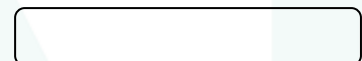


KHARKOVENERGOPRIBOR

SWG-12/1100R

USER MANUAL



CONTENTS

1 Safety Regulations	4
1.1 Safety Precautions	4
1.2 Hazard Symbols.....	4
2 Description And Operating Principle	5
2.1 Purpose	5
2.2 Operating Conditions.....	5
2.3 Storage Conditions	5
2.4 Specification	6
2.5 Design And Operating Principle	7
2.5.1 Operating Mode.....	8
2.5.2 Indicators Modes	9
2.6 Marking	12
3 Proper Use	13
3.1 Preparation For Use	14
3.2 Finishing Operation	16
3.3 Operating Device.....	17
3.3.1 Mode "TEST"	17
3.3.2 Mode "BURN"	18
3.3.3 Mode "SURGE"	19
3.3.4 Mode "ARC"	20
3.3.5 Mode "TDR"	21
4 Maintenance.....	23
4.1 Common Malfunctions And Troubleshooting.....	23

The User Manual provides guidelines for the use of the cable fault location system SWG-12/1100R (hereinafter – System).

The User Manual contains information on the purpose, contents, technical specification, design and operating principle of the System and its units as well as its tools, marking, sealing and packaging.

The User Manual contains information necessary to prepare the System for operation as well as to perform its maintenance, and stipulates the order in which these procedures are to be done.

The visual content of this document is provided for information only. It may be different from the actual appearance of the System. The differences in appearance do not influence the conditions of the System use or its performance capabilities.

The manufacturer retains the right to introduce any changes to the product design provided they do not impair its work.

Used abbreviations

RIF-9L – digital reflectometer;

$V/2$ – propagation velocity in the cable;

SWG-12/1100R – cable fault location system.

1 SAFETY REGULATIONS

1.1 Safety precautions

To prevent injuries to the staff and damages to this or any other device connected to it, maintenance procedures are to be performed by qualified members of the staff only.

The staff should carefully study the User Manual.

The national standards and safety regulations must be followed!

The manufacturer shall not be held responsible for any damage to people or objects resulting from the failure to follow the safety procedure outlined in the User Manual.

1.2 Hazard symbols

These symbols can be found on the System or in the User Manual:



ATTENTION! Indicates a potential danger that can result in a lethal outcome or a serious injury.



ATTENTION! Indicates conditions or actions that can result in damage to the device or equipment connected to.



Protective grounding.



System grounding.



Control grounding.



NOTE. Indicates important information and tips on operating the device.

2 DESCRIPTION AND OPERATING PRINCIPLE

2.1 Purpose

The System is designed for:

- high-voltage testing of objects with direct-current voltage up to 12 kV;
- burning defective cable insulation;
- measuring the distance to the cable fault with the reflectometer RIF-9L based on the low-voltage refractometry method "TDR", voltage wave method "DECAY" and current wave method "ICE".

2.2 Operating conditions

The values of the environment climatic factors for operating the System are specified in Table 1.

Table 1 – System operating conditions

Climatic factors	Value
Ambient temperature, °C	- 10 to + 40
Relative air humidity at temperature of + 25°C, %, max	up to 80%
Atmospheric pressure, mm Hg	630 to 800

2.3 Storage conditions

The System storage conditions are specified in Table 2.

Table 2 – System storage conditions

Climatic factors	Value
Ambient temperature, °C	- 5 to + 40
Relative air humidity at temperature of + 25°C, %, max	up to 60%
Atmospheric pressure, mm Hg	630 to 800

2.4 Specification

The specification of the System is shown in Table 3.

Table 3 – System specification

Type	Value
Supply voltage, V	230 ± 10 %
Supply voltage frequency, Hz	50 ± 1
Maximum power consumption, kV·A	2.0
Dimensions, H×L×D, mm	1112×731×533
Net weight, kg	120
High voltage system	
TEST MODE	
Output DC voltage range, kV	0 – 12
Output DC current range, kV	0 – 10
BURN MODE	
Output DC voltage range, kV	0 – 12
Output DC current range, kV	0 – 100
SURGE MODE	
Maximum discharge pulse energy on any stage, J	1100
Maximum output voltage by stages, kV:	
– stage one	3
– stage two	6
– stage three	12
Operating modes:	
– manual launch of a single pulse	
– automatic launch with discharge pulse intervals, sec	3 – 15
ARC MODE	
Maximum discharge pulse energy on any stage, J	1100
Maximum output voltage by stages, kV:	
– stage one	3
– stage two	6
– stage three	12
Operating modes:	
manual launch of a single pulse	
⏚ MODE	
The high voltage lead is grounded	

Reflectometer RIF-9L	
Distance measurement ranges (for a shortening coefficient of 1.50 or $V/2 = 100$ m/mcs), m	60; 120; 250; 500; 1000; 2000; 5000; 10000; 20000; 50000; 120000
Resolution, m: – at a shortening coefficient of 1.5 ($V/2 = 100$ m/mcs) – at a shortening coefficient of 1.87 ($V/2 = 80.2$ m/mcs)	0.5 0.4
Relative voltage measurement error, %, max	0.2
Sampling rate, MHz	200
Time Domain Accuracy, %, max	0.01
Output impedance range (sampling frequency of 10 Ω), Ω	10 to 500
Probe pulse parameters: – amplitude, V – duration, ns	45 10 to 100000
Measurement range of input amplifier gain, dB	minus 33 to 104
Averaging reflectograms number, pcs	1 to 64
Setting range of: – shortening coefficient – propagation velocity $V/2$, m/mks	1.000 to 3.000 50.0 to 150.0
Setting increment of: – shortening coefficient – propagation velocity $V/2$, m/mks	0.001 0.1
Nonvolatile memory capacity of: – reflectograms with parameters – data on cable shortening coefficients	1000 500
Maximum voltage on measuring inputs, V, max	50
Display resolution, pixel	800×600, TFT, touch-sensitive

2.5 Design and operating principle

The design of the System is shown in Figure 1.

The System consists of a high voltage component and control panel. The System operates with a digital reflectometer RIF-9L (hereinafter "RIF-9L").

The System is mounted on a two-wheel cart. The cart is also supplied with handles for transportation.

On the rear side of the System there are sockets for connecting a high voltage coaxial cable (see Figure 1 Position 6).

For the purpose of safe operation of the System, the operating mode switch is supplied with a key lock (see Figure 1 Position 29). The power can only be switched on with a key.

After the power has been switched on, the button "**START**" comes on (see Figure 1 Position 9), which means the System is ready for high voltage testing.

The output voltage is adjusted by turning the voltage regulator knob (see Figure 1 Position 26).

Press the button "**START**" to activate the testing mode, after which the button "**STOP**" will come on; it means high voltage is being fed. The testing mode can only be activated when the voltage regulator knob is on "zero".

To switch off the testing mode, press the button "**STOP**", (see Figure 1 Position 8), after which the button "**STOP**" will go out.

The button "**EMERGENCY STOP**" (see Figure 1 Position 27) allows for an emergency shout-down of the System;

Output current is monitored with a milliammeter, which has three scales (see Figure 1 Position 20).

Output current is monitored with a kilovoltmeter (see Figure 1 Position 25).

It should be noted that the kilovoltmeter measures the voltage on the object under test even after the testing mode is switched off, when the System stops feeding testing voltage. Keep in mind this feature of the System when working with capacitive load, which retains life-threatening residual voltage after testing.

2.5.1 Operating mode

The System can be operated in the following modes:

- "**TEST**" – overvoltage testing with measuring leakage currents and with the ability to determine the distance to the fault (if the cable overvoltage testing causes a breakdown) using the RIF-9L in the mode "**DECAY**";
- "**BURN**" – burning the cable insulation. In the mode "**BURN**" the damaged cable insulation is burned in order to decrease the impedance between the conductors or between the conductor and the cable screen when it is high. It is required to enable the use of the acoustic or inductive method of cable fault location;
- "**SURGE**" – launching a discharge of the energy accumulated by the high voltage capacitor into a cable. This mode allows for an accurate location of the cable fault with the use of an inductive sensor and a receiver.

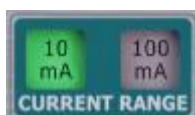
This mode can also be used for operating the reflectometer in accordance with the method "ICE";

- "ARC" – measuring the distance to the cable fault by reflecting the signal from an arc in the cable;
- "⊥" – the high voltage lead of the system is grounded. In this event the cable screen fault can be located with the RIF-9L in the mode "TDR" (Time Domain Reflectometer). This mode is most effective for the following cable faults:
 - open circuit;
 - short circuit.

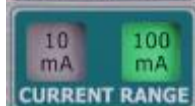


The mode "TDR" applies when the fault impedance does not exceed 200 Ω.

2.5.2 Indicators modes



The System switched to the mode of measuring current in a range of 10 mA



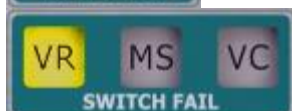
The System switched to the mode of measuring current in a range of 100 mA



Activating overcurrent protection



Activating the feed transformer overheating protection



The handle "VOLTAGE RANGE" is not properly set



The handle "MODE SELECT" is not properly set










The handle "VOLTAGE CONTROL" is not set on 'zero'



Figure 1 – Design and layout of user controls and connectors of System











Table 4 – List of controls shown in Figure 1

No.	Type	Marking	Purpose
1	Control panel		
2	Control panel cover		
3	Socket for connecting control grounding wire		Connection directly to the ground with a metal dowel
4	Terminal for connecting protective grounding wire		Connection to grounding mat
5	Socket for system grounding wire		Connection to object under test
6	Socket for connecting coaxial high voltage cable		Connection to object under test
7	Voltage range switch	"VOLTAGE RANGE"	Output voltage range selection in modes "SURGE" and "ARC"
8	Off button	"STOP"	High voltage off
9	On button	"START"	High voltage on
10	Socket	"~230V 50Hz"	Power cable connection
11	Incoming circuit breaker	"POWER"	Switching on/off and System overload protection
12	Socket	L3	Input for connecting to line L3 of RIF-9L in mode "TDR"
13	Socket	L2	Input for connecting to line L2 of RIF-9L in mode "TDR"
14	Socket	L1	Input for connecting to line L1 of RIF-9L in mode "TDR"
15	Socket	USB-B	PC connection
16	Socket	USB-A	Flash drive connection
17	Button	"1mA"	Switching current measurement range
18	Indicator group of current measurement ranges	"CURRENT RANGE"	"10mA" - current measurement range of 10 mA "100mA" - current measurement range of 100 mA
19	Indicator group of protection	"PROTECTION"	"I" - activating overcurrent protection "t°" - activating feed transformer overheating protection;
20	Output current meter	"CURRENT"	For modes "TEST" and "BURN"
21	Knob for operating mode selection	"MODE SELECT"	Selection of System operating mode
22	Indicator group of controls' positions	"SWITCH FAIL"	"VR" - the knob "VOLTAGE RANGE" is set incorrectly "MS" - the knob "MODE SELECT" is set incorrectly "VC" - the knob "VOLTAGE CONTROL" is not set on 'zero'

23	Pulse refresh rate regulator	"SURGE CYCLE DELAY"	Setting pulse refresh rate
24	Button/indicator	"SINGLE PULSE"	Launching a single pulse
25	Output voltage meter	"VOLTAGE"	
26	Voltage regulator knob	"VOLTAGE CONTROL"	Turn the knob to change voltage
27	Button	"EMERGENCY STOP"	System emergency shut-down
28	Indicator	"POWER"	System power supply indication
29	Key lock switch	"I" ("O")	Turn the key to switch on (off) the control panel power supply
30	Fuse holders		Two fuses for a current of 10 A
31	Encoder knob		Increasing/decreasing the parameters value, moving cursors, navigating menu screens, etc.
32	Button		Switching on/off RIF-9L power supply with respective indication
33	Display of RIF-9L		Displaying graphic information

2.6 Marking

On the System there is the following marking:

Marking reference designation	Description
	Input (0351, ДСТУ ISO 7000)
	Stand-by (5009, IEC 60417-1)
	Switching on (5007, IEC 60417-1)
	Switching off (5008, IEC 60417-1)
	Fuse (5016, IEC 60417-1)
	AC current (5032, IEC 60417-1)
	DC current (5031, IEC 60417-1)
	Warning! Electrical hazard (2.5, ГОСТ 12.4.026)
	Ground (5017, IEC 60417-1)
	Protective grounding (5019, IEC 60417-1)

On the rear side of the System there is a plate with the following marking:
(see Figure 2).



Figure 2 – Plate with marking

3 PROPER USE



CAUTION!

ALL THE MEASUREMENTS ON A CABLE IN THE MODE "TDR" SHOULD BE DONE ON A LINE DISCONNECTED ON BOTH ENDS. TO PREVENT THE REFLECTOMETER LEAD FROM GOING OUT OF ORDER, FIRST DISCHARGE THE LINE BY CONNECTING THE CONDUCTORS TO EACH OTHER AND THE GROUNDING DEVICE




CAUTION!

THE FOLLOWING IS PROHIBITED:

- **OPERATING THE SYSTEM WITHOUT GROUNDING;**
- **OPERATING THE SYSTEM IF THERE IS CONDENSATE, MOIST OR FROST ON THE INSULATORS OR CURRENT DISTRIBUTORS;**
- **LENGTHENING THE HIGH VOLTAGE CABLE WITH UNSUITABLE MATERIALS;**
- **OPERATING THE FAULTY SYSTEM;**
- **CONNECTING THE SYSTEM TO AN UNGROUNDED OBJECT UNDER TEST;**
- **CONNECTING THE OBJECT UNDER TEST TO THE SYSTEM IF THE SYSTEM IS NOT CUT OFF THE POWER SUPPLY;**
- **LEAVING THE SYSTEM ON UNATTENDED BY THE OPERATING STAFF;**
- **PERFORMING WORK ON THE CABLE DURING FAULT LOCATION**


3.1 Preparation for use

- 3.1.1 Study this guide.
- 3.1.2 Follow all the organizational and technical directions of the safety regulations ensuring safe device operation. Put up temporary shields with signs "**Stop! High voltage!**".
- 3.1.3 Cut off the power from the cable with damaged insulation and disconnect both its ends from the objects it is connected to.
- 3.1.4 Place the System vertically.
- 3.1.5 Connect the System to a cable with faulty insulation according to the selected connection diagram (see figures 3 – 5).
 - 3.1.5.1 Connect the System with one end of the protecting grounding to the grounding terminal "" (see Figure 1 Position 4) (on the rear side of the System), and with the screw-clamp on the other end – to the protective grounding mat.



CAUTION!

YOU MUST NOT OPERATE THE DEVICE WITHOUT PROTECTIVE GROUNDING!

- 3.1.5.2 Connect one end of the grounding control wire to the grounding control socket "" (see Figure 1 Position 3) (on the rear side of the System), and the other end – to the grounded dowel of the control grounding.
- 3.1.5.3 Connect the high voltage cable connectors to the System sockets for connecting the high voltage cable (see Figure 1 Positions 5, 6).
- 3.1.5.4 Fully unwind the high voltage cable. Connect the black crocodile clip to the conductor of the faulty cable, and the yellow and green crocodile clip to the grounded screen or the grounded conductor of the faulty cable. The other conductors of the cable under test should also be grounded..
- 3.1.5.5 Connect one end of the power cable to the socket "**~230V 50Hz**" (see Figure 1 Position 10), and the other end to – a power socket 230 V.
- 3.1.6 Set the automatic circuit breaker (see Figure 1 Position 11) to the upper position "**ON**" (off mode). Following this, a white indicator "**POWER**" will come on (see Figure 1 Position 28), which means there is power supply.
- 3.1.7 Turn the key of the lock switch to the position "**I**" (see Figure 1 Position 29). After this, all the indicators will come on for a short period of time to indicate they are in good condition.
- 3.1.8 The System is ready for use.

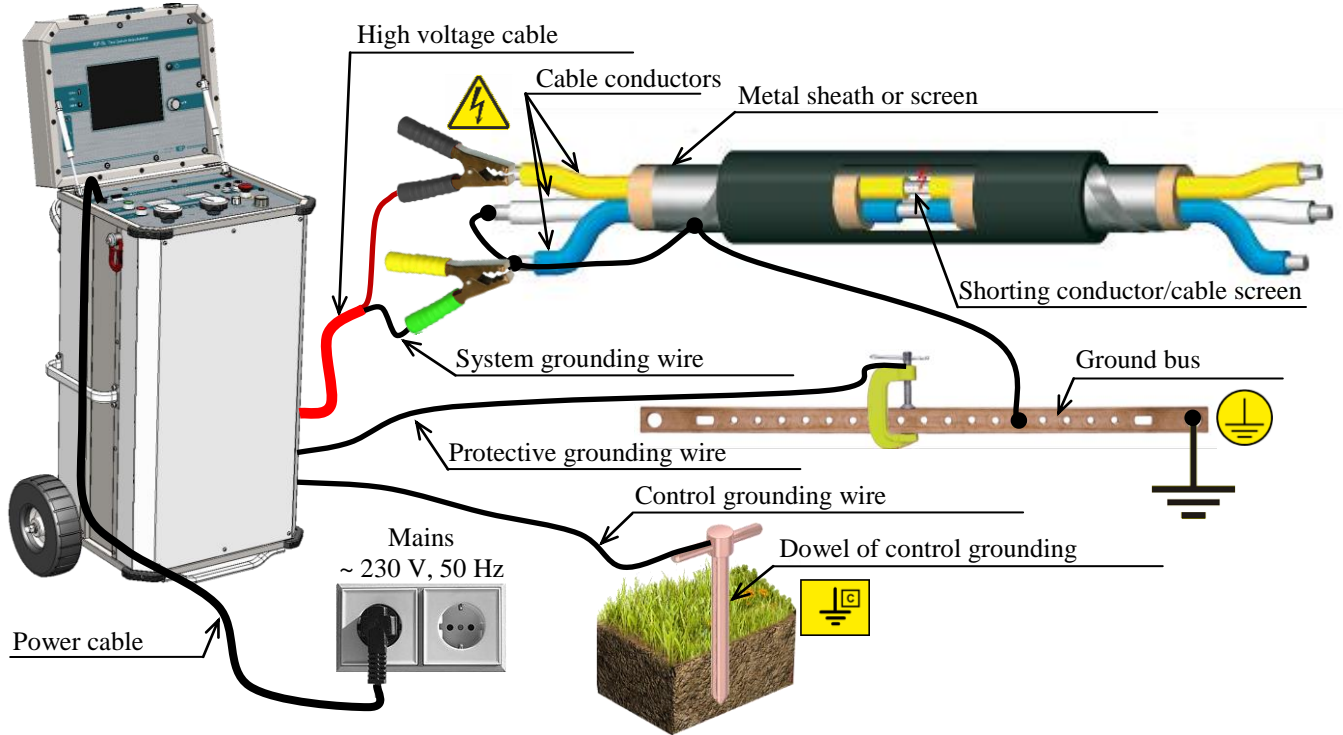


Figure 3 – Single-phase connection of cable under test to System

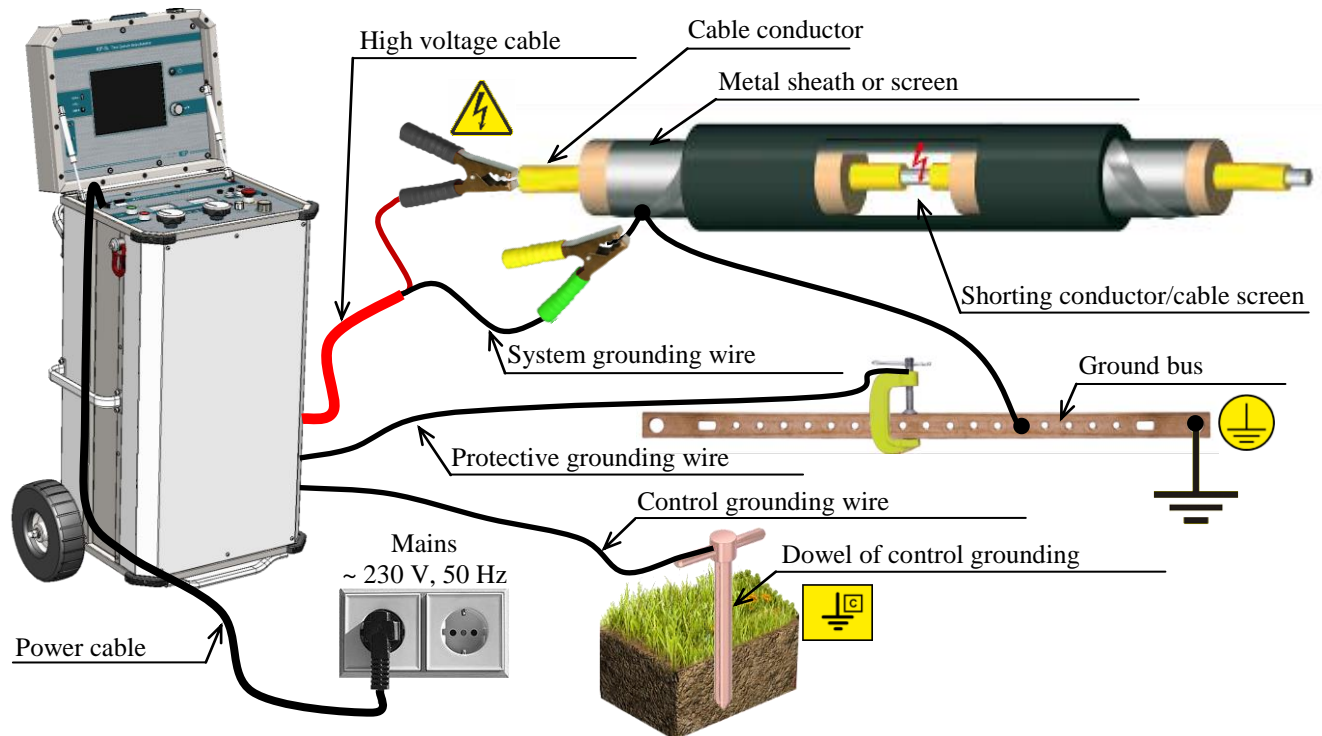


Figure 4 – Connecting a single-conductor cable under test to System

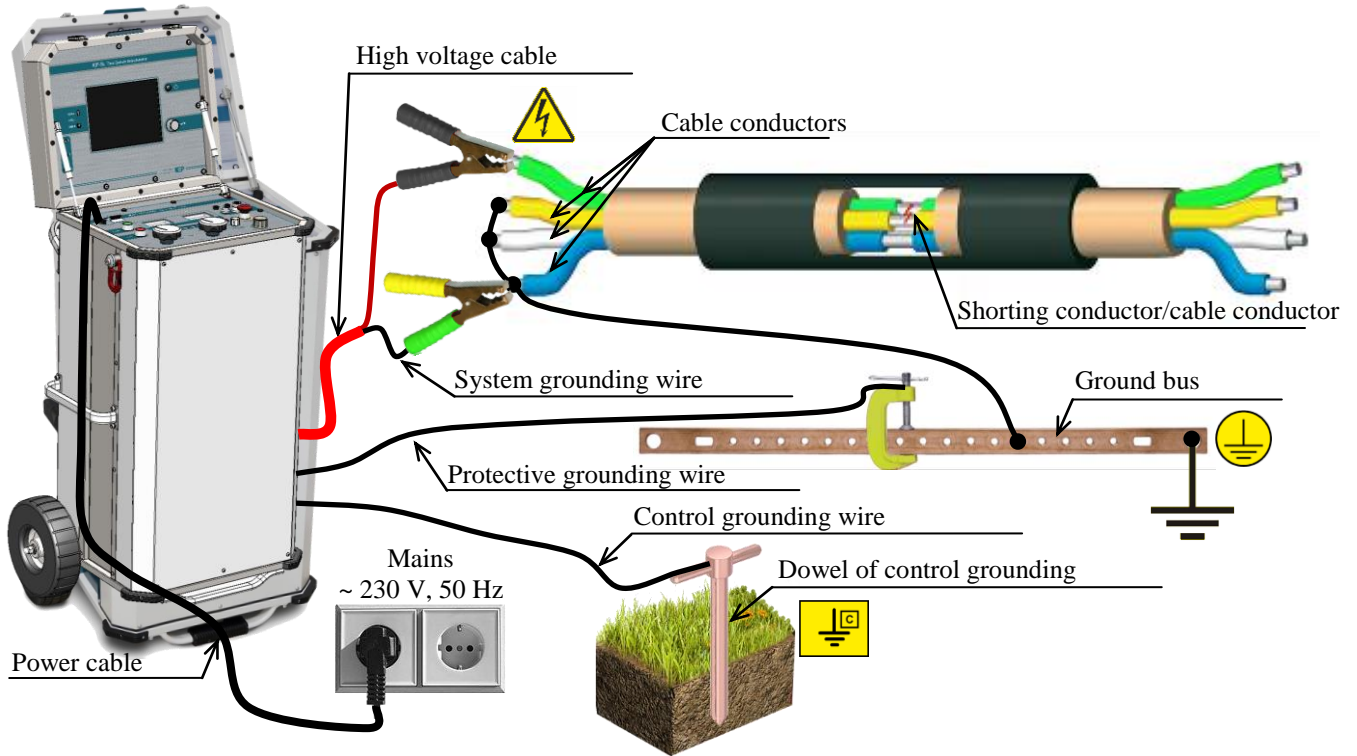


Figure 5 – Connecting a neutral-wire cable under test to System

3.2 Finishing operation

Having finished operating the System, do the following:

- set the voltage regulator knob "**VOLTAGE CONTROL**" (see Figure 1 Position 26) of the System on "zero";
- press the button "**STOP**" (see Figure 1 Position 8) on the front panel of the System control unit;
- turn the key of the lock switch (see Figure 1, Position 29) to the position "○";
- set the automatic circuit breaker (see Figure 1 Position 11) to the lower position "**OFF**" of the System control panel.
- set the switch "**MODE SELECT**" on "⏚"; with this purpose, pull the switch all the way up, set the knob with the pointer on "⏚" and move the switch all the way down.

If no other operations with the System are intended, do the following:

- Disconnect the power cable from the power socket;
- ground the lead of the System high voltage cable with a rod;

- disconnect the high voltage cable from the object;
- disconnect the power cable;
- disconnect the grounding control wire;
- disconnect the protective grounding wire.

3.3 Operating device

3.3.1 Mode "TEST"

3.3.1.1 Follow all the directions of **3.1**.

3.3.1.2 Select the operating mode "TEST"; for this purpose, pull the mode switch "MODE SELECT" (see Figure 1, Position 21) all the way up, set the knob with the pointer on "TEST" and move the switch all the way down. The button "10 mA" will come on (see Figure 1, Position 17), which corresponds to a current measurement range of 10 mA.



If the indicator "MS" from the group "SWITCH FAIL" is yellow, ensure the mode switch "MODE SELECT" has been set correctly.



If the button "START" is blinking, it indicates that the wires of protective, system, and/or control grounding are not properly connected.



If the indicator "VC" from the group "SWITCH FAIL" is yellow, turn the voltage regulator knob "VOLTAGE CONTROL" to the position "ZERO START".


3.3.1.3 Press the button "START" (see Figure 1 Position 9) on the front panel of the System control unit. The button "START" will then go out, and the red button "STOP" will come on (see Figure 1 Position 9).

3.3.1.4 Turn the voltage regulator knob "VOLTAGE CONTROL" (see Figure 1 Position 26) of the System clockwise to increase the output voltage up to the desired value.

The output voltage value is checked based on the readings of the output voltage display "VOLTAGE" (see Figure 1 Position 25) on the front panel of the System control unit (the measurement limit is 12 kV).

The output current value is checked based on the readings of the output current display "CURRENT" (see Figure 1 Position 20) on the front panel of the System control unit (the measurement limit is 10 mA). If you press and hold the button "1 mA", the current meter increases the measurement limit by 1 mA.

3.3.1.5 If during overvoltage testing there is a breakdown, the distance to the cable fault can be determined with the RIF-9L in the mode "**DECAY**":

- press the button "" (see Figure 1, Position 32) on the front panel of the RIF-9L;
- conduct the measurement according to the section "**Conducting measurement in mode "DECAY" (voltage wave method)**" in the RIF-9L user manual.



CAUTION!

IN CASE OF AN EMERGENCY, PRESS THE BUTTON "EMERGENCY STOP"

3.3.1.6 When the testing is over, follow the directions in **3.2**.

3.3.2 Mode "BURN"

3.3.2.1 Follow all the directions of **3.1**.

3.3.2.2 Select the operating mode "**BURN**"; for this purpose, pull the mode switch "**MODE SELECT**" (see Figure 1, Position 21) all the way up, set the knob with the pointer on "**BURN**" and move the switch all the way down. The button "**100 mA**" will come on (see Figure 1, Position 17), which corresponds to a current measurement range of 100 mA.



If the indicator "MS" from the group "SWITCH FAIL" is yellow, ensure the mode switch "MODE SELECT" has been set correctly.



If the indicator "VC" from the group "SWITCH FAIL" is yellow, turn the voltage regulator knob "VOLTAGE CONTROL" to the position "ZERO START".

3.3.2.3 Press the button "**START**" (see Figure 1 Position 9) on the front panel of the System control unit. The button "**START**" will then go out, and the red button "**STOP**" will come on (see Figure 1 Position 8).

3.3.2.4 Turn the voltage regulator knob "**VOLTAGE CONTROL**" (see Figure 1 Position 26) of the System clockwise to increase the output voltage until there is steady current on the meter "**CURRENT**". Allow some time in this mode so that the remains of the cable faulty insulation will burn out and the fault impedance will decrease.

The output voltage value is checked based on the readings of the output voltage display "**VOLTAGE**" (see Figure 1 Position 25) on the front panel of the System control unit (the measurement limit is 12 kV).

The output current value is checked based on the readings of the output current display "**CURRENT**" (see Figure 1 Position 20) on the front panel of the System control unit (the measurement limit is 100 mA).



CAUTION!

IN CASE OF AN EMERGENCY, PRESS THE BUTTON "EMERGENCY STOP"

3.3.2.5 When the testing is over, follow the directions in **3.2**.

3.3.3 Mode "SURGE"

3.3.3.1 Follow all the directions of **3.1**.

3.3.3.2 Select the operating mode "**SURGE**"; for this purpose, pull up the mode switch "**MODE SELECT**" (see Figure 1, Position 21), set the knob with the pointer on "**SURGE**" and move the switch all the way down.

3.3.3.3 Select the required measurement range. For this purpose, pull the voltage range switch "**VOLTAGE RANGE**" (see Figure 1, Position 7) all the way up, set the knob with the pointer on the required symbol ("**3 kV**", "**6 kV**", "**12 kV**") and move the switch all the way down.



*If the indicator "**VR**" from the group "**SWITCH FAIL**" is yellow, ensure the voltage range switch "**VOLTAGE RANGE**" has been set correctly.*

3.3.3.4 To launch a single pulse, do the following:

- set the voltage regulator knob "**SURGE CYCLE DELAY**" on "**SINGLE**";
- press the key "**START**";

Turn the voltage regulator knob "**VOLTAGE CONTROL**" (see Figure 1 Position 26) of the System clockwise to increase the output voltage up to the desired value.

The output voltage value is checked based on the readings of the output voltage display "**VOLTAGE**" (see Figure 1 Position 25) on the front panel of the System control unit (the measurement limit is 12 kV).

- Press the button "**SINGLE PULSE**" (see Figure 1 Position 24) on the front panel of the System control unit. The charged high voltage capacitor of the System will then discharge into the cable and cause a spark discharge in the fault, which will be followed by an acoustic wave.

3.3.3.5 To launch a cycle pulse, do the following:

- Turn the regulator knob "**SURGE CYCLE DELAY**" to set the required pulse refresh rate.

Turn the voltage regulator knob "**VOLTAGE CONTROL**" (see Figure 1 Position 26) of the System clockwise to increase the output voltage up to the desired value.


The output voltage value is checked based on the readings of the output voltage display "**VOLTAGE**" (see Figure 1 Position 25) on the front panel of the System control unit (the measurement limit is 12 kV).



CAUTION!

THE CAPACITORS LIFE TIME DEPENDS ON THE CHARGING VOLTAGE. THE SYSTEM SHOULD NOT BE CHARGED OVER THE UPPER RANGE LIMIT!

3.3.3.6 In this mode it is possible to first locate the fault with the use of the RIF-9L in the mode "**ICE**":

- press the button " (see Figure 1, Position 32) on the front panel of the RIF-9L;
- conduct the measurement according to the section "**Conducting measurement in mode 'ICE' (current wave method)**" in the RIF-9L user manual.




CAUTION!

IN CASE OF AN EMERGENCY, PRESS THE BUTTON "EMERGENCY STOP"

3.3.3.7 When the testing is over, follow the directions in **3.2**.

3.3.4 Mode "**ARC**"

3.3.4.1 Follow all the directions of **3.1**.

3.3.4.2 Press the button " on the front panel of the RIF-9L. When the application loads, set the reflectometer to the mode "**ARC**";

- 3.3.4.3 Select the operating mode "ARC" on the operating mode switch "MODE SELECT" (see Figure 1, Position 21). For this purpose, pull the switch all the way up, set the knob with the pointer on "ARC" and turn the handle all the way down.
- 3.3.4.4 Select the required measurement range. For this purpose, pull the voltage range switch "VOLTAGE RANGE" (see Figure 1, Position 7) all the way up, set the knob with the pointer on the required symbol ("3 kV", "6 kV", "12 kV") and turn the handle all the way down.
- 3.3.4.5 Set the voltage regulator knob "SURGE CYCLE DELAY" on "SINGLE".
- 3.3.4.6 Press the button "START" on the front panel of the System control unit. The button "START" will then go out, and the red button "STOP" will come on.
- 3.3.4.7 Turn the voltage regulator knob "VOLTAGE CONTROL" (see Figure 1 Position 26) of the System clockwise to increase the output voltage up to the desired value.




CAUTION!

THE CAPACITORS LIFE TIME DEPENDS ON THE CHARGING VOLTAGE. THE SYSTEM SHOULD NOT BE CHARGED OVER THE UPPER RANGE LIMIT!

- 3.3.4.8 Conduct the measurement according to the section "Conducting measurement in mode "ARC" (pulsed arc method)" in the RIF-9L user manual. To discharge the charged capacitor of the System into a cable, press the button "SINGLE PULSE" (see Figure 1 Position 24) on the front panel of the System control unit. After launching a single pulse into the cable, the capacitor will charge up to the set value again.
- 3.3.4.9 When the testing is over, follow the directions in 3.2.

3.3.5 Mode "TDR"

- 3.3.5.1 In this mode only the reflectometer is used, without the high voltage system.
- 3.3.5.2 Connect the System with one end of the grounding wire to the grounding terminal " (see Figure 1 Position 4) (on the rear side of the System), and with the screw-clamp on the other end – to the protective grounding mat.



CAUTION!

YOU MUST NOT OPERATE THE DEVICE WITHOUT PROTECTIVE GROUNDING!

- 3.3.5.3 Connect one end of the power cable to the socket "~230V 50Hz" (see Figure 1 Position 10), and the other end to – a power socket 230 V.
- 3.3.5.4 Set the automatic circuit breaker (see Figure 1 Position 11) to the upper position "ON" (on mode). The white indicator "POWER" will then come on.
- 3.3.5.5 Connect the cables from the System package contents on the one end to the

sockets "L1" – "L3" on the System power panel, and on the other end to the cable with faulty insulation according to Figure 6.

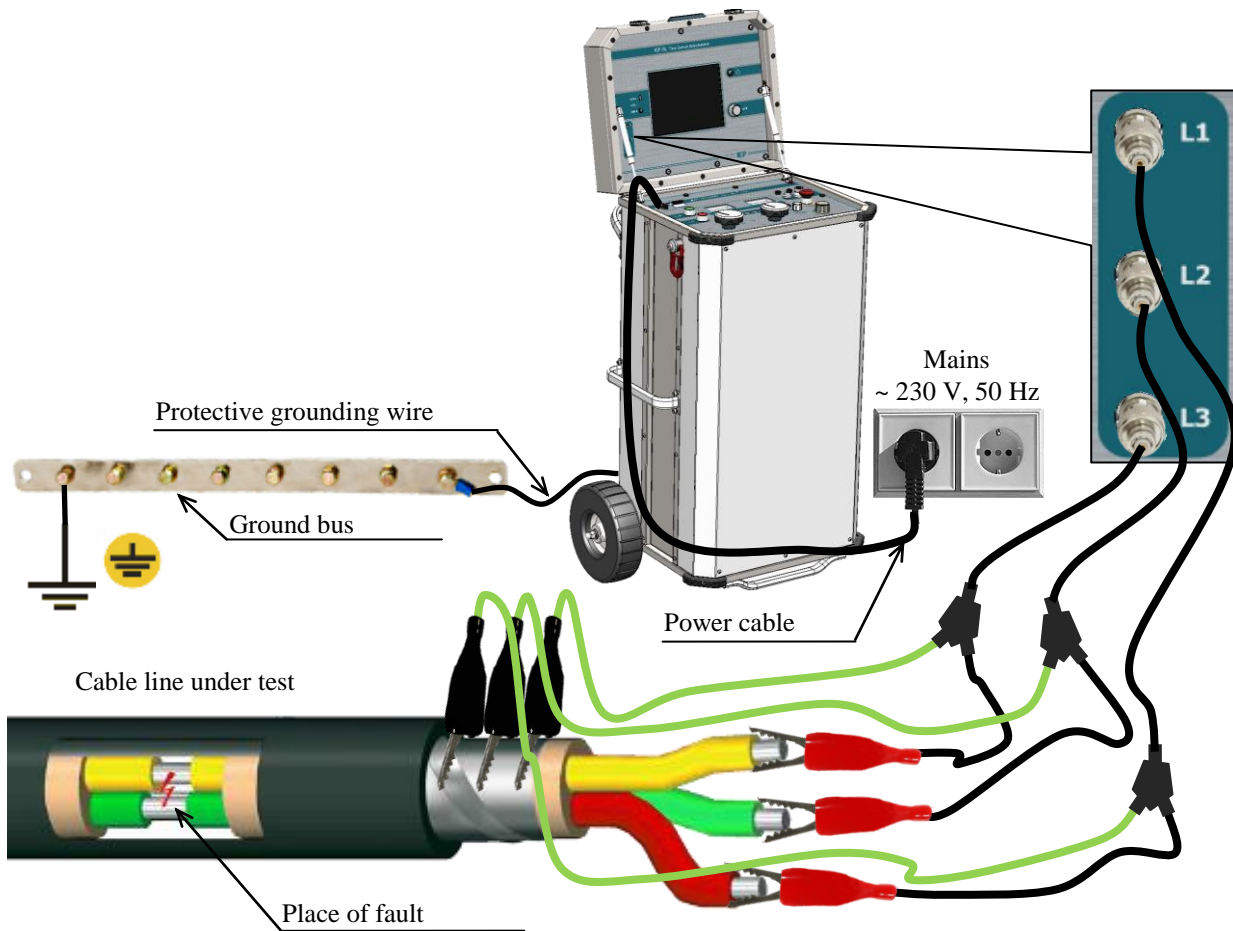


Figure 6 – Connecting System to line under test in mode "TDR"

3.3.5.6 Conduct the measurement of cable features according to the section "Operating the device in mode "TDR" (pulse mode)" of the RIF-9L user manual.

3.3.5.7 When the testing is over, follow the directions in 3.2.

4 MAINTENANCE

4.1 Common malfunctions and troubleshooting

№	Fault symptom	Additional information	Reason and troubleshooting method
1	The System does not switch on in any mode	The button "START" is blinking	The grounding circuit is faulty. Ensure the protective, system, and control grounding are properly connected.
2	The system does not switch on in the mode "SURGE" or "ARC"	The indicator "VR" from the group "SWITCH FAIL" is yellow	Ensure that the voltage range switch "VOLTAGE RANGE" is properly set.
3	The system does not switch on in any mode	The indicator "MS" from the group "SWITCH FAIL" is yellow	Ensure that voltage range switch "MODE SELECT" is properly set.
4	The system does not switch on in any mode	The indicator "VC" from the group "SWITCH FAIL" is yellow	Turn the voltage regulator knob "VOLTAGE CONTROL" to the position "ZERO START"
5	The high voltage capacitor fails to launch a single pulse into the cable in the mode "ARC"	The green indicator of the button "SINGLE PULSE" is out	Set the voltage regulator knob "SURGE CYCLE DELAY" on "SINGLE".
6	The system switches off during high voltage testing in any mode.	The indicator "I" from the group "PROTECTION" is red, and the indicator "VC" from the group "SWITCH FAIL" is yellow	Overcurrent protection has been activated. If the voltage regulator knob "VOLTAGE CONTROL" is set on "ZERO START", the indicators "I" and "VC" will go out and the system can be switched on again
7	The system switches off during high voltage testing in any mode	The indicator "I" from the group "PROTECTION" is red, and the indicator "VC" from the group "SWITCH FAIL" is yellow	Feed transformer overheating protection has been activated. Temporarily stop operation until the temperature decreases and the indicator "t" goes out