

# KIT 4.0

## High Voltage Construction Kit

### Leaflet



**HAEFELY**

Current and voltage – our passion



## GENERALITIES

The **KIT 4.0** is a high-voltage system made of easily configurable elements. Due to its modular design, it is the ideal tool kit for conducting experiments in a university, in an R&D lab, or for a research application. A variety of experiments are possible with the generated AC, DC, and impulse voltages. Configurations are not only easy to put together, they also occupy very little space. A fully assembled experiment occupies an area of 12 m<sup>2</sup> and a volume of approx. 30 m<sup>3</sup>.

### KIT 4.0: NEW GENERATION, LATEST TECHNOLOGY

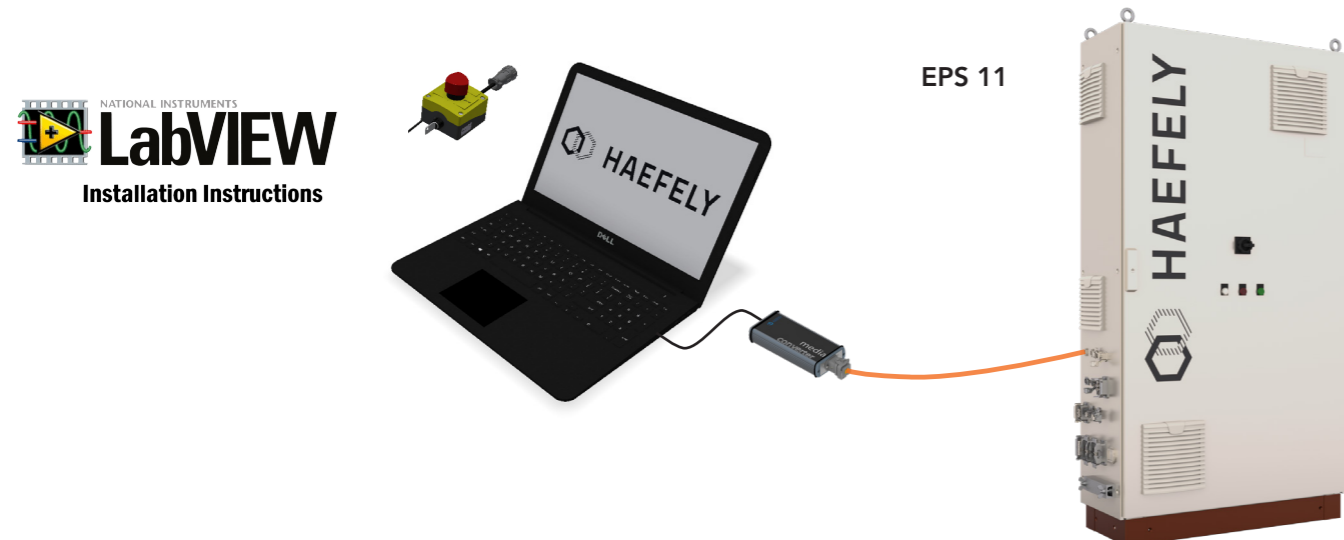
The HAEFELY High-Voltage Construction KIT 4.0 integrates state-of-the-art technology, offering variable frequency experiments to students with safety SIL 3 certification. It integrates an electronic front end, digital oscilloscope for voltage and current measurements, and a completely revamped accessories set. All components have their own NI LabVIEW function block, making the KIT modular in software as well as in hardware.

LabVIEW, a market leader, is a system-design platform and development environment for visual programming language. This software add-on enables new possibilities and greater flexibility such as automated test sequences with data recording.

### QUICK & EASY SET-UP TECHNOLOGY

The configuration is built up by inserting different KIT elements into connection cups or floor pedestals to form a self-supporting arrangement. Every connection cup has two vertical and four horizontal connection possibilities. All components have the same length and the same mechanical mating. No additional tools are required. Thanks to this simple but sophisticated design, the user can create and recreate his set-up quickly and efficiently.

The Electronic Power Supply (EPS), the measuring path, and all active accessories are controlled via the LabVIEW platform (modular visual programming).



## FEATURES

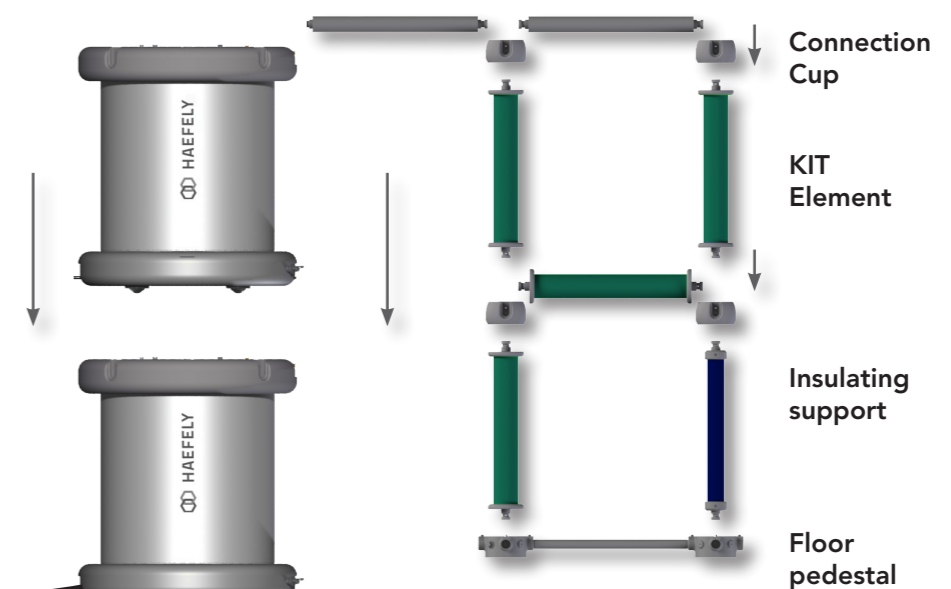
- Based on single high-voltage elements
- Compact AC, DC and impulse voltages test system
- Modular configuration
- Electronic front-end
- Partial discharges free
- SIL 3 with Galvanic Isolation
- Computer controlled with windows based user interface
- LAB View control

## ADVANTAGES

- Perfect for education, students learn by mounting the system using the available elements.
- Ready for research, materials and single parts can be tested with AC, DC or impulses using minimal space.
- Customer decides test and voltage and the necessary elements are delivered.
- Future extensions possible just by acquiring the required high voltage components.
- Extremely fine regulation, testing at low voltages or exact voltages possible.
- Variable test frequency, test at different frequencies than mains or perform a frequency variable test.
- Partial discharges test with high sensitivity.
- The Windows based software allows the basic, clear buttons and indicators helps to control the system.
- With the LABView Module sequences or sophisticated test procedures can be easily programmed by the user.

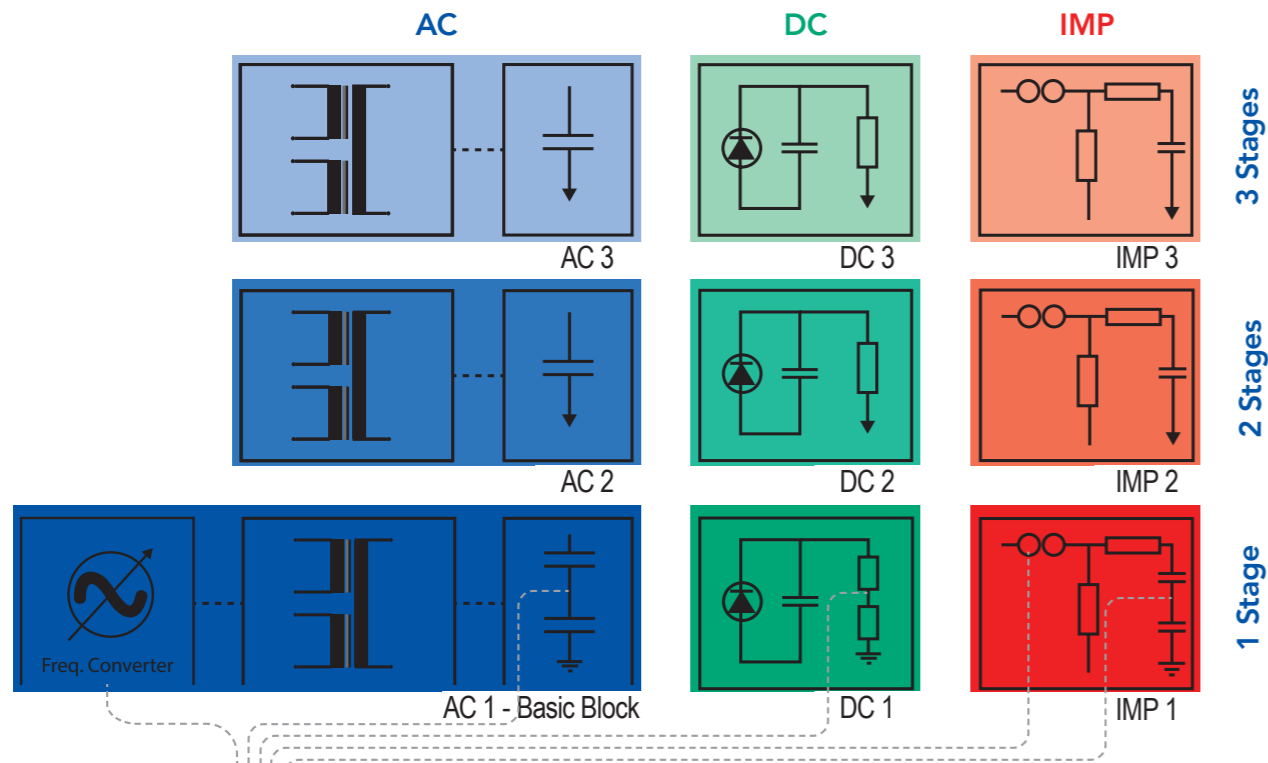
### AC Transformer

### Connection Rod



# KIT CONFIGURATION

The KIT 4.0 configuration is modular and can be extended at anytime. The AC 1 block is the basic block, which will include a 100 kV AC transformer, an electronic power supply cabinet with the control unit. Additional blocks, such as AC 2, 3, DC 1, 2, 3 and IMP 1, 2, 3 can be added to complement the AC 1 block depending on testing needs.



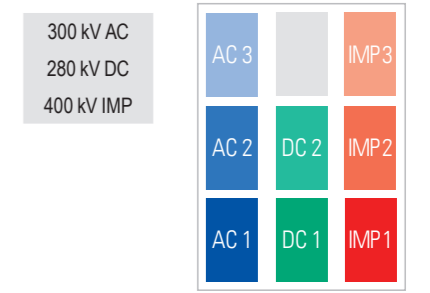
## EPS ELECTRONIC POWER SUPPLY

The EPS 11 is the hearth of the Kit, it is built with power electronics and has been specially developed for high voltage applications. It delivers a sinusoidal PD free signal, at variable frequency, and with extremely wide regulation.

All required controls, connectors and measuring devices (1) for any configuration are also included. Future extensions are therefore possible without any modification.

AC	DC	IMP
300 kV AC	400 kV DC	400 kV IMP
AC 3	DC 3	IMP 3
AC 2	DC 2	IMP 2
AC 1	DC 1	IMP 1
200 kV AC	280 kV DC	280 kV IMP
AC 2	DC 2	IMP 2
AC 1	DC 1	IMP 1
100 kV AC	140 kV DC	140 kV IMP
AC 1	DC 1	IMP 1

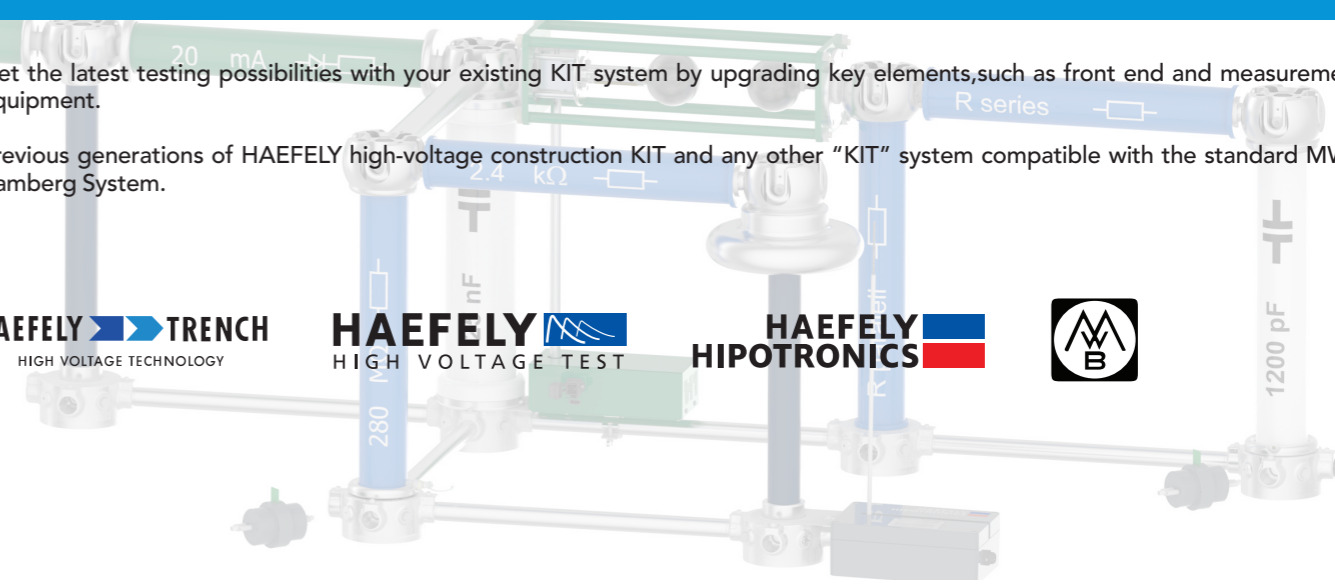
## Example of KIT 4.0



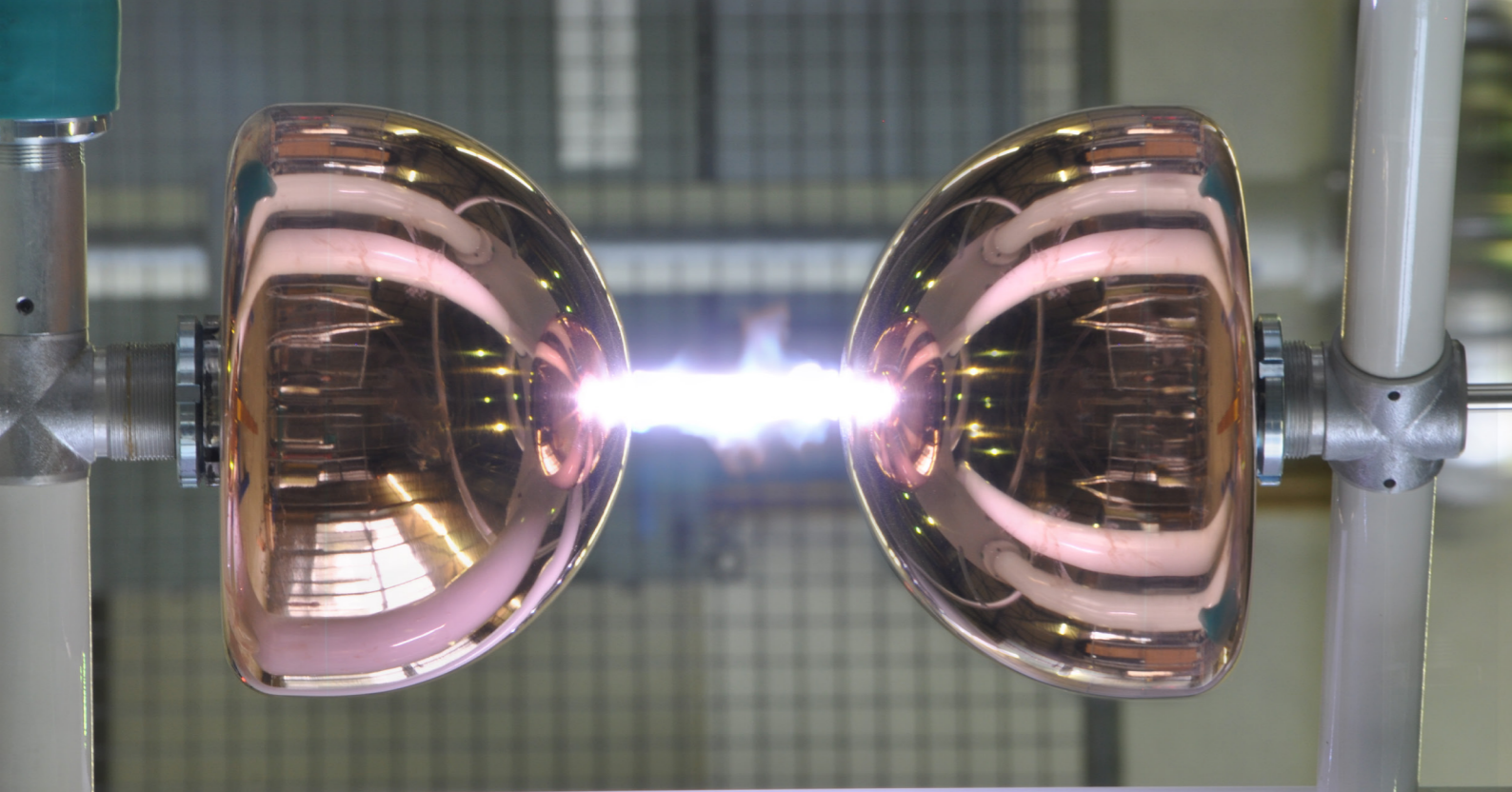
## MODERNIZATIONS & SERVICES

Get the latest testing possibilities with your existing KIT system by upgrading key elements, such as front end and measurement equipment.

Previous generations of HAEFELY high-voltage construction KIT and any other "KIT" system compatible with the standard MWB Bamberg System.







## KIT STANDARD SYSTEMS ORDER INFORMATION

**KIT AC** standard systems are an optimized set of kit elements to perform AC test. All AC kit versions include:

- PZTL AC transformer/s 100 kV - 10 kVA
- EPS Electronic Power Supply cabinet 11 kVA
- AC Kilovoltmeter integrated in the EPS cabinet
- Manual control software and Laptop
- Ground Rod
- Power cables (EPS to Transformer) 10m
- Measuring cables (BNC) 20 m
- Rugged FO cable, 20m



AC 1

AC Kit System  
100 kV AC, 10 kVA



AC 2

AC Kit System  
200 kV AC, 10 kVA



AC 3

AC Kit System  
300 kV AC, 10 kVA



## AC + DC STANDARD SYSTEMS

**KIT AC+DC** standard systems add to the AC 1 configuration the necessary elements for different DC voltages.

- Diode/s
- Measuring and discharge resistor/s
- Capacitors
- Required connecting mechanical elements



AC1 + DC 1

AC and DC Kit System  
100 kV AC, 10 kVA  
140 kV DC



AC1 + DC 2

AC and DC Kit System  
100 kV AC, 10 kVA  
280 kV DC



AC1 + DC 3

AC and DC Kit System  
100 kV AC, 10 kVA  
400 kV DC



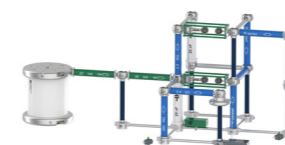
## AC + DC + IMPULSE STANDARD SYSTEMS

**KIT AC+DC+IMP** standard systems add to the AC 1 AND DC configuration the necessary elements for different impulse voltages.



AC 1 + DC 1 + IMP 1

AC,DC and IMP Kit System  
100 kV AC, 10 kVA  
140 kV DC,  
125 kV LI



AC 1 + DC 2 + IMP 2

AC,DC and IMP Kit System  
200 kV AC, 10 kVA  
280 kV DC  
240 kV L



AC 1 + DC 3 + IMP 3

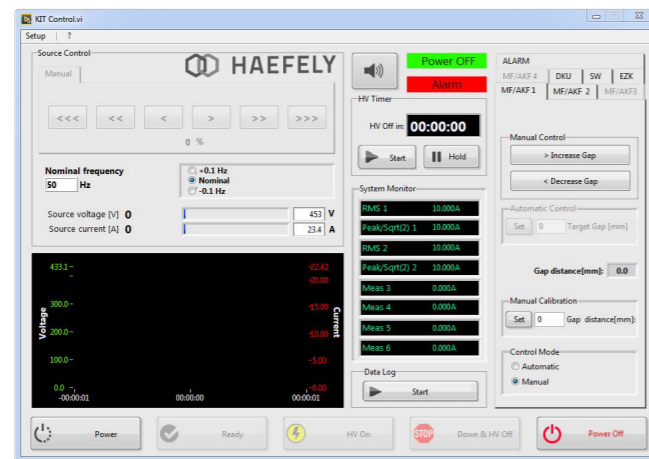
AC,DC and IMP Kit System  
300 kV AC, 10 kVA  
400 kV DC  
365 kV LI



## HIGHEST QUALITY HARDWARE & PREMIUM CHOICE SOFTWARE

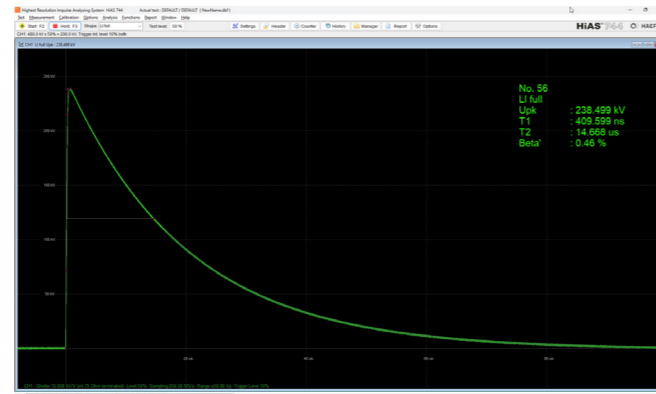
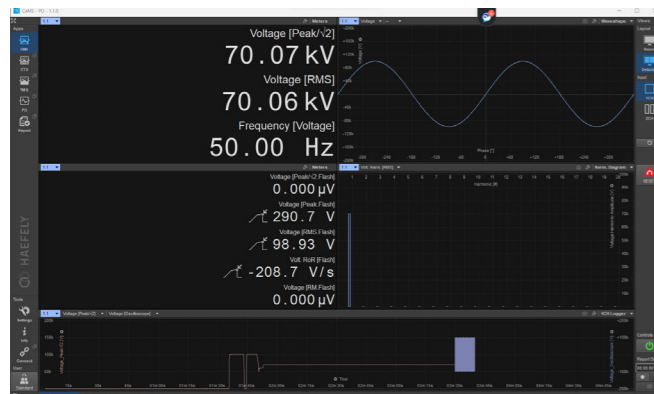
Get further testing possibilities with power electronics front end and laptop controlled system using LabVIEW development environment:

- Database - Accessible
- LabVIEW - Compatible
- Software - Customizable
- Variable Frequency Power - Supplied
- Safety SIL 3 Power Supply- Certified
- PD Measurement - Compatible



## PRECISE MEASURING DEVICES

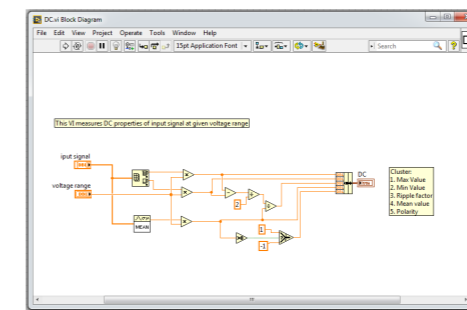
Get complete information about your tests. If oscilloscope function, harmonics content or impulse measurements are required, Kit can be easily extended with HAEFELY HIAS and HAEFELY DMI measuring devices, for calibrated and reliable AC, DC and impulse measurements:



## LABVIEW CONTROL

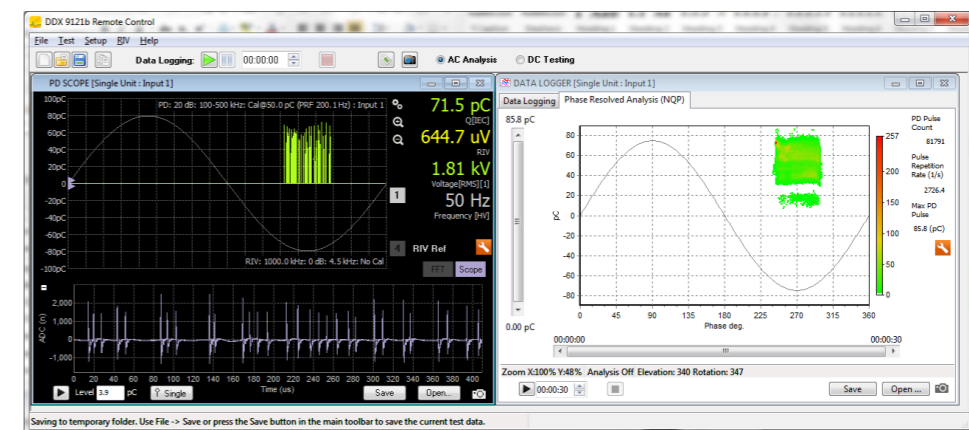
The KIT 4.0 is remote controlled from a laptop (optional) and is delivered with a standard program that allows operating the system for each configuration. In addition to this, all components have their own LabVIEW function block (library is available as an option). LabVIEW is a visual programming language; it integrates a system-design platform with development environment. This add-on enables new possibilities and greater flexibility, such as automated test sequence with data recording.

- Standard system operation program included - System ready to use\*
- LabVIEW functions block available - System customizable
- Intuitive graphical programming, using graphical constructs - Easy to learn, use and maintain
- Possibility of interfacing with third party tools such as MATLAB, Maple, MathCAD, Scilab, MS Access and Excel - Expands analysis and visualization functions
- \*LabVIEW must be available



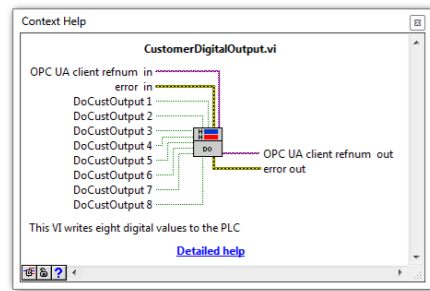
## PARTIAL DISCHARGE MEASUREMENT

With the partial discharge filter option, background noise is generated enabling partial discharge measurement for the AC and DC setup. In addition to the filter option, the PD measurement set is available with coupling capacitor, HAEFELY DDX partial discharge detector and calibrator.



- AC and DC Mode - Enabled
- Built in frequency spectrum analysis and selectable frequency band - Reduces ground noise
- Phase resolved analysis - Expanded PD Interpretation
- Analog output (signal, filter and trigger) - Expanded possibilities

## KIT 4.0 OPTIONS



### LABV FB - LABVIEW FUNCTION BLOCK LIBRARY

LabVIEW library including function block for each KIT component



### DMI 552

The DMI 552 has been developed to measure, record and visualize events during dielectric and breakdown tests in high voltage applications according to IEC 61083-3:2020. This standard defines the requirements for instruments used in AC and DC high voltage applications.



### HiAS 744

The HiAS 744 is a high resolution impulse analyzing system, it measures and determines the impulse waveshape parameters during impulse measurements.



### NK/100/100- STANDARD CAPACITOR 100 PF, 100 KV

SF6-insulated standard capacitor for loss factor measurement or accurate voltage measurement. It can be used together with a C & tan delta measuring bridge (e.g. Tettex Instruments 2840) for high accuracy measurements of the capacitance and tan delta of HV equipment.



### RIP - DC RIPPLE MEASUREMENT

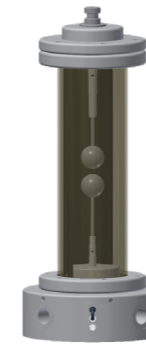
RC arrangement to enable measurement of the DC ripple. One set per stage is necessary. This option is included in the IMP 1, IMP 2 and IMP 3 packages.



### PD MEAS - PD MEASUREMENT SET

This set includes the necessary components for PD measurement. It includes the DDX 9121b measuring instrument, the KAL 9510 calibrator, the coupling capacitor, the blocking impedance, and the AKV 9310 measuring impedance.

## KIT 4.0 OPTIONS



### LDKU - PRESSURE TEST VESSEL

Pressure and vacuum vessel to determine breakdown voltages of electrode arrangements as a function of vacuum and pressure for different insulation gases. The vessel is made of transparent material to observe the test. The control box has a manual valve and a gauge for the settings.



### MF - MEASURING SPARK GAP

The measuring spark gap is used for obtaining breakdown voltages at various arcing distances and various electrodes arrangement. The measuring spark gap can also be used as chopping gap by mounting an electronic trigger sphere EZK. It can also be used as protection spark gap.

The arcing distance can be set through the control laptop.

## KIT 4.0 SPECIFICATIONS<sup>1</sup>



ELECTRICAL INPUT		ELECTRICAL OUTPUT		HARDWARE	
Voltage	3 pH - 380 ... 415 V	Voltage	1 pH - max. 220 V	Dimension	1.1 x 0.5 x 1.85 m
Frequency	47 ... 63 Hz	Frequency	10 ... 200 Hz <sup>2</sup>	Weight	200 kg
App. Power	10 kVA	App. Power	11 kVA	Safety Level	SIL 3
Current	14.4 A	Current	50 A	Duty Cycle	Continuous

CONFIGURATION	RATED VOLTAGE	FREQUENCY	BASE LOAD	RATED CURRENT <i>without comp. reactor</i>	RATED CURRENT <i>with comp. reactor</i>
1 Stage AC	100 kV	50 Hz	100 pF	100 mA	-
2 Stages AC	200 kV	50 Hz	50 pF	38 mA	100 mA
3 Stages AC	300 kV	50 Hz	33 pF	10 mA	80 mA

CONFIGURATION	RATED VOLTAGE	SMOOTHING C	RATED CURRENT
1 Stage DC	140 kV	25 nF	11 mA
2 Stages DC	280 kV	25 nF	11 mA
3 Stages DC	400 kV	25 nF	8 mA

CONFIGURATION	MAX. DC CHARGING VOLTAGE	MAX. CHARGING ENERGY	MAX. LI AT NO LOAD	MAX. LI AT MAX. LOAD	TEST OBJECT RANGE LI
1 Stage IMP	140 kV	250 J	125 kV	98 kV	0 - 300 pF
2 Stages IMP	280 kV	490 J	243 kV	196 kV	0 - 170 pF
3 Stages IMP	400 kV	740 J	365 kV	295 kV	0 - 120 pF

<sup>1</sup> Note: All data is provisional, to be confirmed after order and depending on final scope of supply.



## Global Presence

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**HAEFELY**

Current and voltage – our passion

HV

HIGH VOLTAGE

IN

INSTRUMENT

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reliable.  
precision.