

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 x 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.

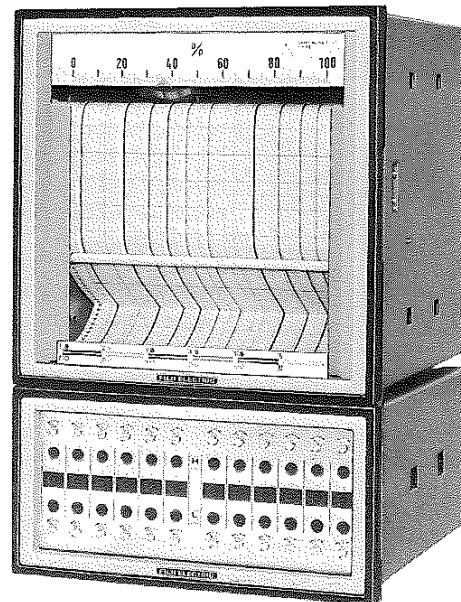
FEATURES

1. **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.
2. **Unit type mechanism**
The inner mechanism is of plug-in unit type, providing easy maintenance and inspections.
3. **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.
4. **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.
5. **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.
6. **Adjustable chart speed**
The gear slide system permits easy selection of recording chart speed in 7 steps from 10mm/h to 1200mm/h.
7. **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 μ A . . . 200mA DC (without base)



- F 100 μ A DC span or more (max. current 200mA) *1
- M 100 μ 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 Ω (at 0 $^{\circ}$ C), more than 50 $^{\circ}$ C span
- N Ditto, but Pt100 Ω (at 0 $^{\circ}$ C), more than 50 $^{\circ}$ C span *4, *5
- J Potentiometric transducer (resistance change 19 Ω to 1500 Ω) 3-wire system *5
- K Potentiometric transducer (resistance change 19 Ω to 1500 Ω) 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 $^{\circ}$ C, K: 150 $^{\circ}$ C, J: 100 $^{\circ}$ C, T: 150 $^{\circ}$ C,
 E: 100 $^{\circ}$ 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: $\pm 0.5\%$ 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 x W x D):
 288 x 288 x 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)

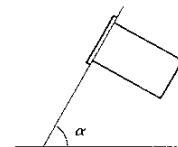
OPTIONAL ATTACHMENTS

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: $\pm 1\%$ 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; 22 Ω
 (load resistance; more than 20k Ω)
Accuracy; $\pm 0.5\%$ 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°



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
	$0.1 \leq I_i < 1$ mA (span)	100Ω	100Ω
	$1 \leq I_i < 10$ mA (span)	10Ω	10Ω
	$10 \leq I_i < 100$ mA (span)	1Ω	10Ω
	$100 \leq I_i \leq 200$ 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
	$4 \leq E_i \leq 40$ mV	$(E_i/4) \times 10^5 \Omega$	4.7MΩ	$(E_i/4) \times 10^2 \Omega$
	$40 < E_i \leq 500$ mV (without burn-out circuit)	More than 1MΩ	4.7MΩ	1kΩ
	$4 \leq E_i \leq 100$ mV (with burn-out circuit)	$(E_i/15) \times 10^5 \Omega$	2.3MΩ	$(E_i/15) \times 10^2 \Omega$
	$0.5 < E_i < 1$ V	100kΩ	100kΩ	100Ω
	$1 \leq E_i < 3$ V	300kΩ	300kΩ	300Ω
	$3 \leq E_i \leq 30$ 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	
K thermocouple	0 to 300 °C	NN-6001		0 to 200	NN-1051		100	NL-1000	
	0 to 400	NN-8001		0 to 250	NN-2501		120	NL-1200	
	0 to 500	NN-1025		0 to 300	NN-6041		125	NL-2500	
	0 to 600	NN-1211		0 to 400	NN-8011		Linear (with numerals)	0 to 20	NL-1001
	0 to 800	NN-8021		0 to 500	NN-1070			0 to 35	NL-7001
	0 to 1000	NN-1041		50 to 100	NL-1010			0 to 40	NL-8001
	0 to 1200	NN-1201		50 to 150	NN-1001			0 to 50	NL-1001
	300 to 600	NN-6025	-40 to 60	NN-1016	0 to 60	NL-1201			
R thermocouple	0 to 1400°C	NN-7011	-50 to 50	NN-1016	0 to 70	NL-7001			
	0 to 1600	NN-8031	-50 to 150	NN-1057	0 to 75	NL-7501			
	700 to 1400	NN-7021	-50 to 100	NN-7502	0 to 80	NL-8001			
	800 to 1600	NN-8016	Cu resistance bulb	0 to 50 °C	NL-1001	0 to 100	NL-1001		
	900 to 1400	NN-1055		0 to 100	NL-1001	0 to 120	NL-1201		
E thermocouple	0 to 400 °C	NN-8005	0 to 120	NL-1201	0 to 140	NL-7001			
	0 to 600	NN-1231	0 to 150	NL-7501	0 to 150	NL-7501			
	200 to 400	NN-1055			0 to 160	NL-8001			
	200 to 500	NN-6011			0 to 250	NL-2501			
					0 to 300	NL-6001			

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		T thermocouple	0 to 150 °C		NN-7515	-20 to 50	NN-1061
	300 to 500	NL-1017			0 to 200		NN-1045	-200 to 150	NN-7045
	300 to 600	NN-6001			0 to 250		NN-2531	Cu resistance bulb	-10 to 40°C
K thermocouple	0 to 150 °C	NN-8065- NN-6001 NN-1035 NN-8051 NL-1016 NN-8035 NN-1215 NN-6005 NN-1052 NN-7045 NN-8041 NN-6015 NN-1061	0 to 300	NN-6021	Square scale (without numerals)	(0 to 100)	NF-1000		
	0 to 200		E thermocouple	100 to 300				NN-1011	
	0 to 250			0 to 100 °C				NN-1011	
	100 to 500			0 to 200				NN-2521	
	200 to 500			0 to 250				NN-6031	
	200 to 700			0 to 300				NN-7035	
	200 to 1000			0 to 350				NN-1005	
	300 to 800			100 to 300				NN-1015	
	400 to 800			100 to 500				NN-8025	
	400 to 1000			300 to 600				NN-6001	
500 to 800						Square scale (with numerals)	0 to 5/10/20	NF-1001	

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

		Description		
		Number of recording points		
1	1-pen	4	3-point, single range	
6		6	6-point, single range	
8		8	12-point, single range	
2	2-pen	5	3-point, double ranges, triple ranges	
7		7	6-point, double ranges, triple ranges	
9		9	12-point, double ranges, triple ranges	
		Input signal		
A	1 to 5V DC	R	Thermocouple, more than 4mV span (with reference junction compensator, without burn-out circuit)	
B	4 to 20mA DC	S	Thermocouple, more than 4mV span (with reference junction compensator and burn-out circuit)	
C	10 to 50mA DC	H	Resistance bulb (3-wire system) JPt 100Ω (at 0°C) 50°C span or over	
D	0 to 100μA . . . 200mA DC without base	J	Potentiometric transducer, 3-wire system	
F	100μA to 200mA DC span (Note 1)	K	Potentiometric transducer, 2-wire system	
M	100μA to 200mA DC span (Note 2)	N	Resistance bulb (3-wire system) Pt100Ω (at 0°C) 50°C span or over	
E	0 to 4mV . . . 30V DC without base			
G	4mV to 30V DC span (Note 1)			
L	4mV to 30V DC span (Note 2)			
Y	No input signal			
Note 1) Base/span is less than 2. Note 2) Base/span is 2 to 5.				
• Making of input signal (input code marked in ⊙)				
		5th digit	6th digit	
	1-pen	⊙	Y	
	2-pen	⊙	Y	
Multi-point	Same input	⊙	Y	
	2 different inputs	⊙	Y	
	3 different inputs	⊙	⊙	
		Power supply		
1	24V AC, 50Hz	3	100V AC, 50Hz	
5		5	200V AC, 50Hz	
Z*		Z*	Other	
2	24V AC, 60Hz	4	100V AC, 60Hz	
6		6	200V AC, 60Hz	
		Application and linearizer circuit availability		
	Application	Linearizer circuit availability		
		5th digit input	6th digit input	7th digit input
Y	General use	x	x	x
E	"	○	x	x
F	"	x	○	x
G	"	x	x	○
H	"	○	○	x
J	"	○	x	○
K	"	x	○	○
L	"	○	○	○
D	For zener barrier connection	x	x	x
M	"	○	x	x
N	"	x	○	x
P	"	x	x	○
Q	"	○	○	x
R	"	○	x	○
S	"	x	○	○
T	"	○	○	○
		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 100Ω) should be used for the detecting element.		
		Alarm device		
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			
		Optional attachment (I)		
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			
		Optional attachment (II) and recording method		
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: Supplied from KERS.
24V \pm 15% 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

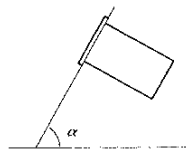
Enclosure: Steel plate

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

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

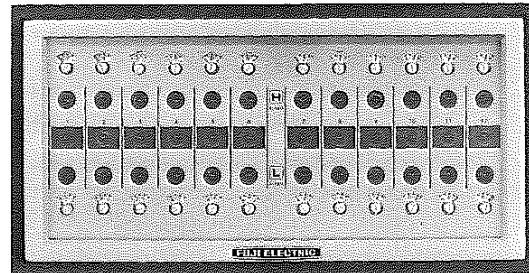
Finish color: Munsell 7.5BG3.2/0.8 (case)
Munsell N1.5 (frame)

Mounting: Within $\alpha = 90$ to 60°



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

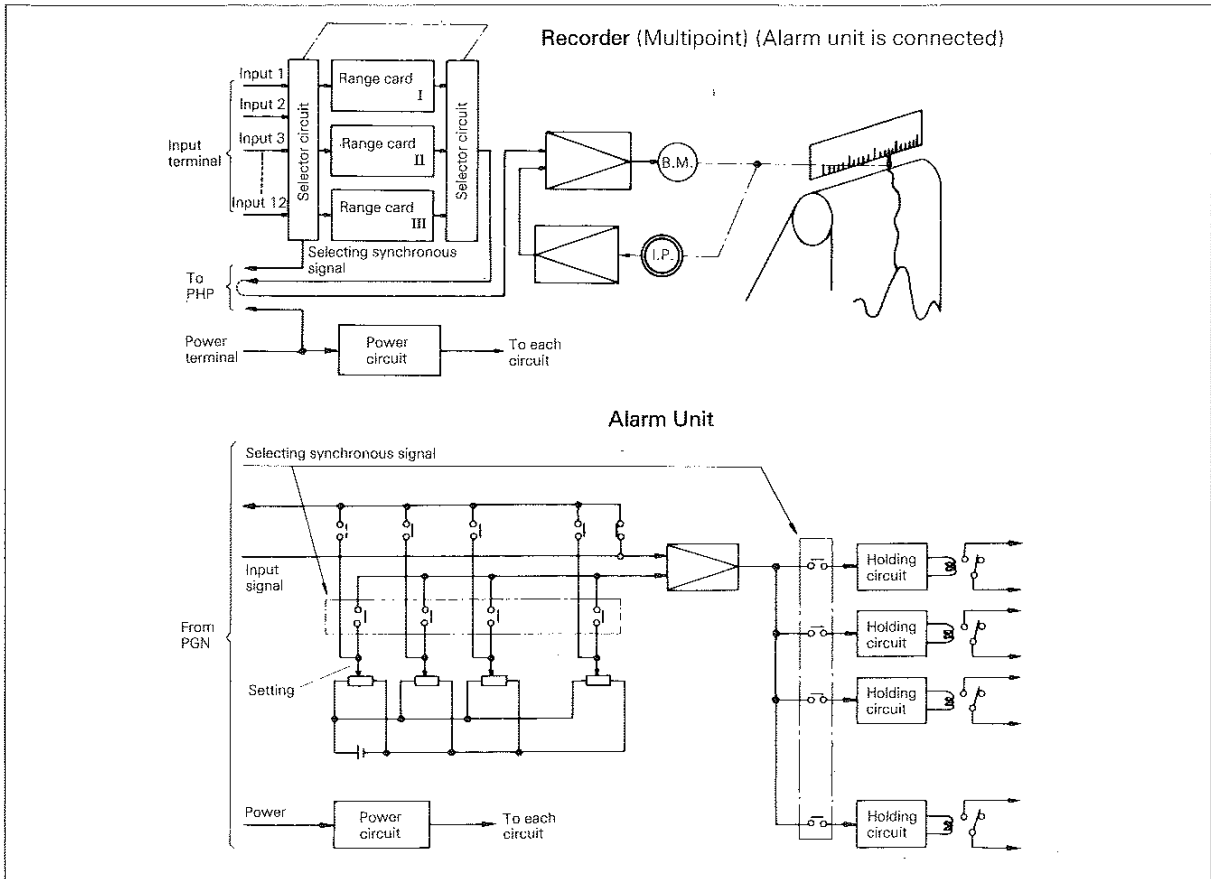


Alarm unit

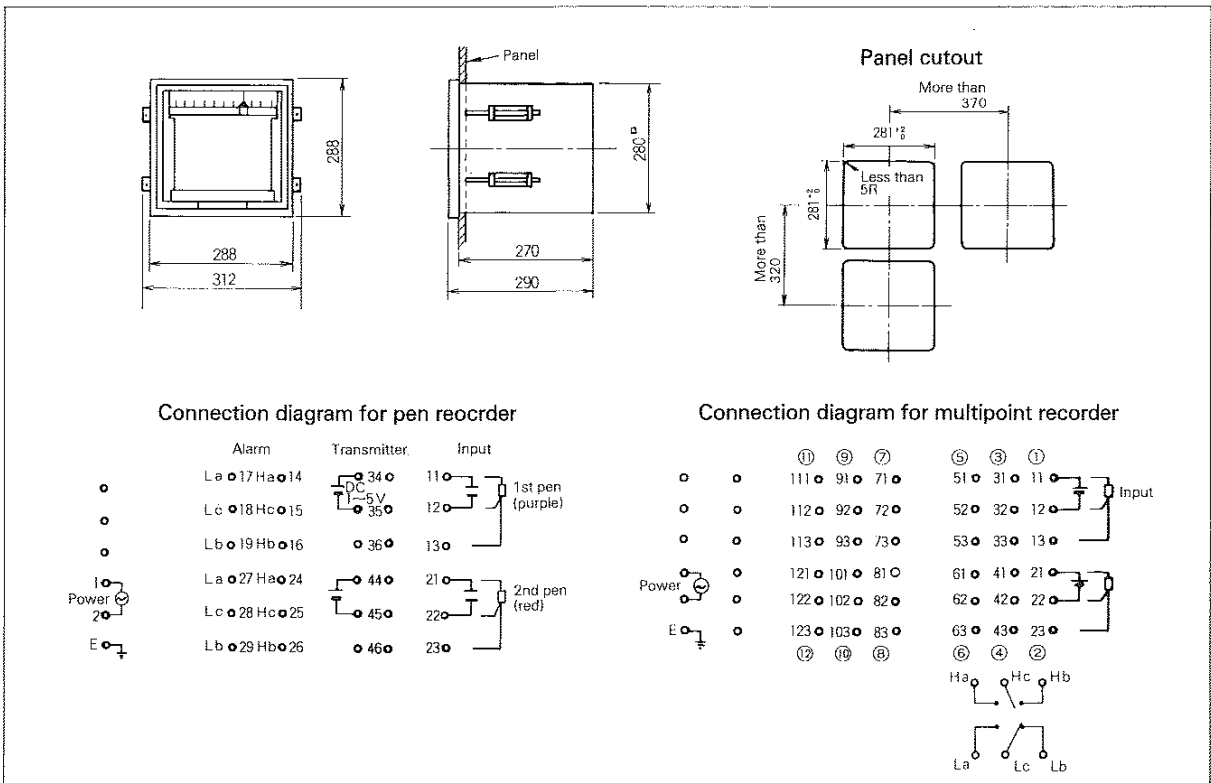
CODE SYMBOLS

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

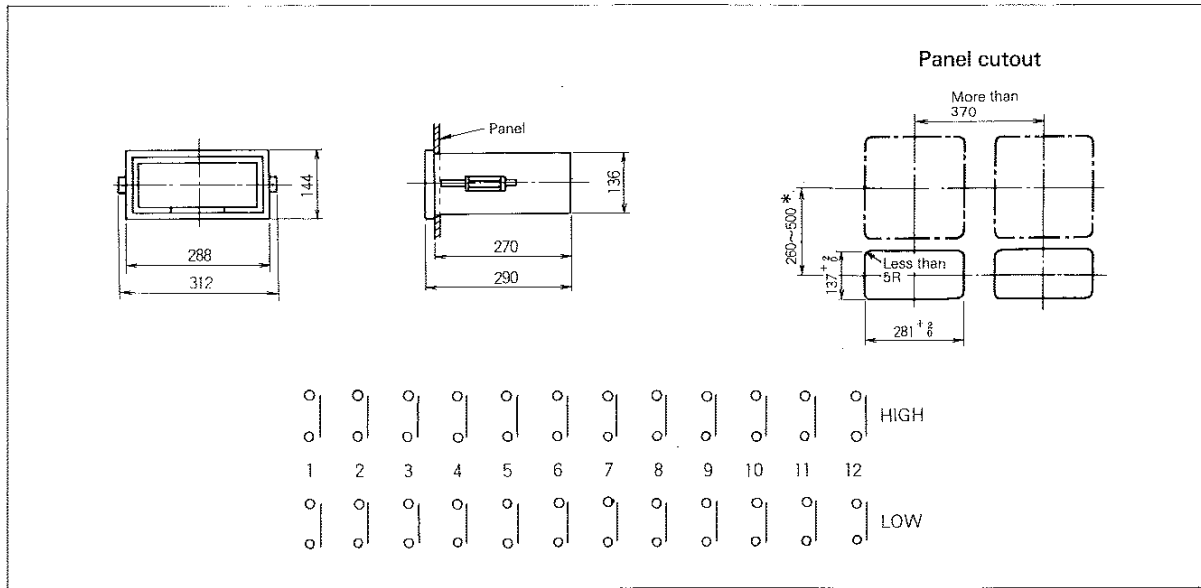
OPERATING PRINCIPLE



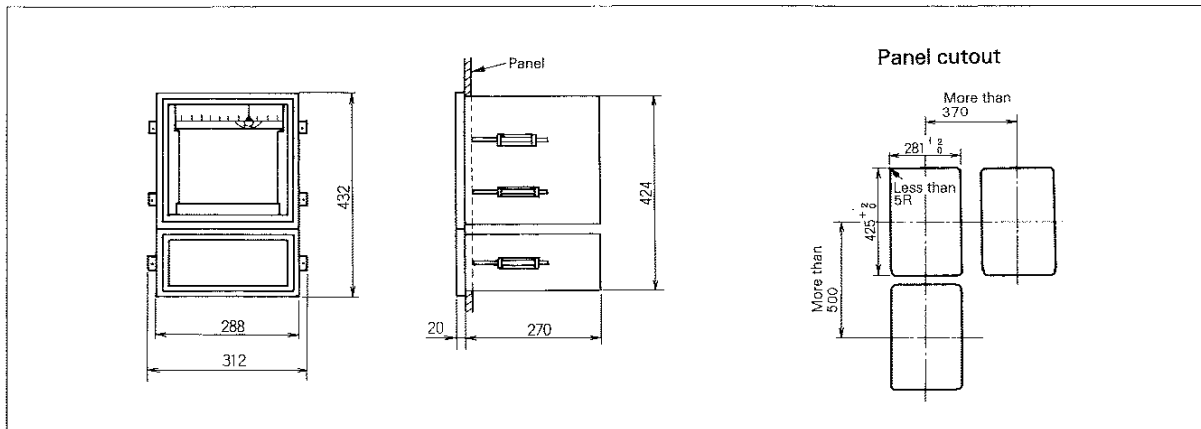
KERS OUTLINE DIAGRAM (Unit : mm), and CONNECTION DIAGRAM



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



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



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