

# WIDE SCALE SELF-BALANCING RECORDER KERS

**DATA SHEET**
**PGN·PHP**

The "KERS" is a wide scale self-balancing recorder developed through advanced techniques in electronics and precision mechanisms, featuring high reliability and maintenance-free operation.

It is designed on the basis of the internationally recognized DIN Standards and is provided with a wide recording scale (200mm) in a casing of 288 × 288mm.

The KERS is served with a variety of recording points from 1-pen to 12 points and is capable of operating in combination with a signal transmitter or an alarm unit prepared as optional accessories.

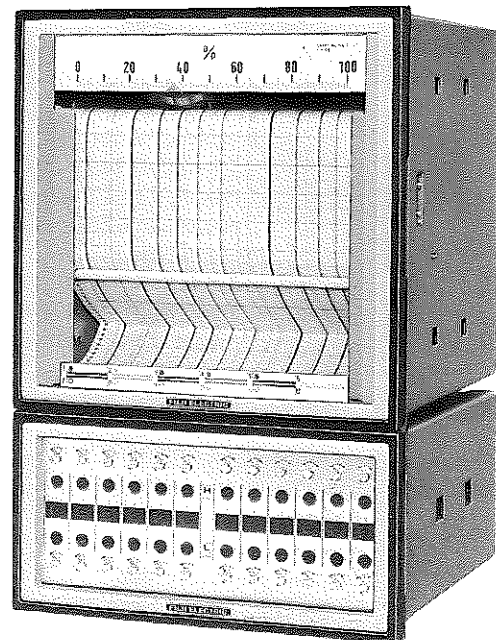
## FEATURES

- High reliability with the use of induction type potentiometer**  
The wide angle induction potentiometer has realized a contactless servo mechanism, resulting in further improvement in reliability.
- Unit type mechanism**  
The inner mechanism is of plug-in unit type, providing easy maintenance and inspections.
- Adoption of internationally recognized DIN Standards**  
The recording chart and ink color as well as the outline dimensions of recorder comply with the requirements of DIN Standards.
- Completely free from ink clogging or uneven printing**  
The use of "SIGN-PEN" type cartridge pen and printing pad has completely eliminated the possibility of ink clogging and uneven printing. Unlike the conventional ink-pen system, the sign-pen system offers easy replacement of ink.
- Range card system input unit**  
The input unit is of a range card system capable of recording three different inputs for multipoint recording. The range card can be changed with another in a simple manner because of the use of plug-in system.
- Adjustable chart speed**  
The gear slide system permits easy selection of recording chart speed in 7 steps from 10mm/h to 1200mm/h.
- Two type multipoint recording systems**  
In addition to the printing pad system, the ink-feed system is also available on request.

## SPECIFICATIONS

Input signal:

- A 1 to 5V DC
- B 4 to 20mA DC
- C 10 to 50mA DC
- D 0 to 100 $\mu$ A . . . 200mA DC (without base)



- F 100 $\mu$ A DC span or more (max. current 200mA) \*1
- M 100 $\mu$ A DC span or more (max. current 200mA) \*2
- E 0 to 4mV . . . 30V DC (without base)
- G 4mV DC span or more (max. voltage 30V) \*1
- L 4mV DC span or more (max. voltage 30V) \*2
- R Thermocouple, 4mV span or more \*3, \*4 (with reference junction compensator, without burnout circuit)
- S Thermocouple, 4mV span or more \*3, \*4 (with reference junction compensator, with burn-out circuit)
- H Resistance bulb, 3-wire system \*4, \*5 JPt100 $\Omega$  (at 0°C), more than 50°C span
- N Ditto, but Pt100 $\Omega$  (at 0°C), more than 50°C span \*4, \*5
- J Potentiometric transducer (resistance change 19 $\Omega$  to 1500 $\Omega$ ) 3-wire system \*5
- K Potentiometric transducer (resistance change 19 $\Omega$  to 1500 $\Omega$ ) 2-wire system \*5

- Note: \*1. Base/span; less than 2  
 \*2. Base/span; 2 to 5  
 \*3. Min. temp. span of thermocouple:  
 R: 500°C, K: 150°C, J: 100°C, T: 150°C,  
 E: 100°C  
 \*4. Linearizer circuit can be added (option)  
 \*5. Base/span; less than 6

**Input resistance:** See Table on Page 3  
**Allowable signal source resistance:** See Table on Page 3  
**Accuracy:** ±0.5% of full scale  
**Dead band:** 0.2% of full scale  
**Number of measuring elements and recording colors:**  
 1-pen purple  
 2-pen 1st pen: purple, 2nd pen: red  
 3-point purple, red, and green dots from 1st point  
 6-point purple, red, black, green, blue, and orange dots from 1st point  
 12-point Printing pad; (6 colors, 12 dots)  
 1 to 6 dots same as 6-point model, 7 to 12 dots are circles of same colors as above  
**Ink feed type;**  
 (12 colors, 12 dots)  
 1 to 6 dots same as 6-point model, 7 to 12 dots are yellow, pink, light blue, greenish yellow, reddish purple, brown.

**Number of measuring ranged:**  
 1 to 3 for multi-point recorder

**Scale length:** 200mm  
**Response time:** Approx. 2 sec.  
**Printing interval:** For multi-point recorder; 10 sec. (60Hz) or 12 sec. (50Hz) (5 sec. (60Hz) or 6 sec. (50Hz) is option)

**Multipoint recording system:**  
 Printing pad system or ink-feed system (on request)

**Chart drive:** Synchronous motor  
**Chart storage system:**  
 Folding system

**Chart speed:** Adjustable to 10, 20, 60, 120, 300, 600 or 1200mm/h with gear slide mechanism  
 \* High speeds of 120, 240, 720, 1440, 3600, 7200 and 14400mm/h are also available with gear slide mechanism.

**Chart length:** 15m (lasts for 1 month at 20mm/h)  
**Power supply:** 24V  $\pm$  15% AC 50 or 60Hz or 100V  $\pm$  10% AC 50 or 60Hz or 200V  $\pm$  10% AC 50 or 60Hz (depending upon customer's specifications)

**Power consumption (approx.):**  
 1-pen 12VA, 2-pen 23VA  
 6- and 12-point 21VA

**Ambient temperature:**  
 0 to 50°C  
 (storage temperature - 10 to + 60°C)

**Ambient humidity:**  
 30 to 90%RH

**Enclosure:** Steel plate case  
**External dimensions (H × W × D):**  
 288 × 288 × 270mm

**Weight (approx.):** 1-pen 13kg, 2-pen 15kg, 6- and 12-point 15kg

**Finish color:** Munsell 7.5BG3.2/0.8 (case)  
 Munsell N1.5 (door frame)

**OPTIONAL ATTACHMENTS**

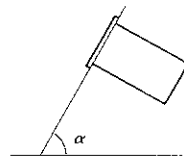
**Alarm device:** For 1-pen and 2-pen recorder  
 Upper and lower limit alarm unit can be mounted on each pen.  
 For 6- and 12-point recorder  
 Upper and lower limit alarm unit can be mounted for common setting and alarm.  
**Contact:** Microswitch  
 1-c contact per alarm.  
**Contact capacity:** 250V AC, 1A (resistance load)  
**Setting accuracy:** ± 1% of full scale  
**Hysteresis:** 1% of full scale  
**Note:** KERS alarm unit (for multipoint recorder) (Model: PHP) is prepared for common setting and individual alarms or individual settings and individual alarms.

**Signal transmission:**  
 This transmission can be mounted to each pen of 1-pen and 2-pen recorder.  
**Output signal;** 1 to 5V DC  
**Output resistance;** 22Ω (load resistance; more than 20kΩ)  
**Accuracy;** ±0.5% of full scale (versus indicated value)  
**Detecting system;** Induction potentiometer

**External chart ON/OFF:**  
 Used for 1-pen or 2-pen only.  
 Chart is fed at ON position of the external contact and stops at OFF position.  
**Rating of external contact;**  
 100V AC, 0.3A min.

**OTHERS**

**Mounting:** Within  $\alpha = 90$  to  $60^\circ$



**Scope of delivery:** Recorder, mounting brackets, standard accessories, instruction manual

Standard accessories:

		1 pen	2 pen	6 point	12 point	3 point
Pen recorder	Chart	3	3	/	/	/
	Purple pen	2	2			
	Red pen	—	2			
	Oil	1	1			
	Fuse	2	2			
Multi-point (pad) recorder	Chart	/	/	3	3	3
	6-point printing pad			2	—	—
	12 point printing pad			—	2	—
	3 point printing pad			—	—	2
	Oil			1	1	1
	Fuse			2	2	2
Multi-point (ink feed) recorder	Chart	/	/	3	3	3
	Ink kit for 6 points (6 colors)			1	—	—
	Ink kit for 3 points (3 colors)			—	—	1
	Ink kit for 12 points (12 colors)			—	1	—
	Ink pad holder			1	1	1
	Oil			1	1	1
	Fuse			2	2	2

REFERENCE TABLE

Input resistance and allowable signal source resistance

Input signal		Input resistance	Input resistance or voltage drop where input is not measured by multipoint recording system.	
Current input	4 to 20mA	6.25Ω	Less than 750mV	
	10 to 50mA	2.5Ω	Less than 750mV	
	$0.1 \leq I_i < 1\text{mA}$ (span)	100Ω	100Ω	
	$1 \leq I_i < 10\text{mA}$ (span)	10Ω	10Ω	
	$10 \leq I_i < 100\text{mA}$ (span)	1Ω	10Ω	
	$100 \leq I_i \leq 200\text{mA}$ (span)	0.68Ω	6.8Ω	
	0.15 to 3mA (Telemeter)	35.1Ω	Less than 750mV	
Input span		when balanced	at power off	Allowable signal source resistance
Voltage input	1 to 5V	1MΩ	1MΩ	1kΩ
	$4 \leq E_i \leq 40\text{mV}$	$(E_i/4) \times 10^6\Omega$	4.7MΩ	$(E_i/4) \times 10^2\Omega$
	$40 < E_i \leq 500\text{mV}$ (without burn-out circuit)	More than 1MΩ	4.7MΩ	1kΩ
	—	—	—	—
	$4 \leq E_i \leq 100\text{mV}$ (with burn-out circuit)	$(E_i/15) \times 10^6\Omega$	2.3MΩ	$(E_i/15) \times 10^2\Omega$
	$0.5 < E_i < 1\text{V}$	100kΩ	100kΩ	100Ω
	$1 \leq E_i < 3\text{V}$	300kΩ	300kΩ	300Ω
$3 \leq E_i \leq 30\text{V}$	1MΩ	1MΩ	1kΩ	

**List of Recording Charts**

**Standard** (for chart speed 20mm/h . . . . charts for other speeds are nonstandard)

Kind of input	Scale	Chart No.	Kind of input	Scale	Chart No.	Kind of input	Scale	Chart No.
J thermocouple	0 to 200° C	NN-1055	Pt100, JPt100 resistance bulb	0 to 50 °C	NL-1001	Linear scale (without numerals)	60 division	NL-6000
	0 to 300	NN-6011		0 to 70	NN-7001		70	NL-7000
	0 to 400	NN-8015		0 to 100	NN-1001		75	NL-7500
	0 to 500	NN-1021		0 to 150	NN-7501		80	NL-8000
		0 to 200		NN-1051	100		NL-1000	
K thermocouple	0 to 300 °C	NN-6001		0 to 250	NN-2501	Linear (with numerals)	120	NL-1200
	0 to 400	NN-8001		0 to 300	NN-6041		125	NL-2500
	0 to 500	NN-1025		0 to 400	NN-8011		0 to 20	NL-1001
	0 to 600	NN-1211		0 to 500	NN-1070		0 to 35	NL-7001
	0 to 800	NN-8021		50 to 100	NL-1010		0 to 40	NL-8001
	0 to 1000	NN-1041	50 to 150	NN-1001	0 to 50	NL-1001		
	0 to 1200	NN-1201	-40 to 60	NN-1016	0 to 60	NL-1201		
300 to 600	NN-6025	-50 to 50	NN-1016	0 to 70	NL-7001			
R thermocouple	0 to 1400°C	NN-7011	-50 to 150	NN-1057	0 to 75	NL-7501		
	0 to 1600	NN-8031	-50 to 100	NN-7502	0 to 80	NL-8001		
	700 to 1400	NN-7021			0 to 100	NL-1001		
	800 to 1600	NN-8016	Cu resistance bulb	0 to 50 °C	NL-1001	0 to 120	NL-1201	
900 to 1400	NN-1055	0 to 100		NL-1001	0 to 140	NL-7001		
		0 to 120		NL-1201	0 to 150	NL-7501		
		0 to 150		NL-7501	0 to 160	NL-8001		
E thermocouple	0 to 400 °C	NN-8005			0 to 250	NL-2501		
	0 to 600	NN-1231			0 to 300	NL-6001		
	200 to 400	NN-1055						
200 to 500	NN-6011							

**Non standard**

Kind of input	Scale	Chart No.	Kind of input	Scale	Chart No.	Kind of input	Scale	Chart No.
J thermocouple	0 to 100 °C	NN-1080	R thermocouple	0 to 800 °C	NN-8045	Pt100, JPt100 resistance bulb	0 to 120°C	NN-1240
	0 to 150	NN-7510		0 to 1000	NN-1031		50 to 200	NN-7501
	0 to 250	NN-2511		0 to 1200	NN-1221		100 to 200	NN-1001
	0 to 350	NN-7031		0 to 1500	NN-7505		100 to 250	NN-7501
	0 to 600	NN-1235		400 to 1000	NN-1205		100 to 300	NN-1051
	100 to 300	NL-1017		400 to 1400	NN-1045		200 to 400	NN-1052
	100 to 500	NL-8013	400 to 1600	NN-1251	300 to 500	NN-1052		
	200 to 400	NL-1018	600 to 1600	NN-1065	-20 to 50	NN-7001		
	200 to 500	NL-6010			-200 to 50	NN-1061		
	300 to 500	NL-1017	T thermocouple	0 to 150 °C	NN-7515	Cu resistance bulb	-200 to 150	NN-7045
	300 to 600	NN-6001		0 to 200	NN-1045			
		0 to 250		NN-2531				
K thermocouple	0 to 150 °C		E thermocouple	0 to 300	NN-6021	Square scale (without numerals)	0 to 100	NF-1000
	0 to 200			100 to 300	NN-1011			
	0 to 250			0 to 100 °C	NN-1011			
	100 to 500	NN-8065		0 to 200	NN-2521	Square scale (with numerals)		
	200 to 500	NN-6001		0 to 250	NN-6031			
	200 to 700	NN-1035		0 to 300	NN-7035			
	200 to 1000	NN-8051		0 to 350	NN-1005			
	300 to 800	NL-1016		0 to 500	NN-1015			
	400 to 800	NN-8035		100 to 300	NN-8025			
	400 to 1000	NN-1215		100 to 500	NN-6001			
	500 to 800	NN-6005		300 to 600				
	500 to 1000	NN-1052						
	500 to 1200	NN-7045						
600 to 1000	NN-8041							
700 to 1000	NN-6015							
700 to 1200	NN-1061							

Note 1) Speed (time division) for standard charts is 20mm/h. Other speeds are all nonstandard.

2) Please order nonstandard charts in sets of 24 rolls.

# CODE SYMBOLS

1 2 3 4 5 6 7 8 9 10 11 12 13

P	G	N						2					
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		Description																																	
		<b>Number of recording points</b>																																	
1		1	1-pen	4	3-point, single range	6	6-point, single range	8	12-point, single range																										
9		2	2-pen	5	3-point, double ranges, triple ranges	7	6-point, double ranges, triple ranges	9	12-point, double ranges, triple ranges																										
		<b>Input signal</b>																																	
A		A	1 to 5V DC			R	Thermocouple, more than 4mV span (with reference junction compensator, without burn-out circuit)																												
		B	4 to 20mA DC																																
		C	10 to 50mA DC			S	Thermocouple, more than 4mV span (with reference junction compensator and burn-out circuit)																												
		D	0 to 100 $\mu$ A . . . 200mA DC without base			H	Resistance bulb (3-wire system) JPt 100 $\Omega$ (at 0°C) 50°C span or over																												
		F	100 $\mu$ A to 200mA DC span (Note 1)			J	Potentiometric transducer, 3-wire system																												
		M	100 $\mu$ A to 200mA DC span (Note 2)			K	Potentiometric transducer, 2-wire system																												
		E	0 to 4mV . . . 30V DC without base			N	Resistance bulb (3-wire system) Pt100 $\Omega$ (at 0°C) 50°C span or over																												
		G	4mV to 30V DC span (Note 1)																																
		L	4mV to 30V DC span (Note 2)																																
Y		Y	No input signal																																
		Note 1) Base/span is less than 2. Note 2) Base/span is 2 to 5.																																	
		<ul style="list-style-type: none"> <li>Making of input signal (input code marked in <math>\odot</math>)</li> </ul> <table border="1"> <thead> <tr> <th></th> <th>5th digit</th> <th>6th digit</th> <th>7th digit</th> </tr> </thead> <tbody> <tr> <td>1-pen</td> <td><math>\odot</math></td> <td>Y</td> <td>Y</td> </tr> <tr> <td>2-pen</td> <td><math>\odot</math></td> <td><math>\odot</math></td> <td>Y</td> </tr> <tr> <td rowspan="3">Multi-point</td> <td>Same input</td> <td><math>\odot</math></td> <td>Y</td> </tr> <tr> <td>2 different inputs</td> <td><math>\odot</math></td> <td><math>\odot</math></td> </tr> <tr> <td>3 different inputs</td> <td><math>\odot</math></td> <td><math>\odot</math></td> </tr> </tbody> </table>													5th digit	6th digit	7th digit	1-pen	$\odot$	Y	Y	2-pen	$\odot$	$\odot$	Y	Multi-point	Same input	$\odot$	Y	2 different inputs	$\odot$	$\odot$	3 different inputs	$\odot$	$\odot$
	5th digit	6th digit	7th digit																																
1-pen	$\odot$	Y	Y																																
2-pen	$\odot$	$\odot$	Y																																
Multi-point	Same input	$\odot$	Y																																
	2 different inputs	$\odot$	$\odot$																																
	3 different inputs	$\odot$	$\odot$																																
		<b>Power supply</b>																																	
1		1	24V AC, 50Hz	3	100V AC, 50Hz	5	200V AC, 50Hz	Z*	Other																										
3		2	24V AC, 60Hz	4	100V AC, 60Hz	6	200V AC, 60Hz																												
Z																																			
		<b>Application and linearizer circuit availability</b>																																	
		Application			Linearizer circuit availability																														
					5th digit input	6th digit input	7th digit input																												
Y		General use			x	x	x																												
E		"			$\circ$	x	x																												
F		"			x	$\circ$	x																												
G		"			x	x	$\circ$																												
H		"			$\circ$	$\circ$	x																												
J		"			$\circ$	x	$\circ$																												
K		"			x	$\circ$	$\circ$																												
L		"			$\circ$	$\circ$	$\circ$																												
D		For zener barrier connection			x	x	x																												
M		"			$\circ$	x	x																												
N		"			x	$\circ$	x																												
P		"			x	x	$\circ$																												
Q		"			$\circ$	$\circ$	x																												
R		"			$\circ$	x	$\circ$																												
S		"			x	$\circ$	$\circ$																												
T		"			$\circ$	$\circ$	$\circ$																												
		Note 1) Linearizer circuit can be equipped only when 5th, 6th and 7th digits of code are R, S and H.																																	
		2) With R, S, H and N in the 5th, 6th and 7th digits, please specify a zener barrier connection. A JIS standard thermocouple or resistance bulb (Pt 100 $\Omega$ ) should be used for the detecting element.																																	
		<b>Alarm device</b>																																	
Y		No alarm																																	
A		With 1-pen alarm (Upper and lower limit alarm)																																	
B		With 1-pen/2-pen alarm (Upper and lower limit alarm each)																																	
C		Common setting/common alarm for multipoint																																	
D		{ Common setting/individual alarms for multipoint } (use KERS alarm unit, Model PHP)																																	
		{ Individual settings/individual alarms for multipoint }																																	
*E		For future installation of PHP																																	
*F		Common setting/common alarm for multipoint + Future installation of PHP																																	
		<b>Optional attachment (I)</b>																																	
Y		None																																	
A		With signal transmitter for 1-pen (1 to 5V DC, One element)																																	
B		With signal transmitter for 1 and 2-pen (1 to 5V DC, One element each)																																	
C		External chart control (pen recorder only)																																	
D		Printing interval: 6 sec (at 50Hz), 5 sec (at 60Hz)																																	
E		A + C																																	
F		B + C																																	
		<b>Optional attachment (II) and recording method</b>																																	
Y		Pen or multi-point (printing pad) system																																	
A		High speed chart drive (120, 240, 720, 1440, 3600, 7200, 14400mm/h)																																	
B		Multipoint (ink-feed) system																																	

• Symbols of resistance bulbs are as follows: JPt100 . . . Previous JIS standard, PT100 . . . New JIS standard

## KERS ALARM UNIT (MODEL PHP)

The KERS alarm unit is used in combination with KERS (Model PGN) to pick up alarm signals such as common setting/individual alarms and individual settings/individual alarms. It also provides measuring point indication and alarm indication which can be monitored on the front panel.

**Type of alarm:** Common setting/individual alarms  
Individual settings/individual alarms

**Number of alarm points:**  
6-point upper limit alarm  
6-point lower limit alarm  
6-point upper and lower limit alarm  
12-point upper limit alarm  
12-point lower limit alarm  
12-point upper and lower limit alarm

**Setting accuracy:** ± 1% of full scale  
(Setting value can be indicated on scale of KERS)

**Hysteresis:** 1% of full scale

**Measuring point indication:**

By LED on front panel

**Alarm output:** Contact; Excitation alarm, 1-a contact per alarm  
Contact capacity; 250V AC, 1A  
250VA (resistance load)

**Power supply:** Indication; By LED on front panel  
Supplied from KERS.

24V  $\pm$  15%  
-10% AC  
100V  $\pm$  10% AC or  
200V  $\pm$  10% AC, 50/60Hz

**Power consumption:**  
Approx. 8 to 18VA

**Ambient temperature:**  
0 to 50°C  
(storage temperature - 10 to +60°C)

**Ambient humidity:**  
Less than 90%RH

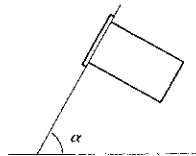
**Enclosure:** Steel plate

**External dimensions (H × W × D):**  
144 × 288 × 270mm

**Weight (approx.):** 6-point alarm 7kg  
12-point alarm 8kg  
24-point alarm 9kg

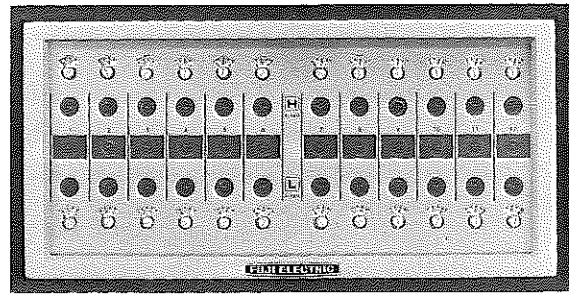
**Finish color:** Munsell 7.5BG3.2/0.8 (case)  
Munsell N1.5 (frame)

**Mounting:** Within  $\alpha = 90$  to  $60^\circ$



**Wiring method:** Connected to KERS with connector, cord length 0.8m (connecting cord is supplied with PHP)

**Scope of delivery:** Alarm unit, mounting brackets, instruction manual

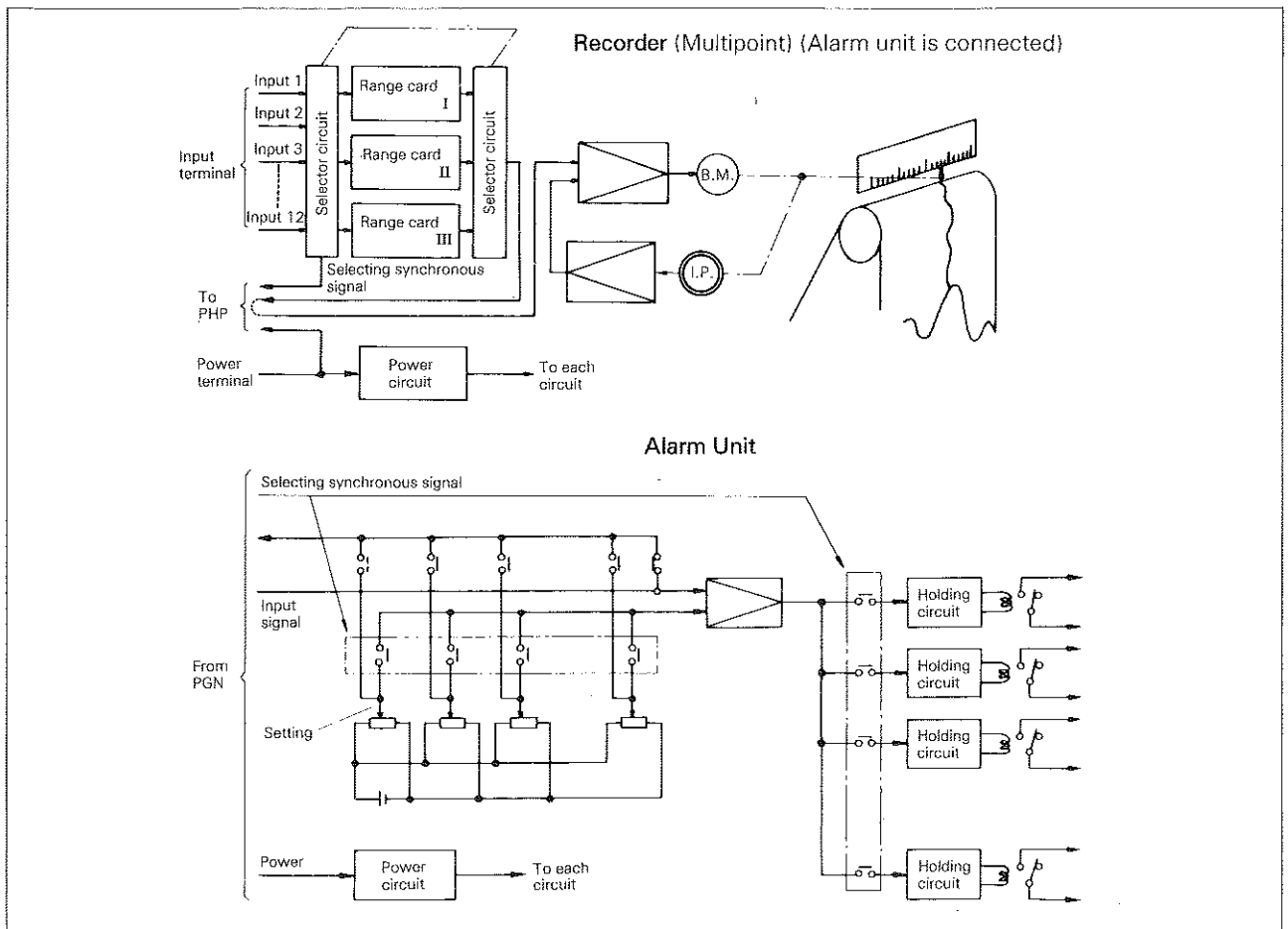


Alarm unit

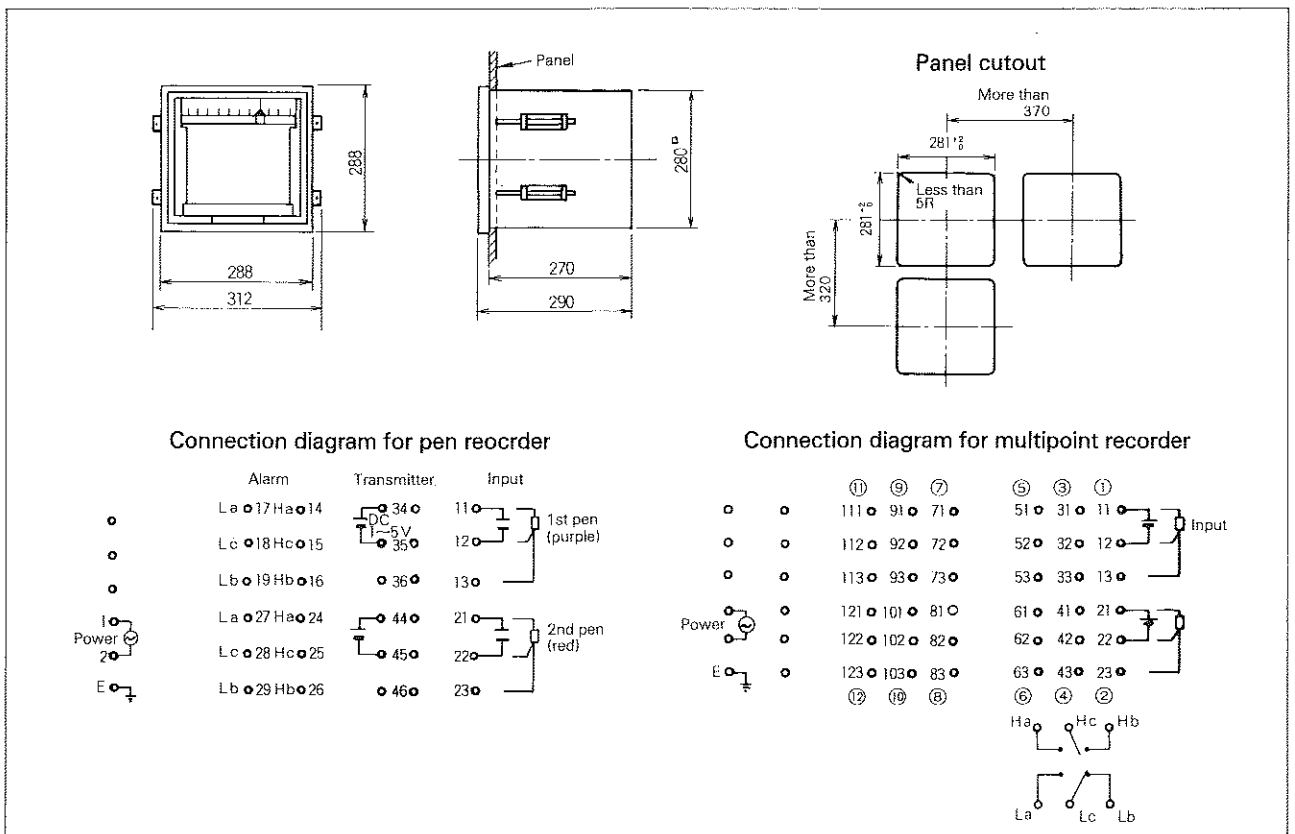
## CODE SYMBOLS

1	2	3	4	5	6	7	8	Description
P	H	P					1	Number of recorder's points
					6			6-point
					8			12-point
				A				Type of alarm
				B				Individual settings/individual alarms
								Common setting/individual alarms
								Alarm action
					H			Upper limit alarm
					L			Lower limit alarm
					K			Upper and lower limit alarm
								Power supply (same as recorder power)
						1		24V AC, 50/60Hz
						3		100V AC, 50/60Hz
						5		200V AC, 50/60Hz
						Z		Others

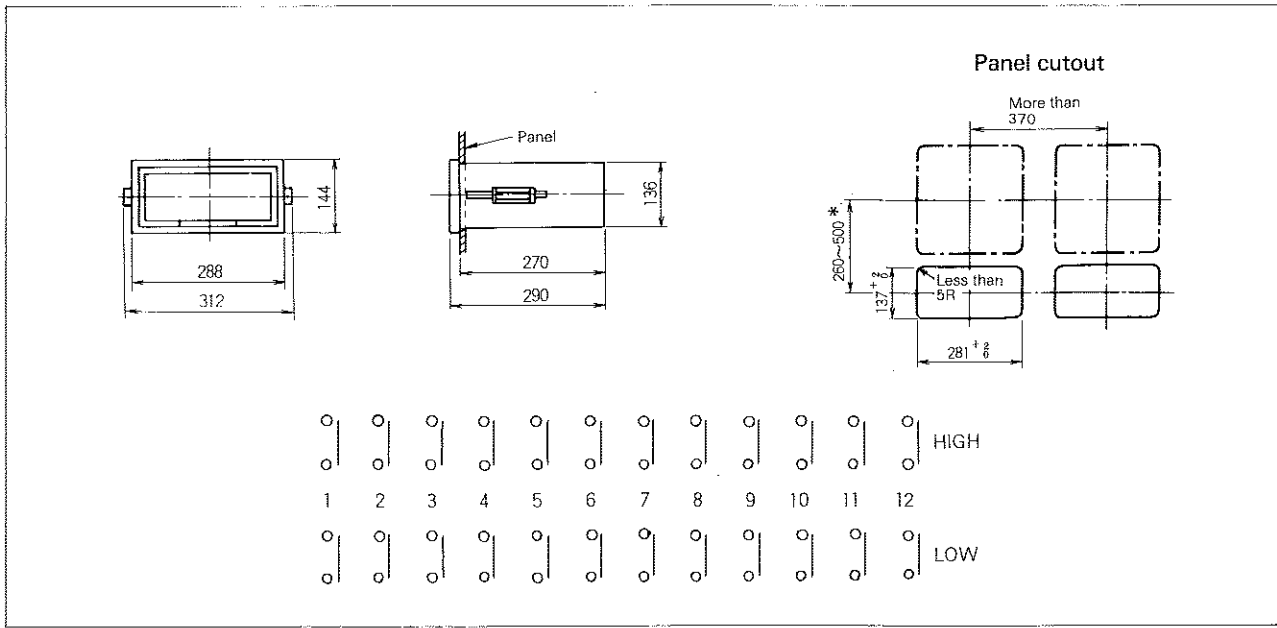
# OPERATING PRINCIPLE



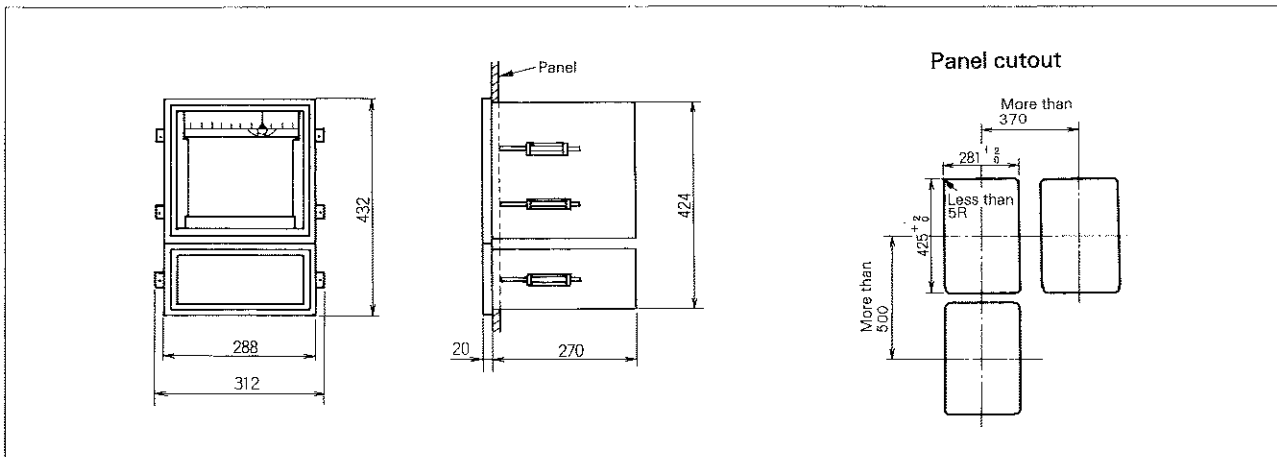
# KERS OUTLINE DIAGRAM (Unit : mm), and CONNECTION DIAGRAM



**KERS ALARM UNIT OUTLINE DIAGRAM (Unit:mm) and CONNECTION DIAGRAM**



**KERS (with alarm unit) OUTLINE DIAGRAM (Unit:mm)**



**Fuji Electric Co.,Ltd.**

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