ANALOG-DIGITAL CONVERTER ADPC-101

Operating manual

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INTRODUCTION

This operating manual (hereinafter referred to as OM) is intended to describe structure, operating principles, technical service and usage of Analog-digital converter ADPC-101 (hereinafter referred to as the Product, ADPC-101).

In addition to the instructions given in this document, the safety regulations and rules applicable in the field shall be observed.

Only those who have read and understood this document and those who have had special training shall be permitted to operate with the PSU according to the applicable regulations.

Terms and abbreviations:

OM – operating manual;

S – software;

SC – short circuit;

TS – technical service;

CL – check list;

LCD – liquid-crystal display;

ADPC-101 – analog-digital converter ADPC-101;

LFSG – large fine-pored silica gel granular.

NMEA (National Marine Electronics Association) – text communication protocol for interconnection of marine (normally navigational) equipment.

Synchro (Selsyn) – electrical AC self-synchronizing micromachines (for smooth transmission of shaft degree).

Step (stepper) motor – synchronous brushless motor with several windings where current supplied to one of stator's windings causes rotor fixation. Sequential activation of motor windings causes discrete angular rotor movements (steps).

Selsyn and step (stepper) type – type of electric motor transmitting data on angular displacement.

1 DESCRIPTION AND OPERATION OF THE PRODUCT

1.1 DESCRIPTION

The Product ensures Analog-digital conversion of obsolete signals from gyro-compasses and logs in NMEA 0183 sentences and transmission of these data to the corresponding navigational equipment.

The Product is used on the ships equipped with gyrocompasses and logs. They do not output current data in NMEA 0183 sentences (IEC 61162) to navigational equipment, which requires course and speed data in digital format. The Product may be installed on communication ships due to their re-equipping with automatic identification system and act as a connecting device converting data from obsolete compasses and logs.

1.2 TECHNICAL SPECIFICATIONS

1.2.1 The Product performs the following functions:

a) Reception of current course data from gyrocompass with synchro or stepper interface;

b) Reception of current speed data from logs with stepper interface or closing contact interface;

c) Display of current speed and course data on the integrated LCD;

d) Conversion of received data into NMEA 0183 format (IEC 61162);

e) Transmission of the converted speed and course data as well as ship rate turn via standard interface RS-232 and RS-422/485 to external equipment in NMEA 0183 format (IEC 61162).

Intuitive menu options and convenient keyboard enable user-friendly settings of the operation modes.

The Product is manufactured in robust moisture-proof metal casing, which may be mounted on bulkheads inside premises.

1.2.2 Types of connected equipment:

a) gyrocompasses:

– SYNCHRO type gyrocompass;

– STEPPER type gyrocompass;

b) logs:

– stepper type log (pulse);

– log with closing contact interface.

Technical specifications of the Product are represented in Table 1.

Table 1 – General technical specifications of the Product

Parameter	Value
Power supply	
Input voltage with galvanic isolation, V DC	9.6 to 36.0
Power consumption, W	3
Input gyrocompass signals	
Max. voltage, V	350
Gyro ratio	360x; 240x; 180x; 90x; 60x; 36x
Max. frequency, Hz	500
Max. rate of course change (rate of turn), °/s	80
Input log signals	
Max. voltage, V	400
Pulse per mile	100; 200; 300; 400; 500; 600
Input parameters	
Optoisolated inputs	+ (except log with closing contact)
Switching threshold levels, V	3; 6
Output parameters	
Number of asynchronous serial ports RS-232 and RS-422/485 interface, pcs.	2
Parity bit	no; even; odd
Stop bits	1 or 2
Update frequency, Hz	1; 2; 5; 10
Output signal format	standard line NMEA 0183 with checksum
	63 variants of NMEA 0183 sentences output (IEC 61162)*
Data bit, bit	8
Baud rate, bit/s	2400; 4800; 9600; 14400; 19200; 28800; 38400; 57600; 76800; 115200; 230400
Range of measured values	
Speed, knots	0.0 to 99.9
Course	0.0° to 359.9°
Data accuracy	
Speed, knots	0.1
Course	0.1°
General specifications	
Overall dimensions, mm	200×134×68
Protection degree	IP22

Parameter	Value
Limiting temperature, °C	–60 to +70
Operating temperature, °C	–15 to +55
Weight, kg	1.2
* Configured by means of three different options to output ship turn rate, current course and speed data.	

1.3 STRUCTURE AND OPERATION OF THE PRODUCT

1.3.1 The Product is manufactured in metal casing where a grounding stud and connection ports are located, see Figure 1.

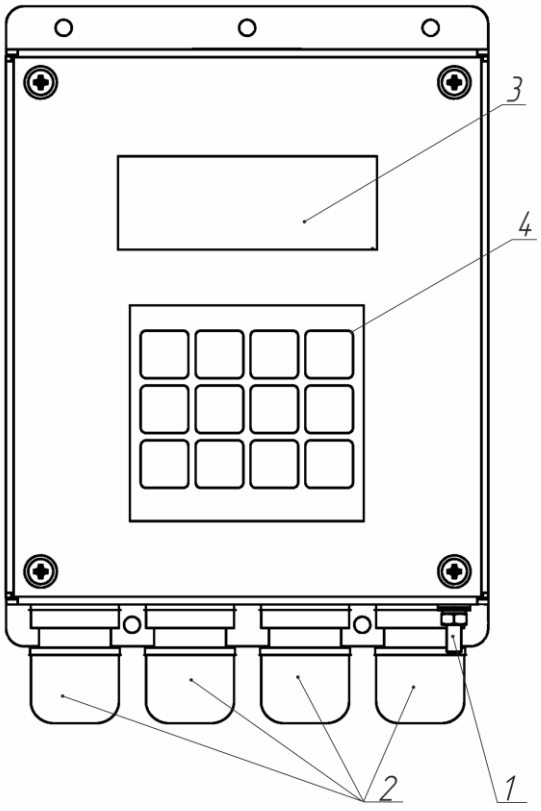

Figure 1 – ADPC-101 external view

The Product structure includes functional elements, see Table 2.

Table 2 – Functional elements

Pos. №	Elements	Type, standard size, identifier	Description
1	Grounding stud	M4x15	Main point grounding element of the Product
2	Cable gland	MG-16	To connect power supply and external equipment
3	LCD	–	To display data
4	Functional keys	“1” and “F1”	“1” to enter digit “1” and, “F1” to access the menu of course data input
		“2” and “F2”	“2” to enter digit “2” and, “F2” to access display mode of distance traveled on the LCD
		“3” and “↑”	“3” to enter digit “3” and, “↑” to navigate “up” in the menu
		“4” and “F3”	“4” to enter digit “4” and, “F3” to access settings menu
		“5” and “+”	To enter digit “5” and “+”
		“6” and “→”	“6” to enter digit “6” and, “→” to navigate “left” in the menu
		“7” and “.”	To enter digit “7” and “.”
		“8” and “←”	“8” to enter digit “8” and, “←” to navigate “right” in the menu
		“9” and “–”	To enter digit “9” and “–”
		“0” and “↓”	“0” to enter digit “0” and, “↓” to navigate “down” in the menu
		“SHIFT”	To change the case
		“CLEAR” and “ENTER”	“CLEAR” to confirm and, “ENTER” to delete data in the menu
Note – See the positions on Figure 1.			

1.3.2 Connection diagrams of the Product are represented in Figures 2–4; for the layout and assignment of printed circuit board terminal connectors, see Figures 5 and Table 3.

To change switching threshold of log and gyrocompass optoisolated inputs, use DIP-switches “J4”, “J5”, “J6”, “J7”, “J8”, and jumpers (see Figure 5). If contacts are closed, threshold input voltage is 6 V, if opened - 3 V.

Threshold voltage, if DIP-switches “J4”, “J5”, “J6”, “J7”, “J8” are opened and closed, are represented below:

a)  or  – threshold voltage approx. 3 V;

b)  – threshold voltage approx. 6 V.

DIP-switch “J10” status:

a)  – ADPC-101 is an end device on RS-422/485 channel;

b)  – ADPC-101 is a middle device on RS-422/485 channel.

Connectors “J9”, “J1” (see Figure 5) are used for device configuration at manufacturing stage and not used during operation.

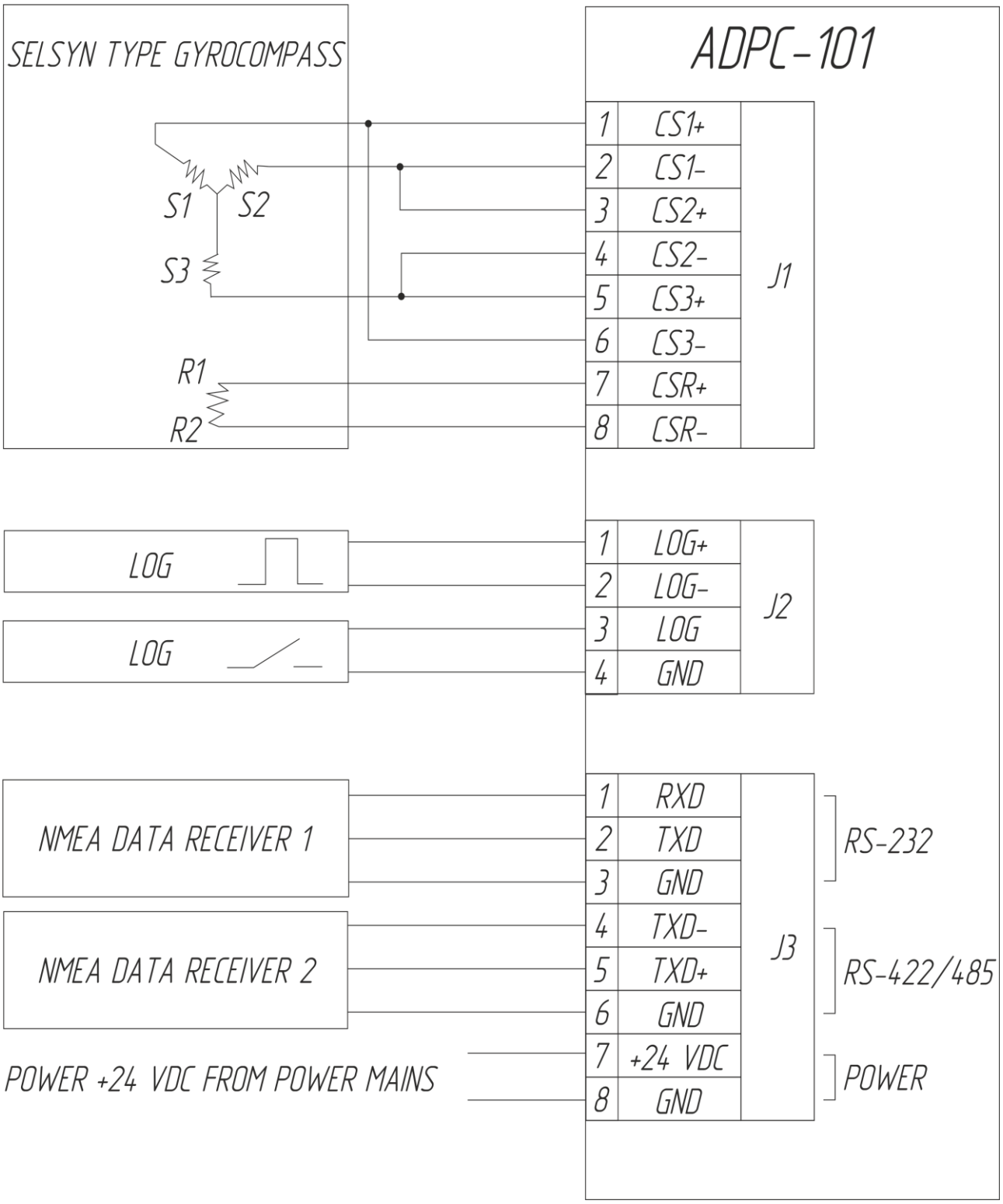

Figure 2 – Connection diagram of selsyn type gyromcompass

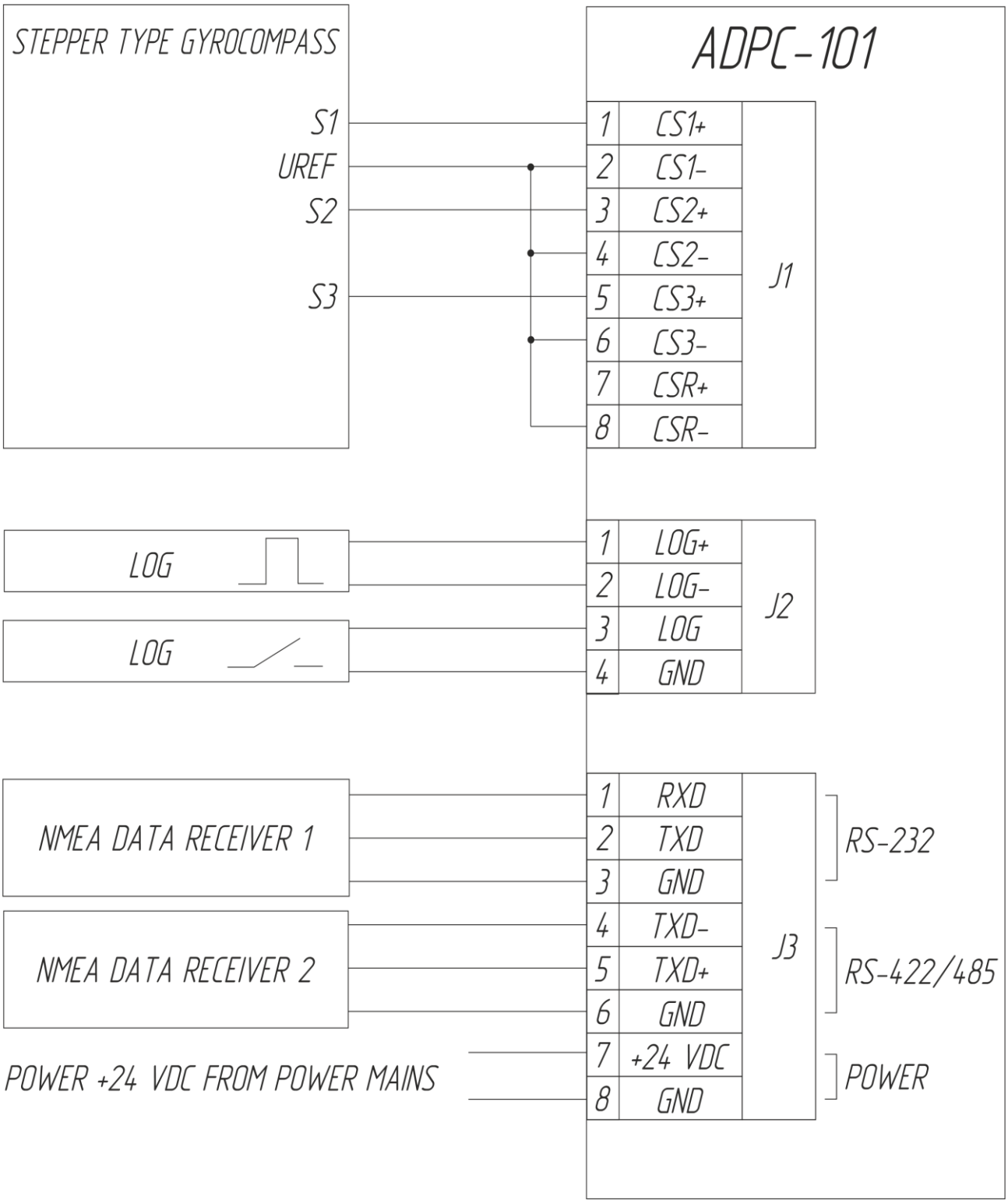

Figure 3 – Connection diagram of stepper type gyromcompass

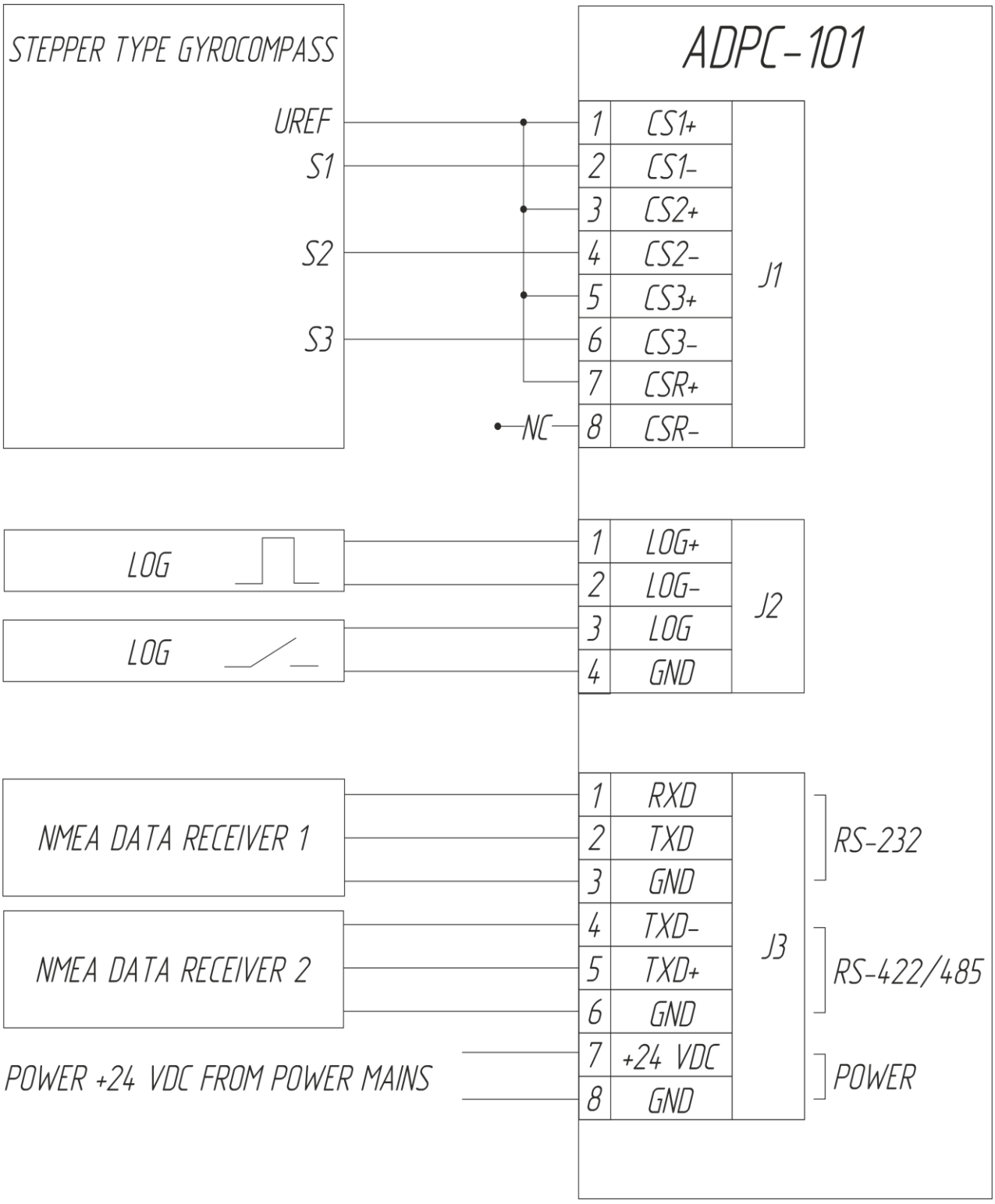

Figure 4 – Connection diagram of stepper type gyrocompass with common positive

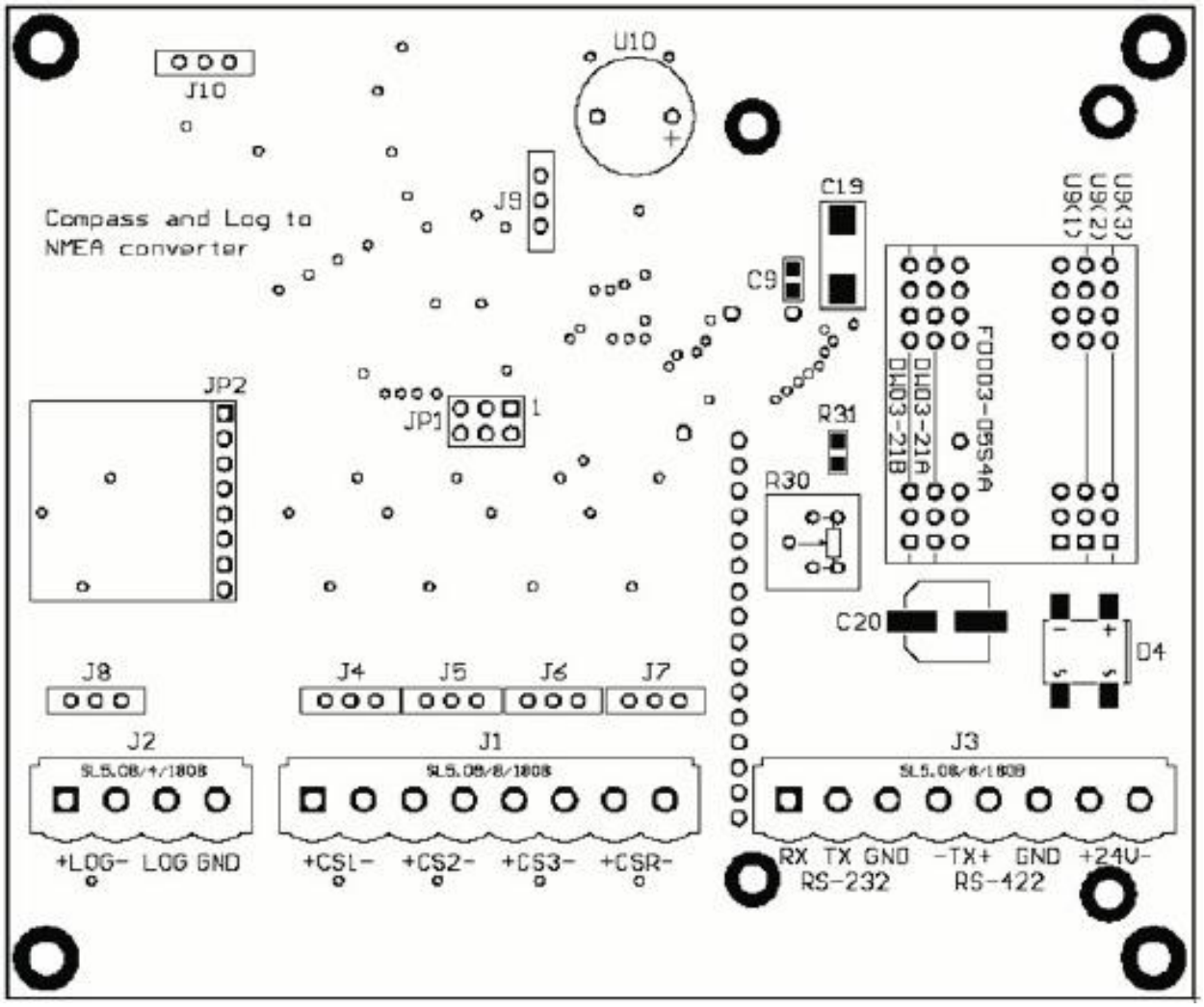

Figure 5 – Terminals layout on the Product's printed circuit board

Table 3 – Assignment of the Product's port terminals

Connector	Terminal №	Description
"J1"	"CS1+"	To connect gyrocompass
	"CS1–"	
	"CS2+"	
	"CS2–"	
	"CS3+"	
	"CS3–"	
	"CSR+"	
	"CSR–"	
"J2"	"LOG+"	To connect log
	"LOG–"	
	"LOG"	
	"GND"	

Connector	Terminal №	Description
“J3”	“RX”	To connect data receivers
	“TX”	
	“GND”	
	“TX–”	
	“TX+”	
	“GND”	
	“+24V”	To connect power supply
	“GND”	

1.4 MEASUREMENT INSTRUMENTS, TOOLS AND APPLIANCES

Consumables required for the TS are represented in Table 4.

Table 4 – Consumables required for the TS

Name and identifier of consumables	Amount of consumables	Note
Cleaning cloth	0.10 kg	1 To clean the Product’s surface – use clean cloth; 2 To remove severe contamination – use cloth soaked in alcohol.
Rectified hydrolytic technical ethyl alcohol	0.05 l	To soak cloth and remove contamination from screen
Varnish	0.05 kg	To cover surfaces of the Product in case of paint coating damage
Abrasive cloth	0.06 x 0.06 m	To polish surfaces of the Product in case of paint coating damage

1.5 MARKING AND SEALING

The Product has a nameplate indicating name, input voltage, power consumption, protection degree, weight, serial number and date of manufacturing.

The sealing of the Product is not provided.

1.6 PACKAGING

At the time of delivery the Product is packed in a corrugated board box and inner packaging (air bubble film) ensuring its transportation and storage at the warehouse.

Transport packaging is also used as a returnable packaging for transportation of the Product to the repair location and back.

The sealing of transport packaging is not provided.

2 INTENDED USE OF THE PRODUCT

2.1 OPERATIONAL CONSTRAINTS

Select the installation site in compliance with operational constraints (operating temperature and protection degree – IP).

Caution! Distance between the installation site and magnetic compass shall not be less than 1 m!

2.2 USAGE PREPARATIONS

2.2.1 Safety features

While preparing the Product for operation, check it visually after unpacking; mechanical damage shall be absent.

Connection to power mains shall be provided only in compliance with input power requirements.

Before connecting the Product shall be switched off and have a proper grounding.

While using the Product the staff shall follow “The technical rules for operation of electric installation” and “Safety rules for operation of electric installation” while testing electrical circuits and insulation resistance.

2.2.2 Visual check procedure

Before switching the Product on:

a) check visually integrity and initial position of the controls;

b) check absence of dust and dirt on the Product casing; clean with a soft cloth if necessary, see Table 4;

c) check that cable connectors are securely connected to the Product and reliable grounding.

2.2.3 Switching on instructions. While connecting the Product and preparing it for operation follow the steps below:

a) transfer circuit breakers of main power switchboard to “OFF” position;

b) connect de-energized cables to the Product;

c) transfer circuit breakers of main power switchboard to “ON” position;

d) enter initial course data and used types of gyrocompass and log.

2.2.4 To switch the Product off:

a) transfer circuit breakers of main power switchboard to “OFF” position;

b) disconnect de-energized cables.

2.3 USAGE OF THE PRODUCT

2.3.1 As soon as power is supplied, the Product transfers to the mode of course and speed data display; herewith gyrocompass and log readings are displayed as zeroes, see Figure 6. Signal is absent on the converter’s output. The Product requires an input of initial course values and gyrocompass and log types.

Unless initial course values and types of gyrocompass and log are entered, the Product will stay in waiting mode, and alarm will work.

To ensure proper operation, select gyrocompass type and log type in the menu settings, see 2.3.8 and 2.3.9, and input manually current course data of used gyrocompass.

If received compass and log data are invalid, the display shows “?” (a question mark) – in the beginning of the relevant line.

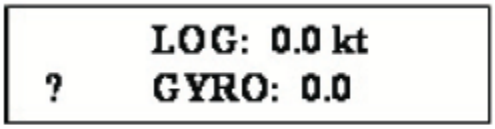

Figure 6 – Display mode of current course and speed data from gyrocompass and log

Note – Re-input current gyrocompass data if type of gyrocompass is changed (stepper or synchro).

2.3.2 If initial course values input is required, select relevant settings in “Need Enter Gyro” menu item. If “Yes” is selected, provide settings according to 2.3.3. If “No” is selected, the Product will output NMEA 0183 sentences (speed data) after switching on, if settings according to 2.3.8,d) were provided.

2.3.3 To input initial course data:

a) Take readings from a gyrocompass connected to the Product;

b) press button “1” on the Product casing; the command to enter course data will appear on the display, see Figure 7;

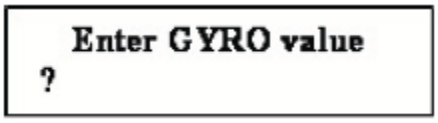

Figure 7 – Course data input

c) enter course data using digit buttons and point ".";

d) press "ENTER".

The LCD returns into display mode of current course data from gyrocompass and log; sound signaling stops.

To edit or delete the last character of the input value, you may use "CLEAR" button.

Buttons "." and "CLEAR" are entered in upper case; note that after pressing "." the case automatically becomes a lower one; after pressing "CLEAR" the case remains upper.

To change the case, use "SHIFT".

The case may be defined by a cursor status:

– blinking cursor with highlighted character space – lower case;

– not blinking cursor (underlining) – upper case.

Caution! All configured options are saved into the non-volatile memory; they are not changed in case of power failure. Gyrocompass course data and distance traveled are set to zero. Input new current course data from the connected compass to ensure correct Product operation.

Notes

1 In this settings mode a user may input a floating point number with one decimal place of a tenth. Invalid values (more than 359.9) will be ignored.

2 If "unuse timeout" option was selected (in position "5s"; "10s"; "15s"; "20s"; "25s" except "OFF"), and a user provides no settings or actions, the Product automatically switches from an input mode to course and speed data display mode without any option changes.

3 Selected options are saved only after pressing "ENTER".

As soon as log and gyrocompass type are selected, initial course data are entered, and valid data are received, the Product starts to output NMEA 0183 (IEC 61162) signal to both outputs RS-232 and RS-422/485 at the same time, with the frequency configured in the Product's settings.

Sample input

1 To enter 320.3 degrees, press the buttons:

"1" "3" "2" "0" "SHIFT" "." "3" "ENTER"

2 To enter 152.4 and then change digit 2 to 8, press:

“1” “1” “5” “2” “SHIFT” “.” “4” “SHIFT” “CLEAR” “CLEAR” “CLEAR” “8” “SHIFT” “.” “4” “ENTER”.

2.3.4 In the mode of additional display of inputs status, LCD shows logic signal states on the Product inputs, which might be useful during installation operations, see Figure 8.

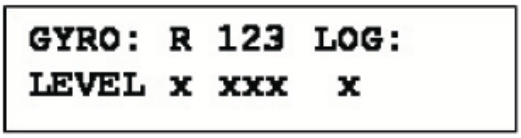

Figure 8 – Additional mode to display inputs status

To switch to the additional mode, press “9”.

For optoisolated input:

a) logic “0” means that signal level is lower than switching threshold;

b) logic “1” means that signal level exceeds switching threshold.

c) “123” – 1, 2, 3 windings of selsyn gyrocompass.

For log’s input with closing contact interface:

a) logic “0” means that contact is opened;

b) logic “1” means that contact is closed.

The Product will stay in this mode unless an operator presses any button.

2.3.5 In traveled distance display mode LCD shows traveled distance since the last time a distance recorder was set to zero. Zeroing occurs when the Product is switched off, or may be carried out by an operator by pressing “7”. When the Product switches to traveled distance mode, an upper line of LCD with speed data is replaced by traveled distance data line, see Figure 9.

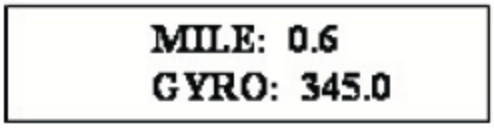

Figure 9 – Traveled distance display mode

To switch to this mode, press “F2”. To exit the mode, press “F2” again.

Speed and course data transmission in NMEA 0183 (IEC 61162) format to converter’s outputs in this mode is not interrupted or changed.

2.3.6 In mode of current ship turn rate display LCD shows current ship turn rate. When switching to this mode, the LCD lower line with current course data starts showing ship rate turn data, see Figure 9.

To switch to the mode, press button “3”. To exit the mode, press “3” again.

2.3.7 Press “F3” to access the settings menu.

To navigate in the menu, use buttons “3”, “0”, which ensure movement «up» and “down”, respectively. To select values, use buttons “6”, “8”, which ensure movement “left” and “right”, respectively.

To exit the mode, press “F” again. To select the values (options), press “ENTER”.

To review software version, press “0”.

2.3.8 Gyrocompass settings:

a) GYRO ratio – ratio between selsyn turn and ship turn: 360x, 240x, 180x, 90x, 60x, 36x;

b) GYRO sign – direction of compass rotation: positive, negative;

c) GYRO type – gyrocompass type: selsyn, stepper.

Note – When switching types of gyrocompass (stepper or selsyn), re-enter current compass data;

d) GYROref polarity – select of signal polarity: positive, negative:

– select of negative polarity for selsyn gyrocompasses leads to signal inversion and consequently operation with displacement for 180°.

– For stepper gyrocompass positive polarity matches high signal level, negative – low signal level, which defines operating mode of gyrocompass.

2.3.9 Log settings:

a) LOG pulse/mile – a number of pulses per mile: 100, 200, 300, 400, 500, 600.

Note – If log’s pulse repetition interval at the moment exceeds information update interval (1s), the speed is calculated according to current accumulated measurement after the last log pulse;

b) LOG bounce delay – time for software treatment of contact bounce:

0, 2, 10, 20, 30, 40, 50, 70, 100 ms.

2.3.10 Settings of serial port:

a) COM baudrate – baudrate: 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 76800, 115200, 230400 bit/s;

b) COM parity – parity bit: NO, EVEN, ODD;

c) COM stop bits – stop bits: 1, 2.

2.3.11 Keyboard setting “Button click” – sound key stroke: Yes, No.

2.3.12 Display setting “Display refresh” – frequency of screen update: 1, 2, 5 and 10 Hz.

2.3.13 Setting of “Unuse timeout” (operator’s inactivity) – time until automatic backlight switch off, menu exit or exit from input mode in case of operator inactivity: 5, 10, 15, 20, 25 s, OFF (timeout is switched off).

2.3.14 “Alarm” settings – function of alarm signaling in case of invalid data from gyrocompass and (or) log, as well as no input of initial course data: ON (alarm is switched on), OFF (alarm is switched off).

2.3.15 NMEA 0183 settings:

a) NMEA REFRESH – update frequency of output data: 1, 2, 5 and 10 Hz;

b) NMEA ROT fmt – formats of output line of ship turn rate:

– Disabled – no output line;

– TIROT – $TIROT,x.x,A*cs;

– HNROT – $HNROT,x.x,A*cs;

c) NMEA GYRO fmt – formats of output line of current course data:

– Disabled – no output line;

– AGHDT – $AGHDT,x.x,T*cs;

– HEHDT – $HEHDT,x.x,T*cs;

– HCHDT – $HCHDT,x.x,T*cs;

– SIVHW – $SIVHW,x.x,T,,,x.x,N,,*cs (mixed format – course and speed are output in one line);

d) NMEA LOG fmt – formats of output line of current speed data:

– Disabled – no output line;

– VMVTG - $VMVTG,,,,,x.x,N,,*cs;

– VMVBW - $VMVBW,x.x,,A,,,*cs (NMEA v 2.0);

– IIVTG - $IIVTG,,,,,x.x,N,,*cs;

– IIVBW - $IIVBW,x.x,,A,,,*cs;

– SIVHW - $SIVHW,x.x,T,,,x.x,N,,*cs (mixed format – course and speed are output in one line);

– VMVBW - $VMVBW,x.x,,A,,,A,,V,,V*cs (NMEA v 2.3);

Note – “cs” is a checksum.

2.3.16 Gyrocompass data are invalid if there is no reference signal:

a) For stepper gyrocompass – no required signal level;

b) For selsyn gyrocompass – no sine wave signal difference, unsynchronization occurrence (disorder of sector sequence) or invalid states.

2.3.17 Log data are invalid if measured speed is equal or more than 100 knots.

If log data occurs to be invalid, relevant NMEA 0183 line (IEC 61162) is not output to serial port, LCD shows “?” – in the beginning of the relevant line. If “Alarm” was selected, sound signaling activates lasting 0.5 s and 0.5 s pause; to reset alarm signaling press any key in the main screen mode or switch off “Alarm”. As soon as valid data are restored, sound signaling is deactivated.

3 TECHNICAL SERVICE OF THE PRODUCT

3.1 GENERAL DESCRIPTION

The Product's TS shall be provided by the staff acquainted with its composition, structure and operation features.

In order to provide safe and reliable operation of the Product, the staff shall maintain semi-annual TS.

TS shall be provided by the staff on the running equipment.

3.2 SAFETY FEATURES

While maintaining the TS, observe 4.2.

3.3 MAINTENANCE ROUTINE

The list of works for all types of the TS is given in Table 5. Maintenance routine procedure is given in the CL, represented in Tables 6–7.

Amount of consumables required for the TS are listed in Table 4.

Table 5 – The list of the TS works

CL №	Work	TS
1	Visual check of the Product	+
2	Test for the Product operability	+
Notes: "+" – work is obligatory.		

Table 6 – CL №1. Visual check of the Product

To be done	Routine	Man-hours per 1 Product
Visually examine the Product	1 check completeness and appearance of the Product; mechanical damage, paint defects must be absent; marking plates shall be present; legends are to be read easily; 2 clean up the Product surfaces with clean cloth; 3 remove severe contamination, parts of corrosion, oil spots from the metal surfaces – using ethyl alcohol, avoiding its penetration inside the Product; all surfaces clean dry by clean cloth and dry up; 4 If varnish paint coating is damaged, polish it with sand paper, then clean with alcohol-soaked cloth, cover with varnish and dry up	1 person 5 mins
Check reliability of cable and bus connection to the Product	1 check that connectors and attaching screws are fastened tight; provide further fastening if needed; 2 check the cable integrity (mechanical damage shall be absent) within visibility	1 person 5 mins

Table 7 – CL № 2. Check of the Product's operability

To be done	Routine	Man-hours per 1 Product
Check operability of the Product	1 connect de-energized power cables, as well as cables of log and gyrocompass to the Product; 2 supply power to log, gyrocompass and Product; 3 make sure that the Product is switched on, and data from gyrocompass and log are transmitted.	1 person 15 min

3.4 PRESERVATION

The Product and set of operational documents are stored in preserved condition in Manufacturer's packaging boxes.

The time of represervation – 2 years from the Manufacturer's commissioning.

The preservation is done in full terms, for 2 years, applying protection and packaging according to the relevant regulatory documents.

The represervation is done in heated rooms in the same order as the preservation.

The represerved Product and documents are placed in package.

4 CURRENT REPAIR OF THE PRODUCT

4.1 GENERAL DESCRIPTION

To provide diagnostics of the problems and defects, use information in Table 8.

Please contact the Manufacturer's service centre in case of other defects, which cannot be traced.

4.2 SAFETY FEATURES

Any repair works shall be provided by personnel examined and received proper qualifications in the area of the occupational safety.

Check grounding of the Product before providing any repair works.

It is PROHIBITED to put a poster "DO NOT switch on! Under Operation!", when power supply switch is in OFF position.

Replacing damaged parts, boards, modules is **PROHIBITED** if power supply of the repaired unit is on

Installation, aligning and repair works are **PROHIBITED** in the room, where less than 2 people are present

4.3 CURRENT REPAIR OF THE PRODUCT

Staff may provide troubleshooting according to Table 8.

Table 8 – The list of possible malfunctions and troubleshooting

Malfunction	Possible reasons	To be done
The Product does not switch on	No mains power	Supply mains power
	Power cable is not connected	Connect the power cable
	Power cable malfunction	Replace the power cable
Power is supplied, but LCD does not work	Faulty connection of LCD flat cable	Connect LCD flat cable properly
	Flat cable is connected, LCD does not work	Contact the Manufacturer's service centre
Keyboard malfunction, keys do not operate	Faulty connection of keyboard flat cable	Connect a flat cable properly
	Flat cable is connected, keyboard does not work	Contact the Manufacturer's service centre
No data from log (gyrocompass)	Log (gyrocompass) is not connected	Connect the log (gyrocompass)
	Log (gyrocompass) has a faulty connection	Connect the log (gyrocompass) according to Figures 2–4
	Invalid settings	Provide correct settings according to 2.3.8, 2.3.9
	Log (gyrocompass) malfunction	Replace the log (gyrocompass)
No data transmission via communication interfaces (RS-232 and RS-422/485)	Connection error of communication interfaces	Connect interfaces properly
	Invalid port settings	Provide port settings according to 2.3.10
Error alarm is malfunctioning	"OFF" is selected in Alarm settings	Select "ON" in Alarm settings

5 STORAGE

The units must be stored in packaging inside areas complying with the required storage conditions (+ 5 to + 40 °C) with the concentration of dust, oil, moisture and aggressive impurities in the air within the required limits for the working areas of production facilities.

After storage or transportation of the device below + 10 °C, it must be unpacked only in heated premises and left packed in normal climate conditions for 12 hours beforehand.

6 TRANSPORTATION

The Product must be transported in the Manufacturer's transportation package in closed means of transport.

Types of shipment:

a) motor vehicle and railroad transportation in closed means of transport (covered cars, multipurpose containers);

b) air transportation (in sealed and heated compartments);

c) sea transportation (in dry service premises).

The units must be transported in compliance with transportation rules applicable for each means of transport.

During loading/unloading operations and transportation, the requirements indicated on warning labels on the boxes/packaging must be observed, and no impacts are permitted since they can affect the safety and performance of the Product.

Inside the means of transport, the packed device must be firmly secured/fastened.

7 DISPOSAL

New equipment, the parts of the Product damaged during operation, and any overage equipment must not be disposed as standard household wastes, since they contain the materials suitable for re-use.

Decommissioned and non-used components of the Product must be delivered to a special waste disposal center licensed by local authorities. You can also send an overage equipment/unit to the manufacturer for its further disposal.

Proper disposal of Product components allows avoiding possible negative environmental and health impacts, and it also allows for proper restoration of components with substantial energy and resources saving.

During operation and upon completion of its service life, the equipment is not hazardous for health and environment

This unit must be disposed according to the rules applied to electronic devices.

Any products marked with a crossed trash bin must be disposed separately from standard house-hold wastes

8 WARRANTY OBLIGATIONS

Manufacturer is under warranty obligations in case of correct Product use according to OM. In case of operation abuse Manufacturer does not accept damage claims.

For more warranty details visit our website www.unicont.com section Support.

Address and contacts of Manufacturer's service centre:

NPK MSA LLC

26E, Kibalchicha St., St Petersburg, Russia, 192174

Tel.: + 7 (812) 602-02-64, 8-800-100-67-19

Fax: + 7 (812) 362-76-36

e-mail: service@unicont.com

ANNEX A
(MANDATORY)
OUTLINE AND INSTALLATION DIMENSIONS

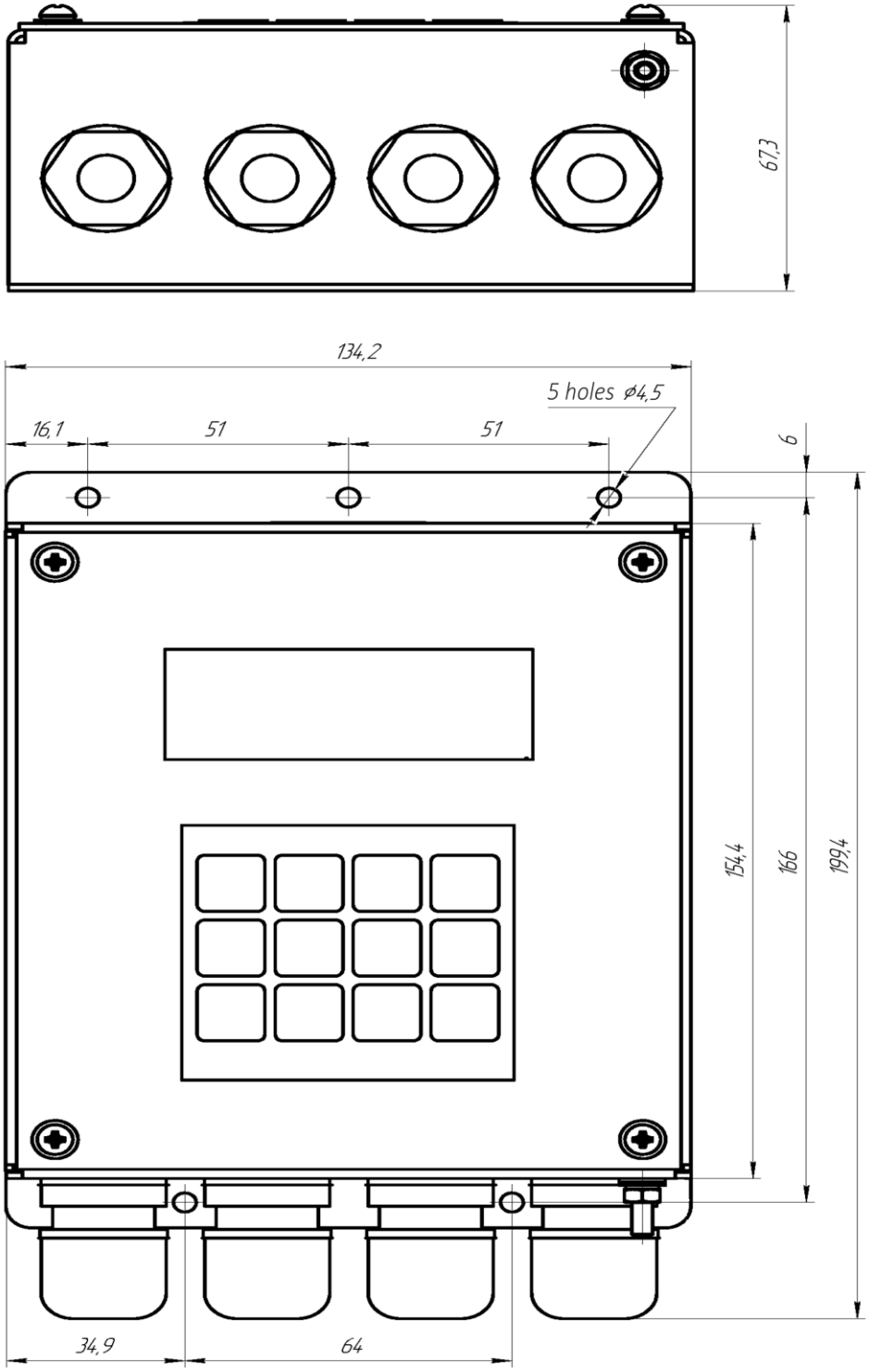

Figure A.1 – Outline and installation dimensions of the Product