

SOUND EVENT DETECTOR

INSTALLATION & SW SPECIFICATION

v3.11

IMPORTANT:
READ THIS INSTRUCTION CAREFULLY
before attempting to operate the SED device.



SOUND EVENT DETECTOR®

Contents of the SED Installation Manual

INTRODUCTION.....	2
SED HARDWARE INSTALLATION INSTRUCTIONS.....	3
BASIC INSTRUCTIONS FOR CORRECT INSTALLATION:.....	3
SED Oxxx (Outdoor):	3
SED Ixxx (Indoor):	9
INSTRUCTION FOR USING SED HARDWARE.....	11
Features.....	11
Important Definitions	11
Supplied Accessories.....	12
FCC IEC Information.....	13
PRECAUTIONS	13
OVERVIEW.....	16
Description of functions.....	16
TECHNICAL PARAMETERS	17
Enclosure	18
GSM DETECTOR VARIANT	19
SIM card installation.....	19
First launch	19
DIRECTIONAL CHARACTERISTIC OF DETECTION RANGE	20
Detection range of outdoor version	21
COMMUNICATION	22
USER INTERFACE AND INTEGRATION.....	23
Appendix A – Declaration of Conformity	24

INTRODUCTION

Thank you for choosing the SED device — an innovative solution for instant detection of dangerous acoustic events such as gunshots, explosions, glass breaking, or human screams. SED helps reduce response time in crisis situations, thereby contributing to a higher level of safety in both public and private spaces.

This user manual will guide you through the complete process of installing and operating the SED detector. It includes technical specifications, mounting instructions for both outdoor and indoor versions, safety warnings, information about server communication, and an overview of the user interface. The aim is to ensure proper and safe operation of the device and to help you make the most of its capabilities.

Please read this manual carefully before installing and commissioning the device.

Thank you for reading the manual in its online form and helping us protect the environment. If you have any questions, feel free to contact our technical support at: support@jalud-embedded.com.

SED HARDWARE INSTALLATION INSTRUCTIONS

BASIC INSTRUCTIONS FOR CORRECT INSTALLATION:

SED Oxxx (Outdoor):



It is necessary to connect the device to the mains voltage at the time of installation to verify the functionality of the device and electrical connection!

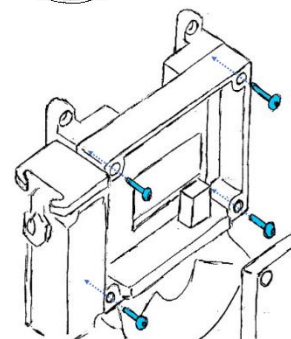
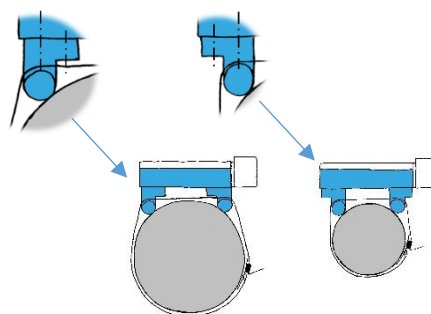
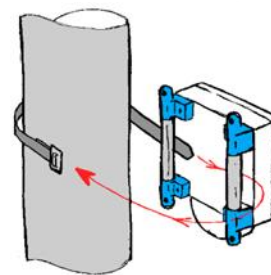
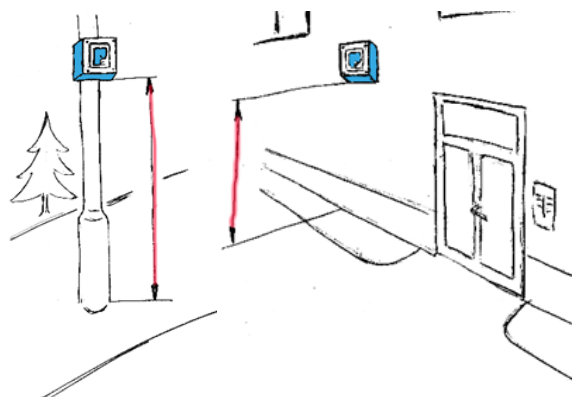
Example of a typical installation: a lighting column or the facade of the house at a height of 3.5-4m (to allow access for servicing the device).

Mounting on a column with stainless steel pulling straps or on a wall with screws (not included), orient the device so that the “ear” is facing downwards and toward the desired monitoring area. Tighten the mounting elements with care to avoid damage to the device casing.

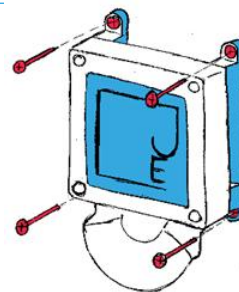
Adjustable brackets can be used for more secure mounting on wide or narrow columns. The brackets can be adjusted by removing the screws that attach them to the device casing and orienting the brackets depending on the width of the column. For wide columns, orient the brackets so that the mounting holes face outwards. For narrow columns, orient the brackets so that the mounting holes face inwards.

The adjustable brackets are a device-level customization and must be specified in the order.

A Torx T20 tool is required for mounting.



If mounting on a flat surface (wall, facade, etc.), using the adjustable brackets, affix the brackets in the "wide" position so that sufficient clearance is given to tighten the lower mounting screws.

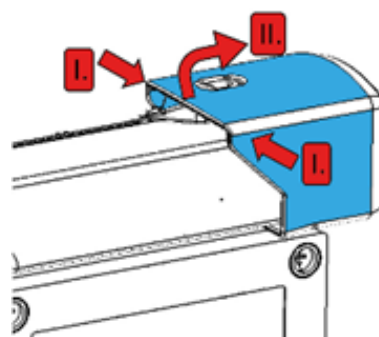


- **Power supply installation instructions for SED OEx, OGx (230V powered)**



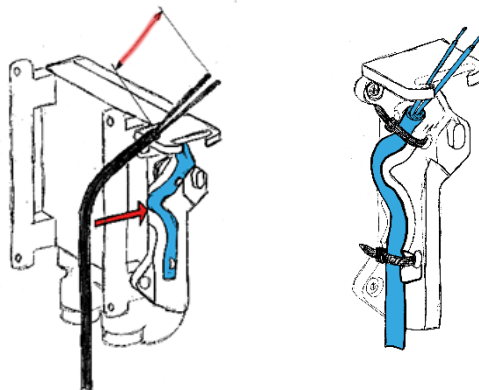
The installation of the electrical power supply is to be carried out by a person professionally qualified according to the applicable legislation!

The canopy is dismantled by pressing the sides and bending the side with the latch hole.

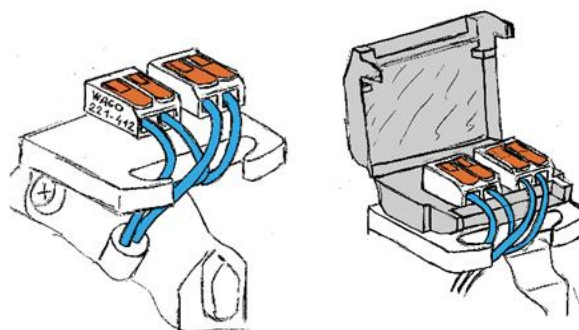


Strip the free end of the supply cable to a length of approx. 60 mm.

The mains voltage supply cable is placed in the cable trough at the rear of the holder and secured using a cable tie with a maximum width of 2.5 mm.



Connect the cable with Wago clamps (included in the package) to the input cables of the SED device, paying close attention to the colour markings. Place the Wago clamps in an open Wago Gelbox. Closing the Gelbox will "wrap" the terminals with gel and thus protecting them against moisture.



The Gelbox is then covered by attaching and snapping on the protective canopy, providing additional protection against rain.

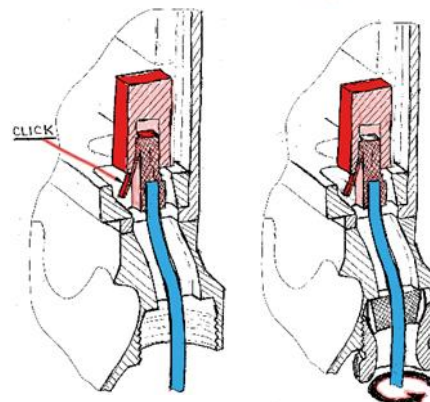
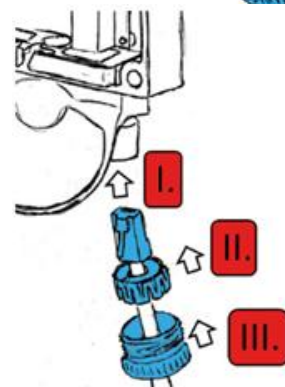
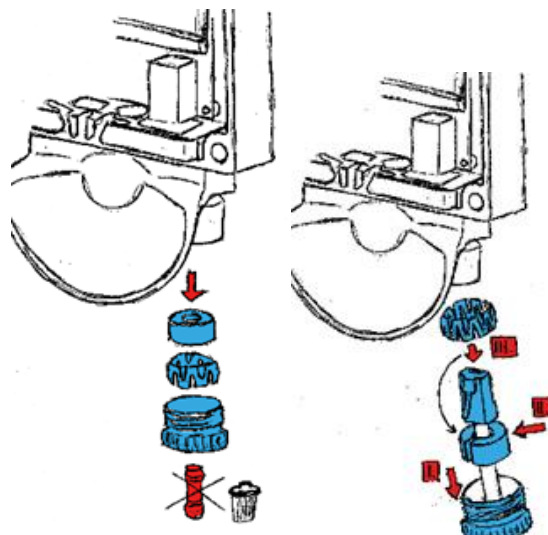
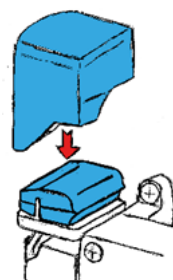
- **Ethernet cable connection instructions for SED OEx (LAN cable connectivity)**

To connect the Ethernet cable (if the device variant supports ethernet connectivity), unscrew the loose nut from the bottom (right side when viewed from the front) and remove the blue seal with the clamp ring. Remove the seal.

Place the nut on the prepared Ethernet cable, then attach the split silicone ring and the flexible plastic clamp ring.

Push the Ethernet cable connector through the nut hole and into the connector socket. The correct insertion of the connector should be checked with the box lid removed.

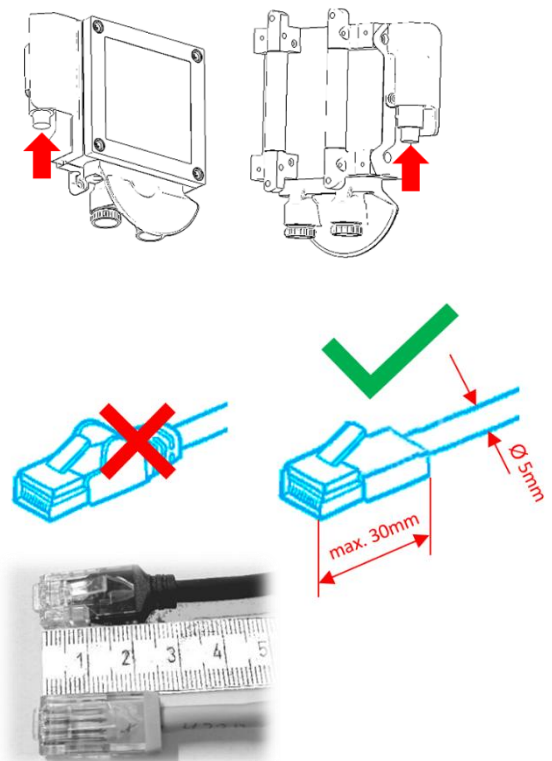
After the connector is properly inserted, the sealing ring with a spacer should be slid into the hole, closed and screwed with a nut. Tightening will seal the inner compartment watertight.



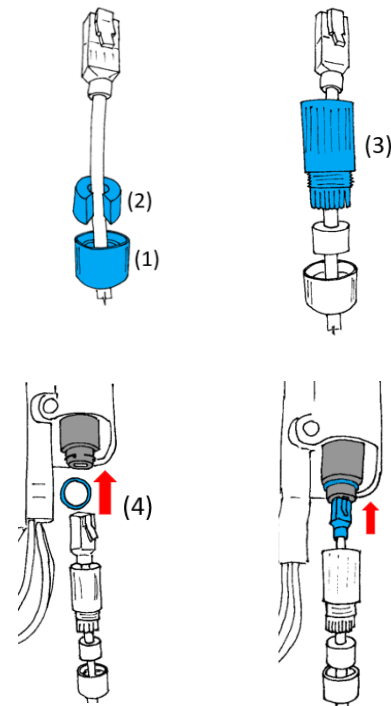
- **LAN cable connection instructions for SED OPx (LAN cable connectivity with PoE power supply)**

To properly install an Ethernet cable with PoE power supply, it is necessary to use a cable with a connector free of protective elements that enlarge the body of the connector (See diagram).

The connector length can be a maximum of 30 mm. Maximum cable diameter is 5 mm. The connector must be inserted through a hole with a diameter of 14 mm. If necessary, a standard LAN connector must be crimped onto the cable of a length adapted to the specific installation.



The accessory package contains parts for installing a waterproof LAN cable connection. First, slide the small union nut (1) onto the LAN cable, open the split ring of the rubber seal (2) and place it on the cable. Then slide the long union nut with the bayonet lock (3).



Slide the thin sealing ring (4) onto the cylindrical part of the LAN cable connector socket on the side of the SED box. Insert the LAN connector into the socket until a click is heard. Slide the union nut onto the bayonet lock of the socket and fasten it by turning it approx. a quarter turn clockwise until it stops. Check that the thin sealing ring is pressed in by the nut and that no gap is visible.

Slide the cut rubber seal along the cable under the lugs of the nut. Make sure that the lugs on the nut do not bend and remain outside the seal. Press the ring into place using a suitably long and thin tool like a 2-3 mm Allen wrench. The rubber seal should be completely hidden in the hole of the nut so that it cannot be moved any further.

Once the rubber seal is in place, install the small union nut and tighten gently. This will form a watertight seal inside of the LAN connector.

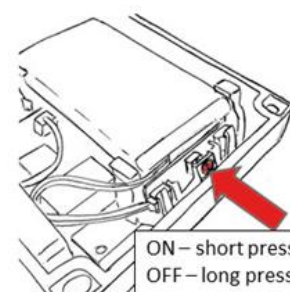
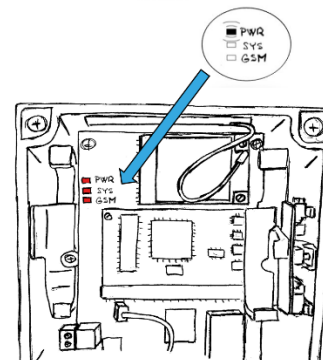
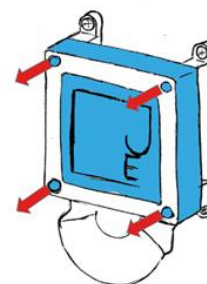
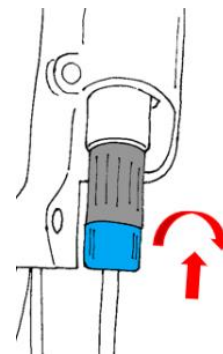
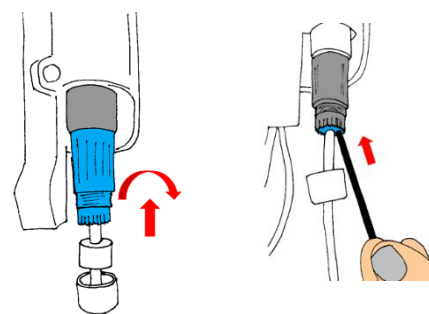
Pay close attention to the execution of all previous steps to ensure long-term, trouble-free operation of the connector in a humid environment.

- **Instructions for verifying functionality after mechanical installation. Checking correct wiring for all SED Oxxx variants.**

After mechanical installation, it is necessary to verify the device's functionality.

Remove the lid of the box by loosening the four plastic screws and check that the LED indicator on the motherboard lights up when the mains voltage is switched on. In the battery version, the indicator is visible when the battery is removed from the holder.

With battery variants, the power supply can be switched on and off with a short (ON) and long (OFF) press of the power button without the presence of mains voltage.

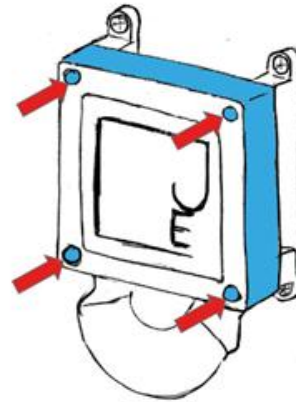




Device functionality on battery power does not ensure device functionality on mains power. Mains power functionality must be tested separately.

To confirm server connection, log in to the SED user application and confirm the device is visible. (For application installation instructions, see Chapter 5 of this manual. The username and password are provided to the customer in the information email sent at the time of sale.)

After verifying the functionality of the device, re-attach the lid of the box and tighten the plastic screws sufficiently to ensure protection against water.

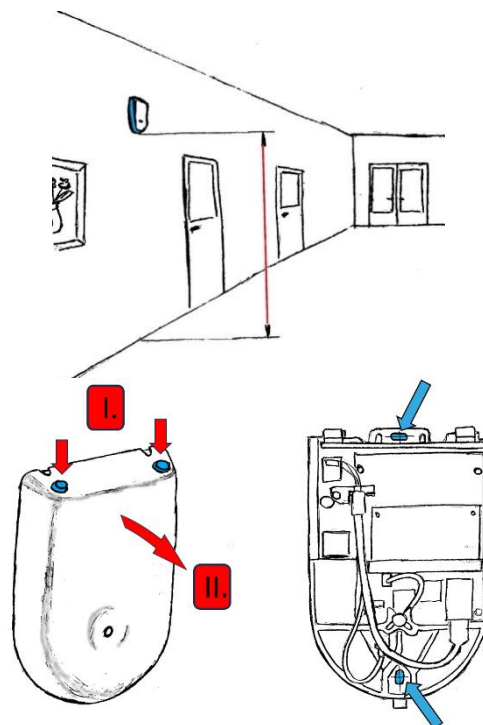
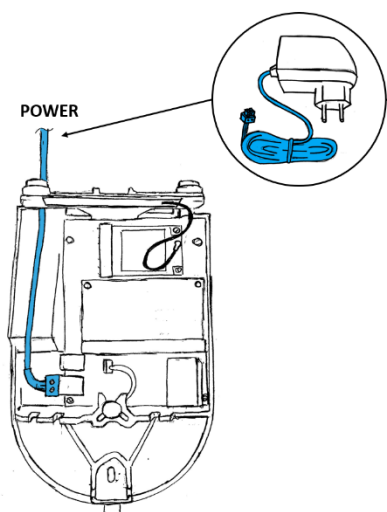
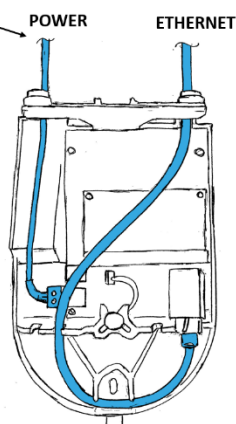
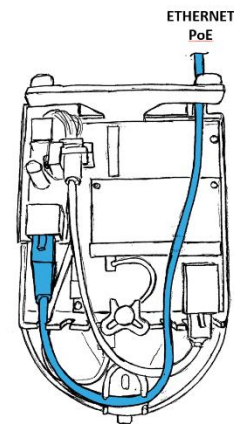


SED lxxx (Indoor):

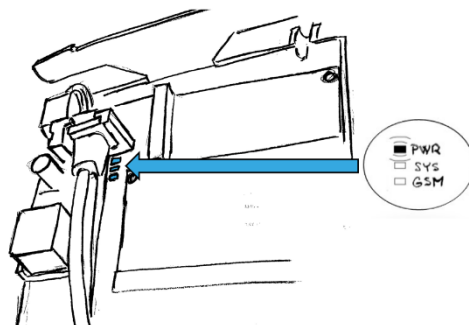
An example of a typical installation: mounting on the inner wall of a room or corridor (at a height of min. 1.5 m) with the "ear" position facing downwards and towards the monitored area.

To remove the outer cover, press the tabs on the top of the device and swing the cover forward.

Mount using suitable screws/bolts (not included). Tighten the mounting components with appropriate force to avoid damage to the casing.

**Electrical wiring varies according to variants:****SED IG****SED IE****SED IP**

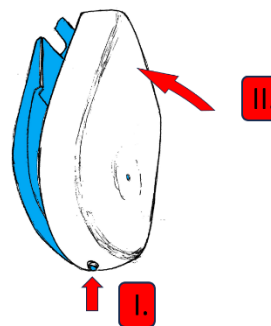
After plugging in the power adapter, Ethernet cable or Ethernet cable with PoE, if applicable, ensure that the power light ("PWR") turns orange.



To confirm the device's server connection, log in to the SED user application and confirm the device is visible. (For application installation instructions, see Chapter 5 of this manual. The username and password are provided to the customer in the information email sent at the time of sale.)



After verifying the functionality of the device, re-attach the box lid by placing it on the bottom tab and pushing the lid towards the wall.



INSTRUCTION FOR USING SED HARDWARE

Sound Event Detector detects, analyses, and reports unwanted acoustic events like gunshots, screams, and glass breaking at the speed of sound!

- ! READ THIS INSTRUCTION MANUAL CAREFULLY before attempting to operate the SED Device.

Features

The SED is designed to improve your response time to dangerous situations by detecting the sounds that accompany them in real-time. When a dangerous situation occurs, the user is informed within seconds to ensure faster reaction time.

The SED is defined as follows:

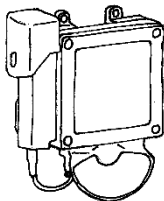
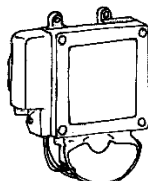
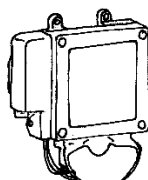
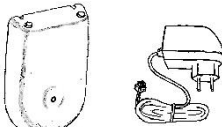
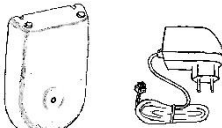
- Real-time impulsive sound detection with immediate user notification using Ethernet/GSM.
- All-in-one embedded solution.
- Monitor any number of devices in real-time using simple HMI
- Real-time event localization and tracking with precision within 5-25m.

Important Definitions

Symbol	Word	Definition
	Warning	Personal injury, fire hazard, or electric shock may occur.
	Info	Tips, recommendations, equipment damage may occur.
	Note	Additional information. No risk of personal injury, fire, or electric shock if disregarded.

Supplied Accessories

Individual package with one Sound Event Detector contains the following components, depending on the variant:

SED variant	Accessory	Qty	Description
OGL OGLC OGB OGBC OEL OELC OEB OEBC		1	Outdoor sound event detector. Power supply 230V.
OP OPC		1	Outdoor sound event detector. PoE power supply.
OGD OGDC OED OEDC		1	Outdoor sound event detector. Module for DC (direct current) power supply.
IG IE		1+1	Indoor Sound event detector + power adapter.
IGD IED		1+1	Indoor Sound event detector + power adapter.
IP		1	Indoor sound event detector. Module for DC (direct current) power supply.

FCC|IEC Information

This equipment has been tested with the limits for IEC 61000-6-1/2 and 61000-6-3/4 digital devices. These limits define the generic transmission standards for residential, commercial, and light-industrial environments and are designed to provide reasonable protection against harmful interference in a residential/public installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try one or more of the following measures:

- Reorient or relocate the device.
- Increase the distance between the equipment and the SED device.
- Connect the equipment to a circuit to which the SED is not connected.
- Consult the dealer or contact us directly

PRECAUTIONS



WARNING RF EXPOSURE! This device emits Radio Frequency (RF) energy. Extreme caution should be observed when operating this device. If you have any questions regarding RF exposure and safety standards, please refer to the Federal Communications Commission Office of Engineering and Technology's report on Evaluating Compliance with FCC Guidelines for Human Radio Frequency Electromagnetic Fields (OET Bulletin 65) or IEC 61000-6-1/2 and 61000-6-3/4 standards - for EU use.



NEVER apply AC power to the [DC5V] socket on the device. This could cause a fire or damage the device.



NEVER apply more 10% difference of 5V DC voltage into [DC5V] socket on the device. This could cause a fire or damage the device.



DO NOT use or place the device in areas with temperatures below -40/-20°C (-40/-4°F) or above +50/+60°C (+122/140°F). The limit values for the individual device variants are given in the technical parameters in the "SED Data Sheet" document. Such temperatures can lead to permanent damage to the device.



DO NOT MAKE changes or modifications to this device, that are not expressly approved by JE. It could void your authority to operate this device under FCC/IEC regulations and the warranty given by JE.



DO NOT place the device near source that generates high intensity sound noise such as heat pump, ventilator, water falls etc.



DO NOT place the device into the tight spaces, near ceilings, or any in locations that could cause attenuation of the event audio signal or, on the contrary, its excessive distortion.



DO NOT install the device on the items that might cause the microphone to resonate (such as a gutter). In general, please try to install the device on a solid object that is ideally not hollow.



DO NOT install the device near strong radio interference and near a strong, magnetic fields, such interference may affect the proper operation of the microphone.



DO NOT forget to tighten main four screws on the top of the device when replacing the SIM card/installing the device, the water might leak inside the enclosure and can result in permanent damage to the device.



REMEMBER that the four cover screws on the front of the device must be proportionally tightened to ensure the declared degree of protection. Water and debris could enter the cover and cause permanent damage to the equipment.



ASSEMBLE according to the manual and tighten the mounting elements in proportion to the materials used. The use of excessive force may lead to the destruction of the plastic parts, which will then not perform their function. Other assembly methods may result in damage to the equipment and void the warranty.

FOR RELIABLE LOCALIZATION install devices ideally in an isosceles triangle configuration and at least 60 meters apart from each other. Be mindful of detection ranges and keep in mind that at least three devices must detect an event for successful localization. We advise against the use of roaming SIM cards, as such SIM cards typically have much longer delays which may significantly affect the precision of localization.

FOR RELIABLE LOCALIZATION please ensure that the GPS coordinates are precise and that SN numbers were accurate when new devices were added to the map.

PLEASE ENSURE that the individual installing the device has all required permit(s) or certification(s) for installation of electronic devices as mandated by the relevant governing bodies in the country of installation.

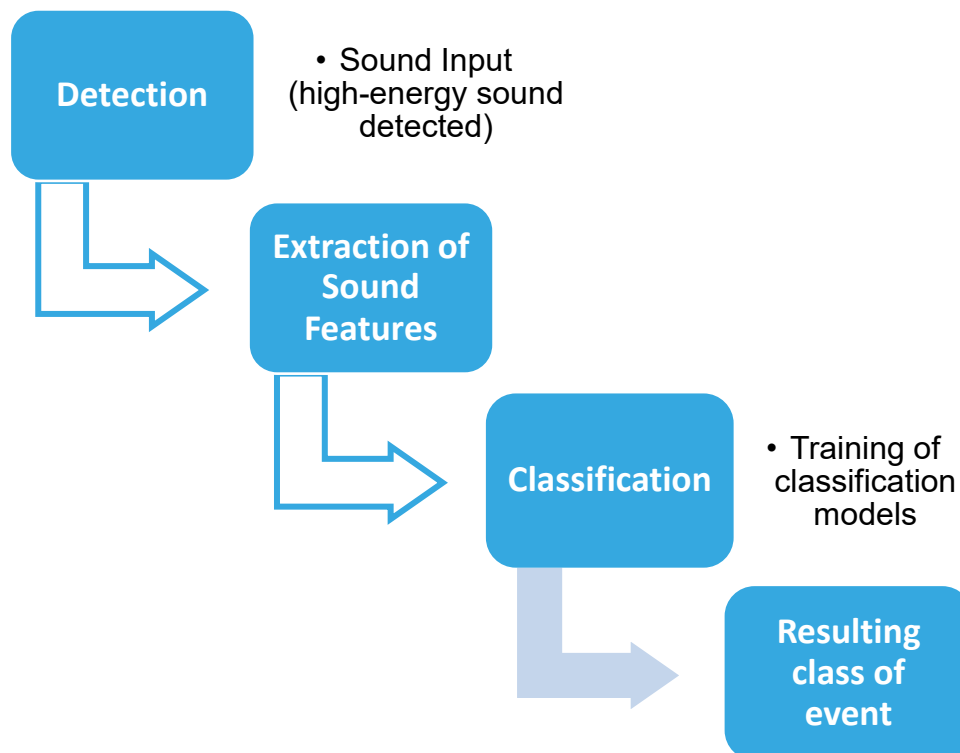
OVERVIEW

The SED is designed to improve your response time to dangerous situations by detecting the sounds that accompany them in real-time. When a dangerous situation occurs, the user is informed within seconds to ensure faster reaction time.

Description of functions

The SED software that runs on the target device is composed of three phases:

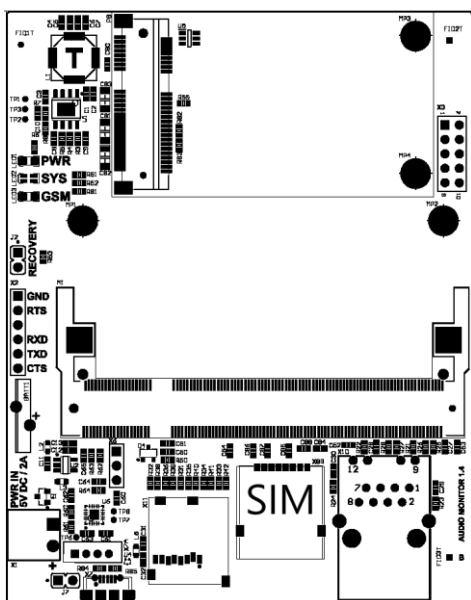
1. Detection of abnormal acoustic events
2. Extraction of sound features
3. Event classification



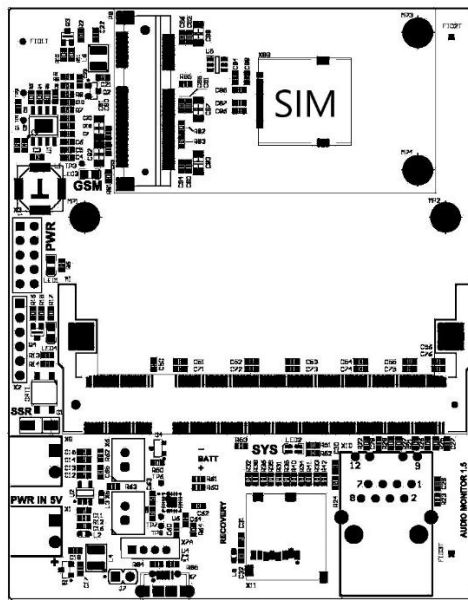
SW composition

TECHNICAL PARAMETERS

- For parameters of individual detector types, see [Datasheet](#)
- 5V/3A DC power supply (+10%), max 15W, recommended power supply 3A.
- Operating temperature range: -40/-20°C to +50/60°C (-40/-4°F to +122/140°F)
- Humidity: 10 % to 90 %
- Board Dimensions: 82 x 104 mm
- Enclosure Dimensions: 135 x 135 x 35 mm
- Overall dimensions (max.): 180x96x215 mm
- GSM Modem: (standard Quectel EC-25 EUX GR, possible other model types)
 - LTE (FDD) B1/B2/B3/B5/B7/B8/B20 (if equipped),
 - HSPA+/UMTS Bands: 900/2100Mhz,
 - GSM/GPRS Bands: 850/900/1800/1900Mhz,
 - Data Transfer Rate: Downlink 21.6 Mbps, Uplink 5.76 Mbps
- Microphone used: 8-directional high sensitivity (gain at least 46dB)



Ser.Nr.: xxxxxx14xxxxxxxxxxx

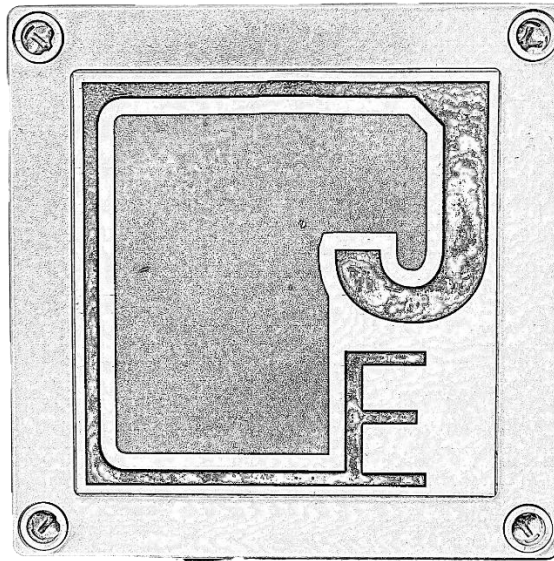


Ser.Nr.: xxxxxx15xxxxxxxxxxx

Board layout and dimensions

Enclosure

The board layout and the mounting holes have been developed for a standardized, highly durable waterproof (IP67) enclosure with dimensions of 130x130x35mm made of Polycarbonate. The bottom section is an amplifier developed for a highly sensitive microphone and significantly prolongs the device's recognition capabilities while protecting the microphone from wind and water. All holes for the amplifier are sealed with O-rings to keep the device waterproof.



Waterproof enclosure with four mounting holes. Remove the four screws of the top cover to access the interior for SIM card installation or for access to the battery module and LED controls.

GSM DETECTOR VARIANT

SIM card installation

Skip this step in case you bought the SED device with pre-installed SIM card.

- Unscrew the four main screws at the top of the device (see Board layout)
- Insert a “no-pin” SIM card into the tray marked as X8 (see Board layout). Double check that the SIM card does not require a PIN. If so, please disable the PIN first.

First launch

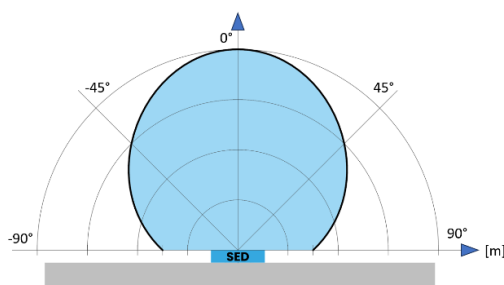
- Plug the device into the attached 5V DC power supply.
- After 2-5 minutes, LED1 (power) and LED3 (GSM) should remain steadily illuminated (no blinking). If so, the device has properly booted and connected to the GSM Network. If LED3 is not active/blinking, ensure the SIM is properly seated and the PIN has been disabled. If this does not solve the issue, allow up to 30 minutes for the device to connect. If the device does not connect after 30 minutes, please contact your local distributor. In the case of returns, please ensure that the device is re-packaged as it arrived in the box.

DIRECTIONAL CHARACTERISTIC OF DETECTION RANGE

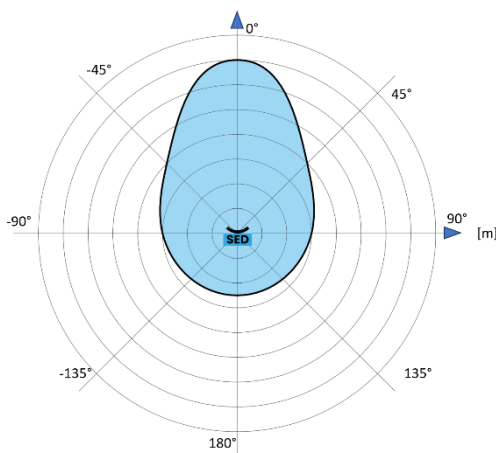
For successful and reliable operation, the difference in signal strength between the classified sound event and the background noise (SNR) must be greater than 10 dB. In other words, if the device is installed in a loud environment with high background noise (ie. Next to an HVAC unit), this can have a significant impact on the detection range.

■ Indoor:

We recommend installing the device at least 1.5 m above the ground. When choosing a location, one should consider the orientation of the device to ensure optimal coverage (as showed below). The reflection of sound waves from walls has a large influence on the detection range in indoor areas, which significantly increases the detection range in all directions. Conversely, narrow passages and “bottlenecks” can reduce detection range.



Directional characteristic of detection range in free space for indoor variant of SED



Directional characteristic of detection range in free space for outdoor variant of SED

- **Outdoor:**

For successful and reliable operation, we recommend installing the device approx. 3.5-4 m above the ground, or even higher if installing in environment with a higher crime rate. When choosing a location, one should consider the orientation of the device to ensure optimal coverage (see Figure 5).

Detection range of outdoor version

The following detection ranges reflect the direction in which the microphone is oriented. The ranges for incidents in front of the detector for the following types of sound events are:



Glass break: up to 50-70+ meters, depending on the direction, type of glass, the tool used to break the glass, and environmental conditions. Up to 45m in opposite (240° to 120°) direction.



Bomb blast and gunshot: up to 250+ meters in 60° to 300°, up to 200+ meters from direction 60° to 90° and 270° to 300°. Up to 180m in opposite (240° to 120°) direction.



Human scream: up to 150+ meters in direction of 60° to 300° and up to 100+ meters when coming from direction 60° to 90° and 270° to 300°. Up to 80m in opposite (240° to 120°) direction.

Distances are approximate and can vary depending on the sound event's position relative to the microphone, environmental conditions, weather conditions, and background noise levels.

COMMUNICATION

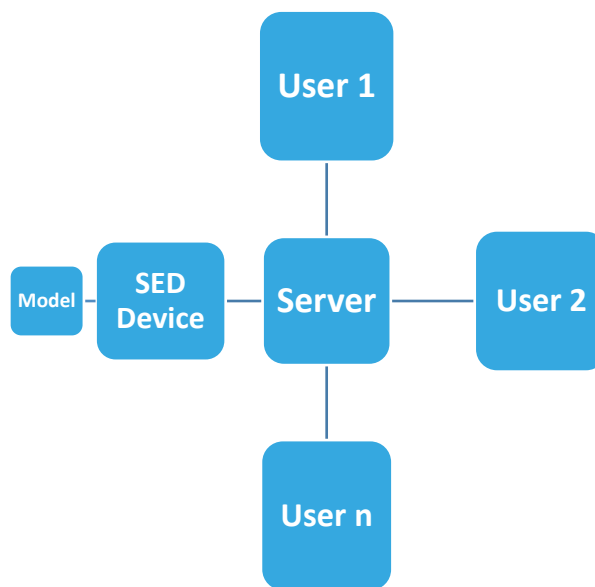
SED devices communicate with the user application over a central node (server).

The server redirects the communication between the devices and the users. It does not handle or process the incoming data.

The server can handle communication for multiple users and some devices can be shared between users.

The server is responsible for storing information about connected devices and informing you when a device connects or disconnects.

The communication is encrypted with the state-of-the-art SSL-TLS v1.2 protocol.



Communication diagram

USER INTERFACE AND INTEGRATION

Our User Application comes free with our devices and software for both desktop and mobile devices. Additionally, we support integration with third-party, ONVIF-conformant Video Management Systems (VMS) so that a separate application is not needed to operate our devices.

SED software can be sideloaded directly into compatible camera models from Axis and Hikvision as a device-free solution.

For more information on the SED User Applications, please see:

- [SED Presentation](#) Application Manual
- [SED Control](#) Application Manual

For more information on Axis and Hikvision software integration, please see:

- Axis: SED ACAP Manual
- Hikvision: SED HEOP Manual

For more information on integration with VMS applications, please see:

- [ONVIF](#) third-party VMS integration Manual

For more information Alerts & Events, please see:

- [Alerts & Events](#) or Alarm table

If you require a manual that was not provided to you at the time of sale, please contact support@jalud-embedded.com.



Appendix A – Declaration of Conformity



EU DECLARATION OF CONFORMITY

We: JALUD Embedded, s.r.o. (Ltd.)
Address: Nepomucká 1355/261
326 00 Plzeň
Czech Republic,

hereby declare our sole responsibility for the product described below, that it is safe if used under the conditions specified by us, and that we have taken all measures to ensure the conformity with technical documentation and with the requirements of relevant directives and standards for all products of this type being introduced on the market.

Product: Sound Event Detector
Type: v1.0, S.N.: 00013143310120210701
Purpose of use: Sound Event Detector detects, analyses, and reports unwanted acoustic events like gunshots, screams, glass breaking, etc.

The product is designed and made in compliance with the requirements of the following European directives:

2014/35/EU	DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits (recast)
2014/30/EU	DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast)
2001/95/EC	General Product Safety Directive (Device run on 5V DC)

The product properties are in compliance with the following harmonized standards:

EN 60335-1:2012/A13:2017	Household and similar electrical appliances - Safety Part 1: General requirements (IEC 60335-1:2010 Modified)
EN 61000-6-3/4	Electromagnetic compatibility (EMC) – Part 6-3 and 4: Generic standards - Emission standard for equipment in residential environments and Generic standards - Emission standard for industrial environments.
EN 61000-6-1/2	Electromagnetic compatibility (EMC) – Part 6-1 and 2: Generic standards - Immunity standard for residential, commercial and light-industrial and Generic and Safety of machinery - General principles for design - Risk assessment and risk reduction

The product was CE marked (2021).

Date and place of issuance: 5.8.2021, Plzeň
Name and signature of authorized person: Dipl. Ing. Lukáš Svoboda, Ph.D.
Managing Director