MERAWEX Sp. z o.o.
Toruńska 8
44-122 Gliwice, Poland
+48 32 23 99 400
merawex@merawex.com.pl
http://www.merawex.com.pl

USER MANUAL

Emergency supply units for sound alarm systems

type

ZDSO400-ER2, ZDSO400-ER4

compliant with:
standards: EN-54-4:1997 + AC:1999 + A1:2002 + A2:2006
Certificate of constancy of performance 1438-CPR-0989
Declaration of performance DWU-MX-04

14.02.2024

WARNINGS

- **Before operating the equipment, please read these Operating Instructions carefully.**
- **Do not disassemble live equipment. Touching internal components risks electric shock or burns.**
- **Observe the basic rules of handling electrical equipment when repairing or replacing it:**
    1. **disconnect the mains power supply and make sure that it cannot be switched on accidentally;**
    2. **disconnect the battery bank, which poses a high energy risk, and make sure that its leads cannot be accidentally short-circuited (such a short-circuit risks fire or explosion);**
    3. **make sure that neighboring devices are not connected to the power supply voltage, and that touching them does not create a hazard.**
- **Protect the device from any objects or liquids entering it - risk of shock and damage to the device.**
- **Do not obstruct the ventilation openings - risks damaging the device.**
- **Ensure a free space of at least 8 cm on the sides of the device allowing its proper ventilation.**
- **The device must be powered from the mains with a protective ground terminal.**
- **The device may interfere with sensitive radio and television equipment placed nearby.**
- **Only authorized and trained personnel may operate the device.**
- **The device can be serviced only by the manufacturer's service department or specialized units authorized by the manufacturer.**

1. Technical description

1.1. Intended use

The emergency supplies are intended to be used as an emergency supply for voice alarm systems (VAS), providing them with the backup battery power for acoustic amplifiers and controllers and other VAS modules separately:

1. ZDSO400-ER2 for up to maximum 6 power amplifiers, operating with one or two battery banks.
2. ZDSO400-ER4 for up to maximum 12 power amplifiers, operating with one to four battery banks.

The emergency supplies mentioned above can also be used for cooperation with the smoke and heat control systems including systems located afar.

1.2. Construction and layout

Emergency supplies designed for installation in a typical 19” rack are assembled inside a metal cassette:

1. ZDSO400-ER2 in standard height of 1U,
2. ZDSO400-ER4 in standard height of 2U.

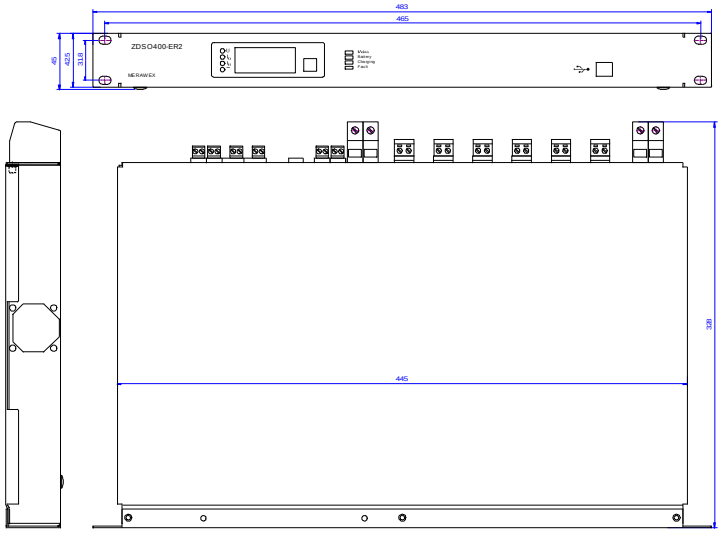

Fig.1. View and nominal dimensions of ZDSO400-ER2 emergency supplies

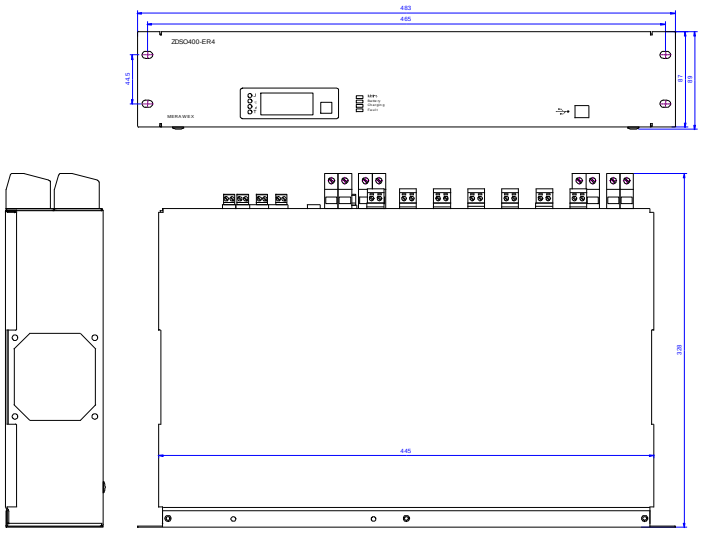

Fig.2. View and nominal dimensions of ZDSO400-ER4 emergency supplies

ZDSO400-ER2 emergency supply

SUPPLIED ACCESSORIES:

1. A temperature sensor;
2. Set of plugs for connecting VAS amplifiers (6 pcs. of the PC 5/2-ST-1-7 plugs);
3. Set of plugs for connecting VAS controllers and other VAS modules (2 pcs. of the MSTB2,5/2-ST plugs);
4. Set of plugs for connecting external signalling inputs (2 pcs. of the MSTB2,5/2-ST plugs).
5. Set of plugs for connecting remote signalling outputs (3 pcs. of the MSTB2,5/3-ST plugs).
6. Plug for connecting 24V power supply for VAS controllers (MC 1.5/4-ST3.81 type) – only for optional version with 48V/24V converter.
7. Ferrite core, toroidal, insulated, dimensions: 22x13.7x6.3 F830 (6 pcs.).

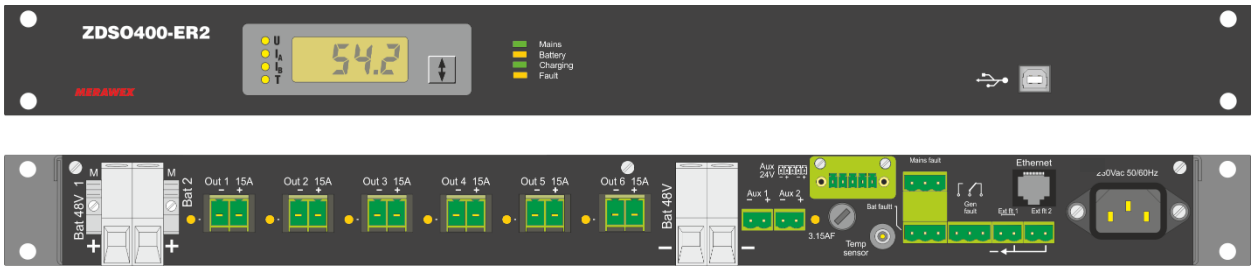

Fig.3. View of the front and back panel of the **ZDSO400-ER2** emergency supply unit**.**

Front panel of emergency supply contains digital display, USB port and 4 LED indicators:

1. **MAINS** (green)
2. **BATTERY** (yellow)
3. **CHARGING** (green)
4. **FAULT** (yellow)

The back panel contains:

1. A male IEC socket for connecting the mains cable (**230Vac 50-60Hz).**
2. Four screw connectors for connecting two 48 V battery banks (**BAT1, BAT2**) and two neighbouring connectors of the circuit equalising voltages of the battery banks **M** (voltage balancer).
3. A socket for connecting the temperature sensor (**TEMP SENSOR**).
4. Two input sockets for external fault indication (**EXT. FAULT 1** and **EXT. FAULT 2**).
5. Three output sockets of relay indication system (**MAINS FAULT**, **BATTERY FAULT** and **GENERAL FAULT**).
6. 6 sockets for connecting VAS 48V amplifiers (from **OUT1** to **OUT6**). They can also be used for connecting the smoke and heat control system devices.
7. A double socket for connecting the network controller and other VAS modules designed to work with 48V power supply (**AUX1** and **AUX2**). They can also be used for connecting the smoke and heat control system devices.
8. A double socket for connecting the network controller and other VAS modules designed for work with 24V power supply (**AUXILIARY OUTPUT 24V**) –optional.
9. **Ethernet** connector (option).

ZDSO400-ER4 emergency supply

SUPPLIED ACCESSORIES:

1. A temperature sensor;
2. Set of plugs for connecting VAS amplifiers (12 pcs. of the PC 5/2-ST-1-7 plugs);
3. Set of plugs for connecting VAS controllers and other VAS modules (4 pcs. of the MSTB2,5/2-ST plugs);
4. Set of plugs for connecting external signalling inputs (2 pcs. of the MSTB2,5/2-ST plugs).
5. Set of plugs for connecting remote signalling outputs (3 pcs. of the MSTB2,5/3-ST plugs).

6. Plug for connecting 24V power supply for VAS controllers (MC 1.5/4-ST3.81 type) – only for optional version with 48V/24V converter
7. Ferrite core, toroidal, insulated, dimensions: 22x13.7x6.3 F830 (12 pcs.).

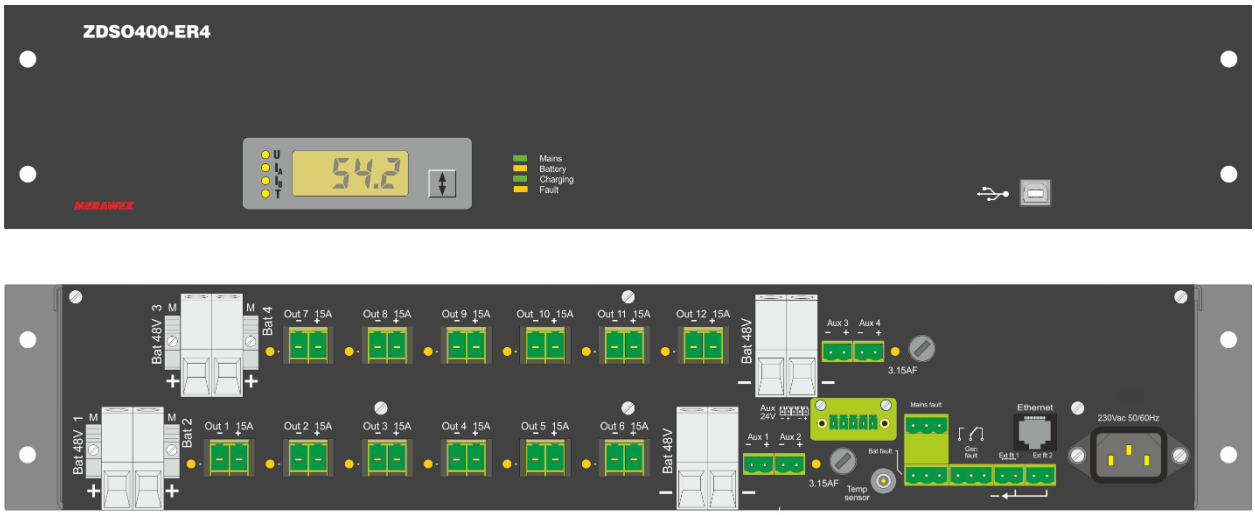

Fig. 4. View of the front and back panel of the **ZDSO400-ER4** emergency supply unit

A digital display panel and USB port together with 4 LED indication diodes are installed in the front panel of the emergency supply unit:

1. **MAINS** (green)
2. **BATTERY** (yellow)
3. **CHARGING** (green)
4. **FAULT** (yellow)

The back panel contains:

1. A male IEC socket for connecting the mains cable (**230Vac 50-60Hz).**
2. Eight screw connectors for connecting four 48 V battery banks (**BAT1, BAT2, BAT3, BAT4**) and four neighbouring connectors of a circuit equalising voltages of battery banks **M** (voltage balancer).
3. A socket for connecting the temperature sensor (**TEMP SENSOR**).
4. Two input sockets for external fault indication (**EXT. FAULT 1** and **EXT. FAULT 2**),
5. Three output sockets of relay indication system (**MAINS FAULT**, **BAT FAULT** and **GEN FAULT**).
6. 12 sockets for connecting VAS 24V amplifiers (from **OUT1** to **OUT12**). They can also be used for connecting the smoke and heat system devices.
7. Two double sockets for connecting the network controller and other VAS modules designed to work with 48V power supply (**AUX1** and **AUX2**). They can also be used for connecting the smoke and heat system devices.
8. A double socket for connecting the network controller and other VAS modules designed for work with 24V power supply (**AUXILIARY OUTPUT 24V**) –optional.
9. **Ethernet** connector (option).

1.3. Basic electrical parameters

Table 1

	ZDSO400-ER2	ZDSO400-ER4
Nominal mains voltage	230V +10% -15% 50 / 60Hz	
Power factor	0.94	
Efficiency (while charging the battery)	84%	
Output voltage stabilisation	0.5%	
Leakage current in the protective cable	<1.5mA	<3mA
Maximum current consumption from the mains	2.7A	5.4A
Nominal voltage of the external battery bank	48V	48V
Nominal voltage of the floating mode operation at 25°C	54.2V	54.2V
Nominal voltage of the bulk charging mode operation at 25°C	56.6V	56.6V

Temperature compensation factor of the floating mode operation and bulk charging	- 96mV/ºC	- 96mV/ºC
Maximum capacity of connected battery banks	160Ah *2) *4) *5)	320Ah *2) *4) *5)
Maximum number of battery banks	2	4
Maximum charging current	8A	16A
Maximum resistance of battery circuit *1)	100mΩ	100mΩ
Nominal load of outputs for VAS amplifiers	6 x 15A	12 x 15A
Nominal load of output for network controller and other VAS modules	1x3A	2x3A
Consumption from the battery for emergency supply own use	< 250mA	< 400mA
Current consumption from the batteries after LVD disconnection	< 2.5mA	< 5mA
Range of output voltage *3)	40.0…57.6V	40.0…57.6V
Maximum current which the emergency supply unit can take from a single battery bank when the main power supply is cut off or disconnected [A]	93A	93A
Maximum current consumed from all battery strings (banks) in the case of the fire alarm [A]	93A	186A

*1) *Guaranteed value of battery bank circuit resistance, at which the fault indication system is switched on for each battery string separately.*

*2) *The given capacities of the batteries include current consumption $I_{max.a}$ from the additional 48V outputs for the VAS controller: 1A for ZDSO400-ER2, 2A for ZDSO400-ER4; Dependency of maximum battery capacity on output current is shown in Table 2, par. 1.4.*

*3) *The listed range includes voltage values between the voltage of a discharged battery bank (at the end of the battery mode cycle) and the value of the bulk charging mode voltage, including temperature compensation.*

*4) *The following User Manual does not include the description of the battery selection and calculating its capacity.*

*5) ***In one 48V battery bank** *(separately each in system)* ***the battery of the same capacity and type must be used**. When you need to replace a battery, please, replace their whole set.*
***Batteries with various capacities could be used in various banks** (e.g. four pcs. 105Ah as 1st bank 48V and four pcs. 150Ah as 2nd 48V bank) but the battery must have the same voltage parameters (in charging mode, floating mode, temperature compensation, discharging/disconnect mode). It is secured when batteries in one bank come from **the same producer and are of the same type and capacity**.*

1.4. Dependency of maximum battery capacity on output current

Increasing the load current decreases the current available to charge battery, which lowers the maximum capacity of battery banks according to following table.

Table 2

Current value possible for continuos powering the loads *1) $I_{max\ a}$	Maximum capacity of connected battery banks	
	ZDSO400-ER2	ZDSO400-ER4
0	185 Ah	370 Ah
1 A	**160** Ah	345 Ah
2 A	135 Ah	**320** Ah
3 A	110 Ah	295 Ah

*1) *Total maximum current sourced from all outputs for VAS modules*

*Highlighted by **Boldface font** are the currents and corresponding capacities mentioned in Table 1 and remark *2) under it.*

1.5. Recommended working conditions

Relative humidity	max. 80%
Direct sunlight exposure	avoid
Surges during operation	avoid
Ambient temperature	
▪ Limits of acceptable storage temperature	-40…+85°C
▪ Working temperature – class **3K5** according to **EN 60721-3-3**	-5…+45°C

2. Operation principle

The microprocessor controller checks the presence of the mains power, battery state, state of external alarms inputs and a number of internal parameters (e.g. acceptable time of the bulk charging). If an improper operation of the device is detected, a fault indication is generated. This operational state is signalled by corresponding diodes, lighting up in the front panel, and by three remote indication relays

accessible in the back panel. When no fault indications present relays are in ON state; fault indication causes switching relays OFF.

The emergency supply circuit is based on a direct floating mode system. The emergency supply, supplied from the mains, is connected in parallel with an external battery bank. When power failure occurs, emergency supply switches over to battery mode w/o interruption.

Figs. 5a. and 5b. below presents block diagrams of both emergency supplies.

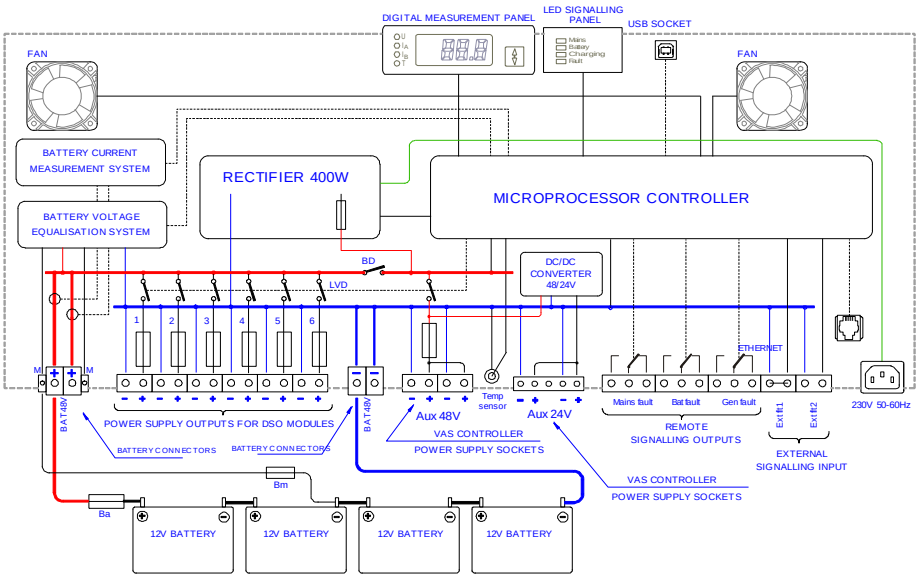

Fig.5a Block diagram of ZDSO400-ER2 emergency supply.

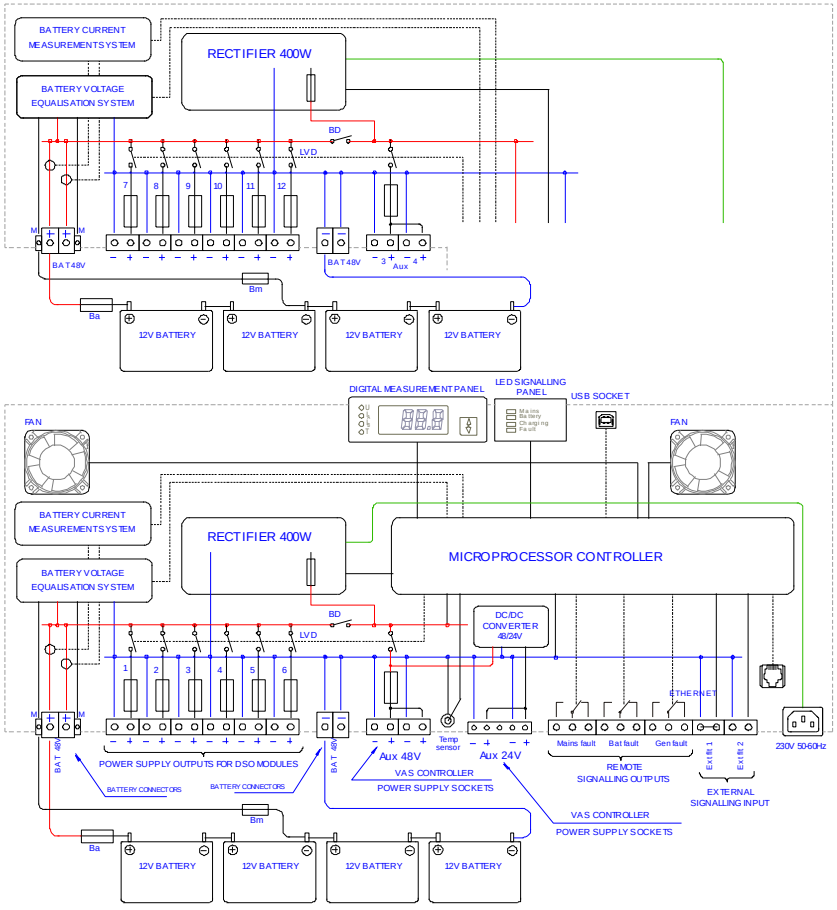

Fig.5b Block diagram of ZDSO400-ER4 emergency supply.

When the mains present, the emergency supply maintains the external battery banks in their fully charged state. Emergency supply's operation is controlled by the microprocessor controller, which independently supervises the batteries, maintaining the floating mode voltage in them (depending on ambient temperature, if the external temperature sensor has been connected). This sensor should be located near the battery. If the sensor is absent, the controller maintains voltage corresponding to the ambient temperature of 25°C.

In case of power failure, the loads connected to the emergency supply in immediate uninterruptible way switch over to battery bank – this is the battery mode. As the mains power supply returns and the battery bank charging current is above a set point, the emergency supply proceeds to the bulk charging mode.
This mode is characterised by charging with the limited current at the increased voltage. The end of the bulk charging is after the preset charging voltage has been reached, after that the emergency supply continues charging in floating mode. If the battery bank is faulty, the bulk charging is interrupted after exceeding the preset maximum, charging time or permissible ambient temperature of the battery bank, additionally corresponding faults are signalled.

Emergency supplies ZDSO400-ER2 and ZDSO400-ER4 are equipped with a LVD – an internal switch of deep discharge. LVD disconnects the outputs from the battery banks when the batteries reach the final voltage, thus preventing them from further discharging and being destroyed.
The second BD disconnector (Battery Disconnector) ensures powering continuity for additional outputs from the rectifier in the case of short circuit of the battery terminals of the charger.

Measurement of battery circuit resistance is an additional function of the controller. The resistance measurement takes place only in the floating mode operation. When result of measurement increases caused by an increase of internal battery resistance or by an increase of battery auxiliary circuit resistance, indication about reaching high battery circuit resistance will be sent (See page 11). If the battery bank gets disconnected, the controller detects a significant increase of battery circuit resistance and indicates a device configuration error.

The emergency supply is equipped with a function of voltage equalisation between batteries of each battery bank. Voltage equalisation takes place as a result of loading the half of batteries which exhibit higher voltage, with a small current, of 100mA. It starts if the voltage difference exceeds 0.1V.
The use of voltage equalising circuit requires an additional connection between the M terminal of a given battery string and the median point of the battery string. Faulty M terminal connection (to an inappropriate terminal of any battery), does not impact operation of emergency supply, just fault indication will appear. Missing M connection is automatically detected and will switch off the voltage equalising system.

The controller of the ZDSO400-ER2 and ZDSO400-ER4 emergency supplies is continuously checking the state of fuses in the outputs for amplifiers and the fuse(s) in the output for the VAS controller. If any of them is broken a fault signal will be generated (the signalling lights on the front panel of the emergency supply unit will switch ON and the remote signalling goes to OFF state). In addition yellow LED indicator located near the faulted fuse is lit.

When the emergency supply unit is switched on, load at the outputs for VAS amplifiers is checked. No current consumption from them is required. If any of the amplifiers has e.g. its own power supply switched off (or faulty), which results in an attempt of switching it on using output voltage of the emergency supply unit, such the state shall be detected and the relay present at this output shall not switch on. Additionally, fault shall be signalled. Relays present at the other outputs shall simply switch on, supplying voltage to workable amplifiers.

During the emergency supply start, the only permitted current consumption is one from the output for the VAS controller. This load, however, decreases the current provided for battery bank charging.

The circuit of the ZDSO400-ER2 or ZDSO400-ER4 is optionally equipped with a DC/DC converter of the output voltage of 24V and the load current up to 5A. The controllers and other VAS modules designed for 24V can be powered from its double output which is available on the back panel. The converter has been equipped with an electronic overload protection – that is why the output located on the back panel has no corresponding fuse.

3. Installation and connection

3.1. Installation

The emergency supply has a form of a cassette offering the IP20 ingress protection, intended for installation in a typical 19” rack using four mounting holes located in the front panel (Fig. 1, 2).

The rack dedicated to the Voice Alarm Systems must have IP30 ingress protection.

To install the emergency supplies in the rack you need to use guide rails. Guide rails supporting the emergency supply cassette should be installed in such a way as not to impede the flow of air to the fans located on the both sides of the cassette. The 8 cm ventilation space is required on both sides of the case.

ATTENTION:

1. **The power supply is not equipped with its own circuit breaker, so it is required to use an installation circuit breaker with overcurrent and short-circuit protection function in the power supply circuits in the 19" rack, such as type S301 C10A.**

2. **(2) The electrical system should be made in the form of a permanent installation equipped with a surge protection system with class B and C protectors. In the 19" rack, it is recommended to use a class D protector.Connection**

3.2.1 Connecting emergency supply to the mains

Connecting the emergency supply to the mains should be implemented by using a 3-wire cable of the 1.5 mm^2 cross-section with increased immunity to fire exposure, together with fixation accessories capable to withstand the fire condition (DIN 4102:12), equipped with the IEC plug.

3.2.2 Load connection

The ZDSO400-ER2 and ZDSO400-ER4 emergency supplies are intended to connect the VAS amplifier modules supplied with the 48V voltage and the network controllers and other VAS modules supplied with 48V or 24V.

The sockets located in the back panel allow connection of single amplifiers with power up to 500W, and current consumption up to 30A, using 2 pin connectors.

Amplifiers operating at higher power (maximum 1000W) should be simultaneously connected to two outputs of the emergency supply unit 30A (total current to 60A).

If the main amplifier is equipped with its spare amplifier present in the VAS system, it is possible to connect both amplifiers to the common emergency supply output (or two outputs for high power amplifiers). However, this connection should be made outside connectors of the emergency supply units.

Plugs for output connection are supplied with the emergency supply unit. Maximum cross-section of the connected wires is 6 mm^2 in the case of outputs provided for amplifiers and 2.5 mm^2 for the 24V emergency supply output providing emergency supply for the VAS controllers and other VAS modules*.

If you use amplifiers, when the mains power connected, they introduce capacity over 47uF on their DC power inputs. Due to that, it is required to use the separating ferrite cores mounted close to the output socket plugs according to the Fig. 6.

Fig. 6. Mounting the ferrite cores on the DC cables to the amplifiers

The ZDSO400-ER2 emergency supply is equipped with two outputs for VAS controllers, and the ZDSO400-ER4 power supply unit has four such outputs. If the VAS system requires a higher number of controllers and modules, corresponding splitting should be implemented outside the power supply unit, adding in each branch external fuse.

* The pairs of the output cables for powering the amplifiers should be passed through the ferrite core delivered with the power supply – according to the Fig. 6.

3.2.3 Connecting battery bank

SAFETY NOTES:

1. **the external battery pack poses a high risk due to the high level of energy stored in it.**
2. **Since the power supply is not equipped with a fuse for the battery battery circuit, a suitable fuse should be installed near the positive terminal of the battery. The fuse should be installed after the battery connections are made, and the fuse should be turned off first when disconnecting the battery. It is permissible to install the fuse in the path connecting the two batteries between each other.**
3. **Before connecting the batteries (similarly when disconnecting the batteries), check whether any of the terminals are not connected in the power supply or in the 19" cabinet to ground. If so, connect this pole last (when disconnecting batteries, disconnect this pole first).**
4. **Reverse connection of the battery terminals in relation to the description on the connector poses a high risk to the operator, and can cause serious damage to both the power supply itself and the attached external devices.**

NOTE: Batteries should be fully charged before installation.

The power supplies are adapted for cooperation with VRLA-AGM battery banks.

The connection of the battery bank should be made with cables with a maximum cross-section of 16mm2 to the terminals on the rear panel of the PSU marked BAT with special attention paid to their polarity. Reverse connection of battery cables can cause serious damage to both the power supply itself and attached external devices.

Positive terminal poles, marked with numbers, make it possible to distinguish a given battery string, as each is supervised separately. The negative poles are shorted to each other.

NOTE: the maximum wiring resistance of the battery and fuse circuit should not exceed 8mΩ.

M outputs of the voltage equalization system should be connected to the center of the corresponding battery string with 0.75mm2 wires. It is required to protect this connection near the battery with its own 0.5...2AF fuse.

3.2.4 Connecting external fault indication system

The emergency supply is equipped with two inputs for connecting external fault indication systems, their sockets are located in the back panel. Corresponding plugs are supplied with the emergency supply. One of the plugs has a factory pre-installed jumper and it has to be placed in the alarm socket

EXT. FAULT 1, even if this input is not used. This input reacts to the open circuit on pins and generates fault signal. It remains idle only when pins are short circuited.

The second input **EXT. FAULT 2** is activated by short-circuiting its pins.

External fault indication systems should be connected using two wire cables accepted for use in fire detection equipment 1x2x0.8 type (with the cross-section 0.8 mm^2).

3.2.5 Remote indication output

Outputs of remote relay indication are 3-pin sockets. The emergency supply unit is supplied with 3-pin plugs. You can use the normally connected (NC) or normally open (NO) contacts of the internal indication relays. Remote indication circuits should be connected by using two wire cables accepted for use in fire detection equipment 1x2x0.8 type (with the cross-section 0.8 mm^2).

3.2.6 Connecting temperature sensor

The external temperature sensor supplied with the emergency supply unit should be connected to the dedicated socket (**Temp sensor**). The sensor should be placed in a direct proximity of the battery bank, **if possible, between the walls of two adjacent batteries.**

4. First Start

4.1. The initial information

The first start of the VAS system including the ZDSO400-ER2 or ZDSO400-ER4 and connected batteries should be done by qualified service personnel of the Manufacturer or the properly trained authorized personnel.

The tests during the first start of the system are necessary to ensure safe and reliable operation – both from the mains and battery backup power.

At the first start, you should check the system completeness and all VAS modules for their compliance with the electrical specifications of the object in which the system is to operate. The check should also include the correctness of connections as well as the battery connected and the indication circuits.

ATTENTION:

1. The values of the battery circuits' resistance ensuring the correct VAS system operation depend on two factors:
    a) battery capacity
    b) current during the fire alarm
2. The factory preset parameters of the battery circuits' resistance can be changed during the first start.

To order the appropriate computer application (par.5.4), please contact the manufacturer of power supplies.

The emergency supply, at the start, stores in its memory information on to which inputs the batteries have been connected. The check is carried out by automatic measurement of the resistance of each individual battery circuit. It is assumed the battery is connected if the measured resistance is lower than 2Ω. The resistance measurements of the battery circuits are conducted periodically and on this basis the battery configuration change can be detected. The detected change is indicated by fault indication and corresponding error code. The configuration change can be accepted in the PC software or by the next start of the device.

If the emergency supply is started without the batteries connected, it will indicate the configuration fault for each of them. In this state, the outputs of the uninterruptible emergency supply for the amplifiers are not connected and the only output connected is the additional output for the VAS controller. In such the case, you need to connect a battery (one or several ones) and cancel the fault indication to have the configuration accepted by the device and start the normal operation.

At the start, the device restores the recently saved operation parameters. The change of these parameters is possible via PC software through the USB or the Ethernet connection (if available) to computer network and by use of any internet browser.

After the successful start of the system, please, perform the following tests of the devices' operation described below.

4.2. Maximum resistance of battery bank circuit

As far as the indication of the impermissible increase of the battery bank circuits resistance is concerned, we can differentiate two types of resistance:

- initial resistance corresponding to the battery circuit resistance (including the battery itself) after making the connections (cables, terminals and fuses)
- permissible battery circuit resistance increase (e.g. due to aging process); its exceeding will trigger the fault circuit indication.

The sum of the initial resistance and the permissible battery circuit resistance increase is indicated in the emergency supply CPR certificate and it cannot be higher than 100mΩ.

Table 3 The resistance values have been listed in the table below.

Resistance value / Resistance categories	**Minimum value**	**Default value (150Ah-160Ah)**	**Maximum value**
	mΩ	**mΩ**	mΩ
Initial resistance	5	25	50
Permissible resistance increase	5	25	50
Total resistance	**10**	50	100

Serially produced ZDSO400-ERx emergency supplies are supplied with the preset values as above to secure correct operation of battery banks resistance measurement circuits with batteries up to 160Ah.
In the case of using lower capacity batteries (e.g.: 65Ah, 100Ah), it is possible to change the default set values into the ones mentioned below:

Table 4

Capacity of battery in a specific bank	**Maximum value of measured string resistance** (acceptable)	**Suggested value to enter as initial resistance** (you can also accept measured value)	**Suggested value to enter as permissible resistance increase**
150-160Ah	max 30 mΩ	25mΩ (default value)	25 mΩ (default value)
100Ah	max 34 mΩ	30 mΩ	30 mΩ
65Ah	max 40 mΩ	35 mΩ	40 mΩ
40Ah	max 46 mΩ	40 mΩ	50 mΩ

Changing preset resistance values for battery banks is possible (please, see the point 5.4).

Readings of initial resistance for individual battery strings can differ from each other - due to the fact that the initial resistance value is affected by such factors as a type and condition of used batteries, a type of fuses used and way and quality of the cabling of the whole battery string (please, see the point 3.2.3).
Please remember – batteries with different capacities aren't recommended.

The parameters of individual battery strings are saved in the parameters of the emergency supply. If the parameters of the battery cabling and battery capacity are different than the factory settings, these parameters should be set to the emergency supply by means of the PC software (see the point 5.4).

In special cases, it is acceptable to use batteries of various capacities in various battery banks, but you can enter only one resistance increase value, common for all battery banks!

If during the installation settings have not been changed, the factory presets remain**.**

For emergency supplies with firmware 01.10 and later, in programing application MERA3 (see par 5.4) battery configuration panel, exists a bookmark "**Battery" used for battery circuit parameters configuration.**

It is mandatory to use it for emergency supplies with firmware 01.10 and later, during first start up, because input of right information about all battery strings configuration is influencing the accuracy of resistance measurement for them. Necessary parameters to enter are (in brackets default values):

- battery capacity (160Ah),
- length of connecting cables (5.4m) including "+","-" and interconnecting link
- their cross-section (25mm^2)
- type and rating of fuses used (DO3-100A).

More details could be found in manual of MERA3 application – see par. 5.4.

4.3. Checking the ability to maintain the output voltage

Please, disconnect the mains. The emergency supply should start operating in the battery operation mode supplying voltage to its all outputs for powering the VAS modules. Check the voltage presence and value by a voltmeter.

In this state, the **MAINS** LED on the front panel of the ZDSO400-ER2 or ZDSO400-ER4 should be off and the **FLT** LED should be on.
The both relays of **MAINS FLT** and **GENERAL FLT** should enter the idle mode (the position of contacts should follow the picture near the connector). The state of the relays can be checked by an ohmmeter.

During the check, the connected VAS modules should function normally.

4.4. Checking battery circuits high resistance indication

When ZDSO400-ER2 or ZDSO400-ER4 is powered from the mains, you should break the circuits of each of the battery strings one after another – by disconnecting or respective disconnect breaker if exist in the circuit.
This is the simulation of an extreme growth of resistance of the battery circuit. The state should be detected during the next test. It can last from 5 do 900s, typically 70s (the default value of the measuring period). Similarly, after cancelling the break, the generated alarm will be cancelled automatically but after the next successful test – after the analogical period of time.
ZDSO400-ER2 or ZDSO400-ER4 emergency supply should notice and indicate it by switching the **FLT** LED ON and changing state of relays **BATTERY FLT** and **GENERAL FLT** to OFF mode (the contacts position following the picture close to the connector).
During the above test, the connected VAS modules should operate normally.

4.5. Sequence for start operation

Suggested sequence of switching on devices in the VAS system:

1. All devices should be switched off (all AMPs and ZDSO400-ERx)
2. Connect batteries (all strings) to the unit
3. Switch on the mains (230Vac) - for all AMPs and ZDSO400-ERx
4. Wait 60s
5. AMPs DC supply inputs should be connected (48Vdc) to outputs of ZDSO400-ERx
6. Connect the PC and via proper software (see point 5.4) enter the initial resistance and the allowable increase in resistance (for systems with batteries with capacity lower than 150 Ah) in accordance with paragraph 4.2. For emergency supplies with firmware 01.10 and later, it is mandatory to enter via MERA3 application also all parameters, describing each battery circuit during first start-up.
7. Check the operation and signaling with disconnected mains power - in accordance with paragraph 4.3
8. Check work and signaling with detachable battery strings sequentially in accordance with paragraph 4.4

5. Operation

5.1. General information

Output voltages and signalling thresholds are preset as factory default values. Emergency supplies after installing require supervision by the service team as some emergency states may occur during the operation of the device.

5.2. Operation safety

The emergency supply unit is a Class I device according to the standard EN 62368-1:2014 + A11:2017, designed for connecting to a permanent, one-phase installation using an earthing cable, according to the HD 60364-4-41:2007 Standard *Electric installations at construction sites.*
The metal case of the power supply units is connected to a protective terminal (PE). The circuits used for connecting the battery, remote indication outputs and remote indication inputs are separated from the power supply circuits and from the case.

The contacts of the remote indication relays are completely separated (galvanically isolated) from all other circuits (including the output circuits).

Inputs of external fault indications are referred to the potential of negative pole of the battery bank.

The EMI filters used in the ZDSO400-ER2 in ZDSO400-ER4 power supplies are equipped with the Y class capacitors causing the appearance of the leakage current in the protective conductor of maximum 1.5 mA in ZDSO400-ER2 and 3mA in ZDSO400-ER4.

5.3. Digital display

Emergency supplies allow digital measurements of basic operation parameters of the system: actual voltage of the supervised battery bank (**U**), its charging or discharging current ($\mathbf{I_B}$), current consumed by the VAS controllers from the 48V emergency supply ($\mathbf{I_A}$) and ambient temperature (**T**), if the temperature sensor has been connected. Actual measurement type (selected by using the vertical arrow button) is distinguished by a LED diode with the corresponding marking. In addition, one can read the error code detected by the

emergency supply unit controller (then all diodes indicating type of measurement are switched off). This position is active only then, when an operation error has been detected in the system and the fault indication has been activated. A list of active errors is accessible by using the vertical arrow button (faulty operation may cause several errors).

Long pressing the arrow button allows measurement of actual operation parameters, starting with the **U**.

5.4. Digital communication

The front panel of the emergency supply unit is equipped with a **USB** communication socket used routinely for servicing. This output is galvanically insulated from all other circuits of the emergency supply unit. The PC software allows performing diagnostic works, making possible checking numerous operation parameters of the emergency supply and modifying its default settings. PC software (MERA3 application) and user manual are available on the manufacturer's website.
Optionally, the emergency supply may be equipped with an Ethernet interface, enabling operation within a TCP/IP network. It has two simple service servers implemented:

- http server for presentation of the current system state as web pages accessible by a web browser;
- ModbusTCP protocol server enabling device control and supervision.

Detailed information can be obtained from the manufacturer.

5.5. Signalling operation state

The emergency supply is equipped with LED, sound and remote indication. The LED indication is used for bringing attention of the personnel to the operation state of the device and to inform about the reason of a potential malfunction. The sound indication system goes together with the LED indication.

Fault indication is maintained as active until it is deactivated by using the vertical arrow push-button located in the display panel. Short press of the button switches OFF the sound indication, while keeping the LED and remote indication systems active. These remaining indications can be deactivated by pressing and holding the vertical arrow button for over 5 seconds. However, it is effective only when the reason triggering the indication has disappeared. The indication systems are reset automatically only when the mains power is restored and external signals at the **EXT. FAULT 1** and **EXT. FAULT 2** inputs are no longer detected. In the case of the power failure, instead of a continuous sound signal, a short, intermittent signal is generated every 15 seconds.

The LED indication comprises four LED diodes located on the front panel of the emergency supply. Three diodes represent current operation modes (**MAINS** - green, **BATTERY** - yellow, **CHARGING** - green), and the fourth diode represents fault (**FAULT** - yellow**)**.

The remote indication system includes three sockets denoted **MAINS FAULT**, **BATTERY FAULT** and **GENERAL FAULT**. Each of the sockets has three pins, switchable by relays, electrically separated from all other circuits. During normal operation of the emergency supply unit, relays are in ON state. It means that indication of Mains Fault (power failure), Battery Fault and General Fault are executed by **switching off** the corresponding relay.

The contacts position in this state (so called zero-voltage state) is shown next to each socket.

List of states of the LEDs and remote indication system is presented in the tables below.

Table 5 LED indication system in the front panel.

DESCRIPTION	COLOUR	STATE	EVENT DESCRIPTION
MAINS	green	on	Normal operation state when the mains present.
		off	No mains or rectifier fault.
BATTERY	yellow	on	Battery operation (no mains or rectifier fault).
		off	Normal operation state when the mains present.
CHARGING	green	blinking	Bulk charging.
		on	Charging during floating mode (after the bulk charging has finished).
		off	Charging has finished.
FAULT	yellow	on	Fault occurred within the emergency supply unit or external fault. Please read the error code from the display in order to determine the reason.
		blinking	External fault indication at **EXT. FAULT 1** or **EXT. FAULT 2** input. ***).**

) If together with the external fault indication an internal fault occurs, the **FAULT LED will be on continuously*

Table 6 LED indication system in the back panel.

DESCRIPTION	COLOUR	STATE	EVENT DESCRIPTION
From **Out 1** to **Out 12**	yellow	on	Fault of output fuse.
		blinking	Current flows out from the output (the indication is activated only before the outputs are switched on).
		off	Output switched on.
AUX	yellow	on	Fault of fuse(s) of additional outputs
		off	Output switched on.

Table 7 Relay indication system.

DESCRIPTION	STATE	EVENT DESCRIPTION
MAINS FAULT	on	Normal operation state at the mains present.
	off	No mains or rectifier fault.
BATTERY FAULT	on	Correct battery operation.
	off	High resistance of battery circuit or battery voltage below a preset level (battery discharged).
GENERAL FAULT	on	No fault.
	off	Fault inside the emergency supply or external fault.

5.6. Maintenance

The device does not require any specific maintenance operations to be performed. Please take care to maintain clean and tidy area around the emergency supply during normal operation.

6. Servicing

6.1. Fuses

Fuses are easily accessible for the service team. Their parameters are specified in the table below.
Table 8

Protected circuit in the emergency supply		
	Fuse type and value of ZDSO400-ER2	Fuse type and value ZDSO400-ER4
Amplifiers outputs – accessible after cover has been dismounted (Fig. 11 - #2)	6 x 16AF (6,3x32mm)	12 x 16AF (6,3x32mm)
Additional output 48V (Fig. 11 - #1)	1 x 3.15AF (6.3x32mm)	2 x 3.15AF (6.3x32mm)

Caution: If fuse replacement requires the cover to be removed, it can be done only after disconnecting the mains and the battery bank.

The VAS system personnel can only exchange the fuses mentioned above. If other fuses used inside the emergency supply unit are broken, a repair performed by qualified service personnel is required.

Fig. 11. below presents location of the fuses inside the emergency supplies

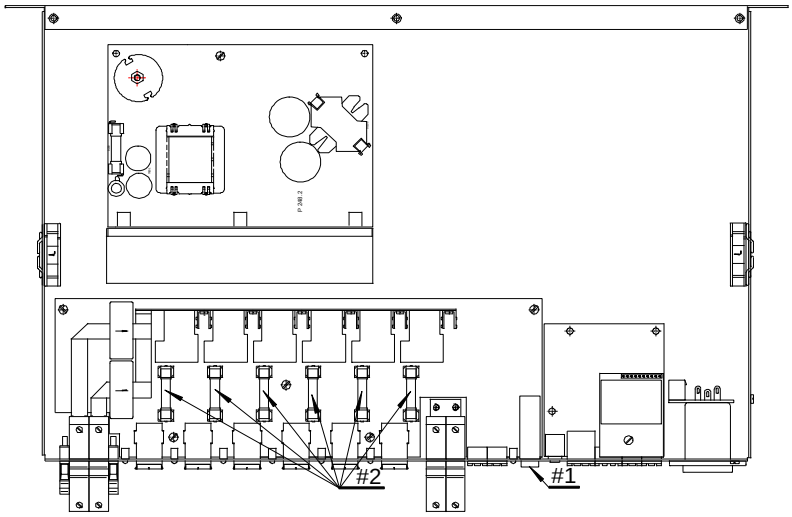

Fig. 11. Location of fuses inside the emergency supply units

ATTENTION:
The ZDSO400-ER4 emergency supply with height 2U on Fig. 12. has two sets of sockets and fuse holders – the upper and lower one. To access the upper set of fuses, the screws that fix the upper shield (A), should be unscrewed. To access the lower set of fuses, also the screws (B) needs to be unscrewed and the upper set of fuses and sockets needs to be raised.

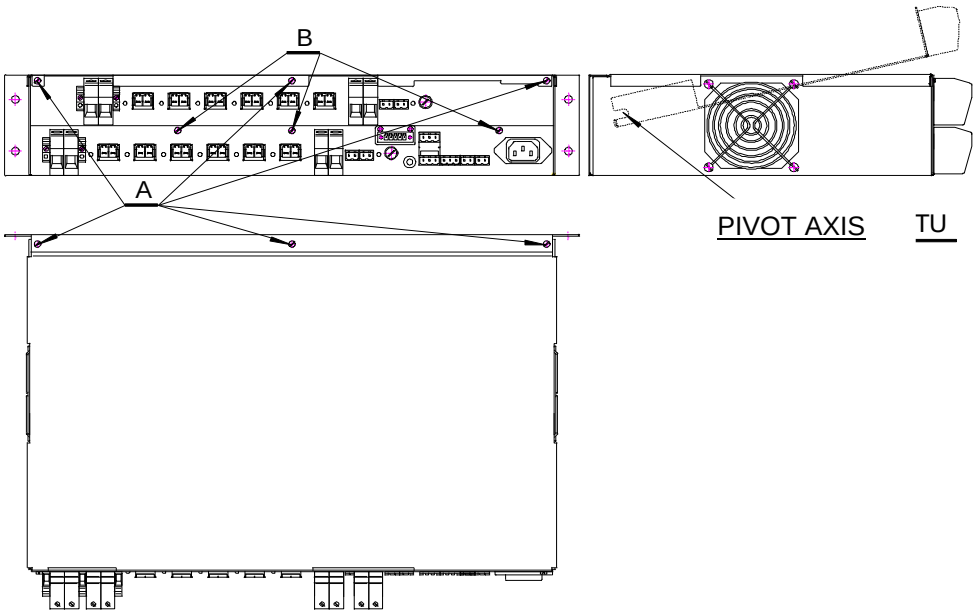

Fig.12. Access to the fuses in the 2U emergency supply version

6.2. Detecting faults and troubleshooting

Most cases of malfunctions which can occur during device operation are indicated and handled by the microprocessor installed in the device. The ZDSO400-ER2 is equipped with 7 fuses (or 14 in the ZDSO400-ER4 emergency supply with 2U height). They can be replaced by qualified service personnel. These are fuses of output circuits – for powering the amplifiers, VAS controllers or the smoke and heat control system devices.

The outputs fuses may be faulty as a result of short-circuit of device outputs. The fuses in output for VAS controller are accessible directly on the rear panels of the emergency supplies. Replacement of fuses in outputs of amplifiers requires the access described in the point 6.1.

Warranty and after-warranty repairs should be performed by service of the manufacturer or by an authorised service partner of the manufacturer.

7. Additional information

7.1. Remarks of the manufacturer

The manufacturer reserves the right to introduce design and technology changes to the product, without diminishing its quality.

7.2. List of indicated error codes

Below is shown a list of codes accessible to the user, which could be read on the digital display. It is possible only then, when the system has detected a fault and the fault indication has been activated.

Codes denoted with the letter E indicate fault or error caused by an external factor. The letter P indicates an internal cause within the emergency supply.

Table 9 List of error codes

Description	Code
Output(s) not disconnected (*by internal relays*)	P01
Output(s) loaded (*during system start*)	E02
Output(s) not connected (*because output loaded during start*)	P03
Outputs (OUT 1-6 or 1-12) fuse fault	E04
AUX1,2 fuse fault	E05
AUX3,4 fuse fault	E06
External fault 1 *) (*unshorted input*)	E07
External fault 2 *) (*short circuit on this input*)	E08
Rectifier-1 fault	P09
Rectifier-2 fault (only in ZDSO400-ER4)	P10
Power failure *)	E11
Voltage on output of emergency supply below 90% of a nominal floating value	E12
High battery voltage (higher than value set as parameters)	E13
Low battery voltage (lower than value set as parameters)	E14
Outputs disconnection (*voltage below LVD parameter*)	E15
---- not in this type of PS ---	P16
Maximum bulk charging time exceeded	E17
Maximum bulk charging temperature exceeded	E18
Low battery temperature	E19
High battery temperature	E20
High device temperature (internal)	E21
- not used -	E22
- not used -	E23
Voltage regulation error	P24
Permissible resistance level for battery series 1 exceeded	E25
Permissible resistance level for battery series 2 exceeded	E26
Permissible resistance level for battery series 3 exceeded	E27
Permissible resistance level for battery series 4 exceeded	E28
Battery 1 configuration error **)	E29
Battery 2 configuration error **)	E30
Battery 3 configuration error **)	E31
Battery 4 configuration error **)	E32
Internal fault - output block 1	P33
Internal fault - output block 2 (only in ZDSO400-ER4)	P34
Measurement/configuration error of the battery temperature sensor	E35
Internal temperature measurement error	P36
Overcurrent of battery 1 connector	E37
Overcurrent of battery 2 connector	E38
Overcurrent of battery 3 connector	E39
Overcurrent of battery 4 connector	E40
Battery 1 balancer system fault	P41
Battery 2 balancer system fault	P42
Battery 3 balancer system fault	P43
Battery 4 balancer system fault	P44
Battery 1 fault (or an improper balancer connection)	E45
Battery 2 fault (or an improper balancer connection)	E46
Battery 3 fault (or an improper balancer connection)	E47
Battery 4 fault (or an improper balancer connection)	E48

*) *Fault without latched indication – disappears independently when the fault reason ceased. Other faults require manual reset, which can be not efficient if the failure cause has not ceased.*

**) *Battery has been disconnected or connected during operation (after the system start)*

7.3. Handling of packaging, used products and batteries

The packaging of the product is made of non-hazardous materials (wood, paper, cardboard, plastic), which can be recycled.

Unnecessary packaging should be handed over to the recipient of waste after sorting.

The used product is non-hazardous waste, which should not be thrown into the general municipal waste container, but should be handed over to the local recipient of waste electrical and electronic equipment.

Proper handling of waste electrical equipment and will contribute to avoiding harmful impacts on human health and the environment resulting from improper storage and processing of such equipment.

7.4. CE marking

CE 1438
MERAWEX Sp. z o.o. - Toruńska 8, 44-122 Gliwice, Poland 13 1438-CPR-0989
EN 54-4:1997 + AC:1999 + A1:2002 + A2:2006 Zasilacz do Dźwiękowych Systemów Ostrzegawczych / Power supply for Voice Alarm Systems ZDSO400-ER2, ZDSO400-ER4 DWU / DoP **:** DWU-MX-04 Inne dane techniczne / Other technical data : patrz Instrukcja obsługi / see operational manual