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BY EDIN

# Univox® SLS-1/3/5

Class D Tech Series

State of the art phased array loop drivers

Installation Guide




Univox® SLS-1 part no 221000
Univox® SLS-3 part no 223000
Univox® SLS-5 part no 225000

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The Installation Guide is based on the information available at the time of printing and are subject to change without notice.

# Introduction

## Univox® SLS-series

The Univox® SLS-serie phased array loop drivers combine 50 years of experience with the newest electronic design to deliver unrivalled quality in a compact stylish housing. In addition to the extraordinary sound clarity, power and performance, the outstanding features for these cold amplifiers are low weight, small size and exceptionally high efficiency. The high voltage follows the latest demands and statements in the IEC 60118-4 standard, giving high quality sound for music as well as for speech.

The external power supply increases the total efficiency compared to traditional built-in transformers. Our Engineering Simplicity philosophy is shown in the functionality and usability of each model.

The three models SLS-1, SLS-3 and SLS-5 share the same features but with different output power. Each offers 3 inputs - 2 of which are programmable - including a 100V line input with priority option, a self-test mode, loop monitor and monitor speaker power driver. With LED indicators for input and output levels, optimizing the system performance is easy.

## SLS systems

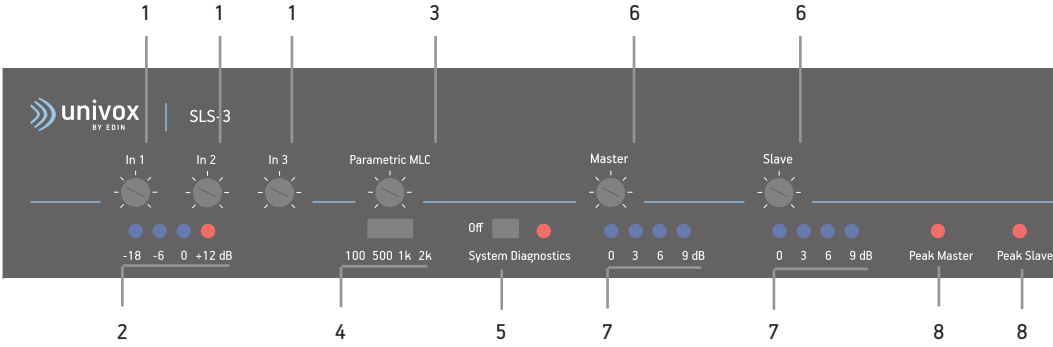
SLS systems consist of two different loop systems, together creating a more controlled field strength distribution with less overspill. They cover any size venue and transmit in several direction removing the mute effect, common for standard loop systems, when tilting head.

For the detailed information about SLS design, please study the Univox Loop Designer (ULD) where several different approaches are visualized in 3-D simulation for a comprehensive understanding.

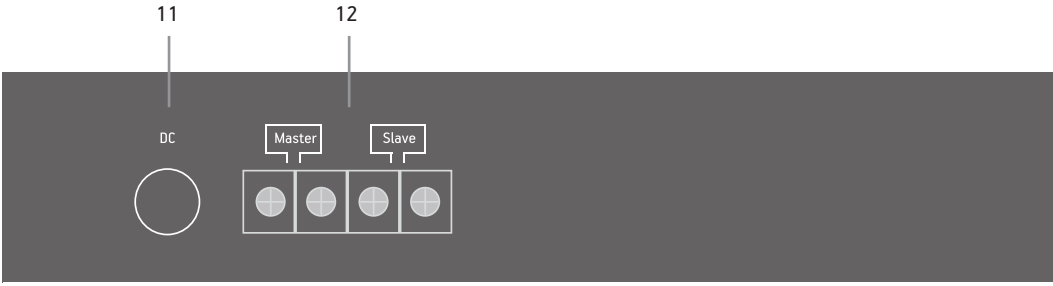
## Included in package

- Loop driver
- DC Power Supply
- Power cable
- 3 pcs of phoenix screw terminals
- 4 pcs of rubber feet (preassembled)
- T-Sign according to ETSI-standard
- Rack mounting plate with 8 screws
- DC Power supply mounting plate with 4 screws
- Certificate/Measuring protocol
- Installation guide

## Overview




1. Input level potentiometers
2. Input level LED bar graph
3. Parametric MLC control
4. Parametric MLC knee point switch
5. System diagnostics switch and LED



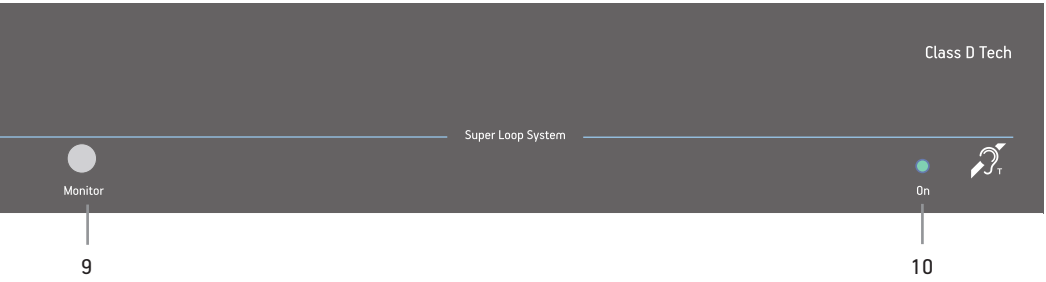

11. DC supply input
12. Master/Slave loop connector
13. Monitor volume control for both headphones and speaker output

**A. MISCELLANEOUS OUTPUTS**

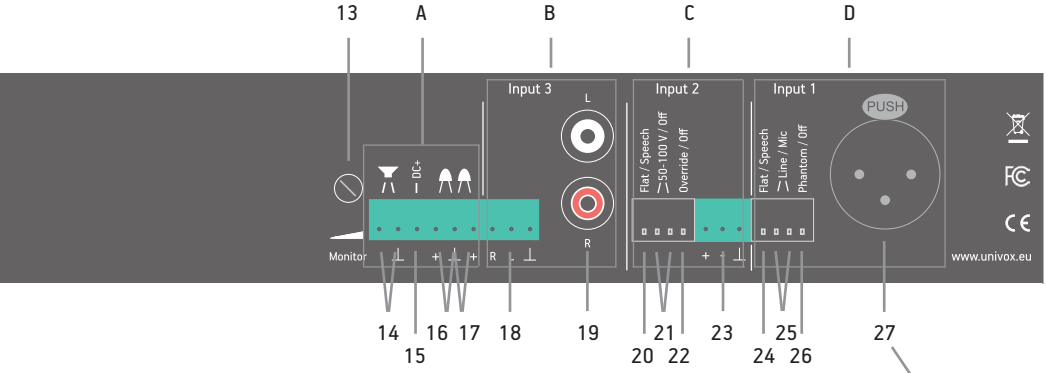
14. Monitor speaker connector
15. Auxiliary DC power output
16. Remote input monitor connector
17. Remote output monitor connector

**B. INPUT 3**

18. Phoenix screw terminal
19. Unbalanced RCA

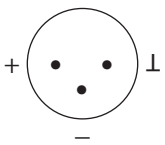



6. Loop current potentiometers master/slave
7. Loop current led bar graphs
8. Peak LEDs Master/Slave
9. Loop monitor headphones socket
10. Power LED




**C. INPUT 2**

20. Speech enhancement switch (Flat/Speech)
21. 50-100 V Line switches On/Off
22. Override switch On/Off (Input 3)
23. Phoenix screw terminal




**D. INPUT 1**

24. Speech enhancement switch (Flat/Speech)
25. Line/Mic sensitivity switches
26. Phantom power voltage switch On/Off
27. Balanced XLR

## Description

1-2. Input level should be set to 0 dB. (i.e. the 0 dB LED should be lit most of the time during the audio programme. The +12 dB LED indicator should not be lit at any time.)

3-4. Parametric MLC control makes it possible to fine tune the frequency response, compensating for the effects of different metal types and configurations.
There are 4 parametric curves starting from; 2 kHz, 1 kHz, 500 Hz and 100 Hz. These set the frequency at which the metal loss correction control starts to compensate. The function is powerful, however, excessive compensation can lead to signal limiting in the treble range. If signal limiting occurs, the red peak LED illuminates.

5. System Diagnostics verify the integrity and function of the loop driver - inputs, output and the loop condition.
Use: Set the switch on the front panel to right position. A built-in 1.6kHz signal pulses at 2 seconds intervals at 0 dB, regardless of the adjusted sensitivity.
If input and output LEDs flashes in unison, the loop driver functions are verified.
If only the input LEDs flashes it indicates that the loop is not connected or the current potentiometer needs to be readjusted..
Switch to left position Off, for normal use.

6. Loop current controls set the output current, i.e. the field strength of the loop.

7. Loop current LED bar graph indicates the level of the loop current, not the field strength. The field strength is measured using a Field Strength Meter, like Univox FSM 2.0.

8. Peak (clip) LEDs illuminate when there is insufficient voltage to maintain a constant loop current. Momentary short term voltage clipping is unlikely to be audible in hearing aids, but if clipping occurs for any length of time (the Peak LED remains on) the audio quality will suffer.
Peak clipping will typically occur when using long thin wires, 2-turn loops and for signals with high frequency spectrum, like modern music. Speech has a small amount of high frequency content. Strong compensation from the parametric MLC control may increase the risk of clipping.
**Note:** use ULD for simulation guidance before installation and commissioning.

9,13,14 Loop Monitor, supports headphone (9) and speaker outputs (14) representing the sound quality of the loop. Volume control for both headphones and speakers, is set by the potentionmeter (13).

10. Power LED verifies power supply connection

11. 4 pin DC Supply socket for secure connection of Univox approved power supplies 90-260VAC, 50-60Hz, only. Connect the power to the amplifier before connecting to the network, otherwise there is a risk of sparking.

12. Loop scew terminals for Master and Slave loop connection

**A. MISCELLANEOUS OUTPUTS PHOENIX SCREW** TERMINAL (6 connectors/screws)

14. Monitor speaker connector
Pin 1+2 (2=GND), speaker output 8-32 Ω

15. Auxiliary DC power output 15V-24V depending on model
Pin 3+2 (2=GND), DC 12-18V output, 100mA

16. Remote input monitor connector indicates at -6dB input level
    Pin 4+5 (5=GND) = LED connection , indication/diagnostic test
17. Remote Output Monitor Connector indicates at 0 dB output level
    Pin 5+6 (5=GND) = LED connection, indication/diagnostic test

**B. INPUT 3 (PHOENIX SCREW TERMINAL/RCA)**

18. Balanced Line: 30 mVrms-5Vrms (-28dBu to 17dBu)
19. Unbalanced RCA left/right

**C. INPUT 2 (PHOENIX SCREW TERMINAL)**

Switchable between line and 50-100V speaker line input
**Note:** The speaker line MUST be balanced at the Phoenix connector (connect (+) and (–) terminal)
Use earth ONLY for free-floating screen or leave unconnected

20. Speech filter: Low cut filter 130-170Hz On/Off
    Speech Enhancement (Flat/Speech) attenuates low frequencies (<150Hz) increasing speech intelligibility for microphone use
    **Note:** When commissioning field strength level and frequency response this feature must be switched to Flat postition
21. Speaker 50-100V balanced Line, sensitivity On/Off
    ***Caution!*** 50-100 V/Line must be set prior to any further settings
22. Override/Priority function mutes inputs and is typically used for voice alarm systems. Signals higher than -6dB on input 2 activates the priority function
23. Balanced Line: -15dBu (50mVrms) to +20.6dBu (8.3Vrms)

**D. INPUT 1 (BALANCED XLR)**

Balanced XLR. Switchable between Line and Mic sensitivity and with or without Phantom voltage
**Note:** With unbalanced connection (not recommended) the pin not used should be grounded.

24. Speech filter: Low cut filter 130-170Hz, On/Off
    Speech Enhancement (Flat/Speech) attenuates low frequencies (<150Hz) increasing speech intelligibility for microphone use
    **Note:** When commissioning field strength level and frequency response this feature must be switched to Flat position
25. Line/Mic sensitivity switches: -55dBu (1.5 mVrms) to +10dBu (2.6Vrms)
26. Phantom voltage 12V, On/Off
27. Balanced XLR

# Installation

## Planning

Calculations for coverage area, metal loss, signal sources, power outlets, dissipating heat and ventilation for loop driver placement and other practical installation issues, must be done prior to the on-site installation. Please refer to **www.univox.eu/planning**

Use Univox Loop Designer (ULD), a free, web-based project planning and design tool that quickly and accurately assists in the design of loop systems.
**www.univoxloopdesign.org**

## Tools required

Copper tape tools, e.g. crimping tool, double-sided adhesive tape, printed warning tape

General audio installation tools, e.g. Ohmmeter

Field strength meter, e.g. Univox FSM 2.0

Listening device, e.g. Univox Listener

## Loop cable

Always install a twin core loop cable to secure necessary connection options, especially vital in environments with uneven metal loss. Univox twin core copper tape gives top efficiency with low induction loss. Use a junction box to alternate between single, double and twin turn loop connections.

Use a feed cable (twisted or twin wire) between the junction box and the loop driver, as well as between the loop figuration and the junction box or loop driver.

## Placement of the driver

The Univox SLS-1, SLS-3 and SLS-5 loop drivers will not generate any excessive heat and can be mounted in 19" racks on top of or below other rack components (check that these don't generate excessive heat), on a wall or another flat surface. In a rack system it is often practical to attach the external power supply on the supporting metallic construction using straps. For mounting of the wall, you need to open the chassi to get access to the holes.

**Note**: Although there are several built-in protection schemes for temperature, current and power etc. we recommend to plan for worst case scenario.

Use general basic audio practice while installing and mounting units and wiring, including loop cable. Avoid feedback interference between analog signal source cables and loop cable. The loop cable mustn't be placed closer than 30cm (12in) to a parallel microphone or mixer cable. Crossing is ok.

## Placement of the microphones

Microphone placement and proximity between microphone and mouth is crucial for improved speech intelligibility. Use shortest distance possible between microphone and mouth/sound source.

## Commissioning and certification

It's important to check the system when the installation is completed. To ensure that the loop installation meets the requirements for field strength, consistency and frequency response, it must comply with the international standard IEC 60118-4.

A guide how to commission a loop system to the IEC performance standard, can be found in the user guide for the Univox FSM 2.0 field strength meter and in the Univox® *Certificate of Conformity*. These documents are also available on www.univox.eu/certify.

## Maximum recommended segment size (to comply with IEC 60118-4)

| **Metallic environment** | **Basic level (1000Hz)** | **IEC level (1600Hz)** | **Field Strength Attenuation** | **Important notes/requirements** |
|---|---|---|---|---|
| No metal | 22m/70ft | 22m/70ft | 0 | |
| Standard reinforced concrete | 7m/23ft | 5m/16ft | 3.5-6dB | Increased current, voltage and power |
| Heavily reinforced concrete | 5m/16ft | 4m/13ft | 3.5-6dB | Increased current, voltage and power |
| Suspended ceiling | 4.8m/16ft | 3,6m/12ft | 4-10 dB | Conductor must be centered in the suspended ceiling framwork (longest distance to metal)<br>Increased current |
| Steel deck/ Metal system floor | 4m/13ft | 3m/10ft | 6-10dB | Increased current |
| Iron bar construction | 3m/10ft | 2m/6.5ft | 4-12dB | Medium/strong damping, depending on placement of wire (avoid placement along metal bars) |

# System setup

## Start-up procedure

1. Disconnect all input and output connections.
2. Each loop must be securely isolated (particularly to safety-ground and other loop connections). Verify the resistance of each loop (approximately 1-3 Ohm).
3. Set all level controls to minimum setting:
   - **System Diagnostics (5)** = Off (switch to left position)
   - **Parametric MLC (4)** = 2kHz (switch to right position)
4. Connect the **Power supply (11)** and verify **Power LED** indication **(10)**
5. Activate **System Diagnostics** by sliding the switch to the right. Input level bar graph peaks **(2)** to 0dB . Output bar graph **(7)** does not indicate.
6. Connect **Master loop (12)** and adjust the output level, making sure input and output bar graphs indicate in unison. Note: a 2-turn loop is often more efficient. See next page.
7. Check field strength for all loop segments using a field strength meter, e.g FSM 2.0. Verify low field strength directly above wires and high in between segments (peaks to approximately -2dB). If not, there might be a local short circuit between wires.
8. Disconnect Master loop and connect Slave loop **(12)**. Repeat the procedure for **Slave loop**.
9. Basic function of the loop system is now verified. Turn **System Diagnostics** off, by sliding the switch to the left.
10. Reconnect Master slave.

## Input connection and adjustments

11. Set all level controls to minimum setting:
    - **System Diagnostic (5)** = Off (switch to left position)
    - **Parametric MLC (4)** = 2kHz (switch to right position)
12. Connect the main audio source to the amplifiers input (B, C or D)
13. Adjust input level (1) to 0dB at input bar graph (2). If using a 1kHz pulsed sine wave signal, simply set to 0dB.

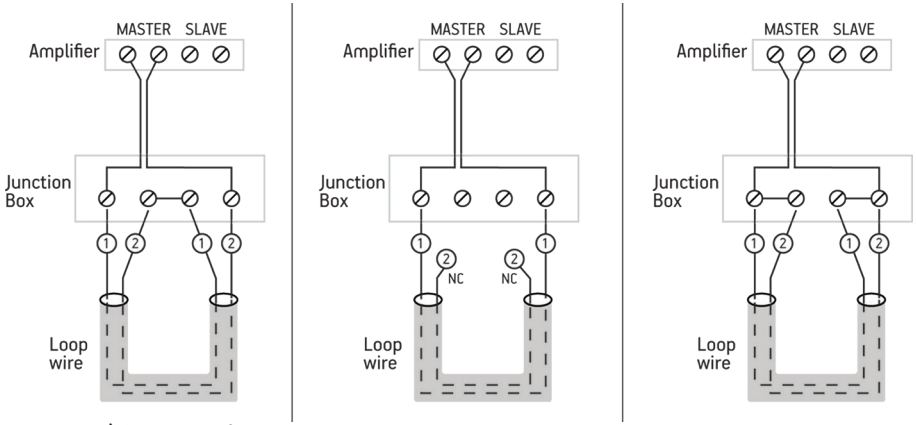
## Output connection and adjustments

14. Field strength setting: Start with the highest efficiency connection, **I)** 2-turn serial connection, in junction box.

15. Set field strength **(6)** to -3dB to 0dB at the peaks. If **Peak (8)** LED flickers only momentarily the connection is acceptable. If **Peak** LED indicates continuously, try rewireing the connections in the junction box in subsequent order: **II)** one wire single turn and then **III)** two parallel wires single turn.

    With this procedure the unit will operate with the highest output possible without generating any heat.

    **Note**: To quickly set up the field strength for a real program source, a PPM instrument is helpful. The Univox Listener has a calibrated level indicator that quickly finds the highest peak.




**I) 2-turn serial connection**

**II) one wire single turn**

**III) two parallel wires single turn**

**Note**: When adjusting the field strength peaks, -2dB field strength works best, due to different dynamic headrooms in hearing aids.

16. Check basic frequency response according to IEC 60118-4, using a field strength meter, e.g FSM 2.0. If necessary, follow **Frequency adjustment procedure** (see page 12).
17. Check the sound quality by using an external listening device (Listener or FSM 2.0), **Monitor speaker connector (14)** or **Monitor (9)** for headphone (volume control on rear panel **Monitor (13)**). When operating at maximum output on low impedance, i.e single turn loops, the automatic limit protection circuit may cut programme peaks. This can be avoided by changing to a 2-turn loop or reduce the output current setting.
18. Start the **Commissioning** process to certify the installation (see page 9).

### Metal Loss Correction frequency setting

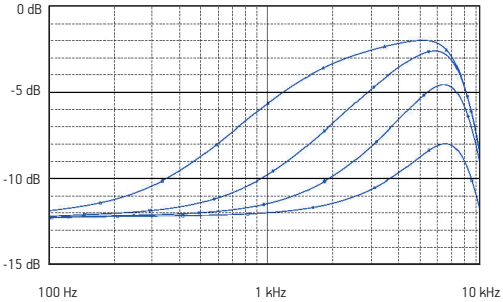
The degree of compensation for metal loss is adjusted with the **MLC potentiometer (3)**. The start/break frequency is set with the **Parametric MLC knee point switch (4)** marked: 100Hz, 500Hz, 1kHz, 2kHz.

1. Start with the break frequency set to 2kHz.
2. Adjust the level to -12dB. If this is not sufficient, move to the next lower frequency and repeat as required.
3. Verify that the loop driver's voltage doesn't saturate, i.e. that the peak indicator **(8)** only flickers temporarily.

## Trouble shooting

| Symptom | Possible cause | Solution |
|---|---|---|
| General malfunction | - | Check the system with the start-up procedure. See page 10. |
| Power LED is off | Power supply not connected<br>Power supply faulty | Connect power supply correctly<br>Replace power supply |
| Input and output LEDs flash on and off | System Diagnostics turned on | Turn System Diagnostics off |
| Output current LEDs are off, input LEDs are on | Loop current turned down | Adjust Loop current |
| Output and input LEDs are off, power LED is on | No input signal<br>Input signal set too low | Check if input signal is present<br>Adjust level of input signal |
| Audio quality is poor, peak LED indicates | Malfunction loop cable<br>Loop impedance is too high<br>Loop current set too high<br>Parametric MLC set too high | Rerun start-up procedure. (page 10)<br>Change the loop: use twin cores in parallel or use a cable with higher cross-section<br>Turn loop current down<br>Turn down Parametric MLC |
| Audio quality is poor, peak LED is off, sound quality using headphone monitor is also poor | Input signal set too high<br>Audio source is of poor quality | Reduce input signal level and check Line/Mic level setting<br>Change/adjust audio source |

## MLC function in maximum position




| Symptom | Possible cause | Solution |
|---|---|---|
| Intelligibility of sound from microphone is poor | Low frequency masking<br>Poor microphone user techniques | Turn speech enhancement filter on<br>Instruct user/reduce speaking distance |
| Microphone connected, input LEDs are off | Phantom power not turned on<br>Input level too low<br>Microphone needs higher phantom voltage<br>Microphone/lead/connectors faulty | Turn phantom power on<br>Increase input level/reduce speaking distance<br>Use valid microphone or connect a microphone mixer (amplifier)<br>Exchange faulty part |
| Alarm/priority signal is not clear | Override DIL switch not set to allow this function | Set DIL switch to correct position |
| Cannot achieve required frequency response at 100 Hz | Speech enhancement filter turned on | Turn speech enhancement filter off |
| Cannot achieve required frequency response at 5 kHz | Parametric MLC not set correctly<br>Frequency dependent losses too high for parametric compensation | Set Parametric MLC to correct level<br>Use smaller/multiple loops |

# Safety

The equipment should be installed by an audio visual technician observing 'good electrical and audio practice' at all times and following all the instructions within this document.



Only use the power adapter supplied with the unit. If the power adapter or cable is damaged, replace with a genuine Univox part.

Power adapter must be connected to a mains outlet close to the amplifier and easily accessible. Connect the power to the amplifier before connecting to the network, otherwise there is a risk of sparking.

The installer is responsible for installing the product in a way that may not cause risk of fire, electrical malfunctions or danger for the user. Do not cover the power adapter or loop driver. Only operate the unit in a well ventilated, dry environment.



Do not remove any covers as there is a risk of electric shock. There are no user serviceable parts inside. Refer servicing to qualified personnel. Please observe that the product warranty does not include faults caused by tampering with the product, carelessness, incorrect connection/mounting or maintenance.

Bo Edin AB shall not be held responsible or liable for interference to radio or TV equipment, and/or to any direct, incidental or consequential damages or losses to any person or entity, if the equipment has been installed by unqualified personnel and/or if installation instructions stated in the product Installation Guide have not been strictly followed.

# Warranty

This loop driver is supplied with a 5 year (return to base) warranty.

Misuse of the product in any way including but not limited to:

- Incorrect installation
- Connection to non-approved power adapter
- Self oscillation resulting from feedback
- Force majeure e.g. lightning strike
- Ingress of liquid
- Mechanical impact

will invalidate the warranty.

# Maintenance and care

Under normal circumstances the product does not need any special maintenance.

Should the unit become dirty, wipe it with a clean damp cloth. Do not use any solvents or detergents.

## Service

Should the system not work as expected, please follow *Checklist for installation* found on www.univox.eu/support or contact the local distributor for further instructions.
Before returning a product to us for service you will need a Service Number from your distributor. They will also send you a Service Report Form which must be completed and returned with the product.

## Technical data

For additional information, please refer to product data sheet and CE certificate which can be downloaded from www.univox.eu/products. If required, other technical documents can be ordered from support@edin.se.

## Environment

To prevent possible harm to the environment and human health, please dispose of the product responsibly by following statutory disposal regulations.

## Measuring devices

### Univox® FSM 2.0, Field Strength Meter

Professional instrument for measurement and certification of loop systems in accordance with IEC 60118-4.




### Univox® Listener, testing device

Loop receiver for fast and simple check of the sound quality and basic level control of the loop.




T CE

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