SA100

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 its pioneering of analogue timing techniques developed over more than 20 years ago, Weis has applied its expertise to develop a robust switchgear test set for performance analysis on high, medium and low voltage circuit breakers.

The Switchgear Analyser (SA100) is an essential substation preventative maintenance tool and aid for power utilities with ever increasing demands for more reliable low cost energy and on-time maintenance.

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
- Datum Velocity
- Velocity at Contact Touch
- Stroke
- Contact Length (Main / Resistive)
- Contact Separation
- Spring Compression on Vacuum Contacts
- Travel Overshoot
- Rebound
- Bounce Time
- Mechanism Times (Pre Latch / Latch Period)
- Acceleration
- Fingerprint Comparison on all channels (Grey Zone Checking)
- Battery Voltage

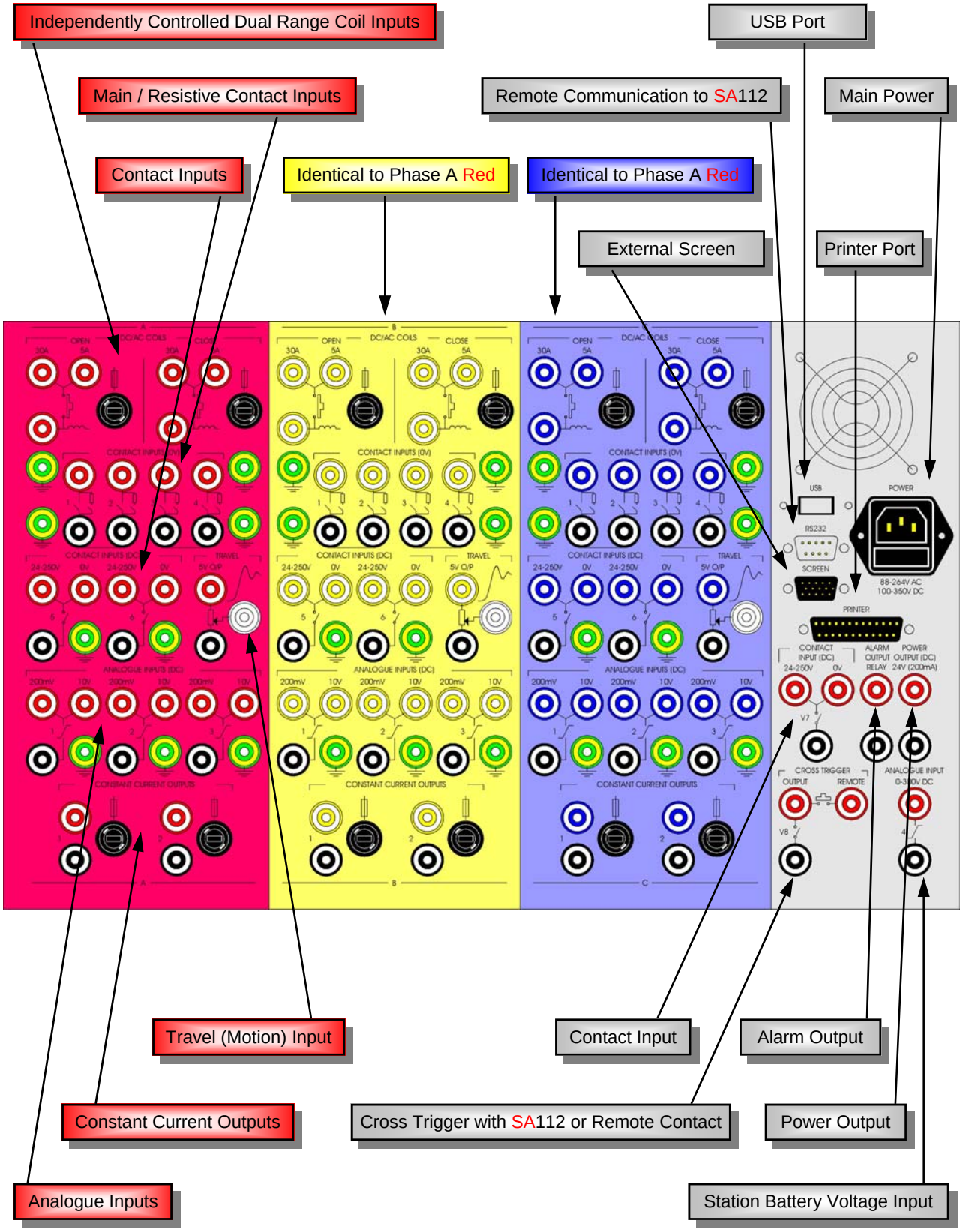
In addition, Dynamic Timing of up to 2 breaks per phase is made available with 6 x 20A constant current outputs.

The SA100 can optionally perform timing of up to 12 main and 12 resistive contacts per phase when combined with the SA112 expansion unit.

Features

- **ROBUST SWITCHGEAR TEST AND ANALYSIS SYSTEM FOR PORTABLE OR FACTORY USE**
- **SOFTWARE *WIZARD* TO SIMPLIFY TEST CONFIGURATION**
- **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**
- **INDENPENDENT CONTROL OF TRIP AND CLOSE AC OR DC COILS PER PHASE WITH 5 OR 30AMP MEASUREMENTMENT RANGES**
- **16 ANALOGUE INPUT FOR: *3 x DUAL RANGE (5 / 30A) TRIP AND CLOSE COIL CURRENT , 3 x TRAVEL, 1 x STATION BATTERY VOLTAGE, 9 x USER CONFIGURABLE***
- **32 DIGITAL INPUTS FOR: *TIMING OF UP TO 4 MAIN AND 4 RESISTIVE CONTACTS PER PHASE, 7 x TIMING CONTACTS (24-250V DC or 0V DC)***
- **CALCULATED INPUTS FOR: *VELOCITY AND ACCELERATION PER TRAVEL INPUT***
- **MEASUREMENT OF UP TO 12 PARALLEL CONTACT (P.I.R.) SWITCHING RESISTORS IN A SINGLE TEST**
- **OPTIONAL PRINTER HOUSED IN CASE**
- **OPTIONAL SA112 EXPANSION UNITS FOR TIMING OF UP TO 12 MAIN AND 12 RESISTIVE CONTACTS PER PHASE INCLUDING FRAME R BREAKERS**
- **SA100 CAN DYNAMICALLY TEST 2 BREAKS PER PHASE WITH BOTH ENDS CONNECTED TO EARTH**

Connections



Switchgear Analyser

Data Management

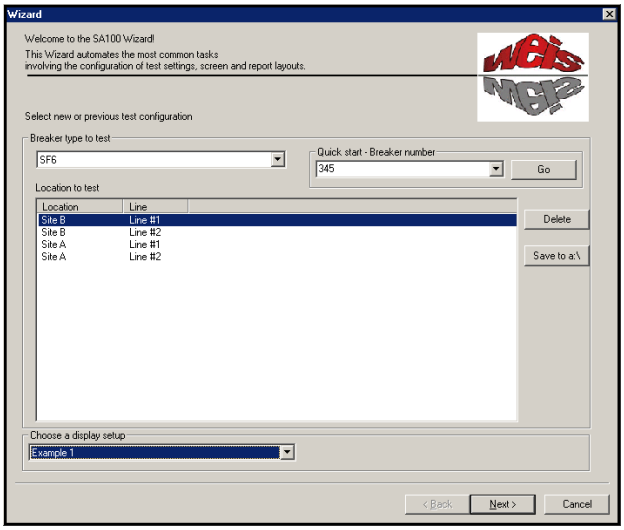
Breaker Test & Analysis software is an essential 32-bit Windows™ database program that provides an easy to use operator interface for configuring & displaying the SA100 test results in graphical and text report formats.

Features:-

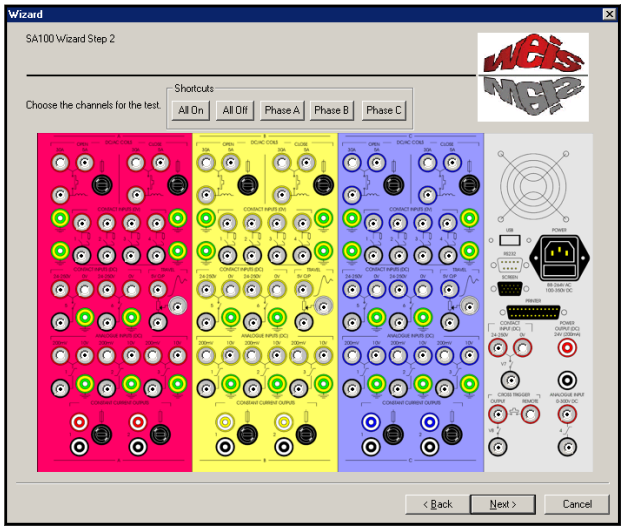
- Operator interface for Regular (via Wizard) or Advanced users
- Results automatically computed with feature to recalculate on configuration change of any existing test record
- Graphical display of captured waveforms with measurement cursors
- Standard or user defined report format
- Archiving of all 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.

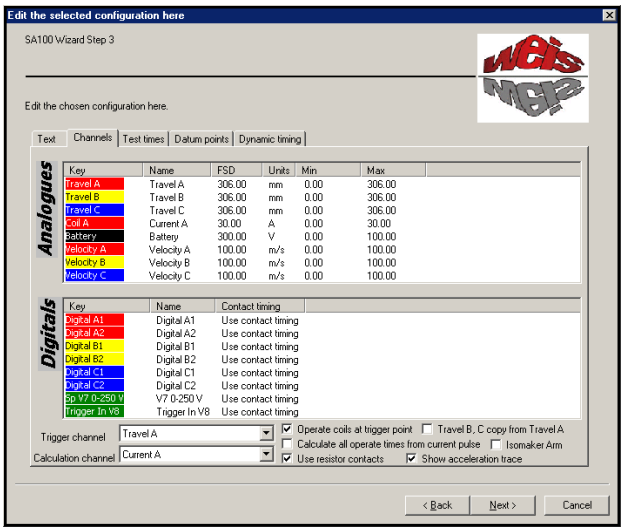
The display and printing of a report can be fully customised to include logo's, in-house styles, text phrases and results format, thus eliminated the need to manually complete a written form in most cases.



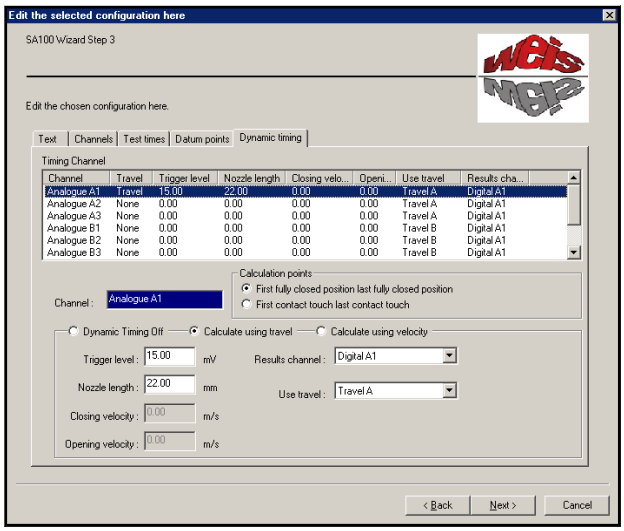
Wizard - Start New or Select Existing Test Configuration



Wizard (Step 2) - Breaker Test Connections



Wizard (Step 3) - Channel Settings



Wizard (Step 3) - Dynamic Test Settings

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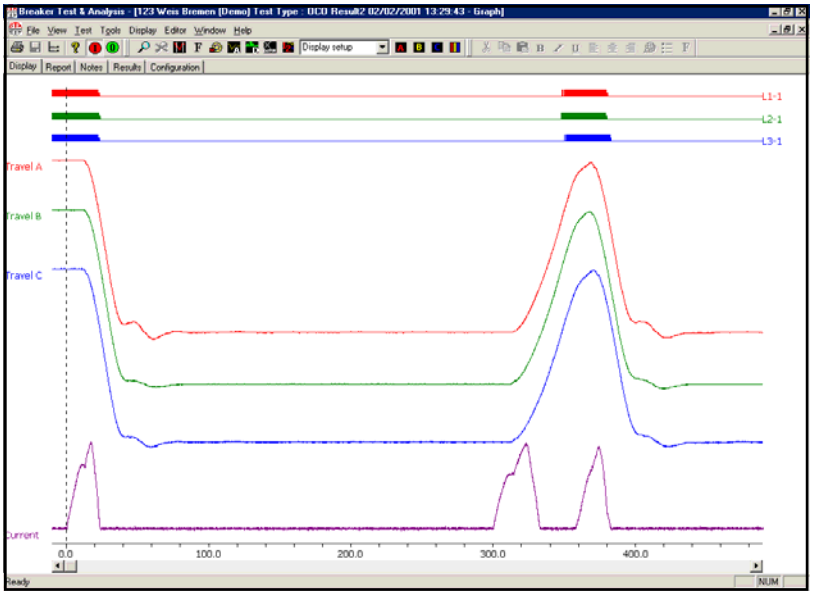


Graphical Display

Features:

Zoom - Time Base

Zoom - Amplitude

Cursors - Measured Value & Time

Colours - Traces & Background

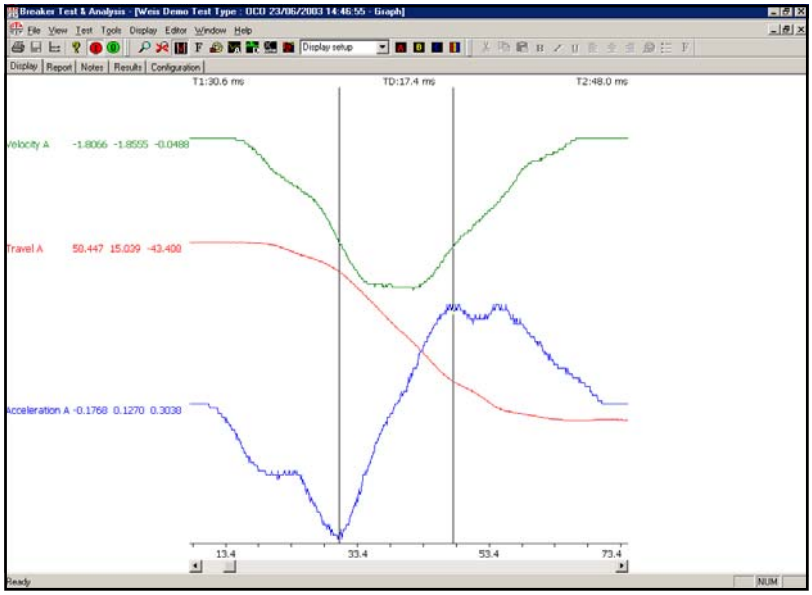
Font - Text Style & Size

Print - Screen as Displayed

Add Calculated Channels

Combine Test Records - Overlay Traces

Select Pre-defined Display Setups



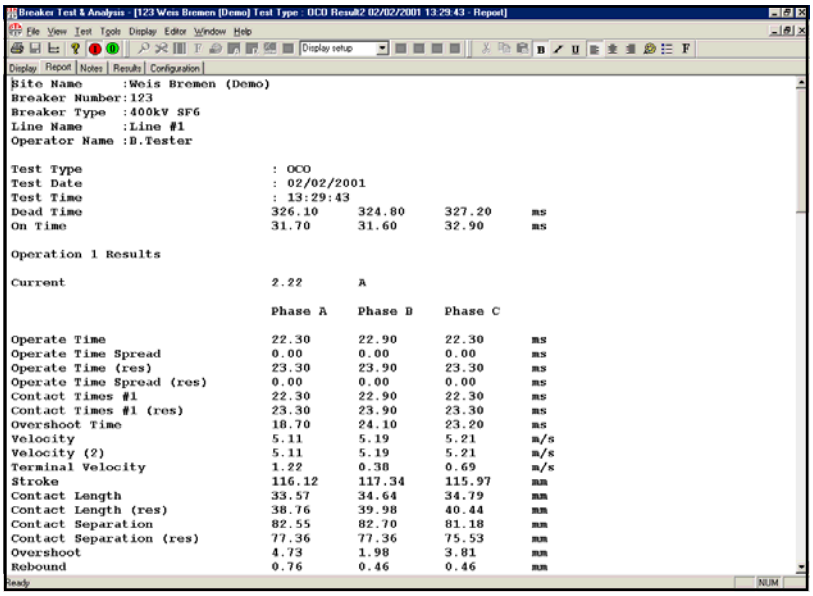
Acceleration & Velocity

Advanced Analysis:

Acceleration Trace Computed from Travel

Velocity Trace computed from Travel

All Graphical View Features Supported



Text Report

Features:

Customise which Results are shown

Edit Headings

Change Font - Text Style, Size & Colour

Select Pre-defined Report Setups

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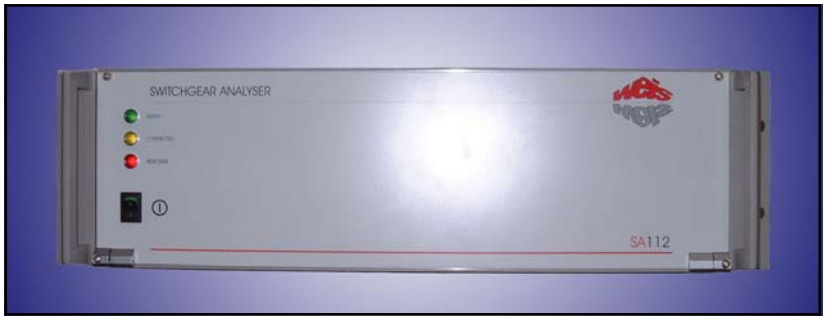
Optional Items / Accessories

SA112 Expansion Unit

The SA112 extends the digital input capacity of a SA100 Switchgear Analyser for timing circuit breakers with up to 12 breaks per phase including Frame R breakers.



Features:-

- Most compact system
- Serial link and 2-wire cross-trigger cable from up to 2 SA112's to an SA100 Switchgear Analyser
- Timing of circuit breakers with up to 12 main and 12 resistive breaks per phase including Frame R types

Dynamic Timing with Both Ends Connected to Earth

Dynamic Timing is performed with a constant current passed through the breakers contacts with both ends connected to earth, providing the most accurate timing test on modern circuit breakers.

This method of timing is possible on a SA100 Switchgear Analyser, however an optional Dynamic Timing Cable Set is required.

Dynamic Micro-Ohm Testing

Dynamic Micro-Ohm Testing of circuit breakers is an advanced technique that provides more detailed information about its condition.

Performing this type of test requires the combined use of the SA100 Switchgear Analyser with a car battery (sourced locally) and an optional Dynamic Micro-Ohm Cable Set (including a current shunt).

Printer

A printer housed within the case is available on request.

Keyboard / Mouse

An external PS2 keyboard with built-in touchpad is available on request. USB keyboards are also available.

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 and optional items.

The case for the SA100 Switchgear Analyser has the added feature rear wheels and the possibility to attach a cable case on top.

SA100

Specifications

INPUTS

Analogue:	3 x Independently controlled trip (open) and close coil current inputs. 3 x Resistive (linear or rotary) travel transducer inputs. 9 x User configurable 0 - 10V DC or 0 - 200mV DC inputs (e.g. for pressure transducers, dynamic timing), selected via input sockets. 1 x 0 - 300V DC (e.g. station battery voltage).
Analogue Accuracy:	<0.5% of fullscale.
Digital:	24 x Contact status inputs providing timing of up to 4 main contacts and 4 resistive contacts per phase (dry contacts). 7 x User configurable inputs for 'wet' or 'dry' contact timing (24 - 250V DC or 0V DC). 1 x Dedicated trigger channel for cross-trigger with optional SA112 expansion units.
Resistive Contact Range:	15 - 10,000 ohms.
Digital Accuracy:	0.1mS / 0.05mS / 0.033mS. Optional 0.01mS*.
Connectors:	4mm safety socket.

OUTPUTS

Coil Operation:	Solid state outputs for trip (open) and close.
Coil Peak Current:	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).
Coil Max. Voltage:	400V peak.
Battery:	6 x Isolated and floating 20A DC constant current battery sources for dynamic breaker timing.
Batt. Characteristics:	Charging time from fully discharged state 8 hours. Recharge time for a single discharge 100 seconds.
Batt. Accuracy:	±0.5%, 100ppm/ºC.
Batt. Drive Capability:	0.0 to 0.5 ohm load.
Power:	24V DC general purpose (e.g. loop powered pressure transducers) supply rated for up to 200mA DC.
Cross-Trigger:	1 x internally wetted relay contact for cross-trigger with optional SA112 expansion units.
Communication:	RS232 for local communication to optional SA112 expansion units.
Alarm:	1 x volt-free relay contact.

RECORDING

Resolution:	12 bit A/D (1:4096).
Sampling Rate:	10 kHz / 20 kHz / 30 kHz. Optional 100 kHz digital sample rate*.
Recording Time:	Selectable up to 100 seconds.
Synchronisation:	All inputs sampled simultaneously.
Start trigger:	Coil current or selectable on any analogue / digital input.

GENERAL SYSTEM

12.1" TFT SVGA (800x600) "High-Bright Sunlight Readable" colour display (600cd). Removable USB Flash-Disk. EIDE hard disk drive. VGA port for external screen. RS232 serial, parallel printer, RJ45 network and 2 x USB ports. 256MB RAM. Windows™ Operating System. All standard Windows Centronics or USB printers supported. Safety keyswitch to enable/disable coil operation and constant current battery operation. 2 x PS2 sockets.

REAL-TIME CLOCK

Range:	Time, date, leap year and day of the year with internal battery backup.
Resolution:	100mSec.

PROGRAMMING - SETTABLE PARAMETERS

User strings:	Site name, breaker number, breaker type, line name, operator name and up to 30 user configurable.
Test times:	Close, Open, Trip Free, Close-Open, Open Close, Open-Close-Open.
Coil operate times:	Initial delay, trip coil "on-time", close coil "on-time", delay time between closing and opening, delay time between opening and closing.
Analogue channels:	Input name, fullscale value, units.

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Digital channels: Input name.
Datum points: 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, stroke, contact length (main/resistive), contact separation, travel overshoot and rebound.
Acceleration and velocity:
Graphical traces derived for each measured travel input with cursor measurement.
Parallel Contact (P.I.R.) Switching Resistors:
Graphical traces for each with cursor measurement.

OPERATING VOLTAGES

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

ENVIRONMENTAL

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

MECHANICAL DETAILS

Enclosure: 6U steel enclosure suitable for Euro 19" wide rack mounting or free standing (tabletop).
Ventilation: Fan assisted.
Weight: <15kg.
Carry Case: Reinforced aluminium with wheels on one end, 710mm(W) x 480mm(H) x 370mm(D).

OPTIONAL SA112 EXPANSION UNIT (for up to 12 main/resistive breaks per phase)

Digital Inputs: 48 x Contact status inputs providing timing of up to an additional 8 main contacts and 8 resistive contacts per phase (dry contacts). Resistive contact range 15 - 10,000 ohms.
15 x User configurable inputs for contact timing (24 - 250V DC).
1 x Dedicated trigger channel for cross-trigger with SA100.
Outputs: 3 x 24V DC supplies for wetting user configurable digital inputs.
3 x Front panel diagnostic LED's (green = Ready, yellow = Connected, red = New Data).
RS232 port for local communication with SA100.
Recording: 10 kHz sampling rate, with sample record automatically aligned (via cross-trigger channels) and integrated within main record.
Operating Voltages: Same as SA100 with inlet / outlet IEC power connections.
Environmental: Same as SA100.
Mechanical Details: 3U steel enclosure suitable for Euro 19" wide rack mounting or free standing (tabletop).
Weight <4kg.
Reinforced aluminium carry case, 560mm(W) x 240mm(H) x 500mm(D).

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