

## Power Transducer Series

### MULTI POWER MONITOR

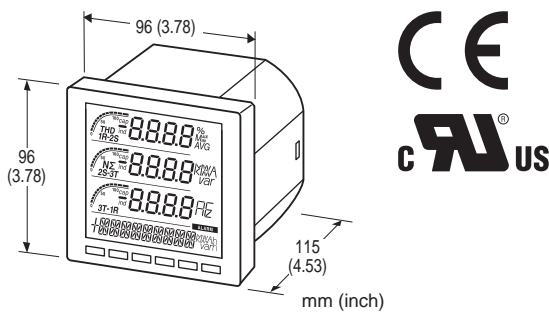
(4 digital displays)

#### Functions & Features

- Measures simultaneously several variables of a heavy-current power system: current, voltage, active, reactive and apparent power, active and reactive energy, power factor, frequency, etc.
- All measured values, counter values, display mode, setting data are stored in the non-volatile memory at the power off
- Conversion factors, system configuration, interval times are programmable using the front buttons
- Open collector output for alarm or energy count

#### Typical Applications

- Multi-functional power monitor incorporated in an electric device: saves space, wiring works, and cost



### MODEL: 53U-1[1][2][3]-[4][5]

#### ORDERING INFORMATION

- Code number: 53U-1[1][2][3]-[4][5]
- Specify a code from below for each of [1] through [5]. (e.g. 53U-1211-M2/H/UL/Q)
- Specify the specification for option code /Q (e.g. /C01/SET)

#### CONFIGURATION

- 1: Single-phase / 2-wire and 3-wire,  
3-phase / 3-wire and 4-wire

#### [1] INPUT

- 1: 480 V / 1 A AC  
2: 480 V / 5 A AC

#### [2] CONTACT INPUT

- 0: None  
( 'External Interface' codes 1, 4 and 5 Not selectable.)  
1: 24 V DC  
( 'External Interface' codes 2, 3, 6, 7, 8 and 9 Not selectable.)  
2: 110 V DC  
( 'External Interface' codes 2, 3, 6, 7, 8 and 9 Not selectable.)

#### [3] EXTERNAL INTERFACE

- 1: Modbus, Do x 1, Di x 1  
2: 4 - 20 mA DC x 4  
3: 1 - 5 V DC x 4  
4: 4 - 20 mA DC x 2, Do x 1, Di x 1  
5: 1 - 5 V DC x 2, Do x 1, Di x 1  
6: 4 - 20 mA DC x 2, Do x 2  
7: 1 - 5 V DC x 2, Do x 2  
8: Modbus, Do x 3  
9: Do x 4

#### [4] AUXILIARY POWER SUPPLY

- AD4: universal (Option /UL not selectable.)  
100 - 240 V AC (Operational range 85 - 264 V, 47 - 66 Hz) /  
110 - 240 V DC (Operational range 99 - 264 V,  
ripple 10 %p-p max)  
M2: 100 - 240 V AC (Operational voltage range 85 - 264 V,  
47 - 66 Hz)

#### [5] OPTIONS (multiple selections)

##### Performance

- blank: Standard  
/H: High accuracy (voltage/current:  $\pm 0.2\%$ , energy:  $\pm 0.5\%$ )

##### Standards & Approvals

- blank: CE marking  
/UL: UL approval, CE marking

##### Other Options

- blank: none  
/Q: Option other than the above (specify the specification)

#### SPECIFICATIONS OF OPTION: Q (multiple selections)

##### COATING (For the detail, refer to M-System's web site.)

- Moving parts and indicators are not coated.  
/C01: Silicone coating (UL not available)  
/C02: Polyurethane coating (UL not available)  
/C03: Rubber coating (UL not available)

##### EX-FACTORY SETTING

- /SET: Preset according to the Ordering Information Sheet  
(No. ESU-6485)

## RELATED PRODUCTS

- PC configurator software (model: PMCFG)
  - PC Recorder Light software for the 53U (model: MSR128LUx) Software downloadable at M-System's web. Software downloadable at M-System's web site.
- A dedicated cable is required to connect the module to the PC. Please refer to the internet software download site or the users manual for the PC configurator for applicable cable types.

## GENERAL SPECIFICATIONS

**Construction:** 96-mm square (1/4 DIN size) panel flush mounted

**Degree of protection**

**Front panel:** IP 50

**Terminal block, housing:** IP 30

**Connection**

**Voltage input:** Connector type terminal block (applicable wire size  $\leq 2.5$  dia, 0.5 - 3.5 mm<sup>2</sup>, stripped length 7 - 8 mm)

**Current input:** Screw terminal block (applicable wire size  $\leq 2.4$  dia, 0.5 - 3.5 mm<sup>2</sup>, stripped length 13 - 15 mm)

**Contact input, contact output, analog output, Modbus, auxiliary power supply:** Connector type terminal block (applicable wire size  $\leq 2.4$  dia, 0.5 - 2.5 mm<sup>2</sup>, stripped length 7 - 8 mm)

**Configuration:** Single phase/2-wire and 3-wire, 3-phase/3-wire balanced/unbalanced load, 3-phase/4-wire balanced/unbalanced load

**Housing material:** Flame-resistant resin (gray)

**Isolation:** Voltage input to current input to contact input to Modbus or configurator jack or analog output to contact output (between each contact output except for External Interface code 8) to power

■ **Measured variables**

**Voltage:** 1 - N, 2 - N, 3 - N, 1 - 2, 2 - 3, 3 - 1

**Current:** 1, 2, 3, N

**Average current:** 1, 2, 3

**Active / reactive / apparent power:** 1, 2, 3,  $\Sigma$

**Power factor:** 1, 2, 3,  $\Sigma$

**Frequency**

**Phase angle between voltages:** 1 - 2, 2 - 3, 3 - 1

**Active energy incoming / outgoing:**  $\Sigma$

**Reactive energy inductive / capacitive:**  $\Sigma$

**Apparent energy:**  $\Sigma$

**Active / reactive / apparent power intervals (demand)**

**Other demands**

**Harmonic contents:** 2nd to 31st

**Max. and min. values**

■ **DISPLAY:** LCD with LED backlight

(LED OFF timer available)

**Signed:** 4 digits, 3 lines

**Energy:** 9 digits, 1 line

**Bargraph:** 3 points

## INPUT SPECIFICATIONS

**Frequency:** 50 / 60 Hz (45 - 65 Hz)

• **Voltage Input**

**Rated voltage**

**Line-to-line (delta voltage):** 480 V

**Line-neutral (phase voltage):** 277 V (single-phase / 2-wire and 3-wire)

**Consumption VA:**  $\leq U_{LN}^2 / 300$  k $\Omega$  / phase

**Overload capacity:** 200 % of rating for 10 sec., 120% continuous

**Selectable primary voltage range:** 50 - 400 000 V

• **Current Input**

**Rated current:** 1 A or 5 A

**Consumption VA:**  $\leq I^2 \cdot 0.01$   $\Omega$  / phase

**Overload capacity:** 4000 % of rating for 1 sec., 2000% for 4 sec., 120% continuous

**Selectable primary current range:** 1 - 20 000 A

**Operational range**

**Voltage, current, apparent power:**  $\leq 120$  % of the rating

**Active/reactive power:**  $\leq \pm 120$  % of the rating

**Frequency:** 45 - 65 Hz

**Power factor:**  $\leq \pm 1$

■ **Contact Input:** 24 V DC or 110 V DC

(input resistance 6 k $\Omega$ )

**Detecting voltage:** External 24 V DC  $\pm 10$  % or 110 V DC  $\pm 10$  %

**ON current:**  $\geq 1$  mA ( $\leq 24$  k $\Omega$  @ 24 V,  $\leq 110$  k $\Omega$  @ 110 V)

**OFF current:**  $\leq 0.1$  mA ( $\geq 240$  k $\Omega$  @ 24 V,  $\geq 1.1$  M $\Omega$  @ 110 V)

**Detecting time:** 10 - 1000 msec.

The status can be monitored on the Modbus; usable to reset energy count or to update average (demand) value.

## OUTPUT SPECIFICATIONS

■ **Modbus**

**Communication:** Half-duplex, asynchronous, no procedure

**Interface:** Conforms to TIA/EIA-485-A

**Max. transmission distance:** 500 meters

**Baud rate:** 1.2 - 38.4 kbps

**Max. number of nodes:** 31 (except the master)

**Protocol:** Modbus RTU

**Node address:** 1 - 247 (factory default setting: 1)

**Parity:** none, even or odd (factory default setting: odd)

**Stop bit:** 1 or 2 (factory default setting: 1)

**Media:** Shielded twisted-pair cable (CPEV-S 0.9 dia.)

■ **DC Current:** 4 - 20 mA DC

**Load resistance:**  $\leq 270 \Omega$

**Measurands converted into analog output:** Voltage, Current, Active / reactive / apparent power, Power factor, Frequency, Harmonic contents

■ **DC Voltage:** 1 – 5 V DC

**Load resistance:**  $\geq 5000 \Omega$

**Measurands converted into analog output:** Voltage, Current, Active / reactive / apparent power, Power factor, Frequency, Harmonic contents

■ **Open Collector**

Programmable for either alarm or energy count.

**Max. rated load:** 130 V DC @50 mA

**Continuous rated load:** 130 V DC @30 mA

**Saturation voltage:** 1.5 V DC

**Measurands applicable to alarm:** Voltage, current, current intervals, neutral current, frequency, energy, energy intervals

(ON delay, deadband and other parameters are selectable)

**Measurands applicable to count:** Energy;

Pulse rate selectable within

0.1 – 10 000.0 kWh/p, kvarh/p, kVAh/p

## INSTALLATION

**Power consumption**

•AC: < 8 VA

•DC: < 4 W

**Operating temperature:** -10 to +55°C (14 to 131°F)

**Storage temperature:** -20 to +80°C (-4 to +176°F)

**Operating humidity:** 90 % RH max. (non-condensing)

**Mounting:** Panel flush mounting

**Weight:** 300 g (0.66 lb)

## PERFORMANCE

**Accuracy** (at 23°C  $\pm 10^\circ\text{C}$  or 73.4°F  $\pm 18^\circ\text{F}$ , 45 – 65 Hz)

**Voltage:**  $\pm 0.3 \%$  ( $\pm 0.2 \%$  for Option /H)<sup>\*1</sup>

**Current:**  $\pm 0.3 \%$  ( $\pm 0.2 \%$  for Option /H)<sup>\*1</sup>

**Power:**  $\pm 0.5 \%$ <sup>\*1</sup>

**Power factor:**  $\pm 0.5 \%$

**Frequency:**  $\pm 0.1 \%$ <sup>\*1</sup>

**Energy:**  $\pm 1 \%$  ( $\pm 0.5 \%$  for Option /H)<sup>\*2</sup>

**Harmonic contents:**  $\pm 1 \%$ <sup>\*1</sup>

**Analog output:** Accuracy of assigned measurand or  $\pm 0.2 \%$ , whichever is greater.

\*1. Percentage of the spans:

480 V for voltage;

1 A or 5 A for current; and

4155 W (5 A) or 831 W (1 A) for active power

The described accuracy levels are ensured at the input 1 % or more for phase 2 current with 3-phase/3-wire unbalanced load, for neutral current with 3-phase/4-wire unbalanced load, and neutral current with 1-phase/3-wire.

\*2. Accuracy level:

Active energy class 0.5S according to IEC 62053-22  
(Reactive energy class 2 according to IEC 62053-23)

**Sampling rate:** 64 samples per cycle

**Data update period:**

**Harmonic contents and frequency:**  $\leq 1.1$  sec.

**Other:**  $\leq 600$  msec.

**Response time:**  $\leq 2$  sec. (0 – 99 %),

$\leq 3$  sec. for frequency and harmonic contents

**Insulation resistance:**  $\geq 100 \text{ M}\Omega$  with 500 V DC

**Dielectric strength:**

4000 V AC @1 minute

(voltage input or current input or contact input or contact output or Modbus or configurator jack or analog output to power)

2500 V AC @1 minute

(voltage input to current input to contact input to contact output to Modbus or configurator jack or analog output)

2000 V AC @1 minute

(between each contact output except for External Interface code 8)

2000 V AC @1 minute (circuits to housing)

## STANDARDS & APPROVALS

**EU conformity:**

EMC Directive

EMI EN 61000-6-4

EMS EN 61000-6-2

Low Voltage Directive

EN 61010-1

Measurement Category III (input)

Installation Category II (power)

Pollution Degree 2

Input to auxiliary power: Reinforced insulation (550 V)

Output to auxiliary power: Reinforced insulation (300 V)

Input to output: Basic insulation (550 V)

RoHS Directive

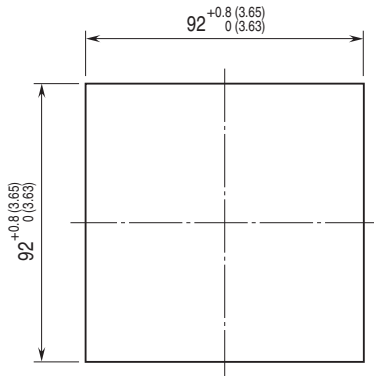
**Approval:**

UL/C-UL general safety requirements

(UL 61010-1, CAN/CSA-C22.2 No.61010-1)

**MOUNTING REQUIREMENTS**

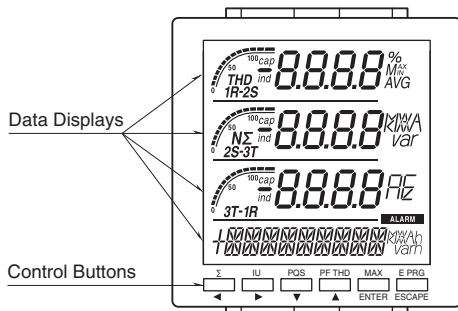
■ PANEL CUTOUT unit: mm (inch)



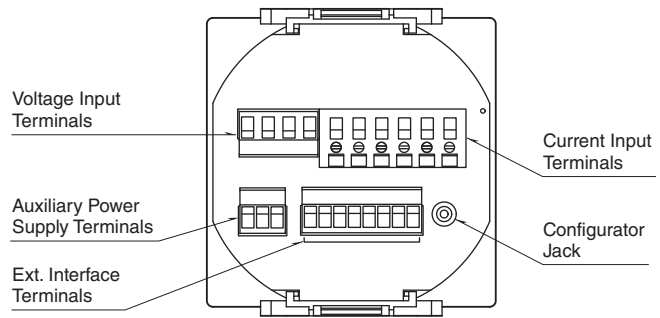
Panel thickness : 2 to 15 mm (0.08 to 0.59 inch)

**EXTERNAL VIEW**

■ FRONT VIEW

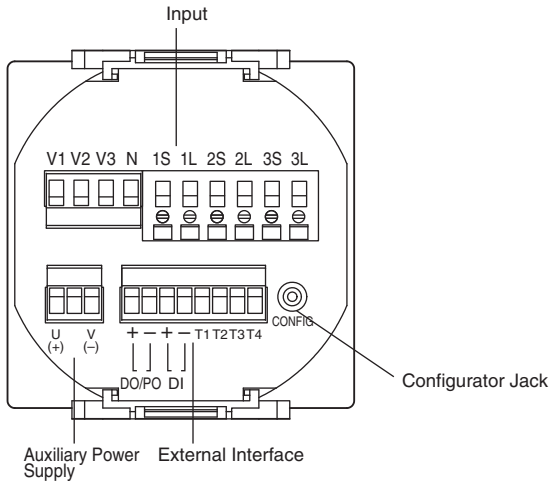


■ REAR VIEW



## TERMINAL CONNECTIONS

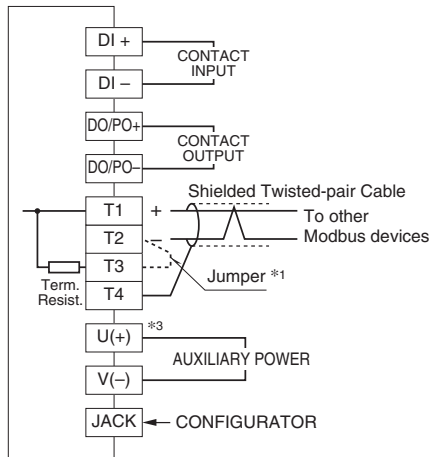
For UL approved model, L and N are marked, instead of U(+) and V(-).



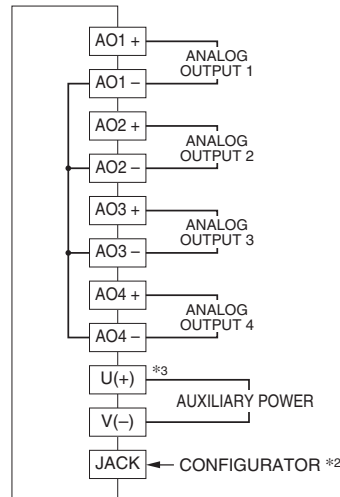
System / Application	Terminal
Single phase / 2-wire	
Three phase / 3-wire, balanced load	
Three phase / 3-wire, unbalanced load	
Three phase / 4-wire, balanced load	
Three phase / 4-wire, unbalanced load	
Single phase / 3-wire	

Note: For low voltage circuit, grounding is not required.

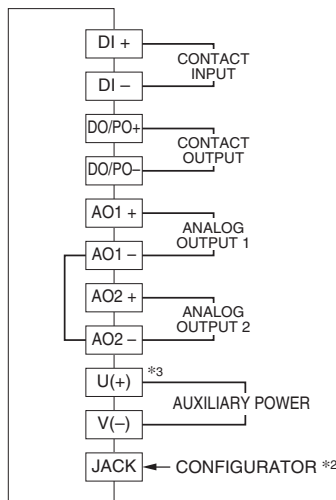
## EXTERNAL INTERFACE CODE: 1



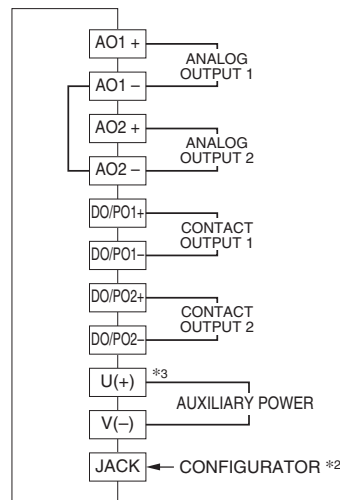
## EXTERNAL INTERFACE CODE: 2, 3



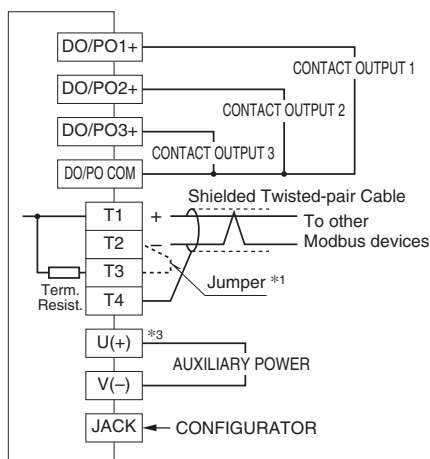
## EXTERNAL INTERFACE CODE: 4, 5



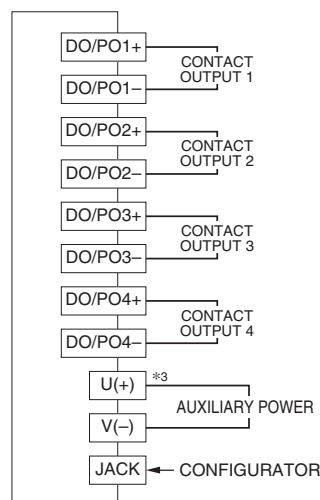
## EXTERNAL INTERFACE CODE: 6, 7



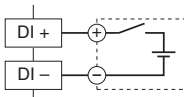
## EXTERNAL INTERFACE CODE: 8



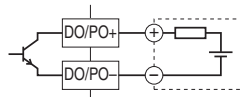
## EXTERNAL INTERFACE CODE: 9



### • Contact Input Connection E.g.



### • Contact Output Connection E.g.



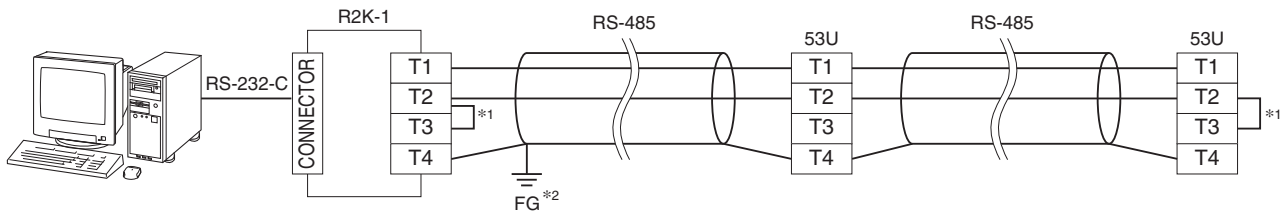
\*1. When the device is located at the end of a transmission line via twisted-pair cable, (when there is no cross-wiring), close across the terminal T2 – T3 with a leadwire.

When the device is not at the end, no shortcircuit wire is required.

\*2. Analog output may momentarily fluctuate while the configurator cable is left connected.

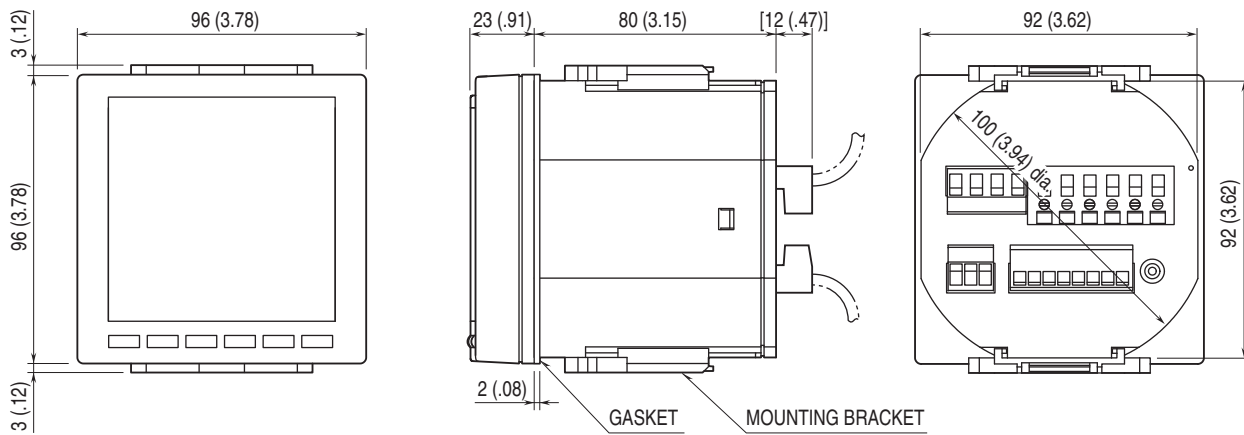
\*3. For UL approved model, L and N are marked, instead of U(+) and V(-).

## MODBUS WIRING CONNECTION



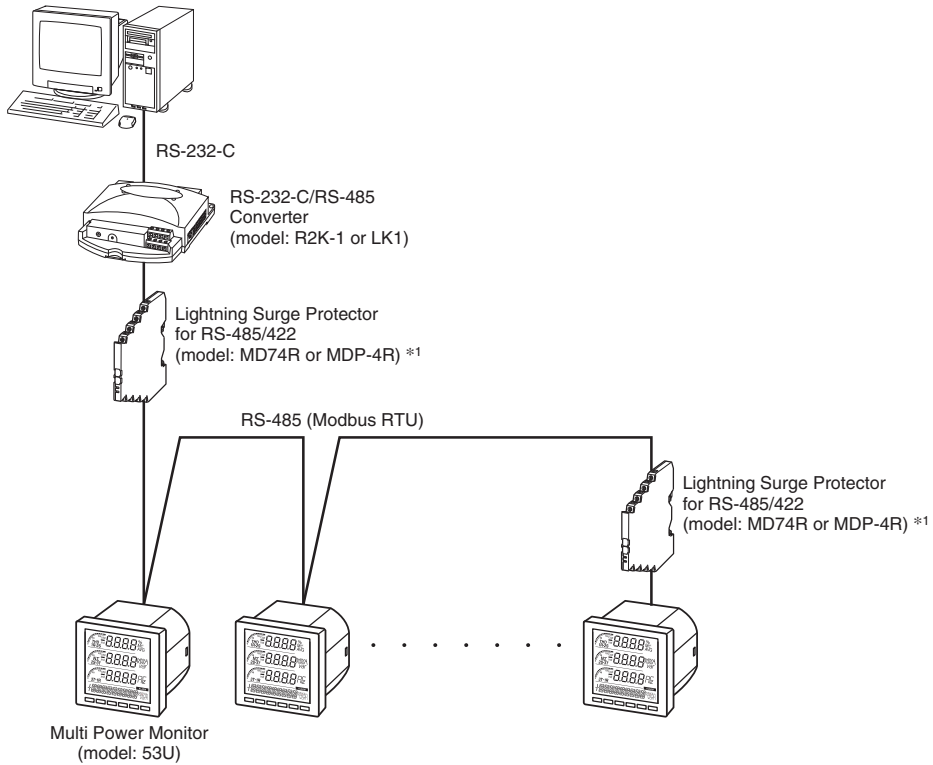
- \*1. Internal terminating resistor is used when the device is at the end of a transmission line.
- \*2. Install shield cables to all sections and ground them at single point.

## EXTERNAL DIMENSIONS unit: mm [inch]

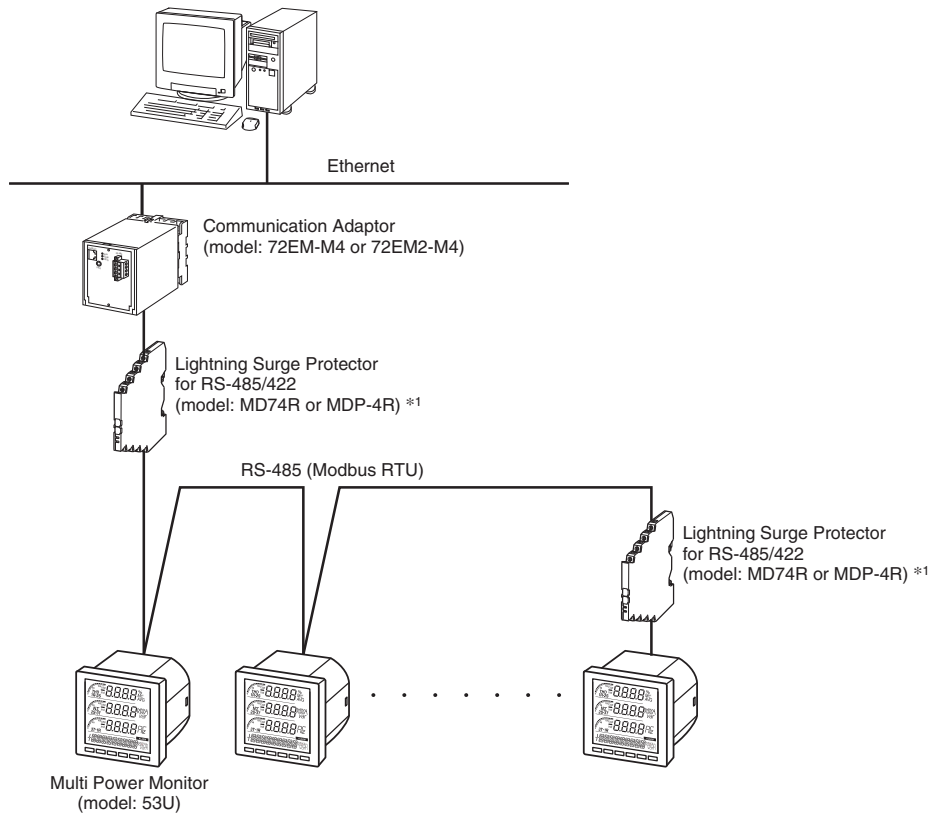


## SYSTEM CONFIGURATION EXAMPLES

### ■ RS-485 / RS-232-C



### ■ RS-485 / ETHERNET



\*1. Insert lightning surge protectors recommended in this example if necessary.





Specifications are subject to change without notice.