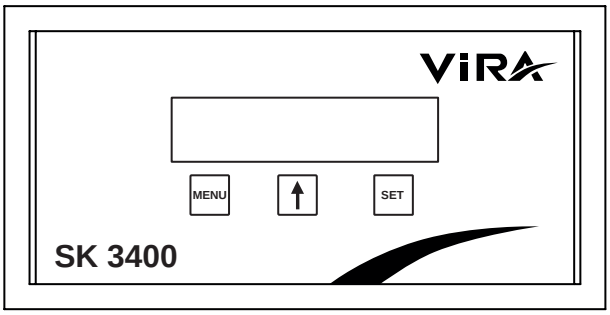
SK 3400
Modulated Level System Controller

Installation, Operating and Maintenance Instructions



- Safety Information
- General Information
- Mechanical Installation
- Electrical Installation
- Connection Types
- Commissioning
- Troubleshooting
- Technical Information
- Technical Assistance

Local regulations may restrict the use of this product to below the conditions quoted.
In the interests of development and improvement of the product, we reserve the right to change the specification without notice.

EN
ENGLISH

1. Safety Notes

The equipment may only be installed, electrically connected and commissioned by suitable persons with the relevant instruction/training.

Maintenance and modification may only be performed by authorised staff who have undergone specific instruction/training.

The terminal blocks of the equipment are live during operation!

There is a risk of serious injury due to electrical shock!

Always cut off the power supply to the equipment before installing, removing or connecting terminal blocks!

The name plate specifies the features of the equipment. Do not comission or operate any item of equipment that does not have its own specific name plate.

1.1 Directives and Standards

The SK 3400 level controller, in combination with SD 2400 level probe, is type approved to the TUV. The TUV "EN 12952 and EN 12953 " describes the requirement for water level control and limiting equipment.

LV (Low Voltage) Directive and EMC (Electromagnetic Compability)

The equipment conforms to the requirements of the Low Voltage Directive 2014/35/EU, the EMC Directive 2014/30 EU.

ATEX (Atmosphere Explosible)

The equipment must not be used in potentially explosive atmospheres, in accordance with European Directive 2014/34/EU.

2. General Information

The Vira D-SK 2400 level controller can be used in conjunction with an SD 3400 level probe as an interval (on-off) level control system in pressurised steam and hot-water plants and in condensate and feedwater tanks. The SK 3400 level controller also indicates two alarm states, which can be configured as minimum or maximum.

2.2 Function

As steam is generated, the water in the boiler evaporates and water must be added with a feed water pump to maintain the level of the boiler. Water should be kept at the right level to avoid damaging the boiler and to ensure efficient operation.

For this reason, a level control system that monitors and controls the water level, detects whether the water level is low and gives an alarm, performs the necessary actions to shut off the feed water pump or burner.

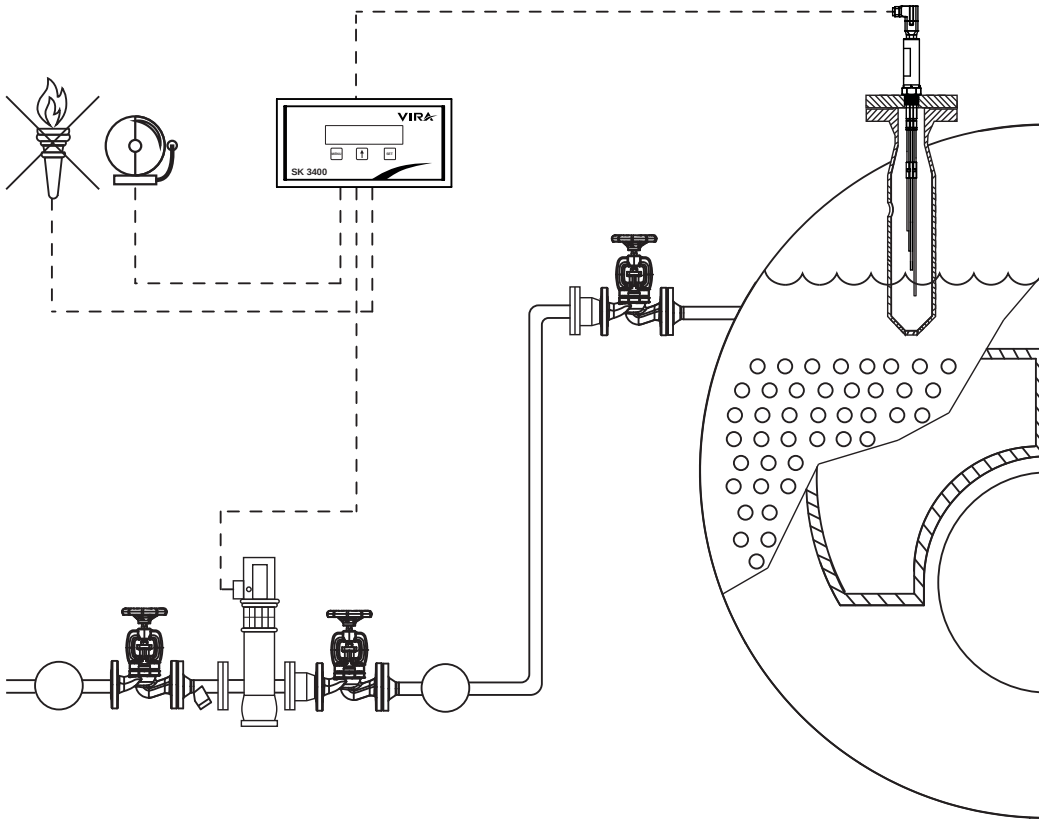


Figure 1 : SK 3400 System Application

The level controller operates as an interval (on-off) level control system, and also indicates when the water reaches two independent alarm states, which can be configured as minimum or maximum.

The switchpoints for water level control and for the minimum or maximum levels are determined by the length of the respective probe tips.

For water level control, the level controller recognises whether the probe tips are immersed or out of the water and, depending on which function is set, it switches the controller output contact, which then turns the feedwater pump on or off .

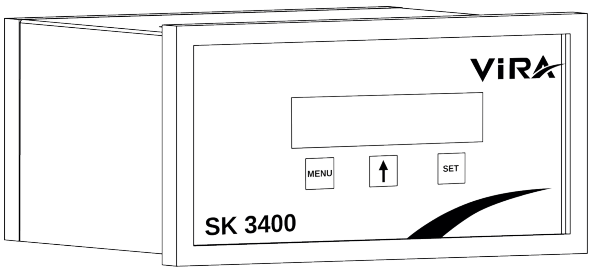


Figure 2 : Perspective View of SK 3400

Typical Applications

- Pressurized steam systems
- Hot-Water plants
- Condensate and feedwater tanks

2.2 Approvals

The SK3400 complies with Electromagnetic Compatibility Directive and all its requirements. This product is suitable for industrial environments. A fully detailed EMC assessment has been made and has the reference number A 0442 21143 00 EY.

The SK3400 complies with the Low Voltage Directive (2014/35/EU) by meeting the standards of:

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

• Water level designation of a steam boiler can be applied like shown in figure below.

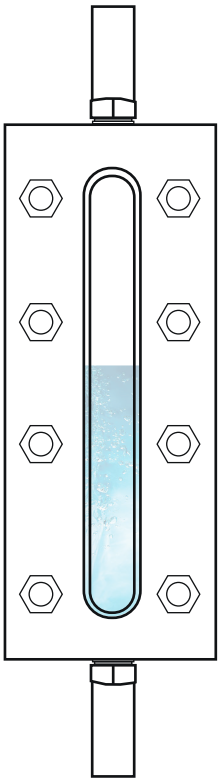


Figure 3 : Example Water Level Designation in Modulating Level Control System

Level defined 0%	: Lowest level that is wanted to be detected by probe. (Probe Min Level)
Level defined 100%	: Highest level that is wanted to be detected by probe. (Probe Max Level)
Set point	: Reference water level that is wanted to be stable.
Control band	: Range of water that is wanted to be stable.
Low alarm	: Water level that is wanted to take low alarm signal.
High alarm	: Water level that is wanted to take high alarm signal.

3. Mechanical Installation

3.1 Dimensions

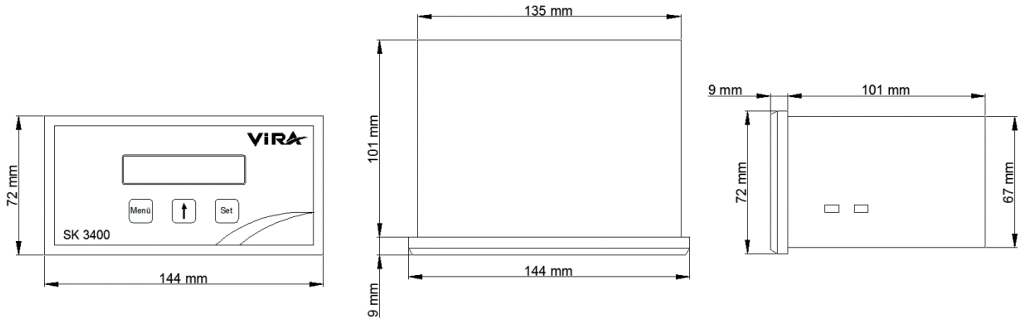


Figure 4 : SK 3400 Modulating Level Controller Case Dimensions

3.2 Panel Mounting of Enclosure

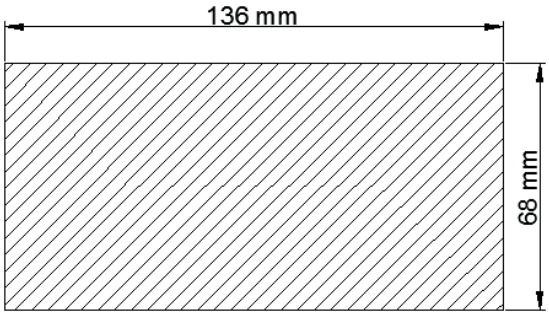


Figure 5 : Panel Cut Out Dimensions of SK 3400 Modulating Level Controller

3.3 Name Plate

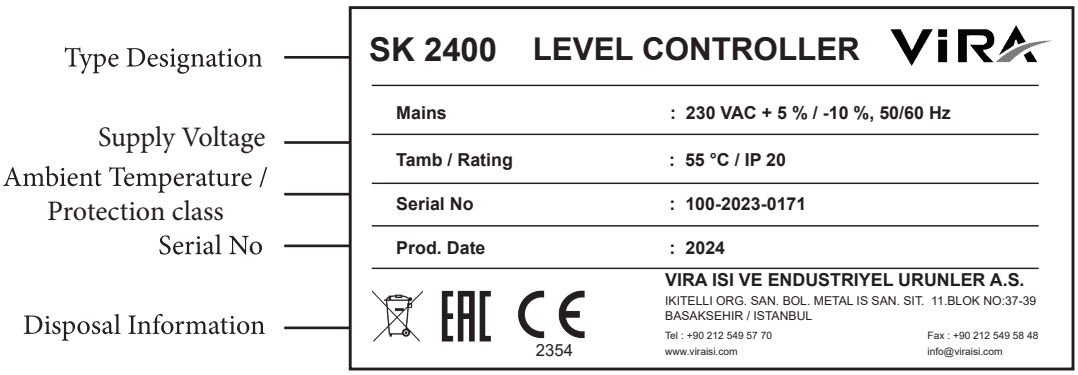


Figure 6 : SK 3400 Name Plate

4. Electrical Installation

4.1 Wiring Diagram

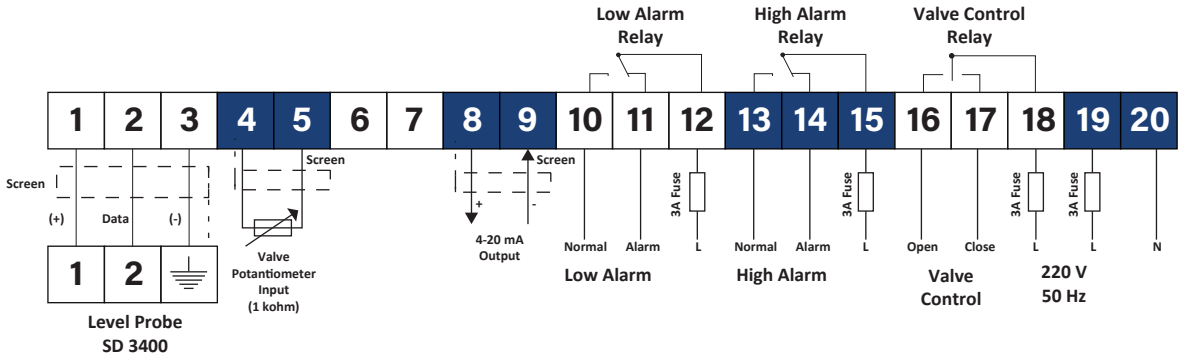


Figure 7 : SK 3400 Modulating Level Controller Wiring Diagram

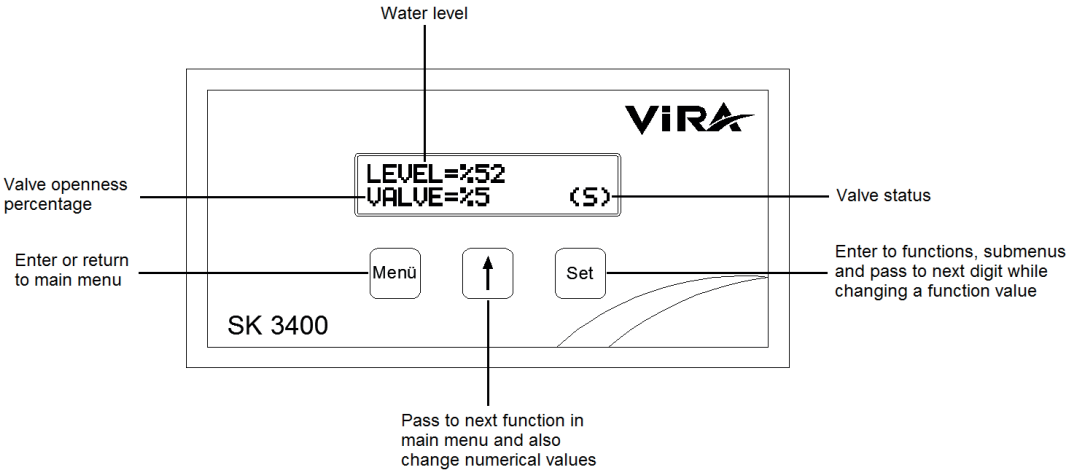
Item	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Table 1 : Wiring Diagram Index

At the all phase inputs of the controller, must be used 3A fuse (non-delay type). Probe cable screen (shield) must be only connected to earth ⏚ terminal of probe (Figure 7). Controller side of the screen must be left unconnected. Avoid connecting any other earth to 3rd terminal input and must not connected with the other earth on the clipboard.Valve potentiometer cable screen (shield) must be only connected to 4th terminal of controller (Figure 7). Valve potentiometer (actuator) side of the screen must be left unconnected.

Note: For wiring of SD 3400 Capacitance Level Probe, please refer to "SD 3400 Capacitance Level Probe Installation and Operating Instructions" and for wiring of BKA 3400 Level Control Valve Actuator, please refer to "BKV 3400 Level Control Valve Installation and Operating Instructions".

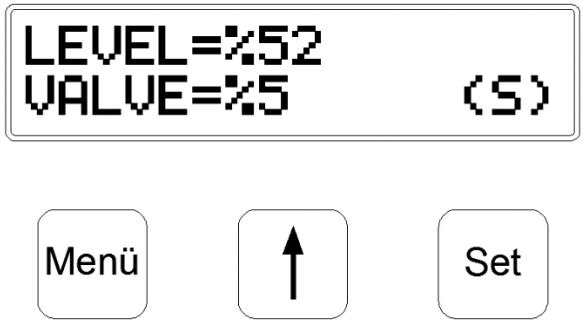
5. FUNCTIONS and CONFIGURATIONS



Menü button is used to enter main menu or return to main menu.

↑ button is used to pass to next function in main menu and also is used to change the numerical values

Set button is used to enter to functions, submenus and is used to pass to next digit while changing a functions value.



The screen seen above is the main screen of SK 3400. On display, upper row shows water level and lower row shows valve openness percentage.

(S) Valve is stable at its current position.

(+) Valve is being opened.

(-) Valve is being closed.

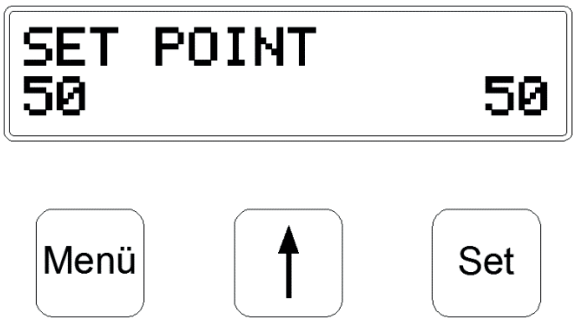
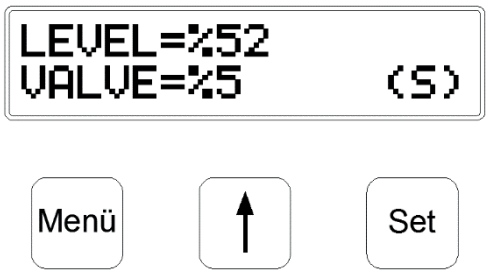


Figure 8: Example Screen Image of a Function Menu

To access the main menu, press and hold Menü button during 3 seconds. ↑ button is used to pass to next function while on main menu. To enter a function Set button is used. When enter a function, ↑ button is used to change digits. To pass to next digit Set button is used. To save the changed function value, press Set button after the last digit is changed. To return to main menu without saving changed function value, Menü button is used.

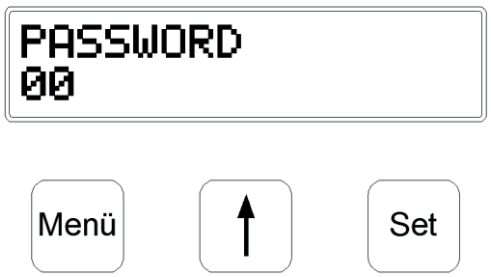
5.2 Changing Functions and Configurations

5.2.1. Startup Screen



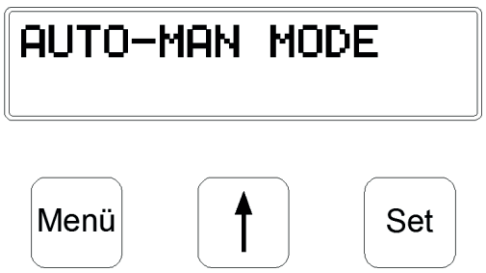
When device is powered, the screen likes the figure on the left. To enter the main menu, press and hold Menü button during 3 seconds.

5.2.2. Password

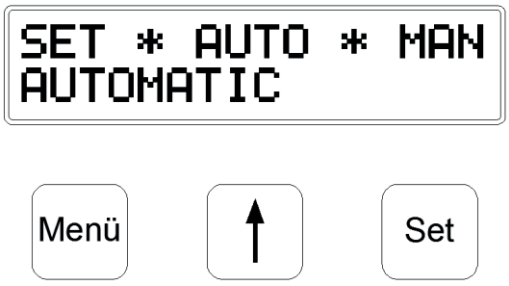


To obstruct unauthorized interferences, SK 3400 has password protection. ↑ button changes each digit and Set button passes to next digit. After change the last digit, Set button accepts the password and if it is true, it automatically enters the main menu.

5.2.3. Auto-Man Mode



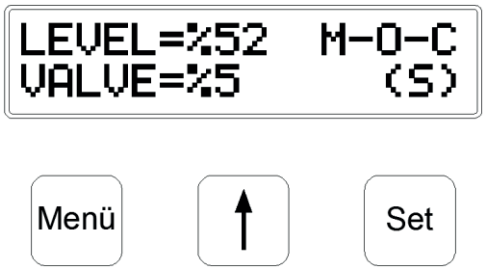
This function is used to set the operating mode of SK 3400. There are two operating modes; AUTOMATIC and MANUAL. In automatic mode, valve is controlled full automatically by SK 3400. In manual mode, user controls valve manually by using SK 3400. Press Set button to enter to function menu.



Menü (SET) Save changes and return to main menu.

(AUTO) Automatic operating mode.

Set (MAN) Manual operating mode.



When manual mode is active, main screen is like the figure on the left. To control the valve and Set buttons are used.

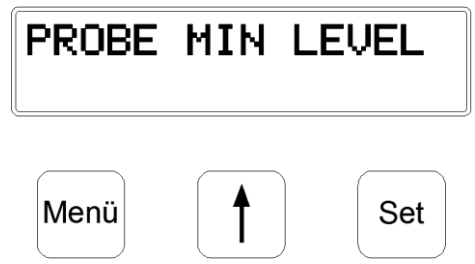
Menü (M) Enter to main menu.

(O) Open the valve.

Set (C) Close the valve.

While valve is opening " +" symbol is appeared and while valve is closing " -" symbol is appeared between the parentheses.

5.2.4. Probe Min Level

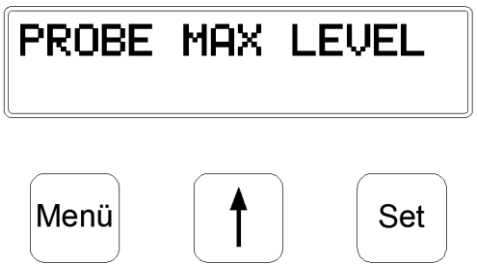


This function is set the lowest water level (level defined 0%) that is wanted to be detected by probe.

Press Set button to enter to function menu.

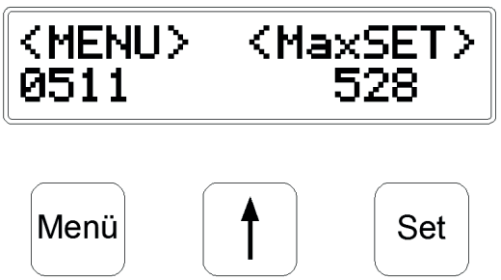
On this screen, number on the right shows previous PROBE MIN LEVEL value. Number on the left shows currently measured water level value. To set new probe min level, press Set button when desired water level value is reached. To return to main menu without saving the value, Menü button is used.

5.2.5. Probe Max Level



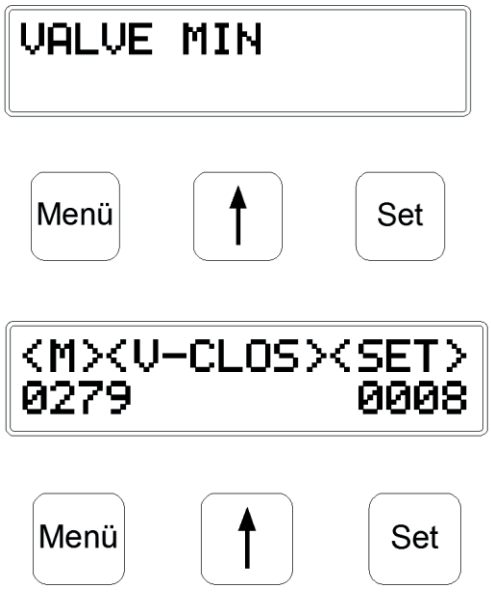
This function is set the highest water level (level defined 100%) that is wanted to be detected by probe.

Press Set button to enter to function menu.



On this screen, number on the right shows previous PROBE MAX LEVEL value. Number on the left shows currently measured water level value. To set new probe min level, press Set button when desired water level value is reached. To return to main menu without saving the value, Menü button is used.

5.2.6. Valve Min

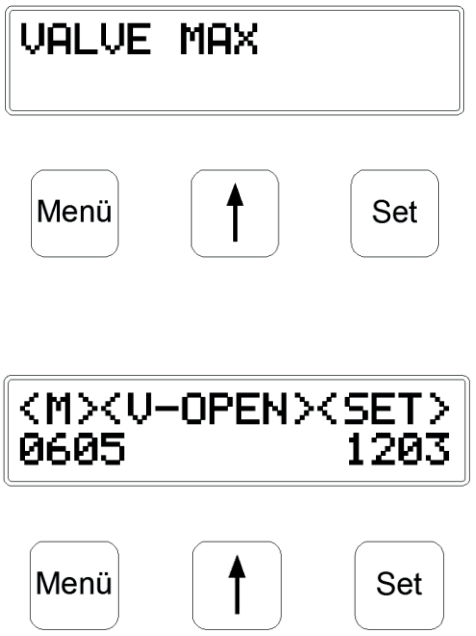


This function is used to set fully closed valve position.

Press Set button to enter to function menu.

On this screen, number on the right shows previous VALVE MIN value. Number on the left shows currently measured valve openness value. To set fully closed valve position, first press and hold button until valve is fully closed. When valve is fully closed, <SET> appears right of the screen. Make sure with your eyes that hand lever on the valve is not rotating any more. Then press Set button to set valve min value. To return to main menu without saving the value, Menü button is used.

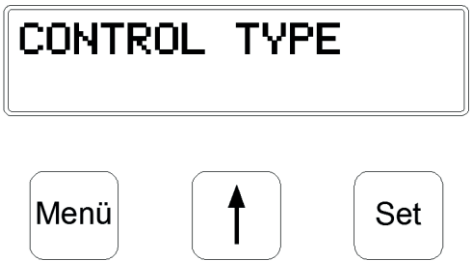
5.2.7. Valve Max



This function is used to set fully opened valve position. Press Set button to enter to function menu.

On this screen, number on the right shows previous VALVE MAX value. Number on the left shows currently measured valve openness value. To set fully opened valve position, first press and hold button until valve is fully opened. When valve is fully opened, <SET> appears right of the screen. Make sure with your eyes that hand lever o n the valve is not rotating anymore. Then press Set button to set valve min value. To return to main menu without saving the value, Menü button is used.

5.2.8. Control Type

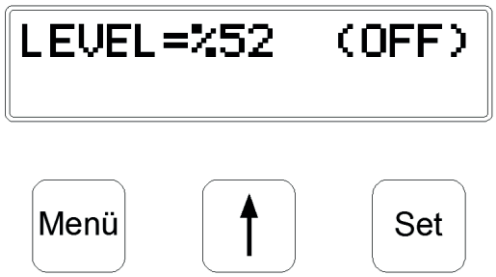


This function is used to set the control type of SK 3400. There are two control types; PROPORTIONAL and ON-OFF. In proportional control, water level is controlled by using signals sent to valve proportionally. In on-off control, valve/pump is controlled based on control band. If water level is under the control band, valve/pump is being opened/started. If water level is over the control band, valve/pump is being closed/stopped. Press Set button to enter to function menu.

Menü (SET) Save changes and return to main menu.

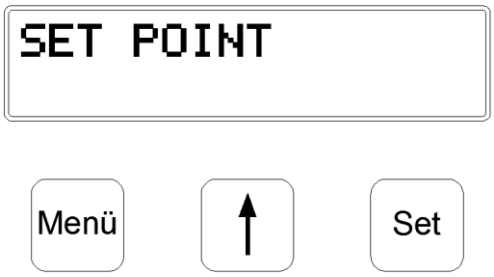
(PRO) Proportional control type.

Set (ON-OFF) On-off control type.

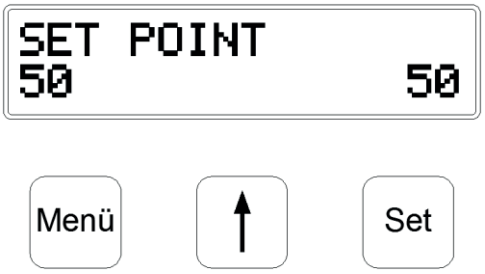


When on-off control type is active, main screen is like the figure on the left. When valve/pump is being opened/operated, (ON) appears left of the screen. When valve/pump is being closed/stopped, (OFF) appears left of the screen.

5.2.9. Set Point



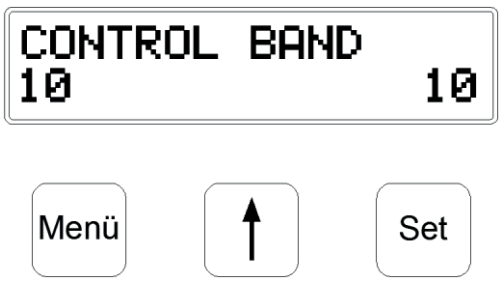
Set point is the referance water level that is wanted to be stable. This value is between PROBE MIN LEVEL (0% water level) and PROBE MAX LEVEL (100% water level) values. Press Set button to enter to function menu.



On this screen, number on the right shows the set point value adjusted previously. From the left part, new set point value can be entered. ↑ button changes each digit and Set button passes to next digit. After change the last digit, Set button saves the new value and returns to main menu. To return to main menu without saving the changed value, Menü button is used.

5.2.10. Control Band

This function is used to set the control range of water level. This value uses SET POINT as referance/base point. For example, if control band is set to 10%, water level is controlled between 55% and 45%. It is valid both proportional control and on-off control. Press Set button to enter to function menu.



On this screen, number on the right shows the control band value adjusted previously. From the left part, new control band value can be entered. ↑ button changes each digit and Set button passes to next digit. After change the last digit, Set button saves the new value and returns to main menu. To return to main menu without saving the changed value, Menü button is used.

5.2.11. Low Alarm

SK 3400 gives low alarm relay output when boiler water level is critically low. Press Set button to enter to function menu.

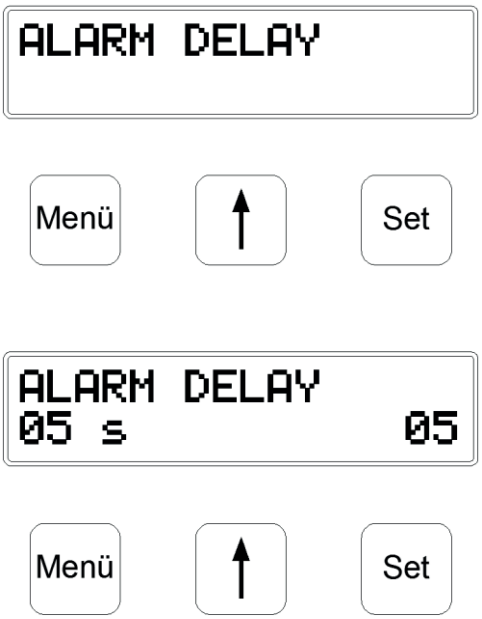
On this screen, number on the right shows the low alarm value adjusted previously. From the left part, new low alarm value can be entered. button changes each digit and Set button passes to next digit. After change the last digit, Set button saves the new value and returns to main menu. To return to main menu without saving the changed value, Menü button is used.

5.2.12. High Alarm

SK 3400 gives high alarm relay output when boiler water level is critically high. Press Set button to enter to function menu.

On this screen, number on the right shows the high alarm value adjusted previously. From the left part, new high alarm value can be entered. button changes each digit and Set button passes to next digit. After change the last digit, Set button saves the new value and returns to main menu. To return to main menu without saving the changed value, Menü button is used.

5.2.13. Alarm Delay

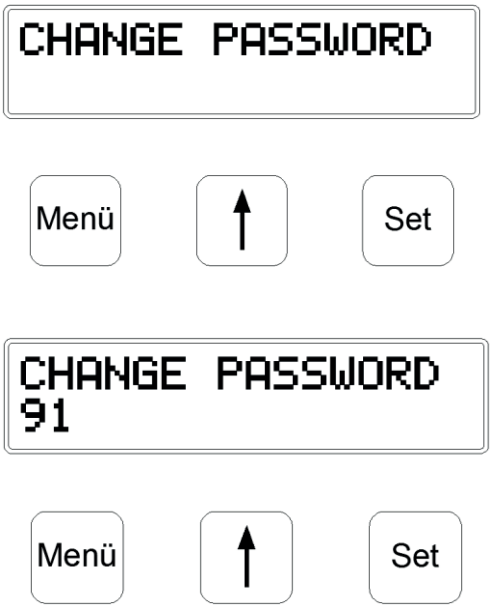


This function is used to avoid wrong alarms caused by water flactuations. Alarm delay displays in seconds.

Press Set button to enter to function menu.

On this screen, number on the right shows the alarm delay time adjusted previously. From the left part, new alarm delay time can be entered. button changes each digit and Set button passes to next digit. After change the last digit, Set button saves the new value and returns to main menu. To return to main menu without saving the changed value, Menü button is used.

5.2.14. Change Password



To obstruct unauthorized interferences, SK 3400 has password protection. This function is used to change the password of device. Press Set button to enter to function menu.

button changes each digit and Set button passes to next digit. After change the last digit, Set button saves the new password and returns to main menu. To return to main menu without saving the changed value, Menü button is used.

Note: Please note the new password above or somewhere you want.

Default password	00
Changed password	

7. Troubleshooting

7.1 Diagnosis and troubleshooting

Please check the following before fault diagnosis:

Supply voltage: Is the level switch supplied with the voltage specified on the name plate?
Wiring: Does the wiring conform to the wiring diagram?
Probe: Do the probe tips have the correct length, and are they correctly assigned on the level controller?
For further diagnosis, please refer to the SD 2400 installation and operating manual.

7.2 High-frequency interference

High-frequency interference can be caused by out-of-phase switching operations. If such interference occurs and results in sporadic failure, we recommend taking the following action to suppress interference:

- Route the connecting cable to the level probe separately from power lines.
- Increase the distance from sources of interference.
- Check the connection of the screen to the central earthing point (CEP) in the control cabinet and in the probe connector.
- Suppress HF interference using hinged-shell ferrite rings.

7.3 Replacement of a " Out of Service" Unit

- Switch off the power supply and cut off power to the equipment.
- Remove terminal blocks from the back of the product.

7.4 Disposal

The equipment must be disposed of in accordance with statutory waste disposal provisions.

• In the event of faults that cannot be remedied with the aid of this manual, please contact our Technical Customer Service.

7.2 Fault Finding List For Troubleshooting

Leds does not light up - No function Fault Mains voltage is not applied The cartridge fuse has been triggered Electronic circuit board defective	**Remedy** Switch on power supply and wire equipment in accordance withthe wiring diagram Discard and replace defective fuse Replace circuit board
Pump switchpoint (low or high) has been reached - Incorrect function Fault The switching function has not been assigned correctly The electrode tips have been cut to the wrong length Dip switch position is not true	**Remedy** Identify electrode supply wires and reconnect the circuit board accordingly Change dipswitch positions accordingly.
Level below switchpoint "Low Level" - No function Fault The electrode tips have earth contact. The isolating valves of the external measuring pot are closed	**Remedy** Check and change position of installation, if necessary Open isolation valves
Switchpoint "High-Level" exceeded - No function Fault High level tip of the probe is not connected to controller's related terminal Sticky or damaged relay Electronic circuit board defective. The electrode body does not have earth connection to the boiler.	**Remedy** Check wiring and reconnect wires, if needed. Replace circuit board Clean seating surfaces and insert metal joint ring. Do not insulate compact system with hemp or PTFE tape!
Pump Relay - No function Fault Pump on and off tips of the probe is not connected to controller's related terminal Sticky or damaged relay Electronic circuit board defective The electrode body does not have earth connection to the boiler. External supplied contactor does not work.	**Remedy** Check wiring and reconnect wires, if needed. Replace circuit board Clean seating surfaces and insert metal joint ring. Do not insulate compact system with hemp or PTFE tape! Check external contactor, change if necessary.
High alarm switchpoint has been reached - Incorrect function Fault The switching function has not been assigned correctly The electrode tips have been cut to the wrong length Dip switch position is not true	**Remedy** Identify electrode supply wires and reconnect the circuit board accordingly Change dipswitch positions accordingly.
Low alarm switchpoint has been reached - Incorrect function Fault The switching function has not been assigned correctly The electrode tips have been cut to the wrong length Dip switch position is not true	**Remedy** Identify electrode supply wires and reconnect the circuit board accordingly Change dipswitch positions accordingly.
Low or High Alarm Relay - Incorrect function Fault The electrode insulation damaged The electrode tips have earth contact. (short-circuit)	**Remedy** Change electrode Check and change position of installation, if necessary
Fault The electrode body does not have earth connection to the boiler	**Remedy** Clean seating surfaces and insert copper joint ring Do not insulate probe body with hemp or PTFE tape!

Table 2 : Troubleshooting Table

8. Technical Information

Supply Voltage	220 VAC (+5% /- 10%), 50/60 Hz
Fuse	external 0.5 A (semi-delay)
Power Consumption	2 W
Connection of Level Probe	4 x inputs for SD 2400 level probe
Probe Tip Voltages	5 Vss
Sensitivity	> 10 µS/cm (water conductivity at 25 °C),
Outputs	2 floating changeover contacts, 12A, 250VAC, cosφ=1, 85°C Low/High). De-energizing delay 3 seconds (Low/High alarm) 1 floating open/close contact, 12A, 250VAC, cosφ=1, 85°C (pump). Contacts requires an external 3A fuse for protection.
Displays and Controls	1 x yellow “Power” LED - for indicating the supply voltage state 1 x red “Alarm 1 (High)” LED for indicating a High alarm 1 x red “Alarm 2 (Low)” LED for indicating a Low alarm 1 x green “Pump” LED for indicating the ON/OFF pump status 1 x 5-pole dip switch for configuration.
Housing	Housing material, base: black polycarbonate Terminal strips can be removed separately
Electrical Safety	Degree of contamination 2 for installation in control cabinet with degree of protection IP 54, fully insulated. Overvoltage category III.
Degree of Protection	Housing: IP 20 to EN 60529
Weight	approx. 0.5 kg
Ambient Temperature	0 °... 55 °C
Transport Temperature	–20 ... +80 °C
Storage Temperature	–20 ... +70 °C
Relative Humidity	max. 95%, no moisture condensation
Approvals	Tüv type approval, EMC and LVD, Machine Directive Conformity

Table 3 : Technical Informations

9. Technical Assistance

For technical assistance or service requests, please directly contact Vira service center by making a phone call or sending an e-mail to **servis@viraisi.com.**

Return faulty or service items to Vira itself or authorized agency in your area. Ensure all items are suitably packed for transit (preferably in the original cartons).

Please provide the following information with any equipment being returned:

- Your name, company name, address and telephone number, order number and invoice and return delivery address.
- Description and the serial number of equipment.
- Full description of the fault or repair required.
- If the equipment is being returned under warranty, please indicate the date of purchase.

VİRA ISI VE ENDÜSTRİYEL ÜRÜNLER A.Ş

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