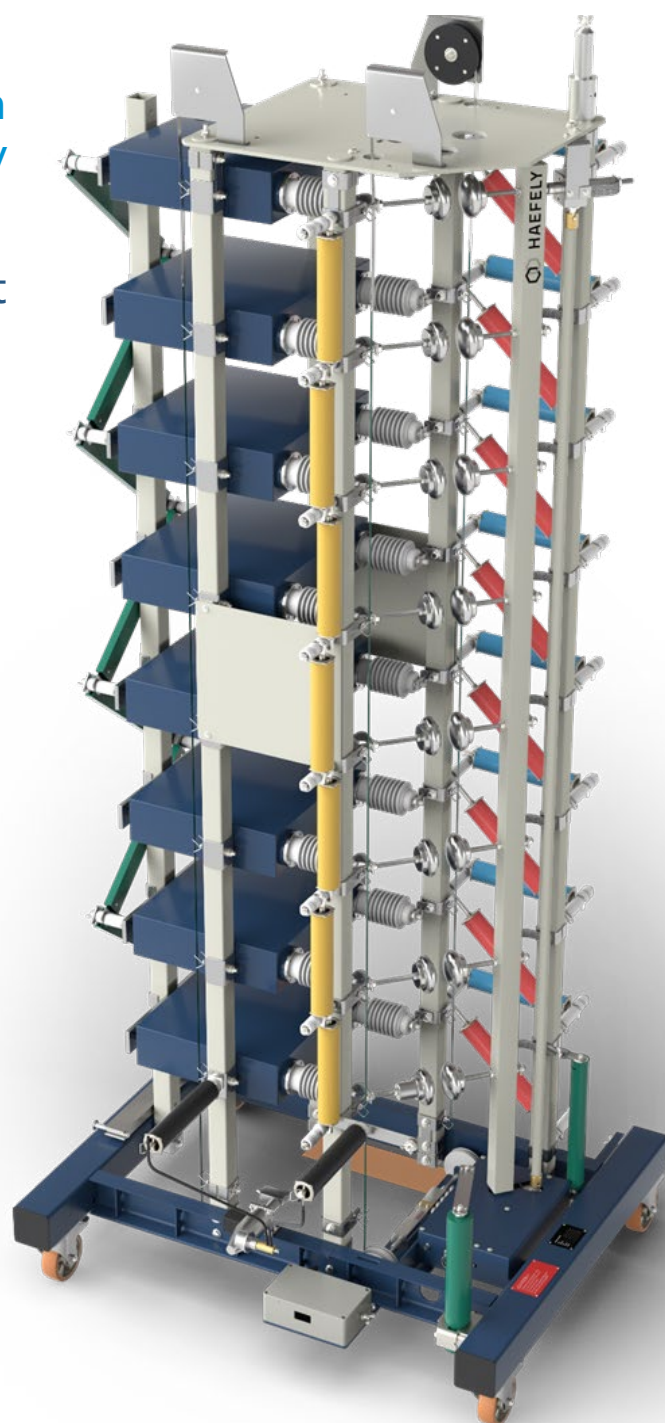


# SGSA

Impulse Voltage Test System  
100 kV - 1'200 kV

Leaflet



**HAEFELY**

Current and voltage – our passion

# General Description

SGSA impulse test systems can be used to generate impulse voltages simulating lightning strokes and switching surges. The total charging voltage ranges from 10 kV to 1'200 kV with a per-stage energy of 5 kJ. The system has all our experience acquired, in building Impulse Generators since 1932, behind it.

Applications covered include testing according to IEC, ANSI/IEEE as well as other national standards.

A number of optional additional circuits and components can be included to optimize the impulse test system.

A control system rated to Safety Integrity Level 3 charges the impulse generator through the charging rectifier

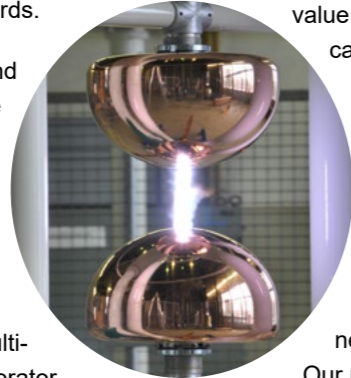
SGSA generators are based on MARX multiplier circuits. The stages in the impulse generator are connected and charged in parallel via the charging resistors. Charging time and charging voltage can be selected by the operator.

Once the selected charging voltage has been reached, a trigger pulse initiates firing of the first spark-gap of the impulse generator. The resulting over-voltage triggers the successive stages. As all the spark-gaps fire, the stages which are in series now, multiply the charging voltage to reach the test voltage.

An impulse voltage divider reduces the impulse voltage to a value that the measuring and recording instruments can use.

The major impulse circuit elements such as capacitors and resistors are arranged in an optimum manner to simultaneously satisfy the two major requirements, smallest possible internal inductance and operating convenience.

The electronic measurement and control components are designed and manufactured in-house. Our many years of experience in dealing with electromagnetic compatibility of electronic devices in high voltage test bays provide the requisite expertise and a trouble-free operation and a long service life are thereby ensured.



## Features

- Charging voltage from 10 kV up to 1'200 kV
- Energy per Stage 5 kJ
- Fast & unique grounding system
- Resistors connected in slip-in sockets
- Mobile on castors

## Advantages

- ✓ Fits every application
- ✓ Wide range of test objects covered
- ✓ Heightened safety
- ✓ Easy to configure
- ✓ Easy relocation in the test field



## Components

- Impulse Generator stack
- Charging Rectifier
- Impulse Voltage Divider
- Control System - HVC 300
- Impulse Analyzer - HiAS 744



## Accessories and Options

- Shunts
- Termination Resistors
- Chopping Gaps
- Glaninger Circuits
- Series Overshoot
- Impulse Current Generation

### Grounding system

The integrated earthing system consists of two earthing switches which discharge the impulse capacitors via earthing resistors. Additionally, motorized earthing strips create a short circuit across all capacitors and ground all stages.



### Protection of Test Objects and Test Systems

The test system is shut down in case of over-voltage, over-current or fast voltage transients.

### Spark Gaps

Spark gaps are located inside the generator structure. One hemisphere is attached to the stack and the other is mobile. A vertical shaft moves all the hemispheres at once.

### Resistors

They are the wave shaping elements and wire-wound for high stability and linearity and are wound on tubes and protected by shrink wrap. Each resistor value has a specific colour for easy identification. These resistors have a plug-in connection for quick and easy reconfiguration. The basic system includes a set of resistors for lightning impulse voltages according to IEC 60060-1

### Resistor Holders

Connection rods with multiple slip-in sockets are mounted and can hold up to 4 resistors



# HVC 300

Latest generation of impulse controls.



HVC 300 is the continuation of a long line of highly successful Haefely Impulse Controls. HVC 300 takes the safety aspect of a High Voltage control UP several notches. It uses **Fiber Optic cables** to connect to the HV hardware in the test field and protects the operator and equipment in the control room completely.

The design of the interface is ultra-modern and utilizes sophisticated visualization techniques only found in the latest mobile devices.

Automating impulse testing is extremely easy- just

fill the tables with required values and the software does the rest.

HVC 300 software shows previews of waveforms which will result from the setting entries made. User can review this and decide to go ahead with the shot or change the setting.

Generator settings are easily visible and accessible. No more digging deep into menus to find the setting needed.

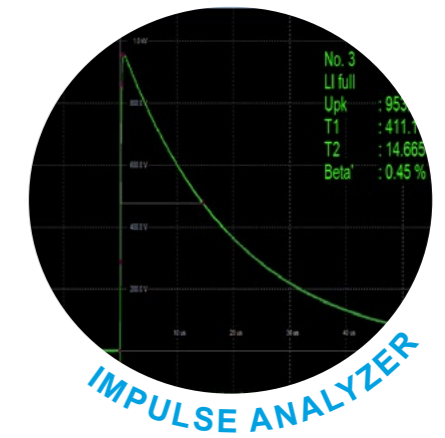
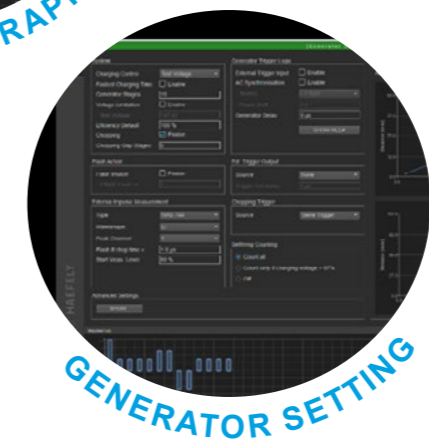
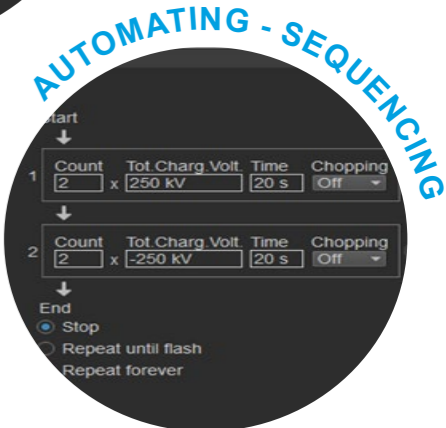
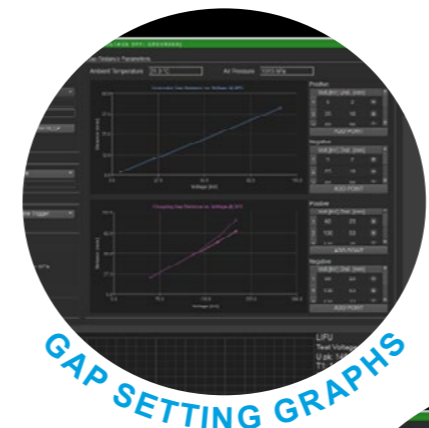
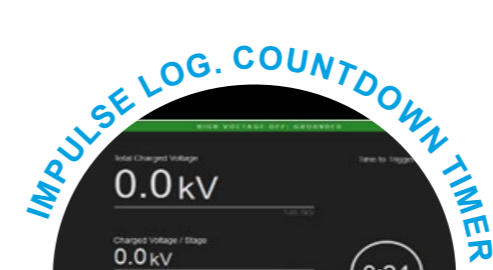
## Features

- Fiber optic connection to the HV section
- Safety Integrity Level - 3 ( SIL 3 ) compliant
- Computer is EMC proof
- Standard SPS components

## Advantages

- ✓ Separation of operator and test field
- ✓ Maximum reduction of risk. High safety
- ✓ Uninterrupted working in a harsh environ
- ✓ Easy availability of spares

Rugged Optic Fiber with Harting Connectors



## Software

- Dark mode User interface
- Wave shape and Polarity preview
- Impulse Countdown timer
- Failures and Alarms prominently visible
- Automated testing
- ✓ Great Visualization
- ✓ All relevant parameters highly visible
- ✓ Know the exact moment of firing
- ✓ Heightened safety
- ✓ Tests are quicker and easier to setup



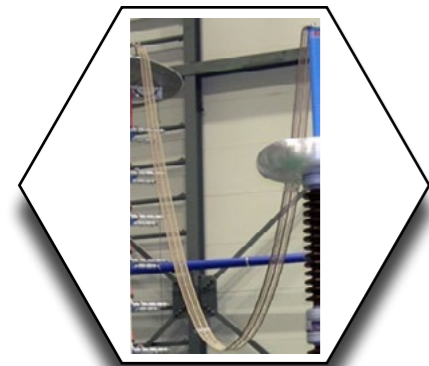
**Glaninger Circuit** is utilised when testing very small inductances, such as the low voltage windings of transformers. This test set can significantly expand the inductive load range of a generator. The circuit is connected to the first or second stage of the impulse generator.

The components are mounted on a wheeled trolley to ease movement in the test field

**Shunts** are used for the measurement of impulse currents. The wave shape of the measured current can be displayed on a Haefely digital impulse analyzing system HiAS 744.

Sleeve shunts, shown here, are consisting of a metal cylinder with coupling flanges and coaxial measuring connector. Interchangeable low-inductive resistor-sleeves can be built into the metal cylinder. A set consists of one cage and three sleeves of 2, 5 and 10  $\Omega$

Other shunts of different values and current capacities are available.



**TERM** ribbon type termination resistors are used when it is difficult to obtain correct impulse shape while testing transformer windings of low impedances. These resistors help to increase the impedance of the test object and are usually utilized together with additional parallel resistors and the Glaninger Circuit.

IEC 60076-3 (2013), §13.1.4.1 / IEEE C57.98 (2011), § 4.1.2.1 & 4.1.3.2 permit resistors up to max. value of 400 Ohm (IEC) / 500 Ohm (IEEE)

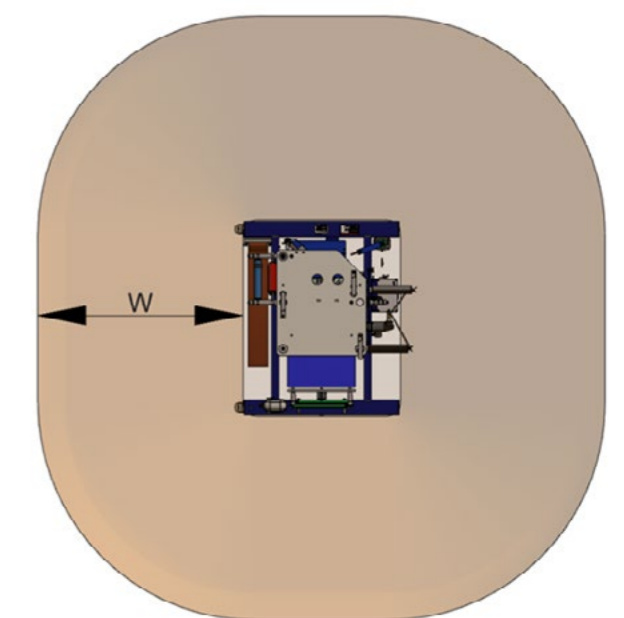
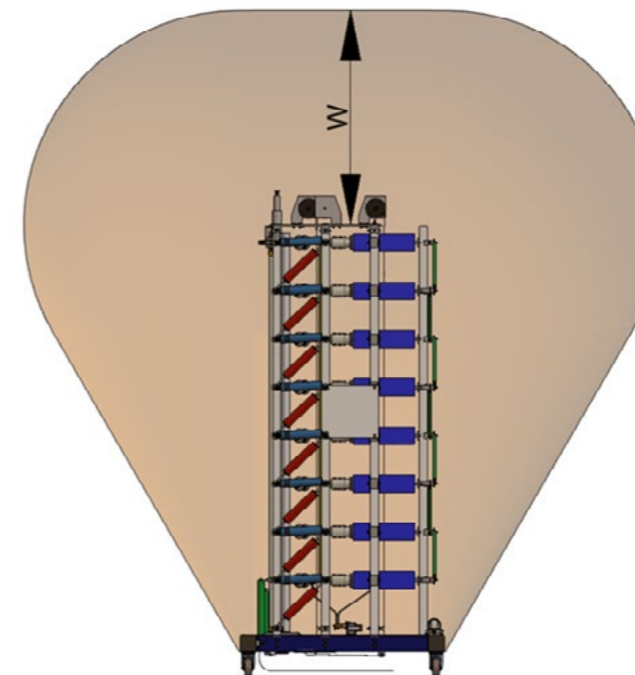
**HiAS 744** is the best digitizer on the market today. From 1997: over 500 HiAS / DiAS have been put into operation. With 16-bit resolution at 250 MS/s, 100 MHz analog bandwidth, HiAS is the highest resolution impulse analyzer.

HiAS is an optically decoupled front-end solution. It accepts  $\pm 2000$  Vpk down to  $\pm 5$  Vpk analog input range with LEMO 4S connector and is over voltage tested to  $\pm 6000$  Vpk



## TECHNICAL DATA

Stages	Max Charging Voltage kV	Max Energy kJ	Height m	Length m	Width m	Net Weight kg	Clearance Li W m
1	100	5	1.1	1.2	1.5	250	0.2
2	200	10	1.4	1.2	1.5	330	0.4
3	300	15	1.8	1.2	1.5	410	0.6
4	400	20	2.1	1.2	1.5	490	0.8
5	500	25	2.5	1.2	1.5	570	1.0
6	600	30	2.9	1.2	1.5	680	1.2
7	700	35	3.2	1.2	1.5	770	1.4
8	800	40	3.6	1.2	1.5	860	1.6
9	900	45	4.0	1.8	1.6	950	1.8
10	1000	50	4.4	1.8	1.6	1140	2.0
12	1200	60	5.2	1.8	1.6	1310	2.4



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**HAEFELY**

Current and voltage – our passion

