

Multifunction Measuring Device 96x96 mm, connection via CT

Cat. N°: 4 120 53



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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° 4 120 53: 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~, 47÷63 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

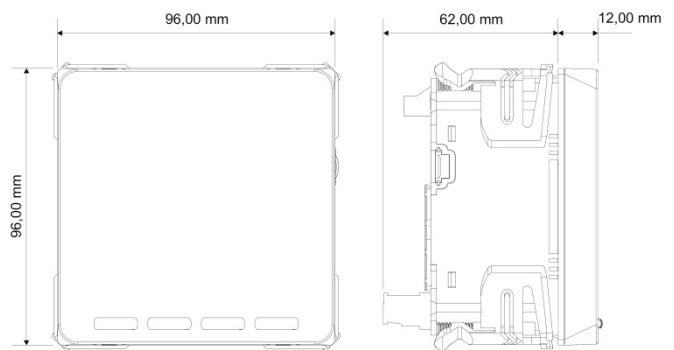
Insertion rated voltages:

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

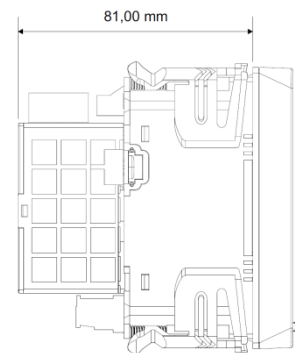
Rated frequency:

- . fn: 50 Hz
- . Admitted variation: 47÷63 Hz

3. OVERALL DIMENSIONS



. with add-on modules



Multifunction Measuring Device

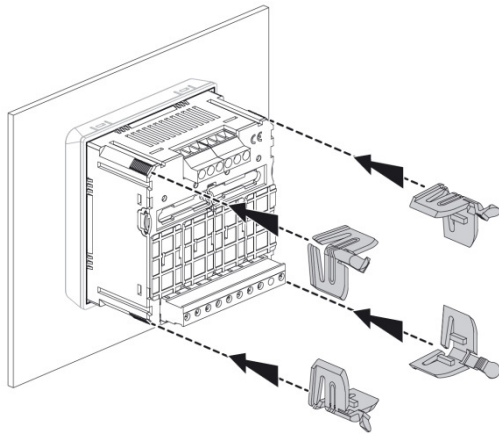
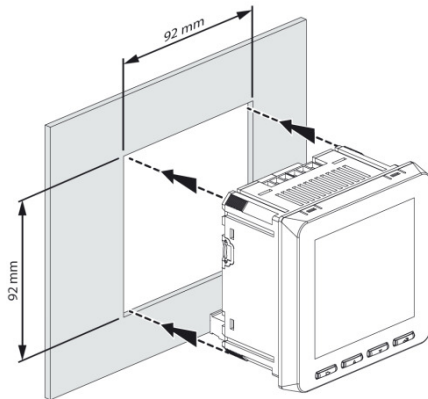
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4. FIXING - CONNECTION

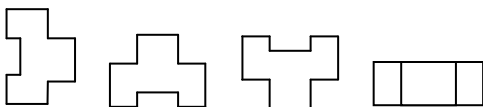
Fixing:

- . 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 (I₁, I₂, I₃): 1 Nm.
- . Voltage measurement terminals (V₁, V₂, V₃, 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

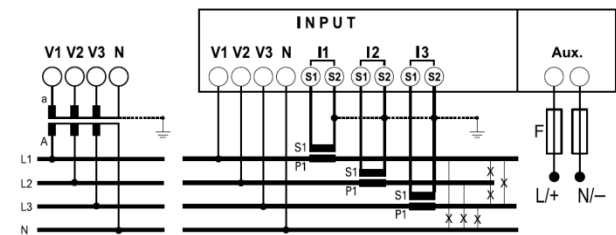
| | Without ferrule | With ferrule |
|----------------|---------------------------------|---------------------------------|
| Rigid cable | 0,05 to 6 mm² | - |
| Flexible cable | 0,05 to 4 mm² | 0,05 to 4 mm² |

- . Other terminals

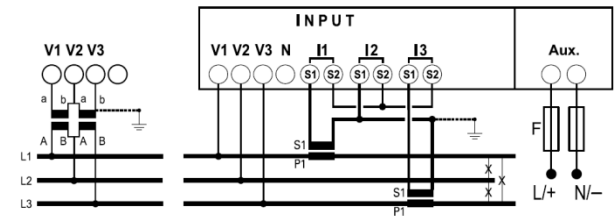
| | Without ferrule | With ferrule |
|----------------|-----------------------------------|-----------------------------------|
| Rigid cable | 0,05 to 4 mm² | - |
| Flexible cable | 0,05 to 2,5 mm² | 0,05 to 2,5 mm² |

Wiring diagrams:

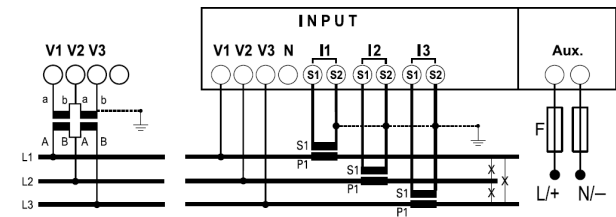
- . 4 wires three-phase network, 3 CT (3N-3E):



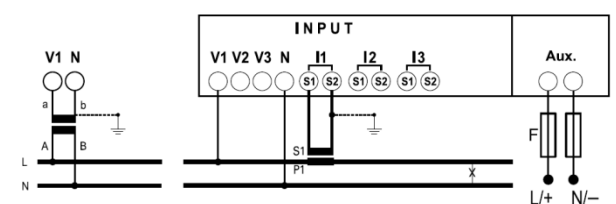
- . 3 wires three-phase network, 2 CT (3-2E):



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



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



For all other wiring diagrams refer to the instruction sheet.

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5. GENERAL CHARACTERISTICS

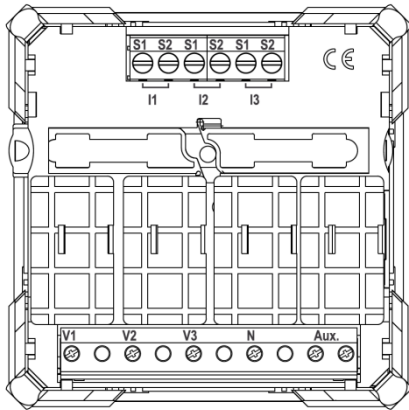
Front face marking:

. 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 $kTA = \text{external CTs ratio}$

(ex. $800A / 5A$, $kTA = 160$).

² $kTV = \text{external VT ratio}$

(ex. $600V / 100V$, $kTV = 6$). For direct connection $kTV = 1$.

In the example, $kTA \times kTV = 160 \times 6 = 960$.

. 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 $kTA \times kTV = 2.000.000$ (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 4 120 61):

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.

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).

5. GENERAL CHARACTERISTICS *(continued)*

Impulse withstand voltage:

- . Supply / Measuring inputs:
 - wave 1,2 / 50 μ s 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:

- . 1,59 dm³.

Consumption (without add-on modules):

- . $\leq 2,5$ VA (a.c. supply)
- . $\leq 3,5$ 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 4 120 53 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 \rightarrow 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_r, 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 | - |

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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 _t | - | - | - |
| 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) | <i>with add-on module 4 120 61</i> |
| THD _u | 2 | 30 ÷ 400 V (Ph/N) 50 ÷ 690 V (Ph/Ph) | - |
| THD-R _u | - | - | - |
| I _h | 1 | 0,1 ÷ 1,2 A (x/1 A) 0,1 ÷ 6 A (x/5 A) | <i>with add-on module 4 120 61</i> |
| THD _i | 2 | 0,1 ÷ 1,2 A (x/1 A) 0,1 ÷ 6 A (x/5 A) | - |
| THD-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) | <i>with add-on module 4 120 61</i> |
| I _h | 1 | 0,1 ÷ 1,2 A (x/1 A) 0,1 ÷ 6 A (x/5 A) | <i>with add-on module 4 120 61</i> |
| Msv | - | - | - |

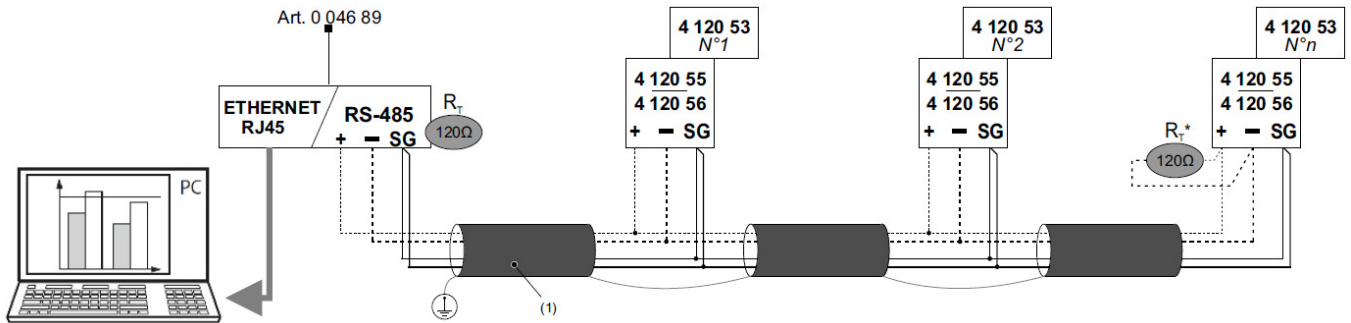
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7.COMUNICATION

RS485 Wiring diagram (with add-on module 4 120 55 or 4 120 56):



(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

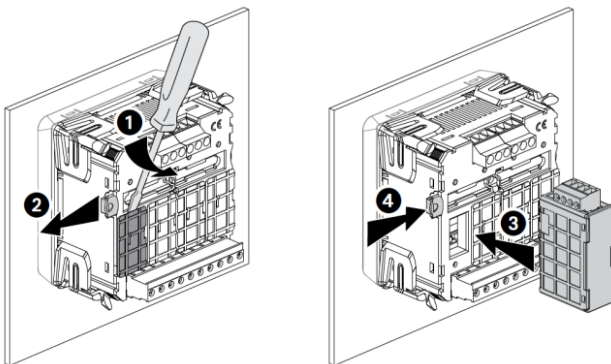
. Modbus communication tables are available at www.e-catalogue.legrandgroup.com, typing "4 120 53" in the search field.

8.ADD-ON MODULES

Range:

- . 4 120 55: Modbus RS485 communication module
- . 4 120 56: Modbus RS485 communication + Memory module
- . 4 120 57: 2 digital inputs / 2 relay outputs module
- . 4 120 58: Temperature measurement module from external Pt100 sensors
- . 4 120 59: 2 pulse outputs module
- . 4 120 60: 2 analog outputs module, 0/4 ÷ 20 mA
- . 4 120 61: Harmonic analysis module

Fixing:



Note: modules must be connected with the device 4 120 53 not supplied.

Screw terminals:

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

Screw head:

- . Screw slotted.

Recommended tightening torque:

- . 0,6 Nm.

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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:

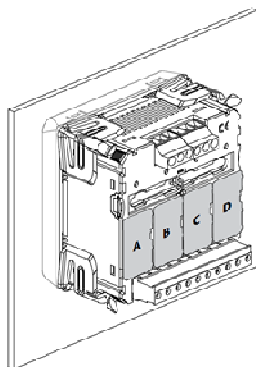
- . Inputs terminals
- . Copper cables.

| | 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 | |
|----------|---|---|---|---|--------|
| 4 120 55 | ✓ | ✗ | ✗ | ✗ | max. 1 |
| 4 120 56 | ✓ | ✗ | ✗ | ✗ | max. 1 |
| 4 120 57 | ✗ | ✗ | ✓ | ✓ | max. 2 |
| 4 120 58 | ✗ | ✗ | ✗ | ✓ | max. 1 |
| 4 120 59 | ✓ | ✓ | ✓ | ✓ | max. 2 |
| 4 120 60 | ✗ | ✗ | ✓ | ✓ | max. 2 |
| 4 120 61 | ✗ | ✓ | ✗ | ✗ | max. 1 |