Multifuncion Measuring Device 96x96 mm, connection via CT, with RS485 port

Cat. N°: **4 120 52**

Contents   **Pages**

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 52: Multifunction measuring device, 96x96 mm for installation on a door or full panel, Modbus RS485 output and pulse output integrated

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

Auxiliary supply:
. 80 ÷ 265 V~, 50 Hz or 400 Hz (automatic selection)
. 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)
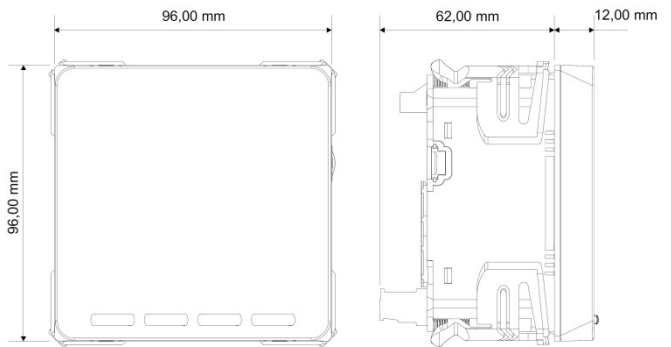. Max, current, Imax: 1,2 In
 x/1 A: 1,2 A
 x/5 A: 6 A

Insertion rated voltages:
. Un: 80÷500 V~ (phase/phase)
. Un: 50÷290 V~ (phase/neutral)

Rated frequency:
. fn: 50 Hz or 400 Hz (automatic selection)
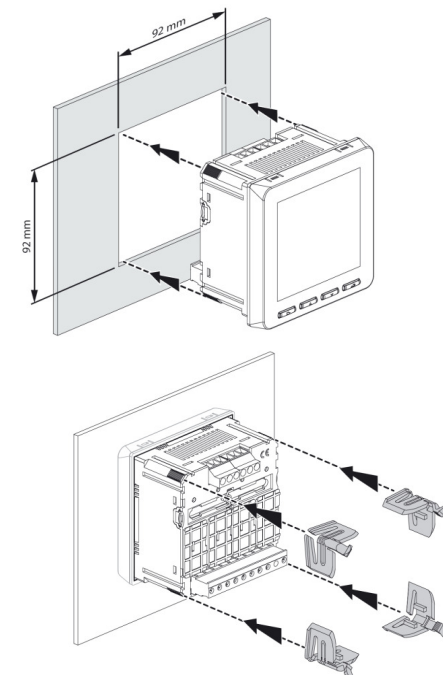. Admitted variation:
 45 ÷ 65 Hz (fn 50 Hz)
 360÷440 Hz (fn 400 Hz)

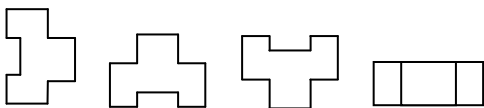## 3. OVERALL DIMENSIONS

4. FIXING - CONNECTION

Fixing:
. On door or full panel
. Cutout 92x92 mm

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4. FIXING - CONNECTION (continued)

Operating position:
. Vertical   Horizontal   Upside down   On the side

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

Screw head:
. Screw slotted (CTs, RS485 and Output 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), Output (1, 2), RS485 (+, -, SG), Auxiliary supply (Aux.): 0,6 Nm.

Tools required:
. CTs terminals: flat screwdriver 5 mm
. Voltage measurement and aux. supply terminals:
  flat screwdriver 3 mm or screwdriver PH0
. Other terminals: flat screwdriver 3,5 mm
. For fixing the device: no tools needed.
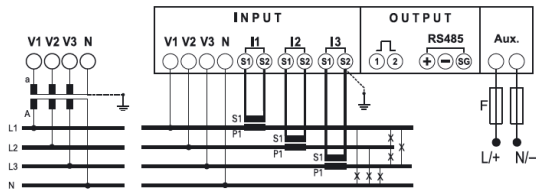
Connectable section:
. Copper cables.
. CTs Terminals

	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):

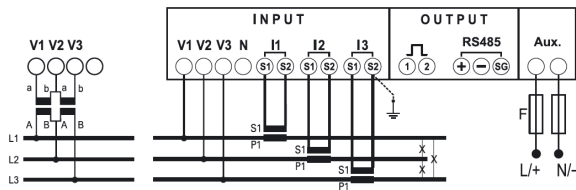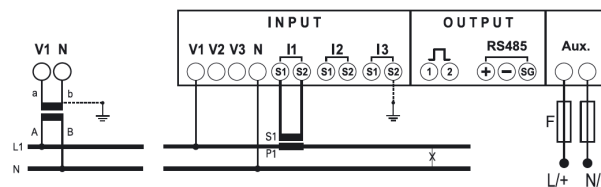. 3 wires three-phase network, 2 CT (3-2E):
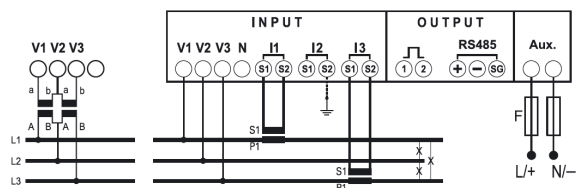
4. FIXING - CONNECTION (continued)

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

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

For all other wiring diagrams refer to the instruction sheet.
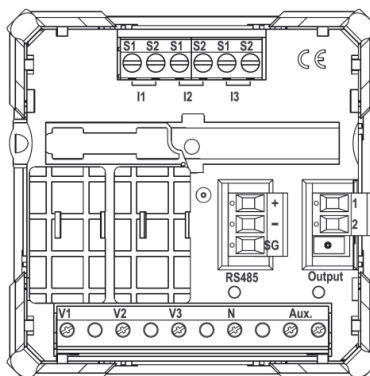
5. GENERAL CHARACTERISTICS

Front face marking:
. Marking by screen printing:

Terminals Marking:
. By permanent ink pad printing.

5. GENERAL CHARACTERISTICS *(continued)*

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. VTs primary voltage: 1200 V.
. Max CTs primary current: 50 kA (CT = x/5A), 10 kA (CT = x/1A)
. Max. product kTA x kTV = 99.990 (CT = x/5A and 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.

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 ± 0,1 Hz)

. 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 1).

. THD (accuracy 1):
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:
Voltages: odd harmonics up to 9th (in display); odd and even harmonics up to 25th (via communication RS485);
Currents: odd harmonics up to 9th (in display); odd and even harmonics up to 25th (via communication RS485);

5. GENERAL CHARACTERISTICS *(continued)*

Measurements update period
. 0,2 s

RS485 communication port's characteristics:
. Programmable addresses: from 1 to 247
. Baud rate: 4,8 - 9,6 - 19,2 - 38,4 kbps
. Parity bit: none, even, odd
. Stop bit: 1
. Galvanically isolated respect to measuring inputs and auxiliary supply
. Standard RS485 3 wires, half-duplex
. Protocol Modbus® RTU
. Response time (time out question/answer): ≤200 ms

Pulse output's characteristics:
. Optorelays with potential-free SPST-NO contact
. Type S0 (IEC/EN62053-31)
. Voltage U_{imp}: max. 27 Va.c./d.c.
. Current I_{imp}: max. 50 mA
. Programmable pulse weight, possible values: 10 – 100 - 1k - 10k - 100k - 1M - 10M Wh/imp or varh/imp
. Programmable pulse duration, possible values: 50 - 100 - 200 - 300 ms.

Alarms output characteristics:
. Optorelays with potential-free SPST-NO contact
. Voltage: max. 27 Va.c./d.c.
. Current: max. 50 mA
. Associable variables:
phase voltages
chained voltages
phase currents
frequency
three-phase active power (positive or negative)
three-phase reactive power (positive or negative)
. Programmable intervention threshold
. Alarm type: high or low threshold
. Relay run mode: normally open (NO) / normally closed (NC)
. Hysteresis: 0÷20%
. Intervention delay: 0÷99 sec.
. Recovery delay: 0÷99 sec.

Output characteristics – Remote control via RS485:
. Optorelays with potential-free SPST-NO contact
. Voltage: max. 27 Va.c./d.c.
. Current: max. 50 mA
. Control type:
bistable (rMtb)
temporized (rMtt)
. Relay run mode: normally open (NO) / normally closed (NC)
. Relay closing time: 0÷99 sec.

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
. Supply / RS485 port:
  wave 1,2 / 50 µs 0,5 J: 6kV
  alternate current 50 Hz / 1 min.: 3 kV
. Measuring inputs / Pulse output:
  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:
. 1,59 dm^3.

Consumption
. ≤ 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 4 120 52 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).

5. GENERAL CHARACTERISTICS *(continued)*

Phase sequence correction diagnostic *(continued)*:
. 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: 1 (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}	1	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 ÷ 300 V (Ph/N) 50 ÷ 500 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 ÷ 300 V (Ph/N) 50 ÷ 500 V (Ph/Ph)	-
THD_u	1	30 ÷ 300 V (Ph/N) 50 ÷ 500 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)	-
THD_i	1	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 ÷ 300 V (Ph/N) 50 ÷ 500 V (Ph/Ph)	-
U_{dip}	-	-	-
U_{swl}	-	-	-
U_{tr}	-	-	-
U_{int}	-	-	-
U_{nba}	-	-	-
U_{nb}	-	-	-
U_h	1	30 ÷ 300 V (Ph/N) 50 ÷ 500 V (Ph/Ph)	-
I_h	1	0,1 ÷ 1,2 A (x/1 A) 0,1 ÷ 6 A (x/5 A)	-
Msv	-	-	-

7.COMMUNICATION

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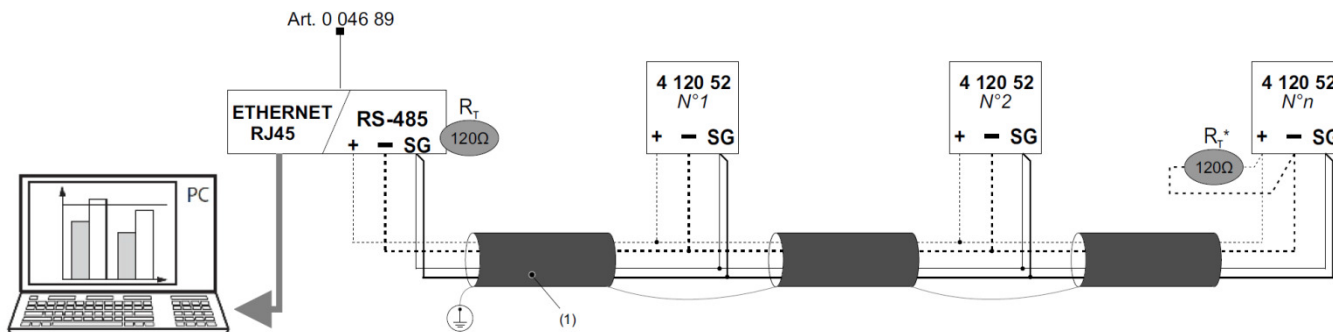
[1] RS485: Prescribed use of Cable Belden 9842, Belden 3106A (or equivalent) for a maximum length of 1000 m, or Category 6 cable (FTP or UTP) for a maximum length of 50 m;
(*)Resistance not furnished

Modbus communication tables

. Modbus communication tables are available at www.e-catalogue.legrandgroup.com, typing "4 120 52" in the search field