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Multifuncion Measuring Device 96x96 mm, connection via CT

Cat. N°:
F4N400

Contents **Pages**

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1. DESCRIPTION - USE

Multifunction Measuring Device.
Measures the main electrical quantities of a single-phase or three-phase network.
The insertion is done by measuring current transformers (CT).

2. RANGE

. Cat. N° F4N400: Multifunction measuring device, 96x96 mm for installation on a door or full panel.
The device can be equipped with several add-on modules to expand its functionality.(see § 8)

Dimensions:

. Device: 96x96 mm.
. Mounting cutout: 92x92 mm

Auxiliary supply:

. 80 ÷ 265 V~, 50/60 Hz
. 100 ÷ 300 Vd.c.
. Protected against reverse polarity

Rated current:

. Rated current, In: 1 A or 5 A (via external current transformer x/1 A or x/5 A)
. Max, current, Imax: 1,2 In
x/1 A: 1,2 A
x/5 A: 6 A

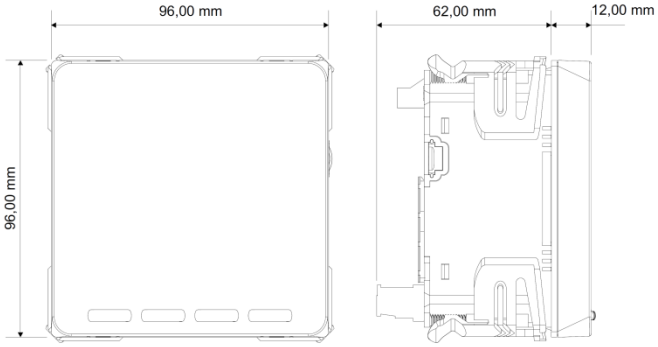
Insertion rated voltages:

. Un: 80÷690 V~ (phase/phase)
. Un: 50÷400 V~ (phase/neutral)

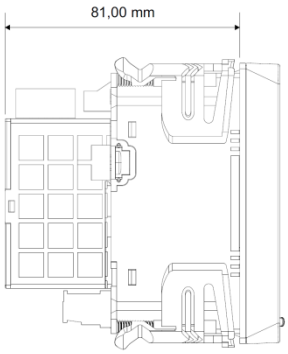
Rated frequency:

. Fn: 50/60 Hz ± 5%

3. OVERALL DIMENSIONS



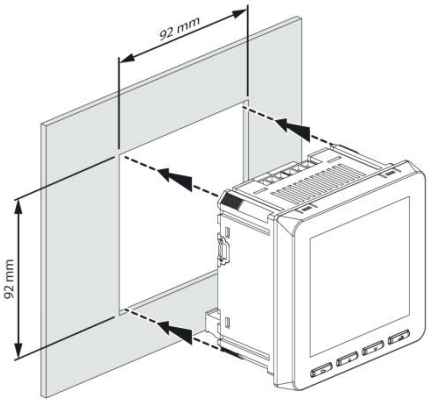
. with add-on modules

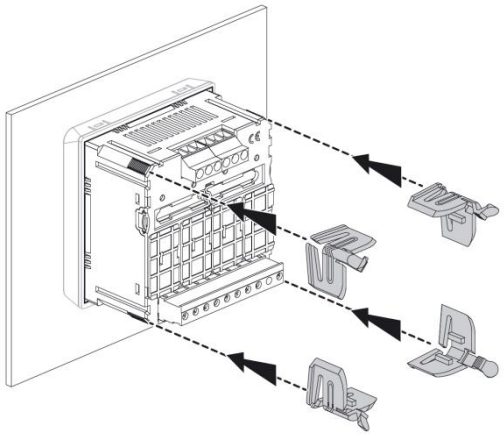


4. FIXING - CONNECTION

Fixing:

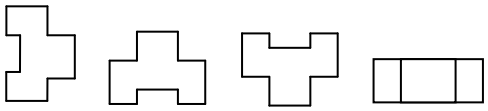
. On door or full panel
. Cutout 92x92 mm





Operating position:

. Vertical Horizontal Upside down On the side



Screw terminals:

. Terminal depth: 8 mm.
. Stripping length: 8 mm

Screw head:

. Screw slotted (CTs terminals).
. Mixed, slotted and Philips (Voltage measurement inputs and auxiliary supply)

Recommended tightening torque:

. CTs terminals (I_1, I_2, I_3): 1 Nm.
. Voltage measurement terminals (V_1, V_2, V_3, N), Auxiliary supply (Aux.): 0,6 Nm.

4. FIXING - CONNECTION *(continued)*

Tools required:

. CTs terminals: flat screwdriver 5 mm
. Voltage measurement and aux. supply terminals:
flat screwdriver 3 mm or screwdriver PH0
. For fixing the device: no tools needed.

Connectable section:

. Copper cables.
. CTs Terminals

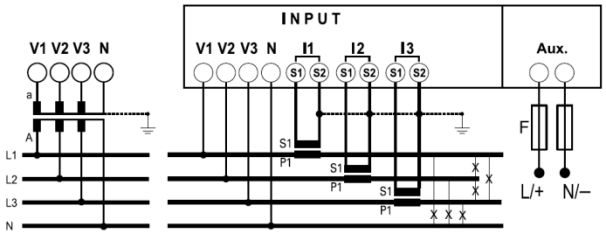
	Without ferrule	With ferrule
Rigid cable	**0,05 to 6 mm²**	**-**
Flexible cable	**0,05 to 4 mm²**	**0,05 to 4 mm²**

. Other terminals

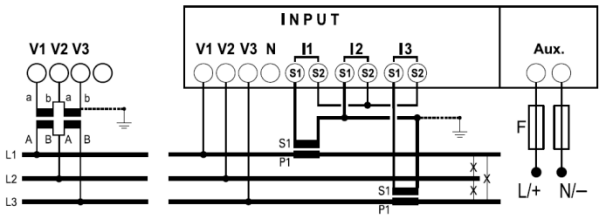
	Without ferrule	With ferrule
Rigid cable	**0,05 to 4 mm²**	**-**
Flexible cable	**0,05 to 2,5 mm²**	**0,05 to 2,5 mm²**

Wiring diagrams:

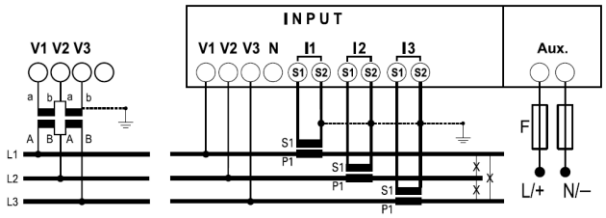
. 4 wires three-phase network, 3 CT (3N-3E):



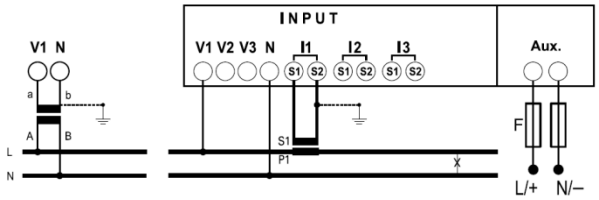
. 3 wires three-phase network, 2 CT (3-2E):



. 3 wires three-phase network, 3 CT (3-3E):



. single phase network (1N-1E):

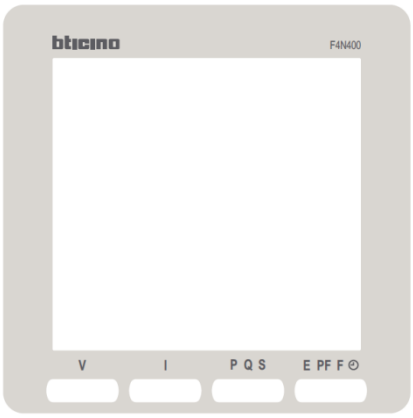


For all other wiring diagrams refer to the instruction sheet.

5. GENERAL CHARACTERISTICS

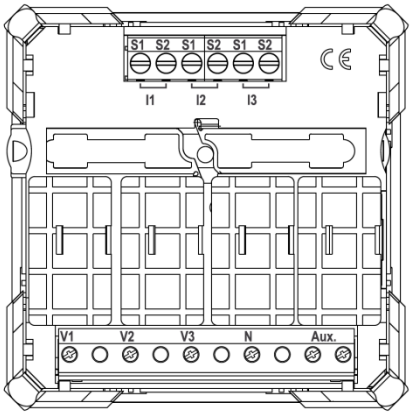
Front face marking:

. Marking by screen printing:



Terminals Marking:

. By permanent ink pad printing.



Display

. Type: LCD back lighted.
. Resolution: automatic adjustment of the display resolution for the decimal digits and for the engineering units as a function of the transformation ratio of the external current transformers (kTA[1]) and, if any, if the external voltage transformers (kTV[2])
[1] kTA= external CTs ratio
(ex. 800A / 5A, kTA = 160).
[2] kTV = external VT ratio
(ex. 600V / 100V, kTV = 6). For direct connection kTV =1.
In the example, kTA x kTV =160 x 6 = 960.
. Refresh time: 1,1 sec.
. Automatic backlight reduction, after 20 sec. of keyboard inactivity

Measuring sensors operating range:

. Max. VT primary voltage: 150 kV
. Max CTs primary current: 50 kA (CT = x/5A), 10 kA (CT = x/1A)
. Max. product kTA x kTV = 2.000.000 (CT = x/5A) and 10.000.000 (CT = x/1A)

Note: Changing one of the parameters kTA or kTV in the setup menu of the device, all the energy counters are reset.

5. GENERAL CHARACTERISTICS *(continued)*

Count starting time:
. t < 5 sec (IEC/EN 62053-21, IEC/EN 62053-23).

Value display and Programming:
. Using front keyboard, 4 keys (refer to user manual).

Measured quantities and Accuracy class:

. Current (accuracy 0,5):
phase: I_1, I_2, I_3;
neutral: I_N.

. Voltage (accuracy 0,5):
phase/phase: U_{12}, U_{23}, U_{31};
phase/neutral: V_{1N}, V_{2N}, V_{3N}.

. Frequency (accuracy 0,5))

. Power:
instantaneous active total power, phase, average value and max. average value (accuracy 0,5);
instantaneous reactive total power, phase, average value and max. average value (accuracy 1);
instantaneous apparent total power, phase, average value and max. average value (accuracy 1);

. Power factor a (accuracy 0,5).

. Energy:
total and partial active energy, positive and negative (accuracy 0,5);
total and partial reactive energy, positive and negative (accuracy 2).

. THD (accuracy 2):
voltages THD: V_1, V_2, V_3 o U_{12}, U_{23}, U_{31};
currents THD: I_1, I_2, I_3, I_N.

. Harmonic analysis *(with add-on module F4N107)*:
Voltages: odd harmonics up to 9th (in display); odd and even harmonics up to 50th (via communication RS485);
Currents: odd harmonics up to 9th (in display); odd and even harmonics up to 50th (via communication RS485);

Measurements update period
. 0,2 s

Plastic material:
. Self-extinguishing polycarbonate.

Ambient operating temperature:
. Min. = - 5 °C Max. = + 55 °C.

Ambient storage temperature:
. Min. = - 25 °C Max. = + 70 °C.

5. GENERAL CHARACTERISTICS *(continued)*

Device protection:
. Recommended fuse 1 A type gG

Protection Index:
. Protection index of terminals against solid and liquid bodies (wired device): IP 20 (IEC/EN 60529).
. Protection index of the front face against solid and liquid bodies: IP 54 (IEC/EN 60529).

Impulse withstand voltage:
. Supply / Measuring inputs:
wave 1,2 / 50 µs 0,5 J: 6kV
alternate current 50 Hz / 1 min.: 3 kV

. All circuits / earth:
alternate current 50 Hz / 1 min.: 4 kV

Pollution degree:
. 2

Installation category:
. III

Average weight per device:
.0, 250 kg.

Volume when packed:
. 0,58 dm^3.

Consumption (without add-on modules)**:**
. ≤ 2,5 VA (a.c. supply)
. ≤ 3,5 W (d.c. supply)

Thermal power dissipated:
. ≤ 5 W.

Phase sequence correction diagnostic:
. In the software of the device there is a specific functionality to detect and correct problems concerning voltage and / or current connections.
The “Testing connections” functions can be activated with a specific password for connections 3-2E, 3-3E e 3N-3E.
Conditions for the execution of the function:
- multifunction device F4N400 must have current and voltage on each phase and the neutral, if present, must be connected to the corresponding terminal “N”.
In addition, the test function requires:
- an electrical 120° three-phase system.
- a value of the power factor PF > 0,5 for 3N-3E and 3-3E or PF > 0,71 for 3-2E.
If the power factor of the system is not included in these ranges, the function cannot be used.
- no crossings between cables connected to secondary of CTs (ex. TA phase 1 → terminals S1 and S2 of I1 and so on).

. Procedure’s access codes:
3333: Start of diagnostic procedure
4444: Display of the current configuration
5555: Restore the default configuration (factory configuration)

6. COMPLIANCE AND APPROVALS

Compliance to standards:

. Compliance with Directive on electromagnetic compatibility (EMC) n° 2004/108/EC
. Compliance with low voltage directive no. 73/23/CEE dated 19 February 1973, modified by directive no. 93/68/CEE dated 22 July 1993, modified by directive n° 2006/95/CE.
. Electromagnetic Compatibility:
emission according IEC/EN 61326-1, class B
immunity according IEC/EN 61326-1.
. Active energy accuracy class: 0,5 (E_a, IEC/EN 61557-12).
. Reactive energy accuracy class: 2 (E_{rv}, IEC/EN 61557-12).

Conformity table to IEC 61557-12 Edition 1 (08/2007)

Performance measuring and monitoring devices (PMD) characteristics		
Type of characteristic	**Specification values**	**Other complementary characteristics**
Power quality assessment function	-	-
Classification of PMD	SD / SS	-
Temperature	K55	-
Humidity + Altitude	Standard conditions	-
Active power and Active energy function performance class	0,5	-

6. COMPLIANCE AND APPROVALS *(continued)*

Conformity table to IEC 61557-12 Edition 1 (08/2007) *(continued)*

Function symbols	Function performance class according to IEC 61557-12	Measuring range	Other complementary characteristics
P	0,5	0,01 ÷ 1,2 A (x/1 A) 0,05 ÷ 6 A (x/5 A)	
Q_A, Q_V	1	0,01 ÷ 1,2 A (x/1 A) 0,05 ÷ 6 A (x/5 A)	
S_A, S_V	1	0,01 ÷ 1,2 A (x/1 A) 0,05 ÷ 6 A (x/5 A)	
E_a	0,5	0 ÷ 9999999,9 MWh	0,01 ÷ 1,2 A (x/1 A) 0,05 ÷ 6 A (x/5 A)
E_{rA}, E_{rV}	2	0 ÷ 9999999,9 Mvarh	0,01 ÷ 1,2 A (x/1 A) 0,05 ÷ 6 A (x/5 A)
E_{apA}, E_{apV}	-	-	-
f	± 0,1 Hz	45 ÷ 65 Hz	-
I	0,5	0,01 ÷ 1,2 A (x/1 A) 0,05 ÷ 6 A (x/5 A)	-
I_N, I_{Nc}	2	0,1 ÷ 1,2 A (x/1 A) 0,1 ÷ 6 A (x/5 A)	-
U	0,5	30 ÷ 400 V (Ph/N) 50 ÷ 690 V (Ph/Ph)	-
P_{FA}, P_{FV}	0,5	0,5 ind ÷ 0,8 cap	-
P_{st}, P_{lt}	-	-	-
U_{dip}	-	-	-
U_{swl}	-	-	-
U_{tr}	-	-	-
U_{int}	-	-	-
U_{nba}	-	-	-
U_{nb}	-	-	-
U_h	1	30 ÷ 400 V (Ph/N) 50 ÷ 690 V (Ph/Ph)	*with add-on module F4N107*
THD_u	2	30 ÷ 400 V (Ph/N) 50 ÷ 690 V (Ph/Ph)	-
$THD\text{-}R_u$	-	-	-
I_h	1	0,1 ÷ 1,2 A (x/1 A) 0,1 ÷ 6 A (x/5 A)	*with add-on module F4N107*
THD_i	2	0,1 ÷ 1,2 A (x/1 A) 0,1 ÷ 6 A (x/5 A)	-
$THD\text{-}R_i$	-	-	-
Msv	-	-	-

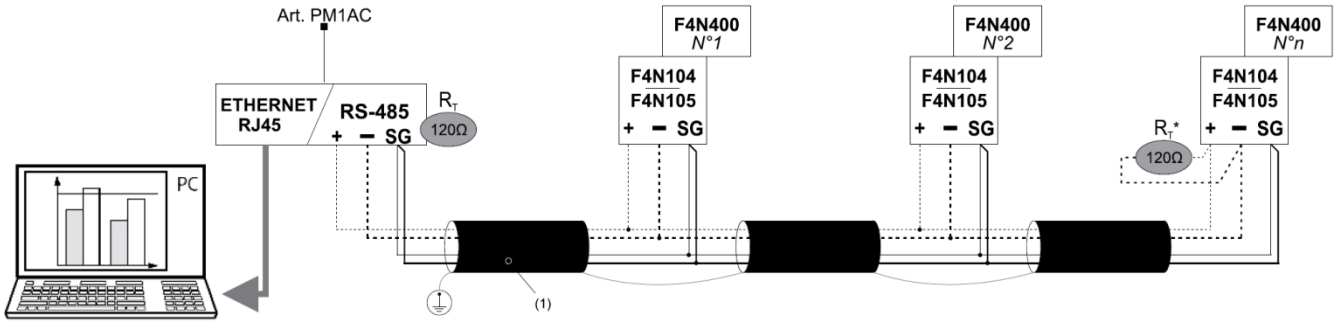
6. COMPLIANCE AND APPROVALS *(continued)*

Conformity table to IEC 61557-12 Edition 1 (08/2007) *(continued)*

Characteristics of "Power quality assessment functions"			
Function symbols	**Function performance class according to IEC 61557-12**	**Measuring range**	**Other complementary characteristics**
f	± 0,1 Hz	45 ÷ 65 Hz	-
I	0,5	0,01 ÷ 1,2 A (x/1 A) 0,05 ÷ 6 A (x/5 A)	-
I_N, I_{Nc}	2	0,1 ÷ 1,2 A (x/1 A) 0,1 ÷ 6 A (x/5 A)	-
U	0,5	30 ÷ 400 V (Ph/N) 50 ÷ 690 V (Ph/Ph)	-
U_{dip}	-	-	-
U_{swl}	-	-	-
U_{tr}	-	-	-
U_{int}	-	-	-
U_{nba}	-	-	-
U_{nb}	-	-	-
U_h	1	30 ÷ 400 V (Ph/N) 50 ÷ 690 V (Ph/Ph)	*with add-on module F4N107*
I_h	1	0,1 ÷ 1,2 A (x/1 A) 0,1 ÷ 6 A (x/5 A)	*with add-on module F4N107*
Msv	-	-	-

7.COMUNICATION

RS485 Wiring diagram *(with add-on module F4N104 or F4N105)*:



(1) RS485: RS485: Prescribed use of Cable Belden 9842, Belden 3106A (or equivalent) for a maximum length of 1000 m, or Category 6 cable (FTP or UTP) for a maximum length of 50 m;
(*)Resistance not furnished with the device

Modbus communication tables

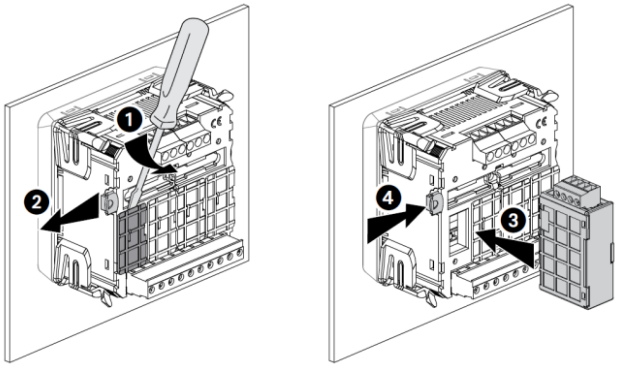
. Modbus communication tables are available at www.download.bticino.it, typing “F4N400” in the search field.

8.ADD-ON MODULES

Range:

. **F4N101**: 2 analog outputs module, 0/4 ÷ 20 mA
. **F4N102**: 2 digital inputs / 2 relay outputs module
. **F4N103**: 2 pulse outputs module
. **F4N104**: Modbus RS485 communication module
. **F4N105**: Modbus RS485 communication + Memory module
. **F4N106**: Temperature measurement module from external Pt100 sensors
. **F4N107**: Harmonic analysis module

Fixing:



Note: modules must be connected with the device F4N400 not supplied.

Screw terminals:

. Terminal depth: 8 mm.
. Stripping length: 8 mm

Screw head:

. Screw slotted.

Recommended tightening torque:

. 0,6 Nm.

8.ADD-ON MODULES *(continued)*

Tools required:

. For inputs terminals (terminals “15-16” and “17-18”): flat screwdriver 2,5 mm
. For outputs terminals (terminals “6-7”, “8-9” and “+ - - SG”): flat screwdriver 3,5 mm
. For fixing the modules to the measuring device: flat screwdriver max. 5 mm.

Connectable section:

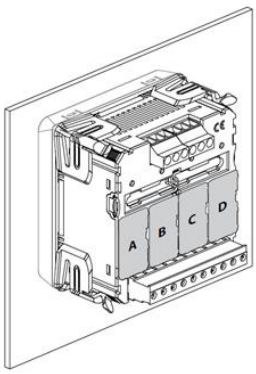
. Inputs terminals
. Copper cables.

	Without ferrule	With ferrule
Rigid cable	**0,05 to 2,5 mm²**	**-**
Flexible cable	**0,05 to 1,5 mm²**	**0,05 to 1,5 mm²**

. Outputs terminals
. Copper cables.

	Without ferrule	With ferrule
Rigid cable	**0,05 a 4,5 mm²**	**-**
Flexible cable	**0,05 a 2,5 mm²**	**0,05 a 2,5 mm²**

Associability table:



	A	B	C	D	
F4N101	×	×	✓	✓	max. 2
F4N102	×	×	✓	✓	max. 2
F4N103	✓	✓	✓	✓	max. 2
F4N104	✓	×	×	×	max. 1
F4N105	✓	×	×	×	max. 1
F4N106	×	×	×	✓	max. 1
F4N107	×	✓	×	×	max. 1