



**SA100R**  
*dynamic  
travel+*

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**Switchgear Analyser  
Breaker Testing**

# Switchgear Analyser

## Introduction

Weis is a specialist company with over 40 years of experience in the commissioning, testing & maintenance of switchgear and power network fault monitoring within the Power Utility Industry.

Based on advanced features of its successful SA100 Switchgear Analyser, Weis has enhanced the Reduced version, SA100R, of its robust switchgear test set for performance analysis on high, medium and low voltage circuit breakers with the options ...

SA100R : Standard version.

SA100R *dynamic* : Dynamic Timing of up to 1 break per phase with 4 x 50A constant current outputs.

SA100R *travel+* : 3 additional Travel channels.

### OPTIONAL ITEMS

**Cable Sets** - A range of standard cable sets & special made cable sets are available on request.

**Transducers** - A full range of transducers and universal mounting arms are available on request.

**Transportation Cases** - Robust purpose made transportation cases are available for the complete range of products.

**Built-in Thermal Printer** - On request.

Possible test results which can be computed per phase for each breaker operation include:-

Peak Coil Current, Current Pulse Length, Operate Times (Main / Resistive), Operate Time Spread (Main / Resistive), On Time, Dead Time, Contact Separation, Datum Velocity, Velocity at Contact Touch, Stroke, Contact Length (Main / Resistive), Spring Compression on Vacuum Contacts, Travel Overshoot, Rebound, Bounce Time, Mechanism Times (Pre Latch / Latch Period), Acceleration and Fingerprint Comparison on all channels (Grey Zone Checking).

**Features**

- ◆ ROBUST SWITCHGEAR TEST AND ANALYSIS SYSTEM FOR PORTABLE OR FACTORY USE
- ◆ COMPUTED RESULTS WITH CUSTOM REPORT FORMAT FEATURE REDUCING TEST TIME
- ◆ CREATE A ELECTRONIC LIBRARY OF BREAKER TEST SETTINGS AND SIGNATURES
- ◆ REVISED CONFIGURATION / RECALCULATION ON PREVIOUS TESTS CAPABILITY
- ◆ SUBSTATION ENVIRONMENT PROVEN WITH A 12.1" HIGH-BRIGHT SUNLIGHT READABLE COLOUR TFT DISPLAY
- ◆ INDEPENDENT CONTROL OF TRIP AND CLOSE AC OR DC COILS
- ◆ 1st TRIP ON-LINE PROFILE CAPTURE
- ◆ SOFTWARE WIZARD TO SIMPLIFY TEST CONFIGURATION
- ◆ 6 ANALOGUE INPUTS FOR:
  - 1 x DUAL RANGE (5 / 30A) TRIP & CLOSE COIL CURRENT
  - 1 OR OPTIONALLY 4 x TRAVEL
  - 3 x USER CONFIGURABLE (0 - 10V DC or 0 - 200mV DC)
- ◆ 10 DIGITAL INPUTS FOR:
  - TIMING OF UP TO 6 MAIN AND 4 RESISTIVE CONTACTS
- ◆ ANALOGUE CALCULATIONS PERFORMED ACROSS ALL THREE PHASES AGAINST SINGLE POLE MOTION / TRAVEL SENSING
- ◆ MEASUREMENT OF PARALLEL CONTACT (P.I.R.) SWITCHING RESISTORS

**Optional**

- ◆ 3 EXTRA TRAVEL INPUTS
- ◆ 4 x 50A CONSTANT CURRENT OUTPUTS
- ◆ CALCULATED INPUTS FOR: VELOCITY AND ACCELERATION FROM TRAVEL INPUT
- ◆ SA100R *dynamic* CAN DYNAMICALLY TEST ONE BREAK PER PHASE WITH BOTH ENDS CONNECTED TO EARTH

## Data Management

Breaker Test & Analysis software is an essential 32-bit Windows™ database program that provides an easy to use operator interface for configuring & displaying the SA100R test results in graphical and text report formats.

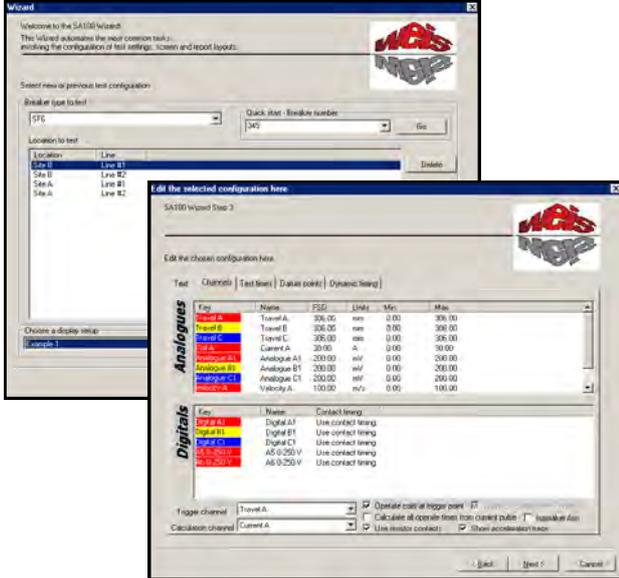
### Features:-

- ◆ Operator interface for Regular (via Wizard) or Advanced users
- ◆ Results automatically computed with feature to recalculate on configuration change of any existing test record
- ◆ Graphical display of captured waveforms with measurement cursors
- ◆ Standard or user defined report format
- ◆ Archiving of all tests and configurations
- ◆ Fingerprint comparison on all channels (grey zone checking)

BTA software runs on a standard IBM compatible PC with a 32-bit Windows™ operating system. This permits the transportation of test records to a regular office based or portable computer.

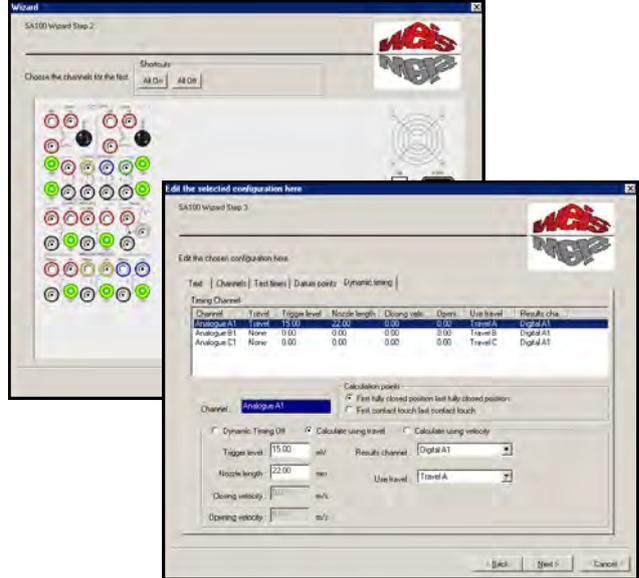
The display and printing of a report can be fully customised to include logo's, in-house styles, text phrases and results format, thus eliminated the need to manually complete a written form in most cases.

Wizard - Start New or Select Existing Test Configuration



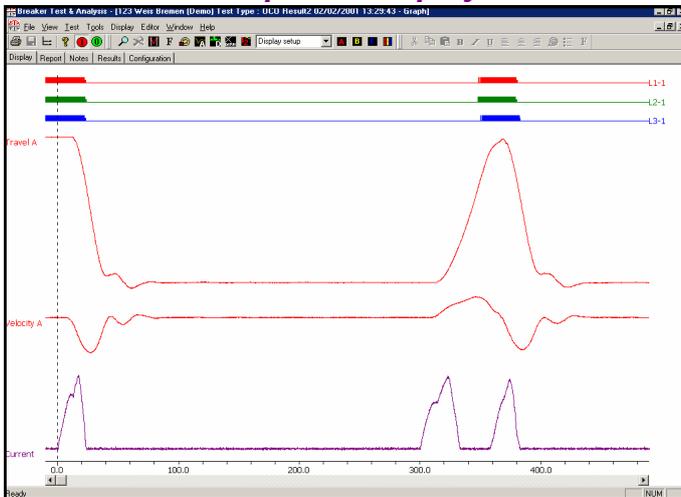
Wizard (Step 3) - Channel Settings

Wizard (Step 2) - Breaker Test Connections



Wizard (Step 3) - Dynamic Test Settings

## Graphical Display



### Graphical Features

- Zoom - Time Base
- Zoom - Amplitude
- Cursors - Measured Value & Time
- Colours - Traces & Background
- Font - Text Style & Size
- Print - Screen as Displayed
- Add Calculated Channels
- Combine Test Records - Overlay Traces
- Select Pre-defined Display Setups

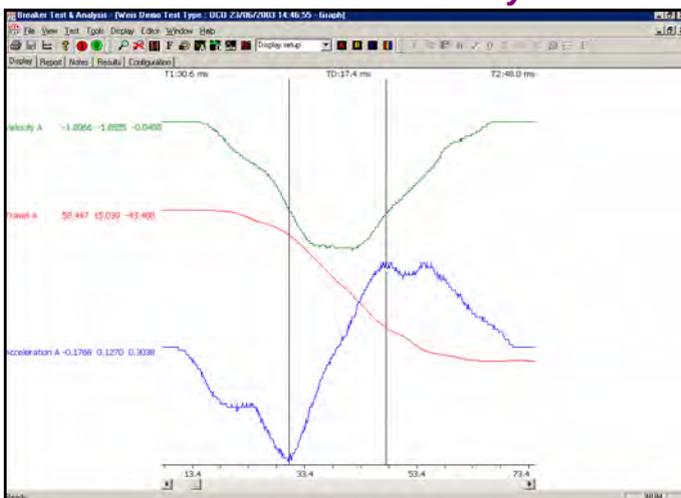
### Advanced Analysis

- Acceleration Trace Computed from Travel
- Velocity Trace computed from Travel
- All Graphical View Features Supported

### Report Features

- Customise which Results are shown
- Edit Headings
- Change Font - Text Style, Size & Colour
- Select Pre-defined Report Setups

## Acceleration & Velocity



## Text Report

Breaker Test & Analysis - [123 Weis Bremen (Demo) Test Type : DCU Result: 02/02/2001 13:29:43 - Report]

Site Name : Weis Bremen (Demo)  
 Breaker Number: 123  
 Breaker Type : 400kV SF6  
 Line Name : Line #1  
 Operator Name : B. Tester

Test Type : OCC  
 Test Date : 02/02/2001  
 Test Time : 13:29:43

Dead Time	326.10	324.80	327.20	ms
On Time	31.70	31.60	32.90	ms

Operation 1 Results

Current	2.22	A		
Operate Time	22.30	22.90	22.30	ms
Operate Time Spread	0.00	0.00	0.00	ms
Operate Time (res)	23.30	23.90	23.30	ms
Operate Time Spread (res)	0.00	0.00	0.00	ms
Contact Times #1	22.30	22.90	22.30	ms
Contact Times #1 (res)	23.30	23.90	23.30	ms
Overshoot Time	18.70	24.10	23.20	ms
Velocity (1)	5.11	5.19	5.21	m/s
Velocity (2)	5.11	5.19	5.21	m/s
Terminal Velocity	1.22	0.38	0.69	m/s
Stroke	116.12	116.12	116.12	mm
Contact Length	33.57	34.64	34.79	mm
Contact Length (res)	38.76	39.98	40.44	mm
Contact Separation	82.55	82.70	81.18	mm
Contact Separation (res)	77.36	77.36	75.53	mm
Overshoot	4.73	4.73	4.73	mm
Rebound	0.76	0.76	0.76	mm

# Specifications

## INPUTS

<b>Analogue:</b>	1 x Independently controlled trip (open) and close coil current inputs. 1 x Linear / rotary resistive travel transducer input, will calculate all 3 phases. <b>3 extra with <i>travel+</i> option.</b> 3 x User configurable 0 - 10V DC or 0 - 200mV DC inputs, selected via input sockets.
<b>Analogue Accuracy:</b>	Calibrated to 0.024%, $\leq \pm 0.5\%$ of reading, $\leq \pm 0.1\%$ of fullscale.
<b>Digital:</b>	10 x Contact status inputs providing timing of up to 6 main contacts and 4 resistive contacts ('dry' contacts). Note: 2 contact status inputs are user configurable for 'wet' or 'dry' contact timing (24 - 250V DC or 0V DC).
<b>Resistive Contact Range:</b>	15 - 10,000 ohms. <b>Digital Accuracy:</b> 0.1mS / 0.05mS / 0.033mS. Optional 0.01mS*.
<b>Connectors:</b>	4mm safety socket.

## OUTPUTS

<b>Coil Operation:</b>	Solid state outputs for trip (open) and close.
<b>Coil Peak Current:</b>	5A (accuracy 2.5mA) or 30A (accuracy 15mA) AC/DC measurement ranges selectable via input sockets. Other measurement ranges possible via optional external shunt; for example 50A Peak (up to 75mS duration) or 100A Peak (up to 50mS duration).
<b>Coil Max. Voltage:</b>	400V peak.
<b>dynamic Option Battery:</b>	4 x Isolated and floating 50A DC constant current battery sources for dynamic breaker timing.
<b>Battery Accuracy:</b>	$\leq \pm 0.5\%$ typical, $\leq \pm 1\%$ maximum, 100ppm/°C.
<b>Battery Drive Capability:</b>	0.0 to 0.08 ohm load at 50A.

## RECORDING

<b>Resolution:</b>	12 bit A/D (1:4096, 0.024%).
<b>Sample Rate:</b>	10kHz / 20kHz / 30kHz selectable. Optional 100kHz digital sample rate*.
<b>Synchronisation:</b>	All inputs sampled simultaneously.
<b>Recording Time:</b>	$\infty$ due to trigger option on all channels.
<b>Start trigger:</b>	Coil current or selectable on any analogue / digital input. <b>1st Trip:</b> 1st trigger selectable on any channel.

## GENERAL SYSTEM

12.1" TFT SVGA (800x600) "High-Bright Sunlight Readable" colour display (600cd). Removable USB Flash-Disk.  
SATA hard disk drive. VGA port for external screen. RS232 serial, RJ45 network and 4 x USB ports.  
1GB RAM. Windows™ Operating System. All standard Windows USB printers supported.  
Safety keyswitch to enable/disable coil operation and constant current battery operation. Optional built-in thermal printer on request.

## REAL-TIME CLOCK

**Range:** Time, date, leap year and day of the year with internal battery backup. 100mS resolution.

## PROGRAMMING - SETTABLE PARAMETERS

<b>User strings:</b>	Site name, breaker number, breaker type, line name, operator name and up to 30 user configurable.
<b>Test times:</b>	Close, Open, Trip Free, Close-Open, Open Close, Open-Close-Open.
<b>Coil operate times:</b>	Initial delay, trip coil "on-time", close coil "on-time", delay time between closing and opening, delay time between opening and closing.
<b>Channels:</b>	Analogue - Input name, fullscale value, units. Digital - Input name.
<b>Datum points:</b>	2 sets of velocity calculation points on travel (speed) curve.

## COMPUTED RESULTS

### Up to a sequence of 3 operations detailing 3-phase information:

Peak coil current, operate times and operate time spread (main/resistive), on time, dead time, datum velocity, velocity at contact touch, acceleration, stroke, contact length (main/resistive), contact separation, spring compression on vacuum contacts, travel overshoot, bounce time and rebound.

### Acceleration and velocity:

Graphical trace derived for measured travel input with cursor measurement.

### Parallel Contact (P.I.R.) Switching Resistors:

Graphical traces for each with cursor measurement. Measurement of up to 4 PIR's or 6 PIR's with *travel+* option.

## OPERATING VOLTAGES

**Prime Power:** 100 to 370V DC, 90 to 264V AC auto-sensing via IEC power connection. Burden <60 VA.

## ENVIRONMENTAL

<b>Operating Temp.:</b>	-20°C to +70°C (-4°F to +158°F)
<b>Humidity:</b>	0 to 97% RH non-condensing.
<b>Isolation:</b>	2kV rms for 1 minute (channel to channel, channel to earth).
<b>Surge Withstand:</b>	To IEC 801-5. 1.2/50µS.
<b>(Transient)</b>	Common Mode: Severity level class 4. Series Mode: Severity level class 3.
<b>Fast Transient Burst:</b>	To IEC 801-4 level 3.
<b>RFI Immunity:</b>	To IEC801-3 level 3. 10V/m 26-1000MHz.
<b>Emissions:</b>	To EN50081-1: 1992.

## MECHANICAL DETAILS

<b>Enclosure:</b>	6U steel enclosure suitable for Euro 19" wide rack mounting or free standing (tabletop).
<b>Ventilation:</b>	Fan assisted. <b>Weight:</b> <9kg. <i>dynamic</i> version adds <1kg.
<b>Optional Carry Case:</b>	Reinforced aluminium with wheels on one end, 710mm(W) x 480mm(H) x 370mm(D).

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### HEAD OFFICE

#### **WEIS GMBH & Co. KG**

Kaffeestrasse 4  
28779 Bremen  
Germany  
Tel: +49 (0) 421 606040  
Fax: +49 (0) 421 607066  
Email: WeisGmbHBremen@t-online.de

### LOCAL REPRESENTATIVE



### UK OFFICE

#### **WEIS GMBH & Co. KG**

'Bay Trees' 47 Beltinge Road  
Herne Bay  
Kent CT6 6DA  
UK  
Tel: +44 (0) 1227 749413  
Email: sales@WeisGmbH.net