

COURSE TRANSLATOR DAC-109

Operating manual

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INTRODUCTION

This operating manual (hereinafter referred to as OM) is intended to describe the structure, operating principles, technical specifications and service of Course Translator DAC-109 (hereinafter referred to as the Product, the DAC).

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:

| | |
|--------|--------------------------------------|
| UCB-91 | Remote control unit UCB-91 |
| AU-106 | Alarm unit AU-106 |
| GYRO | Gyrocompass |
| LCD | Liquid-crystal display |
| SPTA | Spare parts, tools and accessories |
| ED | Engineering documentation |
| KP-124 | Distribution unit KP-124 |
| LFSG | Large fine-pored silica gel granular |
| OM | Operating manual |
| CL | Check list |
| DAC | Course Translator DAC-109 |
| TS | Technical service |

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

Selsyns – DC electric self-synchronous microcomputers (for smooth remote transmission of shaft's rotation angle).

1 DESCRIPTION AND OPERATION OF THE PRODUCT

1.1 DESCRIPTION

The Product converts digital heading data received in NMEA format into synchrosignals required to control analog repeaters and other selsyn-based equipment.

The DAC may be used as a digital repeater to display the current heading data.

1.2 MAIN TECHNICAL SPECIFICATIONS

1.2.1 Technical specifications of the Product are represented in Table 1.

Table 1 – Technical specifications of the Product

| Parameter | Value |
|--|---|
| Electrical specifications | |
| Input voltage, V DC | 24 (18 to 36)* |
| Protection | reverse polarity |
| Output voltage, V AC | $V_{ref}^{**} - 120$ |
| Max. total power consumed by connected selsyns, W | 250 |
| Maximum number of connected synchro-receivers | 8 (through KP-124) |
| Frequency of output voltage, Hz | 50 or 500 |
| Types of connected analog repeaters | synchro / step |
| LCD specifications | |
| Type of display | symbol (16 symbols×2 lines) |
| Displayed data | – received heading value from NMEA signal source; – current position of analog repeaters (converted heading value) |
| Controls | |
| Type of keyboard | Membrane |
| Number of keys | 12 (4×3) |
| Alarm | |
| Sound alarm if NMEA signal is absent on the main channel | |
| Visual alarm if NMEA signal is absent on the main channel (on the LCD) | |
| Output to connect external alarm unit AU-106 | |
| «Alarm» output specifications | |
| Output type | closing (opening) of dry contacts |
| Maximum voltage supplied to «Alarm» output, V | 220 |
| Max. permissible current, passing through «Alarm» contacts, A | 1 |
| Possible reasons for alarm actuation | – NMEA signal is absent on the main channel, – input power supply is absent |

| Parameter | Value |
|--|------------|
| Operating specifications | |
| Operating temperature, °C | –15 to +55 |
| Limiting temperature, °C | –60 to +70 |
| IP rating | IP22 |
| * The range of power supply voltage is represented in brackets. ** Electric voltage relative to which another voltage is counted. | |

1.2.2 Additional units may be connected to the Product. Technical specifications of the units are represented in Tables 2–4.

Table 2 – Technical specifications of the KP-124

| Parameter | Value |
|----------------------------|--------------------|
| Number of inputs / outputs | 1 input, 7 outputs |
| Max. voltage, V | 250 |
| Max. current, A | 5 |

Table 3 – Technical specifications of the UCB-91

| Parameter | Value |
|---|---------------|
| Input voltage, V DC | 24 (9 to 36)* |
| Power consumption, W | 3 |
| Max. current, A | 5 A |
| Number of inputs (outputs) | 2×RS-422/485 |
| Reception / transmission rate, bit/s | 9600 |
| Stop bits | 1 |
| Parity | no |
| Mounting | wall |
| * The range of power supply voltage is represented in brackets. | |

Table 4 – Technical specifications of the AU-106

| Parameter | Value |
|---|------------------|
| Input voltage, DC, V | 24 (9 to 36)* |
| Max. output power, W | 2, max. |
| Consumption current on «Relay» input, mA | 5, max. |
| Number of inputs | 1 |
| Built-in protection | reverse polarity |
| IP rating | IP22 |
| Operating temperature, °C | –15 to +55 |
| Mounting | panel or wall |
| * The range of power supply voltage is represented in brackets. | |

1.3 DESCRIPTION AND OPERATION OF THE PRODUCT

1.3.1 Description

The Product receives digital heading value from NMEA 0183 signal sources and converts it into output sine-wave voltage in order to connect selsyn-receiver windings. Herewith the amplitude of oscillations is set up in such a way that the selsyn-receiver will take a position according to the received digital heading value.

Structural diagram is represented in Figure 1. Since the selsyn-receiver rotation takes some time, which is defined by a number of required rotations (if selsyn rotation to ship turn ratio is different from 1:1) and rotor response time of selsyn-receiver, change of heading on the connected analog repeaters does not occur immediately, but gradually. Both headings (received and converted) are represented on the display. In case the DAC has not displayed the heading value received before on time and has already received new value, it starts processing new received heading value. In other words, the DAC always displays the last received heading value on the selsyn-receivers.

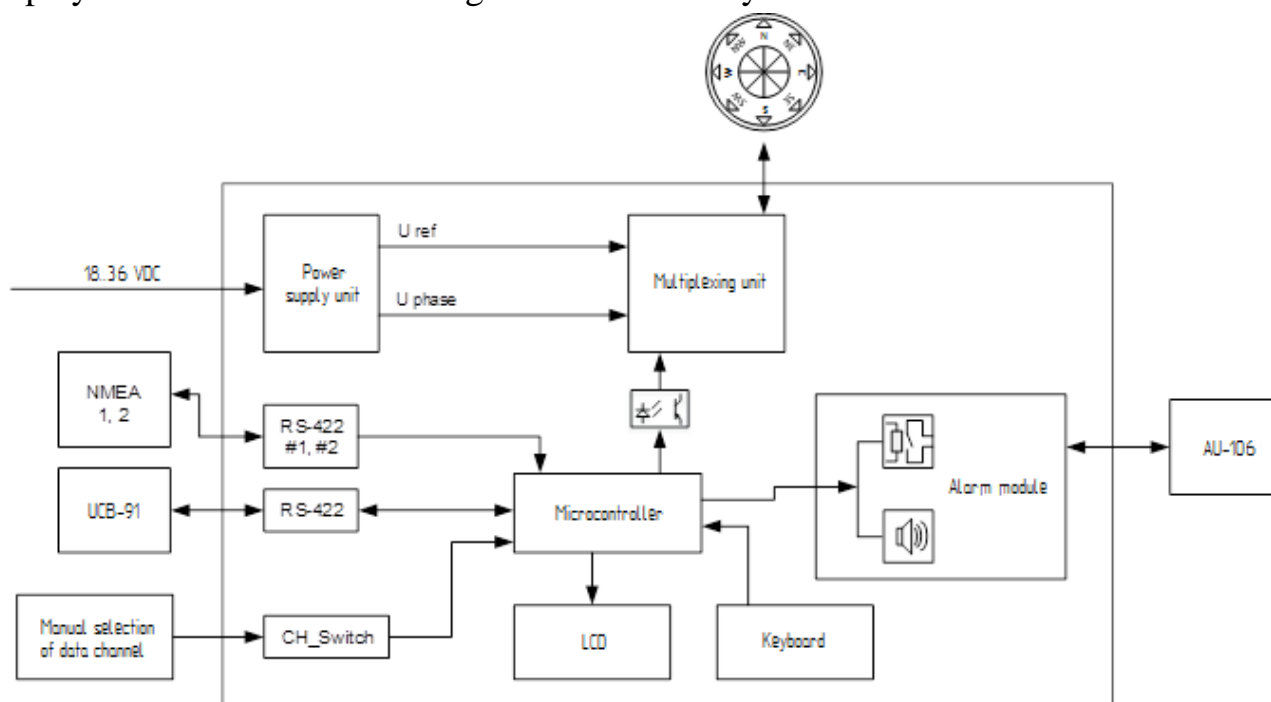


Figure 1 – Structural diagram of DAC heading converter

1.3.2 Controls and indication LEDs

The Product is produced in a metal casing, where LCD, keyboard, piano type switch (ON / OFF), controls and LEDs are located, see Figure 2. For the description of the controls and LEDs, see Table 5.

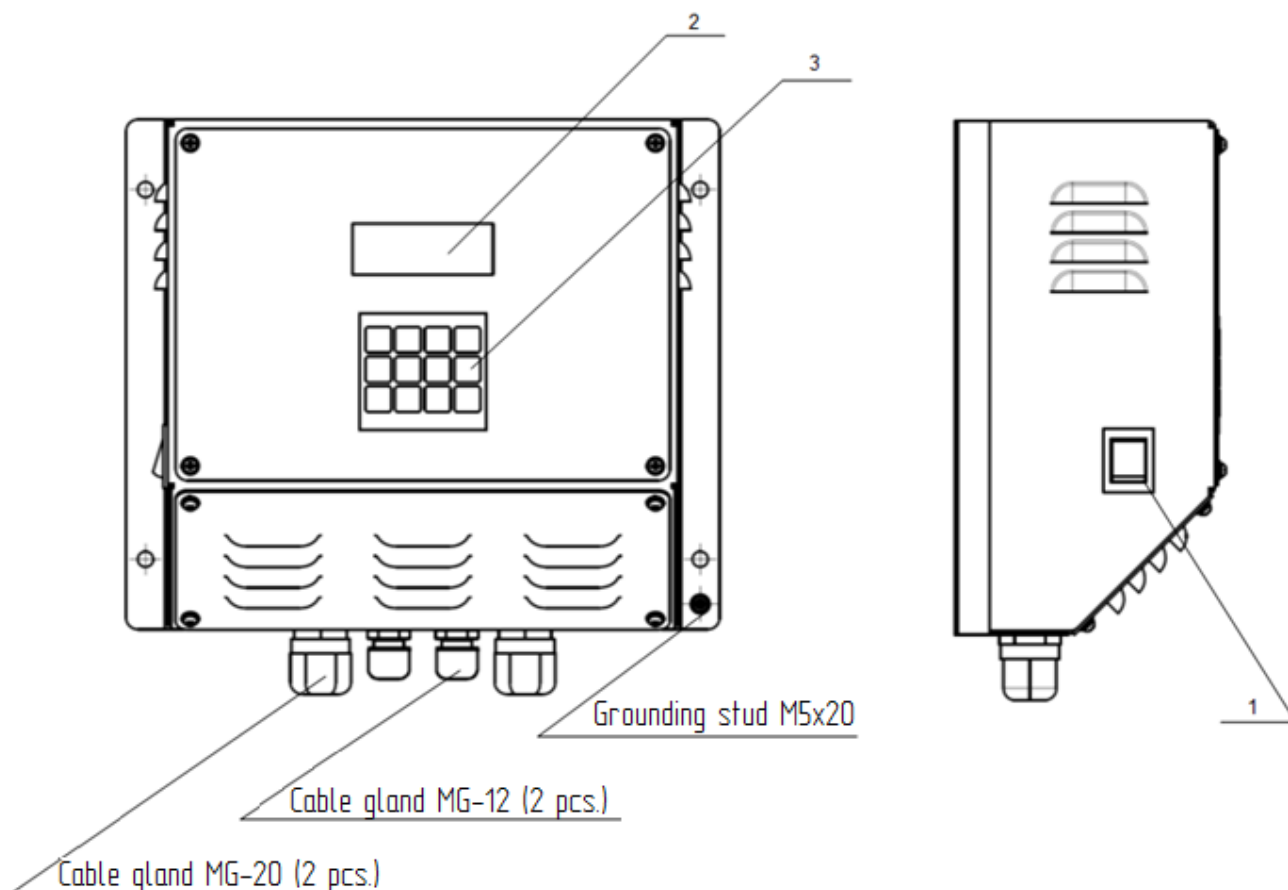


Figure 2 – Layout of the Product's functional elements, controls and LEDs

Table 5 – Description of the Product's functional elements, controls and LEDs

| № | Element | Type, name | Description |
|---|-------------------|------------|---|
| 1 | Piano type switch | «O/1» | To switch ON / OFF the Product, light indication (LED) of power |
| 2 | LCD | – | To display received and current ship's headings |
| 3 | Keyboard | – | To edit parameters and enter heading data |

1.4 MEASUREMENT INSTRUMENTS, TOOLS AND APPLIANCES

Consumables required for the TS are represented in Table 6.

Table 6 – Amount of the consumables required for the TS

| Name and identifier of consumables | Amount of consumables | Note |
|--|-----------------------|---|
| Cleaning cloth | 0.10 kg | To clean contamination from the surfaces |
| Rectified hydrolytic technical ethyl alcohol | 0.01 l | 1 To clean severe contamination from the surfaces 2 To clean surfaces of the Product in case of paint coating damage |
| Varnish | 0.05 kg | To cover surfaces of the Product in case of paint coating damage |
| Abrasive cloth | 0.06x0.06 m | To polish surfaces of the Product in case of paint coating damage |

1.5 MARKING AND SEALING

The nameplates displaying a serial number, date of manufacturing, weight, protection degree, power supply voltage and power consumption are located on the Product.

The sealing of the Product and package is not provided.

1.6 PACKAGING

The Product is packed in a corrugated board box and inner packaging (cardboard) 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 the package is not provided.

2 USAGE OF THE PRODUCT

2.1 OPERATIONAL CONSTRAINTS

The Product shall have a reliable grounding; all cables shall be insulated.

The Product's installation shall be provided in accordance with overall and installation dimensions.

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

2.2 USAGE PREPARATIONS OF THE PRODUCT

2.2.1 Safety features

Before using the Product follow the steps below:

- train staff to use the Product and checkout equipment, as well as occupational safety applicable in the field;
- show the staff ground places of the Product and check reliable grounding;
- only use fuses from SPTA kit;
- switch the power off before disconnecting cables and replacing fuses;
- follow “Rules for Operation of Customers' Electrical Installations” and “Safety Rules for Operation of Customers' Electrical Installations” while testing electrical circuits and insulation resistance of the Product.

2.2.2 Visual check procedure

Before switching the Product on a user shall:

- observe visually the cable integrity and initial position of the controls on the front panels;
- check the absence of dust and dirt on the Product casing; clean with a soft cloth if necessary;
- check reliability of cable connections to the Product.

2.2.3 Switching the Product on

While connecting the DAC and preparing it for operation follow the steps below:

- a) select a place to install the Product (on a vertical bulkhead or mounting panel) and prepare mounting holes according to the overall dimensions, see Annex A;
- b) lead connection cables from the external devices and power supply unit. Connect the cables according to Figures 3–5 to the detachable terminal blocks;

Caution! Do not connect analog repeaters before providing the DAC settings!

- c) set a jumper on the terminal block (P21) and connect the wires to terminal block (P12) according to the required voltage for the analog repeaters, see 2.3.1;
- d) supply power to the Product;
- e) set the operational mode of the Product, focusing on the settings of connected repeaters type;
- f) power OFF the DAC, connect the repeaters and supply power to the Product again;
- g) enter initial current heading on the analog repeaters;
- h) use the GYRO imitation mode or the ship's circulation turn mode to check the operability of Product and connected repeaters, if necessary;
- i) check the Product's operability.

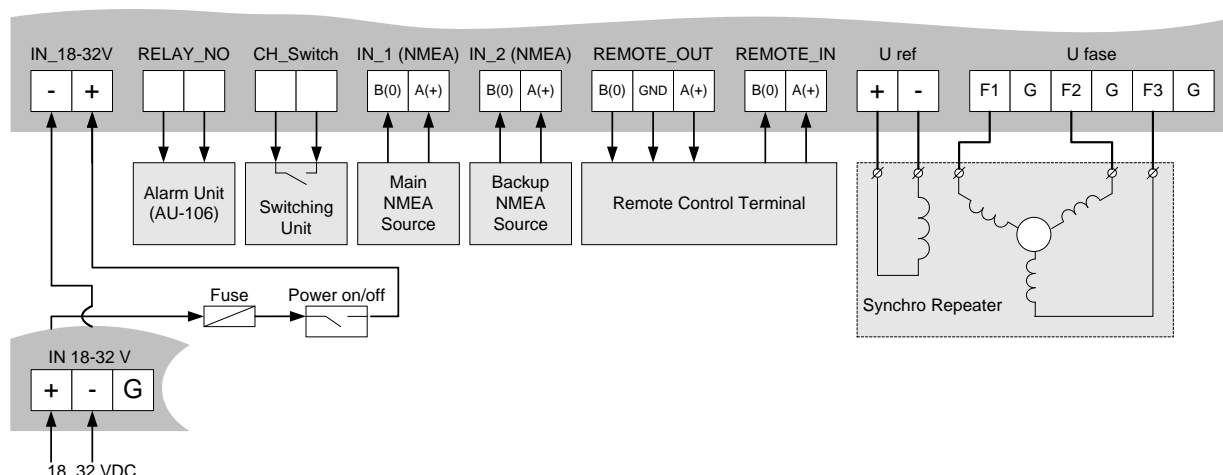


Figure 3 – Connection diagram of the external devices to the DAC

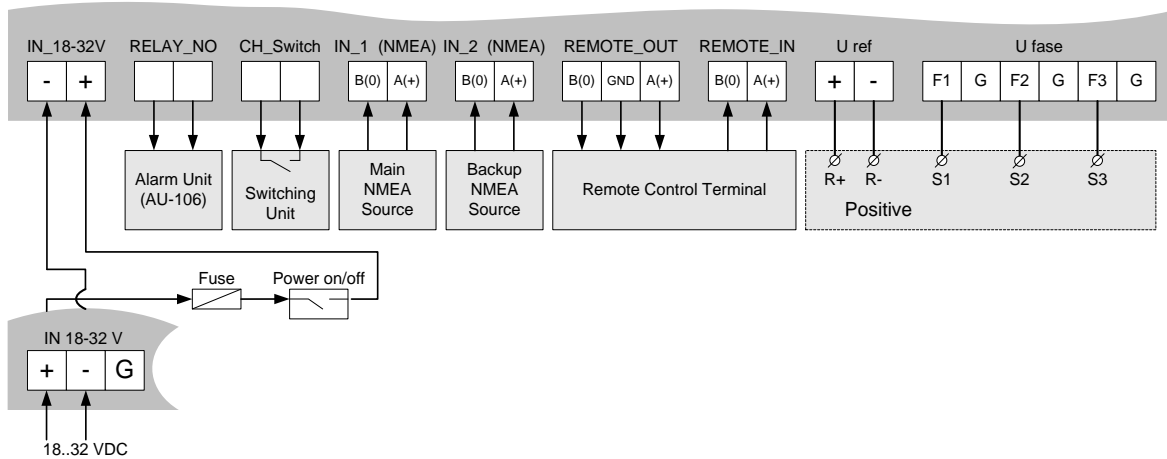


Figure 4 – Connection diagram of the stepper repeater, control on minus

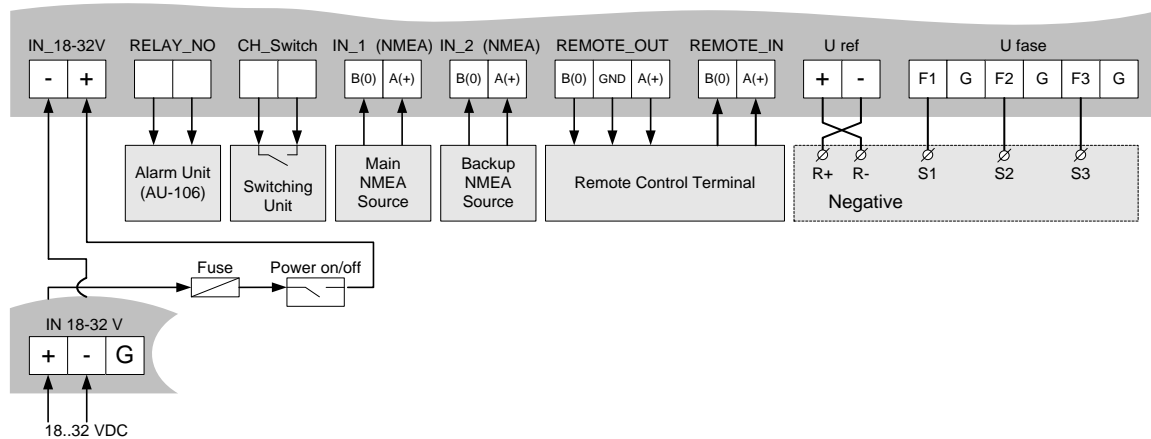


Figure 5 – Connection diagram of the stepper repeater, control on plus

2.3 USAGE OF THE PRODUCT

2.3.1 Selection of the Product's output voltage

Selection of the DAC's output voltage on the phase and reference channels is carried out consequently, in two stages:

a) select connection diagram of internal power cable to terminal block (P12) and set a jumper in the terminal block (P21), see Figure 6.

Set the limit for max. output voltage on the excitation and sync lines in such a way so that it equals or slightly exceeds the required level;

b) using the menu set an output amplitude of excitation and sync voltage according to the repeater's specifications, as percentage of the limit which was set at the first stage.

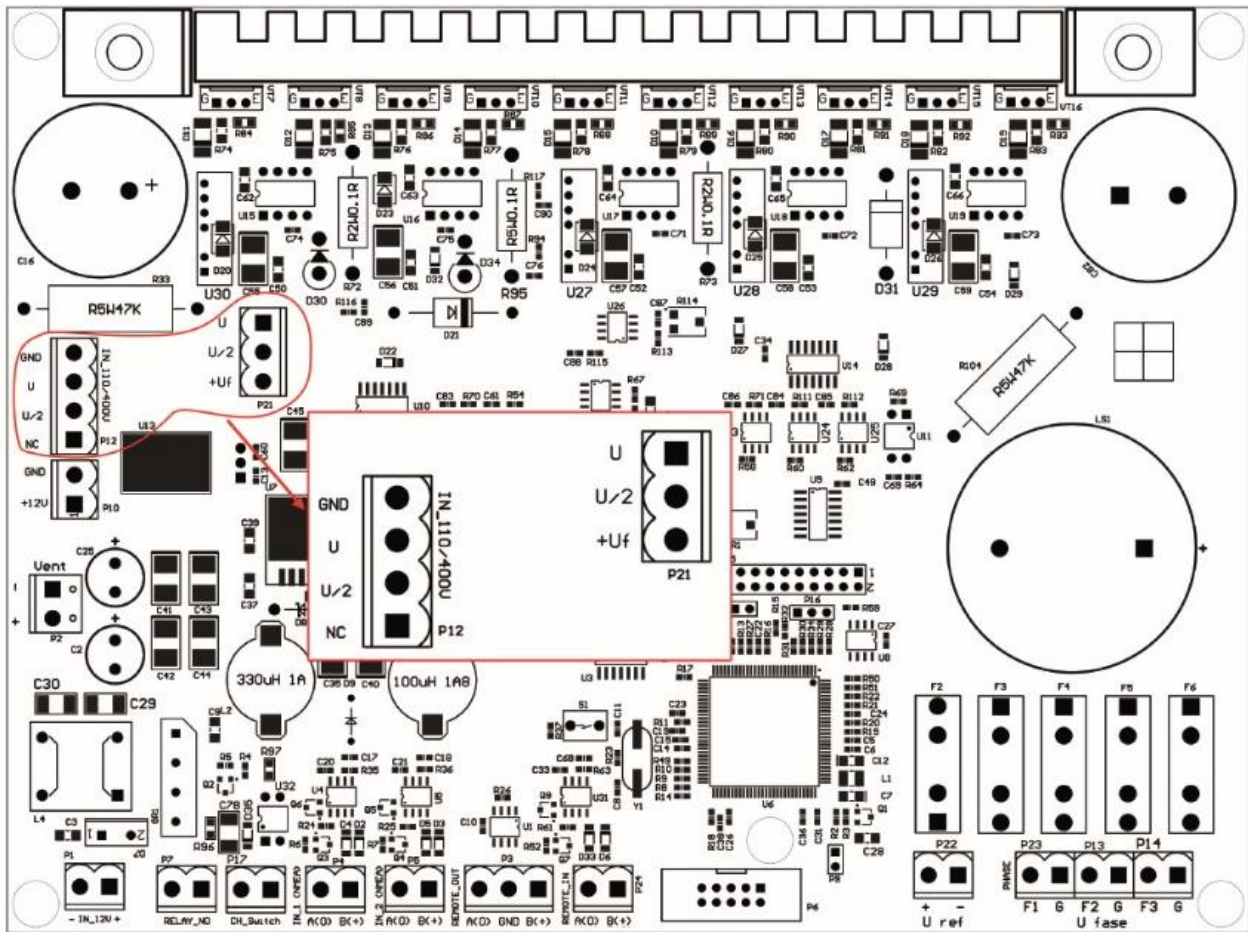


Figure 6 – Terminals blocks P12 and P21

Caution! While delivering the Product the wires are disconnected from the terminal block (P12)!

Example – a user needs to energize synchro-type repeater, excitation voltage 100 V and max. sync 50 V.

Select a connection diagram (P12) and (P21) from Table 7. Select the limit 110 V to provide repeater's excitation voltage (equal to 100 V). Select the limit 75 V to provide repeater's max. sync voltage (equal to 50 V). Thereby a connection diagram is shown in line six of Table 7.

To get an excitation voltage, calculate how many percent it makes from max. value according to the following formula:

$$\frac{U_{req}}{U_{max}} \times 100\% = \text{calculated percent}, \quad (1)$$

where U_{req} – required voltage;

U_{max} – maximum voltage

a) using menu set the value of 90%

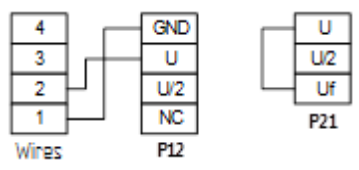
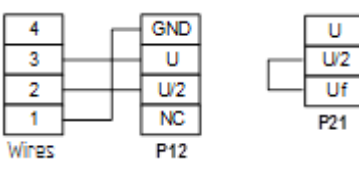
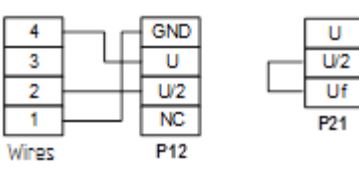
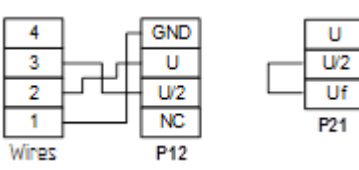
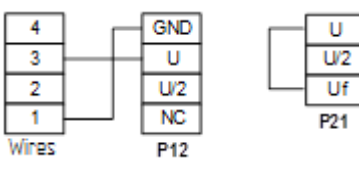
$$\frac{100V}{110V} \times 100\% = 90.9\%;$$

b) calculate the repeater's max. sync voltage likewise and using the menu set the value of 65%:

$$\frac{50V}{75V} \times 100\% = 66.7\%.$$

The diagrams of jumpers' settings in terminal block (P21) and wires connection to the terminal block (P12) for different output voltage levels are represented below.

Table 7 – Voltage selection for selsyn type repeaters

| Diagram of jumper settings in the terminal blocks | Output voltage |
|---|-------------------------------------|
|  | Ref. 0~35 V AC Phase 0~35 V AC |
|  | Ref. 35~75 V AC Phase 0~35 V AC |
|  | Ref. 75~110 V AC Phase 0~35 V AC |
|  | Ref. 0~35 V AC Phase 35~75 V AC |
|  | Ref. 35~75 V AC Phase 35~75 V AC |

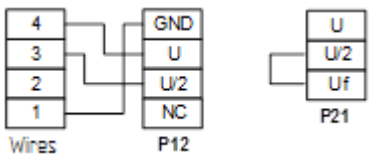
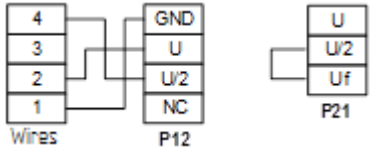
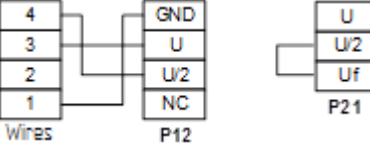
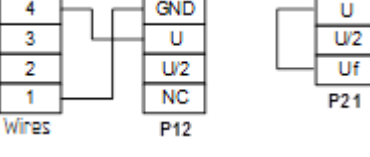
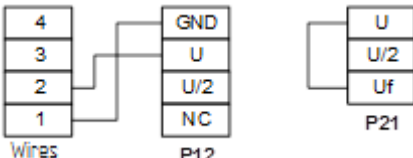
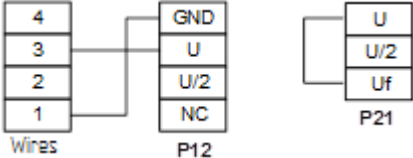
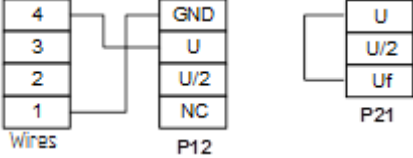
| Diagram of jumper settings in the terminal blocks | Output voltage |
|--|---------------------------------------|
|  | Ref. 75~110 V AC Phase 35~75 V AC |
|  | Ref. 0~35 V AC Phase 75~110 V AC |
|  | Ref. 35~75 V AC Phase 75~110 V AC |
|  | Ref. 75~110 V AC Phase 75~110 V AC |

Table 8 – Voltage selection for the stepper type repeaters

| Diagram of jumper settings in the terminal blocks | Output voltage |
|---|---|
|  | Ref. 0~50 V DC Phase 0~50 V DC |
|  | Ref. 50~100 V DC Phase 50~100 V DC |
|  | Ref. 100~150 V DC Phase 100~150 V DC |

2.3.2 Operation mode of the Product

Once the power is supplied, the DAC transfers to operation mode. In this mode LCD displays 2 heading values:

- a) received heading value from NMEA signal source (e.g., digital gyrocompass);
- b) current heading value on the analog signal receivers (e.g., repeaters connected to the DAC).

In this mode a built-in LCD shows the following information, see Figure 7.

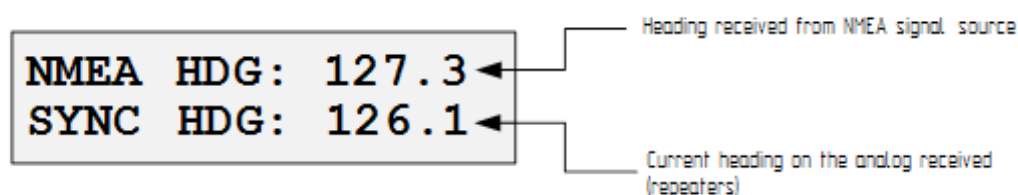


Figure 7 – The Product's display in operation mode

Display shows two heading values due to response time of the selsyn receivers, see 1.3.1.

In operation mode a user can access the Product's settings menu - press [F3] and unlock the keyboard, see 2.3.6.

2.3.3 The Product's settings menu

To call the settings menu, press [F3] in operation mode (see 0), see Figure 8.

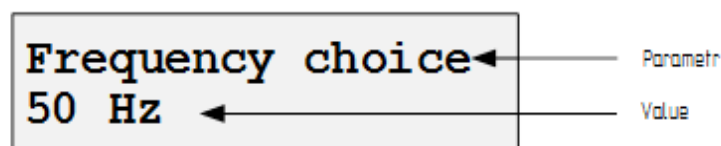


Figure 8 – Settings menu on the Product's display

To exit the menu and return back to operation mode, press [F3] (the settings will be saved).

The upper line shows a parameter to be set. The lower line – current value of this parameter.

To select a parameter use [▲] and [▼] buttons; change the value of the selected parameter using [◀] and [▶] buttons. To confirm the selected value and save it into the non-volatile memory, press [Enter].

The Product's settings and values which may be changed are described below.

Frequency Choice

Frequency selection of output sine wave analog signal.

Frequencies to select: 50 Hz, 500 Hz.

Ratio Choice

Selection of ratio between ship turn and selsyn rotation of analog receiver.

Ratios to set: 1:36, 1:60, 1:90, 1:180, 1:240, 1:360.

Channel Select

A user can select the main channel to receive heading data in digital NMEA 0183 sentences. Once channel #1 is selected, channel #2 will be used as a backup channel. Once channel #2 is selected, channel #1 will be used as a backup channel.

Available main channels to select: Channel 1, Channel 2.

Port 1 Settings

Settings of channel #1. To access the settings submenu of the channel #1 press [Enter].

Available settings for each channel (#1 and #2) are shown in Table 9.

Table 9 – List of channel settings

| Port settings | Value to be selected |
|---------------|---|
| Baudrate | 4800, 9600, 14400, 19200, 28800, 38400, 57600, 115200 |
| Parity | No, Even, Odd |
| Stop bits | 1, 2 |
| CRC Checking | On, Off |

Once CRC Checking parameter is set to «On», the Product tests a checksum of input NMEA sentences. If the checksum test does not comply with an estimated one (i.e., the sentence was received with errors), the Product ignores the received data.

Do not switch this option if NMEA signal sources of version 1 are connected, as the sentences of this NMEA version do not provide retransmitting of checksum.

When a parameter is changed press [Enter] to save the selected value. To exit the submenu, press [F3].

Port 2 Settings

Setting of the channel #2. See «Port 1 Settings».

Backup Channel

If the data are absent on the main channel, the Product switches to the backup channel. If the backup NMEA signal source is not connected, set the parameter to «Off».

Values to be selected: On, Off.

Alarm Sound

If an input NMEA signal is absent on the main channel, the product activates a sound alarm.

Values to be selected: On, Off.

Alarm Period

To select a period of time after which the sound alarm activates; if the data are absent on the main channel the Product switches to the backup channel.

Values to be selected: 2, 3, 4, 5, 6, 7, 8, 9, 10 sec.

Repeater Type

To select a type of repeater.

Values to be selected: Stepper, Synchro.

Ref. Voltage

To select voltage amplitude (from max.) on reference winding.

Values to be selected: 100%, 95%, 90%, 85%, 80%, 75%, 70%, 65%, 60%, 55%, 50%, 45%, 40%, 35%, 30%, 25%, 20%, 15%, 10%, 5%.

Phase Voltage

To select voltage amplitude (from max.) on phase winding.

Values to be selected: 100%, 95%, 90%, 85%, 80%, 75%, 70%, 65%, 60%, 55%, 50%, 45%, 40%, 35%, 30%, 25%, 20%, 15%, 10%, 5%.

2.3.4 Alarm signaling

The DAC ensures several alarm types in case of: data are absent on the main channel; data are absent on the backup channel; data are absent on the main and backup channels; connection to synchro-receiver is absent; initial position of connected analog repeaters is not entered; see Table 10.

Table 10 – Possible malfunctions and indication of the Product's operation status

| Malfunction | Sample of indicator status | RELAY output contacts | Sound alarm* |
|---|-------------------------------------|-----------------------|--------------|
| Initial position of analog repeaters is not entered | NMEA HDG: 127.3 SYNC HDG: ---.- | Closed | 0.2/1 |
| Data are absent on the main channel | NMEA HDG: 127.3? SYNC HDG: 126.1 | Closed | 0.2/1 |
| Data are absent on the backup channel | NMEA HDG: 127.3! SYNC HDG: 126.1 | Opened | 0.5/5 |
| Data are absent on the main and backup channels | NMEA HDG: ---.- SYNC HDG: 126.1 | Closed | 0.2/1 |
| * Length of sound pulses / sound pulse repetition period is listed for the sound alarm. | | | |

Note – To mute sound alarm, press [F2]. At the same time visual alarm continues operation, RELAY output contacts are not opened until the data reception is restored on the main channel.

2.3.4.1 Alarm if data are absent on the main channel

If the Product does not receive heading data on the main channel during the time preset in «Alarm Period» (see 2.3.3), the sound alarm activates; and if «Backup Channel» is set to «On» the Product's switches to the backup channel of NMEA data reception.

Current alarm status is shown on the Product's display in the operation mode (see Figure 9).

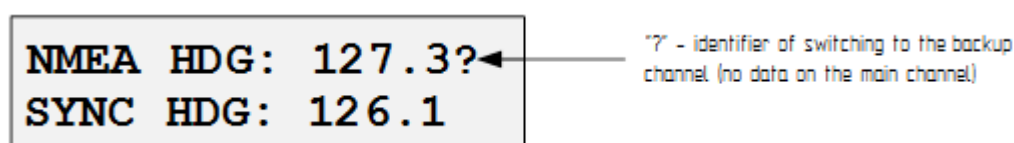


Figure 9 – Alarm status in the operation mode on the display

Visual alarm of data absence (initial position of analog repeaters is not entered) is represented on the display in the following way (see Figure 10).



Figure 10 – the Product's display when initial position data of analog repeaters are absent

If NMEA heading data are not received on the backup channel, the display shows the following (see Figure 11).

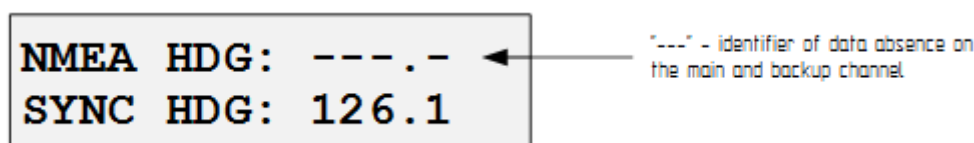


Figure 11 – Display of no heading data

If data reception is restored on the main channel, sound alarm deactivates and the Product switches to the main channel.

Once the alarm activates (a transfer to the backup channel), RELAY output channels also close.

2.3.4.2 Alarm of no data on the backup channel

If «Backup channel» is set to «ON», the DAC controls data reception on the backup channel. If data are absent on the backup channel, «!» appears on the display's upper line to the right of heading which is received on the main channel (see Figure 12). Sound alarm also activates (signal length 0.5 seconds every 5 seconds). RELAY output contacts are not closed.

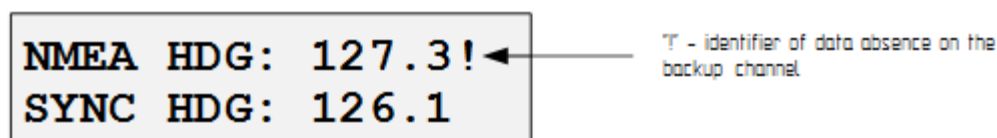


Figure 12 – Display of no data on the Product's backup channel

2.3.4.3 Overload alarm

Once the Product's output is overloaded (e.g., «short circuit»), the DAC automatically cuts off signal forming unit to prevent the circuits and connected equipment from damage. The display shows «Overload protection». To restart the Product a user shall remove the cause of overload and then restart it.

2.3.5 Input of analog repeaters' initial position

Once the DAC is switched on, connected analog repeaters are considered to display heading «0°» by default. If another value is displayed, a displacement (equal to this value) occurs during heading conversion. To prevent this effect the DAC ensures an input of initial position of connected repeaters.

To enter an initial position of analog repeaters provide the following steps:

- a) press [F1] in the operation mode;
- b) enter an initial position of analog repeaters. To delete entered value – press [SHIFT] and [CLEAR] (each press of [CLEAR] deletes one last symbol), to exit mode of deletion – press again [SHIFT];
- c) to save the entered value, press [ENTER].

Samples of setting the initial position:

Set an initial position of analog repeaters «340.1°»:

[F1] [3] [4] [0] [SHIFT] [.] [1] [ENTER]

Set an initial position of analog repeaters «234°»:

[F1] [2] [3] [4] [ENTER].

Caution! If an initial position of repeaters was not entered, the lower line of display shows «---.-». Herewith the Product does not process the changes of digital heading received from NMEA 0183 signal sources.

2.3.6 Unlock the Product's keyboard

To edit the Product's settings in the operation mode, firstly, press [8] [3] [6] [0] one after another to unlock the keyboard, then press the relevant button to enter one of the Product's menus.

If a user tries to enter the menu without pressing the buttons, the display will show the following, see Figure 13.

TO UNLOCK DEVICE
ENTER "8360"

Figure 13 – Display shows to unlock the device by pressing the button combination

The display shows a combination of buttons to press in order to unlock the Product's keyboard.

Note – The keyboard is locked automatically in 8-10 seconds after a user exits the Product's menu.

2.3.7 Debugging and diagnostics tools

2.3.7.1 Imitation of digital gyrocompass

To facilitate debugging of the Product and connected repeaters it ensures the special mode of digital gyrocompass imitation. In this mode the Product ignores the heading data being received from NMEA 0183 signal sources and processes heading data which a user enters using the keyboard.

To switch on the GYRO imitation mode in the operation mode press [5]. The display will show the following, see Figure 14.



GYRO IMITATION
F1-ON F2-OFF

Figure 14 – GYRO imitation ON / OFF mode represented on the Product's display

To switch on the imitation mode, press [F1]; to switch it off (in case it was switched on before) – [F2]. Once [F1] is pressed, the imitation mode switches on; in the operation mode the display's upper line shows «IMIT HDG:» (in place of «NMEA HDG:»). To enter the heading (which should be entered in place of data being received from NMEA signal sources), press [7], and then enter the heading value (similar to 2.3.5).

Caution! Switch off the GYRO imitation mode after a debugging!

2.3.7.2 Imitation of the ship's circulation turn

The imitation of the ship's circulation turn also facilitates debugging of the connected repeaters. In this mode the DAC emulates constant starboard turn, rate 360 degrees per minute. Change of heading on the connected repeaters (if they were connected correctly), shall occur constantly, without jumps and rippling or changes of rotation direction.

To enter this mode, press [9]; the display will show the following, see Figure 15.



CIRCULATION
F1-ON F2-OFF

Figure 15 – Switching ON / OFF imitation mode of the ship's circulation turn on the display

To switch on the mode, press [F1]; to switch it off (in case it was switched before) – press [F2].

Caution! Switch off the imitation mode of the ship's circulation turn after a debugging!

To exit the mode of output channels' status, press any button.

3 TECHNICAL SERVICE OF THE PRODUCT

3.1 GENERAL DESCRIPTION

The technical service (hereinafter – the TS) shall be provided by the staff acquainted with the Product's composition, structure and operation features.

In order to provide safe and reliable operation for the Product, the staff shall maintain a schedule of the technical service:

- technical service № 1 (hereinafter – TS-1) – semi-annual TS;
- technical service №2 (hereinafter – TS-2) – annual TS.

TS-1 and TS-2 shall be provided by the staff on the running equipment.

3.2 SAFETY FEATURES

While maintaining the TS follow the instructions given in 4.2 of the present OM.

3.3 MAINTENANCE ROUTINE

The list of works for all types of the Technical service is given in Table 11. Maintenance routine procedure is given in the checklists (hereinafter - CL), represented in Tables 12, 13.

Amount of consumables required for the TS are listed in Table 6.

Table 11 – The list of the TS works

| CL № | Work | TS type | |
|----------------------------------|----------------------------------|---------|------|
| | | TS-1 | TS-2 |
| 1 | Visual check of the Product | + | + |
| 2 | Test for the Product operability | + | + |
| Notes: «+» – work is obligatory. | | | |

Table 12 – Check list № 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 AK-113 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 13 – Check list № 2. Check of the Product's operability

| To be done | Routine | Man-hours per 1 Product |
|----------------------------------|--|-------------------------|
| Check operability of the Product | 1 power the Product on 2 check that «Power» indication is present | 1 person 5 mins |

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.

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

The Product's operability is controlled by the backlight of по подсветки клавишного переключателя «ON / OFF» and LCD.

To provide diagnostics of the problems and defects, use information in Table 14.

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 DAC 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

Table 14 – The list of possible malfunctions and troubleshooting

| Malfunction | Possible reasons | To be done |
|--|--|---|
| The number of controlled repeaters is less than listed in relevant documentation. | One or several repeaters acidified or have mechanical malfunctions | Remove acidified spots in selsyns, remove the cause of mechanical malfunctions |
| | One or several repeaters are faulty | Detect and remove faulty repeater |
| | Used cable is too long | Increase output signal power |
| | Small cross-section wires are used | Change the cables to the ones with bigger cross-section |
| One or several repeaters are not rotating or rotating with difficulty, nonuniformly. | Contacts' malfunction in the repeater's control lines | Remove the malfunctioning connections to the repeater, acidified spots on connecting terminals, loose connections, tighten the screws and connections, solder connection places |

| Malfunction | Possible reasons | To be done |
|--|--|---|
| Repeater's compass card is rotating nonuniformly (jerky) | Wrong settings of reference and phase voltages of selsyn rotation | Set the relevant voltage of selsyn rotation |
| Display shows black squares | Display's contrast ratio is set too high | Set the contrast ratio to the relevant level |
| Output signal is absent | Power is absent. Jumper of upper PCB (P12) is not set. | Set the jumper of the upper PCB (P12) in compliance with selsyn voltage. |
| The Product doesn't switch on | Connected voltage does not comply with required power supply | Provide 24 V DC power supply |
| | Polarity is reversed | Change the polarity of connected voltage |
| The repeater's information is different from the information set by the converter | Ratio between ship turn and selsyn rotation of analog repeater is set incorrectly | Set the relevant ratio between the ship's turn and selsyn rotation of analog receiver (see 2.3.3) |
| | Wrong or no settings of the repeater's current heading value | Set current position of the repeater heading |
| Display shows «OVERLOAD» | Short circuit in load circuit | Remove the cause of short circuit |
| | Load parameters exceed max. permissible power overload values | Check the connection of the repeaters and control lines (See par. in this Table «The number of controlled repeaters is less than stated in relevant documentation») |
| | Load circuit contains old selsyn's excitation unit | Remove old unit from the load circuit |
| Equipment connected to converter's output circuit (radar, gyrocompass, etc.) do not receive or receive incorrect signal from course translator | Analog-digital receiver does not receive or receives incorrect signal from the converter | Install a filter FDA-122 in a circuit of analog-digital receiver |
| Interference (noise) on the radio equipment | Power cable shielding of repeater or converter is damaged | Provide a shielded power cable of the repeater or converter in good condition |
| Built-in alarm is activated, no data reception | Heading data from data source is absent, wrong settings of reception channel | Set the parameters of source's reception channel (see 2.3.3) |
| | Initial position of the repeaters is not set. | Set the initial position of the repeaters (see 2.3.5) |

5 STORAGE

The units must be stored in packaging inside areas complying with the required storage conditions (+5°C 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:

- motor vehicle and railroad transportation in closed means of transport (covered cars, multipurpose containers);
- air transportation (in sealed and heated compartments);
- 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/package 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.

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.

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

ANNEX A (MANDATORY) TECHNICAL DESCRIPTION OF THE PRODUCT

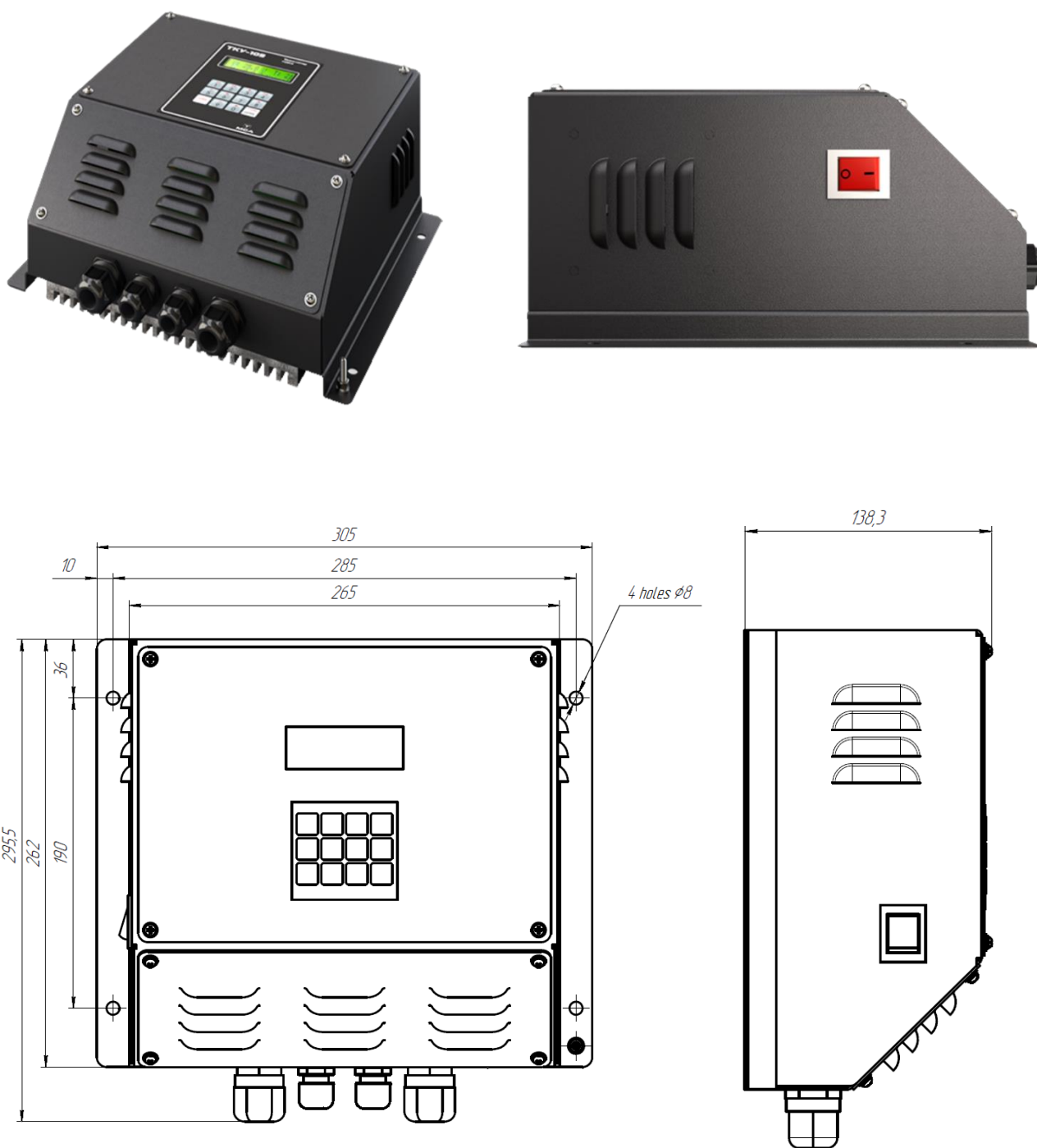


Figure A.1 – The DAC's general drawing and overall dimensions

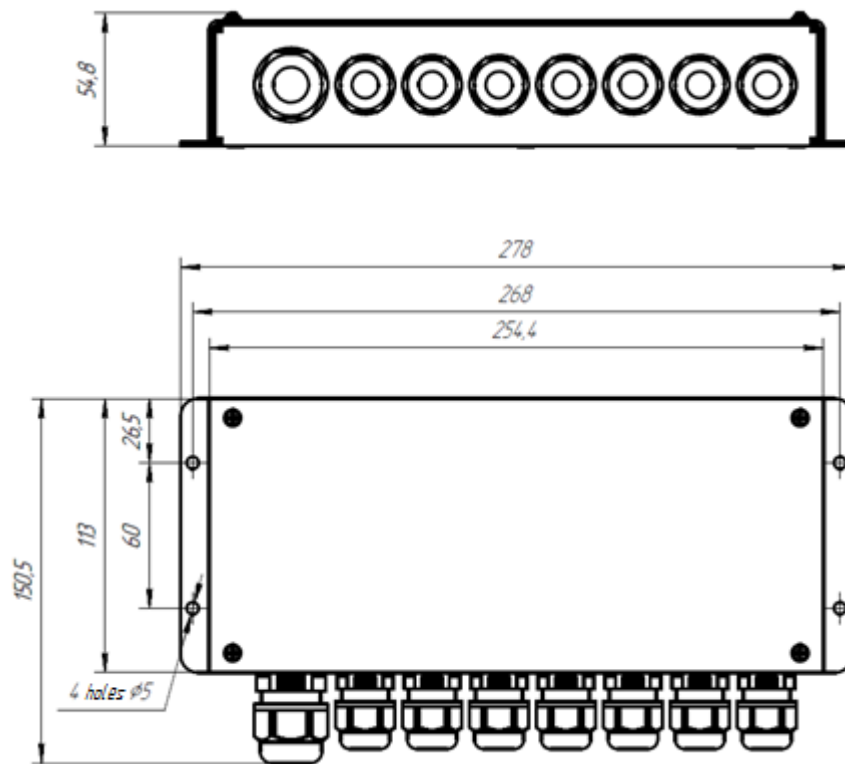


Figure A.2 – Overall dimensions of the KP-124

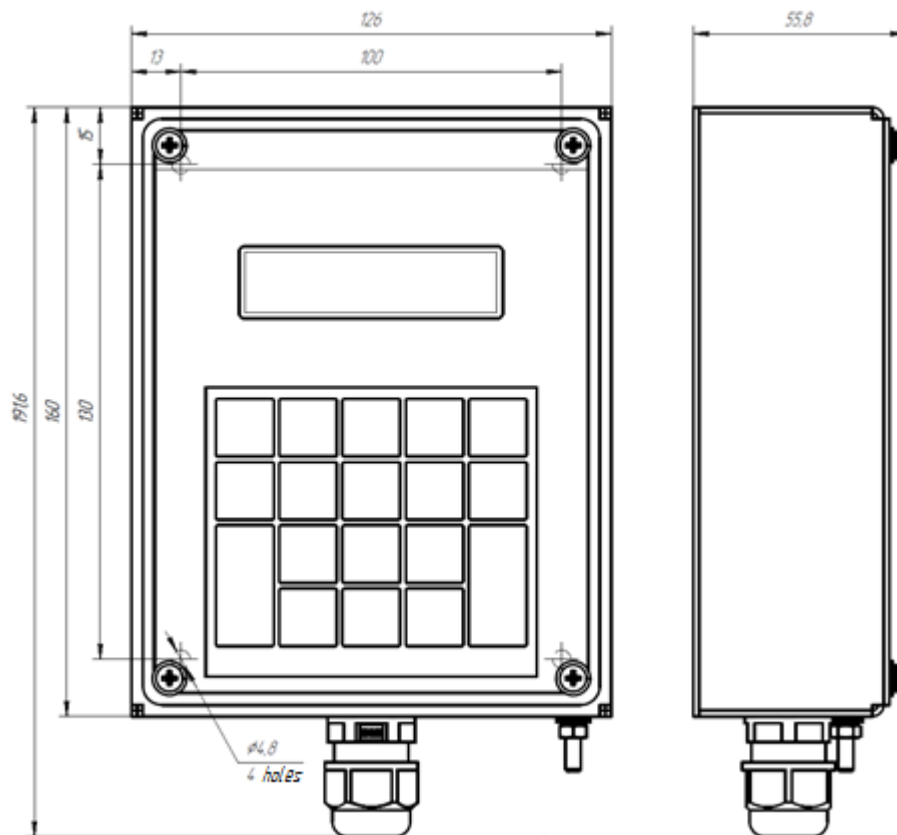


Figure A.3 – Overall dimensions of the UCB-91

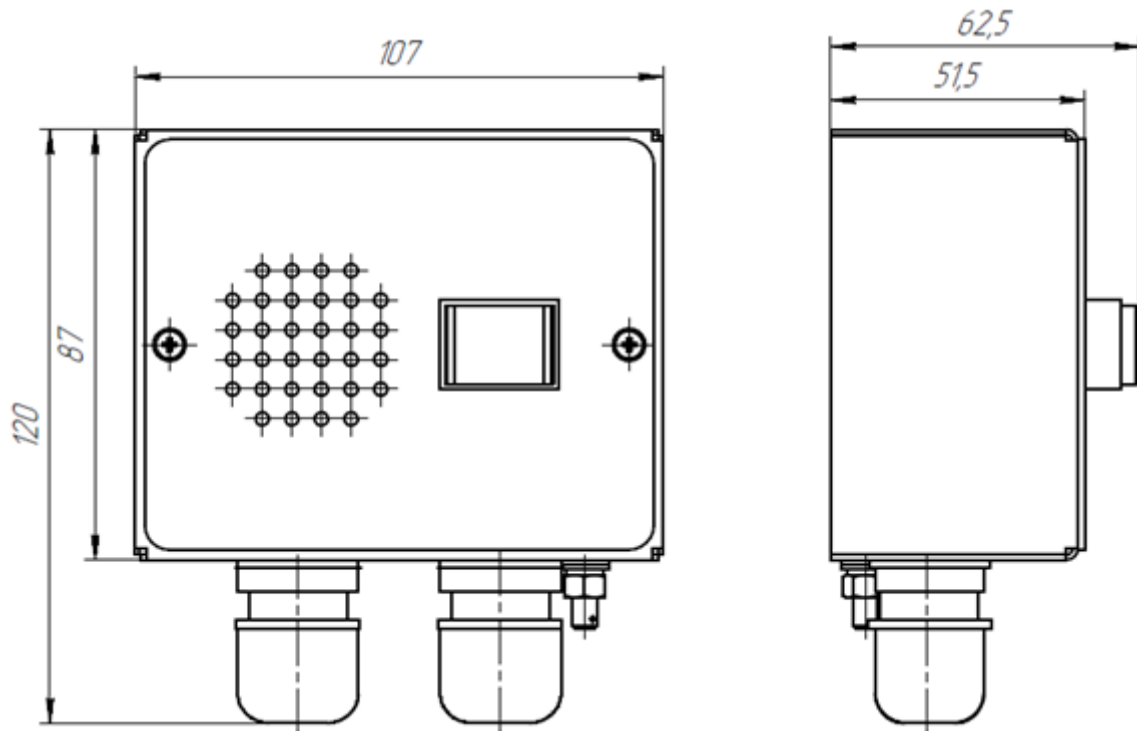


Figure A.4 – Overall dimensions of the AU-106