Circuit Breaker Analyzer & Timer CAT-P

- Compact and ergonomic design - only 1,4 kg (3.1 lbs)
- Internal battery power supply (user replaceable)
- Battery operation for up to 8 hours
- Offline and Online (First trip test) measurement
- DC voltage and DC current measurement
- Coil control (via external module) for OPEN and CLOSE coil
- Touch screen color display 145 mm (5.7 in)
- On-site analysis of test results
  (overlay up to 4 records in graphical form)
- Test results analysis and comparison with
  results obtained from other CAT instruments using DV-Win software

Description

Handheld Circuit Breaker Analyzer & Timer CAT-P is a digital instrument for circuit breakers condition assessment. CAT-P records timing graphs of main arcing contacts, DC substation battery voltage, Trip and Close coil currents. Main contacts operating time in on-line mode is calculated based on AC secondary CT's currents. The timing channels record closing and opening of the main contacts.

CAT-P provides an easy selection of different operating modes:

- Trip (O)
- Close (C)
- Tripfree (CO)
- Reclose (O-C)
- Close-Trip (C-O)
- Trip-Close-Trip (O-C-O)
- First trip

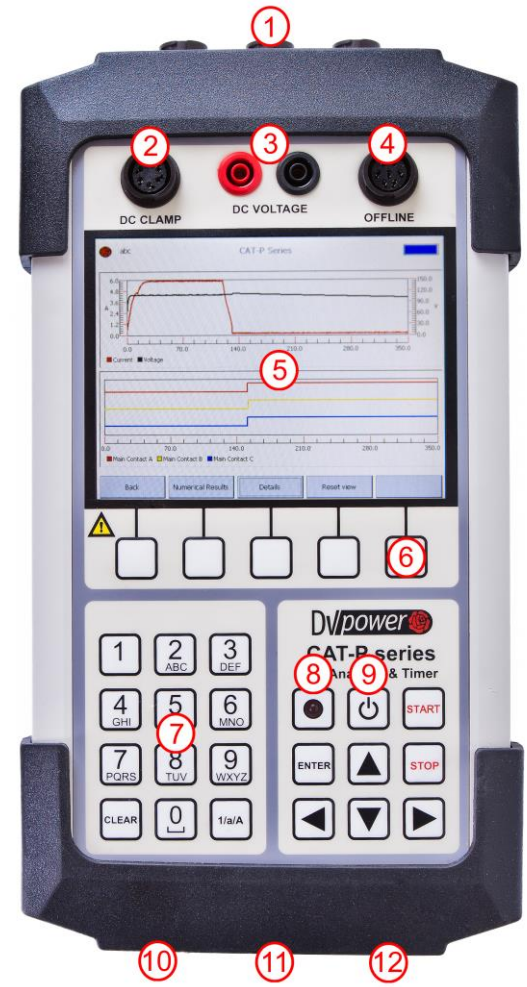
Before the start of the test, the current clamp needs to be connected to the auxiliary circuitry of the circuit breaker. The recording starts when the measured coil current reaches predefined threshold. The hooked DC current clamp measures the current through the auxiliary circuit, Trip or Close coil, depending on the initiated operation.

CAT-P is a powerful diagnostic tool for recording and analyzing:

- Trip/Close coils operation
- Main arcing contacts operation
- Auxiliary contact operation
- DC supply voltage
- Integrity of control circuit wiring

CAT-P displays numerical and graphical results (it can overlay up to 4 records in graphical form). This enables quick onsite analysis of potential defects by comparing the obtained test results.

Features



1 - AC current clamp inputs
Used for recording AC current in Online mode.

2 - DC current clamp input
Used for a DC coil current recording and measurement.

3 - DC voltage channel input
Used for a voltage measurement of an analog signal.

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

5 - Touchscreen display
Touchscreen color display 5.7 in

6 - Soft keys
Used for selecting preferred (test) settings (options/menus) as an alternative to touchscreen.

7 - Alphanumeric keypad
Used for entering breaker data, test data and control functions.

8 - Power ON/OFF indicator
Indicates if the instrument is turned ON/OFF.

9 - Power ON/OFF button
Used for turning ON/OFF the instrument turning.

10 - DC power supply
12 V DC, 3 A
DC adapter 85-264 V AC (47-63 Hz) / 12 V DC

11 - Flash drive
Used for a direct download of test results on a USB memory stick.

12 - PC communication
USB interface for PC.

Application

The list of the instrument applications includes:

- Offline and online testing of circuit breakers - the onsite analysis of circuit breaker defects for immediate attention.
- Timing measurement of up to 3 main contacts (1 break per phase) including pre-insertion resistors (if present in the circuit breaker) and auxiliary contact.
- Resistance measurement of the pre-insertion resistors (if present in the circuit breaker).
- Main contacts bounce time measurement.
- A measurement and graphical display of the coil currents.
- Coil control (via external module – Coil Control Module) for actuation of circuit breaker's OPEN and CLOSE coil.
- Evaluating the state of the substation's battery (or other types of analog signals that may be relevant) by presenting the voltage value numerically and graphically.
- Online measurement (First trip test) as a fast and simple online test which can be performed by a single operator in around 10 minutes. The capture of the vital First trip operation through non-invasive connections while in the energized state.

"First trip" test (Online test)

"First trip" test is important to determine a condition of the coil operating mechanism and give us information how would the circuit breaker perform in a real-life fault situation. Therefore capturing the first trip operation is essential to effective circuit breaker condition monitoring.

A 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 latch friction may increase. Information about the latch friction can be obtained from the coil current waveform recorded during the first trip operation.

When the breaker is in service, the conventional way of offline timing measurement with timing cables across the interrupter cannot be used. Instead of the main contact timing cables, AC, DC current clamps and voltage sense cables are used. The AC current clamps show current flowing through the secondary side of the current transformer in each phase. They can indicate when the current flowing in the main circuit has been interrupted, which gives main contact time. The DC clamps are intended for measuring the DC coil current in auxiliary control circuit and can provide analysis of both the trip coil and main mechanism operation. The voltage sense cables are used for control voltage measurement and can provide a clear indication about the condition of the DC battery and corresponding wiring.

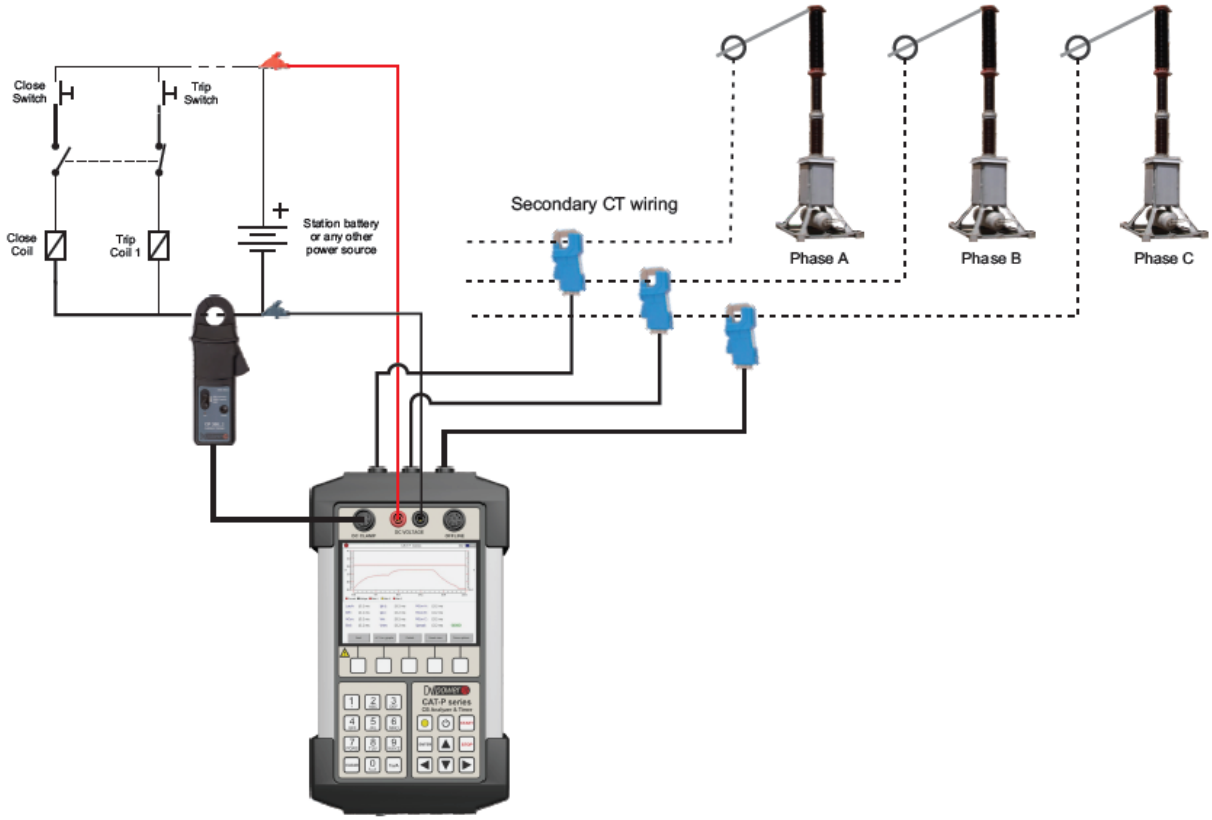


Figure 1. CAT-P connection to live tank circuit breaker with one breaking element per phase for Online testing

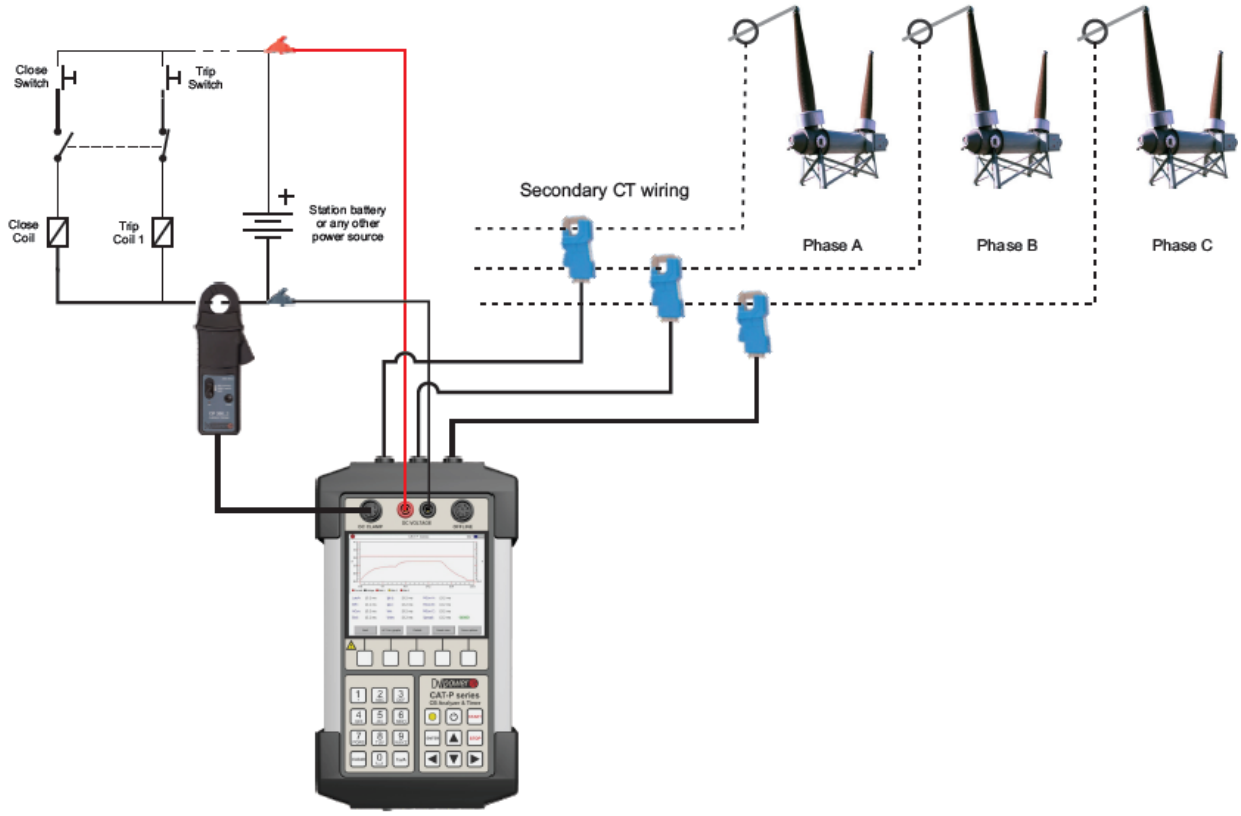


Figure 2. CAT-P connection to dead tank circuit breaker with one breaking element per phase for Online testing

Timing Measurement (Offline test)

The CAT-P can be used in an Offline mode to measure the main arcing contact operating times when the circuit breaker is isolated from the power grid or is being tested at another location such as the manufacturer's premises or a maintenance workshop. When making Offline test connections circuit breaker needs to be is disconnected or separated from its circuit on both sides of the breaker in accordance with the national safety regulations. The circuit breaker needs to be properly grounded to a protective ground.

Timing measurement tests fulfill all the requirements stipulated in IEC 62271-100 and ANSI C37.09.

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. However, in order to assess conditions of high-voltage circuit breakers, it is important to check their operation.

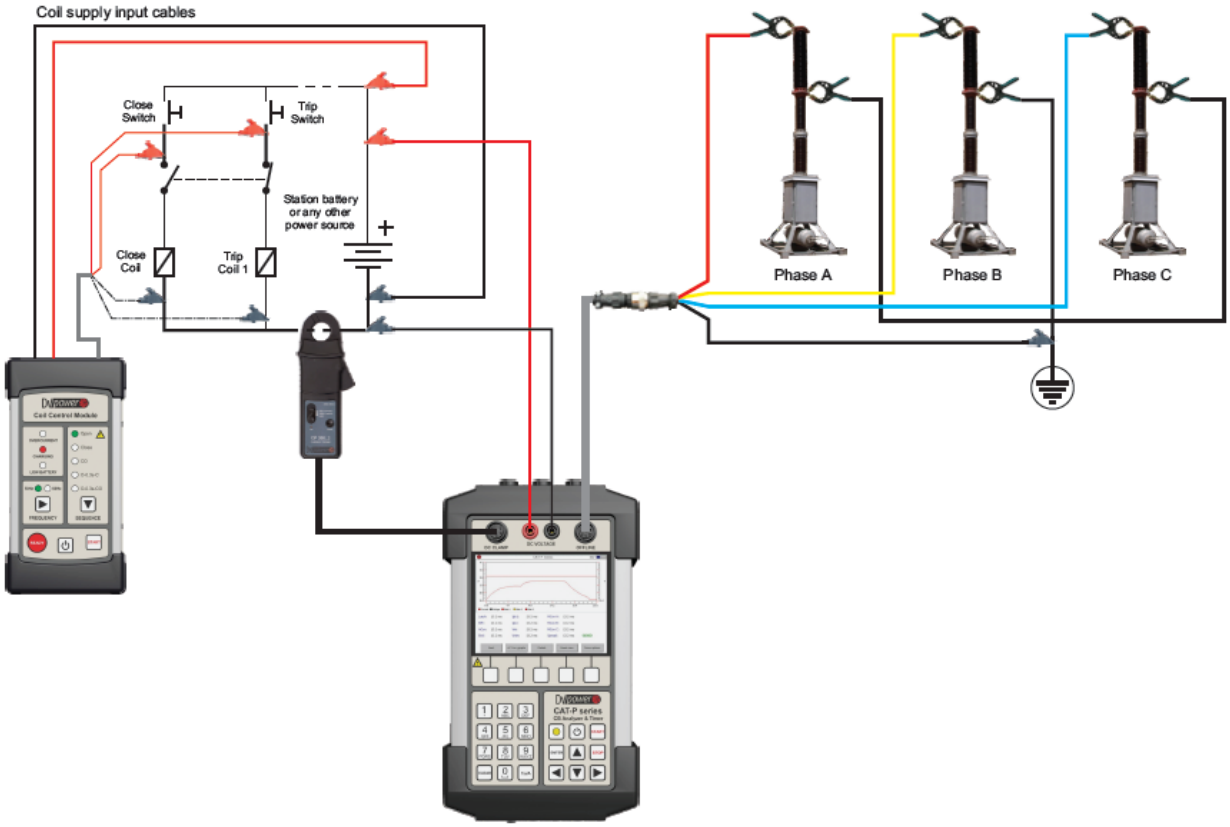


Figure 3. CAT-P and Coil Control Module connection to live tank circuit breaker with one breaking element per phase for Offline testing

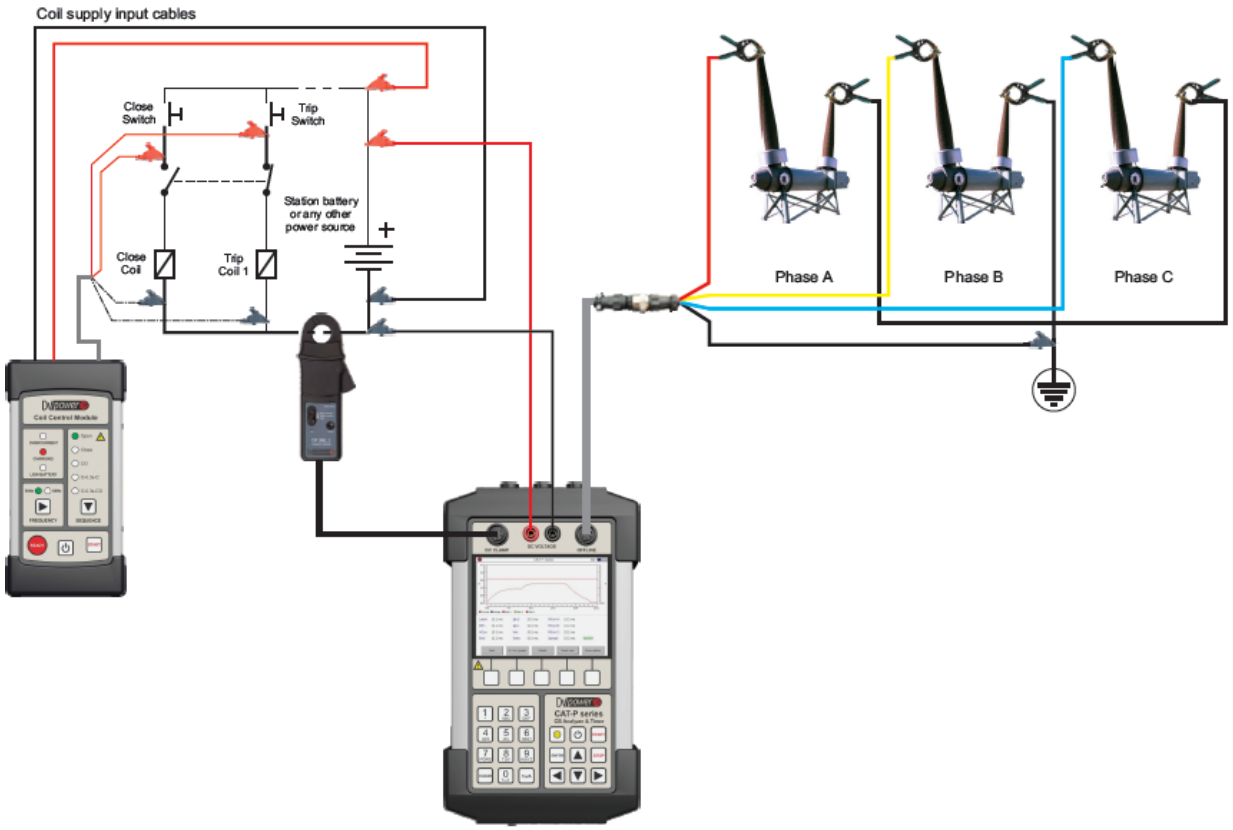
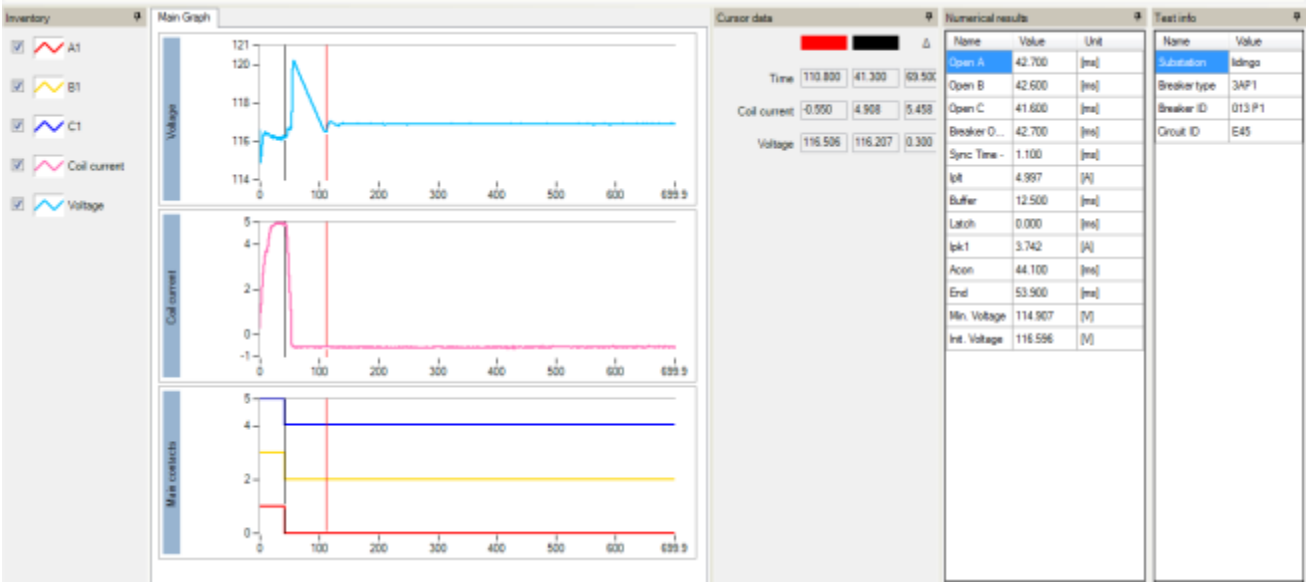


Figure 4. CAT-P and Coil Control Module connection to dead tank circuit breaker with one breaking element per phase for Offline testing

DV-Win software

DV-Win software provides acquisition and analysis of the test results. 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 an automatic unit conversion (e.g. cycles to seconds or mm to inches). The test records can be exported in .catp file format for further analysis.



- Downloading the test results from the CAT-P to PC
- 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

Technical data

Main contact inputs

- Number of contact inputs: 3 (3 x 1), 1 per phase
- Each channel detects Main contacts
  - Closed ≤ 10 Ω
  - Resistor contacts range 10 Ω to 5 kΩ
  - Open ≥ 5 kΩ

  Open circuit voltage: 20 V DC

  Short circuit current 50 mA

Time measurement

Time measurement resolution:

- 0,05 ms to 10 ms depending on test duration (sampling rate up to 20 kHz)

Time accuracy: 0,05% of the reading ± resolution

Breaker operation

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

DC Current Clamps

- Nominal current: 300 A_{RMS} or 450 A DC_{PK}
- Measuring ranges: 30/300 A
- Frequency range: DC to 20 kHz (-3 dB)

AC Current Clamps

- Measuring Range: 0,05 A to 5 A_{RMS}
- Accuracy: ±3% ±1 mV (from 0,05 A to 0,5 A), ±1,5% ±1 mV (from 0,5 A to 1 A), ±1% (from 1 A to 5 A)

DC Voltage Measurement

- Range: ±300 V
- Typical accuracy: ±0,5% RDG ±0,5% FS
- Guaranteed accuracy: ±1% RDG ±1% FS

Handset and inline power supply

- 12 V DC, 3 A
- Input: 90 – 264 V AC, 50/60 Hz

Internal battery supply

- 2 x 3,7 V, 2900 mAh rechargeable and user replaceable Li-ion battery
- 8 hours under normal usage

Display

- Touch screen color display 145 mm (5.7 in)
- Graphic and numeric results

Applicable standards

- Safety:

  Low Voltage Directive: Directive 2014/35/EU (CE conform)

  Applicable standards, for a class I instrument, pollution degree 2,

  Installation category II: IEC EN 61010-1
- Electromagnetic Compatibility:

  Directive 2014/30/EU (CE conform)
  Applicable standard: EN 61326-1
- CAN/CSA-C22.2 No. 61010-1

Environmental conditions

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

Dimensions and weight

- Dimensions (L x W x H):

  CAT-P

  310 x 170 x 58 mm / 12.21 x 6.69 x 2.28 in

  Coil Control Module

  228 x 115 x 53 mm / 8.98 x 4.53 x 2.09 in
- Weight:

  CAT-P: 1,4 kg / 3.1 lbs

  Coil Control Module: 0,6 kg / 1.32 lbs

Warranty

- 3 years

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

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Main Contact Cables 8 m (26.3 ft) with alligator clamps (A1)*

Main contacts connection 3 x 1 m (3.3 ft) and ground 2 m (6.6 ft) cable with alligator clamps (A1)

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

Current clamp 30/300 A power supplied from the instrument with extension 5 m (16.4 ft)

AC Current clamp 1 A / 1 V with cable 5 m (16.4 ft)

Coil Control Module

Coil control cable set 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

Test probe with grip jaws (red, black)

Dolphin clip (red, black)

Plastic transport case for CAT-P

Plastic transport case for accessories

Cable bag

Power supply adapter

The cables are also available in several lengths and terminations.
Please contact DV Power for more information.

Order info

Instrument with included accessories	Article No
Handheld Circuit Breaker Analyzer & Timer CAT-P with DV-Win software including USB stick and mini USB cable, Resistive touch pen and Plastic transport case	CATP000-N-00
Power supply adapter	

Recommended accessories	Article No
Main contacts cable set 8 m with alligator clamps (A1)	CMP-08-SETA1
Main contacts connection 3 x 1 m and ground 2 m cable with alligator clamps (A1)	MC-CG-0302A1
Voltage sense cable set 2 x 5 m 2,5 mm^2 with banana plugs	S2-05-02BPBP
Dolphin clip (black)	DOLPIN-CL-B0
Dolphin clip (red)	DOLPIN-CL-R0
Current clamp 30/300 A power supplied from the instrument with extension 5 m	CACL-0300-09
AC Current clamp 1 A / 1 V with cable 5 m (x 3)	CACL-AC00-05
Plastic transport case for accessories	PLAST-CAS-00

Optional accessories	Article No
Coil Control Module	COCON-MOD-00
Coil control cable 5 m with banana plugs	CO-05-00C5B1
Coil supply cable set 2 x 5 m 2,5 mm2 with banana plugs	C2-05-02BPBP
Voltage sense cable set 2 x 2 m 2,5 mm^2 with banana plugs	S2-02-02BPBP
Voltage sense cable set 2 x 10 m 2,5 mm^2 with banana plugs	S2-10-02BPBP
Coil control cable 10 m with banana plugs	CO-10-00C5B1
Coil supply cable set 2 x 10 m 2,5 mm2 with banana plugs	C2-10-02BPBP
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
Extension cable 5 m for AC Current clamp 1 A / 1 V	CACL-ACE-N10
Main contacts cable set 10 m with alligator clamps (A1)	CMP-10-SETA1
Main contacts cable set 8 m with alligator clamps (A2)	CMP-08-SETA2
Main contacts cable set 10 m with alligator clamps (A2)	CMP-10-SETA2
Main contacts cable set 8 m with SCT clamps	CMP-08-SETST
Main contacts cable set 10 m with SCT clamps	CMP-10-SETST
Resistive touch pen	RSTCH-PEN-00
Plastic transport case for CAT-P	HARD-CASE-PP
Plastic transport case for accessories	PLAST-CAS-00
Cable bag	CABLE-BAG-00
Power supply adapter EU 3 A	PWR-ADP3A-EU
Power supply adapter NA 3 A	PWR-ADP3A-NA
Power supply adapter UK 3 A	PWR-ADP3A-UK
Power supply adapter AU 3 A	PWR-ADP3A-AU

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