

CAT Standard series

Circuit Breaker Analyzers & Timers

- Simple and easy to operate
- Robust design for field use
- Accurate measurement in high voltage environment
- Timing and motion measurement
- Voltage and current measurement
- Detailed analysis of test results using DV-Win software
- Battery operation for up to 8 hours



Description

The CAT Standard series circuit breaker analyzers & timers are stand-alone or a PC-controlled digital instruments for circuit breakers condition assessments. The timing channels record closing and opening of the arcing, resistor, and auxiliary contacts. CAT Standard series records graphs of both trip 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 pre-insertion resistors (if present in the circuit breaker). Test results can be downloaded to a USB memory stick or saved to internal memory. The CAT Standard series internal memory can store up to 500 test results (numerical and graphical data). Test results can also be printed on the 58 mm (2.28 inch) thermal printer (optional accessory) in tabular and graphical form.

CAT Standard series 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 by a testing device) depending on the testing condition. Several time measurement triggers are available to record measurements in various testing conditions:

- external trigger
- analog channels
- 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.

The two coil control analog channels can measure and record the coil currents simultaneously (TRIP and CLOSE), up to 35 A AC/DC.

The two additional analog channels have four selectable voltage ranges available ($\pm 0,5$ V, $\pm 2,5$ V, ± 60 V and ± 300 V AC/DC). They can be used to monitor:

- Circuit-breaker substation battery voltage,
- Motor voltage and current,
- Other types of analog signals that may be relevant.

The transducer channel is intended for measuring the displacement of the circuit breaker moving parts, contact wipe, over-travel, rebound, damping time, and average velocity. Either an analog or a digital transducer can be connected to this universal channel.

Features



1 – Mains power supply input

90 V – 264 V AC; 50 Hz – 60 Hz

2 – Battery charging Indicator (optional)

Indicates whether the battery is completely charged or being charged.

3 – On /Off LED Push button

Turn On/ Off the CAT device.

4 – Thermal printer (optional)

(Built-in 58 mm wide) Graphic and numeric printout of contact and travel wave form.

5 – External Trigger input

External trigger is used to start timing of the breaker when sensing a voltage.

6 – Main contacts inputs

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

7 – Auxiliary inputs

Used for timing measurement of dry or wet auxiliary contacts.

8 – Motion transducer input

Intended for measuring displacement of circuit breaker's moving parts.

9 – 24 V DC output

Used for current clamp supply.

10 – Analog channels inputs

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

11 – PC communication

USB interface.

12 – Flash drive

Used for a direct download of test results on a USB memory stick.

13 – Coil supply input

Voltage supply input for coil control.

14 – Coil control outputs

Used for operating the circuit breaker's TRIP and CLOSE coil.

15 – Breaker state indicator

Indicates CLOSE or OPEN breaker.

16 – Earth (ground terminal)

17 – Alphanumeric keypad

Used for entering breaker data, test data and control functions.

18 – LCD display

20 characters by 4 Lines; LCD display with backlight, viewable in bright sunlight.

19 – READY button

Prepares the instrument for the start of the test.

Application

The list of the instrument applications includes:

- Simultaneous timing measurement of up to 6 main contacts (2 breaks 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 (simultaneity) between the circuit breaker poles,
- A measurement of the coil currents, simultaneously for 2 coils,
- Evaluating the state of the substation's batteries by graphically showing the voltage value,
- A measurement of displacement, contact wipe, over-travel, rebound, damping time and average velocity of the breaker's moving parts.

Timing Measurement

Timing measurement of mechanical operations is one of the most important tests to determine the 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 the main contacts' state. There are no general requirements, related to timing measurement of auxiliary contacts, described in IEC® and IEEE® standards. Anyway, to assess the 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 trip coil and interrupts the trip 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.

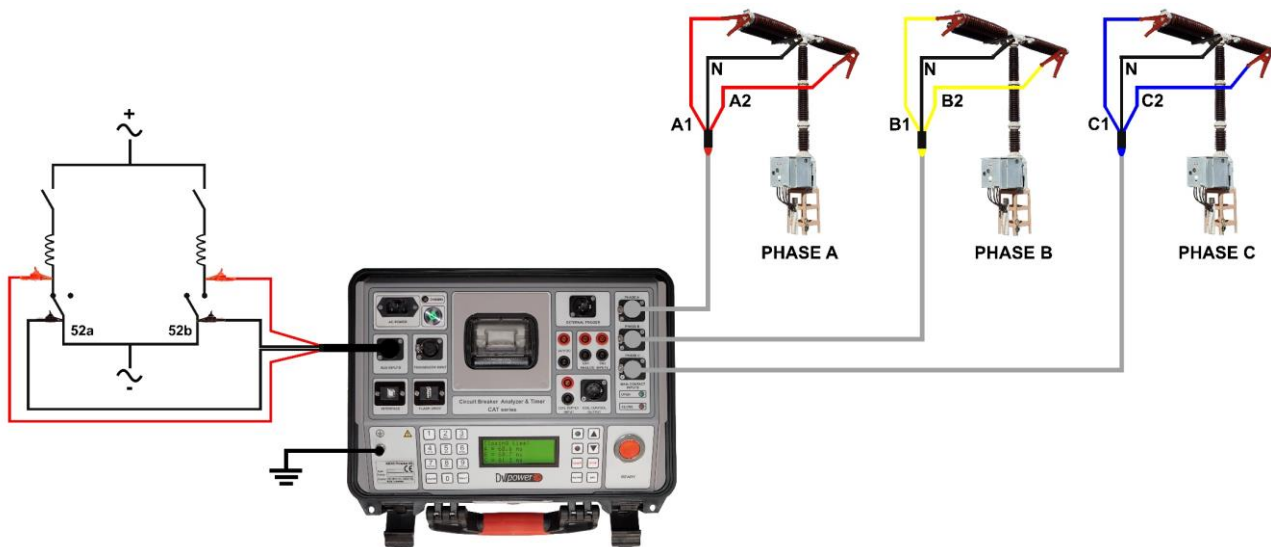


Figure 1: Connecting the main contact timing cables and auxiliary timing cables to a test object.

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 motion transducer channel can acquire data from either a linear or rotary motion transducer.

Due to universal transducer channel 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.



Figure 2: Digital rotary transducer mounted on ABB LTB 245 kV SF6 circuit breaker

User is usually allowed to mount the transducer 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, the motion result 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.

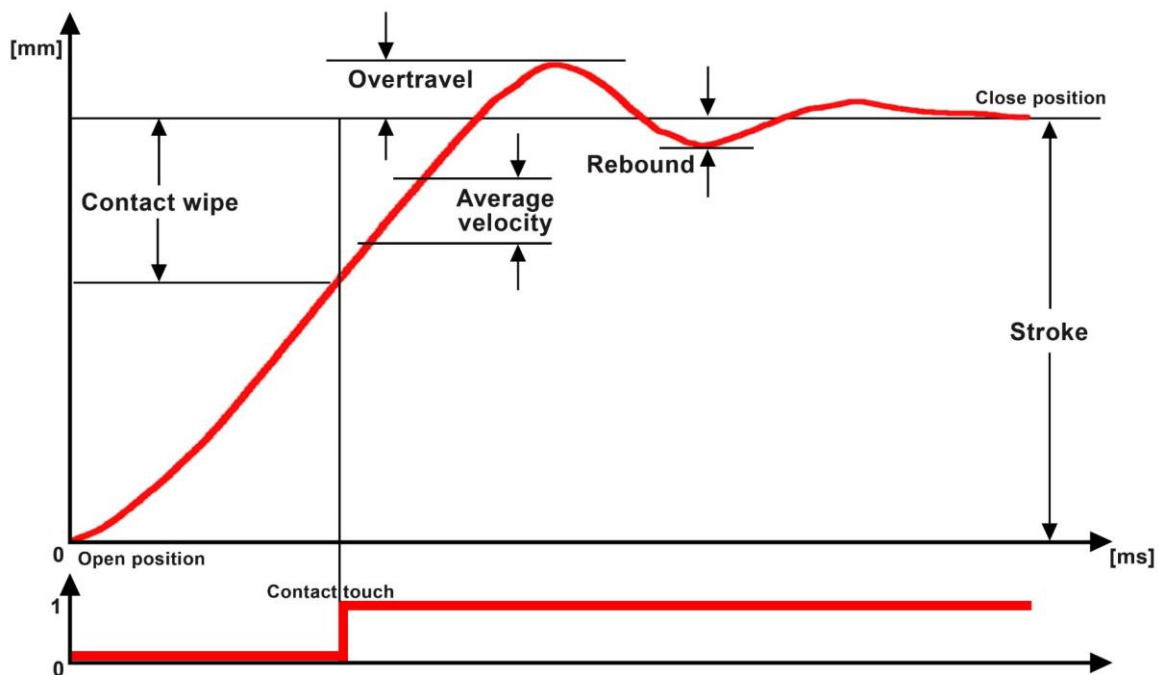


Figure 3. Travel curve and important travel parameters

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 2-3) 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.

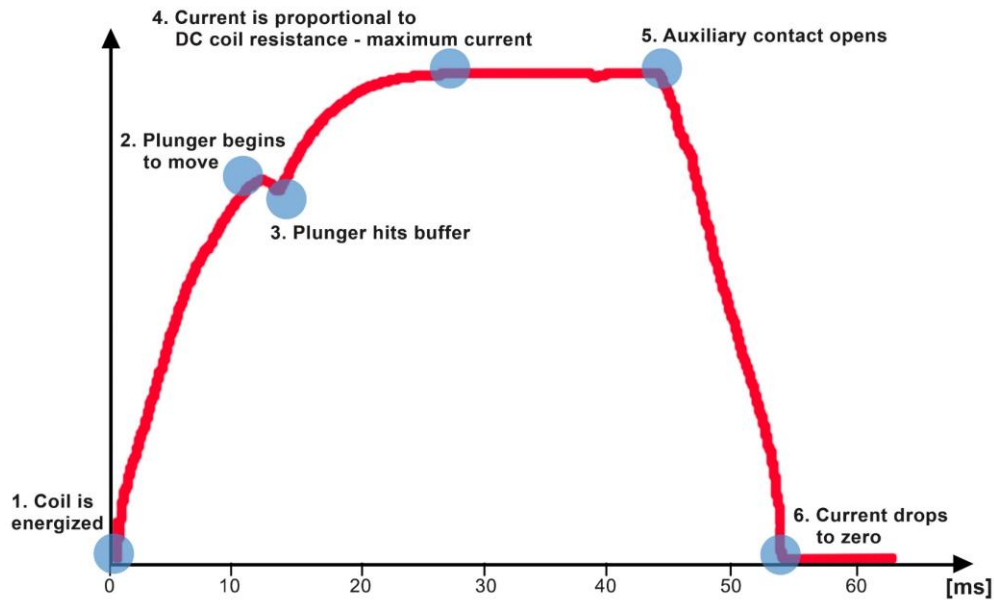


Figure 4. Typical coil current waveform

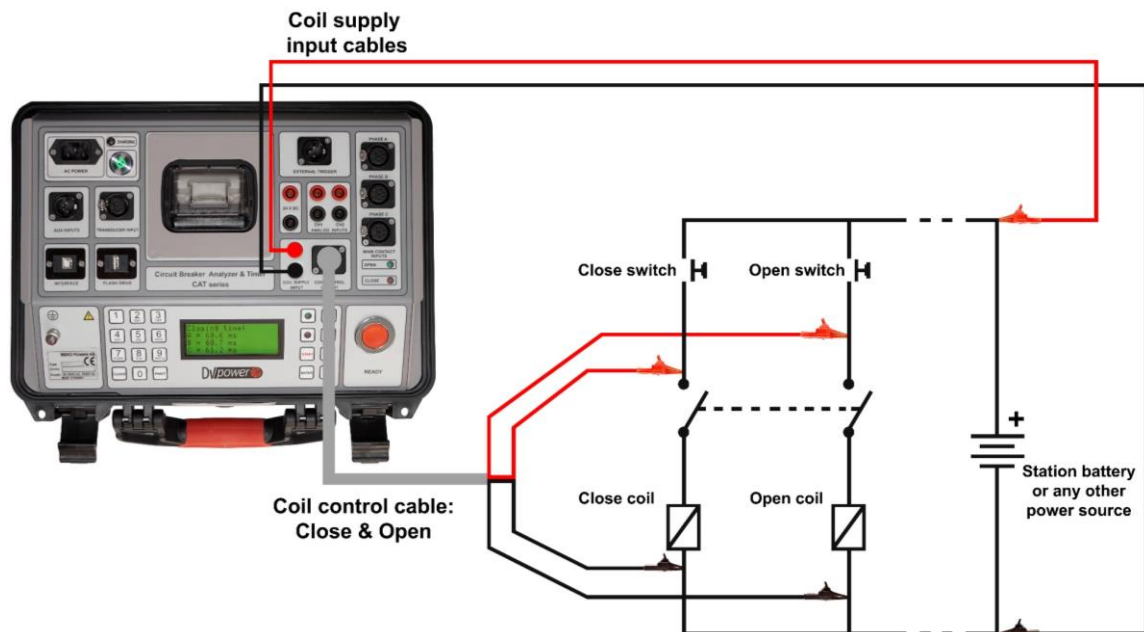


Figure 5. Connecting the coil control cables to circuit breaker control circuit

DV-Win software

Acquisition and Analysis

DV-Win software provides acquisition and analysis of the test results, as well as control of all the CAT Standard 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-Win 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-Win 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 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
- Creation of predefined test plans for an easy and quick field testing
- Customized configuration of the test result graphs



Figure 6. DV-Win software components view

Technical Data

Main contact inputs

- Number of contact inputs:
3 (3 x 1), 1 per phase (CAT03, CAT31, CAT34)
6 (3 x 2), 2 per phase (CAT61, CAT64)
 - 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 300 V 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

Analog inputs

- 2 channels – Coil current measurement
- 2 Voltage channels, each channel has four measurement ranges: $\pm 0,5 \text{ V}$, $\pm 2,5 \text{ V}$, $\pm 60 \text{ V}$ and $\pm 300 \text{ V AC/DC}$

The analog inputs are isolated with respect to all other circuits

DC output

24 V voltage supply for current clamps

Internal memory

Up to 500 test results (numerical and graphical data)

Printer (optional)

- Thermal printer
- Graphic and numeric printout
- Paper width 58 mm (2.28 in)
- Printer operating temperature:
- 20 °C - + 70 °C / - 4 °F - +158 °F

Transducer input

- Digital transducer inputs: 1
- Analogue transducer inputs: 1

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:
 - 5.5 - 7 kg / 12.1 - 15.4 lb.

Warranty

- 3 years + additional 1 (one) year upon registration on DV Power official website (www.dv-power.com)

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

Internal battery supply (optional)

- Built-in rechargeable battery
- Li-Ion 14.4 V Cell – 6800 mAh 98 Wh

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
- CAN/CSA-C22.2 No. 61010-1

Environmental conditions

- Operating temperature:
- 20 °C to + 55 °C / - 4 °F to + 131 °F
- Storage & transportation:
- 40 °C to + 70°C / - 40 °F to + 158 °F
- Humidity 0 % - 95 % relative humidity, non-condensing

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

Accessories



Main contacts cables 5 m (16.4 ft) with SCT clamps* (CM-05-65MXST)



Main contacts extensions cables 5 m (16.4 ft)* (E3-05-65MXFX)



Coil control cable 5 m (16.4 ft) with banana plugs* (CO-05-00C5B1)



Auxiliary contacts cable set 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)



Analog channels cable set 4 x 5 m (16.4 ft) with banana plugs* (C4-05-02BPBP)



Coil supply cable set 2 x 5 m (16.4 ft) 2,5 mm² (14 AWG) with banana plugs* (C2-05-02BPBP)



Current clamp 30/300 A power supplied from the instrument with adapter 5 m (16.4 ft) (CACL-0300-07)



Digital rotary transducer with 5 m (16.4 ft) connection cable (DRT-SET-0005)



Linear analog transducer with 5 m (16.4 ft) connection cable** (LAT-225-C305)



Linear to rotary converter (LTR-CON-0000)



Cable plastic case - large size (CABLE-CAS-03)



Cable bag (CABLE-BAG-00)



Plastic transport case - small size (PLCAS-P00-01)



Universal transducer mounting kit (UTM-KIT-0000)




Universal transducer mounting kit (extended version) (UTM-KIT-0001) + digital rotary transducer with accessories (DRT-SET-005)

*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.

CAT Standard series - models


CAT03

	<p>Main contact inputs Number of Main contact inputs: 3 (3 x 1), 1 per phase</p>
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CAT31

	<p>Main contact inputs Number of Main contact inputs: 3 (3 x 1), 1 per phase</p> <p>Coil control outputs: 2 (1 Open & 1 Close) Auxiliary contact inputs: 3</p>
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CAT34

	<p>Main contact inputs Number of Main contact inputs: 3 (3 x 1), 1 per phase</p> <p>Coil control outputs: 2 (1 Open & 1 Close) Auxiliary contact inputs: 3 Analog input channels: 2 Transducer input channels: 1 (digital and analog channel)</p>
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CAT61

	<p>Main contact inputs Number of Main contact inputs: 6 (3 x 2), 2 per phase</p> <p>Coil control outputs: 2 (1 Open & 1 Close) Auxiliary contact inputs: 3</p>
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CAT64

	<p>Main contact inputs Number of Main contact inputs: 6 (3 x 2), 2 per phase</p> <p>Coil control outputs: 2 (1 Open & 1 Close) Auxiliary contact inputs: 3 Analog input channels: 2 Transducer input channels: 1 (digital and analog channel)</p>
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Order info

Instrument	Article No.
Circuit Breaker Analyzer & Timer CAT03	CAT0300-N-03
Circuit Breaker Analyzer & Timer CAT03 (Battery operated)	CAT0300-B-03
Circuit Breaker Analyzer & Timer CAT31	CAT3100-N-03
Circuit Breaker Analyzer & Timer CAT31 (Battery operated)	CAT3100-B-03
Circuit Breaker Analyzer & Timer CAT34	CAT3400-N-03
Circuit Breaker Analyzer & Timer CAT34 (Battery operated)	CAT3400-B-03
Circuit Breaker Analyzer & Timer CAT61	CAT6100-N-03
Circuit Breaker Analyzer & Timer CAT61 (Battery operated)	CAT6100-B-03
Circuit Breaker Analyzer & Timer CAT64	CAT6400-N-03
Circuit Breaker Analyzer & Timer CAT64 (Battery operated)	CAT6400-B-03

Included accessories	Article No.
Plastic transport case - small size	PLCAS-P00-01
Windows based DV-Win PC software including USB cable	
USB Memory Stick	
Mains power cable	
Ground (PE) cable	

Standard accessories	Article No.
Main contact cables 5 m (16.4 ft) with SCT clamps (<i>for CAT03, CAT31, CAT34</i>)	CM-05-34MXST
Main contact cables 5 m (16.4 ft) with SCT clamps (<i>for CAT61, CAT64</i>)	CM-05-65MXST
Main contact cables extension 5 m (16.4 ft) (<i>for CAT61, CAT64</i>)	E3-05-65MXFX
Coil control cable 5 m (16.4 ft) with banana plugs (<i>for CAT31, CAT34, CAT61, CAT64</i>)	CO-05-00C5B1
Coil supply cable set 2 x 5 m (16.4 ft) 2,5 mm ² (14 AWG) with banana plugs (<i>for CAT31, CAT34, CAT61, CAT64</i>)	C2-05-02BPBP
Jumper cable 1 x 15 cm 2,5 mm ² with banana plugs with retractable isolation (red) (x3) (<i>for CAT31, CAT34, CAT61, CAT64</i>)	JCR-15-2REBP
Jumper cable 1 x 15 cm 2,5 mm ² with banana plugs with retractable isolation (black) (x3) (<i>for CAT31, CAT34, CAT61, CAT64</i>)	JCB-15-2REBP
Auxiliary contact cable 5 m (16.4 ft) with banana plugs (<i>for CAT31, CAT34, CAT61, CAT64</i>)	CA-05-00C4B1
External trigger cable 5 m (16.4 ft) with banana plugs	CE-05-00C4B1
Analog channels cable set 4 x 5 m (16.4 ft) with banana plugs (<i>for CAT34, CAT64</i>)	C4-05-02BPBP
Cable bag (<i>for CAT03, CAT31, CAT61</i>)	CABLE-BAG-00
Cable bag (x2) (<i>for CAT34, CAT64</i>)	CABLE-BAG-00

Optional accessories	Article No.
Main contact cables 3 m (9.8 ft) with SCT clamps*	CM-03-34MXST
Main contact cables 3 m (9.8 ft) with SCT clamps**	CM-03-65MXST
Main contact cables 3 m (9.8 ft) with alligator clamps (A2)*	CM-03-34MXA2
Main contact cables 3 m (9.8 ft) with alligator clamps (A2)**	CM-03-65MXA2
Main contact cables 5 m (16.4 ft) with alligator clamps (A2)*	CM-05-34MXA2
Main contact cables 5 m (16.4 ft) with alligator clamps (A2)**	CM-05-65MXA2
Main contact cables extension 10 m (32.8 ft)	E3-10-65MXFX
Main contact cables extension 15 m (49.2 ft)	E3-15-65MXFX

Coil control cable 10 m (32.8 ft) with banana plugs ***	CO-10-00C5B1
Coil control cable 15 m (49.2 ft) with banana plugs ***	CO-10-00C5B1
Coil supply cable set 2 x 10 m (32.8 ft) 2,5 mm ² (14 AWG) with banana plugs ***	C2-10-02BPBP
Analog channels cable set 4 x 5 m (16.4 ft) with alligator clamps (A1) ****	S4-05-02BPA1
Analog channels cable set 4 x 5 m (16.4 ft) with alligator clamps (A2) ****	S4-05-02BPA2
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
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
Small current clamp 10/100 A with internal battery power supply and extension 5 m (16.4 ft) ****	CACL-0100-01
Digital rotary transducer 5 m (16.4 ft) with accessories ****	DRT-SET-0005
Digital rotary transducer 10 m (32.8 ft) with accessories ****	DRT-SET-0010
Linear analog transducer (TLH) 150 mm (5.9 in) with 5 m (16.4 ft) connection cable and linear transducer rod ****	LAT-150-C305
Linear analog transducer (TLH) 225 mm (8.9 in) with 5 m (16.4 ft) connection cable and linear transducer rod ****	LAT-225-C305
Linear analog transducer (TLH) 300 mm (11.8 in) with 5 m (16.4 ft) connection cable and linear transducer rod ****	LAT-300-C305
Linear analog transducer (TLH) 500 mm (19.7 in) with 5 m (16.4 ft) connection cable and linear transducer rod ****	LAT-500-C305
Universal transducer mounting kit ****	UTM-KIT-0000
Universal transducer mounting kit - extended version ****	UTM-KIT-0001
Linear to rotary convertor ****	LTR-CON-0000
Doble transducer adapter with 5 m (16.4 ft) connection cable ****	DTA-005-C602
Doble transducer adapter with 10 m (32.8 ft) connection cable ****	DTA-010-C602
Doble transducer adapter with 15 m (49.2 ft) connection cable ****	DTA-015-C602
Thermal printer 58 mm (2.28 in) (built-in)	PRINT-058-01
Thermal paper roll 58 mm (2.28 in)	PRINT-058-RO
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
Test probe with grip jaws (black)	TESTPR-GJ-B0
Test probe with grip jaws (red)	TESTPR-GJ-R0
Test probe with split test clamps (black)	TESTPR-SC-B0
Test probe with split test clamps (red)	TESTPR-SC-R0
Dolphin clip (black)	DOLPIN-CL-B0
Dolphin clip (red)	DOLPIN-CL-R0

* Optional accessories for CAT03, CAT31 and CAT34

** Optional accessories for CAT61 and CAT64

*** Optional accessories for CAT31, CAT34, CAT61 and CAT64

**** Optional accessories for CAT34 and CAT64

B-CATSTA-117-EN

Date published: 2024-02-21

Subject to change without notice

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