AXOS

Expandable test systems

User Manual

4700924 | Version 2.2

HAEFELY

Current and voltage – our passion

Revision History

Version	Date	Author	Remarks
2.2	09.02.2022	SG	New layout, safety chapter adapted. Axos[5] and Axos[8] shared document
2.1	13.12.2021	SG	New logos

WARNING: Before taking the equipment into operation, be sure to read and understand fully the operating manual and instructions.

HAEFELY has a policy of continuing improvement on all their products. The design of this equipment will be subject to review and modification over its life. There may be small discrepancies between the manual and the operation of the equipment, particularly where software has been upgraded in the field.

Although all efforts are made to ensure that there are no errors in the manuals, HAEFELY accepts no responsibility for damage or loss that may result from errors within this manual. We retain the right to modify the functionality, specification or operation of the equipment without prior notice.

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Contents

1 Introduction

1.1 General

Welcome to the unique design and concept of modularity designed by HAEFELY.

HAEFELY is recognizing an increasing interest in testing departments to configure the required functions in compact immunity test systems more flexible than ever. For that reason HAEFELY designed a unique concept of modularity which eviscerates large additional investments for customers in the future.

Moreover, constantly reduced product development times call for powerful, easy-to-operate and ready-to-use conducted immunity test systems which can be expanded in a multitude of different test applications. Customer requirements, particularly in the telecommunications and industrial electronics sector, emphasize a test system‘s accuracy and modularity, thus clearly pointing to easy to expand T&M equipment that is favourably priced and suitable for most of industries.

The AXOS series has been tailored to exactly meet these requirements, offering special cost advantages for T&M applications in the development, production and servicing of telecommunications, components as well as safety and industrial electronics.

All AXOS test systems come equipped with all the hardware needed for instant upgrades by only entering optional key codes into the licence code manager of the unit. After entering the key code(s) the additional test functionalities like Surge Combination Wave, Ring Wave, Telecom Wave, EFT/Burst or Voltage Dips and Interrupts become available immediately. No direct intervention has to be done by the user at all.

1.1.1 Basic Device Information

The AXOS compact immunity test system integrates all of the best pieces of our stand alone test systems into one single economic solution.

The AXOS^{5} and AXOS^{8} combines 5 kV Burst/EFT, Surge combination wave, AC/DC Dips & Interrupts, along with an integrated single-phase coupling / decoupling network into one compact system. This allows for quick and completely automated testing to the most common IEC standards.

The AXOS^{8} add Surge combination wave 7kV, Ring Wave 7 kV, Telecom Wave (10/700) 7kV, AC/DC Dips & Interrupts, as well as Magnetic field.

AXOS can either be operated via front panel by the 7” touch screen graphical user interface (GUI) or remotely from the PC. The unit also has a built in test library, according to the IEC Standards, which makes testing easy, reliable and repeatable

All the test parameters can be varied in a broad range. Together with the ability of changing test parameters during test, AXOS8 is not only the ideal product for compliance and pre-compliance testing, it is useful for monitoring & debugging function during design phase.

A wide range of cost-efficient and user friendly coupling / decoupling networks for power lines as well as for symmetrical and asymmetrical data- and signal-lines are available as options.

The Figure 1-1: Axos[5] and Axos[8] Start display shows the starting menu of the AXOS. Test is selected through the touch screen by pressing the corresponding icon (Surge, EFT/Burst, Voltage Dips, Magnetic field, Ring Wave and Telecom Wave).

If the expandable version of AXOS is acquired, Only the Burst test is available. Other icons are disable (light grey) and can only be enable via key code upgrade.

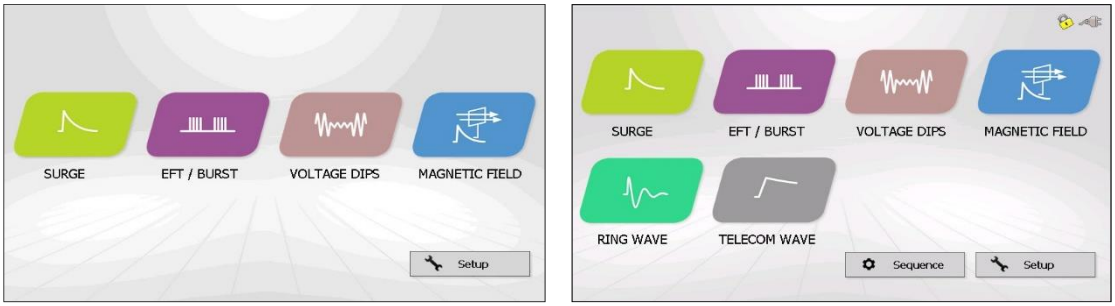


Figure 1-1: Axos[5] and Axos[8] Start display

After selecting one of the functions as shown in the Figure 2-1, there are generally two operating modes of the menu available. Only in pre-compliance is it possible to change parameters even though the equipment is under test. In addition, by pressing a function parameter a basic description gets open and describes the characteristic of it. The values can be directly specified as for each criteria necessary. The same is possible in standard operating mode.

Additionally Ipeak and Upeak to the EUT get displayed on the screen.

It is possible to come back from every application to the start menu as shown in Figure 2-1, when pressing the “home” button. Any test procedure stops immediately.

The LED on every output & coupling paths is lit when specific line output paths have been selected.

1.2 Scope of supply Axos[5]

Test device, one of following models

Qty	Description
1	AXOS[5] Compact Immunity
1	AXOS[5] Surge
1	AXOS[5] EFT/Burst
1	AXOS[5] Voltage Dips

The following items are supplied:

Qty	Description
1	Mains Cable
1	User Manual
1	Calibration certificate

1.3 Scope of Supply Axos[8]

Test device, one of following models

Qty	Description
1	AXOS[8] Compact Immunity
1	AXOS[8] Surge
1	AXOS[8] EFT/Burst
1	AXOS[8] Voltage Dips
1	AXOS[8] Ring Wave
1	AXOS[8] Telecom Wave

The following items are supplied:

Qty	Description
1	Telecom Wave Modul “TS 8” 10/70µs *only with AXOS8 Telecom Wave Test System
1	Automatic dips single phase transf. “DIP 116” ** only with AXOS 8 Dip& Interrupt test
1	Mains Cable
1	User Manual
1	Calibration certificate

On receipt of the unit check that all items have been delivered. In the event of missing or damaged parts please contact your local sales representative stating the serial number, the type of the equipment and the sales order number.

1.4 Accessories and Options Axos[5] & Axos[8]

Optional for both Axos[5] and Axos[8] (for details see product data sheet on www.haefely.com)

Code	Description	Part Number
FP-EFT 32M	3-Phase CDN EFT/Burst 32 A / 690 V	2490170
FP-EFT 100M2	3-Phase CDN EFT/Burst 100 A / 690 V	2495860
FP-COMB 32	3-Phase CDN for Surge, Ring Wave, EFT/Burst 32A / 480 V	2490430
IP4B	Capacitive Coupling Clamp for EFT/Burst	2491300
FP-SURGE 32A	Automatic 3-Phase CDN Surge 32 A / 690 V	2490700
FP-SURGE 100M2	3-Phase CDN Surge 100A / 690 V	2490180
PCD 121	Symmetrical Data & Control Line Coupler	2498010
PCD 126A	Asymmetrical Data & Control Line Coupler	2498030
DEC 5	Symmetrical Data & Control Line Decoupler	2490141
DEC 6	Symmetrical Data & Control Line Decoupler	2490151
DEC 7	Asymmetrical Data & Control Line Decoupler	2490161
DIP 116	Automatic Dips Transformer 16 A 40/70/80%	2490410
MSURGE-A	Magnetic Field Test IEC / EN 61000-4-9	2490441
VTM 15000	Isolation Test 1.2/50 us up to 10 kV	2499960
VTM 15000/05	Isolation Test 1.2/50 us up to 10 kV / 0.5J	2499692
PDP 8000 HV	Differential Probe 1000:1 for Surge	2499911
CP 101	Current Probe Model for Surge	2499931
ES	External Emergency Stop Switch P12	4700751
WL	External Warning Lamp P12	4700750

Remote control software for both Axos[5] and Axos[8]

Code	Description	Part Number
Remote Control	Remote Control Software for AXOS	2490440
Report Software	Reporting Software for AXOS	4700975

Optional independent for Axos[5] and Axos[8].

Code	Description	Axos[5]	Axos[8]
TW 8	Telecom Wave Modul 10/700µs	-	4700915
Calibration	Accredited Calibration AXOS according to ISO/IEC 17025	2490420	2490900

Software Add ons for Axos[5] and Axos[8].

Code	Description	Axos[5]	Axos[8]
Surge Key Code	Key Code for Surge extension AXOS	4700814	4700911
EFT/Burst Key Code	Key Code for EFT/Burst extension AXOS	4700815	4700912
Ring Wave Key code	Key Code for Ring Wave extension AXOS	-	4700913
Dips Key Code	Key Code for Voltage Dips extension AXOS	4700816	4700914

On receipt of the unit check that all items have been delivered. In the event of missing or damaged parts please contact your local sales representative stating the serial number, the type of the equipment and the sales order number.

2 Glossary of Terms and Abbreviations

In the manual, the following conventions are used:

Indicates a hint or a matter of note - if it refers to a sequence of operations, failure to follow the instructions may result in measurement errors.

Indicates hazards. There is a risk of equipment damage or personal injury or death. Carefully read and follow the instructions. Be sure to follow any safety instructions given in addition to those for the site at which tests are being performed.

Wherever possible the corresponding standard (IEC, ANSI) definitions are used. The following abbreviations and definitions are used in this manual:

Abbreviation	Meaning
AC	Alternate current
DC	Direct current
HV	High voltage
Qty	Quantity
RMS	Root mean square
EUT	Equipment Under Test
CDN	Coupling Decoupling Network
LED	Light Emitting Diode
IEC	International Electro-technical Committee
EN	European Norm
ANSI	American National Standards Institute
DEC	Decoupling network
PCD	Coupling / Decoupling module (Electrical circuit for transferring energy between networks with the minimum loss and that attenuates the Surge signal so that it does not cause undue interference to equipment other than the EUT)
STBY	Standby

3 Safety

3.1 General

Safety is the responsibility of the user. Always operate the equipment in accordance with the instructions, always paying full attention to local safety practices and procedures.

This equipment must be operated only by trained and competent personnel who are aware of the dangers and hazards involved in high-voltage-testing and other HV-apparatus. HAEFELY accepts no liability for loss, damage, injury or death caused by the incorrect or unsafe operation of this equipment.

General Safety is the most important aspect when working on or around high voltage electrical equipment. Personnel whose working responsibilities involve testing and maintenance of the various types of high voltage equipment must have understood the safety rules in the manual and the associated safety practices specified by their company, national and regional regulations. Company, national or regional regulations must be fulfilled beyond HAEFELY recommendations.

This system produces hazardous voltages that can causes in shocks, burns or death. It is the responsibility of the personnel to ensure that the system is operated in a safe manner.

HAEFELY and its sales partners refuse to accept any responsibility for consequential or direct damage to persons and/ or goods due to none observance of instructions contained herein or due to incorrect use of the equipment.

3.1.1 Five basic safety regulations

At any entering or working with high voltage systems always consider the five basic safety regulations:

1) Disconnect mains!

2) Prevent reconnection!

3) Test for absence of harmful voltages!

4) Ground and short circuit!

5) Cover or close off nearby live parts!

After high voltage tests have been performed the first thing during entering high voltage parts are should be grounded. A manual ground rod has to be used. In some configurations a recurring voltage on capacitor can appear also after earthing. In these cases a second ground rod can help to reduce that risk.

3.1.2 Ground Connections

The ground connections between the different components of the system have to be made without forming loops (copper-foil or copper-braid) and in best case in star connection. The ground connection should be low inductive and able to carry the continuous short-circuit current.

3.1.3 Test Area

Never operate the system in an explosive environment or where flammable gases or fumes are exciting.

A good test area can enter a separate grounding. This ensures that no disturbances from surrounding machines enter the test field. It is necessary for the test field to have a lower grounding resistance than the surrounding building.

The test area has to be equipped with an adequate security circuit. Also an appropriate shielding and protection against the high voltage parts and terminals has to be installed.

In the test area minimum one manual ground rod has to be installed. It should be placed nearby the entrance of the test area.

3.1.4 Mains Connection

Connection of the system to a supply voltage outside the specified operating range will result in damage to the system along with the risk of injury and fire.

3.1.5 Cleaning and Maintenance

For cleaning and maintenance work it has to be ensured that all parts are disconnected from any mains supply. Always use grounding rods when entering the test area. Use the emergency stop.

Never open a cover or a case before having disconnected the power supply. Always pay full attention to the safety rules (especial on hazardous voltages).

Unauthorized opening of the equipment may damage the system or the EMC protection. It may also cause the equipment to be no longer compliant with the relevant standards and susceptibility requirements. If the equipment has been opened, the calibration can be rendered invalid.

HAEFELY and its sales partners accept no liability for loss, damage, injury or death caused by the incorrect or unsafe operation of this instrument.

3.1.6 Health Notes

This system produces hazardous voltages that can cause shocks, burns or death.

During operation high electric and magnetic fields can occur. The fields can affect to your health. Different measures can help here to reduce the risk (example: shielding against the fields, increase of the distance to the high voltage system, duration of the test, lower voltage/ current levels).

Some system configurations produce loud or monotonous noises. Different measures can help here to reduce the noise (example: acoustic shielding, ear protection, increase of the distance to the high voltage system, duration of the test, lower voltage/ current levels).

People with heart pacemakers should not be in the vicinity of the system during operation.

3.1.7 Device Particular safety notes

The earth connection of the AXOS must be connected to a good earth.

If trigger is pressed without connection to earth, electrical shock may occur!

Remove all external connection cables before removing any covers.

Do not open any system modules, they contains no user replaceable parts.

Never touch the Equipment Under Test (EUT), when the AXOS is operating. Establish a safety barrier around the test setup (Close the circuit pin 4 and pin 5 in Table 5-3).

If any part of the AXOS is damaged or it is possible that damage has occurred, for example during transportation, do not switch on the unit.

Before changing the mains fuse, remove the mains power cord. Fuses should only be replaced with the same type and value.

When applying Magnetic field, do not touch the coil when test is running. Only direct output HI and COM must be used to connect the coil. The coil loop (from HI till COM) must be closed..

Never connect a supply voltage directly to the HI/COM surge outputs. This will damage the unit!!!. Always use a suitable CDN

3.2 Training and Education

The customer is responsible that the persons, which work with the system, are trained and educated in operation and safety for that. Only trained persons are allowed to work with the system. The training has to be repeated in regular intervals. The training has to be documented.

The safety is the responsible of the operators. When working on high voltage system, at least two persons must always be present, one of them bears responsibility for the system and the performed tests. The second person is the role of the safety observer.

Non-test related persons who are working in proximity to the area where testing is performed must be informed. Consistent visual and verbal signals should be agreed and followed.

Operator:

The person who makes the test, connections and operates the system. He must be able to have a clear view of the device under test and the area where the test is performed.

Safety Observer:

The person who is responsible for observing the performance of the test, seeing any safety hazard and giving warning to people.

4 Technical Data

4.1 Device General Specifications

Name	Value
Control Power	85V - 264V, 50/60 Hz
User Test Storage	Unlimited
Remote Interface	Ethernet RJ45
Display	7" / 800x480 / 24bit with touch-screen
External Trigger Input	5V TTL
Dimensions (W x H x D)	19" / 4U(45 x 18 x 49 cm)
Weight	30kg
USB	for USB memory stick
AUX Interface	D-sub 37p for external CDN, external transformer etc.
Synch Input	BNC, 10V – 264V AC
External Start / Stop Input	5V TTL, starts / stops predefined test sequence
Analog Output	0 – 10V, for use with external
Safety Circuit	stops the test when unlocked

4.2 Test Technical specifications

4.2.1 Surge

IEC / EN 61000-4-5 Edition 3 Surge Combination Wave

Name	Value
Output Voltage	0.2 – 7.0kV ±10%
Voltage Rise Time	1.2us ±30%
Voltage Duration	50us ±20%
Polarity	pos / neg / alternate
Output Impedance	2 Ohms
Phase Sync	0 – 359°with 1°steps or asynchronous mode
Counter preselect	1 – 1000 - Infinite

Counter	100000
Peak Voltage Monitor	BNC output: 1000:1 , Display: 3 Digits
Output Current	0.1 – 3.5kA ±10%
Current Rise Time	8us ±20%
Current Duration	20us ±20%
Integrated Single Phase CDN	264V AC / 16A 220V DC / 10A
Impulse Trigger	automatic 2s – 100 minutes manual external trigger input
Peak Current Monitor	BNC output: 1kA/V Display: 3 Digits

4.2.2 Ring Wave (Axos[8] Only)

IEC / EN 61000-4-12 Edition 3 & ANSI/IEEE C62.41 Ring Wave

Name	Value
Max. Voltage	0.2 – 7.0kV ±10%
Frequency	100 kHz
Rise time OC	5 µs
Rise time SC	1 µs
Impedance	12 Ohm, 30 Ohm
Peak Voltage Monitor	BNC output: 1000:1 Display: 3 Digits
Repetition rate	Up to 30 pulses /min
Polarity	Positive / negative / alternate
Floating output	Max. 460 V/AC
Phase sync accuracy	± 1°
Damping rate	0,4<peak1/peak2<1,1
Peak Current Monitor	BNC output: 1kA/V Display: 3 Digits

4.2.3 Telecom Wave (Axos[8] Only)

IEC / EN 61000-4-5 Edition 3 Telecom Wave /ITU K.20, K.21, K. 44, K. 45 (external TW 8 module)

Name	Value
Output Voltage	0.2 – 7.0kV ±10%

Front time OCV	10 µs ±30%
Decay time OCV	700 µs ±20%
Front time SCC	5 µs ± 20%
Decay time SCC	320 µs ± 20%
Source Impedance / coupling	15 Ohm x 1 40 Ohm x 4 40 Ohm gas arresters x 4
Polarity	Positive / negative / alternate
Weight	10 kG
Dimensions (W x H x D)	19" / 4U (45 x 18 x 49 cm)
Outputs	4mm banana socket

4.2.4 Burst

IEC / EN 61000-4-4 Edition 3 EFT / Burst

Name	Value
Output Voltage	0.2 – 5.0kV ±10% at coaxial output
Polarity	pos / neg / alternate
Output Impedance	50 Ohms
Rise Time	5ns ±30%
Impulse Duration	50ns ±30% at 50 Ohm 50ns –15 +100ns at 1000 Ohm
Burst Mode	normal continuous real random
Spike Frequency	1Hz – 1MHz
Burst Duration	10us – 1s
Burst Period	1ms – 10s
Test Time	1s– 1000 minutes
Trigger	automatic manual external trigger input
Integrated Single Phase Coupling / Decoupling Network	264V AC / 16A 220V DC / 10A

4.2.5 Voltage Dips & Interrupts

IEC / EN 61000-4-11 Edition 2 and IEC / EN 61000-4-29 Dips & Interrupts (external DIP 116 module)

Name	Value
Max. Voltage	264V AC/DC
Max. Current	16A AC/DC continuous 20A for 5s 40A for 3s 500A inrush Current
Trigger	automatic manual external trigger input
Interrupt Dip Level	0% 0% – 99% with external voltage source
RMS Voltage Monitor	BNC Output: 100:1 Display: 4 Digits
Interrupt Time	0.5 period – 800 periods 100us – 1000 minutes
Interval Time	1 period – 800 periods synch 100us – 1000 minutes async
Test Time	1s – 1000 minutes Infinite
Phase Sync	0 – 359° 16 / 40 / 50 / 60 Hz asynchronous Mode
RMS Current Monitor	BNC Output: 10A/V Display: 4 Digits

4.2.6 Integrated single-phase CDN

AXOS provides an integrated single-phase coupling / decoupling network for Burst, Surge tests and Ring Wave.

It is protected against over-current by an integrated protection circuit. Current limit can be selected between 1A to 16A in the PROPERTIES menu.

The integrated CDN may be used with AC or with DC power lines.

The input of the integrated CDN (i.e. EUT Supply Input) must be connected to power lines which are protected by a line safety switch equal or less 16A rated current and characteristic B or C.

4.3 Standards

The AXOS8 fulfils the requirements of IEC 61010-1.Product description

4.4 Standards covered by AXOS

Standards covered by AXOS[5]

Standard	Description	Test equipment
IEC/EN 61000-4-4	EFT/Burst	AXOS[5]
IEC/EN 61000-4-5	Surge	AXOS[5]
IEC/EN 61000-4-9	Magnetic field	AXOS[5] & MSURGE-A (external unit)
IEC/EN 61000-4-11	AC Voltage Dip and Interrupt	AXOS[5] & DIP 116 (external unit)
IEC/EN 61000-4-29	DC Voltage Dip und Interrupt	AXOS[5]

Standards covered by AXOS[8]

Standard	Description	Test equipment
IEC/EN 61000-4-4	EFT/Burst	AXOS[8]
IEC/EN 61000-4-5	Surge Combination Wave, Telecom Wave (10/700)	AXOS[8]
IEC/EN 61000-4-9	Magnetic field	AXOS[8] & MSURGE-A (external unit)
IEC/EN 61000-4-11	AC Voltage Dip and Interrupt	AXOS[8] & DIP 116 (external unit)
IEC/EN 61000-4-29	DC Voltage Dip und Interrupt	AXOS[8]
IEC/EN 61000-4-12	Ring Wave	AXOS[8]
ANSI IEEE C.37.90	EFT/Burst	AXOS[8]
ANSI/IEEE C62.41	Ring Wave	AXOS[8]
ITU K.20, K. 21, K. 44, K.45	Telecom Wave (10/700),	AXOS[8] & TW8 (external unit)

For detailed test description of each particular norm please read IEC/EN standard carefully. This is the overall norm, many product norm consist further tests. Indeed, for many products the requirements will be described more detailed in the product norm. Note: Product norms will be partly fulfilled by the AXOS[8] as well. Please contact for further assistance your sales representative or HAEFELY directly.

5 Assembling and Installation Guide

5.1 System Installation and Installation Area

During transport AXOS8 may be subjected to excessive shocks and vibrations, even though every care is taken by HAEFELY AG to provide suitable packaging. Before operating the unit, check for signs of mechanical damage. Damaged packing cases may by a sign of transport damage. Damage caused in transit must be reported to the shipping agent immediately.

5.1.1 Hardware Installation

All safety measures must be followed, as described in corresponding chapter “Safety”.

5.1.2 Ground connection

The "Earth Stud" on the back panel must always be connected to a solid earth before the "EUT Supply Input" is connected to power source. Cross section of connection must be at least 2.5mm squared

5.1.3 EUT inputs

The "EUT Supply Input" on the back is the connection to the integrated single-phase CDN, which can be used up to 16A / 264V.

There are three banana-plugs (stackable) delivered with the standard accessories set:

- black: line conductor
- blue: neutral conductor
- green/yellow: protection earth conductor

These banana plugs shall be mounted on a suitable connection cable.

The EUT Supply Input must be connected to power lines which are protected by a line safety switch equal or less 16A rated current and characteristic B or C.

Inside the AXOS8, there are filter capacitors connected between L-PE and N-PE, as required by the standard.These capacitors will cause a residual current, which will trip the residual current circuit breaker.

Hence, an isolation transformer needs to be inserted between main power supply and "EUT Supply Input" as shown in Figure 4-1 below.

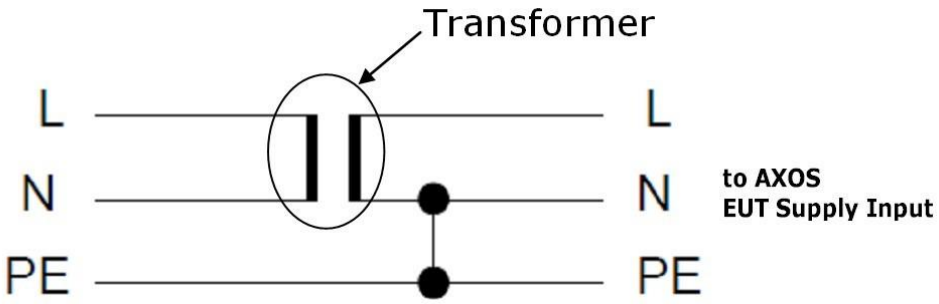


Figure 5-1 Transformer connection

N and PE need to be connected as shown in the Figure Figure 5-1 Transformer connection. This enables that a possible follow current from the mains can be delivered to the EUT.

All further equipment connected after the isolation transformer are not protected any more by the residual current circuit breaker.

5.1.4 Connection to EUT

The L, N and PE banana sockets on the front panel are the outputs of the integrated single-phase CDN. For power line testing, the EUT is connected here.

There are three banana-plugs (non-stackable) delivered with the standard accessories set:

- black: line conductor
- blue: neutral conductor
- green: protection earth conductor

These banana plugs shall be mounted on a suitable connection cable.

5.1.5 V dip Input

The "V dip" input is used to supply voltage having XX% level for Dips testing.

For example, for testing 40% Dips level, 92V supply need to be connected between "V dip" and neutral (at nominal voltage 230V).

In case of interrupt testing i.e. 0% Dips test level, "V dip" must be connected to "N" (neutral) input, using the purple coloured safety banana cable supplied with the standard accessories.

6 Operating Instructions

6.1 Device Front pannel

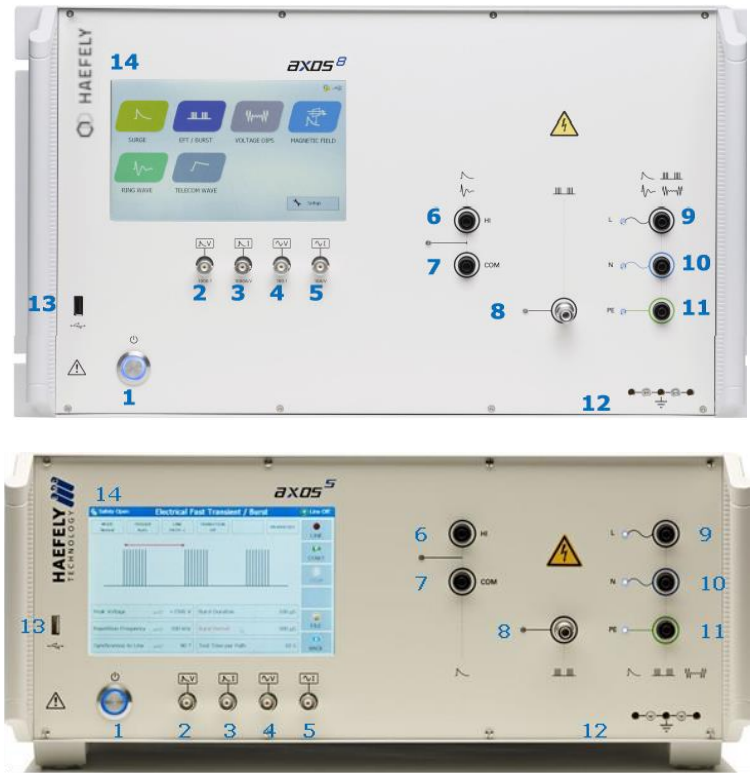


Figure 6-1 Axos Front view

Pos.	Function	Description
1	On/off switch	Turns on and off the power of AXOS[8]
2	Surge impulse voltage monitor output	1000:1 divider for surge impulse. Direct connection to oscilloscope. Example: 5000Vsurge impulse outputs 5V on the BNC socket
3	Surge impulse current monitor output	1000A/V surge impulse current monitor. Direct connection to oscilloscope. Example: 2500A surge current outputs 2.5V on the BNC socket
4	Urms monitor output 100:1	Monitoring the signal of the generator when creating voltage dips or voltage interrupts. Direct connection to oscilloscope.
5	Irms monitor output 10A/V	

6	HI Generator output Surge; (Direct output)	Direct output of surge generator Connection to external CDN. (Consider safety capture1) **Do not connect directly any external supply voltage, generator will be damaged.**
7	COM Generator output Surge (Direct output)	
8	Burst Output	Direct output of burst generator to external CDN or EUT
9	L output to EUT	Connection for single phase EUT to the internal coupling/decoupling network
10	N output to EUT	
11	PE output to EUT	
12	PE	Connection to ground reference plane or the verification adapter
13	USB port for data transfer	Save report data or test files onto USB memory stick
14	Colour touch screen	Every command and adjustment will be controlled and entered via the touch screen

6.2 Device back pannel

Figure 6-2 Axos[8] back pannel

Pos.	Function	Description
1	L “EUT Supply Input” (direct connection of power supply via banana plug)	direct single-phase connection of power supply to the EUT. It can either be connected to a DC power supply or to AC power supply. Awareness, the power supply should NOT be secured by a ground fault Switch. If yes please take capture 4.4 in consideration
2	N “EUT Supply Input” (direct connection of power supply via banana plug)	
3	PE “EUT Supply Input” (direct connection of power supply via banana plug)	
4	V dip (for Voltage dips & interrupts)	Input for the voltage dips und interrupts. For voltage interrupts it has to be connected via banana plug with position 2. However. when using external transformer, the only connection to the generator is through the V dip input

5	HV DC Output	Connection for TW8 module, up to 7kV DC output
6	“Link” to external HAEFELY transformer DIP 116	Input for HAEFELY transformer DIP 116 for voltage dips, then adjustable on 0%,40%, 70% and 80% in reference to the U1 nominal voltage of AXOS8. In any other case the transformer has to be controlled independently and it will be connected only through the “position 4” with the AXOS8.
7	“AUX” inputs and outputs	detailed description of function in 6.2.1
8	“RJ 45”Ethernet Interface	operation of the AXOS8 through an external device, likely a PC for the remote software
9	Sync. BNC Interface	The BNC interface is used for external synchronization of a manual CDN
10	Electrical grounding	The generator must always be connected to a reference earth before every use
11	Main power switch for AXOS8	Switching on/off total power supply

6.2.1 Auxiliary inputs and outputs

AUX (Pos. 7.)	function	description
1	Red warning lamp	Indicates when safety circuit closed
2	Green warning lamp	Indicates when safety circuit opened
3	GND	0 V
4	GND	0 V
5	Safety interlock	When safety barriers installed, connection must be done between pin 5 and pin 4 to close the circle (safety instruments), however, bridge between pin 4 and pin 5 exist as delivery setting
6	GND	0 V
7	Start/Stop program 1 is running (Input)	Start/Stop automatic for starting a predefined program in the “Setup” menu “start file (Figure 5-3)”, signal for instance external device, PLC signal
8	GND	0 V
9	Trigger Input	Input for external trigger to start for instance through an external signal a generator
10	GND	0 V
11	EUT Fail (Input)	External condition (e.g. device or PLC signal), the position becomes 1 and causes an action (Ignore, Alarm, Test Stop or test stop & line off)
12	GND	0 V
13	0-10V Analogue output	Reserved and used for further application
14	GND	0 V

15	Trigger output	When Burst, Surge or Voltage dips package in use, signal becomes 0, after the applied package has finished the signal becomes 1(negation); used for indication of signal on oscilloscope
16	GND	0 V
17	Spare (Reserve)	Not in use
18	GND	0 V

6.3 Setup Menu

The Figure 5-3 shows the “Setup” menu after selecting this button in the starting field. Every button is explained in the Table 5-4.

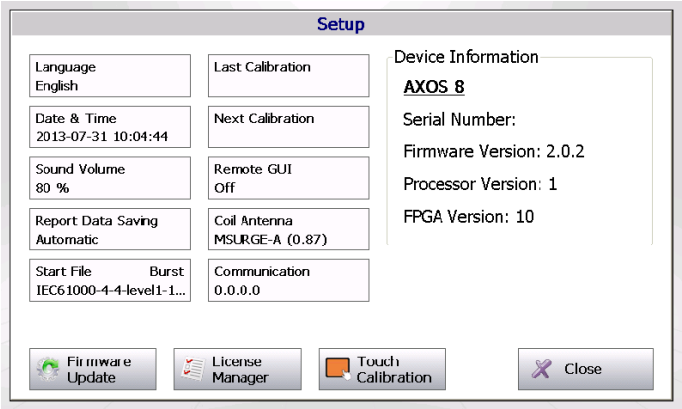


Figure 6-3 Setup Menu

In the right upper corner the current software version, serial number is displayed. The FPGA indicates the hardware of the chip version

Menu field	Description
Language	Selection of different language, only English at this moment.
Date & Time	Edit the current date and time
Sound Volume	Adjusting of sound operating volume and warn signals
Report data saving	Reporting data can be automatically saved when pushing the device in USB port or manually by pressing the “Rep.Data” in the menu of every application and then entering the device
Start file	Selection of predefined test in accordance with particular norm for Surge, Burst, Magnetic field, Voltage dips & interrupts; ring wave and TW8 it gets only applied from an external start/stop automatic (
Last Calibration	Factory calibration from HAEFEY TEST AG, in future term the “next calibration” becomes “last calibration
Next calibration	Recommended calibration period from HAEFELY is 2 years, however, it always depends on the quality management system of every company and certainly the test requirements of equipment and certification environment
Remote GUI	Remote GUI is possible to access when license key purchased from the HAEFELY; switch on/off of communication between remote computer and AXOS8 possible
Coil Antenna	Entering of new “coil Antenna” factor as described in capture 7.2.1
Communication	Communication via RJ45 at the rear view of AXOS8
Firmware update	For updating the new operating software of the AXOS8
License Manager	Entry of license codes for Surge, Burst, Magnetic field, Voltage Dips & Interrupts, ring wave and TW8 as well as remote GUI. After entering the license code, accessible in main menu

Touch calibration	In normal delivery mode there is a pre-calibration of the touch screen. However, if required, please follow and press for few seconds with a pen the cross at the screen. It requires five different positions. Then confirming and as a control measure four different yellow dots get open. Again confirming and the calibration has finished.

After setting has been finished the “Setup” gets closed when pressing the “close” button. Afterwards the starting window gets displayed. It can be selected between Surge, EFT/Burst, Voltage Dips, Magnetic field, Ring Wave and Telecom Wave.

6.3.1 Predefined standard program

The AXOS8 contains predefined standards test for Surge, EFT/Burst, Voltage Dips, Magnetic field, Ring Wave and Telecom Wave according to each particular norm. Each test can be selected and applied through the generator to the EUT. The Figure 6-4 Save and load option of data reflects the different option of managing the data at the “Surge” generator for example. These application works similar for any other impulse generator. The basic operation is similar to normal office applications. Data can be operated as followed: “load”, “Save”, “Save as”, “Copy” and “Delete”. Those options occur on the screen, when “file” button is pushed.

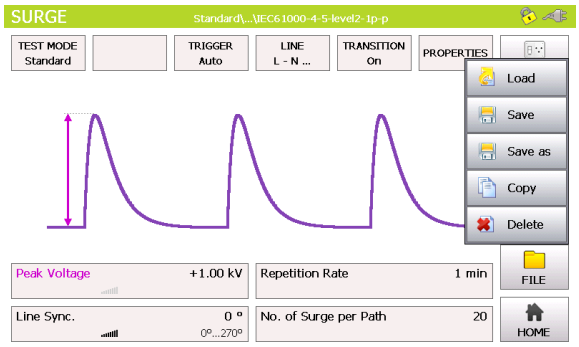


Figure 6-4 Save and load option of data

Two directories can be selected as shown in Figure 6-5 File selection Internal/Standard. However, the “standard” directory can only read and load the predefined test procedure in accordance to the particular norm. The second directory is “Internal”. The internal data (customized testing files) can be saved, loaded and deleted. Either of the directories can only be accessed out of the particular menu, like for instance the “surge” generator.

In addition, the loaded program is displayed in the upper line in either of the standard and pre-compliance menu.

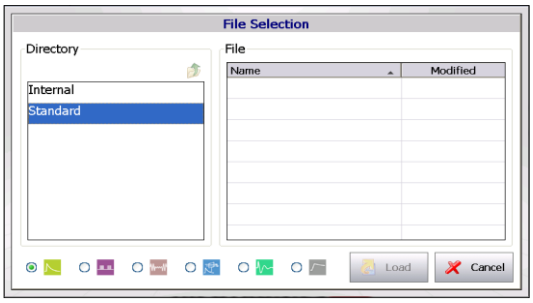


Figure 6-5 File selection Internal/Standard

However, through the “Setup” menu predefined programs can be loaded and applied via an external “start/stop” device. It gets controlled though Pin 7. When particular file has been selected, it must be confirmed with “load”.

Note: When file wants to be applied and started without any external signal parameter, it must be selected inside the specific modus (e.g. Surge”) via “load”. However, if controlled from an external signal, it must be selected through the “Setup” (Figure 6-3 Setup Menu) and then confirmed as seen inFigure 6-5 File selection Internal/Standard. Selection in “setup” menu will not be applied to generator when not external control of the program..

6.3.2 Defined AXOS Commands

Predefined commands are available for the AXOS. Those commands will be given to the unit via LAN network. No Remote software is necessary. For example, remote control programs can be written in C language.

To receive all commands contact either Haefely or your representative directly. Below you will find an example of minimal commands of programming a combination wave generator.

CW:SET:PEAK_VOLTAGE 2500:V
CW:SET:PEAK_VOLTAGE? V
2500.000
CW:SET:TRANS_PEAK_VOLTAGE OFF
CW:SET:TRANS_PEAK_VOLTAGE?
OFF
CW:SET:REP_RATE 5
CW:SET:REP_RATE?
5.000
CW:SET:SURGES 10
CW:SET:SURGES?
10.000
CW:SET:SYNC INT
CW:SET:SYNC?
INT

CW:SET:PHASE 90

CW:SET:PHASE?

90.000

CW:SET:TRANS_PHASE OFF

CW:SET:TRANS_PHASE?

OFF

CW:SET:TRANS_POL OFF

CW:SET:TRANS_POL?

OFF

This commands will be send to AXOS and test can be performed in accordance to it.

6.3.3 Icon bar

The Table presents a overview of icons in the operating menu. The icons get displayed in the right upper corner of the operating menu, except position 3.

1		When button “line” pushed in the operating menu, connection between “EUT supply inputs (L, N, PE)” and “EUT supply output (L, N, PE)” is existing; note: no actual “EUT Supply Input” required for the connection
2		When circuit closed between PIN 5 and PIN 4 in Table 5-3, either through existing factory bridge or external circuit connection
3		When generator charging, symbol gets displayed at touch screen
4		“Reporting data symbol”, when pushing “Rep.Data” button, this floppy icon comes up in the right upper corner of the window and the report of the test will be saved via USB- port on a connected device; Note: only accessible when test has finished
5		Symbol, when L and N on “EUT Supply Input” are exchanged, therefore, L and N must be changed back

6.4 Test Report Data

Test report data can be automatically saved to USB memory stick. If "Report Data Saving: Automatic" is selected in the "Setup" menu, test data are saved automatically after each test. If "Report Data Saving: Manual" is selected, test data can be saved on the memory stick by using the "REPORT" key within the accordingly menu.

The test data are saved into five CSV files which can easily imported into Excel or similar applications. Data are saved as follows:

Prg_Log.csv :	Test coclusion
Prg_Set_Seq.csv :	Test header data
PrgItem002_Log.csv :	Test log data
PrgItem002_Set.csv :	Test setup data

PrgItem_Res.csv : Test overview data

However, with reporting software (capture 14.2) an automatic report gets created and can be used as a reference document for the executed test for instance. For further information contact your representative or HAFEELY directly.

7 Surge

7.1 General information

Please read carefully the Table 5-1 and Table 5-2 in detail before first use of the Surge generator. The short voltage impulse stays on the EUT during several µs. The peak voltage gets up to 7 kV. The generator fulfils the requirements according to the IEC 61000-4-5 norm. The source impedance of the generator is 2 Ω. The HI and COM signals should be used from the beginning as scheduled, because in extern CDN the polarity becomes important. It can be select either between the Hi and Com output or the coupling network (Position 9,10,11 in Figure 5-1). Furthermore, 3 phases CDN, likely the FP SURGE100M2 or FP COMB 32 can be chosen.

7.2 Combination wave generator

In General waveforms are specified as open circuit voltage (OCV) and short circuit current (SCC). The Surge is applied directly from the Generator to the Surge HI and COM output, the waveforms are specified in the next two under captures. The function graphic and the key parameter can be read in the Table 6-1. In accordance to the IEC 60060-1 the front time for the OCV is 1,2 µs ± 30% and the SCC is 8 µs ± 20%.

Definitions	**IEC 60060-1**	
	Front time [µs]	Time to half value [µs]
Open circuit voltage	1,2 ± 30%	50 ± 20%
Short circuit current	8 ± 20%	20 ± 20%

For a detailed description please read the topic “test instrumentation” in the IEC 61000-4-5 norm.

7.2.1 Open Circuit Voltage (OCV)

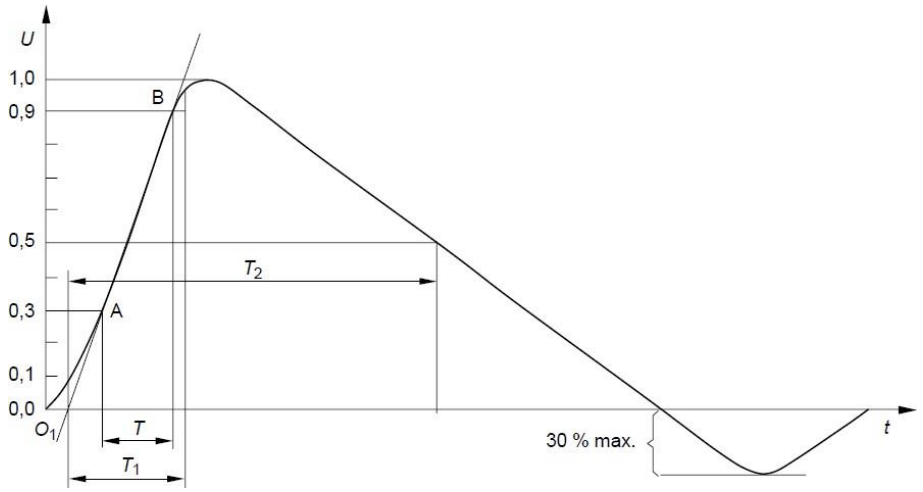


Figure 7-1 Open circuit voltage (OCV) [1]

Front time: T1 = 1,67 x T = 1,2µs ± 30%
Time to half value: T2 = 50µs ± 20%

Verification of the Surge output signal (HI and COM) in the front view can be done with the help of the in capture 15.2.1 described PDP 8000.

7.2.2 Short Circuit Current (SCC)

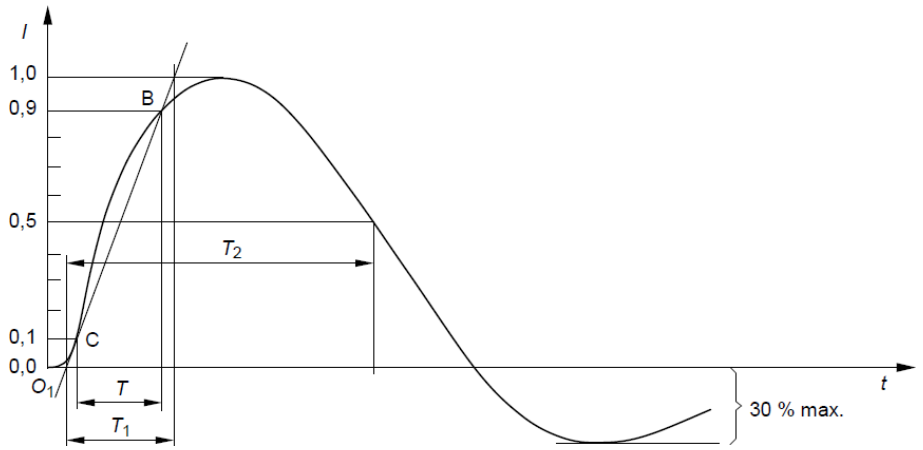


Figure 7-2: Short circuit current (SCC) [1]

Front time: T1 = 1,25 x T = 8 µs ± 20%
Time to half value: T2 = 20 µs ± 20%

For verification of the output signal, a current transformer must be connected between position 6 and position 7 as shown in Figure 5-1. EUT Supply Input must

be disconnected. The current transformer from capture 15.2.2 is for the verification necessary.

7.2.3 SURGE MENU

Test requirements must be achieved by the user according to the IEC 61000-4-5 norm. The safety standards as written in Table 1-1 must be unconditionally fulfilled, when operating the AXOS[8].

In the next step, the user selects either the pre-compliance or the standard operation mode. The Figure 7-3: Surge Standard mode and Figure 7-4: Surge pre-compliance mode reflects either of the appliance modes. As seen by pressing on each particular function parameter a pink bow comes up and the definition of the function gets displayed.

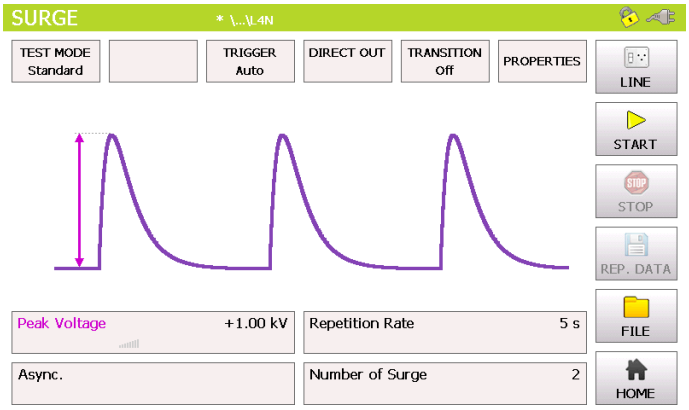


Figure 7-3: Surge Standard mode

When pressing the “home” button the user gets transferred automatically to the start menu.

In the Figure 7-4: Surge pre-compliance mode it is shown the use of the pre-compliance mode. Indeed, every parameter can be changed by simply pressing on the black bows next to the value. Furthermore, it can be changed between direct and line output. All testing parameters can be changed while the generator is operating.

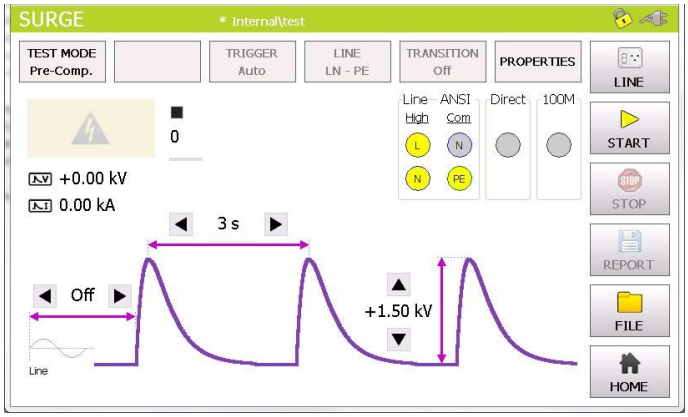


Figure 7-4: Surge pre-compliance mode

For instance, in the Standard Mode after selecting the peak voltage field, the numeric display appears as shown in Figure 6-5. In a similar way works the repetition rate and the number of surge. Awareness is to give for line synchronization; hence, it has been described more detailed in the capture 6.3.4.

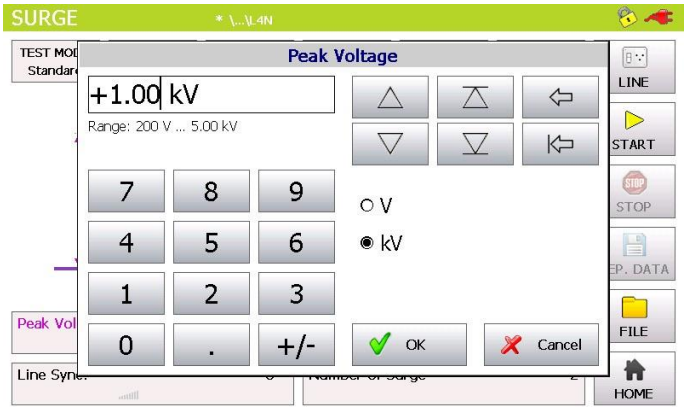


Figure 7-5: Surge peak voltage

In Pre-Compliance Mode, the parameter values can be changed in set increments with the use of arrow keys or by pressing the number between the arrow keys. Pressing the number between the arrow keys will bring up the numeric display shown in Figure 7-5: Surge peak voltage.

Once the value is selected, the screen will return to the operation mode (standard or pre compliance).

The user is able to see nominal values of the peak voltage, reputation time and the synchronization period. Additionally, these values can be modified while the test is proceeding. It happens by simply pressing each particular function. The test stops when pushing the “STOP” button.

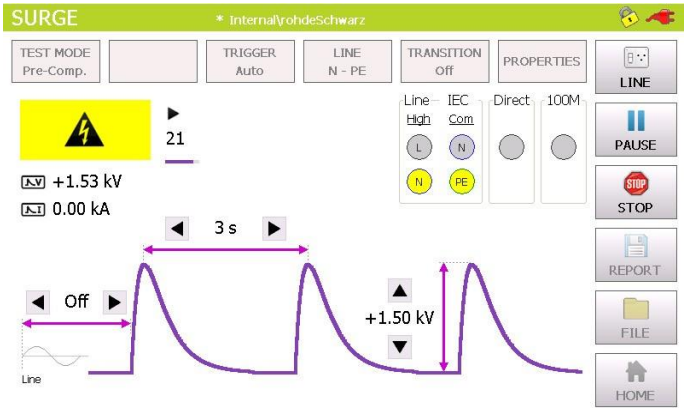


Figure 7-6: Surge Pre-compliance mode charging

In the right corner of the graphic is the plug flashing in red, when direct connection between L, N, PE to the “EUT Supply Input” and button “line” has been pushed. The safety lock symbols shows that the safety circuit has been closed between PIN 4 and PIN 5.

Information about Transition, Trigger and properties has to be entered independently if the test has stopped. “Transition” and “Trigger” are only accessible in standard operating mode.

7.2.4 Properties

In the Figure 6-7 below is the properties menu displayed. The Table 6-2 explains the function more detailed.

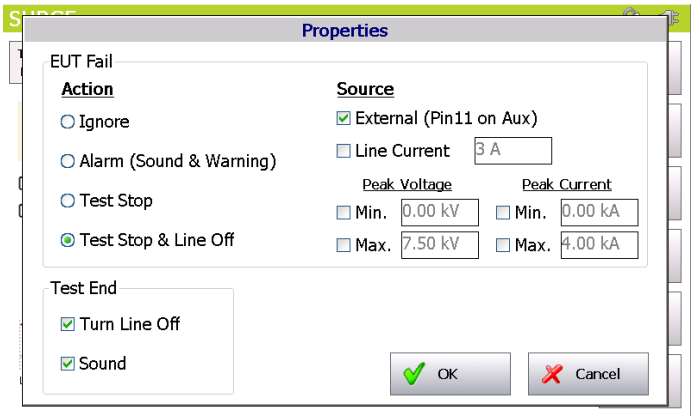


Figure 7-7: Surge properties

The Table describes the different functions more detailed. The window gets closed, when confirming the “OK” button.

Position	Description
External (Pin11 on Aux)	External condition (e.g. device or PLC signal), the position becomes 1 and causes an action (Ignore, Alarm, Test Stop or test stop & line off)
Line Current	Limits the current (L, N, PE front view) to the EUT.
Peak voltage	It defines an area (min. and max.) within the peak voltage value of the surge waveform becomes. If not successful, it causes an action, which can be: Ignore, Alarm, Test Stop or test stop & line off.
Peak current	It defines an area within the peak current (min. and max.) value of the surge waveform can become. If not successful, it causes an action, which can be: Ignore, Alarm, Test Stop or test stop & line off.
Action: Ignore, Alarm, Test stop, Test stop & line off	Due to EUT fails, AXOS^8 cause an action which can be: Ignore, Alarm, Test Stop, Test Stop & Line off.
Turn Line off	Voltage locked at L, N, PE when test has finished
Sound	Acoustic signal when test ends

7.2.5 Transition

The Figure 7-8: SURGE transition mode reflects the transition window of the AXOS^8. The “alternative polarity” makes possible to switch between positive and negative impulses. Alternate polarity, peak voltage and phase can be selected and parameter entered. It is only possible to select phase in either external synchronization or synchronization mode.

Significant awareness must be given in the transitions mode, that Trigger “auto” mode is selected, otherwise it is not possible to access the “Transition” function.

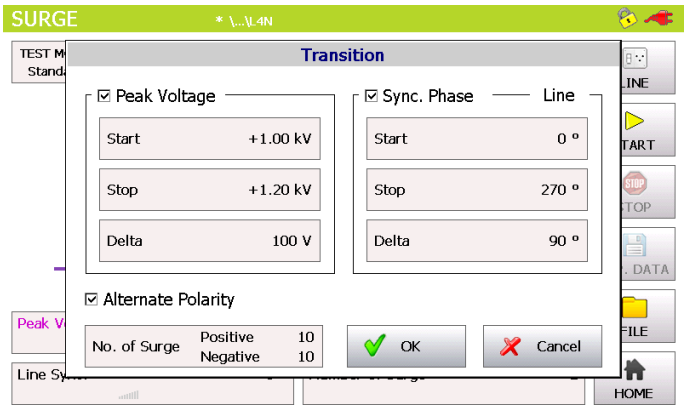


Figure 7-8: SURGE transition mode

After successfully entering the parameter, “OK” button can be pushed and then the “Start” button in the main menu. Test should be proceeding now.

7.2.6 Trigger

In the trigger window it is possible to select between “auto”, “manual” or “external trigger”. When being in “manual mode” the user controls the trigger by pressing the start button first, after the generator is charged the menu button “trigger” flashes up and can be pushed. “Auto mode” provides the signal according to set up and works completely automatically. All key parameter like “peak voltage” sets the user through the touch screen in the main operating window. In “external trigger” the signal for the trigger comes from an external source and gets connected via PIN 11 in the AUX input at the rear view of the AXOS[8].

7.2.7 Synchronization AC

To synchronize the surge signal with the main supply source it is necessary to adjust in the menu “Synchronization” and then “Line Sync.”. Further adjustments of the angle can be done in a range from 0°to 359°. However, if no power supply is connected to the EUT input at the rear view, it has to be entered “Async.”, otherwise it is impossible to get a Surge impulse of the generator.

In external synchronization, the output with the position 8 Figure 5-2 in the rear view is in use. As an external source could be used for instance a manual CDN. Normal operation through the touch screen is possible.

8 Magnetic Field

8.1 General Information

The test setup is described in accordance to the norm IEC 61000-4-9. A SCC waveform will be created. For the magnetic field the coil gets connected directly via banana plug to the surge output HI and COM as written in position 6 and Position 7 in Figure 6-1 Axos Front view. Only these outputs can be used for the Surge impulse.

Do not touch the coil when the test is proceeding. Safety requirements as described in capture 1.1 must be unconditionally fulfilled.

8.2 Magnetic field menu

Standard mode is presented In Figure 8-1: Magnetic field Pre-compliance mode. The parameter can be entered by pressing the numbers. For instance to change the magnet field the parameter “+120 A/m” must be selected and then a new parameter entered.

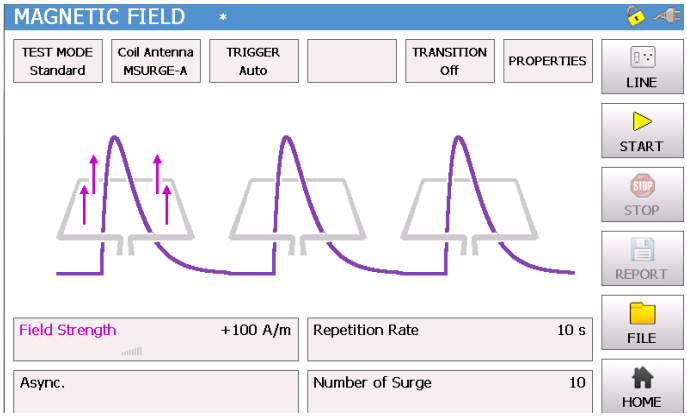


Figure 8-1: Magnetic field Pre-compliance mode

In addition, the purple bow describes the function. On the top of the window it shows which “Coil Antenna” is selected. In the standard mode (Figure 8-2: Magnetic field Standard mode) the values can be changed by pressing on the particular parameter as well. Additionally, the “transition” (capture 10.2.3) can be adjusted.

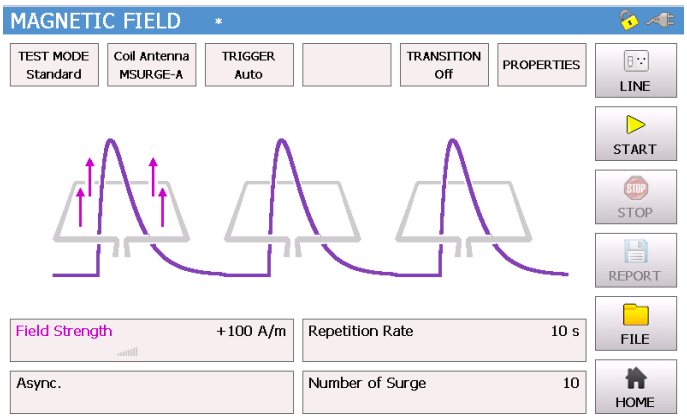


Figure 8-2: Magnetic field Standard mode

When “Line” button pushed, “EUT Supply Input” connected with L, N, PE front view and in the right corner the plug flashes red. After pushing the “Start” button the surge impulse gets applied.

In Figure 8-3: Magnetic field charging is the Surge impulse proceeding. The magnetic field will be displayed and the safety symbol is flashing. The test can be stopped by pushing the “Stop” button. When pushing the “home” button the starting screen as shown in Figure 2-1 gets displayed.

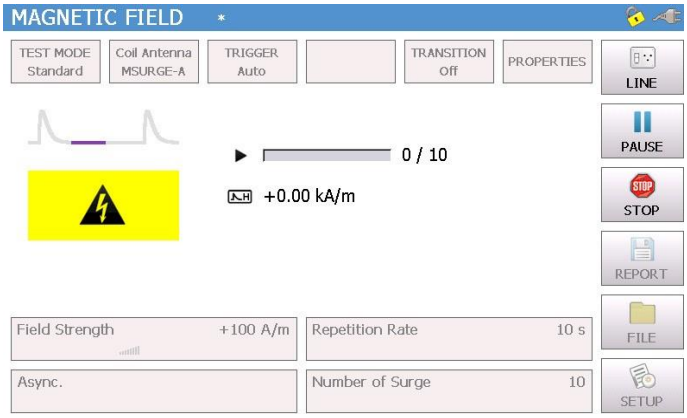


Figure 8-3: Magnetic field charging

In following points “Coil Antenna”, “Trigger”, “Transition” and “properties” will be described. When being in the “Setup” menu (Figure 6-3 Setup Menu), manual has been selected for “rep data”, therefore a test report can be written on a USB device simply by pressing “Rep.Data”. However, first connect device to USB port.

8.2.1 Coil antenna

The setup menu contains a standard predefined coil (MSURGE-A with coli factor 0.87) in accordance to IEC 61000-4-9. It can be add up to 10 different coil factors to the menu. By selecting “delete” coil antenna gets erased.

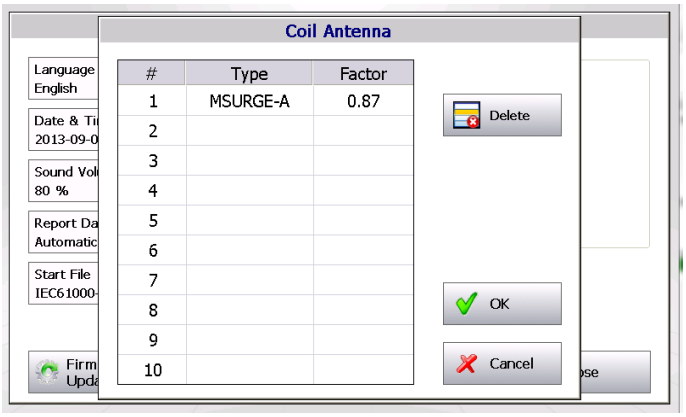


Figure 8-4: Coil Antenna factor from Set Up menu of AXOS8

To add a different coil, it will be entered in setup (Figure 6-3 Setup Menu). This selection can be seen in the operating menu in the magnetic field.

8.2.2 Transition

In “Transition” (Figure 8-5: Magnetic field transition) the user can adjust the “Field Strength”, “Sync. Phase” and “Alternative Polarity”. The description from capture 6.3.2 is valid, except “peak voltage” has been changed to “field strength”. The other parameters stay equal, since an OCC will be applied to the coil antenna and is basically a Surge impulse.

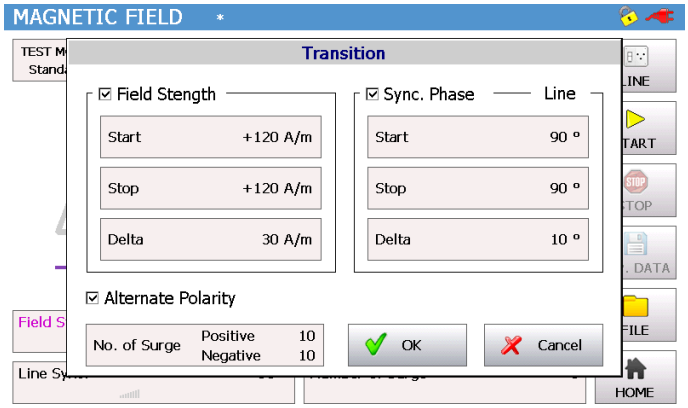


Figure 8-5: Magnetic field transition

When all parameters has been entered then simply confirming with ok and in the menu is showing “transition on”, this indicates the settings will be applied to the coil antenna when pushing the “start” button. Furthermore, when test is proceeding, the intervals for instance of the “field strength” gets displayed.

8.2.3 Properties

Position	description
External (Pin11 on Aux)	External condition (e.g. device or PLC signal), the position becomes 1 and causes an action (Ignore, Alarm, Test Stop or test stop & line off)

Line Current	Limits the current (L, N, PE front view) to the EUT.
Action: Ignore, Alarm, Test stop, Test stop & line off	Due to EUT fails, AXOS^{8} causes an action which can be: Ignore, Alarm, Test Stop, Test Stop & Line off.
Line off	Voltage locked at L, N, PE when test has finished
Line on	Voltage unlocked at L, N, PE when test has finished
Sound on or off	Acoustic signal when test ends

9 Ring Wave (Axos[8] Only)

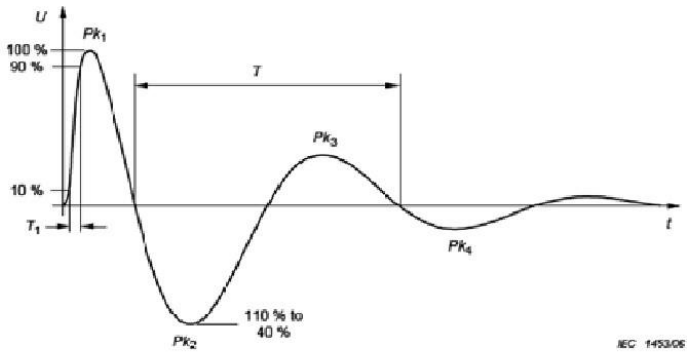
9.1 General Information

The Ring wave impulse generator creates impulses in accordance to the IEC 61000-4-12 ed.3 and ANSI C62.41 norm. Test level up to 7 kV is defined. Waveform has similar characteristics in open circuit voltage as well as short circuit condition. It can be selected between an impedance of 12 Ohm and 30 Ohm on the touch screen accorded to IEC 61000-4-12 norm.

Chapter Operating Instructions must be carefully read before first use of the Ring Wave generator. The peak voltage gets up to 7 kV. The HI and COM signals should be used from the beginning as scheduled, because with extern CDN the polarity becomes important. It can be select either between the Hi and COM output or the coupling network (Position 9,10,11 in Figure 6-1 Axos Front view). Furthermore, 3 phase CDN, likely the FP SURGE100M2 or FP-COMB 32 can be chosen.

9.1.1 Open Circuit Voltage (OCV) Ring Wave

Following output impulse form is defined as the Ring Wave impulse in accordance to IEC 61000-4-12 and ANSI C62.41.



Key
T_1 Rise time
T Oscillation period

Figure 9-1: Ring wave impulse

9.1.2 Ring Wave menu

Test requirements must be achieved by the user according to the IEC 61000-4-12 norm. The safety standards as written in Table 1-1 must be unconditionally fulfilled, when operating the AXOS[8].

In the next step, the user selects either the pre-compliance or the standard operation mode. The Figure 9-2: Ring Wave Standard mode and Figure 9-3: Ring Wave pre-compliance mode reflects either of the appliance modes. As seen by pressing on each particular function parameter a purple bow comes up and the definition of the function gets displayed.

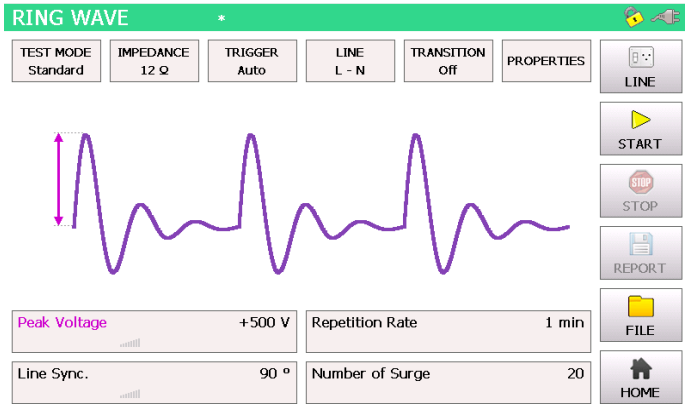


Figure 9-2: Ring Wave Standard mode

When pressing the “home” button the user gets transferred automatically to the start menu.

In the Figure 9-3: Ring Wave pre-compliance mode is shown the pre-compliance mode. Indeed, every parameter can be changed by simply pressing on the black arrows next to the value. Furthermore, it can be changed between direct and line output. All data entries can be done while the generator is operating. It can be selected between 12 Ohm and 30 Ohm couple impedance of generator to EUT.

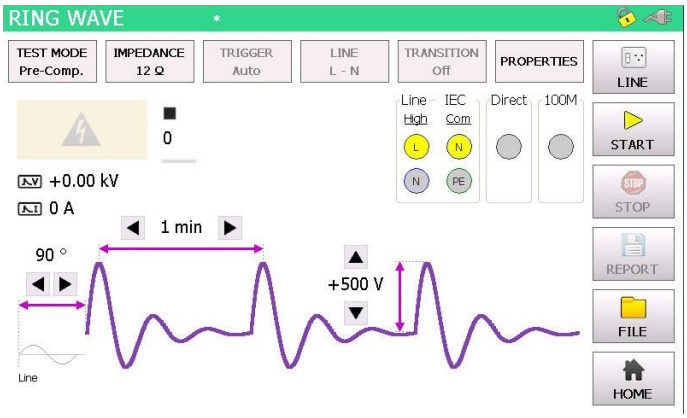


Figure 9-3: Ring Wave pre-compliance mode

In Pre-Compliance Mode, the parameter values can be changed in set increments with the use of arrow keys or by pressing the number between the arrow keys. Pressing the number between the arrow keys will bring up the numeric display shown in Figure 9-4: Ring Wave peak voltage.

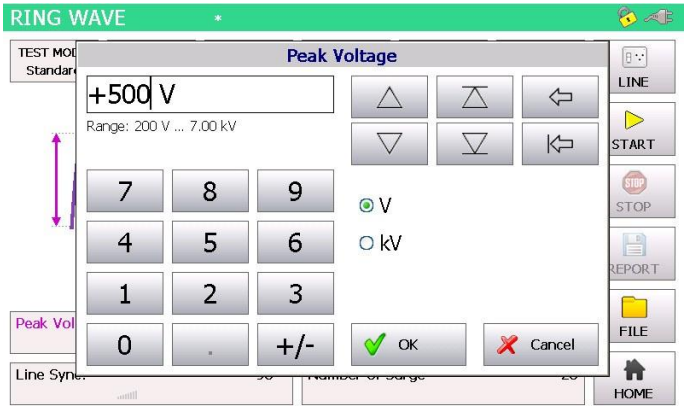


Figure 9-4: Ring Wave peak voltage

After values entered, the start button can be pushed and the window Figure 9-3: Ring Wave pre-compliance mode opens up, if selected pre-compliance mode.

The safety symbol, the direct output and the output voltage and output current are displayed. In addition, the user is able to see nominal values of the peak voltage, reputation time and the synchronization period. Additionally, these values can be modified while the test is proceeding. It happens by simply pressing each particular function. The test stops when pushing the “STOP” button.

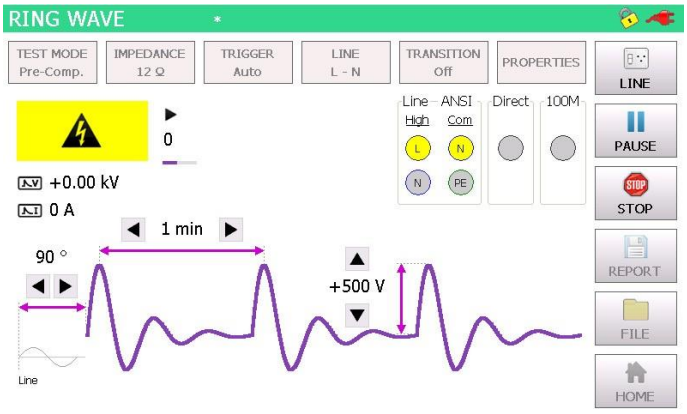


Figure 9-5: Ring Wave Pre-compliance mode charging

In the right corner of the graphic is the plug flashing in red, when direct connection between L, N, PE to the “EUT Supply Input” and button “line” has been pushed. The safety lock symbols shows that the safety circuit has been closed between PIN 4 and PIN 5 in Table 5-3.

Information about Transition, Trigger and properties has to be entered independently if the test has stopped. “Transition” and “Trigger” are only accessible in standard operating mode.

9.1.3 Properties

In the Figure 9-6: Ring Wave properties below is the properties menu displayed. The Table explains the function more detailed.

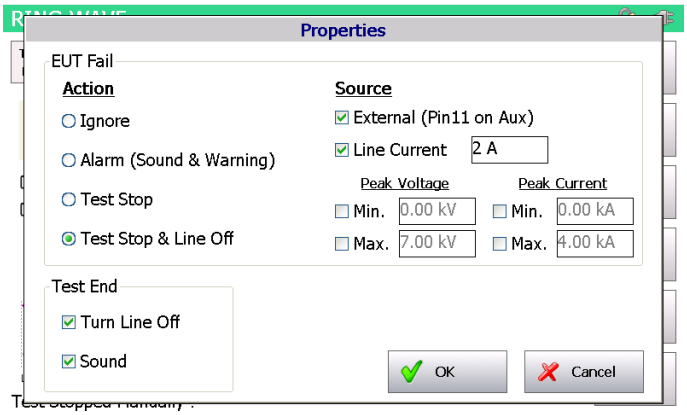


Figure 9-6: Ring Wave properties

The window gets closed, when confirming the “OK” button.

Position	Description
External (Pin11 on Aux)	External condition (e.g. device or PLC signal), the position becomes 1 and causes an action (Ignore, Alarm, Test Stop or test stop & line off)
Line Current	Limits the current (L, N, PE front view) to the EUT.
Peak voltage	It defines an area (min. and max.) within the peak voltage value of the surge waveform becomes. If not successful, it causes an action, which can be: Ignore, Alarm, Test Stop or test stop & line off.
Peak current	It defines an area within the peak current (min. and max.) value of the surge waveform can become. If not successful, it causes an action, which can be: Ignore, Alarm, Test Stop or test stop & line off.
Action: Ignore, Alarm, Test stop, Test stop & line off	Due to EUT fails, AXOS[8] cause an action which can be: Ignore, Alarm, Test Stop, Test Stop & Line off.
Turn Line off	Voltage locked at L, N, PE when test has finished
Sound	Acoustic signal when test ends

9.1.4 Transition

The Figure 9-7: Ring Wave transition mode reflects the transition window of the AXOS[8]. The “alternative polarity” makes possible to switch between positive and negative impulses. Alternate polarity, peak voltage and phase can be selected and parameter entered. It is only possible to select phase in either external synchronization or synchronization mode.

Significant awareness must be given in the transitions mode, that Trigger “auto” mode is selected, otherwise it is not possible to access the “Transition” function.

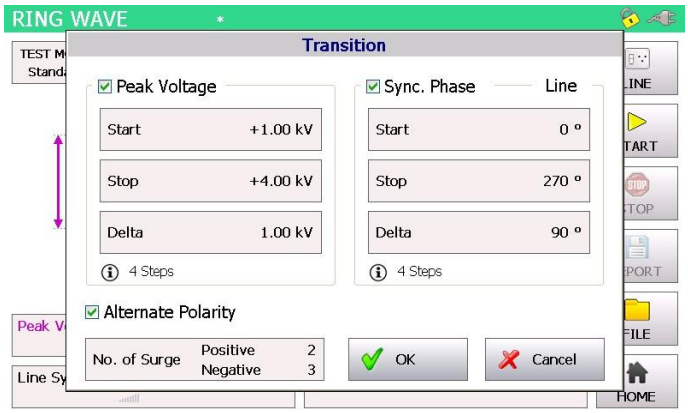


Figure 9-7: Ring Wave transition mode

After successfully entering the parameter, “OK” button can be pushed and then the “Start” button in the main menu. Test should be proceeding now.

9.1.5 Trigger

In the trigger window it is possible to select between “auto”, “manual” or “external trigger”. When being in “manual mode” the user controls the trigger by pressing the start button first, after the generator is charged the menu button “trigger” flashes up and can be pushed. “Auto mode” provides the signal according to set up and works completely automatically. All key parameter like “peak voltage” sets the user through the touch screen in the main operating window. In “external trigger” the signal for the trigger comes from an external source and gets connected via PIN 11 in the AUX input at the rear view of the AXOS[8].

9.1.6 Synchronization AC

To synchronize the ring wave signal with the main supply source it is necessary to adjust in the menu “Synchronization” and then “Line Sync.”. Further adjustments of the angle can be done in a range from 0°to 359°. However, if no power supply is connected to the EUT input at the rear view, it has to be entered “Async.”, otherwise it is impossible to get a Surge impulse of the generator.

In external synchronization, the output with the position 8 Figure 5-2 in the rear view is in use. As an external source could be used for instance a manual CDN. Normal operation through the touch screen is possible.

9.1.7 Output & Coupling Paths

In the output&coupling options (Figure 9-8: ANSI Output & Coupling Paths Ring Wave) can be automatically selected between the manual FP SURGE 100M2, direct output and line output. Similar outputs are used as for SURGE combintaion wave application, simply with different characteristics of generator. Detailed information about the output are explained for the front view in Figure 5-1. The automatic 3 phase CDN FP COMB 32 gets indicated automatically when connected, similar to DIP 116 or TW8 module. The coupling is in accordance to the IEC standard (Figure 9-9: Figure 8-8 IEC Output & Coupling Paths). Additionally, coupling between LN-PE and

(according to ANSI standard) is indicated in Figure 9-8: ANSI Output & Coupling Paths Ring Wave.

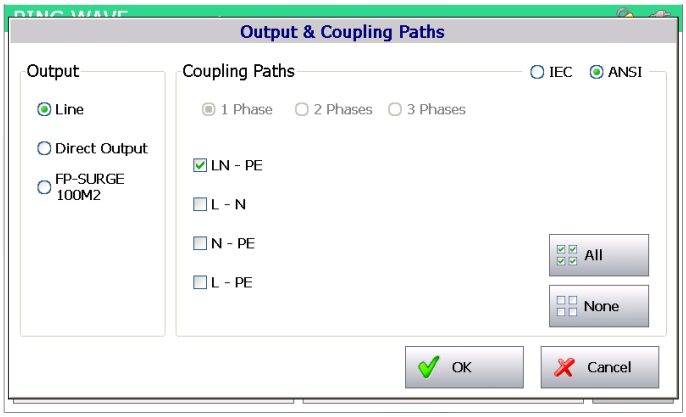


Figure 9-8: ANSI Output & Coupling Paths Ring Wave

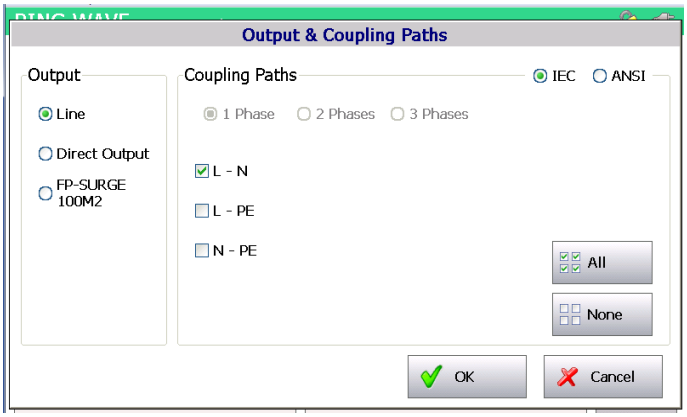


Figure 9-9: Figure 8-8 IEC Output & Coupling Paths

10 Telecom Wave (Axos[8] only)

10.1 General Information

This impulse is characterised as a telecom wave impulse as well as 10/700 impulse. The reason is that under OCV condition the front time is defined with 10µs and time to half value is 700 µs. The main difference to the Combination Wave generator is the front time and time to half value. The basic standard body is the IEC 61000-4-5, similar to the Combination Wave generator. There the impulse form is defined. Further important standards are the ITU K.20, K.21,

K.44 and K.45. The impulse gets applied only to communication line. To be able to apply this impulse wave form to the EUT an external telecom wave TW 8 module is required.

10.1.1 Open Circuit Voltage (OCV) Telecom Wave

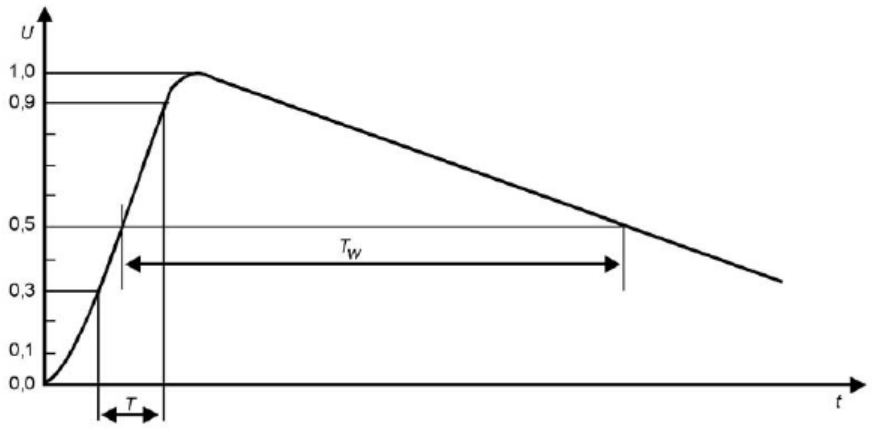


Figure 10-1: Open Circuit Voltage (OCV) Telecom Wave

Front time: $T_f = 1{,}67 \times T = 10\mu s \pm 30\%$
Duration: $T_d = T_w = 700\ \mu s \pm 20\%$

10.1.2 Short Circuit Current (SCC) Telecom Wave

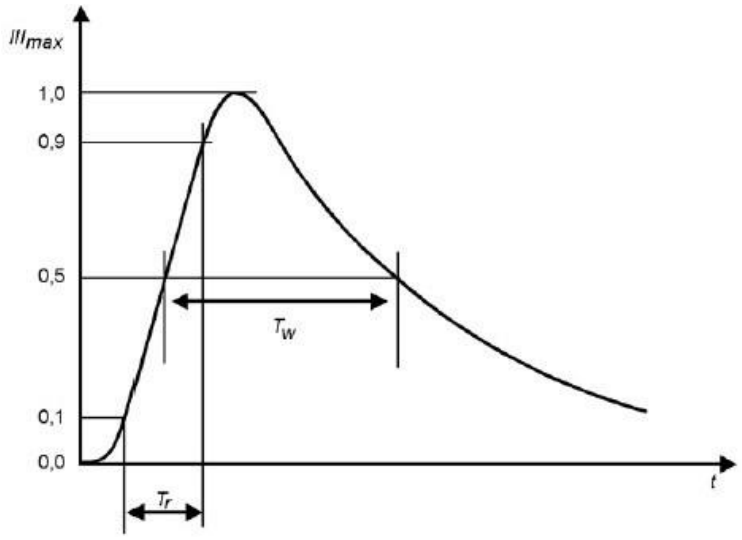


Figure 10-2: Short Circuit Current (SCC) Telecom Wave

Front time: $T_f = 1{,}25 \times T_r = 5\ \mu s \pm 20\%$
Time to half value: $T_d = T_w = 320\ \mu s \pm 20\%$

10.1.3 TW 8 module

When external TW 8 (Figure 10-3: Telecom Wave module) module is connected it gets automatically indicated via the link cable (intelligent input). In the front view are three different coupling impedances (1 x 15 Ohm (HI-COM), 4 x 40 Ohm, 4 x 40 Ohm gas arresters) options. The user selects on the coupling unit (TW8 module) which impedance is required for the particular application. In the block diagram (Figure 9-8) the exact outputs are defined in accordance to the standard.

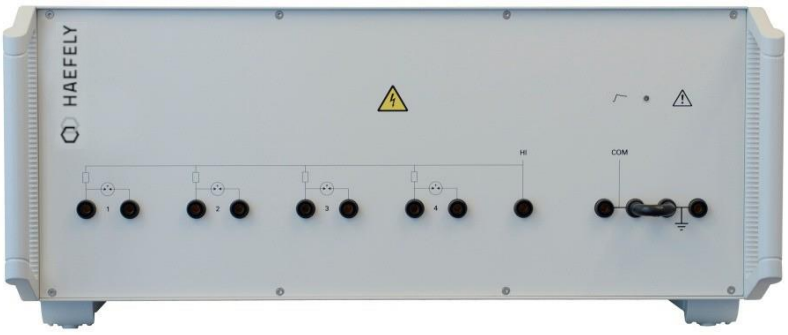


Figure 10-3: Telecom Wave module

On the right hand side there is a black bridge. There I can select if I want to have the output to the EUT either floating or not.

For instance:

Floating: No connection between COM and earth connection → 6 kV adjusted, then 3kV at HI and 3kV at COM

Not floating: connection between COM and PE as above → 6 kV adjusted, then 6kV at HI and 0kV at COM

10.1.4 AXOS 8 + TW 8

Test requirements must be achieved according to the IEC 61000-4-5 ed.3 norm. The safety standards as written in Table 1-1 must be unconditionally fulfilled, when operating the AXOS[8].

The high voltage signal gets applied directly from HV DC output of the AXOS8 to the HV DC input of the TW 8 module in the rear side of the unit. No output at the front view of AXOS8 must be used for the 10/700 application. (Figure 10-4: Connection AXOS 8 + TW 8 Module)

Figure 10-4: Connection AXOS 8 + TW 8 Module

In the next step, the user selects either the pre-compliance or the standard operation mode. The Figure 9-5 and Figure 9-6 reflects either of the appliance modes. By pressing on each particular function parameter a purple bow comes up and the definition of the function gets displayed. Only Peak voltage, repetition rate and number of Surge can be adjusted. There when selecting the field, the value as for instance 500V can be changed. No synchronization with external power supply source is possible.

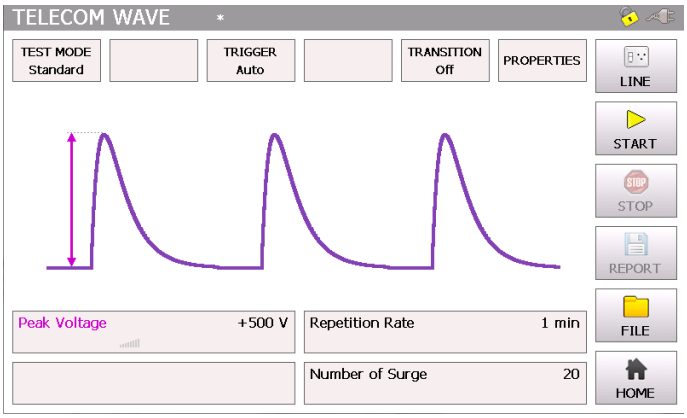


Figure 10-5: Telecom Standard mode

When pressing the “home” button the user gets transferred automatically to the start menu.

In the Figure 10-6: Telecom Wave pre-compliance mode it shows the use of the pre-compliance mode. Indeed, every parameter can be changed by simply pressing on the black bows next to the value. All data entries can be done while the generator is operating.

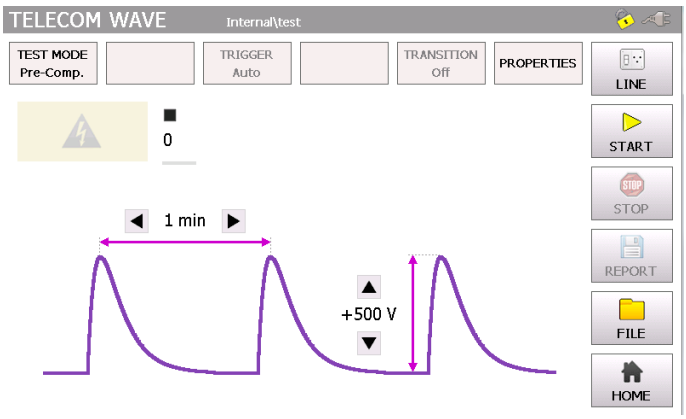


Figure 10-6: Telecom Wave pre-compliance mode

For instance, in the standard mode after selecting the peak voltage field the Figure 10-7: Telecom Wave peak voltage opens up and the parameter can be entered. In a similar way functions the repetition rate and the number of surge.

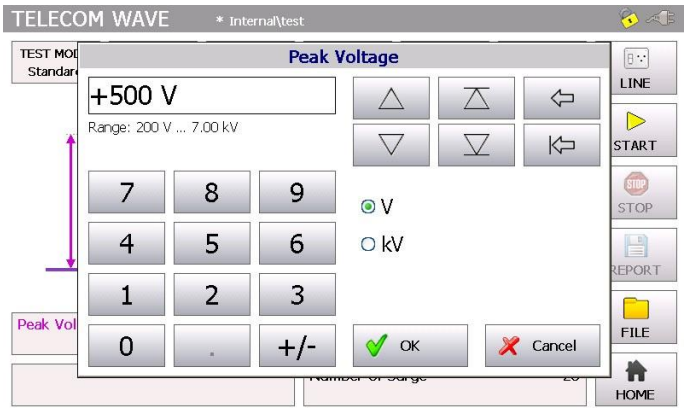


Figure 10-7: Telecom Wave peak voltage

10.1.5 Output & Coupling Paths

In the figure below there are three different (1 x 15 Ohm, 4 x 40 Ohm, 4 x 40 Ohm gas arresters) output options in accordance to IEC 61000-4-5 ed.3 standard. It can be simply connected vie banana plugs with the EUT.

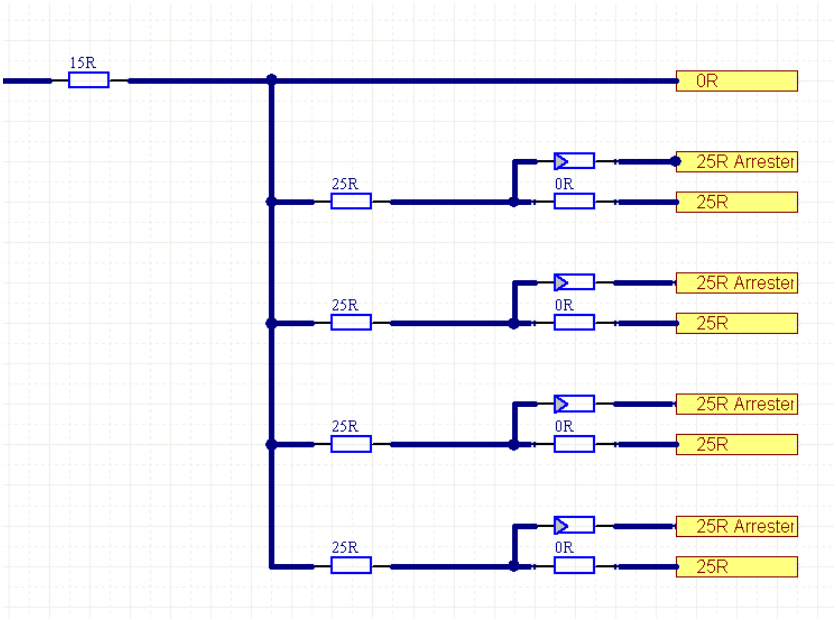


Figure 10-8 External outputs from decouple network of Telecom Wave module

10.1.6 Properties

In the Figure 9-9 below is the properties menu displayed. The Table 9-1 explains the function more detailed.

Figure 10-9: Surge properties

The window gets closed, when confirming the “OK” button. “Turn line off” is turned off automatically, because the impulse gets applied directly via TW8 module and there is no “line” output, only directs (HI-COM) output with different impedances as described in the beginning of capture.

Position	Description
External (Pin11 on Aux)	External condition (e.g. device or PLC signal), the position becomes 1 and causes an action (Ignore, Alarm, Test Stop or test stop & line off)
Line Current	Limits the current (L, N, PE front view) to the EUT.
Action: Ignore, Alarm, Test stop, Test stop & line off	Due to EUT fails, AXOS[8] cause an action which can be: Ignore, Alarm, Test Stop, Test Stop & Line off.
Turn Line off	Voltage locked at L, N, PE when test has finished
Sound	Acoustic signal when test ends

10.1.7 Transition

The Figure 9-10 reflects the transition window of the AXOS[8]. The “alternative polarity” makes possible to switch between positive and negative impulses. Alternate polarity, peak voltage can be selected and parameter entered.

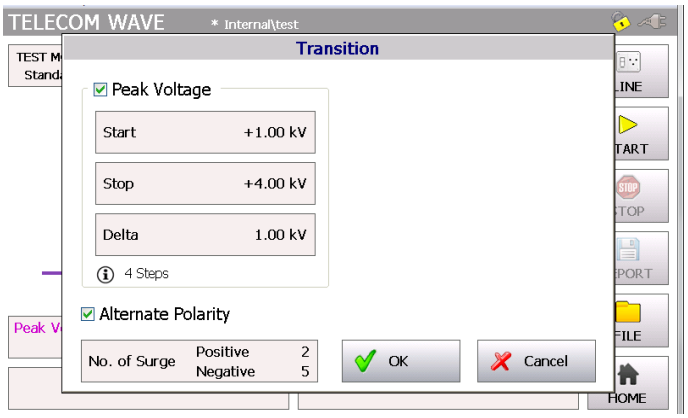


Figure 10-10: Telecom Wave transition mode

After successfully entering the parameter, “OK” button can be pushed and then the “Start” button in the main menu. Test should be proceeding now.

10.1.8 Trigger

In the trigger window it is possible to select between “auto” or “manual”. When being in “manual mode” the user controls the trigger by pressing the start button first, after the generator is charged the menu button “trigger” flashes up and can be pushed. “Auto mode” provides the signal according to set up and works completely automatically. All key parameter like “peak voltage” sets the user through the touch screen in the main operating window.

11 Electrical Fast Transient Burst

11.1 General information

The Burst generator generates Electrical Fast Transient Bursts (EFT) as described in IEC 61000-4-4. The source impedance of the generator is 50 Ω. The burst is a common mode transient, coupled simultaneously to all selected paths with respect to ground. It can be selected between using the coaxial output or the built in mains coupling network.

Test requirements must be achieved by the user according to the IEC 61000-4-4 norm. The safety standards as written in Safety must be unconditionally fulfilled.

11.2 Burst menu

After selecting in the start menu the function “Burst”, the user has the choice between standard and pre-compliance mode. It gets selected in the top icon bar. The Figure 11-1: EFT/BURST Standard mode shows the standard menu. When pressing “peak voltage”, “repetition frequency”, “burst duration” a purple bow opens up and describes visually the waveform impulse.

Furthermore, the user can select between “properties”, “trigger manual”, “Burst mode” and “direct out”. Detailed description is to find in the following under captures. However, when no further adjustment necessary the “Start” button can be pushed and the window (Figure 11-4: Burst pre-compliance mode charging) gets open. When pressing the “line” button, the plug in the right corner flashes red. As a result L, N, PE front view are connected with L, N, PE rear view and full power supply for the EUT is provided.

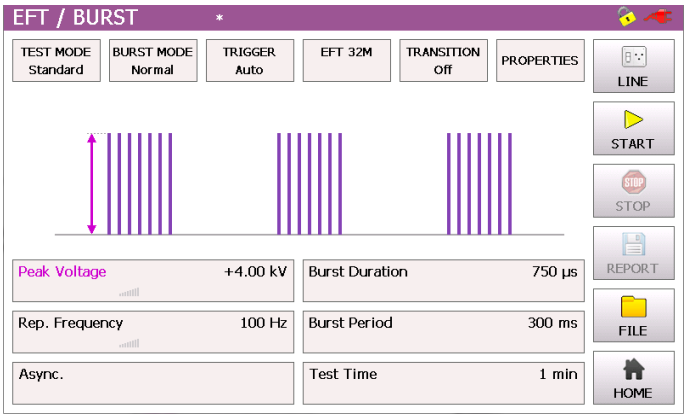


Figure 11-1: EFT/BURST Standard mode

By pressing at each particular value, a new parameter (Figure 11-1: EFT/BURST Standard mode) can be entered. Then confirming with “OK” and the parameter will be written in the standard test mode. In Addition it can be immediately selected between kV and V.

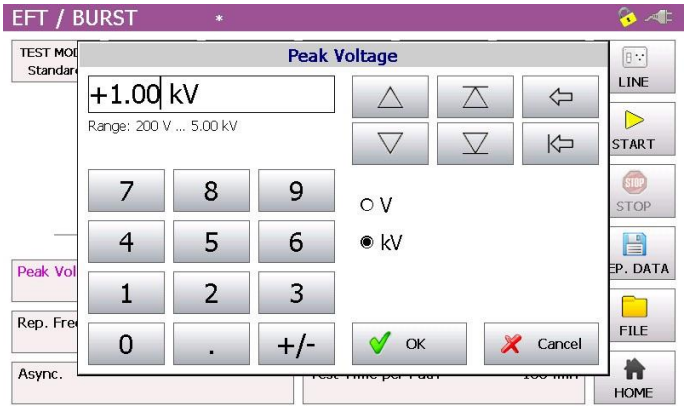


Figure 11-2: EFT/BURST peak voltage configuration

The following graphic represents the pre-compliance mode. In comparison with the standard menu, every command gets displayed the entire visual description of the function is described through purple bows. Main advantage of the pre- compliance mode is that the parameter can be changed while the test is operating.

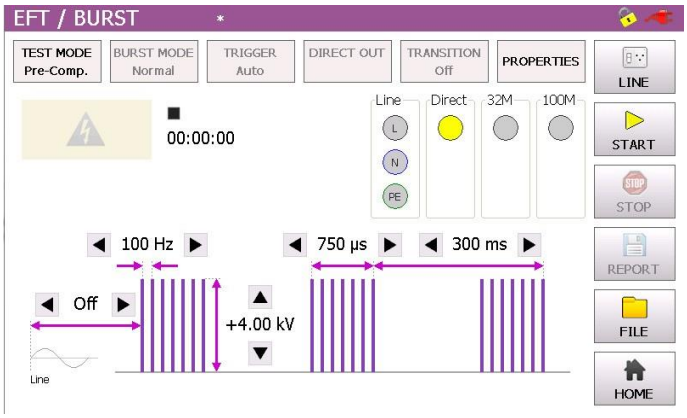


Figure 11-3: EFT / BURST pre-compliance mode

However, when every parameter has been adjusted, the “Start” button can be pushed and generator is charging. Now, the following graphic should be displayed. The selected output path (direct or line (3phase CDN 32M or 100M external unit)) is flashing yellow.

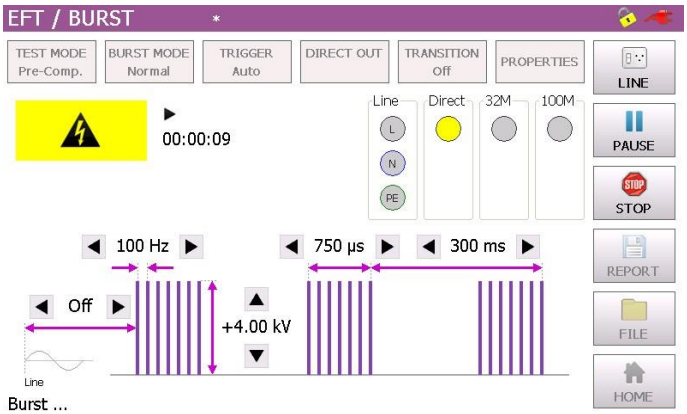


Figure 11-4: Burst pre-compliance mode charging

The Burst waveform gets stopped, when pushing the “Stop” button. Afterwards, test report can be saved on the USB device.

11.2.1 Output & Coupling Paths

In Burst testing mode every line signal gets tested against GND (PE). In direct output the signals stands on the position 8 in Figure 6-1 Axos Front view. It gets connected directly to the EUT or will be used for verification of the Burst waveform. Furthermore, it can be connected to three-phase test CDN. For further assistance please contact HAEFELY directly.

11.2.2 Properties

The next window shows the property window of the Burst waveform. Detailed description of each parameter can be read in the Table below.

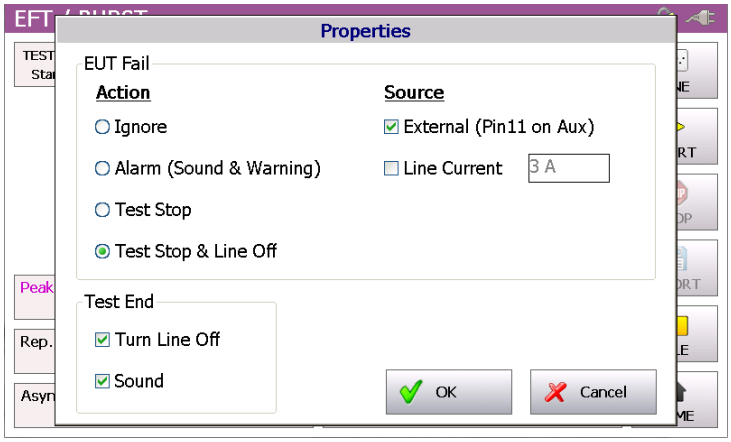


Figure 11-5: BURST properties

Position	Description
External (Pin11 on Aux)	External condition (e.g. device or PLC signal), the position becomes 1 and causes an action (Ignore, Alarm, Test Stop or test stop & line off)
Line Current	Limits the current (L, N, PE front view) to the EUT
Action: Ignore, Alarm, Test stop, Test stop & line off	Due to EUT fails, AXOS[8] cause an action which can be: Ignore, Alarm, Test Stop, Test Stop & Line off.
Line off	Voltage locked at L, N, PE when test has finished (only possible to select, when as output line has been selected)
Sound on off	Acoustic signal when test ends

After selection has been finished, the button “OK” must be confirmed and setting gets applied to the Burst generator.

11.2.3 Transition

The Figure 11-6: BURST Transitionshows the “transition” menu. It is possible to select independently “peak voltage”, “Repetition frequency”, “Phase” and “Alternate polarity”. To be able to select “Sync phase” the synchronization has to be either set as “line Sync” or “external Sync”, otherwise it is not possible to select. (explained in 10.2.5) Every parameter can be changed by selecting each particular value and entering a new.

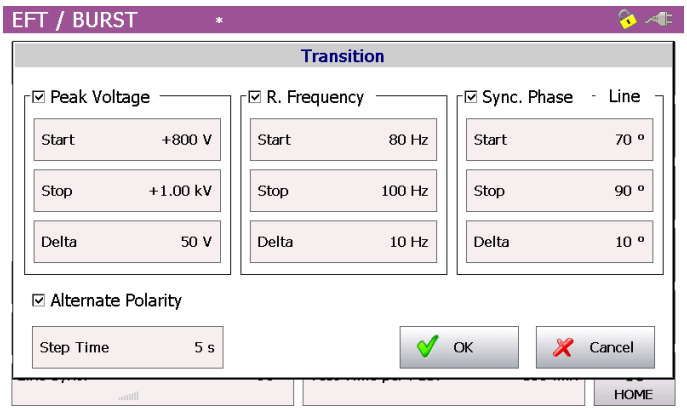


Figure 11-6: BURST Transition

When parameter finalized, it must be confirmed with “OK”. Then either the pre-compliance or standard mode gets open depending on previous operation mode.

11.2.4 Trigger

When selecting “manual trigger” the following window opens up. It gets applied to EUT by pressing the “Trigger” button. It gets always only one Burst package applied.

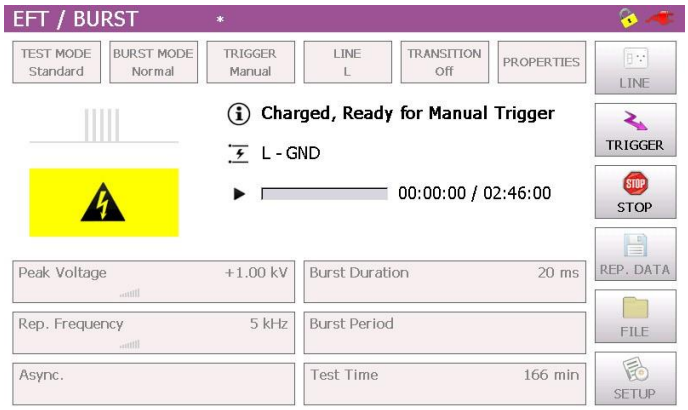


Figure 11-7: BURST mode Trigger normal

Furthermore, it shows between which line and GND the burst package gets applied. After finalizing the process, it will be stopped when pushing the “Stop” button. A manual report gets saved on the USB device, after selecting “Rep.Data” and “manual” selection in the “Setup” menu. When selected automatic (Figure 6-3 Setup Menu) it gets saved automatically on the internal SD card.

11.2.5 Synchronization

To synchronize the burst signal with the main supply source it is necessary to select in the menu “Synchronization” and then “Line Sync.”. Adjustments of the angle can be done in a range from 0°to 359°. However, if no power supply is connected to the EUT supply input at the rear view, it has to be entered “Async.”, otherwise it is impossible to get a Burst waveform in the output.

In external synchronization, the output with the position 8 Figure 6-2 Axos[8] back pannel in the rear view is in use. An external source could be for instance a manual CDN. Finally, normal operation through the touch screen is possible.

11.2.6 Burst mode

The Burst mode gives the user the option to select between “Normal”, “Continuous”, “Real” and “Random BURST” signals. Afterwards the function gets automatically displayed on the screen and can be applied to the EUT after pushing the “Start” button.

12 Voltage dips & interrupts

12.1 General information

For the voltage dips & interrupts only the EUT will be connected via the line outputs (L, N, PE) in the front view. The EUT Supply Input (L, N, PE) in the rear view gets connected to the power supply. For verification of the signal, Pos.4 and Pos.5 in Figure 5-1 can be connected to the oscilloscope. Further adjustments of the operation menu will be described in the following under captures.

12.2 Interrupts

Only the voltage interrupts it is possible to create without an external transformer. To create those interrupts there must be a connection between V dip and N via the purple banana plug, as seen in Figure 11-1. Additionally, it has to be connected to an external powers supply source. Afterwards it can be selected between pre-compliance mode and standard operating menu. The entering of “duration”, “interval”, “test time”, “synchronization” via touch screen by pressing each specific function (Figure 11-3). When pushing the function name a purple bow opens up and defines the parameter in the graphic. After successfully selecting the key parameter, the “start” button can be pushed and the parameter gets applied.

Figure 12-1: Voltage interrupts electrical installation

12.3 Dips

To create the Voltage dips an external transformer is necessary, because a second voltage level is required. When purchasing the DIP 116 from the HAEFELY AG the position 5 at the rear view graphic can be used. The Figure 12-2: DIP 116 Transformer connected gets displayed when DIP 116 is successfully connected. Exact hardware configuration of DIP 116 is described in capture 11.3.1. Fully compatibility is guaranteed with the AXOS[5].

Figure 12-2: DIP 116 Transformer connected

Only in this case the V dip voltage can be proportionally controlled regarding to the U1 nominal voltage via the touch screen or via remote software. Moreover all other adjustments are compatible with the AXOS[8]. Reference voltage according to the U1 nominal can be selected. V dip can either be 0%, 40%, 70% or 80% in reference to U1 nominal, when using the D116 transformer. The selection happens in the “Dip Voltage” menu field. When selecting 0% it creates a voltage interrupt, since the V dip becomes 0V.

The Figure 12-3: Voltage Dips Standard mode shows the voltage dips in standard mode. When pushing the particular function name: “Dip Voltage”, “Line sync.”, “duration”, “interval” and “test time a visual description gets open with a purple bow as seen below. For changing the parameter the value has to be pushed, for instance 5 min. New parameter can be entered. When pushing the button “file” data can be saved and loaded.

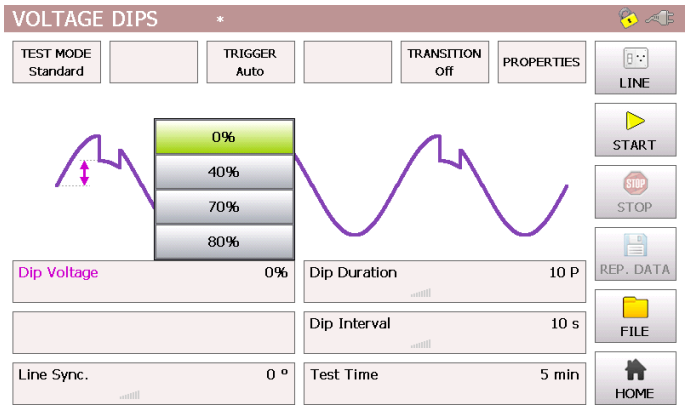


Figure 12-3: Voltage Dips Standard mode

The Figure 12-4: Voltage Dips pre-compliance mode (External transformer)represents the pre-compliance mode of the “voltage dips” menu. The purple bows define the function and show which particular parameter influenced the function. All parameters can be adjusted, when test is operating.

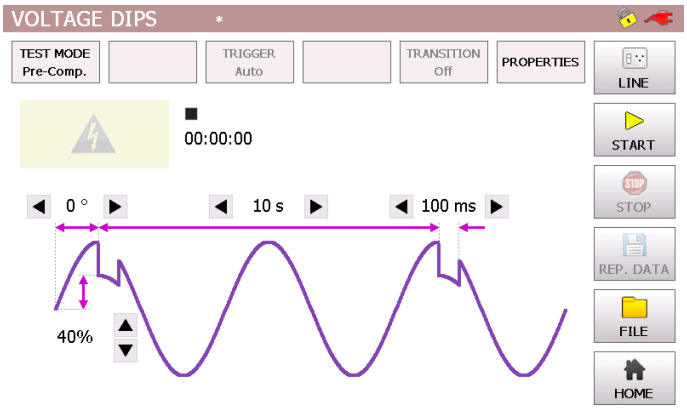


Figure 12-4: Voltage Dips pre-compliance mode (External transformer)

After all parameters have been adjusted and selected the “start” button can be pressed and the voltage dips starting. Significant, is the right selection of “Line Sync”, “Sync” and “external”. Only in either “line Sync” or “Sync” can the phase angle be selected, since an external power supply has to be connected, otherwise the synchronization with the phase would not be technical possible. However, by pushing the “home” button the starting menu.

12.3.1 Transformer DIP 116

The HAEFELY AG DIP 116 transformer will be connected through the V Dip and the Link input at the rear view of the AXOS^8. The DIP 116 has an independent connection to an external power supply via banana plug. Once the setup is done it can be fully automatically controlled through the touch screen of the AXOS^8, when being in the menu of “Voltage Dips”.

Figure 12-5: Transformer DIP 116

Then V dip 0%, 40%, 70% and 80% in reference to U1 nominal. Only with the DIP 116 the proportional voltage adjustment through the menu is possible. The second main advantage will be reflected in the compatibility of the transformer with the AXOS^8 compact immunity tester.

12.3.2 External transformer

The only connection from the external transformer (Figure 12-6: External transformer) with the compact immunity tester happens through V dip and N' at the rear view via banana plug. L and N from the external transformer gets connected to the power supply. The output voltage (between V dip and N) gets displayed as adjusted at the transformer. However, no further adjustment of the second nominal voltage in the AXOS^8 menu possible.

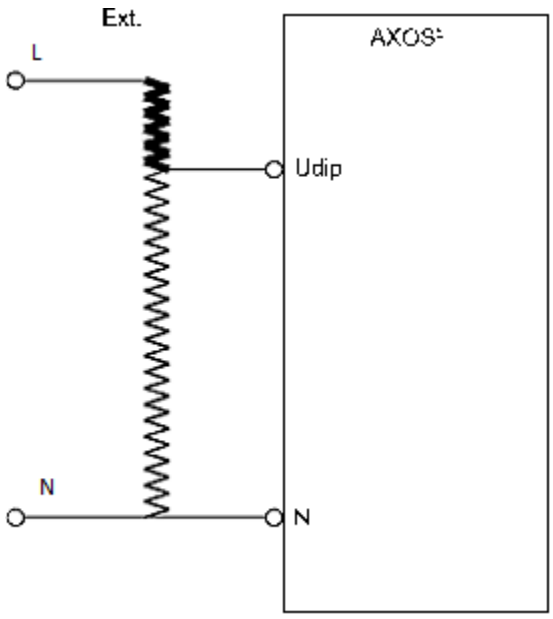


Figure 12-6: External transformer

Now the incoming V dip can be regulated directly at the transformer. Note: No further connection of the link data cable at the rear view possible.

12.3.3 Properties

Position	Description
External (Pin11 on Aux)	External condition (e.g. device or PLC signal), the position becomes 1 and causes an action (Ignore, Alarm, Test Stop or test stop & line off)
Line Current	Limits the current (L, N, PE front view) to the EUT.
Action: Ignore, Alarm, Test stop, Test stop & line off	Due to EUT fails, AXOS[8] cause an action which can be: Ignore, Alarm, Test Stop, Test Stop & Line off.
Line off	Voltage locked at L, N, PE when test has finished
Sound on or off	Acoustic signal when test ends

12.3.4 Transition

The Figure 12-7: Voltage Dips Transition shows the “transition” menu. It is possible to select independently “Duration”, “Interval”, “Phase” and “Alternate polarity”. To be able to select “phase” the Synchrony has to be either set as Synchronization or external Synchronization, otherwise it is not possible to access it. Eventually, every parameter can be changed by pushing the certain value.

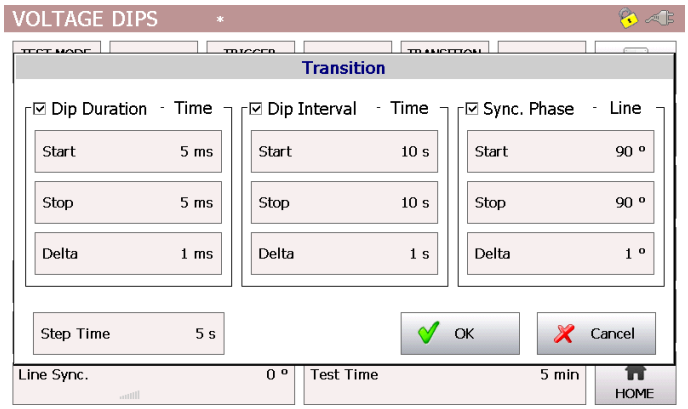


Figure 12-7: Voltage Dips Transition

When finalizing the parameter, it must be confirmed with “OK” and either the pre-compliance or standard mode gets open depending what selection was previously done. In addition the incremental intervals get displayed at each particular function name, like for example “interval”.

12.3.5 Trigger

The trigger can be accessed either from pre-compliance mode or standard mode when generator is not in use. The user can select after pressing the “trigger” button between: “auto”, “manual” and “external”. In “Auto”: signal gets applied automatically in accordance to parameters. In “Manual”: pushing the start button after “manual” selection, then pressing the “trigger” button. In “External”: Signal will be controlled from external source, connection through PIN 11 in Table 5-3.

13 Sequence

13.1 General information

The main aim of the sequence menu is to create automatic testing procedures. It contains either one or several steps. Possible steps are: Message, Timer, Test or comment. The sequence gets started automatically just by selecting the “start” button. The following points in this capture describe the operation menu more detailed and indicate few examples.

13.2 Sequence menu

To access the sequence menu the “sequence” button must be selected in the starting screen of the AXOS[8]

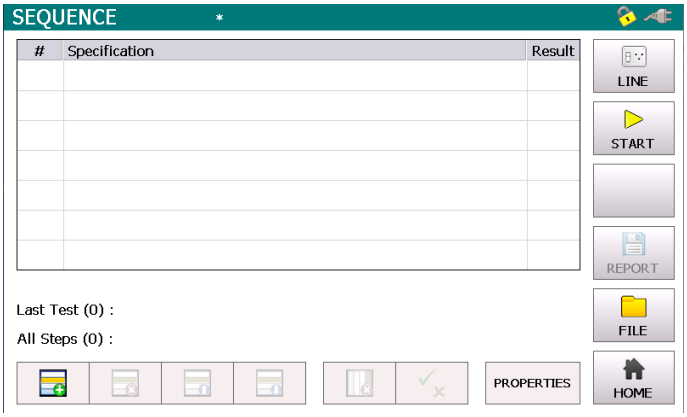


Figure 13-1: Sequence

In the left corner of the Figure 13-1: Sequence you can select between adding a new impulse, moving the step back and forward or simply deleting the entire function. There a behaviour of the EUT can be defined as seen below.

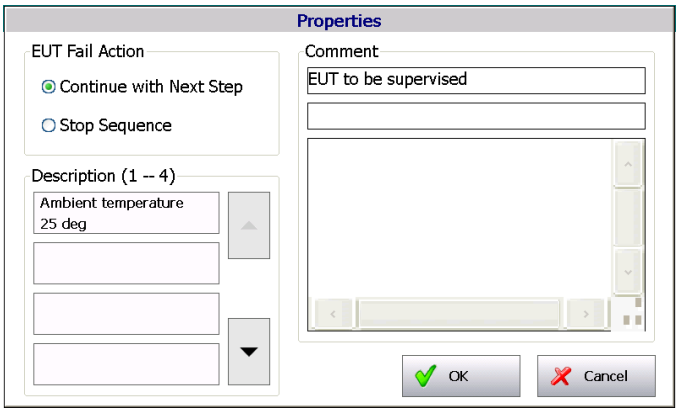
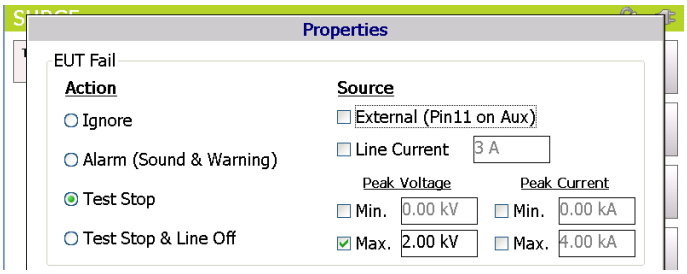


Figure 13-2 Properties Sequence

The “EUT fail Action” is linked to the menu of the properties setting in the particular impulse menu. There it can be for example the SURGE menu (when SURGE selected, could be also Ring Wave, Telecom Wave, or any other impulse).

The next graphic displays the SURGE properties menu. EUT causes the action stop when peak voltage > 2kV.



In the Figure 13-3: Header in description menu of Sequence and Figure 12-4 description and comments can be saved for a sequence file as well as Report data flies. Up to 16 pairs of description (header / content) can be saved.

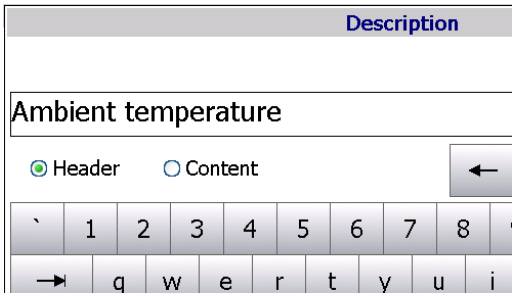


Figure 13-3: Header in description menu of Sequence

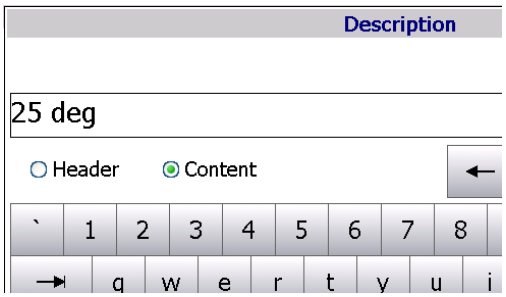


Figure 13-4 Content in description menu of Sequence

As a conclusion those information can be printed in the reporting tool of AXOS[8]. An example of the layout, header and content is shown below. (“reporting software”)

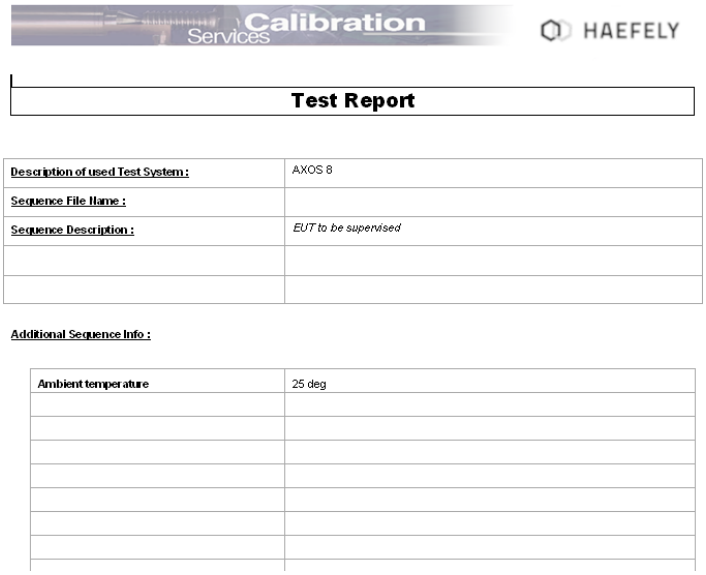


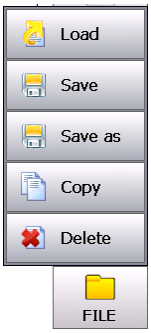
Figure 13-5 Test Report

13.2.1 Add step in sequence

With the following button  a new step gets added into sequence.

This icon adds a new step in the sequence menu. It can be either impulse, test, timer or comment.

When loading an existing “file” (which had been previously saved on internal SD card), “load” button must be selected. It works similar as in operating menu of single impulse form, for example combination wave generator.



Important:

No new test can be created, only existing file can be loaded from either the internal or standard directory. On the other hand adjustment of files can be done in normal application mode of either generator.

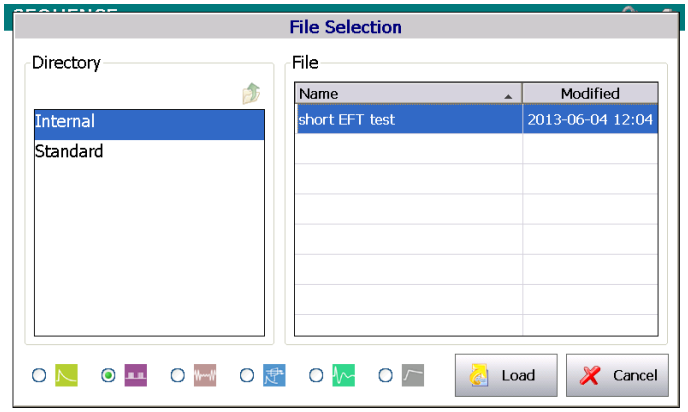


Figure 13-6: Sequence file selection

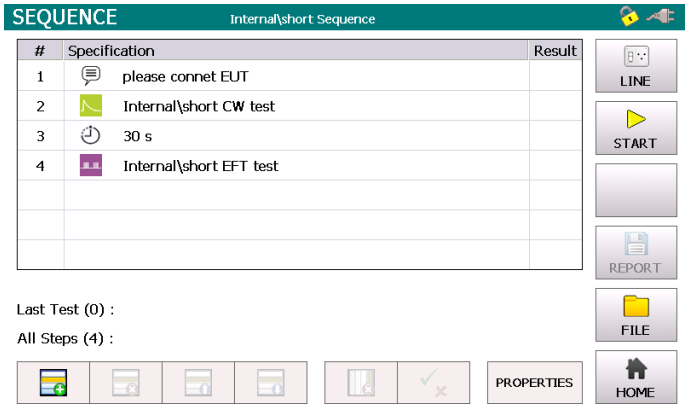
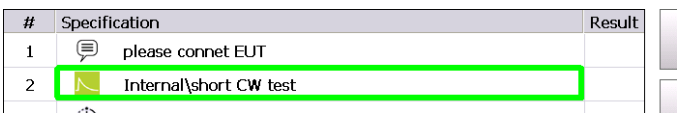
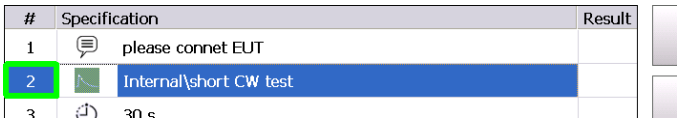


Figure 13-7: Sequence operation diagram

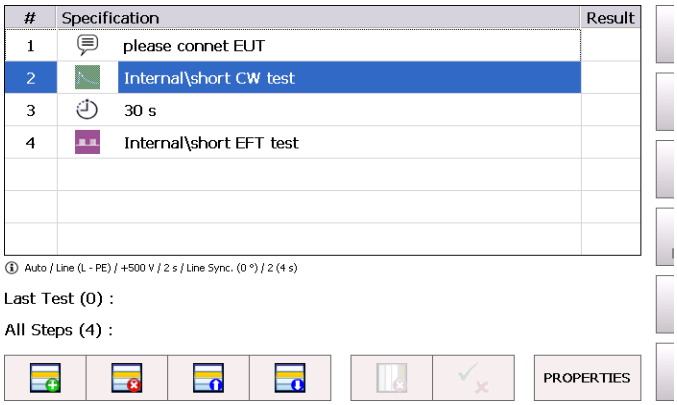
Steps can be editted by clicking on the Specification area of any Step, e.g. for Step #2:



Steps can be selected (without editting) by click the # area.



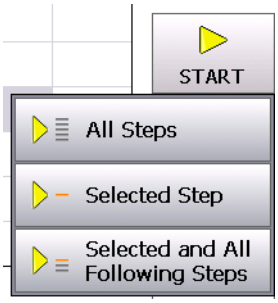
Selected Steps can be moved up, down or can be deleted by buttons 



At bottom of Sequence Steps ⓘ main parameters of selected Step are shown.

13.2.2 Start Sequence

After selecting the start following three options get displayed:



When selecting all steps every command gets applied to EUT and after finished following windows gets shown in accordance to programmed function.

Finally, when test sequence passed, Figure 12-8 comes up. It does not control the immunity criteria of the EUT. Must be checked manually as described in capture 12.2.3.

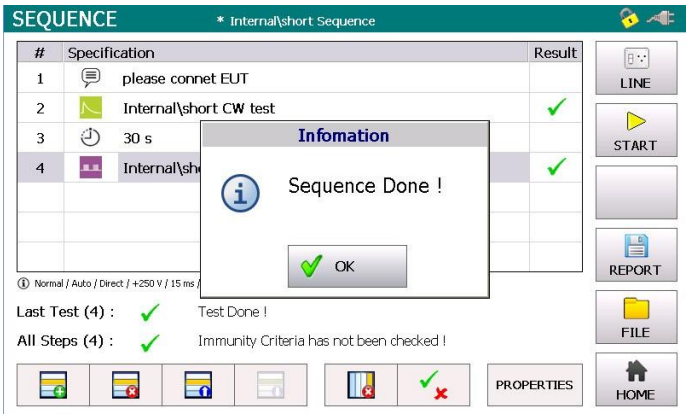


Figure 13-8: Sequence finished

13.2.3 Manually set & Complete sequence result

Sequence button  access the result dialog. There it is possibility to change the final result of the unit (Passed or Failed).

EUT immunity pass/fail criteria can be selected in Figure 12-9 as well.

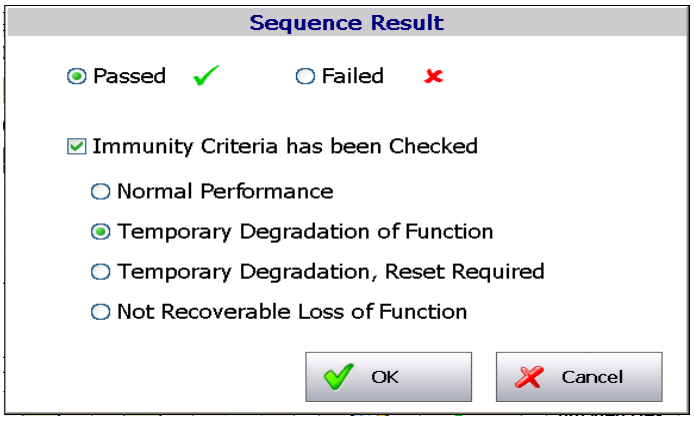


Figure 13-9: Figure 12-9 Sequence result

Criteria is saves when returining to sequence or after Axos is turned off.

13.2.4 Clearing of result

Sequence button  for clearing the test results column.

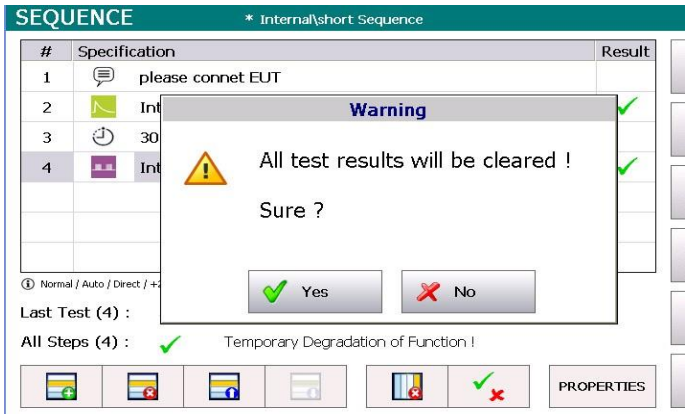


Figure 13-10: Sequence test result cleared

If you edit a Test Step, result will be cleared.

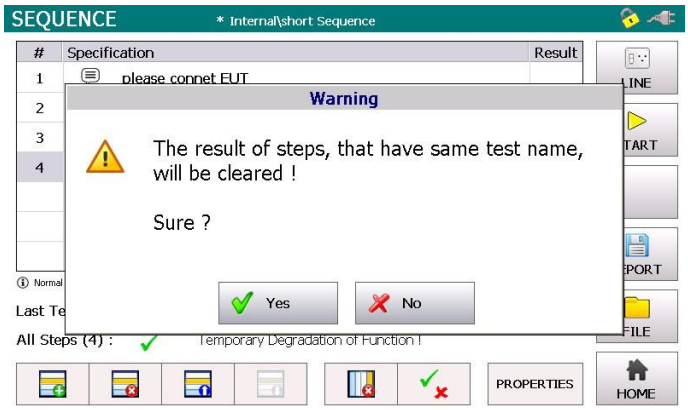
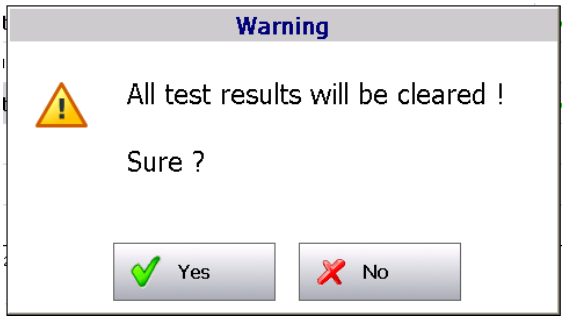


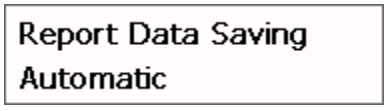
Figure 13-11: Sequence Test result of step cleared

Results will be cleared if you edit a test step.



13.3 Reporting of data

Report data is saved automatically or manually by REPORT button, according AXOS[8] Setup Report Data Saving



Each save of Report Data will create a folder on AXOS[8] internal storage and if insert, on external USB stick. This is same as for single Test Report.

Floppy symbol in header of Sequence dialog is blinking while report data saving to internal storage or external USB stick, and also while saving.

14 Remote Software

14.1 Remote Connection

Connection from remote device and AXOS[8] via RJ45 input at the rear view. Please download the free software “VNC Viewer” from the following link: http://www.realvnc.com/download/viewer/. The AXOS[8] uses the port 5900 for remote communication. In some cases VPN (virtual private network) is required, depending on network.

Significant: Use crossover cable.

The license code for the “remote GUI” will be accessed via “setup” menu as seen in Figure 5-3. Select “license manager”. After entering the license code for “remote GUI” (Figure 14-1), the “remote GUI” section becomes enabled in Figure 5-3.

When operating via WLAN only one remote device can control the AXOS[8], because of safety measures. However, it can be controlled parallel via remote device and touch screen of AXOS[8].

14.1.1 “Point to point” remote control

Connect Ethernet cable to RJ45 input at the rear view and to remote device, e.g. laptop.

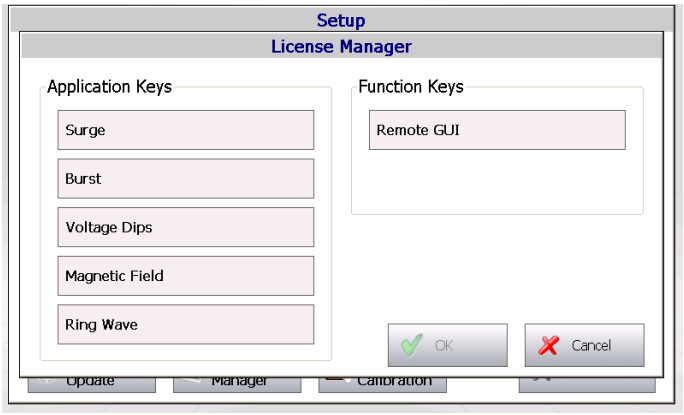


Figure 14-1: License manager

When key code for “Remote GUI” entered, it must be confirmed with “OK”.

Select in the set up window (Figure 6-3 Setup Menu) “remote GUI on”. In Figure 14-2: Ethernet communication, do not tick

“Enable DHCP” (Dynamic Host Configuration Protocol) as seen below. Use the displayed IP address and subnet mask for the following steps.

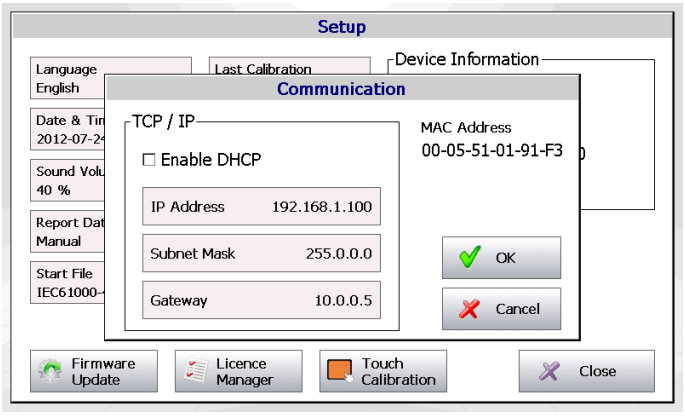


Figure 14-2: Ethernet communication

Setting of remote device with windows 7: Control Panel → Network and Internet → Network sharing Centre → local area connection status → local area connection properties → Internet protocol version 4 (TCP/IPv4) Properties.

The following window should be displayed. Now, changing the adjustments from “obtain an IP address automatically” in “use the following IP address”.

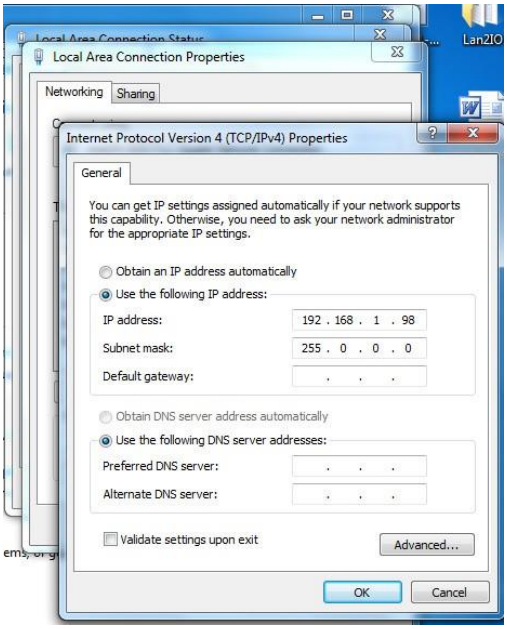


Figure 14-3: Inter Protocol Version 4 (TCP/IPv4)

Enter the new IP address as showed in the AXOS[8] operation window (e.g. Figure 14-2: Ethernet communication), however, the last digit must have ± 2 difference to initial IP address of AXOS[8]. Confirm with ok.

In the last step starting of installed free software “VNC Viewer”. Entering of exact IP-Address as displayed in Figure 14-4 as seen in the AXOS[8] operating window (e.g.192.168.1.100).

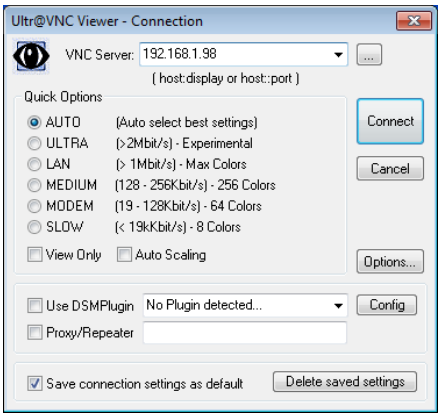


Figure 14-4: VNC Viewer – Connection

Finally, selecting “Connect” button and AXOS[8] gets controlled via remote device.

14.1.2 “WLAN” remote control

Connect either AXOS[8] to given network or to an access point. It depends, if the IP address gets automatically or manually selected through the network. Connection via access point would be usually manually and the process from “point to point” connection must be followed. However, when the network selection happens automatically, the DHCP must be ticked as below. Press “renew” and the IP Address will be given automatically to the AXOS[8].

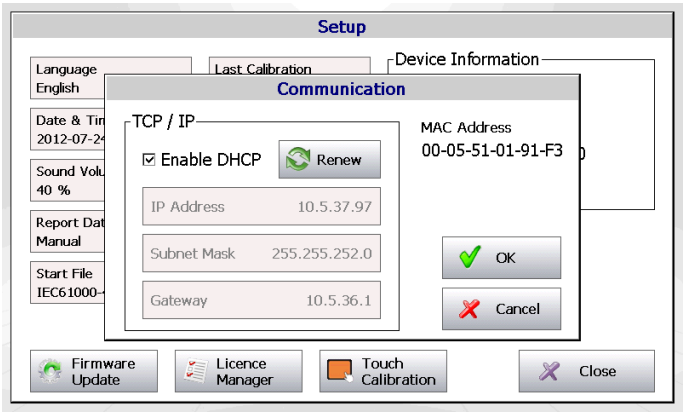


Figure 14-5: Communication, MAC Address

In the next step the automatic given IP address can be written in the VNC Viewer. Selecting of connect button and AXOS[8] can be operated via remote device.

Significant: AXOS[8] uses the port 5900 and it must be given free in the particular WLAN, to ensure impeccable communication of equipment. Additionally, if access to WLAN network secured, it is necessary to make use of the VPN. It is a general requirement to access a network with external remote device and not just particularly for the AXOS[8].

14.2 Reporting Software

The reporting software creates automatically a test report. (Figure 12-5)

The main header can be adjusted with for example individual logo of calibration laboratory or individual company.

The input of data can be either supplied directly via the remote control software or when saving the data on a USB device. Furthermore, the data can be used from the sequence mode menu directly and the report gets created.

Detailed information will be provided with the reporting software tool.

15 Troubleshooting

15.1 General

15.1.1 Introduction

This chapter describes the most common problems and describes how to remedy them. If you have difficulties in day-to-day work, check the common error messages in the next chapters. In case the malfunction can not be found there, please contact us. You should have the following information ready when you call:

- Model Number
- Serial Number
- Software version and options installed.

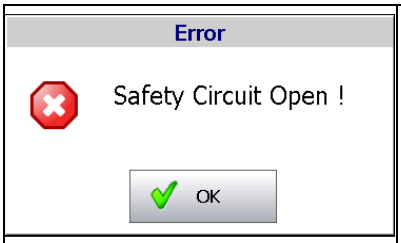
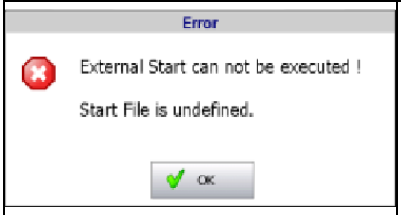
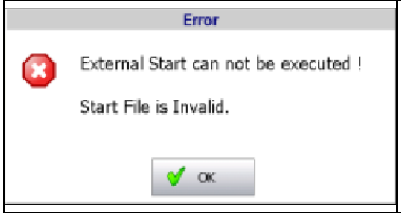
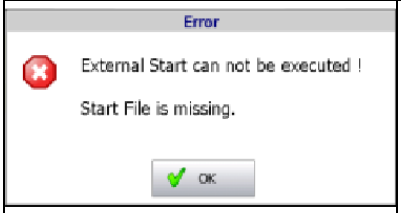
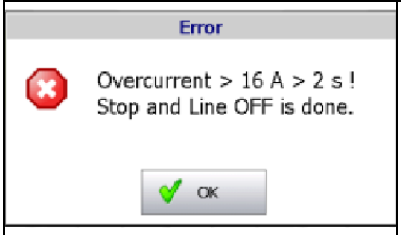
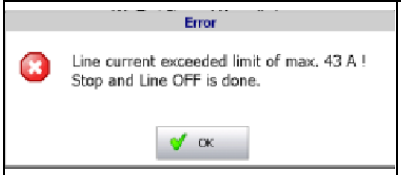
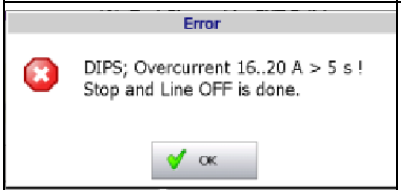
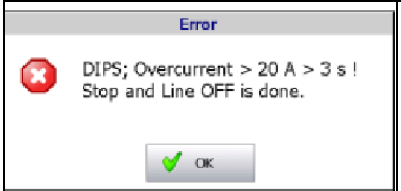
Measurement data and / or print screen will be of tremendous help for locating and solving problems.

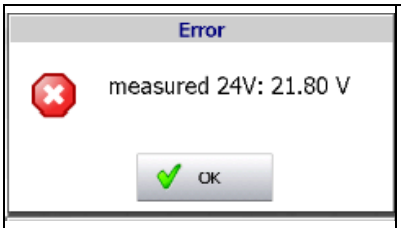
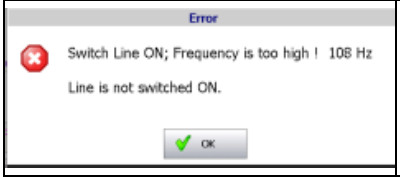
15.2 Error Messages

In the menu is a short summary of possible alarm messages which can occur when operating the AXOS[8].

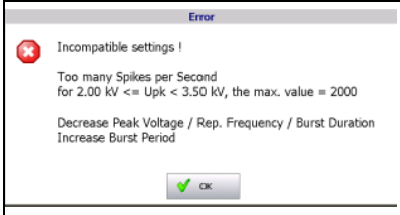
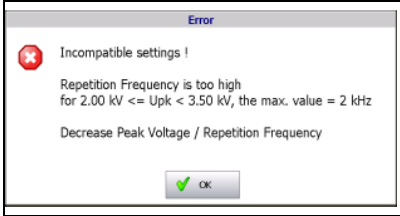
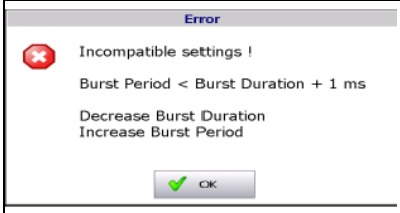
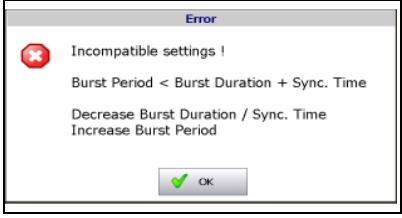
15.2.1 Troubleshooting

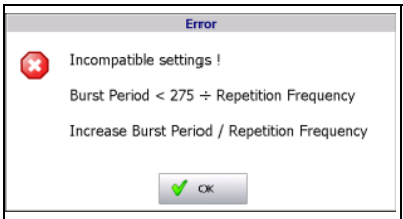
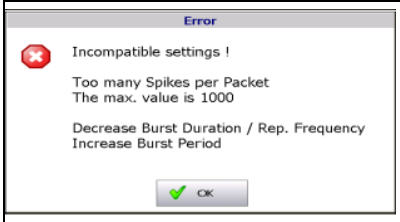
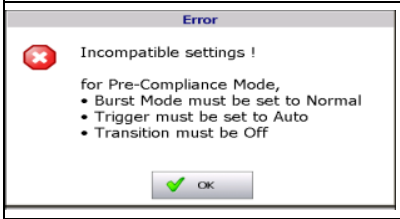
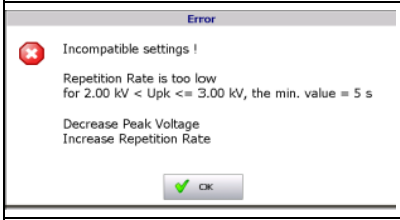
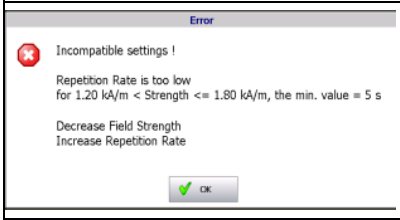
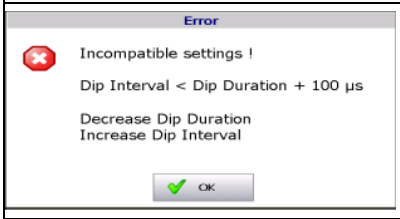
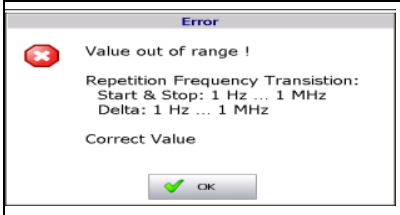
Alarm message	Possible cause	Action needed
	Safety Circuit opened	close Safety Circuit

	tried to start a Test with open Safety Circuit	close Safety Circuit and Start Test again
	no file defined in Setup Start File	define a Start File
	no valid file	define a valid Start File
	no valid file	define a valid Start File
	EUT requires more than 16 A support current, may EUT defect, short circuit EUT	-check Inominal of EUT (max. support with AXOS5 16A) -control EUT independently, short circuit might occurred, -External CDN necessary, if higher I nominal required
	EUT requires more than 16 A support current, may EUT defect, short circuit EUT, protection of AXOS[8]	
	EUT requires more than 16 A support current, may EUT defect, short circuit EUT	
	EUT requires more than 16 A support current, may EUT defect, short circuit EUT	
1 x beep and automatic shut down	at system startup any of internal supply voltages (not 24V) are out of range	send AXOS[8] for repair

	at system startup internal supply voltage 24V is out of range	send AXOS[8] for repair
	- bad or missing Function Key - internal storage card missing or damaged	- go to Setup License Manager and check for correct numbers - send for repair
	Frequency of EUT Supply Input is too high	use EUT Supply Input voltage with nominal frequency of 50 or 60 Hz
	L and N on EUT Supply Input are exchanged	Exchange L and N on EUT Supply Input

15.2.2 Logic errors

Alarm message	Possible cause	Action needed
	Too many spikes per second	Decrease peak voltage / rep. frequency / Burst or increase burst period
	Repetition frequency is too high	Decrease peak voltage , repetition frequency
	burst period / burst duration incompatible	Decrease burst duration / Sync. time
	Incompatible settings	Decrease burst duration /Sync. Time increase Burst period

	Incompatible settings	Increase burst period, repetition Frequency
	Too many spikes per packet	Decrease Burst duration, Rep. Frequency, Increase Burst period
	Incompatible settings for pre-compliance mode	Burst mode must be set to Normal, Trigger must be set to Auto, Transition must be set off
	Incompatible settings	Decrease peak voltage, increase repetition rate
	Incompatible settings	Decrease field strength, increase repetition rate
	Incompatible settings	Decrease dip duration or increase dip interval
	Entered value out of range	Value must be in the range of min. and max. value Note: Similar error can occur, only with different units, however, similar action for solving

16 Service, Maintenance and Contact Information

HAEFELY has a worldwide network of representatives and local service points providing a wide range of services way beyond standard customer support for sales and after-sales inquiries.

Highly skilled and experienced customer support teams guarantee you seamless worldwide service for all our products. Their high level of knowledge is reinforced by continuous, comprehensive product and service training sessions in collaboration with the respective development and production areas as well as our quality management team. In addition to general hotline services, product application training, engineering consulting, assistance with spare parts, repairs and periodical maintenance, there is a wide range of calibration and upgrade services available for our customers all over the world.

16.1 Warranty Information

16.1.1 Guarantee period

The guarantee period is 24 months, or 6 months in case of a multi-shift system. It starts when the supplies leave the works or at the taking-over of the supplies and services should such taking-over have been agreed upon before, or, if the supplier undertakes the erection, upon completion thereof. If dispatch or taking-over or erection are delayed due to reasons beyond supplier's control, the guarantee period shall end not later than 18 months after supplier's notification that the supplies are ready for dispatch.

For replaced or repaired parts the guarantee period starts anew and lasts 6 months after replacement or completion of the repair or taking-over, but not longer than the expiry of a period being double to the guarantee period stipulated in the preceding paragraph.

The guarantee expires prematurely if the customer or a third party undertakes inappropriate modifications or repairs or if the customer, in case of a defect, does not immediately take all appropriate steps to mitigate the damage and give the supplier the possibility of remedying such defect.

16.1.2 Liability for defects in material, design and workmanship

Upon written request of the customer, the supplier undertakes at its choice to repair or replace as quickly as possible any parts of the supplies which, before the expiry of the guarantee period, are proved to be defective due to bad material, faulty design or poor workmanship. Replaced parts shall become supplier's property. The supplier shall bear the costs of remedying the defective parts in its works. If the repair cannot be carried out in supplier's works, the customer shall bear

the related costs to the extent exceeding the customary costs of transport, personnel, travelling, living, dismantling.

16.2 Maintenance

Proper maintenance of your test equipment is crucial to its continued operation and can prevent malfunctions from bringing your production to a halt.

16.2.1 Cleaning the Instrument

The instrument should be cleaned with a lint free cloth, slightly moistened using mild household cleanser, alcohol or spirits. Caustic cleansers and solvents (Trio, Chlorothene, etc.) should definitely be avoided. In particular, the protective glass of the display should be cleaned from time to time with a soft, moist cloth such as used by opticians.

16.3 Verification

In the next captures are descriptions of our additional verification equipment for the AXOS[8]. If further information required of any of the equipment, please either contact your sales representatives or the HAEFELY AG technical support team directly.

16.3.1 Waveform OCV (Surge)

The HAEFELY PDP8000 is a differential impulse measurement probe that can be used to measure surge pulses. Two banana plug cables are provided as the High and Common inputs to the PDP8000, and a coaxial output is provided for connection to an oscilloscope. The divider ratio is 1000:1 and the PDP8000 is rated up to 8kV for surge, 690VAC or 400VDC. The two banana plug will be directly connected to “direct” or “line” output in the front view.

Figure 16-1: PDP 8000

16.3.2 Waveform SCC (Surge)

The current transformer is necessary to verify the SCC waveform. It will be connected with pos.6 and pos.7. Then the outgoing BNC output creates the connection to the oscilloscope. The SCC gets displayed on the oscilloscope and can be compared with the parameter as shown in the operation menu from the AXOS[8]. It represents the signal in accordance to the IEC 61000-4-4. The same test procedure gets applied for L, N, PE output at the front view.

Significant: Do not connect the “EUT Supply Input” with external power supply at the rear view, when using the current transformer. It can be directly purchased through the HAEFELY AG or contact your sales representative.

Figure 16-2: Current transformer

16.3.3 Electrical fast transient/Burst

The HAEFELY EFT Verification Kit includes a 50 Ω and 1000 Ω attenuator as required in the IEC 61000-4-4 standard. The appropriate attenuator is fitted to the “Burst” coaxial output, and an oscilloscope is then connected to the output of the attenuator. For measuring the waveform at the output of the coupling filter, single phase and three phase adapters are available. NOTE: Be sure to disconnect mains power from the “EUT Supply Input” before connecting the measuring attenuators. Measuring attenuators are designed for burst voltages only and will be destroyed if subjected to AC/DC voltage.

Figure 16-3: EFT Verification Kit

16.3.4 Burst verification adapter

Additionally, an EFT verification adapter is available for testing of every single phase (L, N, PE front view from AXOS). It gets connected with the PE pin (Pos. 12 Figure 5-1) and every single phase (L, N, PE Figure 5-1).The BNC output of the burst adapter is then connected to the oscilloscope. Do not connect “EUT Supply Input” to power supply, when verification of burst output.

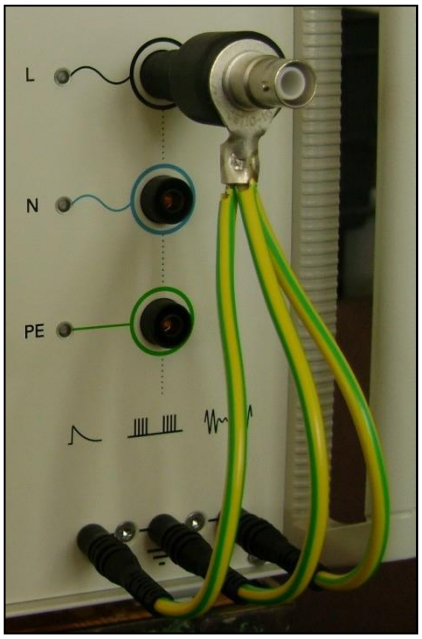


Figure 16-4: Burst verification adapter

16.4 Calibration

Calibration period of the AXOS has to be determined by the user, and depends on the intensity of use and end user requirements. However, it is recommended every 2 years. The AXOS is factory calibrated before shipped and supplied with the calibration certificate in accordance to ISO 9001 management standard.

When delivered new from the factory, the instrument is calibrated in accordance with the calibration report provided. A periodical calibration of the instrument every two years is recommended.

If you are experiencing any trouble with your equipment or are in need of calibration we can determine if someone should come onsite to your facility.

16.5 Spare Parts

Basically, only original replacement parts can be used. HAEFELY can obtain original or equivalent replacement parts. For an efficient work, the customer support needs the following system specific information:

- Project number of the system
- Client's name
- System name plate information of the main components, which contain the replaceable part
- Detailed description of the component that has to be replaced, if possible with picture

16.6 Repair (RMA)

If you are experiencing any trouble with your equipment we can determine if someone should come onsite to your facility for further evaluation and repair or if the equipment should be sent to our factory.

Please note that any equipment that is being sent to the factory for evaluation, repair and or calibration, must have an **RMA (Return Material Authorization)** Number. Please download our easy to use RMA Form by simply clicking the blue RMA Request Form button on the right hand side of this page.

16.7 Support

Software Updates

HAEFELY runs an Internet Update webpage where owners of our test instruments can download the latest firmware, software, manuals, related information etc.

The HAEFELY update page can be reached after log in:

http://www.haefely.com/

Technical Support

If persistent problems or faulty operation should occur, please contact the Customer Support Department of HAEFELY or your local agent. The Customer Support Department can be reached at the following address found in chapter 16.8

We prefer contact via email. Then the case is documented and traceable.

Also the time zone problems and occupied telephones do not occur.

Complete information describing the problem clearly helps us to help you:

Failure description

Used settings

DUT type

Firmware Version

Serial Number

MAC address

Printouts, Pictures, …

16.8 Addresses / Webpage

16.8.1 Europe Office

Haefely AG	
Birsstrasse 300 | 4052 Basel | Switzerland	
Phone	+ 41 61 373 4111
Fax	+ 41 61 373 4912
Sales E-Mail	sales@haefely.com | sales@tettex.com | emc-sales@haefely.com
Service Phone	+41 61 373 4444
Service E-Mail	emc-support@haefely.com

16.8.2 China Office

Haefely AG Representative Beijing Office	
8-1-602, Fortune Street | 67, Chaoyang Road, Chaoyang District | Beijing, China 100025	
Phone	+ 86 10 8578 8099
Fax	+ 86 10 8578 9908
Sales E-Mail	sales@haefely.com.cn

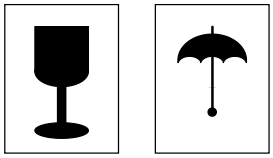
16.8.3 Webpage

Main Page	https://www.haefely.com
Update Page	https://www.haefely.com Login (Log in required)

17 Transport and Storage

17.1 Transport and Packaging

The packing of the equipment provides satisfactory protection for normal transport conditions. Nevertheless, care should be taken when transporting the equipment. If return of the equipment is necessary, and the original packing crate is no longer available, then packing of an equivalent standard or better should be used.



Whenever possible protect the equipment from mechanical damage during transport with padding. Mark the container with the pictogram symbols „Fragile“ and „Protect from moisture“.

17.2 Storage

If the instrument is to remain unused for any length of time, it is recommended to unplug the mains lead. In addition, it is advisable to protect this high precision instrument from moisture and accumulation of dust and dirt with a suitable covering.

18 Disposal, Recycling and Onward Transfers

When the equipment reaches the end of its working life it can, if required, be disassembled and recycled. No special instructions are necessary for dismantling.

The instrument is constructed of metal parts (mostly aluminium) and synthetic materials. It might contain batteries (see the product specification). The various component parts can be separated and recycled or disposed of in accordance with the associated local rules and regulations.

19 Conformity

HAEFELY

Current and voltage – our passion

Declaration of Conformity CE

Haefely AG
Birsstrasse 300
4052 Basel
Switzerland

declares, under its sole responsibility, that the product here mentioned, complies with the requirements of the listed standards or other normative documents.

So, the product complies with the requirements of the EMC Directive 2014/30/EU, the Low Voltage Directive 2014/35/EU and the RoHS Directive 2011/65/EU.

Product:	**AXOS 8**	
	DIP 116	(optional extension module)
	TW 8	(optional extension module)
Description:	The AXOS 8 is an EMC compact tester. It is used to verify the conducted immunity of electrical products. DIP 116 extension is used to test voltage dips according to IEC/EN 61000-4-11. TW 8 extension is used to test 10/700us surges according to ITU and other standards.	
Standards:	EN 61010-1:2010 EN 61326-1:2013	

Dr. Rolf Schmerling
Quality Department Manager
Haefely AG
4052 Basel
Switzerland

Basel, October 8th, 2019

(Signature)

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20 Notes

precision. swiss made.

Global Presence

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I INSTRUMENTS
E EMC