

HV Circuit Breaker Analyzer and Microhmmeter

- Built-in 200 A microhmmeter
- Up to 18 main and 18 resistive contact inputs
- 12 auxiliary timing inputs
- Up to 4 trip/close coils control
- Motion and speed analyzer
- Static and dynamic contact resistance measurement
- Digital transducer for motion analysis
- Minimum trip coil test
- Circuit Breaker test with both sides connected to ground (BSG option).
- Three phase first trip test
- Stand alone functionality - no PC connection is required
- Large graphical high brightness sunlight display
- Analysis and result evaluation directly on the display
- Internal memory for up to 500 test results and 64 pre-defined test plans
- Possibility to synchronize up to four CBA 2000
- TDMS - Test & Data Management Software

A P P L I C A T I O N

The CBA 2000 is a unique test set for the complete test of all circuit breakers. It is a powerful timing and motion analyzer equipment with built-in 200 A pure DC microhmmeter for static and dynamic contact resistance tests. CBA 2000 is a stand alone unit with a large graphical display. The unit is supplied with TDMS analysis software. TDMS performs test results analysis and creates test reports; it allows also to pre-define test plans. TDMS is also a powerful Test and Data Management software compatible with all ISA Test Sets. All CBA 2000 circuits have been designed to ensure safe and reliable operations in the noisy environment of EHV and HV substations.

CHARACTERISTICS

Coil operation

- Number of circuits: 2 (1 Open and 1 Close coils); optional 4 (3 Open and 1 Close coils).
- Type of driver: electronic; it ensures superior timing control.
- Driver characteristic: 300 V DC max; 30 A DC max.
- Operating time accuracy: 50 μ s.
- Measurement of the coil current: one per channel; the waveform is displayed on the dedicated channels.
- Coil current ranges: 2.5; 10; 25 A full scale, user selectable.
- The 4 coils option allows the selection of single or multiple phase opening.
- Coil current measurement accuracy: 0.5% of the reading \pm 0.1% of the selected range.



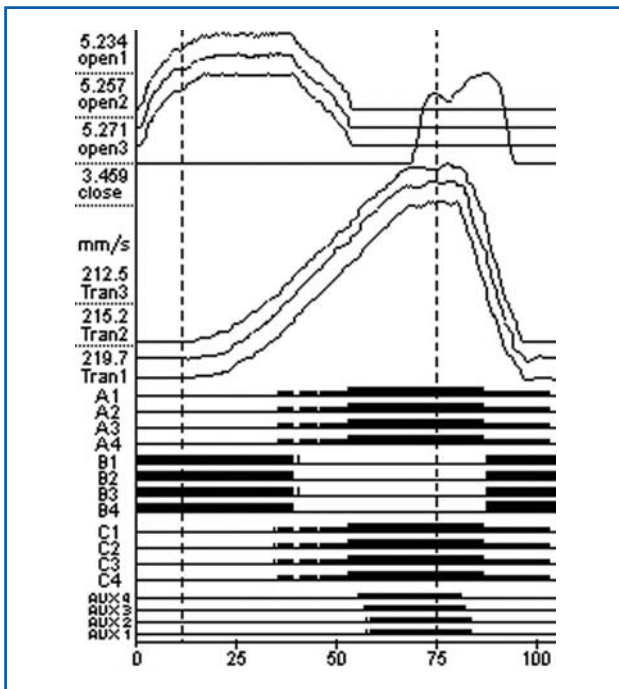
- Outputs are isolated between them.

Main contact inputs

- Number of contact inputs: 6 + 6 resistor contacts (2 breaks per phase), divided in 3 groups of 2 each. In option: 12 or 18, divided in 3 groups of 4 or 6 resistor and main contacts.
- Resistor contact ranges: from 20 Ohm to 10 kOhm.
- Contact test voltage: 24 V. Main contact test current: 50 mA.
- Each input group is isolated with respect to the others.

Event inputs

- Number of auxiliary event inputs: 4, divided in 2 groups of 2 each.
- Optionally: 8 or 12 divided in 4 or 6 groups of 2 each.
- Capability of testing dry or wet contacts: 24 V; 20 to 300 V. Test current: 2 mA.



Test result display

Sample rates

20kHz - 10kHz - 5 kHz - 2kHz - 1kHz - 500Hz - 200Hz - 100Hz, 50 Hz and 20 Hz user selectable.

Timing accuracy

50 μ s \pm 0.025% of the time reading at 20 kHz.

Timing resolution

\pm 50 μ s at 20 kHz.

Maximum record length

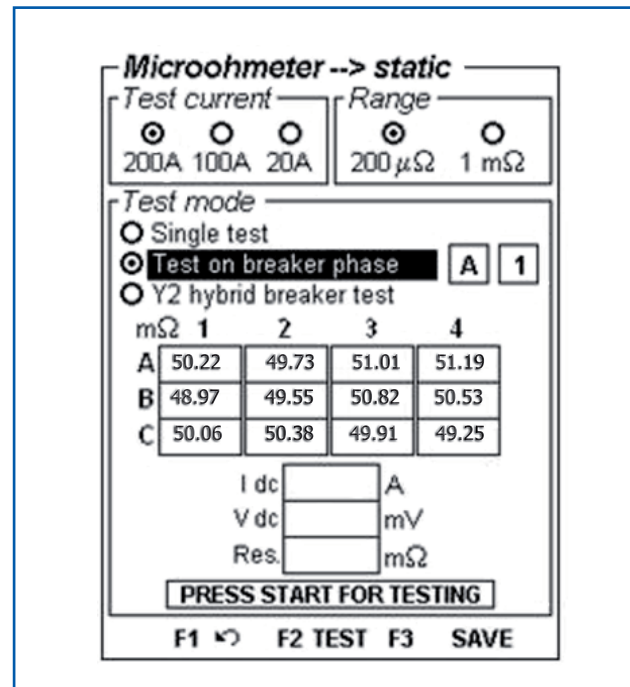
1000 s.

Analog inputs

- Number of analog inputs: 8 (10 Optional).
- 2 (4 optional) dedicated to Open and Close coil currents.
- 1 dedicated to Dynamic and Static Resistance Measurement.
- 3 for travel transducers or analog signals.
- Input voltage range: \pm 10 V.
- 2 general purpose analog input.
- Input voltage range: \pm 5 V; \pm 50 V; \pm 500 V user selectable.
- The analog inputs are isolated with respect to all other circuits.
- Analog input measurement resolution: 16 bit.

Programmable sequences

The user can select the following Open and Close sequences: Open; Close; Open-Close; Close-Open; Open-Close-Open.



Microhmmeter display

Microhmmeter - static and dynamic resistance measurement module (option)

- DC Test current: 200 A, 100 A, 25 A.
- Contact resistance range: 200 μ Ohm; 1.000 mOhm; 10.00 mOhm; 100.0 mOhm; user selectable.
- Resistance measurement accuracy (range 100 mOhm): \pm 1% of the reading \pm 0.2% of the range.

Minimum trip voltage test (option)

The minimum trip voltage test allows the user to verify the minimum trip voltage threshold and the voltage drop off of a trip coil.

- . Two options: 250 V - 4 A; 70 V - 10 A.
- . Maximum voltage adjustment: up to 50% of nominal DC Voltage.

Digital transducer

CBA 2000 can perform the motion analysis of the circuit breaker using digital transducers.

The characteristics are:

- . Up to three digital transducer inputs.
- . Input type: RS 422 - Single ended for incremental encoders with quadrature signal.
- . Max input frequency : 50 kHz.
- . Power supply: 5 V and 12 V supplied by the CBA 2000.

Possibility to use an external power supply up to 24 V.

- . Connections: 3 multiple connectors on the CBA 2000 front panel.

Internal or external Printer (option)

- . Optional internal thermal printer 58 mm wide.
- . Optional external thermal printer SEIKO DPV-414, 112 mm wide.

First trip test (with optional clamps)

Besides the standard off-line timing mode, the CBA 2000 also features an optional three-phase first trip test. In this mode, the CBA 2000 registers the breaker's operation (open or close time, open/close coil current and DC auxiliary voltage) while the breaker is in service. Three AC current to voltage clamps record the secondary currents as the CB opens: the current waveform timing can be measured on the waveforms. It is also possible to record the open current profile with a DC clamp, and also to monitor the auxiliary contacts. The first time detection is important because, if the CB has been in service for a long period in close position, the (first) trip time can be considerably slow because of friction.

In the normal test conduction, the CB is opened before connecting to the poles; so, the first movement friction is lost.

Test set control

The control is local, via graphical display, keypad and pushbutton for menu selection: no PC control is necessary.

Display

Large graphical high brightness sunlight display (viewing area 122 x 92 mm). Test results are displayed graphically and in table format. Zoom functions and cursors for test data analysis are directly available on the CBA 2000 display.

Interfaces to PC

2 available interface: USB and RS232.

Flash drive interface

It allows to download test results and settings to a commercial flash drive memory - USB 2.0 compliant.

Memory size

256 Mbytes: 500 results.

Mains supply

CBA 2000 can operate both from mains (AC or DC) and from internal rechargeable battery:

- . Mains supply:
 - .. From 85 to 265 V AC; 50-60 Hz.
 - .. From 100 to 350 V DC.
- . Internal battery. Battery characteristics: Type: NiMh.

Case

Aluminium case, with hinged removable cover and handle.

Weight and dimensions

Weight: 13 kg basic unit; 15 kg with Microhmmeter module.
Dimensions: 490(W) x 370(D) x 240(H) mm.

Accessories supplied with the unit

The following accessories are always supplied with the unit:

- . Mains cable;
- . Hardware and software user manuals;
- . Serial cable;
- . USB cable;
- . TDMS software.

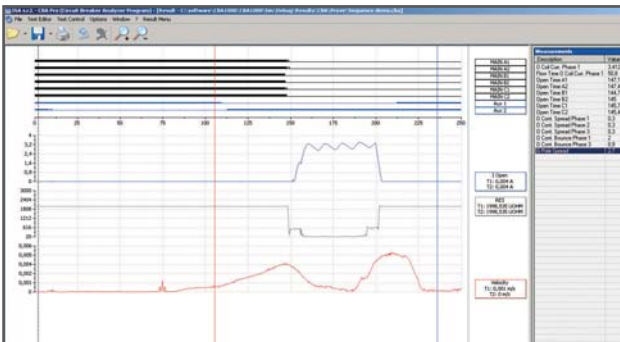
TDMS software

TDMS is a powerful software package providing data management for commissioning and maintenance testing activities. Circuit breaker data and test results are saved in TDMS database for historical results analysis.

TDMS software has the following main features.

- . Full control of CBA 2000 functions from PC.
- . Download of test Plans.
- . Download of test results.
- . Test plans and test results can be viewed, edited in the missing descriptions, saved, printed, exported.
- . Possibility of viewing and overlaying multiple results for easy test result comparison
- . Possibility to pre-set test plans and to download them into the test set.
- . Two cursors select measurement points and intervals.
- . Zoom in and out feature.
- . Enhanced measurement features for movement - speed - acceleration control.

ISA software updating policy allows all the users to update their software from ISA web site www.isatest.com at no additional cost.



Test result analysis

OPTIONS AVAILABLE

The following options are available upon request:

- **Test cable kit:** The connection cables set includes:
 - . Two cables with four conductors each for the connection to the Circuit Breaker coils. Cable length: 10 m; section 1.5 mm².
 - . Three (6 or 9 in option) cables with silicon insulator each for the connection to the main contacts, each with three conductors. Cable length: 16 m; section 1 mm².
 - . Two cables (4 or 6 in option) with silicon insulators for the connection to the Event inputs, with three conductors each. Cable length: 6 m; section 1 mm².
 - . One shielded cable for the low voltage measurement, with two conductors. Cable length: 10 m; section 0.5 mm².
 - . One crocodile clips set (16 clips), with different colors, for the connection to the event contacts and to the 500 V input measurement.
 - . One set of 12 cables, 2 m long, in different colors, for the connection to other inputs.
 - . One set of 20 adaptors with banana on one side and terminator

on the other side, in different colors, for the connection to the event contacts and to the coil inputs.

- . Eight short cables to connect the coils mains.
- . One cable for the minimum trip voltage test option.
- . Three cables for the connection to the analog transducers.
- . Three adaptors for the connection to the analog transducers.
- . Three cables with 10 poles for the connection to the digital transducers.

If microhmmer option is included, the following cables are supplied:

- . Two high current cables, with a conductor. Cable length: 10 m; section 25 mm².
- . Transport plastic case, with handles. Dimensions: 45 x 55 x 22 cm.

- **Additional 2 open driving coils module.** This module increases to 3 the number of Open Coils.
- **Microhmmer - built-in 200 A static / dynamic resistance module** with 10 m long test cables, cross section 25 mm², terminated with high current clamps.
- **Minimum trip voltage test.** This option allows the user to verify the minimum trip voltage threshold and the voltage drop off of a trip coil.
- **Internal thermal printer.** CBA 2000 can be supplied with a built-in thermal printer, 58 mm wide.
- **External thermal printer** Seiko DPV- 414.
- **BSG** is an enhanced safety external module, that allows to test the circuit breaker with both sides connected to ground.
- **Heavy duty transport case with wheels.**
- **Plastic soft bag.**
- **Digital transducer**, model Hegstler RS - 58 - 0 / 5000 AS.41RB, supplied with connection cable 1 m long, terminated with multiple connectors. Other models are available upon request.
- **Linear transducer TLH 150** - 150 mm length (IP40).
- **Linear transducer LWG 150** - 150 mm length.
- **Linear transducer TLH 225** - 225 mm length (IP40).
- **Linear transducer LWG 225** - 225 mm length.
- **Linear transducer TLH 300** - 300 mm length (IP40).
- **Linear transducer TLH 500** - 500 mm length (IP40).
- **Linear transducer LWG 500** - 500 mm length.
- **Linear transducer LWG750** - 750 mm length.
- **Rotary transducer IP 6501** - 355° rotation angle.
- **Pressure transducer** PA-21 Y 40 BAR.
- **Universal Transducer mounting kit** for TLH, LWG and IP travel transducers.
- **DC current clamp**, for coil or motor current measurement.
- **AC current clamp:** three of them allow the three phase first trip test.

APPLICABLE STANDARD

The test set conforms to the EEC directives regarding Electromagnetic Compatibility and Low Voltage instruments.

A) Electromagnetic Compatibility:

Directive 2004/108/EC (CE conform). Applicable standard: EN 61326:2006.

B) Low Voltage:

Directive 2006/95/EC (CE conform).

. Applicable standards, for a class I instrument, pollution degree 2, Installation category II: CEI EN 61010-1.

In particular:

- . Inputs/outputs protection: IP 2X - CEI EN 60529.
- . Operating temperature: -10°C to 55°C;
storage: -20°C to 70°C.
- . Relative humidity: 10 - 95% without condensing.

ORDERING INFORMATION

CODE	MODULE
46169	CBA 2000 - BASIC UNIT 2 breaks per phase - 4 auxiliary inputs - 3 transducer inputs - TDMS software
47169	CBA 2000 - BASIC UNIT 4 breaks per phase - 8 auxiliary inputs - 3 transducer inputs - TDMS software
48169	CBA 2000 - BASIC UNIT 6 breaks per phase - 12 auxiliary inputs - 3 transducer inputs - TDMS software

OPTIONAL ACCESSORIES

CODE	MODULE
15169	Test cables kit with case for CBA 2000 (2 breaks per phase)
55169	Test cables kit with case for CBA 2000 (4 breaks per phase)
65169	Test cables kit with case for CBA 2000 (6 breaks per phase)
92169	Additional 2 Open Coils Module*
90169	Additional 2 Breaks per phase expansion kit
91169	Additional 4 Breaks per phase expansion kit
95169	Microhmmeter - 200 A Static / Dynamic Resistance Module (with test cables 10 m terminated with clamps) *
93169	MTC - Minimum Trip Voltage test module *, **
94169	Internal Thermal Printer *, **
14102	External Thermal Printer
18169	Heavy Duty Plastic Transport Case
19169	Soft carry bag
11166	TLH 150 Analog Linear Transducer 150 mm (IP40)
12166	TLH 225 Analog Linear Transducer 225 mm (IP40)
36166	TLH 300 Analog Linear Transducer 300 mm (IP40)
13166	TLH 500 Analog Linear Transducer 500 mm (IP40)
14166	Analog Rotary Transducer: IP 6501 – 355° rotation angle
26166	LWG 150 Analog Linear Transducer 150 mm
27166	LWG 225 Analog Linear Transducer 225 mm
28166	LWG 500 Analog Linear Transducer 500 mm
42166	LWG 750 linear transducer 750 mm
11169	Digital Rotary Transducer Hengstler RSO-550-170
13169	Pressure transducer PA-21 Y 40 BAR
16166	Universal Analog Transducer mounting kit
17169	Universal Digital Transducer mounting kit
29166	DC Current Clamp
86169	AC current clamp 1 A / 0.1 V
44166	Flexible Coupling Shaft

Options with * must be specified at order.
Options with ** are exclusive each other: code 94169
Internal thermal printer cannot be ordered together
with code 93169 Minimum Trip Voltage Test Module.



Heavy duty plastic transport case



Soft bag



Test cable kit with transport case



Transducers case



Transducers mounting kit



TLH linear transducer



LWG linear transducer



Digital rotary transducer



Analog rotary transducer



Pressure transducer



Current clamp

Safe Circuit Breaker Test with Both Sides Grounded

- Option for ISA Circuit breaker Analyzers CBA 1000 and CBA 2000.
- Work safely while testing.
- Save circuit breaker testing and analysis time.
- Preserve all timing and motion test integrity.
- BSG 1000 allows the test of circuit breakers using Graphite Nozzle.
- This method applies to all kinds of circuit breakers.

I N T R O D U C T I O N

With the BSG option it is possible to perform the circuit breaker timing test with both sides grounded. The grounding connection is NOT removed during the test, as it has to be with conventional test equipment.

Safety is becoming more and more important, and several laws and regulations all around the world prescribe that, at the work location in high voltage installation, all parts which are to be worked on, shall be earthed (grounded) and short circuited. While testing a Circuit Breaker in high voltage substations the situation may become dangerous due to the high electric potential. This can be caused by a capacitive coupling from a close conductor or when lightning strikes the line somewhere, or when a fault occurs during the test and a high potential reaches the circuit breaker.

To improve personnel safety, reduce hooking time and preserve the test set integrity, the use of BSG 1000 is the best practice.

BSG 1000 is also the best solution for testing Circuit Breakers equipped with Graphite Nozzles.



DESCRIPTION

Two BSG 1000 types are available:

- BSG 1000- type 1 for testing one break per phase;
- BSG 1000- type 2 for testing two breaks per phase.

Each BSG 1000 is made of the following elements:

. Three BSG Remote Heads, connected close to the main breaker contacts.

. *Remote Heads for BSG 1000- type 1:*

. Each head has two cables, 2.5 m long, cross section 4 mm², terminated with crocodile clamps.

. One bipolar shielded cable, 3 m long, terminated with crocodile clamps.

. One 8 m long cable, terminated with multi-pole connectors for the connection between Remote Heads and the BSG Main unit.

. *Remote Heads for BSG 1000- type 2:*

. Each head has three cables, 2.5 m long; cross section 4 mm², terminated with crocodile clamps.

. Two bipolar shielded cables, 3 m long, terminated with crocodile clamps.

. One 8 m long cable, terminated with multi-pole connectors for the connection between Remote Heads and the BSG Main unit.

. One BSG Main unit, connected to the CBA 2000 circuit breaker analyzer.

. Connection of BSG Main Unit to CBA 2000: via a cable 1 m long, terminated with a multi-pole connector.



BSG 1000 - Remote Head, type 1

SPECIFICATION

. Number of main contact inputs (type BSG 1000-1): 3, divided in three groups.

. Number of main contact inputs (type BSG 1000-2): 6, divided in three groups of two each.

. Test current injection: 20 A DC nominal.

. Maximum test duration (each test): 1 s

. Graphite nozzles test selection in the menu.

Mains supply

. From 85 to 265 V AC; 50-60 Hz, and:

. From 100 to 350 V DC.

. Maximum supply current: 1 A @ 85 V AC.

Weight and dimensions

BSG 1000 main unit

. Case: aluminium case, with hinged removable cover and handles.

. Weight: 6 kg.

. Dimensions: 325 x 180 x 285 (W x H x D).

BSG 1000 remote heads (three units)

. Case: die-cast aluminium case.

. Weight: 0,7 kg (without cables).

. Dimensions: 125 x 56 x 125 (W x H x D).

ORDERING INFORMATION

CODE	MODULE
22166	BSG 1000 One break per phase including: . No 3 BSG Remote Heads Type1 . No 1 BSG Main unit . No 1 Cables kit
21166	BSG 1000 Two breaks per phase including: . No 3 BSG Remote Heads Type 2 . No 1 BSG Main unit . No 1 Cables kit
17166	Heavy duty plastic transport case for BSG 1000



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EN- CBA 2000 - 04/2015

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Always refer to our technical specification for more detailed information and as formal contract document.