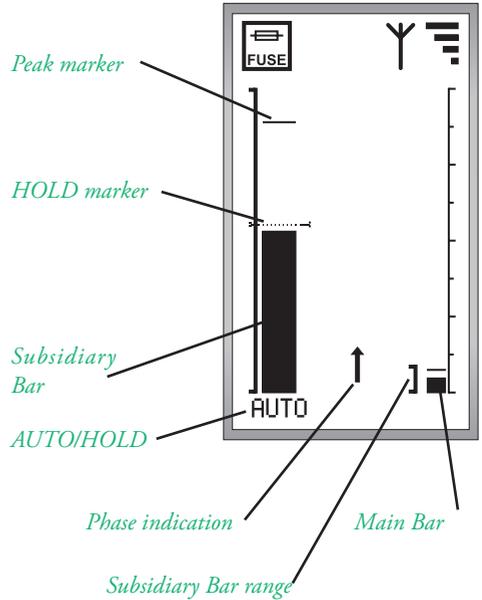
The peak value of the signal received is shown briefly as a peak marker in both bars.

**HOLD mode**

It is possible to lock a peak value and use it as a reference marking. This is very useful for finding the correct fuse connection.

In order to lock a peak value, press while the peak marker is being displayed. A new line shows the HOLD value in both bars and the text HOLD is shown below the Subsidiary Bar.

Press once more to restore the Subsidiary Bar to being a dynamic segment of the Main Bar.





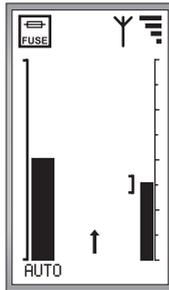
Carry out the following

1. Start the transmitter and receiver by pressing the button on the relevant unit.
2. Check that the symbol is shown on the receiver's display and that the symbol shows at least one bar, preferably several.

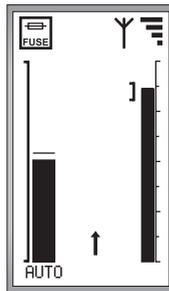


The symbol must also be displayed. If the symbol is not displayed press the button one or more times until is displayed.

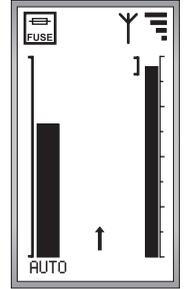
3. Insert the transmitter in the outlet to be checked.
4. Move the top end of the receiver over, under or above the fuses, miniature circuit breakers or RCBOs.



The main bar is higher when there is a strong field from the transmitter. The subsidiary bar shows a magnification of the top section of the bar.

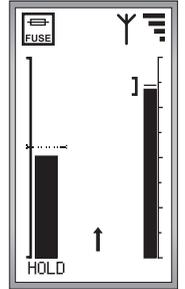


When the highest signal strength is indicated it means that the safety apparatus feeding the outlet that the transmitter is connected to is displayed.

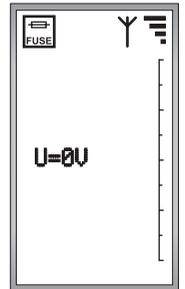


The "HOLD" function can make it easier to carry out testing between fuses that are far apart.

Search for the highest value and press the button. HOLD is shown in the display and the Subsidiary Bar is locked at the current value. It is then very simple to see whether another fuse is showing a higher or lower value than the one just read.



When the correct fuse is disconnected the displays shows U=0V as confirmation that the outlet where the transmitter is connected is unpowered.



Audible indication

Parallel with the bar being higher in stronger fields, this is also indicated by sound pulses, which increase in frequency. The audible indication can be switched off in the User configuration (see page 16)

5. Switch off the transmitter and receiver by pressing the button on the relevant unit for a moment.



## Important!



### Incorrect readings can occur

"Tracker" VS3 is very selective. It automatically removes the signal found on phases other than the one that the outlet is connected to.

"Tracker" VS3 only selects the phase that the transmitter is then connected to. One arrow on the display displays the phase connection at the point measured.

### Incorrect readings can occur in the following cases:

#### If the cables in the fuse box are too close to the front cover

One core leaks a much bigger electromagnetic field than for example a ceramic fuse. A ceramic fuse is optimally screened with the core in the middle and the return core in the sleeve. One core, carrying a 7 KHz current, which has ended up near the fuse box sleeve can give the receiver misleading information.

#### If there are large capacitive loads on the other fuses

Capacitive loads contain capacitors. They serve as small batteries where the comparatively high frequency currents can retrieve their energy. A fuse for such equipment can therefore display similar field strength to the fuse where the transmitter is connected.

#### The current does not run where the measurement with the receiver is being taken.

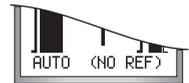
This primarily refers to fuses with ceramic covers. Therefore, one must move the top end of the receiver in different directions to obtain an optimal signal.

### Strong field from wrong phase

In order for VS3 to register something in the bars, the electrical field must be the same phase as the transmitter.

If surrounding cables or objects are emitting a stronger field than the cable or object being tested, VS3 will be suppressed and not show the magnetic field generated by the transmitter, even if it is strong.

Pressing and holding the ☺ button and simultaneously pressing the ○ button disengages the phase control, and the signal from the transmitter is displayed regardless of phase connection. (the function is as if the transmitter were outside the radio range from the receiver) Pressing again re-engages the filter.



*the text "NO REF" is displayed when the phase control is disengaged*

✎ If no level bar is displayed or a very low level is shown, when examining a distribution board, the relevant outlet can be connected to another distribution board or sub-distribution board.

✎ Radio connection between transmitter and receiver must always be established during ongoing measurement so that the two phases where the searched for fuse is not located can be suppressed. Measurement can occur without radio contact, but the risk of incorrect indication is considerably larger.

Check that the symbol  $\Upsilon$  is displayed and that the symbol  $\equiv$  is marked with at least one bar.



## RCD tests

"Tracker" VS3 can check the trip time on a 30 mA RCD or RCOB. The check uses 30 mA constant fault current and the RCD must trip within a maximum of 300 ms.

"Tracker" VS3 can check both RCD/RCBOs of the AC type (for pure sinusoidal fault currents) and A type (for pure sinusoidal and pulsating fault currents with super imposed DC).

The check is carried out according to standards EN 61008 and EN 61009 and test results can be documented.

### Carry out the following

1. Start the transmitter and receiver by pressing the button on the relevant unit.

2. Check that the symbol is shown on the receiver's display and that the symbol shows at least one bar, preferably several.



The symbol must also be displayed. If the symbol is not displayed press the button one or more times until is displayed.

3. "Ready for test" is displayed

4. Connect the transmitter to the electrical outlet that to be checked and is supplied by the RCOB.

5. Press the transmitter's button for 1 second



6. The RCD/RCOB trips and the time is shown in milliseconds (ms) in the receiver's display



If the trip time is greater than 300 ms a warning symbol is also displayed.



7. Switch off the transmitter and receiver by pressing the button on the relevant unit for a moment.

*The outlet must be approved. Carry out a check with "Outlet configuration"*

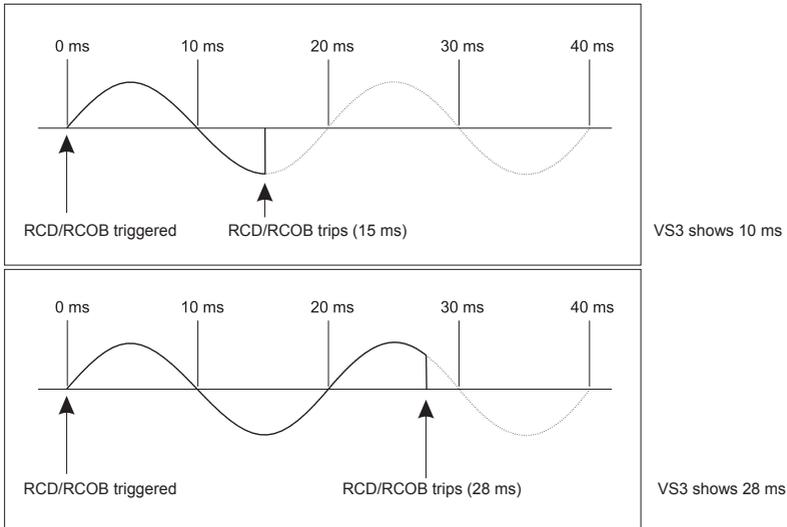
*When the button is pressed on the transmitter the receiver automatically goes to the RCOB menu.*



## How is the measured value presented?



VS3 generates a constant fault current of approximately 30 mA over both periods. The value is calculated for a voltage of 230 V and is not corrected for deviating voltage. Trip times are only calculated on positive parts of the period, which is why the time cannot be exactly given if the trip time occurs during the negative part of the period. The following image explains:



## Typical trip times for RCDs

Type of RCD	Trip times for RCDs	
	Typical times	Longest permitted time according to EN 61008 and EN 61009
* Usual RCD type AC or A	12 - 70 ms	300 ms
** Time delayed (G-type), type A	70 - 190 ms	300 ms

\* Without short time delay and impulse current resistant up to 250A

\*\* With short time delay and impulse current resistant up to 3000 A

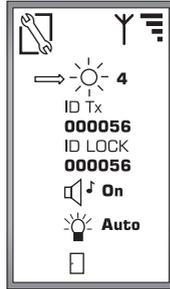


## User configuration

### Settings menu

To access the settings menu hold the  button pressed while the receiver is started using the  button,

The arrow is moved down using the  button and the value is changed using the  button



### Contrast

This changes the contrast of the display.

### ID LOCK

This is the ID that the corresponding transmitter has to have to be tied to the receiver. If the transmitter is switched on the transmitter ID will be presented at ID Tx. These two values must be the same for communication to be established between the units.

If a new transmitter is connected to the receiver carry out the following:

- Switch the transmitter on. The display shows the sender's ID at "ID Tx"
- Press the  button" (if the display has no background lighting and "auto" selected at "background lighting" two presses may be needed)
- "ID LOCK" must display the transmitter's ID. Completed!

### Audible signal

This setting applies if the sound function is to be on or off. The audible indication for a dangerously connected outlet cannot be switched off.

### Background lighting

The following can be selected:

- Always OFF
- Always ON
- Auto

Auto mode means that the lighting is switched on when new information can be read in the display. After a few seconds the display goes out to save the batteries.

In this mode, if the background lighting is out, it can be lit manually by pressing one of the buttons. This means that if a function or menu requires changing the button may have to be pressed twice. The first lights the background lighting and the second carries out the command.

### Exit

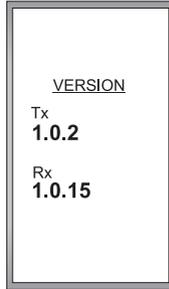
The exit door indicates that one is leaving the settings menu.

### Definitions

**Tx** = Transmitter  
**Rx** = Receiver

**Program version**

If the receiver's ☺ button is held depressed at start both the transmitter and the receiver program versions are shown.

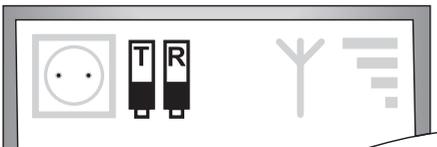


*The versions that are displayed in the picture are only an example.*

**Battery status**

The symbol for battery status is shown at the top of the receiver display. If the batteries are in good condition no symbol is shown. If the batteries in the transmitter start to be discharged a symbol for this is shown

If the batteries in the receiver start to be discharged a similar symbol is shown.



- Transmitter batteries running out 
- Transmitter batteries must be changed 
- Receiver batteries running out 
- Receiver batteries must be changed 

## Technical specification

### TRANSMITTER

Power supply .....	2 x AA batteries (LR6)
Operating range.....	200 - 240 VAC
Frequency range .....	40 - 65 Hz
Accuracy .....	+ - 3%
Radio frequency .....	869,525 MHz
Operating temperature .....	-10°C - +50°C
Altitude.....	< 2000 m
RH .....	80% @ 30°C 50% @ 40°C
Size.....	180 mm x 60 mm x 45 mm
Weight .....	200 g
Material.....	PC-ABS
Safety classification .....	IEC61010-1 CAT II 300V
Approval .....	CE, EMC, R&TTE
Automatic switch-off .....	After approx. 1 hr of inactivity

### RECEIVER

Power supply .....	2 x AA batteries (LR6)
Display.....	128 x 64 pixels
Background lighting .....	Off, On or Auto
Indication E-field.....	Bar graph and sound variation
Max distance to transmitter .....	1.2 km line of sight
Operating temperature .....	-10°C - +50°C
Altitude.....	< 2000 m
RH .....	80% @ 30°C 50% @ 40°C
Size.....	195 mm x 60 mm x 37 mm
Weight .....	210 g
Material.....	PC-ABS
Safety classification .....	IEC61010-1 CAT III 600V
Approval .....	CE, EMC, R&TTE
Automatic switch-off .....	After approx. 1 hr of inactivity

CE certification carried out by NEMKO  
VS3 is patented.