CT33 Cable Tracer

User Manual for Devices CTT33 and CL43 v. X1.0

VESALA®

Contents

CE

Do not discard this product with household or general waste after its end-of-life. Return it for recycling according to EU Waste Electrical and Electronic Equipment directive (WEEE). For more information contact your local distributor or www.vesala.fi.

1. General information about cable tracing

A cable tracer detects the magnetic or electric field which has been induced to a cable or wire using the transmitter. Tracing is often affected by other nearby conductors and ducts. We recommend to read this manual carefully prior to using the **CT33** equipment.

CT33 equipment is intended to be used for example:

- To locate and track mains cables
- To locate and trace telecom cables
- To locate shorts in telecom cables
- To trace coaxial/antenna cables
- To locate floor heating cables
- To locate ducts and duct blockages using transmitter sondes

CT33 can be used both indoors and outdoors, and when properly used, it is safe even with mains environment.
Some tracing tasks may require accessories.

In this manual there are two symbols used to describe grounding & earth connection:

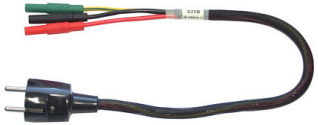
This symbol means grounding through constructions, such as grounded pipes, metal chassis, mains wall socket protective earth connector etc.

This symbol means direct earthing to soil with a ground pick or other similar means so that no other constructions are involved.

2. CT33 Equipment and accessories

2.1 CT33 Basic setup

CTT33 transmitter for galvanic signal feeding. Transmitted frequency 33kHz.



TB10m and **TB10p** CAT-III –feeding cord (black and red, 1.0m, 4mm safety banana plugs).

XKKp and **XKKm** safety crocodile clip (black and red).

S3TB feeding cord, 0.5m Schuko/ 3 pcs. safety banana plugs.

CL43 Receiver for tracing the signal of the transmitter.

SA43 Rod probe to trace cables and sondes on 10kHz and 33kHz frequency.

KOCT33 User manual

KLCT33 Carrying bag for the equipment, accessories and other installation tools (Polypropylene, ~400 x 350 x 90 mm).

2.2 Transmitter accessories

PM50 (Ø 50mm) **or PM100** (Ø 100mm): Clamp-on transformers for signal feeding when direct galvanic connection to cable is not possible.

10/TX-Earthstake

SPA10 Pipe transmitter antenna for tracing of small pipes and ducts (length 10 m).

2.3 Receiver accessories

SA05 Rod probe to locate 512Hz sondes.

LA43 Close range probe to trace and identify cables and wires from a short distance on 10kHz and 33kHz frequency.

KA43 Capasitive probe for wire pairs identification.

A selection of **duct sondes** and **push rods** are available as accessory to locate ducts and pipes and their blockages.

3. CTT33 User interface

Output connectors:
4 mm safety banana jacks for tracing signal output.

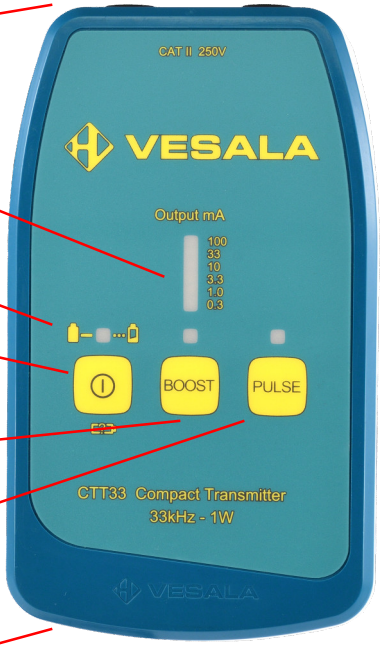
Output mA:
LED bar: Output current display (also software version and battery status)

Power LED
If power LED blink, batteries are weak.

Power button:
To turn power on and off. While powering on LED bar briefly displays software version and after that it displays battery status with reference to full batteries. When device is on, also a short press will display battery status similarly.

BOOST:
Output power selection: When BOOST LED is on, higher output power is selected.

PULSE:
Output signal mode selection: Signal can be continuous (default) or slowly pulsed or fast pulsed. PULSE LED displays which mode is on.



Battery compartment (on the backside of the enclosure. Lid has screws).
CTT33 uses 6 1.5V LR6 (AA) alkaline batteries. Similar NiZn or NiMH batteries can be used but they require a separate charger.

4. Basics on how to use the transmitter

CTT33 transmits 33kHz (32,768Hz) signal always when it is on. The default output power is sufficient for most needs. If BOOST mode is selected (BOOS LED on) output signal is higher but batteries are also drained faster.

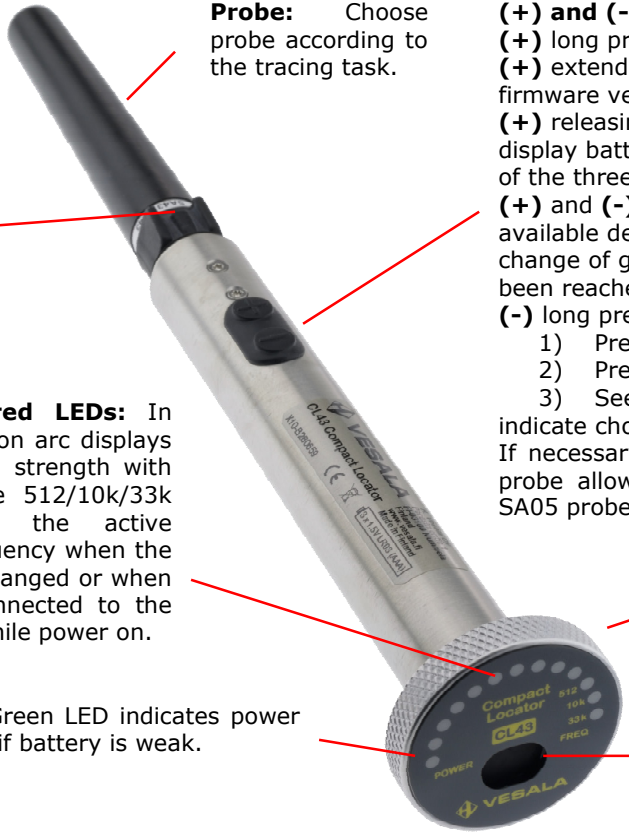
When PULSE LED is on continuously, output signal is continuous. Press PULSE button once or twice to choose 4Hz or 8Hz pulsed signal correspondingly. With receiver pulsed signal is often easier to distinguish from noises. Two pulsed signal modes enable using the two transmitter method for locating wire cuts.

Feeding cords are used to connect the transmitter to the target. Standard cords are safe when properly used but safety precaution must be followed all the time when working with live wires. If galvanic connection and feeding is not possible, inductive signal feeding with a clamp-on transformer may be used instead.

Warnings concerning the transmitter

- **When operating with mains targets, always use contact proof and right safety class cords and adapters, and follow safety instructions.**
- **CTT33 transmitter may be connected to max. 230V rms voltage!**
- **If either transmitter output terminal is connected to a live target, dangerous voltage or current may appear on wires connected to the other output, unless they are properly grounded.**
- **Avoiding interference with telecommunication or electric network is always the responsibility of the user.**
- 
Risk of electric shock: Always disconnect feeding cords before opening the battery lid or enclosure.

5. CL43 Receiver user interface



Probe: Choose probe according to the tracing task.

Probe release button: Press here to remove the probe.

Arc of 12 red LEDs: In normal operation arc displays received signal strength with 24 levels. The 512/10k/33k LEDs display the active operating frequency when the frequency is changed or when a probe is connected to the CL43 device while power on.

Power LED: Green LED indicates power on. LED blinks if battery is weak.

(+) and (-) buttons:
(+) long press: power on / off
(+) extended pressing during start-up: makes the LED arc show firmware version.
(+) releasing press during start-up: makes the LED arc briefly display battery status and the active operating frequency with one of the three rightmost LEDs.
(+) and **(-)** short presses: gain setting up or down, 5 or 7 steps available depending on connected probe. A beep sound indicates change of gain, no beep means that maximum or minimum has been reached.
(-) long press: Initiate change of receiving frequency mode:

1) Press **(-)** until a beep is heard. Keep it pressed!
2) Press **(+)** until another beep is heard.
3) See the LED arc: One of the 512/10k/33k LEDs briefly indicate chosen frequency.

If necessary repeat 1 to 3 to get the right frequency. Connected probe allows choosing only frequencies supported by the probe. SA05 probe always forces CL43 to 512Hz mode.

Batteries: Batteries are located under the user interface cap.

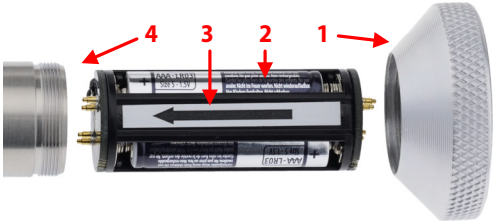
Speaker: Indicates received signal strength; the higher pitch and volume, the stronger the signal.

6. Putting the CL43 receiver into use

Batteries:

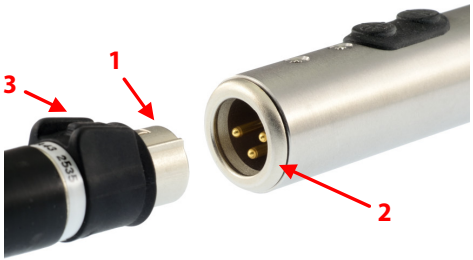
CL43 receiver uses 3pcs AAA (IEC LR03) alkaline batteries. Compatible NiZn batteries can be used but they must be recharged in a separate charger.

To change batteries, turn the user interface cap (1) off and pull the battery holder (2) out from the tube. Replace old cells with new ones. Observe battery polarity: (-) poles must be placed against the spring contacts. Insert the battery holder back into CL43 tube according to the arrow symbol (3). Turn the user interface cap back on the tube (4).



Connecting /disconnecting probes:

CL43 always requires a probe to operate. To attach a probe, push the probe connector (1) in to CL43 socket (2) aligned as in the image until the locking clicks. To remove a probe: Press the release button (3) under the rubber to release the locking and pull the probe out.



Warnings concerning the receiver

- **Though it is not possible to get an electric shock via CL43 receiver probes at less than 600V environment, it is NOT suggested to use CL43 probes so that they touch live targets.**
- **Do not ever let CL43 body touch live targets.**
- **When operating with mains targets, always follow safety instructions.**

7. Using the receiver and probes

7.1 Choosing right frequency and probe for each task

CL43 receiver supports 512Hz, 10kHz and 33kHz frequencies so it is suitable for various tracing tasks:

Frequency	Probe	Intended use	Operating distance
33kHz	SA43	Cable & wire tracing with the CTT33 transmitter Locating 33kHz duct sondes (Vesala MPL4-33, MPL6-33, MPL7-33, MPL9-33, PL18-33)	30cm ... 10m ≤ 10m
33kHz	LA43	Cable & wire tracing and identification at close range with the CTT33 transmitter	≤ 30cm
33kHz	KA43	Wire tracing and identification with the CTT33 transmitter	≤ 20cm
10kHz	SA43	Cable & wire tracing with some of Vesala 10kHz transmitters Locating 10kHz duct sondes (Vesala MPL6-10, MPL7-10, MPL9-10, PL18-10)	30cm ... 10m ≤ 5 m
10kHz	LA43	Cable & wire tracing and identification at close range with Vesala 10kHz transmitters	≤ 30cm
10kHz	KA43	Wire tracing and identification with Vesala 10kHz transmitters	≤ 10cm
512Hz	SA05	Locating 512Hz duct sondes (Vesala PL18-05, PL42-05)	≤ 13 m

With CTT33 transmitter always use 33kHz receiving frequency with CL43 receiver and either black SA43 rod probe, black LA43 close range probe or red KA43 probe. Green SA05 rod probe is only for locating 512Hz duct sondes.

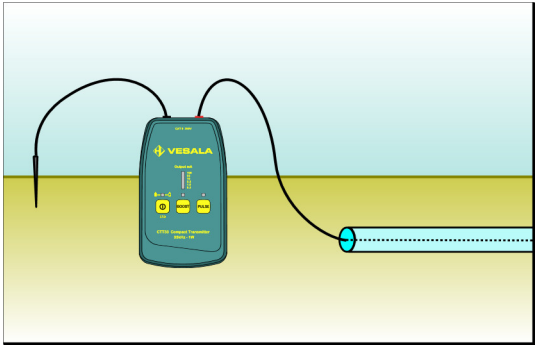
7.2 Setting receiver gain

To adjust CL43 receiving sensitivity, or gain, press **(+)** or **(-)** buttons briefly. Depending on the attached probe, there are 5 or 7 gain steps available. A beep sound indicates change of gain, no beep means that maximum or minimum has been reached. It is recommendable to use gain which makes the LED arc length to be approx. in the middle; that way changes in signal strength are easiest to notice. Audio signal volume and tone pitch from the speaker follow the received signal strength.

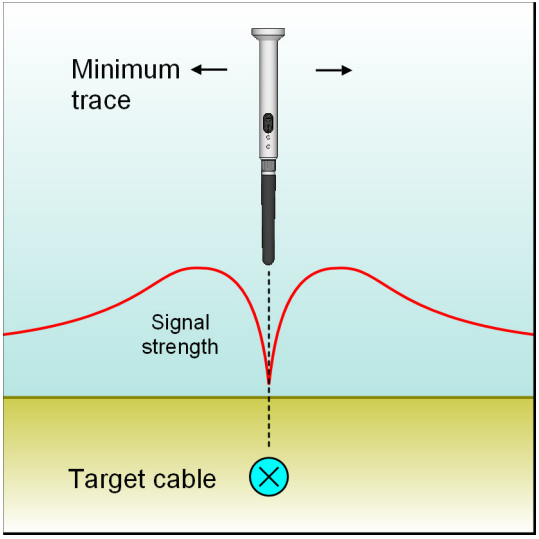
8. How to use a cable tracer

This chapter demonstrates principles on how to use the CTT33 transmitter and CL43 receiver. They are repeatedly faced in practical situations so it is essential to understand them. Operating principles usually don't depend on cable type (whether telecom, mains etc.), instead cable connections play the major role.

8.1 Locating cables from a distance



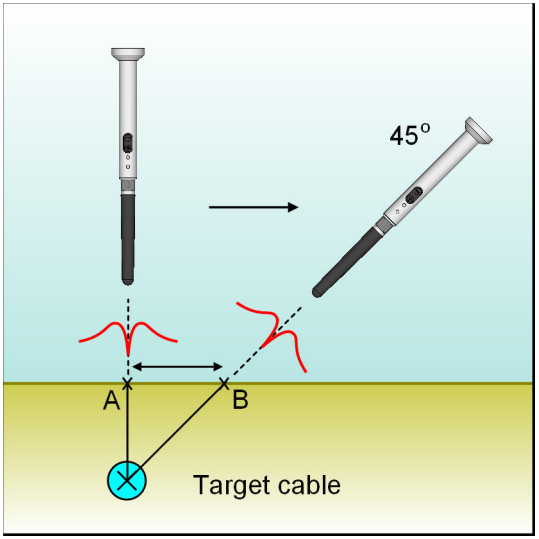
Transmitter: Connect one transmitter output to the cable. To make sure that the tracing signal current return path is distributed widely to the surrounding soil, use a ground pick or additional wire for the other output. Only on special occasions both transmitter outputs are connected to the wires of the traced cable.



Receiver: Follow the cable's route using the SA43 rod probe. Rod probe is very directive, so between two strong signals a very narrow and signal minimum can be seen exactly in the direction of the traced cable (see the image). Hence this is called the minimum (or null) trace method.

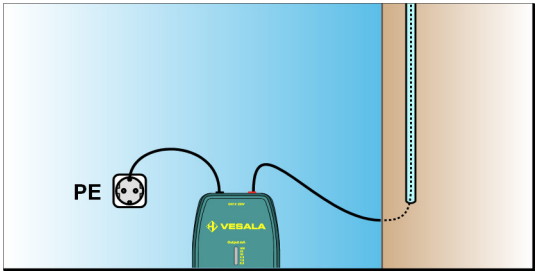
It is also possible to determine cable depth with CL43 and SA43:

Tilt the SA43 probe to a 45 degree angle and find a second minimum. Distance between the first minimum A and the second minimum B equals to cable depth.



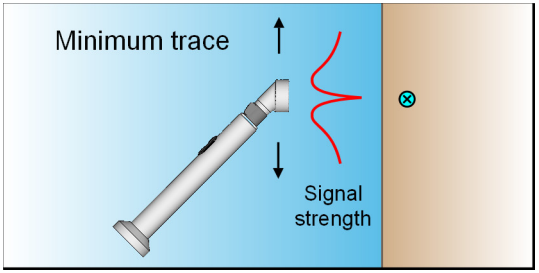
8.2 Tracing indoor cables

Transmitter: Connect one transmitter output to one or more of the cable's wires and second output to a grounding e.g. to wall socket PE (earthing) connector.

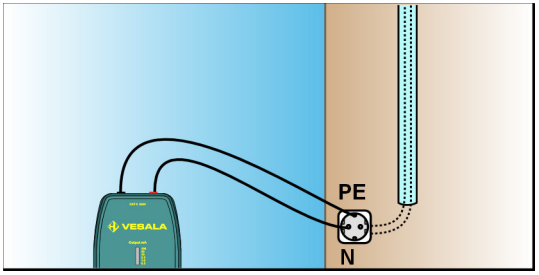


Receiver: Scan wall surface with the LA43 probe to track a signal minimum between two strong signals. If the cable is further away than 30cm, use SA43 probe instead.

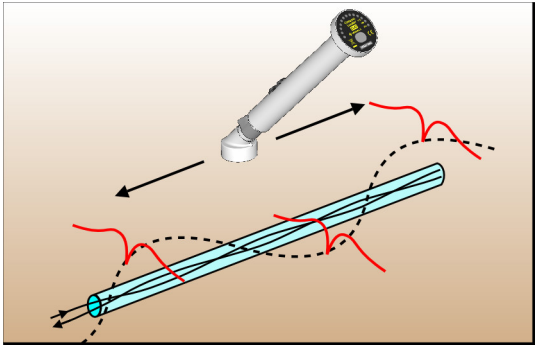
Due to common groundings, signal may also be heard from nearby cables but weaker than from the right cable.



Transmitter: Alternatively connect both transmitter outputs to two different wires of the cable, such as wall socket N and PE. This feeding is more reliable as there is usually less cross talk to other cables hence making it easier to identify the right cable from others.

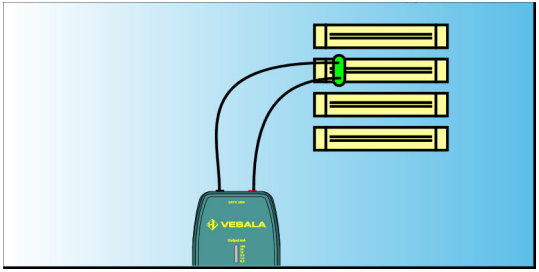


Receiver: With the above feeding, tracing distance is less than 20cm. Scan wall surface with the LA43 probe to track a signal maximums and minimum. As conductors are often twisted inside the cable, signal strength appears to go up and down or minimum zigzags from side to side.



8.3 Identifying wires and wire pairs

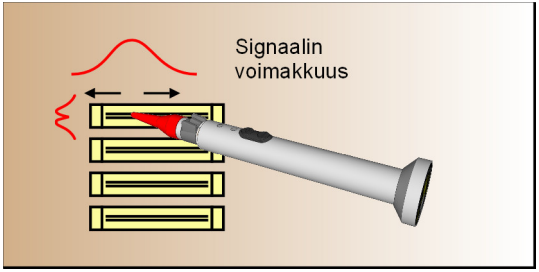
Transmitter: Connect both transmitter outputs to the wire pair that needs to be traced or identified.



Receiver: Use KA43 probe and scan as close as possible over terminal modules to find signal maximum. Strongest signal is above the right pair. Due to cross talk, signal can be heard elsewhere too but weaker.

When the right pair has been found, between its wires there is a minimum. This requires that probe is placed very close to the wires or the pair has open ends.

KA43 probe can be used to identify pairs also along their path, such as on shelves or bunches.



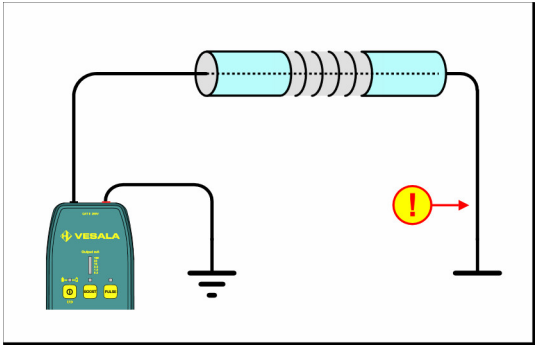
9. Locating underground cables

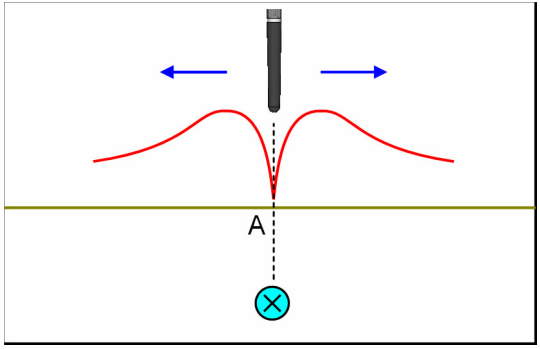
9.1 Neutral electric cables and telecom cables

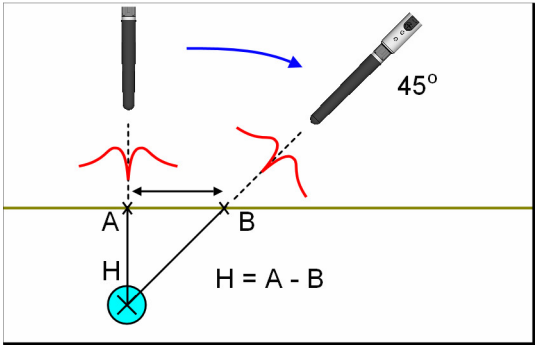
Task: The route of a neutral electric cable or telecom cable must be traced above ground.

- **CTT33:** Connect one transmitter output to one or more wires of the cable. Same wire(s) should preferably be grounded at the other end. Connect transmitter second output to a grounding, preferably with a ground pick to damp soil.

- **CL43:** Use SA43 probe. Trace the cable route by pointing the probe to the signal minimum A.
- Define cable depth by turning the receiver to 45° angle. Trace right above ground until a second minimum B is found. Cable depth H equals to the distance A-B.



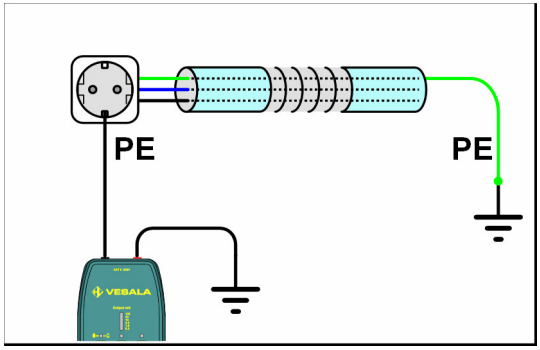


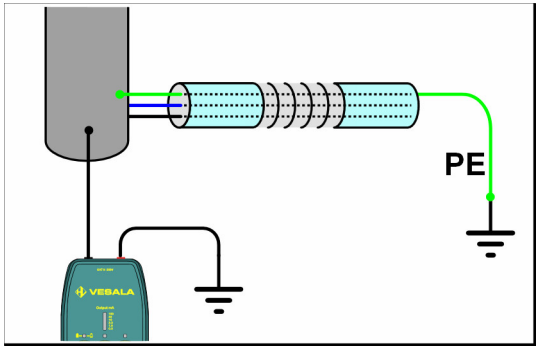


9.2 Live mains cables

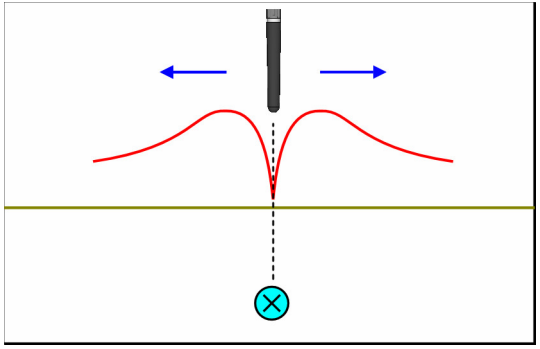
Task: The route of a live electric cable must be traced above ground.

- **CTT33:** Connect one transmitter output to the protective earth, e.g. to a wall socket PE contact. To trace the feeder cable of a metallic light pole, connect transmitter output to the earthed pole itself. Connect transmitter second output with a ground pick to soil as far as possible.





- **CL43:** Use SA43 probe. Trace the cable route by pointing the probe to the signal minimum. If necessary, define cable depth as described in the previous paragraph.

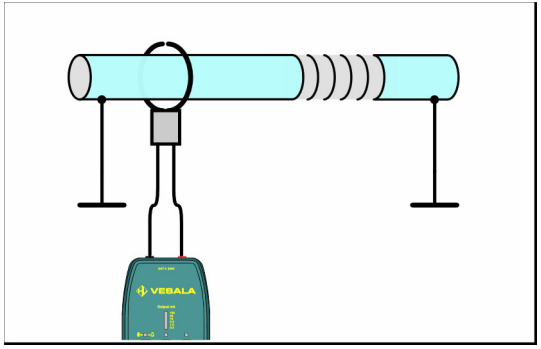


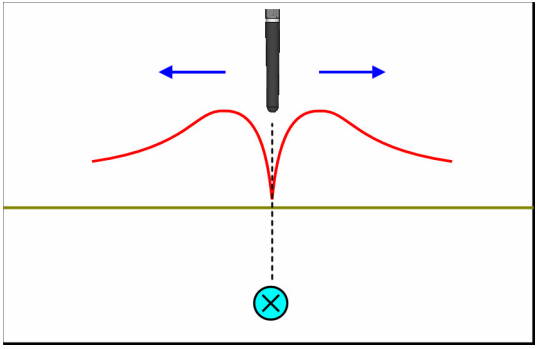
9.3 Cables that can't be reached for galvanic feeding

Task: The route of a live or neutral cable must be traced above ground but cable ends can't be reached.

- **CTT33:** Connect transmitter to a clamp-on transformer and place the clamp around the cable in a place where the cable is visible. Note: Using a clamp requires that the cable has been grounded at the near end, preferably at both ends.

- **CL43:** Use SA43 probe. Trace the cable route by pointing the probe to the signal minimum. If necessary, define cable depth as described in the previous paragraphs.



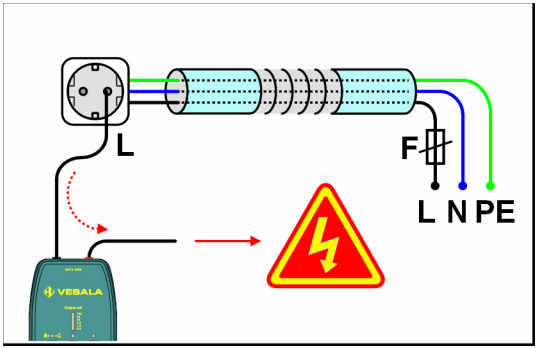


10 Tracing cables and wires indoors

10.1 Live and neutral electric cables

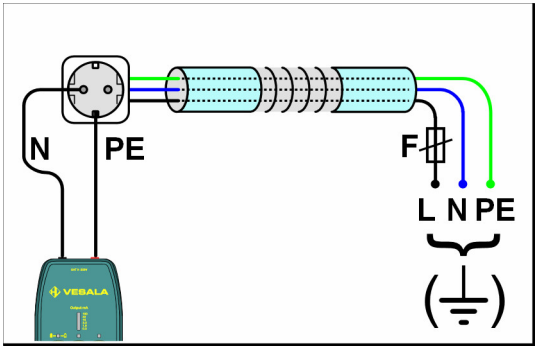
To connect transmitter to live targets, always use proper contact proof safety class cords and adapters and follow safety instructions.

WARNING! If either transmitter output terminal is connected to a live target as shown in the figure, a voltage appears on wires connected to the other output as well, unless they are properly grounded.

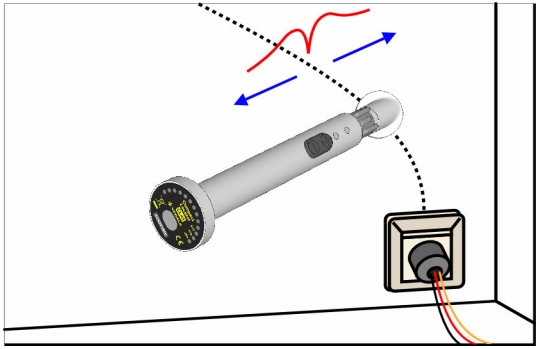


Task: The route of a live or neutral cable must be traced from a short distance, e.g. inside walls or on cable shelves.

- **CTT33:** Connect transmitter between the wall socket N and PE contacts (not to L contact) with the S3TB cord. This method applies to situations where cable is disconnected or a fuse has blown.

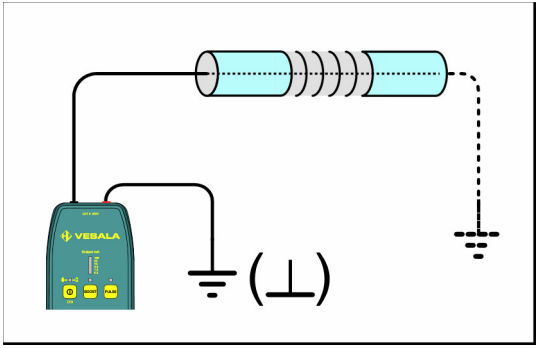


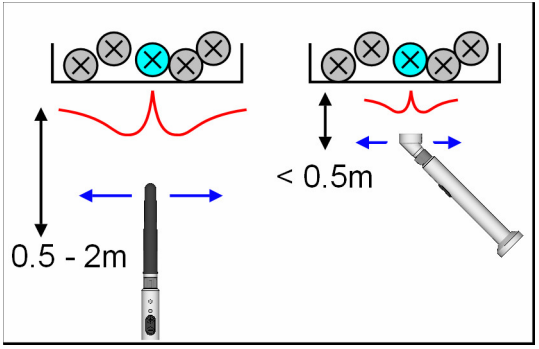
CL43: Use LA43 probe. Trace the cable route by following the signal maximum. Right above the cable there is often a signal minimum.



Task: The route of a live or neutral cable must be traced e.g. on a cable shelf.

- **CTT33:** Connect one transmitter output between a neutral wire of the cable and a separate grounding. Use a ground pick if necessary.
- **CL43:** Use SA43 probe. Trace the cable route by pointing the probe to the signal minimum. At a distance less than 0.5m LA43 probe can be used too.
- If cable's wires are disconnected, signal gets weaker along the path and LA43 probe works better. Closer to the end, signal minimum gradually disappears and there is only a signal maximum above the right cable.





10.2 Wall sockets and circuit breakers & fuses

Task: Electronic circuit breaker for a certain live wall socket needs to be located at the electrical panel or cabinet.

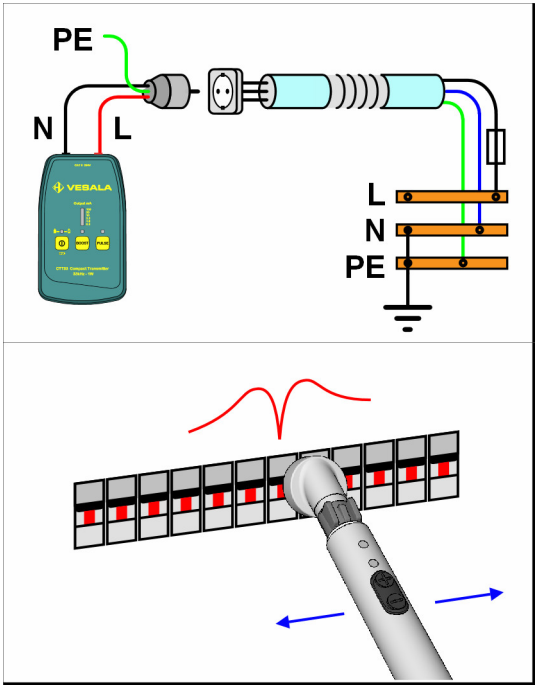
CTT33: Use the S3TB cord and connect transmitter between the wall socket's L and N or L and PE contacts.

CL43: Use LA43 probe. Scan and track all circuit breakers at the electrical panel which give a strong signal. It is normal that several circuit breakers give a signal as they are parallel connected via their phase rail.

Above the right circuit breaker there is usually a very strong signal and a minimum in the middle. If possible turn the circuit breaker off: Signal level should decrease significantly.

It is recommendable to practise receiver use beforehand with known fuses/breakers.

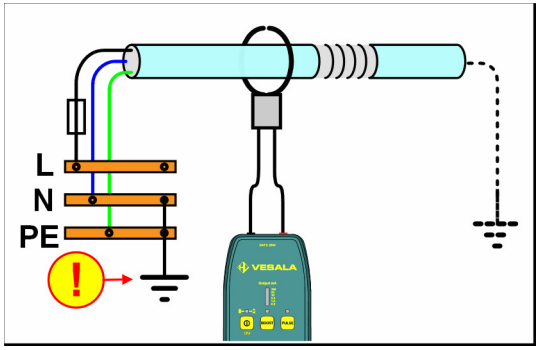
NOTE! If there are several wall sockets connected to the same circuit breaker, transmitter current spreads to other directions and makes it more difficult to locate the right circuit breaker.

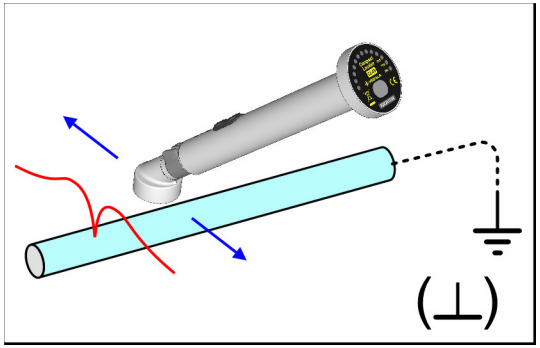


10.3 Cables that can't be reached for galvanic feeding

Task: The route and end of a cable from a cabinet needs to be located without disconnecting the cable or opening the cabinet.

- **CTT33:** Connect transmitter to a clamp-on transformer and place the clamp around the cable in a place where the cable is visible. Note: Using a clamp requires that the cable has been grounded at least at the near end.
- **CL43:** Use LA43 probe. Trace the cable route inside a wall or on cable shelf by following the signal minimum.
- If the other end of the cable is grounded the whole route of the cable is traceable and even SA43 probe can be used by following the signal minimum.





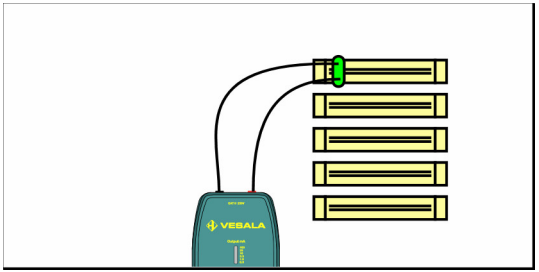
10.4 Tracing and identifying wire pairs

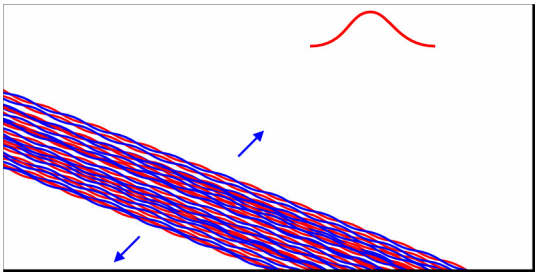
Task: A wire pair needs to be traced between cross connection terminals and identified at the other end.

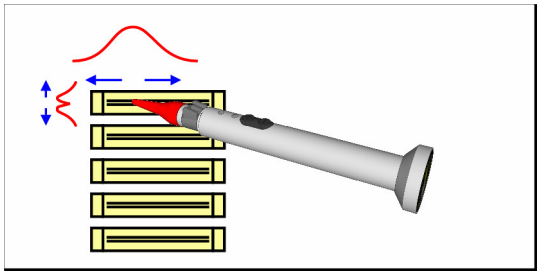
- **CTT33:** Connect both transmitter outputs to the wire pair that needs to be traced or identified. Pair can be unused telecom pair or other unused pair of wires.

- **CL43:** Use KA43 probe. At cable bunches the right pair gives the strongest signal when the KA43 tip is close to it.

- If the pair has been connected to a terminal module, scan KA43 as close as possible over the terminals to find signal maximum. Due to cross talk, signal can be heard elsewhere but the strongest signal is above the right pair. Between the right wires there may be a minimum. Also open wires can be identified this way.





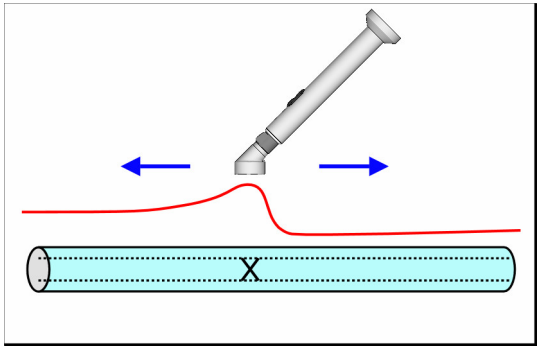


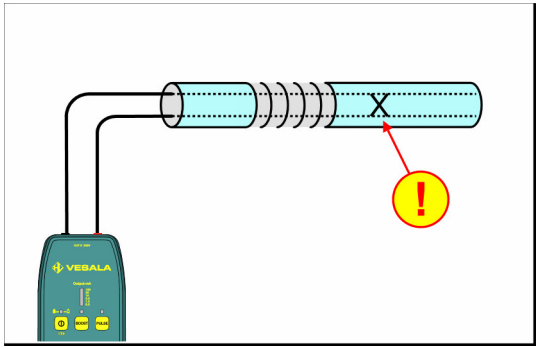
11 Tracing cable faults

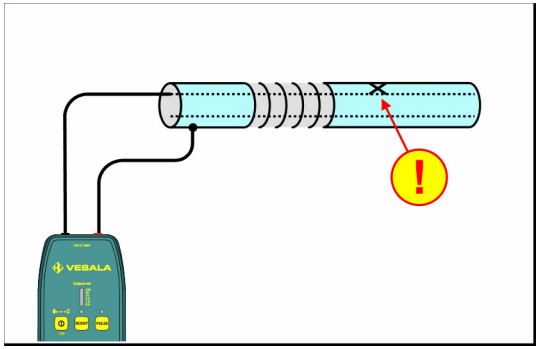
11.1 Location of a short circuit fault

Task: Cable has a short circuit fault which location needs to be traced.

- **CTT33:** Connect transmitter outputs between the shorted wires of the cable. If the short is to the shielding, connect transmitter between the shorted wire and the shielding.
- **CL43:** Use LA43 probe. Monitor signal strength along the cable surface. At fault spot signal gets stronger and then quickly disappears. Low-ohmic short-circuit are easier to find. With shorts caused by water in a cable result depends on how wet the cable is. Ground leaks and leaks to shielding are all traced in a similar manner.



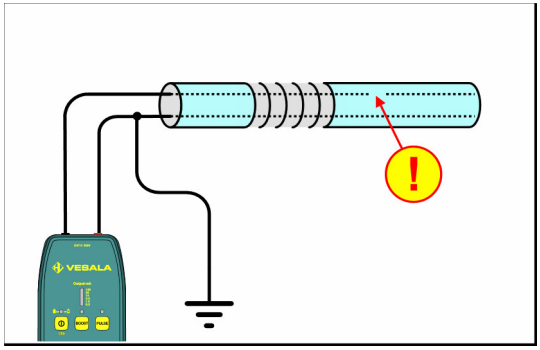


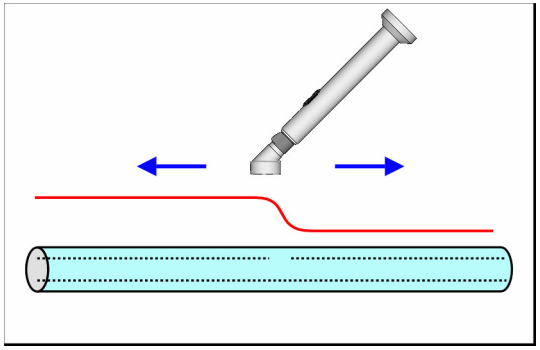


11.2 Location of a open wire (cut fault)

Task: Cable has a open (cut fault) which location needs to be traced.

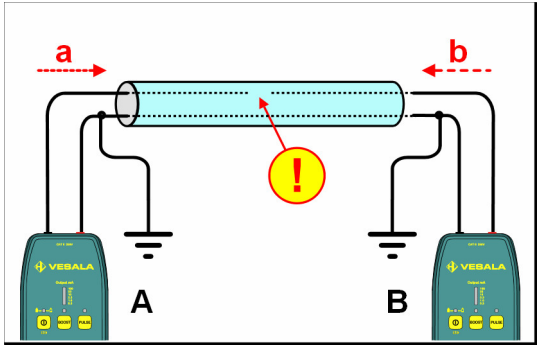
- **CTT33:** Connect one transmitter output to the open wire. Connect second output parallel to all remaining wires and possible shielding and ground them all, preferably using a ground pick to soil.
- **CL43:** Use LA43 probe. Monitor signal strength along the cable surface. At the fault spot signal quickly weakens.

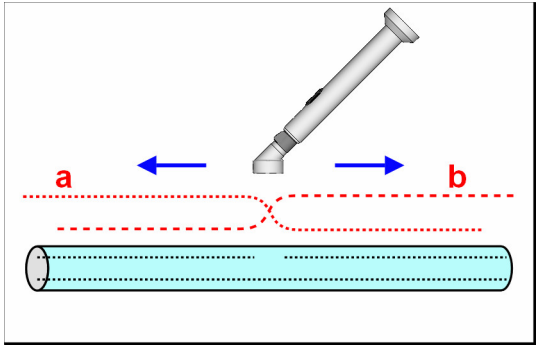




Using two transmitters to locate a cut fault.

- **CTT33:** Connect both transmitters' one output to the cut/open wire. Connect second outputs parallel to all remaining wires and possible shielding and ground them all, preferably using a ground pick to soil at both ends. Set transmitter A to send fast pulsed signal and transmitter B slowly pulsed signal.
- **CL43:** Use LA43 probe. Monitor signal strength and pulsing along the cable surface. At the fault spot signal pulsing should change. Note: This method does not always work because of environmental inequalities.





12 Floor heating cables and their faults

12.1 Preliminary inspection of the target area

As a first step it is always recommendable to perform a systematic inspection at the cable assembly area, assembly method as well as fault type.

Typical reasons to floor heating faults

- Cable has been damaged during assembly. In time heating current has gradually burned the conductors, resulting in an open or short-circuit fault. There may be several faults in the same cable.
- There is an air pocket in the concrete, causing cable over heating and eventually an open or short-circuit.
- The floor structure has changed, e.g. fallen down, causing cracks and damage to cable.
- Renovation work such as drilling or moving fixed furniture has resulted in a latent or immediate damage.

When and how the fault appeared

- Did it blow a fuse (short circuit)
- Did the cable just stop heating (cut cable)
- Did a residual current device trip (ground leak)
- Has there been renovation or other changes made recently or some time before

Measuring cable resistances and capacitances

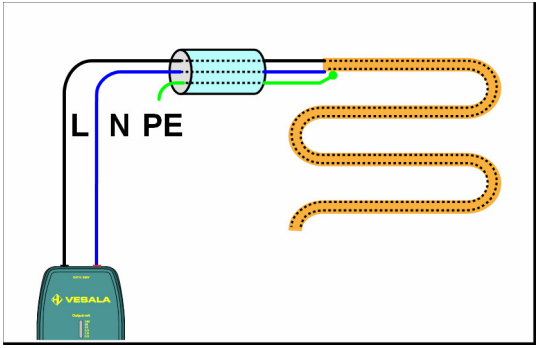
- Make sure that cable wires are not live and disconnect all from the feeding cable.
- Measure resistances and capacitances between all heating cable wires and shield and compare them to normal values of an intact cable (L-N / L-PE and N-PE)
- In case the heating cable is shorted to concrete reinforcement, it is worth measuring all wires against the building's earthing too.
- Resistance values usually reveal the fault type and which wires are affected. Capacitances may help defining the fault distance from the measuring point.

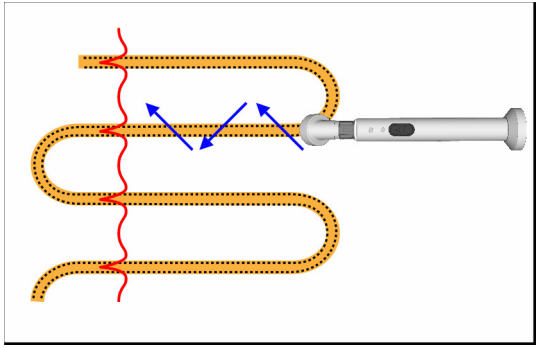
12.2 Tracing floor heating cables and their faults

Task: Floor heating cable route needs to be traced e.g. for defining a fault location or for drilling.

- Follow the route of the heating cable from start to end and mark it on the floor. Often the exact route may reveal faults due to bad assembly or later renovations, such as:
  - Cable has been placed under fixed furniture like closets
  - Sauna stove or bench screws have been inserted too close to the cable
  - Toilet seat screws hit the cable route
- If the fault can't be determined by following the route only, it is necessary to try to find spots along the route where the tracing signal level suspiciously changes (see next paragraph):
  - In case of a short circuit, signal can be followed to the fault where it gets stronger and then disappears
  - In case of an open circuit, signal usually starts to weaken starting from the fault spot

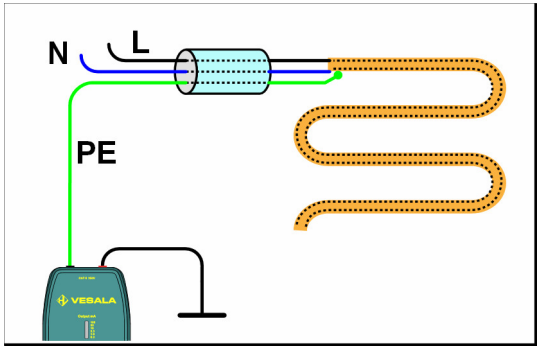
- **CTT33:** Cut the power and disconnect all cable wires from the feeding cable. Connect transmitter between the cable's phase (L) and neutral (N) wires.
- **CL43:** Use LA43 probe. Follow the cable route by scanning the floor surface. Usually there is a noticeable minimum but changes in cable depth and cable's looping back and forth affect how clearly the minimum can be detected. Mark the route on the floor with chalk or tape.

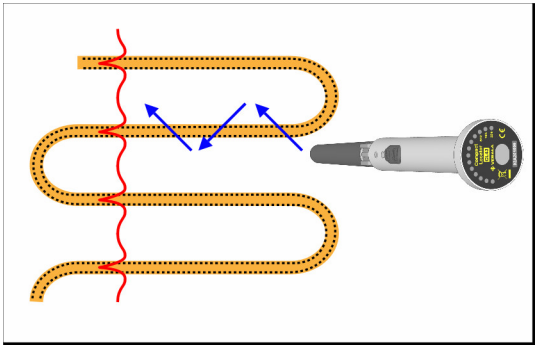




- Especially with cables having a cut SA43 probe may work better than LA43.

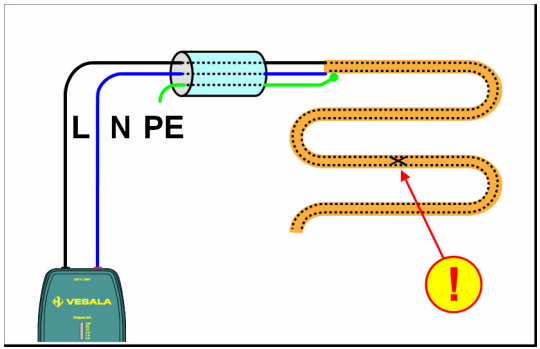
- **CTT33:** Connect one transmitter output to the cable's shielding and second output to a good grounding, e.g. to the feeding cable’s protective earth PE wire.
- **CL43:** Use SA43 probe. Trace the cable route by pointing the probe to the signal minimum.

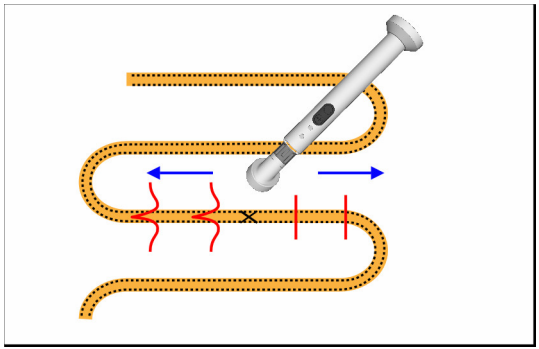




Task: A short circuit in a floor heating cable needs to be traced.

- **CTT33:** Connect transmitter between the **shorted** wires of the cable (in the below figure L and N). Leave the third wire unconnected.
- **CL43:** Use LA43 probe. At fault spot signal gets stronger and then quickly weakens or disappears.

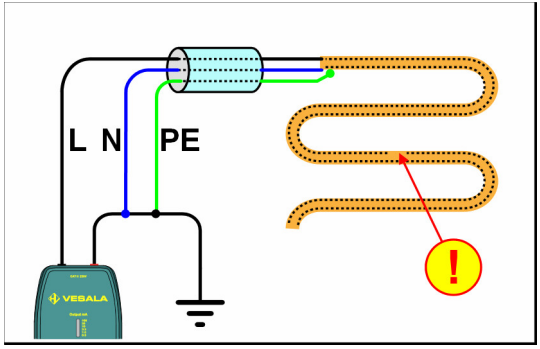


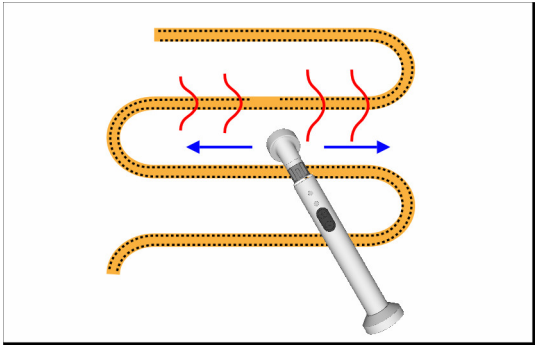


Task: An open fault (cut) in a floor heating cable needs to be traced.

- Several factors affect tracing an open in a heating cable, such as what cable type is at hand, is the cable fully cut or just one wire and what kind of grounding there is to concrete reinforcement. All these require carefulness while tracing and yet it is possible that exact fault location can't be determined.

- **CTT33:** Connect one transmitter output to the cut wire. Connect the second output to the uncut wire & cable shielding and connect both of them to an auxiliary grounding, preferably using a ground pick. Do not use electrical wiring's PE!
- **CL43:** Use LA43 probe. Monitor signal strength along the cable's route. In this case signal is typically weak and no minimum can be detected. At fault spot the signal gets even weaker.



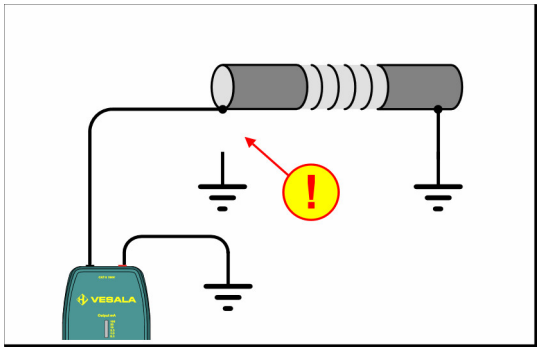


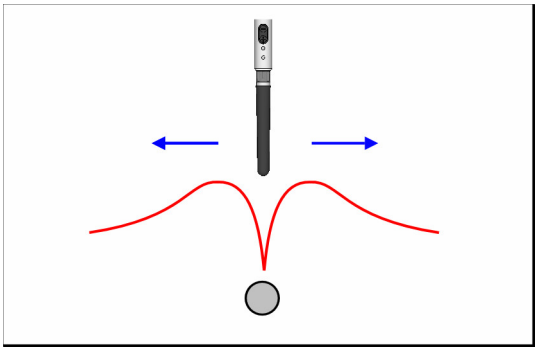
13 Tracing tubes and ducts

13.1 Conductive tubes and ducts inside walls or under ground

Task: The route of a metallic tube needs to be traced under ground or inside wall.

- **CTT33:** Connect one transmitter output to the tube and the second output to a good grounding using a ground pick, inserted to the soil as far as possible.
- **CL43:** Use SA43 probe. Trace the tube route by pointing the probe to the signal minimum. If the tube is inside a wall, also LA43 close range probe can be used.



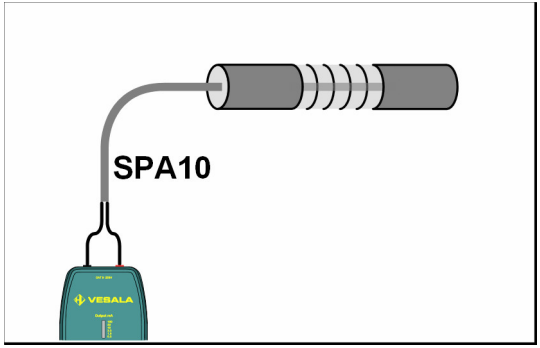


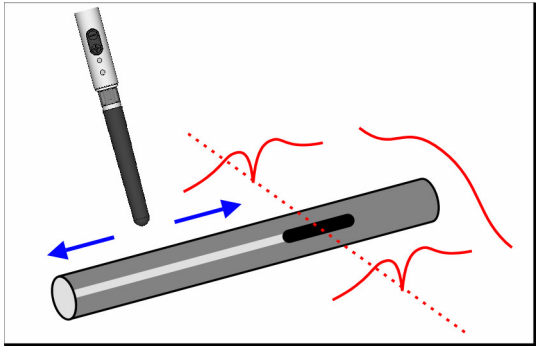
13.2 Non-conductive pipes inside walls etc.

- In these cases an accessory SPA10 (length 10m) pipe transmitter antenna is inserted into the traced tube.

  Task: A blockage of a non-conductive tube needs to be located inside wall.

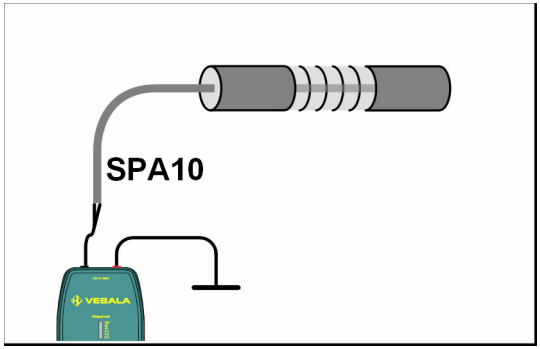
- **CTT33:** Connect both SPA10 terminals to the transmitter. Insert the antenna into the tube until it hits the blockage.
- **CL43:** Use SA43 probe. The SPA10's head or blockage is located where there is a longitudinal minimum and transversal maximum in the signal strength (see closer instructions in the SPA10 manual).

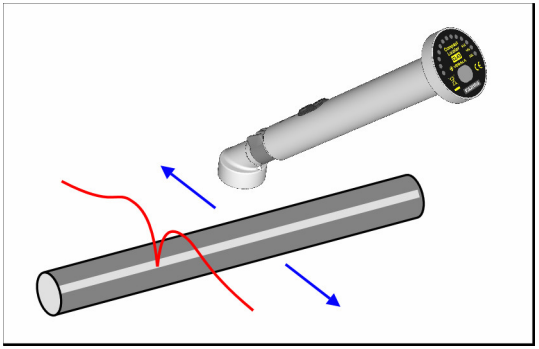




Task: The route of a non-conductive tube needs to be traced inside a wall.

- **CTT33:** Connect one transmitter output parallel to **both** SPA10 terminals and the second output terminal to a grounding, such as a wall socket protective earth PE contact.
- **CL43:** Use LA43 probe. Trace the tube's route by following the signal minimum.



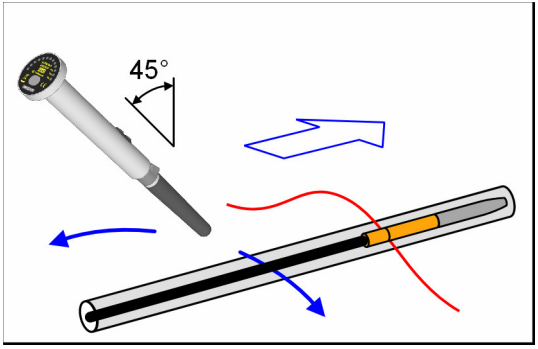


13.3 Using duct sondes to locate duct blockages

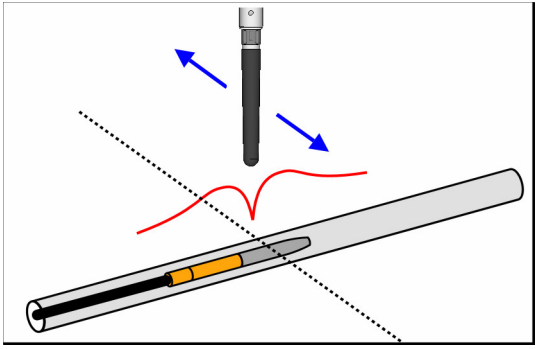
Choosing the right sonde and receiver probe:
10kHz or 33kHz sondes and SA43 rod are optimal to use with non-conductive ducts. 512Hz sondes and SA05 probe are optimal for cast iron or stainless steel ducts, though they can be used with non-conductive ducts as well. Regardless of sonde size or frequency, all sondes are traced similarly. It is advisable to continuously follow the sonde signal as it travels in the duct.

Task: Duct route or possible blockage needs to be located above ground or inside a wall.

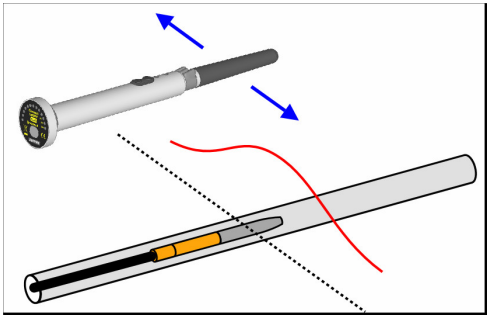
- Approximate location: Hold the CL43 in 45° angle. Scan left and right with the probe and move to the direction where the signal in average gets stronger. Approximately 1m location accuracy can be achieved by this method.



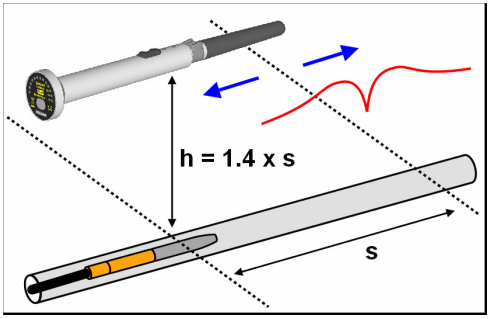
- Exact longitudinal location: Hold the CL43 vertically and follow the sonde signal as it progresses in the duct. To define the exact longitudinal location of the sonde, pinpoint the signal minimum line. It runs transversely (in 90° angle) against the direction of the duct & sonde. Mark the minimum line to ground for a few metres.



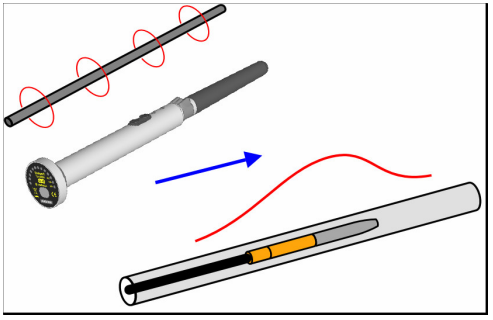
- Exact transversal location: Turn the CL43 & probe to horizontal position and hold it transversely (in 90° angle) above the minimum line. Keep the probe in this position and height and move left and right on the minimum line to find the strongest signal you can get. Signal peak pinpoints the exact sonde location under ground.



- Sonde depth: Hold the CL43 & probe horizontally and transversely (in 90° angle) to the minimum line. Move probe further ahead to the sonde nose direction until another minimum is detected. Sonde depth **h** is the distance **s** of the two minimums multiplied by 1.4.



- Special case: How to locate a sonde close to a very interfering cable, duct or rail: Turn the CL43 & probe parallel to the interfering source (usually horizontal). Keep this attitude and move the CL43 & probe ahead to the sonde nose direction until a signal maximum is detected.



14. Technical data, maintenance and service

14.1. Technical data

Transmitter CTT33

Output signal	33kHz (32,768Hz), output signal either continuous or 4Hz or 8Hz pulsed
Output level	Output level 20Vrms (in Boost mode), max. current 170mArms (in Boost mode). Max. output power 1.3W.
Output impedance	100ohms @ 33kHz, 18kohms@50Hz
Indicators	6 LED bar for output current, three other LEDs
Batteries	6pcs, 1.5V IEC LR6 alkaline batteries (or corresponding NiZn or NiMH cells). Max battery voltage 11V. Low battery warning approx. 6.5V
Power consumption	11 ... 225mA
Rated voltage	250Vrms
Output connectors	2pcs. 4mm safety banana sockets
Output fuse	400 mA, time-delay, 250 V
Over voltage class	CAT II 250V
Enclosure	ABS, size 155 x 90 x 50mm
Weight	Approx. 460g (with batteries)
Enclosure protection rating	IEC 60529 IP55
Usage conditions	-20...+40C, dry or damp conditions
Storage conditions	-40...+60C, dry conditions

Receiver CL43

Receiving frequencies	512Hz, 10kHz and 33kHz (32,768kHz)
Adjustments	2 buttons: power on/off, 7-step gain adjustment, receiving frequency setting
Connectors	Male XLR for probes
Indicators	Green LED (power and low bat warning), 12-level LED arc display for receiving signal strength, software version and indicating receiving frequency setting
Audio indicators	Internal speaker for trace signal and indication tones
Batteries	3 pcs 1,5V IEC LR03 (AAA) alkaline batteries (or corresponding NiZn cells). Low battery warning at approx. 3.7V
Power consumption	20 ... 50mA
Enclosure	Stainless steel and aluminium, 180mm x Ø40 mm, weight approx. 230g (including batteries, no probes
Enclosure protection rating	IEC 60529 IP44
Usage conditions	-40...+60C, dry or damp conditions
Storage conditions	-40...+60C, dry conditions

14.2. Maintenance, storage and warranty

The CTT33 transmitter and CL43 receiver of the CT33 cable tracer equipment do not have any parts that require maintenance by the user, excluding changing of batteries and connecting cords. To avoid dirt or water getting in the devices, clean and dry a soiled device carefully before detaching probes or opening battery compartment. Use a damp cloth, do not use cleaning solvents. If water gets into the battery compartment, allow device dry at room temperature. We recommend that the equipment is stored under dry conditions and at room temperature.

H.Vesala Oy (Ltd.) shall not accept liability of any financial losses or damages, nor for any damage incurred to people, the environment, telecommunications traffic or similar as a result of the use of or the failure to use the device. CT33 has a one-year warranty against factory defects. Warranty shall not cover batteries or faults resulting from normal wear and tear or misuse. Users are advised to contact the manufacturer in case of faults or queries relating to the use of the device. The product has been designed and manufactured in Finland. VESALA® is a registered trademark of H.Vesala Oy (Ltd.).

Manufacture, sales and maintenance

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