

# 100mm PEN RECORDER

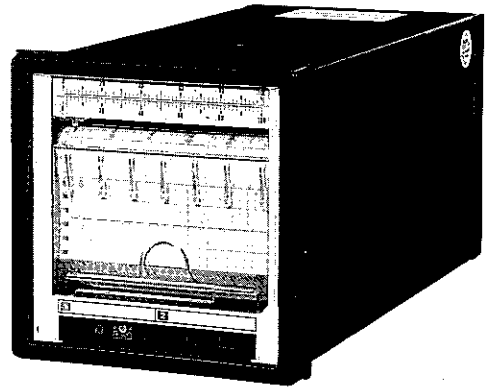
DATA SHEET

PGM

This 100mm-wide pen recorder has a compact and lightweight, DIN size with front panel dimensions of 144 x 144mm.

It is a superb and reliable recorder applicable to a variety of uses, ranging from industrial value recording for various manufacturing and test equipment to monitoring of the weather and environmental pollution.

The recorder comes in 1-pen and 2-pen types and accepts input signals such as from thermocouples, resistance bulbs, DC voltage and current.



## FEATURES

1. **Compact and lightweight DIN size**  
The front panel has a DIN size of 144x144mm, the depth is 285mm and the mass(weight) is only about 4 kg.
2. **Freely settable for a variety of measurements**  
12 types of thermocouples(types B, R, S, K, E, J, T, N, W, L, U, PN), resistance bulbs(JPt100, Pt100), and DC voltages(from 5mV span to 50V max.), or a combination of these inputs, can be selected for each channel.
3. **Numerous functions**
  - Input signals and recording range are easily changeable.
  - Burnout, linearization, recording chart feed speed multistep setting functions are standard-equipped.
4. **Continuous recording for 31 days**  
The recording chart is 15.5m long, which allows continuous recording for 31 days at the standard chart feed speed of 20mm/h.
5. **Easily replaceable cartridge pen**  
A fiber-tip cartridge pen is utilized in this recorder.

## SPECIFICATIONS

### Input section

No. of inputs: 1 pen or 2 pens  
 Input signal: Thermocouple input; B, R, S, K, E, J, T, N, W, L, U, PN  
 Resistance bulb input; Pt 100Ω, JPt100 Ω, 3-wire type  
 DC voltage input; 50mV, 500mV, 5V, 50V ranges  
 DC current input; 4 to 20mA(with 10Ω shunt resistor)  
 Input signal setting and change:  
 Setting and change of input signal is

possible for each channel by the setting pins in the instrument and by rotary and pushbutton switches on the front panel.

Recording range: To be specified when ordering.

Recording range setting and change:

Setting and change of recording range is possible for each channel by means of rotary and pushbutton switches on the front panel. The following two methods are available.

- (1) Selection from the recording range table registered in the instrument.
- (2) A range not registered in the table is freely settable manually. (a signal generator is necessary in this case.)

Note: In either case above, the input signals must be within the recording range.

### Indicating section

Indication method: Scale plate plus indication pointer  
 Scale plate: 100mm length

### Recording section

Recording system: Cartridge type fiber-tip pen

Recording colors: 1st pen--red, 2nd pen--green  
 Recording chart: Z-fold type with total length 15.5m, effective recording width 100mm  
 Chart speed: Selectable from the following ranges with rotary switch and keys on the front panel;  
 10, 20, 24, 30, 60, 120, 200, 300, 600, 1000, 1200, 2000, 2400, 3000, 4000, 6000, 12000mm/h

External control; Standard-equipped. Chart speed is selectable in two steps via external contact input.  
 Contact capacity; 30V, 0.1A  
 Normal speed on instrument applies when contact is open, and remote speed applies when contact is closed.

**Operating section**

Indicator: 7-segment LED(red) 1pc  
 Rotary switch: Hexadecimal digital switch 1pc  
 Pushbutton switch: 2pc

**Performance and characteristics**

Indication accuracy:  
 Thermocouple input;  
 (a) ±0.5% of recording span with recording span 8mV or more.  
 (b) ±1.0% of recording span with recording span 4 to less than 8mV (not including reference junction compensation accuracy)  
 Resistance bulb input;  
 (a) ±0.5% of recording span with resistance variation width 36Ω or more  
 (b) ±1.0% of recording span with resistance variation width 18 to less than 36Ω

DC voltage

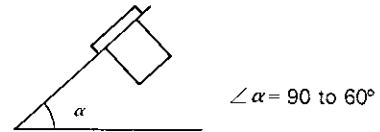
	Recording span	Accuracy
50mV range	(a)8mV or more (b)4 to less than 8mV	±0.5% of recording span ±1.0% of recording span
500mV range	(a)80mV or more (b)40 to less than 80mV	±0.5% of recording span ±1.0% of recording span
5V range	(a)0.8V or more (b)0.4 to less than 0.8V	±0.5% of recording span ±1.0% of recording span
50V range	(a)8V or more (b)4 to less than 8V	±0.5% of recording span ±1.0% of recording span

Reference junction compensation accuracy:  
 ±0.5°C for K, E, J, T, N, L, U, PN  
 ±1.0°C for B, R, S, W  
 Dead band: Within 0.2% of recording span for (a) range  
 Within 0.5% of recording span for (b) range  
 Response time: 3sec. or less  
 Input resistance: 10MΩ or more for thermocouple, 50mV range  
 Approx. 1MΩ for 5V, 50V ranges  
 Approx. 100kΩ for 500mV ranges  
 Measuring cycle: 200ms with 1 pen  
 400ms with 2 pens  
 Insulation resistance:  
 100MΩ or more at 500V DC

Withstand AC voltage:  
 (for 1 minute) 500V between input terminals  
 500V between input terminals and ground  
 1500V between power terminals and ground  
 1500V between power and input terminals

**Structure**

Mounting method: Flush mounting on vertical panel  
 Mounting angle:



Material: Case: steel plate  
 Front door frame: ABS resin  
 Mass(weight): 1-pen type; 3.9kg (without options)  
 (Approx. ) 4kg (with options)  
 2-pens type; 4kg (without options)  
 4.1kg (with options)  
 Outer dimensions (H × W × D):  
 144 × 144 × 285mm  
 Finish color: Case: Munsell N1.5  
 Front door frame: black  
 External terminals:  
 Screw terminals (M4)

**Power supply section**

AC power requirement:  
 100/200V ±10%, 50/60Hz  
 110/220V ±10%, 50/60Hz  
 115/230V ±10%, 50/60Hz  
 120/240V ±10%, 50/60Hz  
 (to be specified)  
 Changeover between 100 and 200V, 110 and 220V, 115 and 230V, and 120 and 240V is possible via wiring at external terminals.  
 AC power consumption:  
 1-pen type; 13VA at 100V without options  
 16VA at 100V with all options  
 2-pens type; 17VA at 100V without options  
 20VA at 100V with all options

**Other standard functions**

Burnout function: Standard-equipped (recording is deflected to 100% side when thermocouple or resistance bulb input is disconnected)  
 Linearize function:  
 Standard-equipped (for thermocouple and resistance bulb input)

**Digital filter:** Selectable from the following ranges for each channel using rotary switch and keys on the front panel; 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60sec

**Saving of set values:**  
In EEPROM (nonvolatile memory)

**Pen position adjustment:** Pen position is adjustable to 0% and 100% place on chart or to 0% and 100% place on scale plate using rotary and pushbutton switches on the front panel.

### Optional specifications

**Alarms: Output;** 1 pen: 2 point relay contact output (NO -1a- contact)  
2 pen: 4 point relay contact output (NO -1a- contact)

Relay contact capacity; 250V AC 3A,  
30V DC 3A (resistance load)

Kinds of alarm; H and L, H and HH or L and LL is settable for each channel using rotary and pushbutton switches on the front panel.

Hysteresis width; approx. 0.5% of recording span

Setting of alarm points; settable by moving pen position using the rotary and pushbutton switches on front panel.

### Normal operating environment

**Ambient temperature:** 0 to 50°C

**Ambient humidity:** 30 to 90% RH, but temperature × humidity must be equal to or less than 3200

**Vibration:** 10 to 60Hz, 0.2m/s<sup>2</sup> (0.02G) or less

**Mounting position:** Front inclination 0°, rear inclination 30°, left/right inclination 0°

**Signal source resistance:**

Thermocouple input; 1kΩ or less

DC voltage input; within 0.1% of input resistance

Resistance bulb input:

within 10Ω per wire; resistance of each wire of 3-wire system should be balanced with the others.

**Warmup time:** At least 30minutes

**Shock:** Should not be applied.

### Transportation/storage conditions

**Temperature:** -20 to +60°C

**Humidity:** 5 to 90% RH, must be noncondensing

**Vibration:** 10 to 60Hz, 2.45m/s<sup>2</sup> (0.25G) or less

**Shock:** 294m/s<sup>2</sup> (30G) or less

### Operating environment influence

**Power supply variation influence:**

Voltage variation: 10% variation

Change in indication...±0.2% of recording span, max.

Change in recording...±0.2% of recording span, max.

Frequency variation: 47 to 63Hz

Change in indication...±0.2% of recording span, max.

Change in recording...±0.2% of recording span, max.

**Input signal source resistance or wiring resistance influence:**

Thermocouple...10μV per 100Ω

Voltage input...Variation of 0.1% change of resistance

Change in indication...±0.2% of recording span, max.

Change in recording...±0.2% of recording span, max.

Resistance bulb...Variation of resistance with changes in 10Ω per wire

Change in indication...±0.2% of recording span, max.

Change in recording...±0.2% of recording span, max.

(3 wires should be balanced.)

**Temperature influence:**

Change in indication...±0.3%/10°C, max

Change in recording...±0.5%/10°C, max.

**Mounting position influence:**

Inclination within 30°

Change in indication...±0.2% of recording span, max.

Change in recording...±0.2% of recording span, max.

**Vibration influence:**

Linear vibration with 10 to 60Hz frequency and 0.2m/s<sup>2</sup> (0.02G) of acceleration is applied to each of 3 directions for 2 hours.

Change in indication...±0.2% of recording span, max.

Change in recording...±0.2% of recording span, max.

Recording range per input signal:

Input signal	Max. range	Min. span	
Thermocouple B R S K E J T N W L U PN	400 to 1760°C	4mV span or more	
	0 to 1760°C		
	0 to 1760°C		
	-200 to 1370°C		
	-200 to 800°C		
	-200 to 1100°C		
	-200 to 400°C		
	0 to 1300°C		
	0 to 1760°C		
	-200 to 900°C		
	-200 to 400°C		
0 to 1300°C			
Resistance bulb Pt100 JPt100	-200 to 600°C	18Ω span or more	
	-200 to 600°C		
DC voltage	50 mV range	-50 to + 50mV	4mV span or more
	500mV range	-500 to +500mV	40mV span or more
	5V range	-5 to + 5V	0.4V span or more
	50V range	-50 to + 50V	4V span or more

Note: B, R, S, K, E, J, T: DIN IEC584, JIS C 1602  
 N: NICROSIL-NISIL(IEC584)  
 W: + side, W -5%Re; - side, W -26%Re (Hoskins Mfg. Co., U.S.A.)  
 L: + side, Fe; - side, CuNi (DIN43710)  
 U: + side, Cu; - side, CuNi  
 PN: Platinel(Engelhard Minerals & Chemicals Corp., U.S.A.)  
 Pt100: JIS C 1604, IEC751 (α=0.003850)  
 JPt100: JIS C 1604 (α=0.003916)

Recording range table:

The maximum recording range and ranges given in the table below are registered for each input signal.

Thermocouple	Resistance bulb	DC voltage, 50mV, 50V ranges	DC voltage, 500mV range	DC voltage, 5V range
Max. recording range varies with kind of thermocouple.	Max. recording range	Max. recording range	Max. recording range	Max. recording range
-200 to 100°C	0 to 50°C	-50 to 50mV	-500 to 500mV	-5 to 5V
0 to 200°C	0 to 100°C	0 to 10	0 to 100	0 to 1
0 to 300°C	0 to 150°C	0 to 15	0 to 150	0 to 1.5
0 to 400°C	0 to 200°C	0 to 20	0 to 200	0 to 2
0 to 500°C	0 to 300°C	0 to 30	0 to 300	0 to 3
0 to 600°C	0 to 400°C	0 to 50	0 to 500	0 to 5
0 to 800°C	0 to 500°C	10 to 50	100 to 500	1 to 5
0 to 1000°C	0 to 1000°C	4 to 20	40 to 200	0.4 to 2
0 to 1200°C	100 to 300°C	-50 to 0	-500 to 0	-5 to 0
0 to 1400°C	200 to 400°C			
0 to 1600°C	-50 to 50°C			
200 to 400°C	-50 to 150°C			
300 to 600°C	-200 to 500°C			
400 to 800°C				
400 to 1400°C				
500 to 1000°C				
600 to 1200°C				
600 to 1600°C				
800 to 1600°C				

CODE SYMBOLS

1	2	3	4	5	6	7	8	9	10	11	12	13	Description	
P	G	M					0	1				Y	<b>Recording points</b> 1 pen 2 pen single scale 2 pen double scale	
														<b>1st pen input signal</b> <b>2nd pen input signal</b> When 1 pen specified...Y Common for 5th and 6th digits of input signal code (thermocouple input) B...X T...T R...R N...N S...S W...W K...K L...L E...E U...U J...J PN...P (resistance bulb input) Pt...H JPt...G (voltage/current input) ±50mV ...M ±500mV ...Q ±5V ...V ±50V ...F 1 to 5V ...A 4 to 20mA...B (with 10Ω shunt resistor)
													<b>Power supply</b> AC 100V/200V 50/60Hz AC 110V/220V 50/60Hz AC 115V/230V 50/60Hz AC 120V/240V 50/60Hz	
													<b>Alarm output</b> None 2 point relay output(1 pen only) 4 point relay output(2 pen only)	
													<b>Scale</b> Specify 2 digit code in scale plate table on page 5.	

ITEMS TO SPECIFY WHEN ORDERING


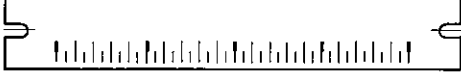
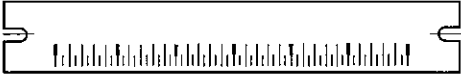
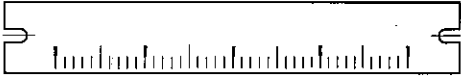

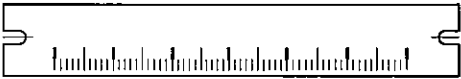
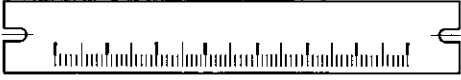
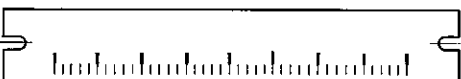
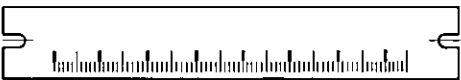
- Code symbols (according to above table)
- Scale specifications (when required)

Note: (1) Recorder will be shipped with 10Ω shunt resistor attached to terminal when 4 to 20mA input signal is specified, and input signal will be set to ±500mV and recording range to 40 to 200mV. For current input other than this, or when shunt resistor is unnecessary, specify according to the converted voltage range.

Recorder will be shipped with input signal set to ±5V and recording range to 1 to 5V when 1 to 5V input signal is specified. Scale should be specified with 11th and 12th digits of code in either case of 4 to 20mA or 1 to 5V input.

(2) When scale specifications are required, refer to the scale plate table on the page 5.

## Scale plate table

Code symbols		Scale plate		Recording chart
11th digit	12th digit	Scale numerals	Scale division	Scale
1	1	0 to 100 °C	10 divisions 	50-division linear (without numerals)
1	2	0 to 1000 °C		
1	3	400 to 1400 °C		
1	4	600 to 1600 °C		
1	5	-50 to 50 °C		
1	A	Numerals or units other than above		
1	S	Without numerals or units		
2	1	0 to 200 °C	20 divisions 	40-division linear (without numerals)
2	2	100 to 300 °C		
2	3	200 to 400 °C		
2	4	-50 to 150 °C		
2	A	Numerals or units other than above		
2	S	Without numerals or units		
3	1	0 to 300 °C	30 divisions 	60-division linear (without numerals)
3	2	0 to 600 °C		
3	3	-200 to 100 °C		
3	A	Numerals or units other than above		
3	S	Without numerals or units		
4	1	0 to 400 °C	40 divisions 	40-division linear (without numerals)
4	2	400 to 800 °C		
4	A	Numerals or units other than above		
4	S	Without numerals or units		
5	1	0 to 50 °C	50 divisions 	50-division linear (without numerals)
5	2	0 to 500 °C		
5	3	500 to 1000 °C		
5	A	Numerals or units other than above		
5	S	Without numerals or units		
6	1	0 to 600 °C	60 divisions 	60-division linear (without numerals)
6	2	600 to 1200 °C		
6	3	0 to 1200 °C		
6	A	Numerals or units other than above		
6	S	Without numerals or units		
7	1	-200 to 500 °C	70 divisions 	70-division linear (without numerals)
7	2	0 to 1400 °C		
7	A	Numerals or units other than above		
7	S	Without numerals or units		
8	1	0 to 800 °C	80 divisions 	80-division linear (without numerals)
8	2	0 to 1600 °C		
8	3	800 to 1600 °C		
8	A	Numerals or units other than above		
8	S	Without numerals or units		
9	1	0 to 150 °C	75 divisions 	75-division linear (without numerals)
9	A	Numerals or units other than above		
9	S	Without numerals or units		
0	0	2 pen, double scale (when '3' specified in 4th digit of code) Specify scale division, numerals and industrial value with relevant codes.		
Z	Z	Non-standard specifications (Scale division non-standard, non-linear scale (voltage/current input), 1 pen double scale, etc.) Specify necessary items such as scale division, numerals and industrial value with relevant codes.		

Note: (1) When 'A' is specified in 12th digit in above table, specify scale numerals and industrial value with relevant codes.

(2) When 'S' is specified in 12th digit in above table, recorder will be shipped with scale plate having only scale lines and no numerals or industrial value.

## SCOPE OF DELIVERY

Recorder, standard accessories, mounting bracket, instruction manual

Standard accessories

Item	1 pen recorder	2 pen recorder
Chart paper	1	1
Fuse(1A)	1	1
Cartridge pen(red)	1	1
Cartridge pen(green)	—	1
Oil	1	1

### OTHER(OPTIONAL) ITEMS

1 2 3 4 5 6 7 8 9 10 11 12												Description
P	E	Y	1	P	G	M	1	-			0	
0	1											1 pen cartridge pen (red) 4 pcs
0	2											2 pen cartridge pen (red) 4 pcs cartridge pen (green) 4 pcs
												S Chart paper with 20mm/h time lines 12 rolls
												X with 60mm/h time lines 36 rolls
												Y with 120mm/h time lines 72 rolls

Note: Recording chart No. should be specified.  
The above represent one year's supply of cartridge pens and recording chart.

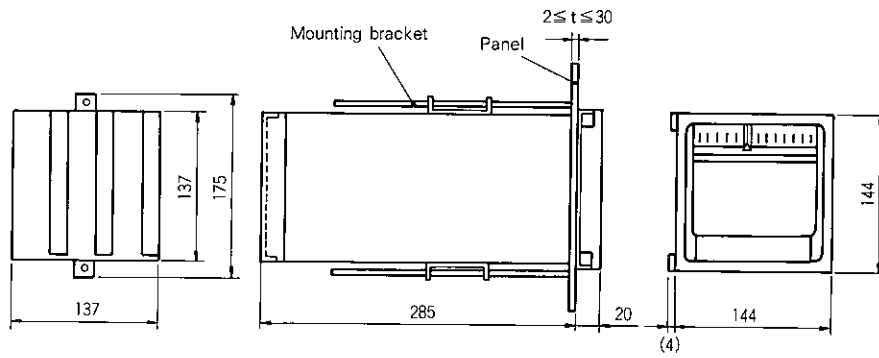
Item	Type	Specification
Shunt resistor	PHZT8101	10Ω ±0.1%

### LIST OF RECORDING CHART NOS. FOR PGM (Standard items)

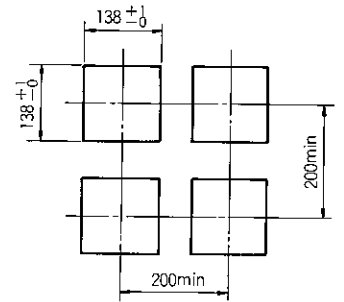
Kind	Scale	Recording chart No.
Linear (without numerals)	40 divisions	HL-4000-S
	50	HL-5000-S
	60	HL-6000-S
	70	HL-7000-S
	75	HL-7500-S
	80	HL-8000-S
Linear (with numerals)	0 to 20 } 0 to 40 }	HL-4001-S
	0 to 25 } 0 to 50 }	HL-5001-S
	0 to 100 } 0 to 30 }	HL-6001-S
	0 to 60 } 0 to 70 }	HL-7001-S
	0 to 14 } 0 to 80 }	HL-8001-S
	0 to 160 } 0 to 75 }	HL-7501-S
	0 to 150 } -50 to +50 }	HL-5010-S
	50 to 100 } 100 to 200 }	

Note: Time scale for 20mm/h is standard (S is suffixed to recording chart No.) on recording chart. Scales for 10, 30, 60 or 120mm/h can be provided on request.

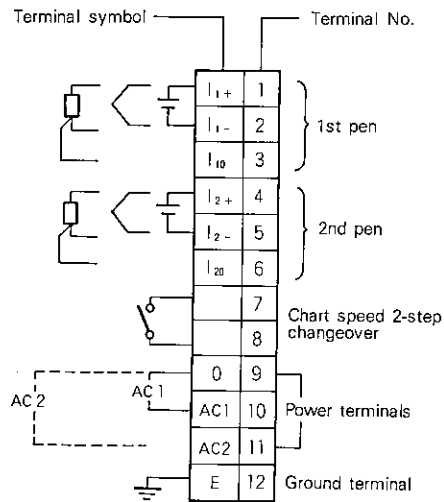
# OUTLINE DIAGRAM (Unit:mm)



Panel cutout dimensions



# CONNECTION DIAGRAMS



	25
	26
	27
	28
	29
	30
	31
	32

- ALARM11
- 1st pen alarm output 1
- ALARM12
- 1st pen alarm output 2
- ALARM21
- 2nd pen alarm output 1
- ALARM22
- 2nd pen alarm output 2

Note: AC 1: Connection terminal for 100, 110, 115 or 120 AC.  
 AC 2: Connection terminal for 200, 220, 230 or 240V AC.  
 Specified voltage will be entered at AC1 or AC2.

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