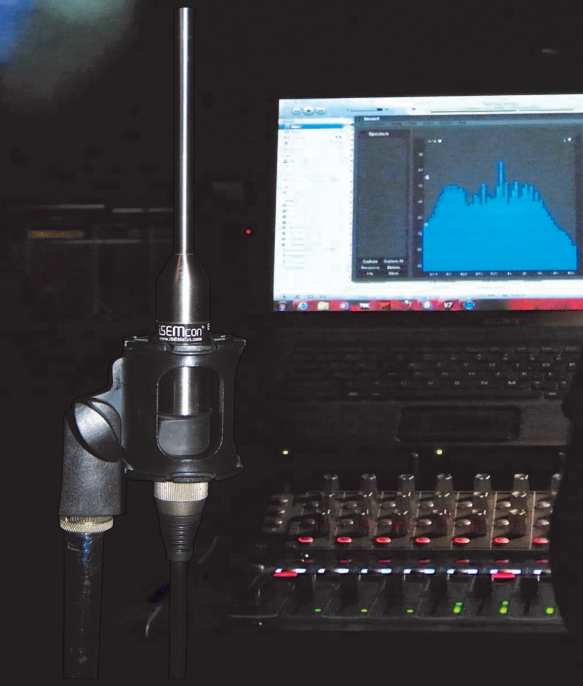
iSEMcon®
ACOUSTICS & VIBRATION DIVISION

iSEMcon
Measurement Microphones
The FOH choice



PRODUCT INFORMATION

EMX-7150

single use microphone,
matched pairs, triples, quads

01-17

Standard windshield included

1/4" acoustical port

High SPL capability
freefield calibration data
diffusefield calibration data*1

Long microphone body
reduces early reflection effects

All stainless steel body
Factory replaceable electronics &
capsule

O-Ring seal

Water tight connection
when using Neutrik*2 NC-3FX-HD
connector

*1: approximated by 90deg incidence response

*2 The corporate names and names of the products stated in this brochure are trademarks or registered trademarks of the respective companies.

AT A GLANCE

The EMX-7150 is a ¼" microphone made from stainless steel and using state of the art water tight Neutrik*3 connectors having a very accurate frequency response combined with the capability to

measure high sound pressure levels up to 145dBspl.

It is a low impedance measurement microphone that can be operated from 12…52 V Phantom Power which is available on most professional microphone preamplifiers and professional computer interfaces. With its mechanically robust design it is well suited for harsh environment use such as open air sound reinforcement measurements. Its class 1 frequency response *(NOTE: NOT A CLASS 1 MICROPHONE)* makes it predestined for room acoustics analysis including recording studios and home theaters. It can normally be used without the included freefield calibration data file for compensation. In this case take the individual calibration data as proof of its superb performance.

TYPICAL APPLICATIONS

- Sound-power and sound-field analysis
- Industrial acoustics
- Room acoustics analysis
- Sound reinforcement
- Real time analyzers

FEATURES

- Frequency range **10Hz…20kHz**
- Sensitivity **6mV/Pa** typ.
- Dynamic range ~30… >140dBspl
- 3% distortion limits >**143dBspl** typ.
- **Calibration** chart and calibration data files included on CD/USB stick.
- **IEC 61672-2013 class 1** frequency response
- Dimensions: acoustic port dia.**¼" (7mm)**
- Microphone body **0.75" (19mm)**
- Overall length 6**" (152mm)**
- Weight **0.3oz (75 grams)**

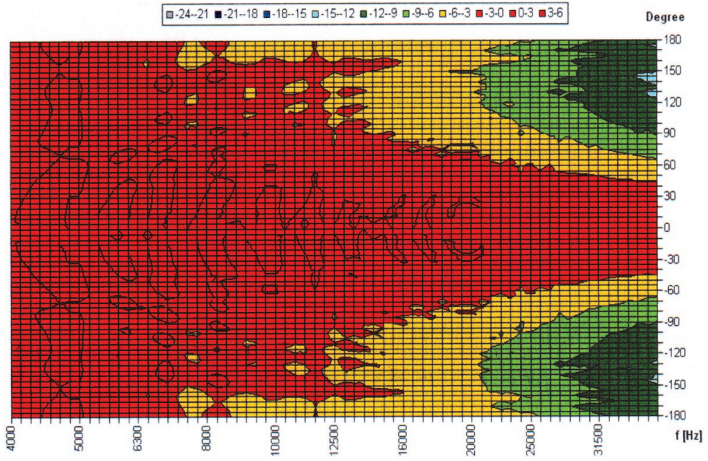
SPECIFICATIONS

Values for 23° Celsius and 48V Phantom Power

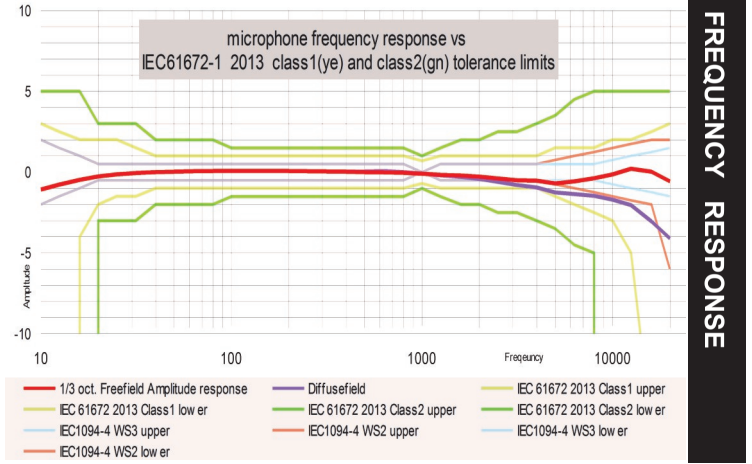
PERFORMANCE	
Frequency Response Characteristic	Free-Field
Polarization Voltage	Prepolarized
Nominal Sensitivity @1kHz	6mV/Pa
Sensitivity Temperature Drift	<0.015dB/K
Microphone Polarity	Non-Inverting
Frequency Response calibrated	10…20.000 Hz
Frequency Response IEC61672 –2013	class 1 *1
Inherent Noise100-10000 Hz	<30dB typ.
Max. SPL. (3% distortion limit)	> 141dBspl
Max. SPL. (3% distortion) typ.	=143 dBspl
Max. SPL. (3% THD) @ 12V Phantom	>140 dBspl
ELECTRICAL	
Output Impedance	< 200 Ω
Phantom Power	12…52Vdc

ENVIRONMENTAL	
Operating Temperature Range	-10…+55°
Storage Temperature Range	-20…+70°
Operating Humidity Range	0…90%r.H.
Axial Vibration Sensitivity	~ 50dB
PHYSICAL	
Housing Material	Stainless Steel
Sealing	O-ring/Polyurethane/Epoxy
Output Connector	XLR male
Dimensions	Ø ¼“(7mm) x 6“(152mm)
Weight	0.3 oz (75g)
CONFORMITY	IEC 61000-6-1;
SPECIAL FUNCTIONALITY	
Voltage Surge Protection	✓
EMC Noise Filter	✓

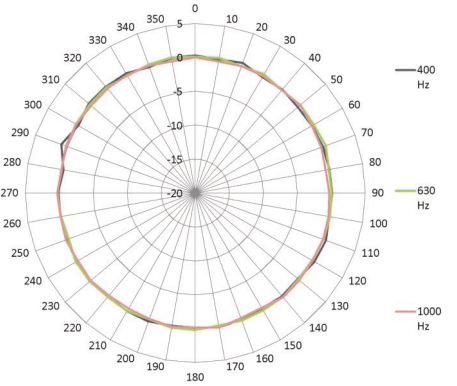
ISOBARS, typical

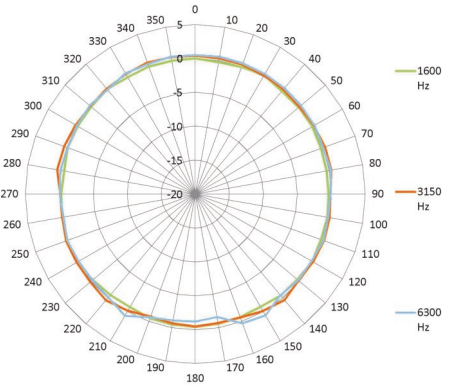


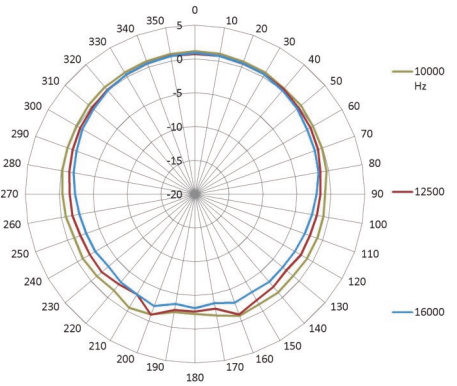
FREQUENCY RESPONSE



POLAR PATTERNS, typical

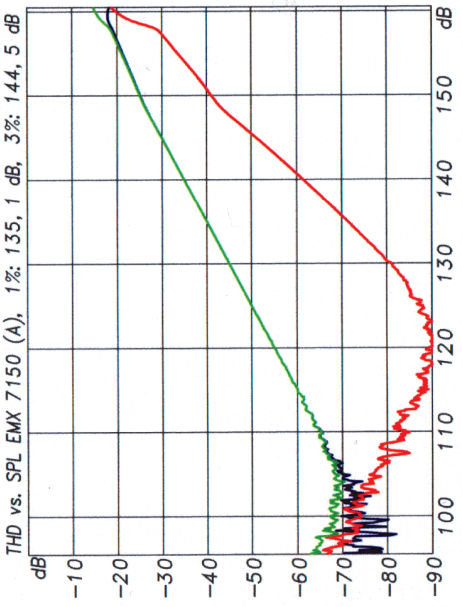






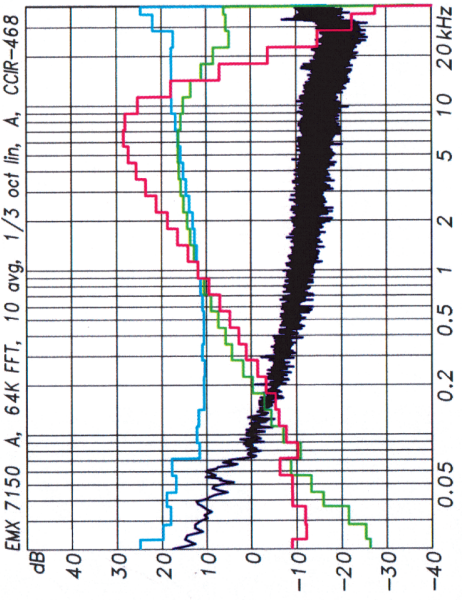
THD vs SPL, typical

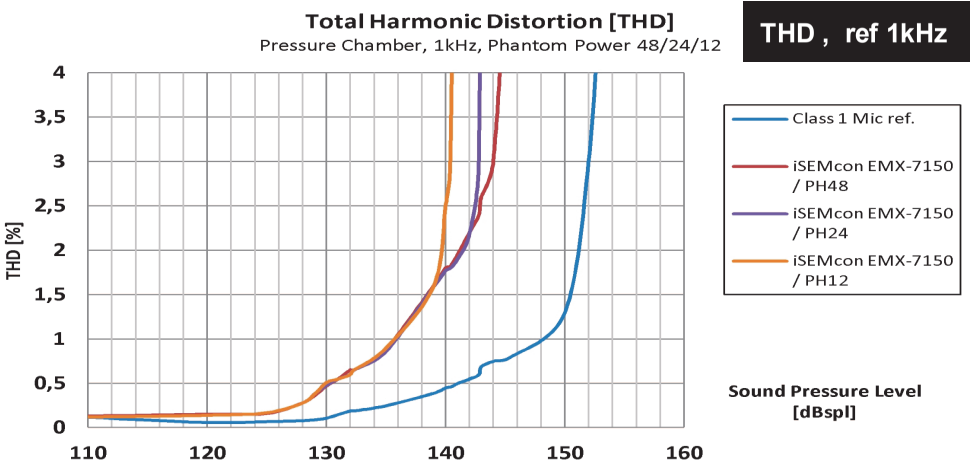
k2, k3 and THD (blue/red/green)



THD vs SPL, typical

Equivalent Noise: FFT, 1/3 Octave, A-weighted, ITU-R 468 RMS weighted (magenta, blue, green, red)



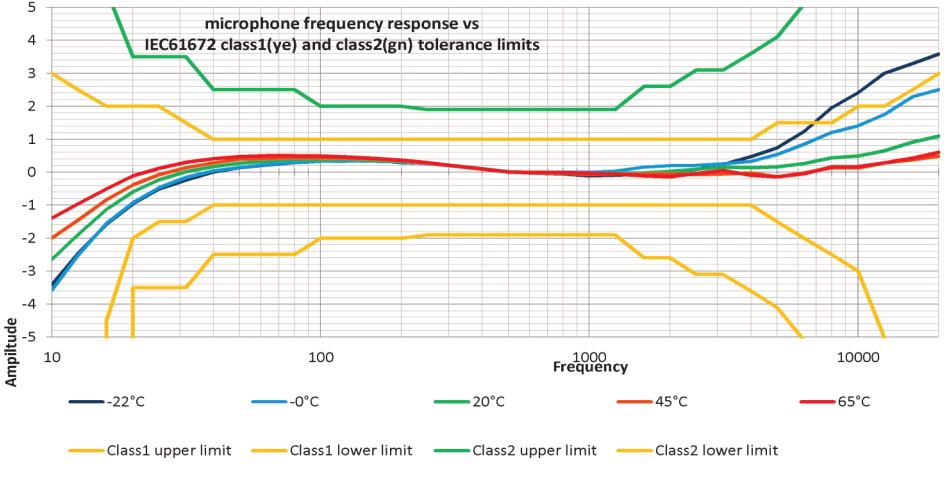


THD , ref 1kHz

CALIBRATION DATA FILE FORMAT

Human readable ASCII file: 1/12 octave

www.iSEMcon.com freefield
Sensitivity 5.88 mV/Pa @1kHz
10.00 -0.02
11.26 0.10
.....
19992.19 0.93
^ frequency (Hz) ^amplitude response (dB



TEMPERATURE STABILITY

The temperature characteristics of the sensitivity of an electret condenser microphone depends on the electrical characteristics of the microphone capsule built-in impedance converter and signal conversion circuitry as well as the acousto-mechanical characteristics of the diaphragm equivalent stiffness. iSEMcon is one of the first microphone manufacturers disclosing the secret about the temperature behavior of electrets based measurement microphones.

The range for the measurement was set at -20° to 65° C which is more than iSEMcon microphones are normally used at. The most important temperatures are 10 °C up to about 55°C which covers indoor as well as open air use. It will give you a good predictable performance whether it is used in a cold autumn night or if the hot summer sun “burns” the microphone body.

The table below shows the microphone sensitivity change @ 1kHz. The diagram on previous page shows how temperature affects the frequency response behavior of an EMX-7150 microphone. The microphone capsule itself is the part being responsible for most of the temperature change. *(see also: Temperature characteristics of electret condenser microphones Acoust. Sci. & Tech. 27, 4 (2006))*

Microphone sensitivity vs. Temperature
typical

		1kHz
Temperature	**-20°C**	6,92
	0°C	6,83
	10°C	6,71
	20°C	6,62
	35°C	6,60
	45°C	6,57
	55°C	6,50

NEW MATCHING MICROPHONES

iSEMcon now offers matching stereo pairs as well as matching triples and quads within a consistent tolerance. While matching microphones , it is crucial to ensure that the frequency response and sensitivity is identical within a specified tolerance . Some of our competitors state that their microphones are matching or sell matching pairs and you are not informed about how those microphones might be different in frequency response and microphone sensitivity.

iSEMcon's matching tolerance

To ensure realistic sound field measurement and multi channel audio experience, each microphone is individually calibrated and selected to meet our standard matching tolerance. The matching tolerance is applicable within the microphone's entire frequency range.

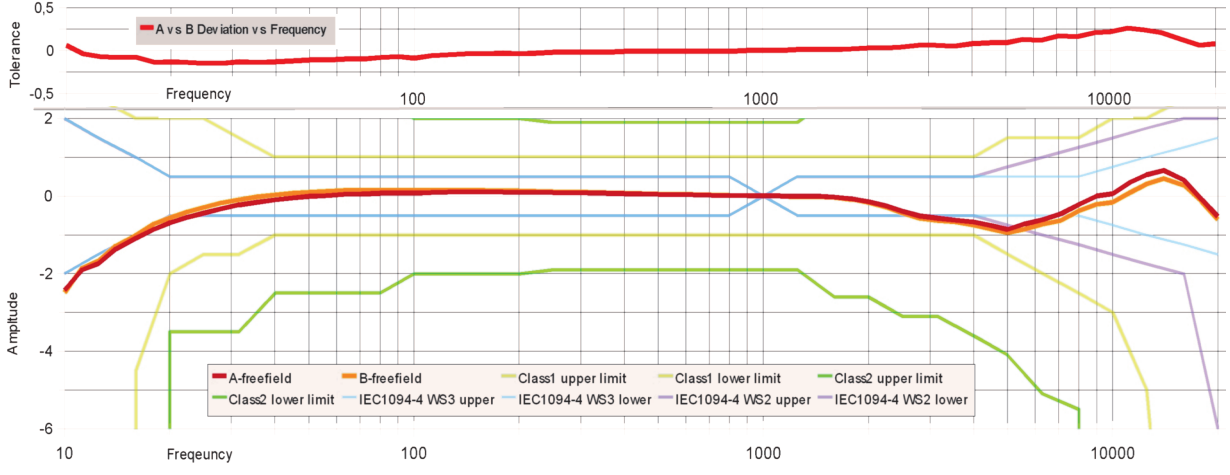
For the EMX-7150 the matching tolerance on frequency response is +/- 0.5dB and 1mV on microphone sensitivity.

The matching process (1-4):

The first stage of testing begins with the selection of microphone capsules. We filter capsules being close in their overall performance (frequency and sensitivity).

The second stage is the microphone manufacture using those selected capsules.

The third stage focuses on final testing of each microphone. This includes the calibration procedure (individual frequency response measurement) as well as sensitivity measurement at 12V, 24V



Matching curve for a EMX-7150 pair

Diagram A vs B vs class 1 and 2 class tolerances

and 48V Phantom power.
Finally we are selecting one reference microphone (A) and compare the overall frequency responses of its potential partners.
FOH: You measure and optimize the acoustical sound field for the audience together with SPL or better say Leq monitoring….. Why not use one matched pair for stereo recordings?

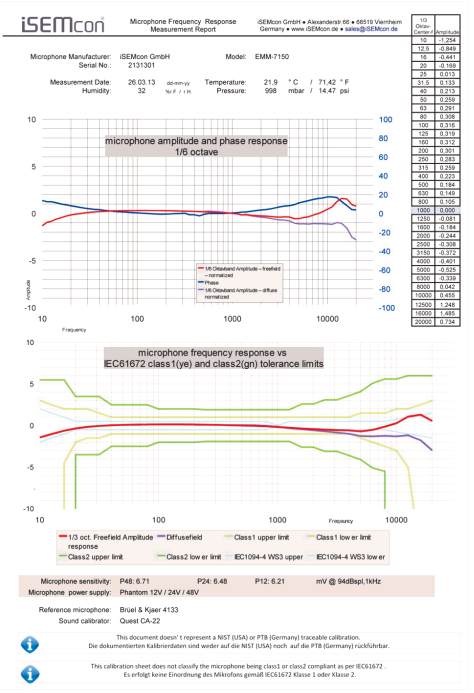
MATCHING PAIRS IN STEREO RECORDING

Matched sensitivity is important when you want center instruments to be heard from the center between your stereo speakers, rather than shifted slightly left or right of center. A level mismatch also can change the musical balance between orchestral instrumentation. Of course, you can compensate for microphone sensitivity differences with your recorder's level controls or mixer's pan pots but not for frequency response mismatch.

Matched frequency response is important for the sharpest possible imaging. The more closely the stereo microphones are matched in frequency response, the better the image focus and localization. For example:
Suppose the left microphone is 3 dB off at 200 Hz relative to the right microphone. For an instrument in the center of the musical ensemble, its reproduced low frequencies will shift toward the left, while mid frequencies will remain in the center . Localization for this instrument will spread or will cause blurring between the real (mid frequency) image and the phantom (low frequency) image.

CALIBRATION

Each microphone sold comes with its individual calibration data. This includes a calibration chart (pdf-file) as well as human readable calibration files for both, freefield and diffusefield response.



Calibration prodecure step 1

Substitution Methode 500Hz … 20kHz

- Reference Speaker Measurement using Reference microphone
- MLS Signal (Maximum Length Sequence) + Gating *(No room response / reflections)*
- Replacing Reference mic with EMX-7150 microphone
- Calculating EMX-7150 frequency response from impulse response data

Calibration prodecure step 2

- Pressure Chamber Method 10Hz...500Hz
- Direct compare of EMX-7150 against a Lab Standard Refernce Microphone using sine sweep signal *1

**1 Freefield microphones as well as pressure response microphones have the same frequency response behavior at low frequencies.*

60 dBspl LEVEL LINEARITY

Each microphone is SPL linearity checked against class 1 tolerances (+/- 0,8dB) as per IEC 61672-1 (2013)

APPLICATION NOTES
FREEFIELD vs. DIFFUSEFIELD USE

Only a small percentage of all acoustical measurements are performed in a well defined and/or well controlled environment of an e.g. acoustical laboratory – on the contrary most acoustical measurements are done under not really controlled conditions. Here are some hints on how to use our microphone.

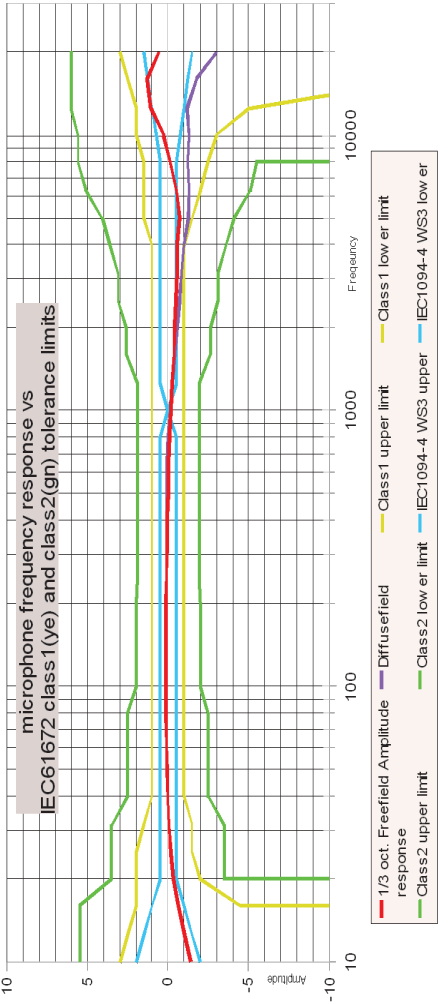
Sound Fields:

Free field:	There are no reflecting objects, only the microphone influences the sound field.
Diffuse field:	There are many reflecting surfaces or sound sources so that the sound waves arrive from all directions.
Pressure field:	This is found in small confined spaces like sound calibrators.

Depending on the nature of the sound field an appropriate microphone, which is optimized for the sound field could be selected. Unfortunately there are many practical situations where the sound field is not really of a well defined type. This application note should give you an idea on how to measure with a free field response microphone.

The free field microphone is the most common in use, chosen on tradition but we should know about the sound field.
The following picture shows both the free field and the diffuse field response of a free field microphone.

A microphone's random (diffuse) incidence response can be approximated by measuring the 90º incidence response relative to a single sound source (as per B&K literature).



The diffuse field response is not easy to measure, because it is not easy to generate a truly diffuse sound field over a wide frequency range but there is a known procedure to estimate the diffuse frequency behavior of a free field microphone.

From literature we know, that a microphone's random (diffuse) incidence response can be approximated by measuring the 90 deg incidence response relative to a single sound source.

While it is an approximation only iSEMcon has measured the 90deg response of many EMX-7150 microphones and used the averaged data to evaluate a 19^{th} order polynomial. This is now used to derive the "diffuse field" response from the microphones free field response data.

Typical freefield measurement:

Speaker measurement. The microphone should target to the sound source (speaker).

Typical diffusefield measurements:

Concert SPL monitoring (normally at FOH), Room Acoustics measurement (RT60): the microphone should not target to the sound source. Let it target to the ceiling. This is the most practical way.

MAINTENANCE

This microphone is a maintenance free product but could require a recalibration in case of a mechanical impact or perodical temperature cycling/use at the min and max working temperature.
In an unlikely event of equipment failure, please contact your local iSEMcon representative or the iSEMcon factory located in Germany (sales@iSEMcon.com). Unauthorised dismantling of the microphone will invalidate the warranty.

ELECTRONIC WASTE

This electronic device should be disposed separately from your household waste at the end of its lifetime. There are various collection systems for recycling in the European Union. For further information please contact your local authority or retailer where you have purchased the product.

INSTALLATION

The EMX-7150 should not be plugged or unplugged into a mixer console or PA system unless the input channel is muted. If the system does not have a muting option the volume should be turned off. This avoids loud popping noise that can cause damage in speakers and/or affect your hearing.

No	Name	Description
150010	EMX-7150	**Bulk version:** EMX-7150 microphone + WS-7XL windscreen + clamp w/ adapter screw+ data-CD, mic in tube, polybag
800060	EMX-7150-CF1	EMX-7150 microphone + clamp w/ adapter screw + WS-7XL windscreen + 1/4" to IEC 1/2" (13,2mm) calibrator adapter + calibration data on USB stick - pouch
800070	EMX-7150-CF2	EMX-7150 microphone + Shockmount w/ adapter screw + WS-7XL windscreen+ 1/4" to IEC 1/2" (13,2mm) calibrator adapter + Calibration data on USB stick - Pouch
800080	EMX-7150-CF/MP	2x EMX-7150 microphone (MATCHED PAIR) + clamp w/ adapter screw + WS-7XL windscreen , 1X 1/4" to IEC 1/2" (13,2mm) calibrator adapter + calibration data on USB stick - Pouch
800081	EMX-7150-CF/MT	3x EMX-7150 microphone (MATCHED TRIPLE) + clamp w/ adapter screw + WS-7XL windscreen , 1X 1/4" to IEC 1/2" (13,2mm) calibrator adapter + calibration data on USB stick - pouch
800082	EMX-7150-CF/MQ	4x EMX-7150 microphone (MATCHED QUAD) + clamp w/ adapter screw + WS-7XL windscreen , 1X 1/4" to IEC 1/2" (13,2mm) calibrator adapter + calibration data on USB stick - pouch

LIMITED WARRANTY

iSEMcon, Germany provides limited warranty for the original iSEMcon product purchased. If you wish to make a warranty claim for your product, take it to the retailer from which you have purchased the product or contact iSEMcon Germany (sales@iSEMcon.com) In accordance with the terms of this limited warranty, iSEMcon guarantees that this product at the time of initial purchase is free of material and manufacturing defects. This guarantee is valid for two (2) years from the date of purchase of a new, unused product by the original end user. As proof of purchase by all means please keep your receipt of purchase. The date of purchase and the name of the product have to be indicated on the receipt. Without this proof, which will be checked by iSEMcon, no claims may be put forward. iSEMcon and its partners reserve the right to charge a processing fee if this product in accordance with the warranty terms fails to meet the warranty criteria.

The warranty undertaking consists at the option of iSEMcon of the elimination free of charge of material and manufacturing defects through repair, exchange of parts or replacement of the entire product. If iSEMcon repairs the product, exchanges parts or replaces the product, then the warranty claim for the defect in question or the replaced product is valid for the remaining duration of the original warranty period or for ninety (90) days from the date of repair, whichever is longer. The repair or replacement claims may be filled with functionally equivalent, reconditioned products if the purchased product is no longer available. The replaced parts or components becomes property of iSEMcon. This warranty claim is void if the product has been tampered with by unauthorised persons or workshops. This limited warranty is valid worldwide in all countries in which in each respective case the national laws do not conflict with these warranty terms. Other or broader claims than those set forth here may not be asserted on the basis of this limited warranty. At the same time,

you as an end user may in your country have legal claims which are not limited by this limited warranty. The limited warranty limits neither your legal rights nor the rights arisen from the purchase contract between you and the retailer.

Excluded from this limited warranty are:

· Minor defects or irregularities in the condition of the product which are insignificant as far as the quality and intended use of the product are concerned.
· Accessories included with the product including data storage media like CD and USB stick.
· Rechargeable and non re-chargeable batteries.
· Defects which have occurred through improper use or misuse of the product including faulty operation, mechanical damage and applying incorrect operating voltage.
· Defects in the product resulting from or in connection with modifications made to the product without prior agreement and written statement .
· Defects in the product resulting from force majeure.
· Defects in the product of which you were already aware of at the time of purchase.
· Defects in the product caused by the use of accessory components or peripheral devices which are not among the original accessories supplied by iSEMcon.

THERE EXISTS NO EXPRESS WARRANTY, REGARDLESS OF WHETHER THEY ARE WRITTEN OR VERBAL, BEYOND THIS PRINTED VERSION. ALL IMPLIED WARRANTIES ARE ONLY VALID FOR THE DURATION OF THIS LIMITED WARRANTY. ISEMCON IS, TO THE EXTENT THAT AN EXCLUSION OF LIABILITY IS PERMITTED, IN NO INSTANCE LIABLE FOR INDIRECT OR CONSEQUENTIAL DAMAGES OF WHATEVER KIND, INCLUDING-BUT NOT RESTRICTED TO-LOST PROFITS AND ECONOMIC DISADVANTAGES.

In some countries/states the exclusion or limiting of indirect or consequential damages or the limiting of the duration of warranty is not allowed. In this case the previously mentioned limitations and exclusions do not apply to you.

Safety clause and unauthorized applications

Products manufactured and/or sold (herinafter products) by iSEMcon GmbH and/or iSEMcon LLC, (hereinafter iSEMcon) are not designed for use as a component in any life support, life safety, or other comparable application. Our products should not be used in any application where the failure or faulty performance of the product might create a risk of personal injury or death. Buyer assumes all risk of loss, damage or injury alleged to arise from the failure or faulty performance of an iSEMcon product in any unauthorized application. Buyer agrees to indemnify and hold harmless iSEMcon, and its directors, employees, agents, representatives and sales partners, from and against any and all claims, costs, damages, losses and expenses including attorney fees which arise from or are alleged to have been caused by any claim for personal injury or death connected with buyer's use of an iSEMcon product in any unauthorized application, including claims which allege that iSEMcom has been negligent in connection with the design or manufacture of the product.

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