

## Multifunction Measuring Device, 4 mod. DIN, connection via CT, with RS485 port

Cat. N°: 4 120 51



Contents	Pages
1. Description - Use.....	1
2. Range .....	1
3. Overall dimensions.....	1
4. Preparation - Connection .....	1
5. General characteristics.....	2
6. Compliance and approvals.....	5
7. Communication .....	8

### 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 51: Multifunction measuring device, 4 DIN modules width (17,8 mm per pole), Modbus RS485 output and pulse output integrated. The device is also equipped with two digital inputs (3 terminals with common point).

#### Width:

. 4 modules (4 x 17,8 mm = 71,2 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

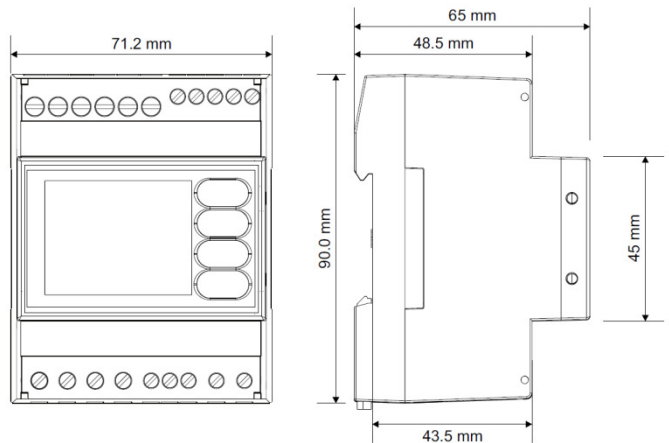
#### Insertion rated voltages:

- . 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



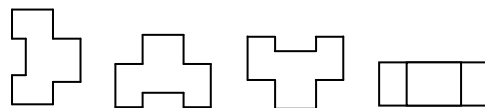
### 4. PREPARATION - CONNECTION

#### Fixing:

- . On symmetrical EN/IEC 60715 rail or DIN 35 rail.

#### Operating position:

- . Vertical Horizontal Upside down On the side



#### Screw terminals:

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

#### Screw head:

- . Screw slotted.

#### Recommended tightening torque:

- . CTs terminals (I<sub>1</sub>, I<sub>2</sub>, I<sub>3</sub>): 1 Nm.
- . Voltage measurement terminals (V<sub>1</sub>, V<sub>2</sub>, V<sub>3</sub>, N), Inputs (1, C, 2), Output (3, 4), RS485 (+, -, SG), Auxiliary supply (Aux.): 0,6 Nm.

# Multifunction Measuring Device, 4 mod. DIN, connection via CT, with RS485 port

Cat. N°: 4 120 51

## 4. PREPARATION - CONNECTION (continued)

### Tools required:

- . CTs terminals: flat screwdriver 4 mm
- . Other terminals: flat screwdriver 2,5 mm
- . For fixing the device on the DIN rail: flat screwdriver 5.5 mm (from 4 to 6 mm).

### Connectable section:

- . Copper cables.
- . CTs Terminals

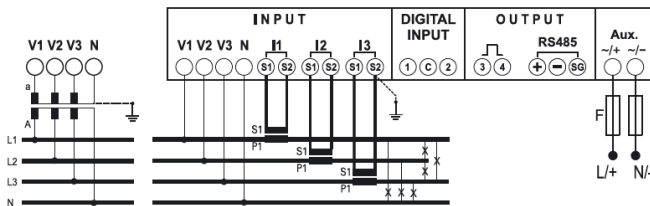
	Without ferrule	With ferrule
Rigid cable	<b>0,05 to 6 mm<sup>2</sup></b>	-
Flexible cable	<b>0,05 to 4 mm<sup>2</sup></b>	<b>0,05 to 4 mm<sup>2</sup></b>

- . Other terminals

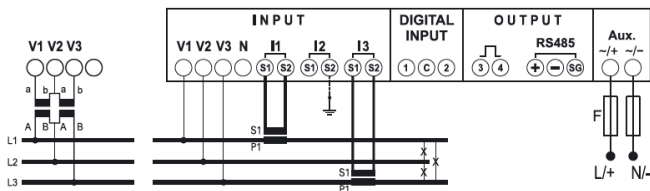
	Without ferrule	With ferrule
Rigid cable	<b>0,05 to 4 mm<sup>2</sup></b>	-
Flexible cable	<b>0,05 to 2,5 mm<sup>2</sup></b>	<b>0,05 to 2,5 mm<sup>2</sup></b>

### Wiring diagrams:

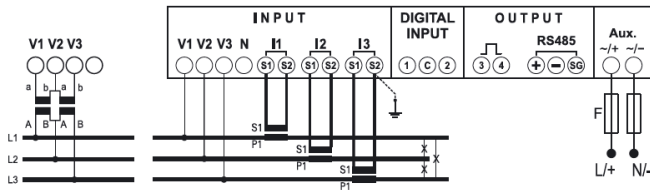
- . 4 wires three-phase network, 3 CT (3N-3E):



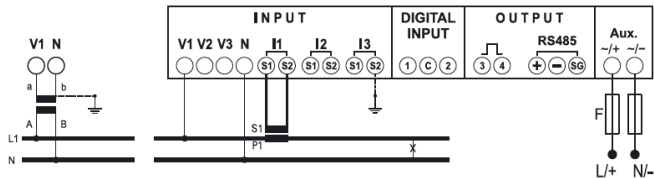
- . 3 wires three-phase network, 2 CT (3-2E):



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



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

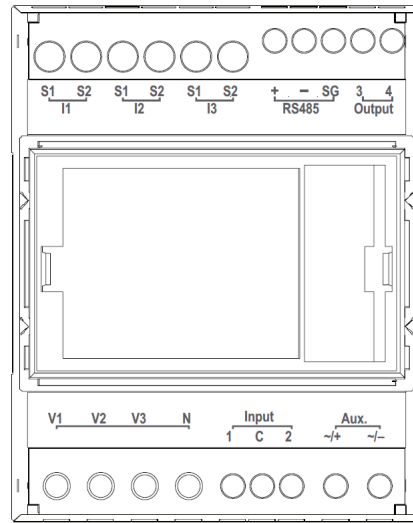


For all other wiring diagrams refer to the instruction sheet.

## 5. GENERAL CHARACTERISTICS

### Case marking:

- . By permanent ink pad printing.



### Front face marking:

- . Adhesive foil:



### 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, of the external voltage transformers ( $kTV^2$ )

<sup>1</sup>  $kTA = \text{external CTs ratio}$

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

<sup>2</sup>  $kTV = \text{external VT ratio}$

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

**5. GENERAL CHARACTERISTICS (continued)**

**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  $\pm 0,1$  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 9<sup>th</sup> (in display); odd and even harmonics up to 25<sup>th</sup> (via communication RS485);  
Currents: odd harmonics up to 9<sup>th</sup> (in display); odd and even harmonics up to 25<sup>th</sup> (via communication RS485);

**Measurements update period**

- . 0,2 s

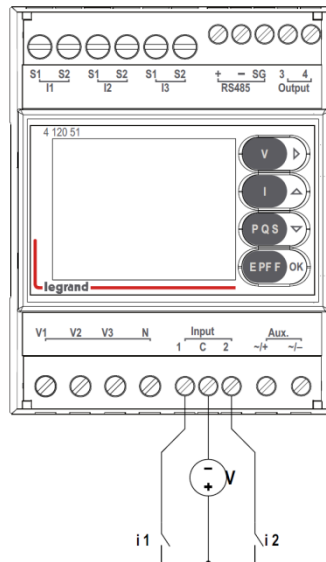
**Energy count mode**

- . 4 selectable modes:  
Asyn: Partial Energy count always active  
Syn: Partial Energy count activated by digital inputs  
Trfs: Energy count on 4 tariffs; switching via the digital inputs  
Cntr: Partial Energy count always active + status of inputs and input pulses counter.

**5. GENERAL CHARACTERISTICS (continued)**

**Digital inputs**

- . 2 active digital inputs, with different use:  
activation of partial energy count  
switching of energy count on 4 tariffs  
input pulse counting
- . 3 input terminals with a common point (1 - C - 2)
- . Max. voltage: 27 Vd.c.
- . Max input pulse frequency: 15 Hz
- . Inputs wiring:



Note: "V" max. 27 Vd.c. (ex. Cat. N°: E49 or 346020)

**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):  $\leq 200$  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.

**5. GENERAL CHARACTERISTICS** *(continued)*

**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.

**Device protection:**

- . Recommended fuse 0,5 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

**5. GENERAL CHARACTERISTICS** *(continued)*

**Pollution degree:**

- . 2

**Installation category:**

- . III

**Average weight per device:**

- . 0, 250 kg.

**Volume when packed:**

- . 0,70 dm<sup>3</sup>.

**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 51 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<sub>a</sub>, IEC/EN 61557-12).
- . Reactive energy accuracy class: 1 (E<sub>r</sub>, 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 <sub>A</sub> , Q <sub>V</sub>	1	0,01 ÷ 1,2 A (x/1 A) 0,05 ÷ 6 A (x/5 A)	-
S <sub>A</sub> , S <sub>V</sub>	1	0,01 ÷ 1,2 A (x/1 A) 0,05 ÷ 6 A (x/5 A)	-
E <sub>a</sub>	0,5	0 ÷ 9999999,9 MWh	0,01 ÷ 1,2 A (x/1 A) 0,05 ÷ 6 A (x/5 A)
E <sub>rA</sub> , E <sub>rV</sub>	1	0 ÷ 9999999,9 Mvarh	0,01 ÷ 1,2 A (x/1 A) 0,05 ÷ 6 A (x/5 A)
E <sub>apA</sub> , E <sub>apV</sub>	-	-	-
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 <sub>N</sub> , I <sub>Nc</sub>	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 <sub>FA</sub> , P <sub>FV</sub>	0,5	0,5 ind ÷ 0,8 cap	-
P <sub>st</sub> , P <sub>t</sub>	-	-	-
U <sub>dip</sub>	-	-	-
U <sub>swl</sub>	-	-	-
U <sub>tr</sub>	-	-	-
U <sub>int</sub>	-	-	-
U <sub>nba</sub>	-	-	-
U <sub>nb</sub>	-	-	-
U <sub>h</sub>	1	30 ÷ 300 V (Ph/N) 50 ÷ 500 V (Ph/Ph)	-
THD <sub>u</sub>	1	30 ÷ 300 V (Ph/N) 50 ÷ 500 V (Ph/Ph)	-
THD-R <sub>u</sub>	-	-	-
I <sub>h</sub>	1	0,1 ÷ 1,2 A (x/1 A) 0,1 ÷ 6 A (x/5 A)	-
THD <sub>i</sub>	1	0,1 ÷ 1,2 A (x/1 A) 0,1 ÷ 6 A (x/5 A)	-
THD-R <sub>i</sub>	-	-	-
Msv	-	-	-

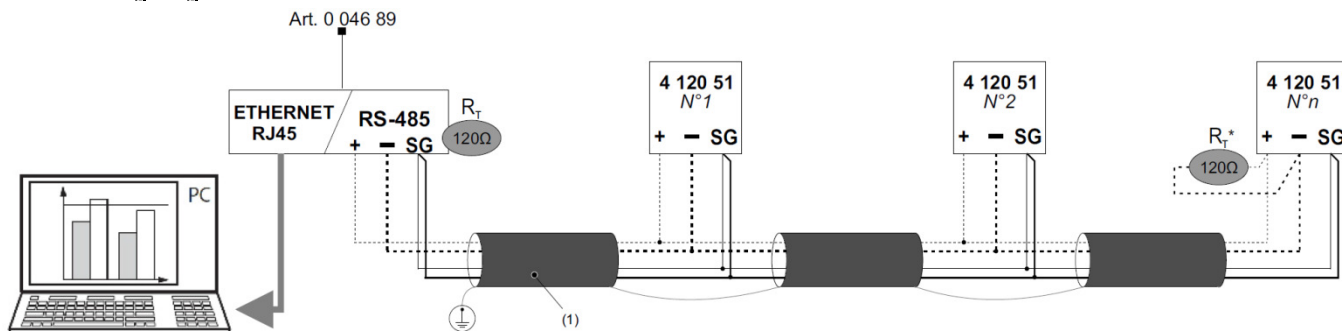
**6. COMPLIANCE AND APPROVALS** *(continued)*

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 <sub>N</sub> , I <sub>Nc</sub>	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 <sub>dip</sub>	-	-	-
U <sub>swl</sub>	-	-	-
U <sub>tr</sub>	-	-	-
U <sub>int</sub>	-	-	-
U <sub>nba</sub>	-	-	-
U <sub>nb</sub>	-	-	-
U <sub>h</sub>	1	30 ÷ 300 V (Ph/N) 50 ÷ 500 V (Ph/Ph)	-
I <sub>h</sub>	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](http://www.e-catalogue.legrandgroup.com), typing "4 120 51" in the search field