

# OPERATION MANUAL

## DIGITAL TEMPERATURE INDICATOR WITH ALARMS



**MODEL : 8080PR1**

**INTERNATIONAL METAL ENGINEERING**

Released on 11<sup>th</sup> Mar 2013

## DESCRIPTION

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The IME 8080PR1 is a micro-controller based Digital Indicator with control output feature, offered in a highly compact, rugged and reliable execution. It is manufactured using selected high-grade components which guarantee its functionality and long operation. It carries a performance guarantee against manufacturing defects and workmanship defects.

The micro-controller based Temperature Indicating Controller Model 8080PR1 is therefore an ideal instrument for temperature measurement applications because of its versatility and inherent accuracy in process measurement and control, besides other superior characteristics such as total immunity to shocks, dust, ambient temperatures, and humidity.

The unit is designed for use in process industries where vibration, inclement weather and corrosive environments prevail. The electronics are enclosed in low copper epoxy coated Aluminum housing; and for more aggressive environments, 316 Stainless Steel housing is optionally available. Both housings meet the requirements of NEMA 4X and IP68.

The instrument has three keys on the front panel, with which the operator can set the parameters and configure the instrument as desired. A four-digit red LED digital display is provided on the front panel which indicates the process temperature value in real time. The display can indicate any scale range between -999 to 9999 units.

The instrument has non-volatile memory (i.e., in case of power failure, the set points and other settings are retained in memory and the indication and control actions resume after power is restored).

The temperature display is factory calibrated to normal operating ranges of the respective temperature sensors through the instrument software and may be changed whenever desired.

The instrument accepts the following input signal:

SR. NO.	TEMPERATURE SENSOR	CALIBRATED RANGE	
		$^{\circ}\text{C}$	$^{\circ}\text{F}$
1.	RTD Pt-100 (three-wire)	-70.0 to 500.0	-94.0 to 932.0

Indications are available both in Degrees Celsius, as well as in Degrees Fahrenheit. The desired unit may be selected at the time of configuration of the instrument.

The input signal is suitably isolated and conditioned by the micro-controller, which displays the actual temperature value in real time on the digital display.

Two Relay outputs are offered in this model – each of which may be configured to operate on either High or Low setting, with its independent hysteresis value. The proportional output is applicable to Relay-1 only, while Relay-2 will operate as simple On-Off. These set-points may be set through the Membrane Switch-pad on the front panel

**Proportional Control:** - A Proportional Control is a generic control loop feedback mechanism (controller) widely used in industrial control systems. A Proportional controller attempts to correct the error between a measured process variable and a desired set-point by using Cycle Time & Proportional Band and then generating an output for corrective action that can adjust the process accordingly.

**Cycle Time:** - The Cycle Time is the time duration for which the Proportional Controller operates ON/OFF cycles of Relay-1 to achieve the desired set point. The Cycle Time is in seconds and has a range from 0 to 60 seconds.

**Proportional Band:** - The Proportional Band is the range below the set point, the controller acts as a proportional to achieve the set-point. Below the Proportional Band the Relay will be continuously ON. The Proportional Band is read in percentage of set point.

Example: -  
Suppose the user sets

Proportional Band	= 20%
Cycle Time	= 10 Seconds
Set Point	= 50°C

then at Process value 40°C, the controller starts Proportional Output with 10 seconds ON time and 0 seconds OFF time. As the process value reaches to set point 50°C, the ON will get reduced and the OFF time will get increased. At Process Value 45°C, the ON time will be 5 seconds and OFF time will be 5 seconds. At process Value 50°C, the ON time will be 0 seconds and OFF will be 10 seconds.

The 8080PR1 has a feature of analog 4 to 20 mA DC output, which can be configured as either a Retransmission or Proportional control output. The retransmission 4 to 20 mA DC output is a linear follower of the input signal, as per displayed process value. However, the Proportional control output of 4 to 20 mA DC will come into effect only when the operator selects Proportional Control; otherwise it will work as a simple ON/OFF signal (4mA or 20mA). The 4 to 20 mA DC control output will depend upon Proportional action of the internal microcontroller corresponding to the set Proportional parameters.

Status of Analog Output depends upon parameter settings are as follows: -

Sr. No.	Relay 1 (Con1)	Analog O/P (C-OP)	4-20mA O/P staus
1	<b>PTOP</b>	<b>Γetn</b>	Linear
2	<b>PTOP</b>	<b>CntL</b>	Proportional
3	HEt	<b>Γetn</b>	Linear
4	HEt	<b>CntL</b>	Linear
5	COL	<b>Γetn</b>	Linear
6	COL	<b>CntL</b>	Linear

The micro-controller based Temperature Indicating Controller Model: 8080PR1 is therefore an ideal instrument for temperature measurement and control applications because of its versatility and inherent accuracy in process measurement and control, besides other superior characteristics such as total immunity to shocks, dust, ambient temperatures, and humidity.

Further, the instrument is manufactured using selected high-grade components which guarantee its functionality and long operational life. The instrument carries a performance guarantee against manufacturing defects and workmanship defects (see Warranty clause).

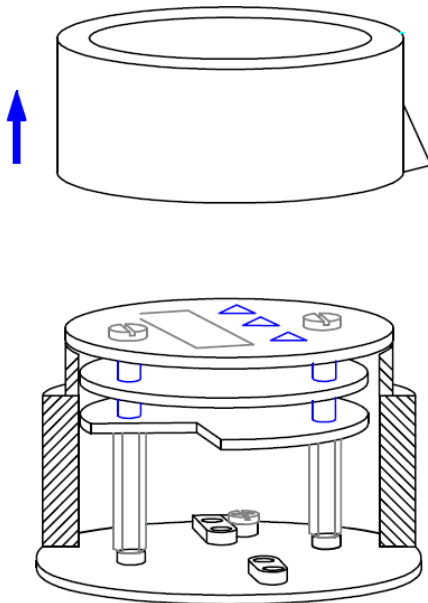
## INSTALLATION

All interconnections to the instrument should be made with strong multi-strand wire of the order of 2.5 sq.mm. The ends of the wires should be properly ferruled and suitable lugs must be used for effective termination. See installation diagram below.

The cables carrying the input (Sensor) signal should be routed separately and properly isolated from the power line cables and Control Relay wiring, to prevent any electromagnetic interference in the input signal readings from the mains power line. Use of shielded twisted pair cable is recommended for analog input signals and compensated cable for temperature sensors. The instrument should be earthed to a proper grounding point before connecting the Power Supply. The voltage between the Earth and Neutral terminals should be negligible (Approx. 1 V AC). The Relay contacts are potential free and any desired voltage may be used in conjunction with the same.

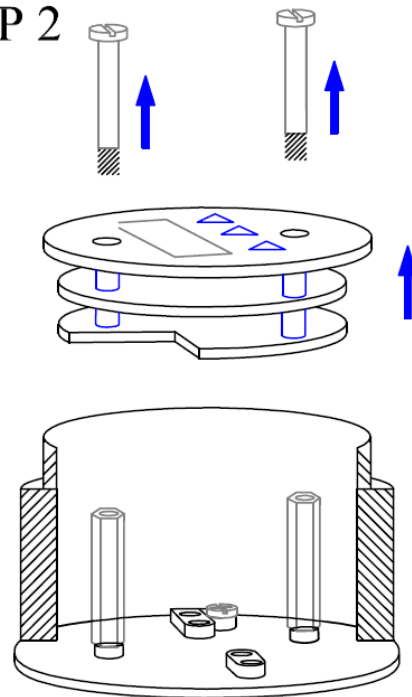
**All Relay Circuits shall be connected to same phase circuit only.**

STEP 1



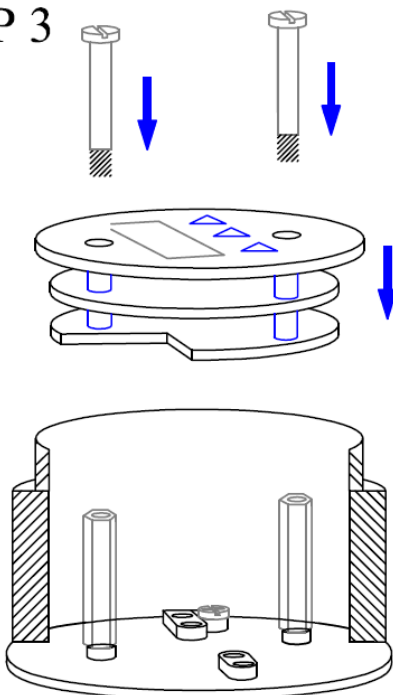
1) UNSCREW AND REMOVE ENCLOSURE COVER

STEP 2



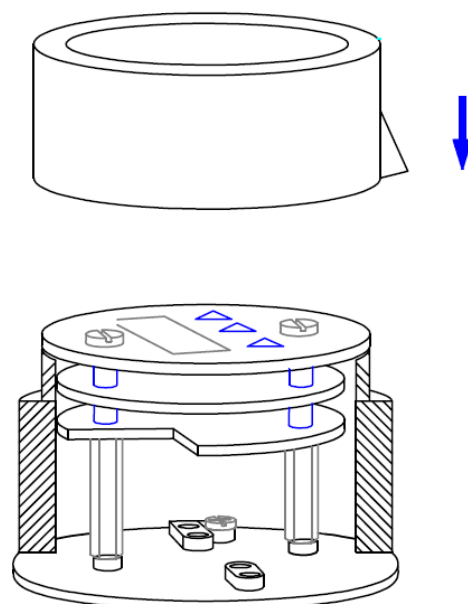
2) UNSCREW CAPTIVE SCREW AND DISMOUNT CIRCUIT BOARD FOR NECESSARY WIRING AND SETTINGS

STEP 3



3) REST CIRCUIT BOARD ON THE OPENING OF THE HOUSING ALIGNING THE MOUNTING HOLES WITH THE STANDOFFS.

STEP 4

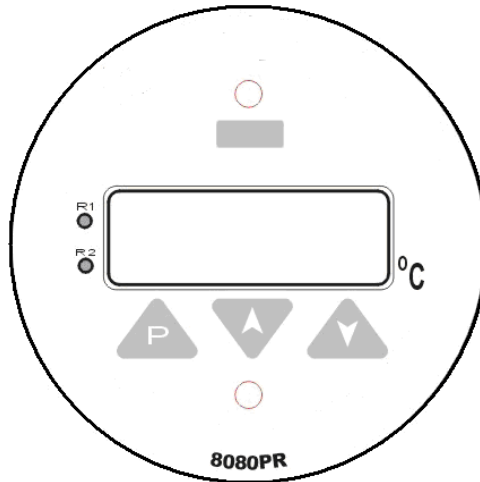


4) CLOSE ENCLOSURE COVER

USE THE SUPPLIED CAPTIVE SCREW TO MOUNT THE CIRCUIT BOARD BACK ON THE HOUSING.

OPERATION AND SETTING

The front panel of the Digital Temperature Transmitter is as shown below:



The Digital Temperature Indicator Controller has a four digit display window on the front panel for indicating the temperature value. Further, two LED indications show the over-range status of the two control Relays.

CONTROL KEYS

The instrument has three keys on the front panel, functions of which are described below:

	<p>The PROG or PROGRAM key is the central coordinating key to access the settings of the instrument. Pressing this Key allows the operator to sequentially view, change and save the parameters.</p>
	<p>The INC or Incrementing key allows the operator to select the numeral in the digit being set on an increasing scale. The digit will sequentially display 0, 1, 2,...9 on each pressing of the INC key. The incrementing speed increases if the key is kept pressed.</p>
	<p>The DEC or Decrementing key allows the operator to select the numeral in the digit being set on a decreasing scale. The digit will sequentially display 9, 8, 7,...0 on each pressing of the DEC key. The decrementing speed increases if the key is kept pressed.</p>

## CONTROL AND USER SETTINGS

The following is the sequence of settings on the Digital Temperature Indicator / Controller. No sensor or external signal source is required to be connected to the instrument for calibration or for any instrument settings.

## CONTROL SETTINGS

All settings to be done using Increment (↑) and Decrement (↓) keys.

KEY PRESSED	INITIAL DISPLAY	ALTERNATING DISPLAY	FUNCTION
(POWER ON)	8.8.8.8.	- - - -	Initialization of internal controller and Lamp Test (self diagnostics).
-	H I G H		If Input Sensor is not connected.
-	actual temp		If Input Sensor is connected.
PROG P	Set1	(preset value)	The Set-point "Set1" for Relay-1 is displayed alternately with the factory preset value.
PROG P	Set2	(preset value)	The Set-point "Set2" for Relay-2 is displayed alternately with the factory preset value.
PROG P	(process value)		(if Sensor is connected)

## USER SETTINGS

All settings to be done using Increment (↑) and Decrement (↓) keys.

KEY PRESSED	DISPLAY	ALTERNATING DISPLAY	FUNCTION
Press and hold Increment (↑) Decrement (↓) key for 2 seconds			Instrument goes in "User" mode.
PROG P	SEn	Γ t d 1	The active Input Signal / Sensor will be displayed on the upper display for three seconds. Γ t d 1 ----- RTD Pt-100 [three-wire] sensor (with 1 deg C Resolution) Γ t d.1 ----- RTD Pt-100 [three-wire] sensor (with 0.1 deg C Resolution)
PROG P	IPC	0000	Set the input correction in the display reading - which directly adds or subtracts from display value. This is the offset correction count to displayed value. The input correction range is from -999 to 9999 counts.
PROG P	CUL	0020	Set the error offset in the 4 to 20 mA retransmission output with this setting. The Offset range is from 0000 to 0040 counts.
PROG P	C-OP	Γ E t n	Set type of Control Output, options are: - Γ etn - Output will be retransmission 4 to 20mA DC (Linear) CntL - Output will be control 4 to 20 mA DC (Proportional)
PROG P	SCLE	CEnt	Set Temperature Scale. The options are : Cent : degrees Centigrade FAΓn : degrees Fahrenheit

PROG P	ΓnGL	0000	“Range Low” setting: The desired Zero (lower) range setting for the process being measured may be set using ↑ and ↓ keys. Options are: -  Γtd 1, Γtd.1 → -070°C
PROG P	ΓnGH	0500	“Range High” setting: The desired Span (Higher) range setting for the process being measured may be set using ↑ and ↓ keys. Options are: -  Γtd 1, Γtd.1 → 0500°C
PROG P	Con1	PΓOP	Type of Control Action for Relay-1 may be set. Options are : PΓOP : Proportional control HEt : Heating Logic COL : Cooling Logic
PROG P	CY - t	0003	Set the Cycle Time for Proportional control action. The Cycle Time can be set from 0001 to 0060 seconds. [Default Value is 3 Seconds] (Option available in Proportional Control mode Only)
PROG P	P - b	0020	Set the Proportional Band for Proportional Control Action in percentage of Set Point. The Proportional Gain can be set from 0000 to 0100%. [Default Value is 0020] (Option available for Proportional Control Only)
PROG P	HY1	0001	Temperature Hysteresis: Adjust the desired Hysteresis in deg Celsius for Relay-1 using INC and DEC keys [e.g. 0001 for a hysteresis of 1 degree].
PROG P	dLY1	0001	Time Hysteresis: Adjust the desired minimum off time (in seconds) between Relay-1 resets (to avoid chatter) using INC and DEC keys. [e.g. 0001 for a hysteresis of 1 second].
PROG P	Con2	HEt	Type of Control Action for Relay-2 may be set. Options are : HEt : Heating Logic COL : Cooling Logic OFF : For Single Relay Operation
PROG P	HY2	0001	Temperature Hysteresis: Adjust the desired Hysteresis in deg Celsius for Relay-2 using INC and DEC keys [e.g. 0001 for a hysteresis of 1 degree].
PROG P	dLY2	0001	Time Hysteresis: Adjust the desired minimum off time (in seconds) between Relay-2 resets (to avoid chatter) using INC and DEC keys. [e.g. 0001 for a hysteresis of 1 second].
PROG P	(process value)		(if Input Signal is connected)

This completes the entire settings of the Digital Temperature Indicator / Controller.

Note: All parameters to be changed / selected using INC and DEC keys).

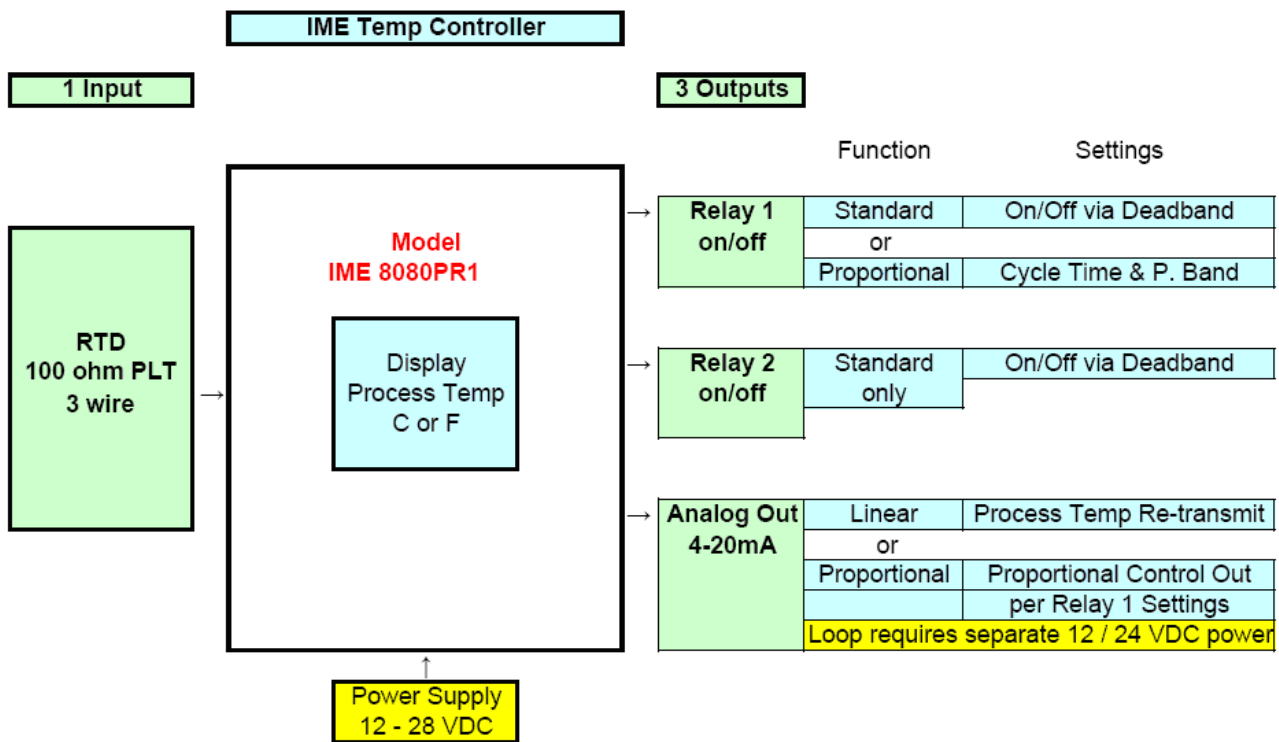
It may be noted that the Analog output signal of 4 to 20 mA DC is automatically scaled to the range of the temperature sensor selected.

The explanation of the various Displays and Messages that would be visible on the instrument Menu are as follows:-

SR.	MESSAGE	DESCRIPTION
1.	Con1 / Con2	Set-Point for Relay-1/2.
2.	HY1 / HY2	Hysteresis for Relay-1/2 [e.g. 0010 for a hysteresis of 10 degrees].
3.	dLY1 / dLY2	Time Hysteresis : To adjust the desired minimum off time (in seconds) between Relay resets (to avoid chatter).
4.	PΓOP	Proportional Control Logic for Relay-1 only

5.	Het	Heating Control Logic for Relay-1/2
6.	COL	Cooling Control Logic for Relay-1/2
7.	Sen	The active Input Temperature Sensor / Signal. Options include : Γtd 1 ----- RTD Pt-100 sensor (1°C Acc) Γtd.1 ----- RTD Pt-100 sensor (0.1°C Acc)
8.	SCLE	Temperature Scale. The options are : CEnt : degrees Centigrade FAFn : degrees Fahrenheit

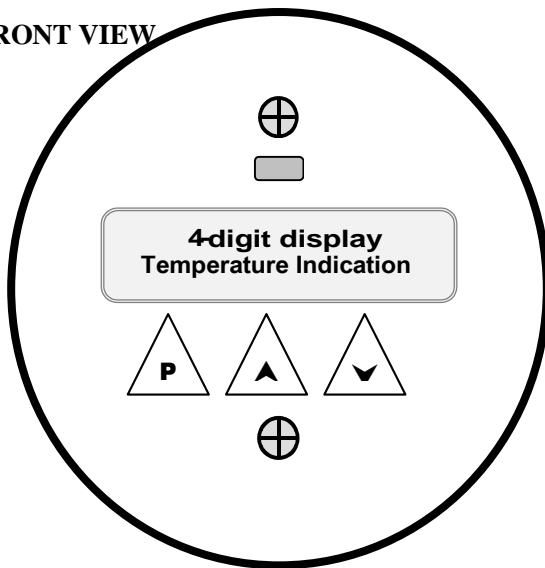
BLOCK DIAGRAM



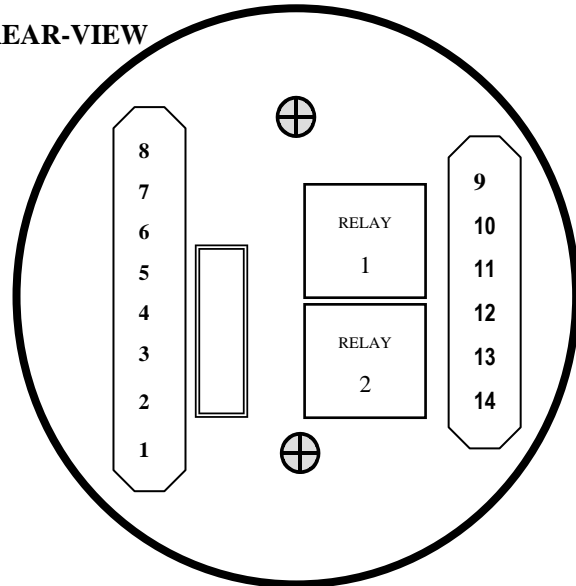


TERMINAL DIAGRAM

FRONT VIEW



REAR-VIEW



TERMINAL BLOCK – 1 (For RTD Pt-100 Sensor)

1	2	3	4	5	6	7	8
+	-	+	-	-	-	+	
12-28V DC Power Supply		4-20mA Output		RTD PT-100		NOT CONN.	

1-2: 12-28V DC Power Supply  
 3-4: 4-20mA Output  
 5-7: RTD PT-100  
 8: Not connected

TERMINAL BLOCK – 2

9	10	11	12	13	14
NC	C	NO	NC	C	NO
RELAY – 1			RELAY – 2		

TERMINAL DETAILS

TERMINAL BLOCK	TERMINAL NO.	NOTATION	DETAILS	
TERMINAL BLOCK - 1	1	+	Power Supply 12 to 28V DC	
	2	-		
	3	+	4 to 20 mA DC OUTPUT	
	4	-		
	5	SEE SENSOR TABLE ALONGSIDE	-	RTD PT-100
	6		-	
	7		+	NO CONN.
		8	NO CONN.	NOT CONNECTED
TERMINAL BLOCK - 2	9	NC	RELAY – 1	
	10	C		
	11	NO		
	12	NC	RELAY – 2	
	13	C		
	14	NO		

## TECHNICAL SPECIFICATIONS

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Model	:	8080PR1
Type	:	Microcontroller based Digital Temperature Indicator with Control option
Input Signal	:	▶ RTD Pt-100 (three-wire) 1°C/0.1°C resolution
Display	:	Seven-segment, red LED display
Indications	:	Four-digit temperature display
Scale Range	:	-70 to 500 (RTD PT-100)
Calibration Range	:	May be calibrated as required
Decimal point	:	Preset depending on Sensor
Response time	:	Typically 200 mS.
Output	:	Relay-1 with Proportional/Heating/Cooling Relay-2 with Heating/Cooling
Analog Output	:	4 to 20 mA DC Output Proportional Control output.
Load Driving Capacity	:	600 Ohms
Contact rating	:	230VAC, 5A RESISTIVE; 24VDC, 5A RESISTIVE
Memory	:	Non-Volatile (on EEPROM)
Settings	:	By Membrane Switchpad on front panel
Accuracy	:	± 0.1% FS
Power Consumption	:	97 mA at 12 V DC
Power Supply	:	12 to 28 V DC
Operating Temperature	:	-40 to 60 Degrees C

## WARRANTY

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International Metal Engineering Pte. Ltd. (IME) for the effective period of the warranty set out below, warrants that its standard products will be free from defects in materials and workmanship under normal use and service.

International Metal Engineering Pte Ltd.'s obligation under this warranty shall not arise until Buyer returns the defective product, freight prepaid to IME's facility in Singapore or any other authorized destination, specified in writing by IME.

The only responsibility of IME under this warranty is, at its option and sole discretion, to replace or repair, free of charge any defective component part of such product.

### EFFECTIVE PERIOD OF WARRANTY

Three years from date of invoice for new products. For repairs the warranty shall be one year from the date of shipment.

### LIMITATION OF WARRANTY

The warranty set forth herein does not extend to and shall not apply to:

Products which have been repaired or altered by other than IME's personnel, unless Buyer has properly altered or repaired the products in accordance with procedures previously approved in writing by IME.

Products, which have been subject to misuse, neglect, accident, or improper installation or operation.

Products, which have been mechanically damaged.

The warranty and remedies set forth above are in lieu of all other warranties expressed or implied, oral or written, either in fact or by operation of law, statutory or otherwise, including warranties of merchantability and fitness for a particular purpose, which IME specifically disclaims.

IME neither assumes nor recognizes any other liability in connection with the sales, installation or use of its products.

IME shall have no liability for incidental or consequential damages of any kind arising out of the sale, installation or use of its product.

The IME address to which notices, authorizations, and approvals and written communications pertaining to this warranty are to be delivered is:

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