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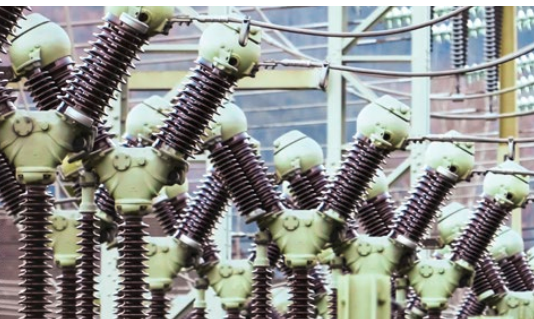
OMICRON

CIBANO 500

3-in-1 test system for
medium- and high-voltage circuit breakers



Medium- and high-voltage circuit breaker testing



The 3-in-1 solution for your convenience

OMICRON's CIBANO 500 is the world's first circuit breaker test system to combine

- > a high-accuracy micro-ohmmeter,
- > a powerful and adjustable coil and motor supply (AC/DC), and
- > a multi-channel timing analyzer.

The lightweight test system is optimized for on-site testing of

- > medium-voltage circuit breakers and
- > high-voltage circuit breakers (dead-tank and live-tank design).

This innovative concept allows you faster and safer wiring, speeds up the whole test process, and delivers one combined test report for all tests carried out.

Active power for your circuit breakers

Due to CIBANO 500's integrated AC/DC power supply there is no longer any need for risky and time-consuming connections to live DC circuits. Additionally, you can operate independently from external power supply units. Thus you can easily carry out commissioning tests on circuit breakers even if there is no station battery installed.

With its active power electronics, the power supply provides you with a constant output power during all tests resulting in stable and reproducible testing conditions.



Only 1 apparatus for the 5 standard tests

1 Static contact resistance test (micro-ohm measurement)

CIBANO 500 checks for a low transmission resistance on the closed breaker to ensure that the load current flows with low losses.

2 Minimum pick-up test

CIBANO 500 determines the minimum voltage necessary to trip and close a circuit breaker. This test is to make sure that your equipment can also be reliably operated in case of low DC supply.

You can set the pass/fail level to a certain percentage of the nominal value. By applying short pulses with increasing amplitudes and breaks in-between CIBANO 500 makes sure that the trip coils don't heat up during testing. As a result, the test becomes safer and easier for you.

3 Timing tests

CIBANO 500 assesses the main contact timing and the delta timing. It can detect incorrect mechanical adjustments or wear phenomena of your circuit breakers by measuring differences between the fastest and slowest phase.

By analyzing their opening and closing time it can detect aging-related phenomena of the circuit breakers.

Possible sequences: O, C, CO, OC, O-CO, CO-CO, O-CO-CO. You can carry out all sequence tests with completely flexible timing.

4 Coil/motor current analysis

CIBANO 500 records the current signature curve of the coils and motors during the circuit breaker operation. Deviations from the expected signature show possible electrical or mechanical defects of the trip or close coils as well as of the release latch.

The trend of motor currents shows you the power needed by the motor.

5 Undervoltage condition test

To date, measuring the impact of undervoltage supply on close and trip operation was only a rough simulation, mostly using dubious resistor-bridge set-ups for adjusting the supply voltage.

Using CIBANO 500's adjustable power supply, you simply set an exact undervoltage of the nominal value and measure the respective behavior of the circuit breaker's coils.

Your benefits

- > 3-in-1 system: micro-ohmmeter, powerful AC/DC supply, and timing analyzer
- > One system for medium- and high-voltage circuit breakers
- > Low wiring effort
- > One combined report for all tests
- > Light-weight test system for on-site testing (20 kg / 44.1 lbs)

Modular concept for simplified testing

CB MC2: making the difference

The main contact module CB MC2 makes testing even more convenient for you, especially on circuit breakers with larger dimensions. The combination of CIBANO 500 and CB MC2 offers you the following advantages:

- > Same wiring set-up for all circuit breaker tests: no time-consuming rewiring necessary
- > Overall wiring minimized and clearly arranged
- > Short high-current cables: easier and faster measuring set-up
- > Light-weight digital connection cables between CB MC2 modules and CIBANO 500: transmission of measuring results without interference

CB MC2: easier, faster, and safer testing

While using CB MC2, all 5 standard tests can be carried out in a row without any change in measuring set-up.

Static contact resistance test

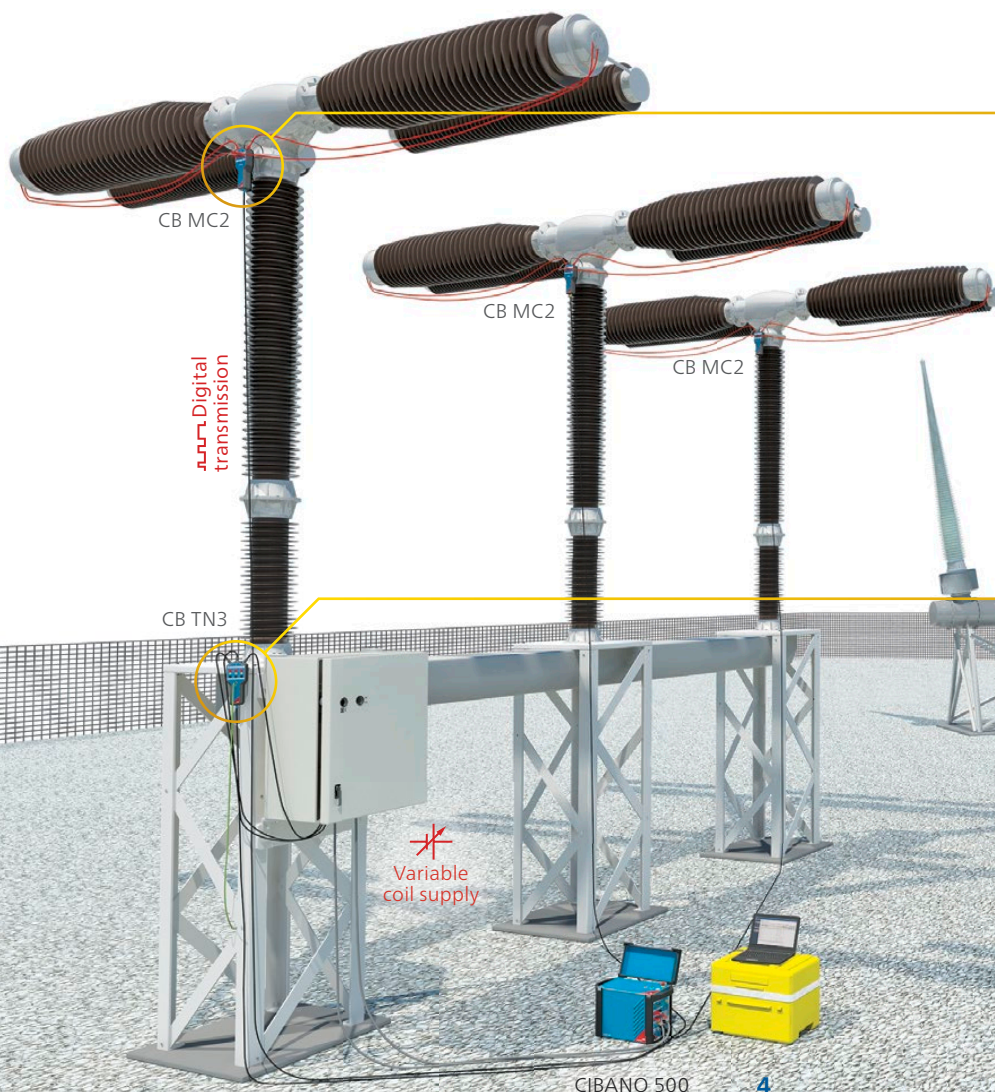
With only one button press you get all contact resistance data of up to 6 interrupter units at a time.

Timing tests

Using CB MC2 you can easily assess the resistor switch timing and analyze opening and closing times of circuit breakers with several interrupters in one phase or different phases.

Both sides grounded

It goes without saying that all above mentioned tests can be done while the circuit breaker is grounded on both sides. This results in increased security levels for operating personnel.



With the configuration CIBANO 500 and 3 x CB MC2 you can perform all tests on 3-phase circuit breakers, with one or two interrupters, without any rewiring.

CB MC2: enhanced functionality

Dynamic contact resistance test

This test records the contact resistance value during circuit breaker operation and delivers information to you about wear-related problems with main and arcing contacts as well as with resistor switches.

This test can also be carried out without rewiring. In combination with the motion/contact travel test you can additionally determine the length and condition of SF₆ circuit breakers' arcing contacts.

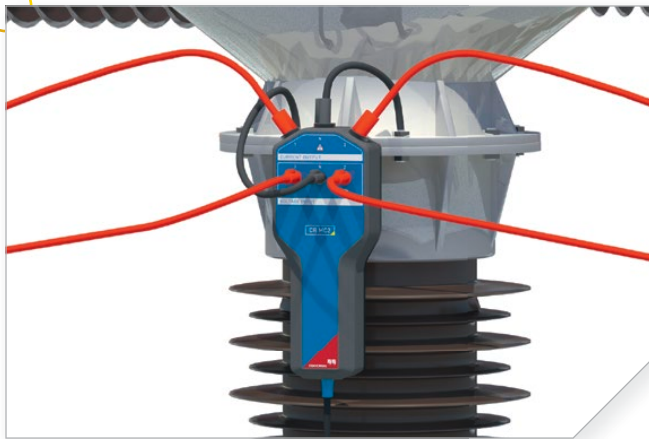
CB TN3: input for motion transducers

Motion/contact travel test

The configuration CIBANO 500, CB TN3, and a motion sensor checks the circuit breaker's complete operating mechanism and mechanical linkage.

As a result you get the performance values such as velocity, over-travel, rebound, etc., which can be compared to the manufacturer data and data acquired by previous measurements.

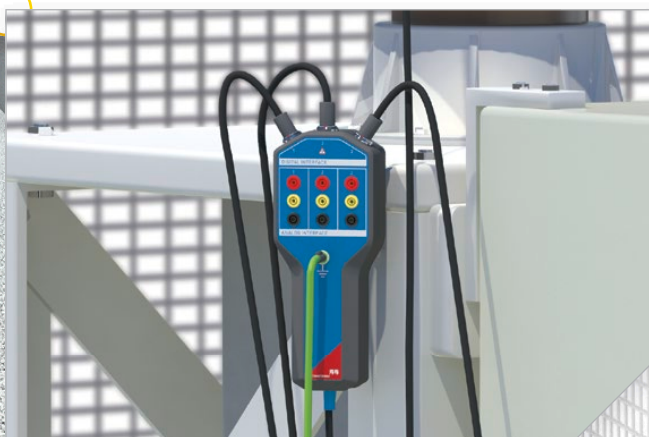
Due to CIBANO 500's open design you can use most motion sensors available and only need to connect a CB TN3 unit between the motion sensor and CIBANO 500.



Main contact module CB MC2

2 high-current outputs and 2 sensitive voltage measurement channels.

- > Keeps high-current cables as short as possible, minimizing the weight of the necessary cables
- > A digitized measuring signal is produced directly at the interrupter keeping analog cables as short as possible: very low noise interference
- > Only one connection cable to the main unit: fast set-up and reduced risk of wiring errors



Transducer node CB TN3

3 analog and digital channels for data acquisition of linear or rotational motion sensors

- > Interference-free digital transmission of measurement results to the main unit via one connection cable
- > Can be connected to most linear or rotational motion sensors

Powerful control software for convenient testing

Primary Test Manager (PTM) Standard

With PTM Standard, which is the control software for CIBANO 500, you can run your circuit breaker tests quickly, tailored to your specific demands as shown below.

Primary Test Manager (PTM) Advanced

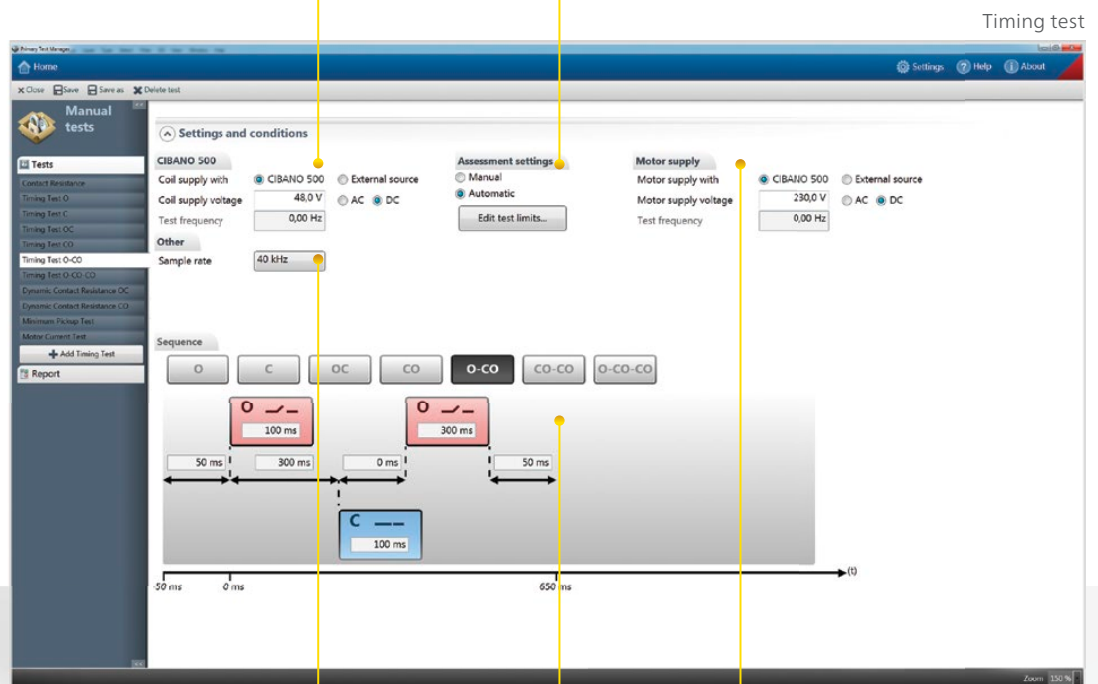
PTM Advanced with its easy-to-follow wiring diagrams intuitively guides you through the entire test procedure in no time at all.

After entering the nameplate data of the circuit breaker under test, PTM generates a tailored test plan in line with current standards. This not only saves you time, but also helps you avoid errors.

The well-structured and comprehensive database of PTM Advanced enables you to manage all your circuit breaker data with ease, including nameplate data, respective tests and reports.

Get instant “pass/fail” assessments of the results.

Coils can be supplied via CIBANO 500 or via the station battery.

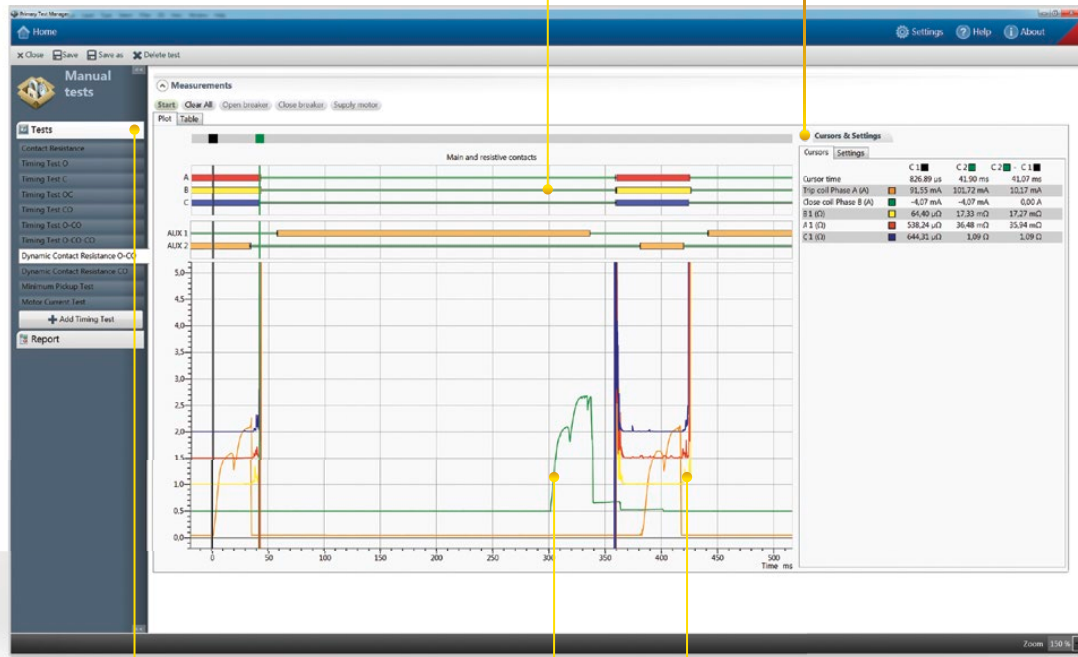


Flexible settings for different sample rates

A graphical overview of the testing sequence makes it easy to set the right timing.

The motor can be supplied via CIBANO 500 or via the station battery.

Dynamic contact resistance test



Binary traces in the graphical view allow a quick overview. Numerical results are available in a tabular view.

Cursors allow detailed analysis of results.

Dynamic resistance measurement analyzes the wear of the arcing contact, for example, of SF₆ circuit breakers.

Coil and motor currents, voltages, or calculated resistances can be shown in the timing diagram.

Set up your individual test plans.

Technical specifications

CIBANO 500

Output specifications, general

Frequency	DC / 15 Hz ... 400 Hz
Power	2.4 kW (continuous) 3.2 kW / 4.2 kVA (for at least 30 s)

Voltage source (A & B)

Source	Range	t_{\max}	I_{\max, t_{\max}^1}	$I_{\max, 2h}^1$
DC	0 ... ± 300 V	15 s	27.5 A	12 A
DC	0 ... ± 150 V	15 s	55 A	24 A
AC	0 ... 240 V	30 s	20 A	12 A
AC	0 ... 120 V	30 s	40 A	24 A

Current source (A & B)

Source	Range	t_{\max}	V_{\max}^1
DC	$3 \times 0 \dots \pm 33.3$ A	15 s	50 V
DC	$3 \times 0 \dots \pm 24$ A	contin.	50 V

Voltage input (V IN) CAT III²

Input	Range	Accuracy ³
DC	0 ... 420 V	0.5 % rd + 0.5 % fs
AC	0 ... 300 V	0.5 % rd + 0.5 % fs

Internal measurement of outputs (A) CAT III⁴

Range name	Range value	Accuracy ³
300 V	0 ... 300 V	DC: 0.1 % rd + 0.05 % fs AC: 0.03 % rd + 0.01 % fs

Internal measurement of outputs (B) CAT III⁴

Range name	Range value	Accuracy ³
300 V	0 ... 300 V	DC: 0.1 % rd + 0.05 % fs AC: 0.03 % rd + 0.01 % fs
3 V	0 ... 3 V	DC: 0.1 % rd + 0.05 % fs
300 mV	0 ... 300 mV	DC: 0.1 % rd + 0.1 % fs
30 mV	0 ... 30 mV	DC: 0.1 % rd + 0.1 % fs

Internal measurement of outputs

Range name	Range value	Accuracy ³
55 A	0 ... 55 A	DC: 0.1 % rd + 0.2 % fs
40 A	0 ... 40 A	AC: 0.1 % rd + 0.1 % fs

Resistance measurement

Range name	Range value	Meas. current	Accuracy ³
30 mV	0.1 $\mu\Omega$... 300 $\mu\Omega$	100 A	0.2 % rd + 0.1 $\mu\Omega$
300 mV	0.5 $\mu\Omega$... 3 000 $\mu\Omega$	100 A	0.2 % rd + 0.5 $\mu\Omega$
3 V	5 $\mu\Omega$... 30 m Ω	100 A	0.2 % rd + 5 $\mu\Omega$
3 V	50 $\mu\Omega$... 300 m Ω	10 A	0.2 % rd + 50 $\mu\Omega$

Binary input (A) CAT III⁴

Binary input type	Toggleing with potential-free (dry) contacts or voltages (wet) up to 300 V DC
Maximum sample rate	40 kHz
Minimum resolution	25 μs

Power specifications

Voltage	Nominal: 100 V ... 240 V AC Permitted: 85 V ... 264 V AC
Frequency	Nominal: 50 Hz / 60 Hz Permitted: 45 Hz ... 65 Hz
Power fuse	Automatic circuit breaker with magnetic overcurrent tripping at $I > 16$ A
Power consumption	Continuous: < 3.5 kW Peak: < 5.0 kW
Connector	IEC320/C20, 1 phase

Command switches

3 channels, such as trip or close (command switches can be routed to any socket in section A or B). Typical voltage drop = 3 V.

Current per channel ⁵	Duty cycle
6 A _{RMS} AC or DC	continuous
15 A _{RMS} AC or DC	20 s on 80 s off
30 A _{RMS} AC or DC	10 s on 190 s off

All input/output values are guaranteed for one year within an ambient temperature of $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C} / 73\text{ }^{\circ}\text{F} \pm 10\text{ }^{\circ}\text{F}$, a warm-up time longer than 25 min. and in a frequency range of 45 Hz to 65 Hz or DC. Accuracy values indicate that the error is smaller than \pm (value read \times reading error [rd] + full scale of the range \times full scale error [fs]). For mains voltages below 190 V AC the system is subject to power restrictions. EtherCAT[®] is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany. Technical data is subject to change without notice.



CB MC2

Interfaces

Digital	4 × EtherCAT ^{®6} , 1 × Ethernet, 1 × Serial, 2 × Safety
Analog	1 × analog input (V IN) 3 × analog input / analog output / binary input (A) 4 × analog input / analog output (B) 1 × booster interface

Environmental conditions

Temperature	Operating: -10 °C ... +55 °C / +14 °F ... +131 °F Storage: -30 °C ... +70 °C / -22 °F ... +158 °F
Relative humidity	5 % ... 95 %, non-condensing
Maximum altitude	Operating: 2 000 m / 6 550 ft, up to 5 000 m / 16 400 ft (with limited specifications, according to footnotes) Storage: 12 000 m / 40 000 ft

Mechanical data

Dimensions (W × H × D)	580 × 386 × 229 mm / 22.9 × 15.2 × 9.0 inch (W = 464 mm / 18.3 inch without handles)
Weight	20 kg / 44.1 lbs

Equipment reliability

Shock	IEC / EN 60068-2-27, 15 g / 11 ms, half-sinusoid, each axis
Vibration	IEC / EN 60068-2-6, frequency range from 10 Hz to 150 Hz, continuous acceleration 2 g (20 m/s ² / 65 ft/s ²), 10 cycles per axis

CE conformity

(EMC) Directive 2004/108/EC and low-voltage Directive 2006/95/EC

EMC	EN 61326-1 Class A, IEC 61326-1 Class A, FCC Subpart B of Part 15 Class A
Safety	EN 61010-1 / EN 61010-2-30 IEC 61010-1 / IEC 61010-2-30 UL 61010-1 / UL 61010-2-30

Current output

Channels	2
Current source	0 ... 100 A DC
Maximum output voltage	2.6 V DC

Static contact resistance measurement

Range	0.1 μΩ ... 1 000 μΩ
Accuracy ³	0.2 % rd + 0.1 μΩ
Measuring current	100 A

Dynamic contact resistance measurement⁷

Range	10 μΩ ... 200 mΩ
Accuracy ³	0.2 % rd + 10 μΩ
Settling time	40 μs
Maximum sample rate	40 kHz
Minimum resolution	25 μs

Timing measurement

Maximum sample rate	40 kHz
Minimum resolution	25 μs

Interface

EtherCAT[®] interface to CIBANO 500

Environmental conditions

Temperature	Operating: -30 °C ... +70 °C / -22 °F ... +158 °F Storage: -30 °C ... +70 °C / -22 °F ... +158 °F
Relative humidity	5 % ... 95 %, non-condensing
Maximum altitude	Operating: 5 000 m / 16 400 ft Storage: 12 000 m / 40 000 ft

Mechanical data

Dimensions (W × H × D)	109 × 272 × 63 mm / 4.3 × 10.7 × 2.5 inch
Weight	1.2 kg / 2.6 lbs

Equipment reliability and standards conformity

Please see CIBANO 500 parameters.

¹ Within the above specified power limit

² From 2 000 m to 5 000 m altitude CAT III compliance only with half voltage

³ Means "typical accuracy"; 98 % of all units have an accuracy which is better than specified

⁴ From 2 000 m to 5 000 m altitude only CAT II compliance or CAT III compliance with half voltage

⁵ Valid while using one channel. Thermal derating when 2 or 3 channels are used in parallel

⁶ Advanced Packages only

⁷ Valid for test currents ≥10 A

Ordering information

CIBANO 500 Standard Package (order no. VE000900)

Hardware

1 × CIBANO 500

Software

- 1 × PTM Standard software
- 1 × Static contact resistance license
- 1 × Timing license
- 1 × Coil current license

Cables and accessories

- 4 × Crocodile clamp for secondary side (red + black)
- 2 × Kelvin clamp 100 A
- 12 × Terminal adapter
- 2 × Safety dongle
- 1 × Standard measurement cable set:
1 × 6 m red, 1 × 6 m black, 3 × 1 m black (2.5 mm²)
- 1 × Summary cable for A outputs (4 × 2.5 mm²)
- 1 × Summary cable for B outputs (5 × 2.5 mm²)
- 1 × Ethernet PC connection cable 3 m / 10 ft
- 1 × Grounding cable (green / yellow) 6 m / 19.5 ft (6 mm²)
- 1 × Power cord CIBANO
- 1 × Soft bag for small accessories
- 1 × CIBANO 500 transport case with wheels
- 1 × CIBANO 500 DVD
- 1 × CIBANO 500 getting started

CIBANO 500 Advanced Package (order no. VE000901)

Hardware

- 1 × CIBANO 500 with EtherCAT® module
- 3 × CB MC2

Software

- 1 × PTM Advanced software
- 1 × Static contact resistance license
- 1 × Timing license
- 1 × Dynamic contact resistance license
- 1 × Coil current license
- 1 × Minimum pick-up license
- 1 × Motor current license

Cables and accessories

Cables and accessories from CIBANO 500 Standard Package plus:

- 1 × CB MC2 soft bag (for 3 CB MC2 modules)
- 3 × EtherCAT® cable 15 m / 49 ft
- 1 × Standard high-current cable set:
6 × 3 m red, 3 × 0.75 m black (10 mm², 6 mm banana plugs)
- 1 × Standard measurement cable set:
6 × 3 m red, 6 × 1 m black (2.5 mm²)
- 1 × Kelvin clamp set:
6 × red, 3 × black (1 × 6 mm and 1 × 4 mm banana plugs each)
- 1 × Y clamp set:
6 × black (3 × 6 mm and 3 × 4 mm banana plugs)
- 1 × Soft bag with belt

CIBANO 500 US Advanced Package (order no. VE000902)

Hardware

- 1 × CIBANO 500 with EtherCAT® module
- 1 × CB TN3

Software

- 1 × PTM Advanced software
- 1 × Static contact resistance license
- 1 × Timing license
- 1 × Coil current license
- 1 × Motion license
- 1 × Minimum pick-up license
- 1 × Motor current license

Cables and accessories

Cables and accessories from CIBANO 500 Standard Package plus:

- 1 × CB TN3 travel case
- 1 × EtherCAT® cable 6 m / 19.5 ft
- 1 × 1-day scheduled training CIBANO 500

CB MC2 Upgrade Option (order no. VEZH0900)

- 1 × CB MC2
- 1 × EtherCAT® cable 15 m / 49 ft
- 1 × Standard high-current cable set:
2 × 3 m red, 1 × 0.75 m black (10 mm², 6 mm banana plugs)
- 1 × Standard measurement cable set:
2 × 3 m red, 2 × 1 m black (2.5 mm²)
- 1 × Kelvin clamp set:
2 × red, 1 × black (1 × 6 mm and 1 × 4 mm banana plugs each)
- 1 × Y clamp set:
2 × black (1 × 6 mm and 1 × 4 mm banana plugs)

CB TN3 Upgrade Option (order no. VEZH0901)

- 1 × CB TN3
- 1 × CB TN3 travel case
- 1 × EtherCAT® cable 6 m / 19.5 ft
- 1 × Rotational transducer incl. cable (digital)

General software upgrades and accessories

Description	Order no.
1 × PTM Standard to PTM Advanced upgrade	VESM0675
1 × Dynamic contact resistance license	VESM0900
1 × Minimum pick-up license	VESM0901
1 × Motor current license	VESM0902
1 × Motion license	VESM0903
1 × EtherCAT® module	VEHO0900
1 × C-Probe 1 current clamp (measuring ranges 10 A and 80 A)	VEZH4000



Get your CIBANO 500 training!

OMICRON Academy offers well-known training courses to answer any individual question you might have. The training "Introduction to CIBANO 500 and testing circuit breakers" covers:

- > Introduction to circuit breakers with basic theory
- > Operating concept of CIBANO 500 and its accessories
- > Circuit breaker testing using CIBANO 500
(with hardware and software)
- > Reasonable mix of theory and practical sessions

 www.omicron.at/en/training

OMICRON is an international company serving the electrical power industry with innovative testing and diagnostic solutions. The application of OMICRON products allows users to assess the condition of the primary and secondary equipment on their systems with complete confidence. Services offered in the area of consulting, commissioning, testing, diagnosis and training make the product range complete.

Customers in more than 140 countries rely on the company's ability to supply leading-edge technology of excellent quality. Service centers on all continents provide a broad base of knowledge and extraordinary customer support. All of this together with our strong network of sales partners is what has made our company a market leader in the electrical power industry.

For more information, additional literature, and detailed contact information of our worldwide offices please visit our website.