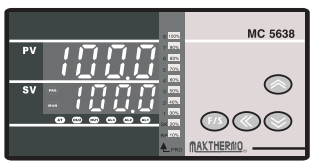
Terwin Instruments Ltd.

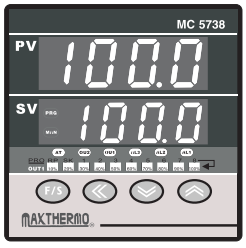
Temperature PID Controllers

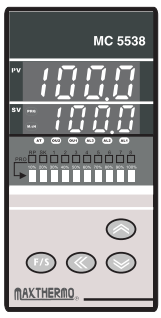
MC-5x38 OPERATIONAL MANUAL

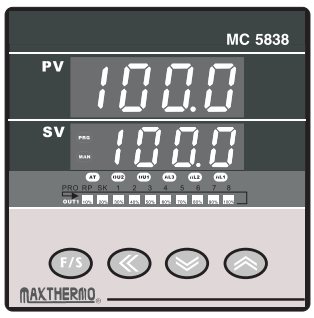
MAXTHERMO®

MC 5438 / MC 5538 / MC 5638
MC 5738 / MC 5838









(

Display unit & Indication lamps

PV =Measured value display
SV =Set value dispaly
AL1 =Alarm 1 output lamp
AL2 =Alarm 2 output lamp
AL3 =Alarm 3 output lamp
OU1 =Control output 1 lamp
OU2 =Control output 2 lamp
AT =Autotuning lamp
MAN =Manual mode lamp
10% ~ 100% =Manipulated output value display
PRG =Programmable mode lamp
1~8 =Segment-in-process display lamp
RP =Ramping mode lamp(programmable mode only)
SK =Soaking mode lamp (programmable mode only)

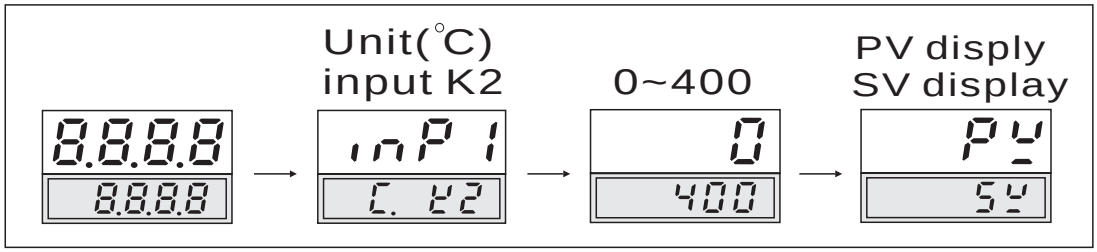
Operation keys

F/S =Function & Set key
=Shift key
=Down key
=Up key
Press 3 sec while the SV is not flashing = Used for returning to initial window
Press 3 sec while in level selection window= Used for calling up lock function
Press 3 sec while in pv/sv initial window= Used for stopping output and SV window will display "HOLD", press 3 sec again to regain output (This function is available only while OUTM is selected 1 or 2)
Press 3 sec while in pv/sv initial window= Used for calling up level selection
Press 3 sec while in level selection window= Used for entering each level

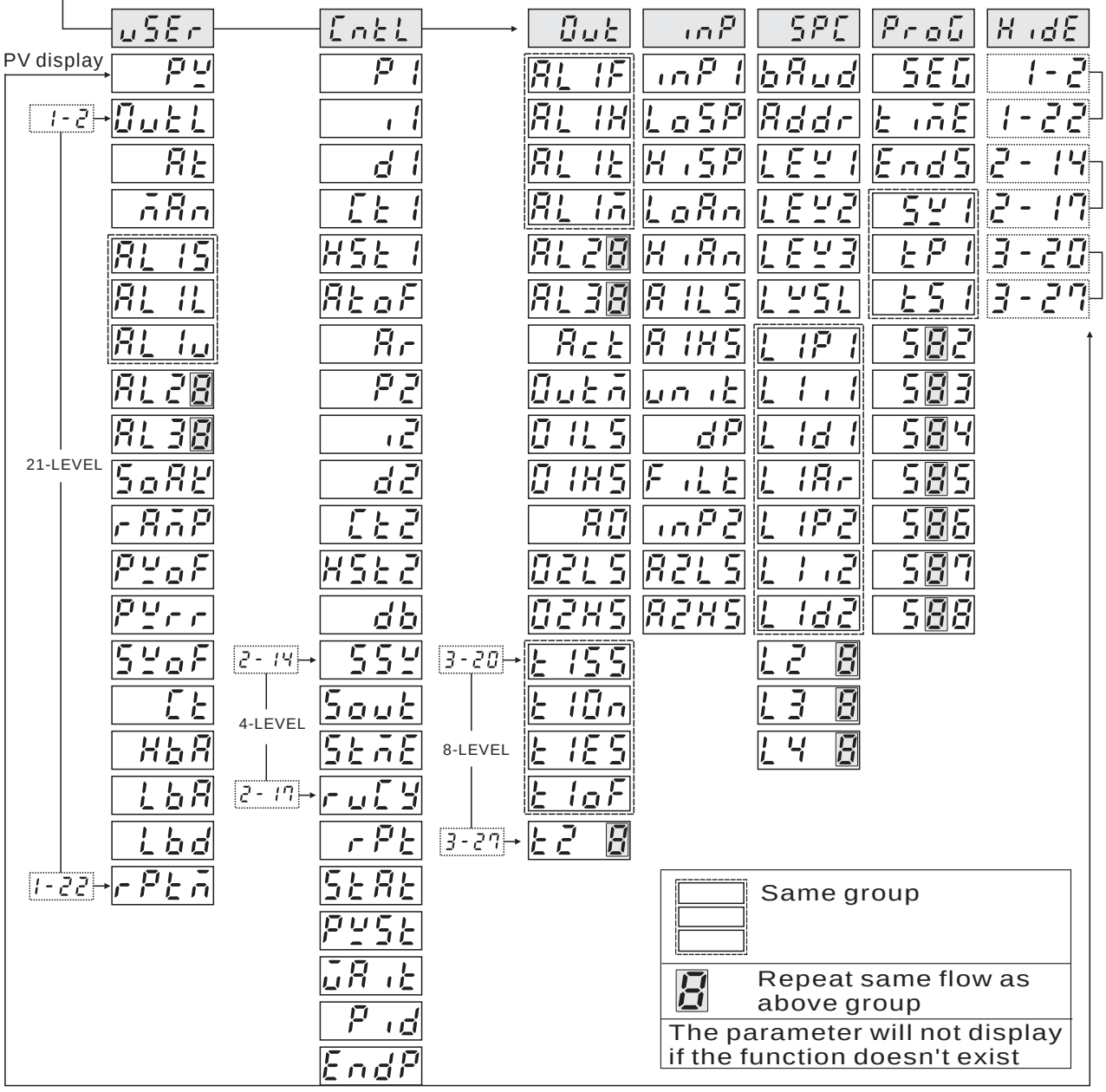
Operation keys (programmable mode only)

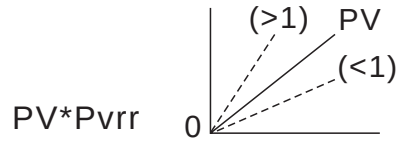
These keys are only operated in PV/SV initial window	
3SEC Run	PRG lights,RP or SK flashes The executing segment lamp lights
3SEC Pause	PRG, RP and SK light The executing segment lamp lights
+ F/S Jump	Jump to the next segment, press first
+ F/S Stop	Turn off all lamps which used for programmable mode, press first
Refer to arrow When PRG Lights (No PRG light in MC-5438)	

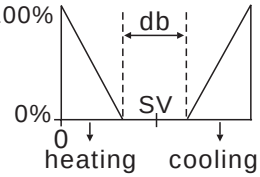
Window checks display after turning on power



LEVEL Parameter flow chart



Parameter		DESCRIPTION	RANGE	Initial value
PV	Pv	Process value	LoSP~HiSP	
SV	Sv	Set value	LoSP~HiSP	0.0
uSEr	▼			
OutL	OutL	Output percentage	0.0~100.0%	0.0
At	At	Auto tuning	No / yes	no
Man	Man	Manual mode	Man1 =power failure memory Man2 =no memory No =non	no
AL1S	AL1S	Alarm 1 set value	If ALIF set at 1 or 2 range=-200~200 If ALIF set at 3 or 4 range=Losp~Hisp If ALIF set at 10 range =1-8 segment ending	10.0
AL1L	AL1L	Alarm 1 lower set value	0~200	10.0
AL1u	AL1u	Alarm 1 upper set value	0~200	10.0
AL2S AL3S		AL2S / AL3S For operating functions refer to the above descriptions		
SoAK	SoAK	Perform only when ALM1 set at 8 or9	0.00~99.59 (h.m)	0.00
rAmP	rAmP	Ramp	0.0~200.0/m	0.0
PvoF	PvoF	Pv offset	-200~200	0.0
Pvrr	Pvrr	Pv ratio	0.001~9.999 	1.000
SvoF	SvoF	Sv offset	-200~200	0.0
Ct	Ct	Current transformer monitor	0.0~100.0A	
HbA	HbA	Heater break alarm time	0.1~100.0A	0.1
LbA	LbA	Control loop break alarm time	0.1~200.0 min	8.0
Lbd	Lbd	LBA dead band	0.0~200.0	0.0
rPtm	rPtm	Repeat times monitor	1~1000	

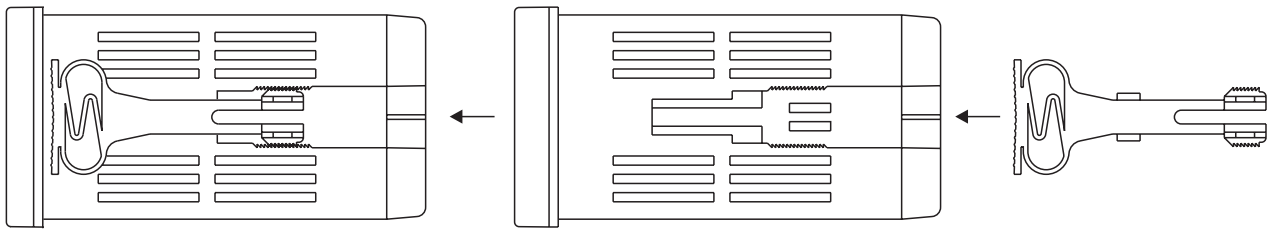
Parameter	DESCRIPTION	RANGE	Initial value
CntL ▼			
P1 P1	Output 1 proportional band	0.0~3000	30.0
i1 i1	Output 1 integral time	0~3600	240
d1 d1	Output 1 derivative time	0~900	60
Ct1 Ct1	Output 1 cyclic time	0~150	15
HSt1 HSt1	Output 1 hysteresis	0.0~200.0	0.0
AtoF AtoF	At offset	-200~200	0.0
Ar Ar	Anti-reset windup	0~100.0% SV-P1 x Ar	100.0
P2 P2	Output 2 proportional band	0.0~3000	30.0
i2 i2	Output 2 integral time	0~3600	240
d2 d2	Output 2 derivative time	0~900	60
Ct2 Ct2	Output 2 cyclic time	0~150	15
HSt2 HSt2	Output 2 hysteresis	0.0~ 200.0	0.0
db db	Dead band/overlap	-200.0~200.0 	0.0
SSv SSv	Soft start set value	0.0~200.0	120.0
Sout Sout	Soft start output percentage	0.0~100.0%	30.0
StmE StmE	Soft start failed time	0~10 min	10
ruCy ruCy	Motor valve cyclic time	1~150 secretary	5
rPt rPt	Program executing times	1~1000	1
StAt StAt	Start mode selection	CoLd = manual rSET=start after power ON Hot= start from memory of power failure	CoLd
PvSt PvSt	Start point selection	RSEt = start from 0 Pv = start from PV	rSEt
wAit wAit	Wait value in program	0.0~200.0	0.0
Pid Pid	PID/Level PID selection	Pid =Pid Lpid =Level Pid	Pid
EndP EndP	Selects control when program ended	Cont = Continue StoP = One program only	StoP

Parameter		DESCRIPTION	RANGE	Initial value
Out ▼				
AL1F	AL1F	Alarm 1 action function	0~12 (see Fig 1)	1
AL1H	AL1H	Alarm 1 hysteresis	0.0~200.0	0.0
AL1t	AL1t	Alarm 1 in program mode on time	0.00~99.59 (h、m)	0.00
AL1m	AL1m	Alarm 1 special mode selection	(see Fig 2)	0
For operating functions refer to the above descriptions Different function see(1),(2),(3) AL2F AL2F (1)AL2M Alarm 2 special mode selection (See Fig 2) 0~7 (2)AL3F Alarm 3 action function (See Fig 1) 0~11 AL3F Al3F (3)AL3M Alarm 3 special mode selection (see Fig 2) 0~7				
Act	Act	Control action selection	CooL / HEAt	HEAt
Outm	Outm	Output mode selection	(see Fig 3)	1
O1LS	O1LS	Output 1 scale low	0.0~100.0%	17.6
O1HS	O1HS	Output 1 scale high	0.0~100.0%	96.0
AO	AO	Analog output selection	Pv=transmit PV Sv=transmit SV dEv=transmit (PV-SV) Mv=transmit output percentage	Pv
O2LS	O2LS	Output 2 scale low	0.0~100.0%	17.6
O2HS	O2HS	Output 2 scale high	0.0~100.0%	96 .0
t1SS	t1SS	Time signal 1 start segment setting	1~8	1
t1On	t1On	Time signal 1 on time setting	0.00~99.59 (h、m)	0.01
t1ES	t1ES	Time signal 1 end segment setting	1~8	1
t1oF	T1oF	Time signal 1 off time setting	0.00~99.59 (h、m)	0.01
t2SS	t2SS	For operating functions refer to the above descriptions		

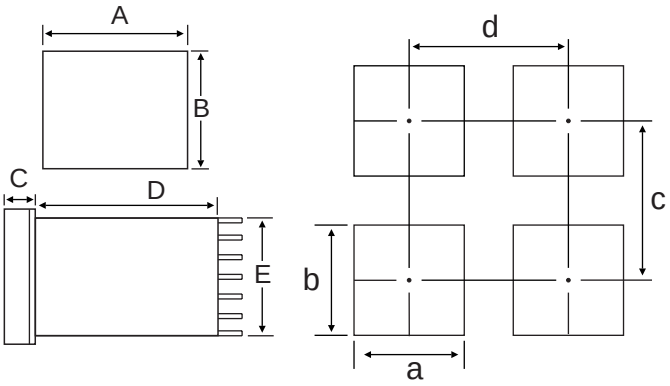
Parameter		DESCRIPTION	RANGE	Initial value
inP ▼				
inP1	inP1	Input 1 selection	(see Fig 4)	K2
LoSP	LoSP	Low setting limit	LOSP~HISP	0.0
HiSP	HiSP	High setting limit	LOSP~HISP	400.0
LoAn	LoAn	Analog input range low	-1999~9999	0.0
HiAn	HiAn	Analog input range high	-1999~9999	100.0
A1LS	A1LS	Analog input 1 scale low	0~FFFF	
A1HS	A1HS	Analog input 1 scale high	0~FFFF	
unit	unit	Unit selection	℃/℉/non	℃
dP	dP	Decimal point	0/0.0/0.00/0.000	0.0
FiLt	FiLt	Digital fitter	0.001~1.000 Non = no function Ct = use for heater break alarm rmSV= use for remote SV	0.900
inP2	inP2	Input 2 selection		non
A2LS	A2LS	Analog input 2 scale low	0~FFFF	
A2HS	A2HS	Analog input 2 scale high	0~FFFF	
SPC ▼				
bAud	bAud	Baud rate	2.4K / 4.8K / 9.6K 19.2K / 38.4K	9.6K
Addr	Addr	Address	0~31	0
LEV1	Lev1	PID range(act only when level PID is selected)	LoSP~HiSP	400
LEV2	Lev2	PID range(act only when level PID is selected)	LoSP~HiSP	400
LEV3	Lev3	PID range(act only when level PID is selected)	LoSP~HiSP	400
LvSL	LvSL	Leve is selection	1~4	1
L1P1	L1P1	Output 1 proportional band for level 1	0.0~3000	30.0
L1i1	L1i1	Output 1 integral time for level1	0~3600	240
L1d1	L1d1	Output 1 derivative time for level1	0~900	60
L1Ar	L1Ar	Anti-reset windup for level1	0.0~100.0%	100.0
L1P2	L1P2	Output 2 proportional band for level 1	0.0~3000	30.0
L1i2	L1i2	Output 2 integral time for level1	0~3600	240
L1d2	L1d2	Output 2 derivative time for level 1	0~900	60
L2P ~ 4		The same as level 1		

Parameter		DESCRIPTION	RANGE	Initial value
PrOG	▼			
SEG	SEG	Program segment monitor	1~8	
tiME	TimE	Program countdown monitor		
EndS	EndS	Program segment end setting	1~8	1
Sv1	Sv1	Sv in segment 1	LoSP~HiSP	100
tP1	tP1	Program time in segment 1	0.00~99.59 (H.M)	0.00
tS1	tS1	Soak time in segment 1	0.00~99.59 (H.M)	0.00
Sv2~8		The same as segment 1		
HIdE	▼			
1-12~1-22		Parameter shows with respect to this position	non~t2of	
2-14~2-17		Parameter shows with respect to this position	non~t2of	
3-20~3-27		Parameter shows with respect to this position	non~t2of	

Mounting procedures



Dimension



Type	A	B	C	D	E	a	b	c	d
MC-5838	96	96	10.5	83	90	$91^{+0.5}_{-0}$	$91^{+0.5}_{-0}$	120	120
MC-5738	72	72	10.5	83	67	$68^{+0.5}_{-0}$	$68^{+0.5}_{-0}$	100	100
MC-5638	96	48	10.5	83	43	$91^{+0.5}_{-0}$	$46^{+0.5}_{-0}$	70	120
MC-5538	48	96	10.5	83	90	$46^{+0.5}_{-0}$	$91^{+0.5}_{-0}$	120	70
MC-5438	48	48	10.5	83	45	$46^{+0.5}_{-0}$	$46^{+0.5}_{-0}$	70	70

Fig 1. Alarm Mode Selection (usedin parameterAL1F,AL2F,AL3F)

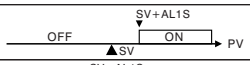
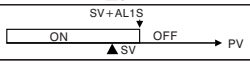
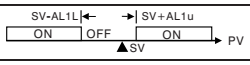
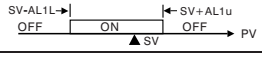
AL1F	AL2F	AL3F	Alarm function selection	
0	0	0	No alarm	
1	1	1	Deviation high alarm	
2	2	2	Deviation low alarm	
3	3	3	Absolute high alarm	
4	4	4	Absolute low alarm	
5	5	5	Deviation high/low alarm	
6	6	6	Band alarm	
7	7	7	System failure alarm (when error information happen)	
8	8	8	Loop break alarm	
9	9	9	Heater break alarm	
10	10	10	Segment ending alarm in program control	
11	11	11	Program ending alarm in program control	
12	12		Time signal alarm	
13	13		Program running alarm in program control	

Fig 2. special alarm function selection (used in parameter AL1M, AL2M, AL3M)

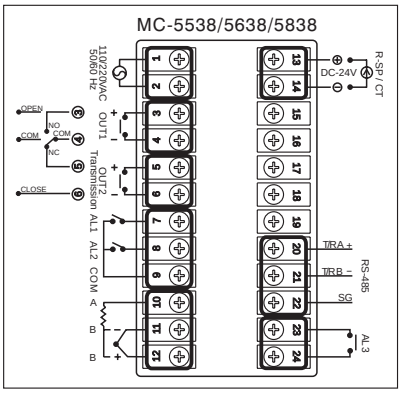
AL1M	AL2M	AL3M	Special alarm mode selection
0	0	0	Normal
1	1	1	Alarm with normal-close contact
2	2	2	Latch
3	3	3	Alarm with normal-close contact and latch
4	4	4	Alarm with inhibit
5	5	5	Alarm with inhibit and normal-close contact
6	6	6	Alarm with inhibit and latch
7	7	7	Alarm with inhibit , normal-close contact and latch
8			Alarm with on-delay timer
9			Alarm with on-delay timer but normal-close contact
10			Alarm with soaking timer
11			Alarm with soaking timer but normal-close contact

Fig 3. output mode selection (used in parameter OUTM)

0	Non
1	Single output
2	Dual output
3	Motor value control output “a” contact
4	Motor value control output b contact
5	Single output with transmitter
6	Single output with soft start
7	Single output with transmitter and soft start
8	Program control
9	Program control with transmitter

※NO.2~9 need to be ordered

External terminal



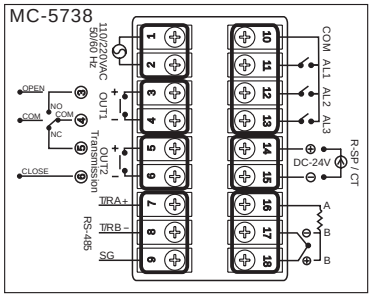


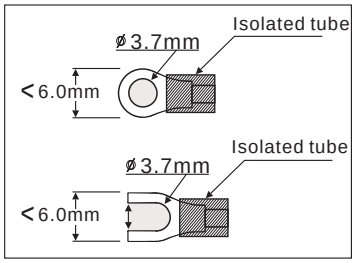
Fig 4. (used in parameter InP1) input & temperature ranges selection

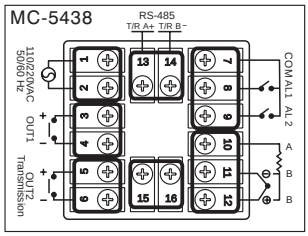
TYPE	℃	℉
K1	0~200	32~392
K2	0~400	32~752
K3	0~800	32~1472
K4	0~1000	32~1832
K5	0~1200	32~2192
j1	0~200	32~392
j2	0~400	32~752
j3	0~800	32~1472
j4	0~1000	32~1832
j5	0~1200	32~2192
t1	-50~50	-58~122
t2	-100~100	-148~212
t3	-200~400	-328~752
r	0~1700	32~3092
E	0~1000	32~1832
S	0~1700	32~3092
b	0~1800	32~3272
n	-200~1300	-328~2372
Pt1	-50~50	-58~122
Pt2	0~100	32~212
Pt3	0~200	32~392
Pt4	0~400	32~752
Pt5	-200~600	-328~1112
jPt	-200~500	-328~932
Lin	-1999~9999	

Fig 5.Error information

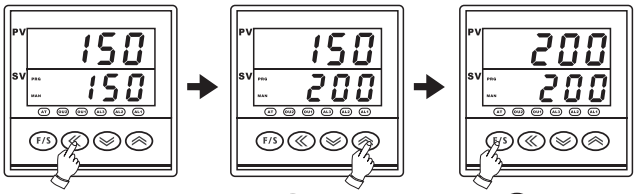
Display	description
in1E	Input 1 error
AdCF	A/D converter failed
CJCE	Cold junction compensation failed
in2E	Input 2 error
PV Blinks	PV exceeds set Ranges
rAmF	Ram failed
intF	Interface failed
AutF	Auto tuning failed

Available terminal





A How to set "SV" example: SV set at 200 C°

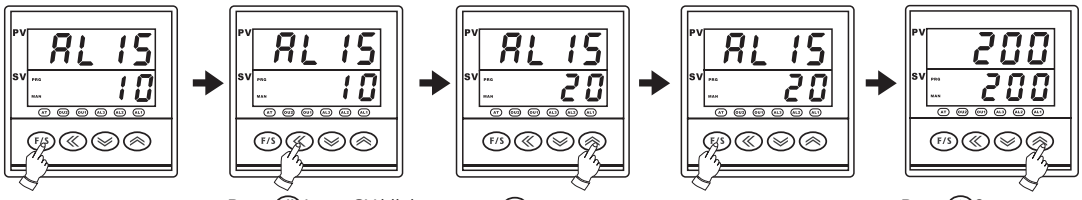


Press ≪ SV blinks
Press ≪ again to move digit

Press ⩓ to increase or
Press ⩔ to decrease the value

Press F/S to enter SV setting

B How to set " AL1S,AL2S,AL3S" example: alarm 1set at 20 C°



Press F/S 1 sec, PV shows "AL1S"

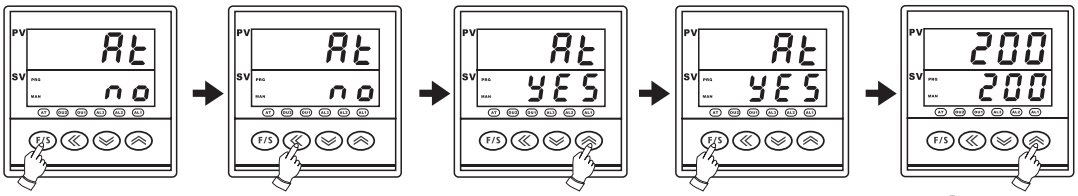
Press ≪ 1 sec, SV blinks press ≪ again to move digit

Press ⩓ to increase or
Press ⩔ to decrease the value

Press F/S to enter AL1 setting

Press ⩓ 3 sec to return to PV/SV window

C How to set "AT" (auto tuning)



Press F/S to shows "AT" on PV window

Press ≪ to show "no" flickering on SV window

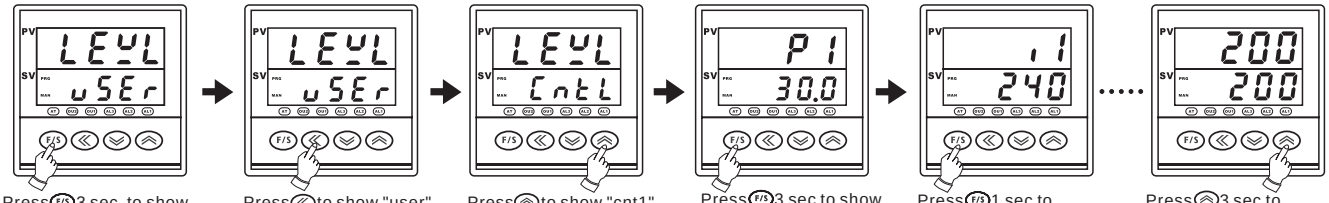
Press ⩓ to show "yes" on SV window

Press F/S to enter AT setting

Press ⩓ 3 sec to return to PV/SV window

D How to enter different "level" for setting parameter

(1) Enter "CntL" level



Press F/S 3 sec to show "LEVL" on PV window (under PV/SV initial window)

Press ≪ to show "user" flickering on SV window (under PV show "LEVL")

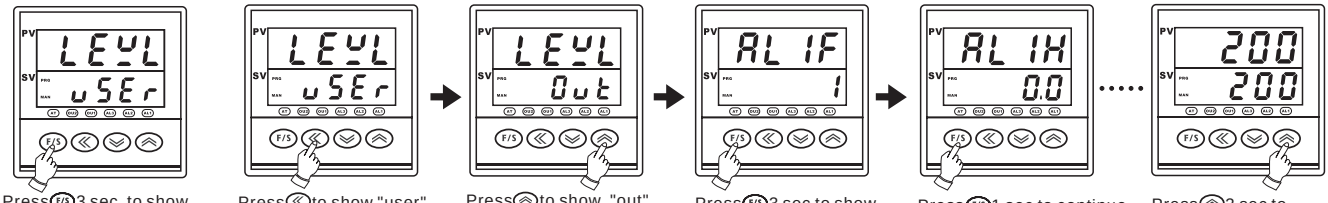
Press ⩓ to show "cnt1" on SV window then press F/S to enter this level

Press F/S 3 sec to show "P1" on PV window

Press F/S 1 sec to continue other parameters in this level

Press ⩓ 3 sec to return to PV/SV initial window

(2) Enter "Out" level



Press F/S 3 sec to show "LEVL" on PV window (under PV/SV initial window)

Press ≪ to show "user" flickering on SV window (under PV show"LEVL")

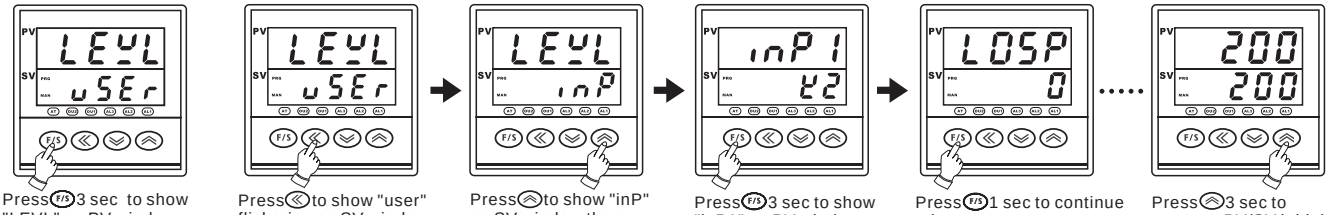
Press ⩓ to show "out" on SV window then press F/S to enter this level

Press F/S 3 sec to show "AL1F" on PV window

Press F/S 1 sec to continue other parameters in this level

Press ⩓ 3 sec to return to PV/SV initial window

(3) Enter "inP" level



Press F/S 3 sec to show "LEVL" on PV window (under PV/SV initial window)

Press ≪ to show "user" flickering on SV window (under PV show"LEVL")

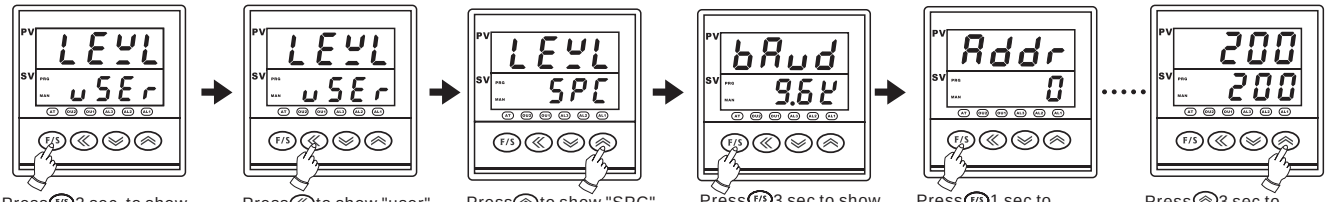
Press ⩓ to show "inP" on SV window then press F/S to enter this level

Press F/S 3 sec to show "inP1" on PV window

Press F/S 1 sec to continue other parameters in this level

Press ⩓ 3 sec to return to PV/SV initial window

(4)Enter "Spc" level



Press F/S 3 sec to show "LEVL" on PV window (under PV/SV initial window)

Press ≪ to show "user" flickering on SV window (under PV show "LEVL")

Press ≫ to show "SPC" on SV window then press F/S to enter this level

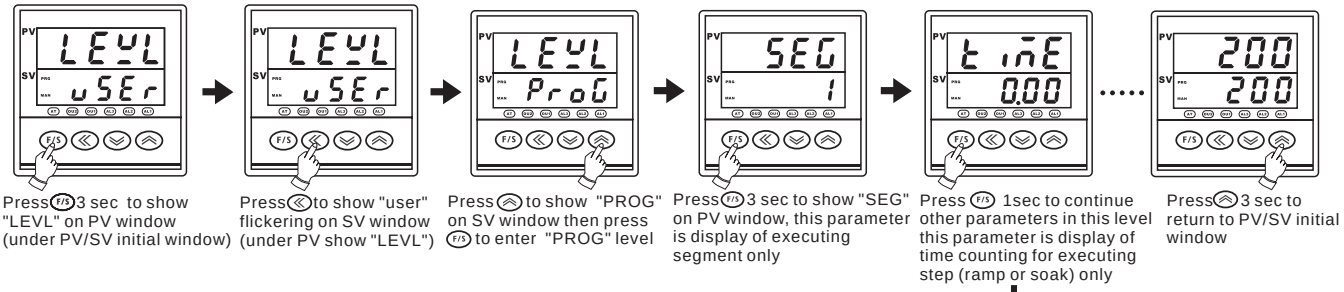
Press F/S 3 sec to show "baud" on PV window

Press F/S 1 sec to continue other parameters in this level

Press ≫ 3 sec to return to PV/SV initial window

(5)Enter program level

* "OUTM" in "out" level must be selected at "8" or "9" (refer to fig 3)



Press F/S 3 sec to show "LEVL" on PV window (under PV/SV initial window)

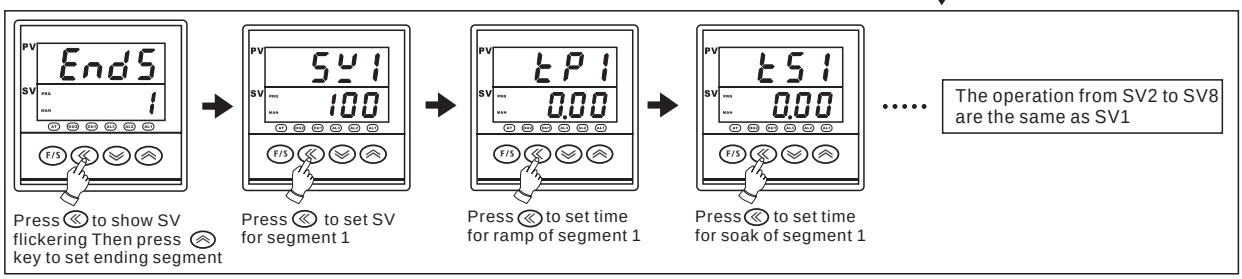
Press ≪ to show "user" flickering on SV window (under PV show "LEVL")

Press ≫ to show "PROG" on SV window then press F/S to enter "PROG" level

Press F/S 3 sec to show "SEG" on PV window, this parameter is display of executing segment only

Press F/S 1sec to continue other parameters in this level this parameter is display of time counting for executing step (ramp or soak) only

Press ≫ 3 sec to return to PV/SV initial window



Press ≪ to show SV flickering Then press ≫ key to set ending segment

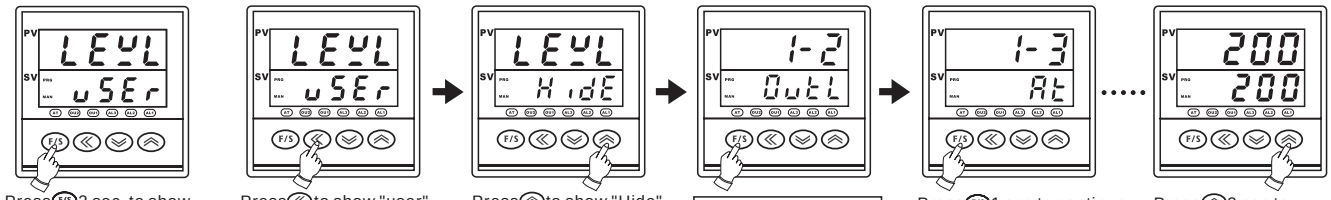
Press ≪ to set SV for segment 1

Press ≪ to set time for ramp of segment 1

Press ≪ to set time for soak of segment 1

(6) Enter "Hide" level

In this level, the user can arrange parameter order or hiding from NO. 1-2 to 1-22, 2-14 to 2-17 and 3-20 to 3-27
(please refer to level parameter flow chart in page 1),but same parameter can not be arranged in 2 positions in the same time,
for example you want to arrange "OUTL" to 1-3 you need to cancel it in 1-2 first.When you want to cancel or hide it you need to choice "non" on the "SV"



Press F/S 3 sec to show "LEVL" on PV window (under PV/SV initial window)

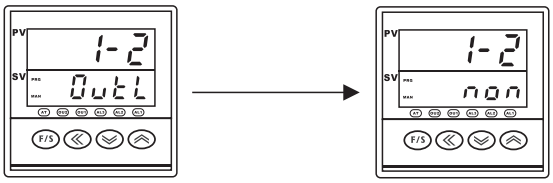
Press ≪ to show "user" flickering on SV window (under PV show"LEVL")

Press ≫ to show "Hide" on SV window then press F/S to enter this level

Press F/S 3 sec to show "1~2" on PV window

Press F/S 1 sec to continue other parameters in this level

Press ≫ 3 sec to return to PV/SV initial window

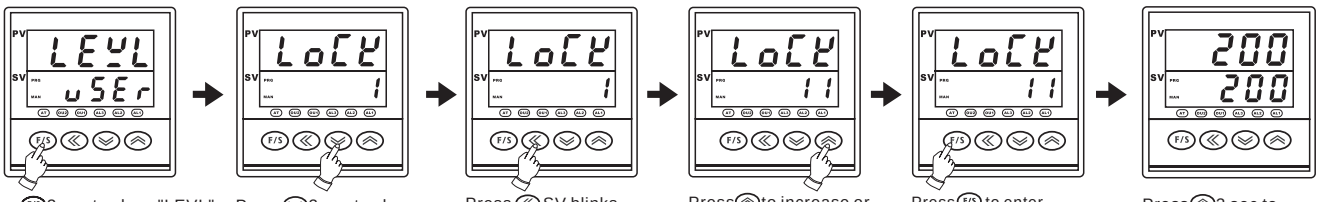


PRESS ≪ 1 SEC to show "OUTL" flickering then press ≪ key to"non" for hiding and canceling or press ≫ key to choice other parameters.

If you choice "non" in 1-2 and press F/S to enter then 1-2 will not display anything but if you choice other parameter in 1-2, it will display which parameter.

The operation in 1-2 to 1-22 , 2-14 to 2-17 and 3-20 to 3-27 all are the same.

E How to set "LoCK" function



Press F/S 3 sec to show "LEVL" on PV window (under PV/SV initial window)

Press ≪ 3 sec to show "LOCK" on PV window

Press ≪ SV blinks

Press ≫ to increase or Press ≪ to decrease code number

Press F/S to enter "LOCK" setting

Press ≫ 3 sec to return to PV/SV initial window

Code number for Lock function

0	all parameters are locked except PV
101	all parameters are locked except SV
11	open"USER" level and above
22	open"CNTL" level and above
111	open"OUT" level (Except OUTM) and above
222	open"I NP" level and above
1100	open"SPC" level and above
2200	open"PROG" level and above
1122	open"HIDE" level and above
1234	open"USER" and "PROG" level only

F. How to modify input

This series controller provides free input for T/C and RTD,
it doesn't need to modify hardware except analog input.

1.Analog input hardware modification

(Refer to S1~S8 on PC board back)
S1 & S2 are shorted with COM. originally,
so it needs to open S1 or S1& S2 and to short some pads as drawing.

INPUT	S1	S2	S3	S4	S5	S6	S7	S8
TC/RTD	○	○	×	×	×	×	×	×
0~20MA	×	○	×	×	○	×	×	×
4~20MA	×	○	×	×	○	×	×	×
0~100MV	×	×	○	×	×	○	×	×
0~1V	×	×	×	○	×	○	×	×
0~5V	×	×	×	×	×	○	×	○
1~5V	×	×	×	×	×	○	○	×
0~10V	×	×	×	×	×	○	×	○

[○] short [×] open

2.Analog input software modification

※Select "Lin" in "inpl" parameter
※Set "LoAn" in "inp" level to lowest range
※Set "HiAn" in "inp" level to highest range

3.Analog input calibration

※Enter "A1LS" parameter in "inp" level
※Provide signal for lowest range and wait for 3 sec then keep pressing key
※Enter "A1HS" parameter in "inp" level
※Provide signal for highest range and wait for 3 sec then keep pressing key
※Return to PV/SV initial window and provide signal for lowest range again then check if PV equals to LoAn
※Provide signal for highest range again then check if PV equals to HiAn
If it is not accuracy after calibrating, please repeat above procedure again

SPECIFICATIONS

PV Input	Typeof Input	TC (K,J,T,R,E,S,B,N)
		RTD (Pt100, JPt100)
		Linear(1-5V, 4-20mA)
	Input Sampling Time	300 ms
Indication	PV/SV Indication	4-digit
	Constant Value Storage System	Non-volatile memory (E^2PROM)
Control Mode	Proportional Band (P)	0.0~3000
	Integral Time (I)	0~3600
	Derivative Time (D)	0~900
	Cycle Time	0~150
	Dead Band	0.0~200.0
Output	Relay Output Relay	Contact, SPDT 3A/240VAC
	Voltage Output	Voltage Pulse
	Linear Output	4~20mA, 1-5V ,
	Motor Control Output	Open loop motor valve
Alarm	Channel	3 Channels (Optional)
Communication	Type of Communication	RS-232, RS-485
General Specifications	Power Supply Voltage & Frequency	AC 90~260V, 50/60Hz
	Power Consumption	<3.5VA
	Ambient Temperature	-10℃ ~ 55℃
	Ambient Humidity	0~80% RH

ORDERING INFORMATION

A B C D E F G

M C - 5438 - 1 0 1 - 0 0 0

A:Type **(Dimension)**

MC-5438 = 48x48mm (DIN 1/16), MC-5538 = 48x96mm (DIN 1/8),
MC-5638 = 96x48mm (DIN 1/8), MC-5838 = 96x96mm (DIN 1/4)),
MC-5738 = 72x72mm

B:Output 1

0=NONE
1=Relay,contact,SPDT 3A/240VAC
2=Volt,voltage pulse,20VDC/20MA
3=mA Curent,4~20mA
4=Open loop circuit servo motor control
A=0~5V
B=0~10V
C=1~5V
D=2~10V

E:Transmission

0=None
1=4~20mA (Adjustable)
2=0~20mA (Adjustable)
A=0~5V
B=0~10V
C=1~5V
D=2~10V

C:Output 2

0=NONE
1=Relay,contact,SPDT 3A/240VAC
2=Volt,voltage pulse,20VDC/20MA
3=mA Curent,4~20mA
A=0~5V
B=0~10V
C=1~5V
D=2~10V

F:Input 2

0=None
1=4~20mA remote set point
2=0~20mA remote set point
3=CT for heater break alarm
A=0~5V remote set point
B=0~10V remote set point
C=1~5V remote set point
D=2~10V remote set point

D:Alarm

0 = NONE
1 = Alarm x 1
2 = Alarm x 2
3 = Alarm x 3

G:Communication

0 = None
1 = RS-232
2 = RS-485