

# NC

series  
Digital PID Controllers

NC 2438  
NC 2538  
NC 2638  
NC 2738  
NC 2838



# BEST CHOICE FOR PROCESS AND TEMPERATURE CONTROL

Application: Control temperature , humidity , pressure , flow and PH.

NC series controllers are microprocessor based controllers. Which have been designed with high accuracy input , various output selection , useful options and good reliability at a competitive price.

NC series use "PID+FUZZY" algorithm to implement excellent control.  
The output status is displayed on the built in "Bar-Graph" display.

NC series not only provide the basic control output selections but also plus advanced options such as "Motor Valve Control" , "SCR/TRIAC Trigger" , and "Programmable RAMP/SOAK".

NC Series support MODBUS protocol. Communication with HMI is more convenient.  
New additional HBA function with competitive price , user can upgrade system safety easily.

Available in 5 sizes , the models and sizes are as below:

NC 2438: 48X48mm (DIN 1/16) NC 2538/NC 2638: 48X96mm (DIN 1/8)

NC 2738: 72X72mm (DIN 3/16) NC 2838: 96X96mm (DIN 1/4)



## CE approval & free power

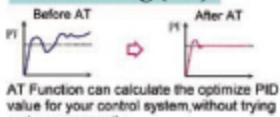
All models get CE approval.  
Operate on any voltage from AC 85~265V at 50/60Hz.  
DC 24V is also available(optional function).

## Heater Break Alarm (HBA)



Heater current flowing through CT can be displayed on controller.  
If heater current is less than HBA set value , AL1 will be activated(optional function).

## Autotuning (AT)



AT Function can calculate the optimize PID value for your control system,without trying and error manually.

## Various Indication Lamps



Real time monitor the status of output (DOUT1/DOUT2),AT,alarm(AL1/AL2/AL3),manual output(MAN) and program(PRO).

## High Accuracy

Input with 14bit A/D resolution , 0.2% accuracy of FS.  
Built in "AutoZero-AutoSpan" function keep good accuracy.

## IP65 Proof



IP65 dust & water proof is available  
for all models(optional function).

## MODBUS Communication



NC series support both MODBUS RTU and MODBUS ASCII protocol.  
Communication between controller and HMI or other equipment is more convenient(optional feature).

## Auto/Manual mode



Conveniently switched between auto/manual output mode by clicking "A/M" key(except "NC-2438").

## Bar-Graph



Output percent displayed on the bar-graph  
in 10 LEDs resolution(except "NC-2438").

## Data Lock Function

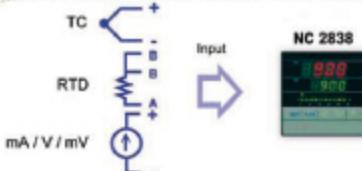
All parameters are separated in 3 operation levels.  
Each parameter can be hidden or locked to prevent unauthorized changes.

# Features

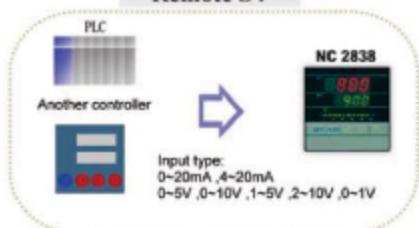
NC Series

Digital PID Controller

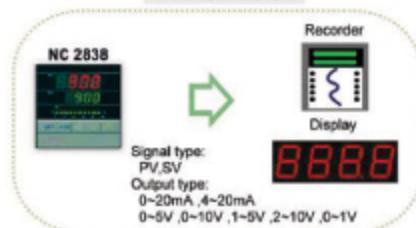
## Various I/O Types



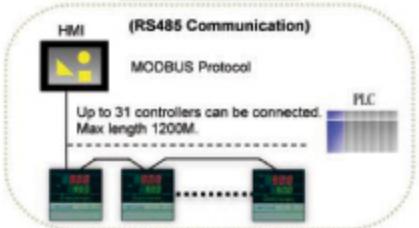
## Remote SV



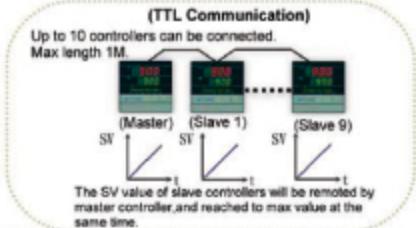
## Transmission



## Communication

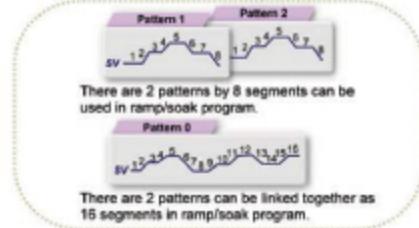


## Communication

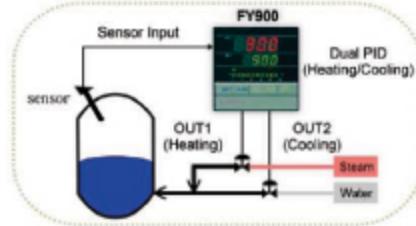


## Special Application

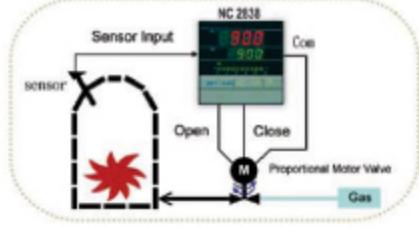
### Ramp/Soak Program



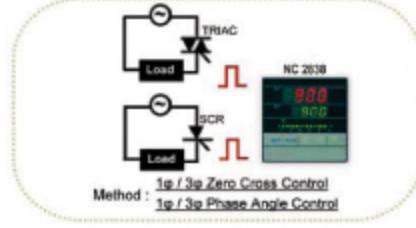
### Heating and Cooling Control



### Motor Valve Control



### SCR/TRIAC Trigger



# Features

NC Series

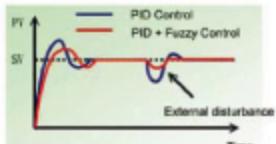
Digital PID Controller

## Excellent Control

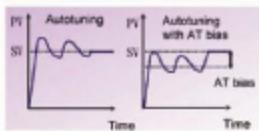
### Control Method

- PID
- PID+FUZZY
- ON/OFF
- ON/OFF Hysteresis

### Fuzzy Logic

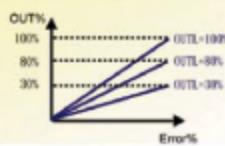


### Autotuning (AT)



When autotuning acts, it will make PV hunting 1~2 cycle to calculate optimize PID value. To protect user's device NC series controller can perform PV hunting below SV by setting AT bias value(ATVL) .

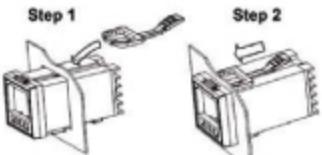
### Limit Setting



Built in output limit function. Use this function to get different gradient output and set limit for output.

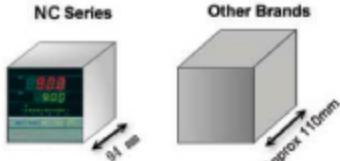
## Convenient Installation

### Easy Mounting



Just push the mounting bracket to panel.  
Without using any screws.

### Saving Space



NC Series are shorter than other brands.  
But with more functions.

## Alarm Function

### Alarm Types

Maximum with 3 sets of alarm.

Alarm types list as below:

**Deviation**  
Deviation High Alarm  
Deviation Low Alarm  
Deviation High/Low Alarm  
Band Alarm

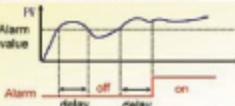
**PV**  
PV High Alarm  
PV Low Alarm

**System**  
System Failed Alarm  
System Normal Alarm

**Program**  
Program Run Alarm  
Program End Alarm  
Segment End Alarm

### Delay Time

Use this function can avoid alarm acts frequently or acts due to external disturbance.



### Hold Function

Use this function can avoid alarm acts at start-up. The alarm action is suppressed at start-up until PV enters the non-alarm range.

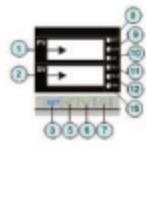
# Appearance

NC Series

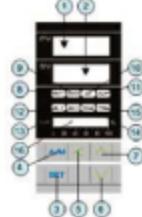
Digital PID Controller

## Parts Description

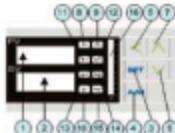
NC 2438



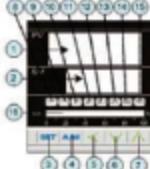
NC 2538



NC 2638



NC 2738/NC 2838

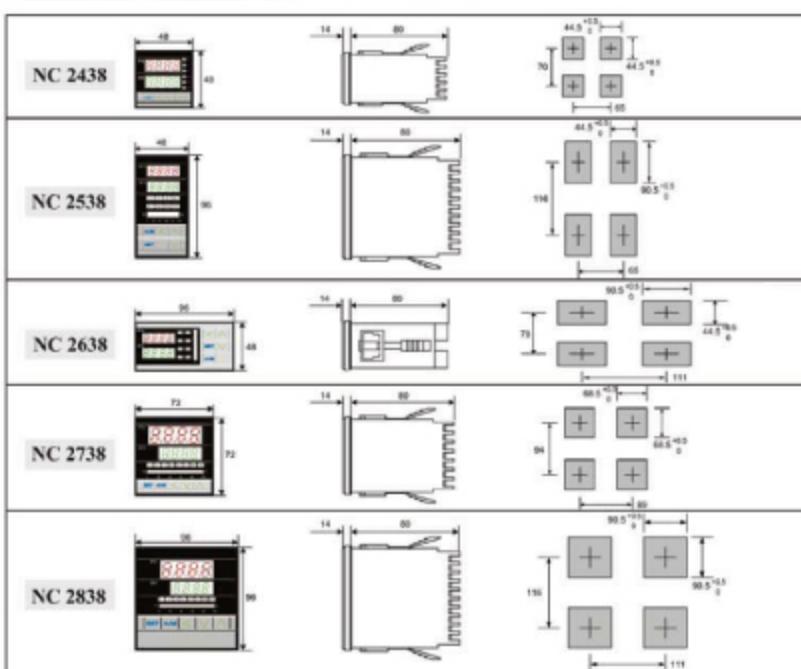


SYMBOL	NAME	FUNCTION
PV	Measured value (PV) display	Displays PV or various parameter symbols (Red)
SV	Setting value (SV) display	Displays SV or various parameter set values (Green)
SET	Set key	Used for parameter setting up and set value registration
A/M	Auto/Manual key	Switches between Auto(M) input mode and Manual output
<	Shift key	Shift digits when settings are changed
V	Down key ("Program Hold")	Decrease numbers ("Only for programmable controller")
A	Up key ("Program Hold")	Increase numbers ("Only for programmable controller")

SYMBOL	NAME	FUNCTION
OUT1	OUT1 lamp	Lights when OUT1 is on (Green)
OUT2	OUT2 lamp	Lights when OUT2 is on (Green)
AT	Autotuning lamp	Lights when Autotuning is activated (Orange)
AL1	Alarm 1 lamp	Lights when Alarm 1 is activated (Red)
AL2	Alarm 2 lamp	Lights when Alarm 2 is activated (Red)
AL3	Alarm 3 lamp	Lights when Alarm 3 is activated (Red)
MAN	Manual output	Used when manual output is activated (Green)
PRO	"Program Running"	"Washes when program running (Only for programmable controller)"
OUT1 %	Output% Bar-Graph display	Outputs are displayed on 10-dot LEDs

## External Dimension

Unit : mm

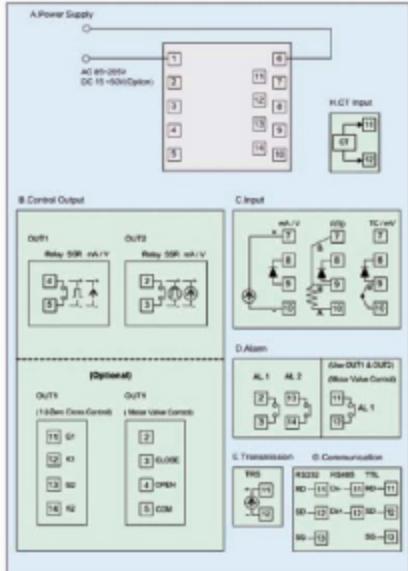


# Terminal Arrangement

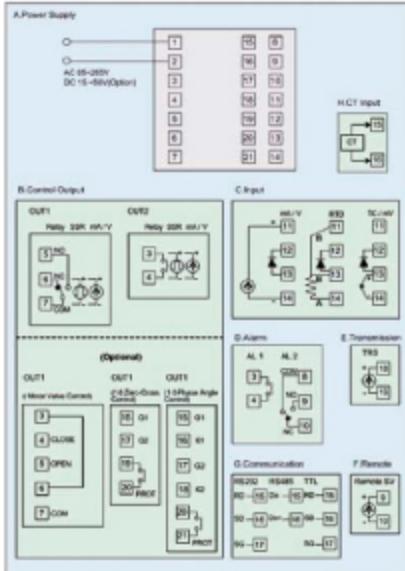
Digital PID Controller

NC Series

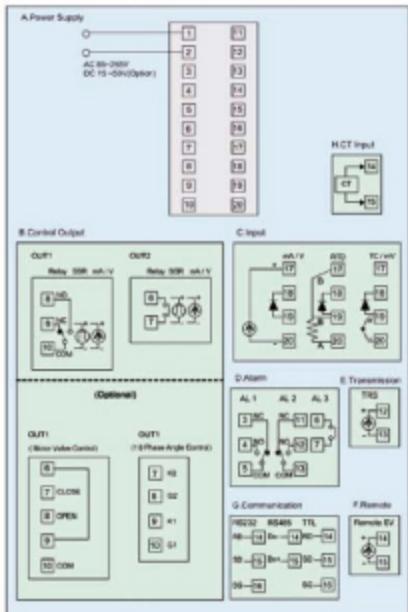
NC 2438



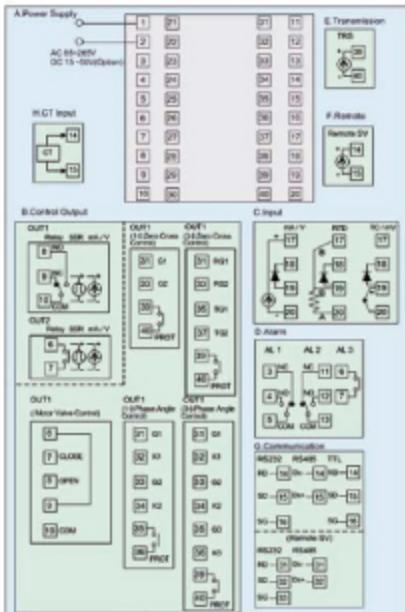
NC 2738



NC 2538/NC 2638



NC 2838



# Specifications

NC Series

Digital PID Controller

## Standard Spec.

Model	NC 2438	NC 2538	NC 2638	NC 2738	NC 2838
Dimension	48X48mm	48X68mm	96X48mm	72X72mm	96X96mm
Supply voltage	AC 85~265V , DC24V (Optional)				
Frequency	50 / 60 HZ				
Power Consumption	approx 3VA	approx 4VA	approx 4VA	approx 3VA	approx 4VA
Memory	Non-volatile memory E <sup>2</sup> PROM				
Input	Accuracy : 0.2%FS , Sample time : 250ms				
TC	K, J, R, S, B, E, N, T, W5Re/W26Re , PL2 , U, L				
RTD	PT100 , JPT100 , JPT50				
mA dc	4~20mA , 0~20mA				
Voltage dc	0~1V , 0~5V , 0~10V , 1~5V , 2~10V -10~10mV , 0~10mV , 0~20mV , 0~50mV , 10~50mV				
DP Position	0000 , 000.0 , 00.00 , .0000 (available for mA or Voltage dc input)				
Output 1	Main control output				
Relay	SPST type	SPDT type	SPDT type	SPDT type	SPDT type
	3A , 220V , electrical life : 100,000 times or more(under the rated load).				
Voltage Pulse	For SSR drive. ON:24V , OFF:0V , maximum load current:20mA.				
mA dc	4~20mA , 0~20mA. Maximum load resistance:560 Ω				
Voltage dc	0~5V , 0~10V , 1~5V , 2~10V. Maximum load current:20mA.				
Alarm 1	SPST type	SPDT type	SPDT type	SPST type	SPDT type
	3A , 220V , electrical life : 100,000 times or more(under the rated load).				
Control algorithms	PID , P , PI , PD , ON/OFF(P=0) , FUZZY				
PID range	P:0~200% , I:0~3600 Secs , D:0~900 Secs				
Isolation	Output terminals (control output , alarm ,transmission) and Input terminals are isolated separately.				
Isolated resistance	10M Ω or more between input terminals and case(ground) at DC 500V 10M Ω or more between output terminals and case(ground) at DC 500V				
Dielectric strength	1000V AC for 1 minute between input terminals and case(ground) 1500V AC for 1 minute between output terminals and case(ground)				
Operating temperature	0~50°C				
Humidity range	20~90% RH				
Weight	NC 2438 approx 150g, NC 2538/NC 2738 approx 225g, NC 2838 approx 300g.				
Display Height	PV:7mm	PV:7mm	PV:7mm	PV:14mm	PV:14mm
	SV:7mm	SV:7mm	SV:7mm	SV:10mm	SV:10mm

## Optional Spec.

Model	NC 2438	NC 2538	NC 2638	NC 2738	NC 2838
RAMP/SOAK Program	2 Patterns with 8 segments each . The 2 patterns can be linked together as 16 segments use.				
Output 2	For heating and cooling control use				
Relay	SPST type	SPST type	SPST type	SPST type	SPST type
Voltage Pulse	For SSR drive. ON:20V , OFF:0V , maximum load current:20mA.				
mA dc	4~20mA , 0~20mA. Maximum load resistance:560 Ω				
Voltage dc	0~5V , 0~10V , 1~5V , 2~10V. Maximum load current:20mA.				
Alarm 2	SPST type	SPDT type	SPDT type	SPDT type	SPDT type
Alarm 3	X	SPST type	SPST type	SPST type	SPST type
Heater Break Alarm (HBA)	Display Range of Heater Current : 0.0~99.9 A , Accuracy : 1%FS Included CT : SC_80_T (0.0~80.0A) Alarm Relay : AL1				
Transmission	Available for PV or SV transmission				
mA dc	4~20mA , 0~20mA. Maximum load resistance:560 Ω				
Voltage dc	0~5V,0~10V,1~5V,2~10V. Maximum load current:20mA.				
Remote SV Input	4~20mA , 0~20mA , 0~5V , 0~10V , 1~5V , 2~10V are available Protocol : MODBUS RTU , MODBUS ASCII , ASCII				
Communication	Interface : RS232 , RS485 , TTL Baudrate : 38400 , 19200 , 9600 , 4800 , 2400 bps. Data bits : 8 , Start bit : 1 , Stop bit : 1 or 2 , Odd or Even parity				
WaterProof/DustProof	IP65				

# Order Information

NC Series

Digital PID Controller

## Model & Suffix codes

Model	Output1	Output2	Alarm	TRS	Remote SV	Communication	Input Type	Power	Water/Dust Proof
NC-2X38	—	1	0	1	0	0	02	A	N
NC 2438	48x48mm	0 None	0 None	0 None	0 None	0 None	See Input Codes	A AC 85~265V	N None
NC 2638	96x48mm	1 Relay	1 Relay	1 1 Set	1 4~20mA	1 4~20mA	1 RS232	D DC24V	W IP65
NC 2738	72x72mm	2 Voltage Pulse (SSR Drive)	2 Voltage Pulse (SSR Drive)	2 2 Sets	2 0~20mA	2 0~20mA	2 RS485		
NC 2538	48x96mm			3 3 Sets	A 0~5V	A 0~5V	3 TTL		
NC 2838	96x96mm				B 0~10V	B 0~10V	A RS232, MODBUS		
(STANDARD)		3 4~20mA	3 4~20mA		C 1~5V	C 1~5V	B RS485, MODBUS		
NC 2438P	48x48mm	4 0~20mA	4 0~20mA		D 2~10V	D 2~10V			
NC 2638P	96x48mm	A 0~5V	A 0~5V						
NC 2738P	72x72mm	B 0~10V	B 0~10V						
NC 2538P	48x96mm	C 1~5V	C 1~5V						
NC 2838P	96x96mm	D 2~10V	D 2~10V						
(RAMP/SOAK Programmable)		5 1pSCR zero cross control							
		6 3pSCR zero cross control							
		7 Motor valve control							
		8 1pSCR phase angle control							
		9 3pSCR phase angle control							

\* HBA : Heater Break Alarm (HBA must use AL1 as alarm relay)

○ Available    ✘ Not available

Options	RAMP/SOAK PROGRAM	1pSCR_Z	3pSCR_Z	Motor valve control	1pSCR_P	3pSCR_P	Output 1	Output 2	Alarm2	Alarm3	HBA	TRS	Remote SV	Communication	Power DC 24V
NC 2438	○	○	✗	○	○	✗	○	○	○	✗	○	○	○	○	○
NC 2538	○	✗	✗	○	○	✗	○	○	○	○	○	○	○	○	○
NC 2638	○	✗	✗	○	○	○	○	○	○	○	○	○	○	○	○
NC 2738	○	○	✗	○	○	○	○	○	○	○	○	○	○	○	○
NC 2838	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

## Input type table

RTD	TYPE	MIN	RANGE	TYPE	MIN	RANGE	TYPE	MIN	RANGE	LINEAR	TYPE	MIN	RANGE
K	K1	0	~200.0°C (392.0°F)	K2	02	0.0~400.0°C (752.0°F)	K3	03	0~600°C (1112°F)		AN1	\$1	-10~10mV
	K4	04	~800°C (1472°F)	K5	05	0~1000°C (1832°F)	K6	06	0~1200°C (2192°F)		AN2	\$2	-2~2V
J	J1	07	~200.0°C (392.0°F)	J2	08	0~400.0°C (752.0°F)	J3	09	0~600°C (1112°F)		AN3	\$3	-5~5V
	J4	10	~800°C (1472°F)	J5	11	0~1000°C (1832°F)	J6	12	0~1200°C (2192°F)		AN4	\$4	-10~10V
R	R1	13	~1600°C (2912°F)	R2	14	0~1600°C (3216°F)					AN5	\$1	0~10mV
S	S1	15	~1600°C (2912°F)	S2	16	0~1789°C (3216°F)					AN6	\$8	0~20mV
B	B1	17	~1820°C (3308°F)								AN4	\$1	0~50mV
E	E1	18	~800°C (1472°F)	E2	19	0~900°C (1652°F)					AN4	\$2	0~20mA
N	N1	20	~1200°C (2192°F)	N2	21	0~1300°C (2372°F)					AN4	\$3	0~5V
T	T1	22	~169~400.0°C (392.0°F)	T2	23	-169~200.0°C (392.0°F)	T3	24	0.0~350.0°C (662.0°F)		AN4	\$4	0~5V
W	W1	25	~2600°C (3632°F)	W2	26	0~2320°C (4208°F)					AN4	\$5	0~10V
PLII	PL1	27	~1300°C (2372°F)	PL2	28	0~1300°C (2534°F)					AN4	\$6	0~5K ohm
U	U1	29	~169~800.0°C (392.0°F)	U2	30	-169~9~200.0°C (392.0°F)	U3	31	0.0~400.0°C (752.0°F)		AN4	\$7	0~2V
L	L1	32	~400°C (752°F)	L2	33	0~800°C (1472°F)					AN5	\$1	10~50mV
JPT	JPT1	41	~169~800.0°C (392.0°F)	JPT2	42	-169~400.0°C (752.0°F)	JPT3	43	-169.9~200.0°C (392.0°F)		AN5	\$2	4~20mA
100	JPT4	44	~200°C (392°F)	JPT5	45	0~400°C (752°F)	JPT6	46	0~600°C (1112°F)		AN5	\$3	1~5V
PT	PT1	47	~169~800.0°C (392.0°F)	PT2	48	-169.9~400.0°C (752.0°F)	PT3	49	-169.9~200.0°C (392.0°F)		AN5	\$4	2~10V
100	DP1	50	~200°C (392°F)	DP5	51	0~400°C (752°F)	DP6	52	0~600°C (1112°F)				
JPT	JPT1	53	~169~800.0°C (392.0°F)	JPT2	54	-169.9~400.0°C (752.0°F)	JPT3	55	-169.9~200.0°C (392.0°F)				
50	JPT6	56	~200°C (392°F)	JPT5	57	0~400°C (752°F)	JPT6	58	0~600°C (1112°F)				