

# CAT250

## Circuit Breaker Analyzers & Timer

- Robust design for field use
- Accurate measurement in high voltage environment
- Touch-screen color display 10.1 inch
- Both Sides Grounded feature for AIS (optional)
- Built-in micro-ohmmeter (up to 500 A) for dynamic and static resistance measurement (optional)
- Built-in printer 112 mm (optional)
- Database of circuit breakers test plans
- DV-CB software for detailed analysis of test results



### Description

The **CAT250** circuit breaker analyzer & timer is stand-alone or a PC-controlled digital instrument for circuit breakers condition assessments.

**Touch-screen interface** provides easy and intuitive control of test device and result analysis.

The **timing channels** record closing and opening of the main arcing, resistor and auxiliary contacts. The main contact channels can also measure the resistance value of the pre-insertion resistors (if present in the circuit breaker).

Furthermore, the main contact timing channels can also measure main arcing contacts operation time of AIS (Air Insulated Substation) circuit breakers with **both sides grounded (BSG)**.

CAT250 series provides an easy selection of different operational modes:

- Open (O)
- Close (C)
- Reclose (O-0,3s-C)
- Trip free (CO)
- O-0,3s-CO
- Open-Close (O-C)
- Close-Open (C-O)
- Open-Close-Open (O-C-O)

Multiple operations, such as Open-Close and Open-Close-Open, can be initiated by using a predefined delay time or by sensing a breaker's contact position.

The circuit breaker operation can be initiated in different ways (for instance from a control room, by a local switch or externally by a testing device) depending on a testing condition. The several time measurement triggers are available to record a measurement in a various testing condition:

- external trigger
- analog channels
- auxiliary channels
- coil control channel

The **auxiliary inputs** are used to monitor dry and wet auxiliary contacts. The six coil control analog channels can measure and record coil currents simultaneously (OPEN and CLOSE), up to 35 A AC/DC.

**Built-in micro-ohmmeter (optional)** provides high current for dynamic and static resistance measurement, as well for BSG timing measurement of dead tank circuit breakers.

The additional **six voltage analog channels** have four selectable voltage ranges available ( $\pm 1$  V,  $\pm 5$  V,  $\pm 60$  V and  $\pm 300$  V AC/DC). They are used to monitor:

- Measurement of coil resistance (simultaneously for 3 coils – during open or close sequence)
- Circuit-breaker substation battery voltage,
- DC and AC currents during the “First trip” test,
- CT secondary currents for BSG test on GIS
- Other types of analog signals that may be relevant.

**Three vibration channel inputs** record circuit breaker vibration fingerprints providing non-invasive assessment of the circuit breaker main contacts using vibration-based analysis.

**Three transducer channels** provide measuring displacement of the circuit breaker moving parts, contact wipe, over-travel, rebound, damping time and an average velocity. Either an analog or a digital transducer can be connected to these universal channels.

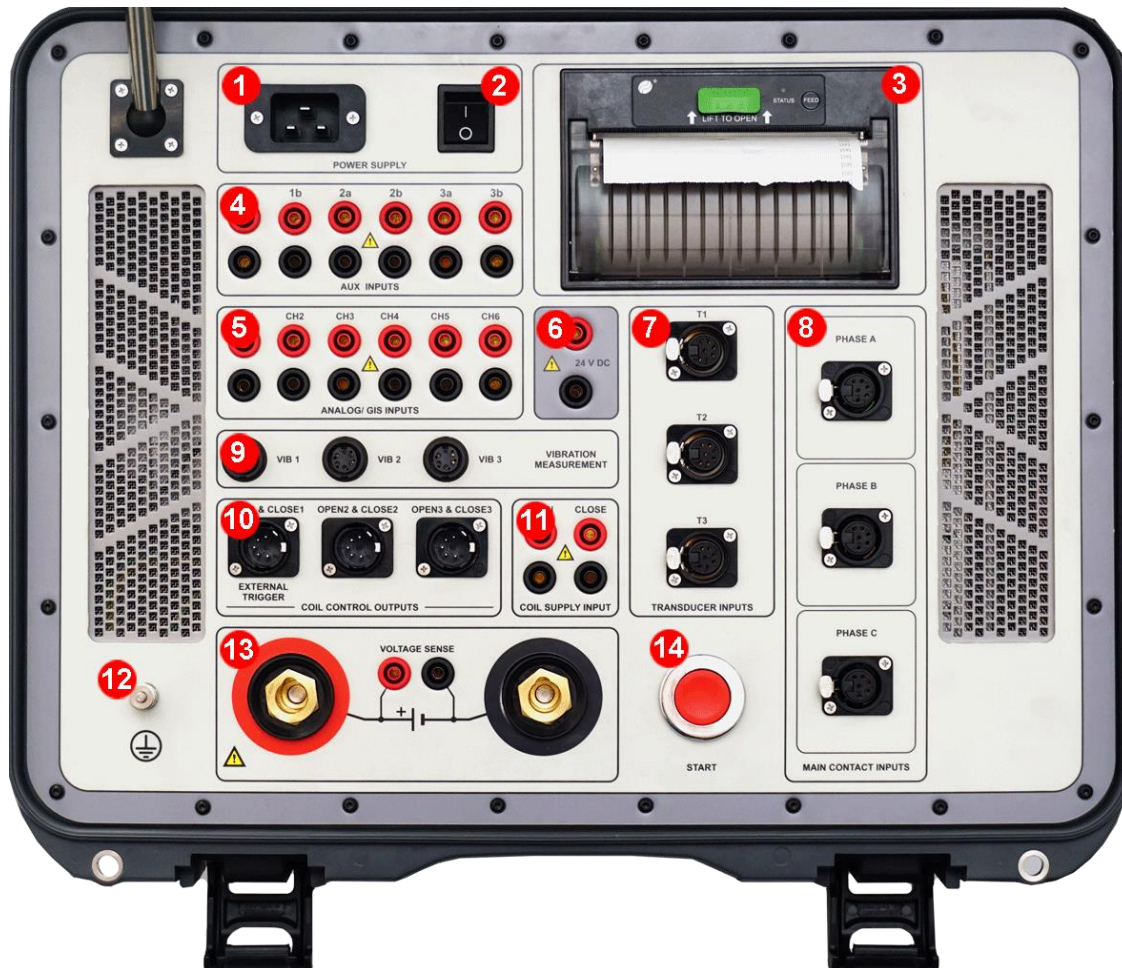
Test results are printed on the 112 mm (4.4 inch) **thermal printer (optional accessory)** in tabular and graphical form.

## Application

The list of the instrument applications includes:

- Simultaneous timing measurement of up to 12 main contacts (4 breaks per phase) including pre-insertion resistors (if present in the circuit breaker) and 6 auxiliary contacts
- Resistance measurement of the pre-insertion resistors (if present in the circuit breaker)
- Evaluation of synchronization between the circuit breaker poles
- Measurement of the coil currents, voltages and resistance (simultaneously for 3 coils – during open or close sequence)
- Evaluating the state of substation’s batteries by graphically showing the voltage value
- Measurement of displacement, contact wipe, over-travel, rebound, damping time and average velocity of the breaker’s moving parts
- Recording of circuit breaker vibration fingerprint
- “First trip” test
- Static resistance measurement
- Dynamic resistance measurement
- Measurement of spring-charging motor time, current and voltage (both DC and AC power supply voltage, when used as CAT & SAT test system)

## Features



### 1 - Mains power supply input

90 – 264 V AC; 50 Hz – 60 Hz

### 2 – On/Off switch

### 3 - Thermal printer (optional)

(Built-in 112 mm (4.4 inch) wide) Graphic and numeric printout of contact and travel wave form

### 4 - Auxiliary inputs

Used for timing measurement of dry or wet auxiliary contacts

### 5 - Analog channels inputs

Used for a voltage measurement of an analog signal that may be relevant.

### 6 - Current clamps voltage supply

24 V voltage output for current clamps

### 7 - Motion transducer inputs

Intended for measuring displacement of circuit breaker's moving parts

### 8 - Main contacts inputs

Used for timing of the main and pre-insertion resistor contacts, and for the resistance measurement of the pre-insertion resistors

### 9 Vibration channels inputs

Intended for circuit breaker vibrations measurement

### 10 - Coil control outputs & external trigger input

Used for operating the circuit breaker OPEN and CLOSE coil or external trigger feature

### 11 - Coil supply input

Separated voltage supply inputs for open and close coil control

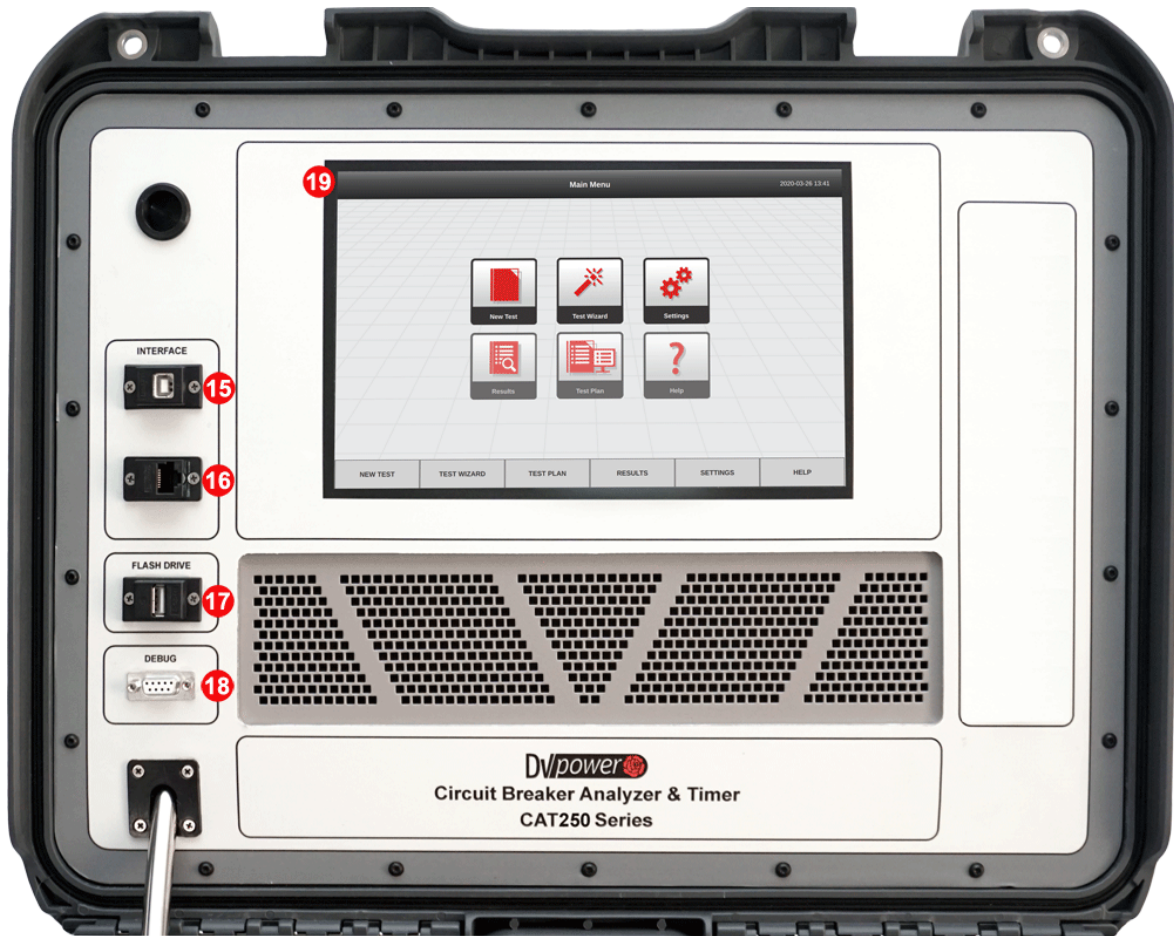
### 12 – Earth (ground) terminal

### 13 - Micro Ohmmeter

(built-in micro-ohmmeter – up to 500 A DC) for static and dynamic contact resistance measurement (optional)

### 14 - START button

Initiates start of the test



**15 - PC communication – USB port**  
USB connection interface

**16 - PC communication – Ethernet port**  
Ethernet connection interface

**17 - Flash drive**  
Used for a direct download of test results on a USB memory stick

**18 – Debug port**  
Used for accessing the SBC application directly. Only used during major upgrades or servicing.

**19 - Display**  
Touch-screen color display 10.1 inch

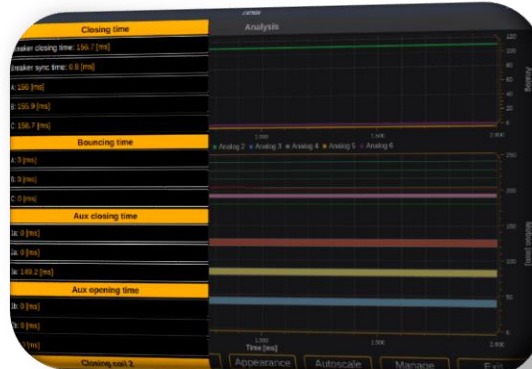
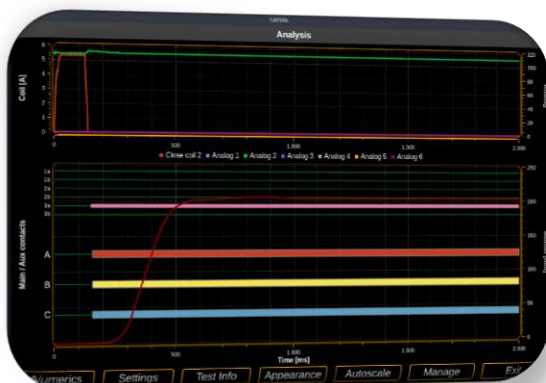
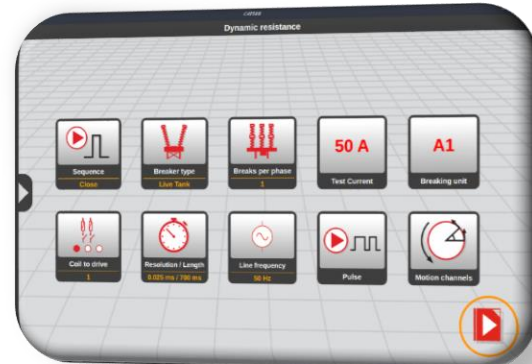


## Touch Screen Interface

New powerful touch screen interface enables control of all the CAT250 series functions. It supports measurements process and intuitive step by step guidance through the entire test procedure, providing faster and easier testing.

All test parameters and settings tools are clearly displayed and can be easily defined or modified. Test results evaluation is supported on site through numerical and graphical presentation.

Graphical presentation of a variety of measurements, timing and dynamic resistance test results uses cursors and powerful zoom functions for detailed analysis.



## Timing measurement

Timing measurement of the mechanical operations is one of the most important tests to determine real condition of the circuit breaker. Timing measurement tests fulfill all the requirements defined by IEC 62271-100 and IEEE C37.09.

In three-phase systems, not only the contacts in a single pole have to operate simultaneously, but all poles must also operate at the same time. All contacts must be synchronized, within a certain tolerance limit.

Synchronization between the circuit breaker poles during opening shall not exceed 1/6 of the rated frequency cycle (3,33 ms at 50 Hz; 2,78 ms at 60 Hz) and during closing shall not exceed 1/4 of the rated frequency cycle, as well (5,0 ms at 50 Hz; 4,17 ms at 60 Hz).

Simultaneous measurements within a single phase are important in situations where a number of contacts are connected in series.

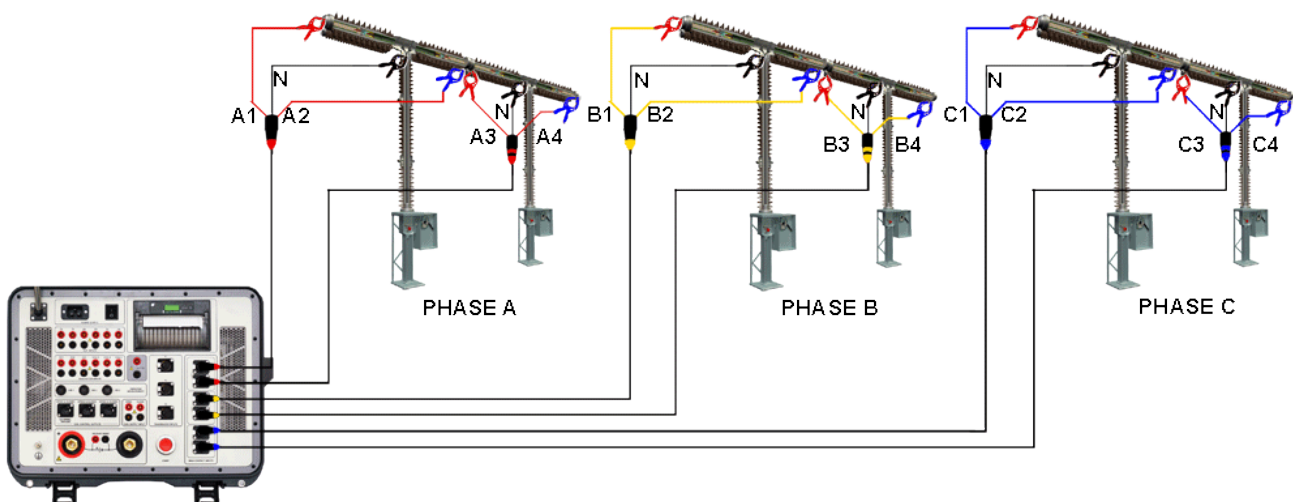
The maximum difference between the instants of contact separation within series connected interrupter units shall not exceed 1/8 of a cycle of rated frequency (2,50 ms at 50 Hz; 2,08 ms at 60 Hz). Maximum difference between the instants of

contacts touching within series connected interrupter units shall not exceed a 1/6 of a cycle of rated frequency (3,33 ms at 50 Hz; 2,78 ms at 60 Hz).

Auxiliary contacts are mechanically driven by the operating mechanism and are used for control and indication of main contacts state. There are no general requirements, related to timing measurement of auxiliary contacts, described in IEC® and IEEE® standards. Anyway, in order to assess condition of high-voltage circuit breakers, it is important to check their operation.

Type "a" contact follows circuit breaker main contact position and must close/open ahead of the closing/opening of the main contact. Type "a" contact is connected in series with the open coil and interrupts the open coil circuit when the circuit breaker opens.

The "b" contact must open/close when the operating mechanism has released its stored energy in order to close/open the breaker. Type "b" contact is connected in series with the closing coil, interrupting the closing coil circuit when the circuit breaker closes.



*Connecting the main contact timing cables to a test object*

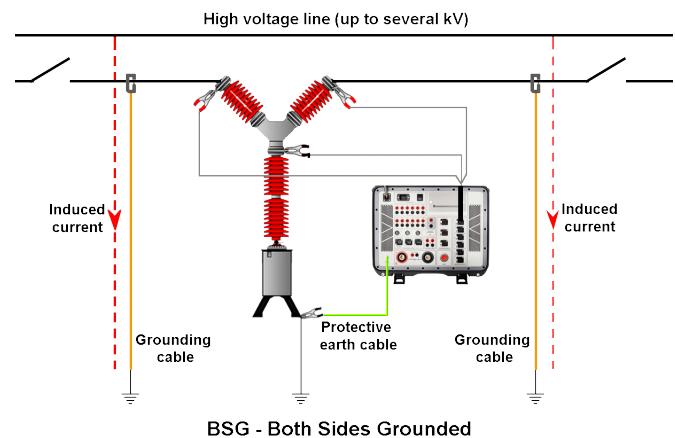
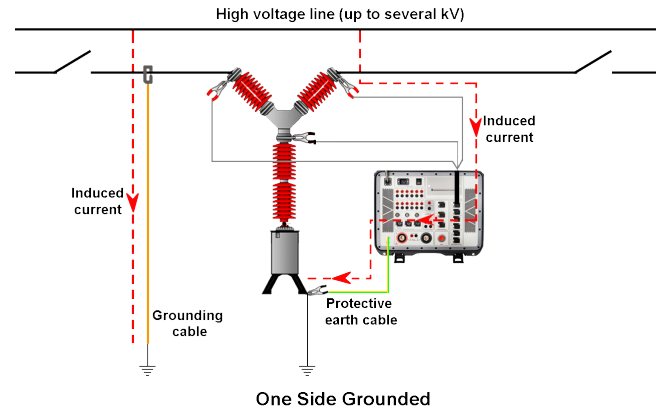
## Both Sides Grounded

Utilities and service companies increase their emphasis and demands on the safety regulations. Regulations and laws (IEEE Standard 510-1983) require all objects to be grounded on both sides before any maintenance work is performed on the object. In all substations grounding on both sides of the circuit breaker contacts is the best way to provide safety. If the circuit breaker (CB) is not grounded on both sides, there is a risk of appearance of induced high voltages and currents at the ungrounded terminals. These safety grounds also eliminate any static discharge in the circuit breaker contact and conduct any line power close to the circuit breaker while the personnel are working.

These earth grounds present a short-circuit condition to the traditional test equipment, and therefore the circuit breaker always looks to be in the closed state. In practice, it is necessary to remove at least one of the safety grounds from the circuit breaker prior to testing, and to reinstall the ground(s) after testing is complete. This procedure is not desirable as it introduces a possibility that the ground may not be reconnected after the test, presenting a safety hazard.

**Both Sides Grounded (BSG) of AIS (Air Insulated Substation)** feature enables safe and fast testing in high voltage substations, without removing the safety ground connections on both sides of the circuit breaker. No additional modules or remote boxes are required.

Each main contacts timing channel is able to detect main contacts state in case when both terminals are grounded. Therefore, for this measurement same main contact cables are used as for conventional timing measurement.



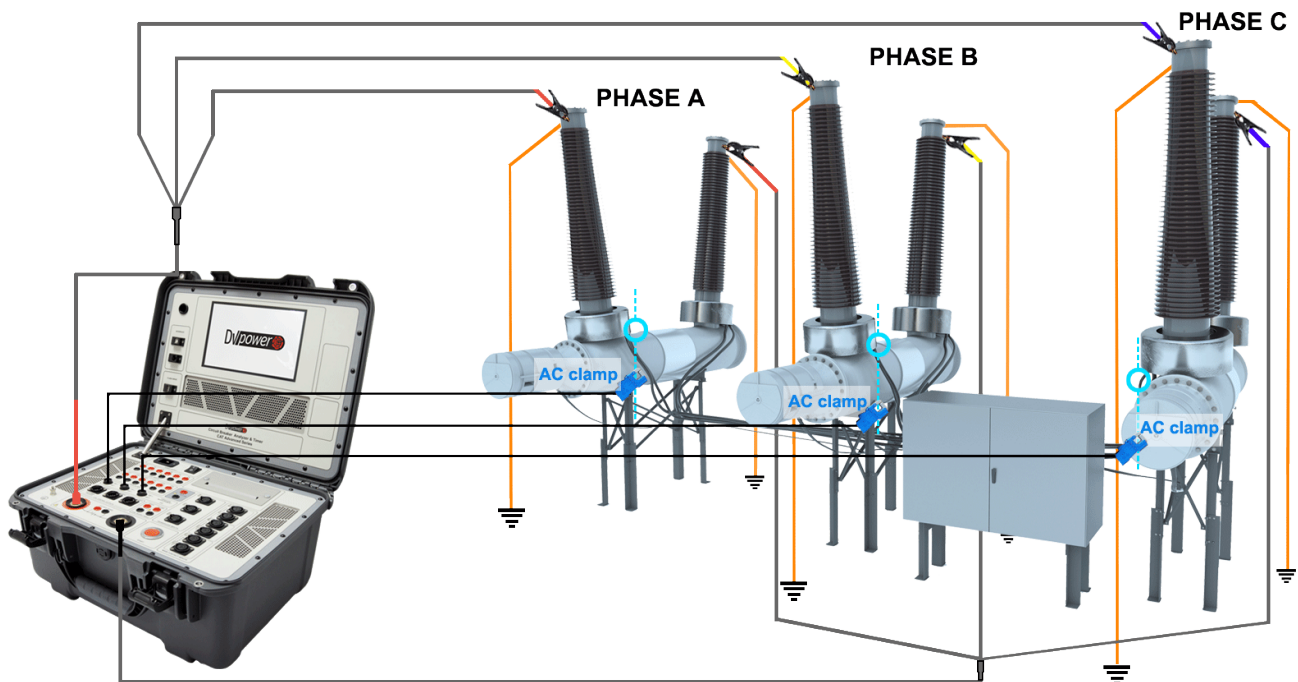
**Both Sides Grounded (BSG) for Dead Tank** feature enables timing measurement of Dead Tank circuit breakers contact time with **any type of grounding system** being applied to both sides of the bushings.

Method is based on the DC current generation through the main circuit and measurement voltage or current response on the CT secondary during CB operation.

Built-in micro-ohmmeter (up to 500 A) is used as a DC current source. A connection from a current

source to circuit breaker terminals is performed with current cables which further branch each in three cables, providing in that way the equal current distribution through all three main contacts.

The AC transformer based current probes are connected to accessible CT secondary terminals. The current AC probes, which outputs are connected to analog channels inputs, will detect a change in the response signals when the circuit breaker contact is opened or closed.



*Timing measurements on Dead Tank circuit breakers with grounding on both sides*



## Motion measurement

Motion measurement of the high voltage circuit breakers' contact system is of crucial importance for assessing a condition of the test object. The three motion transducer channels can acquire data from 3 linear or rotary motion transducers. Each channel can be configured for either an analog or a digital transducer.

Due to universal transducer channels design, a user is able to connect a variety of motion transducers available on the market.

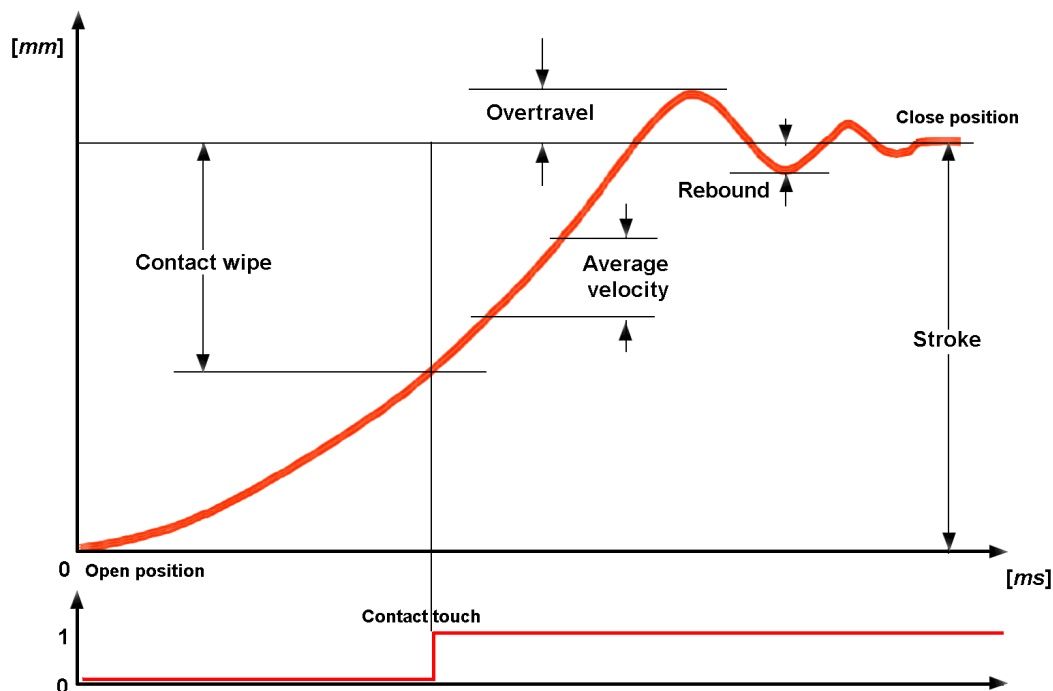
Performance values such as stroke, over-travel, rebound, contact wipe are obtained as a result of the measurement. These values can be compared to the manufacturer's reference data and data acquired from previous measurements. This provides indications about potential wear of the breaker.

Average velocity is calculated between the two points on the motion curve. The upper point is defined as a distance in length or time elapsed from the breaker's closed position, or contact-separation point. The lower point is determined based on the upper point. It can either be a distance below the upper point or a time before the upper point. Up to 5 zones for average velocity calculation can be selected.



Digital rotary transducer mounted on ABB LTB 245 kV SF6 circuit breaker

User is usually allowed to mount transducers on accessible parts of the circuit breaker's mechanical linkage. Beside this, instrument often records rotary motion, even it is known the main contacts motion is linear. As a result, motion results obtained do not represent real movement of the main contacts, but just linear or nonlinear interpretation of the main contacts moving parts displacement. DV-Win software provides transfer function feature which allows user to define linear or non-linear parameters in order to obtain actual displacement values of the main contact moving parts.



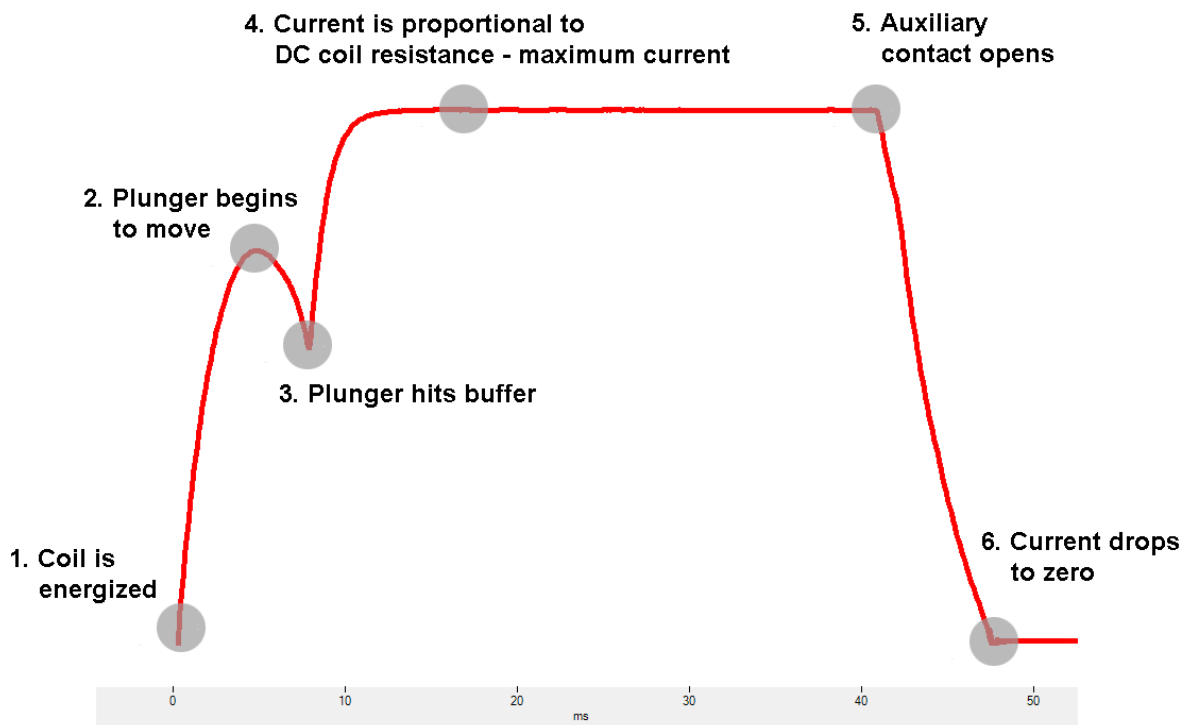
## Coil current measurement

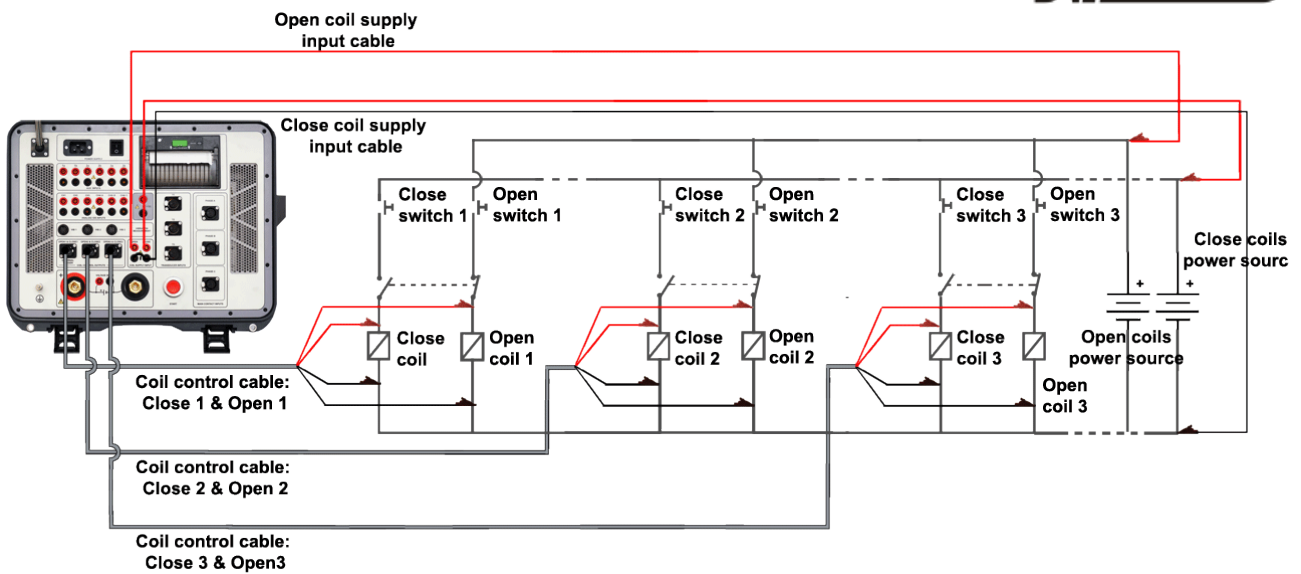
The IEC 62271-100 standard states that it is desirable to record the coil currents waveform, since it provides information about coils' condition (e.g. increased friction of the plungers, burned insulation, short-circuited part of the winding), the latch for release of the operating mechanism (e.g. increased friction) and the operating mechanism (e.g. if there is reduced operating mechanism speed that can be seen based on the opening time of auxiliary contacts).

When the opening or closing command is initiated, the coil is energized (point 1) and the current rises causing a magnetic field to apply a force on the iron plunger. When the force on the plunger exceeds the retaining force the plunger begins to move (point 2). The motion of the iron plunger induces an *EMF* in the coil, effectively reducing the current.

The combined mass of the plunger and the latch continue to move at a reduced velocity causing a further reduction in the coil current (points 2 to 3)

until it hits a buffer bringing it to a rest (point 3). If the current values at points 2 and 3 are higher than specified and the time at point 3 is longer than specified, it may indicate a friction of the plunger and latch. With the plunger at rest, the current increases to the saturation level (DC current which is proportional to the coil resistance, point 4). If the current value from point 4 to point 5 deviates from specific it may indicate a burned insulation or short-circuited part of the winding of coil. Meanwhile, the latch unlocks operating mechanism, releasing the stored energy to open the main breaker contacts. Typically, after a short delay the auxiliary contacts open, disconnecting the opening coil from the control voltage (point 5). As the coil is de-energized the current drops quickly to zero in accordance with the coil inductance (point 6). Longer time than specified at points 5 and 6 may indicate auxiliary contact malfunction or insufficient driving energy of the operating mechanism.



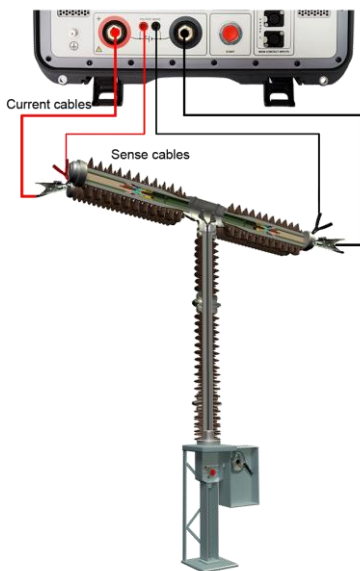


Connecting the coil control cables to 3 open and 3 close coils of the single pole controlled circuit breaker

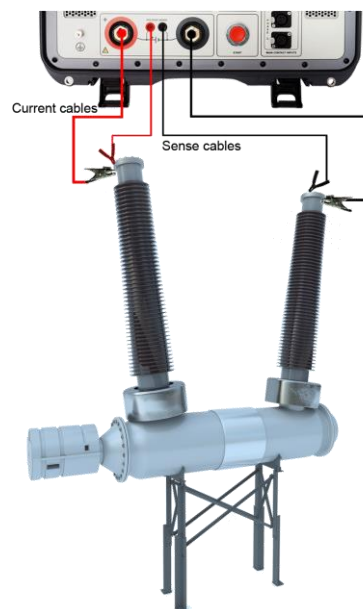
### Static resistance measurement

CAT250 can have either 200 A or 500 A built-in micro ohmmeter, as an optional feature. Incorporated micro ohmmeter generates true DC ripple free current with an automatically regulated test ramps. The resistance measurement is using the well-known Kelvin's four point's method.

The DC current is generated through the closed-circuit breaker contacts. Voltage drop is measured between terminals of the circuit breakers. The resistance is calculated using the Ohm's law  $R=U/I$ .



Micro Ohmmeter cable connection on a live tank circuit breaker



Micro Ohmmeter cable connection on a dead tank circuit breaker

## High – Precision module (built-in)

The high-precision module is newly developed feature available with built-in micro ohmmeters in CAT250. It provides an increased precision and offers a highly accurate contact resistance measurement in the range from 1  $\mu\Omega$  to 30  $\mu\Omega$ , with 0,01  $\mu\Omega$  resolution

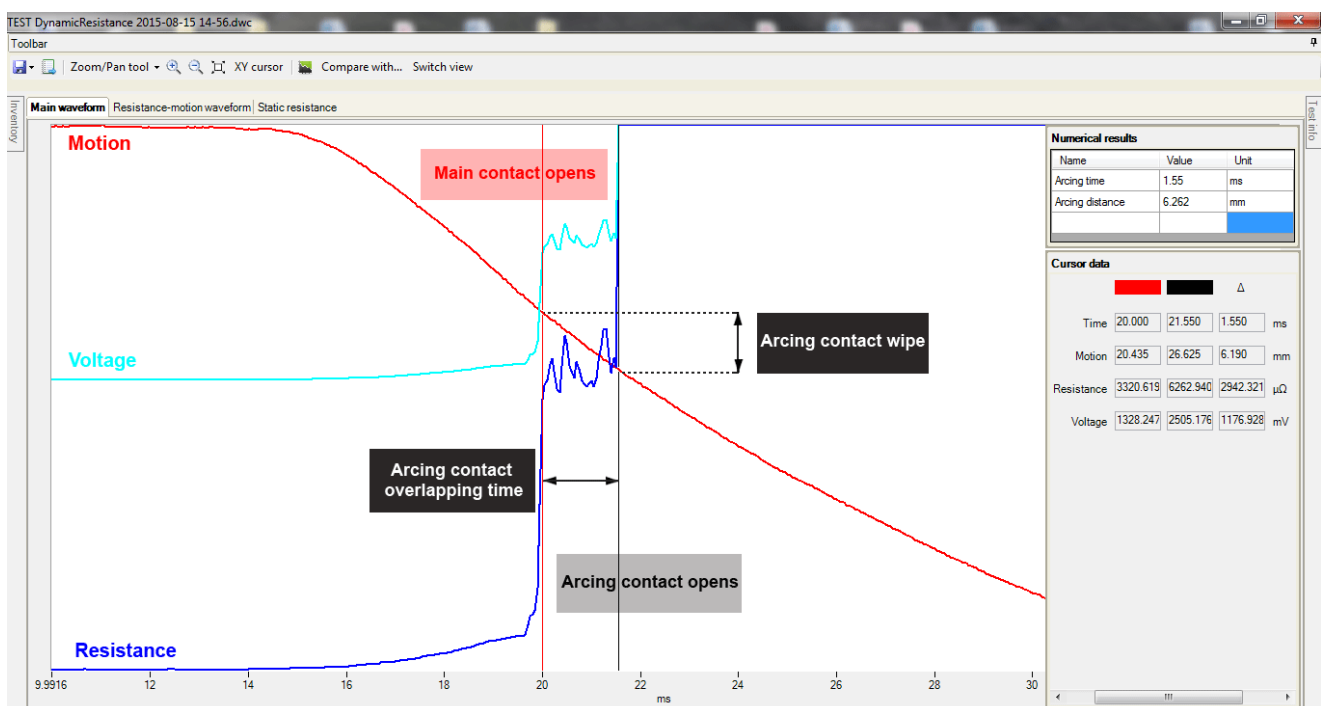
Built-in High Precision Module may be used for applications on very small resistance measurements of non-inductive test objects. This requirement is usually met at resistance inspections of generator circuit breakers, welding joints, GIS testing, etc.

## DRM (Dynamic Resistance Measurement)

The built-in micro ohmmeter can also be used for the DRM. DRM test is performed by injecting a current through the breaker contact and simultaneously monitoring the voltage drop across the breaker contact as well as the current flow during the breaker operation. The DRM test requires the circuit breaker analyzer with a high resolution measurement.

The resistance curve, as a function of a contact travel can be used to reveal potential problems related to the arcing contact condition. The injected current value should be as high as possible but no less than 100 A, to provide a reliable voltage drop reading, thus allowing an easier detection of the arcing contact.

CAT250 can have either 200 A or 500 A built-in micro ohmmeter, as an optional feature.



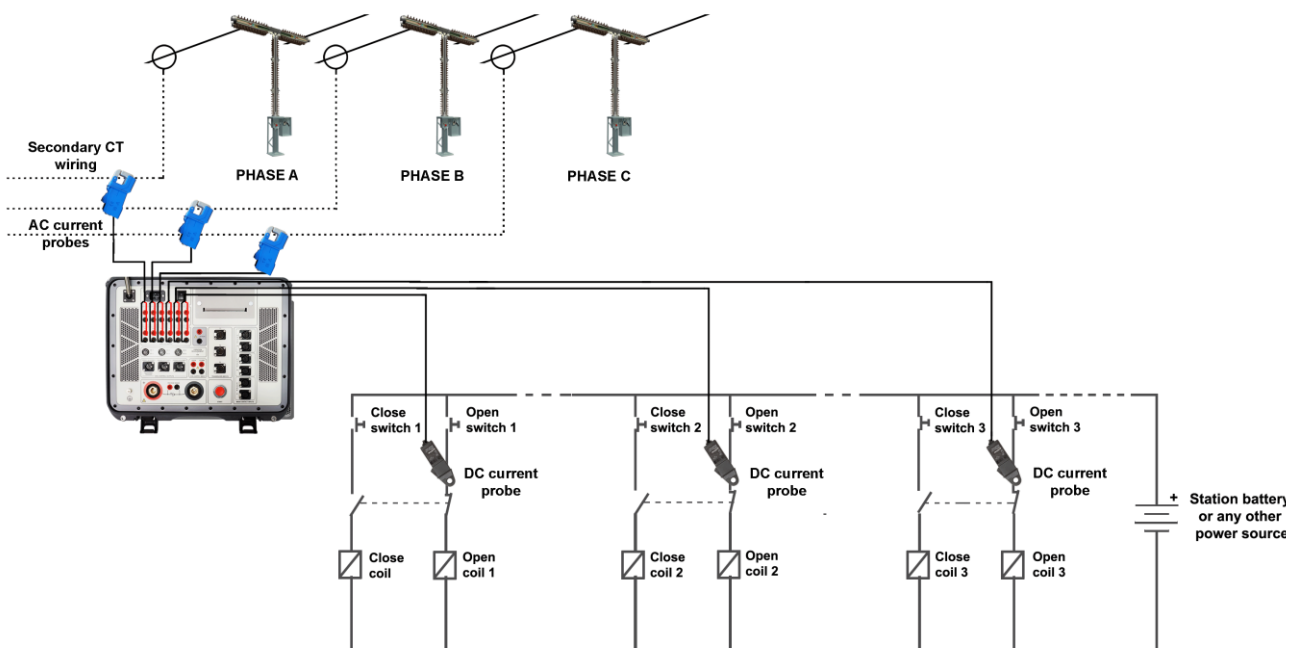


## First trip test

“First trip” analysis is important to determine a condition of the coil operating mechanism. Circuit breaker spends most of its lifetime conducting a current without any operation. Once the protective relay detects a problem, the circuit breaker, that was idle for maybe a year or longer, has to operate as fast as possible. However, if the circuit breaker has not been operated for a long time, the friction of the trip latch release mechanism may increase. Information about the latch friction, open circuit contacts, insufficient spring tension, can be learned from the coil

current waveform recorded during the “**First trip**” test.

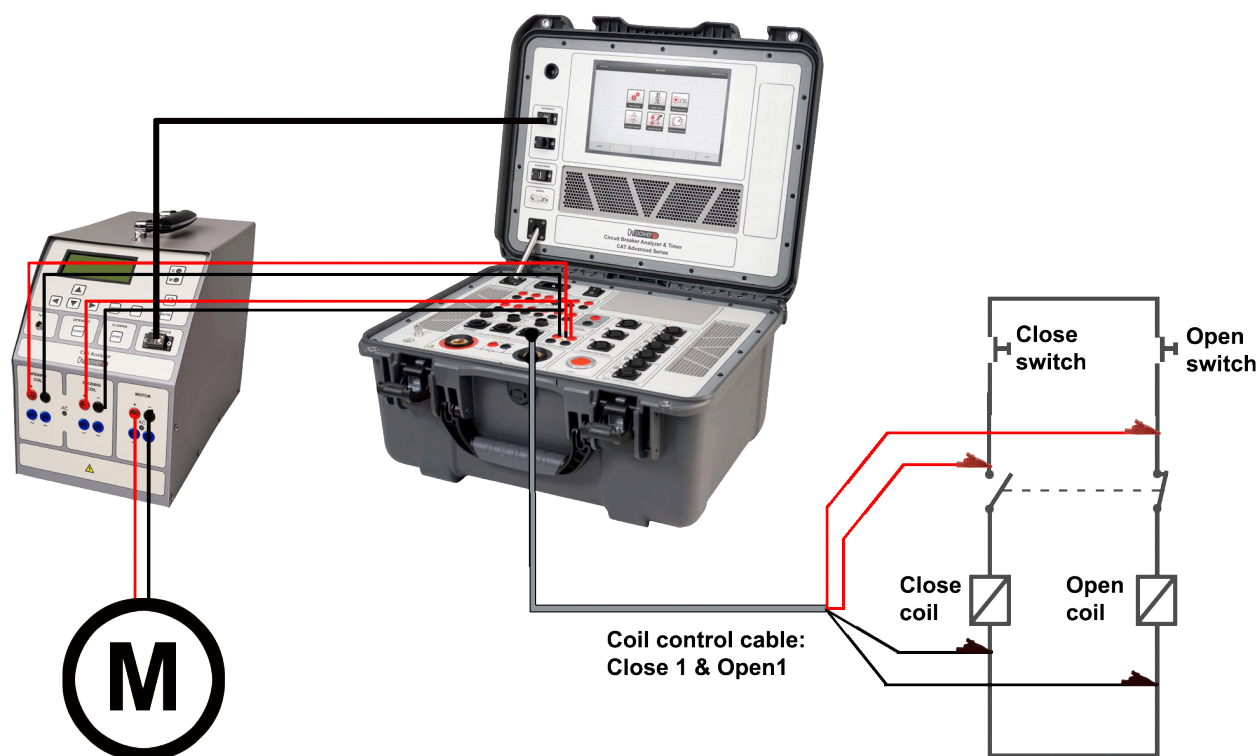
Since the breaker is in service, the conventional way of off-line timing measurement with timing cables across the interrupter cannot be used. Instead of main contact timing cables, three current probes are used. These current probes show current flowing through the secondary side of the current transformer for each phase. The instant when the current stops flowing, reveals the breaker open time.



*Connecting the DC current probes for measurement of the coil current and AC current probes to the line currents during the “First trip” test*

## CAT & SAT as Circuit Breaker Test System

The CAT250 series circuit breaker analyzers & timers can be coupled with DV Power Coil Analyzer SAT II series to create one test system (control and testing done with CAT250 touch screen interface). The SAT40A II series can be used as a power supply unit for measurement of spring-charging motor current and voltage as well as determination of minimum trip voltage of circuit breaker coils.



## DV-CB software

### Acquisition and Analysis

DV-CB software provides acquisition and analysis of the test results, as well as control of all the CAT250 series functions from a PC. It supports measurements process and step by step guidance through the entire test procedure, providing faster, easier and safer testing.

### Graphical presentation

Graphical presentation of a variety of measurements and timing test results uses cursors and powerful zoom functions for detailed analysis. Colors, grids, scales and positioning of the test data are all controlled by the user. DV-CB supports automatic unit conversion (e.g.: cycles to seconds or mm to inches). The test records can be exported in **.dwc** file format for further analysis.

### Database

Results are automatically stored and organized in the database on your PC and are available for analysis and reporting. Each test can be automatically assessed according to manufacturer specifications or based on your individual limit values.

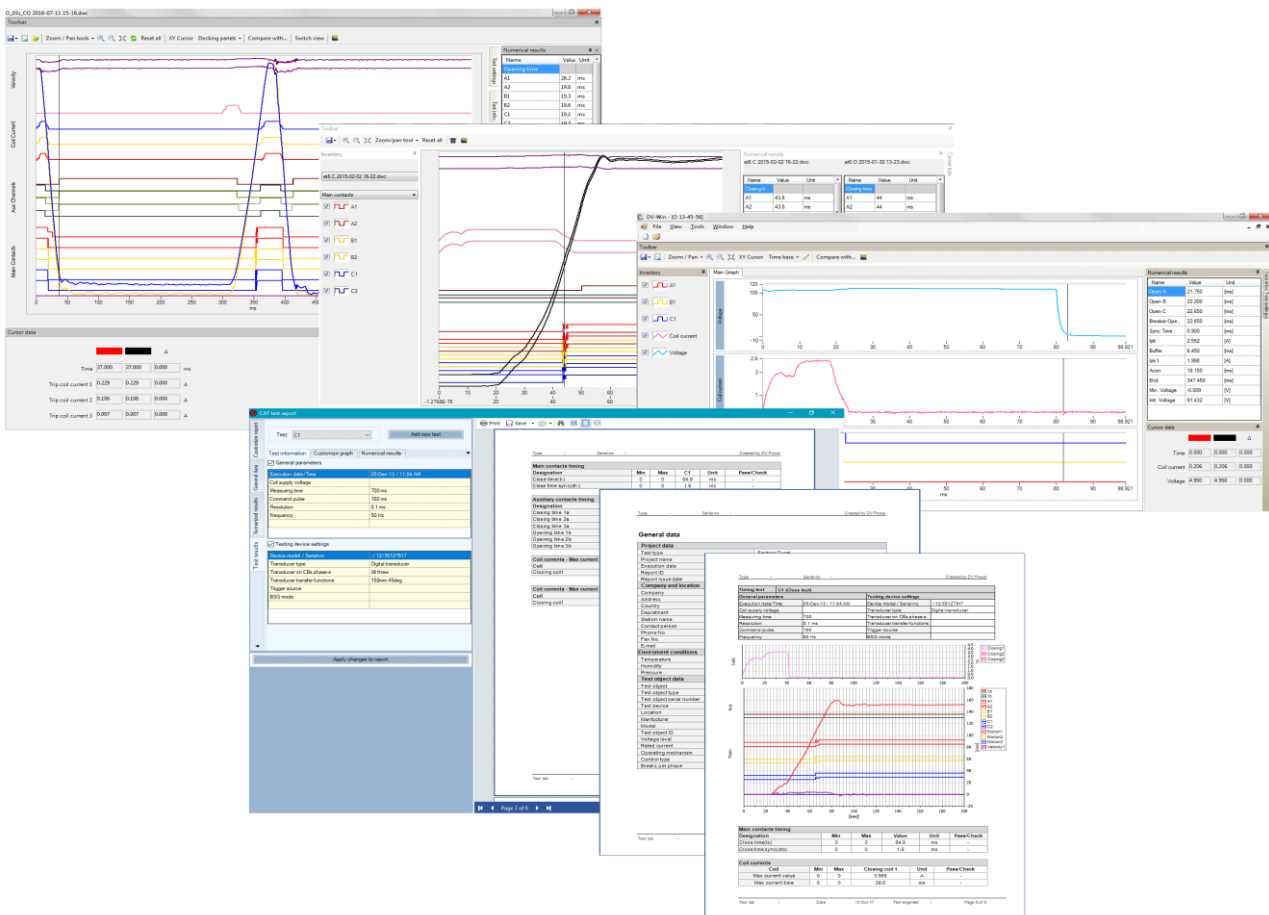
DV-CB software database can be updated with over 500 test plans of different apparatus commonly used in most utilities and substations. This valuable benchmark data used for test results evaluation is provided upon request.

### Reports

DV-Win automatically generates reports including all asset-related information and performed tests. This gives you a comprehensive overview of the test object, test results and assessment. You can easily adapt test reports, for example, by choosing from different types of result tables and diagrams and by providing

comments on every test. Furthermore, you can incorporate your company logo, photos and other test results.

- Full control of the CAT250 functions from a PC
- Downloading the test results from the instrument
- Acquisition and analysis of the test results
- The test results can be viewed, edited, saved, printed and exported
- Viewing and overlaying several graphs, for an easy test result comparison
- Selecting the measurement points and intervals using the two cursors
- Zoom and pan graph feature
- Specific test sequence setup
- Creation of predefined test plans for an easy and quick field testing
- Customized configuration of the test result graphs



## Technical data

### Main contact inputs

- Number of contact inputs: 3,6 or 12
- Each channel detects main and pre-insertion resistor contacts.
  - Closed  $\leq 10 \Omega$ ,
  - Resistor contacts range  $10 \Omega$  to  $5 \text{ k}\Omega$ ,
  - Open  $\geq 5 \text{ k}\Omega$
- Open circuit voltage: 20 V DC
- Short circuit current 50 mA
- Each channel measures resistance of pre-insertion resistors

### Auxiliary inputs

- Number of channels: 6, galvanically isolated
- User selectable: dry or wet
  - Contact sensing (dry):
- Open circuit voltage 24 V DC,
- Short circuit current 5 mA
  - Voltage sensing (wet):
- Working voltage 300 V DC, 250 V AC
- Low activation mode  $\pm 5 \text{ V}$
- High activation mode  $\pm 10 \text{ V}$
- Overcurrent and overvoltage protection

### Coil driver

- Number of channels: 6 (3 open and 3 close coil)
- 6 separate outputs for coil triggering
- Driver characteristics: 300 V DC max, 35 A DC max
- Electronic drivers: it provides superior timing control
- Overcurrent and overvoltage protection
- Coil supply inputs for open and close coil: 300 V DC max, 35 A DC max

### Time measurement

Time measurement resolution:

- 0.025 ms for 1 s test duration (sampling rate 40 kHz)
- 0,1 ms for 2 s test duration (sampling rate 10 kHz)
- 1 ms for 20 s test duration (sampling rate 1 kHz)
- 10 ms for 200 s test duration (sampling rate 100 Hz)

Time accuracy  $\pm 0,05\%$  of the reading  $\pm$  resolution

### Breaker operation

- Close (C)
- Open (O)
- Close-Open (C-O)
- Open-Close (O-C)
- Open-Close-Open (O-C-O)
- First trip test

User can select any desired test sequence

### Current measurement

- Current measurement for Open and Close coil, 6 channels, Hall-Effect sensor
- Range  $\pm 35 \text{ A AC/DC}$  to 5 kHz
- Accuracy  $\pm (0,5 \% \text{ rdg} + 0,1 \% \text{ FS})$
- Graphic presentation: currents waveform is displayed with resolution of 0,1ms

### Coil resistance measurement

- 3 coils simultaneously (Open or Close)
- Measuring range / Resolution
  - $1 \Omega - 99,9 \Omega / 0,1 \Omega$
  - $100 \Omega - 999 \Omega / 1 \Omega$
- Typical accuracy  $\pm (0,5 \% \text{ rdg} + 0,5 \% \text{ FS})$

### Universal transducer inputs

- 3 digital travel transducer channels  
Digital rotary transducers: 2500ppr
- 3 analog travel transducer channels
  - Analog transducer input measurement resolution: 16 bit.
  - Internal supply for linear transducer: 5 V DC

### Time measurement triggers

- External trigger: 2 channels (Open 1 & Close 1), input voltage: 10 V – 300 V AC/DC
- Coil currents: threshold level user selectable
- Auxiliary inputs
- Analog inputs: threshold level user selectable

### Analog inputs

- 6 channels – Coil current measurement
- 6 Voltage channels, each channel has four measurement ranges:  $\pm 1 \text{ V}$ ,  $\pm 5 \text{ V}$ ,  $\pm 60 \text{ V}$  and  $\pm 300 \text{ V AC/DC}$

The analog inputs are isolated with respect to all other circuits

### Vibration channels inputs

Intended for circuit breaker vibrations measurement

- 3 channels – for vibration monitoring sensors
- Resolution: 0,1 ms
- ICP accelerometer,  $\pm 100 \text{ mV/g}$ ,  $\pm 50 \text{ g}$

### DC output

- 24 V voltage supply for current clamps



### Static resistance measurement (optional)

- Built-in Micro Ohmmeter (200 A or 500 A)
- Current range 5 A – 200 A / 500 A
- Max. load voltage 6,2 V
- Resistance range 0,1  $\mu\Omega$  - 999,9 m $\Omega$
- Resolution 0,1  $\mu\Omega$ 
  - Accuracy  $\pm$  (0,1 % rdg + 0,1 % FS)

### Dynamic resistance measurement (optional)

- Voltage and current measuring channels
- DRM sampling rate 40 kHz (0.025 ms time resolution)
- Resolution 16 bit
- Breaker operations available for DRM test:
  - Open (O)
  - Close (C)
  - O – C (auto reclose)
  - C – O (make brake)
  - O-CO

### Printer (optional)

- Thermal printer
- Graphic and numeric printout
- Paper width 112 mm / 4.4 in
- The print density is guaranteed within range: 5°C to 40°C, 20 to 85% relative humidity, non-condensing

### Display

- 10.1" graphical touchscreen display

### Dimensions and weight

- Dimensions (W x H x D):
  - 505 mm x 409 mm x 257 mm
  - 19.9 in x 16.1 in x 10.1 in
- Weight: from 13.2 kg (29.1 lbs) depending on the model and built-in features

### Mains power supply

- Connection according to IEC/EN60320-1; UL498, CSA 22.2
- Mains supply: 90 V - 264 V AC
- Frequency: 50/60 Hz
- Input power:
  - 250 VA (without use of Micro Ohmmeter)
  - 1900 VA (with use of Micro Ohmmeter 200 A)
  - 3900 VA (with use of Micro Ohmmeter 500 A)

### PC Interface

- USB
- Ethernet

### Applicable Standards

- Installation/overvoltage: category II
- Pollution: degree 2
- Safety: LVD 2014/35/EU (CE Conform) Standard EN 61010-1
- EMC: Directive 2014/30/EU (CE Conform) Standard EN 61326-1:2006
- CAN/CSA-C22.2 No. 61010-1

### Environmental conditions

- Operating temperature:
  - 10 °C - + 55 °C / 14 °F - +131 °F
- Storage & transportation:
  - 40 °C - + 70°C / -40 °F - +158 °F
- Humidity 5 % - 95 % relative humidity, non-condensing

### Warranty

- 3 years + additional 1 (one) year upon registration on DV Power official website

*All specifications herein are valid at ambient temperature of + 25 °C and recommended accessories. Specifications are subject to change without notice.*

Accessories



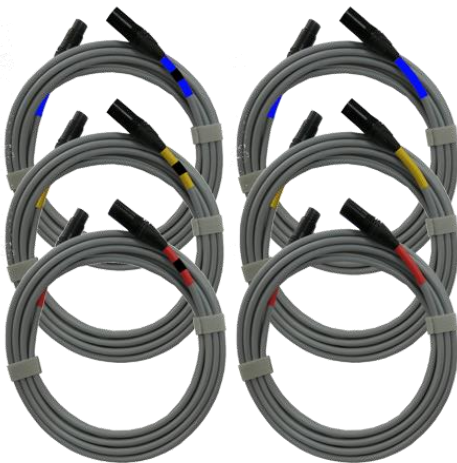
Main contact cables 5 m with SCT clamps (12 channels)  
CM-05-12MXST



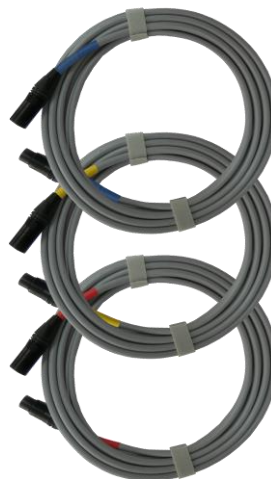
Main contact cables 5 m with SCT clamps (6 channels)  
CM-05-65MXST



Main contact cables 5 m with SCT clamps (3 channels)  
CM-05-34MXST



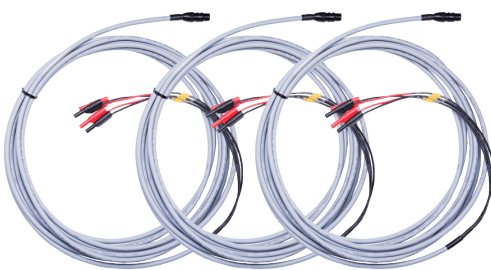
Main contact cables extension 10 m (12 channels)  
E6-10-12MXFX



Main contact cables extension 10 m (3 or 6 channels)  
E3-10-65MXFX



Coil supply cable set 4 x 5 m 2,5 mm<sup>2</sup> (16.4 ft, 13 AWG) with banana plugs



Coil control cable set 5 m with banana plugs (Single-pole control - 6 coil channels)  
CO-05-6BC5B1



Coil control cable 5 m with banana plugs (Three pole control - 2 coil channels)  
CO-05-00C5B1



Auxiliary contacts cable set 12 x 5 m with banana plugs  
AX-05-02BPBP



Analog channels cable set 12 x 5 m with banana plugs  
AN-05-02BPBP



Current cables 2 x 10 m 25 mm<sup>2</sup> with battery clamps (B1) (200 A rated)  
C2-10-25LMB1



Current cables 2 x 10 m 50 mm<sup>2</sup> with battery clamps (B3) (500 A rated)  
C2-10-50VMB3



Sense cables 2 x 10 m with alligator clamps (A2)  
S2-10-02BPA2



Plastic transport case  
HARD-CASE-NC



Cable plastic case - medium size  
CABLE-CAS-02



Cable plastic case with wheels - large size  
CABLE-CAS-W3



Cable bag  
CABLE-BAG-00



Current clamp 30/300 A power supplied from the instrument with adapter 5 m  
CACL-0300-07



AC Current clamp 1 A / 1 V and cable 5 m with banana plugs  
CACL-ACBP-05



Test Shunt 600 A / 60 mV  
SHUNT-600-MK



Digital rotary transducer with 5 m connection cable with accessories  
DRT-SET-0005



Linear analog transducer (TLH) 225 mm with 5 m connection cable  
LAT-225-C305



Doble transducer adapter  
DTA-BOX-C002



Universal transducer mounting kit  
UTM-KIT-0000



Universal transducer mounting kit - extended version  
UTM-KIT-0001



Three phase digital rotary transducer kit (with 5 m connection cable)  
TPH-DRTS-050



Online first trip test kit – three-pole control  
ONFTT-KIT-01



Online first trip test kit – single-pole control  
ONFTT-KIT-00

\*The above cables are also available in several lengths and terminations.  
\*\*The above linear analog transducers are available in several lengths.  
Please contact DV Power for more information.



## Order info

| Instrument  | Article No   |
|---|--------------|
| Circuit Breaker Analyzer & Timer CAT250 with 3 timing channels  | CAT250-03-01 |
| Circuit Breaker Analyzer & Timer CAT250 with 6 timing channels  | CAT250-06-01 |
| Circuit Breaker Analyzer & Timer CAT250 with 12 timing channels | CAT250-12-01 |

| Included accessories            |
|---------------------------------|
| Windows based DV-CB PC software |
| USB cable                       |
| Ethernet cable                  |
| Mains power cable               |
| Ground (PE) cable               |
| Debug adapter                   |
| Transport case                  |

| Recommended accessories   | Article No   |
|---|--------------|
| <b>Main contact cables</b>  |              |
| Main contact cables 5 m (16.4 ft) with SCT clamps (for three timing channels)                                       | CM-05-34MXST |
| Main contact cables 5 m (16.4 ft) with SCT clamps (for six timing channels)   | CM-05-65MXST |
| Main contact cables 5 m (16.4 ft) with SCT clamps (for twelve timing channels)                                      | CM-05-12MXST |
| <b>Main contact cables extension</b>  |              |
| Main contact cables extension 10 m (32.8 ft) (for three or six timing channels)                                     | E3-10-65MXFX |
| Main contact cables extension 10 m (32.8 ft) (for twelve timing channels)   | E6-10-12MXFX |
| <b>Control cabinet cables</b>   |              |
| Coil control cable set 5 m (16.4 ft) with banana plugs (Single-pole control -6 coil channels)                       | CO-05-6BC5B1 |
| Coil supply cable set 4 x 5 m 2,5 mm <sup>2</sup> (16.4 ft, 13 AWG) with banana plugs                               | CS-05-02BPBP |
| Auxiliary contacts cable set 12 x 5 m (16.4 ft) with banana plugs   | AX-05-02BPBP |
| Analog channels cable set 12 x 5 m (16.4 ft) with banana plugs  | AN-05-02BPBP |
| <b>Current cables</b>   |              |
| Current cables 2 x 10 m 50 mm <sup>2</sup> (32.8 ft, 0 AWG) with battery clamps (for built in 500 A micro ohmmeter) | C2-10-50VMB3 |
| Current cables 2 x 10 m 25 mm <sup>2</sup> (32.8 ft, 3 AWG) with battery clamps (for built in 200 A micro ohmmeter) | C2-10-25LMB1 |
| <b>Sense cables</b>   |              |
| Sense cables 2 x 10 m (32.8 ft) with alligator clamps (for built in micro ohmmeter)                                 | S2-10-02BPA1 |
| <b>Cases</b>  |              |
| Cable plastic case - large size (x 2)   | CABLE-CAS-03 |

| Optional accessories  | Article No   |
|---|--------------|
| Micro ohmmeter 200 A (built-in)   | BIMCAT5-2-00 |
| Micro ohmmeter 500 A (built-in)   | BIMCAT5-5-00 |
| Both Sides Grounded (BSG) of AIS (Air Insulated Substation) for CAT250 - 3 timing channels (one break per phase)  | BSG-CAT25-03 |
| Both Sides Grounded (BSG) of AIS (Air Insulated Substation) for CAT250 - 6 timing channels (two breaks per phase) | BSG-CAT25-06 |
| Both Sides Grounded (BSG) for Dead Tank Circuit Breaker for CAT250 series   | BSG-CATDTB-0 |
| Built-in high precision measurement module  | RMO-HPMM-DG0 |
| Current clamp 30/300 A power supplied from the instrument with adapter 5 m (16.4 ft)                              | CACL-0300-07 |
| Current clamp 30/300 A with internal battery supply and extension 5 m (16.4 ft)                                   | CACL-0300-08 |
| Thermal printer 112 mm (4.4 inch) (built-in)  | PRINT-112-00 |
| Thermal paper roll  | PRINT-112-RO |
| Cable plastic case with wheels - large size   | CABLE-CAS-W3 |
| Coil control cable set 10 m with banana plugs (Single-pole control -6 coil channels)                              | CO-10-6BC5B1 |
| Coil control cable set 15 m with banana plugs (Single-pole control -6 coil channels)                              | CO-15-6BC5B1 |
| Coil control cable 5 m with banana plugs (Three-pole control - 2 coil channels)                                   | CO-05-00C5B1 |
| Coil control cable 10 m with banana plugs (Three-pole control - 2 coil channels)                                  | CO-10-00C5B1 |
| Coil control cable 15 m with banana plugs (Three-pole control - 2 coil channels)                                  | CO-15-00C5B1 |
| Auxiliary contacts cable set 12 x 5 m with banana plugs   | AX-05-02BPBP |
| Auxiliary contacts cable set 12 x 10 m with banana plugs  | AX-10-02BPBP |
| Auxiliary contacts cable set 12 x 15 m with banana plugs  | AX-15-02BPBP |
| Analog channels cable set 12 x 5 m with banana plugs  | AN-05-02BPBP |
| Analog channels cable set 12 x 10 m with banana plugs   | AN-10-02BPBP |
| Analog channels cable set 12 x 15 m with banana plugs   | AN-15-02BPBP |

| <b>Main contact cables</b>   |              |
|--|--------------|
| Main contact cables 3 m (9.8 ft) with SCT clamps (for three timing channels)   | CM-03-34MXST |
| Main contact cables 3 m (9.8 ft) with SCT clamps (for six timing channels)   | CM-03-65MXST |
| Main contact cables 3 m (9.8 ft) with SCT clamps (for twelve timing channels)  | CM-03-12MXST |
| Main contact cables 3 m (9.8 ft) with alligator clamps (for three timing channels)                                   | CM-03-34MXA2 |
| Main contact cables 5 m (16.4 ft) with alligator clamps (for three timing channels)                                  | CM-05-34MXA2 |
| Main contact cables 3 m (9.8 ft) with alligator clamps (for six timing channels)                                     | CM-03-65MXA2 |
| Main contact cables 5 m (16.4 ft) with alligator clamps (for six timing channels)                                    | CM-05-65MXA2 |
| Main contact cables 3 m (9.8 ft) with alligator clamps (for twelve timing channels)                                  | CM-03-12MXA2 |
| Main contact cables 5 m (16.4 ft) with alligator clamps (for twelve timing channels)                                 | CM-05-12MXA2 |
| <b>Main contact cables extension</b>   |              |
| Main contact cables Extension 5 m (16.4 ft) (for three or six timing channels)                                       | E3-05-65MXFX |
| Main contact cables Extension 5 m (16.4 ft) (for twelve timing channels)   | E6-05-12MXFX |
| Main contact cables Extension 15 m (49.2 ft) (for three or six timing channels)                                      | E3-15-65MXFX |
| Main contact cables Extension 15 m (49.2 ft) (for twelve timing channels)  | E6-15-12MXFX |
| <b>Current cables</b>  |              |
| Current cables 2 x 5 m 50 mm <sup>2</sup> (32.8 ft, 0 AWG) with battery clamps (for built in 500 A micro ohmmeter)   | C2-05-50VMB3 |
| Current cables 2 x 15 m 70 mm <sup>2</sup> (49.2 ft, 00 AWG) with battery clamps (for built in 500 A micro ohmmeter) | C2-15-70VMB3 |
| Current cables 2 x 5 m 25 mm <sup>2</sup> (32.8 ft, 3 AWG) with battery clamps (for built in 200 A micro ohmmeter)   | C2-05-25LMB1 |
| Current cables 2 x 15 m 35 mm <sup>2</sup> (49.2 ft, 2 AWG) with battery clamps (for built in 200 A micro ohmmeter)  | C2-15-35LMB1 |

| <b>Sense cables</b>  |              |
|--|--------------|
| Sense cables 2 x 5 m (32.8 ft) with alligator clamps<br>(for built in micro ohmmeter)  | S2-05-02BPA1 |
| Sense cables 2 x 15 m (49.2 ft) with alligator clamps<br>(for built in micro ohmmeter) | S2-15-02BPA1 |
| <b>Transducers</b>   |              |
| Digital rotary transducer with 5 m (16.4 ft) connection cable                          | DRT-250-C605 |
| Digital rotary transducer with 10 m (32.8 ft) connection cable                         | DRT-250-C610 |
| Digital rotary transducer with 5 m (16.4 ft) connection cable with accessories         | DRT-SET-0005 |
| Digital rotary transducer with 10 m (32.8 ft) connection cable with accessories        | DRT-SET-0010 |
| Linear analog transducer 150 mm (5.9 in) with 5 m (16.4 ft) connection cable           | LAT-150-C305 |
| Linear analog transducer 225 mm (8.85 in) with 5 m (16.4 ft) connection cable          | LAT-225-C305 |
| Linear analog transducer 300 mm (11.8 in) with 5 m (16.4 ft) connection cable          | LAT-300-C305 |
| Linear analog transducer 500 mm (19.68 in) with 5 m (16.4 ft) connection cable         | LAT-500-C305 |
| Current clamp 30/300 A power supplied from the instrument with adapter 5 m             | CACL-0300-07 |
| AC Current clamp 1 A / 1 V and cable 5 m with banana plugs                             | CACL-ACBP-05 |
| Online first trip test kit – single-pole control                                       | ONFTT-KIT-00 |
| Online first trip test kit – three-pole control  | ONFTT-KIT-01 |
| <b>Transducer mounting kits</b>  |              |
| Universal transducer mounting kit  | UTM-KIT-0000 |
| Universal transducer mounting kit - extended version                                   | UTM-KIT-0001 |
| Mounting bracket for analog linear transducer  | LAT-MNTB-000 |
| Doble transducer adapter   | DTA-BOX-C002 |
| Linear to rotary convertor   | LTR-CON-0000 |

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