

COMBI419 - COMBI420

COMBINED MULTIFUNCTION INSTRUMENTS FOR TESTS ON CIVIL AND INDUSTRIAL ELECTRIC SYSTEMS

Models COMBI419 and COMBI420 are innovative instruments for carrying out tests on electric systems in compliance with standard IEC 60364, for measuring and saving environmental parameters (only COMBI420) of leakage current and of electric quantities such as active power, harmonics, PF on single-phase systems (only COMBI420). These instruments are extremely simple to use and have a wide range of functions which can be selected through the practical multi-language menu. Each model also allows carrying out measurements by using a remote probe (optional accessory PR400), which makes it much easier to carry out more measurements one after the other. The help on line, which can be consulted by the user and is available for all functions, provides a very useful help in connecting the instrument to the system to be tested.

FUNCTIONS	COMBI419	COMBI420
Continuity with 200mA	•	•
Insulation with 50,100,250,500,1000VDC	•	•
Tripping time of RCD type A, AC standard and selective up to 500mA	•	•
Tripping current of RCD type A, AC up to 500 mA	•	•
Loop/line P-N, P-P, P-PE impedance also with high resolution (0.1mΩ) (with optional accessory IMP57)	•	•
Total earth resistance without RCD tripping	•	•
Contact voltage	•	•
Phase sequence indication	•	•
AUTO test (total earth resistance, RCD test, insulation test) on the tested sockets	•	•
Measurement of powers and PF in single-phase systems		•
Voltage and current harmonics up to the 49th with calculation of the THD%		•
Environmental parameter measurement (temperature, humidity, illuminance with optional probes)		•
Leakage current measurement (with optional clamp HT96U)	•	•
Activation of measurements with optional remote probe PR400	•	•
Help on line on the display	•	•
Storage of results	•	•
Optical/USB interface for connection to PC	•	•
Size (LxWxH) mm	222x162x57	222x162x57
Weight (with batteries)	1 Kg	1 Kg

ACCESSORIES	Code
Standard	
3-terminal cable with SHUKO plug	C2033X
Set of 3 cables + 3 alligator clips + 1 test leads	UNIVERSALKIT
Carrying bag	BORSA75N
ISO9000 calibration certificate	
User manual on CD-ROM	
Quick reference guide	
Optional	
PC Windows software + optical / USB cable	TOPVIEW2006
Clamp 1-100-1000A/1V AC, diameter 54mm	HT96U
Temperature/Humidity probe (only COMBI420)	HT52/05
Illuminance (Lux) probe (only COMBI420)	HT53/05
Remote probe	PR400
Accessory for Loop impedance with high resolution	IMP57
Hands-free kit	SP-0400
Magnetic adapter	606-IECN
Safety flexible alligator clip	6007-IEC#



PR400
Optional remote
probe



HT96U
clamp for
AC leakage
current



SP-0400
Hands-free kit

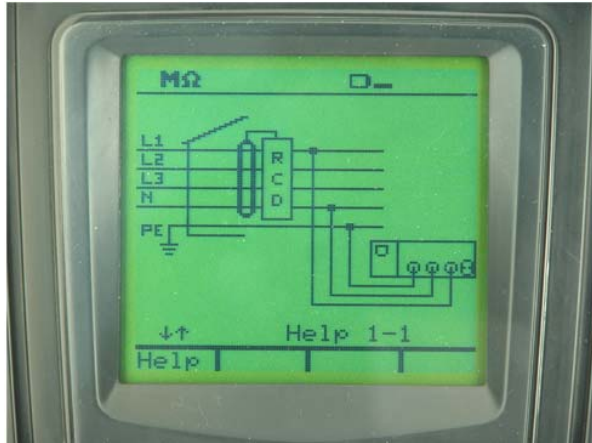
COMBI419
HV000419



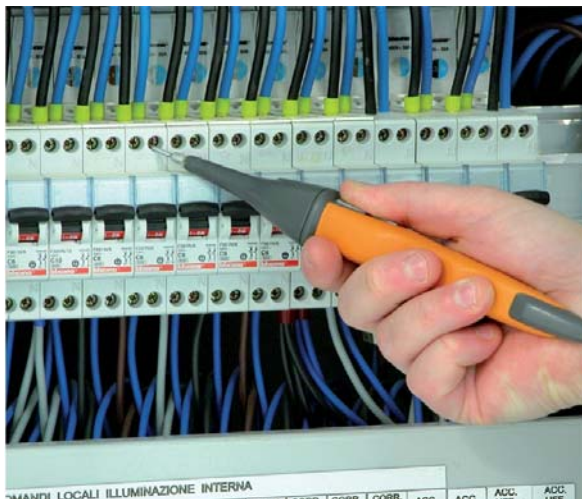
COMBI420
HV000420



1. MAIN FEATURES OF FAMILY 400 METERS



Help on line (available on each function) to support the user while connecting the instrument to the installation under measurement



Each model permits the Start of measurements with remote probe (PR400 optional accessory)



General menu to quickly selection of available test performed by meter
(COMBI419 and COMBI420 models only)



1. MODELS AND FEATURES

Measurements	ISO410	SPEED418	COMBI419	COMBI420
Continuity test on protective conductor with 200mA	✓		✓	✓
Insulation resistance 50-100-250-500-1000VDC	✓		✓	✓
RCDs tripping time and current (general and selective, AC and A types) 10-30-100-300-500mA		✓	✓	✓
Contact voltage Ut		✓	✓	✓
Loop impedance P-N, P-P, P-PE		✓	✓	✓
Loop impedance P-N, P-P, P-PE with high resolution (0.1mΩ) with IMP57 optional accessory		✓	✓	✓
Prospective short circuit current		✓	✓	✓
Global earth resistance Ra without RCDs tripping		✓	✓	✓
Phase sequence		✓	✓	✓
Leakage current (with HT96U optional accessory)			✓	✓
AUTOMATIC test (Ra, RCD time, Insulation) directly on outlet			✓	✓
ACTRMS voltage and current in Single phase system				✓
Active, reactive, apparent powers and power factor in Single phase system				✓
Harmonic analysis U, I, up to 49 th order and THD%				✓
Environmental parameters (°C, %HR, Lux, sound level)				✓
Using optional remote probe for activation of tests	✓	✓	✓	✓
Contextual help at display	✓	✓	✓	✓
Memory and PC interface	✓	✓	✓	✓

2. ELECTRICAL SPECIFICATIONS (*)

Continuity test on protective conductors (COMBI419-COMBI420)

Range (Ω)	Resolution (Ω)	Uncertainty (*)	Category of measure
0.00 ÷ 9.99	0.01	±(2.0%rdg + 2dgt)	CAT III 240V to Ground CAT III 415V between inputs
10.0 ÷ 99.9	0.1		

(*) after cable calibration which eliminates the cable resistance

Test current: >200mA DC per $R \leq 5\Omega$ (calibration included)
current measurement resolution: 1mA

Open leads voltage: $4 < V_0 < 24V$

RCDs tripping time (COMBI419-COMBI420)

Range (ms)	Resolution (ms)	Uncertainty	Category of measure
$\frac{1}{2} I_{AN}, I_{AN}$	1 ÷ 999	±(2.0%rdg + 2 dgt)	CAT III 240V to Ground CAT III 415V between inputs
2 I_{AN}	1 ÷ 200 general		
	1 ÷ 250 selective		
5 I_{AN} RCD	1 ÷ 50 general		
	1 ÷ 160 selective		

Nominal tripping current: 10mA, 30mA, 100mA, 300mA, 500mA

RCD type: AC, A, general and selective

Phase-ground voltage: (110V ÷ 240V) ±10%

Frequency: 50Hz ± 0.5Hz, 60Hz ± 0.5Hz

Voltage contact limits: 25V or 50V



RCDs tripping current (general, AC and A types) (COMBI419-COMBI420)

RCD's type	I _{ΔN}	Range I _{ΔN} (mA)	Resolution (mA)	Uncertainty	Category of measure
AC	I _{ΔN} ≤ 10mA	(0.5 ÷ 1.4) I _{ΔN}	0.1 I _{ΔN}	0%, +10%rdg	CAT III 240V to Ground CAT III 415V between inputs
A		(0.5 ÷ 2) I _{ΔN}			
AC	I _{ΔN} > 10mA	(0.5 ÷ 1.4) I _{ΔN}			
A		(0.5 ÷ 2) I _{ΔN}			

Insulation resistance (DC voltage) (COMBI419-COMBI420)

Test voltage (V)	Range (MΩ)	Resolution (MΩ)	Uncertainty	Category of measure
50	0.01 ÷ 9.99	0.01	±(2.0%rdg + 2dgt)	CAT III 240V to Ground CAT III 415V between inputs
	10.0 ÷ 49.9	0.1		
	50.0 ÷ 99.9		±(5.0%rdg + 2dgt)	
100	0.01 ÷ 9.99	0.01	±(2.0%rdg + 2dgt)	
	10.0 ÷ 99.9	0.1		
	100 ÷ 199		1	
250	0.01 ÷ 9.99	0.01	±(2.0%rdg + 2dgt)	
	10.0 ÷ 99.9	0.1		
	100 ÷ 249		1	
	250 ÷ 499	±(5.0%rdg + 2dgt)		
500	0.01 ÷ 9.99	0.01	±(2.0%rdg + 2dgt)	
	10.0 ÷ 99.9	0.1		
	100 ÷ 499		1	
	500 ÷ 999	±(5.0%rdg + 2dgt)		
1000	0.01 ÷ 9.99	0.01	±(2.0%rdg + 2dgt)	
	10.0 ÷ 99.9	0.1		
	100 ÷ 999		1	
	1000 ÷ 1999	±(5.0%rdg + 2dgt)		

Open leads voltage:

1.25 x nominal test voltage
voltage measurement resolution:1V

Short circuit current:

<15mA (peak) for each test voltage

Nominal current:

>2.2mA with 230kΩ @, 500V; 1mA with 1MΩ @ other test voltage

Contact voltage Ut (COMBI419-COMBI420)

Range (V)	Resolution (V)	Uncertainty	Category of measure
0 ÷ 2U _{lim}	0.1	-0%, +(2.0%rdg + 2dgt)	CAT III 240V to Ground CAT III 415V between inputs

U_{lim} (UI): 25V , 50V

Loop impedance P-P, P-N, P-PE TT/TN systems (COMBI419-COMBI420)

Range (Ω)	Resolution (Ω) (*)	Uncertainty	Category of measure
0.01 ÷ 9.99	0.01	±(5.0%rdg + 3dgt)	CAT III 240V to Ground CAT III 415V between inputs
10.0 ÷ 199.9	0.1		
200 ÷ 1999 (only P-PE)	1		

(*) 0.1mΩ in 0.0 ÷ 199.9 mΩ range (with option accessory IMP57)

Maximum peak current:

3A @ 127V, 6A @ 230V, 10A @ 400V

Test voltage:

(110÷240V) ±10% (P-N, P-PE) ; 50Hz ± 0.5Hz, 60Hz ± 0.5Hz
(110÷415V) ±10% (P-P); 50Hz ± 0.5Hz, 60Hz ± 0.5Hz

Loop impedance P-P, P-N, P-PE IT systems (COMBI419-COMBI420)

Range (mA)	Resolution (mA)	Uncertainty	Category of measure
5 ÷ 999	1	±(5.0%rdg + 3dgt)	CAT III 240V to Ground CAT III 415V between inputs

U_{lim} (UI): 25V , 50V



Global Earth Resistance R_A without tripping the RCD (COMBI419-COMBI420)

Range (Ω)	Resolution (Ω)	Uncertainty	Category of measure
0.01 ÷ 9.99	0.01	$\pm(5.0\%rdg + 1.0\Omega)$	CAT III 240V to Ground CAT III 415V between inputs
10.0 ÷ 199.9	0.1		
200 ÷ 1999 (solo F-PE)	1		

Test current @ 265V:

<15 mA

Test voltage:

$(110 \div 240V) \pm 10\%$ (phase-neutral/PE); 50Hz \pm 0.5Hz, 60Hz \pm 0.5Hz

Ulim (UI): 25V , 50V

Phase sequence with 1 or 2 wires (COMBI419-COMBI420)

Range (V)	Results displayed	Category of measure
$(100 \div 240) \pm 10\%$	"123" → correct phase sequence "132" → wrong phase sequence "11-" → phase coincidence	CAT III 240V to Ground CAT III 415V between inputs

The instrument detects the phase sequence by touching the hot wire. The detection is not performed on insulated cables.

Frequency:

50Hz \pm 0.5Hz, 60Hz \pm 0.5Hz

AC TRMS Voltage (voltmetric input) (COMBI420)

Range (V)	Frequency (Hz)	Resolution (V)	Uncertainty	Category of measure
5.0 ÷ 265.0	47 ÷ 63	0.1	$\pm(0.5\%rdg + 2dgt)$	CAT III 240V to Ground CAT III 415V between inputs

Max crest factor: <1.5

Voltage indicated it's the Max TRMS value considered between any couple of inputs

Frequency (voltmetric input and AUX input) (COMBI420)

Range (Hz)	Resolution (Hz)	Uncertainty	Category of measure
47.0 ÷ 63.0	0.1	$\pm(2\%rdg + 2dgt)$	CAT III 240V to Ground CAT III 415V between inputs

Voltage range: 15V ÷ 460Vrms

Voltage harmonics (voltmetric input) (COMBI420)

Range	Resolution (V)	Uncertainty	Category of measure
2a ÷ 15a	0.1	$\pm(2\%rdg + 5dgt)$	CAT III 240V to Ground
16a ÷ 49a		$\pm(5\%rdg + 10dgt)$	CAT III 415V between inputs

Voltage range: 0.0V ÷ 265Vrms

Fundamental frequency range : 47 ÷ 63Hz

AC TRMS Current (amperometric input) (COMBI420)

Range (A)	Resolution (A)	Uncertainty	Category of measure
0.005 ÷ 1.2 x FS	See table	$\pm(1.0\%rdg + 2dgt)$	CAT I 30V to Ground and between inputs

Frequency range : 47Hz ÷ 63Hz

Current harmonics (amperometric input) (COMBI420)

Range	Resolution (A)	Uncertainty	Category of measure
2a ÷ 15a	See table	$\pm(2\%rdg + 5dgt)$	CAT I 30V to Ground and between inputs
16a ÷ 49a		$\pm(5\%rdg + 10dgt)$	

Frequency range: 47Hz ÷ 63Hz

Current range: ≥ 0.020 x FS

Full scale FS [A]	Resolution [A]	Full scale FS [A]	Resolution [A]
1	0.001	300	0.1
10	0.01	400	0.1
30	0.01	1000	1
100	0.1	2000	1
200	0.1	3000	1



Active, Reactive, Apparent power @ $V_{mis} > 60V$, $\cos\phi = 1$, $f = 50.0Hz$ (COMBI420)

Range (W, VAR, VA)	Resolution (W,VAR, VA)	FS Clamp (A)	Uncertainty
0.0 ÷ 999.9	0.1	FS ≤ 1	± (1.0%rdg + 6dgt)
1.000 ÷ 9.999 k	0.001 k		
0.000 ÷ 9.999 k	0.001 k	1 < FS ≤ 10	
10.00 ÷ 99.99 k	0.01 k		
0.00 ÷ 99.99 k	0.01 k	10 < FS ≤ 100	
100.0 ÷ 999.9 k	0.1 k		
0.0 ÷ 999.9 k	0.1 k	100 < FS ≤ 3000	
1000 ÷ 9999 k	1 k		

Power factor ($\cos\phi$) @ $V_{mis} > 60V$, $f = 50.0Hz$ (COMBI420)

Current range (A)	Range	Resolution	Uncertainty
0.005 ÷ 0.1 x FS	0.80c ÷ 1.00 ÷ 0.80i	0.01	± 2°
0.1 ÷ 1.2 x FS			± 1°

Leakage current AC TRMS (amperometric input) (COMBI419-COMBI420)

Range (mV)	Resolution (mV)	Uncertainty	Category of measure
1 ÷ 1200	0.1	±(1.0%rdg + 2dgt)	CAT I 30V to Ground and between inputs

Frequency range: 50Hz ÷ 60Hz

Environmental parameters (AUX) (COMBI420)

Feature	Range	Resolution	Transduced signal	Uncertainty
Temperature	-20.0 ÷ 80.0°C	0.1°C	-20 ÷ +80mV	±(2.0%rdg + 2dgt)
	-4.0 ÷ 176.0°F	0.1°F	-4 ÷ +176mV	
Humidity	0.0 ÷ 100.0% RH	0.1% RH	0 ÷ +100mV	
DC Voltage	±(0.0 ÷ 999.9mV)	0.1mV	±(0.2 ÷ 999.9mV)	
Illuminance	0.001 ÷ 20.00Lux	0.001 ÷ 0.02Lux	0 ÷ +100mV	
	0.1 ÷ 2000Lux	0.1 ÷ 2Lux		
	1 ÷ 20000Lux	0.1 ÷ 2Lux		



3. GENERAL SPECIFICATIONS

MECHANICAL FEATURES

Dimensions:	235 (L)x165(La)x75(H)mm
Weight (batteries included):	about 1.2kg
Protection degree:	IP50

MEMORY AND SERIAL INTERFACE

Each measurement can be stored	
Memory:	>600 locations
PC communication port:	optical / USB

DISPLAY:

Features:	graphic LCD with backlight
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POWER SUPPLY:

Batteries:	6x 1.5V type LR6, AA, AM3, MN 1500
Battery life:	> 600 measurements (without using the timer)

ENVIRONMENTAL CONDITIONS:

Reference temperature of calibration:	23°C ± 5°C
Working temperature:	0° ÷ 40°C
Working humidity:	< 80%HR
Storage temperature (batteries not included):	-10 ÷ 60°C
Storage humidity:	< 80%HR

GENERAL REFERENCE STANDARDS:

Safety:	IEC / EN61010-1, IEC / EN61557-1, -2, -3, -4, -6, -7
Technical literature:	IEC/EN61187
Safety of accessories:	IEC / EN61010-031 IEC / EN61010-2-032
LOW Ω (200mA):	CEI 64-8 612.2, IEC / EN61557-4
M Ω :	CEI 64-8 612.3, IEC / EN61557-2
RCD:	CEI 64-8 612.9 e app. D, IEC / EN61557-6
LOOP P-P, P-N, P-PE:	CEI 64-8 612.6.3, IEC / EN61557-3
Ra 15 _{mA}	CEI 64-8 612.6.3, IEC / EN61557-3
123:	IEC 61557-7
AUX: sound level measures:	IEC/EN60651:1994/A1 ; IEC/EN60804:1994/A2 type 1
Insulation:	double insulation
Pollution degree:	2
Max altitude:	2000m
Overvoltage category:	CAT III 240V to ground, max 415V among inputs

This instrument complies with the requirements of the European Low Voltage Directives 2006/95/EEC (LVD) and EMC 2004/108/EEC