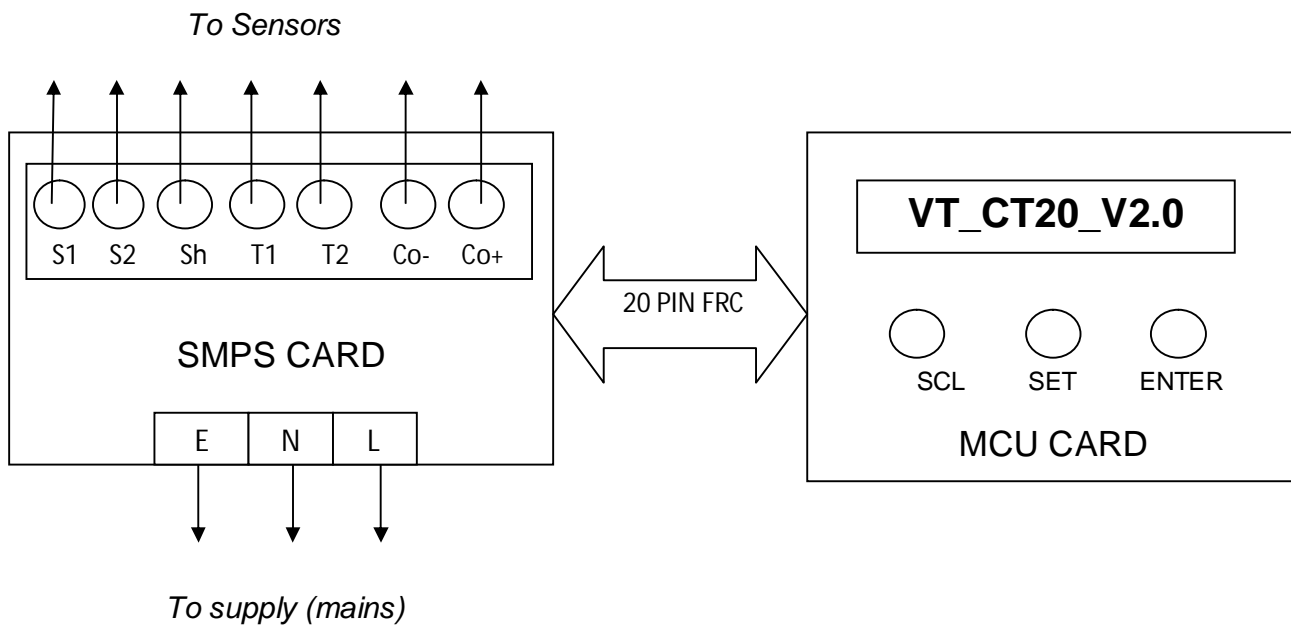


**Operational Manual**  
For  
**CT20**

# 1 PRODUCT OVERVIEW

## BLOCK DIAGRAM



## SPECIFICATIONS

This unit is designed to monitor the conductivity, TDS (Total Dissolved Solid) & temperature of any fluid. System has a LCD display for user interface, three keys (SET, SCL & ENTER) for configuring the menus.

### Specification:

1. System operates with 230V AC supply
2. 16 x 1 Alphanumeric LCD display
3. 3 keys for user interface
4. User interface for setting system parameters for measuring:
  - (1) Conductivity (0 to 990000 uS/cm)
  - (2) TDS
  - (3) Temperature (0 to 200 degree cel)
  - (4) Current Output (4 mA to 20 mA)
  - (5) Relay operation

## 2 SYSTEM CONFIGURATION

### USER INTERFACE

The user interface comprises of 16 x 1 LCD alphanumeric displays & three keys SET, SCL & ENTER.

#### LCD:

Power on display screen:

When the unit is powered on, it will display version name:

Ver 2.0

After 2 seconds, the display will show screens as per the mode selected by user:  
The screen shots could be:

Conductivity

Condt + TDS

TDS + Temp

TDS

Condt + Tem

Condt + Tem + TDS

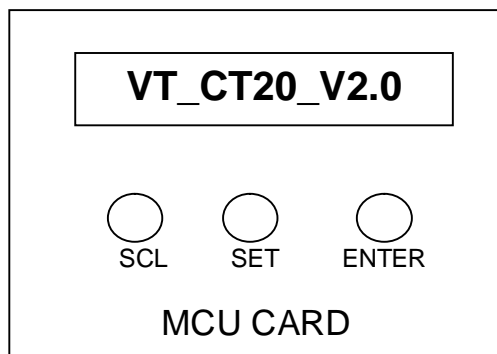
After 2 seconds, the screen will start displaying the measured values of selected parameters.

Cdt (uS/cm): 510

TDS (ppm): 320

Temp: 26.1 deg cel

#### Key Definition:



**1. SET Key:** This key is used for incrementing the count from 0 to 9 in cyclic order in password setting as well as menu selection mode

**2. SCL key:** This key is used for toggling the cursor between different character positions on each key press in password setting as well as menu selection mode. A long key press on SCL key is used to for entering to the password setting mode.

**3. ENTER key:** This key is used for final selection of particular configuration parameter & thus passing the control to next menu.

## CONFIGURATION METHOD

The system can be configured to display various measured parameters. On power on, the display will show version name & will start toggling between various parameters selected previously by user.

Press the SET key for 3 to 4 seconds to enter into password selection mode. If the password entered is invalid, LCD will flash a message "wrong password".

### MENU 1: Configuration menu

1. Cell constant selection
2. Actual cell constant selection
3. Cable length selection
4. Cable length scale factor selection
5. Toggle time selection
6. Mode selection
7. Temperature compensation
8. Display Mode

### MENU 2: 4mA to 20mA o/p range selection

1. High value selection
2. Low value selection

### MENU 3: Relay ON/OFF setting

1. Ambient temperature selection
2. Temperature compensation mode
3. Temperature scale factor
4. Manual temperature selection
5. Relay set point selection
6. Hysteresis value selection
7. Relay position selection
8. Relay ON/OFF delay time selection

#### MENU1:

1. Press SET key for 4 seconds & system will wait for password

Password.....

2. Display will show 00 with first digit blinking

00

**NOTE:** Timeout will occur if user doesn't enter the password for about 8 to 10 seconds

#### Cell constant selection:

If the entered password is 31, the display will show

Cell const: 0.1

1. On pressing 'SCL' or 'SET' key, cell constant value will change (0.1, 0.01, 1 & 10)
2. By pressing ENTER key, the value of cell constant will be set & control will be transferred to actual cell constant selection.

#### Actual cell constant selection:

Actual CC: 0.100

1. Press SCL key to shift the cursor position & SET key to toggle the digits from 0 to 9 in cyclic order
2. If entered actual cc value is not in the range, the display will show "Out of Range".
3. Actual CC is +/- 20% of cell constant
4. By pressing ENTER key, the value of Actual CC will be set & control will be transferred to cable length selection.

#### Cable length selection:

Cable len: Enable

Available options: Enable/Disable

1. Press SCL / SET key to change the cable length
2. By pressing ENTER key that parameter is saved & control goes to toggle time selection menu.

If cable length is enabled, the display will show the scale factor selection parameter

If the cable length is disabled, the option for scale factor selection will not appear on screen

**Scale factor (for cable length) selection:**

**Scale Factor: 0.00**

1. Press SCL key to shift the cursor position
  2. Press SET key to change the digits from 0 to 9 in cyclic order
  3. Press the ENTER key to save the parameter & enter into next mode selection Range: 0.00 to 9.99
- NOTE:** The scale factor (for cable length) selected by user will get multiplied with standard conductivity values & accordingly TDS values will also get affected
- Example:** If the unit is configured with following settings:

- (1) Cell constant: 0.1
- (2) Actual cell constant: 0.100
- (3) Cable len: Enable
- (4) Scale factor: 2.00

Then, the standard value of conductivity which was used to be say 512 S/cm, will now become 1024uS/cm (512 x 2.00)

**CAUTION:** For better & accurate results, do not exceed value of scale factor(for cable length) above 5.55 (especially when cc=10)

**Toggle time selection:**

**Tog time: 00 sec**

1. This option can change the toggling time between various modes
2. Press SET key to change the digits from 0 to 9. Toggle between these digits using SCL key.
3. Press ENTER key to save the parameter & exit from calibration menu

This parameter will decide screen toggling time Range: 00 to 99 sec

**NOTE:** Toggle time selection parameter has no effect when manual display mode is selected

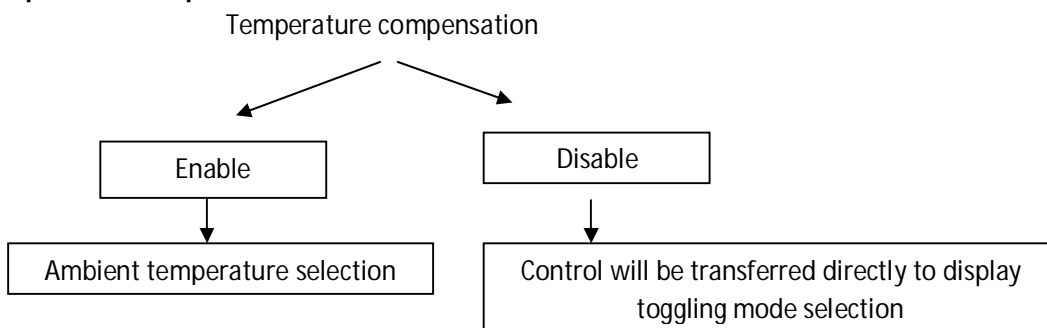
**Mode Selection:**

**Mode Sel: All**

Available options: All, conductivity, TDS, Condt + TDS, Condt + Temp, TDS + Temp

1. This parameter will select the operation mode
2. Press SET or SCL key, the mode can be toggled between 6 different modes of operation  
All, Conductivity, TDS, Temperature, TDS + Temperature, Conductivity + Temperature.
3. Press ENTER key to save the parameter & exit from mode selection menu

**Temperature compensation:**



**Temp Comp: ENABLE**

Available options: Enable / Disable

If temperature compensation is disabled, the display will show the option for selecting display mode related to screen toggling (auto/manual)

1. This parameter will decide whether to enable or disable temperature compensation.
2. Press SET or SCL key to enable or disable the temperature compensation
3. Press ENTER key to save the parameter & shift the control to next menu

If temperature compensation is enabled, the conductivity values will get affected with temperature

If temperature compensation is disabled, the conductivity values will be independent of temperature

**NOTE:** If temperature compensation is enabled, the parameters mentioned below should be configured by entering password 11:

- <1> Ambient temperature selection
- <2> Temperature mode selection (auto/manual)
- <3> Temperature scale factor selection
- <4> Manual temperature selection

**Ambient temperature selection:**

**Ambi Temp: 26.0**

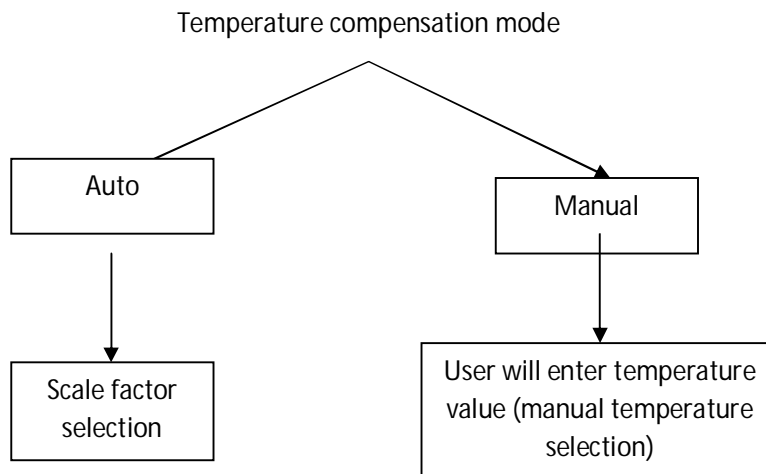
If temperature compensation is enabled, this menu selection parameter will appear on screen.

1. Press the SCL key to change the cursor position
2. Press SET key to toggle the count from 0 to 9 in cyclic order
3. Press ENTER key to save the parameter & shift the control to next menu

This menu will decide the temperature to which the measured values of temperature from PT-100 will be compared  
Range: 0.0 to 99.9

**Suggested Range:** 20.0 to 40.0 degree cel

**Temperature compensation mode:**



**TempMode: Auto**

Available options: Auto / Manual

If temperature compensation is enabled, this menu selection parameter will appear on screen.

1. This parameter will decide whether the temperature compensation should be automatic or manual
2. Press SCL or SET key to select between the two modes
3. Press ENTER key to save the parameter & shift the control to next menu
4. If manual mode is selected, then the user should enter the value for temperature manually.

After pressing ENTER key, temperature value will be saved.

In manual mode, sensor need not be connected at terminals T1 & T2. The value of manual temperature selected by user will be observed on LCD screen & this temperature value will be compared with ambient temperature for measuring conductivity with temperature compensation.

In Auto mode, option for entering temperature scale factor will appear on screen. In this case, the value of temperature displayed on LCD will be temperature measured from sensor connected at terminals T1 & T2 multiplied with the scale factor. This calculated value of temperature will be compared with ambient temperature for measuring conductivity with temperature compensation.

#### **Temperature scale factor selection:**

**Scale Factor: 0.0**

Range: 0.0 to 9.9

This menu selection parameter will appear on screen if AUTO mode is selected for temperature compensation.

1. This parameter will select the scale factor for temperature compensation
2. Press SCL key to toggle the cursor positions
3. Press SET key to toggle the count from 0 to 9 in cyclic order
4. Press ENTER key to save the parameter & shift the control to next menu

#### **Manual temperature selection:**

**Temp: 20.3 degree cel**

Range: 0.0 to 200 degree cell

This menu selection parameter will appear on screen if MANUAL mode is selected for temperature compensation

1. This parameter will prompt the user to select the temperature manually
2. Press SCL key to shift the cursor position
3. Press SET key to toggle the count from 0 to 9 in cyclic order
4. Press ENTER key to save the parameter & shift the control to next menu

#### **Display mode selection:**

**DispMod: Auto**

Available options: Auto / Manual

This parameter will decide whether the screen toggling should be automatic or manual

When auto mode is selected, the display will toggle the selected parameters automatically with toggle time set by user.

When Manual mode is selected, the display will show only one parameter at a time & will show the next selected parameter on ENTER key press

1. Press SET/SCL key to change the display mode (automatic/manual)
2. Press ENTER key to save the parameter & shift the control to next menu

## MENU2: 4MA TO 20MA CURRENT OUTPUT RANGE SELECTION

1. if entered password is 12, display will show 4 to 20 ma output range selection menu. the decimal point will be adjusted according to cell constant selected as follows:

<1> Cell constant: 1

High Val: 10000.00

Low Val: 00100.00

Range: 00000.00 to 99999.99

<2> Cell constant: 10

High Val: 100000.0

Low Val: 001000.0

Range: 000000.0 to 999999.9

<3> Cell constant: 0.1 & 0.01

High Val: 1000.0000

Low Val: 0010.0000

Range: 0000.000 to 9999.999

1. Press SET key to change count from 0 to 9 in cyclic order
2. Press SCL key to change the cursor position
3. Press ENTER key to save the selected values

### Example:

High value: 1000.0000

Low value: 0100.0000

**Expected operation:** Current output will be in between 4mA to 20mA for conductivity values between 100 to 1000. If the conductivity is below 100, the current output will be 4mA. On the other hand, if the conductivity is above 1000, current output will be 20mA.

## MENU3: Relay ON/OFF setting

### Relay Set Point menu:

1. If entered password is 11, display will show Relay setting menu. The decimal point will be adjusted according to cell constant selected as follows:

<1> Cell constant: 1

Set pt: 000000.00

Range: 00000.00 to 99999.99

<2> Cell constant: 10

Set pt: 000000.0

Range: 000000.0 to 999999.9

<3> Cell constant: 0.1 & 0.01

Set pt: 0000.000

Range: 0000.000 to 9999.999

1. Press SET key to change the count from 0 to 9 in cyclic order
2. Press SCL key to change the cursor position
3. Press ENTER key to save the selected value



### Set Hysteresis menu:

Set hyst: 00%

1. Press SET key to change count from 0 to 9 at each position in cyclic order
2. Press SCL key to change the cursor position
3. Press ENTER to save the parameter & display will show Relay NO/NC selection menu

Range: 00% to 99%

### Relay NO/NC select menu:

Available options: NO / NC

NO NC sel: NO

1. Press SCL/SET key to view the available options
2. Press ENTER to save the parameter & display will show ON/OFF delay selection menu

### ON/OFF delay time set menu:

ON delay: 00 sec

1. Press SET key to change digits from 0 to 9. Use SCL key to toggle between these digits
2. Press the ENTER key to save the parameter & exit.

Range: 00 sec to 99 sec

### Example:

Set Point = 500

Set Hysteresis = 0%

NO/NC selection: NO

On delay: 01 sec

**Expected operation:** For the values of conductivity below 500, the relay will be at NO position. If the conductivity exceeds above 500, the relay will shift to NC position after 1 second.

## 3 OPERATION INSTRUCTIONS

1. While measuring the conductivity without temperature calibration, there is no need to connect sensor at temperature input terminals
2. When measuring the conductivity with temperature compensation, the values of conductivity will vary according to temperature
3. When manual display mode is selected, the value of selected parameter will appear on screen till the time ENTER key is pressed. After pressing the ENTER key, next selected parameter will appear on screen.

Example:

If manual display mode is selected & along with that if mode selected is "ALL" then, display should show all the measured parameters (conductivity, TDS & Temperature).

In the manual mode, after all parameters are configured display should show:

Cdt (uS/cm): 512

Unless & until ENTER key is pressed, display will not show next measured parameter  
After pressing ENTER key, display will show:

TDS (uS/cm): 312

4. Current output: The current output is dependent on setting high value & low value. These are actually the values of conductivity used to generate current output in range 4 mA to 20 mA.

Example:

High value = 1000

Low value = 100

Then after setting these values, user should get 4 mA current at conductivity of 100 uS/cm & 20 mA

Current at conductivity of 1000 uS/cm (terminals c0+ & c0-). The values of current will be in between 4 mA to 20 mA for any value of conductivity in range 100 uS/cm to 1000 uS/cm. If the measured value of conductivity is below 100 uS/cm, the current output will be 4 mA; on the other hand if measured value of conductivity is above 1000 uS/cm, the current output will be 20 mA.

5. Relay operation: Relay operation is dependent on following factors:

Example:

Set Point = 01000.0

Hysteresis = 0%

NO / NC selection: NO

On time delay = 04 sec

For the values of conductivity in between 300 (1000 - 700) & 1700 (1000 + 700), Relay will be at NO position, if the conductivity falls out of range, after 4 sec relay position will change to NC.

Till the time the conductivity values are below 1000, the relay will be at NO position. When the conductivity increases above 1000, relay switches to NC position.

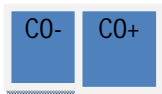
## 4 EXTERNAL INTERFACE

Conductivity Meter Connectors:

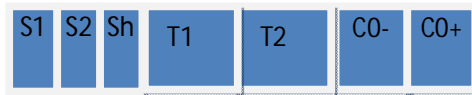
CN2: Main Supply 230volts 50Hz.



CN3: 4 to 20mA current output.



CN4: Sensor probe input.



T1 = Temperature IN

T2 = Temperature IN

S1 & S2 = Conductivity sensor input

C0+ & C0- = Current output

## 5 ERROR HANDLING

### ERROR MESSAGES

1. In the password selection mode, when the wrong password is entered, LCD screen shows password error.... message.

**Wrona Password .....**

2. If the resistance value exceeds the calibrated value & does not fall in the range defined, display will show the error message "Temperature out Of Range".

**Temp out of range**

3. If the entered value of actual cell constant is out of range, then display will show message:

**Out of Range**

**TEST REPORT**

Product

Model

Sr. No.

CC/ range

Cal. Factor

Standard	Actual
μ S/Cm /PPM	μ S/Cm /PPM

**This is to certify that the product mentioned above have been tested and calibrated at our works and have been found working satisfactorily as per the technical specifications of the product.**

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**WARRANTY CERTIFICATE**

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We certify that the instrument mentioned above has been tested by us and is guaranteed for a 12 months from date of dispatch. We undertake to make good by replacement or repair defects arising due to faulty design, material and or workmanship within the above mentioned period. Provided that the part in respect to which the complaint is made, is sent at the purchaser's expense.

The warrantee is valid subject to:

The meter or part there of not being subject to alteration, accident abuse or misuse. The installation having been done as per guide lines in the manual.

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Client: \_\_\_\_\_

Date of Dispatch \_\_\_\_\_ for Vatturkar Industrial



**VATTURKAR INDUSTRIAL**