HiAS™ 744
HIGHEST RESOLUTION IMPULSE ANALYZING SYSTEM

www.haefely.com
**IMPULSE ANALYZER**

**Application**

Dielectric tests with impulse voltage are done to confirm the quality of insulation for HV equipment and are mandatory as per international standards. A defined impulse wave shape is applied to the test object and changes in the wave shape caused by the test object are used for detection of insulation faults. Determining these changed parameters exactly makes it absolutely necessary to have a fast and accurate measuring system. This procedure is commonly used for routine testing of transformers, cables, bushings, etc.

**Unique device - Tailor made for the industry**

HAEFELY, the pioneer company for impulse testing since 1904, has been continuously developing and upgrading tailor made high-voltage impulse measuring/analyzing solutions over the years. The latest in a long line of distinguished impulse analyzers is the Highest Resolution Impulse Analyzing System HiASTM™ 744. HAEFELY has set a new benchmark with unmatched performance. The new front-end solution provides a 16-bit resolution at 250 MS/s with the highest measurement accuracy. Software, which has been upgraded to suit the new hardware, retains the comfortable interface proven and tested by over hundreds of satisfied users. Furthermore, it remains compatible with all previous versions of HiASTM™ data files, allowing for comparison to older measurements.

**Galvanic isolation**

The optically decoupled front end provides complete galvanic isolation between control room and test field. It thus affords the personnel the highest safety level and in addition minimizes ground loop, resulting in a reduced interference coupling.

**HiASTM™ SERIES – PIONEERING!**
### FEATURES

- 16-bit resolution at 250 MS/s, 100 MHz analog bandwidth
- Optically decoupled front-end solution
- ±2000 Vpk down to ±5 Vpk analog input range with LEMO 4S connector
- 2 Channels digitizer unit, can be cascaded
- Exceeds latest IEC 61083-1, -2, IEC 60060-2, IEEE Std. 4 and related standards
- 4th Generation digitizer
- Mains powered

### BENEFITS

- The highest measurement accuracy in the market
- Excellent interference immunity & safe operation
- Integrated solution, no additional divider necessary, compatible with any divider ratio
- Synchronous multi-channel record
- Compliant, advanced state-of-the-art solution
- Software & solution proven by many hundreds of satisfied users
- No battery pack or recharge needed

### PEAK PERFORMING ANALYZER – UNBEATEN!

Real wave shape captured and displayed by means of the highest resolution and an outstanding sampling rate

![Lightning impulse peak comparison](image)

- 16-bit / 250 MS/s
- 14-bit / 250 MS/s
- 16-bit / 25 MS/s
**HiAS™ 744 front-end**

**Conventional**

- **RUGGED** fiber optic link cable
- **Shielded copper cable**
- **Galvanic Isolation**
**GALVANIC ISOLATION**

Fiber optic link between the HiASTM™ 744 and the control PC provides a complete galvanic isolation, with the following benefits:

- The length of the fibre optic cable does not impact the divider load, its ratio or the calibration.
- The galvanic isolation fully ensures safety of personnel. With the HiASTM™ 744, there is no electrical connection between the control room and the high voltage test room.

**INTERFERENCE**

Electromagnetic Interference (EMI) is reduced to the absolute minimum by:

- Limiting the active ground loop area.
- Using a direct 2 kV input range (there is no need of a second low voltage divider with additional cabling).
- Perfectly shielding the digitizer.

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**Front-end digitizing**

*With the HiASTM™ 744 as front-end digitizer, the ground loop and the resulting disturbances are minimized.*

**Conventional back-end digitizing**

*With a back-end digitizer, there is a large ground loop with a wider area to collect disturbances.*
HiAST™ 744 SOFTWARE
– HIGHLY ADVANCED & PROVEN

Automatic parameter evaluation and impulse type recognition of all common voltage and current impulse shapes
After an impulse test the software collects, stores, calculates, normalizes and displays all measured signals. This allows the user to see the final result of the actual impulse test step without need of any interaction.

Multi-functional curve display
Raw data points, mean curves, reference points and lines etc. are automatically visualized in one window for intuitive understanding and handling of the parameter calculation. A toolbox can be opened by a mouse-click to access all curve related functions such as zooming, print preview, recalculation, manual evaluation, smoothing, cursors, grid normalization, grid optimization, editing curve information, add memos, save measurement and save as ASCII.

Software built according to internationally accepted standards
The software fulfills the latest IEC 60060, IEC 61083-2, IEEE Std. 4 and other related standards. Combined testing (impulse on DC) is implemented by a special setup to automatically calculate all requisite impulse and DC parameters according to the latest recommendations and standards committee drafts (IEC CDV 62895: 2015). Also ODT (Operating duty testing) and composite testing (impulse and AC) are supported. Users who upgrade from the older versions of HiAST™ get to keep using data from previous tests. Older HiAST™ 743 data can be loaded and the IEC parameter evaluation according to older editions is possible for comparison purposes with archived measurements.

Easy to use, intuitive, proven graphical user interface
All needed operation functions are operable on the top level of the multilingual software by dedicated buttons. The setup, supported by interactive graphics and visualization hints, is done with a single dialog and helps the user to easily check the setup and thereby avoid failures.

Approved database structure
All measurements and data are stored in a database structure. This enables easy documentation, sorting, searching and recognition of the saved tests. Export of data to ASCII format is also supported for further evaluation in third party analysis tools.

Automatic report generator
Connected to the database is the integrated reporting tool with pre-defined and user definable layouts and styles. Over the data manager one can easily preview and select desired single impulses or full tests, groups or sub groups to report and print.
Loaded with supporting tools
Software comes loaded with tools like sequencer, step-response calculation, curve import, IEC software calibration check, history stack, windows arrangement, header information, data manager, pop-up counter, calibration information and password protection and more. In addition the software supports automatic hardware calibration when used together with our optional calibrator RIC 422.

Loaded with diagnosis tools
- Parameter Tolerance Analysis (PTA). Impulse curves can be manually chosen from the database or can be predefined and auto calculated with a pass/fail output.
- Difference Analysis Function (DAF). Enables auto-fit and auto-zoom. Impulse curves can be manually selected from the database or can be predefined and auto calculated with a pass/fail output.
- Fast Fourier Transformation (FFT). Gives an overview of the frequency spectrum of the measured impulse.
- Transfer & Coherence Function (CTF). Useful for advanced power transformer analysis.
- Comparison Tool (CT). Used to determine scale factor of divider and measurement systems by reference method according to IEC 60060-2.

Divider scale factor matrix
The different scale factors of different voltage dividers in a test field (DC, AC, SI, and LI, according to IEC 60060-2) can be entered into a predefined matrix and will be automatically applied by the software. Up to 10 different dividers with their factors can be defined, labeled, saved and easily selected.

HF rejection filter
Noise from different sources in the test field can obscure signals of interest, especially when currents are being measured. Variable frequency function performs filtering on the measurement to eliminate unwanted high-frequency instability or noise.

Selective analysis depth
Visualization of only basic analysis information for routine tests or advanced tooling with additional parameters for diagnostic purposes can be easily selected.

Remote control
Software and the impulse controls of Haefely can be connected together. In this combination the HiAS™ can be remote controlled. All impulse and range parameters are set automatically according to the next expected impulse type.

Office software
The HiAS™ software is also available as an office package that can be run without connected channel hardware, thus enabling preparation of test set ups, accessing data and evaluating parameters from the comfort of one’s desk. It is also possible to perform offline diagnostics and prepare reports based on measurements stored in the database.

"FEATURES DON'T SELL SOFTWARE, – EXPERIENCE DOES!"
# HiASTM 744 Product Range

## Data Acquisition

<table>
<thead>
<tr>
<th></th>
<th>HiASTM 744</th>
<th>HiASTM 744-S</th>
<th>HiASTM 744-REF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amplitude Resolution</strong></td>
<td>11 bit (0.05 %)</td>
<td>16 bit (0.0015 %)</td>
<td>16 bit (0.0015 %)</td>
</tr>
<tr>
<td><strong>Sampling Rate</strong></td>
<td>1 .. 125 MS/s</td>
<td>1 .. 250 MS/s</td>
<td>1 .. 250 MS/s</td>
</tr>
<tr>
<td><strong>Analog Bandwidth (-3 dB)</strong></td>
<td>≥ 50 MHz</td>
<td>≥ 100 MHz</td>
<td>≥ 100 MHz</td>
</tr>
<tr>
<td><strong>DC Accuracy</strong></td>
<td>±0.25 % RD ±0.02 % FS</td>
<td>±0.20 % RD ±0.02 % FS</td>
<td>±0.15 % RD ±0.02 % FS</td>
</tr>
<tr>
<td><strong>Rise Time</strong></td>
<td>7 ns</td>
<td>3.5 ns</td>
<td>3.5 ns</td>
</tr>
<tr>
<td><strong>Memory Depth</strong></td>
<td>2 MS</td>
<td>2 MS</td>
<td>2 MS</td>
</tr>
<tr>
<td><strong>Measuring Input(s)</strong></td>
<td>1 or 2 channels</td>
<td>2 channels</td>
<td>2 channels</td>
</tr>
<tr>
<td><strong>Expandable</strong></td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

### Overall System Accuracy

<table>
<thead>
<tr>
<th></th>
<th>HiASTM 744</th>
<th>HiASTM 744-S</th>
<th>HiASTM 744-REF</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Full and tail chopped</em></td>
<td>±1.5 % $U_{pk}$</td>
<td>±1 % $U_{pk}$</td>
<td>±0.7 % $U_{pk}$</td>
</tr>
<tr>
<td><em>Impulses (SI, LI)</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Front chopped</em></td>
<td>±2 % $U_{pk}$</td>
<td>±1 % $U_{pk}$</td>
<td>±1 % $U_{pk}$</td>
</tr>
<tr>
<td><em>Impulses (LIC)</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Time Parameters</em></td>
<td>±3 %</td>
<td>±2 %</td>
<td>±1.8 %</td>
</tr>
<tr>
<td><em>T1, Tp, Tc, T2, etc.</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Calibration</em></td>
<td>factory²</td>
<td>factory²</td>
<td>EN / ISO 17025</td>
</tr>
</tbody>
</table>

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1. Expandable with a second device: $2 + 2 = 4$ channels
2. EN / ISO 17025 calibration optional
3. Valid for the full input range ± 5 Vpk up to ± 2000 Vpk and for the full temperature range
# TECHNICAL SPECIFICATIONS

## HiAS™ 744 /-S /-REF

### Analog Part
- **Signal Input Connectors**: LEMO 4S
- **Input Voltage Ranges**: ± 2000, ± 1000, ± 500, ± 200, ± 100, ± 50, ± 20, ± 10, ± 5 Vpk
- **Overvoltage Protection**: 3000 Vpk
- **Overvoltage Tested**: 6000 Vpk (1.2/50 µs, 10/700 µs)
- **Input Impedance**: 2 MΩ // 10 pF (additional 75 Ω termination switchable)
- **Triggering**: Internal slope, level, auto
- **Filter, HF Rejection**: Low pass, Bessel 5th order, adjustable: OFF, 1, 3, 10, 30 MHz

### Operating Conditions
- **Supply**: 90 .. 264 VAC, 50/60 Hz, 50 VA
- **Temperature Range**: 5 .. 50°C (Reference Conditions 15°C .. 35°C)
- **Humidity**: 5 .. 90 % r.h., non-condensing

### Mechanical
- **Dimensions, weight**: 34.2 x 31.5 x 8.6 cm, approx. 6 kg
- **Vibration Tests**: IEC 60068-2-64 Spectrum A1 Transportation 1a

### Standards
Fulfills or exceeds the requirements of latest IEC 60060, IEC 61083-1, IEC 61083-2, IEEE Std. 4 and other related standards referenced to the above mentioned

### Parameter Verification
Fully automatic (with optional Reference Impulse Calibrator RIC 422, controlled by HiAS™ software)

### Scope of Delivery with HiAS™ 744 /-S /-REF
- Mains cable CH 2.5 m + extension CH 10 m (to CCU), additional set of plugs for custom cable assembly

## Media Box

### Data link
- **Link HiAS™ 744 to Media Box**: Fiber optic with rugged HARTING connector, Han 3A-gw-M20, SC type, IP44
- **Link Media Box to PC**: Ethernet 10/100 (data), USB 2.0 (power)

### Operating Conditions
- **Temperature Range, Humidity**: 5 .. 50 °C, 5 .. 90 % r.h., non-condensing
- **Dimensions, Weight**: 22 x 8.5 x 3.5 cm, approx. 400 g

### Scope of Delivery with Media Box
- Ethernet cable 1 m, USB cable 1 m, RS232 cable & RS232/USB converter (for remote control from GC 257 or GC 223)

## Rugged Fiber Optic Cable

### Cable
- 4-fiber cable, 50/125 µm OM2, Ø 5.6 mm, PUR jacket, according to IEC 60794-1-2 for harsh environments

### Connector
- Rugged HARTING connector, Han 3A-gw-M20, SC type, IP44

## System Software

### Requirements
- **Platform**: Laptop or Industrial PC
- **Min. Hardware**: CPU i3 or better, 8 GB RAM, USB 2.0 (power) and Ethernet 10/100
- **Operating System**: Windows 7, Windows 10
**HiAS™ 744 CONFIGURATION**

**STANDARD PACKAGE**

1. **HiAS™ Package**
   - HiAS™ 744 No. 4490014
   - HiAS™ 744-S No. 4490015
   - HiAS™ 744-REF No. 4490016

**Including**

2. Software Basic Package
3. Media Box
4. Rugged Fiber Optic Cable, X m

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**Diagram**

- Laptop
- Software
- Media Box
- Rugged Fiber Optic
- PCI

**Options**

- Standard scope of supply
- Option
## OPTIONS

### Software

<table>
<thead>
<tr>
<th>Software</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office Package</td>
<td>4771570</td>
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<tr>
<td>Older IEC Ed. Evaluation</td>
<td>4771574</td>
</tr>
<tr>
<td>Comparison Tool (^1)</td>
<td>4771576</td>
</tr>
<tr>
<td>Transfer &amp; Coherence Function</td>
<td>4771576</td>
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</tbody>
</table>

### Rugged Fiber optic cable

<table>
<thead>
<tr>
<th>Cable Length</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rugged Fiber Optic Cable, 2 m</td>
<td>4844189</td>
</tr>
<tr>
<td>Rugged Fiber Optic Cable, 10 m</td>
<td>4844025</td>
</tr>
<tr>
<td>Rugged Fiber Optic Cable, 20 m</td>
<td>4844026</td>
</tr>
<tr>
<td>Rugged Fiber Optic Cable, 40 m</td>
<td>4844028</td>
</tr>
<tr>
<td>Rugged Fiber Optic Cable, 60 m</td>
<td>4844030</td>
</tr>
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</table>

### HiASTM™ 744-S /-REF (extension to 4 channels)

<table>
<thead>
<tr>
<th>Extension</th>
<th>No.</th>
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</thead>
<tbody>
<tr>
<td>HiASTM™ 744-S, 2 channels extension</td>
<td>4771610</td>
</tr>
<tr>
<td>HiASTM™ 744-REF, 2 channels extension</td>
<td>4771611</td>
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</table>

\(^1\) Included in HiASTM™ 744-2REF package

### Lemo cable

<table>
<thead>
<tr>
<th>Cable Length</th>
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<tbody>
<tr>
<td>Lemo Cable, 0.6 m</td>
<td>2404281</td>
</tr>
<tr>
<td>Lemo Cable, 1 m</td>
<td>4771625</td>
</tr>
<tr>
<td>Lemo Cable, 2.5 m</td>
<td>4770321</td>
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<tr>
<td>Lemo Cable, 10 m</td>
<td>2404283</td>
</tr>
<tr>
<td>Lemo Cable, 20 m</td>
<td>2404284</td>
</tr>
<tr>
<td>Lemo Cable, 30 m</td>
<td>2404286</td>
</tr>
<tr>
<td>Lemo Cable, 40 m</td>
<td>2404287</td>
</tr>
<tr>
<td>Lemo T-Piece</td>
<td>0751611</td>
</tr>
<tr>
<td>Lemo-Lemo 90° Elbow plug</td>
<td>0410131</td>
</tr>
<tr>
<td>Lemo-BNC adapter</td>
<td>0412750</td>
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</table>

### Divider

Refer to our Divider Series CS, CR, CZ, RCZ, R, RCR

### Shunt

Refer to our Shunt Series SH-H, SH-Q, SH-R

### Laptop

Laptop 15”

<table>
<thead>
<tr>
<th>Laptop Package</th>
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<tbody>
<tr>
<td>HiASTM™ Software Installed</td>
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### Laptop Package

Laptop 15” 22” Screen, Keyboard, Mouse

<table>
<thead>
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<th>Laptop Package</th>
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<tbody>
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<td>HiASTM™ Software Installed</td>
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### Industrial PC Package

PCI 811b Process Computer

<table>
<thead>
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<tbody>
<tr>
<td>22” Screen, Keyboard, Mouse HiASTM™ Software Installed</td>
<td>4771578</td>
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### Printer

<table>
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<tr>
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<tr>
<td>Color Laser Printer</td>
<td>0780815</td>
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### Extended Warranty

<table>
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<tr>
<th>Warranty Period</th>
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<tr>
<td>24 Months</td>
<td>4842936</td>
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<tr>
<td>36 Months</td>
<td>4842937</td>
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### Basemount Package

For X-Style Divider Base

<table>
<thead>
<tr>
<th>Basemount Package</th>
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<tbody>
<tr>
<td>For Divider with Plate Base</td>
<td>3716219</td>
</tr>
</tbody>
</table>

### SCS calibration of HiAS 744

<table>
<thead>
<tr>
<th>Calibration</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>First sensor, 2 channels, New Device</td>
<td>4771683</td>
</tr>
<tr>
<td>Second sensor, 2 channels, New Device</td>
<td>4771627</td>
</tr>
</tbody>
</table>

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![Diagram of HiASTM™ 744 Configuration](image)