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Univox® FSM

Digital Field Strength Meter for AFILS

User manual

To download the test tones and commissioning reports, please visit univox.eu or scan the QR code.

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Overview

*The range indicator LEDs flash blue when the battery is low

Note: Battery compartment and selector for RMS/PPM and Peak Hold ON/OFF can be found on the unit's back. Remove silicone case and battery compartment cover for access.

Introduction

The Univox® FSM is a digital meter and listener for measuring, testing and commissioning Audio Frequency Induction Loops (AFILS).

The FSM is designed to offer a fast, reliable and precise method of verifying, checking and testing and induction loops performance to IEC 60118-4 by both professionals and laymen.

Please visit Univox.eu to download the required test signals to be used in conjunction with the FSM. While Univox recommends that these signals be used with a professional signal generator, you may also use any other device capable of playback. Such as tablets, smartphones, media players and laptops.

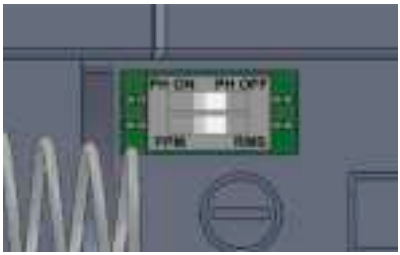
The Univox FSM comes with a silicone case, two AA alkaline batteries and a quick start guide.

Instructions

Initial setup

Univox FSM offer more than one way of measuring magnetic field strength and the FSM has a wide dynamic range between -44 dB and 8 dB ref. 400 mA/m @ 1 kHz in two separate ranges to measure high and low frequency response. It also allows for two different ways of measuring, RMS and PPM.

1. Decide whether to set the meter in PPM (Peak Program Meter) or RMS 125ms mode.
2. Decide whether to activate the Peak Hold (PH) function.



RMS mode is the specified mode of measuring in IEC 60118-4 and should be considered default. PPM is however considered to be advantageous for dynamic signals such as speech and music and is specified in IEC 60118-4, IEC 62489-1, IEC TR 63079 and BS7594 and is used for all types of broadcast monitoring.

Note: When using continuous sine wave signals, both modes will show the same result.

The PH function holds and maintains the highest reading on the display for 3 seconds before decaying. The PH value may be dismissed by a brief touch of the power on button.

Select operating modes by using the dip switches located in the battery compartment. The factory default settings are RMS and Peak Hold off. (See image above).

Inserting the batteries

IMPORTANT!
The sensors for the touch buttons are calibrated when you insert the batteries. For the sensors to function properly it is essential to not touch near or on any of the 3 buttons on the front while they are calibrating. Avoid inserting the batteries while holding the meter face down in your hand.

To insert the batteries:

1. Remove the silicone case, if fitted, then press and slide the battery cover down to remove.
2. Take precautions to make sure that the touch buttons are not in contact with anything conductive such as metal surfaces or skin. Insert the top battery first.
3. Slide the battery case back in to place and put the meter back into the silicone case. Place the meter in the silicone case bottom first.

The FSM will indicate when power is low and batteries need replacing when the blue range indicator LED starts flashing. Please dispose of the old batteries responsibly and in accordance with local regulations.

Note: When replacing batteries, remove the batteries with the FSM switched ON. If the FSM in switched OFF, wait 15 seconds to allow for any residual charge in the internal circuits to dissipate before replacing the batteries. When the FSM is in standby mode the residual charge will keep the unit active for 10-15 seconds.

Field strength calibration

The FSM is factory calibrated in accordance with IEC 60118-4. The FSM may over time become less accurate and it's recommended that the instrument is recalibrated once a year to make certain that the readings are true and accurate.

If the FSM is dropped or otherwise damaged, the calibration of the instrument should be checked and verified and if necessary the FSM must be recalibrated.

Please contact Univox support if you require a recalibration.

Using the FSM

Switch power ON by touching and holding the ON/OFF touch button on the front of the meter until the LED light above the FLAT touch button turns solid blue, (minimum 1 second) then release. To power Off the meter simply touch and hold the ON/OFF touch button again until the blue LED light above the FLAT touch button turns off.
Upon powering up, the meter is in A-weighted measurement mode on high range (-18 dB to 8 dB ref. 400mA/m @ 1kHz).

To select wide frequency measurement range, touch the FLAT button until the LED light turns on (minimum 0.25 seconds). FLAT mode is only used when measuring, checking or adjusting the frequency response of the induction loop system.

To select low level range (-44 to -18 dB ref. 400 mA/m @ 1 kHz), touch the RANGE button (minimum 0.25 seconds).

Note: Low level range is used to measure magnetic background noise. This is done with an A-weighted filter applied, therefor, the FLAT button is deactivated while in low level range.

To dismiss the Peak Hold reading, briefly touch the power ON/OFF button for between 0.25 and 0.5 seconds. (Holding for too long will power down the unit).

Audio output

Connect a pair of headphones with a standard 3-pole 3.5mm headphone plug to the headphone jack on the meter. The meter outputs audio always, on both sensitivity ranges and both EQ settings. Control and adjust the volume by turning the thumb wheel next to the headphone jack left or right.

Auto Power OFF

The FSM will automatically go to sleep after 40 minutes if no input from buttons or the magnetic field strength is detected above the lowest LED.

The magnetic field sensor

The pick-up coil used to detect magnetic fields receives a maximum signal when the FSM is in an upright vertical position. This is typical for area coverage systems where the user will be seated or standing. This is the position of which the FSM has been calibrated. The silicone case is designed to let the FSM rest firmly in any orientation. A depression in the back of the case indicates the coils location.

Note: While the position of the coil is important when commissioning any system, it's even more so when measuring small local systems such as neck loops and counter loops. The coil's location towards the back of the meter allows you to position the meter as close to the source being measured as possible while still being able to read the display.

Note: The orientation of the coil relative to the loop plane will be different when measuring local systems such as reception desks, ticket counters or intercom systems etc. The orientation will also be different when measuring magnetic spill from an area coverage system at risk of introducing a feed back loop in conjunction with electric guitars fitted with a single coil pickup.

Instruction for use

Note: These instructions are general for Univox loop amplifiers. If your amplifier is of another make, always consult the manufacturer's manual to see any specific settings or procedures that may have to be accounted for before continuing.

Note: Typical heights for use are 1.2m for seated, 1.7m for standing and 1.45m if users may be seated or standing. Other heights may be used in specific circumstances.

1. Define the intended area of use.
2. Define your test points.
3. Magnetic background noise measurement:
   - With the induction loop amplifier turned off. All other mains operated equipment and lights within the test area that are normally in use turned on.
   - Power ON the FSM and touch the RANGE button to select low range.
   - Hold the meter in an upright vertical position with the depression on the back of the silicone case at the intended listening height.
   - Take measurements at each defined test point. Survey the entire intended area of use to verify that the area is free from background noise. Use a pair of headsets while taking measurements to hear any potential background noise.
   - The magnetic background noise should ideally be less than -47dB, however the maximum level allowed by IEC 60118-4 is -32dB. The areas of where background noise is in excess of -32dB but does not exceed -22dB should be marked out on a floor plan. This level of magnetic background noise is generally audible for the user and will have an adverse effect on the user's experience and the intelligibility of the system.
   - **Note:** The above statement refers to systems for long term listening. For short term listening the highest acceptable level in accordance with IEC 60118-4 is -22dB. This pertains to i.e. counter loop systems.
   - If the background noise level exceeds the permitted level across the intended area of use, AFILS may not be the optimal solution. I.E the entire area of use is between -22 and -32dB or for short term listening above -22dB.
   - **Note:** There are occasions where the frequencies that make up the noise may be acceptable. This can be verified by analyzing the audio and verifying the frequency spectrum. If you require assistance or advice, please contact the Univox Support team or your local distributor.
4. Checking Loop interference
   - After completing steps 1-3, switch the induction loop amplifier ON.
   - Touch the RANGE button on the FSM and select LOW RANGE.
   - Hold the meter upright in a vertical position at the intended height of use.
   - Take readings from the LED display at the designated test points while listening to the signal via a pair of headphones. Check whether the loop system is picking up any interference. Ideally the background noise levels are the same as when measured in step 3.

5. Measuring field strength level
   - Turn on a pulsed 1kHz signal and increase the input gain of the amplifier input the source is connected to until the AGC becomes active. Set the gain until three blue LEDs light up. The red +12dB LED should not light up.
   - Make sure that the MLC is turned off.
   - Add current to the system by turning up the current control about 3/4.
   - With the FSM set to HIGH RANGE and FLAT frequency response, take measurements with the FSM held in an upright vertical position at any of the defined test points and intended height of use. Adjust the current output until the FSM indicates that the field strength is 0dB. Check all test points and make any adjustment necessary to achieve ±3dB across all test points.
6. Measuring frequency response
   - Lower the output by 12dB.
   - Play the Multi Frequency test signal and take readings. Listen with headphones to determine which signal is playing. The multi frequency test signal consists of pulsed 100Hz, 1kHz and 5kHz sine waves played in sequence.
   - Record the measurements. 100Hz and 5kHz should be within ±3dB relative to 1kHz at each test point. If needed adjust the frequency response by using the MLC.
   - After the test is complete, increase the output by 12dB.
7. Live test
   - Play a speech emulated test signal, HA speech or ITU, a prerecorded audio track or speak into a microphone.
   - At each test point, wait for and measure the peak value. The live audio signal should peak at 0dB at one test point. Other test points should peak at ≥6dB.
   - If needed, adjust the current output.
8. Measuring overspill
   - If needed define test points outside of the intended area of use.
   - Apply a pink noise test signal in the system.
   - Set the FSM to LOW RANGE.
   - Take measurements. The overspill is considered background noise and measurements should be carried out whenever there is concern for overspill into adjacent areas also fitted with induction loops or up on a stage, where live music may be performed.
   - If the FSM does not indicate any signal present, switch to HIGH RANGE and turn FLAT off to verify that there is no high-level background noise emanating from the system.
   - **Note:** When checking overspill on a stage, the FSM should be tilted vertically with the bottom of the FSM facing the area where an audience may be seated. The FSM should be held waist high to emulate the position of an electric guitar. The pickup coil of an electric guitar is susceptible to magnetic fields in this orientation.
9. Once you have completed the commissioning, hand over the report to the venue, and make sure to explain how the system operates and functions.

Specifications

Part no. 401016

16 color-coded LEDs:	Green = acceptable Yellow = unacceptable (on high range) Red = out of range
Meassuring range:	High range: -18 to +8dB ref 0.4A/m Low range: -44 to -18dB ref 0.4A/m
Calibration accuracy at 400 mA/m:	±0.5dB at 1kHz
Resolution:	1dB between -3dB/+6dB and -29/-20dB
Meter display modes:	RMS (125ms) or PPM (Tr=3.5ms, Tf=1.7s for 20dB fall)
Peak Hold display:	Hold peak for 3 seconds, decay at 128ms/LED
A-weighted frequency response:	Accuracy better than ±1dB 100Hz to 10kHz, ±2dB 25Hz to 20kHz
'FLAT' frequency response:	Accuracy better than ±1dB 50Hz to 10kHz, mask as per IEC TR 63079 Annex E
Audio monitor output:	2x12mW into 32 Ohms
Auto power off time:	40 minutes
Standby time:	18 months (alkaline batteries)
Run time:	150 hours (alkaline batteries)
Battery status indicator:	Solid blue range indicator = good battery, flashing = low battery
Battery type:	2xAA, alkaline or rechargeable
Dimensions:	120 by 78 by 33mm in silicone case 117 by 69 by 28mm without silicone case
Weight:	196g (inc. batteries and silicone case)
Relevant Standards:	IEC 60118-4 System performance requirements EN 62489-1 Methods of measuring and specifying the performance of system components IEC 61672-1 Sound level meters (A-weighting & integration time) IEC 60268-10 Peak Program Level Meters IEC TR 63079 Code of practice for hearing loop systems BS7594 Code of practice for AFILS EN 61000-6-3 EMC emissions EN 61000-6-1 EMC immunity
RoHS:	2011/65/EU
WEEE:	2021/19/EU
Included:	Batteries, silicone case and quick start guide
Available accessories:	Headphones, case

Environment and recycling

At the end of their useful life, the packaging, product and batteries should be disposed of via a suitable recycling centre. Do not dispose of with your normal household waste. Do not incinerate.

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