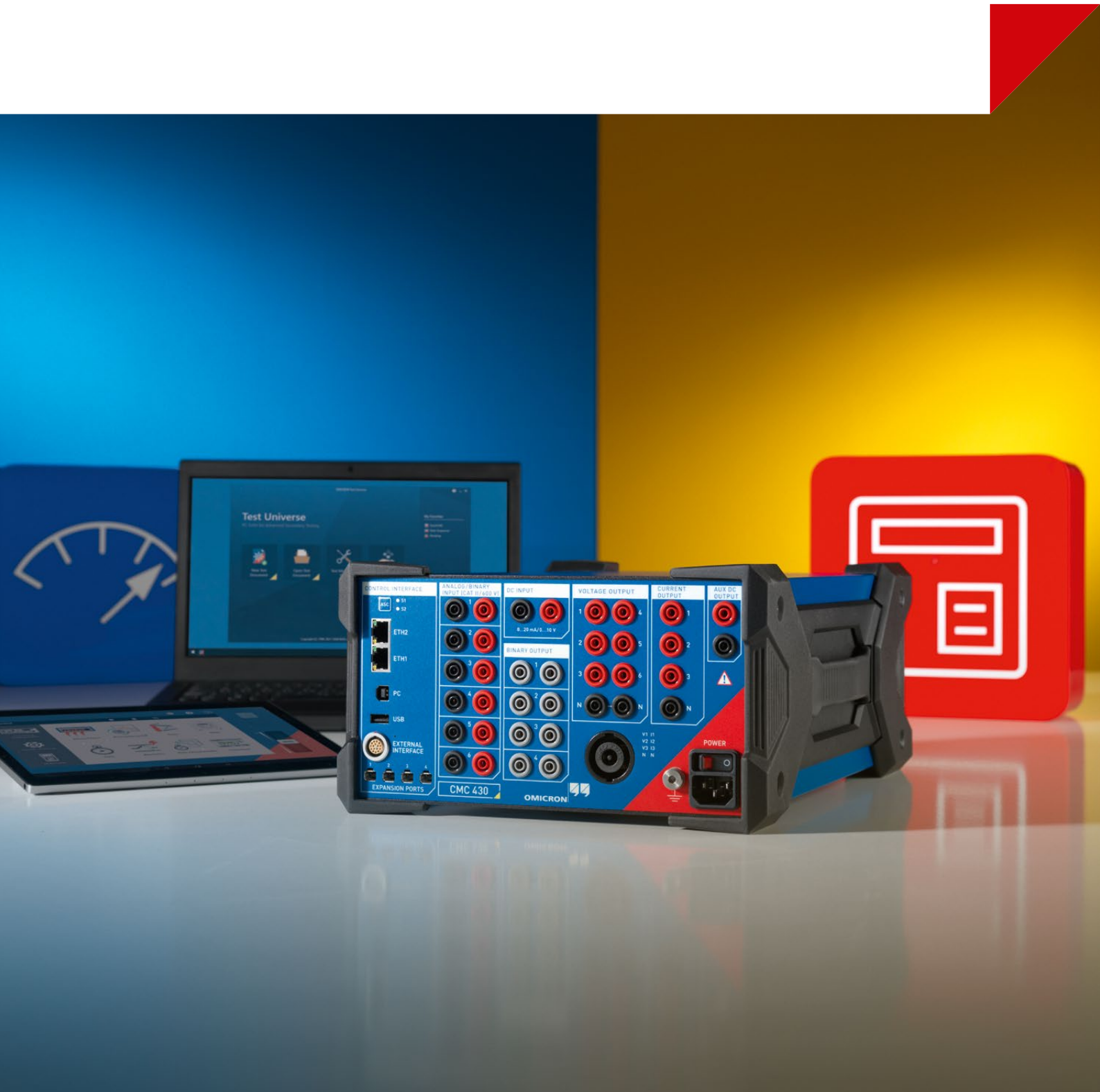
OMICRON

CMC 430

Ultra-portable Protection Test Set and Calibrator



Extremely light, precise, and flexible

Demanding challenges in future protection testing

Time and cost pressure in the field of protection testing have reached a new level of intensity. This trend is expected to continue or even rise in the future. Concurrently, the requirements on testing equipment are ever increasing.

It's no longer just classic hardwired facilities that need to be commissioned or routinely tested. More and more communication based secondary protection and measurement equipment present new challenges to personnel and test sets. The calibration of energy meters, measuring transducers, PQ meters, and other measuring equipment also needs to be addressed at this point.

protection testing and calibration solution

Lightening the load

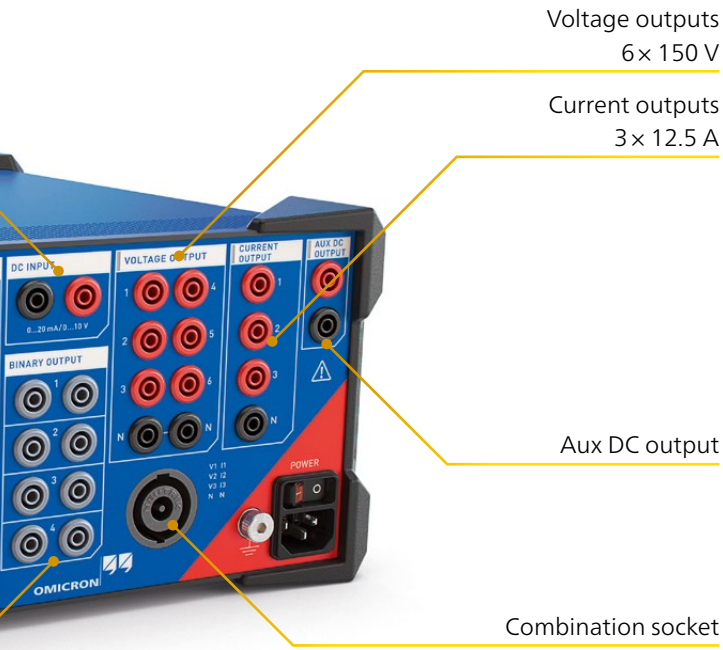
For testing modern protection and measurement devices, current and power requirements are often not very demanding, especially when 1 A CT secondaries are used. Why carry around bulky and heavy equipment? What if there was an integrated testing and calibration solution for practically all types of devices installed in secondary circuits?

Based on years of experience, the CMC 430 combines many innovative ideas and impresses with excellence in electrical engineering and ultimate ease of use. It gives technicians the opportunity to work with one of the lightest yet highly precise and versatile protection test sets in the world!

Climbing to new heights in usability, versatility and performance

The CMC 430 is the preferred choice for test engineers in cases where excellent transportability is needed. Three current outputs provide up to 12.5 A per phase, for occasional six-phase tests two CMC 430 can be combined using the Expansion Mode. Its low weight of just 8.7 kg / 19.2 lbs, and robust design with its edge protection makes the device ideal for both outdoor and indoor use.

Typically, this device is most suitable in environments where numerical and communication based protection prevails. With its extraordinarily high precision, it is also an ideal source based calibrator for all kinds of measurement devices such as energy meters, transducers, PQ meters, and PMUs. The CMC 430 combines its outstanding performance as a relay tester and calibrator with hybrid measurement and recording facilities (analog, binary, IEC 61850 GOOSE messages and SV).



Your benefits

- Ultra-portable **(8.7 kg / 19.2 lbs)**
- Convenient on-site handling
- Six voltage outputs
- Relay test set **and** calibrator
- Six current outputs with two CMC 430 (Expansion Mode)
- Hybrid measurement and recording

omicronenergy.com/cmc430

Benefit from a variety of applications and different software tools

The CMC 430 is designed to work with OMICRON's most powerful software tools. You can control the device using either a Windows PC/laptop/tablet and connect via Ethernet/USB cable or Wi-Fi.

Test Universe is the most powerful and convenient software tool for basic parameter related testing of protection and measurement devices in power systems. It offers a wide range of comprehensive software options that are based on various packages in 16 languages.

The packages are tailored to specific operational requirements and contain a selection of Test Universe test modules. Each module is function-oriented and can operate either on a stand-alone basis or can be embedded in test plans for fully automated testing. Software for special applications completes the range.

Test Universe enables a variety of test approaches, from manual to fully automated and standardized tests, running on a PC or laptop. The OMICRON Control Center (OCC) allows the option to individually combine testing functions into an overall test plan. With the related Protection Testing Library (PTL), OMICRON provides a collection of prepared test plans for a vast number of relay-specific testing applications and test objects.

Test Universe also comprises generic test modules to create and perform special tests not covered by the function related modules. Furthermore, each module includes the automatic reporting function for fully formatted test reports.

For more information see page 6.

Application areas

Protection testing

CMC 430 enables easy and reliable testing of solid state relays, numerical relays, or IEC 61850 IEDs. With its six voltage outputs, it is ready for testing synchro-check and bay control systems with six voltage inputs. With RelaySimTest, the device performs distributed testing by simultaneously controlling multiple CMCs.

The **CMControl App** is an easy-to-use control alternative to Test Universe specifically designed for quick manual testing. It runs on a Windows PC/laptop/tablet. The menu navigation guides the user step by step through the test sequence. The test tools included and the integrated fault models are optimized for manual testing to quickly obtain reliable test results that can simply be saved.

For more information visit our website
omicronenergy.com/cmcontrol-p

RelaySimTest is a unique software for protection and scheme testing using one or more CMC test sets. Its system-based testing approach validates the correct operation of the entire protection system by simulating realistic power system events. In addition to common tests, RelaySimTest also reveals settings, logic and design errors in the scheme, requiring only a minimum of test steps.

For distributed tests, such as teleprotection or line differential protection, multiple CMC 430s can be controlled from only one PC while remote devices are connected via a simple Internet connection and are time synchronized by CMGPS 588 or CMIRIG-B.

For more information visit our website
omicronenergy.com/relaysimtest

Calibration

The CMC 430 generates highly precise test signals for measurement device calibration, such as energy meters, transducers or PQ devices.

Measurement

The CMC 430 provides two Ethernet ports and six analog/binary input channels. Along with its software option EnerLyzer, it supports hybrid measurements of analog/binary signals, IEC 61850 GOOSE messages and SV as well as transient recording, while analog outputs are active.

Testing software packages and add-ons

A wide range of testing software is available consisting of Test Universe modules and additional tools. We have bundled typical testing requirements into useful software packages, but each package can of course be adapted to individual needs.

Essential offers a good introduction with basic functions and modules; can serve as a base for custom compiled packages

Standard contains all modules that are typically used for settings-based testing of protection devices

Enhanced like Standard, specifically extended by functions for system-based testing and transient simulation as well as for free programming

Complete covers all functions and software modules that are offered for controlling CMC test sets

			Packages			
			Essential	Standard	Enhanced	Complete
Test Universe modules	OMICRON Control Center [1]	Automation tool, document-oriented test plan, template and report form	■	■	■	■
	QuickCMC	Convenient manual testing in the Test Universe environment	■	■	■	■
	State Sequencer	Determining operating times and logical timing relations by state-based sequences	■	■	■	■
	Harmonics	Generation of signals with superimposed harmonics	■	■	■	■
	CB Configuration	Module for setting the CB simulation	■	■	■	■
	Ramping	Determining magnitude, phase, and frequency thresholds by ramping definitions	■	■	■	■
	TransPlay	Playback of Comtrade files, recording of binary input status	■	■	■	■
	Advanced TransPlay	Playback of Comtrade files, recording of binary input status, processing options and automatic assessment	□	■	■	■
	Pulse Ramping	Determining magnitude, phase, and frequency thresholds by ramping definitions	□	■	■	■
	Overcurrent [2]	Automatic testing of positive/negative/zero sequence overcurrent characteristics	□	■	■	■
	Distance	Impedance element evaluations using single-shot definitions in the Z-plane	□	■	■	■
	Advanced Distance	Impedance element evaluations using automatic testing modes	□	■	■	■
	VI Starting	Testing of the voltage dependent overcurrent starting function of distance relays	□	■	■	■
	Autoreclosure	Testing of the autoreclosure function with integral fault model	□	■	■	■
	Differential [3]	Comprehensive three-phase differential relay testing (four modules)	□	■	■	■
	Annunciation Checker	Verification of the correct marshalling and wiring of protection devices	□	■	■	■
	Power	Testing with visualization and assessment in the P-Q plane (basic)	□	■	■	■
	Advanced Power	Testing with visualization and assessment in the P-Q plane (enhanced)	□	■	■	■
	Transient Ground Fault [4]	Simulation of ground-faults in isolated or compensated networks	□	□	■	■
	Synchronizer	Automatic testing of synchronizing devices and synchro-check relays	□	□	■	■
	Meter	Testing of single and multifunction energy meters	□	□	□	■
	Transducer	Testing of measurement transducers	□	□	□	■
	PQ Signal Generator	Simulation of power quality phenomena according to IEC 61000-4-30 and IEC 62586	□	□	□	■
IEC 61850	IEC 61850 Client/Server	Automatic SCADA testing in accordance with IEC 61850	□	□	□	■
	GOOSE Configuration	Testing with GOOSE according to IEC 61850	□	□	□	■
	Sampled Values Configuration	Testing with Sampled Values according to IEC 61850-9-2 (“9-2 LE”) and IEC 61869-9	□	□	□	■
	IEDScout	Universal software tool for working with IEC 61850 IEDs	□	□	□	□
Additional tools	CMControl P App	Quick and easy manual testing of protection and measurement devices	□	■	■	■
	CMC Swift	Easy and intuitive tool for simple protection and wiring checks	□	■	■	■
	RelaySimTest [4]	System-based protection testing by simulating realistic power system events	□	□	■	■
	Adv. Transformer Features	Advanced transformer features for differential protection	□	□	□	■
	Motor Features	Motor features for asynchronous motor simulation	□	□	□	■
	CMEngine	Programming interface for controlling CMC test sets with user specific software	□	□	■	■
	EnerLyzer	Analog measurements and transient recording with CMC test sets	□	□	□	■
	TransView	Transient signal analysis for COMTRADE files	□	□	□	■
	ADMO light [5]	Asset and maintenance management for protection systems	■	■	■	■

Contained in all packages: OCC Batch, AuxDC Configuration, ISIO Connect (for ISIO 200), Polarity Checker (for CPOL3).

[1] Includes licenses for Pause Module, ExeCute, TextView
[2] Includes license for Overcurrent Characteristics Grabber
[3] Includes Single-Phase Differential
[4] RelaySimTest license also includes the license for Transient Ground Fault
[5] ADMO light is limited to 50 assets but can be upgraded to a full ADMO version at any time

■ Contained
□ Optionally available

CMC 430 accessories

The following accessories are part of the CMC 430 standard delivery but can also be ordered separately.

	Description	Item no.
	> Country-specific power cord with C13 connector, 2.5 m / 8 ft.	
	> Ethernet patch cable 1.5 m / 5 ft.	E1664300
	> Ethernet patch cable 3 m / 10 ft.	E1664400
	> USB connection cable, 2 m / 6.6 ft, A/B	B1021101
	> Test leads with 4 mm / 0.16 in safety plugs (6× red, 6× black), 2 m / 6.6 ft	P0006168
	> Flexible terminal adapters (12× black)	E0439201
	> Flexible test lead adapters with retractable sleeve (6× red, 6× black), 5 cm / 2.0 in	P0006167
	> Grounding cable with battery clamp and cable lug M6 / 0.24 in, 6 m / 20 ft	B0349701
	> Soft bag	E1635901

Optional accessories [1]

	Description	Item no.
	CMC wiring accessory package For connecting test objects to CMC test sets, consisting of: > 12 flexible test lead adapters for connections to narrow terminals > 12 flexible test lead adapters with retractable sleeve for connections to non-safety sockets > 8 flexible jumpers for paralleling current outputs or shorting neutrals of binary inputs > 8 crocodile clips for contacting pins or screw bolts > 12 flexible terminal adapters for screw-type terminals > 12 solid terminal adapters for screw-type terminals > 20 cable lug adapters for M4 (0.15 in) screws > 10 cable lug adapters for M5 (0.2 in) screws > 1 test lead to ground test objects, e.g. in a lab environment, 3 m / 10 ft. > 10 cable ties > 1 accessory bag	P0010657
	Wireless USB adapter For wireless control of the CMC 430. [2]	P0012739
	Expansion port cable Connect two CMC 430 for six current outputs (expansion mode). 1 m / 3.3 ft. 2.5 m / 8.2 ft.	 B1630800 B1631500
	Generator combination cable Connection between the generator combination plug of the CMC 430 to the test object.	B1328100
	Transport case Heavy duty transport case with wheels, pluggable end plates, and extendable handle for effective protection against dust, dripping water, and mechanical damage of a CMC 430 and accessories, suitable for unattended shipping. The lid may be raised for use as a bench for a notebook while the CMC 430 stays in the case.	B1636100
	Trolley / Backpack With wheels, extendable handle and shoulder straps for transportation of a CMC test set including accessories. For simple mechanical protection, not for unattended shipping.	E1636000

[1] Non-exhaustive list. For the complete list please visit our website: omicronenergy.com/cmc430
[2] Wi-Fi is subjected to technical and legal constraints. For more information contact your local OMICRON sales department.

CMC 430 accessories [1]

	Description	Item no.
	CMGPS 588 GPS controlled time reference with integrated antenna. It is optimized for outdoor usage and works as a PTP grandmaster clock according to IEEE 1588-2008, IEEE C37.238 (Power Profile), IEC 61850-9-3 (Utility Profile).	P0006433
	CPOL3 polarity and wiring checker For checking a series of terminals for correct wiring. The signal can be injected into the primary side of a CT. Thus, the correct polarity of CT wiring can be included in the test.	P0009398
	LLX1 – Testing devices with sensor inputs LLX1 is the ideal solution for testing protection and measurement devices with inputs for voltage and current sensors. A wide range of cables are available for easily connecting LLX1 to different devices that have specific connectors and pinouts. For a complete list please visit our website: omicronenergy.com/llx1	P0006381
	LLX2 – Low level interface for external amplifiers and accessories LLX2 provides a standard low level interface for controlling external amplifiers such as the CMS 356 and other low level accessories with a 16-pin LEMO-type connector.	P0006382
	LLX3 – Versatile low level outputs with 4 mm sockets LLX3 provides low level outputs using standard 4 mm sockets. This makes LLX3 a flexible solution for further applications such as experimental setups.	P0006383
	VBO3 – Voltage transformer VBO3 is a three-phase voltage transformer which extends the range of application of a CMC up to 600 V (L-N).	P0006276
	C-Probe 2 Active AC and DC current clamp with voltage output.	P0012683
	OSH 256 + ASH1 set For the status detection of optical pulse LEDs of energy meters. It is suitable for a wavelength range of 550 nm to 1000 nm. It consists of the OSH 256 optical scanning head and the ASH1 adapter for connection to the binary inputs.	P0009600

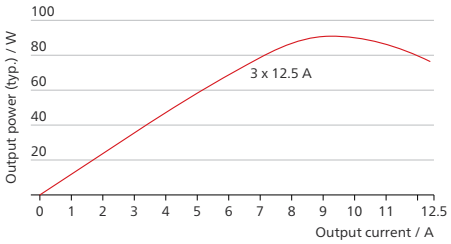
[1] Non-exhaustive list. For the complete list please visit our website: omicronenergy.com/cmc430

Overview of technical specifications [1]

CMC 430

Current amplifier

Setting range	3-phase AC (L-N)	3 × 0 … 12.5 A
	1-phase AC (L-L)	1 × 0 … 12.5 A
	1-phase AC (LLL-N)	1 × 0 … 37.5 A
	DC (LLL-N)	1 × 0 … ±37.5 A
Power	3-phase AC (L-N)	3 × 90 W typ. at 9 A
		3 × 85 W guar. at 9 A
	1-phase AC (L-L)	1 × 180 W typ. at 9 A
		1 × 170 W guar. at 9 A
	1-phase AC (LLL-N)	1 × 250 W typ. at 24 A
		1 × 200 W guar. at 24 A



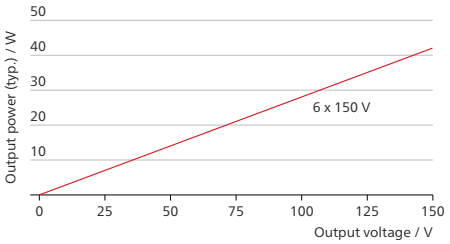
Current magnitude accuracy			
Range	typical [2,3]	1 year [2]	2 years [2]
10…100 Hz; I < 6 A	0.02 + 0.005	0.04 + 0.01	0.07 + 0.01
10…100 Hz; I > 6 A		0.08 + 0.01	0.11 + 0.01
Resolution		100 µA	
Max. compliance voltage (L-N/L-L)		17 Vpk / 34 Vpk	
Ranges		1.25 A / 12.5 A	

General amplifier specifications

Frequency range	Sine signals	DC … 1000 Hz
	Harmonics, Inter-harmonic, Transients	DC … 3000 Hz
Resolution	< 5 µHz	
Phase accuracy 50/60 Hz (ref V1)	0.005° typ.	0.02° guar.
THD+N at 50/60 Hz	< 0.1 % at full scale	
Simulated Power/ Energy (1 Year)	0.1 % of set value at 50/60 Hz; PF = 1 50 V to 70 V at < 2 W 0.05 A to 6 A at < 0.3 Ohm	

Voltage amplifier

Setting range	6-phase AC (L-N)	6 × 0 … 150 V
	3-phase AC (L-L)	3 × 0… 300 V (without common N)
	DC (L-N)	3 × 0 … ±212 V
Power	6-phase AC (L-N)	6 × 42 W typ. at 150 V
		6 × 37.5 W guar. at 150 V
	3-phase AC (L-L)	3 × 42 W typ. at 150 V
		3 × 37.5 W guar. at 150 V
	1-phase AC (L-L)	1 × 84 W typ. at 300 V
		1 × 75 W guar. at 300 V



Voltage magnitude accuracy			
Range	typical [2,3]	1 year [2]	2 years [2]
10…100 Hz (V1-V3)	0.015 + 0.005	0.04 + 0.01	0.06 + 0.01
10…100 Hz (V4-V6)		0.07 + 0.01	0.11 + 0.01
Resolution		100 µV	

Auxilary DC supply

Voltage range	12 … 264 VDC
Power	Inrush (< 2 s) 120 W / 2 A Continuous 50 W / 0.8 A

Binary inputs

Number	6 (each fully isolated)
Trigger criteria	Toggeling of potential-free contacts, AC or DC voltage compared to threshold voltage
Ranges	10 mV / 100 mV / 1 V / 10 V / 100 V / 600 V
Sampling rate	10 kHz (resolution 100 µs)
Max. measuring time	Infinite

Binary outputs

Type	4 relay 4 transistor
Relay breaking capacity	Imax: 8 A / Pmax: 2000 VA at 300 VAC Imax: 8 A / Pmax: 50 W at 300 VDC

[1] The full technical specifications are available on request. All data specified are guaranteed, except where indicated otherwise. OMICRON guarantees the specified data for one year after factory calibration, within 23 °C ±5 °C / 73 °F ±10 °F in the frequency range from 10 to 100 Hz and after a warm-up phase > 30 minutes

[2] ± (% of set value + % of range) or better

[3] Typical values apply to 98 % of all devices immediately after a factory calibration (adjustment)

Technical specifications

DC measuring inputs

Measuring range voltage	±10 mV, ±100 mV, ±1 V, ±10 V
Measuring range current	±1 mA, ±20 mA

Analog AC + DC measuring inputs

Number	6, each fully isolated
Sampling frequency	10 kHz, 40 kHz (configurable)
Nominal input ranges (RMS values)	10 mV / 100 mV / 1 V / 10 V / 100 V / 600 V
Amplitude accuracy (1 V/10 V/100 V)	0.08 + 0.03 (1 year [1]) 0.11 + 0.04 (2 years [1])
Analog measurement quantities	I, V (AC/DC, RMS and instantaneous), ϕ, f; P, Q, S, harmonics (up to 64th), df/dt
Hybrid [2] recording while analog outputs are active	With software option EnerLyzer Live

IEC 61850 [3]

Publishing

GOOSE	360 virtual binary outputs, 128 GOOSEs
Sampled Values	IEC 61850-9-2 („9-2LE"), IEC 61869-9

Subscribing

GOOSE	360 virtual binary inputs, 128 GOOSEs
Sampled Values	IEC 61850; IEC 61869-9

Maximum number of streams

Publishing	RelaySimTest: 4, Test Universe: 3
Subscribing	2

Time synchronization

Internal system clock

Frequency drift	< 0.37 ppm / 24 h < 4.6 ppm / 20 years

CMC 430 to external reference

Absolute timing accuracy (voltage/current)	< 1 µs typ., < 5 µs guar.
To external voltage	Reference signal on binary input 6: 10 … 600 V / 15 … 70 Hz
Precision Time Protocol (PTP)	IEEE 1588-2008 IEEE C37.238-2011 (Power Profile) IEC/PAS 61850-9-3 (Utility Profile)

CMC 430 to test objects

IRIG-B, PPS, PPX	Via CMIRIG-B

Power supply

Nominal	100 … 240 V, 50/60 Hz, 1000 W

Environmental conditions

Operation temperature	-25 … +50 °C / -13 … +122 °F
Storage temperature	-40 … +70 °C / -40 … +158 °F
Relative humidity	5 … 95 %, non-condensing

Equipment reliability

Electromagnetic interference (EMI)

International / Europe	IEC/EN 61326-1, IEC/EN 61000-6-4, IEC/EN 61000-3-2/3, CISPR 32 (Class A)/EN 55032 (Class A)
North America	47 CFR 15 Subpart B (Class A) of FCC

Electromagnetic susceptibility (EMS)

International / Europe	IEC/EN 61326-1, IEC/EN 61000-4-2/3/4/5/6/8/11

Safety

International / Europe	IEC/EN 61010-1, IEC/EN 61010-2-030
North America	UL 61010-1, UL 61010-2-030, CAN/CSA-C22.2 No. 61010-1, CAN/CSA-C22.2 No. 61010-2-030

Mechanical tests

Classification	IEC 60721-3-7
Vibration	IEC 60068-2-64
Shock	IEC 60068-2-27
Free fall	IEC 60068-2-31

Miscellaneous

Weight	8.7 kg / 19.2 lbs
Dimensions	270 × 150 × 380 mm / 10.6 × 5.9 × 15.0 in
Interfaces	2 PoE ethernet ports 1 USB Type-B port 1 USB Type-A port 1 External interface 4 Expansion ports: For LLX1–LLX4 and expansion mode LED indication status of analog output signals Configurable beeper

Certifications

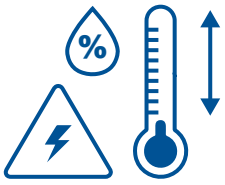
Developed and manufactured under an ISO 9001 registered system

[1] ± (% of reading + % of range) or better
[2] Analog, binary, SV and GOOSE
[3] The GOOSE and Sampled Values functionality require software licences for the respective configuration modules

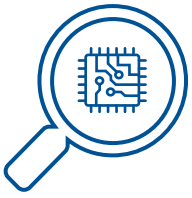
We create customer value through ...

Quality

Highest safety and security standards

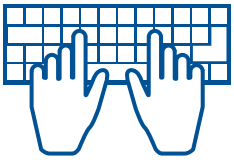


Up to 72 hours burn-in tests



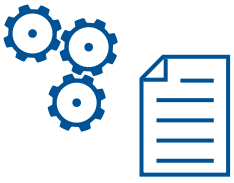
100% routine testing for all components

Innovation



>200 developers keep our solutions up-to-date

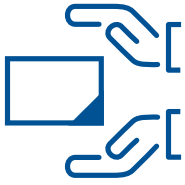
Reinvestment >15% in R&D



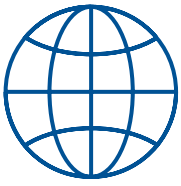
Up to 80% time saving through automation

Support

Professional technical support

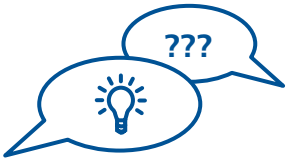


Comprehensive calibration and repair services



20+ offices worldwide

Knowledge



>300 Academy trainings per year

OMICRON hosted trainings and events

Free papers & application notes

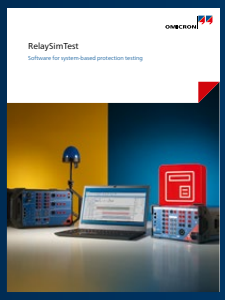
OMICRON is an international company that works passionately on ideas for making electric power systems safe, secure, and reliable. Our pioneering solutions are designed to meet our industry's current and future challenges. We always go the extra mile to empower our customers: we react to their needs, provide extraordinary local support, and share our expertise.

Within the OMICRON group, we research and develop innovative technologies for all fields in electric power systems. Customers worldwide rely on the accuracy, speed, and quality of our reliable, user-friendly solutions for electrical testing of medium- and high-voltage equipment, protection systems, digital substations, and cybersecurity.

Founded in 1984, OMICRON draws on their decades of profound expertise in the field of electric power engineering. A dedicated team of more than 1,300 employees provides solutions with 24/7 support at 23 locations worldwide and serves customers in more than 170 countries.

The following publications provide further information on the solutions described in this brochure:

CMC 430 Ordering Information



RelaySimTest

Emotions are energy. Our energy moves.

Move with us! Scan the QR code to explore our events, training courses, and products. Stay connected by following us on social media.

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