SIGNAL GEOFÍSICA LTDA
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ALMAZ Marine

aquatic system for continuous resistivity imaging and time domain electromagnetic method

Main features:

- 34 high-precision channels
- Powerful transmitter (600 W) delivers up to 6 A
- Onboard GNSS receiver and optional tail buoy
- Optional echo sounder and resistivity meter
- Optional switchbox for bottom observation
- Towed streamers for surface, bottom and deep-towed surveys

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Application area:

- Engineering surveys
- Solid minerals exploration
- Building materials exploration
- Locating gas pockets in gas-saturated silts
- Gas hydrates exploration
- Environmental studies
- Permafrost mapping
- Locating freshwater sources in the sea (underwater discharge of groundwater)
- Determining sub-bottom geology for dredging purposes
- Variations in the salinity of the water column
- Characterizing the sub-bottom of estuaries

ALMAZ Marine is the most modern system in the World for performing continuous resistivity imaging (ERT and IP) or time domain electromagnetic method (TDEM) with line-to-line configuration. An optional switchbox allows performing resistivity imaging when placing streamers on the seafloor. It is possible to work both in freshwater and saltwater areas up to nx10 m depth. Synchronous data logging on 32 reception channels (MN) provides the highest possible* resolution and depth of survey up to ~ 75 m. Coordinate referencing is provided by built-in GNSS receiver and the optional GNSS tail buoy; water resistivity, depth and even water temperature are measured by an optional resistivity meter and echo sounder.

Receivers

ALMAZ Marine has 34 precision channels with constant self-potential (SP) compensation. 32 reception channels (MN), and two for current record and signal voltage measurement (AB). All that raw data can be recorded with sampling rate up to 3,600 Hz (7,200 Hz on request) per channel for further processing. Each receiver is isolated and has a filter. ALMAZ receiver is among the best on the market and provides minimal noise, good phase characteristics stability and full waveform measurement.

Transmitter

We have developed a 600 W power transmitter designed for aquatic applications. It works with currents up to 6 A and voltages up to 300 V (up to 600 V peak-to-peak) using a meander or paused meander waveform. These parameters provide measurable signal on all channels with standard 5-meter electrode spacing streamers, even in the marine area. The transmitter uses batteries (24 V) or alternating power supply (100-240 V, 50/60 Hz). ALMAZ Marine can also work with an external transmitter with continuous current recording in the AB line.

Arrays and streamers

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ALMAZ Marine supports two arrays – dipole-dipole and gradient. The first is intended to get the best resolution and depth. Gradient array provides a significantly higher signal level at the MN dipoles, so it is preferable to use it in salty or heavily polluted (from 0.3 Ohm·m) water areas. Both arrays are designed to provide optimal data coverage of the pseudosection.

Two versions of ALMAZ Marine can be ordered with connectors for standard 64- or 72-electrode streamers. The standard spacing between the electrodes along the streamer is 2.5, 4 or 5 meters. Transmitter electrodes are located outside the receiving streamer, and their spacing is easily adjustable. Thus, the length of an array from 162,5 to 365 and more meters is provided, which allows to estimate the depth of the survey in average geological conditions from 35 to 75 m, respectively.

Streamer for near-surface towing has floats, that allow to control immersion depth and to make the streamer visible on water. The floats can be detached, so that the streamer is laid on the bottom, connected to third-party ERT stations or a switchbox, and seafloor surveys can be performed. Deep-towed streamers with built-in pressure sensors, magnetic compasses and INS are also available, which allows to compute array position precisely in the water column. Bottom towing is another option and it is good to increase the resolution and depth of surveys, while maintaining a high speed of work.

Navigation

Coordinate referencing of the data is provided by the supplied external multisystem GNSS receiver. In some cases, it is necessary to connect a third-party satellite receiver - ALMAZ Marine supports the standard NMEA 0183 protocol and can be connected to most navigation devices via RS-232 connection. Additional control of the streamer position is performed using an optional tail buoy equipped with its own GNSS receiver and battery.

Software

- ALMAZ Marine is controlled from a laptop running under Windows
- Fast survey planning - profiles positioning with towed streamer offsets calculation
- Easy setup of measurement mode
- Navigation along the profile and real time collected data visualization with direction deviation and bottom topography, pseudosection plotting, etc.
- Saving raw and / or processed data for subsequent inversion

Reliability and warranty

Our R&D specialists have extensive experience in performing geophysical surveys. We are well aware that such equipment must be reliable, and the service

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must be fast and comfortable. We give 3 years warranty on all our ALMAZ Marine systems, and our technical support will promptly answer any of your questions. If you are still working with outdated equipment - take advantage of our trade-in offer and protect your projects from potential problems.

Important "little things"

We know that there are no trifles in geophysical instrumentation, and we pay maximum attention to all the details. Here are some of them:

- All connectors are installed in the central part of the panel - this means that during transport they will be perfectly protected by a sealed shock-resistant case
- Towed streamers are reinforced with Kevlar
- The complex can be powered by both 24 V batteries and 100-240 V AC with a frequency of 50/60 Hz

Delivery set:

- ALMAZ Marine unit
- Software for survey planning and data collection
- Onboard GNSS receiver

Optional:

- Towed streamer with a set of transmitter electrodes and floats
- Towed resistivity meter
- Echo sounder
- Tail buoy with GNSS receiver
- Switchbox for seafloor measurements
- Deep-towed electrical streamer with a set of transmitter electrodes
- ALMAZ Marine unit with the sampling rate of 7 200 Hz
- ALMAZ Marine unit with a larger number of channels
- ALMAZ Marine unit for AUVs and ROVs
- ZondRes2d software
- ZondRes3d software

On request it is possible to customize ALMAZ Marine unit with a larger number of channels, in a submersible version in a sealed container for installation on controlled underwater vehicles or with other additional features. In order to properly formulate technical specs of your system, please contact us in any way indicated on the website.

Specification:

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Number of MN measuring channels	32
Supported arrays	Dipole-dipole and gradient
MN channel dynamic range	Channel 1: +/- 20 V; channels 2-32: +/- 10 V
MN channel offset correction	Channel 1: +/- 20 V; channels 2-32: +/- 10 V with 1 mV accuracy
Input voltage protection on MN channels	+/- 75 V
MN channel resolution	0,1 µV
Input impedance	5 MOhm
MN channel gain factors	1, 2, 4, 8, 16, 32, 64, and 128
Voltage measurement accuracy	1 %
Additional measuring channels	Transmitter signal current and voltage measurement - 2 channels
Transmitter maximum output power	600 watts
Maximum output current	6 A
Maximum output voltage	+/- 300 V (600 V peak-to-peak)
Current measurement accuracy	1%
Output current waveform	Meander (ON+/ON-) or meander with pause (ON+/OFF/ON-/OFF)
Operating frequency of the transmitter	0 - 10 Hz
Sampling rate of channels	Standard: 3 600 Hz. On request: 7 200 Hz.
Measured values	Voltage during current flowing and pause, self potentials, transmitter voltage and current, battery voltage. Optional: water resistivity, depth and temperature.

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Calculated values	Apparent resistivity, polarizability and chargeability; differential phase parameter, measurement error, electrode coordinates, pseudodepth of measurements
PC communication interface	Ethernet 1Gb
Additional interfaces	2 × RS-232
Number of electrodes in the streamer	64 or 72
Standard distance between electrodes in a streamer	2.5, 4, or 5 m
GNSS receiver	External with RS-232 (NMEA 0183) connection with the ability to record RAW data. Received signals: GPS L1C/A and L2C; GLONASS L1OF and L2OF; Galileo E1B/C and E5b; BeiDou B1I and B2I; QZSS L1C/A, L1S, and L2C. SBAS: WAAS, EGNOS, MSAS, GAGAN, SDCM.
Power	24 V battery or 100-240 V 50/60 Hz AC
Operating temperature range	-20 ÷ +60 °C
Unit dimensions	617×528×280 mm
Measuring unit weight	20 kg

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