Highest performance with up to 200 MS/s sampling rate and 12 to 14 Bit resolution simultaneously in all channels

The well-established Impulse Voltage Measuring Systems TR-AS, including the digital recorders from our own development and manufacturing, were consequently further developed and now feature improved sampling rates up to 200 MS/s in real-time with 14 Bit resolution simultaneously in up to 16 measuring channels.

The new developed composite A/D- converter hardware system generates raw data with up to 14 Bit resolution together with the highest available sampling rate of 200 MS/s today – and optionally 400 MS/s with 10 to 12 Bit resolution is available for steep i.v. tests. The high sampling rate of 200 MS/s and the high bandwidth of 50 MHz show increased accuracy and reduced standard deviations for the front time of full impulses as also for the peak and the time-to-chopping at front chopped impulses.

A careful design using sophisticated programmable logic controllers and SMT optimizes the demanding requirements like high sampling rate, small risetime, minimized noise, short settling time, small measuring uncertainty and good long-term accuracy.

This results in nearly smooth waveshapes without visible quantization steps and significantly improves the accuracy of diagnosis using difference method or transfer function.

The direct input of the high bandwidth precision amplifiers with an input impedance of 1 MOhm allows the measurement of the step response of the 2000 V measuring input.

The patented multi-timebase allows setting of up to 8 individual sampling rates each with a selectable number of samples, so individual time profiles can be generated, e.g. a profile similar to an exponential timebase.

As an option, for multichannel applications in the high power test field, the sampling rate of each individual channel can be independently selected. With this option fast transients and slow events can be recorded with

**Common Features of TR-AS®:**

- **80% input range steps** allow finest adaptation to measuring voltage:
- **Direct input** 10-8-6.4-5-4-3.2-2.5-2-1.6-1.25-1-0.8-0.64-0.5-0.4-0.32-0.25-0.2-0.16-0.12-0.1 V
- **Double overload of inputs** guaranteed without saturation effect e.g. at unexpected high impulse current amplitudes
- **Long-term stable scale factors** of all amplifier stages guaranteeing stable calibration results for many years
- **80% input range steps** allow finest adaptation to measuring voltage:
- **Direct input** 10-8-6.4-5-4-3.2-2.5-2-1.6-1.25-1-0.8-0.64-0.5-0.4-0.32-0.25-0.2-0.16-0.12-0.1 V
- **Double overload of inputs** guaranteed without saturation effect e.g. at unexpected high impulse current amplitudes
- **Long-term stable scale factors** of all amplifier stages guaranteeing stable calibration results for many years

**Desktop-Housing DERA 6**

Compact design for i.v. tests and calibrations in the test field and on site with connection to printer and fileserver via glassfibre LAN

12" TFT Color Display

Keyboard with trackball in drawer

Measuring rack mount with 1 to 4 channels each with:

- Direct input 100 mV to 10 V on rear
- Input 12 V to 2000 V on rear

**Dimensions:** approx. 55x55x35 cm (BxDxH)

**Weight:** approx. 25 kg

**Measuring Rack MIRA 25**

Compact design with all components including printer inside the rack easy to move inside the test field

All sensitive connections inside the rack (keyboard, display, printer) are well shielded

17” or 19” large TFT-Display

Keyboard with trackball in drawer

Laser Printer in drawer

Measuring rack mount with 1 to 4 channels each with:

- Direct input 100 mV to 10 V on front
- Input 12 V to 2000 V on front

Measuring line bushings to the rear

Suitable for i.v. tests and calibrations in the test field with high electromagnetic distortions

**Dimensions:**

approx. 55x65x125 cm (BxDxH)

**Weight:** approx. 80 kg
The TR-AS RC digital recorder are designed for recording task only. The WinTR-AS software installed on the external control computer overtakes all control functions of the test procedure via the LAN with:

Setting and arming the TR-AS RC, transfer of the raw data after recording, evaluation and display of shapes, saving the records in the database, generating the test record and printing to any network printer.

TR-AS RC Remote Control Housing
for connection via LAN (green) to the host computer (PC or Laptop)
Measuring rack mount with 1 to 4 channels with brackets for building into any 19" measuring rack or for using on the desk
Direct input 100 mV to 10 V
Measuring Input 12 V to 2000 V
suitable for i.v. tests and calibrations in the test field and on-site
Dimensions: approx. 50x55x20 cm (BxDxH)
Weight: approx. 16 kg

Working Desk with Measuring Rack MIRA 12
for installation of 19" measuring rack mount, for reducing of electromagnetic interferences into the necessary connection cables and disturbances caused hereby, with complete assembly of the offered components, with additional mains filter, approx. dimensions: Table 160 x 80 x 75 cm, MIRA 55 x 60 x 70 cm (bxdxh)

Industrial PC Control Computer
19" TFT display, Color Laserprinter, Keyboard and Mouse, connected to the TR-AS digital recorder via glassfibre LAN

TR-AS RC Remote Control Housing
Measuring rack mount with 1 to 4 channels with brackets for building into any 19" measuring rack or for using on the desk
Direct input 100 mV to 10 V
Measuring Input 12 V to 2000 V
for connection via LAN to the host computer (PC or Laptop)

This new designed measuring technique of network controlled digital recorders gives the possibility for applications were measuring channels are distributed in large test fields, in control rooms on-site or anywhere around the world via Internet.

The following example show how to reduce earthing problems in a very large transformer testfield.

The left picture show the typical arrangement of the voltage and current measuring circuit with a measuring system TR-AS or TR-AS RC for voltage and current with the known

**Earthing Problem:**
I.V. Generator, chopping gap and i.v. divider have with respect to the Test Object a different ground potential. During the impulse test ground currents are flowing over the coaxial shield of the measuring lines which cause distortions in voltage and current lapse.

The right picture show the suggested arrangement with the solved earthing problems using two separate remote controlled TR-AS RC digital recorder for voltage and current measurement.

Both digital recorders are controlled from the control computer with installed WinTR-AS software which joins the records of voltage and current to one common record.
### Technical Data of Digital Recorder

<table>
<thead>
<tr>
<th>Digital Recorder</th>
<th>100 - 8</th>
<th>100 - 10</th>
<th>100/200 - 12</th>
<th>400 - 12</th>
<th>200 - 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated resolution output data (Bit / %)</td>
<td>8 / 0.4</td>
<td>10 / 0.1</td>
<td>12 / 0.025</td>
<td>12 / 0.025</td>
<td>14 / 0.006</td>
</tr>
<tr>
<td>Static integral non-linearity (%)</td>
<td>0.5</td>
<td>0.25</td>
<td>0.2</td>
<td>0.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Static differential non-linearity</td>
<td>0.8</td>
<td>0.6</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Dynamic differential non-linearity</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Sampling rate selectable</td>
<td>2.5 kHz - 25 / 60 / 100 / 200 MS/s</td>
<td>2.5kHz-400 MS/s</td>
<td>2.5 kHz-200 MS/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sampling interval uncertainty</td>
<td>0.1 ns</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-linearity of Quartz Time Base</td>
<td>0.01%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Record Length (standard/optional)</td>
<td>65536 / 262144 / 512K / 1M</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Timebase</td>
<td>2 to 8 selectable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timebase Recording Mode</td>
<td>A-B-C...H-Sequence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Input Stage

**No. Measuring Channels:** 1...4

**Measuring input, single ended:** N-type / LEMO optional

**Measuring range for impulse:** 12 - 2000 V

**Bandwidth analogue (-3dB):** DC - 50 MHz (70 opt.)

**Risetime:** 7 ns (5 ns opt.)

**Input test voltage 0.1/2000 us:** 7 kV

**Input impedance:** 1 Mohm / 30 pF

**Direct measuring input:** 65 mV - 10 V, BNC

**Bandwidth analogue (-3dB):** DC - 70 MHz

**Risetime:** 5 ns

**Input impedance:** 1 Mohm / 30 pF

**Input Settings:** Factor 1 2 automatically controled

**Internal Noise Level:** < 0.1%

**Interferences:** < 0.1%

#### Record Interval

- at sampling rate 200 MHz: 640 µs / 1.25...6 ms
- at sampling rate 100 MHz: 640 µs / 2.5...12 ms
- at sampling rate 5 MHz: 12.5 ms / 50...200 ms

#### Trigger

- channels single, OR-connected: yes
- internal level: pos. and neg. level
- internal dynamic (deviation): pos. and neg. ΔU/Δt
- external: 5 - 200 V, BNC

#### Selftest and Calibration check

- memory, scale factor and risetime

#### Limits on overall errors

- according to all applicable Standards (IEC 1083, IEC 60, IEEE 1122, IEEE 4, ...)

#### Impulse scale factor

- constancy in time interval 0.25-1.0 µs and 0.42 µs µs after >20 ms: ≤ 1%
- uncertainty: < 0.5%

#### Lightning and switching i.e., full and standard chopped, impulse current

- peak value: 1% (0.7% optional)
- time parameter: 2%
- front chopped voltage 1.2/50 µs
- peak value, Tc=0.5µs: 1.5% (1% optional)
- time-to-chopping, Tc=0.5µs: 3% (2% optional)

#### Evaluation

- WinTRAS - Software
- shape, accuracy: according to IEC-81083-2
- automatic meancurve calculation ON/OFF selectable
- manual evaluation ON/OFF selectable

#### Calibration Interval

- every 2 to 4 years recommended

---

**Control and Evaluating System**

**Personal Computer** state of the art, e.g. 2 GHz, RAM 256 MByte, Harddisk 80 GByte, Diskdrive 3.5", CD/DVD-RW, Color-Laserprinter, Streamer, Glassfibre-Netconnection, ...

**Power:** Voltage 230 V +10%/-20%, (optional 100/115 V), Frequency 50-60 Hz, Power 400 VA

**Environmental:** Ambient Temp +5...+40°C, Humidity 0...90%, non condensating

Technical data and design subject to change without notice. Alternative design on request.

### Application

**Approved and reference measuring systems in high-voltage and high-power tests**

- precise steep impulse measurement
- simultan multichannel systems
- dynamic tests
- fourier-analyses
- quality control ..

**DKD-Calibration**

The measuring systems can be calibrated in our DKD Calibration Laboratory accredited by the PTB. The Calibration Laboratory issues DKD-Calibration Certificates which documents the traceability to National Standards.

#### Type Test Report TR-AS 100-10

Since 01.08.1993 a complete type test report according to IEC 1083-1 is available for the digital impulse voltage measuring system TR-AS 100-10 which is designed as an approved, reference or reference standard measuring system.

#### Type Test Report TR-AS 200-14

The new family with TR-AS 100-12 to TR-AS 200-14 consequently continue developed show improved performance. The excellent overall performance makes them to the finest systems available today for comparative measurements during transformer tests.

A complete family of digital recorders!