

Circuit Breaker Analyzer & Timer **CAT31**

- Simple and easy to operate
- Robust design
- Timing and motion measurement
- 3 timing channels (3x1) for main and resistive contacts
- 3 timing channels for auxiliary inputs
- Open and Close coils current measurement
- Results printed on 80 mm (3.15 in) thermal printer
- Test results analysis and reports using DV-Win software



Description

Circuit Breaker Analyzer & Timer CAT31 can be used as a standalone or a PC-controlled digital instrument for circuit breakers condition assessment. The timing channels record closing and opening of the main, resistor, and auxiliary contacts. CAT31 records graphs of both, the open and close coil currents and displacements of the HV and MV circuit breaker moving parts. The main contact channels can also measure the resistance value of the preinsertion resistors (if present in the circuit breaker). Test results are printed on the 80 mm (3.15 in) thermal printer (optional accessory) in tabular and graphical form.

CAT31 provides an easy selection of different operational modes:

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

- Close-Trip (C-O)
- Trip-Close-Trip (O-C-O)

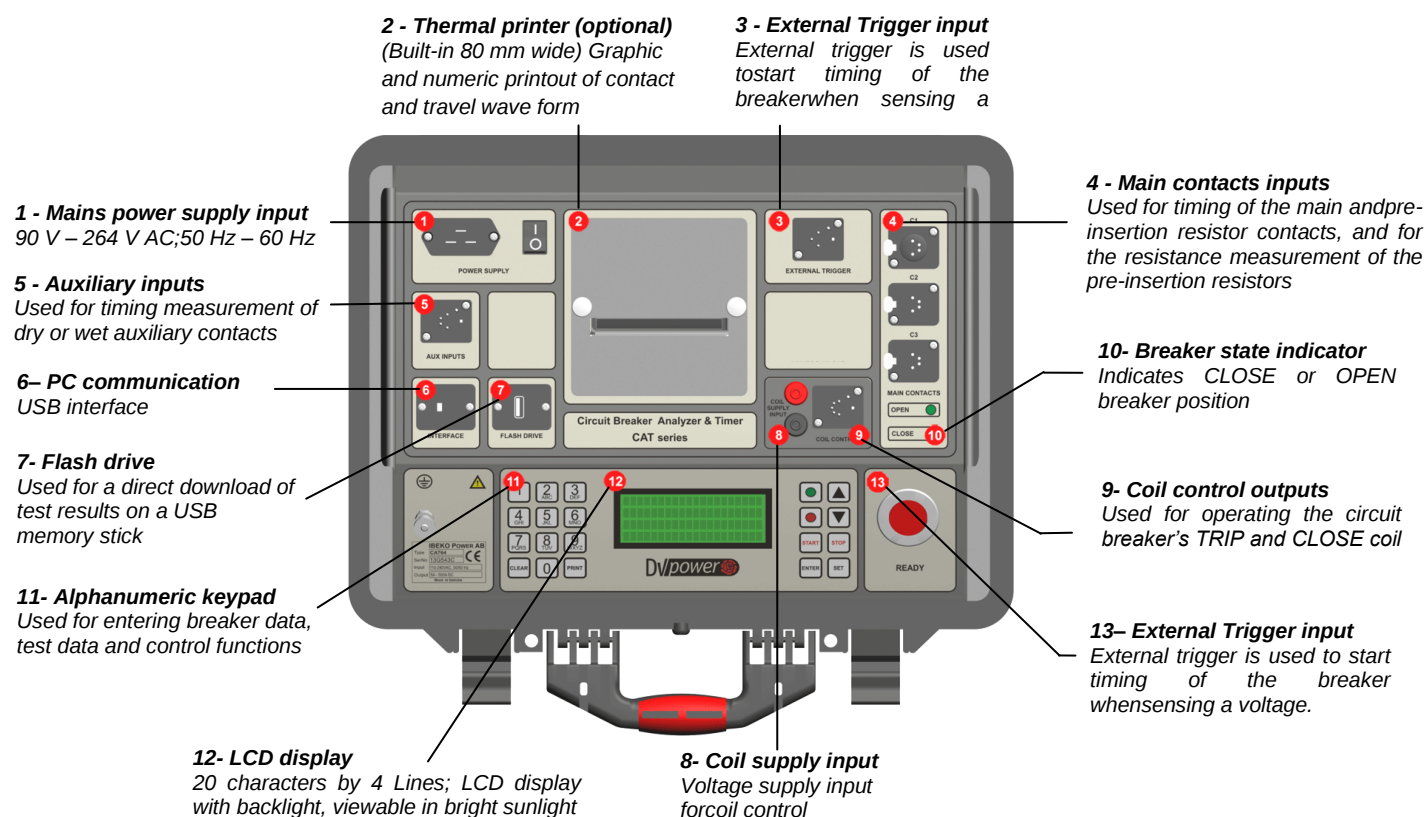
Multiple operations, such as Trip-Close and Trip-Close-Trip, can be initiated by using a predefined delay time or by sensing a breaker's contact position.

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

- external trigger
- auxiliary channels
- coil control channel

The auxiliary inputs are used to monitor dry and wet auxiliary contacts. The external trigger input can be used as the additional auxiliary input.

Features



Application

The list of the instrument applications includes:

- Simultaneous timing measurement of up to 3 main contacts (1 break per phase) including pre-insertion resistors (if present in the circuit breaker) and 3 auxiliary contacts
- Resistance measurement of the pre-insertion resistors (if present in the circuit breaker)
- Evaluation of synchronization between the circuit breaker poles
- A measurement of the coil currents, simultaneously for 2 coils

Timing Measurement

Timing measurement tests fulfill all the requirements stipulated in IEC 62271-100 and ANSI C37.04-1999.

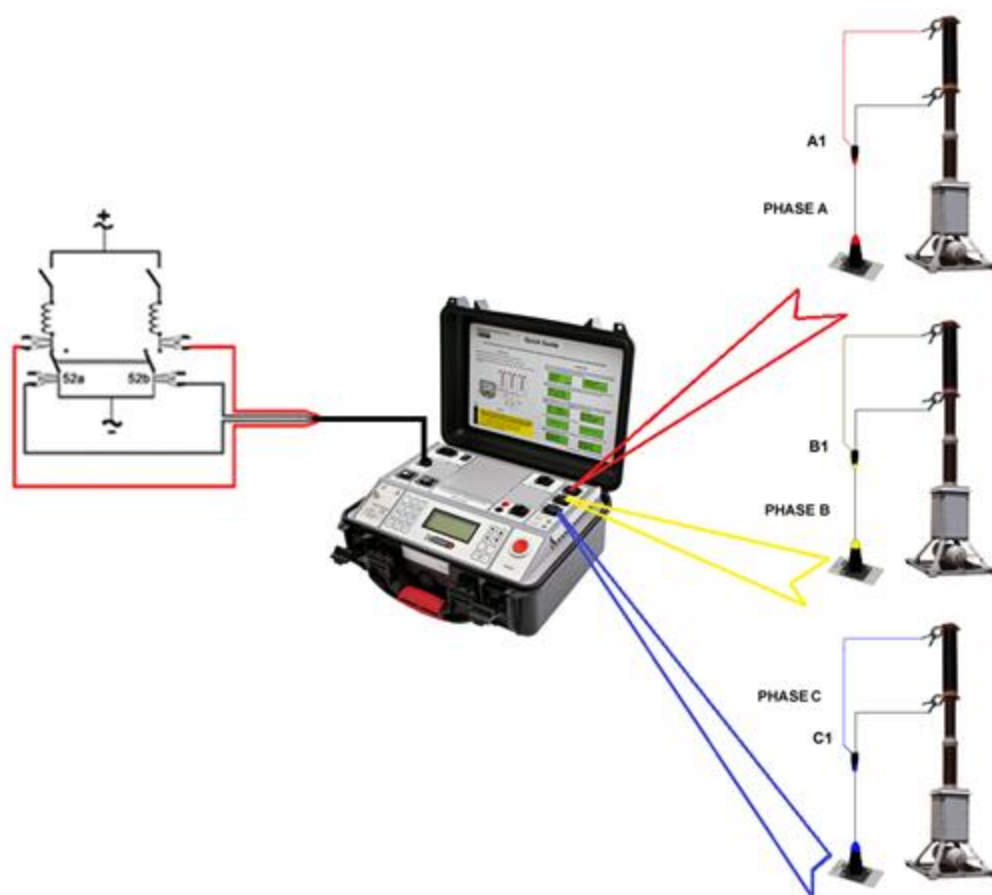
Synchronization between the circuit breaker poles during opening shall not exceed 1/6 of the rated frequency cycle (3,33 ms at 50 Hz; 2,78 ms at 60 Hz) and during the closing shall not exceed 1/4 of the rated frequency cycle as well (5,0 ms at 50 Hz; 4,17 ms at 60 Hz).

Auxiliary contacts are mechanically driven by the operating mechanism and are used for control and indication of the main contacts state. There are no general requirements, related to timing measurement of auxiliary contacts, described in

IEC® and ANSI® standards. Anyway, in order to assess condition of high-voltage circuit breakers, it is important to check their operation.

Type "a" contact is opened/closed when the circuit breaker main contacts are opened/closed, while type "b" contact is opened/closed when the circuit breaker main contacts are closed/opened.

Type "a" contact is connected in series to the trip coil. It interrupts the trip coil circuit when the circuit breaker opens. Type "b" contact is connected in series to the closing coil, interrupting the closing coil circuit when the circuit breaker closes.

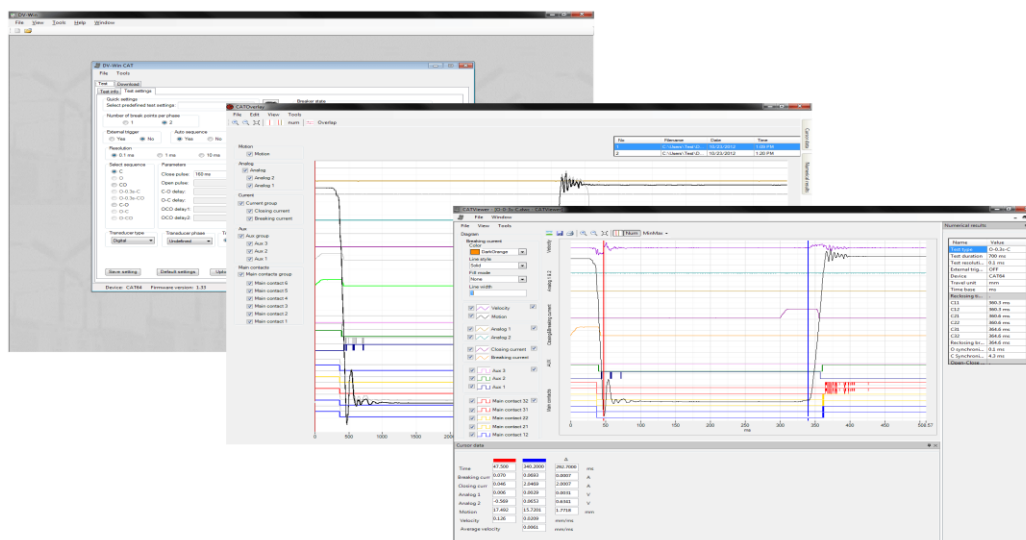


Connecting the main contact timing cables and auxiliary timing cables to a test object.

DV-Win

DV-Win application software suite provides acquisition and analysis of the test results, as well as control of all the CAT31 functions from a PC. Graphical presentation of a variety of measurement 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-Win supports an 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.



DV-Win Main Features

- Full control of the CAT 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
- Customized configuration of the test result graphs
- Creation of the predefined test plans for an easy and quick field testing

Technical Data

Main contact inputs

- Number of contact inputs: 3 (3 x 1), 1 per phase
 - Each channel detects Main and pre-insertion resistor contacts.
 - Closed $\leq 10 \Omega$,
 - Resistor contacts range 10Ω 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: 3, galvanically isolated (external trigger input can be used as a third auxiliary input)
- User selectable: dry or wet
 - Contact sensing (dry):
Open circuit voltage 24 V DC,
Short circuit current 5 mA
 - Voltage sensing (wet):
Working voltage 300V DC, 250V AC
Low activation mode $\pm 5\text{V}$
High activation mode $\pm 10\text{V}$
- Overcurrent and overvoltage protection

Time measurement

Time measurement resolution:

- 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: 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)

The user can select any desired test sequence

Coil driver

- Number of channels: 2 (Trip and Close coil)
- Two separate outputs for coil triggering
- Driver characteristics: 300 V DC max, 35 A DC max
- Electronic drivers provide superior timing control
- Overcurrent and overvoltage protection
- Coil supply input: 300 V DC max, 35 A DC max

Current measurement

- Current measurement for Trip and Close coil, 2 channels, Hall-Effect sensor
- Range $\pm 35\text{A DC}$ to 5 kHz
- Accuracy $\pm (0,5 \% \text{ rdg} + 0,1 \% \text{ FS})$
- Graphic presentation: currents waveform is displayed with a resolution of 0,1 ms

Printer (optional)

- Thermal printer
- Graphic and numeric printout
- Paper width 80 mm (3.15 in)

Time measurement triggers

- External trigger: 2 channels (trigger input voltage: 10 V – 300 V AC/DC)
- Coil currents: threshold level user selectable
- Auxiliary inputs (change of contacts state)

Dimensions and weight

- Dimensions (W x H x D):
405 mm x 170 mm x 335 mm
15.9 in x 6.7 in x 13.1 in
- Weight: 7 kg / 15.4 lb

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
- Fuse 2 A / 250 V, Fast blow, not user replaceable

Applicable standards

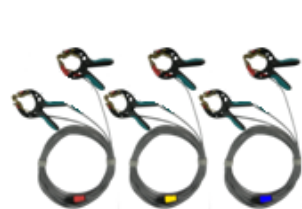
- Installation/overvoltage: category II

- Pollution: degree 2
- Safety: LVD 2006/95/EC (CE Conform) EN 61010-1
- EMC: Directive 2004/108/EC (CE Conform) Standard EN 61326-1:2006
- CAN/CSA-C22.2 No. 61010-1, 2nd edition, including Amendment1

Environmental conditions

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

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



in contacts cables 5 m (16.4 ft) with TTA clamps*



Main contacts extensions cables 5 m(16.4 ft)*



Coil control cable set 5 m (16.4 ft) with banana plugs*



Auxiliary contacts cable set 5 m (16.4 ft) with banana plugs*



External trigger cable 5 m (16.4 ft) with banana plugs*



Coil supply cable set 2 x 5 m (16.4 ft) 2,5 mm² (13 AWG) with banana plugs



Cable plastic case - large size



Cable plastic case with wheels - large size

**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 with included accessories	Article No
Circuit Breaker Analyzer & Timer CAT31	CAT3100-N-00
DV-Win PC software including USB cable	
Mains power cable	
Ground (PE) cable	

Recommended accessories	Article No
Main Contact Cables 5 m (16.4 ft) with TTA clamps	CM-05-34MXWC
Coil control cable set 5 m (16.4 ft) with banana plugs	CO-05-00C5B1
Coil supply cable set 2 x 5 m (16.4 ft) 2,5 mm ² (13 AWG) with banana plugs	C2-05-02BPBP
Auxiliary contacts cable 5 m (16.4 ft) with banana plugs	CA-05-00C4B1
External Trigger Cable 5 m (16.4 ft) with banana plugs	CE-05-00C4B1
Cable bag	CABLE-BAG-00

Optional accessories	Article No
Main Contact Cables 3 m (9.8 ft) with TTA clamps	CM-03-65MXWC
Main Contact Cables Extension 5 m (16.4 ft)	E3-05-65MXFX
Main Contact Cables Extension 7 m (23 ft)	E3-07-65MXFX
Main Contact Cables Extension 10 m (32.8 ft)	E3-10-65MXFX
Main Contact Cables Extension 12 m (39.4 ft)	E3-12-65MXFX
Main Contact Cables Extension 15 m (49.2 ft)	E3-15-65MXFX
Main Contact Cables Extension 17 m (55.8 ft)	E3-17-65MXFX
Coil Control Cable 10 m (32.8 ft) with banana plugs	CO-10-00C5B1
Coil supply cable set 2 x 10 m (32.8 ft) 2,5 mm ² (13 AWG) with banana plugs	C2-10-02BPBP
Auxiliary Contact Cable 10 m (32.8 ft) with banana plugs	CA-10-00C4B1
External Trigger Cable 10 m (32.8 ft) with banana plugs	CE-10-00C4B1
Thermal printer 80 mm (3.15 in) (built-in)	PRINT-080-00
Thermal paper roll 80 mm (3.15 in)	PRINT-080-RC
Cable plastic case - small size	CABLE-CAS-01
Cable plastic case - medium size	CABLE-CAS-02
Cable plastic case - large size	CABLE-CAS-03
Cable plastic case with wheels - medium size	CABLE-CAS-W2
Cable plastic case with wheels - large size	CABLE-CAS-W3
Transport case	HARD-CASE-LC