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USER MANUAL

Power supply for Voice Alarm Systems (VAS)

type

ZDSO-230V

complies with EN 54-4

Certificate of constancy of performance No. 1438-CPR-1052

Declaration of performance DWU-MX-23

01.10.2024

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Warnings

- Before operating the device, please read this manual carefully.
- Do not touch the internal components of the working device - risk of shock or burns.
- Protect the device from penetration of any objects or liquids - risk of shock and damage to the device.
- Do not obstruct the vents - risk damaging the device.
- The device must be supplied from the power grid with a protective ground terminal.
- The device may interfere with sensitive radio and television equipment placed nearby.
- Pay special attention to the connection of the battery terminals; reverse connection of the battery terminals will damage the power supply.
- The device can only be serviced by the manufacturer's service department or specialized units authorized by the manufacturer.
- The device is designed to work with external high-capacity battery banks. Particular attention should be paid to the dangers of their weight and the possibility of fire or explosion in case of short-circuiting the battery leads.

1. General description and purpose

ZDSO-230V power supplies are designed for use in voice alarming systems (VAS). They act as a charger and supervisor for external battery banks of 48V guaranteed voltage, in accordance with EN 54-4. Their primary function is to provide backup power to all elements of the VAS in the event of a main power outage from the power grid.

The 5U high power supply enclosure is designed to be mounted in a typical 19" rack and allows for operation with four battery banks. The power supplies are available in four power versions shown in the table below:

	ZDSO-230V-3000	**ZDSO-230V-6000**	**ZDSO-230V-9000**	**ZDSO-230V-12000**
Output power	3kVA	6kVA	9kVA	12kVA

Along with the power supply is provided:

- Four 1.5m long temperature probes with their own plugs;
- A set of 2 plugs for connecting relay signaling outputs;
- A connector for connecting the input of an external fault indication with a factory-applied jumper;
- Plug for the battery voltage equalization system (the so-called balancer).

For a detailed description of the plugs, see sec. 7.3

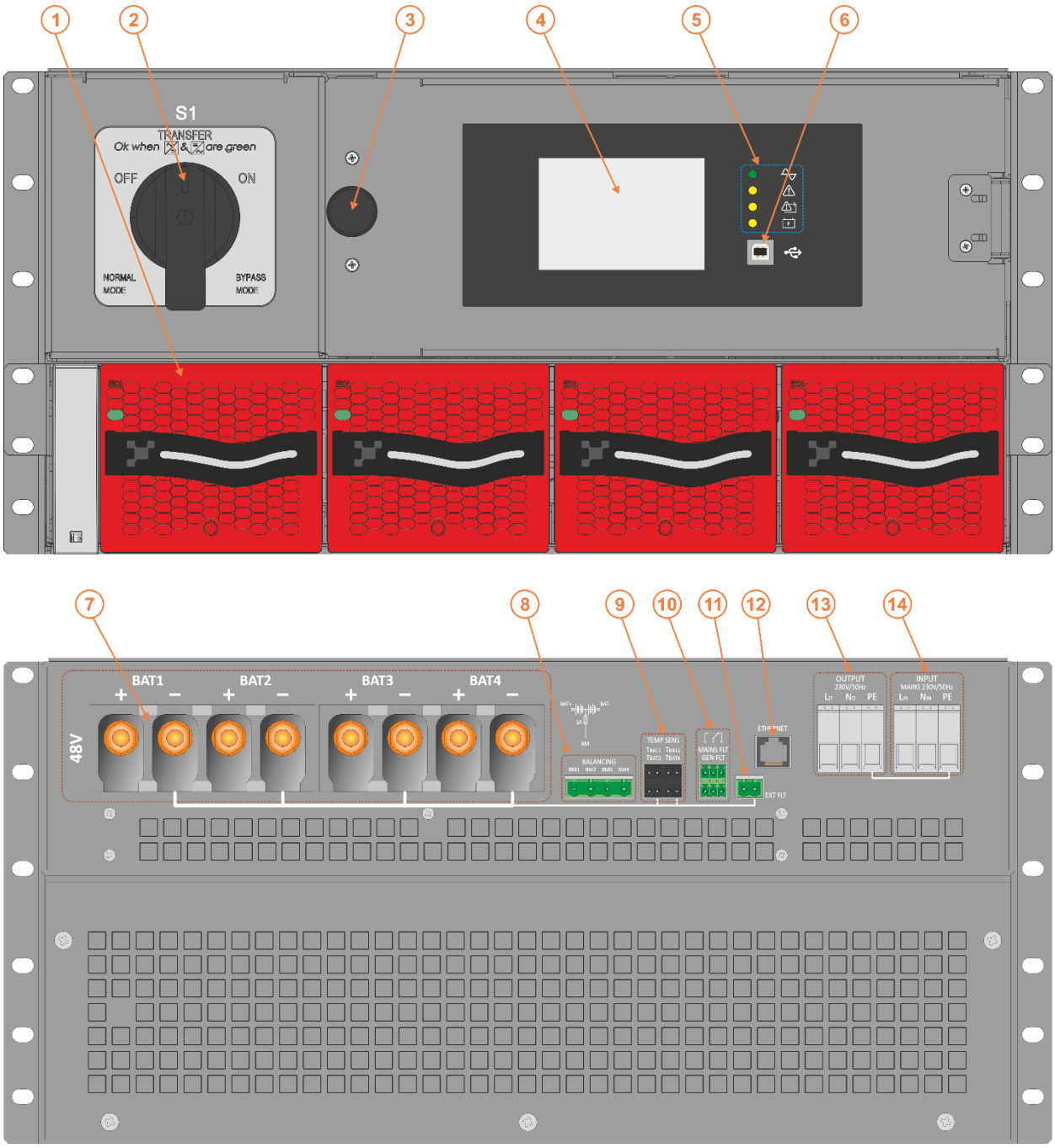


Fig.1. View of the front and rear panel of the ZDSO-230V PSU

The front panel of the power supplies features a set of 4 LED indicator lights, an LCD touchscreen display and a USB digital communication connector socket (type B).

The individual indicator LEDs have designations:

	Mains	green		**Batt Fault**	yellow
	Fault	yellow		**Charging**	yellow

1.1. Power supply components

The most important components found in the power supply are collected in the table below.

Designation	Function
1	Converter modules (1...4pcs depending on version)
2	Power supply mode switch
3	Lock knob for access to internal power supply security features
4	LCD touchscreen display for ongoing monitoring and configuration of the power supply
5	LED indicator assembly
6	USB connector (type B) for power supply configuration from PC application
7	M8 pin terminals for connecting the battery bank.
8	Balancer circuit connector
9	Four sockets for connecting temperature probes.
10	Two relay signaling outputs with available changeover contacts.
11	External fault signal input.
12	Ethernet connector socket (optional).
13	230V guaranteed voltage output$_{AC}$
14	230V mains power input$_{AC}$

A detailed description of operating status signaling regarding both the power supply and converters is provided in Section. 8.4.

2. Electrical parameters

A summary of basic electrical parameters is provided in the table below.

Basic electrical parameters

	ZDSO-230V-			
	3000	**6000**	**9000**	**12000**
Mains power supply				
Nominal supply voltage	230V 50/60Hz			
Supply voltage range *1)	184...253V			
Nominal supply current	11.8A	23.6A	35.4A	47.2A
Maximum supply current	14.0A	28.0A	42.0A	56.0A
Power factor	PF ≥ 0.98			
Leakage current in the protective conductor at 240V	≤ 45mA			
AC output parameters				
Nominal output **Out** voltage	230V$_{AC}$ ±5%			
Nominal output **Out** current	10.4A	20.8A	31.3A	41.7A
Nominal output **Out** power	2.4kW	4.8kW	7.2kW	9.6kW
Output voltage frequency	50 / 0.03%			
Overload	125% (15 seconds)			
Cooperation with batteries				
Rated battery voltage	48V			
Maximum number of battery strings	4			
Floating operating voltage at 25°C	54.24V (2.26V/cell).			
Bulk charging voltage at 25°C	56.64V (2.36V/cell).			
Disconnection voltage of a discharged battery	42.0V (1.75V/cell).			
Temperature coefficient of battery voltages	-80mV/°C			
Maximum total capacity of external battery bank	1080 Ah	1200 Ah	1200 Ah	1200 Ah
Maximum charging current *2)	50 A			
Max. resistance of a single battery circuit *3)	max 100 mΩ			

Max. load current of a single battery bank	120A			
Max. battery load current (total)	200A			
Battery power consumption for the power supply's own needs				
	1.5A	2.8A	4.1A	5.4A
– with RGR attached – after RGR disconnection	<10 mA			
Other				
Relay signaling outputs – galvanic isolation – available contacts – load capacity	yes NO, NC 60V/1A at resistance load			
Fault signal input – galvanic isolation *4) – load – resistance to external voltage	not +5V/1.5mA +100V/-1V			

**1) The available output power (2400W/converter) is limited at supplies below 195V and drops linearly to 2200W/converter for 184V$_{AC}$.*

**2) The specific value depends on the selected capacity of the battery bank (see section 6.4).*

**3) The specific value in the specified range can be determined from either the program or the display panel*

**4) The input is connected to the negative voltage rail of the power supply battery.*

Voltage resistance of circuits

Network circuits – output circuits *) – chassis	 4200Vdc 2800Vdc
Output circuits (48V outputs, battery bank) – chassis	 710Vdc
Relay signaling circuits – output circuits – chassis	 710Vdc 710Vdc
Ethernet digital communication circuits (if used) – output circuits – chassis	 2100Vdc 2100Vdc

**) The figure given is the insulation strength level and not the voltage test level between the indicated circuits. Such a test can only be performed under special conditions and not on a complete, assembled product.*

Attention.

The USB digital communication connector is galvanically connected to the PSU chassis (the PE line of the mains power supply) and at the same time is isolated from the other circuits of the PSU.

Compliance with standards

Electrical safety	EN 62368-1:2020 + A11:2020 class I
Functionality	EN 54-4:1997 + AC:1999 + A1:2002 + A2:2006
EMC immunity	EN 50130-4:2012 + A1:2015
EMC emissions	EN IEC 61000-3-2:2019 + A1:2021 EN 61000-3-3:2013+A1:2019+A2:2022 EN IEC 61000-6-3:2021

The power supply complies with the requirements of Regulation (EU) No. 305/2011 of the European Parliament and of the Council of March 9, 2011. (CPR Construction Products Regulation).

3. Mechanical and environmental parameters

The ZDSO-230V power supply has a metal enclosure in the form of a cassette designed for installation in a typical 19" cabinet. Meeting the requirements of the EN 54-4 standard requires that the cabinet in which the VAS system is installed has a protection level of at least IP30.

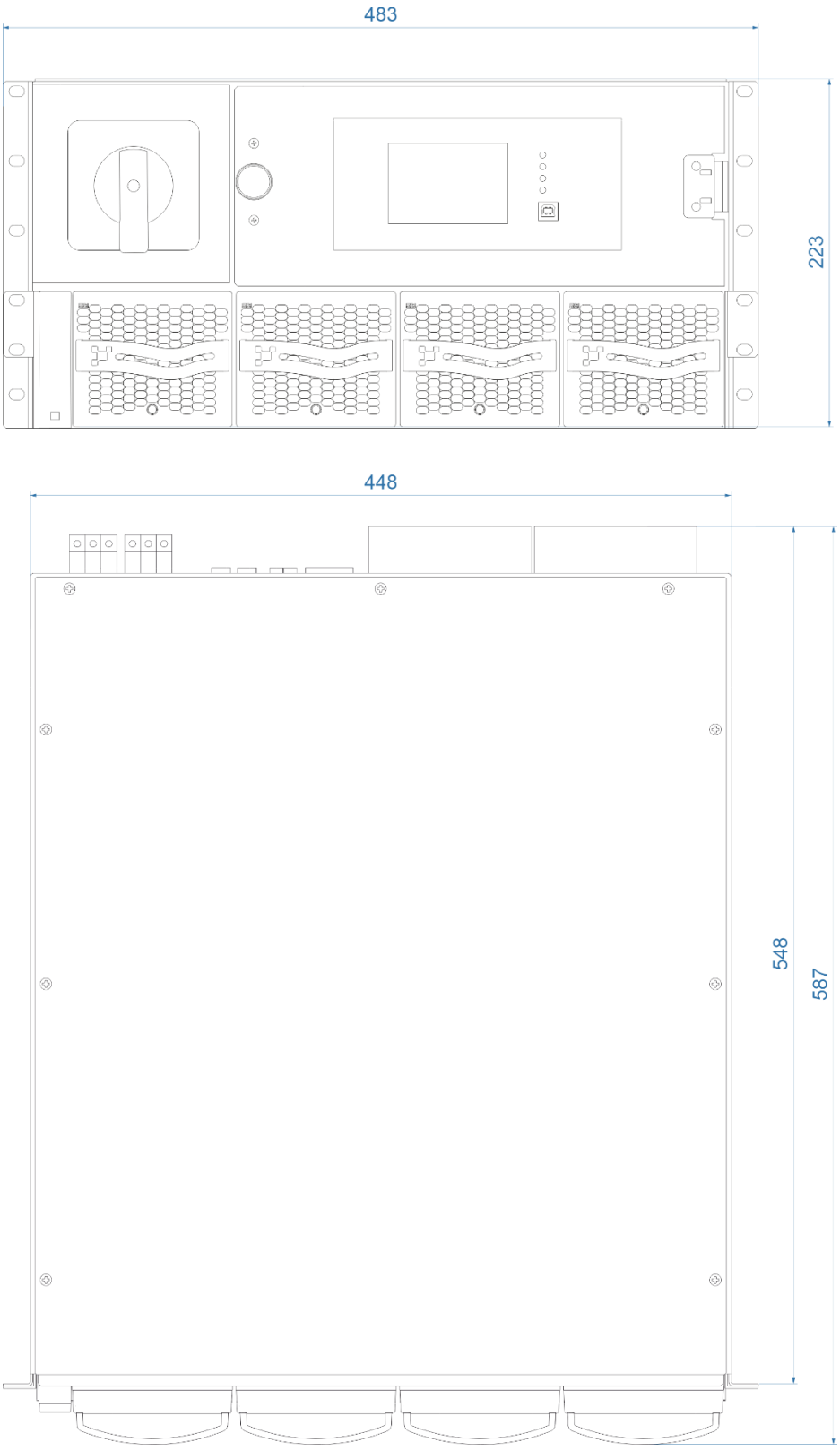


Fig.2. View and overall dimensions of the ZDSO-230V power supply.

Mechanical and environmental parameters

Mechanical parameters	
Overall dimensions (W x H x D)	483(19") × 223(5U) × 587mm
Depth of the cabinet rack (including connectors)	548 mm
Degree of protection	IP20

Mass	30kg	35kg	40kg	45kg
Environmental parameters				
Operating temperature range (class 3K5 according to EN 60721-3-3)	-5...45°C			
Cooling	internal, forced			
Storage temperature	-40...70°C			
Relative humidity	5...85%			
Direct insolation	unacceptable			
Strokes during operation	unacceptable			

4. Description of operation

A simplified schematic of the power supply is shown below in Fig.3.

The power supply system is based on converter modules (AC/DC/AC converters) with the ability to work with an attached battery bank. When mains power is present, the converters supply current to **the OUT** output and charge the battery at the same time, and when mains power is lost, the load is automatically taken over by the battery.

Protection of the battery bank from deep discharge is provided by an **LVD** disconnect switch. If the battery is not connected or its terminals are short-circuited, the voltage at the **OUT** output is maintained continuously (at the current mains voltage). This is a requirement of the EN 54-4 standard.

There are overcurrent protections at the input and output of the PSU and in the battery circuit, which are located inside the PSU and are accessible to the operator after opening the bezel located at the front of the PSU (item 3 Fig.1)

ZDSO-230V power supplies are equipped with several circuits for measuring current: at each battery output and in each converter. This makes it possible to recognize disconnection or damage to the battery causing uneven current distribution between batteries. It is also possible to activate an alarm indicating such a condition.

Two more special sub-systems are used in the power supply system: the RMS unit for measuring the resistance of each battery circuit (this is a requirement of the EN 54-4 standard) and the **BATTERY BALANCER** system for equalizing the voltages between battery banks. The latter is an optional accessory, designed to extend the life of the batteries by preventing the appearance of excessive voltage differences between the batteries. Its use is optional.

It is required to use an **F BAL** fuse near the battery on each output to protect the connection wire in case of insulation damage and accidental short circuit.

Attention.

It is imperative that the system uses an **F BAT** battery fuse located near the positive terminal of the battery bank to protect the battery and its connections from the effects of a short circuit. The size of the fuse should depend on the maximum current load that can occur in the system.

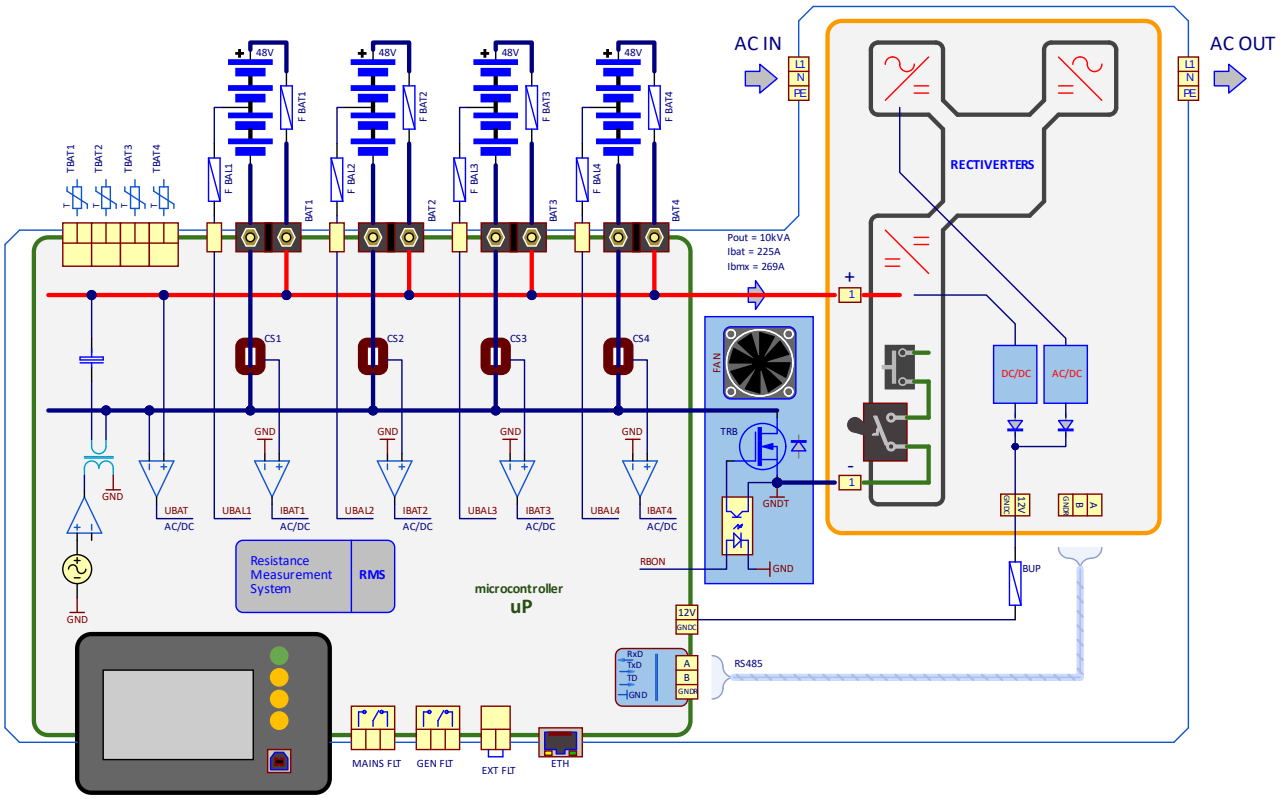


Fig.3. Simplified diagram of the ZDSO-230V power supply.

The operation of the entire ZDSO-230V power supply is managed by a microprocessor controller **mP**. Its basic tasks include:

- Perform internal measurements of voltages and currents, including mains voltage, necessary for the operation of the power supply;
- Controlling rectifiers (**CONVERTER**) to ensure proper charging and operating conditions of battery banks;
- Temperature measurement of all battery banks;
- controlling **fault** signaling relays (**Mains fault** and **Gen** fault) and accepting an external fault signal (**Ext fault**);
- LED indication control on the front panel of the power supply;
- control of the battery circuit resistance measurement system (**RMS**), the battery voltage equalization system (**BATTERY BALANCER**) and the power supply interior cooling fan (**FAN**);
- support for digital communication via a USB link on the front panel of the power supply and an optional **ETHERNET** link on the rear panel.

5. Battery operation. Operating modes.

5.1. Floating mode, battery charging.

Floating operation is a type of operation in which the converters are powered from the power grid, simultaneously supplying power to the loads and charging the batteries. The controller regulates the converters in such a way as to maintain the preset voltage specific to the battery type on the batteries after charging. If in the system, after a temporary mains power outage and partial discharge of the battery, the charging current is maintained at a sufficiently high level, the so-called bulk charging will be activated. This is charging with an increased end of charge voltage.

Bulk charging is terminated under normal conditions when the current drawn by the battery falls below a set level. Termination of charging can also occur in emergency situations: when the preset permissible charging time is exceeded, when the battery temperature exceeds the permissible level, or when the battery cannot be monitored (e.g. the temperature probe is disconnected).

If at least one temperature probe is connected, both the floating operation voltage and the bulk charging voltage are temperature dependent.

In the absence of temperature measurement, the floating voltage appropriate for operation at 25°C is maintained and bulk charging is not triggered.

To ensure proper operation of the power supply with the battery and to meet the requirements of the EN 54-4 standard, the appropriate maximum charging current should be set depending on the battery capacity used, required to operate a specific VAS.

The parameters for floating operation as well as bulk charging can be set in the power supply using the user interface or a special PC application for operating the power supply.

5.2. Test supervised battery discharge.

Optionally, you can enable the function of periodically discharging the batteries to check their condition. If the batteries have not been discharged or recharged for a certain period of time counted in days, the converters will switch to battery charging. This state lasts for the set time or until the voltage on the batteries drops by the set value, which is signaled by a battery test error. During this test a constant power is drawn from the batteries proportional to the set charging current.

5.3. Battery operation.

Battery operation takes place in the event of a mains power outage, when the converters supplying power to the loads draw current from the battery bank. When the battery is discharged to a predetermined level, the controller disconnects the battery, which protects it from too deep a discharge. Return to normal operation is possible after the return of mains power.

6. Selection of rechargeable batteries.

6.1. Required battery capacity of rechargeable batteries.

This is the capacity specific to the VAS, determined based on its design, the required backup time and the nature of operation (how the VAS broadcasts messages). It also takes into account the aging of the battery bank. Its calculation is beyond the scope of this manual.

6.2. Maximum battery capacity according to EN 54-4 standard

The load on the **OUTPUT** output limits the available charging current of the battery bank and, consequently, its capacity. This is due to the requirements of the EN 54-4 standard, which imposes a specific time of 24 hours to charge the battery bank to 80% of its nominal capacity. The power drawn from the **OUTPUT** is the power available during charging and is referred to by this standard as Pmax_a.

The EN 54-4 standard also defines the Pmax_b load as the maximum short-term power that can be drawn when battery charging is not required. For the ZDSO-230V power supply, these will be the maximum powers that can be drawn from the **OUTPUT**, i.e. 2.4kW, 4.8kW, 7.2kW and 9.6kW for a power supply with one, two, three and four converters, respectively (see section 2.).

In order to protect the battery from too high charging current, which could lead to early battery wear, the ZDSO-230V power supply allows you to limit it by selecting the maximum charging current in the menu available on the graphic display of the power supply. The selected value indicates the maximum total charging current (the sum of the charging currents of all battery strings).

The available power from the **OUTPUT** Pmax_a is directly related to the battery capacity used. This is shown in the graph below:

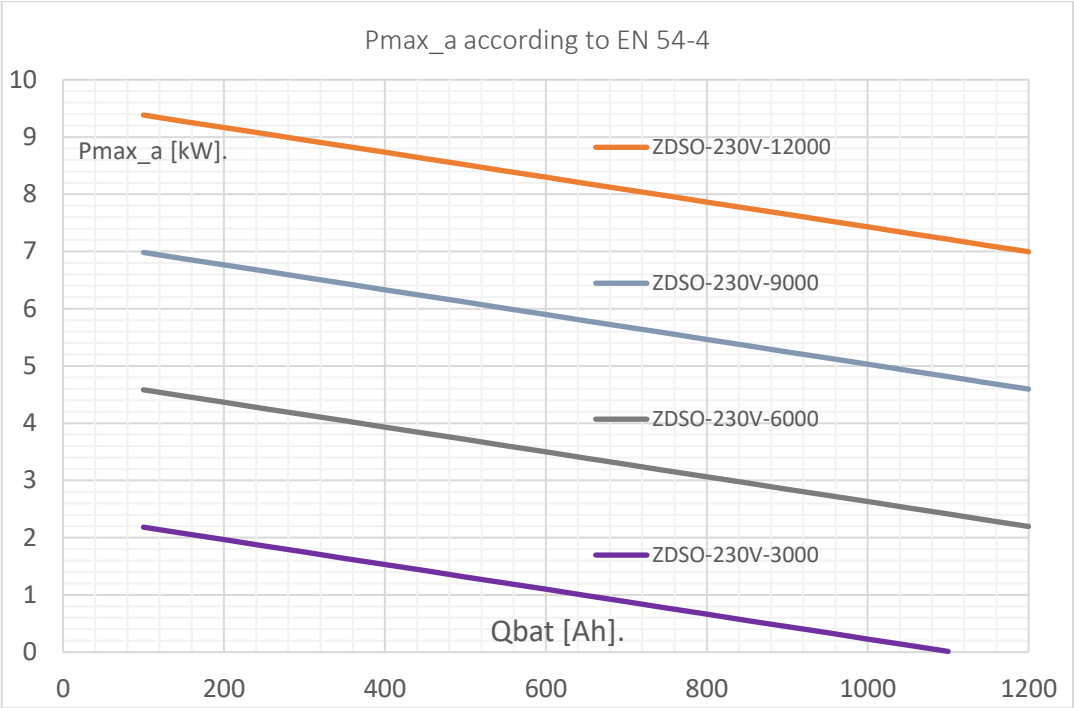


Fig.4. Maximum power that can be drawn from the **OUTPUT** (Pmax_a) at a given battery capacity batteries.

6.3. Maximum load of the battery bank in the VAS system.

The required capacity of the battery bank in the VAS system is determined by balancing the two types of loads with their durations:

- power drawn from the battery bank continuously to supply power to control devices or those providing communication in the VAS - standby, and
- power drawn from battery banks by audio power amplifiers, in the absence of mains power during a fire alarm - alarm condition.
  The load level can reach several hundred amps (~200A for full load). The actual magnitude, in addition to the number and type of devices used in a given VAS system, also depends on the nature of the alarming method used: the level and duration of continuous signals and voice messages, and the intervals between them.

The durations of individual loads can vary, depending on the fire scenario adopted. Typical values are the current during 30 hours of supervision (battery operation, without mains power, but still before the alarm) and the alarm time of 30 min, along with its power at -3dB (i.e. 50%) of the maximum power of audio amplifiers in the VAS.

Calculation of the required capacity of the battery bank, due to the large number and variety of components, is beyond the scope of this manual. However, in any situation, the manufacturer of ZDSO-230V power supplies is available to help with these calculations.

6.4. Set the size of the battery charging current.

The battery charging current can be set in the corresponding display menu window located on the front panel of the device. For a detailed description of the user-accessible menu, see sec. 9

The following table indicates the value of charging current to be set depending on the total installed capacity of the battery bank (regardless of the number of battery strings used).

Q_B [Ah]	100	200	300	400	500	600	700	800	900	1000	1100	1200
I_B [A]	4	8	12	16	20	24	28	32	36	40	44	48

Attention.

Cooperating battery packs must be of the same type, of the same capacity and in the same state (degree of charge).

6.5. Battery circuit resistance measurement.

The ZDSO-230V power supply, due to the requirements of the EN 54-4 standard, has a system for measuring the resistance of the battery circuit, that is, both the battery itself and other elements included in this circuit and located outside the power supply. These include fuses, connection wires, screw terminals, etc. Resistance measurement is not performed during battery operation and in situations when the battery is charging.

The set value should be related to both the resistance of the battery banks used (this one is based on the capacity of the battery) and the way it is connected (the length and cross-section of the connection wires and the battery fuse used). However, the resistance value must not be set too high, because during a possible fire alarm, the consumption of a very large current from the battery bank by the converters, may cause on the assumed resistance of the battery path too large a drop in the supply voltage - below the permissible minimum battery voltage for proper operation of the converters.

7. Installation and connection

7.1. Assembly

The power supply cassette is designed for mounting in a typical 19" rack. The use of guides supporting the cassette is required. Do not obscure the ventilation holes located on the front of the converters. Provide at least 10 cm ventilation clearance from the rack door.

The faceplate of the cassette should be screwed to the rack of the cabinet with at least four M6 screws.

In order for a cabinet with a VAS system installed to meet the requirements of EN 54-4, it is sufficient for it to have an IP30 degree of protection.

Attention.

The selection of conductors in power supply and control systems for fire protection devices should take into account the provisions of §187 of the Regulation of the Minister of Infrastructure of March 12, 2009 (Journal of Laws No. 56 item 461, as amended) on the technical conditions to be met by buildings and their location, as amended.

7.2. Fuses

The device is equipped with internal protections on both the $230V_{AC}$ (inputs and outputs) and constant-voltage (battery) sides. These protections can be accessed by turning the knob located on the front of the device and tilting the LCD display board (see Fig.5).

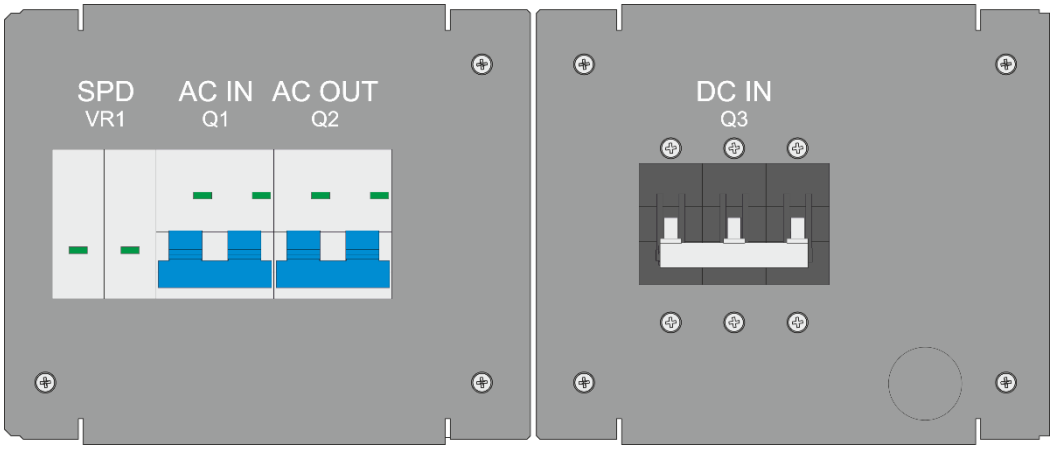


Fig.5 Security view.

7.3. Connecting

The following table lists the connectors used in the ZDSO-230V power supply, along with their maximum load capacity and maximum cable cross sections.

Overview of ZDSO-230V power supply connectors

Output type	Connector / plug type	View	Quantity
Mains power supply **INPUT, OUTPUT**	HDFK10 16mm^2 76A		
Battery **BAT1, BAT2, BAT3, BAT4**	Pin connector 50mm^2 200A		
M outputs of the voltage equalization system	GMSTB 2.5/4-ST-7.62 1.5mm^2		1 pc.
Relay signaling outputs **Gen fault** and **Mains fault**	FMC 1.5/3-ST-3.81 1.5mm^2		2 pcs.
Ext fault external **fault** indication input	MSTB 2.5/2-ST-5.08 1.5mm^2		1 pc.
Temperature probe input **Temp sensor**	FMC 1.5/2-ST-3.81 *1)		4 pcs.

**1) Plug factory installed on the temperature probe cable. A custom design of the temperature probe can be ordered from the power supply manufacturer (see section 8.8.2.).*

7.4. Connection of the power grid

Use a 3-core 16mm cable to connect the power supply inside the VAS system cabinet^2 .

The necessary installation should be made in the form of a permanent installation equipped with a suitable C63A overcurrent protection and surge protection system installed outside the power supply cassette. The application of a specific surge protection solution depends on the conditions of both the power system used and the equipment working in it. This is a task for a specialist who, based on EN 62305 and HD 60364 standards, will propose a specific solution. Effective protection will be a multi-stage system covering the entire VAS system, not just the power supply.

7.5. Connection of VAS system elements

Guaranteed Voltage **Output** is designed to connect elements of the VAS. The connection should be made with a 3-core 16mm^2 wire . It is recommended to use a suitable strip outside the power supply cassette allowing to make the required connections.

7.6. Connecting a battery bank

The connection of the battery should be made with wires with an appropriate cross-section for the expected load. It is required to use wires with crimped eye lugs having an 8mm opening. The maximum width of the tip must not exceed 20mm.

Attention.

ZDSO-230V power supplies use a battery connector equipped with pin terminals, with M8 thread, made of brass. The wire with a ring terminal should be screwed on with a torque of 4...5Nm to ensure proper electrical contact. Do not exceed 6Nm due to the possibility of breaking the clamp. This will ensure adequate pressure and at the same time will not lead to the pin breaking.

All bolted connections must be made solidly. Connections should be as short as possible. The two wires connecting the battery and the power supply should be run close to each other (in parallel) so that they do not create unnecessary inductive loops that can cause damage to the VAS power system in case of short circuits in the power supply circuits.

By design, a circuit for measuring the resistance of a battery circuit should serve to detect a damaged or worn battery whose resistance has clearly increased. Thus, the resistances of a working battery can be related to the resistances of the connections. The dominant role should be played by the battery and not by other components in the circuit. We recommend that you assume that the resistance of the connections (their length is double the distance between the battery and the power supply) should be at most equal to the resistance of a single 12V battery. The corresponding diagram is shown below in Fig.6.

Example.

The circuit uses a 150Ah battery 1.5m away from the power supply (the length of the battery connections is 3m). Since the resistance of the 12V 150Ah battery is 3.5mΩ, the resistance of the connections should be less than 3.5mΩ. This condition is met by a cable with a cross section of 25mm² , 35mm² or 50mm .²

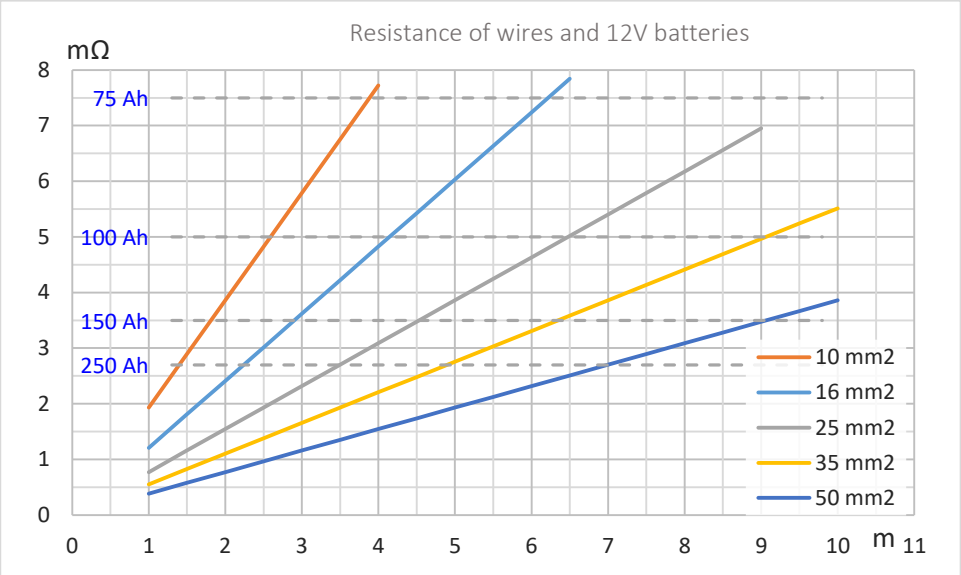


Figure 6. Resistances of wires of different lengths and a given cross-section against typical resistances of 12V batteries.

For the purpose of fault signaling in the form of exceeding the permissible increase in the resistance of battery circuits, two types of resistance are distinguished:

- initial resistance (R_{INIT}) corresponding to the resistance of the entire battery circuit (batteries, wires, terminals, fuses)

- the permissible increase in resistance (ΔR) of the battery circuit (e.g., as a result of aging), beyond which the fault indication of this circuit will be triggered.

The sum of the initial resistance and the allowable increment **(R_{BAT})** must not be greater than 100mΩ.

Resistance values are specified in the table below.

Resistance	Value minimum	**Default value for 150Ah**	Maximum value
	mΩ	**mΩ**	mΩ
Initial resistance - **R_{INIT}**	5	**25**	50
Increase in resistance - **ΔR**	5	**25**	50
Total resistance - **R_{BAT}**	10	**50**	100

Changing the values of the settings for the level of signaling of exceeding the resistance of the battery track is possible through the interface on the LCD display and PC software for configuration and supervision of the power supply.

After starting the device, read the measured resistance value of each battery string and compare the measured values with each other. The result of the measurement is affected by the resistance of the battery tracks, the fuse, the internal resistance of the battery and the resistances of the connections themselves. The initial resistance of each battery string should be between 15mΩ and about 40mΩ. Large discrepancies in resistance measurements between battery tracks may suggest that either battery is damaged or that the connections between them are not made correctly.

Important!

The set resistance refers to the resistance of each, single battery string.

The power supply is equipped with a single battery circuit fuse, common to all battery strings, located inside the unit behind the display module (this fuse can be accessed by tilting the display partition) and its design is based on a common positive rail. In addition, install appropriate fuses in the immediate vicinity of

the positive terminal of each battery string to protect against the effects of a possible short circuit (see Fig.3.).

Attention.

- Before connecting the battery terminals in the power supply, this fuse must be disconnected. Its connection should be preceded by a thorough check of polarity and quality of connections
- Pay special attention to the polarity of the battery to be connected and the battery terminals of the power supply. Reverse wiring can cause serious damage to the power supply.
- Note that on the unused terminals of the battery connectors during the operation of the device voltage appears from the batteries attached to the device, so it is necessary to protect these terminals from accidental short-circuiting by putting on the appropriate covers supplied with the device.

7.7. Connection of battery voltage equalization circuits (balancer).

The voltage equalization circuit socket located near the battery connector allows connecting the battery midpoint (the point where the two batteries in a given battery string are connected) with a special load circuit of the power supply. Its task is to equalize voltages between batteries connected in series.

The connection should be made with a 0.75...1mm cable^2 , at the end of which, near the battery bank, a 0.63A fast fuse is mounted (see Fig.3.). Its function is to protect the made connection from accidental short circuit, in case the wire slips out of the plug of the balancer connector or is damaged.

Connect the wires first to the plug and then to the battery center points. Incorrect connection of the wire, with any battery battery terminal is safe.

The use of a voltage equalization system is not mandatory. A suitable fuse holder can be ordered from the power supply manufacturer (see section 8.8.2).

7.8. Connecting an external fault signal

The active state of the fault signal input is the state in which both contacts of the **EXT FLT** connector are open. Therefore, in a situation where this input is not used, the connector supplied with the power supply should be placed in its socket with a jumper installed at the factory.

If the external fault signal is fed from outside the cabinet where the VAS components are mounted, this connection should be made with a pair of shielded cables. The shield of the cable should be attached to the grounded structure of the cabinet. Therefore, it is best to use an intermediate element in the cabinet, such as single-track connectors for the TS-35 rail with a grounding terminal. In this case, no special requirements are imposed on the cable between this intermediary element and the **EXT FLT** connector of the power supply.

It is recommended to use either isolated contacts of an external relay or an optocoupler to control the **EXT FLT** input. However, it is necessary to pay attention to the polarity and level of the electrical load brought by the input (see point 2.).

Attention.

One of the contacts of the **EXT FLT** connector is galvanically connected to the negative rail of the power supply and battery, (it has a special marking). It follows that all control circuits connected to it will also be connected to the negative rail of the power supply and battery.

7.9. Output of relay remote signaling

Relay remote signaling outputs are equipped with 3 field connectors providing all 3 relay contacts: NO, NC and C. They are galvanically isolated from the other circuits of the power supply.

If the remote signaling is taken outside the cabinet where the VAS system components are mounted, the connection of each output used should be made with a pair of shielded cables. The cable shield should be attached to the grounded structure of the cabinet. Therefore, it is best to use an intermediate element in the cabinet, such as single-track connectors for the TS-35 rail with a grounding terminal. In this case, no special requirements are imposed on the cable between this intermediary element and the relay output connectors of the power supply.

7.10. Temperature probe connection

Four identical temperature probes are supplied with the power supply to measure the temperature of the corresponding battery. It is recommended to attach the probe to the positive terminal of the battery attached to the positive terminal of the battery connector. The controller continuously compensates for the current voltage on the basis of the measured temperatures of the individual batteries and is able to detect an overheating battery string.

Damage to the temperature probe, including its disconnection, will cause the power supply to switch to 25°C-specific operation. Bulk charging will also not be triggered.

If the power supply is equipped with less than four battery strings, an additional probe can be used to measure, for example, the ambient temperature and does not directly affect the operation of the power supply. It is used to control the operating conditions of the VAS. It should be mounted in the upper part of the rack of the cabinet in a place not exposed to direct heat or air movement caused by fan operation.

The probes are equipped with their own plugs at the factory. Since an element with significant resistance has been used as a temperature sensor, if necessary in a particular installation, it is possible to shorten the probe cable accordingly or extend it with the use of intermediate elements, such as single-track connectors for the TS-35 bus. The probes do not have a distinguished polarity.

8. Support

8.1. Introductory news

Output voltages as well as signaling thresholds are set at the factory. It is possible to change these settings in the appropriate menu window of the display or an external computer and special software, but this can be done only after consultation with the manufacturer. Do not solve ad hoc operational problems by changing the operating parameters of the power supply.

ZDSO-230V power supplies should be subjected to periodic technical inspections by the manufacturer's service department, or a unit authorized by the manufacturer, at least once a year, throughout their lifetime. Any work performed by unauthorized persons, or abandonment of periodic inspections, may result in the loss of the manufacturer's warranty and transfer responsibility for the proper functioning of the power supply to the user. The performance of the inspection should be confirmed by an appropriate protocol according to the model established by the manufacturer.

It is also recommended that between inspections, during normal operation of the equipment, attention should be paid to any electrical and mechanical damage, both to the power supply itself and to the cooperating devices, which could affect the operation of the entire unit. Any observations and concerns arising from this should be reported to the manufacturer to assess their potential impact on further operation.

For technical and service issues and periodic inspections, contact the MERAWEX Service Department or the manufacturer's authorized unit directly.

ZDSO-230V power supplies work with external battery banks, which should be tested periodically:

- Once a quarter, check the correctness of operation of the VAS when operating from a battery bank with the mains supply disconnected;
- Once a year, test the capacity of the battery bank. If their capacity has fallen below 80% of the nominal capacity, the entire battery bank should be replaced with a new one without fail. It is also recommended to carry out such replacement every 4 years of its life.

Attention.

The obligation to carry out regular technical inspections of fire protection equipment results from the decree of the Ministry of Internal Affairs and Administration of 7.06.2010 on fire protection of buildings, other buildings and grounds (Journal of Laws No. 109, item 719, §3 paragraph 3, as amended).

8.2. Safety of use

The ZDSO-230V power supply is a class I device according to EN 62368-1 designed for connection to a permanent single-phase installation with the use of a protective conductor according to the HD 60364-4-41:2007 *Electrical installations in buildings.*

The metal housing of the power supply is connected to the protective terminal of the mains power cable, and the interference filters used in power supplies are equipped with capacitors that cause the appearance of a significant leakage current in this cable.

All other circuits of the power supply are isolated from both the mains circuits and its enclosure (see point 2.). Hence, if it is required in a given system, it is possible to connect the negative rail with the enclosure of the cabinet in which the VAS system is installed. It is best to make this connection visibly and with easy access to it from the negative terminal of the battery bank.

Remote signaling relay contacts are completely isolated from all circuits (including output circuits).

The external fault signal input is located at the potential of the negative rail of the battery bank. The connection of this input should not duplicate the connections of the negative pole of the power supply to those components of the VAS that control it. This can lead to the flow of significant equipotential currents and consequent damage to this input. It is safest to control it with isolated relay contacts or through an optocoupler.

8.3. Digital communication

The power supply has a USB communication connector on the front panel used as standard for service purposes. The service software allows for diagnostics, making it possible to check many of the PSU's operating parameters and change its default settings. The output is galvanically isolated from all other circuits of the PSU.

The power supply can be optionally equipped with an Ethernet interface for TCP/IP network operation. It has an implementation of two simple service servers:

- http server to present the current status of the system in the form of web pages accessible from a web browser;
- ModbusTCP protocol server to monitor and control the device.
- SNMP v1 agent

Detailed information is available from the manufacturer of the power supply.

8.4. Operating status indication

The power supply is equipped with light and remote signaling, the state of which is maintained until the condition that triggered it ceases (removal or disappearance of the cause)

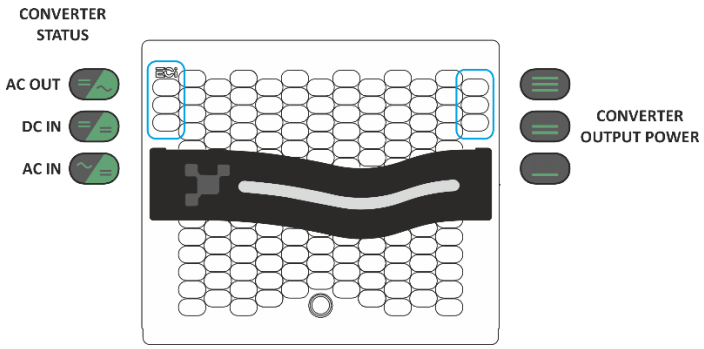
A summary of LED and remote signaling states is shown in the following tables.

LED light indication on the front panel.

DESCRIPTION		STATE	DESCRIPTION OF THE EVENT
MAINS green		lit	Normal operating condition with mains power present. At least
		pulses	No mains power or non-functioning converters (power system).
		quenched	Device off.
BATT FAULT. yellow		lit	Errors with battery handling: - Too high resistance or interruption of the battery path - Incorrect battery voltage - Temperature measurement error - Uneven current distribution between batteries - Battery test error - Balancer error
		quenched	No battery-related errors
FAULT yellow		lit	There has been a failure in the power supply or outside the power supply. *1)
		quenched	Normal operating condition with mains power present - no fault signals.

CHARGING yellow		lit	Bulk charging
		quenched	No charging

LED light indication on the converter panel.



CONVERTER STATUS LED	DESCRIPTION OF THE EVENT
quenched	No power supply
lit - green	Correct operation of the converter
pulsating - green	Converter operational, working conditions unsuitable
lit - yellow	Converter startup signaling
pulsating - yellow	Problem with converter startup
pulsating - red	A correctable error has occurred
lit - red	Serious damage to the converter

OUTPUT POWER LED	STATE			
< 5%	pulses		x	x
5% to 40%	lit		x	x
40% to 70%	lit			x
70% to 95%	lit	x		
100%	lit			
100% overload	pulses			

Relay remote signaling.

DESCRIPTION	STATE	DESCRIPTION OF THE EVENT
MAINS FLT	attached	Normal operating condition with mains power present. At least one converter is operating.
	disabled	No mains power supply or no working converter.
GEN FLT	attached	No damage
	disabled	There has been a defect in or outside the power supply. *)

) The fuses of the **AC OUT and **DC IN** outputs are also signaled, as well as an external fault inputted to the **EXT FAULT** input. In addition, on a power outage, the **GEN FAULT** relay turns off when the outage lasts longer than 12s.*

On the rear panel of the power supply, near the **MAINS FAULT** connector, is shown the contact arrangement that applies to each of the signaling outputs in a state in which the relay is not energized (the so-called no-voltage state). During correct operation of the power supply and the absence of faults, all relays are energized.

8.5. Bypass mode

In Bypass mode, the voltage from the INPUT input is applied directly to the OUTPUT. In this state, it is possible to remove the converters from the cassette without a power loss at the output.

In order to reduce the surge current when switching the operation of the power supply from normal mode to Bypass mode, it is required to set the output voltage of the converters to the same value as the mains voltage before switching.

Once both voltages are equalized, the device can be switched to Bypass mode with switch S1 from NORMAL to BYPASS position without stopping at TRANSFER position.

In this state, it is also possible to disconnect the battery bank after disconnecting its fuse (see section 7.2).

8.6. Normal mode

To return to normal operation of the PSU, confirm that the batteries are connected correctly and then switch on the battery fuse. Then switch the switch S1 from the BYPASS position to the TRANSFER position and wait until the converters signal correct operation (it takes about 1min.). Then switch the switch to the NORMAL position.

8.7. Maintenance

The device does not require any special maintenance. During normal operation, you should only take care to keep the surrounding area of the power supply clean.

8.8. Service

8.8.1. Power supply repairs.

Any repairs to the power supply, whether under warranty or out-of-warranty, can only be performed by the manufacturer or a service partner authorized by the manufacturer.

8.8.2. Accessories.

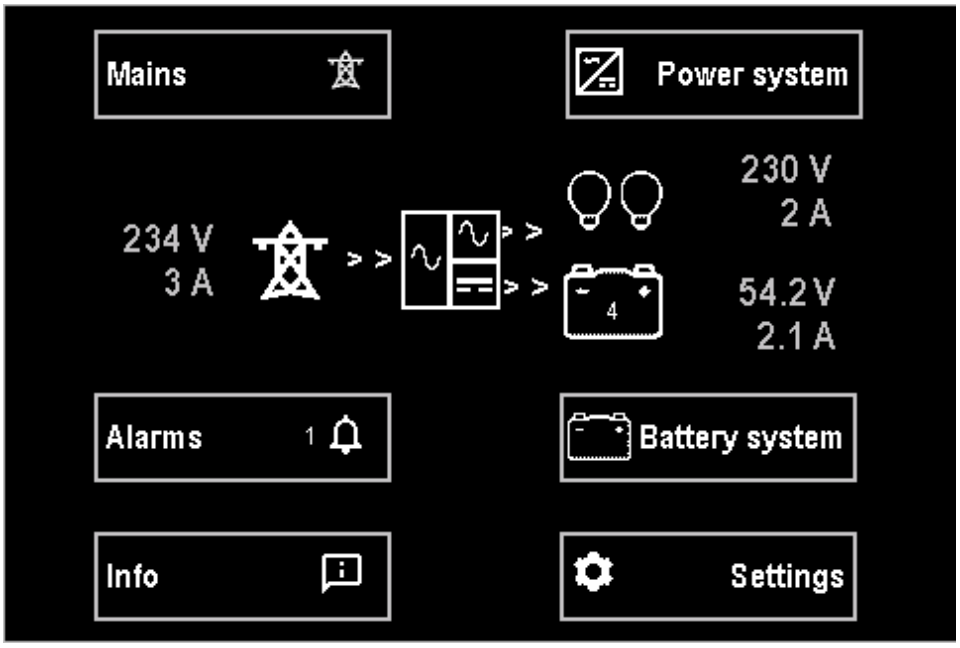
You can order accessories from the manufacturer of the power supply to facilitate the installation of the power supply in a particular, specific VAS system. These include:

- A set of wires for connecting a single battery string equipped with a fuse holder and a fuse of the selected length with fitted ring terminals for connection to the power supply and battery leads
- For the voltage equalization system: a fuse holder equipped with a suitable fuse with connecting wires of the selected length and installed eyelets for connecting the battery leads;
- A complete temperature probe of the required length.

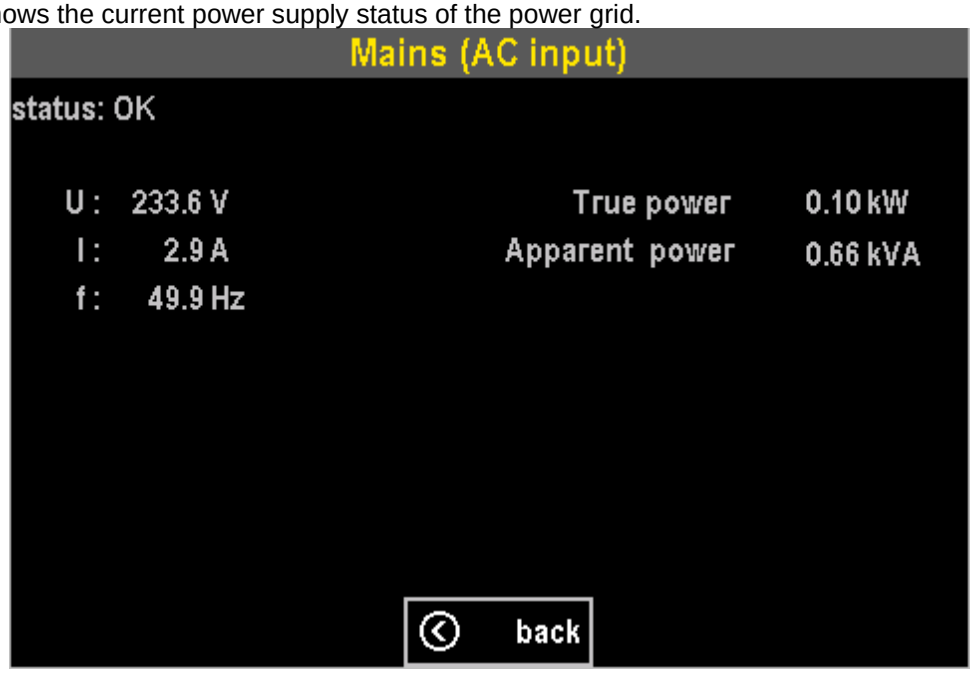
9. User interface.

The device is equipped with a touchscreen display that allows you to check the status of the device and make changes to settings and operating parameters.

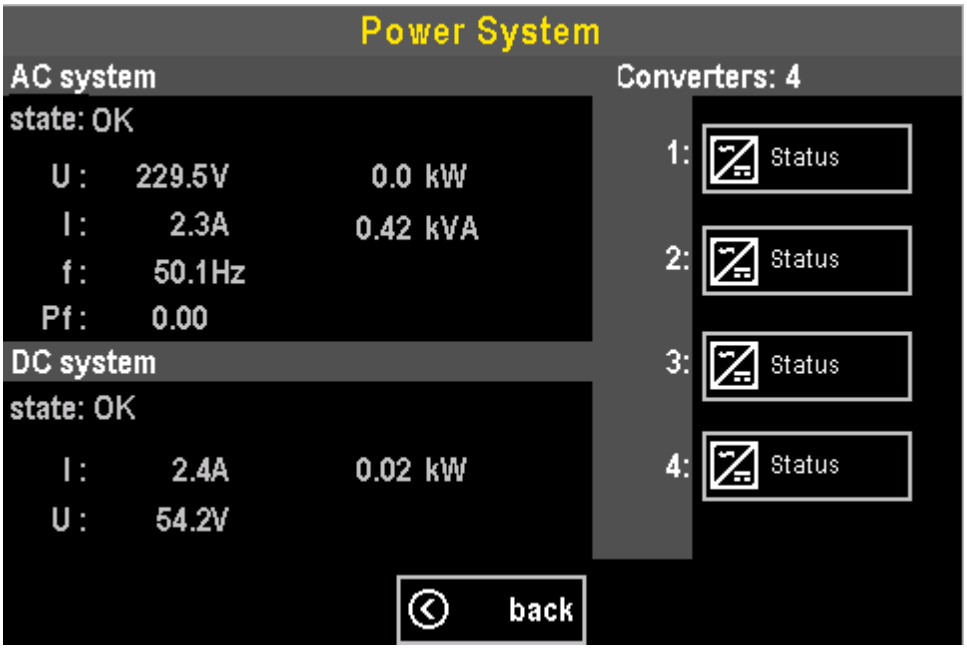
The basic screen contains general information about the status of the system. From this level you can go to lower levels with more detailed information. From each level, with prolonged user inactivity, there will be an automatic return to this screen.



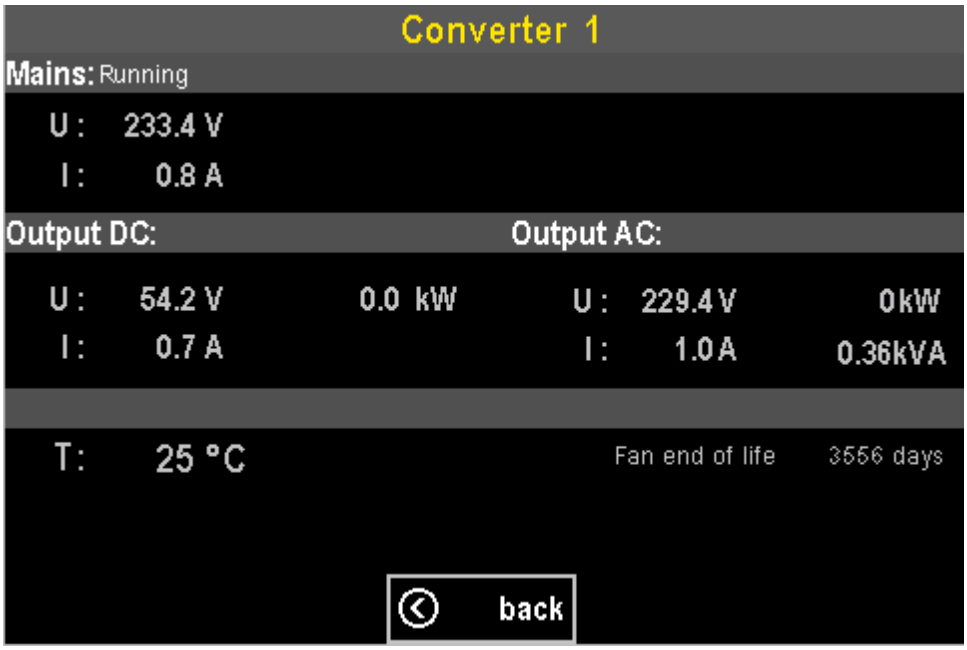
- **Mains** shows the current power supply status of the power grid.



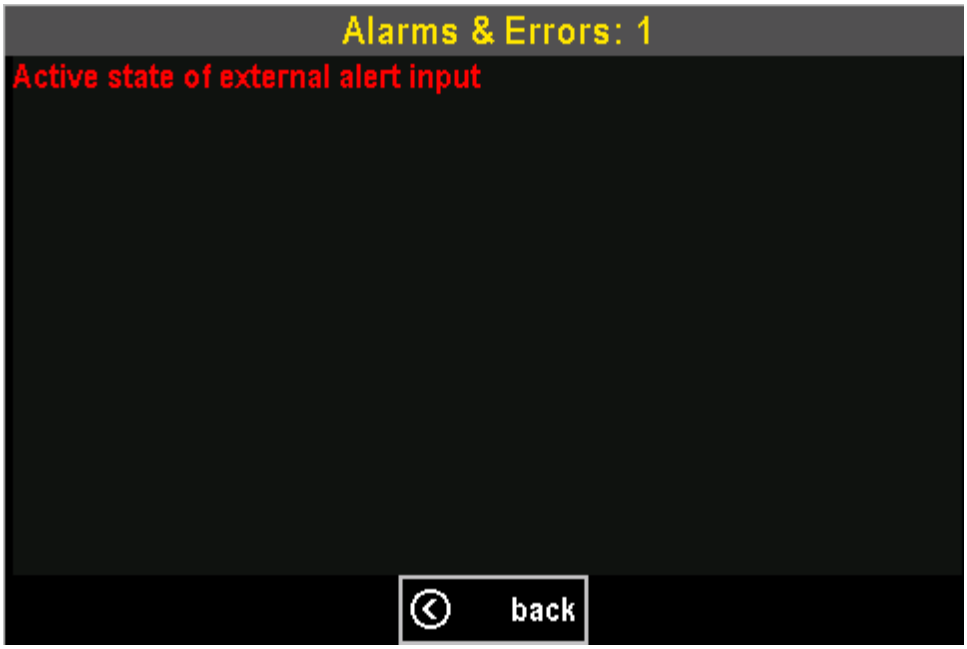
- **Power system** shows the general operating status of the system of converters supplying power to the load and charging the batteries. From here you can proceed to display detailed information about each converter.



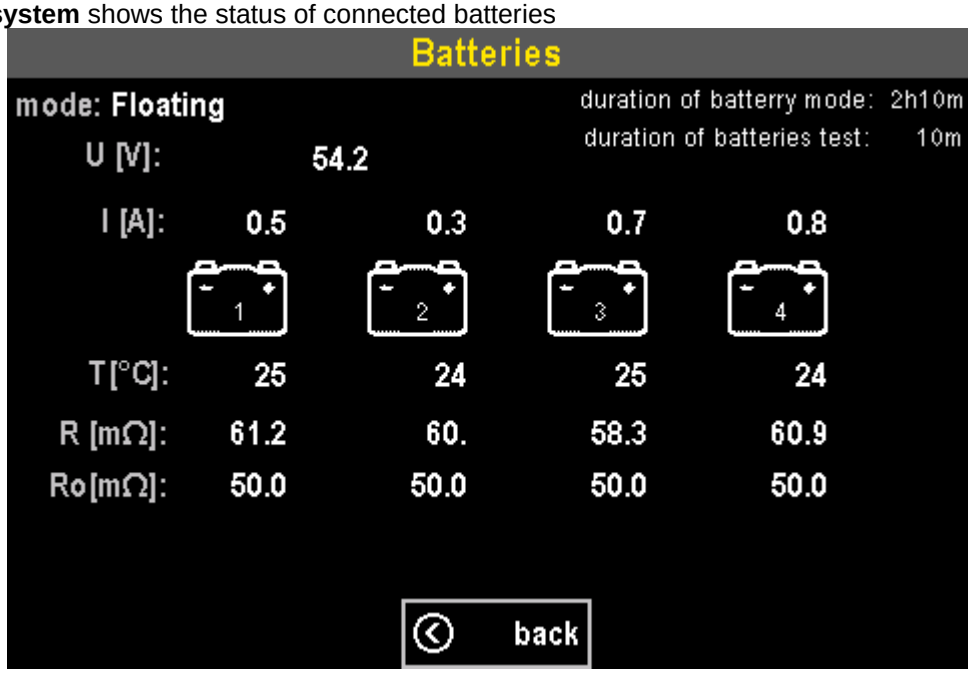
After selecting the converter status display, e.g.: 1, the following screen will be shown, and yellow LEDs will flash for a few seconds on the indicated converter for identification purposes.



- **Alarms** displays a list of active errors and alarms of the device.

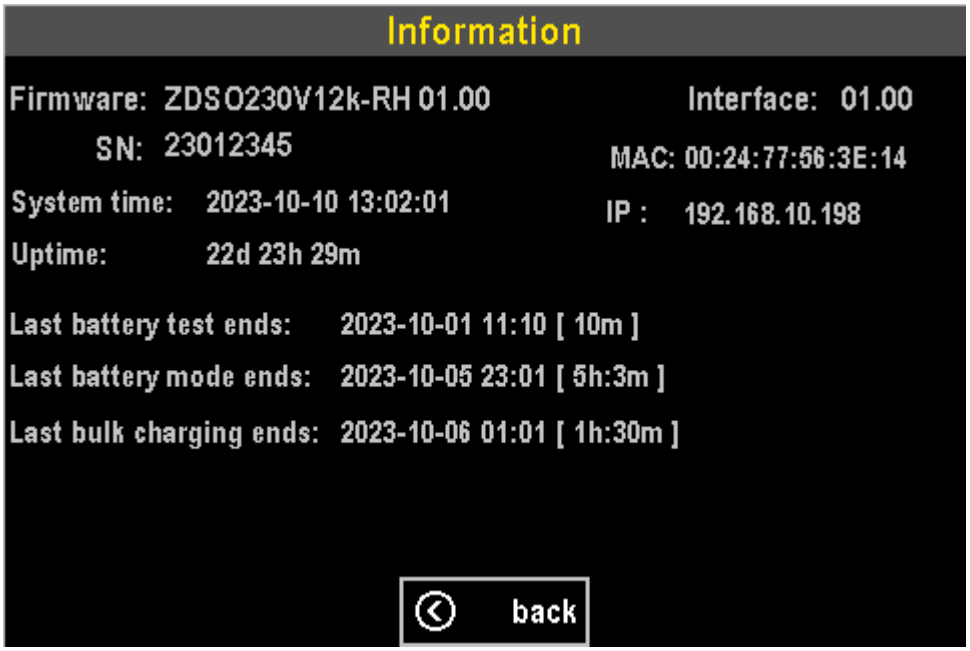


- **Battery system** shows the status of connected batteries

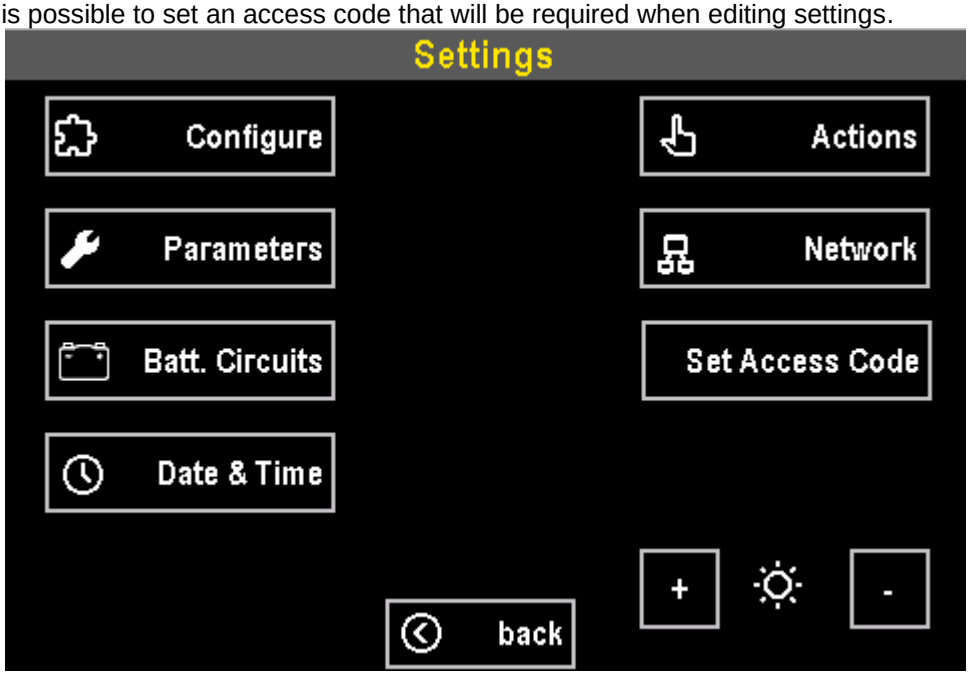


Information about the operating mode, the duration of the last battery mode and battery test are shown. Track resistance and reference resistance values are shown.

- **Info** here are presented information about the device and its operation



- **Settings** is the screen from which you can access the configuration and operation settings of the device. It is possible to set an access code that will be required when editing settings.



General scheme of organization of the user interface:

Basic screen
- **Mains**
- **Power system**
  - **Converter 1 status**
  - **Converter 2 status**
  - **Converter 3 status**
  - **Converter 4 status**
- **Alarms**
- **Battery system**
- **Info**
- **Settings**
  - **Configure**
    Edit device configuration, required number of batteries, converters. Allows you to enable or disable battery balancing, test execution and Bulk charging functions
  - **Parameters**

Allows you to edit the values of the operating parameters

Batt. Circuits

Battery track reference resistance level settings

Date & Time

Date and time setting

Action

Starting or stopping the battery test
Forcing battery resistance measurement
Enforcing Bulk battery charging mode

Network

Setting network parameters
Enable or disable support for NTP, SNMP, Http, ModbusTcp

Set Access Code / Use access code

Set or enter an access code to unlock editing

9.1. Operating parameters.

Parameter	Setting range
Battery Floating mode voltages for 25°C *Floating voltage (@25°C)*	52.8 .. 54.2 .. 55.2 V
Bulk battery charging mode voltages for 25°C *Floating voltage (@25°C)*	55.2 .. 55.7 .. 57.6 V
Temperature compensation factor for battery voltage *Coefficient of temperature compensation*	-128 .. -80 .. 0 mV/°C
Maximum battery charging current (total for all tracks) *Maximum charging current (for all battery banks)*	5 .. 25 .. 50 A
High asymmetry of battery currents *High asymmetry of battery currents*	1 .. 5 .. 20 A
Battery disconnection voltage *Voltage to disconnect batteries (LVD)*	40.0 .. 42.0 .. 48.0 V
Low battery voltage *Low battery voltage*	40.0 .. 46.0 .. 48.0 V
High battery voltage *High battery voltage*	58.0 .. 58.0 .. 60.0 V
Battery resistance measurement period *Period of the resistance measurement*	10 .. 10 .. 360 minutes
Maximum accepted increase in battery track resistance *Maximum acceptable increase of resistance*	1 .. 20 .. 100 mΩ
Battery test period (supervised discharge) *Period of battery test*	1 .. 30 .. 365 days
Duration of battery test (supervised discharge) *Duration of the battery test*	1 .. 10 .. 120 minutes
Maximum acceptable voltage drop during battery test *Maximum acceptable drop of voltage during test*	1.0 .. 5.5 .. 12.0 V
Maximum acceptable battery temperature difference *Maximum acceptable temperature difference*	2 .. 5 .. 20 °C
High battery temperature *High battery temperature*	40 .. 45 .. 60 °C
Low battery temperature *Low battery temperature*	-20 .. 0 .. 5 °C
Low mains voltage *AC supply low voltage*	172 .. 184 .. 210 V
High mains voltage *AC supply high voltage*	230 .. 265 .. 276 V
High load current *High output current*	10 .. 40 .. 50 A

9.2. Inventory of detected and signaled errors

Error name	description
Errors related to battery handling	
Error of batteries configuration	Detected number of batteries inconsistent with declared in settings
Lack of battery 1	
High increase of battery 1 resistance	(level set in parameters)
Battery 1 balancer fault	
Lack of battery 2	
High increase of battery 2 resistance	(level set in parameters)
Battery 2 balancer fault	
Lack of battery 3	
High increase of battery 3 resistance	(level set in parameters)
Battery 3 balancer fault	
Lack of battery 4	
High increase of Battery 4 resistance	(level set in parameters)
Battery 4 balancer fault	
Error of measurement battery 1 temperature	
Low temperature battery 1	(level set in parameters)
High temperature battery 1	(level set in parameters)
Error of measurement battery 2 temperature	
Low temperature battery 2	(level set in parameters)
High temperature battery 2	(level set in parameters)
Error of measurement battery 3 temperature	
Low temperature battery 3	(level set in parameters)
High temperature battery 3	(level set in parameters)
Error of measurement battery 4 temperature	
Low temperature battery 4	(level set in parameters)
High temperature battery 4	(level set in parameters)
High difference in temperatures of batteries	(level set in parameters)
Large asymmetry of battery currents	(level set in parameters) Activation time 60minutes
Failure of the test battery mode	During the battery test, the maximum acceptable voltage drop was exceeded
Low battery voltage	(level set in parameters)
High battery voltage	(level set in parameters)
Batteries disconnected (LVD)	Batteries disconnected
DC breaker disconnected (Q3)	DC track (battery) fuse disconnected
A short circuit has been detected on the battery input	
Errors related to the power system	
Converters: DC overload	Overload of the DC system of the converter unit (battery operation)
Converters: AC overload	Overloading of the AC system of the converter unit (load handling)
Error of converters configuration	Detected number of converters not in accordance with declared in settings

High output current	High output current (level set in parameters)
Low AC input voltage	High mains voltage (level set in parameters)
High AC input voltage	Low mains voltage (level set in parameters)
AC input disconnected (VR1)	
AC input breaker disconnected (Q1)	AC power fuse disconnected
AC output breaker disconnected (Q2)	AC output fuse disconnected
Power failure	Power outage
Converter 1: failure	Failure of converter 1
Converter 2: failure	Converter failure 2
Converter 3: failure	Converter failure 3
Converter 4: failure	Converter failure 4
Other system and control system errors	
Active state of external alert input	EXT FLT signal activity
Internal error, system not ready	Power system reports not ready for operation, can happen during startup, if this error persists for a long time, service required
Internal error, system failure	General power system malfunction, service required
LVD contactor control error	Battery contactor control error, service required
DC voltage control error	Loss of control on battery voltage setting, service required
Internal error, RTC domain	Time and date layout error, date and time reset required
Parametres set problem	An error in the parameter set was detected and default values were used, re-setting is required
Memory error	Controller memory operation error, service required
Internal battery low voltage	Discharged 3.2V battery that maintains power to controller in off state, replacement required

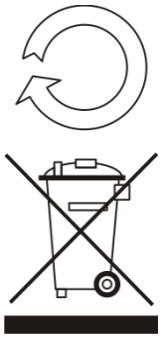
9.3. Additional information

The manufacturer reserves the right to make design and technological changes that do not deteriorate the quality of the product.

10. CE marking

CE 1438
MERAWEX Sp. z o.o. Toruńska 8, 44-122 Gliwice, Poland 24 1438-CPR-1052
EN 54-4:1997 + AC:1999 + A1:2002 + A2:2006 Power supply for Voice Alarm Systems ZDSO-230V-3000, ZDSO-230V-6000, ZDSO-230V-9000, ZDSO-230V-12000 DWU: DWU-MX-23 Other technical data : see operational manual

11. Handling of packaging and used products



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 constitutes non-hazardous waste, which should not be disposed of in the general municipal waste container, but should be handed over to a local waste collector for used electrical and electronic equipment.

Proper handling of waste electrical equipment, will help avoid harmful impacts on human health and the environment resulting from improper storage and processing of such equipment.