

# FREQUENCY TRANSMITTER

(field- and PC-configurable)

MODEL **M3LPA2**

## 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 M3LPA2 with Option A is programmable using the PC configurator software. For detailed information on the PC configuration, refer to the M3LPACFG instruction manual. The M3LPACFG 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

- This equipment is suitable for Pollution Degree 2 and Installation Category II (transient voltage 2500V). Reinforced insulation (signal input or output to power input: 300V) and basic insulation (signal input to output: 300V) are maintained. Prior to installation, check that the insulation class of this unit satisfies the system requirements.
- Altitude up to 2000 meters.
- The equipment must be mounted inside a panel.
- Insert noise filters for the power source connected to the unit. TDK-Lambda Model RSEN-2020 or equivalent is recommended.
- The equipment must be installed such that appropriate clearance and creepage distances are maintained to conform to CE requirements. Failure to observe these requirements may invalidate the CE conformance.

- 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:  
100 – 240V AC rating: 85 – 264V, 47 – 66 Hz, approx. 3 – 5VA  
10 – 32V DC rating: 9 – 36V, approx. 3W

### ■ 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.

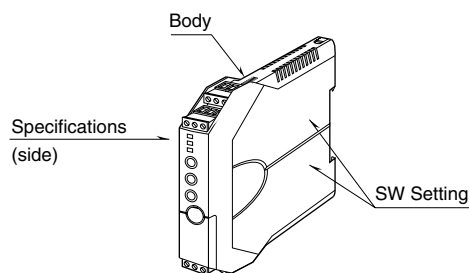
### ■ AND ....

- 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.

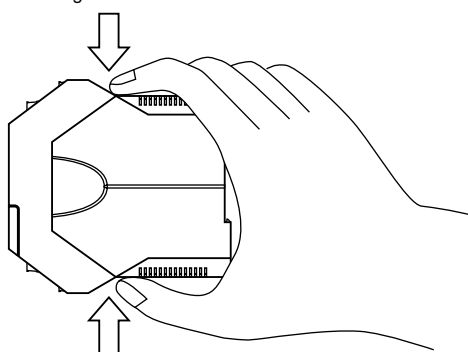
## COMPONENT IDENTIFICATION



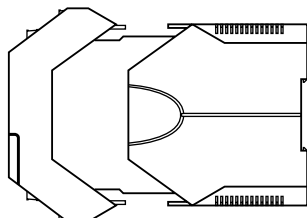
### ■ HOW TO OPEN THE COVER WHEN SETTING DIP SW

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

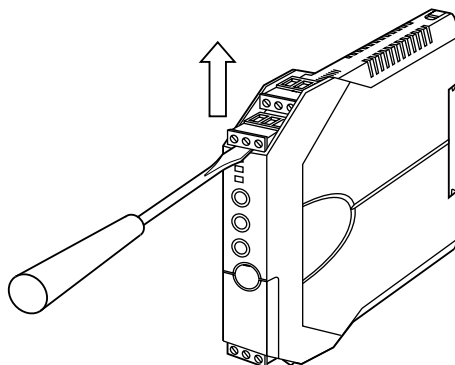


• Housing Cover Fully Opened



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

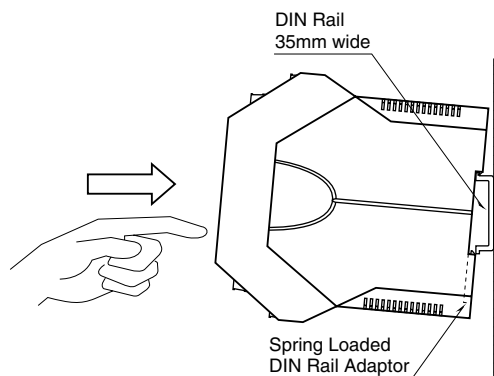
When you need to separate the euro type connector terminal blocks from the transmitter body for wiring, insert a minus driver between the euro type connector terminal block and the housing body, pull up the driver and pull out the euro type connector terminal block.



## INSTALLATION

### ■ DIN RAIL MOUNTING

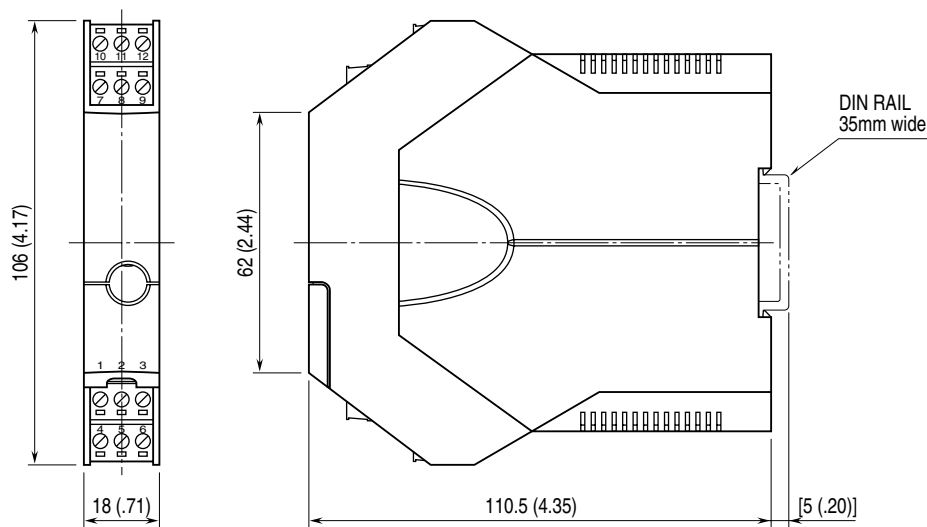
Set the unit so that its DIN rail adaptor is at the bottom. Position the upper hook at the rear side of the unit on the DIN rail and push in the lower. When removing the unit, push down the DIN rail adaptor utilizing a minus screwdriver and pull.



## TERMINAL CONNECTIONS

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

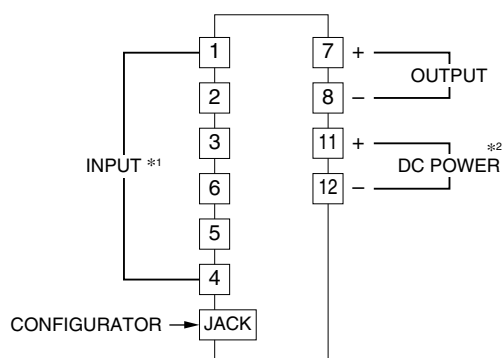
### EXTERNAL DIMENSIONS unit: mm (inch)



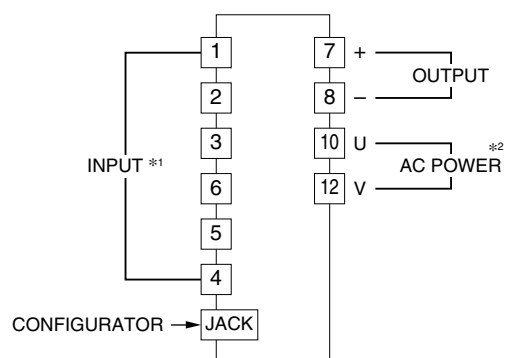
• When mounting, no extra space is needed between units.

### CONNECTION DIAGRAM

#### DC POWERED TYPE



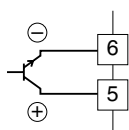
#### AC POWERED TYPE



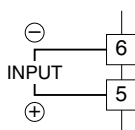
\*2. Be aware that the AC power and DC power connect to different terminals.

#### \*1. Input Connection Examples

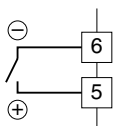
##### Open Collector



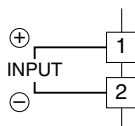
##### Voltage Pulse



##### Mechanical Contact

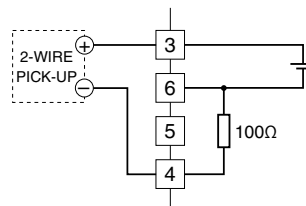


##### RS-422 Line Driver Pulse

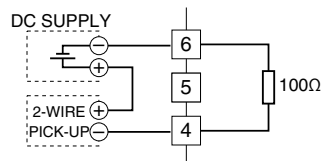


##### Two-wire Current Pulse

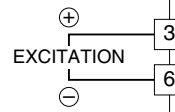
###### Built-in Excitation



###### External DC Supply



##### Excitation Supply



## ■ 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>

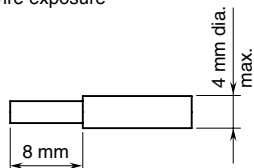
AI 0,75-8GY 0.5 to 0.75 mm<sup>2</sup>

AI 1,0-8RD 0.75 to 1.0 mm<sup>2</sup>

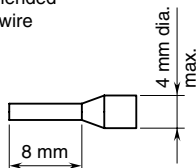
AI 1,5-8BK 1.0 to 1.5 mm<sup>2</sup>

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

Wire exposure

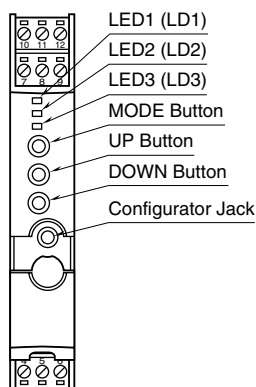


Recommended ferruled wire

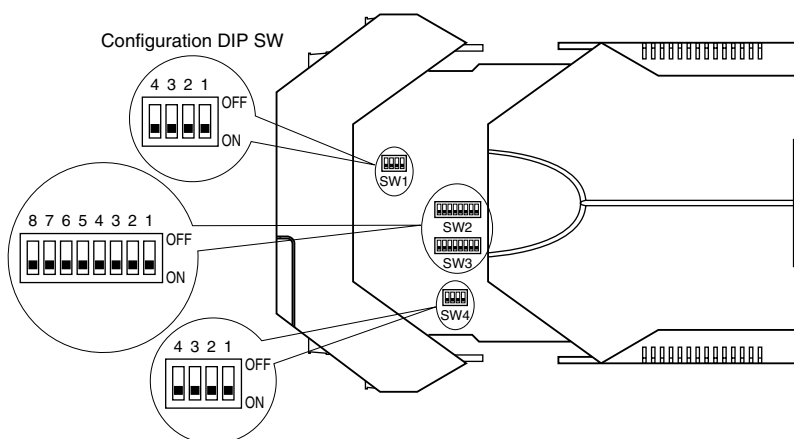


## EXTERNAL & INTERNAL VIEWS

### ■ FRONT VIEW



### ■ SIDE VIEW



The DIP switch setting is required to select output 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 Option B type is for the field configuration only.)

The internal DIP switches are used to configure input and output type. Once the module is configured, precise 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 only once after the power supply is turned on. Set the switches with the power supply removed.

### ■ DIP SW CONFIGURATION MODE

Turn the SW3-8 OFF to enable the DIP SW (Field Configuration) mode as shown in Table 1.

See Table 3 through 10 to configure the input and Table 11 for the output.

### ■ PC CONFIGURATION MODE

Turn the SW3-8 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 following: the output type must be selected with the DIP SW1-1 through SW1-4 (See Table 12), and the pulse sensing type and noise filter must be selected with the DIP SW4-1 through SW4-3 (See Tables 9 and 10).

For detailed information on the PC configuration, refer to the M3LPACFG instruction manual.

## ■ CONFIGURATION MODE (SW3)

Table 1

MODE	SW3-8	Configuration mode can be Confirmed with the front LED.
DIP SW PC	OFF ON	

## ■ FRONT CONTROL BUTTON LOCK (SW3)

Table 2

LOCK	SW3-1	PC Configuration is not disabled when the front control button function is locked.
Unlock Lock	OFF ON	

## ■ INPUT TYPE (SW2)

Table 3

INPUT	SW2-2	SW2-1
Open collector Mechanical contact	OFF	OFF
Voltage pulse	ON	OFF
Two-wire current pulse	OFF	ON
RS-422 line driver pulse	ON	ON

## ■ FREQUENCY RANGE (SW2)

Table 4

FREQUENCY	SW2-5	SW2-4	SW2-3
0 – 10 Hz	ON	OFF	OFF
0 – 100 Hz	OFF	ON	OFF
0 – 1 kHz	ON	ON	OFF
0 – 10 kHz	OFF	OFF	ON
0 – 200 kHz	ON	OFF	ON

## ■ PULSE AMPLITUDE (SW2)

Table 5

AMPLITUDE	MAXIMUM VOLTAGE	SW2-8	SW2-7	SW2-6
50 – 100 V <sub>p-p</sub>	100 V *1	OFF	OFF	OFF
25 – 50 V <sub>p-p</sub>	50 V *2	ON	OFF	OFF
10 – 25 V <sub>p-p</sub>	25 V	OFF	ON	OFF
5 – 10 V <sub>p-p</sub>	10 V	ON	ON	OFF
1 – 5 V <sub>p-p</sub>	5 V	OFF	OFF	ON
0.5 – 1 V <sub>p-p</sub>	1 V	ON	OFF	ON
0.1 – 0.5 V <sub>p-p</sub>	0.5 V	OFF	ON	ON

\*1. Max. 30 V<sub>rms</sub>, 42.4 V<sub>peak</sub> or 60 V DC for UL approval

\*2. Max. 30 V<sub>rms</sub>, 42.4 V<sub>peak</sub> or 50 V DC for UL approval

## ■ CUTOFF (SW3)

Table 6

SW3-7 is usable only with the M3LPA2-x/B.

CUTOFF	SW3-7
With (0.1% fixed)	ON
Without	OFF

## ■ POLARITY (SW3)

Table 7

POLARITY	SW3-6
Bipolar	OFF
Unipolar	ON

When Bipolar is selected, the internal detecting level is fixed to 0 V.

## ■ EXCITATION SUPPLY (SW3)

Table 8

EXCITATION	SW3-5	SW3-4
4 V	ON	OFF
8 V	OFF	ON
12 V	ON	ON

## ■ PULSE SENSING (SW4) \*3

Table 9

SENSING	SW4-3
Capacitor coupled *4	OFF
DC coupled *5	ON

\*3. DIP SW setting is required for PC configuration type.

\*4. Frequency range must be 0 – 100 Hz or higher. 0 – 1 kHz or higher for sinusoidal waveform input. Frequencies lower than 10 Hz may be out of accuracy conformance.

\*5. For sinusoidal waveform input with the pulse amplitude smaller than 1 V<sub>p-p</sub>, the frequency range must be 0 – 1 kHz or higher, or extend the sampling time by using the PC configurator software.

## ■ NOISE FILTER (SW4) \*3

Table 10

FILTER	SW4-2	SW4-1
Large	ON	OFF
Small	OFF	ON
Without	OFF	OFF

Time constant is set to 50 msec. with the 'large' noise filter setting and to 10 msec. with the 'small' noise filter setting.

## ■ OUTPUT TYPE (SW3 &amp; 1)

Table 11

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

## ■ OUTPUT TYPE / PC CONFIG (SW1) \*3

Table 12

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

## 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 10 – 12 (AC) or 11 – 12 (DC) 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.

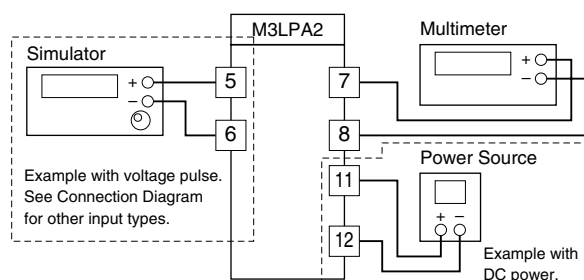
## I/O RANGING & FINE ADJUSTMENTS

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 (e.g. M3LPA2-R4/A, DC powered type)

- 1) Mount the DIP-SW-configured M3LPA2 on to a DIN rail.
- 2) Connect the M3LPA2 to a simulator and a multimeter and to a DC power source as shown below.
- 3) Turn the power supply on and wait for 10 minutes.



### ■ INPUT & OUTPUT RANGING

[Example] Setting input to 10 – 80 Hz (DIP SW range 0 – 100 Hz), output to 1 – 5 V DC (DIP SW range  $\pm 10$  V).

- 1) Run Mode: Confirm that the green LED is blinking (model M3LPA2-x/A) or the green LED turns on (model M3LPA2-x/B).
- 2) Detecting Level Adjustment Mode: Hold down MODE button for longer than 5 seconds until the LD1 red LED is ON.
- 3) Detecting Level Setting: Apply the full-scale input level (e.g. 100 Hz) from the simulator and press UP or DOWN buttons until the output meter shows the full-scale output level (e.g. +10 V).
- 4) Input Ranging Mode: Press MODE button and confirm that the LD1 red LED is ON and the LD2 red LED is blinking.
- 5) 0% Input Ranging: Apply the desired minimum input level (e.g. 10 Hz) from the simulator and hold down DOWN button until the LD1 blinks for approx. 5 sec. and then turns OFF. When you release the button, the LD1 is returned to ON.

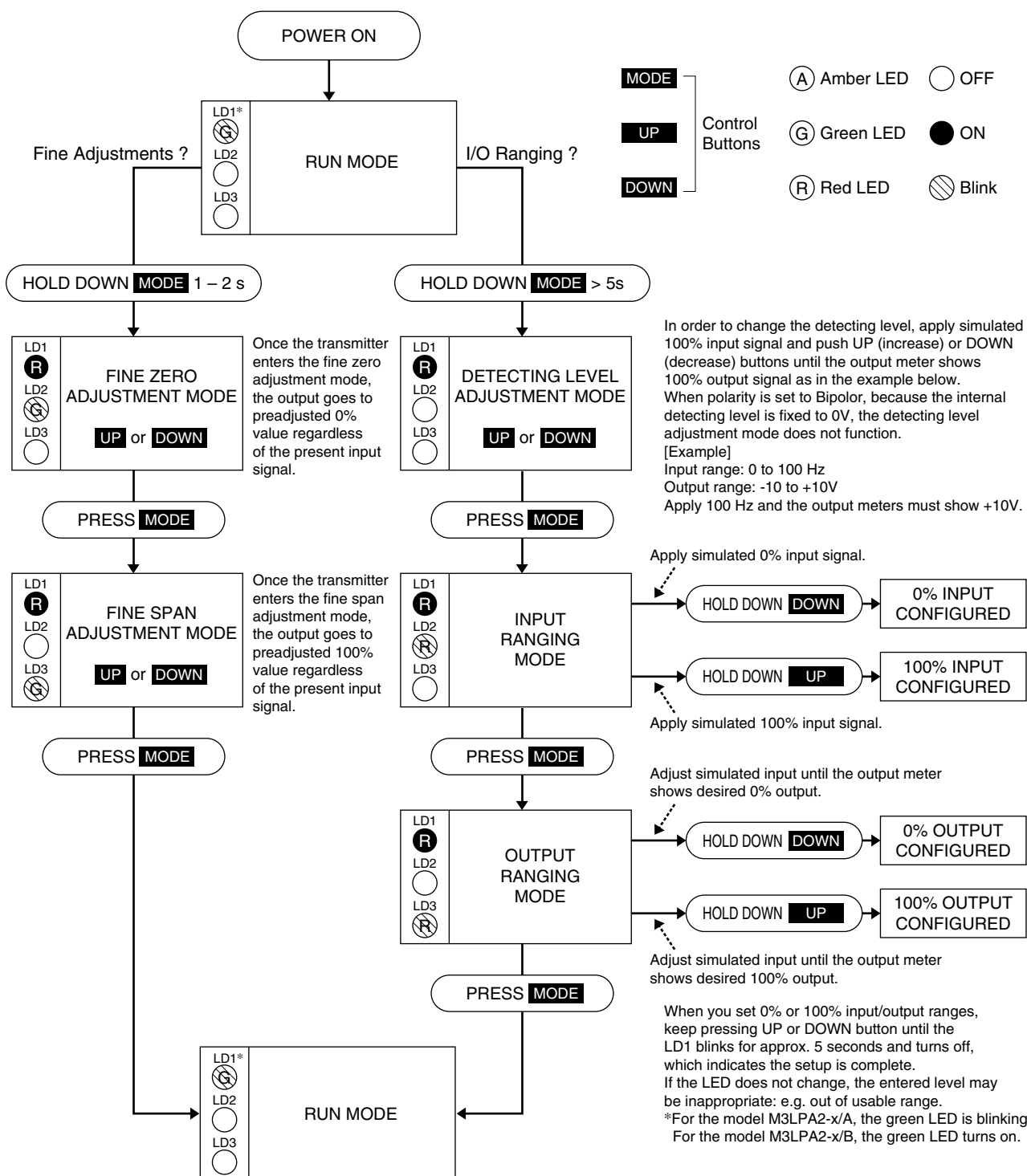
The blinking LD1 means that the value is stored in the memory. If LED's blinking frequency does not change, the entered level may be inappropriate: too small a span, or out of usable range (same for all steps).

For setting 0% input to 0 Hz, apply certain frequency below 1 Hz.

- 6) 100% Input Ranging: Apply the desired maximum input level (e.g. 80 Hz) from the simulator and hold down UP button until the LD1 blinks for approx. 5 sec. and then turns OFF. When you release the button, the LD1 is returned to ON.
- 7) 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.

- 8) 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. 5 sec. and then turns OFF. When you release the button, the LD1 is returned to ON.
- 9) 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. 5 sec. and then turns OFF. When you release the button, the LD1 is returned to ON.
- 10) Run Mode: When calibration is completed, press MODE button once and confirm that: the LD1 green LED is blinking in case of M3LPA2-x/A; and the LD1 green LED is ON in case of M3LPA2-x/B.

## ■ CALIBRATION FLOW CHART



## ■ INPUT TYPE & RANGE

Table 13

INPUT TYPE	MINIMUM AMPLITUDE	MAXIMUM RANGE	MAXIMUM AMPLITUDE
Open Collector	4 V	0 – 200 kHz	12 V
Mechanical Contact	4 V	0 – 10 Hz	12 V
Voltage Pulse	0.1 V	0 – 200 kHz	100 V
Two-wire Current Pulse	4 mA	0 – 200 kHz	25 mA
RS-422 Line Driver Pulse	—	0 – 200 kHz	—

## ■ OUTPUT TYPE & RANGE

Table 14

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

## ■ 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 M3LPA2-x/A) or the green LED turns on (model M3LPA2-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 M3LPA2-x/A; and the LD1 green LED is ON in case of M3LPA2-x/B.

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

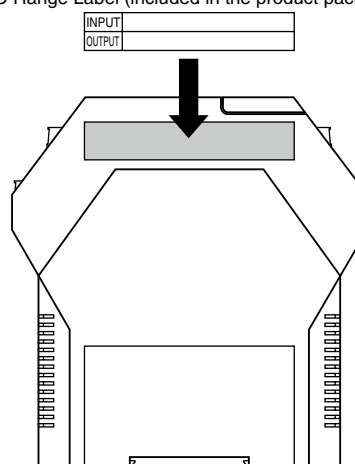
Note 2: There is no limitation of entering values for multiple times within one step of Calibration Mode. Signal level is stored each time the respective UP or DOWN button is pressed. However, for the input ranging, end always with 100% (UP).

Note 3: Once the transmitter enters the fine zero or span calibration mode, the output goes to preadjusted 0% or 100% value respectively regardless of the present input signal.

## ■ 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.

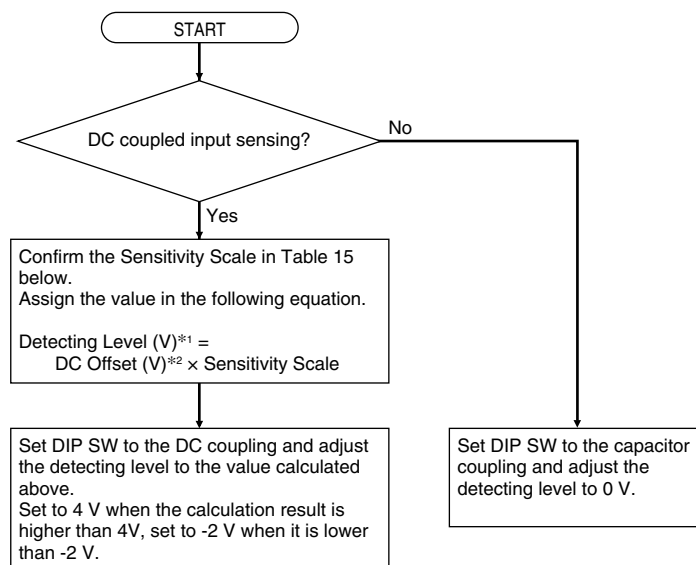
I/O Range Label (included in the product package)





## ADJUSTING DETECTING LEVEL BY USING PC CONFIGURATOR SOFTWARE

PC Configurator Software (model: M3LPACFG) can be used to adjust the detecting level with Option A type. Appropriate detecting level is determined according to the flow chart below (voltage pulse or 2-wire current pulse input only).



\*1. Rounded off to one decimal place.

\*2. Divide a 2-wire current pulse input (mA) by 10 and convert it into voltage (V).  
e.g. Offset = 10 mA --> 10 mA x 1/10 = 1 V

**Table 15**

PULSE AMPLITUDE	SENSITIVITY SCALE
50 – 100 Vp-p	1/20
25 – 50 Vp-p	1/10
10 – 25 Vp-p	1/5
5 – 10 Vp-p	1/2
1 – 5 Vp-p	1
0.5 – 1 Vp-p	1
0.1 – 0.5 Vp-p	1

A specific sensitivity scale is applied according to the pulse amplitude by setting up the DIP switch and PC Configuration Software. The scaled input voltage is then compared to the detecting level at -2.00 through +4.00 V.

With DC coupling, the scaled maximum input voltage level must be higher than and the scaled minimum input voltage level must be lower than the detecting level so that the pulse state is accurately detected.

### • Setting Examples

Voltage Pulse Input (DC Offset = Pulse Amplitude / 2)

PULSE AMPLITUDE (Vp-p)	AMPLITUDE RANGE (Vp-p)	DETECTING LEVEL (V)
100	50 – 100	2.5
50	25 – 50	2.5
30	25 – 50	1.5
25	10 – 25	2.5
15	10 – 25	1.5
10	5 – 10	2.5
7.5	5 – 10	1.9
5	1 – 5	2.5
3.5	1 – 5	1.8
2	1 – 5	1
1	0.5 – 1	0.5
0.5	0.1 – 0.5	0.3

2-wire Current Pulse Input (DC Offset = Pulse Amplitude / 2)

PULSE AMPLITUDE (mAp-p)	AMPLITUDE RANGE (Vp-p)	DETECTING LEVEL (V)
16 (1.6 Vp-p)	1 – 5	0.8
25 (2.5 Vp-p)	1 – 5	1.3







## HOW TO RESET TO DEFAULT STATUS


















- 1) Set SW3-4 and SW3-5 to OFF position.
- 2) Turn on the power supply to the transmitter while pressing MODE button.
- 3) Wait until green LED turns on at the LD1, LD2 and LD3.
- 4) Reset SW3-4 and SW3-5 to the previous position. Turn off and on the power supply.

## 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.

-  Amber LED     OFF  
 Green LED     ON  
 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 – 12.
LD2 		LD2 	
LD3 		LD3 	
LD1 	<b>Output Saturated in PC Configuration Mode (Option A)</b> The output is saturated 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 