431413

All-Russian Classification of Products

ZETLab

DIGITAL SEISMIC RECORDER

ZET 048

INSTRUCTION MANUAL

ЗТМС.411126.001 РЭ

ООО “ETMS”

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Introduction

This instruction manual describes the design and operation philosophy of ZET 048-E ЗТМС.411126.001 and ZET 048-E ЗТМС.411126.001 digital seismic recorder (further called the “Recorder”). This instruction manual contains general principles of recorder operation and instructions for its installation, startup, maintenance, operation, transportation, and storage.

The Recorder must be operated only by qualified technicians or engineers.

Unpacking, installation, startup and preparation for operation may be performed both by the user or a representative of a service organization under agreement signed when purchasing the Recorder.

Manufacturer reserves the right to make minor changes to the design and circuit of the Recorder without making relevant amendments to the operation and technical documentation provided that these changes do not influence its technical specifications.

This instruction manual and accompanying documents shall be observed at all stages of the Recorder operation.

This instruction manual and history sheet are included in the Recorder supply package and shall be stored together with the Recorder.

A single instruction manual may be issued for batches of recorders up to 10 pcs.

1 Recorder description and operation

1.1 Purpose

ZET 048 digital seismic recorder is an electric signal measuring instrument intended for measuring and recording signals from seismic sensors.

Recorders may be used in standalone mode or incorporated in automated systems for seismic and seismological surveys, work on-shore, in sea, at seabed, and from ice using methods of refracted or reflected waves and deep tow seismic surveys (reflection seismic survey, refraction seismic survey, deep seismic sounding) from artificial and natural seismic sources, earthquake converted-wave method, and in engineering surveys.

The Recorder performs functions of the following measuring instruments: DC voltage meter, AC voltage meter, and recorder.

The Recorder can:

- Measure the constant and alternating signal components and record those in a file with time reference;
- Record signals (store digitalized signal values with subsequent recording to a memory device).

The Recorder may be used in standalone mode, or incorporated in automated systems:

- in test and command and measuring complexes;
- in process control systems;
- for scientific and technical studies.

Electric specifications are guaranteed in the following normal operation conditions

- environment temperature (20 ± 5)º*C*;
- relative air humidity (30-80) *%*;
- atmospheric pressure (630 – 795) *mm Hg*;
- power supply frequency (50 ± 0,5) *Hz*;
- AC power supply voltage (220 ± 22) *V*.

Operation conditions: according to 3 group of GOST 22261.

1.2 Technical specifications

1.2.1 Recorder name, model No, label according to the design documentation are provided in Table 1.1 below. Dimensions of Recorders of different designs are provided in Table 1.2 below.

Table 1.1

Name	**Description**	**Modification**	**No of input channels***
ZET 048 recorder	3TMC.411126.001	E.	4
			8
			16
		I	4
			8
			16

**differential input channels*

Example of the Recorder record at order and in the documents for the equipment in which it can be used:

ZET 048 recorder of industrial version and having 16 input channels has the following designation:

Recorder ZET 048-I16 TU 4314-007-76603936-2011

Note: The manufacturer reserves the right to make minor changes and improvements to the design and software without reflecting such changes and improvements in this operation manual, provided that they do not impair the technical specifications.

1.2.2 The Recorder has the following functions: calibration and functional control of channels in **AC voltage meter, DC voltage meter,** and **Recorder** modes.

1.2.3 Input resistance of the input channels of the Recorder is (100 ± 10) *kOhms*.

1.2.4 Maximum input voltage is at least ± 10 V.

1.2.5 Recorder power supply voltage

- +12 V ±20% for E and C versions;
- +5 V ±10% for I version.

1.2.6 Sampling rage can be selected from: 50, 100, 250, 500, 1000, 2500 Hz.

*Recorder specifications in **DC voltage meter** mode:*

1.2.7 In **DC voltage meter** mode, the Recorder measures DC voltage.

1.2.8 DC input voltage limits: from minus 10 V to plus 10 V.

1.2.9 Assumed error limits for DC voltage measurement shall not exceed $\pm(0{,}01 \cdot U_{meas.}+1.0)$ mV (here and further, $U_{meas.}$ is the level of measured input voltage).

1.2.10 DC offset shall not exceed 1 mV.

*Recorder specifications in **AC voltage meter** mode:*

1.2.11 In **AC voltage meter** mode, the Recorder measures AC voltage.

1.2.12 Input alternating voltages range is from 0.0007 to 7 *V*.

1.2.13 Assumed error limits for AC voltage measurements when measuring sinusoidal signals shall not exceed $\pm (0.01 \cdot U_{meas.} + 0.05)$ mV.

1.2.14 Inherent noise, not more than:

0.050 mV	(2500 Hz ADC sampling rate)
0.030 mV	(1000 Hz ADC sampling rate)
0.030 mV	(500 Hz ADC sampling rate)
0.020 mV	(250 Hz ADC sampling rate)
0.020 mV	(100 Hz ADC sampling rate)
0.020 mV	(50 Hz ADC sampling rate)

*Recorder specifications in **Recorder** mode:*

1.2.15 The Recorder keeps its specifications when processing signals coming from the input in real-time mode, and signals recorded in ***Recorder*** mode.

General specifications

1.2.16 Recorder frequency range, not less than:

0.1 *Hz* to 1000 *Hz*	(2500 Hz ADC sampling rate)
0.1 *Hz* to 400 *Hz*	(1000 Hz ADC sampling rate)
0.1 *Hz* to 200 *Hz*	(500 Hz ADC sampling rate)
0.1 *Hz* to 100 *Hz*	(250 Hz ADC sampling rate)
0.1 *Hz* to 40 *Hz*	(100 Hz ADC sampling rate)
0.1 *Hz* to 20 *Hz*	(50 Hz ADC sampling rate)

1.2.17 Frequency response unevenness at sampling rates of 2500, 1000, 500, 250, 100 and 50 Hz in the relevant frequency ranges, not more than ±0.1 dB.

1.2.18 Measuring channels response difference, not more than 0.5%.

1.2.19 Interchannel mixing ratio, not more than minus 80 *dB* at 20 *Hz* frequency.

1.2.20 Phase differential between channels at 20 *Hz* frequency, not more than 2°.

1.2.21 Continuous operation duration, with technical specifications kept, at least 9 hours for ZET 048-E version. With constant external power supply, unlimited duration of continuous operation is permissible.

1.2.22 Dimensions and weight of the Recorder are in accordance with the values in Table 1.2.

Table 1.2

ZET 048 version and No of channels	Dimensions, not more than, mm	Weight, not more than, kg
ZET 048-E (Recorder in expeditionary version) 4-16 channels	355x280x165.	3.5
ZET 048-I (Recorder in industrial version) 4-16 channels	218x145x82.	2.0

1.2.23 Reliability requirements

1.2.23.1 Recorder mean time between failure, at least 8000 hours.

1.2.23.2 Recorder guaranteed service life, 12 months.

1.2.24 Sustainability, strength and environmental resistance requirements.

1.2.24.1 The Recorder performs its functions, and keeps its specifications in raised humidity conditions (up to 90% @ +25°C).

1.2.24.2 The Recorder performs its functions, and keeps its specifications in temperature range from -40°C to +80°C.

1.2.24.3 The Recorder is resistant to mechanical stresses during transportation, performs its functions and keeps its specifications after the stresses.

1.2.25 EM compatibility requirements.

1.2.25.1 Recorder industrial radio interference level is in accordance with GOST R 51318.22:

1.2.25.1.1 Quasi-peak values of radio-influence field strength from the Recorder do not exceed those provided in Table 5 of GOST R 51318.22.

1.2.25.2 The Recorder is resistant to EM interference according to GOST R 50839:

1.2.25.2.1 The Recorder is resistant to RF EM fields according to GOST R 51317.4.3 with 2 hardness degree at permissible operation quality criterion A.

1.2.25.2.2 The Recorder is resistant to electrostatic charges influence according to GOST R 51317.4.2, 3 hardness degree (contact and air discharges) at permissible operation quality criterion C.

1.2.25.2.3 The Recorder is resistant to nano-second impulse interference in power supply ports according to GOST R 51317.4.4 with 3 hardness degree at permissible operation quality criterion B.

1.2.25.2.4 The Recorder is resistant to micro-second high-energy impulse interference in power supply ports according to GOST R 51317.4.5 with 2 hardness degree with interference transmission through “wire-wire” and “wire-earth” circuit at permissible operation quality criterion A.

1.2.25.2.5 The Recorder is resistant to dynamic power supply alternations (dips, surges, and interruptions) according to GOST R 51317.4.11 with 2 hardness degree at permissible operation quality criterion B.

1.3 Composition

1.3.1 Recorder supply package is provided in Table 1.3 below.

Table 1.3

Name	Description	Quantity
Recorder*	ЗТМС.411126.001	1 pcs.
Software package on electronic medium	–	1 computer
cable HighSpeed USB 2.0	–	1 pcs.
History sheet	ЗТМС.411126.001 ФО	1 pcs.
Verification method description	ЗТМС.411126.001 МП	1 pcs.
Instruction manual	ЗТМС.411126.001 РЭ	1 pcs.
Operator manual	ЗТМС.00026-01 34 РО	1 pcs.

* Modification and version according to the order.

1.3.2 Depending on the conditions of supply and agreement, Recorder may also be completed with:

- PC or notebook;
- one or several SecureDigital memory memory card of up to 32 GB capacity;
- network card for connection to Ethernet 100Base-T local access network;
- primary transducers;
- external power sources for autonomous operation (batteries);
- cables of various lengths for connection to primary transducers;
- cables of various lengths for connection to Ethernet 100Base-T local access network;
- tight packing for Recorder transportation and storage, etc.

1.4 Recorder construction

1.4.1 The Recorder is a hardware and software complex consisting of state of the art hardware components.

1.4.2 Recorder user's tasks are solved under control of operation system installed on the PC.

1.4.3 Work with the relevant applied software shall be performed in accordance with the operator manual for the software included in the Recorder supply package.

1.4.4 Purpose of ports, and controls, and indicators:

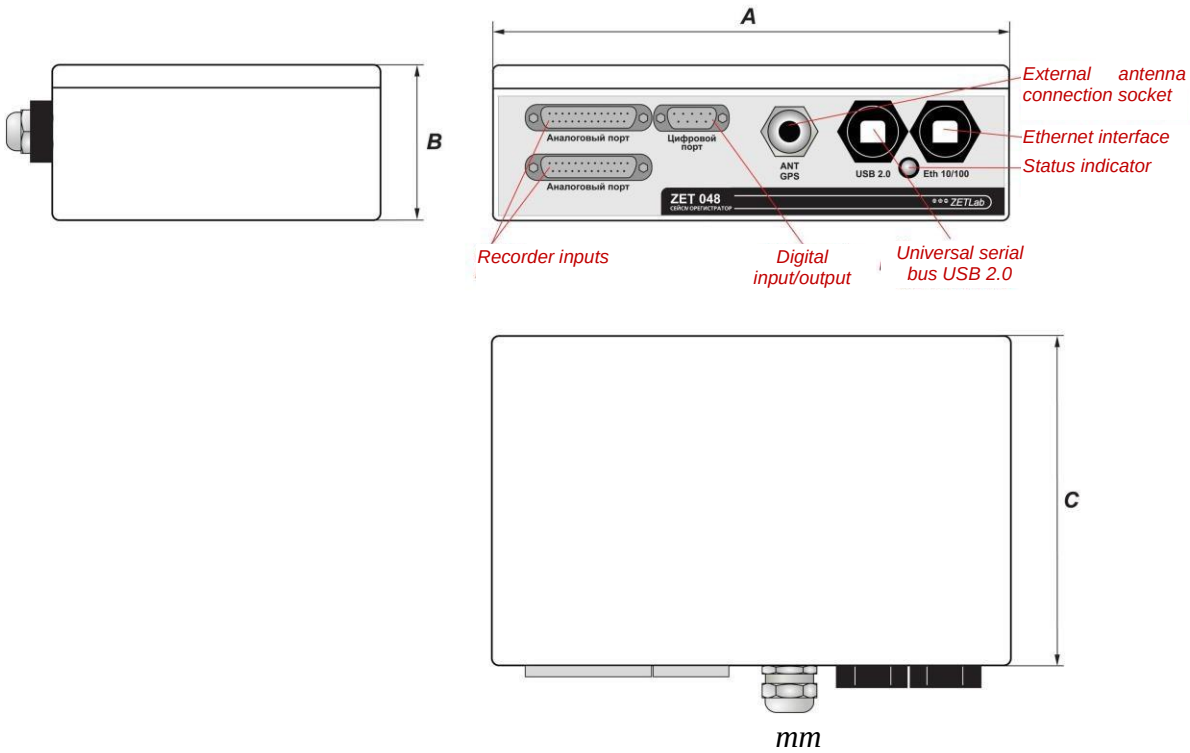
- *USB 2.0 interface (USB 2.0 port)* is intended for connection of recorders to PC via HighSpeed USB 2.0 interface bus, as well as for power supply to the Recorder of ZET 048-I version;
- *Ethernet 10/100 interface (Eth 10/100 port)* is intended for connection of recorders to PC via Ethernet 100Base-T local access network (option), as well as for power supply to the Recorder of ZET 048-C and ZET 048-I version (option);

- *GPS port* is intended for connection to an external GPS/GLONASS antenna;
- *Digital port (DB-9 port) (in ZET 048-I version only)* is intended for input/output of digital signals and, if relevant options are available, can also be used for:
    - Synchronization of several Recorders within a common network (see “Operator Manual. Part 1”, “AD and DA converter parameter settings” section);
    - External triggering in standalone mode (see “Operator Manual. Part 2”, “Standalone Recorder”).
    - Control of connected actuators using “Regulator” software or in ZETView SCADA system;
    - Dry contact signal transmission (see “Operator manual. Part I”, “Vibration sensor” section); purpose of DB-9 port outputs is described in Appendix A;
- *Analogous port (DB-25 port for ZET 048-I version and 2РМ24Б19Г1В1 for ZET 048-E and ZET 048-C versions)* input channels of the Recorder (sensors connection port), also is used for power supply to connected seismic sensors (±12V), power supply monitoring, and transmission of calibration signal to the sensors from an external generator to excite sensible elements of seismic sensors for their verification without uninstallation;

  outputs purpose description for DB-25 and 2РМ24Б19Ш1В1 is provided in Appendix A;
- *Slot for SecureDigital (SD) memory card (available for ZET 048-E version only; ZET 048-I has an in-built memory card)* is intended for installation of a memory card for signals recording in standalone mode;
- *“Power” button* on the Recorder control panel for ZET 048-E version is intended for supplying power to the Recorder and connected sensors;

Attention!!! To supply power, press the power button and hold until status indicator located near USB ports lights up.

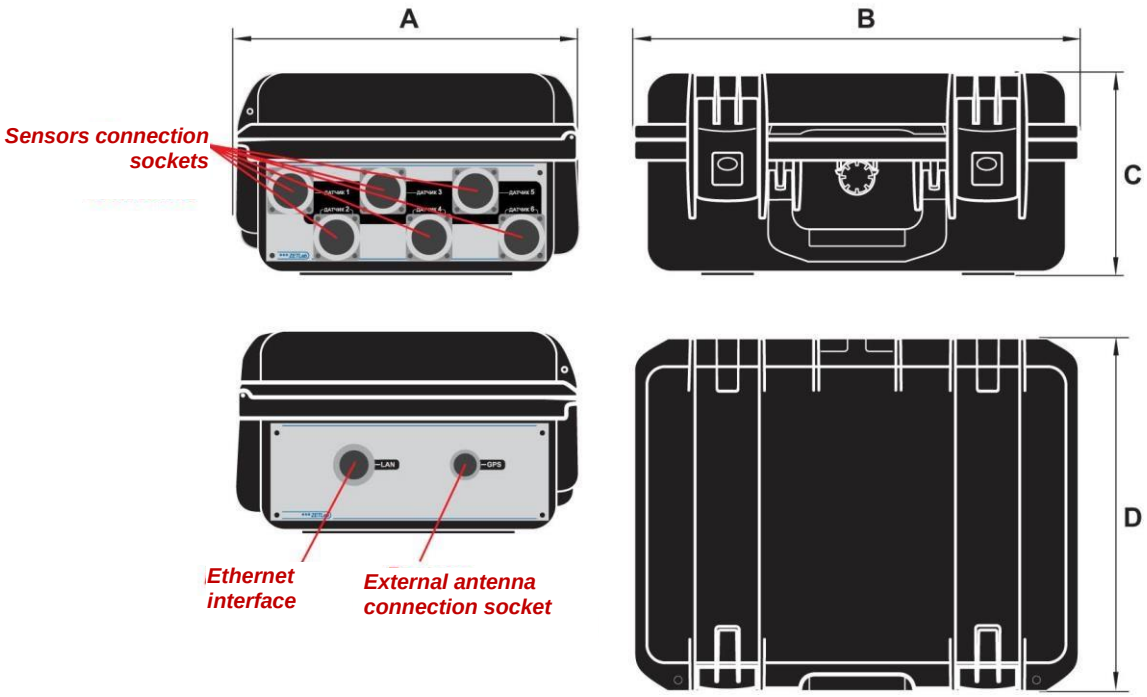
- *Ports + and –* on the Recorder control panel for ZET 048-E version are intended for connection of a charging device for charging the in-built batteries;
- *“Charging” button* on the Recorder control panel for ZET 048-E version is intended for starting up batteries charging process;
- *ТЕСТ_ГЕНЕРАТОР (TEST GENERATOR)* on the Recorder control panel for ZET 048-E version is intended for connection of an external generator for transmitting signals to seismic sensors to verify them without uninstallation;
- *SD1 and SD2 light indicators* on the Recorder control panel for ZET 048-E version are intended for indication of memory card status: glows RED, card is full; blinking GREEN, recording is in process;
- *“Power” light indicator* on the Recorder control panel for ZET 048-E version is intended for power supply indication: when “Power” button is pressed, the indicator lights up RED;
- *Status indicator (near USB port)* is intended for the Recorder operation status: glows GREEN, the Recorder is connected to a PC and power is on; blinking GREEN, transmission of digitalized data to the PC.



mm

No of channels	A	B	C
4-16	222	82	146
20-32	260	90.5	160

Figure 1.1. ZET 048-I general view and dimensions



mm

A	C	C	D
385	165	280	355

Figure 1.2. ZET 048-E general view and dimensions

Figure 1.3 ZET 048-E recorder control panel

1.5 Recorder operation

1.5.1 General instructions

1.5.1.1 During operation, it is prohibited to:

- disassemble the Recorder without agreement with the manufacturer;
- connect external power supply sources (batteries) or network cards not complying with the Recorder input voltage requirements;
- transmit to the Recorder inputs any signals not complying with the Recorder input specifications.

1.5.2 Safety measures

1.5.2.1 Only persons who studied this instruction manual and having permit to work on electric equipment with up to 1000 V voltage may operate the Recorder.

1.5.2.2 Recorder connection to power supply network shall be performed by means of sockets which have protective grounding contact. Grounding contact resistance shall not exceed 4 Ohms, no contact between grounding and neutral is permitted in power supply sockets.

1.5.2.3 Prior to powering up the Recorder, check grounding availability in sockets (such checkup shall be performed by specially trained personnel), and visually check the integrity of power cables.

1.5.2.4 During Recorder operation and daily maintenance, follow the general safety rules and instructions below:

1) No detachable connections shall open or close while the Recorder is in operation;
2) No Recorder connection to or disconnection from power supply is permitted while the Recorder is ON;
3) After work completion, disconnect the Recorder from power supply (or de-energize completely the Recorder power supply circuit);
4) No ventilation openings blockage by foreign objects is permitted (to prevent the Recorder overheating);
5) Operation of a Recorder which has mechanical damage is strictly prohibited;
6) Recorder power up and off shall be performed only by using the normal switch of the device.

1.5.2.5 Recorder connection to, or disconnection from, any external devices which has an independent power supply source, when both devices are energized, is strictly prohibited.

1.5.2.6 To prevent dust or foreign objects from getting inside the Recorder, it is recommended to cover the Recorder with a protective hood (not included in the Recorder supply package).

1.6 Recorder preparation for use

1.6.1 Unpacking

1.6.1.1 In case of transportation at negative temperatures, the packed Recorder shall be kept under normal atmospheric conditions during at least 8 hours.

1.6.1.2 Unpacking shall be performed on a horizontal stable surface free from foreign objects. Recorder unpacking procedure shall be as follows:

1) Check Recorder operation documentation availability;

2) Check the Recorder supply package for compliance with item 3 of 3TMC.411126.001 ФО history sheet;

3) Inspect the Recorder paying special attention to any signs of mechanical damage and damage to coatings of the body of the Recorder and cables.

Recommendations: In case of storage location availability, keep the package. If the Recorder has to be moved outside of the premise where the unpacking took place, the Recorder should be packed back in the manufacturer's packing to protect it from possible damage during transfer.

1.6.2 Installation

1.6.2.1 The Recorder shall be installed following the procedure below:

1) Place the Recorder at the place most convenient for further work;

2) When the Recorder is powered up from a mains adapter, to prevent any damage, place the Recorder at the distance not more than 2/3 of power supply cables length from power supply sockets to which the power supply cables are to be connected.

Attention! Power supply sockets shall be fixed securely and be easily accessible. Lead wires shall be insulated securely.

3) When working with a PC, connect the Recorder to the PC (1.6.2.2); when working in standalone mode, install a memory card (1.6.2.3).

4) Connect primary transducers to the Recorder (description of input channels ports of the Recorders of different versions is provided in Appendix A);

5) connect power supply cables to the Recorder.

Attention! Prior to connecting power supply cables to the Recorder, check that the power supply cables are disconnected from the power supply sockets.

6) Connect the Recorder power supply cables to power supply sockets.

1.6.2.2 Connect the Recorder to a PC.

1.6.2.2.1 The Recorder shall be connected to a PC via High Speed USB 2.0 interface bus according to the electric connections diagram (Figure 1.4). Description of the Recorder operation and settings is provided in the relevant section of “Operator Manual. Part 1”.

1.6.2.2.2 The Recorder shall be connected to a PC via Ethernet 100Base-T LAN (if the relevant option is available) according to the electrical connections diagram (Figure 1.5, Figure 1.6, and Figure 1.7). Cat 5 twisted pair cable (Patch Cord UTP cat. 5e) termination diagram when the Recorder is connected directly to a PC is provided in Table 1.4. Cat 5 twisted pair cable (Patch Cord UTP cat. 5e) termination diagram when the Recorder is connected to a PC through a switch is provided in Table 1.5. Description of the Recorder operation and settings is provided in the relevant section of “Operator Manual. Part 1”.

1.6.2.3 Preparation for work in standalone mode

1.6.2.3.1 If the Recorder is completed with a removable memory card (ZET 048-E version), to work in standalone mode, it is necessary to install SecureDigital (SD) memory card into the slot located on the Recorder control panel in ZET 048-E version. Memory card installation diagram is shown in Figure 1.8. Recorder setting for operation in standalone mode and Recorder operation in this mode are described in the relevant section of “Operator Manual. Part 2”, АВТОНОМНЫЙ РЕГИСТРАТОР (STANDALONE RECORDER) programme.

1.6.2.4 Connection of the Recorder power supply

1.6.2.5 *Power supply connection for ZET 048-I Recorder version.*

1.6.2.5.1 When the Recorder is connected to a PC via HighSpeed USB 2.0 interface bus, the Recorder is energized via HighSpeed USB 2.0 interface bus.

1.6.2.5.2 When the Recorder is connected to a PC via Ethernet 100Base-T LAN, the Recorder may be energized via Ethernet bus (if the relevant option is available) or from external power supply devices (supplied as option).

1.6.2.5.3 The Recorder operating in standalone mode is powered up by external power supply devices (supplied as option).

1.6.2.5.4 When the Recorder is powered up externally, USB 2.0 port is used.

1.6.2.6 *Power supply connection for ZET 048-E Recorder version.*

1.6.2.6.1 Power supply of ZET 048-E Recorder version is from internal batteries. To power up the Recorder, press Питание (Power) button on the Recorder control panel and hold until the status indicator near USB port lights up (Figure 1.3).

1.6.2.6.2 Charging of the internal batteries of ZET 048-E Recorder version is through + and – ports located on the Recorder control panel. To start batteries charging, it is necessary to connect the charging device to + and – ports (Figure 1.9) and press Заряд (Charging) button.

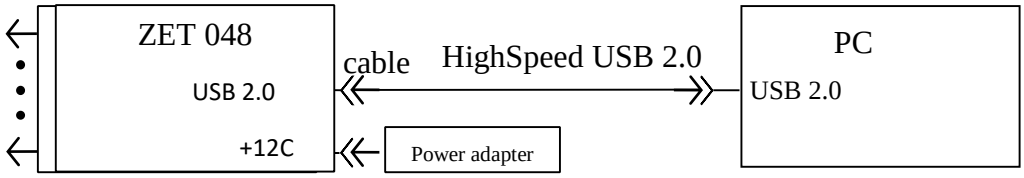


Figure 1.4. ZET 048-E connection to a PC via USB 2.0 interface

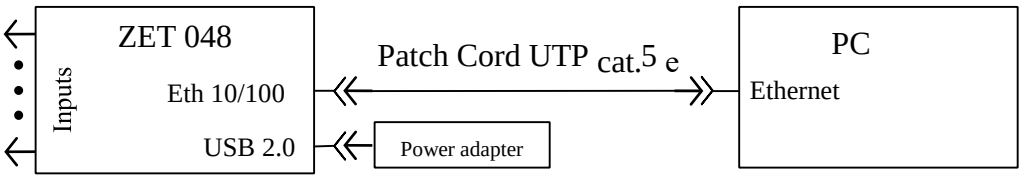


Figure 1.5. ZET 048-I connection to a PC via Ethernet interface with external power supply

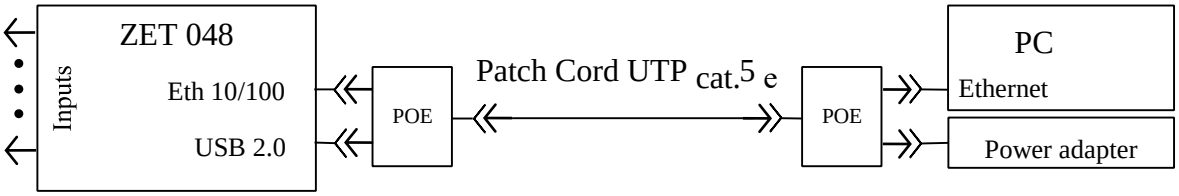


Figure 1.6. ZET 048-I connection to a PC via Ethernet interface with power supply via Ethernet interface

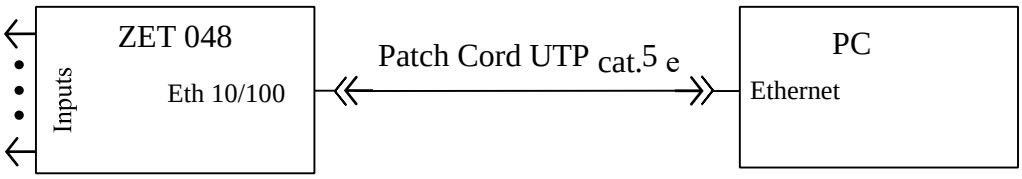


Figure 1.7. ZET 048-E connection to a PC via Ethernet interface

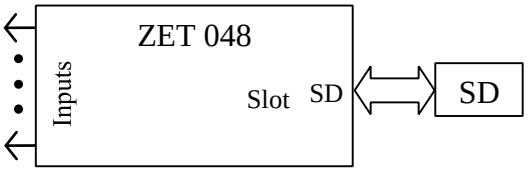


Figure 1.8. ZET 048-E connection for standalone mode operation

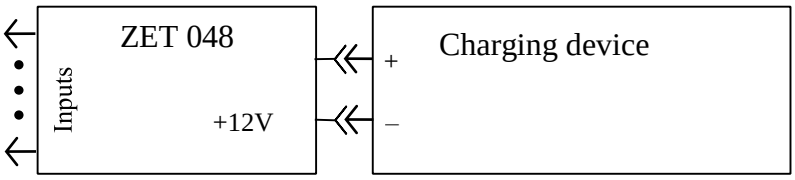


Figure 1.9. Charging device connection to ZET 048-E

Table 1.4

Patch Cord UTP cat.5e (Recorder – PC)		
One side	**Twisted pair core color**	**Other side**
1	White-orange	3
2	Orange	6
3	White-green	1
4	Blue	4
5	White-blue	5
6	Green	2
7	White brown	7
8	Brown	8

Table 1.5

Patch Cord UTP cat.5e (Recorder – switch, switch – PC)		
One side	**Twisted pair core color**	**Other side**
1	White-orange	1
2	Orange	2
3	White-green	3
4	Blue	4
5	White-blue	5
6	Green	6
7	White brown	7
8	Brown	8

1.6.2.6.3 The following rules and requirements shall be observed when operating the Recorder:

1) The Recorder shall be placed at least 1 *m* away from heating devices;

2) Cables shall be laid neatly and with no folds, connectors shall be attached to the matching ports using the standard fixings;

3) The Recorder shall not be subjected to direct sunlight;

4) Repeated connection of the Recorder shall be at least 30 *c* after powering it off.

1.7 Use of the Recorder

1.7.1 Operation procedure

1.7.1.1 ***Recorder startup when it is connected to a PC via HighSpeed USB 2.0 interface***

1.7.1.1.1 Connect primary transducers to the Recorder inputs (the ports descriptions are provided in Appendix A).

1.7.1.1.2 Power up the PC and wait until PC OS loads.

1.7.1.1.3 Connect the Recorder with included HighSpeed USB 2.0 cable to HighSpeed USB 2.0 port of the PC (1.6.2.2).

1.7.1.1.4 Ensure the Recorder power supply

- *ZET 048-I version*: power supply is via USB 2.0 bus;
- *ZET 048-E version*: Press Питание (Power) button on the Recorder control panel (Figure 1);

1.7.1.1.5 Installation of ***ZETLab*** software and drivers and first and subsequent Recorder startup procedures are described in the relevant section of "Operator Manual. Part 1".

1.7.1.1.6 Perform the necessary works with the Recorder (measurements, analysis, etc.).

1.7.1.1.7 After work, turn off PC power.

1.7.1.2 ***Recorder startup when it is connected to a PC via Ethernet 100Base-T LAN***

1.7.1.2.1 Startup the Recorder for operation with the PC via HighSpeed USB 2.0 (repeat actions 1.7.1.1.2–1.7.1.1.4).

1.7.1.2.2 Set the required IP address and subnetwork mask on the Recorder and PC. IP address and subnet mask setting are described in the relevant section of "Operator Manual. Part 1".

1.7.1.2.3 Disconnect the Recorder from USB bus.

1.7.1.2.4 Connect primary transducers to the Recorder inputs.

1.7.1.2.5 Connect the Recorder to LAN using Patch Cord UTP cat 5e (Recorder – switch).

1.7.1.2.6 Ensure the Recorder power supply

- *ZET 048-I version*:
  - *from the network card*: insert the jackplug of the network card to USB 2.0 port on the Recorder back panel, and plug the network card adapter into AC 220V socket.
  - *from external power supply sources (batteries)*: insert the matching part of the Recorder power supply joint to USB 2.0 port on the Recorder back panel and connect the matching part of the power supply port to external +5V power sources. After connection to USB of a working PC, the Recorder will switch to USB operation mode.
- *ZET 048-E version*: press Питание (Power) button on the control panel and hold it until status indicator located to the left from the USB port lights up.

1.7.1.2.7 Perform the necessary works with the Recorder (measurements, analysis, etc.).

1.7.1.2.8 After work, turn off Recorder and PC power in any sequence.

1.7.1.3 ***Recorder startup when it is in standalone mode***

1.7.1.3.1 When the Recorder is completed with a removable SecureDigital (SD) memory card, install SecureDigital (SD) memory card into SD slot (1.6.2.3).

1.7.1.3.2 Startup the Recorder for operation with the PC via HighSpeed USB 2.0 (repeat actions 1.7.1.1.2–1.7.1.1.4), and set standalone operation scenario.

1.7.1.3.3 Recorder setting and operation in standalone mode is described in the relevant section of "Operator Manual. Part 2".

1.7.1.3.4 Disconnect the Recorder from USB bus.

1.7.1.3.5 Connect primary transducers to the Recorder inputs (the ports descriptions are provided in Appendix A).

1.7.1.3.6 Set the Recorder at workplace for standalone mode of operation.

1.7.1.3.7 Ensure the Recorder power supply

- *ZET 048-I version*:
  - *From the network card*: insert the jackplug of the network card to USB 2.0 port on the Recorder back panel (Figure 1.3), and plug the network card adapter into AC 220V socket;
  - *From external power supply (batteries)*: insert the matching part of the Recorder power supply joint to USB 2.0 port on the Recorder back panel (Figure 1.3) and connect the matching part of the power supply port to external +5V power sources. After connection to USB of a working PC, the Recorder will switch to USB operation mode.
- *ZET 048-E version*: Press Питание (Power) button on the Recorder control panel.

1.7.1.3.8 The Recorder will, according to a pre-set scenario on SecureDigital (SD) memory card, record digitalized time-stamped signals either right after all necessary software from the Recorder internal memory loads up, or from external startup via digital or analogous input.

1.7.1.3.9 After recording the required information on SecureDigital (SD) memory card, turn off the Recorder power supply and primary transducers.

1.7.1.3.10 To analyze and view the recorded information it is necessary to connect the Recorder with HighSpeed USB 2.0 to HighSpeed USB 2.0 port and power up the PC. After the operation system loads, transfer the data from SecureDigital (SD) memory card to PC hard drive and perform analysis and processing of the data obtained. Data transfer from SecureDigital (SD) memory card to PC hard drive is described in the relevant section of “Operator Manual. Part 2”.

1.7.1.3.11 After work, turn off the Recorder power.

1.7.1.4 **Adjustment**

1.7.1.4.1 The Recorder does not require any special actions for setting and adjustment.

1.7.2 Possible failures and troubleshooting

1.7.2.1 When working with an operation system or a particular applied software package, some failures may occur, information on which is shown on the screen by the operation system or the relevant applied software package. Such failures can be solved by the user in accordance with the instructions provided on the monitor screen.

1.7.2.2 If, having performed all required actions correctly, the user still receives failure messages, the operation system or the relevant applied software package should be re-installed using licensed copies, and then all previous operations shall be repeated.

1.7.2.3 In case of the Recorder failure during the warranty period, the user shall submit the relevant claim to the supplier.

1.7.2.4 Claim submission to the supplier is performed in the following cases:

1) Stop of operation of the software listed in the order form, or of user's software specified in the Recorder supply agreement;

2) Incorrect software termination which led to information loss or corruption not due to any incorrect actions of the operator;

3) Periodic failures.

Note: A criterion of the Recorder failure is occurrence of failure signs which require for further intended use performance of repeated actions for resolving a task or tests.

2 Maintenance

2.1 The Recorder requires no special maintenance.

2.2 Functionality check is performed automatically each time the Recorder is turned on.

2.3 Prior to performance of any work for maintaining proper technical condition of the Recorder, the following shall be completed:

1) Turn off the Recorder power supply;
2) Disconnect all Recorder power cables from sockets.

2.4 The following daily measures should be implemented to ensure proper technical condition of the Recorder:

1) Visual inspection to discover any mechanical damage to bodies and casings;
2) Checking connectors and cables condition;
3) Dust removal from the Recorder surfaces shall be performed using soft wet cloth, without using chemical or abrasive cleaning products.

3 Storage and transportation requirements

3.1 The Recorder shall be stored in the original packing in the heated premises at temperature 5–40 °C and up to 80% air humidity, according to GOST 22261.

3.2 In the premise where the Recorder is stored, no vapors of acids, alkali or other chemically active substances the vapors or gases of which may cause corrosion.

3.3 The Recorder in original packing may be transported in accordance with the requirements of GOST 21552-84:

- by automotive transport, to distances of up to 1000 km at speed not exceeding 60 km/h, by hard-top highways, and up to 500 km at speed not exceeding 20 km/h, by soil roads;
- by railroad transport, to distances of up to 10000 at speed in accordance with the standards set by the Ministry of Transportation, with the Recorder located at any point of the train;
- by air transport, to any distance at any speed, in an air-tight section.

3.4 Placement and fixation of the Recorder package in means of transportation shall ensure its stability and prevent any movements during transportation.

Packed recorders stacking height: maximum two rows.

3.5 Recorder package shall be protected from atmospheric residues and sun radiation during transportation. Climatic conditions for transportation:

- environment temperature: from minus 50°C to plus 50°C;
- relative air humidity: up to 98% at 25°C;
- atmospheric pressure: from 84 to 107 kPa (from 630 to 800 mm Hg).

3.6 During loading and unloading recorder packages, the requirements of manipulation signs and inscriptions on the packing shall be strictly observed.

Appendix A (reference). Connectors description

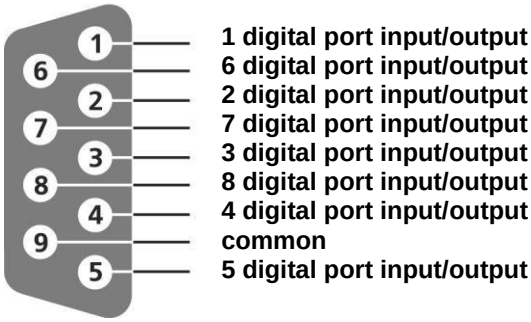


Figure A.1. Purpose of connector outputs DB-9 (ZET 048-I)

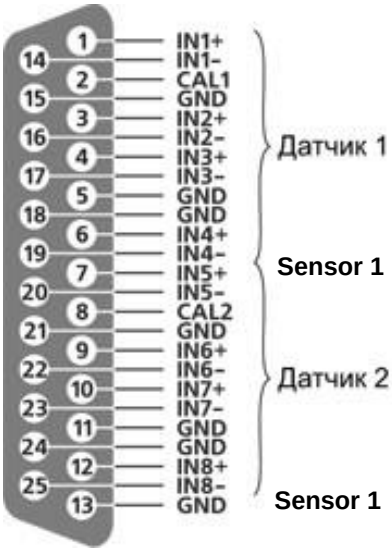


Figure A.2. Purpose of DB-25 (ZET 048-I) connector

Figure A.3. Purpose of connector outputs 2РМ24Б19Ш1В1. (2РМГ24Б19Ш1Е2) (ZET 048-E)

Contact number	Purpose	Note
1	IN1+	Differential input 1+
2	IN1-	Differential input 1 –
3	IN2+	Differential input 2+
4	IN2-	Differential input 2 –
5	IN3+	Differential input 3+
6	IN3-	Differential input 3 –
7	IN4 +	Differential input 4+
8	IN4-	Differential input 4 –
9	Power +12	Sensor power supply +12 V
10	Power -12	Sensor power supply –12 V
11	ACT	Generator output
12	GND	Common
13		
14		
15		
16		
17		
18		
19		

Changes registration sheet

Chang.	Sheet (page) #				Total sheets (pages) in docum.	Doc. #	Incoming # of accomp. doc. and date	Signature	Date
	changed	replaced	new	cancelled					