

HVA Family

HVA34 | HVA60 | HVA90 | HVA94 | HVA120

HVA30-5 | HVA30-7 | HVA40-5 | HVA54-3 |
HVA54-5 | HVA68-2

User Manual

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Subject to alterations –
errors excepted
Illustrations are not binding



High Voltage Test System

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1 Introduction

Purpose

This User Manual serves to ensure the proper and safe use of the HVA test instrument.

1.1 Regarding this Document

HVA device

This document applies to corresponding HVA units from the first generation. HVA refers to HVA34, HVA60, HVA90, HVA94, HVA120, HVA30-5, HVA30-7, HVA40-5, HVA54-3, HVA54-5 and HVA68-2.

Target user

This User Manual is designed to inform various user groups. The scope and depth of the information provided may not be appropriate for all users. However, it is important that all users familiarize themselves with this document in full. The following is a guideline indicating the most significant information as a function of the user's responsibilities.

User	Responsibilities	Focus
HVA operator	<ul style="list-style-type: none"> To connect the equipment To carry out the manual or pre-programmed test sequence To verify validity of HVA application To adjust instrument settings To program automatic test sequences in accordance with particular testing standards 	<p>All sections</p> <p>Particular focus on all safety messages</p>
Procurement, management	<ul style="list-style-type: none"> To assure that the workplace is safe and has all required equipment To assure that HVA operators are qualified technicians To assure that operators fulfil their responsibilities 	<p>Particular focus on safety messages and information regarding general product description.</p>

Safety



NOTICE

This Manual should always be on hand when using the HVA test instrument.

1.2 Documentation Conventions

The following explain the **symbols** and **safety messages** found in this document. The employment of safety symbols and signal words are in compliance with American National Standards Institute standard ANSI Z535.6 "Product Safety Signs and Labels."

Safety messages

Danger

DANGER

Indicates a hazardous situation, which, if not avoided, will result in death or serious injury.

Warning

WARNING

Indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

Caution

CAUTION

Indicates a hazardous situation, which, if not avoided, could result in minor or moderate injury.

Notice

NOTICE

Indicates suggested practices to protect equipment and property.

Symbols



Yellow triangle, framed in black: Used to indicate a potential hazard. Only used in conjunction with description of the possible hazard! Detailed symbol may correspond to this specific hazard.



Red outlined circle with red diagonal line: Used to indicate prohibited practices. The described handling practice is not allowed to be carried out!



Blue circle with white exclamation mark: Used to indicate recommended precautionary measures or a situation that can lead to property damage.

b2 Customer Portal – customers.b2hv.com

Register now and get access to a quick and comprehensive support and product database.

The b2 Customer Portal is reserved for b2 electronic customers. Register and get:

- Information about meetings and training sessions
- Documents and manuals
- New software or firmware versions
- Support and service requests
- Send messages
- Request Newsletters

The screenshot shows the b2 High-Voltage Customer Portal. The header includes the b2 logo and navigation links: Home, Device, Training Dates, Master Data, Change password, and Logout. The main content area is titled "Device" and features a "Register a device" form with four input fields and a "Register" button. Below the form is a table titled "Registered devices" with columns for Device, SerialNo., registered on, Downloads/Documents, and Supportrequests. The table lists three devices: BA100, BA75, and BA75, all registered on 17.10.2013. At the bottom of the page, there is a footer with contact information for b2 electronic GmbH.

Device	SerialNo.	registered on	Downloads/Documents	Supportrequests
BA100	GB5008.12 A 019	17.10.2013	Downloads/Documents »	Supportrequests »
BA75	GB5001.12 A 047	17.10.2013	Downloads/Documents »	Supportrequests »
BA75	GB5001.12 A 004	17.10.2013	Downloads/Documents »	Supportrequests »

1.3 Legal Considerations

Warranty

b2 provides a one-year warranty from the original purchase date of the instrument for all necessary parts and labour. This warranty is void in the event of abuse; incorrect operation or use; unauthorized modification or repairs; or failure to perform the specified maintenance as indicated in this User Manual. This warranty does not include normal consumable items such as lamps, paper rolls, printer ribbons, batteries or other auxiliary items.

This warranty and our liability are limited to replacing or repairing defective equipment, at our discretion. Equipment that is returned to b2 must be packed in original packaging. All shipped items must be prepaid and insured. No other warranties are expressed or implied.

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Your opinion matters!

Your comments and suggestions are of value. We are dedicated to supporting your needs. Offering you optimal documentation is part of our promise of quality.

Improvement suggestions regarding this Manual can be sent to:

office@b2electronic.at

Thank you for your feedback!

2 Safety

Safety has **priority!** Respect all **safety information**; only use the HVA for **appropriate applications** and ensure that operators possess the required **operator qualifications**.

2.1 General Safety



NOTICE

User Manual

Before carrying out any high voltage test with this instrument, read this User Manual in its entirety.

2.2 Work Safety



DANGER

Electric shock hazard

Never assume that equipment is safe to handle – always use the required safety equipment and earthing procedures.

- All procedures must comply with local safety regulations.
- Always treat exposed connectors and conductors as potential electric shock hazards.
- DUT must be earthed, de-energized and isolated from all power sources.
- All auxiliary electrical apparatus such as switchgear, surge arresters, etc., must be isolated from the test power source and the DUT.
- All cables and connectors must be inspected for damage before use. Damaged equipment is not allowed to be used.
- Earth connections must be made first and removed last!
- DUT must be discharged and earthed before disconnecting the test lead.
- Avoid testing alone. In the event of an emergency, another person's presence may be essential.



DANGER

Authorized personnel only

The test area must be secured to keep non-qualified personnel off the premises!

- Signs must warn all persons of the high voltage test area.
- Only qualified electrical technicians should have access to the test area.
- Other persons must be accompanied by qualified electrical technicians and must be informed of the risks involved.

**WARNING****Radiation hazard**

Testing vacuum bottles, above their voltage rating, with DC can produce dangerous X-rays.

**NOTICE****Equipment handling**

DUT must have clean connections.

Test instruments are only allowed to be repaired or modified by authorized b2 personnel.

**NOTICE****If required, according to local safety regulations**

Wear high voltage gloves when handling high voltage cables and equipment.

WARNING

This is a class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

2.3 Appropriate Applications

The HVA test instrument is designed to perform high voltage insulation testing of various types of highly capacitive loads.

Appropriate DUTs

DUT Type	Examples
Cables	<ul style="list-style-type: none"> • Extruded cables (e.g. XLPE) • Laminated cables (e.g. PILC) • Insulated cables • Cable jacket/sheath
Other highly capacitive loads	<ul style="list-style-type: none"> • Generators • Switchgear • Transformers • Rotating machines • Insulators • Bushings

Appropriate measurements

Measurement	Examples
Test	<ul style="list-style-type: none"> • Capacitance • Resistance • Dielectric breakdown voltage • RMS current • Applied voltage



NOTICE

Other applications

Before proceeding, contact b2 to validate appropriate use!

2.4 Operator Qualifications

HVA operators must be **qualified electrical technicians!** Proof of required qualifications for working in high voltage domain is mandatory. It is highly recommended that operators have completed an emergency rescue-training program.

3 General Description

3.1 Technical Specifications

Characteristic ¹	HVA30-5	HVA34	HVA60	
Article number	SH5004	SH5006	SH5014	
Input supply voltage	110-240 V; 50/60 Hz; $\pm 10\%$			
Input supply power	1.5 kVA	400 VA	1.5 kVA	
max. output voltage	VLF sine wave	23 kV _{rms} 33 kV _{peak}	24 kV _{rms} 34 kV _{peak}	44 kV _{rms} 62 kV _{peak}
	VLF square wave	30 kV	34 kV	60 kV
	DC [+/-]	30 kV	34 kV	60 kV
	resolution: 0.1 kV, accuracy: $\pm 1\%$			
max. output current	60 mA _{rms}	10 mA _{rms}	26 mA _{rms}	
	resolution: 1 μ A, accuracy: $\pm 1\%$			
Resistance range	0.1 M Ω ...5 G Ω			
Output frequency	0.01 Hz-0.1 Hz in steps of 0.01 Hz (default 0.1 Hz) – auto frequency selection			
Sheath test	max. test voltage: 10 kV, duration: 1 min-15 min trip current: 0.1 mA-5.0 mA			
Sheath fault location mode ²	max. test voltage: 10 kV, duration: 1 min-60 min pulse/period: 1:3 / 4 s, 1:5 / 4 s, 1:5 / 6 s, 1:9 / 6 s			
Frequency optimization	Yes			
Output load capacity	at 0.1 Hz	3.8 μ F	0.5 μ F	1 μ F
	at reduced frequency/voltage	15 μ F	12 μ F	10 μ F
Metering	voltage and current (true rms and/or peak), capacitance, resistance, time, flashover voltage			
Output duty	Continuous! No thermal limitation for operating time.			
Test modes	manual & automatic			
Output modes	AC (VLF) symmetrical and load independent across full range, DC (plus or negative polarity), burn/fault condition or fault trip mode, jacket/sheath testing			
Safety	Dual discharge device (internal) ³	50 Hz-12 kV feedback protection/ dual discharge device (internal)		
Computer interface	RS232 & USB flash memory module			
Record storage	Built-in memory: up to 50 reports, 40 test sequences USB memory flash drive: unlimited			
PC software [included]	b2 ControlCenter for Windows			
Weight	45 kg	19.5 kg	57 kg	
Dimensions ⁴ (mm) L x W x H	450 x 340 x 520	430 x 250 x 360	450 x 340 x 520	
Environment	Storage temperature	-25°C to 70°C		
	Operation temperature	-10°C to 50°C		
	Humidity	5-85% non-condensing		

Characteristic ¹	HVA30-7	HVA40-5	HVA54-3	HVA68-2	
Article number	SH5005	SH5009	SH5012	SH5016	
Input supply voltage	190-240 V, 50/60 Hz				
Input supply power	3 kVA				
max. output voltage	VLF sine wave	24 kV _{rms} 34 kV _{peak}	32 kV _{rms} 45 kV _{peak}	38 kV _{rms} 54 kV _{peak}	48 kV _{rms} 68 kV _{peak}
	VLF square wave	34 kV	45 kV	54 kV	60 kV
	DC [+/-]	34 kV	45 kV	54 kV	60 kV
	resolution: 0.1 kV, accuracy: ± 1%				
max. output current	120 mA _{rms}			52 mA _{rms}	
	resolution: 1 µA, accuracy: ± 1%				
Resistance range	0.1 MΩ...5 GΩ				
Output frequency	0.01 Hz-0.1 Hz in steps of 0.01 Hz (default 0.1 Hz) – auto frequency selection				
Sheath test	max. test voltage: 10 kV, duration: 1 min-15 min trip current: 0.1 mA-5.0 mA				
Sheath fault location mode ²	max. test voltage: 10 kV, duration: 1 min-60 min pulse/period: 1:3 / 4 s, 1:5 / 4 s, 1:5 / 6 s, 1:9 / 6 s				
Frequency optimization	Yes				
Output Load Capacity	at 0.1 Hz	7 µF	5 µF	3 µF	2 µF
	at reduced frequency/voltage	15 µF	15 µF	10 µF	10 µF
Metering	voltage and current (true rms and/or peak), capacitance, resistance, time, flashover voltage				
Output duty	Continuous! No thermal limitation for operating time.				
Test modes	manual & automatic				
Output modes	AC (VLF) symmetrical and load independent across full range, DC (plus or negative polarity), burn/fault condition or fault trip mode, jacket/sheath testing				
Safety	50 Hz-12 kV feedback protection/dual discharge device (internal)				
Computer interface	RS232 & USB flash memory module				
Record storage	Built-in memory: up to 50 reports, 40 test sequences USB memory flash drive: unlimited				
PC software [included]	b2 ControlCenter for Windows				
Weight	57 kg				
Dimensions ⁴ (mm) L x W x H	450 x 340 x 520				
Environment	Storage temp.	-25°C to 70°C			
	Operation temp.	-10°C to 50°C			
	Humidity	5-85% non-condensing			

Characteristic ¹	HVA54-5	HVA90	HVA94	HVA120	
Article number	SH5013	SH5017	SH5018	SH5019	
Input supply voltage	190-240 V; 50/60 Hz; ±10%				
Input supply power	6 kVA	3 kVA			
max. output voltage	VLF sine wave	38 kV _{rms} 54 kV _{peak}	64 kV _{rms} 90 kV _{peak}	66 kV _{rms} 94 kV _{peak}	85 kV _{rms} 120 kV _{peak}
	VLF square wave	54 kV	90 kV		100 kV
	DC [+/-]	54 kV	90 kV		100 kV
	resolution: 0.1 kV, accuracy: ± 1%				
max. output current	120 mA _{rms}	41 mA _{rms}	41 mA _{rms}	56 mA _{rms}	
	resolution: 1 µA, accuracy: ± 1%				
Resistance range	0.1 MΩ...5 GΩ				
Output frequency	0.01 Hz-0.1 Hz in steps of 0.01 Hz (default 0.1 Hz) – auto frequency selection				
Sheath test	max. test voltage: 10 kV, duration: 1 min-15 min trip current: 0.1 mA-5.0 mA				
Sheath fault location mode ²	max. test voltage: 10 kV, duration: 1 min-60 min pulse/period: 1:3 / 4 s, 1:5 / 4 s, 1:5 / 6 s, 1:9 / 6 s				
Frequency optimization	Yes				
Output load capacity	at 0.1 Hz	5 µF	1 µF	0.85 µF	1 µF
	at reduced frequency/voltage	12 µF	10 µF	10 µF	5 µF
Metering	voltage and current (true rms and/or peak), capacitance, resistance, time, flashover voltage				
Output duty	Continuous! No thermal limitation for operating time.				
Test modes	manual & automatic				
Output modes	AC (VLF) symmetrical and load independent across full range, DC (plus or negative polarity), burn/fault condition or fault trip mode, jacket/sheath testing				
Safety	50 Hz-12 kV feedback protection/dual discharge device (internal)				
Computer interface	RS232 & USB flash memory module				
Record storage	Built in memory: up to 50 reports, 40 test sequences USB memory flash drive: unlimited				
PC software [included]	b2 ControlCenter for Windows				
Weight	169 kg	127 kg	128 kg	198 kg	
Dimensions ⁴ (mm) L x W x H	863 x 445 x 610	545 x 445 x 610		790 x 445 x 740	
Environment	Storage temp.	-25°C to 70°C			
	Operation temp.	-10°C to 50°C			
	Humidity	5-85% non-condensing			

¹ Technical Specifications are subject to change. b2 reserves the right to modify values in accordance with future HVA development.

² in combination with locator set (not in scope of supply) | ³ 50 Hz-12 kV feedback protection (optional)

⁴ dimensions without handles

3.2 Design Features

To assure that the workplace is safe and that operators can fulfil their responsibilities with ease, the HVA provides the following features.

Feature	Purpose/application	Advantage
Optimized frequency Selection/automatic load measurement	<ul style="list-style-type: none"> To test capacitive loads No instrument restart necessary 	<ul style="list-style-type: none"> Facilitates testing Limits number of connections to the DUT
Fully automatic test sequences	<ul style="list-style-type: none"> To test according to IEEE or other standards 	<ul style="list-style-type: none"> Facilitates complex testing Facilitates test repetition
Real time display	<ul style="list-style-type: none"> To indicate instantaneous output voltage display. 	<ul style="list-style-type: none"> Facilitates testing
Load independent output	<ul style="list-style-type: none"> To indicate true symmetrical sinusoidal and square wave waveforms output 	<ul style="list-style-type: none"> Facilitates testing
Built-in memory	<ul style="list-style-type: none"> To save test sequences To save test reports 	<ul style="list-style-type: none"> Facilitates test repetition Facilitates documentation
Arc management	<ul style="list-style-type: none"> To provide short-circuit protection To allow for fault conditioning 	<ul style="list-style-type: none"> Limits test interruptions commonly encountered when using conventional HV test instruments that immediately trip on arc detection.
Automatic load measurement	<ul style="list-style-type: none"> To limit connections to the DUT 	<ul style="list-style-type: none"> Facilitates testing
Intelligent design	<ul style="list-style-type: none"> To avoid moving parts and need for lubrication 	<ul style="list-style-type: none"> Reduces maintenance Improves instrument durability and reliability
Instrument Lock-Key switch ⁴³	<ul style="list-style-type: none"> To prevent unauthorized use 	<ul style="list-style-type: none"> Improves safety
Local and remote emergency OFF switches	<ul style="list-style-type: none"> To shut down operations in emergency situation 	<ul style="list-style-type: none"> Improves safety
Fully integrated discharge and transient circuit	<ul style="list-style-type: none"> To ground the DUT after testing To protect the unit from transient over voltages 	<ul style="list-style-type: none"> Improves safety Protects instrument
Initial load clearance test at reduced voltages	<ul style="list-style-type: none"> To check automatically for shorts or grounds, during load measurement, before test initiation 	<ul style="list-style-type: none"> Improves safety

Feature	Purpose/application	Advantage
Return voltage indication	<ul style="list-style-type: none">To monitor external high voltage greater than 100 V (AC or DC)	<ul style="list-style-type: none">Improves safety
Discharge status indication	<ul style="list-style-type: none">To indicate when DUT is not fully discharged. LED Red  lights when residual voltage greater than 100 V	<ul style="list-style-type: none">Improves safety during normal disconnection procedures

3.3 External Interlock and Control



NOTICE

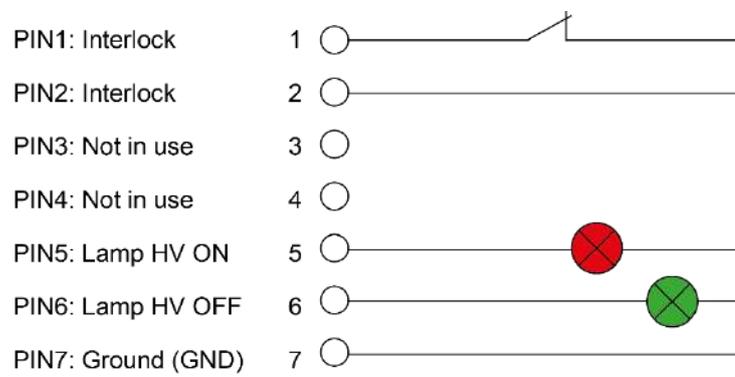
Equipment NOT included

Cables for remote control and external lamps are not supplied by b2!

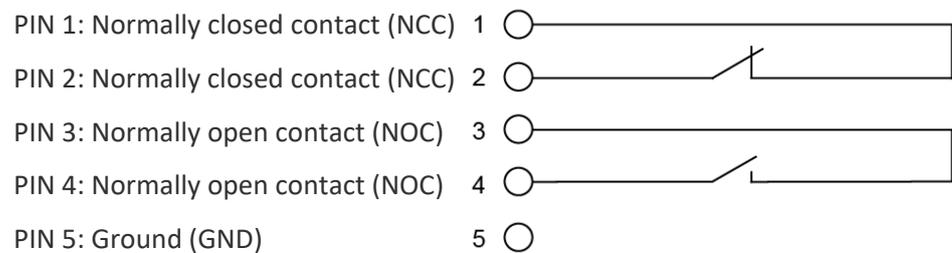
External lamp requirements:

- Rating: Max 1.2 W
- Recommended colors: red, green

PINOUT connection (optional)



PINOUT connection for EXTERNAL HV ON/OFF (HVA54-5)



3.4 Shipment Content

Items included in the scope of delivery of the HVA are listed below. The ¹ marking specifies items that are country specific. For inquiries, please contact b2. Please note that the items depend on availability and delivery terms.

HVA accessories

The following items are included in all HVA accessories.

Except the items marked with ² that are not included in the HVA120 accessories.

GH0522 ²	Earth Lead 4 m 6 mm ² transparent M6/Clamp		GH0602	HVA USB Flash Adapter	
KEK0017	Cable Serial DB9 f/f Link 3 m		GH0612	HV Emergency Adapter	
KEK0049	UC232R-10 "ChiPi" USB-RS232 Adapter		KEC0007	Extra Key for Power On ⁴³	
DHV0078	HVA Family Manual		KDD0016	USB Pen Flash Drive classic black b2	

HVA30-5 accessories

The following items are included in the HVA30-5 accessories.

GH0570	HVA34 HV Test Lead 65 kV 4 m 80 A Clamp		KEK0038 ¹	Power Cord EF/C13 10 A 3 m black	
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HVA34 accessories

The following items are included in the HVA34 accessories.

GH0570	HVA34 HV Test Lead 65 kV 4 m 80 A Clamp		KEK0038 ¹	Power Cord EF/C13 10 A 3 m black	
KEK0076	Earth Lead 4 m 6 mm ² yellow/green M6/M6				

HVA60 accessories

The following items are included in the HVA60 accessories.

GH0508	HVA60 HV Test Lead 100 kV 5 m MC14		KEK0038 ¹	Power Cord EF/C13 10 A 3 m black	
KES0105	Angle Bracket Connector 14 mm		GH0580	Red Clamp 600 A with MC 14 mm Socket	

HVA90, HVA94 accessories

The following items are included in the HVA90 and HVA94 accessories.

GH0540	HVA94 HV Test Lead 100 kV PD 7 m MC14		KEK0086 ¹	Power Cord EF/C19 16 A 3 m black	
KES0105	Angle Bracket Connector 14 mm		GH0580	Red Clamp 600 A with MC 14 mm Socket	

HVA120 accessories

The following items are included in the HVA120 accessories.

GH0635	HVA120 HV Test Lead 160 kV PD 10 m MC14		GH1009	Earth Lead 5 m 16 mm ² flat transparent M6/Clamp	
KEK0086 ¹	Power Cord EF/C19 16 A 3 m black		KES0105	Angle Bracket Connector 14 mm	
GH0580	Red Clamp 600 A with MC 14 mm Socket				

HVA68-2 accessories

The following items are included in the HVA68-2 accessories.

GH0653	HVA68-2 HV Test Lead 100 kV 5 m MC14		KEK0086 ¹	Power Cord EF/C19 16 A 3 m black	
KES0105	Angle Bracket Connector 14 mm		GH0580	Red Clamp 600 A with MC 14 mm Socket	

HVA30-7, HVA40-5, HVA54-3 accessories

The following items are included in the HVA30-7, HVA40-5 and HVA54-3 accessories.

GH0655	HVA54-3 HV Test Lead 100 kV 5 m 150 mA MC14		KEK0086 ¹	Power Cord EF/C19 16 A 3 m black	
KES0105	Angle Bracket Connector 14 mm		GH0580	Red Clamp 600 A with MC 14 mm Socket	

HVA54-5 accessories

The following items are included in the HVA54-5 accessories.

GH0801	HVA60 HV Test Lead 75 kV PD 5 m MC14		KEK0147 ¹	Power Cord 5 m 32 A 3x6.0 mm ²	
KES0105	Angle Bracket Connector 14 mm		GH0580	Red Clamp 600 A with MC 14 mm Socket	

4 Design and Construction

4.1 Control Elements

HVA control and connection components are located on two panels.

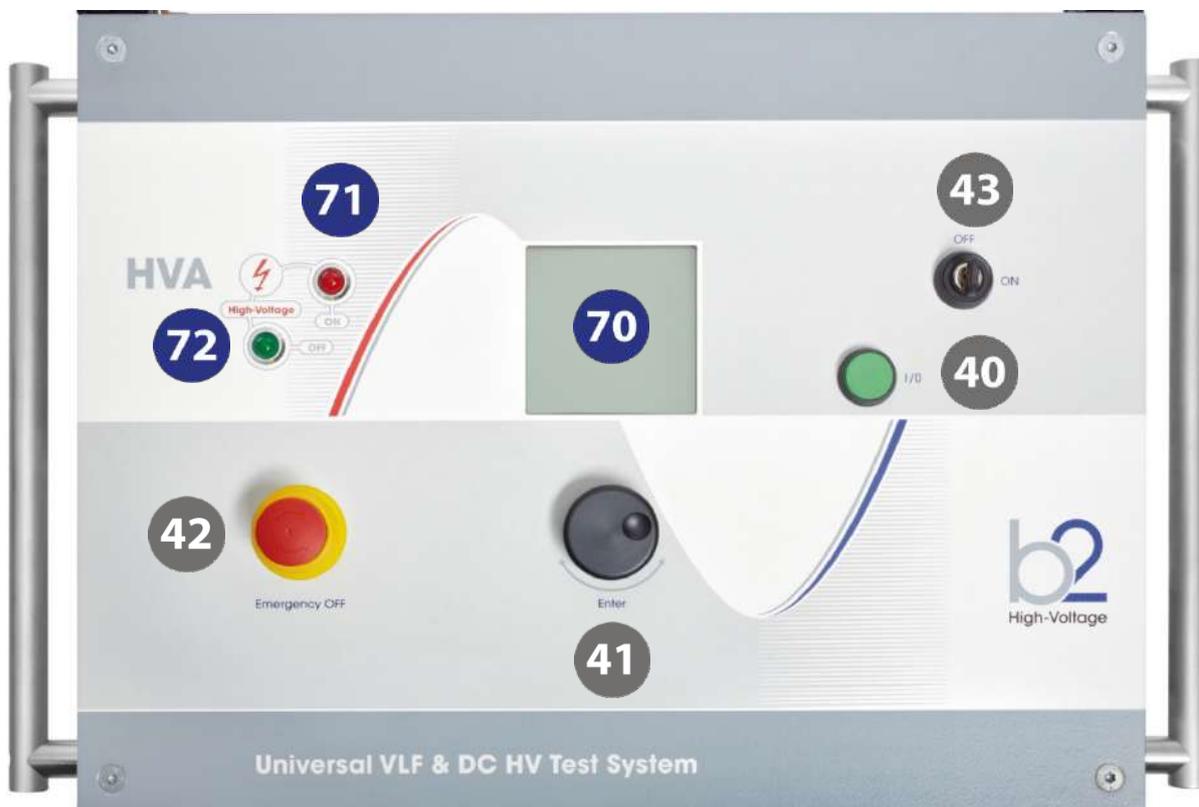
Panel orientation



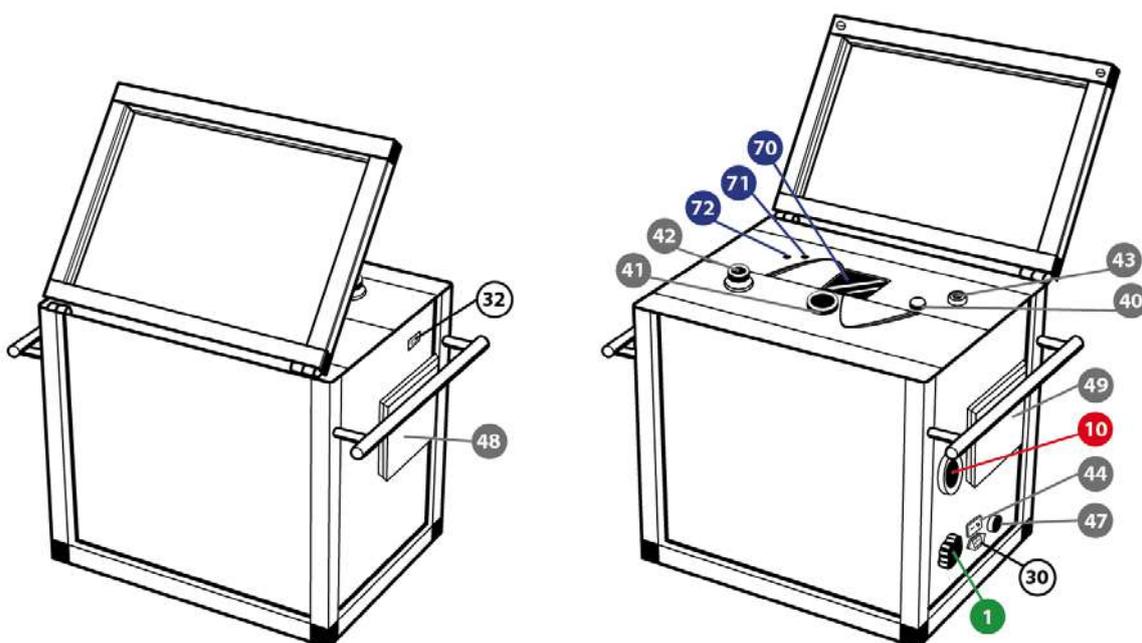
Orientation	Description
Front	<ul style="list-style-type: none"> • Test controls and emergency shutdown • HV status information
Right side	<ul style="list-style-type: none"> • Cable and power source connections • External connections (for remote controls) • RS232 port/USB flash adapter

Switches and controls

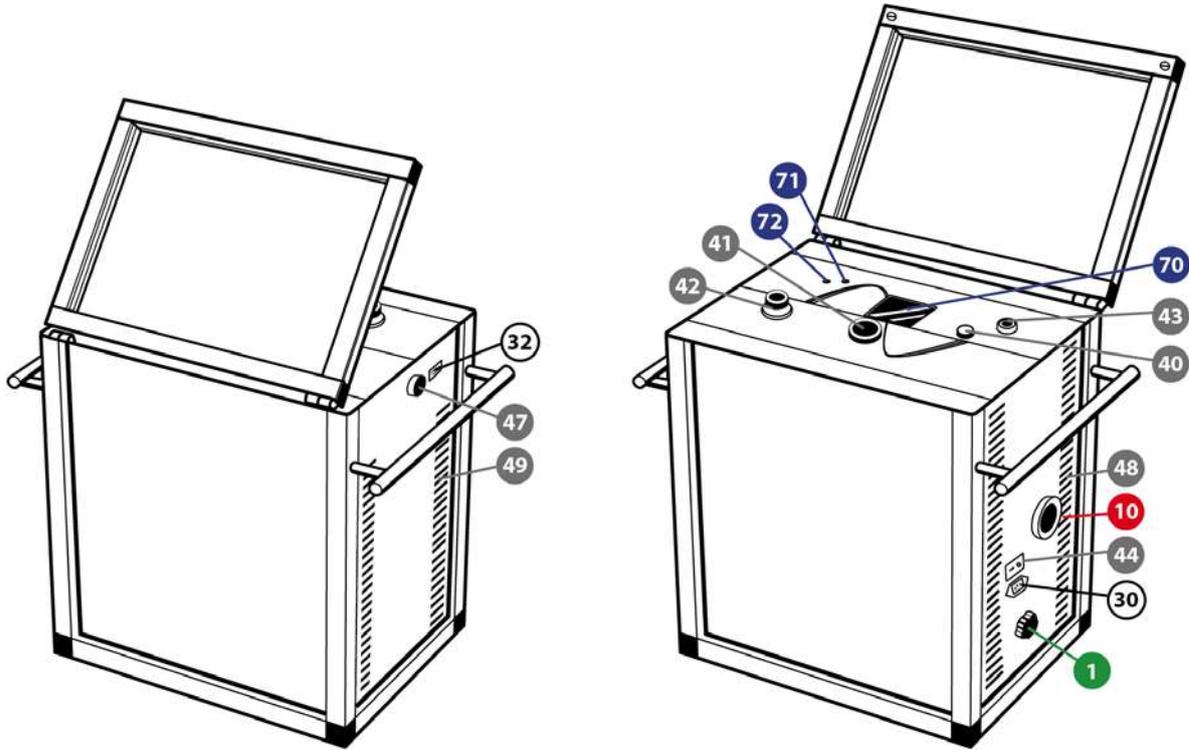
Front panel



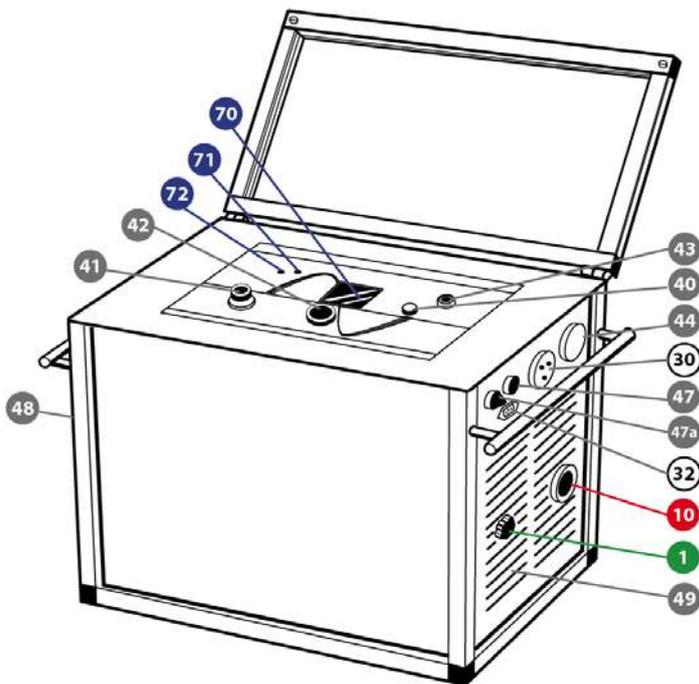
HVA34



HVA30-5, HVA30-7, HVA40-5, HVA54-3, HVA60, HVA68-2, HVA90, HVA94, HVA120



HVA54-5

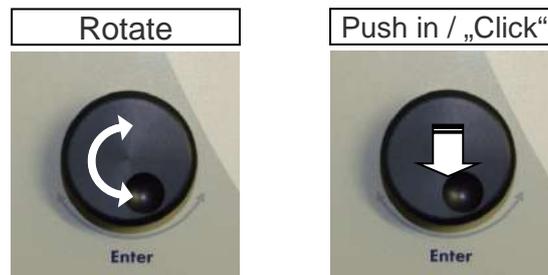


Pos.	Name	Description
1	Earthing connector	Serves as connection point from HVA to earth.
10	HV output connector	Serves as connection point from the HVA to the HV test lead. To connect → Screw the HV test lead into the HV output connector and tighten
30	Power supply plug	Serves as connection point from the HVA to the power source.
32	Communication port	Serves as connection point from the HVA to PC (via RS232) or to a USB device (via USB flash adapter).
40	HV switch [on/off]	Activates high voltage. <ul style="list-style-type: none"> To activate HV output → Press within 10 seconds after START
41	Navigation knob	Enables user to select options and functions shown on display. <ul style="list-style-type: none"> To scroll selection up or down → Rotate To enter selection → Click (push in)
42	Emergency OFF	Activates emergency shutdown. Operation is only possible when emergency OFF is released. <ul style="list-style-type: none"> To activate emergency OFF → Press in
43	Key switch [on/off]	Locks the unit to prevent against unauthorized use. <ul style="list-style-type: none"> To disable unit → Remove key from the OFF Position To reactivate unit → Replace key and turn to ON Position.
44	Main switch [on/off]	Activates the HVA. This switch is a fuse with integrated magnetic auto-reset 16 A <ul style="list-style-type: none"> To reset → Turn the main switch OFF and then ON again
47	Remote control interlock plug	Provides interlock for the remote switch (i.e. door interlock). Can be connected to a remote emergency OFF switch, a gate, foot pedal or dead man switch
47a	External HV ON/OFF	Connection for an external HV ON/OFF button
48	Air vent	Air inlet with filter, for cooling of electronic elements.
49	Air vent	Air outlet, for cooling of electronic elements.
70	Display screen	Displays menu, options and status information.
71	LED red	Indicates HV status. * Red light indicates → High voltage is ON (possible DANGER) → DUT not discharged residual voltage >100 V)
72	LED green	Indicates HV status. * Green light indicates → High voltage is OFF

4.2 User Interface

Display navigation

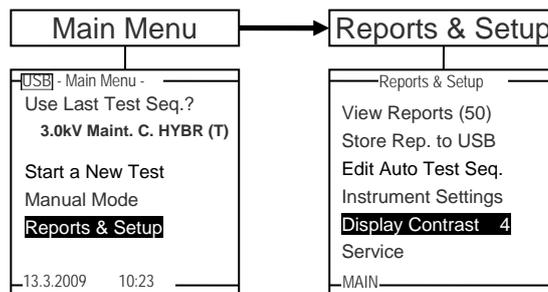
The navigation knob ⁴¹ enables the user to select or change options shown on the HVA display screen ⁷⁰



- To move to another item in a menu or to any other field possible on the actual displayed screen → Rotate the knob.
- To scroll through options or to change value displayed of an active field → Rotate the knob.
- To select marked option or to accept set value accept → Push in/“click”

Display contrast

The contrast of the HVA display screen ⁷⁰ can be adjusted. The “Display Contrast” setting is found in the “Reports & Setup” menu.

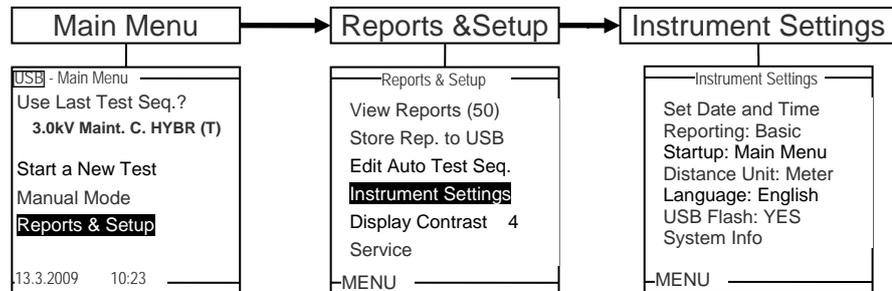


- The lowest value is “1”, refers to the lightest background.
- The greatest value “10” refers to the darkest background.

To select, push in/“click” the navigation knob ⁴¹ until “Display Contrast” is highlighted. Rotate the knob to change the value. Push in/“click” to enter the new value.

4.3 Instrument Setup

The HVA instrument settings should be established prior to first utilization and can be modified at any time thereafter. "Instrument Settings" is found in the "Reports & Setup" menu.



Setting	Options	Example
Set Date and Time	Select "Set Date and Time" from "Instrument Settings" menu to arrive at appropriate screen. "Clock Format" selected here appears in reports and on the Main Menu display hereafter: <ul style="list-style-type: none"> • 24 h • am/pm 	
Reporting	"Reporting" type selected here is generated when report mode is active in testing hereafter. <ul style="list-style-type: none"> • Extended • Basic 	
Startup	"Startup" default screen selected here appears as 1 st screen when HVA is turned ON hereafter. <ul style="list-style-type: none"> • Main Menu • Manual Mode 	
Distance Unit	"Distance Unit" selected here sets the unit for entering cable length when creating test parameters and reporting information hereafter. <ul style="list-style-type: none"> • Feet • Meter 	

Setting	Options	Example
Language	“Language” selected here appears as display hereafter. <ul style="list-style-type: none"> English 	<p>Instrument Settings Set Date and Time Reporting: Basic Startup: Main Menu Distance Unit: Meter Language: English USB Flash: yes System Info MAIN</p>
USB Flash	“USB Flash” defines the status of communication port ³² . <ul style="list-style-type: none"> Flash: Yes (for USB flash adapter) Flash: No (for RS232) 	<p>Instrument Settings Set Date and Time Reporting: Basic Startup: Main Menu Distance Unit: Meter Language: English USB Flash: yes System Info MAIN</p>
System Info	“System Info” displays HVA characteristics. This information cannot be modified by the operator: <ul style="list-style-type: none"> Version: Installed HVA Hardware SN: HVA unit serial number Last Cal: Date of last calibration Ctrl.: Temperature 	<p>System Info Version 1.24.1 SN: 0123456789012 Last Cal. 12/02/2004 Ctrl. 80°F – PU 82°F MAIN</p>

4.4 Operation modes

The following describes the scope of each HVA operation modes: **test modes**, **output modes**, **arc management modes** and **data transfer modes**.

Test modes

The HVA can be operated in “manual” or “automatic” mode. For detailed procedure, see 5.2 – Manual Test Mode, and 5.3 – Automatic Test Mode.

Test Mode	Characteristics
Manual	Designed to facilitate rapid testing. Test parameters of the last manual test appear as the default setting. <ul style="list-style-type: none"> • Test parameters can be changed immediately before activating a test. • Basic reporting most appropriate setting. (Extended reporting will generate a report with most fields left blank)
Automatic	Designed for testing with predefined configuration in order to satisfy specific requirements (e.g. IEEE, IEC standards). <ul style="list-style-type: none"> • Test sequence must be configured and saved at any time before testing. • Extended reporting most appropriate setting.

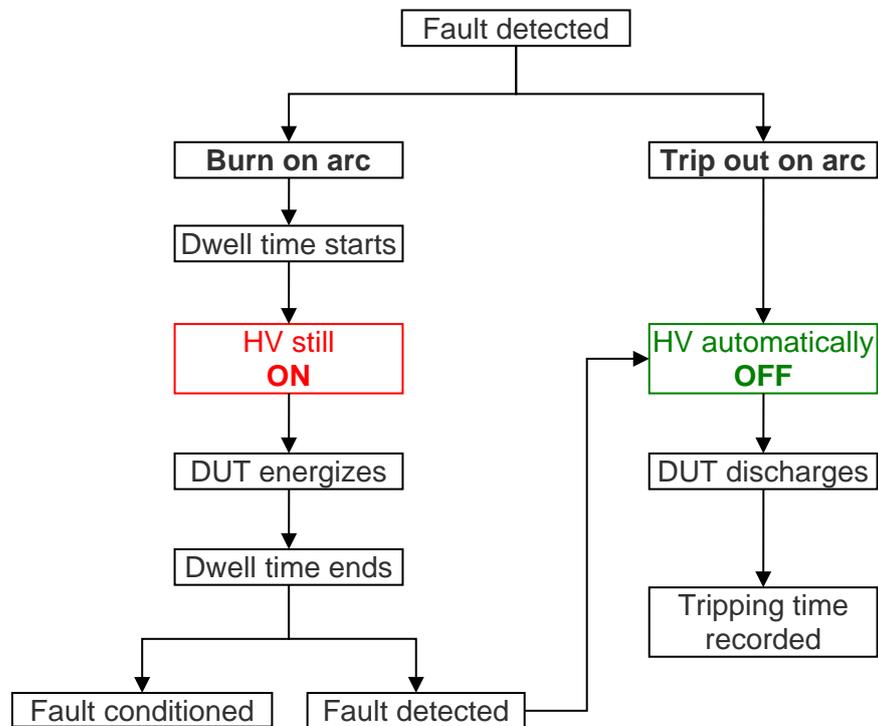
Output modes

The HVA can carry out HV test in the following output modes:

Output mode	Characteristics
DC [-/+]	<p>Single polarity output. DUT is polarized (negative/positive) with respect to ground</p> <ul style="list-style-type: none"> • Not recommended for testing extruded cables (e.g. XLPE cables) • Measured valued: dielectric loss of the DUT (including leakage current across terminations) • DC: Most commonly used DC output mode
VLF Withstand Test (VLF) sine-/square wave	<ul style="list-style-type: none"> • Suitable for testing extruded cables (e.g. XLPE cables) and other DUTs • Measured values shown as RMS
Vacuum bottle testing	<ul style="list-style-type: none"> • Not suitable for testing with DC above DUT voltage rating (X-ray Hazard) • Possible in manual and automatic test modes • Trip current and rise rate are user defined • Measured valued: peak voltage
Sheath test	<ul style="list-style-type: none"> • Suitable for sheath test • Duration is user defined • Max. test voltage: 10 kV
Sheath fault location mode	<ul style="list-style-type: none"> • Suitable for sheath fault location • Duration is user defined • Pulse user defined (1:3 / 4 s, 1:5 / 4 s, 1:5 / 6 s, 1:9 / 6 s)

Arc management modes

If a fault is detected during a HV test, the arc management mode determines how the failure is managed. The “burn on arc” mode will condition the fault whereas the “trip out on arc” mode will immediately switch HV off.



Data transfer modes

The HVA built-in memory can save up to 50 reports and 40 test sequences. Data storage location and transfer capability depends on the configuration of the communication port ⁽³²⁾.

Configuration	Characteristics
RS232 (standard)	<ul style="list-style-type: none"> During testing, RS232 cables are not connected to communication port ⁽³²⁾ Test sequences are directly saved to HVA memory New reports are directly saved to HVA memory All test sequences and reports saved in HVA memory can be transferred to the linked PC once the HVA Control Center CD has been installed
USB flash adapter (optional)	<ul style="list-style-type: none"> During testing, USB adapter and stick are connected to communication port ⁽³²⁾ When connected, left hand corner of main menu displays “USB” Test sequences are directly saved to HVA memory New reports are directly saved to USB stick inserted in adapter Reports saved on the USB stick can be retrieved and viewed on the HVA display: <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 5px; width: 30%;"> <p style="text-align: center; border-bottom: 1px solid black;">Main Menu</p> <p>USB - Main Menu - HVA 120</p> <p>Use Last Test Seq.?</p> <p>3.0kV Maint. C. HYBR (T)</p> <p>Start a New Test</p> <p>Manual Mode</p> <p>Reports & Setup</p> <p>13.3.2009 10:23</p> </div> <div style="border: 1px solid black; padding: 5px; width: 30%;"> <p style="text-align: center; border-bottom: 1px solid black;">Reports & Setup</p> <p>View Reports (2)</p> <p>Store Rep. to USB</p> <p>Edit Auto Test Seq.</p> <p>Instrument Settings</p> <p>Display Contrast 4</p> <p>Service</p> <p>MAIN</p> </div> <div style="border: 1px solid black; padding: 5px; width: 30%;"> <p style="text-align: center; border-bottom: 1px solid black;">USB</p> <p>View Report 2/2.</p> <p>ALPHA</p> <p>ALPHA 2</p> <p>MAIN SELECT DEL CLR-ALL</p> </div> </div> <ul style="list-style-type: none"> All reports saved in HVA memory can be transferred to the linked USB stick: <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 5px; width: 30%;"> <p style="text-align: center; border-bottom: 1px solid black;">Main Menu</p> <p>USB - Main Menu - HVA 120</p> <p>Use Last Test Seq.?</p> <p>3.0kV Maint. C. HYBR (T)</p> <p>Start a New Test</p> <p>Manual Mode</p> <p>Reports & Setup</p> <p>13.3.2009 10:23</p> </div> <div style="border: 1px solid black; padding: 5px; width: 30%;"> <p style="text-align: center; border-bottom: 1px solid black;">Reports & Setup</p> <p>View Reports (2)</p> <p>Store Rep. to USB</p> <p>Edit Auto Test Seq.</p> <p>Instrument Settings</p> <p>Display Contrast 4</p> <p>Service</p> <p>MAIN</p> </div> <div style="border: 1px solid black; padding: 5px; width: 30%;"> <p style="text-align: center; border-bottom: 1px solid black;">USB</p> <p>USB Memory Stick attached</p> <p>No Reports to Store</p> <p style="text-align: center;">OK</p> </div> </div>

5 Test Procedure



DANGER

Electric shock hazard!

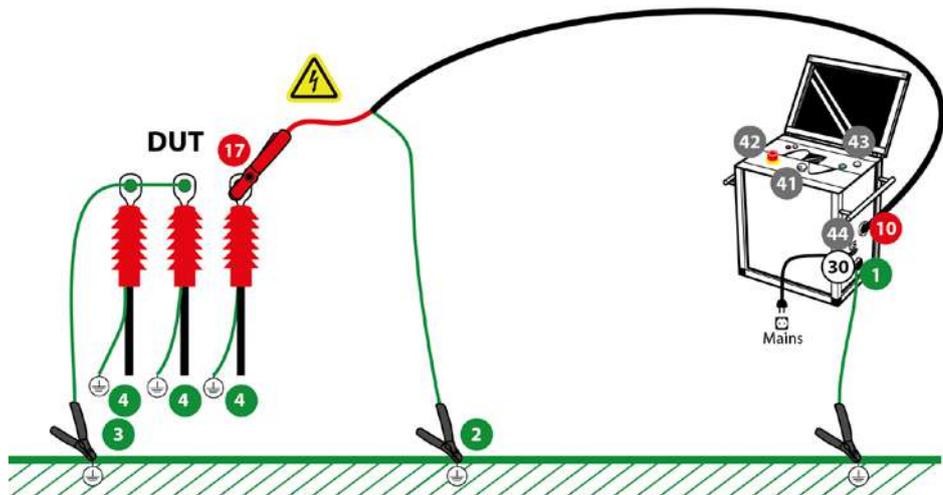
All procedures must comply with local safety regulations.

- Before operating the HVA, equipment setup procedure must be completed!
 - Cables must be connected in the proper sequence!
 - Before turning on the power supply and before activating the HVA, verify that all system elements are properly grounded!
- See 5.1 – Equipment Setup: Steps **S1-S7**

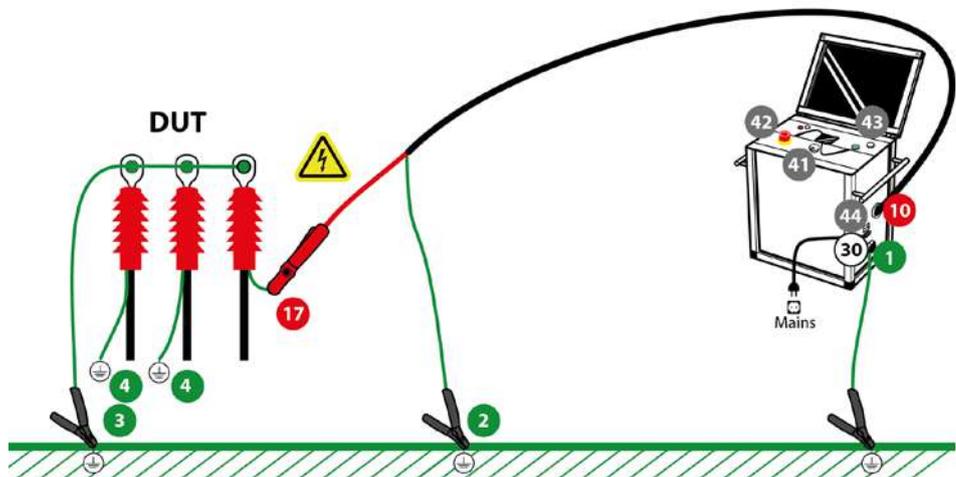
5.1 Equipment Setup

Steps **S1-S9** describe the **equipment setup** procedure. When carrying out multiple tests, the earth and power supply connections must always remain intact. The HV test lead must be reconnected before each subsequent test (i.e. repeat procedure as of step S3).

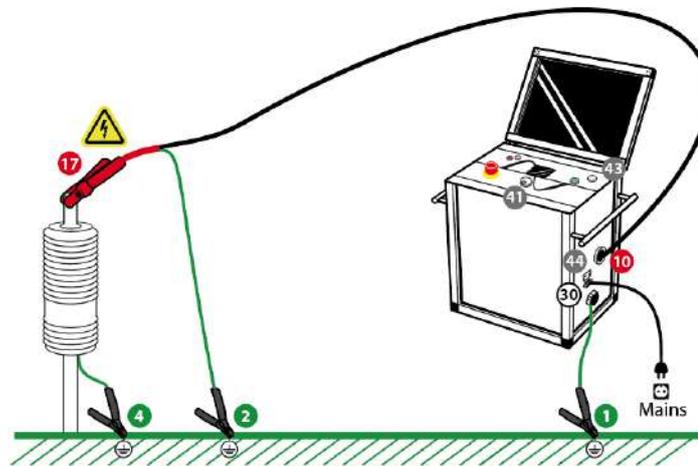
Connection diagram: VLF withstand test



Connection diagram: sheath test and fault location



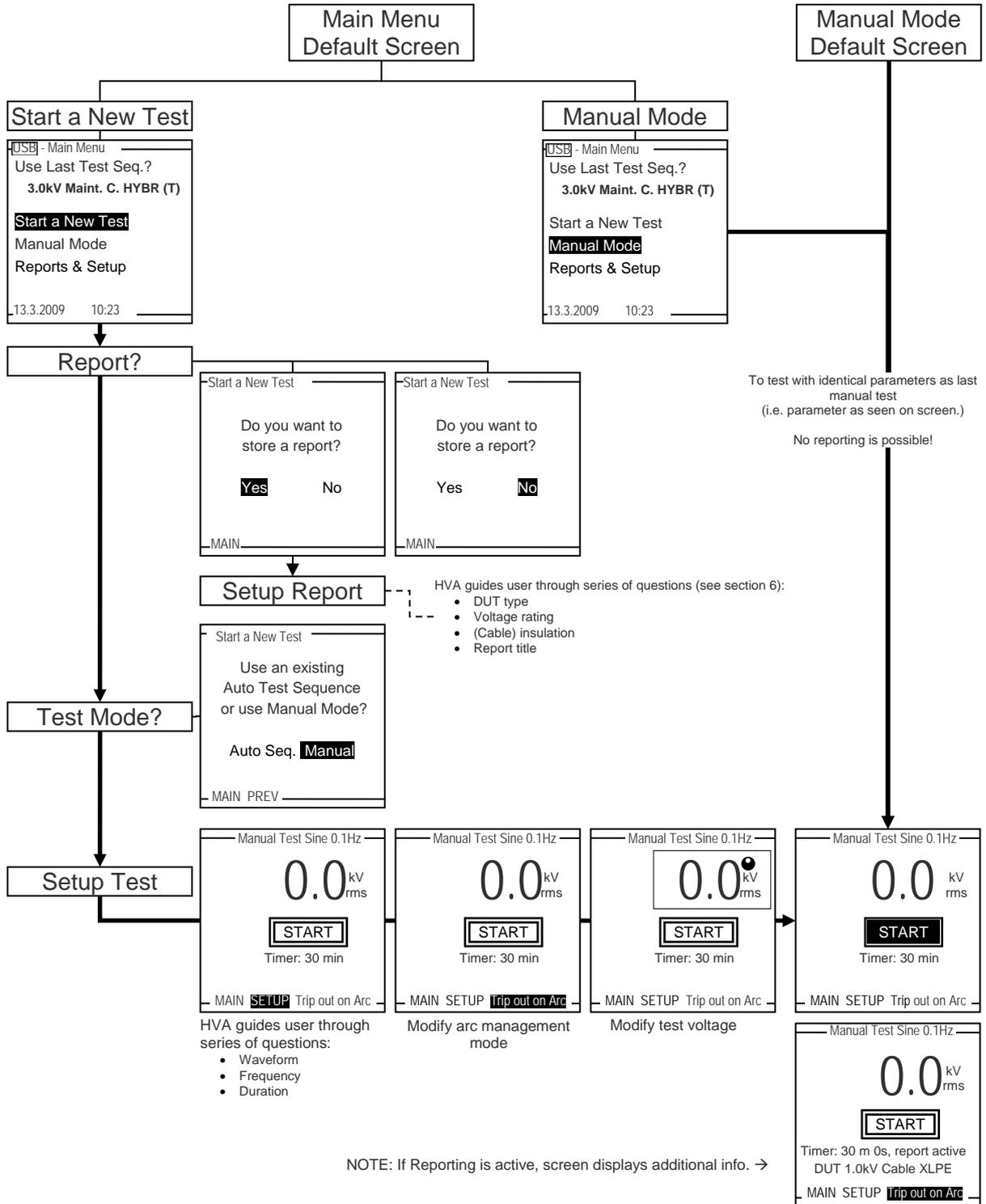
Connection diagram: vacuum bottle test



Step	Procedure (withstand test)
S1	Connect all earthing cables <ul style="list-style-type: none"> • Connect earthing cable to the HVA earthing connector 1 • Connect earthing cable to the DUT ground 3 4
S2	Connect power supply cable <ul style="list-style-type: none"> • Connect the power supply cable to the HVA power supply plug 30
S3	Connect HV test lead <ul style="list-style-type: none"> • Screw the HV test lead into the HVA HV output connector 10 • Connect the HV cable shield to earth 2 (if clamp is available) • Connect other end of HV test lead (clamp including screen protector) to the DUT 17
S4	Verify connections <ul style="list-style-type: none"> • Check that all cables are attached securely.
S5	Configure interlock plug <ul style="list-style-type: none"> • Verify that the HV interlock adapter is connected 47 If operating with remote controls (optional): <ul style="list-style-type: none"> • Connect external lamps or remote switches • Refer to 3.4 – Shipment Content for connection diagram and material requirements
S6	Configure communication port 32 For USB data transfer mode: <ul style="list-style-type: none"> • Connect the USB flash adapter • Insert USB stick Otherwise: Verify that RS232 cable is not connected to the HVA!
S7	Turn “ON” HVA main switch 44
S8	Turn key switch 43 to the “ON” position
S9	The HVA system automatically boots. <ul style="list-style-type: none"> • Start-up default screen appears “Main Menu” or “Manual Mode” screen See 4.3 – Instrument Setup Select appropriate option from default screen and proceed to appropriate section for further instructions: <ul style="list-style-type: none"> • See 5.2 – Manual Test Mode or See 5.3 – Automatic Test Mode

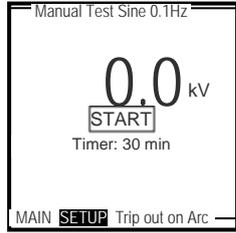
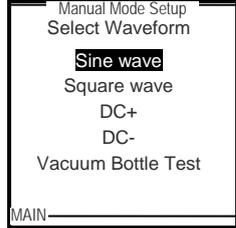
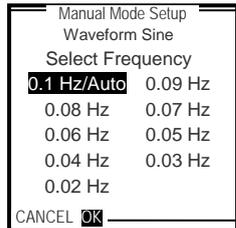
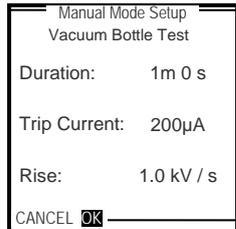
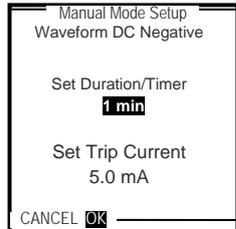
5.2 Manual Test Mode

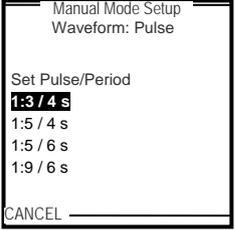
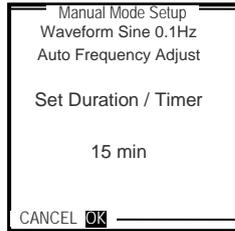
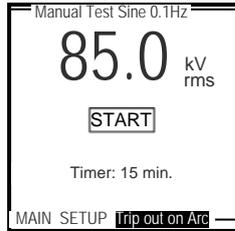
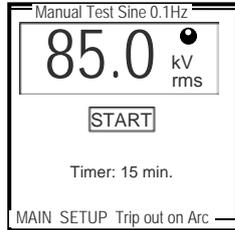
This HVA test mode facilitates rapid testing. If the default is the “Manual Mode Screen,” a test with the same settings as the previous test can be started directly after activating the system. Similarly, if the “Main Menu” is set as the 1st screen, select “Manual Mode.” Otherwise, select “Start a New Test” to change test parameters or to activate reporting.



Setting manual test parameters

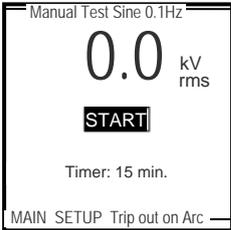
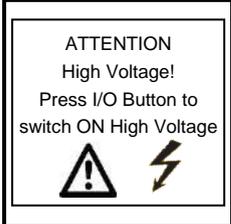
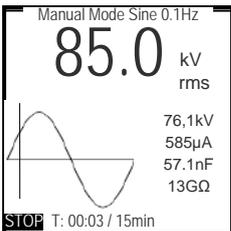
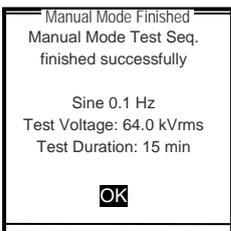
Steps **MS1-MS6** describe how to **set manual-mode test parameters**.

Step	Procedure (set manual test parameters)	Example
MS1: SETUP	To set the waveform, frequency or test duration, select "SETUP" on bottom of "Manual Test" screen	
MS2: SETUP: Waveform	Select one of the following output modes: <ul style="list-style-type: none"> • Sine wave • Square wave • DC+ • DC- • Vacuum bottle test • Sheath test • Sheath fault location 	
MS3: Sine wave; square wave: SETUP: Frequency	Set the frequency to as close to 0.1Hz as possible. <ul style="list-style-type: none"> • 0.1 Hz/Auto: Recommended setting that automatically maintains the frequency as close to 0.1Hz as possible To correct entry, select "CANCEL" at bottom of display.	
MS4: Vacuum bottle test: SETUP: Trip current rise rate	Set the test "Duration": <ul style="list-style-type: none"> • Min. = 5 seconds; Max. = 15 minutes Set the test "Trip Current": <ul style="list-style-type: none"> • Min. = 200 μA, Max. = 1000 μA Set the test "Rise" rate: <ul style="list-style-type: none"> • Min. = 0.5 kV/s, Max. = 5.0 kV/s 	
MS5 Sheath test	Set the test "Duration/Timer": <ul style="list-style-type: none"> • Min. = 1 minute; Max. = 15 minutes Set the test "Trip Current": <ul style="list-style-type: none"> • Min. = 0.1 mA, Max. = 5.0 mA 	

Step	Procedure (set manual test parameters)	Example
MS6: Sheath fault location	Select one of the following pulse/periods: <ul style="list-style-type: none"> • 1:3 / 4 s • 1:5 / 4 s • 1:5 / 6 s • 1:9 / 6 s For example: 1 second on and 3 seconds off, every 4 seconds.	
MS7: SETUP: Duration (not applicable vacuum bottle test)	To modify the duration, rotate navigation knob  . To accept value, push in knob. <ul style="list-style-type: none"> • Min. test duration = 1 minute • Max. test duration = 24 hours To return to “Manual Mode” screen, select “OK”	
MS8: Arc management mode	Rotate navigation knob  until the field on bottom of the screen is highlighted. To change the mode, push in the knob. One of the following modes will be displayed: <ul style="list-style-type: none"> • Trip out on arc • Burn on arc 	
MS9: Preset test voltage: (optional-voltage can be set once test has been initiated!)	Entering the test voltage before activating the manual-mode test “START” is optional . In manual mode, voltage can be set once test has been initiated! To set the test voltage before activating the manual-mode test “START”: Rotate navigation knob  until voltage field is framed. The dot in upper right hand corner indicates that the test voltage is in pre-set mode. To modify the value, rotate navigation knob  . <ul style="list-style-type: none"> • Voltage limits see 3.1. <i>Technical Specifications</i> To accept the value, push in knob  . The dot in upper right hand corner disappears indicating that the test voltage is set.	

Running a Manual Test

Steps **MR1-MR6** describe how to **run a test in the manual mode**.

Step	Procedure (run manual test)	Example
<p>MR1: START</p>	<p>Start the test when test parameters displayed on the “Manual Test” screen are correct.</p> <p>Rotate navigation knob  until the “START” field is highlighted.</p> <ul style="list-style-type: none"> To run the test, push in knob . 	
<p>MR2: HV activation</p>	<p>Once the activation screen appears,</p> <ul style="list-style-type: none"> Press the HV switch  within 10 seconds. <p>If the HV switch is not activated within the 10-second window, the “Manual Mode” screen will reappear.</p>	
<p>MR3: Test startup</p>	<p>“Startup” appears on the screen to indicate that the HVA is initializing the test.</p>	
<p>MR4: Set test voltage (if not preset in step MS6)</p>	<p>Rotate navigation knob  to modify the voltage value.</p> <ul style="list-style-type: none"> Voltage limits see 3.1 – <i>Technical Specifications</i> 	
<p>MR5: Test</p>	<p>Test begins automatically</p> <p>The bottom of the screen indicates the lapsed time</p> <ul style="list-style-type: none"> T: lapsed time/total test duration 	
<p>MR6: Test end</p>	<p>Display indicates end of manual test</p>	

5.3 Automatic Test Mode

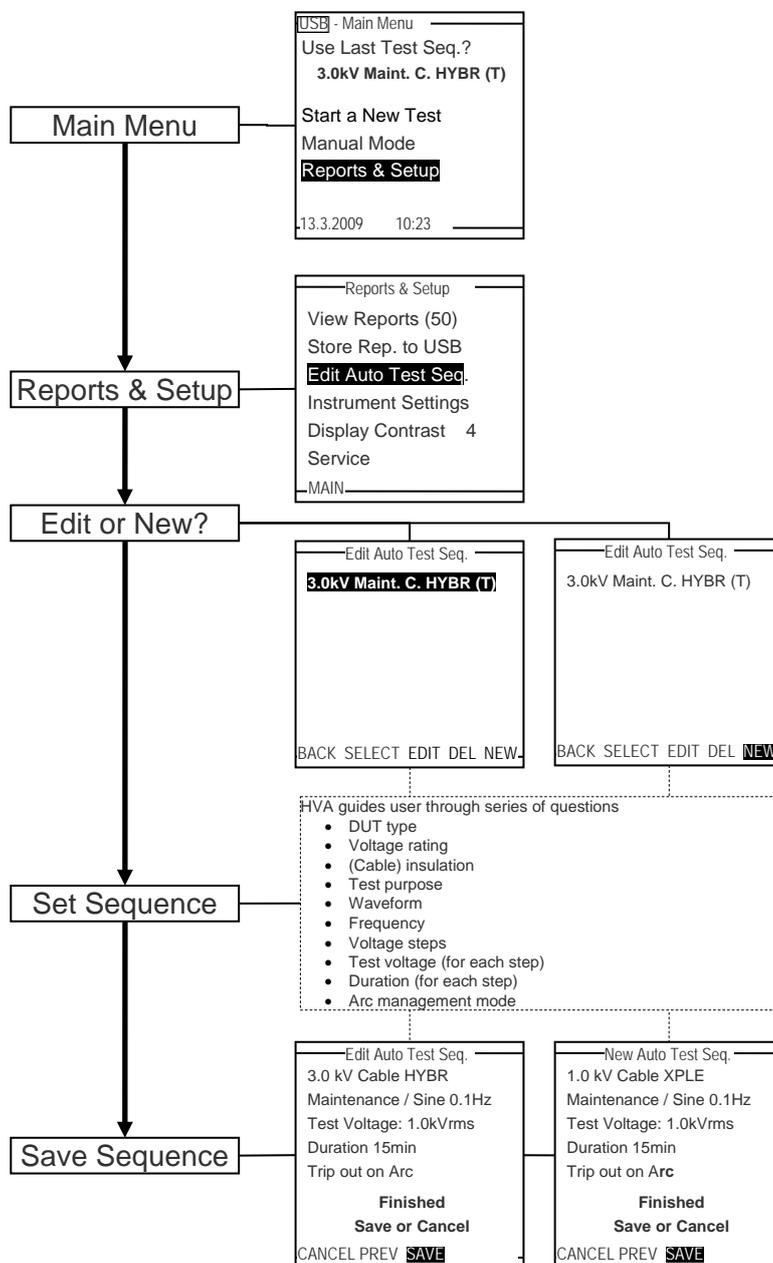
This HVA test mode facilitates testing in order to satisfy specific requirements (e.g. IEEE, IEC standards). The test sequence can be configured, modified and saved at any time before testing.



NOTICE

No automatic test sequence programmable for sheath test and sheath fault location.
Already programmed in manual mode!

Configuring Auto Test. Sequence Overview



Configuring auto test sequence – detailed steps

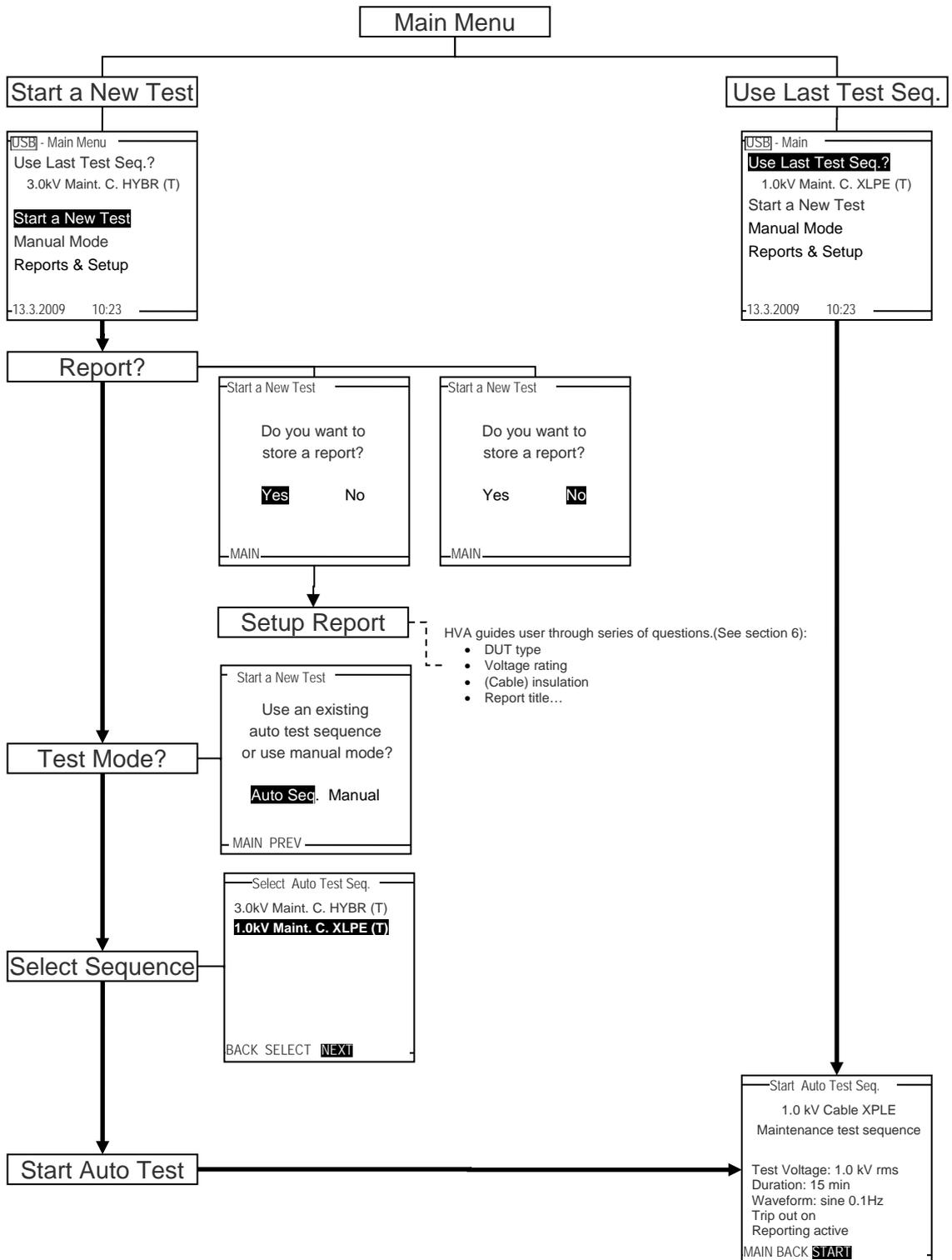
Steps **AS1-AS15** describe how to **configure a test sequence**.

Step	Procedure (configure automatic sequence)	Example
AS1: EDIT or NEW?	<p>The “Edit Auto Test Seq.” Menu displays the sequences already stored in memory.</p> <ul style="list-style-type: none"> To modify an existing program, highlight the corresponding program from the list and select the “EDIT” option on the bottom of the screen To create a new program, select the “NEW” option on the bottom of the screen 	
AS2: DUT	<p>Select one of the following DUT types:</p> <ul style="list-style-type: none"> Cable Motor Generator Transformer Switchgear Other Vacuum bottle 	
AS3: Voltage rating	<p>Specify the voltage rating of the DUT.</p> <p>This is a characteristic of the DUT and does NOT refer to the test voltage!</p> <p>To increase/decrease the voltage rating, rotate navigation knob 41</p> <p>To accept value, push in knob.</p>	
AS4: (Cables only) Insulation	<p>Select one of the following cable insulation types:</p> <ul style="list-style-type: none"> XLPE PILC EPR PE PVC HYBRID (combination of types) OTH. (other) 	
AS5: Test purpose	<p>Select aim of test from one the following:</p> <ul style="list-style-type: none"> Acceptance Maintenance Diagnostic 	
AS6: Waveform	<p>Select one of the following output modes:</p> <ul style="list-style-type: none"> Sine wave Square wave DC+ DC- Vacuum bottle test 	

Step	Procedure (configure automatic sequence)	Example
AS7: Frequency (sine wave or square wave only)	Set the frequency to as close to 0.1 Hz as possible. <ul style="list-style-type: none"> 0.1 Hz/Auto: Recommended setting that automatically maintains the frequency as close to 0.1 Hz as possible Permitted values: 0.02-0.1 Hz in 0.01 Hz increments 	
AS8: Voltage steps	Specify the number of voltage steps to be applied to the DUT. <ul style="list-style-type: none"> Min. voltage levels: 1 step Max. voltage levels: 4 steps 	
AS9: Test voltage	Specify test voltage for each step: <ul style="list-style-type: none"> Voltage limits see 3.1 – Technical Specifications For multiple voltage steps: HVA automatically advances to next step. Values are displayed in a table.	
AS10: Duration	Specify test duration for each step: <ul style="list-style-type: none"> Min. test duration/step = 1 minute Max. test duration/step = 120 minutes For multiple voltage steps: HVA automatically advances to next step. Values are displayed in a table.	
AS11: Arc management mode	Select one of the following arc management modes: <ul style="list-style-type: none"> Trip out on arc Burn on arc 	
AS12 (Vacuum bottle only) Trip current	Set the test "Trip Current": <ul style="list-style-type: none"> Min. = 200 μA, Max. = 1000 μA 	

Step	Procedure (configure automatic sequence)	Example
<p>AS13 (vacuum bottle only)</p> <p>Rise rate</p>	<p>Set the test “Rise” rate:</p> <ul style="list-style-type: none"> • Min. = 0.5 kV/s • Max. = 5.0 kV/s 	<p>New Auto Test Seq. 60.0kV Vacuum Bottle Maintenance Test Voltage 1.0kV Duration: 1min 0sec Rise Rate? 0.5kV/s CANCEL PREV NEXT</p>
<p>AS14: Save sequence</p>	<p>Test sequence setup is complete.</p> <ul style="list-style-type: none"> • To save the program, select “SAVE”. <p>The program will be stored under a name referring to its test parameters. (To modify name, see AS15.)</p> <p>The sequence is found in the “Edit Auto Test Seq.” menu display. See Step AS1.</p>	<p>New Auto Test Seq. 1.0 kV Cable XPLE Maintenance/Sine0.1Hz Test Voltage: 1.0kVrms Duration: 15 min Trip out on Arc Finished Save or Cancel CANCEL PREV SAVE</p>
<p>AS15: (optional) Edit sequence title</p>	<p>To modify the sequence title from program already saved in HVA memory, highlight the corresponding sequence from the “Edit Auto Test Seq.” menu display.</p> <ul style="list-style-type: none"> • select the “EDIT” option on the bottom of the screen • select the “TITLE” option on the bottom of the screen <p>For naming directions, see 6 – Reporting Procedure – Report Naming Instructions</p>	<p>Edit Auto Test Seq. 3.0kV Maint. C. HYBR (T) BACK SELECT EDIT DEL NEW</p> <p>Edit Parameters. 1.0 kV Cable XPLE Maintenance Test Seq. 1 Step / Test Setup Test Voltage: 1.0kVrms Duration: 15 min Wave: Sine 0.1/Auto Trip out on Arc CANCEL SAVE TITLE</p> <p>Auto Test Seq. Title Edit Title 1.0kV Cable CANCEL SAVE</p>

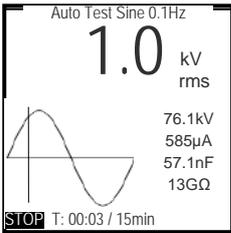
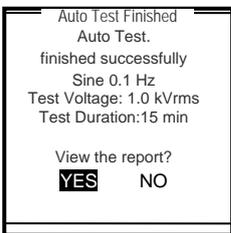
Running an automatic test – overview



Running an automatic test – detailed steps

Steps **AR1-AR9** describe how to **run a test in the automatic mode.**

Step	Procedure (run automatic test)	Example
<p>AR1: Use Last Seq. or Start New Test</p>	<p>To repeat the previous test sequence:</p> <ul style="list-style-type: none"> • Select “Use Last Test Sequence” from “Main Menu” • Proceed to step AR5 <p>Otherwise, select:</p> <ul style="list-style-type: none"> • “Start a new Test” 	
<p>AR2: De-/activate Reporting</p>	<p>To activate reporting:</p> <ul style="list-style-type: none"> • Select “YES”, See 6 – Reporting <p>To conduct a test without generating a report:</p> <ul style="list-style-type: none"> • Select “NO” 	
<p>AR3: (If Reporting active: this step follows report setup completion)</p>	<p>To run an test sequence:</p> <ul style="list-style-type: none"> • Select “Auto Seq” 	
<p>AR4: Select sequence</p>	<ul style="list-style-type: none"> • Select the appropriate test sequence • To continue, select “NEXT” 	
<p>AR5: Parameter verification</p>	<ul style="list-style-type: none"> • Verify that the selected sequence defines the correct test parameters <p>To run the auto test sequence:</p> <ul style="list-style-type: none"> • Select “START” from the bottom of the screen 	
<p>AR6: HV activation</p>	<p>Once the activation screen appears,</p> <ul style="list-style-type: none"> • Press the HV switch within 10 seconds. <p>If the HV switch is not activated within the 10-second window, the “Start Auto Test Seq.” screen will reappear.</p>	

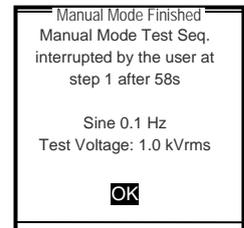
Step	Procedure (run automatic test)	Example
AR7: Test startup	"Startup" appears on the screen to indicate that the HVA is initializing test	
AR8: Test	Test begins automatically The bottom of the screen indicates the lapsed time <ul style="list-style-type: none"> T: lapsed time/total test duration 	
AR9: Test end	Display indicates end of auto test If Reporting is active, the user can immediately view the report.	

5.4 Interrupting a Test

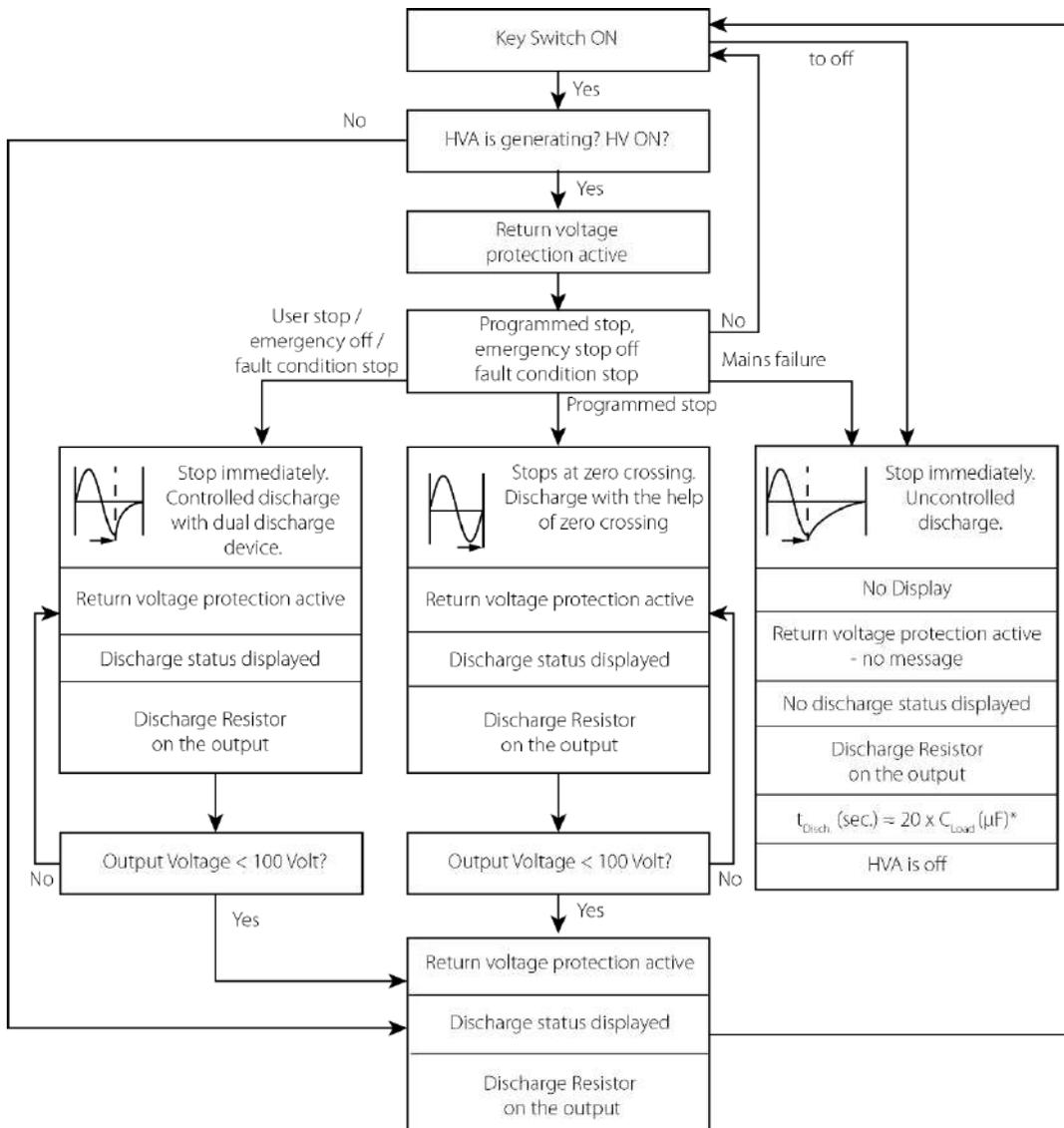
Once a test has started, it can be interrupted at any time. It is recommended to select the appropriate method corresponding to the situation.

Situation	Procedure	Example
Routine STOP (No emergency)	<p>When a test is in progress, "STOP" on the display screen is highlighted.</p> <p>To interrupt the test, push in/click the navigation knob ⁴¹.</p> <ul style="list-style-type: none"> • HVA software deactivates HV • Test stops 	
Alternative	<p>When a test is in progress, press the HV switch ⁴⁰ to deactivate high voltage.</p> <ul style="list-style-type: none"> • HVA hardware deactivates HV • Test stops 	
Emergency stop	<p>In an emergency situation, press the emergency OFF ⁴² to shut down the system.</p> <ul style="list-style-type: none"> • HVA hardware deactivates HV • Test stops 	

After test interruption, a message is displayed indicating that the test has been terminated by the user:



5.5 Discharge Status



* Discharge time approximation: $t_{\text{Discharge}} (\text{sec.}) \approx 20 \frac{\text{s}}{\mu\text{F}} \times C_L (\mu\text{F})$

Example: Load Capacitance $C_L = 1.2 \mu\text{F}$. $t_{\text{Discharge}} \approx 20 \times 1.2 = 24 \text{ sec.}$

This is an approximation only and does not replace the safety rules.

6 Reporting Procedure

Report type

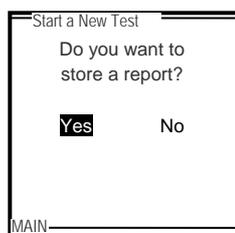
The HVA can generate two report types: A “Basic” report with limited information or a more complete “Extended” report. The type of report generated corresponds to the entry selected in “Instrument Settings”. Before testing, verify that the desired type is set!

See 4.3: Instrument Setup

Report information	Basic	Extended
DUT type	✓	✓
Voltage rating	✓	✓
(Cable) insulation type	✓	✓
Report title	✓	✓
Phase name		✓
Company name		✓
Region name		✓
Station name		✓
Line length		✓
Size of DUT		✓
Manufacturer		✓
Work order		✓
Operator name		✓

Report activation

Reporting is possible in both the test modes. To generate a report in the manual mode, the procedure must begin with “Start a New Test” from the main menu. See 5.2 – Manual Test Mode

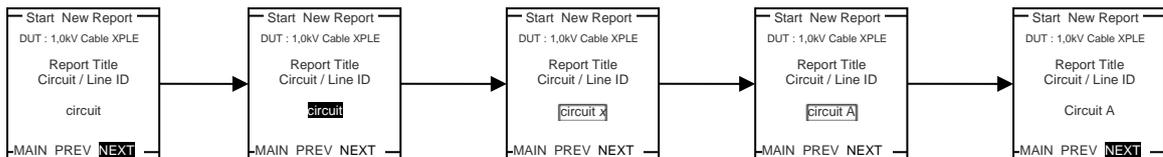


Report naming instructions

To enter the report information, some steps (i.e. steps R4-R13) require the operator to enter a user-selected name. If no name is entered, the corresponding category appears blank in the report.

Possible entries include:

- A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
- . , ; : " # - + /
- 0 1 2 3 4 5 6 7 8 9

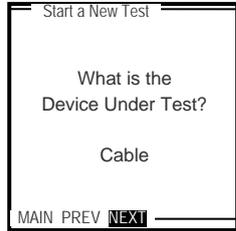
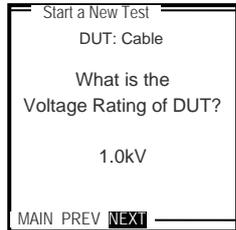
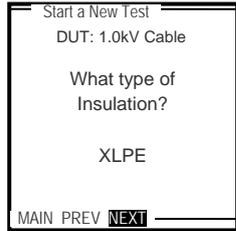
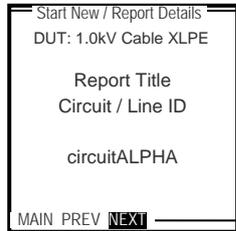
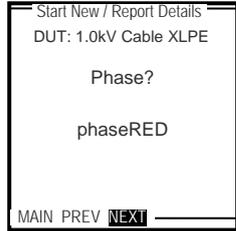
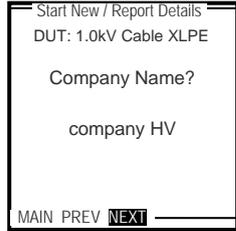


- To activate naming: Rotate navigation knob , then push in/click.
- To select characters: Rotate knob  clockwise
- To DELETE: Rotate knob  counter clockwise until < symbol appears
- To SPACE: Rotate knob  counter clockwise until _ symbol appears
- To confirm: double click knob 

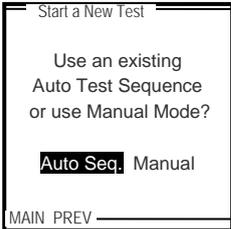
Entering report information

The HVA guides the user through a series of questions dependent on the report type already set in “Instrument Settings.” These steps are independent of the test mode, since the user has not yet selected “Manual” or “Automatic.” Note that, although some of the following steps (i.e. R1-R3) require entry of identical information as in “Configuring Auto Test. Sequence” (i.e. steps AS2, AS3 and AS4), these steps are not identical!

Steps R1-R13 list the **report information** that the HVA asks the user to enter when the “Extended” reporting mode is active.

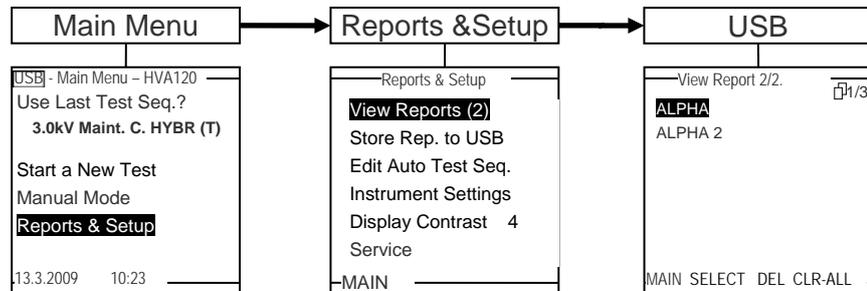
Step	Procedure (Reporting)	Example
R1: DUT	<p>Specify the type of DUT. Select one of the following options:</p> <ul style="list-style-type: none"> • Cable • Motor • Generator • Transformer • Switchgear • Other • Vacuum bottle 	
R2: Voltage rating	<p>Specify the voltage rating of the DUT.</p> <p>This is a characteristic of the DUT and does NOT refer to the test voltage!</p> <p>Rotate navigation knob  to increase or decrease voltage rating value.</p>	
R3: Insulation (only applicable for cables)	<p>Specify one of the following cable insulation types:</p> <ul style="list-style-type: none"> • XLPE • PILC • EPR • PE • PVC • HYBRID (combination of types) • OTH. (other) 	
R4: Report title	<p>Set report name</p> <ul style="list-style-type: none"> • User defined entry, typically the cable number or ID for cable testing 	
R5: Phase (Extended only)	<p>Specify circuit phase</p> <ul style="list-style-type: none"> • User can define up to 3 phases if required 	
R6: Company (Extended only)	<p>Specify company name</p>	

Step	Procedure (Reporting)	Example
R7: Region (Extended only)	Specify region name	<p>Start New / Report Details DUT: 1.0kV Cable XLPE Region Name? region CHEROKEE MAIN PREV NEXT</p>
R8: Station (Extended only)	Specify station name	<p>Start New / Report Details DUT: 1.0kV Cable XLPE Station Name? station BETA1 MAIN PREV NEXT</p>
R9: Line length (Extended only)	Specify line length <ul style="list-style-type: none"> Units correspond to “Distance Unit” set in “Instrument Settings” (see 4.3 – Instrument Setup) 	<p>Start New / Report Details DUT: 1.0kV Cable XLPE Line Length? linelen 200 meter MAIN PREV NEXT</p>
R10: DUT size (Extended only)	Specify DUT size Typical entries include: <ul style="list-style-type: none"> Conductor size for cable test Horsepower or kW for motor test 	<p>Start New / Report Details DUT: 1.0kV Cable XLPE Size of DUT? size 4/0 MAIN PREV NEXT</p>
R11: Manufacturer (Extended only)	Specify manufacturer name	<p>Start New / Report Details DUT: 1.0kV Cable XLPE Manufacturer Name? manufacturer ABC MAIN PREV NEXT</p>
R12: Work order (Extended only)	Specify work order name	<p>Start New / Report Details DUT: 1.0kV Cable XLPE Work Order? W.Order: WOO9A MAIN PREV NEXT</p>
R13: Operator (Extended only)	Specify operator name	<p>Start New / Report Details DUT: 1.0kV Cable XLPE Operator Name? operator J.SMITH MAIN PREV NEXT</p>

Step	Procedure (Reporting)	Example
End of reporting procedure	<ul style="list-style-type: none"> To continue in manual test mode: See 5.2 Steps MS1-MS5 – set test parameters Steps MR1-MR6 – run test 	 <p>Start a New Test</p> <p>Use an existing Auto Test Sequence or use Manual Mode?</p> <p>Auto Seq. Manual</p> <p>MAIN PREV</p>
Select test mode	<ul style="list-style-type: none"> To continue in automatic test mode: See 5.3 Steps AS1-AS15 – configure sequence Steps AR1-AR9 – run test 	

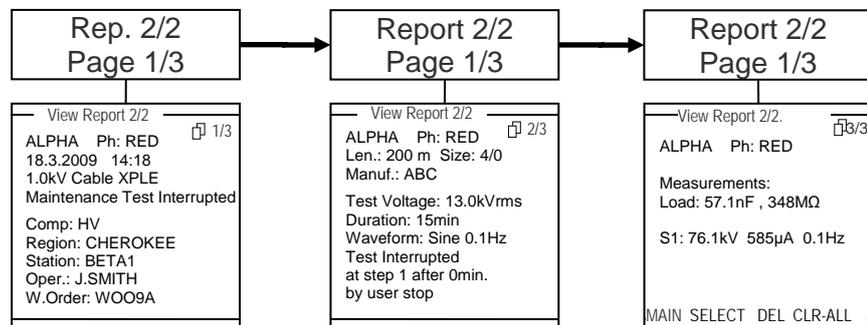
Viewing report

Reports can be viewed directly on the HVA display screen. In “Reports & Setup,” the number of reports saved appears in parentheses following “View Reports.” Reports are listed according to date, with the first entry corresponding to the latest report saved.



When a report is selected, the screen header indicates:
“Reference # of report in view/total number of reports saved”.

The upper right-hand corner displays:
“Page # in view/total number of report pages.”



7 Disconnection Procedure



DANGER

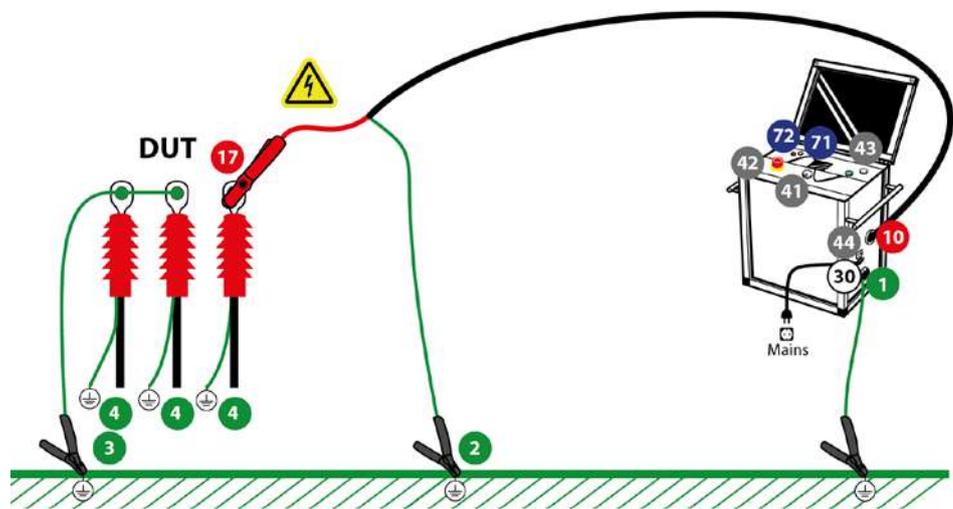
Electric shock hazard

Never assume that equipment is safe to handle without using the required safety equipment and earthing procedures.

Disconnection procedures must comply with local safety regulations.

- Before disconnecting test lead, DUT must be discharged and earthed.
- Earth connections must be removed last!

Disconnection diagram



Normal conditions

Steps **D1-D8** describe the **normal disconnection** procedure.

Step	Procedure (normal disconnection)
D1	Press Emergency OFF 42 Stop test according 5.4. and press emergency OFF to lock against re-energizing
D2	Verify HV status <ul style="list-style-type: none"> • Wait until LED red 71 light deactivates (indicates residual voltage < 100 V)
D3	Discharge and earth the DUT complying with local safety regulations
D4	Turn OFF HVA <ul style="list-style-type: none"> • Turn the HVA main switch 44 off
D5	Lock HVA in disabled state to prevent unauthorized use: <ul style="list-style-type: none"> • Turn key switch 43 to OFF position and remove key

Step	Procedure (normal disconnection)
D6	Disconnect the test lead <ul style="list-style-type: none">• Disconnect the test lead from the DUT ¹⁷• Unscrew the test lead from the HV output connector ¹⁰
D7	Disconnect power supply cable from power supply plug ³⁰
D8	Disconnect earth <ul style="list-style-type: none">• Disconnect the earthing cable from the HVA earthing connector ¹• Disconnect the earthing cable from the DUT



Discharge Stick

System Failure

In case of errors or failure due to a loss of power during testing, additional precaution is required. The HVA LED red  light cannot indicate when residual voltage is less than 100 V. To guarantee that the residual voltage has dissipated before removing the test lead, the DUT must be de-energized using a discharge stick.

Steps **D1*-D7*** describe the **disconnection** procedure in case of **system failure**.

Step	Procedure (system failure disconnection)
D1*	Switch HVA OFF Press emergency OFF  <ul style="list-style-type: none"> • Turn the HVA main switch  off • Lock HVA in disabled state to prevent unauthorized use: Turn key switch  to OFF position and remove key
D2*	<ul style="list-style-type: none"> • Verify correct functioning of discharge stick
D3*	Discharge and earth the DUT complying with local safety regulations <ul style="list-style-type: none"> • Discharge DUT using a discharge stick
D4*	Before disconnecting test lead, wait until residual voltage has dissipated <ul style="list-style-type: none"> • Required wait time depends on the resistance of the discharge stick • Rule of thumb: For standard discharge sticks, wait a minimum of 10 min.
D5*	Disconnect the test lead <ul style="list-style-type: none"> • Disconnect the test lead from the DUT • Unscrew the test lead from the HV output connector 
D6*	Disconnect power supply cable from power supply plug 
D7*	Disconnect earth <ul style="list-style-type: none"> • Disconnect the earthing cable from the HVA earthing connector  • Disconnect the earthing cable from the DUT

8 Instrument Care

Cleaning



DANGER

Electric shock hazard!

Only clean the instrument when turned off!

After use, clean the HV cable connection points.



Storage



CAUTION

Instrument damage

Do not store the HVA outdoors!

Keep the HVA away from liquids!

HVA should be stored indoors in the following environmental conditions:

- Temperature: -25°C to 70°C (-13°F to 158°F)
- Humidity: 5-85% non-condensing

Maintenance and Repairs



NOTICE

Authorized personnel only!

Repairs and maintenance should only be performed by authorized b2 personnel.



One yearly inspection by authorized b2 personnel is recommended.

9 Accessories

Accessories are not included in the scope of standard delivery of the HVA. These items are available for order through b2. For orders, please contact b2.

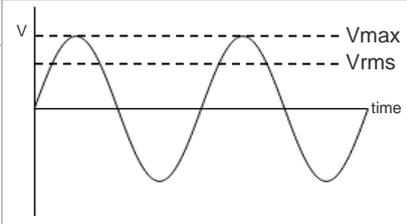
Art. No.	Item	Description
SH5021	TD30 Tan-Delta Set 24 kV _{rms}	
SH5023	TD60-MC Tan-Delta Set 44 kV _{rms}	
SH5025	TD90-MC Tan-Delta Set 64 kV _{rms}	
SH5026	TD120-MC Tan-Delta Set 85 kV _{rms}	
SH5027	PD30-E Partial Discharge Diagnostics System 30 kV	
SH5030	PD60-2 Partial Discharge Diagnostics System 60 kV	
SH5031	PDTD60-2 Partial Discharge Diagnostics System 60 kV	
SH5032	PD90-2 Partial Discharge Diagnostics System 90 kV	

Art. No.	Item	Description
SH5033	PDTD90-2 Partial Discharge Diagnostics System 90 kV	
SH5035	PD120-2 Partial Discharge Diagnostics System 120 kV	
SH5034	PDTD120-2 Partial Discharge Diagnostics System 120 kV	
VKR0002	HVA30 Transport Case	
VKR0009	HVA68-2/HVA40-5 Transport Case with Wheels	
VKR0012	HVA90/HVA94 Transport Case on Wheels	
VKR0037	HVA54-5 Transport Case	
VKR0038	HVA120 Transport Case	
GH0604	Discharge Stick 60 kV 1440 r 9 kJ	
GH0628	Discharge Stick 30 kV 6000 r 4 kJ 750 mm	
KES0105	Angle Bracket Connector 14 mm	
GH0610	HVA34 Calibration	
GH0611	HVA60 Calibration	
GH0648	HVA30-7 Calibration	

Art. No.	Item	Description
GH0616	HVA90 Calibration	
GH0627	HVA120 Calibration	
GH0749	HVA54-3 Calibration	
GH0750	HVA40-5 Calibration	
GH0751	HVA68-2 Calibration	
GH0753	HVA94 Calibration	

10 Glossary and Abbreviations

The following explains abbreviations and selected terms used in this document in alphabetical order.

Term	Explanation
Arc	Self-maintained gas conduction for which most of the charge carriers are electrons supplied by primary-electron emission (source: IEC)
Auto Adjust Frequency "0.1 Hz/Auto"	Mode that maximizes output frequency to highest allowable value <ul style="list-style-type: none"> • Greatest allowable frequency depends on the test load and test voltage applied • For loads greater than 1µF, the instrument automatically reduces the frequency
DUT	Device under test
Duty (continuous)	Load state in which the relay remains energized for a period long enough to reach thermal equilibrium
Fault	An unplanned occurrence or defect in an item which may result in one or more failures of the item itself or of other associated equipment (source: IEC)
Frequency [Hz]	Number of cycles per unit of time: $f = 1/\text{period (time)}$, units = Hz 1 Hz = 1 cycle/1 second 0.1 Hz = 1 cycle/10 seconds, etc.
Hipot	High potential (voltage)
HV	High Voltage (tension) <ul style="list-style-type: none"> • Extremely high voltage: typically 220 kV or 380 kV • High voltage: typically 110 kV
IEC	International Electrotechnical Commission
Peak value	Maximum voltage = V_{\max}
RMS value	Root mean square voltage <ul style="list-style-type: none"> • $V_{\text{rms}} = V_{\max} / \sqrt{2}$
	
To short	Forcing the electric potential differences between two or more conductive parts to be equal to or close to zero (Infinite current flows in a short circuit)
To trip	Opening the circuit (no current flows in open circuit)
VLF	Very low frequency <ul style="list-style-type: none"> • Typically between 0.01-0.1 Hz

11 Declaration of Conformity

HVA34



Konformitätserklärung EC-DECLARATION OF CONFORMITY

Die Firma: **b2 electronic GmbH**
The Company: **Riedstraße 1
6833 Klaus
AUSTRIA**

erklärt, dass das Produkt: **HVA34**
declares that the product:

Verwendungszweck: **Universal VLF & DC High Voltage Test System**
Intended purpose:

Das bezeichnete Produkt stimmt mit den Vorschriften folgender europäischer Richtlinien überein:
The indicated product is in correspondence with the following regulations of European Council:
Subsequently the instrument complies with the requirements of the EMC directive 89/336/EEC and 92/31/EEC.

	Nummer/ Kurztitel Number / Titel	Eingehaltene Vorschriften Observed regulations
<input type="checkbox"/>	Shock	IEC68-2-27 15g/11ms half Sinus
<input type="checkbox"/>	Vibration	IEC68-2-6 10...150Hz:2g
<input checked="" type="checkbox"/>	EMC	IEC6100-4-2 ESD Level 4 (8/15kV) IEC6100-4-4 Burst 4kV 5kHz EN55011
<input type="checkbox"/>	Safety	EN60950 EN50191 EN61010-1

Aussteller **Leiter Qualitätssicherung**
Issuer Director Qualitymanagement

Ort, Datum **Klaus, 2011-01-05**
Place, Date



Rudolf Blank

Diese Erklärungen bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusage von Eigenschaften. Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
This declaration certifies the compliance with the indicated regulations, it doesn't guarantee attributes. Pay attention to the security advices of the relevant product information.

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HVA30-5


Konformitätserklärung

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 Intended purpose:

Das bezeichnete Produkt stimmt mit den Vorschriften folgender europäischer Richtlinien überein:
 The indicated product is in correspondence with the following regulations of European Council:

	Nummer/ Kurztitel Number / Titel	Eingehaltene Vorschriften Observed regulations
✓	EMC	IEC6100-4-2 ESD Level 4 (8/15kV) IEC6100-4-4 Burst 4kV 5kHz EN55011
✓	Safety	EN60950 EN50191 EN61010-1

Aussteller **Leiter Qualitätssicherung**
 Issuer Director Qualitymanagement

Ort, Datum **Klaus, 2006-05-29**
 Place, Date



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HVA30-7, HVA40-5, HVA54-3



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Verwendungszweck: **Universal VLF & DC High Voltage Test System**
Intended purpose:

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The indicated product is in correspondence with the following regulations of European Council:

	Nummer/ Kurztitel Number / Titel	Eingehaltene Vorschriften Observed regulations
✓	EMC	IEC6100-4-2 ESD Level 4 (8/15kV) IEC6100-4-4 Burst 4kV 5kHz EN55011
✓	Safety	EN60950 EN50191 EN61010-1

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HVA54-5


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Verwendungszweck: **Universal VLF & DC High Voltage Test System**
 Intended purpose:

Das bezeichnete Produkt stimmt mit den Vorschriften folgender europäischer Richtlinien überein:
 The indicated product is in correspondence with the following regulations of European Council:

	Nummer/ Kurztitel Number / Titel	Eingehaltene Vorschriften Observed regulations
✓	EMC	IEC6100-4-2 ESD Level 4 (8/15kV) IEC6100-4-4 Burst 4kV 5kHz EN55011
✓	Safety	EN60950 EN50191 EN61010-1

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 Issuer Director Qualitymanagement

Ort, Datum **Klaus, 2012-11-20**
 Place, Date



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HVA60



Konformitätserklärung
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AUSTRIA

erklärt, dass das Produkt: **HVA60**
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Verwendungszweck: **Universal VLF & DC High Voltage Test System**
Intended purpose:

Das bezeichnete Produkt stimmt mit den Vorschriften folgender europäischer Richtlinien überein:
The indicated product is in correspondence with the following regulations of European Council:

	Nummer/ Kurztitel Number / Titel	Eingehaltene Vorschriften Observed regulations
✓	EMC	IEC6100-4-2 ESD Level 4 (8/15kV) IEC6100-4-4 Burst 4kV 5kHz EN55011
✓	Safety	EN60950 EN50191 EN61010-1

Aussteller **Leiter Qualitätssicherung**
Issuer Director Qualitymanagement

Ort, Datum **Klaus, 2005-07-05**
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HVA68-2



Konformitätserklärung

EC-DECLARATION OF CONFORMITY

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6833 Klaus
AUSTRIA

erklärt, dass das Produkt: **HVA68-2**
 declares that the product:

Verwendungszweck: **Universal VLF & DC High Voltage Test System**
 Intended purpose:

Das bezeichnete Produkt stimmt mit den Vorschriften folgender europäischer Richtlinien überein:
 The indicated product is in correspondence with the following regulations of European Council:

	Nummer/ Kurztitel Number / Titel	Eingehaltene Vorschriften Observed regulations
✓	EMC	IEC6100-4-2 ESD Level 4 (8/15kV) IEC6100-4-4 Burst 4kV 5kHz EN55011
✓	Safety	EN60950 EN50191 EN61010-1

Aussteller **Leiter Qualitätssicherung**
 Issuer Director Qualitymanagement

Ort, Datum **Klaus, 2015-12-11**
 Place, Date

Rudolf Blank

Diese Erklärungen bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften. Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
 This declaration certifies the compliance with the indicated regulations, it doesn't guarantee attributes. Pay attention to the security advices of the relevant product information.

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HVA90, HVA94



Konformitätserklärung
EC-DECLARATION OF CONFORMITY

Die Firma: **b2 electronic GmbH**
The Company: **Riedstraße 1**
6833 Klaus
AUSTRIA

erklärt, dass das Produkt: **HVA90 / HVA94**
declares that the product:

Verwendungszweck: **Universal VLF & DC High Voltage Test System**
Intended purpose:

Das bezeichnete Produkt stimmt mit den Vorschriften folgender europäischer Richtlinien überein:
The indicated product is in correspondence with the following regulations of European Council:

	Nummer/ Kurztitel Number / Titel	Eingehaltene Vorschriften Observed regulations
✓	EMC	IEC6100-4-2 ESD Level 4 (8/15kV) IEC6100-4-4 Burst 4kV 5kHz EN55011
✓	Safety	EN60950 EN50191 EN61010-1

Aussteller **Leiter Qualitätssicherung**
Issuer Director Qualitymanagement

Ort, Datum **Klaus, 2010-01-16**
Place, Date



Rudolf Blank

Diese Erklärungen bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften. Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
This declaration certifies the compliance with the indicated regulations, it doesn't guarantee attributes. Pay attention to the security advices of the relevant product information.

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HVA120


Konformitätserklärung

EC-DECLARATION OF CONFORMITY

Die Firma: **b2 electronic GmbH**
 The Company: **Riedstraße 1**
6833 Klaus
AUSTRIA

erklärt, dass das Produkt: **HVA120**
 declares that the product:

Verwendungszweck: **Universal VLF & DC High Voltage Test System**
 Intended purpose:

Das bezeichnete Produkt stimmt mit den Vorschriften folgender europäischer Richtlinien überein:
 The indicated product is in correspondence with the following regulations of European Council:

	Nummer/ Kurztitel Number / Titel	Eingehaltene Vorschriften Observed regulations
✓	EMC	IEC6100-4-2 ESD Level 4 (8/15kV) IEC6100-4-4 Burst 4kV 5kHz EN55011
✓	Safety	EN60950 EN50191 EN61010-1

Aussteller **Leiter Qualitätssicherung**
 Issuer Director Qualitymanagement

Ort, Datum **Klaus, 2013-01-20**
 Place, Date

Rudolf Blank

Diese Erklärungen bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften. Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
 This declaration certifies the compliance with the indicated regulations, it doesn't guarantee attributes. Pay attention to the security advices of the relevant product information.

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