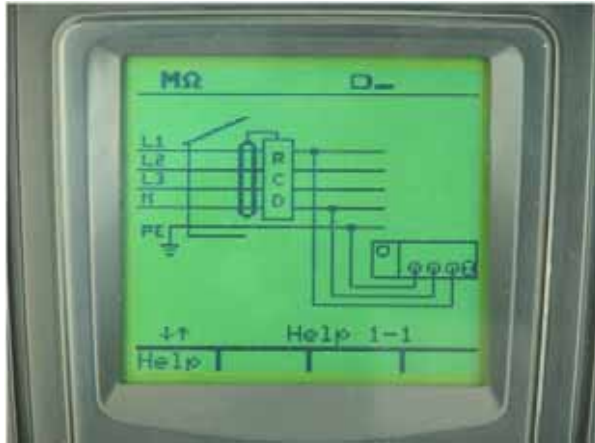
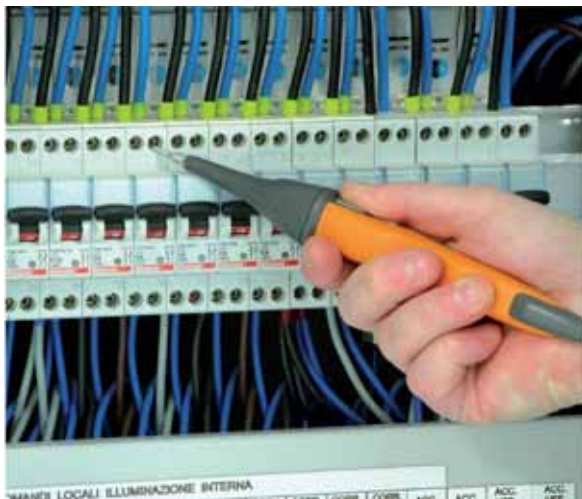


1. MAIN FEATURES OF FAMILY 400 METERS



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 (*)

Accuracy is indicated as \pm (% rdgs + no. of dgt) at 23°C \pm 5°C, con relative humidity <60%HR

(*) Technical specification can be modified without notice

Continuity test on protective conductors (COMBI419-COMBI420)

Range (Ω)	Resolution (Ω)	Accuracy (*)	Category of measure
0.00 \div 9.99	0.01	$\pm(2.0\%rdg + 2dgt)$	CAT III 240V to Ground CAT III 415V between inputs
10.0 \div 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)	Accuracy	Category of measure
$\frac{1}{2} I_{\Delta N}, I_{\Delta N}$	1 \div 999	$\pm(2.0\%rdg + 2dgt)$	CAT III 240V to Ground CAT III 415V between inputs
2 $I_{\Delta N}$	1 \div 200 general		
	1 \div 250 selective		
5 $I_{\Delta N}$ RCD	1 \div 50 general		
	1 \div 160 selective		

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

RCD type: AC, A, general and selective

Phase-ground voltage: 100V \div 265V

Frequency: 50Hz \pm 0.5Hz, 60Hz \pm 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)	Accuracy	Category of measure
AC	I _{ΔN} ≤ 10mA	(0.5 ÷ 1.4) I _{ΔN}	0.1 I _{ΔN}	-0%, +5.0% I _{ΔN}	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}	0.1 I _{ΔN}		
A		(0.5 ÷ 2) I _{ΔN}			

Insulation resistance (DC voltage) (COMBI419-COMBI420)

Test voltage (V)	Range (MΩ)	Resolution (MΩ)	Accuracy	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	±(5.0%rdg + 2dgt)	
	50.0 ÷ 99.9			
100	0.01 ÷ 9.99	0.01	±(2.0%rdg + 2dgt)	
	10.0 ÷ 99.9	0.1	±(5.0%rdg + 2dgt)	
	100 ÷ 199	1		
250	0.01 ÷ 9.99	0.01	±(2.0%rdg + 2dgt)	
	10.0 ÷ 99.9	0.1		
	100 ÷ 249	1	±(5.0%rdg + 2dgt)	
	250 ÷ 499			
500	0.01 ÷ 9.99	0.01	±(2.0%rdg + 2dgt)	
	10.0 ÷ 99.9	0.1		
	100 ÷ 499	1	±(5.0%rdg + 2dgt)	
	500 ÷ 999			
1000	0.01 ÷ 9.99	0.01	±(2.0%rdg + 2dgt)	
	10.0 ÷ 99.9	0.1		
	100 ÷ 999	1	±(5.0%rdg + 2dgt)	
	1000 ÷ 1999			

Open leads voltage:

 1.1 x nominal test voltage
voltage measurement resolution:1V

Short circuit current:

 <3.0mA @ 500V
<2.0mA @ 50, 100, 250, 1000V

Nominal current:

<2.17mA @ 230kΩ, 500V; 1mA @ 1MΩ, 1000V

Protections:

the instrument returns an error message while detecting an input voltage >30V

Contact voltage Ut (COMBI419-COMBI420)

Range (V)	Resolution (V)	Accuracy	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 (COMBI419-COMBI420)

Range (Ω)	Resolution (Ω) (*)	Accuracy	Category of measure
0.01 ÷ 9.99	0.01	±(5.0% rdg + 2 dgt)	CAT III 240V to Ground CAT III 415V between inputs
10.0 ÷ 199.9	0.1		

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

Maximum peak current:

3.65A @ 127V; 6.64A @ 230V; 11.5A @ 400V

Test voltage:

100÷265V (phase-neutral) / 100÷460V (phase-phase); 50Hz ± 0.5Hz, 60Hz ± 0.5Hz

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

Range (Ω)	Resolution (Ω)	Accuracy	Category of measure
0.01 ÷ 19.99	0.01	$\pm(5.0\%rdg + 1.0\Omega)$	CAT III 240V to Ground CAT III 415V between inputs
0.1 ÷ 199.9	0.1	$\pm(5.0\%rdg + 10dgt)$	
1 ÷ 1999	1		

Test current @ 265V:

<15 mA

Test voltage:

 100÷265V (phase-neutral); 50Hz \pm 0.5Hz, 60Hz \pm 0.5Hz

Utlim (UI): 25V , 50V

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

Range (V)	Results displayed	Category of measure
100 ÷ 460	"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)	Accuracy	Category of measure
0.1 ÷ 460.0	47 ÷ 63	0.1	$\pm(1.0\%rdg + 2dgt)$	CAT III 240V to Ground CAT III 415V between inputs

Crest factor: 1.41

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)	Accuracy	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)	Accuracy
2nd ÷ 20th	0.1% Vh1	$\pm(10\%rdg + 2dgt)$
21st ÷ 49th		$\pm(20\%rdg + 2dgt)$

Voltage range: 15V ÷ 460Vrms

Fundamental frequency range : 47 ÷ 63Hz

AC TRMS Current (amperometric input) (COMBI420)

Range (mV)	Resolution (mV)	Accuracy	Category of measure
0.1 ÷ + 999.9	0.1	$\pm(1.0\%rdg + 2dgt)$	CAT I 30V to Ground and between inputs
1000 ÷ 1200	1		

Frequency range : 47Hz ÷ 63Hz

Frequency (amperometric input) (COMBI420)

Range (Hz)	Resolution (Hz)	Accuracy	Category of measure
47.0 ÷ 63.0	0.1	$\pm(2\%rdg + 2dgt)$	CAT I 30V to Ground and between inputs

Voltage range: 5mV ÷ 1200mVrms

Current harmonics (amperometric input) (COMBI420)

Range	Resolution (V)	Accuracy	Category of measure
2a ÷ 20a	0.1% Ih1	$\pm(2\%lettura + 2cifre)$	CAT I 30V to Ground and between inputs
21a ÷ 49a			

Frequency range: 47Hz ÷ 63Hz

Current range: $0.001 \times \text{CFS} \div 1.2 \times \text{CFS} \rightarrow \text{CFS} = \text{Clamp Full Scale}$

Power (COMBI420)

Measurement	Range	Power factor	Accuracy
ACTIVE POWER	0.1V x 0.001 CFS ÷ 460.0V x 1.2 CFS	1	0,05CFS ≤ V _{AUX} ≤ 0,1CFS ± 1,5% rdg 0,1CFS ≤ V _{AUX} ≤ CFS ± 1,0% rdg
		0.8 ind, 0.8 cap	0,1CFS ≤ V _{AUX} ≤ 0,2CFS ± 1,5% rdg 0,2CFS ≤ V _{AUX} ≤ CFS ± 1,0% rdg
REACTIVE POWER	0.1V x 0.001 CFS ÷ 460.0V x 1.2 CFS	1	0,05CFS ≤ V _{AUX} ≤ 0,1CFS ± 2,5% rdg 0,1CFS ≤ V _{AUX} ≤ CFS ± 2,0% rdg
		0.5 ind, 0.5 cap	0,1CFS ≤ V _{AUX} ≤ 0,2CFS ± 2,5% rdg 0,2CFS ≤ V _{AUX} ≤ CFS ± 2,0% rdg
		0.25 ind, 0.25 cap	0,2CFS ≤ V _{AUX} ≤ CFS ± 7,0% rdg

CFS = Clamp Full Scale

V_{AUX} = current value converted in voltage signal

Power factor (cosφ) (COMBI420)

Range	Resolution	Accuracy
0.00 ÷ 1.00	0.01	± 2 dgt

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

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

Frequency range: 50Hz ÷ 60Hz



3. GENERAL SPECIFICATIONS

MECHANICAL FEATURES

Dimensions:	240 (L) x 160 (W) x 70 (D) 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:

EMC:	89/336/EEC guideline amended with 93/68/EEC (IEC61326)
LVD:	73/23/CEE guideline (IEC61010)
Product guideline:	IEC61557
Insulation:	class 2 (double insulation)
Pollution degree:	2
Overvoltage category of the voltage inputs (installation/measurement):	CAT III 240V to ground, 415V between inputs
Overvoltage category of the AUX input:	5V to ground
Max altitude:	2000m