

Unicont SPb Ltd

Automatic Battery Charger CH-105

Technical Documentation

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The present Operating Manual (OM) is applicable to automatic battery charger of CH-105 model (hereinafter referred to as ABC).

The Operating Manual is to be used for study of design, principles of operation and operating rules of ABC while operating it as per its intended use and during maintenance. The Operating Manual can also be used for obtaining information on battery chargers for developing the appropriate sections of operating documentation for the equipment in which ABC can be used as a component.

1. Purpose

The automatic battery charger CH-105 is to be used on marine and river vessels in dry service spaces of bridge, superstructures or lower decks and it charges accumulator batteries of various ship equipment (electronic cartography devices, automatic system, radio communication devices, etc.), as well as other industrial, transport equipment and communication system equipment.

2. Delivery Set

- | | |
|---------------------------|---------|
| 1. Battery charger CH-105 | 1 piece |
| 2. Operation manual | 1 piece |

3. Technical characteristics

Table 1 List of modifications of ABC CH-105.

Parameter	CH-105	CH-105-24	CH-105-2412A	CH-105-110VDC	CH-105-220VDC
Input voltage:	110/220 V AC, 50/60 Hz	24 V DC (19 to 72 V)		110 V DC(72...114)	220VDC (190-300)
Maximum output power:	600 W	500 W	350 W	350 W	500 W
Charging voltage:	9 to 30 V DC (for charging the batteries with operating voltage 12 V or 24 V)				
Charging current:	1–20 A	1–16 A	1–12 A	1–16 A	1–14 A
Type of battery charger:	Automatic				
Standard capacity of charged batteries:	40–200 A×h	40–160 A×h	40–120 A×h	40–160 A×h	400–140 A×h
AB charging time at	10 hours max. up to 80 %				

maximum output:	
Controls:	Keypad (4 keys). Power on/off switch
Indicators:	Digital light-emitting diode indicators (for display of present current value and charging voltage) – 2 pcs Light-emitting diodes displaying operation mode of ABC (charging, normal, failure) – 3 pcs.
Accuracy of measured values	current – 0.2 A voltage – 0.1 V
Number of digits in displayed values	current 0.1 A (format XX.X) voltage 0.1 V (format XX.X)
Signalling	<ul style="list-style-type: none"> – loss of ship network supply voltage – start of AB with reverse polarity – start of ABC with disconnected AB (breakage of AB circuit) – excessive voltage in power supply circuit – overload or short-circuit in AB circuit – charging current or voltage exceed the preset limits
Types of alarm signals	Built-in: relay contacts, sound signal, red light-emitting diode External (connected): Alarm unit AU-106
In-built protection:	<ul style="list-style-type: none"> – excessive voltage of supply network. – connection of power supply with reverse polarity – stability to power supply loss – excessive current in AB circuit (overload / short-circuit) – connection of AB with reverse polarity – protection of battery from deep discharge (connected function) – protection of battery from overheating (with use of thermal sensor)
Protection class	IP 22
Operating temperature range:	-20..+55 °C
Overall dimensions:	345 × 265 × 140 mm
Weight:	7 kg, max.

4. Principle of operation of battery charger

Battery charger CH-105 allows to charge automatically the accumulator batteries connected to it (maximum charging current and voltage are set by the user). The battery is charged by combined method (operation in current stabilization mode in the phase of main charge with switching to voltage stabilization mode in terminal phase). The example of charging current and voltage curves of ABC is given on the graphs below (refer to Figure 1):

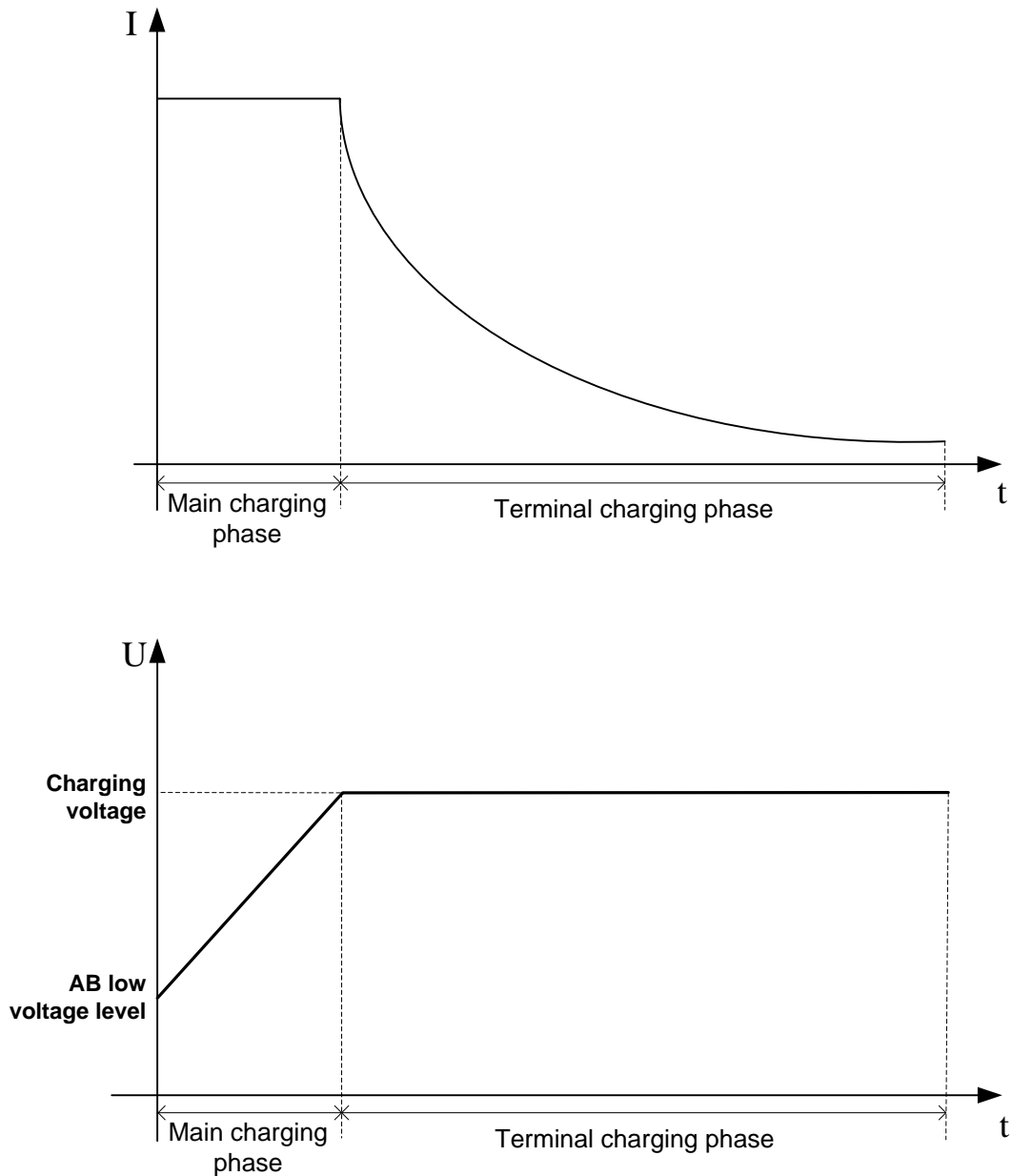


Figure 1 ABC charging current and voltage curves

5. Installation and connection of battery charger

5.1 Installation

ABC is installed in the following sequence:

1. Select and prepare the place for installation of the device so as to ensure free access, input of cables and termination of their ends. Vertical bulkhead inside the vessel is a convenient place for installation.

CAUTION! When selecting the place for installation of the device ensure safe distance to the port-hole so that the water splashes do not penetrate the device when the port-hole is opened.

ABC shall be installed at a distance at least 1 m away from magnetic compass.

When ABC is installed in the panel or utility room, take into account the requirements of Para 7.

2. Properly secure the case of battery charger on the vertical bulkhead with the help of bolts or self-tapping screws. By the effort of hand check for reliability of its fastening. The information on installation and overall dimensions of ABC are specified in installation diagram of this OM (refer to Figure 2);

3. Bring the cables of connected devices to ABC. Use the cable of KMIB (Э) brand or its substitutes with the appropriate cross-section of cores. When selecting the cable use information on diameters of cable leads (Table 2) and maximum dimensions of cross-sections of ABC terminals (Table 3).

CAUTION! Before laying and connecting the cables to ABC decide if there is a requirement to use ABC function on protection of AB from deep discharge and select the appropriate method of load connection to accumulator battery (refer to Para 5.2.4).

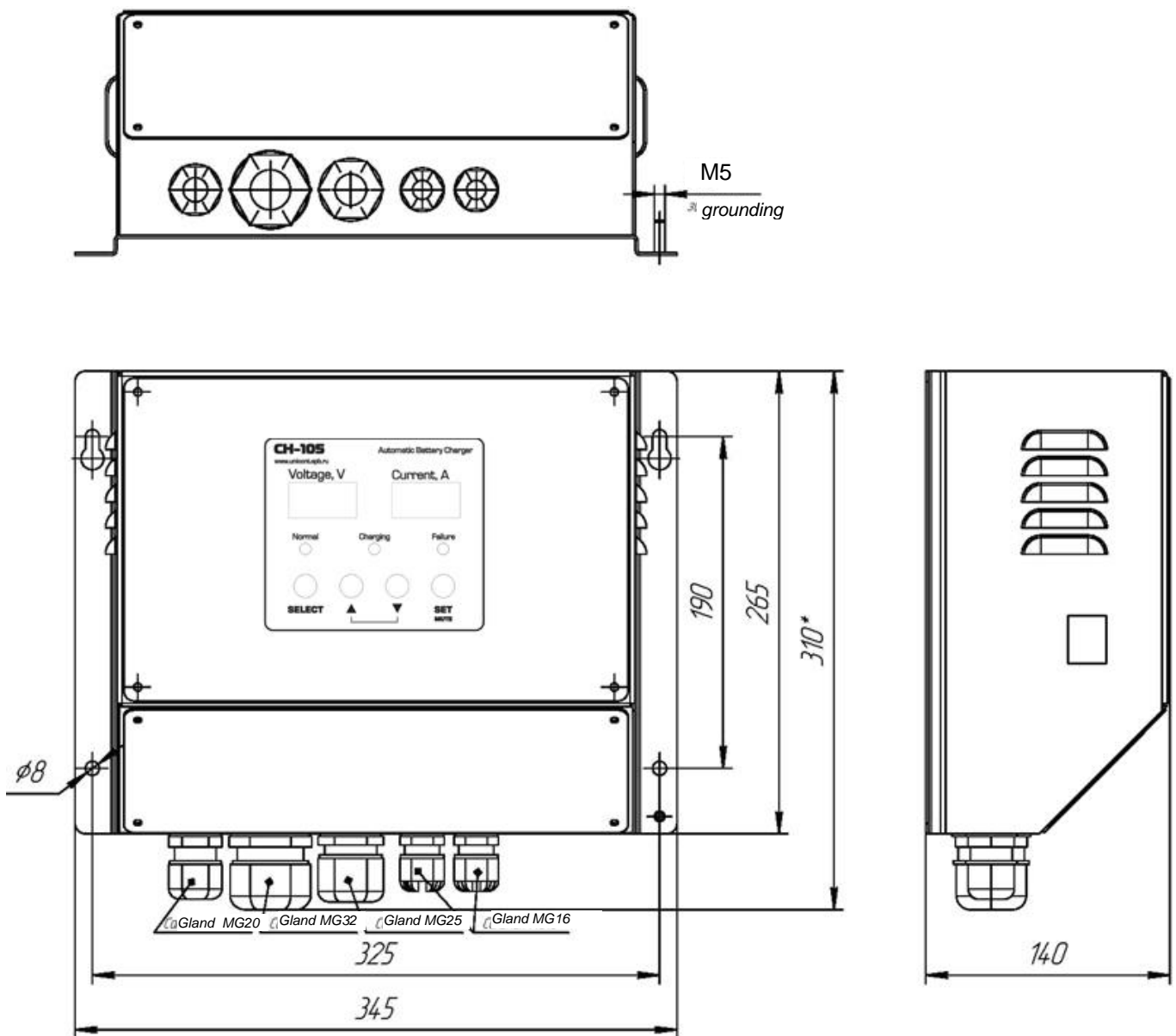


Figure 2 Overall dimensions and installation diagram of ABC

Table 2 Diameters of through holes of ABC glands

Type of gland	Internal diameter of gland
MG 16	6–10 mm
MG 20	9–14 mm
MG 25	13–18 mm
MG 32	18–25 mm

5.2 Connection OF ABC

5.2.1. ABC Connection Procedure

ABC is connected in the following sequence:

1. Remove the device lower cover;
2. Insert the connecting wires of supply circuit, accumulator battery and other connected devices through the glands located in the lower part of the device case
3. Ground ABC case to the common grounding bus. The grounding bolt is located from the right side in the lower part of ABC case (Figure 2).
4. Connect the wires of accumulator battery and peripheral equipment to battery charger terminals in accordance with the diagrams (refer to Paras 5.2.2 and 5.2.3).

5. **This paragraph is applicable only to battery charger with marking CH-105 (Table 1).** Ensure that the onboard power supply complies with the requirements of this OM (110 or 220 VAC). From factory ABC is delivered adjusted to supply voltage from network of 220 V 50/60 Hz. If ABC receives power supply from network of 110 V 50/60 Hz, switch the power unit to power supply from 110 V network. To switch the supply voltage of ABC to voltage 110 V 50/60 Hz, on power unit set the voltage selector from position "220 V" to position "110 V" (bottom-upwards). Supply voltage selector is located from the right side of power unit.

6. Connect the power cable to terminals "Input" of ABC (refer to Para. 5.2.5).

CAUTION! For safety of the personnel before connecting the power cable to ABC make sure that it is completely de-energized.

7. Apply power to ABC with the help of key switch located on the left side of ABC case. Five seconds after start ABC will be set to operating mode and will display present value of AB voltage. From the factory ABC is delivered adjusted to charging current and voltage values of 0.2 A and 25.5 V, respectively (if a battery with operating voltage below 24 V is connected to ABC, take into consideration that because the value of charging current is small, the battery charger will not damage the battery since the preset current is comparable with AB leakage current; however do not leave ABC enabled for a long time without changing the charging voltage to the appropriate value).

Note! During adjustment of ABC built-in signalling can operate. To disable the sound signal, press the key "Mute" (refer to Figure 9).

8. In ABC menu set the value of charging current and voltage corresponding to the connected AB (refer to Para 10).

9. Make sure that ABC operates normally: charging current and voltage do not exceed the set values and green or yellow light-emitting diode glows (refer to functions of light-emitting diodes, Table 6).

If the alarm operates, find and eliminate the cause of its operation (refer to the table of alarms, Table 4).

Safety precautions:

- Do not allow the device to get into water, as well as ingress of water inside the device.
- When cleaning the device surface do not use organic solvents to exclude damage of marks and inscriptions.

DO NOT:

- tense the cables connected to ABC;
- connect ABC to networks with parameters different from the ones specified in the present Manual;
- use the device against its intended use;
- operate faulty device.

5.2.2. Connection of AB to ABC

Connect the cable of accumulator battery to terminal "BATTERY" of ABC.

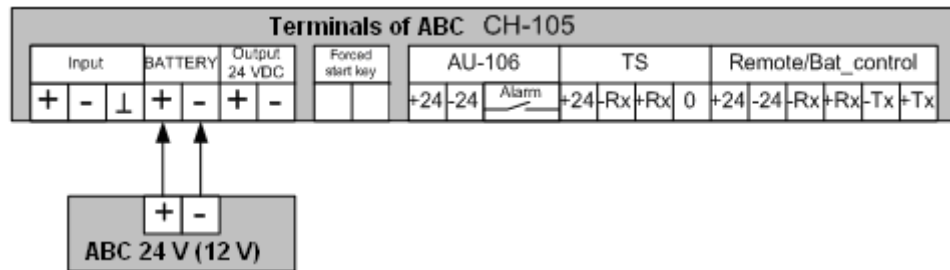


Figure 3 Diagram of AB connection to ABC

Table 3 Cross-section of ABC terminals

Designation of terminal	BATTERY	Output 24 V DC	Input	AU-106	TS	Remote/Bat_control
Wire cross-section	16 mm ²		6 mm ²	1.5 mm ²		

5.2.3. Connection of Additional Devices to ABC:

Besides the accumulator battery the following devices can be connected to battery charger:

- thermal sensor DTS-135
- alarm unit AU-106
- remote-control unit UCB-91

Thermal sensor DTS-135 is intended for checking the temperature of charged battery. It is recommended to use the thermal sensor as part of ABC with helium batteries. Temperature sensor DTS-135 is connected to terminal "TS" of ABC (refer to Figure 4).

Alarm unit AU-106 is intended to inform the navigator that ABC is in alarm mode by means of visual and sound signal and it is used when ABC is installed inside the panel or in the rooms remote from the bridge (refer to Para 7) Alarm unit AU-106 is connected to terminal "AU-106" of ABC (refer to Figure 4).

Remote-control unit UCB-91 is intended for remote control of ABC; it is connected to control unit through standard interface RS-232. Remote-control unit is connected to terminal "Remote/Bat_control" of ABC (refer to Figure 4).

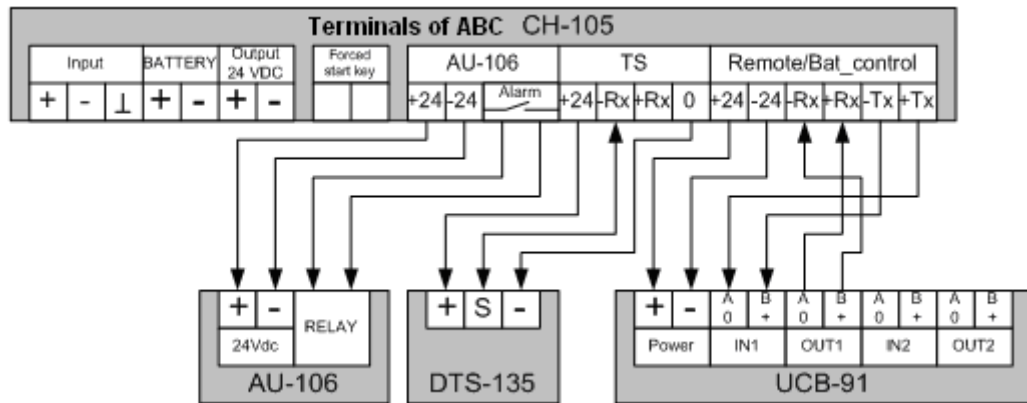


Figure 4 Connection diagram of additional devices (AU-106, DTS-135, UCB-91) to ABC.

5.2.4. Connection of Load to ABC

The load can be connected to AB by two methods: directly to AB circuit (refer to Figure 5) or by means of switched connection through special terminals of ABC (refer to Figure 6).

Direct method of connection is used for loads of any capacity; switched connection is used for loads with consumption currents not exceeding 30 A.

Method of switched connection enables to use the function of AB protection from deep discharge (for more details refer to Para 11). ABC function on AB protection from deep discharge is enabled in ABC menu (refer to Para. 10.2.3.).

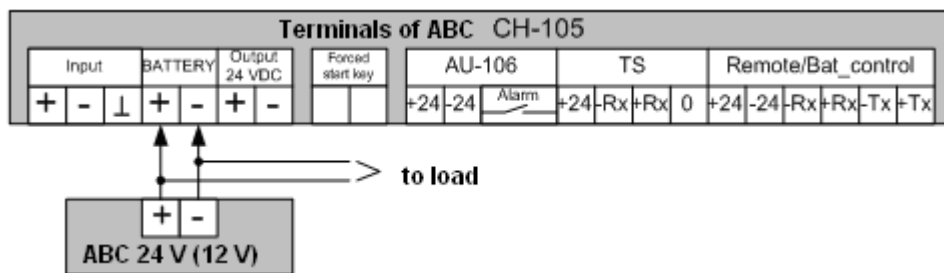


Figure 5 Diagram of direct connection of load to AB

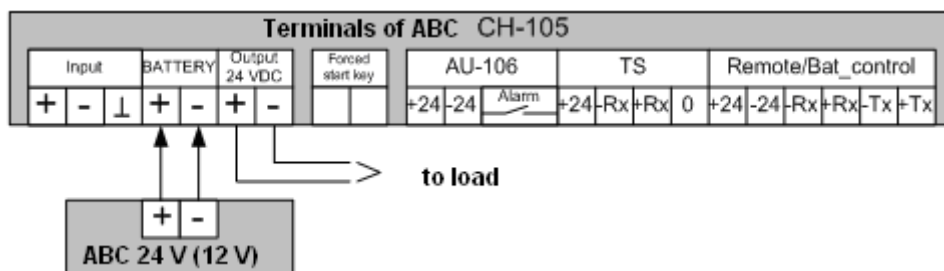


Figure 6 Diagram of switched connection of load to AB

Note! Voltage of terminal “Output 24VDC” of ABC is directly linked to voltage of AB connected to terminal "BATTERY" of ABC, i.e. when a battery of 12 V is connected to ABC, the voltage at terminal “Output 24VDC” equals to 12 V and when a battery of 24 V is connected to ABC, the voltage at terminal “Output 24VDC” equals to 24 V.

It is recommended not to use ABC as main power supply since the reserved load connected to AB circuit can be de-energized by ABC despite of availability of power supply line voltage (for example, in case of short-circuit in AB circuit or in case of strong sagging of charging voltage when ABC charges deeply discharged battery). To ensure reliable supply by reserved load, it shall be fed from separate power unit (refer to example in Figure 7).

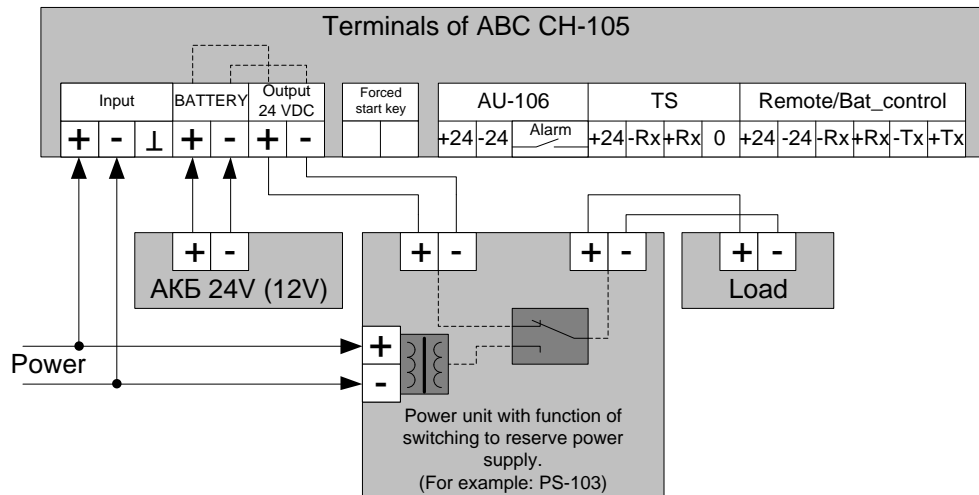


Figure 7 Example of load connection with usage separate power unit

5.2.5. Connection of Power Network to ABC

Connect the cable of power network to terminal "Input" of ABC.

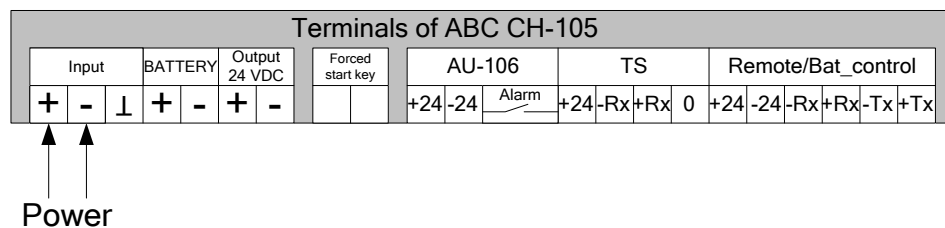


Figure 8 Diagram of power network connection to ABC.

6. ABC protection

ABC has a number of electronic circuits and elements ensuring protection of the device and accumulator battery:

1. Protection of ABC against excessive voltage in power supply network – ensured by means of electromechanical disconnection of ABC from power network. When protection operates, the alarm signalling is enabled (sound signal is enabled, light-emitting diode Failure of red colour lights up and the relay contacts open). Protection operates at supply voltage level exceeding 36 V. When supply network voltage becomes normal again, ABC will automatically be started and will continue charging the battery in standard mode.

2. Protection of ABC from transient processes in power supply circuit – ensured by inductance-capacitance filter in-built in ABC. The filter suppresses the interference appearing in power supply circuits without interruption of ABC operation process.

3. Protection of ABC from current overload or short-circuit in AB circuit is ensured by means of electronic blocking of power output. In case of overload or short-circuit in AB circuit, ABC identifies build-up of output current and instantly disconnects all power from power output with further enabling of alarm signal (sound signal is enabled, light-emitting diode Failure of red colour lights up and relay contacts open). The power output will continue to remain disabled until the cause of overload (or short circuit) is eliminated. After eliminating the cause of overload or short circuit the power output will automatically be unblocked, ABC will automatically be started and will continue charging the battery in standard mode.

4. Protection of ABC from connection of AB with reverse polarity is ensured by means of electromechanical disconnection of ABC charging circuit from AB followed by alarm signal (sound signal is enabled, light-emitting diode Failure of red colour lights up and relay contacts open). When AB with appropriate polarity is connected, ABC will automatically be connected to AB and will continue charging AB in standard mode.

5. Protection of AB from overheating is ensured by selection of ABC with the required charging rate. To activate this protection use the external thermal sensor TDS-135 which is directly attached to AB wall. The sensor transfers present temperature of accumulator battery to ABC via communication cable. As the temperature increases, ABC automatically reduces voltage and charging current to prevent overheating of AB. When this protection operates, the signalling is not activated since charging parameters change in dynamic mode.

6. **This paragraph is applicable only to battery chargers with direct current power supply** (refer to Table 1). Protection of ABC from connection of power supply with reverse polarity is ensured by means of electromechanical disconnection of ABC from power supply network. When protection operates, the alarm signalling is enabled (sound signal is enabled, light-emitting diode Failure of red colour lights up and the relay contacts open). When supply network with correct polarity is connected, ABC will automatically be started and will continue charging the battery in standard mode.

7. **This paragraph is applicable only to battery chargers with alternating current power supply** (refer to Table 1). ABC is not sensitive to the sequence of connection of power network phase and with any sequence it will operate with the same functionality. This protection is not followed by signalling.

7. Connection of external alarm unit

If ABC is installed inside the panel or utility room from which the navigator cannot hear built-in alarm signals of ABC, for alert use the external alarm unit AU-106 which will inform the navigator about loss of ABC input power supply or setting of ABC to emergency operation mode.

Operation of external signalling of AU-106 is based on the principle of closing/opening of "dry contacts" of ABC relay. AU-106 receives power supply from AB being charged or if required from other independent power supply sources.

ABC has special terminals for connection of alarm unit AU-106 with marking "AU-106" (refer to Figure 4).

8. ABC ALARMS and signalling

Battery charger has alarm signalling with visual, sound and relay signalling of navigator about emergency situation in ABC operation. Alarm situations in which the signalling operates are specified in the table (Table 4):

Table 4 Alarm situations causing activation of ABC signalling

Type of emergency situation	Red light-emitting diode	Buzzer	Relay contacts
Loss of ABC input power supply	+	+	Open
Start of ABC with disconnected AB (operates only when ABC is started)	+	+	Open
Connection of AB to ABC with reverse polarity (operates only when ABC is enabled)	+	+	Open
Overvoltage in ABC supply circuit	+	+	Open
Current overload or short-circuit in AB circuit	+	+	Open
Charging voltage beyond the preset limits	+	+	Open
Charging current beyond the preset limits	+	+	Open
Connection of power supply with reverse polarity (only for ABC with d.c. power supply)	+	+	Open

If one of the above mentioned situations takes place, ABC automatically activates built-in signalling and external alarm unit AU-106. To disable sound signalling, press the key "MUTE" (refer to Figure 9); here, visual signalling will remain active until the cause of signalling is eliminated.

9. Controls and indication

ABC has the following controls and indicators: control keys, three light-emitting diodes indicating the state and operation mode of ABC and two digital light-emitting diode indicators (refer to Figure 9).

1. Control keys are intended for adjustment of ABC, acknowledgement of sound and switching of indication display modes (refer to the table with functions of ABC control keys, Table 5).

Table 5 Functions of ABC control keys

Key	Function
“SELECT”	Button for selection of main menu items.
“▲” and “▼”	Buttons for selection of possible options of the corresponding of menu item.
“SET/Mute”	Button for confirming/keeping the selected menu item and disabling (acknowledgement) of sound signal with enabled alarm sound signal.

2. Digital light-emitting diodes are intended for display of present values of charging current and voltage of ABC.

3. Light-emitting diodes Failure, Normal and Charging are intended for indication of present operation mode of ABC. (Refer to Table 6, Figure 9).

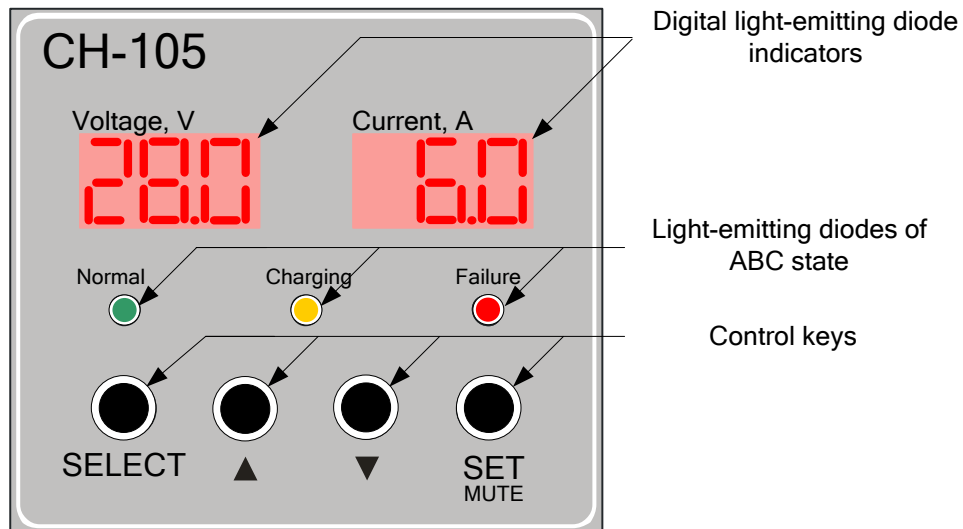


Figure 9 Layout of controls and indicators of ABC CH-105

Table 6 Colors of light-emitting diode indicators of ABC

Light-emitting diode indicator	Function
Charging (yellow)	Activated during the main charging phase of AB, i.e. when ABC is in current stabilization mode (refer to the graph of charging current and voltage curves, Figure 1).
Normal (green)	Activated during the terminal charging phase of AB, i.e. when ABC is in voltage stabilization mode (at this moment the battery voltage reaches the voltage value set by the user, refer to the graph of charging current and voltage curves, Figure 1).

Failure (red)	Activated in case of discharge of AB or setting of ABC to alarm mode (refer to Table 4).
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10. Menu structure and adjustment OF ABC

10.1 Menu structure

Menu structure of automatic battery charger CH-105 is the following:

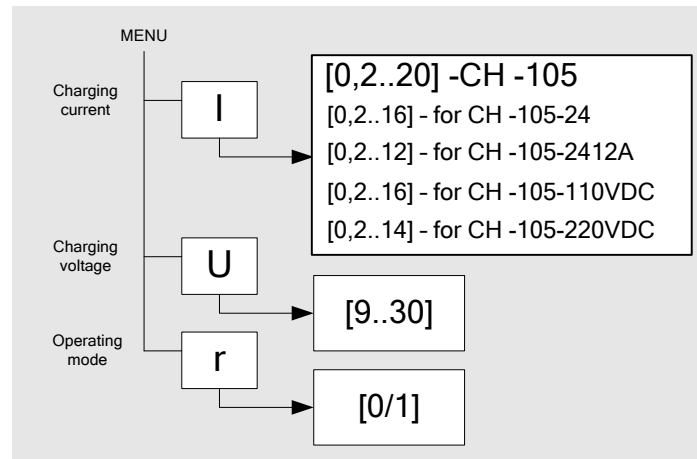


Figure 10 ABC menu structure

Table 7 Description of ABC menu items

Menu item	Description
I	Selection of AB charging current (varies within 0.2–16 A)
U	Selection of AB charging voltage (varies within 9–30 V)
R	Activation of AB function of protection from deep discharge (enable – 1 / disable – 0)

Before setting the charging current and voltage study Paras 12 and 13 of this Operating Manual.

10.2 ABC adjustment

10.2.1. Setting of Charging Current

Charging current is set by the user by means of built-in keypad of the battery charger. To set the required value of current, proceed as follows:

- Press the key "SELECT" of ABC until character "I" appears on the left indicator of the device. At the same time the earlier set charging current will be displayed on the right indicator of the device
- Use keys ▲ and ▼ to set the required charging current value
- Press key "SET" to confirm the set value and record it in non-volatile memory of the device.

10.2.2. Setting of AB Charging Voltage

Charging voltage is adjusted by the user by means of built-in keypad of the battery charger.

To set charging voltage, proceed as follows:

- Press the key "SELECT" until character "U" appears on the left indicator of the device. Earlier set charging voltage will be displayed on the right indicator of the device
- Use keys ▲ and ▼ to set the required charging voltage value
- Press key "SET" to confirm the set value and record it in non-volatile memory of the device.

10.2.3. Activation of AB Function of Protection from Deep Discharge

The function of battery protection from deep discharge is enabled or disabled by the user by means of built-in keypad of the device (for detailed description of function refer to Para 11).

To enable or disable this function, proceed as follows:

- Press the key "SELECT" until character "r" appears on the left indicator of the device. Present value of selected function state "0" or "1" will be displayed on the right indicator of the device
- Use keys ▲ and ▼ to set the required state of function (1 – on, 2 – off)
- Press key "SET" to confirm the set value and record it in non-volatile memory of the device.

CAUTION! Before starting the function of battery protection from deep discharge study Para. 11 of this Operating Manual.

11.ABC function of battery protection from deep discharge

ABC has built-in function of battery protection from deep discharge. This function enables to use capacity qualities of battery most effectively and to maintain its service life as specified by the battery manufacturer. The function is activated by selection of menu item "r" in ABC menu and by setting its value to "1". When "0" is set, the function of AB protection from deep discharge is disabled (refer to Para 10.2.3). Current consumption of load and method of load connection to AB determine the possibility of using the function of AB protection from deep discharge. The function of accumulator battery protection from deep discharge can be used only if switched connection of load is used (refer to Para 5.2.4, Figure 6).

When direct method of load connection is used (refer to Para 5.2.4, Figure 5), the function of battery protection shall be disabled, since. ABC will not be able to disconnect the battery from load.

12.Recommendations on setting of charging current

To recharge the accumulator batteries, set the current as recommends by the manufacturer of these batteries in proper Certificate.

If it is impossible to know the factory charging parameters, the manufacturer of the battery charger recommends setting the charging current not exceeding 10% of accumulator battery capacity.

Example of calculation:

At battery capacity (C) of 150 Ah the charging current will be equal to $C_{150} \times 0.1 = 15 \text{ A}$

(This value of current allows to exclude damage of accumulator batteries due to application of high current.)

13.Recommendations on setting of charging voltage

Charging voltage of AB shall be set by the user in accordance with the documentation on accumulator battery.

If it is impossible to know the factory values of battery charging voltage, the manufacturer of battery charger recommends to set charging voltage of 28.4 V for 24 V batteries and 14.2 V for 12 V batteries.

(The specified charging voltages are optimum for the majority of ship accumulator batteries.)

If ABC is used without thermal sensor, after the recommended value of charging voltage is set on the battery charger monitor the battery temperature during the first day and, in case of obvious overheating of AB, reduce the set values of voltage and current until the optimum thermal conditions are obtained. Installation of thermal sensor is mandatory for use of helium batteries connected as per buffer circuit (i.e. when the load is supplied from AB without power unit).

CAUTION! In each particular case the manufacturer strongly recommends to use the documentation of the battery.

14. Transportation and Storage

The battery charger shall be stored in heated space at air temperature of +5 °C to +35 °C (maximum values of -30 °C to +70 °C), at relative humidity of air not exceeding 95 % at temperature of +25 °C and content of dust, oil, moisture and aggressive admixtures in the air not exceeding the norms envisaged by GOST 12.1.005-88 for the working zone of production areas.

The device shall be transported in transport container of the manufacturer in closed transport.

Means of transport:

- automobile and railway closed transport (covered wagons, universal containers)
- by air (in pressurized and heated bays of airplane)
- by sea (in dry service spaces).

The device shall be transported in accordance with the transport regulations in force for the particular transport.

During handling operations and transportations strictly observe the requirements of handling marks on boxes and do not allow bumps and impacts which can affect preservation and serviceability of the device.

Packed devices shall be reliably secured in vehicles.

After storage in stores or transportation at temperature below +10 °C the devices shall be unpacked only in heated spaces after keeping them unpacked in under normal climatic conditions for 12 hours.

15. Warranty

The manufacturer guarantees the unit CH-105 complies with this manual provided that the operation, transportation and storage conditions are adhered to during the warranty period.

The unit's warranty period expires 24 months from the date of its shipping from the manufacturer's storehouse.

Within the warranty period, the owner is entitled for a free repair, or a replacement of a separate part, provided that the malfunction occurred through the manufacturer's fault.

Warranty repair is provided if the unit is submitted with the manufacturer's label and a legible serial number available on it, as well as this operating manual.

The manufacturer is not responsible and cannot guarantee the unit's operation:

1. After the warranty period is over;
2. In case of the failure to observe the unit's operation, transportation, storage and installation rules and conditions;
3. If the unit is in an unmarketable condition, or has a damaged body, and other causes beyond the manufacturer's control;
4. If self-made electrical devices were used.
5. If there was an attempt to repair the unit by a person who is not an authorized representative of the manufacturer.

If the owner loses this operating manual or the manufacturer's label with a serial number, the manufacturer shall not provide their copies, and the owner shall be divested of the right for a free repair during the warranty period.

Upon the warranty expiry, the manufacturer shall facilitate the repair of the unit at the owner's expense.

Note: in case of warranty repair, the unit's disassembling from the installation site and its delivery to the manufacturer's service center are done at the owner's expense.

Visit the manufacturer's website www.unicont.com (section "support/warranty") to find:

- forms to fill in claims,
- full warranty description;
- full description of the warranty service rendering procedure.

The manufacturer service center's address and contact details:

Unicont SPb, Ltd.

Bld. 26E Kibalchich Str., Saint Petersburg, 192174, Russia

tel.: + 7 (812) 602 02 64

fax: +7 (812) 362 76 36

e-mail: service@unicont.com

16. DATE OF PACKING

Automatic Battery Charger CH-105 №
 name of article designation serial number

Packed Unicont SPb Ltd., Russia.
 Manufacturer

according to the requirements of the current technical documentation.

_____ _____ _____
 post signature clarification of signature

_____ _____
 year, month, day

17. ACCEPTANCE DETAILS

Automatic Battery Charger CH-105 №
 name of article designation serial number

was manufactured and accepted in accordance with the regulatory requirements of the state standards and applicable technical documentation, and is suitable for operation.

Quality control representative

Stamp _____ _____
 here signature clarification of signature

_____ _____
 year, month, day

18. DATE OF COMMISSIONING

Automatic Battery Charger CH-105 №
 name of article designation serial number

The unit has been put into operation.

Date of installation: _____

Place of installation: _____

Person in charge of installation: _____