VERTEX VD SERIES

USER MANUAL

The Vertex **VD series Temperature Controllers** are a “Low Cost” Digital alternative to analog controllers, designed for use in simple applications where three term (PID) control is not required. It comes from the factory with default settings making it an “on/off” controller but can be user configured to have proportional action “proportional”. It has a single digital display allowing access to all the parameters including the “Process Variable” and “Set Point”. It is fully configurable on input including PT100 (RTD).

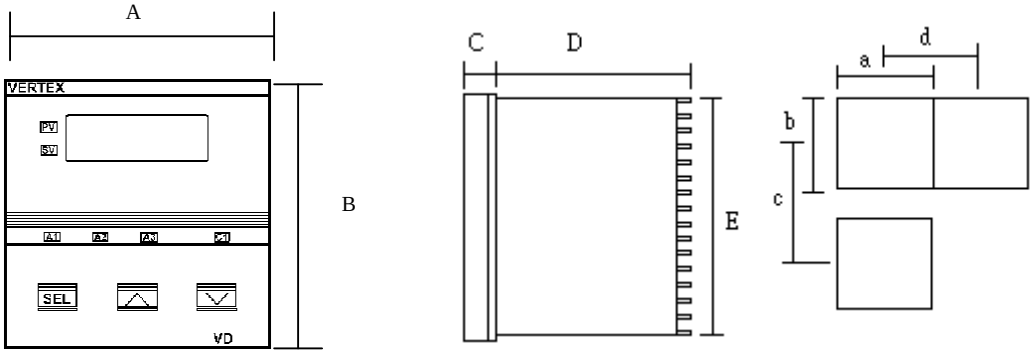
There are three simple steps required to get you up and running:

1. **Installation**
2. **Wiring**
3. **Commissioning**

Installation

Select the panel cut-out sizes from the table depending on the Model VD controller you have chosen and install the controller accordingly in your panel.

■PANEL CUTOUT：

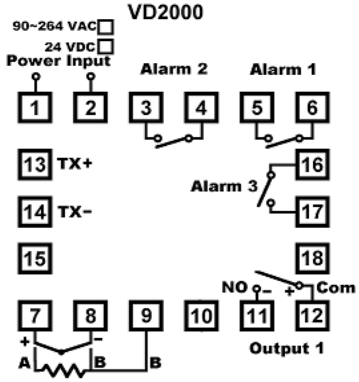


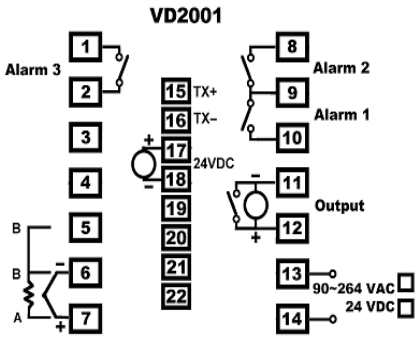
Model	A	B	C	D	E	a	b	c	d
VD-2000	48	48	6	100	45	45+0.5	45+0.5	60	48
VD-2001	72	72	9	80	67	68+0.5	68+0.5	90	72
VD-2002	48	96	9	80	91	45+0.5	92+0.5	120	48
VD-2003	96	48	9	80	45	92+0.5	45+0.5	48	120
VD-2004	96	96	10	80	91	92+0.5	92+0.5	120	96

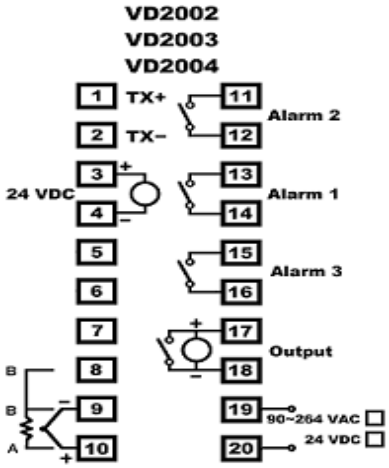
(Unit:mm)

Wiring

■WIRING DIAGRAM：







Wiring Precautions:

Before wiring please check the model you are using and establish the correct terminals you should use, by using this information and double checking it against the label on the label on the controller.

1 **Mains Power**:

1.1 You can use any mains voltage between 90 and 264 Volts AC (50 or 60 Hz) or DC

1.2 You can also order the controllers with a “Low Voltage DC” input that will accept anything between 18 ~ 32 VDC for the mains power voltage.

1.3 The When using DC mains the input is not polarity sensitive

1.4 For Model VD2000 the mains voltage wiring goes on terminals 1 + 2

1.5 For Model VD2001 the mains voltage wiring goes on terminals 13 + 14

1.6 For Model VD2003/2004 the mains voltage wiring goes on terminals 19 + 20

2 **Inputs will mostly be either thermocouple or RTD (PT100)**

2.1 Firstly check on the box and case label to see if the controller you are installing is T/C meaning thermocouple or PT100.

3 **Thermocouples have two wires only.**

3.1 Points to check are that the thermocouple is connected on the correct terminals.

3.2 For Model VD2000 this is terminals 7 + 8 with the thermocouple +ve wire on terminal 7 and the –ve wire is on terminal 8.

3.3 For Model VD2001 this is terminals 6 + 7 with the thermocouple +ve wire on terminal 7 and the –ve wire is on terminal 6.

3.4 For Model VD2003/2004 this is terminals 9 + 10 with the thermocouple +ve wire on terminal 10 and the –ve wire is on terminal 9.

3.5 If the temperature reads but responds in the reverse when testing, like when heating the display goes down instead of up just swap these two wires around. This will not harm the controller in any way if it is not correct.

4 **PT100 (RTD) in most cases have three wires.**

4.1 For Model VD2000 use terminals 7 + 8 + 9. The one color goes on terminal 7 and the two wires with the same color go on terminals 8 + 9

4.2 For Model VD2001 use terminals 5 + 6 + 7. The one color goes on terminal 7 and the two wires with the same color go on terminals 5 + 6

4.3 For Model VD2003/2004 use terminals 8 + 9 + 10. The one color goes on terminal 10 and the two wires with the same color go on terminals 8 + 9.

4.4 If you are using a PT100 (RTD) with only two wires, one wire will go on the terminal where the "one color" described above goes, and the other wire one on either of the other two terminals used for PT100 inputs as described above and then you must bridge with a short piece of wire between these two terminals that would have carried the same color wire as described above.

5 **Control outputs can be either "relay" or "SSR"**

5.1 Please check carefully on the box and label on the side of the controller to make sure what type of output your controller has. Incorrectly wiring this may blow the output and you will be charged for repairing it.

5.2 All controllers are "Relay" output as factory standard. To have SSR you must especially order them with this option.

6 **Relay output....**If you are using a relay output controller use the normally open contact to switch the power going to the contactor. On the VD2000/2001 these terminals are 11 + 12, VD2003/2004 terminals 17 + 18

6.1 Wiring this part of the circuit often involves other circuitry within the machine and someone with general electrical knowledge should have a look at the circuit to decide how this should be connected.

6.2 If you are replacing an old controller of a different make, carefully identify each wire on the old controller and then substitute them in the correct position on the new VERTEX model.

6.3 Extreme care should be taken if attempting to do this as experience shows that most times when it goes wrong it was a simple swapping of a wire or two that causes the problem.

6.4 Always take time up front and write everything down clearly before disconnecting anything and take extreme care not to swap or confuse wires. This should be done by someone with a good knowledge of electrical wiring circuits.

7 **SSR output**...If you are using a SSR output controller you would simply wire two wires from the +ve and - ve output terminals directly to the corresponding polarity terminal on the SSR. For Model VD2000 this will be terminals 11 (-ve) and 12 (+ve) and for Model VD2001 terminals 11 (-ve) and 12 (+ ve) and Model VD2003/2004 terminals 17 (+ve) and 18 (-ve)

7.1 If the controller is SSR output, it means the output signal is 24 Vdc. <u>It is for use with SSR's that have a control signal input of 3 ~32 Vdc.</u>

7.2 It will not work with SSR's that have a control signal of 90~250 Vac.

7.3 <u>If you have a SSR that works with 90~250 Vac</u> you will need a relay output controller that will simply switch the higher voltage signal feeding the Solid State Relay.

7.4 If you have any doubt at all consult your supplier who will assist in checking what exactly you have or need.

Commissioning

Having correctly wired the unit you are now ready for the initial turn on.

1. Turn the power on and watch the display as the controller self tests and powers up.
2. You will be able to see which thermocouple type the unit is set up for.
3. Once the power up is completed you will be looking at the measured temperature.
4. This parameter is identified by the small “PV” light, which will be on.
5. You can now check and set the set point you require.
6. You access this parameter by pressing either the up or down keys once.
7. The “SV” light will now be on and you will be looking at the set value, which you should now set to about 70% of your final operating temperature.
8. You do this in order to watch the temperature rise to the setpoint at which point the output identified by light “C1” must turn off.
9. Once the “C1” light is off there should be no power going to the heating elements and the temperature should stop rising. Should this not happen you must turn off the power and check your wiring.
10. The controller is supplied with a factory default making it an on/off controller. This means that the temperature will rise up to the setpoint at which point it will switch off (“C1” off) and then drop a little before the heating turns on again.
11. The controller is factory set with Pb=0 (on/off control mode). In this mode you can adjust a deadband around the setpoint by changing the HYST parameter. It works like this, see Fig 1.
12. To Access the different levels, hold down the ‘SET’ key in for about 5 seconds.

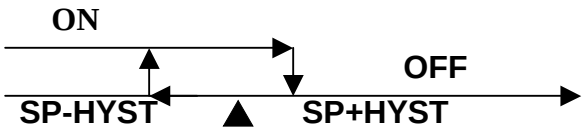
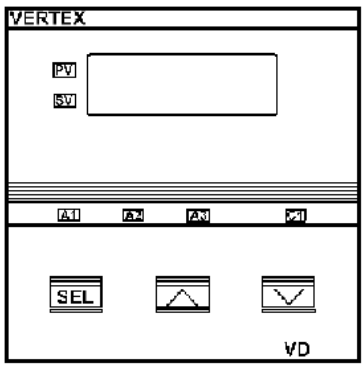


FIG1

■FRONT PANEL DESCRIPTION：



(1)PV － Process Value
(2)SV － Setting Value
(3)C1 － Control LED
(4)A1 － Alarm 1 LED
(5)A2 － Alarm 2 LED
(6)A3 － Alarm 3 LED

(1) SET **SET KEY. Press once to access the next programmable parameter.**

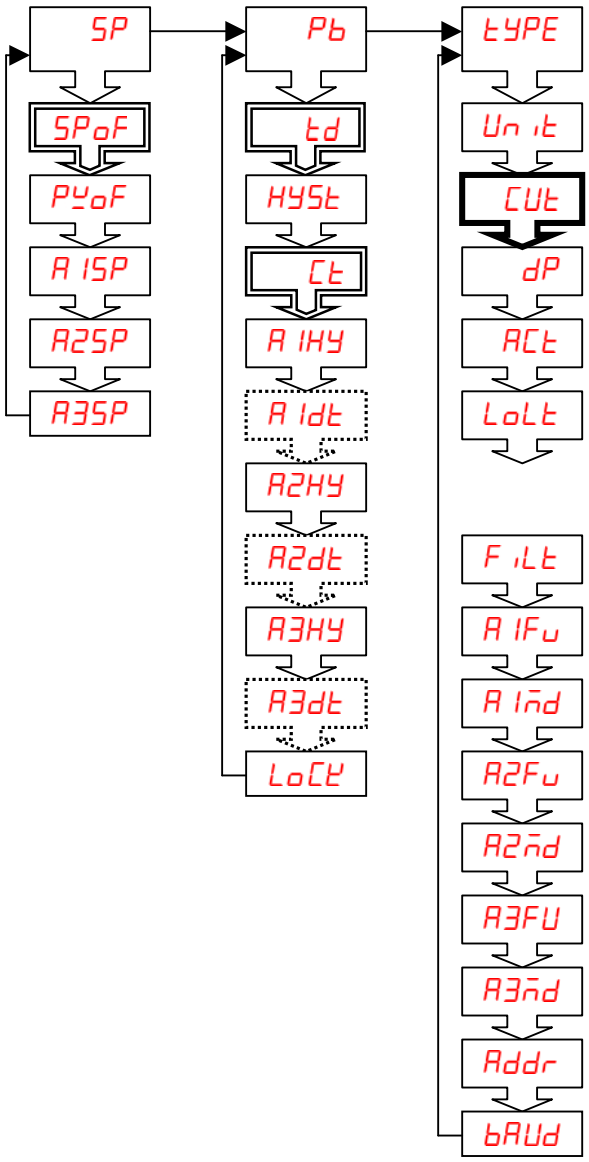
(2) ∧ **UP KEY. Press to increase the set point or parameter value.**

(3) ∨ **DOWN KEY. Press to decrease the set point or parameter value.**

(4) SET ∧ **Press the SET and UP keys once to return the normal operation.**

■ PROGRAMMING LEVEL PARAMETERS

lst. Prog. Level 2nd. Prog. Level 3rd. Prog. Level



1. When Pb=0.0 these parameters will not appear, and will be replaced by HYSt .
2. These parameters will appear when A1Fu= t.on or t.Off. and A1HY will not be displayed. (L=1~3, A1, A2,A3)
2. These parameters will appear when tYPE= LinE and Unit will not be displayed.

FIRST PROGRAMMING LEVEL PARAMETERS

CODE	DESCRIPTION	RANGE	Default
SP	**Control set point value**	LoLt — HiLt	100
SPoF	**Set point offset**. This should always be left at 0 as any value here will create an offset in control either above or below the "actual " setpoint. It is used as a "manual reset" when the controller is used in the proportional control mode.	-1000-1000 (-100.0-100.0)	0
PVoF	**Process value offset**. This should be left at 0 as any other value will cause the PV display to read inaccurately by the amount either above or below the actual value. This is used in applications such as double boilers where the PV reading is taken in a jacket and the product temperature may be a few degrees lower.	-1000-2000 (-100.0-200.0)	0
A1SP	**Alarm 1 set point**	-1999—9999	10
A2SP	**Alarm 2 set point**	-1999—9999	10
A3SP	**Alarm 3 set point**	-1999—9999	10

SECOND PROGRAMMING LEVEL PARAMETERS

CODE	DESCRIPTION	RANGE	Default
Pb	**Proportional band.** Set to 0.0 for ON/OFF control mode.	0.0-300.0%	0.0
td	**Derivative (Rate).** When Pb=0.0, this parameter will not appear.	0-900sec	60
HYSt	**Hysteresis** for ON/OFF control on output. When Pb = 0.0 this parameter will not appear.	0-2000 (0.0-200.0)	2
Ct	Proportional cycle **time of control output. When Pb = 0.0 this parameter will not appear.** Set to 15 or 20 for relay output, Set to 1 or 2 for SSR output, Set to 0 for current output.	0-100sec	15
A1HY	**Hysteresis of alarm 1.** When A1Fu= t.on or t.Off, A1HY is not displayed.	0-2000	0
A1dt	A1Fu =**t.on or t.Off** (Alarm 1 action with delay time)	99 MM. 59 SS. 99 HH. 59MM.	
A2HY	**Hysteresis of alarm 2**. When A2Fu= t.on or t.Off, A2HY is not displayed.	0-2000	0
A2dt	A2Fu =**t.on or t.oFF**(Alarm 2 action with delay time)	99 MM. 59 SS. 99HH. 59 MM.	
A3HY	**Hysteresis of alarm 3**. When A3FU= t.on or t.Off, A3HY is not displayed.	0-2000	0
A3dt	A3FU =**t.on or t.oFF**(Alarm 3 action with delay time)	99 MM. 59 SS. 99HH. 59 MM.	
LoCK	**Parameter lock.** This security feature locks out selected levels or single parameters prohibiting tampering and inadvertent programming changes.		

0000	All parameters are locked.
0001	Only SP is adjustable.
0010	USE (level) and A1(parameter) are adjustable.
0011	USER、PID(level) and A1、A2(parameter) are adjustable.
0100	USER、PID、OPTI(level) and A1、A2(parameter) are adjustable.
1000	Additional A3(parameter). All parameter you can find out,but can't adjustable.
1001	Additional A3(parameter)，only SP is adjustable.
1010	Additional A3(parameter). USER(level) and A1(parameter) are adjustable.
1011	USER、PID (level) and A1、A2、A3 (parameter) are adjustable.
1100	All parameters in all level are opened.

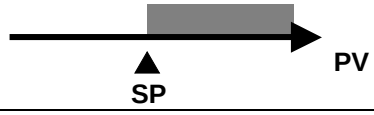
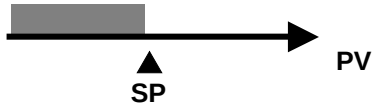
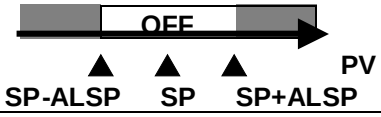
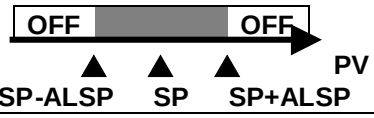
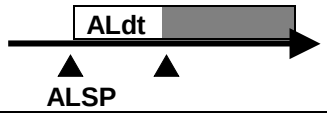
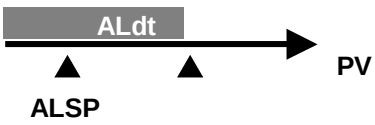
THIRD PROGRAMMING LEVEL PARAMETERS

CODE	DESCRIPTION	RANGE	Default
tYPE	**Input type selection.**	**Refer to figure.**	**K**

TYPE	RANGE(℃)	RANGE(℉)
J	-50 ～ 1000	-58 ～ 1832
K	-50 ～ 1370	-58 ～ 2498
T	-270 ～ 400	-454 ～ 752
E	-50 ～ 1000	-58 ～ 1832
B	0 ～ 1800	32 ～ 3272
R	-50 ～ 1750	-58 ～ 3182
S	-50 ～ 1750	-58 ～ 3182
N	-50 ～ 1300	-58 ～ 2372

	C	-50 ～ 1800	-58 ～ 3272	
	D-PT	-200 ～ 850	-328 ～ 1652	
	J-PT	-200 ～ 600	-328 ～ 1112	
	LINE	-1999 ～ 9999		
Unit	**Unit of process value.** The parameter is not displayed when tYPE=LinE		°C : **Degrees C.** °F : **Degrees F.**	℃
CUt	**Used to limit the process value when linear input (type=line) signal is out of range.** **None=** this function is not used. **Lo =** The process value will be limited to LoLt when input signal is lower than the scale range. **Hi =** The process value will be limited to HiLt when input signal is higher than the scale range. **Lo.Hi =** The process value will be limit within the range of LoLt to HiLt when input signal is out of scale.		**nonE，Lo** **Hi，Hi.Lo**	nonE
dP	**Decimal Point selection.** 0000：No decimal point. 000.0：0.1 resolution 00.00：0.01 resolution, used for linear input only. 0.000：0.001 resolution, used for linear input only. After changing the decimal point parameter please re-check all the parameters.		**0000** **000.0** **00.00** **0.000**	**0000**
Act	**Output control action.**		rEV **:Reverse action for heating.** dir **:Direct action for cooling.**	rEV
LoLt	**Low limit of span or range**. Set the low limit lower than the lowest expected SV and PV display.		**Full range**	**0**
HiLt	**High limit of span or range.** Set the high limit higher than highest expected SV and PV display.		**Full range**	**500**
FiLt	**Software filter.**		**0.00-100.0**	**5.0**
A1FU	**Alarm 1 function. Refer to alarm function section for detail.**		**nonE, Hi, Lo, dif.H,dif.L, bd.Hi , bd.Lo, t.on, t.oFF**	diF.H
A1md	**Alarm 1 mode. Refer to alarm mode section for detail.**		**nonE, Stdy, Lath, St.La HH.mm, mm.SS**	nonE
A2FU	**Alarm 2 function. Refer to alarm function section for detail**		**nonE, Hi, Lo, dif.H,dif.L, bd.Hi , bd.Lo, t.on, t.oFF**	diF.L
A2md	**Alarm 2 mode. Refer to alarm mode section for detail.**		**nonE, Stdy, Lath, St.La HH.mm, mm.SS**	nonE
A3FU	**Alarm 3 function. Refer to alarm function section for detail**		**nonE, Hi, Lo, dif.H,dif.L, bd.Hi , bd.Lo, t.on, t.oFF**	diF.L
A3md	**Alarm 3 mode. Refer to alarm mode section for detail.**		**nonE, Stdy, Lath, St.La HH.mm, mm.SS**	nonE
Addr	**RS485 address**		**0-255**	**0**
bAUd	**Communication baud rate.** 2.4k=2400bps, 4.8k=4800 bps, 9.6k=9600 bps, 19.2k=19200 bps		**2.4k, 4.8k, 9.6k, 19.2k**	**9.6k**

ALARM TYPE SELECTION

A1FU/A2FU	ALARM TYPE	ALARM OUTPUT OPERATION
nonE	Alarm function OFF	Output OFF
H i	PV high alarm	
Lo	PV low alarm	
d iF.H	Deviation high alarm	
d iF.L	Deviation low alarm	
bdH i	Band high alarm	
bdLo	Band low alarm	
t.on	PV high alarm with delay time	
t.oFF	PV low alarm with delay time	

ALARM SPECIAL FUNCTION SELECTION

ALMD	DESCRIPTION
nonE	**Normal alarm mode**
StdY	**Startup inhibit** When selected, in any alarm function, prevents an alarm on power up. The alarm is enabled only when the process value reaches the alarm set point for the first time and is used to avoid alarm trips during startup.
LAtH	**Latch mode.** When selected, the alarm output and indicator latch as the alarm occurs. The alarm output and indicator will be energized even if the alarm condition has been cleared and will only reset when the power to the controller is switched off..
StLA	**Standby and latch mode**
HH.nn	**99Hours 59 Minutes**
nn.SS	**99Minutes 59Seconds**

■■ERROR MESSAGE AND TROUBLESHOOTING

Symptom	Probable	Solution
UUUU	-Input signal below the low limit -Incorrect input sensor selection	-Set a higher value to high limit. -Check connect input sensor selection.
nnnn	-Input signal below the low limit -Incorrect input sensor selection	-Set al lower value to low limit. -Check correct input sensor selection
oPEn	-Sensor break error -Sensor not connected	-Replace sensor -Check the sensor is connected correctly
Keypad no function	-Keypads are locked -Keypads defective	-Set"LoCK"to a proper value -Replace keypads
Process value unstable	-Improper setting of Pb, Ti, Td and CT	-Start AT process to set Pb, Ti, Td automatically -Set Pb, Ti, Td manually
No heat or output	-No heater power or fuse open -Output device defective or incorrect output used	-Check output wiring and fuse -Replace output device
All LED's and display not light	-No power to controller -SMPS failure	-Check power lines connection -Replace SMPS
Process Value changed abnormally	-Electromagnetic Interference (EMI) or Radio Frequency Interference (RFI)	-Suppress arcing contacts in system to eliminate high voltage spike sources. Separate sensor and controller wiring from "dirty" power lines. Ground heaters
Entered data lost	-Fail to enter data to EEPROM	-Replace EEPROM

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