

FC SERIES COMPACT CALCULATOR

DATA SHEET

PNM2

The FC series compact calculator is a high cost-performance, flexible, and highly functional calculator which inputs 5 analog signals and 6 digital signals, digitally performs complex calculations such as arithmetic, square root extraction, time-factor calculations, etc., and then provides 5 analog and 6 digital outputs.

FEATURES

1. Highly functional calculator using a microprocessor

A variety of calculating functions are coordinated into functional units called wafers. Complex calculations are thus performed flexibly and accurately through connection of the computational wafers.

2. International standards

This instrument is compact in size, conforming to international standards IEC. It operates on 24V DC power to deliver 1 to 5V DC signals as recommended by IEC standards.

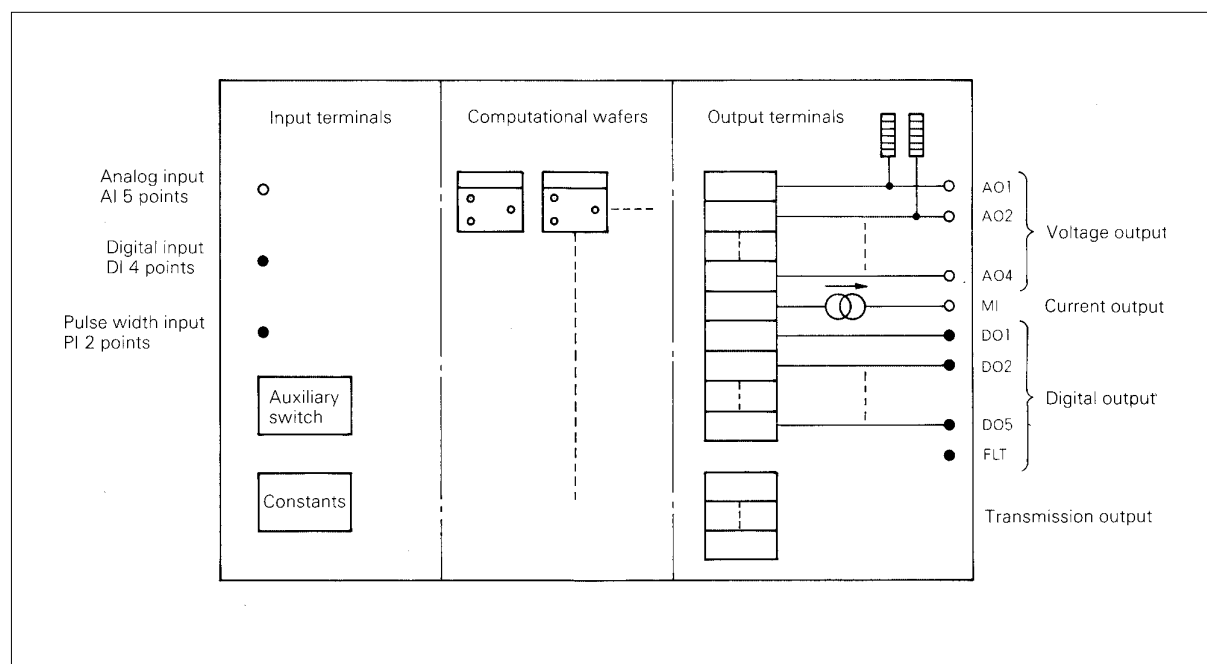
100V and 200V AC power are also available for convenience of operation.

3. Contents of calculation are changeable on the spot

The contents of calculation can be specified on the spot using key operation on the front panel. And the contents are retained even at power failure due to utilization of a non-volatile memory.



FUNCTIONAL PRINCIPLE



SPECIFICATIONS

1. Computational functions

(1) Wafers

The wafer is a functional software package which realizes the computational functions needed for instrumentation control. A calculator which responds flexibly to the application purpose is realized through combination of these wafers having their own individual functions.

The PNM is capable of executing a total of either 24, 48 or 64 wafers. The wafers given in the table below are standard-equipped which enables selection according to the purpose of application.

- For computation: A variety of computations are feasible by combining the wafers in Table 1.

(2) Internal input/output terminals

Various internal terminals for connecting external analog input/outputs and digital input/outputs with wafers are provided.

(3) Constants

These can be freely defined as parameters for use in calculation. (32 constants with 24 wafers, 48 constants with 48 wafers, 64 constants with 64 wafers)

(4) Computation cycle

0.2 sec (24 wafer type)

0.4 sec (48 wafer type)

0.5 sec (64 wafer type)

Table 1 List of computational wafers

Wafer name	Kinds	Outline of functions
Logical computation	6	Performs logical computation such as AND, OR, NOT, EOR and a combination of these.
Arithmetic computation	5	Performs computation such as addition, subtraction, multiplication and division.
Temperature/pressure compensation	1	Performs temperature/pressure compensation using differential pressure, correcting pressure and/or proper temperature.
Linearize	3/6/8	Performs segmented line approximation using 15 segmented line functions (6 kinds with 48 wafers, 8 kinds with 64 wafers).
Flip-flop	1	RS flip-flop
Pulse width integration	1	Adds the input change amount at each basic cycle to the previous integrated value.
Selector	1	Compares two input values, and outputs the result of high/low judgment as HIGH output (higher one) or LOW output (lower one).
Changeover	1	A switch function which selects either input or output. An analog hold circuit can also be combined.
Timer	1	Outputs an on-delay/off-delay timer signal via input signal start according to the timer setting.
Square root computation	1	Subjects an input value to square root extraction and outputs the result. Also has a low input cutoff function.
Lead, lag	3	Subjects the input to lead or lag computation and outputs the result. Used for analog filter function and various compensations.
Limiter	1	Limits the input within the range of upper/lower limit setting and outputs the result. Also outputs an upper/lower limit alarm signal.
Absolute value sign inversion	1	Subjects the input to absolute value processing and outputs the result. Also judges the input value sign (positive, negative) and outputs the results.
Ramp function	2	Outputs a signal which changes in ramp-like form toward the target value within the set full-scale time. Includes two kinds for minute and hour unit.
Analog average	1	Subjects the input data to sequential integration, calculates the average for each average value calculation time and outputs the result.
Analog integration	1	Integrates the value obtained by multiplying the input data via a proportional constant, and outputs the result.
Pulse generation	1	Outputs a pulse at a set time interval.
Dead band	1	Adds dead band compensation to the input and outputs the result.
Pulse number counter	1	Detects the rise of a pulse and counts the number of pulses.
Pulse number output	1	Integrates the input signal, converts it to number of pulses and outputs the result.
Decoder	1	Decodes binary input of two bits and outputs it at 4 terminals.
Moving average	2	Calculates moving average for the input data and outputs the result.
Sample hold	1	Holds the input value according to sample time (0/1) and outputs it successively.
Dead time	9	Usable for dead time compensation control, etc. Data sampling is available in units of 1 second and 1 minute.
On-off	1	Outputs an on-off signal with hysteresis versus the input.
Alarm	1	Compares the input with the set value, and outputs the judgment result.
Position type pulse width change	1	Performs output processing for time-proportional PID control.

Various applications are feasible by combining encoder, saw-tooth wave generating and sine wave generating wafers.

2. Input signal

(1) Analog input signal AI1:

One input selectable from the following

Voltage input signal	1 to 5V DC	Input resistance: 1M Ω or more; accuracy: $\pm 0.2\%/FS$ (*)
Current input signal	4 to 20mA DC	24V $\pm 2V$ DC can be supplied to transmitter when using AC source (approx. 35mA); accuracy: $\pm 0.2\%/FS$
Thermocouple input	Type J: 0 to 600°C K: 0 to 1200°C E: 0 to 800°C R: 0 to 1600°C	10mV DC span or more; cold junction compensation comprised; accuracy: $\pm 0.5\%/FS$
Resistance bulb input	Jpt100, Pt100 -50 to 500°C	50°C span or more; accuracy: $\pm 0.5\%/FS$

Note: *FS: Full scale

(2) Analog input signal: 4 points

Analog input	AI2	1 to 5V DC	Input resistance: 1M Ω or more Accuracy: $\pm 0.2\%/FS$
Analog input	AI3		
Analog input	AI4		
Analog input	AI5		

(3) Digital input signal: 4 points

Digital input	DI1	Contact input (photo-coupler insulation)	ON/0V, OFF/24V (input current approx. 11mA/24V DC)
Digital input	DI2		
Digital input	DI3		
Digital input	DI4		

(4) Pulse width or pulse number input signal: One set

Pulse width input signal	PI ₊	Contact input (photo-coupler insulation)	ON/0V, OFF/24V (input current approx. 11mA/24V DC)
Pulse number input signal	PI ₋		ON/0V, OFF/24V (approx. 11mA/24V DC); input max. frequency: 500Hz

3. Output signal

(1) Current output signal: One point

Current output	MI ₊ MI ₋	4 to 20mA DC	Allowable load resistance: 600 Ω or less; accuracy: $\pm 0.2\%/FS$
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(2) Analog output signal: 4 points

Analog output	AO1	1 to 5V DC	Output resistance: 1 Ω or less; accuracy: $\pm 0.2\%/FS$
Analog output	AO2		
Analog output	AO3		
Analog output	AO4		

(3) Digital output signal: 6 points

Fault output	FLT	Open collector output (Photo-coupler insulation)	Output rating 30V x 0.1A DC max.
Digital output	DO1		
Digital output	DO2		
Digital output	DO3		
Digital output	DO4		
Digital output	DO5		

4. Internal uniform data conversion

(1) Analog data

Standard	Minimum	Maximum
0.00 to 100.00%	-327.6%	327.67%

(2) Digital data

Input/output status	Data
ON (contact closed)	0.01%
OFF (contact open)	0.00%

5. Indication, setting, operating functions

(1) Bargraph indication

	RV indicator	GV indicator
Indication type	LED (red)	LED (green)
No. of segments	101+2	101+2
Range	0 to 100% linear	0 to 100% linear
Resolution	1%/FS	1%/FS
Scale length	100mm	100mm
Indication mode	0 to 100% bargraph indication 0 to 100% reverse bargraph indication dot indication -50 to +50% deviation indication	

(2) Run mode indication

Indicating method:

LED (red); red, H/L

(3) Numerical indication, setting

Indication method:

LED (red), name 3 digits+numerals 5 digits (including negative sign)

Indication contents:

Indication contents such as constants, segmented line and wafers selectable by $\overline{F/S}$, \triangle and ∇ keys on the front.

Setting method: By operation of $\overline{F/S}$, \triangle , ∇ , \boxtimes , and \overline{ST} keys on the front.

6. Power failure processing function

Power failure detection:

Calculation stops at power failure detection.

During power failure:

Operating parameters retained by capacitor backup within 5 minutes. Constants, segmented line, wafers, parameters etc. are stored in non-volatile memory (lasts 10 years expected at ambient temperature below 50°C).

At power recovery:

Initial or continuous start mode can be set within 5 minutes. Recovery from power failure lasting longer than 5 minutes is done by initial.

7. Self-diagnosis functions

Computing circuit fault:

H, L lamp simultaneously lit FLT contact output ON, computation stops

Input/output signal fault, run output disconnection:

H, L lamp simultaneously lit; FLT contact output ON, computation and output processing for other than run output continue.

Fault contents indication:

Cause of fault is numerically indicated on front-panel numerical indicator

8. Transmission function

(1) Transmission items

Monitor items: PNM → host
Fault information, constants, analog input/output, digital input/output, etc.

Setting, operation items:

Host → PNM
Constants, etc.

(2) Transmission setting inhibit:

Parameter setting enable/inhibit can be designated by transmission from the host. Designation is done by keys on the front panel.

(3) Transmission interface

(a) T-link: Private interface

Transmission speed: 500Kbps
No. of units connectable: 32 max.
Transmission distance: 1km max.
Transmission form: Multi-drop
Control method: I/O transmission and message

(b) RS-422A/485: Universal interface

Transmission speed: 2400, 4800, 9600 or 19200 bps configurable
No. of units connectable: 31 max.
Transmission distance: 1km max.
Transmission form: Multi-drop
Control method: Polling/selecting

(c) CC data line: Private interface

Transmission speed: 19.2 Kbps (fixed)
No. of units connectable: 15 max.
Transmission distance: 500m max.
Transmission form: Multi-drop
Control method: Polling/selecting

9. Other functions

Data protective function by pass code

10. Usage conditions

Power supply: Selectable from three types
24V DC (20 to 30V DC), 100V AC (85 to 132V AC/47 to 63Hz), 200V AC (187 to 264V AC/47 to 63Hz)

Power consumption:
Approx. 12W (DC), approx. 20VA (AC)

Dielectric strength:
1500V AC for 1 minute

Insulation resistance:
100MΩ or more at 500V DC

Ambient temperature:
0 to 50 °C

Ambient humidity:
90% RH or less

Enclosure: Steel case

Casing protective structure:
Front section: IP65 (IEC 529)

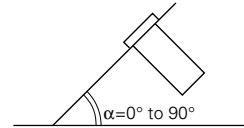
Rating plate (Name plate):
100 (H) x 70 (W), white acrylic resin

Dimensions: 144 (H) x 72 (W) x 391 (D) mm, IEC (DIN) standard

Mass (weight): Approx. 2.9kg

Mounting method:

Indoor panel mounting, vertical mounting standard, can be tilted within following angle



Finish color: Front panel; Munsell N1.5
Casing; Munsell N1.5

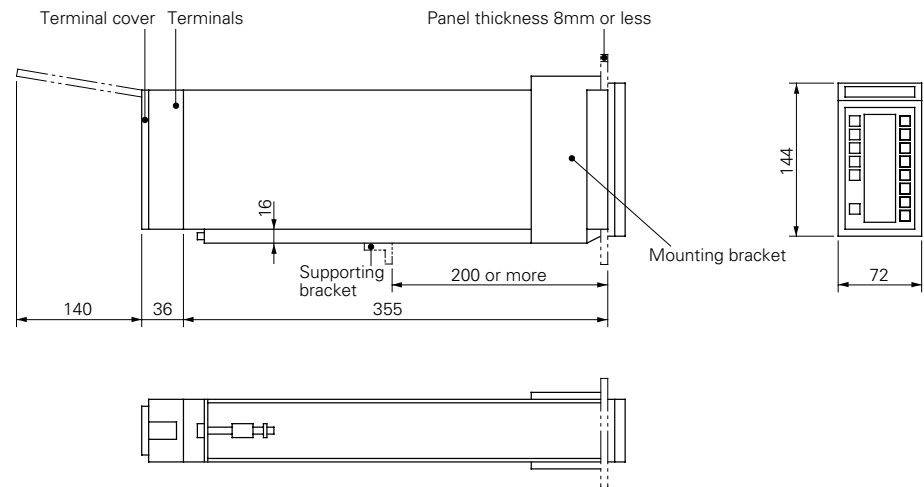
Scope of delivery: Calculator and mounting bracket
Item to be ordered separately:
Communication cable (type PNZ)

CODE SYMBOLS

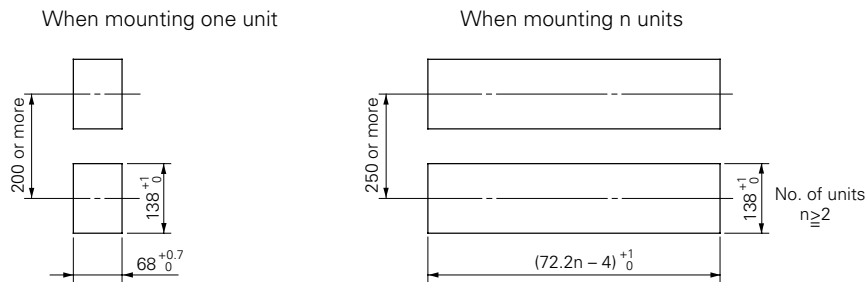
1	2	3	4	5	6	7	8	9	10	11	Description
P	N	M	2	Y	5	-	0				
A											Measured input signal
B											1 to 5V DC
C											4 to 20mA DC
D											J thermocouple
E											K thermocouple
F											E thermocouple
G											R thermocouple
W											10mV DC span or more, with cold junction compensation
											Resistance bulb, JPt 100
											3 wire type, 50 °C span or more
											Resistance bulb, Pt100,
											3 wire type, 50 °C span or more
											Power supply
1											24V DC (20 to 30V DC)
2											100V AC (85 to 132V AC/47 to 63Hz)
3											200V AC (187 to 264V AC/47 to 63Hz)
											Transmission function
											Y.....None
											T.....T-link
											R.....RS-422A
											S.....RS-485
											C.....CC data line
											Wafer connection/no. of wafers executable
											0...None/24 wafers
											1...Provided/24 wafers
											2...None/48 wafers
											3...Provided/48 wafers
											4...None/64 wafers
											5...Provided/64 wafers

Note: Resistance bulb symbol is as follows;
JPt100.....JIS C 1604-1981
Pt100.....IEC Pub 751-1983

OUTLINE DIAGRAM (Unit:mm)

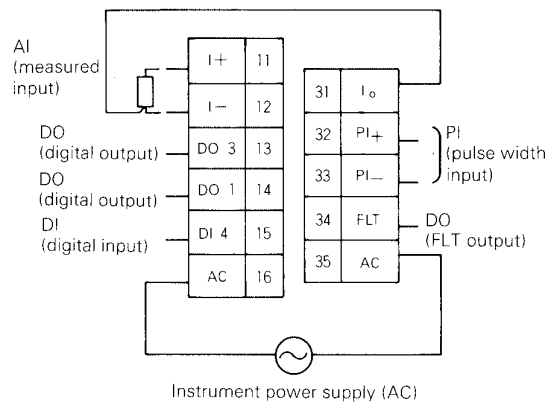


Panel cutout



CONNECTION DIAGRAM

Block terminals (M4 screw)



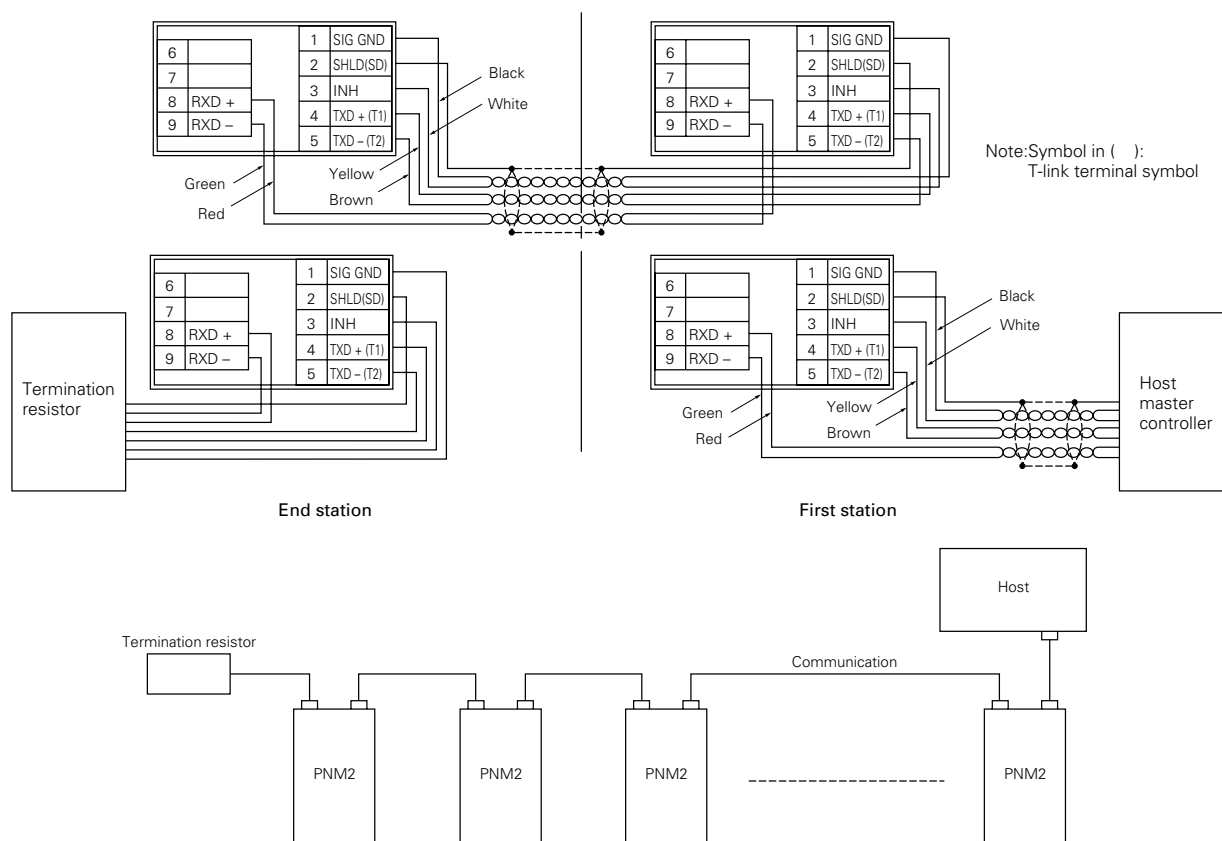
AO (analog output)	AO 1	51	71	AI 2	AI (analog input)
AO (analog output)	AO 2	52	72	AI 3	AI (analog input)
AO (analog output)	AO 3	53	73	AI 4	AI (analog input)
AO (analog output)	AO 4	54	74	AI 5	AI (analog input)
AI, AO (common bus)	SC	55	75		
Power supply output	MI+	56	76	SC	AI, AO common bus
	MI-	57	77	DO 2	DO (digital output)
DO (digital output)	DO 4	58	78	DI 3	DI (digital input)
DO (digital output)	DO 5	59	79	DI 2	DI (digital input)
Instrument power supply (24V DC)	PC*	60	80	DI 1	DI (digital input)
24V power for DI, DO	PCD	61	81	VP*	+ Instrument power supply (24V DC)
Ground	G	62	82	VPD	+ 24V power for DI, DO

Note: The symbol in case of AC instrument power is VPO, PCO. The output is approx. 24V DC (0.1A max.)

Analog output 1 terminal connection specifications

1 to 5V DC A in 5th digit of code		Termocouple C,D,E,F in 5th digit of code	
4 to 20mA DC B in 5th digit of code		Resistance bulb G,W in 5th digit of code	
4 to 20mA DC with inner DC power supply of CC-S B in 5th digit of code			

Transmission connector



⚠ Caution on Safety

*Before using this product, be sure to read its instruction manual in advance.

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