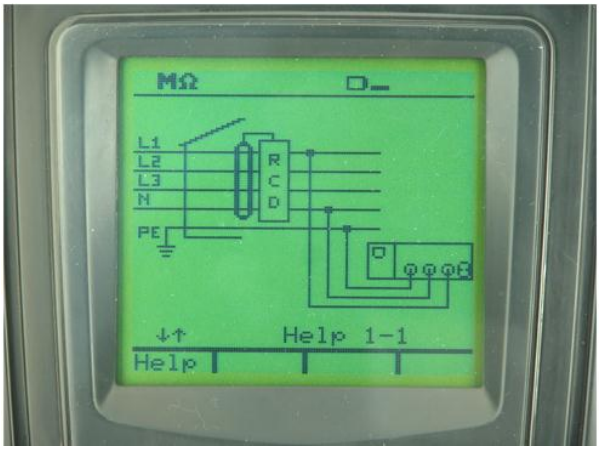
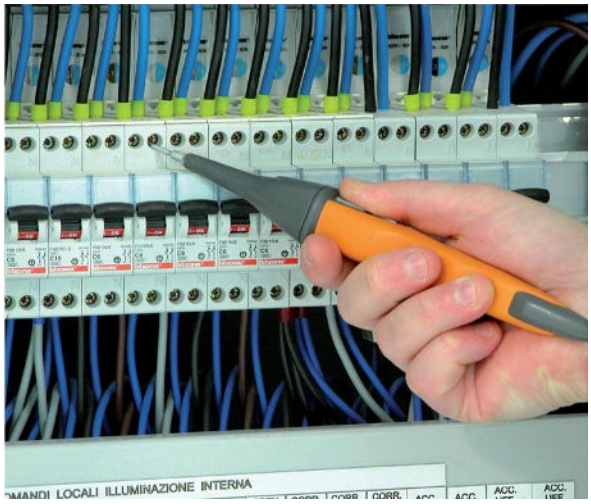
1. MAIN FEATURES OF FAMILY 400 METERS



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 49th order and THD%				✓
Environmental parameters (°C, %HR, Lux)				✓
Using optional remote probe for activation of tests	✓	✓	✓	✓
Contextual help at display	✓	✓	✓	✓
Memory and PC interface	✓	✓	✓	✓

2. ELECTRICAL SPECIFICATIONS

Continuity test on protective conductors

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≤5Ω (calibration included) ; Current measurement resolution:1mA
Open leads voltage: $4 < V_0 < 24V$

RCDs tripping time

Range (ms)		Resolution (ms)	Uncertainty	Category of measure
½ $I_{\Delta N}$, $I_{\Delta N}$	1 ÷ 999	1	±(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) ±10%
Frequency: 50Hz ± 0.5Hz, 60Hz ± 0.5Hz
Voltage contact limits: 25V or 50V

RCDs tripping current (general, AC and A types)

RCD's type	IΔN	Range IΔN (mA)	Resolution (mA)	Uncertainty	Category of measure
AC	IΔN ≤ 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	IΔN > 10mA	(0.5 ÷ 1.4) $I_{\Delta N}$			
A		(0.5 ÷ 2) $I_{\Delta N}$			

Insulation resistance

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	±(5.0%rdg + 2dgt)	
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

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

Utlim (Ul): 25V , 50V

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

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

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

Utlim (Ul): 25V , 50V

Global Earth Resistance R_A without tripping the RCD

Range (Ω)	Resolution (Ω)	Uncertainty	Category of measure
0.01 ÷ 9.99	0.01	±(5.0%rdg+ 1.0Ω)	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) ±10% (phase-neutral/PE); 50Hz ± 0.5Hz, 60Hz ± 0.5Hz

Utlim (Ul): 25V , 50V

Phase sequence with 1 or 2 wires

Range (V)	Results displayed	Category of measure
(100 ÷ 240) ±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 ± 0.5Hz, 60Hz ± 0.5Hz

AC TRMS Voltage

Range (V)	Frequency (Hz)	Resolution (V)	Uncertainty	Category of measure
5.0 ÷ 265.0	47 ÷ 63	0.1	±(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	± (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	± (2% rdg + 5dgt)	CAT III 240V to Ground CAT III 415V between inputs
16a ÷ 49a		± (5%rdg + 10dgt)	

Voltage range: 0.0V ÷ 265Vrms

Fundamental frequency range : 47 ÷ 63Hz

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 @ Vmis>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) @ Vmis>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		

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
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
LOWΩ (200mA):	CEI 64-8 612.2, IEC / EN61557-4
MΩ:	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
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