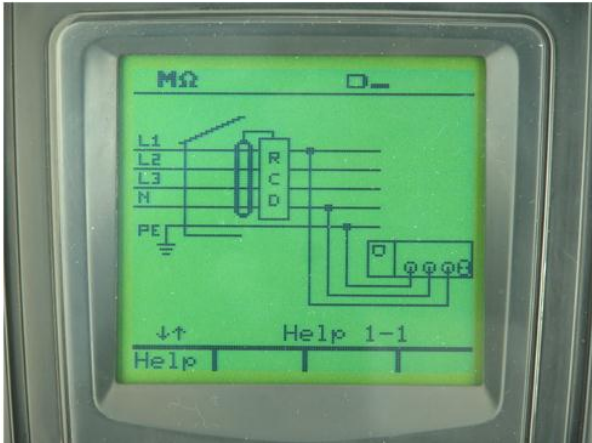
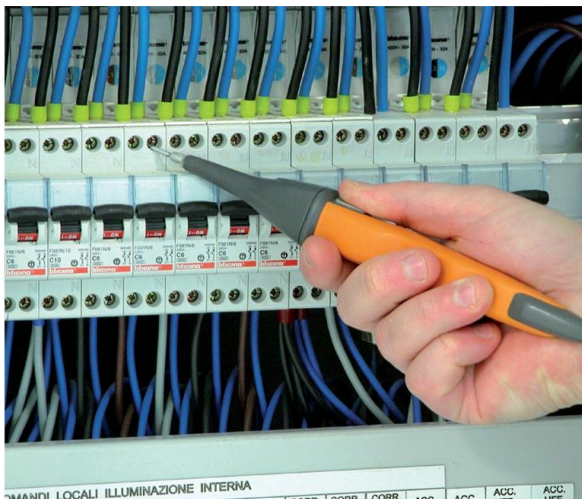


## 1. MAIN FEATURES OF FAMILY 400 METERS



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)



# COMBI420

Multifunctional meter for safety test and power measurement

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## 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 $U_t$		✓	✓	✓
Loop impedance P-N, P-P, P-PE		✓	✓	✓
Loop impedance P-N, P-P, P-PE with high resolution (0.1m $\Omega$ ) with IMP57 optional accessory		✓	✓	✓
Prospective short circuit current		✓	✓	✓
Global earth resistance $R_a$ without RCDs tripping		✓	✓	✓
Phase sequence		✓	✓	✓
Leakage current (with HT96U optional accessory)			✓	✓
AUTOMATIC test ( $R_a$ , 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 <sup>th</sup> order and THD%				✓
Environmental parameters ( $^{\circ}$ C, %HR, Lux)				✓
Using optional remote probe for activation of tests	✓	✓	✓	✓
Contextual help at display	✓	✓	✓	✓
Memory and PC interface	✓	✓	✓	✓



# COMBI420

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## 2. ELECTRICAL SPECIFICATIONS

### Continuity test on protective conductors

Range ( $\Omega$ )	Resolution ( $\Omega$ )	Uncertainty (*)	Category of measure
0.00 ÷ 9.99	0.01	$\pm(2.0\%rdg + 2dgt)$	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<sub>0</sub> < 24V

### RCDs tripping time

Range (ms)	Resolution (ms)	Uncertainty	Category of measure
$\frac{1}{2} I_{\Delta N}, I_{\Delta N}$	1 ÷ 999	$\pm(2.0\%rdg + 2 dgt)$	CAT III 240V to Ground CAT III 415V between inputs
2 I $_{\Delta N}$	1÷200 general		
	1÷250 selective		
5 I $_{\Delta N}$ 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)  $\pm$ 10%

Frequency: 50Hz  $\pm$  0.5Hz, 60Hz  $\pm$  0.5Hz

Voltage contact limits: 25V or 50V

### RCDs tripping current (general, AC and A types)

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

### Insulation resistance

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

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 230k $\Omega$  @, 500V; 1mA with 1M $\Omega$  @ other test voltage



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## Contact voltage $U_t$

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

U<sub>lim</sub> (UI): 25V , 50V

## Loop impedance P-P, P-N, P-PE TT/TN systems

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

(\*) 0.1m $\Omega$  in 0.0 ÷ 199.9 m $\Omega$  range (with option accessory IMP57)

Maximum peak current: 3A @ 127V, 6A @ 230V, 10A @ 400V

Test voltage: (110÷240V)  $\pm$ 10% (P-N, P-PE) ; 50Hz  $\pm$  0.5Hz, 60Hz  $\pm$  0.5Hz  
(110÷415V)  $\pm$ 10% (P-P); 50Hz  $\pm$  0.5Hz, 60Hz  $\pm$  0.5Hz

## Loop impedance P-P, P-N, P-PE IT systems

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

U<sub>lim</sub> (UI): 25V , 50V

## Global Earth Resistance $R_A$ without tripping the RCD

Range ( $\Omega$ )	Resolution ( $\Omega$ )	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÷240V)  $\pm$ 10% (phase-neutral/PE); 50Hz  $\pm$  0.5Hz, 60Hz  $\pm$  0.5Hz

U<sub>lim</sub> (UI): 25V , 50V

## Phase sequence with 1 or 2 wires

Range (V)	Results displayed	Category of measure
(100 ÷ 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

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

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

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



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Multifunctional meter for safety test and power measurement Page 5 - 6

## AC TRMS Current (In1 input)

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

Frequency range : 47Hz ÷ 63Hz

## Current harmonics (In1 input)

Range	Resolution (A)	Uncertainty	Category of measure
2a ÷ 15a	See table	± (2% rdg + 5dgt)	CAT I 30V to Ground and between inputs
16a ÷ 49a		± (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<sub>mis</sub>>60V, cosφ=1, f=50.0Hz

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 (cosφ) @ V<sub>mis</sub>>60V, f=50.0Hz

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 (In1 input)

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

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		



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Multifunctional meter for safety test and power measurement

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## 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 $\Omega$ (200mA):	CEI 64-8 612.2, IEC / EN61557-4
M $\Omega$ :	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 <sub>mA</sub>	CEI 64-8 612.6.3, IEC / EN61557-3
123:	IEC 61557-7
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