User Manual

Vesala CL43 X2.1 ENG

for Vesala CL43 Compact Locator version X2.1
combined with at least one of the following
antennas: SA43, SA05, LA43 or KA43
IMPORTANT: Read carefully before use.
Keep for future reference.



English

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VESALA

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1 Safety notes

To avoid possible harm, read and follow these instructions.

DANGER: Risk of electric shock, fire or property damage

The outer surface of CL43 Compact Locator is electrically conductive. Touching hazardously live circuits with CL43 Compact Locator may result in an injury or death. Dropping or placing CL43 Compact Locator on a live circuit may result in a short circuit, fire or property damage. Do not use CL43 Compact Locator near exposed, hazardously live circuits.

DANGER: Risk of electric shock or fire

Circuits may be misidentified of mislabeled. Always test circuits for hazardous voltages before performing operations on them.

CAUTION: Referring to the documentation needed

When identifying circuits in certain electromagnetic conditions, CL43 Compact Locator may give a false positive indication or may fail to give a correct indication. Refer to instructions for use to learn how to properly identify circuits with CL43 Compact Locator.

In the event of electric shock

1. Quickly assess the situation.
2. Turn off the power if possible.
3. Disconnect the patient from the supply with an insulating object if necessary.

4. Assess the condition of the patient.
5. Alert emergency responders if necessary.
6. Give CPR if necessary.
7. Direct emergency responders to the patient.
8. Prevent further injuries by informing others about the accident.
9. Always seek medical attention.

In the event of fire

1. Quickly assess the situation.
2. Turn off the power if possible.
3. Alert others in danger.
4. Alert emergency responders if necessary.
5. Try to put out the fire if possible.
6. Contain the fire if possible.
7. Direct emergency responders to the location.

In the event of property damage

1. Quickly assess the situation.
2. Turn off the power if possible.
3. Prevent further damage by informing others about the accident.
4. Repair or replace damaged property.

2 General description

2.1 Intended use

CL43 Compact Locator is a hand held 512 Hz and 33 kHz receiver which can be used indoors or outdoors. When used with one or more signal generators CL43 Compact Locator can locate and identify cables, wires, circuit breakers, switches, fuses and cable faults. Together with a sonde CL43 Compact Locator can locate and identify ducts, pipes, cavities and their blockages. CL43 Compact Locator is always used combined with a separate dedicated antenna which is selected according to located object and work environment.

2.2 Specifications

I/O ports	One male 3-pin XLR for dedicated antennas
Operating frequencies	512 Hz 32768 Hz
Ambient temperature	-10°C…+40°C
Humidity	0…90 % RH
Storage conditions, batteries installed	+5°C…+30°C 10...90 % RH, non-condensing

Storage conditions, batteries removed	-20°C…+40°C 10...90 % RH, non-condensing
Degree of protection	IEC 60529: IP44
LED-indicators	Green power LED with low battery warning Red 12-level LED arc display for receiving signal strength, battery voltage, firmware version and receiving frequency
Audio output	Internal waterproof speaker
Batteries	3 pcs 1.5 V IEC LR03
Current consumption	15...60 mA
Nominal battery voltage	4.5 V
Operating voltage range	3.6...6.5 V
Enclosure	Stainless steel, aluminium and polyamide, 180 x Ø46 mm
Weight	232 g with LR03 batteries, no antennas attached

International standards this product is in conformance with	EN 301 489-1 V2.2.3 EN 301 489-3 V2.3.2 EN 303 454 V1.1.1 EN 61010-1:2010/A1:2019/AC:2019-04 EN IEC 63000:2018
Electromagnetic environment	ETSI EN 301 489-1 Residential, commercial and light industrial environment
User control functions and stored data	Gain setting in 7 or 5 steps depending on antenna, 10 dB/step
Type of modulation	Continuous wave or 100 % AM @ <10 Hz

Supported dedicated antennas	**SA05**: H-field antenna for 512 Hz, 156 x 23 x 20 mm, weight 105 g, green part is insulated, effective range up to 10 m **SA43**: H-field antenna for 32768 Hz, 156 x 23 x 20 mm, weight 90 g, black tip is insulated up to white label, effective range up to 10 m **LA43**: H-field proximity antenna for 32768 Hz, 73 x 35 x 35 mm, weight 70 g, black cylindrical part is insulated up to white label, effective range when locating cables up to 30 cm or up to 2 m when locating sondes **KA43**: E-field antenna for 32768 Hz, 90 x 23 x 20 mm, weight 30 g, red part is insulated, effective range up to 30 cm

2.3 Package contents



The following items are supplied in the package.

- CL43 Compact Locator receiver (V11360)
  Version number is indicated at the beginning of the serial number.
- 1.5 V alkaline battery LR03 (J01573), 3 pcs



One or more of the following four antennas are supplied depending on chosen kit. Selecting suitable antenna for each task is the most important part of locating. Antenna type is indicated at the antenna connector.

- SA43 Rod antenna (V14306), black, for locating buried cables with a 33 kHz signal generator or locating non-conductive ducts with 33 kHz sondes
- SA05 Rod antenna (V14308), green, for locating conductive ducts made of cast iron or stainless steel, or non-conductive ducts with 512 Hz sondes
- KA43 Capacitive antenna (V14320), red, for identifying exposed open wires, wire pairs or single wires with a 33 kHz signal generator



- LA43 Proximity antenna (V14310), black. Use with a 33 kHz signal generator: for identifying exposed cables, looped wires, circuit breakers, switches and fuses, locating cables in tight spaces, locating cables and cable faults under or inside a surface such as a floor or a wall. Use with a 33 kHz sonde: for locating non-conductive ducts with larger sondes, pinpointing sondes inside exposed non-conductive ducts



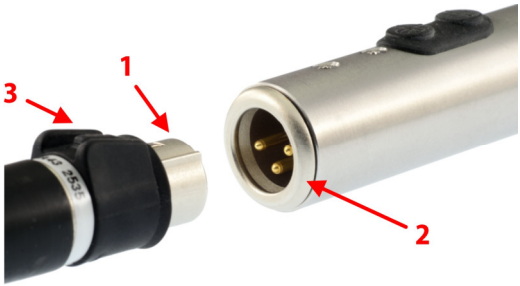
Additional antennas or spares may be purchased separately. Other accessories or devices may be sold together with CL43 Compact Locator or included in the kit. Refer to their corresponding information for use.

2.4 Removing and inserting batteries

Turn the user interface cap anti-clockwise and pull the battery holder out. Remove old batteries. Insert three new LR03 (AAA) alkaline batteries. Observe battery polarity: place negative poles against the spring contacts. Insert the battery holder arrow end first back into the receiver unit. Turn the user interface cap clockwise until it stops.



2.5 Inserting and removing antennas



CL43 Compact Locator always requires an antenna to operate. Choose antenna according to the locating task. To attach an antenna, push the antenna connector (1) into socket (2) aligned as in the image until the latch clicks. To remove an antenna: Press the antenna release button (3) under the rubber to release the latch and pull the antenna out. Antennas are water and dust protected only when connected to the receiver unit. If an antenna is wet or dirty, dry and clean it before removing the antenna in order to avoid dirt and water getting inside the connector.

2.6 CL43 parts and functions

Plus key
Long press: toggle power on or off
Short press: increase sensitivity
Extended start-up press: display firmware version
Releasing after start-up:
display battery voltage and receiving frequency

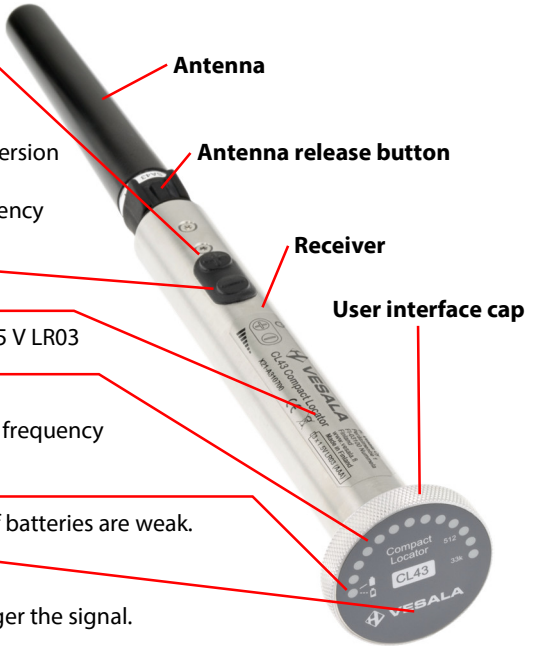
Minus key
Decrease sensitivity

Batteries
Located under the user interface cap: 3 x 1.5 V LR03

LED arc
Indicates received signal strength.
The 512 and 33k LEDs display the receiving frequency after antenna insertion.

Power LED
Green LED indicates power on. LED blinks if batteries are weak.

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



3 Operating CL43 Compact Locator

3.1 Using antennas

SA43 Rod antenna or **SA05 Rod antenna** is typically used by pointing it towards the approximate direction of a buried or hard-to-reach target cable, wire or duct. A very narrow and accurate signal minimum, also called signal null, can often be detected exactly in the direction of the target accompanied by a maximum both sides of this null. This is called the minimum locating method. Rod antennas are very sensitive and lowering the sensitivity is usually needed when approaching the target. If strong interfering magnetic field from a stationary source prevents operation, rod antennas can be rotated to an angle which effectively cancels the interference. Such sources include power lines, wiring and heavy equipment in an industrial site, electric trains, subways and trams including their tracks and wiring. When the target is exposed and accessible, it is usually easier to use a proximity antenna.

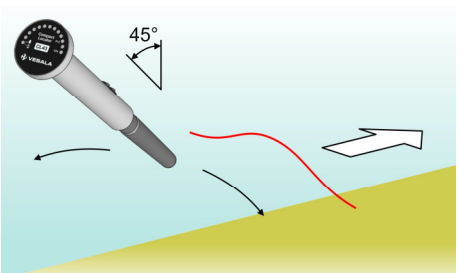
LA43 Proximity antenna has a flat, round, insulated bottom which is set or moved on the target surface, duct, wire, cable or cable bunch. A narrow signal minimum can often be detected right above the target, especially if the distance is short. If the target surface is sensitive it is recommended to use a piece of soft cloth between the antenna and the surface to prevent scratches. Although a proximity antenna is relatively insensitive to distant sources of interference, its limited range makes it ineffective when locating buried cables or ducts with the smallest sondes. In those cases, use a rod antenna instead.

KA43 Capacitive antenna is typically moved above exposed wires or wire pairs, or above wire terminals. The very tip of the antenna is the active point which senses the signal generator voltage on the target. A looped, shorted or loaded wire cannot be detected with a capacitive antenna. Use a proximity antenna in those cases.

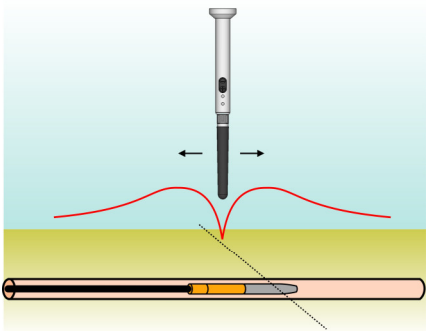
3.2 Locating ducts with a sonde

Sonde is a small, independent transmitter device that generates a magnetic field which oscillates at a specific frequency depending on the sonde type. Ducts, pipes, tubes, cavities or their blockages can be located by inserting a sonde inside of them and then locating the sonde. Objects made of a non-conductive material can be located with a 33 kHz sonde and either Rod antenna SA43 or a Proximity antenna LA43. Conductive ducts made of cast iron or stainless steel should be located with a 512 Hz sonde and SA05 Rod antenna making use of their low frequency which penetrates these materials.

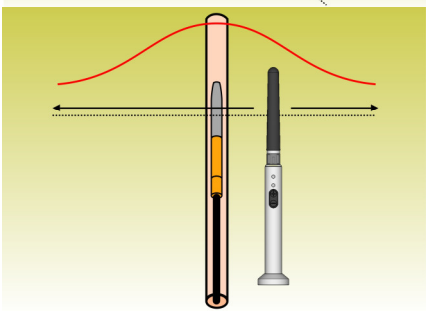
Approximate location: Hold the CL43 in 45° angle. Scan left and right with the antenna and move to the direction where the signal gets stronger in average. Location accuracy of approximately 1 m can be achieved by this method.



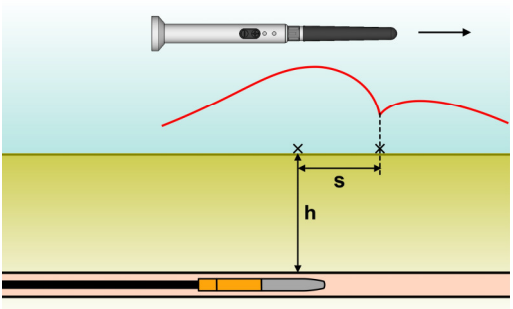
Exact longitudinal location: Hold CL43 vertically and approach the sonde in the duct. To define exact longitudinal location of the sonde, pinpoint signal minimum line. It runs transversely (90°) against the direction of the duct. Mark the minimum line to the ground.



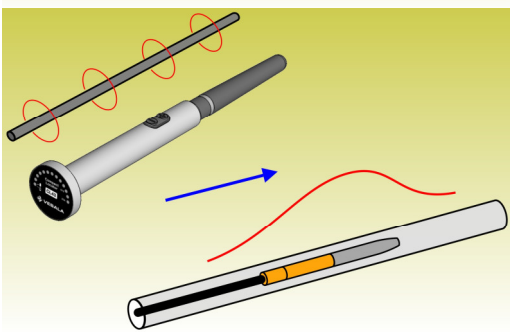
Exact transversal location: Turn CL43 to horizontal position and hold it transversely (in 90° angle) above the minimum line. Keep the antenna in this position and height and move left and right on the minimum line to find the strongest signal you can get. Signal peak pinpoints the exact sonde location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



Sonde depth: Hold the CL43 horizontally and transversely (in 90° angle) to the minimum line. Move CL43 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.



Cancelling interference: To locate a sonde close to an interfering cable, duct or rail with a rod antenna: Rotate CL43 parallel to the source of interference (usually horizontal) thus minimizing its effect. Keep this attitude and move CL43 towards the sonde until a signal maximum is detected.



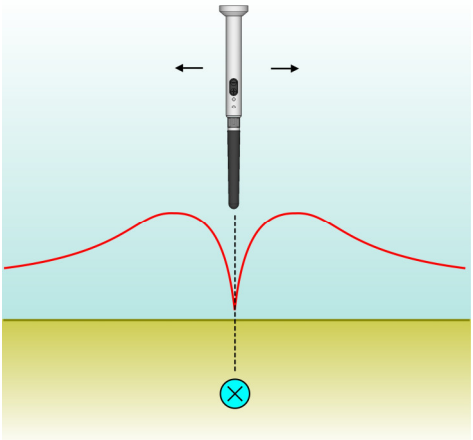
3.3 Using signal generators

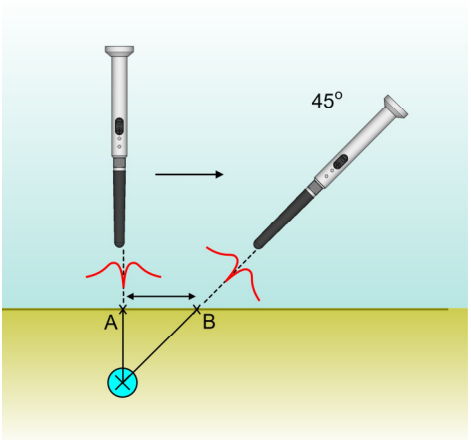
A cable locator detects the magnetic or electric field which has been induced to a cable or wire using a signal generator. Locating is often affected by other nearby conductors and ducts. In order to use a signal generator with CL43, select a signal generator that outputs 33 kHz (32768 Hz) frequency. For safe and proper connection refer to signal generator information for use.



3.4 Locating buried cables

Connect a signal generator between the located cable and ground or use an inductive coupler. Use SA43 Rod antenna to track the cable route starting at the signal generator. Pinpoint the cable exact location using the minimum locating method. Tilt CL43 to a 45° angle and find a second minimum. Distance between the first minimum A and the second minimum B equals to cable depth.

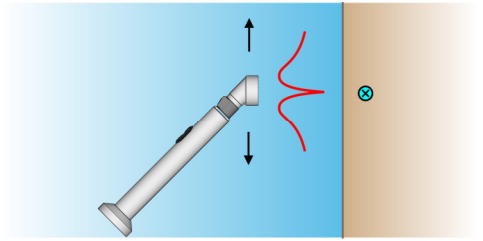


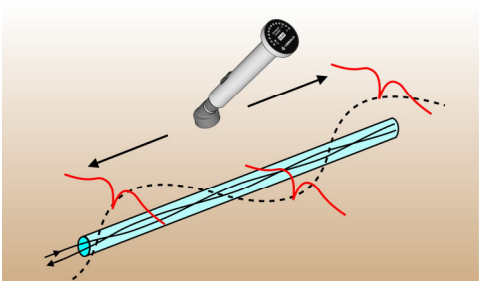


3.5 Locating cables and wires at a short distance

Connect a signal generator between the located cable and ground, use an inductive coupler or connect between different cable conductors. Use LA43 Proximity antenna to track the cable or wire route starting at the signal generator. Pinpoint the cable using the minimum locating method.

If the signal current return path is within the same cable, locating range will be reduced. Also, as conductors are often twisted inside the cable, the signal strength often appears to go up and down or minimum zigzags from side to side.





⚠ **CAUTION**: If there are other cables or wires nearby, the signal may often be detectable on those too. Carefully scan which cable or wire gives the strongest signal. Using a low sensitivity may be necessary to distinguish between similar signal levels.

3.6 Locating cable faults

Cable faults are sometimes difficult to locate. It is possible that a failed cable has multiple faults which may or may not be of different types. Repairing some faults may be necessary before the rest can be found. Fault properties can change during locating making work even more difficult.

Completely disconnect all conductors and any possible shielding at both ends of the faulty cable and use a multimeter to determine the type of the fault: short circuit, open circuit or a combination of faults. If necessary, refer to multimeter information for use. Connect a signal generator between all the conductors of the located cable and ground. Locate the cable using methods described in sections 3.4 and 3.5 and mark the entire cable route.

Short circuit: Connect a signal generator between the shorted conductors and leave other conductors unconnected. If received signal strength allows, use LA43 Proximity antenna. If signal is weak, use SA43 Rod antenna. Starting from the signal generator, note any sudden changes in signal strength along the cable route. Typically received signal strength increases before the short and drops suddenly at the short. If possible, repeat from the other cable end.

Open circuit: To reduce labour when the cable is very long, measure the capacitances between the cut conductor and ground and an intact conductor and ground with a multimeter. The approximate fault distance from the cable end is the first value divided by the second value multiplied by the cable length. If necessary, refer to multimeter information for use. Connect a signal generator between ground and the faulty conductor. Ground all the other conductors and shield. It may be necessary to use the signal generator at a high output level. Refer to signal generator information for use if necessary. If received signal strength allows, use LA43 Proximity

antenna. If signal is weak, use SA43 Rod antenna. Starting from the signal generator, note any sudden changes in signal strength along the cable route. Typically received signal strength decreases just before the open fault and may slightly increase after it. If possible, repeat from the other cable end.

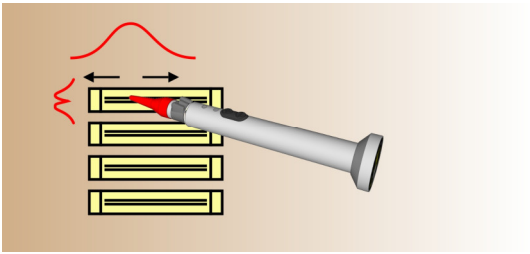
3.7 Identifying circuit breakers, switches and fuses in low voltage network

When there is a need to locate the circuit breaker, switch or fuse that feeds a cable, connect a signal generator between the live and neutral conductors of the cable. Refer to signal generator information for use for safe and proper connection. Use LA43 Proximity antenna and scan all suspected circuit breakers, fuses or switches.

⚠ **CAUTION**: The signal may be detectable at several devices. The correct one will usually have the strongest signal combined with a sharp null and a strong maximum both sides of the null. Using a low sensitivity may be necessary to distinguish between similar signal levels. Opening the correct circuit breaker or switch or removing the fuse will considerably lower the received signal strength.

3.8 Locating and identifying open ends of wires

Connect both signal generator outputs to a wire pair or between a single wire and ground. Use KA43 Capacitive antenna and scan as close as possible over the wires or terminals to find signal maximum. Strongest signal is above the right wire or pair. A minor minimum may be present in the middle of the pair. Due to cross talk, signal can be received elsewhere too but weaker.



4 Taking care of your equipment

4.1 Storing

Remove batteries before storing the device for an extended period of time. Batteries left in the device may eventually leak and cause damage. Store the device, batteries and accessories inside its original packaging in a dry, warm place.

4.2 Cleaning

If the device is dirty or wet, clean and dry the outer surface of the device and accessories with a soft cloth before changing batteries or removing the antenna. Avoid getting dirt or water inside the device. A small amount of isopropanol can be used to remove stains and disinfect the outer surface. Battery compartment, battery holder and the contact surfaces inside the interface cap should only be cleaned with isopropanol. Always apply a small amount of white petrolatum or pure petroleum jelly to the cap threads and contact surfaces after cleaning these parts to ensure smooth cap operation and reduce wear.

4.3 Troubleshooting

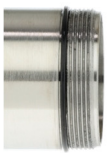
If case of trouble, follow the table below for possible remedy.

Problem	Possible explanations	Remedy
The device does not power up.	One or more battery is empty.	Replace all batteries.
	One or more battery is reversed.	Orient batteries minus end to spring.
	Battery holder is reversed.	Install the battery holder arrow end first.
	User interface cap is loose.	Firmly rotate the user interface cap clockwise until it stops.
	Battery holder is broken.	Replace the battery holder. See supplier contact information for replacement part.
Received signal is too high.	Sensitivity is too high.	Decrease sensitivity by pressing minus key repeatedly.
	Antenna selection is wrong.	Use LA43 Proximity antenna when working very close to a target.
	Signal generator level is too high.	See signal generator manual for level adjustment.

Problem	Possible explanations	Remedy
No received signal or the signal is weak.	Sensitivity is too low.	Increase sensitivity by pressing plus key repeatedly.
	Antenna selection is wrong.	Only use antennas for their intended purposes. See sections 2 and 3.
	Distance to target is too high.	Move closer.
		Only use LA43 Proximity antenna when working very close to a target.
	Signal generator level is too low.	See signal generator manual for level adjustment.
	Signal generator is unconnected or connection is wrong.	See signal generator manual for proper connection.
	Signal source has shut down.	Check that signal generator or sonde operates normally.
	Antenna is broken.	Replace the antenna. See supplier contact information for replacement part.

Problem	Possible explanations	Remedy
Indication of received signal also when signal generator or sonde is off.	Interfering signal is received from another signal source.	Decrease sensitivity, move closer, increase signal generator level, use a larger sonde, try another connection type, switch off interfering source or use rod antenna and rotate receiver into an angle which cancels the interfering signal.

4.4 Maintenance



Periodically check that the interface cap O-ring seal is in working condition to ensure protection against water and dust. If the O-ring is damaged or missing, carefully clean the thread, then apply a small amount of white petrolatum or pure petroleum jelly to the threads and finally replace the O-ring with a similar one: Ø23.0 x Ø1.0 mm NBR70, part number N01238.



When changing batteries check that the batteries have not leaked and the battery holder is in a working condition. Replacement battery holders, part number V14110, are available from the supplier.

4.5 Modifying and misuse

Do not attempt to modify the device or accessories in any way. Do not use accessories other than specified. A modified device or accessory may work in an unpredictable way or may fail to work at all. A modified or unspecified antenna may damage the device or may subject the device to interference.

Do not use excessive force with the device. Do not use the device as a mechanical tool to dig soil or move objects with. Do not drop, throw or step on the device.

4.6 Warranty

CL43 Compact Locator has one-year warranty against material or manufacturing defects from the date of purchase. The warranty shall not cover batteries, normal wear and tear, misuse or faults resulting from modifying the product.

4.7 Disposal

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 supplier or local agent.



5 Supplier contact information

Service, accessories, spare parts, replacement user manuals and technical support:
H. Vesala Oy
Peräsimentie 1, FI-03100 Nummela, Finland
Tel. +358 44 200 2005, info@vesala.fi, www.vesala.fi

6 Declaration on conformity

Hereby, H. Vesala Oy, declares that the radio equipment type CL43 Compact Locator version X2.1 is in compliance with the essential requirements and other relevant provisions of directives 2014/53/EU and 2015/863/EU. The full text of the EU declaration of conformity is available at the following internet address: www.vesala.fi/cl43/doc

Hereby, H. Vesala Oy, declares that the radio equipment type CL43 Compact Locator version X2.1 is in conformity with the relevant UK legislation: S.I. 2016/1091, S.I. 2016/1101, S.I. 2017/1206 and S.I. 2012/3032. The full text of the UK declaration of conformity is available at the following internet address: www.vesala.fi/cl43/ukdoc