

COURSE REPEATER DR-309

Operating manual

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INTRODUCTION

This operating manual (hereinafter referred to as the OM) covers the Course repeater DR-309 (hereinafter referred to as the Repeater or the Product).

The OM is intended to describe operating principles, technical specifications and rules for the safe Product operation.

Only those who have had general education in the area of electronic devices, and those who have read and understood this document shall be permitted to operate with the Repeater. In addition to the instructions given in this document, the safety regulations and rules applicable in the field shall be observed.

Terms and abbreviations:

OM – Operating Manual;

TS – Technical Service;

CL – Check List.

1 DESCRIPTION AND OPERATION OF THE PRODUCT

1.1 DESCRIPTION

The Product displays the vessel's course data received in NMEA 0183 standard sentences (hereinafter referred to as – NMEA) from various digital sources using a card and LED indicator. The Product rebroadcasts input NMEA data through an RS-422 interface.

The Product is designed for sea- and river-going vessels, and industrial application.

The Product's detailed specifications, environment conditions, overall and installation dimensions are represented in Technical description of the Product.

1.2 TECHNICAL SPECIFICATIONS

The Product ensures:

- display of three NMEA data types: “HDT”, “HDG”, “HDM”;
- display of ship's course data;
- equipment interfacing via two asynchronous serial galvanically isolated ports, RS-422 and RS-232 (with NMEA standard support);
- input data retransmission to external ship systems from the selected ports;
- the Repeater is controlled using the relevant buttons on the front panel (menu access / exit, screen backlight brightness adjustment, switching of data sources);
- manual adjustment (using control buttons on the front panel) of backlight brightness level (14 levels totally).

1.3 OPERATION OF THE PRODUCT

The Product's operation (processing of input ship's course data) is ensured by the controller. The receiver transmitters of interfaces RS-422/232 ensure the data reception.

The card display provides a user-friendly data presentation and consists of a card, stepper motor, encoder and character display for digital data. The card has a built-in LED display (Gyro, Magnetic, THD), which shows the selected source of course data. Use three buttons “F”, “▼” and “▲” to control the Product. The functional diagram is represented in Figure 1.

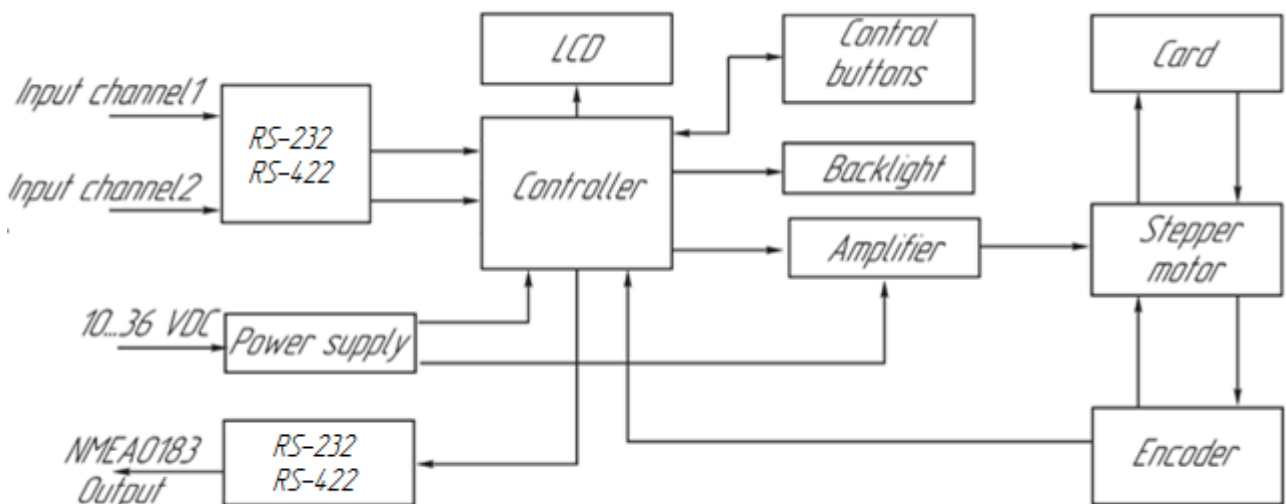


Figure 1 – Functional diagram of the Product

The Product has two input channels. Each channel can have an individual configuration which is carried out using the configuration menu. The main sources of the course data are gyro compass, magnetic compass and satellite compass.

The Product's operation can be configured for a certain data source. The settings in this case include the following:

- defining a number of the input channel;
- setting NMEA sentence type “HDG”, “HDM”, “HDT”;
- switching on (off) a checksum test mode.

The Product receives and processes the input course data according to the selected settings, represents the data on the character display, which is located in the lower left corner and then - on the card.

The Product may be used as a repeater (to retransmit data).

The input data are retransmitted via the output channel RS-422.

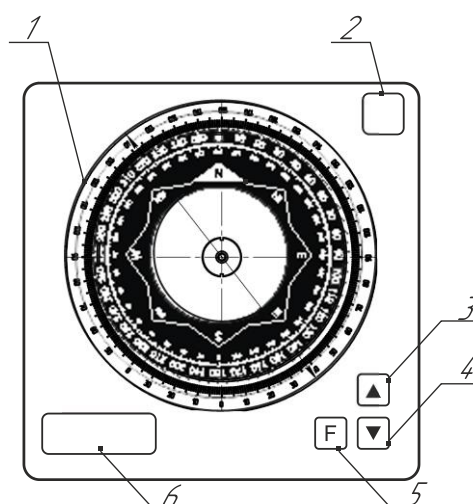


Figure 2 – Controls and LEDs of the Product

Table 1 – Controls and LEDs of the Product*

№	Name	Description
1	Dual scale card	Displays NMEA parameters
2	GYRO; Magnetic; THD	LED display – represents the current source of the course data
3	“▲”	Increases backlight brightness; scrolls the menu items and parameter settings
4	“▼”	Decreases backlight brightness; scrolls the menu items and parameter settings
5	“F”	Switches the course data sources Long button push ensures access to the main menu mode
6	Character display	To work with menu and display the input values

*The functions are described in the display mode.

1.4 MEASUREMENT INSTRUMENTS, TOOLS AND APPLIANCES

Operability control of the Product is carried out using integrated controls and LEDs.

The TS of the Product is carried out using consumables listed in Table Table 2.

Table 2 – Amount of 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, where the user can find a serial number, date of manufacturing, weight, protection degree, input voltage and power consumption are located on the Product's casing.

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 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.

2 USAGE OF THE PRODUCT

2.1 OPERATIONAL CONSTRAINTS

The Product shall have proper grounding; all cables shall be insulated; non-insulated / bare ends shall be absent.

2.2 USAGE PREPARATIONS OF THE PRODUCT

2.2.1 Safety features

While preparing the Product for usage observe it visually and check the absence of mechanical damage.

Before the operation a user shall:

- train staff to use the Product and checkout equipment, as well as occupational safety applicable in the field;
- check proper grounding;
- only use fuses recommended by the Manufacturer;
- 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 Method of the Product’s visual check

Before powering the Product on a user shall:

- check visually the integrity of control elements on the front panel;
- clean any contamination or dust from the front panel with clean cloth, if present;
- check reliability of cable connections to the Product.

2.2.3 Switching the Product on

Once the power is supplied, the Repeater automatically switches on.

2.3 USAGE OF THE PRODUCT

The Product is delivered with the factory settings; the settings may be changed if necessary.

2.3.1 Synchronization of compass card and character display readings

Synchronize a card and character display in case of readings mismatch; select “SYNC” in the main menu and provide an adjustment of readings.

2.3.2 Settings of input and output channels

Select “CH1” in the main menu to set the parameters for the first input channel and provide the settings of transmission rate, parity bit and number of stop bits.

Select “CH2” in the main menu to set the parameters for the second input channel and an output channel and provide the settings of transmission rate, parity bit and number of stop bits.

2.3.3 Settings of data sources

Select “SOUR” in the main menu to provide settings of data sources (Gyro, Magnetic, THD).

Individual settings can be provided for every data source: the user can detect input channel number, set a NMEA sentence type (“HDG”, “HDM”, “HDT”), as well as switch on / off checksum test mode.

2.3.4 Backlight brightness adjustment

Backlight brightness of card, character and LED displays in the course display mode (Gyro, Magnetic, THT) is adjusted using “▼” and “▲” buttons. To increase brightness press “▲” button; to decrease it - press “▼”.

Caution! The Product sets the last used level of brightness after powering on.

2.3.5 Selection of input data source

The current data source is displayed on the LED display located in the upper right part of the Product. Use “F” button to switch to another source of input data in the main menu mode.

Use the menu to provide settings of every data source.

Caution! The Repeater saves the last selected data source in case of powering off (on).

2.3.6 Operating mode

The Product can have several operating modes:

1) course display mode is the main one for the Product;

2) use the menu operation mode of the Product to set the operating parameters.

When the Product operates in the second (2) mode, data retransmission and display of course data on a compass card and LED display stops. The backlight brightness of character display and data source display (Gyro, Magnetic, THD) is set to the maximum. As soon as the user exits this mode, the brightness and operability are put into normal status;

3) emergency operation mode to detect emergencies;

4) emulation (test) mode is used to check the Repeater's system operability.

Once the Product is switched on it immediately transfers to the course display mode. If the data transmission stops the Product switches over to the emergency mode.

To access the menu use "F" button.

Caution! Once the Product is switched on, it represents the last saved user settings, backlight brightness level and selected source of course data downloaded from the non-volatile memory.

2.3.7 Course display mode

In the course display mode the Product displays the input data on the card, repeats these data on the built-in LED and retransmits them via an output channel RS-232/422.

2.3.8 Main menu mode

The Product's settings are carried out in the main menu.

To access the menu press and hold "F" button for 3 seconds, until you see "CH1" on the LED display, see Figure 3.

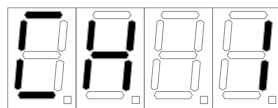


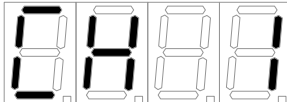
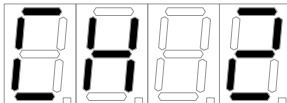
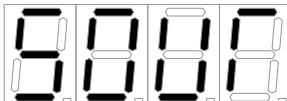



Figure 3 – Main menu access

Description of the control buttons in the main menu mode:

- "F" – to access the selected submenu;
- "▲" and "▼" – to select the submenu.

Menu sections (submenus) and their description are represented in Table 3.

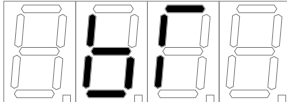
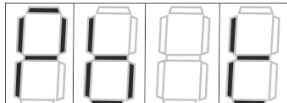
Table 3 – Description of the main menu items

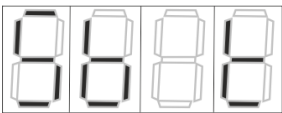
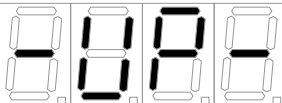
Code of menu mode	Description
“CH1” 	Configuration submenu of the first (input) channel
“CH2” 	Configuration submenu of the second (input (output)) channel
“SOUR” 	Configuration submenu of the data sources
“SYNC” 	Synchronization mode of the Repeater’s compass card
“TEST” 	Test mode
“-UP-” 	Menu exit

2.3.9 Submenu of the first “CH1” and second “CH2” channels

The submenu (“CH1”, “CH2”) ensures configuration of the communication channels main parameters “CH1”, “CH2”. The first and second channels’ menus contain the same items.

Table 4 – Description of the submenu “CH1”, “CH2”

Submenu code “CH1”, “CH2”	Description
“BR” 	To select data reception rate. Possible values (kbit/s): 2.4, 4.8, 9.6, 11.4, 19.2, 28.8, 38.4, 57.6, 76.8, 115.2,
“Pbit” 	To select parity bit. Possible values: 0 – no parity bit, 1 (odd) – odd parity bit, 2 (even) – parity bit

Submenu code “CH1”, “CH2”	Description
“Sbit” 	To select stop bit number. Possible values: 1 – one stop bit, 2 – two stop bits
“-UP-” 	Submenu exit “CH1” (“CH2”)

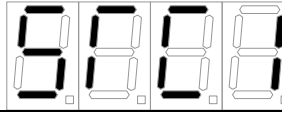
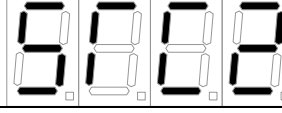
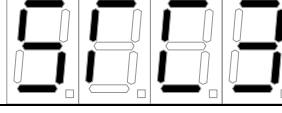

Description of the control buttons in the configuration submenu of channels “CH1”, “CH2”:

- “F” – to access the selected submenu. While selecting parameters – to save the selected value and exit the submenu;
- “▲” and “▼” – to select the submenu.

Caution! Use “F” button to set up (save) the selected value. The Product will exit the configuration submenu.

2.3.10 Configuration submenu of the data sources “SOUR”

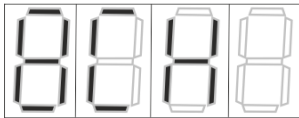
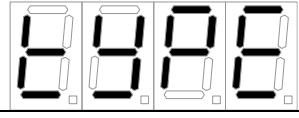
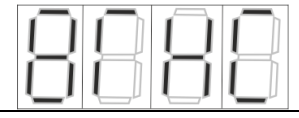
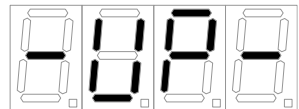
Table 5 – Description of the submenu items “SOUR”

Submenu code “SOUR”	Description
“SRC1” 	Configuration submenu of the first source of course data (Gyro)
“SRC2” 	Configuration submenu of the second source of course data (Magnetic)
“SRC3” 	Configuration submenu of the third source of course data (THD)
“-UP-” 	“SOUR” submenu exit

2.3.11 Individual settings submenu “SRC1”, “SRC2”, “SRC3” of course data sources

Main parameters of every input data source “SRC1”, “SRC2”, “SRC3” are configured in the submenu. Configuration menu items of every course source are the same.

Table 6 – Description of the submenu items “SRC1”, “SRC2”, “SRC3”

Submenu code “SRC1”, “SRC2”, “SRC3”	Description
“CH” 	To select input data channel (where the data source is connected) Possible values: 1 – first channel, 2 – second channel
“TYPE” 	To select required NMEA sentence type Possible values: 1 – “\$--HDG”, 2 – “\$--HDM”, 3 – “\$--HDT”,
“CRC” 	Switch on (off) checksum test function of NMEA 0183 sentence Possible values: “ON” – checksum test is on, “OFF” – checksum test is off
“-UP-” 	“SRC1” submenu exit (“SRC2” or “SRC3”)

Description of the control buttons in the configuration submenu of course data source “SRC1”, “SRC2”, “SRC3”:

- “F” – to access the selected submenu. While selecting parameters – to save the selected value and exit the submenu;
- “▲” and “▼” – to select the submenu.

Caution! Use “F” button to set up (save) the selected value. The Product will exit the configuration submenu.

2.3.12 Data retransmission

The Product supports a function of data retransmission. The port “Output channel”, see Figure 1 retransmits only input data of the active channel according to the configured parameters of the selected course data source.

Caution! Input “CH2” and output “OUTPUT” settings (transmission rate, parity bit check, a number of stop bits) comply, as one receiver-transmitter unit is used; therefore, retransmission occurs under the settings provided for the second input channel “CH2” in the configuration submenu of the second channel.

2.3.13 “SYNC” mode to synchronize the compass card

“SYNC” mode allows for synchronizing the data of compass card and character display in case of their mismatch.

Access the submenu “SYNC” to carry out synchronization. Compass card will be set to the specific position. Wait until the compass card stops. The character display will show the previous saved synchronization value. If the readings of character display and compass card mismatch, set the current value of the compass card using “▲” and “▼” buttons. Press “F” button. The synchronizing value will be recorded to the non-volatile memory; The Product will exit the synchronization mode.

Description of the controls in the “SYNC” mode:

- “F” – to save the selected values and exit the synchro menu;
- “▲” and “▼” – to set the present position (degrees).

2.3.14 “TEST” simulation mode

“TEST” simulation mode ensures emulation of the Product’s operation mode with no input data. During emulation the character display and compass card represent the periodic course value. The current mode ensures periodic 1 Hz frequency data transmission in format:

“\$HEHDT, xxx.x, T*hh<CR><LF>”,

where

xxx.x – is the current course value in the simulation mode;

hh – checksum CRC;

“<CR><LF>” – end of line (carriage return and line feed).

Parameters of the output channel “OUTPUT” which provides transmission comply with the settings of the input channel “CH2”.

Select “TEST” in the main menu to switch the simulation mode on and then press “F”.

Press “F” again to exit the simulation mode.

2.3.15 Light alarm

2.3.15.1 Emergency operation mode

Once the input data are invalid or not compliant with the configured format or data are no longer received, the Product switches to the emergency mode.

2.3.15.2 Light signaling

When the emergency is detected, the Product operates in the emergency mode. Compass card backlight starts flashing; character display shows “----”, see Figure 4.

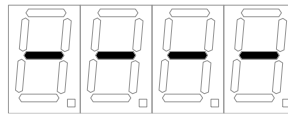


Figure 4 – Data are absent

Press any button to deactivate the backlight flashing.

After deactivating the Product will still operate in the emergency mode with the character display showing “----”.

2.3.16 Recovery

To return the Product to normal operation, choose one of the following solutions:

- 1) fix the equipment which caused the stop in data transmission; restore transmission of the course data;
- 2) change the settings in case the current Repeater parameters and data format are not compliant;
- 3) switch to the backup data source using “F” button .

Once the emergency is eliminated, the Repeater switches to the course display mode.

3 TECHNICAL SERVICE OF THE PRODUCT

3.1 GENERAL DESCRIPTION

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 System units, the staff shall maintain a schedule of the technical service:

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

TS-1 is organized and controlled by a person in charge and carried out by the staff on the running equipment.

TS-2 is organized and controlled by a person in charge and carried out by the staff.

The recommended amount of consumables to provide the TS is represented in Table Table 2.

3.2 SAFETY FEATURES

While carrying out the TS follow the instructions given in 2.2.1 of this OM.

3.3 MAINTENANCE ROUTINE

The list of works for all types of the Technical service is given Table 7. Maintenance routine procedure is given in the CL, represented in Tables 8 and 9.

Table 7 – The list of the TS works

CL №	Work	TS type	
		TS-1	TS-2
1	Visual check of the Product	+	+
2	Test for the unit operability	–	+
3	Check of completeness, SPTA kit and operational documents	–	+
Notes 1 “+” – work is obligatory. 2 “–” – work is not required.			

Table 8 – 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; legends are to be read easily; 2 Clean all surfaces by clean cloth; 3 Remove severe contamination, parts of corrosion, oil spots: – from metal surfaces: by suds, avoiding its penetration inside the device; all surfaces clean dry by clean cloth and dry up; – from LED: by alcohol soaked cloth. Do not use hard cloth, paper, glass cleaning liquids or chemicals; Do not press hard on the surface while cleaning; Do not spray liquid directly to the surface of the Product; 4 In case of varnish damage clean it with abrasive cloth, then alcohol soaked cloth, cover with varnish and let dry	1 person 5 minutes
Check reliability of cable and bus connection to the unit	Make sure that connectors and attaching screws are fastened tight, provide further fastening if needed	1 person 5 minutes

Table 9 – CL № 2. Check of the Product operability

To be done	Routine	Man-hours per 1 Product
Check the operability of the Product	1 power the Product on; 2 start the “TEST” simulation	1 person 5 minutes

Table 10 – CL № 3. Completeness and condition of SPTA kit and operational documents

To be done	Routine	Man-hours per 1 Product
Check the completeness and condition of SPTA kit and operational documents	1 check presence of SPTA kit and operational documents are compliant with those listed in section “Completeness” in the Certificate; 2 check every item in SPTA kit and storage time; if the kit has been used, recomplete it	1 person 10 minutes

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 Repeater's preservation is done in full terms, for 2 years, according to the relevant regulatory documents.

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

The represerved Product, SPTA kit and documents are placed in package. The time of storage – 2 years.

4 CURRENT REPAIR OF THE PRODUCT

4.1 GENERAL DESCRIPTION

The Repeater's operability is controlled by the LEDs on the front panel.

To provide diagnostics of the problems and defects, use information in Table 11.

Please contact the Manufacturer's service centre in case of other defects, which are not represented in the above mentioned table.

Within the terms of warranty coverage the opening of package is done with the witness of the manufacturing company representative, who makes the Act of opening.

As soon as the Product is returned to the base facilities, a Manufacturer's representative shall be called in order to make a damage claim.

4.2 CURRENT REPAIR

The personnel can only eliminate defects which are listed in Table 11.

All other defects shall be carried out only by the Manufacturer's specialists or the Manufacturer's representatives.

The Repeater's malfunction may be caused by mechanical or electrical damage as well as by invalid settings. Some possible reasons of defects and possible solutions are represented in Table 11.

Table 11 – Possible problems / defects and troubleshooting

Problem / defect	Possible reasons	To do
The Product doesn't switch on	Ship power supply is absent	Provide the ship power supply
	Fuse's malfunction	Replace the fuse
	Power cable is not connected	Connect the power cable
Data are not displayed / absent	Poor connection of cables between each other. Invalid settings of ports.	Check the cable connections and data format; check the settings of ports
Backlight is absent	The minimum brightness level was set	Check the brightness level settings
Invalid display of course data on the card (error)	The Product is not synchronized	Synchronize the Product

5 STORAGE

The Product 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 Product below +10 °C, it must be unpacked only in heated premises and left 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 Product 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 the 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 for electronic devices in the country of the buyer



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

8 WARRANTY

The Manufacturer shall have warranty obligation in case of the Product's proper use, according to OM. In case of misuse of equipment the Manufacturer shall 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 Str., 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

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