

# STRAIN GAUGE TRANSMITTER

(field- and PC-configurable)

MODEL **M3LLC**

## BEFORE USE ....

Thank you for choosing us. Before use, please check contents of the package you received as outlined below.

If you have any problems or questions with the product, please contact our sales office or representatives.

### ■ PACKAGE INCLUDES:

Signal conditioner .....(1)  
I/O range and tag name label sheet .....(1)

### ■ MODEL NO.

Confirm Model No. marking on the product to be exactly what you ordered.

### ■ INSTRUCTION MANUAL

This manual describes necessary points of caution when you use this product, including installation, connection and basic maintenance procedures.

The M3LLC with Option A is programmable using the PC configurator software. For detailed information on the PC configuration, refer to the M3CFG instruction manual. The M3CFG PC Configurator Software is downloadable at our web site.

## POINTS OF CAUTION

### ■ CONFORMITY WITH UL

- This equipment is suitable for use in a Pollution Degree 2 environment.
- This equipment is to be used with the maximum operating voltage 30Vrms and 42.4Vpeak or 60V DC.
- The equipment must be mounted inside a suitable fire enclosure.
- Operating temperature: -25 to +55°C (-13 to +131°F)

### ■ CONFORMITY WITH EU DIRECTIVES

- The equipment must be mounted inside a panel.
- Insert noise filters for the power source, input and output connected to the unit. COSEL Model NAC-04-472, TDK Model ZCAT 3035-1330 or equivalent is recommended.
- The actual installation environments such as panel configurations, connected devices, connected wires, may affect the protection level of this unit when it is integrated in a panel system. The user may have to review the CE requirements in regard to the whole system and employ additional protective measures to ensure the CE conformity.
- Install lightning surge protectors for those wires connected to remote locations.

### ■ POWER INPUT RATING & OPERATIONAL RANGE

- Locate the power input rating marked on the product and confirm its operational range as indicated below:  
10 – 32V DC rating: 9 – 36V, approx. 5W

### ■ GENERAL PRECAUTION

- Before you remove the unit or mount it, turn off the power supply and input signal for safety.

### ■ ENVIRONMENT

- Indoor use.
- When heavy dust or metal particles are present in the air, install the unit inside proper housing with sufficient ventilation.
- Do not install the unit where it is subjected to continuous vibration. Do not subject the unit to physical impact.
- Environmental temperature must be within -25 to +65°C (-13 to +149°F) with relative humidity within 0 to 95% RH in order to ensure adequate life span and operation.
- Be sure that the ventilation slits are not covered with cables, etc.

### ■ WIRING

- Do not install cables close to noise sources (relay drive cable, high frequency line, etc.).
- Do not bind these cables together with those in which noises are present. Do not install them in the same duct.

### ■ EXCITATION

- Be sure to use the excitation of the unit.
- Adjust excitation voltage so that the current is below the maximum current of the excitation.

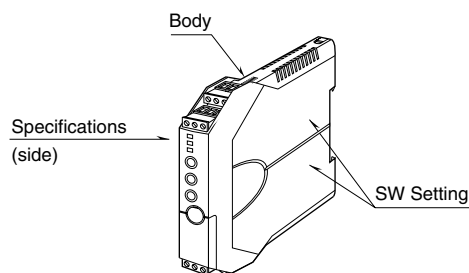
### ■ AND ....

- The unit is designed to function as soon as power is supplied, however, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.

## LIGHTNING SURGE PROTECTION

We offer a series of lightning surge protector for protection against induced lightning surges. Please contact us to choose appropriate models.

## COMPONENT IDENTIFICATION

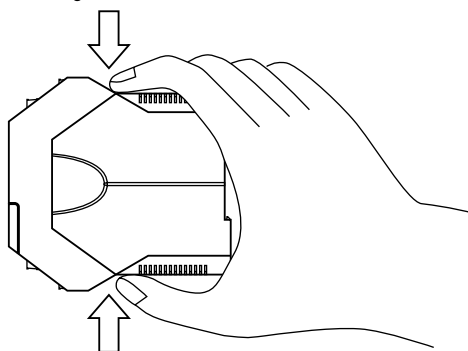


### ■ HOW TO OPEN THE COVER WHEN SETTING DIP SW

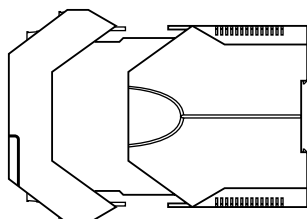
Hold at the top and bottom of the unit as shown below and slide the housing cover gently to open until it hits the latching inside the unit.

#### Caution:

Handle the cover carefully to protect internal components from damage. DO NOT pull beyond where the housing cover is latched. The plastic housing may be damaged.

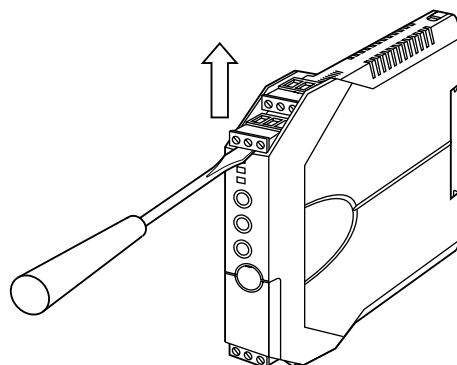


#### • Housing Cover Fully Opened



### ■ HOW TO SEPARATE THE EURO TYPE CONNECTOR TERMINAL BLOCKS

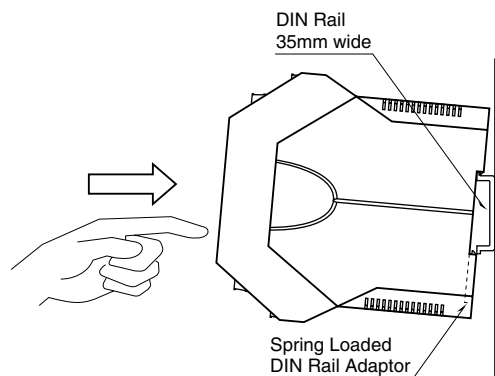
When you need to separate the euro type connector terminal blocks from the transmitter body for wiring, insert a minus driver between the euro type connector terminal block and the housing body, pull up the driver and pull out the euro type connector terminal block.



## INSTALLATION

### ■ DIN RAIL MOUNTING

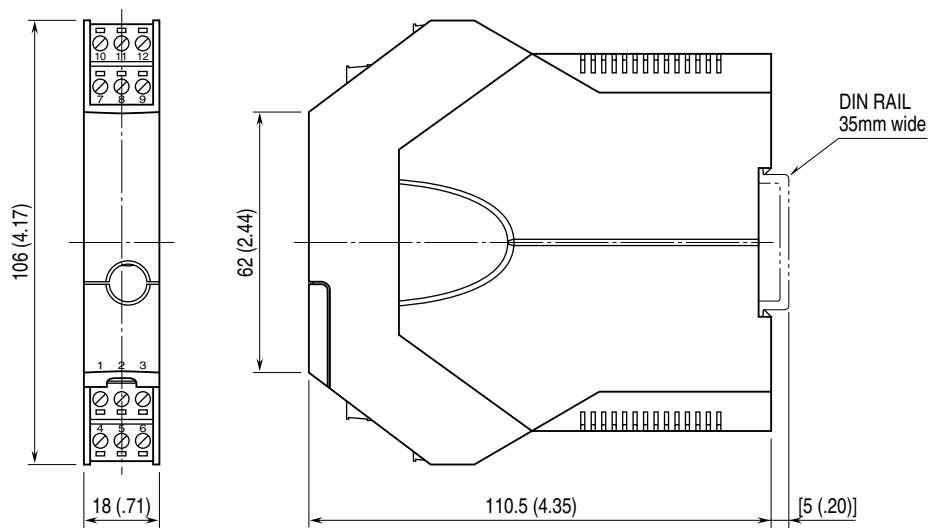
Set the unit so that its DIN rail adaptor is at the bottom. Position the upper hook at the rear side of the unit on the DIN rail and push in the lower. When removing the unit, push down the DIN rail adaptor utilizing a minus screwdriver and pull.



## TERMINAL CONNECTIONS

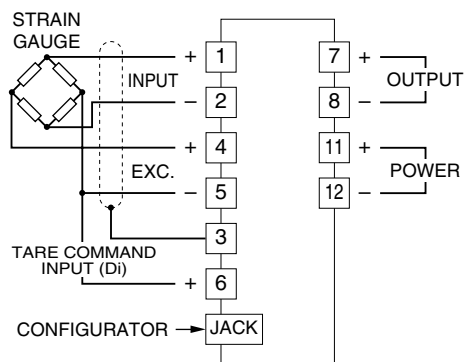
Connect the unit as in the diagram below or refer to the connection diagram on the side of the unit.

### EXTERNAL DIMENSIONS unit: mm (inch)



• When mounting, no extra space is needed between units.

### CONNECTION DIAGRAM



### WIRING INSTRUCTIONS

- Applicable wire size

Solid: 0.2 to 2.5 mm<sup>2</sup> (0.55 to 1.75 dia.)

Stranded: 0.2 to 2.5 mm<sup>2</sup>

Tinning wire ends may cause contact failure and therefore is not recommended.

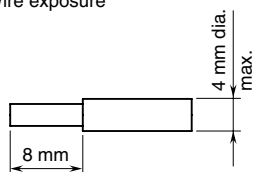
Ferruled: 0.2 to 1.5 mm<sup>2</sup> (0.55 to 1.35 dia.)

The following Phoenix Contact terminals are recommended:

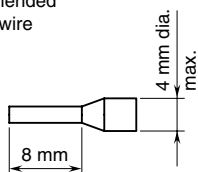
AI 0,25-8YE	0.2 to 0.25 mm <sup>2</sup>
AI 0,34-8TQ	0.25 to 0.34 mm <sup>2</sup>
AI 0,5-8WH	0.34 to 0.5 mm <sup>2</sup>
AI 0,75-8GY	0.5 to 0.75 mm <sup>2</sup>
AI 1,0-8RD	0.75 to 1.0 mm <sup>2</sup>
AI 1,5-8BK	1.0 to 1.5 mm <sup>2</sup>

- Expose wire conductors by 8 mm (0.31").

Wire exposure

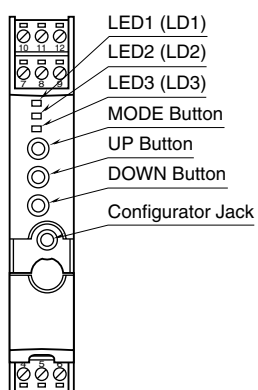


Recommended ferruled wire

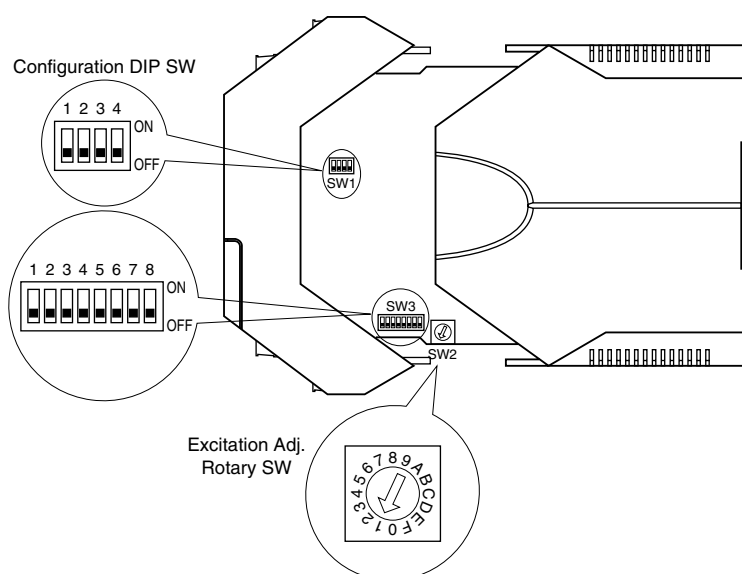


## EXTERNAL & INTERNAL VIEWS

### ■ FRONT VIEW



### ■ SIDE VIEW



For M3LLC-x-R4/A, the DIP switch setting is required to select output and input types before setting a precise output range using the PC configurator software.

## CONFIGURATION MODE & DIP SW SETTINGS

When you program the transmitter module, two configuration modes are available: Field Configuration using DIP SW / control buttons, and PC Software. (The M3LLC-x-R4/B is for the field configuration only.)

The internal DIP switches are used to configure excitation and output type. Once the module is configured, precise input and output ranges are set up with the front control buttons using a simulator connected to the input terminals and a multimeter connected to the output terminals as a reference.

The calibrated input and output ranges are stored in the internal memory. The module reads the DIP-switch-calibrated configuration (except for the excitation voltage) only once after the power supply is turned on. Set the switches with the power supply removed (except for the excitation voltage).

### ■ DIP SW CONFIGURATION MODE

Turn the SW3-3 OFF to enable the DIP SW (Field Configuration) mode as shown in Table 1.

See Table 3 and 4 to configure the excitation and Table 5 for the output.

### ■ PC CONFIGURATION MODE

Turn the SW3-3 ON to enable the PC Configuration mode as shown in Table 1. All programmable features can be set up on a PC regardless of other DIP SW setting except for the output type must be selected with the DIP SW1-1 through SW1-4 (See Table 6).

For detailed information on the PC configuration, refer to the M3CFG instruction manual.

■ CONFIGURATION MODE (SW3) Table 1

MODE	SW3-3	
DIP SW	OFF	Configuration mode can be Confirmed with the front LED.
PC	ON	

■ FRONT CONTROL BUTTON LOCK (SW3) Table 2

Table 2 setting is applicable to firmware version 3.01 or higher (marking on the product).

LOCK	SW3-4	
Unlock	OFF	PC Configuration is not disabled when the front control button function is locked.
Lock	ON	

■ EXCITATION VOLTAGE, COARSE (SW2) Table 3

Set excitation voltage to the range between 0.1 and 10 V.

SW2	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Exc. Volts	0	1	2	3	4	5	6	7	8	9	10	11	12	12	12	12

Note: Although the voltage can be set higher than 10 V, it is out of specification.

■ EXCITATION VOLTAGE, FINE (SW3) Table 4

POSITION	SW3-5	SW3-6	SW3-7	SW3-8
OFF	+0 V	+0 V	+0 V	+0 V
ON	+0.8 V	+0.4 V	+0.2 V	+0.1 V

■ OUTPUT TYPE & RANGE

Table 7

OUTPUT TYPE	MINIMUM SPAN	MAXIMUM RANGE	CONFORMANCE RANGE
DC Current	1 mA	0 to 20 mA	0 to 24 mA
DC Voltage, Narrow Spans	250 mV	-2.5 to +2.5 V	-3 to +3 V
DC Voltage, Wide Spans	1 V	-10 to +10 V	-11.5 to +11.5 V

■ OUTPUT TYPE (SW3 & 1) Table 5

OUTPUT	SW3-1	SW3-2	SW1-1	SW1-2	SW1-3	SW1-4
0 – 20 mA	OFF	OFF	OFF	OFF	ON	OFF
-2.5 – +2.5 V	OFF	ON	ON	OFF	OFF	ON
-10 – +10 V	ON	OFF	OFF	ON	OFF	ON

■ OUTPUT TYPE / PC CONFIG (SW1) Table 6

OUTPUT	SW1-1	SW1-2	SW1-3	SW1-4
0 – 20 mA	OFF	OFF	ON	OFF
-2.5 – +2.5 V	ON	OFF	OFF	ON
-10 – +10 V	OFF	ON	OFF	ON

## CHECKING

- 1) Terminal wiring: Check that all cables are correctly connected according to the connection diagram.
- 2) DIP SW setting: Check that the switches are set to appropriate positions.
- 3) Power input voltage: Check voltage across the terminal 11 – 12 with a multimeter.
- 4) Input: Check that the input signal is within 0 – 100% of full-scale.
- 5) Output: Check that the load resistance meets the described specifications.

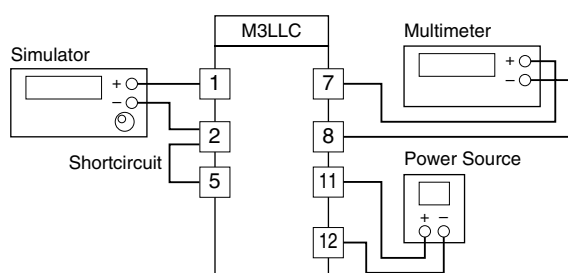
## I/O RANGING & FINE ADJUSTMENTS

After the DIP SW setting is complete, set up the precise input and output range using the front control buttons. Be sure that the front control button function is enabled with the DIP switch setting.

The front LEDs' colors and blinking patterns help you to easily identify the transmitter's status and confirm the set-up actions in each step of Calibration Modes. Please read the following explanations referring to "Calibration Flow Chart".

### ■ PREPARATION

- 1) Mount the DIP-SW-configured M3LLC on to a DIN rail.
- 2) Connect the M3LLC to a simulator and a multimeter and to a power source as shown below.
- 3) Turn the power supply on and wait for 10 minutes.



### ■ INPUT & OUTPUT RANGING

[Example] Setting input to 0 – 10 mV, output to 1 – 5 V DC

- 1) Run Mode: Confirm that the green LED is blinking (model M3LLC-x-x/A) or the green LED turns on (model M3LLC-x-x/B).
- 2) Input Ranging Mode: Hold down MODE button for longer than 5 seconds until the LD1 red LED is ON and the LD2 red LED is blinking.
- 3) 0% Input Ranging: Apply the desired minimum input level (e.g. 0 mV) from the simulator and hold down DOWN button until the LD1 blinks for approx. 2 sec. and then turns OFF. When you release the button, the LD1 is returned to ON.

The blinking LD1 means that the value is stored in the memory. If LED's blinking frequency does not change, the entered level may be inappropriate: too small a span, or out of usable range (same for all steps).

- 4) 100% Input Ranging: Apply the desired maximum input level (e.g. 10 mV) from the simulator and hold down UP button until the LD1 blinks for approx. 2 sec. and then turns OFF. When you release the button, the LD1 is returned to ON.

- 5) Output Ranging Mode: Press MODE button and confirm that the LD1 red LED is ON and the LD3 red LED instead of LD2 is blinking.
- 6) 0% Output Ranging: Increase or decrease the simulated input until the meter shows the desired minimum output level (e.g. 1 V). Hold down DOWN button until the LD1 blinks for approx. 2 sec. and then turns OFF. When you release the button, the LD1 is returned to ON.
- 7) 100% Output Ranging: Increase or decrease the simulated input until the meter shows the desired maximum output level (e.g. 5 V). Hold down UP button until the LD1 blinks for approx. 2 sec. and then turns OFF. When you release the button, the LD1 is returned to ON.
- 8) Run Mode: When calibration is completed, press MODE button once and confirm that: the LD1 green LED is blinking in case of M3LLC-x-x/A; and the LD1 green LED is ON in case of M3LLC-x-x/B.

### ■ ZERO & SPAN ADJUSTMENTS

After the transmitter is installed and operational, fine zero and span tuning can be performed as explained below. Both zero and span are adjustable within  $\pm 15\%$ .

- 1) Run Mode: Confirm that the green LED is blinking (model M3LLC-x-x/A) or the green LED turns on (model M3LLC-x-x/B).
- 2) Fine Zero Adjustment Mode: Hold down MODE button for 1 or 2 seconds until the LD1 red LED is ON and the LD2 green LED is blinking.  
Use UP (increase) and DOWN (decrease) buttons to adjust the output to 0%.
- 3) Fine Span Adjustment Mode: Press MODE button and confirm that the LD1 red LED is ON and the LD3 green LED instead of LD2 is blinking.  
Use UP (increase) and DOWN (decrease) buttons to adjust the output to 100%.
- 4) Run Mode: When fine adjustment is completed, press MODE button once and confirm that: the LD1 green LED is blinking in case of M3LLC-x-x/A; and the LD1 green LED is ON in case of M3LLC-x-x/B.

Note 1: Calibration steps can be skipped when not needed by repeating pushing MODE buttons.

Note 2: There is no limitation of entering values for multiple times within one step of Calibration Mode. Signal level is stored each time the respective UP or DOWN button is pressed. However, for the input ranging, end always with 100% (UP).

### ■ TARE ADJUSTMENT

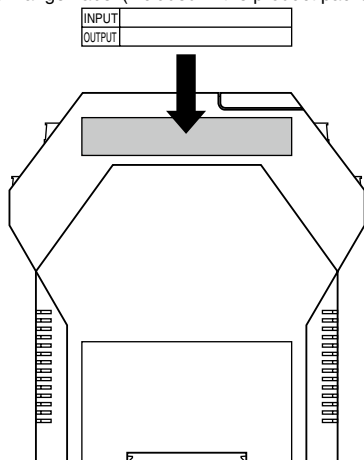
- 1) Apply tare load to the sensor.
- 2) Close across the tare command input terminals. Tare adjustment value is set so that present sensor input value equals input 0%.
- 3) Open the tare command input terminals.

Note: When input calibration or ranging is performed, tare adjustment value is reset to 0% automatically. Perform the tare adjustment again.

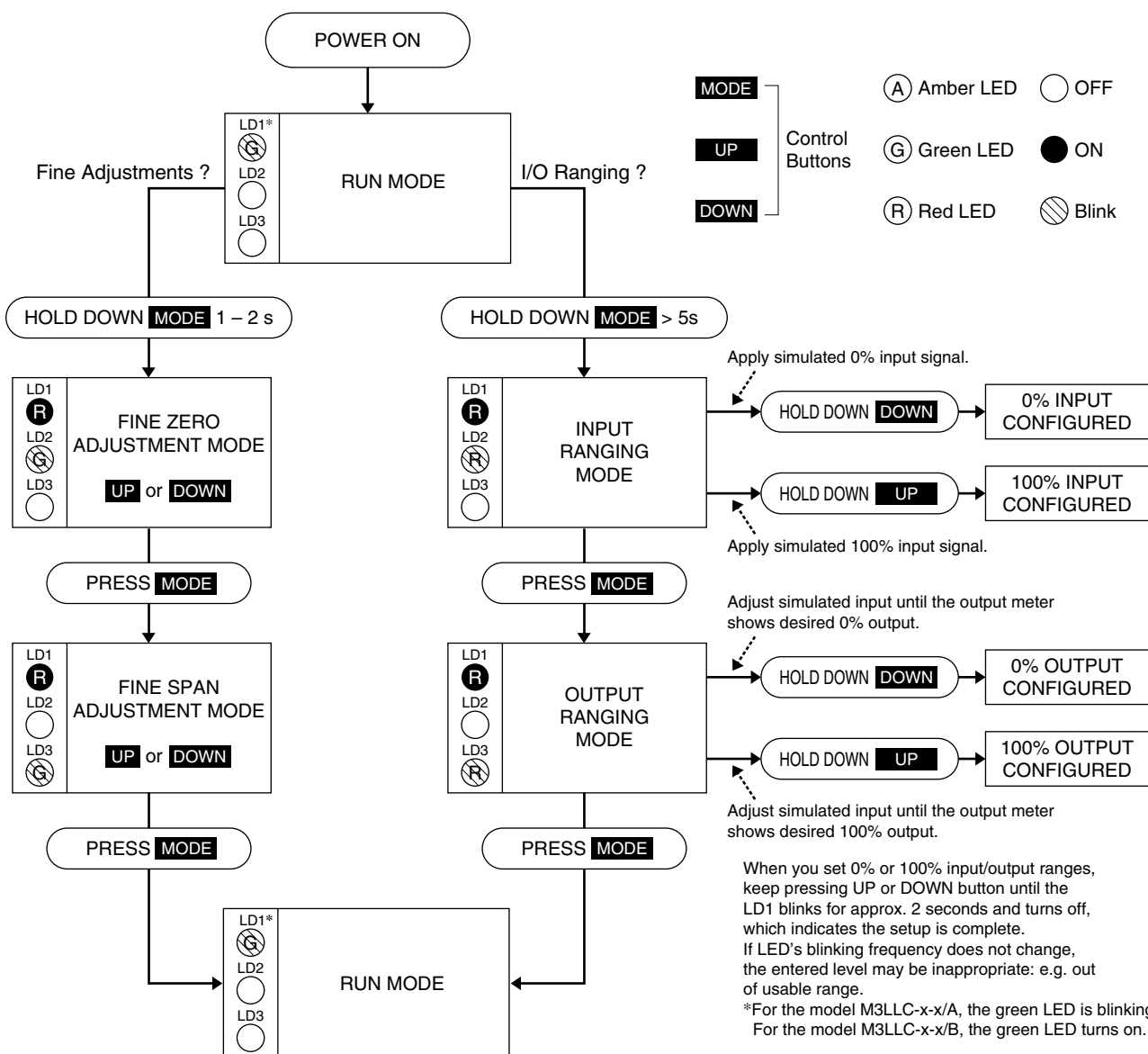
## ■ I/O RANGE LABEL

Blank I/O range labels are included in the product package.  
Write in the configured ranges and put the label on the side  
as shown below.

I/O Range Label (included in the product package)



## ■ CALIBRATION FLOW CHART


























## STATUS INDICATOR LED

Combinations of the three front LEDs (LD1, LD2, LD3) indicate the transmitter's operating status by different blinking patterns.

Examples are shown below.

- (A) Amber LED    (○) OFF  
 (G) Green LED    (●) ON  
 (R) Red LED    (⦿) Blink

NORMAL OPERATION (RUN) MODE			
LD1 	<b>PC Configuration RUN Mode (Option A)</b> The transmitter is configured via PC and is in normal operating conditions.	LD1 	<b>DIP SW Configuration RUN Mode</b> The transmitter is configured via DIP SW and is in normal operating conditions.
LD2 		LD2 	
LD3 		LD3 	
ERROR MODE			
LD1 	<b>System Error</b> Indicates the CPU's communication error.	LD1 	<b>DIP SW Error</b> DIP SW configuration is inappropriate. Check the DIP SW setting referring to Tables 2 – 6.
LD2 		LD2 	
LD3 		LD3 	
LD1 	<b>Input Saturated in PC Configuration Mode (Option A)</b> The input is saturated.	LD1 	<b>Input Saturated in DIP SW Configuration Mode</b> The input is saturated.
LD2 		LD2 	
LD3 		LD3 	
LD1 	<b>Output Saturated in PC Configuration Mode (Option A)</b> The output is below -15% or above 115%.	LD1 	<b>Output Saturated in DIP SW Configuration Mode</b> The output is below -15% or above 115%.
LD2 		LD2 	
LD3 		LD3 