

TDS Blowdown Controller

BK 5000-T

Installation and Operating Instructions

EN

English

CONTENT

1.SAFETY INFORMATIONS	II
2.GENERAL INFORMATIONS	1
2.1 Description	1
2.2 Approvals	2
3.TECHNICAL SPESIFICATIONS	2
4.INSTALLATION and WIRING	3
4.1 Installation	3
4.2 Wiring.....	3
5.COMMISSIONING	6
6.FUNCTIONS and CONFIGURATIONS	7
6.1 Display Definitions and Button Functions	7
6.2 Changing Functions and Settings	8
6.2.1. CONDUCTIVITY SET	9
6.2.2. CONDUCTIVITY HYSTERESIS SET	9
6.2.3. ALARM SET.....	9
6.2.4. ALARM HYSTERESIS SET	9
6.2.5. CONDUCTIVITY CALIBRATION	9
6.2.6. CHANGE PASSWORD	10
6.2.7. VALVE RELAY TEST	10
6.2.8. ALARM RELAY TEST	10
6.2.9. LANGUAGE	10
6.2.10. TEMPERATURE	11
6.2.11. PROBE DATA	11
6.2.12. VERSION	11
6.2.13. SERVICE SETS	11
6.2.14. MODBUS SLAVE ADRESS SETTINGS	11
6.2.15. MODBUS BAUDRATE SETTINGS	12
7.MAINTANANCE	12

1. SAFETY INFORMATION

Installation, commissioning and maintenance of this device must be done by a qualified personnel in compliance with the operating instructions. Otherwise device and related equipments may be damaged and personnel may be injured. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

National and local regulations must be taken into consideration.



Warning!

Please make sure to remove the main supply before installation. Otherwise this may cause damage to the product, personal injuries or even death

1.1 Tools

Before starting work, make sure that you have suitable tools and consumables available.

1.2 Temperature

Let the temperature to cool down after isolation to avoid danger of burns.

1.3 Freezing

Required precautions must be taken at the places where they may be exposed to temperatures below freezing point.

1.4 Lighting

Make sure there is enough lighting, particularly where detailed or tough work is required.

1.5 Pressure

Make sure that any pressure is isolated and safely vented to atmospheric pressure. Do not assume that the system has depressurised even when the pressure gauge indicates zero.

1.6 Access

Before attempting to work on the product, safe Access must be ensured. If necessary, lifting gear should be used.

1.7 Residual hazards

The external surface of the product may be very hot. If used at the maximum operating conditions according to the specs, the surface temperature of some products may reach temperatures of 239°C.

1.8 Hazardous environment

Plant rooms are usually explosion risk areas. There may be lack of oxygen, dangerous gases extremes of temperature, hot surfaces, fire hazard excessive noise, moving machinery.

1.9 Suitable protective clothing

In order to be protected against the hazards of chemicals, high temperature, radiation, noise, falling objects, and dangers to eyes and face, anyone around requires protective clothing suitable in the plant room.

1.10 Hazardous liquids or gases

Be aware of that it cannot be known what may have been in the pipeline at previous usage. Consider: flammable materials, substances hazardous to health, extremes of temperature.

1.11 Supervision

All work must be carried out or be supervised by a suitably competent person. Installation and operating personnel should be trained in the correct use of the product according to the Installation and Operation Instructions.

1.12 Disposal

Unless otherwise stated in the Installation and Operation Instructions, this product is recyclable and no ecological hazard.

1.13 Returning products

When returning products to Vira Isı ve Endüstriyel Ürünler A.Ş the customers must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk.

2. GENERAL INFORMATIONS

2.1 Description

As a boiler generates steam, any impurities which are in the boiler feedwater and which do not boil off with the steam will concentrate in the boiler water.

As the time passes and dissolved solids become more and more concentrated, the steam bubbles on the surface tend to become more stable. Eventually, substantial part of the steam space in the boiler becomes filled with bubbles and foam is carried over into the main steam.

This is obviously undesirable situation. Both, the steam leaves the boiler wet and boiler water contains high level of dissolved and suspended solids. These solids will contaminate control valves, heat exchangers and steam traps as well as whole installation.

The TDS (Total Dissolved Solids) level in steam boilers is controlled using TDS Blowdown Control System more accurately. The conductivity controller BK 5000-T measures the electrical conductivity and temperature of the boiler water with the help of the conductivity probe BD 5600-T and the integrated temperature sensor. The conductivity values are automatically compensated to the reference temperature of 25 ° C. The BK5000T can also be used with the BD5400 or BD 5300-T conductivity probe. When used with BD 5400, the BK5000-T does not receive temperature information and therefore does not compensate for temperature.

The conductivity controller BK5000-T and the conductivity probe are used as limit switches. For example, in a boiler or feed water tank, the conductivity controller BK 5000-T instantly measures and displays the conductivity value. When the conductivity value reaches the set value, the blowdown valve opens. If the water drops below the set value, the blowdown valve is closed. The conductivity setpoint can be set to the desired value.

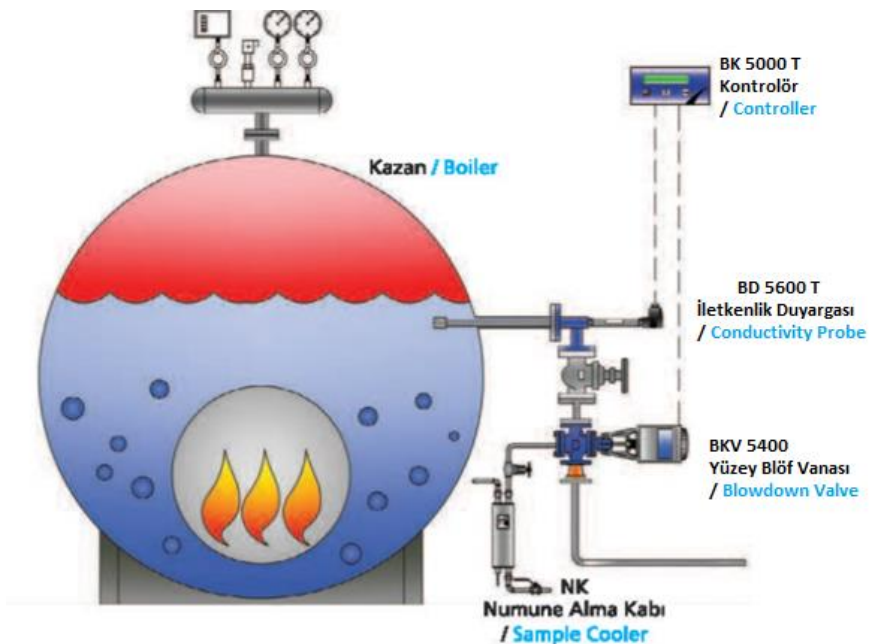


Figure 1: Connection of TDS Blowdown System BS4-T to a steam boiler

2.2 Approvals

The BK 5000-T complies with the Electromagnetic Compatibility Directive and all its requirements. This product is suitable for industrial environments. A fully detailed EMC assessment was performed and the reference number is A 0442 21142 00 EY.

The BK 5000-T complies with the Low Voltage Directive (2014/35 / EU) in accordance with the following standards:

- EN 61010-1: 2010, safety requirements for electrical equipment for measurement, control and laboratory use.

3. TECHNICAL SPECIFICATIONS

Enclosure	: IP 54
Maximum Ambient Temp.	: 55 °C
Maximum Wire Length	: 100 m (Controller to Probe)
Main Supply Voltage	: 220/230 Vac
Frequency	: 50/60 Hz
Power Consumption	: 1 VA
Conductivity Measuring Range	: 10-10000 $\mu\text{S}/\text{cm}$
4-20 mA Current Transmitter	: Yes (Option)
Modbus RTU Communication Setup	: Yes (By RS 485 Port)
Dimensions (height x depth x width)	: 72 x 110 x 144 mm
Weight	: 0.5 kg

Not: The conductivity measurement range should be specified as 10-2000 or 100-10000 $\mu\text{S}/\text{cm}$ before ordering.

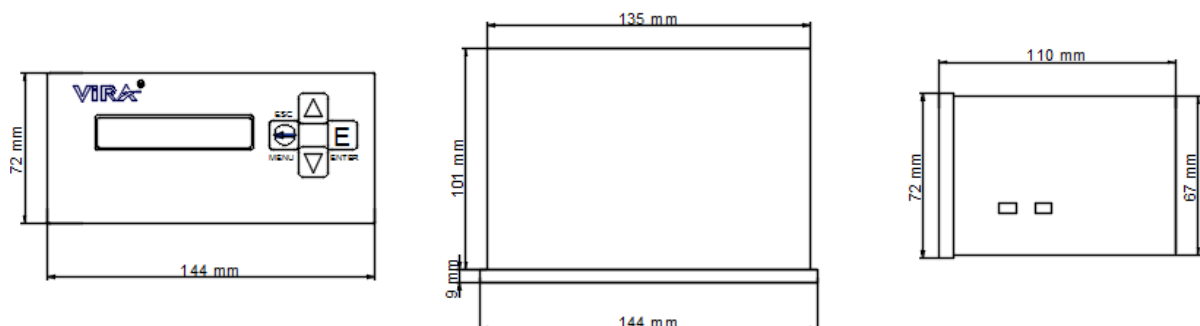


Figure 2: Case dimensions of TDS Controller BK 5000-T

4. INSTALLATION and WIRING

4.1 Installation

TDS Controller BK 5000-T is front panel mounting enclosure type and can be applied to the front panel with two screw clamps supplied. Allow 20 mm minimum clearance all-round the unit for air circulation.

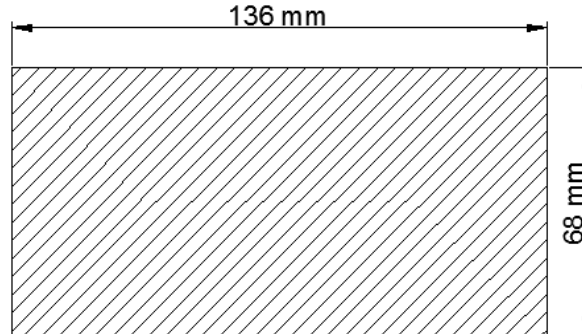


Figure 3: Panel cut out dimensions of TDS Blowdown Controller BK 5000T

4.2 Wiring

Wiring between controller and probe, 5x0,22 mm² 5x0.50 mm² screened (shielded) cable can be used. Relocation of terminal blocks should be avoided. There are phase inputs between 12th and 15th terminal connections of the controller. So, from 1st to 6th terminal connections must not connect to from 12th to 15th terminal connections or vice versa. Otherwise, device can be damaged , it may even cause personal injuries.

4.2.1 BK 5000-T Controller and BD 5600-T Probe Connection

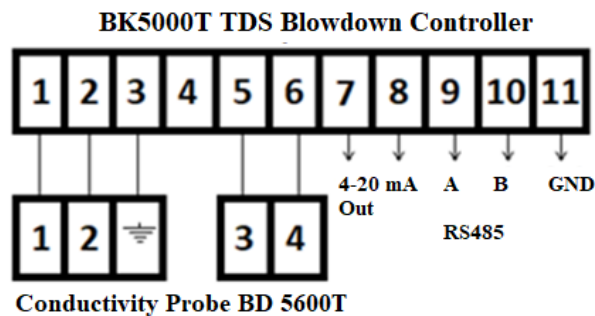


Figure 4: BK 5000-T and BD 5600-T Wiring Diagram

4.2.2 BK 5000-T Controller and BKV 5400 Blowdown Valve Wiring

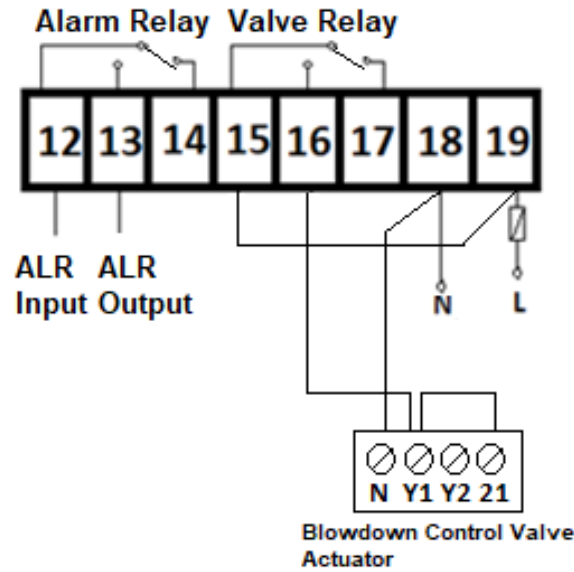


Figure 6: BK 5000-T and BKV 5400 Wiring Diagram

4.2.3 4-20 mA Current Loop Wiring

In electrical signaling an analog current loop is used where a device must be monitored over a pair of conductors. A major application of current loops is the industry standard 4–20 mA current loop for process control applications, where they are extensively used to carry signals to SCADA systems, programmable logic controllers (PLCs) etc. These loops have the advantages of simplicity and noise immunity, and have a large international user and equipment supplier base.

BK5000T has 4-20mA current loop transmit capability for remote monitoring. With the two values of 4 & 20 mA representing 0–10000 microS of the range of measurement.



Figure 7: BK5000-T 4-20 mA Current Transmitter Wiring Diagram

4.2.4 RS485 WIRING (MODBUS RTU)

Modbus RTU is an open, serial (RS 485) protocol derived from the Master/Slave architecture. It is a widely accepted protocol due to its ease of use and reliability. Modbus RTU is widely used within Industrial Automation Systems (IAS). This wide acceptance is due in large part to MODBUS RTU's ease of use.

MODBUS RTU messages are a simple 16-bit CRC (Cyclic-Redundant Checksum). The simplicity of these messages is to ensure reliability. Due to this simplicity, the basic 16-bit MODBUS RTU register structure can be used to pack in floating point, tables, ASCII text, queues, and other unrelated data.

BK5000T has a serial port (RS-485) to communicate with PLCs, SCADA SYSTEMs, other monitoring devices etc. Process Value, Set Point and Alarm Set Value can be read using this port and MODBUS RTU protocol.

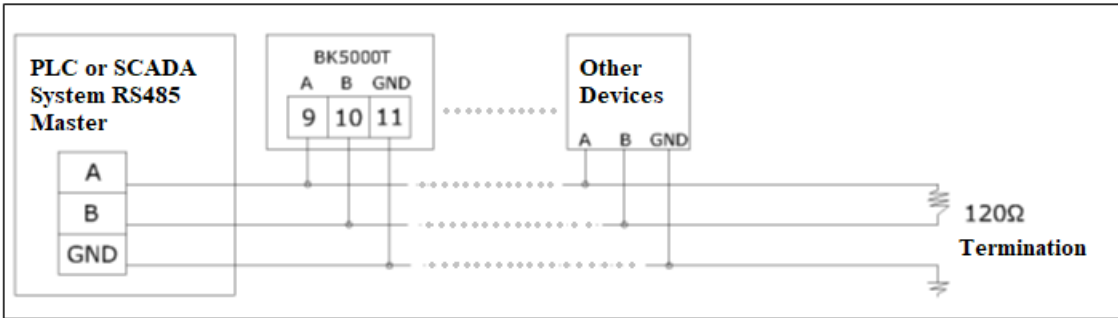


Figure 8: BK 5000-T RS 485 Wiring Diagram

5. COMMISSIONING



Warning!

At the all phase inputs of the controller, must be used 1A fuse (non-delay type).

Probe cable screen (shield) must be connected to only $\frac{1}{\equiv}$ terminal of the probe.

Avoid connecting any other earth to 3rd terminal input of the controller and must not connected with the other earth on the clipboard.

Not: For wiring of BD 5600-T Conductivity Probe, please refer to “BD 5600-T Conductivity Probe Installation and Operating Instructions”

- Be sure that all phase and neutral ends are connected to the right terminals
- 1A fuse must be used in all phase inputs of the controller (fast acting type).
- The probe cable must be shielded.
- A separate ground must not be connected to terminal 3 of the controller.
- Check alarm function and valve open function from TEST menu and be sure they are working correctly.

Menu —> Valve Relay Test

Menu —> Alarm Relay Test

- After system reaches its nominal pressure and temperature, it should be taken sample water from boiler and by measuring the samples conductivity, BK 5000-T TDS Blowdown Controller should be calibrated.
- For proper measurement, it is recommended to use VIRA NK-20 Sample Cooler.

6. FUNCTIONS and CONFIGURATIONS

6.1 Display Definitions and Button Functions

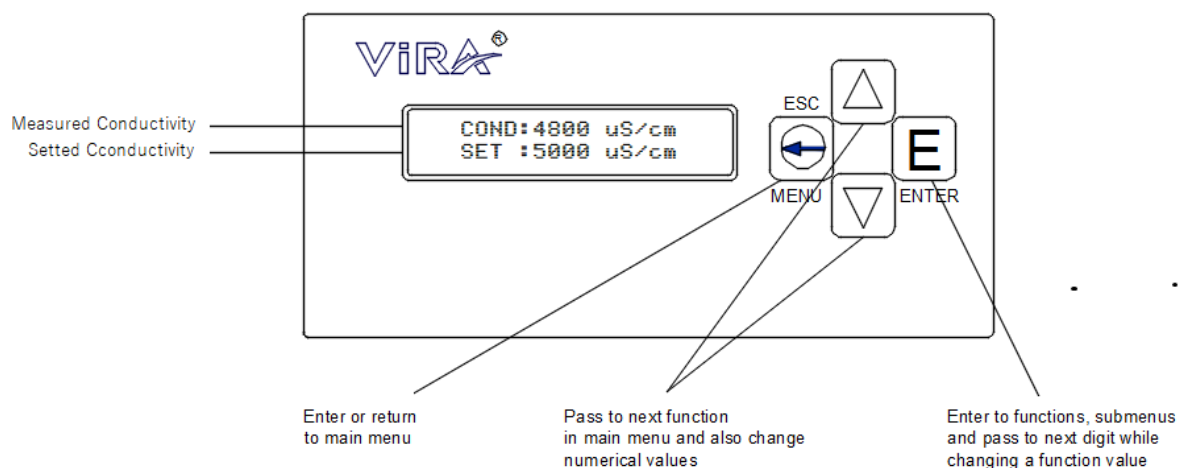


Figure 9: Front Panel and Buttons Definition

MENU (ESC) Button is used to enter the **MAIN MENU** or escape to the **MAIN MENU**.

UP Button is used to pass to next setting in the main menu and also is used to **increase** the numerical values.

DOWN Button is used to pass to next setting in the main menu and also is used to decrease the numerical values.

ENTER Button is used to enter the menus and also is used to record adjusted values.

6.2 Changing Functions and Settings

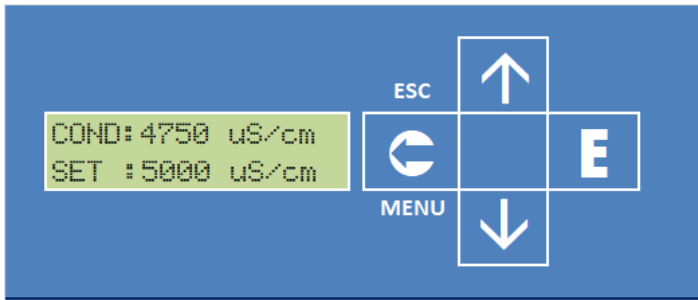


Figure 10: Main Screen

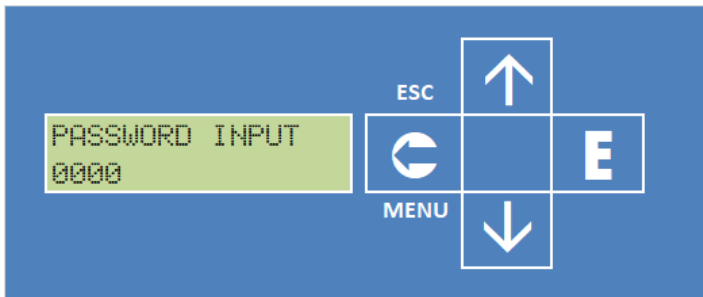


Figure 11: Password Screen

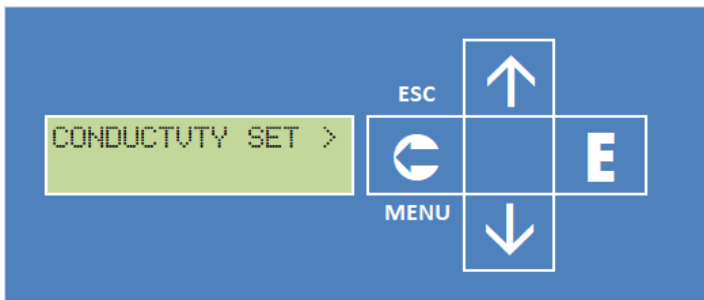


Figure 12: First Menu Screen

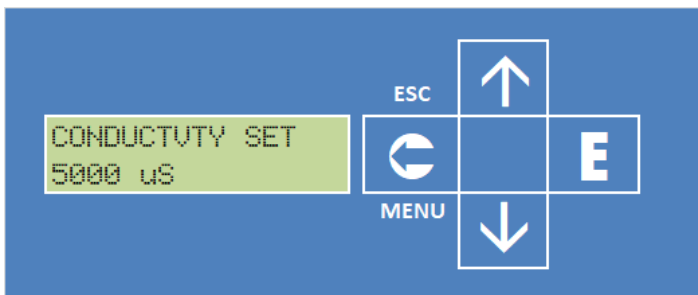


Figure 13: Parameter Changing Screen

When the device is powered up, the screen appears like the figure on the side. This is the **MAIN SCREEN** of BK 5000T. On the display, upper row shows instant conductivity value and lower row shows preset conductivity value.

To enter the **MAIN MENU**, press the **MENU** button one time. Using **UP** and **DOWN** button input the password value and press **ENTER** BUTTON. If the password is correct, the controller switches to setting mode. (Default password is '0000')

Next screen is '**CONDUCTIVITY SETTING**'. When the **UP / DOWN** buttons pressed, next parameter will be shown on the screen or pressed **ENTER** button; '**CONDUCTIVITY SET**' parameter can be changed.

The parameter value is changed with the **UP** and **DOWN** buttons and then pressed the **ENTER** button to save the new parameter value. Press the **ESC** button to exit without saving new value.

6.2.1 CONDUCTIVITY SET

```
CONDUCTIVITY SET  
5000  $\mu$ S
```

Boiler water conductivity desired value. If the conductivity of water reaches to set value, the relay2 (Valve control relay) is switched on and the valve opens.

6.2.2 CONDUCTIVITY HYSTERESIS SET

```
HYSTERESIS SET  
0200  $\mu$ S
```

This function is used to prevent fluctuations of the valve when opening and closing. It can be selected 4-5% of set conductivity value

6.2.3 ALARM SET

```
ALARM SET  
8000  $\mu$ S
```

BK 5000T provides ALARM relay output (Relay1) when conductivity level gets over the value adjusted with this function.

6.2.4 ALARM HYSTERESIS SET

```
ALARM HYS. SET  
0300  $\mu$ S
```

This value is used to prevent the alarm relay from frequently switching on / off. 4-5% of the set alarm set value can be selected.

6.2.5 CONDUCTIVITY CALIBRATION

```
CALIBRATION  
4993  $\mu$ S
```

This function is used to define water's conductivity value taken properly from boiler. When taking water sample from boiler and calibrating the controller, the boiler must be at operating pressure and temperature. To take more appropriate sample for measuring and calibrating, ViRA NK Sample Cooler is recommended.

While calibrating to the new value, after the new value entered, to complete the calibration, must wait for 30 seconds. During this time, the following screen appears.

```
CALIBRATION  
C=4993 30
```

6.2.6 CHANGE PASSWORD

```
CHANGE PASSWORD  
0000
```

To obstruct unauthorized interferences, BK 5000T has password protection. This function is used to change the password of the device.

6.2.7 VALVE RELAY TEST

```
VLVE RELAY TEST
```

This function is used to test the Valve Relay (Relay2) working properly. If pressed **ENTER** button, the valve remains open for 15 seconds and appears the following screen.

```
VLVE RELAYTEST  
15
```

6.2.8 ALARM RELAY TEST

```
ALRM RELAYTEST>
```

This function is used to test the Alarm Relay (Relay1) working properly. If pressed **ENTER** button, the Relay1 switches on for 5 seconds, appears the following screen and then switched off.

```
ALRM RELAY TEST  
5 s
```

6.2.9 LANGUAGE

```
LANGUAGE >
```

This function is used to choosing the language. The language is selected by using the **UP** and **DOWN** buttons. The selected option is saved by using **ENTER** button. Two options in language selection are Turkish (Türkçe) and English.

```
LANGUAGE  
ENGLISH
```

```
DİL  
TÜRKÇE
```

6.2.10 TEMPERATURE

```
TEMPERATURE >  
0000
```

This function shows the temperature of water. When the **ENTER** button pressed, appears following screen.

```
TEMPERATURE  
165.4 C
```

6.2.11 PROBE DATA

```
PROBE DATA>
```

This menu shows the signal coming from the probe. This function is used to check whether the probe works normally. When the **ENTER** key is pressed, the following screen appears. Values may vary depending on water temperature and conductivity.

```
V:2000 I:0206  
T:53124
```

6.2.12 VERSION

This function shows the **VERSION** of current software. When the **ENTER** button pressed, appears following screen.

```
VERSION  
1.01
```

6.2.13 SERVICE SETS

This function is used to set device on the factory. End-user cannot use this menu.

```
SERVIS SET>
```

6.2.14 MODBUS SLAVE ADDRESS SETTINGS

If the controller will be connected PLC or SCADA systems, a slave address must be assigned to the controller. Each slave (BK5000T and/or other slave devices) in a network is assigned a unique unit address from 1 to 247.

```
MODBUS SLV ADDR  
0001
```

6.2.15. MODBUS BAUDRATE (Veri Hız) SETTINGS

This function is used to set communication speed. Modbus baudrate is set from 1 to 4.

Baud RateTable :

0	1200
1	2400
2	4800
3	9600
4	19200

MODBUS BAUDRATE
3

7. MAINTANANCE



Warning!

Please make sure to remove the main supply before detach the device. Otherwise this may cause damage to the product, personal injuries or even death.

When any fault situation occurs or maintenance is necessary, please contact with “**Vira Isi Service Department**”.

Vira Isı ve Endüstriyel Ürünler A.Ş.

Metal İş Sanayi Sitesi 11. Blok No: 37-39

İkitelli / İSTANBUL

Tel : 0 212 549 57 70

Fax : 0 212 549 48 58

E-mail : info@viraisi.com

: servis@viraisi.com

Web : www.viraisi.com